Wireless Applications in a mobile World

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Railway Interiorsexpo

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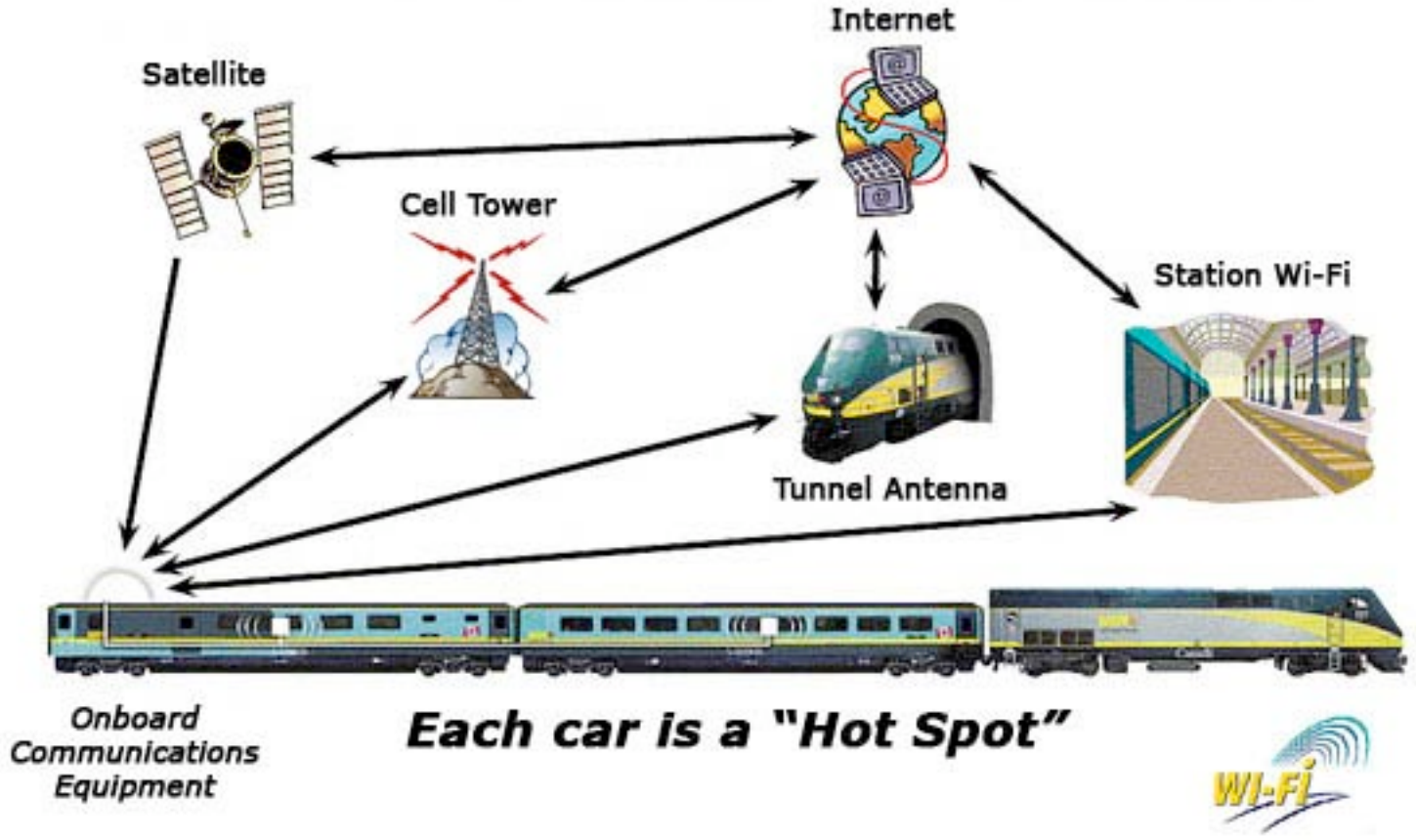
The Challenge!

- Provide high speed connectivity to systems and services for the benefit of operations and passengers.
- Enable cost effective and reliable connectivity
- Deliver a scalable and supported wireless solution
- Migrate technologies and applications to a set of common standards where possible
- Ensure all solutions offer an appropriate level of security and availability

Transit Applications



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The problem!

