Outline

• Motivation, Swedish Broadband & FTTH status
• Acreo Broadband Project
• The Swedish Broadband Testbed
  • Overview
  • Services
  • Access related parts
  • Technologies
  • Status
• Summary
Triple Play: Network convergence via IP
Sweden has a broadband penetration of 25%

- ADSL more than 50% but:
  - One large scale FTTB NW -B2
  - Several Broadband Islands
  - About 21% of the broadband connections are via Ethernet LANs incl FTTH
  - 44% of the total # of FTTx connections in EU are in Sweden
Swedish FTTx deployments: Vällingby

- 5000 connections
- 800 active internet users
- Operator Telia
- P2P dual MM fibre local node - CPE Internet
- 5 ISP
- Local channels
- Local portal for tenants
Swedish FTTx deployments: Sollentuna

- 12750 connections
- 5600 active Internet users
- Operator Power utility company
- P2P dual SM fibre
- Internet, 5 ISP
- IPTV - 160 subscribers
- IP-telephony, VOD
- Local channels-events
Swedish FTTx deployments: Hudiksvall

- 2500 connections
- 600 active internet users
- Operator Hudiksvall metro network
- P2P MM fibre from last node
- Internet, 1 ISP,
- IP-TV, VOD- trials
The Open Network Concept

All End Users can reach all Service Providers

Service Providers

The Open Network

End Users
The Testbed Idea

• **Scale of trial**
  • Without cost of dedicated field trial (deployment, infrastructure)
  • With direct connections to lab environment

• **Open Network**
  • End-user perspective
  • Multiple Service- and Content Providers

• **Real End-users & Services**
  • Paying but volunteered & “friendly” end-users
  • Real services but delivered on non-commercial basis
The Swedish Broadband Project

Technology Projects

Test-bed

- Hudiksvall
- Link
- Stockholm
- EU projects

Optical Amplifiers
Access
Network Architecture
Tunability
High Speed Transmission
Video Quality

The Swedish Broadband Project

NOC Conference Eindhoven June 29th 2004 —10
Services & Physical Network

Services

Triple play - data (Internet, peer to peer), telephony (VoIP) and IPTV

Physical network

• IP-based network
• AON Fast Ethernet 100 Mbps
• 6-7 access areas
• 2 different access concepts (L2/L3)
• 3 access first-mile technologies (Cu, MM, SM)
• Target 200 test-users (currently 139)

Designed and managed by Acreo
Jointly financed by Swedish government and the broadband industry
The Testbed

- End-to-end Network
- Open Network
- Real End-users
- Real Services
- Available for trials for companies, Universities, EU-projects...

Gbit Ethernet network

Gbit Ethernet over 4+4 C/D-WDM channels
An End-to-end Testbed, e.g. local peer-to-peer or via the metro and trunk network.
The Testbed: Focus on Access

- Hudiksvall City Network
  - Sånglårkan
  - Knösta
  - Vallvägen

- Main Node Hudiksvall
  - Mo
  - L3 Lab node

- Ericsson Lab Network
  - CPE
  - STB
  - VoIP

- Sollentuna Energi Network
  - L2

Protected WDM transmission link, 380 km
Rural area 10km NW of Hudiksvall

~185 private houses passed

Initial take-rate > 50%

End-user installation fee SEK4990

Monthly fee: SEK200

Excavation to branching point by the end-user (10-500 m)

SM fibre

Up to 3km from house to node location

Fibre blowing distance: 55m - 1km
Multicast TV + Unicast VoD (typically 5Mbps/channel)

~ 20 TV channels and > 10 movies available
Internet traffic

Monthly: Max In: 19.6 Mb/s
Average In: 3.6 Mb/s
Max Out: 20.5 Mb/s
Average Out: 6.3 Mb/s
Current Test Targets: Access related

- Security & Robustness
- Scalability
- Multicast in L2 & L3 for AON
- QoS
- Interoperability
- Traffic shaping (Rate limiting and priority etc)
- Interfaces between transport layers (e.g. fibre/WDM/TDM/Carrier grade Ethernet/IP)
- Interfaces towards metro network & trunk (Nobel, Muppet)
- End-user feedback & behaviour
The Testbed in EU Projects

Multi Service Access Everywhere

Next generation Optical network for Broadband in Europe

Multi-Partner European Test Beds for Research Networking
In Summary

• Swedish Broadband islands & Open Networks
• Acreo Broadband Project
• The Swedish Broadband Testbed:
  • Triple-Play
  • End-to-End
  • Access, Metro and Trunk NW
  • Deployments of access areas
  • Test Targets
  • Partnership in EU projects