

Crafting a resilient world

Using Internet of Things and Artificial Intelligence

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TNO innovation
for life

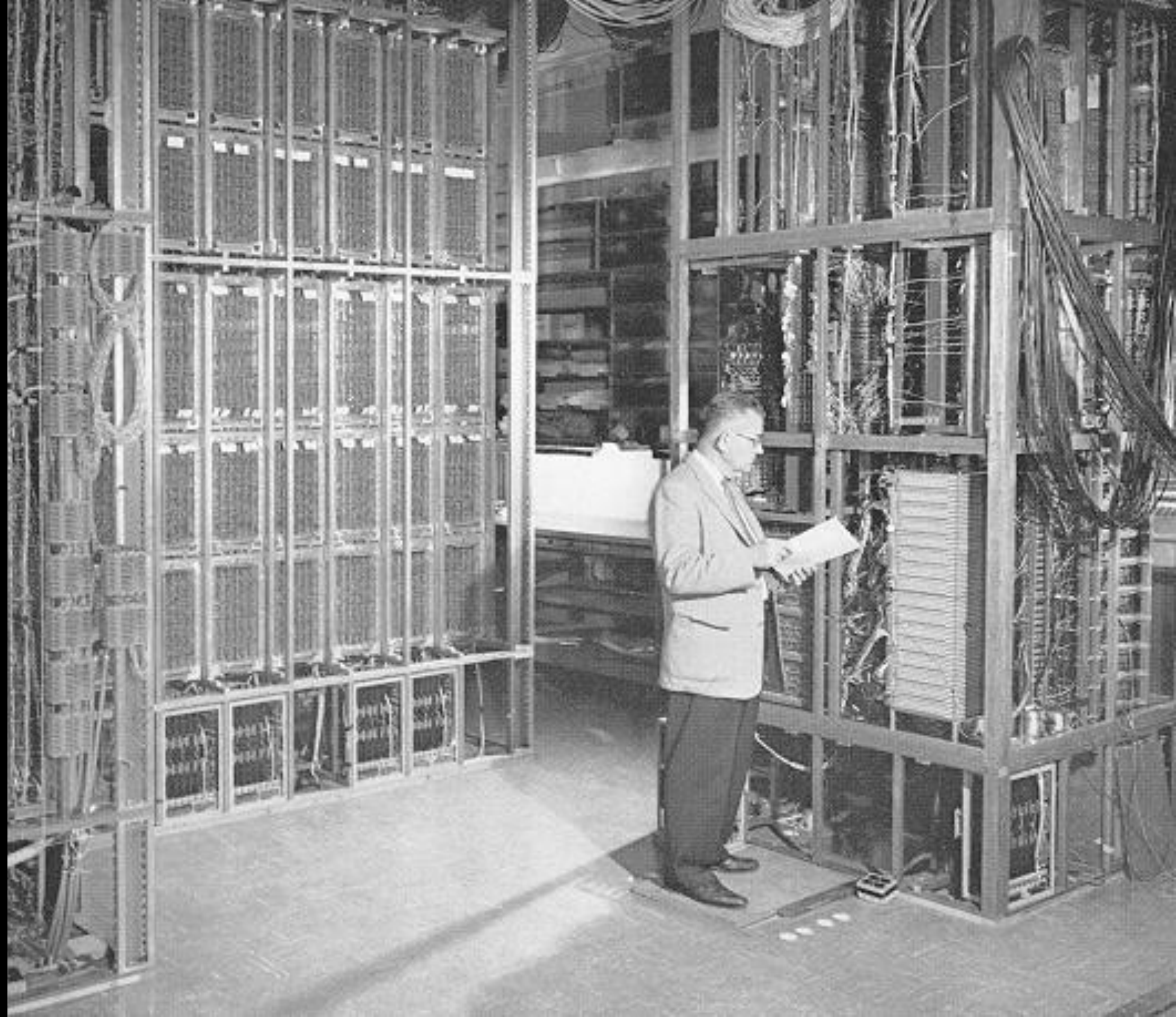
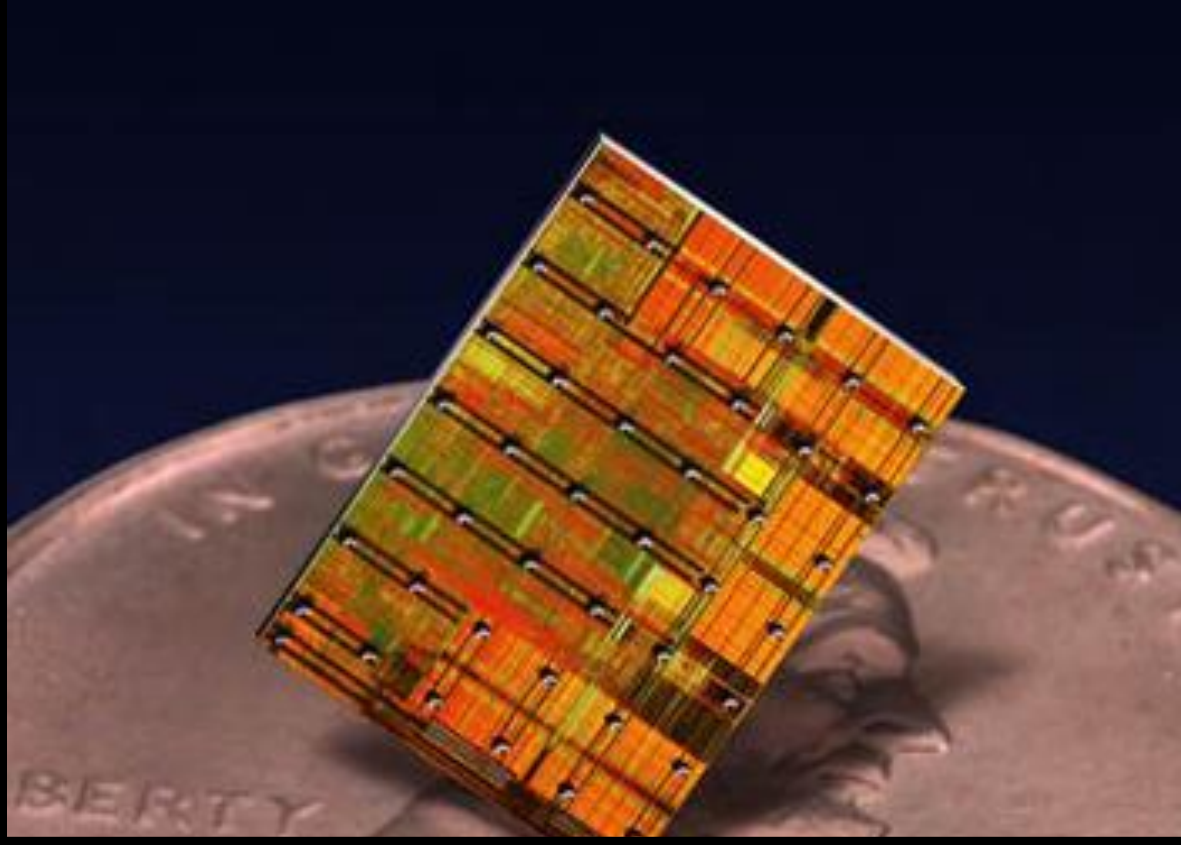
**UNIVERSITY
OF TWENTE.**

