

# The Perspective from ESA/ECSAT: Achievements, Challenges and Opportunities

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# Inauguration of ECSAT 9<sup>th</sup> July 2015



European Space Agency



# A New Beginning for ESA in the UK...



ESA UNCLASSIFIED – For Official Use

agency

...based on a strong heritage of the UK in ESA



Agency



# ESA and external events are now being hosted at our ECSAT conference facility



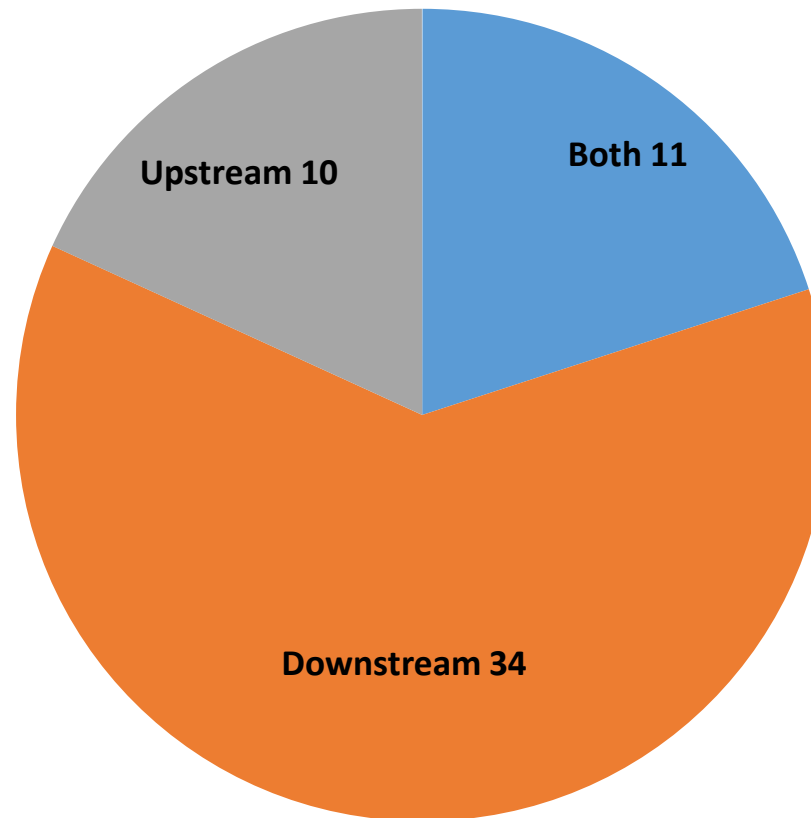
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# Space related organisations at Harwell

Six years ago there were six space related entities on campus: now there are 55.



