



Z E N U I T Y

Shape the
FUTURE
of **DRIVING**

Autonomous Drive – why?

Our current road transportation system is not sustainable!

Urbanisation => growing mega cities

Air pollution
Over use of fossil fuel
Self-driving cars are part of the solution!



Traffic accidents – almost always due to human errors



Desire for better use of our time



An autonomous car will not...

- ... fall asleep
- ... be distracted
- ... look in the wrong direction
- ... exceed speed limits
- ... get drunk

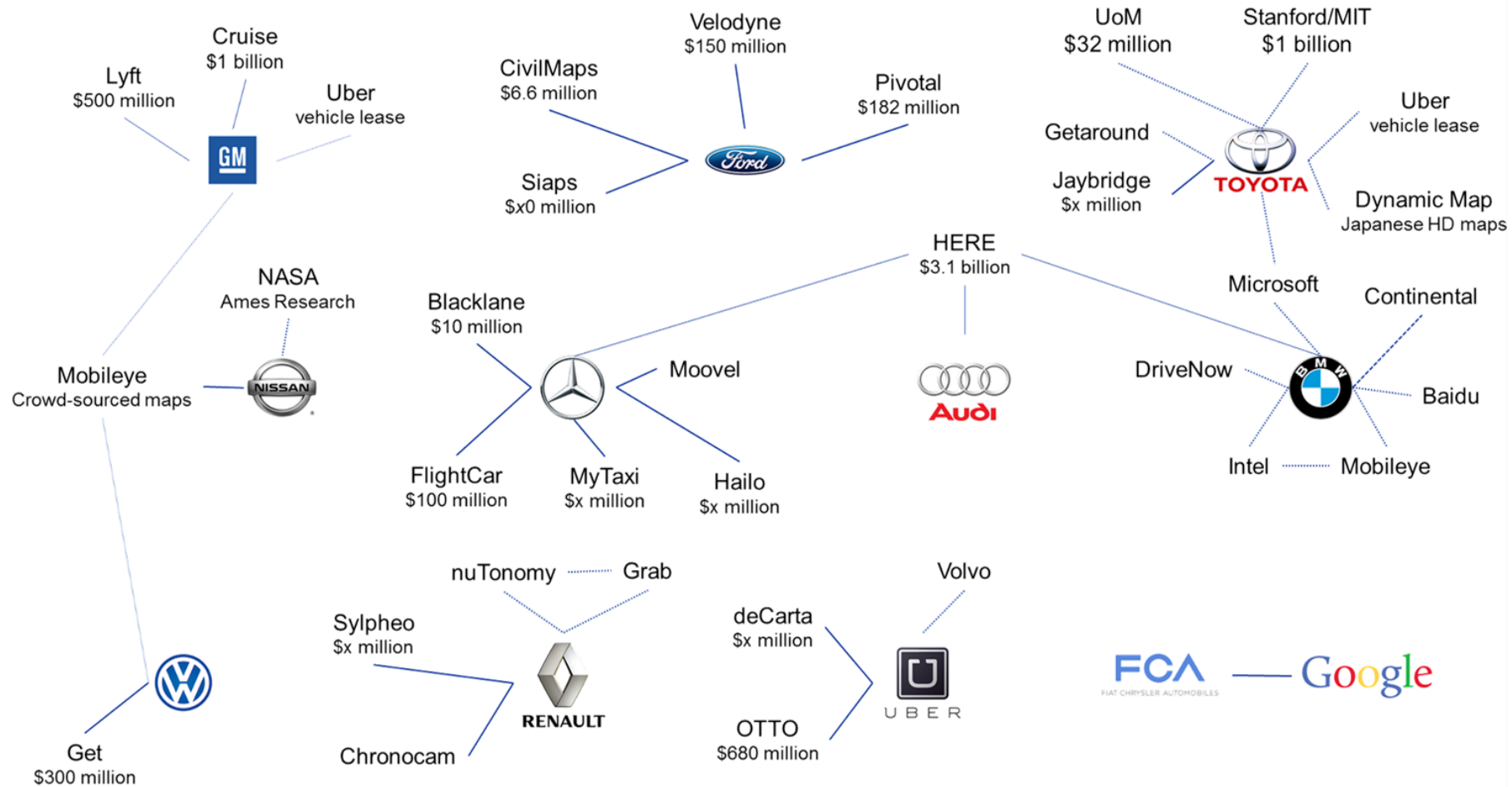
An autonomous car will...

