





BROADBAND BUS ROUTER

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Demands on Operator

Enabling with Broadband Connectivity

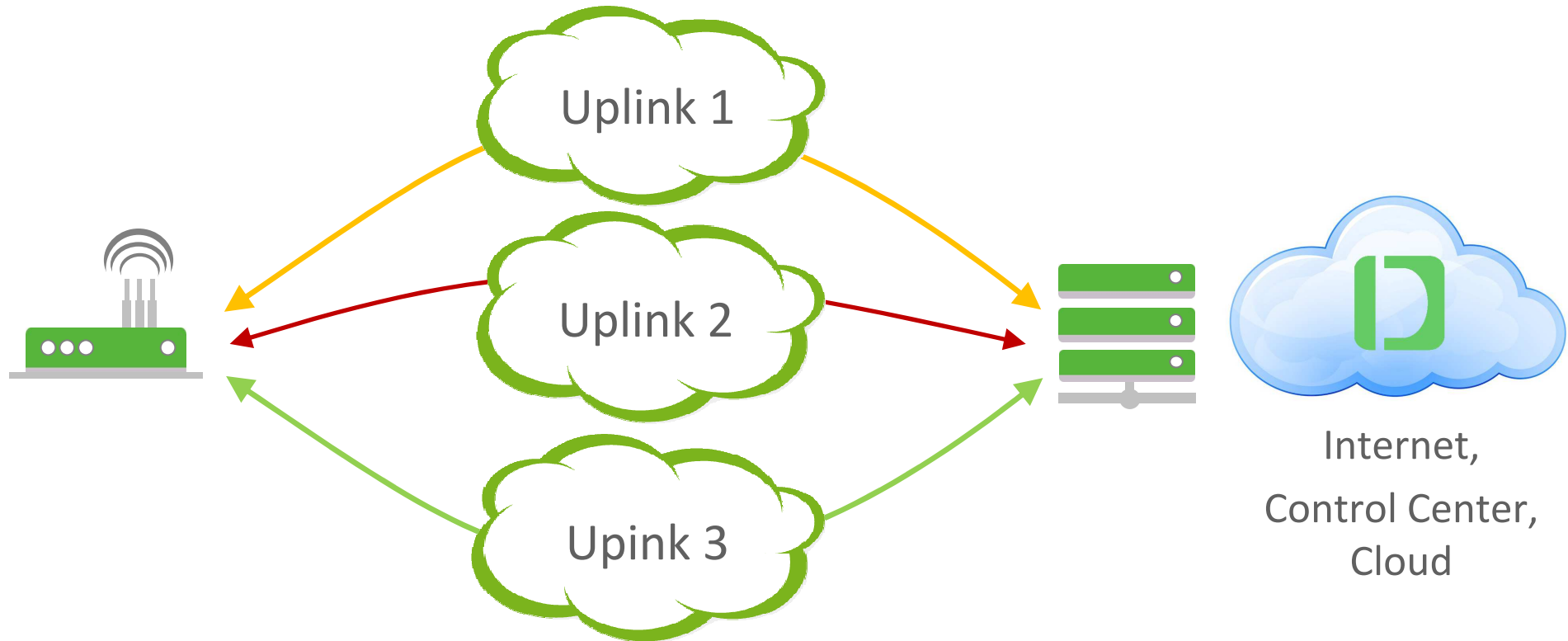




Approach

Secure Always-ON Connectivity

Dragontech Systems delivers service-aware intelligent access products which enable new services and ensure critical IP communications, leveraging connectivity over multiple mobile or wireless networks.





Broadband On-The-Move

Key Considerations

Challenges:

- Data connectivity of a moving bus
- Service availability, coverage
- Achieving adequate bandwidth
- Variations in field strength, latency, throughput
- IP address management
- Handover speed and session persistence
- Security
- Remote management
- Scalability

Conclusion:

- Advanced multi-uplink routing technology required
- Hand-Over and Load Balancing improve solution



Strategy

Broadband Internet On-The-Move

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Software-Centric Approach

Wireless Technology Agnostic – LTE, 3G, EDGE, CDMA2000 EV-DO, WiFi

Multipath Handover Routing and Dynamic Load Balancing

Open Source Solution – Linux

Capability to Integrate with Other On-Board IP-systems

Platforms for Specific Verticals (Railway, Bus, Public Safety)

Platform Compliance with Relevant Standards, CE, EN50155, 50121, 61373, "e" etc.

Remote Management Support

Software Lisencing Available for User Hardware



Topology

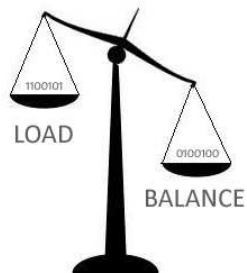
Modes of Operation – Uplink Connection

VPN Handover Mode



- Applications: Condition Based Maintenance, Operative Systems, AFC-systems
- => Increase coverage and service availability
- One uplink with VPN (IPSEC) used at a time
- All available uplinks are in standby with VPN open
- Immediate and transparent handover with connection persistence
- Connections managed based on link availability, response time and performance

Dynamic Load Balancing Mode



- Application: Passenger WiFi Service, PIS, Video Surveillance
- => Increase bandwidth and maximize coverage
- Load balancing on up- and downlink
- All links are used together to increase bandwidth (not speed)
- Traffic dynamically allocated to available uplinks



Overview

What is Load Balanced Link Bonding?

