

Mobile Capacity Growth

May 2011

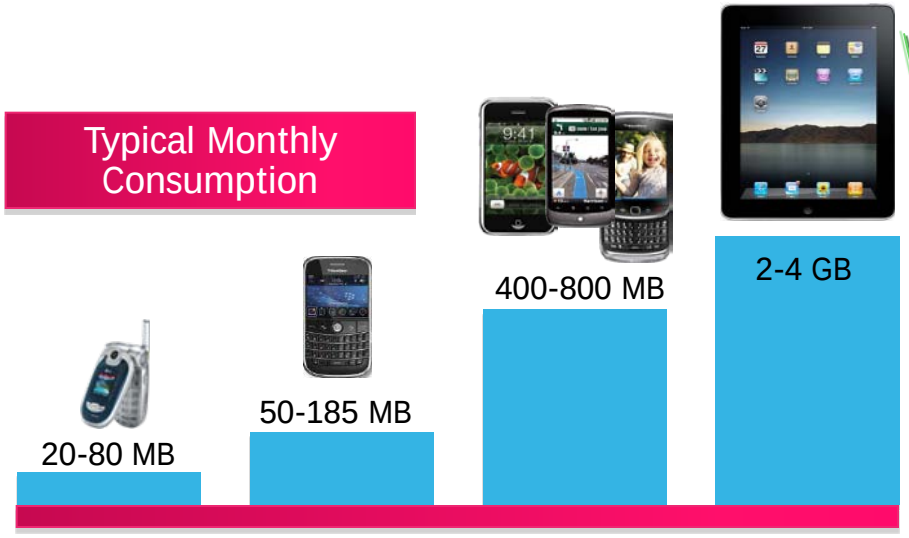
Rasika Abeysinghe PhD

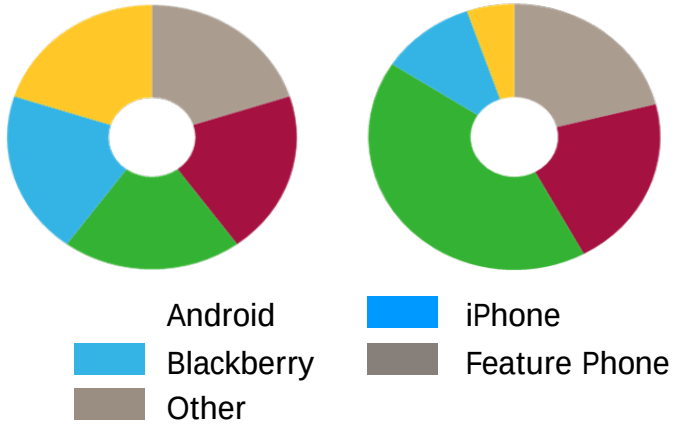
Director, Network Solutions

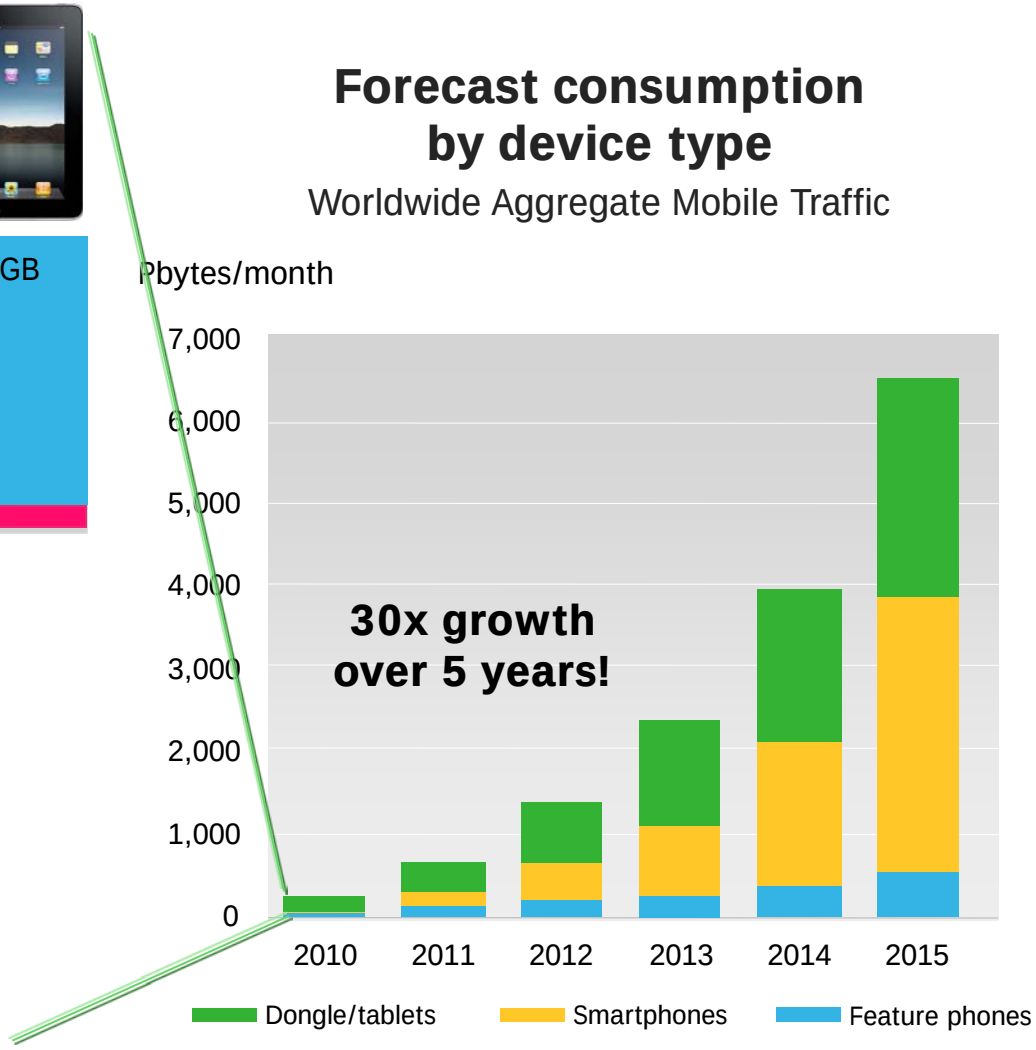
Alcatel·Lucent

