



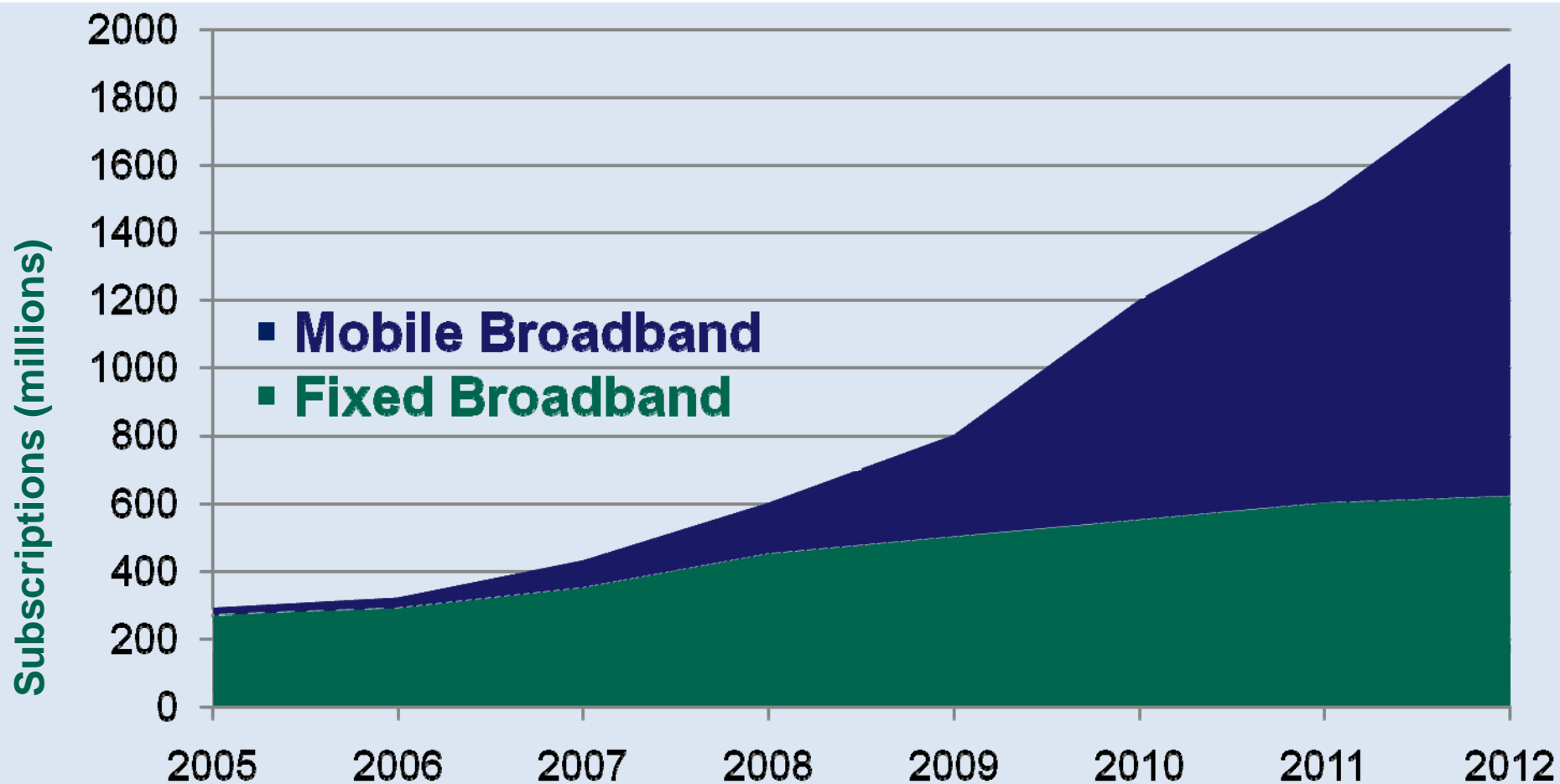
## **Business Drivers for Selecting LTE Technology**

HSPA+ & LTE Executive Briefing, Jan 27, 2009  
Hank Kafka, Vice President, Network Architecture, AT&T