## Upstream and Downstream Organisations at Harwell

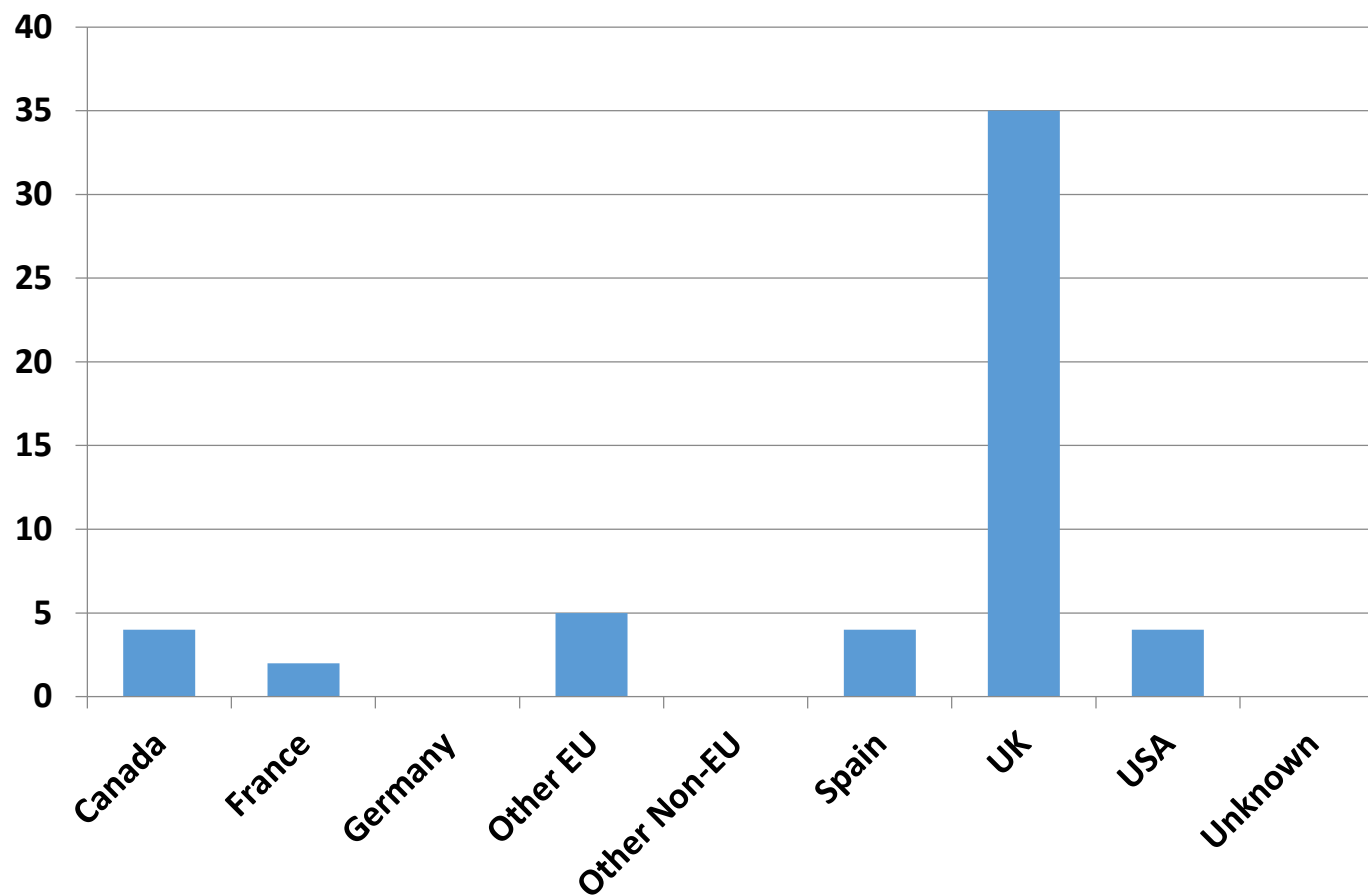


# Space related organisations at Harwell by country of origin:

40% of the newcomers are from outside the UK



**Number of Space Organisations at Harwell by Country of Origin**



## Diversity in activities

- Telecommunications
- Integrated Applications
- Earth Observation
- Exploration
- Technology
- Business Incubation



## Specific identity

- Development of commercial space based products and services
- Development of downstream applications
- Spin-out and spin-in

## Gateway to rest of ESA, Europe and UK

- Bringing ESA to the UK
- Bringing the UK to ESA



# ESA Climate Office

## International Climate activities



### Formal International Roles



- Chair, WG Climate
- Carbon Task Force
- WG CalVal



- Chair, Science Committee



- Carbon Flagship
- Forest Observations



- Cross-programme secondment

Space Agency Liaison on Climate -  
NASA, NOAA, JAXA, USGS, CNES,  
DLR, UKSA, ASI, CSA

### Advisory Roles



Data  
Advisory  
Council

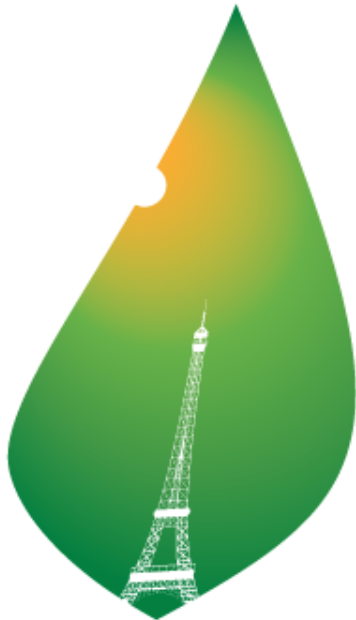


Copernicus  
Climate  
Change  
Service



Data and  
Applications  
Advisory  
CCI liaison

CCI Climate Science  
Advisory Body (GCOS,  
WCRP, TOPC, GTOS,  
ECMWF, FAO, JCOMM)



