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# AN INCREASINGLY ALL- BROADBAND/MOBILE WORLD

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# The “100 Percent Ceiling”

Broadband Mobile will be the most significant part of the TMT Ecosystem

“There will be no limit on the number of connections as part of the mobile grid... Everything has the potential to be connected to the web...call it the 100 Percent Ceiling”

Ivan Seidenberg  
Chairman & CEO of Verizon  
CTIA Wireless 2009

# Paradigm Shift in Telecom

## -Explosive Not Glacial

### Old Paradigm

### New Paradigm

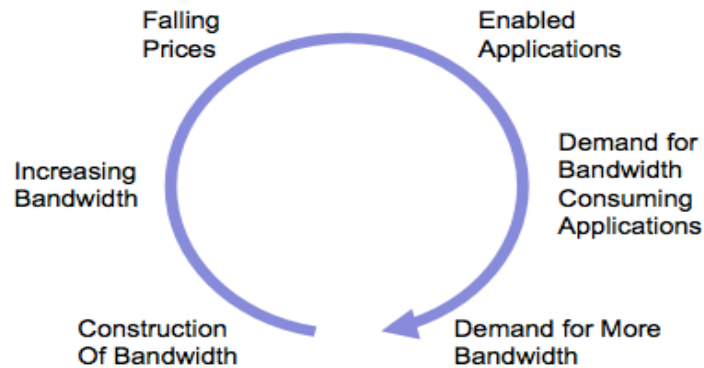
1. Old business model: end-to-end control of network assets—vertical integration	1. New business model: shared network assets, differentiation occurs on applications, content, customer care and performance
2. Distinct devices attached to unique networks dominated service delivery <ul style="list-style-type: none"> <li>•TV-Video</li> <li>•PC-Data</li> <li>•Telephone Voice</li> <li>•Market share concentrated among a few big players</li> </ul>	2. Blurring of lines: multiple services go over converged networks to assorted devices—single complex technological environment <ul style="list-style-type: none"> <li>•Mobile Video, Internet TV</li> <li>•Market share fragmented amongst many players</li> </ul>
3. PC-centric world <ul style="list-style-type: none"> <li>•Main link to Internet</li> </ul>	3. Mobile-centric world <ul style="list-style-type: none"> <li>•Mobile web-based content will be dominant source of information, games, services, etc.</li> </ul>
4. New service introduction incremental <ul style="list-style-type: none"> <li>•800 Service Voice, Caller ID, Premium Cable, Downloads</li> </ul>	4. New services transformational <ul style="list-style-type: none"> <li>•IPTV, Mobile-Content, Streaming Mobile Video, Peer-to-Peer</li> </ul>
5. Devices passive to network <ul style="list-style-type: none"> <li>•Network capabilities “pushed” to end-user equipment—network capacity drives demand</li> </ul>	5. Devices drive network services and thus explosion of bandwidth use <ul style="list-style-type: none"> <li>•Smartphones lead deployment of 3G/4G network capacity</li> </ul>
6. Enterprise/home-based management of facilities and services	6. Web-based services such as cloud computing, software as a service
7. Value in physical assets	7. Value in applications/content
8. Modest, predictable demand growth within largely well-defined geographic bands. Very low increase in demand per user <ul style="list-style-type: none"> <li>•Regional/national demand for traditional services</li> </ul>	8. Explosive, unpredictable bandwidth growth that transcends borders. Large growth in mobile data traffic per subscriber driven by multitude of wireless broadband devices <ul style="list-style-type: none"> <li>•Global demand for non-traditional services</li> </ul>
9. Network upgrades driven mainly by sheer volume	9. Advanced next-gen application will require intelligent network technology beyond capacity upgrades to support the diversity and quality requirements of advanced next-gen mobile apps.
10. Reasonable tracking of revenues with demand <ul style="list-style-type: none"> <li>•High revenue yield on narrowband services (e.g. old long distance rates)</li> </ul>	10. Divergence of revenue and demand—much lower revenue yield per unit of bandwidth (e.g. video streaming)
11. Walled gardens for wireless carriers <ul style="list-style-type: none"> <li>•Wireless carriers only offered home-growth content and features</li> </ul>	11. Off-deck applications <ul style="list-style-type: none"> <li>•Wireless carriers allow 3<sup>rd</sup> party developers to access their networks               <ul style="list-style-type: none"> <li>-iPhone/ATT deal drove this</li> <li>-Google now developing a Smartphone not sold via carriers so it can dictate features</li> </ul> </li> </ul>

