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Paper No. 16
MOVING AHEAD WITH MEDIA CONVERGENCE

AMIC 9TH ANNUAL CONFERENCE
THE DIGITAL MILLENNIUM: OPPORTUNITIES FOR ASIAN MEDIA
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MOVING AHEAD WITH MEDIA CONVERGENCE

Abstract

A "Virtual Earthquake" is rocking the whole world. The waves are shaking the electronic landscapes reshaping and realigning them. The difference between this earthquake and a real one is just that virtual earthquake waves are propagating towards the "epicenter" thus creating a number of POP's (Points of Presence). Electronic Ecosystem is affected by these continuing waves creating opportunities for us in diminishing the boundaries of the physical world. The waves are electronic paths or "Medias" and the phenomenon is "Convergence".

Just imagine an "Electronic Disneyland" where one ride can make you to travel on the surface and water and in the air without you being bothered about the underlying mechanisms. You just enjoy the "speed" and "connections".

To realize the dream of an "Electronic Disneyland", the world is building digital infrastructure. I try to solve this story by navigating the following waypoints:

1. SERVICES – THE PUSHING FORCES
2. INTERNET – THE ENABLING FORCE
3. CONVERGENCE – SYNERGY BETWEEN PUSHING AND ENABLING FORCES
4. RECENT CONVERGENCE TRENDS
5. MARKET DRIVERS SERVICE TYPES
6. SHAKING WITH THE WAVES – CONSOLIDATING OUR UNDERSTANDING
   - INTERNET PLATFORMS
   - CONSUMER PLATFORMS
   - CORPORATE PLATFORMS
   - PHYSICAL INFRASTRUCTURE PLATFORMS
   - WIRELESS INFRASTRUCTURE PLATFORMS
7. CONVERGENCE REALITIES
8. WHERE WILL WE END UP
9. GLOBAL VIRTUAL INFRASTRUCTURE
10. CONCLUSION
Have a look at our global resources. The last century ended with billions people, an almost fully interconnected voice network, 700 million communication lines, 200 million internet users, 2 million broadband lines, 200 million wireless connections, thousands of new and different communications service providers, 3 million plus web sites and 800 million plus web pages.

By 2005, the number of communication lines, wireless links and internet users are expected to grow over one billion each while broadband users will soar to over 500 million.

The world is building digital infrastructure with the following goals:

- Everyone will be connected.
- The future is digital and wireless.
- All of our devices will be connected smartly.
- The competition will be global. That means, locally, the competition will be global.
- The pushing and enabling forces are services, internet and convergence.

And this is just the conclusion of the introduction!

1. SERVICES – THE PUSHING FORCES

- The consumer is looking for options.
- The consumer is looking for customization.
- The consumer wants to change his mindset and grow.
- The consumer wants to try before buy.
- The consumer wants to reach previously not reachable areas / information sources.
- The consumer is looking for the speed to be able to access the services.

And the consumer wants information in all forms – voice, text, images, audio / video and data.

2. INTERNET – THE ENBLING FORCE

First-generation internet provided a basic connectivity while second-generation internet providers are pushing unique selling propositions with services like web hosting and IP based services. The third-generation is about shifting a business perspective to selling content with customization forcing the conventional information business models to getting obsolete and collide. Internet providers are realizing the need to increase their service and revenue base by merging broadcast, cable, telecommunications and satellite distribution models creating an impact on physical network infrastructures and information industries.

The strategic issues concerning everyone are:

- For a local carrier with access network, how to get into higher speed multimedia market, how to offer a wide variety of broadband technologies and which technology to deploy?
- For a wireless provider, how to get more minutes away from landlines onto wireless networks and how to provide features as messaging and internet access to the network?
- For a landline and wireless service provider, what could be the architectural changes to the network and how to merge wireless and fixed networks?
- For a long-distance carrier with no local access, how to get access to the customer?
- For an internet and content provider, how to package a service that can be differentiated from the competitor?
• For an operator having regional presence, how to provide what everyone wants – the local loop access, wireless, internet and high-speed data services?

• For a cable operator, how to upgrade services to provide telephony, internet access, multimedia content apart from the basic services?

