

Vehicle Communications

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**“WHEN VEHICLES TALK TO EACH OTHER,
WHAT SHOULD THEY SAY?” ☺**

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V2I Communications

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- **Roadside Equipment (RSE)**
 - Safety critical information broadcast in real-time
 - Local detailed maps
 - DGPS corrections
- **Applications (examples):**
 - Cooperative Intersection Collision Avoidance Systems
 - Road departure warning
 - Danger zones, Speed limits
 - Weather based hazards

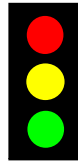


CICAS-V Concept of Operations

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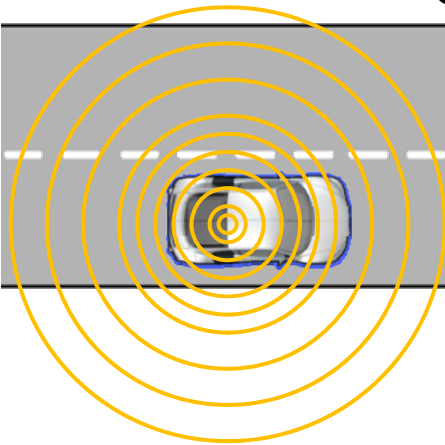
GID



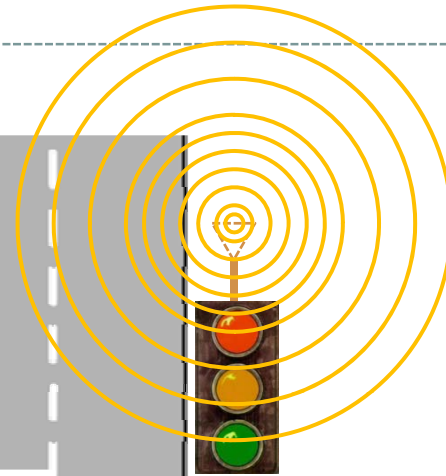
SPAT



DGPS



Lane level matching
required for complex
intersections



Active RSE @
5th Ave & El
Camino Real
Atherton, CA

15th ITS World Congress (New York, 2008)

