

Wireless? What? Why? How?

Trish Messiter

CLARINOX TECHNOLOGIES Pty Ltd

ClarinoX *'Technology Behind Solutions'*



“ Everything abstract is ultimately part
of the concrete ”

~ Edith Stein



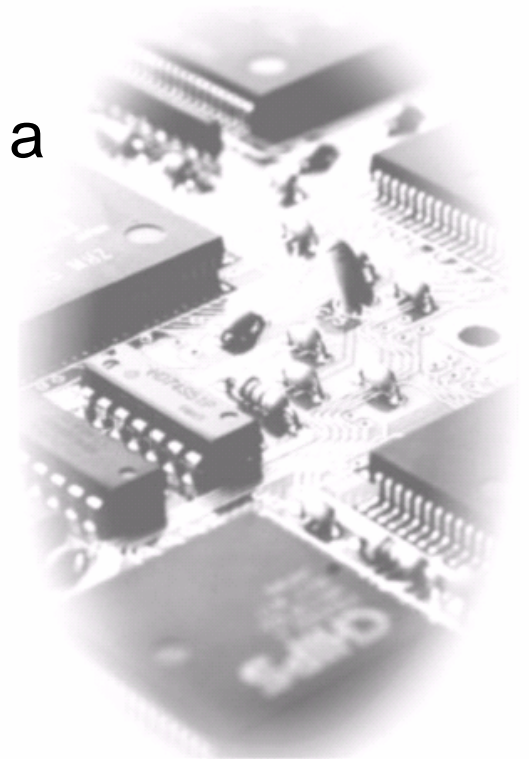
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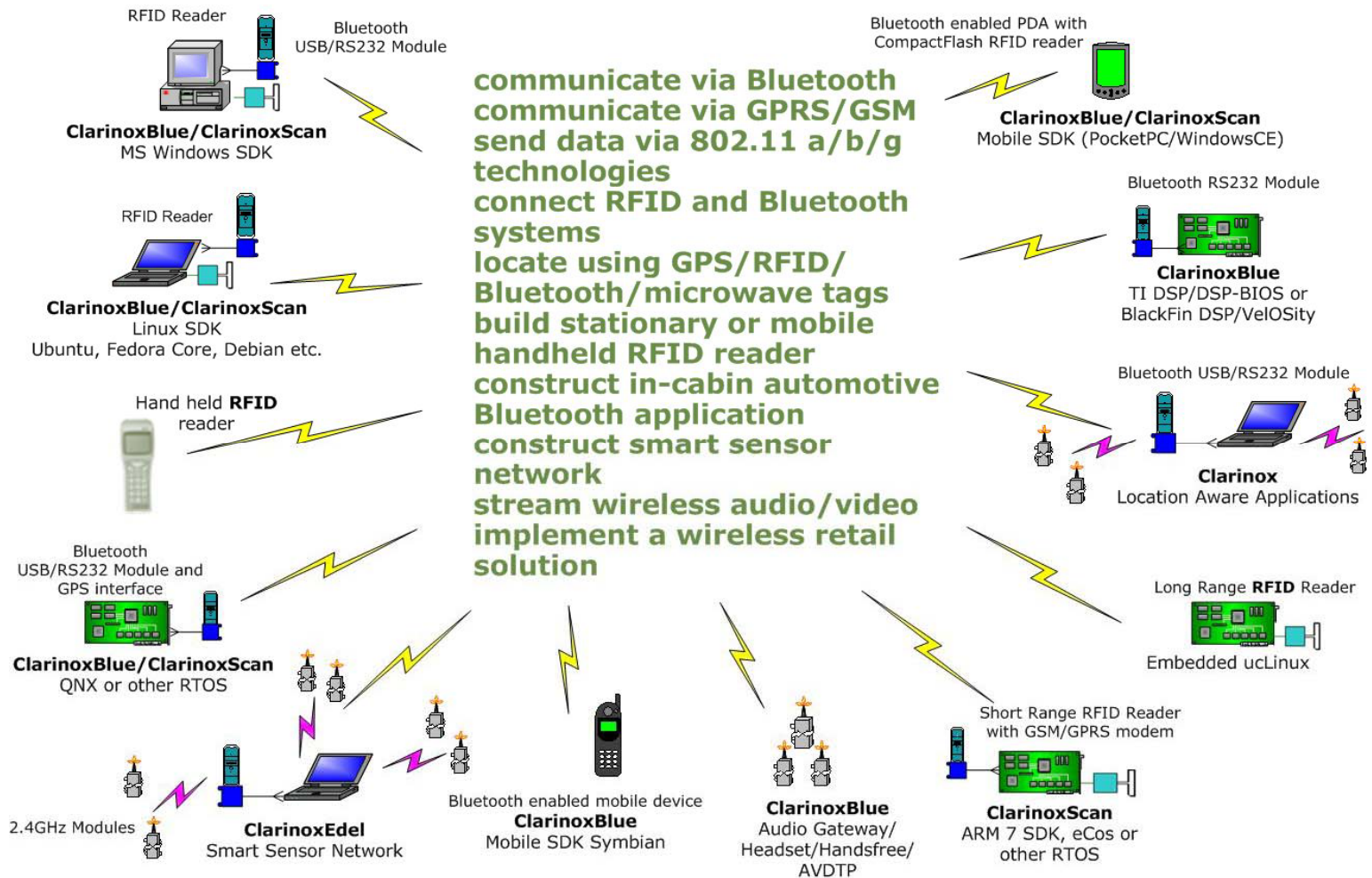


