Next Generation Network Roadmap in Thailand & Overview of Chulalongkorn University’s Network Research Group

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Outline

- Next Generation Network (NGN)
  - NGN Roadmap in Thailand
  - NGN Testing/Trial Use Center in Phuket
- Network Research Group Activities
  - COREGAME, MOVENET, WITS
  - Research examples using Cluster Machine
- Updated information
  - AUNSeedNet & Chulalongkorn University for Neighbouring Countries Scholarships

NETWORKING
(Implementation of End-to-End Communication)
Signalling/Service Networks

Network is Complex

Endless Stairs
Knowledge Accumulation of University Students

Final-year Undergraduate

1st Year

2nd Year

3rd Year

Communication Milestones

Optical Fiber

Wireless Electromagnetic Waves

Smoke / Fire Signals Over Air

Electrical Signals in Copper Wire

1878
Current Drives of Change

- Multimedia, mobile personal computing and WWW dictate the value of networked services
- New access network technologies (xDSL, 2.5/3G/4G, WiFi, WIMAX, FTTH) allow higher level of demands enter core network
- Explosion in available bandwidth due to optical transmission
- Data dominates voice so new network technologies must rather be designed for data hence packet-based backbone

Homogeneous Traffic
Single-Service Network
Fixed Clients

Network Evolution

Heterogeneous Traffic
Multiple-Service Network
Mobile Clients

Core Networks in Thailand

<table>
<thead>
<tr>
<th>Past</th>
<th>Current</th>
<th>&lt; 5-10 years</th>
<th>10+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP ATM</td>
<td>IP MPLS</td>
<td>IP MPLS</td>
<td>IP DWDM</td>
</tr>
<tr>
<td>SDH</td>
<td>Ng-SDH</td>
<td>DWDM</td>
<td></td>
</tr>
</tbody>
</table>

Performance

QoS
Good
Bad

Capacity
Cost
Traffic
Revenue
Erlang System

- 1876 Alexander Graham Bell patents his invention of the telephone
- 1885 Berlin - Telegraph Conference. First provisions for international telephone service
- 1917 (BE 2460) Anders K. Erlang proposed the Erlang formula for dimensioning telephone inter-city trunk

Call Loss Probability

NGN roadmap in Thailand

Final Study Report (2008)
by Chulalongkorn University
Submitted to
National Telecommunications Commission Thailand
Paradigm of Thailand NGN Roadmap

- Core network
- Wired/Wireless access networks
- Service
- Technology & application trials
- Regulatory framework

NGN roadmap for Thailand

Continued upgrade of core switch to soft-switching technology
IMS deployment & IPv4 to IPv6 migration
Fixed-mobile convergence

Wired IP broadband penetration (subs per 100 households)

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>10%</td>
<td>16%</td>
<td>22%</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

Wireless access in-band migration
3G implementation
WIMAX implementation

Continued expansion of narrow-band services
Wide-scale accessibility for broadband services
Innovation of new IP-based services for ubiquitous society
**Final Goal:** NGN roadmap for Thailand

**Towards Vision of Meaningful NGN for Wellness of Population by 2014**

**Ongoing Activities to Promote Meaningful NGN in Thailand**

- NGN Testing/Trial Use Center in Phuket
- NGN Forum Thailand
- TRIDI
- NTC initiatives in educational applications of NGN

**Introduction**

- Need for testbed to resolve common critical issues in migrating from legacy networks to IP networks
- Comprehensive NGN pilot test program conducted in Thailand.
- Phuket has been selected as our test city.
Objectives

- Test and evaluate the migration to IP networks
- Study the feasibility (both technical and economic) of the migration to NGN and obtain effective investment strategies
- Refine the roadmap for future migration to NGN

Cooperations

- Industry is invited to join in and bring equipments and applications to test/evaluate within this project.
- Benefits e.g. compatibility and inter-operability testing with other systems and applications
- NTC subsidy in the transportation of equipment within the country and the import taxes as well as necessary basic test infrastructures.

Collaborators

[List of logos and names of collaborators]
**Scope of NGN Testing / Trial Use**

1) NGN Wireless ACCESS: Wimax
2) NGN Wired ACCESS: FTTx
3) NGN CORE: IMS
4) End-to-end NGN: VoIP QoS
5) NGN Applications

**WiMAX**

1. Lab Test
2. Field Test
3. Roaming Between WiMAX and CDMA EVDO

**WiMAX Lab Test**

*NGN Wireless ACCESS: Wimax testing & trial use (CAT Telecom)*
### Wireless Access Technology

