Space Qualification and Reference Design for Myriad 2

Aubrey Dunne, Ubotica CTO

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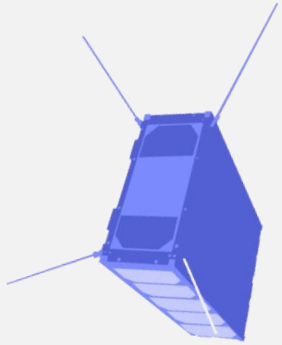
Artificial Intelligence On-Orbit



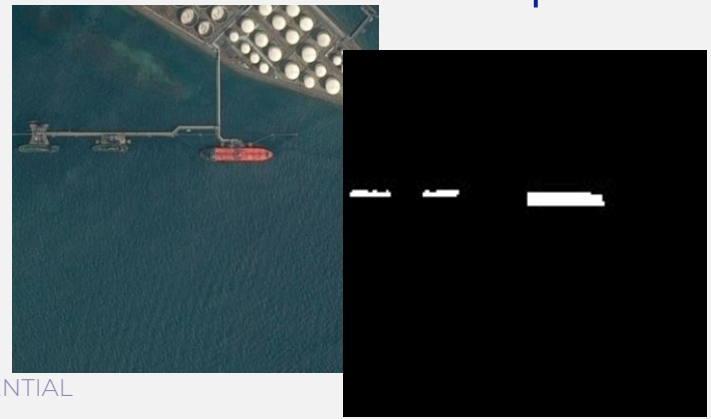
- Artificial Intelligence is transforming terrestrial processing
  - How can smallsats benefit from AI on-orbit?
- Can COTS edge processing be deployed on-satellite to realise AI use cases?
  - Object detection, compression, alert generation…
  - No device of its class previously characterised for space flight

Low-SWaP Solution?

- Myriad family of devices from Intel Movidius
  - 1-2W nominal power envelope
  - Designed for edge CV and AI processing
  - Hardware acceleration