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

IOT

Internet of Things







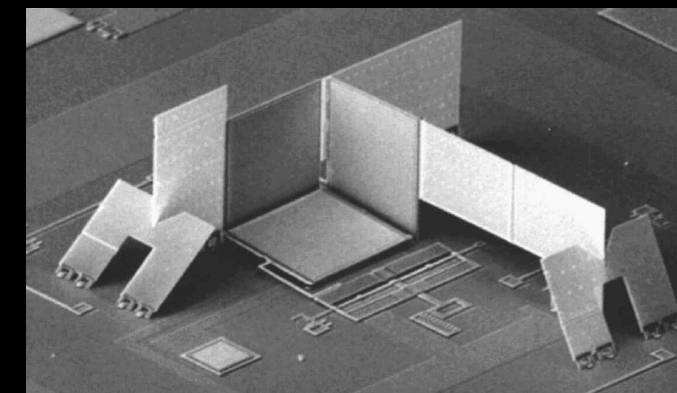
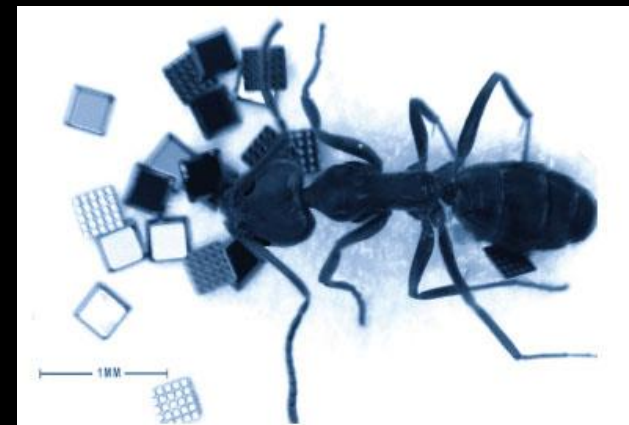
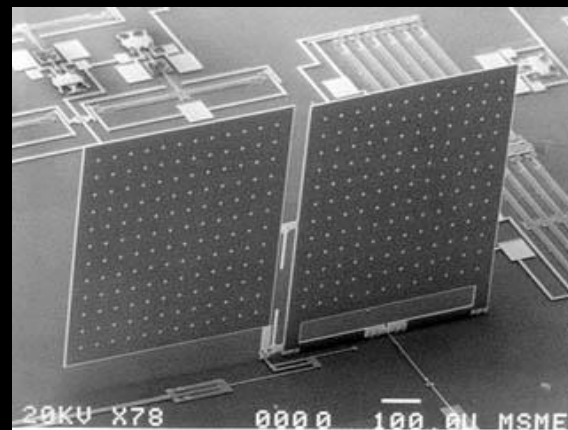


