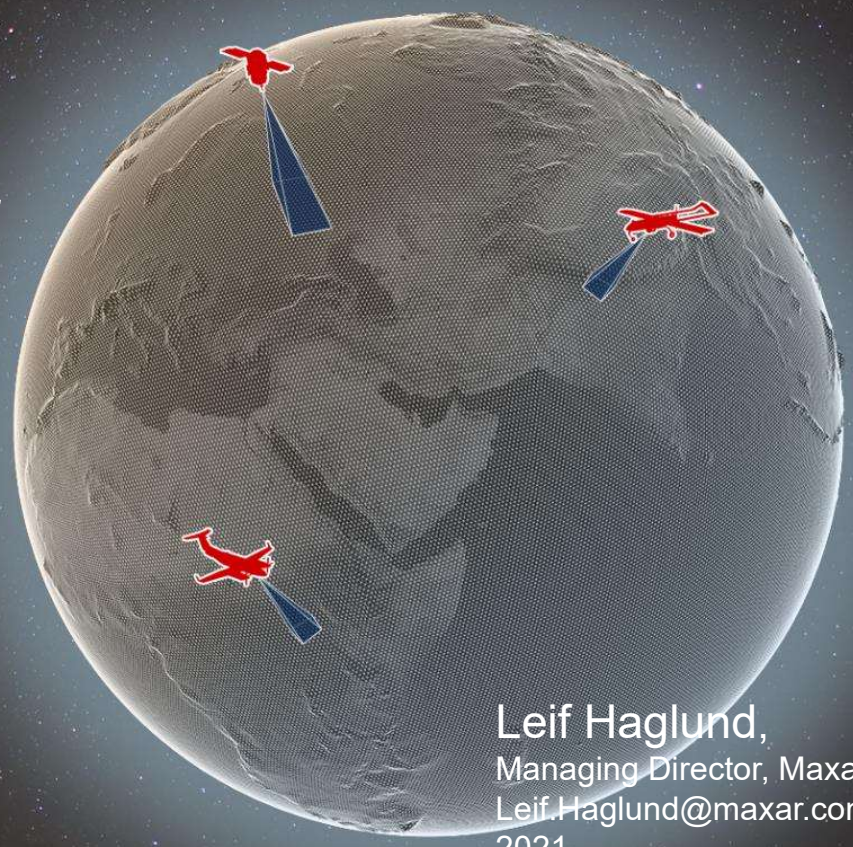
THE GLOBE IN 3D

To be the source of the most accurate digital representation of the globe in 3D, generating new capabilities.