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

BANDWIDTH NEEDS TODAY







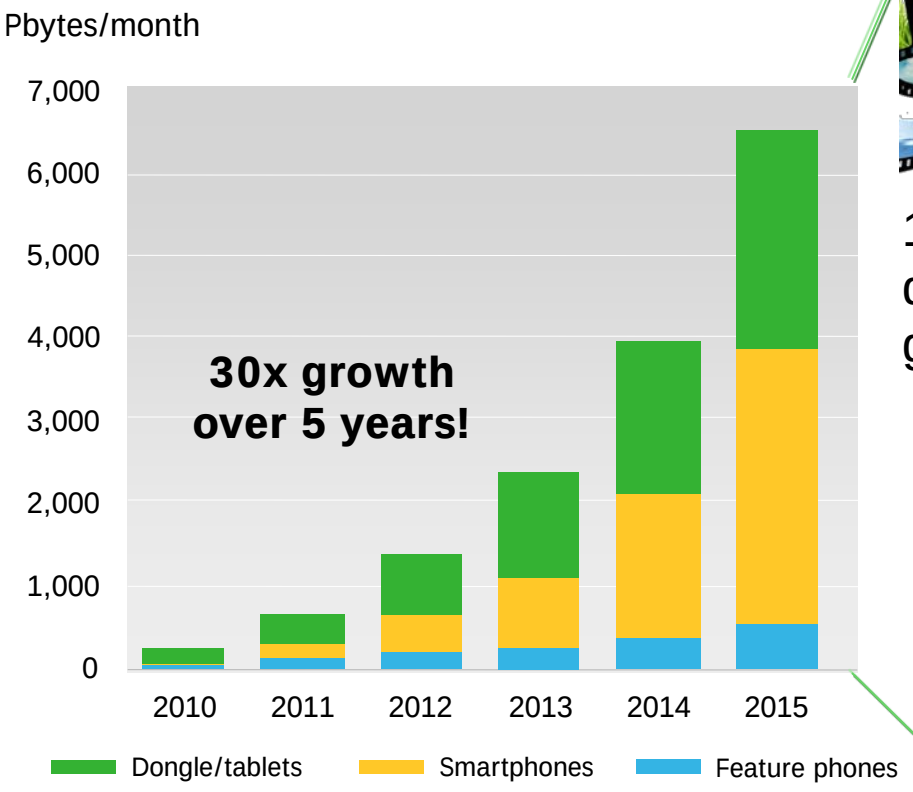
Source: Alcatel-Lucent measurements using 9900 WNG within live networks and Bell Labs analysis

