Speech Technologies in Cars and the Role of ITU-T

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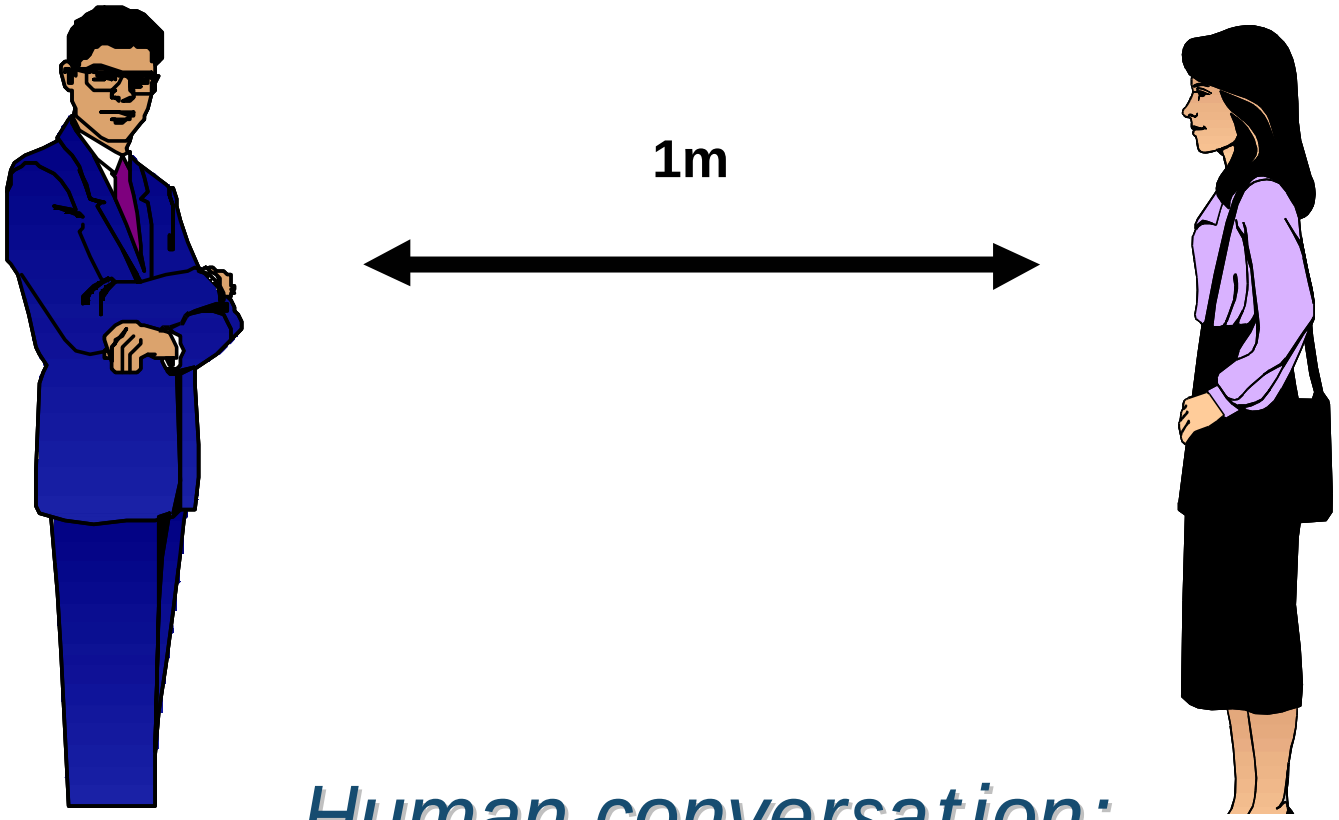
Why Speech Technologies

=> Auditory Channel of the human system available

Speech applications

- The main speech applications:
  - Speech recognition systems
  - Speech dialog systems
  - Text to speech systems
  - Speech enhancement for communication systems
  - Hands-free communication
  - Enhanced in-car communication systems between passengers

Human interaction



Human conversation:

"orthotelefonic reference position"

