

5G in Augmented Reality and Virtual Reality

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XReality Team

WELLS
FARGO



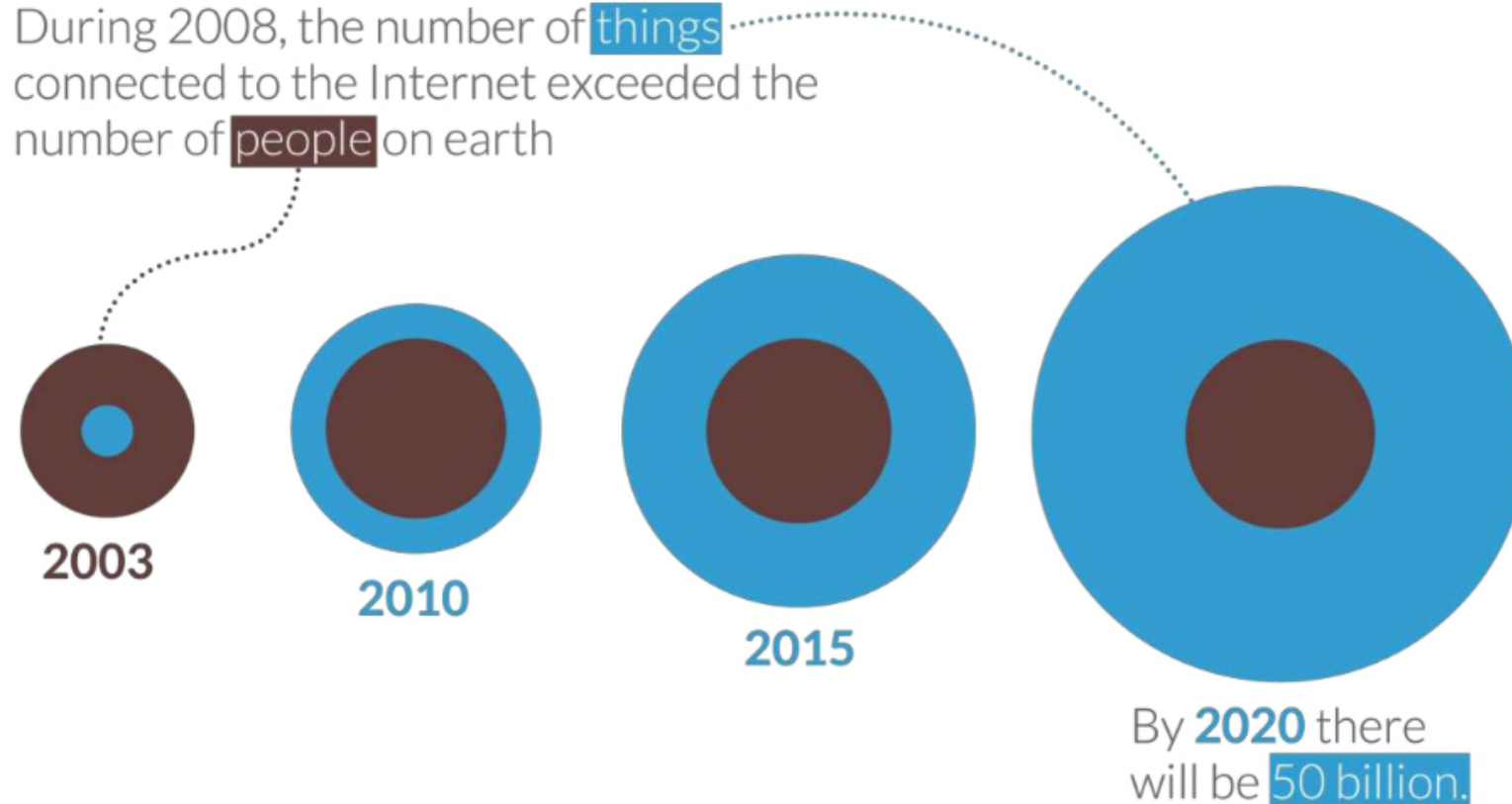
JACOBSTM
Engineering SA



Presentation outline

- Intro to 5G and Mixed Reality (AR/VR)
- AR & IoT ~ Virtual Environment of Things (VEoT)
- How AR impacts 5G Networks
- Reducing computational needs for spatial AR applications

Big Data & Big Things



Non-human centric > **human** centric data **by 2025**

A key challenge: Human-to-Thing interface



touch



dashboard



voice

Virtual Reality → Augmented Reality → Mixed Reality



AR + IoT → Virtual Environment of Things

Integrating real-world smart things and virtual-world avatars/holograms in a computer generated virtual environment so that entities in either worlds can interact with one another in a real-time manner.

