

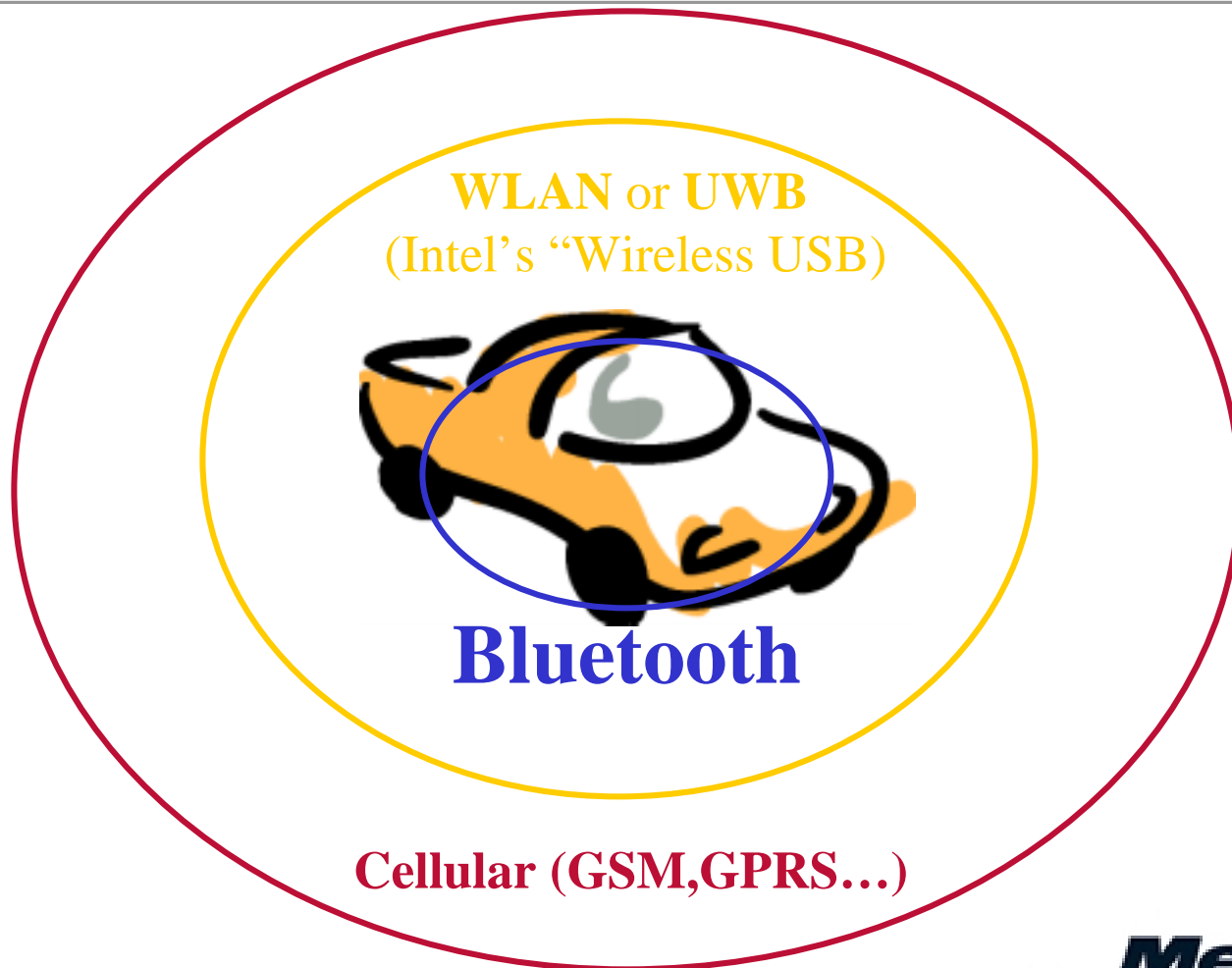


Bluetooth for Automotive

- Why Bluetooth?
- Project experiences
- Next applications for Bluetooth in Vehicles
- Evolving the Bluetooth standard;
what's new in 1.2

Why Bluetooth?

