行政院及所屬各機關出國報告

(出國類別：其他)

參加90年亞洲電子聯盟(AEU)第十七屆年會及技術研討會報告

服務機關：中華電信研究所

出國人　職　　稱：所長

　　姓　　名：梁隆星

出國地點：泰國

出國期間：90年7月29日至90年8月3日

報告日期：90年9月25日

系統識別號:C09004967

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報告名稱:

參加90年亞洲電子聯盟(AEU)第十七屆年會及技術研討會

主辦機關:

中華電信研究所

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出國人員:

梁隆星　中華電信研究所　　所長

出國類別: 其他

出國地區: 泰國

出國期間: 民國 90 年 07 月 29 日 -民國 90 年 08 月 03 日

報告日期: 民國 90 年 09 月 25 日

分類號/目: H6／電信　／

關鍵詞:　亞洲電子聯盟,AEU

內容摘要: 亞洲電子聯盟創始於一九六八年，我國由電信總局代表爲創始會員之一，目前仍保有(Taiwan, R O.C.)之會籍名稱。該會秘書處設在日本，由日本的「ITU日本協會」負責，會員分類亦倣ITU，分正會員(Full Member)及副會員(Associate Member)兩大類(ITU稱「國家會員(Member State)」與副會員)，政府機關皆以「正會員」身分加入，若無政府機關加入之國家，其首先申請加入的財團法人或公司得爲正會員，目前正會員數僅剩八個，副會員數有七個，會務及規模明顯萎縮。該會活動大致有兩年一次的大會(General Assembly)、不定期的研究小組會議、及技術研討會。本次相關會議及活動計有七月三十日的研究小組會議及大會會前會、七月三十一日的大會、八月一日的技術研討會、八月二日的泰國電信展參觀等。依總公司呂總經理之指示，由職代表公司參與技術研討會並發表論文" Deployment of ATM / xDSL Network in Chunghwa Telecom, Taiwan. "

本文電子檔已上傳至出國報告資訊網

參加 Asia Electronic Union 會議並發表論文報告

內容

一、 緣起

亞洲電子聯盟創始於一九六八年，我國由電信總局代表為創始會員之一，目前仍保有(Taiwan, R.O.C.)之會籍名稱。該會秘書處設在日本，由日本的「ITU 日本協會」負責，會員分類亦做 ITU，分正會員(Full Member)及副會員(Associate Member)兩大類(ITU 稱「國家會員(Member State)」與副會員)，政府機關皆以「正會員」身分加入，若無政府機關加入之國家，其首先申請加入的財團法人或公司得為正會員，目前正會員數僅剩八個，副會員數有七個，會務及規模明顯萎縮。該會活動大致有兩年一次的大會(General Assembly)、不定期的研究小組會議、及技術研討會。本次相關會議及活動計有七月三十日的研究小組會議及大會會前會、七月三十一日的大會、八月一日的技術研討會、八月二日的泰國電信展參觀等。依總公司呂總經理之指示，由職代表公司參與技術研討會並發表論文" Deployment of ATM / xDSL Network in Chunghwa Telecom, Taiwan. "

二、 AEU 會議

7/30 上午本人代表中華民國台灣參與研究小組會議及大會會前會，由於各國經濟情況不甚樂觀，因此，與會情況並不積極，只有主辦國泰國、日本、韓國、印度、斯利蘭卡、緬甸、馬來西亞及中華民國參與。

大會重要決議事項如下：

(一)該會更名為亞洲電子暨資訊通信聯盟(Asia Electronics & Info-communications Union)。

(二)廢除正、副會員制度，改採全權會員(仍稱 full member)及個人會員(Individual Member)，全權會員享表決權，個人會員則無。

(三)舊會長(President)斯里蘭卡籍的 Dr. Perera 卸任，由泰國交通部郵電廳廳長 Mr. Sethaporn 接任(惟渠即將退休，由副廳長升任廳長後續任，彼亦將於一年後退休)，印度 Mr. Rajecva Ratna Shah 任副會長，兩年後升任會長。

(四)秘書處由擔任會長的國家擔任的提議暫緩討論，因泰國尚未有接秘書處之準備，故秘書處仍由原有意承接之印度資訊科技部接手，明年四月一日前完成交接(印度不願承接負債)。

(五)會費暫不調整，俟新秘書處正式運作後，再詳細估算成本開銷提交大會議決。

(六)下(十八)屆大會將於二００三年於印度召開。

八月一日的技術研討會由泰國電信協會(TCT)、泰國郵電廳及該聯盟聯合舉辦，以「邁向未來的資訊通訊科技」為題，共有來自日本、韓國、印度、泰國、印尼、及我國九位講者，我國則由中華電信研究