GLOBAL AND SCALABLE PRECISION IN 3D

Leif Haglund,
Managing Director, Maxar Sweden
Leif.Haglund@maxar.com
2021

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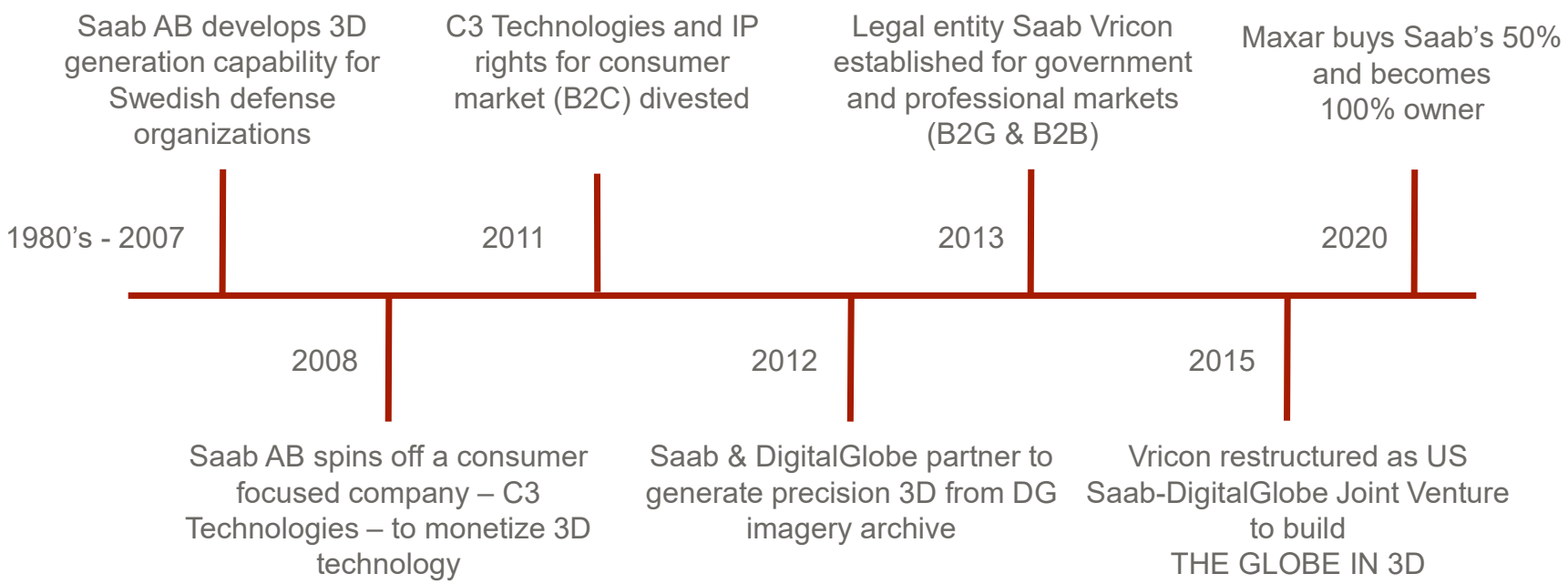
VRICON ORIGINS OF VRICON

A Maxar Company



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MAXAR INTERNATIONAL SWEDEN

MAXAR TECHNOLOGIES

Contribution: The worlds largest and best commercial satellite image archive, >120PByte

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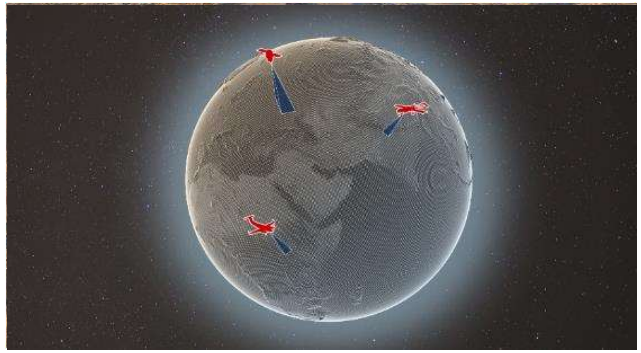
THE GLOBE IN 3D

Office in Linköping, Sweden



~2 000 000 km2/month

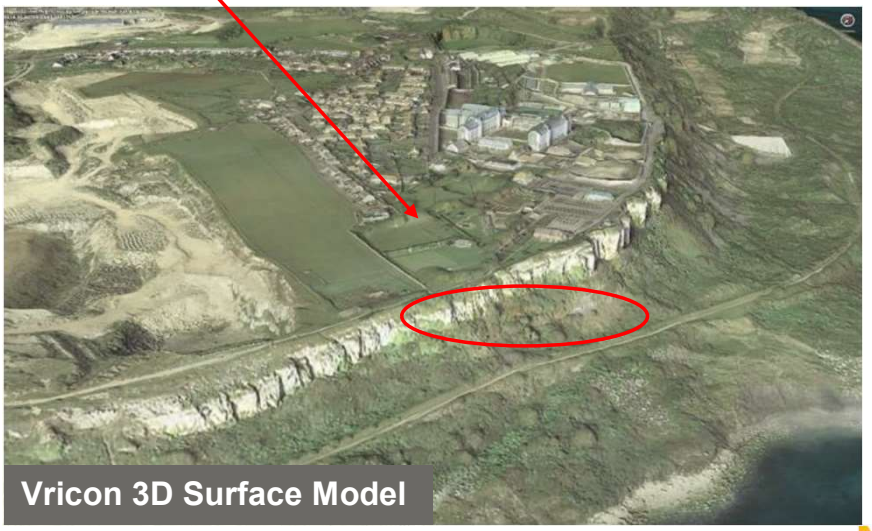
~90 personnel in US
Data production
Marketing and Sales

65+25 personnel in Sweden
R&D
Marketing & Sales Support

WHY 3D?