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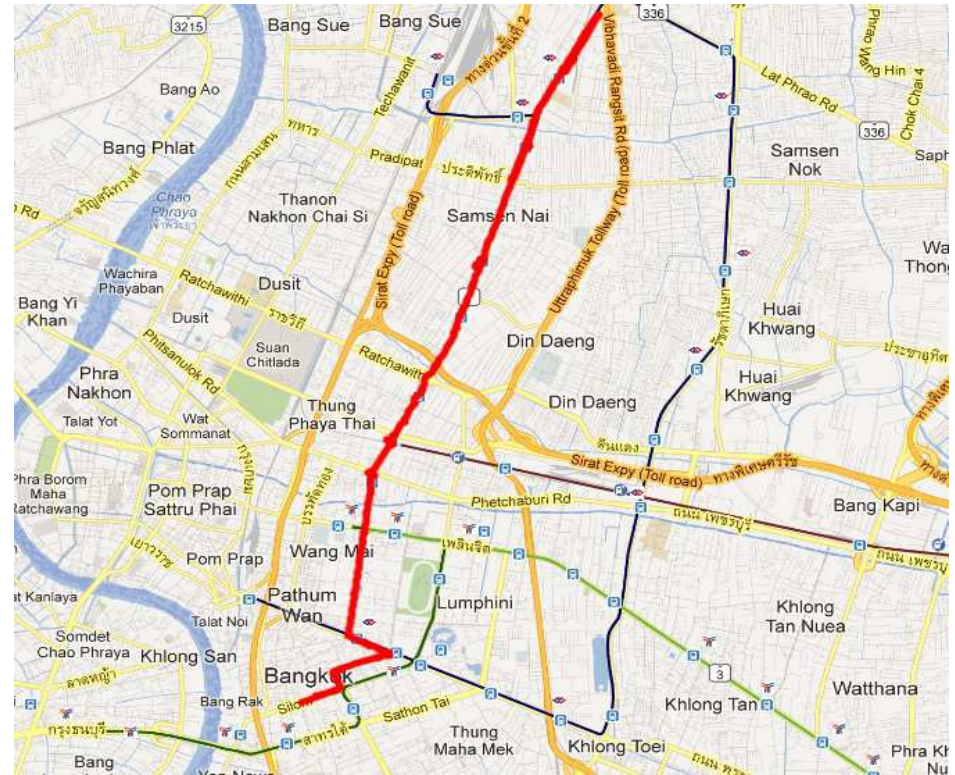
- **Combining multiple LTE/3G/EDGE/CDMA2000 up-links** into one single high capacity connection
- Load balancing and **bonding on both up- and down-link**
- Uplinks qualified dynamically to determine **optimal balancing**
- Network sees only **one single connection**
- Each uplink has its own **VPN for traffic**
- Packets distributed dynamically to all uplink VPNs based on **intelligent algorithm**
- Back-end **Gateway Server combines** distributed packets together
- Router takes advantage of **maximal available cellular capacity** at all times
- **Link loss** will cause packets to be **distributed to remaining available links**
- **Continuous connection** and **session persistence**



Network Coverage

How Many Uplinks are Needed?

- Achieved data capacities 2-5Mbit/s downstream and 0,5-1 Mbit/s upstream (HSPA+ service)
- Total Time – 3347s
- No Internet Connection Available – 1s
- Internet Connection – 3346s (100%)
- Good communication on all 3G Uplinks – 2397s
- No Communication Available Operator 1 – 83s
- No Communication Available Operator 2 – 8s
- No Communication Available Operator 3 – 12s