## Virtuous Circle of Bandwidth Demand

### Circa 1999

*For a Fiber-Based World...*

*In Terrestrial Fiber World, Network Deployment of Bandwidth Drive Demand for High Bandwidth Services*

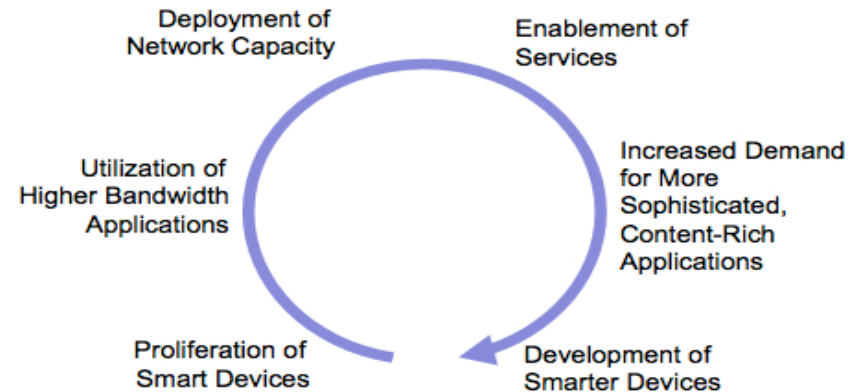


As bandwidth reaches mass markets, connected applications which run over network-based services (i.e. social networking, interactive gaming, image and music downloading, content sharing, streaming video, e-commerce, etc.) will proliferate and thus drive the need for more bandwidth

### Circa 2010

*Global Mobile Data Traffic...*

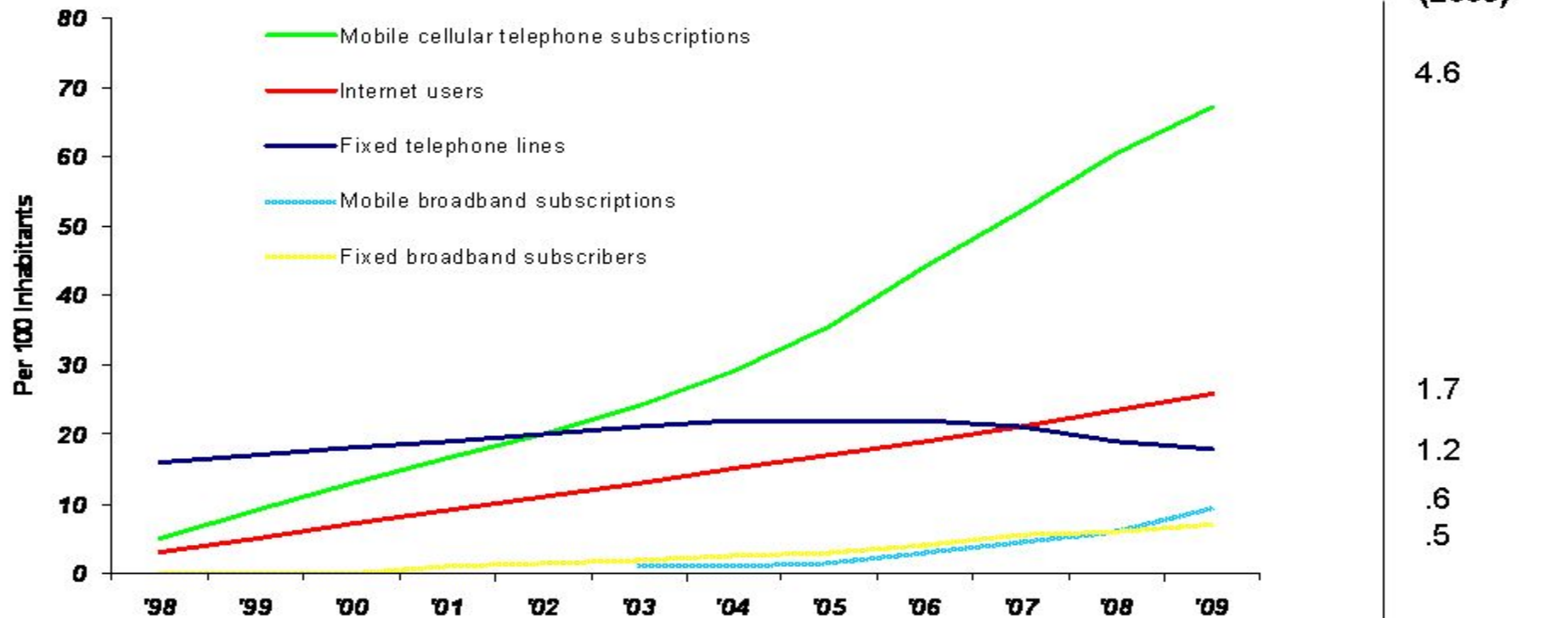
*In Mobile Broadband World, High End Wireless Handsets/Laptops Exponentially Multiply Traffic via Enablement of Broadband Services in the Devices*



