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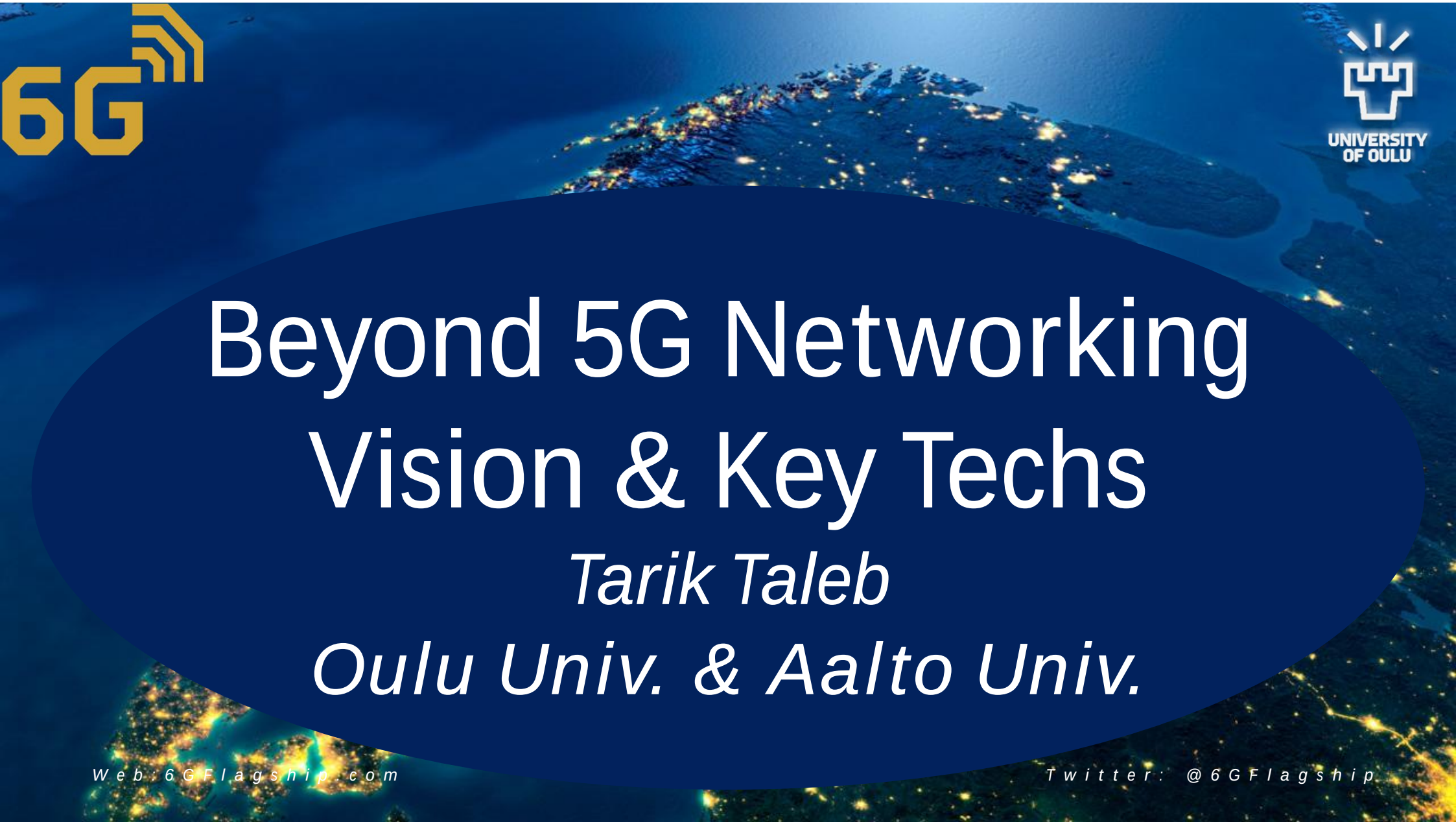
6G
UNIVERSITY OF OULU
Beyond 5G Networking