# Why LTE?

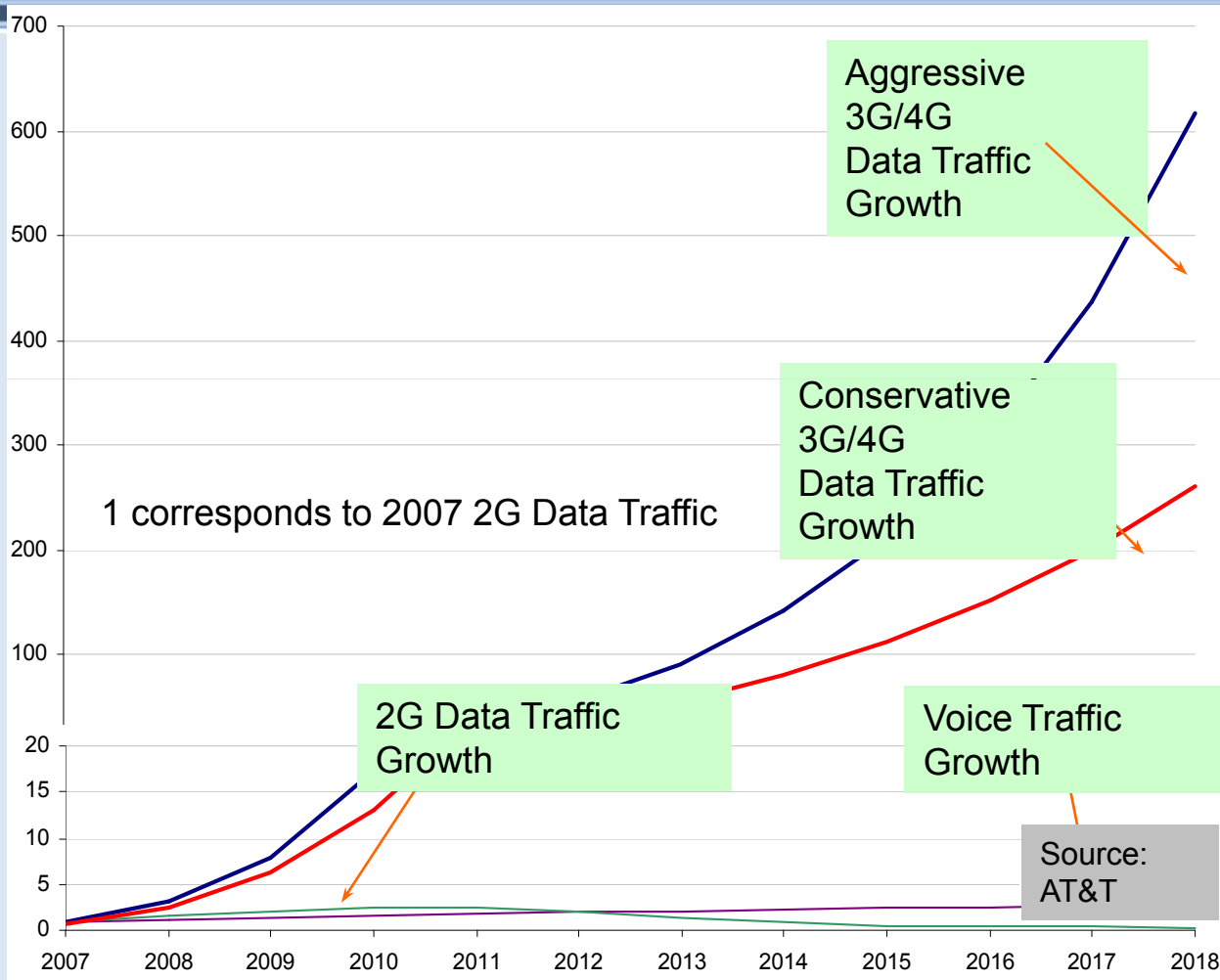
- ➔ •HSPA, HSPA+ provides **great data speeds with impressive improvements** over next 2-3 years
- ➔ •HSPA, HSPA+ is already the **mobile broadband technology of choice worldwide**
- ➔ •LTE will be adopted by **>80% of the world's wireless carriers**
- ➔ •**Incredible economies of scale** will be created with LTE through the GSM community as well as the CDMA community

# Projected Broadband Growth



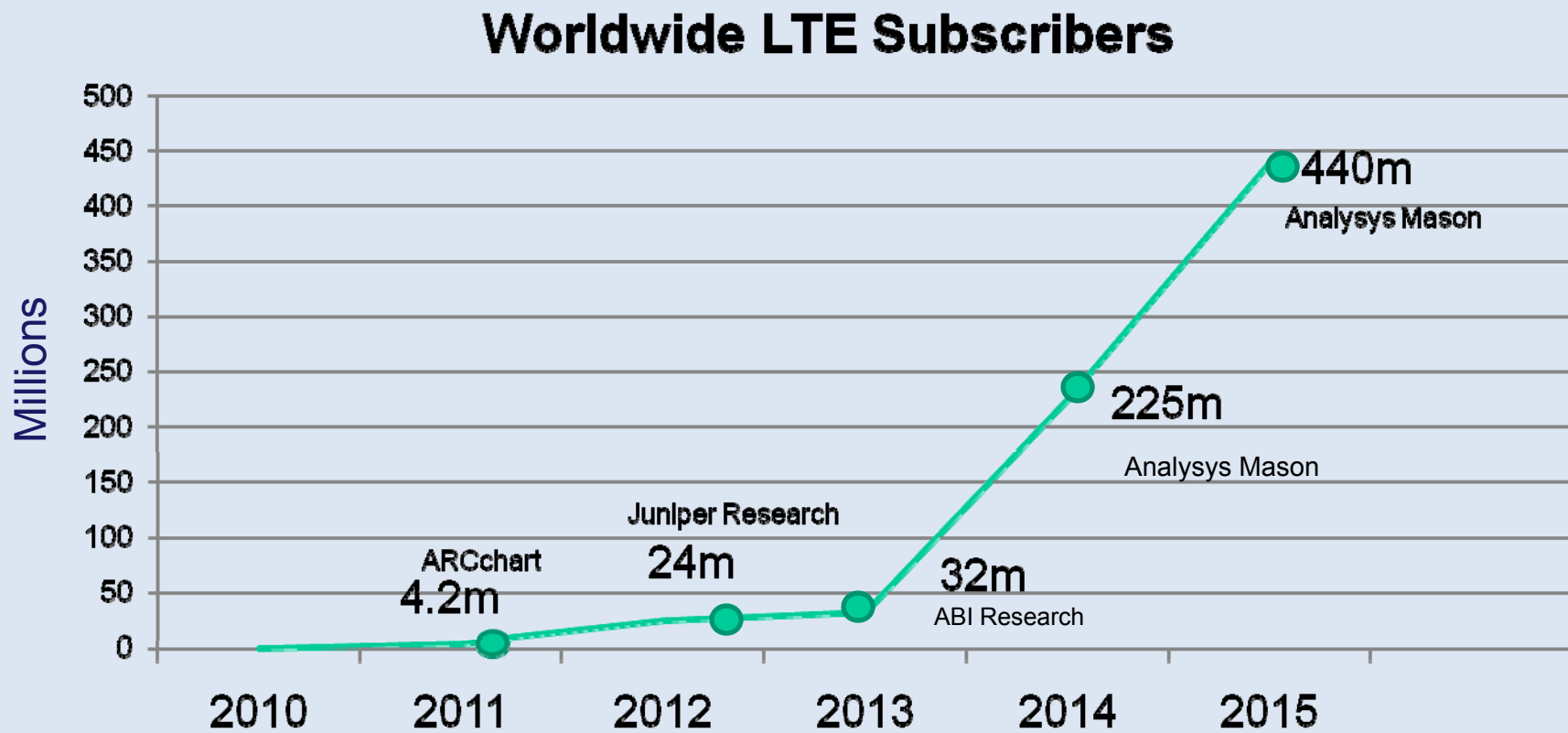
Source: Ovum, Strategy Analytics, Ericsson

