# ARTIFICIAL INTELLIGENCE FOR ACCELERATED GROWTH

TRANSVERSAL TECHNOLOGIES ENABLE AMBITIOUS APPLICATION SCENARIOS

COMPUTE POWER ← **AI** → BIG DATA

AMAZON
GOOGLE
FACEBOOK
APPLE

ALIBABA
BAIDU
TENCENT
XIAOMI

COMPUTE POWER ← **AI** → BIG DATA

↓

SECURE DISTRIBUTED AI

APPLICATION SPECIFIC AI

**DIFFERENTIATING**
FROM OTHER MAJOR WW INITIATIVES

**AMBITIOUS**

**COMPREHENSIVE**

**INCLUSIVE**

**COMBINING**

ACADEMIC EXCELLENCE

DIGITAL TECHNOLOGY LEADERSHIP

INDUSTRY LEADERSHIP

APPLICATION POTENTIAL

# COMPREHENSIVE & INDUSTRY DRIVEN

POLICY MAKERS
GENERAL PUBLIC

INDUSTRY

STRATEGIC RESEARCH

ACADEMIC PARTNERS

Building on strengths

OUTREACH, EDUCATION AND POLICY SUPPORT

INDUSTRY SUPPORT ACTIONS

APPLIED R&D PLATFORM BUILDING

GROUNDBREAKING FOUNDATIONAL RESEARCH

Addressing industry needs

Strengthen AI impact on industrial processes

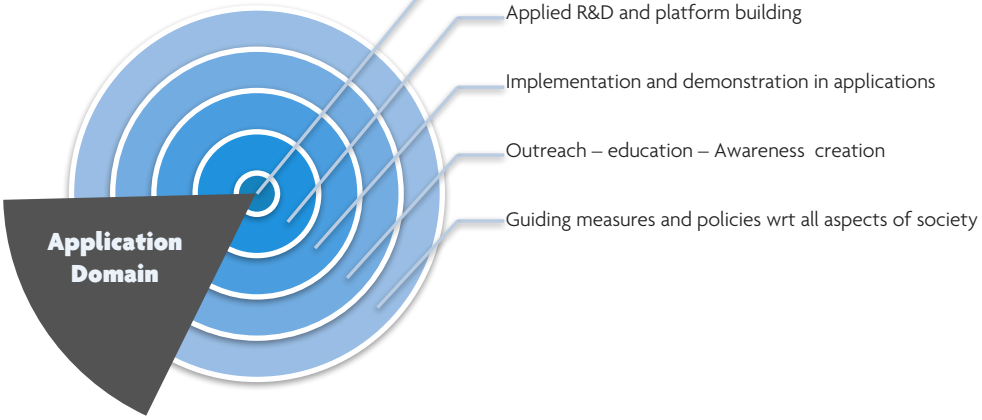
Strengthen AI impact on Offering of companies

Strengthen AI impact on Business models

New start-ups / scale-ups in AI and related domains

# A CONTINUUM FROM EXPLORATION TO IMPLEMENTATION

## WITH ALL KEY FLEMISH STAKEHOLDERS



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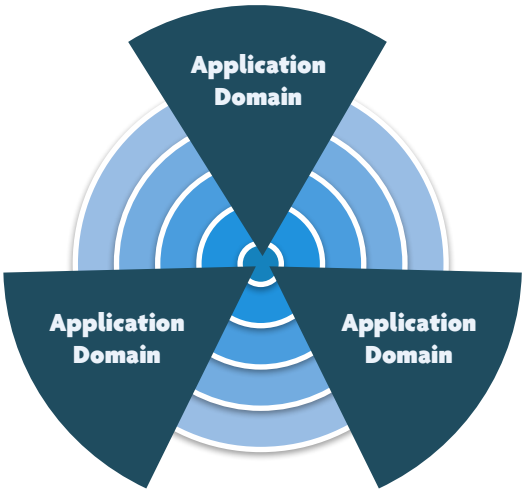