所梁隆昱所長主講本國的 ATM/ADSL 佈建，工研院電通所劉俊麟經理主講網路電話(VoIP)。一般聽眾收費一千五百泰銖，約合新台幣一千兩百元。與會共約七十位，至下午僅餘四十人，規模及場地設備皆遜於電信總局於去年六月所舉辦者。

八月二日為泰國國家通信日，每兩年擴大舉辦電信展，由該國交通部長主持開幕典禮，約有七十家廠商參展，規模狀況皆不及我國電信展活動熱絡。

三、拜會泰國相關電信業者

本次趁參與泰國 AEU 會議之空檔順道拜會泰國電信業者，如 TOT 新任的董事長 Prof. Suphachai Phisitvanich，Sethagorn Cusripitucle，Director General，Post and Telegraph Department，談及中華電信與 TOT 加強雙方合作之可能性，本公司駐泰國代表辛先生也陪同拜會。

另協助本所合作廠商泰國 Taimark 公司拜會並介紹本所研發現況，包含泰國第二大固網業者 TT&T，主要國際業務業者 CAT，WCS 等，各家業者對本所多項研發成果均強烈表達興趣，此均為本所下一波具市場潛力之技術輸出產品。

四、附件

DEPLOYMENT OF ATM/XDSL NETWORK IN CHUNGHWA TELECOM, TAIWAN

Lung-Sing Liang

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ABSTRACT

In this paper, we present the deployment status of ADSL (Asymmetrical Digital Subscriber Line) and ATM (Asynchronous Transfer Mode) networks of Chunghwa Telecommunication Co , Ltd. (CHT) in Taiwan CHT a governmental telecom carrier, operates both domestic and international telecom businesses Demands for broadband services are increasing rapidly in Taiwan, and it is predicted to exceed one million broadband users by the end of 2001 To keep pace with the domestic broadband needs, CHT has been aggressively deploying broadband infrastructures For local access loop, CHT has been deploying ADSL network and Multi-Function Optical Access Network (MFOAN) system to provide broadband and narrowband service rapidly Moreover, ATM and IP-based backbone infrastructure has also been deployed

To provide high-speed Internet access service for elementary-middle schools, Ministry of Education (MOE) and CHT jointly promote an "Internet to elementary/middle schools" project Since June 1999, CHT has successfully deployed ADSL network for about 3,600 elementary/middle schools and each connection is with 1 5 Mbps and 384 Kbps for downstream and upstream transmission Furthermore, commercial ADSL service was launched in August 1999, and the transmission rates include 512K/64k, 768K/128K, 1 5M/384K, 3M/512K, 6M/640K for downstream and upstream respectively Subscribers mainly use the ADSL service for Internet-surfing and Intranet applications, however, Multimedia on Demand (MOD) application based on ADSL access will be available by the end of 2001 Up to June 2001, the number of ADSL users is over 400,000 Additionally, to satisfy the increasing communication bandwidth requirements of business buildings and communities, CHT is constructing MFOAN system to act as the Fiber In-The-Loop access platform and provides diverse narrowband and broadband services, including POTS, Pay-phone, IDSL (64/128 Kb/s), ADSL, HDSL, ISDN, T1/E1, leased line To reduce provisioning and operational cost, and simplify troubleshooting, CHT has been developing integrated Network Management System (NMS) to manage different vendors' ADSL and ATM equipment

To satisfy the transmission requirements regarding reliability, high speed transmission, scalability, and guaranteed quality of service (QoS), CHT has deployed ATM and IP-based backbone network and provides differentiated services such as IP-VPN, multimedia communication service (MCS), unified message service (UMS), web-base customer service (WCS), etc In the near future, advanced technologies and services, such as IP DSLAM, multi-service xDSL (ADSL, SHDSL), Voice over DSL, VoIP, IP-based backbone using GSR/TSR and MPLS technologies, will be studied

Deployment of ATM/xDSL Network in Chunghwa Telecom Taiwan

Lung-Sing Liang

President of Chunghwa Telecom Labs

August 1, 2001

Contents

Introduction

- Demands for broadband services are increasing rapidly in Taiwan, and predict to exceed one million broadband users by the end of 2001.
- Telecommunication deregulation promotes four operators of fixed telecommunication networks participate in the deployment of broadband networks in Taiwan.
- To keep pace with domestic broadband needs, *Chunghwa Telecom Co., Ltd. (CHT)* has aggressively been deploying broadband infrastructures.

Introduction(cont.)

- About 3600 elementary-middle schools ADSL service had been deployed in June 1999.
- CHT launched commercial ADSL service in August 1999 to provide high-speed Internet-surfing and Intranet applications. By the end of 2001, Multimedia on Demand (MOD) application based on ADSL access will be available.
- Evolution toward IP-based Networks.