**PARIS2015**  
CONFÉRENCE DES NATIONS UNIES  
SUR LES CHANGEMENTS CLIMATIQUES  
**COP21·CMP11**



### ESA Climate Office Events in Paris during COP21

#### Blue Zone

- ESA Booth showcasing CCI

#### Grand Palais

- Climate Change Visualisation Tool
- Public Event with EOP speaker, P. Lecomte

#### Palais de la Découverte

- ESA/CNES: My Planet from Space and Climate Change

#### 7<sup>th</sup> Arr Town Hall

- Space for Climate

# ECSAT and Robotic Exploration: Particular angles on big stories like Exomars



## Key Enabling technologies:

**Autonomy**

**Nuclear Power Systems**

**Sample Curation**

Simulation and Modelling

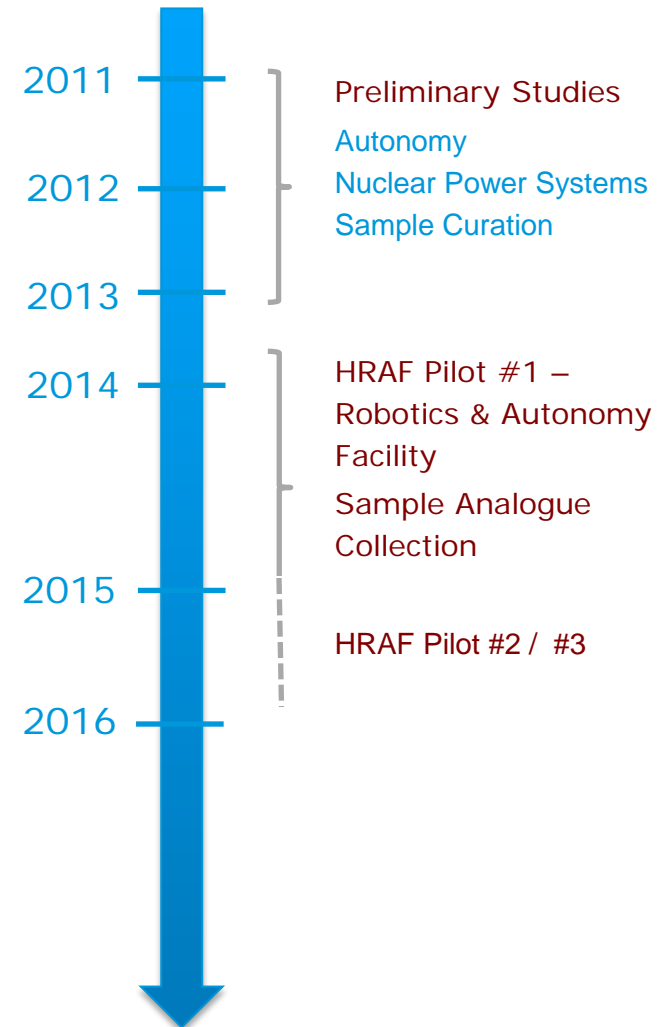
Field trials

Virtual engineering lab

Data Archiving

European networking

Harwell Robotics and Autonomy Facility



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ESA BIC Harwell managed by STFC Innovations offers a comprehensive business support package:



Over £40,000 for intellectual property (IP) protection, design, prototyping and market studies



Office space and access to shared facilities



Hands-on business development support



Up to 40 hours of technical support from STFC

Up to 80 hours access to I-TAC facilities

# ESA BIC Alumni



# ARTES Programme (Advanced Research in Telecommunications Systems)



**Industry  
competitiveness  
support**



**Public-Private  
Partnerships**



**Applications &  
capabilities  
build-up**





# Quantum: a Public Private Partnership between ESA and Eutelsat /Airbus D&S



Satellite launch mass: 3.5 tonnes  
Lifetime: 15 years  
Payload power: 5 kW  
Payload mass: 450 kg

Quantum developed by a core team:  
Airbus Defence & Space (UK) as the satellite and  
payload prime;  
SSTL (UK) for the platform; plus  
Airbus Defence & Space (formerly EADS CASA  
Sp), Space Engineering (IT) and others

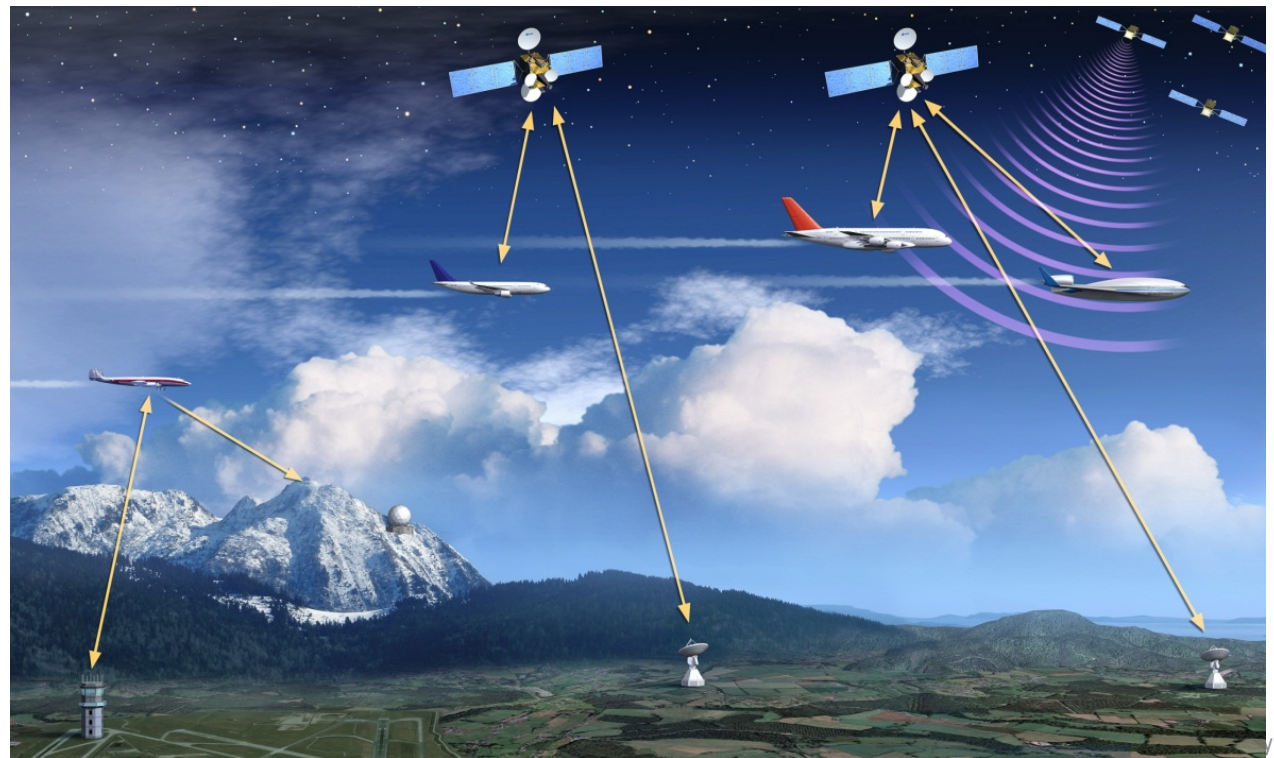
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# Three PPPs have been contracted from the subscriptions at C-Min 14: There is clear opportunity for more



