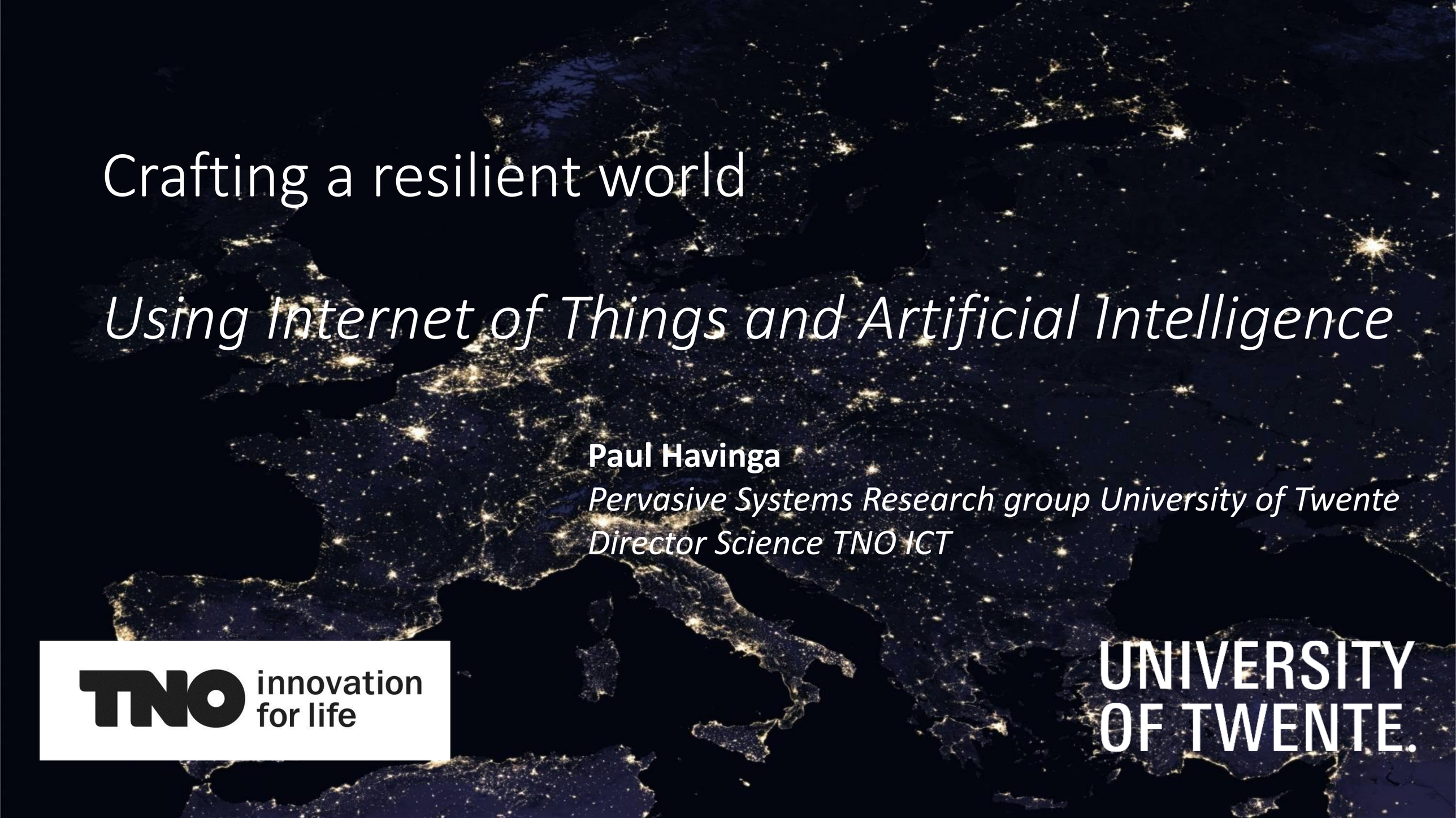


Crafting a resilient world

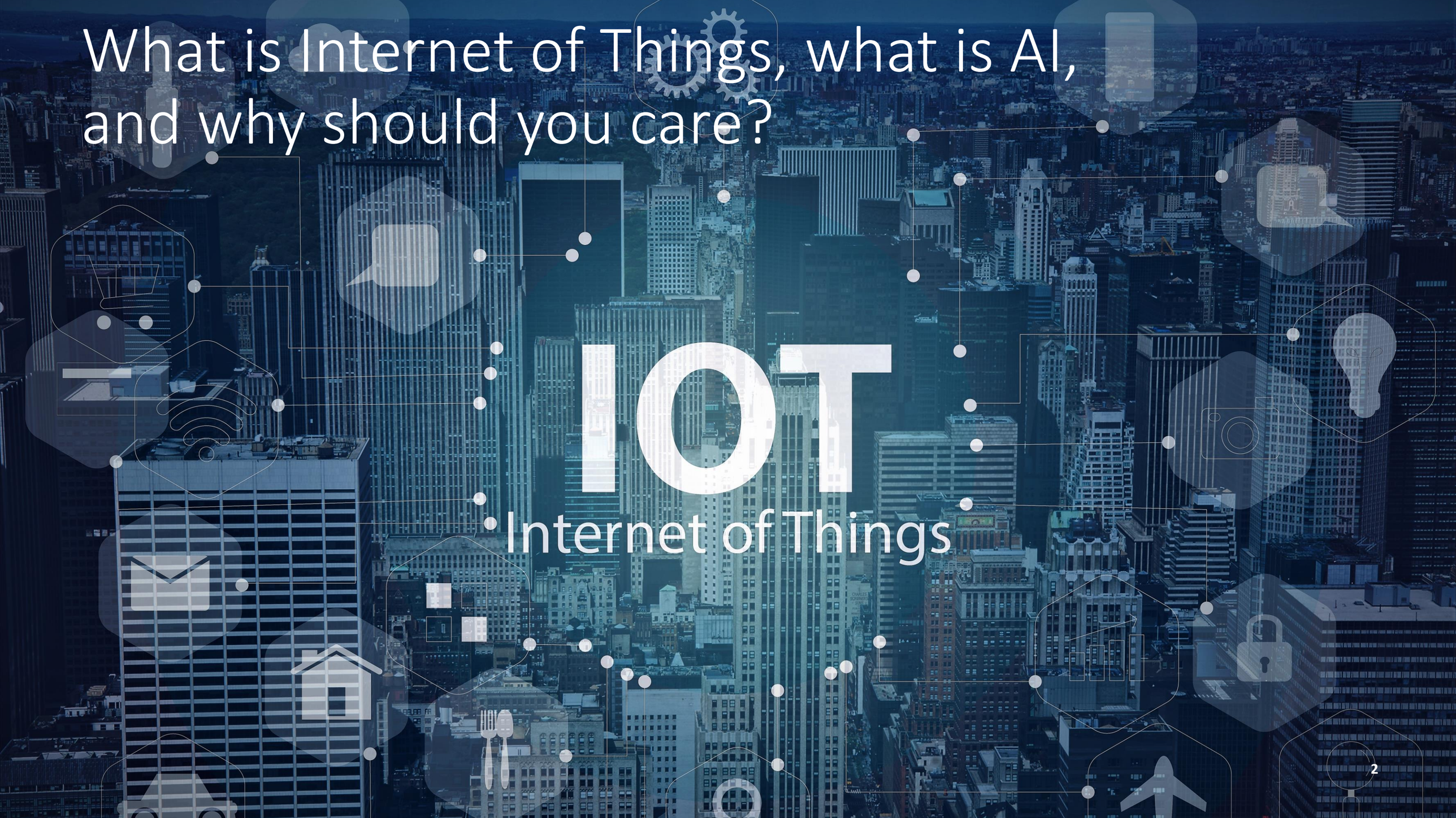
Using Internet of Things and Artificial Intelligence