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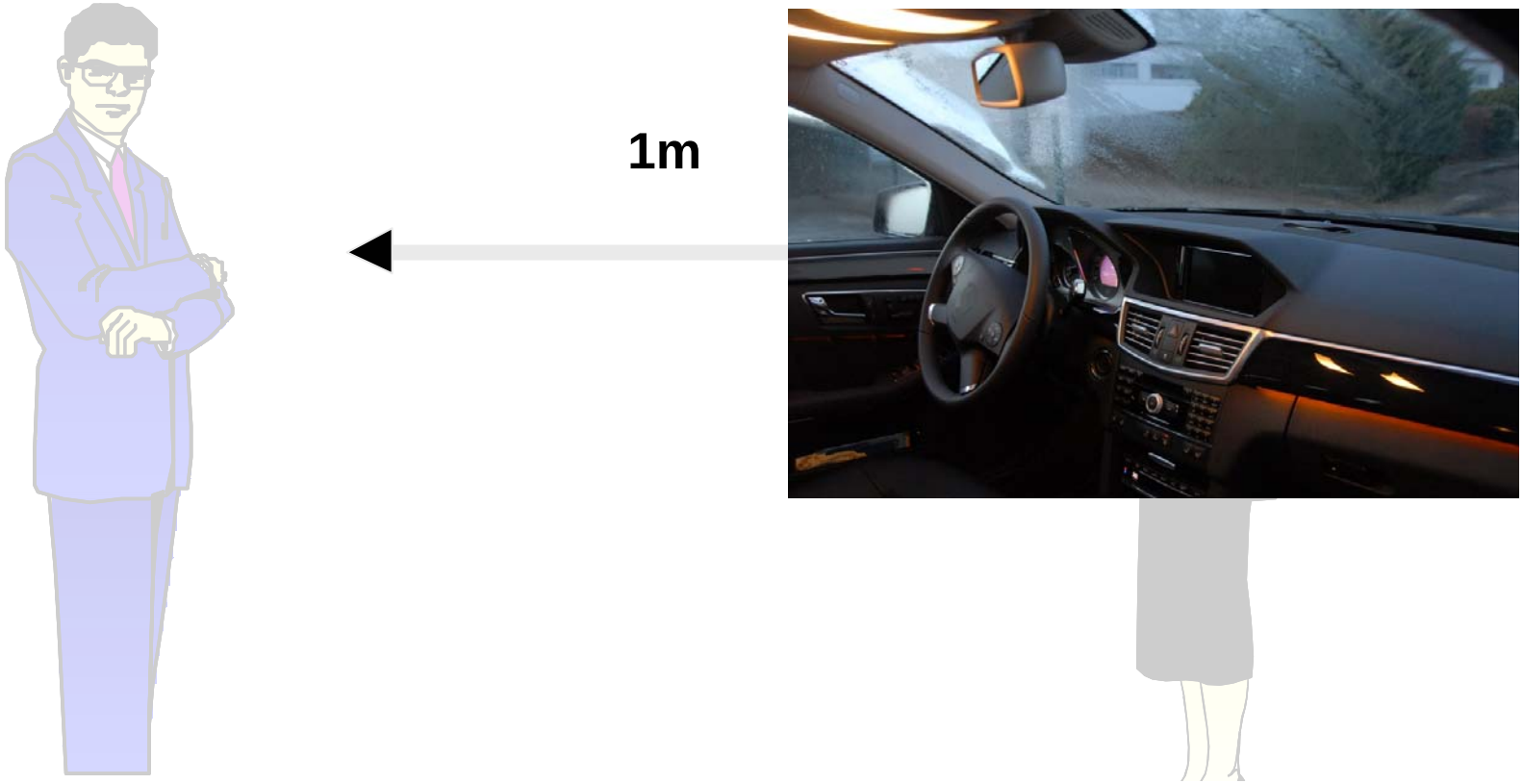
Speech dialog systems