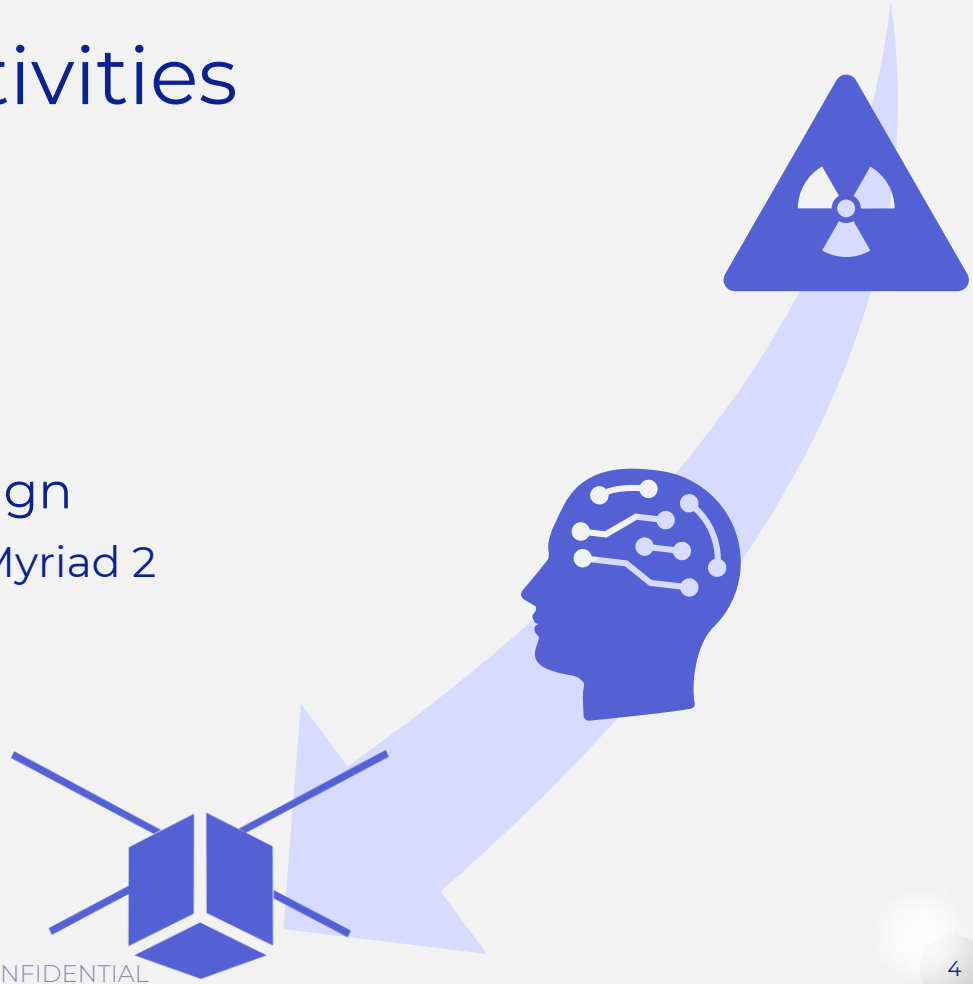
Credit: Intel

- Is the Myriad family a viable solution for AI in space?
  - Test
  - Design
  - Deploy



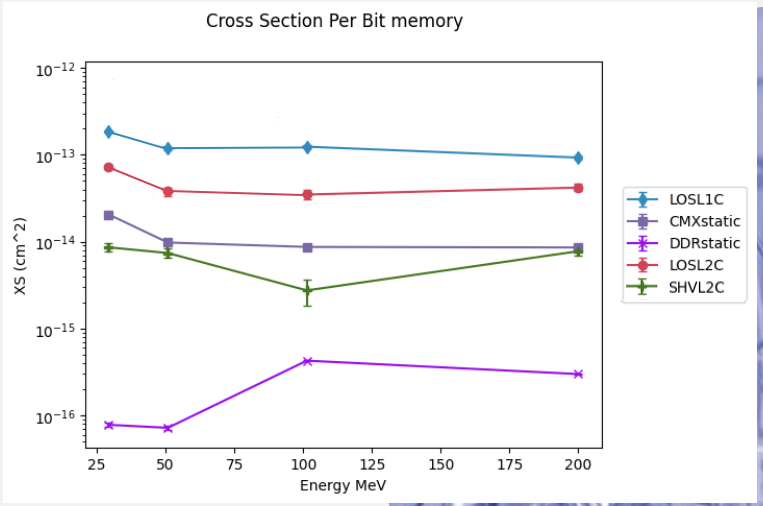
Activities

- Myriad 2 characterisation
  - 2x Heavy Ion tests
  - 1x TID test
  - 1x Proton test
- AI acceleration engine design
  - CogniSatXE built around Myriad 2
  - Software toolkit
- CubeSat deployment
  - Φ-Sat-1
  - MANTIS



Myriad 2 Characterisation

- TID → 49krad
- SEL → no latch-ups
- SEU → cross sections

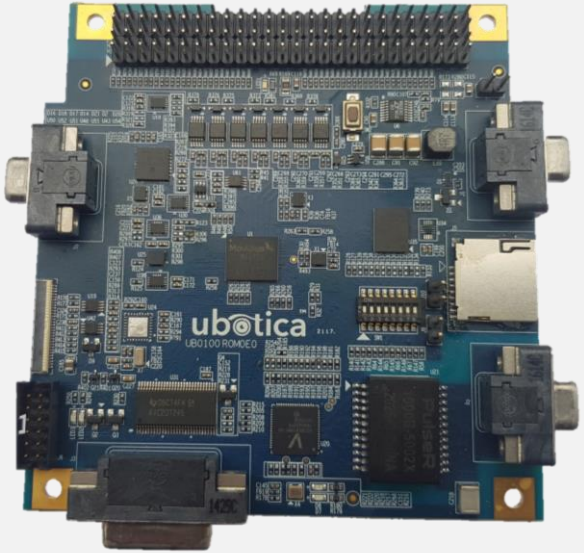


- LEO upset rates (SSO, AP8)

