



GOALS

FIVE brings to Fed4Fire+ the first Cellular-V2X software radio modem based on commodity equipment aiming at:

- Evaluation in real-world conditions
- Integration of an ITS stack implementation and GPS tools
- Development of Proof-of-Concept Assisted Driving Applications on top of the LTE-V2X technology
- Demonstrations using Robots and Field Trials using vehicles

NITOS

w.iLab.t

CHALLENGES

Innovation

- Emergence of V2X communication technologies for future ITS systems
- V2X Radio Technologies Evolution: From 802.11p to LTE-V2X&NR-eV2X
- Market: a small number of closed solutions based on 802.11p; first closed solution for LTE-V2X expected for late 2018 – early 2019

Experimentation

- Limited availability of experimental platforms for V2X
- Challenging experimentation requirements (Mobility, Hardware, etc.)

A new C-V2X modem based on commodity equipment (SDRs, SBCs)

Synthesize heterogeneous F4F+ resources for performing technology demos and field trials

RESOURCES

Testbed Capabilities

Features tested



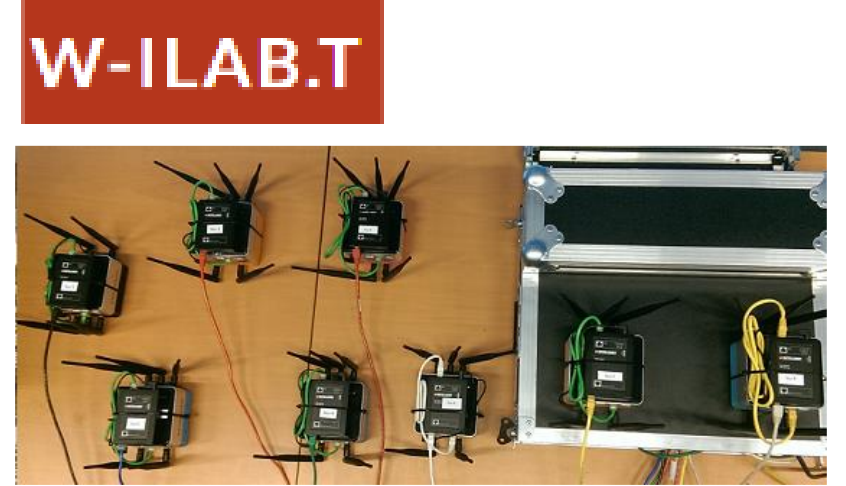
- Controlled RF environment
- Multi-node setup with SDRs/GPPs
- ETSI Geo-networking Implementation

- Real-time/RF modem evaluation over-the-air
- Integration with an ITS stack
- No real mobility (only simulated)



- Controlled RF environment
- Indoor mobility conditions
- WiFi/LTE interfaces, Limited number of SDRs on demand

- SDR stack performance under mobility
- Real PoC ITS applications for autonomous driving