POLICY MAKERS
GENERAL PUBLIC

INDUSTRY

sirris .AGORIA

Vlaams netwerk van ondernemingen

STRATEGIC RESEARCH

imec FLANDERS MAKE

VIB

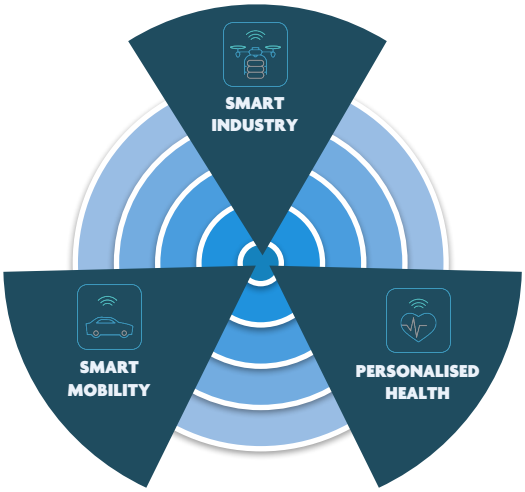
ACADEMIC PARTNERS

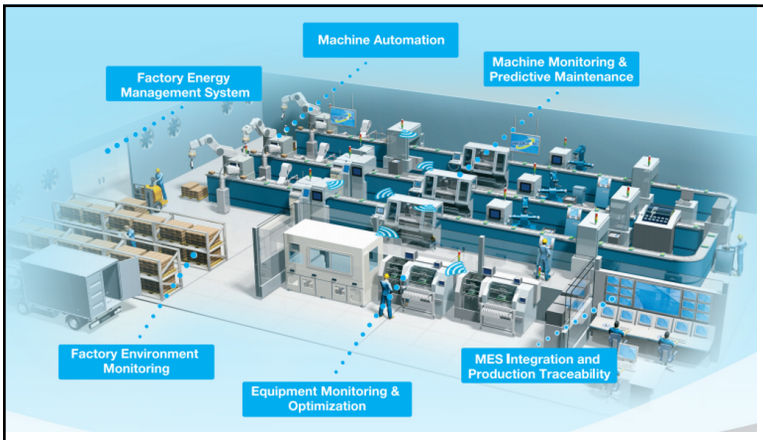
VUB VRIJE UNIVERSITEIT BRUSSEL

UNIVERSITEIT GENT

KU LEUVEN

Universiteit Antwerpen



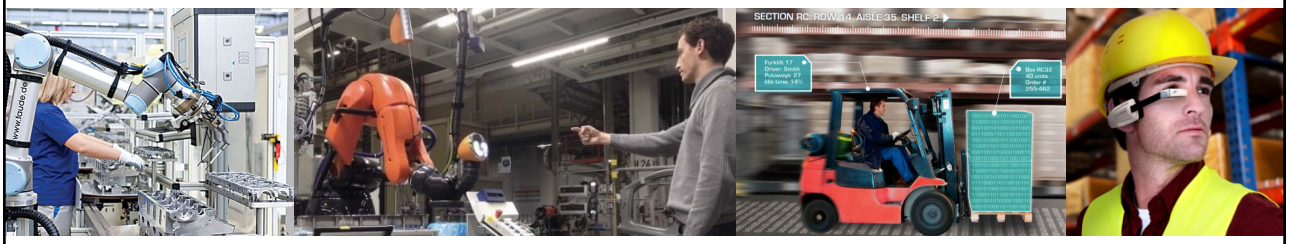



# SMART INDUSTRY

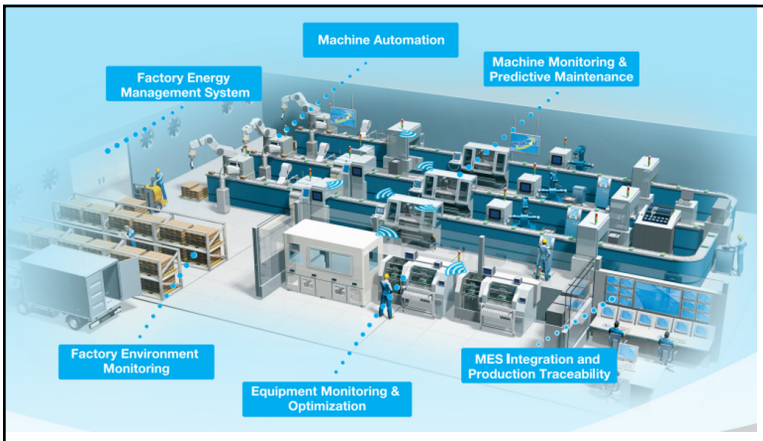
SMART INDUSTRY

Smaller production series – faster product updates
More variability – different product flavors
Reduce shipping cost
...

