Global trends in telecom development & new challenges for developing countries

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Agenda

● Market trends
  ➢ Network evolution
  ➢ Paradigm shift
  ➢ Tariff evolution

● Challenges for developing countries
  ➢ IP Telephony
  ➢ Mobile service
  ➢ Internet issue
A Mobile Revolution

Fixed Lines vs. Mobile Users, worldwide, Million

Source: ITU World Telecommunication Indicators Database.
Calling opportunities worldwide

1993
- 89.7%
- 5.0%
- 0.3%

1998
- 52.7%
- 7.5%
- 19.9%

2003
- 23.4%
- 26.7%
- 25.0%
- 25.0%

Source: ITU Fixed-Mobile Interconnect website: [http://www.itu.int/interconnect](http://www.itu.int/interconnect)
Impact of new technologies

- Mobile subscribers
- Internet subscribers
- Mobile penetration
- Internet penetration
Asia-Pacific international communications capacity, Gbit/s
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)

- **Idle circuits**
  - 2002, total = 6.7m circuits of which IPL = 29.4%
  - 1995, total = 0.26m circuits of which IPL = 10.6%

**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

- Domestic fixed telephone: 38.5%
- International fixed telephone: 4.5%
- Mobile: 38%
- Other: Data, Internet, leased line, etc.: 19%

Source: ITU World Telecom Indicators Database.
Selected rates for call termination
In Euro cents per minute

- **Mexico**
  - Settlement/RIO: 0.150
  - Mobile: 0.08
  - Fixed: 0.08

- **China**
  - Settlement/RIO: 0.140
  - Mobile: 0.022
  - Fixed: 0.022

- **India**
  - Settlement/RIO: 0.180
  - Mobile: 0.138
  - Fixed: 0.151

- **Germany**
  - Settlement/RIO: 0.251
  - Mobile: 0.019
  - Fixed: 0.017

- **France**
  - Settlement/RIO: 0.164
  - Mobile: 0.016
  - Fixed: 0.017

**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

<table>
<thead>
<tr>
<th>Region</th>
<th>No policy for IP Telephony</th>
<th>Full Competition</th>
<th>Partial Competition</th>
<th>Prohibited</th>
<th>Restricted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>14</td>
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<td>8</td>
<td>4</td>
<td>1</td>
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<td>6</td>
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<td>Arab States</td>
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<tr>
<td>Europe/CIS</td>
<td>2</td>
<td>29</td>
<td>1</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Non-licensed PTOs may offer IP Telephony, but not licensed PTOs</th>
<th>Users are able to make IP phone calls, but no company is licensed to provide it</th>
<th>Licensed PTOs are allowed to offer IP Telephony, but users are not allowed to use it</th>
<th>All PTOs are allowed to offer IP Telephony, but users are not allowed to use it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Barbados</td>
<td>Afghanistan</td>
<td>Bhutan</td>
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<td></td>
<td>Sri Lanka</td>
<td>Algeria</td>
<td>Congo DR</td>
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<td></td>
<td>Suriname</td>
<td>Antigua &amp; Barbuda</td>
<td>DR</td>
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<td></td>
<td>TYFR Macedonia</td>
<td>Indonesia</td>
<td>Kyrgyzstan</td>
</tr>
</tbody>
</table>

**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-independent 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

<table>
<thead>
<tr>
<th>Broadband monthly sub. prices, US$, July 2004</th>
<th>Cost 100 kbit/s as % of monthly income</th>
</tr>
</thead>
<tbody>
<tr>
<td>China 1</td>
<td>Japan 1 (0.00)</td>
</tr>
<tr>
<td>Lithuania 2</td>
<td>Sweden 2 (0.01)</td>
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<tr>
<td>Jordan 3</td>
<td>Korea (Rep.) 3 (0.02)</td>
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<td>Slovak Republic 4</td>
<td>Taiwan, China 4 (0.04)</td>
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<td>Japan 5</td>
<td>Hong Kong, China (0.04)</td>
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<tr>
<td>Belarus 6</td>
<td>United States 6 (0.06)</td>
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<td>Macao, China 7</td>
<td>Canada 7 (0.06)</td>
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<td>Taiwan, China 8</td>
<td>Belgium 8 (0.07)</td>
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<td>Singapore 9 (0.09)</td>
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<td>Australia 10</td>
<td>Switzerland 10 (0.10)</td>
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<td>Sri Lanka 11</td>
<td>Germany 11 (0.13)</td>
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<td>Israel 12</td>
<td>Denmark 12 (0.15)</td>
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<td>Korea (Rep.) 13</td>
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<td>Cyprus 15</td>
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<td>Hong Kong, China 18</td>
<td>France 18 (0.20)</td>
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<td>Israel 19 (0.24)</td>
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<tr>
<td>Brazil 20</td>
<td>United Kingdom 20 (0.26)</td>
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<td>Estonia 21</td>
<td>Luxembourg 21 (0.28)</td>
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<td>Senegal 22</td>
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<tr>
<td>Mexico 27</td>
<td>New Zealand 27 (0.55)</td>
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<td>New Zealand 28</td>
<td>Czech Republic 28 (0.86)</td>
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<tr>
<td>Barbados 29</td>
<td>Greece 29 (0.86)</td>
</tr>
<tr>
<td>Morocco 30</td>
<td>Estonia 30 (0.92)</td>
</tr>
</tbody>
</table>

Overall subscription charges are important

But factoring in the speed of the connection and income is the more telling story

Source: ITU Internet Reports 2004: The Portable Internet.
Traditional regime: Joint provision of service
Emerging regime: Market entry and interconnection