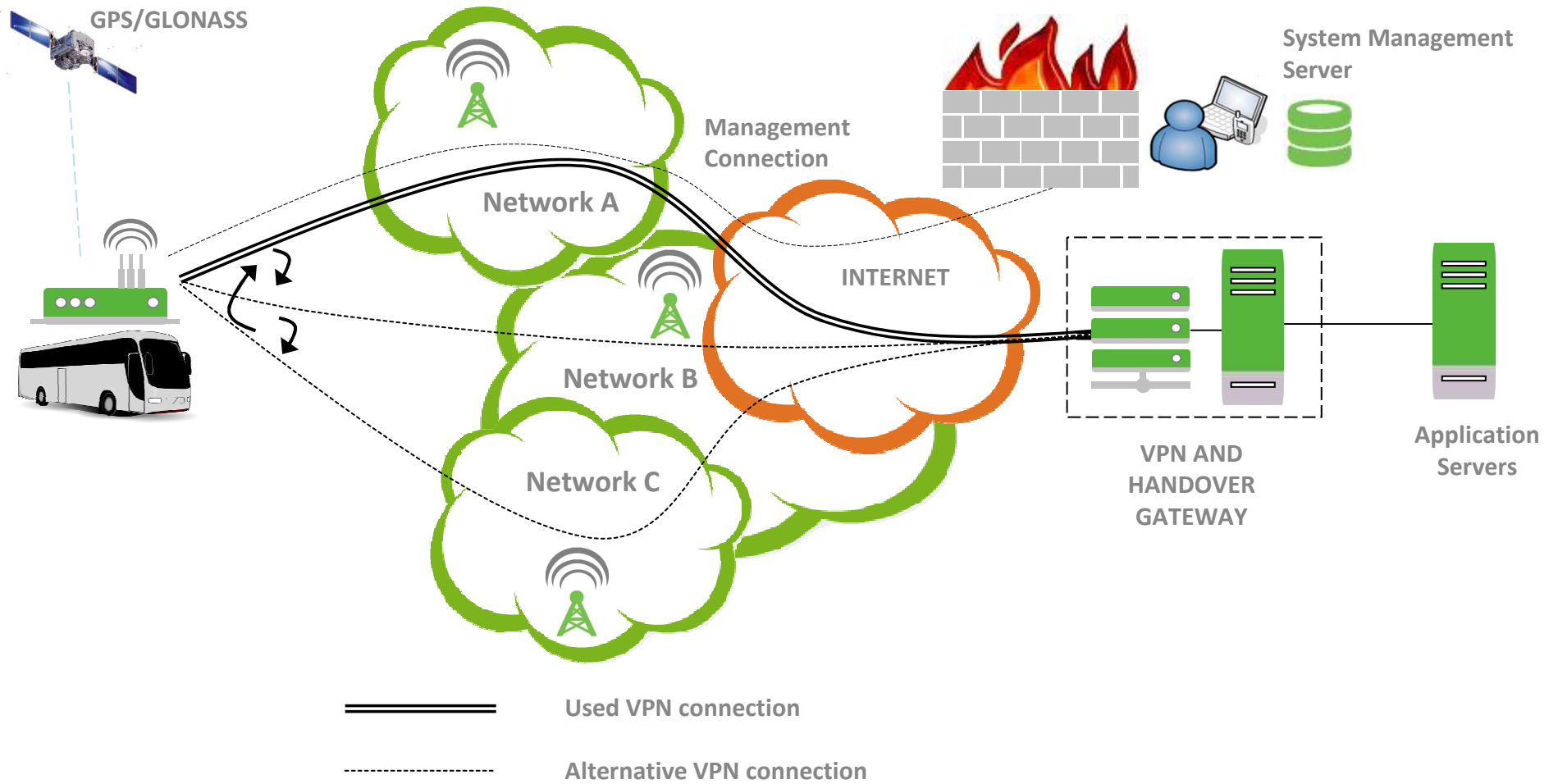


100% coverage combining three different operators



Routing Overview

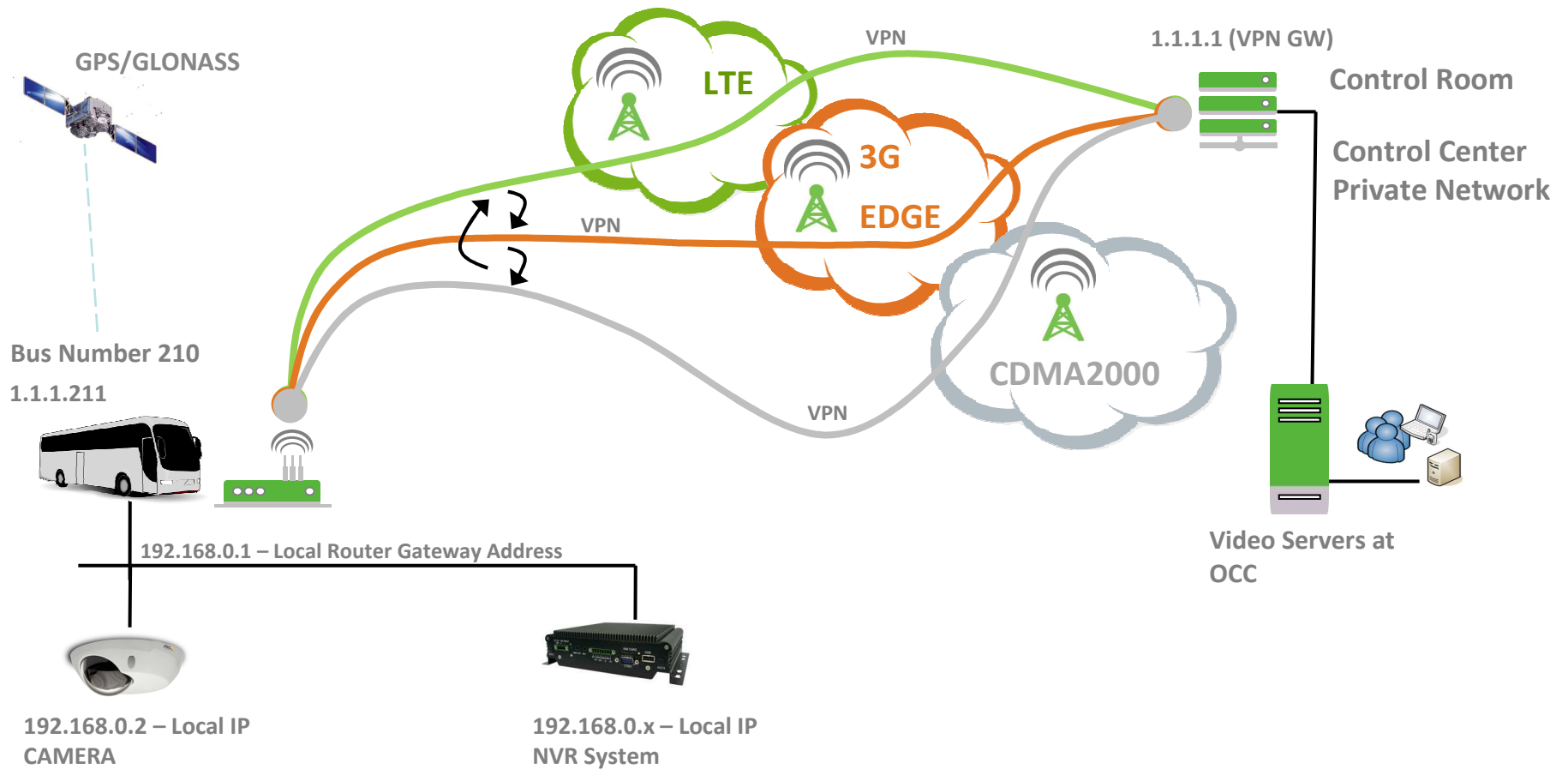