Vision & Key Techs
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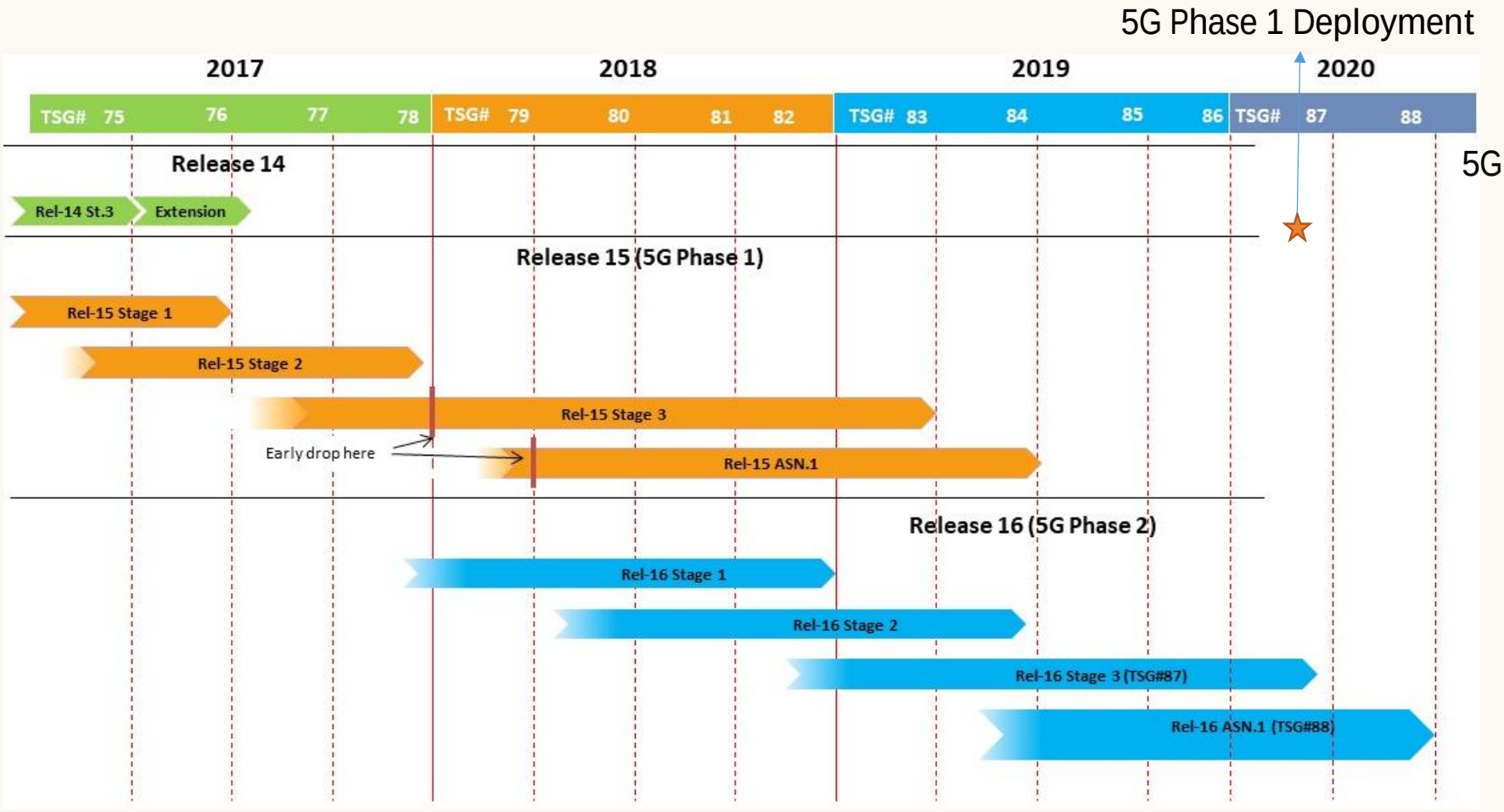
Outline

