Car-to-Car Communication - Market Introduction and Success Factors

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Car-to-Car Communication

What is the scope of Car-to-Car applications ?

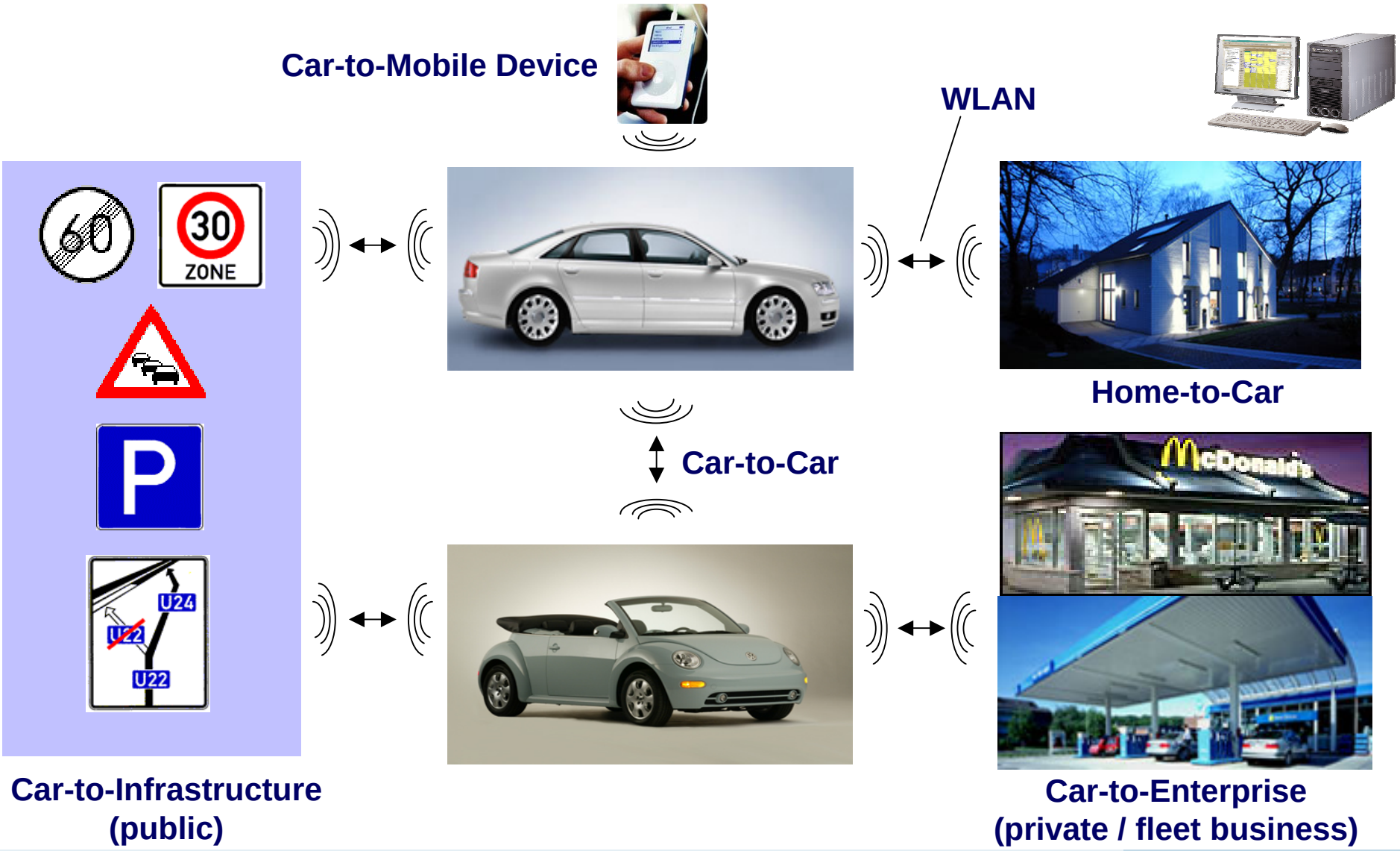
Which market mechanisms apply to Car-to-Car communication ?

How can it be introduced to the market ?

