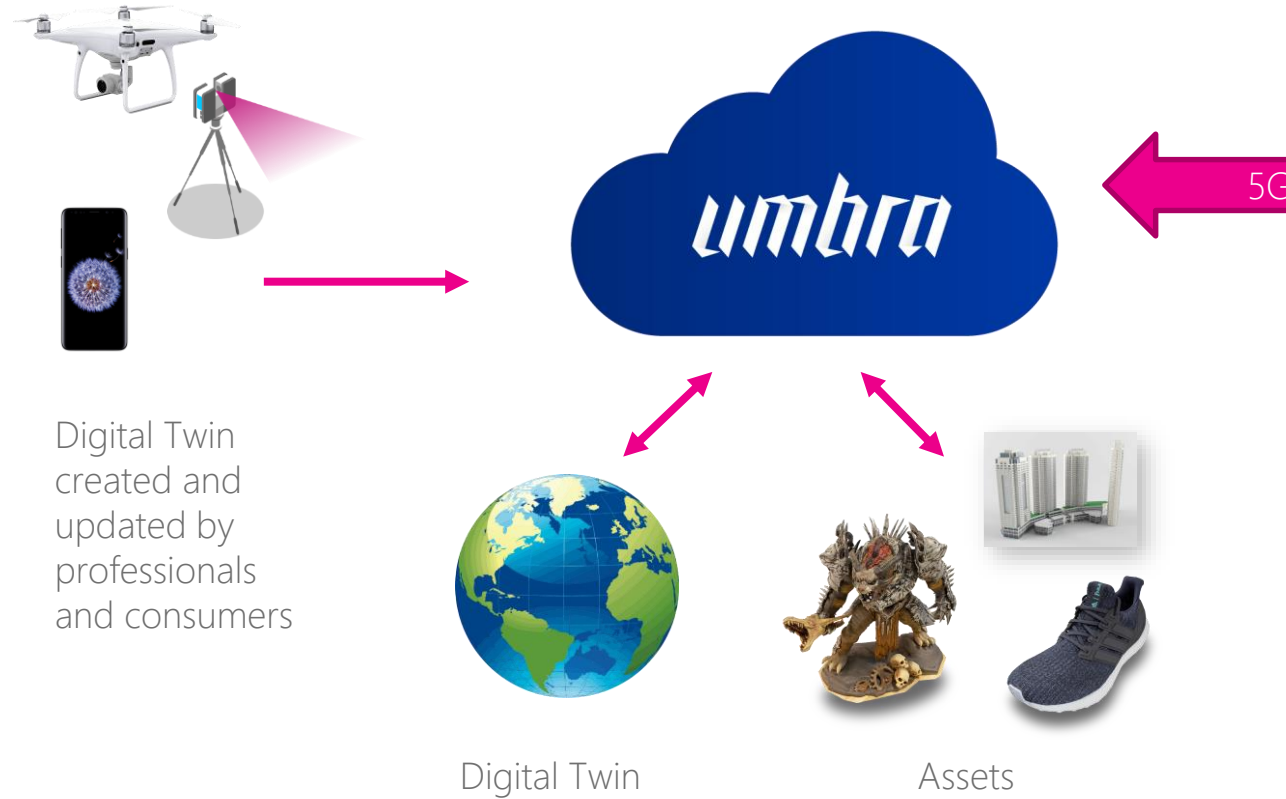# Delivering the AR Cloud in Ultra High-Resolution

May 2019 – Otso Mäkinen – otso@umbra3d.com

The AR Cloud

Digital Twin created and updated by professionals and consumers

umbra

5G

Digital Twin

Assets

AR Cloud consumed with mobile devices

AR Cloud Challenges

o   3D Asset Quality

- ○ Photorealistic rendering on mobile is challenging
- ○ Manual optimization of high-quality models is incredibly time-intensive

o   Digital Twin Size and Scale

- ○ Capture quality is compromised because the Earth's digital twin is so massive
- ○ Streaming a massive digital twin is impossible

o   Accurate User Localization

- ○ Relevant pieces of the digital twin must be delivered to the client device real-time
- ○ Data must be optimized for fast processing

Umbra Solution

o   Instant Content Delivery

    o   Fast client-side rendering
    o   No loading times
    o   Automatically scale quality for most relevant data
    o   No manual optimization work needed

o   No Limits on Data Size or Quality

    o   No need to compromise capture resolution
    o   Bring massive models to AR (stadiums, skyscrapers)

o   Cloud Scale

    o   Enables millions of concurrent users
    o   Massively parallel data processing
    o   Unbounded storage capacity

