

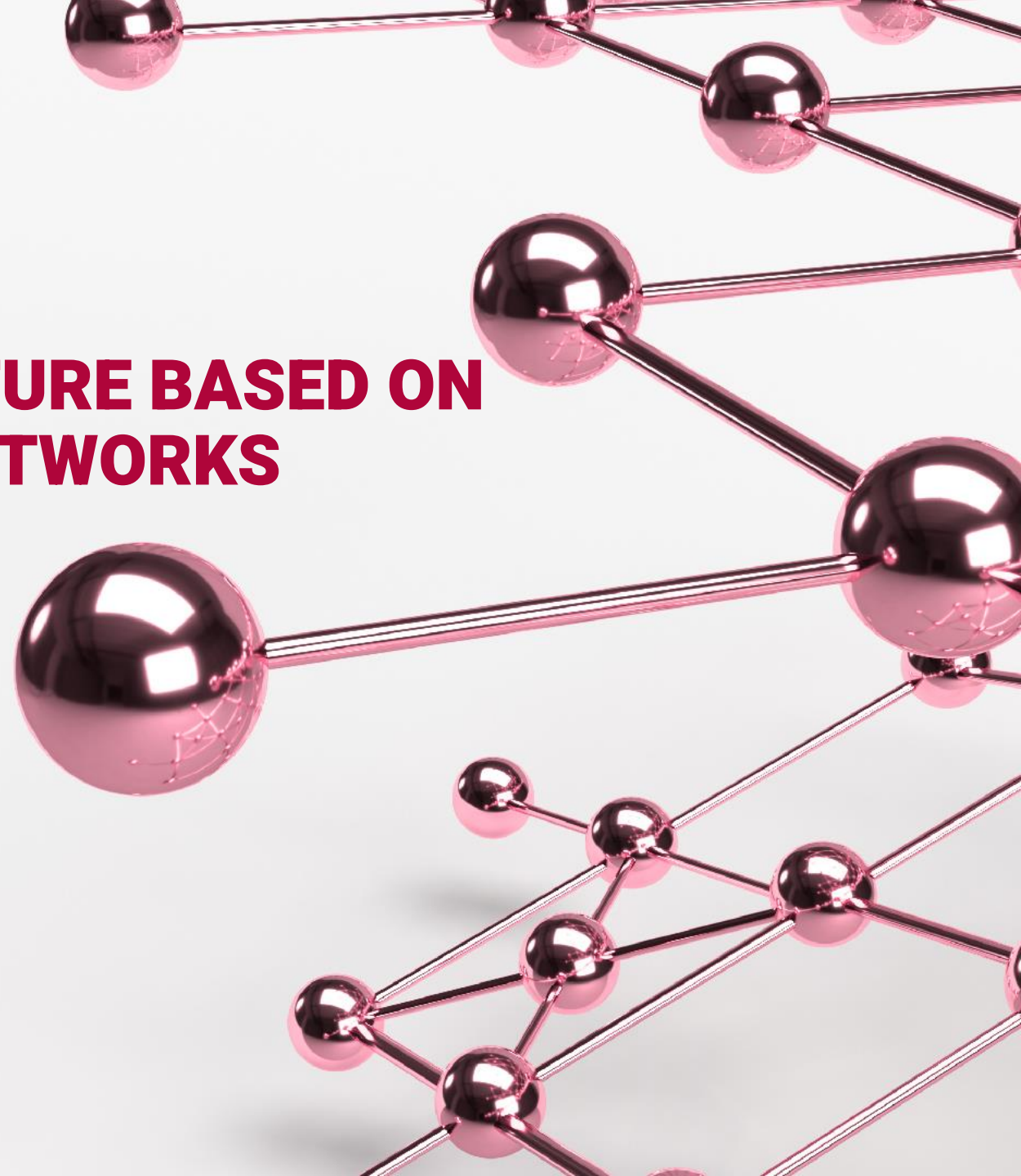


# DESIRE6G – A 6G ARCHITECTURE BASED ON DEEPLY PROGRAMMABLE NETWORKS

INTRODUCTION TO PROJECT  
DISTRIBUTED GENUINE INTELLIGENCE FOR 6G

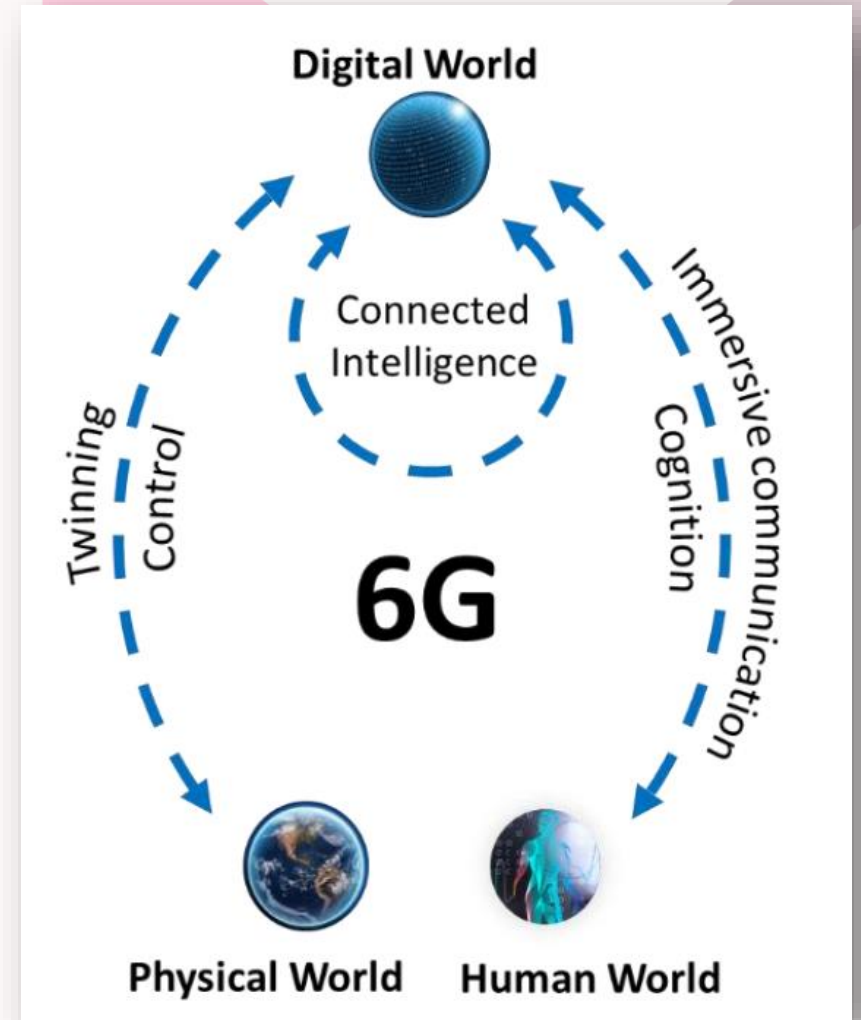
**Vincent Lefebvre,**

Sarl TAGES SOLIDDHIELD. France  
28/03/2024 INCYBER LILLE



# WHAT IS 6G?

- No general globally-accepted vision on 6G
- European vision (6G-SNS)
  - Massive digitalization – Phy representation
  - Connected intelligence – Awareness, real-timeness
  - Network as Compute Fabric - Decisions, actions
- Key values
  - Sustainability
