

Appendix A - CaberNet Related Projects

This appendix lists all the projects related to the main themes of the vision document in which partners have been involved in the last 4 years. Section A.1 lists all projects in the alphabetical order of their short names/abbreviations/acronyms. Section A.2 provides brief information about each of these projects.

A.1 Table of the Projects

| | |
|---------------|------------------------------------------------------------------------------------------------------------------------------------|
| 2WEAR | A Runtime for Adaptive and Extensible Wireless Wearables |
| @HA | At Home Anywhere |
| Adapt | Middleware Technologies for Adaptive and Composable Distributed Components |
| ADVISES | Analysis Design and Validation of Interactive Safety-critical and Error tolerant Systems |
| AGILE | Architectures for Mobility |
| AIMS | Action, Interaction and Multimedia Smart Spaces |
| Albatross | Wide Area Cluster Computing |
| ALICE | Architecture for Location-Independent Computing |
| ALPINE | Application Level Programmable Inter-Network Environment |
| Amoeba | |
| AMSD | Accompanying Measure on System Dependability |
| ANDROID | Active Networks Distributed Open Infrastructure Development |
| ARION | An Advanced Lightweight Architecture for Accessing Scientific Collections |
| AS23 | Advanced Testing Techniques for Complex Systems |
| AutoMed | Automatic Generation of Mediator Tools for Heterogeneous Database Integration |
| AVANCE | Fault-tolerance in Audio/Video Communications via Best Effort Networks |
| BASS | Broadband Access Services Solution |
| BISON | Biology Inspired Techniques for Self-Organization in Dynamic Networks |
| BMAN | |
| CAMELEON | Context Aware Modelling for Enabling and Leveraging Effective interactiON |
| CAMS | Context-Aware Mobile Services |
| CANU | Communication in Ad-Hoc Networks for Ubiquitous Computing |
| CARES | Certification Assessment Requirements for ESA Software |
| CARMEN | Context-Aware Multimedia Environment for Narrative |
| CarTALK2000 | |
| CASCO | Investigating Context Aware Support for Cooperation Applications in Ubiquitous Computing Environment |
| CAUTION++ | Capacity and Network Management Platform for increased Utilisation of Wireless Systems of Next Generation |
| CAVEStudy | |
| CHISEL | |
| COMCAR | Communication and Mobility by Cellular Advanced Radio |
| COMIT | Convergence of MHEG and Internet Technologies |
| CORTEX | Co-operating Real-Time Sentient Objects: Architecture and Experimental |
| COW | Cross-Organizational Workflow Management |
| CryoSat- ISVV | CryoSat- Independent Software Verification & Validation |
| Crystal-L | Correct Modular Group Communication Middleware |
| CUCHULAINN | |
| CYCLADES | An Open Collaborative Virtual Archive Service Environment |
| DANCE | Dynamic Application Oriented Network Services |
| DARP | Defence Aerospace Research Partnership on High Integrity Real-Time Systems |
| DBench | Dependability Benchmarking |
| DCSC | Dependable Computing Systems Centre |
| DEAR-COTS | Distributed Embedded ARchitectures using COTS components |
| DEEM | Dependability Modeling and Evaluation Tool for PMS A tool for the dependability modeling and evaluation of multiple phased systems |
| DEGAS | Design Environments for Global ApplicationS |

| | |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
| DepAuDE | Dependability for Embedded Automation Systems in Dynamic Environments with Intra-site and Inter-site Distribution Aspects |
| DHX | Digital Ecological and Artistic Heritage Exchange |
| DIRC | Interdisciplinary Research Collaboration in Dependability of Computer-Based Systems |
| DISCS | Diversity In Safety Critical Software |
| DISPO | DIverse Software PrOject |
| DISPO-2 | DIverse Software PrOject |
| DISRS | A Distributed Infrastructure for Secure Reputation Services |
| DIT | Dependable Intrusion Tolerance |
| DOTS | Diversity with Off-The-Shelf Components |
| DRAGON | Database Replication based on Group Communication Primitives |
| DSoS | Dependable System of Systems |
| ESSL | Enhanced SSL |
| EYES | Energy efficient sensor networks |
| FABRIC | Federated Applications Based on Real-time interacting Components |
| FESTIVAL | Fertilizing distributEd Systems To support cooperatIVe AppLIcations |
| FIRST | Flexible Integrating Scheduling Technology |
| FIT | Fault Injection into Time Triggered Architecture |
| FLARE | Framework for Location-aware Augmented Reality |
| FORCES | Forum for Creation and Engineering of Telecommunications Services |
| FORWARD | A Future of Reliable Wireless Ad hoc networks of Roaming Devices (part of Next Wave Technologies and Markets) |
| GRASS | GeneRic Architecture for Smart Spaces |
| GLOSS | GLObal Smart Spaces |
| GOPI | A Generic Object Platform Infrastructure |
| GRIDKIT | A Reflective Component-based Implementation of the Open Grid Services Architecture (OGSA) |
| Hello | H.323 telephony over QoS capable networks |
| HYSYS | Modular Design of Hybrid Systems |
| Ibis | Efficient Java-based Grid Computing |
| I-Cities | Information Cities |
| iTransIT | |
| ITO | Information Technology Online |
| JETS | Journey Estimation Time Systems |
| Jgroup | |
| LandMARC | Lancaster and Microsoft Active Research Collaboration |
| LicenseScript | A language and framework for calculating licenses and information over constrained domains |
| LinkMe | LinkMe: Distributed Link Services for Mobile Environments |
| MAFTIA | Malicious and Accidental Fault Tolerance for Internet Applications |
| Mansion | A Large-scale Distributed Mobile Agent System |
| Manta | Fast Parallel Java |
| MAVA | Multimedia Document Versatile Architecture |
| MICS | Mobile Information and Communication Systems |
| Mickado | Mobile Calculi based on Domains |
| Mole | |
| MOTION | Multicast Communication |
| MP6 | Security Models and Policies for Healthcare and Social Information and Communication Systems |
| myGrid | |
| Neko | A Single Environment to Simulate and Prototype Distributed Algorithms |
| NET | Network Emulated Testbed |
| NetEmu | Real-time Emulation of Computer and Communication Networks |
| NETKIT | A Reflective Component-based Infrastructure for Programmable Networks |
| NEXT TTA | High-Confidence Architecture for Distributed Control Applications. |
| Nexus | An Open Global Infrastructure for Spatial-Aware Applications |
| NIPON | User based IP Accounting |

| | |
|-------------|----------------------------------------------------------------------------------------------------------------|
| NUSS | Notebook University of Stuttgart |
| ObjectWeb | |
| OGSA-DAI | Open Grid Services Architecture Data Access and Integration |
| OpenORB | The Role of Reflection in the Design of Middleware Platforms |
| Orca | The Orca Parallel Programming Language |
| Ozone | New Technologies and Services for Emerging Nomadic Societies |
| PAST | A large-scale, peer-to-peer archival storage facility |
| PATIA | Adaptive Management System for Distributed Web Services |
| PerSL | Pervasive Software Licensing |
| PETERS | Pre-Exploitative Tools for Evaluating Reliability of Software |
| Pin&Play | Assessment of a Network Technology that connects Smart Objects through Surfaces to which they are pin-attached |
| PISEIA | Infrastructure Simulation, Evaluation and Implementation Architecture |
| Polyander | Language Based Policy Specification, Analysis and Deployment for Large-scale Systems |
| PolyNet | Policy Based Management of Adaptive Networks |
| PONDS | Policy Notation for Distributed Systems |
| PRIDE | Integrated Design Environment for Dependable Systems |
| PRIME | Privacy and Identity Management for Europe |
| PROFUNDIS | Proofs of Functionality for Mobile Distributed Systems |
| PURTA | Precise UML for Real-Time Applications |
| RAMS | Reliability, Availability, Maintainability and Safety analysis of critical software |
| RAPID | Roadmap for Advanced Research in Privacy and Identity Management |
| Ravenspark | |
| Relate | Assessment of a Relative Positioning Technologies for Compositional Tangible User Interfaces |
| REMNUe | Advanced Real-time Multi-media and Networking Execution Platform and Development Environment |
| RIS | Dependability Engineering Network |
| R-Fieldbus | High Performance Wireless Fieldbus In Industrial Related Multi-Media Environment |
| SACS | Security Aspects of Distributed Component-Structured Software |
| SAHARA | Software Architectures for Heterogeneous Access Networks infrastructures |
| SCRIBE | A scalable group communication system |
| SECURE | Secure Environments For Collaboration Among Ubiquitous Roaming Entities |
| SegraVis | Syntactic and Semantic Integration of Visual Modelling Techniques |
| SeNDT | Sensor Networking with Delay Tolerance |
| SETTA | Systems Engineering for Time-Triggered Architectures |
| SFB 467 | Transformable Business Structures for Multi-Variant Serial Production |
| SHIMA | Integrated Modular Avionics for Small Helicopters |
| SISTER | |
| Smart-Its | Interconnected Embedded Technology for Smart Artefacts with Collective Awareness |
| SmartOffice | |
| SmartShelf | |
| SP4 | High Quality Software Architectures for Global Computing on Cooperative Wide Area Networks |
| STADY | Applied STatic and Dynamic verification of critical software |
| STATUS | Software Architecture that Supports Usability |
| STEAM | Scalable Real-Time Events and Mobility |
| TAPAS | Trusted and QoS Aware Provision of Application Services |
| TBMAC | Time Bounded Medium Access Control |
| TEASE | TElematics Architecture Study for Environment and Security |
| TeleMuM | Using Multimedia and Mobility to Improve Education in the Area of Telematics |
| Think | Think Is Not a Kernel |
| TRAFFIQS | Traffic Engineering and Resource Allocation for Further Improvements of QoS in Networks |
| UniTEC | UNIversal Trust-architecture for Electronic Commerce |

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|-----------|-------------------------------------------------------------------------------------------------------------------------------------|
| UTC | Rolls-Royce University Technology Centre for Systems and Software Engineering |
| UTC-NG | Urban Traffic Control – Next Generation |
| VENICE | Voice over IP, just Another Web Service |
| VIVIAN | Opening Mobile Platforms for the Development of Component-based Applications |
| VOSS | Validation of Stochastic Systems |
| V-Planet | The Virtual Planet |
| Weave.NET | Language-Independent Aspect-oriented Programming |
| WAND | Wireless Ad Hoc Network for Dublin |
| WhATT | |
| XOP | XenoServers Open Platform |
| | A Constructive Framework for Partial Specification |
| | Analysis and Evaluation of the Integration of Vision Systems over Industrial Local Area Networks |
| | Analysis and Implementation of a System for Parameters Measuring and Operation Controlling of Automotive Diesel Engines |
| | Analysis of Replication Techniques |
| | Anthill Project |
| | Automated Verification of Probabilistic Protocols with PRISM |
| | Automatic Validation of Web Services |
| | Automatic Verification of Randomized Distributed Algorithms |
| | Aware Goods |
| | BAE SYSTEMS Systems Integration Consortium |
| | Deriving Authority from Security Policy |
| | Design and Realization of Survivable Computer Systems and Networks |
| | Design Support Environments for Distributed Systems |
| | Development and Analysis of Fault Tolerant Distributed Applications Based on Time Triggered Architecture for Automotive Environment |
| | Distributed Expert Systems for Process Monitoring and Controlling: Alcoholic Fermentation Application |
| | Emergency Multimedia |
| | Equator |
| | Event Management for Mobile Users |
| | Formal analysis of security properties |
| | Formal Description and Model Checking of Web Service (WS) Protocols |
| | Global Computation using Events |
| | Globe |
| | High-Security Real Time Distributed System: Mobile Robot Control Application |
| | K-Components |
| | Living in a Smart Environment |
| | Micro-controller Based Control System for a Laser: Image Capturing Application of the Injection in an Automotive Diesel Engine |
| | Model-based security management |
| | Network-aware Programming and Interoperability |
| | Probabilistic Model Checking of Mobile Ad Hoc Network Protocols |
| | Semantics-Guided Design and Implementation of Group Communication Middleware |
| | Sentient Objects |
| | Sentient Traffic Simulation |
| | Traffic Engineering for Service-Integrated Networks with Real-time Communications |
| | Trust and Security Aspects of Distributed Component-Structured Software |
| | Validation of Graphically Elicited Multi-variate Probability Models for Safety Assessment of Computer-based Systems |
| | Verification of Quality of Service Properties in Timed Systems |
| | Workload based Caching and Scheduling Algorithms for Proxy Servers |
| | XenoServers |

A.2 Project Descriptions

For each project we have included the short name, the full title, the start and end dates, a list of partners, a brief abstract, a list of related chapters in the vision document and a brief list of main publications.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: 2WEAR

Project Title: A Runtime for Adaptive and Extensible Wireless Wearables

Start Date: January 2001

End Date: December 2003

URL: <http://2wear.ics.forth.gr/>

CaberNet members involved on the project: FORTH, Greece

Other Partners: Nokia; NRC ETHZ; ICS MASC

The Project:

The 2WEAR project explores the concept of a personal system that is formed by putting together computing elements in an ad-hoc fashion using short-range radio. Certain elements are embedded into wearable objects, such as a wristwatch and small general-purpose compute/storage modules that can be attached to clothes or placed inside a wallet. Others have the form of more conventional portable computers, like PDAs and mobile phones. Also, there are stationary elements as part of the environment, some of which are visible, such as big screens and home appliances, while others are not directly perceivable by the user, such as network gateways and backend servers. In this dynamic setting, where the user composes her computing system merely by bringing devices in proximity with each other, the project investigates a component-oriented communication architecture and adaptive runtime functions for the management of storage and user interface resources. A prototype wearable system with the above features has been implemented using various embedded and COTS devices.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- Runtime Support for a Dynamically Composable and Adaptive Wearable System, S. Lalis, A. Karypidis, A. Savidis and C. Stephanidis, in the IEEE International Symposium on Wearable Computing, NY, 21-23, October 2003.
- Supporting Adaptive Operation in a Dynamically Composable Personal System, S. Lalis, in the Workshop on European Research on Middleware and Architectures for Complex and Embedded Cooperative Systems, held in conjunction with the IEEE International Symposium on Autonomous Decentralised Systems (ISADS 2003), in Pisa, Italy, 9-11 April 2003.
- Continuity of interaction in nomadic interfaces through migration and dynamic utilisation of I/O resources”, A. Savidis, N. Maou, I. Pachoulakis, C. Stephanidis, UAIS Journal. Special issue on “Continuous interaction in future computing systems. 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: @HA

Project Title: At Home Anywhere

Start Date: November 2001

End Date: October 2005

URL: <http://wwwes.cs.utwente.nl/aha/>

CaberNet members involved on the project: Universiteit Twente, The Netherlands

Other Partners:

The Project:

The "At Home Anywhere" (@HA) project's focus is on in-home digital networking and its applications. @HA integrates home appliances, devices, sensors and actuators in one coherent distributed architecture, based on a common integrated network. This network supports different types of traffic (real-time and non-real-time) with different characteristics, such as entertainment, 'normal' data traffic, and sensing and control. Additionally, @HA researches the use of resource-lean embedded systems, so that even inexpensive small devices can be integrated. Main application area is ambient intelligence (or ubiquitous computing), specifically integrated home systems and health care ubiquitous computing. @HA is sponsored by NWO and by the IBM equinox program

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- J. Scholten, P. G. Jansen, L. Hop "Communicating Personal Gadgets" IEEE Consumer Communications and Networking Conf., published by IEEE Computer Society Press, Los Alamitos, California, held in Las Vegas, Nevada, Jan., 2004, to appear.
- P. G. Jansen, F. T. Y. Hanssen, M. E. Lijding "Scheduling of Early Quantum Tasks", 15th Euromicro Conf. on Real-Time Systems, published by IEEE Computer Society Press, Los Alamitos, California, held in Porto, Portugal, Jul., 2003, pp. 203-210.
- M. E. Lijding, P. G. Jansen, S. J. Mullender "Implementing and Evaluating Jukebox Schedulers Using JukeTools", 20th IEEE Symposium on Mass Storage Systems. IEEE Computer Society Press, Los Alamitos, California, held in San Diego, California, April 2003, pp. 92-96.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Adapt

Project Title: Middleware Technologies for Adaptive and Composable Distributed Components.

Start Date: 01.09.2002

End Date: 31.08.2005

URL: <http://adapt.ls.fi.upm.es/adapt.htm>

CaberNet members involved on the project: Universidad Politecnica de Madrid; University of Newcastle; Universita di Bologna; Swiss Federal Institute of Technology Zurich (ETHZ)

Other Partners: McGill University (McGill), University of Trieste (Trieste), Arjuna Technologies Ltd.

The Project:

The Adapt project is interested in developing support for the creation of adaptable web services. Web services have been proposed as a platform independent middleware solution that can interconnect components and applications across organizations. Two kinds of web services can be distinguished. Basic web services, those that do not rely on other services. And composite web services that invoke other web services to achieve their functionality. One of the main challenges being faced in the web service arena is how to achieve dynamically adaptable services.

That is, services that adapt themselves to the changing environment. The way to achieve this adaptability is different in basic and composite services. For basic services, a generic infrastructure to build dynamic web services is needed. This generic infrastructure will enable the creation of web services that can adapt dynamically (i.e., while being online) to events such as site failures, site recovery, reconfigurations and changes in the load. On the other hand, adaptability in composite services takes a different form. Composite service adaptability consists in adapting the composition to changes in its constituent services.

Additionally, what is especially interesting is the ability to predict the properties of the composition out of the properties of its constituent services.

List of relevant chapters:

Group Communication, Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

- R. Jimenez-Peris, M. Patiño-Martinez, G. Alonso. An Algorithm for Non-Intrusive, Parallel Recovery of Replicated Data and its Correctness. 21st IEEE Int. Conf. on Reliable Distributed Systems (SRDS 2002), pp. 150-159. Oct. 2002, Osaka, Japan.
- Kistijantoro, G. Morgan, S. K. Shrivastava and M.C. Little, Component Replication in Distributed Systems: a Case study using Enterprise Java Beans, 22nd IEEE/IFIP Symp. on Reliable Distributed Systems (SRDS2003), Florence, Oct. 2003.
- G. Masarin, A. Bartoli, V. Maverick. On-line consistency checking for replicated objects. Int. Conf. on Distributed Objects and Applications (DOA), 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ADVISES

Project Title: Analysis Design and Validation of Interactive Safety-critical and Error tolerant Systems

Start Date: 2002

End Date: 2006

URL: <http://www.dcs.gla.ac.uk/advises/>

CaberNet members involved on the project: ISTI-CNR, Italy

Other Partners:

University of Glasgow (UK), Risoe, TU Delft, University of Liege, University of Paderborn (Germany), University of Toulouse I, University of York (UK)

The Project:

'Human-error' is often cited as a contributory factor in the failure of many safety-critical systems. A critical barrier to such techniques is the need to integrate systems engineering, human factors, management studies and user interface design. This is a significant obstacle because there has been a mutual ignorance about complementary disciplines, a lack of methods in certain areas and a failure to integrate existing techniques. Our research will, therefore, focus on the following objectives: interdisciplinary training of young researchers including exposure to industrial strength problems, integration of existing systems engineering, management studies, human factors and HCI design techniques, development of new techniques for the development of interactive, safety-critical systems.

List of relevant chapters: Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AGILE

Project Title: Architectures for Mobility

Start Date: January 2002

End Date: December 2004

URL: <http://www.pst.informatik.uni-muenchen.de/projekte/agile/index-e.html>

CaberNet members involved on the project: CNUCE-CNR, Italy

Other Partners:

- Ludwig-Maximilians-Universität München, Institut für Informatik, Munich, Germany
- Università di Pisa, Dipartimento di Informatica, Pisa, Italy
- Università di Firenze, Dipartimento di Sistemi ed Informatica, Florence, Italy
- Istituto di Scienza e Tecnologie della Informazione "A. Faedo", Pisa, Italy
- ATX Software SA - ATX, Lisbon, Portugal (Contractor)
- Fundação da Faculdade de Ciências da Universidade de Lisboa, Lisbon, Portugal
- Warsaw University, Institute of Informatics, Warsaw, Poland

The Project:

Architectural approach to mobile systems developments based on a uniform mathematical framework supporting (i) sound methodological principles, (ii) formal analysis, and (iii) refinement across levels of development. In particular AGILE is developing:

- Primitives for explicitly addressing mobility within architectural models.
- Algebraic models of the evolution processes that result from system reconfiguration caused by mobility of components.
- Extensions to modelling languages like the UML that make the architectural primitives available to practitioners, together with tools for supporting animation and early prototyping.
- Analysis techniques for supporting compositional verification of properties addressing evolution of computation, coordination and distribution.
- Refinement techniques for relating logical modelling levels with the distribution and communication topology available at physical levels.

List of relevant chapters:

Mobile Systems, Rigorous Design

Three publications reporting outcomes from the project

- L. Andrade, P. Baldan, H. Baumeister, R. Bruni, A. Corradini, R. De Nicola, J.L. Fiadeiro, F. Gadducci, S. Gnesi, P. Hoffman, N. Koch, P. Kosiuczenko, A. Lapadula, D. Latella, A. Lopes, M. Loreti, M. Massink, F. Mazzanti, U. Montanari, C. Oliveira, R. Pugliese, A. Tarlecki, M. Wermelinger, M. Wirsing, A. Zawlocki. AGILE: Software architecture for mobility. In M. Wirsing, D. Pattinson, R. Hennicker, Eds, Recent Trends in Algebraic Development Techniques -16th International Workshop, WADT 2002, Frauenchiemsee, Germany, Sept. 24-27, 2002, LNCS-2755. Springer, 2003.
- H. Baumeister, N. Koch, P. Kosiuczenko, M. Wirsing. Extending activity diagrams to model mobile systems. In M. Aksit, M. Mezini, R. Unland, Eds, Objects, Components, Architectures, Services, and Applications for a Networked World. International Conference NetObjectDays, NODE 2002, Erfurt, Germany, Oct. 7-10, 2002. LNCS-2591, pp. 278-293. Springer, 2003.
- A. Lopes, L. Andrade, J. Fiadeiro, M. Wermelinger. Architectural techniques for evolving control systems. In Formal Methods for Railway Operation and Control Systems. L'Harmattan Press, 2003.
- S. Gnesi. The hal environment and the handover protocol. ENTCS, 2003. FMICS workshop, Invited talk.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AIMS

Project Title: Action, Interaction and Multimedia Smart Spaces

URL: <http://www.dsg.cs.tcd.ie/sites/AIMS.html>

Start Date: 2001

End Date: 2003

CaberNet Members Involved: Trinity College, Dublin

The Project:

The primary focus of the AIMS project is to investigate the use of computer vision within smart spaces and, in particular, how computer vision can be used in conjunction with other types of sensors to acquire context information from the environment. The main goals of the CAMS project are to develop computer vision technologies that can be used to sense people and objects and the interactions between the two within a smart space. New methods for acquiring context information from the environment and the development of an interactive scripting technology will simplify the development of smart spaces. Research into smart spaces has steadily come to the forefront of the ubiquitous computing research community over the last number of years. Smart spaces promise to enhance the environment in which we live by integrating information technology seamlessly into everyday settings. Facilitating the development of these types of smart environments requires research into many different areas - from computer vision to distributed computing to human computer interaction. The AIMS project uses computer vision techniques to detect and track objects and people as they move about a smart space. A single camera is situated high on a wall to give a large field of view. Once objects can be reliably tracked, actions such as sitting and standing, picking up and dropping an object, or using a phone can be interpreted. Using the data from the vision system, along with data from various other sensors new methods for acquiring context information are available. The methods are based on a model that actively encourages entities to collaborate in the acquisition of context information from the environment. There is also an investigation into how the proximity of context information to an entity is important in the understanding and modelling of an environment.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Albatross

Project Title: Wide Area Cluster Computing

Start Date:

End Date:

URL: <http://www.cs.vu.nl/albatross/>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

The goal of the Albatross project is to better understand application behaviour on wide-area networks. A recent technology trend is Cluster Computing, where high-speed clusters of workstations are themselves connected over lower-speed links. Cluster Computing raises a host of research issues such as fault tolerance, performance, and programmability. The focus of Albatross is on programmability and performance. Cluster Computing is approached from the applications side. It is obvious that parallel applications that communicate heavily need a high-speed link to function properly. On the other side of the scale, parallel applications that hardly communicate at all will also work well over a slow link. Cluster Computing has both types of interconnect. In Albatross we try to find out which applications work, which do not, and if so, what can be done to make them work. Our current work is on wide-area programming with MPI and Java. Our main experimentation platform is DAS (DAS is built as a cooperation between 4 Dutch universities.) It is a wide-area supercomputer consisting of 200 200 MHz Pentium Pro's, divided over 4 clusters, 128-24-24-24, at the participating universities.) The goal of Albatross is to ease the writing of applications that execute efficiently on wide-area clusters of workstations, for a wide range of applications. Albatross builds on experience with a number of parallel and distributed languages, run-time systems, and applications; in particular, Orca and Panda from Vrije Universiteit, and Cilk and CRL from MIT. See the respective pages for on-line papers with details

List of relevant chapters:

Operating Systems

Three publications reporting outcomes from the project

- Rody Schoonderwoerd: Network Performance Measurement Tools - a Comprehensive Comparison, Master's thesis, Vrije Universiteit Amsterdam, November 2002.
- Mathijs den Burger: A Monitoring Tool for Grid Networks, Master's thesis, Vrije Universiteit Amsterdam, February 2002.
- Thilo Kielmann, Henri E. Bal, Sergei Gorlatch, Kees Verstoep, Rutger F.H. Hofman: Network Performance-aware Collective Communication for Clustered Wide Area Systems. Accepted for publication in Parallel Computing, 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ALICE

Project Title: Architecture for Location-Independent Computing

URL: <http://www.dsg.cs.tcd.ie/sites/ALICE.html>

Start Date: 2000

End Date: 2003 (Second implementation)

CaberNet Members Involved: Trinity College, Dublin

The Project:

The ALICE project is concerned with the design and implementation of an architecture that allows mobility support to be added to object-oriented middleware frameworks, such as implementations of CORBA, Java RMI or SOAP. Operations in mobile environments pose challenges that are not in evidence in the wired environment. For example, mobile devices have limitations in the form of limited processing power, battery life etc. implying software for mobile hosts must use as little resources as possible. Network characteristics of mobile hosts are generally more varied and diverse than fixed hosts and mobile hosts may be connected to various different physical endpoints at various points in time. Also, physical host mobility causes connection endpoints to wired networks to change frequently. In the case of mobile servers, this can cause several references held by clients to become obsolete rapidly. The ALICE project defines an architecture that allows mobility support to be added to any object-oriented middleware framework that supports a set of minimal requirements. The architecture itself is captured in a set of modular, reusable components that can be used to instantiate the architecture for different object-oriented middleware frameworks. Such modified frameworks have the attractive feature that mobility support remains completely transparent for those portions of distributed applications that do not reside on mobile hardware, while portions that do reside on mobile hardware can be aware or unaware of mobility as required for the application in question. In addition, modified frameworks retain interoperability with unmodified frameworks implementing the same architecture thus ensuring there is no compatibility issue.

List of relevant chapters:

Mobile Systems, Distributed Object and Component Technologies

Three publications reporting outcomes from the project:

- Greg Biegel, Vinny Cahill, Mads Haahr. A Dynamic Proxy-Based Architecture to Support Distributed Java Objects in Mobile Environments. DOA 2002: International Symposium of Distributed Objects and Applications. Irvine, CA. October 2002.
- Mads Haahr, Raymond Cunningham and Vinny Cahill. Towards a Generic Architecture for Mobile Object-Oriented Applications. SerP 2000: Workshop on Service Portability. San Francisco, December 2000.
- Mads Haahr, Raymond Cunningham, Vinny Cahill. Supporting CORBA Applications in a Mobile Environment. MobiCom '99: 5th International Conference on Mobile Computing and Networking. Seattle, August 1999.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ALPINE

Project Title: Application Level Programmable Inter-Network Environment

Start Date: 2001

End Date: 2004

URL: <http://www.cs.ucl.ac.uk/research/alpine/>

CaberNet members involved on the project: BT Labs lead and fund the work, Lancaster CS department, UCL CS, Imperial College, UK

Other Partners: UTS School of Computing Sciences, Sussex University

The Project:

The broad area of work is in programmable networks for telecommunications. Recent interest on active networks at MIT (David Tennenhouse et al) and at Penn State (Jonathan Smith) has resulted in a large body of work emerging from a DARPA funded program of work.

Imperial College's area within this project is in policies for security and management of programmable (active) and adaptive networks for telecommunications.

Overall Work Areas of the project are:

- Proximity services - Client/Server/Proxylet Level Routing
- Policy & Management & Security
- Performance Comparison
- Router level v. Application Level

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Amoeba

Project Title:

Start Date: ongoing

End Date:

URL: <http://www.cs.vu.nl/pub/amoeba/amoeba.html>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

Amoeba is a powerful microkernel-based system that turns a collection of workstations or single-board computers into a transparent distributed system. It has been in use in academia, industry, and government for about 5 years. It runs on the SPARC (Sun4c and Sun4m), the 386/486, 68030, and Sun 3/50 and Sun 3/60. At the Vrije Universiteit, Amoeba runs on a collection of 80 single-board SPARC computers connected by an Ethernet, forming a powerful processor pool. This equipment is pictured below. It is used for research in distributed and parallel operating systems, runtime systems, languages, and applications.

List of relevant chapters:

Operating Systems

Three publications reporting outcomes from the project

Full documentations for Amoeba system is available from the project web page.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AMSD

Project Title: Accompanying Measure on System Dependability

Start Date: 2002

End Date: 2003

URL: <http://www.am-sd.org/>

CaberNet members involved on the project: University of Newcastle, UK; LAAS - CNRS, France; ISTI, Italy

Other Partners: ARC Seibersdorf research (ARCS) Austria, Joint Research Centre (EC-JRC-IPSC); Adelard, UK

The Project:

AMSD addresses the need for a coherent major initiative in FWP6 encompassing various aspects of dependability (reliability, safety, security, survivability, etc.); education and training; and means for encouraging and enabling sector-specific IST RTD projects to use dependability best practice. The results will be an overall dependability roadmap that considers dependability in an adequately holistic way, and a detailed roadmap for dependable embedded systems.

List of relevant chapters:

Distributed Systems Security, Dependable Systems

Three publications reporting outcomes from the project:

The main result of the project is the dependability roadmap "A dependability Roadmap for the Information Society in Europe"– can be downloaded from the project web page.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ANDROID

Project Title: Active Networks Distributed Open Infrastructure Development

Start Date: June 2000

End Date: October 2002

URL: <http://www.cs.ucl.ac.uk/research/android>

CaberNet members involved on the project: British Telecommunications plc (BT), Universidad Politécnica de Madrid (UPM)

Other Partners: University College London (UCL): CS and EE, COMPAQ, National Technical University of Athens (NTUA), MediaSec Technologies GmbH, 6WIND SA, Netcelo SA

The Project:

The vision of the ANDROID project was that users of a network (end users, service providers/integrators etc.) should be offered the ability to control shared network equipment (including computing resources) to meet their individual needs and preferences. This control should be achievable without explicit reference to the owner of the resources concerned. This places strong requirements on the approach to management, specifically resource and security management.

ANDROID developed prototype implementations of key management system components, addressing in particular computing resource management and security. These components were used to enhance existing active node prototypes with features that are necessary before deployment. Experiments in a wide area setting but on a limited scale have demonstrated the feasibility of supporting a diverse range of applications, and modelling has been used to address issues with scaling the proposed approach to much larger networks.

List of relevant chapters:

Network and Distributed System Management

Two publications reporting outcomes from the project

- I. Liabotis, O. Prnjat, L. Sacks, "Policy-Based Resource Management for Application Level Active Networks", Second IEEE Latin American Network Operations and Management Symposium LANOMS 2001; Belo Horizonte, Brazil, August 2001
- L. Sacks, O. Prnjat, I. Liabotis, T. Olukemi, A. Ching, M. Fisher, P. Mckee, N. Georgalas, H. Yoshii, "Active Robust Resource Management in Cluster Computing Using Policies", to appear in the Journal of Network and Systems Management, Special Issue on Policy Based Management of Networks and Services.
- O. Prnjat, I. Liabotis, T. Olukemi, L. Sacks, M. Fisher, P. McKee, K. Carlberg, G. Martinez, "Policy-based Management for ALAN-Enabled Networks"; IEEE 3rd International Workshop on Policies for Distributed Systems and Networks - Policy 2002, Monterey, CA, USA, June 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ARION

Project Title: An Advanced Lightweight Architecture for Accessing Scientific Collections

Start Date: January 2001

End Date: February 2004

URL: <http://www.arion-dl.org>

CaberNet members involved on the project: FORTH, Greece

Other Partners: University of Crete(Computer Science Department), Consiglio Nazionale delle Ricerche (Istituto per la Matematica Applicata), National Technical University of Athens (Department of Naval Architecture and Marine Engineering), HR Wallingford Group Ltd, London School of Economics and Political Science (Enterprise LSE Limited), Oceanographic Company of Norway (Oceanography Department), Joint Research Centre of the European Commission (Institute for Environment and Sustainability)

The Project:

ARION provides a service-based infrastructure designed to support search and retrieval of scientific objects, and capable of integrating collections of scientific applications including datasets, simulation models and associated tools for statistical analysis and dataset visualization. These collections may reside in geographically disperse organizations and constitute the system content. On-demand scientific data processing workflows are also actively supported, in both interactive and batch mode.

The underlying computational grid used in ARION is composed of geographically distributed and heterogeneous resources, namely, servers, networks, data stores and workstations, all resident to the member organizations that provide the scientific content and resources. ARION provides the means for organizing this ensemble so that its disparate and varied parts are integrated into a coherent whole. Hence, ARION can be viewed as the middleware between users, the data they wish to process and the computational resources required for this processing. In addition, the system offers semantic description of its content in terms of scientific ontologies and metadata information. Thus, ARION provides the basic infrastructure for accessing and deriving scientific information in an open, distributed and federated system. To achieve these goals ARION has brought together two closely related technology trends that are undergoing continuous development and have reached an acceptable level of maturity, namely the Semantic Web and the Grid. The gain from this promising coupling is the combination of large-scale integration of resources with a universally accessible platform that allows data to be shared and processed by automated tools as well as by people. The system's demonstration scenarios involve environmental applications (offshore to near shore transformation of wave conditions, synthetic time series and monthly statistical parameters, coupled ocean-atmosphere models etc.).

List of relevant chapters:

Group Communication, Distributed Systems Security, Service-oriented Computing, Mobile Agents

Three publications reporting outcomes from the project

- C. Houstis, S. Lalis, V.Christophides, D. Plexousakis, E. Vavalis, M. Pitikakis, K. Kritikos, A. Smardas, Ch. Gikas, "A Service infrastructure for e-Science: the case of the ARION system", 14th International Conference on Advanced Information Systems Engineering (CAiSE 2002), E-Services and the Semantic Web workshop (WES2002), Toronto, Canada, May 27-28, 2002, Springer, Lecture Notes in Computer Science LNCS 2512, pp. 175-187
- C. Houstis, S. Lalis, M. Pitikakis, G. Vasilakis, K. Kritikos, A. Smardas, "A grid service-based infrastructure for accessing scientific collections: The case of the ARION system", The International Journal of High Performance Computing Applications, Vol. 17, No 3, Fall 2003, pp.269-280.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AS23

Project Title: Advanced Testing Techniques for Complex Systems

Start Date: Nov 2001

End Date: Nov 2002

URL: <http://www.laas.fr/TSF/AS23>

CaberNet members involved on the project: LAAS - CNRS, France

Other Partners: IRISA (Triskell, Vertecs projects), LaBRI, LRI, VERIMAG

The Project:

This is a French national project launched by the STIC scientific department of CNRS. It addresses the robustness testing of systems with respect to erroneous or untimely inputs from their environment.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AutoMed

Project Title: Automatic Generation of Mediator Tools for Heterogeneous Database Integration

Start Date: 1st May 2001

End Date: October 2003

URL: <http://www.doc.ic.ac.uk/%7Epjm/automed>

CaberNet members involved on the project: Imperial College, UK

Other Partners:

Department of Computer Science, Birkbeck College

The Project:

The AutoMed project investigates the practical application of graph based database schema transformation, its use in automating global query processing and the application of heuristic and evolutionary computing techniques to schema improvement and global query optimisation for heterogeneous databases.

