

The Role of IT in Achieving NIC Status in the Year 2000

Keynote Address

Prof Kilnam Chon

Korea Advanced Institute of Science & Technology

Republic of Korea

e-mail: chon@cosmos.kaist.ac.kr

The Development of Academic Networks in the Next Decade

Abstract

Computer networking started in late 1960s. It is growing very rapidly now, and is becoming truly global. Issues on global academic networking from the Asia-Pacific perspective are addressed in this paper.

Various coordination efforts on the academic networking are taking place around the world including the Asia-Pacific region. More effective coordination on the academic networking in the region is desired.

Background

There are around two million computers in global networks with twenty million users.[mat93, lync93] The growth rate is around 50 to 100 % every year. With this pace, we will have one tenth to one billion users and computers in the global networks by the year 2001. Many countries are developing information highways to accommodate a large number of users as well as new applications such as networked information and remote conferencing. [byte91, chon93]

Many professionals in research and education communities among many

countries are currently major users of the global networks. They use the network regularly by spending their time on the network and exchange information through the network. In other words, they are forming the global community for research and education professionals. The community is growing rapidly, and others are joining the community, too.

Computer networking started in late 1960s. Countries in the Asia-Pacific region carried on research and development, and deployed limited networking among a few countries such as Japan in 1970s.[chon85]

With readily available network software such as TCP/IP and UUCP in early 1980s, computer networking started growing among Asia-Pacific countries. We also started linking among ourselves as well as to North America and Europe. The situation is similar in North America and Europe. The international leased line link started in late 1980s. Most leased line links are to USA.[apc93]

Pacific Computer Communications Symposium was held in 1985 to assess academic networking in the Asia-Pacific region as well as global networking. [chon85] Joint Workshop in Computer Communications is held in East Asia annually since then. PACCOM Meeting

started in late 1980s, which also became the annual event. UNESCO also organized meetings through its regional informatics network projects.[unes92] Its focus is to introduce networking to developing countries as well as regional coordination.

International Academic Networkshop was held annually since early 1980s. Its successor, INET is organized by Internet Society for the global networking community. Internet Society also organizes IETF and management committees.

Coordination Committee for Intercontinental Research Networking (CCIRN) was organized in 1987 to coordinate links between North America and Europe.[negg92] Asia-Pacific joined CCIRN in early 1990s, and APCCIRN was formed in 1993. Its members span from Pakistan in the east to the west coast of North America with over 20 countries and regions. These countries varies substantially from country to country.

In order to progress global networking, the Asia-Pacific community needs to address various issues including the following;

1. Link Coordination
2. Non-Networked Countries
3. Local Language Support
4. Coordination

Link Coordination

The database on international links of countries in the Asia-Pacific region is compiled by APCCIRN Secretariat.[apc93]. The international links are shown diagrammatically in Appendix. Most of the leased line links are to USA with minor links among the east Asian countries. There are several reasons to this phenomenon.

1. The leased line does not cost very much. Cost of a leased line to a neighboring country is usually 10 to 20% cheaper than the cost of a leased line to USA.
2. All countries primarily communicate with USA.
3. One fat pipe makes more sense than multiple thin pipes in computer networking.

By connecting to the same place in USA, we can solve the problem of intracontinental exchanges among Asia-Pacific countries. Such a model was proposed by the author in mid-80s.[chon85] This still leaves another problem to solve; transit to other continents. Global Internet eXchange (GIX) is the model proposed at Intercontinental Engineering Planning Group (IEPG) recently. [alme92] Conceptually, GIX changes the US-centric networking as currently practiced to the global networking as depicted in Figures 1 and 2.