VPN Connection with Handover





Live-View Video

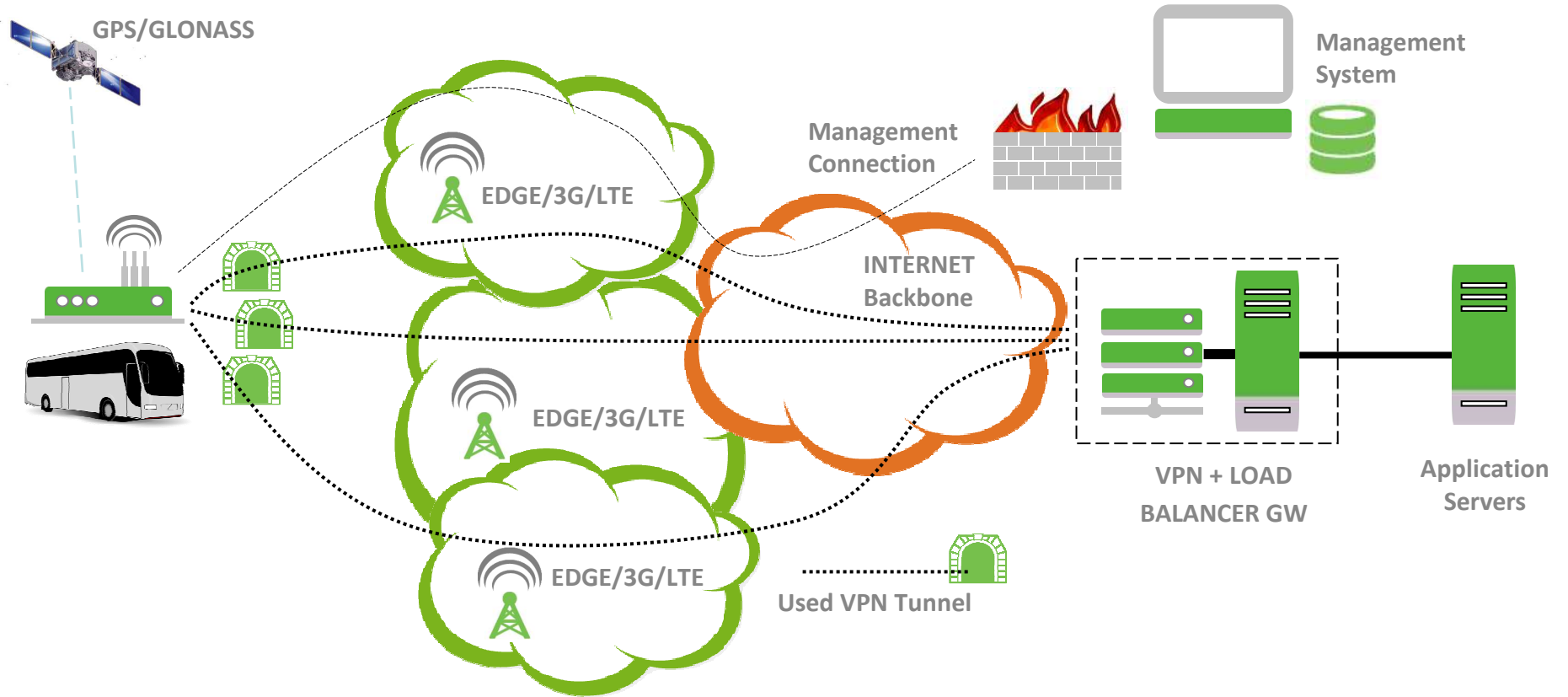
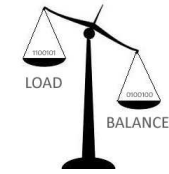
Connection with VPN





