TelCos in the Metaverse

**Monetizing Next-Generation Networks
by enabling XR Applications**

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The XR Ecoystem is key to monetize your next-gen network assets. Defining a viable Technology & Partnering Strategy now is essential to ensure success.

The XR Ecosystem is a key driver to monetize Next-Gen TelCo Networks

- XR Use Cases enable to demonstrate and monetize the key advantages of TelCos next-gen network assets (ultra-low-latency, high throughput, etc.).
- These Use Cases include for example: Cloud Gaming, immersive meetings, remote maintenance, employee trainings in VR, 3D navigation, etc.

TelCos need to master the interplay of 4 key network components:

Network Slicing	Edge Computing	Latency Management	Service & NW APIs

Currently the XR Industry lacks following capabilities for its maturity, but TelCos are in a central role to overcome those:

XR Glasses are still lacking consumer appeal in terms of price, weight, form factor and most importantly field of view.

CSPs are key Enabler
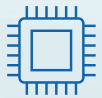
The XR ecosystem requires remote compute from the cloud/edge to enable the display of photorealistic virtual elements.

The communication between compute and device needs an app-specific, ultra-low-latency networking for a high FPS UX

TelCos should define a Technology & Partnering Strategy that describes their role within the XR Ecosystem beyond the network play.

- CSPs network play will gain overall relevance within XR, but hyperscalers and game engines will dominate the high margin Ecosystem Enablement.

- Next to the core networking there are further valuable business opportunities:
  1. Multi-Edge-Cloud Infrastructure Orchestration / Edge Co-location
  2. Cloud Anchor Hosting (Especially for Fixed customers' homes)
  3. New TelCo services such as holographic calls / remote collaboration.

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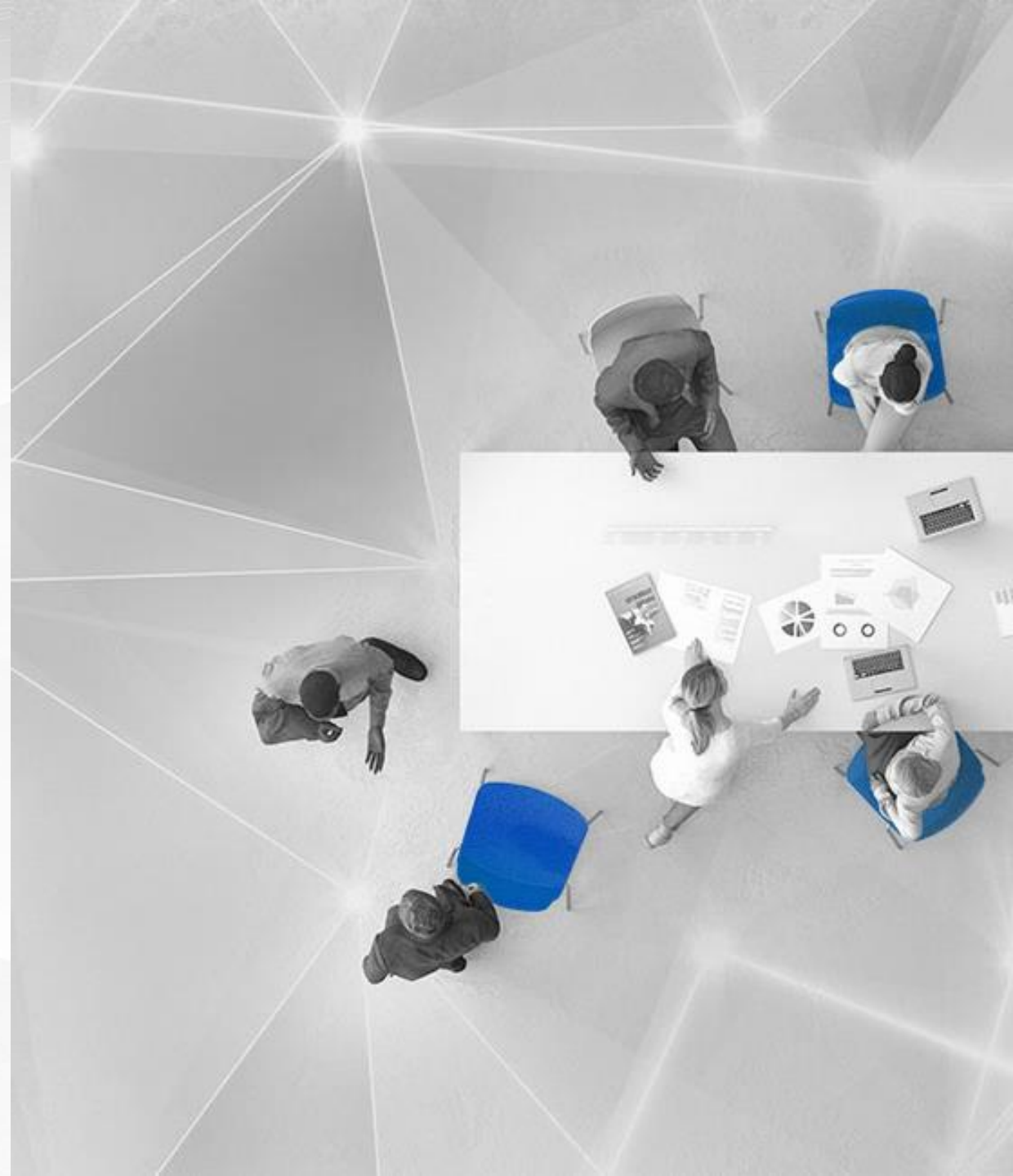
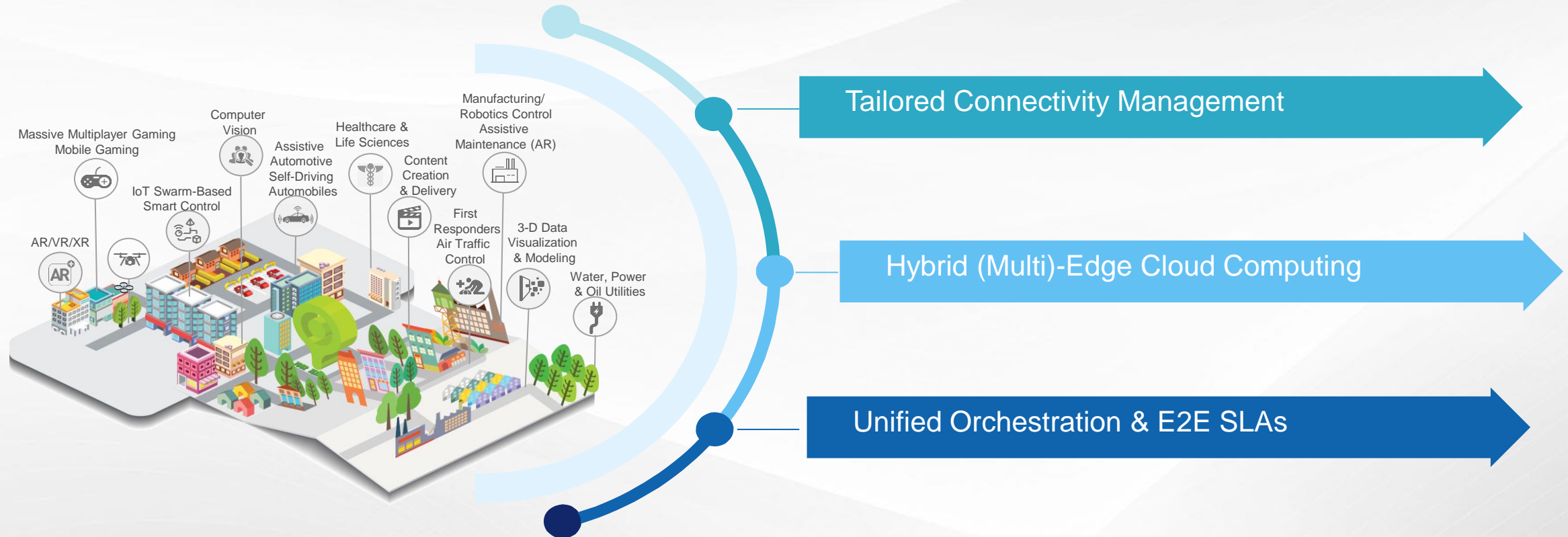# New digital services require CSPs to speed up the transformation towards Next Generation Network Capabilities while ensuring their subsequent monetization.
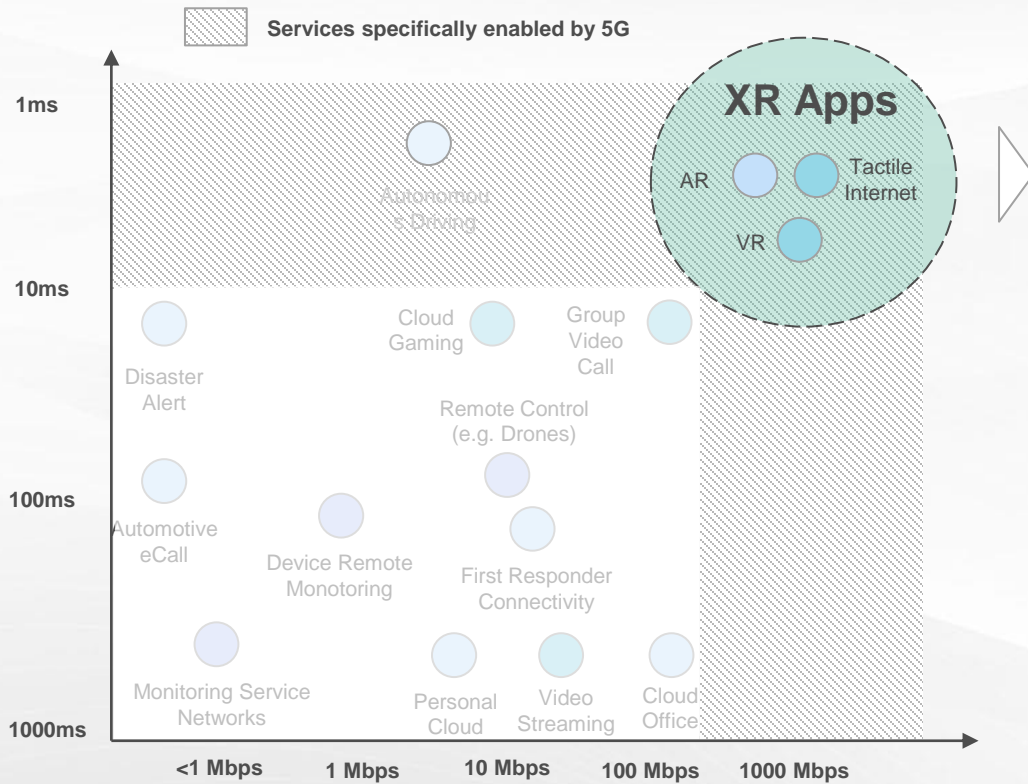
Emerging Application Ecosystems require…