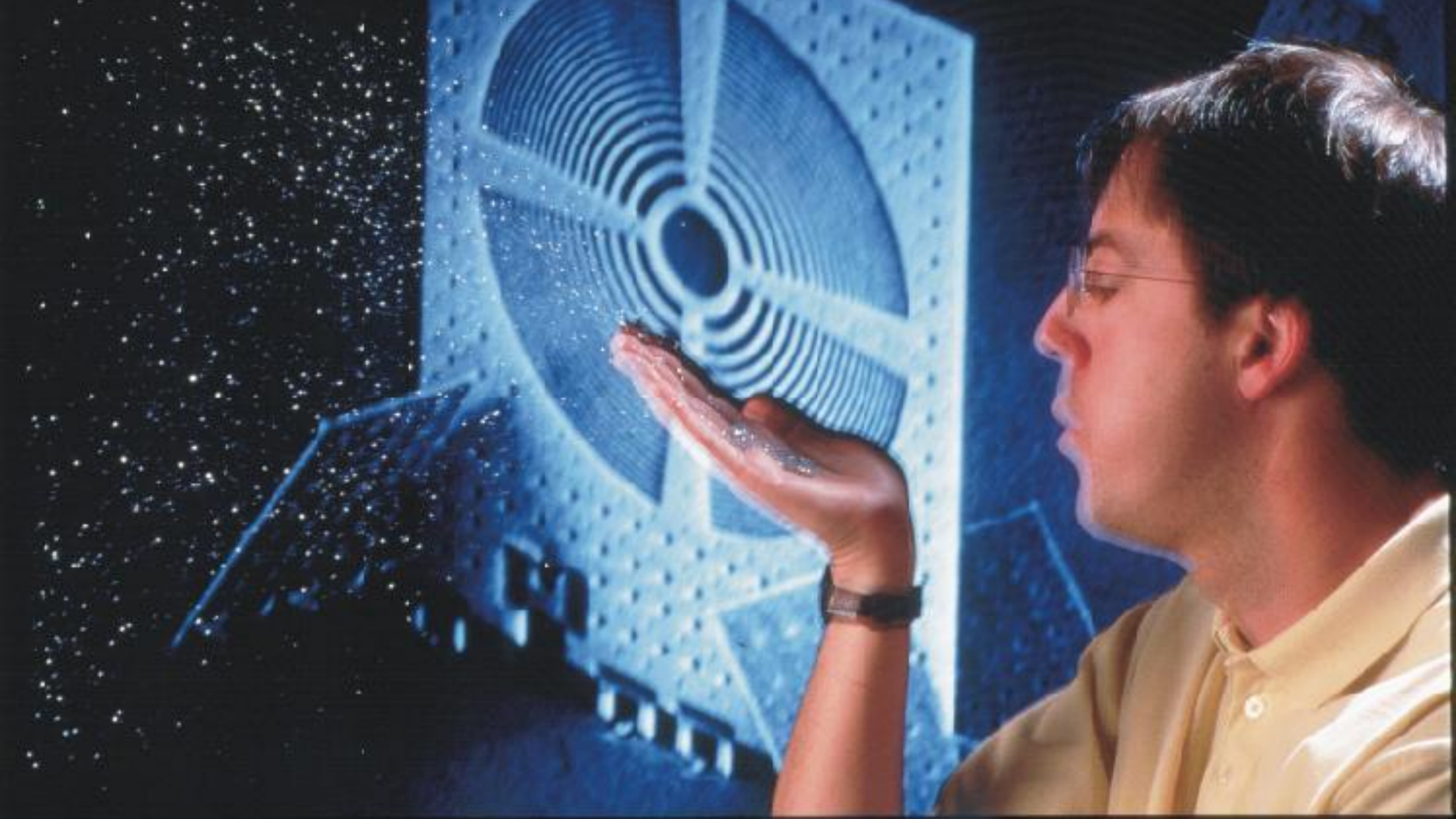
Smart Dust vision in 1999

"Mobile Networking for Smart Dust"

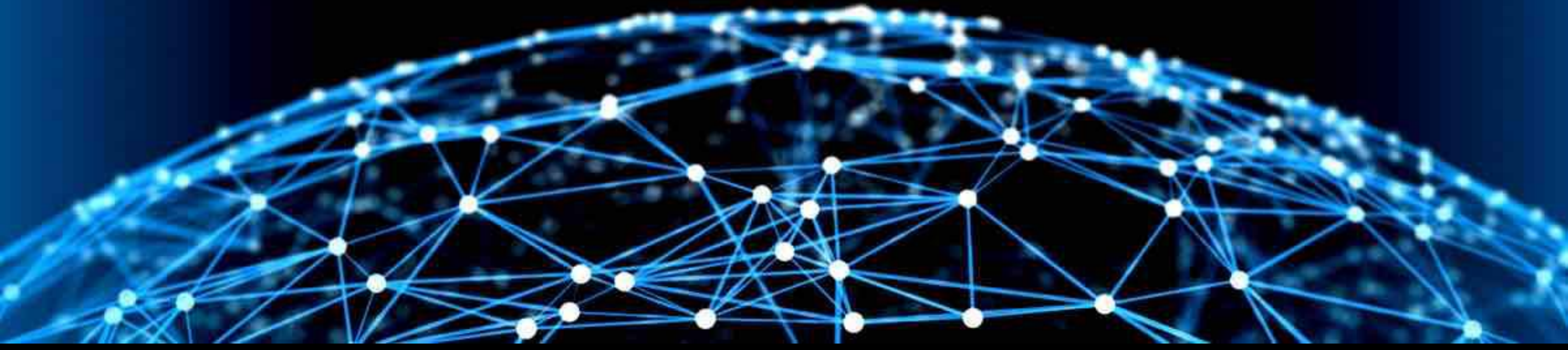
J.M. Kahn, R.H. Katz and K.S.J. Pister,
MobiCom 1999