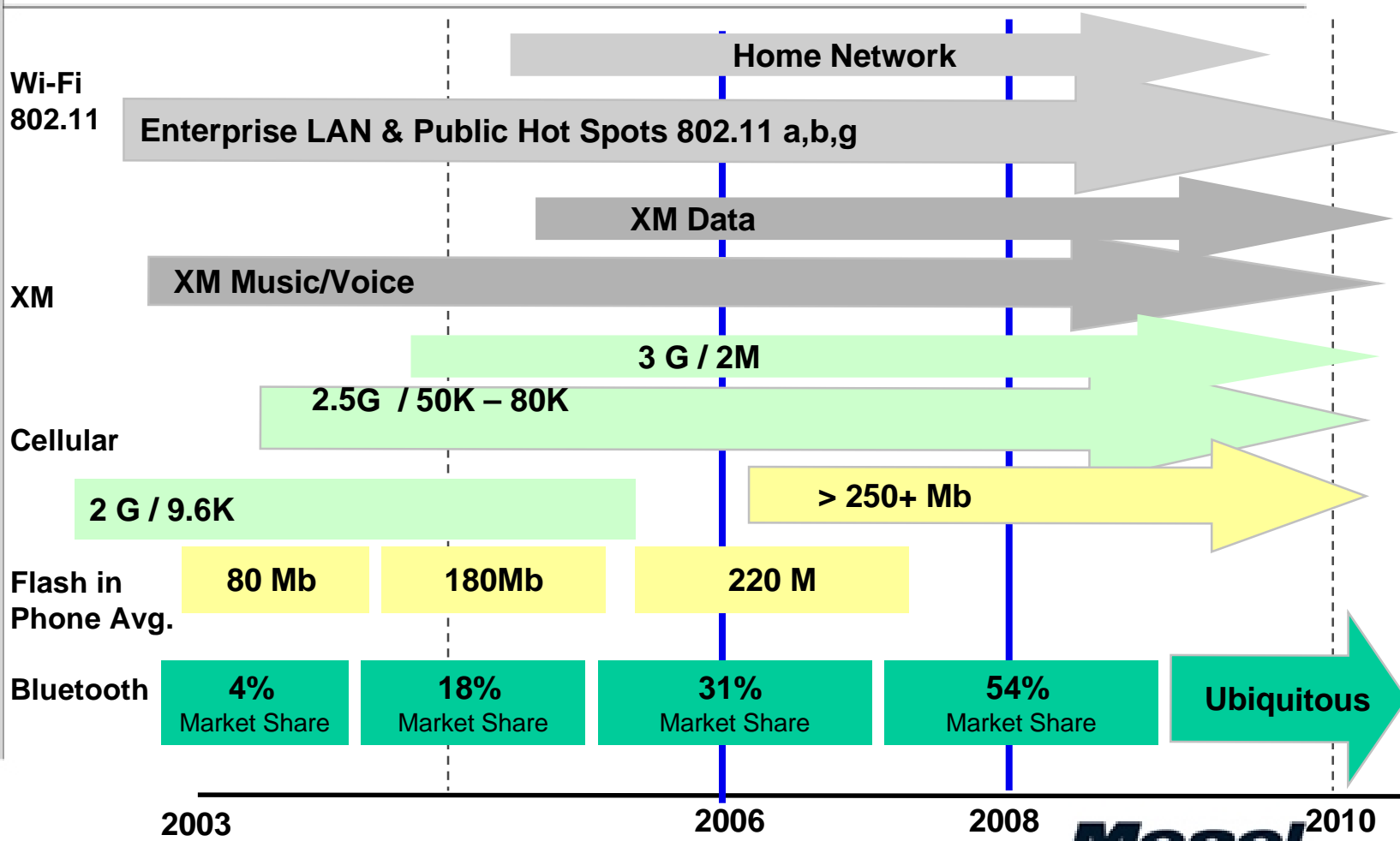
Wireless Communication in Automotive



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Why Bluetooth?