- Competing wireless technologies from fixed and mobile providers
- Existing technologies unable to scale cost effectively or provide required throughput reliably
- Next generation technologies always ‘jam tomorrow’
- Missed revenue generation opportunities
- Fear of obsolete standards causing technology stagnation
  - (VHS v Betamax)

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The Landscape (Cellular)

Cellular Architecture solutions:

- GSM / UMTS (3GPP) Family
- GSM (2G)

- * GPRS
- * EDGE (EGPRS)
- o EDGE Evolution
- * CSD
- o HSCSD

•UMTS (3G)

- * W-CDMA (UMTS)
- * HSPA
- o HSDPA
- o HSUPA
- o HSPA+
- * UMTS-TDD
- o TD-CDMA
- o TD-SCDMA
- * FOMA
- 3GPP Rel. 8 (Pre-4G)
- * E-UTRA

The Landscape (WiFi)

WiFi architecture solutions

IEEE 802.11 and 802.16 technologies

802.11n,

802.11a,

802.11b,

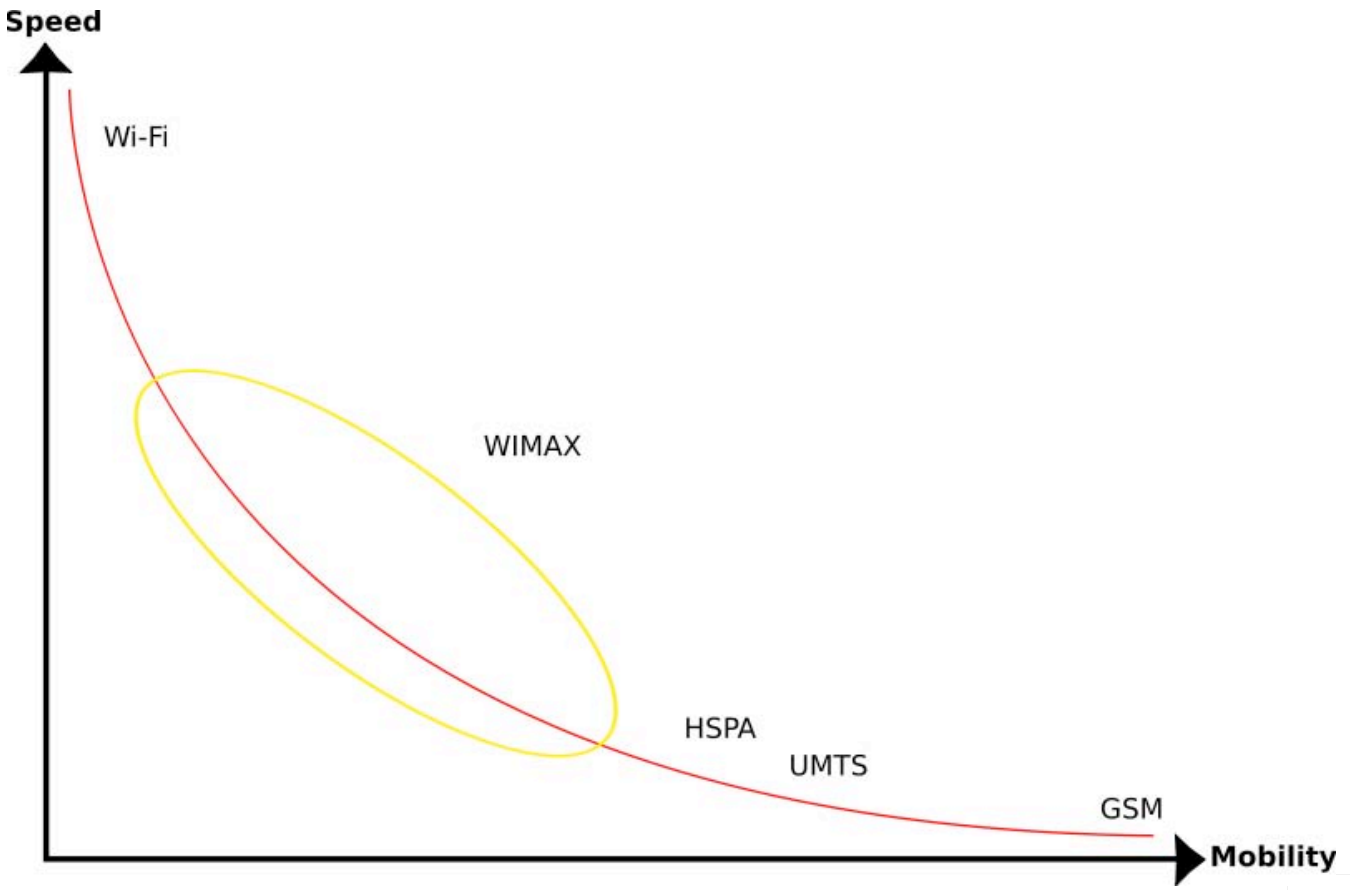
802.11g,

802.16e,

Comparisons

Standard	Family	Primary use	Radio technology	Downlink (Mbit/sec)	Uplink (Mbit/sec)	Notes
LTE (Long Term Evolution)	UMTS/4G mobile	Mobile Internet	OFDMA/MIMO/SC-FDMA	326	86	LTE advanced offers ovr 1Gbit/s
802.16e	**WIMAX (Worldwide interoperability for Microwave)**	**Mobile Internet**	**MIMO-SOFDMA**	**70**	**70**	**Quoted speeds only achievable at very short ranges, more practically 10 Mbit/s at 10 km.**
Edge Evolution	GSM	Mobile Internet	TDMA/FDD	1.9	0.9	3GPP release 7
UMTS W-CDMA HSDPA+HSUPA HSPA+	**UMTS/3G**	**Mobile Internet**	**CDMA/FDD CDMA/FDD/MIMO**	**0.384 14.4 42**	**0.384 5.76 11.5**	**HSDPA widely deployed. Typical downlink rates today 1–2 Mbit/s, ~200 kbit/s uplink; HSPA+ downlink up to 42 Mbit/s.**
