RegTech: Promise, and Preconditions

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A New Wave of Regulatory Governance?

- **First wave: structural reforms (1970s-1980s)**
  - Privatizations, liberalizations: market-oriented reforms
- **Second wave: regulatory reform (1980s-1990s)**
  - Ex ante filters + “Less is more”
- **Third wave: regulatory governance/management (2000s)**
  - Policy cycle concept + importance of oversight
- **Fourth wave: re-designing government (2010s)**
  - Regulating technology, and regulating “with” technology
  - Experimental, adaptive regulation, design-based rules
  - Algorithmic and data-driven regulation
  - “The perfect technology of justice”?

Promising areas for RegTech

- **Regulation of algorithms**
  - EU P2B proposed regulation; algorithmic take-down (e.g. copyright, fake news)
- **Open API regulations**
  - EU PSD2 “Open banking” regulation
  - Mandatory or voluntary data-sharing (e.g. IDS, in-vehicle data sharing)
- **Algorithmic regulation/enforcement**
  - Predictive analytics (e.g. PredPol)
  - Co-regulatory solutions plus ex ante/ongoing monitoring
- **Experimental regulation**
  - Virtual sandboxes, virtual data spaces
- **Verification of compliance**
  - Trust-based systems, trustless systems coupled with zero-knowledge tools
- **“Zero red tape”**
  - From administrative burdens reduction to user-centric, “zero contact” administrative procedures

“Regulatory engineering”

- New screens
  - Openness/neutrality
  - Interoperability
  - Scalability
  - Contestability
  - Resilience
  - Enforceability
  - Input/throughput/output/outcome accountability
  - Trusted/trustless systems
- New experiments
  - RCTs
  - (Virtual) sandboxes
  - Ideation Sprints and rapid prototyping
  - Regulation via “extensions”
  - Algorithmic auditing and differential access to data
  - Co-regulatory schemes

Taxonomy of algorithmic approaches (Yeung 2017)

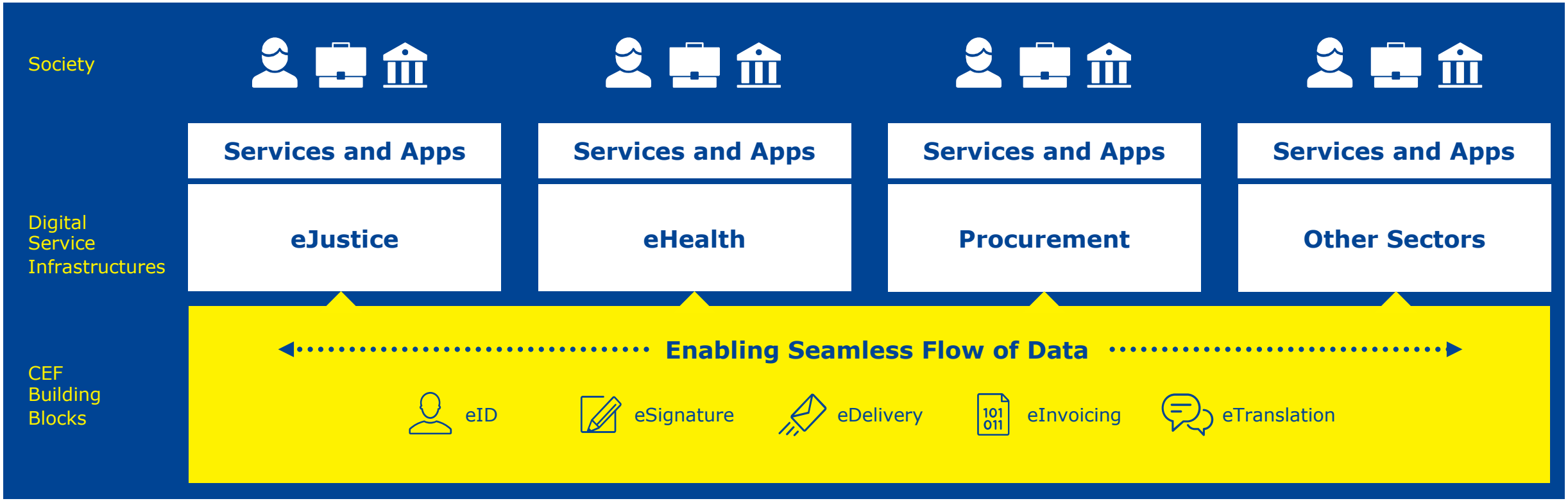
	Standard setting	Monitoring	Enforcement/ Sanction	Description
1.	Fixed	Real time reactive violation detection	Automated	Simple real-time sanction administration systems
2.	Fixed	Real time reactive violation detection	Recommender system	Simple real-time warning systems
3.	Fixed	Pre-emptive violation prediction	Automated	Simple pre-emptive sanction administration systems
4.	Fixed	Pre-emptive violation prediction	Recommender system	Simple predictive recommender system
5.	Adaptive	Real time reactive violation detection	Automated	Complex sanction administration systems
6.	Adaptive	Real time reactive violation detection	Recommender system	Complex real-time prioritization systems
7.	Adaptive	Pre-emptive violation prediction	Automated	Complex predictive sanctioning systems
8.	Adaptive	Pre-emptive violation prediction	Recommender system	Complex predictive recommender systems