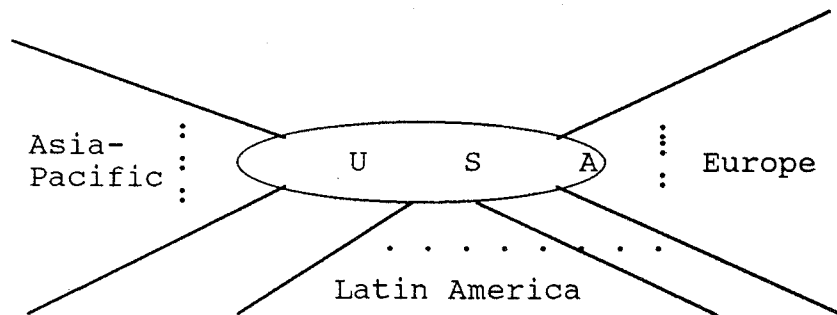


Figure 1: Current Global Networking

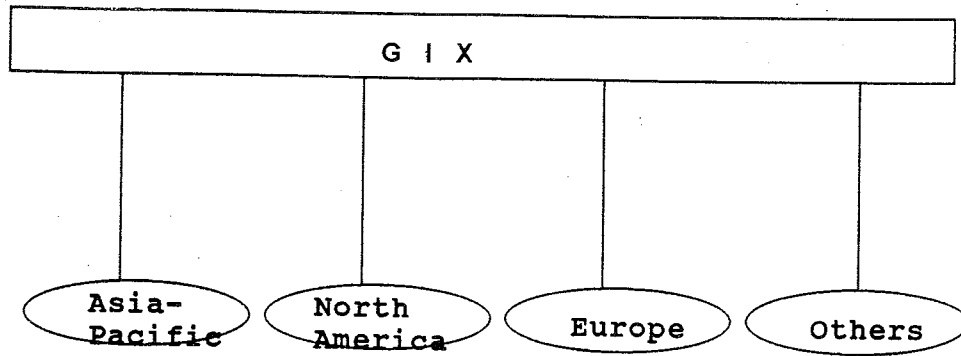


Figure 2: Global Networking Based On GIX

The European group of IEPG is working on GIX implementation, in particular the route server to be implemented in the east coast of USA.[bate93] In order to eliminate the transit traffic, all continents must connect to GIX, be it a point or interconnected points. For the Asia-Pacific community, it is more natural if GIX is located in the west coast of USA. In the same token, the east coast is more natural for Europe, and the south of USA for Latin

American. For the distributed GIX, the problem is who to support the link between GIXs. This is particularly true when we extend GIX beyond USA to the other side of the Pacific or the Atlantic since intercontinental links are far more expensive than intracontinental links for North America.

The emerging commercial operation may solve the problem.

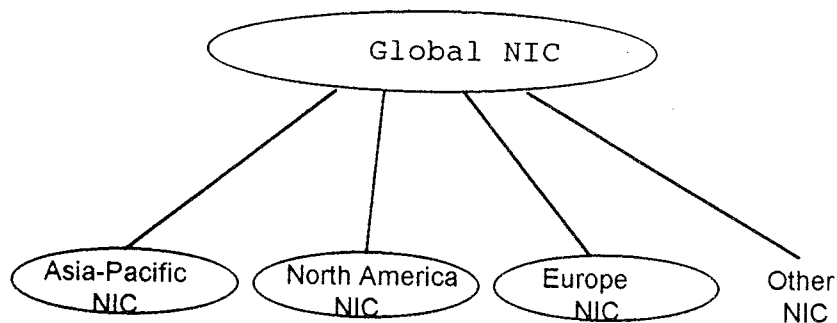


Figure 3: Global NICs

Network information centers (NICs) are another issue to be resolved to realize the global networking. The recent announcement of US National Science Foundation on INTERNIC is the step

toward the globalization of the networking. [nsf93] Like GIX, NIC should have the symmetric structure as depicted in Figure 3.

If the INTERNIC is modularized to Global NIC and North American NIC, the symmetric structure for the global networking is established. Then, the global financial arrangement to support the global NIC as well as the regional financial arrangement for regional NICs is needed.

