National Education Network in Thailand

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Chair of ThaiREN
Agenda

- Introduction to UniNet and ThaiREN
- From UniNet to NEdNet
- Research and Education Activities
UniNet Conceptual model

UniNet

Student

Information Network

University

Learning Center

UniNet

Learning Center

E-Library

Research

E-learning

Tele-conference

Library

Distance Learning

Campus

University

Learning Center

Distance Learning
UniNet2 Network Topology
Thai Research & Education Networks

ThaiREN
Thai Research and Education Network

ThaiRen: UNINET ↔ ThaiSARN (NECTEC)
1 Gbps
International R&E Peering Network
Trans-Eurasia Information Network Phase 3
Research & Education Collaborations

- TEIN2
- THAILAND
- Seminar
- Research
- Conference
- UniNet
- Thaisarn
From UniNet to NEdNet
(National Education Network)

The Previous Education Networks
1. MOE Net (Primary, Secondary Schools)
2. VEC Net (Vocational Network)
3. UniNet (University Network)

Thailand Government approved Stimulus Package (SP2) in 2009 Budget 5,000 M Baht or 116 M US$ to Integrate all Education Network to National Education Network (NEdNet)
Targets

- National Education Network
- Provide appropriate bandwidth for all level of education
- UniNet Network expansion to a network of Ministry of Education. Support usage of the entire education system.
  - 1) University connected (Dark Fiber) with bandwidth 1 Gbps - Nx1 Gbps.
  - 2) Vocational institutions bandwidth 100-1,000 Mbps.
  - 3) school bandwidth 10-100 Mbps.
- Research network at least 10 Gbps.
Scope in 2009-2011

- Fiber Optic to accommodate the core network (Backbone) that can support bandwidth 20 - 50 Gbps.

Linked network institutions / agencies for education. At least the following.

293 Universities (1,000 Mbps each of the N x 1,000 Mbps).

415 Vocational Education (100 - 1,000 Mbps)

3,000 schools (10 - 100 Mbps).

- Development Teacher tv (IPTV) to provide resources for education.
What the study established in 2008

Changing quality requirements

TWO WAVES OF BROADBAND SERVICES

- Social networking
- LD video streaming
- Basic video chatting
- Small file sharing
  - SD IPTV

Today

Requirements
- Download 3.75 Mbps
- Upload 1 Mbps
- Latency 95 ms

Tomorrow

Requirements
- Download 11.25 Mbps
- Upload 5 Mbps
- Latency 60 ms

- Visual networking
- HD video streaming
- Consumer telepresence
- Large file sharing
  - HD IPTV

Broadband Quality Score

A global study of broadband quality
September 2009

Source: CISSO, 2009
Broadband Quality Score (BQS)

- BQS is calculated based on normalized values of: Download and Upload throughput, and Latency
- 24 million records sourced from actual tests from Speedtest.net (Ookla) during May 2008 and May - July 2009
- Weights assigned to each factor for today's and tomorrow's (3 to 5 years) applications.

\[ \text{BQS (today)} = 55\% \text{ Download} + 23\% \text{ Upload} + 22\% \text{Latency} \]

**BQS threshold: 30**
- Download 3.75 Mbps
- Upload 1 Mbps
- Latency 95ms

\[ \text{BQS (tmrw)} = 45\% \text{ Download} + 32\% \text{ Upload} + 23\% \text{Latency} \]

**BQS threshold: 50**
- Download 11.25Mbps
- Upload 5Mbps
- Latency 60ms

Source: CISSO, 2009
# Service Requirements for Today & Tomorrow

<table>
<thead>
<tr>
<th>Application</th>
<th>Downstream</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streaming Audio</td>
<td>128K - 384K</td>
<td>64K</td>
</tr>
<tr>
<td>Internet Access</td>
<td>256K - 1.5M</td>
<td>64K - 640K</td>
</tr>
<tr>
<td>Telecommuting</td>
<td>1.5M – 3M</td>
<td>1.5M – 3M</td>
</tr>
<tr>
<td>Standard Video Conferencing</td>
<td>384K - 1.5M</td>
<td>384K - 1.5M</td>
</tr>
<tr>
<td>Distance Learning</td>
<td>384K - 1.5M</td>
<td>384K - 1.5M</td>
</tr>
<tr>
<td>Personal Telepresence – HD</td>
<td>1.5M – 10M</td>
<td>1.5M – 10M</td>
</tr>
<tr>
<td>Interactive Video</td>
<td>1.5M - 6M</td>
<td>128K - 6M</td>
</tr>
<tr>
<td>Video on Demand</td>
<td>1M - 18M</td>
<td>64K - 640K</td>
</tr>
<tr>
<td>Multiple Digital TV</td>
<td>2M - 8M</td>
<td>64K - 640K</td>
</tr>
<tr>
<td>HDTV/IPTV</td>
<td>6-18M</td>
<td>64K</td>
</tr>
<tr>
<td>Gaming</td>
<td>2-20M</td>
<td>64K - 20M</td>
</tr>
</tbody>
</table>

[www.ftthcouncil.org](http://www.ftthcouncil.org)
Bitrate vs. Reach for Last Mile Technologies

[Graph showing bitrate vs. distance for various technologies: GigabitEthernet, FastEthernet, GPON aggregate, GPON per user, ADSL, ADSL2+, VDSL, Cable aggregate, Cable per user, WiMax aggregate, WiMax per user, PLC aggregate, PLC per user.]