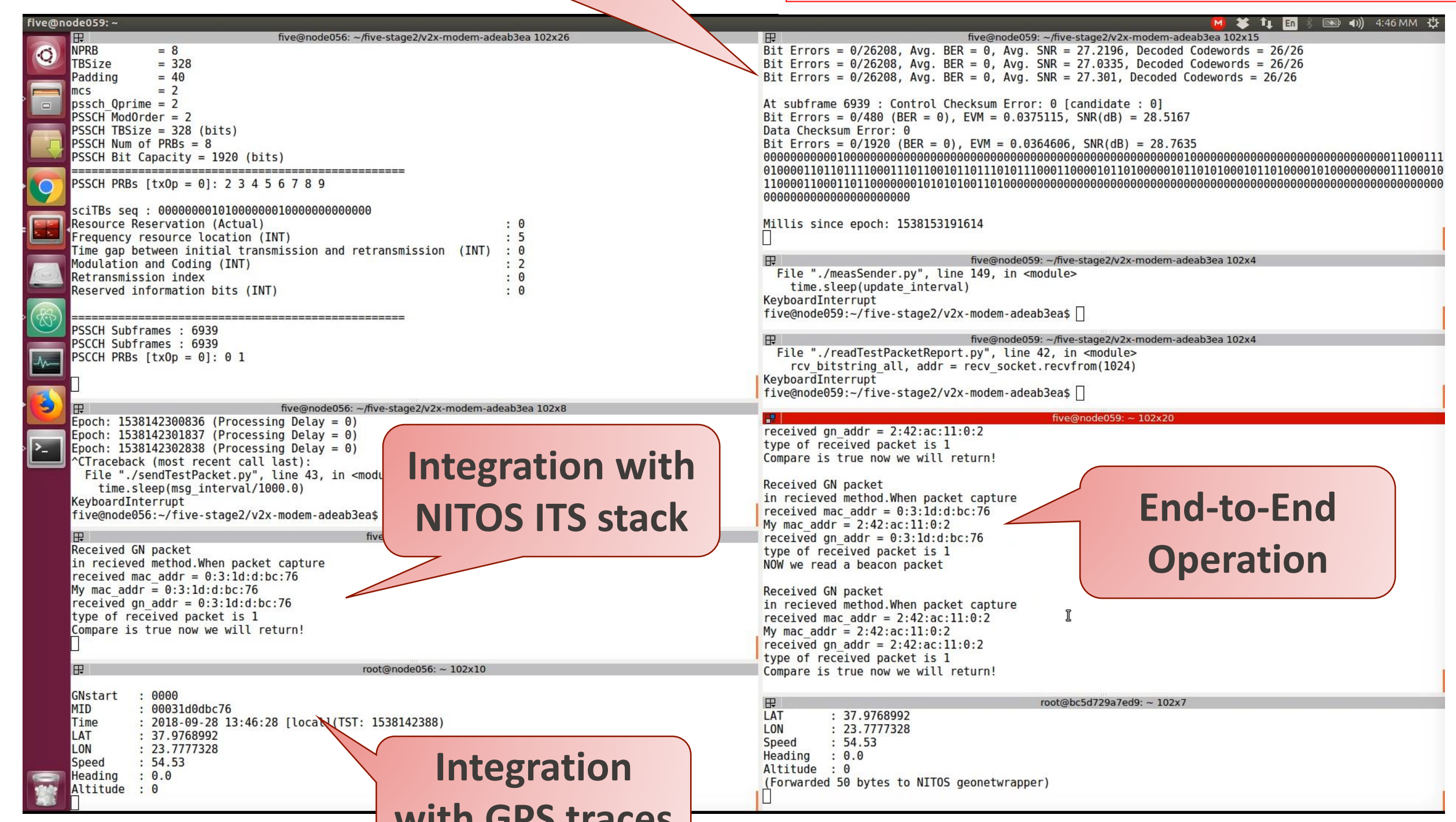
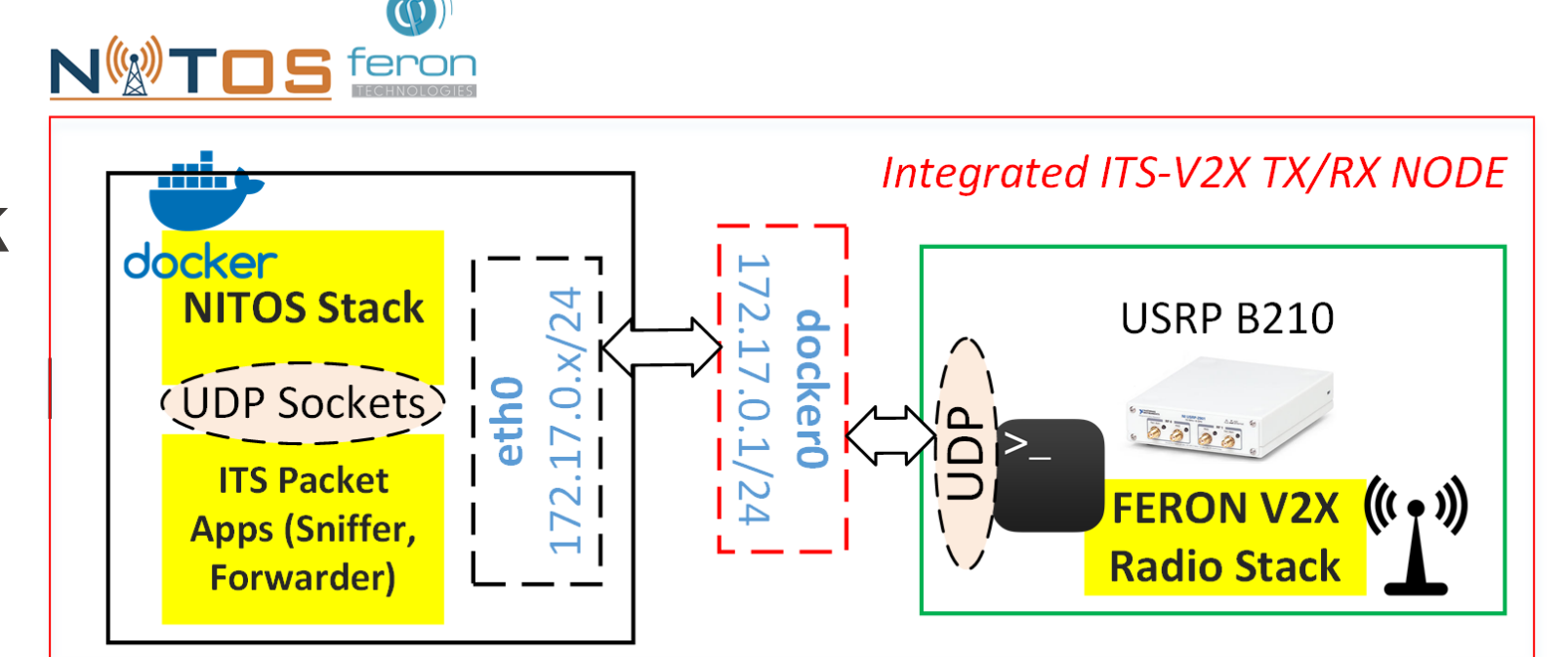


