

Towards ITS deployment

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Smart mobility, TU/e wide

Cooperative Driving (platooning), A270: Helmond-Eindhoven, 2011
(Mechanical Engineering/TNO)

Full electric: Lupo (ME)



Full Solar: Stella 1



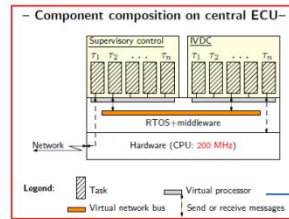
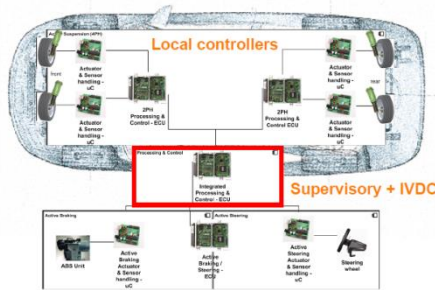
Strategic Area Smart Mobility

And of course, Stella LUX



Smart mobility, TU/e wide

- 4X Local controllers for steering, braking, suspension;
- Front and rear IVDC;
- 1X Global IVDC state estimation and supervisory control.



M&CS, ME

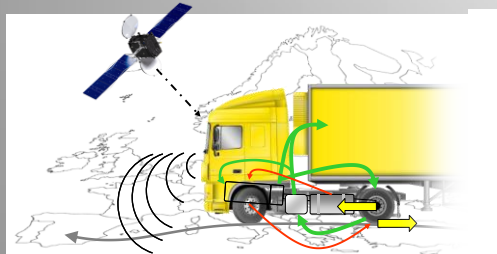
(Semi-)independent developed components by various partners!



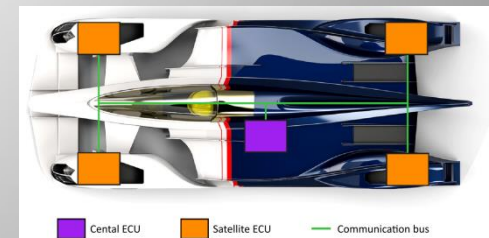
Hybrid Innovations for Trucks (HIT) project