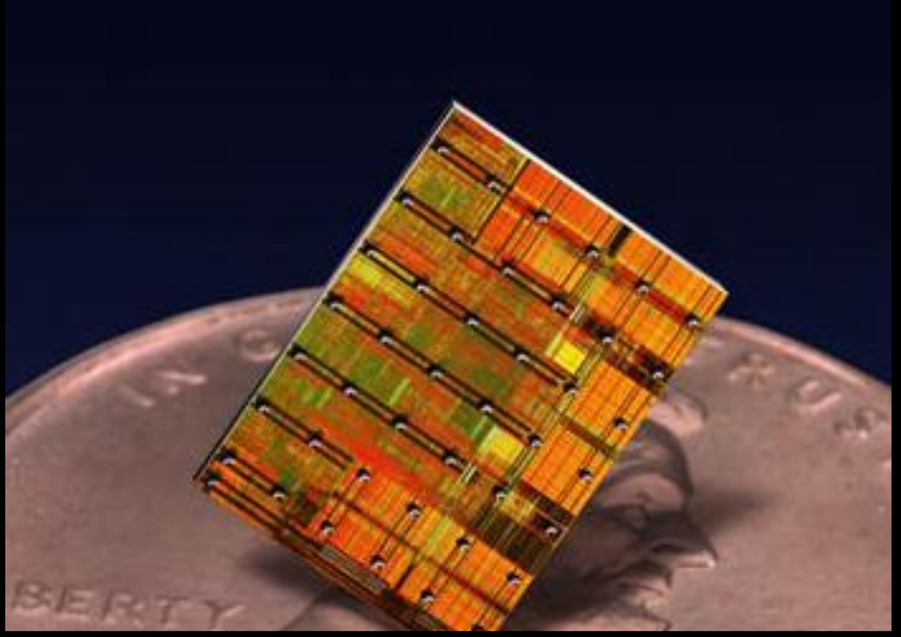
Paul Havinga
Pervasive Systems Research group University of Twente
Director Science TNO ICT

TNO innovation for life

UNIVERSITY OF TWENTE.

What is Internet of Things, what is AI, and why should you care?