- Outdoor deployment
- Mobility conditions & live GPS info
- Vehicle-to-vehicle trials

- Modem evaluation (coverage, stability, LOS/NLOS) in the wild
- Demonstration of assisted driving applications

DEMO I

Real-time ITS Beacon packet transmission over the Sidelink V2X Communication Channel



Real-time Tx/Rx modem operation

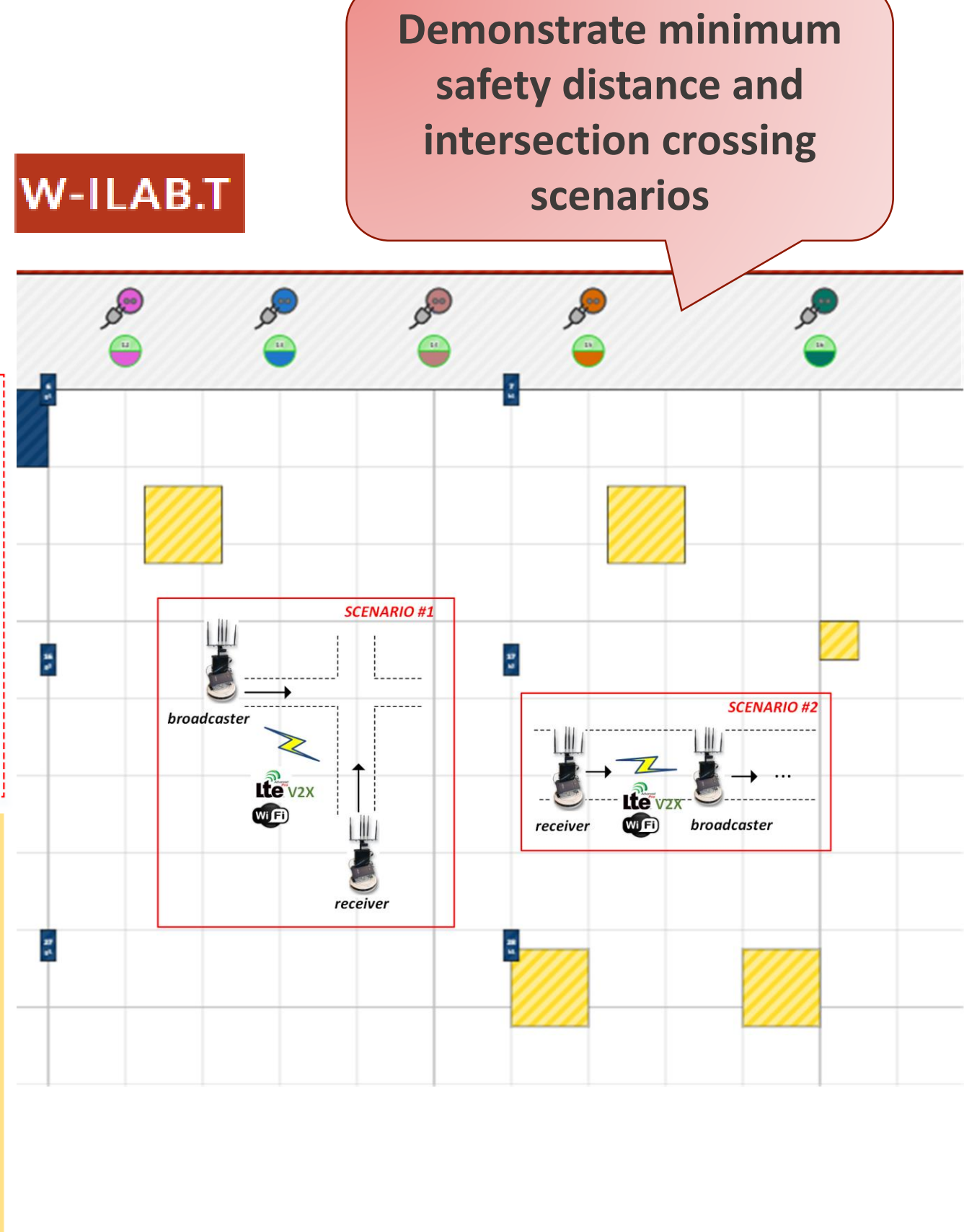
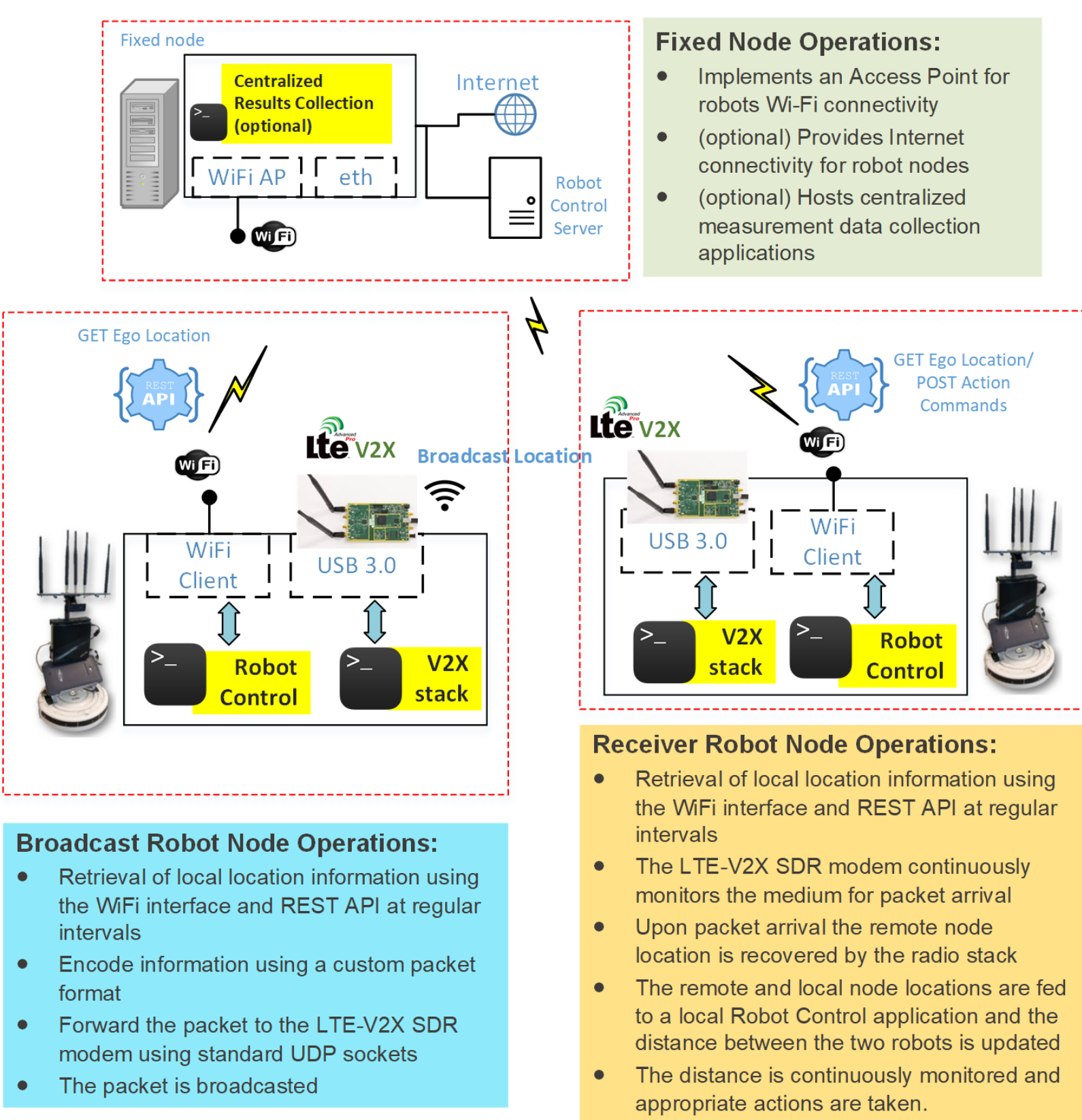
Integration with NITOS ITS stack