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



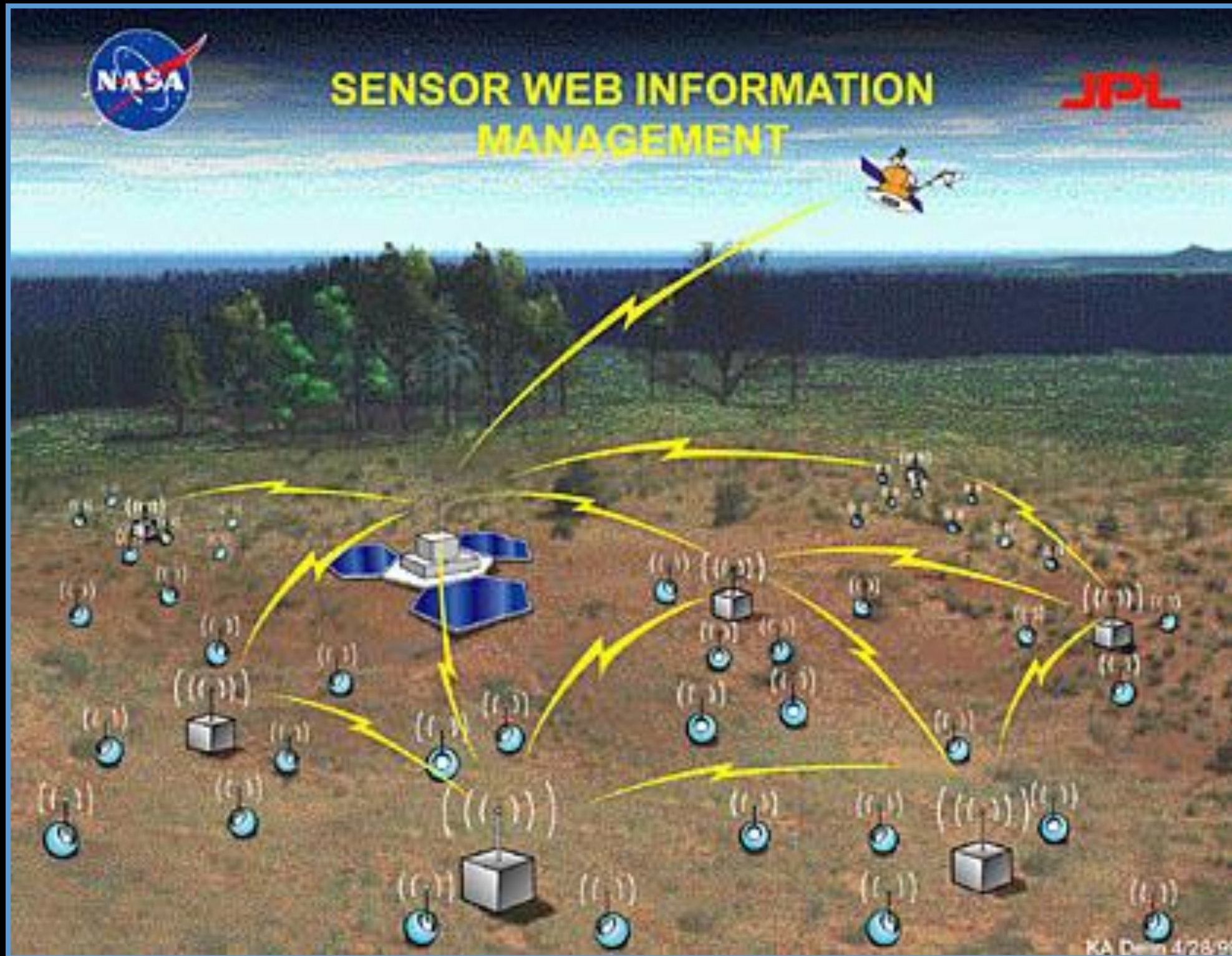


Network Topology