Embedded Developments

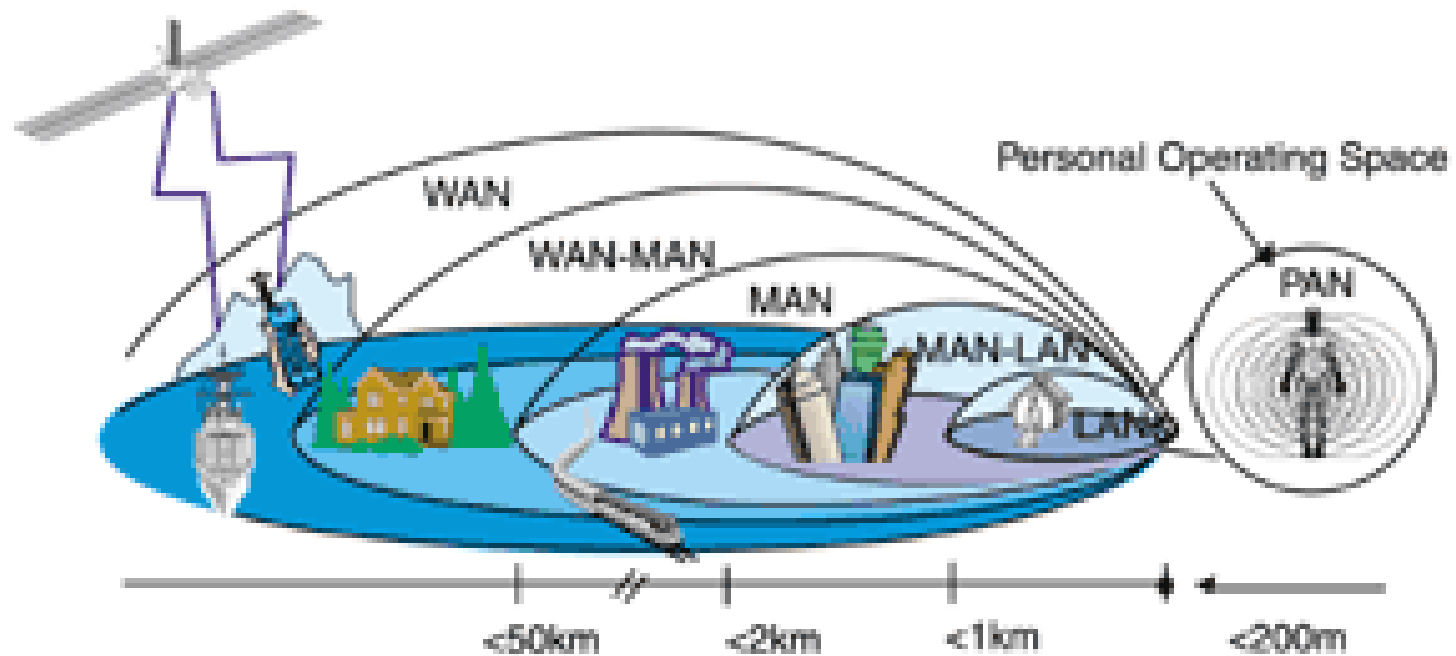
- Computer systems that do not appear, to the everyday user, to be such
- Hidden computer systems that form a part of a larger system or product
- More microprocessors used in embedded systems than in PCs
- Embedded systems market US\$46 billion in 2004 US\$88billion by 2009 (BCC research group)