UMTS-TDD	UMTS/3GSM	Mobile Internet	CDMA-TDD	16	16	Reported speeds according to IPWireless using 16QAM modulation similar to

Capabilities



Applications

- 3G/UMTS is a handset standard bringing broadband ‘like’ speeds to mobile devices.
  - Mobile broadband and IP applications, push email etc
  - Modem ‘dongle’

- 802.11/16 is a fixed point to multi point standard ‘currently’ used in broadband delivery
  - Full range of IP deliverable internet broadband facilities
  - Streaming video etc
  - VOIP facilities
  - Intel based chipset for laptops

Future capabilities

802.16e rolling out now with data rates of up to 100 - 300Mb/sec

Systems already in operation with over 100 Million subscribers

3GPP rolling out Long Term Evolution (LTE)

– Currently still under development and expected to role out by 2011-12

Predicted speeds of up to 1Gb/sec depending on range and network capacity

Status

- Markets are large enough to sustain BOTH standards with tens of millions of both handheld devices and laptops being equipped for wireless IP
- Users will not notice significant differences as both are IP based services delivering broadband speeds
- Handheld devices will likely remain with a 3GPP solution while Laptop users, as now, will prefer the WiFi/WIMAX solution
- Rail vehicles will deploy multi mode modems to provide solutions to BOTH architectures for handheld and laptop users
- However, as now, contention and capacity will define the QOS

Future rail access architectures

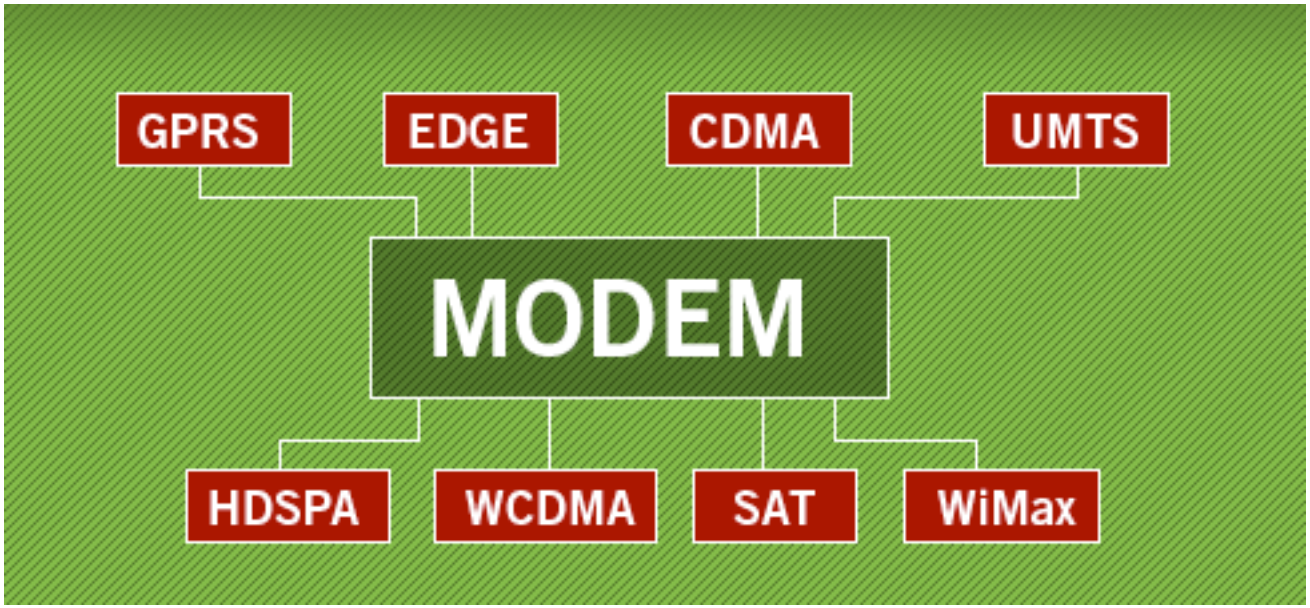


Image courtesy of Siemens -Pulz8

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