Umbra Workflow
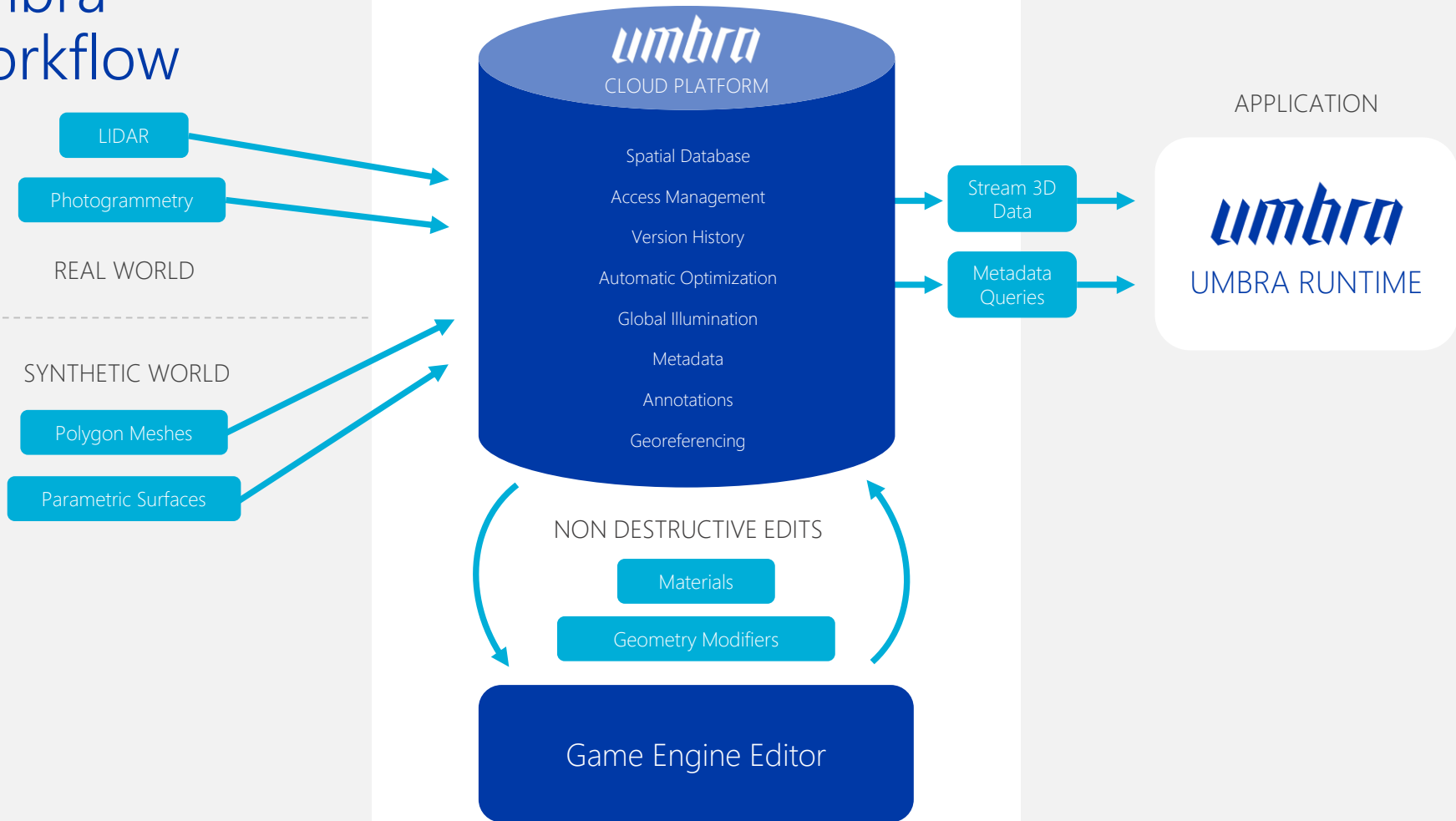
Competitive Comparison

Katajanokka, Helsinki by Umbra

Same location by Google Earth
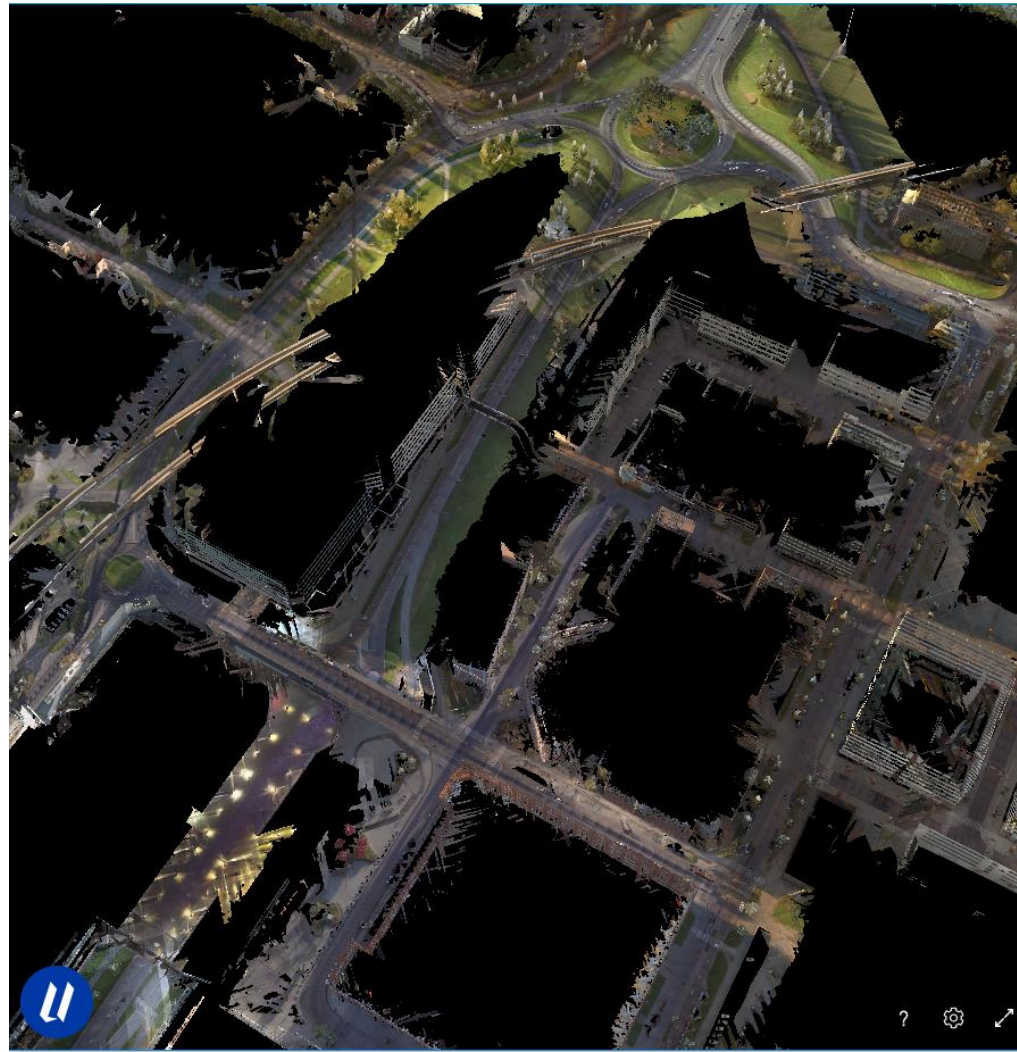
Use Case Highlight
AR Visualization

- Upload design directly from the design tool into Composit
- Align 3D model (BIM) on top of the real world in AR
- Check for potential errors and report

Use Case Highlight
ML Training for Autonomous Vehicles

- Scan the world (i.e. streets, buildings) in ultra high-resolution 3D
    - ~1mm accuracy
    - LiDAR, photogrammetry
- Automatic workflow to process from input to optimized 3D
- Photorealistic quality minimizes machine learning bias caused by rendering artifacts

Use Case Highlight
Digital Twin Visualization

- Bring complex 3D content into a game engine
  - Multiple sources of input data
  - Bypass time-consuming workflows
  - Decrease turnaround times
  - Deploy on desired platform
- Create and deliver a custom visualization
  - Store or factory layout
  - Communicate infrastructure / city planning

Sitowise & City of Helsinki - Raide-Jokeri
City-crossing speed tramline visualization

SITOWISE

TARGET

City of Helsinki

Why now?

o **5G** is almost here
  - o GB bandwidth and low latency is needed to deliver truly immersive experiences

o **Ubiquitous Reality Capture** is emerging
  - o Drones and autonomous fleets capture the real world for high-value business and consumer applications
  - o Mobile phone cameras are good enough to produce high quality photogrammetry content

o **Cloud storage and compute** pricing continues to decline
  - o First time ever it is possible to do highly-parallelized compute at scale and profitably

o **XR** is maturing
  - o Devices are in market, but very little content available
  - o Ultra high-resolution is required for full immersion

Thank You!

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