- 5G Current Standards
- 5G Current Challenges
- Beyond 5G Use Cases & Requirements
- Key Network Technologies for Beyond 5G
  - § Service-Based Architecture/Cloud Nativeness
  - § Deterministic Networking
  - § Tight Integration of Mobile-Transport Networks
  - § Artificial Intelligence & Data Analytics
  - § Autonomic Network & Service Management

3GPP Roadmap



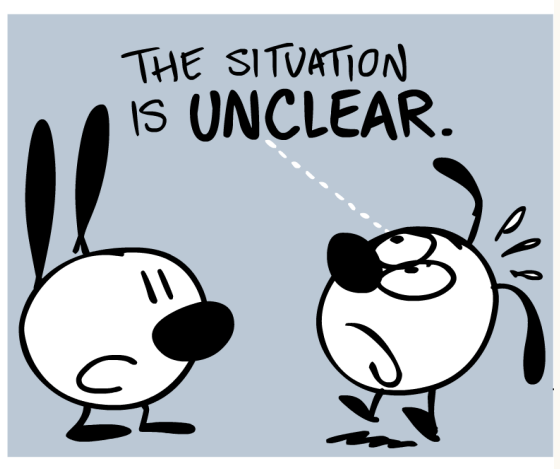
5G Phase 1 Deployment

2021

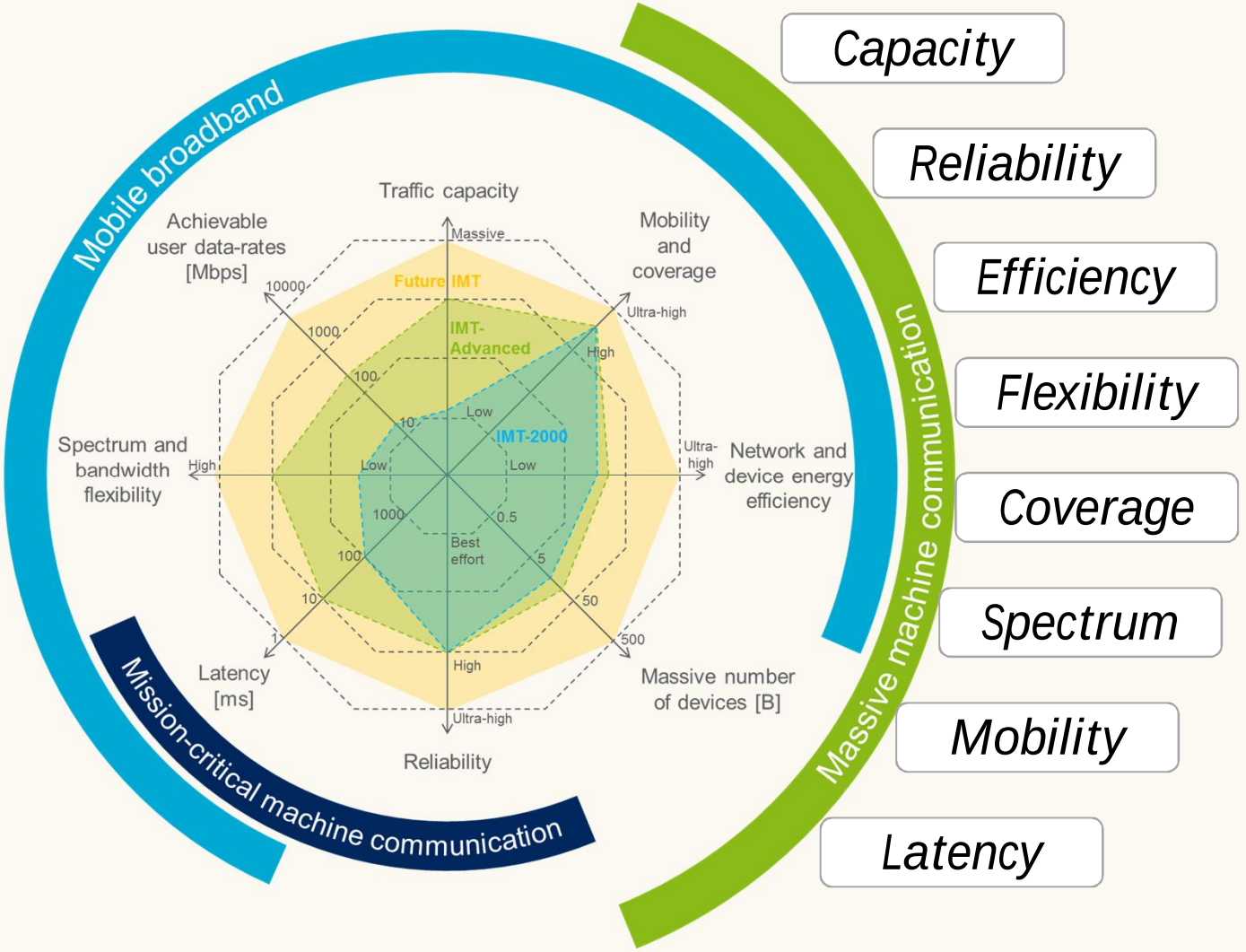
5G Phase 2 Deployment

Current State of 5G

- **Challenging Biz Models**
  - Verticals/OTT do not buy/pay



5G Requirements



Current Stand of 5G Use Cases

Higher speeds x10 / Wider coverage

mmWave Backhaul / Multi-Service / Slicing

eMBB

5G

CUP Separation/ C-RAN functional split

Meeting the Required Latency challenging

6G URLLC

Broadband access in dense areas	Broadband access everywhere	Higher user mobility	Massive Internet of Things	Extreme real-time communications	Lifeline communications	Ultra-reliable communications	Broadcast-like services
PERVASIVE VIDEO	50+ MBPS EVERYWHERE	HIGH SPEED TRAIN	SENSOR NETWORKS	TACTILE INTERNET	NATURAL DISASTER	E-HEALTH SERVICES	BROADCAST SERVICES

