

ACCELERATING GROWTH BY AND FOR THE NETHERLANDS

Opportunity to join
6G Future Network Services
Leading Applications

Jos Berièrè, Paul Wjngaard
September 2022



› AMBITION: BUILDING A STRATEGIC AND LEADING POSITION FOR THE DEVELOPMENT AND APPLICATION OF 6G NETWORKS

By becoming a leader in the development of intelligent components and networks, and their application in the most important sectors of the Dutch economy, the future earning capacity of BV Nederland will be strengthened.

Deadline for proposal 180 mE growth fund 3 Februari 2023

Intelligent components



Users & applications



System integrators – Operators - Users

Intelligent Networking



Strengthen Ecosystem



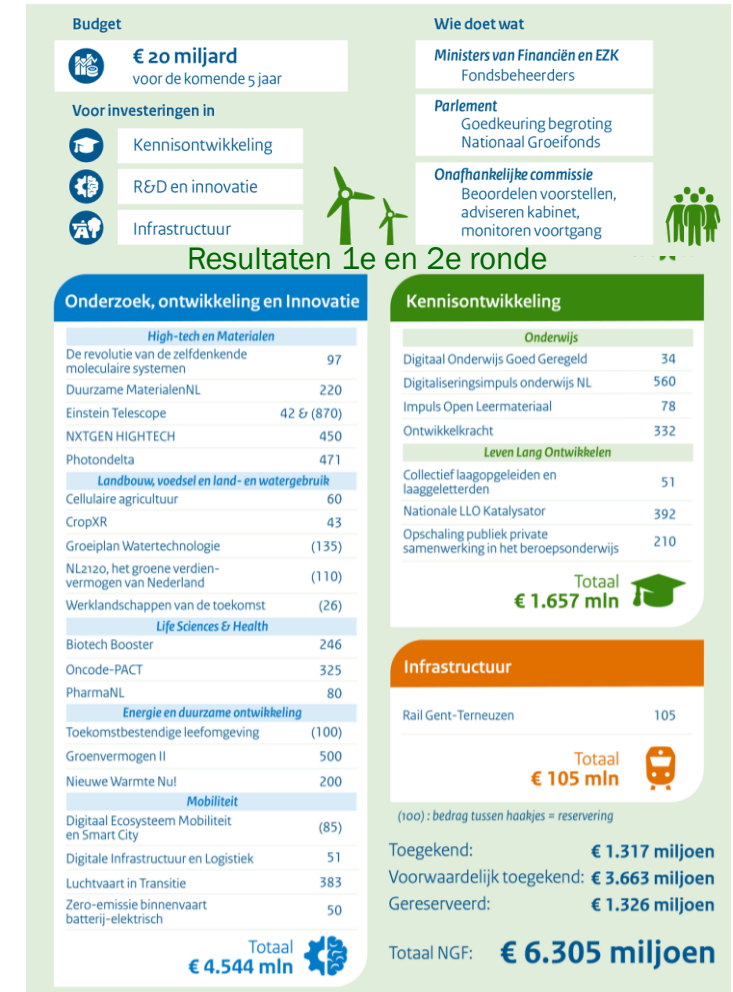
NATIONAL GROWTH FUND – 3RD ROUND

6G Intelligent components and networks – Future Network Services proposal:

- › Proposal will follow “departmentale route” and apply for “Research, Development and Innovation” funding
- › Total project size 180MEuro (including 90MEuro private participations – In kind and in value/Cash)
- › Project period 6 years (H2 2023 – 2029)
- › Mix of public funding instruments (RvO, NWO, direct to partners), taking into account State Aid guidance
- › Proposal for governance structure still to be drafted in line with best practices of first and second round NGF proposals

Nationaal Groeifonds

Voor economische groei en welvaart, ook voor komende generaties



PRESSRELEASE 26 SEPTEMBER 2022

Home / Mobiel / TNO: vergaande samenwerking nodig voor ontwikkeling 6G

TNO: vergaande samenwerking nodig voor ontwikkeling 6G

NIEUWS | MOBIEL | NEDERLAND | 11:27 | BLADWIJZER



Nederland heeft een verregaande samenwerking tussen publieke en private partijen nodig voor de ontwikkeling van de volgende generatie communicatienetwerken, met name 6G. Dat meldt TNO vandaag.

Digitale infrastructuur is van vitaal belang voor Nederland. Het is daarom noodzakelijk dat toekomstige communicatienetwerken supersnel, betrouwbaar, beschikbaar en veilig zijn. Om dat te realiseren is verregaande samenwerking gericht op onderzoek en ontwikkeling van de volgende generatie communicatienetwerken nodig, aldus TNO.

generatie communicatienetwerken nodig, aldus TNO.

Future Networks Services

ICT/magazine kennisdelenkennismaken

IT management Cloud Security Datamanagement Communicatie / Telecom Internet **ICT/zorg**

VOLG ONS: f in

Consortium wil grotere rol voor Nederland in ontwikkeling 6G

DOOR REDACTIE ICT-MAGAZINE - 26/09/2022



Home Voor mij Media Ontdek Meer



6G moet nog veel sneller worden dan 5G en de TU/e werkt er nu al hard aan

VANDAA De Telegraaf NIEUWS SPORT ENTERTAINMENT FINANCIEL VROUW LIFESTYLE WAT U ZEGT

Nederlandse tech wil €90 miljoen voor ontwikkeling 6G: 'Antenne hier maken'

Door WOUTER VAN BERGEN 3 jaar geleden in FINANCIEL

Nederland zoekt meer grip op ontwikkeling 6G

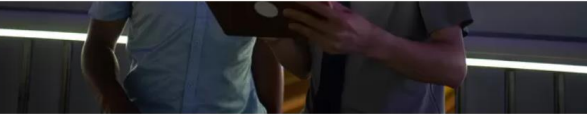
TNO roept geïnteresseerde organisaties op mee te werken in nieuw initiatief.



Duurzaam Gezond Veilig Digitaal Sectoren Werken bij Meer

AD NIEUWS REGIO SPORT SHOW PLAY PODCAST PUZZEL

Auto Geld Gezin Gezond Koken & Eten Tech Werk Wonen



Na 5G komt 6G... maar wie zit daar nu op te wachten?

Terwijl het 5G-telefoonnetwerk nog niet eens volledig is uitgerold in Nederland, wordt er nu alweer gesproken over 6G. Wat is dat, wanneer komt dit, en hebben we het echt nodig?

Jan Meijroos 21-06-22, 08:00 Laatste update: 21-06-22, 14:48



Televisies en smartphones worden groter, computermonitoren breder, resoluties steeds hoger en ook de manier waarop draadloos data wordt verstuurd en ontvangen gaat steeds sneller. In onze huizen draaien de eerste routers nu op Wifi 6, terwijl Wifi 7 al in de maak is. Hetzelfde geldt voor 6G. Maar zijn we niet pas net aan het wennen aan 5G?

Consortium Future Network Services wil grotere rol voor Nederland in ontwikkeling 6G

Ubiquitous digital infrastructure 26 september 2022

Het ministerie van Economische zaken en Klimaat (EZK) en de Topsector ICT steunen het Groeifondsvoorstel van TNO en partners voor het realiseren van het Future Networks Services (FNS) programma. Het Groeifondsvoorstel wordt ingediend in de derde aanvraagronde van het Nationaal Groeifonds, die begin 2023 sluit. Bedrijven en kennisinstellingen uit de sector worden opgeroepen om zich zo spoedig mogelijk aan te sluiten bij het voorstel. Tientallen telecombedrijven, technische universiteiten en kennisinstellingen hebben zich inmiddels aangesloten.

Future Network Services

Digitale infrastructuur is van vitaal belang voor Nederland. Het is daarom noodzakelijk dat toekomstige communicatienetwerken nog sneller, betrouwbaar, beschikbaar en veilig zijn. Om dat te realiseren is verregaande samenwerking nodig tussen publieke en private partijen, gericht op onderzoek en ontwikkeling van de volgende generatie communicatienetwerken, met name 6G.





6G is sneller dan 5G, stabiel en kan meer dataverkeer tegelijk aan.

FOTO ANP/HH

MET 6G ALLES SNELLER EN NOG BETER TE VINDEN

Terwijl 5G nog niet eens volledig is ingevoerd in Nederland, werken onderzoekers alweer aan de volgende standaard voor draadloze datacommunicatie 6G, die vanaf 2030 moet worden ingevoerd. Wat kunnen we verwachten?

1 Wat is er mis met 5G?

Het kan altijd nog sneller, stabiel en met grotere hoeveelheden data. En wat de telecomsector graag wil toevoegen met 6G, is dat daarmee ook tot op een paar centimeter precies de plaats kan worden bepaald van apparaten die met het netwerk zijn verbonden.

2 Waarom willen ze dat?

Net als 5G, wordt 6G vooral ontwikkeld met de gedachte in het achterhoofd dat steeds meer apparaten online met elkaar verbonden zullen zijn, waaronder zelfrijdende auto's, smarthome-netwerken of robots die de boel op straat schoonhouden, in de landbouw of in industriële omgevingen werken. Huidige plaatsbepalingmethoden als gps zijn soms ontoereikend voor dat soort doeleinden.