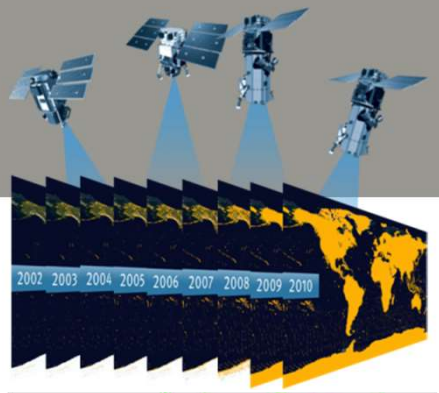
Comparison showing Weymouth, UK, in Traditional 2D, Google Earth, and Vricon

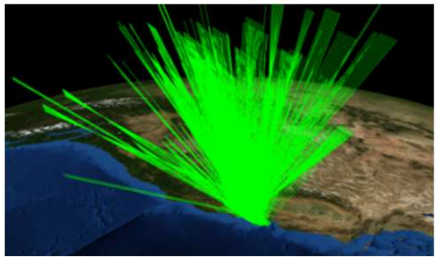
This 35m high wall is not visible in typical lower-resolution datasets.

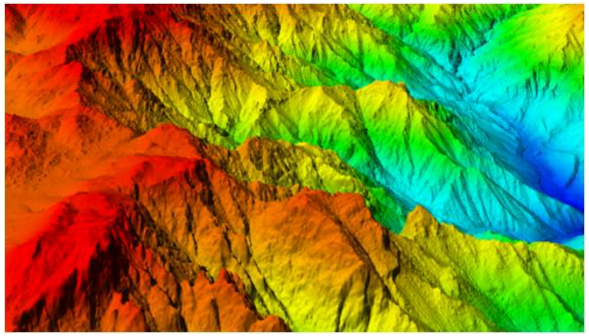


PRODUCTION FLOW

1 Satellite Imagery	➔	2 Vricon 3D Surface Model	➔	3 (optional) Other data products - Vricon DSM - Vricon DSM-10 - Vricon True Ortho - Vricon Point Cloud







Multiple overlapping satellite images from archives	➔	The Vricon 3D Surface Model is produced from: • Multiple overlapping images • A unique stereo algorithm	➔	Other data products can be derived from the Vricon 3D Surface Model