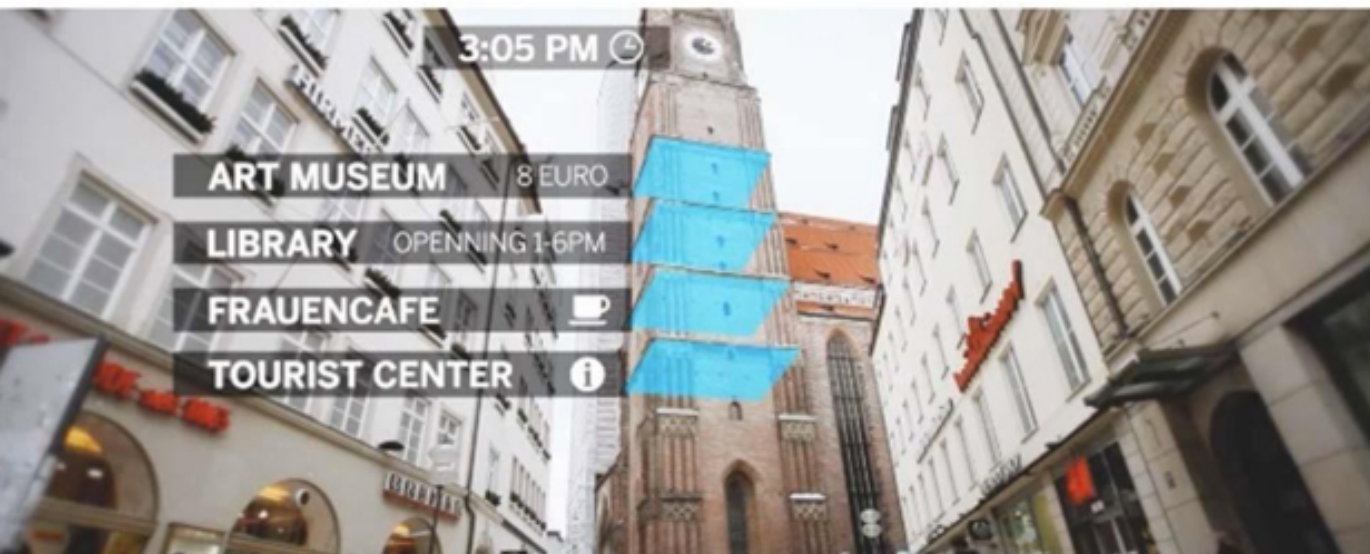
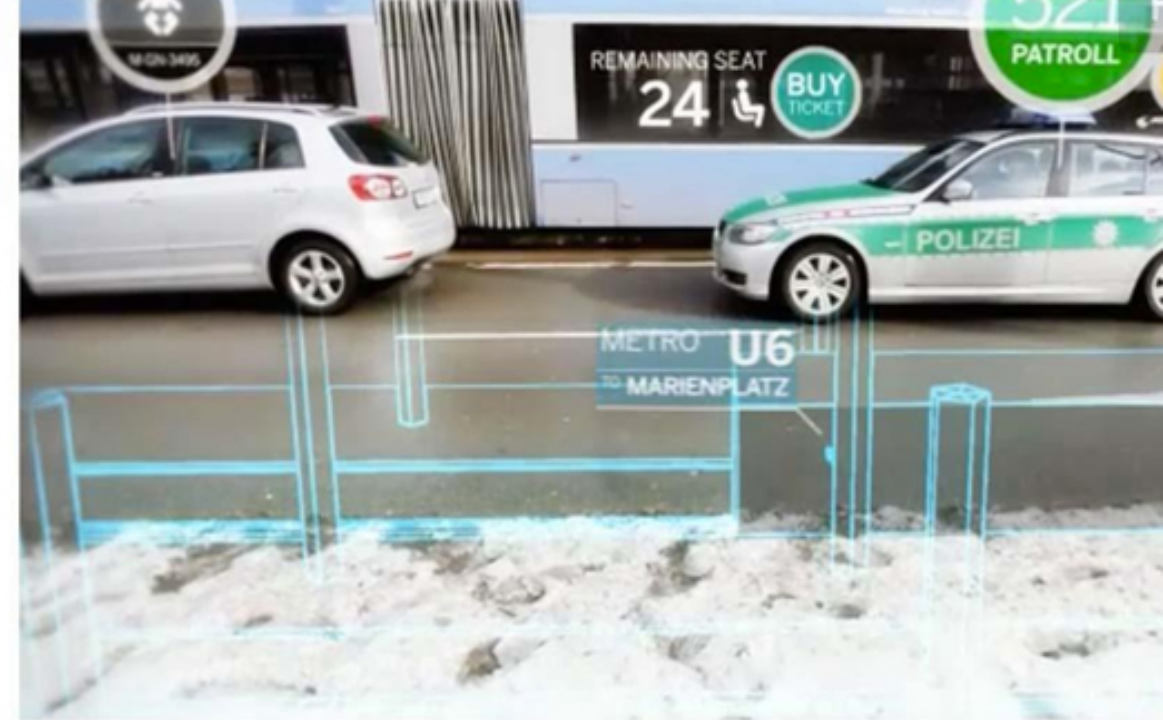
