Telefónica
desde 1924

12:00 - 12:45

Holographic meetings for the people: The next gen solution powered by Telefónica's 5G and Edge network and Matsuko

Maria Vircikova - CEO of Matsuko
Alex Harmand - Core and Platforms Technologies Manager, Telefónica Global CTIO
David Moro - Head of Service Platforms, Telefónica Global CTIO

MWC2024
100 Years
Leading Change

Telefónica
since 1924

Democratization of Holographic Meetings

Experience Real Presence

MWC 2024

Welcome!

Alex Harmand

Global CTIO, Core and Platforms Technologies Manager, Telefónica

David Moro

Global CTIO, head of Service platforms, Telefónica

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Comms evolution

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We have been evolving our voice to VoIP and need to go beyond

Evolution post-IMS and RCS introduction (2010s) lacked significant innovatio

focus on convergence & cost reduction

And now:

- **API**fication and **cloud**-native
- The emergence of **XR**

.. Telefonica is actively shaping its network roadmap to anticipate demands of tomorrow's consumers.

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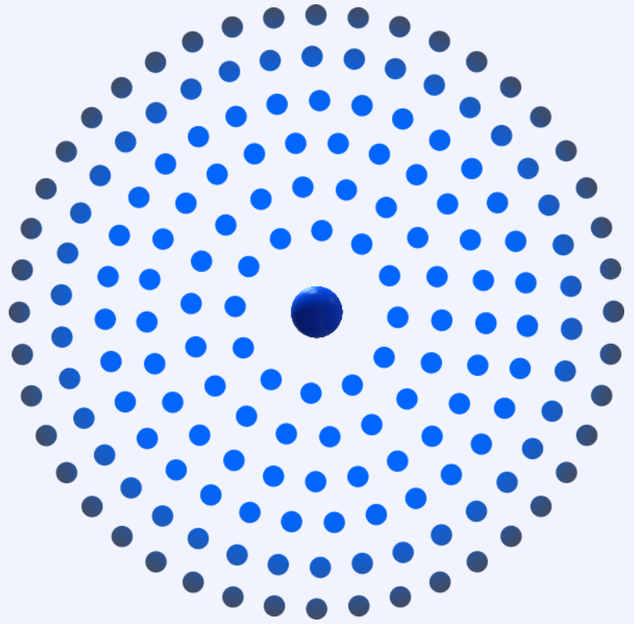
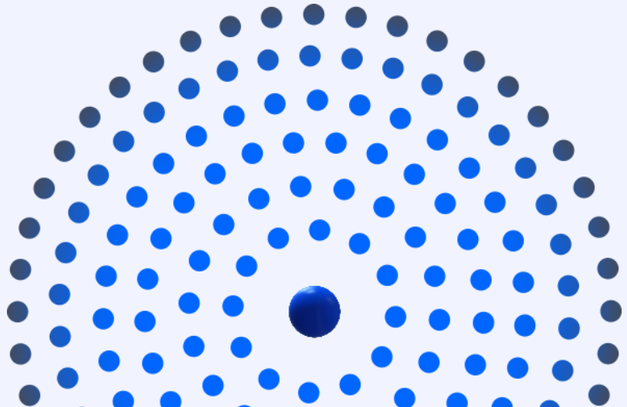
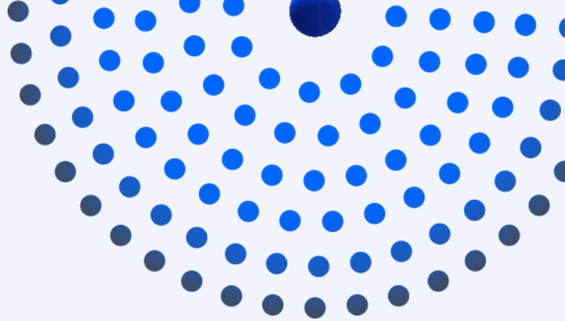
Lessons learnt with VoLTE







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VoLTE adoption has been a complex journey

Handset Enablement: Initial hurdle, requiring significant tech advancements.

Industry Approach: Initially cautious, focusing on legacy service **continuity**.

Current Status: Telefonica and peers nearing completion with up to **80%** average penetration.

Missed Opportunities: Emphasis on **traditional** services, overlooking VoLTE's full potential.

Example: **ViLTE** (video calls over LTE) remains untapped

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We have captured key takeaways through this transformation

- Shift from Person to Person to **A2P** B2B2X:

  OTT platforms dominate P2P

- Easing Access to **Channels**… leveraging API exposure.

- Diverse Ecosystem of **Devices**…. **APIfication** essential for coverage.

- Clear Differential Needed:

  …. **holographic comms** + optimal network capabilities

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VoNR?

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Our technology strategy

1 Voice APIfication

2 New Calling

3 Evolution to XR and holographics

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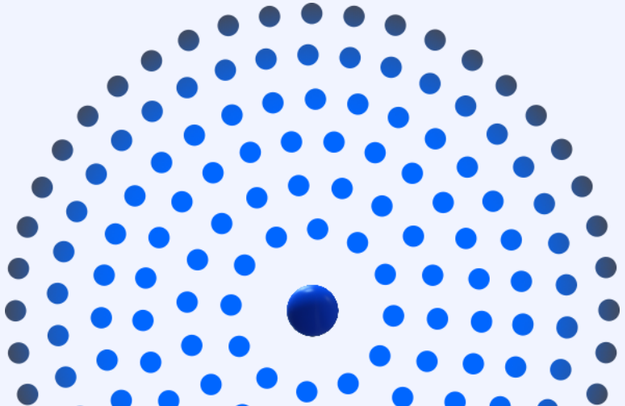
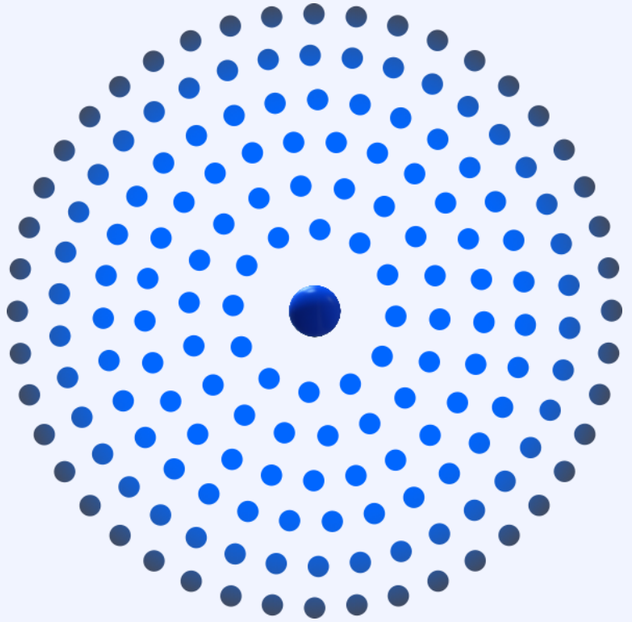
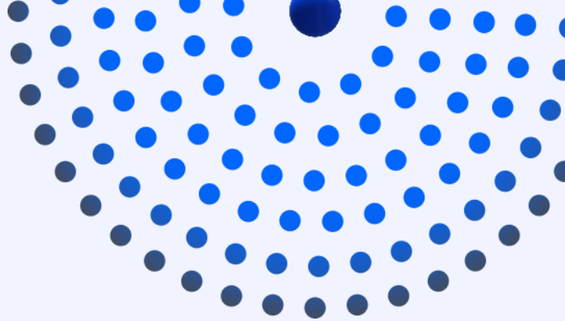
1. APIfication of Voice







