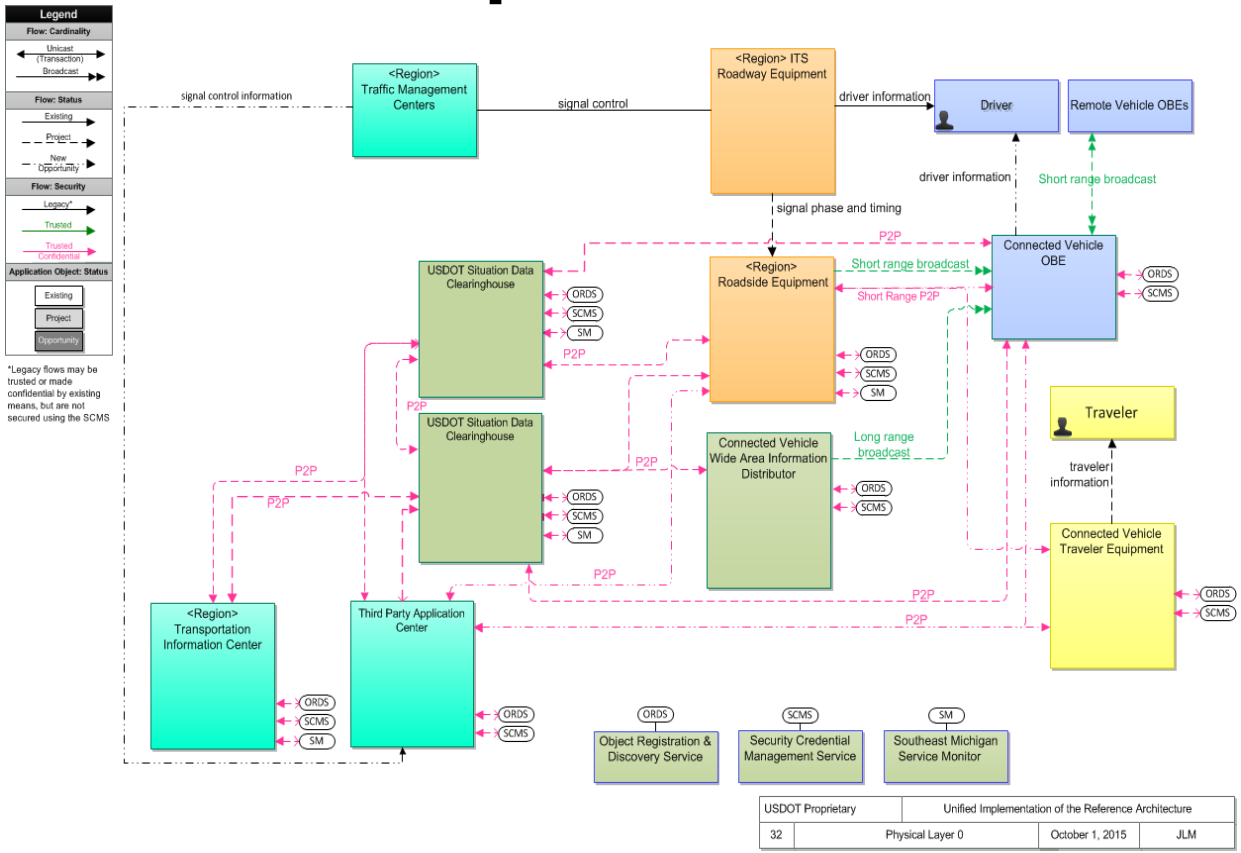
5.9 GHz DSRC in Connected Vehicle Pilots

"Supporting Smart Cities and a Smart Continent"

TRB Annual Meeting Session 764 - Connected-Vehicle Pilot Projects

January, 2016

Unified Implementation of the CVRIA



Connected Vehicle Reference Implementation Architecture.

Makes use of all available communication media.

Uniform data unit definitions.

