Global Internet Connectivity:
A critical success factor in the information economy

Dr Tim Kelly,
International Telecommunication Union,
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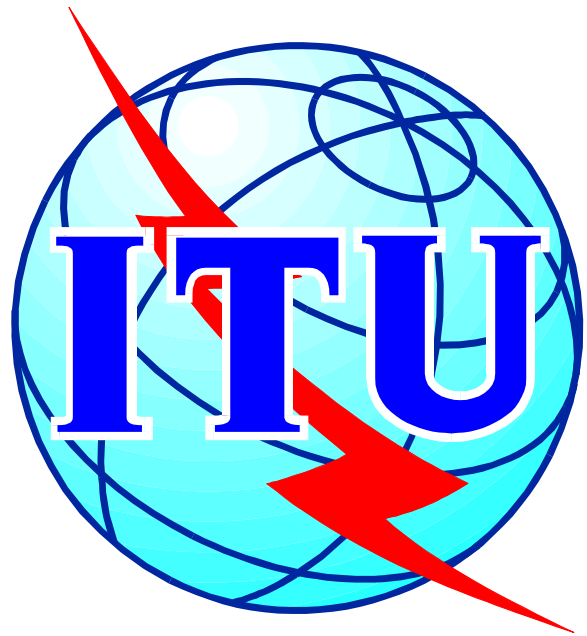
2001

