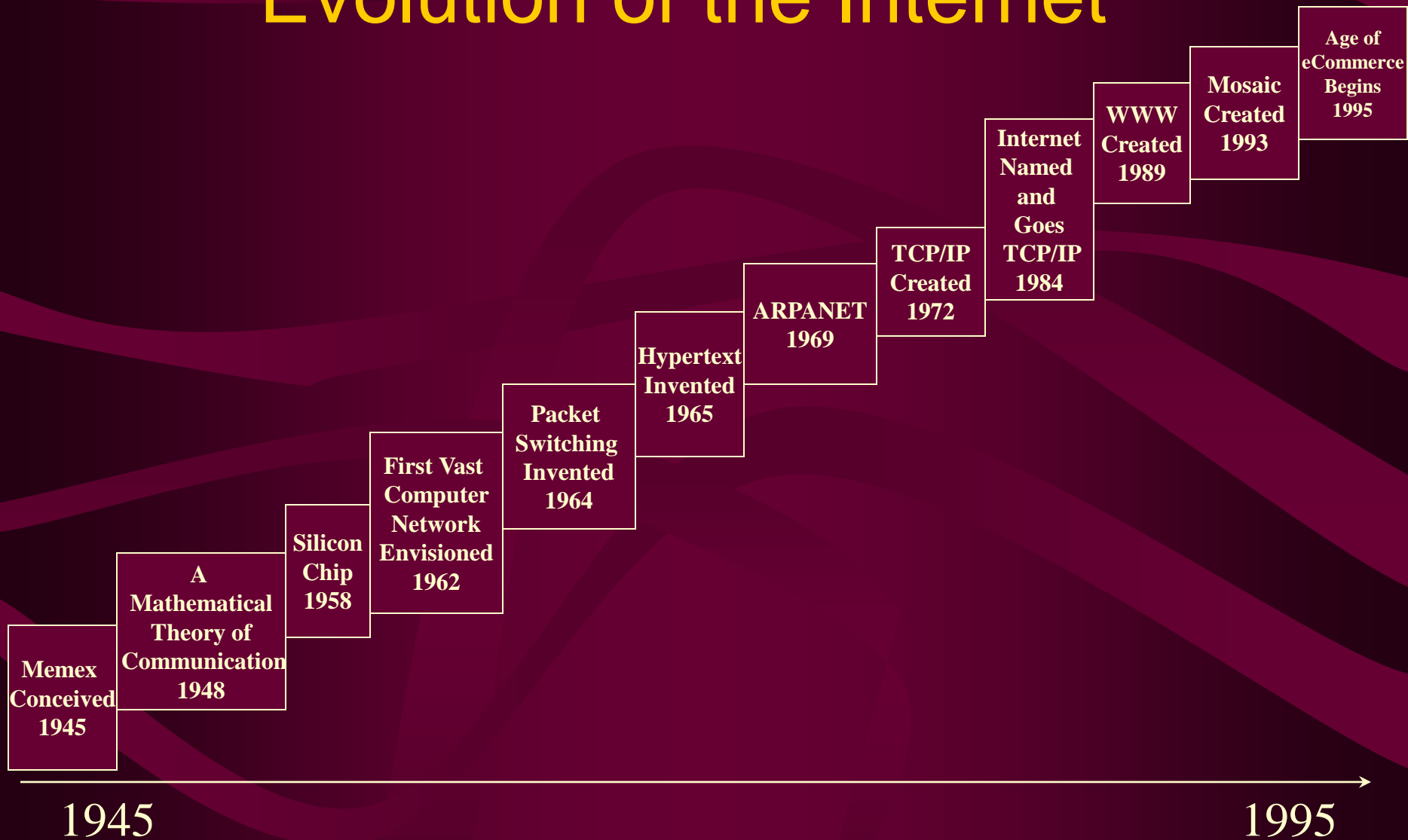# Internet/Broadband-an overview

Faculty of Network Planning

ALTTC, Ghaziabad.

Brief History of the Internet

❖ 1968 - DARPA (Defense Advanced Research Projects Agency) contracts with BBN (Bolt, Beranek & Newman) to create ARPAnet

❖ 1970 - First five nodes:
  - UCLA
  - Stanford
  - UC Santa Barbara
  - U of Utah, and
  - BBN

❖ 1974 - TCP specification by Vint Cerf

❖ 1984 – On January 1, the Internet with its 1000 hosts converts en masse to using TCP/IP for its messaging