# Projected Traffic Growth

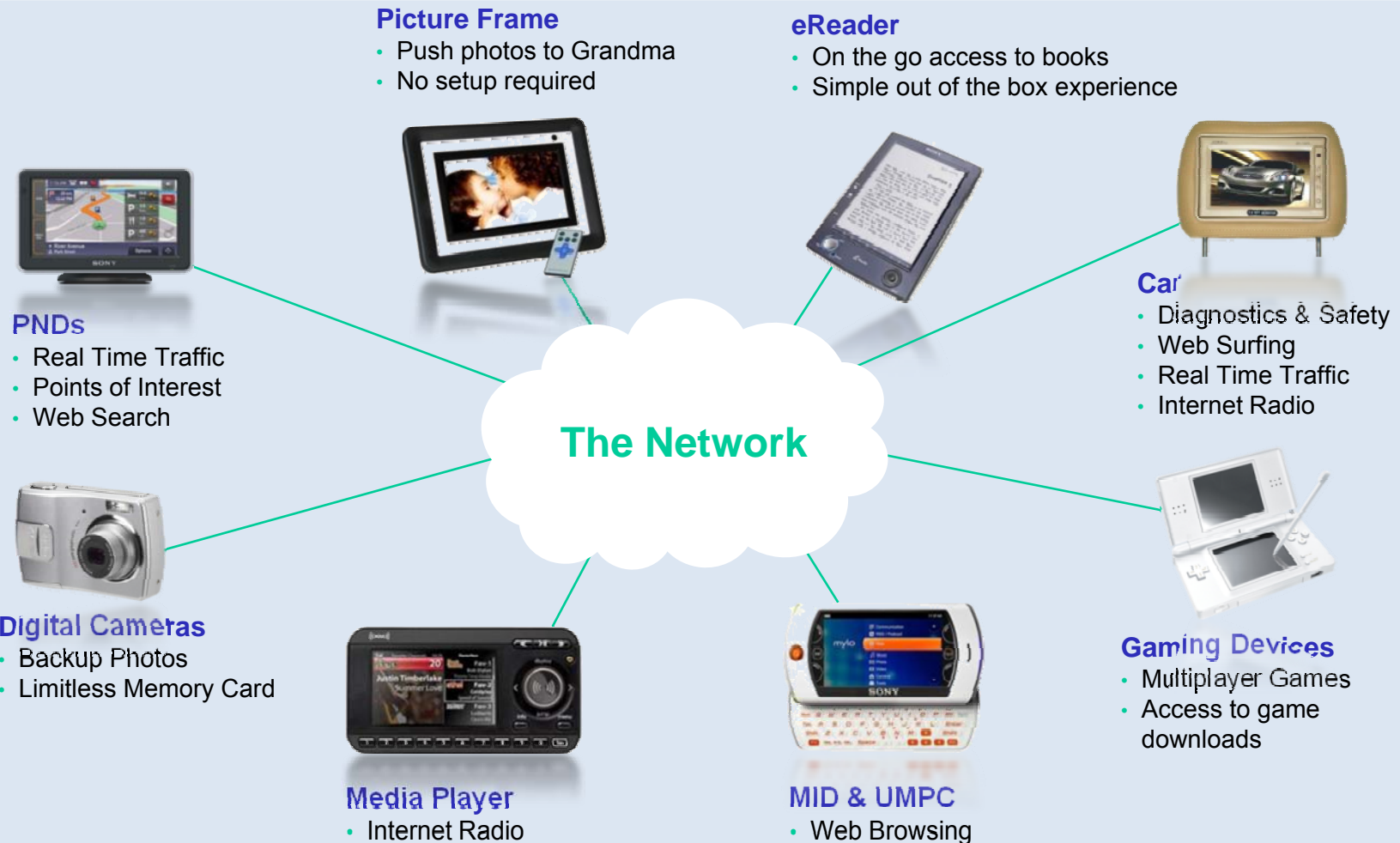


Source: Peter Rysavy, 3G Americas

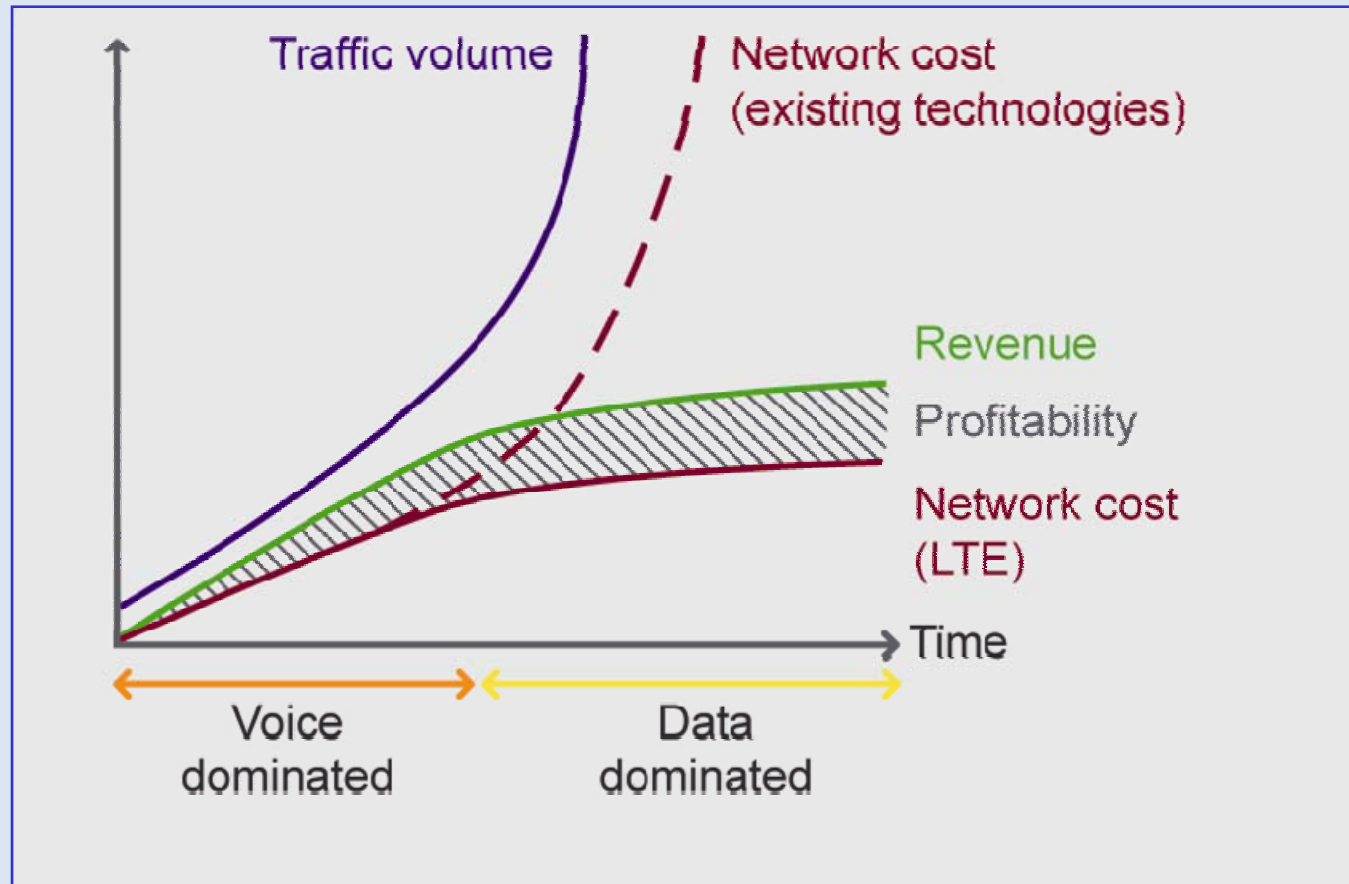
# LTE Subscriber Growth Forecasts



# Devices Primed For Embedded Wireless



# Profitability demands lower price per MByte



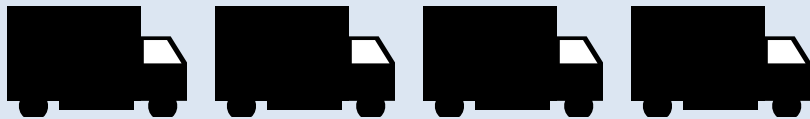
Source: Nokia-Siemens

# LTE Lowers Opex Dramatically

	UMTS	HSPA (2 X 5MHz)	LTE (2 X 5MHz)
Theoretical average throughput	128-384 Kbps	1 Mbps	4 Mbps
Theoretical maximum throughput	2 Mbps	14 Mbps	20 Mbps
Monthly downlink traffic	230 TB (5MHz) 500 TB (10MHz)	500 TB	1800 TB