Which premises have to be accomplished ?

What does it mean to vehicle manufacturers ?

Communication Channels for Car-to-X Communication



Current Situation

Car-to-Car Communication is generally agreed to have the potential to significantly improve road safety.

But: No common view exists on how to economically exploit the technology and on how to introduce the technology to the market.

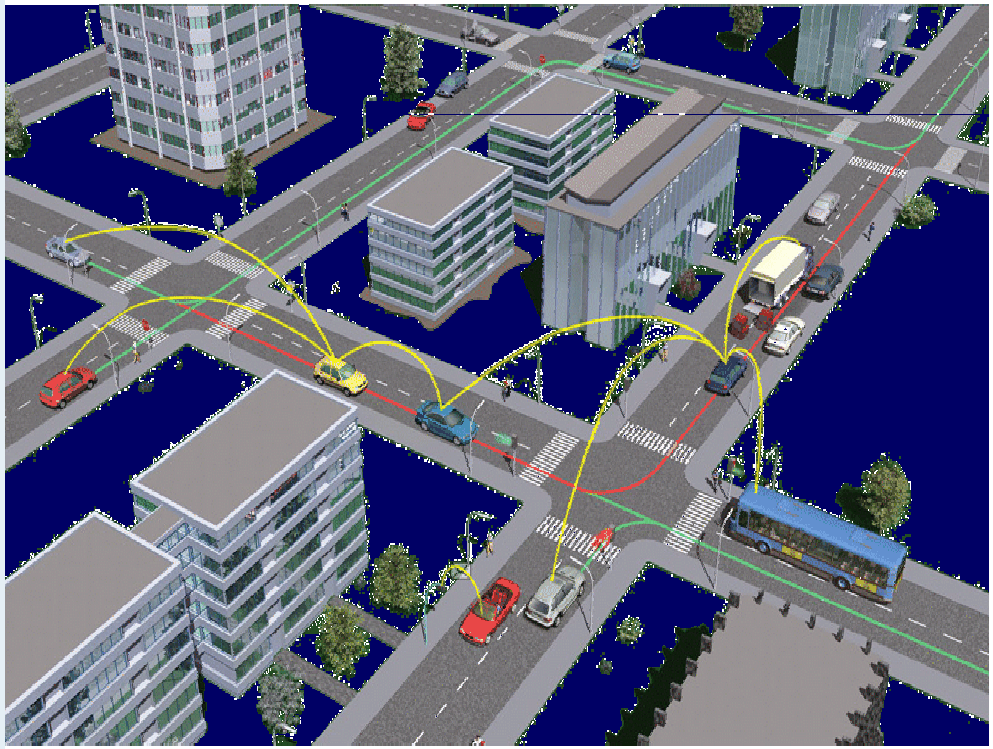
Issue

Car-to-Car Communication is subject to the market mechanisms of technologies with network effects.

Network effects means that the customer value of this technology growths with its dissemination.

Particularly for Car-to-Car Communication the customer perceivable value with sufficient quality of service requires a minimum market penetration.