Digital Factory Twin
Smarter quick learning cobots
Human-machine interaction
Augmented and virtual reality
Sensors monitoring the factory floor, Safety
Highly skilled workers

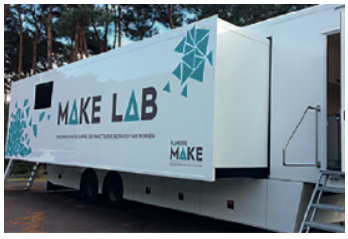




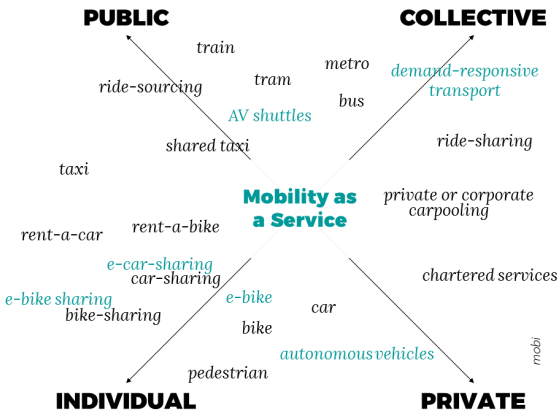



# SMART INDUSTRY

SMART INDUSTRY




Innovation, validation and demonstration in vehicle industry, in the machine building industry and in production environments




## SMART MOBILITY

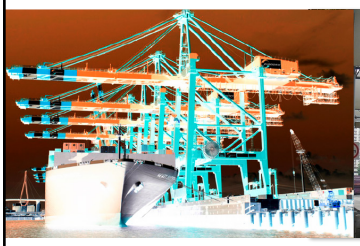
SMART MOBILITY

Reduce congestion
Improve safety
Reduce social exclusion
Improve sustainability
Regain public space

**END GOALS**

Shared Situational Awareness
Intelligent Intersections
Joint & Synchromodal scheduling
Spare capacity tracking
Mobility shaping
Last mile delivery

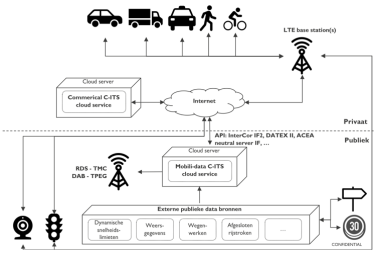
**ENABLING USE CASES**



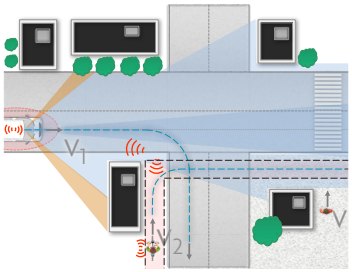
## SMART MOBILITY

SMART MOBILITY

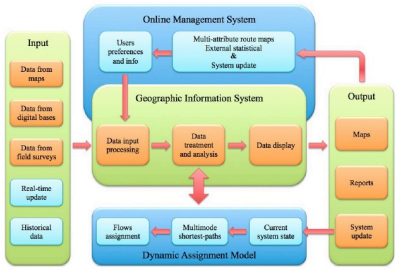
### SHARED WIRELESS CONNECTIVITY




### DISTRIBUTED INTELLIGENCE & SENSOR FUSION

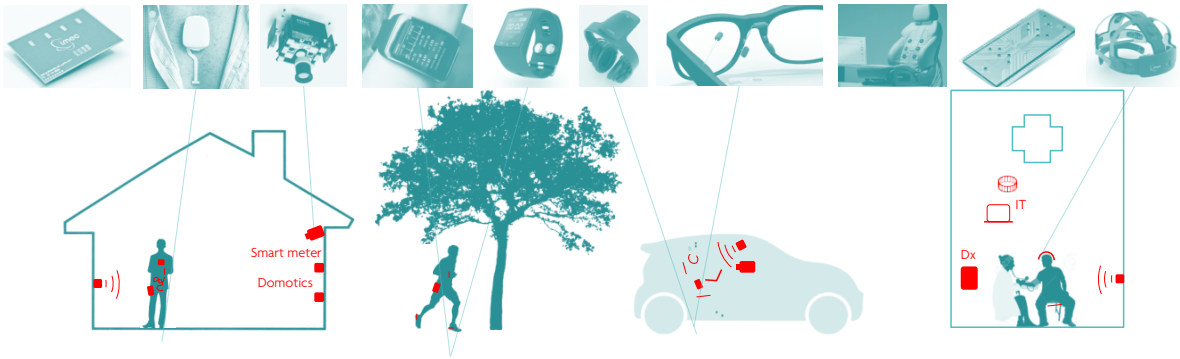



### OPEN DIGITAL TRANSPORT TWIN



## PERSONALISED HEALTH

PERSONALISED HEALTH






## PERSONALISED HEALTH

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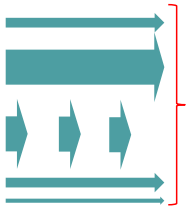