- ... react much faster than a human
- ... be able to evaluate the situation 360° around the vehicle
- ... drive all night without getting tired
- ... optimise fuel consumption according to planned route

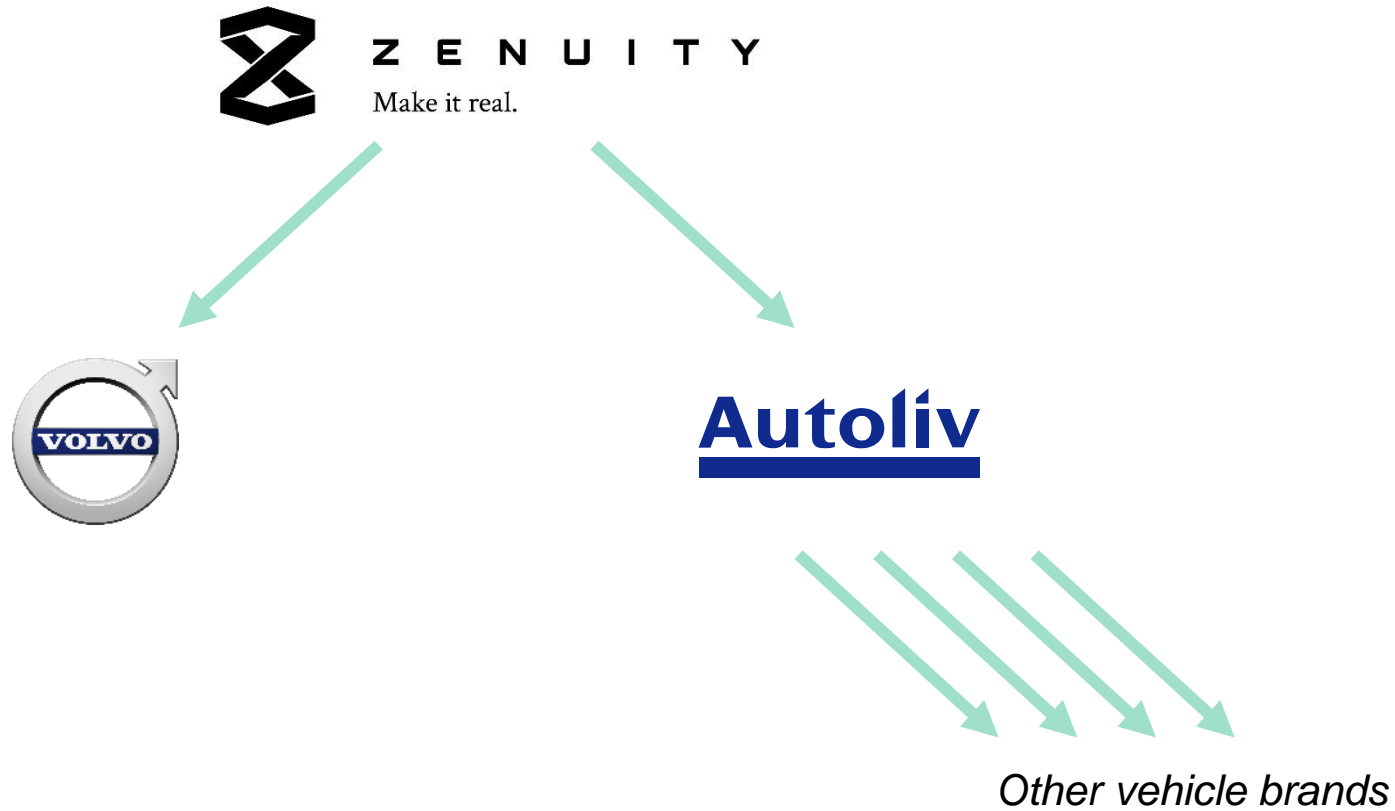
???

- How can we ensure that the Autonomous car can handle every situation?
- Who is legally responsible if a car hits a pedestrian which it did not detect?
- Will people trust the system?
- Will the authorities allow AD vehicles at all? What demands will they put on car makers?
- How can we protect a connected car fleet against terrorism?
- Will my kids have to get a drivers' license?

