

# **Copenhagen's C-ITS platform future opportunities and challenges**

**Webinar: Compass4D - Up-scaling C-ITS and market roll-out, 27-06-2016**



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# Content:

- **Background**
- **CPH 2025 Climate Plan**
- **Copenhagen Compass4D Experience**
- **Copenhagen ECO-Driving Experience**
- **C-ITS Challenges**
- **ITS World Congress 2018 in Copenhagen**
- **Invitation to Open Meeting**

# Background

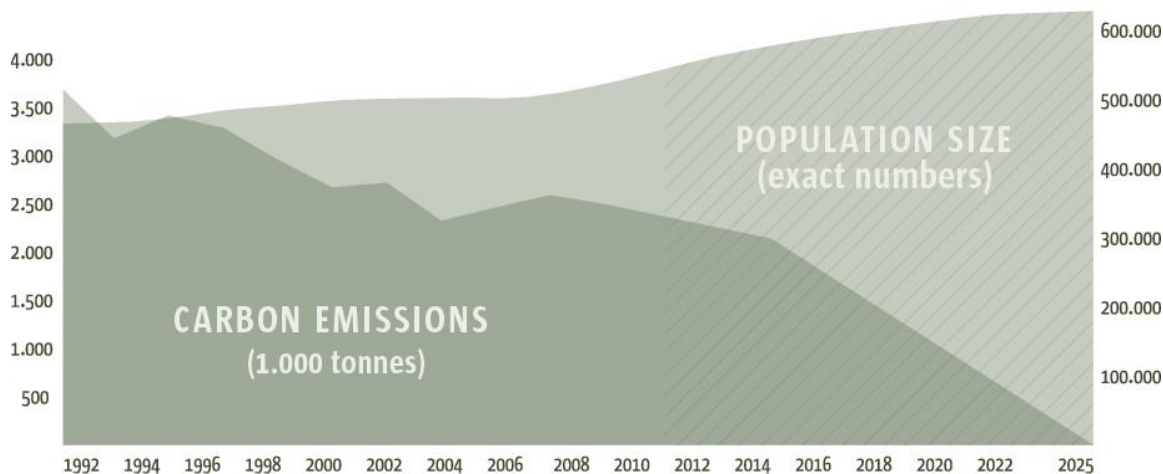
**Copenhagen the  
First CO2 Neutral  
City by 2025**



# CPH 2025 Climate Plan

## The major goals for mobility in 2025 are:

- 75% of all trips in Copenhagen are on foot, by bicycle or public transport.
- 50% of all trips to work or education in Copenhagen are by bike.
- 20% more passengers use public transport.
- Public transport is carbon neutral.
- 20-30% of all light vehicles run on new fuels.
- 30-40% of all heavy vehicles run on new fuels.



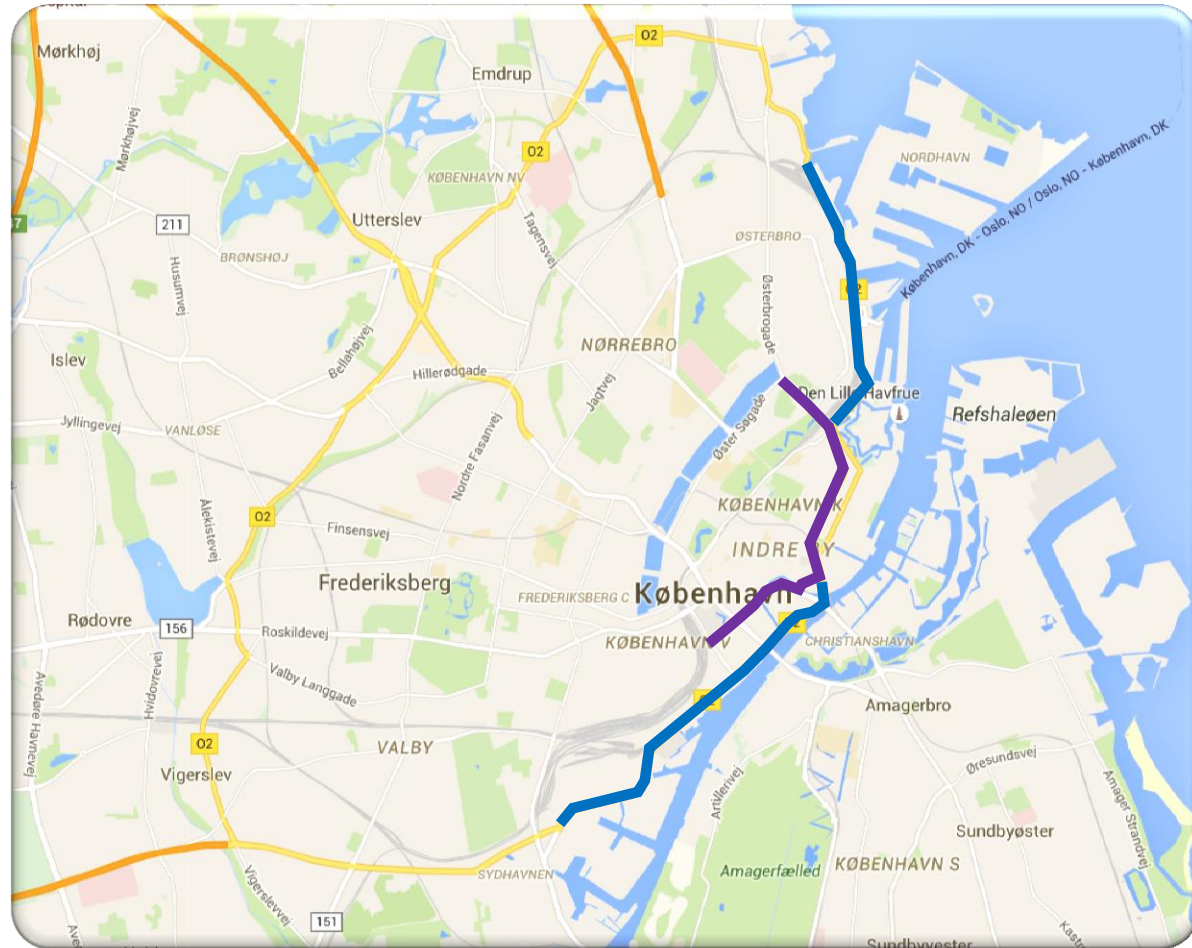
Copenhagen's population growth versus CO<sub>2</sub> emissions reduction