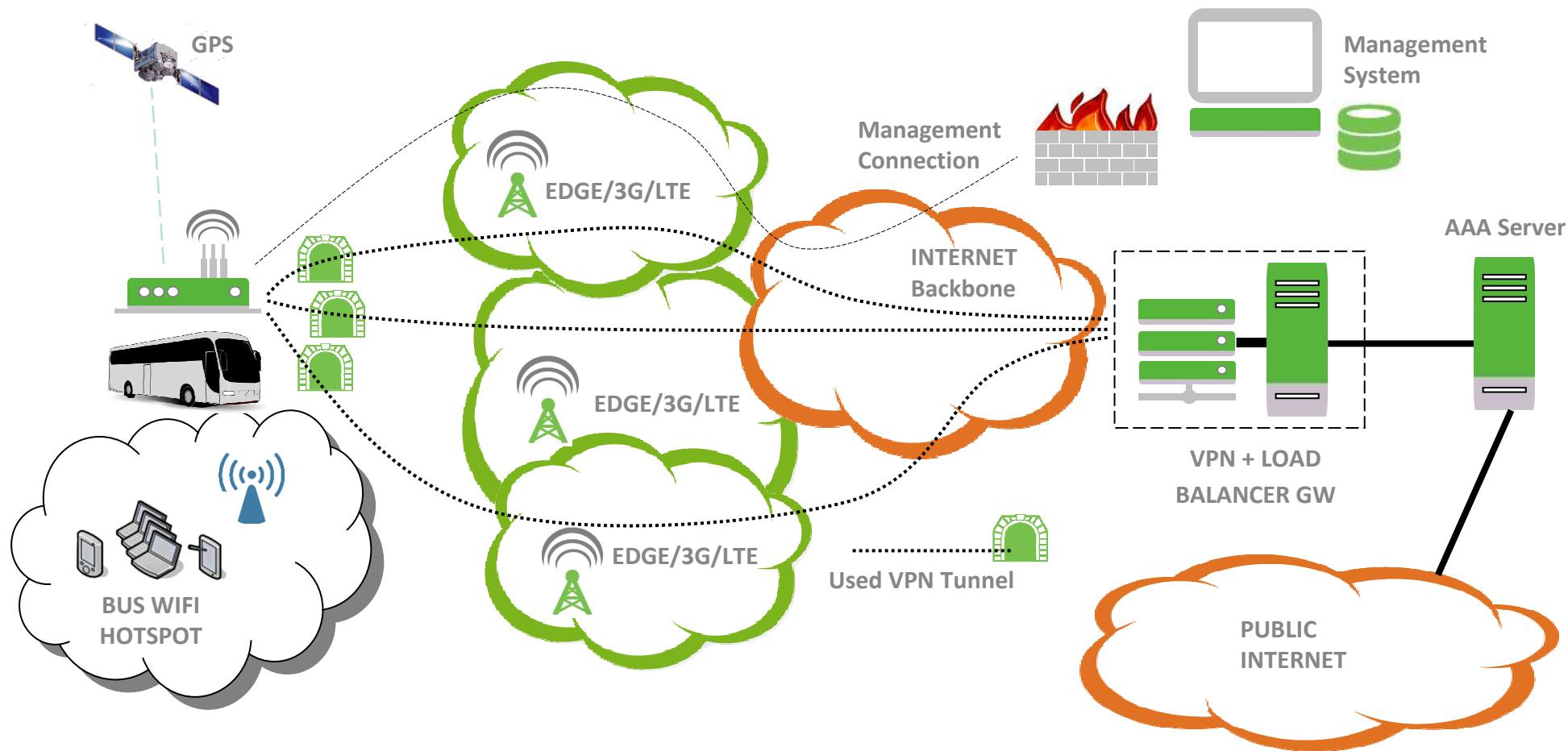
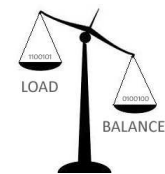
Routing Overview