Evolution of the Internet

Memex Conceived 1945

A Mathematical Theory of Communication 1948

Silicon Chip 1958

First Vast Computer Network Envisioned 1962

Packet Switching Invented 1964

Hypertext Invented 1965

ARPANET 1969

TCP/IP Created 1972

Internet Named and Goes TCP/IP 1984

WWW Created 1989

Mosaic Created 1993

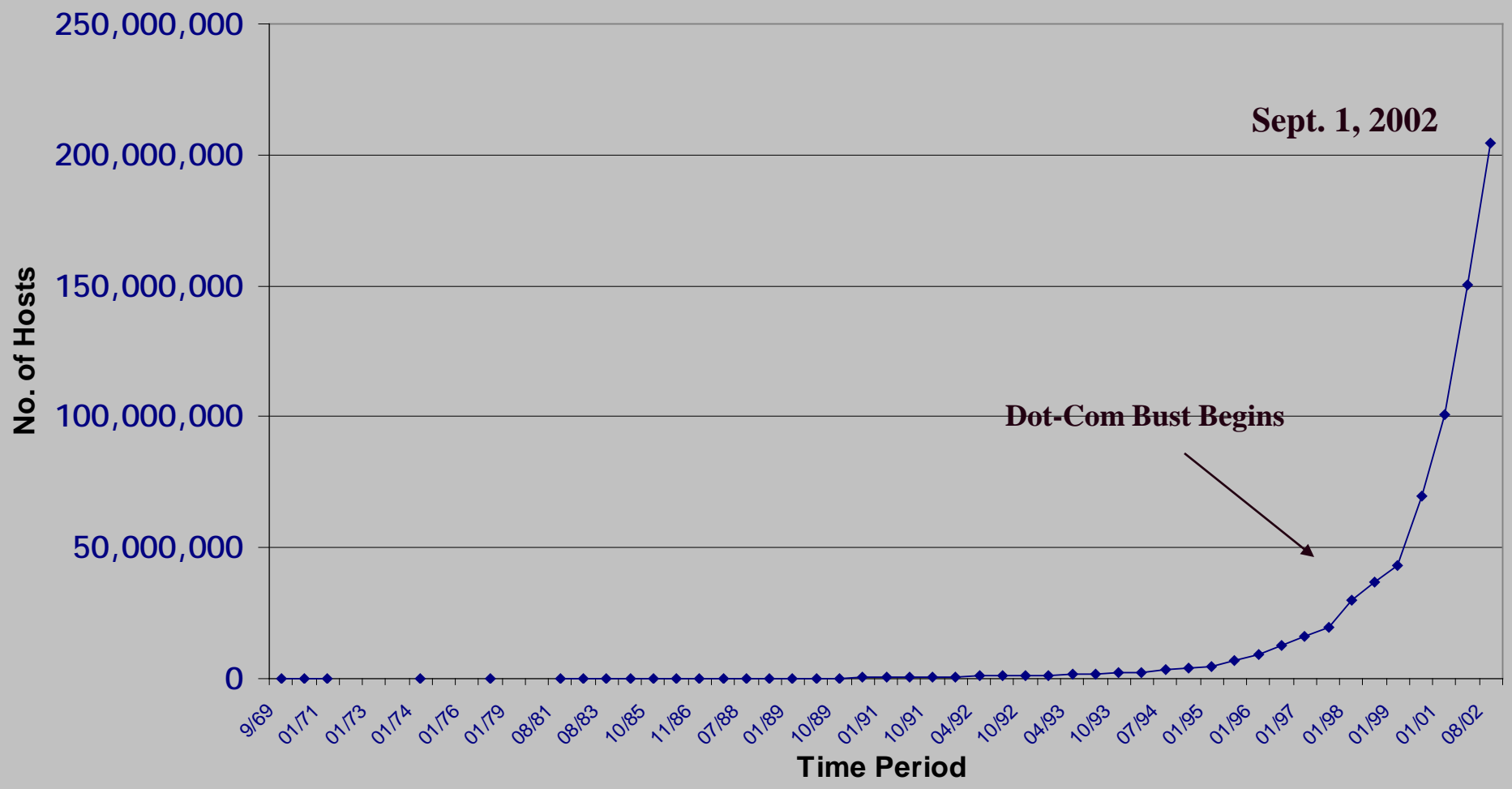**Age of eCommerce Begins 1995**

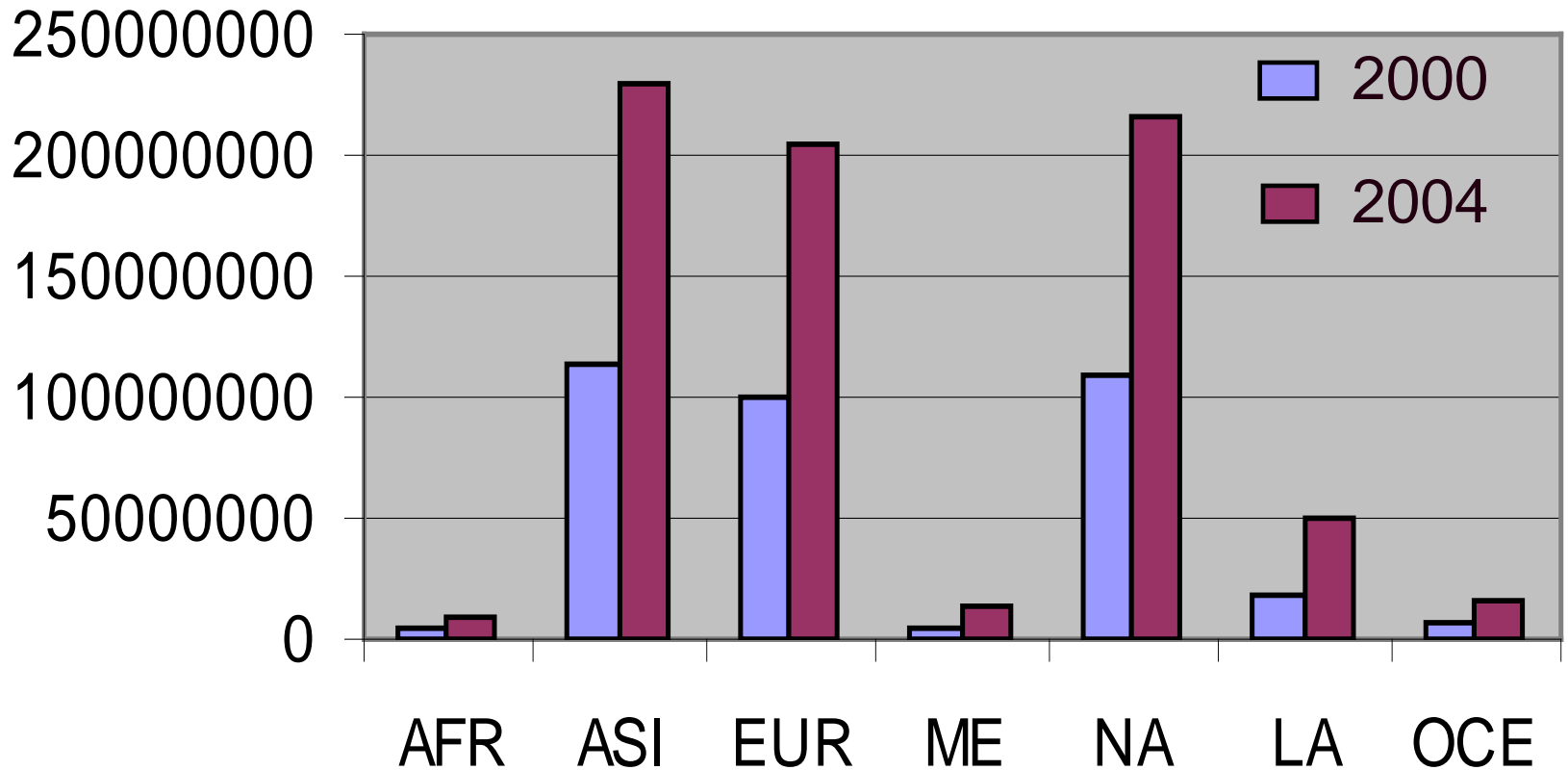1945   1995

Internet Growth Trends

- ❖ 1977: 111 hosts on Internet
- ❖ 1981: 213 hosts
- ❖ 1983: 562 hosts
- ❖ 1984: 1,000 hosts
- ❖ 1986: 5,000 hosts
- ❖ 1987: 10,000 hosts
- ❖ 1989: 100,000 hosts
- ❖ 1992: 1,000,000 hosts
- ❖ 2001: 150 – 175 million hosts