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- ? Network Market Status of Taiwan
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  - Managed-IP Network
- Summary

Network Market Status of Taiwan

- Market shares for ISP by 2001/6

Users / ISPs	Dial-up users	Broadband Users
HiNet	2,100,000	370,000
SeedNet	530,000	60,000
TTNet	555,000	10,000
APOL	450,000	30,000
ETWebs	0	91,000
GigaMedia	0	90,000

Network Market Status of Taiwan(cont.)

❑Access Technologies for Internet users by 2001/3

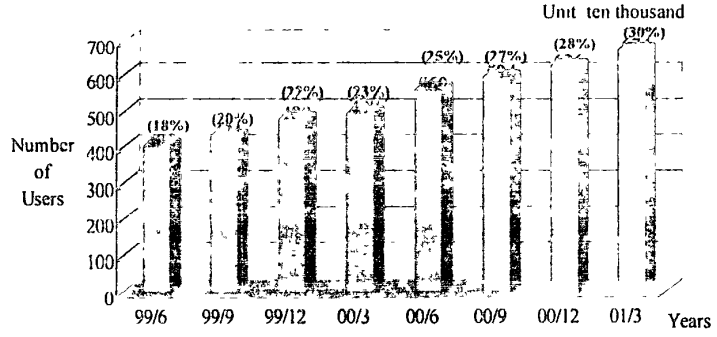
Access Types	Num of Users	Season Growth rate
PSTN Dial-Up	5,280,000	6%
Leased Line	17,000	1%
ADSL*	220,000	89%
Cable Modem	140,000	27%
ISDN	15,000	-6%
Satellite	3,000	0%

Source Ministry of Economic Affairs, ROC
Institute for Information Industry

* ADSL users has exceeded 400,000 by June 2001

Network Market Status of Taiwan(cont.)

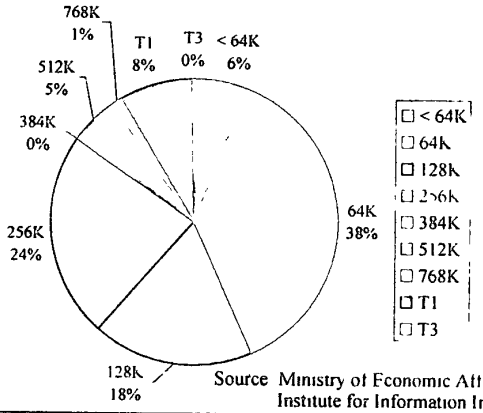
❑Growth of Internet Users from 1999/6 to 2001/3



(xx%) Internet users divided by population Source Ministry of Economic Affairs, ROC
Institute for Information Industry

Network Market Status of Taiwan(cont.)

❑Bandwidth requirements for leased line users



Source Ministry of Economic Affairs ROC
Institute for Information Industry

Network Market Status of Taiwan(cont.)

❑Total of bandwidth for International connections by 2001/3.

By countries

Source Ministry of Economic Affairs ROC

Bandwidth / Country	Aggregated Bandwidth Mbps (2000/12)	Aggregated Bandwidth Mbps (2001/3)
America	1,506	2,285
Hong Kong	133	354
China	95	247
Japan	183	193
Canada	92	137
Singapore	92	96
Korea	14	22
Australia	10	14
Others	9 892	11 892
Total	2,136	3,360

Network Market Status of Taiwan(cont.)

- Total of bandwidth for International connections by 2001/3.
  By ISP or Carrier

Country \ Bandwidth	Aggregated Bandwidth Mbps
HiNet	1,647
TWGate	356
ISNet	252
SeedNet	159
TANet	156
ETWebs	90
TFN	89
NCIC	62
TTNet	57
FETNet	48
APON	45

Source: Ministry of Economic Affairs, ROC

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Broadband Technologies

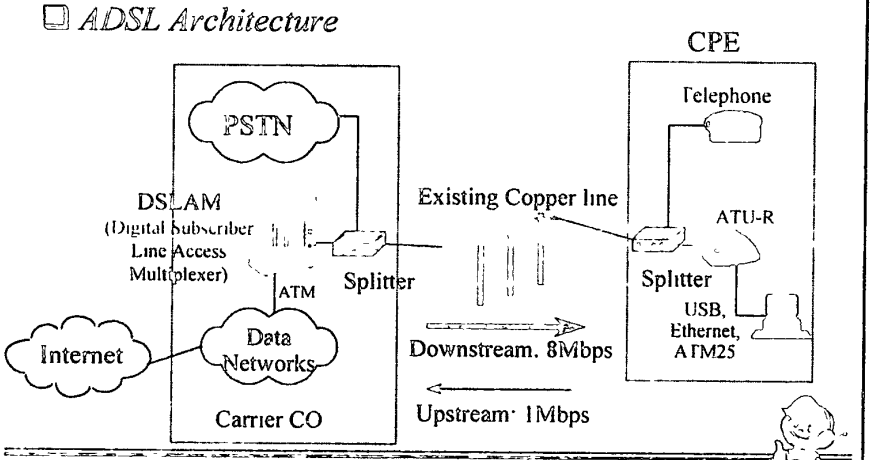
- Asymmetric Digital Subscriber Line (ADSL)
- Asynchronous Transfer Mode (ATM)
- Multi-Protocol Label Switching (MPLS)
- Gigabit/Terabit Switch Router (GSR/TSR)