In new Mobile-Web World—smart devices drive deployment of bandwidth rich networks

## A Decade of ICT<sup>1</sup> Growth Driven by Mobile Technologies

By sheer force of numbers, mobile will be epicenter of new broadband content and applications



- Mobile Cellular has been the most rapidly adopted technology in history
- Mobile is the most widespread personal technology on the planet—30% of mobile phone owners have two or more subscriptions
- Mobile Broadband subs surpassed fixed broadband subs in 2008
- There are over 4 times as many mobile subscribers than PCs—why mobile is where broadband content will gravitate
- More than 1 Billion new mobile phones are sold annually versus 200 million new TVs or 300 million new PCs—mobile relative position strengthening

<sup>1</sup>Information and Communications Technology

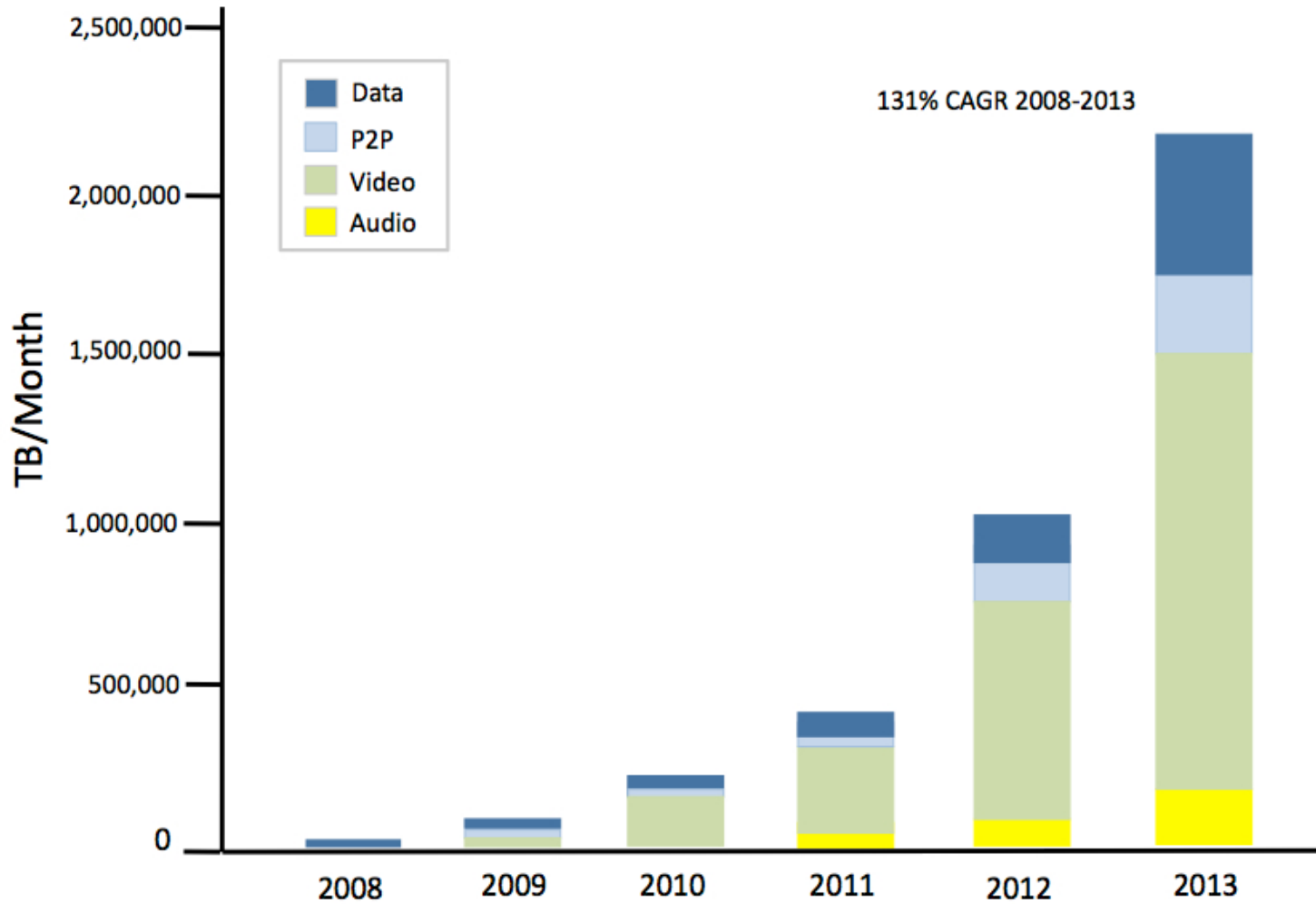
Source: ITU

## Global Mobile Data Traffic Will Double Every Year Through 2013

- Mobile data traffic will increase a thousand-fold in seven years from 2005-2012—half the time it took fixed Internet traffic to increase a thousand-fold (14 years)
- By 2013, 64% of world's mobile traffic will be video, up from 40% in 2008—Mobile Video is forecast to have the highest growth rate of any application measured within the Cisco Index that tracks networking applications
- Mobile Broadband handsets (>3G) and laptops with aircards will drive over 80% of global mobile traffic by 2013
  - A single iPhone or Blackberry generates more data traffic than 30 basic-feature cellphones
  - A laptop aircard generates more data traffic than 450 basic-feature cellphones

As Smartphones/broadband mobile devices grow as percent of total base demand for mobile bandwidth explodes

