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The robots are coming - technical and societal aspects of autonomous vehicles

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Disclaimer:
- Every statement is my own opinion only
- No statement has anything to do with products or services of my employer

Overview

- The (allegedly) irresistible rise of autonomous, connected, electric mobility
- The challenges
- Some probable Scenarios
  - Who will profit?
  - Who displaces whom?
- How will all these changes be financed?

The CASE Buzz-word

The alleged future of all traffic:

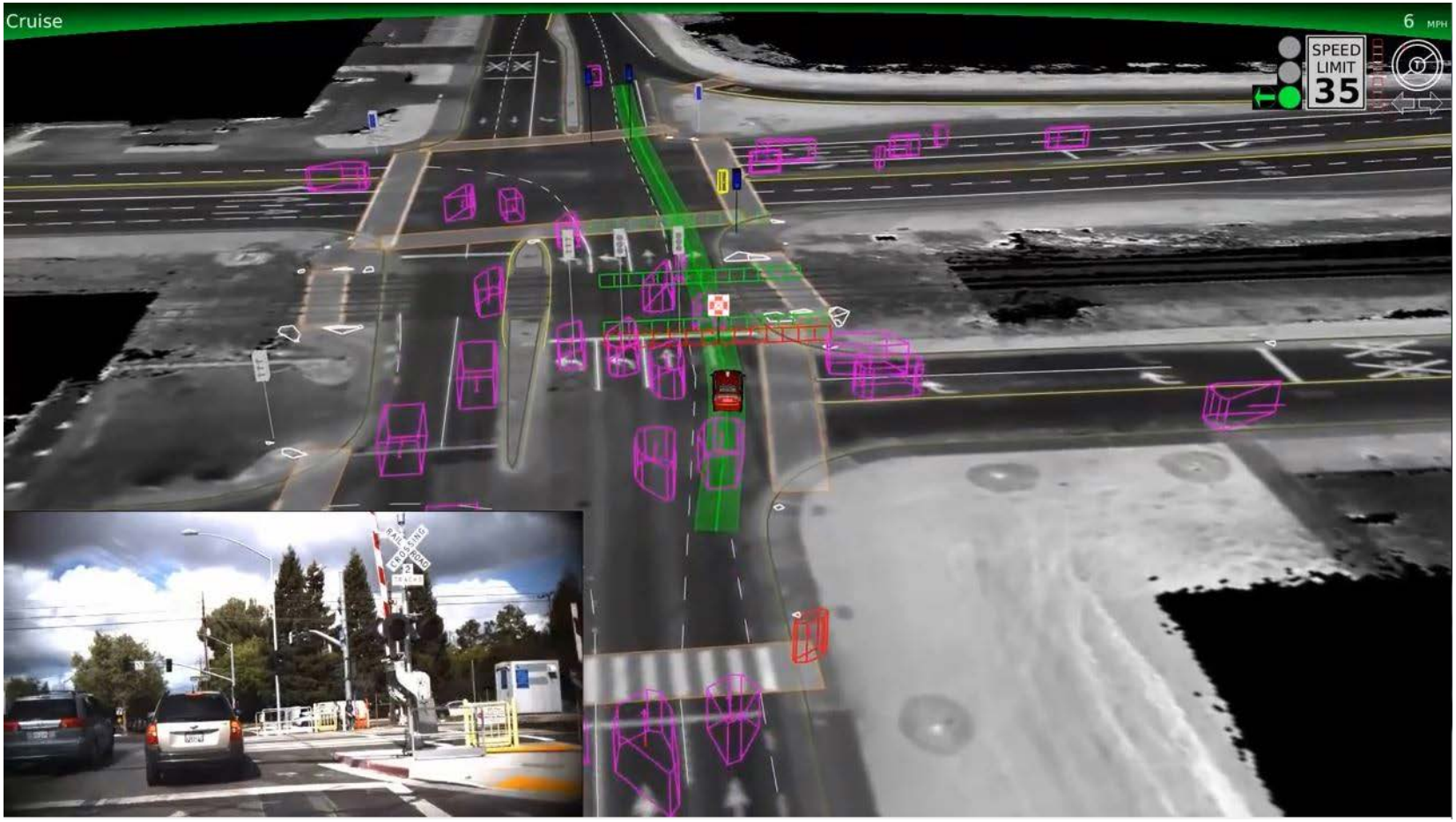
C = Connected
A = autonomous
S = Shared / Service-based
E = Electric

https://www.daimler.com/case/

Some challenges

- “Connected” requires tremendous improvements in safety and security (“Trust” for the Informationen received)
- “Autonomous” requires break-thrus for various types of algorithms (Recognition of objects and situations) and sensors (which must become cheaper bei order of magnitude)
- “Electric for all” requires major investments in charging infrastructure, especially in towns with apartment-blocks, etc.
- “Dynamic Loading” on the road requires some technology break-thrus and huge investments