- Architecture site

http://standards.its.dot.gov/DevelopmentActivities/CVReference

- SET-IT tool site
  - Version 2.1
  - Sample project

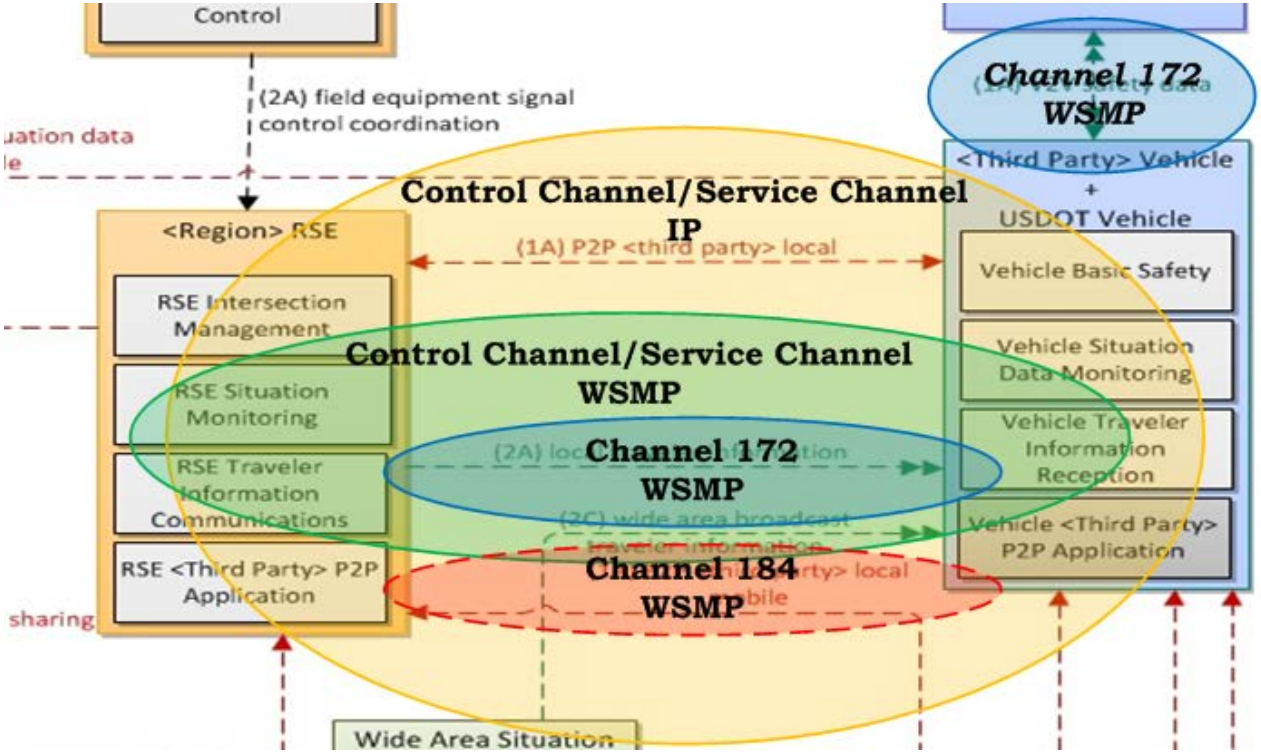
http://www.iteris.com/cvria/html/resources/tools.html

DSRC – a Key Part of Communications

- Large-scale pilots are underway that will exercise the **a complete system architecture** with the **full capability of DSRC**
- We have arrived at a **consensus of interpretation** of standards for the next generation of installations
- **Production programs** are underway

DSRC is ready to be part of the next Generation

DSRC in the Reference Architecture



DSRC has 4 parts

- **Channel 172** WSMP for time critical, very efficient data sharing for crash avoidance and efficiency improvement
- **Channel 184** WSMP for Public Service use
- Control Channel/Service Channel (**Channels 174 – 182**) for other WSMP
- Control Channel/Service Channel (**Channels 174 – 182**) for IP transport

Maturity levels

4 levels of maturity in the use of DSRC:

1. DSRC on **Channel 172 for crash avoidance**
   - Safety Pilot/Model Deployment
2. DSRC on **Channel 172 for intersection safety and efficiency** improvement
3. DSRC on **All Channels** for a variety of **message-based uses**
   - Connected Vehicle Pilots
4. DSRC on **all channels** for **message-based and IP transport-based** uses.
   - Smarts City Challenge project, Grants projects

No one entity has to build all of the parts. Different parties can contribute parts of the whole.