Key preconditions

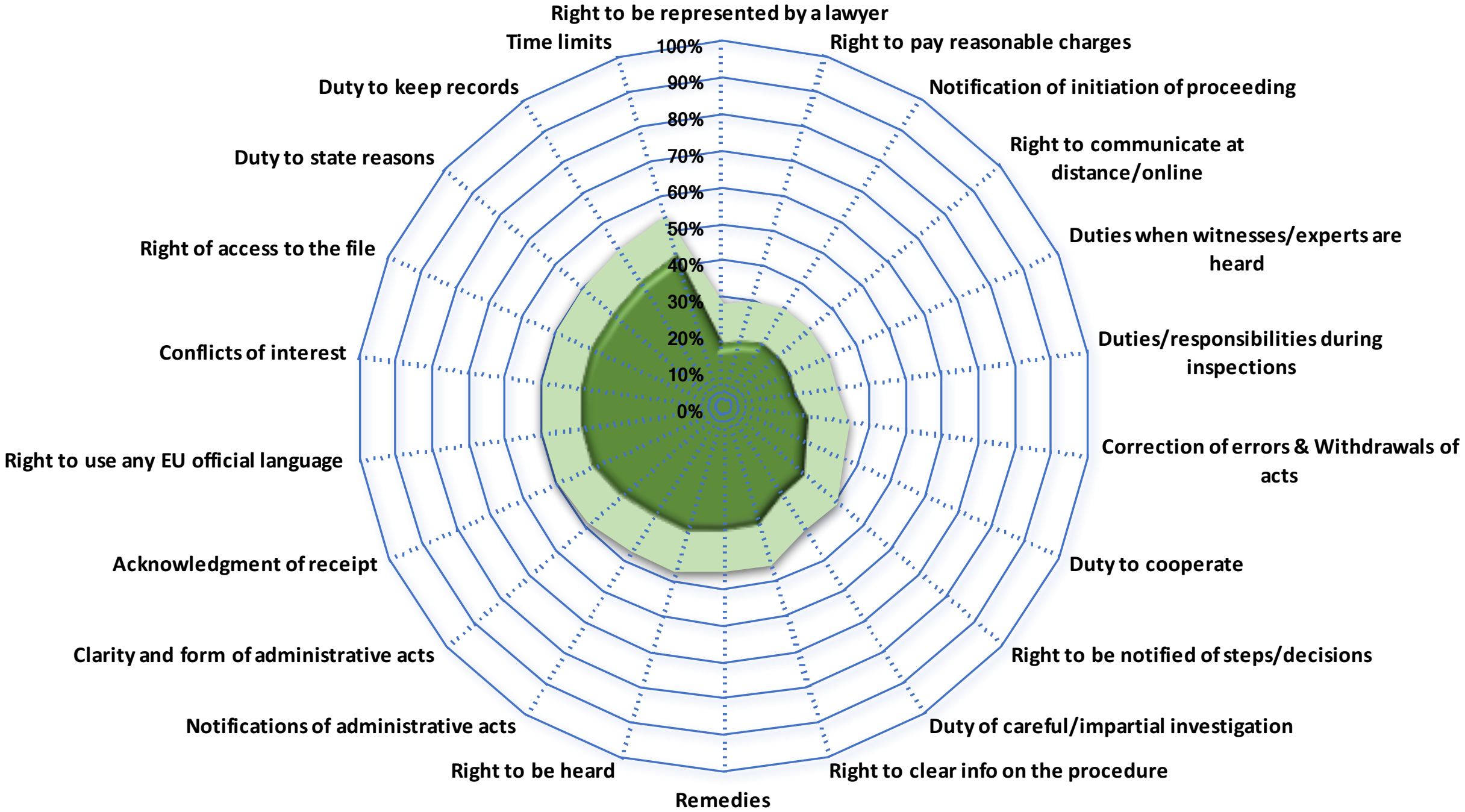
- Infrastructure
- Trust!
- Ethical rules and minimum legal standards for AI and blockchain
- Compatible procedures: technology is no solution for administrative chaos
- Legal interoperability: work on open standards and “federated” standards
- Technical interoperability: e.g. forthcoming EU blockchain platform
- Understanding of layered architectures
- Skills in government