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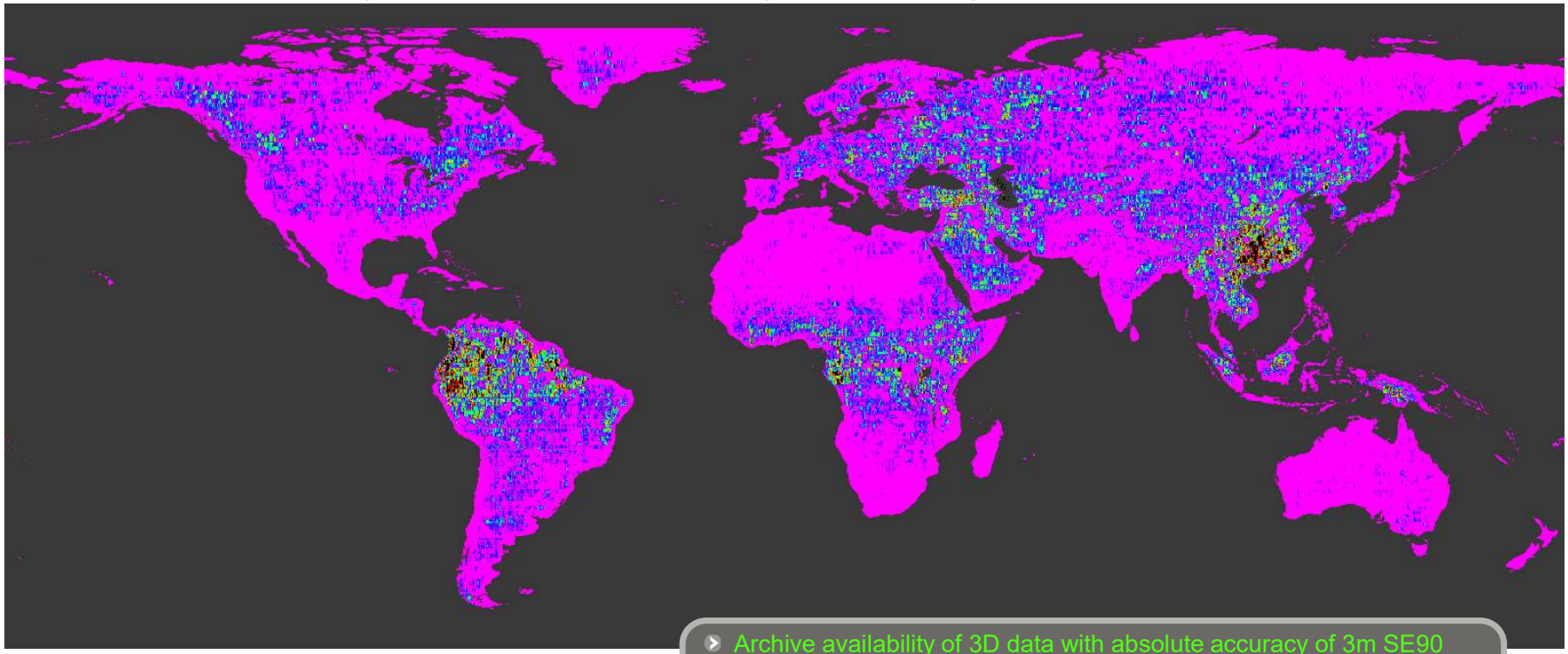
COVERAGE AND ACCURACY

- Absolute accuracy of 3m SE90 (Spherical Error 90%)
- Today (Oct 1 – 2021) ~36 Msqkm
- No Ground Control Points (GCPs) needed
- The accuracy has been independently validated by multiple institutions



- Archive availability of 3D data with absolute accuracy of 3m SE90 (Magenta, Blue, Green)
- More images are needed for 3m SE90 – (Black, Red and Yellow)

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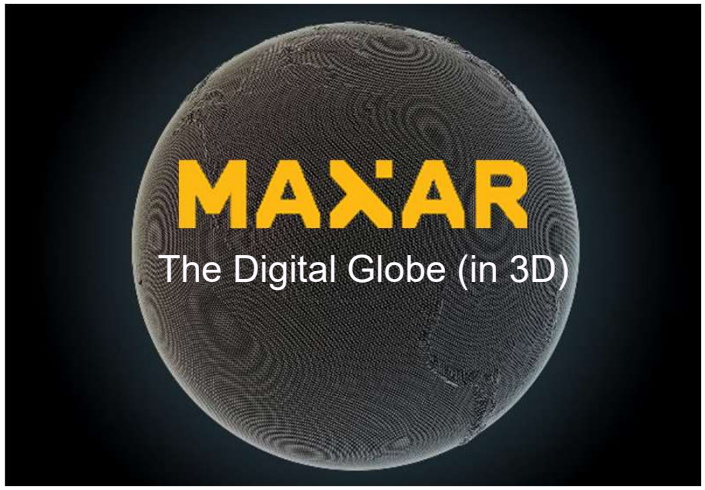
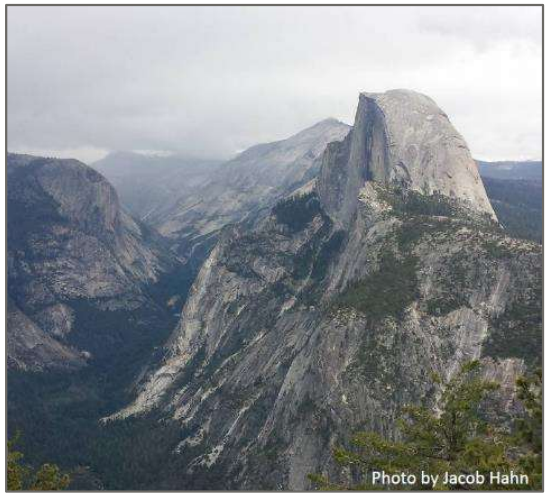
THE GLOBE IN 3D