AI

Data fusion

Trusted
Secure

@datacenter
@extreme edge

EHR

Patient Doctor Government Industry Insurer

# PERSONALISED HEALTH

PERSONALISED HEALTH

## Leading R&D organizations in all disciplines

imec VIB vito FLANDERS MAKE
UZ GENT UZ LEUVEN Universitair Ziekenhuis Brussel UZA
KU LEUVEN UNIVERSITEIT GENT Universiteit Antwerpen VUB VRIJE UNIVERSITEIT BRUSSEL

flanders.bio

janssen Ablynx
... Galápagos BIOCARTIS ...
materialise Multiplicom

## Reputation for clinical trials and biotech ecosystem

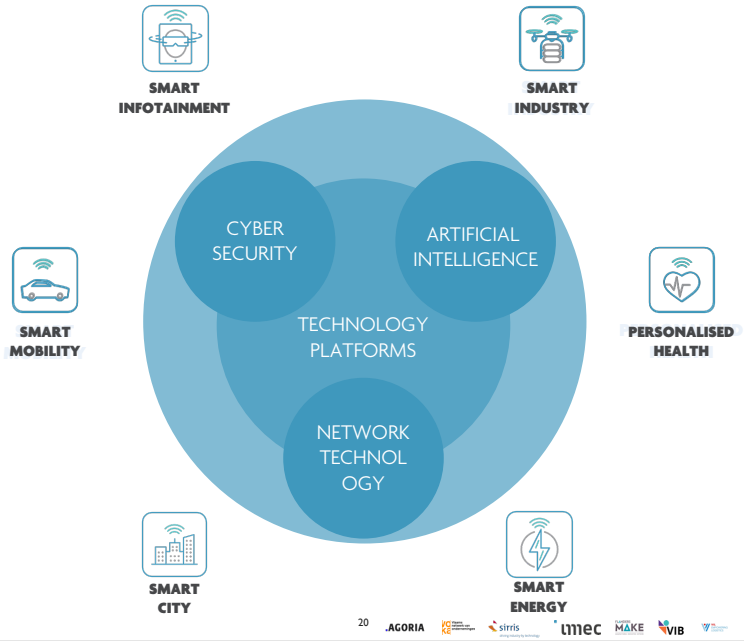
**fastest**
clinical approval in EU - 15 days

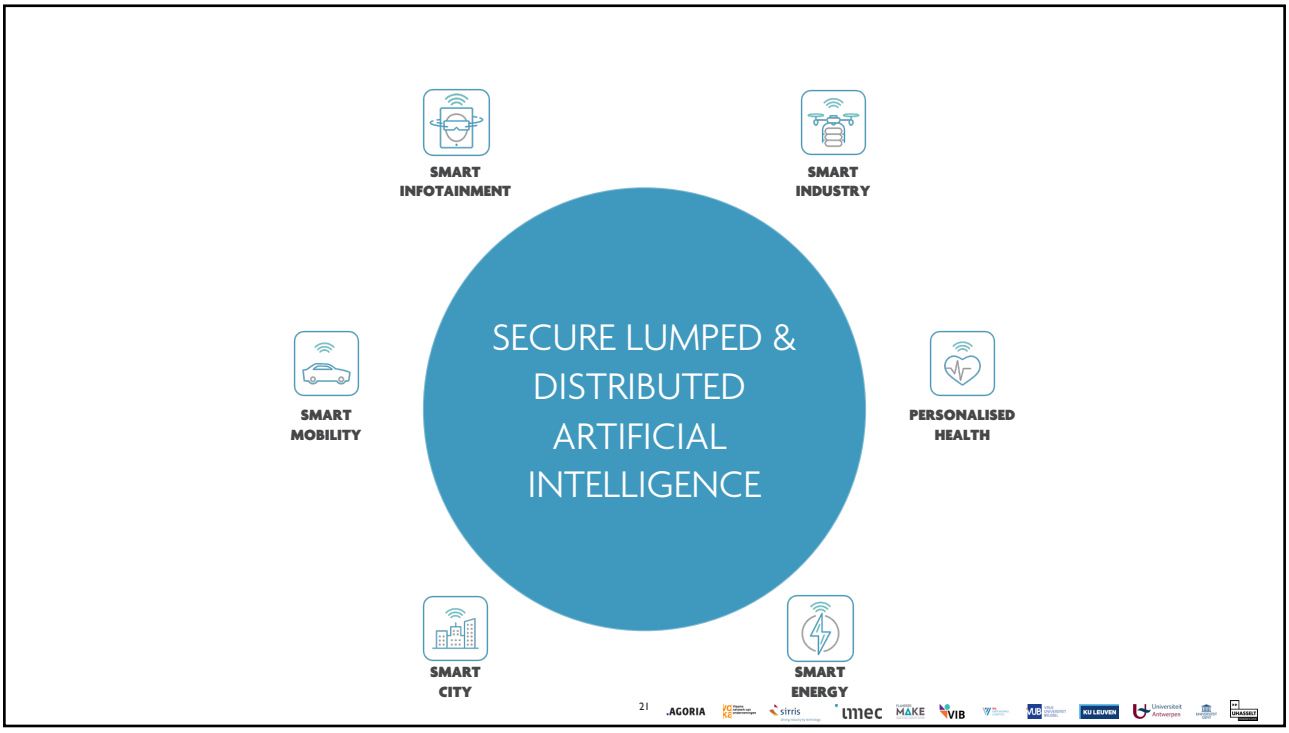
**#2**
in Europe for number of trials per capita