List of relevant chapters:

Group Communication, Network Storage Services

Three publications reporting outcomes from the project

- E. Jasper, N. Tong, P.J. McBrien, A. Poulouvasilis. View Generation and Optimisation in the AutoMed Data Integration Framework. In Proceedings of CAiSE03 Forum, Editors: J. Eder, T. Welzer, Univ. of Maribor Press, pp. 29-32, 2003
- P.J. McBrien, A. Poulouvasilis. Data Integration by Bi-Directional Schema Transformation Rules. In Proceedings of ICDE03, IEEE, 2003
- H. Fan, A. Poulouvasilis. Tracing Data Lineage Using Schema Transformation Pathways In Knowledge Transformation for the Semantic Web Editors: B. Omelayenko, M. Klein IOS Press, 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: AVANCE

Project Title: Fault-tolerance in Audio / Video Communications via Best Effort Networks

Start Date: 2000

End Date: ongoing

URL: <http://www.informatik.uni-hamburg.de/TKRN/world/abro/ongore.htm>

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners:

The Project:

Best effort networks typically are not able to satisfy any quality of service (QoS) guarantees regarding (minimum) packet throughput, (maximum) packet delay or delay jitter. Therefore, these networks have to be modified in order to be able to support real-time communications. In this project we elaborate new techniques for fault-tolerance which allow one to accept some deficiencies in network quality (e.g. packet losses). The techniques we investigated and analysed are either part of some dedicated middleware or they are directly supported by the distributed applications. In case of audio / video communications, which has been the focus of our studies up to now, we are analysing, in detail, techniques such as FEC, adaptive video encoding, information dispersal, traffic smoothing as well as combinations of these techniques [Richter 2000], [Wolfinger et al. 2001]. Both, quantitative and qualitative assessments of the improvement in video quality are focal points of our research [Heidtmann et al. 2001].

List of relevant chapters:

Mobile Systems, Dependable Systems

Three publications reporting outcomes from the project:

- Heidtmann K., Kerse J., Suchanek T., Wolfinger B.E., Zaddach M., Fehlertolerante Videokommunikation über verlustbehaftete Paketvermittlungsnetze, GI-Fachtagung "Kommunikation in Verteilten Systemen" KiVS 2001, Hamburg, Februar 2001, in: Killat U., Lamersdorf W (Hrsg.), Kommunikation in Verteilten Systemen, Springer, Berlin, 2001.
- Richter J.P., Spezifikations- und Messmethodik für ein adaptives Dienstgütemanagement, Dissertation, Fachbereich Informatik, Univ. Hamburg, erschienen in: Wolfinger B.E. (Hrsg.), Berichte aus dem Forschungsschwerpunkt Telekommunikation und Rechnernetze, Band 1, Shaker-Verlag, 2000; "Best Dissertation Award 2000" by GI/ITG Special Interest Group on "Communications and Distributed Systems" (KuVS) and Best Dissertation Award "Wissenschaftsakademie für Kommunikations- und Informationstechnik" (WAKI).
- Wolfinger B.E., Zaddach M., Techniques to Improve Quality-of-Service in Video Communications via Best Effort Networks, IEEE International Conference on Networking, ICN '01, Colmar, July 2001.
- Ziviani A., Wolfinger B.E., de Rezende J.F., Duarte O.C.M.B., Fdida S. Joint Adoption of QoS Schemes for MPEG Streams, Multimedia Tools and Applications Journal, Kluwer Academic Publishers (accepted for publication).

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: BASS

Project Title: Broadband Access Services Solution

URL: <http://www.dsg.cs.tcd.ie/sites/BASS.html>

Start Date: January 2000

End Date: June 2001

CaberNet Members Involved: Trinity College, Dublin; Karlsruhe University, Germany

The Project:

The BASS project aims to enlarge the number of people with access to global resources i.e. information and ideas, by evaluating and proposing mechanisms to provide "broadband" connection to multimedia services at reasonable costs and with the appropriate level of quality. Potential broadband multimedia applications include residential user access to virtual learning services. Today's broadband services are characterised by many users accessing many services across a crowded Internet via a few ISPs. There is no guaranteed Quality of Service for access. New services exacerbate this internet congestion as consumers adopt Voice over IP and networked appliances such as gaming consoles. The Internet bottleneck must be overcome by intelligently routing the customer traffic to guarantee Quality of Service. The BASS technology achieves QoS guarantees by routing customer traffic directly to multiple service providers through the public packet network, thereby bypassing the problems of Internet congestion. BASS also addresses how to maintain a guaranteed Quality of Service with multiple diverse uses of a single xDSL line. An important evaluation is how well a system model satisfies Quality of Service requirements. The BASS project have developed an Automatic Formal Methods based Verification System (AFM-VS) to guarantee that system models satisfies specified QoS requirements, particularly transport level QoS e.g. throughput, jitter delay etc.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project:

- T. Savage and R. Meier. BASS: A Virtual Classroom Service Exploiting Broadband Access. Dept. of Computer Science, Trinity College Dublin, Ireland, 2002. Technical report TCD-CS-2002-26
- T. Savage, B. Holmes, and B. Tangney. State-of-the-art broadband delivery and collaboration technology. Is it compatible with advances in learning theory? In Proceedings of the 2nd International Conference on Technology in Teaching and Learning
- T. Savage, R. Meier, and V. Cahill. Near and far: Exploring the use of broadband technology to overcome segregation between distance and face-to-face students. In Proceedings of the 2nd International Conference on Technology in Teaching and Learning

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: BISON

Project Title: Biology-Inspired Techniques for Self-Organization in Dynamic Networks

Start Date: January 2003

End Date: December 2005

URL: <http://www.cs.unibo.it/bison>

CaberNet members involved on the project: Università di Bologna, Italy

Other Partners:

- Telenor Research and Development (Norway)
- Department of Methods of Innovative Computing, Center for High Performance Computing, Technical University of Dresden (Germany)
- IDSIA (Switzerland)
- Santa Fe Institute (USA)

The Project:

BISON will explore the use of ideas derived from complex adaptive systems (CAS) to enable the construction of robust and self-organizing information systems for deployment in highly dynamic network environments. BISON will cast solutions to important problems arising in Ad-Hoc and Virtual networks, P2P and Grid computing systems as desirable global properties that systems should exhibit.

List of relevant chapters:

Dependable Systems, Service-oriented Computing Mobile Systems

Three publications reporting outcomes from the project

- A. Montresor, O. Babaoglu. The BISON Project. In the IEEE Computational Intelligence Bulletin, Vol 1, No. 1, December 2002.
- A. Montresor, O. Babaoglu. Biology-Inspired Approaches to Peer-to-Peer Computing in BISON. In *Proceedings of the Third International Conference on Intelligent System Design and Applications*, Tulsa, Oklahoma, August 2003.
- V. Maniezzo, L. Gambardella, F. de Luigi. Ant Colony Optimization. In *New Optimization Techniques in Engineering*, G. C. Onwubolu, B. V. Babu (eds.), Springer-Verlag.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: BMAN

Project Title:

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: Imperial College, UK

Other Partners:

The Project:

BMAN will investigate the application of mobile computation models in business processes to the configuration, management and execution of distributed workflow systems for inter-enterprise B2B e-business; new business models and best business practices, exploiting mobile systems and software for business process modelling, are expected to be developed.

List of relevant chapters:

Mobile Agents, Control and Coordination in Dynamic Virtual Organisations

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CAMELEON

Project Title: Context Aware Modelling for Enabling and Leveraging Effective interactiON

Start Date: 2001

End Date: 2004

URL: <http://giove.cnuce.cnr.it/cameleon.html>

CaberNet members involved on the project: ISTI-CNR, Italy

Other Partners: University of Grenoble (France), University of Louvain (Belgium), IS3 (France), Motorola Italy (Italy)

The Project:

The goal of this project is to build methods and environments supporting design and development of highly usable context-sensitive interactive software systems by: providing the means to express context-dependent information in a set of models usable at design-time by developers and at run-time by dynamically reconfigurable systems, developing tools that support the use of information contained in abstract representations to drive the design and development of concrete interfaces for multi-context applications while preserving usability, developing techniques and components that facilitate the development of adaptive, context-dependent applications, providing prototypes for validating the methods, techniques and tools developed.

List of relevant chapters: Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Limbourg, Q., Vanderdonckt, J. Comparing Task Models for User Interface Design. Chapter 6, in Diaper, D., Stanton, N. (Eds.), *The Handbook of Task Analysis for Human-Computer Interaction*, Lawrence Erlbaum Associates, Mahwah, 2003
- Calvary, G., Coutaz, J., Thevenin, D., Limbourg, Q., Bouillon, L., Vanderdonckt, J. A Unifying Reference Framework for Multi-Target User Interfaces. *Interacting with Computers*. Vol. 15, No. 3, June 2003, pp. 289-308.
- Bandelloni R., Paternò F., Platform Awareness in Dynamic Web User Interfaces Migration. In *Proceedings of Mobile HCI 03*. Udine, Italy, 8-11 September 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CAMS

Project Title: Context-Aware Mobile Services

URL: <http://www.dsg.cs.tcd.ie/sites/CAMS.html>

Start Date: 2001

End Date: 2003

CaberNet Members Involved: Trinity College, Dublin

The Project:

CAMS project focuses on developing a context-oriented application model for ubiquitous computing. The CAMS middleware allows data streams from sensors embedded in daily artefacts to be fused into high-level abstractions. The approach taken in CAMS is to build and experiment with actual sensor-augmented artefacts. The first test-bed is a table tennis scenario where sensors have been embedded in the table, bats and mats. Global computing foresees a massively networked environment supporting a large population of diverse but cooperating entities. Due to the potentially highly mobile environment, the composition and characteristics of this network will be both highly dynamic and unpredictable. As pervasive environments and ubiquitous computing become closer to reality, the differences between infrastructure and wireless networks will become ever more transparent to the user, i.e. it will become increasingly difficult to distinguish wireless ad-hoc infrastructures with wired, fixed ones. A mobile user will expect context rich information regardless of current physical location or network structure. This is the main focus of the CAMS project, where meaningful context from sensor-rich environments is extracted enabling context-sensitive applications. The CAMS middleware processes the data flow possibly through augmentation or fusion produced by the sensors and generates an event stream that can be monitored by applications.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

None

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CANU

Project Title: Communication in Ad-Hoc Networks for Ubiquitous Computing

Start Date: 2001

End Date: ongoing

URL: <http://canu.informatik.uni-stuttgart.de>

CaberNet members involved on the project: Universität Stuttgart, Germany

Other Partners:

The Project:

The CANU project focuses on research topics related to the mobile ad hoc networking (MANET) characteristic of mobile devices that users carry as well as smart environments. Currently our research is directed into the following areas: Information Dissemination: propagation of information can be viewed as an "infection with information". In the spirit of this idea we investigate which kinds of data can be distributed via epidemic algorithms. A major objective in this research area is the development and classification of epidemic algorithms in order to obtain a mathematical model which allows statements about information distribution with respect to delivery speed, coverage, movement pattern, and communication characteristics - to name a few. Routing: mobility and ad hoc networking expose new challenges to routing of messages between nodes in a MANET. Stability of routes cannot be assumed due to the mobility of nodes in the network. Currently, most simulations and evaluations are based on the so-called random walk model of mobile nodes. However, in reality this only holds true for few application scenarios, such as rescue operations and military missions. More likely, users will follow roads and building structures, e.g. floors and doors, and cars are deliberately kept on roads instead of driving through rivers or buildings. Application Architectures: ubiquitous computing environments can be characterized by their continuing change over time induced by the movement of users. Users carry functionality to an area where other users can benefit from it. In order to allow flexible execution of applications, adaptation has to be provided. The objective here is to analyse the requirements of applications in changing ubiquitous computing environments and allow them to adapt to the changing characteristics of the environment.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- Tian, Jing; Hähner, Jörg; Becker, Christian; Stepanov, Illya; Rothermel, Kurt: Graph-Based Mobility Model for Mobile Ad Hoc Network Simulation. In: IEEE Computer Society Press (ed.): Proceedings of the 35th Annual Simulation Symposium: San Diego, California, April 14
- Khelil, Abdelmajid; Becker, Christian; Tian, Jing; Rothermel, Kurt: An Epidemic Model for Information Diffusion in MANETs. In: Dahlberg, Teresa; Meo, Michela; Zomaya, Albert; (ed.): Proceedings of the 5th International Workshop on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM'02) at MobiCom 2002.
- Bauer, Martin; Becker, Christian; Rothermel, Kurt: Location Models from the Perspective of Context-Aware Applications Mobile Ad Hoc Networks. In: Personal and Ubiquitous Computing. Vol.6 (5-6).

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CARES

Project Title: CARES: Certification Assessment Requirements for ESA Software

Start Date: April 2001

End Date: November 2003

URL: -

CaberNet members involved on the project: Critical Software, Portugal

Other Partners:

ASTRIUM SAS, France

EADS-Airbus, France

ADELARD, United Kingdom

DNV, The Netherlands

Critical Software, Portugal

The Project:

The objective of the ESA's CARES project (14899/01/NL/JA) is to produce a generic scheme for the software related aspects of certification of space systems. It is achieved through the collection and analysis of information about existing certification bodies and standards. In addition, a detailed assessment of the possible contribution to certification of different RAMS techniques is undertaken. A generic three-step scheme is defined, described hereafter:

- Definition of software engineering requirements for the development of certifiable embedded software in space systems, and definition of certification requirements that the project and the system must comply with. These requirements are to be applied as a tailoring of the ECSS-E40B and ECSS-Q80B standards from ESA, with extensions to cover two other key standards, namely DO-178B and IEC 61508.
- Definition of a generic certification plan describing the processes to be followed (with inputs and outputs) for the certification of the software of a space system.
- Definition of requirements for the accreditation of organisations or personnel supporting the certification process.

List of relevant chapters:

Dependable Systems, Real-Time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CARMEN

Project Title: Context-Aware Multimedia Environment for Narrative

URL: <http://www.dsg.cs.tcd.ie/sites/Carmen.html>

Start Date: 2002

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The CARMEN project aims to deliver a multimedia application development framework for applications that reside in a wireless ad hoc network. This framework will extend an existing multimedia development environment to support the management of context-aware multimedia hearsay (i.e. notes left for users in particular locations). The framework will be based on a novel middleware that utilises context-aware reasoning for multimedia information dissemination amongst the diverse community covered by the Wireless Ad hoc Network for Dublin (WAND) network. The middleware will encompass implementations of novel algorithms for multimedia hearsay management, context-aware reasoning to support multimedia hearsay dissemination, and Quality of Service over ad hoc networks. The CARMEN project aims to deliver a multimedia application development framework for applications that reside in a wireless ad hoc network. The middleware will encompass implementations of novel algorithms for multimedia hearsay management, context-aware reasoning to support multimedia hearsay dissemination, and Quality of Service over ad hoc networks. Context-aware multimedia information dissemination with guaranteed Quality of Service requires support from a novel middleware that utilises context-aware reasoning. The framework will encapsulate context-awareness via “hearsay” messages and will implement novel algorithms for hearsay dissemination and guaranteed QoS for the ad hoc wireless network

List of relevant chapters:

Mobile Systems, Distributed Multimedia Platforms

Three publications reporting outcomes from the project:

None

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CarTALK 2000

Project Title:

Start Date: 2001

End Date: 2004

URL: <http://www.tpd.tno.nl/smartsite259.html>

CaberNet members involved on the project: University of Stuttgart

Other Partners: DaimlerChrysler, Germany

- * Centro Ricerche FIAT, Italy
- * TNO, Netherlands
- * Robert Bosch, Germany
- * Siemens SICN, Italy
- * University of Cologne, Germany

The Project:

The goal of the CarTALK 2000 European project is to improve the safety of all traffic participants through a co-operative driver assistance systems based upon car-to-car communication. To support co-operative driving, time-critical safety related information must be transmitted between cars or cars and infrastructure. Hence an extendable self-organizing radio system has to be developed for both inter-vehicle communication and vehicle-infrastructure communication. This system will be realized as a mobile ad hoc radio network, which is organized by the vehicles itself in a de-central way. Current solutions in mobile ad hoc networking are not suited for extreme highly dynamic networks such as cars driving on the highway. Therefore, new concepts in radio communication protocols have to be developed and the adaptation of the existing protocols like TCP/IP must be considered to enable further seamless interaction with infrastructure-based communication networks. In addition to co-operative driver assistance systems and inter-vehicle communication, the CarTALK 2000 project will further be extended to support new services such as infotainment and info-mobility applications.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- J. Tian, L. Han, K. Rothermel, and C. Cseh. "Spatially Aware Packet Routing for Mobile Ad Hoc Inter-Vehicle Radio Networks", to appear in the IEEE 6th International Conference on Intelligent Transportation Systems (ITSC), Shanghai, China, October 12-15, 2003.
- J. Tian and L. Coletti. "Routing approach in CarTALK 2000 project". In Proc. of the 12th IST Summit on Mobile and Wireless Communications, Aveiro, Portugal, June 15-18, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CASCO

Project Title: Investigating Context Aware Support for Cooperative Applications in Ubiquitous Computing Environments

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/users/fittond/>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

This project is exploring how the sharing of context in ubiquitous environments can support cooperation and what issues this raise, e.g. privacy

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CAUTION++

Project Title: Capacity and Network Management Platform for increased Utilisation of Wireless Systems of Next Generation

Start Date: 01.11.2002

End Date: 30.04.2005

URL: <http://www.telecom.ece.ntua.gr/CautionPlus/>

CaberNet members involved on the project: ISTI (CNR, Pisa), University of Florence, is a sub-contractor of ISTI

Other Partners: Institute of Communication and Computer Systems / National Technical University of Athens (EL), Technical Research Centre of Finland / Information Technology VTT (FIN), COSMOTE Mobile Telecommunications S.A. (EL), MOTOROLA GSGIT (I), TELEFONICA I&D (Spain), ELISA Communications (FIN), ERICSSON HELLAS (EL), MOTOROLA UK (UK), Universitat Politecnica de Catalunya (E)

The Project:

The main objective of the project is the smooth transition from existing wireless systems to new generation ones. CAUTION++ will exploit knowledge and system platform developed under the framework of CAUTION project and extend this to UMTS and systems beyond. The main goal of this project is to design and develop a novel, low cost, flexible, highly efficient and scalable system able to be utilized by mobile operators to increase the performance of all network segments. The project will face the new deployment and operation challenges posed by new generation systems in contrast to those in existing ones, exploiting the new possibilities to provide enhanced capacity, quality and reduced costs. Control and management of the cellular network resources under critical situations, e.g. public events, New Year's Eve, earthquakes are to be pursued as well. Dependable Systems: The challenge of resource management and mobility support, especially in multiple radio environments, unavoidably results in a higher system complexity that deserves special attention. The implication is that issues concerning the dependability of the components/mechanisms composing the resource management architecture need to be addressed to some extent.

List of relevant chapters:

Dependable Systems, Mobile Systems

Three publications reporting outcomes from the project

- Bondavalli, F. Di Giandomenico, F. Grandoni, P. Lollini, S. Porcarelli. Dependability Provisions for a Network Management Platform. in the Fast Abstracts Supplement of the IEEE International Conference on Dependable Systems and Networks (DSN 03), San Francisco, US, on 22-25 June 2003.
- F. Di Giandomenico, S. Porcarelli, P. Lollini, A. Bondavalli, «Dependability Issues in Radio Resource Management of Wireless Systems», in Proc. 6th International Symposium on Wireless Personal Multimedia Communications (WPMC '03), Japan, October 2003.
- S. Porcarelli, F. Di Giandomenico, A. Bondavalli, I. Mura, M. Barbera. Service Level Availability Estimation of GPR. IEEE Transactions on Mobile Computing. 2, 3, July-September 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CAVESudy

Project Title:

Start Date: ongoing

End Date:

URL: <http://www.cs.vu.nl/~renambot/vr/html/intro.htm>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project: Our goal is to build a system that combines the power and the functionalities of computational steering and virtual reality. Such an environment, combining both the control over a simulation and the immersion in the data space, does not exist yet as far as we know. CAVESudy mainly consists of two parts: a code generator and a VR framework, to minimize the programming for the control of the simulation and the data management, the user has to describe the simulation by a description file. This file is processed to generate two objects, a proxy and a server. The simulation is wrapped into a server object to control its execution. The server's interface provides methods to start, stop, pause, and resume the simulation. The data generated by the simulation are automatically propagated to the proxy object. This object can be seen as a local copy of the remote simulation. Through the network, it reflects the input values and the commands to the server. Furthermore, it manages the incoming data from the simulation and presents them to the VR framework.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project

- Luc Renambot, Tom van der Schaaf, Henri E. Bal, Desmond Germans, Hans J.W. Spoelder "Griz: Experience with Remote Visualization over an Optical Grid". Accepted for publication in "Future Generation of Computer Systems (FGCS)".
- Desmond Germans, Hans Spoelder, Tom van der Schaaf, Luc Renambot, Henri Bal "Matched-Filter Based Geometric Alignment for Tiled Displays" Submitted to publication.
- Luc Renambot, Tom van der Schaaf, Henri Bal, Desmond Germans, Hans Spoelder, Thilo Kielamann. "Tiled Displays to Enable Collaboration on the Grid". Journal paper, submitted to publication.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CHISEL

Project Title: A Policy-Driven, Dynamic Adaptation Framework for Context-Aware Middleware

URL: <http://www.dsg.cs.tcd.ie/sites/Chisel.html>

Start Date: 1999

End Date: 2003

CaberNet Members Involved: Trinity College, Dublin

The Project:

The Chisel project is investigating the use of reflective techniques as a vehicle for the development of a framework for dynamic adaptation, using middleware as a case study. The approach will be to allow different application-specific and user-specific policies to control the dynamic adaptation of component behaviours to add on non-functional behaviours to base-level objects or classes. The intelligence of the user and the application to drive dynamic adaptation, as the execution environment, the application resources and demands and the users' resources and requirements change, in a possibly erratic and unpredictable manner, is critical. When an application needs to adapt it is usually not because the core problem domain of the application has changed, but rather that a non-functional requirement or behaviour of some object within the application needs to change. The Chisel project is an open framework for dynamic adaptation of service using reflection in a policy-driven context-aware manner. The framework will allow users and applications to make mobile-aware dynamic changes to the behaviour of various services of the middleware, and allow the addition of new unanticipated behaviours at run-time, without changing or stopping the middleware or an application using it.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- John Keeney, Vinny Cahill. "Chisel: A Policy-Driven, Context-Aware, Dynamic Adaptation Framework." In Proceedings of the Fourth IEEE International Workshop on Policies for Distributed Systems and Networks (POLICY 2003), Lake Como, Italy. 4 - 6 June 2003. pp. 3 - 14.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: COMCAR

Project Title: Communication and Mobility by Cellular Advanced Radio

Start Date: July 1999

End Date: June 2002

URL: <http://www.comcar.de/>

CaberNet members involved on the project: Universität Stuttgart, Institute of Parallel and Distributed Systems (IPVS)

Other Partners: Ericsson Eurolab Deutschland GmbH, DaimlerChrysler AG, Sony International (Europe) GmbH, T-Systems Nova GmbH

The Project:

The COMCAR project targets at the conception and prototypical realization of an innovative mobile communication network, which shall satisfy the increasing demand for IP-based multimedia and telematics services especially in cars and railways. The COMCAR project is a part of UMTSplus, a new system concept sponsored by the German Ministry for Education and Research (BMBF), which aims at universality and mobility in telecommunication networks and systems. The main focus in COMCAR is on interactive mobile IP-based services. Existing and upcoming elaborated radio technologies and infrastructure as GSM, GPRS and UMTS shall be used and optimized. Moreover, COMCAR exploits the coexistence and co-operation of mobile with digital broadcast (DxB) systems to enable high-quality asymmetric IP communication.

COMCAR will provide a flexible communication environment in which QoS parameters will change on a wide scale. COMCAR will examine how this scenario might influence emerging new Internet technologies for integrating QoS in IP networks. The work at the IPVR concentrates on the development of mobile middleware technologies that allow adaptive mobile multimedia applications to react specifically to changing user needs and network situations. Currently an application model is being developed which covers the different aspects of multimedia applications. The model is the basis for developing jointly with the project partners a QoS architecture adjusted to the model. For the realization of the QoS architecture the middleware services have to be identified and the interfaces to the application and to the considered IP QoS concepts described. A demonstrator will be built, which will show the COMCAR-specific key-features and validate the concepts. The elaborated components will be implemented and can be used to realize example applications.

List of relevant chapters:

Mobile Systems, Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- E. Kovacs, R. Keller, T. Lohmar, R. Kroh, A. Held. Adaptive Mobile Applications over Cellular Advanced Radio (PIRMC2000), http://www.comcar.de/papers/PIRMC_final.PDF
- R. Kroh, A. Held, M. Aldinger, R. Keller, T. Lohmar, E. Kovacs. High-Quality Interactive and Broadband IP Services for the Vehicle on the Net - The COMCAR Approach - (ITS2000), http://www.comcar.de/papers/COMCAR_ITS2000.pdf
- J. Huschke, W. Rave and T. Köhler, "Downlink Capacity of UMTS Coexisting with DVB-T MFNs and Regional SFNs". IEE conference on 'Getting the most out of the radio spectrum', London, October 24-25, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: COMIT

Project Title: Convergence of MHEG and Internet Technologies

Start Date:

End Date:

URL: <http://www.cs.ukc.ac.uk/projects/comit>

CaberNet members involved on the project: University of Kent, UK

Other Partners:

The Project:

The COMIT (Convergence of MHEG with Internet Technologies) project is funded by the Engineering and Physical Science Research Council under its Multimedia and Networks Architectures program. The COMIT project intends to research models and mechanisms for the integration of the MHEG-5 component of the DAVIC specification for Digital TV with current WWW technologies, such as HTML and with emerging ones, such as XML, SMIL, etc. We propose firstly to develop and compare, by means of simulation, models of an integrated service; and secondly to investigate extensions to MHEG and to the various WWW systems by means of which the two may be interfaced

List of relevant chapters: Distributed Multimedia Platforms

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CORTEX

Project Title: CO-operating Real-Time Sentient Objects: Architecture and Experimental

URL: <http://cortex.di.fc.ul.pt/>

Start Date: April 2001

End Date: March 2004

CaberNet Members Involved: Trinity College, University of Lisboa, Lancaster University.

Other partners: Universitat Ulm, Germany

The Project:

The CORTEX project is exploring the fundamental theoretical and engineering issues that must be addressed to deliver real-time, context-aware applications composed of collections of sentient objects, i.e. mobile intelligent software components, which interact with each other in ways that demand predictable and sometimes guaranteed quality of service. Most of the current large-scale information systems are centralised and reactive, i.e. they are centrally managed and controlled and respond to user requests. We are now at the point where the emergence of a new class of large-scale decentralised and proactive applications, i.e., applications that operate independently of direct human control, can be envisaged. It can be foreseen that future mission-critical computer systems will be comprised of networked components that will act autonomously in responding to a myriad of inputs to affect and control their surrounding environment. These developments will enable a new generation of applications in areas such as intelligent vehicles, mobile robotics, smart buildings, and traffic management as well as in more traditional areas such as telecommunications management, process control and C3 (command, control and communications). To accommodate growth and adaptability with respect to number of participants, integration of new services, and quality of service issues etc. new computational models are needed. These models must be more powerful than the client/server model, which does not reflect the autonomy and spontaneity of co-operating intelligent entities. Proactive applications need active components (sentient objects), which are able to sense their environment and spontaneously interact and co-operate with others. Moreover, the communication infrastructure supporting these applications will involve a plethora of different network types and media with widely varying attributes concerning addressing schemes, topology, bandwidth and reliability. A goal of the CORTEX project is to develop a programming model that supports the development of applications constructed from mobile sentient objects. Critical to the envisaged application scenarios is the provision of incremental real-time and reliability guarantees as well as the design of an open, scalable system architecture that reflects the heterogeneous structure and performance of the networks

List of relevant chapters:

Real-time Systems, Dependable Systems, Distributed Object and Component Technologies, Mobile Systems, Rigorous Design, Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project:

- P. Veríssimo, A. Casimiro The Timely Computing Base Model and Architecture. IEEE Transactions on Computers - Special Issue on Asynchronous Real-Time Systems, 51, 8, 2002
- P. Veríssimo, A. Casimiro. Event-Driven Support of Real-Time Sentient Objects. Proc. the Eighth IEEE International Workshop on Object-oriented Real-time Dependable Systems (WORDS 2003), Guadalajara, Mexico, 2003
- P. Veríssimo, V. Cahill, A. Casimiro, K. Cheverst, A. Friday, J. Kaiser. CORTEX: Towards Supporting Autonomous and Cooperating Sentient Entities. In European Wireless 2002, Italy, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: COW

Project Title: Cross-Organizational Workflow Management

Start Date: 2001

End Date: 2002

URL: <http://www.informatik.uni-stuttgart.de/ipvr/vs/en/projects/COW/>

CaberNet members involved on the project: University of Stuttgart

Other Partners: DaimlerChrysler AG, Research and Technology Lab. IT for Engineering Ulm, Germany

The Project:

Enterprise-wide and cross-organizational workflow management is investigated within the scope of cooperation with the research laboratory of DaimlerChrysler AG in Ulm. Background of application is the product development in the automotive industry. It is aimed to integrate workflows tightly even across organization's boundaries. However, autonomy and privacy of organizations regarding their implemented business processes should be kept. Main aspects of the subject are the modelling of cross-organizational aspects as well as the coupling of different workflow management systems. For these areas, it is planned to carry out analysis, conception and prototypical implementation.

List of relevant chapters:

Control and Coordination in Dynamic Virtual Organisations, Service-oriented Computing, Group Communication

Three publications reporting outcomes from the project

- Jordan, Joachim; Kleinhans, Ulrich; Kulendik, Ottokar; Porscha, Jürgen; Pross, Alwin; Siebert, Reiner: Transparent and Flexible Cross-Organizational Workflows for Engineering Cooperations in Vehicle Development. In: PDT Europe 2002.
- Kulendik, Ottokar; Rothermel, Kurt; Siebert, Reiner: Cross-organizational workflow management - General Approaches and their Suitability for Engineering Processes. In: Schmid, Beat (ed.); Stanoevska-Slabeva, Katarina (ed.); Tschammer, Volker (ed.): Proceedings of the First IFIP-Conference on E-Commerce, E-Business, E-Government : I3E 2001 ; Zuerich, Switzerland, October 3-5, 2001

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CryoSat - ISVV

Project Title: CryoSat - Independent Software Verification & Validation

Start Date: May 2002

End Date: May 2004

URL:

CaberNet members involved on the project: Critical Software, Portugal

Other Partners:

Astrium GmbH, Germany; Space Systems Finland, Finland; SoftWcare, Spain

The Project:

CryoSat (PHASE C/D SUBCONTRACT Number: F 39094-2820) is the first satellite of the Living Planet Programme that the European Space Agency (ESA) undertakes in the framework of the Earth Explorer Opportunity Missions (see <http://www.esa.int/export/esaLP/cryosat.html>). It is a three-year radar altimetry mission, scheduled for launch in 2005, dedicated to the observation of the polar regions, particularly the variations in the thickness of the Earth's continental ice sheets and marine ice cover. Its primary objective is to study possible Earth's climate variability and trends, and to predict the thinning of arctic ice due to the global warming.

One of the most important on-board software applications of the CryoSat satellite is the Control and Data Management Unit (CDMU). This application constitutes the central control unit for all the on-board data handling (DH) and the attitude and orbit control system (AOCS) of the satellite. Astrium GmbH (<http://www.astrium-space.com>) is the prime contractor for the CryoSat mission, and Critical Software is the prime contractor of the Independent Software Verification & Validation activities (ISVV), on which the CDMU application is being screened. The ISVV activities encompass a number of static and dynamic analysis techniques (e.g., robustness and stress testing, traceability matrices, code inspections, software failure mode effects and criticality analysis, schedulability analysis, etc.) that are applied by personnel not involved in the development process of the target product to ensure complete independency.

As part of the ISVV activities, schedulability analysis and WCET calculation are also to be performed. The selected tool for the WCET calculation is Bound-T (see <http://www.bound-t.com>), which is based on static code analysis techniques.

List of relevant chapters:

Dependable Systems, Real-Time Systems

Publications reporting outcomes from the project

- M. Rodríguez, N. Silva, J. Esteves, L. Henriques, D. Costa, "Challenges in Calculating the WCET of a Complex On-board Satellite Application", In proc. of the *3rd Int. Euromicro Workshop on Worst-Case Execution Time Analysis*, Porto, Portugal, pp. 3-6, July 1, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Crystal-L

Project Title: Correct Modular Group Communication Middleware

Start Date: ongoing

End Date:

URL: <http://lsrwww.epfl.ch/Research/Crystal/>

CaberNet members involved on the project: Ecole Polytechnique Fédérale de Lausanne, Switzerland

Other Partners: Massimo Merro (University of Verona)

The Project: In this project we are interested in the design, verification and implementation of group communication using a modular approach, which is based on implementing properties required by an application as separate protocols, and then combining selected protocols using a software framework.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- Appia vs. Cactus: Comparing Protocol Composition Frameworks. Sergio Mena, Xavier Cuvellier, Christophe Grégoire, Adndré Schiper. Proceedings of SRDS 2003, October 2003.
- Modeling Consensus in a Process Calculus. Uwe Nestmann, Rachele Fuzzati and Massimo Merro. Proceedings of CONCUR 2003, Springer LNCS, September 2003.
- A Step Towards a New Generation of Group Communication Systems. Sergio Mena, André Schiper, Pawel T. Wojciechowski. Proceedings of Middleware 2003, June 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CUCHULAINN

Project Title:

URL: <http://www.dsg.cs.tcd.ie/>

Start Date: 2000

End Date: 2003

CaberNet Members Involved: Trinity College, Dublin

The Project:

The CUCHULAINN project investigates access control mechanisms and security models aiming to provide a unified security framework for distributed applications. The ASCap framework was developed during the CUCHULAINN project, which is providing the basis for further research on adaptive, multi-policy security. Various security models have been proposed for different types of application requirements and numerous types of execution environments. Adding code to the application to authenticate principals, authorise operations and establish secure communication among distributed software components typically reinforces these security models. This code is often application and context-specific, which makes it difficult to integrate applications with each other. A unified access control mechanism supporting most of the existing security models and offering a number of additional controls that are normally provided by security mechanisms, have been developed in the CUCHULAINN project. Security policies are enforced by verification on the object server, while the overall system semantics can be modified by external security servers and ASCap proxies that are instantiated at runtime independent of the application code. This dynamic system model allows the construction of a framework that can support multiple security policies for different objects at the same time by mapping principals and credentials from one security model to another.