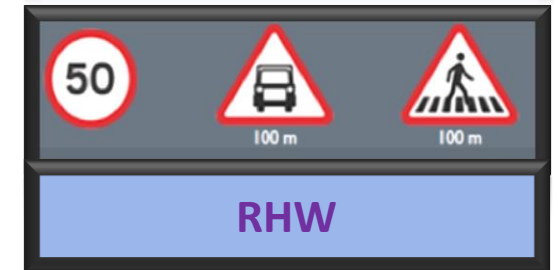
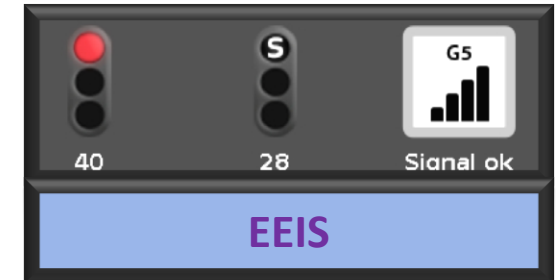
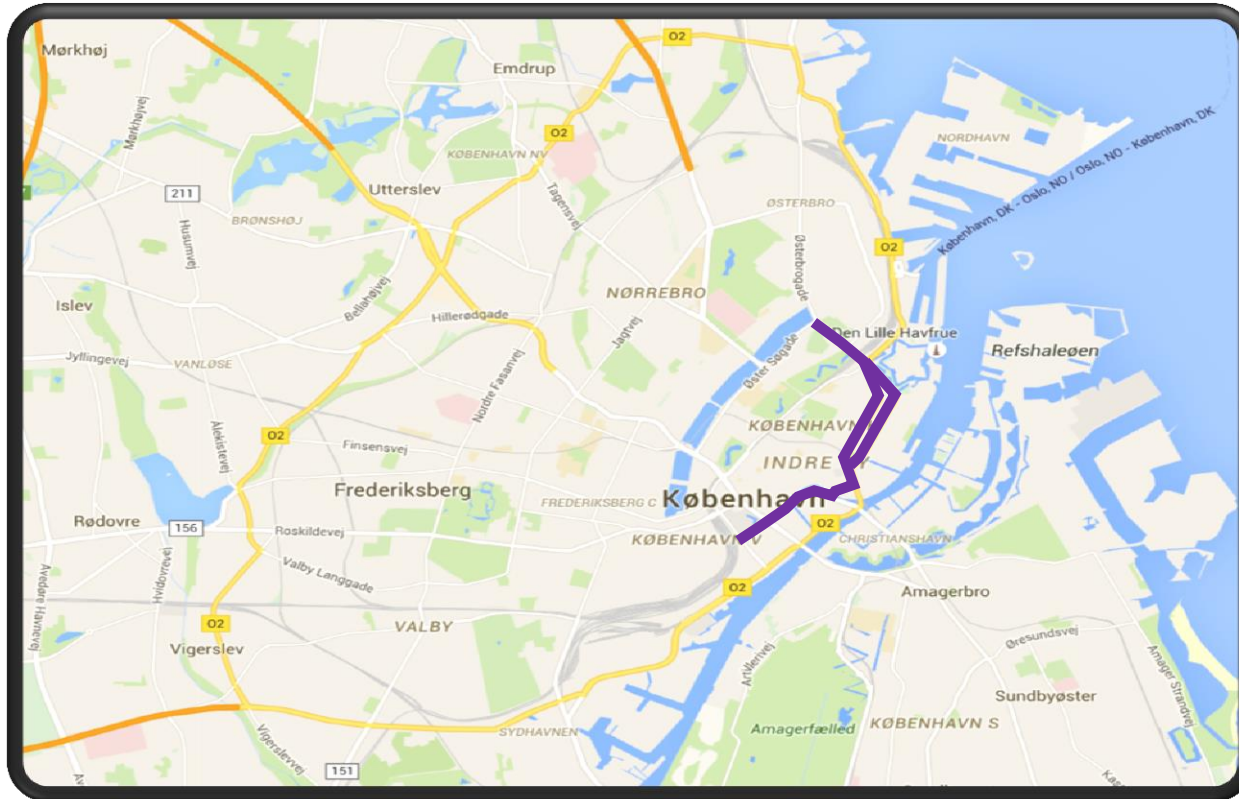


# C-ITS Platforms in Copenhagen

- **Compass 4D**
- **ECO-Driving**



# Compass4D in Copenhagen



17 Trucks



2 HV



87 buses

# Benefits and user experiences

## Emissions (in gCO<sub>2</sub>)

City	Type	Baseline operation	Functional Operation	% Change
Copenhagen	Bus	5287	4901	-7.30%

## Time (in seconds)

City	Type	Baseline operation	Functional operation	% Change
Copenhagen	Bus	875	786	-10.17%

TTG and TTR is perceived as useful

Improve work environment related to anticipation of signal changes

Drivers perceive work as more professional



# EcoDriving in Copenhagen



# Rationale behind EcoDriving 1 of 2

EcoDriving is one in a series of Intelligent Traffic Solutions to contribute to Copenhagen's climate goals