[Source: www.ftthcouncil.org]
Full Network Solution Scheme

- **Backbone Layer**
- **Distribution/Provincial Layer**
- **Metro/District Layer**
- **EndPoint/ LastMile**

**Network Layers**
- **All Optical Network**
- **DWDM/Optical fiber**
- **Metro Net / Optical fiber**
Network Architecture

2009
- 108 Universities
- 10 Schools

2010
- 89 Universities
- 185 Education area office

2011
- 415 Vocational
- 2,990 schools
Strategies

ICT for Education and ICT for Good Governance

- Availability
- Accessibility
- Affordability
- Administratively
Network Topology

Regional node
Regional gateway
UniNet

10 Gbps to Provincial node
40-50 Gbps between Regional node
50 -160 Gbps Backbone
50-160 Gbps redundant Backbone

Provincial node
Regional node
Regional gateway
UniNet

10 Gbps to Provincial node
40-50 Gbps between Regional node
40-50 Gbps for redundant
50 -160 Gbps Backbone
50-160 Gbps redundant Backbone

Bangkok Metropolitan
FTTx/FTTs Technology

[Diagram showing the layout of FTTx/FTTs technology with labels for CENTRAL OFFICE, DISTRIBUTION, ACCESS, and University/Vocational institutions.]
Other Last mile Technology

- **Ethernet**
  - 2.4 GHz

- **WiMAX**
  - 10 Km
  - Point to Point 40 km
  - Fiber optic >50 km

- **Satellite**
  - University/Vocational

- **Leasedline**
  - < 2 km

- **ADSL**
  - < 5 km

- **WiMAX/ WiFi**
  - 0.5 Km
  - IEEE 802.11b/g 11-54Mbps

- **IEEE 802.16a**
  - 75 Mbps

- **Point to Multi-Point**
  - 10 Km
  - 2.4 GHz
Research and Educational Activities
Distance Education on Internet-Based

• The Project of Inter-University Network (UniNet) is established by notification of Ministry of University in 1996. This year the project is 12-year- in operating and serving for universities and institutions.

• UniNet has provided hi-speed information network linked to universities, institutes, and campuses 180 sites over the country. Linking with foreign countries research network enables Thai universities/institutes to manage virtual classrooms with universities/institutes abroad.

• This project improves Thai education to be comparable to other countries. And now UniNet is developing particular research network which enables members to reach the source effectively.
Case Study: KMITL Global Media Classroom (Prof. Supawadee Ratanamat) in collaboration with Ball State University, USA and Tokai University, Japan (2004-2006) and Muroran Institute of Technology (2007), using Internet2 and TEIN2 Network provided by UniNet
Activity

- Telemedicine DVTS (Digital Video Transport System)
- Next Generation Internet (IPv6)
- AMP (Active Measurement Project)
- EOS (Earth Observing System)
- DCN/PERFSONAR
- Global IP–USN Testbed
- Multicast, HD–Television Streaming Testbed
- Grid Computing
- Network Monitoring
Distance Learning System

- Support H.323 VCS and MCU
- Streaming & Broadcast Server
- CanalAVIST, Vclass
- IPTV (Teacher TV)
- IDL (Interactive Distance Learning)
Research Working Groups

- IPv6
- Multicast Technology
- Grid
- Security
- Network Monitoring
- Open Source

- E-Learning and Multimedia
- GIS
- Web cache
- Distance Learning
- Telemedicine
- E-Culture
Type of NEdNet services

• **Type 1 Network for Education Internet:**
  – Online Reference Database Access
  – E-learning
  – Tele-Distance Learning
  – Teleconference
  – Access Internet for Education

• **Type 2 Network for Education and Research Internet:**
  – Network Monitoring and Measurement
  – Network for Virtual access
  – Network for Grid computing
  – Network for continuous research
  – Network for Tele-medicine

• **Type 3 Network for Education and Research Testbed:**
  – Network Research for Testbed
  – Network Research for Demonstration
  – Global IP-USN Testbed
Application and Services On NEdNet

• Network Service
  – New Generation Network Research
  – DWDM Testbed and Services for Researcher
  – L3 Service (IP connection) and L2 VPN (Ethernet connected)
  – IPv4 and IPv6 Multicast
  – Point Of Present :POP service for university and institute

• Application Service
  – Network Monitoring and Measurement
  – Overlay Services (Thailand Library Instigated System Network)
  – Virtualization Everywhere
  – Provisioning of QoS (L2 and L3)
  – Telemedicine (DVTS…VCS )
  – IPTV (Teacher TV  support HD (720p,1080p)
  – Distance Learning
  – E-learning
  – IDL (Interactive Distance Learning )
  – Vclass (Virtual Class Room)
Thanks you

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Research Collaborations