List of relevant chapters:

Distributed Systems Security, Distributed Object and Component Technologies

Three publications reporting outcomes from the project:

- J. Abendroth and C. D.Jensen, "A Unified Security Framework for Networked Applications", In Proceedings of the Computer Security Track of the Symposium of Applied Computing (SAC2003), pp. 351-357, 2003
- J. Abendroth and C. D.Jensen, "Partial Outsourcing: A New Paradigm for Access Control", In Proceeding of the 8th ACM Symposium on Access Control Models and Technologies (SACMAT 2003), pp. 134-141, 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: CYCLADES

Project Title: An Open Collaborative Virtual Archive Service Environment

Start Date: November 2001

End Date: August 2003

URL: <http://www.ercim.org/cyclades/index.html>

CaberNet members involved on the project: ISTI-CNR, Italy

Other Partners: GEIE-ERCIM, ICS- FORTH, FhG-FIT, University of Dortmund, University of Duisburg-Essen

The Project:

The main goal of CYCLADES is the development of a system, which provides an open collaborative virtual archive environment, which (among others) supports users, communities (and their members) with functionality for advanced search in large, heterogeneous, multidisciplinary digital archives (ii) collaboration; and (iii) filtering and recommendation. A main feature of CYCLADES is that it will use the protocol specified by the Open Archives Initiative {<http://www.openarchives.org>} (OAI) to harvest and index metadata records from any archive that supports the OAI standard.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Renda E.M., Straccia, U., A Personalized Collaborative Digital Library Environment: a model and an application. In Information Processing & Management, Elsevier, in publication.
- Fuhr N., Fischer G., An RDF Model for Multi-Level Hypertext in Digital Libraries presented at the Workshop on Web Information Retrieval at the IT 2002, 32nd Annual Conference of the German Informatics Society, Dortmund, October 2002.
- Gross, T., CYCLADES: A Distributed System for Virtual Community Support Based on Open Archives. In Proceedings of the 11th Euromicro Conference on Parallel, Distributed, and Network-Based Processing - PDP 2003 (Feb. 5-7, Genova, Italy). Clematis, A., Ed. IEEE CS Press, Los Alamitos, CA, 2003. pp. 484-491.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DANCE

Project Title: Dynamic Application Oriented Network Services

Start Date: April 2001

End Date: October 2003

URL: <http://www.icsy.de/forschung/dance/>

CaberNet members involved on the project: Universität Kaiserslautern, Germany

Other Partners:

The Project:

Today one can see a fast development of Internet applications. The number of applications for different communication tasks is continuously increasing. There are applications for simple data transfer as well as for complex interactive multimedia applications. These different applications have different requirements for the communication. Nevertheless most applications have to use very simple communication services. New and specialized service are not used, just as Quality of Service (QoS) capabilities of networks. This is because applications are constituted to use a specific protocol during the development of the application. Therefore only simple protocols which are available everywhere are used. The aim of this project is to develop and realize a concept for the dynamic switching of communication service for applications. First applications and communication services must be decoupled by an appropriate API. This is a precondition for the dynamic assignment of communication service at runtime. Then the selection of an appropriate communication service based on the application requirements and the knowledge about the services must be realized. This makes applications independent of the available communication software. It will be possible that applications profit of new technologies without adapting the application, whereby the same application is still compatible to already existing technologies.

List of relevant chapters: Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Dirk, H., Bernd R.: Service-Oriented Protocol Interfaces and Dynamic Intermediation of Communication Services, Communications, Internet and Information Technology (CIIT 2003), Scottsdale, AZ, USA, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DARP

Project Title: Defence Aerospace Research Partnership on High Integrity Real-Time Systems

Start Date: October 2002

End Date: ongoing

URL: <http://www.cs.york.ac.uk/hise/darp/index.php?link=research/geninfo.inc>

CaberNet members involved on the project: University of York, UK

Other Partners: BAE SYSTEMS, Rolls-Royce plc, QinetiQ

The Project: The DARP builds on two existing research centres which have been extremely successful in technology transfer. BAE SYSTEMS has funded the Dependable Computing Systems Centre (DCSC) at York and Newcastle since 1991. The DCSC focuses on safety-critical real-time systems and has produced important research results. Rolls-Royce has funded the University Technology Centre (UTC) in Systems and Software Engineering since 1993. Thus the aim has been to define research activities which are valuable, complementary to existing programmes, and to ensure synergy so that the results of the DARP programme can be integrated with the other work, to meet the technical and commercial challenges:

- Current classes of systems – build on emerging methods to achieve a dramatic reduction in the cost of developing and assessing HIRTS, and to facilitate change at a cost proportional to the impact of the change;
- Emerging classes of systems – develop methods for designing, assessing and managing new classes of systems, e.g. systems of systems and high authority autonomous vehicles;
- Cost and risk – develop and validate measurement frameworks for systems and software engineering processes, enabling accurate prediction and precise control of costs and risks.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DBench

Project Title: Dependability Benchmarking

Start Date: January 2001

End Date: Dec 2003

URL: <http://www.laas.fr/DBench>

CaberNet members involved on the project: LAAS-CNRS, France, Chalmers University of Technology, Sweden, Critical Software, Portugal, Germany, Universidade de Coimbra, Portugal, Universität Erlangen-Nürnberg, Germany, Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

This is a European IST project (project IST-2000-25425). DBench aims to define a conceptual framework and an experimental environment for benchmarking the dependability of commercial off-the-shelf components (COTS) and COTS-based systems. It will provide system developers and end-users with means for characterising and evaluating the dependability of a component or a system, identifying malfunctioning or weakest parts, requiring more attention, tuning a particular component to enhance its dependability, and comparing the dependability of alternative or competing solutions.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- K. Buchacker, M. D. Cin, H. J. Höxer, R. Karch, V. Sieh and O. Tschäche, "Reproducible Dependability Benchmarking Experiments Based on Unambiguous Benchmark Setup Descriptions", in Int. Conf. on Dependable Systems and Networks (DSN 2003), (San Francisco, CA, USA), pp. 469-78, IEEE CS Press, 2003.
- K. Kanoun, H. Madeira and J. Arlat, "A Framework for Dependability Benchmarking", in Supplement of the 2002 Int. Conf. on Dependable Systems and Networks (DSN-2002), (Washington D.C., USA), pp. F7-F8, 2002.
- M. Vieira and H. Madeira, "Benchmarking the Dependability Benchmark of Different OLTP Systems", in Int. Conf. on Dependable Systems and Networks (DSN 2003), (San Francisco, CA, USA), pp. 305-10, IEEE CS Press, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DCSC

Project Title: BAE SYSTEMS Dependable Computing Systems Centre

Start Date: ongoing

End Date:

URL: <http://www.cs.york.ac.uk/dscs>

CaberNet members involved on the project: University of York, UK; University of Newcastle, UK

Other Partners:

The Project:

The DCSC was established in 1991 at the Universities of York and Newcastle. This was the start of a long-term relationship between British Aerospace (as it was then known) and its academic partners. British Aerospace became part of BAE SYSTEMS in December 1999 and the commitment to the relationship continues into the new millennium. The Research centre will achieve its mission by research and by technology transfer into the BAE SYSTEMS operating companies.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DEAR-COTS

Project Title: Distributed Embedded ARchitectures using COTS components

Start Date: October 1999

End Date: September 2001

URL: <http://dear-cots.di.fc.ul.pt/>

CaberNet members involved on the project: Instituto Politécnico do Porto, Portugal

Other Partners: Faculdade de Ciências da Universidade de Lisboa, IDMEC – Instituto de Engenharia Mecânica – Pólo FEUP, CIEA – Instituto Superior de Engenharia do Porto do IPP, IST Instituto Superior Técnico da Universidade Técnica de Lisboa.

The Project:

The main purpose of the DEAR-COTS project (funded by the Portuguese government - PRAXIS/P/EEI/14187/1998) was the specification of an architecture based on the use of commercial off-the-shelf (COTS) components, able to support distributed computer controlled systems where reliability and timeliness are major requirements. Within the project specific contributions have been made on studying protocols for fault-tolerance in CAN networks and on developing a transparent framework for the replication of hard real-time applications.

List of relevant chapters:

Real-time Systems, Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DEEM

Project Title: Dependability Modelling and Evaluation Tool for PMS: A tool for the dependability modelling and evaluation of multiple phased systems.

Start Date: ongoing

End Date:

URL: <http://bonda.cnuce.cnr.it/DEEM>

CaberNet members involved on the project: CNUCE and IEI (CNR, Pisa), Italy; University of Florence, Italy

Other Partners:

The Project:

Analytical dependability modelling of Phased Mission Systems (PMS), a class of systems whose operational life consists of a sequence of non-overlapping periods, called phases. Because of their deployment in critical applications, the dependability modelling and analysis of PMS is an issue of primary relevance. Our methodology, which exploits the power of the class of Markov regenerative stochastic Petri net models, allows developers to obtain an analytical solution with a low computational complexity, basically dominated by the cost of the separate analysis of the system inside each phase. This methodology is supported by the tool DEEM, a dependability modelling and evaluation tool for PMS, currently under development.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DEGAS

Project Title: Design Environments for Global Applications

Start Date: January 2002

End Date: December 2004

URL: <http://www.omnys.it/degas/>

CaberNet members involved on the project: University of Pisa, Italy

Other Partners: University of Trento (Italy), Omnys - Wireless Technology (Italy), Technical University of Denmark, Motorola Technology Centre Italy, University of Edinburgh (United Kingdom)

The Project:

The interaction between objects (such as mobile terminals) implies that future applications, designed and developed to be processed by these "smart" objects, must be compliant to work in a distributed environment. Hence, developers will need specific development tools for this kind of applications: i.e. global applications.

The objective of the DEGAS project is therefore to define and design a development environment for global applications based on a modelling language such as UML (Unified Modelling Language). Such a development environment should allow a developer of global applications to evaluate his applications from a qualitative and quantitative point of view.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- C.Bodei, P.Degano, F.Nielson, H.Riis Nielson. Flow Logic for Dolev-Yao Secrecy in Cryptographic Processes. *Future Generation Computer Systems*, 18 (6), pp. 747-756, 2002. Elsevier
- C.Bodei, P.Degano, R.Focardi, C.Priami Primitives for Authentication in Process Algebras. *Theoretical Computer Science*, 283(2), June 2002
- C.Bodei, P.Degano, R.Focardi, C.Priami. Authentication Primitives for refining protocol specifications. *Proceedings of the Workshop on Issues on the Theory of Security (WITS'02)* (co-located with POPL'02), Portland Oregon, USA, 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DepAuDE

Project Title: Dependability for Embedded Automation Systems in Dynamic Environments with Intra-site and Inter-site Distribution Aspects

Start Date: 1 January 2001

End Date: 31 March 2003

URL: www.depaude.org

CaberNet members involved on the project: Katholieke Universiteit Leuven, Belgium

Other Partners: CESI S.p.A., Milan, Italy; Siemens AG, Munich, Germany; Università Studi Ferrara, Ferrara, Italy; Università di Torino, Turin, Italy; TXT e-solutions S.p.A., Milan, Italy

The Project:

The project's goal is to develop a methodology and an architecture to improve dependability for non-safety critical, distributed, embedded automation systems with both IP (inter-site) and dedicated (intra-site) connections.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- G. Deconinck, V. De Florio, O. Botti. "Software-Implemented Fault-Tolerance and Separate Recovery Strategies Enhance Maintainability," *IEEE Trans. Reliability*, 51, 2, Jun. 2002, pp. 158-165.
- S. Bernardi, S. Donatelli. Building Petri net scenarios for dependable automation systems, Proc. of the 10th Int. Workshop on Petri Nets and Performance Models (PNPM2003), pages 72-81, Urbana-Champaign, Illinois (USA) September, 2003, IEEE CS.
- G. Deconinck, V. De Florio, R. Belmans, G. Dondossola, J. Szanto. "Experiences with integrating recovery strategies into a primary substation automation system," Proc. of Int. Conf. on Dependable Systems and Networks (DSN-2003), Dependable Computing and Communications Symp., San Francisco, CA, Jun. 22-25, 2003, pp. 80-85.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DHX

Project Title: Digital Ecological and Artistic Heritage Exchange

Start Date: 2002

End Date: 2005

URL: <http://www.eurasian-dhx.org/>

CaberNet members involved on the project: ISTI-CNR, Italy

Other Partners: Fraunhofer Institute for Media Communication (IMK), Germany; Vertigo Systems, Korea Institute of Science and Technology (KIST), Korea; RMH New Media GMBH, Germany; University of Crete (UOC), Greece; Barco n.v. , Belgium; University of Milano (UNIMI), Italy; Numeri, Italy

The Project:

The DHX project aims to establish a networked virtual reality infrastructure and content development environment for museums and cyber theatres, for mutual exchange of digital cultural and natural heritage. European and Asian partners are participating for transcontinental shared immersive experience in a global scale using high-bandwidth trans Euro-Asian networks. The main goal of the project is to provide a distributed IT infrastructure for globally shared immersive experiences. To support the creation of the different scenarios, it is aimed to improve the authoring tools for digital storytelling by computer vision methods in cultural and natural heritage. Within the scenarios, multi media knowledge bases and digital libraries will be accessed. Finally, human heritage will be presented to large scale networked audience for interactive exploration, edutainment and education. By creating distributed cultural heritage experiences as next generation of digital collections, we hope we can initiate new business areas.

List of relevant chapters: Distributed Multimedia Platforms

Three publications reporting outcomes from the project:

- Kruijff, E., Severin, I. Transcontinental guidance and exploration of digital cultural heritage (DHX). In proceedings of CIDOC/ADIT 2003, St. Petersburg, Russian Federation, 2003.
- Sergey V. Matveyev, Martin Göbel. The Optical Tweezers: Multiple-Point Interaction Technique. Proceedings of the ACM Symposium on Virtual Reality Software and Technology, pp. 184-188, Osaka, Japan, 2003.
- P. Mazzoleni, E. Bertino, S. Valtolina, E. Ferrari, C. Boeri. ViRdB: Integrating Virtual Reality and Multimedia Databases for Customized Visualization of Cultural Heritages. Presented as "sketch and application" at the SIGGRAPH03 Conference, San Diego (CA), July 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DIRC

Project Title: Interdisciplinary Research Collaboration in Dependability of Computer-Based Systems

Start Date: 1 July 2000

End Date: 30 June 2006

URL: <http://www.dirc.org.uk/>

CaberNet members involved on the project: University of Newcastle, UK; City University London, UK; University of Edinburgh, UK; Lancaster University, UK; University of York, UK

Other Partners:

The Project:

The EPSRC-funded collaboration addresses the dependability of computer-based systems. Dependability is a deliberately broad term to encompass many facets including reliability, security and availability. The term "computer-based systems" draws attention to the involvement of human participants in most complex systems. Because of the breadth of this view, the interdisciplinary approach will include sociologists and psychologists as well as computer scientists, statisticians etc. The six-year research funding will enable the collaboration to tackle broad and fundamental problems of creating dependable systems.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- Dobson, J.E., Jones, C., Procter, R., Rouncefield, M. Williams, R. Inter disciplinary approaches to the design of dependable computer systems: Editorial message: special track on inter-disciplinary approaches to the design of dependable computer systems. In Proceedings of the 2002 ACM symposium on Applied computing ACM Press, pp. 704 - 705, 2002
- Sommerville, I., Martin, D. and Rouncefield, M. Informing the RE Process with Patterns of Cooperative Interaction. Invited keynote paper. International Arab Journal of Information Technology, Volume 1, Issue 1, 2003
- Baxter, G.D., Tan, K., Newell, S., Dear, P.R.F., and Monk, A. Analysing requirements for decision support in neonatal intensive care. Archives of Disease in Childhood, Volume 88, Issue 1, pp. A46, 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DISCS

Project Title: Diversity In Safety Critical Software

Start Date: April 1997

End Date: October 2000

URL: http://www.csr.city.ac.uk/csr_city/projects/discs.html

CaberNet members involved on the project: City University, UK; University of Newcastle, UK

Other Partners:

The Project:

The DISCS project tackles basic issues of interest to the users of design diversity: builders of fault-tolerant, safety-critical, software-based systems, their customers and the agencies responsible for the evaluation and licensing of such systems. The practical aim is better understanding to support better decision-making.

In the long run, better means of designing fault-tolerant systems will make these less expensive in production and will lessen the uncertainty about the fitness for purpose of the eventual product. Better means of evaluation will allow us to place greater confidence in the reliability and safety of systems, and thus better control the societal risk of critical systems. The work at CSR at City University has focused on reliability modelling for diverse systems: we have extended previous models in various directions: modelling and assessment of a specific system rather than of an 'average' system, consideration of the fault insertion process and of the effects of project management decisions. The results affect product planning (what reliability gains can be expected from using design diversity), development (what project decisions can best achieve effective diversity) and assessment, acceptance and licensing (how to judge the reliability of a specific diverse system). In addition to the practical support for decision-making about diverse software-based systems, this modelling work improves our understanding of issues of diversity, reliability and common-mode failure in a wider context, with possible practical applications in the many other areas of engineering and organisational studies where these issues arise. In parallel, CSR at Newcastle have concentrated on structuring methods for diverse design. The DISCS project has also interacted with our DISPO project (with the University of Bristol), supporting the use of diversity for nuclear safety

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- Littlewood, B., Popov, P., Strigini, L., "Design Diversity: an Update from Research on Reliability Modelling", Proc. Safety-Critical Systems Symposium 2001, Bristol, U.K., Springer. 2001.
- P. Popov, L. Strigini, A. Romanovsky. "Choosing effective methods for design diversity - how to progress from intuition to science", in SafeComp'99, Toulouse, France, September, p. 272-285, 1999.
- A. Romanovsky. Class Diversity Support in Object-Oriented Languages. Journal of Systems and Software. v. 48, 1999, pp. 43-57.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DISPO

Project Title: DIverse Software PrOject

Start Date: March 1997

End Date: May 2000

URL: http://www.csr.city.ac.uk/csr_city/projects/dispo.html

CaberNet members involved on the project: City University, UK

Other Partners: SSRC, University of Bristol (UK).

The Project: Focuses on the use of diversity in nuclear protection, and will improve the practical advice available to the developers and customers of protection systems using diverse redundancy. The objectives of this project are:

- To estimate/quantify the probability of coincident failure of two diverse software versions performing the same function or at least show that it is acceptably low;
- To establish a useful, predictive metric for 'diversity' and define supporting data requirements.
- This project addresses the problem of obtaining claimable reliability benefits from the use of diverse software based systems. The beneficiaries of this research are nuclear regulators and utility companies

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- B. Littlewood, P. Popov, L. Strigini, "Assessing the reliability of diverse fault-tolerant software-based systems", *Safety Science*, vol. 40, pp. 781-796, Pergamon, 2002.
- P. Popov, L. Strigini, J. May, and S.Kuball, "Estimating Bounds on the Reliability of Diverse Systems". *IEEE Transactions on Software Engineering*, 2002.
- P. Popov, "Reliability Assessment of Legacy Safety-Critical Systems Upgraded with Off-the-Shelf Components", *SAFECOMP'2002*, September 2002, Catania, Italy.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DISPO-2

Project Title: DIverse Software PrOject

Start Date: July 2000

End Date: June 2003

URL: http://www.csr.city.ac.uk/csr_city/projects/dispo-2.html

CaberNet members involved on the project: City University, UK

Other Partners:

The Project:

This project is a follow-up to the successful DISPO project (1997-2000). It builds on many years of successful research on software fault tolerance and diversity at CSR. From the viewpoint of safety assessment, we will study the practical application of the mathematical models we have previously produced for assessing failure correlation in diverse systems. From the viewpoint of achieving diversity for safety and reliability, we will advance the understanding of the effects of "diversity-seeking decisions".

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- Littlewood, B., Popov, P. and Strigini, L., "Design Diversity: an Update from Research on Reliability Modelling", Proc. Safety-Critical Systems Symposium 2001, Bristol, U.K., Springer.
- Littlewood, B., Popov, P. and Strigini, L., "Modelling software design diversity - a review", ACM Computing Surveys.
- Strigini L and Popov P, "The Reliability of Diverse Systems: a Contribution using Modelling of the Fault Creation Process", CSR technical report. 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DISRS

Project Title: A Distributed Infrastructure for Secure Reputation Services

Start Date: January 2001

End Date: Ongoing

URL:

CaberNet members involved on the project: Telematics Department, Technische Universität Hamburg-Harburg, Germany.

Other Partners:

The Project:

In the project necessary requirements for and peculiarities of Reputation Services are investigated, that are intended to work on top of a distributed infrastructure such as a Peer-to-Peer network. A Reputation Service builds trust between trading partners on global e-marketplaces by collecting and aggregating ratings participants give on past transactions.

In order to assess the efficiency of solutions meeting these requirements, the project has proposed metrics, which can not only be used to evaluate current systems, but also to guide the design of new systems. Also infrastructure aspects and security considerations indirectly affecting application-level services are reviewed and suggestions to solve these issues are proposed.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

- Fahrenholtz, D. and Bartelt, A. Towards a Sociological View of Trust in Computer Science. In: Schoop, M. and Walzcuch, R., Eds. Proceedings of the 8th Research Symposium on Emerging Electronic Markets. Maastricht, The Netherlands, 2001.

Fahrenholtz, D. and Lamersdorf, W., Transactional Security for a Distributed Reputation Management System. In: K. Bauknecht, A. Min Tjoa and Quirchmayr, G., Eds. Proceedings of the 3rd International Conference on Electronic Commerce and Web Technologies. Aix-en-Provence: Springer-Verlag Heidelberg, pp. 214 - 224. 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DIT

Project Title: Dependable Intrusion Tolerance

Start Date: June 2000

End Date: Nov 2003

URL: <http://www.sdl.sri.com/projects/dit/>

CaberNet members involved on the project: LAAS - CNRS, France

Other Partners: SRI International, Menlo Park, CA, USA.

The Project:

The DIT project is part of the DARPA OASIS program (Organically Assured & Survivable Information Systems). The aim of the project is to develop Internet servers (in particular, Web servers) able to tolerate intrusions (complementarily to accidental faults). The DIT architecture is based on diverse platforms (OS + application software) providing identical contents, under the control of diversified proxies. Error detection mechanisms (content comparison, integrity checks, mutual monitoring by proxies) are completed by EMERALD intrusion detection tools. The redundancy level is automatically adapted according to the current alert level, with graceful performance degradation.

List of relevant chapters:

Dependable Systems, Distributed Systems Security

Three publications reporting outcomes from the project

- A Valdes, M. Almgren, S. Cheung, Y. Deswarte, B. Dutertre, J. Levy, H. Saidi, V. Stavridou and T. E. Uribe, "An Architecture for an Adaptive Intrusion Tolerant Server", in Security Protocols Workshop, (Cambridge, UK), 2002.
- Y. Deswarte, J.-J. Quisquater and A. Saidane, "Remote Integrity Checking - How to Trust Files Stored on Untrusted Servers", in 6th IFIP TC-11 WG 11.5 Working Conference on Integrity and Internal Control in Information Systems (IICIS 2003), (Lausanne, Switzerland), Kluwer Academic Publishers, 2003.
- Saïdane, Y. Deswarte and V. Nicomette, "An Intrusion Tolerant Architecture for Dynamic Content Internet Servers", in First ACM Workshop on Survivable and Self-Regenerative Systems (SSRS'03), (Fairfax, VA, USA), 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DOTS

Project Title: Diversity with Off-The-Shelf Components

Start Date: November 2000

End Date: April 2004

URL: http://www.csr.city.ac.uk/csr_city/projects/dots.html

CaberNet members involved on the project: City University, UK; University of Newcastle, UK

The Project:

The DOTS project unifies two strands of research in software engineering: design diversity for fault tolerance, and re-use of off-the-shelf software. It builds on previous work on diversity at the Centre for Software Reliability, and in particular on the DISCS project (Diversity In Safety Critical Software). It is motivated by the increasing industrial interest in using off-the-shelf (rather than bespoke) software for building new systems or applications. Its premises are:

- In many applications, the main problem with off-the-shelf components is the difficulty of achieving confidence of sufficient reliability;
- Software fault tolerance (diversity) is a convenient way of increasing system reliability without changing the internals of software modules;
- Software fault-tolerance in the form of modular redundancy with diversity (as in "multiple-version software) becomes affordable and convenient when based on OTS items. This possibility has not been sufficiently studied. Some methods for increasing the dependability of COTS-based systems (e.g. depending on wrappers with filtering or monitoring functions) are actually other examples of software fault tolerance, but have not been studied as such, e.g. to guide architectural decisions to achieve better reliability. The general goal of this project is to support decisions both in the acceptance of a system including OTS items and in its development, i.e. in the choice and combination of OTS items, their interconnection and system-level verification.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- T. Anderson, M. Feng, S. Riddle, A. Romanovsky. Protective Wrapper Development: A Case Study. In Proc. 2nd International Conference on COTS-Based Software Systems, ICCBSS 2003. Ottawa, Canada, February 2003. pp 1 - 14. LNCS 2580, Springer
- P. Popov, S. Riddle, A. Romanovsky, L. Strigini, On Systematic Design of Protectors for Employing OTS Items. In Proc. of the 27th Euromicro Conference. Warsaw, Poland, 4 - 6 September 2001. pp 22 - 29.
- P. Popov, L. Strigini, A. Romanovsky. Diversity for Off-The-Shelf Components, International Conference on Dependable Systems and Networks (ICDSN'2000), 25-28 June 2000, New York, Workshops and Abstracts, pp. B60-B61.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DRAGON

Project Title: Database Replication based on Group Communication

Start Date: February 1998

End Date: January 2001

URL: <http://www.inf.ethz.ch/department/IS/iks/research/dragon.html>

CaberNet members involved on the project: EPFL, Switzerland

Other Partners:

The Project: This project aims at designing and implementing a tool to support replication in distributed databases using distributed system concepts (group communication technology), and ensuring replica consistency with good performance. The intention was to bring closer the point of view of the distributed systems community and of the database community in the context of replication. The result of the project is a better understanding of the different replication techniques used by the two communities and new strategies to use group communication in the context of database replication.

List of relevant chapters:

Dependable Systems, Group Communication

Three publications reporting outcomes from the project

- B. Kemme, F. Pedone, G. Alonso, A. Schiper, and M. Wiesmann. Using optimistic atomic broadcast in transaction processing systems. *IEEE Transactions on Knowledge and Data Engineering*, 15(3), pp. 1018-1032, July 2003.
- M. Wiesmann. Group Communications and Database Replication: Techniques, Issues and Performance. PhD thesis, Ecole Polytechnique Fédérale de Lausanne, Switzerland, May 2002. Number 2577.
- B. Kemme, F. Pedone, G. Alonso, A. Schiper, and M. Wiesmann. Using optimistic atomic broadcast in transaction processing systems. Technical Report DSC/2001/053, École Polytechnique Fédérale de Lausanne, Switzerland, November 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: DSoS

Project Title: Dependable Systems of Systems

Start Date: 1 April 2000

End Date: 31 March 2003

URL: <http://www.newcastle.research.ec.org/dsos/>

CaberNet members involved on the project: INRIA - Rocquencourt, France; LAAS - CNRS, France; University of Newcastle, UK; Technische Universität Wien, Austria

Other Partners: QinetiQ, Malvern, UK; LRI Paris-Sud, France; Universität Ulm Germany

The Project:

DSoS is a European IST project (IST-1999-11585) that aims to develop significantly improved means for composing a dependable "system of systems" from a set of largely autonomous component computer systems. The project focuses on the design (type, placement, properties) of the interfaces that form the common boundaries between component systems, and the associated validation and dependability assessment activities.

List of relevant chapters:

Dependable Systems, Software Architectures, Control and Coordination in Dynamic Virtual Organisations

Three publications reporting outcomes from the project

- V. Issarny, C. Kloukinas, A. Zarras. Systematic Aid for Developing Middleware Architectures. In Communications of the ACM, Issue on Adaptive Middleware, 45(6). 2002.
- C. Jones, P. Periorellis, A. Romanovsky, I. Welch. Structured Handling of On-Line Interface Upgrades in Integrating Dependable Systems of Systems. In N. Guelfi, E. Astesiano, G. Reggio (Eds.). Scientific Engineering for Distributed Java Applications International Workshop, FIDJI 2002 Luxembourg-Kirchberg, Luxembourg, November 28-29, 2002. LNCS 2604. Springer-Verlag, pp. 73-86. 2003.
- M. Rodriguez, J.C. Fabre, J. Arlat, "Wrapping real-time systems from temporal logic specifications", 4th European Dependable Computing Conference (EDCC-4), Toulouse (France), 23-25 October 2002, Lecture Notes in Computer Science 2485. Eds A.Bondavalli, P.Thevenod-Fosse, 2002, ISBN 3-540-00012-7, pp.253-270.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ESSL

Project Title: Enhanced SSL

Start Date: June 2000

End Date: ongoing

URL: <http://lsrwww.epfl.ch/Research/>

CaberNet members involved on the project: Ecole Polytechnique Fédérale de Lausanne, Switzerland

Other Partners:

The Project:

The goal of the ESSL project is to develop a new secure communication protocol that enhances SSL to generate legally binding proofs of data exchanges between the parties using the protocol. The aim is to provide a simple and standardized mechanism which ensures that both parties have a digitally signed record of their exchange.

ESSL represents a major improvement versus currently available solutions, in which non-repudiation is achieved at the application level. This implies either expensive industry-specific complete software, or deep integration and systems architecture modifications.

Being implemented at the protocol level as an enhancement of the existing SSL layer, ESSL can be easily integrated with any application to provide a secure track of sensitive data exchanges (non-repudiation of electronic transactions, provide proof of data receipts, keep track of access to data, etc).

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: EYES

Project Title: Energy efficient sensor networks

Start Date: March 2002

End Date: February 2005

URL: <http://eyes.eu.org/>

CaberNet members involved on the project: Universiteit Twente, The Netherlands; Rome University "La Sapienza", Italy;

Other Partners: Nedap N.V., the Netherlands; Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy; Technical University of Berlin, Germany; Infineon Technologies, Austria

The Project:

The EYES project is a three year European research project (IST-2001-34734), on self-organizing and collaborative energy-efficient sensor networks. It address the convergence of distributed information processing, wireless communications, and mobile computing.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- R. Di Pietro, Y. W. Law, L. V. Mancini, S. Etalle. "LKHW: A Directed Diffusion-Based Secure Multicast Scheme for Wireless Sensor Networks", 1st Int. Workshop on Wireless Security and Privacy (WiSPR), Taiwan, ROC, Oct., 2003.
- Y. W. Law, R. Corin, S. Etalle, P. H. Hartel. "A Formally Verified Decentralized Key Management Architecture for Wireless Sensor Networks", 4th IFIP TC6/WG6.8 Int. Conf on Personal Wireless Communications (PWC), M. Conti, S. Giordano, E. Gregori, S. Olariu (eds.). Springer Verlag, Berlin, held in LNCS 2775, Sep., 2003, pp. 27-39
- Y. W. Law, S. Etalle, P. H. Hartel "Assessing Security-Critical Energy-Efficient Sensor Networks", 18th IFIP TC11 Int. Conf. on Information Security, Security and Privacy in the Age of Uncertainty (SEC), D. Gritzalis, S. De Capitani di Vimercati, P. Samarati, S. K. Katsikas (eds.). Kluwer Academic Publishers, 2003, pp. 459-463

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FABRIC

Project Title: Federated Applications Based on Real-time interacting Components

Start Date: 2002

End Date: 2004

URL: <http://www.extra.research.philips.com/euprojects/fabric/summary.htm>

CaberNet members involved on the project: Malardalen University, Sweden; INRIA France

Other Partners: Philips, THOMSON multimedia R&D France, Technische Universiteit Eindhoven, Netherlands Organisation for Applied Scientific Research, Maelardalen Hoegskola.

The Project:

In the consumer electronics market, the development of new embedded home applications is hampered by the existence of many different communication technologies. FABRIC aims at developing an architecture in which several standards and technologies in the home networking context can be integrated. More than integration alone, FABRIC allows the management of the complete network to satisfy End-to-End Quality of service (QoS) requirements. FABRIC will be guided in this process by the requirements of a chosen application: multiple roaming multimedia streams.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Presentation at FTDCS 03: Adopting redundancy techniques for multicast stream authentication, Authors: T. Cucinotta, G. Cecchetti, G. Ferraro of Scuola Superiore Sant'Anna at Piazza Martiridella Libertà, 33, Pisa, Italy

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FESTIVAL

Project Title: Fertilizing distributEd Systems To support cooperatIVe AppLications

Start Date: 1997

End Date: 2003

URL:

<http://www.informatik.uni-stuttgart.de/ipvr/vs/projekte/Festival/festival.engl.html>

CaberNet members involved on the project: Universität Stuttgart, Germany

Other Partners:

The Project:

Cooperation and interaction between people is gaining increasing importance, e.g. for work in offices and factories, for shared design of documents or software, in electronic markets or teleteaching. These interactions can be supported by suited groupware respectively communityware that is based on computer networks and distributed systems. The project FESTIVAL aims at two things. On one hand the application of new concepts like mobile agents, mechanisms for mediation, context awareness and usage of ad-hoc networks to group- and communityware is examined. At the other hand, a generic tool kit for arbitrary kinds of interaction is going to be developed.

List of relevant chapters:

Control and Coordination in Dynamic Virtual Organisation, Service-oriented Computing

Three publications reporting outcomes from the project

- Burger, Cora: A Comparison of different platforms for a collaborative distributed document environment. In: ISA 2000 (ed.): Proceedings of International ICSC Symposium on Multi-Agents and Mobile Agents in Virtual Organizations and E-Commerce (MAMA 2000)
- Burger, Cora: Groupware - Kooperationsunterstützung für Verteilte Anwendungen, dpunkt Verlag Heidelberg, November 1997. ISBN: 3-920993-60-8.
- Burger, Cora; Schramm, Oliver: Co-authoring in dynamic teams with mobile individuals. In: Gellersen (ed.): Proceedings of the International Symposium on Handheld and Ubiquitous Computing (HUC 99). Vol. 1707

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FIRST

Project Title: Flexible Integrating Scheduling Technology

Start Date: 1 May 2002

End Date: April 2005

URL: <http://www.idt.mdh.se/salsart/FIRST/>

CaberNet members involved on the project: Malardalen University, Sweden; University of York, UK

Other Partners: Universidad de Cantabria, Spain; Scuola Superiore S.Anna, Italy

The Project: The objective of the proposed research is to develop a real-time scheduling framework for applications demanding various types of tasks, constraints, and scheduling paradigms within the same system. The FIRST project will investigate the following issues: co- operation and coexistence of standard real-time scheduling schemes, time- triggered and event-triggered, dynamic and fixed priority based, as well as off-line based. Integration of different task types such as hard and soft, or more flexible notions, e.g., from control or quality-of- service demands, and fault-tolerance mechanisms temporal encapsulation of subsystems in order to support the composability and reusability of available components including legacy subsystems monitoring and maintenance of control systems over the Internet.