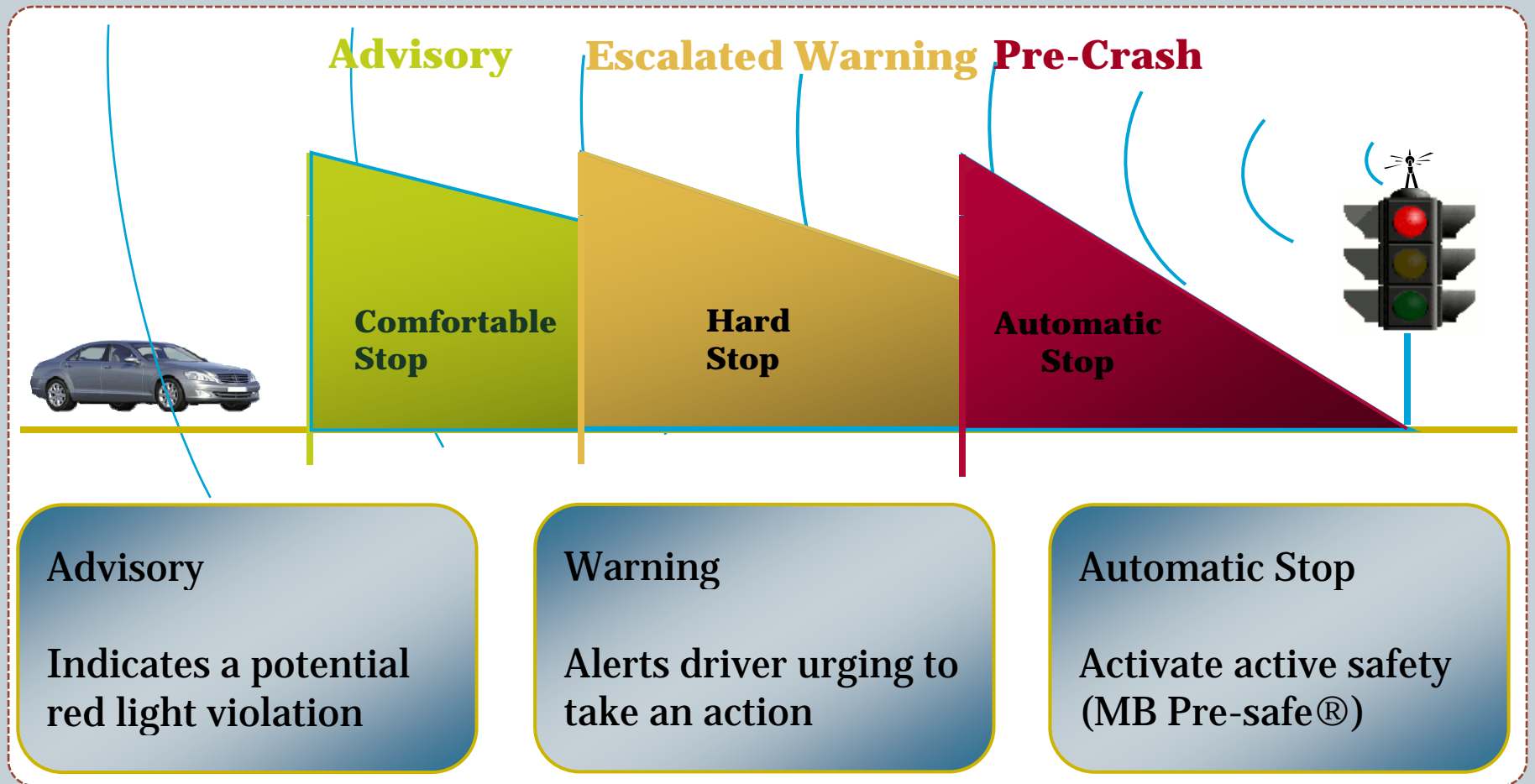
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- Largest Intelligent Transport Systems event to date
- MB presented an “Integrated Safety” demo