Thresholds of Market Penetration to enable Car-to-Car Functions



Information

> 5 % De-central traffic information

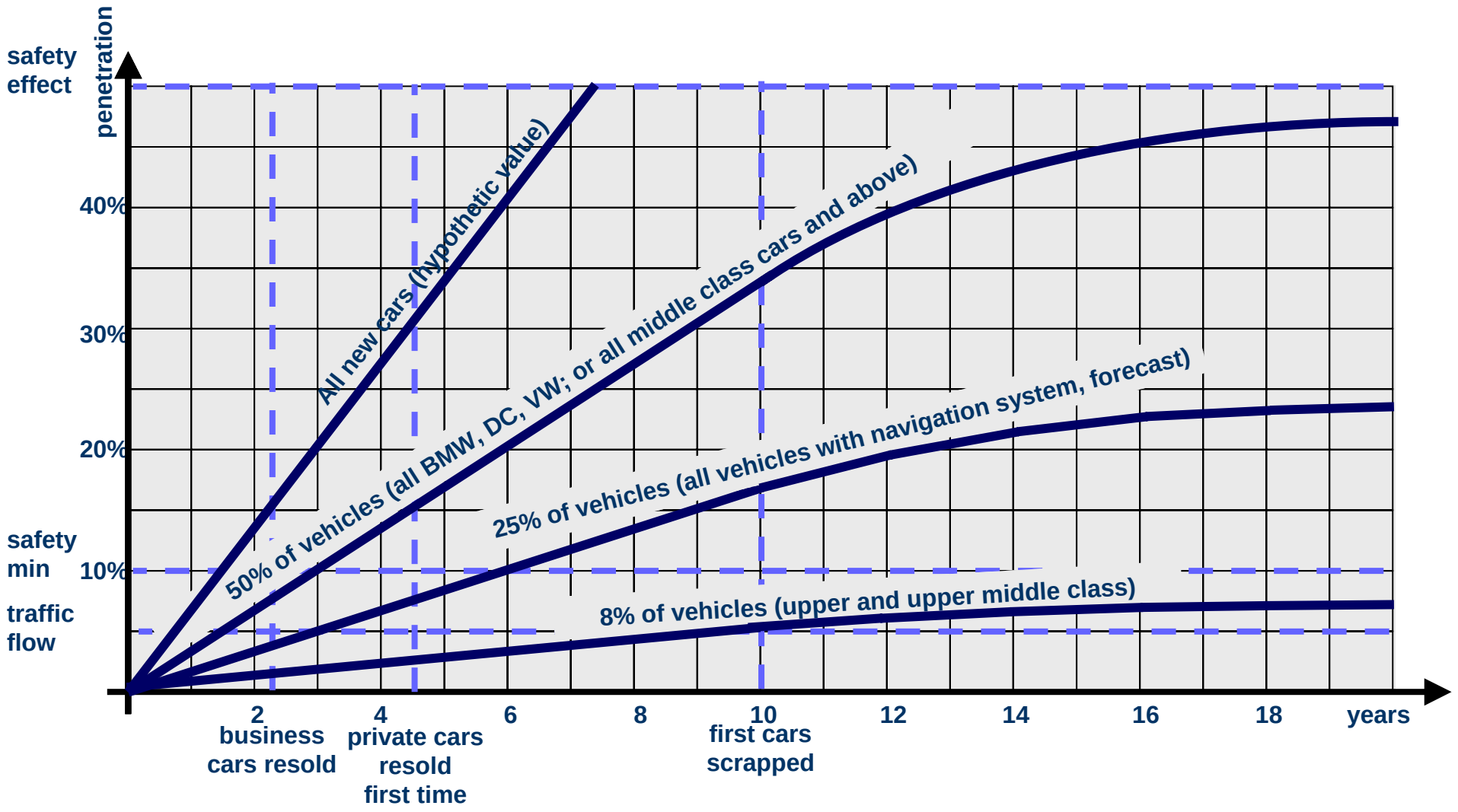
Warning

> 10 % Road condition warning
Congestion warning
Breakdown ahead warning
Emergency alert warning
Crash ahead warning

Cooperation

> 95 % Intersection collision avoidance
Lane change warning
Take over collision avoidance
Cooperative driving

Market Penetration of Car-to-Car Communication depending on Equipment Rates. Case: Germany



The Dilemma....

1. **Car-to-Car Communication Functionality must be installed in more than 25% of all new vehicles if it shall be available in a reasonable time frame.**

   This is why it is not possible to introduce Car-to-Car Communication in the classical top down approach.

2. **The safety and information features of Car-to-Car Communication work only if all car makers apply the same technology at the same time.**

   This is why standard Car-to-Car Communication Features do not enable unique selling points.

3. **A car maker who waits until others have generated sufficient market penetration has economic benefits and thus a competitive advantage.**

Strategic Options to Resolve the Dilemma (1)

Mandatory introduction to improve road safety

- ⇨ **penetration is secured**
- ⇨ **safety improvements are not measurable before 15 years after introduction.....**
- ⇨ **... if measurable at all: autonomous driver assistance systems will continue to improve road safety, so that the effect of C2CC is difficult to separate.**
- ⇨ **Safety improvement by C2CC cannot be measured by the generation who have introduced it.**

Free market mechanisms

- ⇨ **driven by customer value**
- ⇨ **roadmap: next slide**

Strategic Options to Resolve the Dilemma (2)

Free Market Mechanisms

Car makers equip several million vehicles with C2CC units and start selling the feature as soon as minimum market penetration has reached.