… Next Generation Network Capabilties

Massive Multiplayer Gaming
Mobile Gaming

Computer Vision

Healthcare & Life Sciences

Manufacturing/ Robotics Control Assistive Maintenance (AR)

IoT Swarm-Based Smart Control

Assistive Automotive Self-Driving Automobiles

Content Creation & Delivery

AR/VR/XR

First Responders Air Traffic Control

3-D Data Visualization & Modeling

Water, Power & Oil Utilities

Tailored Connectivity Management

Hybrid (Multi)-Edge Cloud Computing

Unified Orchestration & E2E SLAs

Source: Detecon digital telco 2025.

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Yet only a few services are able to take advantage of the combined benefits of CSP's future Network Capabilities – XR Apps being the most relevant!

Network Requirements of Next-Gen Apps

Exemplary Use Cases within the XR-Segment

Services specifically enabled by 5G

XR Apps

AR   Tactile Internet

VR

1ms

10ms

100ms

1000ms

<1 Mbps   1 Mbps   10 Mbps   100 Mbps   1000 Mbps

Automated Driving

Disaster Alert

Cloud Gaming   Group Video Call

Remote Control (e.g. Drones)

Automotive eCall   Device Remote Monotoring   First Responder Connectivity

Monitoring Service Networks   Personal Cloud   Video Streaming   Cloud Office

B2C   B2C   B2C

Mobile Cloud Gaming (on smart glasses)   **Immersive Media (on smart glasses)**   **Immersive Gaming (on smart glasses)**

B2B   B2B   B2B

XR Immersive Meetings   **Mobile Remote Maintenance**   **VR Training (on 5G Campus)**
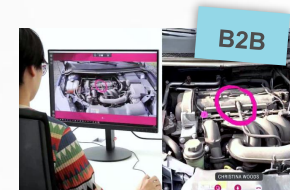
Source: GSMA Intelligence (adapted).

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The Vision of XR is the Metaverse:
Diverse virtual experiences enabling new exciting extended realities.

A day in a life of a future XR User:

16:00

08:00   24:00

08:30 | Commute to client	10:00 | Working at client	14:00 | Coffee Break	18:30 | Play with Kids	20:00 | Watch Bundesliga	21:00 | Virtual Shopping
▪ Start live-navigation in FOV ▪ Holographic call with client	▪ Read & answer emails ▪ Last changes to client pitch	▪ Mobile Cloud Gaming ▪ Watch Netflix, Youtube, etc.	▪ Play Harry Potter XR game ▪ Join multiplayer experience	▪ Watch Bundesliga ▪ View add. info as overlay	▪ Virtual shopping with family ▪ Use Avatar to try on clothes
NEXT	NOW	NOW	NEXT	NOW	NEXT

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Currently the XR Industry lacks 3 major capabilities for its maturity – CSPs are key for its realization.

Devices

MR Glasses & VR Headsets are constantly being improved and are slowly entering the B2C sector (e.g. Oculus, Nreal). However, currently they are still lacking consumer appeal in terms of price, weight, form factor and most importantly field of view.

Essential Role by CSPs
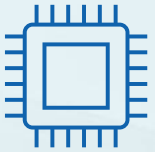
Computing Power

XR Glasses are lacking the necessary computing power to display high quality Virtual Objects. Hence, offering compute from the cloud/edge enables a photorealistic UX while simultaneously reducing weight, price and form factor of the devices (see above).

Latency & Jitter

A key element for XR is the network connectivity which is currently lacking both in terms of latency & jitter. A fast and reliable image transmission above 60FPS (a frame at least every 16ms) is crucial. Thus, CSPs need to enable app-specific network management.
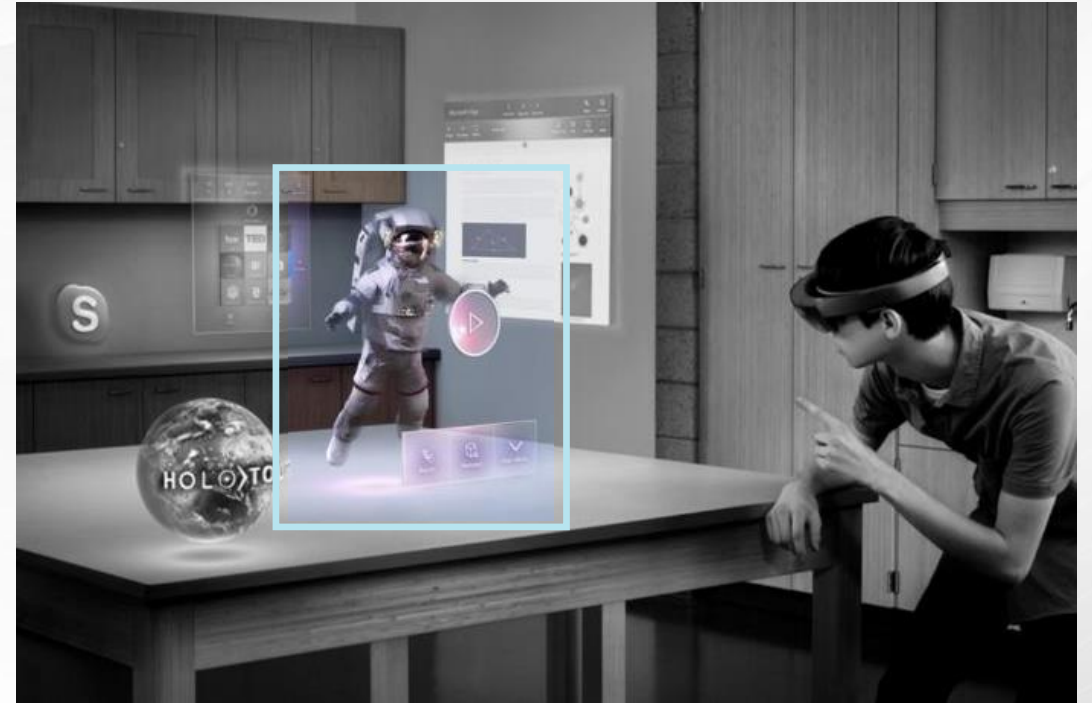
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Example: Executing XR Apps via CSP-optimized remote rendering on the TelCo Core creates a superior UX and a competitive advantage for TelCos.

UX Benefits of Telco-Core remote rendering
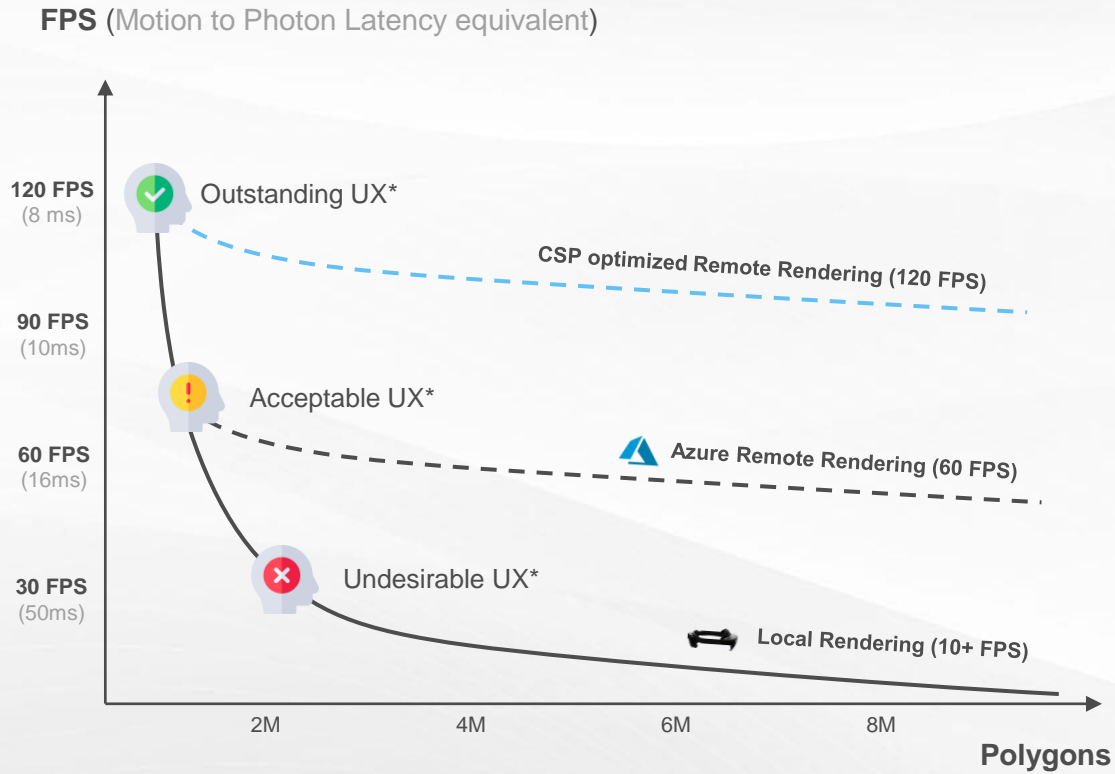
Interactive high quality UX only possible via remote rendering

