THE WAY TOWARDS AUTONOMOUS DRIVING

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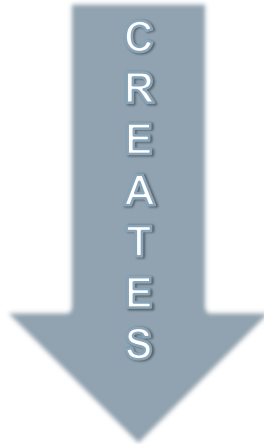
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Mega Cities

Global Growth

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From 1 billions cars today to 2-4 billion cars in our lifetime

The need for smarter vehicles which are
- Safer
- More efficient

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MOTIVATION TO DEVELOP AUTOMATED FUNCTIONS II

- Driver is the weak point
- Fatalities:
  - 38% caused by mental factors (sleep, drowsiness, medical)
  - 46% caused by misjudgement (safety distance, speed, weather, lane keeping, stationary objects)

Source: Auto Motor Sport 19, May 2010
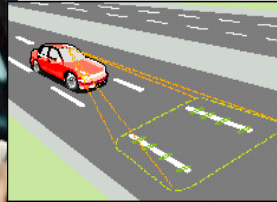
FORD FOCUS AVAILABLE DRIVER ASSISTANCE SYSTEMS

Blind Spot Information System

Low Speed Safety System

Driver Alert

Lane Keeping Aid

Active Park Assist / Parallel Parking

Lane Departure Warning

Traffic Sign Recognition

Power Child Locks

All Seat Beltminder Display

Adaptive Cruise Control

Auto High Beam

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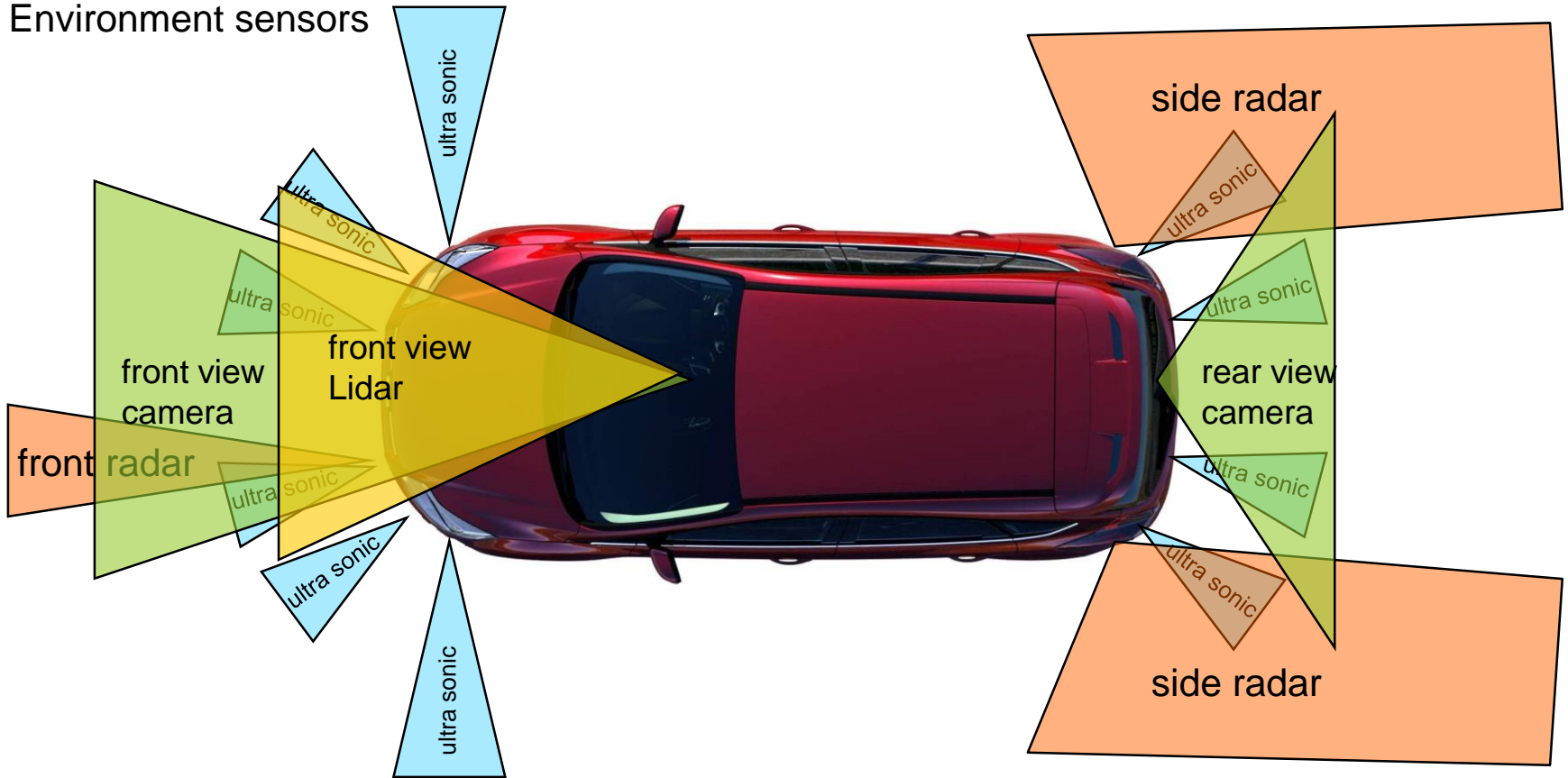
Vehicle state sensors (e.g. wheel speeds, yaw rate)