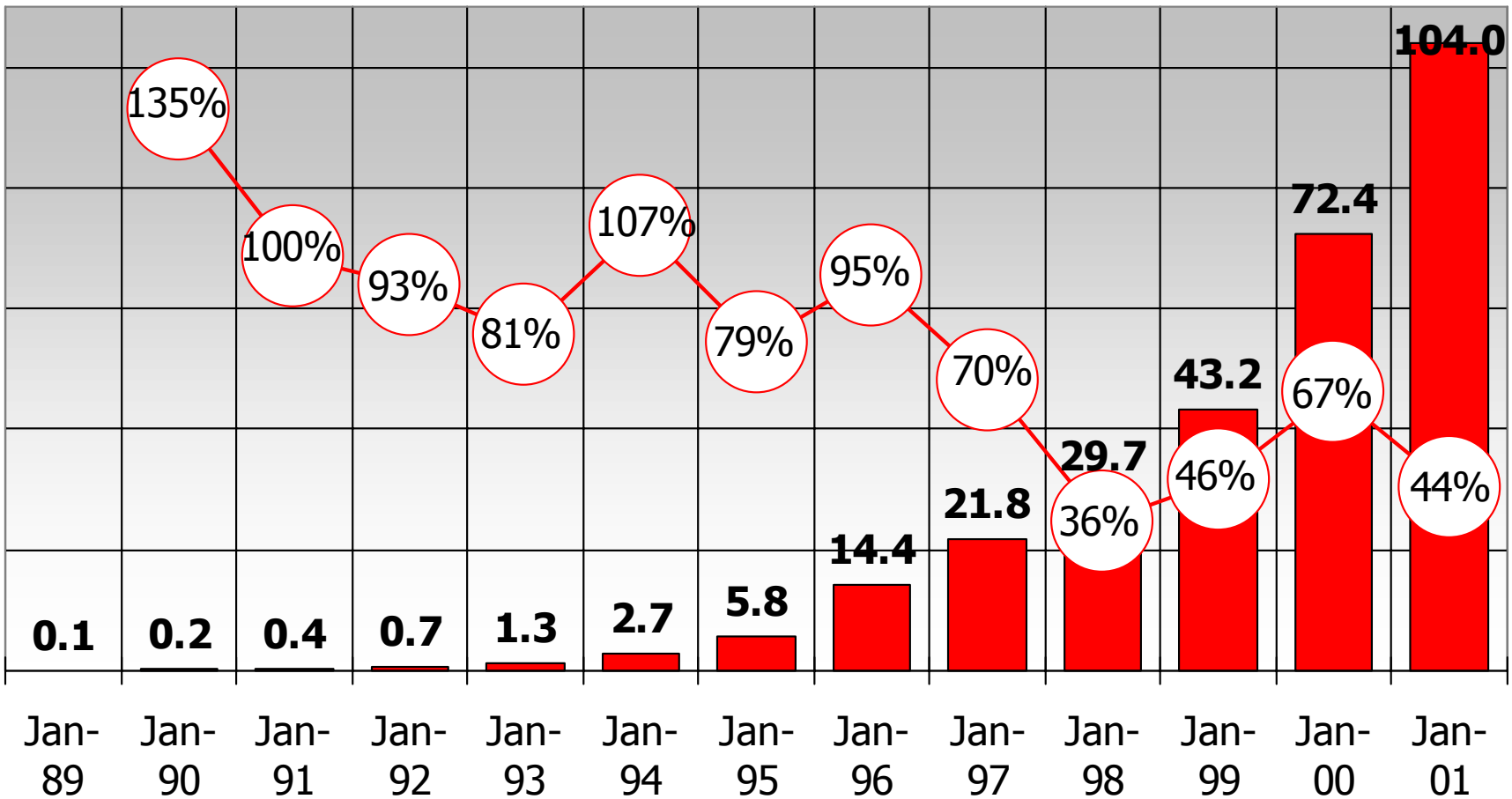


The views expressed in this paper are those of the author and may not necessarily reflect the opinions of the ITU or its membership. Tim Kelly can be contacted at tim.kelly@itu.int.

Agenda

- Connectivity and reach
  - ⇨ Internet and the digital divide
  - ⇨ Some international comparisons
  - ⇨ Some common myths
  - ⇨ “The Internet latecomer” problem
- Connectivity and richness
  - ⇨ Broadband deployment
  - ⇨ Barriers to broadband deployment
- Connectivity and economic opportunity

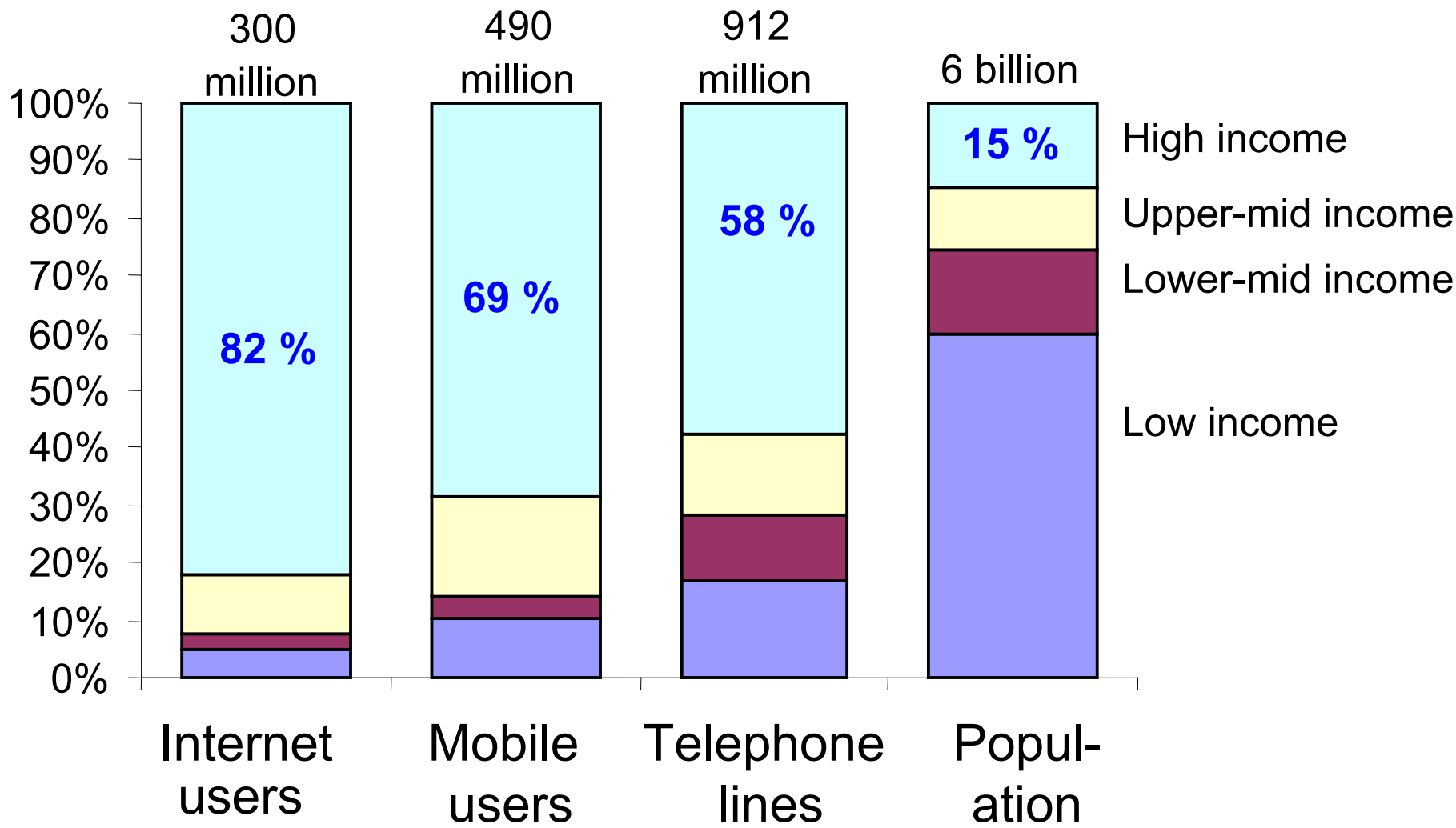
Number of Internet host computers, in millions, and annual growth in %