FPS (Motion to Photon Latency equivalent)

- **120 FPS** (8 ms) — Outstanding UX*
- CSP optimized Remote Rendering (120 FPS)
- **90 FPS** (10ms)
- Acceptable UX*
- **60 FPS** (16ms) — Azure Remote Rendering (60 FPS)
- **30 FPS** (50ms) — Undesirable UX*
- Local Rendering (10+ FPS)

2M   4M   6M   8M   **Polygons**

*Source: adapted from https://community.fologram.com/t/hololens-2-polygon-count-and-frame-rate/49; *FPS assumptions are based on asynchronous time warping.*

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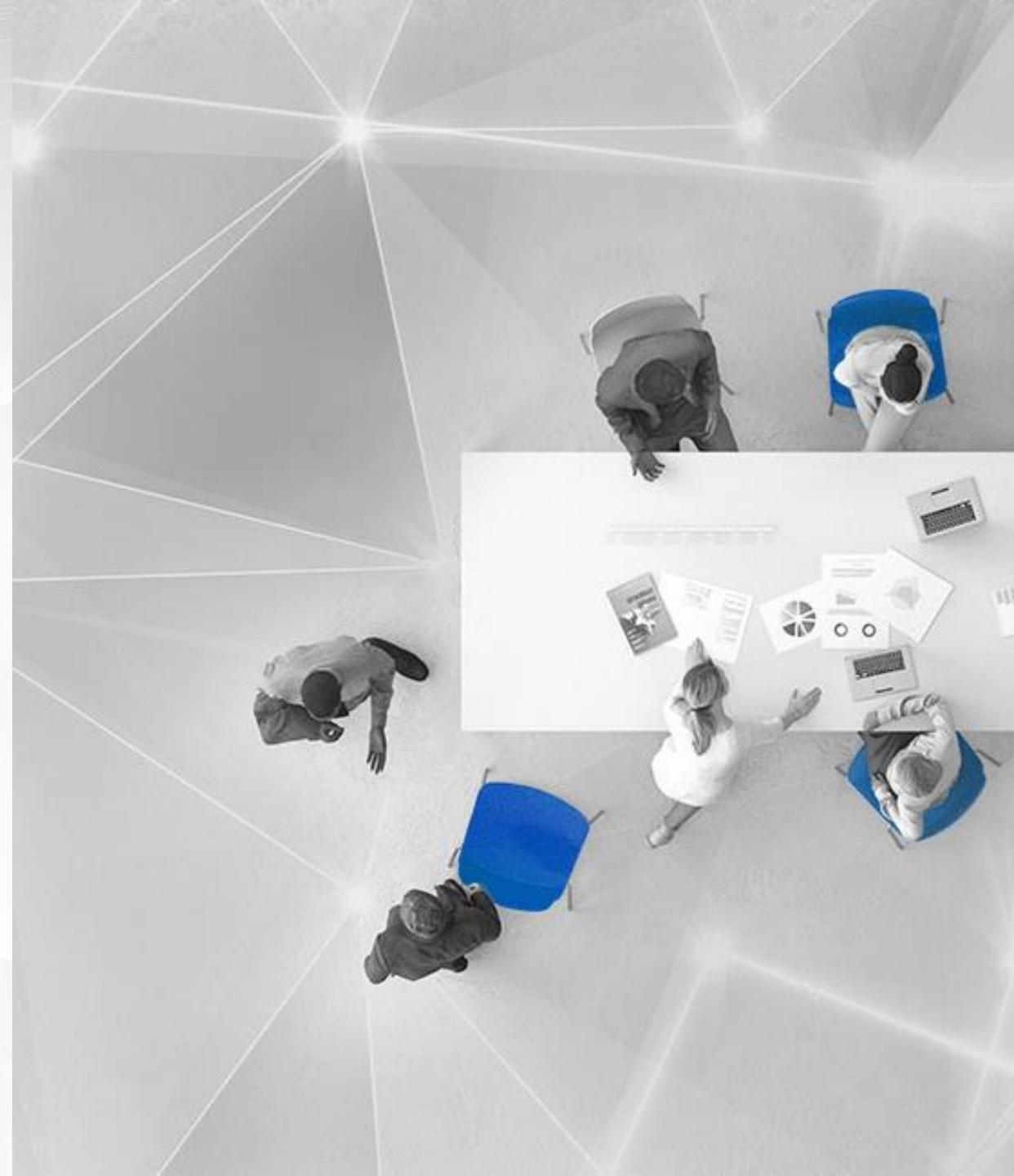
To monetize this potential TelCos need to master the interplay of 5G Network Slicing, Edge-Computing, Latency Management & their orchestration via APIs.
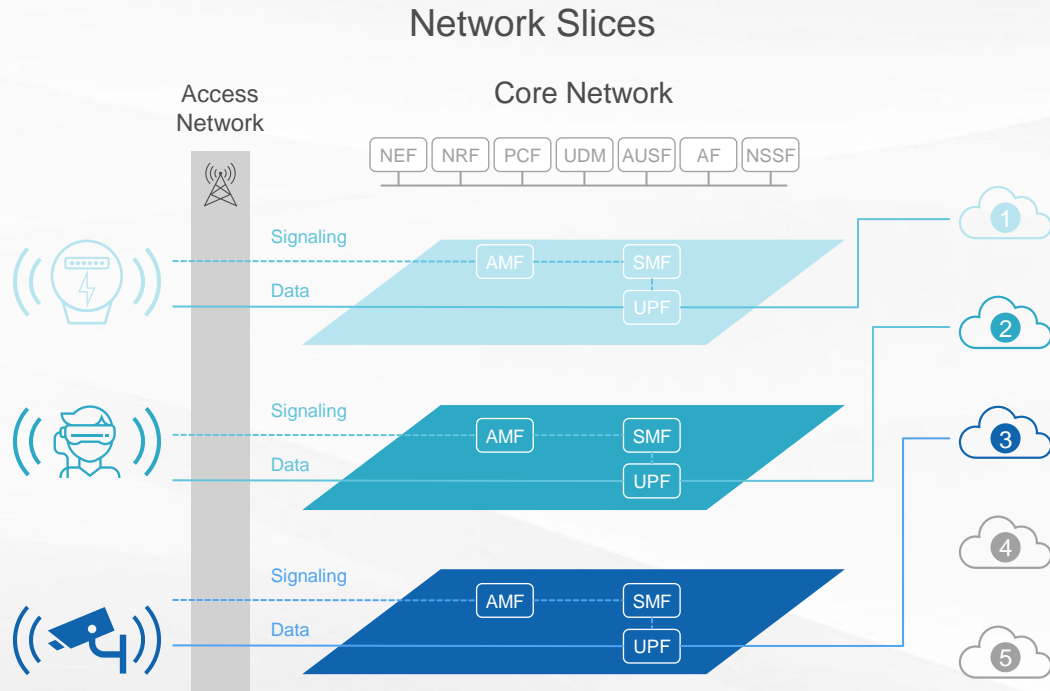
Latency Impact of Network Evolution
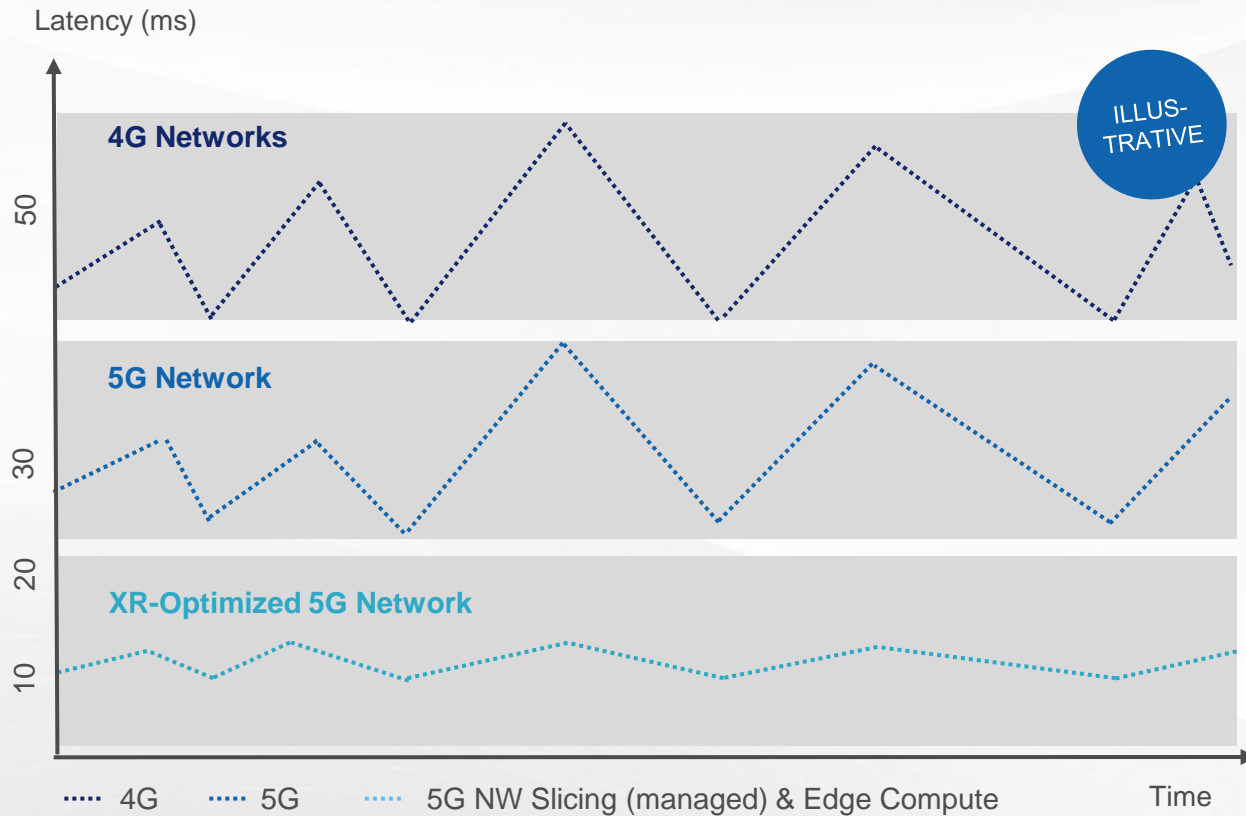
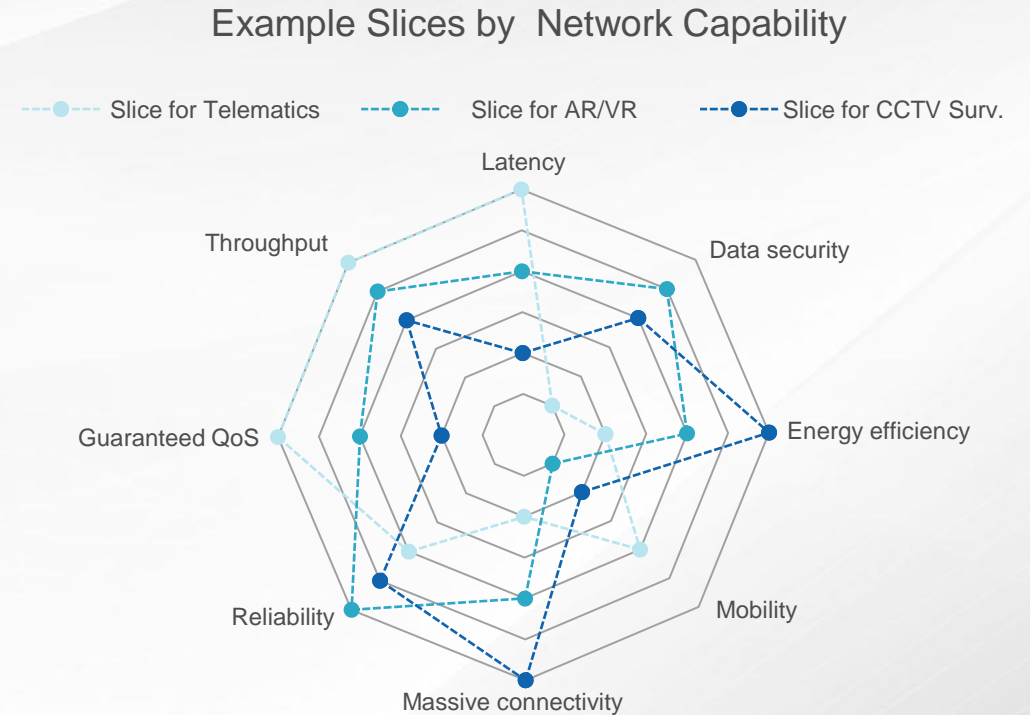## Key Technologies to enable Network Evolution