Asymmetrical Digital Subscriber Line

- Provide asymmetric broadband access capability using existing telephone line.
- Asymmetrical transmission:
  - Downstream: 1.5Mbps to 8Mbps
  - Upstream: 64Kbps to 1Mbps
- Provide telephone and data services simultaneously
- Modulations:
  - CAP (Carrierless Amplitude & Phase)
  - DMT(Discrete MultiTone)

Asymmetrical Digital Subscriber Line (cont.)

ADSL Architecture



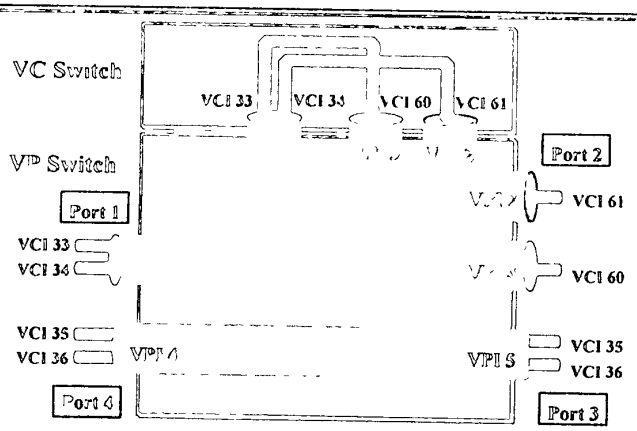
Various DSL Technologies

Types	Line code	Data Rate	Distances
IDSL	2B1Q	128Kbps	18kft
HDSL (G.991.1)	2B1Q/CAP	1 544Mbps/2 048 Mbps	12kft
SDSL	2B1Q/CAP	384Kbps~2 048M bps	13 5kft
ADSL (G.992.1, 992.2)	CAP/DMT	D 1 5M~6Mbps U 640k~1Mbps	15kft
VDSL (G.993.1)	QAM/CAP/DMT/ DWMT	26~52Mbps 6-12Mbps	1Kft 4 5kft
HDSL2 (ANSI)	TCPAM	1 544Mbps	12kft
SHDSL (G.991.2)	TCPAM	192Kbps~2 3Mbps	15 5kft

Asynchronous Transfer Mode

- Mature technology
- Short and fixed cell
- Connection-oriented
- Statistical multiplexing
- Handling voice, video and data simultaneously
- Guaranteed Quality of Service (QoS)
- High capacity
- Permanent/Switched Virtual Connection (PVC/SVC)
- Working with legacy networks

Asynchronous Transfer Mode(cont.d)

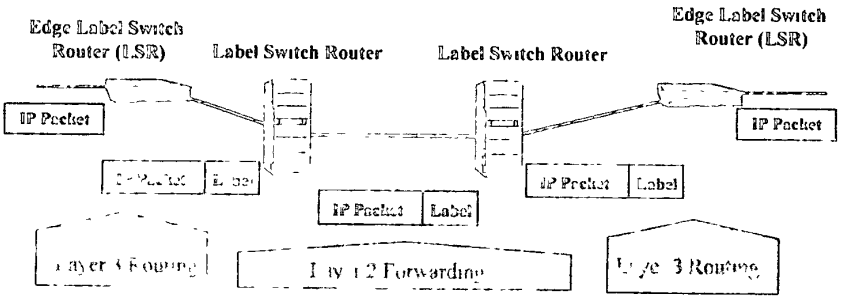


- VC Switch Switch using VPI and VCI values
- VP Switch Switch using VPI values

Multi-Protocol Label Switching

- Motivations:
  - Integrate IP routing and layer 2 switching
  - IP packet routed at edge and switched in core
  - Facilitates the integration of ATM and IP
  - Enables the use of explicit routing(traffic engineering)/source routing in IP networks
  - Provide IP-VPN service

Multi-Protocol Label Switching (cont.)