Wireless Infrastructure Roll-Out



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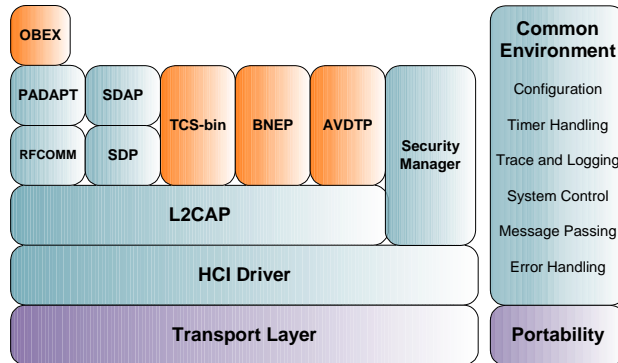
Bluetooth in the Automotive environment

- Customer expectations:

- Automotive Grade !**

- The vehicle value sets expectation on the Quality of Service for Bluetooth in the car.

MECEL BLUETOOTH SDK



Product Characteristics

Mecel provides a compact and flexible solution for your Bluetooth development.

The Mecel Bluetooth Software Development Kit (SDK) includes the core layers of the Bluetooth protocol stack.

Developed in ANSI-C, it has a strong emphasis on resource efficiency and reliability, and is designed to be platform independent, hence making it ideal for small embedded systems.

“Automotive Grade” software
Software components fulfilling the automotive design criteria’s and developed by engineers with domain knowledge and that is familiar to general automotive requirements

- Robust
- Maintainable
- Portable
- Resource efficient
- Qualified by Bluetooth SIG
- Built-in debug support
- Comprehensive Documentation

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Mecel's Bluetooth product experience



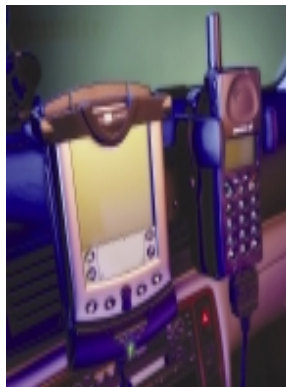
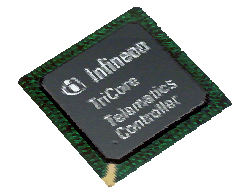
New Saab 9-3



New Vehicle's
SOP MY2006



Infineon Headset



MPC Communiport



3 Mobile Phones



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Project experiences

Bluetooth in the Automotive environment

- *Getting the Bluetooth message across*

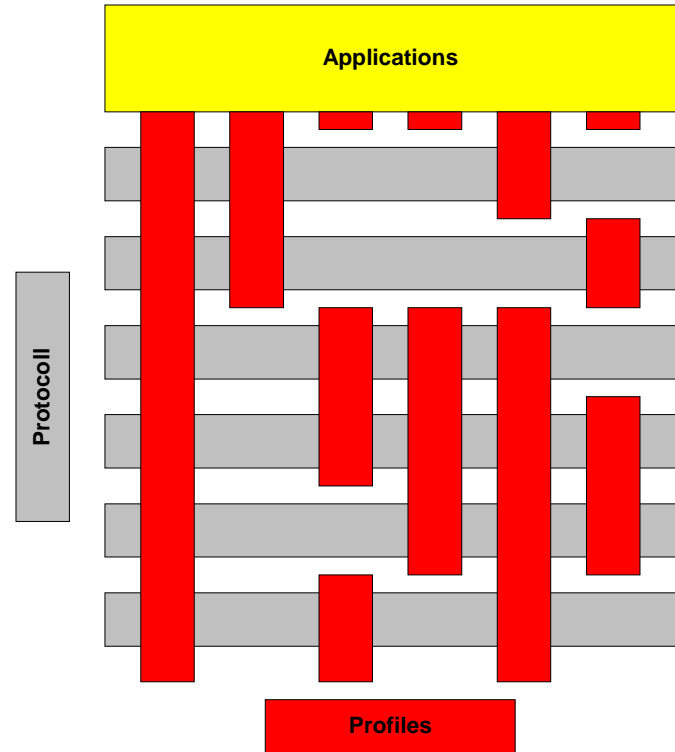
Concept of Bluetooth profiles is not obvious
Bluetooth functionality is seen as

"all or nothing"

