



Bluetooth in Automotive Applications

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Business Manager

2000-12-05

Mecel

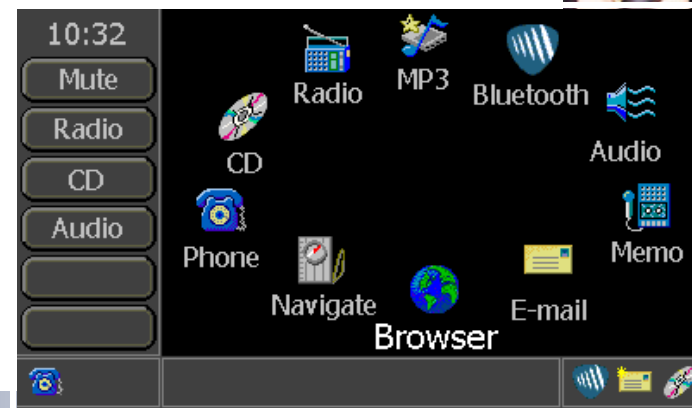
www.mecel.se

Presentation Overview

- Background
- A modern vehicle architecture
- Automotive Requirements
- Automotive Applications
 - Feasible
 - Not Feasible
- Automotive Software Design Issues

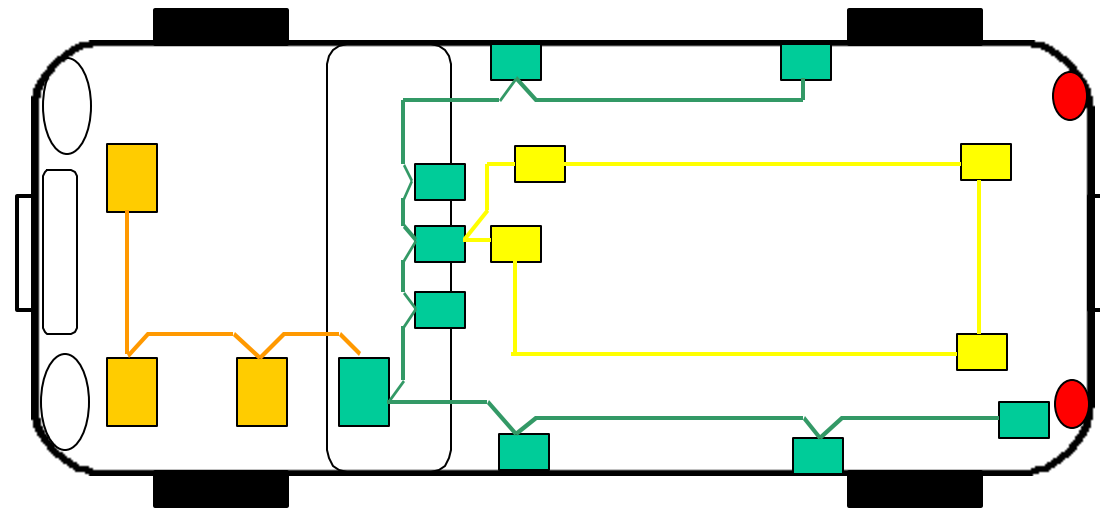
Background

- Mecel is a systems & s/w engineering company based in Sweden
- 18 years of automotive electronics experience
- Focus on Infotainment since -95
- Joined Bluetooth SIG in May-98. Have own s/w implementation with emphasis on resource efficiency and dependability



Bluetooth in Automotive Applications
Anders Eliasson, Mecel

A modern vehicle architecture



1980

1990

2000

Engine Ctrl
Radio

Multiplex
Hi/Low Speed

Fibre Optic
Wireless

of
ECU's

2

5-10

10-20

Automotive Requirements

MIL spec @ no cost !!!

No bugs accepted !!!