- ⇨ **penetration is secured**
- ⇨ **huge initial cost without pay back**

Car makers package C2CC features with other C2XC functions that use the same or similiar technolgy.

C2CC functionality is sold on top as soon as required penetration is achieved.

- ⇨ **slow penetration**
- ⇨ **cost on top must be marginal**

X = public infrastructure

vehicle communicates with/via traffic infrastructure

- ⇨ **requires upfront public investments, or...**
- ⇨ **...possibly re-use of existing infrastructure (e.g. road toll) if technical requirements are met**

X = consumer electronis and/or private networks

vehicle communicates with WLAN-equipped (consumer) devices and lokal networks

- ⇨ **roadmap: next slide**

The Vehicle in the Connected World of Tomorrow (1)

vehicles are wirelessly connected with mobile consumer electronics

- **smart phone, MP3 player, fitness monitor, laptop etc.**

novel functions in the mobile context

- **end-to-end navigation**
- **mobile device as data carrier from/to vehicle**

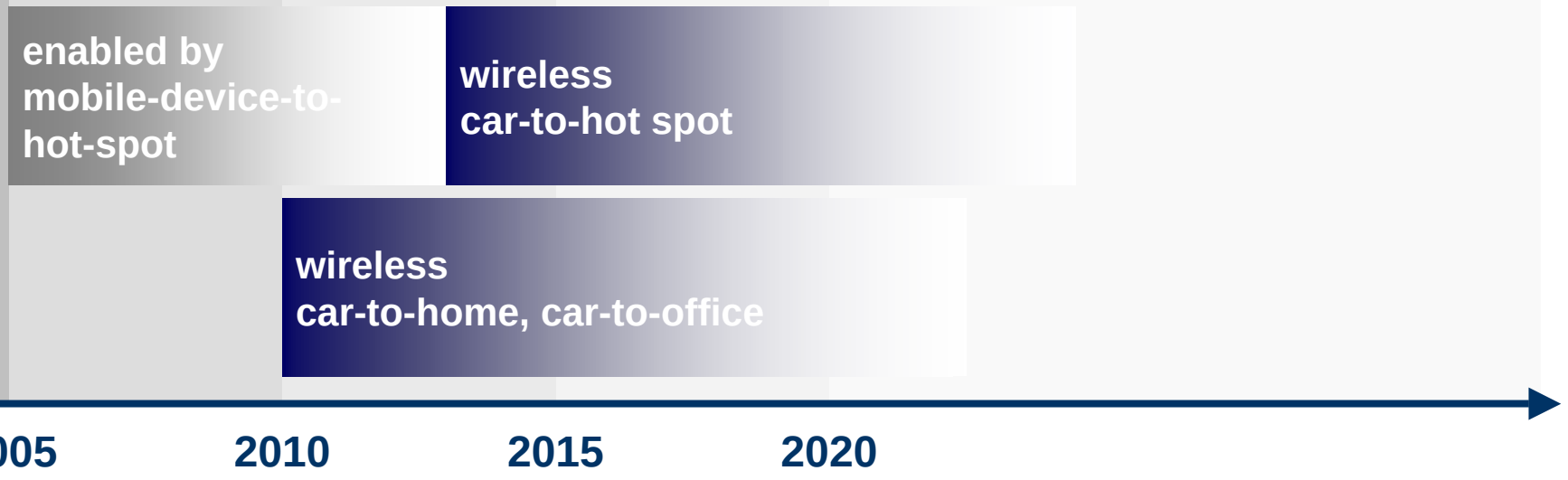
The Vehicle in the Connected World of Tomorrow (2)

vehicles are wirelessly connected to local networks

- **data exchange between PC at home/office and vehicle in garage/parking**
  e.g. for travel preparation or appointment navigation

... and networks with open access (e-commerce)

