THE FUTURE OF TELECOMMUNICATIONS AND NETWORKING - AN ATTEMPT TO PREDICT THE UNPREDICTABLE

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Rapporteurs: Dr Richard Hopkins and Dr Richard Snow

DSI

The Future of Telecommunications and Networking--an Attempt to Predict the Unpredictable

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Almost 20 years ago

- Farber & Baran in *Science*
  - The Convergence of Computing and Telecommunications Systems,
- noted that the two fields were merging in their underlying mechanism
- Now let's see where further thinking will lead us

PSI

The merging of computing and communications will drive the future.

- we went from computers without networks -> computers with networks -> networks with computers ->
- the cloud inverts
  - » the total network is the real action
  - » the computers are no longer the motivating item as in the early days

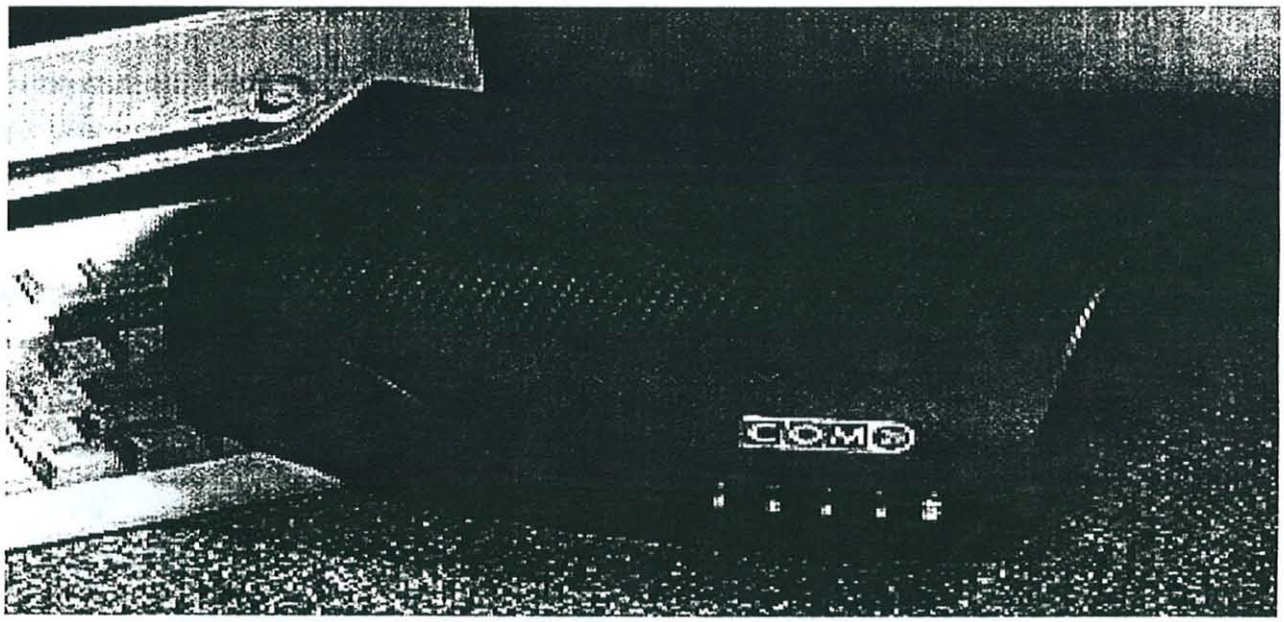
PSI

No longer can we develop computers

- » without paying attention to the networks
- » And no longer can we develop networks without wondering if our computer architectures are OK

Where will we be the next few years?

Com21 Cable Modem



DISCUSSION

Rapporteur: Dr Richard Hopkins

Lecture One

Professor Capriz remarked that there seems to be an inherent conflict between the need to control complexity, which requires simple, narrow interfaces and the properties of WANs which have wide interfaces. To this Professor Farber replied that it is possible to have complex systems with simple interfaces, and that the way to build complex systems is from small parts which interface cleanly.

Then Professor Capriz commented that the demand for complexity is beyond our capacity, as, for example, in Air Traffic Control Systems, to which Professor Farber replied that the Air Traffic Control Systems problems referred to are largely organisational problems. He further commented that the FAA had no overall design, and no idea about feasibility - they just had a "wish list" and placed the contract to the lowest cost bid.

Dr Anderson raised the point that we do manage to successfully build complex systems in other disciplines and the problem is inadequate Software Engineering.

Professor Farber identified the problem with Software Engineering as being that it is too prone to deal with "toy" solutions and the tools being provided are only good for "toy" systems. In response Dr Anderson identified the problem as being that the field is full of charlatans, to which there was the comment that it was full of optimists rather than charlatans. Professor Farber then further commented that the number of charlatans in the field makes it very difficult for the non-charlatans.

The question of multiprocessors was raised by Professor Vogt. He recalled that the speaker had said that multi-processors will be the norm in the future and asked him to elaborate on the distinctions between different types of multi-processor architectures. Professor Farber responded by saying that he didn't understand the distinction between loosely-coupled and tightly-coupled - everything is loosely coupled. He elaborated to say that multi-processors will be largely for reliability and some element of performance, and the most important thing is that we need the reliability of the telephone system.

DISCUSSION

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Lecture Two

Professor Randell speculated on the source of the pressure for high bandwidth communications. He wondered whether this would come from universities rather than from business. Professor Farber agreed, pointing out that universities can be more easily persuaded to take risks than commercial organisations. In fact, he said, Universities *have* to be risk takers. Last time universities took this kind of risk in networking (referring of course to ArpaNet), they spawned a multi-million dollar industry.

Following a discussion involving Professors Shepherd and Tedd regarding the differences between SuperJANET II and SuperJANET III, Professor Farber pointed out that American universities were able to go out and buy what they required, as opposed to the situation in British universities, and this included high speed networking.

Both Professor Kopetz and Professor Vogt wanted Professor Farber's view on the choice between reliability and Quality of Service. Professor Farber's response was that both were important, and this is not really a choice. We have to find ways of improving both, although when pressed, he felt that reliability was perhaps the more crucial of the two.