Advantages

- Absolute Accuracy: 3m SE90
- Resolution: 50 cm
- Consistent global coverage
- Unclassified, Shareable, Interoperable
- Urban/Human level of detail

INNOVATION, PROGRESSION

1. **Unique scalable algorithms** – Patented and proven, sensor agnostic technology resulting from decades of Saab R&D in image processing, navigation and optronics
2. **Massive satellite image archives** – More than 100 petabytes of constantly growing imagery are available now just within the DigitalGlobe archive
3. **High Performance Computing** – Massive computation capacity affordable now
4. **Graphic devices** – Normal computers and handheld devices ready to consume high accuracy 3D data

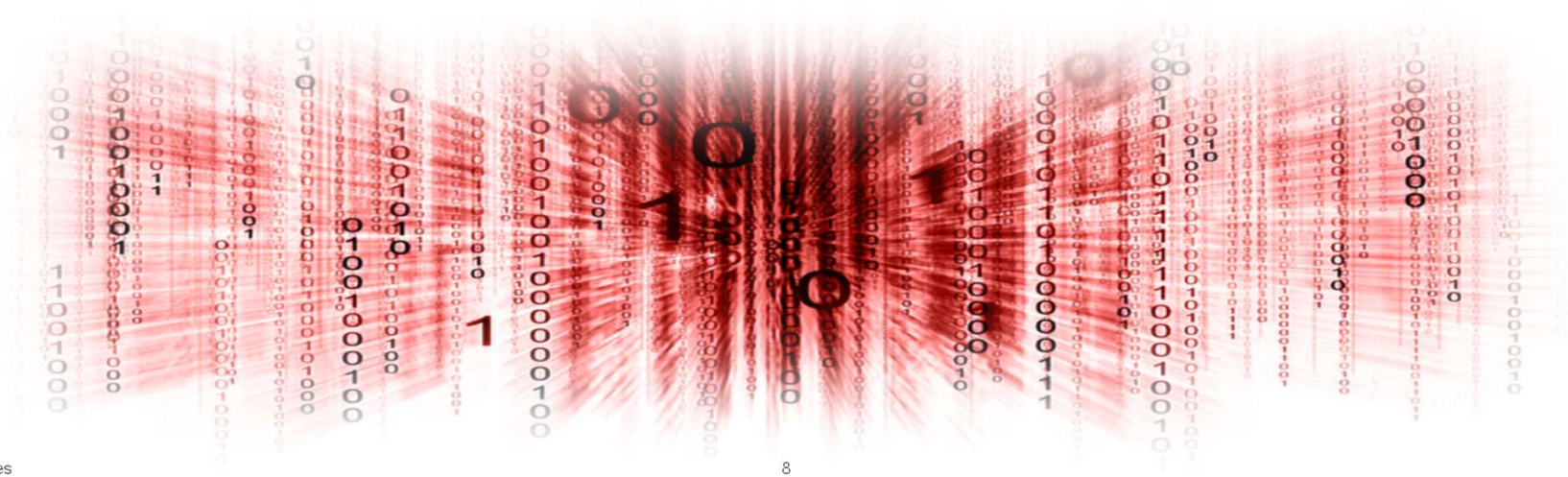


Image source: http://rmsnews.com/wp-content/uploads/2015/06/Big-Data-et-recrutement.png

Precision 3D Registration – In real time

An introduction in P3DR full motion video

Overview:

- Introduction & Background
- Precision 3D Registration
- The real time aspect
- Under the hood
- Optimization steps
- System integration

