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Commercial Activities and the Internet

AARNet Briefing Paper

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The widespread adoption of the TCP/IP architecture as the predominate networking platform by the research community has proved to be a fertile catalyst for the adoption of this architecture in other sectors.

There are many attributes of TCP/IP which have lead to this position, including availability over a wide range of system platforms, cost effectiveness, scaleability in size and speed and capability across diverse physical transport media. Certainly it is an impressive observation that a single interconnected TCP/IP network directly supports a large proportion of the research sector, with the TCP/IP Internet now effectively spanning the globe with some 2,000,000 directly connected users.

As an aside, such a widescale deployment of the internet protocol suite does not imply that this is a truly stable network architecture: there are many pressures on the protocol suite, including aspects such as application engineering (electronic mail and multimedia and national character set considerations are good examples of current deficiencies in the associated application suite), network addressing (where the current address structure and growth implies a major engineering problem when the current Class B subset of the 32 bit address space is fully allocated some time in the next 2 - 4 years) and packet routing issues (where due to the design decision to logically separate connectivity and locality issues from address allocation, and the consequent packet delivery routing engineering is essentially a table lookup algorithm) and the particular requirements arising from early experiments in very high speed networks. Indeed the conclusion here is perhaps that, as with spoken languages, an unchanging protocol suite is one which is to all intents and purposes unused.

However the answer to these factors of instability within the TCP/IP protocol suite have been changing over the last 18 months. Whereas it may have been possible to maintain previously that "TCP/IP has no future" as being a position consistent with the general policy directions of the time (governments mandating OSI profiles in purchasing is consistent with such a view), current thinking is now more aligned to an attitude of coexistence and parallel developmental effort within a multiprotocol environment, and the policy position of migration of deployed TCP/IP networks to an OSI environment is no longer a realistic strategy.

From a pragmatic perspective it would appear that the medium term future will see a fertilization of the TCP/IP application suite with some of the outcomes of the OSI research activity, and a continued evolution of the lower TCP/IP layers as they adapt to the forthcoming transport technologies, and these two directions are seen as being the major foci of developmental activity within the industry. While such a strategy may not be viewed as welcome news by the proponents of the OSI approach, it does illustrate that there has been another major shift in attitude by the customer base.

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This attitude shift is one where the general policy strategy of the deployment of multiprotocol solutions on Local Area Networks, complemented by "interim" use of X.25 transport protocols as a precursor to a total homogeneous OSI solution is now altering to an approach of engineering the Wide Area Network as a simple extension of the multiprotocol Local Area Network.

These changing attitudes have implied a changing position on the part of the telecommunications carriers with respect to the data communications market. These carriers, which to data have offered only leased line capacity (generally with numerous community of access restrictions) on a point-to-point basis, together with a complementary public access X.25 packet switched service, are now having to re-assess the current market requirements and, as a consequence, are now viewing the multiprotocol public carrier service as one which has an associated viable market base.

It is in this area that the research sector has gained a wealth of operational experience over the last decade. Accordingly it comes as no surprise that a number of public carriers attended the recent INET'91 Conference in June 1991. These carriers included Advanced Network and Services, Inc. (ANS), Alternet, Performance Systems International (PSI), Sprint, MCI and SWIPNET, as well as a representative from the International Telecommunication Union itself. It is evident that their attendance at INET'91 was motivated by a desire to identify major market opportunities within the research sector, as well as an information gathering exercise in assessing the marketing of such technologies to the broader potential customer base.

While it is evident that this activity by the public carriers will expand considerably in the short and medium term, there will still be a couple of fundamental issues that are necessary to be resolved. The first of these is the resolution of an applicable tariff structure. While point-to-point leased lines are readily tariffed, a connectionless packet switched network environment implies a requirement for a radically different tariff structure to the usage-based charging environment adopted in the public X.25 networks. Current practice for the emerging commercial carriers is to drop usage-based charges in favour of a fixed tariff base based on tail loop capacity into the backbone infrastructure. The second is that of inter-carrier settlements associated with transit traffic, where the carriers have to determine an internal structure of funding transit transit traffic in order to implement the customer requirement of maximal cross-connectivity. The first of these commercial carrier traffic interchanges (the US CIX) uses a policy of no settlement charges, whereas the ANS CO+RE / FARNET / NSFNET interchange (yet to the physically implemented) uses a settlement based on actual traffic flows.

The observation is that over the next 12 - 24 months commercial carriers offering a public multiprotocol transport network will enter the market in considerable force in those areas where the research Internet is already established. In marketing these services it is also likely that these carriers will have to offer a layer 3 routing service which is overtly more cost effective, and offering enhanced connectivity, in order to be a viable alternative to construction of a network using dedicated leased lines and customer premise routers. In this case it is possible that, as has been the case in Finland where such an offering is established, the research sector will in turn migrate the provision of lower layer services to the carrier in order to realize such economies.