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London
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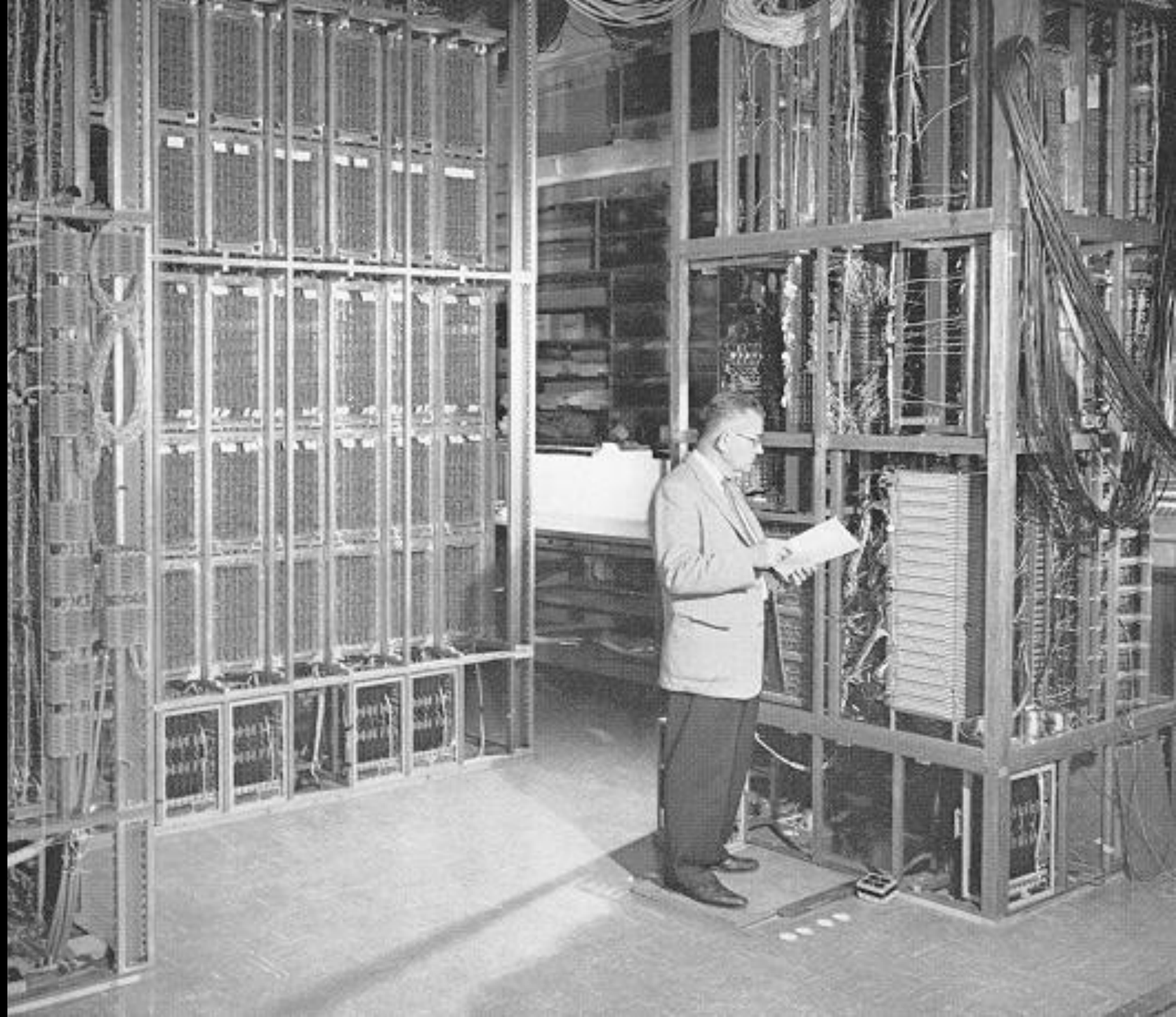
Browser
Gmail
Market
Camera
Phone
Contacts
Messaging




590
584
520


NIKEPLUS.COM

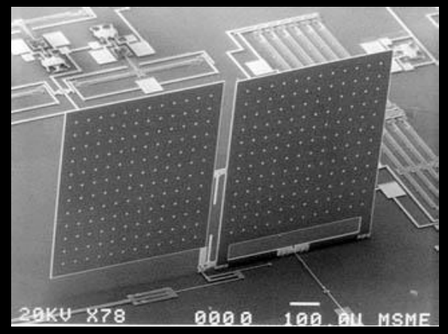

7-14-2008

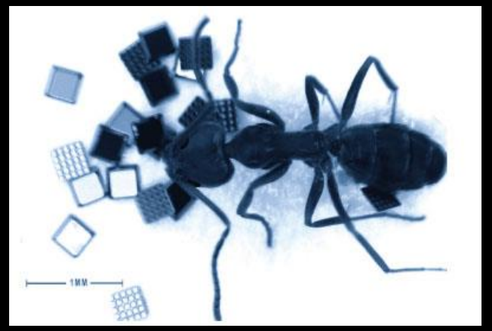
Smart Dust vision in 1999

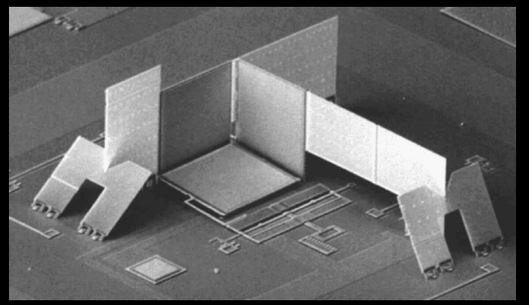
"Mobile Networking for Smart Dust"

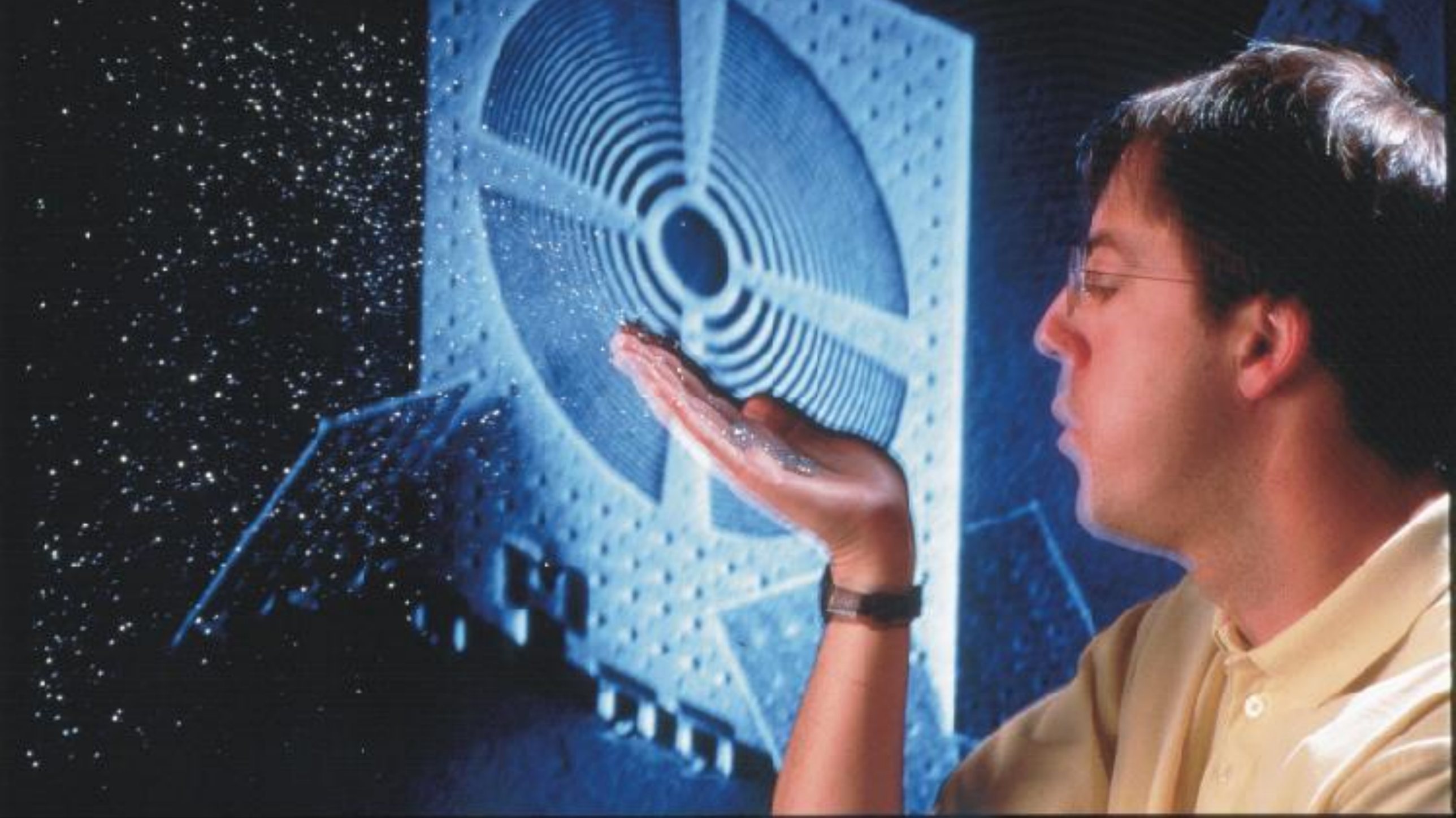
J.M. Kahn, R.H. Katz and K.S.J. Pister,
MobiCom 1999

