IP and PSTN: Two worlds collide:

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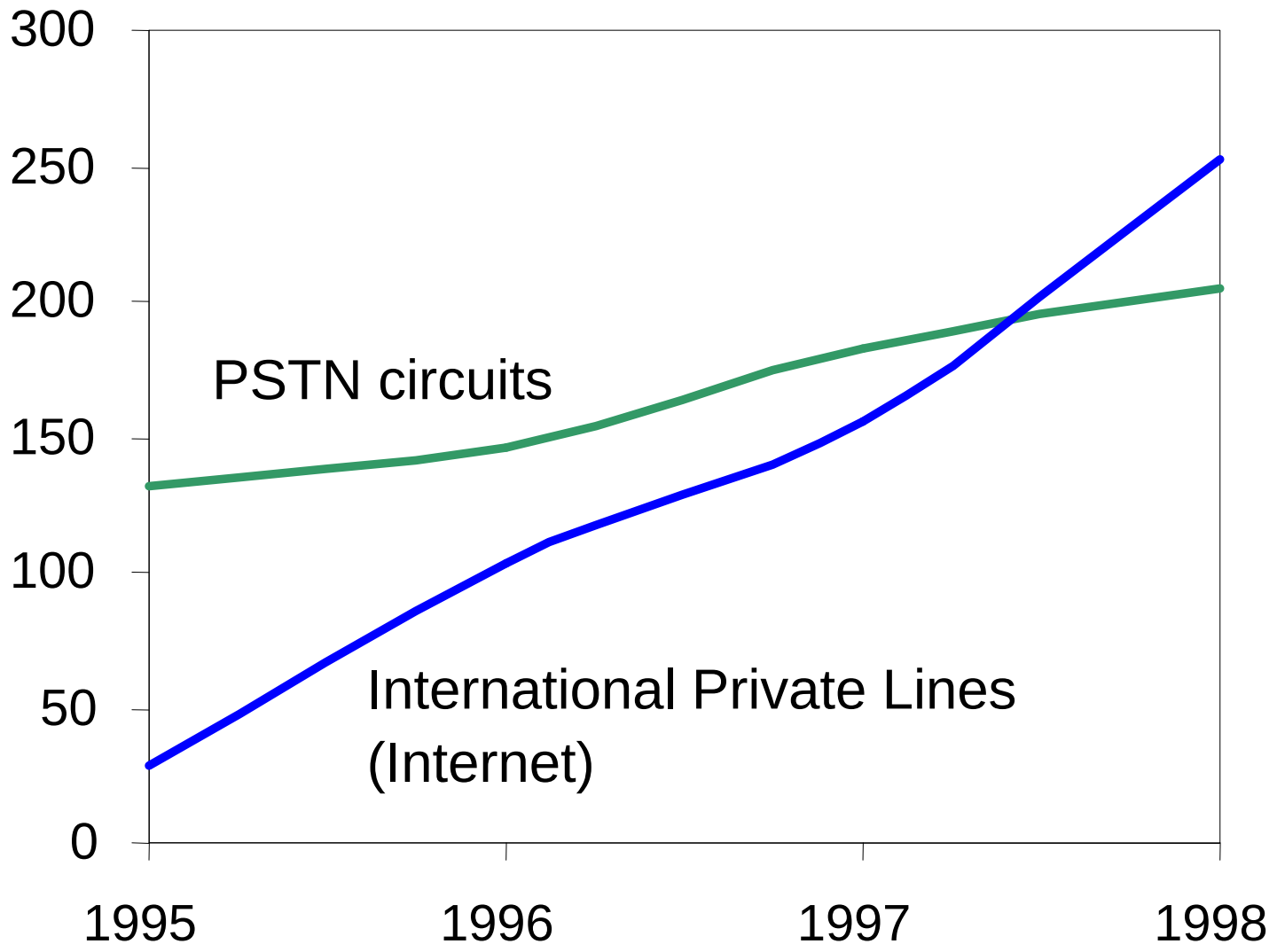
18 July 2000

Note: The views expressed in this presentation are those of the author and do not necessarily reflect the opinions of the ITU or its membership. Dr Tim Kelly can be contacted by e-mail at Tim.Kelly@itu.int.