Safety-Critical Domain Certification

InMotion, Solar Team, "Cars in Context" TU/e projects



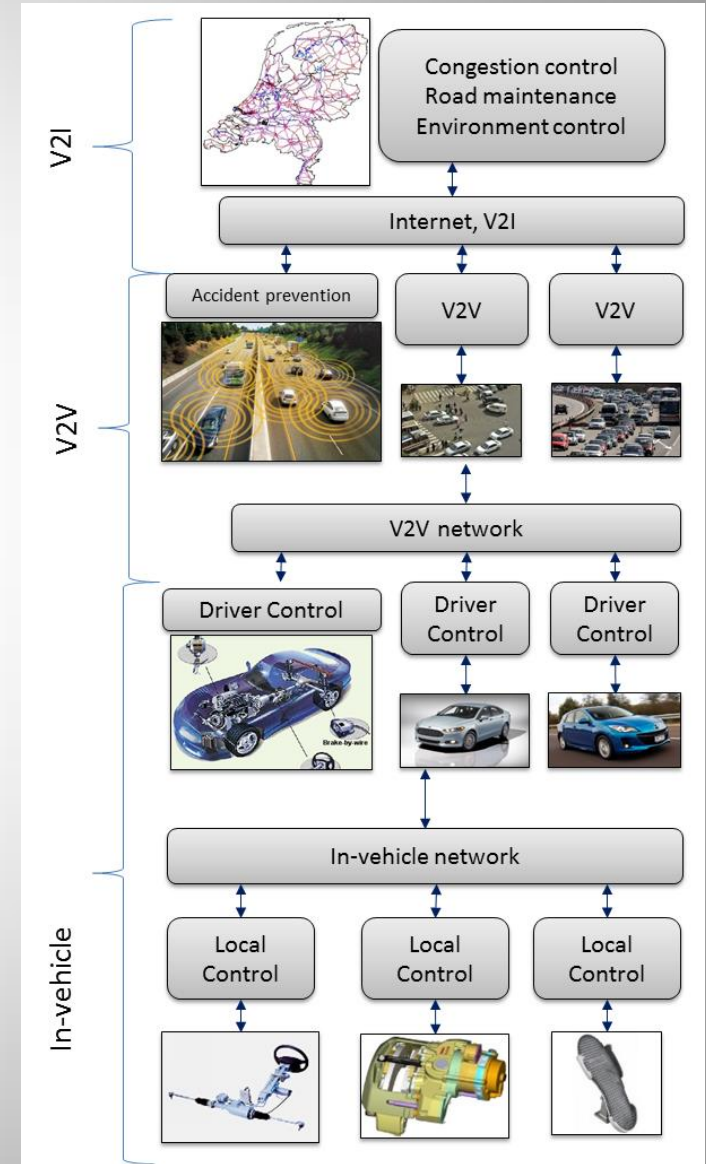
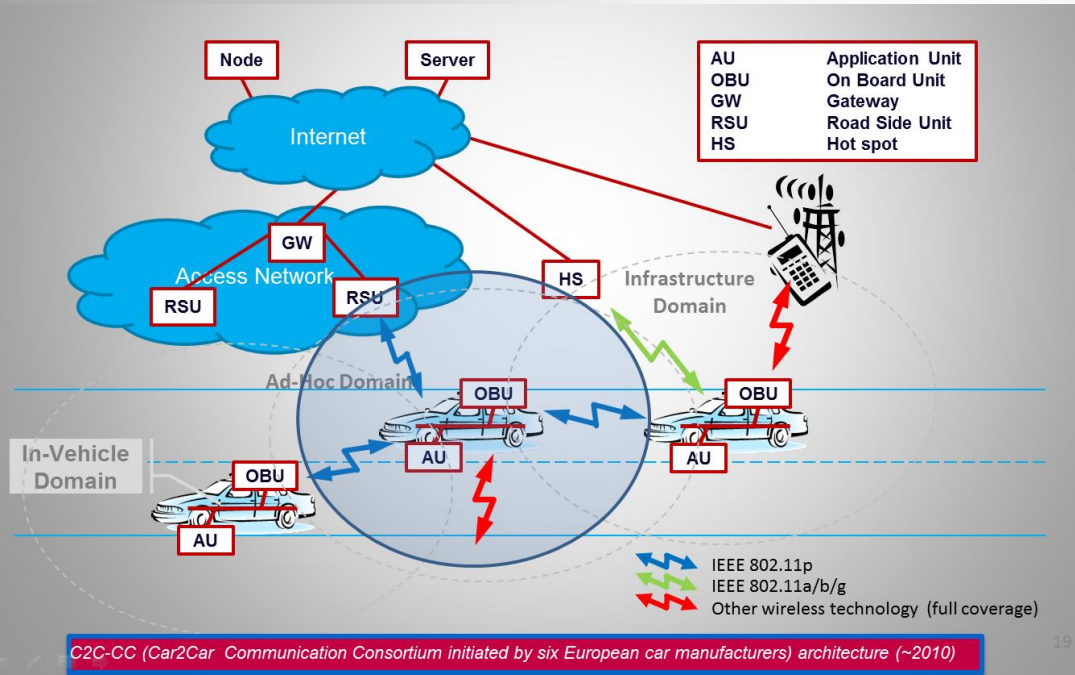
Functional safety methodology (PDEng projects)



Agenda

- Towards ITS deployment
 - ‘roadblocks’ for progress
 - elements of forthcoming projects
 - CONVERGE solutions
- Ongoing, and new projects

What are we talking about?



Towards deployment

- Many pilots ongoing
 - e.g. A67, A58 in the Netherlands
 - VIBe consortium
 - won't try to list them all
- Do they form a path towards deployment?
- Can we have access to large numbers of vehicles and large test sites?

Privacy, Safety, and Security

- **Privacy:** control over personal information
- **Safety:** freedom from danger or risk on injury resulting from recognized but potentially hazardous events
- **Security:** regulating access to (electronic) assets according to some policy
 - *policy*: allowed and disallowed actions
 - *security mechanisms*: can be regarded as enforcing the policy
- Privacy and safety restrictions result in *security policies*
 - security for privacy and security for safety

Deployment: security

- Security for safety is a must?
 - perhaps *trust-based* solutions work
- Privacy is a big concern, but
 - what is the threat model precisely?
 - and is this threat worse than what can be tracked anyway?
 - can we work with *trust*?
- Installing PKI infra should not be a problem
 - but who is the authority?
 - CONVERGE has a solution to this
- CONVERGE has solutions. Is this solved now?