- **media download e.g. at gas stations, drive through**
- **location based services: event, sales offerings, sightseeing locations...**
- **new cross-business models**



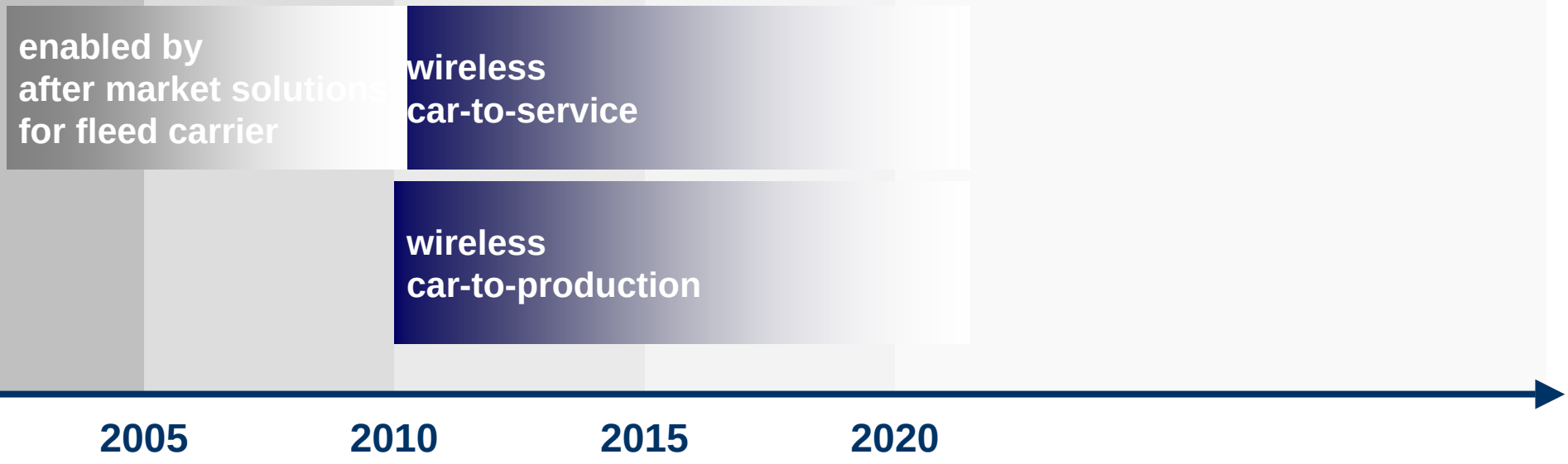
The Vehicle in the Connected World of Tomorrow (3)

vehicles communicate wirelessly with car maker and dealer

- **digitalized front desk with service point**
- **diagnostics and software updates at service station**
- **wireless data connection to vehicle in production**
- **remote diagnostics**

... and fleed carrier

- **e.g. automated rental car return**



The Vehicle in the Connected World of Tomorrow (4)

vehicles start communicating wirelessly with other cars (soft applications)

- **decentral traffic data collection – everywhere and up to date**
- **improved road safety, e.g. warning of incidents in blind corner, ice warning...**
- **improved vehicle distance control (swarm control)**
- **local coordination of rescue forces**

The Vehicle in the Connected World of Tomorrow (5)