Oscar Sjöberg

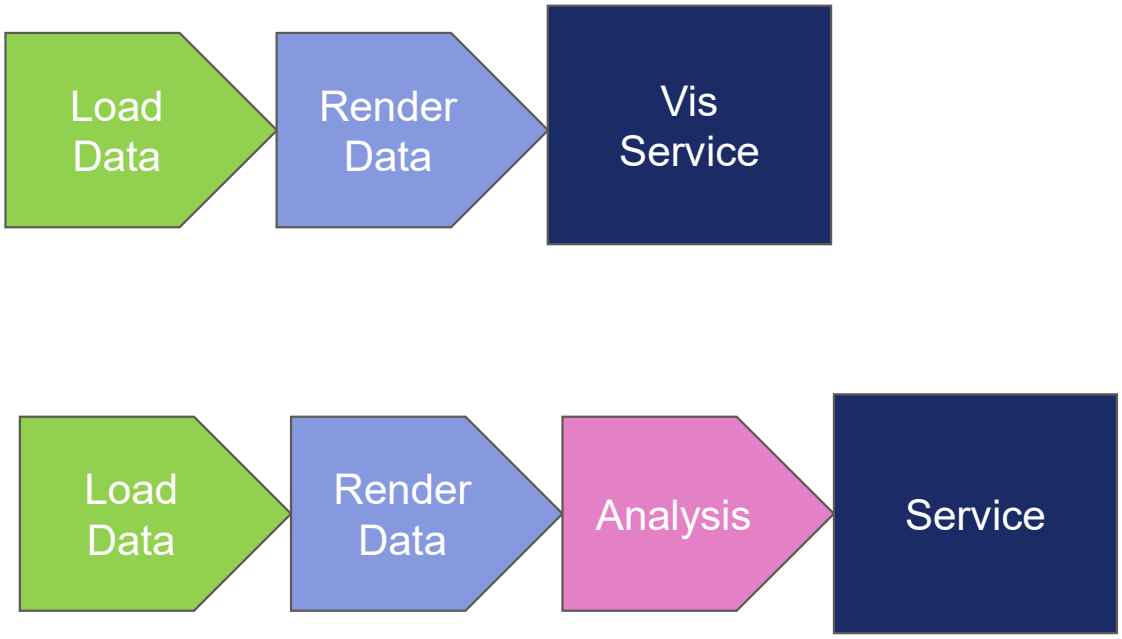
Software Engineer with a focus on computer vision at Maxar

MSc in Engineering, image and signal processing

Intro

- Summer internship and part time
- Started in the Engine team
- Developing the 3d engine for rapid and effective visualization of the 3D data
- Used by SAAB flight simulation 60Hz