... and the industry is reshaping



Zenuity's way to market



Two customers, no exclusivity

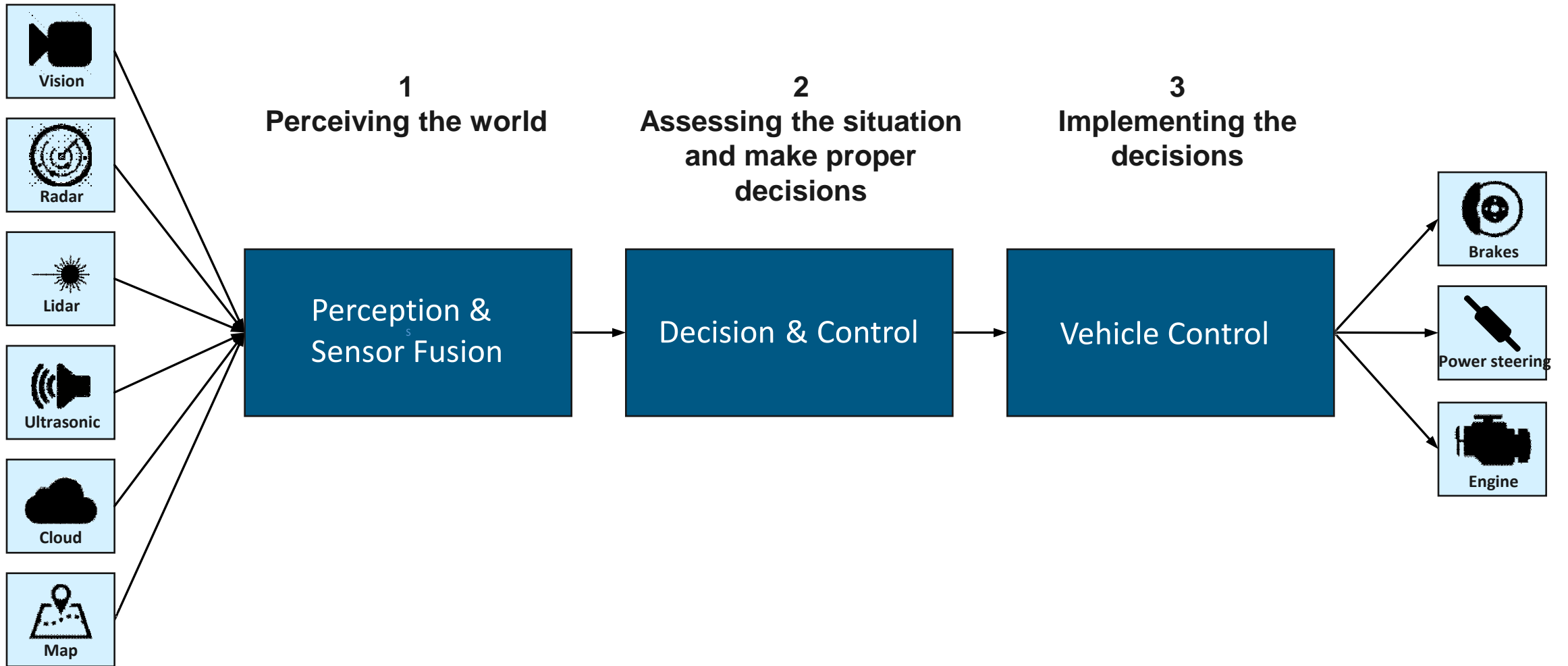
Autoliv markets, sells licenses and adapts to customers

Zenuity's Technology Scope

Software for Intelligent Vehicles

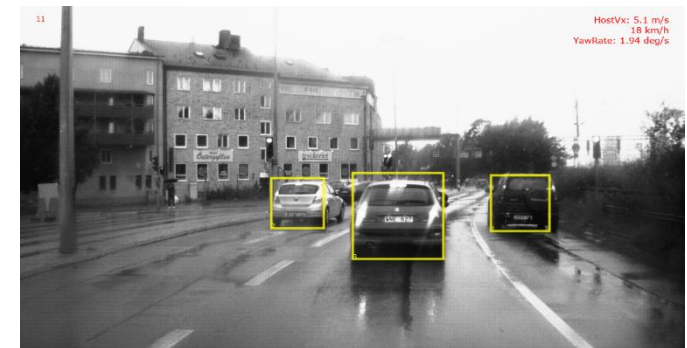
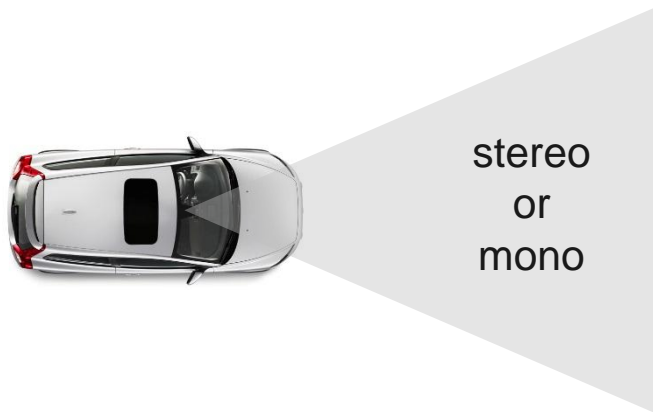
- Advanced Driver Assistance Systems – supervised automation (ADAS)
- Automated Driving Systems – unsupervised automation (AD)
- Cloud-based software for a vehicle fleet
- To potentially serve all car brands, our offer scales from low-cost to world-leading functionality