- ❖ 2002: over 200 million hosts
- ❖ By 2010, about 80% of the planet will be on the Internet
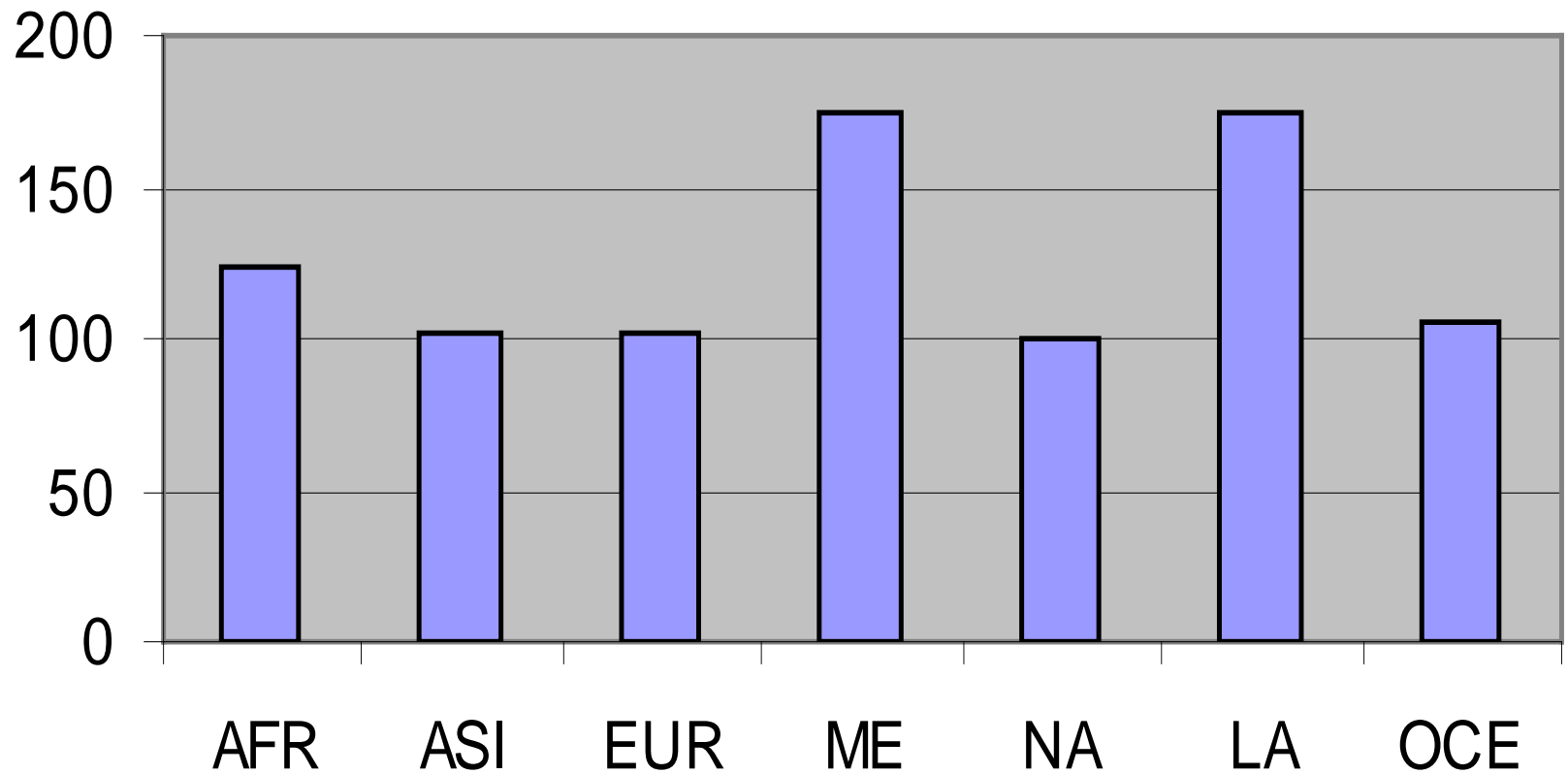
Growth of Internet Hosts *
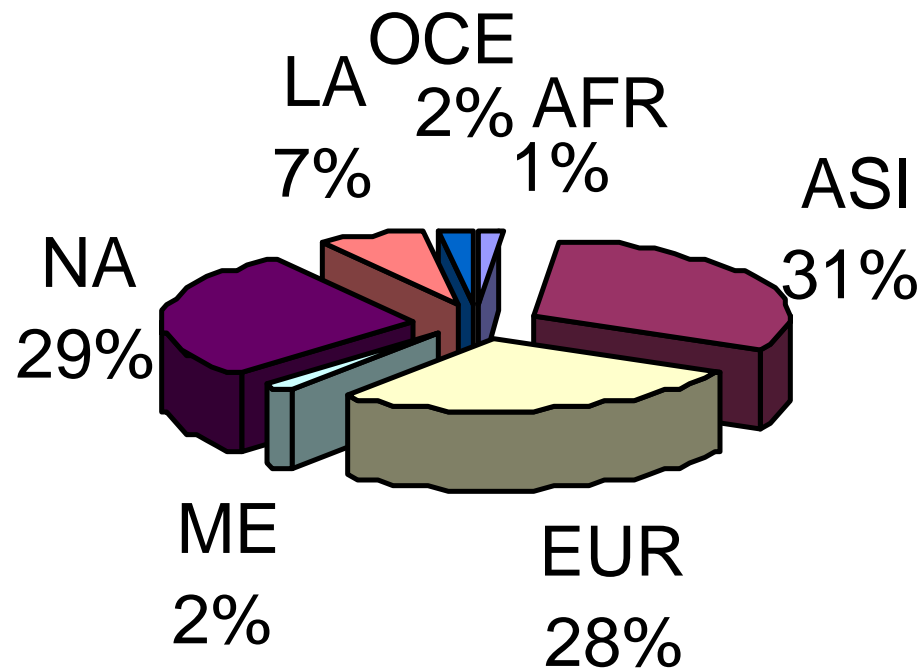# Sept. 1969 - Sept. 2002
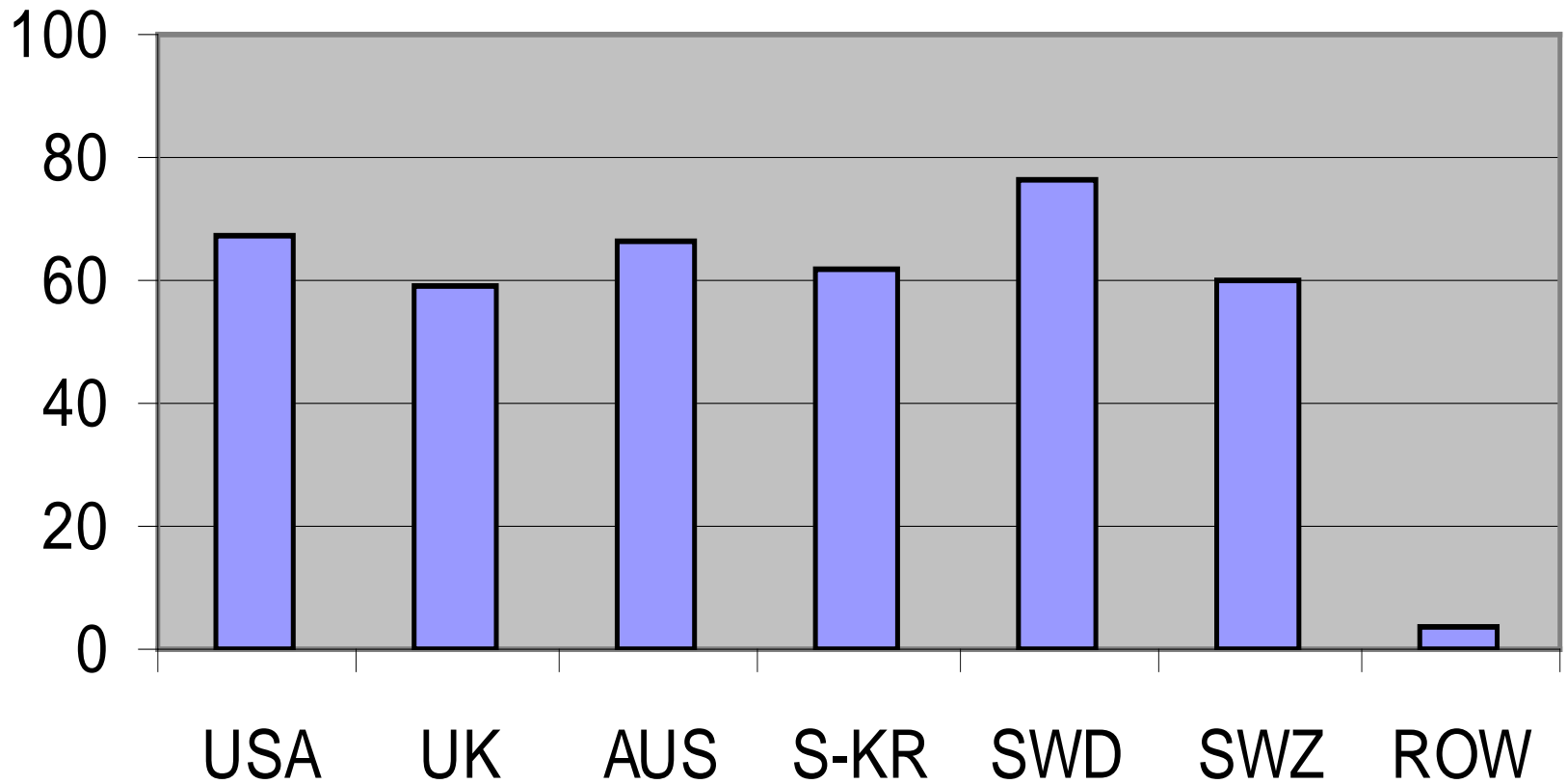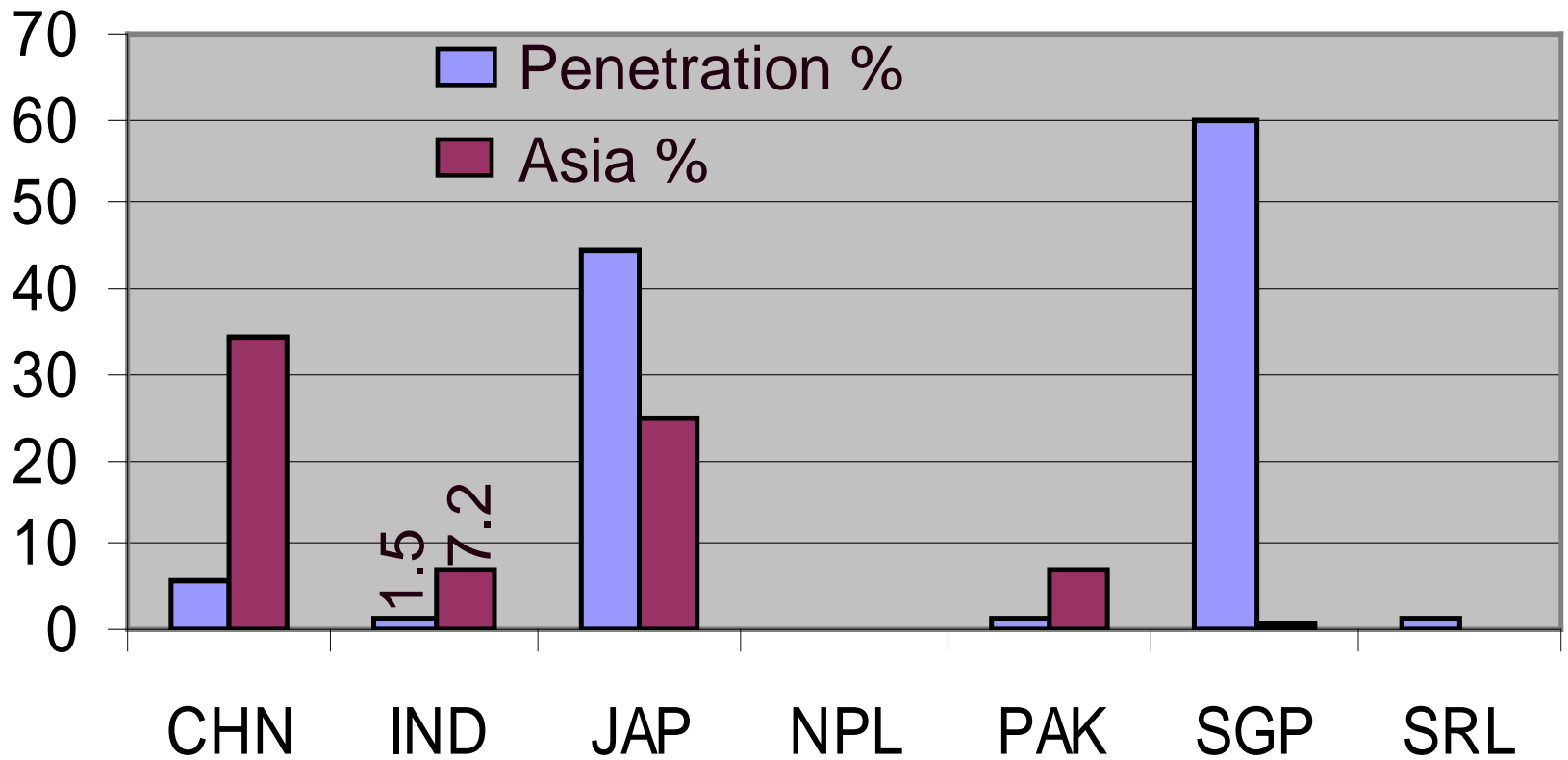
Internet Users-Region Wise