Source: ITU, adapted from Internet Software Consortium <www.isc.org>.

Digital divide = Infrastructure divide

User distribution, by income group, Jan 2000

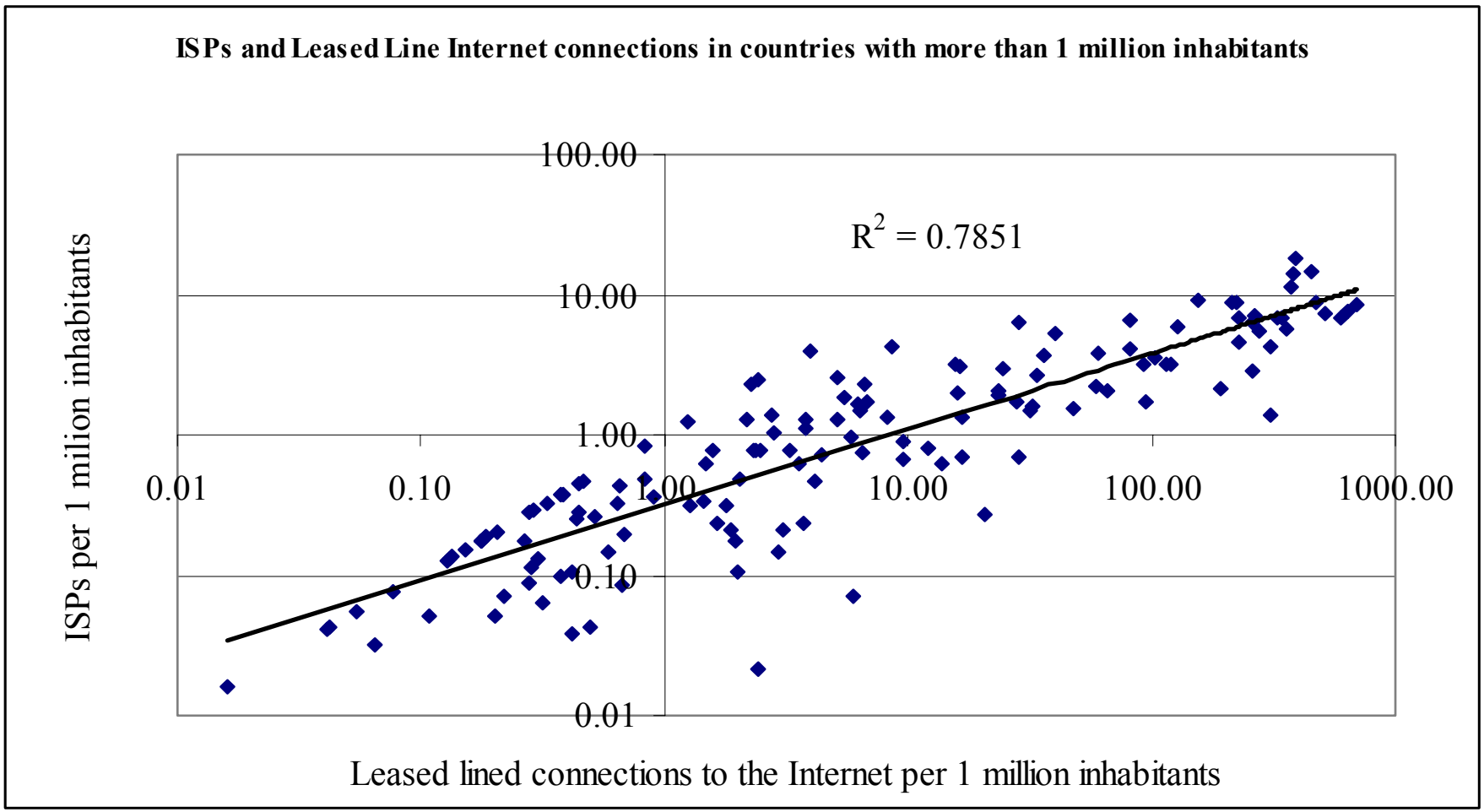


Source: ITU World Telecommunication Indicators Database.