„Google Car“ – An enviable overview



https://www.youtube.com/watch?v=dk3oc1Hr62g

How to get this overview? Lots of Sensors and Computer

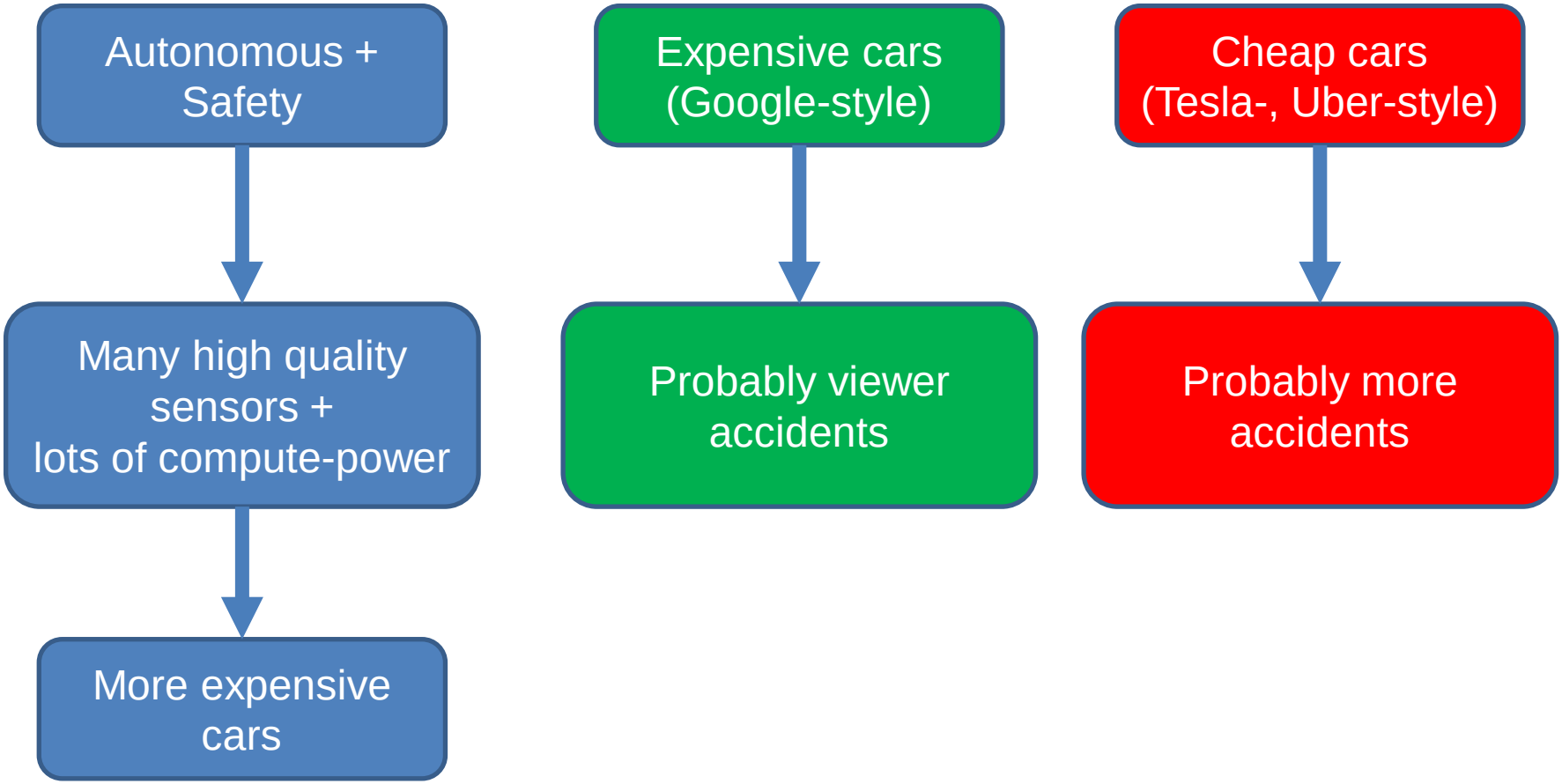
	LIDAR	RADAR	CAMERA
Volvo XC90	1	10	7
Ford Fusion	7	7	20

Autonomous and electrical – both are expensive

- Autonomous cars need many Sensors and lots of compute power (good sensors can double the costs – Google vs. Tesla/Uber)
- Elektric cars (and specially hybrids) are (still) rather expensive
- This means that those cars are only of interest for few private owners

heise.de 2018

Autonomy and Safety



Autonomy and Security

- Current cars are rather vulnerable regarding IT-attacks from outside (see https://sicherheitskultur.at/autos.htm)
- Current IoT-devices are very vulnerable against hacking attacks (see https://sicherheitskultur.at/iot.htm)
- Can anybody believe that with autonomous connected cars everything will be secure by magic?
- Remote-Control of cars is already a standard offer of insurance and leasing companies - easy to be hacked