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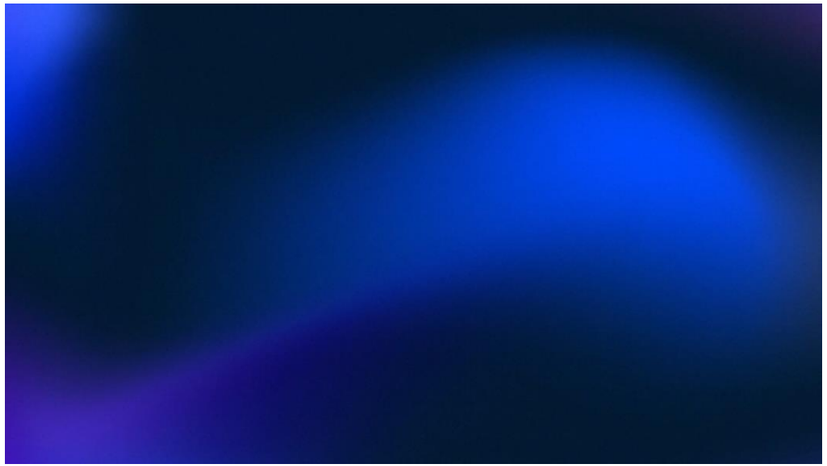
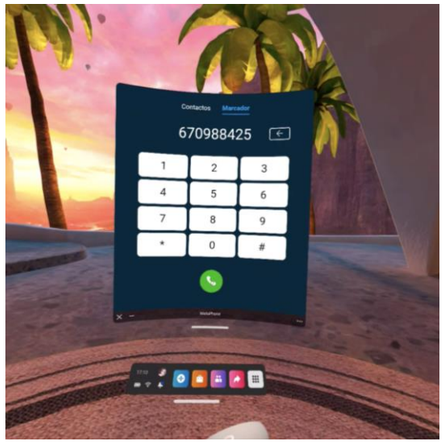
Voice APIs

- APIfication drives innovation and customer value.
- Technologies: WebRTC, IMS core exposure
- WebRTC extends comms to any device
- Branded Calls & Call Protect
- Voice Calls in XR experiences





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2. New Calling

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An interactive call experience with visual information in the dialer

Use cases:

replacing DTMF menus by clickable menus,…

…real-time translation, and

…..video announcements during voice calls.

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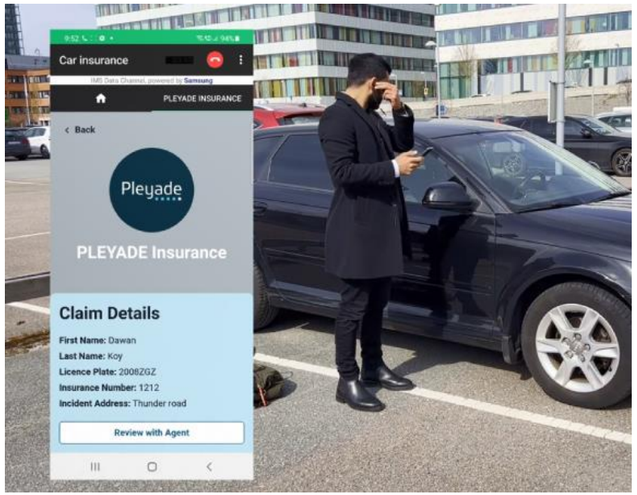
New Calling: Phased approach

Phase 1: Leveraging ViLTE: add visual information to the voice call

Phase 2: IMS Data Channel (IMS DC):



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3. Evolution to XR

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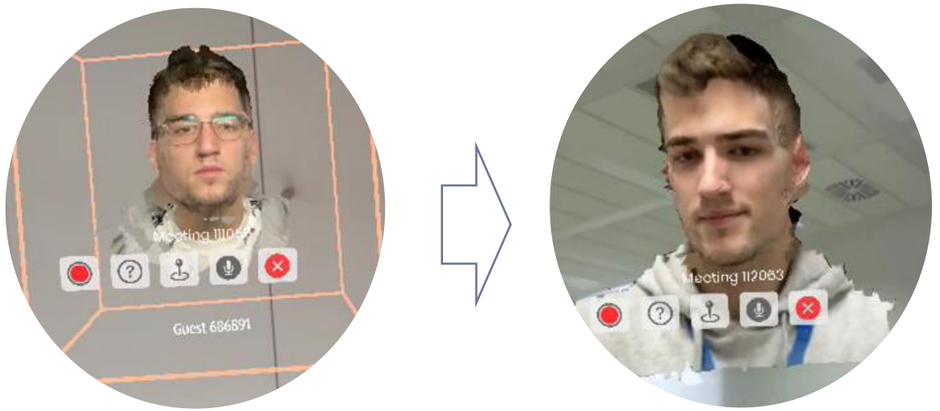
XR: technology shift and new experiences

- The XR Opportunity
- Quality Milestone in holographics
- Common control layer
- Initial demonstrations between Vodafone, DT, Orange, and TEF suceeded.



