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# Mobile traffic forecasts 2010-2020 & offloading solutions



15 May 2011

Understanding  
the  
Digital World

## IDATE

Consulting & Research

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- ▶ Main trends & drivers for the mobile market
- ▶ Mobile traffic forecasts 2010-2020
- ▶ Congestion in mobile networks
- ▶ Offloading solutions



## **Main trends & drivers for the mobile market**

### Major drivers and trends that will shape the world of 2010-2020

- ▶ Mobile voice was overtaken by mobile data at the end of 2009. Data was the number 1 service category at the beginning of 2010 in terms of traffic generated on mobile networks. Mobile voice traffic growth is expected to remain limited compared to the explosive growth in data traffic from 2010 to 2020.
- ▶ Currently mobile data traffic drastically reaches very high figures for mobile broadband <sup>(1)</sup> subscribers. In November 2010, one Scandinavian operator indicated that the average 3G smart phone user consumed 375 MB/month of data. The average 3G broadband user consumed 5 GB/month, largely through HSPA-data cards. But the average LTE consumer (all data cards) used 14 GB – 15 GB/month of data. In the USA, one operator announced an average of 7 GB per month of data for a base of 2 million subscribers in July 2010.
- ▶ Growing number of mobile devices such as tablets, dongles, smartphones and connected devices are being used.

<sup>(1)</sup> By “Mobile Broadband”, we refer to subscriptions and devices using technologies that can offer 3G bitrates (or higher, such as HSPA, HSPA+ and LTE). In this context, GSM and GPRS are not considered as Mobile Broadband technologies

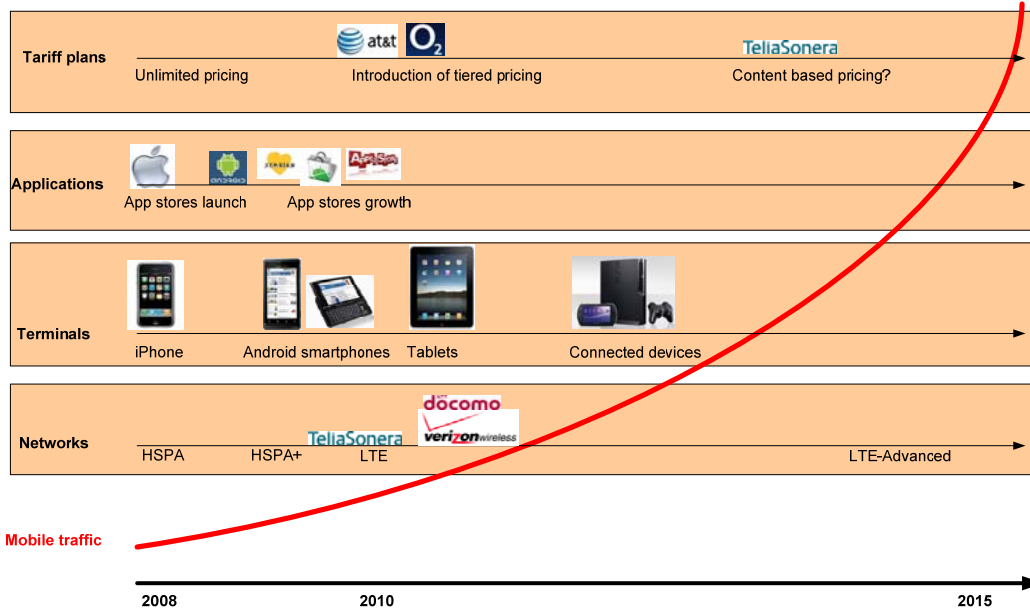
### Main trends and drivers

- ▶ The LTE ecosystem is developing rapidly as LTE took off in 2010 and LTE-Advanced is planned for 2015 according to time to market expectations.
- ▶ In 2010, the machine-to-machine (M2M) market already represents 53 million modules. M2M will continue to grow significantly. However in the future, the main contribution for mobile traffic will come from other devices.
- ▶ Small cells and Femtocells are becoming the solutions of choice for increasing network capacity.
- ▶ Social networking has become very important for mobile users and now represents new consumption patterns and generates significant traffic.
- ▶ Video has become increasingly important and is the N°1 source of data traffic. TV content provision by Internet also generates data traffic on mobile networks

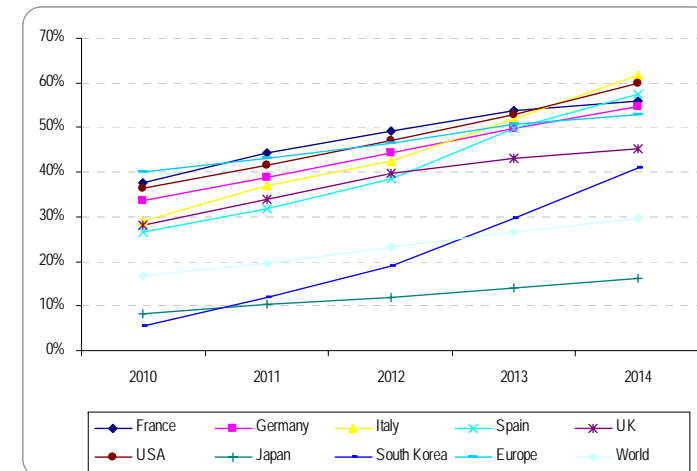
# Mobile Broadband drivers

- ▶ Mobile penetration rates
- ▶ The smartphones impact
- ▶ New devices: tablets & other connected devices
- ▶ Evolutions of the mobile value chain