Wireless Embedded Developments



Wireless



Wireless

Wireless Category	Technologies
WAN	GSM, GPRS, EDGE, CDMA etc, GPS
MAN	IEEE802.16 (WiMax), IEEE802.20 (Mobile Broadband Wireless Access), IEEE802.22 (Wireless Regional Area Networks)
LAN	IEEE802.11 family
PAN	Bluetooth, Zigbee, RFID, Nordic, UWB



Wireless

Wireless Category	Main Applications
WAN	Long distance (up to worldwide) voice communications
	Global Location determination
	Data transfer

Wireless

Wireless Category	Main Applications
MAN	Medium distance (up to metropolitan area) broadband access
	Could be voice communications, Data transfer, internet access

Wireless

Wireless Category	Main Applications
LAN	Short distance (up to 200 -300 m) computer network access
	Can facilitate internet access (via local computer network) and applications available from that such as VoIP, email etc
	Reasonably high speed (up to 54Mbits/s) data transfer



Wireless

Wireless Category	Main Applications
PAN	Short distance (up to 100m) voice, data, music, video
	Local Location determination

Data Rates

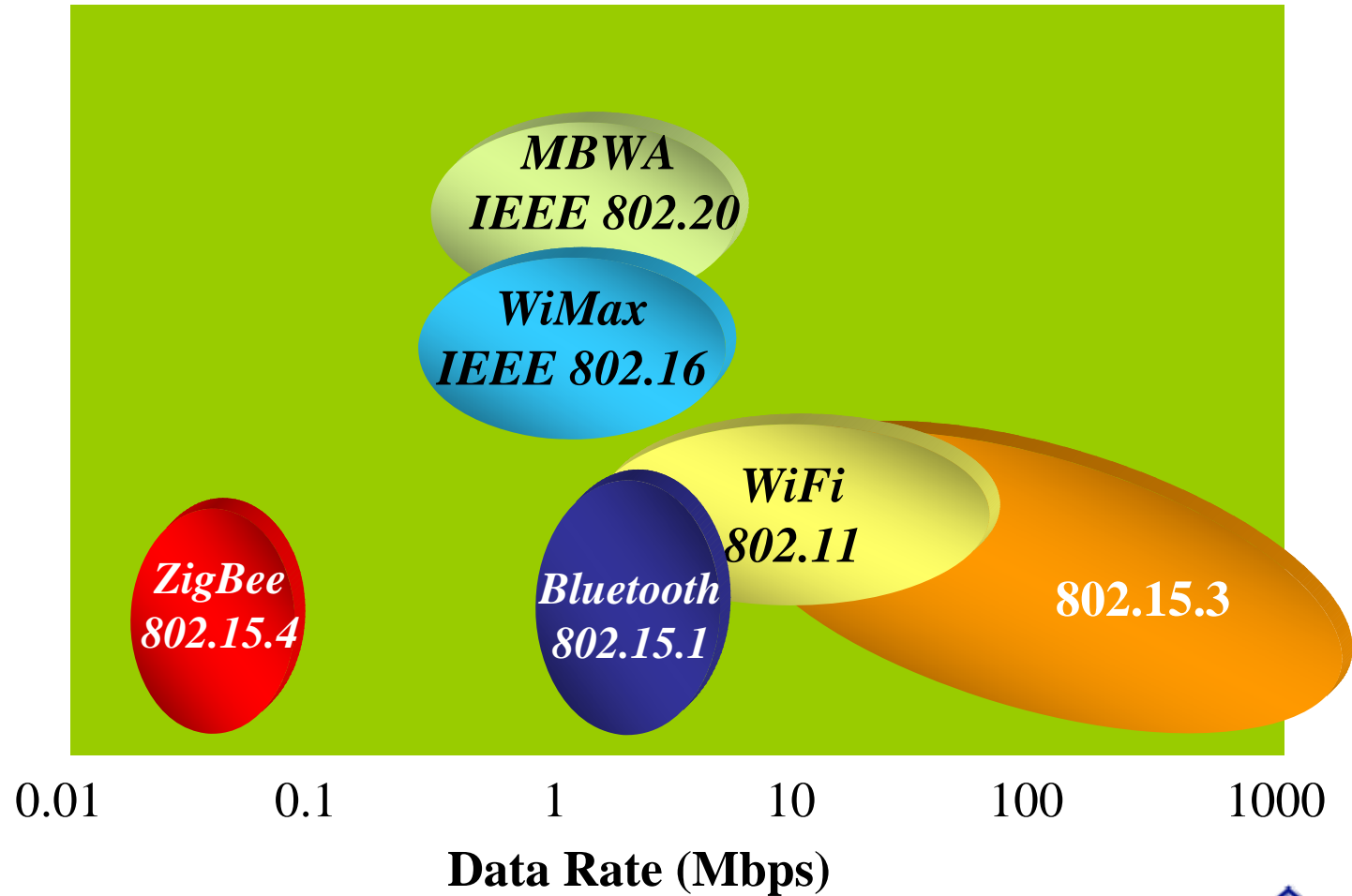
Range

WAN

MAN

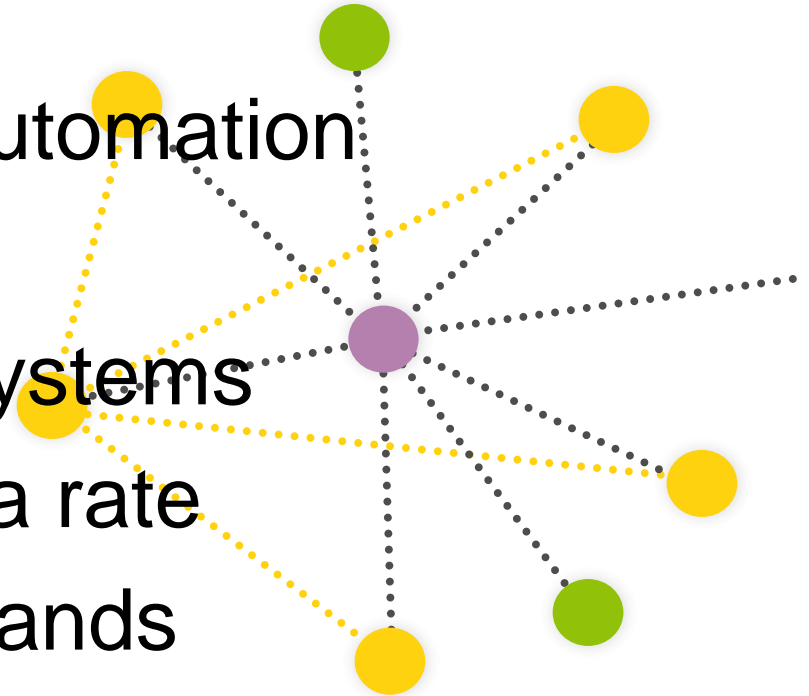
LAN

PAN



Zigbee

- Home and building automation
- Sensor networks
- Medical monitoring systems
- 250 kbits/s gross data rate
- 27 channels over 2 bands
- Optimized for timing-critical applications and power management
- Full Mesh Networking Support



RFID

- Active or passive tags
- Range approx 5cm to 5m
- Barcode, smart card, ticketing, NFC, sensors networks
- low data storage capacity and low data transmission rate
- Multiple frequencies
- Multiple standards