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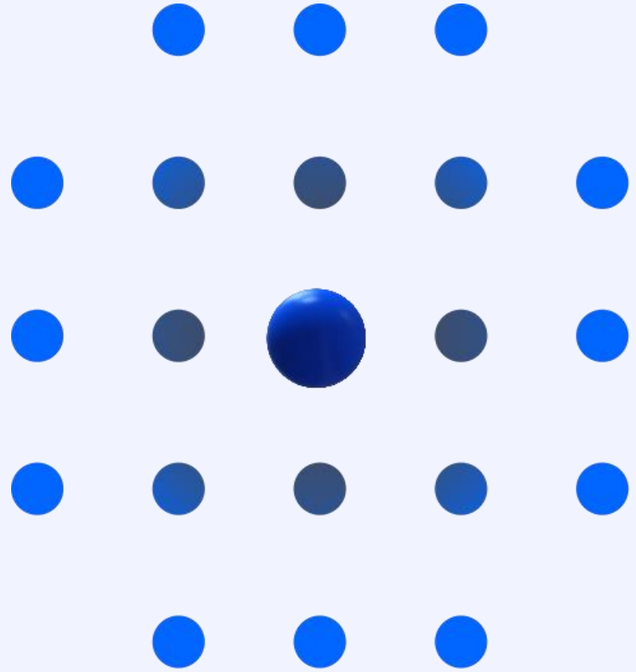
We are true believers in comms



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Leading the industry

Comms APIs

Bring Your Own Number (webRTC) API 1.0

New Calling and IMS Data Channel

Fostering adoption

European Reserch

Innovation on control layer

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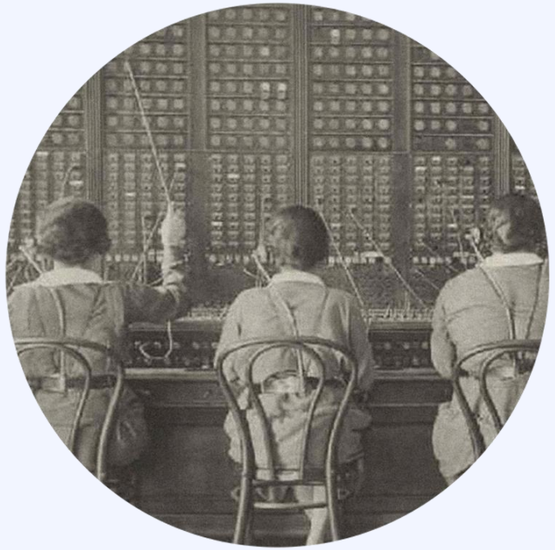
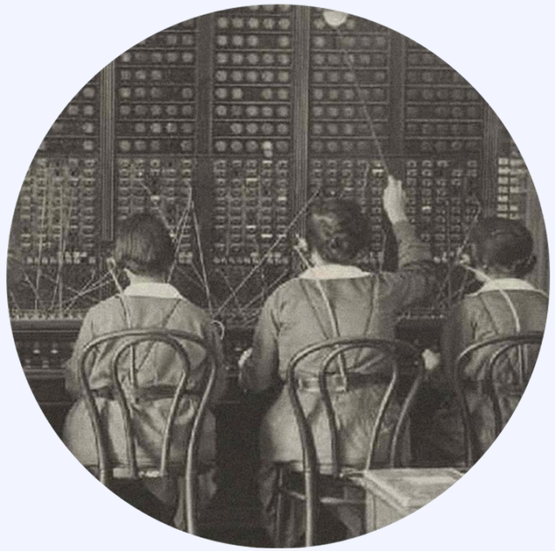
We want to make our world more human by connecting lives.





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Let’s invite our guests.

Maria Vircikova,
CEO and co-Founder
at MATSUKO

MATSUKO

Chris Penrose,
Global Head of Business Development – Telco
at NVIDIA

NVIDIA

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Holograms make the connection human when we are remote.

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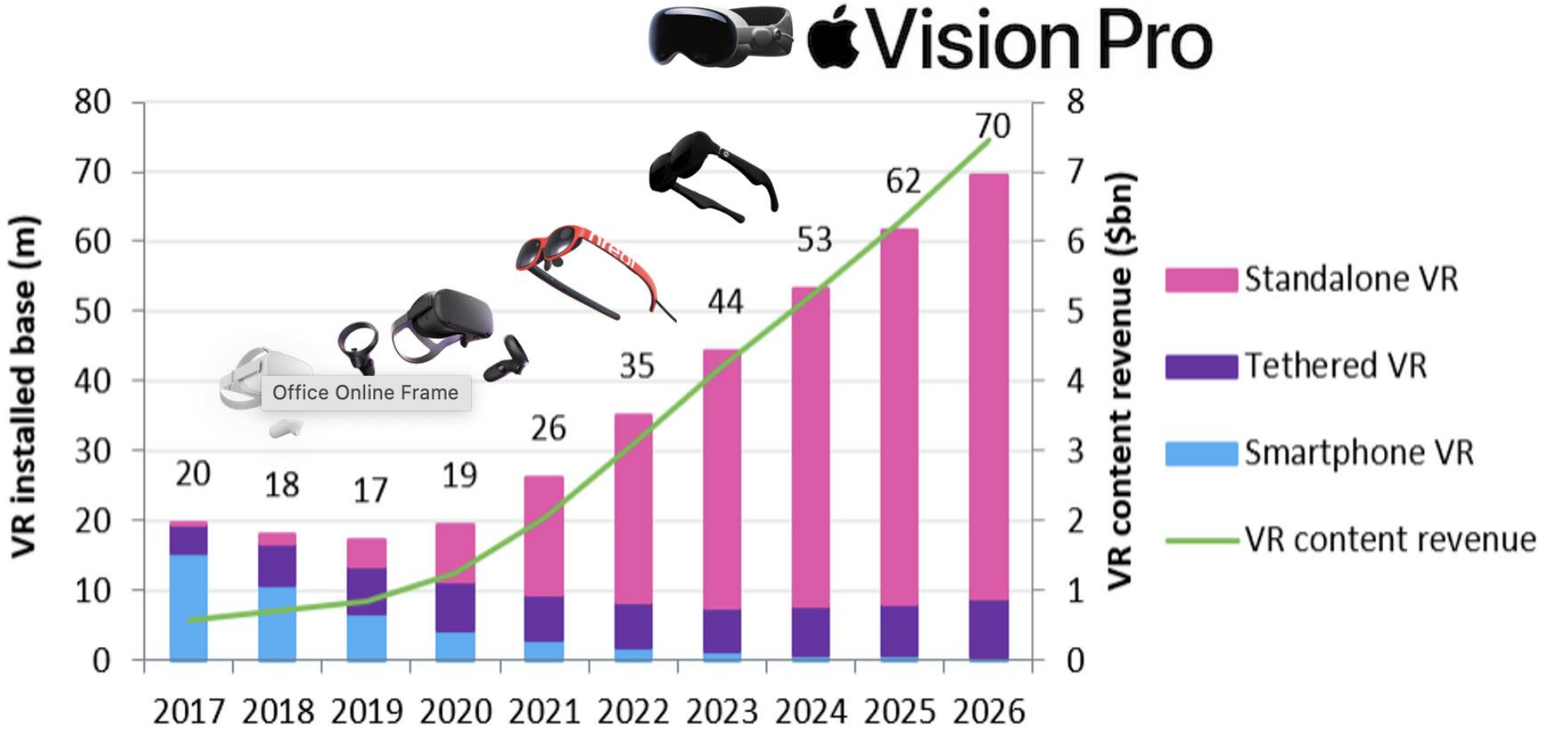
Personal-> mobile-> spatial computer

- Spatial computer: new mobile device.
- A similar inflection point as smartphones in 2007.
- XR install base is about to reach critical mass.
- This is the era of spatial computing.