## Enablers of mobile Internet

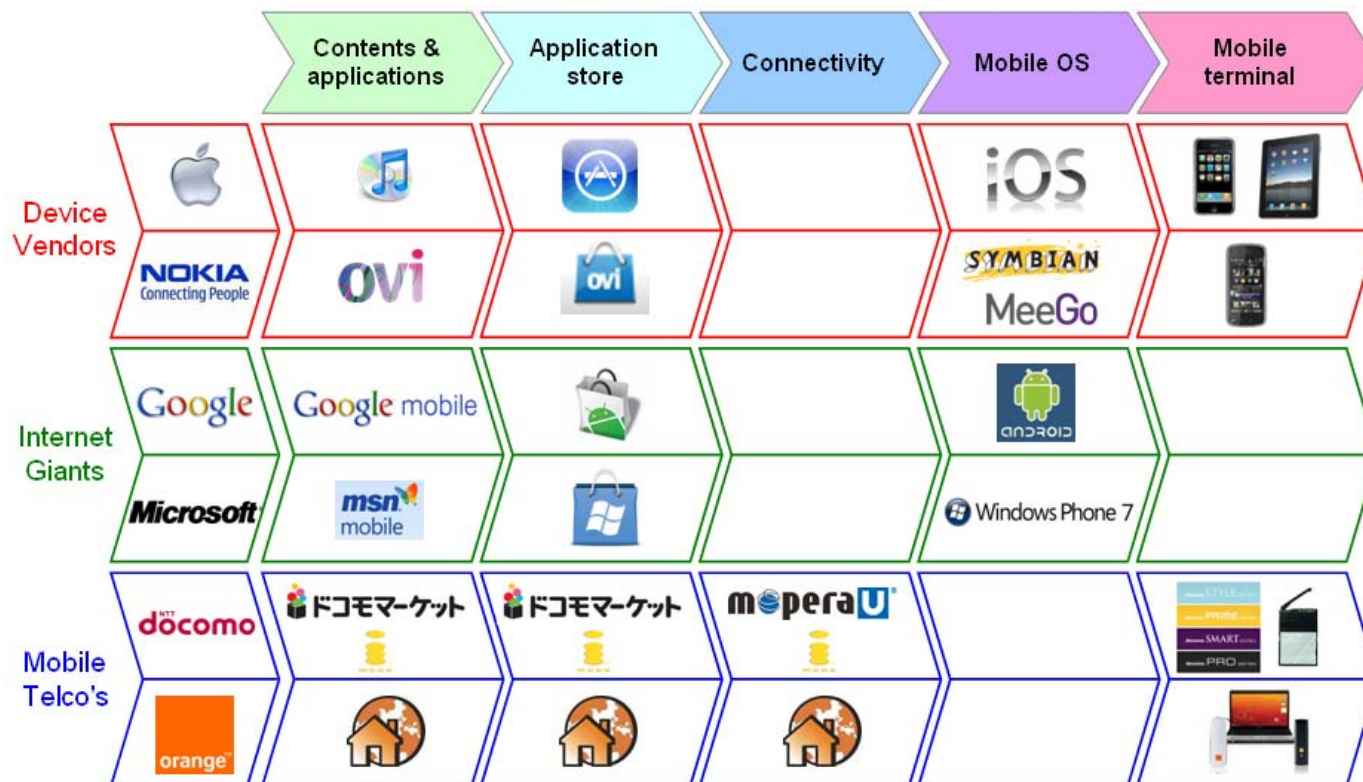


## Share of smartphones in mobile shipments, 2010-2014 forecast



Source: IDATE

## Evolutions of the mobile value chain



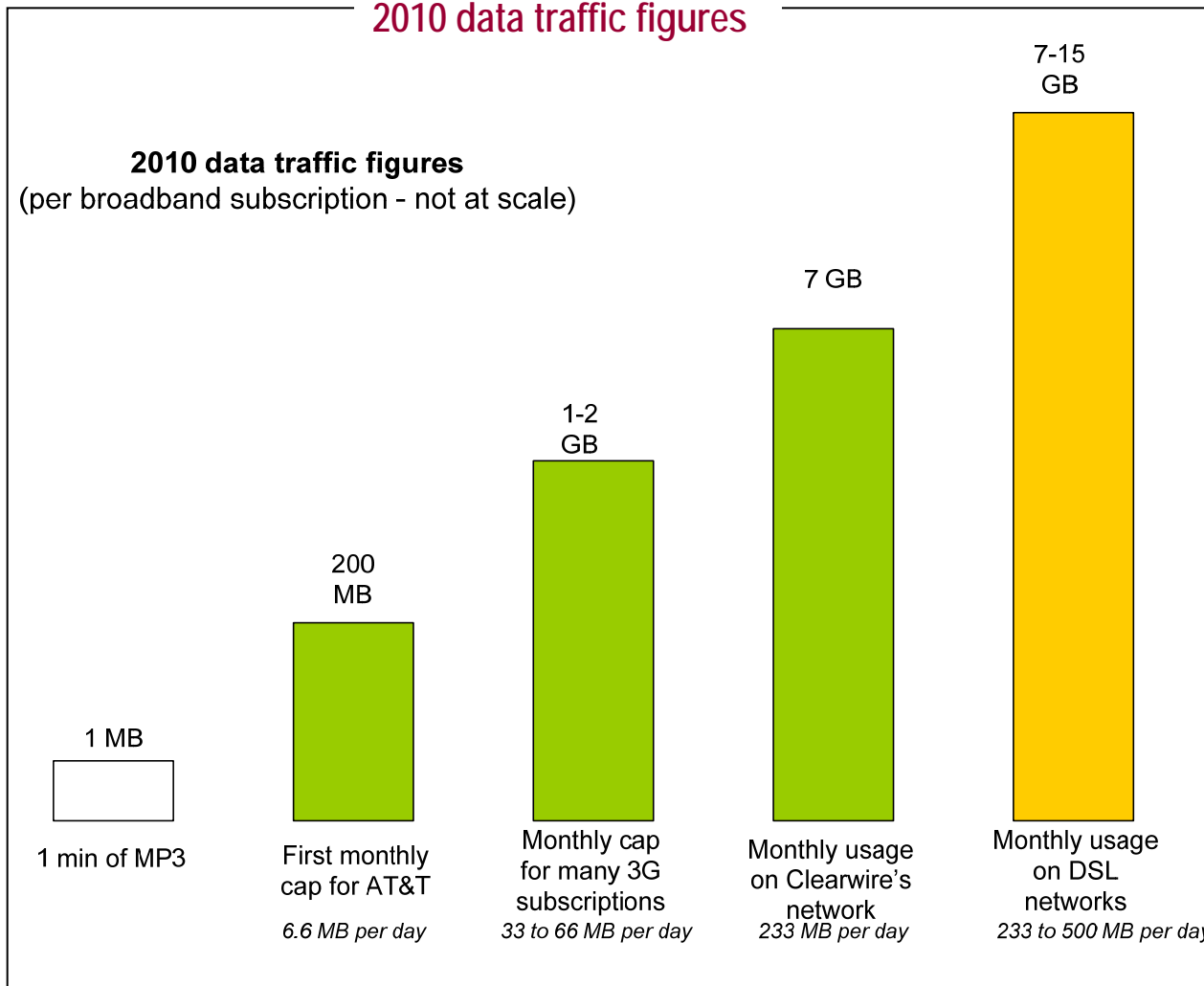
Source: IDATE

The arrival of Internet and PC actors in the mobile sector

- ▶ Apple with the iPhone and the AppStore concept
- ▶ Google launching the Android Operating System

## 2010 traffic on mobile and fixed networks

### 2010 data traffic figures



### Network capacity units

Kilobyte	KB	$10^3$
Megabyte	MB	$10^6$
Gigabyte	GB	$10^9$
Terabyte	TB	$10^{12}$
Petabyte	PB	$10^{15}$
Exabyte	EB	$10^{18}$