Human – machine communication

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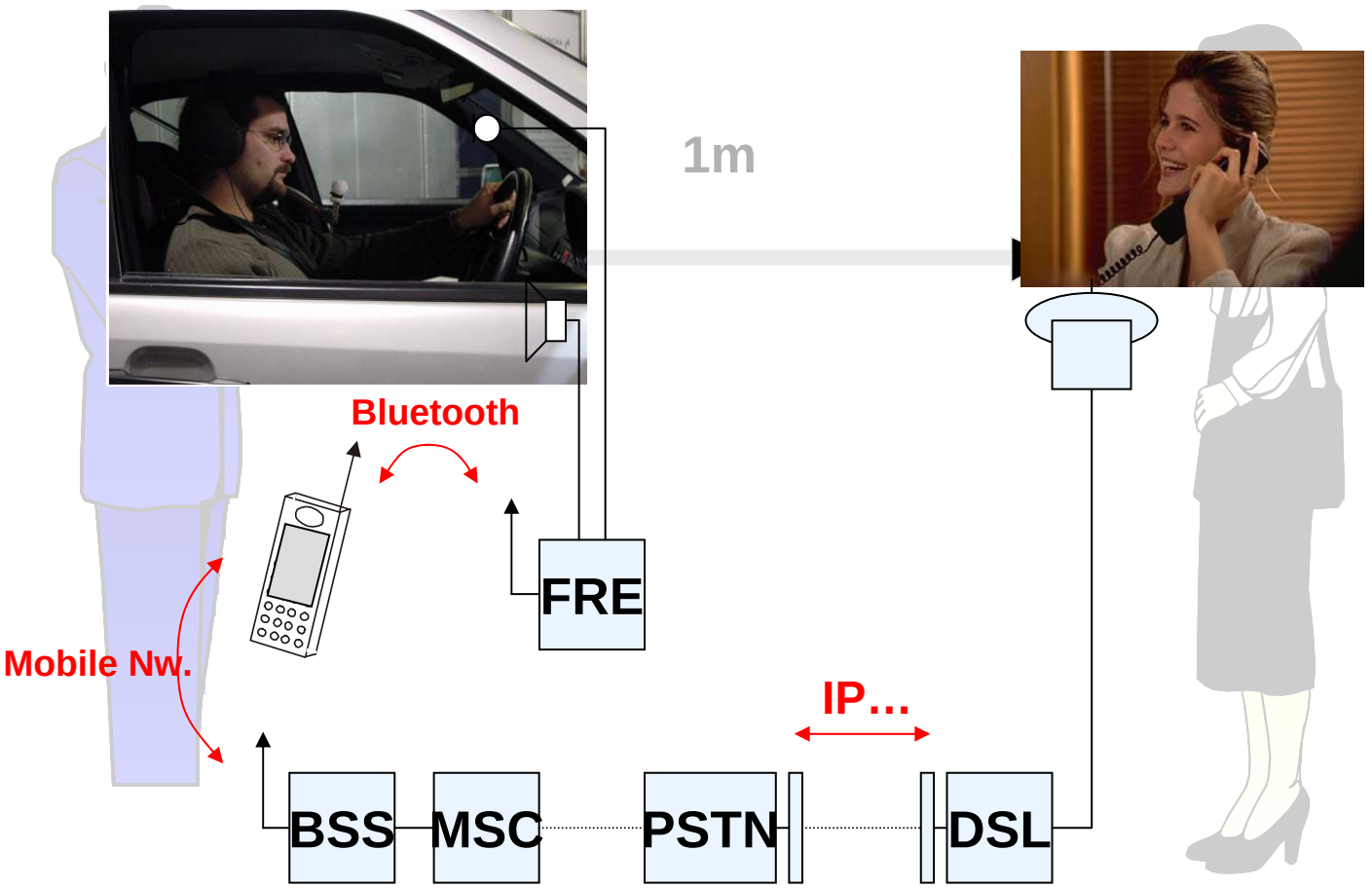
- Seamless man-machine interaction requires:
  - Superior speech recognition
  - Superior speech synthesis
  - High quality text to speech systems
  - Superior dialog systems

Hands-Free Communication



- Seamless human interaction requires low distraction form the driving task:
  - Superior speech sound quality (in the car and from car to landline)
  - Superior noise cancellation
  - Low delay transmission
  - Wideband speech is highly preferred

Why Wideband in Cars?