Example: EU ISA^2

EU’s transition towards smart government



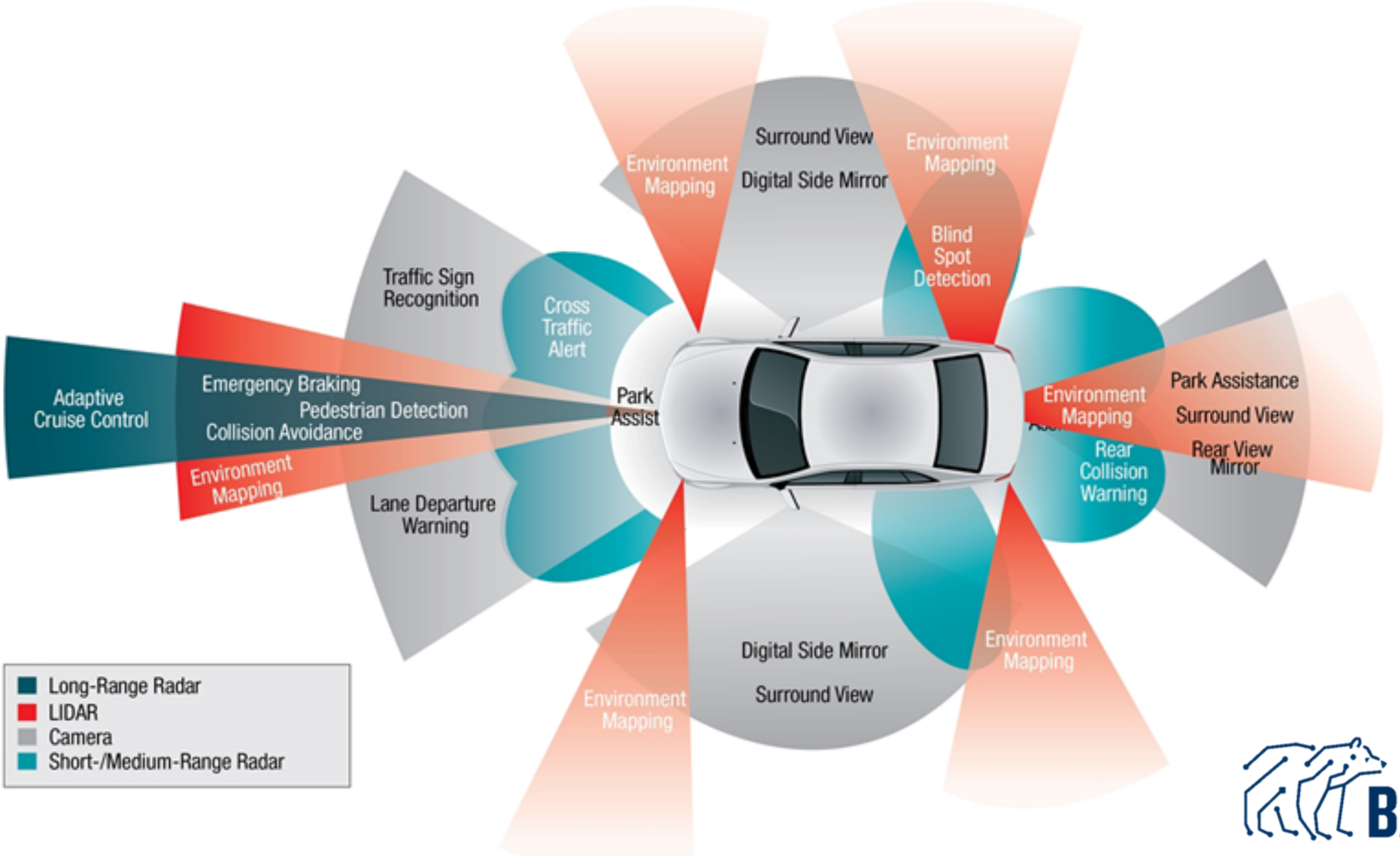
Source: European Commission, DG DIGIT (2018)



