Operator Strategies for Mobile Broadband

Márcio Nunes - Diretor de Engenharia
Mobile Broadband is likely to overtake Fixed Broadband in 2010

Mobile Broadband Outlook for the Americas, Rio de Janeiro, 26 April 2010

Source: Teleco; Huawei
Broadband in Brazil

Broadband Penetration in 2009

Mobile Broadband Participation in Cell Phones Base

World

Brazil

- 2004: 1.6%
- 2005: 3.3%
- 2006: 5.7%
- 2007: 8.2%
- 2008: 10.1%
- 2009: 12.8%

Brazil

- 2008: 1.4%
- 2009: 2.0%
- 2Q09: 2.5%
- 3Q09: 2.9%
- 4Q09: 4.0%
- Jan/10: 6.0%

3-years delay

Mobile Broadband in Brazil has room to grow

Source: Teleco; Huawei
The device we formerly knew as the cell phone is evolving into an Internet-enabled consumer device.
Trends - Device sophistication

Global Devices Sales (in millions)

Smartphones market share in Brazil

Smartphones are gaining momentum in Brazil

Mobile Broadband Outlook for the Americas, Rio de Janeiro, 26 April 2010

Source: Teleco; Huawei
Trends – Sophisticated devices drive broadband growth

Utilization rate

<table>
<thead>
<tr>
<th>Activity</th>
<th>iPhone</th>
<th>Market average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>83%</td>
<td>13%</td>
</tr>
<tr>
<td>Web search</td>
<td>60%</td>
<td>7%</td>
</tr>
<tr>
<td>Web services</td>
<td>59%</td>
<td>25%</td>
</tr>
<tr>
<td>Social Networks</td>
<td>50%</td>
<td>6%</td>
</tr>
<tr>
<td>Mobile TV/Video</td>
<td>30%</td>
<td>7%</td>
</tr>
<tr>
<td>Online games</td>
<td>21%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Improved user experience drive broadband growth

Source: M-Metrics; Nielsen; Cisco
Video will drive mobile data traffic growth

*EB = Exabyte = 1,000,000 TB; Source: Cisco Visual Networking Index 2009 - 2014

Mobile Broadband Outlook for the Americas, Rio de Janeiro, 26 April 2010

Source: Cisco
Mobile Broadband Outlook for the Americas, Rio de Janeiro, 26 April 2010

Mobile Broadband evolution

Devices evolution
- Convergence of communications
  - Communications
  - Web capabilities
  - Multimedia
- Connectivity to various access networks

Users evolution
- User behaviour trend from Wired to Wireless
- End-users utilizing increasingly advanced communications services and applications
  - Same Rich Apps and Services in all environments (Multimedia, High bandwidth, latency dependent)
  - Consistent Quality of Experience
- Individuals becoming content creators

Network evolution
- High data rates
- All-IP Network
- QoS
- Co-existence and integration of different access networks

Trends are driving RAN evolution
RAN Technologies Evolution

Higher efficiency
Faster user experience

1G
2G: GSM
2,5G: EDGE
3G: UMTS & HSDPA
UMTS & HSPA+
LTE

RAN technologies evolving towards LTE

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HSPA Evolution

- Higher efficiency
- Faster user experience

Combinations

- 84
- 42 Multi Carrier
  - WRAN W10A
- 28 MIMO
  - WRAN P7FP
- 21
  - 15 codes, 64QAM
  - WRAN P7
- 7
  - 10 codes, 16QAM
  - WRAN P5

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Portugal
All on HSPA Evolution

- 3 million Mobile Broadband subscribers
- YoY growth 55%

- All three mobile operators launched HSPA Evolution with 21 Mbps

Source: ANACOM, Portuguese telecom regulator
Industry forecasts high adoption rates for LTE

"(...) Além das vantagens tecnológicas, o LTE começa desde o início a ganhar escala. Pela primeira vez, a maioria dos players, operadores e fabricantes, estão apoiando o mesmo padrão móvel, o que deve contribuir para aumentar os volumes de equipamentos e dispositivos (...)"

Source: Qualcomm
## RAN Evolution

<table>
<thead>
<tr>
<th></th>
<th>UMTS</th>
<th>HSPA</th>
<th>HSPA+</th>
<th>LTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networks in service</td>
<td>346</td>
<td>325</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>Countries in service</td>
<td>140</td>
<td>137</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Networks Planned/In deployment</td>
<td>79</td>
<td>92</td>
<td>N/A</td>
<td>135</td>
</tr>
</tbody>
</table>

137 LTE operations in 55 countries to be deployed
Up to 25 LTE networks in service by end 2010

High number of LTE commitments

Source: 3GAmericas
Mobile Broadband Outlook for the Americas, Rio de Janeiro, 26 April 2010

Source: Ericsson
Network Architecture evolution

1. **IP extension to access layers**
   - Traffic optimization
   - Flexibility in expansions

2. **MetroEthernet**
   - IP-RAN enabler

3. **IMS**
   - LTE and current access networks integration enabler
   - New Services
RAN evolution - Coverage expansion

- GSM coverage of today normally very good
- HSPA coverage still not showing its full potential
- LTE is around the corner but will not provide country-wide coverage in many years

HSPA coverage will grow before LTE large scale deployments
Transport convergence
Optimize Communication Networks

GOAL: ONE SINGLE IP TRANSPORT INTERFACE @ RAN

BTS/NodeB/eNodeB Common Site

All IP RAN over Ethernet

Fully flexible network
With lowest total cost of ownership

TDM/IP

IP

Aggregation

IP upgrade
Single interface
Native IP/Eth

BSC/RNC/CGW

BSC

RNC

CGW

Source: Ericsson
Network Architecture evolution

Air interface

Mobile Backhaul - RAN EDGE

SDH/Rings

Cell Sites

BTS

NodeB

BSC

RNC

Aggregation

SDH/PDH Microwaves

Cell Sites

Core IP/MPLS

SGSN

GGSN

MGW

G-MSC

IP/MPLS

PSTN

Internet

ATMoMPLS
FRoMPLS
TDMoMPLS

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Network Architecture evolution

IMS

Redes Segmentadas

Services

IMS

Applications

Transport, Switching and Access

IMS as the enabler of LTE and current access networks integration

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Key Takeaways

- **Trends are driving RAN evolution**
  - Mobile Broadband is likely to overtake Fixed Broadband in 2010
  - The device we formerly knew as the cell phone is evolving into an Internet-enabled consumer device
  - Video will drive mobile data traffic growth

- **RAN technologies evolving towards LTE**
  - Strong industry drivers for LTE
  - Industry forecasts high adoption rates for LTE
  - High number of LTE commitments worldwide

- **Backhaul bottleneck**

- **Network architecture evolution demands**
  - All-IP Transport convergence
  - RAN evolves to IP and the Backhaul evolves to Ethernet
  - IMS as the enabler of LTE and current access networks integration
Thank you!

Márcio Nunes
Marcio.Nunes@claro.com.br