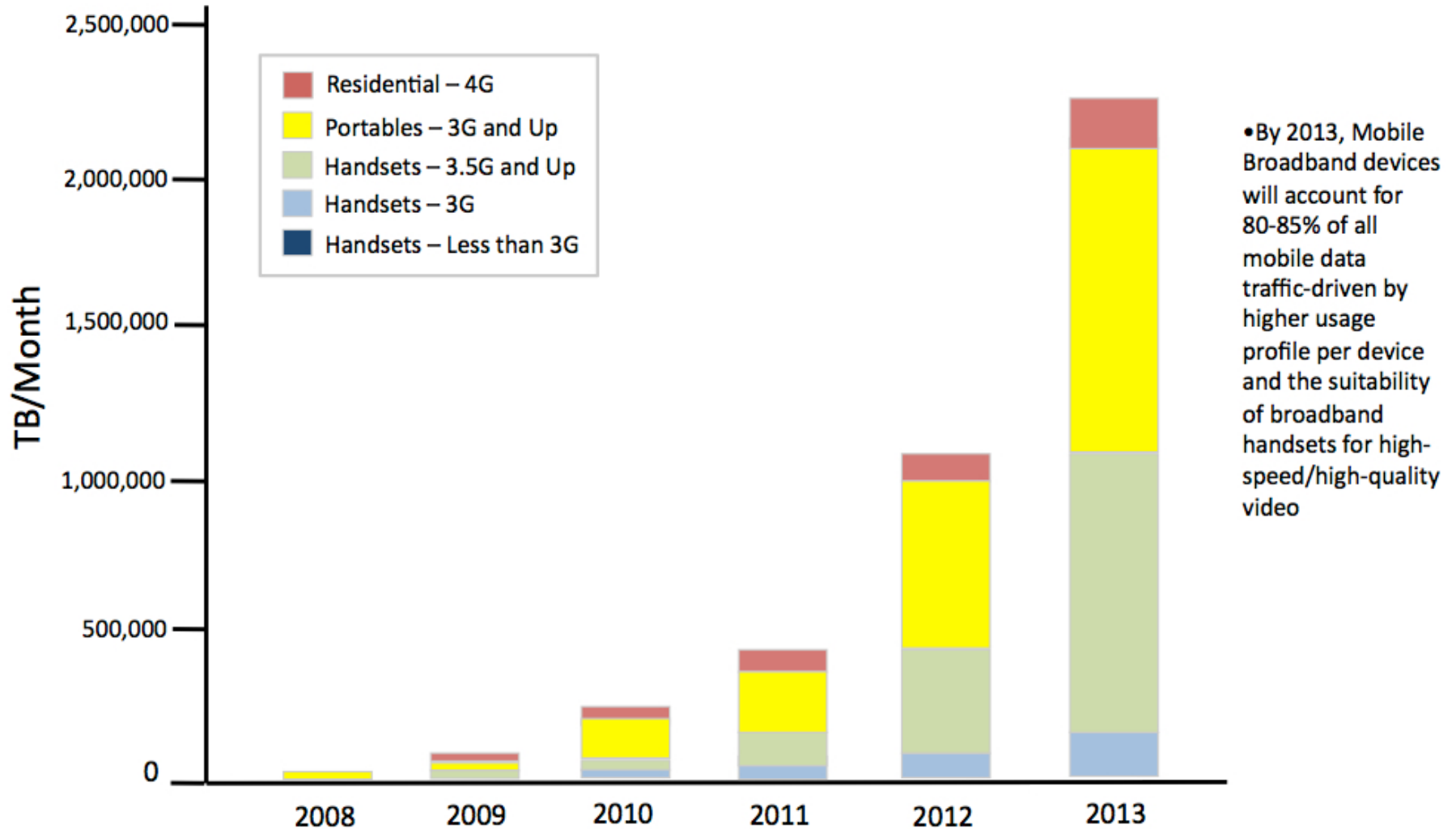
### Cisco Forecasts 2 Exabytes Per Month of Mobile Data Traffic in 2013



Suffice it to say a large number –one Exabyte = 1 quintillion or 1 million-trillion bytes!!!  
 • Mobile video is big driver

Source: Cisco, 2009

## Mobile Laptops and Mobile Broadband Handsets Drive Traffic Growth



•By 2013, Mobile Broadband devices will account for 80-85% of all mobile data traffic-driven by higher usage profile per device and the suitability of broadband handsets for high-speed/high-quality video