Developing Countries

Countries in the Asia-Pacific region varies in many respects: geography, culture, social environment, living standard, and population. This situation makes Asia-Pacific different from other continents which tend to be more homogeneous.

Many countries in Asia-Pacific like other continents have domestic networks as well as international links to global networks. Some countries still lack appropriate networking facility. They are located in the following regions:

- Pacific Islands
- East Asia
- South Asia
- Central Asia
- Middle East

In order to make these non-networked and weakly networked countries to well networked countries, we need to have appropriate engineering plans. In Africa, United Nation and Italy are collaborating to work on the network infrastructure now.[trum92] In Latin America, Organization of American States is looking into a similar project as well as grass root movement among networking people. [gold93] In Asia-Pacific, there were some regional efforts like PACNET and

AUSEnet in 1980s.[chon85] More recent efforts are by Australian on several countries in Southeast Asia.

The effort by University of South Pacific in the South Pacific countries is also noteworthy. UNESCO has been working in this area through its Information Infrastructure Program.[unes92] Regional Informatics Network Projects have been implemented as a part of the program. RINSEAP and RINSCA were established. Recently, UNESCO is looking into merging these two operations into one, RINAP. Additionally, it is looking into establishment of centers of excellence to support these non-networked and weakly networked countries.

UNDP has been working on another networking project, called Sustainable Development Network (SDN).[undp92] SDNs combine face-to-face meetings, electronic and other means of communications to link sources and users of information on sustainable development. UNDP is working on infrastructure development for SDN in each country now.

We need to come up with a regional solution to work on the non-networked and weakly networked countries systematically. The initial dialup network may be better supported regionally such as the center of excellence proposed by UNESCO. Regional institutions such as Asian Institute of Technology could play the instrumental role through its human network of developing countries. Once the traffic reaches to the level which justify the international leased line, the coordination may be done at the link coordination mentioned previously.

Local Language Support

Many Asian-Pacific countries have quite large character sets unlike European languages. This and other differences

force us to develop the network software and/or modify existing network software substantially. Since the local language support is a unique issue in the Asia-Pacific countries, we need to pay particular attention. Otherwise, the networking is good only in English which limits the usage, and we may end up user-unfriendly systems.

Internationally, various organizations are working on the local language support, which is called internationalization and localization. The former provides the framework on which all local languages are supported, and the latter is the actual implementation of the local language support. To have a unified view on the localization, the localization profile for each country or region is necessary. International Standards Organization is working on the internationalization through its committees, JTC1/SC22 on the generic issues, and other subcommittees on specific issues. Uniform and X/Open are working together, called XoJIG, on the generic internationalization framework, which is the major input to JTC1/SC22. Various organization such as Unix International and Open Software Foundation among others are working on various issues through their working groups.

Among the Asia-Pacific countries, Japan and Republic of Korea have fairly well developed local language support. Chinese language support is being developed by various countries and regions, and their efforts need to be harmonized. Other languages are not well supported at this moment.

We need to work out in two levels: one at global and Asia-Pacific level on internationalization and coordination, and the other at individual country or language region on localization. We need to come up with internationalized network software as well as internationalized specifications. The localized network software can be handled through local clearinghouses.

Universal code systems such as Unicode and ISO 10646 may have major impact to the internationalization and localization. [iso92] Since the systems offer the generic framework which makes localization to specific language environment much easier and consistent. On the other hand, the harmonized development of such a code system is not easy at all.

Coordination

Globally, Internet Society (ISoc) tries to be a focal point on Internet activities such as conference (INET), and the standard making group (Internet Engineering Task Force (IETF)). IETF is still subsidized by the U.S. Government, and it would take some time before IETF becomes truly global.

Coordinating Committee for Intercontinental Research Networking (CCIRN) is another global group on networking. It is expected to coordinate the research and education networking, and has its own engineering group, Intercontinental Engineering Planning Group (IEPG). APCCIRN and APEPG are the regional groups of CCIRN and IEPG respectively. APCCIRN may need to play a broader role as there are not much regional organizations unlike USA and Europe. Lack of regional funding agencies in the Asia-Pacific region makes the coordination very limited and difficult, too.