Growth Rate % (2000-2004)

Internet Access-World Share

Internet Penetration %

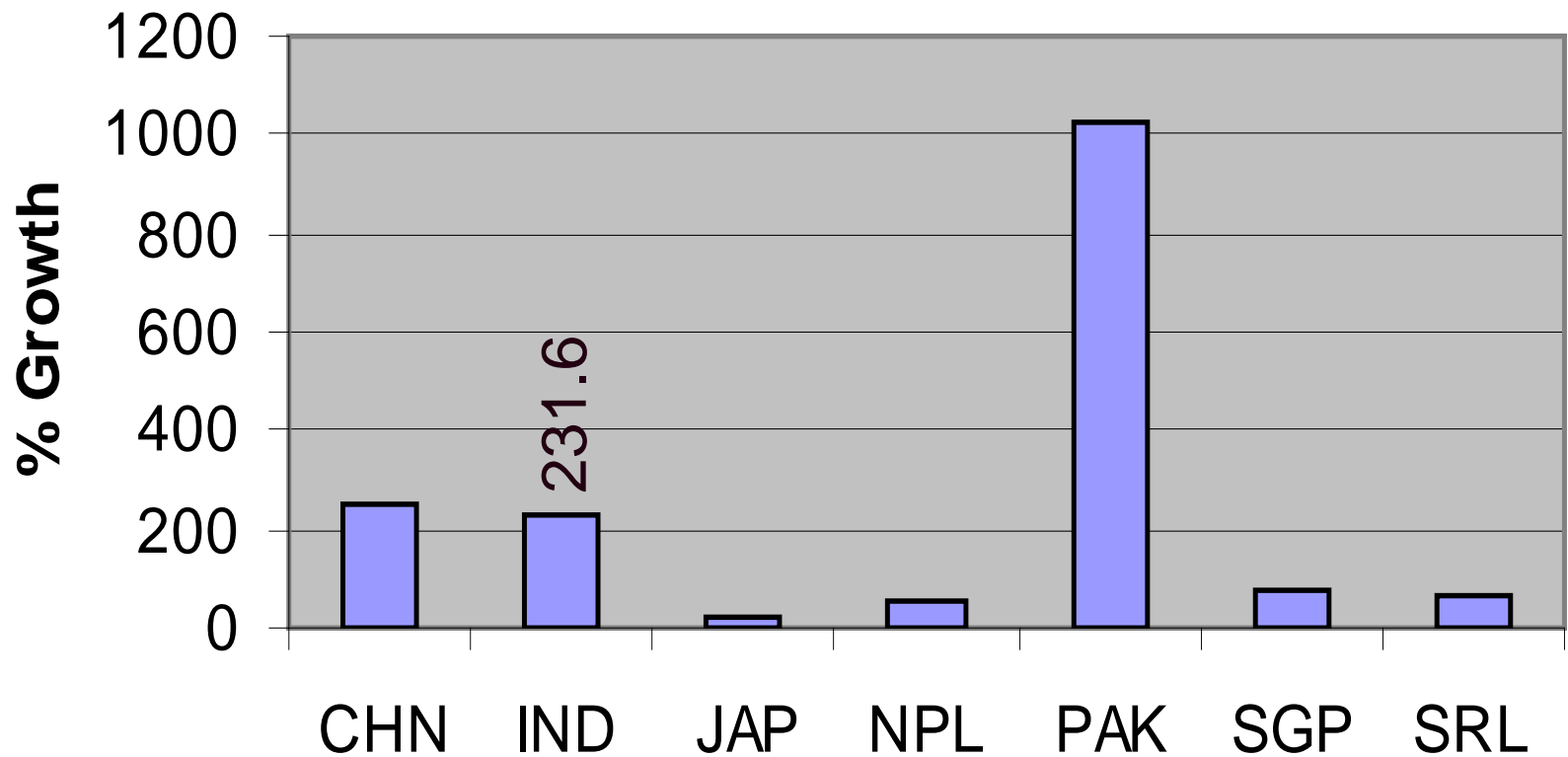# Internet (Penetration% - Asia%)