- unrealistic user expectations

Protocols and Profiles

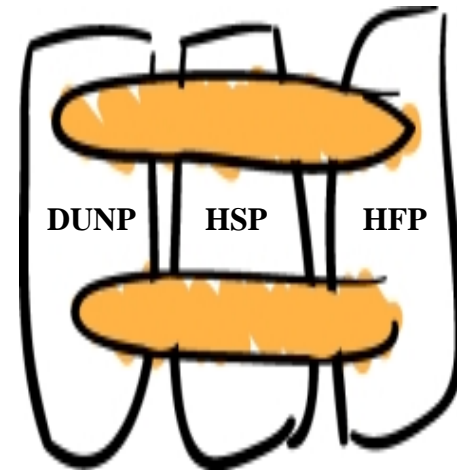
- Protocols for communication
- Profiles to ensure interoperability
 - Different use case scenarios
 - Specifies how to use different protocols
 - Specifies content in SDP data base



Automotive applications

Profile support - decision

- Handsfree profile
 - use of private mobile phone in the vehicle's speaker and microphone.
- Headset profile
 - using headset instead of speakers and microphone in car, for private call's.
- Dial-Up Networking profile
 - using mobile phone as modem.
- SIM Access Profile
 - wireless usage of a portable phone's SIM card





Project experiences

Profile support - decision SAAB 9-3

Saab chose not to include the Handsfree profile at launch

- Handsfree profile was not finalized when project started
- Use of an integrated trunk-mounted phone, for optimum external antenna performance
- Market for Bluetooth headsets expected to take off first

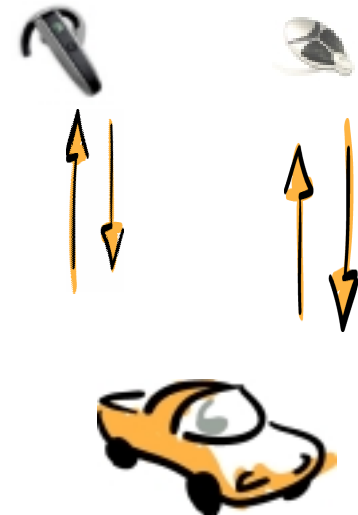
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Project experiences

Supported functionality – headset

- voice control through headset
- headset audio output is routed to in-car voice recognition system
- voice audio can be transferred between headset and vehicle
- increased voice control hit-rate in cabriolet model
- use of multiple headsets possible
- works in car proximity - in-/outside cabin call can be set-up by voice control from headset

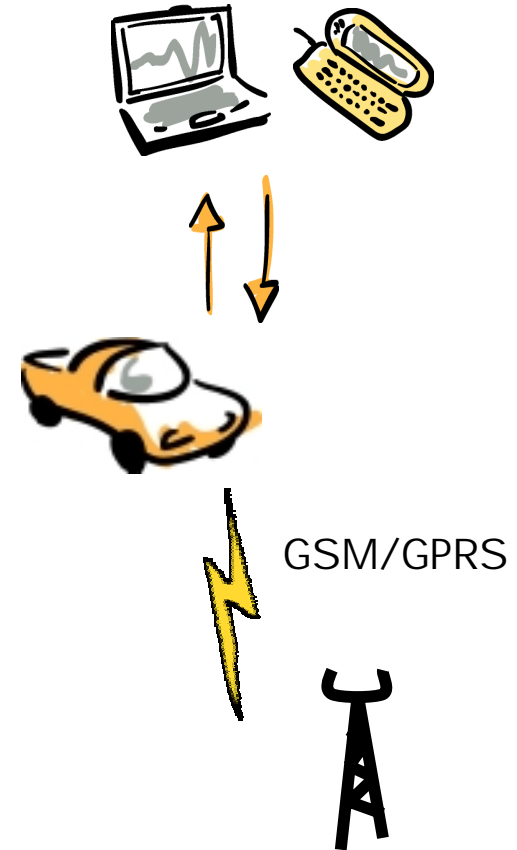




Project experiences

Supported functionality – Dial-Up Networking

- uses integrated phone as modem driver is shown data call status at all times
- low connection time, high data rate GPRS connection makes mobile Internet access viable
- priority handling is used to handle incoming/outgoing call when online
- works in car proximity - in-/outside cabin



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Project experiences

Bluetooth in the Automotive environment

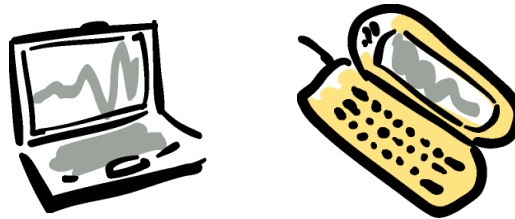


Headsets

- Problem with Headsets deviating from the standard!
 - When the user deviates from the normal use case, Example: deny after a service search instead of accept.
 - Normal use case is not a problem.
- Trend is that exceptions handling quality is improving.