vehicles communicate wirelessly with traffic infrastructure

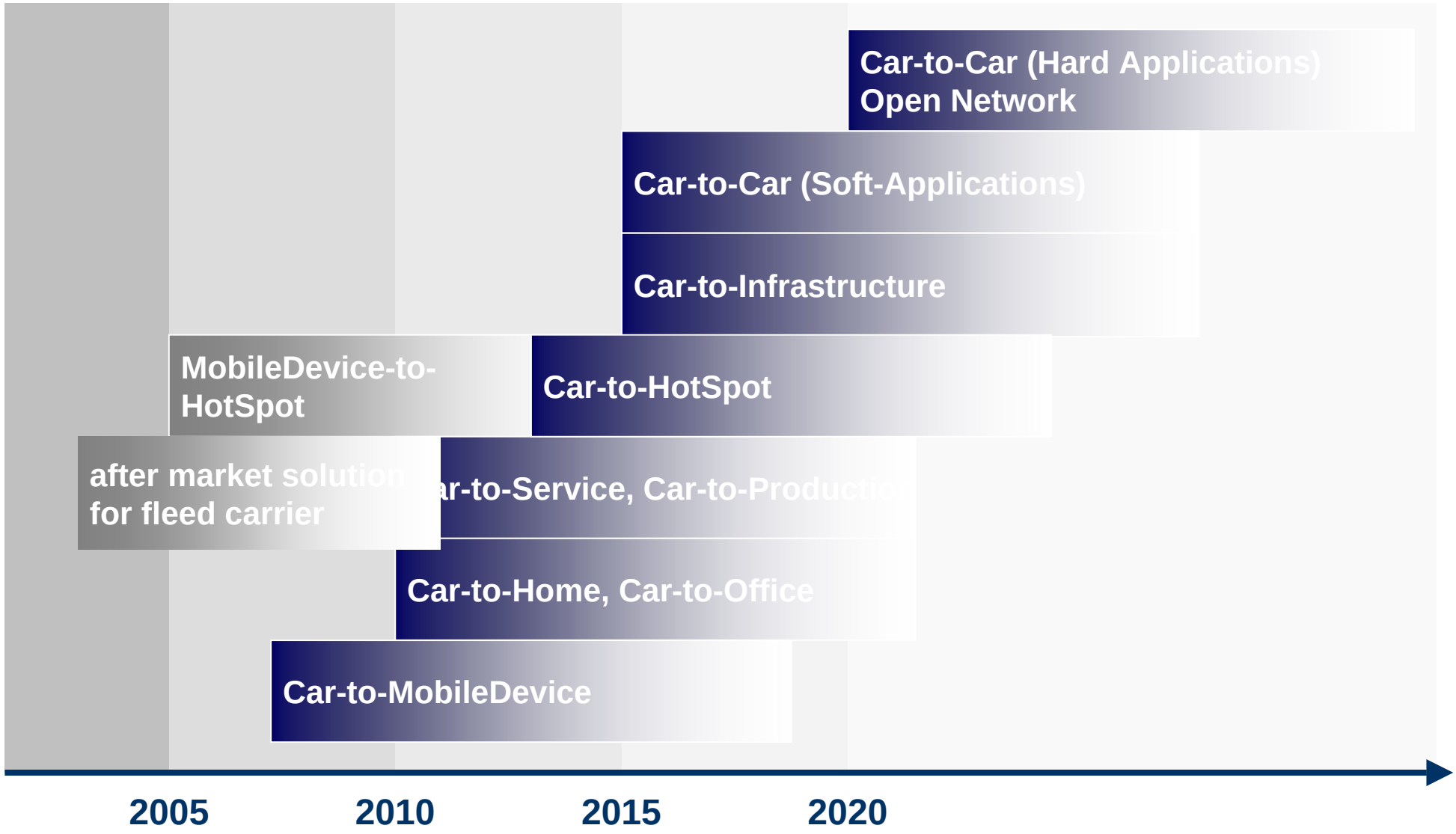
- **local traffic control / guidance e.g. in construction areas, event areas**
- **supplementary traffic sign information**

The Vehicle in the Connected World of Tomorrow (6)