FIRST will provide functionality for the schemes for POSIX compliant operating systems, including monitoring and maintenance of control systems over the Internet

List of relevant chapters:

Real-time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FIT

Project Title: Fault Injection into Time Triggered Architecture

Start Date: May 1, 2000

End Date: 2002

URL: <http://www.disca.upv.es/gstf/>; <http://www.setnet.org/Research/Current/FIT.htm>

CaberNet members involved on the project: Technische Universität Wien, Austria; Chalmers University of Technology, Sweden; Universidad Politécnica de Valencia, Spain

Other Partners: Carinthia Tech Institute, Austria; TTTech Computertechnik GmbH, Vienna, Austria; Czech Technical University, Prague, Czech Republic; AB Volvo, Gothenburg, Sweden; Motorola GmbH, Germany

The Project:

The novel time-triggered architecture (TTA) is gaining growing acceptance in industry as a generic architecture for highly dependable hard real-time systems. It is thus of eminent significance for industry and society in general, that the design decisions that are at the core of this architecture are validated by all possible means. It is the objective of the project to experimentally validate the system concepts of the TTA, taking a prototype TTP/C controller chip, developed within the ESPRIT project TTA, as the basis. The experiments determine the error-detection coverage of the TTA in a realistic application by using different hardware and software based fault-injection methods. It is planned

- to determine the error detection coverage of the TTA in realistic application by different hardware and software based fault injection techniques
- to locate the weaknesses in TTA and search for design alternatives to correct these weaknesses
- to find the optimal parameter set for error detection mechanisms under techno-economical constraints
- to compare the effectiveness of different fault injection methods

List of relevant chapters:

Dependable Systems, Operating Systems, Real Time Systems

Three publications reporting outcomes from the project:

- A. Ademaj, H. Sivencrona, G. Bauer, J. Torin. Evaluation of Fault Handling of the Time-Triggered Architecture with Bus and Star Topology. In Proceedings of the IEEE International Conference on Dependable Systems and Networks (DSN 2003) pp. 123-132, San Francisco, USA, June 2003.
- S. Blanc, J. Gracia, P. J. Gil: A Fault Hypothesis Study on the TTP/C Using VHDL-Based and Pin-Level Fault Injection Techniques. International Symposium on Defect and Fault Tolerance in VLSI Systems (DFT 2002) pp. 254-262, Vancouver, Canada, November 2002.
- A. Ademaj. A Methodology for Dependability Evaluation of the Time-Triggered Architecture Using Software Implemented Fault Injection. In Proceedings of the fourth European Dependable Computing Conference, EDCC-4, pp. 172-190, Toulouse, France, October 2002.
- P. Herout, S. Racek, J. Hlavicka: Model-Based Dependability Evaluation Method for TTP/C Based Systems. In Proceedings of the fourth European Dependable Computing Conference, EDCC-4, pp. 271-282, Toulouse, France, October 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FLARE

Project Title: Framework for Location-aware Augmented Reality

URL: <http://www.dsg.cs.tcd.ie/sites/FLARE.html>

Start Date: 2001

End Date: 2002

CaberNet Members Involved: Trinity College, Dublin

The Project:

FLARE (Framework for Location-aware Augmented Reality Environments) is a framework for use in the development of mobile, location aware applications. Such applications will use the actual position of a users' environment and map this position into a virtual environment, which is overlaid onto the real world. The Augmented Reality (AR) that the user experiences will consist of what is seen (the physical environment) and the virtual reality presented by the application using FLARE, which will be presented on a visual display unit for example a screen or head mounted display. Combining augmented reality with the new advances in mobile computing (e.g. smaller mobile devices with better transmission range and power levels), has enhanced the world of interactive game-playing, particularly multi-player games. Augmented reality is in effect the "middle-ground" between virtual reality and reality itself. Augmented reality enhances the users perception of the real world by overlaying virtual objects or information. In essence, the user exists both in the real world, and a virtual world, both of which are aligned. The user is subject to the rules of both worlds. Game objects such as other players will already be visible as they will (probably) be in the same game environment. However, virtual objects such as remote players, computer players, or application generated virtual objects (e.g. ammunition) objects, can be overlaid onto what the user sees as the real world. Instead of interfacing with a virtual game world through a computer monitor, the user moves through the game environment, which is a product of what actually exists - the environment the user is in, and the virtual game environment, interacting with virtual objects in the environment and other players. FLARE is a framework for the development of mobile, location-aware applications that communicate in a wireless environment. Such applications will use the actual position of a users' environment and map this position into a virtual environment, which is overlaid onto the real world.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- N. Reijers, R. Cunningham, R. Meier, B. Hughes, G. Gaertner, and V. Cahill, "Using Group Communication to Support Mobile Augmented Reality Applications." in Proceedings of the 5th IEEE International Symposium on Object-oriented Real-time distributed Computing (ISORC 2002). Crystal City, VA, USA, 2002.
- M. O. Killijian, R. Cunningham, R. Meier, L. Mazare, and V. Cahill, "Towards Group Communication for Mobile Participants." in Proceedings of Principles of Mobile Computing (POMC'2001). Newport, Rhode Island, USA, 2001, pp. 75-82.
- J. Fitzpatrick, "Flare: A Framework for Location Aware Augmented Reality Games", Undergraduate Final Year Project, May 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FORCES

Project Title: Forum for Creation and Engineering of Telecommunications Services

Start Date: September 1998

End Date: August 2001

URL: <http://www.cs.stir.ac.uk/~kjt/research/forces/intro.html>

CaberNet members involved on the project: University of Kent, Kent; BT Plc; University of Lancaster

Other Partners: Dependable Systems Associates Ltd.; Ericsson UK Ltd.; Marconi Communications; University of Glasgow

The Project:

FORCES is the *Forum for Creation and Engineering of Telecommunications Services*. The project's mission is establishing collaborations between UK industrialists and academics to further the science and engineering of service creation and management in telecommunications.

The rationale for the project is to unite UK workers in the field of telecommunications services. A service in the telecommunications sense is a package of network functions that is marketed separately. Service creation deals with the development of network functionality that is directly used by the subscriber. Service management deals with the deployment and maintenance of services. FORCES is building a network of UK workers in this field, acting as a single focus for collaboration. The project is facilitating exchange and exploitation of expertise and techniques.

The main goals of the project are to act as a UK forum on engineering telecommunications services, to bring together UK industrial and academic researchers in this field, to foster discussion of related problems and solutions, and to disseminate know-how so as to improve UK competitiveness. The project is contributing to areas such as intelligent networks, distributed information management, service creation, formal methods, software engineering and info-businesses.

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: FORWARD

Project Title: A Future of Reliable Wireless Ad hoc networks of Roaming Devices (part of Next Wave Technologies and Markets)

Start Date: 2003

End Date: 2004

URL: <http://www.nextwave.org.uk/>

CaberNet members involved on the project: University of Birmingham

Other Partners:

The Project:

FORWARD is part of the "Next Wave Technologies and Markets" DTI-sponsored programme, which aims to ensure that UK business is structured and equipped to exploit new information and communications technologies and products that enable intelligent functionality to be embedded into devices that will eventually become an integral part of daily life. Central to such flexible, ambient intelligent environments are the wireless devices from which they are formed, and the protocols that determine how they communicate. But these exciting scenarios for ubiquitous computing cannot truly be realised unless the technologies are trusted. Project FORWARD will investigate the development of trustworthy wireless communications for future pervasive computing environments, delivering a methodology based on rigorous tools and techniques. By applying such rigorous methodologies at the design stages of a product development lifecycle more costly errors can be removed prior to prototype and testing.

List of relevant chapters:

Mobile Systems, Distributed Systems Security, Rigorous Design

Three publications reporting outcomes from the project

- M. Kwiatkowska, G. Norman, D. Parker and J. Sproston Performance Analysis of Probabilistic Timed Automata using Digital Clocks In Proc. Formal Modeling and Analysis of Timed Systems (FORMATS'03). 2003
- M. Kwiatkowska, G. Norman and J. Sproston Probabilistic Model Checking of the IEEE 802.11 Wireless Local Area Network Protocol In Proc. PAPM/PROBMIV'02, volume 2399 of LNCS, pp. 169-187, Springer-Verlag 2002
- M. Kwiatkowska, G. Norman and D. Parker PRISM: Probabilistic Symbolic Model Checker In Proc. TOOLS 2002, volume 2324 of LNCS, pp. 200-204, Springer-Verlag 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: GRASS

Project Title: GeneRic Architecture for Smart Spaces

URL: <http://www.dsg.cs.tcd.ie/sites/GRASS.html>

Start Date: 2002

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The work carried out under GRASS aims to produce frameworks to support development of context-aware systems for deployment in mobile and ubiquitous environments. FMCAT (Framework for Mobile, Context-Aware Trails) is a subproject of GRASS with the objective to design and implement a software framework to facilitate the development of mobile, context-aware trail-based applications. Combining the use of context data in the generation and dynamic reconfiguration of trails with mobile operation capabilities, gives rise to opportunities for developing novel applications. In parallel with FMCAT the Generic Context Architecture project is developing a generic software architecture to satisfy the context data requirements of a varied range of context-aware applications. The fields of mobile and ubiquitous computing are now widely recognised as the next major advance in information technology. Mobile computing is primarily concerned with the use of mobile devices in wireless environments, whereas ubiquitous computing is concerned with bringing about the “disappearance” of the computer, embedding it naturally so that we can use computer technology as part of our daily lives without thinking about it. These two areas combine to facilitate the development of mobile, context-aware software systems. Context-aware systems are those that have an understanding of the physical and social situation in which they are deployed. Such systems apply this information to provide services appropriate to the user and their prevailing context. The GRASS project is helping to increase the ubiquity of mobile computing by developing frameworks to support development of context-aware systems for deployment in mobile and ubiquitous environments.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

None

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: GLOSS

Project Title: GLObal Smart Spaces

URL: <http://www.dsg.cs.tcd.ie/sites/GloSS.html>

Start Date: 2001

End Date: 2003

CaberNet Members Involved: Trinity College, Dublin

Other Partners: University of Strathclyde - Glasgow Scotland, University of St Andrews – Scotland, Université Joseph Fourier, laboratoire IMAG-CLIPS - Grenoble, France.

The Project:

As pervasive environments become closer to reality, the differences between infrastructure and wireless networks will become ever more transparent to the user, i.e. it is becoming increasingly difficult to distinguish wireless ad-hoc infrastructures with wired, fixed ones. In this new ubiquitous environment, movement is unrestricted and computation happens in a distributed but also highly geographically localised style. The GloSS project is concerned with providing middleware support for large-scale outdoor environments where mobile nodes communicate and roam freely. A new computational paradigm can be associated with such environments that take invisible computing one step further and realises novel techniques to exploit this model of space resembling the vision set by Hillier in “Space is the Machine”. The GLOSS project addresses the scenario where only devices at the human interface are visible and is seeking to develop a precise understanding of how services (both physical and information-based) are used and interleaved into people's daily lives.

List of relevant chapters:

Mobile Systems, Group Communication

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: GOPI

Project Title: A Generic Object Platform Infrastructure

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/users/geoff/GOPI/index.html>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

The GOPI project is building a distributed object-based middleware platform, or object request broker, that is intended to support soft real-time/ multimedia applications in a distributed environment. A key principle of the GOPI approach is that media-streams should be treated as first-class entities in the object-based distributed environment. For example, they should be visible in IDL definitions and handled in the same resource management environment as standard object invocations.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- [Coulson,97] Coulson, G. and Clarke, M.W., "A Distributed Object Platform Infrastructure for Multimedia Applications", Proc. 3rd Workshop on High Performance Protocol Architectures (HIPPARCH'97), Uppsala, Sweden, June 1997.
- [Coulson,98] Coulson, G. and Clarke, M.W., "A Distributed Object Platform Infrastructure for Multimedia Applications", Computer Communications, Vol 21, No 9, pp 802-818, July 1998.
- [Coulson,99a] Coulson, G., "A Configurable Multimedia Middleware Platform", IEEE Multimedia Magazine, Vol 6, No 1, pp 62-76, IEEE Press, January-March 1999.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: GRIDKIT

Project Title: A Reflective Component-based Implementation of the Open Grid Services Architecture (OGSA)

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

In this project, we are designing and developing a backwardly OGSA-compatible Grid services platform using our OpenCOM/ OpenORB technology as a hosting environment. The platform will incorporate key results and techniques from the last five years of research in object-based middleware (e.g. in performance engineering). It will also feature a programming model that integrates OGSA with the facilities and services found in object-based middleware environments so that application developers can leverage these from OGSA without having to learn multiple APIs. Furthermore, we will exploit the inherent extensibility of the OpenCOM-based hosting environment to yield an OGSA platform that can naturally evolve to support new binding types and exploit useful generic services that are available in a number of specific environments (web-services, CORBA services, Jini services, etc.). We will also exploit the adaptability of the hosting environment to support predictable resourcing of bindings to enable e-Science applications to be able to specify QoS levels and have such specifications meaningfully supported.

List of relevant chapters:

Service-oriented Computing, Distributed Object and Component Technologies

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Hello

Project Title: H.323 telephony over QoS capable networks

Start Date: December 1998

End Date: October 2002

URL: <http://www.icsy.de/forschung/abgeschlossen/abgeschlossen4.shtml>

CaberNet members involved on the project: Universität Kaiserslautern, Germany

Other Partners:

The Project:

This project aims to improve the media quality provided by H.323 communication. This includes the usage of Quality of Service (QoS) capabilities of networks as well as the improved media processing within the endsystems. Especially the number of dropped media frames and end-to-end delay is aimed at being reduced.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Reuther, B., Krause, S., Müller, H.: Datenfluss gesteuerte CPU-Lastkontrolle, Deutsches Patentamt, Patent Nr. 2001P13825 DE, 2001.
- Bernd Reuther, Markus Hillenbrand, Supervised Media Processing with Real-Time Priority, 7th IASTED International Conference on Internet and Multimedia Systems and Applications; IMSA 2003; August 13-15, 2003; Honolulu; Hawaii; USA.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: HYSYS

Project Title: Modular Design of Hybrid Systems

Start Date: March 1996

End Date: February 1999

URL: <http://ls4-www.informatik.uni-dortmund.de/RVS/P-HYSYS/>

CaberNet members involved on the project: Universität Dortmund

Other Partners: Deutsche Forschungsgemeinschaft (DFG) - Programme: Analysis and Synthesis of Continuous-Discrete Technical Systems (KONDISK)

The Project:

The approach concentrates on the formal development of real-life hybrid technical systems. A specification technique for the formal design, analysis, and verification of continuous-discrete models is developed which, particularly, facilitates the modular development of distributed process control software.

List of relevant chapters:

Real-time Systems

Three publications reporting outcomes from the project

- P. Herrmann, H. Krumm, O. Drögehorn, W. Geisselhardt: Framework and Tool Support for Formal Verification of High Speed Transfer Protocol Designs. In: Telecommunication Systems, Kluwer Academic Publisher, 20, 3-4, pp. 291-310. 2002.
- S. Kowalewski, P. Herrmann, S. Engell, R. Huuck, H. Krumm, Y. Lakhnech, B. Lukoschus, H. Treseler: Approaches to the Formal Verification of Hybrid Systems. In: at - Automatisierungstechnik, 49, 2, pp. 66-74. 2001.
- P. Herrmann, H. Krumm: A Framework for the Hazard Analysis of Chemical Plants. In: Proceedings of the 11th IEEE International Symposium on Computer-Aided Control System Design (CACSD2000), pp. 35-41, Anchorage, Alaska, USA, IEEE CSS, September 2000. Omnipress. 2000.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Ibis

Project Title: Efficient Java-based Grid Computing

Start Date: ongoing

End Date:

URL: <http://www.cs.vu.nl/ibis/>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

The goal of the Ibis project at the Vrije Universiteit Amsterdam is to design and implement an efficient and flexible Java-based programming environment for Grid computing, in particular for distributed supercomputing applications. Java has many advantages for Grid computing. Foremost, by being based on a virtual machine concept, it is inherently more portable than traditional, statically compiled languages, making it much easier to execute Java applications in a heterogeneous Grid environment. Also, Java is based on a high-level, object-oriented, type-safe programming model and it has built-in support for multithreading and distributed computing. Unfortunately, Java's support for distributed computing, Remote Method Invocation (RMI), has important shortcomings for high-performance Grid computing: it is difficult to implement efficiently and only expresses client-server style communication. Ibis addresses these problems. Ibis boosts RMI performance using several optimizations, especially to avoid the high overhead of runtime type inspection that current RMI implementations have. Earlier projects (e.g., Manta) applied similar optimizations by writing parts of the runtime system in native code (C instead of Java), giving up Java's high portability. The philosophy behind Ibis is to try to obtain good performance without using any native code, but allow native solutions to further optimize special cases. For example, a Grid application developed with Ibis can use a pure-Java RMI implementation over TCP/IP that will run "everywhere". However, when the application runs on, say, a Myrinet cluster, the RMI runtime system can request Ibis to load a more efficient communication implementation for Myrinet that partially uses native code. The Ibis project also addresses the lack of expressiveness of Java RMI, which provides only synchronous client-server communication. The Ibis programming environment supports a range of communication paradigms, including group communication and collective communication, integrated cleanly into Java. Other systems typically resort to extensions that are less well integrated with Java's object-oriented model, such as using a native MPI library.

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

- R. V. van Nieuwpoort: Efficient Java-Centric Grid-Computing. Ph.D. thesis Vrije Universiteit Amsterdam, the Netherlands, September 2003.
- R. V. van Nieuwpoort, J. Maassen, R. Hofman, T. Kielmann, H. E. Bal: Ibis: an Efficient Java-based Grid Programming Environment, Joint ACM Java Grande - ISCOPE 2002 Conference, pp 18-27, November 3-5, 2002, Seattle, Washington, USA.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: i-Cities

Project Title: Information Cities

Start Date: 1999

End Date: ongoing

URL: <http://icities.csd.uoc.gr>

CaberNet members involved on the project: FORTH, Greece

Other Partners: University of Crete (Computer Science Department), Swedish Institute of Technology (SICS), Ecole Polytechnique (Laboratoire de l'Econometric), IBM T.J. Watson (Institute of Advanced Commerce)

The Project: The Information Cities project models aggregation/segregation patterns in a virtual world of infohabitants (humans, virtual firms, on-line communities and software agents acting on their behalf).

List of relevant chapters:

Control and Coordination in Dynamic Virtual Organisations, Group Communication

Three publications reporting outcomes from the project

- Internet et la Distribution de Biens Physiques: Analyse de l' Emergence de Nouvelles Structures Verticales dans le Secteur du Vin [PDF] published in the Revue Economique, Vol. 52, pp 213-232 in October 2001
- Regularities in the Formation and Evolution of Information Cities. Presented in The 2nd Kyoto Meeting on Digital Cities held in Kyoto, Japan in October 19-20, 2001
- Information Cities Over the Internet; Taxonomies, Principles and Architecture [PDF] presented in the Digital Communities 2002 Conference held in Chicago, USA in November 4-6, 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: i-Cities

Project Title: Information Cities

Start Date: 1999

End Date: 2002

URL: <http://icities.csd.uoc.gr>; <http://pi.ijs.si/ProjectIntelligence.Exe?Cm=Project&Project=ICITIES>

CaberNet members involved on the project: FORTH, Greece

Other Partners: University of Crete (Computer Science Department), Swedish Institute of Technology (SICS), Ecole Polytechnique (Laboratoire de l'Econometric, IBM T.J. Watson (Institute of Advanced Commerce)

The Project: The Information Cities project models aggregation/segregation patterns in a virtual world of infohabitants (humans, virtual firms, on-line communities and software agents acting on their behalf). The Information Cities project models the aggregation and segregation patterns in a virtual world of infohabitants (humans, virtual firms, on-line communities and software agents acting on their behalf). The objective is to capture aggregate patterns of virtual organisation, emerging from the interaction over the emerging information infrastructure, a virtual place where millions (or billions) meet of infohabitants meet, co-operate and trade: a stable and scalable micro-environment that supports the efficient provision of many e-commerce and personal services, and allows for the continuous creation of new activities and relationships. To investigate conditions of emergence and evolution of Information Cities, we will develop an open multiagent environment, flexible and adaptive to the dynamic nature of the Information Society.

List of relevant chapters:

Distributed Multimedia Platforms, Service-oriented Computing

Three publications reporting outcomes from the project

- Internet et la Distribution de Biens Physiques: Analyse de l' Emergence de Nouvelles Structures Verticales dans le Secteur du Vin. Published in the Revue Economique, Vol. 52, pp 213-232 in October 2001
- Regularities in the Formation and Evolution of Information Cities. Presented in The 2nd Kyoto Meeting on Digital Cities held in Kyoto, Japan in October 19-20, 2001
- Information Cities Over the Internet; Taxonomies, Principles and Architecture [PDF] presented in the Digital Communities 2002 Conference held in Chicago, USA in November 4-6, 2001. Submitted in the ICS Journal

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: iTransIT

Project Title:

URL: <http://www.dsg.cs.tcd.ie/sites/iTransIT.html>

Start Date: 2003

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The iTransIT initiative is investigating, in cooperation with Dublin City Council, the definition and prototype implementation of an ITS (Intelligent Transport System) architecture for Dublin in the light of current major infrastructure developments such as the M50 motorway, the Dublin Port Tunnel, and Luas, the Dublin Light Rail System. iTransIT will consider the application of wireless communication to urban traffic management. Distributing real-time traffic congestion information to mobile and stationary users requires the propagation of a graphical congestion map within a potentially densely populated urban area using wireless technology. There are many issues arising, for example guaranteeing real-time multimedia support in wireless networks, and the impact of wireless technology on existing legacy traffic information systems. The iTransIT project aims to provide a real-time traffic congestion map for Dublin. Such a map analyses intersection data and displays an up-to-date graphical picture of the state of traffic congestion in Dublin City. This congestion map will be made available initially to Dublin City Council users and eventually to the general public. In addition, monitoring software for the Luas light rail system that is able to provide complete data on tram calls time through intersections and to estimate arrival times on a junction-to-junction basis will be designed.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- M. Dineen, "Real-Time Display of Dublin Traffic Information on the Web", in Dept. of Computer Science: Trinity College Dublin, Ireland, 2000.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ITO

Project Title: Information Technology Online

Start Date: 01.04.2001

End Date: 31.12.2003

URL: <http://iasc88.ias.uni-stuttgart.de/ito/>

CaberNet members involved on the project: University of Stuttgart

Other Partners: TU Munich, TU Dresden, TU Hamburg-Harburg, PH Ludwigsburg

The Project:

The ITO project aims at building a constructivist training supply for international courses in the fields of electro-technology and information technology as well as computer science. This is performed by means of Multimedia and Internet technologies. The focus is on the following aspects: Enrich lecture contents with multimedia modules like interactive animation and simulation applets (sub-project HiSAP). Construct learning modules and make them available for exchange and reuse between lecturers of nationwide project partners. Develop a learning environment for self studies. Due to the constructivist approach, this means a large portion of exercises and self-evaluation (sub-project HiSPIN) as well as collaboration support. For the latter, ITO cooperates closely with the projects FESTIVAL and NUSS. Take into account special requirements of students who are handicapped visually or auditively, or are disabled. The project is funded by BMBF, the German Ministry of Education.

List of relevant chapters:

Control and Coordination in Dynamic Virtual Organisations, Group Communication

Three publications reporting outcomes from the project

- C. Burger, K. Rothermel. A framework to support teaching in the area of distributed systems. In: ACM Journal on Educational Resources in Computing (JERIC). Vol. 1 (2001)
- C. Burger, S. Papakosta, K. Rothermel. "Application sharing in teaching context with wireless networks". Proc. World Congress NETWORKED LEARNING IN A GLOBAL ENVIRONMENT - Challenges and Solutions for Virtual Education, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: JETS

Project Title: Journey Estimation Time System

URL: <http://www.dsg.cs.tcd.ie/sites/JETS.html>

Start Date: 2001

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

JETS is concerned with estimating journey times on the national road network of Ireland. The system is based on the use of GPS centralized floating vehicle data. Vehicle positions and speeds are mapped onto the national road network and this data is manipulated to provide accurate estimations of journey times. This data can be presented to the end user in a wide variety of formats across numerous platforms. Advances in GPS and GIS architecture have led to greater accuracy of location information, for example using GPS centralized floating vehicle data, journey estimation time can be calculated. The JETS project uses GPS centralized floating vehicle data for vehicle positions and speeds which are mapped onto the national road network of Ireland and used for accurate estimations of journey times. This project is financed by the National Roads Authority and forms part of a larger EU project - Streetwise, which is concerned with the provision of multi-modal travel and traffic information across the Ireland/UK to Continental Europe corridor.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Jgroup

Project Title:

Start Date: ongoing

End Date:

URL: <http://www.cs.unibo.it/projects/jgroup/>

CaberNet members involved on the project: Università di Bologna, Italy

Other Partners: Department of Telematics, Norwegian University of Science and Technology, Trondheim, Norway

The Project: Jgroup is an integration of the group communication paradigm with distributed object technologies like Java RMI and Jini. Jgroup supports a programming paradigm called *object groups* that enables development of reliable and highly available services based on replication. Client objects are enabled to perform *group method invocations* on group of replicated servers, with specific guarantees on the reliability of multicast invocations.

List of relevant chapters:

Distributed Object and Component Technologies, Dependable Systems, Group Communication

Three publications reporting outcomes from the project

- Hein Meling, Alberto Montresor, Ozalp Babaoglu, Bjarne E. Helvik. Jgroup/ARM: A Distributed Object Group Platform with Autonomous Replication Management for Dependable Computing Technical Report UBLCS 2002-12, October 2002
- O. Babaoglu, R. Davoli, A. Montresor. Group Communication in Partitionable Systems: Specification and Algorithms. In IEEE Transactions on Software Engineering, 27(4):308-336, April 2001
- Alberto Montresor, Renzo Davoli, Ozalp Babaoglu. Enhancing Jini with Group Communication In *Proceedings of the ICDCS Workshop on Applied Reliable Group Communication (WARGC 2001)*, April 2001, Phoenix, Arizona (USA).
- Hein Meling, Bjarne E. Helvik. ARM: Autonomous Replication Management in Jgroup In Proceedings of the 4th European Research Seminar on Advances in Distributed Systems (ERSADS), Bertinoro, Italy, May 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: LandMARC

Project Title: Lancaster and Microsoft Active Research Collaboration

Start Date: 1999

End Date: 2001

URL: <http://www.landmarc.net/start.htm>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

LandMARC is a Microsoft Research funded two-year project at Lancaster University, UK. The main aim of the project is to build a research environment based on Microsoft technology which will support a number of important areas in mobility, distributed systems, and networking research in which Lancaster has established an international reputation.

List of relevant chapters:

Operating Systems, Mobile Systems

Three publications reporting outcomes from the project

- Nicholas J. P. Race, Daniel G. Waddington and Doug Shepherd. A Dynamic RAM Cache for High Quality Distributed Video. In Proceedings of Interactive Distributed Multimedia Systems and Telecommunication Services (IDMS'2000), 17-20 October 2000, CTIT/University of Twente, Enschede, The Netherlands.
- Nicholas J. P. Race, Daniel G. Waddington and Doug Shepherd. An Experimental Dynamic RAM Video Cache. In Proceedings of Network and Operating Systems Support for Digital Audio and Video (NOSSDAV'2000), 26-28 June 2000, Chapel Hill, North Carolina.
- Stefan Schmid, Joe Finney, Andrew Scott, Doug Shepherd. In Active Component Driven Network Handoff for Mobile Multimedia Systems. Proceedings of Interactive Distributed Multimedia Systems and Telecommunication Services (IDMS'2000), 17-20 October 2000, CTIT/University of Twente, Enschede, The Netherlands.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: LicenseScript

Project Title: A language and framework for calculating licenses and information over constrained domains

Start Date: October 2002

End Date: September 2004

URL: <http://wwwes.cs.utwente.nl/licensescript/>

CaberNet members involved on the project: Universiteit Twente, The Netherlands

Other Partners: Telematica Instituut

The Project:

The project LicenseScript develops and demonstrates an integrated framework for analysis and design of secure information delivery systems. Specifically, this project aims at the development of a framework in which one can specify, analyse and enforce Digital Rights. Other important application areas of the proposed framework are Privacy Protection, Sensor data Processing, and the protection of classified data.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

- C. N. Chong, R. Corin, S. Etalle, P. H. Hartel, W. Jonker and Y. W. Law. LicenseScript: A Novel Digital Rights Language and its Semantics,. 3rd International Conference on Web Delivering of Music WEDELMUSIC 2003, Interdisciplinary Centre of Scientific Research in Music (ICSRiM), University of Leeds, United Kingdom, September 2003.
- C. N. Chong, R. Corin, Y. W. Law, S. Etalle and P. H. Hartel. LicenseScript - A Novel Digital Rights Language. Int. Workshop for Technology, Economy, Social and Legal Aspects of Virtual Goods, Ilmenau, Germany, May, 2003.
- C. N. Chong, Y. W. Law, S. Etalle and P. H. Hartel. LicenseScript - A Language and Framework for Calculating Licenses on Information over Constrained Domains (Extended abstract). 7th CaberNet Radicals Workshop, Bertinoro, Forli, Italy, 13—16 October 2002.
- C. N. Chong, S. Etalle and P. H. Hartel. Comparing Logic-based and XML-based Rights Expression Languages. Workshop on Metadata Security (WMS) of International Federated Conferences (OTM '03), held in Catania, Sicily, Italy, In Proceedings of the 2003 International Conference on Distributed Objects and Applications (DOA), published by Springer-Verlag, November 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: LinkMe

Project Title: LinkMe: Distributed Link Services for Mobile Environments

Start Date: ongoing

End Date:

URL: <http://www-dse.doc.ic.ac.uk/Projects/linkme>

CaberNet members involved on the project: Imperial College, UK

Other Partners: University of Southampton, UK

The Project

The overall objective of this project is to provide a distributed link service for mobile users of distributed hypermedia (Web) information systems. The work is novel in that integrates work on open hypermedia, mobile agents, constraint specification and software architectures and has broader applicability in areas such as programmable telecommunications.

List of relevant chapters:

Mobile Systems, Software Architectures in dependable and Distributed Systems, Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: MAFTIA

Project Title: Malicious- and Accidental-Fault Tolerance for Internet Applications

Start Date: 1 January 2000

End Date: 28 February 2003

URL: <http://www.newcastle.research.ec.org/maftia/>

CaberNet members involved on the project: LAAS - CNRS, France; Universidade de Lisboa, Portugal; University of Newcastle, UK

Other Partners: Systems Assurance Group of QinetiQ, Malvern, IBM Zurich Research Lab, Cryptography and Security Group of Saarland University

The Project:

MAFTIA is a European IST project (IST-1999-11583) aimed at investigating the tolerance paradigm in security. Instead of just aiming to prevent intrusions, the aim is to make the overall system secure and operational, even if some subsystems are successfully attacked.

List of relevant chapters:

Dependable Systems, Distributed Systems Security

Three publications reporting outcomes from the project

- Y. Deswarte, N. Abghour, V. Nicomette and D. Powell, "An Internet Authorization Scheme using Smart Card-Based Security Kernels", in International Conference on Research in Smart Card (e-Smart 2001), (I.Attali and T.Jensen, Eds.), (Cannes, France), Lecture Notes in Computer Science, 2140, pp.71-82, 2001.
- L. C. Lung, M. Correia, N. F. Neves and P. Veríssimo, "A Simple Intrusion-Tolerant Reliable Multicast Protocol Using the TTCB", in 21º Simpósio Brasileiro de Redes de Computadores, Natal, Brazil, 2003.
- K. Julisch, Data Mining for Intrusion Detection - A Critical Review, in Applications of Data Mining in Computer Security, D. Barbera and S. Jajodia (eds.) Kluwer Academic Publishers, Boston, 2002.
- I. Welch, R. J. Stroud, Using Reflection as a Mechanism for Enforcing Security Policies on Compiled Code, Journal of Computer Security, Vol: 10 IOS Press, Netherlands, pp 399-432, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Mansion

Project Title: A Large-scale Distributed Mobile Agent System

Start Date: ongoing

End Date:

URL: <http://www.cs.vu.nl/mansion/>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

The Mansion paradigm provides a conceptual framework for developing applications distributed over a large number of hosts using simple concepts. Logically, a Mansion world (application) consists of a set of hyperlinked rooms which contain objects, mobile agents and hyperlinks to other rooms. Objects are located in only one room and can be accessed (only) by agents in this room. A mobile agent is essentially mobile code, which can migrate to any machine hosting the world (these machines may be physically located anywhere on the Internet) to find information or perform a task for its owner. An agent can only be in one room at a time, but can, in principle, communicate with other agents anywhere in the world (i.e., in any room); each agent has a world-wide, unique identifier which allow other agents to communicate with it. Mansion is supported by a middleware layer that provides the primitives for agents to do work in a Mansion world. The Mansion middleware can be seen as a (widely) distributed operating system, using which mobile code can roam through a Mansion world; objects and agents are available in each world in a well-defined way using an API provided by the middleware. The design leans on a body of related work, varying from mobile code security and existing mobile agent and mobile code systems to distributed (operating) systems and distributed object architectures. A number of concepts (such as support for replicating passive data) are derived from the Globe distributed object architecture.

List of relevant chapters:

Mobile Agents, Distributed System Security

Three publications reporting outcomes from the project

- G. van 't Noordende, F. M.T. Brazier, A. S. Tanenbaum "A Security Framework for a Mobile Agent System", Proceedings of the 2nd Int'l Workshop on Security of Mobile Multiagent Systems (SEMAS-2002), Bologna, Italy, July 16, 2002. DFKI Research Report RR-02-03 pp. 43-50.
- G. van 't Noordende, F. M.T. Brazier, A. S. Tanenbaum "Mansion: A Structured Middleware Environment for Agents", 3rd International SANE Conference, May 27 - 31, 2002, Maastricht, The Netherlands (poster abstract).
- G. van 't Noordende, F. Brazier, A. S. Tanenbaum, Maarten van Steen "Position Statement: Mansion, A Distributed Multi-Agent System", Eighth Workshop on Hot Topics in Operating Systems (HotOS-VIII), Elmau, Germany, May 20-22, 2001, p. 183.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Manta

Project Title: Fast Parallel Java

Start Date: 12 Oct 2001

End Date: ongoing

URL: <http://www.cs.vu.nl/~rob/manta/>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

Manta is a native Java compiler. It compiles Java source codes to x86 executables. Its goals are to beat the performance of all current Java implementations. Currently it already contains a highly efficient RMI implementation (source code compatible with std. RMI). It is currently about 30 times faster than standard implementations. Class libraries are taken from kaffe, classpath and partly homebrew. In doing experiments with Java RMI and JavaParty, we found the programming model of RMI and JavaParty to be convenient, but we also found that performance of remote method invocation for programming parallel clusters of workstations is too slow by far. Two-way latency of Sun's RMI is on the order of 1200 microsecond on Myrinet. Our Panda library achieves 30 microsecond on the same hardware. Based on our experience with Orca, we have written a Java system, called Manta, featuring a full-fledged native compiler and RMI run time system, that does a null-RMI in 34 microseconds. Manta supports the complete Java 1.1 language, including exceptions, garbage collection and dynamic class loading. Manta also supports some Java extensions, such as the JavaParty programming model (the 'remote' keyword), replicated objects (described at JavaGrande 2000), and efficient divide and conquer parallelism (the 'spawn' and 'sync' keywords from cilk). The divide and conquer system is called 'Satin' and was presented at Euro-Par 2000 and PPOPP'01. Furthermore, we have built a distributed shared memory (DSM) system on top of Manta, called Jackal, described at JavaGrande 2001 and PPOPP'01. At this moment we are working on a completely new backend for our native compiler, which will generate code that is more efficient than the code generated by our current implementation. A preliminary release of Manta is scheduled for the near future

List of relevant chapters:

Distributed Objects and Component Technologies

Three publications reporting outcomes from the project

- R. V. van Nieuwpoort: Efficient Java-Centric Grid-Computing, Ph.D. thesis Vrije Universiteit Amsterdam, the Netherlands, September 2003.
- R. V. van Nieuwpoort, J. Maassen, R. Hofman, T. Kielmann, H. E. Bal. Ibis: an Efficient Java-based Grid Programming Environment Joint ACM Java Grande - ISCOPE 2002 Conference, pp 18-27, November 3-5, 2002, Seattle, Washington, USA.
- R. V. van Nieuwpoort, T. Kielmann, H. E. Bal. Efficient Load Balancing for Wide-area Divide-and-Conquer Applications. Proc. Eighth ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPOPP'01), Snowbird, UT, June 18-19, 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: MAVA

Project Title: Multimedia Document Versatile Architecture

Start Date: 01.04.1998

End Date: 31.12.2001

URL: <http://www.ub.uni-stuttgart.de/ub/mava/envs/mava.phtml>

CaberNet members involved on the project: Universität Stuttgart, Germany

Other Partners:

The Project:

MAVA is a platform independent multimedia presentation system. In contrast to present approaches MAVA focuses on the realization of the extensibility of language concepts and media items instead of developing a new document language or language concepts. The extensibility permits a later integration of existing concepts into MAVA. There are several different application areas for multimedia documents like information providing, computer-based training or multimedia games. All these application areas differ in the required concepts and media items. Concepts define which possibilities exist for the author to define interdependencies or relations between media items. An example for a concept is interval operators used in temporal synchronization, but there are further different concepts for temporal synchronization. Media items contain the original information that has to be presented by the document. Examples for media items are audio or video sequences or text. MAVA is realized in Java. For the processing of continuous media data the Java Media Framework is used. In the first phase, the presentation system for MAVA documents was developed. The second phase covered the development of a document editor and the integration into the Internet.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Bauser, J.; Rothmel, K.: Specification and Implementation of an Extensible Multimedia System. In: Scholten, Hans (ed.); van Sinderen, Marten J. (ed.): Proceedings of the 7th International Workshop on Interactive Distributed Multimedia Systems and Telecommunication Services (IDMS 2000).
- Hauser, J.: A Component-based Extensible Multimedia System. In: Arabnia, H. R. (ed.): Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA '2001).
- Hauser, J.; Rothmel, K.: Document Specification and Dissemination with an Extensible Multimedia System. In: Killat, U. (ed.); Lamersdorf, W. (ed.): Proceedings of the 12th Kommunikation in Verteilten Systemen (KiVS).

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: MICS

Project Title: Mobile Information and Communication Systems

Start Date: 2001

End Date: ongoing

URL: <http://lsrwww.epfl.ch/cavin/nccr-mics>

CaberNet members involved on the project: Ecole Polytechnique Fédérale de Lausanne, Switzerland

Other Partners:

The Project:

The goal of this project is to define and implement distributed middleware building blocks and algorithms for Mobile Ad-hoc NETWORKS (MANETs).