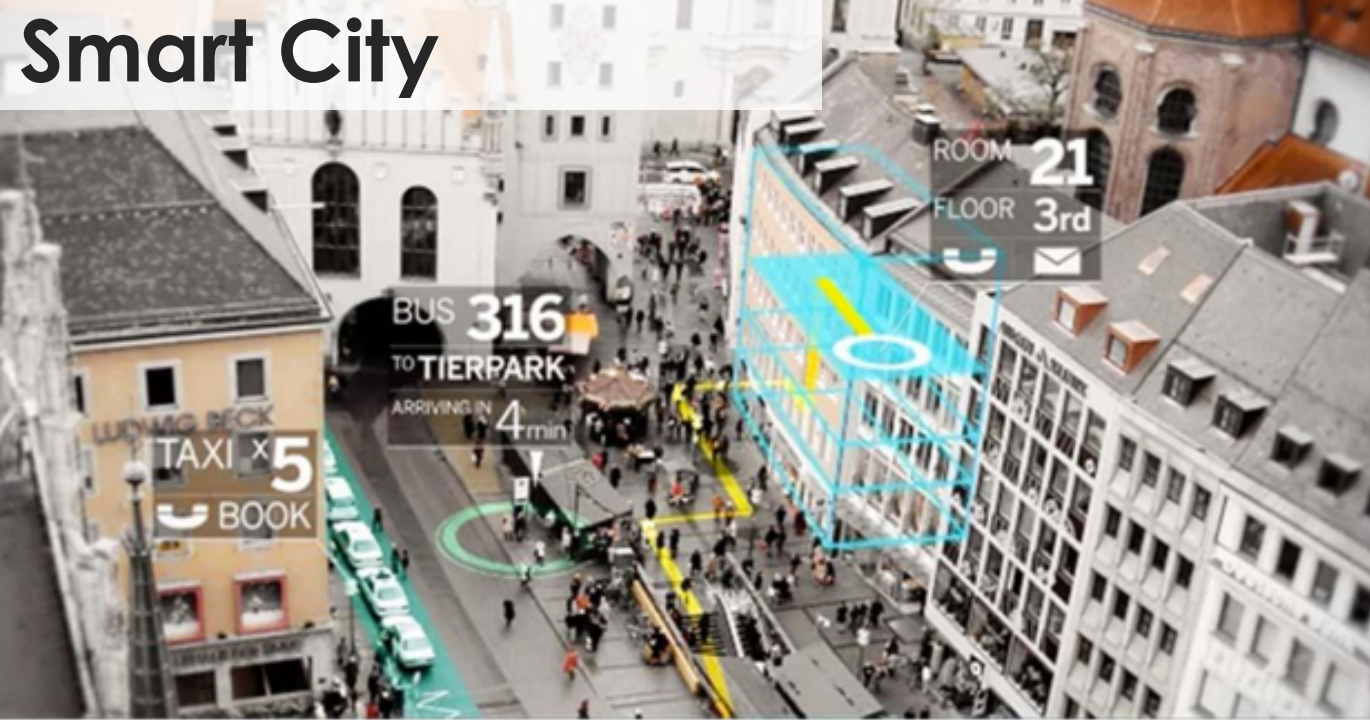
- **Low latency + High bandwidth communication is an enabler of this service**