3D Telepresence is a trillion-dollar market opportunity



Source: Omdia's Consumer VR Headset and Content Revenue Forecast

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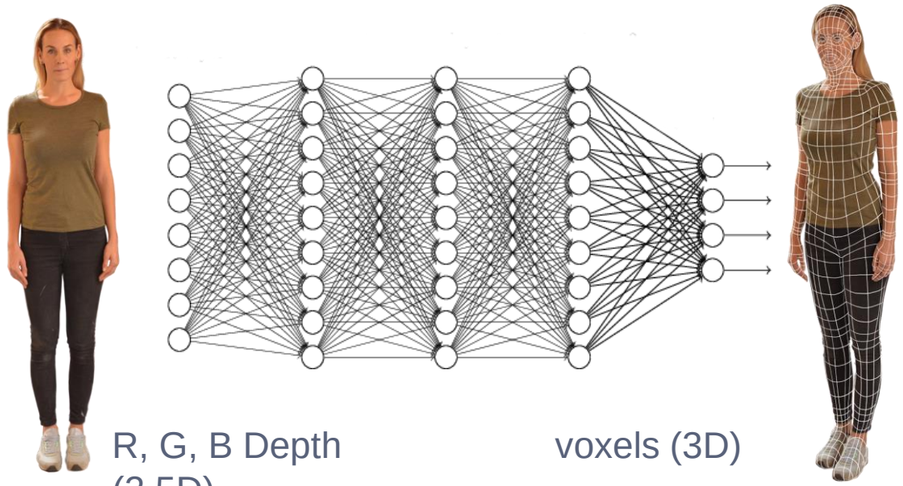
This is the era of spatial computing & AI

- AI applied in 3D.
- The synergy of these technologies holds the potential to redefine user experiences across industries.



R, G, B Depth (2.5D)

voxels (3D)

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The closest experience to real meetings.

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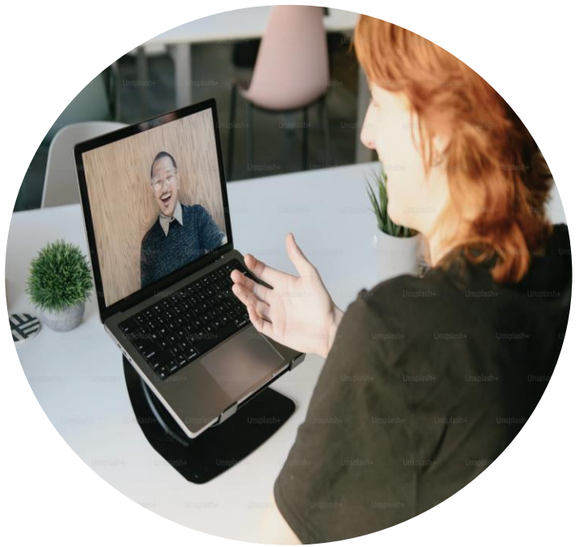
Lack of physical presence in the workplace

There was no solution for realistic spatial meetings.

- Lower engagement of the employees.
- Isolation of remote staff.
- Faster burn-out.
- Disconnection of remotely working employees.

2D video calls



Avatars – 3D but not real

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The Essence of Communication is our Presence

Let's jump into a spatial meeting

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MATSUKO

Today, in 2024, we democratize holographic meetings.

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3D Telepresence Democratization

Hologram are native to spatial computing

- Realistic 3D Telepresence until now only in capture studios.
- Full body & great quality but complicated setup
- Our solution is the world's only real-time **mobile solution for spatial realistic pre sence**.

Capture Studios

Realtime and Real Presence

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Complex technology as a simple mobile app

Hardware Agnostic Technology

- **Capture** Devices (Sender): iPhone 12 or higher, Android cameras
- **Rendering** Devices (Receiver/Viewer): Apple Vision Pro, Meta Quest, Lenovo A3
- **Network** Configurations: 4G, 5G, Wi-Fi, EDGE
- **Cloud** (powered by NVIDIA GPUs)
- **Hosted Servers**: Virtual Machines (for reconstruction, utilizing NVIDIA GPUs), Session Manager (connects and manages users)

Sender
(camera)

MATSUKO on iOS using mobile camera (MacBook camera)

Service Deployment

Reconstructor
(AI Software,
Data Training)

Receiver
(XR)

MATSUKO on xOS

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Towards immersive & productive meetings

Holograms are native to spatial computing

- No scanning needed.
- Real people - not avatars.
- Real expressions, real emotions.
- Review with 3D objects.
- Faster feedback loop.

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2D to 3D in REAL TIME
quality achieved using single camera

- **Mapping**: Each pixel corresponds to a voxel.
- **Correction**: In 3D, native correction compensates for 2D camera lens distortion.
- **Complete Reconstruction**:
  The algorithm fills in missing hologram parts. Artificial Intelligence reconstructs even the non-visible parts.
- **Hardware-Agnostic:** Technology is adaptable and works across devices.