1 Gigabyte = 1,000 Megabytes

1 Terabyte = 1,000 Gigabytes

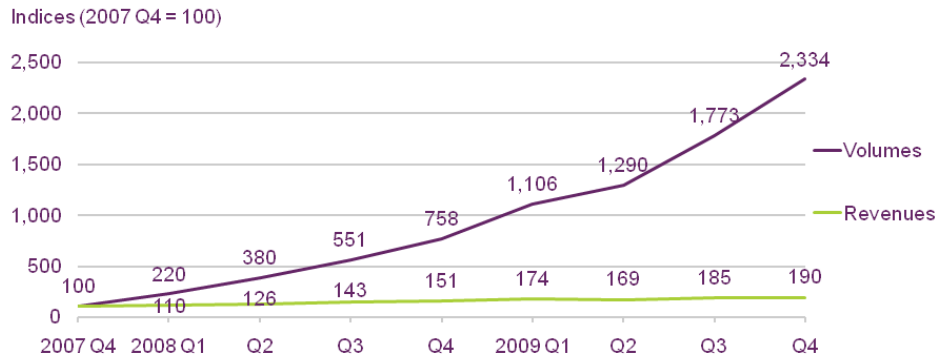
1 Petabyte = 1,000 Terabytes = 1,000,000 Gigabytes

1 Exabyte = 1,000 Petabytes = 1,000,000 Terabyte

# The dramatic growth of mobile data traffic

## UK mobile data traffic growth

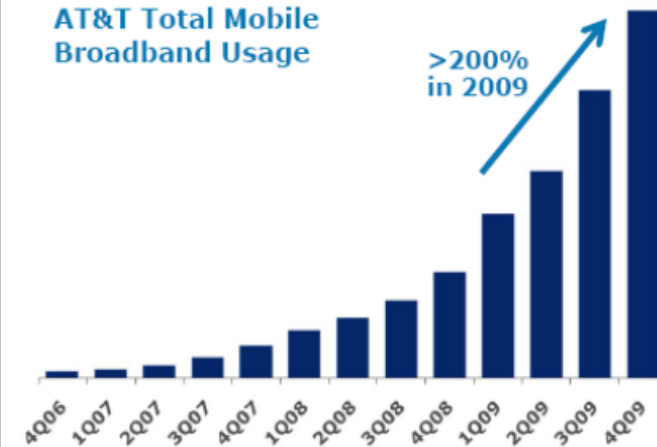
Mobile data volumes and revenues



Source: Ofcom

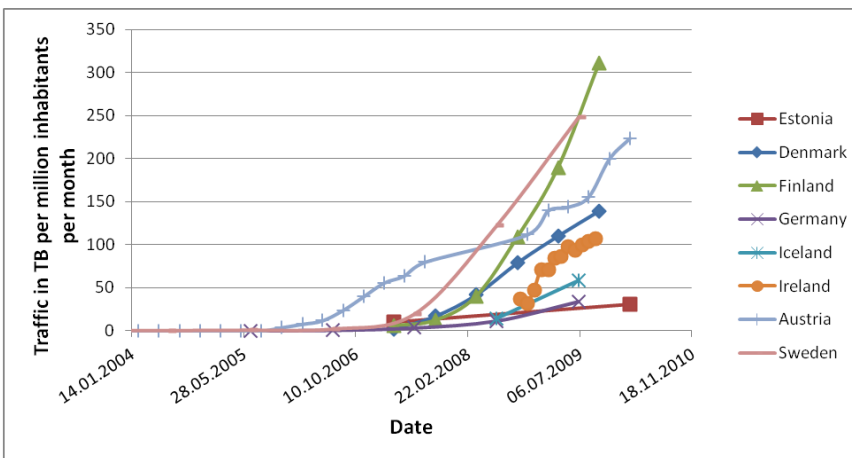
## AT&T traffic evolution

AT&T Total Mobile Broadband Usage



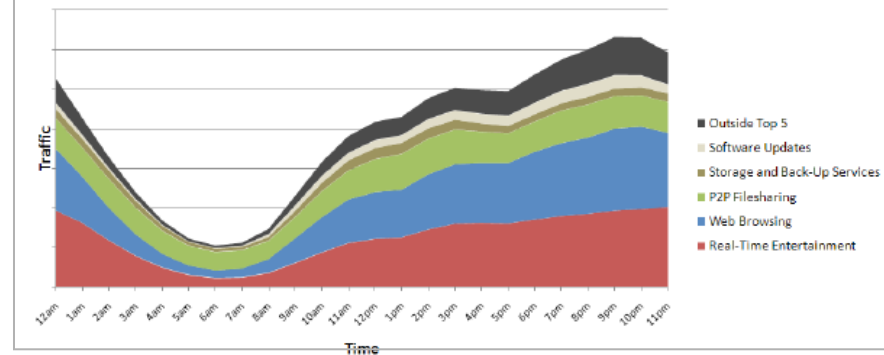
Source: AT&T

## Mobile data traffic evolution (TB per million inhabitants per month) in some European countries



Source: ECC PT1

## Daily traffic consumption in Europe



Source: Sandvine

## The dramatic growth of data traffic

### Daily mobile broadband data per subscription in European countries

Country	Time	Mobile Broadband Traffic per Day
Sweden	2009	61 MB/subscriber (average of private and corporate)
Finland	2H/2009	61 MB/subscription
Denmark	2H/2009	43 MB/subscription
Austria	Q4/2009	42 MB/subscription
Ireland	Q1/2010	42 MB/customer (average btw business and residential)
Iceland	2H/2009	31 MB
Slovak	n/a	15 MB/subscriber
Germany	2009	4.8MB/UMTS user (*as a response to Q2)
Netherlands	2H/2009	2.5MB/connection
Malta	1Q/2010	0.5MB/subscriber