SENSOR WEB INFORMATION MANAGEMENT





GREAT BARRIER REEF

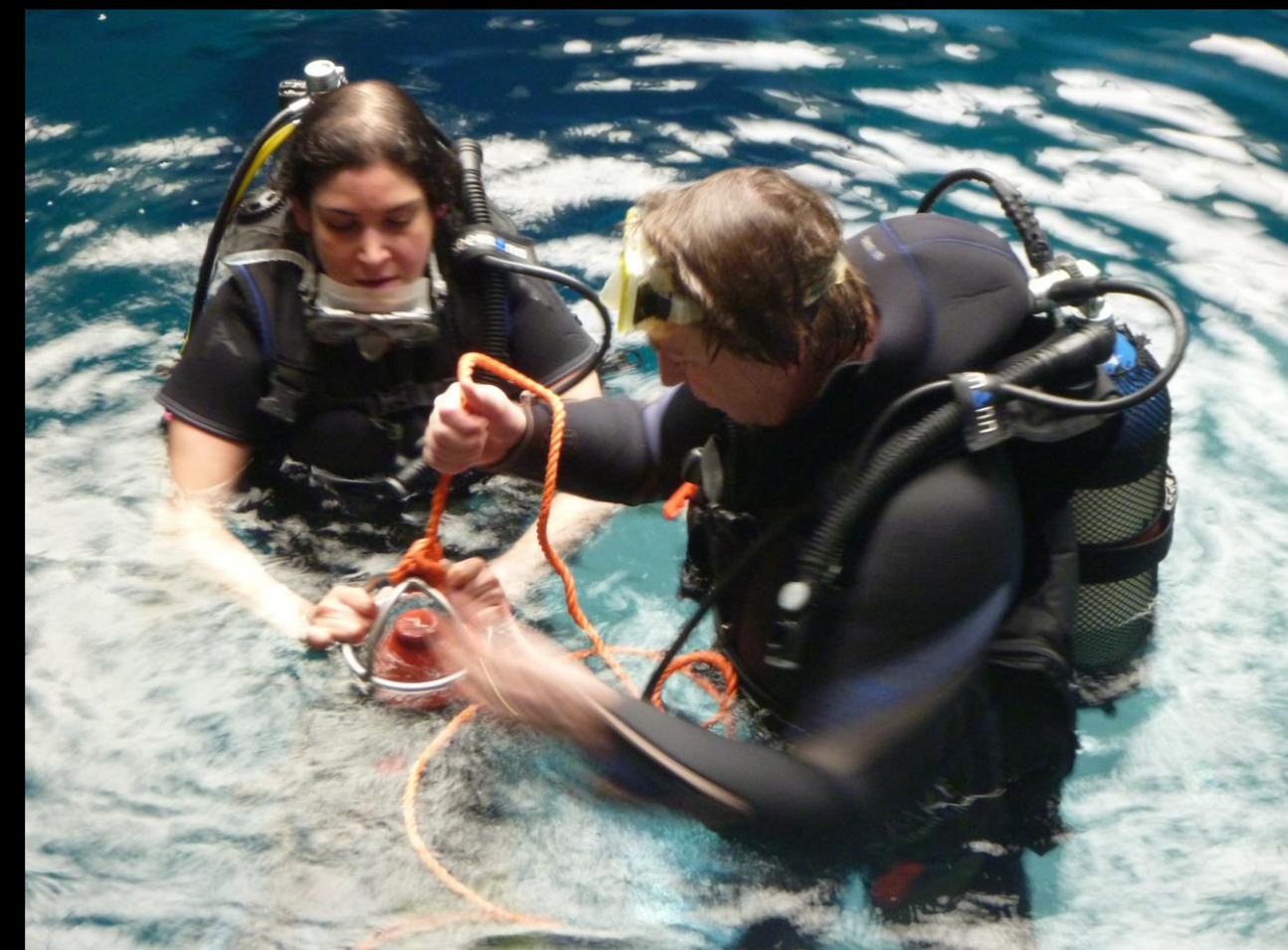
ENVIRONMENTAL MONITORING.

