



6G FUTURE NETWORK SERVICES

About me

Introduction 5G chasm

6G Leading Applications

ABOUT ME



MSc Telecom TuDelft

14 years at Royal KPN in several roles

- Multibillion spectrum auctions, network modernization tenders, many PoC
- Responsible for introduction 5G in business market and several 5G fieldlabs

2 yrs Independent consultant

Today

- International Collaborations (Global)
- Vertical engagement (Europe)
- Leader Programline 3 (NL)
- NGO Smart Parks – Wildlife conservation (Africa)

Personally

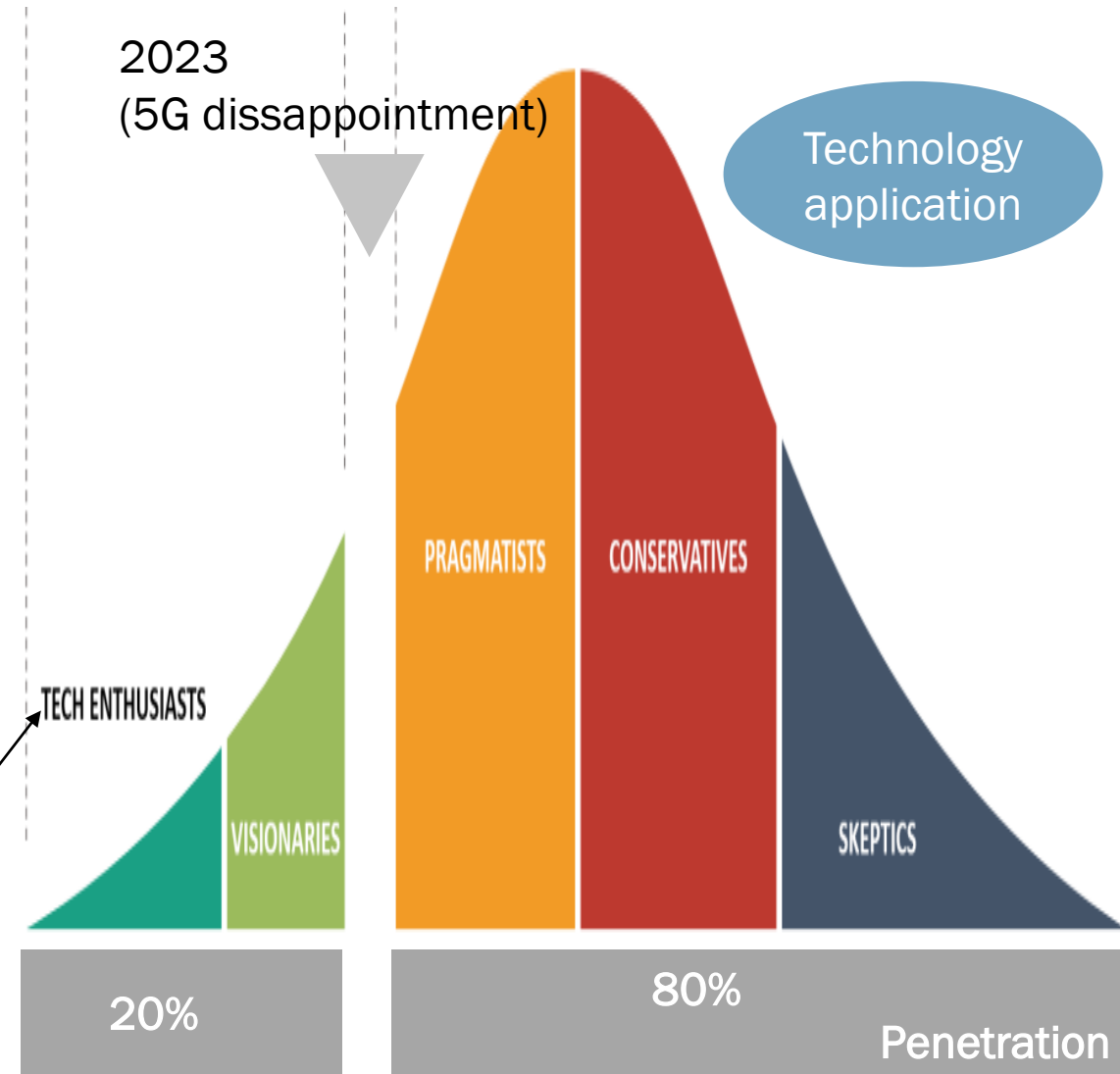
- Home improvement (Solar, Smart Home, Underfloor heating, ..)
- (Drone) Photography
- Endurance running