NN Model	Upsets/day
Inception V3	0.76
3 Layer FC	73.10
MobileNetSSD	0.72

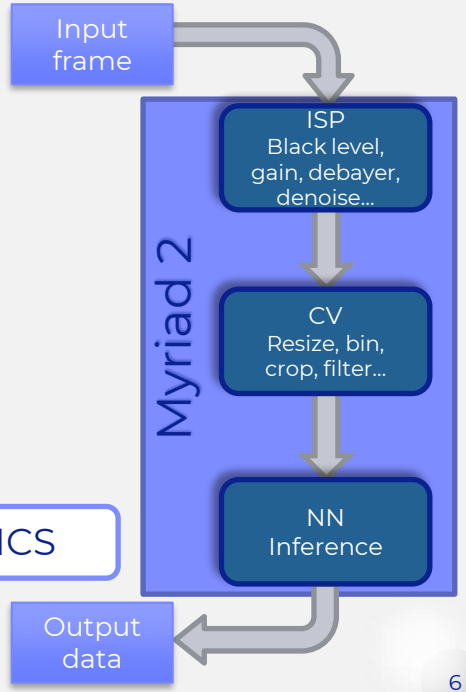
AI Acceleration Engine Design

- Space-grade characterised AI CubeSat solution



CogniSatXE

CogniSatHCS



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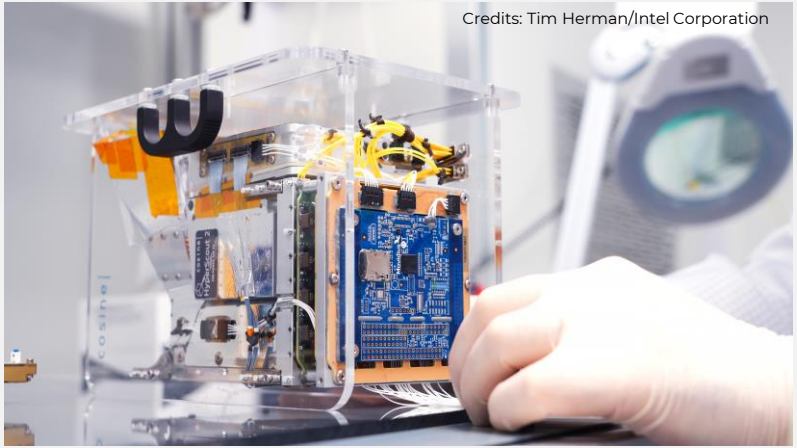
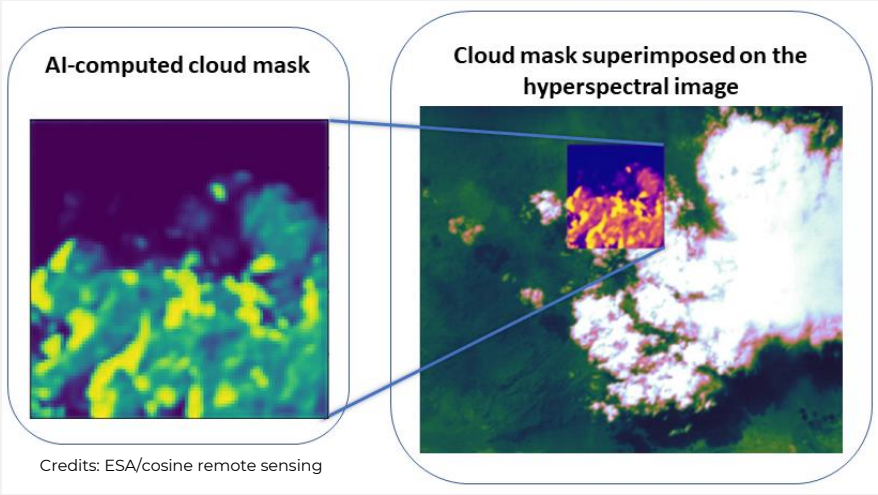
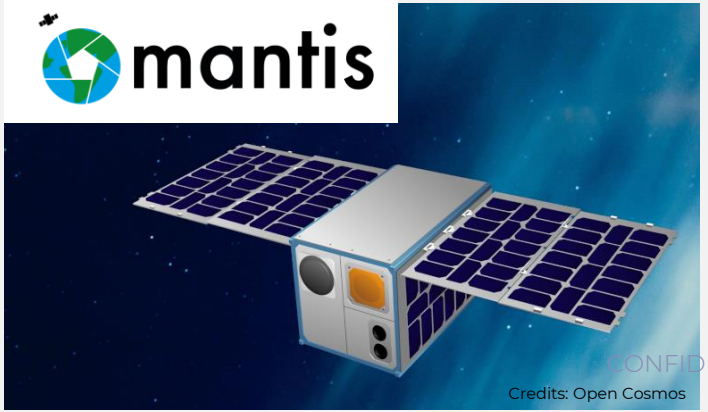
CubeSat Deployment