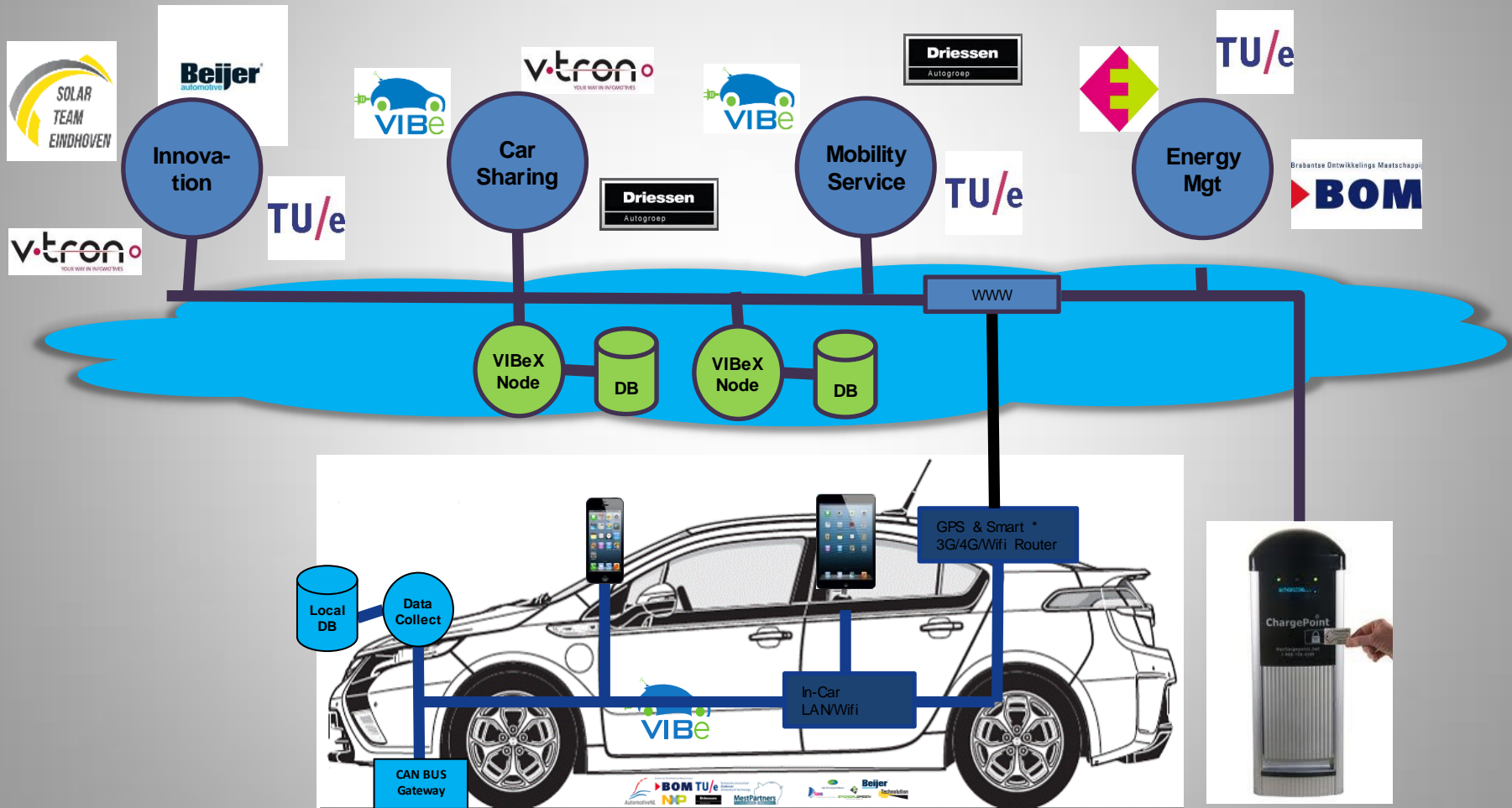
Certification

- Third party ITS application development
 - on top of an (open) stack inside vehicles
 - on top of collected data in the cloud
- Development process of safety critical systems
 - ISO 26262
- See previous slide: trust anchors
- CONVERGE has solutions for this, and a programming concept
 - services, compliance, certification
 - layered service discovery
 - proxy-based forwarding

Next Generation Vehicle OS...