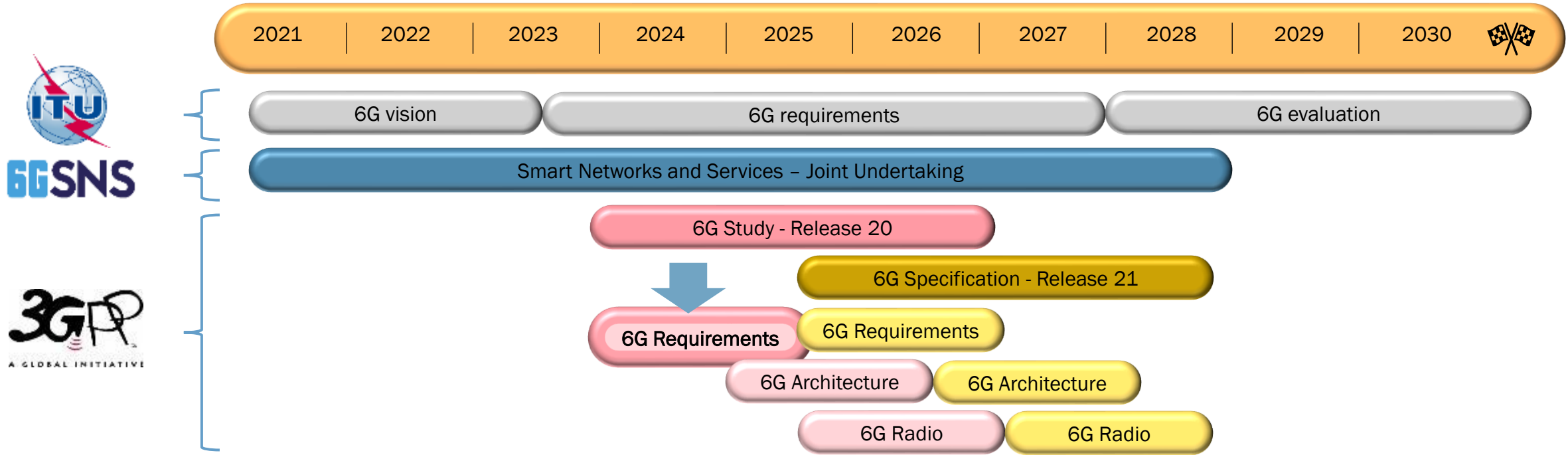
› AFTER THIS PRESENTATION, YOU WILL KNOW

- Why SORA is holding back drone logistics
- How to wait less time for green on your bike
- Which (unique) animal resembles today's 5G machines
- And some insight in the thinking of FNS consortium parties WHY 6G

WHY 6G?