Automotive Requirements

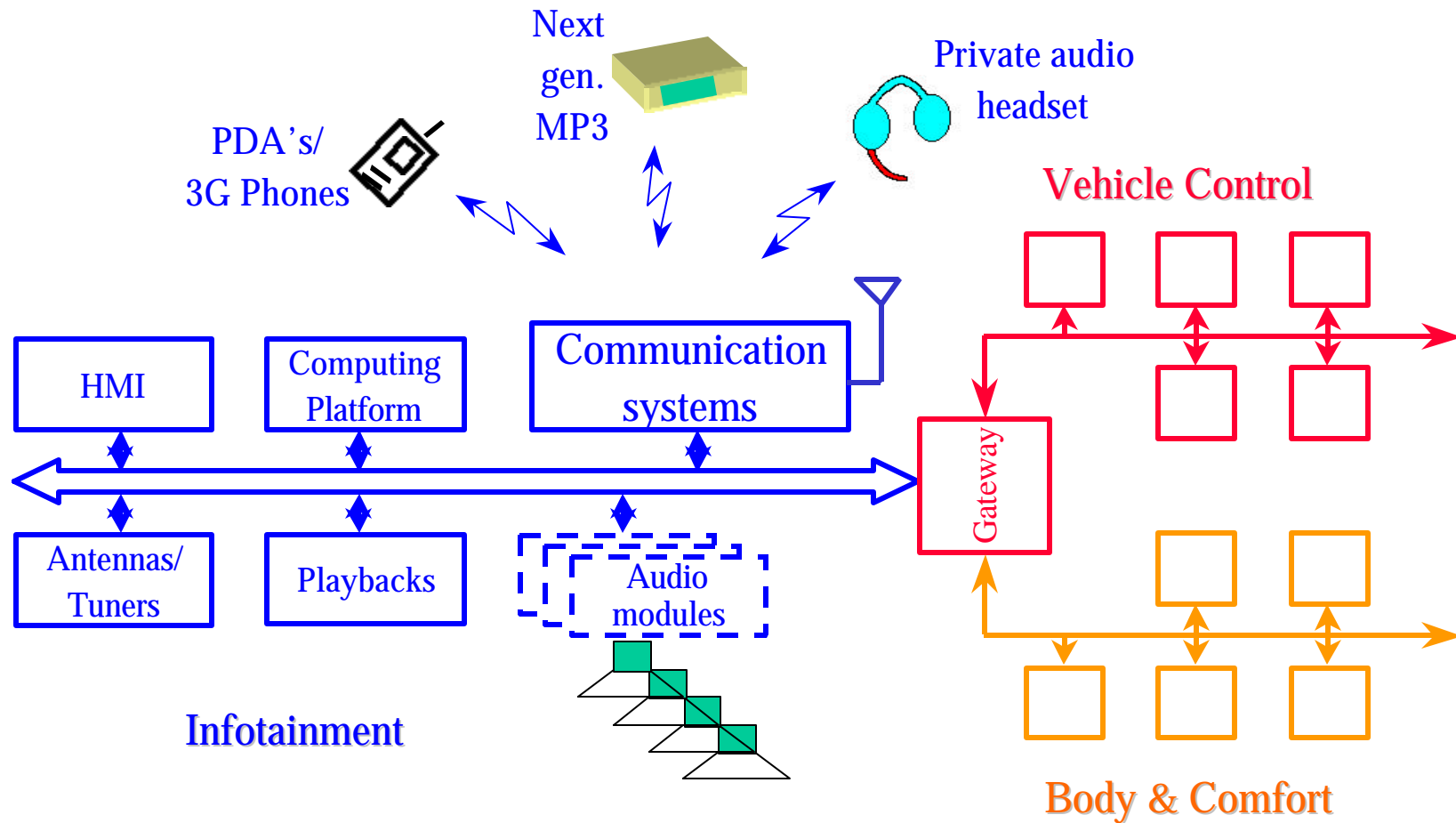
- Development cycle time
- Product life time
- Reliability
- Cost
- Integrity
- Quiescent current
 - Operating temp.
 - EMC
- ...
- ...

