ITS – Intelligent Transportation Systems

**Vision:** ITS technology *improve safety by managing traffic*  
*Within the same road infrastructure*

- **Communication:**
  - V2C - Vehicle to Center
  - V2V - Vehicle to Vehicle
  - V2I - Vehicle to Infrastructure
C2R Future is in M2M Networking

In the auto
Moving
Out in the world
Living

In the office
Working
@home
@work
Traffic Management Models

Vehicle 2 Driver Interface

Vehicle 2 Vehicle, Local & Control Center

(Virtual) Virtual Sub-Center (VSC)
Vehicle 2 Vehicle Communication

Traffic Control

Vehicle, Driver & Control Center

Regional Control Center (RCC)
Vehicle 2 Center Communication

COM2REACT

Paris, 26th October 2007
Road and Environment Mobile Sensors

Mobile Sensors

GPRS NETWORKS

GPS

Traffic efficiency and safety system

COM2REACT
Paris, 26th October 2007
Data Flow from Vehicle to Center

Mobile Sensors: Data Capture, Analysis, Store & Forward
Communication
Data, Network Management
Traffic Management
Service Provider

Data Flow from Vehicle to Center
What is the optimal technology to be selected?
V2C Application Needs

<table>
<thead>
<tr>
<th>Technology</th>
<th>Typical File Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS</td>
<td>9KB</td>
</tr>
<tr>
<td>Email</td>
<td>10KB</td>
</tr>
<tr>
<td>Text file</td>
<td>40 KB</td>
</tr>
<tr>
<td>Java Games</td>
<td>1 MB</td>
</tr>
<tr>
<td>Music Files</td>
<td>4 MB</td>
</tr>
<tr>
<td>Rich Multimedia</td>
<td>&gt;10MB</td>
</tr>
</tbody>
</table>

- **GPRS**: 80 Kbps
- **CDMA 1X**: 153 Kbps (shared circuit voice + data)
- **EDGE**: 236 Kbps
- **UMTS WCDMA**: 384 Kbps -> 2.0 Mbps (shared circuit voice + data)
- **1xEV-DO**: 2.4 Mbps (all IP packet, 3.1 Mbps Rev A)
- **1xEV-DV**: 3.1 Mbps (shared circuit voice + data)
- **UMTS HSDPA**: 14.4 Mbps (shared circuit voice + data)
- **WiMAX 802.16e**: ~16 to 18.0 Mbps (in 5 MHz - nomadic)
- **Canopy Advantage**: ~20.0 Mbps (in 20MHz – fixed)
- **WiMAX 802.16d**: ~70.0 Mbps (in 20MHz – fixed/portable)
- **OFDM 4G**: ~100 Mbps (in 20MHz – mobile)

**Peak Rate (Mbps)**

- ~70.0 Mbps (in 20MHz – fixed/portable)
- ~20.0 Mbps (in 20MHz – fixed)
- ~100 Mbps (in 20MHz – mobile)
- ~16 to 18.0 Mbps (in 5 MHz - nomadic)
- 3.1 Mbps (shared circuit voice + data)
- 2.4 Mbps (all IP packet, 3.1 Mbps Rev A)
- 384 Kbps -> 2.0 Mbps (shared circuit voice + data)
- 14.4 Mbps (shared circuit voice + data)
- 236 Kbps
- 153 Kbps (shared circuit voice + data)
- 80 Kbps

**Typical File Size**

- Java Games: 1 MB
- Music Files: 4 MB
- Rich Multimedia: >10 MB
- SMS: 9 KB
- Email: 10 KB
- Text file: 40 KB

**Note:** Values are approximate and may vary based on specific circumstances and technologies.
C2R – Communication Network

V2C - Vehicle to Center & V2V - Vehicle to Vehicle
Muni-WiFi – next to the door

Mesh and Muni Wi-Fi are expanding Wi-Fi’s reach

- Lots of high-profile announcements
  - Philadelphia, London, Chicago, San Francisco, Taipei
  - Variety of smaller scale deployments in place today
- Enabling coverage from large campus deployments to cities
- Various pricing models in play
- This will be an interesting space to watch

By 2010, Muni-Wi-Fi networks will cover 126,000 sq. mi.
VSC – Virtual Sub-Center
C2R System Layers

Traffic Application Layer

VSC Layer (VSC1)

VANET Layer

Physical Layer

Vehicle 1

VSC Layer (VSC1)

VANET Layer

Physical Layer

Vehicle 1

VSC Layer (VSC1)

VANET Layer

Physical Layer

Vehicle 1

RCC Communication Channel

RCC Communication Channel (V2C)
Traffic flow Control

RCC

Regional hazard warning

local hazard warning

at link 5

VSC

at link 5

at link 7

80

at link 7

80

at link 5

50

at link 7

80

Traffic efficiency and safety system
Collision warning
V2V + V2C: Environmental monitoring & prediction
COM2REACT
COoperative CoMmunication System
TO Enhanced Safety And EffIciency
In European Road Transport

Project Presentation
Paris, 26th October 2007

Thank You
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker/Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30 - 09:45</td>
<td>Dr. Arnaud de La Fortelle - Welcome/Greetings</td>
</tr>
<tr>
<td>09:45 - 10:00</td>
<td>Dr. Chanan Gabay - Project overview</td>
</tr>
<tr>
<td>10:00 - 10:20</td>
<td>Dr. Eleonora Mincheva - VSC concept</td>
</tr>
<tr>
<td>10:20 - 10:40</td>
<td>Dr. Arnaud de La Fortelle - VSC technology</td>
</tr>
<tr>
<td>10:40 - 11:00</td>
<td>Prof. Fritz Busch - VSC traffic efficiency &amp; safety impact</td>
</tr>
<tr>
<td>11:00 - 11:15</td>
<td>Prof. Claude Laurgeau - Technological achievements</td>
</tr>
<tr>
<td>11:15 - 11:30</td>
<td>Cesar Moro - C2R Business model</td>
</tr>
<tr>
<td>11:30 - 13:00</td>
<td>On-site Exhibition demonstration &amp; Refreshments</td>
</tr>
</tbody>
</table>