Barriers to connectivity

- **Regulatory barriers**
  - ⇨ 46 countries permit only one ISP
  - ⇨ A significant minority of countries restrict access to international IP bandwidth to a single IAP
  - ⇨ A majority of countries place limitations on use of international IP bandwidth for voice over IP
- **Economic barriers**
  - ⇨ High costs for int'l leased lines in some markets, esp. those without infrastructure competition
  - ⇨ For countries with only low levels of IP demand, unit bandwidth costs are higher than for countries with higher levels of demand (economies of scale)
  - ⇨ Many countries are not served by international cables (e.g., landlocked countries, small islands)

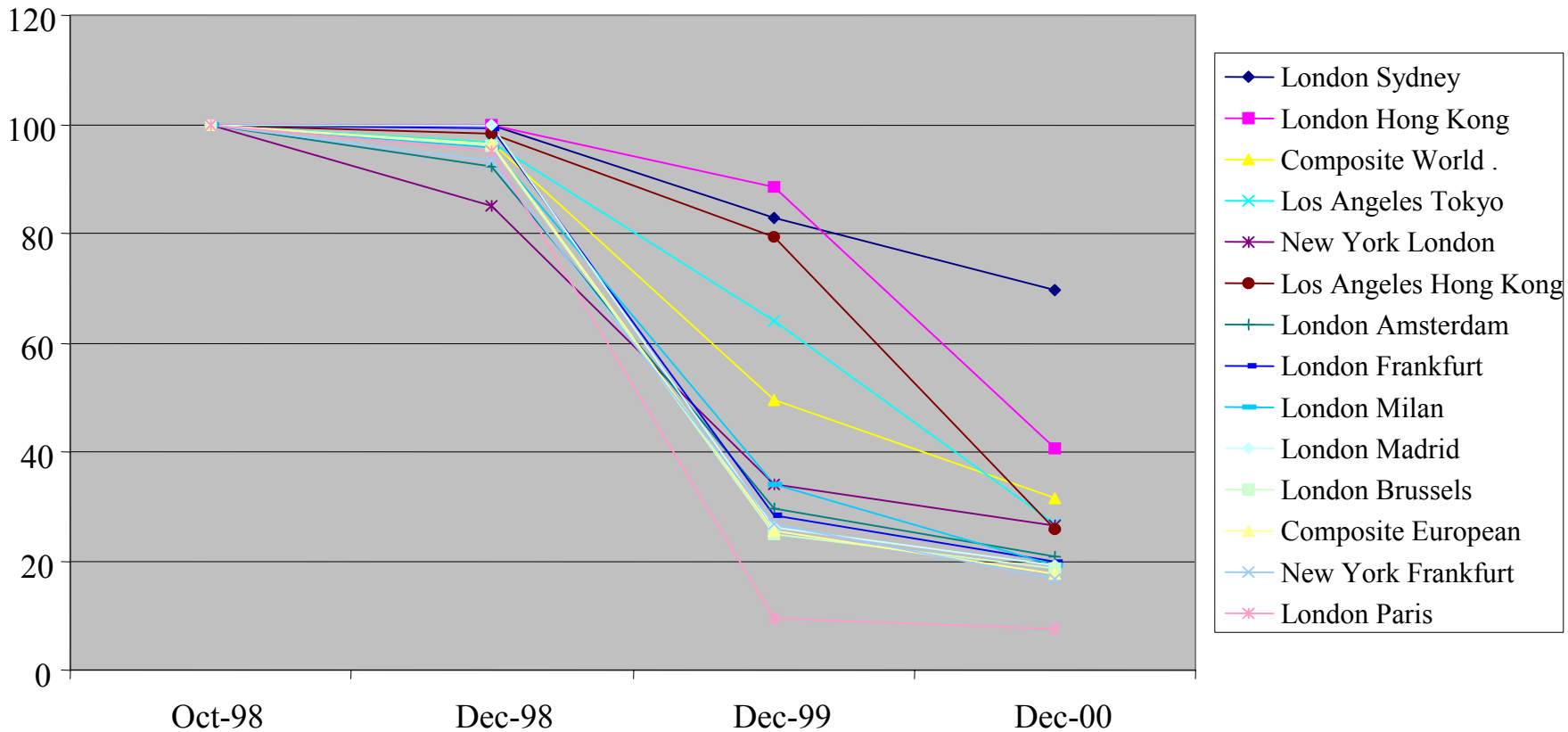
More connectivity = more ISPs = more connectivity



Source: OECD, adapted from Netcraft.