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



UNDERWATER SENSOR SYSTEMS.

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





Sportman Staalbouw

ONTWERP HET EIGEN BEDRIJFSHAL
mijnbedrijfshal.nl

Docum

GENESI STRUCTURAL HEALTH MONITORING

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

Défense d'entrer
Nous déclinons toute responsabilité
en cas d'accidents
L'entrepreneur





AWARE FIRST RESPONDERS

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





WiBRATE

WIRELESS VIBRATION MONITORING.

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

Monitryx Bearings - Home / Search

Current Version: 1.3 You are currently looking at data for: London & South Eastern Railway Limited

Filter / Search:

Show: Bearing Health Index

Unit: All Units

Reported In: All Time

Show BHI: All Categories

Sort By: Worst Unit First

Show Empty:

filter reset

Summary:

Unit	Reported	#Cat 1	#Cat 2	#Cat 3
375821	03/08/12 11:14	5	2	0
375803	02/08/12 19:54	1	1	0
375820	01/08/12 17:28	1	0	0
375810	03/08/12 15:22	2	0	0
375811	03/08/12 07:48	1	0	0
375808	02/08/12 15:28	0	0	0
375816	03/08/12 16:20	0	0	0
375805	02/08/12 12:02	0	0	0
375804	03/08/12 09:11	0	0	0
375801	03/08/12 14:54	0	0	0

Unit Overview:

Unit	Vehicle(s)				
375821	73321	79021	78221	73721	
375803	73303	79003	78203	73703	
375820	73320	79020	78220	73720	
375810	73310	79010	78210	73710	
375811	73311	79011	78211	73711	
375808	73308	79008	78208	73708	
375816	73316	79016	78216	73716	
375805	73305	79005	78205	73705	
375804	73304	79004	78204	73704	
375801	73301	79001	78201	73701	

Wheel Loc: DA2
 Bearing S/N: E703
 Last Reported: 17:28 01/08/2012
 BHI: 1.516
 Av Temp [oC]: 28
 Max Temp [oC]: 28

[View Graph](#) | [Close](#)

A person in a dark uniform is using a long-handled tool to attach a sensor to a rhinoceros. The rhinoceros is lying on the ground in a savanna setting. Another person's leg and green boot are visible in the background.

SMART PARKS ANTI POACHING.

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



Animals as sentinels





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



An aerial photograph of a sprawling industrial complex, likely a steel mill or refinery. The facility is characterized by numerous tall, cylindrical smokestacks, some of which are emitting thick plumes of white steam or smoke. The ground is a dense network of pipes, walkways, and various industrial structures. In the background, a body of water is visible, with several large barges or ships docked along the shore. The overall scene depicts a complex and active industrial environment.

SUPREME SMART INDUSTRY.