METHOD, SYSTEM, AND MEDIUM FOR 3D OR 2.5D ELECTRONIC COMMUNICATION
United States Patent Application No. 17/538,664
Filed November 30, 2021, issued October 10, 2023

Real person video stream

Reconstructed hologram

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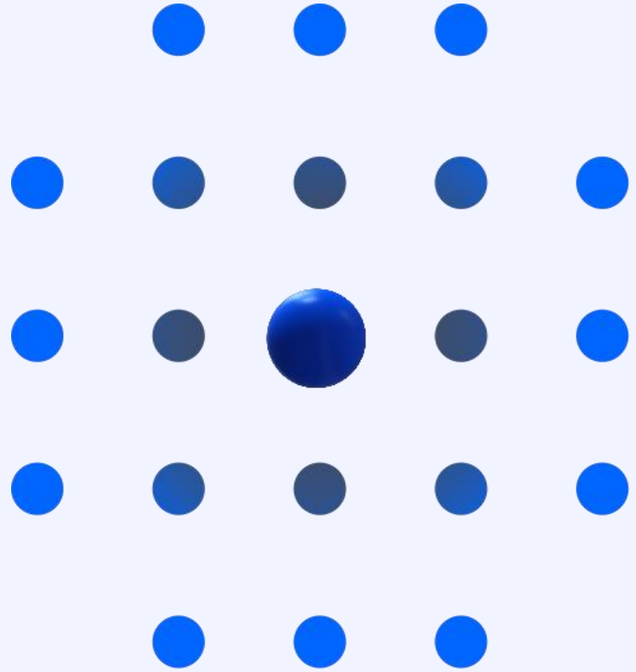
Who are the early adopters of the new era in computing?



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Spatial computing pioneers

Companies with remote working employees or customers with '3D needs'

Automotive, Architecture, Construction, Real estate, 3D content creation

- **Advantages**

  Quicker reviews

  Increased engagement

  Boosted productivity

- **Impact:**

  Immersive team collaboration

  Engaging presentation to customers.

INDIVIDUAL PRODUCTIVITY, TEAM PRODUCTIVITY	TRAININGS, ADULT LEARNING	GUIDED WORK, REMOTE ASSISTANCE
Remote collaboration as effective as in-person	Realistic and engaging learning experiences	Remote experts guide local operators or workers
Private and portable headsets for VR immersion	See instructor, screenshare, or 3D object simultaneously	Devices provide real-time and spatial information
Bridge physical and digital worlds	VR and AR modes for immersive learning	Presence and collaboration enhanced
Review 3D creations remotely in real-time	Transferable to the real world	Authentic support in real-life scenarios

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The operator role in holographic comms

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Our vision: holograms are the next step

Voice is an essential service

Our ambition is to provide holographic comms as **ubiquitous** as voice calls

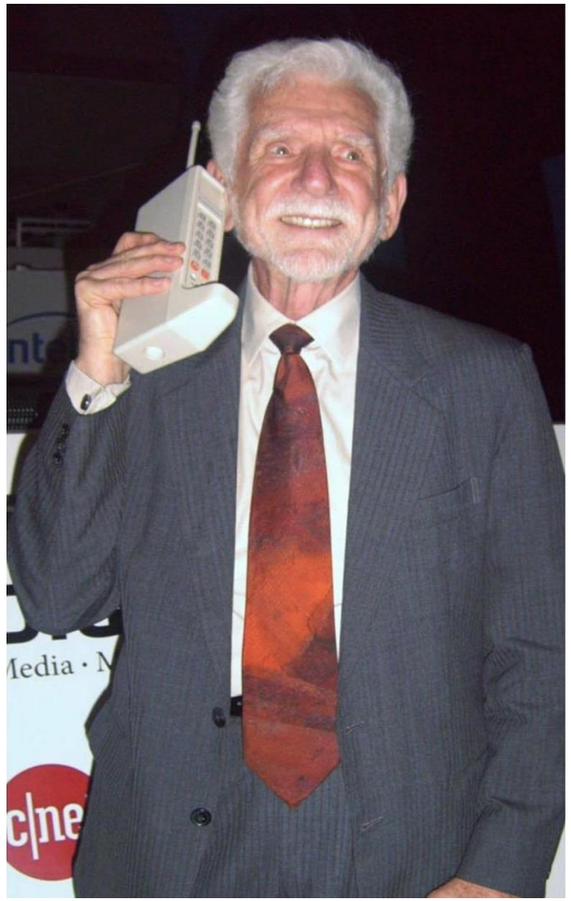
Any user

Any country

Interconection

Mobility

Roaming



On April 3rd, 1973, Mr. Martin Cooper made the first publicized handheld mobile phone call on.

On February 2nd, 2024, Apple starts selling the Apple Vision Pro and MATSUKO is one of the first apps, providing holographic calls.

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Our vision: top quality holograms

We delivery Voice with top quality

We want the same for holographic comms

For that,
MATSUKO leverages our **network enablers**

.

Live hologram captured using Meta Quest 2

5G

Edge

Network Apis

Slicing

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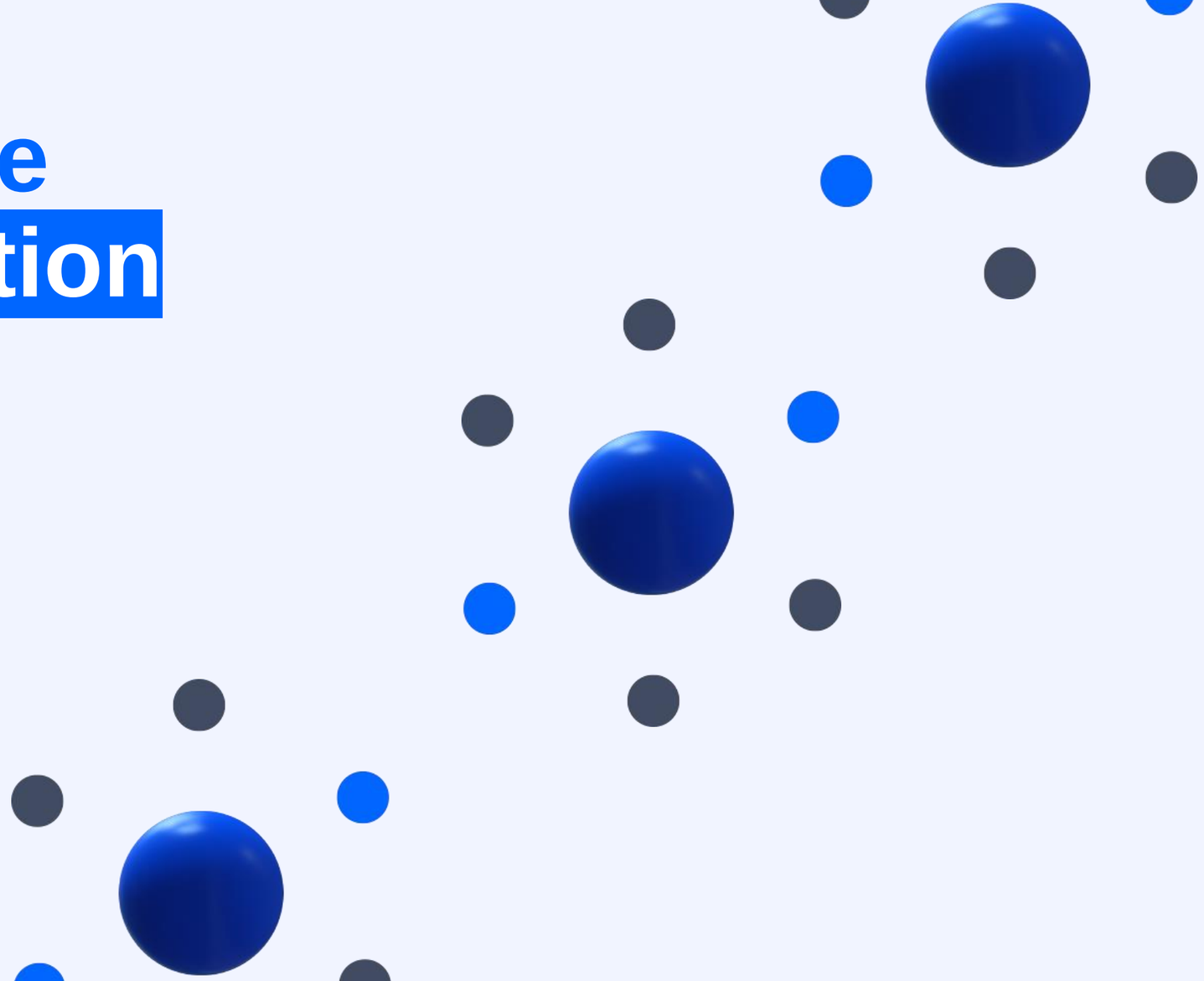
Pieces of puzzle of democratization