Load Balanced Multi-Link Connection





Passenger WiFi System Architecture



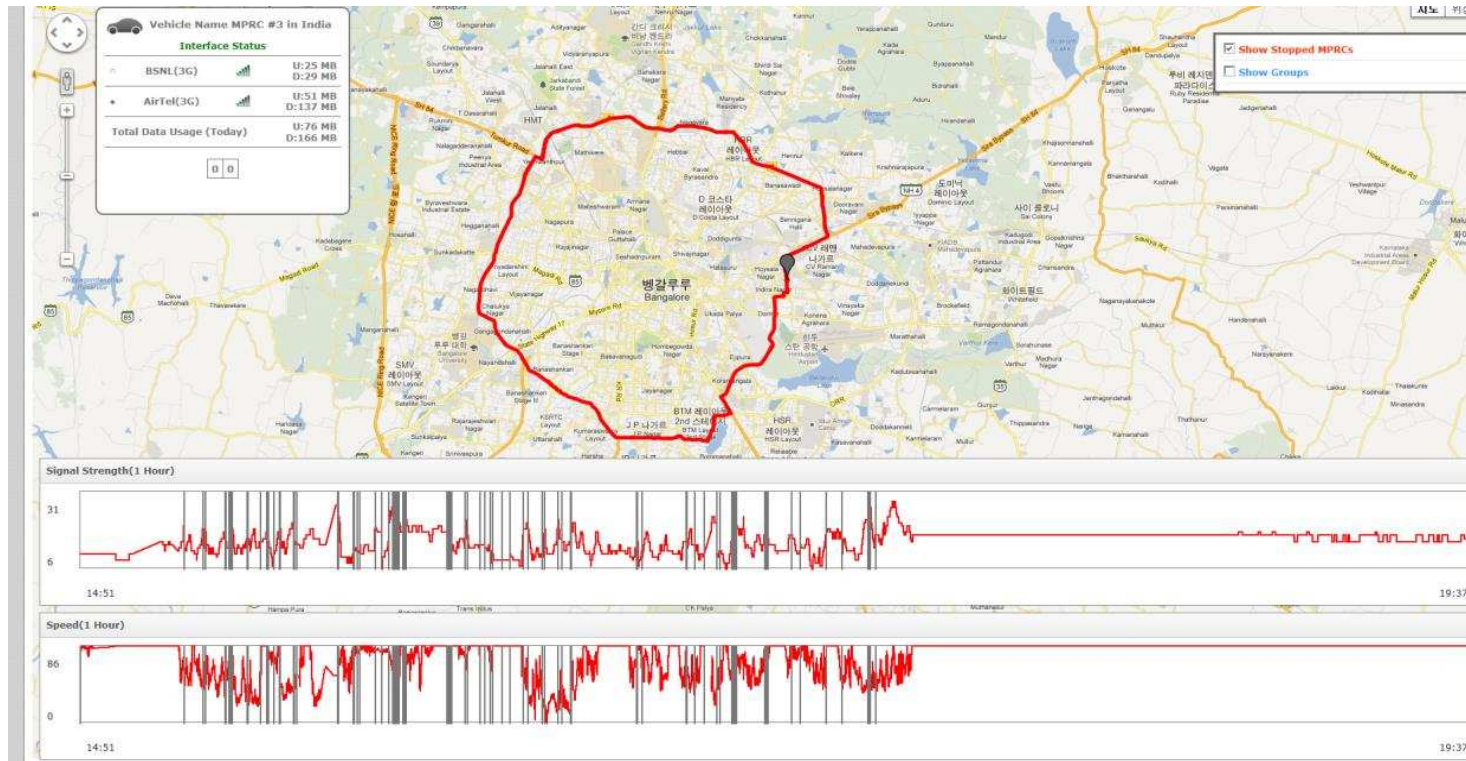


System Management

Remote Monitoring System

Features

- Vehicle location, speed and heading
- Network quality, field strength, link and router status, data usage logging
- Administrator able to control, manage, configure and update routers from remote

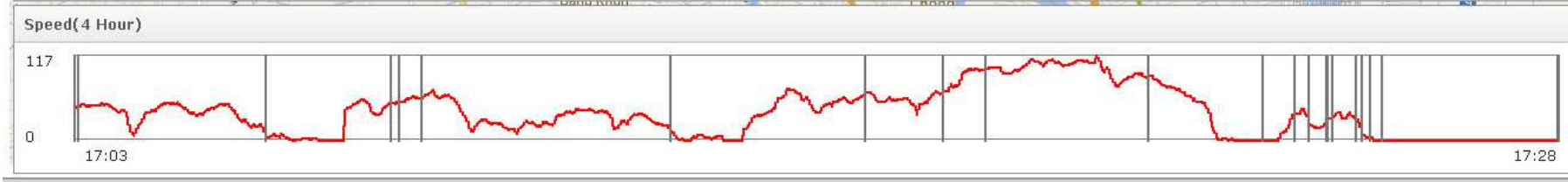
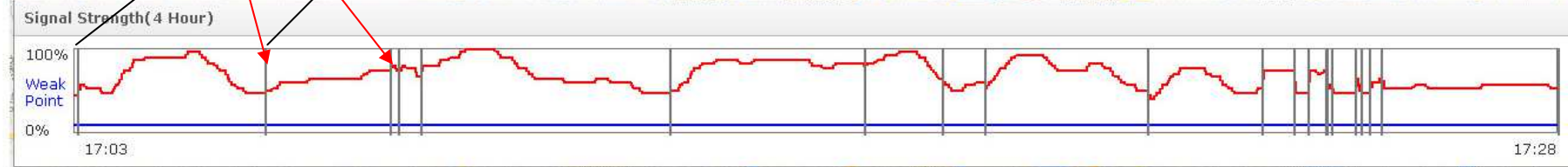