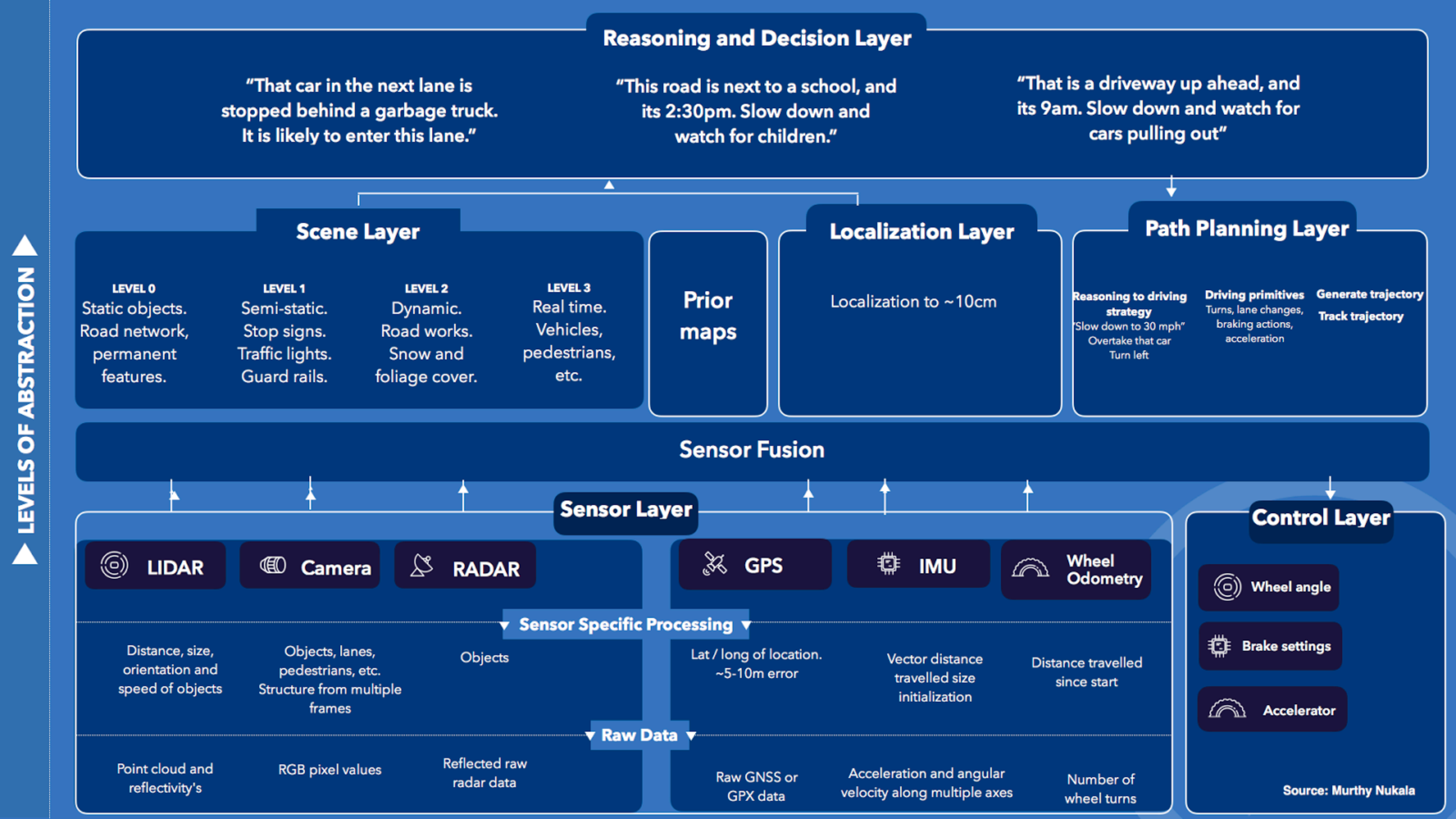
Number of institutions = 65 (all institutions)

