# *Voice over IP:*
## *Reconciling Internet Peering with a Settlements Environment*

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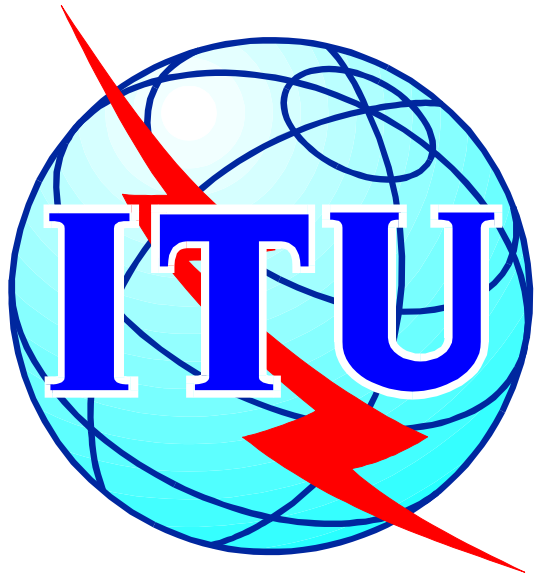


**IIR "Optimising Interconnection Accounting and Settlement Strategies", Nice 7-8 December 2004**

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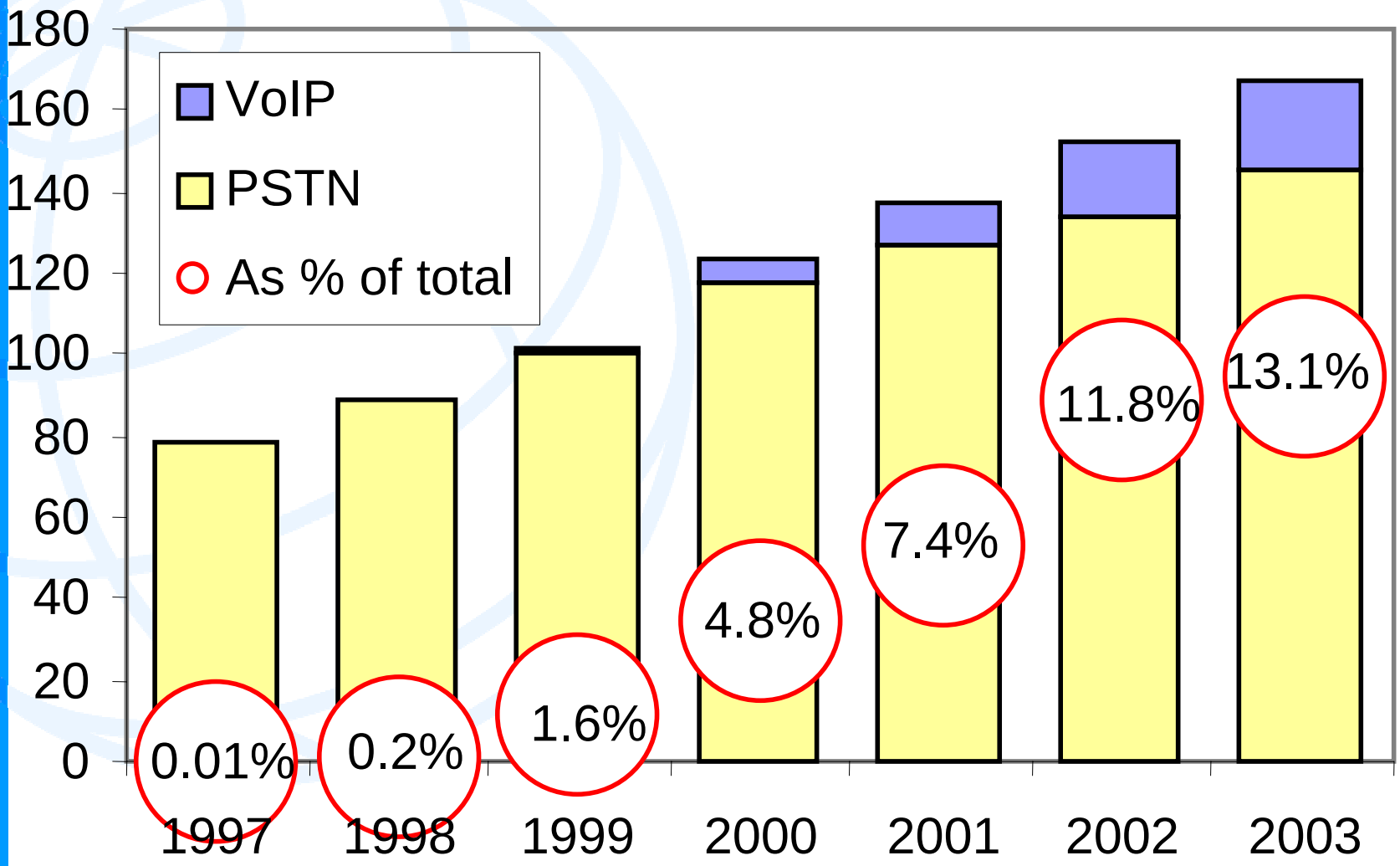
# Agenda: Internet peering and settlement