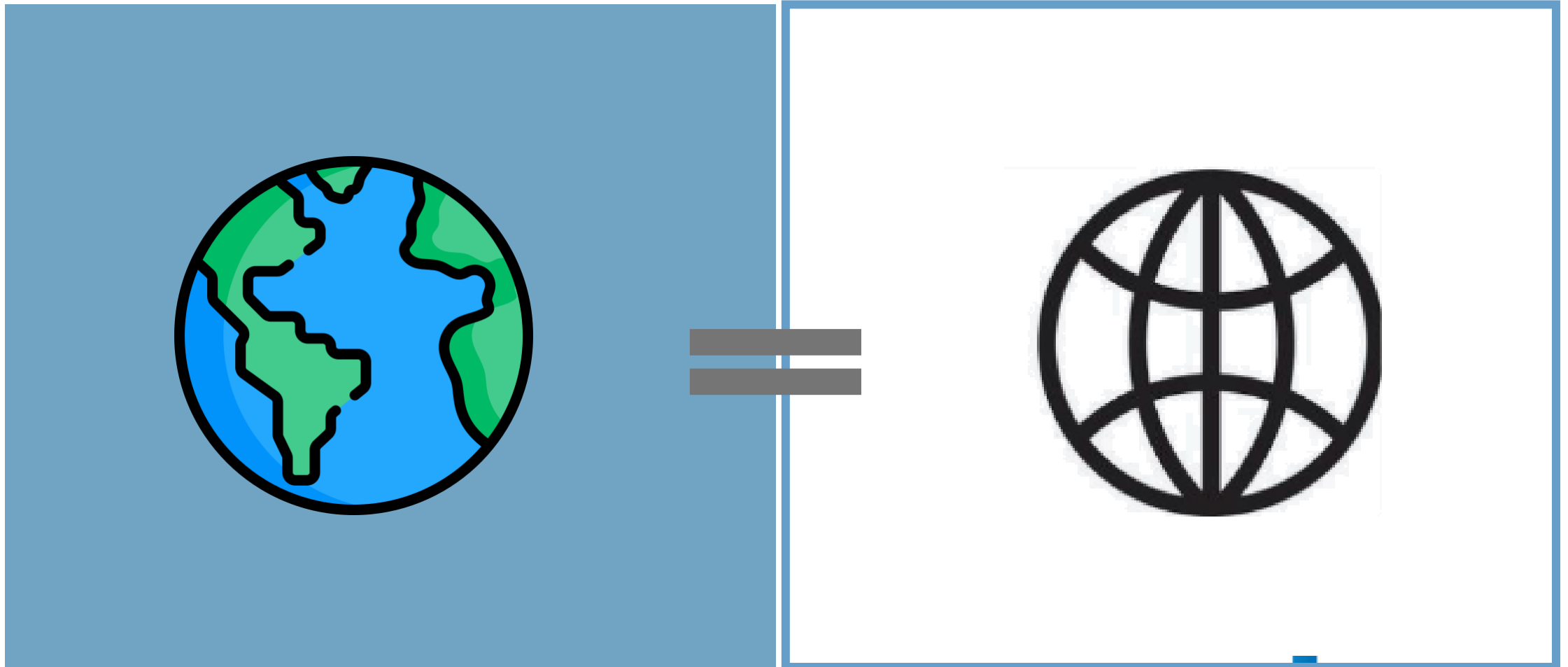
TIME IS NOW TO SHAPE 6G



Recognized



› **6G VISION: PHYSICAL & DIGITAL WORLD BECOME THE SAME**
DIGITAL SPACE DECISIONS IMPACT PHYSICAL WORLD IN REALTIME



WHY IS 6G RELEVANT FOR APPLICATIONS

Capability

Why is this important?

10x capacity



Support efficiently Growth of XR / Video cost

Submilisecond
Native Deterministic (new)



Support for (wired) critical applications
Digital twin

Deterministic Networks



Applications / processes which cannot tolerate stochastic behaviour

Openess



Reduce integration cost in MVNO / Enterprise / Indoor market

Sensing (new)