“a network of tiny sensors, robots, or devices, installed with wireless communications, that can detect anything from light and temperature, to vibrations, etc.”

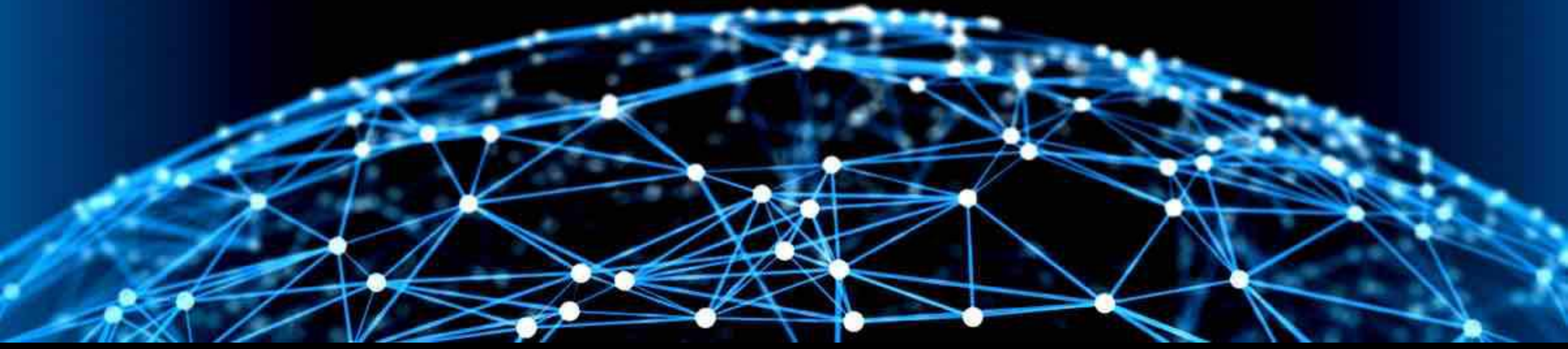


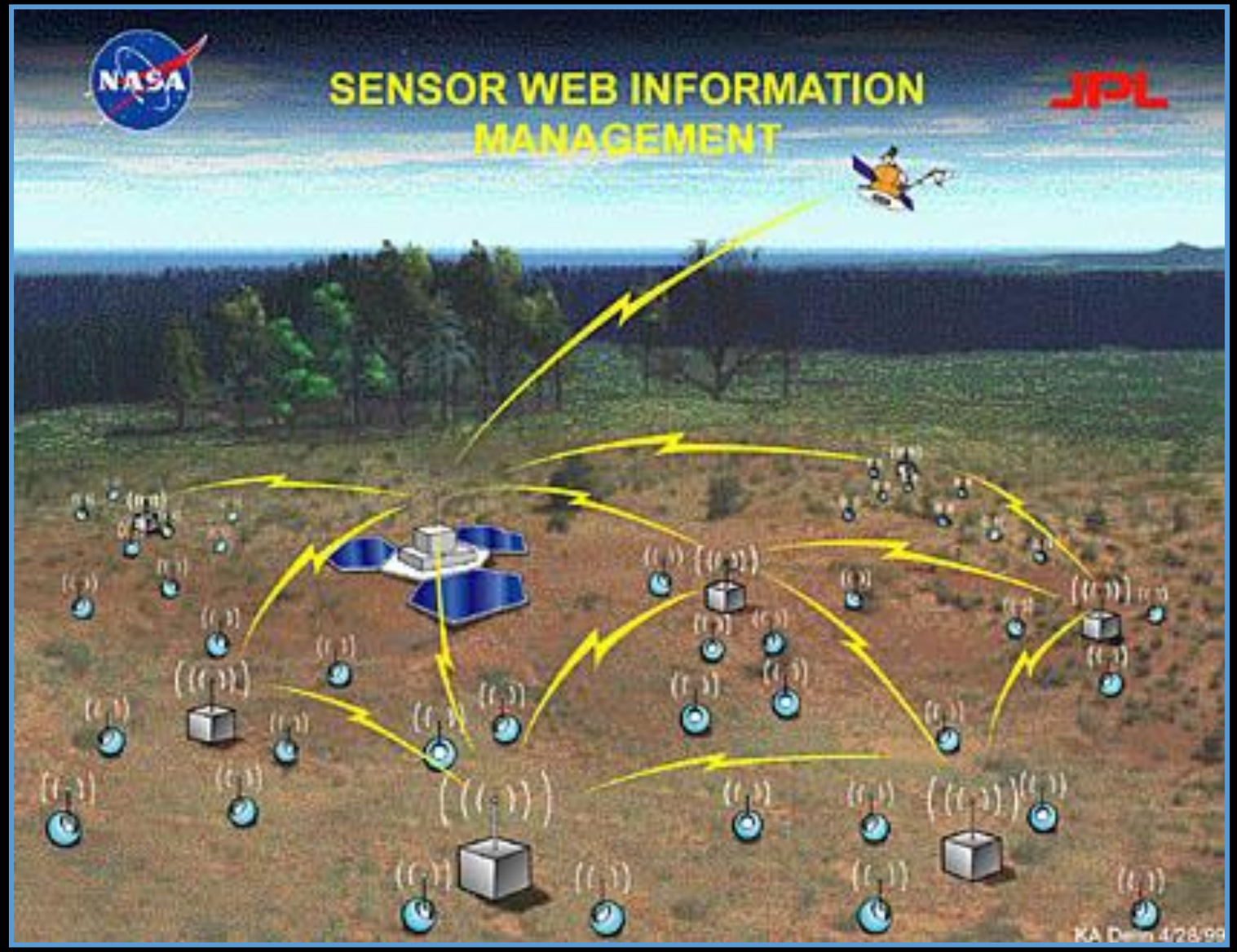






Network Topology




NASA
SENSOR WEB INFORMATION MANAGEMENT
JPL
KA Dem 4/28/99

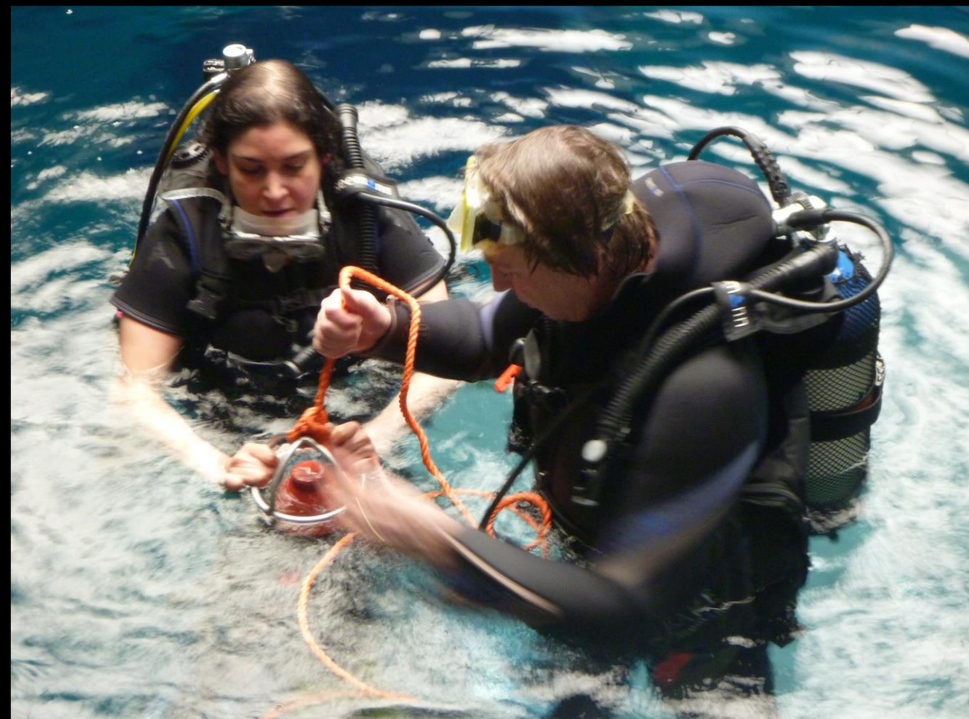
GREAT BARRIER REEF

ENVIRONMENTAL MONITORING.

- Buoys with sensor strings
  - temperature
  - Motion
  - light
- 3D monitoring
- ‘real-time’

UNDERWATER SENSOR SYSTEMS.