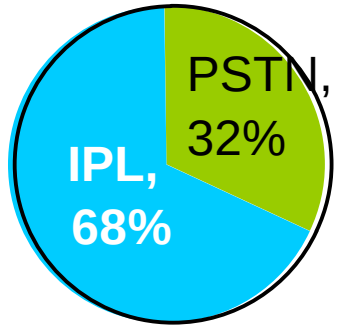
Agenda

- IP overtaking voice
  - ⇨ By circuit capacity
  - ⇨ By long-distance traffic volume
  - ⇨ By local traffic volume
- Wholesale pricing models
  - ⇨ What makes the Internet different from the public switched telephone network?
  - ⇨ International IP connectivity
- Developing country concerns
  - ⇨ Costs of being an Internet “latecomer”
  - ⇨ International co-ordination (D.120)

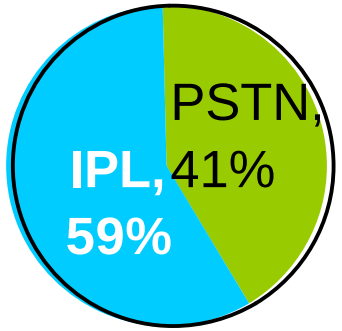
Number of int'l circuits in use, worldwide, and by region 1998 (in thousands)



