Deploy Broadband Networks for the Rising Bandwidth Demands

Purpose: Information
Submitted by: Chinese Taipei
Deploy Broadband Networks for the Rising Bandwidth Demands

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Agenda

- Broadband profile and progress in Chinese Taipei
- CHT’s network deployment for Broadband
- Prepare for the future
- Concluding Remarks
Profile of Broadband Island

BB household online 64%

- Population: 23,131,093
- Area: 35,980 sq km
- Household: 7,835,375

International internet BandWidth

Regular Internet users upto 11Million

Average download speed up from 0.6Mbps('02) to >5.1Mbps ('09)

### Broadband network coverage targets

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</thead>
<tbody>
<tr>
<td>Wireless Broadband &amp; Convergence Network</td>
<td>Fixed Broadband (&gt;50M) Coverage 70%</td>
<td>Bandwidth</td>
<td>30M</td>
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<tr>
<td></td>
<td></td>
<td>Coverage</td>
<td>45%</td>
<td>55%</td>
<td>65%</td>
<td>75%</td>
<td>80%</td>
<td>50%</td>
<td>58%</td>
<td>65%</td>
<td>70%</td>
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**Notes:**
- Company completed privatization on August 12, 2005.

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**Diagram:**
- Yearly milestones and network coverage targets from 1996 to 2007.
- Highlighted achievements and significant events in the telecommunications sector.

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**Image:**
- Visual representation of network expansion and coverage targets over time.

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**CHT Proprietary**
Milestones for ICT Development in Chinese Taipei

- **ICT Development Plan (2002~2006)**
  - 1.e-Government
  - 2.e-Industry
  - 3.ICT Infrastructure

- **ICT Development Plan (2007~2011)**
  - 1.Mobile Communication Buildup
  - 2.Deepen ICT Application

**Summary of the 26th STAG Board Meeting**

- **M-Taiwan Project**
- **e-Taiwan Project**
- **e-Government Plan**
- **e-Industry Driving Plan**
- **NII Driving Plan**
- **Digital Content Driving Plan**
- **e-Learning Driving Plan**

**i-Taiwan**

**u-Taiwan**

**upgrade**

Source: NICI, 2008/9
Broadband profile and progress in Chinese Taipei

CHT’s network deployment for Broadband

Prepare for the future

Concluding Remarks
Operator’s Concerns – to deliver new value to customers with new revenue to offset the decoupling, to justify the network Capex/Opex…
Chunghwa Telecom - an incumbent, privatized, integrated Operator

- Revenue 184Bn NT$ (2009)
- Evolve to a ICT value-creating company
- Oversea Offices & Subsidiaries: US, China, Japan, Singapore, Vietnam, Thailand, Hong Kong ...
- Global presence: 27 PoPs in Asia, 3 PoPs in Europe, 11 PoPs in US

Local Service
- DLD
- ILD

2G GSM
2.5G GPRS
3G WCDMA
3.5G HSDPA

Mobile
(9.2M subs, 35%)

Fixed-line
(12.4M subs, 97%)

Core Business

Internet & Data

Network Infrastructure

Broadband Access (4.3M, 83%)
- ADSL
- WLAN
- FTTx

Internet Services (ISP)
- HiNet (4.1M subs, 72%)
  (backbone BW > 1Tbps)

Business Intranet
- X.25 \ ATM \ FR
- IPVPN

Leased Line

VAS:
- SMS
- MMS
- JAVA Game
- Ring Back Tone
- Mobile internet
- Mobile TV

Others
- Handsets sale
- Billing handling services

% (market share) As of Dec. 2009

CHT Proprietary
CHT's Broadband Network Architecture

Access aggregation Network

Regional aggregation Network

HiNet/NGN_CN Network

HiNet

NGN_CN

Transport Network (NG-SDH/Fiber)

GbE interface

NG-SDH/Fiber

Other ISP

HiNet/NGN_CN Network

ATM

POI

POI

POI

POI

POI

GvE

STM-1

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

STM-1/DS-3

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**CHT follows the trend to converge IP backbones**

- C4、C5、IP-VPN and MOD were integrated to the NGN IP backbone (8->4)
- 4->3->1(2) will depend on some key factors *(watch-and-wait ?)*
  - The merge of HiLink to VPN (4->3)
  - The convergence of 2G/3G managed IP to the managed IP backbone (3->2)

<table>
<thead>
<tr>
<th>Year</th>
<th>PTSS C4</th>
<th>HiLink</th>
<th>PTSS C5</th>
<th>MOD</th>
<th>VPN</th>
<th>2G / 3G</th>
<th>Managed (MPLS)</th>
<th>Managed Core</th>
<th>Best Effort</th>
<th>Integrated IP Cores</th>
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8 IP core networks

3 IP cores

Managed

Best Effort

Integrated IP Cores
CHT deploys FTTx Network for customer’s value

**CO**
- **FTTEx**
  - Feeder: 200-3000m
  - Cross-connect: Cabinet
  - Distribution: 100-700m
  - Building/Home
  - ADSL2+
    - 3-20 Mbps (Downstream)
    - <1 Mbps (Upstream)