Internet Users-2000 & 2004
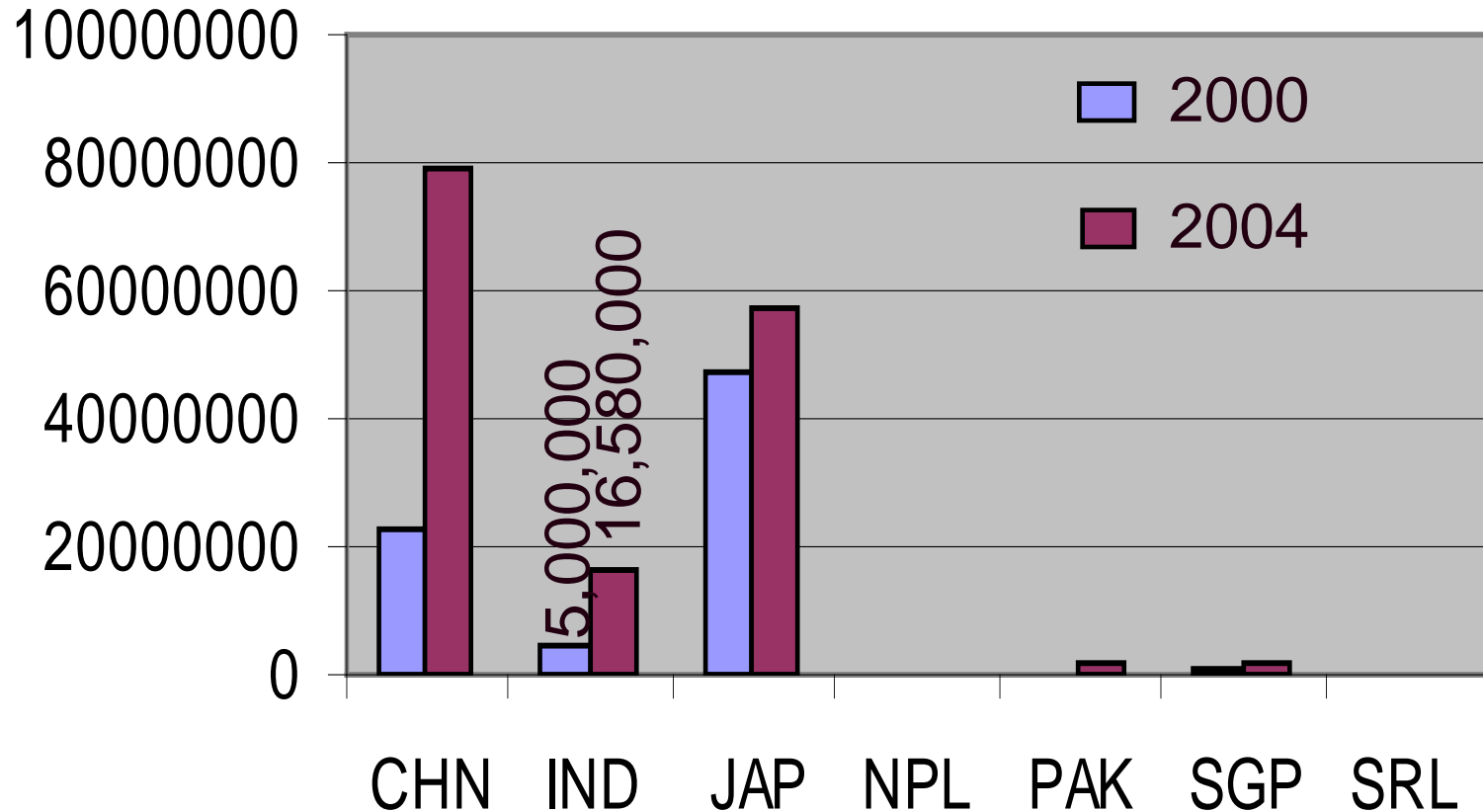
Growth Rate % (2000-2004)

Broadband Policy-2004

❖ Broadband connectivity as defined in Broadband policy-2004 is an "always on" data connection that is able to support interactive services including Internet access and has the capability of minimum download speed of 256 kbps to an individual subscriber from the POP of the service provider

Broadband Policy-2004

❖ Salient Features:

- De-licensing of 2.40-2.48 Ghz band for outdoor low output

- Enabling VSAT operators to transmit data up to 2 Mbps (At present 512 Kbps in CUG domestic network)

- Allowing DTH operators to give one way Internet facility. For bi-directional VSAT license will be required.

- BSNL & MTNL to utilise copper and allowing them to enter into arrangement with private players to utilise copper and content creation

Broadband Services

❖ High speed Internet Access

❖ Video-on-Demand

❖ Interactive Games

❖ Share market dealing & personal banking

❖ News, travel & leisure information

❖ Music/Movie Download

❖ Chatrooms & newsgroups

Broadband Services

- ❖ E-mail & instant messaging
- ❖ Personal websites and online magazines
- ❖ Educational materials & research resources
- ❖ Tele-medicine
- ❖ Work at home
- ❖ Internet radio & webcast concerts

Broadband Users

❖ There are about 100 million Broadband subscriber worldwide and are increasing by about 2,00,000 every month