- Signals from the deep
- Offshore industry
- Predictive maintenance
- Environmental monitoring



mijnbedrijfshal.nl

GENESI STRUCTURAL HEALTH MONITORING

- Wireless sensing
  - During construction
  - And during the next decades
- Research topics
  - Adaptive sampling
  - Event detection
  - Wireless network
  - Energy harvesting

AWARE

FIRST RESPONDERS

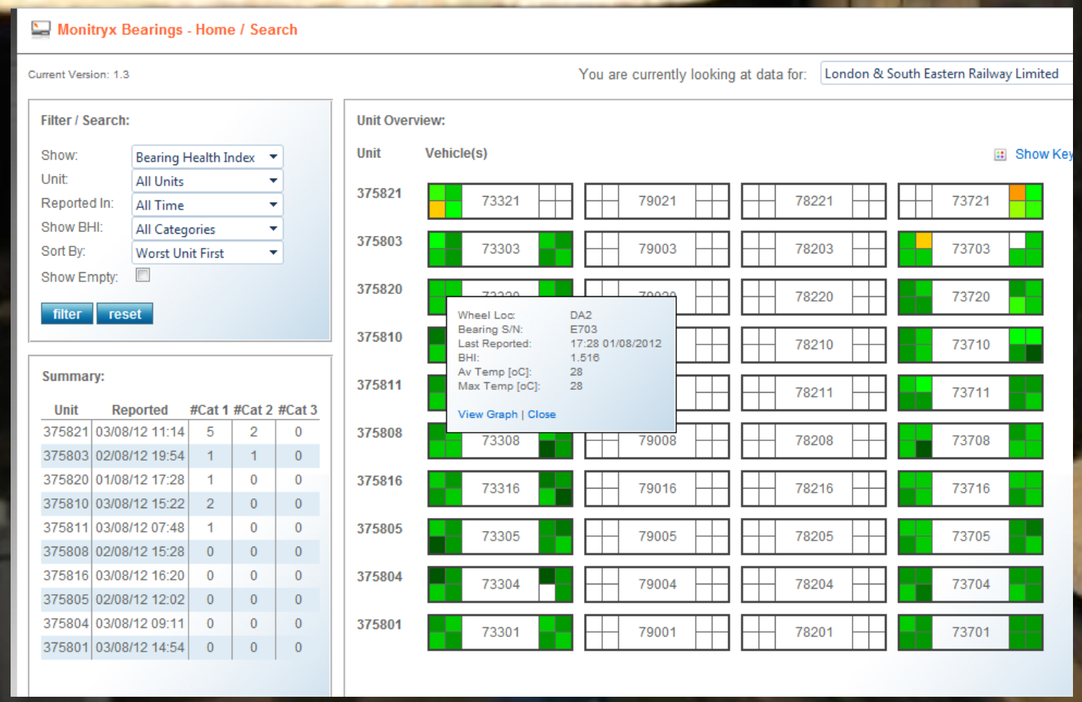
- Wireless sensing
  - From the air
  - Sensors in clothing
- Research topics
  - Sensor coverage
  - Event detection
  - localization