Integrated Safety Demonstration

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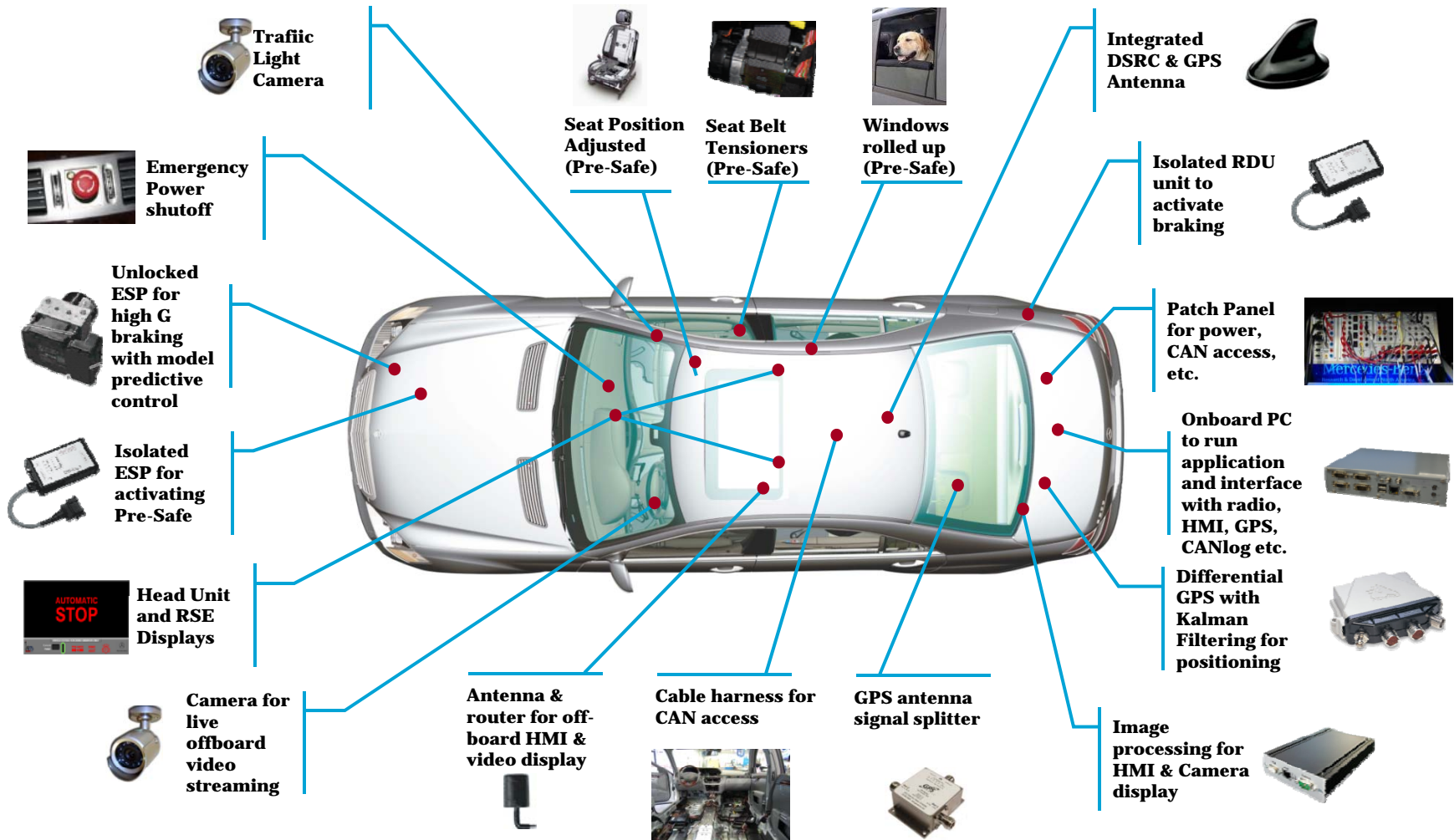
Demo Driver Vehicle Interface

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System Components Overview

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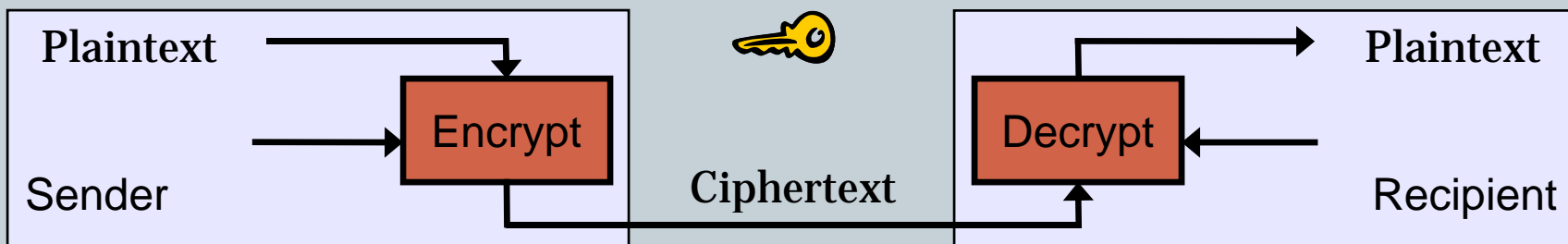


Symmetric-key (aka shared key) Encryption

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- Same key for both encryption and decryption
- Symmetric-key algorithms:
 - provide confidentiality
 - generally fast, especially in comparison with public-key algorithms
 - key management (i.e., selecting, distributing, and storing keys) is difficult