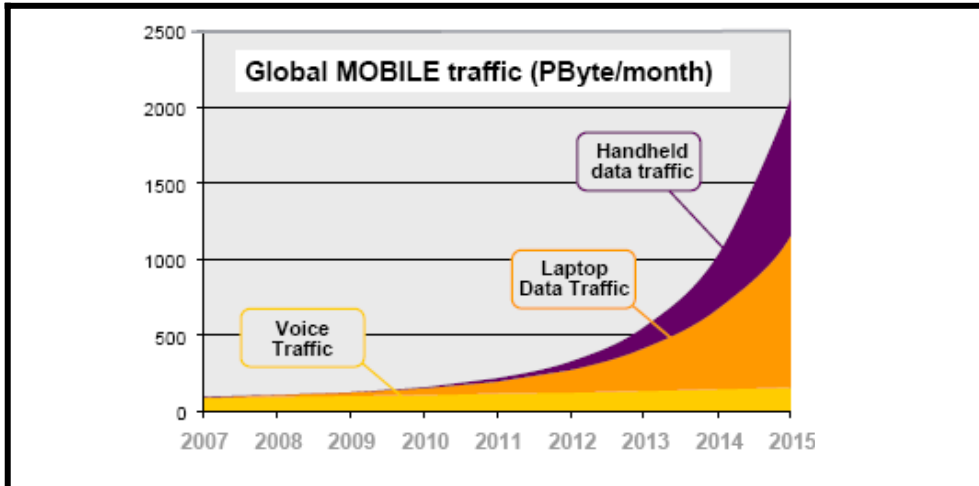
Source: : ECC PT1



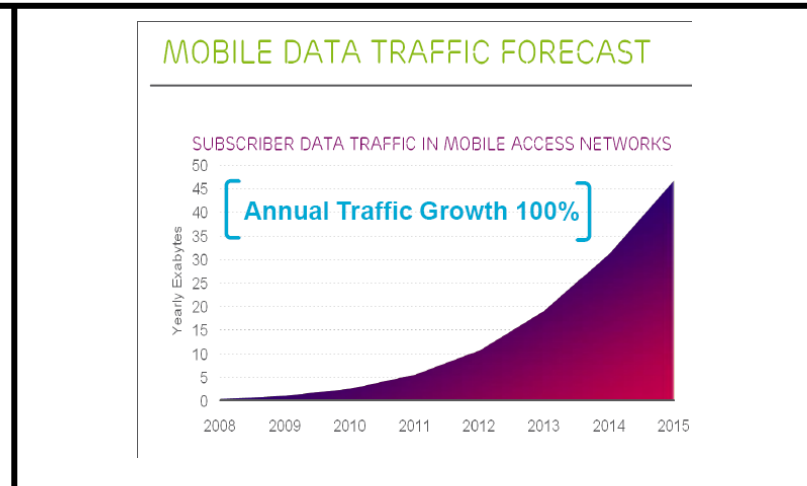
## Mobile traffic forecasts 2010-2020

# Mobile traffic forecasts (equipment vendors)

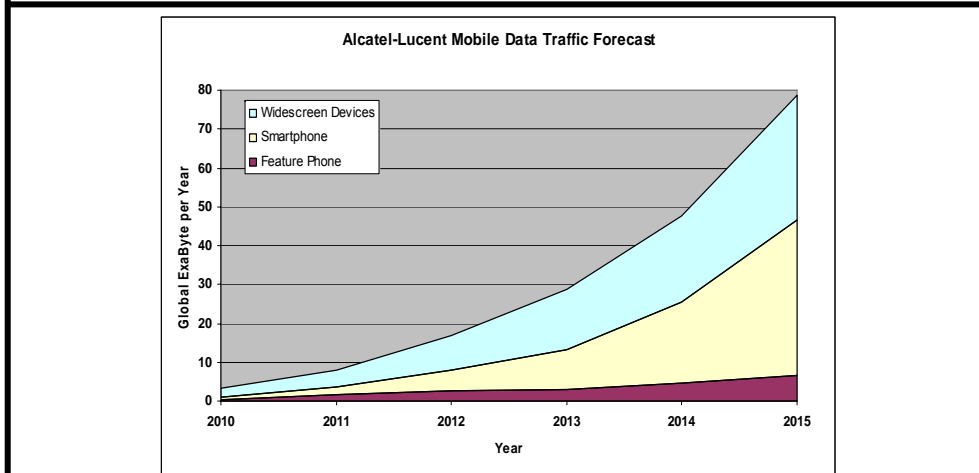
## Mobile traffic evolution from equipment vendors' perspectives



Source: Nokia Siemens Networks, 2009



Source: Ericsson, 2010



Source ALU: November 2010

**30x Growth in Global Aggregate Mobile Traffic**  
**31% CAGR MBB Subscribers**  
**41% SmartPhones in 2012**

## Main hypothesis

In this report, mobile traffic forecasts represent:

- ▶ Traffic forecasts presented in this section represent the uplink and downlink traffic for voice and data
- ▶ The traffic taken into account is the traffic transported on mobile networks using licensed spectrum
- ▶ Wi-Fi offloading is not taken into account <sup>[1]</sup>
- ▶ The forecasts include the traffic managed by Femtocells
- ▶ The forecasts presented in this report do not take into account RFID traffic or any other traffic on unlicensed frequency bands

<sup>[1]</sup> Wi-Fi or any type of traffic offloading on unlicensed spectrum relates, by essence, to stationary wireless broadband access. It implies some usage restrictions/limitations on the quality, mobility and security of the service. As such, Wi-Fi is a 'second choice' solution to a primary mobile broadband access. The two access methods (mobile broadband and stationary wireless broadband) are complementary, not competing. There will always be applications that work reasonably well in best effort, while many others will need QoS. This Report clearly focuses on mobile broadband - that is, not stationary wireless broadband - and therefore Wi-Fi traffic was excluded from this Report.

## Global mobile subscriptions forecasts (including M2M)

Global Base (million)	2010	2015	2020
Europe	1 033	1 222	1 427
Americas	915	1 166	1 437
Asia	2 579	3 825	4 957
Rest of the world	801	1 276	1 863
<b>World</b>	<b>5 328</b>	<b>7 490</b>	<b>9 684</b>

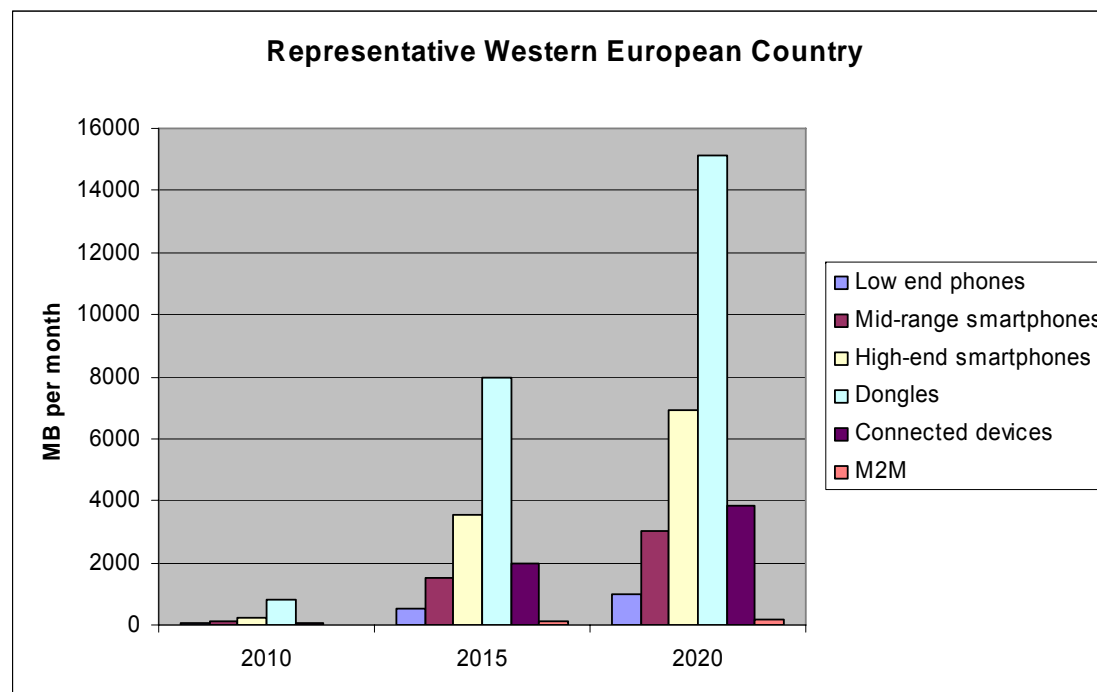
## Mobile traffic forecasts 2010-2020

### Main hypothesis - Traffic mix

A Representative Western European country is considered as a country with

- ▶ 50 million population in 2010 and 50.2 million in 2020
- ▶ 62.6 million subscriptions in 2010 and 85.4 million subscriptions in 2020, respectively.