3 Wat kan 6G nog meer?

Net als zijn voorgangers 4G tot en met 5G is 6G weer sneller, stabiel en kan het meer dataverkeer tegelijk aan. Daarvoor maakt het straks onder andere gebruik van nog hogere frequentiebanden dan 5G. Omdat dat ook meer energie kost, moeten de netwerken ook slimmer worden en gaan zendstations onder

andere hun signaal niet als een grote lamp in het rond stralen, maar als een spot zich nog preciezer richten op de telefoon of een ander apparaat dat ermee verbonden is.

4 Hoe komt zo'n standaard als 6G tot stand?

De standaarden zijn afspraken over allerlei specificaties en technische protocollen, zodat alle apparaten die eraan voldoen zonder hobbels met elkaar kunnen samenwerken en communiceren. Grote telecomproviders en fabrikanten uit de hele wereld stellen eerst samen vast waar ze denken dat behoefte aan is en wat haalbaar is, en gaan daarna bakkeleien welke technieken ze daar precies voor inzetten. Bij 4G en 5G kwam daar een wereldwijde standaard uit, maar bij 3G waren er nog verschillen tussen Europese specificaties en die in de Verenigde Staten, zodat niet alles over en weer werkte. Deze keer is het de vraag of er geen aparte Chinese standaard komt, nu de uitwisseling van technologie tussen dat land en het

Westen onder druk staat.

5 Kan Nederland daarin nog een rol spelen?

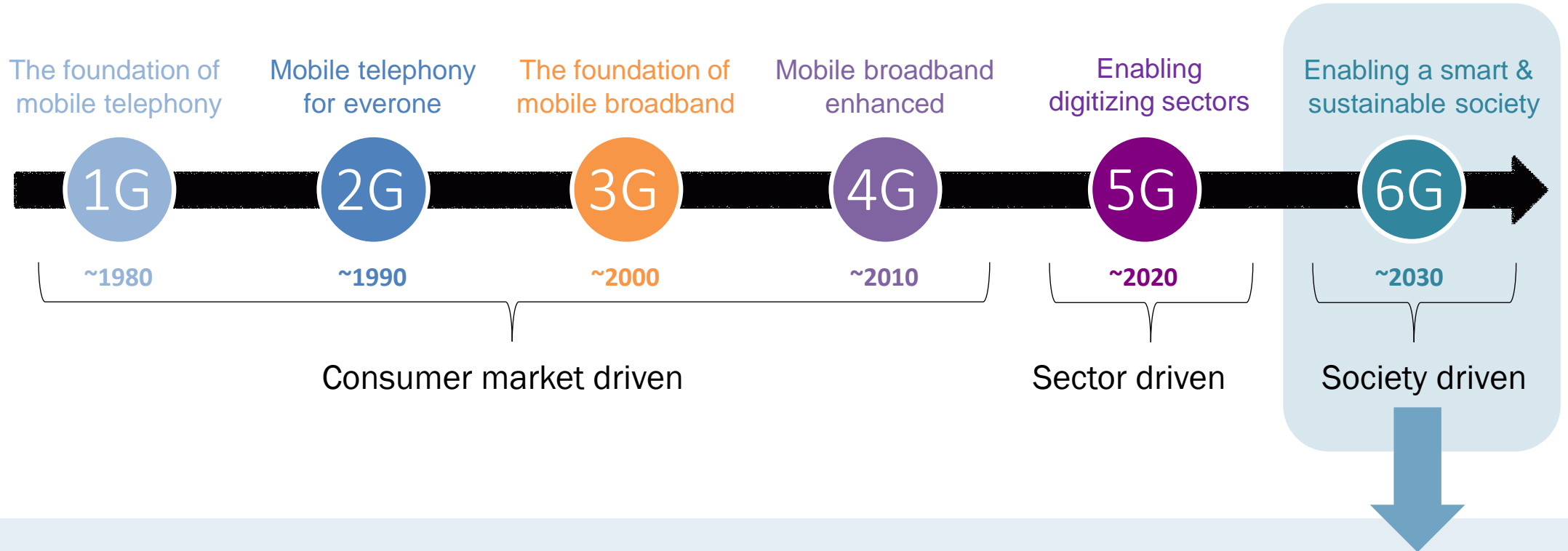
Nederlandse onderzoekers hopen van wel. Een van de technologieën waarover afspraken moeten worden gemaakt, is het gebruik van bepaalde chip- en antennetechnologie, waarover veel kennis is in ons land. Een consortium met TNO, de technische universiteiten van Eindhoven,

Delft en Twente en bedrijven als NXP, Signify en Ampleon dienen binnenkort samen met het ministerie van Economische Zaken en de Topsector ICT een voorstel in bij het Nationaal Groeifonds om 180 miljoen euro te investeren in de ontwikkeling van technologie die kans maakt de wereldwijde standaard voor dat deel van 6G te worden. Van dat geld moet de helft van de overheid komen, de helft komt uit de particuliere sector. Of dat uiteindelijk ook lukt, hangt af van de standaard waarvoor uiteindelijk in het wereldwijde overleg tussen partijen wordt gekozen.

Wouter van Bergen



THE FUTURE STEP BEYOND 5G WILL NOT BE BUSINESS AS USUAL



Stakes / impact on society has become too high for individual organizations in new geopolitical landscape

- Digital sovereignty: creation points of control and prevent strategic vendor and geopolitical dependencies
- Reliability: technical availability, control and trustworthiness to prevent public or national disruption
- Sustainable: energy consumption and footprint within societal goals

WORLDWIDE 6G ANNOUNCED GOVERNMENT GRANTS

6G IS DEEMED A TECHNOLOGY OF STRATEGIC IMPORTANCE



US Funding 2.5BE



EU Funding: 2BE



Unknown



700mE



500mE



290mE

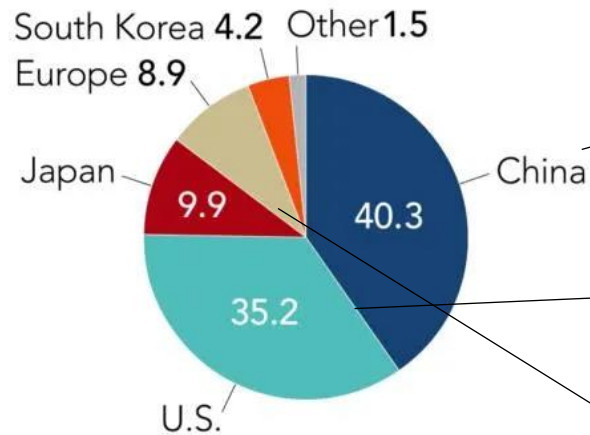


EU IS RESPONDING TO CHINA & USA LEAD IN PATENT FILINGS

THIS IS A PRELUDE 'STANDARD ESSENTIAL PATENTS' ONLY MATTER

6G patent applications by country/region

(As of August 2021, in percent)



Applications for nine areas related to core 6G technology
Source: Cyber Creative Institute

China – Top priority in 14th plan period ('21-'25) claims leadership in next tech frontier

- Huawei
- Companies in various sectors (>40)

USA - Dominated by tech companies

- Qualcomm, Google, Apple, IBM, Microsoft, AWS

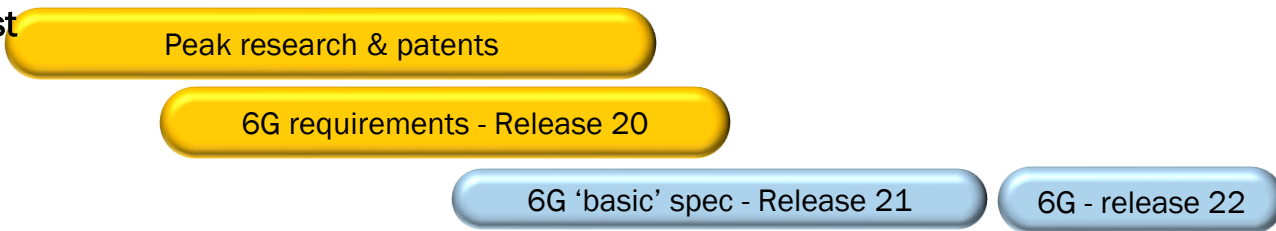
Europe & member states are responding

- Equipment vendors Ericsson, Nokia
- Strong culture of collaboration in EU – but so far limited patent filings about '6G system solutions' or sector specific 6G implementations needed for valorization

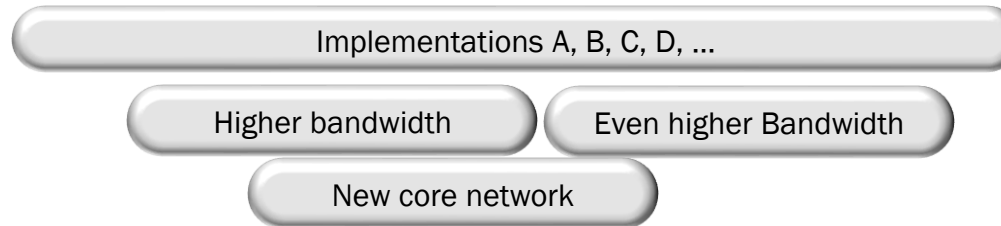
6G CAN BE INFLUENCED – 5G IS ABOUT LEVERAGING TECH