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

BANDWIDTH NEEDS TOMORROW

Forecast consumption by device type

Worldwide Aggregate Mobile Traffic





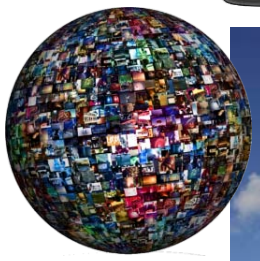
More tablets





~80% smartphone in the US

100b App downloads globally





Personal and Corporate Cloud Computing



3m First Responders in the US

615m Machine to Machine devices

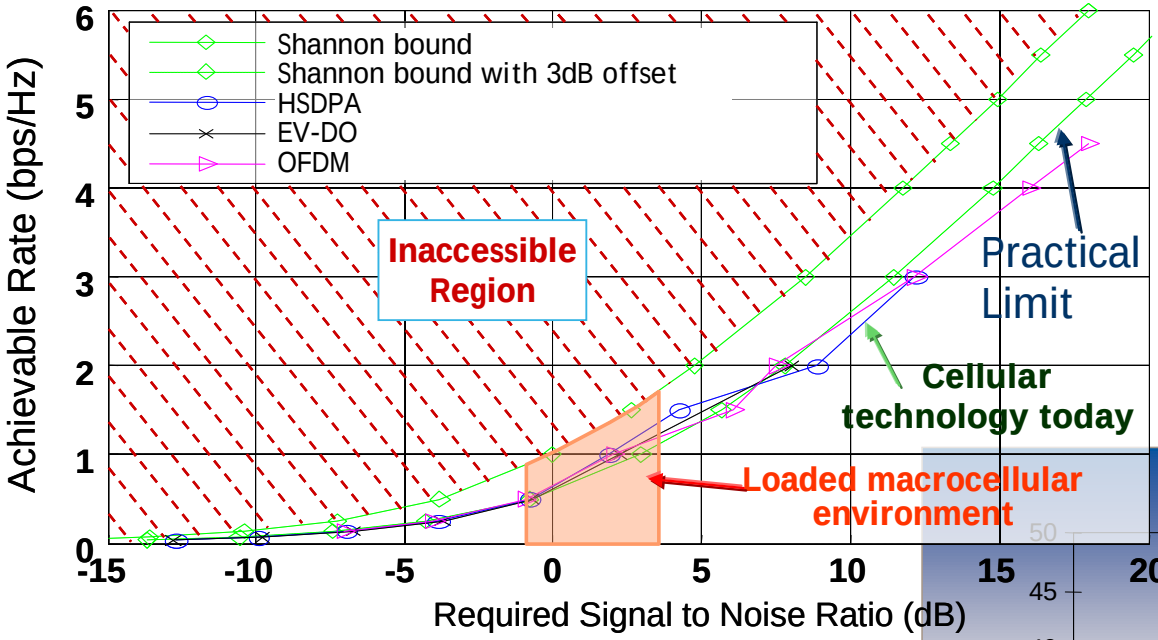




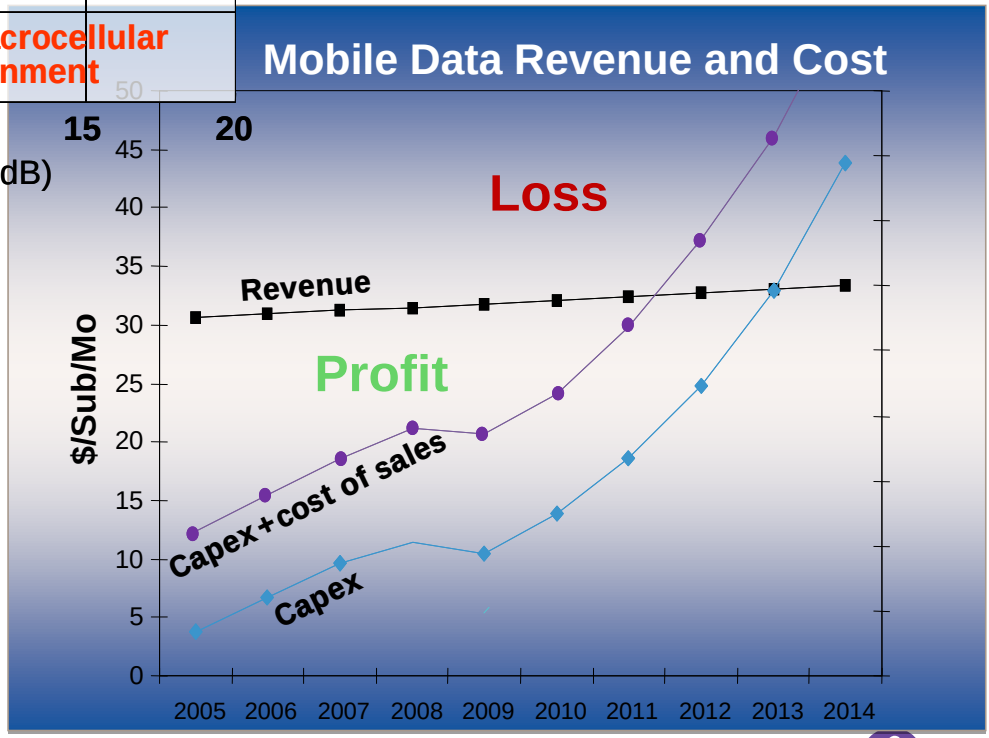
Source: Alcatel-Lucent measurements using 9900 WNG within live networks and Bell Labs analysis