• FOR A USER, CAN HE GET ALL THE SERVICES VIA ONE INTERFACE.

3. CONVERGENCE – SYNERGY BETWEEN PUSHING AND ENABLING FORCES

Information exists in five basic forms – voice, text, images, audio/video and data. Information industries have traditionally been defined in terms of the form of information as processed by them.

(Refer Fig. 1)

To combine different forms of information over heterogeneous medias has been the prime focus of the "Convergence Industries". This is most clearly illustrated by the explosion of the Internet. The technologies are rapidly becoming "Multimedia". The transformation will result in only three major industries (not five as in Fig. 1):

1. Digitized Content
2. Multimedia Devices
3. Convergent Networks

(Refer Fig. 2)

Thus, the multimedia industry is emerging not as a set of three vertical businesses, but as a collection of five horizontal activities that together deliver content to consumers (Figure 2). These activities correspond to the industry segments identified, namely:

• Content - Products and services transmitted by the medium

• Packaging - The bundling of, or selecting from among, massive arrays of available content, and the addition of integrative and presentational functionality to create a finished product for consumers

• Transmission network - The physical infrastructure that supports the transport of information

• Manipulation infrastructure - That which provides intelligence to the distribution system. Historically this included the processing/storage hardware and various types of software in computer and telecommunications systems, but in the multimedia industry it will also include a new type of manipulation software that will perform the required interactive multimedia network tasks

• Terminals - Any of a variety of local devices employed to capture and display information

We are now ready to understand the phenomenon of "Convergence" from a number of approaches:
• The coming together of consumer devices such as telephone, television and PC.
• The delivery of multiple services local, long-distance, international, data, internet and wireless services from one service provider in one service package.
• The consolidation of existing networks and systems into one common service interface.
• Refers to the blurring of dividing lines among traditionally distinct products and services, technologies, markets, industries and regulatory regimes.

"CONVERGENCE" is facilitating the death of formal inflexible structures to enable everyone realize the dream of global digital infrastructure.

(Refer Fig. 3)

Figure 3 depicts convergence in layer 1 is much less compared to other layers, the hype about all in one devices notwithstanding. Convergence in layer 4 has happened to a great extent. The reason probably is its relative distance from the end consumer. Layer 2 and layer 3 are areas where convergence has created challenges for the regulators. Though they are beyond the layer 1, they have market directly to the customer, especially in telecom, where they in fact influence the choice of the consumer about his layer 1 devices.

4. RECENT CONVERGENCE TRENDS

• Wireless-based technologies have been shifting to cable based infrastructures and wireline based technologies are shifting to wireless mediums. The examples are Television, cable TV and mobile telephony.
• Dial Tone has been redefined as Data Tone to describe packets travelling on circuit-switched networks. The trend is to push intelligence into these networks.
• Circuit-switched networks are retiring.
• Flexibility of digitized information to create a whole new range of services and applications.
• ISP’s starting to distribute audiovisual material, voice telephony capability.
• Computer industry is primarily providing higher processing, memory and storage capabilities to converging industries and will fade away ultimately.
• Major threats have been to Newspaper and Book publishing industries. The challenge has been to package the customized information, to deliver it over a no. of networks, to provide latest and accurate “content”, price adjustments between paper and internet editions.
• Advertisements having instant ordering capabilities with a click of the mouse on internet taking away the weightage from a TV or newspaper advertisement.
• Optical networking creating continuously higher capacities to accommodate multimedia traffic and enabling QoS.