ICE Phase 1: First tranche of Phase 1 signed with **Inmarsat** at the UK Space Conference in Liverpool

Plus ongoing development of Iris aeronautical safety precursor services



# Plenty of contracts for new PPPs: but what do they mean in practise?





# Comments on what Quantum means, by Michel de Rosen, Eutelsat CEO



- “the contract signature is a defining moment for the commercial satellite industry”
- “rewriting the rulebook on how satellites are designed, built and operated”
- “A game changer from a commercial perspective... clients want Reach and Flexibility”
- “for the first time a satellite can go anywhere in orbit; in a matter of minutes we can redefine the services we offer”
- “constantly able to adapt to our clients’ needs, instead of asking them to adapt to our satellites”.

# Comments on Indigo by Stephen Spengler, Intelsat CEO



- “ESA has recognised the need for continual development in innovation throughout the satellite ecosystem.”
- “Project Indigo and ESA support... gives us the opportunity to develop and add new features... using the full power of Intelsat EPIC, we can deliver new services across multiple markets.”
- “None of this would be possible without the support of ESA... PPPs drive technology innovation and develop thought leadership.”
- “Working together we will... secure our collective position in the global communications landscape, open new markets and create jobs and economic growth.”

# Support programmes for developing Satcom products & services



**TRL 0-2**

Tech. gaps identified  
Feasibility studies

**TRL 3,4,5**

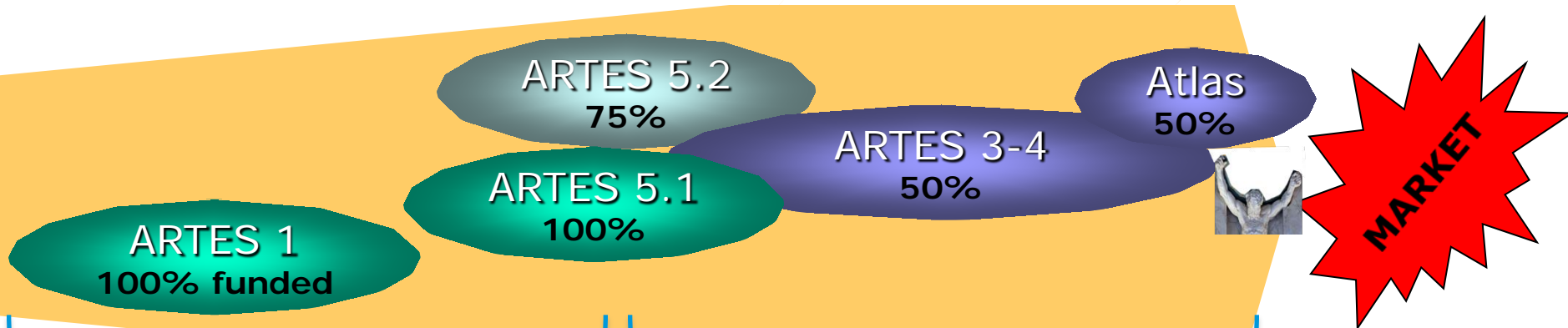
BBs, EMs, Prototypes

**TRL 6**

EQM, Qualification model

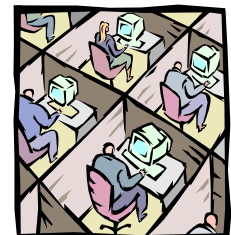
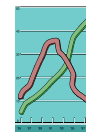
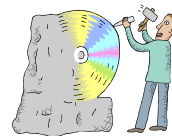
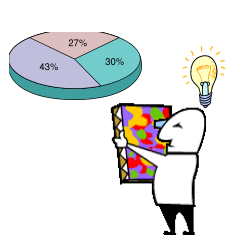
**TRL 7,8,9**

PFM, FM  
Space proven, heritage



**ESA driven (100% funded)**

**Industry driven  
(co-funded, business case)**



**Market Dev.**

Study

Development

Demo

Content Dev.

Deployment

Op. Service



# Support programmes for developing applications and services



## ARTES 20 Integrated Applications Promotion (IAP) *(using multiple space assets e.g. Satcom, Satnav, Earth Observation)*

## ARTES 3-4 Satcom Applications *(Capacity Building, Distance Learning, B2B/B2C, Telemedicine, etc.)*



The aim is to establish operational and economically sustainable services!

ESA funding is mostly 50%:  
industry and users contribute the other 50%,  
which helps ensure the services are sustainable.