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

Limitations of Physics and Economics



- There is a limit to the amount of information that can be compressed into a given bandwidth (Shannon bound)
- 3G and 4G technologies are near that limit



- Techniques such as cell splitting, small cells can help with reusing spectrum to satisfy capacity demand
- However, this increases the cost of capacity
- Also, increasing frequency reuse also increases interference, thus reducing spectral efficiency

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

Mobile Technology Evolution

1.25MHz 5MHz

3G



Today

4G/LTE

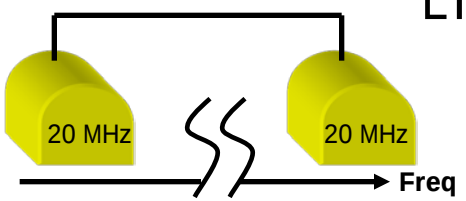
LTE with MIMO increases spectral efficiency by 30-50% compared to 3G

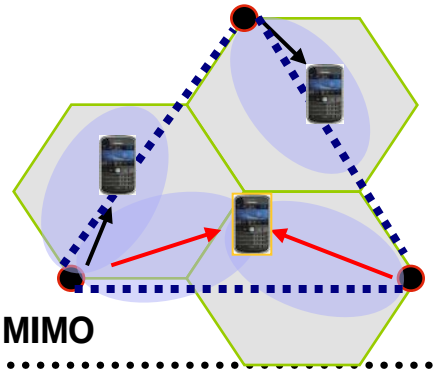
LTE scales better than 3G reaching full potential with 10MHz+ bandwidths

1.4MHz 3MHz 5MHz 10MHz 20MHz

LTE Advanced

Carrier Aggregation





Network MIMO

LTE Advanced brings new innovations enabling higher throughputs to end users

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

Bell Labs Leads the Way with LIGHTRADIO™



Modular Active Antenna Array

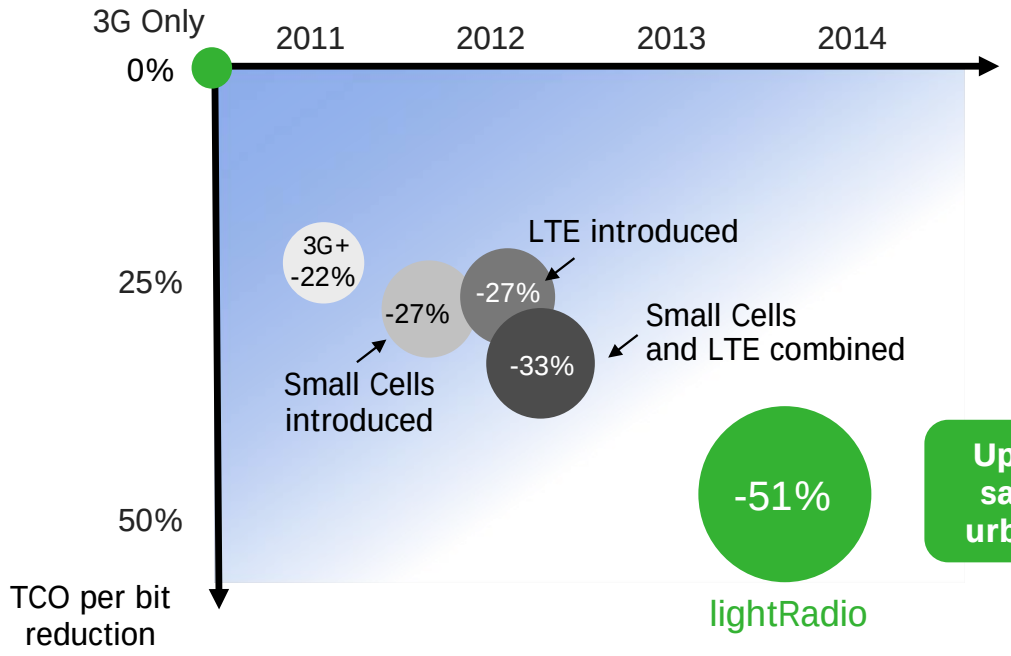


Multi-band Remote Radio Head





System on Chip based multi-technology Baseband



Cost Effective Coverage and Capacity

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.

Summary

- Mobile data traffic is expected to grow 30 times over the next 5 years
- The physical limitation on data compression (Shannon bound) creates the need for the availability of wider bandwidth
- Spectrum reuse through small cells and cell splitting can help with maximizing the use of scarce spectrum, but the cost of equipment and increase in interference make indefinite reuse impractical
- Technology improvements, including 4G/LTE, enable the use of wider spectrum bandwidths to increase network capacity and improve end user experience
- More spectrum is needed to maintain the current momentum of innovation

COPYRIGHT © 2011 ALCATEL-LUCENT. ALL RIGHTS RESERVED.