4G mIoT

Radio: LTE-M/NB-IoT
Business Model-Open

eMBMS – 3GPP Rel.14
Business Model-Open

3GPP Rel.14 Mission Critical Services
UAV enhancements

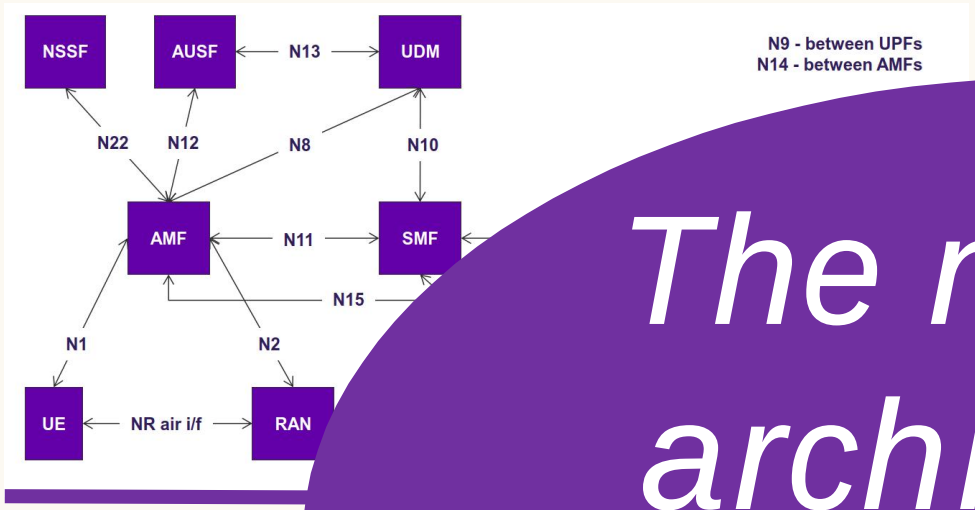
Reliability of 99.999% not feasible

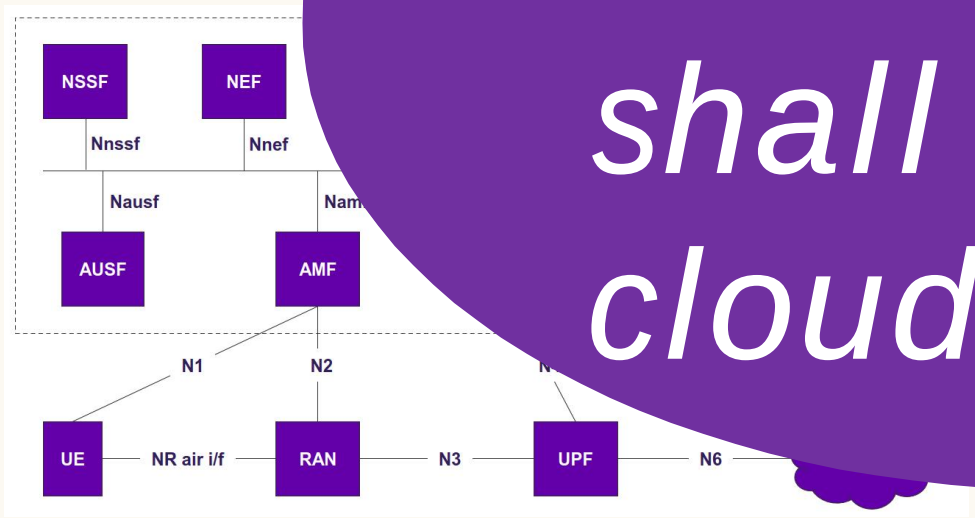
Beyond 5G Use Cases

- Holographic Teleportation
- Augment Projection Surfaces
- Situational Awareness - Analytics
- Internet-of-Everything (IoE)
- Digital identity
- Vehicular – Autonomous Driving
- UAV Services
- Deterministic Services
  - Tactile Internet
  - eHealth
  - Industry 4.0

Network Evolution towards Beyond 5G

Service Based Architecture





The network architecture shall be truly cloud-native!