## EcoDriving



Traffic signal optimisation

Information services and  
dedicated Variable  
Message Signs for cyclists



Dynamic urban space



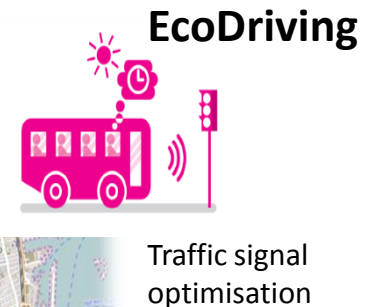
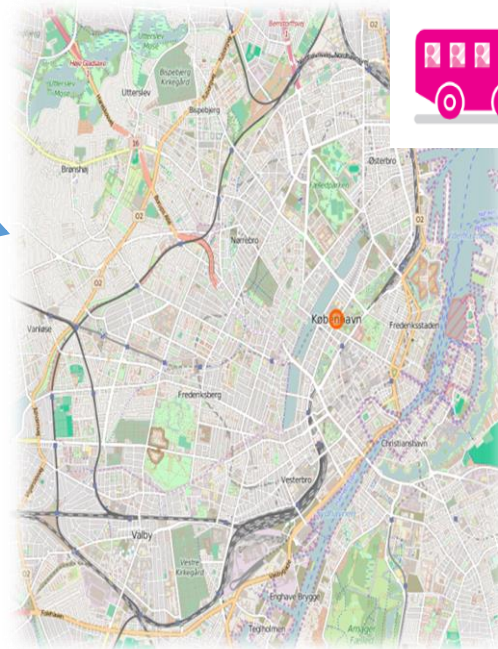
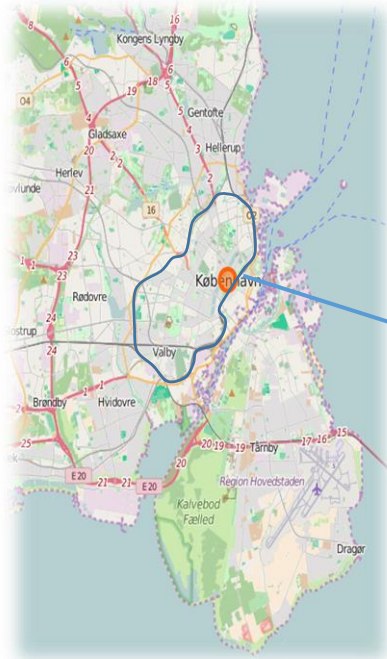
Road network management using a City Traffic Management System



Intelligent street lighting

# Rationale behind EcoDriving 2 of 2

Pull heavy vehicles to the secondary ring road and provide them a smooth trip





# EcoDriving in a nutshell



## Who?



Truck drivers and the truck companies they work for, cyclists and motorists in general



Traffic managers in the City of Copenhagen

## What?

Reduce the number of stops for the road users by providing dynamic speed advice at controlled intersections by using time-to-green and time-to-red facilities on the designated corridors to reduce their CO<sub>2</sub> emission, and more convenient travel experience.



## Why?



Truck companies reduce fuel costs

CO<sub>2</sub>

Less emissions of noxious gasses in the city



A smoother travel experience for the drivers



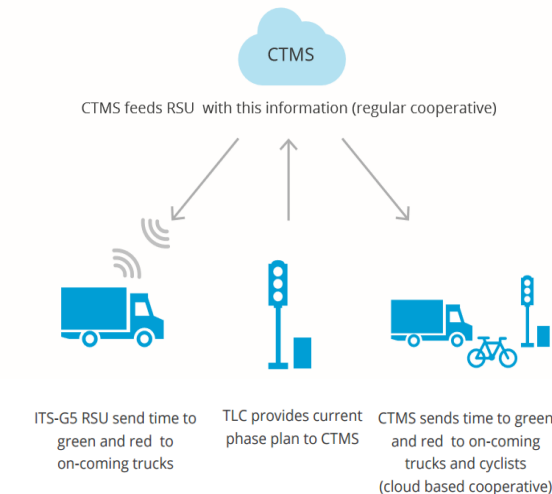
(Bus) companies and private motorists reduce fuel costs

## How?

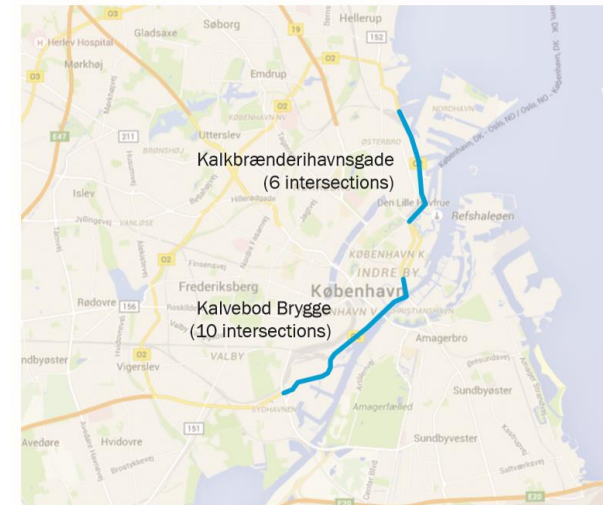
CTMS keeps an overview of the time-to-green and time-to-red at the various directions on the intersections.

CTMS passes the time-to-green and time-to-red on to vehicle drivers via ITS-G5 and via cellular 3G/4G.

On-board application (for smart phone) derives dynamic speed advice from time-to-green and time-to-red.



