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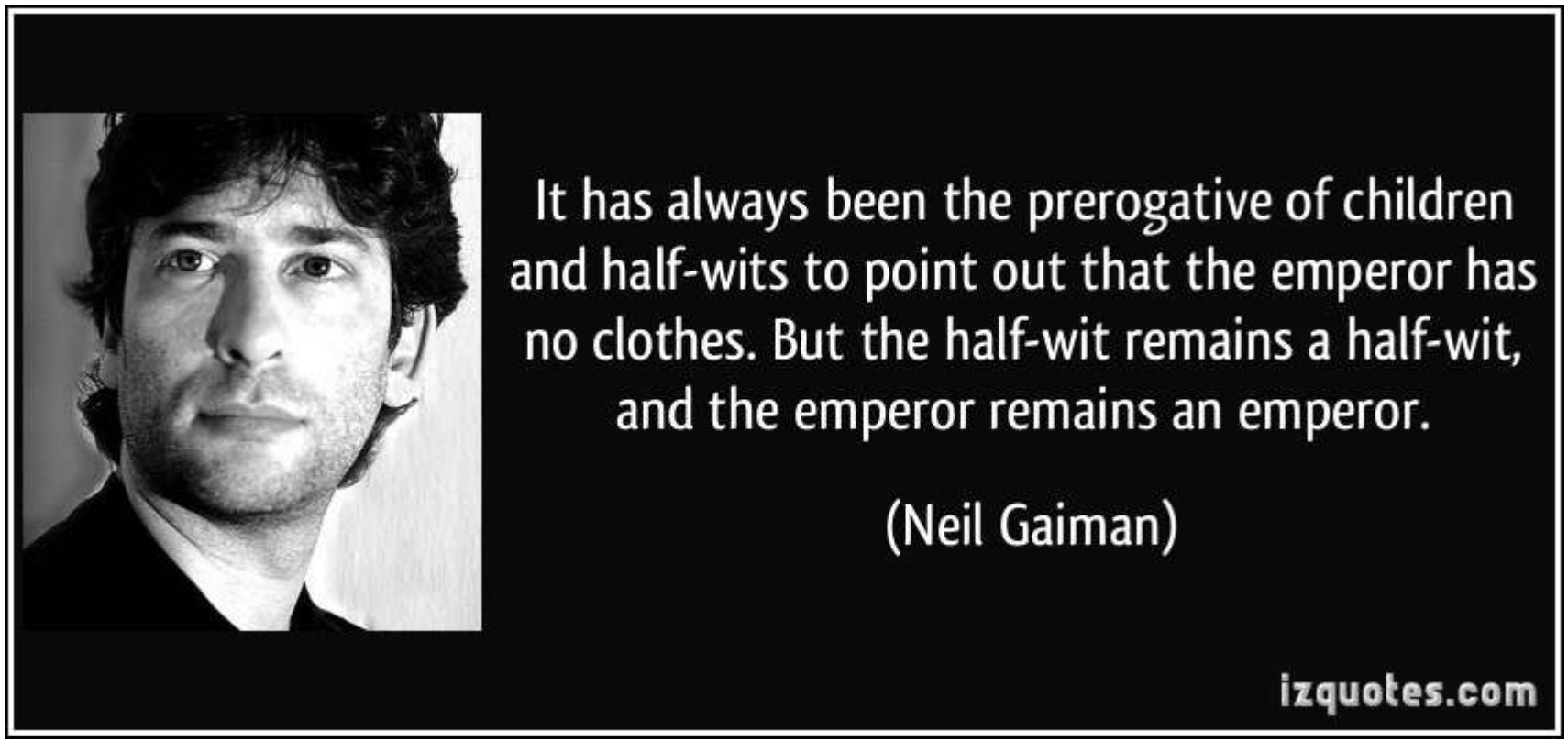
FROM STAND-ALONE ITS TO CONNECTED ITS:

WHAT DOES IT MEAN FOR CITIES AND REGIONS?

THE COMING REIGN OF C-ITS?