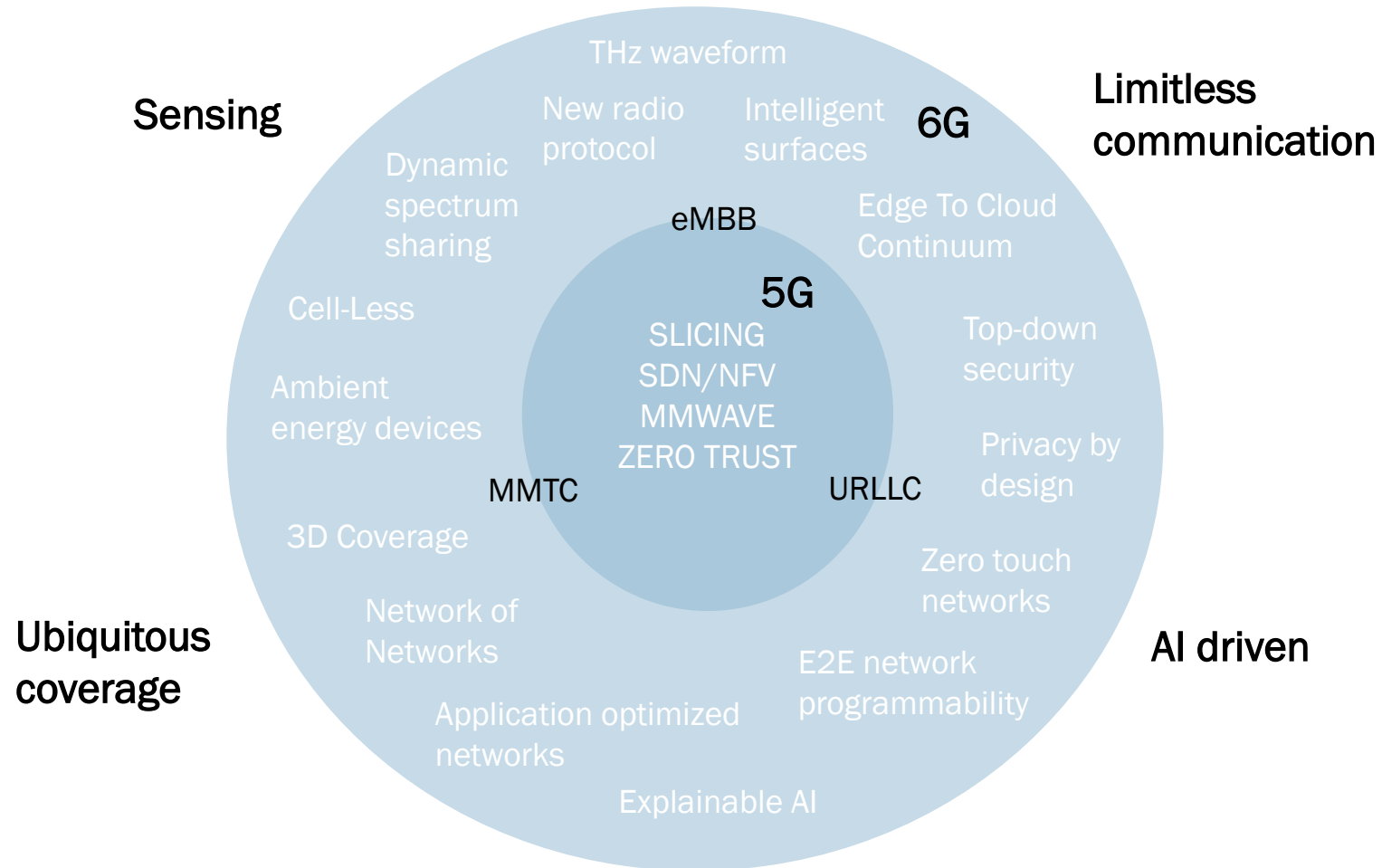
Influence standard development by Dutch interest



Leveraging technology for Dutch companies

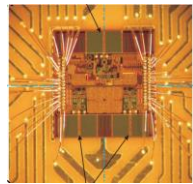
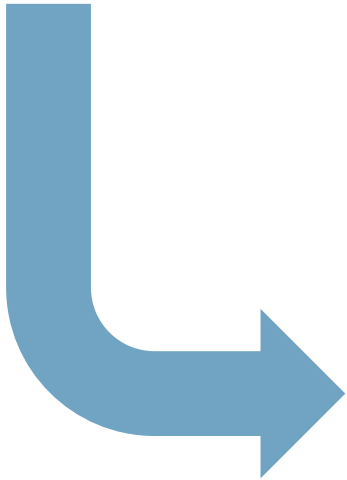


› 6G: AI DRIVEN MOBILE NETWORK FOR SUSTAINABLE, RELIABLE, LIMITLESS COMMUNICATION & SENSING

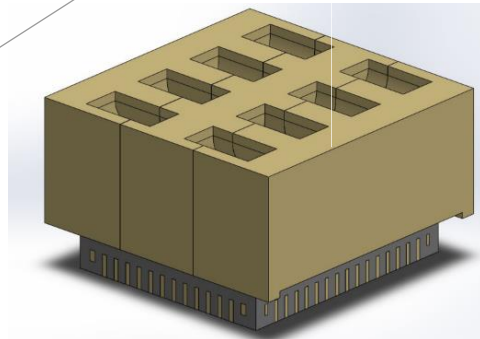


PROGRAM LINE 1: INTELLIGENT COMPONENTS

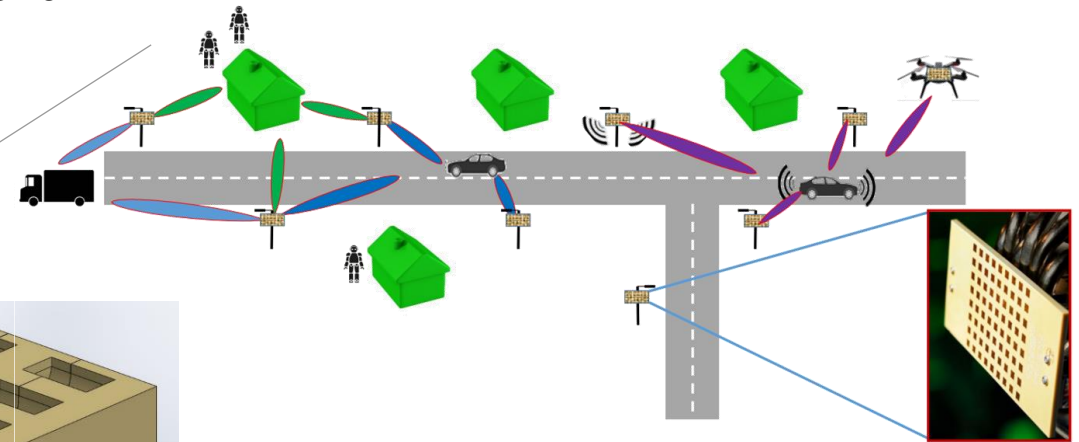
- 6G will use mm-wave frequencies up to 100 GHz and beyond
- Software antennas are required to enable distributed Massive-MIMO
- Highly integrated concepts are required
 - Existing concepts are too power hungry and far too expensive
 - Aperture sharing



Software antenna integrated on chip



Antenna in Plastic (AIP)



Active Array deployed in System

PROGRAM LINE 1: EXISTING ECOSYSTEM, LARGE EU 5G/6G COMPONENTS



www.silika-project.eu



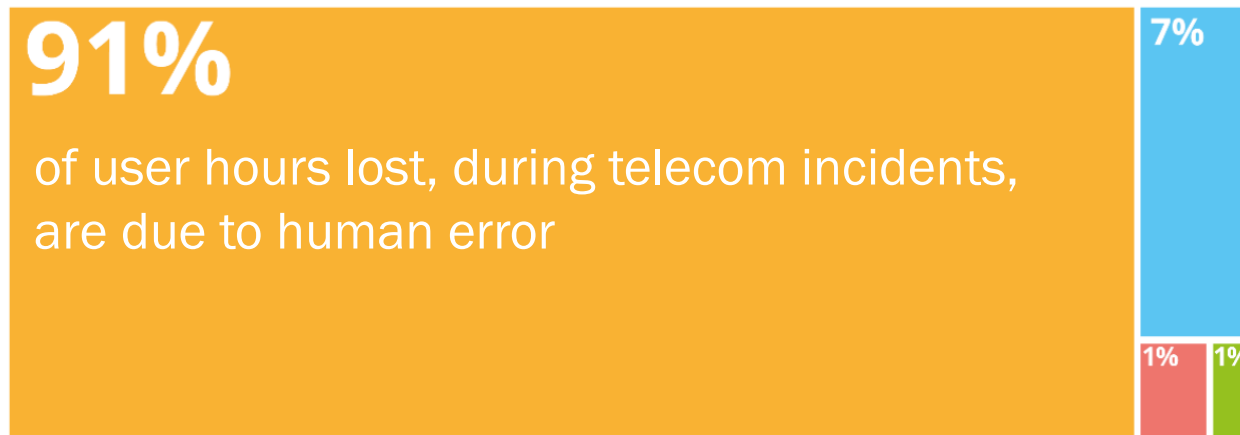
<http://www.mywave-project.eu/>

Innostar (EU)
NextPerception (EU)
Anterra (EU)
FreePower (NWO)
ShareWaves (NWO)