Market liberalisation and investment brings down prices

Band-X: Bandwidth Price Index (2Mbit/s). Oct '98 =100



Source: Band-X.

Connectivity: Myths and misses

- The total bandwidth available in the United States is increasing three-fold every year. Therefore there will soon be universal connectivity.
- Some 264 economies have Internet access. Therefore the whole world is connected.
- Bandwidth across the Atlantic will soon amount to more than 1 Mbit/s for every person in North America and Europe. Therefore usage will soon be too cheap to meter

Connectivity: Myths and misses

WRONG!

Connectivity is about distribution, not about total quantity

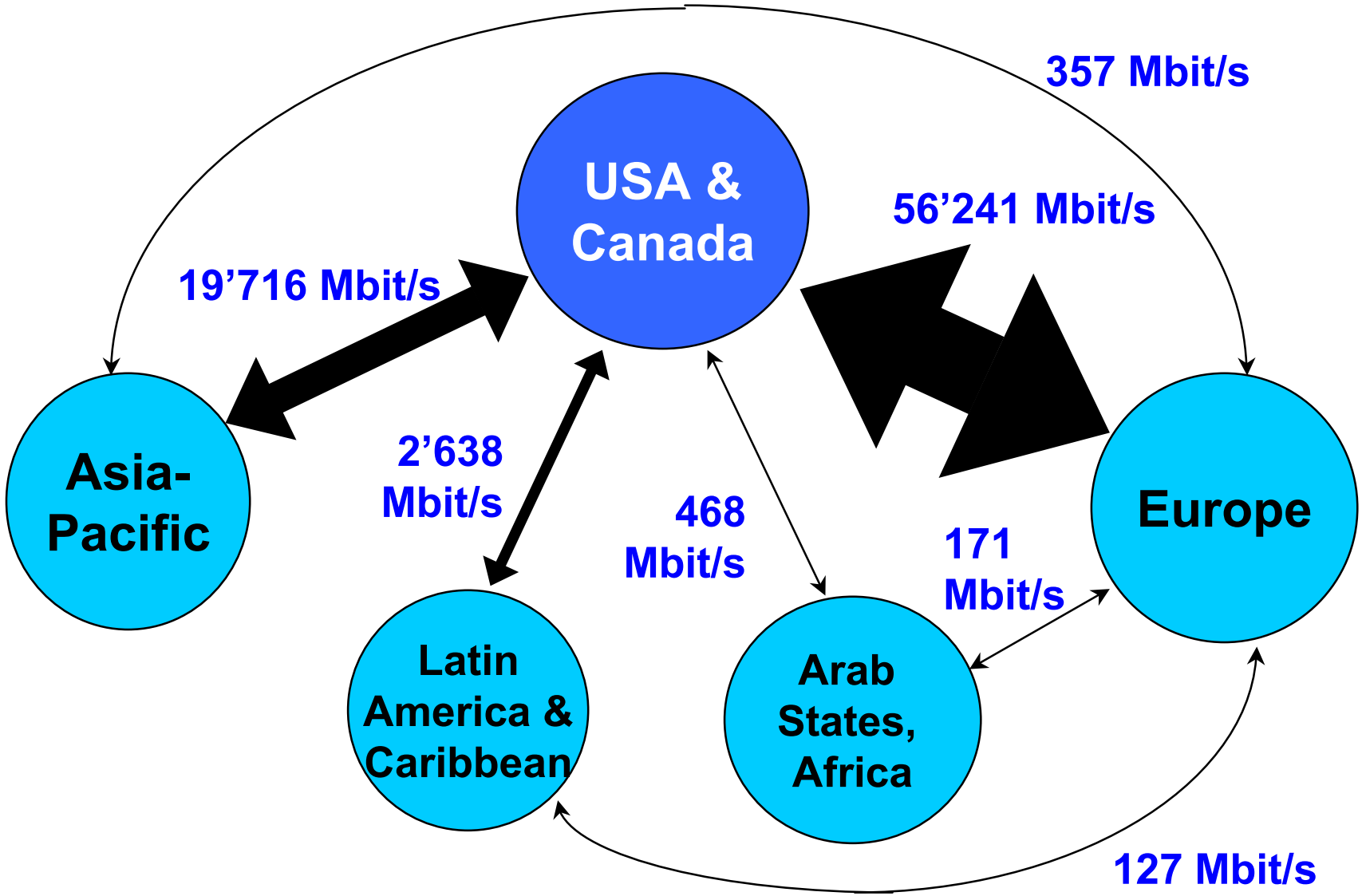
WRONG!