Automotive Requirements

- A vehicle will be exposed to varying RF-conditions

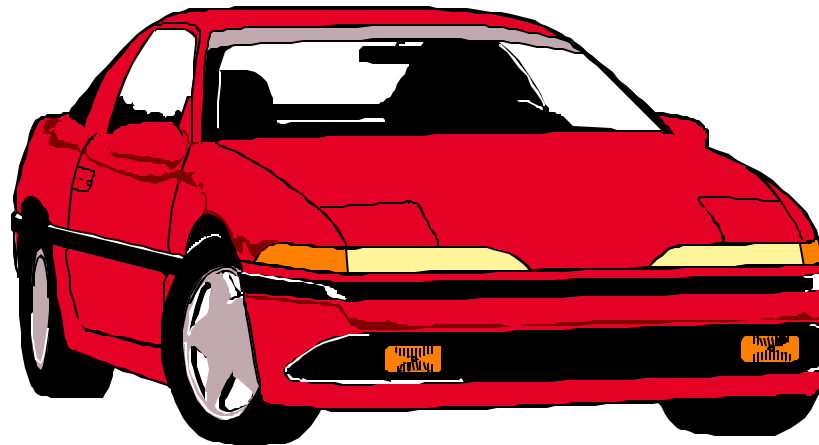
~~**Bluetooth for
safety related
vehicle applications**~~

Automotive Applications



Automotive Applications

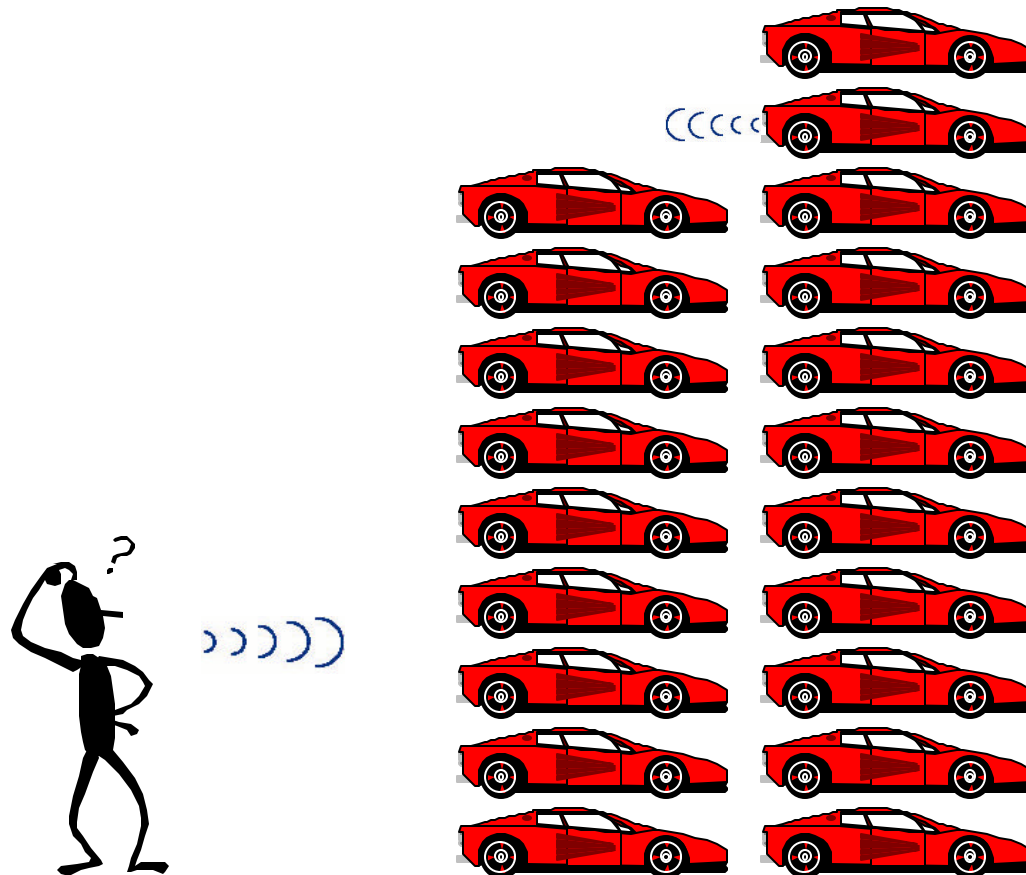
- Handsfree with headset
- Synchronise phonebook
- Forward incoming call to embedded phone
- PDA surf/chat via embedded phone