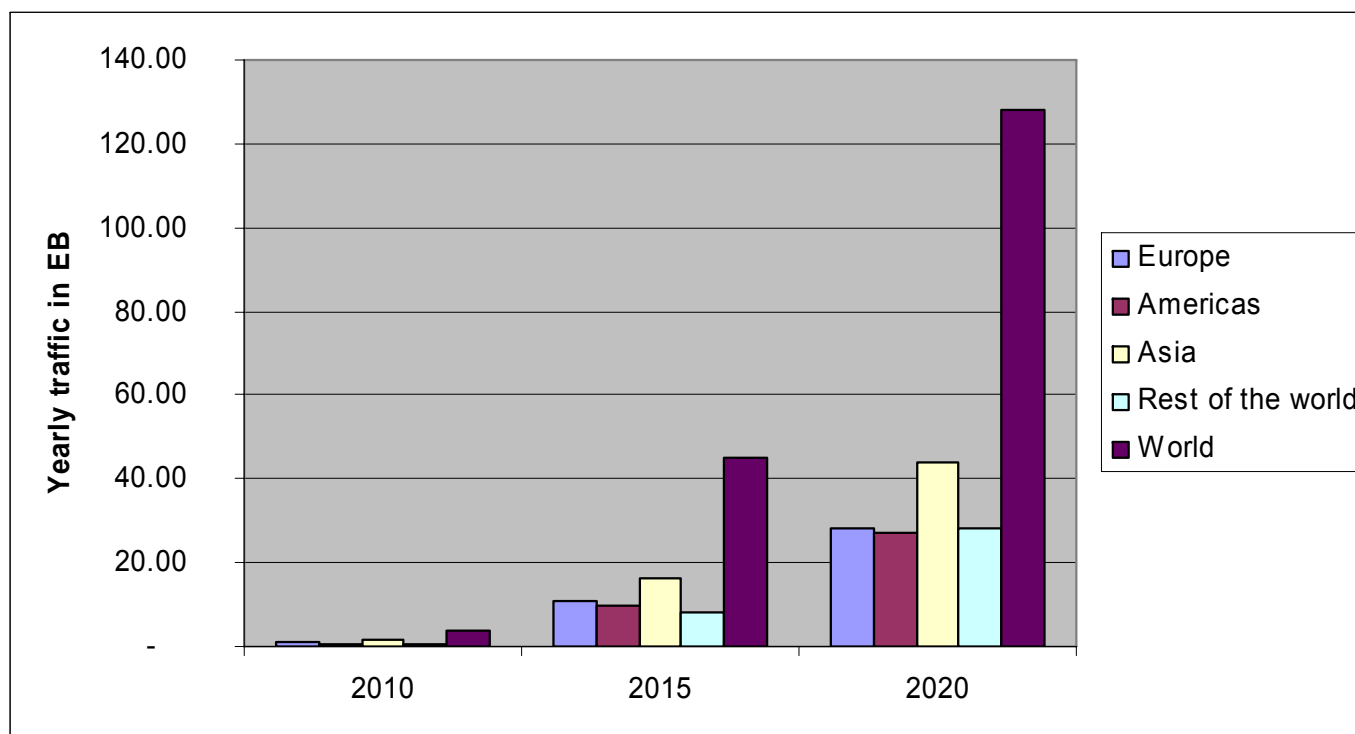
### Monthly traffic per device (representative Western European country)



## Total mobile traffic

As a conclusion, total worldwide mobile traffic will reach more than 127 EB in 2020, representing an 33 times increase compared with 2010 figure.

Total mobile traffic (EB per year)



Source: IDATE

### Total daily mobile traffic

From 2010 to 2020, total daily mobile traffic in the representative Western European country will grow 67 times from 186 TB to 12540 TB.

Total daily mobile traffic	2010	2015	2020
Representative Western European Country (TB per day)	186	5,098	12,540

- ▶ Significantly, at least 80% of the traffic volume remains generated by users, leading to large variations of the total mobile traffic both in terms of time and space variations of traffic.
- ▶ Future mobile networks must be designed to cope with such variation of traffic and uneven traffic distribution, while at the same time maintaining a permanent and extensive geographical coverage in order to provide continuity of service to customers.
- ▶ These opposite constraints are some of the most significant future challenges for operators.

## Total daily mobile traffic per subscription

In 2020, daily traffic per Mobile Broadband subscription <sup>[1]</sup> in the representative Western European country will stand at 294 MB as an average and at 503 MB for dongles only.

Finally, we anticipate total worldwide mobile traffic of 351 EB in 2025 representing a 174% increase compared to 2020.

Daily mobile traffic per subscription	2010	2015	2020
Mobile Broadband (MB per day)	10	155	294
Dongles (MB per day)	26.7	265	503

<sup>[1]</sup> According to the model used in this report, users of Mobile Broadband (MBB) subscriptions with high-end smartphones and dongles will represent 31% of the subscriptions in 2020 and 63% of the mobile traffic