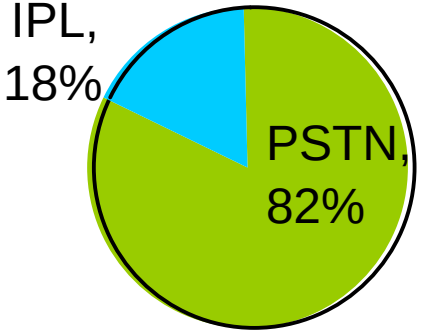
Western Europe



Asia

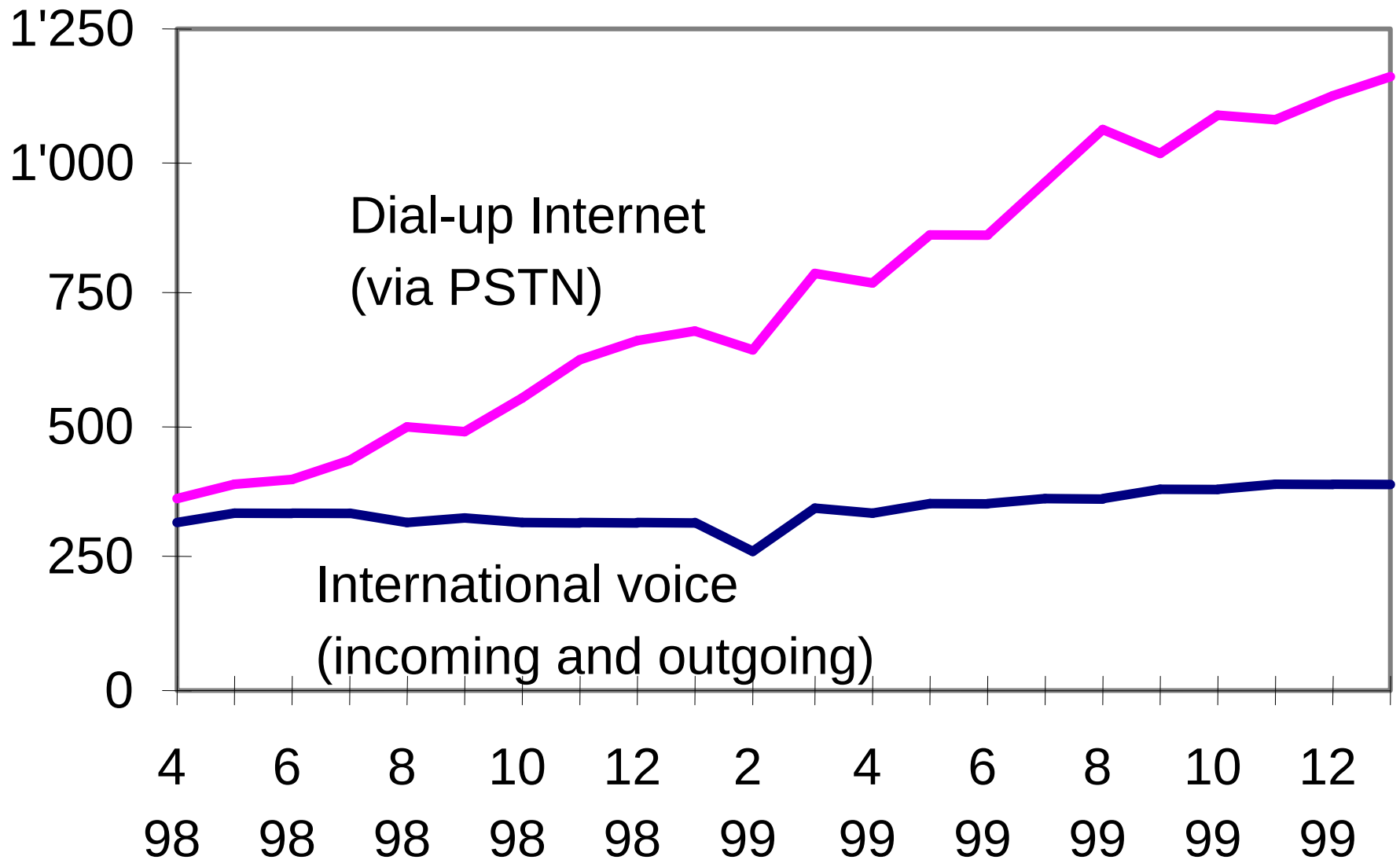


Caribbean