**18%**
of EU biotech market cap was generated in Belgium in 2016

FIT






SMART INFOTAINMENT
SMART INDUSTRY
SECURE LUMPED & DISTRIBUTED ARTIFICIAL INTELLIGENCE
SMART MOBILITY
PERSONALISED HEALTH
SMART CITY
SMART ENERGY
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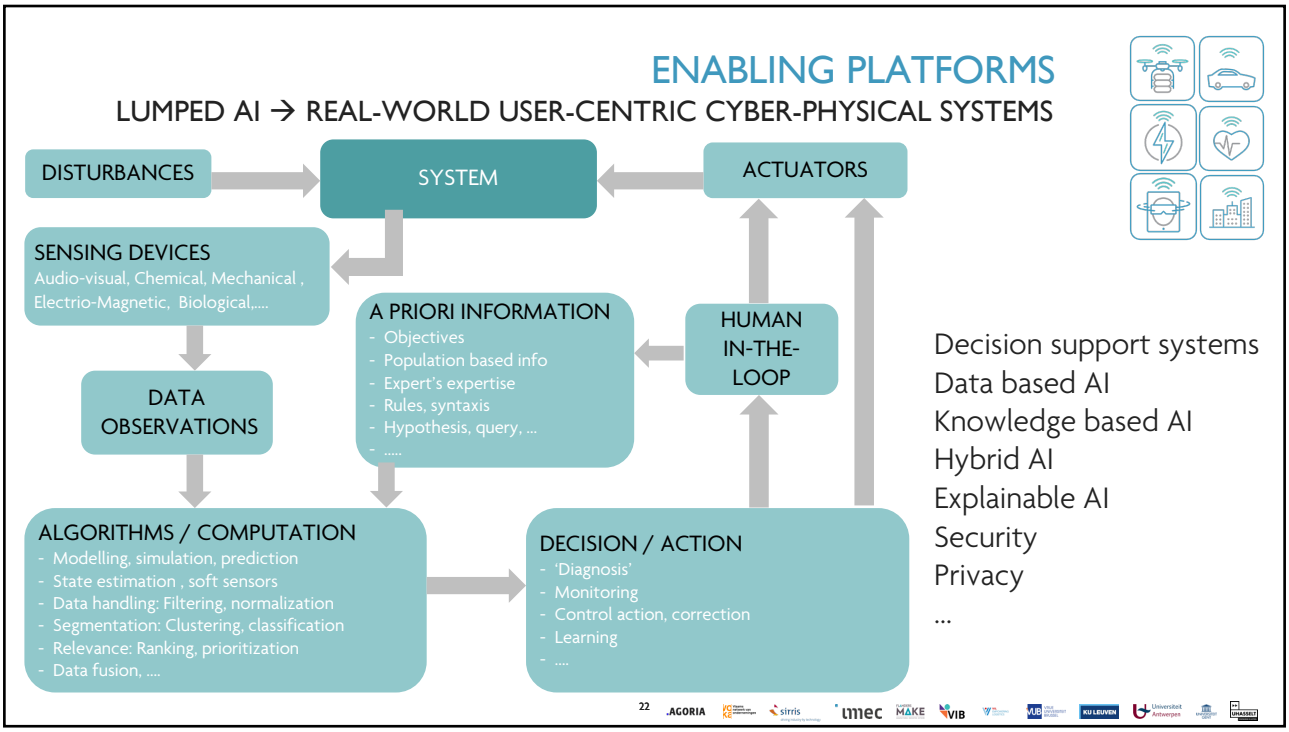
ENABLING PLATFORMS
LUMPED AI → REAL-WORLD USER-CENTRIC CYBER-PHYSICAL SYSTEMS
DISTURBANCES
SYSTEM
ACTUATORS
SENSING DEVICES
Audio-visual, Chemical, Mechanical , Electrio-Magnetic, Biological,....
A PRIORI INFORMATION
- Objectives
- Population based info
- Expert's expertise
- Rules, syntaxis
