CLUTCH SPACE SYSTEMS

SOFTWARE DEFINED MULTI-STATIC RADAR SYSTEM FOR SSA

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CONTENT

CLUTCH SPACE OVERALL CAPABILITY

SCALABLE GROUND OPERATIONS

- ✓ Automated constellation management and mission planning systems for SoC and MoC operations
- ✓ Visualised dashboards for directing attention and large scale monitoring

SOFTWARE DEFINED GROUND STATIONS

- ✓ Provide entry level turnkey ground stations
- ✓ Can be rapidly deployed to solve redundancy issues
- ✓ Remote installation

DIGITAL ANTENNA SYSTEMS

- ✓ Introduce flexibility to the network
- ✓ Enables connection to multiple satellites
- ✓ Push more variability and local configuration

WHO WE ARE

- Formed in 2018, worked together since 2012
- UK Based – Surrey Research Park with Airbus, SSTL, BAE Systems
- Formed in 2018, worked together since 2012
- Delivered multiple successful LEO and EO missions for Airbus/ SSTL in previous roles
- Strong systems and commercial experience

Martin Philp
CEO

Over 30 years in Broadcasting, Robotics, SaaS Business – Airbus/SSTL

Vladimir Ten
CTO

15 years in systems engineering, Successful LEO/EO missions with Airbus/SSTL

Melanie Redding
NED, CHAIR

Global NED Roles, Secured £1bn contracts in satcoms, defence & security background

Ricky D'Costa
BD Manager

Multi-disciplined background in technical sales and marketing – Airbus/ NPL

OUR CUSTOMERS

Defence & Security

Ministry of Defence

INTERNATIONAL SPACE PITCH DAY

[dstl] The Science Inside

ROYAL AIR FORCE

Commercial EO/ Remote Sensing

SATELLITEVU

deimosimaging an urthecast company

urthecast

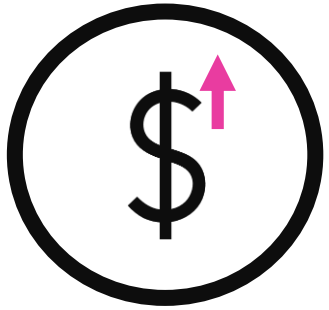
Space Institutions

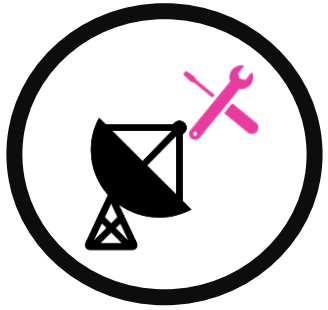
esa

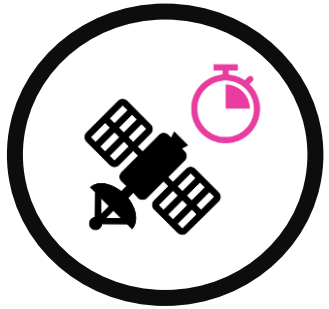
UK SPACE AGENCY

PROBLEMS WITH SATELLITE OPERATIONS

1. High cost of ground operations to set up, maintain and use
2. Command and Control only for an hour a day in LEO
3. Inability to instantly access a satellite in low earth orbit







CLUTCH SPACE SOLUTION

Developing a global ground station network to enable persistent communication

Traditional Space

- Hardware centric design
- Single Mission/Satellite
- Slow to Progress
- Very Expensive to Scale

Clutch Space Systems

- ✓ Persistent and constant communication
- ✓ Dynamic & Scalable & Adaptable
- ✓ Rapidly Configurable & Re-configurable
- ✓ >80% lower purchase & operating costs
- ✓ Moving with industry from CAPEX to SaaS

Going from 'dial-up' to 'broadband' for Satellite Operations

CLUTCH SPACE SOLUTION

Legacy Architecture

Ground Station Equipment List

- Downconverters and upconverters
- RF switches
- Signal generators
- Proprietary data and signal handling modules
- Modulators and demodulators
- Network switches and routers
- Servers and workstations
- Antenna
- Motorized antenna mount

- **Needs Planning Permission**
- **Weather Tolerance**
- **Maintenance and Upkeep**

Clutch Solution

Reduces list to 3 elements

- Digital antenna system
- No moving parts - like a TV aerial
- Power and cloud access to software defined back-end

90% reduction

in hardware and operating costs

SOLUTION FEATURES

1. Single virtual antenna user interface with global visibility
2. Planned network of hundreds of antenna sites
3. Thousands of satellites can be handled simultaneously
4. Compact and static design – can be mounted on any rooftop – smaller than an aircon unit!

Fig. Visibility region becoming larger as more ground stations are deployed and visibility cones overlap.