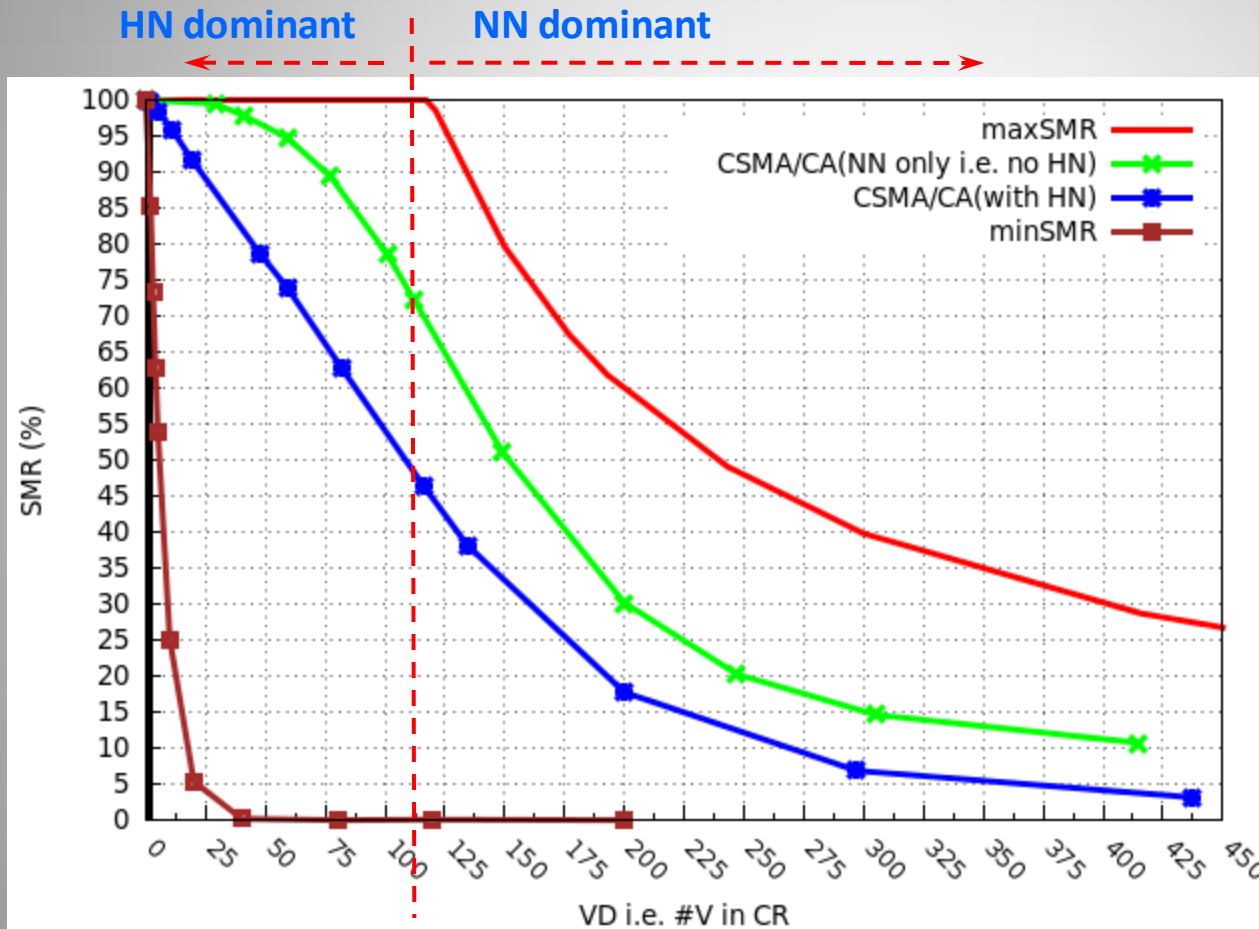
VIBe consortium: cloud based apps



ISO 26262: functional safety

- Safety under performing normal functions
 - avoid excessive risk of normal functions
 - examine – and deal with – common failures [fault → error → failure]
- Explicit ‘safety life cycle’ for automotive products
- ‘Safety goals’ classified in risk classes, are determined for each ‘hazardous event’
 - risk class: ASIL, Automotive Safety Integrity Class
 - QM, ASIL A-D, order of magnitude of risk
 - combination of severity, exposure, controllability
 - e.g S3, E4, C3: life threatening, highly probable, difficult to control (ASIL D)
- Adherence to ISO 26262 expected to increase