Credits: Tim Herman/Intel Corporation



Credits: ESA/cosine remote sensing



Credits: Open Cosmos

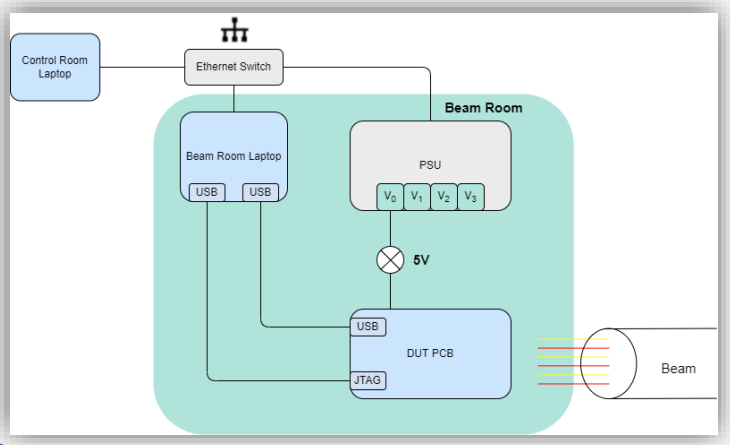
#AI4PHISAT2

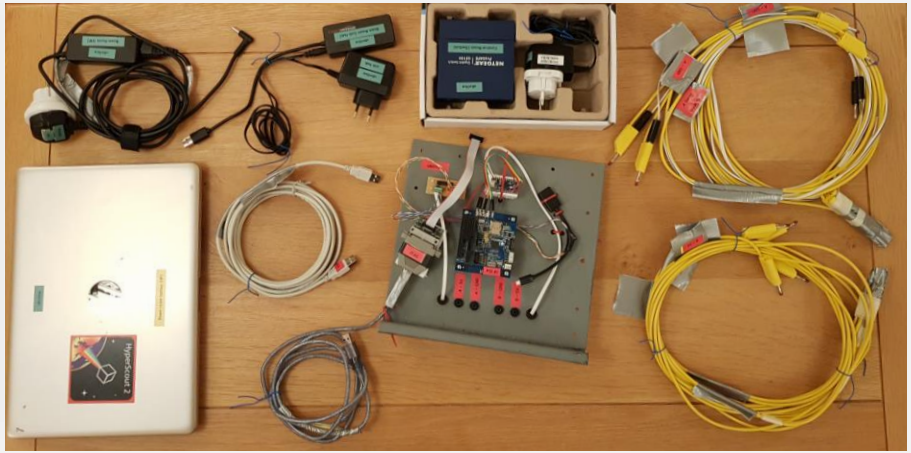
esa AI4EO

A bridge between EO and AI

Lessons Learned

- COTS AI acceleration in LEO was successful
- Complete test coverage for a complex SiP is challenging
- Remote radiation testing is feasible





Next Steps

- Upcoming products
  - CogniSatXE2 next gen acceleration solution
  - CogniSatCam Intelligent Camera
- Partnering to enable low-SWaP intelligence
  - Launch camera provider
  - CubeSat developer
- Partnering to further test AI aspects of Myriad