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How do we democratize holographic meetings?

No 2D limitations, no delays, no misunderstandings

Network enablers

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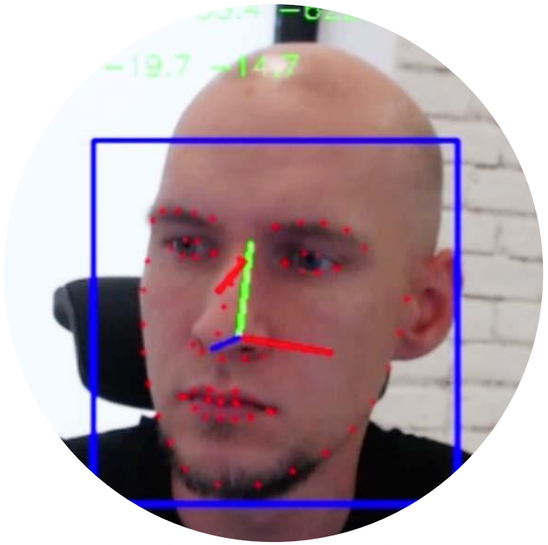
Eye contact in 3D space



NVIDIA MAXINE

3D object streaming

NVIDIA CLOUDXR™

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Network enablers

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A bit of architecture

Participant Sender

Servers

Participant Receiver

apply network enablers to the user plane to ensure top quality

& to the control plane to scale to millions of users

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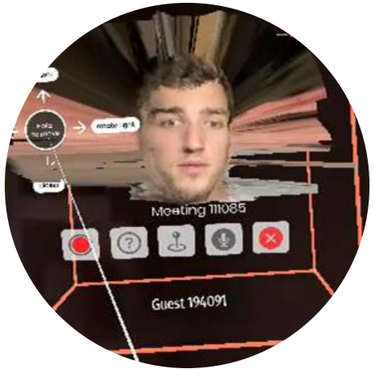
More quality, more demand from the network

First videos. Poor hologram quality, low number of FPS. Fairly granular and little sense of real time.

11/2022

6,42 FPS 10,7 Mb/s



Performance optimization setting for execute processing on GPU threads, not working properly on Telefónica GPUs.

1/2023

7,51 FPS 14,3 Mb/s

Great increase in image quality, dynamism and hologram definition. Higher FPS number.

3/2023

15 FPS 11 Mb/s

Improved hologram quality for ears. Very good quality.

4/2023

12,7 FPS 9 Mb/s

Hologram quality evolution in 6 months

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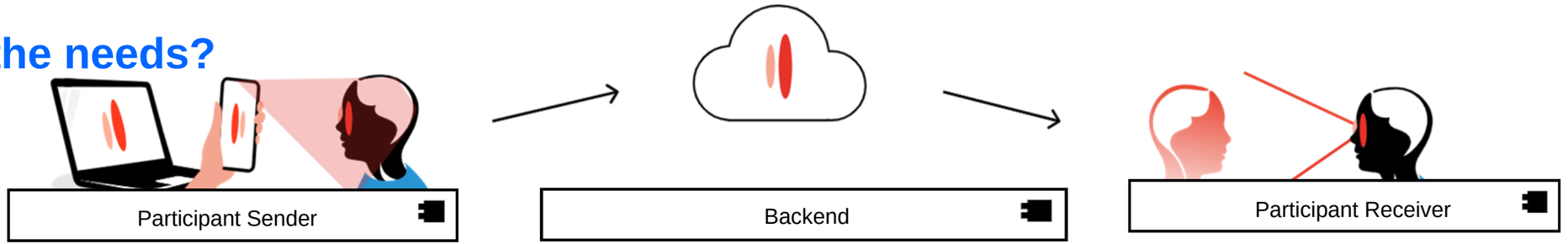
Which are the needs?



		Capture Device (iPhone) (color / depth)	Connectivity (upload) (closest node)		inter-MNO networking	Backend/Reconstructor (color / depth)	Connectivity (download) (access leg)		Viewer Device (nb of vertices)
			FPS: 15	FPS: 30			FPS: 15	FPS: 30	
Hologram Resolution Bandwidth ranges are controlled via WebRTC bitrate controller (minimum requirement)	low	(128 x 96) / (128 x 96)	2-3 Mb/s	4-6 Mb/s		(128 x 160) / (128 x 160)	3-4 Mb/s	6-8 Mb/s	nb of vertices: 15k-20k
	mid	(256 x 192) / (256 x 192)	3-4 Mb/s	6-8 Mb/s		(256 x 320) / (256 x 320)	4-6 Mb/s	8-12 Mb/s	nb of vertices: 50k-80k
	high	**(1024 x 768) / (256 x 192)**	**4-6 Mb/s**	**8-12 Mb/s**		**(1024 x 1280) / (256 x 320)**	**5-7 Mb/s**	**10-14 Mb/s**	**nb of vertices: 50k-80k**
Latency (Expected) (high resolution)	4G (Cloud)	(256 x 192) / (256 x 192)	20-40 ms	40-60 ms	25-45 ms	30 ms	20-40 ms	40-60 ms	roundtrip: 190-470 ms
	5G (Cloud)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	20-40 ms	30 ms	10-30 ms	15-35 ms	roundtrip: 130-320 ms
	5G (EDGE)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	10-30 ms	30 ms	5-25 ms	5-25 ms	roundtrip: 110-270 ms
	Wifi (EDGE)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	10-30 ms	30 ms	5-25 ms	5-25 ms	roundtrip: 110-270 ms

