



The Road to 4G



Mobile Monday Toronto Event - February 2011

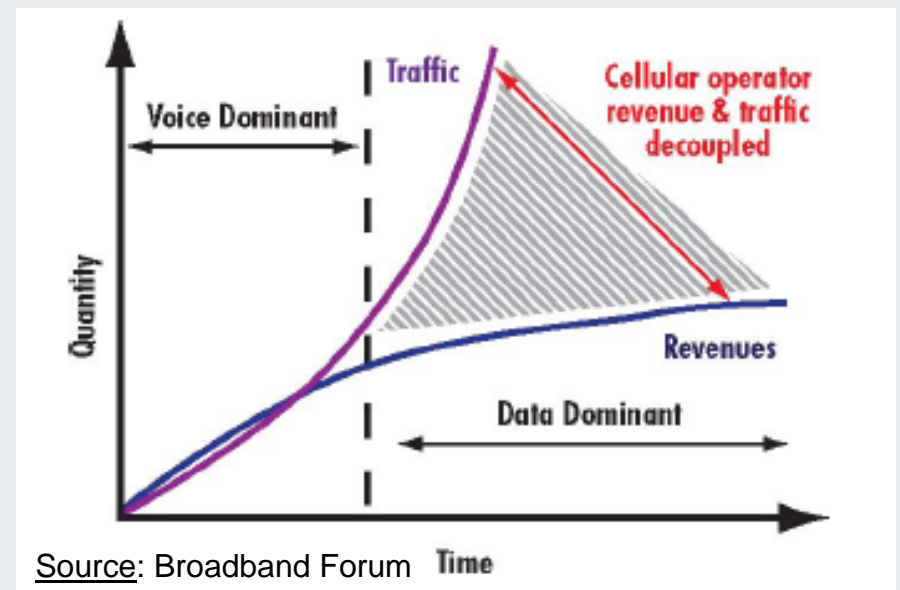
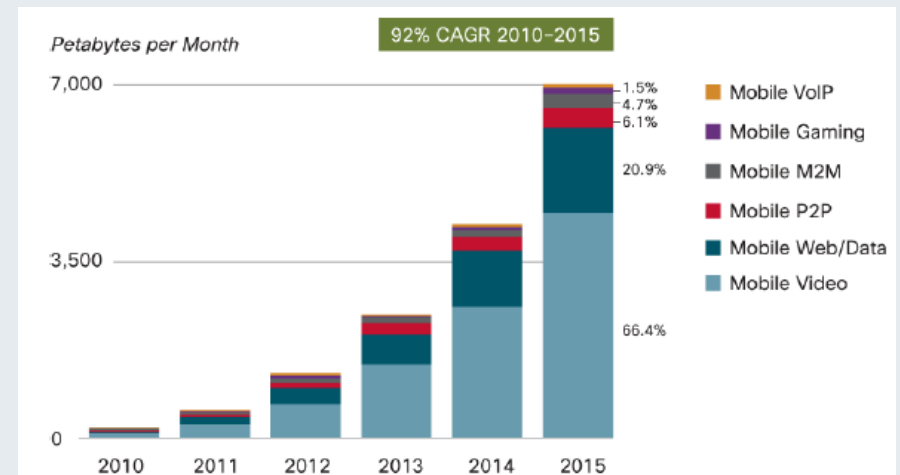
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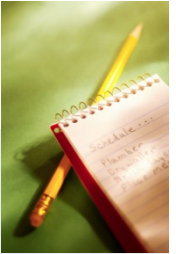
F R O S T & S U L L I V A N