(Refer Fig. 4, Fig. 5, Fig. 6, Fig 7)
5. MARKET DRIVERS AND SERVICE TYPES

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<th>Service</th>
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<td>Interactive Speech</td>
<td>Telephony</td>
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<tr>
<td>Real-time Image Transfer</td>
<td>Audio Conferencing</td>
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<td>Electronic Mail</td>
<td>Facsimile</td>
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<td>Multimedia Document Retrieval</td>
<td>Text Mail</td>
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<td>Video On Demand</td>
<td>Voice Mail</td>
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<td>Interactive Video Services</td>
<td>WWW Image Databases</td>
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<td>Computer supported cooperative learning</td>
<td>Tele-working</td>
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<td>Broadcast TV / Radio / Data</td>
<td>Cooperative editing</td>
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<tr>
<td>Distributed Processing</td>
<td>Cooperative engineering</td>
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<td>Real-time Multipoint Retrieval</td>
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<td>Distributed Manufacturing</td>
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Method of Distribution

- Digital TV – as point-to-multipoint in push mode
- Virtual Channels – as point-to-multipoint in push mode
- Video on Demand – as point-to-point in pull mode
- Near Video-on-demand – as point-to-multipoint in push mode
- Web Services – as point-to-point in pull mode
- Video-Conferencing – as point-to-multipoint in push mode
6. SHAKING WITH THE WAVES – CONSOLIDATING OUR UNDERSTANDING

Convergence era is gearing up everyone to cooperate. No one company can do everything needed to make tomorrow’s realities happen. Temperatures are rising as the “virtual earthquake” is just started. What comes next during these shock waves can be predicted with “Service Diversity” and “Technology Discontinuity”. Change is coming from every direction. The building blocks may not have the power to overhaul the electronic landscape, but they are just rocking the world with opportunities, which we have to decode.

We understand the building blocks as existing and future platforms:

INTERNET PLATFORMS

- The creation of a common distribution network that will replace previously known telephone, telecom and PC networks and revolutionize the distribution of many other products and services.
- Killer applications mostly on-demand and interactive likely to take advantages of convergence. Distribution and localized content to shrink the distance between the content and end-users.
- Quality of Service protocols for priority packets, queuing to enable various classes of service.
- Terminals will become multi-functional.
- Telephony companies wishing to provide broadband services in local areas will form alliances with content providers and become packagers of quality content.
- Cable companies will consolidate to offer broad distribution to content providers and will seek telephony alliances to access switching capabilities.
- Wireless companies will continue to extend the service range and roaming services with data capabilities.
- IP multicast protocol to deliver a data packet or stream in one-to-many configuration and to minimize backbone and server capacity usage.
- End-to-end facilities control to guarantee network availability and service quality for different classes of traffic.
- Distributed directory services to enable unified access control, authentication, service management, provisioning and billing process.
- Media and product distribution chains to enable revenue-sharing among product and service suppliers, distributors, retailers and fulfillment outlets.
- With Convergence, standards are going to become increasingly important as a way to ensure interoperability among disparate networks with different topologies.
- ISP’s defined as sales and marketing channel and first line customer support.
CONSUMER PLATFORMS

- Home networking is linking and centralized control of all electronic and electrical devices in the home. In addition to existing television, CD players and other entertainment equipment, these will include modems, telephones, fax machines, PC's and its peripherals.

- The opportunities will be in making the home "smart " with security and fire detection systems. Ability to activate above devices from remote locations will be a challenge. IP is expected to give help to these devices as a common language. Ongoing customer demands will derive the consumer electronics circuit technology developments.

- There is convergence of a different kind in the printing technologies with the central focus on the printer. The trend is towards the integration of printing with copying, scanning, imaging, internet and networking technologies. The vendors have started integrating different peripheral applications into one device called the Multi-functional Device ( MFD ). Vendors are working actively on printing applications on consumer devices such as digital cameras and mobile phones.

CORPORATE PLATFORMS

- E-commerce is a new way for merchants to reach customers and market goods and services. For banks, it will mean being able to exchange funds transfer electronically. For big corporates, it means being able to conduct business with trading partners and customers anytime without physical boundaries.

- Corporates creating " dynamic supply chains " to reduce transaction costs and maintain minimum inventory levels will be driving factors to create more opportunities for various service providers.

- Corporates will be moving more of their network traffic off private point-to-point WAN's and onto public switched networks and internet. VPN's are the building blocks to provide a set of administration and configuration service in setup and operation of secure data transfer.

PHYSICAL INFRASTRUCTURE PLATFORMS

- The main issue is deploying higher speed backbones to increasingly accommodate complex multimedia traffic on the network. What was sufficient six months back is no longer enough. There are myriad solutions in achieving Gigabit speeds in backbone networks.