Latency (ms)

4G Networks

ILLUS-TRATIVE

5G Network

XR-Optimized 5G Network

50
30
20
10

Time

•••• 4G   •••• 5G   •••• 5G NW Slicing (managed) & Edge Compute

5G Evolution

XR Evolution

Network Slicing

Network Slicing

Edge Computing

Latency Management

Service & NW APIs
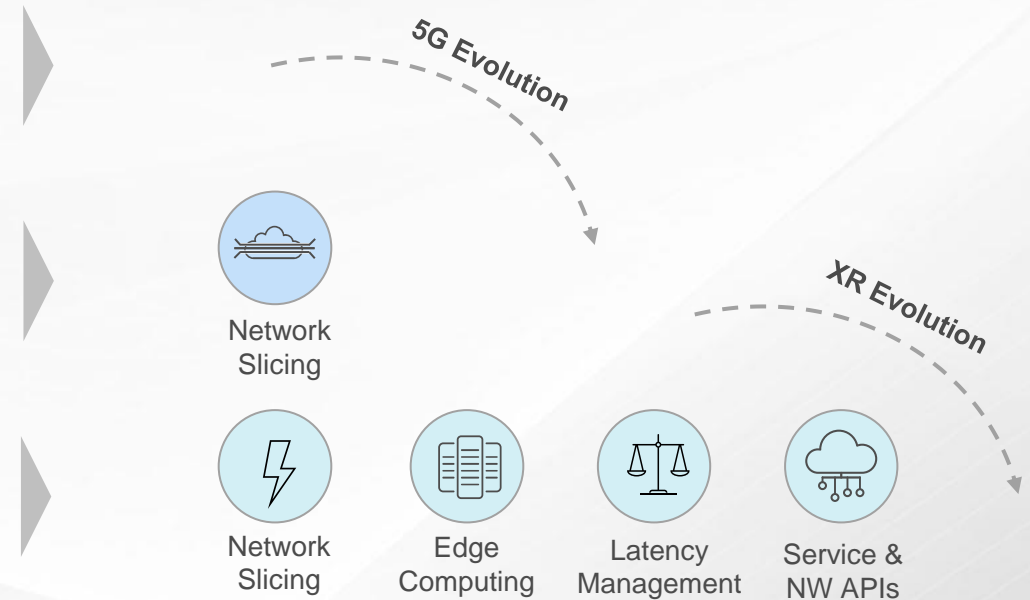
(A) Network Slicing enables TelCos to offer and monetize separate network capabilities per application group (e.g. XR).

Network Slicing Enables…

Network Slices

Access Network

Core Network

NEF | NRF | PCF | UDM | AUSF | AF | NSSF

Signaling
AMF | SMF
Data
UPF

Signaling
AMF | SMF
Data
UPF

Signaling
AMF | SMF
Data
UPF

1
2
3
4
5

… different Network Properties per Application Group

Example Slices by Network Capability

- - - Slice for Telematics   - - - Slice for AR/VR   - - - Slice for CCTV Surv.

Radar chart axes: Latency, Data security, Energy efficiency, Mobility, Massive connectivity, Reliability, Guaranteed QoS, Throughput

Detecon USP: Active engagement in the worlds-first 5G standalone E2E Network Slicing Trial.

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(B) Latency management enables a low & stable Latency by adapting the bandwidth of the focal application – thereby improving the UX considerably.

A stable, low Jitter by dynamically adapting the bandwidth
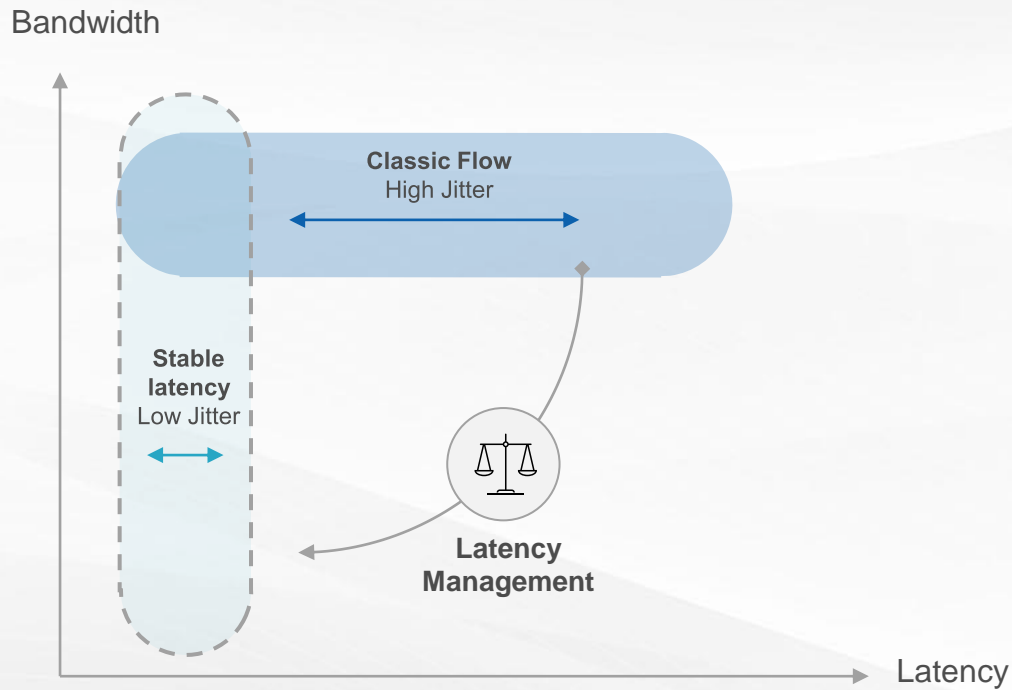
Technical Concept of managed latency