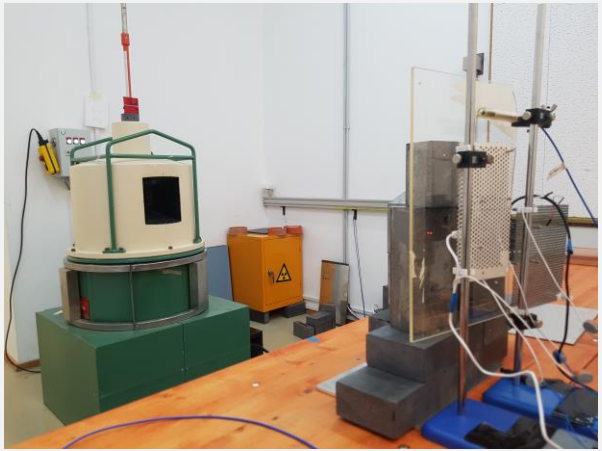
Application Space

- Use cases
  - AI enabled CubeSats
  - Launch vehicles
  - VMC systems
- Commercialisation
  - Platform provider
  - Integrator & Applications provider
  - Real-time insights enabler

Seed funding recently closed to accelerate product range development

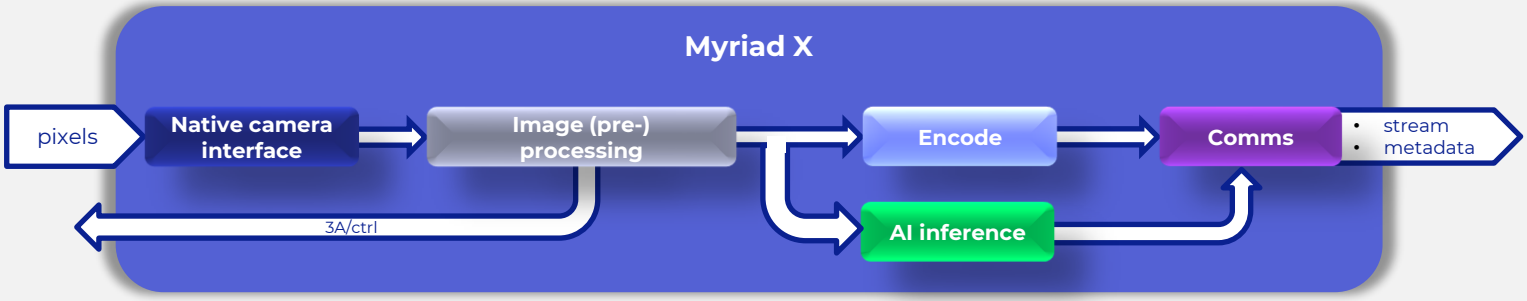
ESA Programmes & Facilities

- De-risk Element 1 co-funded radiation test campaigns
  - GSTP funding contributed to CogniSatXE HW & SW development
- ESA's Co-60 test facility used for TID
- ESA-TEC radiation test expertise
- COVID impact → external testing requirements