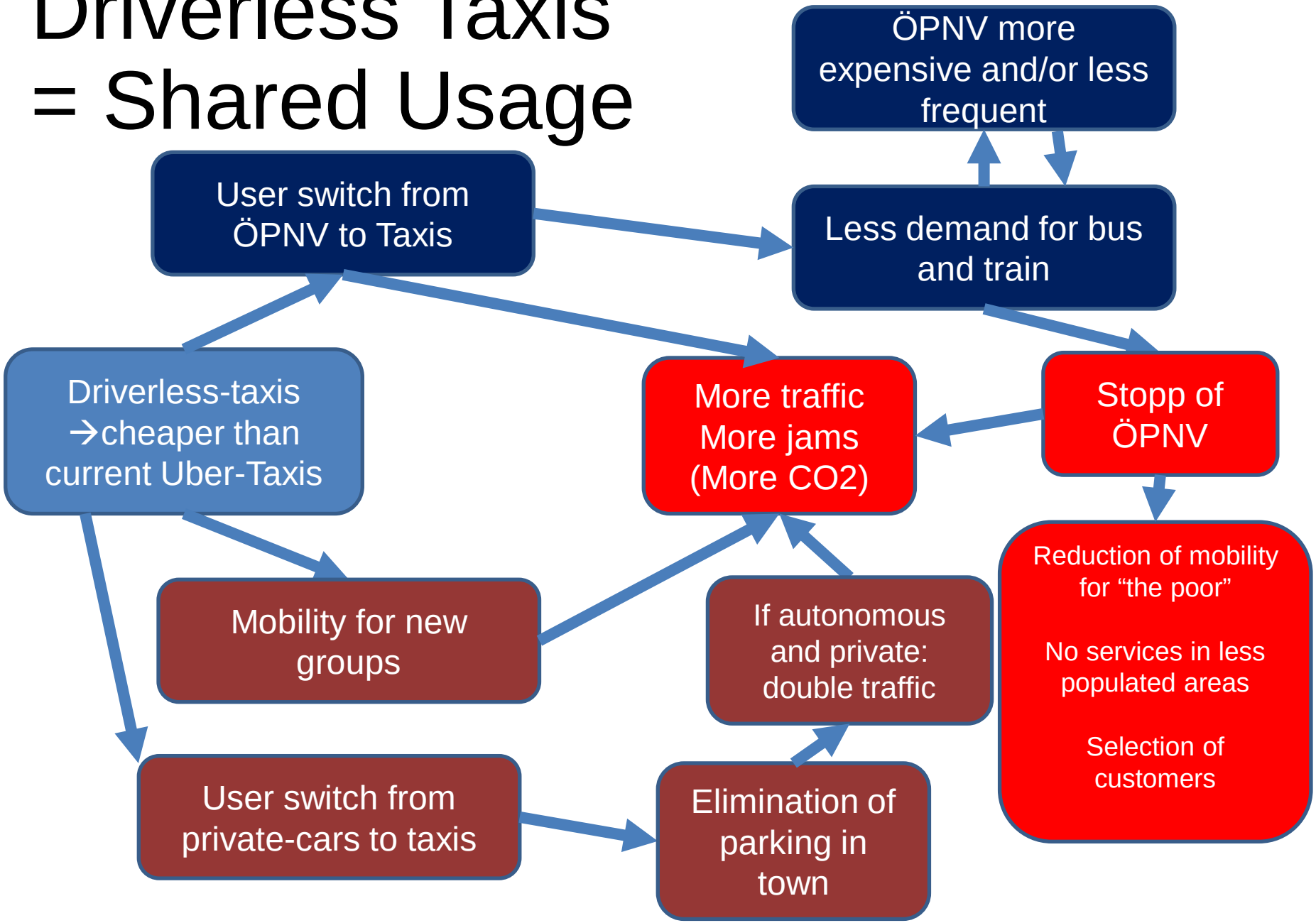
Who is interested in expensive Autonomy?

The extra cost is acceptable if by going autonomous a (paid) staff member can be avoided.

Main areas:

- Autonomous transport-systems in private environments (warehouse, mining, airports)
- Autonomous taxis (in well defined, tested areas) – Uber, Lyft
- Autonomous trucks on highways, doing 24 service (with or without platooning)