- Bell lab's recent laboratory breakthrough: a single optical fiber with 1000 wavelengths, each supporting between 2.5 to 3 Gbps. Within the core of the internet, a technique known as Dense Wavelength Division Multiplexing ( DWDM ) has increased the bandwidth per optical strand by multiplexing multiple wavelength increasing the effective bandwidth per fiber.

- As for the access network, more and more DSL technology and cable moderns are being deployed which is also forcing the carrier networks to increase their core bandwidth reserves.

- While the way forward is IP, the debate is divided over whether this should run over ATM, over SDH / SONET transmission systems or directly over wavelength used for wavelength-division multiplexing ( WDM ).
WIRELESS INFRASTRUCTURE PLATFORMS

- New telephone companies want to build integrated networks from scratch, establishing at the outset a similar portfolio of fixed and mobile service to challenge incumbents. All are striving for "oneness", one bill, one telephone number, one customer contact trying to get the fruits of true mobility and local number portability.

- GSM operators offer 9.6 kbps circuit-switched data. Users can transfer files, access the internet and send e-mail and faxes by connecting their devices to a GSM phone or a modem or by using GSM smart phones.

- SMS allows messages of upto 160 characters to be transmitted from base stations and display on the LCD of mobile phones.

- HSCSD uses four consecutive 14.4 kbps time slots for a maximum uncompressed speed of 57.6 kbps. In addition to internet access, e-mail and telephone service, HSCSD supports mobile navigation.

- GPRS provides packet data rates of upto 171.2 kbps, using eight 21.4 kbps channels. GPRS can tunnel transparently from the mobile terminal to the intra/internet, giving the terminal the same status as an IP host on a local area network.

- EDGE, formerly known as GSM 384, offers upto 384 kbps when using all eight time slots. The enhanced modulation automatically adapts to the quality of radio links, offering the highest data rate in good propagation conditions close to base station sites, while ensuring wide area coverage at lower speeds.

- Universal Mobile Telecommunications Systems (UMTS), 3G supports data rates upto 2 Mbps and both packet/circuit/switched functionality. Several connections can be active simultaneously: for instance, a packet switch connection for web browsing and a circuit switched connection for video conferencing.

- A number of wireless access network technologies are intended to be used to serve the consumer market. These are Direct Broadcast Satellite (DBS), Multi-Channel Multi-point Distribution Service (MMDS), Local Multi-point Distribution Service (LMDS) and Low Earth Orbit (LEO) satellites.

- Technology advances and current trends mean that the worlds of television and radio sets are set to collide with the cellular industry.

7. CONVERGENCE REALITIES

Are we learning from the shock waves? Is convergence really starting to take a shape? A survey of 300 service providers say they cannot integrate new technologies fast enough and are always at the risk of falling behind their competitors because of fast shifting mix of opportunities in the mix of constant changes in customer requirements, technology and regulations.

(Refer Fig. 8, Fig. 9, Fig. 10)

(Fig. Source: survey of 300 service provider executives by tele.com and TeleChoice Inc. (Boston))
8. WHERE WILL WE END UP

The Internet2 Project, a consortium effort of over 100 universities, is investing in upgrading campus and national network platforms for such application areas as digital libraries, collaboration environments, tele-medicine, and distance-independent instruction.

The focus of Internet2 is on enabling applications. It isn't possible to forecast all the applications we will see, but a sample of what we're working on today will give a flavor for the future:

- Digital libraries featuring streaming high-fidelity audio and video content, large bitmap scanned images that appear instantaneously on the screen, and new forms of data visualization.
- Collaboration environments that encompass virtual laboratory support, remote instrumentation, session record and playback, easy-to-use real-time discussions with audio, video, text, and every window having "whiteboard" features.
- Immersion environments, supporting new forms of collaboration through three-dimensional, virtual shared presence.
- Music instruction with high-fidelity, multi-channel, multi-party audio and video; interactivity, to support ensemble playing and music/dance improvisation; and synchronization of audio, video, and annotations.
- Tele-medicine, including remote diagnosis, surgery and monitoring.
- Computation- and data-intensive applications, such as the correlation of physical and social science data involved in evaluating population movement in the context of a region's climate changes.