Project experiences

Bluetooth in the Automotive environment



PDA's & Laptops

- Complicated HMI in Dial Up Networking terminal devices (PDA).
 - Difficult to configuring the chain:
PDA/PC -> Vehicle/phone -> Service-provider
 - Windows XP improves Bluetooth HMI for Laptops.

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Next applications for Bluetooth in Vehicles

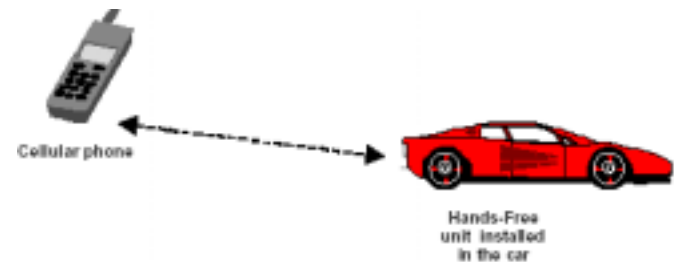
Automotive use cases

■ Hands-Free Use case

- Wireless hands-free with basic remote control features
- Bluetooth instead of car-embedded phone
 - Easy to integrate and less expensive
 - Enables simultaneous voice and data
- Hands-Free Profile 1.0

■ Phone Access Profile: PAP

- Probably renamed to HFP 2.0
- Phone Book & SMS features



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Next applications for Bluetooth in Vehicles

Automotive use cases

■ SIM-Access Use Case

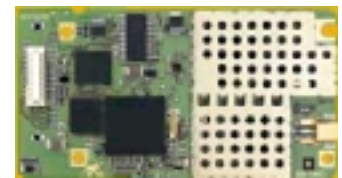
- In-car phone with remote SIM Access
- Access SIM data over Bluetooth for the in-car phone
- Mobile phone's account
- Access to Mobile phone data
- External antenna