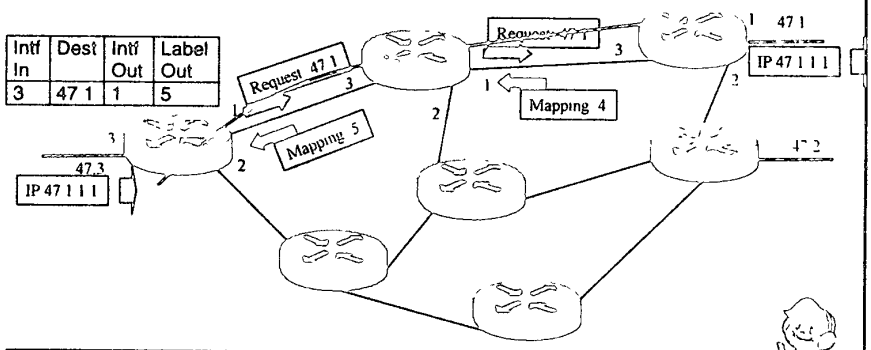
MPLS involves routing at the edges, switching in the core

Multi-Protocol Label Switching (cont.)

Intf In	Label In	Dest	Intf Out	Label Out
3	5	47.1	1	4

Intf In	Label In	Dest	Intf Out
3	4	47.1	1

Intf In	Dest	Intf Out	Label Out
3	47.1	1	5



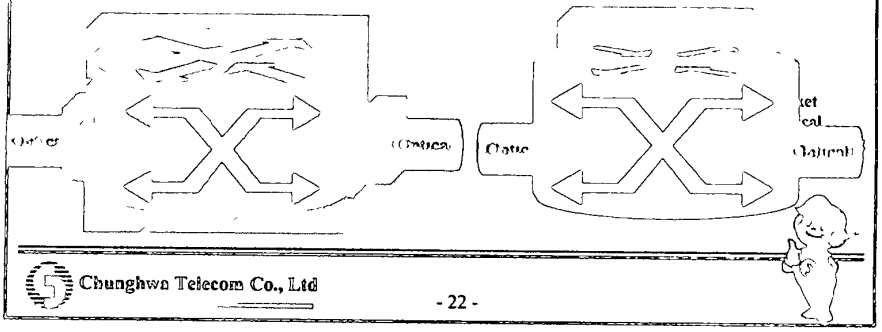
GSR/TSR

GSR

- System capacity above 1 Gbps
- Interconnected with DWDM by means of OADM
- Provide ATM, POS interfaces

TSR

- System capacity above 1 Tbps
- Integrated Router and DWDM
- Provide POS interface



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xDSL/ATM Deployment of CHT

- CHT has been deploying access and backbone broadband infrastructure.
- Deploy ATM and IP-based backbone network to provide differentiated services, e.g., IP-VPN, multimedia communication service(MCS), unified message service (UMS), web-base customer service (WCS).

xDSL/ATM Deployment of CHT (cont.)

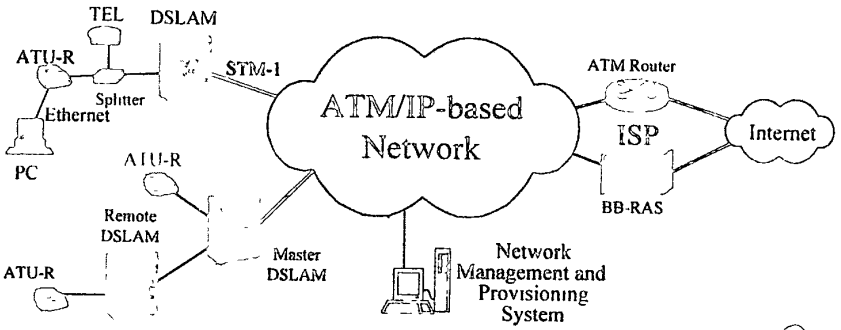
- CHT devotes much effort to developing broadband equipment, e.g., ATM equipment, SONET ADM, E/O Transceiver, NMS, etc.
- Together with self-developed ATM SW, and other vendors' ATM SW, ADSL equipment to deploy ATM/ADSL broadband access network.
- CHT is also deploying Multi-Function Optical Access Network (MFOAN) system to act as the Fiber-In-The-Loop access platform and provides diverse narrowband and broadband services.

ADSL Deployment of CHT

- Time Schedules:
  - Provided about 3,600 junior and middle schools nationwide for Internet access in June 1999.
  - Launched commercial ADSL service in August 1999.
  - Five types of transmission rates, 512K/64k, 768K/128K, 1.5M/384K, 3M/512K, 6M/640K for downstream and upstream respectively.
- Scalability:
  - More than 400,000 subscribers in June 2001.
  - Expect 1 million ADSL users by end of 2001.

ADSL Deployment of CHT(cont.)

❑Network Architecture



BB-RAS BroadBand Remote Access Server

ADSL Deployment of CHT(cont.)