<table>
<thead>
<tr>
<th>Technology</th>
<th>Speed</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WiFi (802.11g)</td>
<td>25-54 Mbps</td>
<td>100-300 m</td>
</tr>
<tr>
<td>2. WiMAX (802.16e)</td>
<td>5-10 Mbps</td>
<td>2000 – 3000 m</td>
</tr>
<tr>
<td></td>
<td>BW 5,10 MHz</td>
<td></td>
</tr>
<tr>
<td>3. CDMA 1xEVDO Rev-A</td>
<td>3.1 Mbps</td>
<td>1500 – 8000 m</td>
</tr>
<tr>
<td>4. EDGE</td>
<td>348 kbps</td>
<td>1500 – 8000 m</td>
</tr>
</tbody>
</table>

### Roaming/Interworking Test

Reference: WiMAX Forum Network Architecture
Stage 2 - 3GPP2 - WiMAX Interworking - Release 1, Version 1.2

### Interoperability with CDMA 1xEV-DO, WiMAX and WiFi

**Application Test Result**

<table>
<thead>
<tr>
<th>Application</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Browsing</td>
<td>✓</td>
</tr>
<tr>
<td>Download File (FTP)</td>
<td>✗</td>
</tr>
<tr>
<td>Video Chat</td>
<td>✗</td>
</tr>
<tr>
<td>Voice over IP</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Remark:** When Mobile Station switches to the other network, it has to acquire new IP address from new network. There will be an effect to the application that requires constant data transmission but for the application likes web browsing that doesn’t always have an effect. We called this kind of switches network “loosely coupled internetworking.”
FTTx
Test & Trial Results

FTTH Systems

FTTH Lab Test in Chula
OLT from Forth (Thai)
ONU from Forth (Thai)
Splitter from ADC Krone
G.652D fiber from EE of CU

FTTH Lab Test in Chula (Contd.)
FTTH Lab Test@ Chula of Equipment from Manufacturer (1 Gbps, 20 km)

OLT from Forth (Thai)
ONU from Forth (Thai)
Splitter from ADC Krone

G.652D fiber at EE Lab of CU

FTTH-NGN service trial project in Phuket, supported by NTC, Forth, and ADC Krone, and CAT

OLT by Forth
Short-length Fiber
Passive optical splitter by ADC Krone
Fiber #1
Router
Fiber #2
Shared 40 (or 100 Mbps)
Fiber #3

Japan

NTC's NGN Phuket Test bed

NGN CORE : IMS NGN test (MIAC (JP), NEC and TOT Thailand)

ประเทศไทย

Thailand

NTC Head Office
Telephone Exchange
Existing TOT Network (PSTN)

IMS Servers

No.1 SIP Terminal
No.2 Video Terminal

OLT by Forth
Short-length Fiber
Passive optical splitter by ADC Krone
Fiber #1
Router
Fiber #2
Shared 40 (or 100 Mbps)
Fiber #3

NTC's NGN Phuket Test bed

NGN CORE : IMS NGN test (MIAC (JP), NEC and TOT Thailand)
AIS VoIP Testing Configuration

End-to-end NGN: VoIP QoS test
(AIS & other ACCESS/CORE participants)
AIS VoIP Testing Configuration

End-to-end NGN: VoIP QoS test
(AIS & other ACCESS/CORE participants)

Access Link Bandwidth of 2 Mbps can support:
1. Codec G.711: 25 Concurrent Calls
2. Codec G.729: 80 Concurrent Calls

SIP Trunking Interoperability Test

Regulatory Support Initiatives in Research/Development/Deployment for Thai Telecommunication Industry
“Established in 2007 with vision to keep Thai telecommunication industry in pace with telecommunications technology and industry worldwide by promoting research and industrial development for sufficiency economy and sustainable development of Thailand”.

Regulatory Initiatives in Educational Applications of NGN

Tele-center for Education and Development in Rural Area (on celebrating to H. M. the King’s 80th Anniversary)

Mae Fah Luang University
Chiang Rai Province,
North of Thailand
Her Royal Highness Princess Maha Chakree Sirindhorn on the opening of NTC 1st tele-educational center, Mae Fah Luang Project, 4 Mar 2009
การประกาศสร้างแหล่งเรียนรู้โดยใช้สื่อ Multimedia
e-Magazine on Web

ภายในโครงการดำเนินการทดลองห้องเรียน และประเมินผลการบ้านแบบสิ้น
จากโครงข่ายต้องการเป็นโครงข่ายที่สนใจทวีปภูเก็ต ของสังกัดภูเก็ต ศรีภูเก็ต และภูเก็ตวิทยาลัย.

ร่างความรู้: โทรศัพท์และสื่อสารสังคม (Telecommunication for Quality of Life)

แนวทางการปรับภูมิทัศน์ผ่านการทดลองแบบสมมติ ให้พัฒนาขุมทรัพย์ ระลอกละแหล่งดิจิทัล
Towards Vision of Meaningful NGN for Wellness of Population

Thank you for your kind attention

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