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# Agreement signed between ESA and Seraphim Space & Special Situation Fund



## **>£80m VENTURE FUND**

Funded via British Business Bank (£50m)

Space Industry Corporates (+£10m)

HNWI's to invest the balance

## **ADVISORY BOARD**

Drawn from investing Space Corporates

Establish 8 long term investment themes

Assistance with Due Diligence

Help to identify suitable NEDs

## **EXPERIENCED FUND MANAGER**

Broad investment horizon – Space Eco-system

Target portfolio size 20-25 companies

Initial £1-2m investments, up to £12m per company

Minority stakes in A round opportunities

Spin-outs from (space) corporates

Pro-active management - seat on all boards

Fund appoints Chairmen and NED's

Exits period typically 5-7 years

“ESA teams up with venture fund” (Financial Times, 10/8/15)

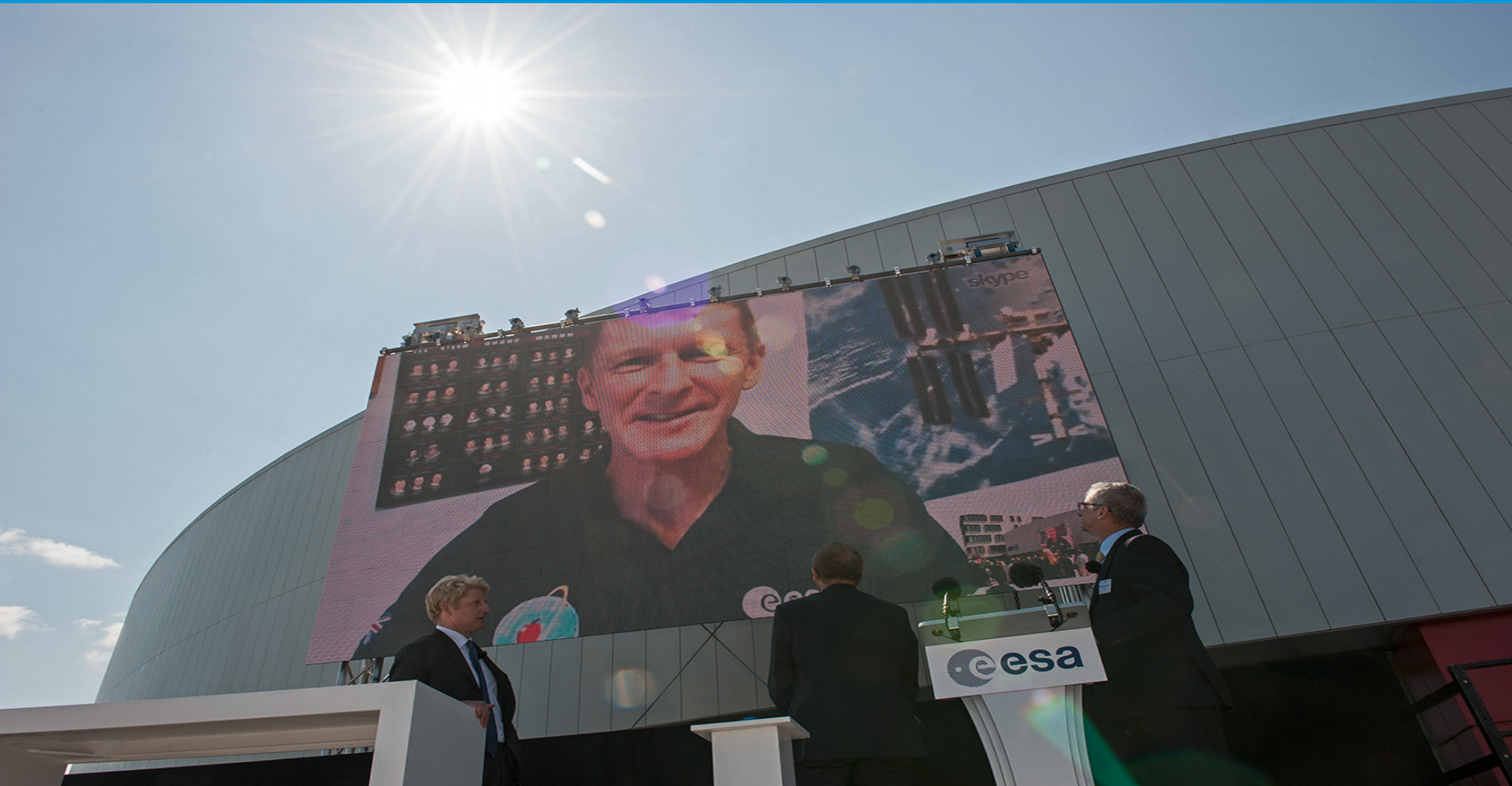
# Opportunities for 2016: The new Advanced Manufacturing Lab



3D X-ray CT equipment (above)  
and EOS 3D printing machine  
(right), to be used in the Lab