ICE

WiBRATE

WIRELESS VIBRATION MONITORING.

- A sensor node on every wheel
  - Analyses bearings vibration
  - Energy harvested
  - Completely wireless
- Reduced maintenance intervals
- Increased safety



SMART PARKS
ANTI POACHING.

- Protecting wildparks against poachers
- Multi-sensor network
- Long-range and short range wireless
- Activity recognition


Animals as sentinels

Posture of animals

Dispersion

- density
- patterns

Communication (sound)

Stress levels of individual animals or herds

Behaviour Activity and Intensity

SMART FARMING
ANIMAL MONITORING.

- Health monitoring
- Increase production
- Better water management
- Less mineral fertiliser

ROVI
ROAD QUALITY MONITORING.

- Using the smartphone as sensor
- Crowd monitoring
- Smart signal processing
- Sensor fusion

ROAD SAFETY MONITORING.

- Identify driver behavior
- Detect speed differences
  - Radar in backlight
- Combine with road quality

COUNTDOWN
SMART LOGISTICS.

- Smart pallets
- Indoor positioning
- Smart contracts
- Blockchain
- Big data analytics

LOCUS INDOOR POSITIONING.

- Track assets
- Navigate indoors
- Features
  - Calibration free
  - Highly scalable
  - Accurate
- Using BLE/WiFi/LoRa

SUPREME
SMART INDUSTRY.

- The factory of the future
- Reliable wireless communication
- Real-time, graceful degradation
- Predictive maintenance
- Sensor data analytics

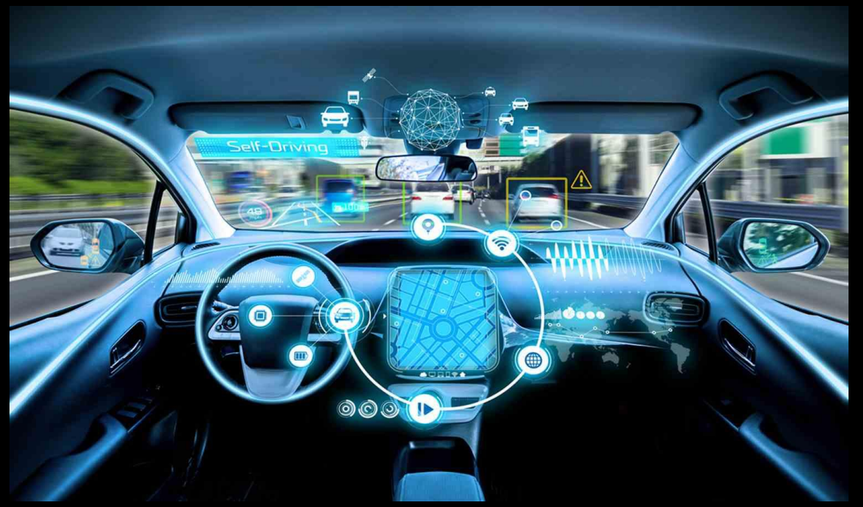
UNOBTRUSIVE SENSING HEALTHCARE.

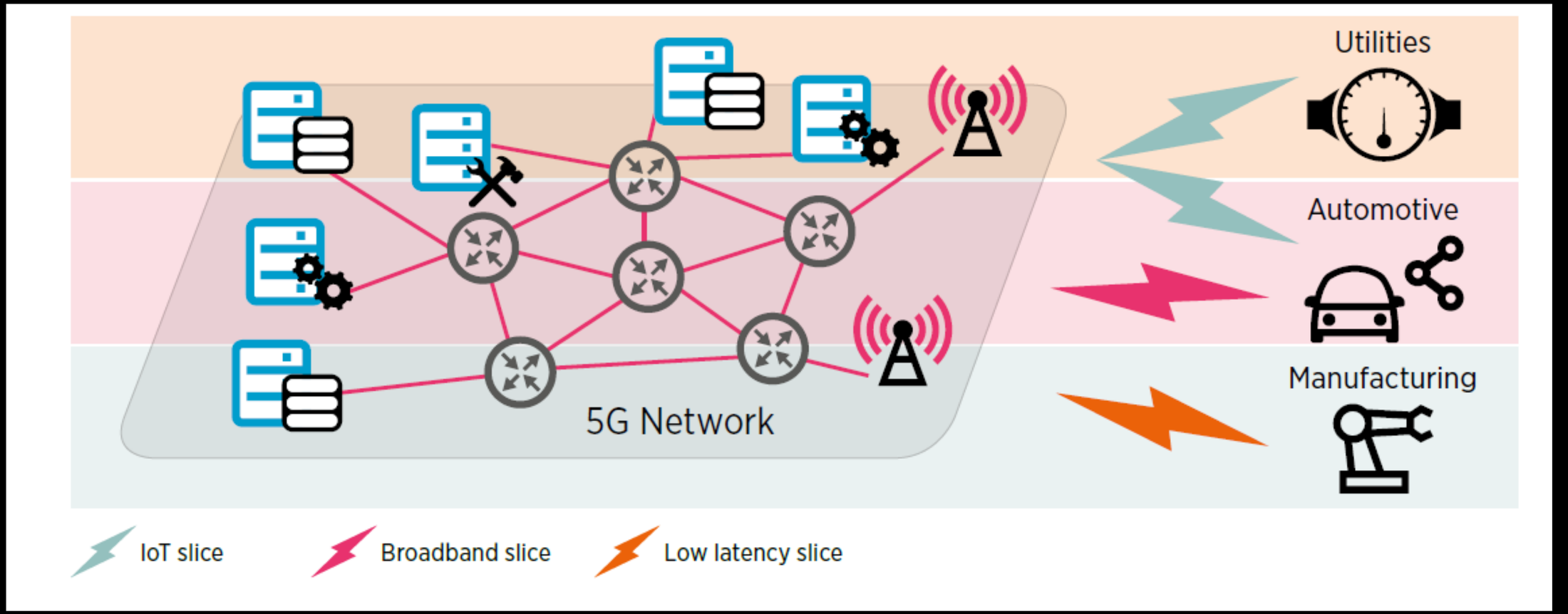
- Supporting elderly people
- Activities, behavior, mood, intentions
- Physiological sensing (e.g. hartrate)
- Using CSI analysis
  - to detect WIFI disturbances