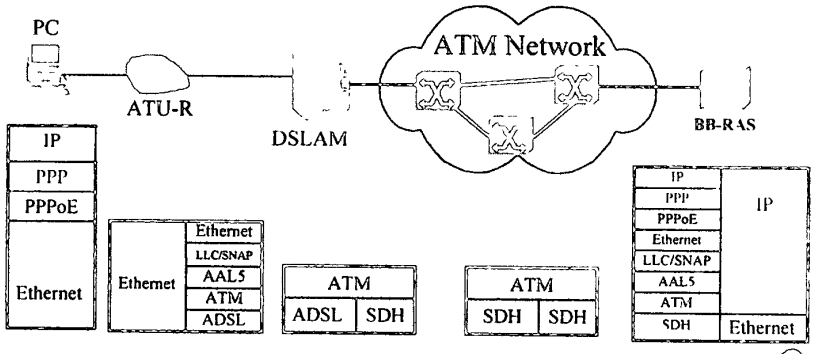
❑ADSL tariff includes ADSL local access fee (including rental ATU-R modem and splitter) and ISP's Internet access fee.

❑Types of tariff for ADSL service

- ➢Flat rate charge
- ➢Time-duration charge

ADSL Deployment of CHT(cont.)

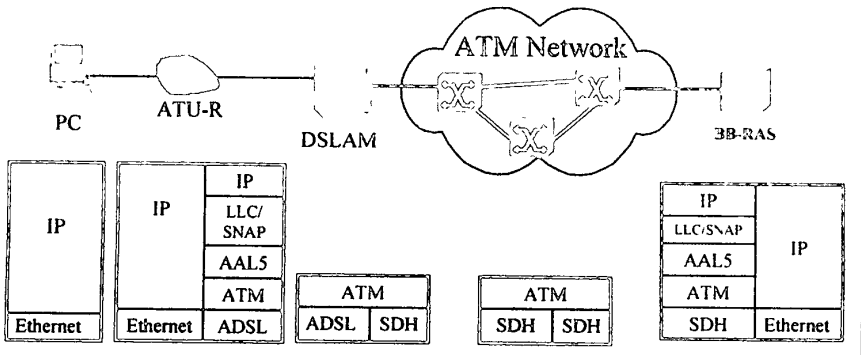
Protocols stacks for time-duration connections



1 PPPoE Point-to-Point over Ethernet (for dynamic IP assignment)
2 LLC/SNAP Logical Link Control/Sub-Network Attachment Point

ADSL Deployment of CHT(cont.)

Protocols stacks for flat-rate connections



1 LLC/SNAP Logical Link Control/Sub-Network Attachment Point
2 Static IP assignments

ADSL Deployment of CHT(cont.)

- ADSL Local Access Fee:

Service Classes	一	二	三	四	五
Downstream (bps)	512K	768K	1536K	3M	6M
Upstream (bps)	64K	128K	384K	512K	640K
Installation fee	NT$1500 (US$44 12)				
Rental fee per month	NT$700 (US$20.6)	NT$800 (US$23 5)	NT$1100 (US$32.4)	NT$1600 (US$47.1)	NT$3200 (US$94.1)

ADSL Deployment of CHT(cont.)

- ISP Internet access fee (HiNet): time-duration charge

Set-up	Minimum fee per month	Free Hours	Fees for times over free hours	Maximum fee Per month
NT$1500 (US$44 1)	NT$799 (US$8 8)	8 hours	NT$0.6/per min (US$1 7 cents)	NT$499 (US$14 7)

1 Downstream rate up to 512 Kbps
2 Dynamic IP assignment

ADSL Deployment of CHT(cont.)

- ISP Internet access fee (HiNet) : Flat-rate charge

Types	Maximum Upstream	Maximum Downstream	Set-up	Monthly fee
1	64 Kbps	512 Kbps	NT$1500 (US$44 1)	NT$2800 (US$82 4)
2	128 Kbps	768 Kbps		NT$5,600 (US$164 7)
3	384 Kbps	1536 Kbps		NT$16,800 (US$494 1)

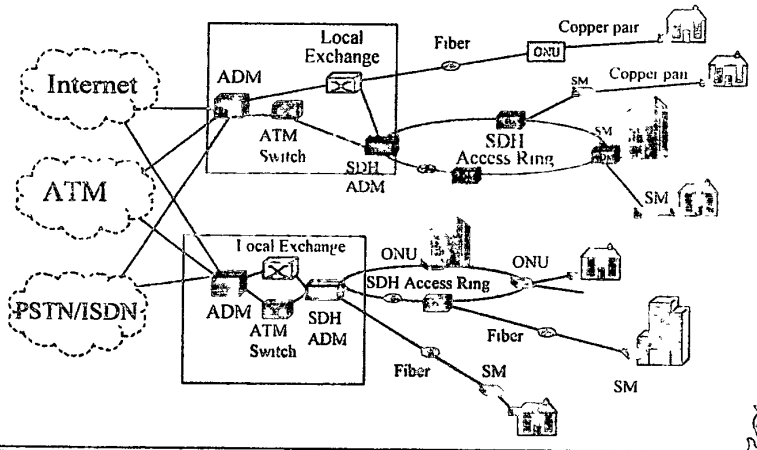
ADSL Deployment of CHT(cont.)