Software Defined

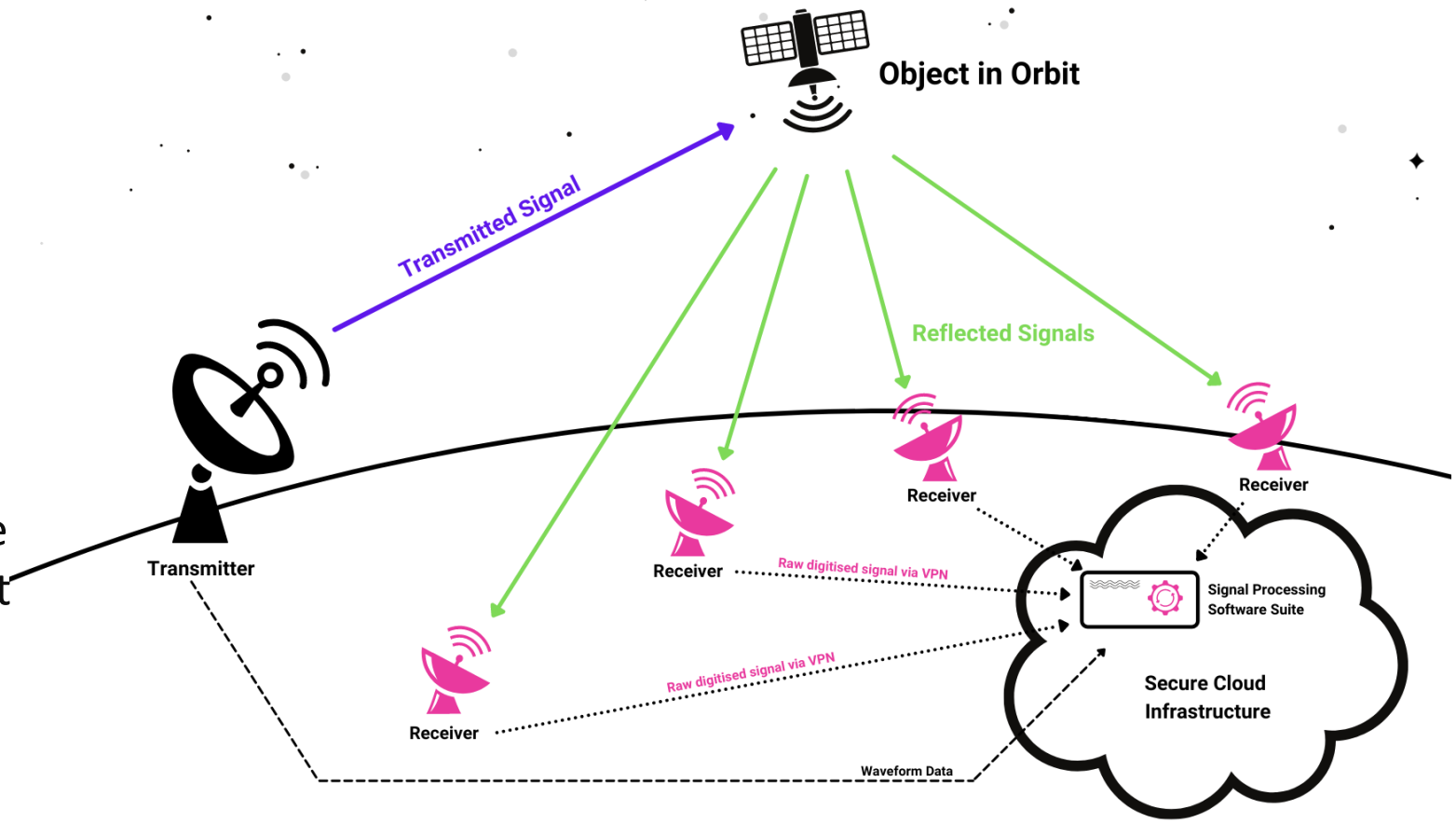
Multi-Static Radar System

for Space Situational Awareness

INTRODUCTION - ARCHITECURE

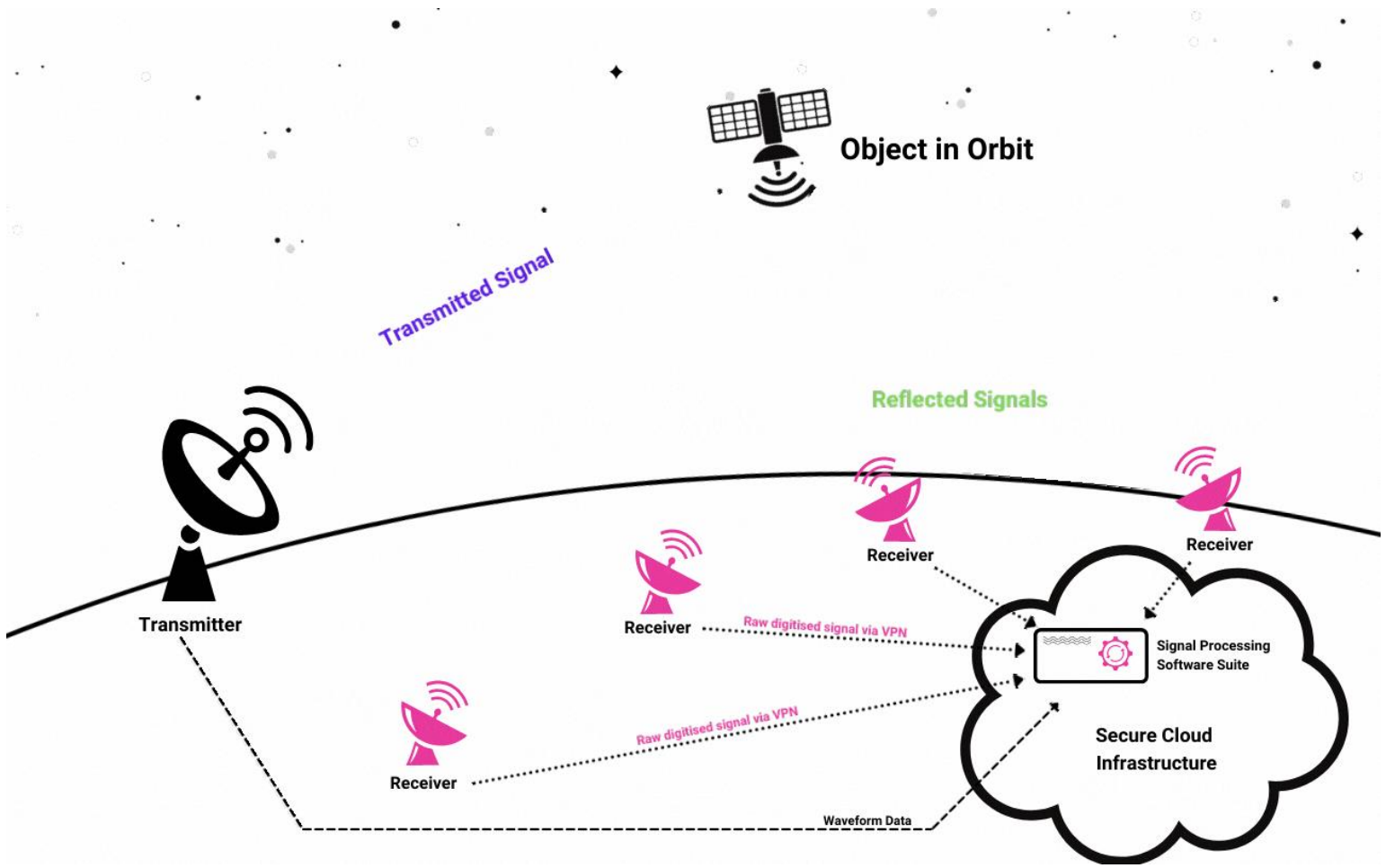
Multi-Static Radar Architecture

- Consists of one or more transmitter stations
- Multiple receiver stations spread over a large geographic area
- Receiver stations are powered by Clutch software defined backends and smart antenna system



HOW IT WILL WORK

- System will use multiple cost effective smart antenna systems as receivers
- A transmitter transmits continuous/pulse RF waveforms at a satellite in LEO
- Reflected signals are picked up by multiple receivers
- Raw received signals will be aggregated and processed in cloud boosting the SNR and enabling observation aspect diversity



SYSTEM BENEFITS

Acquire LEO positional and other characterisation data efficiently and accurately

Estimate more advanced information of an object regime in LEO, including operational status and attitude modes

Receiver smart antennas and overall system is **low cost, flexible, easy to deploy and operate** thanks to utilising CSS proven software defined backend

Software defined architecture **enables connectivity, syncing and post processing in the cloud** or in private server

DEVELOPMENT STAGE

TIMELINE

Partners for SSA
related operations (NORSS) and transmitter facility (Chilbolton – RAL SPACE) has been selected

6-8 Months
Plans for demo batch production and manufacturing process in place

Present
Software defined digital antenna systems currently in TRL 4

10-12 months
Early customer engagement to refine solution

End of 18 Months
Demonstrate a network of 3-5 receivers with whole system at TRL 5

END USER PULL

Massive implications for Defence and Government

- ✓ Ability to efficiently identify accurate locations at any time of observed LEO object
- ✓ Understanding current attitude regime and potentially current state of a satellite
- ✓ Monitoring military space objects more comprehensively than ever before
- ✓ Ensuring operators are complying with UKSA's licensing requirements
- ✓ Providing large amounts raw recorded data for R&D at Dstl

THE ASK

- Looking for early stage customer engagement between Q1-Q2 2022
- Further collaboration with partners in SSA and satellite operations
- Seeking funding opportunities for further development and R&D activities

TALK TO US

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