Asia-Pacific may be ready for the regional conference for networking community like NET in USA and JENC in Europe. If we can have a successful regional conference, it could be the best focal point on the networking activities in the region. We are currently considering the expansion of Joint Workshop on Computer Communications to accommodate such a scope; for networking community in the Asia-Pacific region.

There are several major coordinations to be managed. NIC is one of them. GIX is

another one as mentioned previously. The Asia-Pacific region needs to support APNIC as a community and the global NIC through APNIC. Technically, it may not pose much problem, but financially, it may pose some coordination problems. Currently JNIC in Japan is carrying on the APNIC experiment, and we need to decide on the operation soon.

Remarks

1. Commercial Services

Since Asia-Pacific is late comers to the computer networking, commercial operations are very visible throughout the region from the initial stage. Some even started the first international leased line shared by commercial operation.

General service providers in USA are active in the Asia-Pacific countries, and many links are provided through the general service providers. Altnet/UUNET is the first service provider to the region. ICM Pacific operated by Sprint is another service provider. They provide services to both commercial and non-commercial sectors.

Local commercial service providers in the Asia-Pacific region, on the other hand, does not provide services to research and education community in general. They rather concentrate on the commercial sector.

2. Applications

Most of applications in Asia-Pacific are developed elsewhere, and we rather concentrate on the localization of these applications. This trend is expected to continue for sometime.

3. Networked Information

Networked information poses an even bigger problem since most of information materials are in local languages, i.e., non-English. This causes problem on information tools, translation, and other issues on natural language.

4. Non-Networked Countries

There still are many non-networked countries in Asia-Pacific like in Africa and Latin America. As mentioned previously, we need to come up with some elaborate schemes to eliminate non-networked countries from Asia-Pacific. Meantime, we should start working on individual countries one by one as we have been doing.

5. Distributed GIX

As mentioned in Section Two, the European group of IEPG is working on the first GIX implementation. Asia-Pacific needs to extend the scope of the European implementation, possibly extend to the distributed GIX spanning the east and west coasts of USA. Architecturally, the distributed GIX should handle the case of GIX in each continent. Commercial operation must be taken into accounts as the commercial operation would be an indispensable element of the GIX operation in future.

References

- [alme92] G. Almes, et al, Global Internet Exchange (GIX), Working Paper, IEPG, 1992.
- [apc93] APCCIRN Secretariat, APCCIRN Database on International Links, APCCIRN-007, 1993.
- [bate93] T. Bates, et al, Internet Routing in a Multi Provider, Multi Path Open Environment, Working Paper, IEPG, 1993.
- [byte91] Byte, Special Issue on Wide Area Networks, July 1991.
- [chon85] K. Chon, et al, Proceedings of Pacific Computer Communications Symposium, North Holland, 1985.
- [chon93] K. Chon, Information Highway - Networks of Networks, KAIST, April 1993.
- [gold93] Personal Conversation with S. Goldstein, Feb 1993.
- [inet92] Internet Society, Proceedings of INET, 1992.
- [iso92] ISO, Multi-Octet Code System, DIS 10646, 1992.
- [lync93] D.C. Lynch and M.T. Rose, Internet System Handbook, Addison-Wesley, 1993.
- [mat93] Matrix News, March 1993.
- [negg92] K. Neggers, "CCIRN," Proc. of INET, 1992.
- [nsf93] NSF, INTERNIC Announcement, 1993.
- [trum92] Stefano Trumpy, RINAF Implementation Plan, UNESCO/IIP, Dec 1992.
- [undp92] UNDP, The Sustainable Development Network, 1992.
- [unes92] UNESCO, Academic and Research Networks in the Asia and Pacific Region, 1992.