Basic system architecture



Perception - Computer Vision

Today

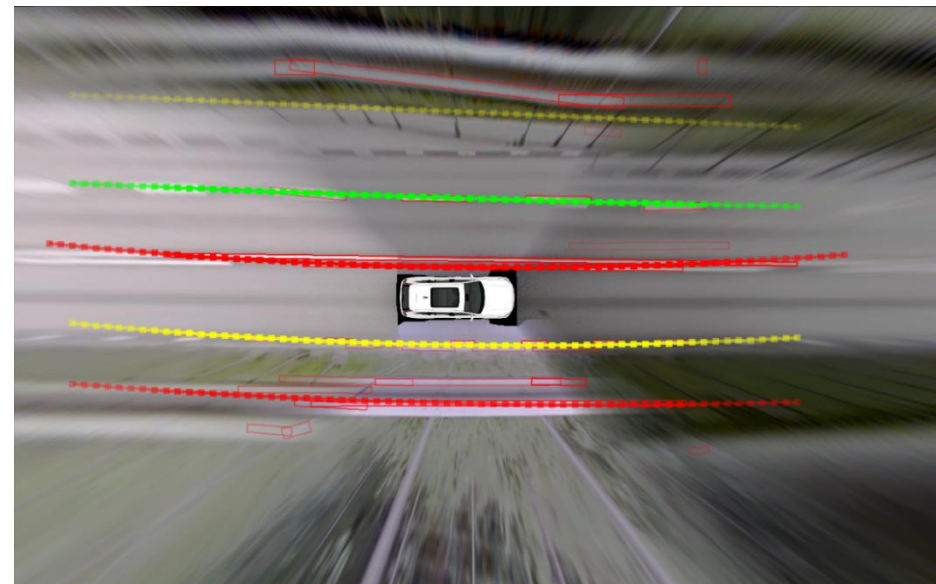


Perception - Computer Vision

Tomorrow



multi-camera



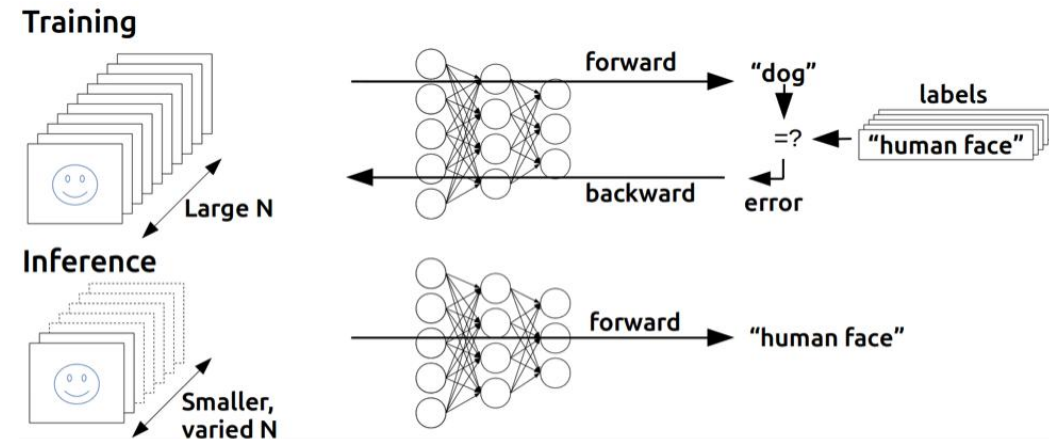
Perception – Deep Learning

Tomorrow

There has been a rapid development of Deep Learning the last 5-10 years due to:

- Innovations that led to more effective training methods
- More available training data
- Increased processing power has reduced training time

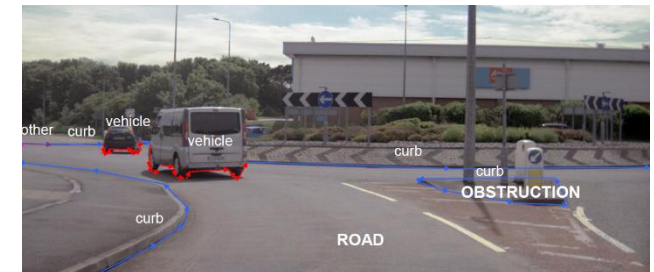
- Repeat
1. Feed data through the network
 2. Calculate difference between the network's output and ground truth
 3. Change the network's parameters using the back-propagation algorithm
 4. Check the network's ability to generalize on test data