Typical cost per (downlink) megabyte at maximum use of network	Euro 0.6	Euro 0.3	Euro 0.1

Source: Analysys Research 2007

# OFDM: Delivering the Data



OFDM Trucking Company

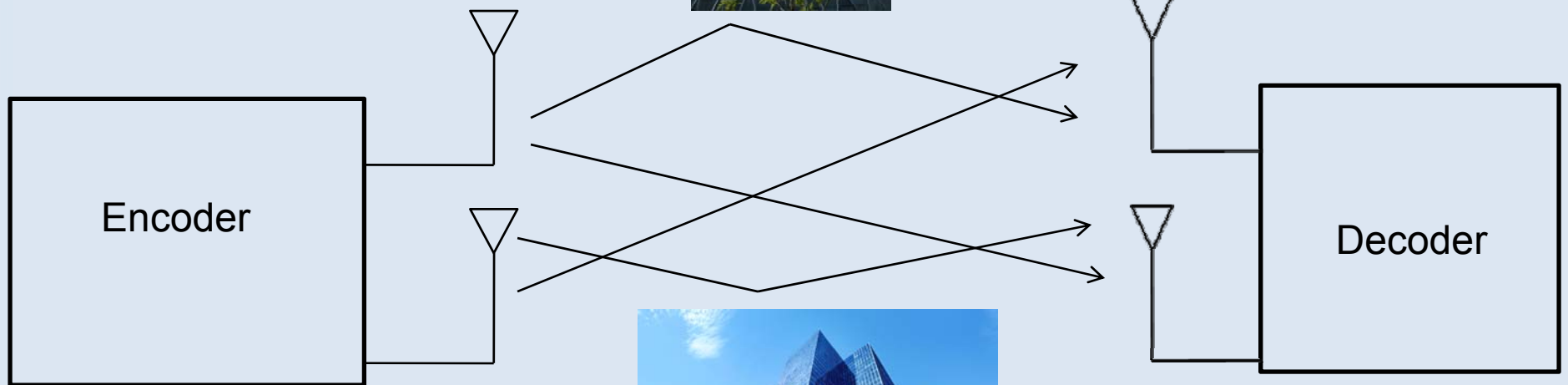


FDM Trucking Company

## OFDM Advantages

- Copes with severe channel conditions
- Robust against narrowband interference
- Can be deployed across various frequency bands
- Scales easily for different amounts of available bandwidth
- Effective for broadcast systems, higher bandwidth radio systems, and high peak data rates in large blocks of spectrum.