**FTTN/C**
- VDSL2 17a
  - 25-50 Mbps (Downstream)
  - 2-10 Mbps (Upstream)

**FTTB**
- VDSL2 30a
  - 50-100 Mbps (Downstream)
  - 25-40 Mbps (Upstream)

**FTTH**
- PON
  - 0.1-1.0 Gbps
    - (Downstream & Upstream)

**Network Types**
- **Fibre Loop**
- **Copper Loop**

**Other Details**
- OLT/L2 SW
- MDU/VDSL2
- OLT
- PON
CHT’s FTTx Deployment Plan

FTTx access penetration targets (with rate > 30Mbps)

- The penetration ratio >50% by 2016.
- # of FTTx subscribers > # of ADSL subscribers expected by Q4, 2010.
Win-Win strategy between CHT and CPE Vendors

- Co-work in CHT Labs for early CPE assessment for Spec. compliance and key quality/performance during service trial phase

- CHT Labs hosted several GPON IOT Plugfests since 2008
  - International Well-known (5) OLTs were invited, 11 domestic and China(T&W) ONU vendors attended (July 2009)

CHT Proprietary
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Prepare for the future – Green ICT, Green by ICT

- Growth with Green strategy
- The power consumption of FTTH (PON) is 80% less than FTTN (xDSL) on the average
- Cloud computing (virtualization & usage based tariff …) sounds more energy effective (Flat rate/all-you-can-eat BM for internet access might not be good for energy saving)
- CHT launched iEN & IRMAS energy management services
- CHT will promote Video presence, remote surveillance, ITS etc. low carbon alternatives

GPON Energy and Cost efficiency

Energy Consumption (MWh/y) and Cost (k€/Y) for ADSL2+ and PON FTTH.

- 80% Energy & Cost savings by replacing ADSL2+ with PON.*

Energy MWh/Y  Cost M€/Y (100k subs)

*) Costs for air conditioning are not considered

Green IDC
- Consolidate
- Virtualize
- Optimize
- Leverage

Green PC
- Energy-aware application
- Energy-aware OS
- PSU
- IDC Management
- IDC Cooling
- Power distribution

Green Mobile
- Energy-aware application
- Energy-aware OS
- Low-Power HW

Ref: ITU-T FG ICT&CC 24 March 2009

Prepare for the future – Welcome Cloud Computing

Expected Effects
1. UI traffic demands more access BW
2. Cloud IDCs are desired, computing power shifted from intranet to cloud virtual servers
3. latency, reliability, fault tolerance, trust/security, seemless access, ... are critical
4. New business models emerging
5. ...

Cloud Computing Types

Opportunities
G-cloud as well as SaaS, IaaS, PaaS ...

For CHT network
Cloud IDCs, access and backbone traffic, inter-cloud backbones or VPN OSS/BSS ...

...
Prepare for the future – more/broader channels to the world

- **Participated in investment:** 9 submarine optical cable
  - Danshui (淡水): APCN2, TPE
  - Toucheng (頭城): APCN, SMW3
  - Fangshan (坊山): SMW3, CUCN
  - Unlanded Chinese Taipei: JUCN, PAN AMERICAN, SAFE, TPC5

- **Purchased IRU:** 6 submarine optical cable IRU
  - Landed Chinese Taipei: EAC, FNAL/RNAL
  - Unlanded Chinese Taipei: PC-1, TGN, FEA, EuroAfrica

- **Total bandwidths:** 394.6Gbps (as of 2009/12)

- **Participation in investment** the APG in 2010~2012, and other potentials

- **Bandwidth growth is highly expected in the following years** (among Asia Pacific)
Prepare for the future – seamless networking for win-win

Enjoy high quality services with 30Mbps high speed networks, 3 billion objects networking, and an Intelligent sensor environment.

Deploy networks to build a UNS environment

Collaborate applications to meet the demand

Demands in our daily life
- Medical
- Surveillance
- ITS
- Entertainment
- Life and work efficiency

Fixed Networks: xDSL, Cable, FTTx

Device

Content

Terrestrial/Radio

GPRS/WCDMA/HSDPA/HSUPA

WLAN/WIMAX

Satellite

Identity / Authentication

Security

Library info

Telecare

Medical

Logistics

Government

Travel guide

Advertisement

Shopping

TV
NM and customer care are essential and will be value-creating

- TR-069 protocol
- eTOM software framework
- ITIL lifecycle process
- CMMI …
- new considerations for green and cloud
- …

HiNet Network Operation Center

Customer Service Center
Concluding Remarks

- The market power is essential to the growth of Broadband network and services, our experience is worthy of reference.

- Bandwidth’s Trend is Relentless, Chung-Hwa Telecom will continually develop advanced fiber optics technology (such as all-optics):
  - Deploys the xPON infrastructure to offer up to 50Mbps bandwidth for user’s triple-play demands this year.
  - Service continuity with quality, architecture flexibility for innovation platform, cost effective and sustainability are the major concerns to phase the NGN transitions.
  - IPTV (MOD), cloud, green, ICT as well as beyond NGN will be pursued consistantly.

- Opportunities and risks are out there, we are figuring out new win-win strategies and differentiated values to customers.
Thanks for your attention.