Classic flow control

Classic flow control looks at the end-to-end connection and handles the traffic control based on parameters derived from the over all flow.
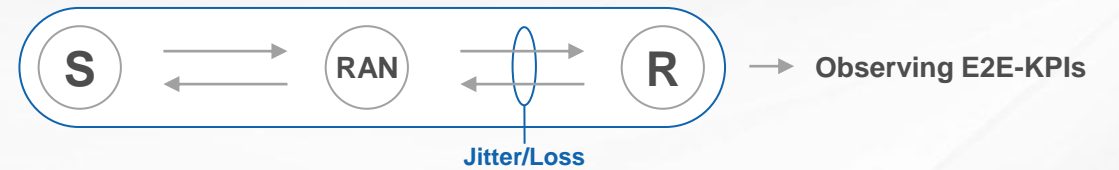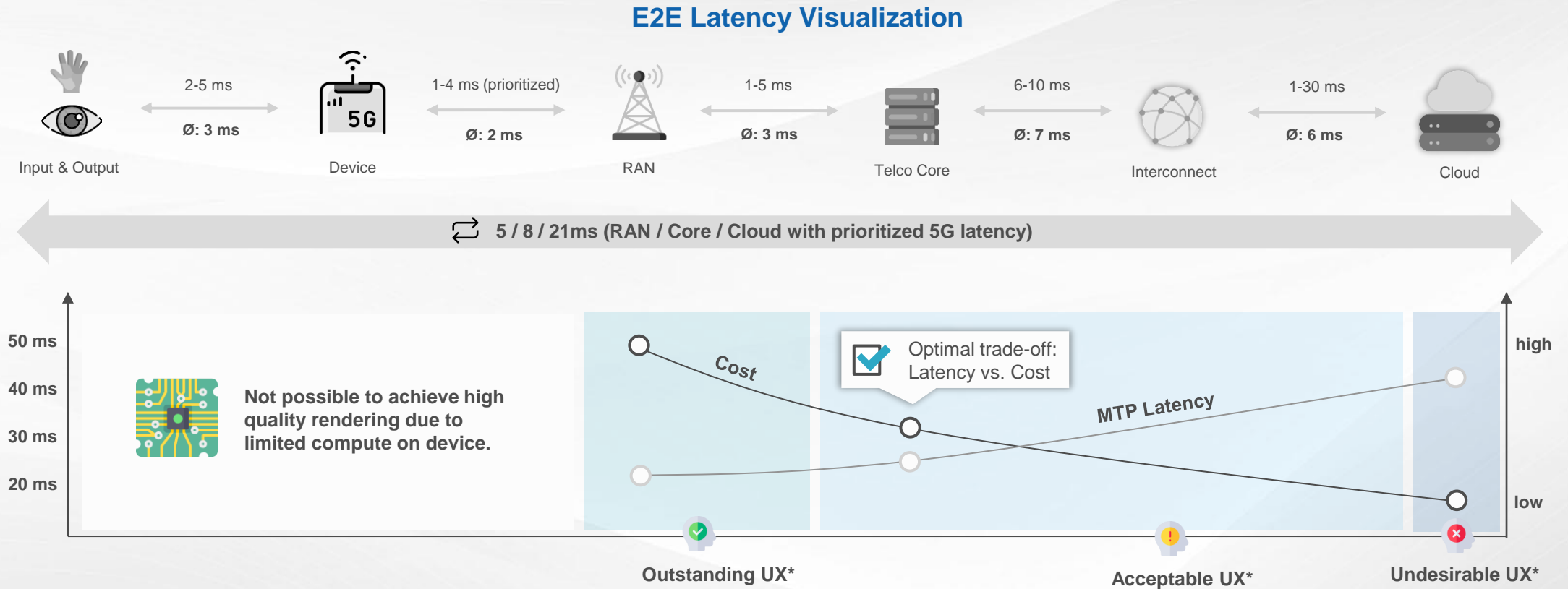

vs.

RAN aware flow control

RAN aware flow control uses feedback provided by the eNodeB to adjust the traffic according to the channel capacity, resulting in a stable latency.
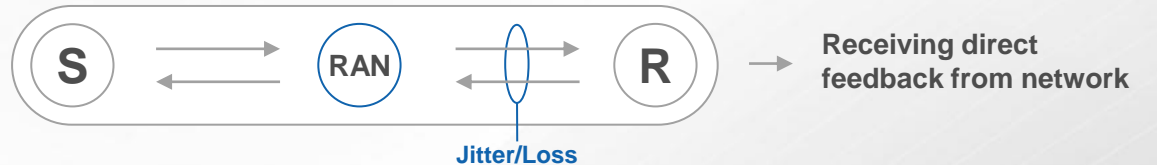
Detecon USP: Supporting the adaption of the standardization for low-latency signaling.

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(C) Rendering & Multi-User Sync on the TelCo Core creates an optimal trade-off between latency & costs - a strategic advantage only offered by TelCos.

E2E Latency Visualization

	2-5 ms		1-4 ms (prioritized)		1-5 ms		6-10 ms		1-30 ms	
	Ø: 3 ms		Ø: 2 ms		Ø: 3 ms		Ø: 7 ms		Ø: 6 ms	
Input & Output		Device		RAN		Telco Core		Interconnect		Cloud

⇄ **5 / 8 / 21ms (RAN / Core / Cloud with prioritized 5G latency)**

- 50 ms
- 40 ms
- 30 ms
- 20 ms

Not possible to achieve high quality rendering due to limited compute on device.

Cost

☑ Optimal trade-off: Latency vs. Cost

MTP Latency

- high
- low

Outstanding UX* **Acceptable UX*** **Undesirable UX***

Detecon USP: Deep Expertise in Edge Computing, especially based on MobiledgeX establishment & architecture development.

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(D) Future XR services need to utilize specific network capabilities via a refined set of APIs managed and aligned by the relevant players in the value chain.

1 Capabilities
Exposable via Network APIs, e.g. slicing, positioning, managed QoS, IDM etc.

2 Exposure
Abstraction to Service APIs, incl. access control, billing, cross-operator federation etc.

3 Technical Aggregation (optional)
Enrichment to Service API, e.g. hyperscalers, MEX etc.

Consumption
E.g. app & device developers, enterprises, end-users
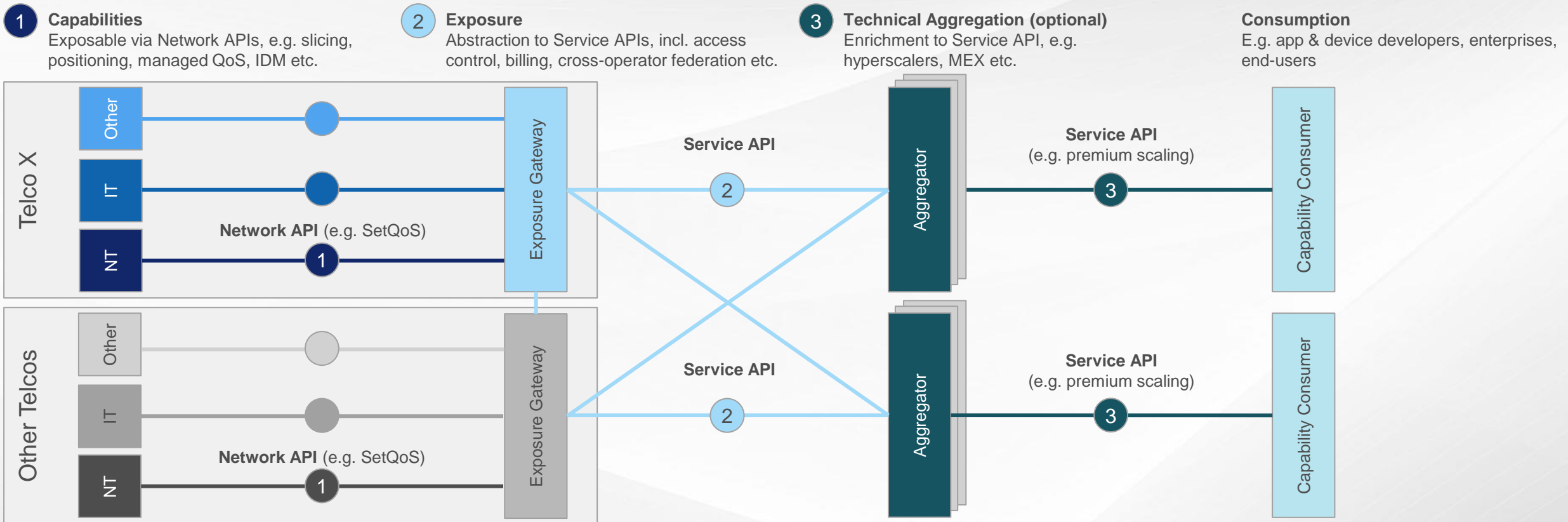
Detecon USP: Deep involvement in the developer ecosystem as well as the GSMA NEF API standardization.