Driver input sensors (e.g. steering wheel angle, brake & accelerator pedal, switches)

Environment sensors

AUTOMATED DRIVING DEVELOPMENT – CRUISE CONTROL

Cruise Control

- Keep vehicle speed constant

ACC (Adaptive Cruise Control)

- Maintains constant distance to vehicles in front

ACC stop & go / full speed ACC

- Stops until stand still
- Automatically starts driving again

Traffic Jam Assist

- Automated steering control to stay in the current lane (until 50 km/h)
- The driver permanently monitors the system

Automated high-way driving

possible today

in future
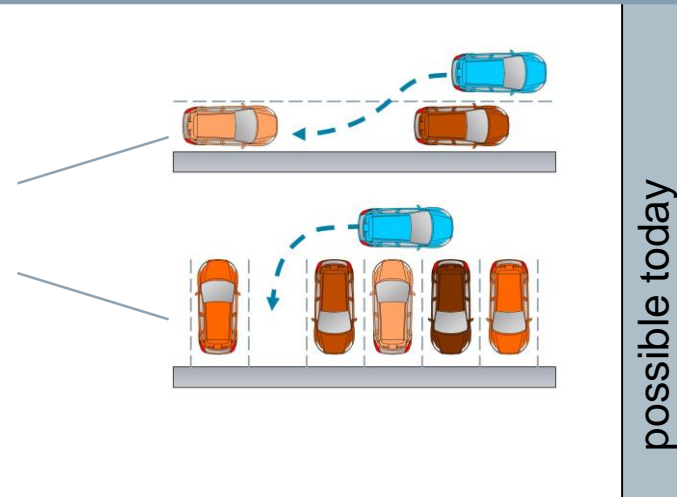
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AUTOMATED DRIVING DEVELOPMENT – PARKING

Ultra-sonic parking sensors

- Warns the driver for obstacles

Semi-automatic parallel parking

Semi-automatic perpendicular parking

- Steering control
- The driver controls the speed of the car via accelerator and brake pedals

possible today

Automatic parallel parking

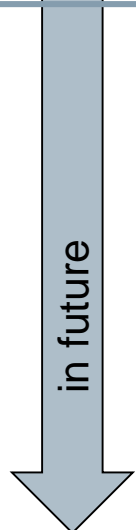- Steering, brake and throttle control

Smart phone parking

- Driver monitors vehicle from the outside during the parking manoeuvre

Automatic valet parking

- Driver does not monitor the vehicle during the parking manoeuvre
- Separated parking deck without pedestrians required