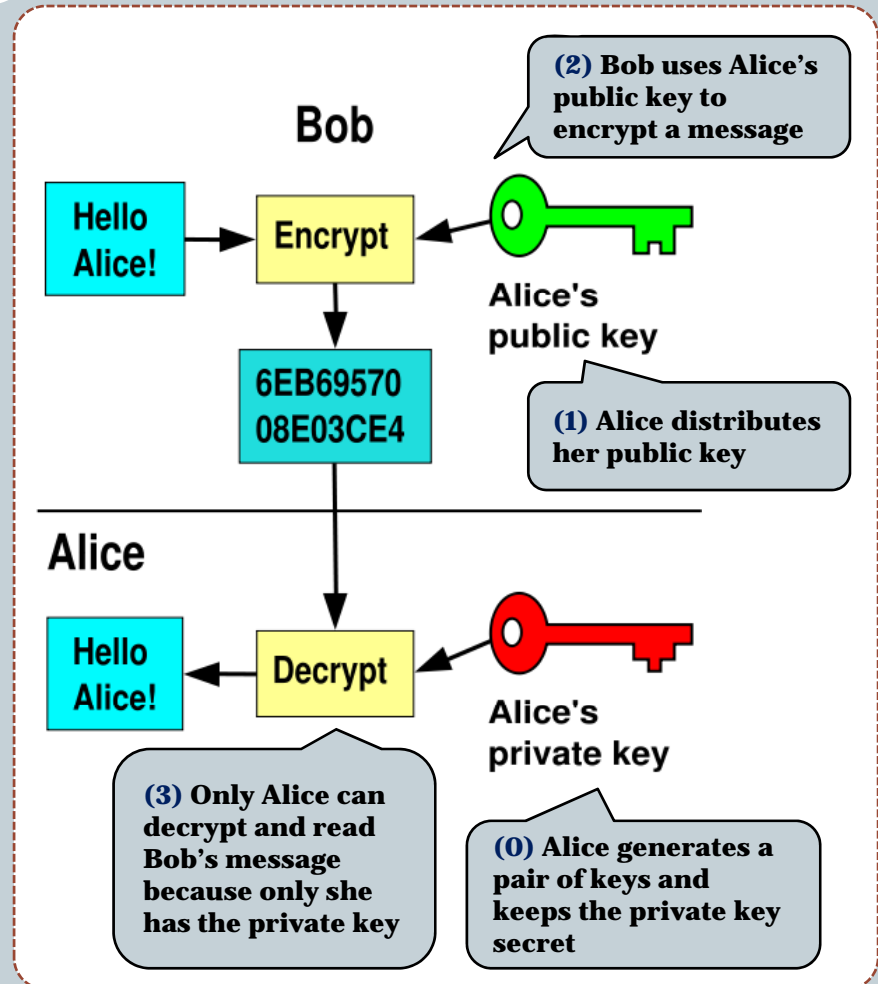
$\text{Decrypt}_{\text{shared key}} (\text{Encrypt}_{\text{shared key}} (\textit{plaintext})) = \textit{plaintext}$



Public-key (asymmetric) Cryptography

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- **Pair of keys**
 - it is very hard to obtain the private key from the public key
 - easier key management
- **Digital signatures:**
 - source authentication
 - message integrity
- **Digital certificates:**
 - someone's public key and other credentials
 - signed by a trusted authority with a well-known public key

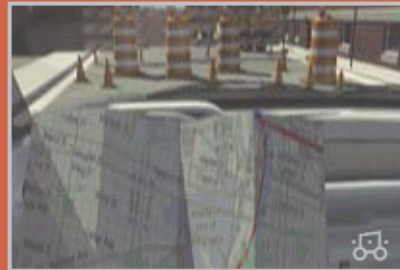


Which Communications?

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**Home Entertainment
Sync and Go**



**Digital Map
Update**



**Wireless
Diagnostics**



**Probe Data
Collection**



**Emergency Vehicle
Warning**



**Inter-Vehicle Hazard
Warning**



**Intersection Collision
Avoidance**

Summary

- Roadside Equipment (RSE)
- Intersection Collision Avoidance
- Can 5.9 GHz DSRC support control functions?
- How do we ensure security and privacy?