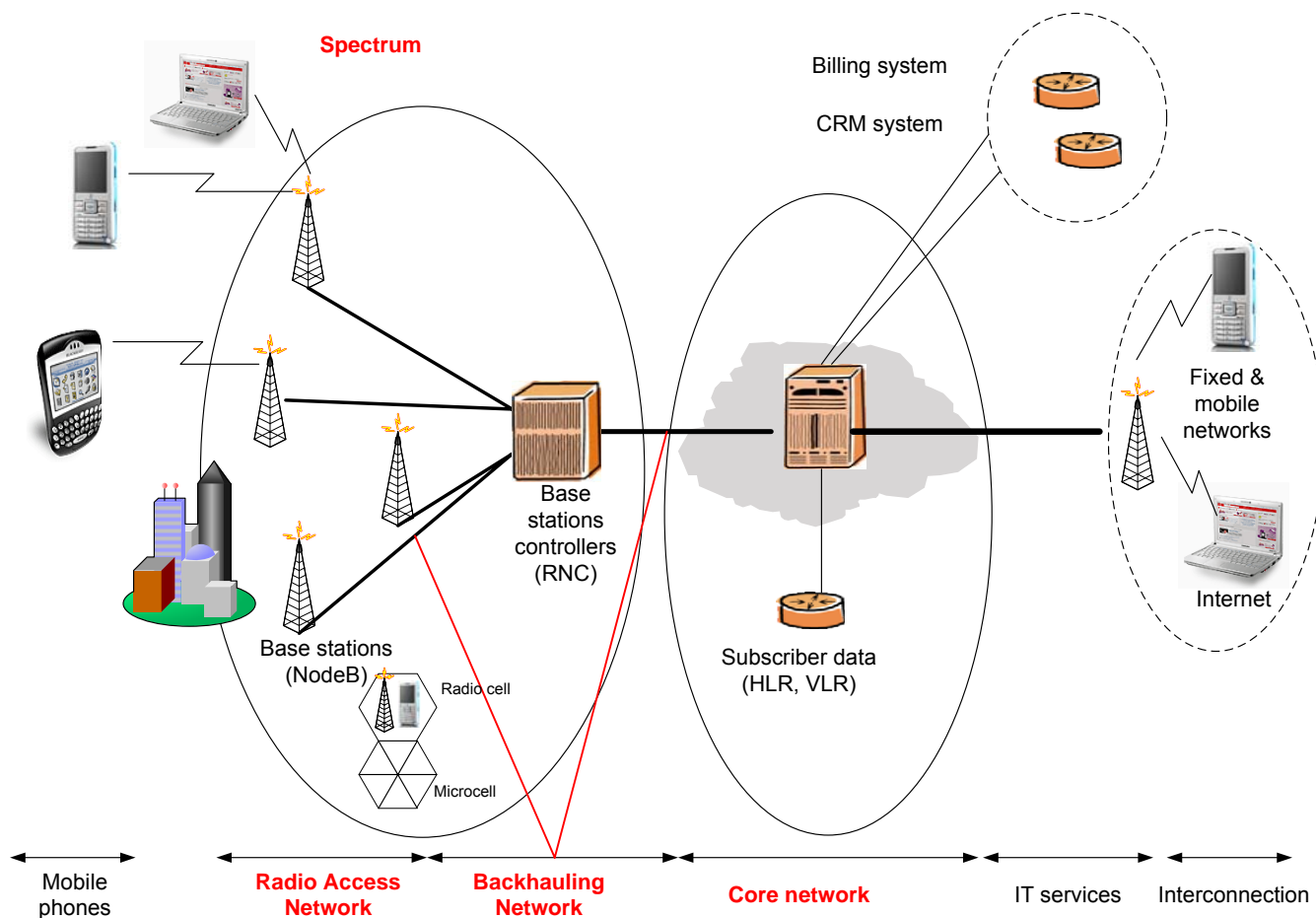
## Congestion in mobile networks

# Where does saturation occur?

► Data traffic & related signaling traffic

► 4 main bottlenecks

► RAN & Spectrum, Backhaul, Core Network



Source: IDATE

# Technical options for mobile operators

## Adapt Backhauling

- Previous standard LLs no longer sufficient
- IP migration required

## Data Offload

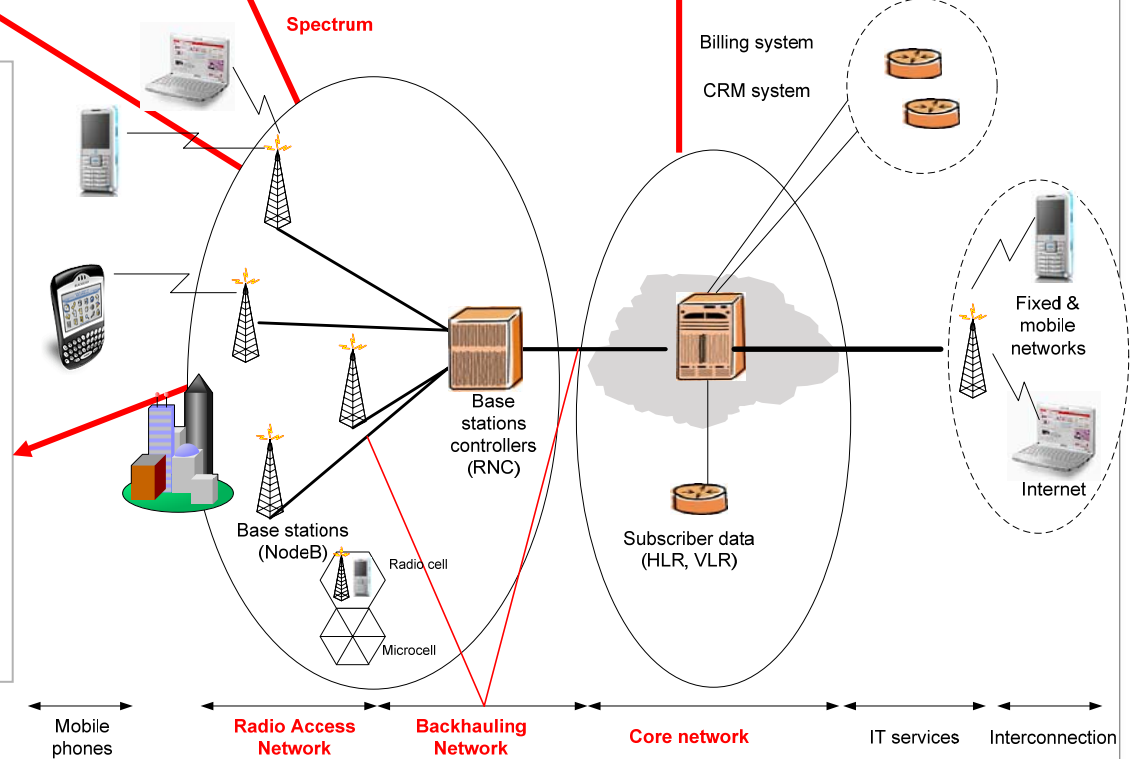
- Wi-Fi
- Femtocells
- Dedicated Broadcast