Agriculture



Smart City

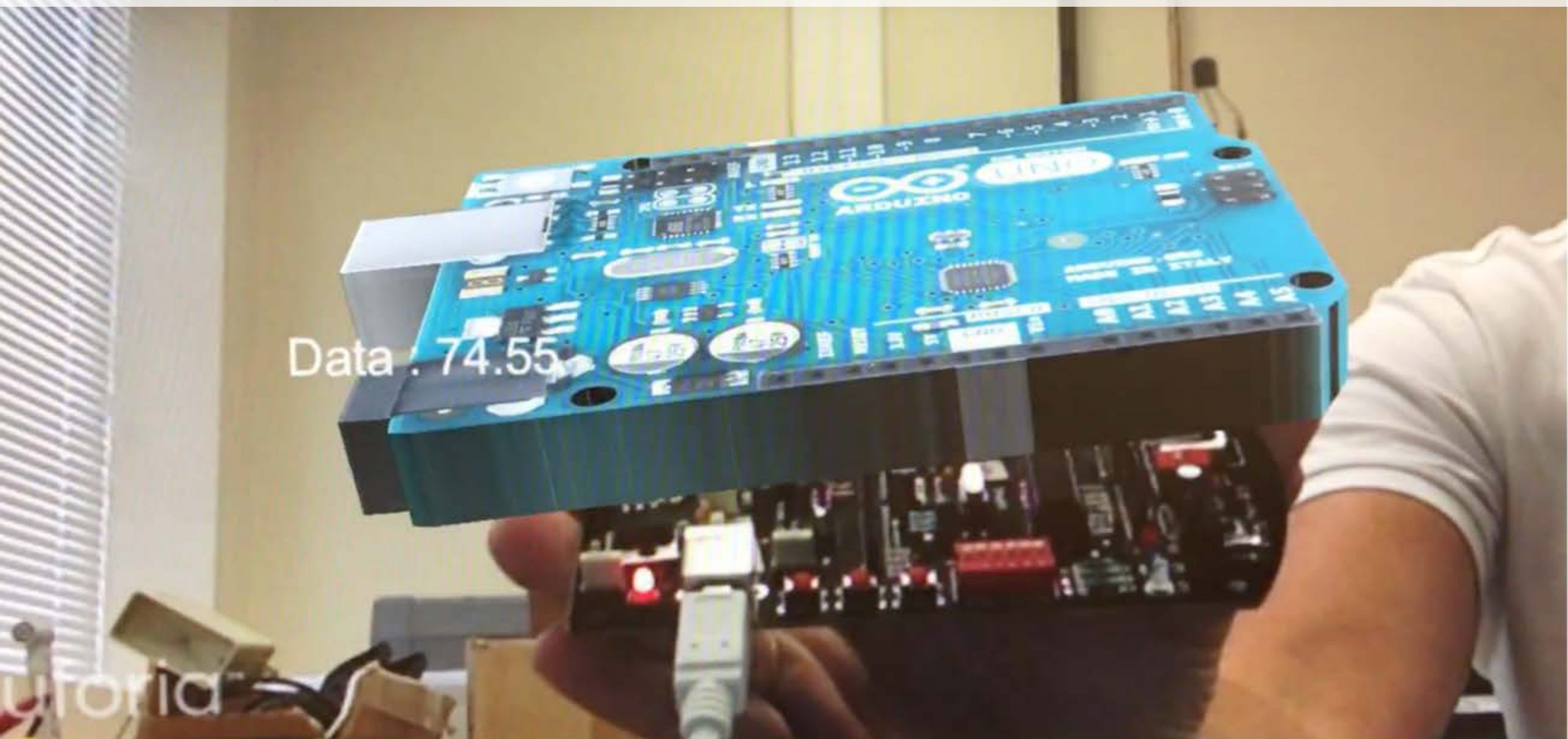


XReality Research Group focus

- Integrate IoT networks with AR applications
- Target Low Latency <25ms (Tactile Internet)
- Enable resource allocation of AR applications running over 5G
- Design an interactive visual communication (**Virtual Twin**)
- Focus on industrial applications (Civil Eng, Networking, Health)