The majority of countries have less connectivity than a single ADSL link

WRONG!

The vast majority of fibre optic cable is left dark and is made available only when price is right

Inter-regional Internet backbone



Source: TeleGeography Inc., Global Backbone Database. Data valid for Sept. 2000.

Inequalities in Inter-continental Internet bandwidth

- **Singapore**
  - ⇨ Estimated 950’000 Internet users (Dec 1999)
  - ⇨ Around 800 Mbit/s international capacity (June 2000)
  - ⇨ Around 20 kbit/s per user (assuming 1 hour per day)
- **Egypt**
  - ⇨ Estimated 200’000 users (Dec 1999)
  - ⇨ Around 26 Mbit/s international capacity (May 2000)
  - ⇨ Around 3 kbit/s per user (assuming 1 hour per day)
- **Uganda**
  - ⇨ Estimated 25’000 users (Dec 1999)
  - ⇨ Around 2 Mbit/s international capacity (Feb 2000)
  - ⇨ Around 1.9 kbit/s per user (assuming 1 hour per day)

Telecom connectivity and Internet connectivity: What's the difference?

Telecom world

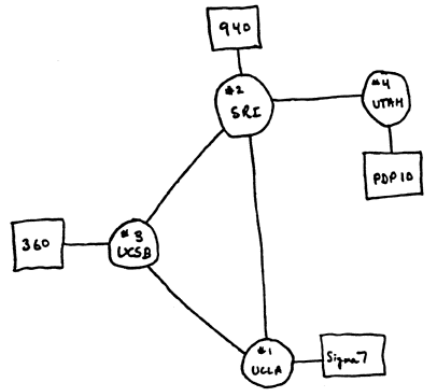
- Platform is jointly-provided circuits (cost-sharing)
- Operators typically guarantee end-to-end connectivity
- Financial arrangements based on negotiated settlement rates
- Cash flows from core to periphery of network

Internet world

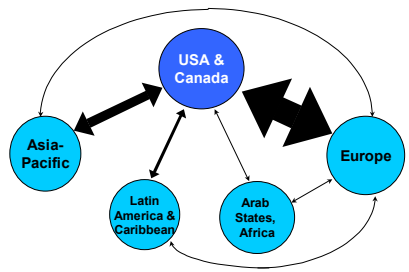
- Platform is leased circuits (full-circuit paid by connecting operator)
- Internet exchange points typically guarantee only efficient routing of traffic
- Peering between Tier 1 IXPs; traffic exchange payments from Tier 2 IXPs
- Cash flows from periphery to core of network

The "Internet latecomer" problem

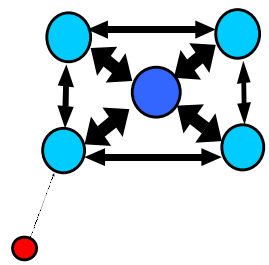
- In the beginning, the Internet was:
  - ⇨ North American
  - ⇨ Not-for-profit
  - ⇨ Used primarily for email & file transfer



- By the mid-1990s, the Internet had:
  - ⇨ Spread to the OECD countries
  - ⇨ Begun "privatisation" of the backbone
  - ⇨ Become primarily a channel for the Web



- By 2005, the Internet may be:
  - ⇨ Available throughout the world
  - ⇨ A fully commercial undertaking
  - ⇨ Used primarily for multimedia streaming