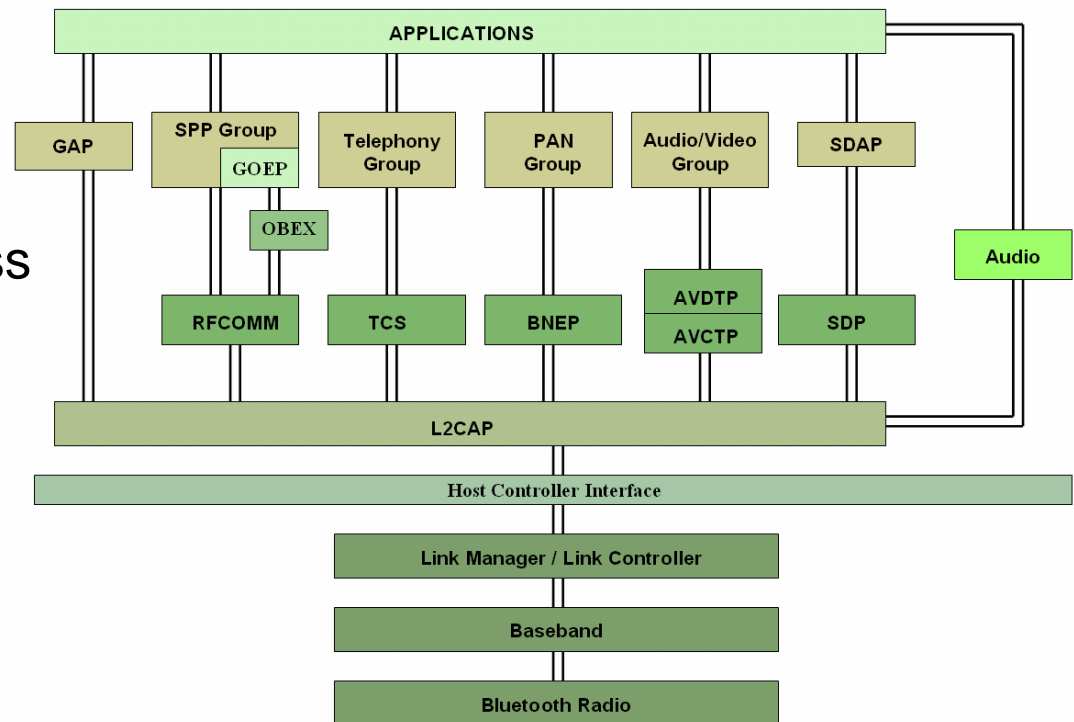
Nordic Solution

- Low power solution (battery life up to years of operation)
- Range up to 100m
- Sensors networks, location determination



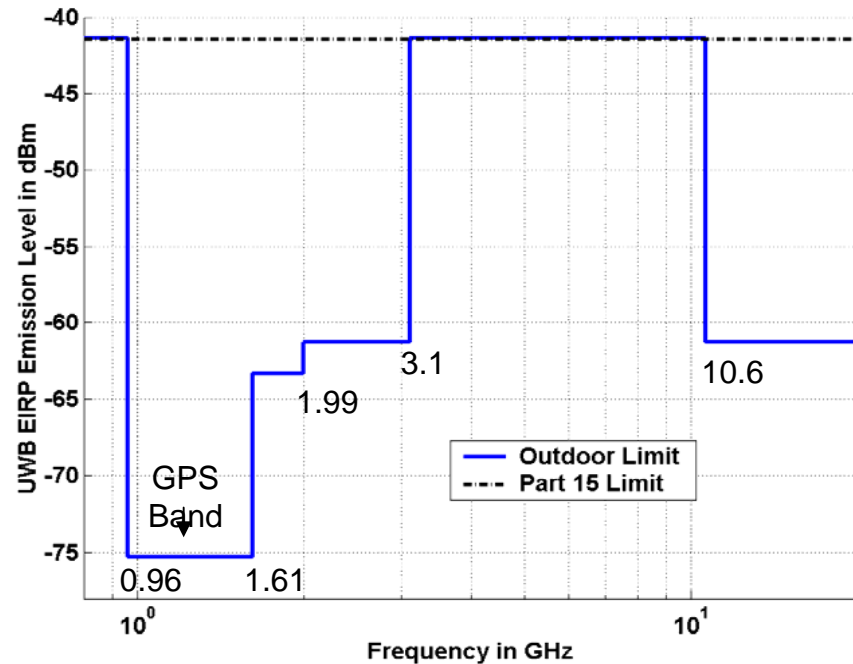
Bluetooth

- Headsets / Handsfree voice communications; Sensor networks; Medical systems; Printing; Music
- Inclusive of Wibree (wrist watches, wireless keyboards, toys and sports sensors)
- Up to 3 Mbits/s gross data rate
- 79 channels
- Encryption, authentication, security key



UWB (Ultra-Wideband)

- 3.1–10.6 GHz
- Up to 480 Mbps (IEEE P802.15.3a)
- Radar, imaging or positioning systems (high resolution, high accuracy local positioning)
- Typically 1 to 5 m