System Management

Remote Monitoring System

Start Date 2014-02-11 H 10 M 42 End Date 2014-02-11 H 20 M 42





RIDE-IT

Solution Highlights



- Open Linux platform – x86 PC architecture
- Future proof, wireless technology agnostic
- 4G/LTE and CDMA2000 ready
- Effective use of bandwidth of all available connections
- Combination of dynamic network handover and intelligent load balancing
- Parallel active VPN tunnels on all wireless connections
- Internet connectivity within 40s from power-up
- Multiple WWAN Uplink connection
 - Up to three EDGE/3G/LTE VPN connections used in parallel
 - Load balancing to maximize available throughput
 - Uninterrupted browsing experience
- GPS positioning (Optional 3D G-sensor Dead Reckoning)
- 802.11 b/g/n access point for in-vehicle secure WiFi
- Dual 10/100/1000Mbit Ethernet ports for
 - DVR systems
 - Passenger counters
 - Ticket or payment systems (AFC)
 - Infotainment systems
- Purpose-built for vehicle installation: enclosure, connectors and power supply + UPS
- Remote management and monitoring



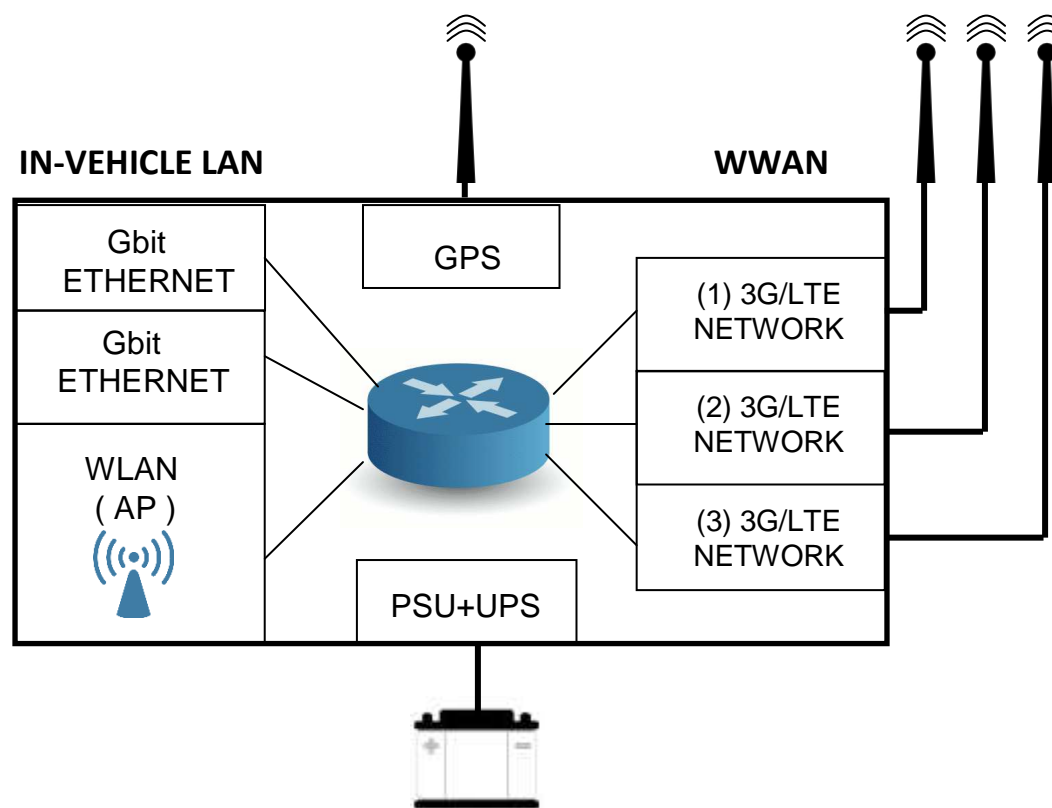


RIDE-IT Router

System Overview



- 3x EDGE/3G/LTE/CDMA2000 EV-DO network uplinks supported
- High sensitivity GPS receiver (Optional 3D G-sensors for Dead Reckoning)
- Optional UPS Back-up
- Load Balancing and VPN Handover Modes
- Router maintains all available connections active and in parallel use
- Active VPN open on all connections ensures “0-Delay” handover and routing of traffic
- Advanced network qualification criteria
 - Cell type
 - Signal strength
 - Data throughput
 - Latency
- All available networks used dynamically in parallel with active dynamic load balancing ensuring maximal available bandwidth for WiFi clients