## Where?



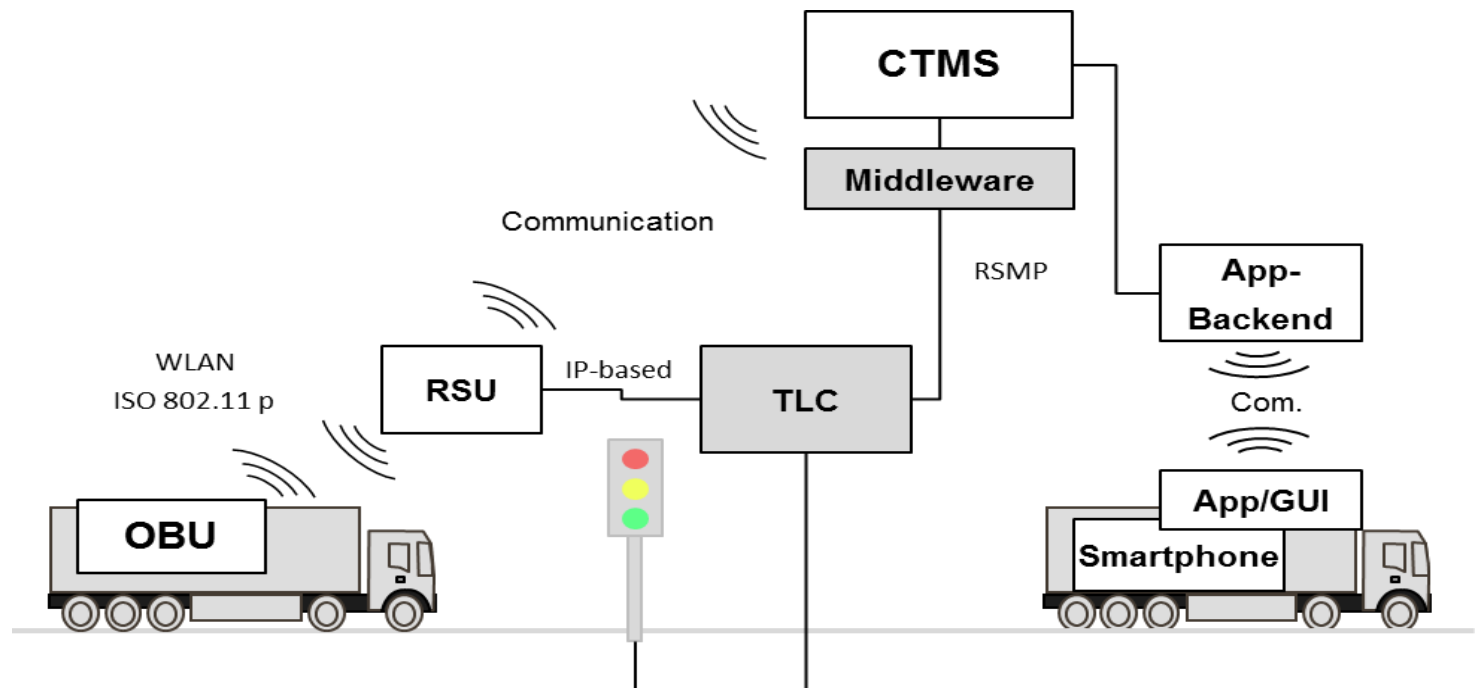
## Privacy matters

For ECO driving data comes from a variety of sources: on board units and GPS data from the ECO driving app.

Data from onboard units and GPS data from local apps will be anonymized before being sent from the app. The database will only store aggregated data.

# EcoDriving comes with two appearances

- Cloud-based using cellular 3G/4G
- Regular, using ITS-G5 in addition





# Equipment for EcoDriving

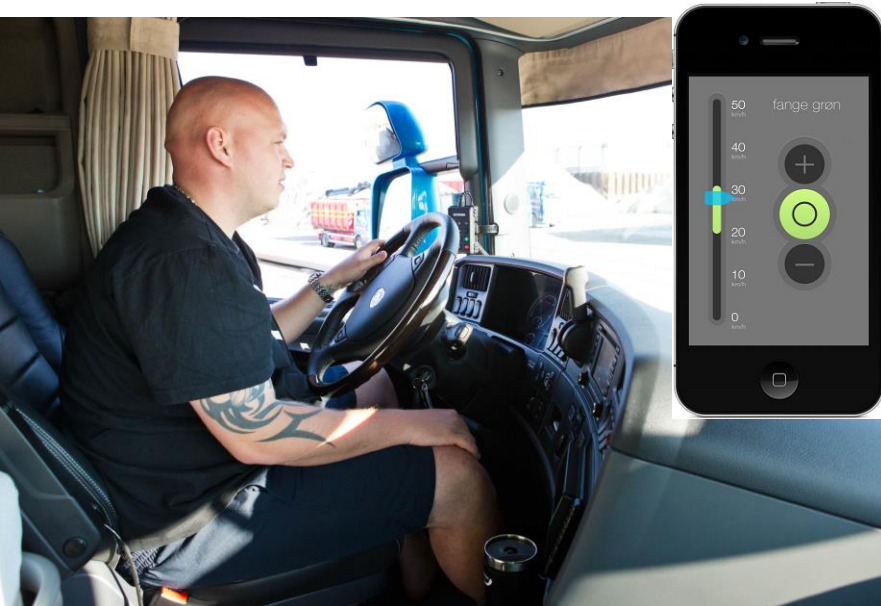
- Cloud based, just a smartphone
- Regular, in addition:
  - an easy to install ITS-G5 on-board unit (OBU) that connect wirelessly to the smartphone
  - ITS-G5 road side units (RSU)



# Human-machine Interface

Specifically designed for ITS Copenhagen taking into account:

- User Perspective
- Color blindness
- Costumisation
- regulations



# Comparison of Various Modules for EcoDriving & COMPASS4D

	COMPASS4D	EcoDriving Copenhagen
<b>Communication Methods:</b>		
Regular (ITS-G5)	✓	✓
Cloud based (3G/4G)		✓
<b>Modules:</b>		
Energy Efficient Intersection	✓	✓
Multi-modal (incl. cyclists)		✓
Bus Priority	✓	
Road Hazard Warning	✓	
<b>Human Machine Interfaces:</b>		
• Sound		✓
• Multiple languages		✓