  - Inclusion
  - Trustworthiness



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# DEEP PROGRAMMABILITY & SECURE DISTRIBUTED INTELLIGENCE FOR REAL-TIME END-TO-END 6G NETWORKS

**Project coordination:**  
University of Amsterdam

**Technical coordination:**  
Ericsson Hungary

**Duration:**  
01/01/2023 - 31/12/2025

**Total Cost:**  
6.227.919€



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# DEEP PROGRAMMABILITY & SECURE DISTRIBUTED INTELLIGENCE FOR 5G NETWORKS

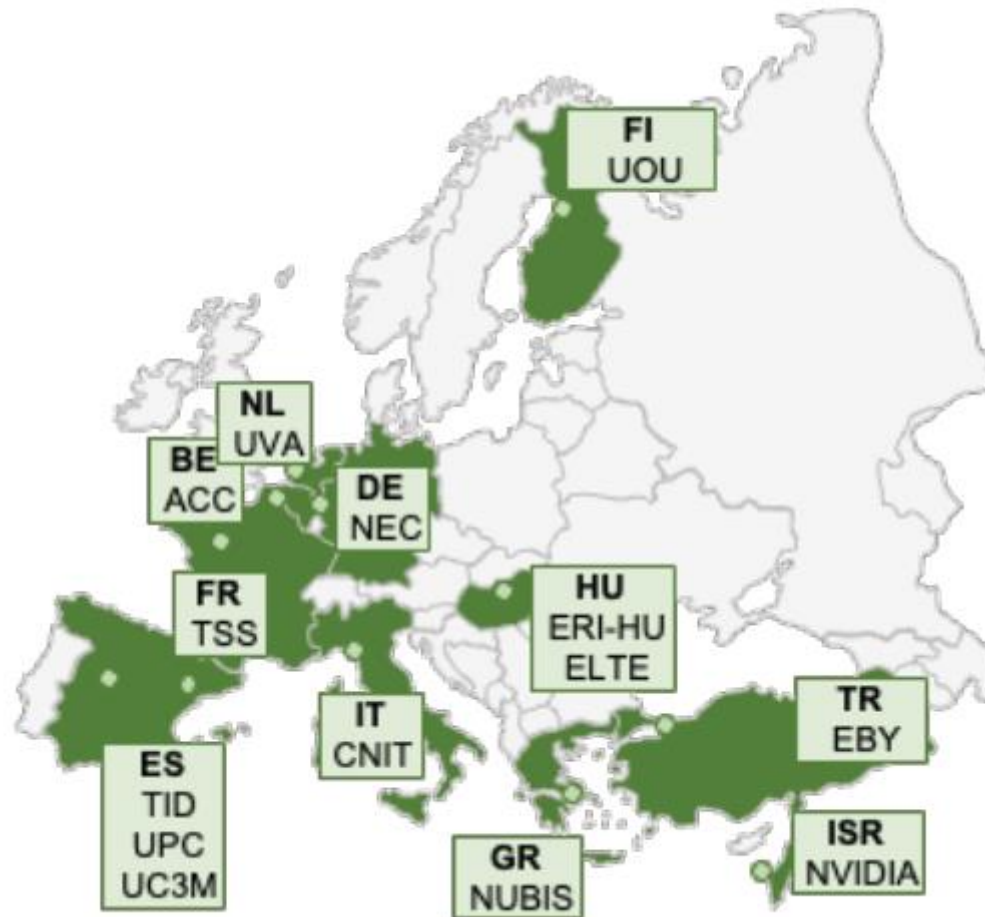
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Follows