Automotive Applications

■ Remote Access / Control

- Lock/Unlock
-



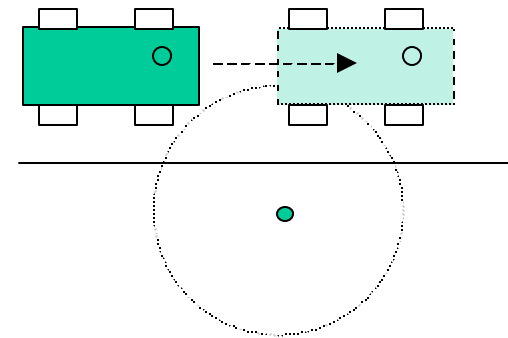
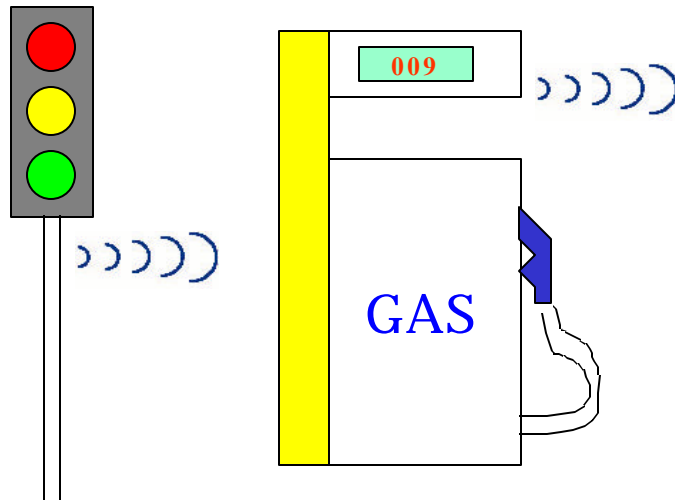
Automotive Applications

■ Remote Access / Control

- Lock/Unlock
-

■ “Drive-By” Services

- Intelligent Roadsigns
- Tolling
-



~~transfer 1 kbyte data~~

~~@ 100 kbit/s~~

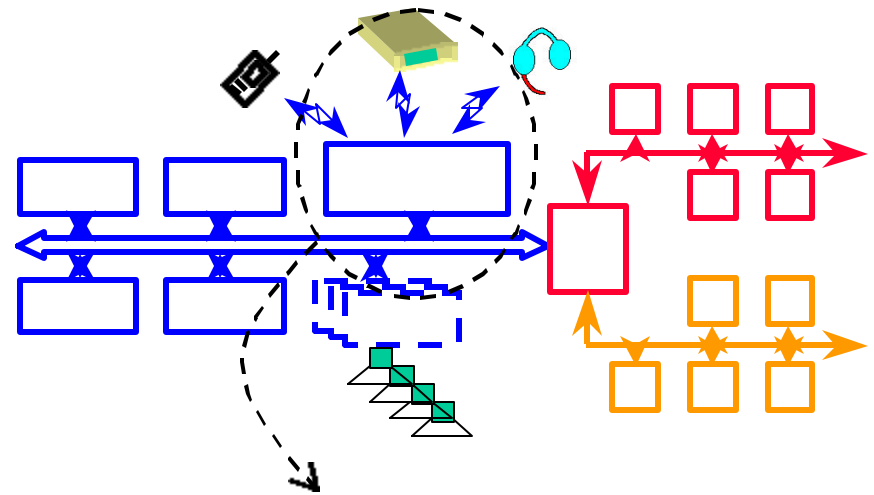
~~need $\gg 0.1$ s~~

~~assume 10 m within range~~

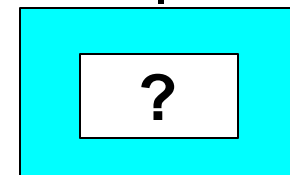
~~max speed $\gg 100$ m/s~~

Automotive Applications

- Remote Access / Control
 - Lock/Unlock
 -
- “Drive-By” Services
 - Intelligent Roadsigns
 - Tolling
 -
- High Throughput Applications
 - Interfacing the In-vehicle Bus
 - Interference
 -



SCO / ACL up to 723 kbit/s



20+ Mbit/s

Synchronous/Asynchronous

Automotive Software Design Issues

- The “s/w” will be extremely exposed during its lifetime
- There is no reset button & the battery is not easily accessible
- Automotive grade quality cannot be reached by testing only
 - Quality & robustness need to be “guaranteed” by design

Automotive Software Design Issues

- Robustness
- Resource efficiency
- Maintainability
- Portability

Finally ...

... I would like to thank You
for Your attention !

Please read more about the
Mecel Bluetooth SDK
at our website: www.mecel.se
or see us at the Telelogic stand
in the exhibition area