- **Why settlements in a peering environment?**
  - **Mix of PSTN and Internet Protocol traffic**
  - **Mix of fixed, mobile and hybrid traffic**
  - **“Third coming” of Voice over IP (Skype, Vonage)**
- **VoIP around the world**
  - **Where it’s legal, where it’s tolerated**
  - **Regulatory conundrums**
- **Technology trends**
  - **Where will we be in 5 years’ time?**
  - **Mini case study: Japan**

# International voice traffic

## (in billions of minutes)

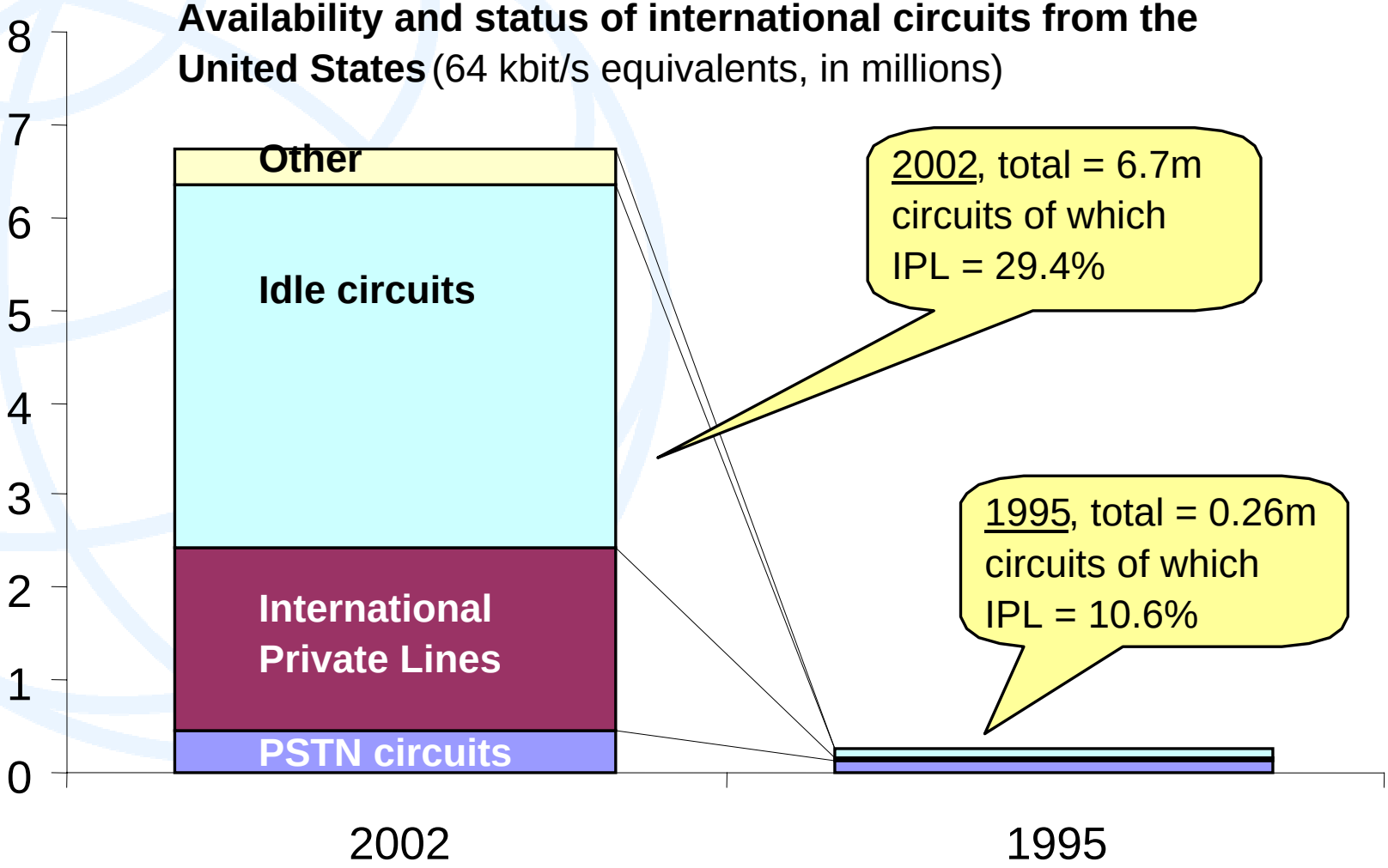



*Source:* ITU / TeleGeography

# Changing mix of int'l circuits

## Rise of international private lines

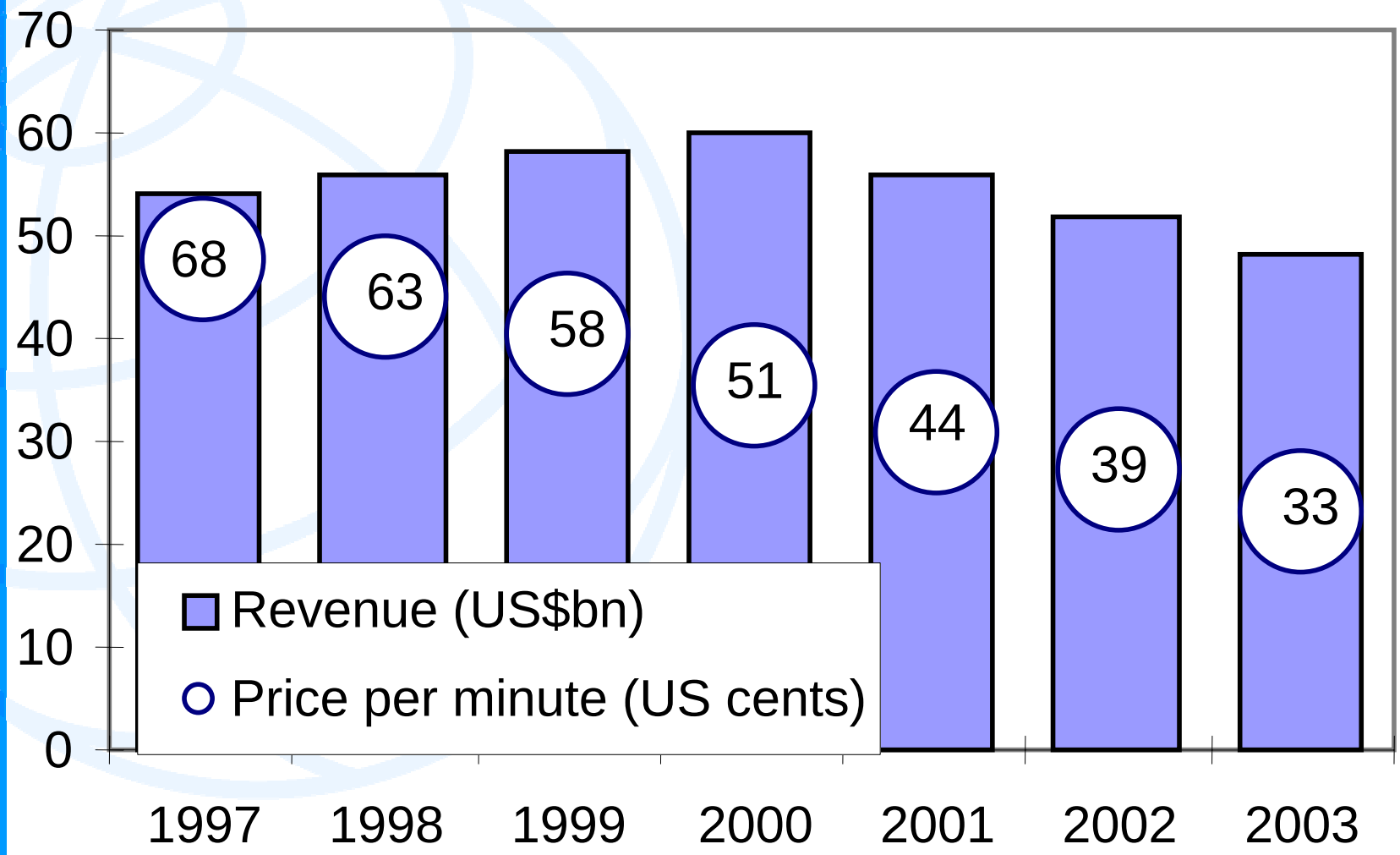
**Availability and status of international circuits from the United States** (64 kbit/s equivalents, in millions)




*Source:* ITU, adapted from FCC Circuit Status Report.