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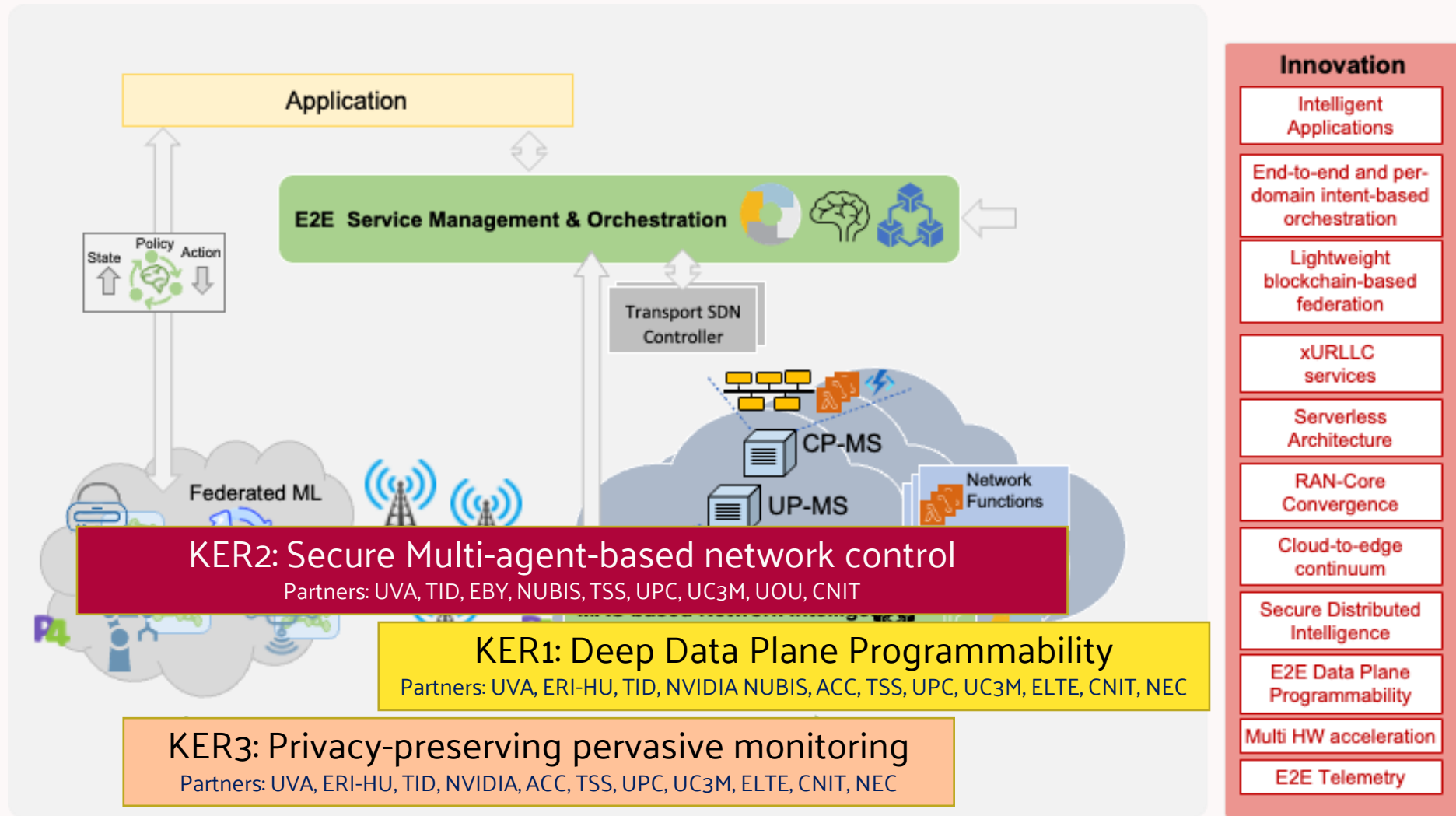
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SHIELD