New applications

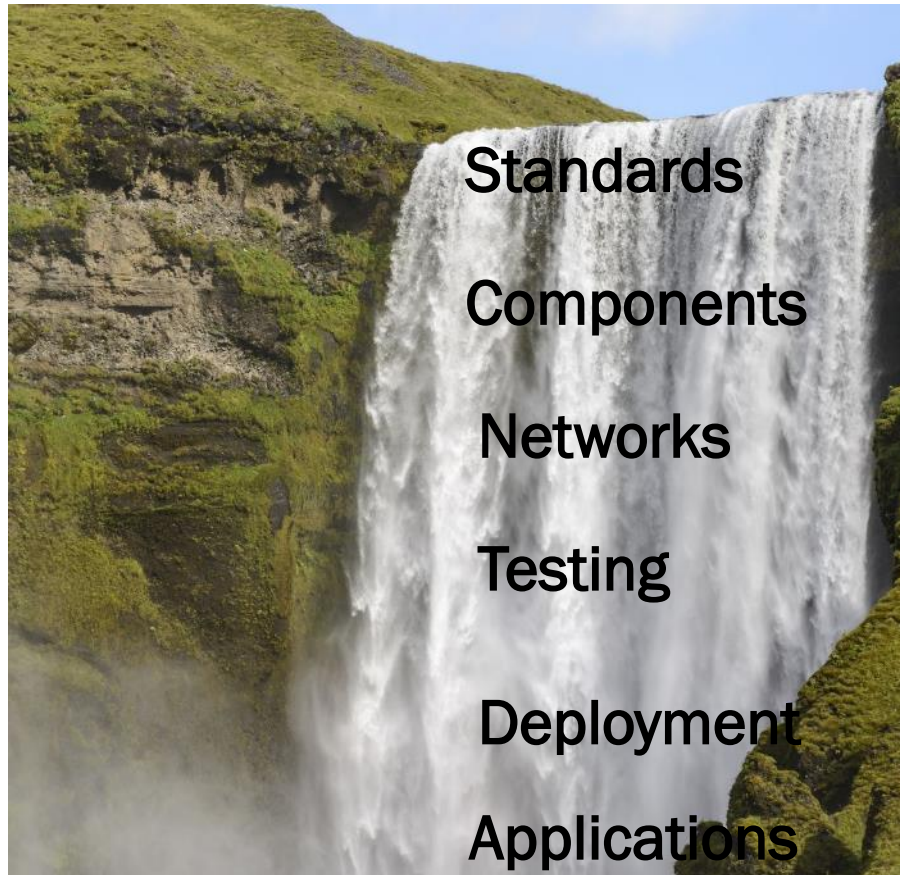
Zero Energy IoT



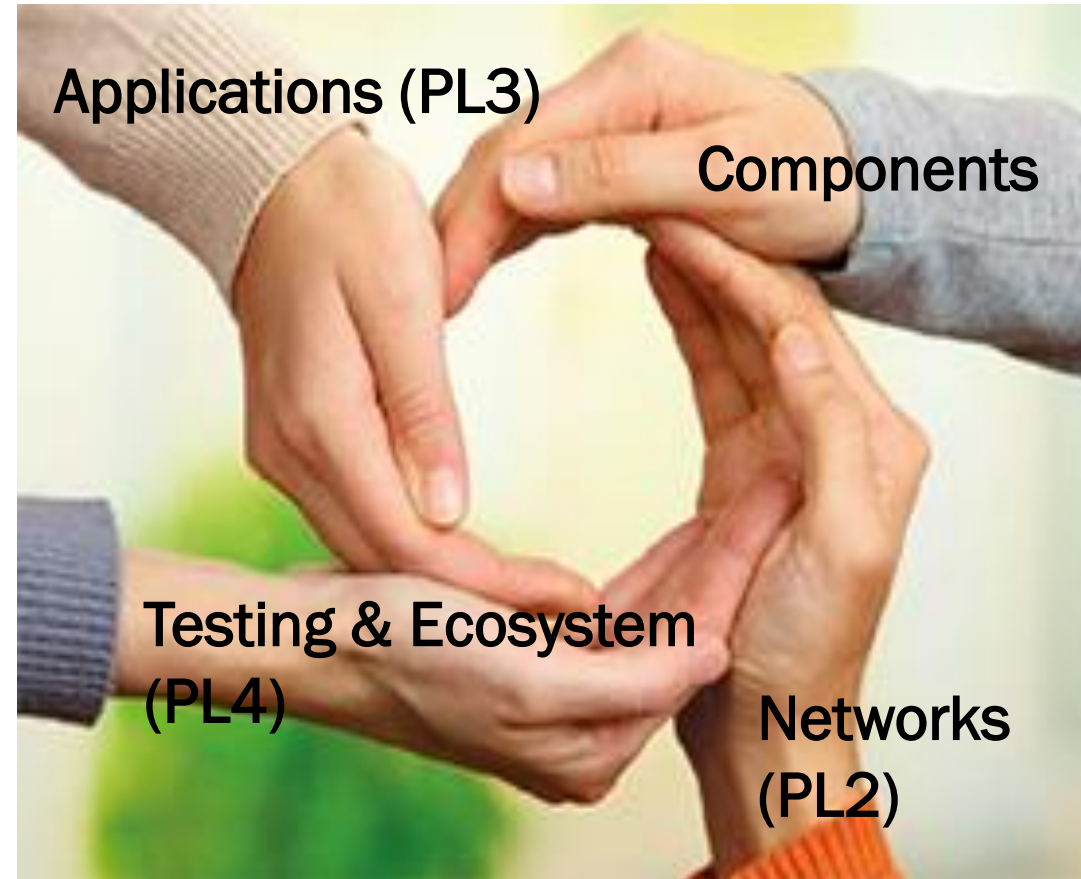
New IoT applications which do not allow battery swaps

HOW TO ADDRESS 5G LEARNINGS

5G technology will change the world




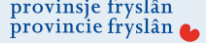































How can 6G facilitate the market / society (E2E)



LEADING APPLICATIONS (PL3)

GOAL, ENABLING 6G & PARTNERS OF LEADING APPLICATIONS

	Leading application	Goal	Why 6G	Partners	
A	Transport hubs	Ground assisted flight control	Programmed heavy payload drones from centralized location at scale	Programmability	      
	Image guided therapy	Therapy assistance modules & collaboration	Increase innovation & lifecycle	> 20 GBps	 
	Smart grid	Predictive balancing demand & supply in access grid	Increase power quality and reduce congestion	Programmability	    
B	Wireless detection	Wireless detection of traffic participants	Improve mobility and safety	JCAS	    
	6G Wireless Factory	Hyper digitization of machines	Accelerate innovation & increase lifecycle of complex machines	< 1ms	  
	E-Commerce	Monetization of 6G micro-services channels & sales	Monetization of micro-services	Diversity of UE & services	  
	EXER-Gaming	Optical tracking & rendering from 6G edge icw slicing	Exercise & gaming for the masses	Bandwidth & latency	  
	Potential Open Call		Programmed ground based vehicles on (semi)-private terrains Rail / Hyperloop Public Safety	JCAS & reliable localization	    