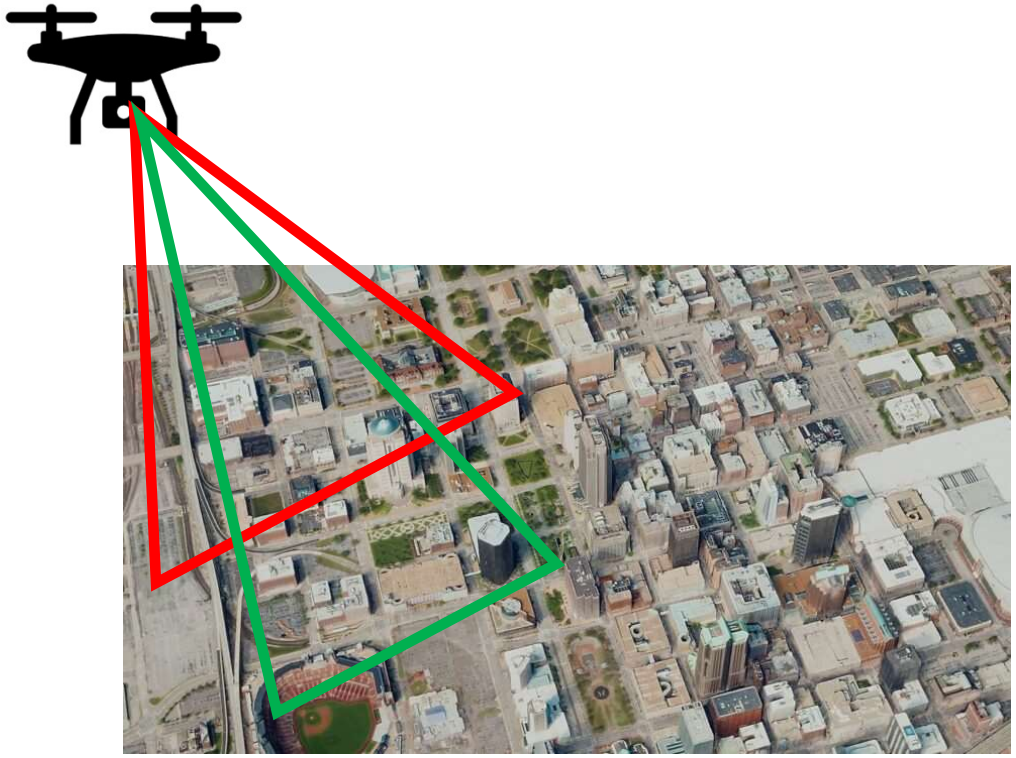
The Soft Real Time Aspect



Precision 3D Registration
(P3DR Full Motion Video)

P3DR

- What is P3DR?



- *Georegister means that the internal coordinate system of a map or aerial photo image can be related to a geographic coordinate system.*

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Single Image Registration

Not registered

Registered

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P3DR Real time aspects

- Maintain a capacity of 30-60Hz
- Latency of 150ms

- If load increases the rendering will be allowed less time to fully render – leads to suboptimal registration.

- Video conference
  - Static scene with few variations
  - Compression is easy

  - Dynamic scene
  - Plenty of compression artifacts

- P3DR
  - Static scene
  - Rendering gets cached

  - Dynamic scene
  - Rendering is suboptimal

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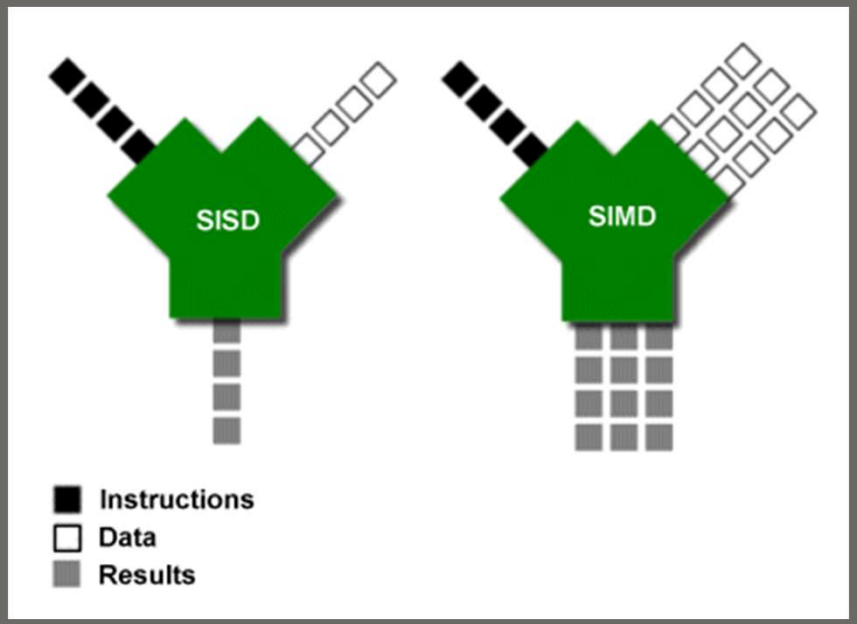
P3DR
Optimization

Image processing in real time systems

- Image handling for streaming services uses specialized hardware for decompression.
- 3D graphics render using GPU

CPU-based:

- Effective async rendering with thread pool
  - Caching previous result
- SIMD for image matching and operations (Similar Instructions Multiple Data)