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- Samuel Bendahan, Giovanni Camponovo, Yves Pigneur. Multi-issue actor analysis: tools and models for assessing technology environments. *Journal of Decision Systems*.
- Sonja Buchegger and Jean-Yves Le Boudec. Coping with False Accusations in Misbehavior Reputation Systems for Mobile Ad-hoc Networks Performance Evaluation.
- Olivier Dousse, Francois Baccelli, Patrick Thiran,. Impact of Interferences on Connectivity in Ad Hoc Networks. *IEEE/ACM Transactions on Networking*.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Mikado

Project Title: Mobile Calculi based on Domains

Start Date:

End Date:

URL: <http://mikado.di.fc.ul.pt/>

CaberNet members involved on the project: INRIA, France; University of Lisbon, Portugal

Other Partners: France Télécom R&D, France, University of Florence, Italy; University of Sussex, UK

The Project:

Mikado is an IST project whose goal is to construct a new formal programming model, based upon the notion of domain as a computing concept, which supports reliable, distributed mobile computation, and provides the mathematical basis for a secure standard for distributed computing in open systems.

Specifically, MIKADO intends:

- To develop new formal models for both the specification and programming of large-scale, highly distributed and mobile systems.
- To develop new programming languages features supporting such models, and to study their combination with functional and object-oriented programming.
- To develop specification and analysis techniques which can be used to build safer and trustworthy systems, to demonstrate their conformance to the specifications, and to analyse their behaviour
- To prototype new virtual machine technologies that can be used to implement in a "provably correct" way such models and languages.

List of relevant chapters:

Rigorous Design

Three publications reporting outcomes from the project:

M. Lacoste. Building Reliable Distributed Infrastructures Revisited: a Case Study. International DOA Workshop on Foundations of Middleware Technologies (WFoMT'02), 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Mole

Project Title:

Start Date: 1995

End Date: 2000

URL: <http://mole.informatik.uni-stuttgart.de/>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

Mobile agents are a new programming paradigm in the area of distributed systems. Traditional object-oriented approaches in this area distribute objects over the network with a very fine granularity and let the underlying system decide where these objects have to be placed and accessed, respectively. The mobile agent paradigm follows another approach instead. Mobile agents are clusters of objects that hold no reference to objects external to the cluster. They have the ability to move autonomously from node to node in an arbitrary network. They use resources represented by special service agents, and they can provide services of their own (i.e. can provide value-added services). Mobile agents work asynchronously, since they do not depend on a connection to the node where they have been started. Even the choice of the node on which they compute is entirely theirs (this is part of the agent autonomy). Only when they have finished their assigned task do they contact their home node (or the parent application) to report the results. Mobile agents communicate with other agents through message passing, RPC, or through higher communication concepts (e.g. sessions). Since they are autonomous and able to move anywhere in the network of nodes, security of the agent on one hand and, equally important, of the nodes providing the infrastructure on the other hand, is of foremost importance. Some prospective applications are e-commerce, adaptable services, an infrastructure for mobile computing devices, or intelligent information retrieval in the Internet.

List of relevant chapters:

Mobile Agents

Three publications reporting outcomes from the project

- M. Straßer, J. Baumann, F. Hohl: Mole - A Java Based Mobile Agent System, Proc. 2nd ECOOP Workshop on Mobile Object Systems, dpunkt-Verlag 1997
- J Baumann, F. Hohl, N. Radouniklis, K. Rothermel, M. Straßer: Communication Concepts for Mobile Agent Systems, Proc. 1st Int. Workshop on Mobile Agents MA97, Springer Verlag, 1997
- J. Baumann, F. Hohl, K. Rothermel, M. Straßer: Mole - Concepts of a Mobile Agent System In "Mobility, Mobile Agents and Process Migration - An Edited Collection", Springer Verlag, 1999.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: MOTION

Project Title: Multicast Communication

Start Date: 1999

End Date: 2002

URL: <http://www.informatik.uni-stuttgart.de/ipvr/vs/personen/maihoefer/Research.engl.html>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

Multicasting is the efficient transmission of a message to a group of receivers. A multitude of new application areas are based on this transmission technique, e.g. news and software distribution, distributed computing and multimedia applications like videoconferencing and teleteaching. In those applications the communication model is changed. A receiver does no longer have to "pull" the sender for messages, but as soon as the messages are available, the sender distributes them to the receivers (push technology). Multicasting is efficient because network resources are used very economically. It is sufficient to send a message once in order to be received from all receivers of this group. Group management is necessary to administer the multicast participants. The group membership is dynamic, i.e. joining and leaving a group is possible at any time. Unreliable multicasting is already available in the Internet, but there is no guarantee that messages are delivered to all participants. The current research concentrates on reliable multicast. Existing multicast solutions are insufficient because they have several deficits that we want to improve in the MOTION project. This includes the insufficient error semantics, the building of the administration structure for reliable message delivery and the support for mobile participants. During the last year we have developed a new protocol to build the administration structure in a scalable and fault tolerant way. This leads to a considerable improvement for large and dynamic groups. The new protocol was implemented in a simulation environment and compared to existing approaches. Besides this we have investigated existing multicast transport protocols for their error semantics and suitability for particular application categories. We will use the results to improve these protocols or to develop a new transport protocol if necessary.

List of relevant chapters:

Group Communication

Three publications reporting outcomes from the project

- K. Rothermel, C. Maihöfer: A Robust and Efficient Mechanism for Constructing Multicast Acknowledgment Trees, Proceedings of the Eight International Conference on Computer Communications and Networks (IEEE ICCCN 99), 1999
- C. Maihöfer, K. Rothermel: Optimal Branching Factor for Tree-Based Reliable Multicast Protocols, 2001 International Symposium on Performance Evaluation of Computer and Telecommunication Systems(SPECTS)
- C. Maihöfer, K. Rothermel: A Delay Analysis of Tree-based Reliable Multicast Protocols, Proceedings of the Tenth International Conference on Computer Communications and Networks (IEEE ICCCN 2001), 2001

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: MP6

Project Title: Security Models and Policies for Healthcare and Social Information and Communication Systems

Start Date: Nov 2001

End Date: Nov 2003

URL: http://www.telecom.gouv.fr/rnrt/projets/res_01_59.htm

CaberNet members involved on the project: LAAS-CNRS, France

Other Partners: Ernst & Young Audit, ONERA, Toulouse, IRIT, Mastersecurity, ETIAM, ENST Bretagne, SupElec- Rennes, France Telecom R&D

The Project:

It is a project of the French national RNRT research network. The project aims to analyse security requirements for information systems in healthcare and social sectors, and to develop security policies adapted to these requirements, supported by models able to verify certain properties. Authorization and anonymization problems are of particular interest, and two policy examples will be developed for these two cases.

List of relevant chapters:

Distributed Systems Security, Dependable Systems

Three publications reporting outcomes from the project

- A. Abou El Kalam, R. E. Baïda, P. Balbiani, S. Benferhat, F. Cuppens, Y. Deswarte, C. Saurel, G. Trouessin, "Security Models and Policies for Health and Social Information and Communication Systems". The 1st French-speaking Conference on Management and Engineering of Hospital Systems (GISEH 2003), (Lyon, France), pp. 268-277, 2003 (in French).
- A. Abou El Kalam and Y. Deswarte, "Security Model for Health Care Computing and Communication Systems", in Security and Privacy in the Age of Uncertainty, 18th IFIP Int. Conf. on Information Security (IFIP/Sec'2003), (Athens, Greece), pp. 277-288, 2003.
- A. Abou El Kalam, R. El Baïda, P. Balbiani, S. Benferhat, F. Cuppens, Y. Deswarte, A. Miège, C. Saurel and G. Trouessin, "Organization Based Access Control", in 4th IEEE Workshop on Policies for Distributed Systems and Networks (POLICY-2003), (Como, Italy), pp.120-131, IEEE CS Press, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: myGrid

Project Title

Start Date: 1998

End Date: ongoing

URL: <http://www.mygrid.org.uk/>

CaberNet members involved on the project: University of Newcastle UK

Other Partners: University of Manchester UK; University of Nottingham UK; University of Sheffield UK; University of Southampton UK; IT Innovation Centre UK; European Bioinformatics Institute; AstraZeneca UK; GlaxoSmithKline UK; Merck KGaA UK; Epistemics Ltd UK; GeneticXchange UK; Network Inference UK; IBM; Sun Microsystems

The Project:

myGrid is a research project that extends the Grid framework of distributed computing, producing a virtual laboratory workbench that will serve the life sciences community. The integration environment will support patterns of scientific investigation that include: accumulating evidence, assimilating results, accessing community information sources and collaborating with disparately located researchers via electronic forums. Scientists will have the ability to customize the work environment to reflect their preferences for resource selection, data management and process enactment. MyGrid's applicability to the bioinformatics community will be tested through use cases our academic and industry partners develop. Minimally, the environment will be able to support activities relating to the analysis of functional genomic data and the annotation of pattern databases.

myGrid develops an open source high-level middleware to support personalised in silico experiments in biology on a Grid. The Grid is proposed as the next generation infrastructure necessary to support & enable the collaboration of people & resources through highly capable computation & data management systems.

A number of BioGrid projects are underway, including the Asia Pacific BioGrid Initiative, the North Carolina BioGrid, the Canadian BioGrid, etc. These primarily focus on the sharing of computational resources, large-scale data movement & replication for simulations, remote instrumentation steerage or high throughput sequence analysis. However, much bioinformatics requires support for a scientific process that has more modest computational needs, but has significant semantic complexity. myGrid is building services for integration such as resource discovery, workflow enactment & distributed query processing. Additional services are needed to support the scientific method & best practice found at the bench but often neglected at the workstation, notably provenance management, change notification & personalisation. The target users of myGrid are tool & service providers who build applications for a community of biologists.

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

- Smith,J., Gounaris,A., Watson,P., Paton,N.W., Fernandes, A.A.A., Sakellariou,R. Distributed query processing on the Grid. In Lecture Notes in Computer Science, 2536, pp. 279-290. 2002.
- Wilkinson,M.D., Links,M. BioMOBY: an open source biological web services proposal. Brief. Bioinform., 3, pp. 331-341. 2002.
- Wroe, C., Stevens,R., Goble,C., Roberts,A., Greenwood,M. A suite of DAML+OIL ontologies to describe bioinformatics web services and data. International Journal of Cooperative Information Systems, 12, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Neko

Project Title: A Single Environment to Simulate and Prototype Distributed Algorithms

Start Date: ongoing

End Date:

URL: <http://lsrwww.epfl.ch/neko>

CaberNet members involved on the project: Ecole Polytechnique Fédérale de Lausanne, Switzerland

Other Partners:

The Project:

The goal of the project is to build a highly extensible yet simple and easy to use Java framework for constructing and testing reliable distributed algorithms

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

- Péter Urbán, Xavier Défago, André Schiper. Neko: A single environment to simulate and prototype distributed algorithms. *In* Proc. of the 15th Int'l Conf. on Information Networking (ICOIN-15), Beppu City, Japan, February 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NET

Project Title: Network Emulation Testbed

Start Date: 2001

End Date: ongoing

URL: <http://net.informatik.uni-stuttgart.de/>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

The ever-evolving Internet faces new dimensions and applications. The growing number of connected machines and the demand for new services like media-streaming, location-based services and mobile internet access require the development of new applications and even new internet protocols. A major issue in the design of new communication protocols and distributed applications is always the scalability: A program may work fine in the local environment of the developer, but what about the behaviour in a real internet environment with many users? How does the new application deal with a mixture of high- and low-bandwidth links, lost connections, high delays? It is essential to answer these questions before the application is really used. To answer the questions above, the usual way for developers of distributed applications and protocols is to run a simulation program like NS-2. Those programs can simulate Internet environments with specified characteristics. However, the simulator can't be used with the original application to be analyzed. In order to integrate the application with the simulator, the application itself must be modelled in a way the simulator can understand. In fact, the application often has to be (re-)implemented to become a part of the simulator. In contrast, emulation systems can make their flexible network infrastructure work like a specified network. In this environment, the applications to be analyzed can be run on separate, real machines, not inside a simulator. As a result, you analyze the real code of an application, not a model of the application, which could be incomplete or even wrong. Additionally, the emulation even includes characteristics of the application environment you might have omitted in a simulation model, like the timer intervals of the operating system your application runs on. In general, your analysis in an emulation environment will be more exact than simulation results. The NET project will provide an emulation testbed for the performance analysis of distributed applications and protocols using a cluster system with flexible connection infrastructure.

List of relevant chapters:

Service-oriented Computing, Mobile Systems

Three publications reporting outcomes from the project

- Herrscher, D.; Leonhardi, A.; Rothermel, K.: Modeling Computer Networks for Emulation. In: Proceedings of the 2002 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'02), Las Vegas
- Herrscher, D.; Rothermel, K.: A Dynamic Network Scenario Emulation Tool. In: Proceedings of the 11th International Conference on Computer Communications and Networks (ICCCN 2002), Miami (FL), Oct 14-16, 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NetEmu

Project Title: Real-time Emulation of Computer and Communication Networks

Start Date: 1999

End Date: 2005

URL: <http://www.informatik.uni-hamburg.de/TKRN/world/abro/ongore.htm>

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners: University of Essen, Germany

The Project:

For design, construction and assessment of computer networks it is essential to evaluate the performance of these networks and of applications using networks. To realize both goals we developed a tool to calculate delays and losses in modelled networks and to emulate them in real-time [Bühning et al. 2000].

The real-time network delay and loss emulator is understood as a system providing network interfaces where other systems can connect to. These systems can host distributed applications communicating over the emulator without noticing any differences between the emulator and an actual physical network. The network emulator has to deliver each packet – if not decided to be lost – with the computed delay accurately. The network emulated may include network-internal sources of background load as well as interfaces for external sources of load.

With this tool two main tasks can be addressed without building up a complete physical network: On the one hand, the behaviour of a distributed application can be evaluated assuming different network configurations. On the other hand, the behaviour of the network can be evaluated as a consequence of changes made on the application side (e.g., load dependent application-layer encoding). The tool built allows a bunch of methods to model and evaluate networks under real-time conditions, e.g., use of discrete simulation, traces or analytical models. A special research focus is put on the real-time simulation of, possibly multi-hop, mobile ad-hoc networks (MANETs) [Scherpe et al. 2002] and of interconnected networks including Internet paths [Scherpe et al. 2003].

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- Bühning F., Scherpe C., Modellierungsverfahren zur lastabhängigen Verhaltensprognose von Kommunikationsnetzen in Echtzeit, Proc. 14. Symp. Simulationstechnik, ASIM 2000, Hamburg, 2000
- Scherpe C., Wolf J., Echtzeitsimulation von Multi-Hop-Ad-hoc Netzen, 16. Symp. Simulationstechnik, ASIM 2002, Rostock, 2002
- Scherpe C., Wolfinger B. E., Salzmann I.: Model Based Network Emulation to Study the Behavior and Quality of Real-Time Applications. 7th IEEE Internat. Symp. on Distributed Simulation and Real-Time Applications, DS-RT 2003 (Delft, 2003)

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NETKIT

Project Title: A Reflective Component-based Infrastructure for Programmable Networks

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/users/geoff/NETKIT/>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

The NETKIT project is exploring an approach to programmable networking that is inspired by the way in which middleware technology has revolutionised the (related) field of distributed applications. We believe this to be a highly promising and exciting approach that can leverage current research on specific programmable networking techniques and make these techniques significantly easier to deploy, integrate, extend and manage. In more detail, we are developing a generic, language-independent, component-based toolkit for programmable networking systems. This is building on our existing OpenCOM/ OpenORB component/ middleware technology, and is addressing all levels of programmable networking in an integrated manner from in-band packet handling on routers to high level signalling protocols. Our aim is to encompass all current programmable networking paradigms (e.g. open signalling, active networking, and application-level active networking approaches), and to support, in a uniform manner, the configuration, reconfiguration and runtime management of programmable network systems at all system levels.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NEXT TTA

Project Title: High-Confidence Architecture for Distributed Control Applications

Start Date: January 2002

End Date: January 2004

URL: <http://www.vmars.tuwien.ac.at/projects/nexttta/>

CaberNet members involved on the project: TU Vienna, Chalmers University of Technology, Sweden; Budapest University of Technology and Economics, Hungary; Technical University of Darmstadt, Germany; University of York, UK

Other Partners: AUSTRIAMICROSYSTEMS AG; AUDI AG; TTTECH COMPUTERTECHNIK AG; VERIMAG, France; University of Ulm, Germany

The Project:

The NEXT TTA project enhances the structure, functionality and dependability of the time-triggered architecture (TTA) to meet the austere cost structure of the automotive industry, while satisfying the rigorous safety requirements of the aerospace industry. By placing the safety-relevant algorithms, that are formally analyzed, into intelligent replicated star couplers, NEXT TTA reduces the cost and generalizes the failure assumptions of the node computers. Event-triggered communication services are integrated into the TTA to increase the required flexibility. The synchronous programming environment LUSTRE and its tool set are extended for the TTA and automated worst-case-execution-time analysis is explored. CORBA compliant interfaces are provided in order to make TTA systems interoperable with the open information infrastructure. The limits of implementing the TTA with COTS components in the gigabit range are investigated.

List of relevant chapters:

Real-time Systems, Dependable Systems

Publications reporting outcomes from the project

- G. Bauer, H. Kopetz, W. Steiner "The Central Guardian Approach to Enforce Fault Isolation in a Time-Triggered System" Proceedings of the 6th International Symposium on Autonomous Decentralized Systems (ISADS 03) April 2003, Pisa, Italy.
- G. Bernat, A. Colin, S. M. Petters "WCET Analysis of Probabilistic Hard Real-Time Systems" Real-Time Systems Symposium, December 2002, Austin, Texas, USA.
- H. Kopetz, N. Suri "Compositional Design of RT Systems: A Conceptual Basis for Specification of Linking Interfaces" Proceedings of the 6th IEEE International Symposium on Object-oriented Real-Time Distributed Computing (ISORC) May 2003, Hakodate, Hokkaido, Japan.
- P. Puschner "Algorithms for Dependable Hard Real-Time Systems" Proceedings of 8th IEEE International Workshop on Object-Oriented Real-Time Dependable Systems (WORDS 2003), January 2003, Guadalajara, Mexico.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Nexus

Project Title: An Open Global Infrastructure for Spatial-Aware Applications

Start Date: 1998, 2000, 2003

End Date: 1999, 2002, 2006

URL: <http://www.nexus.uni-stuttgart.de>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

The main objective of the Nexus project is the definition and realization of world models that provide the basis for a wide range of context-aware applications, especially for mobile users. In this scope, issues concerning communication, information management, methods for model representation and sensor data integration are covered. Applications of world models serve as a basis to derive requirements and to evaluate the system concepts. Besides the technical problems, which result from merging different research areas from the fields of computer science, geographic information systems, databases and other technical fields, issues in the area of information security and social acceptability have to be investigated that are a consequence of the existence of such digital world models. The Nexus project started in 1988 with two project partners. In 2000 a research group with four project partners was founded leading to the creation of a "Center of Excellence" with nine partners at the University of Stuttgart in 2003. The multidisciplinary approach of the Nexus Center of Excellence particularly allows research with respect to problems concerning secure use of personal data as well as social relevancy and acceptability of such information systems.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- Hohl, F.; Kubach, U.; Leonhardi, A.; Rothermel, K.; Schwehm, M.: Next Century Challenges: Nexus - An Open Global Infrastructure for Spatial-Aware Applications, Proceedings of the Fifth Annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom'99), Seattle, Washington, USA, T. Imielinski, M. Steenstrup, (Eds.), pp. 249-255, ACM Press, 1999
- U. Kubach, K. Rothermel: Exploiting Location Information for Infostation-Based Hoarding, In Proceedings of the Seventh ACM SIGMOBILE Annual International Conference on Mobile Computing and Networking (MobiCom 2001), pp. 15-27, Rome, Italy, July 2001
- Leonhardi, A.; Rothermel, K.: Architecture of a Large-scale Location Service, In Proc. of the 22nd Int. Conf. on Distributed Computing Systems (ICDCS 2002), Vienna, Austria, pp. 465-466, 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NIPON

Project Title: User based IP Accounting

Start Date: April 2001

End Date: October 2003

URL: <http://www.icsy.de/forschung/nipon/>

CaberNet members involved on the project: Universität Kaiserslautern, Germany

Other Partners:

The Project:

The aim of the NIPON project is to enable IP accounting systems to distinguish different users. Today's accounting systems are only able to distinguish between different hosts. Therefore on multiuser hosts and PC pools it is not possible to identify the user of a network resource. With respect to the exponential growth of bandwidth consumption and of the upcoming QoS capabilities of networks, it becomes more important to identify the person who is responsible for the usage of network resources.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project:

- Zhang, Ge; Reuther, B.; Müller, P.: Distributed Agent Method for User Based IP Accounting, 7th CaberNet Radicals Workshop, 13-16 October 2002, Bertinoro (Forlì), Italy.
- Zhang, Ge; Reuther, B.; Müller, P.: User Oriented IP Accounting in Multi-user Systems, The 8th IFIP/IEEE International Symposium on Integrated Network Management, Colorado Springs, USA, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: NUSS

Project Title: Notebook University Stuttgart

Start Date: 2001

End Date: 2002

URL: <http://www.informatik.uni-stuttgart.de/ipvr/vs/en/projects/NUSS/>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

The success of teaching is heavily depending on students participating actively in lectures. With portable devices and wireless communication, new possibilities arise to support this process. In cooperation with the Computing Center, the Education Department and other faculties at the University of Stuttgart, NUSS examines this potential. It is funded by BMBF, the German Ministry for Education. In this project, the Distributed Systems Department studies the idea of application sharing during lectures.

List of relevant chapters:

Group Communication

Three publications reporting outcomes from the project:

Bosau, D.; Burger, C.; Wacker, A.; Pfletschinger, M.: Context-Sensitive Interaction Support during Augmented. In: Finney, Joe (ed.); Haahr, Mads (ed.); Montresor, Alberto (ed.): Proceedings of the 7th CaberNet Radicals Workshop, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: ObjectWeb

Project Title:

Start Date: 1999

End Date: ongoing

URL: <http://www.objectweb.org/>

CaberNet members involved on the project: INRIA, France

Other Partners: France Telecom R&D, Bull; Institut National Polytechnique de Grenoble, France; Université Joseph Fourier, France, and more.

The Project:

ObjectWeb is a consortium dedicated to the development of innovative open-source middleware. Its aim is to foster the development of open-source middleware for cutting-edge applications: EAI, e-business, clustering, grid computing, managed services and more.

List of relevant chapters:

Distributed Object and Component Technologies, Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: OGSA-DAI

Project Title: Open Grid Services Architecture Data Access and Integration

Start Date:

End Date: 2003

URL: <http://www.ogsadai.org.uk>

CaberNet members involved on the project: Newcastle University (North -East Regional e-Science Center -UK)

Other Partners: National e-Science Center (UK), IBM, Oracle

The Project:

The project aims to provide a component library for accessing and manipulating data in a Grid for use by the UK and international Grid community. It also provides a reference implementation of the emerging GGF recommendation for Database Access and Integration Services (DAIS). The project develops a middleware glue to interface existing databases, other data resources and tools to each other in a common way based on OGSA. As part of this glue a simple integration of distributed queries to multiple databases. OGSA-DAI will also interact with other Grid standards and software to support replication services and complex workflows

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: OpenORB

Project Title: The Role of Reflection in the Design of Middleware Platforms

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/research/mpg/reflection/>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

The aims of the OpenORB Project are: i) to develop an architecture for reflective middleware, based on industrial standards such as CORBA, ii) to develop a prototype implementation of this architecture, and iii) to demonstrate the effectiveness of this approach in key areas such as QoS management, distribution transparency, and group services. Our ultimate aim is to be able to define a meta-object protocol (MOP) for standards such as CORBA.

Key issues in this research include:

- developing a language independent reflective architecture,
- investigating issues of security and integrity, and iii) minimising the performance overhead of reflection.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project

- H. A. Duran-Limon, G. S. Blair, "Reconfiguration of Resources in Middleware" In the 7th IEEE International Workshop on Object-oriented Real-time Dependable Systems (WORDS 2002), San Diego, CA, January, 2002.
- G. S. Blair, G. Coulson, et al. "The Design and Implementation of Open ORB version 2." IEEE Distributed Systems Online Journal 2(6): 2001.
- F. M. Costa, G. S. Blair, G. Coulson, "Experiments with an architecture for reflective middleware", in Integrated Computer-Aided Engineering, vol 7, pp. 313-325, IOS Press, 2000.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Orca

Project Title: The Orca Parallel Programming Language

Start Date: ongoing

End Date:

URL: <http://www.cs.vu.nl/orca/>

CaberNet members involved on the project: Vrije Universiteit, Amsterdam

Other Partners:

The Project:

Orca is a language for parallel programming on distributed systems, based on the shared data-object model. This model is a simple and portable form of object-based distributed shared memory.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project

- R. Veldema, C. J.H. Jacobs, R. F.H. Hofman, H. E. Bal: "Object Combining: A new aggressive optimization for Object Intensive Programs", ACM JavaGrande ISCOPE 2002 Conference, Seattle, WA, Nov. 2002, pp. 165-174. Copyright 2002 by ACM, Inc.
- R. V. van Nieuwpoort, J. Maassen, R. Hofman, T. Kielmann, H. E. Bal: "Ibis: an Efficient Java-based Grid Programming Environment", ACM JavaGrande ISCOPE 2002 Conference, Seattle, WA, Nov. 2002, pp. 18-27. Copyright 2002 by ACM, Inc.
- J. Maassen, R. van Nieuwpoort, R. Veldema, H.E. Bal, T. Kielmann, C. Jacobs, R. Hofman: "Efficient Java RMI for Parallel Programming", ACM. Trans. on Programming Languages and Systems, Vol. 23, No. 6, pp. 747 - 775, Nov. 2001. Copyright 2001 by ACM, Inc.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Ozone

Project Title: New Technologies and Services for Emerging Nomadic Societies

Start Date: October 2001

End Date: 2004

URL: <http://www.extra.research.philips.com/euprojects/ozone>; <http://www.extra.research.philips.com/>

CaberNet members involved on the project: INRIA, France

Other Partners: Philips Electronics Nederland B.V., T-Systems Nova, Berkom, IMEC, Philips Research France (PRF), EPICTOID, Technical University of Eindhoven, INRIA, Thomson Multimedia, LORIA.

The Project:

Ozone, an IST project whose goal is to investigate, define and implement/integrate a generic framework to enable consumer oriented ambient intelligence applications. Requirements investigation at the beginning of the process as well as the evaluation at the end are use case driven and will involve extensive user trials. The resulting framework is intended to enhance the quality of life by offering relevant information and services to the individual, anywhere and at anytime.

List of relevant chapters:

Mobile Systems, Distributed Multimedia Platforms, Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PAST

Project Title: A large-scale, peer-to-peer archival storage facility

Start Date: ongoing

End Date:

URL: <http://www.research.microsoft.com/~antr/PAST>

CaberNet members involved on the project: Microsoft Research, UK

Other Partners:

The Project:

PAST is a large-scale, peer-to-peer archival storage utility that provides scalability, availability, security and cooperative resource sharing. Files in PAST are immutable and can be shared at the discretion of their owner. PAST is built on top of Pastry, a generic, scalable and efficient substrate for peer-to-peer applications.

List of relevant chapters:

Network Storage Services

Three publications reporting outcomes from the project

- A. Rowstron and P. Druschel, "Storage management and caching in PAST, a large-scale, persistent peer-to-peer storage utility", 18th ACM SOSP'01, Lake Louise, Alberta, Canada, October 2001.
- P. Druschel and A. Rowstron, "PAST: A large-scale, persistent peer-to-peer storage utility", HotOS VIII, Schloss Elmau, Germany, May 2001
- Rowstron and P. Druschel, "Pastry: Scalable, distributed object location and routing for large-scale peer-to-peer systems". IFIP/ACM International Conference on Distributed Systems Platforms (Middleware), Heidelberg, Germany, pages 329-350, November 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PATIA

Project Title: Adaptive Management System for Distributed Web Services

Start Date: 2001

End Date: 2003

URL: <http://www.doc.ic.ac.uk/%7Ejamm/research/patia.html>

CaberNet members involved on the project: Imperial College, UK

Other Partners: The Digital Village (BBC) & Sun Microsystems

The Project:

The Patia project aims to carry out studies into data placement and request scheduling to prototype an adaptive web server management system.

List of relevant chapters:

Distributed Multimedia Platforms, Service-oriented Computing

Three publications reporting outcomes from the project

- McCann J .A., Jawaheer G. 'Experiences in Building the Patia Autonomic Webserver' to be published in 1st International Workshop "Autonomic Computing Systems", DEXA 2003.
- McCann J .A. 'The Database Machine: Old Story, New Slant?' Proceedings of the first Biennial Conference on Innovative Data Systems Research, VLDB, January 5-8 2003.
- McCann J .A., Jawaheer G., Sun L., 'Patia: Adaptive Distributed Webserver (a Position Paper)' International Symposium on Autonomous Decentralized Systems (ISADS). April 2003
- P. Kostkova, McCann J.A. Support for Mobile Location-aware Applications in MAGNET, 2nd Annual International Workshop on Web Databases, Springer-Verlag Lecture Notes in Computer Science (LNCS), Thuringia, Germany, October 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PerSL

Project Title: Pervasive Software Licensing

URL: <http://www.dsg.cs.tcd.ie/sites/PerSL.html>

Start Date: May 2003

End Date: April 2005

CaberNet Members Involved: Trinity College, Dublin

The Project:

The Pervasive Software Licensing (PerSL) project is investigating use of Web Services as a platform for pervasive computing, with a focus on the application area of software licensing for mobile devices. Licensing models and license management systems are going through major changes because traditional shrink-wrapped software licensing does not cater for the needs of the modern software market. The emergence of new platforms such as mobile computing will revolutionise how software is licensed and managed [DD03]. Software license systems are moving towards more flexibility and supporting several licensing models. Future licensing systems will be capable of tracking the usage of software and charge users based on the amount of actual usage of the software. The PerSL project focuses on licensing laws for mobile devices. For example, how will the mobile licensing models integrate with existing licensing systems on the customers' and vendors' side?

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- [DD03] Ivana Dusparic and Jim Dowling, Mobile Software Licensing, Technical Report. July 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PETERS

Project Title: Pre-Exploitative Tools for Evaluating Reliability of Software

Start Date: August 1997

End Date: October 2000

URL: http://www.csr.city.ac.uk/csr_city/projects/peters_demo/home.html

CaberNet members involved on the project: City University, UK

Other Partners:

The Project:

This project is concerned with the development of general techniques for obtaining accurate measures and predictions of the reliability of software. It builds on very successful, and novel, research within the Centre for Software Reliability that now allows certain reliability measures to be accompanied by a guarantee of accuracy, and in very general circumstances allows the reliability predictions from models to be improved in the light of their previous errors.

The work here mainly addresses the problems faced by statistically unsophisticated users of these new advanced statistical approaches: it provides means whereby the power of the techniques can be made accessible to industrial reliability engineers and software engineers.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Pin&Play

Project Title: Assessment of a Network Technology that connects Smart Objects through Surfaces to which they are pin-attached

Start Date: ongoing

End Date:

URL: <http://ubicomp.lancs.ac.uk/pin&play/>

CaberNet members involved on the project: Lancaster University, UK

Other Partners: Viktoria Institutue, Sweden

The Project:

Pin&play is a new approach of ad-hoc networking among objects that people can attach to large surfaces, such as notes that people pin to notice boards or artefacts that people hang on the walls in their home. It incorporates augmentation of common vertical surfaces such as walls and notice boards with low-cost conductive material to create smart surfaces as a communication medium. The objects are attached to such surfaces by means of simple pin connectors, to provide users with a familiar mechanism for adding objects to the network. This is a European IST project (project IST-2001-37007).

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PISEIA

Project Title: P2P Infrastructure Simulation, Evaluation and Implementation Architecture

URL: <http://www.dsg.cs.tcd.ie/sites/PISEIA.html>

Start Date: 1st April 2003

End Date: 2006

CaberNet Members Involved: Trinity College, Dublin

The Project:

The PISEIA project investigates topological aspects of peer-to-peer networks, focusing on the comparative evaluation of topologies in terms of performance, security, scalability and suitability for individual applications. The Peer-to-Peer (P2P) communications paradigm is emerging as the infrastructural basis for a new suite of Internet applications, for example media-sharing. Different applications deploy different topologies, i.e., ways of arranging the nodes to form a P2P network. The PISEIA project aims to develop a general model of P2P topology and a generic simulation and implementation framework that will enable comparative evaluation of P2P topologies and easy migration from simulation to production-quality code.

List of relevant chapters:

Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Polyander

Project Title: Language Based Policy Specification, Analysis and Deployment for Large-scale Systems

Start Date: 2001

End Date: 2004

URL: <http://www.doc.ic.ac.uk/%7Emss/Polyander.html>

CaberNet members involved on the project: Imperial College, UK

Other Partners:

The Project:

The project aims to further the development of policy-based network and systems management and achieve significant advances in user definition of policies by combining the language based approach formulated at Imperial College with the CISCO Information Model based on the Common Information Model, a DMTF Standard.

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PolyNet

Project Title: Policy Based Management of Adaptive Networks

Start Date: October 2000

End Date: 2003

URL: <http://www.doc.ic.ac.uk/%7Emss/polynet.html>

CaberNet members involved on the project: Imperial College, UK

Other Partners:

The Project:

The overall objective is to evaluate the Ponder Policy Specification language as a means of specifying and implementing both security and management policies for adaptive networks. The specific objectives of this proposal are:

- To develop techniques and interfaces for interaction between policy-based applications and policy-enabled networks in order to support dynamic adaptation;
- To investigate the use of Ponder management and security policies as a means of 'programming' network components such as routers, firewalls or dynamic proxy servers within the network for applications requiring adaptive networks;
- To extend the Ponder compiler for IETF/DMTF information models and schema to demonstrate that Ponder is a suitable language for specifying the many different types of policies being defined within these standards groups;
- To provide techniques and tools for the use of Ponder in producing FPGA-based network processors, particularly implementations involving run-time reconfiguration of hardware components;
- To set up an experimental testbed for policy based management, and develop a simple policy aware application as a means of evaluating the application-network policy interface and the use of reconfigurable FPGAs for fastpath adaptation in network elements.

List of relevant chapters:

Distributed Systems Security, Network and Distributed System Management

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PoNDS

Project Title: Policy Notation for Distributed Systems

Start Date: ongoing

End Date:

URL: <http://www-dse.doc.ic.ac.uk/Research/policies/projects.shtml>

CaberNet members involved on the project: Imperial College, UK

Other Partners:

The Project:

This project is investigating the application of policy specification languages to service level agreements.

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PRIDE

Project Title: Integrated Design Environment for Dependable Systems

Start Date: 20.05.2002

End Date: 20.11.2003

URL: <http://www.isti.cnr.it/ResearchUnits/Labs/dc-lab/research-pro.html>

CaberNet members involved on the project: ISTI (CNR, Pisa), Italy

Other Partners: Intecs HRT S.p.A

The Project:

This project is funded by the Italian national space agency (ASI). The main goal of PRIDE is the development of a software environment for the design of dependable systems, based on the UML notation and integrating verification and validation techniques through a transformational approach towards the most common analysis tools. The project pursues the following objectives: i) to enrich the UML notation to properly represent models for dependable systems; ii) the definition of a set of transformations for quantitative and qualitative analysis of dependable systems models, hiding the mathematical technicalities to the user; iii) the development of an integrated environment supporting the defined transformations; iv) demonstration of the validity of the approach through a case study in the aerospace field.

List of relevant chapters:

Dependable Systems, Rigorous Design

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PRIME

Project Title: Privacy and Identity Management for Europe

Start Date: 2003

End Date: 2007

URL: TBD

CaberNet members involved on the project: LAAS-CNRS, Katholieke Universiteit Leuven Research & Development, Aachen University of Technology / RWTH Aachen, Institut EURECOM.

Other Partners: Compagnie IBM France, IBM Research, Zürich Research Laboratory, Unabhängiges Landeszentrum für Datenschutz, Technische Universität Dresden, Deutsche Lufthansa AG, Siemens Aktiengesellschaft, Hewlett-Packard Ltd., Karlstad University, Università di Milano, Joint Research Centre, Johann Wolfgang Goethe-Universität Frankfurt, Chaum LLC, Erasmus University Rotterdam, JaTeK GmbH, Tilburg University, Fondazione Centro San Raffaele del Monte Tabor, Swisscom, T-Mobile.