Country A

Jointly provided circuit

Country B

Circuit provided by operator B
Once a foreign carrier accepts the benchmark rate, it can negotiate ISR arrangements with US carriers.
Telephone service using data transmission
(By-passing accounting rate)

Country A
Operator A

Country B
VSAT
Inter-connection
PSTN

Voice is packetized = data transmission
Telephone regulations do not apply
IP Telephony

Call from International Telecommunication Network (ITN) to another ITN via IP-based Network

ADSL

Or Call initiated by ADSL

Call initiated from PSTN/ISDN/PLMN to PSTN/ISDN/PLMN

Local or distributed function

IP Network

IWF

PSTN/ISDN/PLMN

Terminating Network

Originating Network

Local or distributed function
Operator in A sends traffic to operator in C under an arrangement of exclusivity:

1. Operator in A is a partner of operator in C
2. Settlement rates A/B > C/B

Operator in C declares traffic to B on transit through A:

3. Operator in B receives traffic at settlement rate C/B instead of A/B
4. Operator in C "re-labels" the traffic as originated in C

Refire and other practices using accounting rate system
Mobile tromboning & high mobile termination charge

International boundary

Operator X or Operator A’s facility in another country

Operator A’s Int’l facility

Operator B’s Int’l facility

Operator A’s national network

Operator B’s mobile network

High Interconnection charge

Operator B’s fixed network

Called C

Called B

Operator A’s

Caller A
Delivering international voice traffic in 2002

Originating international voice traffic

- Direct dealing with the terminating country: 70%
- Via a wholesale carrier: 30%
- Refile via a third country: 15%
- Sender keeps all exchange of traffic: 65%
- Via a point of presence in the terminating country: 20%

Traditional bilateral settlement rate system
Falling prices (1)

Average retail price of one minute call to USA.

Source: ITU adapted from FCC and national data (34 countries).
Falling Price (2):
SwissCom, price per minute of local call and call to US

Swiss call prices.
US cents per minute.
Source: ITU.
Infrastructure capacity and costs, TransAtlantic cables, 1983-2000

Cost per voice path (US$), declining by 41% p.a.

Capacity (voice paths), growing by 64% p.a.

Source: ITU, TeleGeography Inc., FCC.
Note: Voice-path numbers assume a compression ratio of 5:1 to number of circuits.
If distance is dead, and bandwidth is infinite ... What do we bill for?
What do we bill for?

- Bill for network connection
  - Increasing integration of monthly telephone subscription and Internet subscription prices

- Bill for privacy/advertising
  - Privacy-protected customer pays premium
  - Customer agreeing to receive advertising pays less

- Bill for quality of service
  - Differentiated by transmission quality, waiting time, bandwidth on demand, value-added secretarial support, mail functions etc.

- Bill for Billing
  - Customising of billing: by service, by user, by site
Internet, price and service trends

- Towards a flat-rate price structure
  - All you can eat for US$20.00
- Towards lower service quality
  - “Best efforts” service delivery at lowest price
- Death of distance
  - Message to other side of earth costs same as a message sent next door
- Cross-promotion of Internet and other services
  - “Free PC” with three year’s ISP subscription
  - “Free Internet” with residential local loop charges
- Tendency towards industry concentration
  - AOL’s subscriber base > next ten ISPs added together
Challenges for developing countries

- Service, tariff and technical issues
  - Alternative calling procedures
  - Public switched network to IP based network
  - Challenges related to mobile service

- Regulatory issues
  - Interconnection rules
  - Implementation of USO
  - Tariff Rebalancing

- Internet connectivity in developing countries
  - Guideline for negotiating IIC
  - Traffic based negotiation
Declining prices for mobile access, global average, in US$, 1992-2000

Connection charge, in US$


Monthly subscription, in US$


Note: CAGR = Compound Annual Growth rate.
14 per cent of high-spending customers generate 53% of revenue.

22% of customers generate 36% of revenue.

24% of customers generate 8% of revenue.

40% of customers generate 3% of revenue.

40 per cent of low-spending customers generate 3% of revenue.

Source: Price Waterhouse Coopers, based on Canadian data.
Mobile and fixed Settlement rates, Mobile/Fixed ratio

From FCC data
Notice of Inquiry
October 2004
Network Externality

- Universal Service Obligation Fund = Cross Subsidy
  - Not recognized as cost
- Network externality = increase utility of a network to users
  - Operators to provide incentives for users to join the network = this can be added to the usage price or to the monthly subscription fee
- The network externality effect has a solid basis in economic analysis and had successfully – at least with some regulators – been brought to bear by mobile operators on their case for higher termination rates
  - Can be used by the developing countries to enhancing take-up and roll-out of the network
Do Customers in A derive benefit from more Customers in B?
If so, how much?
Is benefit to calling operators in A enough incentive to agree prices above cost?
How can we be sure that an externality will be passed through to connect more customers in B?

Accounting rate

Customers A
Access network A1
Access network A2
International operator A
International operator B
Access network B1
Access network B2
Customers B

Country A
(Calling)
Country B
(Called)

International externalities
**Inter-regional Internet connectivity**

Note: Gbit/s = Gigabits (1’000 Mb) per second.
Source: ITU adapted from TeleGeography.
**Int’l Internet Connectivity (IIC)**

- In 2001, for telephony services, settlement payment to developing countries amount to around: **5 billion US$**
- Now with decrease of accounting rates, they receive less and because of Internet payment developing countries pay some **2 billions US$**
- SG3 adopted Recommendation D.50 on IIC
  - Fair sharing of Int’l Internet backbone network
- Barriers to Internet Connectivity
  - Regulatory Barriers
  - Economic Barriers
- What need to do?
  - Internet Exchange Point (IXP) = cost and service gains