DSRC FREQUENTLY ASKED QUESTIONS

Why is DSRC the answer to communications-based active safety?

Communications-based active safety applications use vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) short range wireless communications. V2V with GPS is a new type of 360 degree object detection sensor. The connected vehicle provides continuous safety at considerably reduced cost, reduced complexity and offers additional functionality.

DSRC is the answer to communications-based active safety because:

- It operates in a licensed frequency band
- It is primarily allocated for vehicle safety applications by FCC Report & Order – Feb. 2004 (75 MHz of spectrum)
- It provides a secure wireless interface required by active safety applications
- It supports high speed, low latency, short range wireless communications
- It works in high vehicle speed mobility conditions
- Its performance is immune to extreme weather conditions (e.g. rain, fog, snow, etc.)
- It is designed to be tolerant to multi-path transmissions typical with roadway environments
- It supports both inter-vehicle and vehicle ↔infrastructure communications

Why is it THE only alternative today?

Communications-based active safety systems need a tightly controlled spectrum for maximized reliability. DSRC communications take place over a dedicated 75 MHz spectrum band around 5.9 GHz allocated by the US FCC for vehicle safety applications (FCC Report & Order, Feb 2004).

DSRC is preferred over Wi-Fi because the proliferation of Wi-Fi hand-held and hands-free devices that occupy the 2.4 GHz and 5 GHz bands, along with the projected increase in Wi-Fi hot spots and wireless mesh extensions, could cause intolerable and uncontrollable levels of interference that could hamper the reliability and effectiveness of active safety applications.

DSRC was developed with a primary goal of enabling vehicular safety applications. DSRC is the only short-range wireless alternative that provides:

- Fast Network Acquisition: Active safety applications require immediate establishment of communication.
- Low Latency: Active safety applications must execute in the smallest amount of time possible.
- High Reliability when Required: Active safety applications require high level of link reliability.
- Priority for Safety Applications: Safety applications on DSRC are given priority over non-safety applications.
- Interoperability: DSRC ensures interoperability which is the key to successful deployment of active safety applications.
- Security & Privacy: DSRC provides safety message authentication and privacy.

What technical issues (latency, etc.) make it the answer?

The normal Wi-Fi means of recognizing nearby stations and associating with them (establishing a link between two or more devices) cannot be used for active safety applications because it can take multiple seconds to complete this association. Active safety applications require immediate

establishment of communication. Several changes from the basic technology (Wi-Fi) were required to achieve this goal. The most significant change is to accommodate an extremely short time in which devices must recognize each other and transmit messages to each other. A large number of these safety applications require response times measured in milliseconds. For this reason, the periodic transmission of safety messages is used so that vehicles receiving the safety messages can immediately determine if they should respond or not.

DSRC is similar to IEEE 802.11a, except for the major differences summarized below:

- *Operating Frequency Band:* DSRC is targeted to operate in a 75 MHz **licensed** spectrum around 5.9 GHz, as opposed to IEEE 802.11a which is allowed to utilize only the **unlicensed** portions in the frequency band.
- *Application Environment:* DSRC is meant for **outdoor high-speed vehicle** (up to 120 mph) applications, as opposed to IEEE 802.11a originally designed for **indoor WLAN** (walking speed) applications. In IEEE 802.11a, all PHY parameters are optimized for the indoor low-mobility propagation environment.
- *MAC Layer:* The DSRC band plan consists of seven channels which include one control channel. It can support a **large family** of vehicular safety and non-safety applications.
- Safety Priority: **Prioritizing** safety over non-safety applications is not part of IEEE 802.11a.
- *Physical Layer:* The bandwidth of each DSRC channel is 10 MHz, as opposed to the 20 MHz IEEE 802.11a channel bandwidth. This brings better wireless channel propagation with respect to **multipath delay spread and Doppler effects** caused by high mobility and roadway environments.