Next applications for Bluetooth in Vehicles

Handsfree v.s. SIM Access Use Case

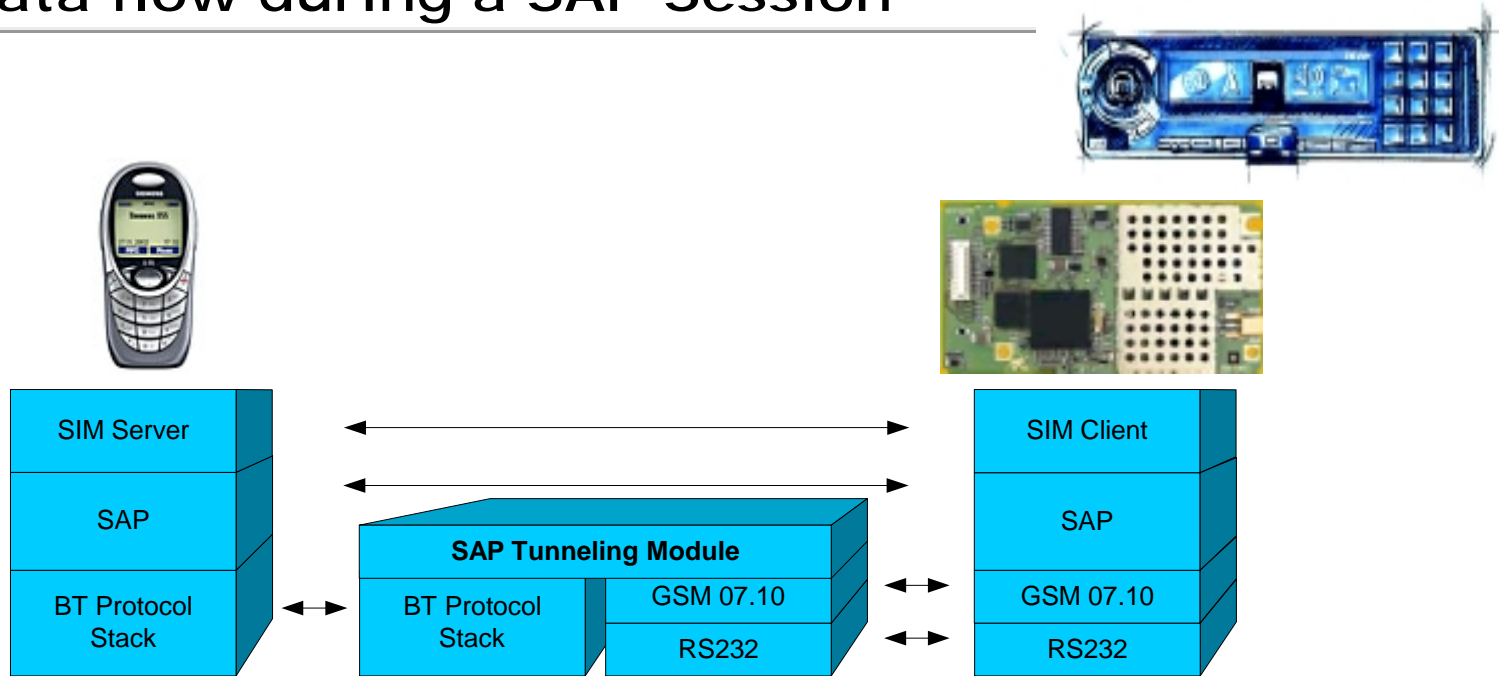
- Driver enters the car talking on the handy phone.
- The driver switches to Handsfree mode
 - This implies that the Handsfree profile is used.
- The phone call ends.
- A new phone call start after a minute.
 - This time the SIM Access profile is used and the internal phone module, AC45.
 - **But the SIM card in your handy is used**



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Next applications for Bluetooth in Vehicles

Data flow during a SAP Session



- Transmitting raw SAP data on a multiplexed serial channel

Next applications for Bluetooth in Vehicles

More use cases

- **Interfacing other mobile devices**

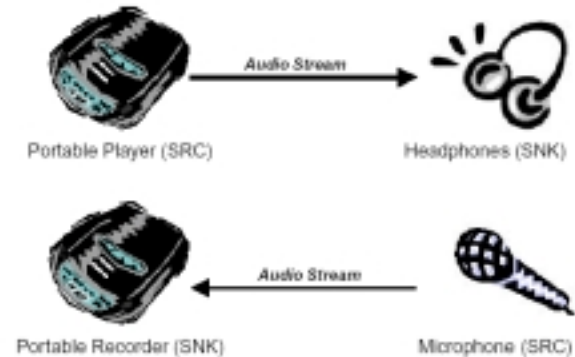
- Audio streaming, (eg. MP3)
- Video streaming
- Pictures

- **Access to vehicle network**

- Diagnostics
- Vehicle interface

- **Bluetooth for in-vehicle network communication?**

- Ex. Audio connections
- only non-critical entertainment functions



Evolving the Bluetooth standard; what's new in 1.2

Bluetooth Specification status

- **Bluetooth Specification 1.1**
 - Core
 - Profiles (GAP, SDAP, SPP, CTP, Intercom, HSP, DUN, FAX, LAN, OPP,FTP,SYNC.)
- **Adopted and draft Profiles**
 - Multimedia Profiles: A/V-profiles, Imaging, Printing,
 - Car Profiles: Hands-Free 1.0, SIM Access
 - Misc.: PAN, HID, ISDN, Local Positioning



Evolving the Bluetooth standard; what's new in 1.2

New versions of the Bluetooth Specification

- **Bluetooth Specification 1.2** (released November 2003)
 - Faster Connection
 - Improved Audio quality
 - Enhanced Quality of Service (QoS)
 - Adopted Frequency Hopping (improved co-existence with 802.11b)
 - Various LMP improvements

- **Bluetooth 2.0 ?**
 - No official release plans from SIG at this point
 - Higher Data Rate
 - Medium rate: 2-3 Mbps (Same RF but new modulation techn.)
 - High rate: 4/8/12 Mbps (New Radio)



Thank You!

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