Source: **FCC. Applies to US carriers only.**

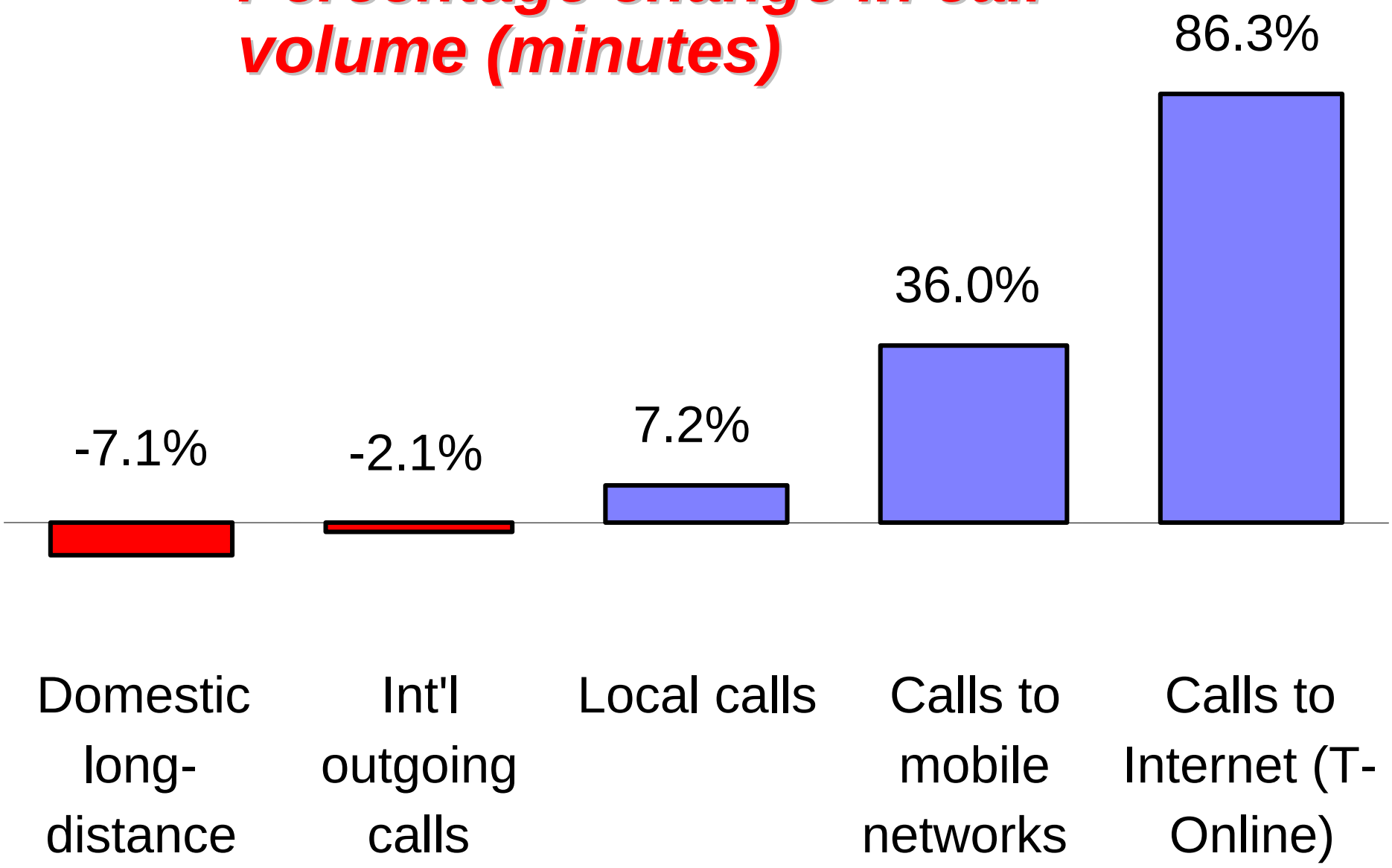
Minutes of use by month, Hongkong SAR ('000s)