- Asia Pacific – 45%
- USA – 30%
- Europe, Middle East & Africa – 25%

Broadband Penetration %
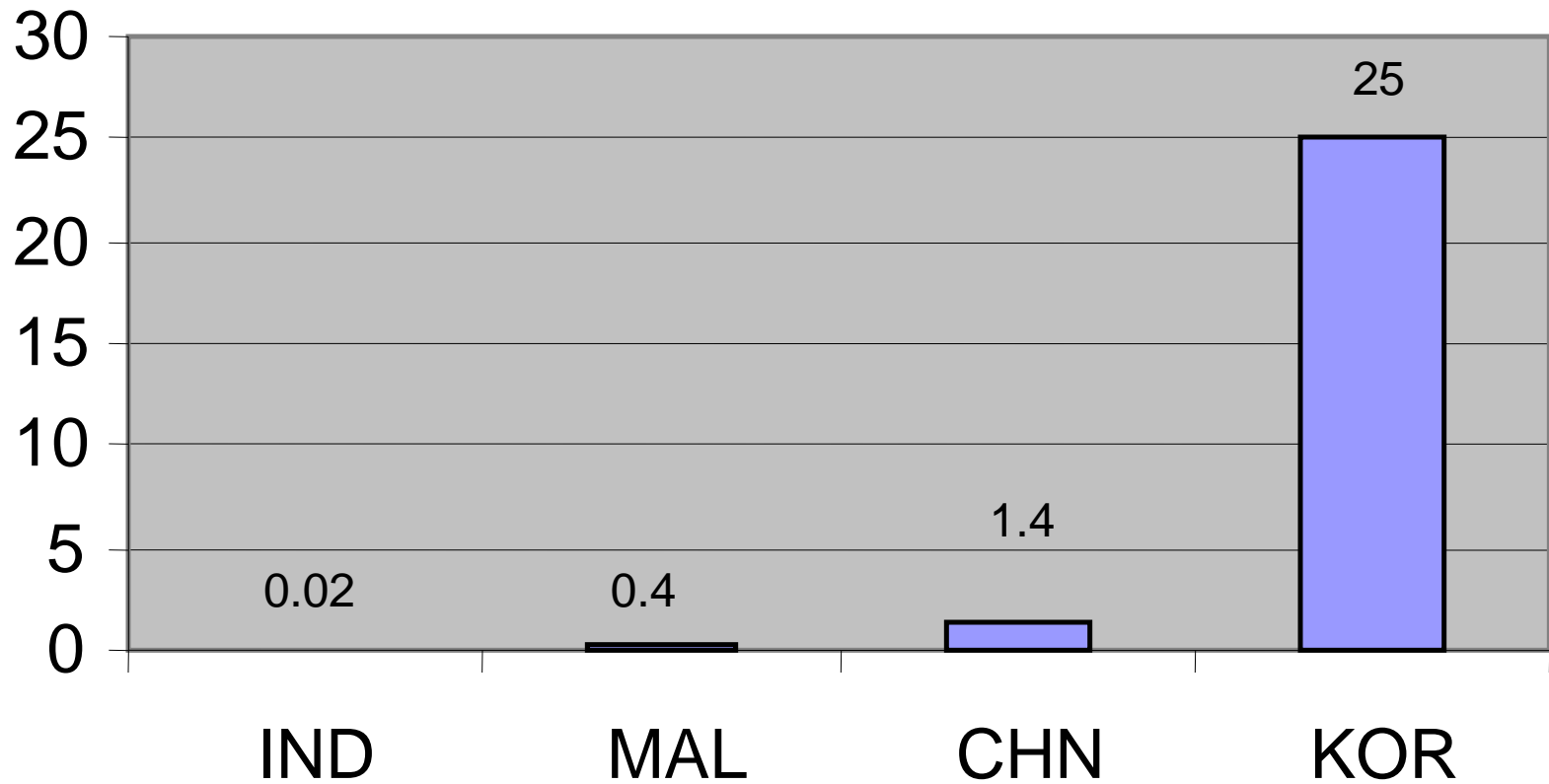
Internet v Broadband Sub's in India
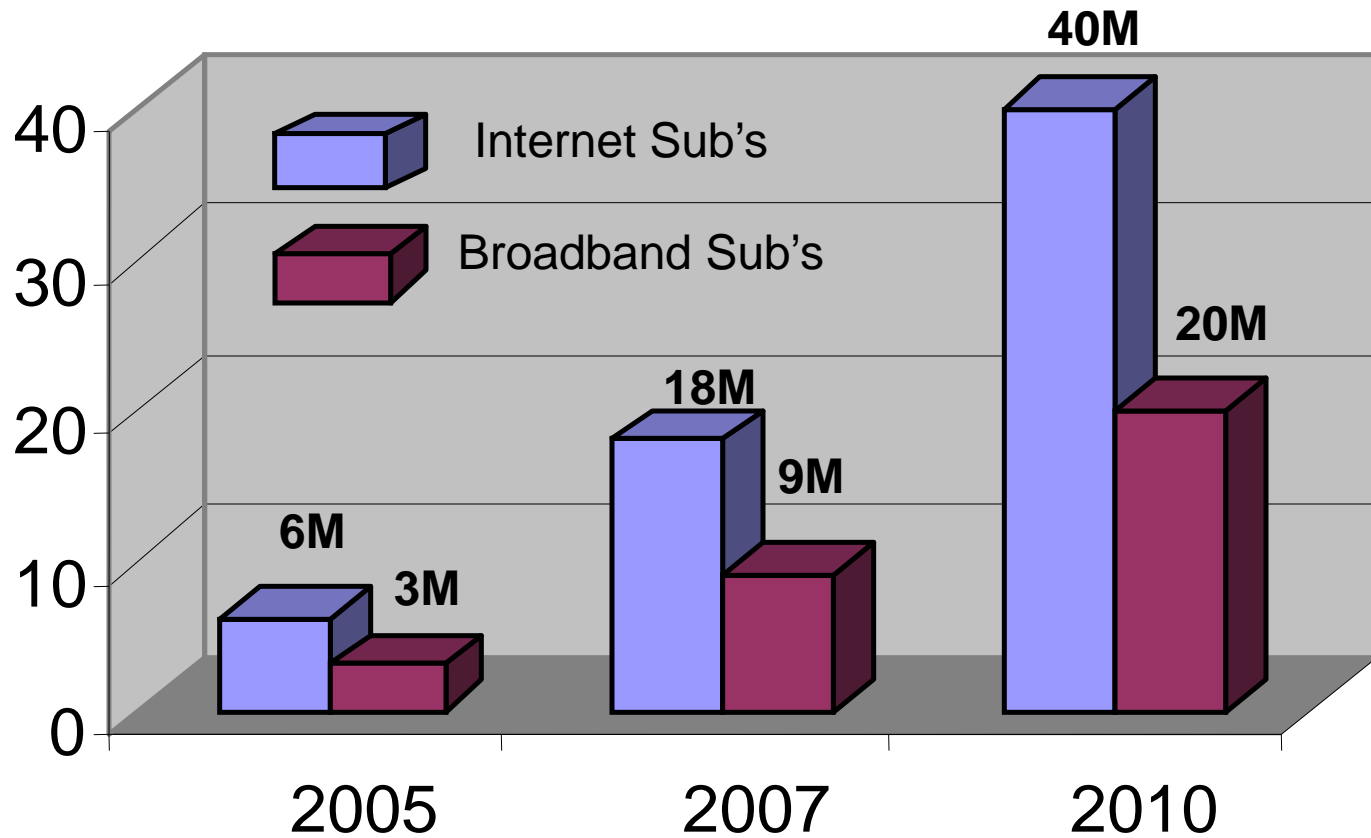
Broadband Technologies