Integration with GPS traces

End-to-End Operation

DEMO II

Safety applications demonstration using the LTE-V2X SDR modem in w-iLab.t Robot Facility



Demonstrate minimum safety distance and intersection crossing scenarios

DEMO III

LTE-V2X field trials using the w-iLab.t portable test-bed

Node assembly

Experiment node tested in lab

Experiment node mounted in vehicle

Trials

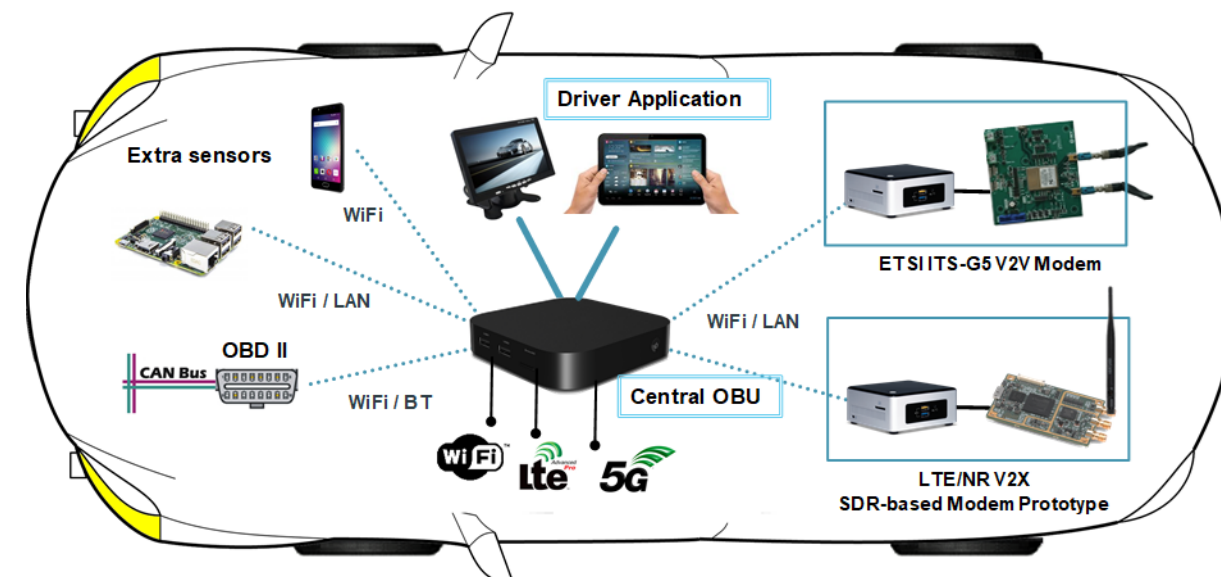
Experiment GPS traces

Receiver Performance trend with respect to inter-car distance

IMPACT

Technical Aspects

- Validation & Demonstration of FERON's LTE-V2X software modem under real-world conditions
- Integration of new functionalities enabling the development of ITS application on top of FERON software modems
- Understand the implications of vehicular applications to lower layers (real-time operation, data-rate demands)



Business Aspects

- Enhance visibility & credibility of new company's product through demonstrations and field trials
 - Promotion activities: Visits to potential partners, participation in industry days & international workshops
 - Commercialization Plan: Beta version ready by Q3-18, 1st public release at end of Q4-18*
- * Already in discussions with 3 interested companies

CONCLUSIONS & FOLLOW-UP

- FIVE promotes ITS experimentation in Fed4Fire+
- Provide a configurable novel software radio modem for the emerging Cellular-V2X radio technology enabling early technology testing in the field
- Offers a flexible deployment of NITOS ITS stack in Docker container, new open applications for manipulating ITS packets and new tools for realizing dynamic experiments using the w-iLab.t robots.
- Demonstrate the ability of Fed4Fire+ for
 - accelerating new product development
 - early product testing even in challenging scenarios
- Exciting follow-up activities in our plans:
 - Demos with potential partners/clients from the Operators and Manufacturers Industries (*in discussion*)
 - Integration of the soft-modem to a vehicle OBU (*in discussion*)
 - Proposal submitted to another FIRE project OC for extending its infrastructure with C-V2X experimentation capabilities and ITS functionalities