Driverless Taxis = Shared Usage

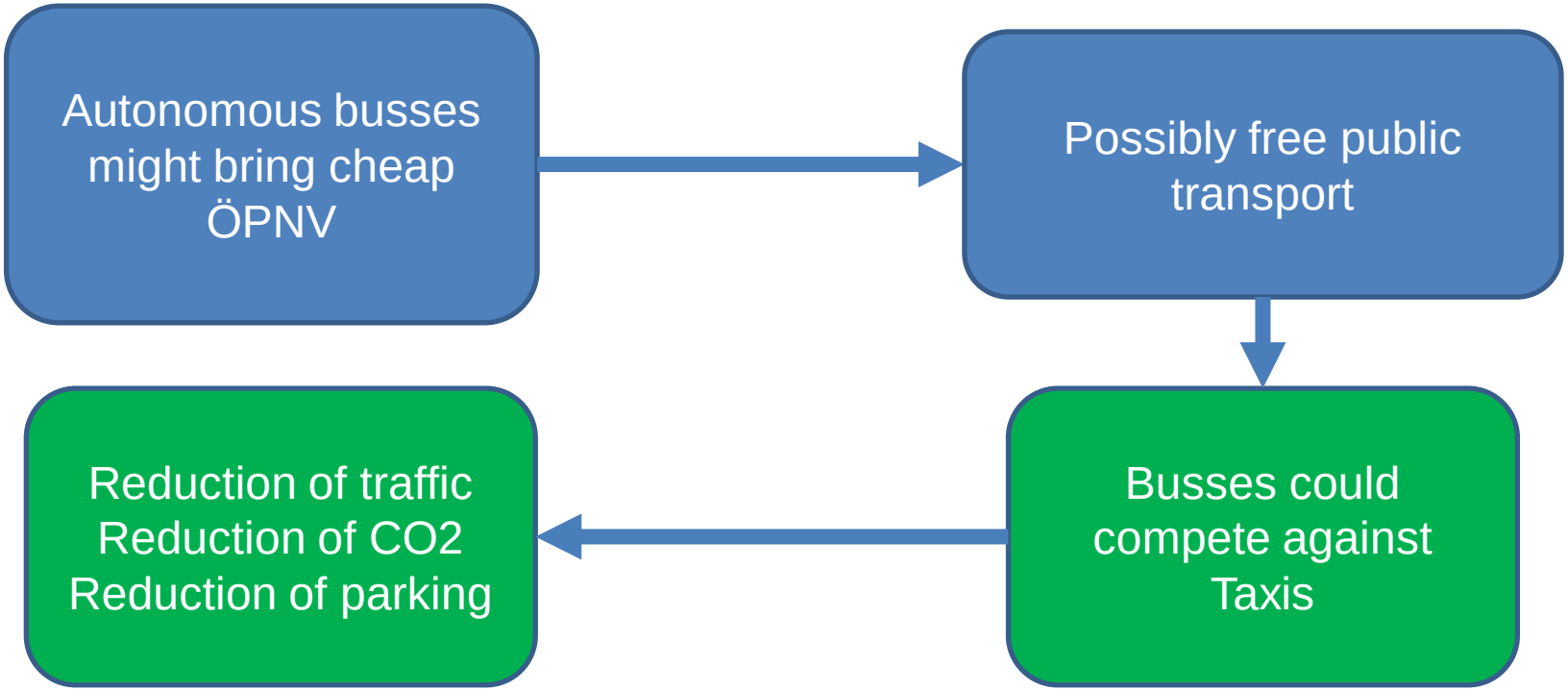


The attack against public transport has started

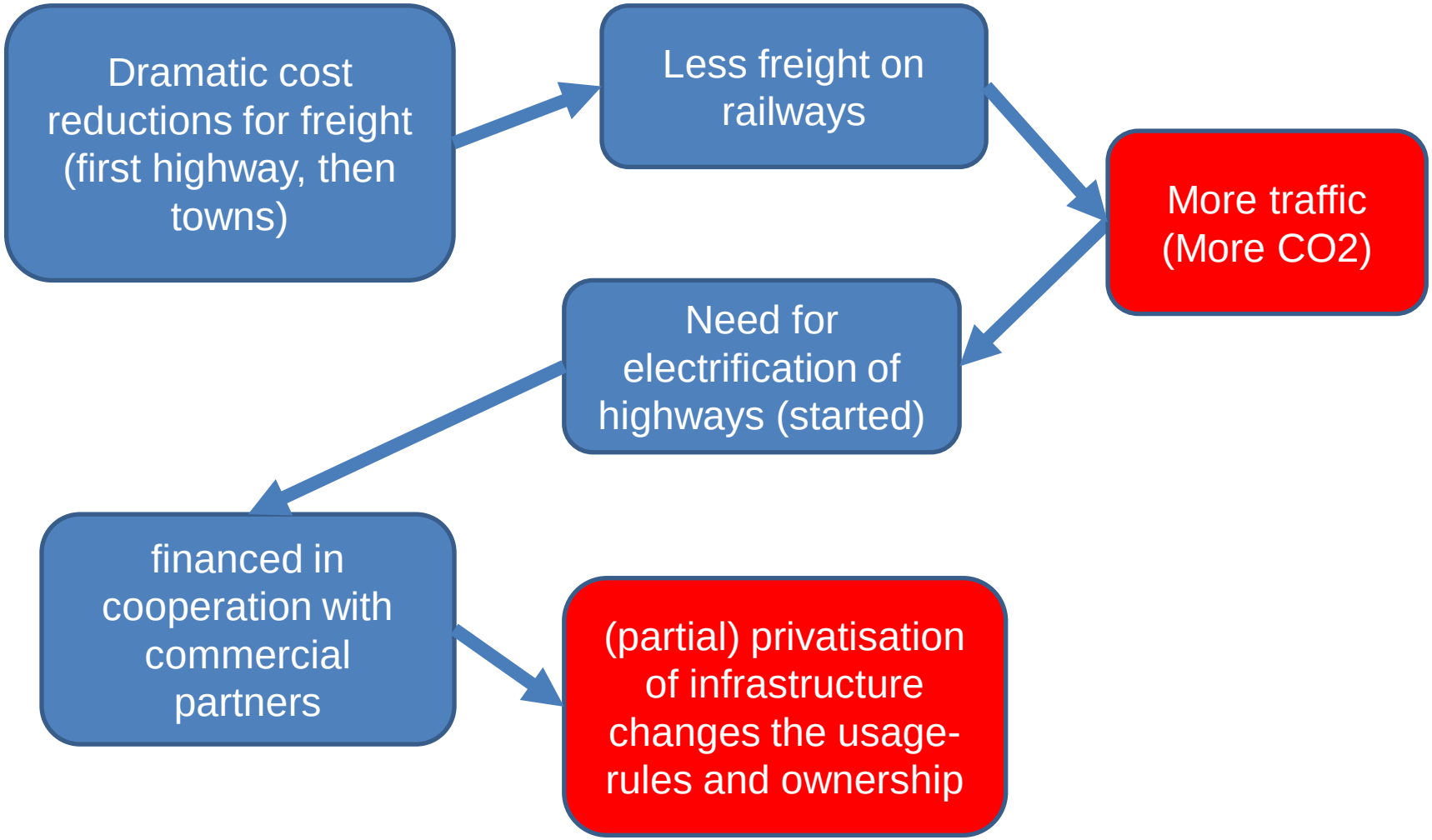
- In some US-cities improvements and repair for the public mass-traffic infrastructure are already questioned because „this is ancient technology“
- Federal subsidies are to be redirected to autonomous developments

https://www.nytimes.com/2018/07/20/upshot/driverless-cars-vs-transit-spending-cities.html