Source: Cisco, 2009

# The Market for Next Generation Wireless Broadband is Here and Now

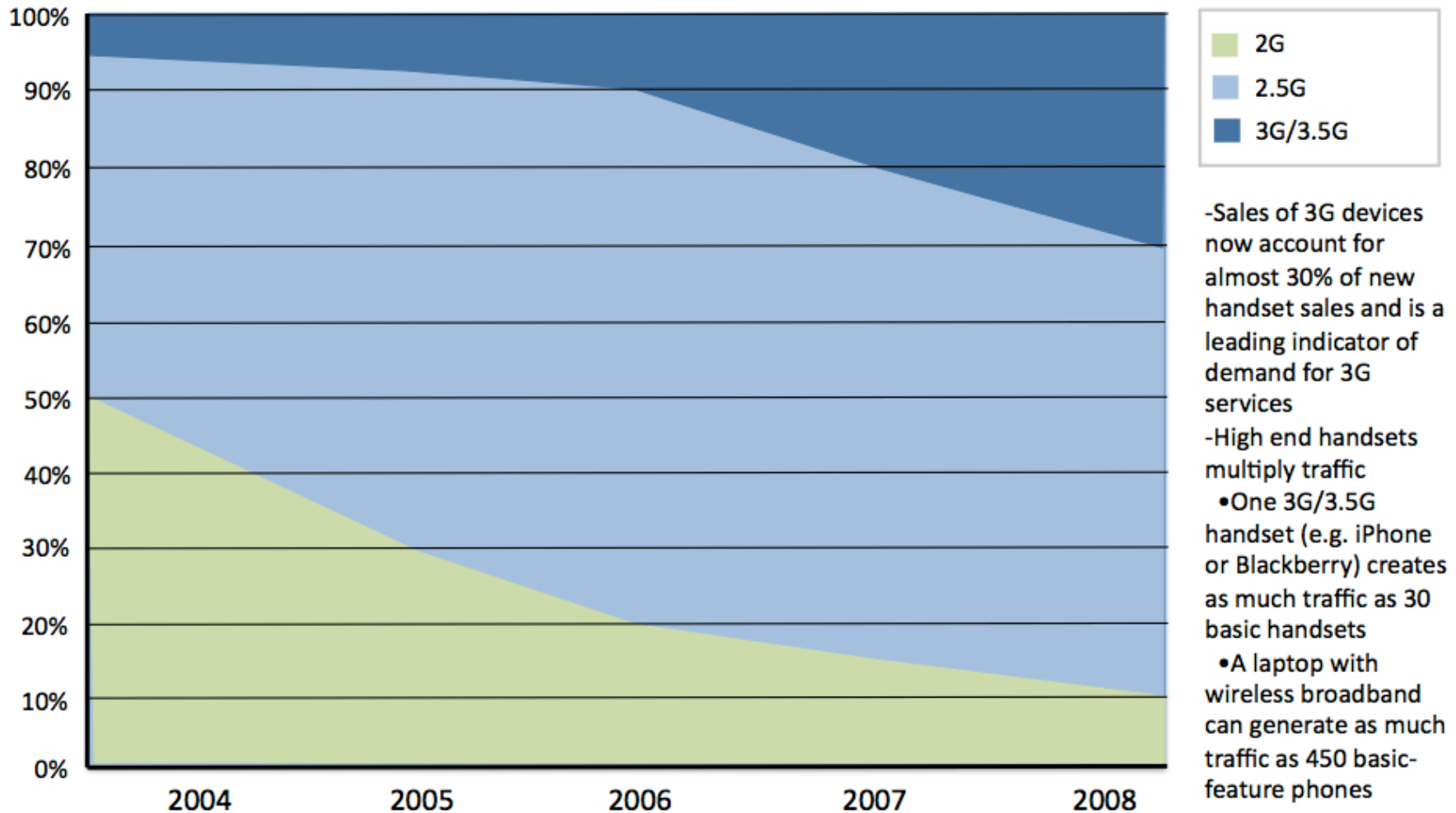
- Smartphone users (as represented by iPhone) are dramatically more bandwidth intensive
  - As Smartphones ramp-up as a percent of the installed base (currently 13% of global handsets), demand for bandwidth will explode—taxing network infrastructure

Usage <sup>1</sup>	iPhone Users	Average Wireless User
Streaming Video	31%	5%
YouTube	30%	1%
Google Maps	35%	3%
Social Networking	50%	4%
Web Search	58%	6%