Looking Forward to the Next Generation

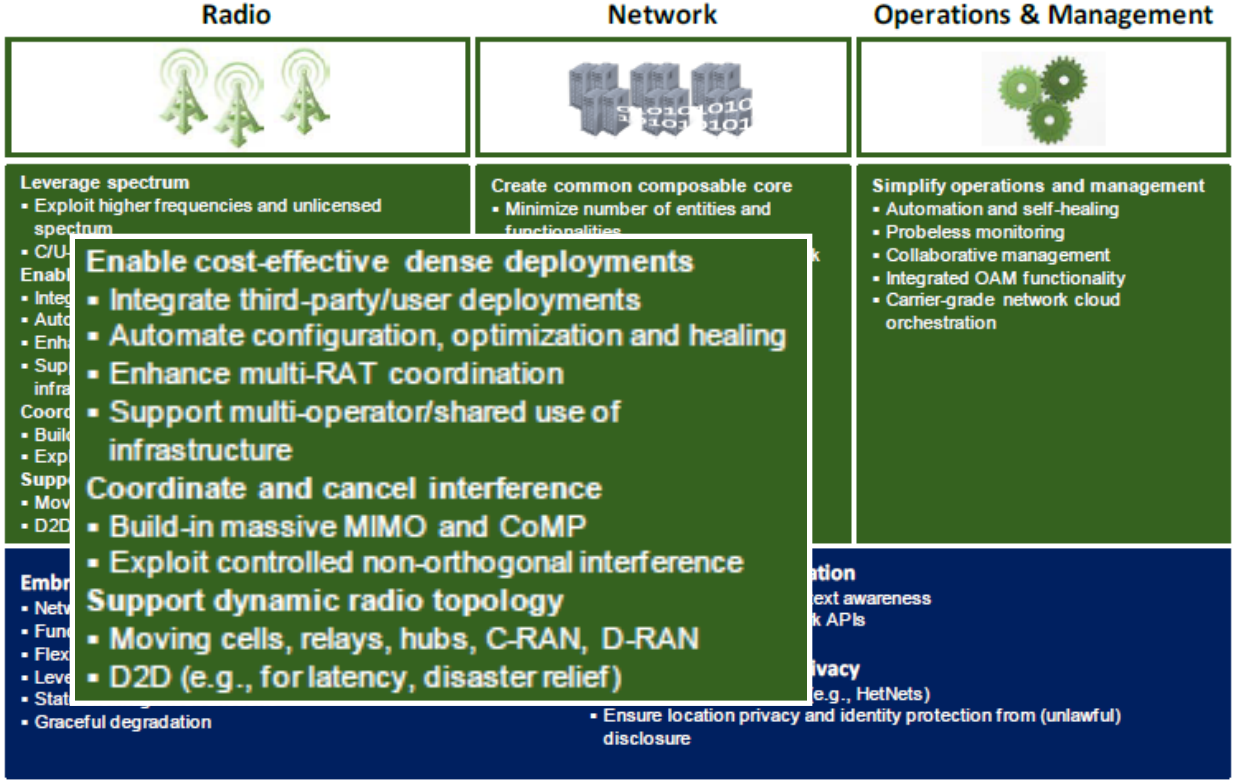


Figure 7: 5G design principles

- Better coordination of Radio Access Technologies
- Opportunity of preserve the capabilities of DSRC in a portfolio of wireless services
- DSRC could drop into 5G to cover significant vehicle-oriented use case needs

NGMN 5G White Paper, Next Generation Mobile Networks Alliance, 17 February, 2015

DOT Smart City Challenge

- Designed to help cities begin to address the challenges of rapid population increases and rapidly growing demands on their transportation infrastructure
- Up to $40M
- https://www.transportation.gov/smartcity/
- https://youtu.be/14adE8pVakI

