Photorealistic 3D digital twins and 360-degree situational awareness

FIIF EVENT WITH AISA PROJECT: AI FOR SITUATIONAL AWARENESS

21.11.2024

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Photorealistic AI-based 3D digital twin representations

Recent advancements in AI-based 3D representation techniques such as Neural Radiance Fields (NERFs) and 3D Gaussian Splatting (3DGS) brings unprecedented photorealism and 3D geometry understanding for digital twin representations

Example:
Simulation on 3D Digital Twin NERF model

Nokia 3D Gaussian Splatting Pipeline

1

Data Capture

Equirectangular, fisheye or perspective material

360-degree video frames

2

Preprocessing

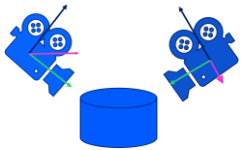
Rectification, stitching, cropping, color corrections etc.

2D images

3

Camera calibration

Camera poses and intrinsics acquired e.g. with structure from motion (SFM).



4

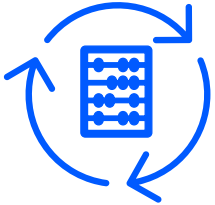
Formatting

Format data for the used model.

5

Model Optimization

Depending on the dataset and image size training time varies, but **many times faster than NeRF** models



training

6

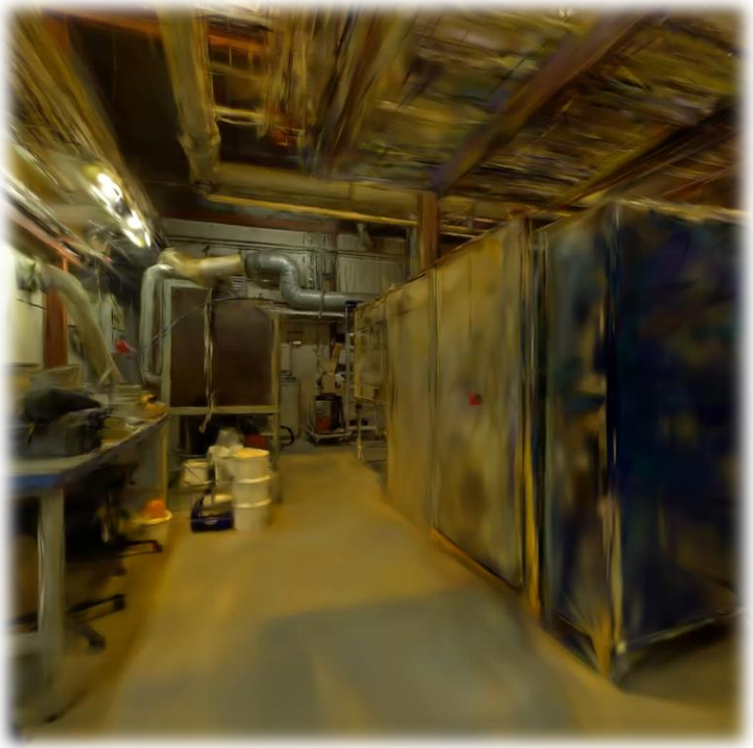
Rendering

Depending on model size and computational power, it can be done in **REAL TIME**

Manufacturing site situational awareness via 3D Digital Twin

Extend 360 video capability with 3D digital twin model and real-time 3D Gaussian Splatting (3DGS)

- Proof of concept done with Valmet
- Ideal for creating **photorealistic digital twins** of real-world environments.
- **Utilizes AI** to create high-quality, interactive 3D scenes from photos.
- **Enables real-time remote rendering and augmentation** of virtual information in 3D space.