The Project:

Information technologies are becoming pervasive and powerful to the point that privacy of citizens is now at risk. In the Information Society, individuals want to keep their autonomy and easily retain control over personal information, irrespective of their activities. The widening gap on this issue between laws and practices on the networks undermines trust and threatens critical domains like mobility, health care and the exercise of democracy. PRIME addresses this issue via an integrative approach of the legal, social, economic and technical areas of concern to build synergies about the research, development and evaluation of viable solutions on privacy-enhancing identity management that focus on end-users. The work plan supports this integration over the project lifetime through multiple iterations of increasing complexity. PRIME elaborates a framework to integrate all technical and non-technical aspects of privacy-enhancing identity management. During and after the project, the framework will act as a lingua franca between all actors and reinforce their roles and responsibilities for full effectiveness. PRIME advances the state of the art far beyond the objectives of existing initiatives to address foundational technologies (human-computer interface, ontologies, authorization, cryptology), assurance and trust, and architectures. It validates its results on the basis of prototype and application developments and experiments with end-users in selected sensitive domains. PRIME creates awareness and timely disseminates its results, in particular through computer-based education. PRIME involves leading experts from application and service providers, data protection authorities, academic and industrial research, and invites all major stakeholders to join its Reference Group. PRIME participation prepares the transfer of its results to industry and standardisation to strongly support European privacy regulations and reinforce European leadership. Privacy is becoming a major security concern. The PRIME project to be started within FP6 is dedicated to privacy and identity management.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project:

None

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PROFUNDIS

Project Title: Proofs of Functionality for Mobile Distributed Systems

Start Date: January 2001

End Date: December 2003

URL: <http://www.it.uu.se/profundis/>

CaberNet members involved on the project: University of Pisa, Italy

Other Partners: FFCT, Universidad Nova de Lisboa, Portugal, INRIA Sophia-Antipolis, France, Uppsala University, Sweden

The Project:

PROFUNDIS is a FET GC project with the main goal to advance the state of the art of formal modelling and verification techniques to the point where key issues in mobile distributed systems, such as security protocols, authentication, access rights and resource management can be treated rigorously and with considerable automatic support. We shall implement automatic and partly automatic analysis methods for ascertaining correct behaviour of such systems. For this purpose we shall integrate and focus on several strands of ongoing theoretical work. PROFUNDIS consists of three technical Work Packages (WPs), and a fourth WP which is devoted to project management. The project is divided among four sites: Uppsala (UU), Lisbon (FFCT), INRIA Sophia Antipolis and Pisa. Each site is active in all work packages, to a degree that varies between sites and over years. Each work package has an appointed leader. The Steering Committee consists of the co-ordinator and all site and work package leaders.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- D. Sangiorgi, Types, or: Where's the difference between CCS and pi?. In *Proc. CONCUR '02*, LNCS 2421, Springer Verlag. 2002. accompanying paper for an invited talk.
- D. Teller, P. Zimmer, D. Hirschhoff, Using Ambients to Control Resources. In *Proceedings of the 13th Int. Conf. in Concurrency Theory (CONCUR'02)*, LNCS 2421, Springer Verlag. 2002.
- Vallecillo, V. T. Vasconcelos, A. Ravara, Typing the Behavior of Objects and Components using Session Types. In *Electronic Notes in Theoretical Computer Science*, 68, Elsevier Science Publishers. 2002. presented at FOCLASA'02 - 1st International Workshop on Foundations of Coordination Languages and Software Architectures.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: PURTA

Project Title: Precise UML for Real-Time Applications

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: University of York, UK

Other Partners:

The Project:

Tata Consultancy Services are funding a three-year project called PURTA (Precise UML for Real-Time Applications). This project is developing a precise semantic framework for UML that will permit it to be applied to the specification of high integrity real-time systems.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: RAMS

Project Title: RAMS: Reliability, Availability, Maintainability and Safety analysis of critical software

Start Date: January 2003

End Date: December 2004

URL: <ftp://ftp.estec.esa.nl/pub/tos-qq/qqs/RAMSFrameContract/>

CaberNet members involved on the project: Critical Software, Portugal

Other Partners: -

The Project:

The main objective of the ESA's RAMS project (ESTEC/Contract N° 16582/02/NL/PA) is to validate several safety and dependability techniques. More precisely, the RAMS project aims at:

- Performing extensive validation of safety and dependability software techniques.
- Providing valuable results to improve the quality of the software, thus promoting the application of dependability and safety methods and techniques.

Two specific case studies are to be developed:

1. The execution of a SFMECA (Software Failure Modes, Effects and Criticality Analysis) on the *Spacecraft Control and Operation System* software product (SCOS 2000) together with a code inspection on selected modules. The SFMECA is a bottom-up approach starting from the possible failure modes of low-level software components and identifying possible consequences at upper levels. This is done to support the assessment of the software architecture as regards the effects of potential software failures.
2. The definition and execution of robustness and stress testing on the RTEMS OTS (Off-The-Shelf) microkernel. The purpose of the robustness testing is to define test cases that are within or outside the specification boundaries of the system and to monitor the results produced at runtime. Stress testing aims at creating test cases in such a way that an exceptional high workload is achieved. The Xception tool is selected to execute the robustness and stress test cases on the RTEMS/ERC32 based system. It can generate source code level mutants in user applications that interface with the Classic or POSIX APIs of RTEMS.

Both case studies demonstrate the application of the safety and dependability evaluation techniques and make suggestions allowing the improvement of both the target software and the applied techniques.

List of relevant chapters:

Dependable Systems, Real-Time Systems

Publications reporting outcomes from the project

- Critical Software, SA, "Call-off Order 01: SFMECA and Code Inspections on SCOS-2000 2.3e Evaluation Report", Report CSW-RAMS-2003-TNR-1515, DL-RAMS01-08, Version 1.3, October 31, 2003 (ftp://ftp.estec.esa.nl/pub/tos-qq/qqs/RAMSFrameContract/SW_FMECAonSCOS2000andCodeInspections/).

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: RAPID

Project Title: Roadmap for Advanced Research in Privacy and Identity Management

Start Date: 2002

End Date: 2003

URL: http://www.ra-pid.org/default/show.gx?_app.page=show-USR.html&Object.object_id=KM-----0000000000000002

CaberNet members involved on the project: LAAS - CNRS, France, Katholieke Universiteit Leuven, Belgium

Other Partners:

The Project:

RAPID aims to develop a strategic roadmap for applied research in the area of privacy and identity management. In order to preserve its overall relevance, RAPID has set itself the ambitious goal to complete its work plan in 12 months. To support this aim, RAPID will put in place a dedicated project management and scientific co-ordination structure by combining human resources and skills and state of the art quality assurance techniques.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project:

The final reports of the RAPID roadmap and of the individual streams are available on the project web site.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Ravenspark

Project Title:

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: University of York, UK

Other Partners:

The Project:

This is an EPSRC/DERA (now Qinetiq) funded project that also involves Praxis and BAE SYSTEMS. The project is concerned with: formal analysis of Ravenscar programs (Ravenscar is a simple subset of Ada95 tasking features) using Model Checking, and linking formalised subsets of the sequential parts of Ada (such as Spark) with Ravenscar.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Relate

Project Title: Assessment of a Relative Positioning Technologies for Compositional Tangible User Interfaces

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/research>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

The Smart-Its project is interested in a far-reaching vision of computation embedded in the world. In this vision, mundane everyday artefacts become augmented as soft media, able to enter into dynamic digital relationships. In our project, we approach this vision with development of "Smart-Its" - small-scale embedded devices that can be attached to everyday objects to augment them with sensing, perception, computation, and communication. We think of these "Smart-Its" as enabling technology for building and testing ubiquitous computing scenarios, and we will use them to study emerging functionality and collective context-awareness of information artefacts. This is a European IST project (project IST-2001-39264).

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: REMUNE

Project Title: Advanced REal-time MUlti-media and Networking Execution Platform and Development Environment

Start Date: ongoing

End Date:

URL: <http://www.solinet-research.com/remune/>

CaberNet members involved on the project: Ecole Polytechnique Fédérale de Lausanne, Switzerland

Other Partners: Solinet GmbH, Alcatel AGSEL, Teletel S.A, ARM Ltd, MIltch Hellas S.A., Thales Communications S.A., Centre Suisse D'Electronique Et De Microtechnique, University of Maryland USA; Northeastern University USA.

The Project:

REMUNE is a European IST project (IST-2000-65002). The main goal of REMUNE is to develop and validate through industrial test-beds an advanced Real-time Operating System and Development Environment (RTOS) supporting multimedia and networking services for embedded systems and product-services.

List of relevant chapters:

Real-time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: RIS

Project Title: Dependability Engineering Network

Start Date: Jan 2001

End Date: Dec 2004

URL: <http://www.ris.prd.fr/index.html.en>

CaberNet members involved on the project: LAAS - CNRS, France

Other Partners: Astrium, France, Airbus, France, Technicatome, THALES

The Project:

RIS is a cooperative academia-industry network managed by LAAS that aims to share past experience and to stimulate joint working groups on themes dealing with dependability engineering of software-intensive systems.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project:

- P David, H. Waeselynck (Eds.), Open Source Software and Dependability, 234p. Hermès Science, Paris, 2003 (in French).
- M. Kaâniche, J.-C. Laprie, J.-P. Blanquart, "A Framework for Dependability Engineering of Critical Computing Systems", Safety Science, 9 (40), pp. 731-52, December 2002.
- M. Mersiol, J. Arlat, D. Powell, A. Saidane, H. Waeselynck, C. Mazet, "FAST: a Prototype Tool for Supporting the Engineering of Socio-technical Systems", in 3rd European Systems Engineering Conference, (Toulouse, France), pp. 33-40, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: R-Fieldbus

Project Title: High Performance Wireless Fieldbus In Industrial Related Multi-Media Environment

Start Date: 2000

End Date: 2002

URL: <http://www.rfieldbus.de>

CaberNet members involved on the project: Instituto Politécnico do Porto, Portugal

Other Partners: Ifak, Germany; LPC, Greece; ISEP, Portugal; Softing, Germany; Siemens, Germany; ISI, Greece

The Project:

The R-Fieldbus project (funded by the European Commission - IST-1999-11316) aims at developing an innovative wireless communication architecture supporting industrial multimedia. Within this project the group has proposed a new hybrid wired/wireless PROFIBUS solution where most of the design options are made in order to guarantee the proper real-time behaviour of the overall network [Alves 2002]. Furthermore, the group has also participated in the development of a double stack architecture, allowing the tunnelling of TCP/IP traffic in wired/wireless PROFIBUS networks [Pacheco 2001].

List of relevant chapters:

Distributed Multimedia Platforms, Mobile Systems

Three publications reporting outcomes from the project:

- M. Alves, E. Tovar, F. Vasques, G. Hammer, K. Röther, "Mobility Management in Hybrid Wired/Wireless Token-Passing Fieldbus Networks". The 2nd IFIP Networking (Networking 2002), May 2002, Pisa, Italy.
- Alves, M., Tovar, E. and Vasques, F. "Evaluating the Duration of Message Transactions in Broadcast Wired/Wireless Fieldbus Networks", 27th IEEE Annual Conference of the Industrial Electronics Society (IECON'01), December, 2001, Denver, Colorado, USA.
- Pacheco, F., Tovar, E., Kalogeras, A, Pereira, N., "Supporting Internet Protocols in Master-Slave Fieldbus Networks", 4th IFAC Conference on Fieldbus Technology (FET'01), November 15-16, 2001, Nancy, France.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SACS

Project Title: Security Aspects of Distributed Component-Structured Software

Start Date: December 1999

End Date: ongoing

URL: <http://ls4-www.informatik.uni-dortmund.de/RVS/P-SACS/>

CaberNet members involved on the project: Universität Dortmund

Other Partners: Deutsche Forschungsgemeinschaft (DFG)

The Project:

Component-structured software is composed from components which are independently created, combined, and deployed. The high number of principals is a reason for more subtle security risks than in monolithic programs. In order to solve this problem we develop a formal security model for component-structured software. Moreover, we are developing methods and tools for securing components and applications against hostile attacks.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

- P. Herrmann: Formal Security Policy Verification of Distributed Component-Structured Software. September/October 2003, Springer-Verlag.
- P. Herrmann: Trust-Based Protection of Software Component Users and Designers. To appear in: 1st International Conference on Trust Management, LNCS, Heraklion, May 2003, Springer-Verlag.
- P. Herrmann, G. Herrmann: Security-Oriented Refinement of Business Processes. In: 5th International Conference on Electronic Commerce Research (ICECR02), ATSM, IFIP, Montreal, October 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SAHARA

Project Title: Software Architectures for Heterogeneous Access Networks infrastructures

Start Date: ongoing

End Date:

URL: <http://sahara.di.univaq.it/>

CaberNet members involved on the project: Università di Bologna, Italy

Other Partners:

A couple of paragraphs describing what the project is about: The global objective of the project is to provide a characterisation of the architectural abstraction levels needed to properly develop HASAs (heterogeneous access software applications), together with some proposals of analysis and verification tools, tuned to the functional and QoS properties of interest.

List of relevant chapters:

Software Arhctitures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SCRIBE

Project Title: A scalable group communication system

Start Date: ongoing

End Date:

URL: <http://research.microsoft.com/~antr/SCRIBE/>

CaberNet members involved on the project: Microsoft Research, UK

Other Partners:

The Project:

The SCRIBE system under development in at Microsoft Research Cambridge is a generic, scalable and efficient event notification system. It provides application level multicast based on the publish-subscribe paradigm. SCRIBE is self-organizing, flexible, highly scalable and efficient. It is built on top of Pastry, a generic, scalable, self-organizing substrate for peer-to-peer applications. Applications of SCRIBE include instant messaging/presence notification, news broadcast and stock quote dissemination.

List of relevant chapters:

Group Communication, Mobile Systems, Dependable Systems

Three publications reporting outcomes from the project

- M. Castro, P. Druschel, A.-M. Kermarrec, A. Rowstron, "Scalable application level anycast for highly dynamic groups". NGC 2003, Munich, Germany, September 2003.
- M. Castro, M. B. Jones, A.-M. Kermarrec, A. Rowstron, M. Theimer, H. Wang and A. Wolman, "An Evaluation of Scalable Application-level Multicast Built Using Peer-to-peer overlays", Infocom 2003, San Francisco, CA, April, 2003.
- M. Castro, P. Druschel, A.-M. Kermarrec, A. Rowstron, "SCRIBE: A large-scale and decentralised application-level multicast infrastructure", IEEE Journal on Selected Areas in Communications (JSAC) (Special issue on Network Support for Multicast Communications). 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SECURE

Project Title: Secure Environments For Collaboration Among Ubiquitous Roaming Entities

URL: <http://secure.dsg.cs.tcd.ie>

Start Date: 2001

End Date: 2004

CaberNet Members Involved: Trinity College, Dublin and University of Cambridge, Cambridge

Other Partners: Universities of Aarhus, Geneva and Strathclyde

The Project:

The SECURE project is investigating the design of dynamic and self-configuring security mechanisms that are appropriate for global computing based on the human notion of trust. The size and dynamics of the global computing infrastructure means that the security policy must encompass billions of potential collaborators and computational entities that offer services will be confronted with requests from entities that they have never met before.

Global computing foresees a massively networked environment supporting a large population of diverse but cooperating entities. Due to the potentially highly mobile environment, the composition and characteristics of this network will be both highly dynamic and unpredictable. Entities will be both autonomous and mobile and will have to be capable of dealing with unforeseen circumstances ranging from unexpected interactions with other entities to disconnected operation.

The properties of the global computing infrastructure introduce new security challenges that are not adequately addressed by existing security models and mechanisms. The size of the global computing infrastructure means that security policy must encompass billions of potential collaborators. Mobile computational entities are likely to become disconnected from their home network, which requires the ability to make fully autonomous security decisions; they cannot rely on a specific security infrastructure such as certificate authorities and authorisation servers. The dynamism of the global computing infrastructure means that computational entities which offer services will be confronted with requests from entities that they have never met before, also mobile entities will need to obtain services within environments that are unfamiliar and possibly hostile. The SECURE project will design a dynamic self-configuring security system based on the human notion of trust. The application of the human notion of trust leads naturally to a decentralised approach to security management that can tolerate partial information although there is an inherent element of risk for the trusting entity. Fundamentally, it is the ability to reason about trust that allows entities to accept risk when they are interacting with other entities. The central problem addressed by the SECURE project is to provide entities with a basis for reasoning about trust, with a computational model of trust that will provide the formal basis for reasoning about trust and for the deployment of verifiable security policies.

List of relevant chapters:

Mobile Systems, Distributed Systems Security

Three publications reporting outcomes from the project:

- V. Cahill et al. Using Trust for Secure Collaboration in Uncertain Environments. IEEE Pervasive Computing, 2(3), 2003, to appear.
- D. Ingram. Trust-based Filtering for Augmented Reality. Proceedings of the First International Conference on Trust Management, LNCS, vol. 2692, 2003.
- B. Shand, N. Dimmock, J. Bacon. Trust for Ubiquitous, Transparent Collaboration. Proceedings of the First International Conference on Pervasive Computing, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SeNDT

Project Title: Sensor Networking with Delay Tolerance

Start Date: December 2002

End Date: December 2004

URL: <http://down.dsg.cs.tcd.ie/sendt/>

CaberNet Members Involved: Trinity College, Dublin

Other Partners:

The Project:

The SeNDT project aims to develop a proof-of-concept sensor node hanging off a delay tolerant network. The main emphasis of the project are four-fold: Application, where the main task is to survey the requirements for different types of environmental monitoring; Technical, for example power consumption and sources, sensor networking (with or without delay tolerance) etc; Legal, SeNDT is intended to produce evidence that is legally significant; and Commercial, where there will be analysis on how much corporate money is spent on technology such as this. The Delay-Tolerant Networking is concerned with how to address the architectural and protocol design principles arising from the need to provide interoperable communications with and among extreme and performance-challenged environments where continuous end-to-end connectivity cannot be assumed. Examples of such environments include spacecraft, military/tactical, some forms of disaster response, underwater, and some forms of ad-hoc sensor/actuator networks. Among the challenges to be addressed are: large delay for transmissions resulting from either physical link properties or extended periods of network partitioning, routing capable of operating efficiently with frequently-disconnected, pre-scheduled, or opportunistic link availability, high per-link error rates making end-to-end reliability difficult, heterogeneous underlying network technologies (including non-IP-based internets), and application structure and security mechanisms capable of limiting network access prior to data transit in an environment where round-trip-times may be very large. The SeNDT project aims to apply delay tolerant networking technology to fill a niche for sensor nodes that cannot use more typical networks (e.g. those assuming IP or GSM/SMS connectivity).

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SETTA

Project Title: Systems Engineering for Time-Triggered Architectures

Start Date: January 2000

End Date: January 2002

URL: <http://www.setta.org/>

CaberNet members involved on the project: Alcatel, Austria; TU Vienna, Austria; University of York, UK

Other Partners: DaimlerChrysler AG, EADS, Germany; Renault, France; Siemens VDO Automotive, Germany; Decomsys, Austria; TTTech, Austria

The Project:

The overall goal of the SETTA project is to push time-triggered architecture - an innovative European-funded technology for safety-critical, distributed, real-time applications such as fly-by-wire or drive-by-wire - to future vehicles, aircraft, and to train systems. To achieve this goal, SETTA focuses on the systems engineering of time-triggered architectures. The key characteristic of time-triggered, distributed real-time systems is that all significant events, including tasks and messages, do not occur at random points in time, but rather have to adhere to a pre-determined schedule. Time-triggered systems thus offer various important advantages compared to a traditional approach, such as predictability concerning their real-time behaviour, which make them uniquely suited for complex, safety-critical real-time systems.

List of relevant chapters:

Real-Time Systems, Dependable Systems

Three publications reporting outcomes from the project

- R. Kirner, R. Lang, G. Freiberger, P. Puschner “Fully Automatic Worst-Case Execution Time Analysis for Matlab/Simulink Models”, In Proceedings 14th International Euromicro Conference on Real-Time Systems, Vienna, Austria, June 2002.
- C. Scheidler, P. Puschner, S. Boutin, E. Fuchs, G. Gruensteidl, Y. Papadopoulos, M. Pisecky, J. Rennhack, U. Virnich “Systems Engineering of Time-Triggered Architectures – The SETTA Approach”, In Proceedings 16th IFAC Workshop on Distributed Computer Control Systems, Sydney, Australia, 29th November – 1st December. 2000.
- Papadopoulos Y. “Automated Safety Monitoring, A Review and Classification of Methods”, Journal of Condition Monitoring and Diagnostic Engineering Management, under review.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SFB 467

Project Title: Transformable Business Structures for Multi-Variant Serial Production

Start Date: 1997

End Date: 2002

URL: http://www.informatik.uni-stuttgart.de/ipvr/bv/projekte/sfb467/sfb467_engl.html

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

Companies which are operating in today's rapidly changing markets have to cope with frequent and unpredictable changes in their environment. The SFB is set up to provide answers to the questions arising in this context. Obtaining a company which has the ability to react quickly upon the changes in the market, pro-actively undertakes the necessary adaptations and continuously modifies its own structures to the varying needs. This requires entirely new organisational methods. The building blocks of such new corporate structures are autonomous performance units which are arranged in guided self-organisational networks to form a transformable system. A key position of such companies is the infrastructure for communication and cooperation which has been designed in the subproject C4

List of relevant chapters:

Service-oriented Computing, Control and Coordination in Dynamic Virtual Organisations

Three publications reporting outcomes from the project

- M. Becht, J. Klarmann, M. Muscholl: Modellierung flexibler Workflows mit teilausführbaren Aktivitäten Workshop im Rahmen der DCSCW'98 "Flexibilität und Kooperation in Workflow-Management-Systemen", Dortmund, September 1998.
- M. Becht, T. Gurzki, J. Klarmann, M. Muscholl: ROPE: Role Oriented Programming Environment for Multiagent Systems In: Proceedings of the Fourth IFCIS Conference on Cooperative Information Systems (CoopIS'99), Edinburgh, Schottland, September 1999
- J. Klarmann: Using Conceptual Graphs for Organization Modeling in Workflow Management Systems. In: Proceedings Professionelles Wissensmanagement (WM 2001) Baden-Baden, March 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SHIMA

Project Title: Integrated Modular Avionics for Small Helicopters

Start Date: ongoing

End Date:

URL: <http://www.shl.co.uk/Downloads/Avionics2000.pd>

CaberNet members involved on the project: University of York, UK

Other Partners:

The Project:

This project is funded by the DTI and features partners from: Stewart Hughes, Smiths Industries, and the University of York. The overall goal of the project is to investigate the applicability of IMA technology, which is defined for large-scale avionics systems, in a small helicopter environment. The specific aims are to: design and prototype a high integrity APEX-compliant operating system kernel which supports temporal and spatial fire-walling using the Ravenscar Profile of Ada 95, and demonstrate the prototype using a mixed language (Ada and C) application containing both safety critical and non-critical components.

List of relevant chapters:

Dependable Systems, Real Time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SISTER

Project Title:

Start Date:

End Date:

URL:

CaberNet members involved on the project: Instituto Politécnico do Porto, Portugal

Other Partners:

The Project:

The SISTER project (funded by the American-Portuguese Development Foundation - FLAD 471/97) main goals were to stimulate research in the broad area of Real-Time Systems, and to support post-graduation (mainly PhD) of the group elements. Within this project, the group developed computational models and tools to guarantee fault-tolerant real-time communication in distributed computer-controlled systems, based in industrial communication networks, such as PROFIBUS [Tovar 1999b], P-NET [Tovar 1999a] or CAN [Pinho 2000].

List of relevant chapters:

Real Time Systems

Three publications reporting outcomes from the project:

- [Pinho 2000] L. Pinho, F. Vasques, E. Tovar. "Integrating Inaccessibility in Response Time Analysis of CAN Networks". Proceedings of the 3rd IEEE International Workshop on Factory Communication Systems (WFCS'2000). Porto, Portugal. September 2000. pp. 77-84.
- [Tovar 1999a] E. Tovar, F. Vasques, A. Burns. "Supporting Real-Time Distributed Computer-Controlled Systems with Multi-hop P-NET Networks". Control Engineering Practice 7(8). Pergamon, Elsevier Science. August 1999. pp. 1015-1025.
- [Tovar 1999b] E. Tovar, F. Vasques. "Real-Time Fieldbus Communications Using Profibus Networks". IEEE Transactions on Industrial Electronics 46(6). December 1999. pp. 1241-1251.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Smart-Its

Project Title: Interconnected Embedded Technology for Smart Artefacts with Collective Awareness

Start Date: 1 January 2001

End Date: 30 June 2003

URL: <http://www.disappearing-computer.net/projects/SMARTITS.html> <http://www.smart-its.org/>

CaberNet members involved on the project: Lancaster University, UK, Universität Karlsruhe, Germany

Other Partners: Technical Research Centre of Finland, Finland, The Interactive Institute II Aktiebolag, Sweden, Eidgenoessische Technische Hochschule Zuerich, Switzerland, Universitaet Karlsruhe (TH), Germany

The Project:

The Smart-Its project is interested in a far-reaching vision of computation embedded in the world. In this vision, mundane everyday artefacts become augmented as soft media, able to enter into dynamic digital relationships. In our project, we approach this vision with development of "Smart-Its" - small-scale embedded devices that can be attached to everyday objects to augment them with sensing, perception, computation, and communication. We think of these "Smart-Its" as enabling technology for building and testing ubiquitous computing scenarios, and we will use them to study emerging functionality and collective context-awareness of information artefacts.

The project is part of the European initiative The Disappearing Computer, and funded in part by the Commission of the European Union, and by the Swiss Federal Office for Education and Science.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- L.E. Holmquist, F. Mattern, B. Schiele, P. Alahuhta, M. Beigl and H.W. Gellersen. Smart-Its Friends: A Technique for Users to Easily Establish Connections between Smart Artefacts, Proc. of UBIComp 2001, Atlanta, GA, USA, Sept. 2001.
- O. Kasten, M. Langheinrich. First Experiences with Bluetooth in the Smart-Its Distributed Sensor Network. Workshop on Ubiquitous Computing and Communications, PACT 2001, Barcelona, Spain, Sept. 2001.
- B. Schiele and S. Antifakos. Beyond Position Awareness. To appear in: Proceedings of the Workshop on Location Modeling, UBIComp 2001, Atlanta, USA, September 2001.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SmartOffice

Project Title:

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: Universität Karlsruhe, Germany

Other Partners:

The Project:

SmartOffice interoperates the development of different applications and hardware projects located in the field of interactive and ubiquitous office augmentation. This includes for example mechanisms for enhanced meeting room scheduling and different applications providing added value for the participants in a meeting and the employees in an office environment. One of the major contributions to this project will be the development of an interactive and interconnected doorplate for meeting rooms and offices providing easy access to relevant data and environmental functions

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SmartShelf

Project Title:

Start Date: ongoing

End Date:

URL: <http://www.teco.uni-karlsruhe.de/research/ubicomp/smartshelf/>

CaberNet members involved on the project: Universität Karlsruhe, Germany

Other Partners:

The Project:

The goal of the SmartShelf project is the development of a prototype of an augmented shelf for various consumer products. Products located on the shelf will be equipped with RF-ID tags, replacing the now used barcodes. In addition to the functionality of the familiar barcode the RF-ID tags open up new ways of stock management. One example of a field of application for the Smart Shelf is the feasibility of the implementation of an ongoing taking inventory not only in the stock but also in the shop. This we hope to achieve by the ability to detect every single product in a shop placed on a Smart Shelf.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: SP4

Project Title: High Quality Software Architectures for Global Computing on Cooperative Wide Area Networks

Start Date: 01.07.2002

End Date: 30.12.2004

URL:

CaberNet members involved on the project: ISTI (CNR, Pisa), Italy

Other Partners: University of Pisa, University of L'Aquila, University of Florence, University of Bologna, University of Milan, CESTIA-CNR, TILAB, Think3

The Project:

This project is funded by the Italian Ministry of University and Research. The goal of this project is to define suitable network-aware programming primitives, to design and implement a software architecture supporting them on top of existing platforms and to check the results on two case studies requiring a high level, guaranteed QoS. Validation and verification methods based on model checking and quantitative QoS evaluation will also be developed and experimented. The first case study will concern innovative telecommunication services and will be developed in collaboration with the largest Italian ICT (privately owned) research center (CSELT). The second case study will be in the area of groupware support for design and will involve a medium-size CAD company (Think3). The Dependability Group at ISTI will contribute to the identification and quantitative evaluation of appropriate QoS indicators.

List of relevant chapters:

Dependable Systems, Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

- S. Porcarelli, M. Castaldi, F. Di Giandomenico, A. Bondavalli, P. Inverardi, "An Approach to Manage Reconfiguration in Fault-Tolerant Distributed Systems," in Proc. ICSE-WADS Workshop on Architecting Dependable Systems, 2003.
- S. Porcarelli, F. Di iandomenico, "On the effects of outages on the QoS of GPRS networks under different user characterizations", in Proc. 4th European Dependable Computing Conference (EDCC-4), Toulouse, October 2002, pp. 7-23.
- Bondavalli, S. Chiaradonna, D. Cotroneo, L. Romano, "A Fault-Tolerant Distributed Legacy-based System and Its Evaluation," To appear in Proc. LADC2003- 1st Latin-American Dependable Computing Conference, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: STADY

Project Title: Applied STAtic and DYnamic verification of critical software

Start Date: February 2002

End Date: October 2003

URL: http://www.esa.int/export-ind/ESA-Article-art_print_friendly_1043239865975.html

CaberNet members involved on the project: Critical Software, Portugal

Other Partners: SoftWcare SL, Spain

The Project:

STADY (ESA/ESTEC Contract Nr. 15751/02/NL/LvH) is an R&D project from ESA, which aims at research and demonstration of an innovative technique for the verification of safety and reliability characteristics of software in space applications. This technique is based on the joint application of static and dynamic verification methods. Two case studies demonstrate the applicability of the proposed technique:

- The *Open Ravenscar Kernel* (ORK)
- An on-board software test application built on the *On-Board Operations Support Software* (OBOSS-II) product

The project undertakes an extensive survey of available methods and tools. It further defines the new STADY methodology, which combines a static method based on SFMEA (Software Failure Modes and Effects Analysis) and SFTA (Software Fault Tree Analysis), with a dynamic technique based on the injection of software faults with the Xception tool. The development of a specific plug-in allows Xception to be easily ported to the ERC32/ORK-based target system. The synergetic combination of static and dynamic analysis techniques brings a huge potential since each one contributes to mitigate the shortcomings of the other. Static analysis provides important inputs to the definition of suitable fault-models reproducing common programmer mistakes that are to be simulated during dynamic analysis of the system under evaluation.

List of relevant chapters:

Dependable Systems, Real-Time Systems

Publications reporting outcomes from the project

- R. Maia, F. Moreira, R. Barbosa, D. Costa, L. M. Pinho, P. Rodriguez, K. Hjortnaes, “Verifying, Validating and Monitoring the Open Ravenscar Real Time Kernel”, In proc. of the *12th International Real-Time Ada Workshop* (IRTAW12), Viana do Castelo, Portugal, September 15-19, 2003.
- F. Moreira, R. Maia, D. Costa, N. Duro, K. Hjortnaes, P. Rodriguez, “Static and Dynamic Verification of Critical Software for Space Applications”, In proc. of the *Data Systems In Aerospace conference 2003* (DASIA'03), Prague, Czech Republic, June 2-6, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: STATUS

Project Title: Software Architecture that Supports Usability

Start Date:

End Date:

URL: <http://pi.ijs.si/ProjectIntelligence.Exe?Cm=Project&Project=STATUS>

CaberNet members involved on the project: Imperial College, UK

Other Partners: IHG: The Information Highway Group, FI - UPM: Facultad de Informática, Xavier Ferré, Ana María Moreno, RuG: Rijksuniversiteit Groningen, ICSTM: Imperial College of Science, Technology and Medicine, LogicDIS

The Project:

The aim of the STATUS project is to study and determine the connections between software architecture and the usability of the resultant software system and to explain the characteristics of software architectures that improve software usability.

The scientific and technological objectives of the STATUS project are the following

- Identify usability attributes that are possibly affected by software architecture.
- Study how usability attributes can be influenced by software architecture. New architectural style that supports usability.
- Identify architectural patterns that are repeated in the e-commerce domain to study their relationship with usability, and its improvement with respect to this quality attribute.
- Propose a development process that integrates traditional software development techniques with techniques proper to the field of usability.

List of relevant chapters:

Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

- LTSA-MSC: Tool Support for Behaviour Model Elaboration Using Implied Scenarios Sebastian Uchitel, Robert Chatley, Jeff Kramer and Jeff Magee. Proceedings of TACAS '03, Warsaw April 2003.
- Model-based Simulation of Web Applications for Usability Assessment. Robert Chatley, Jeff Kramer, Jeff Magee and Sebastian Uchitel. Proceedings ICSE 2003 Workshop "Bridging the Gaps Between Software Engineering and Human-Computer Interaction". Portland (Oregon), USA, May 2003. pp. 5-11.
- Modelling Undefined Behaviour in Scenario Synthesis. Uchitel, J. Kramer and J. Magee. 2nd International Workshop on Scenarios and State Machines: Models, Algorithms, and Tools at the 25th IEEE International Conference on Software Engineering (ICSE03). Portland, USA, May 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: STEAM

Project Title: Scalable Real-Time Events and Mobility

Start Date: 1999

End Date: ongoing

URL: http://www.dsg.cs.tcd.ie/?category_id=-45

CaberNet Members Involved: Trinity College, Dublin

The Project:

STEAM is an event-based middleware designed for use in ad hoc networks. STEAM differs from other event-based middleware because its architecture does not rely on the presence of any separate infrastructure. In addition, event notification filters are distributed, and filtering may be applied to functional (e.g. subject) and non-functional (e.g. quality) attributes).

Existing research on event-based middleware for wireless networks has mainly focused on what may be termed *nomadic applications*. These applications are characterized by the fact that mobile nodes make use of the wireless network primarily to connect to a fixed network infrastructure, such as the Internet, but may suffer periods of disconnection while moving between points of connectivity. Such applications typically use infrastructure networks. As a result, most of previous work has concentrated on handling disconnection while mobile nodes participating in the event-based communication move from one access point to another. In recent years, collaborative applications, which are composed of mobile nodes that use the wireless network to communicate with each other within some common geographical area, have become more prevalent. Although these applications may use infrastructure networks, they will often use ad hoc networks to support communication without the need for a separate infrastructure. Consequently, this collaborative style of application allows loosely coupled components to communicate and collaborate in a spontaneous manner. It is within this ad hoc environment that STEAM evolved. STEAM differs from other event-based middleware in that its architecture does not rely on the presence of any separate infrastructure, event notification filters are distributed, and filtering may be applied to functional and non-functional attributes. In particular, filters may be applied to either the subject or the content of an event notification, or to non-functional attributes such as location and time. Filters may be used to define geographical areas within which event notifications are valid, thereby bounding the propagation of these notifications. Such proximity-based filtering represents a natural way to filter events of interest in mobile applications thus reducing flooding.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- R. Meier. Communication Paradigms for Mobile Computing. ACM SIGMOBILE Mobile Computing and Communications Review (MC2R), vol. 6, pp. 56-58, 2002.
- R. Meier and V. Cahill, "Exploiting Proximity in Event-Based Middleware for Collaborative Mobile Applications," in Proceedings of the 4th IFIP International Conference on Distributed Applications and Interoperable Systems (DAIS'03). Paris, France: Springer-Verlag Heidelberg, Germany, 2003, to appear.
- B. Hughes and V. Cahill. Towards Real-time Event-based communication in Mobile Ad Hoc Wireless Networks in Proceedings of 2nd International Workshop on Real-Time LANS in the Internet Age 2003 (ECRTS/RTLIA03), Porto, Portugal, 2003, pp. 77-80.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: TAPAS

Project Title: Trusted and QoS Aware Provision of Application Services

Start Date: ongoing

End Date:

URL: <http://www.newcastle.research.ec.org/tapas/>

CaberNet members involved on the project: University of Newcastle, UK; Universita di Bologna, Italy; University of Cambridge, UK

Other Partners: Adesso; The Department of Computer Science, University College London (UCL), UK

A couple of paragraphs describing what the project is about:

Organisations, particularly small and medium scale enterprises (SMEs), are finding it increasingly difficult to develop, maintain and manage their information technology (IT) applications. This is largely due to difficulties in attracting and retaining trained staff. The solution may lie in Application Service Providers (ASPs). These organisations hold the promise of providing a solution by hosting applications on their own, remotely managed servers. However, to work effectively, Asps must guarantee security and provide resilience. Furthermore, Asps need to ensure that hosted applications are capable of accessing a wide variety of services irrespective of the platform or the organisation through which they are provided. The mechanism for this lies in service level agreements (SLAs) over commonly available infrastructures.