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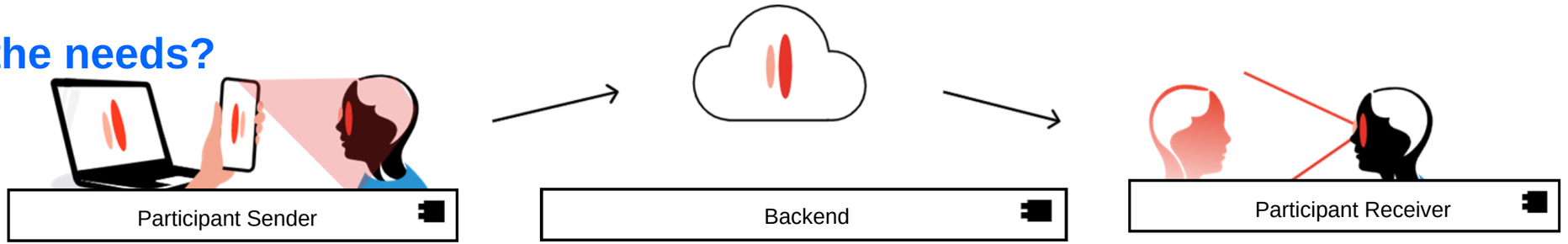
Which are the needs?



		Capture Device (iPhone) (color / depth)	Connectivity (upload) (closest node)		inter-MNO networking	Backend/Reconstructor (color / depth)	Connectivity (download) (access leg)		Viewer Device (nb of vertices)
			FPS: 15	FPS: 30			FPS: 15	FPS: 30	
Hologram Resolution Bandwidth ranges are controlled via WebRTC bitrate controller (minimum requirement)	low	(128 x 96) / (128 x 96)	2-3 Mb/s	4-6 Mb/s		(128 x 160) / (128 x 160)	3-4 Mb/s	6-8 Mb/s	nb of vertices: 15k-20k
	mid	(256 x 192) / (256 x 192)	3-4 Mb/s	6-8 Mb/s		(256 x 320) / (256 x 320)	4-6 Mb/s	8-12 Mb/s	nb of vertices: 50k-80k
	high	**(1024 x 768) / (256 x 192)**	**4-6 Mb/s**	**8-12 Mb/s**		**(1024 x 1280) / (256 x 320)**	**5-7 M**	**10-14 Mbps**	**of vertices: 50k-80k**
Latency (Expected) (high resolution)	4G (Cloud)	(256 x 192) / (256 x 192)	20-40 ms	40-60 ms	25-45 ms	30 ms	20-40 ms	40-60 ms	roundtrip: 190-470 ms
	5G (Cloud)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	20-40 ms	30 ms	10-30 ms	15-35 ms	roundtrip: 130-320 ms
	5G (EDGE)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	10-30 ms	30 ms	5-25	**15-25 MS**	ndtrip: 110-270 ms
	Wifi (EDGE)	(1024 x 768) / (256 x 192)	5-25 ms	5-25 ms	10-30 ms	30 ms	5-25 ms	5-25 ms	roundtrip: 110-270 ms

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What are MATSUKO needs?

1 hologram = **14 Mbps**,
50 ms RTT

3 holograms = **42 Mbps**,
50 ms RTT

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What Network Enablers?

5G & Edge

Reduce latency and maximize throughput

Scale robustly

Network APIs, Slicing

Insure resources for high quality

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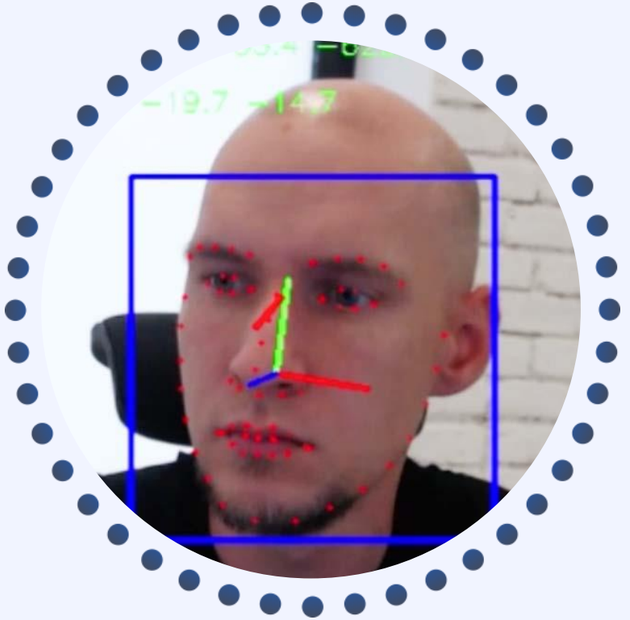
Eye contact in 3D space