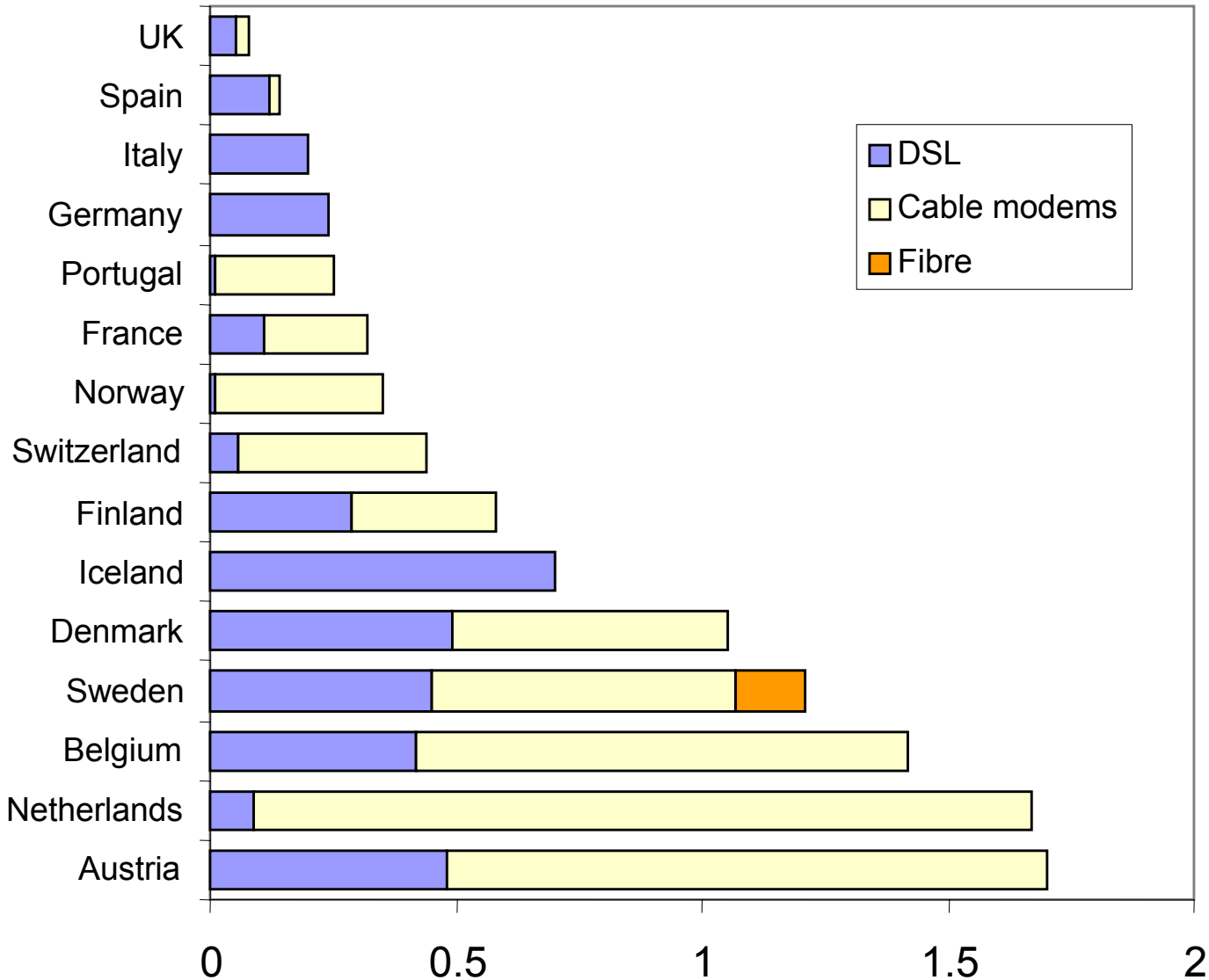


Two LDC "success stories"

- **Nepal**
  - ⇨ 16-fold increase in IP connectivity in 8 months following liberalisation of VSAT market in 1999
  - ⇨ Lowest IP access prices in South Asia
  - ⇨ BUT, opening up VSAT market has lead to a drastic fall in incoming telephone traffic and settlements
- **Uganda**
  - ⇨ Rapid increase in network growth following introduction of second national operator, MTN Uganda
  - ⇨ First country in Africa where mobilephone outnumbered fixed-line telephones
  - ⇨ BUT, entire national capacity is less than 2 Mbit/s