9. REALIZING VIRTUAL INFRASTRUCTURE – The Grand vision of Information Superhighway

The model presents the following five critical layers - management, applications, information, networks, and transport—linked with pervasive security, interoperability, and reliability requirements:

- the transport layer consists of optical fibers, coaxial cable, copper wire, switches, satellites, and transmitters
- the networks layer consists of thousands of logical networks superimposed on the transport layer
- the information layer includes databases and electronic libraries containing text, images, and video
- the applications layer contains software and consumer electronics needed to access the superhighway's information and services
- the management layer consists of operations and administrative centers, emergency response teams, and security services.
Nil: A Convergence of Technologies and of Cultures?

- "The National Information Infrastructure ("Nil") -- today represented by the universally accessible telephone system, broadcast and cable television, libraries, bookstores, remotely accessible databases, and the Internet, and ultimately supplemented by broadband switched networks with digital connections to homes and public facilities -- can be an electronic market for information, and an electronic townhall."

Convergence Of Different Cultures Representing Different Segments Of Users Such As Broadcasters, Telephone Companies, and Internet Users.

The goal of "National Information Infrastructure" will be technology based empowerment of humans, Economic growth through information networking in trade and commerce, travel & tourism, transportation and all service sectors. National level applications supporting these views are:

- Teleworking
- Distance learning
- A network of Universities and research centres
- Telematic services for Small and Medium enterprises
- Road traffic Management
- Air Traffic Control
- Health Care Networks
- Electronic Tendering
- E-Governance
- City information Highways

Further complexity would be to connect all Nil's to a virtual infrastructure known as "Global Information Infrastructure".

(Refer Fig. 11)

10. CONCLUSION

The "virtual earthquake" is inducing a lot of excitement. "Convergence" is redefining "Information Infrastructure". The backbone to this information infrastructure is extensive services, networking and telecommunication links.

To make it happen, an equal thrust is required to balance the skills with the technologies and vice versa. I define the trend as "Skill Convergence" as a direct result of "Technology Convergence" resulting in "Converging Industries".

The shockwaves are so exciting that we have "converged" here to understand them.

Thank You.
References

- Voice&Data magazine, December 1999
- Tele.com magazine May 15, 1997, April 1999, June 7, 1999
- ETSI paper on "European Information Infrastructure"
- White paper on "Residential Broadband", Cisco Systems
- DataQuest Magazine, March 31, 2000
- Mobile Communications International, April 2000
- OECD Report on "Convergence"
Fig 1 -
The traditional Form based Information Industries

CREATE & COLLECT
[CONTENT]
DISPLAY [DEVICES]
STORE [MEMORY DEVICES]
PROCESS [APPLICATIONS]
DISTRIBUTE [TRANSPORT]

CREATE & COLLECT
[CONTENT]
DISPLAY [DEVICES]
STORE [MEMORY DEVICES]
PROCESS [APPLICATIONS]
DISTRIBUTE [TRANSPORT]

Fig 2: How the Information Industry Will Realign
Fig 3: The Service Delivery Model

Fig 4: PAST
Fig 5: PRESENT

Services

Infrastructure

Open

Proprietary

Fig 6: FUTURE

Services

Infrastructure

Open

Proprietary
Fig 7: MARKETS

Services
- Voice & Fax messaging
- Online Internet
- International call trace
- Pre-paid calling cards
- Remuneration systems

Infrastructure
- ISDN services
- Switchover
- Trunking
- Encoding
- Telephony & protocols

Network

Enterprise

Fig 8: Most companies' Convergence Initiatives are starting in 1999
Is this their year of Convergence?

- 1998
- 1999
- 2000
- 2001
- 2002

74% 
16%
5%
2%
Fig 9: Altered States
85% agree that service providers' market positions will be altered due to convergence.

Fig 10: Convergence Drivers
Fig 11:
VIRTUAL INFRASTRUCTURE
MONETISING EYEBALLS: FROM CONTENT TO COMMERCE

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