## Traffic prioritization

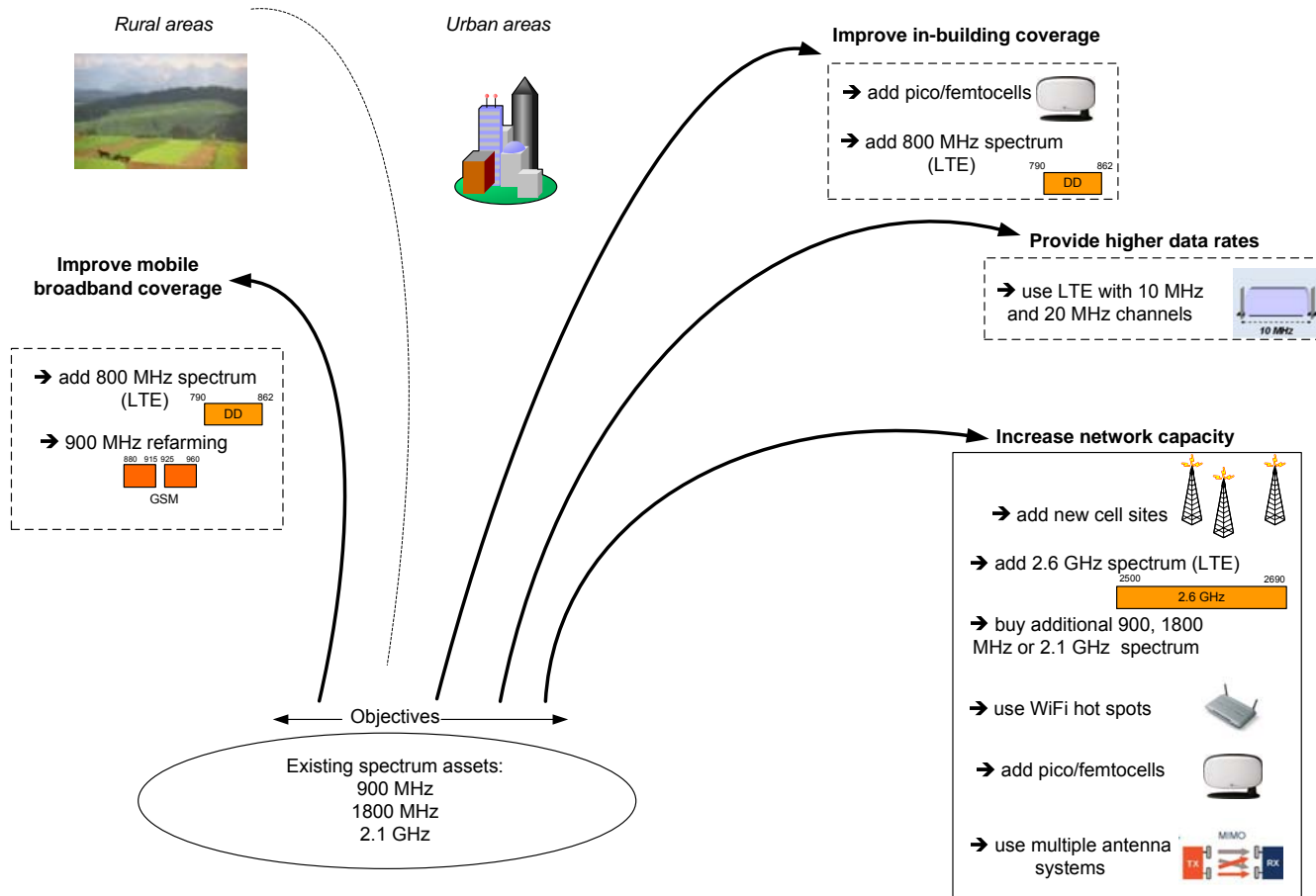
- DPI techniques & Bandwidth management

## Improve Radio Access Network

- Add new cell sites/ small/pico/femto- cells
- Switch to HSDP+/LTE/LTE Adv.
- Buy additional spectrum and refarming
  - Spectrum auction to come
    - 2.6 GHz, 800/1800 MHz, 2.1 GHz
    - 3.5 GHz
  - Digital dividend: 800 MHz TV
  - Refarming: 900 MHz for 3G



# Technical options for mobile operators



- ▶ A range of options having a significant impact on CAPEX
- ▶ Need to adapt backhauling capacity (FTTx, new microwave links...)

## Strategic/Marketing options

- ▶ Inevitable decline in per unit data price
- ▶ Shake up of wireless pricing schemes

- Introduce usage caps
  - “fair & reasonable” data usage
  - Premium for data-hungry sites?
  - Reduced connection speed when user exceeds cap
  - Incentives to change usage behavior

- Introduce classes of services
  - Premium for higher bandwidth & reliability
- Introduce usage-based pricing

### Usage-based pricing

Cost Monthly	Modem cost	Data	
<b>\$29</b>	FREE	3GB	<a href="#">Add to cart</a>
<small>(Total min cost over 12 months is \$348)</small>			
<a href="#">Terms &amp; Conditions</a>			
Cost Monthly	Modem cost	Data	
<b>\$39</b>	FREE	6GB	<a href="#">Add to cart</a>
<small>(Total min cost over 12 months is \$468)</small>			
<a href="#">Terms &amp; Conditions</a>			
Cost Monthly	Modem cost	Data	
<b>\$49</b>	FREE	8GB	<a href="#">Add to cart</a>
<small>(Total min cost over 12 months is \$588)</small>			
<a href="#">Terms &amp; Conditions</a>			

Source: Vodafone Australia

### Wireless pricing schemes

Data Packages		<a href="#">Why do I need a data package?</a>	
Device Type	Monthly Access Per Line	Data Allowance	Per-MB Rate
Feature Phones	—	Pay per use	\$1.99
Feature or 3G Multimedia Phones	\$9.99	25 MB	20¢ after allowance
Feature, 3G Multimedia or 3G Smartphones	\$29.99	Unlimited	—

Data package of \$9.99 or higher required for 3G Multimedia Phones.  
Data package of \$29.99 or higher required for 3G Smartphones.