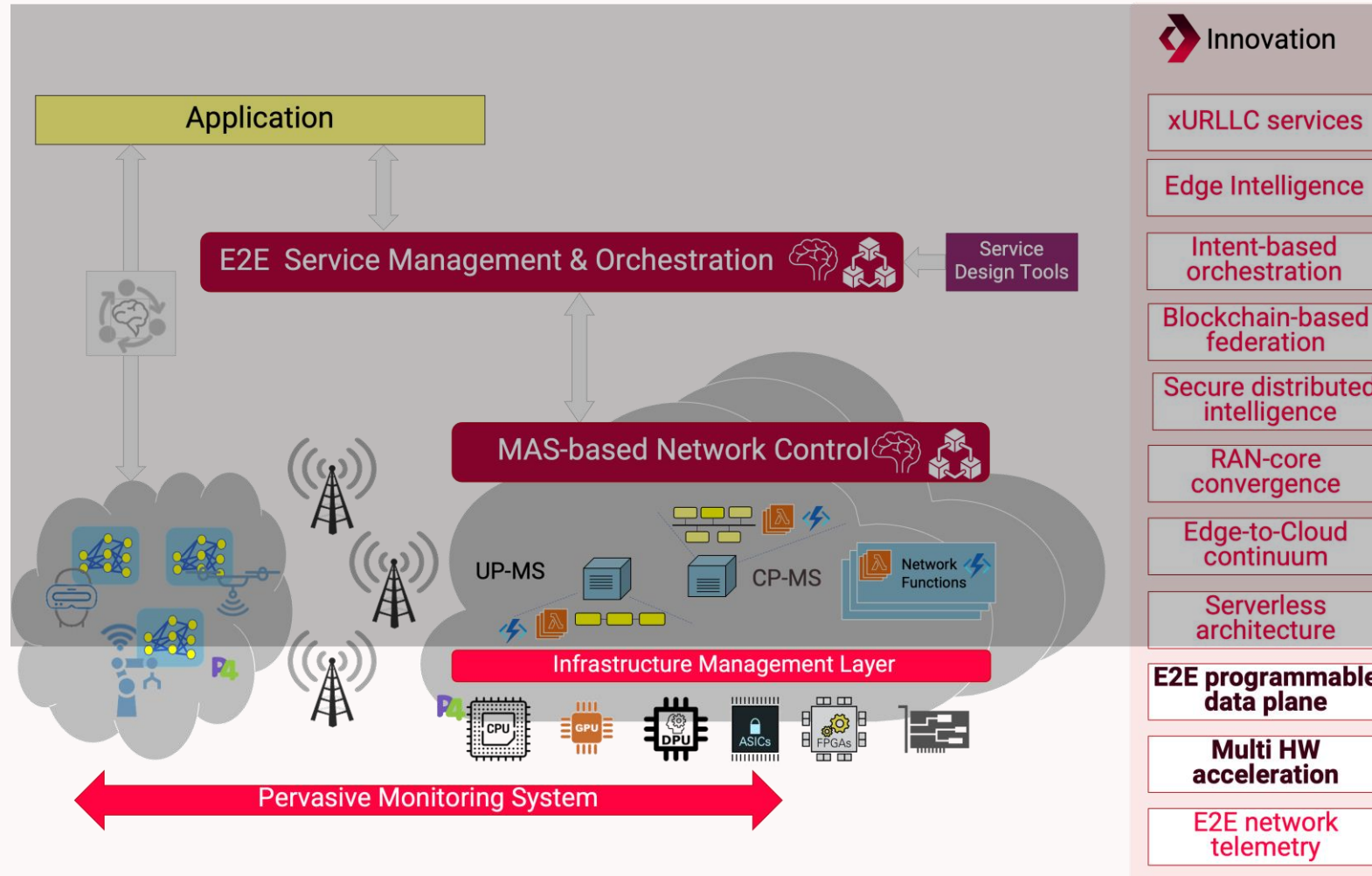
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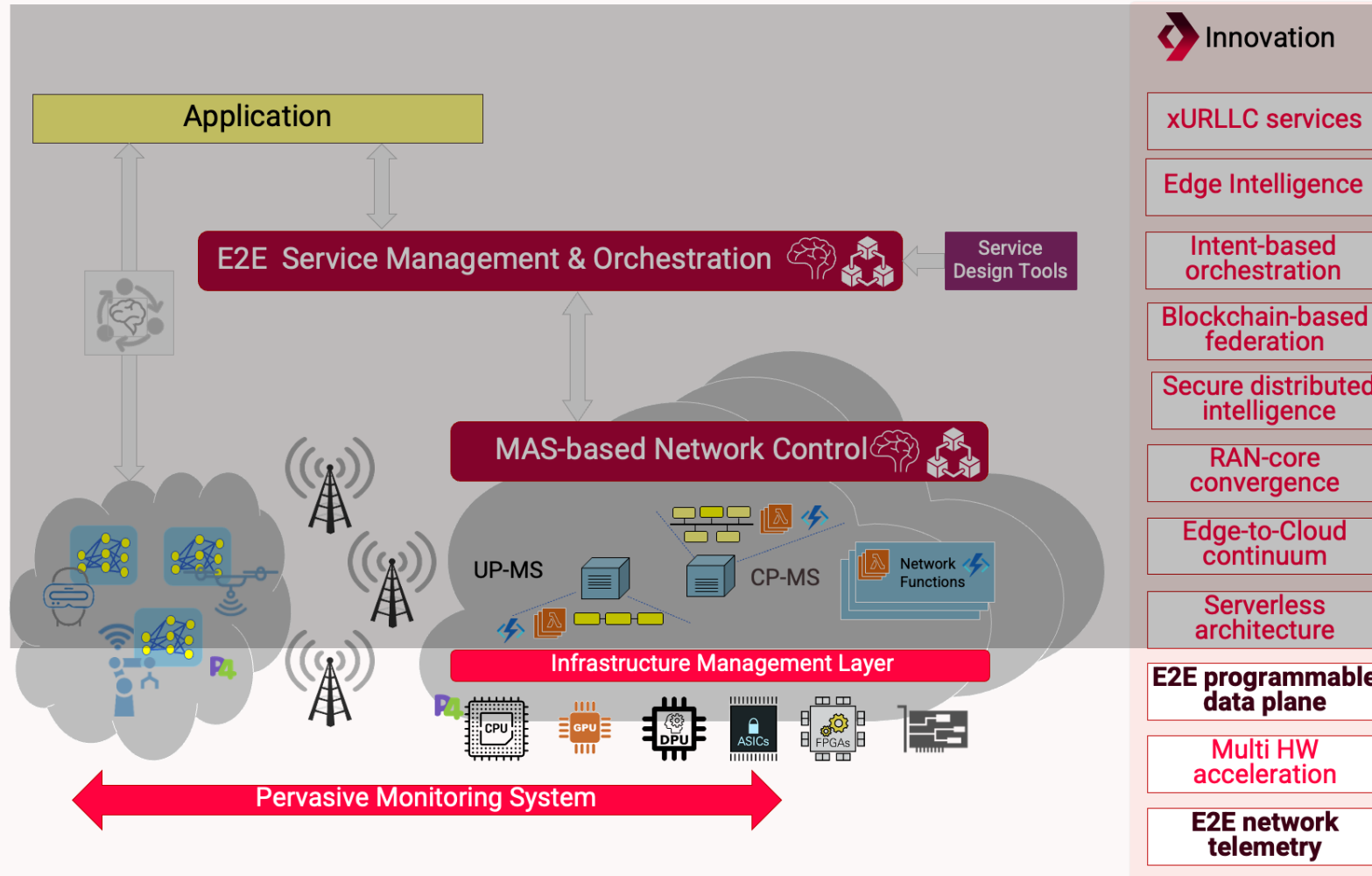
# D6G ARCHITECTURE



