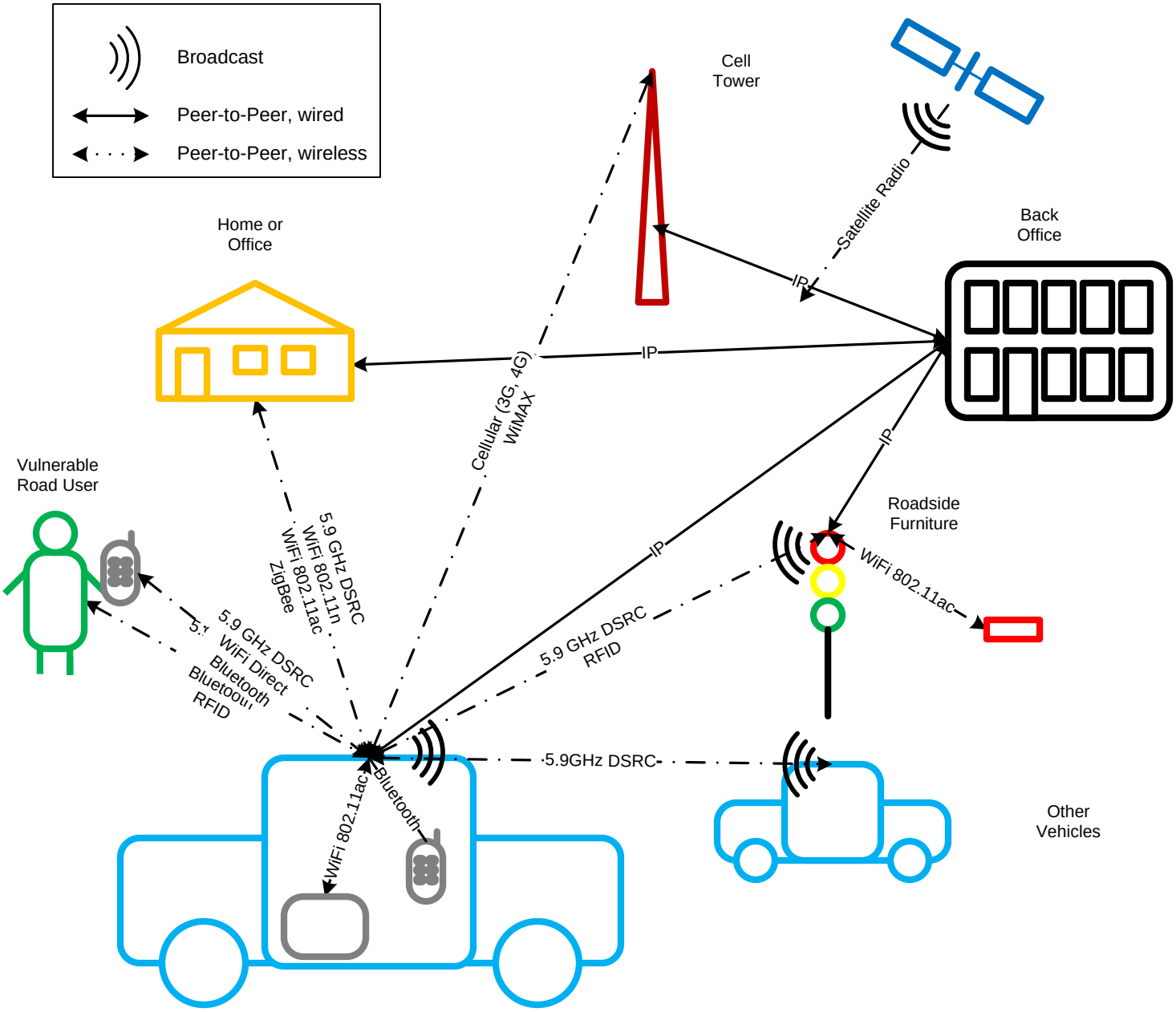
M2M Context
Where does 5.9GHz fit in?
Communication media options

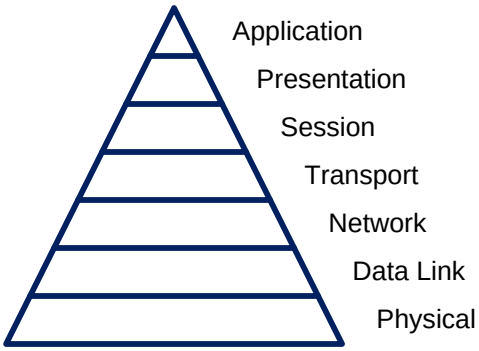


What 5.9GHz DSRC is good for:

- Small data exchanges (one frame with signature and if needed encryption).
- Urgent data exchanges (broadcast mode for rapid situation information sharing).
- Data exchanges from and among rapidly moving vehicles.

What 5.9GHz DSRC is not good for:

- Large file transfers while moving.
- Voice data.
- Streaming media.