The Data Factory

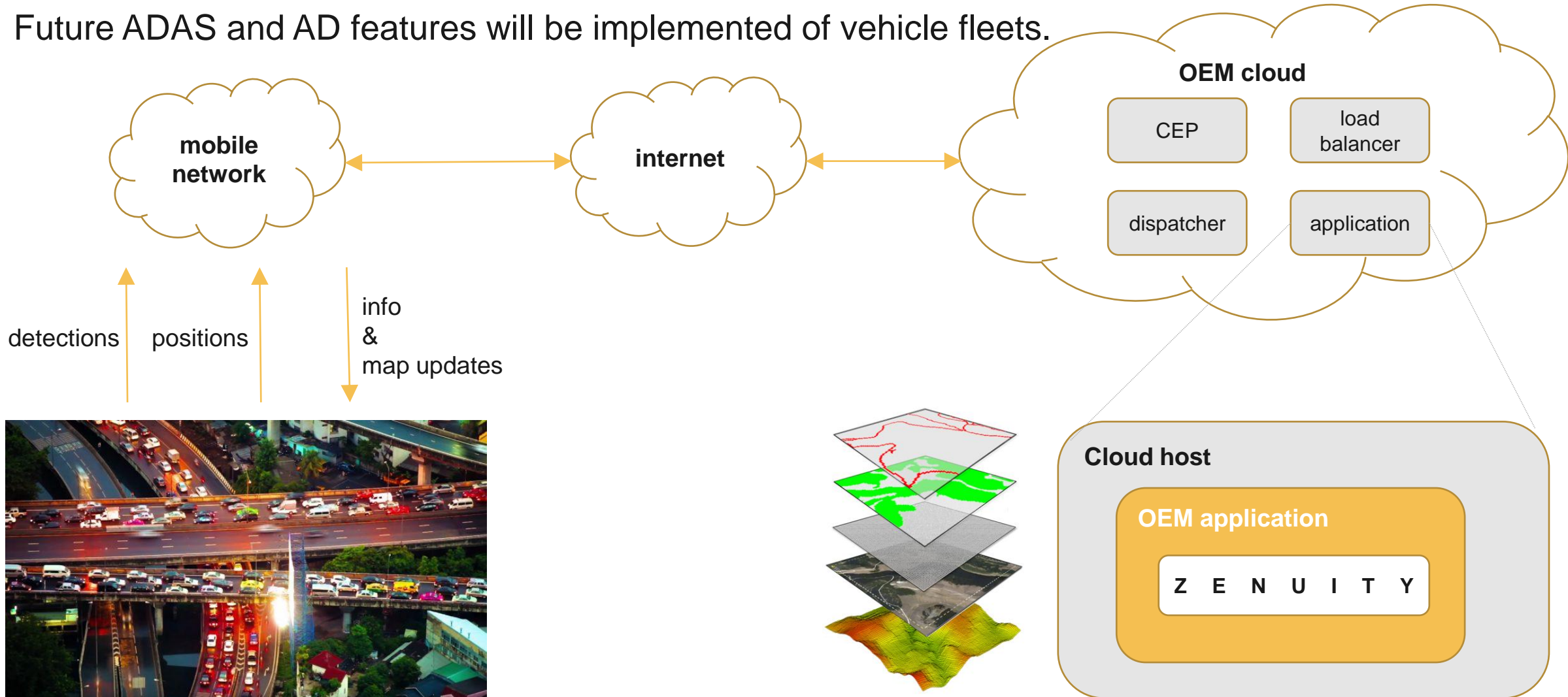
Creating an efficient data factory is a key to success

- Collect data large amounts of training and test data
- Annotate semi-automatically
- Pixel-based (expensive) vs region-based
- Artificial training data.



Feature – Cloud-based software

Future ADAS and AD features will be implemented of vehicle fleets.



Feature - Collision Avoidance

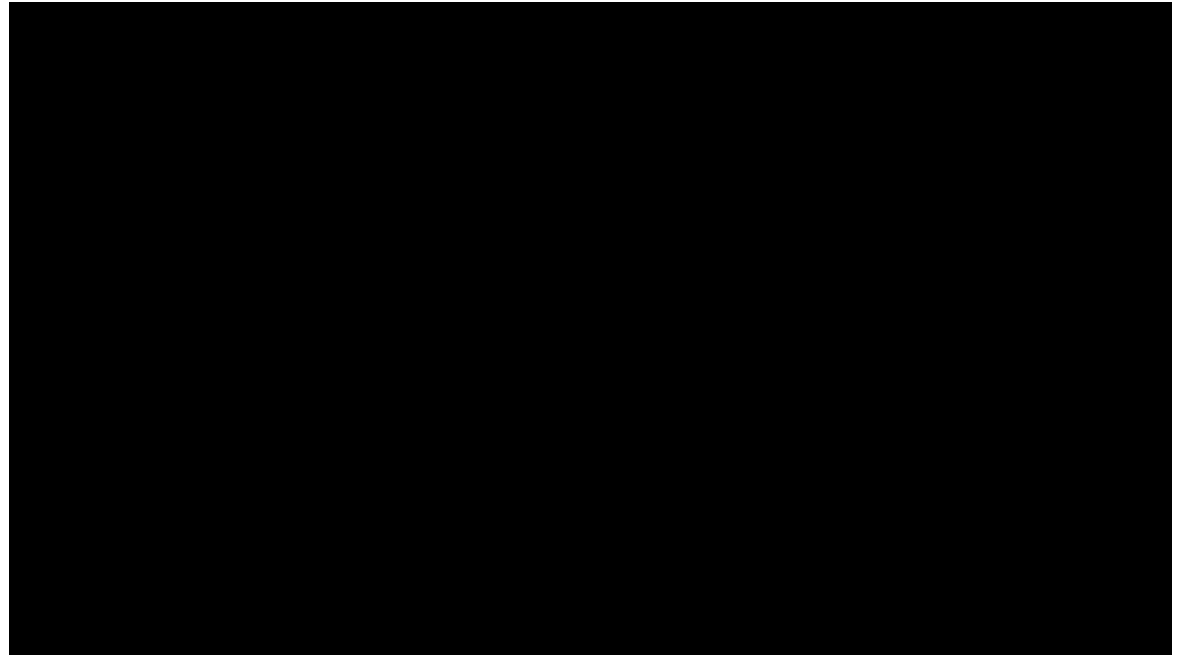


Help the driver to avoid any type of collision, by warning and interventions

Automatic Emergency Braking saves lives every day!