# Challenges & Opportunities for 2016: Capitalise on Tim Peake's mission





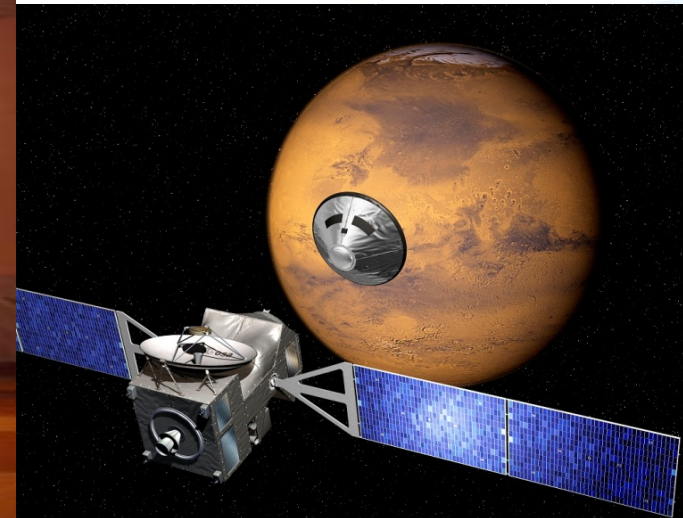
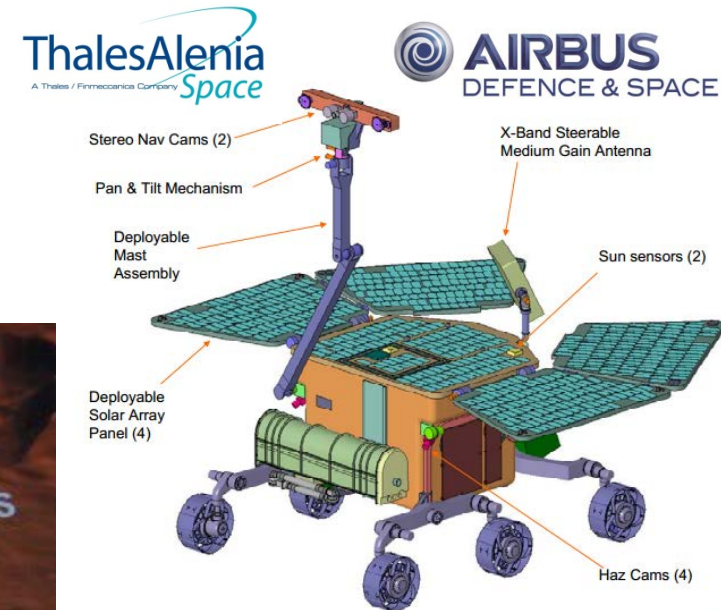
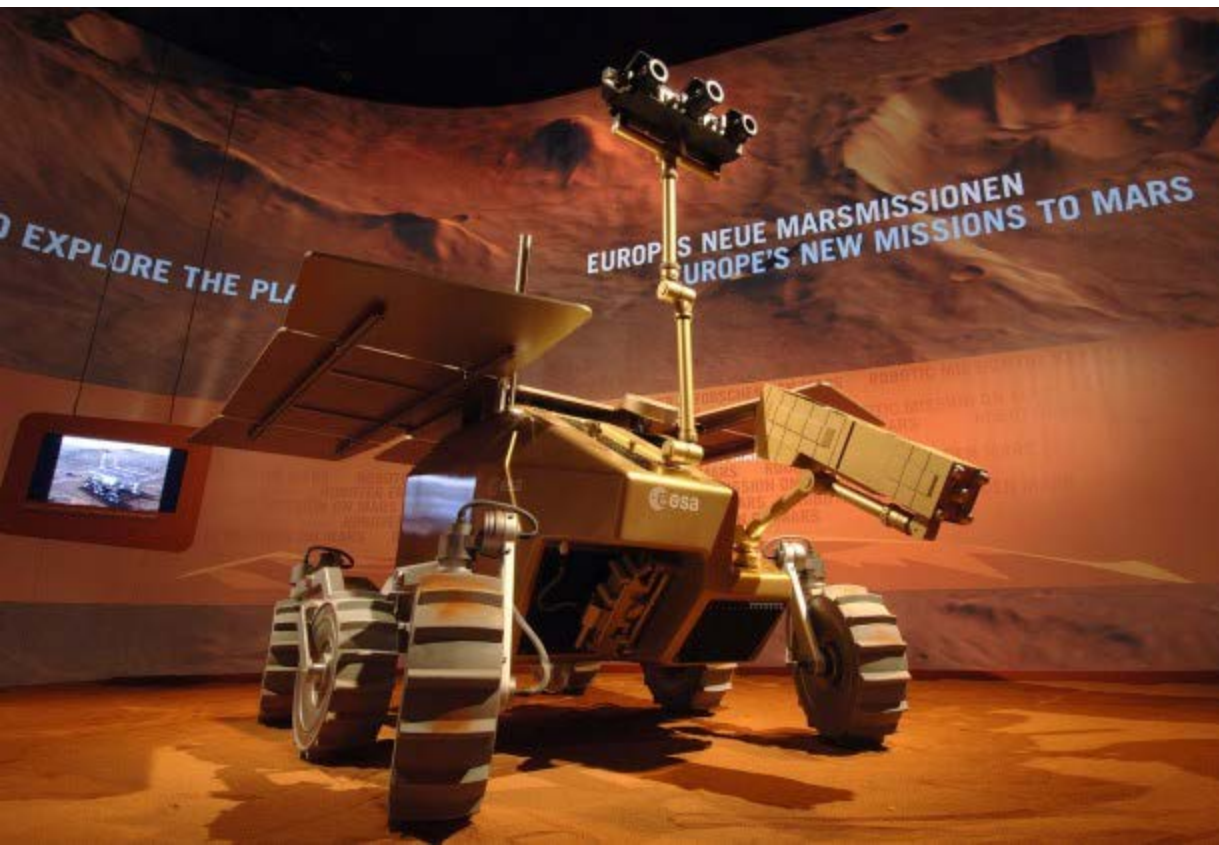
# Opportunities for 2016: A UK ESA Director in charge of the whole exploration programme