› PROGRAM LINE 2: CHALLENGE COMPLEXITY

- › Complexity of operating communications networks has been growing with every new generation



SYSTEM
FAILURES



HUMAN
ERRORS



MALICIOUS
ACTIONS



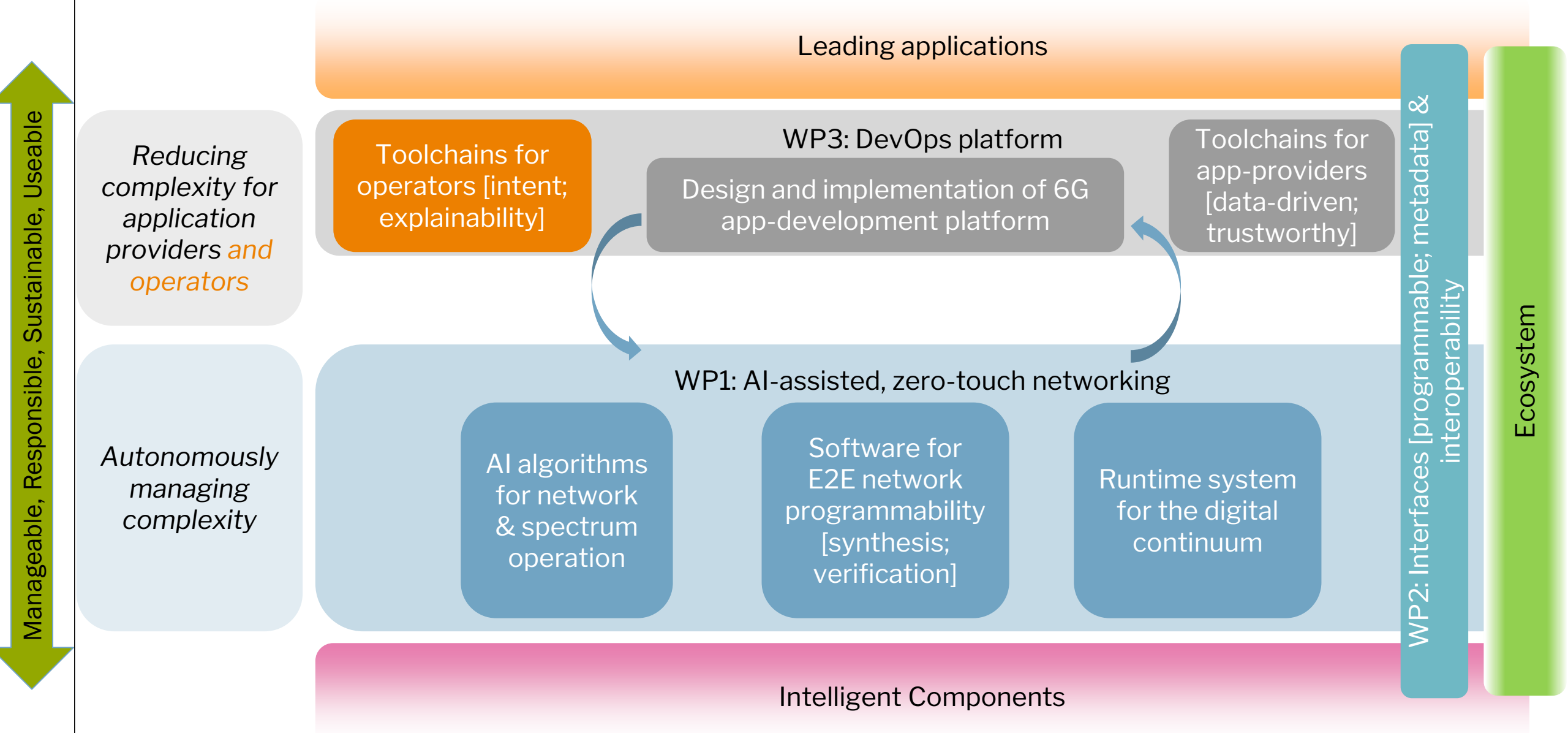
NATURAL
PHENOMENA

Source:






<https://www.enisa.europa.eu/publications/telecom-security-incidents-2021>

- › Complexity blocks digital sovereignty!

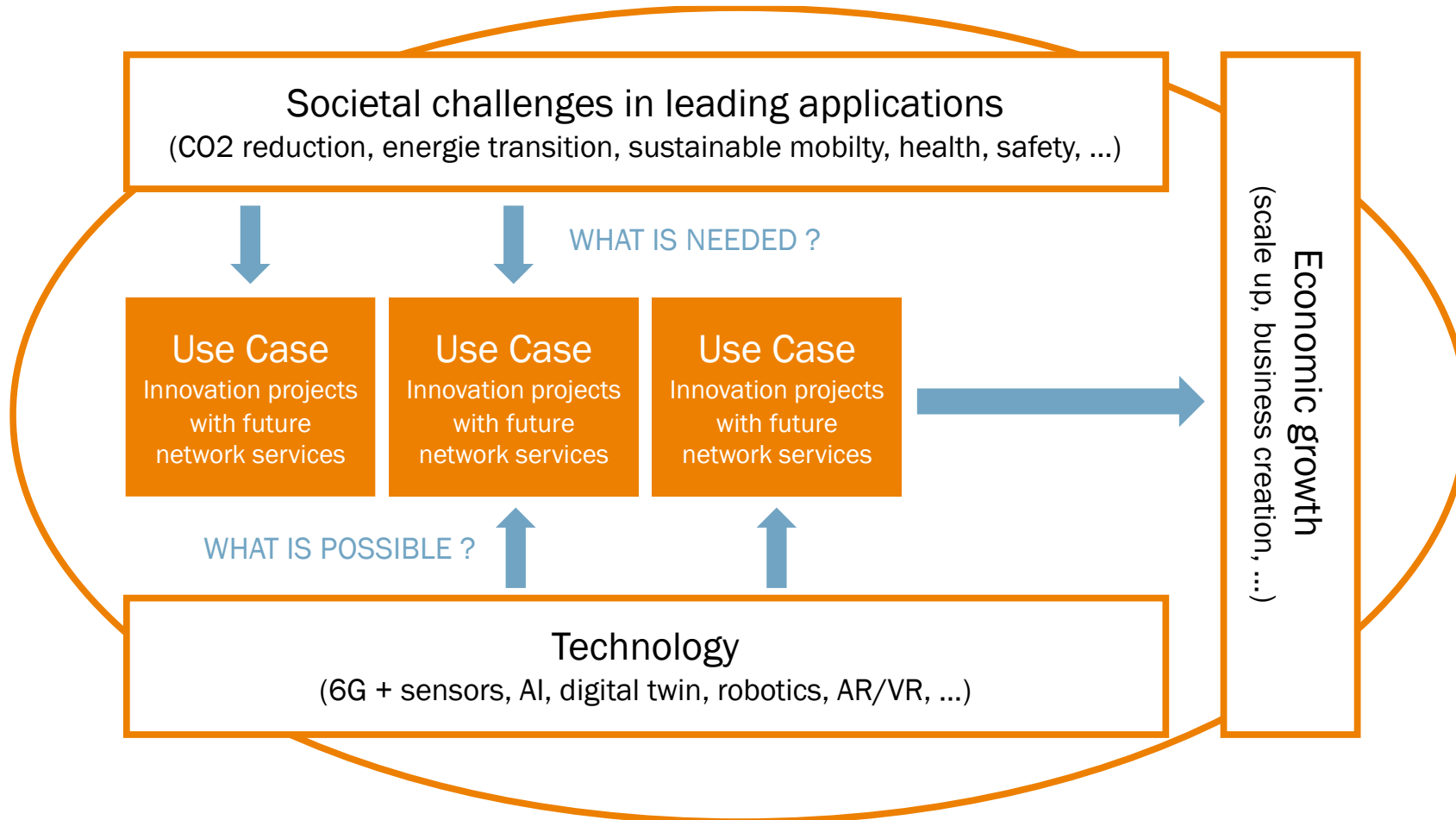
PROGRAM LINE 2 – OVERVIEW (UNDER CONSTRUCTION!)



