Software Defined Multifunction LIDAR

CEOI Emerging Technologies
Challenge Workshop

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Introduction: QinetiQ

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Introduction: Software Defined Multifunction LIDAR (SDML)
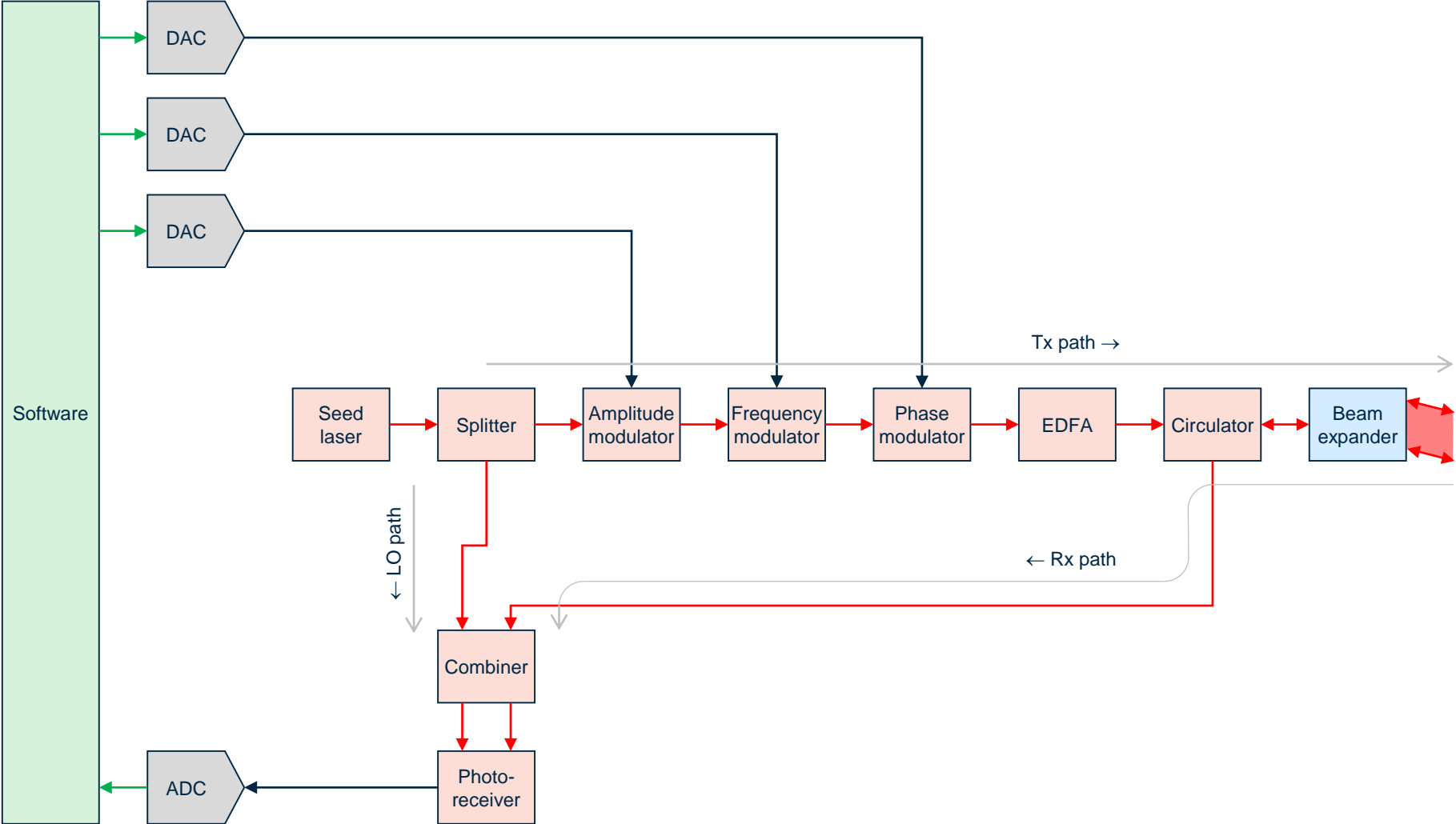
- ## What is LIDAR?
  - Like radar but using light.
  - Many different types:
    - Range finding, 3D imaging.
    - Velocimetry, vibrometry, anemometry.
    - Optical comms, retro-comms.
  - Fundamentally, what discriminates them?:
    - The mod-demod scheme.
    - One or two schemes are 'hard-wired' into conventional LIDAR systems.