Source: OFTA (www.ofta.gov.hk)

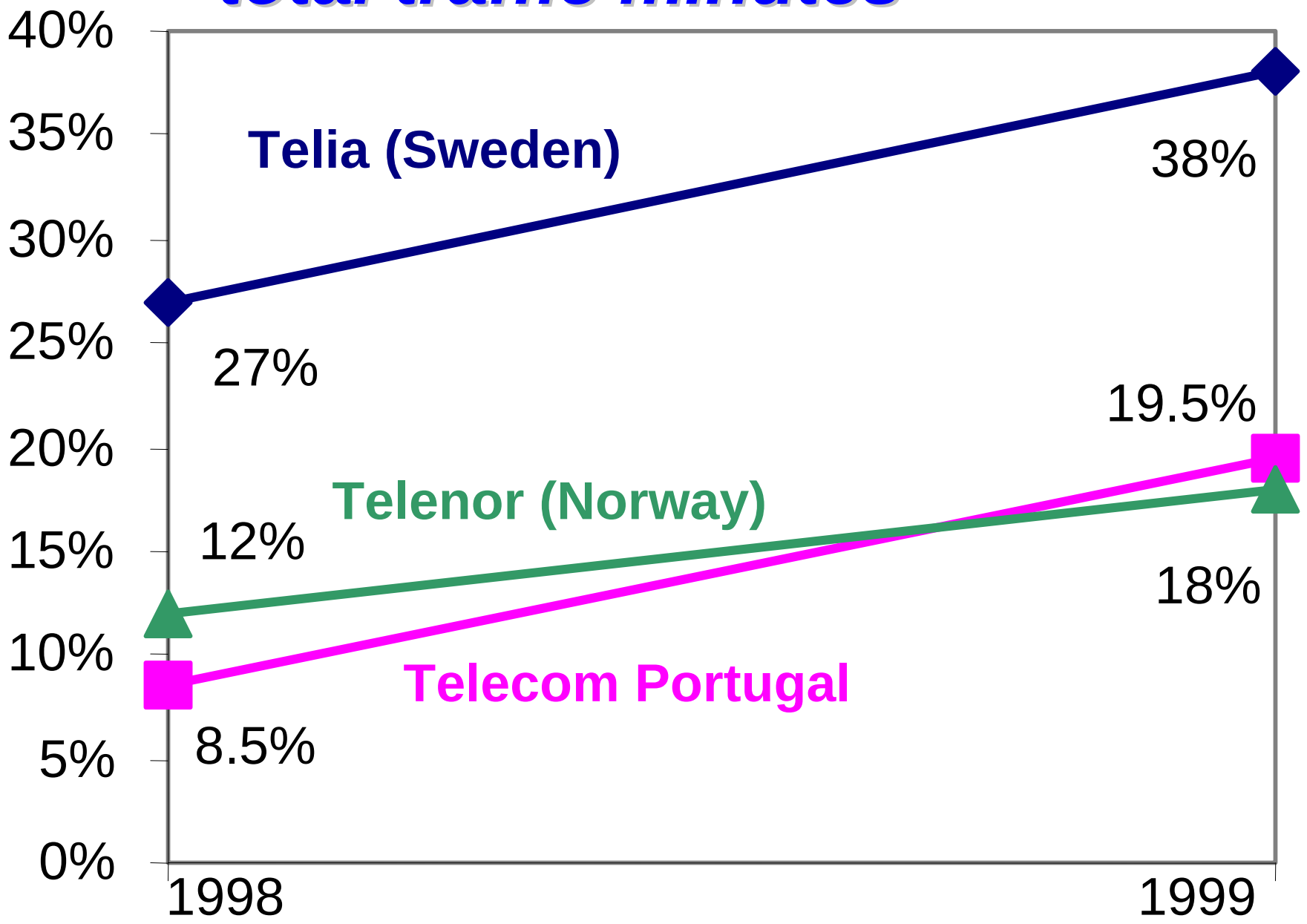
Deutsche Telekom

Percentage change in call volume (minutes)



Source: **Deutsche Telekom annual report.**

Dial-up Internet traffic as % of total traffic minutes



Source: PTO annual reports. *Note:* For Telia, Internet traffic as % of local minutes. For others, as % of total

Wholesale pricing of Internet

- Domestic access
  - ⇨ Leased lines
  - ⇨ Dial-up lines
- International connectivity
  - ⇨ Local half-circuit
  - ⇨ Foreign half-circuit (e.g., from USA, Europe)
- Traffic exchange
  - ⇨ Local
  - ⇨ Foreign

Different wholesale pricing arrangements

Public switched telephone service

- Per minute wholesale pricing of end-to-end int'l traffic
- International accounting rate and settlements system applies
- Domestically-regulated interconnect regimes
- Access charges payable for call origination and termination
- Some transparency

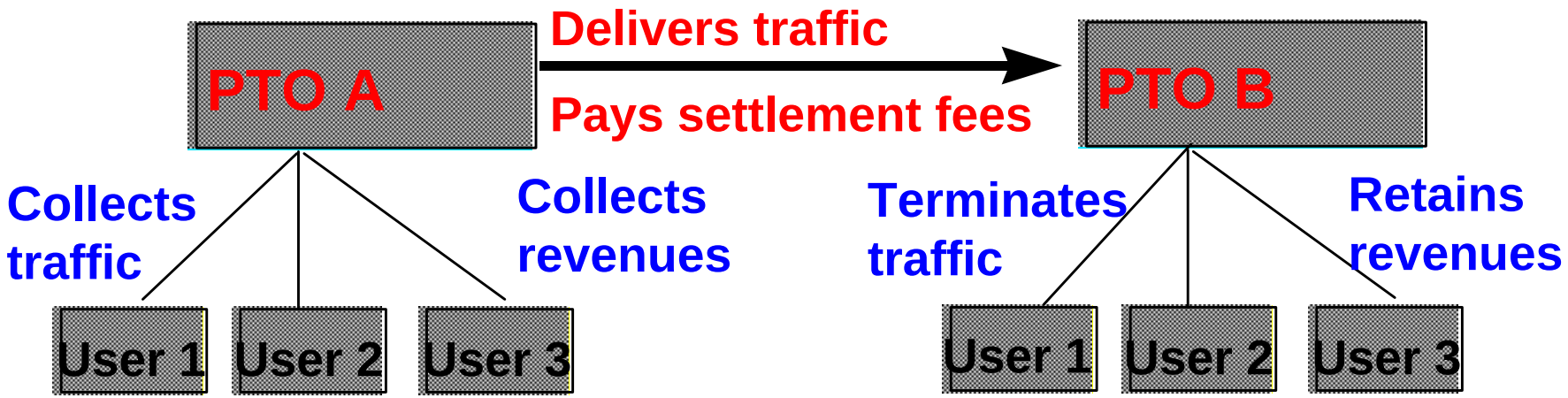
Public Internet service

- Usage-based wholesale pricing is rare (NZ and AUS are exceptions)
- Peering arrangements, usually based on capacity or traffic exchanged
- No end-to-end int'l settlement payments
- No regulation of peering arrangements
- No access charges payable for IP traffic in US
- No transparency