# International voice traffic trends

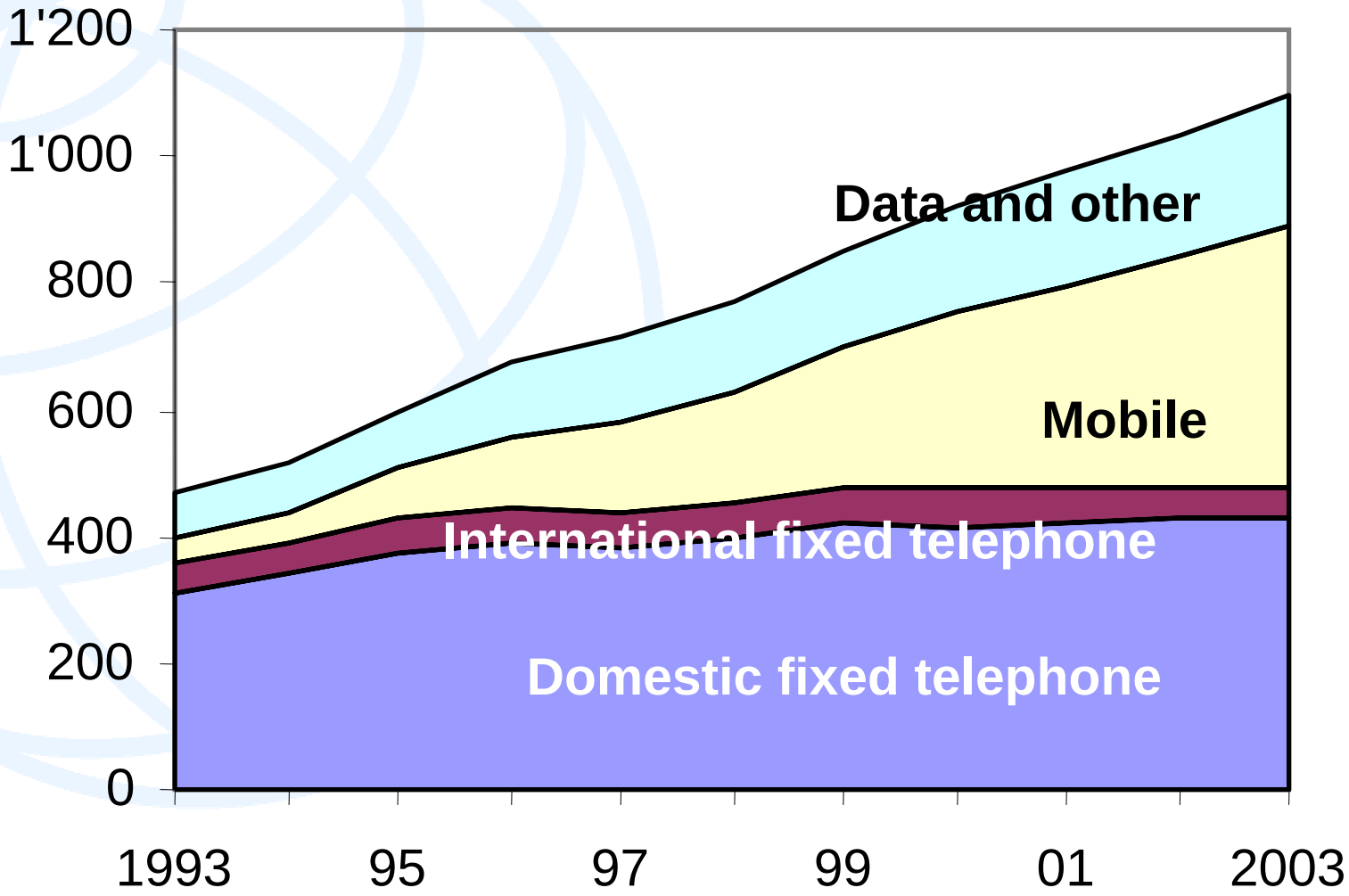
## Revenue (US$bn) and price per min ( cents)




*Source:* ITU World Telecom Indicators Database.