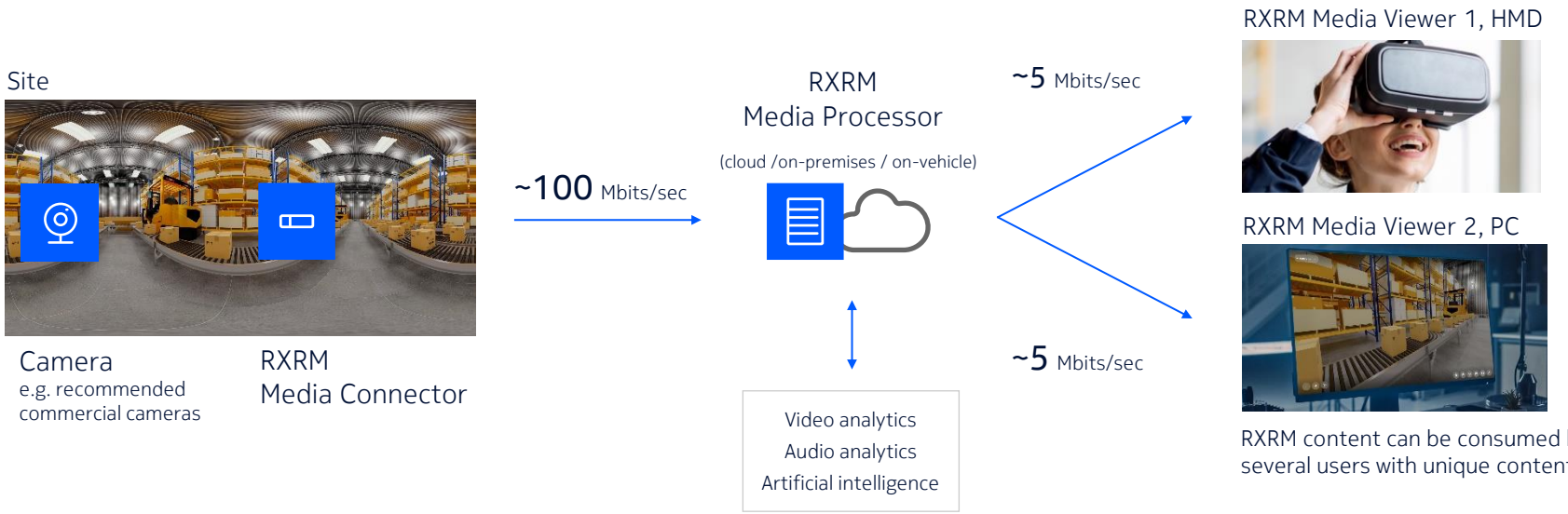


Digital Twin of Valmet manufacturing site 3DGS model generated by Nokia's 3DGS pipeline

Nokia Real-time eXtended Reality Multimedia (RXRM)

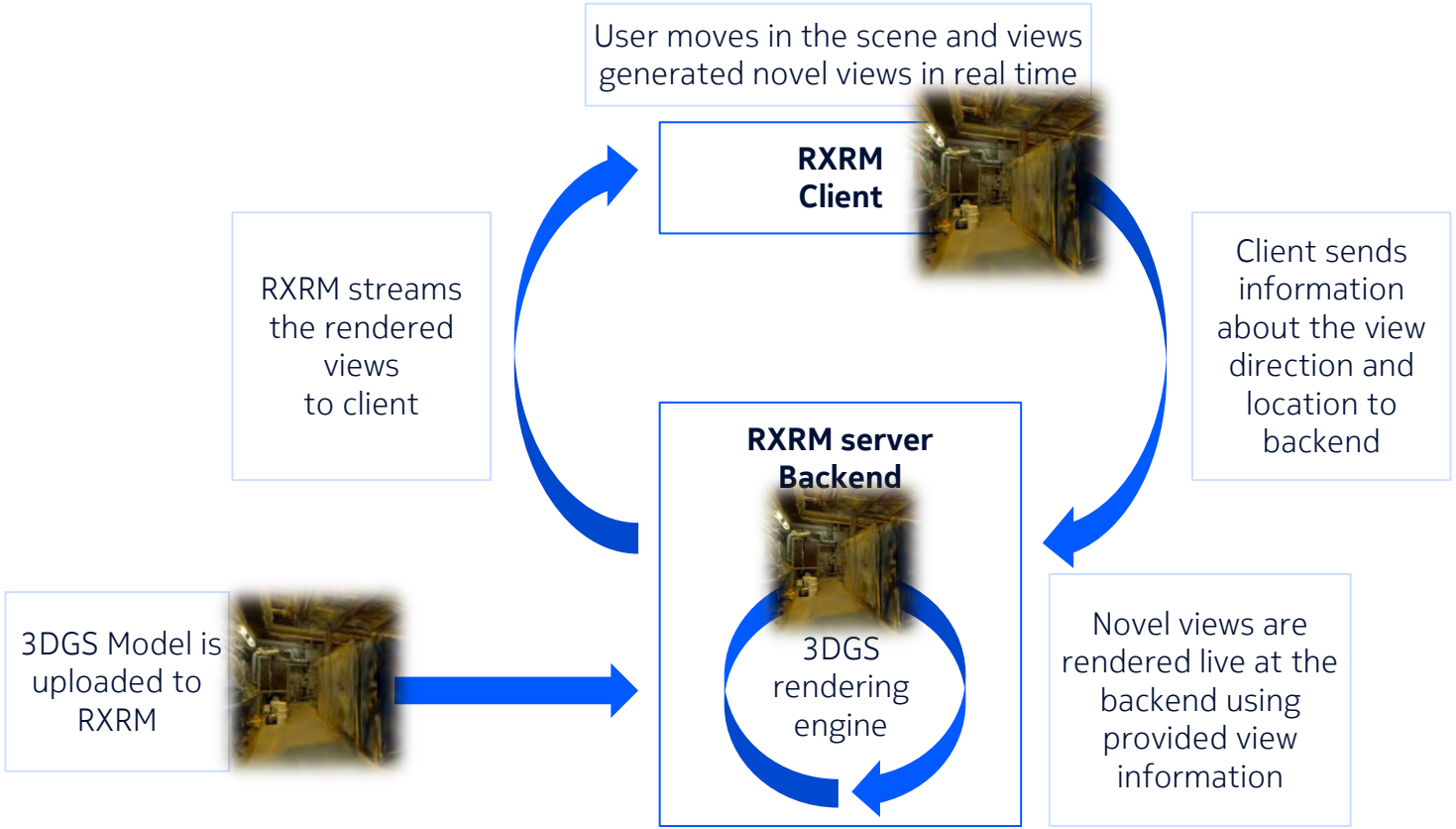
Real-time low-delay XR multimedia delivery with bandwidth optimization.

By only streaming the part of the 360° video that is visible to the viewer,
bandwidth requirements are reduced by up to 90% – for very low latency and no loss in quality.



https://www.nokia.com/industries/rxrm/

Real time 3D GS remote rendering on Nokia **RXRM**

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