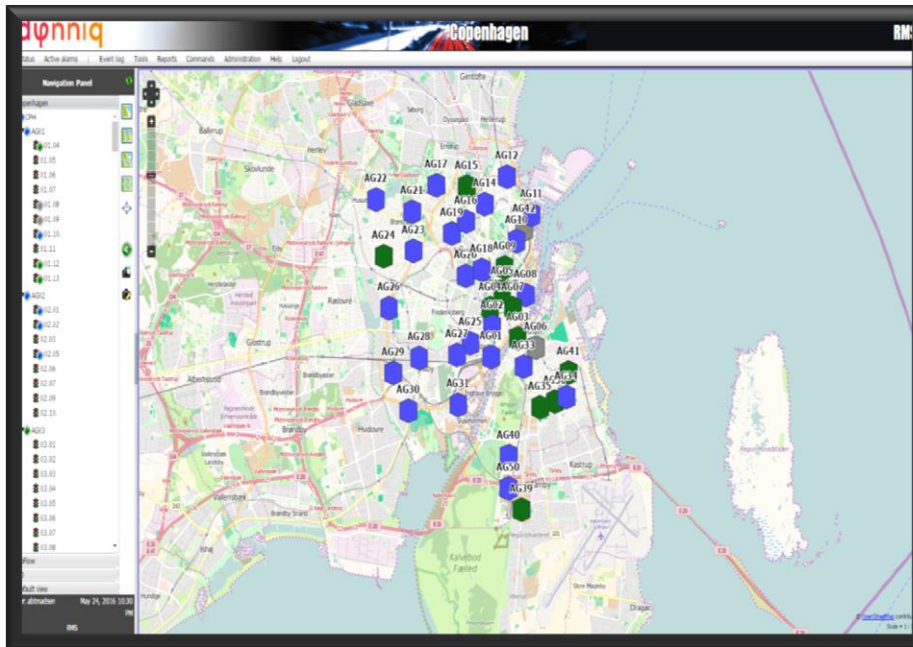
# The challenges for C-ITS





# Challenge 1

***“Traffic Management procedures and systems have not been created with C-ITS in mind”***



TLC

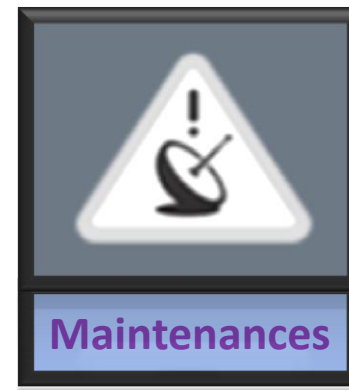
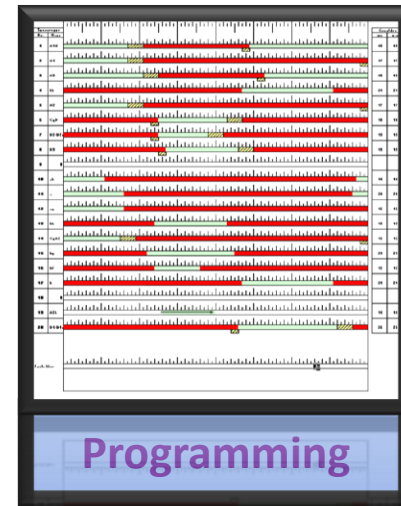
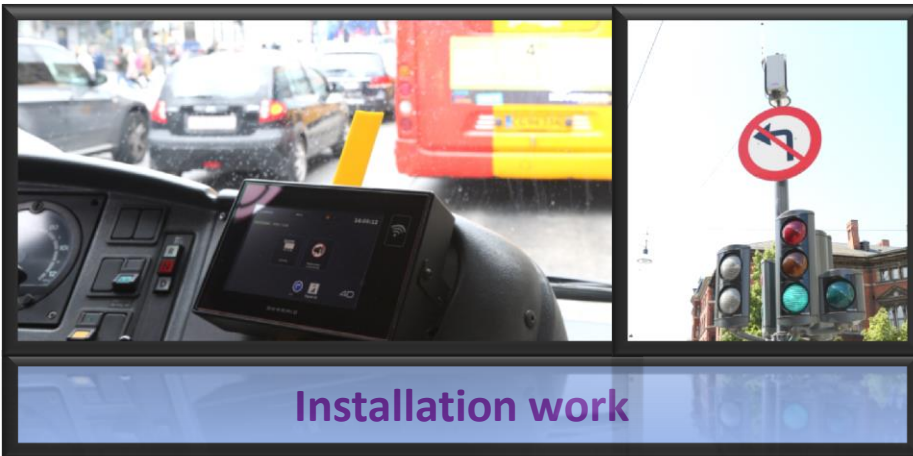
COMPASS4D Backoffice info		
2016 May 24 18:02:41		
RSU status changed:		
DOWN:		
status:		
RSU1004	UP	since 2016-05-09 13:00:02
RSU1005	UP	since 2016-05-09 13:00:02
RSU1003	UP	since 2016-05-09 13:00:02
RSU1002	UP	since 2016-05-09 13:00:02
RSU202	UP	since 2016-05-10 14:00:12
RSU302	UP	since 2016-05-10 14:00:12
RSU701	DOWN	since 2016-05-24 13:02:35
RSU702	UP	since 2016-05-23 17:02:25
RSU705	UP	since 2016-05-24 18:02:41
RSU813	UP	since 2016-05-24 18:02:41
RSU812	UP	since 2016-05-23 12:02:22
RSU803	UP	since 2016-05-24 18:02:41
RSU808	UP	since 2016-05-24 18:02:41
RSU801	UP	since 2016-04-21 14:55:57
RSU802	UP	since 2016-05-09 13:00:02
RSU806	UP	since 2016-05-03 21:58:50
RSU807	UP	since 2016-05-01 09:58:18
RSU809	UP	since 2016-05-09 13:00:02
RSU814	UP	since 2016-05-11 15:00:23
RSU310	UP	since 2016-04-24 07:56:29
RSU311	UP	since 2016-05-01 09:58:18

RSU



# Challenge 2

***“Lack of experiences with C-ITS from local providers”***



# Challenge 3

## *“Standards:*

- *Not backward compatibility between OBU/RSU*
- *No standards between TLC/RSU*
- *No standards between OBU/HMI”*