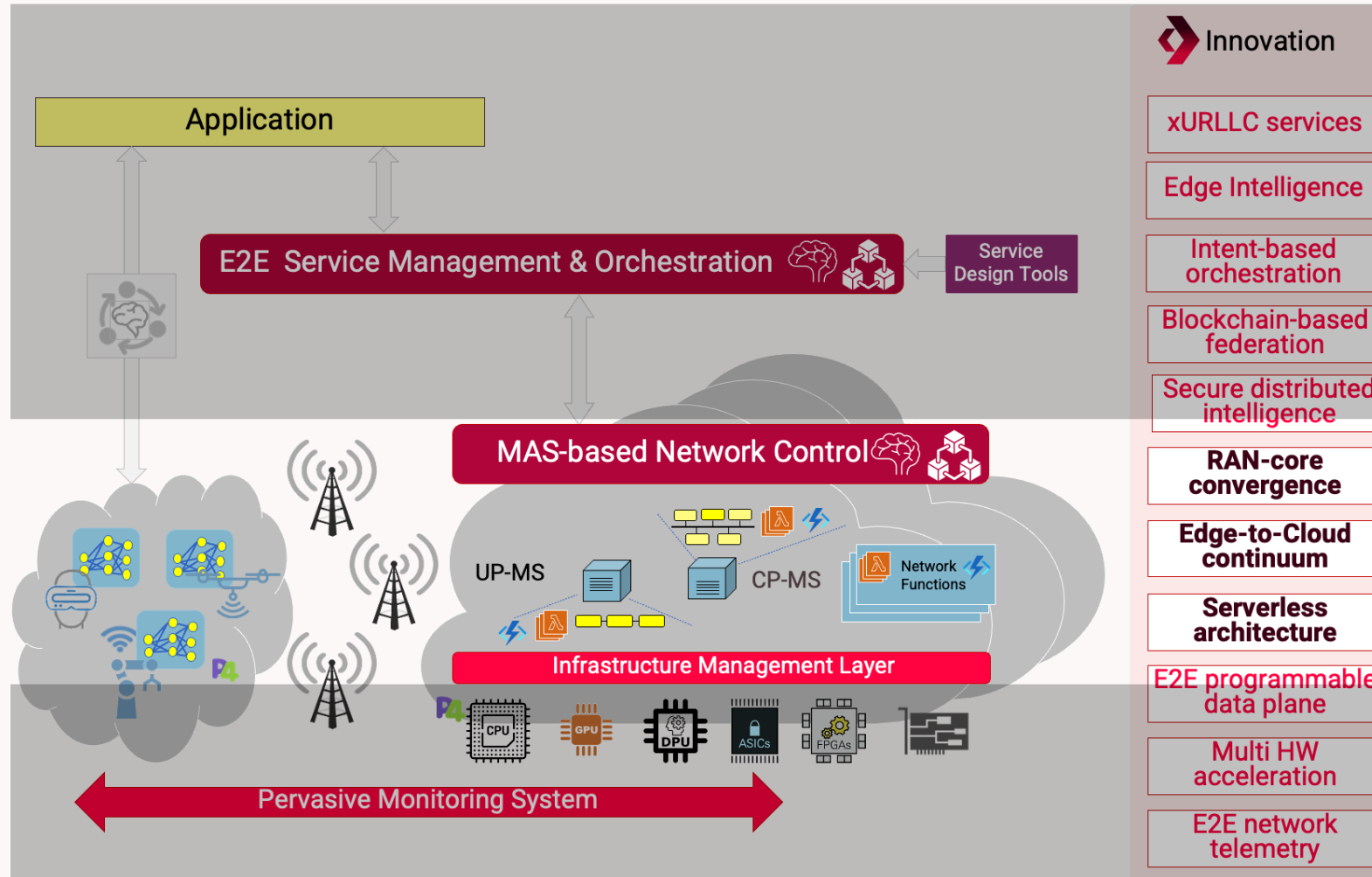
# DEEP PROGRAMMABILITY



# E2E NETWORK VISIBILITY

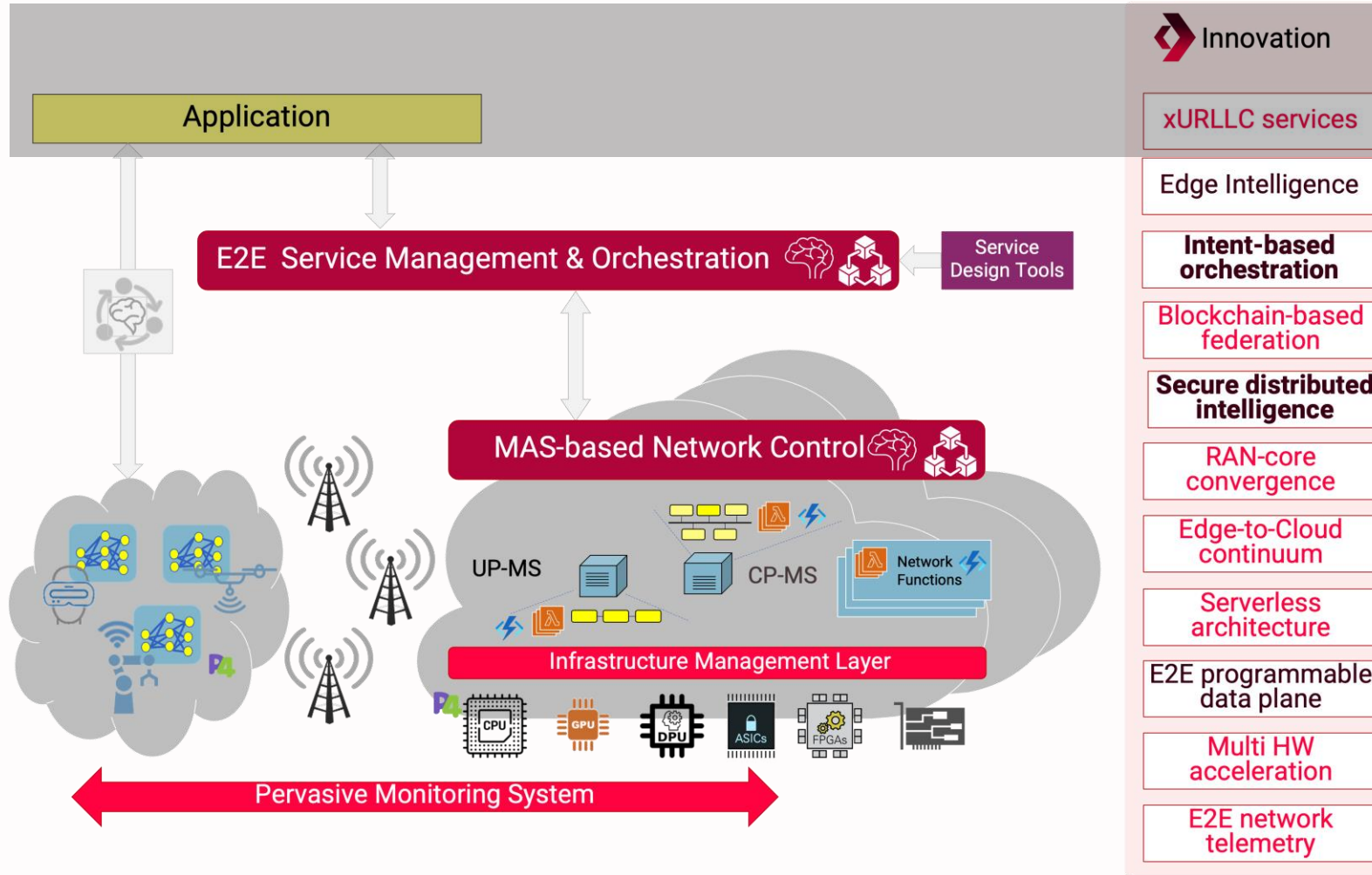


# CLOUD NATIVE

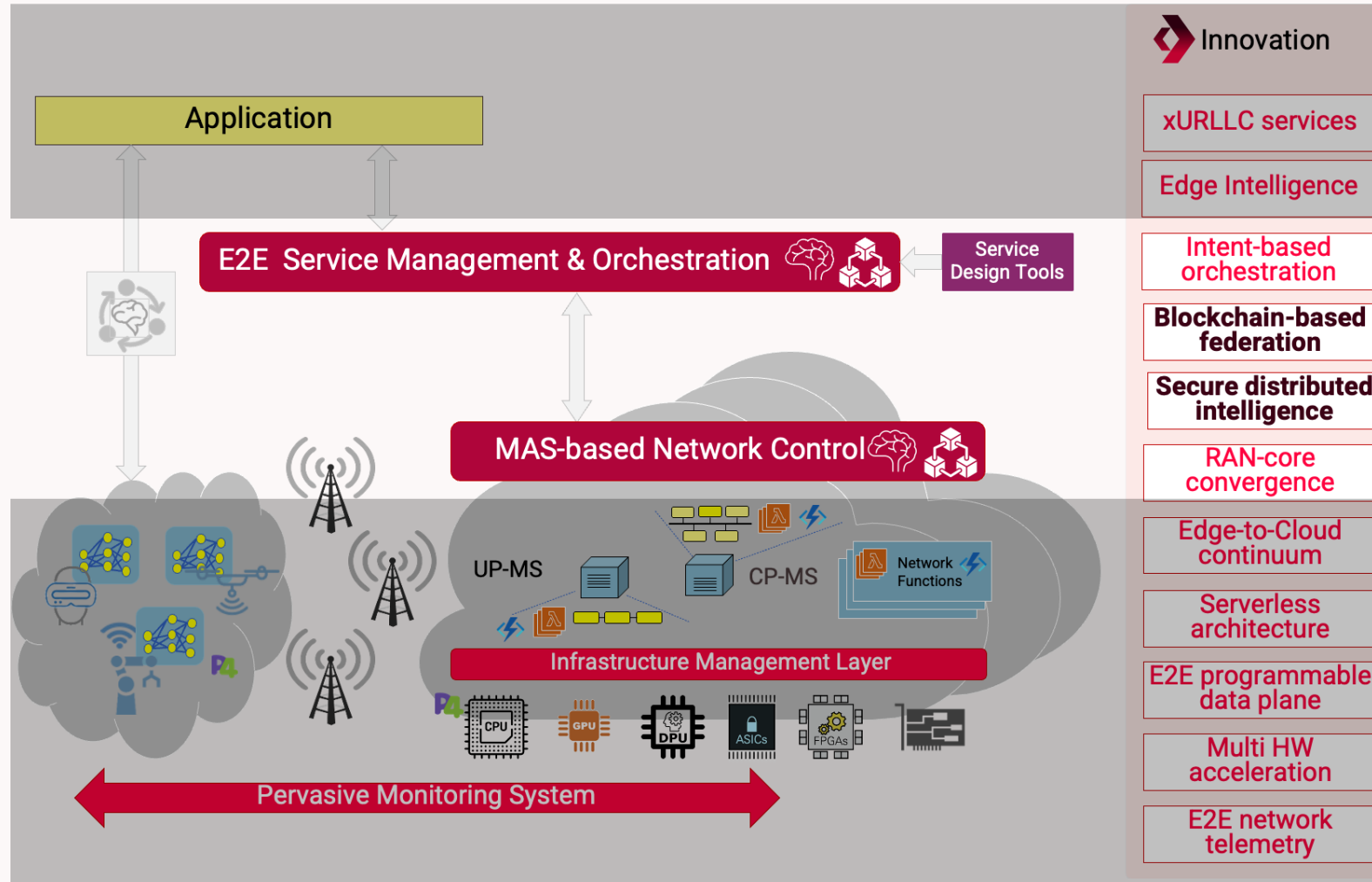




# AI-NATIVE



# DLT FOR ZERO-TRUST ARCHITECTURE



# DISTRIBUTED GENUINE INTELLIGENCE

## Motivation

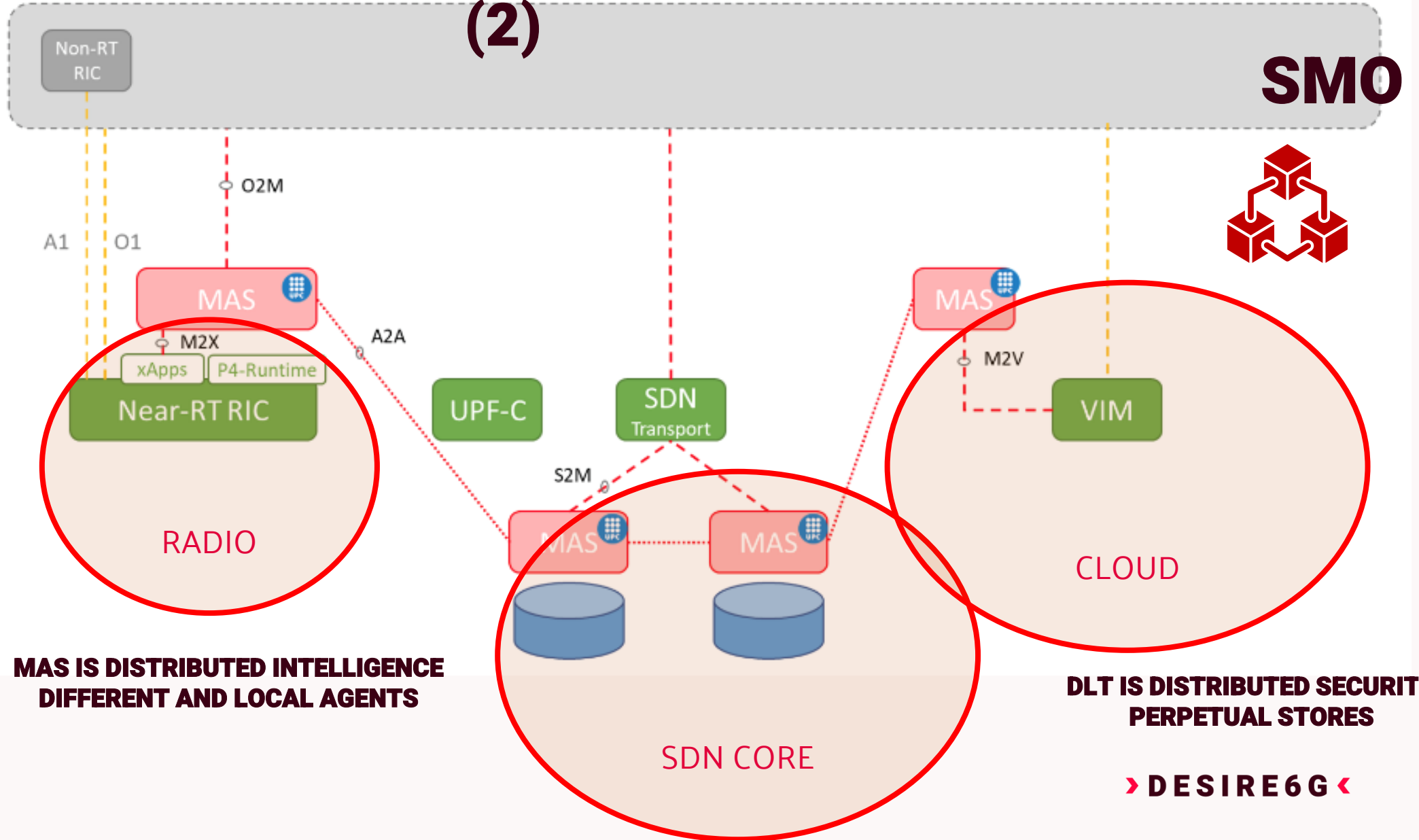
- MAS agents are AI nodes, ingesting local telemetry acting locally and East-West. They are resource optimization decision takers, hence security sensitive.
  - MAS agents are dynamically created by the SMO (MLFO pipeline). They are parametrized at bootstrapping.
  - Inter agent trust must be established when interplaying.
- 
- **Develop a dynamic and traversal attestation scheme. (Check genuiness)**
  - **Bootstrapping and execution phases must be secured.**