- Wideband services in mobile networks available soon

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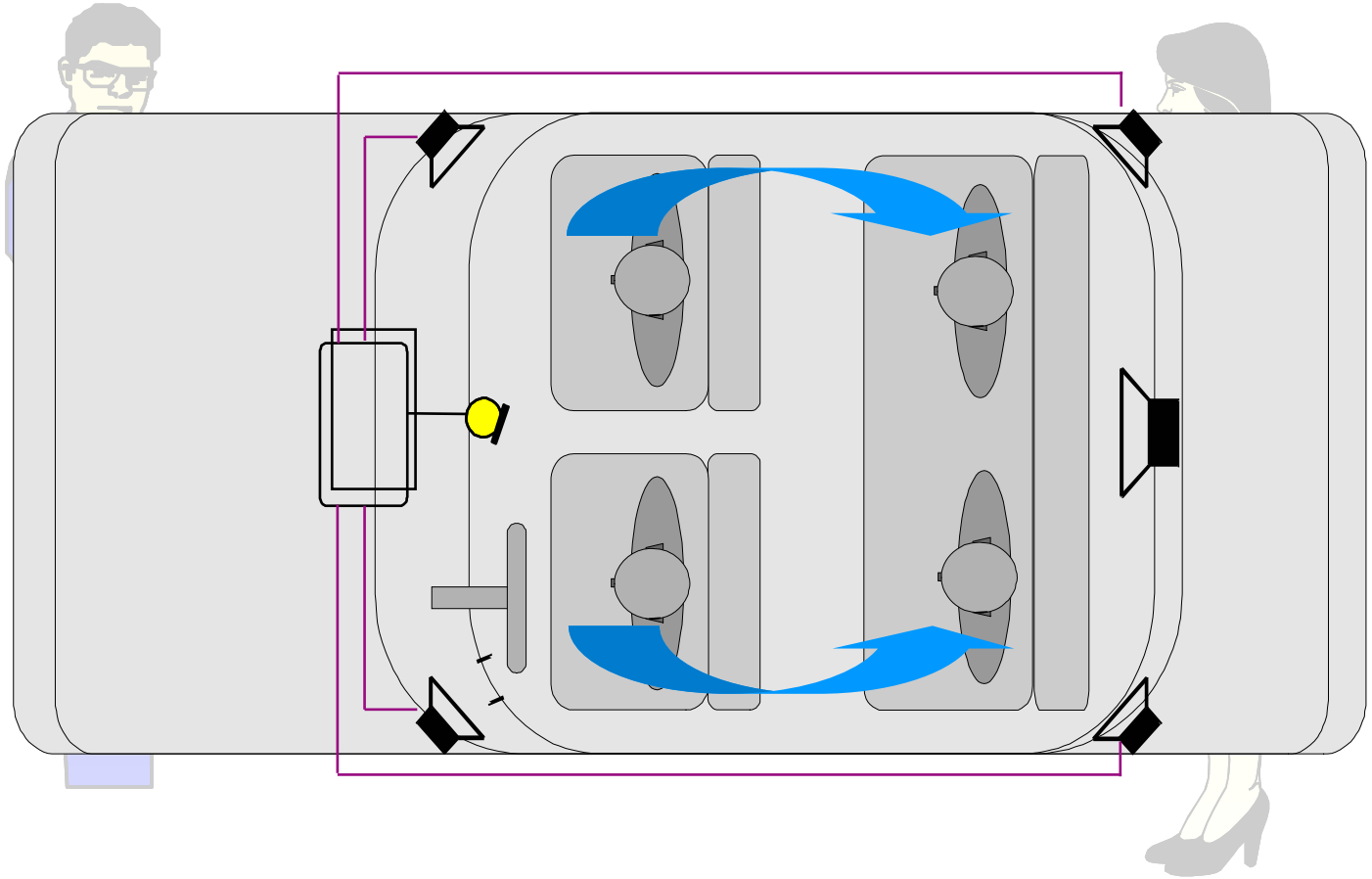
- Enabling wideband telephony (100 Hz- 8 kHz) in cars

  - Fullband 
  - Narrow band (car) 
  - Wideband (car) 

- ***Efficient use of the high quality audio systems in cars:***
  - Getting superior sound quality
  - Increasing speech intelligibility
  - Increasing naturalness of a conversation
  - Reduce drivers distraction due to poor speech quality