# MIMO Using Multiple Paths to Boost Throughput and Capacity



Source: 3G Americas

# LTE: Spectrum Flexibility and Efficiency

LTE to operate in 1.4, 1.6, 3, 3.2, 5, 10, 15 and 20 MHz bandwidths

Significantly improved spectrum efficiency

Downlink target (bits/sec/Hz/site)

- 3-4 times that of Release 6 HSDPA

Uplink target (bits/sec/Hz/site)

- 2-3 times that of Release 6 enhanced uplink

# LTE Cost Advantages for GSM Operators

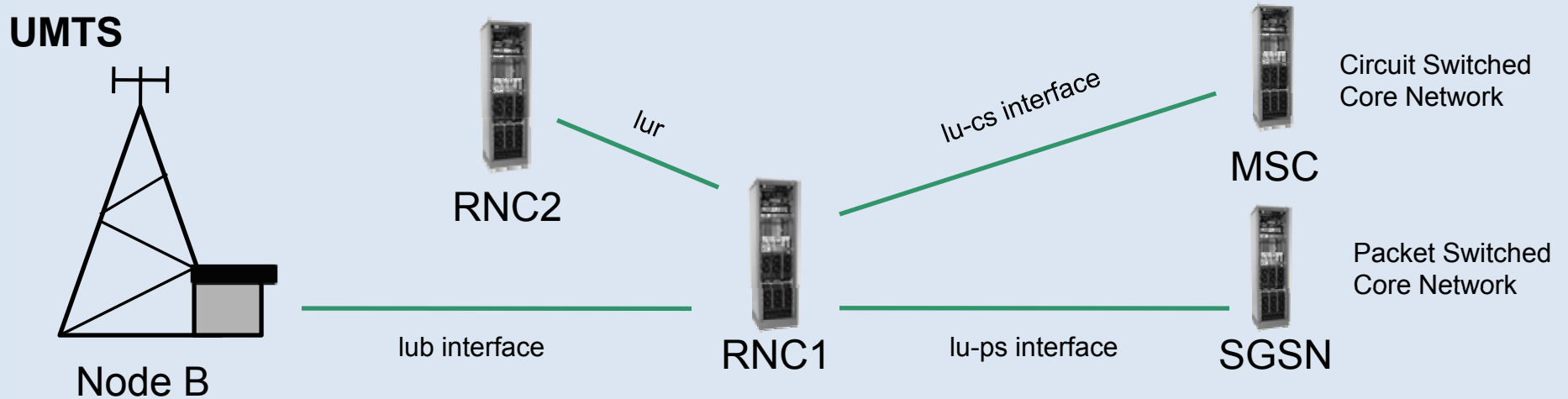
Deployment of LTE on existing sites and sharing of common infrastructure (e.g. antenna masts; site infrastructure like power supply, air conditioning, and security equipment; feeder cables and even antennas)

Sharing of backhauling equipment between LTE/SAE and existing network technologies provided at the same site