6G TIME IS NOW TO INFLUENCE



FNS Program line KPI 7 3GPP specifications – of which #3 also PoC



A) GROUND ASSISTED FLIGHT CONTROL



› A) WHY DRONE LOGISTICS IS A NO BRAINER

The global Drone Logistics and Transportation market size is expected to reach USD 18311.06 million by 2030 and exhibit a CAGR of 55.2% in the forecast period (2023–2030),

Alternative for majority packages < 1 kg

Alternative for hard to reach locations wadden eilanden, near-, offshore,

New long range & crane drone are available



LACK OF PROVEN ROBUSTNESS HOLDS DRONE LOGISTICS BACK

Specific Operation Risk Assessment (SORA)** is needed for drone logistics

- ✓ Approval needed of operation
- ✓ Allowed within controlled airspace*
- ✓ Any UAV, weight class & ground area is potentially allowed
- **Show sufficient robustness** (measures & proof/certification) weighted against impact (UAV kinetic impact, area)

Measures for robustness are not applicable, available and challenging to realize

- Visual & Instrument Flight Rules cannot limited used as theses are based on manned flight
- Little proven / certified measures against ground & mid-air collision for (new) failure scenario's
- *(Evaluation by) parties with competence (experts) pose chicken – egg problem*



How many illegal drone flights in A'dam per day
How many above 120 mtr
How many BVLOS?

* Of top 10 NL cities only Almere & Utrecht have limited CTR restrictions (<20% of population)

** Obviously a standard scenario (STS) is preferred, but deemed way-out for logistics operations (today only 1 drone allowed to fly rural 2 km BVLOS)

AMBITIE DDS 2029



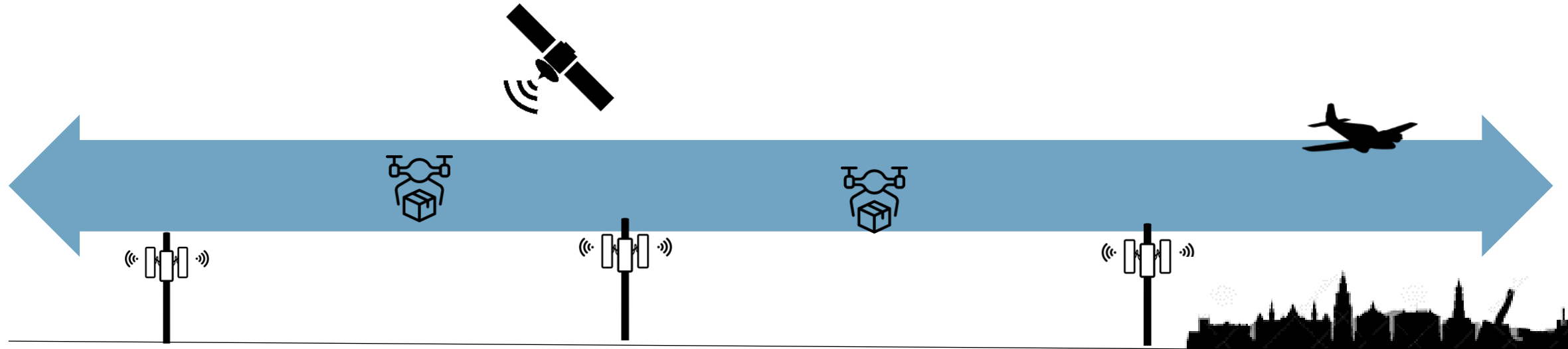
Geprogrammeerd, autonoom, vanuit een centrale plek met zoveel mogelijk cargo (kleine en grote payloads) en passagiers drones zo ver mogelijk vliegen, in heel Nederland.



... een duurzame samenleving waarin we het gehele, lagere luchtruim inzetten voor het
VEILIG, BETROUWBAAR, EFFICIËNT EN SNEL vervoeren van goederen en personen

GOAL FNS: GROUND ASSISTED 6G FLIGHT CONTROL

PREDICTABLE & REPLICABLE ROBUSTNESS IN A CORRIDOR ALLOWING A PREDEFINED SORA



6G potential requirement

- Deterministic broadband 6G @100 mtr
- Native integration with satellite
- UAV localization / Sensing
- Cell-Less
- Global ecosystem (proof)



Measures adding to predictable & acceptable Risk

- Command & Control to allow realtime flight plan changes
- Protected realtime location, detect & avoid data
- Failsafe First Person View by drone operator
- Realtime Emergency flight mode