How CV Pilots can use Certification Services

1. A **Site Operator** requests the **Certification Operating Council (COC)** to develop certification testing based on the **Device Requirements**
2. **COC** develops **Test Specifications** based on **Device Requirements**
   - COC and the Site Operator agree on certification criteria
3. The **Site Operator** references **Test Specification** in the procurement guidelines to **Vendors**
4. **Vendors** submit products to **COC** for the **Certification Testing**
5. **COC** conducts device testing per **Test Specification**
6. **COC** uses 3rd part test results + results from their own certification testing
7. **COC** issues certification verdict
8. **COC** issues **Certification Mark** on passing
9. **Site Operator** buys marked devices

Main points

- Scalable to a **continent-wide deployment**.
  - Not just a smart city but a smart continent with uniform implementations and ubiquitous access for fundamental elements

- Demonstrates **full utility of assets**.
  - All of the capabilities of spectrum allocations are demonstrated and effective ways of sharing capacity are shown.

“Make no little plans. They have no magic to stir [people]’s blood and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever-growing insistency.”

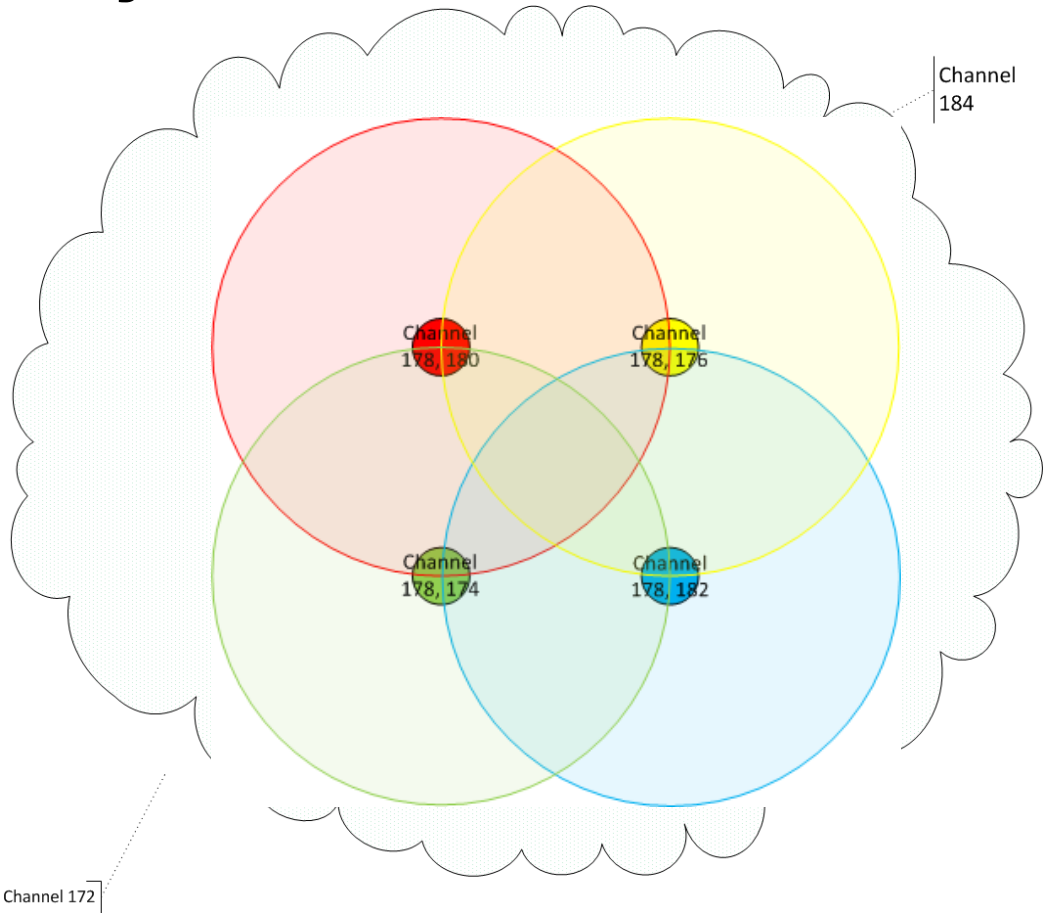
- Daniel Burnham

“I have always believed in planning big, and I have always discovered after the fact that, if anything, we didn’t plan big enough.