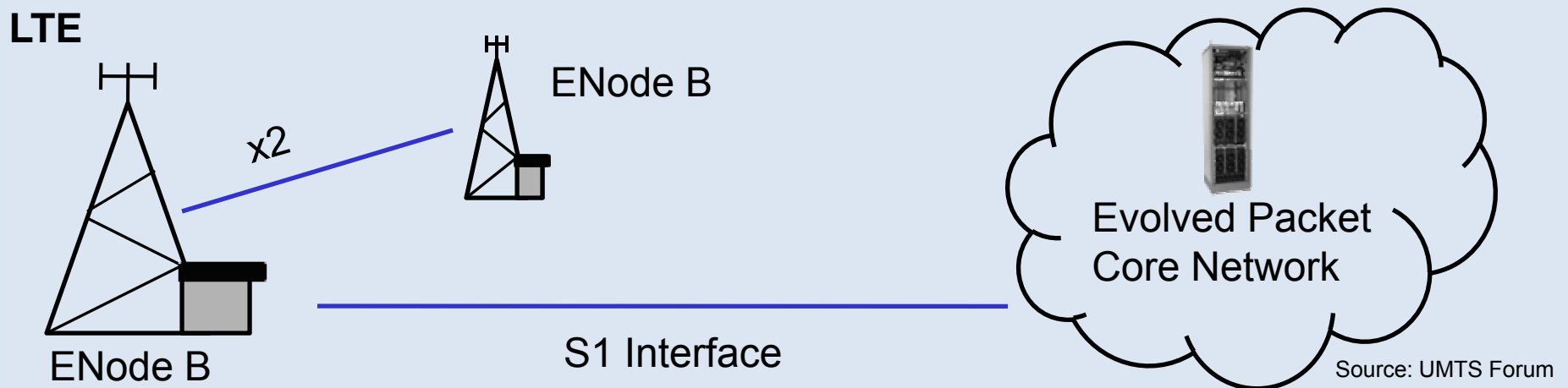
Common network management platforms

# LTE: Flat Architecture

## UMTS

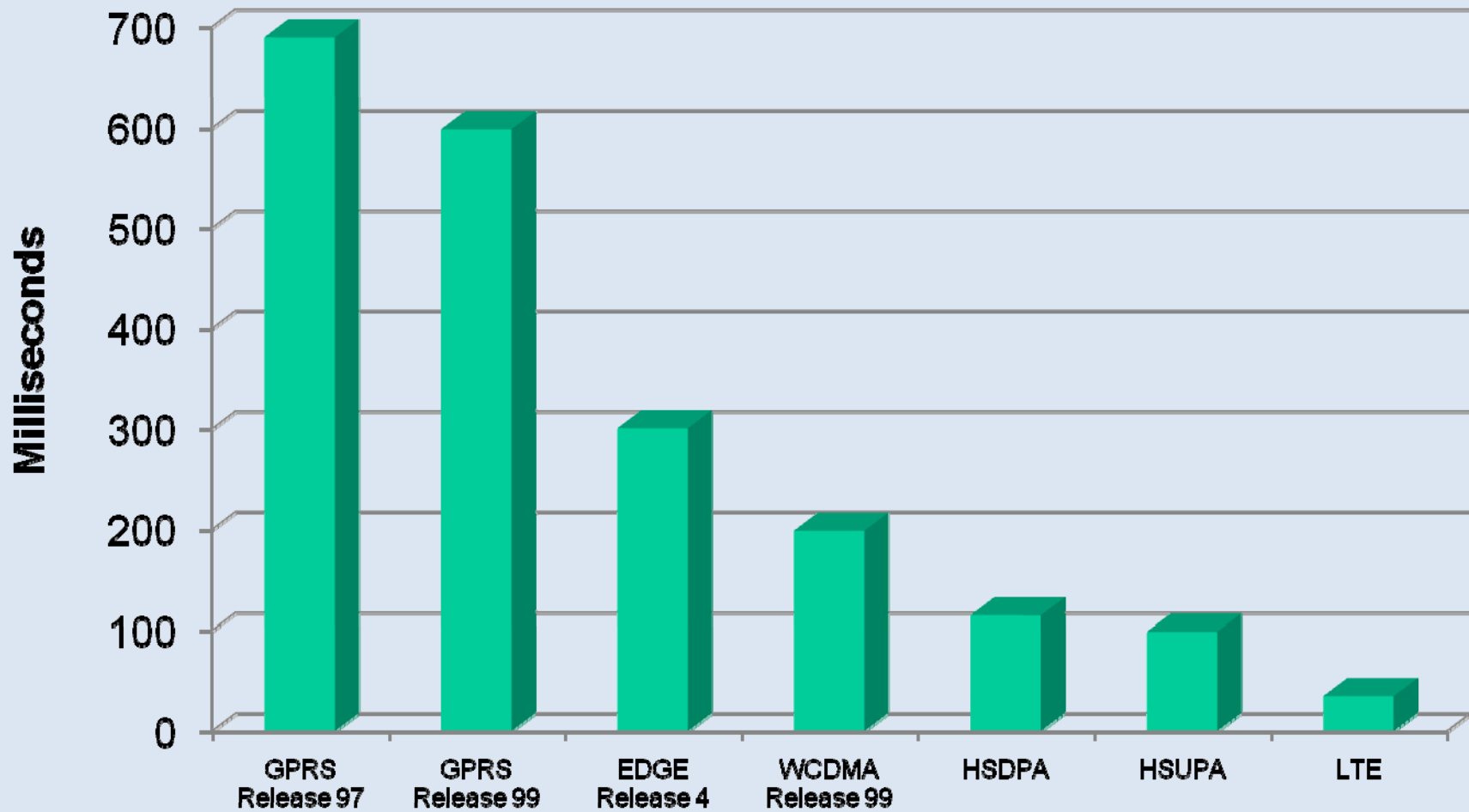


## LTE



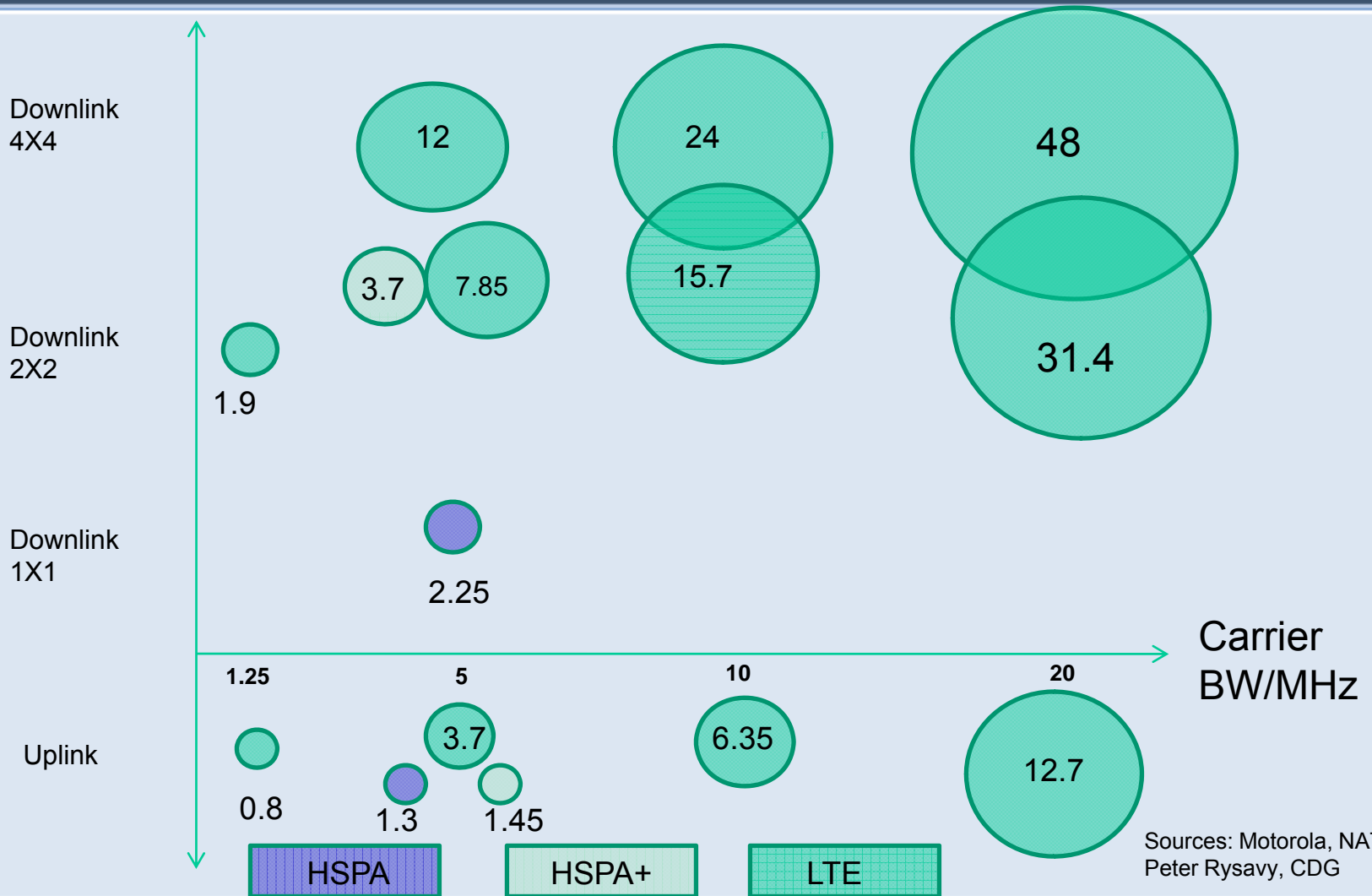
Source: UMTS Forum

# Latency Improves with 3GPP Evolution



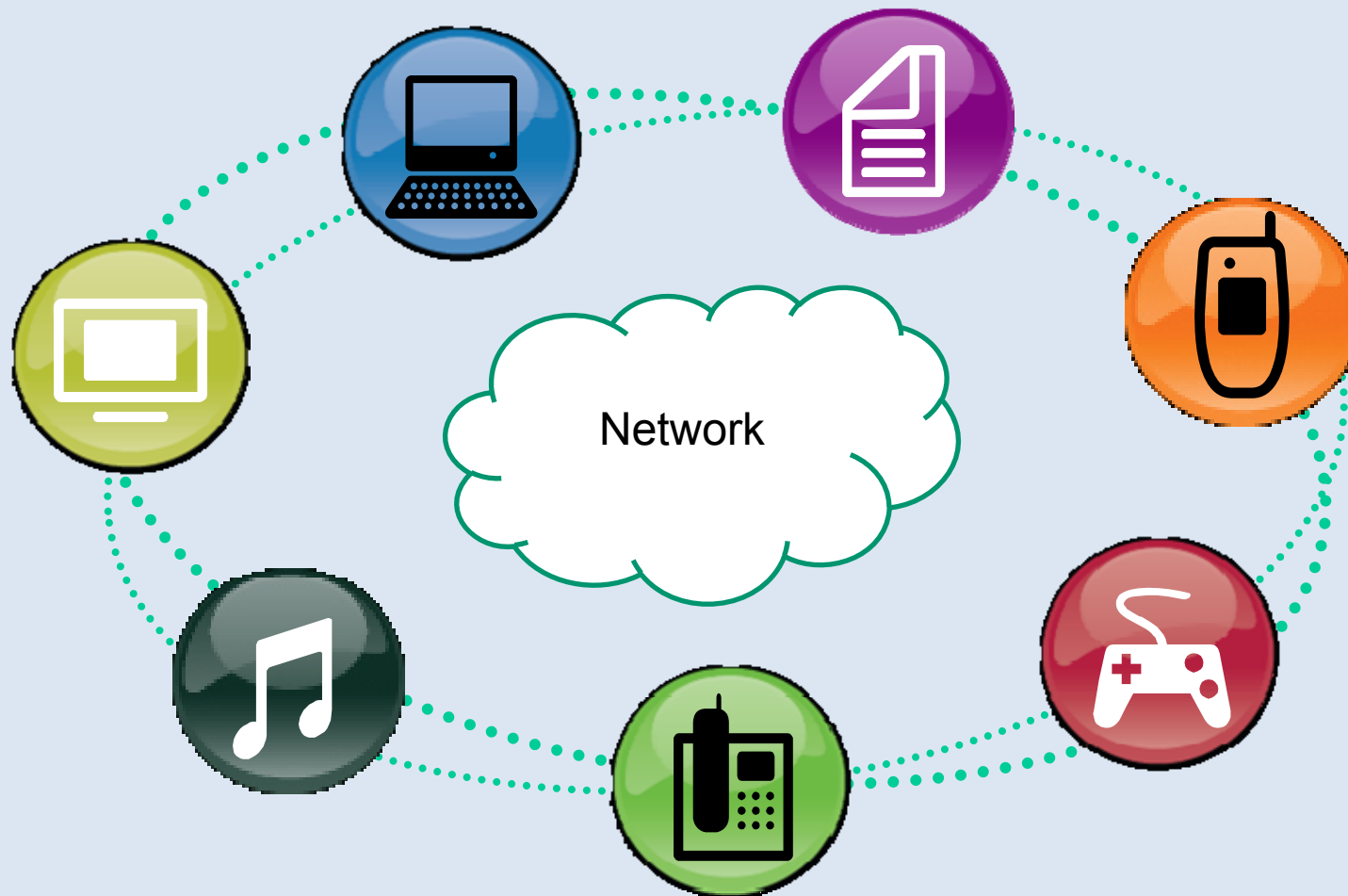
Source: Peter Rysavy, 3G Americas

# Sector Throughput (Capacity)

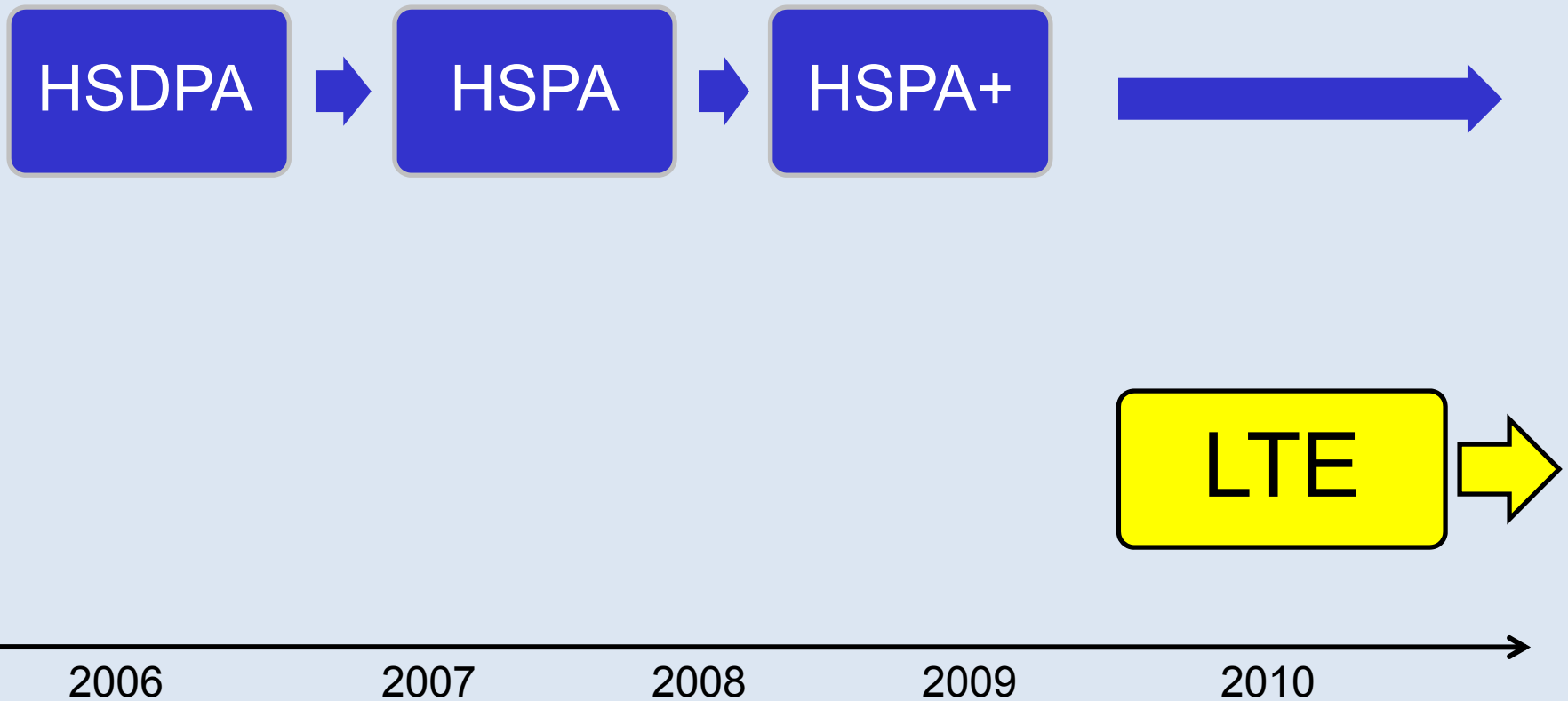


# IMS: IP Multimedia Subsystem

The Platform Driving Convergence