- Hypothesis, query, ...
- .....
HUMAN IN-THE-LOOP
DATA OBSERVATIONS
ALGORITHMS / COMPUTATION
- Modelling, simulation, prediction
- State estimation , soft sensors
- Data handling: Filtering, normalization
- Segmentation: Clustering, classification
- Relevance: Ranking, prioritization
- Data fusion, ....
DECISION / ACTION
- 'Diagnosis'
- Monitoring
- Control action, correction
- Learning
- ....
Decision support systems
Data based AI
Knowledge based AI
Hybrid AI
Explainable AI
Security
Privacy
...
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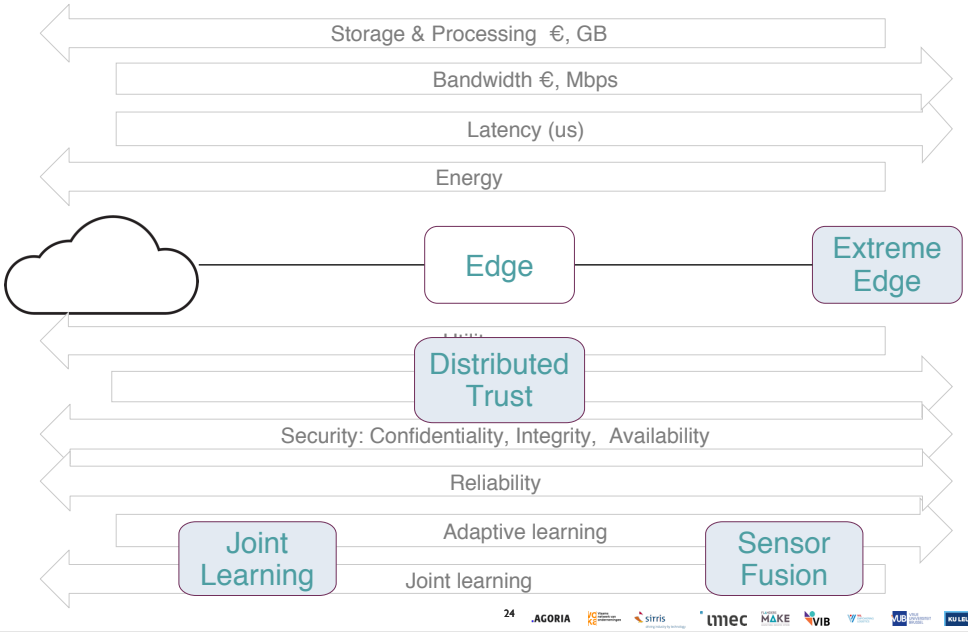
## ENABLING PLATFORMS