oosely coupled services, flexibility
iented control plane

nteract with
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al and
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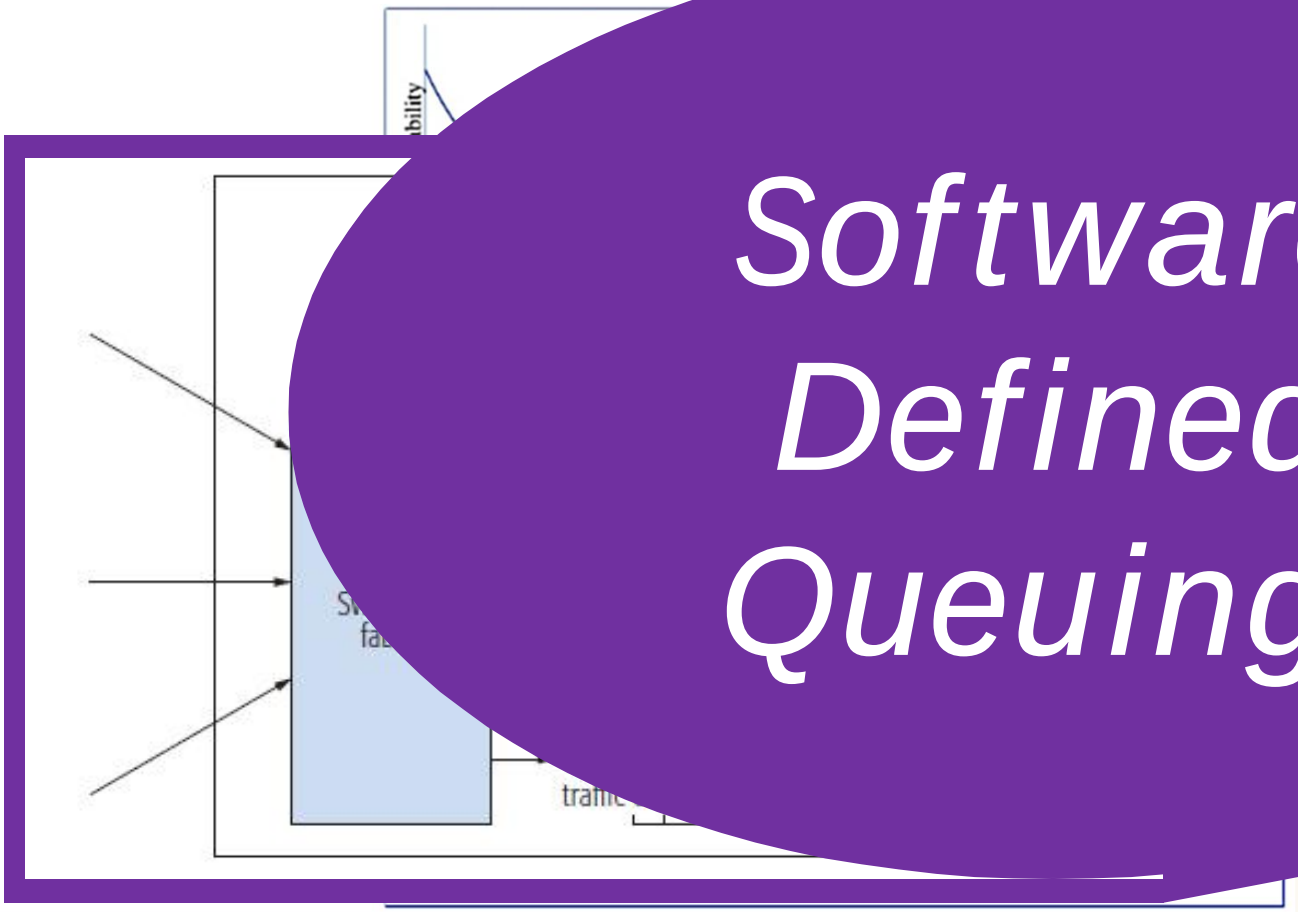
parties via
nd APIs

Extreme LLC – Deterministic Networking

Packet Loss and Latencies



Software Defined Queuing!

Service Characteristics:

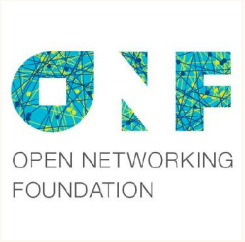
- …nded delay/jitter from source to …ion.
- …lerance.
- …t-of-order packet