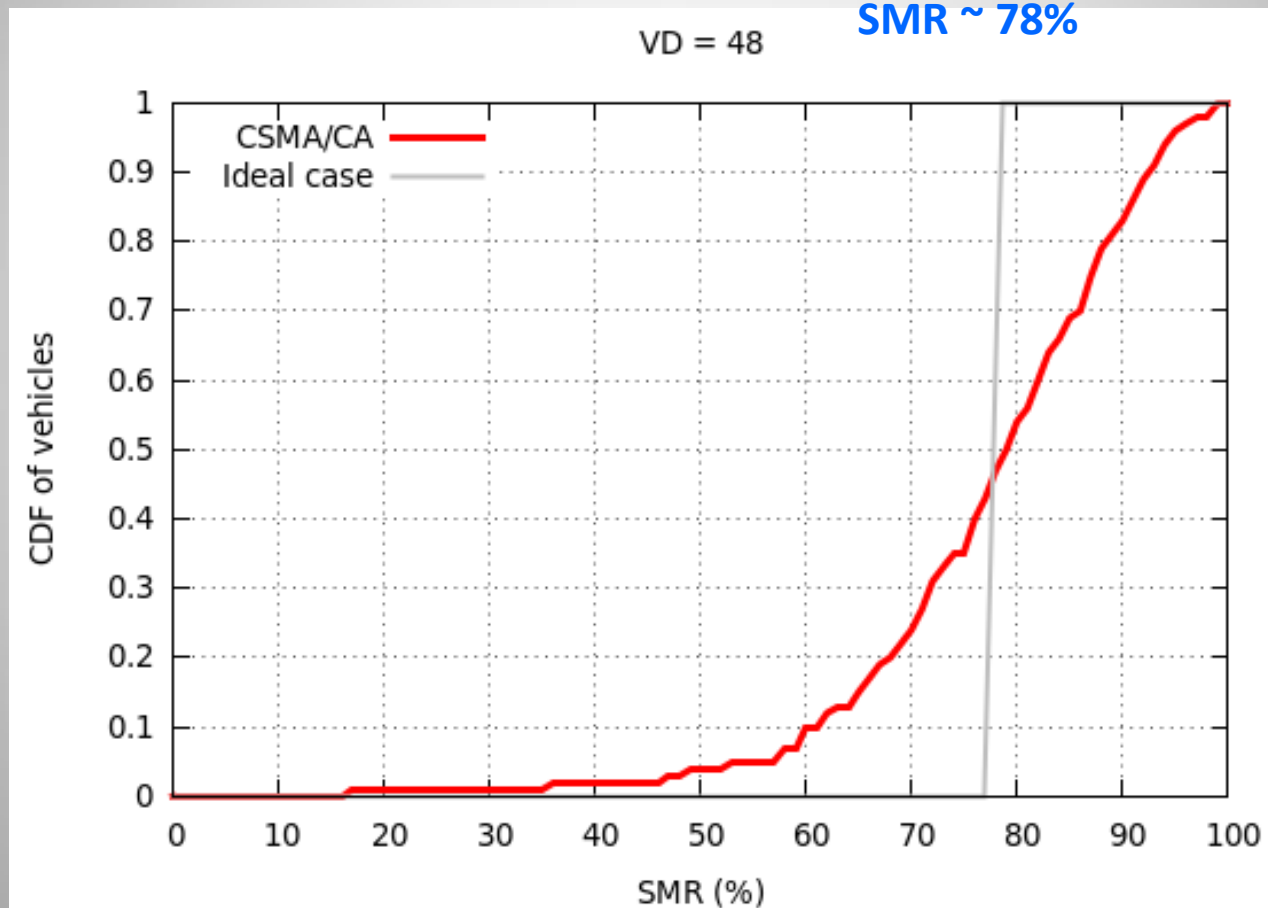
Deployment: scalability



- Message loss in 802.11p as function of number of vehicles in neighborhood
 - interference
 - hidden nodes

Model, analysis, and improvements for V2V communication based on 802.11 p, Batsuuri, Bril, Lukkien

Deployment: scalability



Evolutionary introduction

- Requirement: adding technology / applications that can only make things (some metrics) better
 - implies a restriction in introduced applications
 - **Question:** considering that technology can fail: can we ever accept a situation where failure of this new technology would break safety?
 - compare to flat tires or failure of power steering
- For legacy: develop equipment that can have a basic functionality satisfying the above requirement

Stakeholder inclusion

- Different governmental bodies
- Manufacturers
- Application developers
- CONVERGE has proposals for this

Communication

- Is there IPv6 bandwidth in 802.11p?
- Will RSUs be there or will it be 5G?
- Do we need QoS management?
 - CONVERGE has solutions for this
 - also for combining 5G and G5

Science or Engineering

- Is research needed?
 - some at least to examine emergent effects
- Or just engineering?
 - yes, a lot
 - needs planning instead of bottom up growth
- Or legal matters? Laws?
 - o yes
- Getting the right partners to team up?
 - yes, stakeholders must be included, and facilitated

Ongoing

- Cooperative driving (iGame)
- Autonomous driving (iCave)
- Applications, application development
 - trust and security
 - application stack inside vehicles
 - applications on top of cloud collected data (VIBe)
- Functional safety

Project opportunities

- Horizon 2020, testbeds
- ITEA? (software intensive systems)
- other programs?
- With who?

Discussion