UBIQITOUS NETWORKS

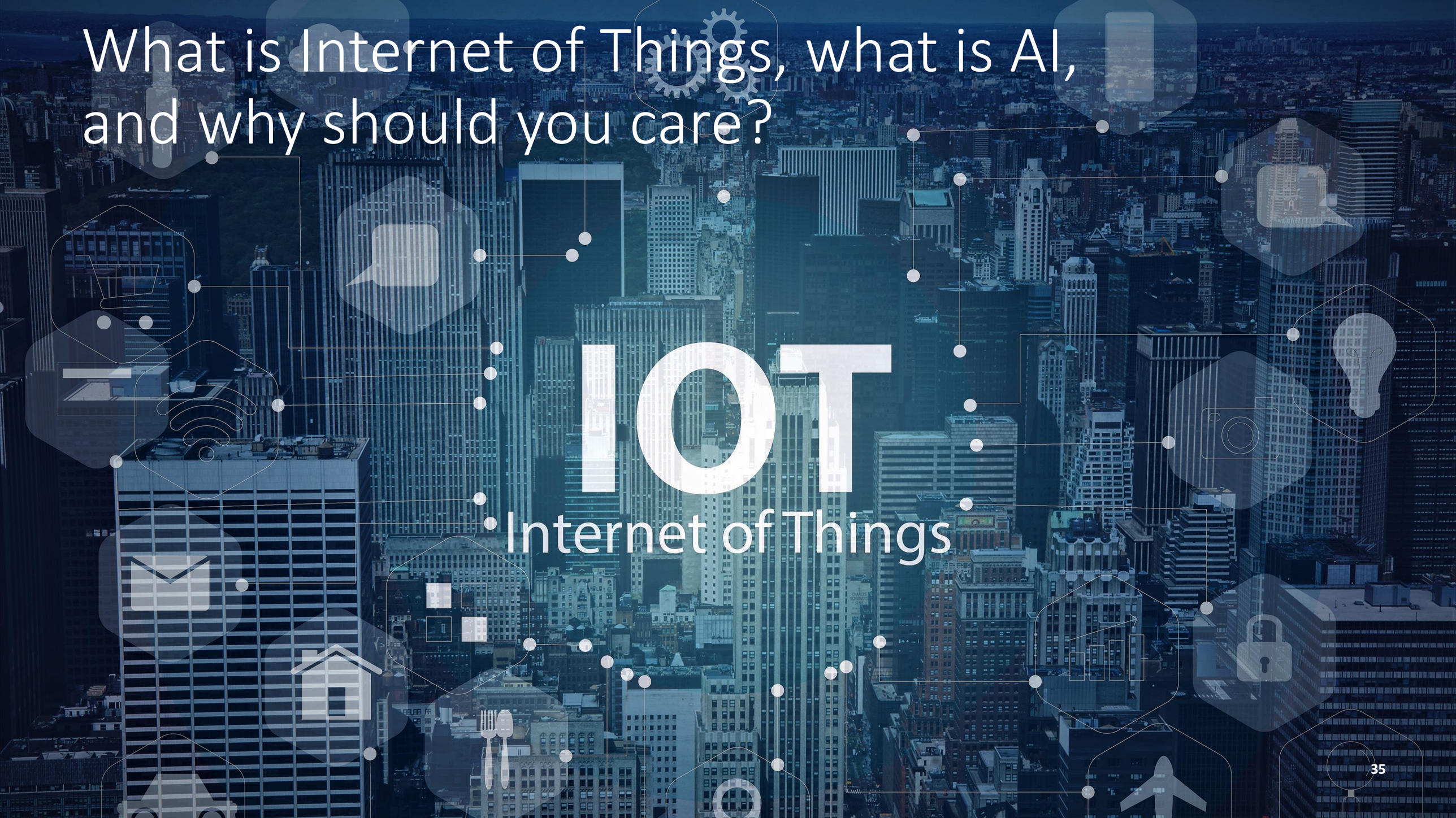
BEYOND PEOPLE.