Settlements-based traffic

PTO = Public Telecommunications Operator

PTOs A & B split the cost of the int'l circuit

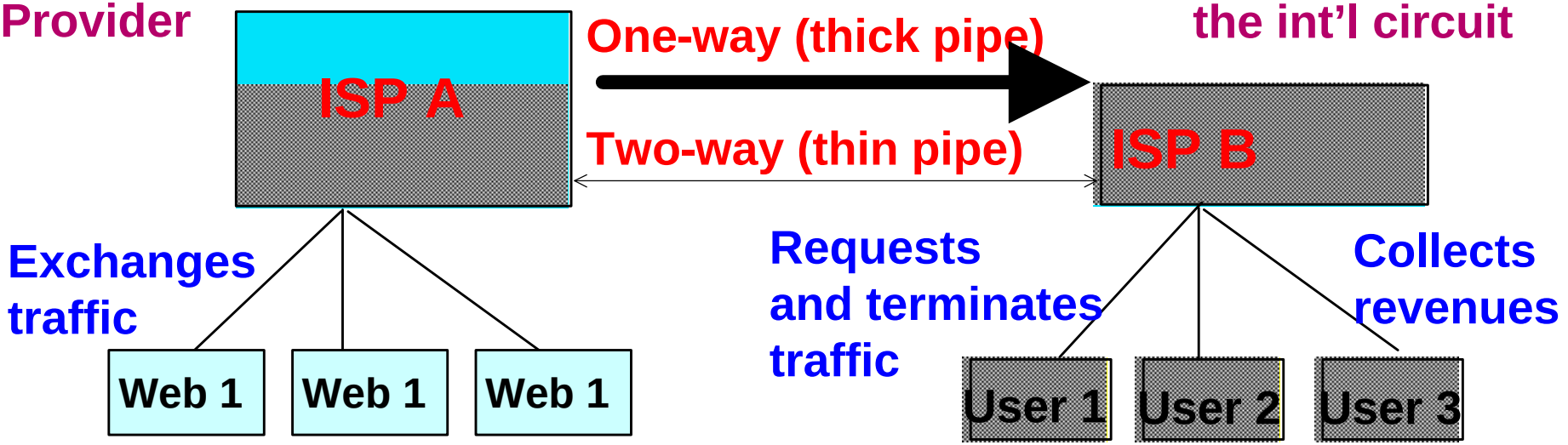


For accounting rate traffic, a direct bilateral relationship is established between the origin and termination operators. Intermediate transit operators are compensated from the accounting rate which is usually split 50:50. PTO B retains net settlement.

Internet Peering traffic (Web)

ISP = Internet Services Provider

PTO B pays the full cost of the int'l circuit



For Internet Peering traffic, ISP B pays for both halves of the International circuit(s) which are used for peering with ISP A. ISP B also pays for traffic exchange.

ISP B may pay for the circuit directly, or in conjunction with one or more PTOs.

Settlements and Peering: What's the difference?

- **Settlement-payment traffic**
  - ⇨ Substantial revenue transfers, from core to periphery of network
  - ⇨ Promotes "organic" network growth
  - ⇨ So, Operators generating less traffic than they receive have an incentive to keep prices high
- **Peering traffic**
  - ⇨ Some revenue transfers, from periphery to core of network
  - ⇨ Promotes "spontaneous" network growth
  - ⇨ So, ISPs generating less traffic than they receive have an incentive to force prices down

Internet traffic flows are highly asymmetric

Public switched telephone service

- Traffic flows are bilateral and broadly match value flow in that caller, who initiates the call, also pays for it
- Call-back reverses the direction of the call, from a statistical viewpoint, but caller still pays & benefits
- Traffic flows unbalanced between developed and developing countries