Alternative Scenario: Autonomous ÖPNV



Driverless trucks (and/or Platooning)



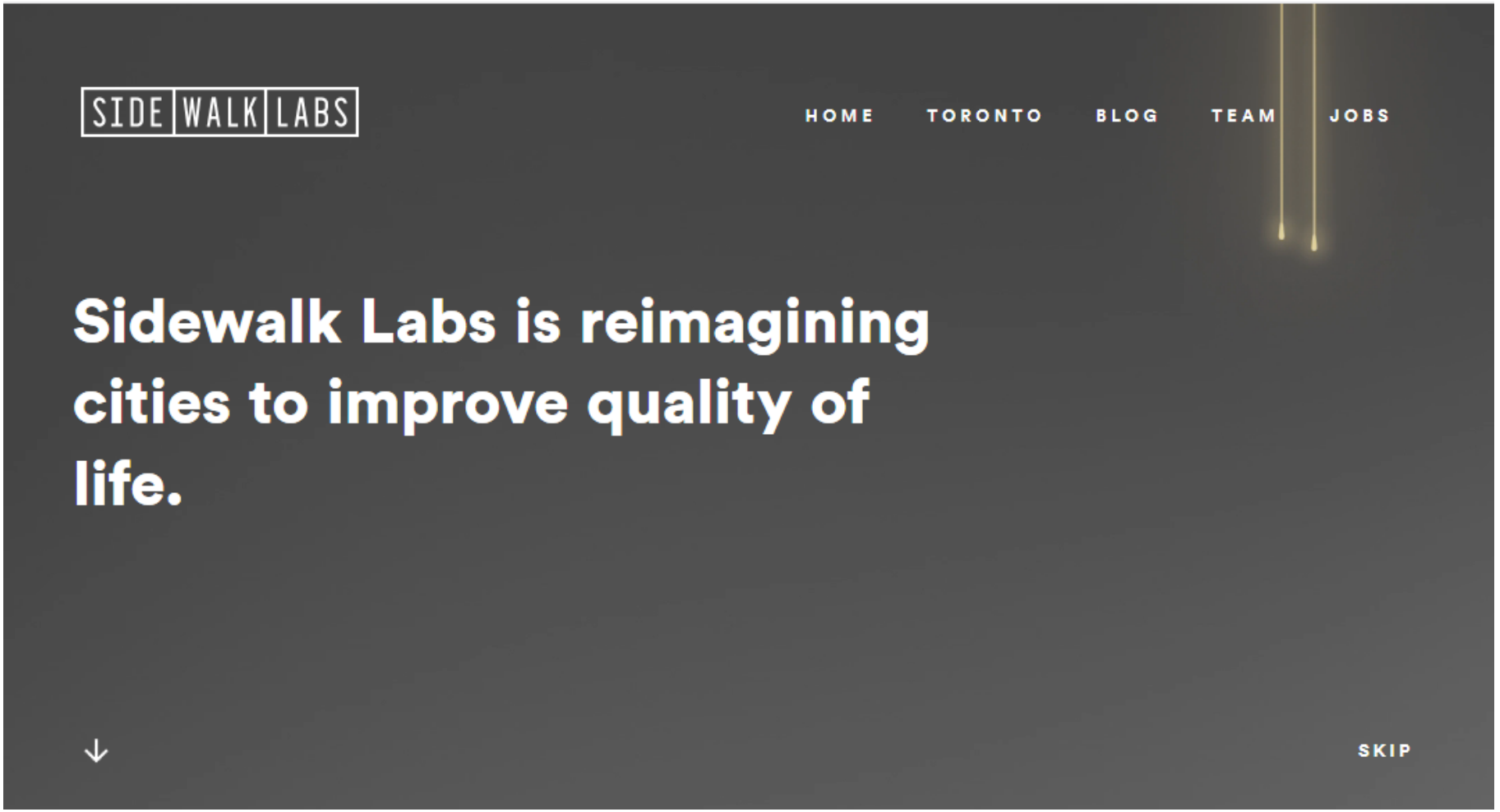
PPP and Smart City: Paying with your data

Digital Infrastructure is expensive.
Sometimes big company are offering extremely good deals.