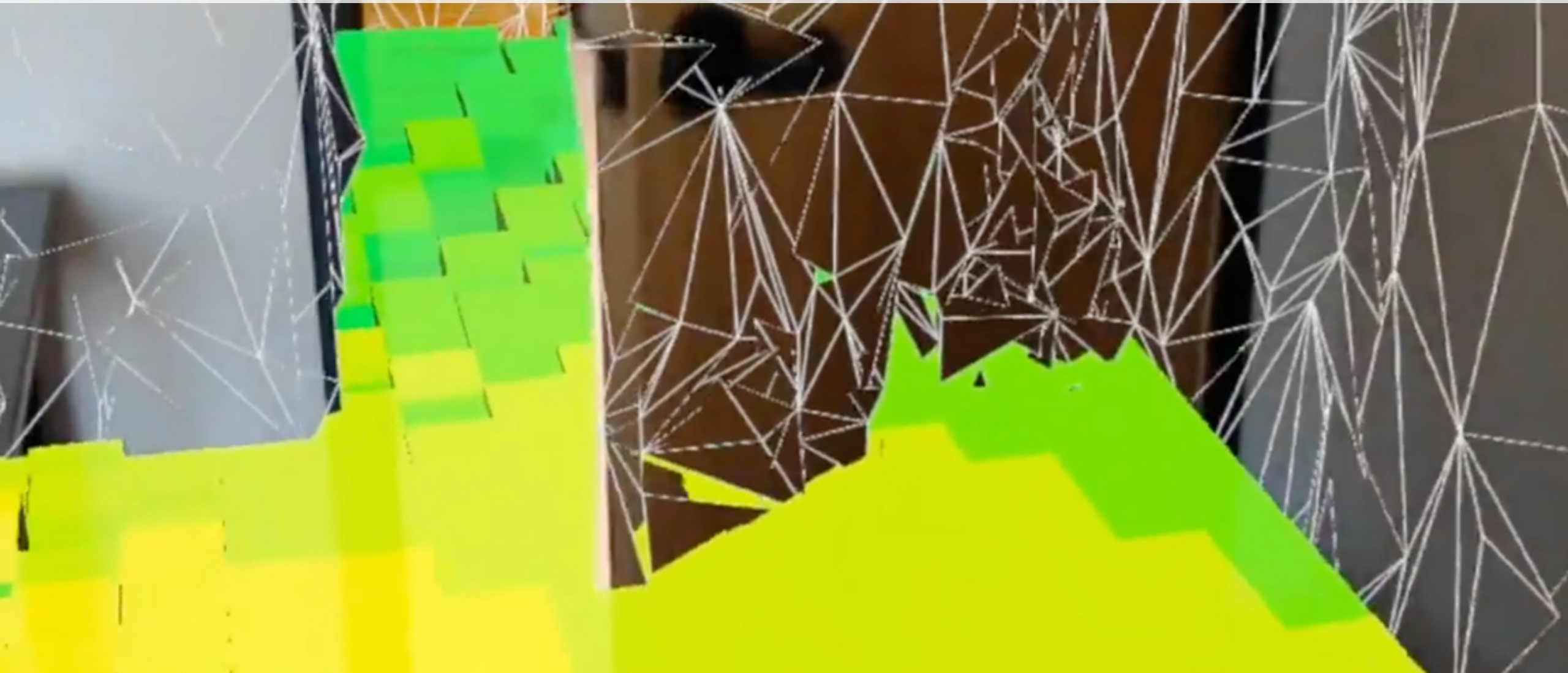
Demo: Object identification

View video → <https://youtu.be/jeEM5w0aKMU>



Demo: Radio visualization

View video → <https://youtu.be/npcdQPvOb6o>



Demo: Training First Responders

View video → https://youtu.be/5PAr118_hSQ



Augmented
Training Systems