- To reduce provisioning and operational cost, and simplify troubleshooting, CHT has been developing integrated NMS to manage different vendors' DSLAM and ATM SW equipment.
- Advanced technologies and services, e.g., IP DSLAM, multi-service xDSL (ADSL, SHDSL), Voice over DSL, IP-based backbone, etc., will be evaluated in the near future.

Multi-Function Optical Access Network

- Multi-Function Optical Access Network (MFOAN) system is the key Fiber-In-The-Loop (FITL) access platform.
- MFOAN includes transport and access networks to provide integrated broadband and narrowband services.
- Consists of SDH Transport system and Service Multiplexer(SM)/Optical Network Unit (ONU).
- CHT has been deploying MFAON system, and will be in service after August 2001.
- Provided services : POTS, Pay-phone,64/128 Kb/s, ISDN, T1/E1 leased line, ADSL, HDSL.

MFOAN Network Architecture

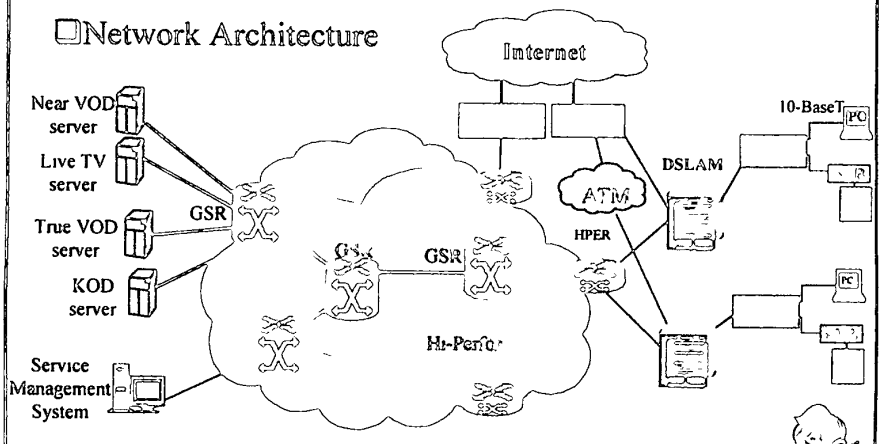


Multimedia on Demand

- Based on GSR/TSR and ADSL broadband technologies.
- To launch commercial service by the end of 2001
- Applications
  - Internet Access
  - Video on Demand (VOD)
  - KARAOK on Demand (KOD)
  - Digital Switched Broadcasting TV (Live TV)
  - Near VOD (NVOD)

Multimedia on Demand(cont.)

- Network Architecture



Managed-IP Network

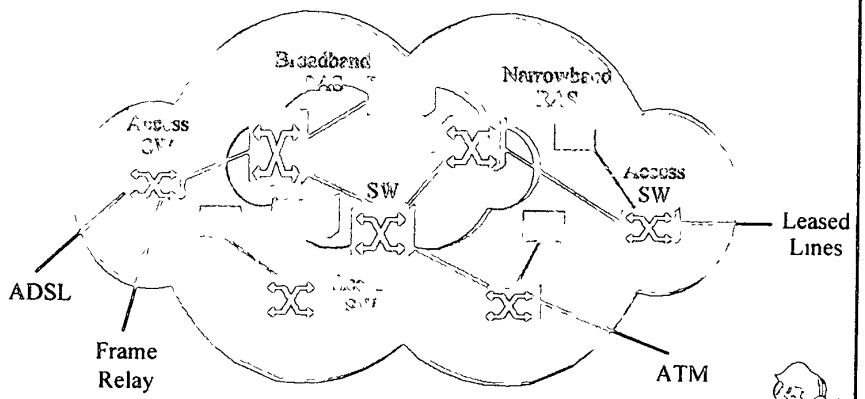
- Based on ATM/IP equipment, e.g., ATM SW and BB-RAS, to provide IP-based services.
- Provide comprehensive services:
  - IP-VPN
  - Multimedia communication service (MCS)
  - Unified message service (UMS)
  - Web-base customer service (WCS)

Managed-IP Network (cont.)

- Access Technologies:
  - ADSL
  - Frame Relay
  - ATM
  - Leased Line
- Plan to deploy pure IP-based network using GSR/TSR and MPLS technologies to provide more flexible and scalable capability.

Managed-IP Network (cont.)