- Highly diverse in requirements
- Factories, automotive, e-health, media,…
- Adaptable, scalable, heterogeneous


Self-Driving


Utilities
Automotive
Manufacturing
5G Network
IoT slice
Broadband slice
Low latency slice

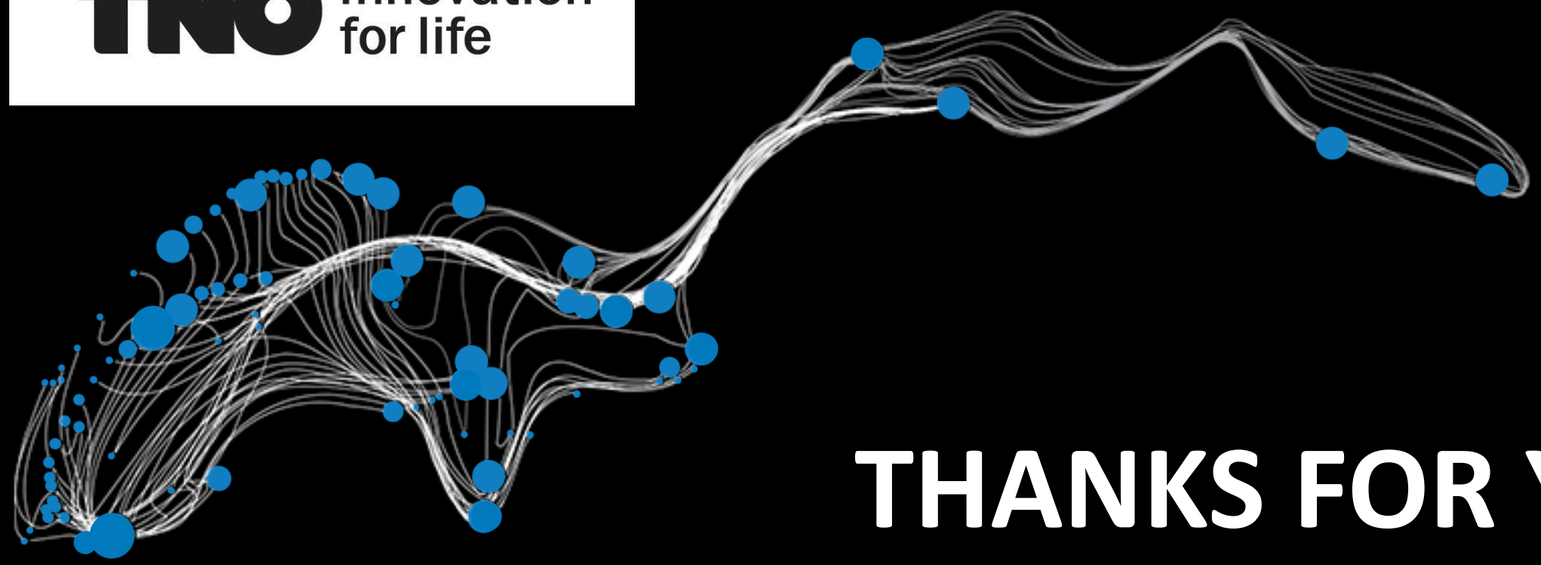
What is Internet of Things, what is AI, and why should you care?

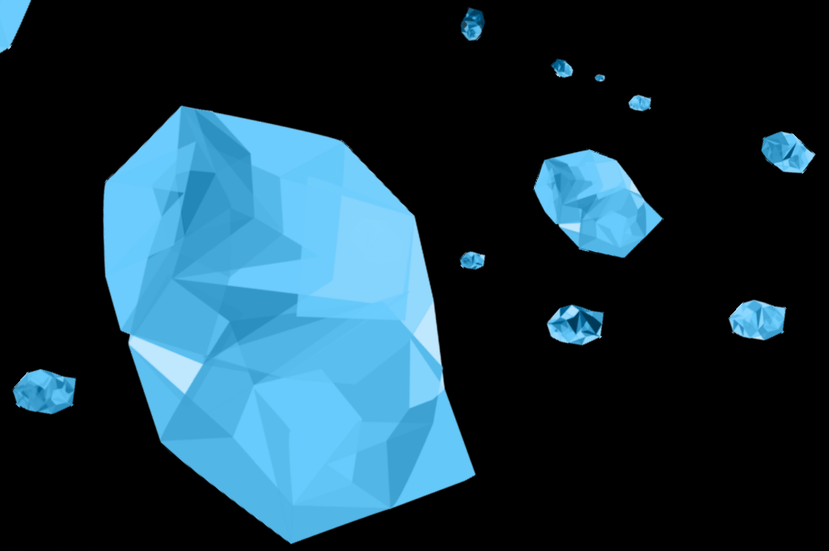


Well…. To have answers to questions like

- How can we protect our critical infrastructure?
- Are the bridges still safe to be used?
- How can we make factories sustainable?
- How to assure that the internet is available?
- …..

TNO innovation for life





THANKS FOR YOUR ATTENTION

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Paul.Havinga@tno.nl
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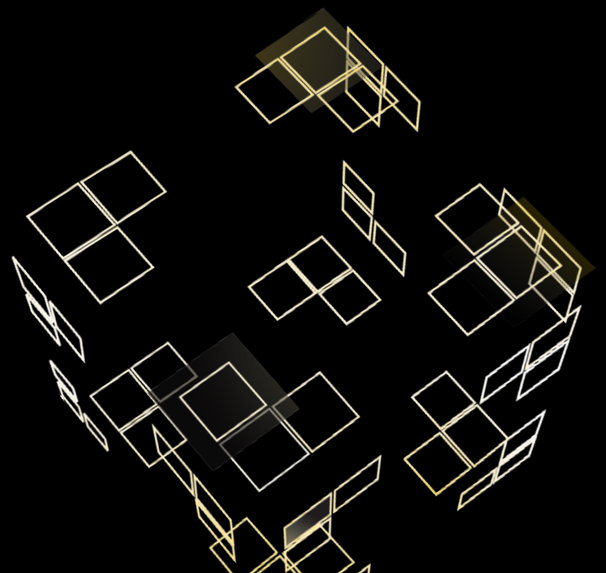

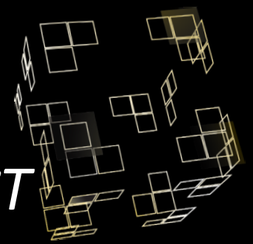

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