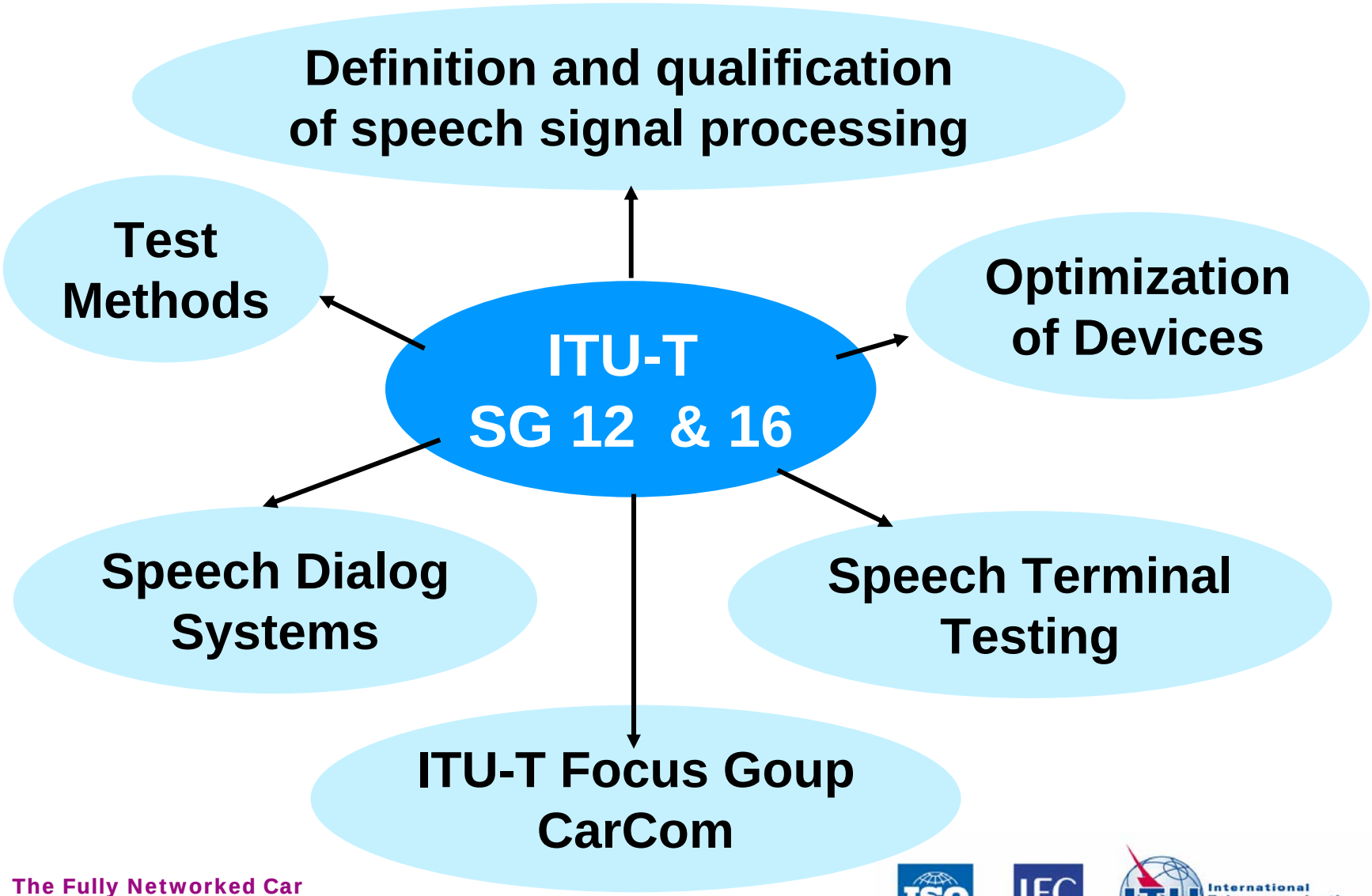
In-Car Communication



General Requirements for In-Car Communication

- Seamless human interaction requires:
  - Increased intelligibility, esp. from front to back passengers
  - In-Car communication system support not audible for people in the car
  - No artifact under any operation condition
  - Adaptive to different noise/driving situations