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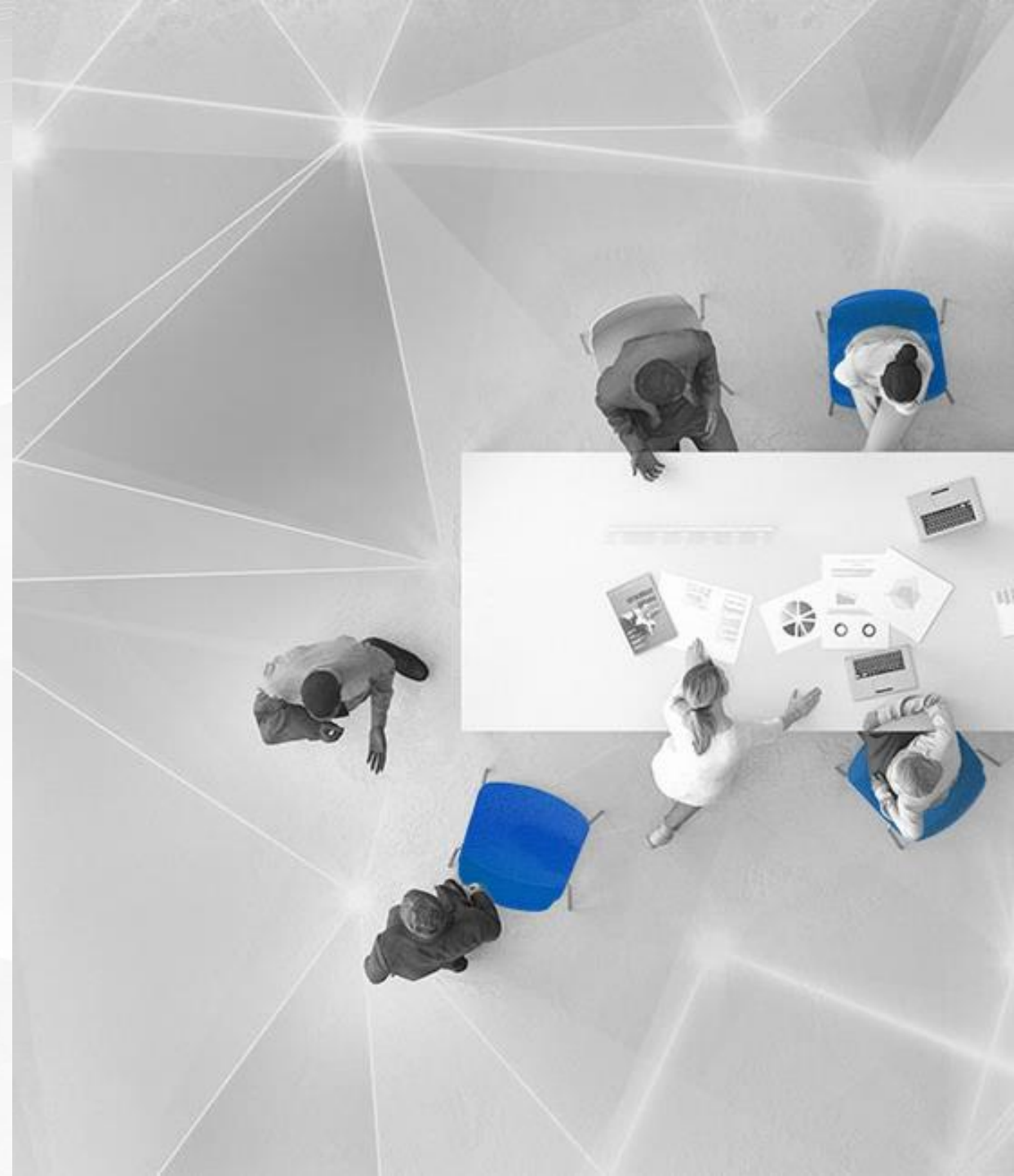
CSPs network play will gain overall relevance within the XR, but hyperscalers and game engines will dominate the high margin Ecosystem Enablement.

The XR Value Chain

- Apps
- Ecosystem
- HW & Infra

Apps & Experiences

Search & Ads

Creator Enablement

Spatial Computing

Human Interface

Networking

Infra-structure

Example Elements
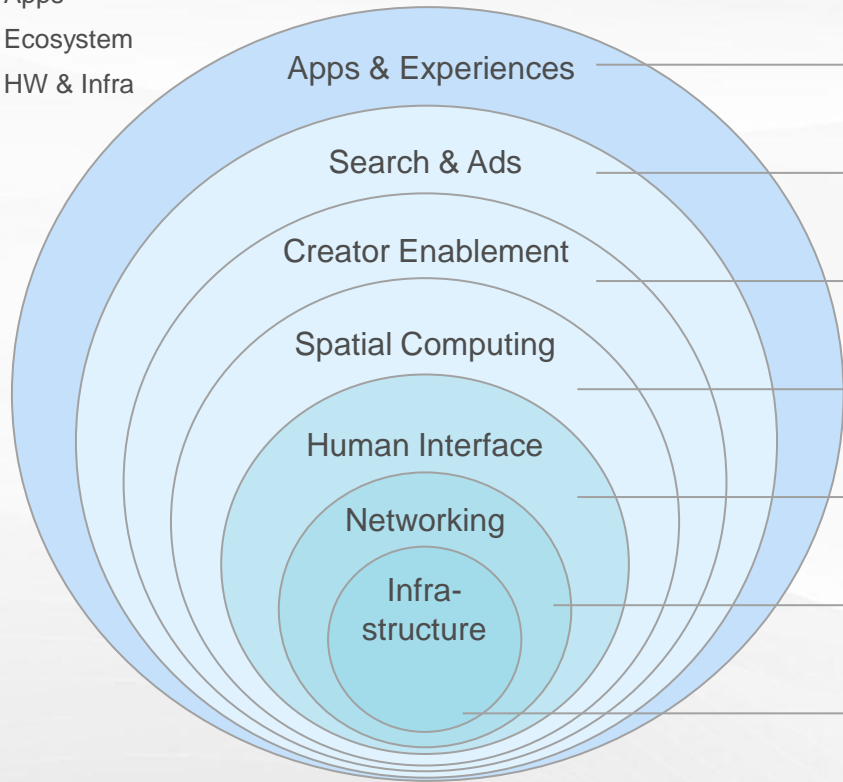
The XR Value Chain	Example Elements
Apps & Experiences	Games, Social, Travelling, Shopping, Remote-Assistance etc.
Search & Ads	Ad-Networks, Ratings, App-Stores, Search IDM, Payment, etc.
Creator Enablement	Design Tools, 3D Asset Markets, Workflow, 3D Engines etc.
Spatial Computing	Geospatial Mapping, Object recogn., Localization, Point Clouds, etc.
Human Interface	Cell Phones, Smart Glasses, Wearables, etc.
Networking	App-specific network provisioning, latency management, etc.
Infrastructure	Cloud/Edge-based CPU/GPUs, Datacenter management, etc.

Dominant Players

Profit Margin

Source: Adapted from https://medium.com/building-the-metaverse/the-metaverse-value-chain-afcf9e09e3a7

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Additionally, there are further valuable business opportunities beyond the traditional role of TelCos.

(Multi) Edge Cloud Orchestration & Edge Co-Location

XR requires Edge compute for rendering, SLAM & multi-user sync within the TelCo network to allow for an optimal UX. Deciding upon a Strategy (Build, Buy, Partner; Single / Multi-Edge Cloud Strategy e.g. via AWS, MobiledgeX, etc.) is crucial.

Secure Cloud Anchor Storage on Routers

Working with router providers sets TelCos to be in prime position to offer a private edge closest to the user. Using the infrastructure that is part of service delivery already allows to store cloud anchors of the user's homes or apartments securely 'on device'.

Monetize new TelCo Services

If Telcos position themselves in the right way, the technological developments offer the opportunity to monetize new TelCo services adapted to the Metaverse such as Holographic Calls or Remote Collaboration for example.

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Hence developing a sound Partnering & Technology Strategy is key for TelCos in order to take a central role in the future ecosystem of XR Applications.
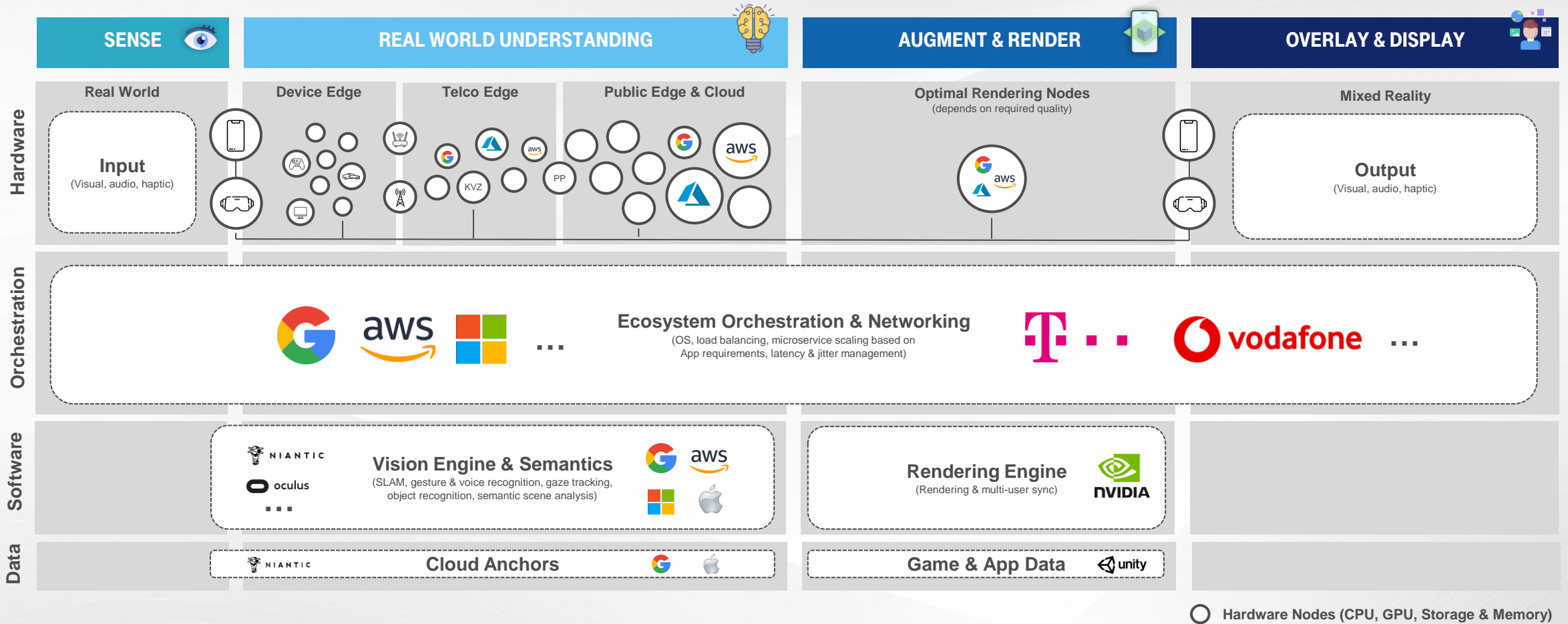
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Cloud Gaming at home: Hundreds of games instantly at your fingertips – without expensive gaming hardware or any downloads.