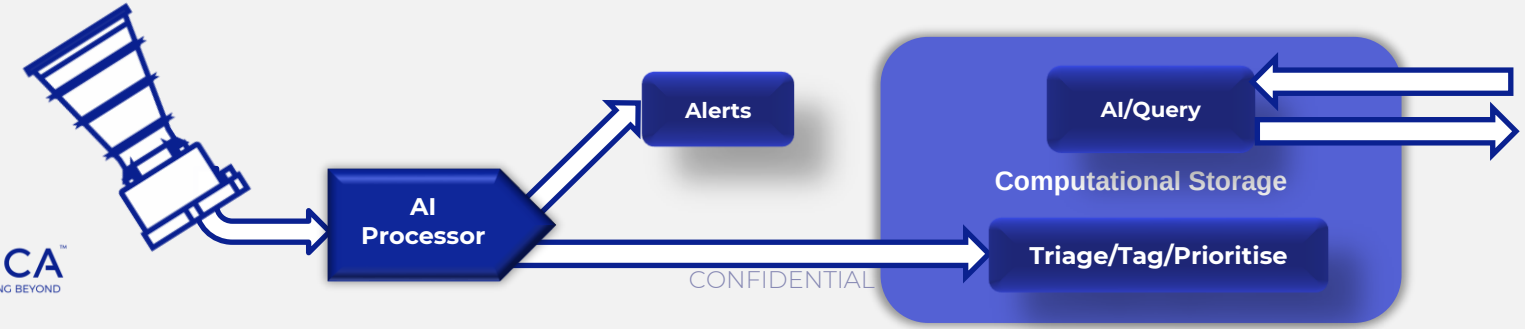


The Future with GSTP

- Intelligent Space Camera (GSTP El. 2)



- Computational Storage with Active Triage (GSTP El. 1)



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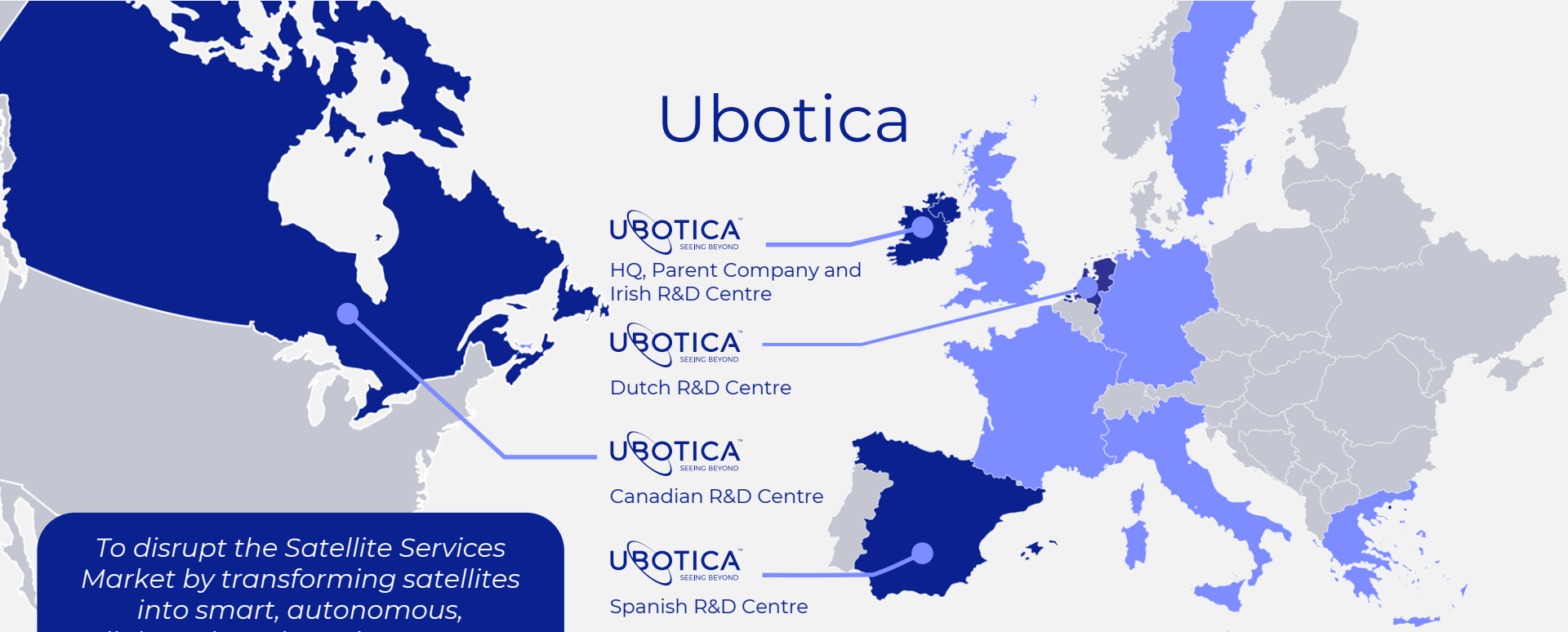

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Thank you!
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