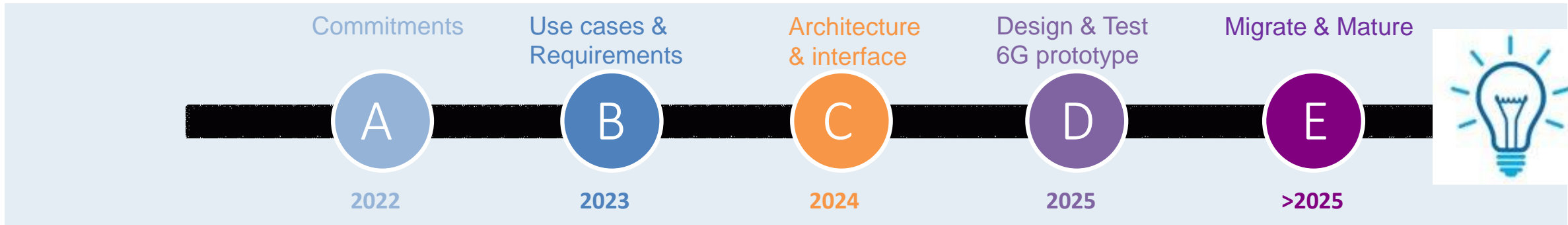
EXAMPLE 6G POSSIBILITIES AND REQUIRED CAPABILITIES

	<u>Possible application area's</u>	Limitless communication	AI driven	Ubiquitous Coverage	Sensing & interaction
	Interactive Massive Twinning	X			X
	Holographic communication	X			X
	Robots swarms & co-bots	X	X		
	Bio sensors		X	X	
	Environment sensing		X		X

PROGRAM LINE 3 – LEADING APPLICATIONS



PROGRAMLINE 3: LEADING APPLICATIONS & TIMELINE



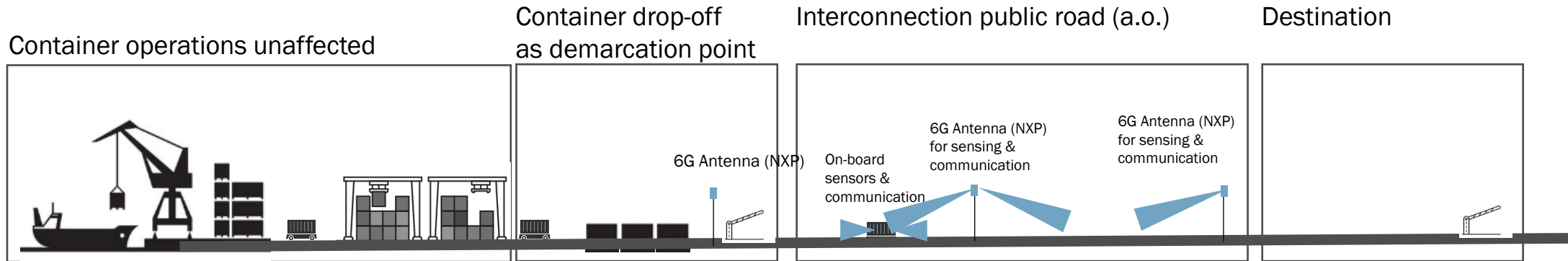
Leading application

Transport hubs	Intralogistic autonomous transport also over public roads /passways
Collaborative surgery	Collaborative invasive surgery team to be extended with supervision of senior surgeon not in the room
Smart grid	Allow realtime control over 6G of 10KVA actuators & lower.
Safest Intersection	Digitally forgiving intersections to mitigate cycling risky behaviour through sensing & communication
XR remote support	Allow remote, deep visual access to very advanced machinery

6G network components, intelligent network & test Facilities from programline 1,2,4

TRANSPORT HUBS: AGV FOR INTERCONNECTIONS

6G SENSING TO ALLOW SAFE PASSAGE OVER PUBLIC ROADS



Logistics chain require increasing automation to improve efficiency, uptime and for labor shortage
 Further optimization can be achieved if public road can be used by AGV to reach the destination

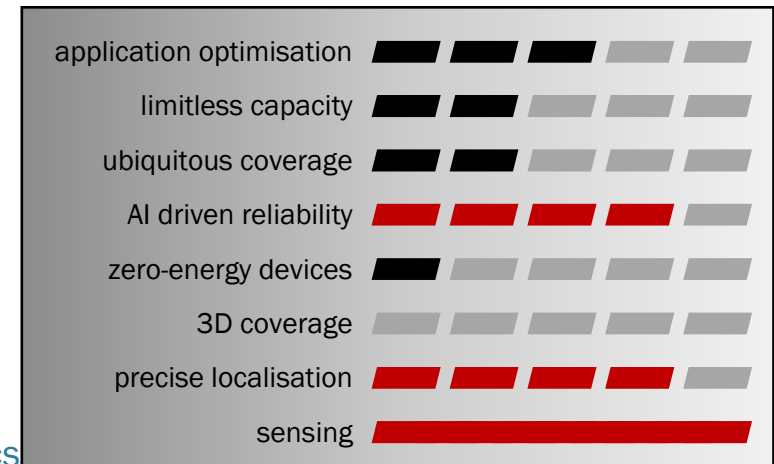
KEY TECH - 6G SENSING & COMMUNICATION UNDER DEVELOPMENT BY NXP / NOKIA-ERICSSON*

- Affordable standardized sensing of people, bikes, cars – but also for AGV / terminals
- This in conjunction with its onboard sensors to allow safe passage on public roads by various AGV as the technology is standardized

INTRODUCTION

- Having a clear drop off / on point on the terminal as it allows operations to be unaffected (similar to train)
- On the path could be airports tele-operated or for very predictable shifts ('offload')

* JCAS – Joint Communication and Sensing [Unpacking joint communication and sensing in 6G - Eric](#)



› IMPROVING LIVES IN 2030 1,2

SHARED 3D MENTAL MODEL OF PATIENT IN SURGERY



Use case: Shared 3D mental model of patient in surgery

- › In ageing population, increasing complexity of surgery & scarcity of specialists – supervised surgery by medium specialists (and later supported by robotics)
- › Advanced pre-op planning & visualization (tasks) is also a foreseen digitization step

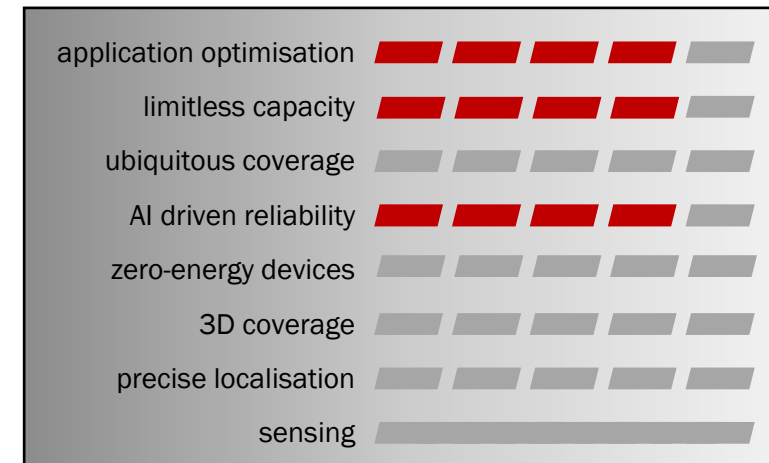
6G requirements:

- › Cloud continuum
- › Advanced H2M interaction
- › AI driven reliability

5G requirements:

- › MMTC
- › URRLC

- › Access to cure increasingly is tougher, especially outside cities / lower income while treatments are becoming increasingly complex and specialized
- › Investment is done in robotics, AI & 6G where remote surgery capability is a ‘moonshot’, requiring the extremes of future technical capability / surgery procedures. A more manageable step forward would be a 3D shared mental model using either holographic interactive display and/or advanced glasses
- › Still, this moonshot paves the way of lower cost equipment in operating theater offloading more advanced software capability in the cloud and facilitates adoption of 3D, light weight digital user equipment (AR / VR), haptic gloves, advanced (realtime) data processing.



SMART GRID – GRID MONITORING AND CONTROL

CONTROL OF ENERGY-NETWORKS NEEDS HIGHEST RELIABILITY



Source: Hyve Power

Use case: monitoring and control of the energy access network

- › Decentralized monitoring and control of energy balance, frequency, quality between substation & buildings (EMS) through clear demarcation
- › Ultra-high reliability is needed, and in certain situations (very) low delay

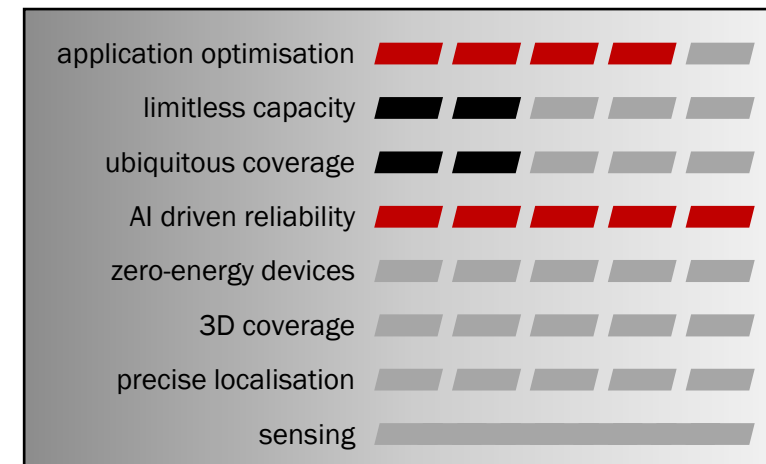
6G requirements:

- › Ultra-reliability
- › Cloud-Continuum
- › Zero-energy devices

5G requirements:

- › Edge compute (privacy)
- › Slicing (security)

- › Balancing the energy networks is becoming more and more difficult in access
- › Currently, there are limited options to control both supply and demand – centralized solutions or those directly communicate to endpoints are not feasible
- › Situational awareness and decentralized optimization in access grid will make a difference.