# Sources of telecom revenue

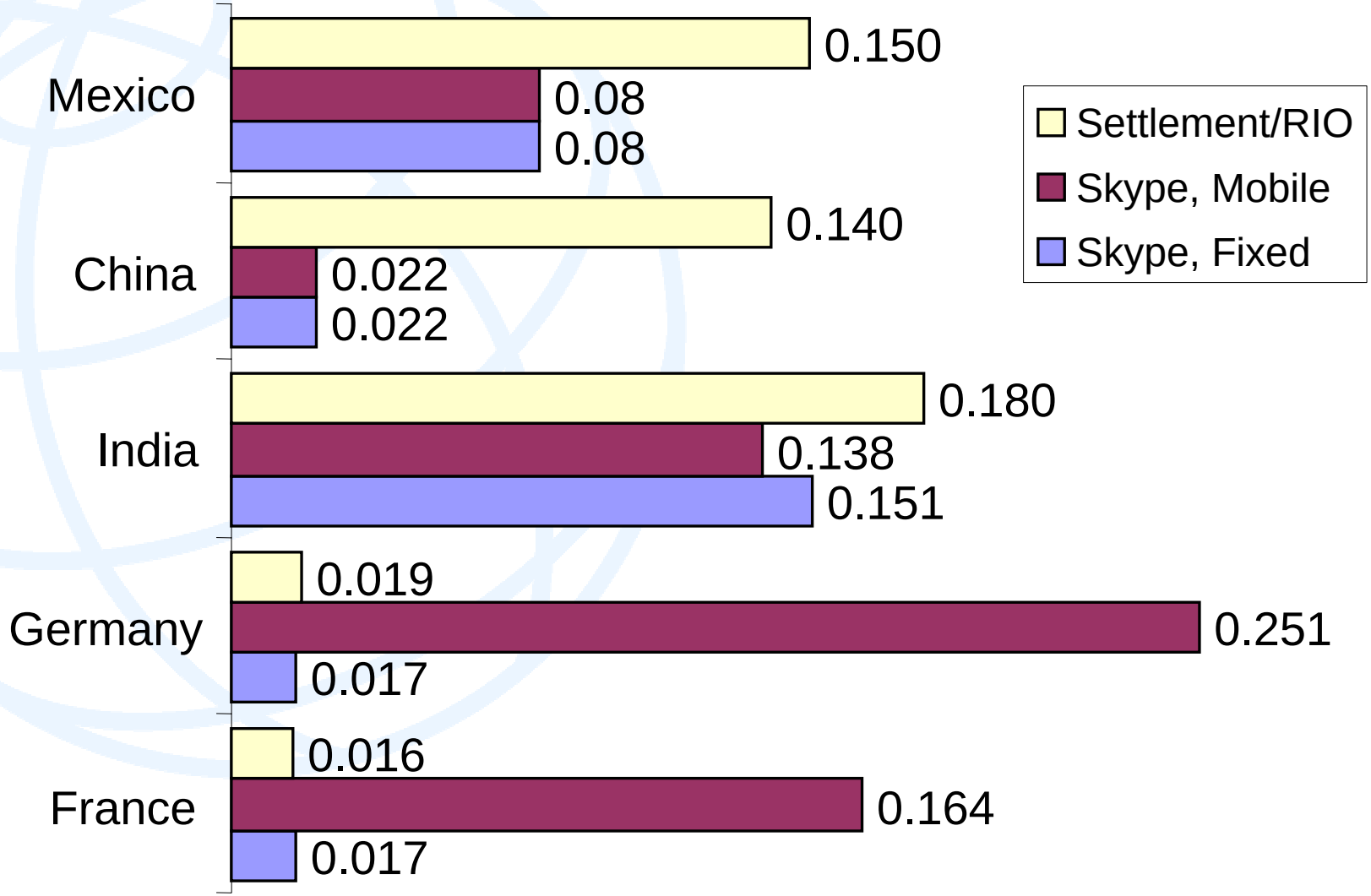
## Worldwide, in US$ billions




*Source:* ITU World Telecom Indicators Database.

# Selected rates for call termination

## In Euro cents per minute




*Note:* Mobile and fixed rates are for SkypeOut. Settlement is from US and Reference Interconnect Offer is for double tandem.