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



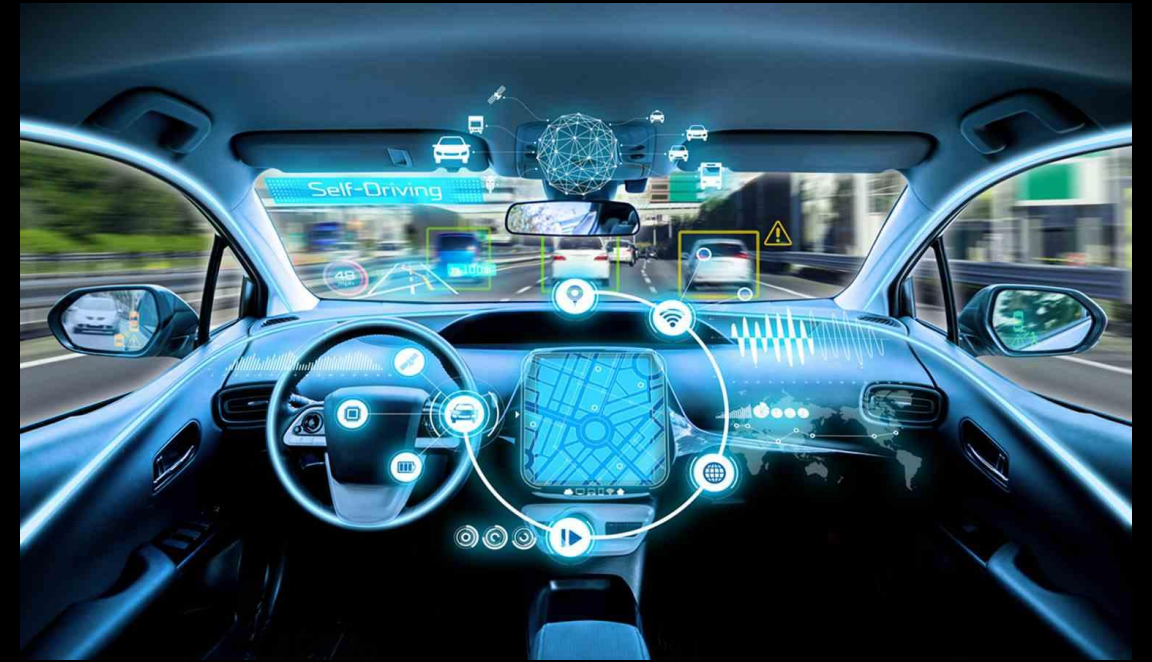
UNOBTRUSIVE SENSING HEALTHCARE.

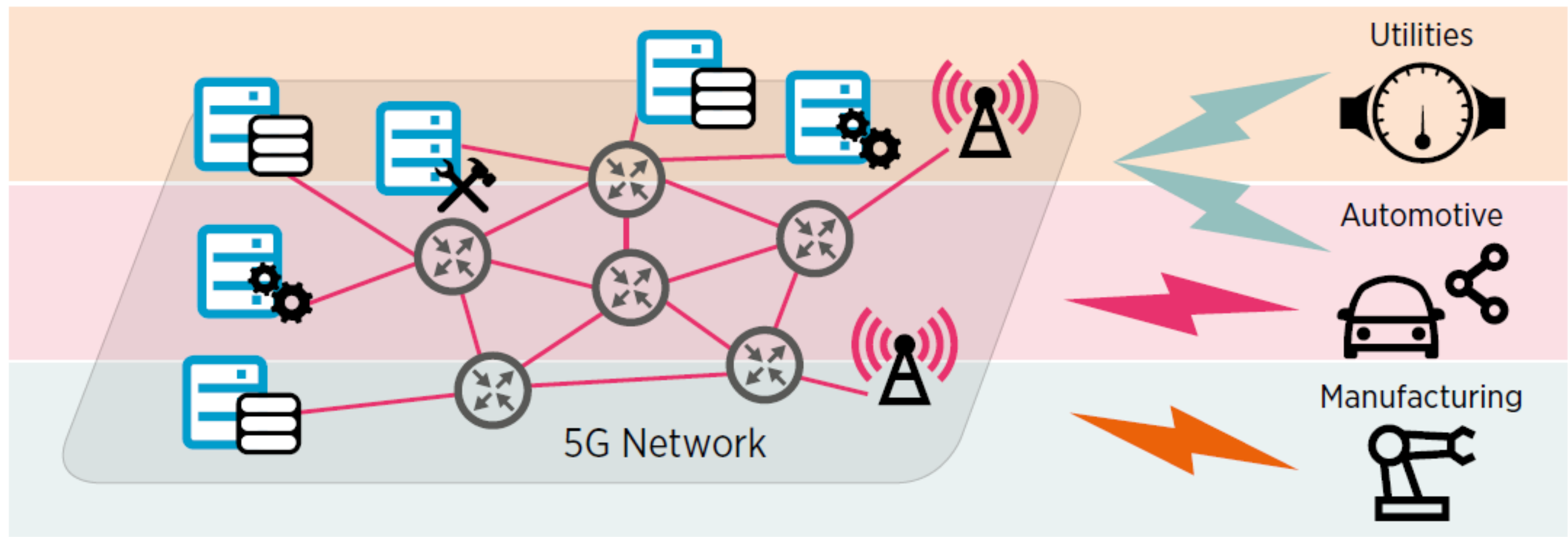
- Supporting elderly people
- Activities, behavior, mood, intentions
- Physiological sensing (e.g. heart rate)
- Using CSI analysis
 - to detect WIFI disturbances