[2] D6G: "Pervasive monitoring and distributed intelligence for 6G near real time operation". EUCNC Post

[3] D6G: "Securing Multi-Agent Systems for Near Real-Time Control of 6G Services". EUCNC Post

# ON GOING WORK ON ATTESTATION

(2)

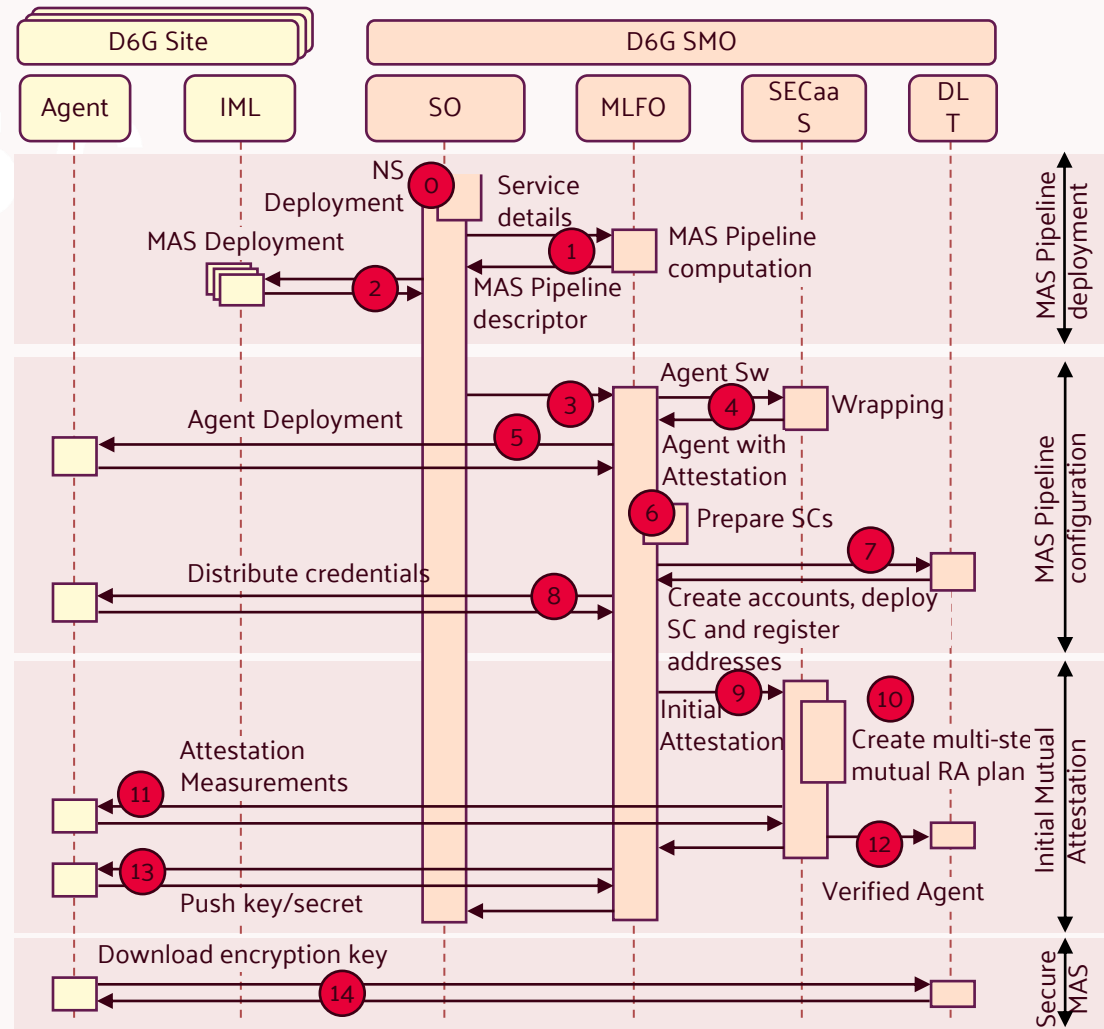


**MAS IS DISTRIBUTED INTELLIGENCE  
DIFFERENT AND LOCAL AGENTS**

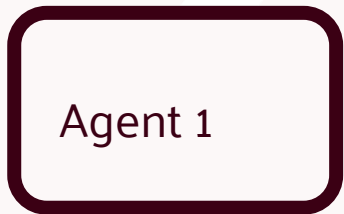
**DLT IS DISTRIBUTED SECURITY  
PERPETUAL STORES**

# DESIRE6

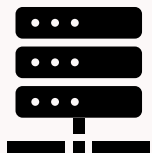
- Step 4: Wrapping
- Step 9: Initial Attestation
- Step 10: Create multi-step mutual RA plan
- Step 11: Attestation Measurements
- Step 12: Verified Agent



# DLT BACK MUTUAL ATTESTATION OVERVIEW



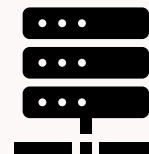
Binary sent to  
SECaaS



Agent 1:  
publicKey:  
'5lRa2LZ9j3Uv5Qa4s3tRgBv5ZmKtYlWdDgXpFPxw6E  
o7'  
privateKey:  
'4kPd4MZ4ZB3x6C4K2jD3Cv5FzGhHjKkKtLmNnOpP  
qRs'  
signature:  
'Ht2EzG4jJ5k6L7mN8nO9pQrStUvWxYzABbCcDdEfFg  
Hh'