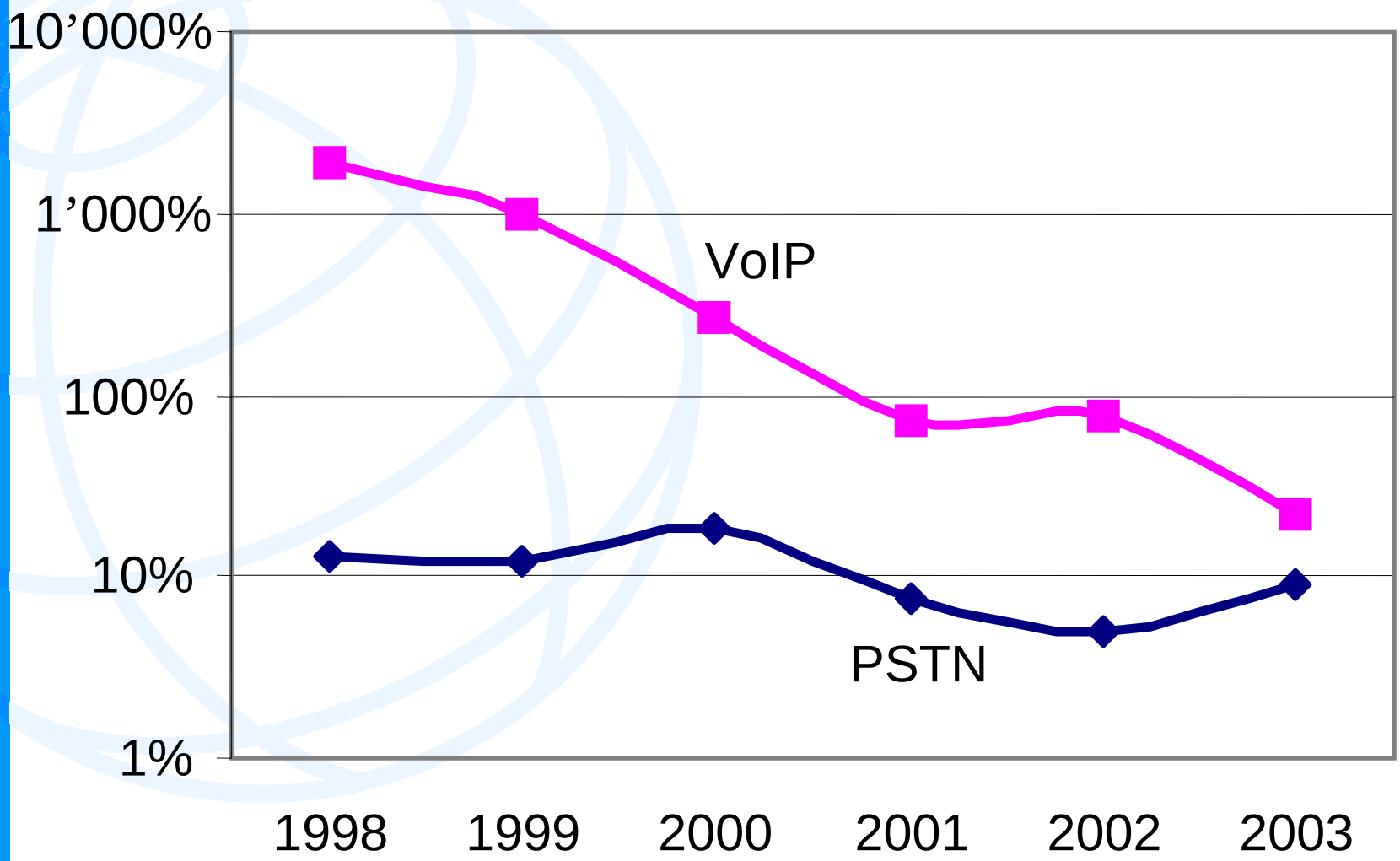
*Source*: Skype, FCC, Analysys.

# The "third coming" of IP Telephony

- **1995-1999:**
  - **"Internet phone", offered primarily over the public Internet (e.g. FreeWorld Dial-up, DialPad)**
- **2000-2002**
  - **"VoIP", offered as discounted telephony over IP-based networks (e.g. Net2Phone, iBasis)**
  - **Collapse of dot.com bubble left many VoIP companies struggling as incumbent PTOs also offered VoIP services or acquired VoIP operators (e.g. China Telecom, Teleglobe)**
- **2003-present**
  - **"Voice over broadband", offered as free or flat-rate chat plus discounted calls to PSTN/mobile users (e.g. Vonage, Skype)**
  - **"Corporate IP", as users shift both data and voice to a unified IP platform**