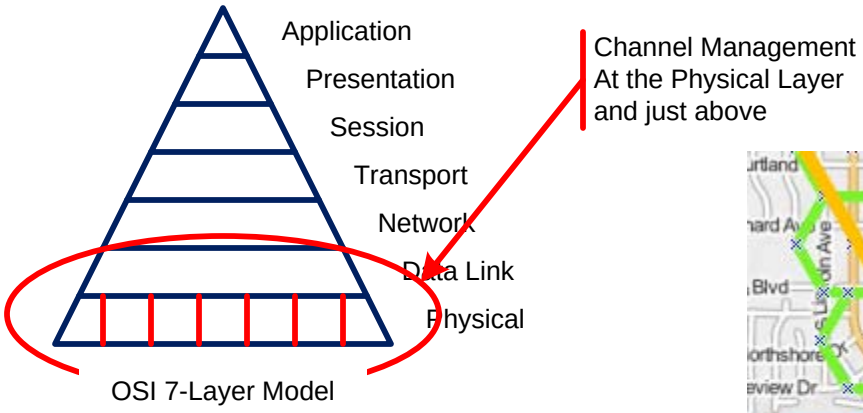
OSI 7-Layer Model

What 5.9GHz DSRC could be better:

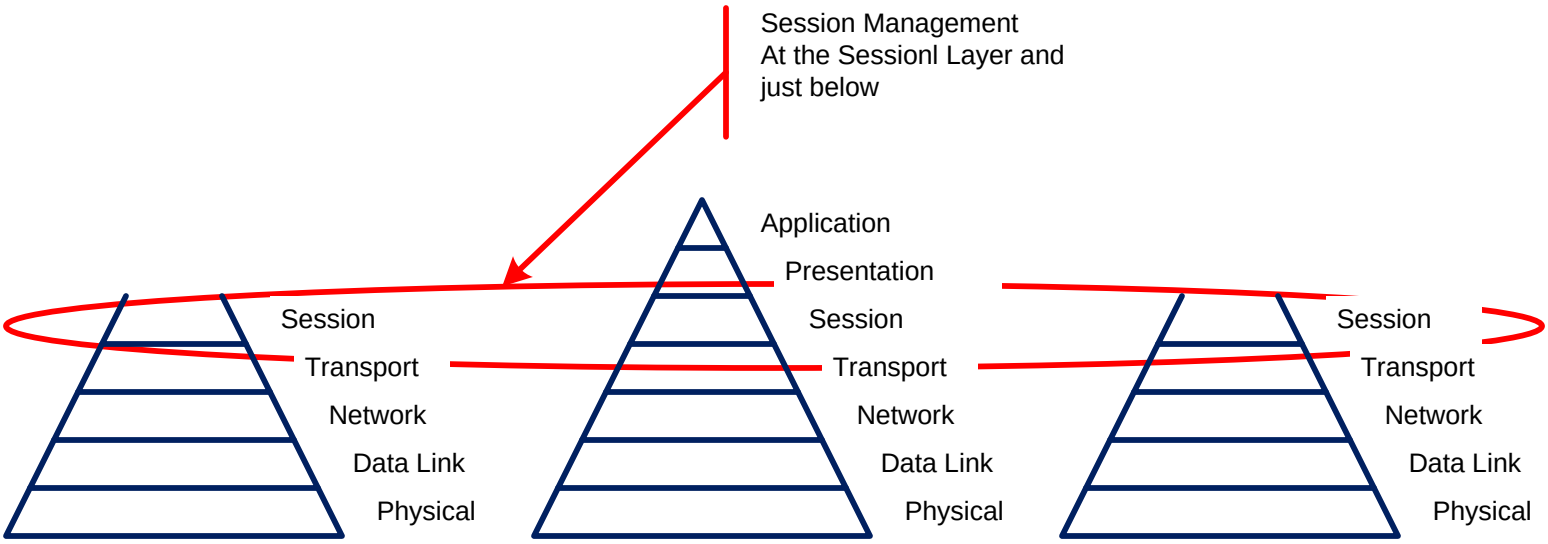
- Improvements to channel management.
- Addition of session management to better coordinate with other wireless media.

While keeping important aspects of the existing scheme:

- All sessions are initiated by the mobile element.
- No permant ID is exposed.



OSI 7-Layer Model



OSI 7-Layer Model
Cellular (2G, 3G, 4G)

OSI 7-Layer Model
5.9GHz DSRC

OSI 7-Layer Model
Whatever

Related work:

- Mobility-Assisted Fast Handover for Proxy Mobile IPv6 in Vehicle-to-Infrastructure Communications, Henghui Lu, Sheng Zhang and Xiaokang Lin, 2012 15th International IEEE Conference on Intelligent Transportation Systems, Anchorage, Alaska, USA, September 16-19, 2012.
- Assumed that V2I communication would be used for human-oriented activity - voice, video, social network or human-centric activities done on devices in moving vehicles. Peer-to-peer data exchanges are needed for machine-oriented purposes – control, reporting, automatic financial transactions etc.
- Added the ability to use knowledge of vehicle's location and heading, and knowledge of the location of access points to predict and facilitate fast handovers.
- Only considered DSRC communication medium, did not consider a mix of media such as WAN or WiFi.

Unique aspects of IP data exchanges in 5.9GHz DSRC implementations:

- Date exchanges support M2M type applications designed to improve the safe and efficient operation of vehicles, or other vehicle-oriented tasks (no voice, video, social network or human-centric activities).
- Mobile devices do not have permanent IP addresses. The IP address is created as needed from information provided by the gateway device and the mobile device's current MAC address.
- Each gateway device has a enables a unique IP address range.
- Mobile devices switch their MAC address as often as every 5 minutes.
- Data exchanges to support applications are always initiated by the mobile device.
- Data exchanges tend to be small – Request (by mobile), Response (from server), Acknowledgement by mobile) – with each element small enough to fit into one frame including signature and if needed encryption.
- A few of the exchanges will involve large file transfers.

Some elements of a solution:

- The availability of media would be constantly checked so that all possible are checked at least once per second.
- DSRC channels would be sampled for 100+ msec listening for WSA's.
- WiFi and cell monitored according to usual practice
- A session manager would monitor the availability of media and make decisions about what is used (even within a single session) based on decision rules.