From the perspective of AARNet it is advisable to monitor these developments closely, and be prepared to migrate the mechanisms of the provision of lower layer levels of the network protocol stack to the most beneficial and cost effective solution throughout this period of transition.

AARNet & International Link Issues

This area is one which today is entering an area of considerable uncertainty. To briefly recap the current arrangements: the 256kbps satellite service between Melbourne and Mountain View Ca is based on a bilateral agreement between AARNet and a research program which is managed by Associate Professor Neilsen of the University of Hawaii. Funding for the Australian half-circuit and Australian operational costs is undertaken by AARNet, while funding for the US half-circuit, the local tail loop and operational costs are met by the program. This program, PACCOM, is one of assistance in the provision of general infrastructure links in the Pacific, and is funded principally by various US Federal agencies who either have specific program of mission requirements in the Pacific (as in the case of NASA and the DoE) or are participating on the basis of supporting general infrastructure services to the international scientific research community (in the case of the NSF).

Long term stability of funding of the PACCOM program is not an assured attribute of this US program. As with all other research sector programs, funding is generally provided on a year-by-year basis, based on current objectives and perceived benefits of the program (as is the case of AARNet itself within Australia).

This does imply the creation of an environment which is subject to pressures of change. For example the current NASA program requirement for connectivity to the Australian Bureau of Meteorology will reduce in importance once similar earth station facilities are implemented within the US to those in use by the Bureau.

In assessing our medium term position it is appropriate that AARNet preserves a position of flexibility with respect to considering the various mechanisms of the provision of essential international connectivity. It is in relation to this environment, and also in relation to the commercial carrier interest in the provision of public multiprotocol transportation services, that the IBM Pacific initiative is correctly considered.

IBM, IBM Pacific, ANS & ACCI

IBM's involvement with the research sector in networking in a longstanding one. IBM is q major sponsor of BITNET, a network supporting electronic mail and file transfer, which although is strongly US in terms of membership also provides connectivity in the Pacific, South America and Western and Eastern Europe. BITNET is a store / forward network architecture, which is a system oriented network architecture rather than a network-oriented architecture. IBM's basis of participation within BITNET (and the parent bodies of CREN in the US and EARN in Europe) is that of subsidisation of the costs of various links (typically as a component of the marketing of IBM systems to the academic sector). IBM has also been involved with the US Internet since 1987. The 5 year NSF backbone network solicitation was awarded to the MERIT university consortium, which in turn was strongly support by MCI with the provision of high speed dedicated point-to-point links and IBM with the supply of packet switching equipment. Additionally through the Easinet program IBM has been involved in the funding of infrastructural links, including an open access trans-Atlantic T1 link.

More recently IBM and MCI have joined to underwrite the formation of a not-for-profit corporation, Advanced Network & Services, Inc (ANS) which is now providing 45Mbps (T3) services to the NSFNET backbone. In the last three weeks ANS has also announced the formation of a for-profit subsidiary, which is supporting commercial access internet services under the announced CO+RE program. While this program uses the same physical T3 infrastructure as the NSFNET backbone network, this is a distinct program supporting essentially user-funded traffic rather than NSFNET sponsored traffic.

Within Asia-Pacific IBM Pacific are contemplating undertaking an active role in supporting international links. It would appear that ANS is providing technical advise to such a program.

It is understood that the substance of the program to be announced at the Hong Kong meeting is the financial support for a high capacity international link (T1 speeds have been mentioned) operating between the national internet research network and the a US grounding point (presumably the ANS network). The financial program associated with provision of such a link is one of a five year sliding funding. It is unclear which nations would take up such an offer, but is is reasonable to postulate that this offer will be made to at least Korea, Japan, Taiwan, Hong Kong Singapore and Australia.

Further details would probably include that the decision to admit commercial traffic onto the link would be that of the national network provider, but of course any such revenue gained by switching local commercial customers into the US ANS network would offset the costs of the full circuit T1 link as the local financial commitment increases over the five year period.

Conclusions

Of course it should also be noted that this is not the only contemplated program of activity, and the other providers, such as Alternet, PSI, and Infonet will no doubt be assessing the same market and will in all likelihood be making similar offers over the next year or so.

The issue internally within Australia, and in respect to the international connections is at this stage to maintain considerable flexibility in discussing potential courses of action, and not to enter into binding or limiting agreements with a single supplier at this point in time.

It is reasonable to state that the position will change radically in March 1993 when the PACRIM East undersea fibre is commissioned, and a digital gigabit fibre link will connect Australia and New Zealand into the Pacific

infrastructure at Hawaii. With such a link the impact on the extent of carriers and the associated services and tariffs will be an entirely different picture to that which exists today.