Cloud Gaming on **TV or PC**
via **Brodband** and **Edge**

XR Ecosystem

Evaluation:

Wow-factor: ★ ★ ★
5G relevancy: ★ ★ ★
User relevancy: ★ ★ ★ ★
Revenue size: ★ ★ ★ ★

Telco Play:

High Bandwidth broadband connection together with Telco Edge enables graphic and performance on par with high end gaming hardware.

B2C   Gaming   Market-ready

Customer Proposition:

- No expensive gaming hardware required
- Directly installed on your Smart TV or tablet
- Game content included in your subscription

Stream

Command

Video Encoding
Game Rendering
Game Logic
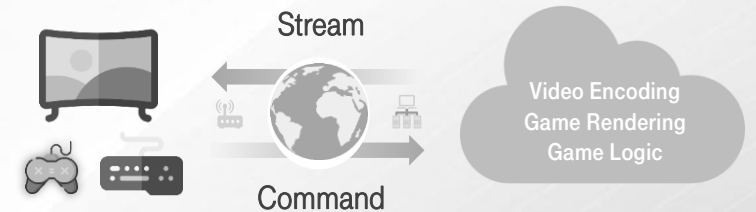
Mobile Cloud Gaming: Play high-end console and PC games everywhere simply from the cloud. All you need is your XR glasses and a controller.

Cloud Gaming on **MR Glasses**
via **5G** and **Edge**

XR Ecosystem

👤 B2C   🎮 Gaming   🔵 Mature PoC

Customer Proposition:

- Play high-end games everywhere simply
- Enjoy best graphics via cloud rendering
- All you need is a controller and the Nreal XR Glasses

Evaluation:

Wow-factor:	★★★★
5G relevancy:	★★★★
User relevancy:	★★★
Revenue size:	★★★★

Telco Play:

Low/managed latency 5G connection together with Telco Edge enables graphic and performance on par with high end gaming hardware on the go (e.g. in car-entertainment).

Stream

Command

Video Encoding
Game Rendering
Game Logic

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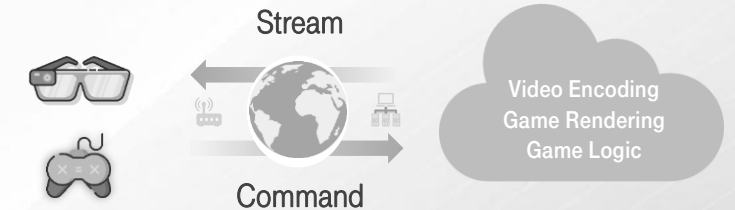
Immersive Media: Watch your favourite videos, movies and social media posts in HD quality on the go via a virtual 80" screen in your field of view.

Immersive Media on MR Glasses
via 5G and Edge

XR Ecosystem

Captured in real time through nreal light

👤 B2C   📷 Media   🔵 Market-ready

Customer Proposition:

- Videos/movies on the go via a virtual 80" HD screen
- High quality social media in your field of view
- Experience immersive content (concerts) via glasses

Evaluation:

Wow-factor: ⭐⭐⭐

5G relevancy: ⭐⭐

User relevancy: ⭐⭐⭐⭐⭐

Revenue size: ⭐⭐⭐

Telco Play:

5G/4G tariff enables mobile HD streams of media content (e.g. in car entertainment) in combination with high volume data package.

Stream

Command

Video streaming & media content

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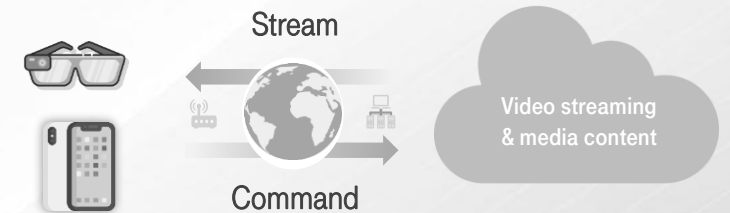
3D Gaming on MR Glasses: Experience 3D games that merge with the real world – e.g. shoot monsters in your backyard.

3D Gaming on **MR Glasses**
via **5G** and **Edge**

XR Ecosystem

B2C · Gaming · Mature PoC

Customer Proposition:

- New 3D gaming experiences via MR Glasses
- Use phone as controller to e.g. shoot monsters, etc.
- Multi-player – e.g. play with friends in park or garden

Evaluation:

Wow-factor: ★ ★ ★ ★ ★
5G relevancy: ★ ★ ★ ★ ★
User relevancy: ★ ★ ★
Revenue size: ★ ★ ★ ★ ★

Telco Play:

5G low/managed latency connection enables multi-player synchronization below critical UX threshold. Cloud rendering on Telco Edge can further enhance experience.

Stream

Command

Video Encoding
Game Rendering
Game Logic

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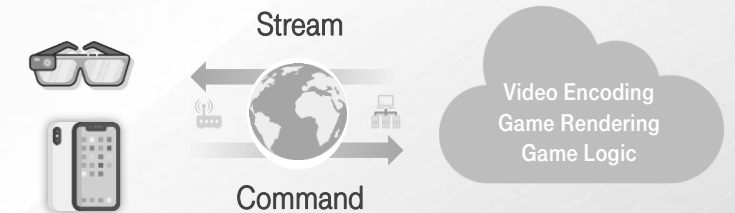
Collaboration on MR Glasses: A new depth of collaboration for creative vocations such as architecture, engineering and design thinking.

Training on **MR Glasses**
via **Broadband** and **Edge**

XR Ecosystem

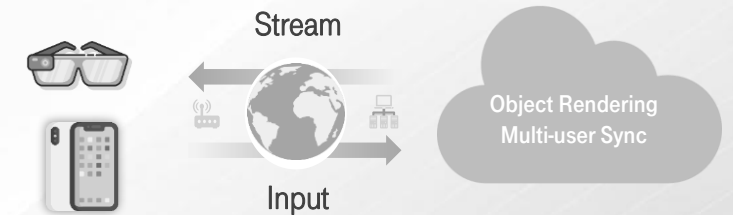B2B   Collab.   Mature PoC

Customer Proposition:
- Design thinking & collaboration around 3D objects
- Better interaction regarding creative tasks
- Have a virtual meeting room (post-its, etc.)

Evaluation:

Wow-factor: ★ ★ ★ ★
5G relevancy: ★ ★ ★
User relevancy: ★ ★ ★
Revenue size: ★ ★ ★

Telco Play:
High Bandwidth broadband connection enables new forms of remote collaboration. Cloud rendering from Telco Edge can enhance graphic quality considerably.

Stream

Input

Object Rendering
Multi-user Sync

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Remote Maintenance on Phones and MR Glasses: Increase workforce productivity by sharing expert insights with staff in the field.

Collabroation on **Phones & MR Glasses**
via **Broadband, Mobile** and **Edge**

XR Ecosystem
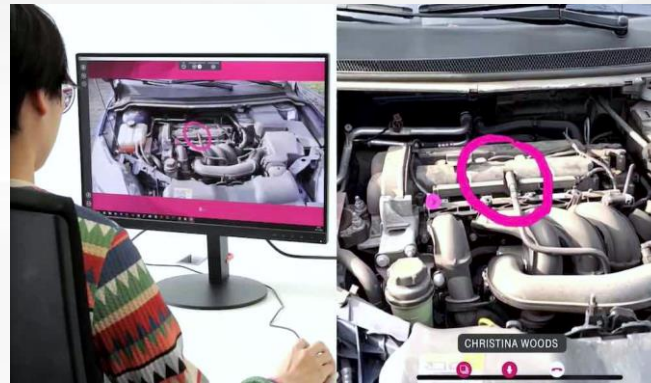

B2B Collab. Mature PoC

Customer Proposition:

- Remote support of field workers via Phones & MR glasses*
- Experts share knowledge via „see-what-I-can see" mode
- Increase workforce efficiency and customer satisfaction

Evaluation:

Wow-factor:	★ ★ ★ ★
5G relevancy:	★
User relevancy:	★ ★ ★ ★ ★
Revenue size:	★ ★ ★ ★

Telco Play:

Quality of connection will increase user experience. 5G network slicing may be relevant in remote locations to enable service in the first place.

Stream

Input

Field worker   Expert
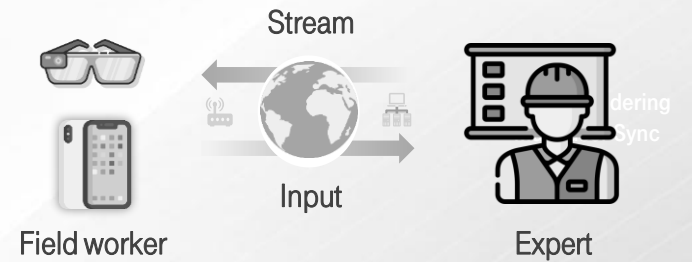
*MR glasses will be supported in the future (Q3/Q4 2020)

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Training in VR: Simulate new tasks and let employees learn quickly and cost-efficiently in a low risk, virtual environment.