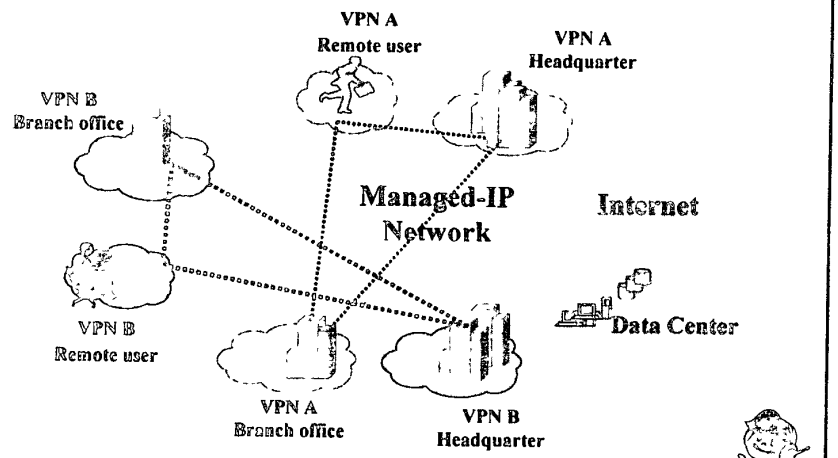
- Network Architecture



Managed-IP Network for VPN Service

- Network-based IP-VPN service can alleviate maintenance effort and cost for users.
- Provide service for Intranet, Extranet, Remote access, and Internet applications.
- Provide different Class of Services (CoS) to satisfy user's requirements.
- Value-Added services, e.g., Co-location, IDC, ERP rental.

Managed-IP Network for VPN Service(cont.)



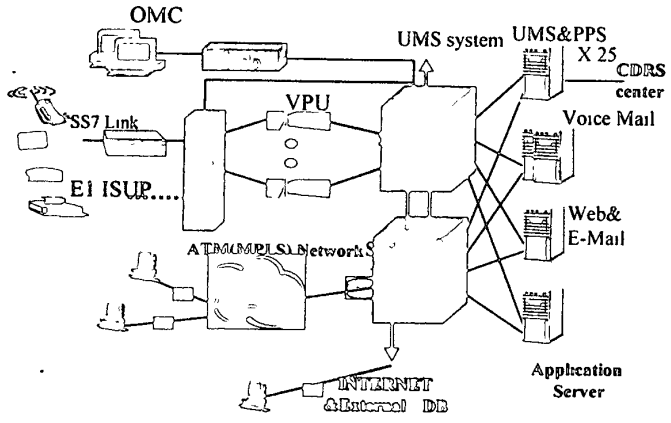
Managed-IP Network for MCS Service

- Various applications:
  - Video multicast
  - Distance learning
  - Distance medicine
  - Video on demand

Managed-IP Network for UMS Service

- Provide unified interface for users to access voice, fax, e-mail, text-to-speech, speech recognition, and image services.
- Various methods for users to access UMS
  - PSTN users via PSTN network
  - Internet users via Internet
  - Broadband users via Managed IP network

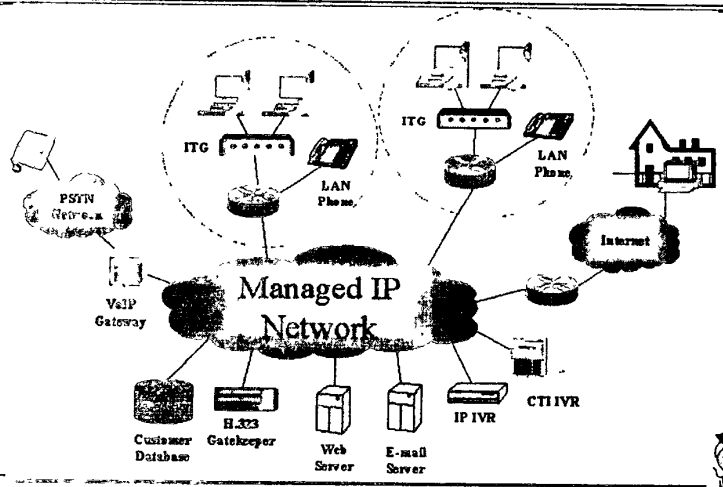
Managed-IP Network for UMS Service (cont.)



Managed-IP Network for WCS Service

- Provide real-time voice service for PSTN and network users, and also provide automatic e-mail reply and chat by text services on IP network.
- Integrated platform for Web server, E-mail, automatic call distribution(ACD), IP PBX, H.323 gatekeeper, CTI interface, Interactive Voice Response (IVR), VoIP gateway, subscriber database, and billing system, and provide different access channels for users.

Managed-IP Network for WCS Service(cont.)



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- Broadband Technologies
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  - ATM/ADSL Networks
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  - Managed-IP Network
- ?Summary

Summary

- Leveraging access transmission capability is necessary for providing broadband services to residential users.
- CHT deploys access and backbone broadband infrastructures based on different technologies, and increases international bandwidth to provide users end-to-end broadband services.
- To meet fast growing domestic demand for diverse broadband services is CHT's mission and goal.