in future

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FORD'S STRATEGIES FOR AUTOMATED DRIVING RESEARCH
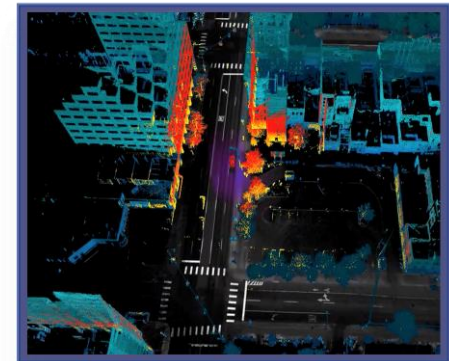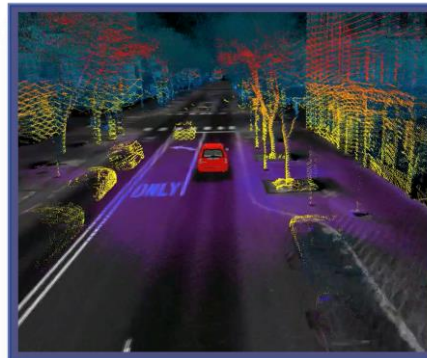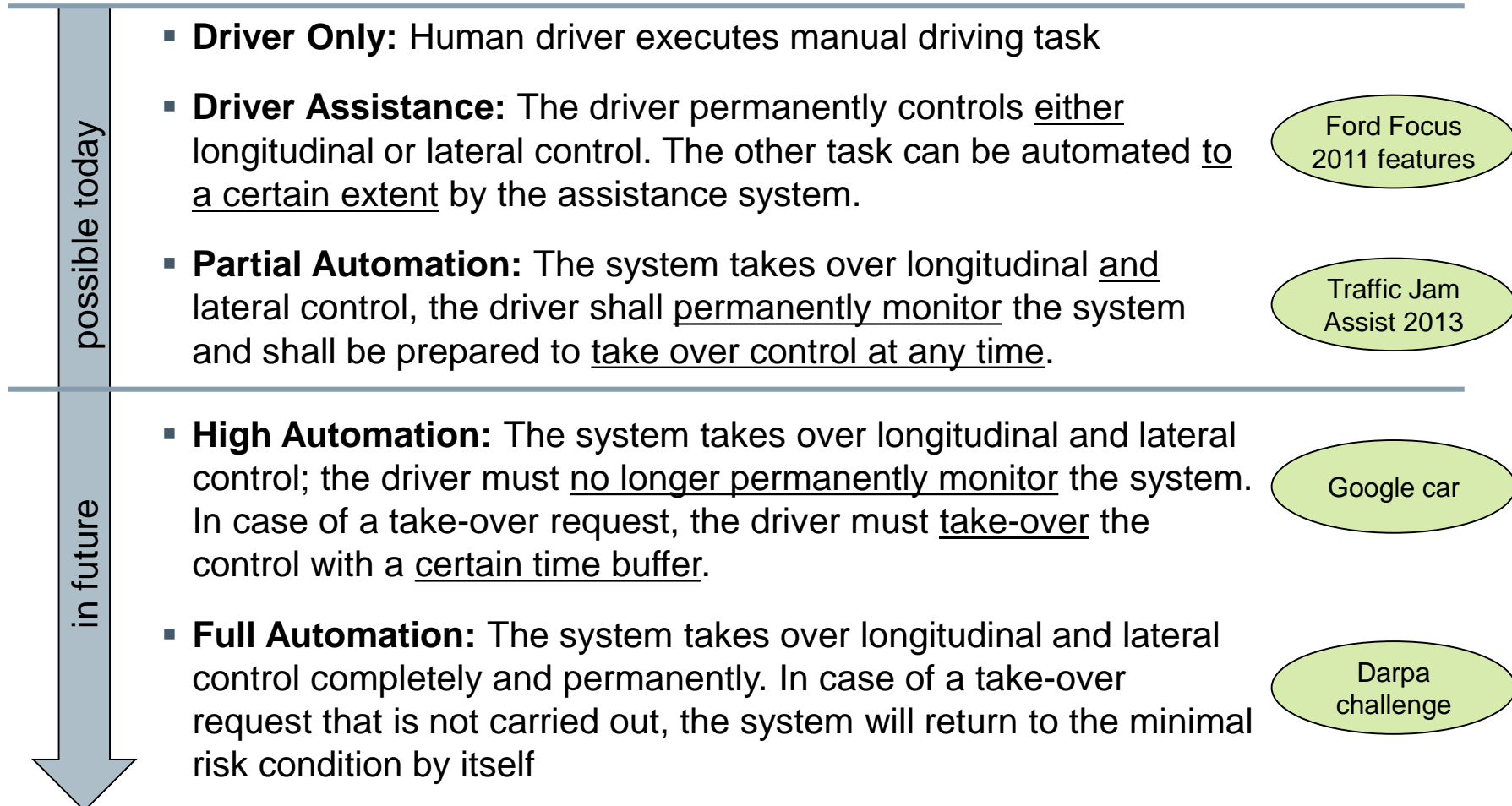
- **Building Block**
  - Involves working with our current production suppliers to enhance and combine the existing sensors and algorithms to create new, more capable automated driving features

- **Top-Down**
  - Involves creating a state-of-the-art Automated Driving platform to do leading edge research on what is possible in the absence of near-term production constraints

VEHICLE AUTOMATISATION CLASSIFICATION

possible today

- **Driver Only:** Human driver executes manual driving task

- **Driver Assistance:** The driver permanently controls <u>either</u> longitudinal or lateral control. The other task can be automated <u>to a certain extent</u> by the assistance system.