- Alfred Sloan

Back up slides

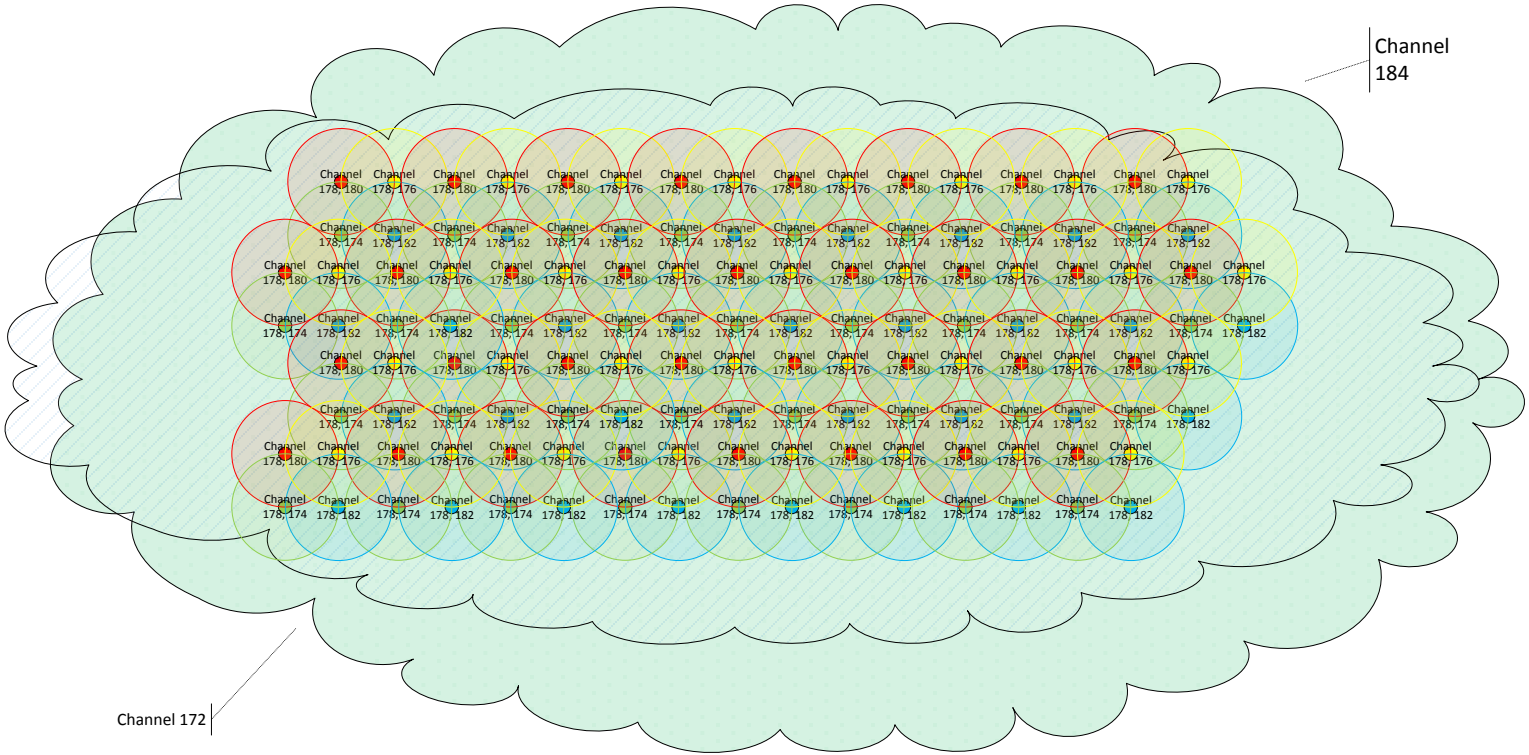
Adjacent Channels



One way to get the most capacity from the medium:

- Channels 172, 178, and 184 are everywhere.
- The Service Channels 174, 176, 180, and 182 can be deployed with some separation to avoid competition in adjacent zones.

Deployed over a Region



A region would start to look like this.

10 to 20 gateways per square Kilometer would be needed.