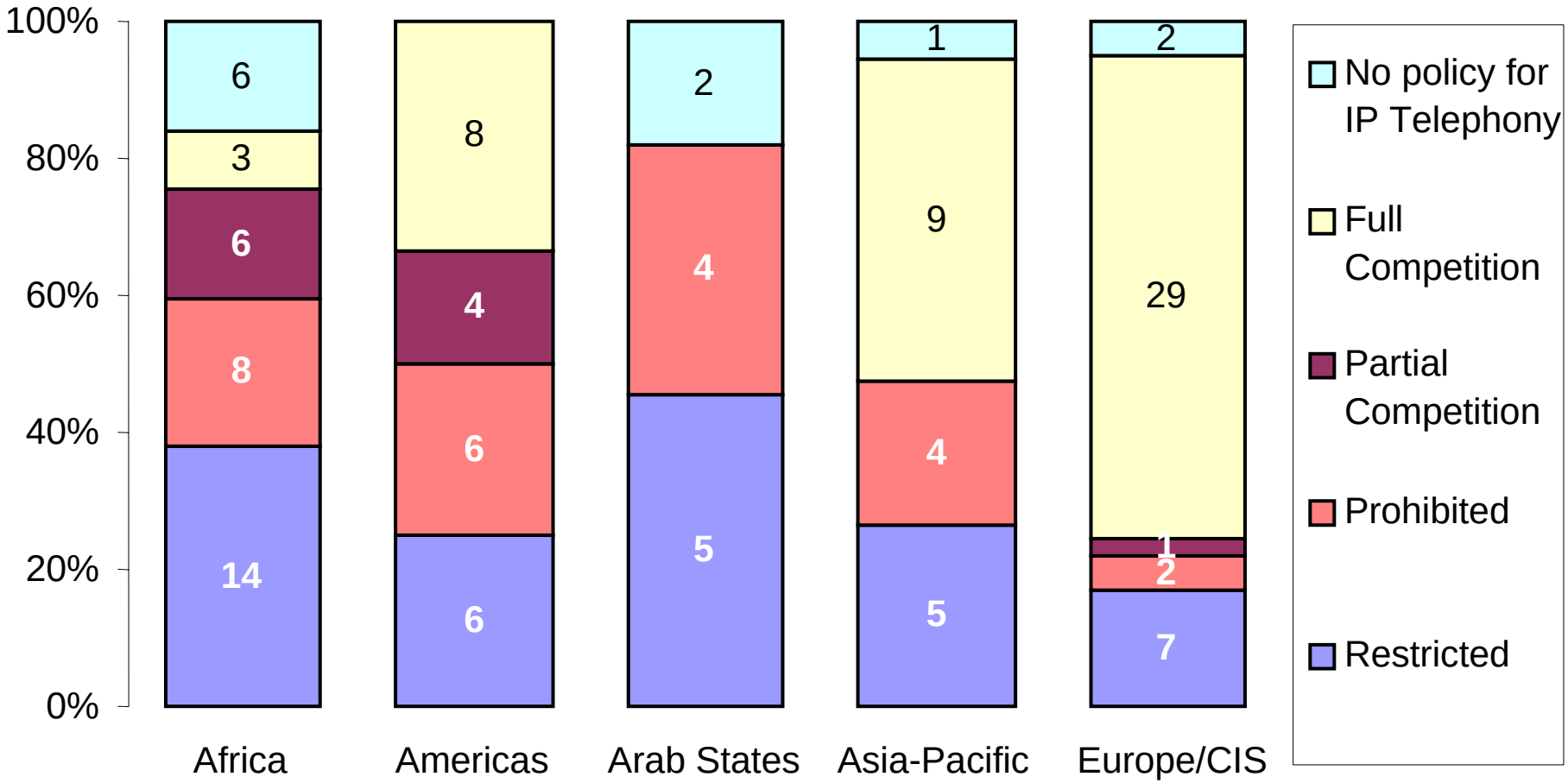
# Annual growth rates

## International voice traffic, in %




*Note:* Vertical scale is logarithmic.
*Source:* ITU / TeleGeography

# Regulatory status of IP Telephony
## By region, 2003




*Note:* Based on responses from 132 economies. “Prohibited” means no service is possible. “Restricted” means only licensed PTOs can offer the service. “Partial competition” means non-licensed PTOs may use either IP networks or the public Internet. “Full competition” means anyone can use or offer service.
*Source:* ITU (2005, forthcoming): General Trends in Telecom Reform”

# Regulatory dilemmas

## Examples of regulatory confusion or inconsistency in regulation of IP Telephony

| *Non-licensed PTOs may offer IP Telephony, but not licensed PTOs* | *Users are able to make IP phone calls, but no company is licensed to provide it* | *Licensed PTOs are allowed to offer IP Telephony, but users are not allowed to use it* | *All PTOs are allowed to offer IP Telephony, but users are not allowed to use it* |
|---|---|---|---|
| Brazil | Barbados | Aghanistan | Bhutan |
| | Sri Lanka | Algeria | Congo DR |
| | Suriname | Antigua & Barbuda | Kyrgyzstan |
| | TYFR Macedonia | Indonesia | Togo |
| | | Malawi | |
| | | Mali | |
| | | Morocco | |
| | | Oman | |
| | | Pakistan | |
| | | Paraguay | |
| | | Rwanda | |
| | | Uganda | |

*Note:* Based on responses to 2003/04 questionnaire from 132 economies. Only selected responses are shown.
"PTO" = Public Telecommunications Operator.
*Source:* ITU World Telecommunication Regulatory Database.