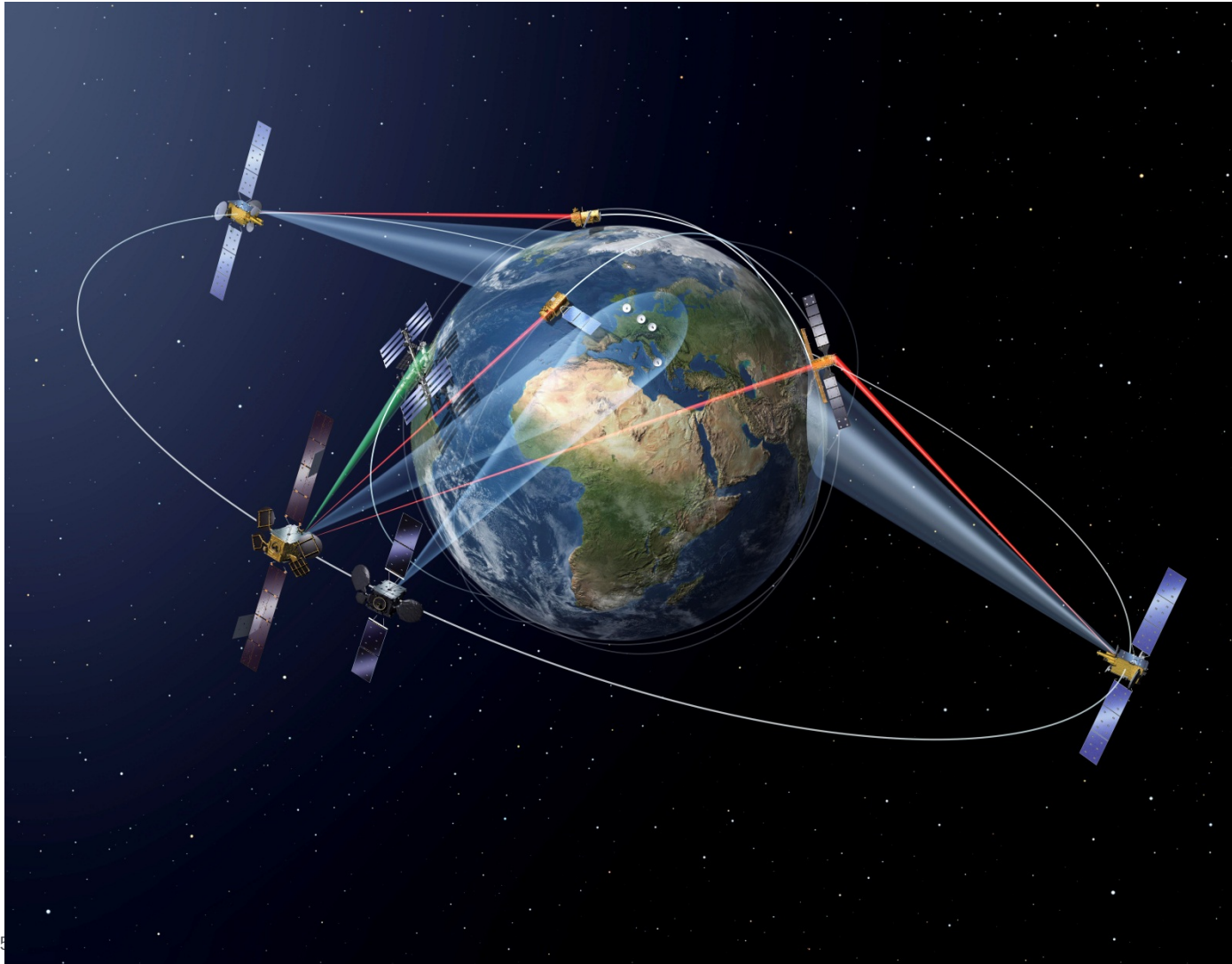
# Challenges and Opportunities: how to apply robotics & autonomous systems technologies to wider markets