No  
standards



V1.0



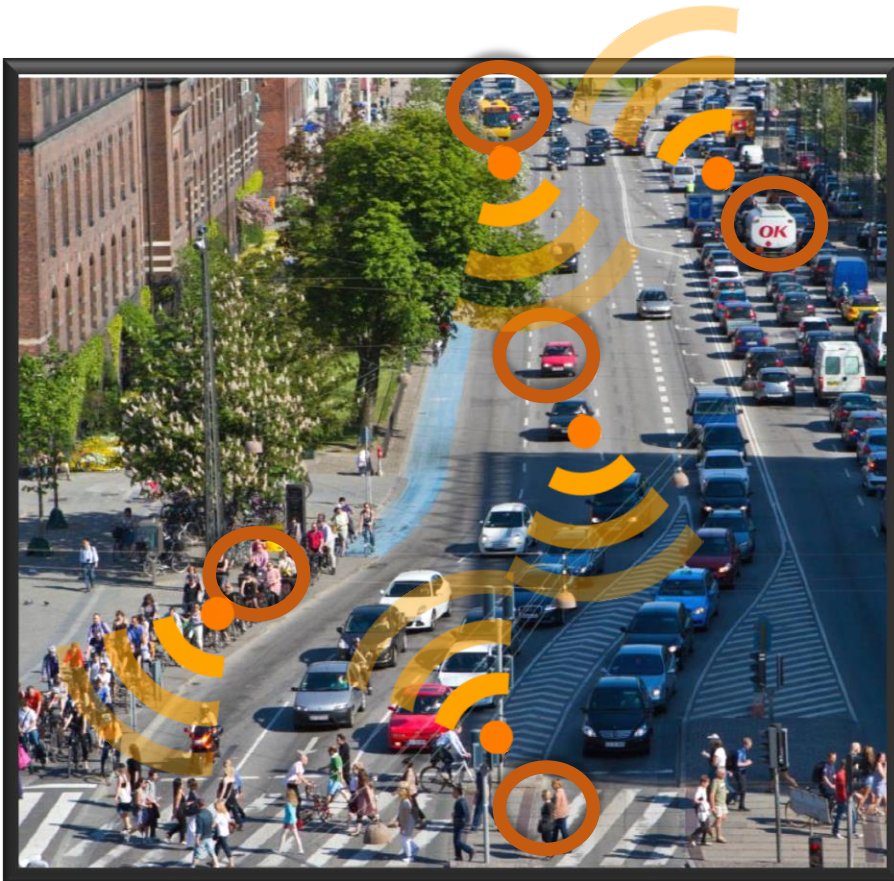
V1.1

No  
standards



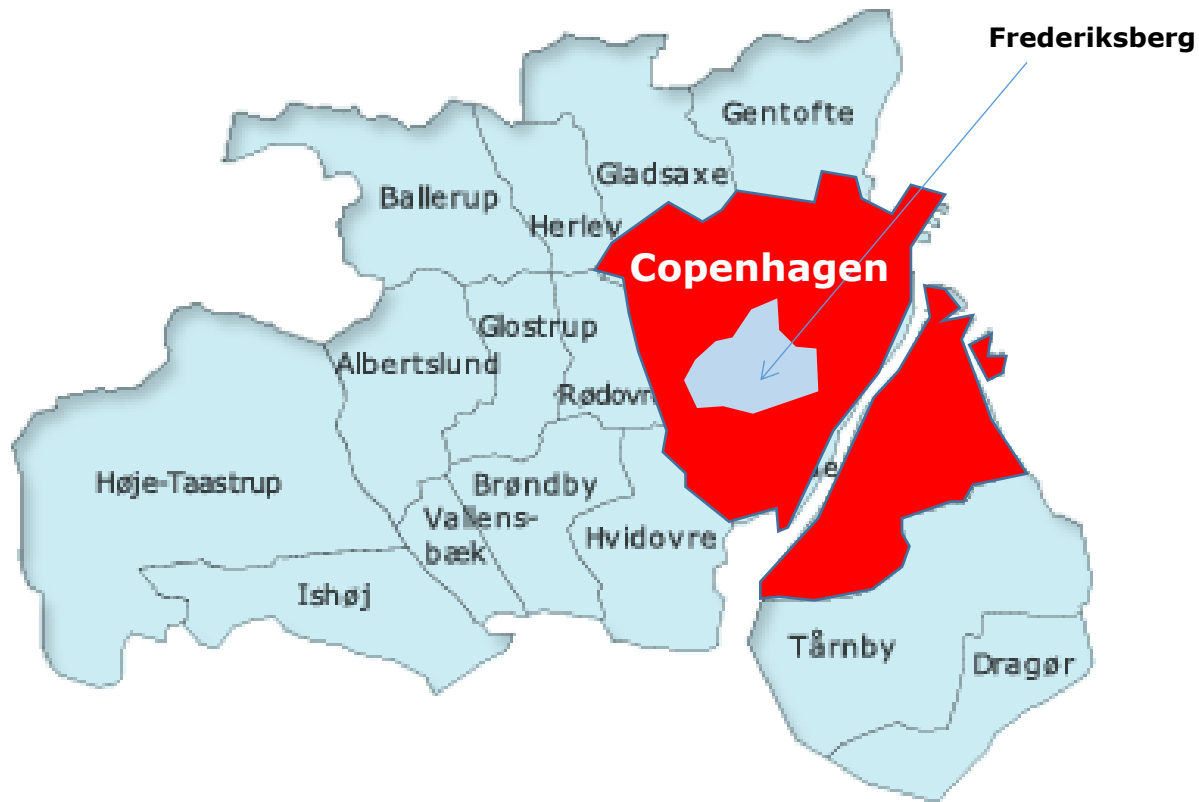
# Challenge 4

*“Not clear which communication technology to be used for which services and which road users”*