<sup>1</sup>Percent of users who utilize a given capability

Source: MMetrics

## New Mobile Phone Sales by Generation



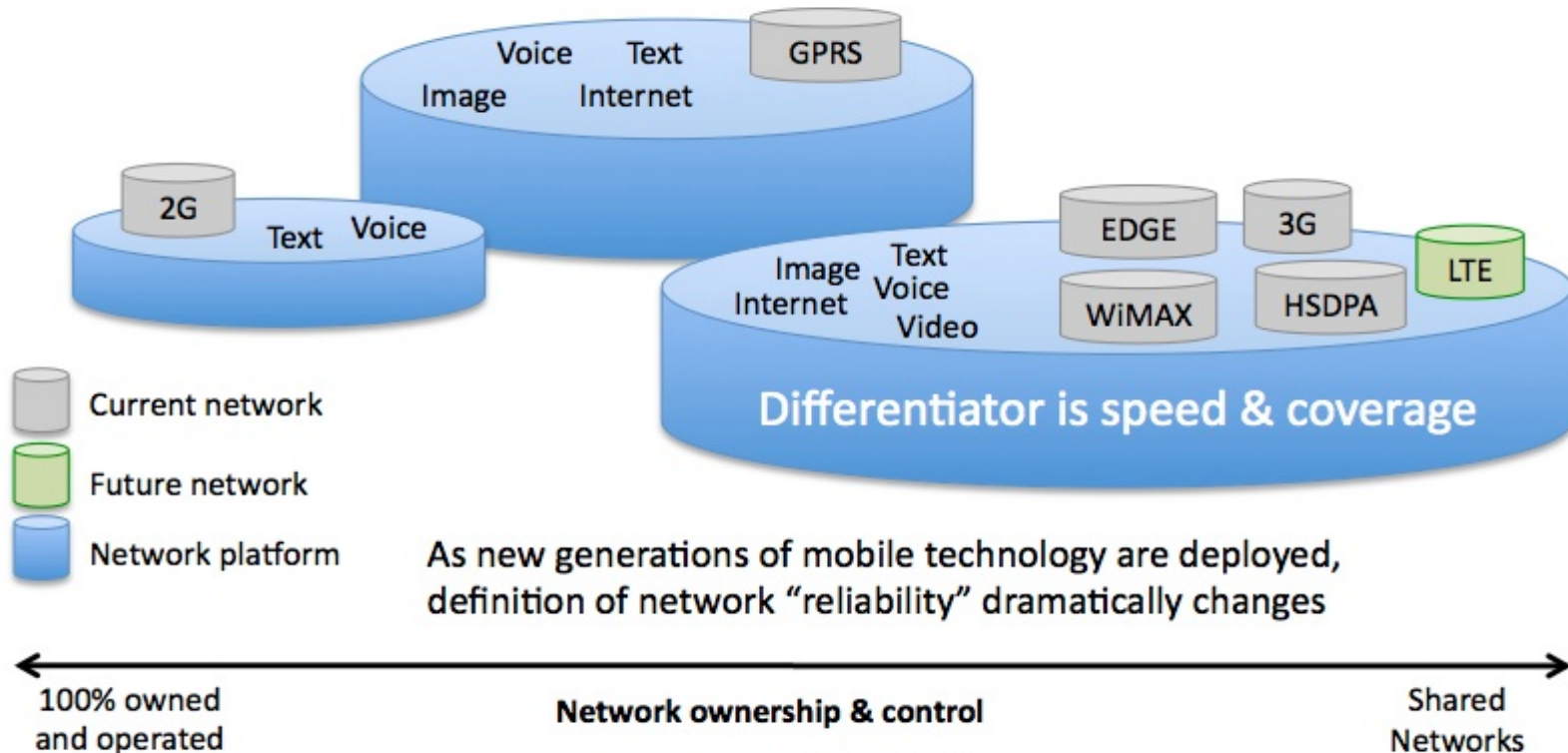
- Sales of 3G devices now account for almost 30% of new handset sales and is a leading indicator of demand for 3G services
- High end handsets multiply traffic
  - One 3G/3.5G handset (e.g. iPhone or Blackberry) creates as much traffic as 30 basic handsets
  - A laptop with wireless broadband can generate as much traffic as 450 basic-feature phones

Source: Tomi Ahonen, 2009

## Mobile Eco System

### Mobile Technologies and Applications Supported

Premium performance in a high bandwidth world will drive carriers to network sharing



# So, what does this all mean for LPTV?

- Clearly, demand for bandwidth will grow exponentially as more “devices on steroids” are deployed and become an increasingly large share of wireless ecosystem
- This will tax the infrastructure of existing carriers who are loathe to expand networks into less densely populated geographies but who require ubiquitous coverage as a marketing tool
- Even in urban and high bandwidth corridors carrier capital spending has limits given cash flow restraints and issues like Net Neutrality which may dampen appetite to spend on incremental capacity if no payoff
- LPTV could be an ENABLER of mobile and fixed broadband via network sharing arrangements with larger carriers if:
  - It can demonstrate return path capabilities so as not to be solely a broadcast medium (though that has some virtue – such as a facilitator of IPTV)
  - It can be “cellularized” to add a mobile element to the obvious fixed attributes
  - It can deploy multicast vs unicast capabilities
- If technology proves out, LPTV three most likely areas of value-added are:
  - Urban areas as an off-load transport path for existing carriers
  - Interstate highway corridors
  - Rural areas where LPTV can be a largely fixed wireless broadband solution to fill the void left by larger telecom/cable carriers who do not deploy network