Broadband Technologies

Wireless

Wireline

Wireless	Wireline
3G Mobile	DSL (Digital Sub's Line)
Wi-Fi (Wireless Fidelity)	Cable Modem
WiMAX	Optical Fibre Technologies
LMDS & MMDS	PLC (Power Line Communication)
FSO (Free Space Optics)	
Satellite	

Wireless LAN Standards

Standard	Data Rate (Max.)	Distance	Frequency
IEEE 802.11a	54 Mbps	50 Meters	5.0 GHz
IEEE 802.11b (Wi-Fi)	11 Mbps	100 Meters	2.4 GHz
IEEE 802.11g (Backward compatiable with 802.11b)	54 Mbps	100 Meters	2.4 GHz
HiperLAN2 (ETSI Standard)	54 Mbps	50 Meters	5.0 GHz

Broadband Wireless Technologies

❖ 3G Mobile

- Based on WCDMA & CDMA

- Supports data rates

  ▪ 144 kbps for outdoor mobile environment

  ▪ 384 kbps in low mobility environment

  ▪ 2 mbps in indoor environment

❖ Wi-Fi (Wireless Fidelity)

- Wireless LAN with Broadband option

- Most widely used LAN standard (IEEE 802.11b)

- Uses 2.4 Ghz band & delivers 11 mbps of data over distances of 100 meters

Broadband Wireless Technologies

❖ WiMAX-Worldwide interoperability for Microwave Access

- IEEE 802.16 standard defines the Wireless MAN air interface specification

- Complements Wi-Fi by providing wireless broadband backhaul to 802.11 hotspots and last mile

- Service area range of 50 kms

- Provides shared data rates up to 70 mbps in 2-11 Ghz band

Broadband Wireless Technologies

❖ **LMDS & MMDS**

- Provides point-to-multipoint two way broadband service

- LMDS-Local Multipoint Distribution System

  - Operates in various bands such as 10.5 Ghz (8 kms) and 26 & 28 Ghz (3 kms)

  - Provides various interfaces at user end like E1, 4xE1, 10/100 BaseT Ethernet etc.

- MMDS-Multichannel Multipoint Distribution System

  - Operates in 2-3 Ghz (20-40 kms radius)

  - Provides high speed data rates upto 10 Mbps

Broadband Wireless Technologies

❖ FSO (Free Space Optics)

- Also known as FSP (Free Space Photonics) or Optical wireless
- Enables optical transmission of data through open space at near infrared wavelengths (Tera Hz)
- Offers 10 Mbps-2 Gbps over few kilometers

Broadband Wireless Technologies

❖ Satellite

- Uses VSAT (very Small Aperture Terminals) & DTH (Direct To Home) terminals
- C, Ku & Ka bands are used for services involving fixed terminals
- L band is used for mobile services
- Offers data rates 9.6 Kbps for a handheld terminal and 60 Mbps for a fixed VSAT terminal
- Future will support up to 155 Mbps

Broadband Wireline Technologies

❖ DSL-Digital Subscriber line

- Technology for high bandwidth to home and small businesses over ordinary copper telephone lines

- Achievable data rate depends on the distance and cable impairments

DSL Technologies

Technology	ITU-T Standard	Distance	Downstream Data Rate	Upstream Data Rate
ADSL	G-992.1	3.5 Kms	8 Mbps	640 Kbps
Splitterless ADSL	G-992.2	4.0 Kms	1.5 Mbps	512 Kbps
ADSL-Extended Bandwidth	G-992.5	1.5 Kms	16 Mbps	100 Kbps
2 Wire High-Speed DSL	G-991.2	3.0 Kms	2312 Kbps	2312 Kbps
4 Wire High-Speed DSL	G-991.2	3.0 Kms	4624 Kbps	4624 Kbps
Very High-speed DSL	G-993.1	300 Mts	52 Mbps	6-26 Mbps
Very High-speed DSL	G-993.1	700 Mts	26 Mbps	26 Mbps

Broadband Wireline Technologies

❖ Cable Modem

- Allows high speed access to the Internet via a cable television network

- Uses cable modem technology through the use of Set-Top-Box at the customer premises

Broadband Wireline Technologies

❖ Optical Fibre Technologies

- Optical fibre with its unmatched capacity to carry enormous amount of information over unlimited distances can be deployed for broadband access in:
  - PON (Passive Optical Network)
  - FTTH (Fibre-To-The-Home)
  - FTTC (Fibre-To-The-Curb)
  - HFC (Hybrid Fibre Co-axial)

Broadband Wireline Technologies

❖ PLC-Power Line Communication

- Also referred as BPL (Broadband over Power Lines)

- Can provide broadband Internet access through ordinary power lines

- Most extensive networks in the world, surpassing the phone network as well as the cable network in size and coverage

- Suffers from technological challenges due to interference with noise, radio and television etc.

Thanks