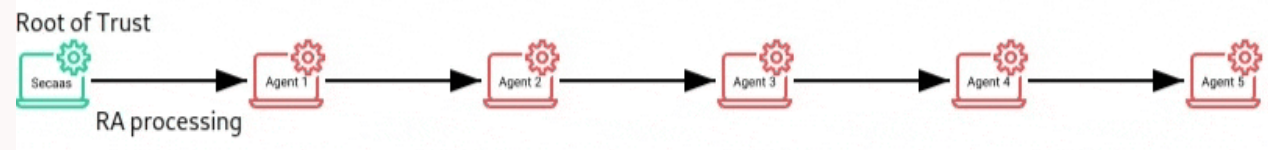
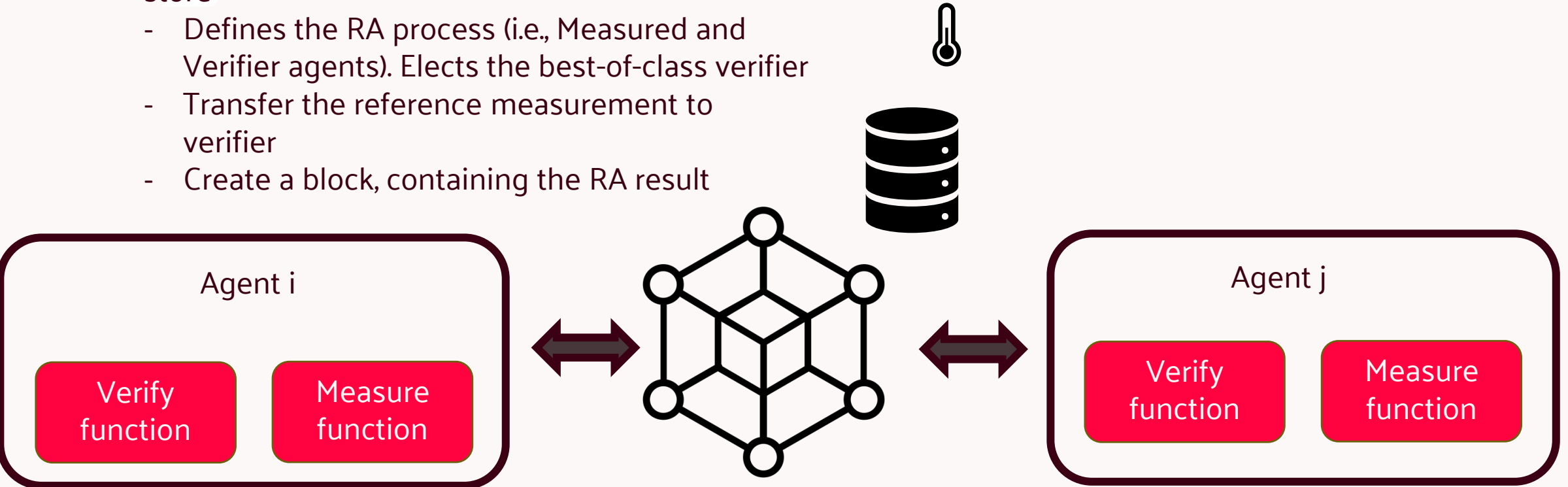
Rewritten Binary  
sent back with RA  
functions



# DLT BACK MUTUAL ATTESTATION OVERVIEW

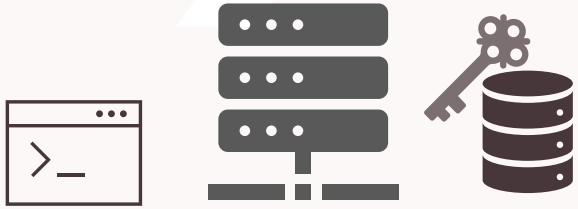
DLT/Smart Contract is bridged to the SECaaS store

- Defines the RA process (i.e., Measured and Verifier agents). Elects the best-of-class verifier
- Transfer the reference measurement to verifier
- Create a block, containing the RA result



# REMIND AND WORK IN PROGRESS ON REMOTE ATTESTATION

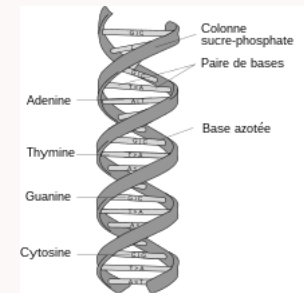
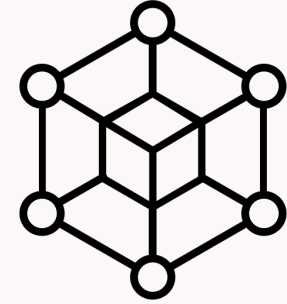
## BINARY REWRITTING



Software-based Mutual Attestation

- Platform-agnostic and cross domain (apply able for the cloud continuum)
- Scalable and flexible (programmable consensus)
- Work in Progress: Always sustainable runtime integrity verification:
  - a. Inversion of the clock master and best efforts
  - b. Scattered hash function, run on-the-flow to decrease penalty
  - c. Presentations at EUCNC (Poster) and ICTON (Demo)

## BLOCKCHAIN





# TAKE-AWAY

## Distributed Genuine Intelligence (MAS agents)

- MAS fosters distributed intelligence, central to our architecture security
- DLT is a major asset to establish trustworthiness, traceability
  - Scalability must be considered in the design: block content, production frequency
  - Flexible technology by smart contract programming (e.g., service federation, election of nodes)
- Mutual Remote Attestation, powered by DLT and SECaaS opens disruptive cyber security pathways for 6G services and networking
  - Platform agnostic, infra-agnostic, flexible reference measurement delivery
  - Network continuum (IoT, edge, core, cloud)
  - Programmable root of trust
  - Continuous attestation with novel security claims (e.g., proof of execution, integrity, locality, identity)
  - **Best effort sustainable security, conciliating security and performance for 6G**

[2] D6G: "Pervasive monitoring and distributed intelligence for 6G near real time operation". EUCNC Post

[3] D6G: "Securing Multi-Agent Systems for Near Real-Time Control of 6G Services". EUCNC Post



# THANKS!

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