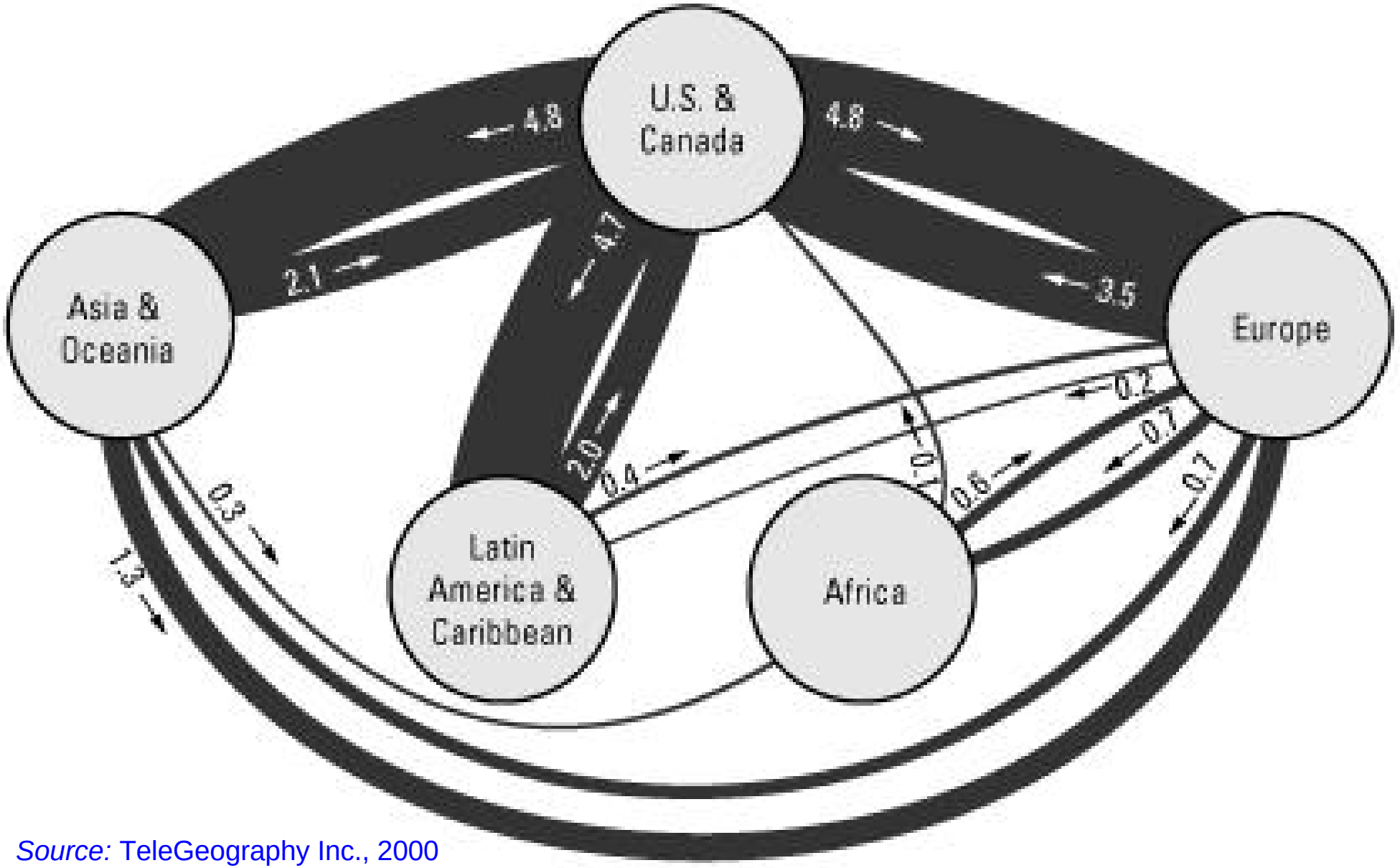
Public Internet service

- Traffic flows are multi-lateral: A single session may poll many countries
- Web-browsing is dominant form of traffic: traffic flow is dominantly towards user who initiates the call. Web traffic highly asymmetric
- Newer forms of Internet traffic (telephony, push media, streaming video etc) reverses traffic flow to be from user which initiates the call