B) WIRELESS DETECTION IN A COUNTRY WITH HIGHEST DENSITY OF FIXED INDUCTIVE LOOPS



THE ISSUE OF FIXED INDUCTIVE LOOPS IN THE TARMAC

Need

Optimal Traffic Flow

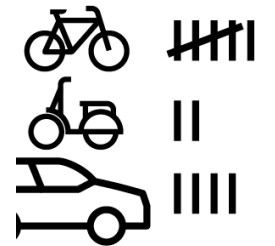
Reality

- Limited information on speed, vehicle type & intent
- Detection issues for bikes, motorcycles, ...

Sustainability policies

(e.g. less truck stops, ad hoc green wave for groups of cars, road-closures, ...)

- Static
- (Counting) study a priori
- Reactive based on complaints



Easy (re)deployment

(no lane closures a.o.)

- Failure rate 7 yrs
- Lane closure & traffic redirection

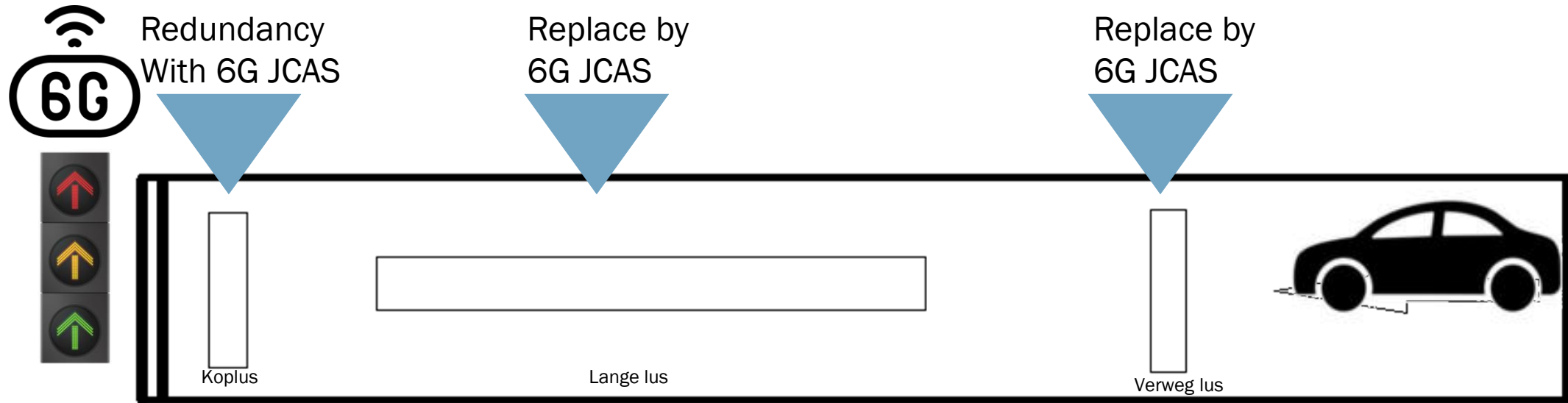


› AMBITION STATEMENT WORKPACKAGE LEADER

Wij zorgen voor **beschikbaarheid en doorstroming** in het verkeer, zodat iedereen met plezier blijft reizen. Het is de ambitie van Vialis om ervoor te zorgen dat dit op een **veilige en duurzame** wijze gebeurt, zodat de impact op de leefomgeving en toekomstige generaties beperkt blijft.



› GOAL: WIRELESS DETECTION OF TRAFFIC (WAVE 1)



6G potential requirement

- Joint Communication & Sensing (JCAS)

Improvements in traffic flow, sustainability

- Continuous detection count, vehicle type & speed
- Improved detection of bikes,
- Improvement in reliability
- No lane closure in case of maintenance

*GPS data is insufficient accurate in difficult environments

› 6G 'WIRELESS FACTORY'



› HUH? WHAT ABOUT 5G FACTORIES?



Focus on production proces

Decentralized intelligence in HW / legacy protocols
(flexible) factory automation
5G stops @PLC (not inside machine)



Focus on machine

Centralization of intelligence
Innovation & integral view machine behavior
6G stops end points (Sensors, Motors, User Interface, ...)

WHAT IS THE CHALLENGE OF DECENTRALIZED INTELLIGENCE?

The **'loose confederation of [embedded] software providers'**, these 150 software providers write their millions of lines of code in different programming languages, which if you know anything about programming, **you'll realise means you can forget about writing efficient, fast code [for integral behavior].**

[Further complicating] Even though it says Ford on the front, I actually have to go to Bosche to get permission to change their seat control software.

