Internet-2 in Israel

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What we will discuss

• Philosophy
• National infrastructure
• International infrastructure
• Industry and Internet-2
• Applications
Purpose

• To provide Israeli researchers with Quality of Service (Qos) and Class of Service (CoS) via the Internet, in order to conduct their R&D activities with colleagues in Europe and the USA

• Not intended to speed up standard Internet access
NGI vs Internet-2

- NGI - Next Generation Internet
  - Go faster
    - optical switching
    - OC-3072 - 160Gb/sec links

- Internet-2
  - Go smarter
    - Quality of Service
    - Class of Service - DiffServ
Internet-1 vs Internet-2

- **Internet-1**
  - socialist philosophy
  - everyone gets an equal share of the bandwidth

- **Internet-2**
  - capitalist philosophy
  - those who pay extra get a better level of service
National overview

• Internet-2 uses the Bezeq Magnet network (ATM)
  – OC-3 (155Mb/sec) connections to all 8 universities

• Internet-2 uses as backup the Bezeqcom network (ATM)
  – OC-3 connections to all universities with 10Mb/sec UBR connections
National overview

• Connection of both Bezeq ATM networks to each university via donated ATM switches (FORE)
  – unique solution - not known as available elsewhere

• Each ATM switch interconnects to the current campus Cisco router, thereby providing IP services
Typical University connection

Cisco router

FORE ATM switch

Campus ATM switch

Bezeqcom

Magnet

10Mb

155Mb/sec
National Overview

• To provide native ATM services, campuses will be able to connect their existing ATM infrastructure directly to the new ATM edge switch.

• Machba (IUCC) charged by government decision to be the implementor and operator.
Industry

• Industry (R&D units only) will be able to connect via either E1 (2Mb/sec) or E3 (34Mb/sec) to the TAU GigaPOP
  – technology of connection dependent on what Bezeq can supply - Sifranet, Frame Relay or ATM
  – minimum access speed - 2Mb/sec

• Connectivity only via the TAU GigaPOP
Industry connection
International connectivity

• International tender closed Nov 16, 1998
• Carriers: Bezeq, Barak, GoldenLines, Israsat, Israsrv, Teleglobe
• Looking for T3 (45+Mb/sec) to USA via satellite
  – Chicago - StarTap - interconnection point for all foreign countries to Internet-2
  – Canada, Singapore, Taiwan, Russia, France, Korea, Netherlands, Japan
• Looking for E3 (34Mb/sec) to Europe
International connectivity to Europe

• Connection in Europe is to QUANTUM network
  – QUANTUM - 16 NRNs (National Research Network) in Europe
  – Q-Med - Mediterranean consortium of Israel, Cyprus, Greece, Italy and Dante
  – Partially funded by EC (40%)
  – Israel connects to London via Golden Lines - 34Mb/sec - due to price
Solution

- Quantum
- London
- 10Mb/sec ATM
- E3 - MED1 - FLAG
- Satellite - T3
- Israel BIU
- Israel TAU

Chicago
Satellite connectivity to USA

• Israsat/Gilat won tender
• IUCC purchased a full transponder
  – Mhz and not Mb
• Able to reach OC-3 speeds via transponder
Results

• Europe RTT: 76ms

• Chicago RTT: 560ms
Industry and international access

• Global Internet contains 78,000 networks
• QUANTUM contains about 2,100 networks of the NRN’s
  – http://www.dante.net/ten-155/
• Unlimited access to QUANTUM sites at 34Mb/sec
• Internet-2 is more complex
• StarTap has many US government high speed networks interconnected
Industry and international access

• Examples of StarTap peers
  – vBNS, ESNET, Abilene (Internet-2), MREN, DREN, NASAnet

• Total StarTap peers (out of 78,000) is also about 2000
  – http://www.startap.net/
  – http://www.internet2.edu/
How much of the Internet?

- 2100 from Europe
- 2000 from USA
- \( \frac{4100}{78000} = 5.7\% \) of the Internet is accessible via Internet-2
Industry and international access

• Not meant to replace Internet-1 (commodity) access
  – R&D units will still be required to maintain their Internet-1 access lines
  – Machba will be using a small 8Mb/sec pipe to run Internet-1 traffic for itself
• Will give up to 45Mb/sec throughput for high-speed R&D projects
Four things needed to connect (that cost money)

1) Connection from Bezeq - via ATM
   4-34 Mb/sec
2) Cisco router to handle multi-homed connection
   – BGP-4 & NAT
3) Possible: system integrator
4) Connection to Machba - free till July 2000+
The University Internet-2 Topology for 1999

Legend:
Bezeqcom links: 10Mb/sec
Magnet links: 155Mb/sec
GigaPOP
Applications

• The toughest part of the entire network
• Tele-immersion
• Tele-medicine
• Tele-learning
• Digital libraries
• Terabyte database replication
More applications

• Remote instrumentation
  – telescopes, microscopes, robots, CAT, MRI

• Video conferencing
  – Example: CERN’s Virtual Room Videoconferencing System
    – http://vrvs.cern.ch
Timing

• National ATM upgrade completed by end of May 1999
  – Magnet upgrade by end of June 1999
• QUANTUM line installed May 12, 1999
  – operational May 21, 1999
• StarTap line installed July 23, 1999
• Industry connections - 1st half of 2000
Management structure

- Government decision from June 9, 1998 to set up Internet-2

- Committee:
  - co-chairs of the ministry
  - members include:
    - Ministry of Communications
    - Ministry of Science
    - Ministry of Economics
    - Ministry of Finance
    - Head of the cabinet
    - Government's Deputy Head of the treasury
Management - continued

- Many observers from: Ministry of Science, Ministry of Communications
  - handles all tenders and all day to day policy

- is mandated to handle all operational issues of setting up and running the network
Financials

- $10M/yr for a period of 4 years
  - 90% on telecommunications services
  - 10% equipment and manpower
  - reduced to about $8M/yr

- Financial split:
  - 42% - Universities
  - 35% - Ministry of Science
  - 13% - Chief Scientist
  - 10% - Ministry of Finance
Policy

• Policy as to who/what qualifies as R&D industry
  – will be based on a per project basis
  – requests will have to be sent to the המנהלה
• Policy has not been set how much connection costs will be for industry
  – the המנהלה will set price levels
  – initially free till July 2000 (perhaps even longer)
More?

• http://www.internet-2.org.il
  – FAQ, news, maps, Authorized Use Policy, etc.