vehicles communicate and interact wirelessly with other cars in an open network

- **collision mitigation and avoidance**
- **platooning of cars**

The Roadmap to Car-to-Car Communication



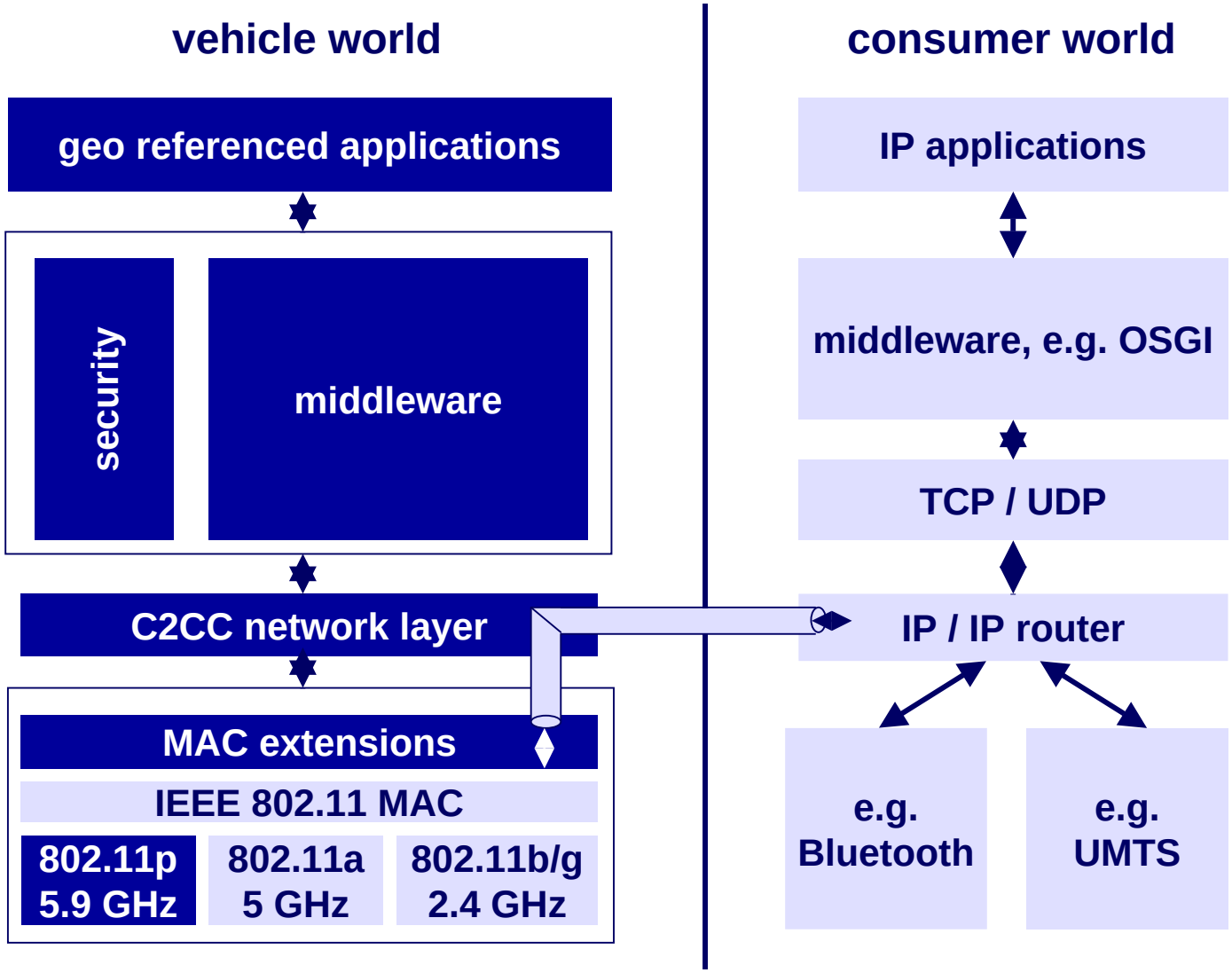
Premises to the Roadmap of Car-to-Car Communication

The basic Car-to-Car Communication functions have to be developed and implemented in enabling Car-to-X Communication systems as soon as possible.
Future systems need to be backward compatible.

System synergies between IEEE 802.11p solutions for reliable and real time communication and 802.11 a/b/g solutions for consumer electronics have to be exploited.

Major Car-to-Car Communication applications require a reliable real time communication. This can only be achieved by allocation of an exclusiv frequency (in discussion: 5.9 GHz band).

Architecture of a combined car-to-car and car-to-consumer solution. Synergies help to achieve the cost targets.



Conclusion

Even though final Car-to-Car Communication applications are still far away, the premises for their market introduction are being laid today:

- **Car-to-X Communication is anchored in the elctronics roadmaps of vehicle manufacturers.**
- **Car-to-Car Communication technologies and applications are being standardized across the automotive industry by the European Car-to-Car Communication Consortium.**
- **The necessary frequency domain must be allocated.**


Thank you !