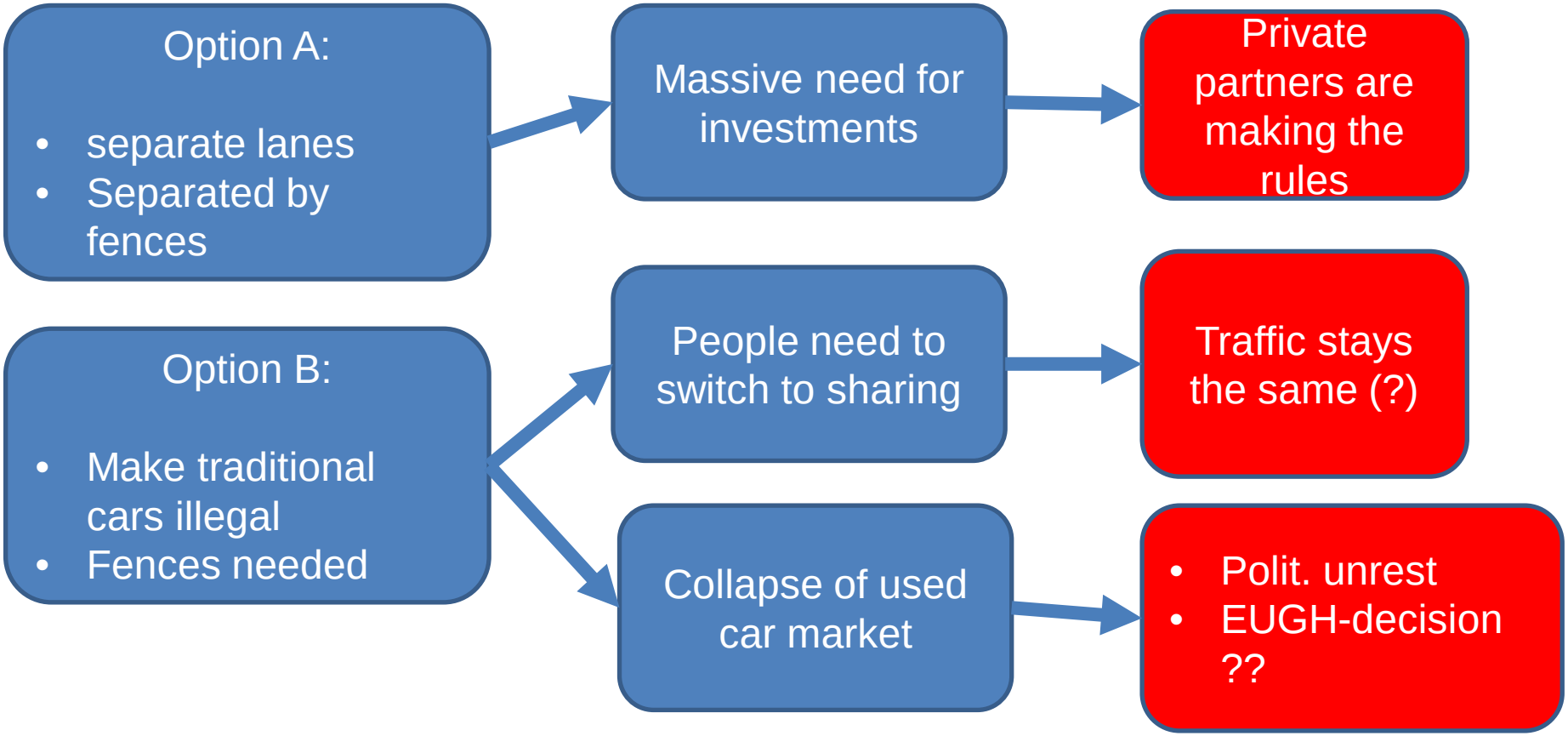
Example:
A consortium dominated by Google implements WiFi in New York – just asks for the data of ALL citicens

https://www.villagevoice.com/2016/07/06/google-is-transforming-nycs-payphones-into-a-personalized-propaganda-engine/

Google’s Sidewalk Labs



if autonomous and traditional traffic don’t “fit together” ?