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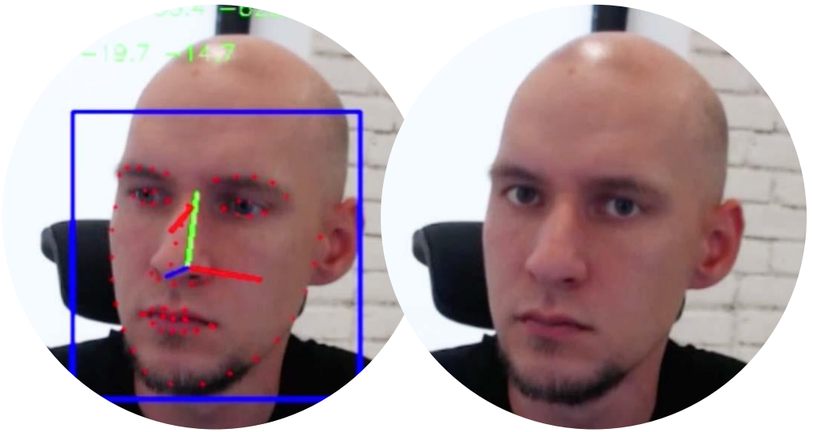
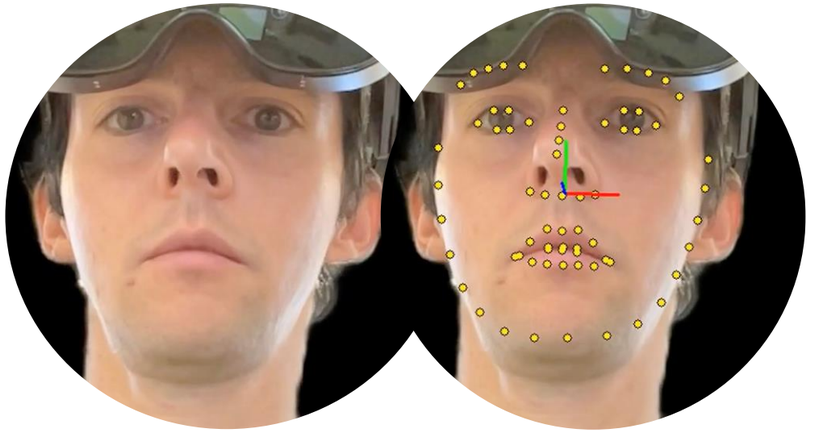
Leveraging NVIDIA Maxine for Eye Contact

Eye contact in the 3D space

NVIDIA Maxine to maintain
eye contact of participants
in the 3D space, which enhances
the sense of presence
and immersion



Eye/gaze redirection to maintain eye contact of participants in the 3D space



Head alignment to align one frame to another in the 3D space

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3D object streaming

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Leveraging NVIDIA CloudXR

NVIDIA CloudXR
streaming SDK for delivering in realtime realistic graphics across 5G and Wi-Fi networks.

Thanks to NVIDIA CloudXR, participants are able to visualize high-resolution 3D objects and environments in real time **in the holographic meeting.**

NVIDIA CLOUDXR™

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What is the future of holographic meetings?

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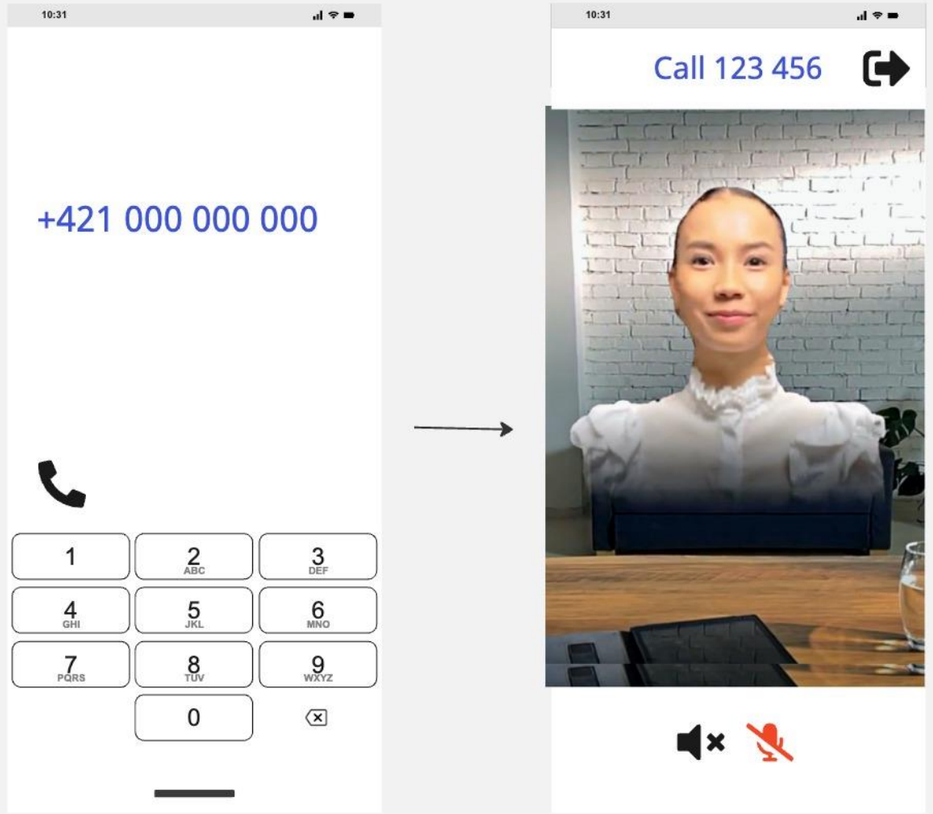
Vision for the future

Bring MATSUKO Holographic Presence to as many USERs, DEVICES and EXPERIENCES as possible.

- Make holographic calls from smartphone dialers
- Expose holographic comms to third parties via simple APIs and SDK

Start a call

WebGL 3D hologram rendering



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Future of holographics

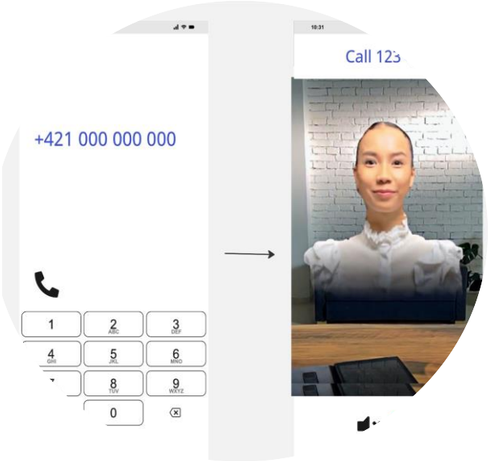
HOLOGRAPHIC SDK (API)

Easy way for developers to bring human presence into XR environments and content.

6G XR: IMS INTEGRATION

Provide holographics within voice calls, through the smartphone dialler.

EU funded Project



www.6g-xr.eu

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Your invitation to experience presence

"You look very great, really good. **It's like in Star Wars. Good spatial feeling,** really great. And much more personal than 2D video. This is very impressive."

"The app is incredible, with a **strong feeling of presence** of the person."

"I know of no other company on the planet producing **real time holograms with the quality** you are producing."

"I was impressed by the **fidelity** of the images and the effect of **immersion**."

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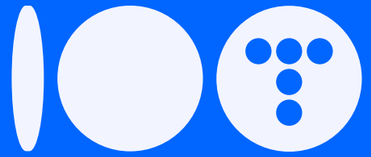

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