# IP Telephony in five year's time

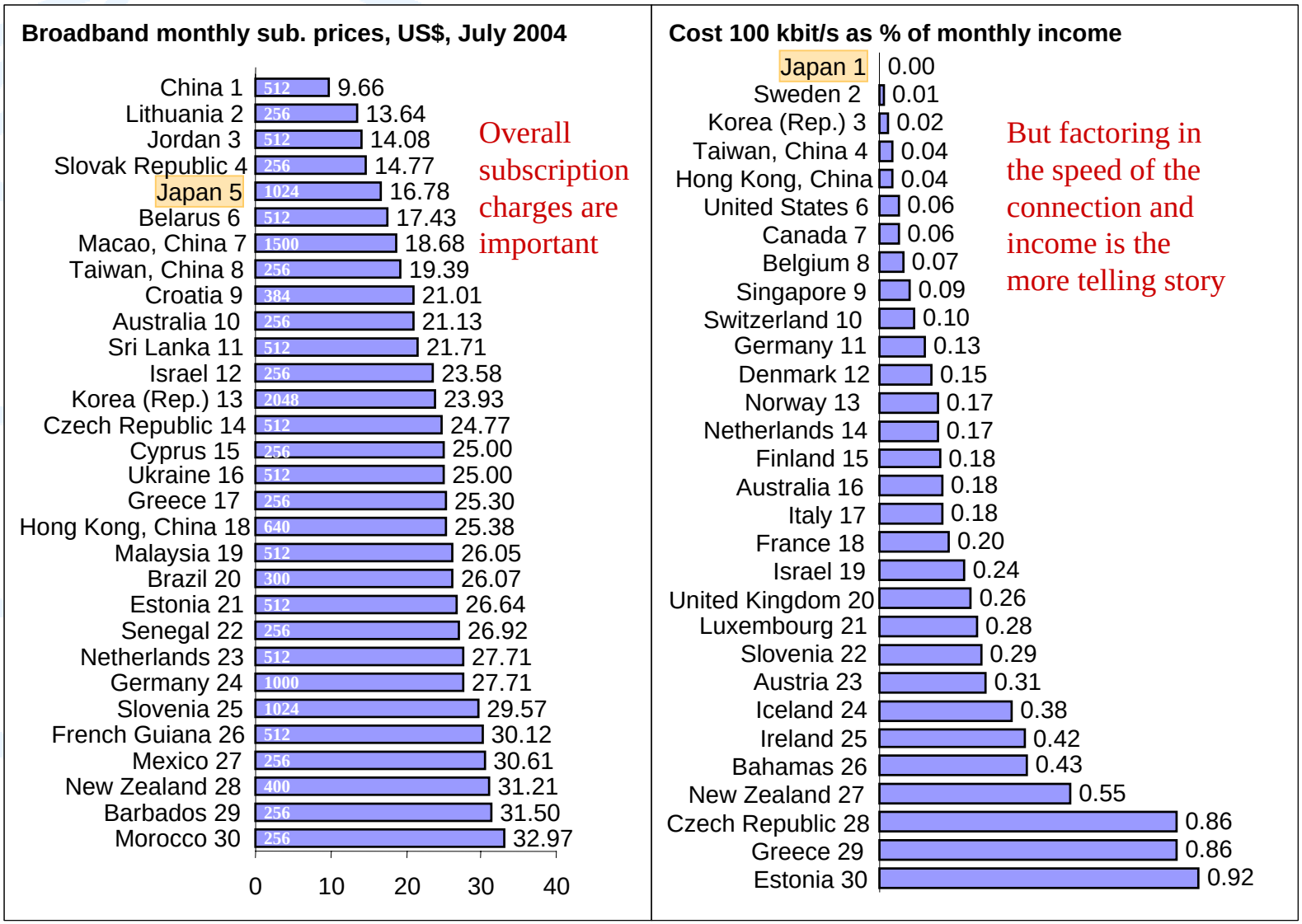
## Major technological and regulatory trends

- **IP-based traffic indistinguishable from PSTN**
  - Around 100 bn minutes of IP-based international traffic in 2008, or >50% of total
  - Many carriers will have all IP-networks
  - A majority of voice traffic will originate on wireless networks and much of it will be IP-based
- **Numbering convergence**
  - ENUM will allow calls to and from IP voice on multiple different devices
  - Numbering plan will allow for non-geographic and device-indendent VoIP numbers
- **Voice over IP over mobile**
  - Voice will increasingly travel over data channel in mobile networks to provide discounted calling prices

# Mini case study: IP Telephony in Japan

- **In 2000, Japanese Ministry (now MIC) introduced new rules on unbundling local loop and co-location**
  - **Rapid rise of DSL connections**
  - **Very low prices (<US$20 per month)**
  - **Service speeds in excess of 26 Mbit/s**
- **Yahoo BB! Entered marked in September 2001 with bundled DSL and VoIP**
  - **MIC defined numbering plan (prefix 050) for VoIP, allowing calls to be received on PCs**
  - **November 2002, >7m VoIP numbers allocated to ISPs**
  - **VoIP development consortium worked with MIC to establish standards for QoS, interconnection, tariffs, number allocation etc.**

# Japanese broadband prices are among the lowest in the world




*Source:* ITU Internet Reports 2004: The Portable Internet.

# Conclusions

- Inter-operator settlements remain important (and become more complex) in an environment dominated by IP
- Per-minute settlement remains preferred choice for voice, even for VoIP carriers
- Major new issues: VoIP over broadband and over mobile
- Regulators face tough challenges to maintain stance of technological neutrality and to remain one step ahead of the market