  Ford Focus 2011 features

- **Partial Automation:** The system takes over longitudinal <u>and</u> lateral control, the driver shall <u>permanently monitor</u> the system and shall be prepared to <u>take over control at any time</u>.

  Traffic Jam Assist 2013

in future

- **High Automation:** The system takes over longitudinal and lateral control; the driver must <u>no longer permanently monitor</u> the system. In case of a take-over request, the driver must <u>take-over</u> the control with a <u>certain time buffer</u>.

  Google car

- **Full Automation:** The system takes over longitudinal and lateral control completely and permanently. In case of a take-over request that is not carried out, the system will return to the minimal risk condition by itself

  Darpa challenge

Source: German Federal Highway Research Institute (BASt - Bundesanstalt für Straßenwesen)

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Ford was one of only 6 teams to have reached successive Finals of the event

Stopping, merging, and yielding across densely moving traffic

120m

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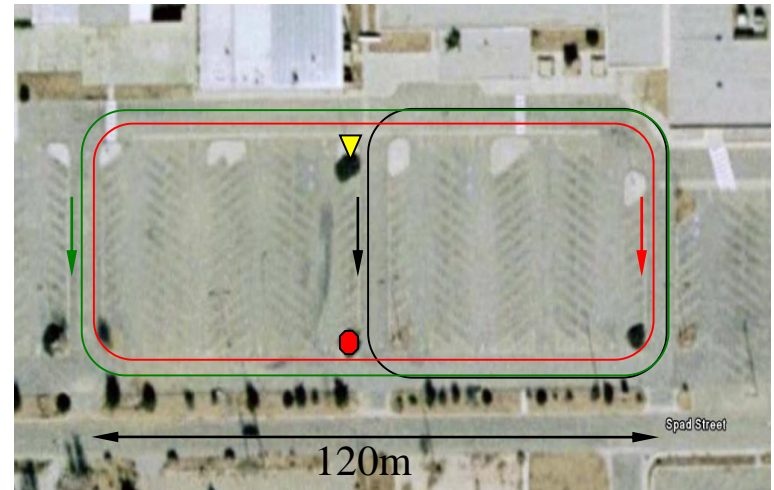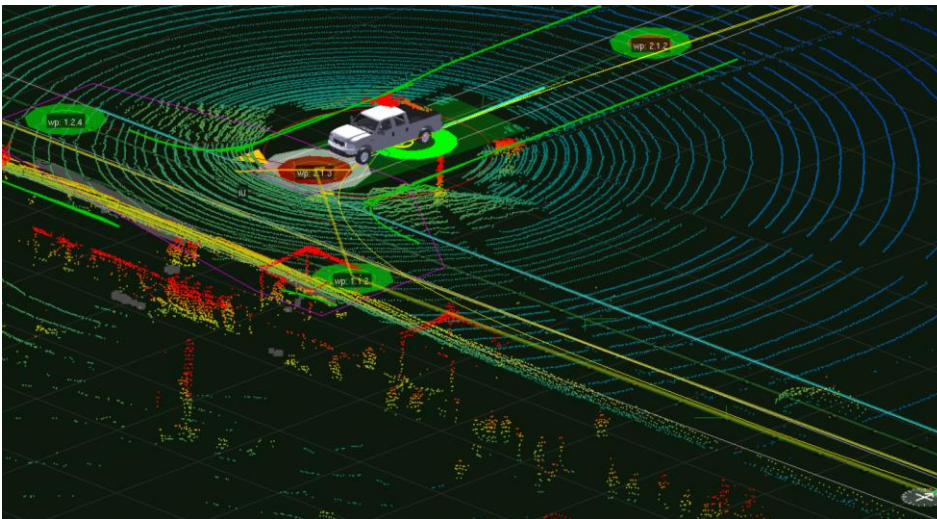
SUMMARY

- Active Safety & Driver Assistance systems will significantly reduce the number of traffic accidents, injuries and fatalities

- Ford strategy is to make this systems available through our complete vehicle line-up and all geographical regions

- The next generation systems will have increased automated driving capability and take over some of the driving tasks under controlled condition

- Full vehicle automation is still in the research phase and the speed at which solutions take hold will be determined largely by customer acceptance of new technologies and how quickly cities develop enabling systems and infrastructure

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Q & A

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