List of relevant chapters:

Software Architectures for Distributed and Dependable Systems, Dependable Systems, Control and Coordination in Dynamic Virtual Organisations, Distributed System Security

Three publications reporting outcomes from the project

- N. Cook, S.K. Shrivastava and S.M. Wheater, "Distributed Object Middleware to Support Dependable Information Sharing between Organisations", IEEE/IFIP International Conference on Dependable Systems and Networks (DSN-2002), June 2002, Washington DC.
- N. Mezzetti, F. Panziera, "The Data Grid: Security and Privacy Issues", Proc. 4th European Dependable Computing Conference, Toulouse (F), 22-25 Oct. 2002.
- D. Lamanna, J. Skene, W. Emmerich. SLang: A Language for Defining Service Level Agreements. In Proc. of The International Workshop on Future Trends of Distributed Computing Systems (FTDCS'2003), San Juan, Puerto Rico. IEEE Computer Society Press.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: TBMAC

Project Title: Time Bounded Medium Access Control

URL: <http://www.dsg.cs.tcd.ie/sites/TBMAC.html>

Start Date: 1999

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The Time-Bounded Medium Access Control (TBMAC) protocol is based on time-division multiple access with dynamic but predictable slot allocation. TBMAC uses a lightweight atomic multicast protocol to achieve distributed agreement on slot allocation and employs location information to minimise contention for slots. TBMAC is the first time-bounded MAC protocol for multi-hop wireless ad hoc networks. With the increased research in ad hoc networks new application domains such as the intercommunication between mobile robots or inter-vehicle communication for traffic management systems have emerged. Timely communication is critical to allow applications in these domains to be realised. Real-time communication in wired networks is typically supported at the MAC layer, for example TDMA or CAN. These approaches are inappropriate for dynamic ad hoc networks due to their underlying assumptions about the static nature of the network. In the mobile computing domain, wireless communication links are characterized by bandwidth constraints, higher error rates and by intermittent signal loss. These characteristics taken together mean that traditional real-time communication protocols are not applicable in a mobile domain. To facilitate reliable applications that operate in mobile contexts real-time communication protocols must be available. Most previous work on medium access control (MAC) protocols for wireless ad hoc networks has focused on the twin goals of maximising throughput and minimising average packet delay as required for general-purpose applications. The objective of TBMAC is to develop a new MAC protocol for use in multi-hop ad hoc networks with a goal of providing time-bounded access to the wireless medium for applications with guaranteed response time requirements, with a known probability.

List of relevant chapters:

Mobile Systems, Real Time Systems

Three publications reporting outcomes from the project:

- Raymond Cunningham and Vinny Cahill, System Support for Smart Cars: Requirements and Future Directions. In Proceedings of the 9th ACM SIGOPS European Workshop (SIGOPS2000).
- Raymond Cunningham, Vinny Cahill, Time Bounded Medium Access Control for Ad Hoc Networks, Principles of Mobile Computing (POMC'2002), Toulouse, France, 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: TEASE

Project Title: TElematics Architecture Study for Environment and Security

Start Date: ongoing

End Date:

URL: <http://dlforum.external.forth.gr:8080/tease/>

CaberNet members involved on the project: FORTH, Greece

Other Partners: Alcatel Space Industries (Coordinator), Nottingham Scientific Limited (NSL), The Institute of Computer Science (ICS), The Austrian Research Centers Seibersdorf, TRASYS Belgium, Société Européenne des Satellites (SES) ASTRA

The Project:

Success of the European "Global Monitoring for Environment and Security" (GMES) initiative hinges on the existence of a suitable architecture for services, information and communication fluxes. Objectives of TEASE study is to develop such an European-scale architecture:

- innovative and optimally designed for operational environment, risks and security management, with an optimised use of state-of-the-art information technologies
- featuring a high capability to inter-operate pre-existing parts of various types: data, services, actors, etc ... originally not designed to interface to each other.
- integrating organisational aspects and favouring market opportunities

A development plan, starting by a pilot-project, targets a quick and reliable implementation of GMES network.

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: TeleMuM

Project Title: Using Multimedia and Mobility to Improve Education in the Area of Telematics
(*German:* Multimedialität und Mobilität zur Verbesserung der Lehre im Bereich Telematik)

Start Date: May 2003

End Date: February 2005

URL: http://www.mmkh.de/projekte/projekte_36.html

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners: Participants of E-Learning Consortium Hamburg (ELCH)

The Project:

Learning modules, which make intense use of multimedia features, are elaborated within this project. All the modules will be concerned with the area of networking, the specific emphasis being placed on: video communications via the Internet and mobile networks modelling and traffic engineering of communication networks networking technology.

An additional goal of this project is to study security and performance aspects when using mobile communication networks (e.g. WLANs) in E-Learning scenarios.

The TeleMuM project at the University of Hamburg identifies and analyses the security risks which might occur in E-learning scenarios at universities (e.g. in accessing E-learning platforms or when establishing workgroups/group communication infrastructures). Security policies are elaborated and adequate security measures will be evaluated. Moreover, the performance limitations of nowadays WLAN systems are studied, in particular, if we use those networks to support audio/video communications in an E-learning context.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project:

- Scherpe C., Wolfinger B. E., Salzmann I.: Model Based Network Emulation to Study the Behavior and Quality of Real-Time Applications. 7th IEEE Internat. Symp. on Distributed Simulation and Real-Time Applications, DS-RT 2003 (Delft, 2003)

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Think

Project Title: Think Is Not a Kernel

Start Date: ongoing

End Date:

URL: <http://think.objectweb.org/>

CaberNet members involved on the project: INRIA Rhône-Alpes, France, Institut National Polytechnique de Grenoble, France, Université Joseph Fourier, France

Other Partners: France Telecom R&D, INRIA

The Project:

Think is a platform for the development of distributed operating systems kernels. The goal of the Think architecture is to ease the development of efficient, flexible, and secure operating systems. Think provides the system programmer with interfaces that reify the underlying hardware, and optional system abstractions proposed as libraries. This a joint project with France Telecom R&D.

Think is a software framework for component-based operating system kernels. This software framework based on components provides flexibility which encourages code re-use and reduces operating system kernels development time. Three key concepts are exploited: components, bindings (which model interactions) and domains (which model isolation). This approach allows various kernel infrastructures to be built either statically or dynamically, ranging from micro-kernels through to classical monolithic kernels and application-specific kernels. The implementation of such software framework is calling **Kortex**. Kortex is a open source THINK components library which provide commonly used kernels components for building operating system. Actually, this library is targeted for Apple Power Macintosh. This library supplies operating system components that implement low-level services such as drivers and high-level services such as thread management and network connection. Arbitrary compositions of these components result in the required kernel infrastructure.

List of relevant chapters:

Operating Systems

Three publications reporting outcomes from the project

J.-P. Fassino, J.-B. Stefani, J. Lawall, G. Muller. THINK: A Software Framework for Component-based Operating System Kernels. Proceedings of Usenix Annual Technical Conference, 2002, Monterey (USA), June 10-15, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: TRAFFIQS

Project Title: Traffic Engineering and Resource Allocation for Further Improvements of QoS in Networks

Start Date: 1999

End Date: ongoing

URL: <http://www.informatik.uni-hamburg.de/TKRN/world/abro/ongore.htm>

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners: Universite' P. et M. Curie, LIP6, Paris, France

The Project:

This long term project tries to approach various aspects of "Traffic Engineering" including:

- Load measurement at different interfaces of a protocol/service hierarchy within service-integrated networks focussing on video traffic (MPEG-1/ -2, H.261, H. 263) on one hand and on UDP / IP traffic on the other hand;
- Load modelling based on measurements covering again video traffic as well as packet traffic;
- Load prediction by means of modelling load transformation processes;
- Construction of load generators for synthetic load in LANs or in Internets and their combination with load transformers;
- Traffic management, e.g. prioritization of video traffic in DiffServ based networks.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project:

- Cong J., Wolfinger B.E., Zaddach M., Design and Application of Multi-Layered Load Generators, 2nd IASTED Internat. Conf. on Communications, Internet and Information Technology (CIIT 2003), 17.-19. Nov. 2003, Scottsdale, Arizona/USA
- Zaddach M., Modellierung, Charakterisierung und Transformation von Videoverkehrslasten, Dissertation, Fachbereich Informatik, Univ. Hamburg, erschienen in: Wolfinger B.E. (Hrsg.), Berichte aus dem Forschungsschwerpunkt Telekommunikation und Rechnernetze, Band 2, Shaker-Verlag, Aachen 2001; "Best Dissertation Award 2003" GI/ITG-Fachausschuss "Messung, Modellierung und Bewertung von Rechensystemen" (Measurement, Modelling and Evaluation of Computer Systems)
- Ziviani A., Wolfinger B.E., de Rezende J.F., Duarte O.C.M.B., Fdida S., Joint Adoption of QoS Schemes for MPEG Streams, Multimedia Tools and Applications Journal, Kluwer Academic Publishers (accepted for publication)

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: UniTEC

Project Title: UNiversal Trust-architecture for Electronic Commerce

Start Date: 01.09.2000

End Date: 31.08.2003

URL: <http://www.informatik.uni-stuttgart.de/ipvr/vs/en/projects/UniTEC/>

CaberNet members involved on the project: University of Stuttgart, Germany

Other Partners:

The Project:

The first years of the phenomenal growth of Electronic Commerce, if defining EC as commerce being done by using mainly the Internet, were characterized by the upcoming of the so-called New Economy. The New Economy consists of companies whose business models rely heavily on the use of the Internet as communication medium. In the meanwhile, the bankruptcy of several well-known companies has shown, that the hype in this area is over. A major hindrance of the worldwide acceptance of the Internet-offerings of many companies is missing trust in their competencies and in the companies in general. Thus, trust building and branding are essential concerns of many companies of the New Economy but not limited to those. The UniTEC project is dealing with questions like how trust can be modelled in a digital system and how trust can be passed on from one entity to another. Trust essentially consists of two different parts: the first one being explicit knowledge which depends largely on personal experiences or the experiences others have made about a certain person, company etc.. The second part is a rather tacit knowledge, a feeling (e.g. being on the same wavelength) which is hard to put into words but which has nevertheless a strong influence on the "total trust". UniTEC tries to model trust by using recommendations that users of the system are giving out about companies, products of all kinds or other users in addition to feedback mechanisms. Concepts are developed about how to represent, store and forward those recommendations, how requests can be formulated for such a system and mechanisms have to be developed to guarantee the privacy of the involved users

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

- M. Kinader, K. Rothermel: Architecture and Algorithms for a Distributed Reputation System, Proc. of the First International Conference on Trust Management, Springer LNCS 2692, Crete, Greece, May 2003
- M. Kinader, S. Pearson: A Privacy-Enhanced Peer-to-Peer Reputation System, To appear in Proc. of the 4th International Conference on Electronic Commerce and Web Technologies (EC-Web 2003), Prague, Czech Republic, September 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: UTC

Project Title: Rolls-Royce University Technology Centre for Systems and Software Engineering

Start Date: ongoing

End Date:

URL: <http://www.cs.york.ac.uk/utc>

CaberNet members involved on the project: University of York, UK

Other Partners:

The Project:

Rolls-Royce established, in October 1993, a University Technology Centre (UTC) in Systems and Software Engineering; Rolls-Royce also fund an associated project known as ASSET. The work is particularly concerned with the production of electronic engine controllers (EECs) for large civil and military aircraft engines. The current work is in the area of requirements analysis, reuse of specifications and designs, timing and schedulability analysis, safety cases and metrics. ASSET is concerned with the rapid, and cost-effective, development of EEC software, and is producing prototype tools to assist such a process

List of relevant chapters:

Dependable Systems, Real Time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: UTC-NG

Project Title: Urban Traffic Control – Next Generation

URL: http://www.tcd.ie/Transport_Research_Centre

Start Date: 2003

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The objective of this project is to explore the design of next generation Urban Traffic Control (UTC) systems. In the coming years, an increase in the number of available sensors/actuators will increase the amount of information available to UTC systems. UTC-NG will undertake the design of a next generation UTC system capable of exploiting the available information to support existing and to build new traffic-related applications. The UTC-NG project is part of the Centre for Transportation Research and Innovation for People (TRIP), a multidisciplinary research centre. Existing traffic control systems utilise a relatively small amount of information that is typically provided by sensors at traffic junctions and traffic cameras providing journey-time estimations. In the coming years, an increase in the number of available sensors/actuators, for example GPS devices, wireless communication, electronic signs, will increase the amount of information available to Urban Traffic Control (UTC) systems. The increased availability of such information will have a significant impact on next generation Urban Traffic Control systems and on future traffic applications for example, smart roads, in-car guides etc. The UTC-NG project is exploring the design of next generation traffic control systems to enable real-time response to actual traffic conditions both locally and globally across the system.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: VENICE

Project Title: Voice over IP, just Another Web Service

Start Date: October 2002

End Date: ongoing

URL:

CaberNet members involved on the project: Universität Kaiserslautern, Germany

Other Partners:

The Project:

The project VENICE researches the future development of VoIP associated with web services. Within the project a new model is put forward which maps VoIP functionalities on web services. Further additional capability characteristics shall be realized as web services. Advantages over other models should be:

- The Client software is simple. The client is exempt from updates which have to be carried through at regular intervals;
- A new performance feature can easily and quickly be placed; third party performance features shall be supported;
- It is simple to generate client software for different types of end systems;
- No hardware has to be integrated into a local network. There is no additional administration expenditure for hard- or software.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: VIVIAN

Project Title: Opening Mobile Platforms for the Development of Component-based Applications

Start Date: June 2000

End Date: August 2002

URL: <http://www-nrc.nokia.com/Vivian/index.html>

CaberNet members involved on the project: INRIA-Rocquencourt, France

Other Partners:

ADISOFT (D), CAS (D), HUT (FIN), INT (F), MEMODATA (F), NOKIA (FIN), PALMWARE (F), PARAVANT (FIN), PHILIPS (NL), UNICOM (FIN)

The Project:

Mobile communication, personal computing and distributed information services are merging in a rapid pace and existing commercial platforms for mobile devices need a substantial boost in order to meet the new market needs. To help in this direction, the ITEA VIVIAN project proposes a suite of middleware services for a variety of application domains accompanied by a developer's guide which together will ease the task of third party vendors producing applications for mobile end-users.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- Burmakin, E. M., Tuominen, J.O. Development Of Context-Aware Applications Operating In Mobile Environments. Software Engineering and Applications (SEA 2002), 4-6 November 2002, Cambridge, USA (accepted for publication).
- M. Boulkenafed, V. Issarny. Coherency Management in Ad hoc Group Communication. In the Proceedings of the Software Infrastructures for Component-Based Applications on Consumer Devices, September 16, Lausanne, Switzerland.
- D. Conan, et al. Handling Network Roaming and Long Disconnections at Middleware Level. In the Proceedings of the Software Infrastructures for Component-Based Applications on Consumer Devices, September 16, Lausanne, Switzerland.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: VOSS

Project Title: Validation of Stochastic Systems

Start Date:

End Date:

URL: <http://www7.informatik.uni-erlangen.de/tree/IMMD-VII/Research/Projects/NWO-DFG/>

CaberNet members involved on the project: RWTH Aachen, Germany

Other Partners: University of Nijmegen, The Netherlands, University of Twente, The Netherlands, University of Bonn, Germany, University of Erlangen-Nuernberg, Germany

The Project:

This project is concerned with modelling and verification of stochastic aspects of computer systems such as distributed systems, networks and communication protocols. These aspects are essential to reason about the performance and dependability characteristics of systems, as well as to assess the correctness of probabilistic, distributed algorithms and protocols. The project aims at the integration of modelling and computer-integrated verification techniques for the analysis of complex systems with stochastic behaviour. The goal is to adapt and extend some prominent techniques that have been proven to be successful for modelling and assessing qualitative characteristics of computer systems to a stochastic setting. Modelling techniques, such as input-output (I/O) automata and process algebra, and verification techniques, such as model checking will be thoroughly investigated. Concretely, we plan to extend existing collaboration between the partners to apply these techniques to model, analyse, and optimise systems described as Markov processes.

VOSS is a research collaboration between the Netherlands and Germany within the NWO-DFG bilateral cooperation program. It is a cooperation project between three German universities and two Dutch universities on modelling and validation of, among others, dependable systems. The project is financed by the Dutch and German science foundation (NWO and DFG). Applicability also lies in networking and real-time systems.

List of relevant chapters:

Dependable Systems, Rigorous Design

Three publications reporting outcomes from the project

- C. Baier, H. Hermanns, B. Haverkort, J.-P. Katoen. Automated performance and dependability evaluation using model checking. In M. Calzarossa, S. Tucci, editors, Performance Evaluation of Complex Systems: Techniques and Tools volume 2459 of Lecture Notes in Computer Science. Rome, Italy. Springer-Verlag, 2002, pp. 261-289.
- C. Baier, J.-P. Katoen, H. Hermanns, B. Haverkort. Simulation for continuous-time Markov chains. In L. Brim, P. Jancar, M. Kretinzki and A. Kucera, editors, Concurrency Theory (CONCUR), volume 2421 of Lecture Notes in Computer Science, pp. 338-354. Brno, Czech Republic, 2002.
- H. Bohnenkamp, P. van der Stok, H. Hermanns, F. Vaandrager. Cost-Optimisation of the IPv4 Zeroconf Protocol. In Proceedings of the 2003 International Conferences on Dependable

Systems and Networks, June 22-25, San Francisco CA, IEEE CS Press, pp. 531-540, June 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: V-Planet

Project Title: The Virtual Planet

Start Date: 2001

End Date: 2004

URL: <http://vr.c-s.fr/vplanet/>

CaberNet members involved on the project: ISTI-CNR, Italy

Other Partners: CS-SI – France, CRS4 – Italy, DLR – Germany, IGN – France, CNES France

The Project:

The Virtual Planet project aims at studying and developing a Virtual Reality state-of-the-art product (V-Planet Explorer) that will allow the real-time 3D rendering of our planet at any available resolution and on mainstream personal computers. The system shall enable a large number of persons, experts or common people, to explore and interact in real time with the vast amounts of natural and cultural information gathered about the Earth. The contribution of the Visual Computing Lab entails the field of mesh simplification and multi-resolution representation and virtual navigation of huge digital terrain models.

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: Weave.NET

Project Title: Language-Independent Aspect-oriented Programming

Start Date: 1999

End Date: 2003

URL: <http://www.dsg.cs.tcd.ie/sites/Weave.NET.html>

CaberNet Members Involved: Trinity College, Dublin

Other Partners:

The Project:

Weave.NET explores aspect-oriented programming (AOP) in the .NET Framework. The project aims to provide a language independent mechanism for supporting the AspectJ notion of AOP that is also consistent with the component model of the .NET Framework. Research in Aspect-Oriented Software Development investigates and applies techniques for modularizing the crosscutting functionality of a system. Crosscutting functionalities are challenging to design and implement in isolation, because their proper behaviour emerges from how they affect other functionality within the program. Aspects address crosscutting concerns, of which a good number arise from the execution environment. The canonical examples are performance and network quality. Mainstream aspect-oriented development focuses on compile-time bound aspects, leaving load-time weaving unexplored. All AOP approaches are potentially programming language independent, but for whatever reason few have realised multi-language support. The Weave.Net project explores the value of language independence, load-time weaving, and modelling aspects as components to aspect-oriented programming.

List of relevant chapters:

Distributed Object and Component Technologies, Real Time Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: WAND

Project Title: Wireless Ad Hoc Network for Dublin

Start Date: 2002

End Date: ongoing

URL: <http://www.dsg.cs.tcd.ie/sites/WAND.html>

CaberNet Members Involved: Trinity College, Dublin

Other Partners: Media Lab Europe

The Project:

WAND will look beyond the standard 802.11b WLAN networks based on access points that are being installed all over the world, to wireless networks of the future that will connect microprocessors embedded in all the devices surrounding us. The millions of nodes per city that such a future scenario implies point to new types of applications where the instantaneous delivery of data is not necessarily important and where structureless networks will rely on the ad hoc connections between nearby nodes to establish multi-hop dynamic routes to propagate data and messages between out-of-range nodes. WAND will support the development of novel applications particularly in the areas of public space art, tourism, local communications, traffic monitoring/information, and gaming. The technical challenges of developing such self-organising wireless networks and the opportunity to explore global emergent phenomena arising from the short-range interactions between nearby nodes must coincide with the human or social factor in the introduction of new technology and its integration with community life. The cultural, social and commercial interest for wireless community networks must be considered as a whole. As a first research step toward this goal, the WAND project is developing novel applications particularly in the areas of public space art, tourism, local communications, traffic monitoring/information, and gaming. In addition, WAND will be used to test the interoperability of licence-free broadband communications services with fixed-line and cellular networks.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- S. Weber, V. Cahill, S. Clarke, M. Haahr. Wireless Ad Hoc Network for Dublin: A Large-Scale Ad Hoc Network Test-Bed . ERCIM News, vol. 54, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: WhATT

Project Title:

Start Date: November 2002

End Date: November 2004

URL: <http://www.dsg.cs.tcd.ie/sites/WhATT.html>

CaberNet Members Involved: Trinity College, Dublin

Other Partners:

The Project:

The WhATT project explores models for minimising the energy consumption of future ubiquitous computing environments. Currently there is much research into power management for extended battery-life of stand-alone mobile devices. The WhATT project extends this work to accommodate the power management of the entire system of computing devices that comprise a ubiquitous computing environment or '*Smart Space*'. These include users' mobile devices, personal desktop machines, servers and network infrastructure. The massive growth in computing over the last ten years has led to the current situation where computing now accounts for a significant proportion of a building's electrical energy consumption. In addition to this, heat generated from computing devices increases the load on the building's ventilation and cooling systems, in turn, further increasing energy consumption. Power management and energy efficiency is becoming a hot topic of research, highlighted by the "European Union Strategy for the security of energy supply". Current research has focused on power management for extended battery-life of stand-alone mobile devices. In the future power management of the entire system comprising a mobile ubiquitous environment (smart space) must be considered. The WhATT project is researching new power management techniques suitable for ubiquitous computing environments. The power management policy is aimed at aggressively managing power of all devices in the system with user context playing an important role in the development of these new power management policies.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym: XOP

Project Title: XenoServers Open Platform

Start Date: ongoing

End Date:

URL: <http://www.cl.cam.ac.uk/Research/SRG/netos/xeno/>

CaberNet members involved on the project: University of Cambridge, UK

Other Partners:

The Project:

This project aims to build a public infrastructure for wide-area distributed computing. We envisage a world in which Xenoserver execution platforms will be scattered across the globe and available for any member of the public to submit code for execution. Crucially, the sponsor of the code will be billed for all the resources used or reserved during the course of execution. This will serve to encourage load balancing, limit congestion, and hopefully even make the platform self-financing.

As part of this project we are developing *XenoMon*, a hypervisor which securely multiplexes the resources of a machine between a number of overlaying *guest* operating systems. Performing the resource division task at such a low level allows the support of multiple OS types on a single machine.

List of relevant chapters:

Operating Systems

Three publications reporting outcomes from the project

- XenoTrust: Event-based distributed trust management. Boris Dragovic, Evangelos Kotsovinos, Steven Hand and Peter Pietzuch.
- Xen 2002 Paul R Barham, Boris Dragovic, Keir A Fraser, Steven M Hand, Timothy L Harris, Alex C Ho, Evangelos Kotsovinos, Anil V S Madhavapeddy, Rolf Neugebauer, Ian A Pratt and Andrew K Warfield. Technical Report UCAM-CL-TR-553, January 2003.
- The Xenoserver Computing Infrastructure Keir A Fraser, Steven M Hand, Timothy L Harris, I. M. Leslie and I. A. Pratt Technical Report UCAM-CL-TR-552, January 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: A Constructive Framework for Partial Specification

Start Date: October 2000

End Date: October 2003

URL: <http://www.cs.ukc.ac.uk/research/groups/tcs/framework>

CaberNet members involved on the project: University of Kent, UK

Other Partners:

The Project:

The aim of this project is to provide a general, practical and constructive framework for the composition of partial specifications which together describe an envisaged system. To this aim we will seek an integration of the general categorical framework used in algebraic specification, and the practical and constructive approach for viewpoints developed in the Consistency project (<http://www.cs.kent.ac.uk/research/groups/tcs/consistency/>).

Specifically, building on our existing work in this area, we will:

- develop a categorical framework for partial specification;
- instantiate this framework with formal notations, e.g. Z and process algebra;
- investigate the compositional properties of refinement relations that can be derived from the framework;
- use a subset of UML to evaluate the framework in an area where refinement and consistency are not as well understood.

List of relevant chapters:

Rigorous Design

Three publications reporting outcomes from the project

- A formal framework for viewpoint consistency. H. Bowman, M.W.A. Steen, E.A. Boiten, and J. Derrick, *Formal Methods in System Design*, 21, pp. 111-166, September 2002.
- Integration of specifications through development relations. Eerke Boiten and John Derrick, In H. Ehrig, B.J. Kramer, and A. Ertas, editors, *Proceedings of IDPT: the Sixth Biennial World Conference on Integrated Design and Process Technology*, p. 8. SDPS, June 2002
- Integrating specifications: Development relations and correspondences. Eerke Boiten, In Hartmut Ehrig and Martin Grosse-Rhode, editors, *INT'02: Integration of Software Specification Techniques*, ETAPS 2002 Satellite Workshop, p. 1, April 2002 Invited Lecture.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Analysis and Evaluation of the Integration of Vision Systems over Industrial Local Area Networks

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

The objective of this project is to analyse the integration of an industrial vision system in a Profibus DP Network and study the performance and dependability.

List of relevant chapters:

Dependable Systems, Real Time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Analysis and Implementation of a System for Parameters Measuring and Operation Controlling of Automotive Diesel Engines

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf/>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

The objective of this project is to design an open architecture for the control of a diesel engine in a benchmark laboratory.

List of relevant chapters:

Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Analysis of Replication Techniques

Start Date: February 2000

End Date: May 2003

URL:

CaberNet members involved on the project: EPFL, Switzerland

Other Partners:

The Project:

The goal of the project is to analyse the efficiency of various group communication algorithms developed in a time-free model. The efficiency of these algorithms will be measured in terms of latency and throughput. Latency and throughput can be obtained by implementation. However, in this case the results depend on a specific environment. For this reason the goal of the project is also to find an adequate model for estimating the cost of group communication algorithms, allowing analytical cost estimation, or cost estimation based on simulation.

List of relevant chapters:

Group Communication

Three publications reporting outcomes from the project

- P. Urban, X. Defago, A. Schiper Contention-Aware Metrics for Distributed Algorithms: Comparison of Atomic Broadcast Algorithms Proc. 9th IEEE Int. Conf. on Computer Communications and Networks (ICCCN), pp 582-589, October 2000.
- Coccoli, P. Urban, A. Bondavalli, A. Schiper Performance Analysis of a Consensus Algorithm Combining Stochastic Activity Networks and Measurements Proc IEEE Int. Conf on Dependable Systems & Networks (DSN), pp 551-560, June 2002.
- P. Urban, I. Shnayderman, A. Schiper Comparison of Failure Detector and Group Membership: Performance Study of Two Atomic Broadcast Algorithms Proc IEEE Int. Conf on Dependable Systems & Networks (DSN), pp 645-654, June 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Anthill

Start Date: 2001

End Date: ongoing

URL: <http://www.cs.unibo.it/projects/anthill/>

CaberNet members involved on the project: Università di Bologna, Italy

Other Partners: Department of Telematics, Norwegian University of Science and Technology, Trondheim, Norway

The Project: Anthill is a framework aimed at supporting the design, development and analysis of peer-to-peer (P2P) protocols and algorithms. Anthill is based on the multi-agent systems (MAS) paradigm. The aim is to integrate paradigms and techniques inspired by natural and artificial complex adaptive systems in order to improve the robustness and the efficiency of P2P applications.

List of relevant chapters:

Mobile Agents

Three publications reporting outcomes from the project

- Ozalp Babaoglu, Hein Meling, Alberto Montresor. Anthill: A Framework for the Development of Agent-Based Peer-to-Peer Systems. In Proc. of the 22th International Conference on Distributed Computing Systems (ICDCS '02), Vienna, Austria, July 2002.
- Alberto Montresor, Heing Meling, Ozalp Babaoglu. Messor: Load-Balancing through a Swarm of Autonomous Agents. In Proc. of the 1st International Workshop on Agents and Peer-to-Peer Computing, Bologna, Italia, July 2002.
- Alberto Montresor, Heing Meling, Ozalp Babaoglu. Towards Self-Organizing, Self-Repairing and Resilient Large-Scale Distributed Systems. In "Future Directions in Distributed Computing". Lectures Notes of Computer Science, 2584, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Automated Verification of Probabilistic Protocols with PRISM

Start Date: 2003

End Date: 2006

URL: www.cs.bham.ac.uk/~mzk/prismprot

CaberNet members involved on the project: University of Birmingham, UK

Other Partners:

The Project: This EPSRC-funded project (grant GR/S11107) aims to extend and develop the probabilistic verification tool PRISM to improve its support for verification of probabilistic protocols. Probabilistic protocols employ a random element, such as a random number generator or a stream of random bits, in order to arrive at simple, elegant and fast algorithmic solutions to a variety of distributed coordination problems. Real-world examples include leader election in IEEE 1394 FireWire, Byzantine agreement, multicast protocols (the Spinglass project) and anonymity protocols (Crowds). A necessary consequence of the inclusion of randomness is the increase in complexity of reasoning about correctness of such algorithms, which must combine probabilistic analysis with conventional reasoning.

List of relevant chapters:

Distributed Systems Security, Rigorous Design

Three publications reporting outcomes from the project

- M. Kwiatkowska, G. Norman, J. Sproston Probabilistic Model Checking of Deadline Properties in the IEEE1394 FireWire Root Contention Protocol Special Issue of Formal Aspects of Computing, 14:295-318 2003
- M. Kwiatkowska, G. Norman, D. Parker PRISM: Probabilistic Symbolic Model Checker In Proc. TOOLS 2002, volume 2324 of LNCS, pages 200-204, Springer-Verlag 2002
- Symbolic computation of maximal probabilistic reachability (with M. Kwiatkowska and J. Sproston). In Proc. 13th International Conference on Concurrency Theory (CONCUR'01), LNCS 2154, Springer-Verlag, 2001

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Automatic Validation of Web Services

Start Date: 2001

End Date: Ongoing

URL:

CaberNet members involved on the project: Technische Universität Hamburg-Harburg, Germany.

Other Partners:

The Project:

The autonomous development of components in service-oriented computing requires emphasising on interface specifications. The goal of the project is to investigate the automatic validation for Web Services. By automatic validation we mean the process of checking if occurring message flows conform to their specifications. It is performed by a general-purpose validator, which observes messages exchanged by communication partners and analyses the conformance to the previously read specification. This allows non-conformance to be immediately detected and corrective actions to be taken before putting risk on the systems dependability. The automatic validation can be applied to a single interface between a pair of communication partners or to the choreography of messages exchanged between several communication partners that can be part of a composite web service.

Since available specification techniques for Web Services are either too restricted in their expressiveness or not well-suited for the automatic validation, a new specification technique "Specifications using XQuery expressions on Traces" (SXQT) is developed in the project. Extending the W3C's Web Services Description Language (WSDL) message-flows are constrained in a temporal and structural manner with expressions of first order logic.

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project:

- M. Venzke. Automatic Validation of Web Services. In: Proceedings of the 8th CaberNet Radicals Workshop. Hotel Eden Roc, Ajaccio, Corsica, October 5th - 8th, 2003.
- M. Venzke, S. Pitzek. Accessing Fieldbus Systems via Web Services. In: Proceedings of the First Workshop on Intelligent Solutions in Embedded Systems (WISES), Vienna University of Technology, Austria, June 27th, 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Automatic Verification of Randomized Distributed Algorithms

Start Date: 1998

End Date: 2001

URL: <http://www.cs.bham.ac.uk/~mzk/rando/>

CaberNet members involved on the project: University of Birmingham, UK

Other Partners:

The Project:

This EPSRC-funded project (grant GR/M04617) is concerned with extending conventional model checking techniques to the case of randomized distributed algorithms. These are algorithms which are designed to run on hardware consisting of many interconnected processors (and often geographically 'distributed', as in the case of a network of processors), and which use randomization, that is, make choices at random, using electronic coin flipping. It turns out that randomized algorithms are much faster than their deterministic counter- parts, but verifying their correctness against the specification is much more involved because of the need for sophisticated probabilistic analysis.

List of relevant chapters:

Distributed Systems Security, Rigorous Design

Three publications reporting outcomes from the project

- M. Kwiatkowska, G. Norman. Verifying Randomized Byzantine Agreement. In Proc. Formal Techniques for Networked and Distributed Systems (FORTE'02), volume 2529 of LNCS, pp. 194-209, Springer-Verlag 2002
- M. Kwiatkowska, G. Norman, R. Segala. Automated Verification of a Randomised Distributed Consensus Protocol Using Cadence SMV and PRISM In Proc. CAV'01, volume 2102 of LNCS, pp. 194-206, Springer-Verlag 2001
- L. de Alfaro, M. Kwiatkowska, G. Norman, D. Parker, R. Segala. Symbolic Model Checking of Concurrent Probabilistic Processes using MTBDDs and the Kronecker Representation In Proc. TACAS 2000, volume 1785 of LNCS, pp. 395-410, Springer-Verlag 2000

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Aware Goods

Start Date: ongoing

End Date:

URL: <http://www.teco.edu/~albrecht/>

CaberNet members involved on the project: Universität Karlsruhe, Germany

Other Partners:

The Project:

In order to supervise goods during transport from the supplier to the consumer we are trying to introduce a small digital device with a CPU, memory and sensors on it. This device has to control the goods and the resulting measuring values are stored in the device's memory. Once arrived at the product's final destination the device will be automatically read out via infrared or any other possibly wireless communication and the data will be transferred into the consumer's backend system (quality management system/ERP system). The backend system can then check the recorded data and determine the state of the goods. If certain limits are exceeded, an alarm can be invoked and the damaged goods can instantly be returned to the supplier. This system shall offer a continuous control over the goods and a seamless integration into the existing backend systems of the suppliers as well as the consumers, following the concepts of electronic commerce. The advantage is that the error rate is much lower as no manual transferring of data is needed any more. The goods supervise themselves, which results in the term "aware goods". The measurements of digital devices are also much more accurate than those of analogous ones. This offers better control and accuracy of values to present in insurance matters. The transferring of the values is accelerated and thus costs can be reduced.

The list of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: BAE SYSTEMS Systems Integration Consortium

Start Date: 1999

End Date: ongoing

URL: <http://www.baesystems.com>

CaberNet members involved on the project: University of York, UK; University of Newcastle, UK

Other Partners: University of Loughborough

The Project:

This project involves collaboration between the Universities of York, Newcastle and Loughborough with BAE SYSTEMS. The work at York is targeted at software productivity improvement. This is divided into the following areas:

Automatic Software Production - This focuses upon the trusted automatic generation of high-level language from models (e.g. UML).

Object-Oriented Modelling - This focuses upon the use of UML within a systems and software engineering context. This involves meta-modelling with UML and investigation of product line architectures.

List of relevant chapters:

Dependable Systems, Real Time Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: BMAN

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: Imperial College, UK

Other Partners:

The Project:

BMAN investigates the application of mobile computation models in business processes to the configuration, management and execution of distributed workflow systems for inter-enterprise B2B e-business; new business models and best business practices, exploiting mobile systems and software for business process modelling, are under development.