MULTI-AGENT SECURE DISTRIBUTED AI

- distributed collaborative AI system will execute simultaneously on many devices and servers.
- communication between agents and in the data chain
- reduction of the data to core features
- meet the timing & energy constraints, need for specialized hardware architectures at edge



## ENABLING PLATFORMS



# ENABLING PLATFORMS

## NEW COMPUTE @ EXTREME EDGE

**Brain inspired**

Cortical | SNN | …

**Deep learning**

CNN | LSTM | …

**Conventional ML**

Support Vector | Markov chains | Decision trees | …

| | | | | | |
|---|---|---|---|---|---|
| Algorithm selection for customer problem | Network selection and optimization | | | | |
| | **No power budget limitations?** | | | **Limited power budget** | |
| Selection of implementation platform | GPU | FPGA | Accelerator | **Lower accuracy acceptable** Low precision | Analog/CIM |
| Evaluation | Software/PC | FPGA/board | ASIC/board | Imec platform | Imec platform |
| Productization Time line | 3 months | IC-link 6-9 months | IC-link 18 months | IC-link 2 years | imec 5 years |

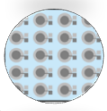
New ways of acquiring knowledge
Efficient collaborative work
New medical practices
Augmented daily life

# ENABLING PLATFORMS

## AR/VR

Authentication

Medical imaging

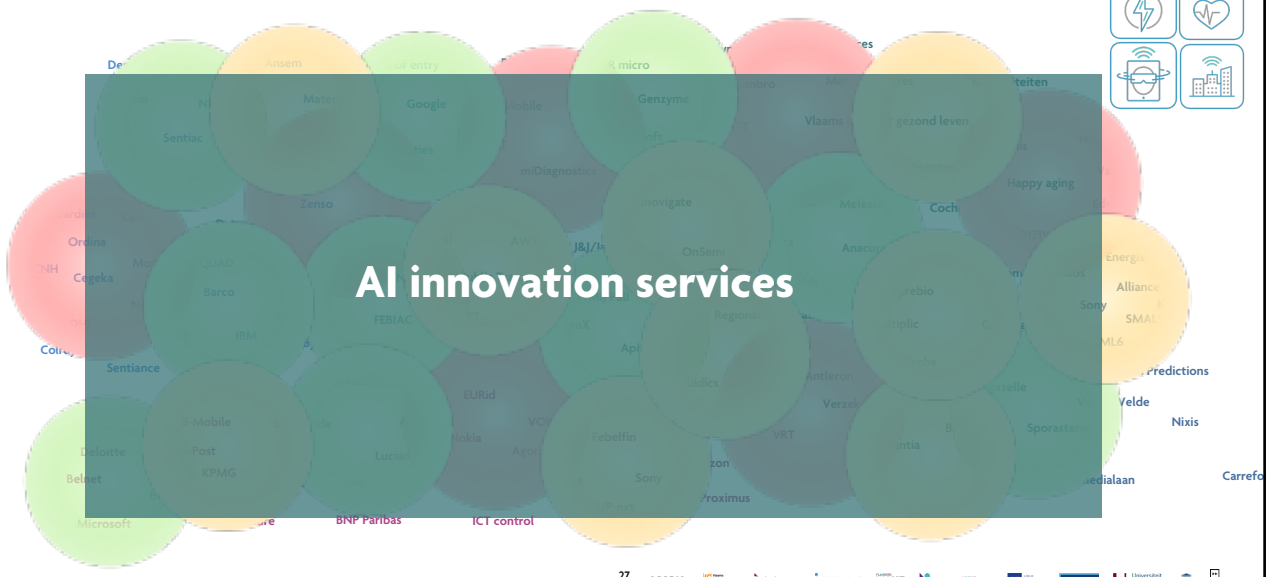


Directional sound

Haptic feedback

Gesture recognition

## INDUSTRY ACCESS AND ADOPTION






## INDUSTRY ACCESS AND ADOPTION

***Artificial Intelligence Innovation Service***

AI awareness and outreach

- neutral and comprehensive AI 'starting guide' (whitepaper); online AI compass chatbot
- pro-active outreach (AI 101 trainings, AI Summer School, AI hackathons)
- campaigns to raise public awareness, involvement and empowerment
- organize an annual competition by defining a challenge that requires a distributed AI solutions

Flemish testbeds and access to AI technology

- low-cost AI hard- and software platform, including standard software platform with AI building blocks
- BYOData, AI FabLab ; MakeLab (Cobots, AR/VR, AI) – Future assembly and smart productivity labs
- access to an extended (mobile) infrastructure for prototyping and testing edge and extreme edge applications
- Access to new platforms

Strong AI community

# POLICY THINK TANK

## *Policy support*

Co-design approach
Recommendations avoiding AI bias, Explainable Artificial Intelligence, improving algorithmic/AI transparency and accountability etc.
Link up with EU policy
Involve stakeholders for complex ethical and policy issues
Drafting of ethical codes and guidelines

## *Societal outreach*

Make AI developments visible for society, and promote ethical and socially responsible deployment, focusing on both positive and negative points
Public outreach efforts, Public awareness raising and empowerment
Following up on media representation of AI: mapping change in different (mis)representations of AI

## *Thought leadership*

Societal and ethical aspects of AI
Attract thought international leaders
Programme of work related to societal and ethical aspects

## *Policy and society validation/certification*

test environment/regulatory sandbox for Human AI data mapping, bias detection, ethical issues, 'AI exam' acceptance and behavioural tests, co-working with AI