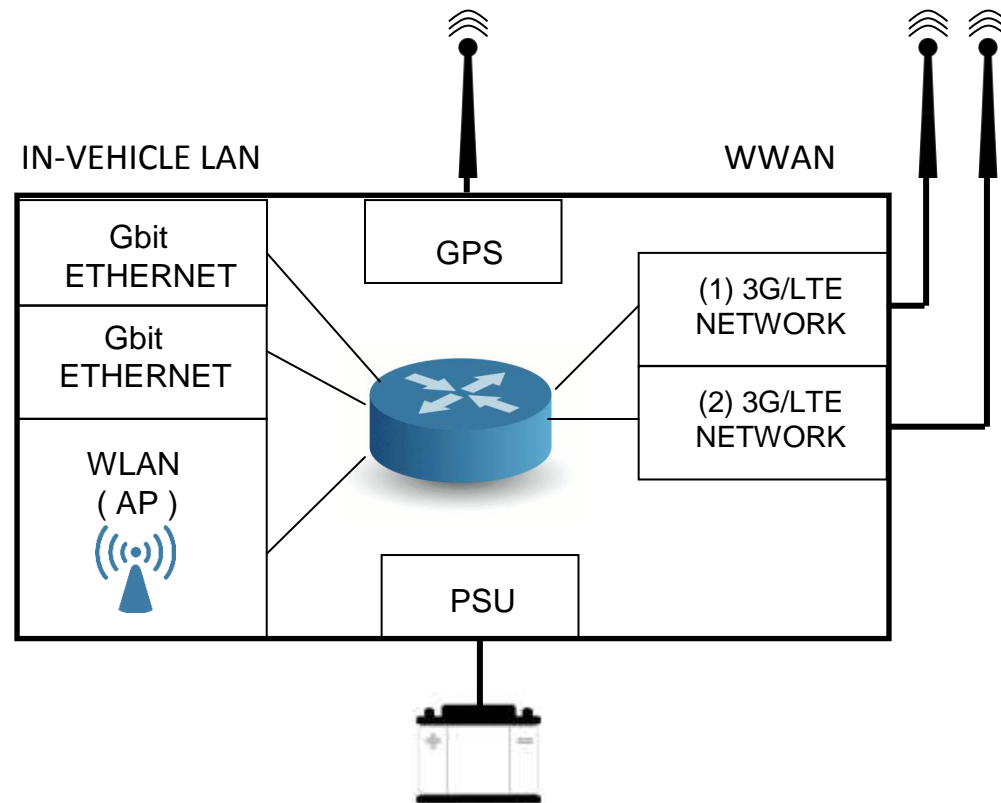


RIDE-IT-LITE Router

Entry-Level System Overview



- 2x EDGE/3G/LTE/CDMA2000 EV-DO network uplinks supported
- High Sensitivity GPS receiver
- Load Balancing Operation
- Router uses all available connections in parallel on up- and downlink
- Active VPN open on all connections ensures “0-Delay” handover and routing of traffic
- Advanced network qualification criteria
 - Cell type
 - Signal strength
 - Data throughput
 - Latency
- All available networks used dynamically in parallel with active dynamic load balancing ensuring maximal available bandwidth for WiFi clients

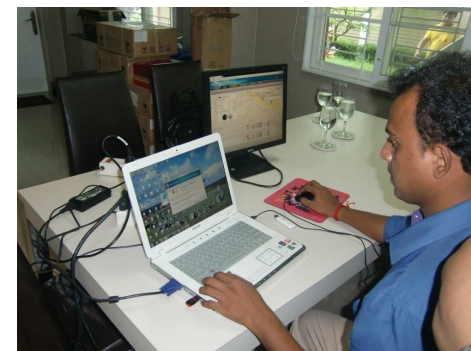
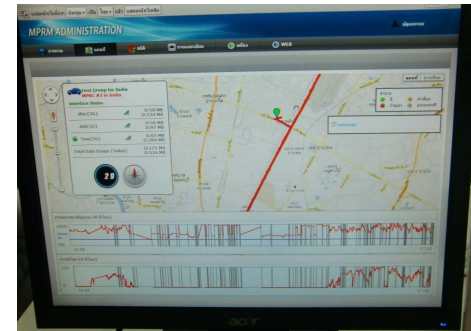




On-Site Engineering

Trials – Validation - Engineering

- Onsite Testing and Validation
 - Operator and network performance
 - Coverage and service availability
 - In-vehicle tests
 - Testing of country-specific modems
- Trials
 - Demonstrations and POC
 - Operational tests with customer application
 - Real-world performance tests
 - Reports and log files
- Engineering
 - Router configuration for wireless scenarios
 - Custom feature validation on-site
 - Network systems engineering
 - Installation of gateway servers on-location
 - Training and support





Contact Information



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