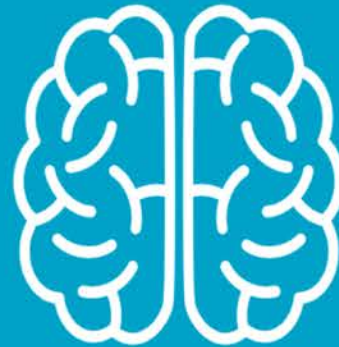


Pilot from training



Case Study Austin/Travis Co. EMS AMBUS

Memory Recall
by up to



45%

Faster on Task
by up to



29%

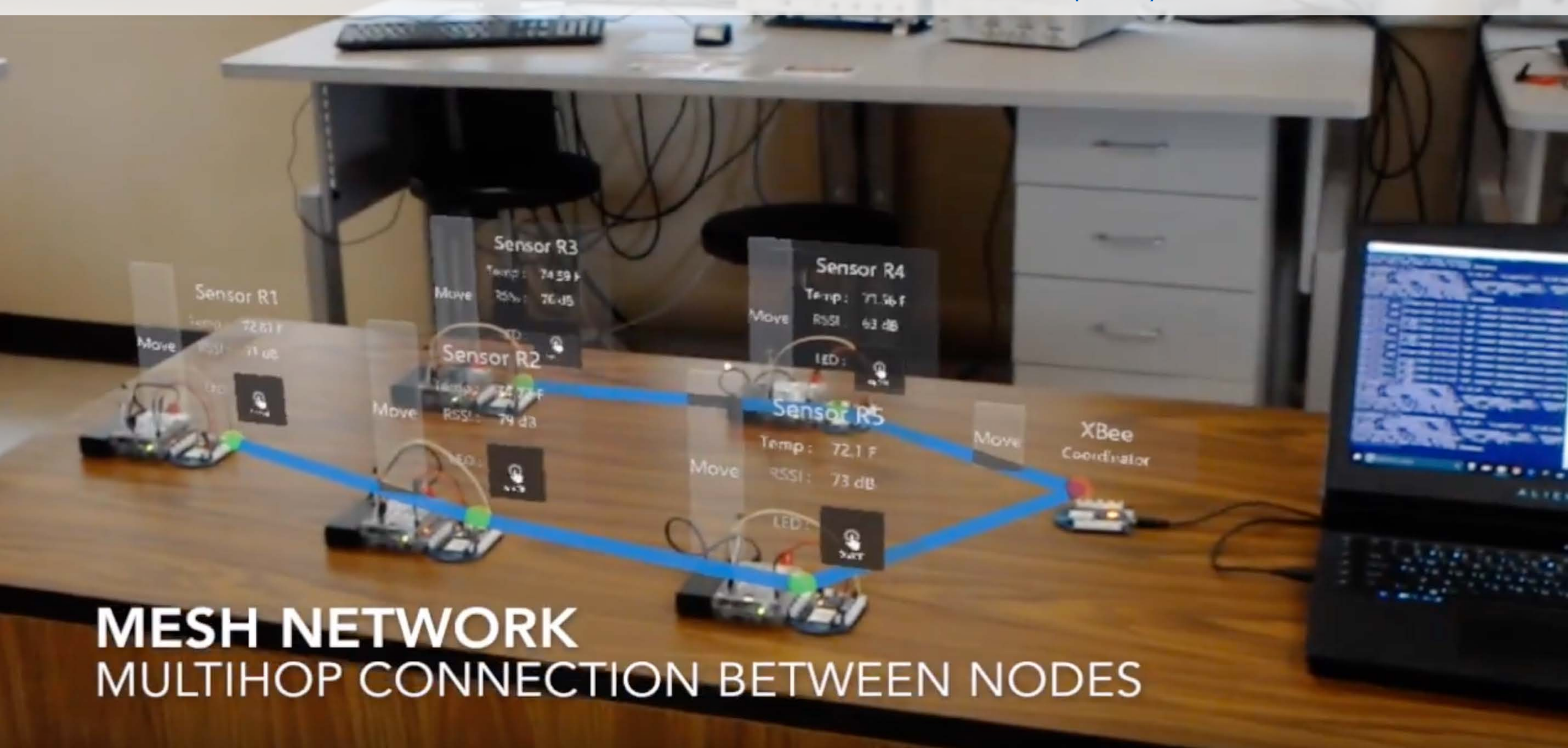
Cheaper
by up to



10x

Demo: Network visualization

View video → <https://youtu.be/GEB9C4mVQ4Q>