There is still a huge potential to improve:

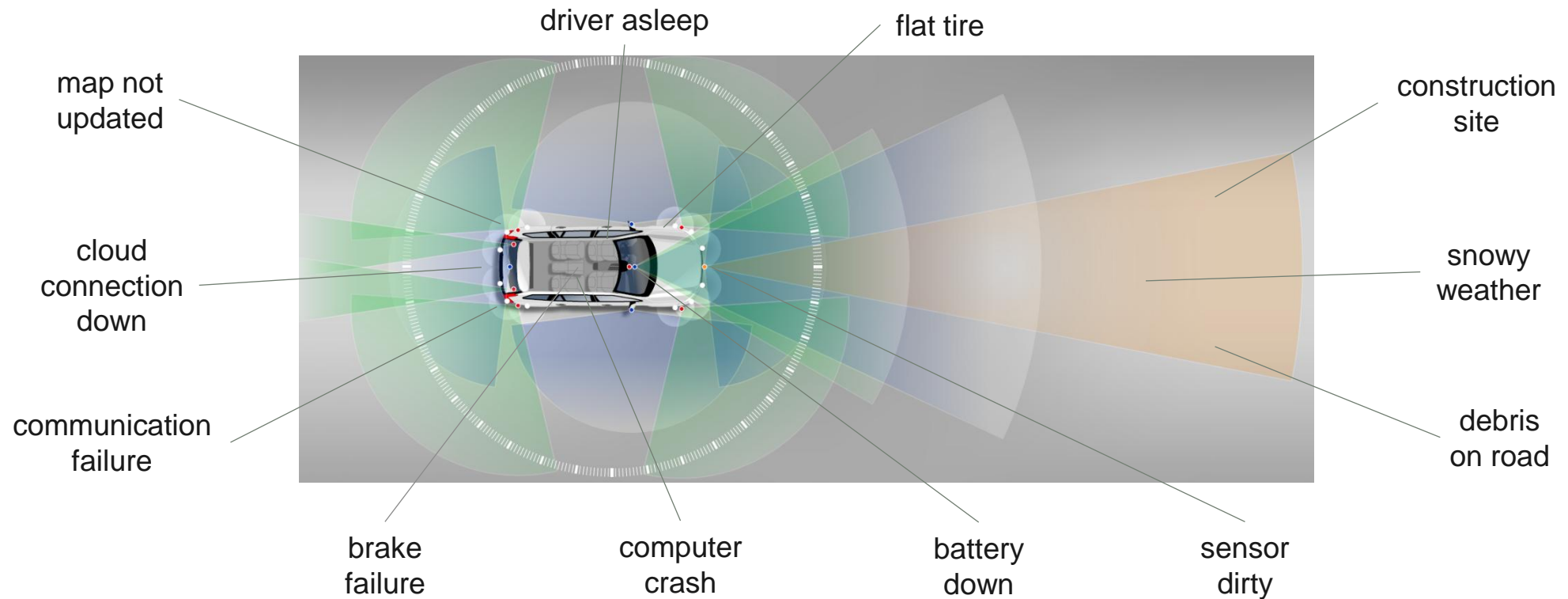
- More scenarios
- Stronger interventions, including steering.
- Driver adaptation



Feature - Autonomous Driving (AD)

Easy to demonstrate – challenging to make it real.

What if the unlikely happens and there is no test driver as a back-up?