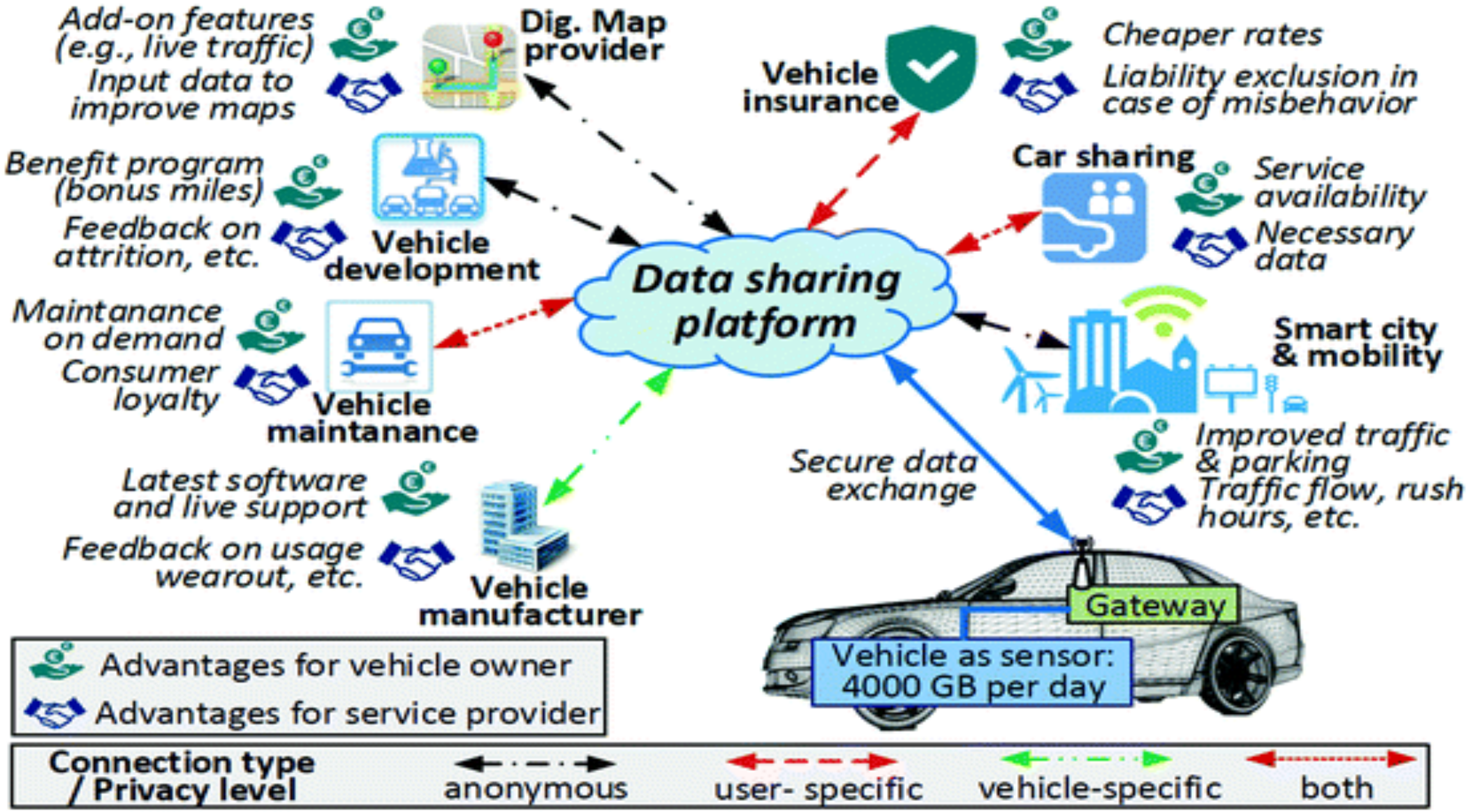
Source: Renda et al. (2018)