Training on **VR Glasses**
via **Broadband** and **Edge**

XR Ecosystem

👤 B2B   🎓 Training   🔵 Market-ready

Customer Proposition:

- Simulate new tasks in a low risk, virtual environment
- Let employees learn quickly and cost-efficiently
- Experience a unique level of graphical detail

Evaluation:

Wow-factor: ★ ★ ★
5G relevancy: ★ ★ ★
User relevancy: ★ ★ ★ ★
Revenue size: ★ ★ ★ ★

Telco Play:

High bandwidth broadband / 5G together with Telco Edge enables Cloud streaming of HD content. Potential synergy with 5G campus networks.
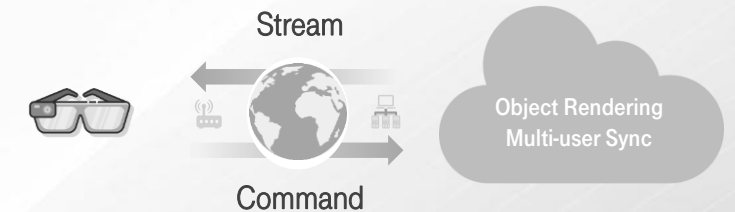
Stream

Command

Object Rendering
Multi-user Sync

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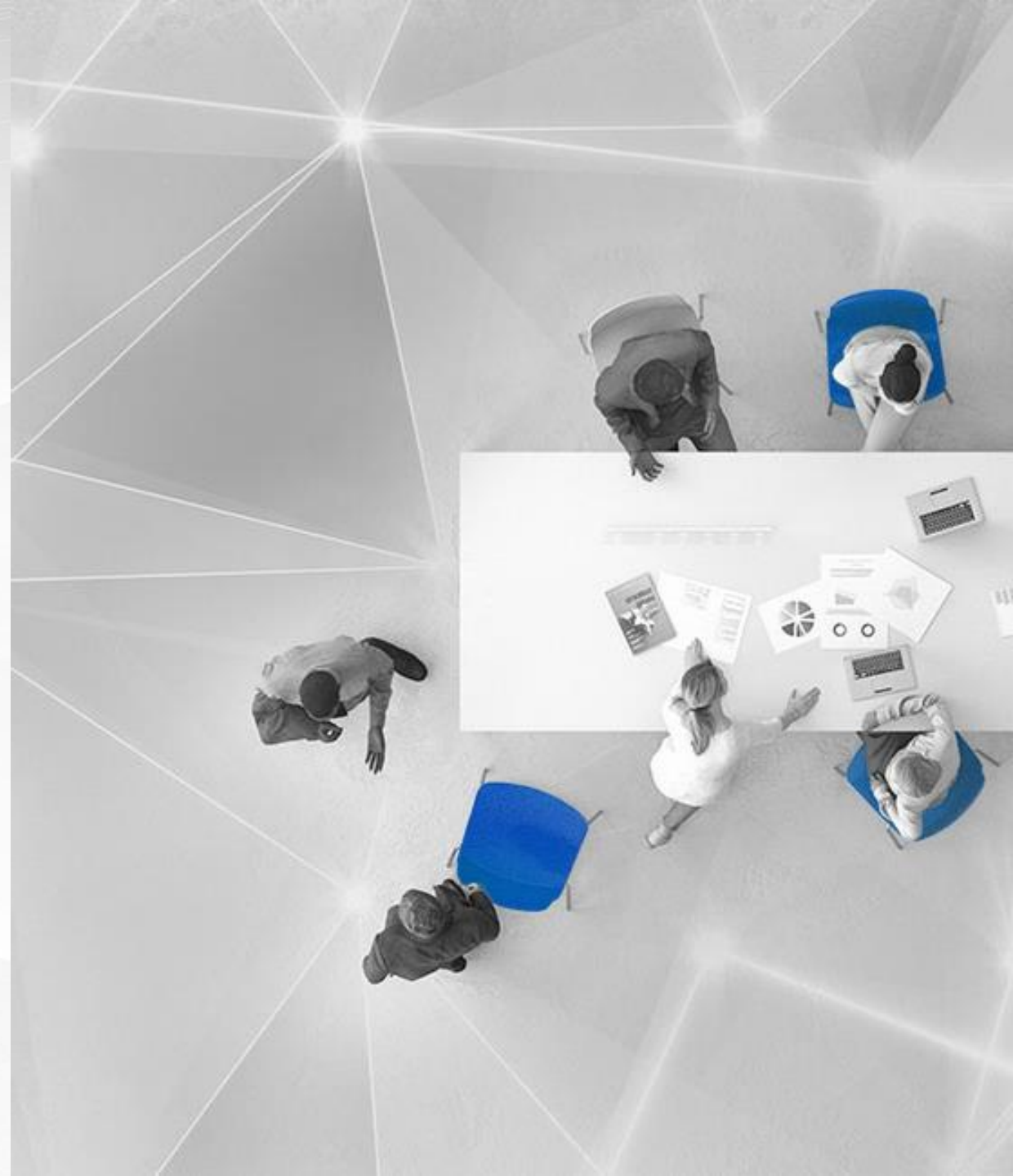# Detecon offers you the most sophisticated expertise in the industry based on insights from the world's leading players within the XR Ecosystem.

XR Devices & Use Cases

- Expertise in creating B2B and B2C experiences with the leading device manufacturers (Nreal, Hololense, Oculus, etc.).
- Supporting the development and market launch of multiple use cases / device bundles both within the B2C and B2B sector.

Edge Computing & 5G Networking

- Supporting the establishment of MobiledgeX (Cloud, Edge & 5G architecture approach, business model, etc.)
- Accompanying the development of state-of-the-art 5G network capabilities like adapted latency management & network slicing.
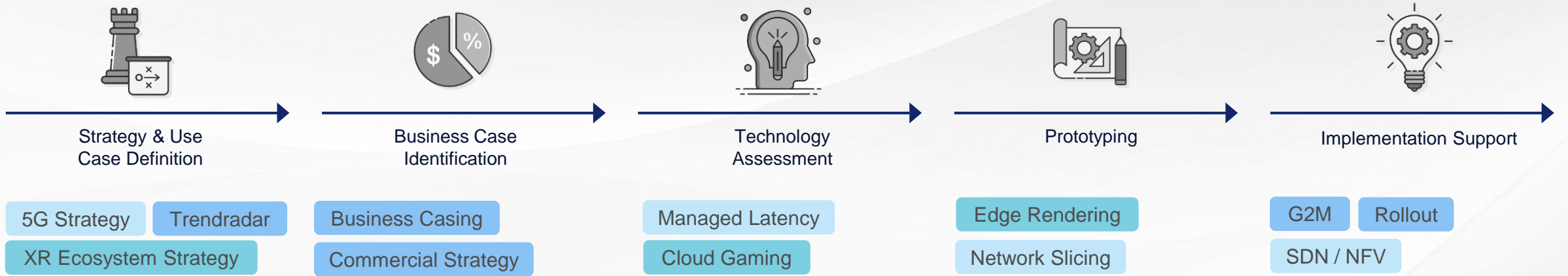

Ecosystem Building

- Guiding the acceleration of and subsequent collaboration with various XR Start-ups (e.g. through Hackathons).
- Helping to define the API architecture of future networking capabilities in close collaboration with the GSMA.

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XR is happening now. We can help you to find your approach – from strategy to execution by building on our vast service portfolio in XR & 5G.

Strategy & Use Case Definition	Business Case Identification	Technology Assessment	Prototyping	Implementation Support

Strategy & Use Case Definition
- 5G Strategy
- Trendradar
- XR Ecosystem Strategy

Business Case Identification
- Business Casing
- Commercial Strategy

Technology Assessment
- Managed Latency
- Cloud Gaming

Prototyping
- Edge Rendering
- Network Slicing

Implementation Support
- G2M
- Rollout
- SDN / NFV

XR Devices & Use Cases

- Device Benchmarking
- Use Case Evaluation
- Commercial Strategy
- Trendradar
- Rollout
- Business Casing
- User Trials
- Prototyping
- Agile Development
- G2M
- …

Edge Computing & 5G Networking

- 5G Readiness Check
- Open RAN
- 5G Strategy
- Managed Latency
- Network Slicing
- SDN / NFV
- Edge Strategy
- 5G Campus
- Fixed Access
- Edge Management
- Network Planning
- …

Ecosystem Building

- XR Ecosystem Strategy
- CPU Vision
- Edge Rendering
- Multi-User Sync
- XR Cloud
- Persistent Mapping
- Cloud Gaming
- …

DETECON
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Our team consists of experts from diverse domains, allowing us to approach the XR Ecosystem holistically and to create maximum value for your company.

Nicolas Stichel

- Lead of Detecon's XR Tribe
- Expert for Technology Strategy
- Proven track record in developing disruptive tech products in the fields of XR, IoT or Blockchain
- Deep understanding of the emerging Metaverse

Konstantin Ritschel

- Expert for latency management in 5G networks
- Integration of real-time capabilities in applications (focus AR/VR)
- Profound international project experience in the Telco industry

Tim Haunz

- Extensive experience in developing and implementing XR use cases
- Expert for network technology and campus networks
- Specialist for partnerships with start-ups

Matthias Klos

- Profound knowledge of artificial intelligence and computer vision
- Experience in virtual engineering, manufacturing and Industry 4.0
- Advocate for user-centered innovation and design

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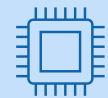
Thank you.

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