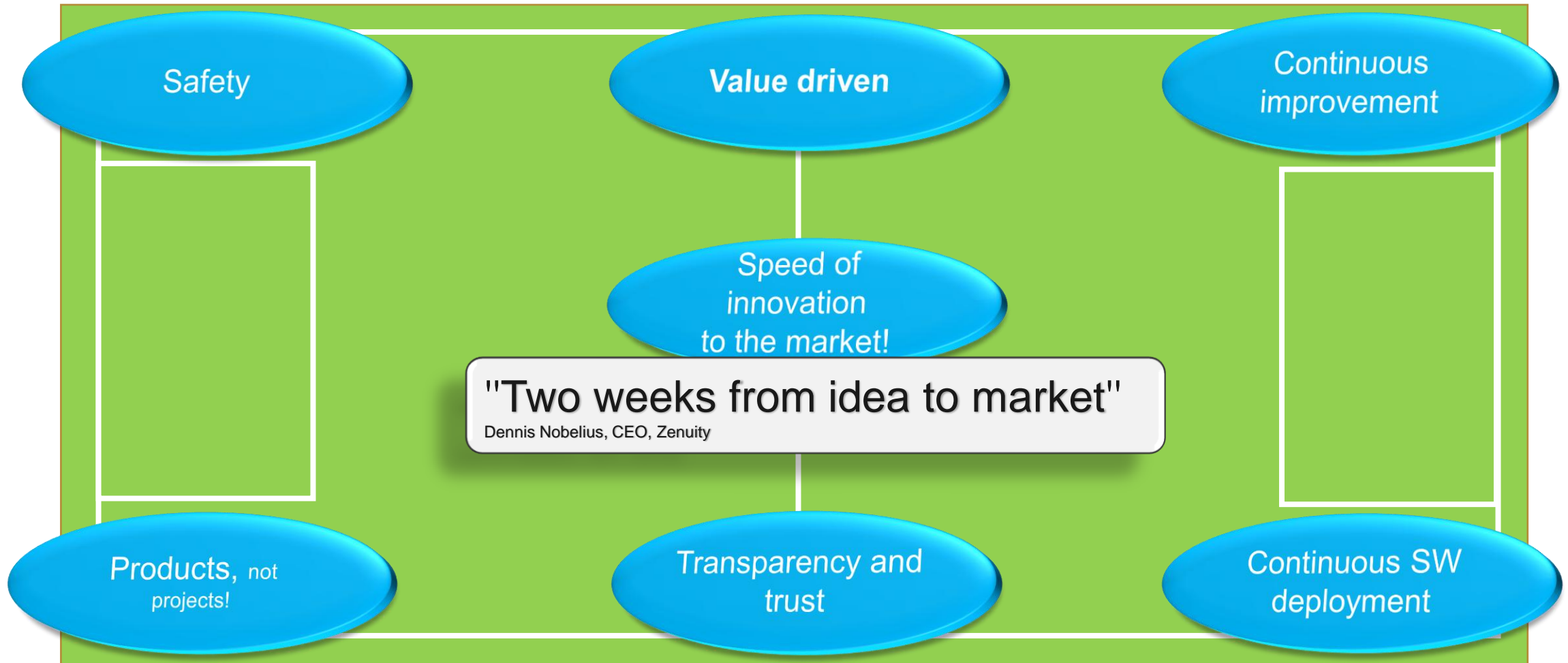


WAY OF WORKING AT ZENUITY

This description is:

- Intended as a wanted position description
- Continuously evaluated and adjusted
- General and non detailed, containing the most central roles and principles

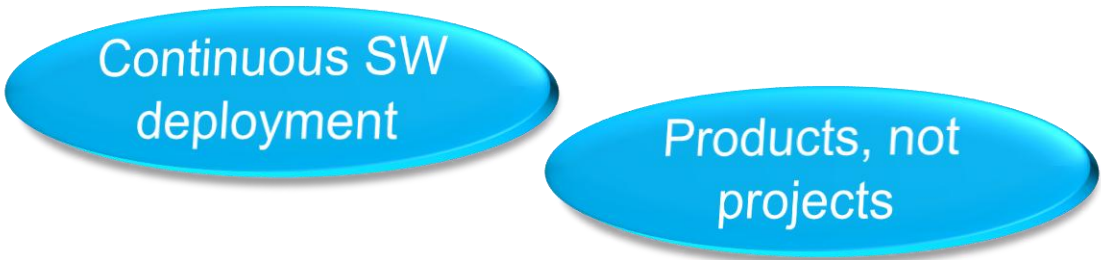
Zenuity agile "corner flags"



- Dynamic forecast process to focus investments and resources where needed
- The most value bringing initiatives are prioritized. Business case and ROI forecast are mandatory
- All employees must dare to prioritize the most value bringing activities with the available resources

Continuous inspection and adaptation of all activities in the company, helps us to build a company that improves and stays competitive today and tomorrow





Continuous SW
deployment

Products, not
projects

- Continuously deploy valuable, fully functional and safe product improvements to customers and end users
- => agile contracts, continuous product evolution in line with a dynamic roadmap instead of contractually binding fixed date and content
- => Our success depends on our ability to continuously add market leading value to our customers/end users and their trust in this ability

❖ Start



❖ Delivery

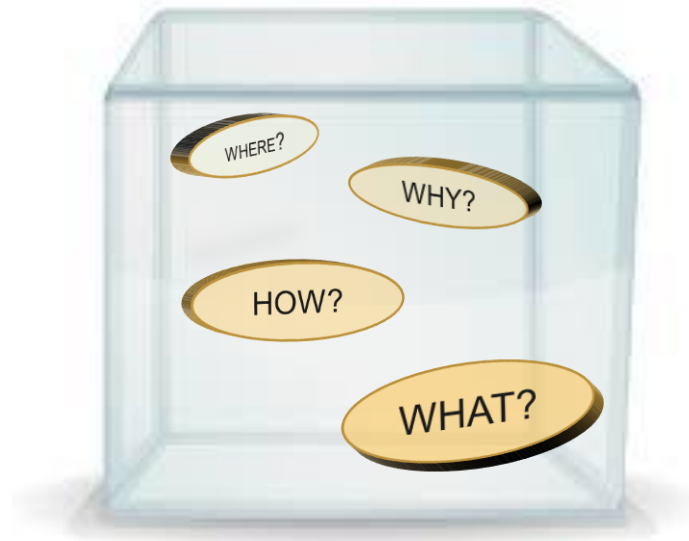
- Revenue far in future
- Slow user feedback
- Organized according to fixed scope → change is difficult and slow