## *Legal challenges of AI*

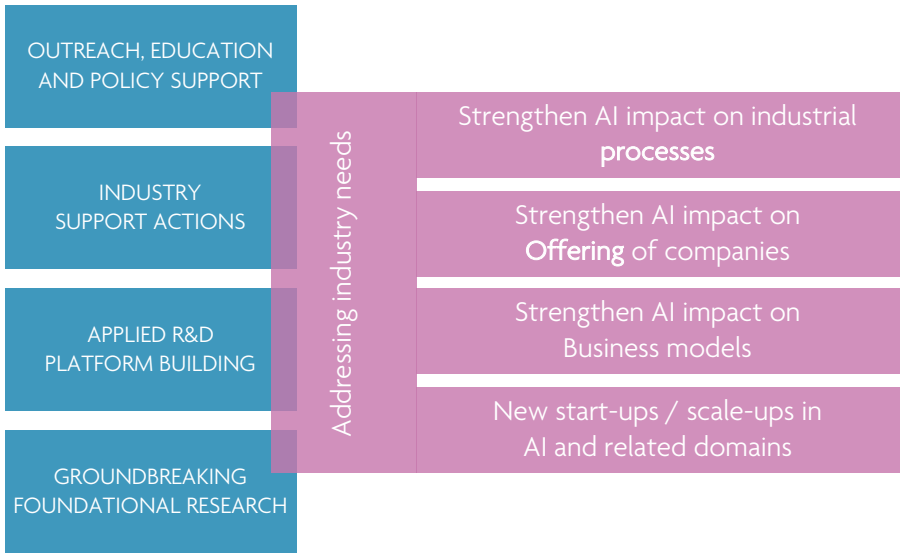
Baseline principles, constraints and touchstone cases
Systematic inventory of the issues to adjust current laws
Identify systemic changes requiring legislative shifts
New public policy models to regulate such systems
Certification of adaptive and non-deterministic systems
liability allocation amongst the actors
Openness of AI systems, e.g. source code, data, safety
Adherence to the European standards of privacy and data



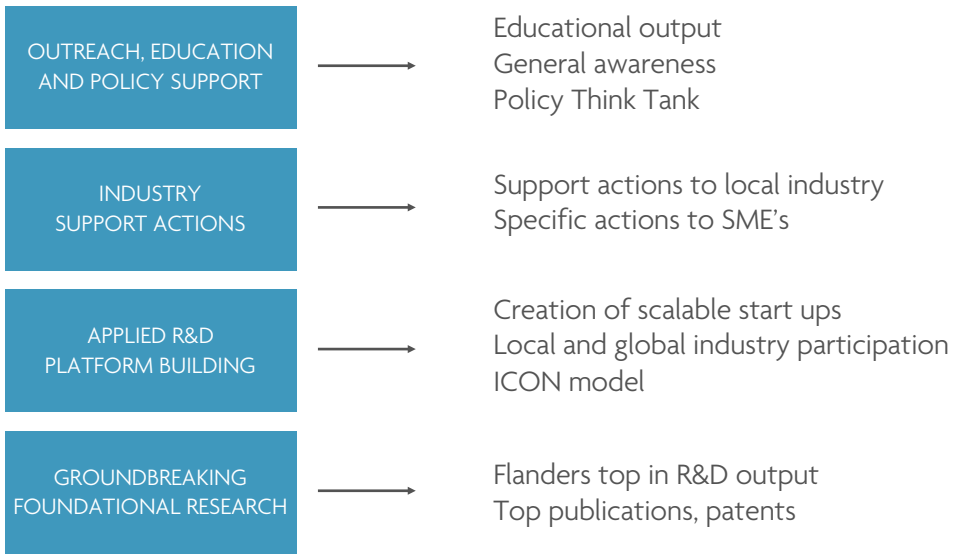
# FLEMISH INDUSTRIAL AI PROGRAM

| GOALS<br>Address industry needs, accelerate industrial adoption | ACTIONS | PARTNERS & STAKEHOLDERS |
|---|---|---|
| Strengthen AI impact on industrial **Processes** | OUTREACH, EDUCATION, ETHICS, POLICY SUPPORT | Existing companies with demand for AI |
| Strengthen AI impact on **Offering** of companies | INDUSTRY SUPPORT ACTIONS | Private technology providers in AI |
| Strengthen AI impact on **Business** models | INDUSTRIAL AI PORTAL NEW PLATFORM BUILDING | Federations, intermediaries, ecosystems, ... |
| Strengthen the local **AI offering** | DEMAND DRIVEN APPLIED R&D | Universities & Research organizations |
| | | Flemish Government |

# FLEMISH INDUSTRIAL AI PROGRAM




# OUTPUT TO BE MONITORED THROUGH KPI'S



# AMBITIOUS

OUTREACH, EDUCATION AND POLICY SUPPORT

INDUSTRY SUPPORT ACTIONS

APPLIED R&D PLATFORM BUILDING

GROUNDBREAKING FOUNDATIONAL RESEARCH

*"België heeft nieuwe ambitie nodig"*

*- Thierry Geerts -*

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sirris
driving industry by technology

Vlaams netwerk van ondernemingen

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FLANDERS MAKE
MANUFACTURING INNOVATION NETWORK

VIB

VIL
EMPOWERING LOGISTICS

VUB VRIJE UNIVERSITEIT BRUSSEL

KU LEUVEN

Universiteit Antwerpen

UNIVERSITEIT GENT

UHASSELT
KNOWLEDGE IN ACTION

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