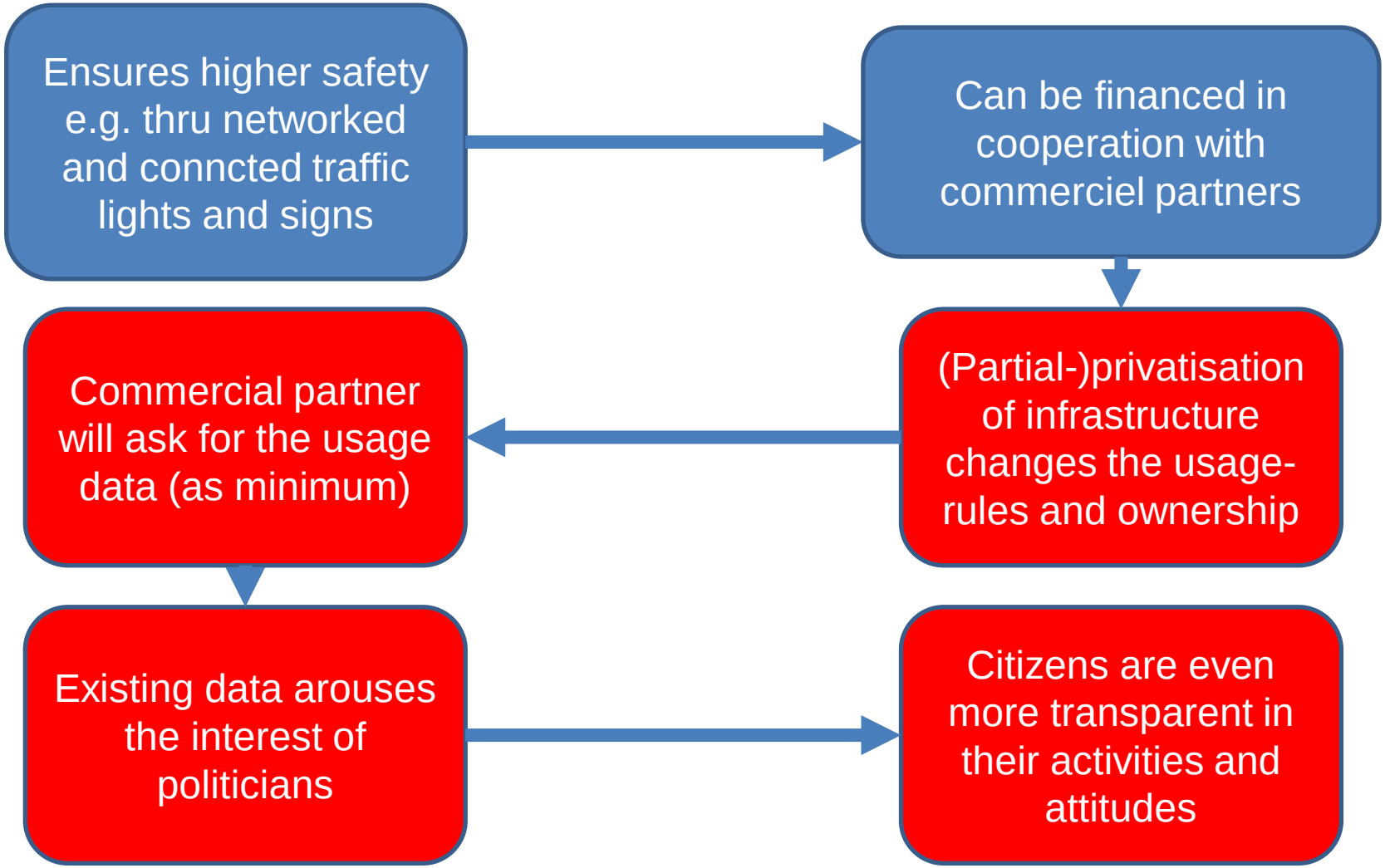


Towns without Road Signs and Traffic Lights

One Idea:
Cars are negotiating right-of-way and pass with minial distance in a “chaotic” but optimal way.
Virtual Traffic Lights: System Design and Implementation - https://arxiv.org/abs/1807.01633

Minor side issues like older cars, cyclists and pedestrians will be integrated via apps.

Connected intelligent Infrastructure = expensive



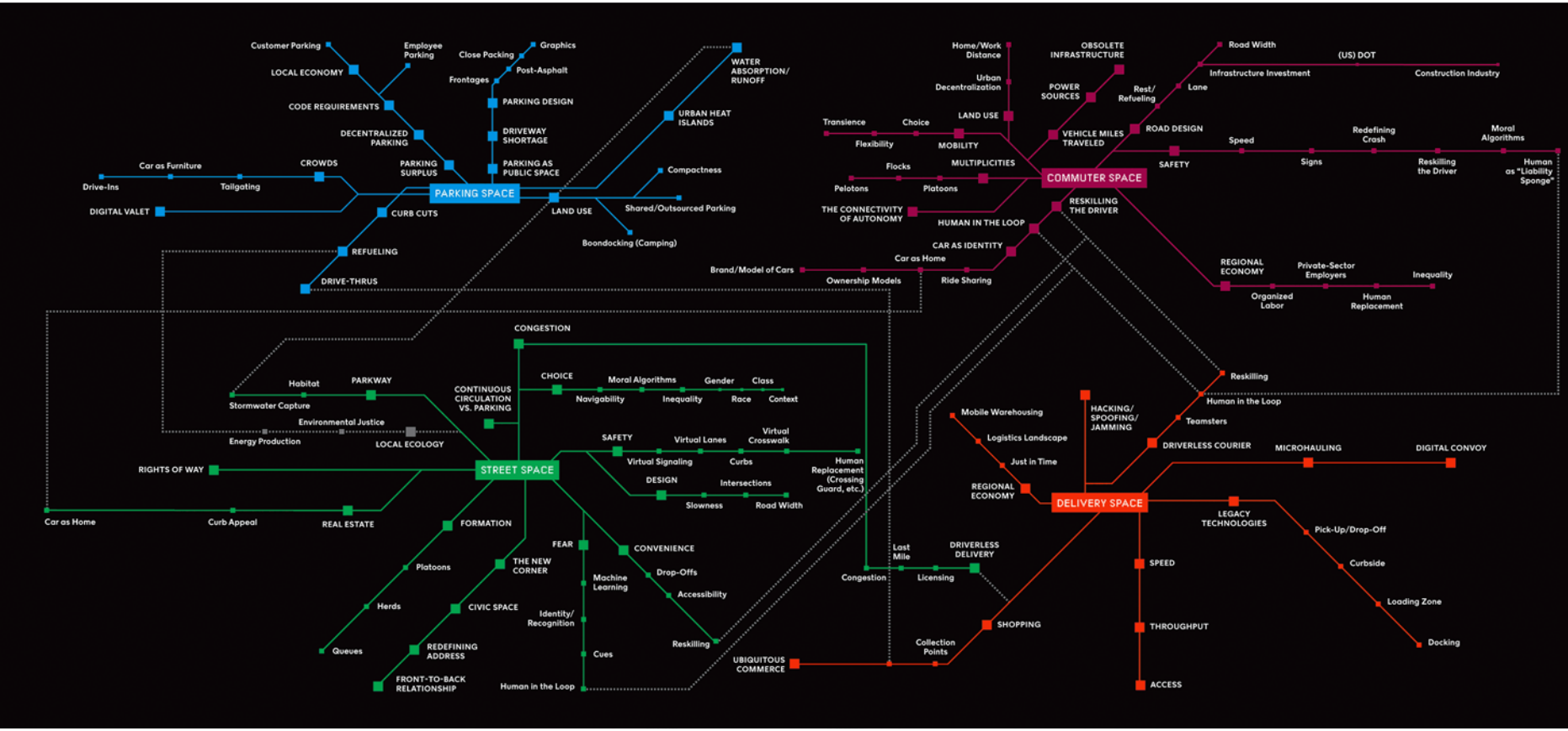
Inclusion vs „Digital Divide“

- Is the usage of the (partially) privat infrastructure possible without smartphone app?
- Is usage still possible without agreeing to data collection? (end of anonymous travel)
- Is it still possible to pay with cash?
- Will there still be services in remote areas?