VS

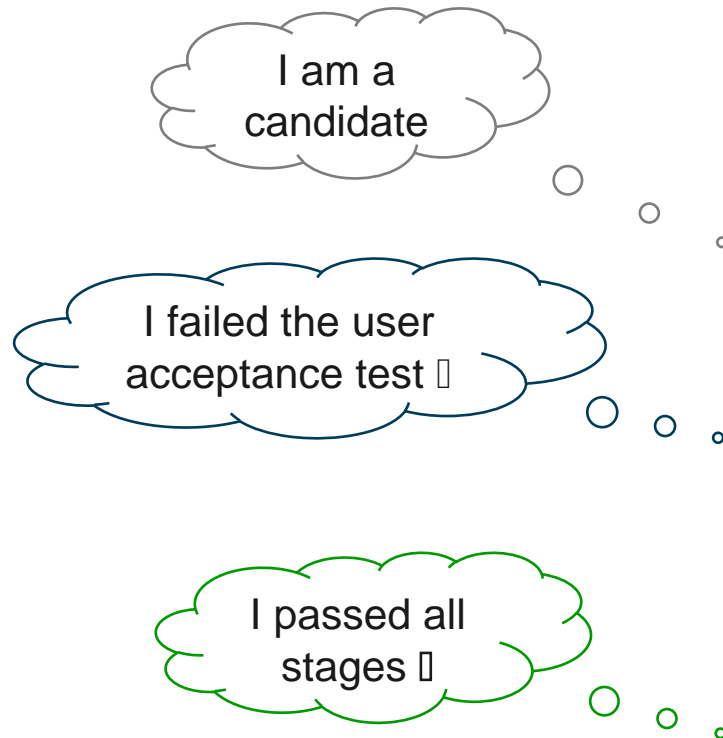


- Continuous revenue
- Continuous user feedback
- Organized for changes → changes are easy and quick

- Transparency is the enabler for trust, both internally and externally
- Base decisions on facts and data, not speculative assumptions
- We all need to have access to and understand the WHERE?, WHAT?, HOW? and WHY? to be able to prioritize our work (backlog transparency) and become increasingly empowered
- Status reports are based on actual measures of working products (demonstrations)



The deployment pipeline should be visible to everyone



Pipeline Activity - Cruise

https://demo.studios.thoughtworks.com/cruise/tab/pipeline/history/Demo

Most Visited - Getting Started Latest Headlines Firebug Lite Craftertopia Poha laminayulo2's favori Wilson & Alroy's Fiv ADP iPayStatements

Pipeline Activity in Trader

Trader	Commit	Acceptance	Performance	UAT	Prod
1.2.86 revision: 86 10 minutes ago by dfarley	✓	auto → ✓	auto → ✓	manual →	manual →
1.2.85 revision: 85 1 hour ago by jhumble	✓	auto → ✓	auto → ✓	manual → ✓	manual → ✓
1.2.84 revision: 84 2 hours ago by jhumble	✓	auto → ✓	auto → ✓	manual → ✗	manual →
Subversion - http://chistdcrsdmo01/svn/demo/trunk/ jhumble #14 Fix performance problem 84					
1.2.82 revision: 82 1 day ago by dfarley	✓	auto → ✓	auto → ✓	manual →	manual →
1.2.81 revision: 81 1 day ago by jhumble	✓	auto → ✓	auto → ✓	manual → ✓	manual → ✓
1.2.80 revision: 80 1 day ago by jhumble	✓	auto → ✗	auto →	manual →	manual →

demo.studios.thoughtworks.com

Zenuity focuses on "elevating people's lives by creating inspiring technology for **safe** and intelligent mobility"

- We develop products that **save** lives, but have the potential of harming people if not done right
- The functional safety work can not be a separate process, but needs to well integrated into our daily work



Current implementation

- Product Backlog
 - Cover work at all levels in the company
 - Continuously refined and re-prioritized
- Product Owners
 - Work towards several teams
 - Responsible for priority of backlog
 - Responsible for synchronization towards other teams
- ~30 teams
 - Cross-functional
 - Autonomous
 - 6-9 people

4P

- Purpose
- Procedures
- Performance indicators
- Principles

The 4P exercise should be performed:

- Every time a new team is established
- When the team is changing any of the Ps above

Biggest challenges

- Knowledge of agile methods and why we should use them
 - Internally
 - Our partners
- Common focus and priority
- Communication



Z E N U I T Y

Make it real.