3 Major Problems for Operators Today

Source: Cisco Systems' VNI, Jan. 2011

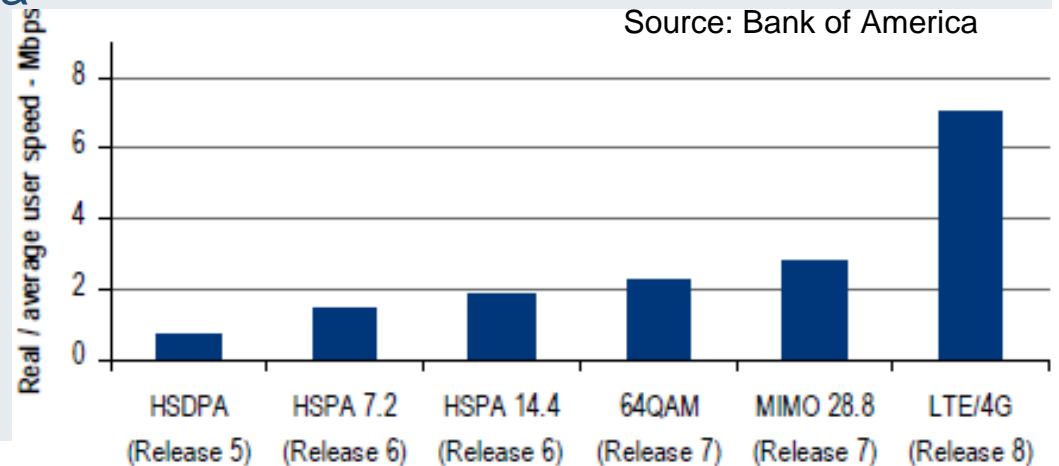
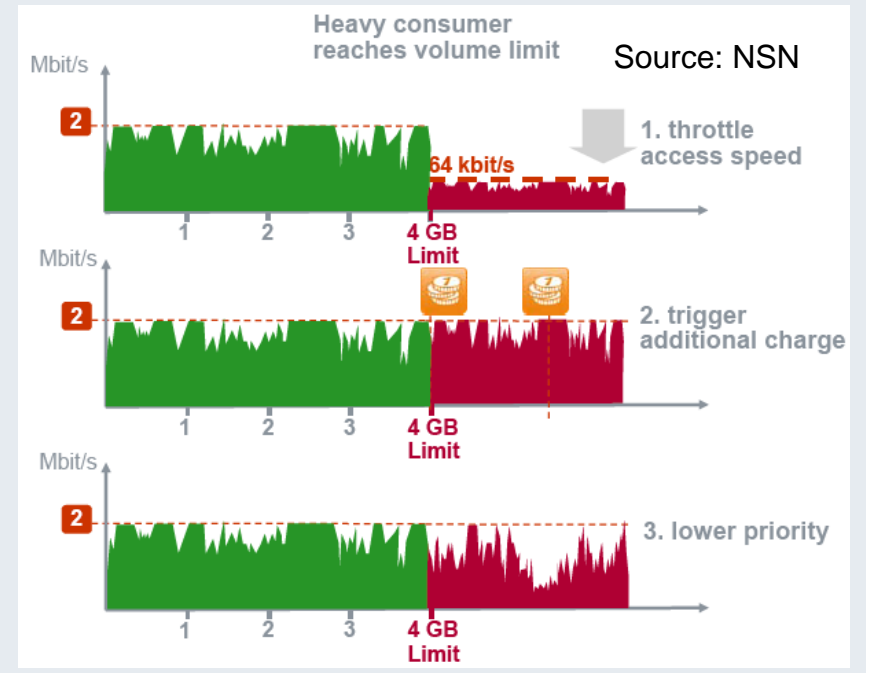
1. **Mobile data traffic continues to grow**
 - Culprits: smartphones (iPhone, etc.), mobile BB via USB modem, unmetered mobile data plans, advent of video (streaming, P2P, etc.)
2. **Network congestion becoming a key concern in 3 areas at varying degrees**
 - RAN (Radio Access Network): currently OK but adding capacity in areas of dense subscriber counts and high usage (e.g. in urban environments: NY, SF, etc.)
 - Backhaul: critical issue w/ upgrade to IP backhaul form circuit (old T1/E1 lines)
 - Core / signaling: (10x increase in session attempts/device for a smartphone)
3. **Data traffic growth much higher than data revenue growth**
 - Not all mobile data is profitable: 75-90% of traffic generates ~10% of service revenues
 - Unintended consequences: mobile data growth leads to lower MTRs (e.g., Sweden)





Ways for Operators to Address These Issues

1. Adopt network management policies
2. Buy up additional spectrum (e.g., upcoming 700 MHz auction in Canada)
3. Macro offload: Femtocell and Wi-Fi
4. Site / network sharing (e.g., Tele2 / TeliaSonera, Bell / Telus HSPA overlay, 3UK / T-Mobile, etc.)
 - Savings range from 4 to 11%
5. Technology evolution to get extra efficiency (e.g., LTE)
 - Lower latency (delay)
 - Increased throughputs (~ DSL)
 - Greater spectral efficiency