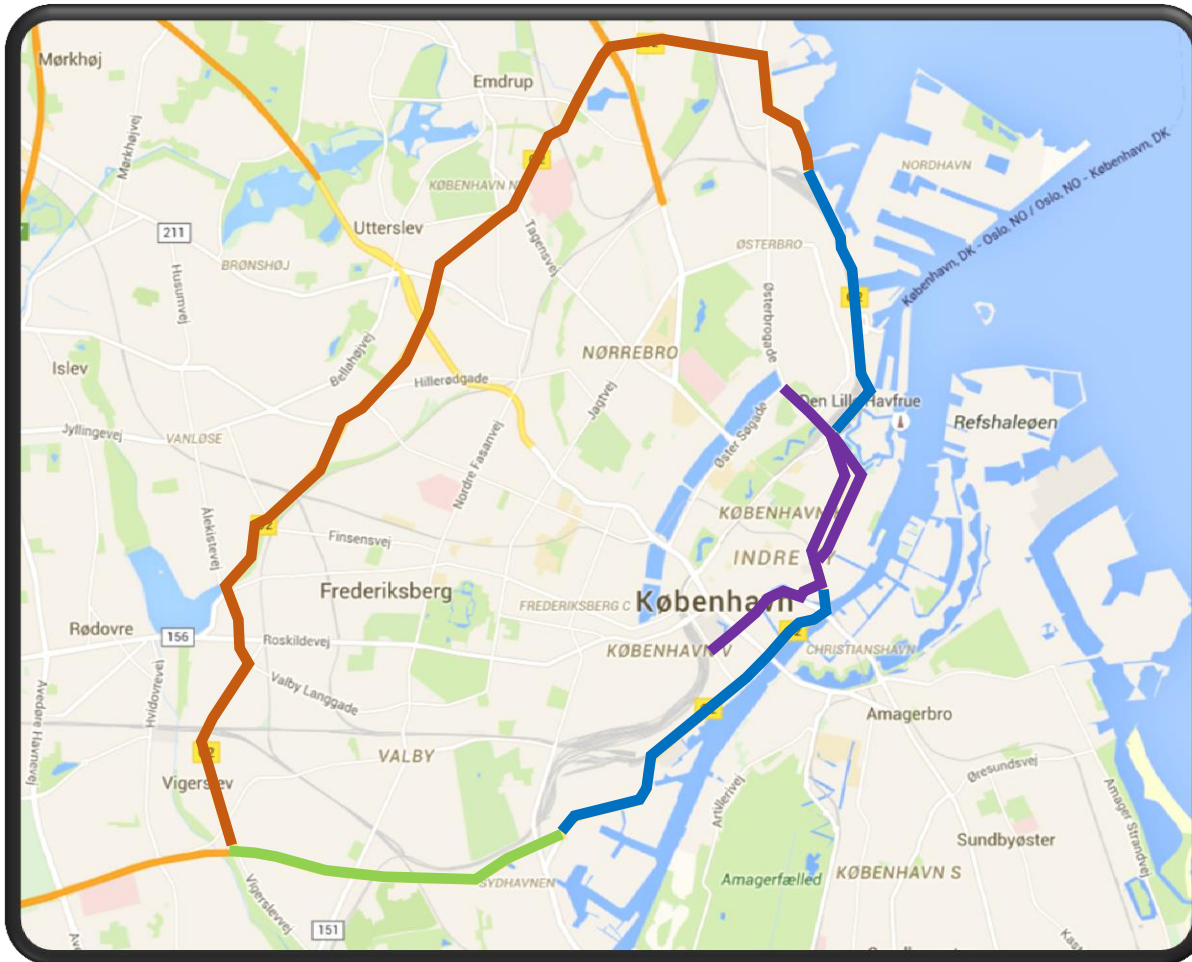


# Challenge 5

*“Roll out of C-ITS to surrounding municipalities is difficult”*



# Future Plans



**Compass4D (2013-2016)**  
 21 RSU  
 G5  
 EEIS/RHW  
 106 Buses/Trucks

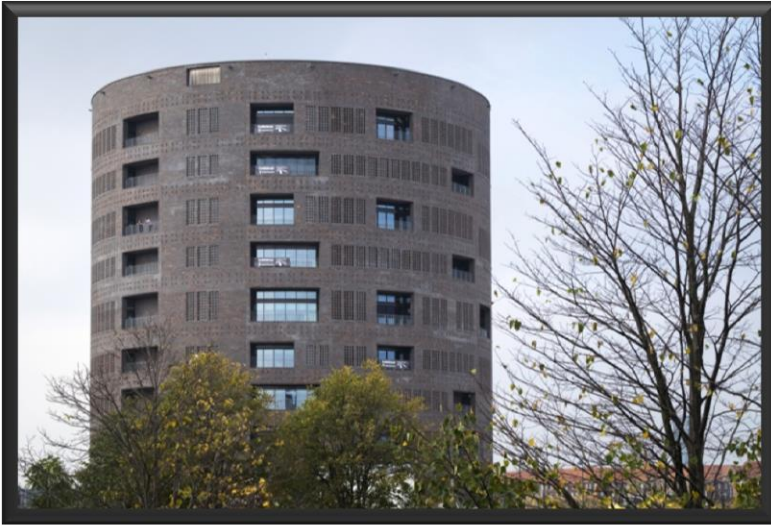
**Folehaven (2014)**  
 12 RSU  
 G5  
 EEIS  
 20 Trucks