- ## What is SDML?
  - Mod-demod abstracted into *software*.
  - Switch between sensing modalities at run time.
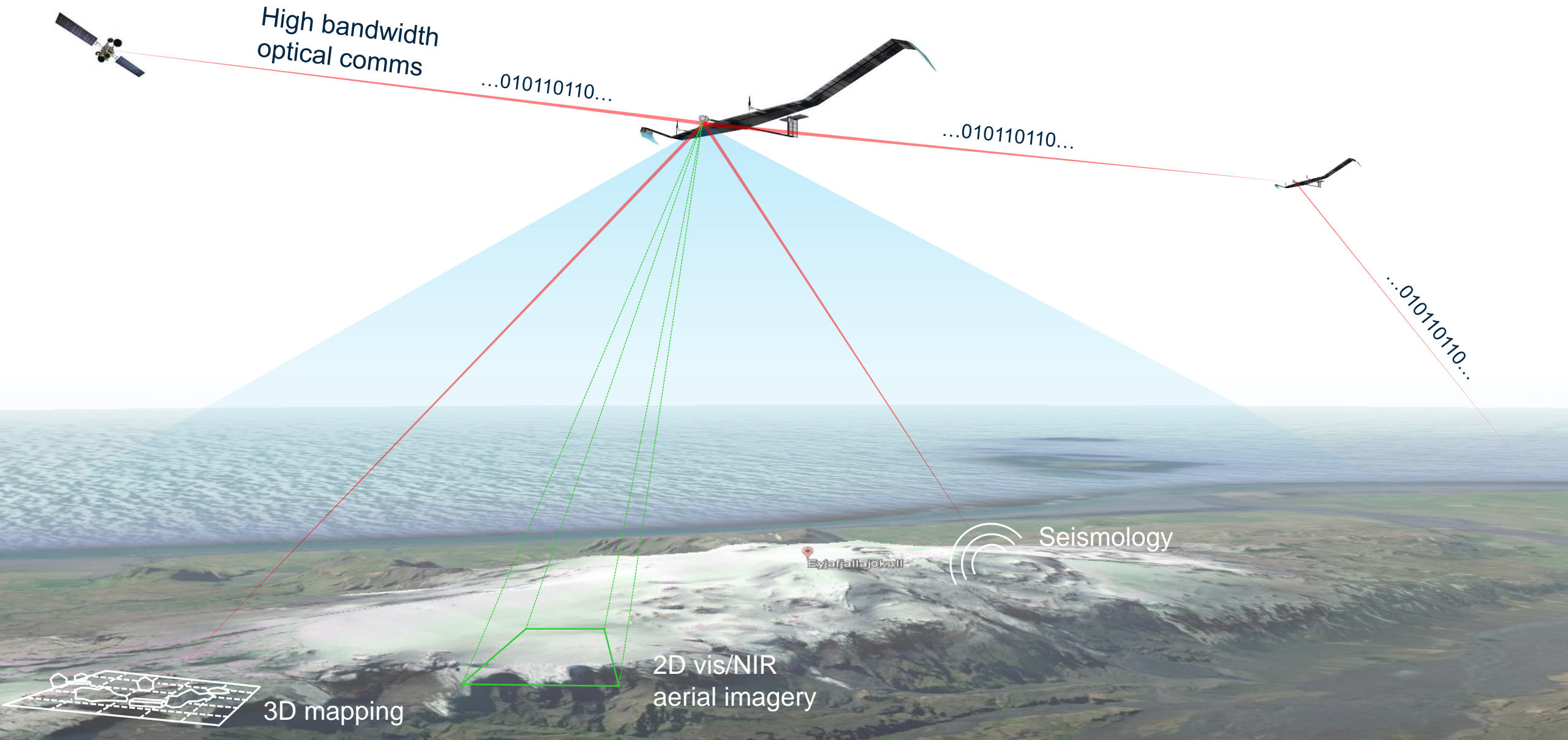 - Allows *many modes in a single payload*.

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Introduction: Software Defined Multifunction LIDAR (SDML)

SDML: Earth Observation Capability

Sensing Mode	Application Examples
3D imaging/mapping.	Mapping, planning, biomass monitoring, precision agriculture, disaster/damage assessment.
2D vis/NIR imaging	Conventional aerial imagery, NDVI imagery.
Vibrometry.	Stand-off seismology.
High bandwidth covert optical comms.	GBit+ covert, secure, bidirectional comms.
Retro-comms.	Comms 'tags' for unattended ground sensors.

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SDML: Earth Observation Capability

High bandwidth optical comms

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Seismology

Eyjafjallajökull

2D vis/NIR aerial imagery

3D mapping

SDML for High Altitude Pseudo Satellites (HAPS)

SDML for HAPS

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ARLOESIADAU
glyndŵr
INNOVATIONS

+

AIRBUS
DEFENCE & SPACE

HAPS payload design advice and environmental testing.

=

2 x flight capable SDML payloads

Demo: covert, secure high bandwidth optical communications

ARMY

JOINT FORCES COMMAND

ROYAL NAVY

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SDML: Proof of Principle

Satellite image: Google

video

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Summary

- **SDML is real:**
  - Funded, current development programme.
  - Flight hardware deliverables.
  - Flight trials ~2021.

- **Access to missions / mission enablement / science enablement:**
  - SDML + HAPS offers persistent sensing (high-volume data collection).
  - Optical comms mode offers high-volume data egress.
  - HAPS a stepping stone to space-based SDML?

- **Science enablement:**
  - We invite the scientific community to engage!

- **Commercial:**
  - Optical comms for delivery of internet services into infrastructure-poor regions.
  - Commercial of 3D/2D imagery products.

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