…Ns Layer 2

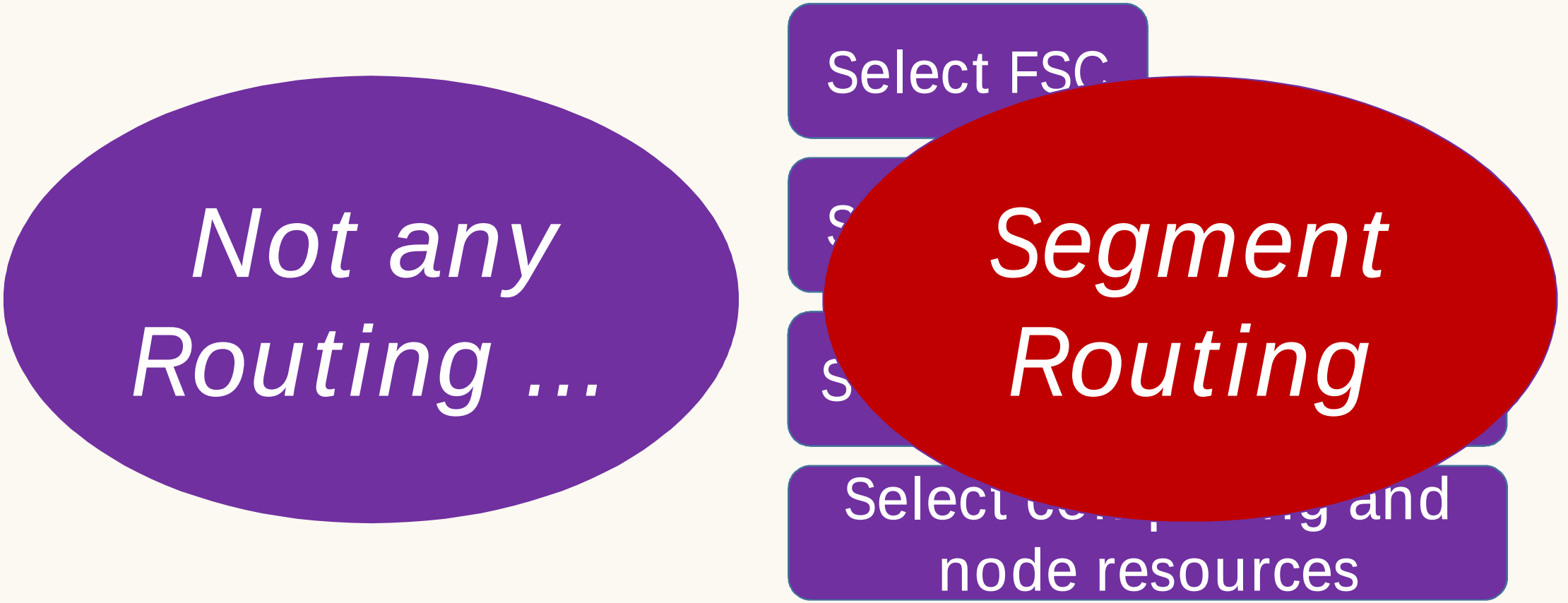
IEEE

Extreme LLC – Deterministic Networking

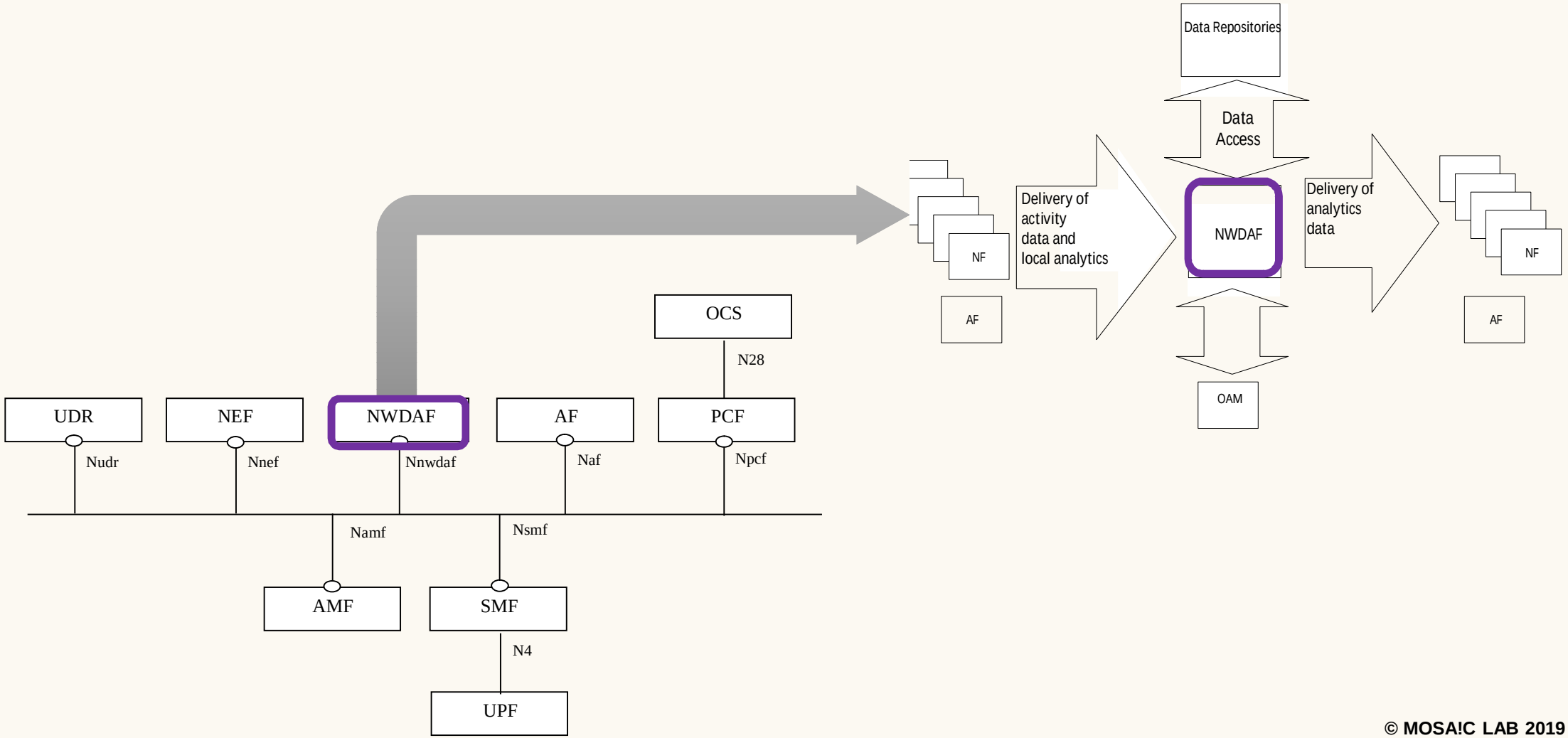
Tighter Integration with Transport Network