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CITIES AND ITS

- There is a lot in Europe
- It's increasingly integrated
  - Standards like DATEX, frameworks like UTMC
  - Exploiting developments in mainstream ICT
- What about C-ITS?
  - Direct communication with all (equipped) vehicles for traffic management and information purposes
  - May offer a more (cost-)effective way of delivering certain traffic management functions

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C-ITS DEVELOPMENTS

- Historically, a lot of early interest in
  - “Connected vehicles”
  - “Automated highways”
- Urban context much less well studied
- Cities are not slow to react – many have had extensive C-ITS systems for years
  - Bus priority systems
  - Tolling systems

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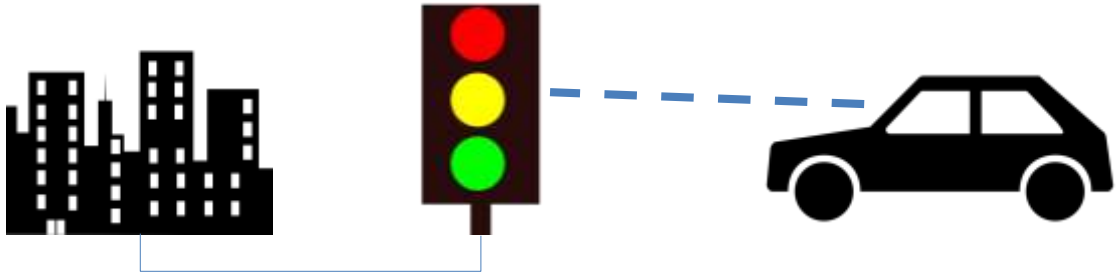
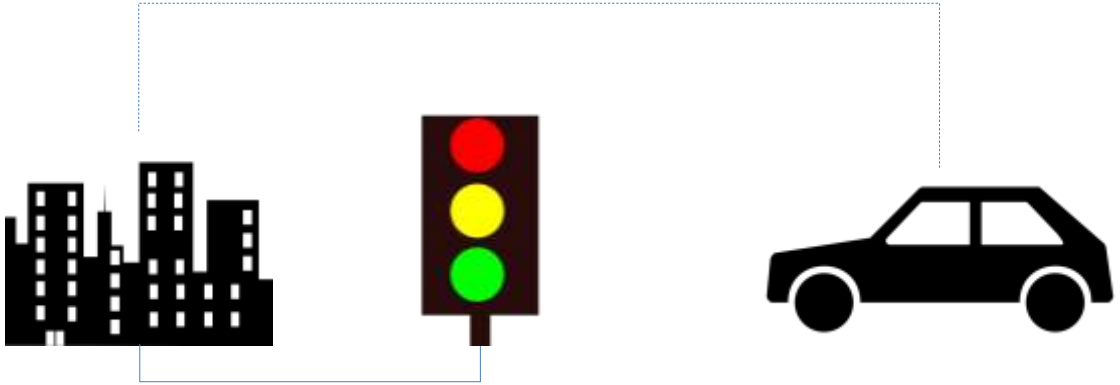
TWO GENERIC APPROACHES

City *Traveller*

Local comms



Wide area comms



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WHAT'S NEW: COMMS

- ITS G5
  - Reserved WiFi spectrum for safety applications and other C-ITS services
  - Short-range : 300-500m (up to 1000m) depending on environment
  - Spectrum not (currently) owned by any market player = free of charge communications...
  - ...but requires a road-side unit
  - Low latency of data transfer = critical for safety applications (eg, emergency braking) but less relevant for urban applications – traffic efficiency oriented

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WHAT'S NEW: STANDARDS

- Standardised message sets
  - CAM / Cooperative Awareness Message: a message ('I am here') sent by a vehicle one to ten times per second with data on vehicles position, direction, speed etc.
  - DENM / Distributed Environmental Notification Message: warning message (eg, slippery road, crash) sent with high priority to a vehicle based on information from the vehicle or the infrastructure
  - SPaT / Signal Phase & Timing: information to the vehicle on traffic light state and future changes
  - MAP: describes the physical geometry of an intersection
  - IVI / In-vehicle information: presentation of physical road sign information in-side the vehicle

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Part 2: Requirements and solutions

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CITY INTERESTS IN C-ITS

- Many analyses of C-ITS services with “in principle” city benefits
- The following examples come from city voices:
  - Kassel (CIMEC partner city)
  - CODECS
  - C-ITS Platform, Urban WG
  - CIMEC collation

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KASSEL

Kassel documenta Stadt

- Some opportunities
  - Exact prediction for PT vehicles
  - Better priority correlated towards competing demands (dialog with vehicle)
  - Priority for emergency vehicles with same technology
  - New and better tools for quality management
  - New and better data available
  - Prediction of traffic situations
  - Reliable traffic information
  - Less traffic signs and less costs