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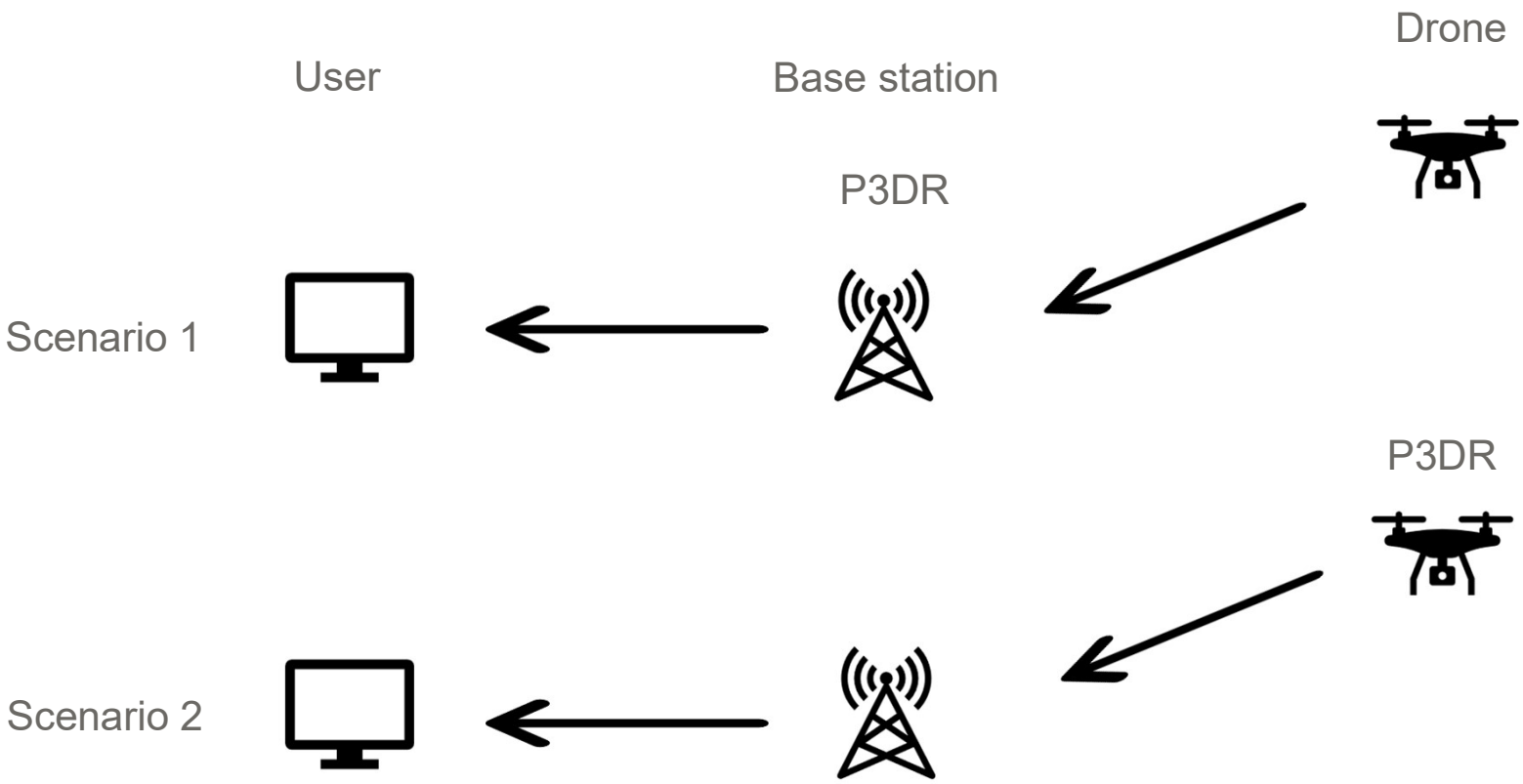
P3DR Video Integration

Use cases



Integration of P3DR

- There is an abundance of drones.
- The associated meta data needs to be of a certain quality.
- How to evaluate how they will work with P3DR?
- Using applications like P3DR, in a non real time scenario.
- Finding inconsistencies in the meta data with regular data analysis.

Questions?