Extreme LLC – Deterministic Networking



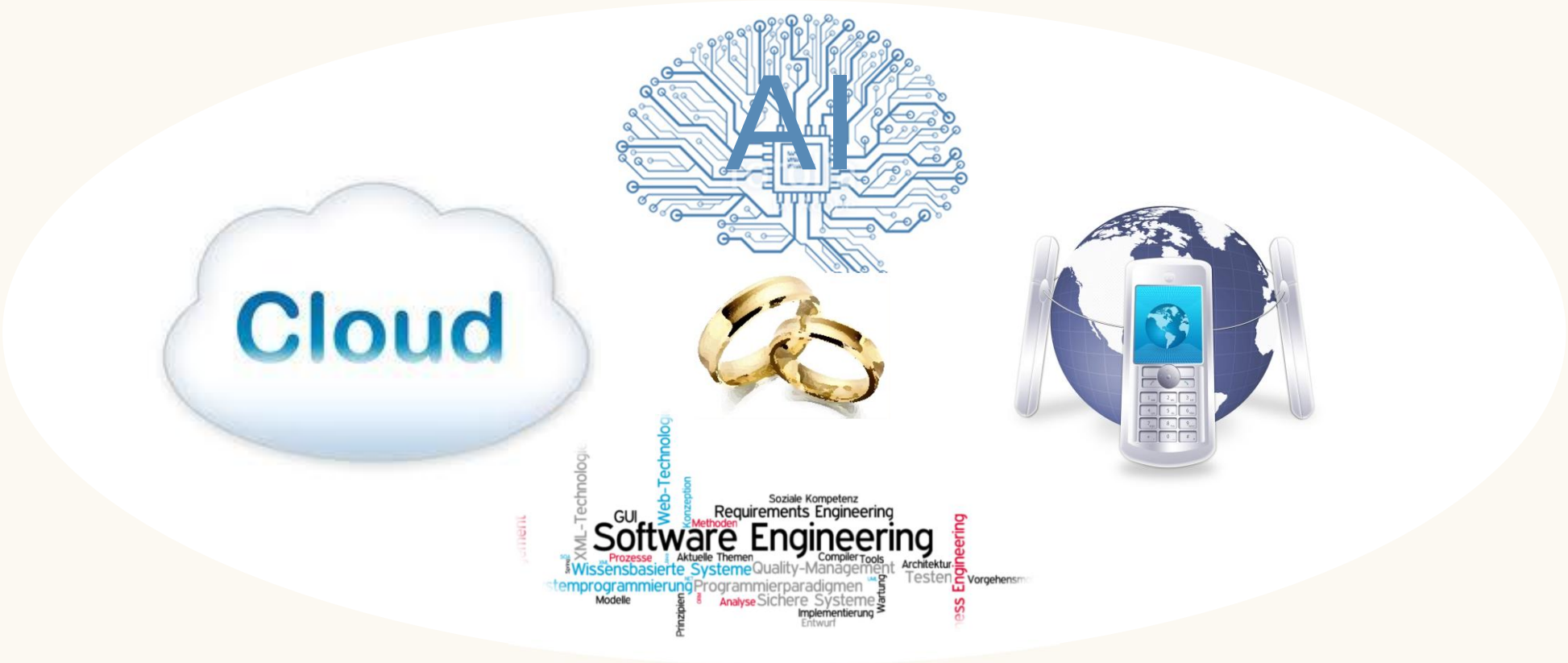
AI & Data Analytics



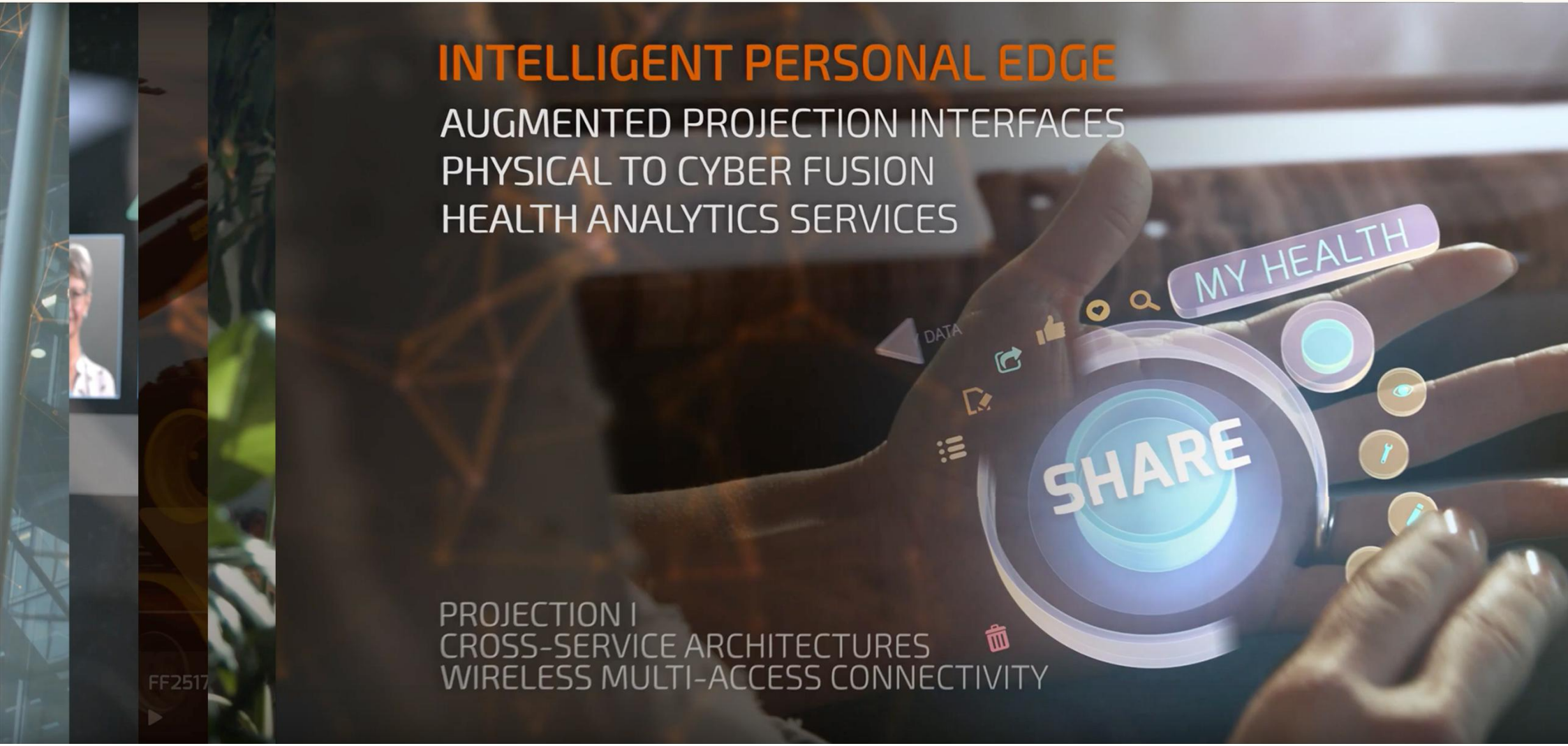
The 6G era … Autonomous NW/Service Management

No limits in applicability ...

6G is the tech to bring in AI stakeholders ...



AI & Smart Connectivity will be everywhere …



Some take away for beyond 5G networking …

- True Cloud Nativeness
- Extreme LLC in 6G
  - Deterministic networking
  - SW Defined Queuing
  - Tight integration with transport network
  - Segment routing
- AI & Data Analytics
- Automatic Network/Service Management

Thank you for your attention!

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