TRAFFIC – INTERSECTION SAFETY

6G SENSING CAPABILITY BRINGS NEW OPPORTUNITIES



Source: Smart2Zero

Intersection of the future with sensing capability

- › Provide cooperative detection of non-connected road users; cyclists, pedestrians with network & vehicle to provide warning towards driver to increase safety
- › Allow (partial) substitution or enhancement of traditional sensor in tarmac for detection to reduce cost and time to repair.
- › Allow high capacity exchange of data of vehicle and other users to allow direct interaction & decisionmaking to allow optimum traffic management

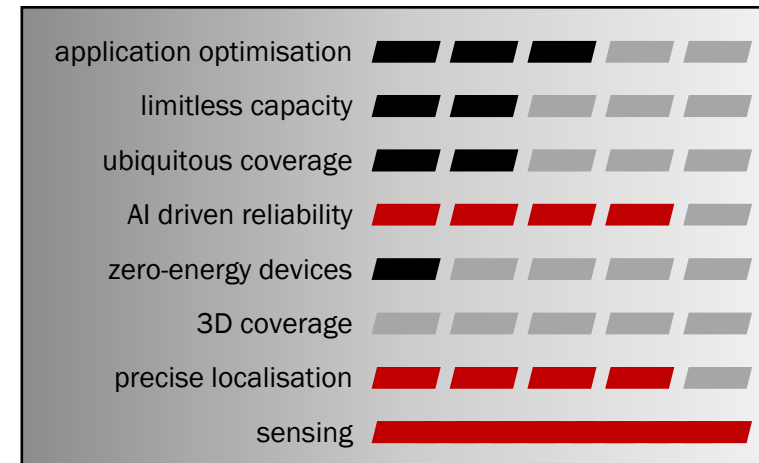
6G requirements:

- › Sensing
- › Localisation
- › Edge to Cloud / Reliability

5G requirements:

- › Low delay networking
- › Edge computing

- › Today majority of detection is done by tarmac based sensors which do not provide context (how many cars), intent (where does someone want to go) and only provides information if triggered (e.g. pedestrian does not use the switch).
- › Upcoming alternative is the use of camera's with AI to overcome these limitations.
- › 6G sensing promises several advantages, higher cost-effectiveness, native privacy (sensor is not able to detect person or vehicle distinct features) and futureproofness as it allows interaction with connected person / car which is the long term vision.



REMOTE XR SUPPORT LEVERAGING 6G FOR NATIVE INTERACTIONS WITH DEEP INSIGHTS



High Fidelity XR remote support

- › Provide natural XR interaction with remote systems of customers (different domain) with deep insight into system

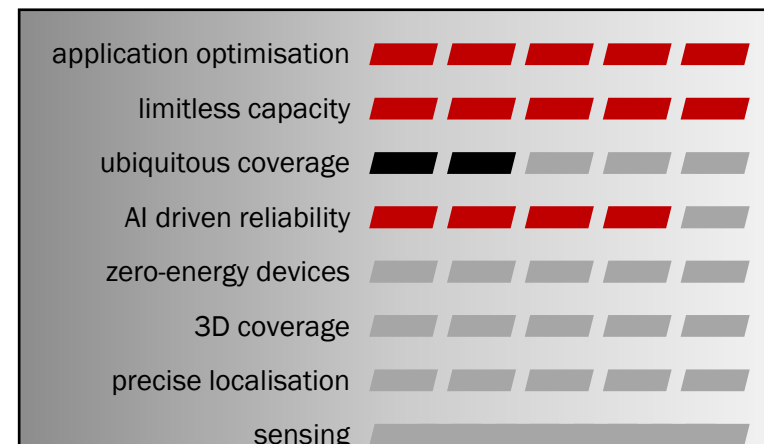
6G requirements:

- › Trusted connection
- › Edge to Cloud / Reliability

5G requirements:

- › Low delay networking
- › Edge computing

- › COVID accelerated the use of remote support, where previously an expert was flown in.
- › But there are still many limitations to be addressed – collaboration with various parties, quality of the interaction & deep insights into the systems
- › All these improvements in factories (abroad) need to be done in secure, reliable and clear verifiable way (legal).



FUTURE NETWORK SERVICES



Peter Rake

Program Manager

[LinkedIN](#)

Leader of 5Groningen program in the last 6 years on behalf of Economic Board Groningen. Collaboration in 5G fieldlab with renowned telecom operators, international vendors and Tier 1 research institutes. Prior to this position, Peter was engaged as ICT manager at KPN for 20 years.



Bart Smolders

Intelligent Components

[LinkedIN](#)

Professor in Electromagnetics / Antennas at University of Eindhoven, Dean of the Department of Electrical Engineering



Fernando Kuipers

Intelligent Networking

[LinkedIN](#)

Leading TU Delft's Lab on Internet Science, whose research revolves around understanding and improving the performance and reliability of Internet and communications infrastructures



Jos Berière

Leading Applications

[LinkedIN](#)

16 years mobile Operator experience. Within KPN overall responsible for 5G launch in the business market. Led operations for customer & vendors tenders, customer trials, standardization and multi-billion spectrum auctions & leases. Recently supporting the NGO SmartParks.



Lenneke de Voogd

Ecosystem

[LinkedIN](#)

Over 20 years of experience in innovation, setting up public-private partnerships for R&D in collaboration with knowledge institutes, companies and government. Within TU Delft I am business developer at the Innovation & Impact Centre and Programme manager for Do IoT Fieldlab.



Pieter Nooren

Program Strategy

[LinkedIN](#)

Over 20 years of experience in communication network architectures and business ecosystems, with a focus on interoperability. Senior consultant at TNO in digital infrastructure projects: 5G field trials, net neutrality and roaming for business customers, EU projects and government.



Paul Wijngaard

Partnership manager

[LinkedIN](#)

32 years of working experience in communications network industry both at operator and technology vendor side. In depth relationship network in industry and leading roll in sector. Within TNO ICT responsible for Telecom market segment and focus on topics like 5G/6G, Intelligent networking, Edge cloud, IoT



Ramon Rentmeester

Sr Policy manager

[LinkedIN](#)

16 years of working experience with the dutch Government, first as a consultant at RVO for European Research & Innovation Programs and since 2014 at the Ministry of EZK. Currently responsible for areas like: Spectrum, Security and continuity and Research & Innovation 5G/6G

› ANNEX

› THERE IS NO PLACE LIKE HOME

TRUSTED BIO-SENSING



Source: Hyve Power

Use case: providing safety @home for elderly

- › Elderly can have biometric monitoring with minimal pervasive devices supported by sensing of mobility & heart/respiration
- › Patient care can act based on much larger data set

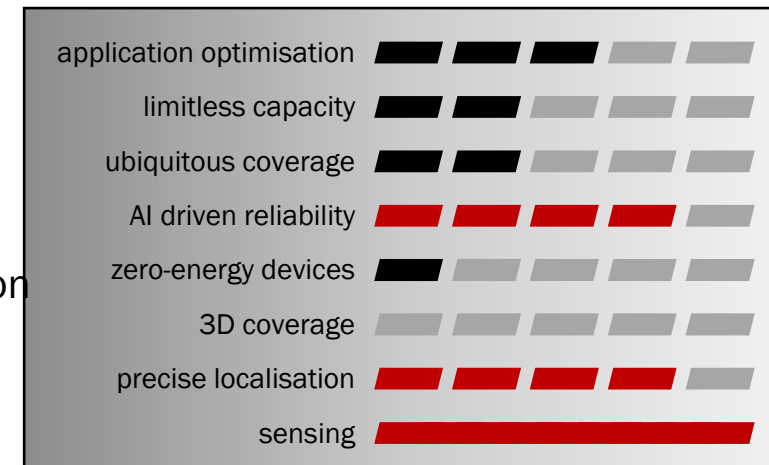
6G requirements:

- › Trust & self learning reliability
- › Sensing
- › Cloud Continuum
- › Ubiquitous coverage

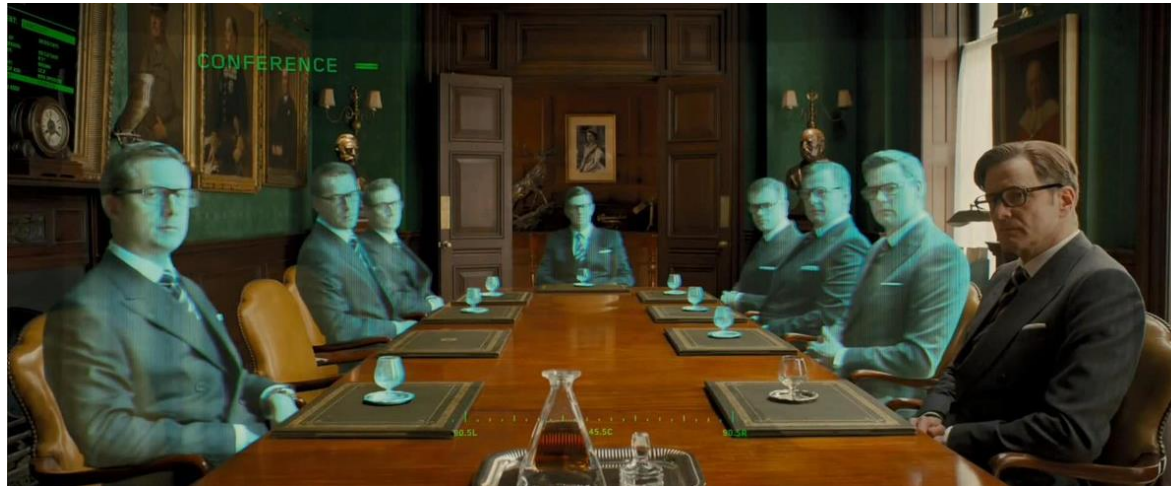
5G requirements:

- › MMTC

- › Elderly are staying longer at home increasingly requiring care
- › Existing biometric wearables or sensing are intrusive, lack coverage / easy integration in every home
- › 6G offers promise of zero power sensors, self learning reliability and non intrusive sensing compared to cameras



› NEXT LEVEL COLLABORATION ‘VIRTUAL TELEPORTATION’



Source: Kingsmen movie

- › XR communication is starting to appear, AR glasses are getting better
- › There are still performance bottlenecks for full holographic communication
- › Good edge computing support requires massive bandwidth for holographic streams
- › Domain of both big tech industry and small startup companies

Use case: fully holographic communication

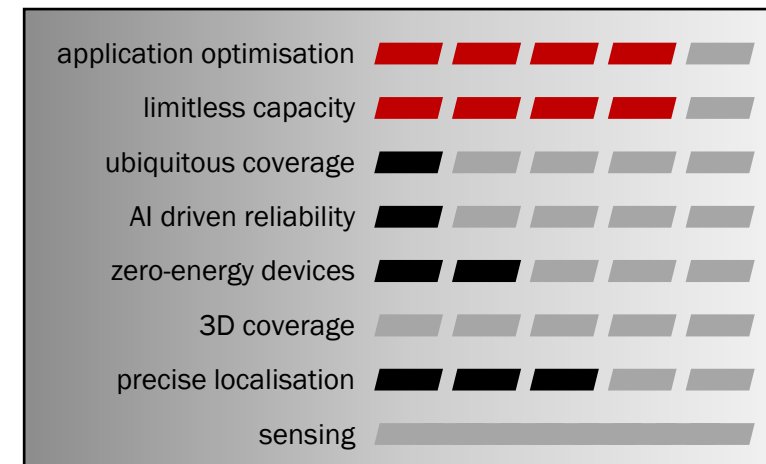
- › High bandwidth and low latency required for realtime communication
- › Lightweight devices require energy efficiency for full-day use
- › Haptic devices can further enhance experience

6G requirements:

- › Ultra-high bandwidth
- › Ultra-low delay
- › Cloud continuum

5G requirements:

- › Edge computing



FACTORY OF THE FUTURE – INDUSTRY 5.0

COMPLETE DYNAMIC MANUFACTURING



Source: Bloomberg news

- › Factories are typically static, designed for making certain products at scale
- › More and more versatile robots are used
- › Ultimately, using only mobile robots allows for highly customizable factories
- › This requires industry and telecom operators to work together closely

Use case: fully customizable factories

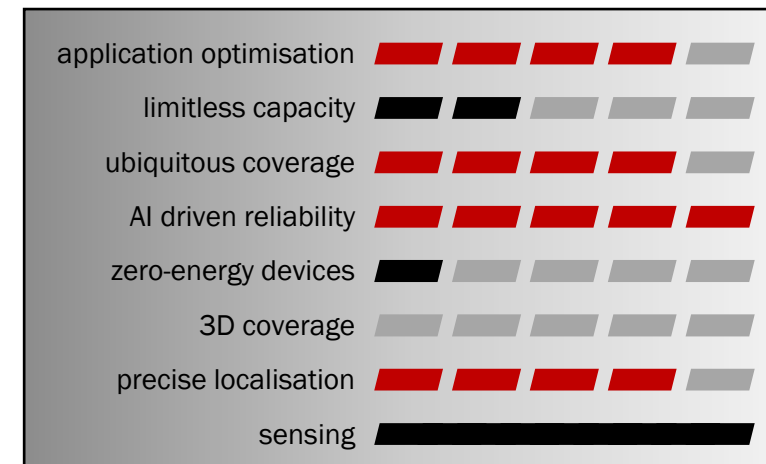
- › Mobile robots for internal logistics and manufacturing
- › Tracking and correcting vehicles & drones in realtime

6G requirements:

- › Trusted & self-learning connectivity
- › Sensing
- › Edge to Cloud
- › Limitless capacity

5G requirements:

- › URLLC
- › Edge computing
- › Private / Slicing (security)



TRAFFIC – MASS TELE-OPERATED DRIVING & FLYING

REMOTELY MONITORING AND CONTROLLING VEHICLES & DRONES



Source: T-Systems

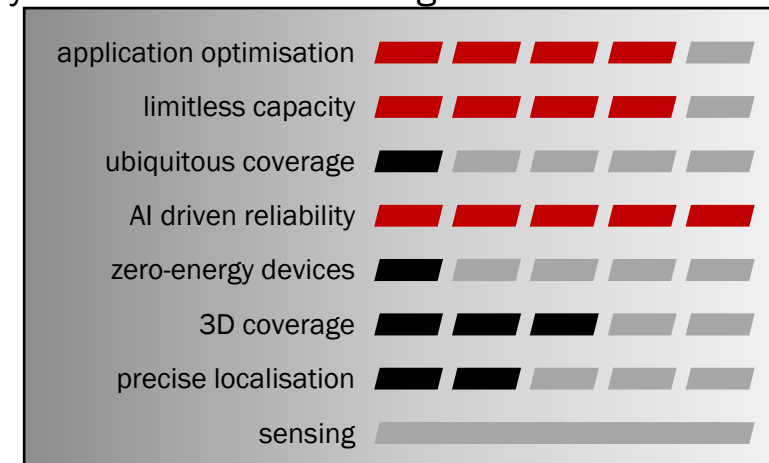
Use case: remote operator drives or flies

- › High bandwidth / low latency connection is needed
- › High reliability is essential, although vehicles may often cope (temporarily) themselves

6G requirements:

- › Low delay
- › High bandwidth
- › Ultra-reliability
- › 3D coverage (drones)
- › Localisation
- › Sensing

- › Full autonomous driving is still far away, but quite possible for parts of a route
- › More drones are foreseen in delivery, surveillance
- › Tele-operation of vehicles is a step towards fully autonomous vehicles, taking over when needed
- › This requires cooperation from car manufacturers, but also new companies offering remote driving services



INDOOR/OUTDOOR LOGISTICS - AUTOMATION

PRECISE LOCALISATION, MASSIVE MTC AND ULTRA-RELIABILITY



Source: Starship

- › Fully autonomous logistics is the ultimate solution for many logistic challenges
- › Sidewalk robots are a big step, but are not yet fully autonomous
- › Massive autonomous logistics will require some form of network support
- › Specialized robot companies compete here with big tech companies

Use case: (small) semi-autonomous vehicles & drones

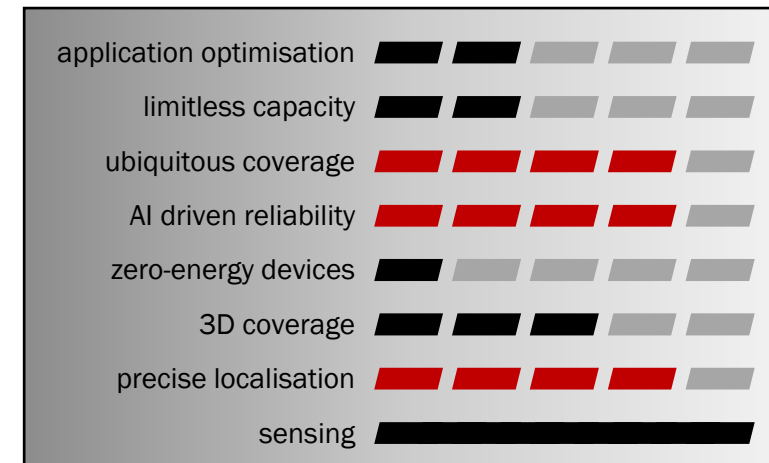
- › Monitoring and control of semi-autonomous vehicles
- › Tracking and correcting vehicles & drones in realtime

6G requirements:

- › Precise localization
- › Ultra-reliability
- › Massive IoT

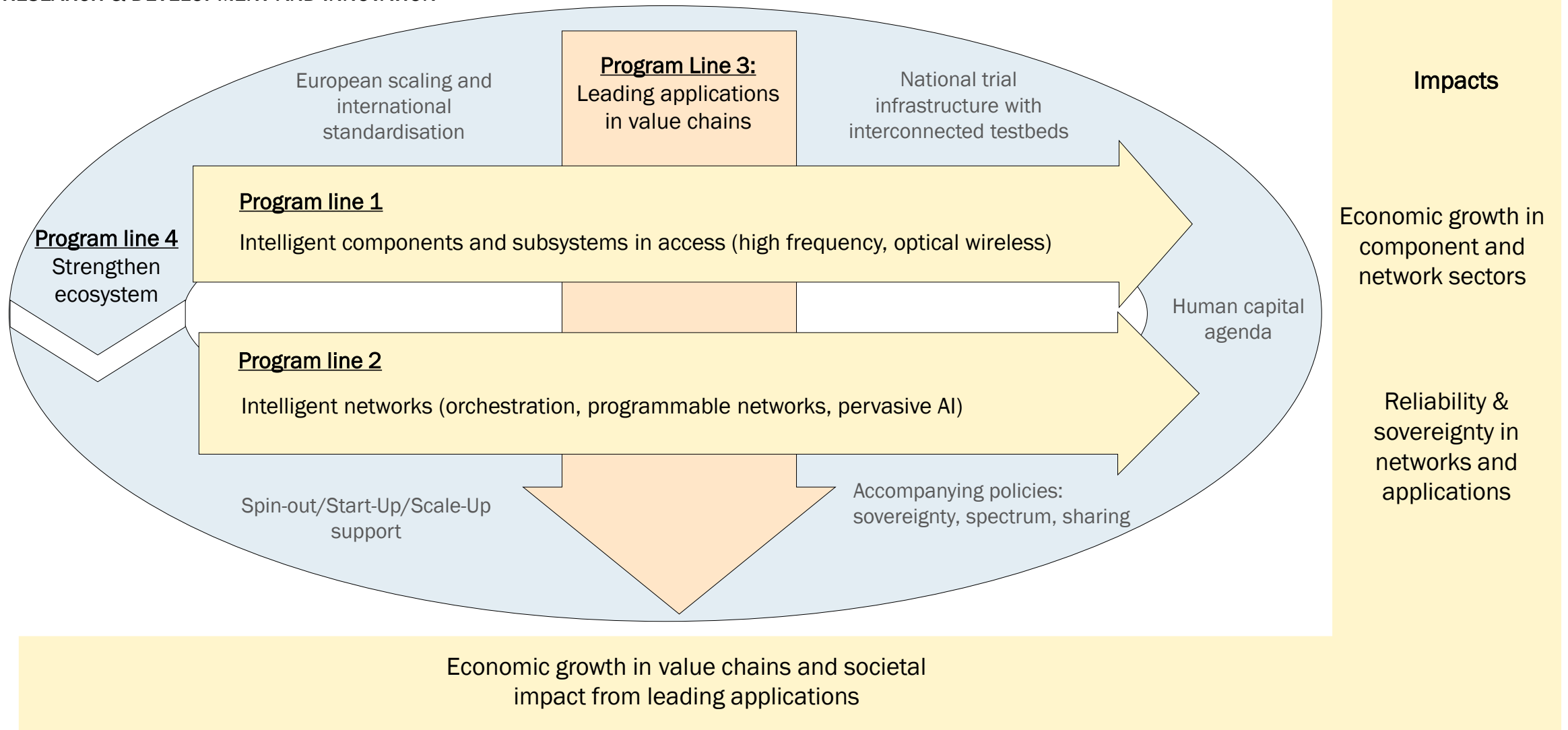
5G requirements:

- › Low delay networking
- › Edge computing



ORGANIZATION FUTURE NETWORK SERVICES PROPOSAL

RESEARCH & DEVELOPMENT AND INNOVATION

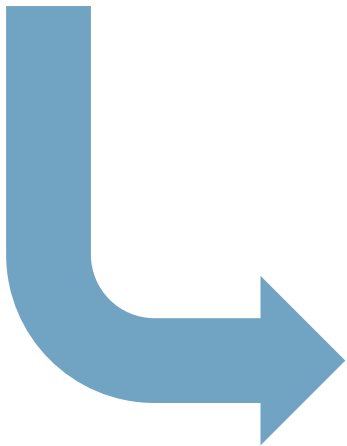


DEVELOPMENT IN DUTCH MOBILE INNOVATION HUB

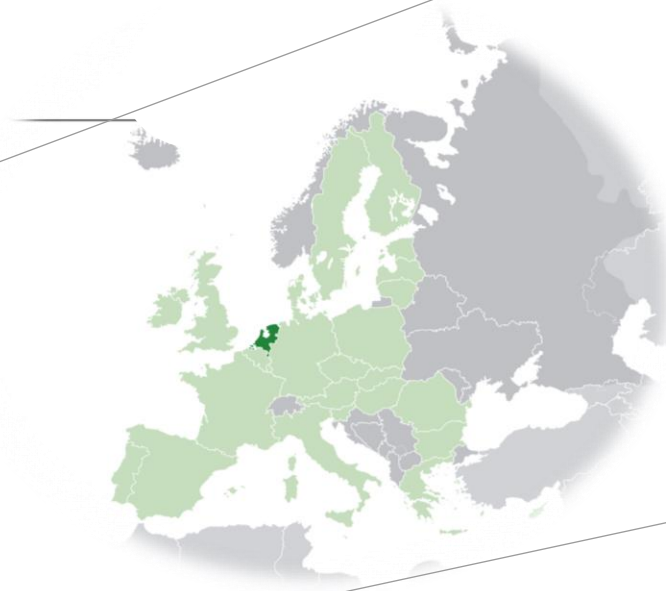
THE FIRST NATIONWIDE MOBILE NETWORKING TEST CENTER & DEVELOPMENT COMMUNITY

Today's limits regional fieldlabs are to be addressed

- Fragmentation
- Limited pre-commercial HW & SW
- Ease of access / environment
- Linkage regional / national / international / global
- Limited human capital



Founding of Dutch Wireless
Network Test Center & Innovation Hub

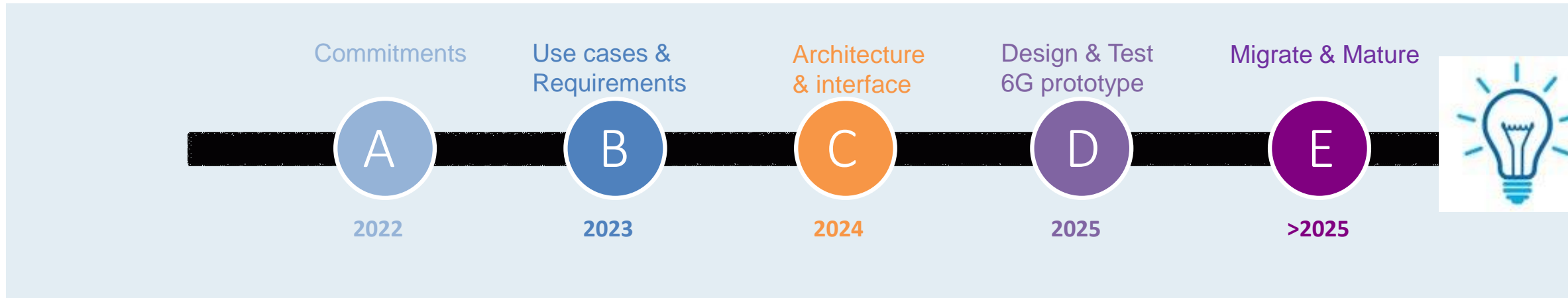


Embedded in Europe
Flagship projects



Global impact
on standards

LEADING APPLICATIONS ROLES



User group platform – driving ‘impact’ & supply requirements

- Driving requirements → input & feedback on workpackage progress, definition
- (optional) First organizations to test, validate demonstrators / – facilitated by programline line 4
- Participation #6 one-day meetings per year + preparation & feedback [minimum 200 hrs / yr)

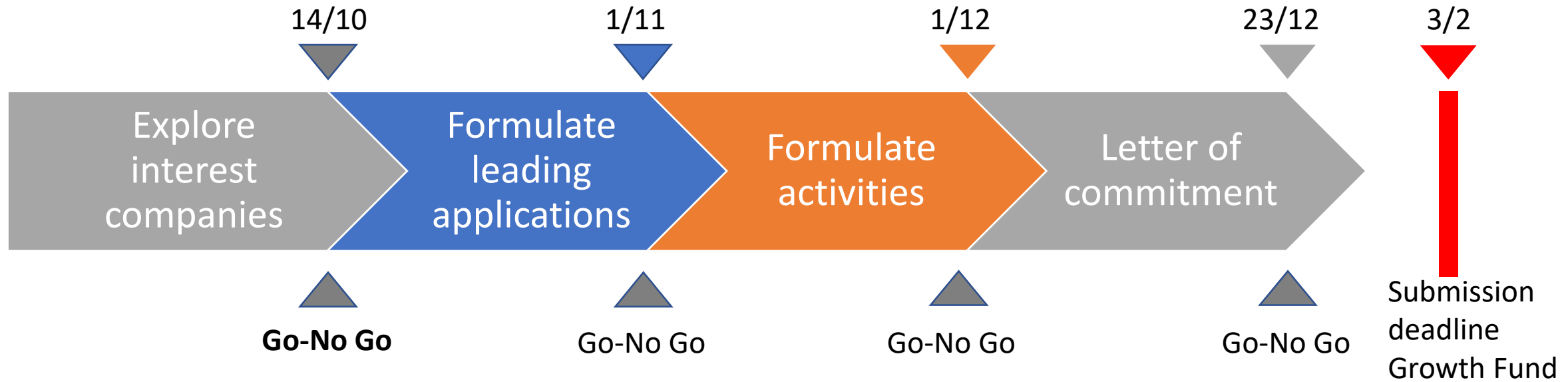
Leader - workpackage & developer - key for ‘outcome’

- Definition of scope workpackages, managing progress
 - Long term perspective (patents / IPR etc)
 - Potential to scale / impact on at least EU level
- sufficient (development) capacity indicative >2 #FTE

(Deep tech) Unicorns

- Development of extension, enhancement or (‘niche’) module
- Dev. / integration capacity > #0.25 FTE

LEADING APPLICATIONS TIMELINE FOR PROPOSAL





TNO innovation
for life

› **THANKS FOR YOUR TIME**

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