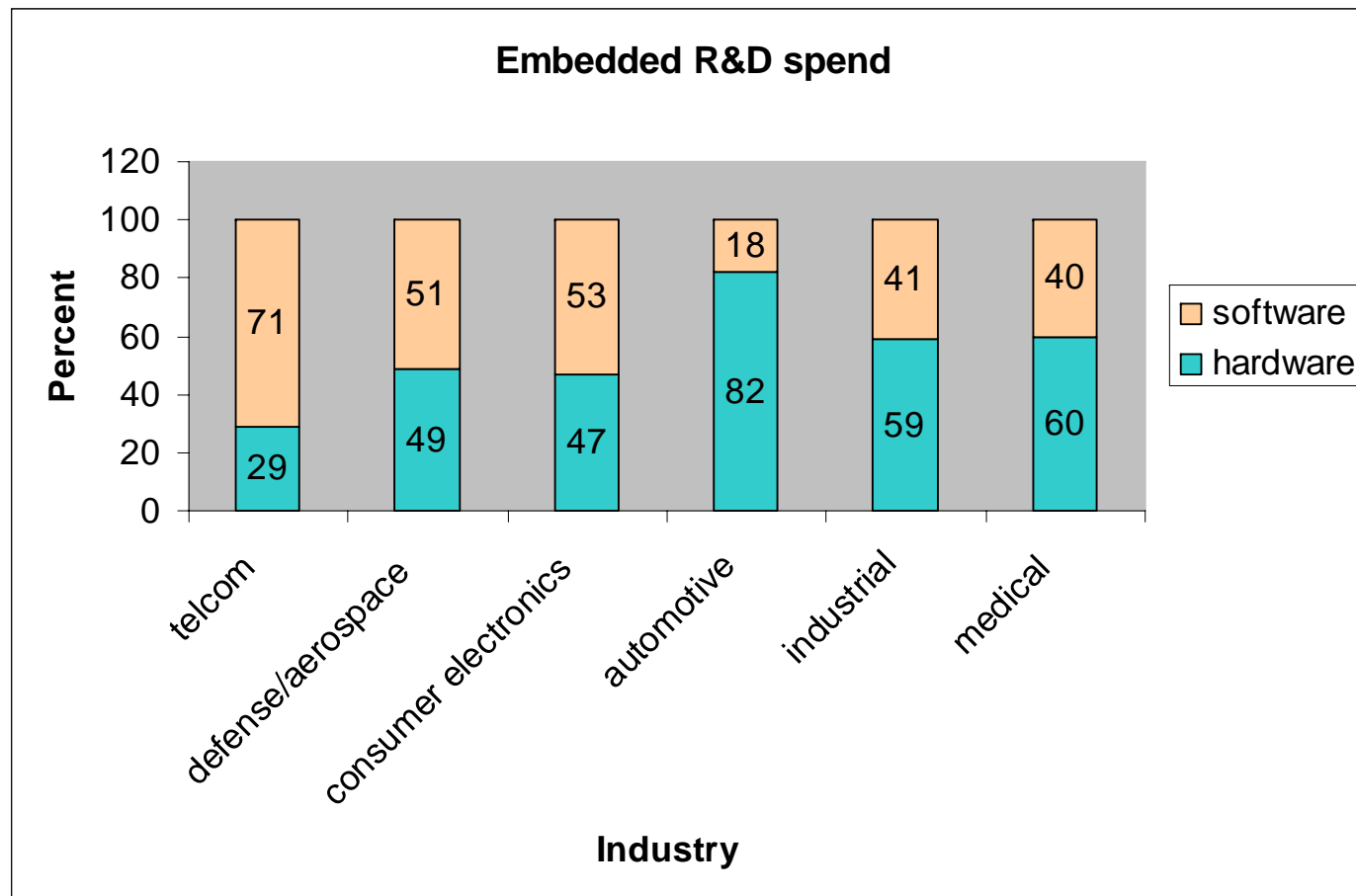


Issues

- Multiple technologies
 - Multiple standards
 - Requirements may be conflicting
 - Requirements change over time
 - Technologies change over time
- Increasing complexity ; hardware & software