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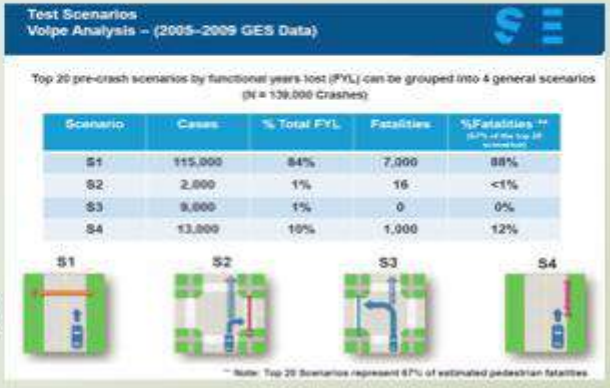
CODECS

	Day 1 Services			Bundle
1	Emergency electronic brake light	V2V	Safety	1
2	Emergency ve			
3	Slow or station			
4	Traffic jam ahe			
5	Hazardous loc			
6	Road works wa			
7	Weather condi			

- Tram warning (general)
- Tram interlocking control
- Blind spot detection (to avoid collisions with cycles and pedestrians)
- Localisation of vehicles
- Use of C-ITS to improve inter-modal transport

- Motorcycle approaching awareness (M2V)
- Motorcycle warning (Car sends CAM (V2V) triggering a warning generation M2V)
- Pedestrian warning by public transport (V2V)
- Pedestrian warning by RSU (Car sends CAM (V2V) triggering a warning generation I2V)
- Pedestrian warning by P2V (Car sends CAM (V2V) triggering a warning generation P2V)
- Bicyclist approaching awareness (B2V)
- Bicycle warning (Car sends CAM taking a turn at crossing (V2P), bicycle sends warning (P2V))



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C-ITS PLATFORM – URBAN WG

#	Day 1 Services
1	Emergency electronic brake light
2	Emergency vehicle approaching
3	Slow or stationary vehicle(s)
4	Traffic jam ahead warning
5	Hazardous location notification
6	Road works warning
7	Weather conditions
8	In-vehicle signage
9	In-vehicle speed limits
10	Probe vehicle data
11	Shockwave damping
12	GLOSA / Time To Green (TTG)
13	Signal violation/Intersection safety
14	Traffic signal priority request by designa vehicles

#	Day 1.5 Services
1	Off street parking information
2	On street parking information and management
3	Park & Ride information
4	Information on AFV fuelling & charging stations

Traffic signal priority request by designated vehicles V2I	14
Green Light Optimized Speed Advisory GLOSA/Time To Green (TTG) V2I	12
Traffic information and smart routing (V2I)	10
Park and Ride information (V2I)	9
Road works warning (V2I)	6
In-vehicle speed limits (V2I)	6
Probe Vehicle Data	6
Vulnerable road user protection (pedestrians, cyclists, motorcyclists) (V2X)	6

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CIMEC USE CASES

- UC1: Individual routing of vehicles
- UC2: In-vehicle signs
- UC3: In-vehicle signal information
- UC4: Management of loading and unloading areas for distribution vehicles
- UC5: Control the access of heavy goods vehicles with dangerous goods to tunnels
- UC6: Regulation of access to free lanes for electrical vehicles
- UC7: Green lights for police and emergency vehicles
- UC8: Traffic Light management
- UC9: Green lights for public transport vehicles
- UC10: Green lights for cyclists
- UC11: Parking management
- UC12: Inform about incidents in the road network and control access to these areas
- UC13: Inform about emergencies in the road network and control access to these areas
- UC14: Control access to given roads for not emission-free cars on days with poor air quality
- UC15: Speed enforcement around schools
- UC16: C-ITS services for vulnerable road users
- UC17: Pedestrians crossing in front of bus/tram
- UC18: Bike lane change and unusual crossing

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Part 3: Challenges and practicalities

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REALITY CHECK

- Why do we need this (ie what can it do for us)?
- What products are on offer, and at what cost?
- Are there other ways of doing the same thing better/quicker/more cheaply/at lower risk?
- Are there are higher priorities on our time and money?

(Existing C-ITS deployments, like bus priority, fulfil these criteria)

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UNDERSTANDING THE COSTS

- Cost of acquiring (or upgrading) roadside devices
- Cost of installing and commissioning roadside devices
- Cost of acquiring (or upgrading) central systems, including the additional cost of integration of roadside devices
- (Additional) cost of the city's communication network between centre and roadside; also possibly additional costs of electricity supply
- Cost of acquiring and/or training staff to use the system
- Cost of maintenance, repair, upgrade and replacement of system elements
- Any direct contribution to the cost of in-vehicle systems – in the case of city vehicles, the whole cost
- Cost of marketing to prospective road users
- Cost of technical support to actual road users
- Potential costs associated with consequences such as complaints and claims

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SUPPLIER READINESS

- In general suppliers see potential in city C-ITS...
- A few key suppliers have a clear vision and an action plan for deployment
  - And they don't reveal much information!
- Most have no well-defined plan – investment in product development will be limited as long as:
  - Their current ITS-market position is not in danger
  - There is no clear business case for city C-ITS
  - They still face too many challenges (technical, political, legal, etc.)