Jim Farley, Ford CEO 06/2023

Challenges



Patching / update complicated




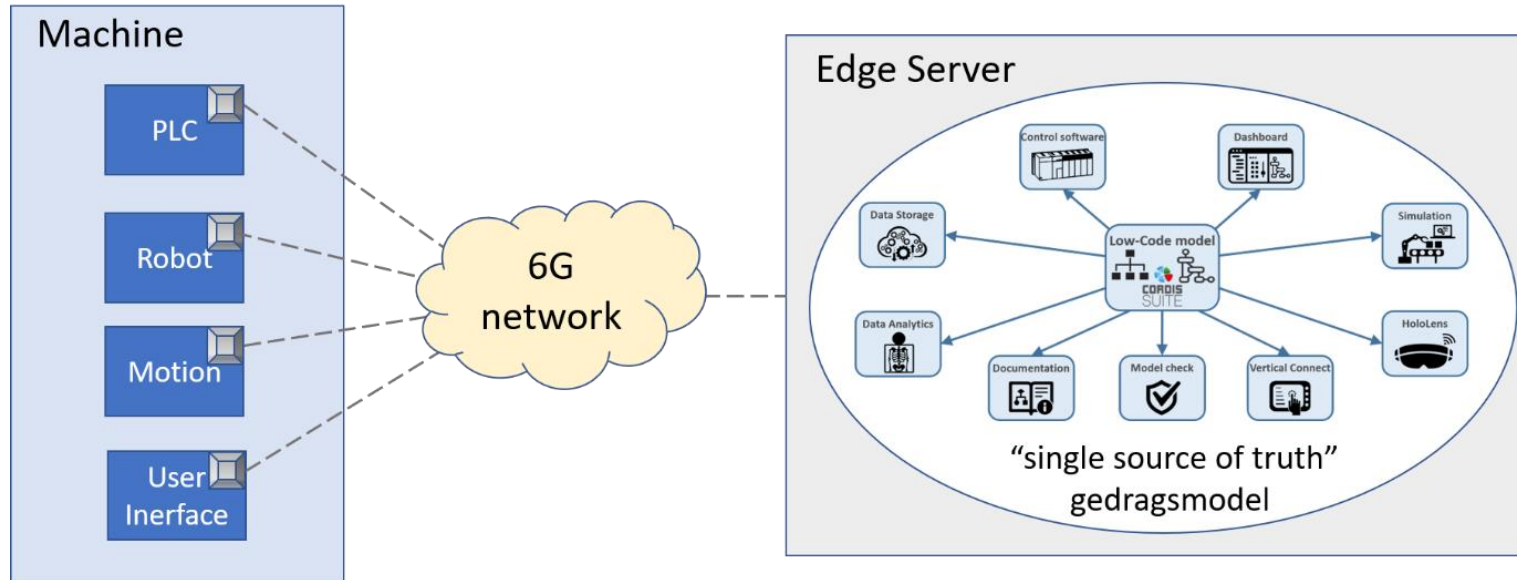
No deep insight remotely



Introduction Single Point Of Failure

6G WIRELESS FACTORY

 6G “eSIM capable embedded module”



6G Potential Requirements

- < 1 ms
- Deterministic Networks

Benefit usecaess

- Removal of “wear and tear” high speed wired sensors / components (sponsor ASML)
- Remote service scenario leveraging 6G & low code (KPN, Cordis Suite,...)

ANNEX

IMAGE GUIDED THERAPY OF THE FUTURE



Philips

- Market leader in image guided therapy worldwide which grows YoY 5%
- A specialized hospital has a minimum of 2, but more general hospitals >6
- Development, production & visitor center in Best

Customer challenges

- Shortage of surgeons and on-prem hardware based equipment

Prototype

- Private network & near hosting to enable advance software tools for surgeons
- Enable intuitive H2M interaction & collaboration

Portfolio: Security, Cloud, XR, Private Network

TRANSPORT HUB: DRONE TRANSPORT CORRIDOR (> 30KM)



Package delivery



Hydrogen drone (HiFly)



BVLOS from CTR

Enablers for drone transport

- ✓ Longhaul drones (hydrogen)
- ✓ Beyond Visual Line Of Sight
- Heavy lifting



Market scales:

Flying within manned, controlled airspace on relevant corridors is allowed

Realtime (connectivity) is prerequisite

Today only a few pre-planned drone flights are allowed within a Controlled Airspace

Portfolio: deterministic (reliable) drone layer



Gomibo: One Platform, All Channels

Website | App | Store | Contact Center | Chat | Self-service



Upsell / crosssell of 5G Advanced & 6G Services by lowering channel cost.