A photograph of a cellular tower with multiple antennas and cables against a clear blue sky. The tower is a complex structure of metal poles and equipment, with several large, white, rectangular antennas mounted on it. The background is a clear, bright blue sky. The tower is the central focus of the image, with various cables and components visible. The overall scene is a clear, sunny day.


UBIQUITOUS NETWORKS BEYOND PEOPLE.


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





 IoT slice

 Broadband slice

 Low latency slice

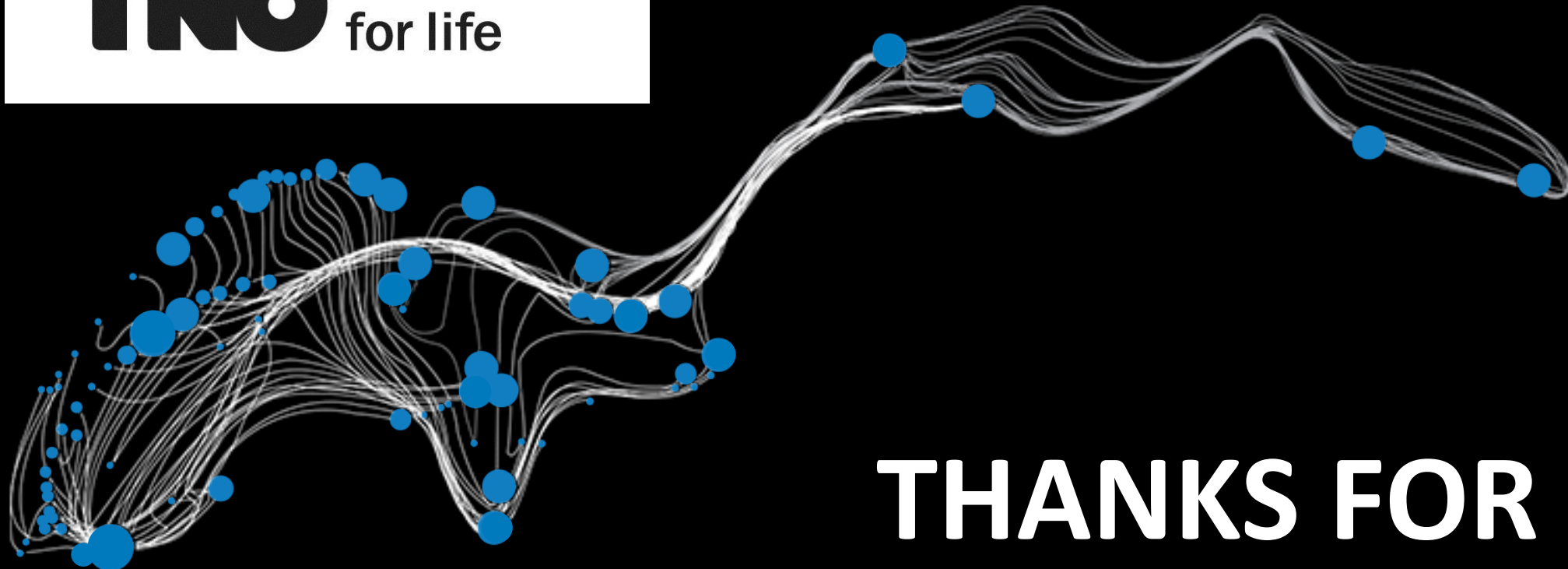
What is Internet of Things, what is AI,
and why should you care?

IOT

Internet of Things

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?
-



THANKS FOR YOUR ATTENTION

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