Developing country concerns

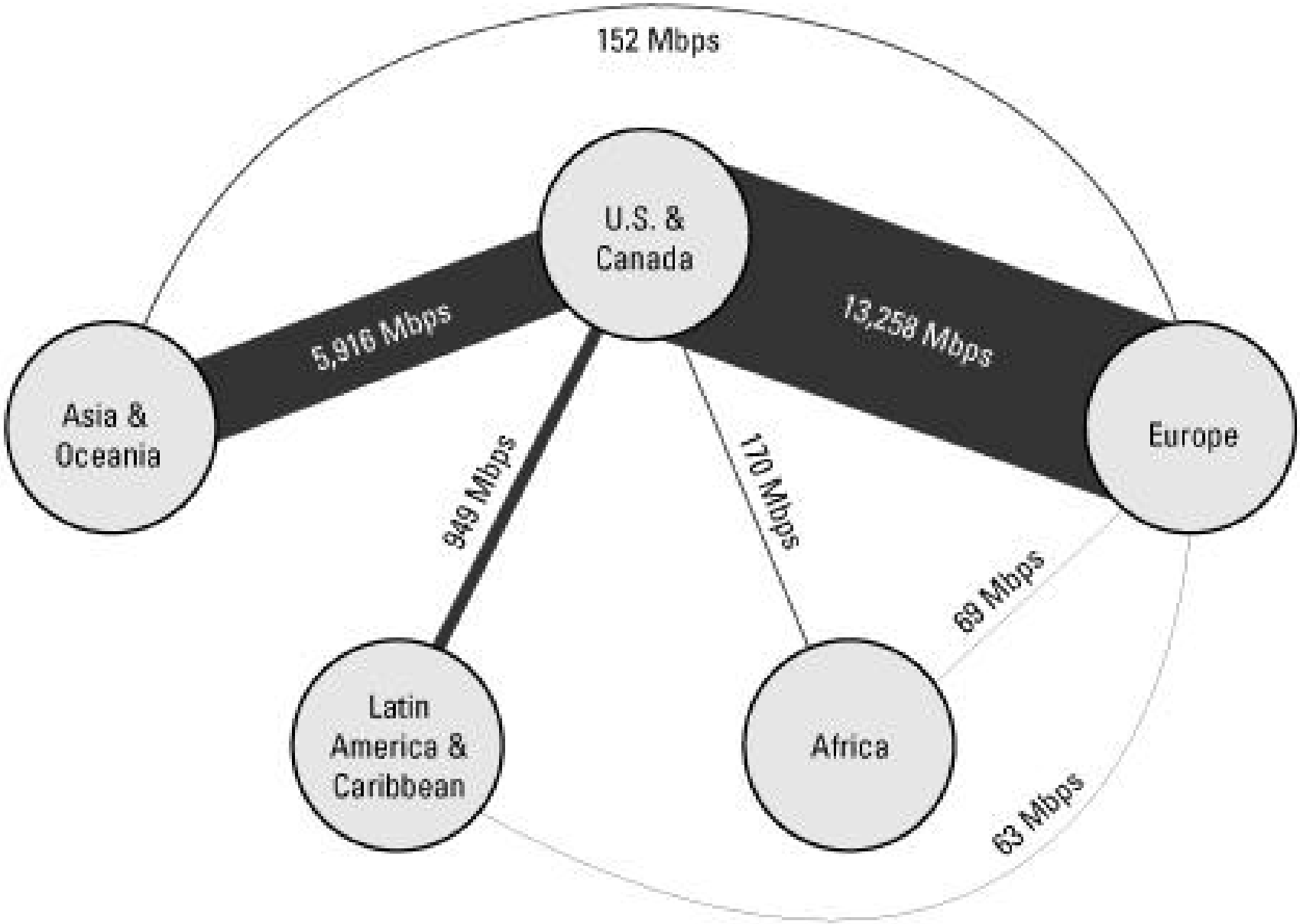
- Developing countries receive no international settlement payments for IP traffic
  - ⇨ Increasingly, incoming IP traffic includes IP telephony and fax traffic which they must terminate
- They must pay to peer with US/EU backbone
  - ⇨ Peering costs are rising as IP traffic continues to grow exponentially
- They must pay both half-circuits of the International Private Line to the foreign ISP
  - ⇨ Even though traffic flows in both directions over the circuit, once it is established
- Telephone and fax traffic shifting to the Internet
  - ⇨ What will replace the US$7 bn from settlements?

Global PSTN traffic, 1998, Mill. Mins



Source: TeleGeography Inc., 2000

Global Inter-regional IP backbone



Source: TeleGeography Inc., Global Backbone Database. Data valid for Sept. 1999.

Draft ITU-T Recommendation D.120: International Internet Connection

Noting the rapid growth of the Internet and Internet based international services:

It is recommended that administrations* negotiate and agree bi-lateral commercial arrangements applying to direct international Internet connections whereby each administration* will be compensated for the costs that it incurs in carrying traffic that is generated by the other administration.

Note: To be voted at the World Telecom Standardization Assembly in September 2000.

*** "Administration" means national administration of recognised operating agency**