Devices and Hardware

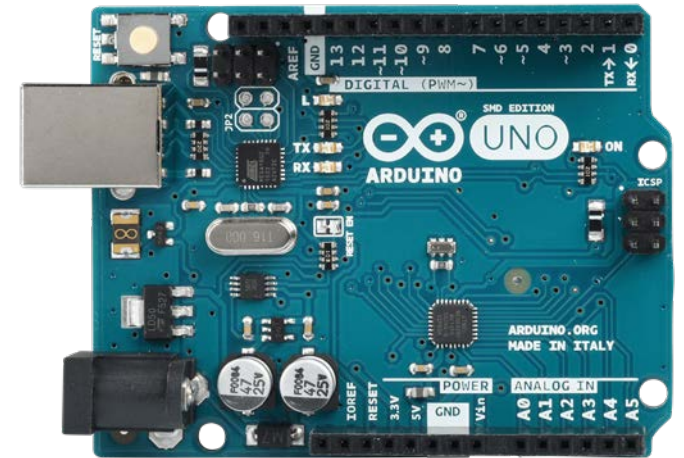
Augmented Reality

- Microsoft HoloLens VR headgear

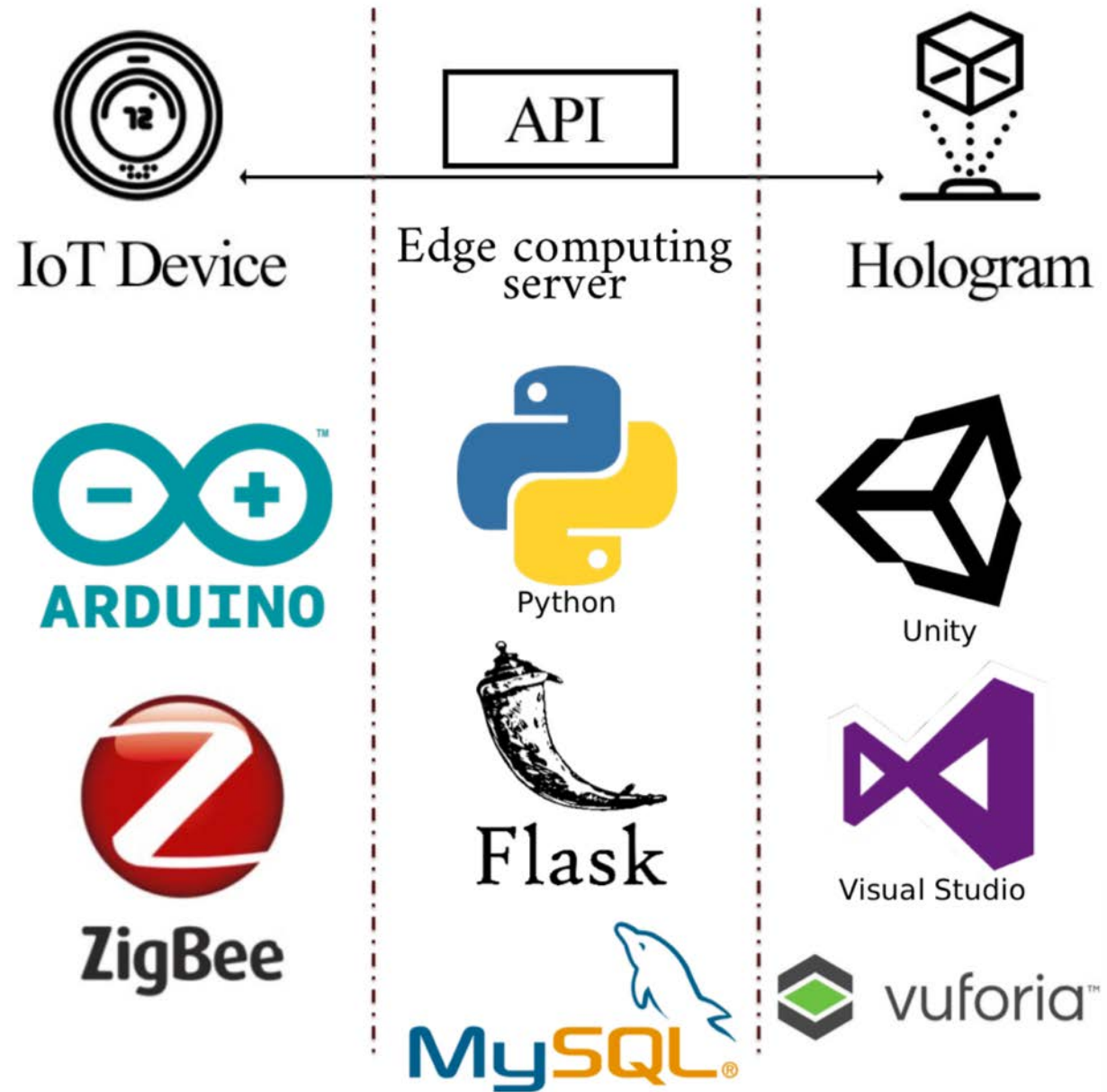


Internet of Things

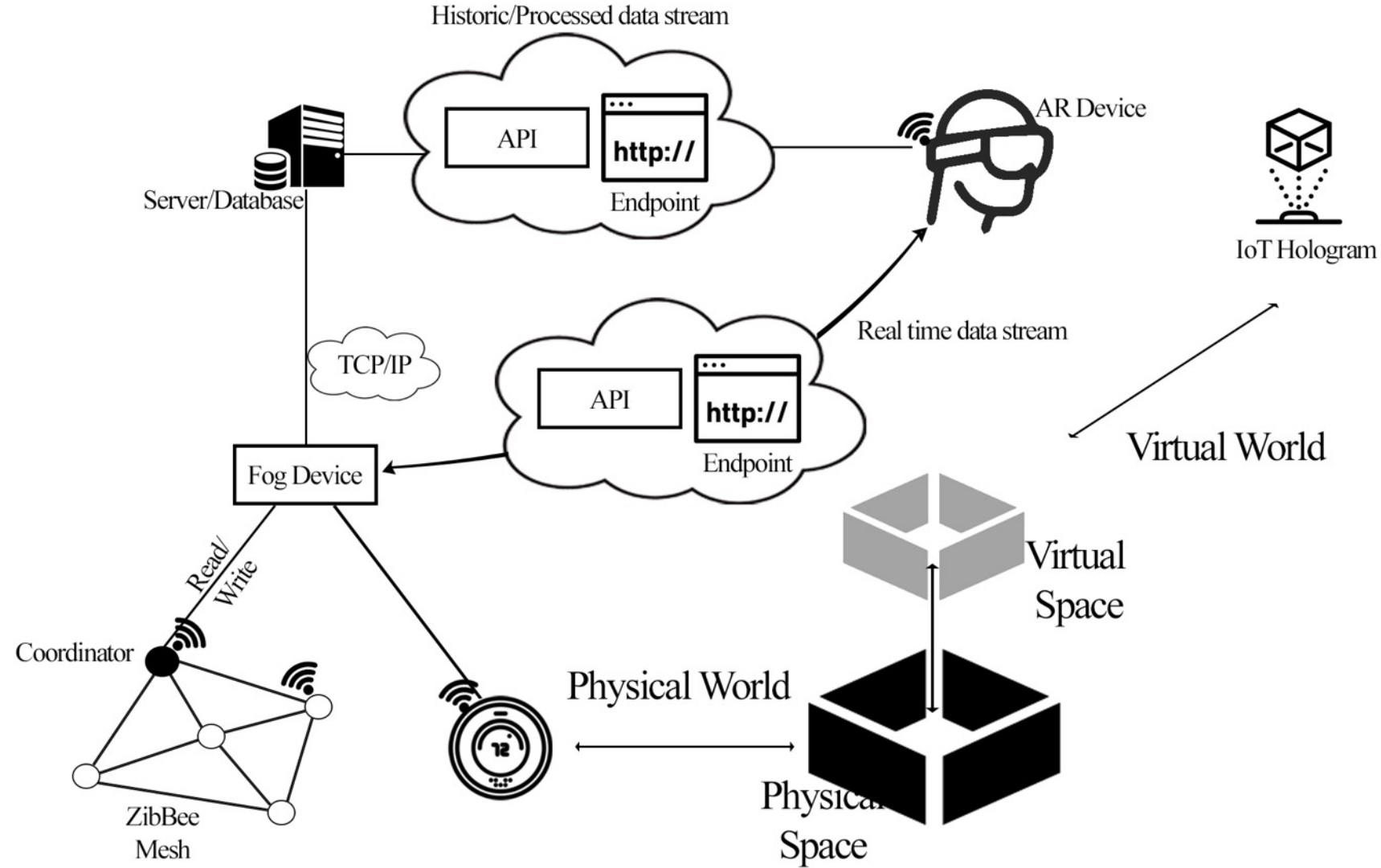
- Arduino Uno R3
- ZigBee XBee S2D
- Raspberry Pi (Edge computing)