The Role of ITU-T



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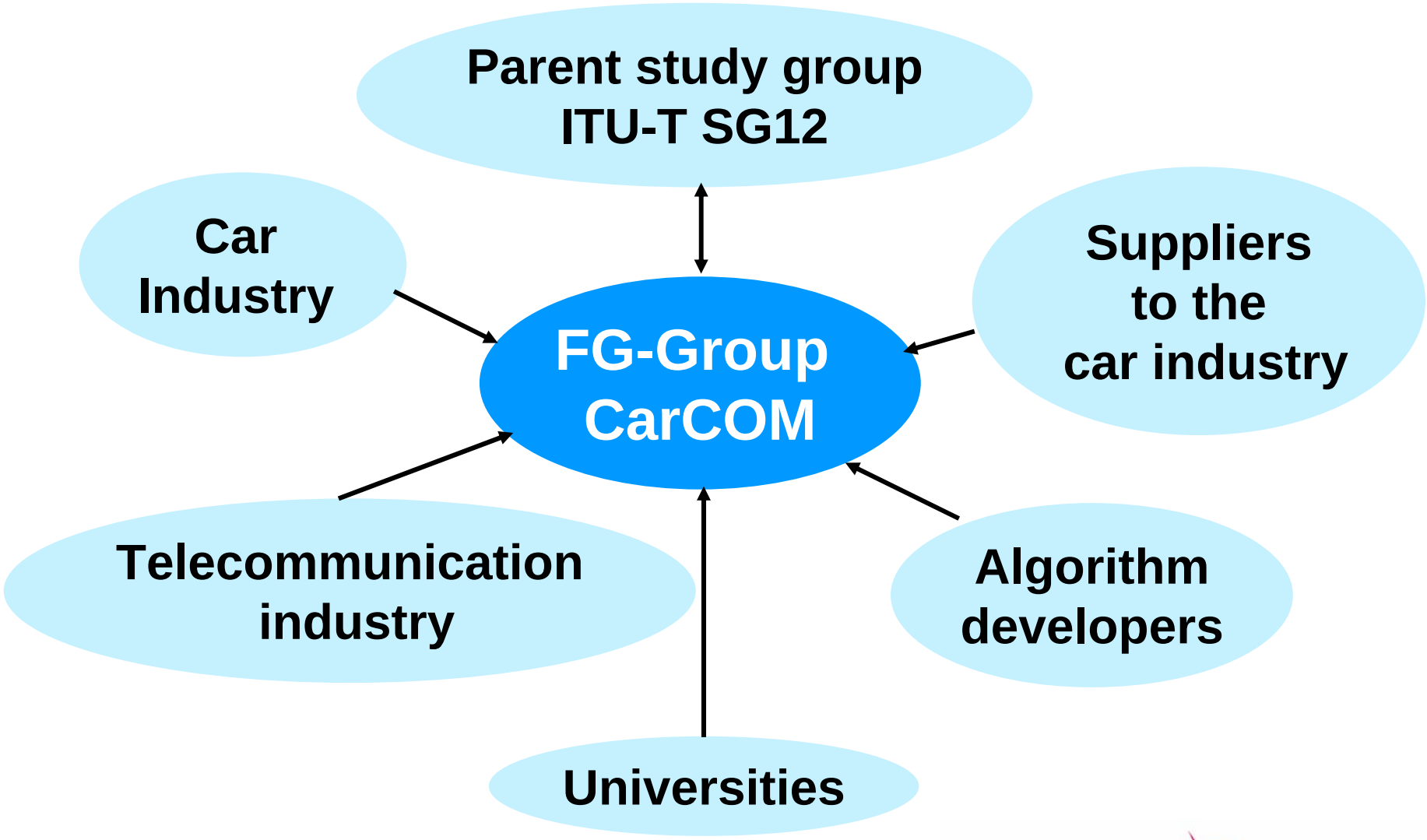
The ITU-T Focus Group CarCom



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ITU-T: Speech Dialog Systems

In car systems:

- Control of car information systems (telephony, navigation, car specific functions, …)

Network based systems:

- Control of network accessible functions (telephony, network based navigation, web-browsing….)

Standardization activities in ITU:

- *P.851: Subj. evaluation of dialog systems*
- *Suppl. 24 to P. Rec.: Parameters describing the interaction with spoken dialog systems*

ITU-T FG CarCOM: Speech Recognition

In car systems:

- Control of car information systems (telephony, navigation, car specific functions, …)

Network based systems:

- Control of network accessible functions (telephony, network based navigation, web-browsing….)

Standardization activities in ITU:

- *Workitem ITU-T focus group CarCom – acoustical frontend for speech recognition*

ITU-T FG CarCOM: Hands-Free Telephony in Cars

Integrated systems:

- Completely integrated in the car infrastructure typically including speech recognition, navigation….

After market systems:

- Independent of car infrastructure, sometimes including speech recognition, navigation

Standardization activities in ITU based on work in FG CarCOM:

- *ITU-T P.1100 for narrowband hands-free*
- *ITU-T P.1110 for wideband hands-free*
- *New work on subsystem requirements*

The Role of HEAD acoustics

- Providing expertise for testing and optimization of all speech technologies used in cars
- Providing test systems for speech applications to the car industry, suppliers, algorithm developers and chipset manufacturers
- Supporting standardization since 20 years based on the expertise and basic research at HEAD acoustics

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Conclusion

- Speech technologies in cars may actively contribute to deploy new services in cars
- Speech technologies may help to reduce drivers distraction if properly implemented
- HEAD acoustics is providing all types of test services and systems for testing and optimization of speech technologies
- ITU-T is an excellent source and basis for speech related technologies and their standardization
- FG CarCOM is actively working on advanced standards for hands-free implementations and subsystems, more:

  http://www.itu.int/ITU-T/focusgroups/carcom/