**Ring Road East (2016-2017)**  
 16 RSU  
 G5/3G  
 EEIS  
 30 Trucks + app

**Ring Road West (2017-2018?)**  
 26 RSU  
 G5/3G  
 EEIS  
 ??



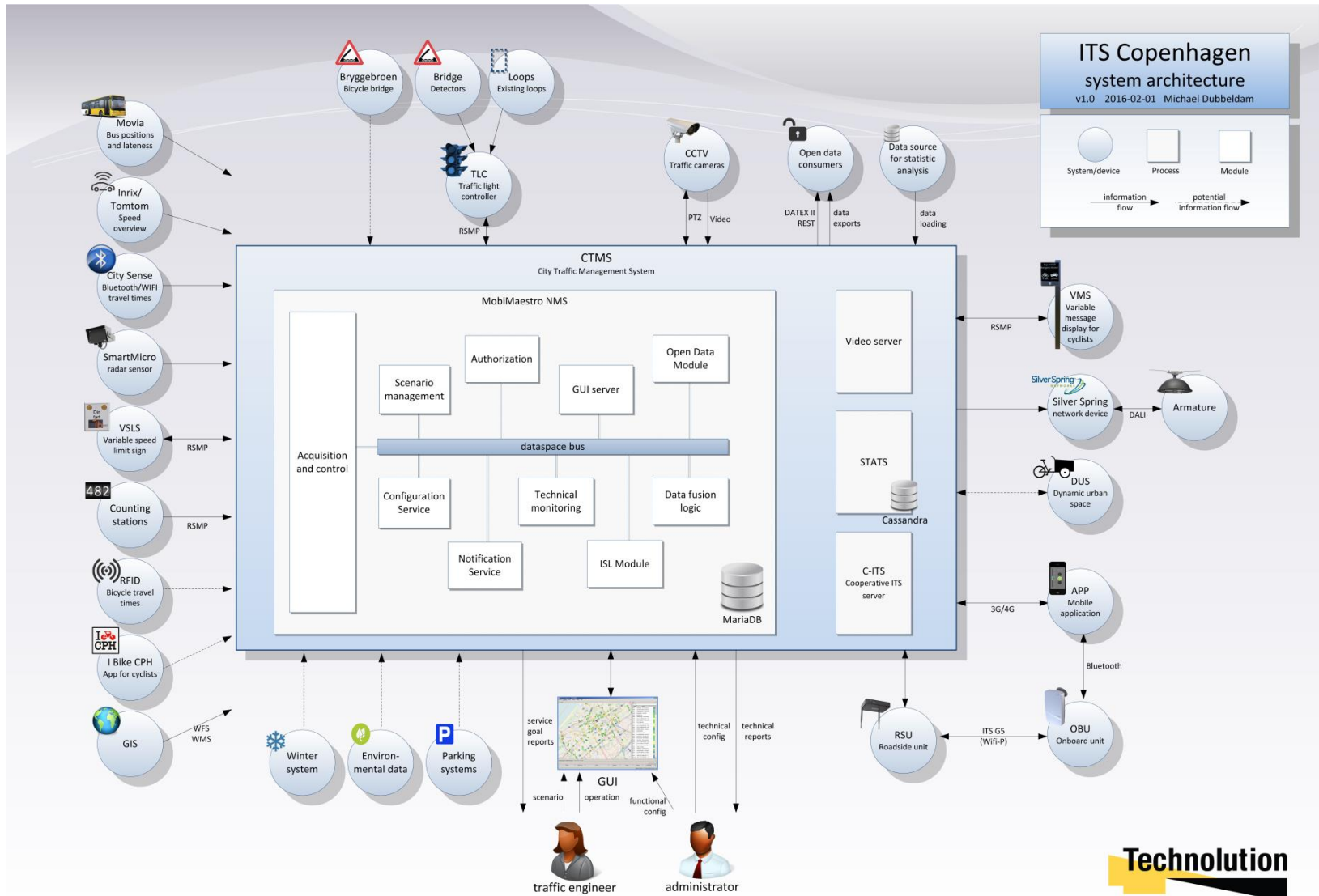
# Traffic Management Center



- Cooperation between state and city
- Shared strategy, goals and vision
- Interactive traffic management and traffic information

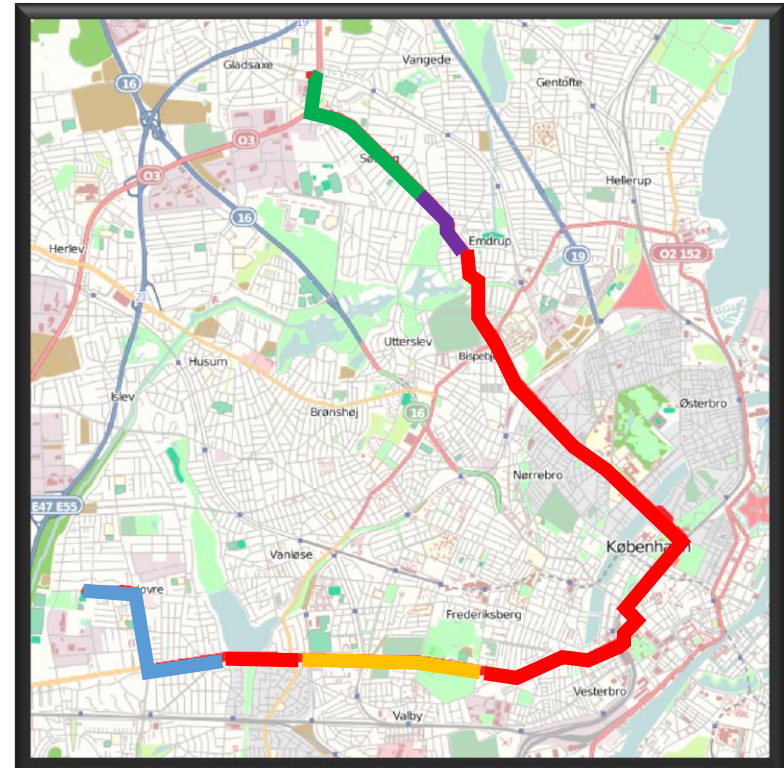


# CTMS



# Bus Line 6A

- Cooperation between 5 cities
- Interoperability between different systems
- Cooperative traffic management of one specific bus line





# ITS WORLD CONGRESS COPENHAGEN 2018



# ITS World Congress 2018

Open Meeting 15 & 19 September,  
Bella Center, 14:00-16:00  
Copenhagen

Contact Person: Charlotte Vernegren Christensen

Mobil: +45 2363 8317, Email: [cx7b@tmf.kk.dk](mailto:cx7b@tmf.kk.dk)





# ITS World Congress 2018

## Participation:

3,500 expected delegates

10,000 expected visitors at the exhibition area

## Program:

Strong program that presents best practice, research results, enhance the share of knowledge, exchange of view points and information

## Exhibition:

15.000 m<sup>2</sup> of expo with approx. 300 exhibitors

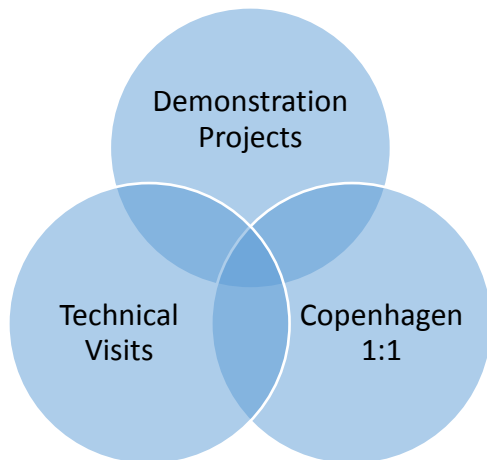


# "Quality of Life"

## Themes:

- Cross-border ITS solutions
- Co-modality
- Freight and logistics
- Automation
- Intelligent Green Mobility

## Show cases:







**Thank you for your attention!**