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Deriving Authority from Security Policy

Start Date: 2002

End Date: 2003

URL: http://www.jisc.ac.uk/index.cfm?name=project_aaa_kent

CaberNet members involved on the project: University of Kent, UK

Other Partners:

The Project:

Integrating the authorization of access to national services with the constantly changing requirements for access and resource management within institutions leads to a very complex network of constraints, and will lead to high operational costs and barriers to uptake. This project is studying the potential of the recent research work on policy driven management to provide more effective solutions to the integrated management of security. It is using an extended scenario to estimate the complexity involved and the benefits of a policy-based approach in overcoming it. It will deliver a review of how these techniques can be applied to the national academic infrastructure over a five-year period and identify the actions needed to realise the benefits.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Design and Realization of Survivable Computer Systems and Networks

Start Date: 1999

End Date: ongoing

URL: <http://www.informatik.uni-hamburg.de/TKRN/world/abro/ongore.htm>

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners: Members of Deutsches Forschungsnetz (DFN)

The Project:

Survivable systems are known to be resistant to different kinds of problems. Among these are failures due to software or hardware faults, but also attacks caused by computer criminals. The design and implementation of survivable systems therefore requires a variety of different steps to support system analysis and synthesis. In this project, we elaborate a new approach to design survivable systems (in particular computer and communication networks) based on a repeatedly applied analysis of the system to identify various kinds of threats, errors and performance bottlenecks. Our evaluation of a survivable system combines fault-, performance- and security management. In [Benecke 2002] the approach is applied, by way of example, to packet screens as important building blocks of firewalls. Another emphasis of the project is put on the efficient solution of analytical reliability models and their application to communication networks [Heidtmann 2002].

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project:

- [Benecke 2002] Benecke C., Überlebensfähige Sicherheitskomponenten für Hochgeschwindigkeitsnetze - Entwurf und Realisierung am Beispiel einer Packet Screen, Dissertation, FB Informatik, Univ. Hamburg, 2002, erschienen in: Wolfinger B.E. (Hrsg.), Berichte aus dem Forschungsschwerpunkt Telekommunikation und Rechnernetze, Band 3, Shaker-Verlag, Aachen, 2002
- [Heidtmann 2002] Heidtmann K., Statistical Comparison of Two Sum-of-Disjoint-Products Algorithms for Reliability and Safety Evaluation, 21st Intern. Conf. on Computer Safety, Reliability and Security, SAFECOMP 2002, Catania/Italy, September, 2002, in: Anderson S., Bologna S., Felici M. (Eds.), Computer Safety, Reliability and Security, Lecture Notes in Computer Science No. 2434, Springer, Berlin, 2002, pp. 70-81

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Design Support Environments for Distributed Systems

Start Date: 1 April 2000

End Date: 2003

URL: <http://www.cs.kent.ac.uk/projects/dse4ds/>

CaberNet members involved on the project: University of Kent, UK

Other Partners:

The Project:

This project aims to extend facilities for the design of multimedia distributed systems, to ensure that they can meet the needs of complex systems which will include the use of stream communication, multicasting and Quality of Service (QoS) constraints.

The work will augment UML to support specification and design of distributed multimedia systems by providing support for streams, Quality of Service and multicasting, and provide a basis for predictions on performance and to ensure they meet QoS constraints the design environment.

The project builds on the work of the Permabase project, funded by BT Networks and Systems which designed and produced prototypes for automated performance prediction for distributed systems

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Design and Verification of Distributed Multi-media Systems. D.H. Akehurst, B. Bordbar, J. Derrick, A.G. Waters. Technical Report 1-03, University of Kent at Canterbury, January 2003.
- Design Support for Distributed Systems: DSE4DS. D.H. Akehurst, B. Bordbar, J. Derrick, A.G. Waters. In J. Finney, M. Haahr, A. Montessor, Eds, Proceedings of the 7th CaberNet Radicals Workshop, October 2002.
- A framework for UML consistency. J. Derrick, D. Akehurst, E. Boiten. In L. Kuzniarz, G. Reggio, J. L. Sourrouille, Z. Huzar, Eds, UML 2002. Workshop on Consistency Problems in UML-based Software Development, pp. 30-45, October 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Development and Analysis of Fault Tolerant Distributed Applications Based on Time Triggered Architecture for Automotive Environment

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

The objective of this project is to design a brake by wire system based on Time Triggered Architecture and a bridge for a light control subsystem based on CAN network.

List of relevant chapters:

Real Time Systems, Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Distributed Expert Systems for Process Monitoring and Controlling: Alcoholic Fermentation Application

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

The objective of this project is to design a distributed architecture that uses a variation of expert systems called ruled-nets for the control of chemical process systems applied to alcoholic fermentation.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Emergency Multimedia

Start Date: ongoing

End Date:

URL: <http://www.comp.lancs.ac.uk/computing/staff/adrian.html/links.php?TopicId=1&Topic=Projects>

CaberNet members involved on the project: Lancaster University, UK

Other Partners:

The Project:

Emergency Multimedia (EMM) explores the use of mobile computer systems to assist the Langdale and Ambleside Mountain Rescue team (LAMRT). The system is based around a set of devices (medical ECG, pulse and blood oxymetry monitor, GPS compass, digital camera carried in a single rescuer's rucksack whose data can be combined and transmitted in real-time back to the mountain rescue base. The rucksack also contains a small embedded PC (based around a PC104 stack) with a 'DiskOnChip' solid state disk containing Linux and our driver software.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Equator

Start Date: 2001

End Date: 2007

URL: <http://www.equator.ac.uk/>

CaberNet members involved on the project: Lancaster University, UK

Other Partners: University of Bristol, University of Nottingham, The Royal College of Art, University of Southampton, University of Sussex, University College London.

The Project:

Equator is a six-year Interdisciplinary Research Collaboration (IRC) supported by EPSRC that focuses on the integration of physical and digital interaction. The IRC brings together researchers from eight different institutions and a variety of disciplines that address the technical, social and design issues in the development of new inter-relationships between the physical and digital. A series of experience projects engage with different user communities to develop new combinations of physical and digital worlds and how explore these may be exploit enhance the quality of everyday life. A series of research challenges explore new classes of device that link the physical and the digital, research into adaptive software architectures and new design and evaluation methods that draw together approaches from social science, cognitive science and art and design.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project

- K. Clarke, K. Cheverst, G. Dewsbury, D. Fitton, J .Hughes, M. Rouncefield, I. Sommerville, T. Hemmings, T. Rodden. Cultural Probes: Eliciting Requirements for Dependable Ubiquitous Computing in the Home. June 2003.
- A. Dix, J. Marshall. At the right time: when to sort web history and bookmarks. June 2003.
- A. Dix, C. Chisalita, G vander Veer. Moments of Significance - the meanings of event: enablement, initiation, completion. June 2003.
- Crabtree, A., Rodden, T., Hemmings, T., Benford, S. "Finding a place for UbiComp in the home", Proceedings of the 5th Annual Conference on Ubiquitous Computing, October 12th-15th, Seattle: Springer. 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Event Management for Mobile Users

Start Date: 01.01.2001

End Date: 31.12.2003

URL: <http://www.informatik.uni-stuttgart.de/ipvr/vs/en/projects/EventManager/index.html.en>

CaberNet members involved on the project: University of Stuttgart, Germany; Microsoft Research in Cambridge, UK

Other Partners:

The Project:

The purpose of this project is to investigate possible architectures and mechanisms for an Internet-scale event management system, taking the mobility of the users into account. In order to derive the requirements for such an event management system and to have an environment for testing the results this project is closely integrated with the Nexus project. Here the support for spatial events, e.g. when two people meet or when somebody enters a building, is investigated. The main focus of this project is on the observation of complex events, where the sources of information that are needed for the observation are distributed among different servers. So the information has to be brought together for evaluation, taking into account the properties of the underlying distributed system such as delay and clock synchronization for the semantics of the event observation. The project is carried out as a cooperation between Microsoft Research in Cambridge (UK) and the University of Stuttgart.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

- Bauer, Martin; Rothermel, Kurt: Towards the Observation of Spatial Events in Distributed Location-Aware Systems. In: Wagner, Roland (ed.): Proceedings of the 22nd International Conference on Distributed Computing Systems Workshops, Vienna, 2002.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Formal analysis of security properties

Start Date: Jan. 2003

End Date: Dec. 2005

URL: http://ls4-www.cs.uni-dortmund.de/RVS/Projekte_e.html#fms

CaberNet members involved on the project: University of Dortmund

Other Partners:

The Project:

A method is under development which achieves the formal modelling of computer networks, their security mechanisms and services as well as behaviours of attackers and administration processes performing activities of technical network, system, and application management. Networks, mechanisms, services and processes are modelled as State Transition Systems. Verification and analysis apply Leslie Lamport's Temporal Logic of Actions (TLA). The specification technique cTLA and a cTLA-based specification framework are used in order to support the modular description of systems and their structured verification. Moreover the cTLA-specifications used can be translated into Gerard Holzmann's Protocol Specification Language PROMELA and analyzed by means of his efficient tool SPIN. Based on the method, we aim to the study of security properties of networked IT-infrastructure. In particular, we want to investigate effects of attacks and erroneous administration activities as well as undesired interferences of attack and administration processes. Many attacks and incorrect administration procedures boost each other and have serious indirect impacts which will take effect in the course of future operation steps of networked IT systems. The TLA-based modelling of security-related system behaviours therefore aims to the formal analysis of possible system and administration flaws in order to develop modular security service design principles which help to limit the propagation of malicious effects.

List of relevant chapters:

Distributed Systems Security

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Formal Description and Model Checking of Web Service (WS) Protocols

Start Date: 2003

End Date: Ongoing

URL:

CaberNet members involved on the project: Telematics Department, Technische Universität Hamburg-Harburg, Germany.

Other Partners: Microsoft Research, USA

The Project:

Service based architectures to cope with the increasing need for an interoperability framework between applications are currently state of the art. In particular, the advent of XML schema based interface standards like Web Services are investigated broadly from standardization organisations and vendors on a global scale. That led and will further lead to a large number of standards considered (e.g. basic Web Service specifications like SOAP, WSDL and UDDI as well as advanced Web Service specifications like WS-Federation, WS-ReliableMessaging, WS-Security, WS-Transaction or even WS-Application specification like BPEL4WS).

It is obvious that the need to prove the correctness of the design of these protocols is emerging, since most of the advanced and application specific WS protocols are not yet implemented, but will be in the near future. In order to avoid implementing design flaws a rigorous proof of important properties has to be applied at the level of design abstractions. Since most of the currently used FDT's are focusing either on implementation abstractions or on interaction abstractions (e.g. Hoare style abstractions), a specific need to support design abstractions is evident. This observation has lead to the project, which investigates the use of the most advanced and tool supported specification approach called Temporal Logic of Actions (TLA+) developed by Leslie Lamport for proving safety and liveness properties of WS design specifications. As a starting point the WS Atomic Transaction specification (<http://www-106.ibm.com/developerworks/library/ws-transpec/>) was chosen.

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Global Computation using Events

Start Date: October 1998

End Date: December 2001

URL: <http://www.cl.cam.ac.uk/Research/SRG/opera/projects/global.html>

CaberNet members involved on the project: University of Cambridge, UK

Other Partners:

The Project:

We have pioneered event-based middleware since the early 1990's. The Cambridge event architecture (CEA) proposed that events should be programmed as typed, programming language objects, automatically converted as required for transport by middleware services and we investigated a number of ways of achieving this using standard middleware. Our EPSRC grant "Global computing using events" ended in December 2001. The main result was an architecture for federating event systems. We are also working on a large-scale, event-based middleware, *Hermes*. The approach is to use XML for event transport among a network of brokers. Hermes is built on a peer-to-peer overlay network. Programmers in end systems may use a standard programming language, such as Java, and XPath is used to support automatic conversion. We are working on distributed filtering for notifications and advertisements, using P2P to define rendezvous, and an event composition service.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- Eiko Yoneki, "Pronto: Mobile Gateway with Publish-Subscribe Paradigm over Wireless Network". 4th ACM/IFIP/USENIX International Conference on Middleware (Work in Progress), Rio de Janeiro, Brazil, June 2003. (IEEE Distributed Systems Online Vol.4 No.5, May 2003).
- Eiko Yoneki and Jean Bacon, "Gateway: a Message Hub with Store-and-forward Messaging in Mobile Networks". Proc of the 23rd IEEE International Conference on Distributed Computing Systems Workshops (MCM - Mobile Computing Middleware), Providence, Rhode Island, USA, May 2003, pp. 348-353.
- András Belokosztolszki, David M. Eyers, Peter R. Pietzuch, Jean Bacon and Ken Moody, "Role-Based Access Control for Publish/Subscribe Middleware Architectures". International Workshop on Distributed Event-Based Systems(DEBS03), San Diego, CA, USA. 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Globe

Start Date:

End Date:

URL: <http://www.cs.vu.nl/globe/>

CaberNet members involved on the project: Vrije Universiteit, The Netherlands.

Other Partners:

The Project:

Globe is a research project on building a worldwide scalable distributed system. It aims to develop a powerful unifying paradigm for the construction of large-scale wide area distributed systems: **distributed shared objects**. In our model, the universe consists of a vast number of shared objects, each of which has some associated methods. Authorized users of an object may invoke an object's methods. A method can return the contents of a Web page, but it can also accept an email or news message, look up a name in a worldwide distributed database, access a file or perform an arbitrary other action. Physically, objects are distributed, with active copies on multiple machines at the same time. Our objects use peer-to-peer communication: applications load (part of) the object implementation in their address space to participate in the distributed object. Users may contact any copy to have methods performed, but they know nothing about the internal structure and protocols used inside the object. This scheme allows different objects to use different algorithms for data partitioning, replication, consistency, and fault tolerance, in a way transparent to the users. Objects have location-independent names and are constructed from a control subobject, a communications subobject, a replication subobject, a security subobject, and a semantics subobject that does the actual work. The first four are taken from libraries or are compiler generated from the semantics object. This approach makes it simple to automatically build distributed, replicated, secure, worldwide objects. All the user has to do is write the semantics object and specify which distribution, replication, and security libraries to bind to. The system does the rest.

List of relevant chapters:

Distributed Object and Component Technologies

Three publications reporting outcomes from the project;

- M. Jelasity, W. Kowalczyk, M. van Steen. "An Approach to Aggregation in Large and Fully Distributed Peer-to-Peer Overlay Networks." Proc. 12th Euromicro Conference on Parallel, Distributed and Network based Processing (PDP 2004), A Coruna, Spain, February 2004.
- J.M. Wams, M. van Steen. "A Flexible Middleware Layer for User-to-User Messaging." Proc. 4th IFIP Int'l Conf. on Distributed Applications and Interoperable Systems (DAIS), Paris, November 2003.
- S. Sivasubramanian, G. Pierre, M. van Steen. "A Case for Dynamic Selection of Replication and Caching Strategies." Proc. Eighth Int'l Workshop on Web Content Caching and Distribution, Hawthorne, NY, September 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: High-Security Real Time Distributed System: Mobile Robot Control Application

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf/>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain; Universitat Politècnica de Catalunya, Spain

Other Partners:

The Project:

The objective of this project is to develop a distributed fault tolerant architecture for a mobile robot control. This architecture uses a vision and a wireless subsystem and motion control subsystem interconnected by a fibre optics area network (CAN).

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: K-Components

URL: <http://www.dsg.cs.tcd.ie/sites/K-Components.html>

Start Date: 1999

End Date: 2004

CaberNet Members Involved: Trinity College, Dublin

The Project:

K-Components is a component model for building context-adaptive applications. It is based on asynchronous architectural reflection as a basis for realising adaptive application behaviour. Aspects of dynamic software architectures and control theory form the basis for much of the work in K-Components. Architecture meta models are runtime representations of a system's software architecture. An architecture meta-model that is causally connected to its base implementation is reflective and programs that operate on this architecture meta model are architecturally reflective. Classes of systems that can benefit from architectural reflection include: context-adaptive software, adaptable middleware and self-adaptive middleware. In existing reflective programming languages, reflective computation is executed in-line (or synchronously) with the application execution but reflective computation can also execute asynchronously to application execution. The K-Components project defines a new asynchronous model of computational reflection. K-Components shows how asynchronous reflection can allow programmers to configure the trade-off between the execution-overhead of reflective code and the responsiveness to adaptation conditions. K-Components support the dynamic adaptation of software architectures through meta-level programs that monitor and reconfigure the software architecture.

List of relevant chapters:

Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project:

- Jim Dowling, Vinny Cahill, "Dynamic Software Evolution and the K-Component Model", Workshop on Software Evolution, OOPSLA 2001.
- Jim Dowling, Vinny Cahill, "The K-Component Architecture Meta-Model for Self-Adaptive Software", In Proceedings of Reflection 2001, LNCS 2192.
- Jim Dowling, Vinny Cahill, "Building a Dynamically Reconfigurable minimum CORBA Platform with Components, Connectors and Language-Level Support", Workshop on Reflective Middleware, IBM Pallisades, New York, 2000.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Living in a Smart Environment

Start Date: ongoing

End Date:

URL:

CaberNet members involved on the project: Universität Karlsruhe, Germany, Universität Stuttgart, Germany

Other Partners:

The Project:

This is a research project founded by the Gottlieb Daimler and Karl Benz Stiftung. It combines the competences of various institutes and will look into the implications of the introduction of ubiquitous computing on social life and society. TecO as participant in this overall project will develop a second generation of the Memo Clip. The Memo Clip II project is focused on improving and extending the concept of the standard PDA. PDAs provide the user with a simple context aware application: the calendar. This application is designed to interactively alert the user depending on the actual date and time to remember appointments, entered earlier. In Memo Clip II we want to extend this well-established system with additional context information the user can use as a trigger for the reminder event. One major focus in this work will be on location as an additional context to connect with relevant information.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Micro-controller Based Control System for a Laser: Image Capturing Application of the Injection in an Automotive Diesel Engine

Start Date: ongoing

End Date:

URL: <http://www.disca.upv.es/gstf>

CaberNet members involved on the project: Universidad Politécnica de Valencia, Spain

Other Partners:

The Project:

The objective of this project is to develop a microcontroller and FPGA systems to control a laser system and vision system to take pictures of injection process inside a cylinder in a diesel engine.

List of relevant chapters:

Network and Distributed System Management

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Model-based security management

Start Date: Oct. 1998

End Date: Dec. 2003

URL: http://ls4-www.cs.uni-dortmund.de/RVS/Projekte_e.html#mbsm and <http://ls4-www.cs.uni-dortmund.de/RVS/MA/hk/MobaPro.html>

CaberNet members involved on the project: University of Dortmund

Other Partners:

The Project:

The approach of model-based management supports the derivation of management applications. It concentrates on a hierarchically layered model representing the abstract nominal behaviour of the managed system, the working points and functions of the management application, and the internal structure and dependencies of the system. An object-oriented graphical modelling tool and predefined class libraries support the comfortable development of models. We apply model-based management to security management of enterprise IT systems supporting the integrated management of the various security services and mechanisms (e.g., firewalls, VPN-elements, authentication, authorization). In particular, we support that the detailed configuration settings and management rules of the different services and mechanisms can be derived from abstract policies.

List of relevant chapters:

Network and Distributed System Management, Distributed Systems Security

Three publications reporting outcomes from the project:

- Lück, S. Vögel, H. Krumm: Model-Based Configuration of VPNs. In: 8th IEEE/IFIP Network Operations and Management Symposium (NOMS2002), pp. 589-602, Florence, April 2002. IEEE Computer Society Press.
- Lück, C. Schäfer, H. Krumm: Model-based Tool-Assistance for Packet-Filter Design. In: M. Sloman, E. Lupu, J. Lobo (Eds.), Proceedings of the IEEE Workshop on Policies for Distributed Systems and Networks (Policy 2001), pp. 120-136, Bristol, UK, Lecture Notes in Computer Science 1995, 2001. Springer-Verlag.
- Ingo Lück, Marcus Schönbach, Arnulf Mester, Heiko Krumm: Derivation of Backup Service Management Applications from Service and System Models. In R. Stadler, B. Stiller (eds.), Active Technologies for Network and Service Management, Proc. DSOM'99, pp. 243-255, Springer-Verlag, LNCS 1700, 1999.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Network-aware Programming and Interoperability

Start Date: 2001

End Date: ongoing

URL: <http://www.cs.unibo.it/msproject/>

CaberNet members involved on the project: Università di Bologna, Italy

Other Partners: Microsoft Research Europe; Department of Computer Science – Florence University; Department of Computer Science – Pisa University

The Project:

The goal of this project is to identify proper tradeoffs to relieve the programmer as much as possible from the burden of dealing explicitly with low-level events taking place in open, distributed, and mobile system. The research focuses on three areas: models of computation, programming languages and distributed system technology.

List of relevant chapters:

Distributed Object and Component Technologies, Mobile Systems, Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Probabilistic Model Checking of Mobile Ad Hoc Network Protocols

Start Date: 2003

End Date: 2006

URL: <http://www.cs.bham.ac.uk/~mzk/adhoc>

CaberNet members involved on the project: University of Birmingham, UK

Other Partners:

The Project:

This EPSRC-funded project (grant GR/S46727) aims to investigate the foundations of modelling and analysis of mobile ad hoc network protocols, with the view to develop automated design validation methods capable of performance prediction and correctness assurance. Performance prediction, an essential factor when evaluating ad hoc network designs due to mobility, inherent delays in the underlying transmission mechanism and potential loss of interconnectivity, will be achieved through the novel probabilistic model checking techniques previously developed at Birmingham.

List of relevant chapters:

Mobile Systems, Distributed Systems Security, Rigorous Design

Three publications reporting outcomes from the project

- M. Kwiatkowska, G. Norman, D. Parker, J. Sproston Performance Analysis of Probabilistic Timed Automata using Digital Clocks In Proc. Formal Modelling and Analysis of Timed Systems (FORMATS'03). 2003.
- M. Kwiatkowska, G. Norman, J. Sproston Probabilistic Model Checking of the IEEE 802.11 Wireless Local Area Network Protocol In Proc. PAPM/PROBMIV'02, volume 2399 of LNCS, pp. 169-187, Springer-Verlag 2002
- M. Kwiatkowska, G. Norman, D. Parker PRISM: Probabilistic Symbolic Model Checker In Proc. TOOLS 2002, volume 2324 of LNCS, pp. 200-204, Springer-Verlag 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Semantics-Guided Design and Implementation of Group Communication Middleware

Start Date: Dec 2001

End Date: Dec 2003

URL:

CaberNet members involved on the project: EPFL, Switzerland

Other Partners:

The Project:

The project will contribute to the design of future middleware for building fault-tolerant applications in wide-area networks. The operational semantics and the algebraic techniques developed can be used as the basis for reasoning formally about group communication protocol.

List of relevant chapters:

Group Communication

Three publications reporting outcomes from the project

- P. Wojciechowski, S. Mena, A. Schiper Semantics of Protocol Modules Composition and Interaction Proc 5th Int Conf Coordination 2002, LNCS 2315, pp. 389-404, Springer, April 2002.
- S. Mena, A. Schiper, P. Wojciechowski A Step Towards a New Generation of Group Communication Systems Proc Int. Middleware Conf, LNCS 2672, pp. 414-432, Springer, June 2003.
- S. Mena, X. Cuvellier, Ch. Gregoire, A. Schiper Appia vs. Cactus: Comparing Protocol Composition Frameworks Proc IEEE Int. Symp on Reliable Distributed Systems (SRDS), 2003.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Sentient Objects

URL: http://www.dsg.cs.tcd.ie/sites/Sentient_Objects.html

Start Date: 2001

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin

The Project:

The event-based communication model includes mechanisms for the specification of constraints on the propagation and delivery of events. A sensor is a software abstraction that encapsulates a hardware sensor device and produces software events in response to real-world stimuli. An actuator consumes software events and encapsulates a physical device capable of real-world actuation. A sentient object is an entity that can both consume and produce software events, and lies in some control path between at least one sensor and one actuator.

The recent proliferation of cheap, small, and increasingly accurate sensor technologies is creating a new information revolution where applications that interact with the physical environment are becoming widespread. This awareness of the physical environment, and its use by applications in fulfilment of their goals, is known as context-awareness and a number of promising applications have appeared which make use of context information e.g. The Context Toolkit and “Sentient Computing with Active Bat Technology”. Context-awareness is of particular importance in mobile environments where the operating environment is constantly changing due to the mobility of devices and the characteristics of wireless communication technologies. In such environments, context-awareness can enable applications to respond intelligently to variable bandwidth, unreliable connections and the economy of different connections. One of the greatest challenges in context-aware computing, and one that has not yet been adequately addressed, is the provision of middleware and services to support the application developer. The major problem lies in providing generic support for the acquisition and use of multiple fragments of information gleaned from (potentially unreliable) multi-modal sensors in a mobile environment. In addition, the mobile environment poses further challenges with regard to the dependability, predictability, and timeliness of communication. The sentient object model project, defines software abstractions that ease the use of sensor information, and associated actuation, by context-aware applications. At the heart of the model is an event-based communication model that permits loose coupling between objects and consequently supports mobility and application evolution.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

- Vinny Cahill, Gregory Biegel Sentient Objects for Context Aware Business Process Management In Proceedings of 2003 SAP Innovation Congress, Miami, Florida February 2003.
- Gregory Biegel, Vinny Cahill Sentient Objects: Towards Middleware for Mobile Context-Aware Applications European Research Consortium for Informatics and Mathematics ERCIM News No. 54, July 2003.
- Adrian Fitzpatrick, Gregory Biegel, Siobhán Clarke, Vinny Cahill. Towards a Sentient Object Model Position Paper Workshop on Engineering Context-Aware Object Oriented Systems and Environments (ECOOSE)², Seattle WA, USA November 2002

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Sentient Traffic Simulation

URL: <http://www.dsg.cs.tcd.ie/sites/sentienttraffic.html>

Start Date: 2002

End Date: ongoing

CaberNet Members Involved: Trinity College, Dublin.

The Project:

The goal of the Sentient Traffic Simulation project is to apply the sentient object model developed from the Sentient Objects project to motor vehicles and investigate these sentient vehicles in the context of a city traffic environment. Following previous research in large-scale sentient computing the objective is to determine the applicability of sentient computing to vehicular traffic, culminating with a simulation of the traffic in Dublin over a twenty four hour period. A sentient object is a context aware, mobile, intelligent entity that perceives its environment via sensors and acts upon it via actuators. Sentient objects have a number of possible application scenarios one such scenario is in vehicular traffic automation. Increased demands on the existing road infrastructure have lead to congested freeways and city roads that are unable to cope with the volume of traffic using them. At the same time, motor vehicles are becoming ever smarter with the introduction of driver-assist systems, navigation and other systems that will eventually lead to the evolution of fully automated vehicles. Enabling technologies such as Automatic Cruise Control are reaching the end of the R&D phase and could be rolled out within years. The Sentient Traffic Simulation project applies a sentient object model to motor vehicles and investigates these sentient vehicles in the context of a city traffic environment with the aim of accurately simulating the traffic in Dublin over a twenty-four hour period.

List of relevant chapters:

Mobile Systems

Three publications reporting outcomes from the project:

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Traffic Engineering for Service-Integrated Networks with Real-time Communications

Start Date: ongoing

End Date:

URL: <http://www.informatik.uni-hamburg.de/TKRN/world/abro/ongore.htm>

CaberNet members involved on the project: University of Hamburg, Germany

Other Partners: University of Tübingen; University of Calgary, Canada; Université Pierre et Marie Curie, LIP6, Paris, France; Universidade Federal do Rio de Janeiro, Brazil

The Project:

This long term project tries to approach various aspects of Traffic Engineering including:

- Load measurement at different interfaces of a protocol / service hierarchy within service-integrated networks focussing on video traffic (MPEG-1/ -2, H.261, H. 263) on one hand and on UDP / IP traffic on the other hand
- Load modelling based on measurements covering again video traffic as well as packet traffic
- Load prediction by means of maudlin load transformation processes
- Construction of load generators for synthetic load in LANs or in Internets;
- Traffic management, e.g. prioritization of video traffic in DiffServ based networks

List of relevant chapters:

Distributed Multimedia Platforms

Three publications reporting outcomes from the project

- Wolf J., Wolfinger B.E., Efficient Resource Management for Distributed Applications with Real-Time Requirements in Broadcast Networks, 8th CaberNet Radicals Workshop, 2003
- Wolfinger B.E., Wolf J., le Grand G., Improving Node Behavior in a QoS Control Environment for Local Broadcast Networks, Proc. of the International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS), 2003
- Wolf J., Wolfinger B.E., le Grand G., Anelli P., Leistungsbewertung von Algorithmen zur dynamischen Ressourcenverwaltung in lokalen "Broadcast"- Netzen, GI/ITG-Fachtagung "Kommunikation in Verteilten Systemen" KiVS 2003, Leipzig, Februar 2003

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Trust and Security Aspects of Distributed Component-Structured Software

Start Date: Jan. 2002

End Date: Dec. 2004

URL: http://ls4-www.cs.uni-dortmund.de/RVS/Projekte_e.html#tsa

CaberNet members involved on the project: -

Other Partners: -

The Project:

Component-structured software is composed from components which are independently created, combined, and deployed. The high number of principals is a reason for more subtle security risks than in monolithic programs and special protection mechanisms are needed, which, however, introduce overhead and influence the application performance. Therefore a trust management system is applied which keeps track of the current risks, experiences, and trust levels of components and principals. The protection mechanisms employed in the applications are equipped with adaptation functions which adjust the monitoring efforts to the current trust levels and requirements.

List of relevant chapters:

Distributed Systems Security, Software Architectures for Distributed and Dependable Systems

Three publications reporting outcomes from the project:

- P. Herrmann: Formal Security Policy Verification of Distributed Component-Structured Software. To appear in: 23rd IFIP International Conference on Formal Techniques for Networked and Distributed Systems (FORTE'2003), IFIP, LNCS, Berlin, September/October 2003, Springer-Verlag.
- P. Herrmann: Trust-Based Protection of Software Component Users and Designers. In: 1st International Conference on Trust Management, pp. 75-90, LNCS 2692, Heraklion, May 2003, Springer-Verlag.
- P. Herrmann, L. Wiebusch, H. Krumm: State-Based Security Policy Enforcement in Component-Based E-Commerce Applications. In: 2nd IFIP Conference on E-Commerce, E-Business & E-Government (I3E), pp. 195-209, Lisbon, October 2002. Kluwer Academic Publisher.

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Validation of Graphically Elicited Multi-variate Probability Models for Safety Assessment of Computer-based Systems

Start Date: March 2000

End Date: February 2002

URL: http://www.csr.city.ac.uk/csr_city/projects/ropa.html

CaberNet members involved on the project: City University, UK

Other Partners:

The Project:

As in the case of other non-trivial software-based systems, we must assume that failure of safety critical systems is possible, and attempt to discover whether or not, in the case of each system, failure is sufficiently unlikely for the system to be licensed for operational use. There are a number of special features of complex, software-based, safety-critical systems which contribute to the difficulty of assessing their dependability. There is insufficient objective statistical evidence to assure - by testing, or from actual operation of related systems in related environments - that the required level of reliability has been achieved in the case of a new system. For this reason, safety assessors turn to other sources of evidence in an attempt to increase their assurance that such a system is fit for purpose. These other sources might include measurable evidence relating to the quality of the requirements elicitation and design processes, or to the competence of development personnel; as well as the use of more subjective expert assessment of these and other factors. In taking account of much of this evidence, there will not always be scientifically accepted or widely agreed relationships and causal models on which to rely.

This project attempts to investigate the contribution that graphical probability models or "belief networks" might make to these problems. In particular it focuses on: Examining and comparing the value of alternative graphical formalisms such as Directed Acyclic Graphs, Undirected Graphs and Chain Graphs. In particular we hope that use of these multiple formalisms might increase our assurance that the builders and users of such graphical models understand the "system of conditional independence assumptions" depicted by such graphs as fully and correctly as possible. The development of automated methods of providing a multiplicity of forms of feedback of the structure, assumptions and consequences of such graphical probability models. We intend that this model feedback should include automatically computed symbolic (as well as numeric) forms of model output. In these ways we aim to develop methods of deepening a safety assessment expert's appreciation of, and interaction with, the formal conditional-independence model expressed by a graphical formalism, and hence gaining confidence that such models, ultimately and after appropriate adjustment, can become a valuable aid to and a fair representation of the coherent beliefs of such experts.

List of relevant chapters:

Dependable Systems

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Verification of Quality of Service Properties in Timed Systems

Start Date: 2000

End Date: 2003

URL: <http://www.cs.bham.ac.uk/~mzk/realtime/>

CaberNet members involved on the project: University of Birmingham

Other Partners:

The Project:

This EPSRC-funded project (grant GR/N22960) aims to address the foundations of the verification of quality of service properties of real-time systems. The design and analysis of many systems, such as communication protocols, embedded systems and multimedia protocols, requires detailed knowledge of their real-time aspects, in addition to the functional requirements. Existing approaches, however, can only verify deterministic (hard) deadlines, i.e. properties such as "if the packet is sent then it will be delivered within 80 ms". In the presence of lossy media or faulty hardware, hard deadlines can be too restrictive. Probabilistic (soft) deadlines provide a viable alternative; these express the probability of a certain target of quality of service being achieved (here delivery occurring within 80 ms with probability at least 90%/at most 3%). For applications such as audio or multimedia protocols, which process and transmit continuous media data, it is often necessary to allow stochastic timing, in the sense that the user could specify that packets are sent according to exponential or normal distribution. In such cases, measures such as mean time to delivery are additionally required.

List of relevant chapters:

Distributed Systems Security, Rigorous Design

Three publications reporting outcomes from the project

- M. Kwiatkowska, G. Norman and J. Sproston Probabilistic Model Checking of Deadline Properties in the IEEE1394 FireWire Root Contention Protocol Special Issue of Formal Aspects of Computing, 14, pp. 295-318 2003
- M. Kwiatkowska, G. Norman, R. Segala, J. Sproston Automatic Verification of Real-time Systems with Discrete Probability Distributions Theoretical Computer Science, 282, pp. 101-150 2002
- Verifying Quantitative Properties of Continuous Probabilistic Timed Automata (M.Z. Kwiatkowska, R. Segala, J. Sproston). In Proc. 12th International Conference on Concurrency Theory (CONCUR'00), LNCS 1877, pp. 123-137, Springer-Verlag 2000

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: Workload based Caching and Scheduling Algorithms for Proxy Servers

Start Date:

End Date:

URL:

CaberNet members involved on the project: RWTH Aachen, Germany

Other Partners:

The Project:

In this project we exploit knowledge about recent requests at web-proxies, obtained from a statistical study of request logs, to improve the performance (response time and hit rate) of web proxy servers. We do so by obtaining, using statistical techniques, a classification of the proxy requests based on the requested object size. This classification then forms the basis for a class-based caching approach and a weighted-fair priority queueing approach. Analytical studies, simulations and a prototype implementation show the advantages of our approach, which can be implemented in a very effective way (with lower costs than competing caching and scheduling strategies). Our approach also allows for an adaptive scheduling and caching scheme (with which we are currently experimenting).

List of relevant chapters:

Service-oriented Computing

Three publications reporting outcomes from the project

Network of Excellence in Distributed and Dependable Computing Systems

Acronym:

Project Title: XenoServers

Start Date:

End Date:

URL: <http://www.cl.cam.ac.uk/Research/SRG/netos/xeno>

CaberNet members involved on the project: University of Cambridge, UK

Other Partners:

The Project:

This project aims to build a public infrastructure for wide-area distributed computing. We envisage a world in which Xenoserver execution platforms will be scattered across the globe and available for any member of the public to submit code for execution. Crucially, the sponsor of the code will be billed for all the resources used or reserved during the course of execution. This will serve to encourage load balancing, limit congestion, and hopefully even make the platform self-financing. As part of this project we are developing XenoStore, a distributed peer-to-peer storage system which provides high reliability and availability by the use of advanced caching and coding techniques.

List of relevant chapters:

Network Storage Services

Three publications reporting outcomes from the project

- Xen and the Art of Virtualization. P. Barham, B. Dragovic, K. Fraser, S.T.m Harris, A. Ho, R. Neugebar, I. Pratt, A. Warfield. Proceedings of the ACM Symposium on Operating Systems Principles (SOSP), October 2003
- Language support for lightweight transactions. T. Harris, K. Fraser. In the 18th ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA-2003), October 2003.
- Design choices for language-based transactions. T. Harris Technical Report UCAM-CL-TR-572, August 2003