Technologies

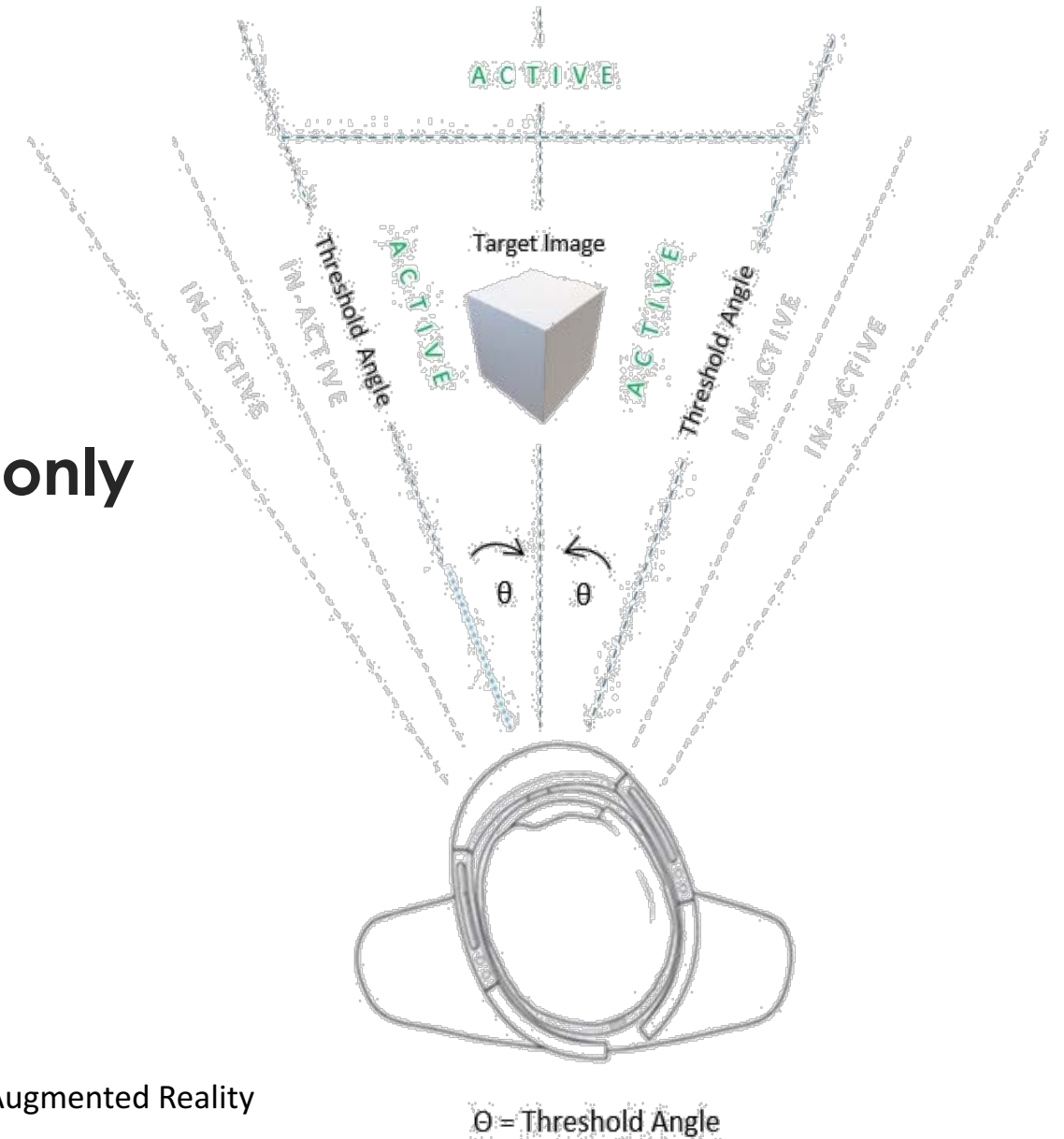


Architecture



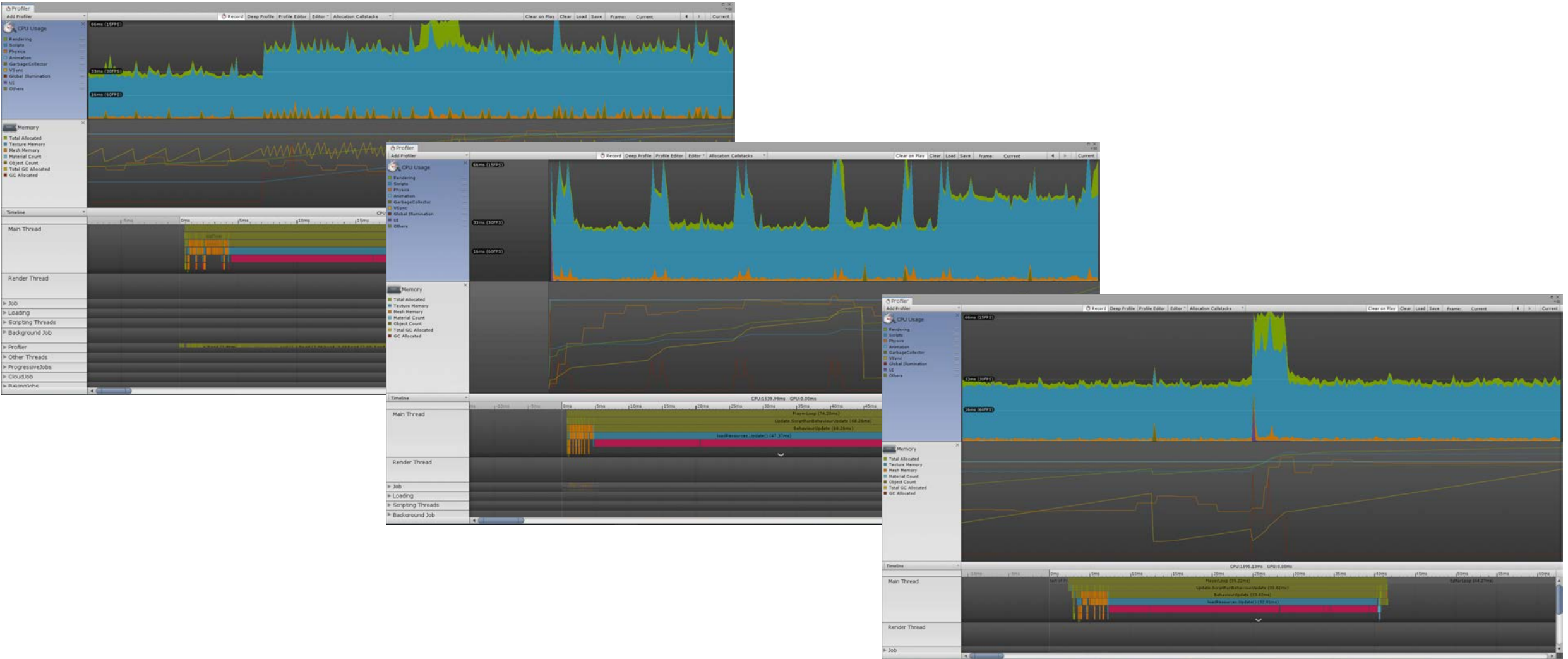
Caching for Object Detection

- Object detection/recognition runs **only** when field of view overlaps with hologram position



G. Koutitas, I. Koutsopoulos, et. al., "Angle Optimizer: Reducing Network Workload in Augmented Reality Applications", under preparation, IEEE, 2019

First comparisons

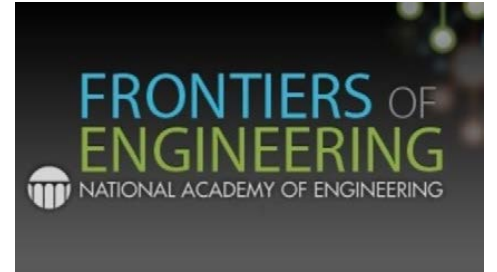


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Future work: Holoportation



Thank you!



<http://xreality.wp.txstate.edu/>

www.AugmentedTrainingSystems.com

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