Example: automated driving


Environment Mapping
Surround View
Digital Side Mirror
Environment Mapping
Blind Spot Detection
Traffic Sign Recognition
Cross Traffic Alert
Adaptive Cruise Control
Emergency Braking
Pedestrian Detection
Collision Avoidance
Environment Mapping
Park Assist
Lane Departure Warning
Environment Mapping
Rear Collision Warning
Park Assistance
Surround View
Rear View Mirror
Environment Mapping
Digital Side Mirror
Surround View
Environment Mapping
Long-Range Radar
LIDAR
Camera
Short-/Medium-Range Radar

BAIR


LEVELS OF ABSTRACTION
Reasoning and Decision Layer
"That car in the next lane is stopped behind a garbage truck. It is likely to enter this lane."
"This road is next to a school, and its 2:30pm. Slow down and watch for children."
"That is a driveway up ahead, and its 9am. Slow down and watch for cars pulling out"
Scene Layer
LEVEL 0
Static objects. Road network, permanent features.
LEVEL 1
Semi-static. Stop signs. Traffic lights. Guard rails.
LEVEL 2
Dynamic. Road works. Snow and foliage cover.
LEVEL 3
Real time. Vehicles, pedestrians, etc.
Prior maps
Localization Layer
Localization to ~10cm
Path Planning Layer
Reasoning to driving strategy
"Slow down to 30 mph"
Overtake that car
Turn left
Driving primitives
Turns, lane changes, braking actions, acceleration
Generate trajectory
Track trajectory
Sensor Fusion
Sensor Layer
LIDAR
Camera
RADAR
GPS
IMU
Wheel Odometry
Sensor Specific Processing
Distance, size, orientation and speed of objects
Objects, lanes, pedestrians, etc. Structure from multiple frames
Objects
Lat / long of location. ~5-10m error
Vector distance travelled size initialization
Distance travelled since start
Raw Data
Point cloud and reflectivity's
RGB pixel values
Reflected raw radar data
Raw GNSS or GPX data
Acceleration and angular velocity along multiple axes
Number of wheel turns
Control Layer
Wheel angle
Brake settings
Accelerator
Source: Murthy Nukala



Source: Kaiser et al. (2018)


Thank you!