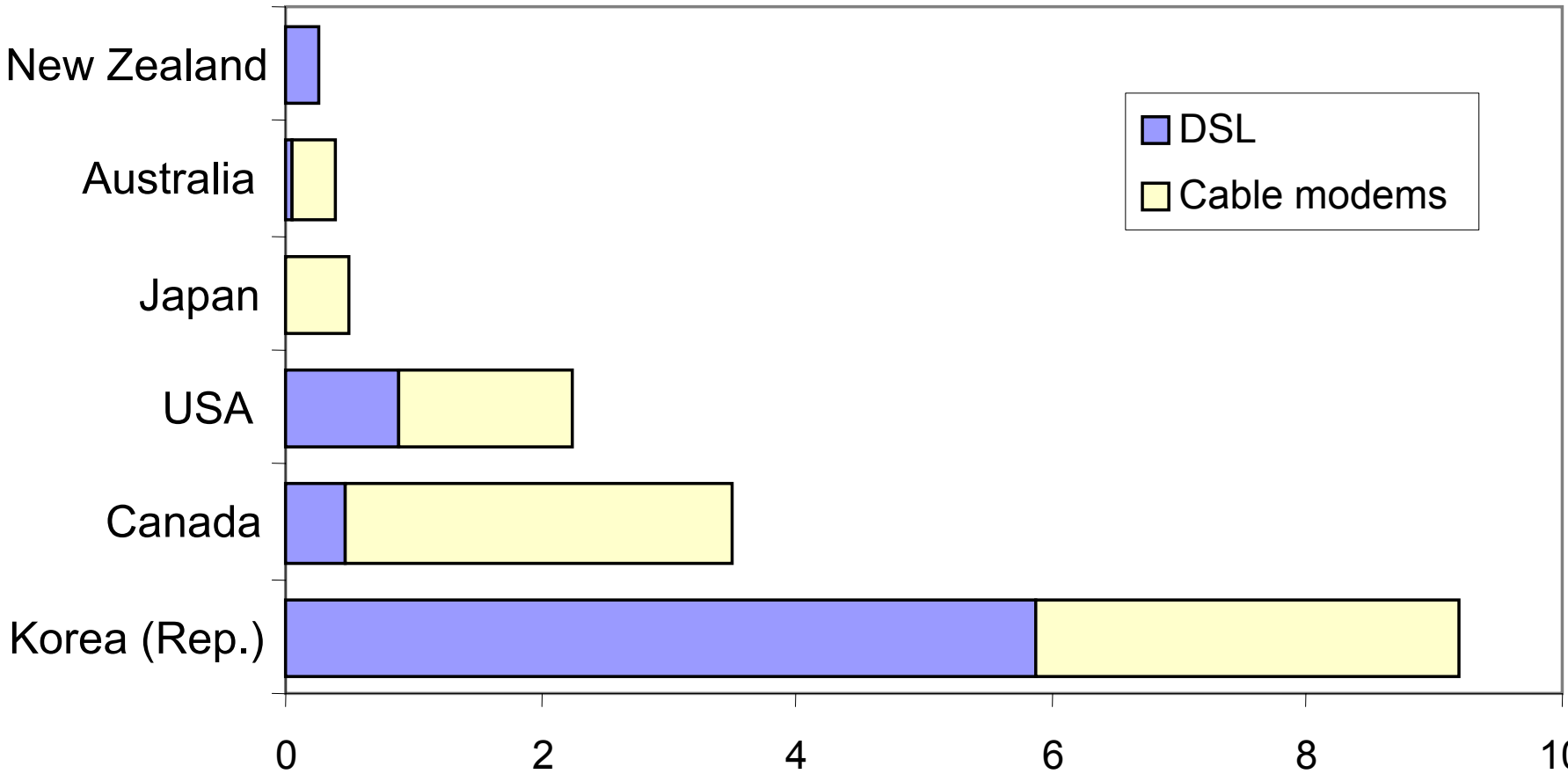
Source: Internet Diffusion Case Studies at: http://www.itu.int/ti/casestudies

Broadband in Europe, installed lines, per 100 inhabs, Dec. 2000



Source: OECD, ITU.

Broadband outside Europe, installed lines, per 100 inhabs, Dec. 2000



Source: OECD, ITU.

Barriers to broadband deployment

- **Technical barriers**
  - ⇨ Technical constraints on DSL technologies and cable modems on older cable TV networks.
- **Regulatory barriers**
  - ⇨ Where infrastructure competition is not permitted, roll-out had been slower and prices higher.
  - ⇨ Where there is cross-ownership between cable TV operators and incumbent telcos, roll-out is slower.
- **Economic barriers**
  - ⇨ High costs for network roll-out = high prices
  - ⇨ Financial crisis is slowing down deployment
  - ⇨ Perceived lack of “killer applications”

Connectivity and economic opportunity

- Connectivity in the 21st Century will play an equivalent role to trade routes in earlier eras
  - ⇨ Trade in information goods will outweigh trade in goods
- Connectivity differences between economies are much greater than would be predicted by differences in wealth or market structure:
  - ⇨ There is an International IP connectivity divide between developed and developing nations
  - ⇨ Disparities in broadband access between developed countries
- International digital divide initiatives have focused on using ICTs to extend access to healthcare, education, governance etc
  - ⇨ BUT, without connectivity, demand side initiatives are largely irrelevant

ITU Internet Diffusion Case Studies

- 2000
  - ⇨ 6 studies covering Bolivia, Egypt, Hungary, Nepal, Singapore, Uganda
- 2001
  - ⇨ Regional focus on ASEAN
- Purpose:

  "To understand the factors that may promote or retard the development of the Internet in different countries"

www.itu.int/ti/casestudies