- Todays' customer experience of performance & speed is underperforms
- Poor technical standardization by TMForum (foremost functional)
 - Legacy focus on product delivery ('silo's') underperform in bundled approach
 - Increasing diversity of 5G/6G services

Prototype will be built in program



Improve your ARPU



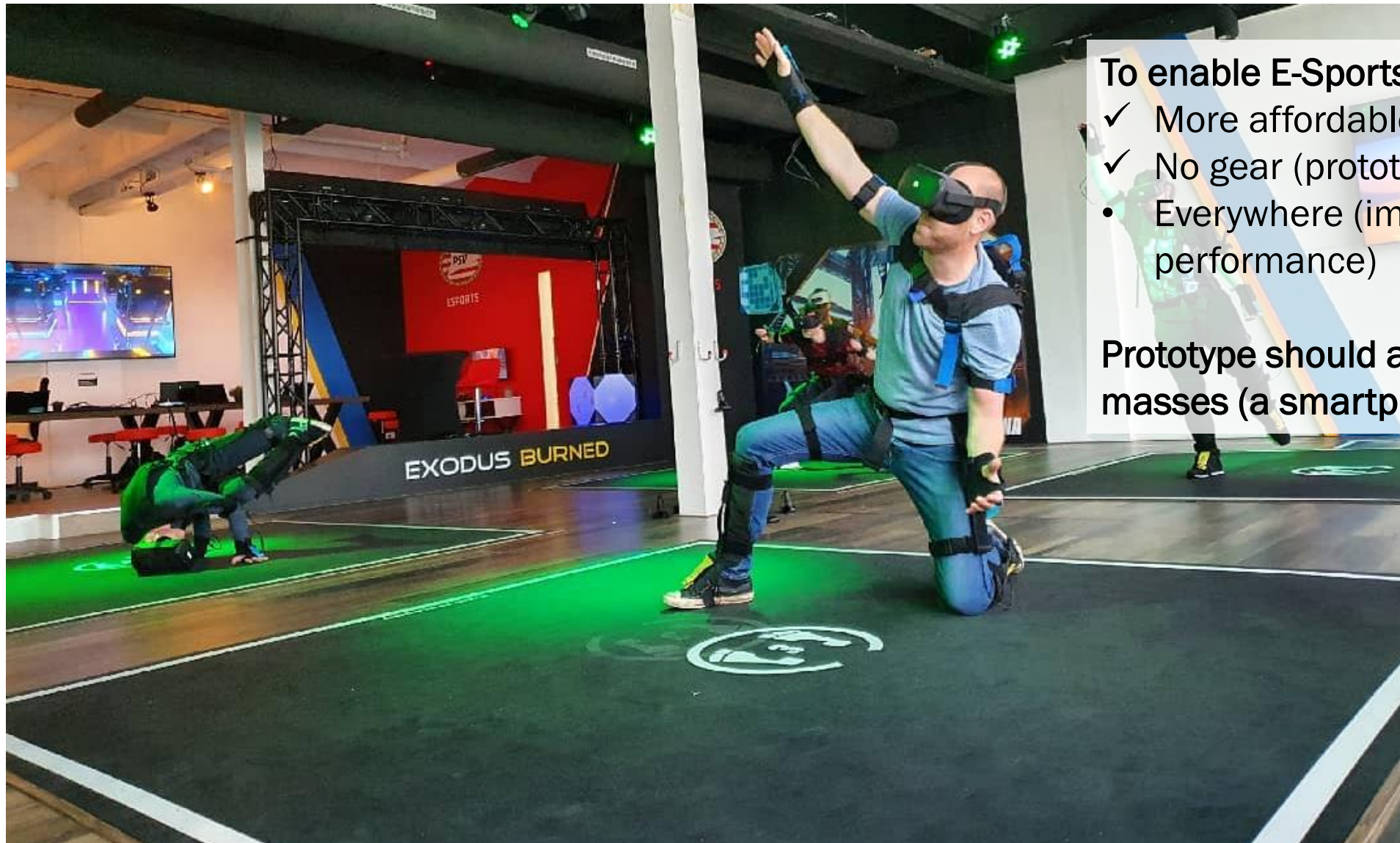
Lower your costs



+100

Improve your NPS

ACTIVE E-SPORTS



To enable E-Sports for the masses

- ✓ More affordable gear
- ✓ No gear (prototype)
- Everywhere (improve cloud & network performance)

Prototype should allow entry for the masses (a smartphone)