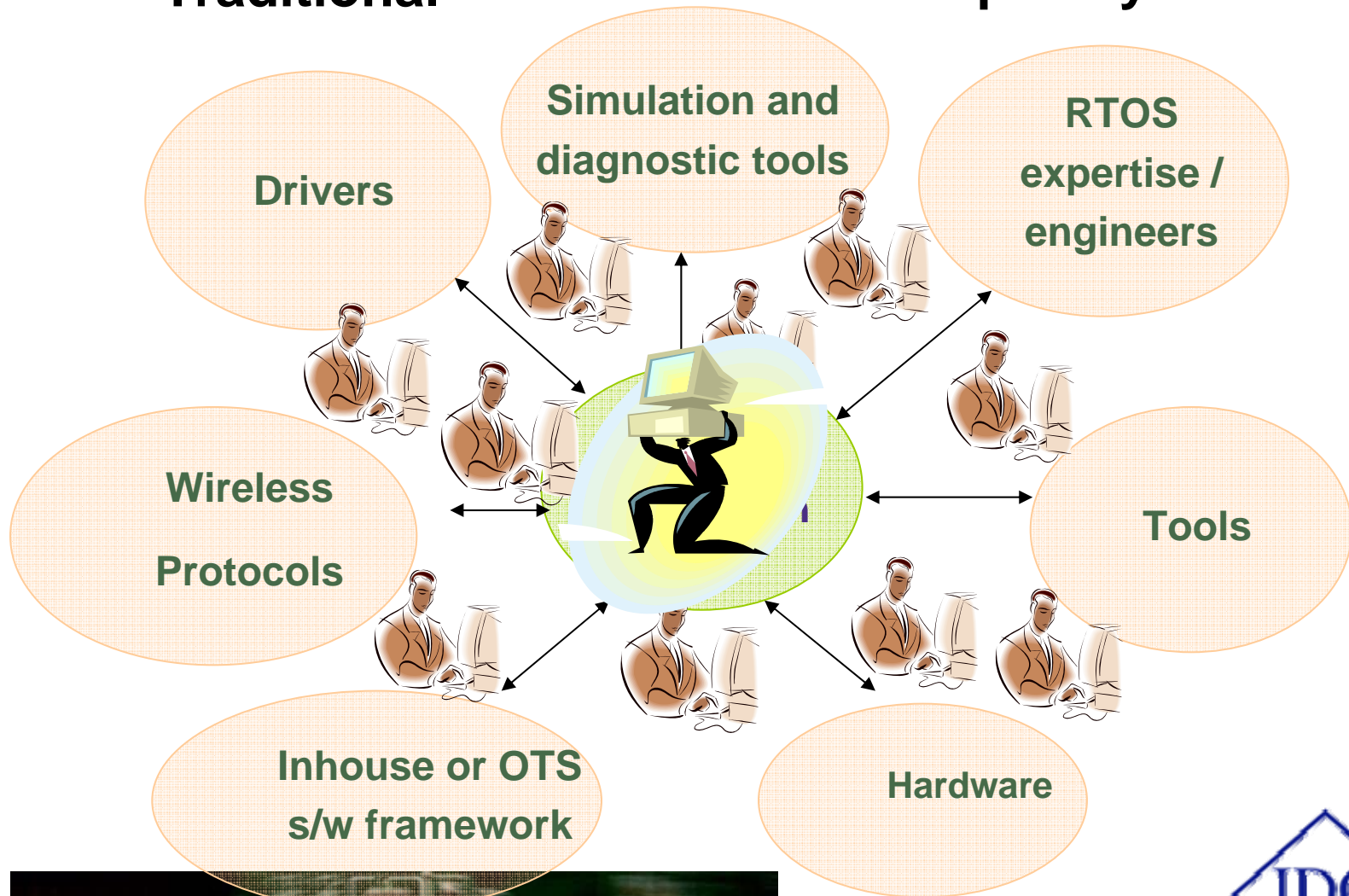
Embedded Developments



Embedded Developments

Traditional

Increased complexity



Summary: how to pick the right technology

	RFID	Zigbee	Nordic	Bluetooth	WiFi	UWB
Power Usage	Low	Low to Medium	Low	Low to Medium	High	Low to Medium
Data rate	Low	250kbits/s	1Mbits/s	3Mbits/s	55Mbits/s	480Mbits/s
Coverage	Up to 5m	Up to 100m	Up to 100m	Up to 100m	Up to 200m	Up to 100m
Complexity of protocol	Low	Medium	Medium	High	Medium	High
Complexity of app	Low	Medium	Medium	Medium	High	Medium
HW costs	Tags – low Readers – med to high	Low	Low	Medium	High	High
OS/RTOS	n/a	n/a	n/a	Yes	Yes	Yes
Security	Limited	Medium	Low	High	High	High
Example Apps	Product id, tracking	Home automation	Sensor network, tracking	Voice, music	Data transfer, VoIP	Imaging, data, WUSB



References

- This presentation included information from the websites of the following organisations:
 - IEEE
 - Wikipedia
 - Institute for Infocomm Research (I2R)
 - Zigbee alliance
 - Bluetooth Special Interest Group