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RISK

- Breach of privacy
- Accident liability
- Political risk (e.g. through poor public reception)
- Supply failure
- Imposition of excessive costs or other burdens on road users
- Operational inadequacy (e.g. through shortage of skilled staff)

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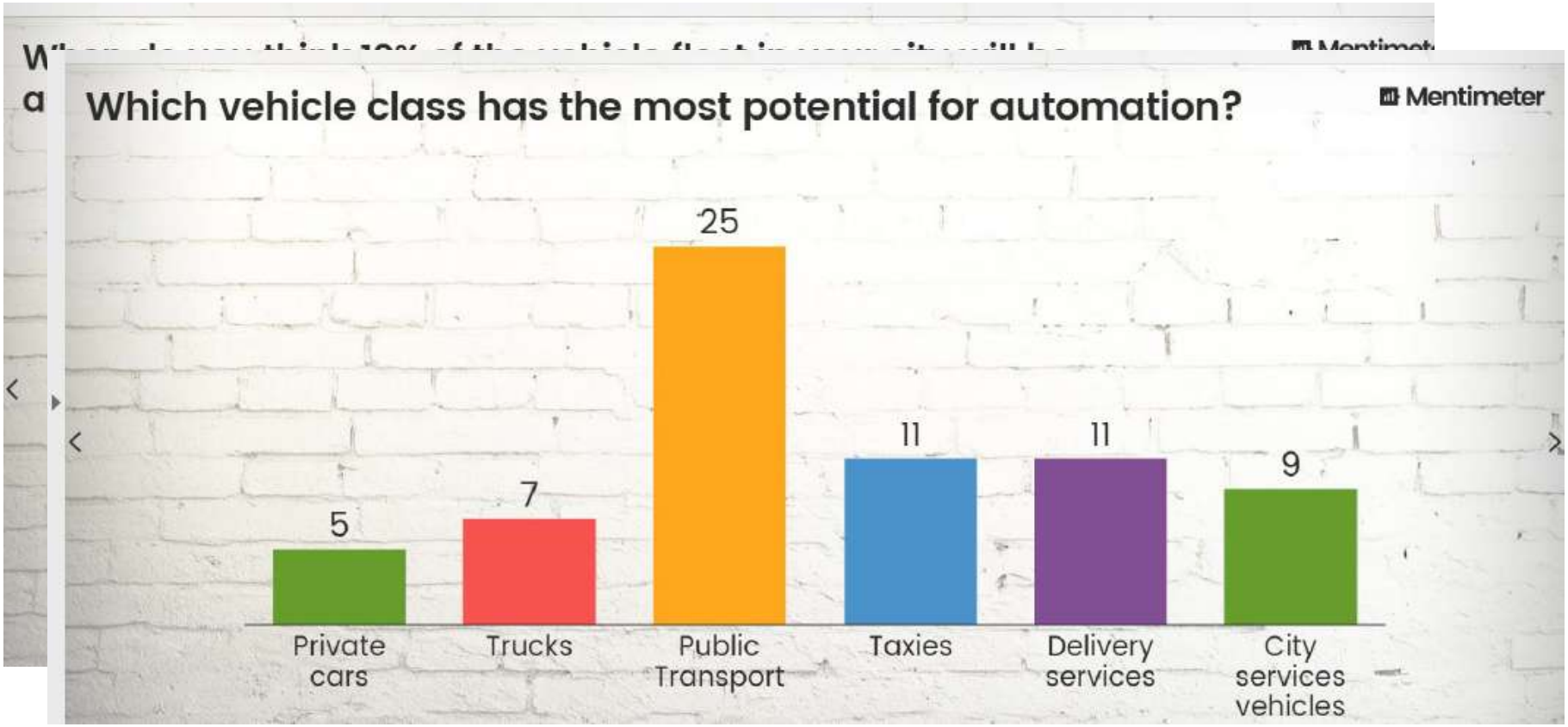
AUTOMATED VEHICLES



Part 4: The way ahead

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CLOTHES FOR THE EMPEROR?

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OUR PARTNERS

SINTEF

POLIS

Albrecht Consult

Centaur

Statens vegvesen
Norwegian Public Roads Administration

Kassel documenta Stadt

Reading Borough Council
Working better with you

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clúster de movilidad y logística
mugikortasun eta logistika klusterra

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Thank you!