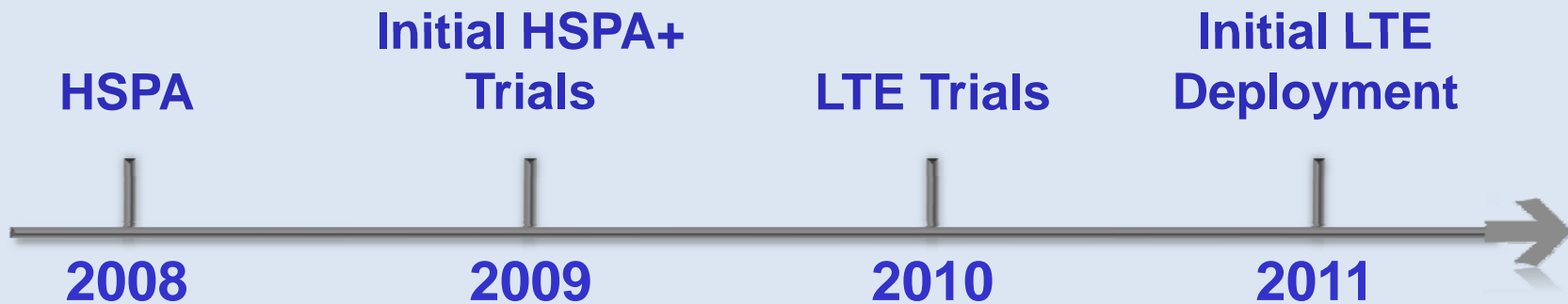


# 3GPP Evolution



# Clear Path to 4G/LTE

## AT&T Network Technology Timeline



Source: AT&T

# LTE Targets

## High data rates

- Peak data rates: at least 100 Mbps (DL) / at least 50 Mbps (UL)
- Average user throughput: 3-4 times (DL), 2-3 times (UL) HSPA reference
- Cell-edge user throughput: 2-3 times (DL & UL) HSPA reference

## Low latency

- User plane: Less than 10 ms (RAN RTT)
- Control plane: Less than 100 ms (idle → active)

## High spectral efficiency

- Three times HSPA R6 baseline
- Improved performance for broadcast services

## Simplicity

- Less signaling, auto-configuration of eNodeB

## Spectrum flexibility

- Deployable in a wide range of different spectrum allocations of different sizes
- Unpaired and paired spectrum, variable duplex distance

# A Global Commitment to LTE





**Thank you!**

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Hank Kafka, Vice President, Network Architecture, AT&T