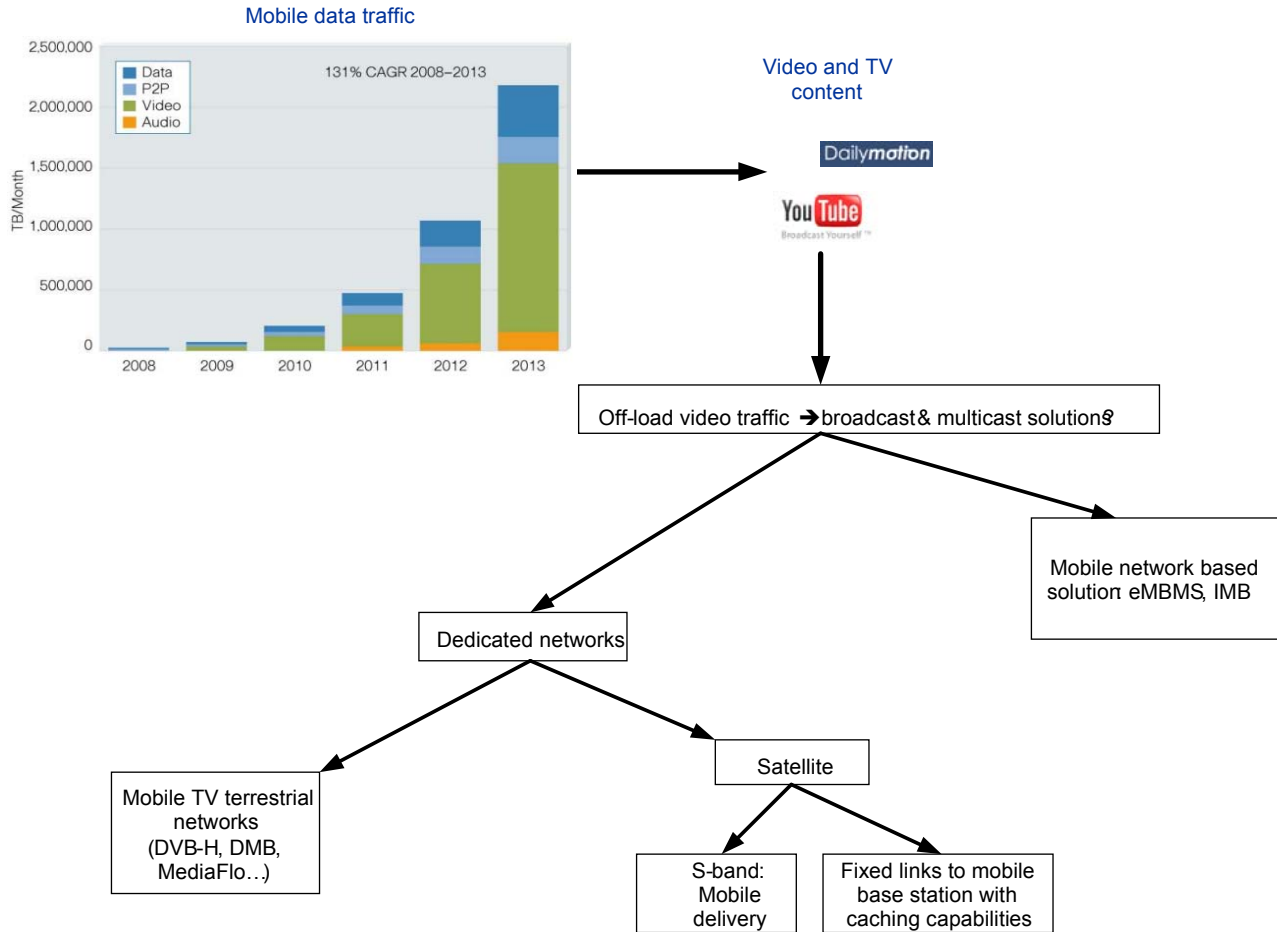
Source: Verizon Wireless



## Offloading solutions

# Alternative infrastructures may bring relief for stretched mobile infrastructures

## Offloading video content with broadcast/multicast systems



- Overlay networks are an alternative to offload traffic from mobile networks. Bandwidth intensive multimedia content can be delivered to 3G devices equipped with appropriate broadcasting receivers via broadcasting technologies, such as DVB-H, DMB, IMB and MediaFLO
- Content delivery networks such as Akamai are carrying much of the traffic to the edges of the fixed core networks. Satellite-based solutions could provide similar services for mobile networks. By delivering content directly to the base stations, satellite links can provide massive relief for mobile core and backhaul networks

## A valuable resource for carrying nomadic users' traffic



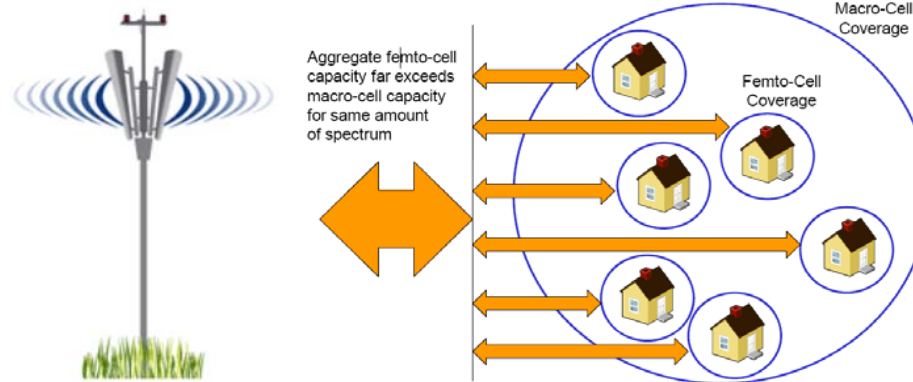
- Many of the latest mobile phones have Wi-Fi and VoIP capabilities, so that they can browse the internet and make and receive VoIP calls, as well as normal mobile (GSM) calls. These mobile WiFi voip can work with modem WiFi router, giving the choice to make as few or as many calls as customers want
- WiFi are widely available in public locations (airports, train stations, restaurants..) and provide an easily accessible resource in areas where substantial amounts of traffic are generated
- Orange has developed an iPhone application called "spot'finder" which help iPhone users to find free near hotspots
- The widget can be downloaded for free from the operator's web site and lists some 50,000 free public hotspots accessible to Orange customers in France and abroad

## O<sub>2</sub> UK

- O2 in the UK has played the Wifi card since the launch of the iPhone in 2007
- As the number of iPhones rose and traffic growth accelerated, O2 kept adding locations to the list of available WiFi hotspots. Through partnerships with The Cloud and BT Openzone, O2's iPhone users can now use some 10,500 WiFi hotspots in the UK, up from 7,500 in 2007
- However, this additional capacity has not been sufficient to keep pace with traffic growth. As the *O2 network has seen an 18-fold increase in data carried over the network in the last year and traffic continues to double every three months* according to its top-exec, O2 has faced network outages in late 2009 in the London area
- As a consequence, O2 announced to install 200 additional base stations in the UK's capital

## Femtocells as a solution to congestion

- This approach allows spectrum to be reused at a much higher factor than the wide area network, effectively giving each subscriber the full bandwidth of the radio channel. For applications such as media transfer, femto cells can significantly off-load the wide area network
- The femtocell architecture assumes that a customer already has a wireline Internet connection to provide the backhaul connectivity between the access point and the operator network : femtocells do not work if the goal is for mobile broadband to be an alternative to wireline connectivity.



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- However, while benefiting from increased indoor coverage for phone calls, consumers may not so much shift their data traffic from 3G to the femtocell , but rather from their home WiFi to the femtocell. Hence, the offload potential seems limited
- Femtocells are so far limited to residential and business locations but are no substitutes yet for public WiFi networks
- Femtocells pose logistical problems in terms of spectrum management, interference (between adjacent apartments, for example), configuration and management.
- Overall, femtocells may be a piece in the MNOs' puzzle to contain traffic growth, but they are no silver bullet

## Femtocells as a solution to congestion

### Two main players faced to real mobile congestion



#### AT&T

- The MNO was the subject of complaints about spotty coverage while struggling to cope with the demand
- Especially in dense populated markets (such as New York) where the usage of the iPhone is the highest.  
→ Makes effort in adding capacity from cell sites to its backbone network by increasing the number of high-speed backhaul connections



#### O2 UK

- Sporadic network congestion through intermittent data outages have been observed on O2 network with the iPhone 3G introduction
- Especially in a few districts of London  
→ Backhaul agreement concluded with BT

### For the majority, dense urban areas are the biggest cause of concern

- where there are many heavy users
- where under-capacity has been identified



#### Mobile network densification requires

- Additional small cells
- Add picocells
- Add urban femtocells



#### SK Telecom

- Data-only femtocell deployment called Data Femto in order to optimize traffic offload and solve congestion issues



#### NTT DoCoMo

- Expects to deploy femtocells alongside its LTE macro network; looking forward femto availability
- Its partners NEC plans to be ready for trials at the end of 2011 and for commercial products in 2012

- **The combination of smartphones, dongles, netbooks and 3G / 3G + mobile networks provoked a real explosion of the consumption of data**
- **Historically, networks were thought to exchange e-mails or surf on web pages. But the consumption of TV and video raise congestion problems**
- **When certain limits of capacities was reached, operators were in the habit of investing. But today, mobile networks do not correspond to the challenges of the next years and mobile operators are still cautious concerning expenditures**
- **Even if some congestion of the network phase happen in the urban zones in rush hours, current 3G / 3G+ networks are still not saturated, 3G spectrum has not yet been fully allocated in many countries**
- **Future usages (VoIP and Mobile TV particularly) will significantly increase needs in bandwidth**
- **But in the near future, congestion and saturation network issues in dense areas will be more frequent, a network upgrade will be necessary.**
- **The main solutions offer to operator are: LTE, WiFi offloading and femtocells deployment**