Brave new worlds with 100% connected autonomous traffic

- Very few car repair shops, caused by lack of accidents
- No more drivers license of driving schools
- Car insurance looking for new business
- New structures for inner towns (e.g. parking)
- No more traffic lights, traffic and road signs (pedestrians crossing with the help of apps)
- No more public traffic “as we know it”
- Fully transparent citizens

Many more Higher Order Effects



Many connected Topics:
Parking, Shopping, Streets, Commuting, Delivery, . . .

https://www.nytimes.com/interactive/2017/11/08/magazine/tech-design-autonomous-future-cars-100-percent-augmented-reality-policing.html

100 years ago

Source: Markus Petzl - disruptive – beyond your strategy

100 years ago

- horse-drawn carriage and buses had been replaced by electrical, then gas-operated vehicles (success of gas only after invention of starting motor)
- End of horse manure problems in towns
- 50 years later: Mobility for (nearly) all
- But: Accidents at much higher speed, polution, CO2, NOx, urban sprawl, car-traffic dominance of urban planning, …..

100 years ago

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- Stop of wns
- 50 years
- But: Acc Benzing awl, dominance of urban planning, …..

Foto: Library of Congress/No known restrictions.

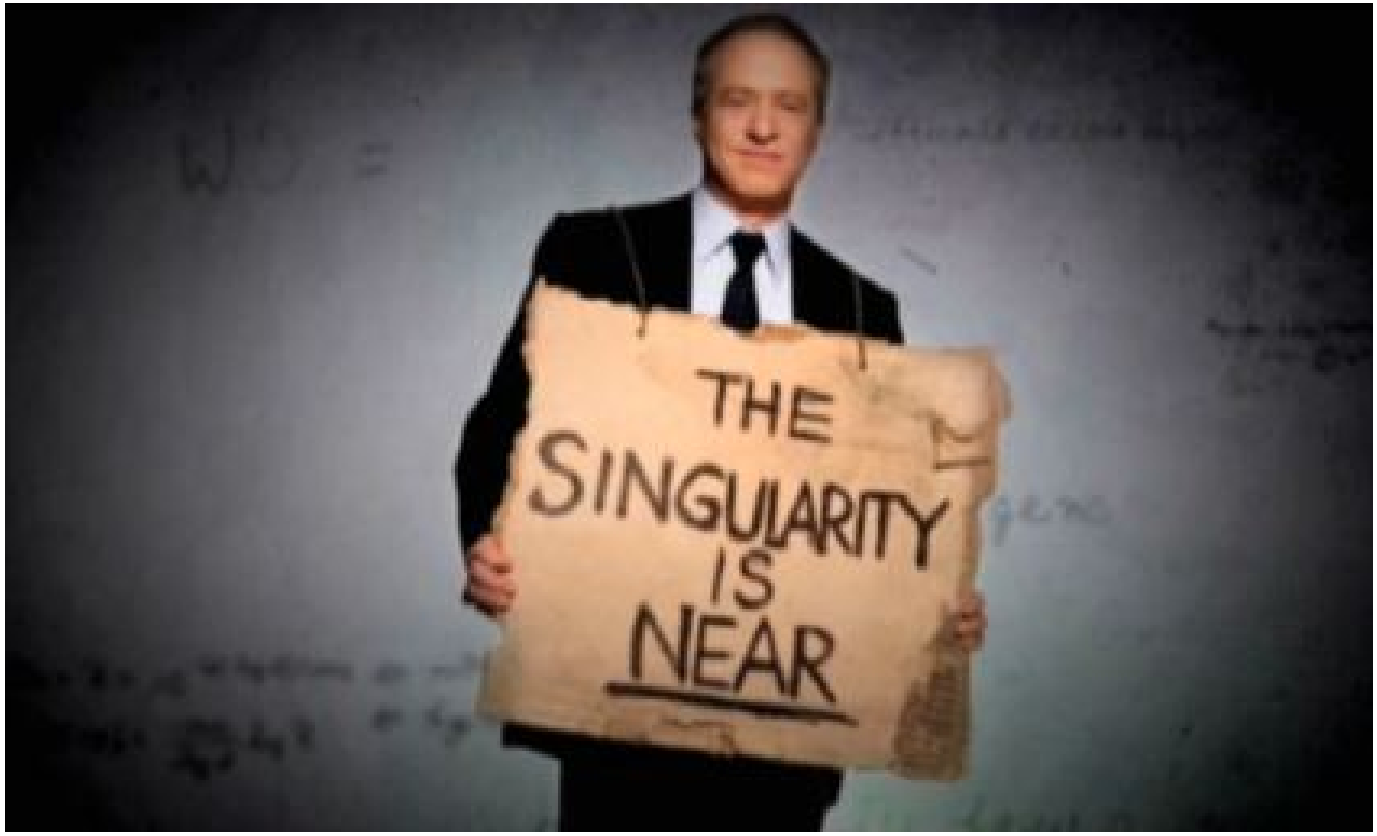
Conclusion

We don’t really know what we are getting into, but

- pressure from technologists,
- the phantasy, what problems could all be solved and
- the exstasy of the politician

seem to be infinite

Thanks



Ray Kurzweil – „director of engineering“ at Google

A lot more on: https://philipps-welt.info/autonom.htm