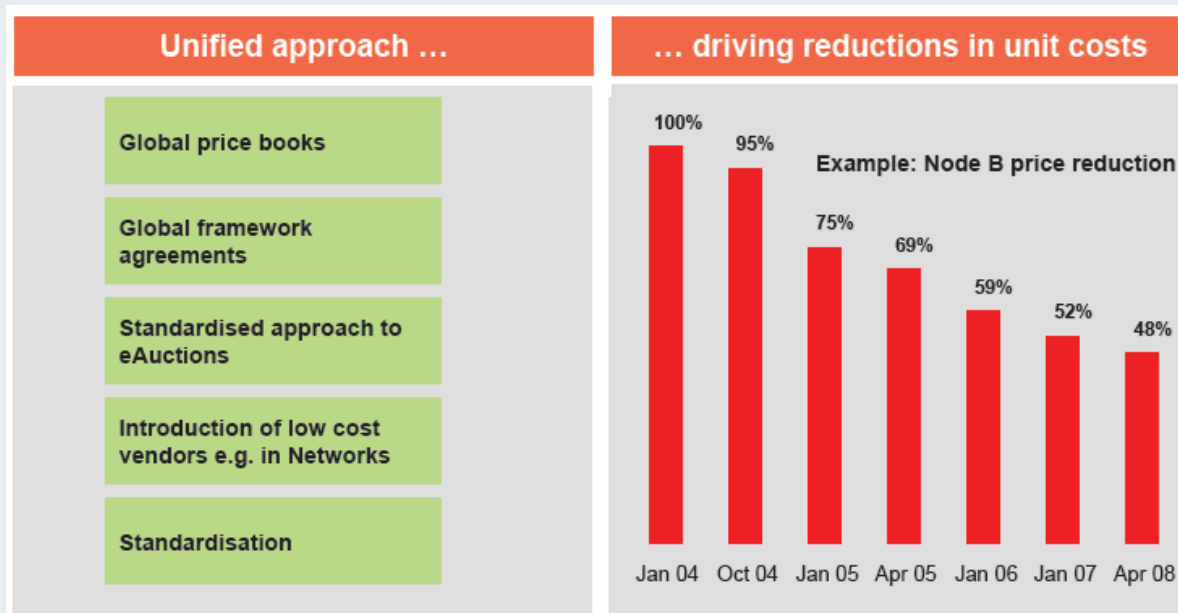


Will Pricing Pressures Help 4G/LTE?

- Operators shifting from CAPEX to OPEX-based models
- Service providers are moving towards utilization-driven pricing structures and opting for a just-in-time model as opposed to over-provisioning their systems as much as in the past
- Some carriers are reluctant to embrace the latest technology as they are increasingly realizing that early adopters often pay more (e.g., Vodafone 3G example - Node B)
- HSPA+ first, LTE later

Current LTE Price points:

- Orange: €50 - €100M to upgrade 2 large French cities from 3.75 to 4G
- Telenor LTE overlay tender is worth ~\$200M over 6 yrs.



Source: Vodafone (based on its 3G experience)

4G kit prices expected to drop over time, faster than for 3G



Canada's Road to 4G...

- Operators generally perceived by the industry as smart followers rather than early adopters
- Rogers conducting LTE trial (Ottawa area), initially on the AWS spectrum band but then on the 700 MHz band (subject to gov't approval)
- Crucial: 700 MHz digital dividend spectrum auction (est. 2H 2012) “**beachfront property**” band between 698-806 MHz (70-90 MHz assuming a 24 MHz public safety allocation)
- This cannot take place before issues such as the WindMobile question are resolved (will the Government finally take action vis-à-vis foreign ownership rules/restrictions?) – this is TBD, but will need to be addressed in 2011
- The auction will determine which of the new entrants will stay and which will sell out (before/after the auction with a 2013 closing if the buyer is an incumbent)
- Issues: set asides (to encourage new entrants), resale restrictions (to create some exit barriers for new entrants), spectrum caps, etc.
- Lengthy consultation process (2 stages) suggests an auction in late 2012

Q & A Session



Thank You

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