## EXOMARS PROGRAMME 2016-2018



# Challenges & Opportunities for 2016: Fulfil the potential of EDRS/GlobeNET (including Sentinel data at Harwell)

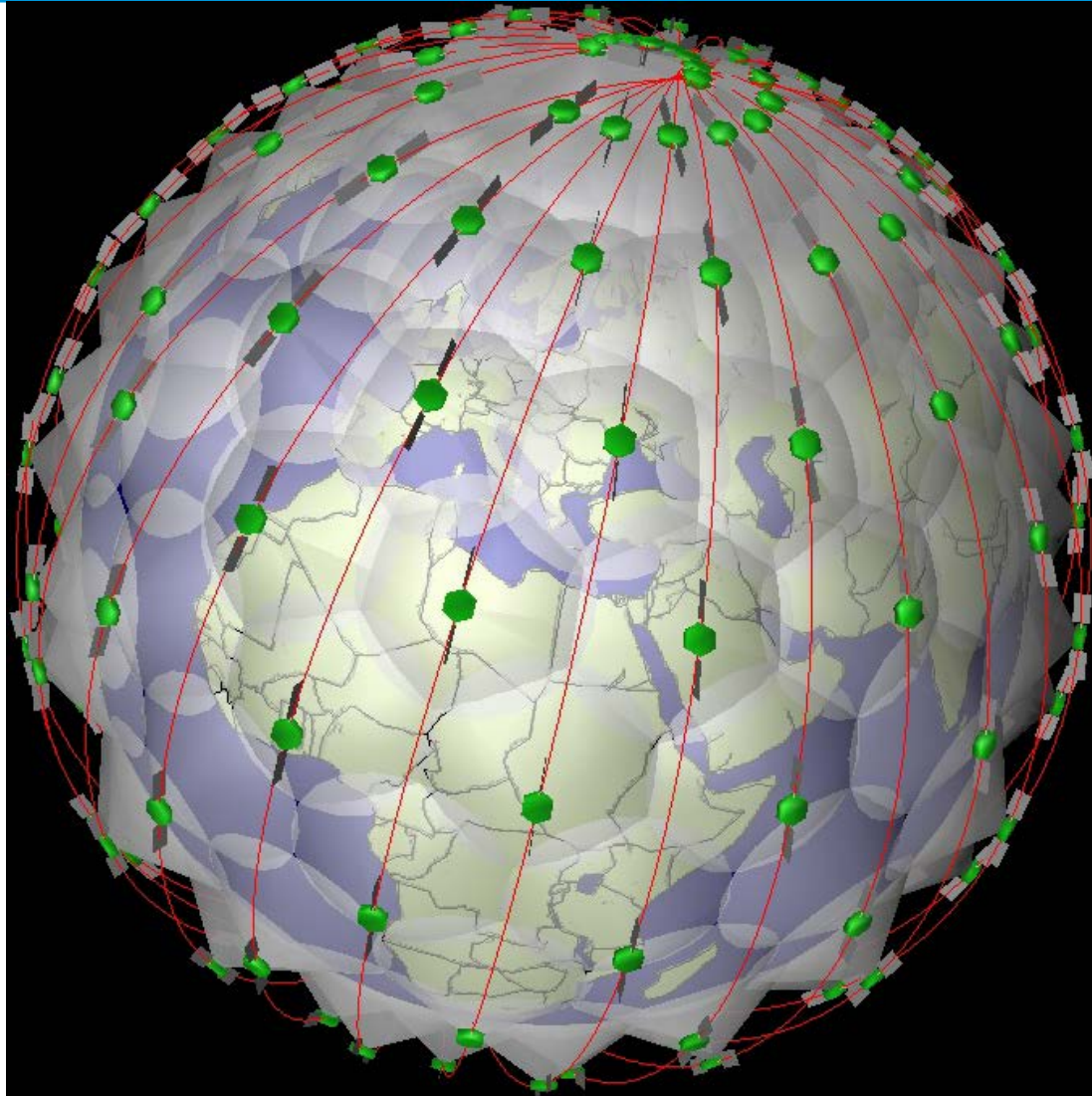


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# Challenges & Opportunities for 2016: Megaconstellations may be a game changer and are certainly moving very fast



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# Challenges for 2016: GOVSATCOM to improve our safety & security



# Harwell Campus development plans

## Next Phase = 500,000 square feet



Planning application Q1 2015

Construction start due Q3 2015

"The Quad":

- Innovation Centre
- Gym & Cafe
- Public realm
- Additional technical & office space (45-60k square feet per building)
- Flexible plots to south
- Hotel and amenities to north





# Harwell Campus development plans

## Space Cluster = 250,000 square feet

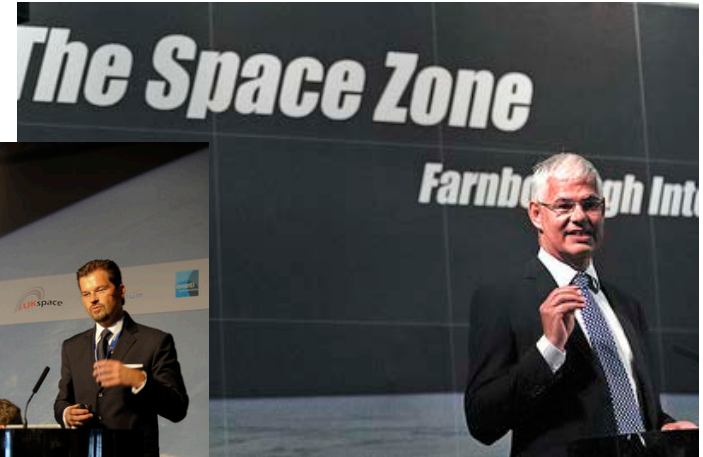


Create sense of arrival.  
Rationalise what's there.  
Properly interconnect  
facilities.  
Human interactions are key.



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# The Space Innovation Growth Strategy Challenge



## By 2020

UK space industry reaching £19 billion turnover

## By 2030

UK space industry reaching £40 billion turnover  
(10% of the global space-enabled market)



# Challenges for 2016: double the flow of new BIC incubatees in the UK, with some growing exponentially



Cornersto

GigBug

 **esplorio**  **RealTag**  
Anti-Counterfeiting Technology



...SimplyPrecise



 **MIRICO**

S&AO

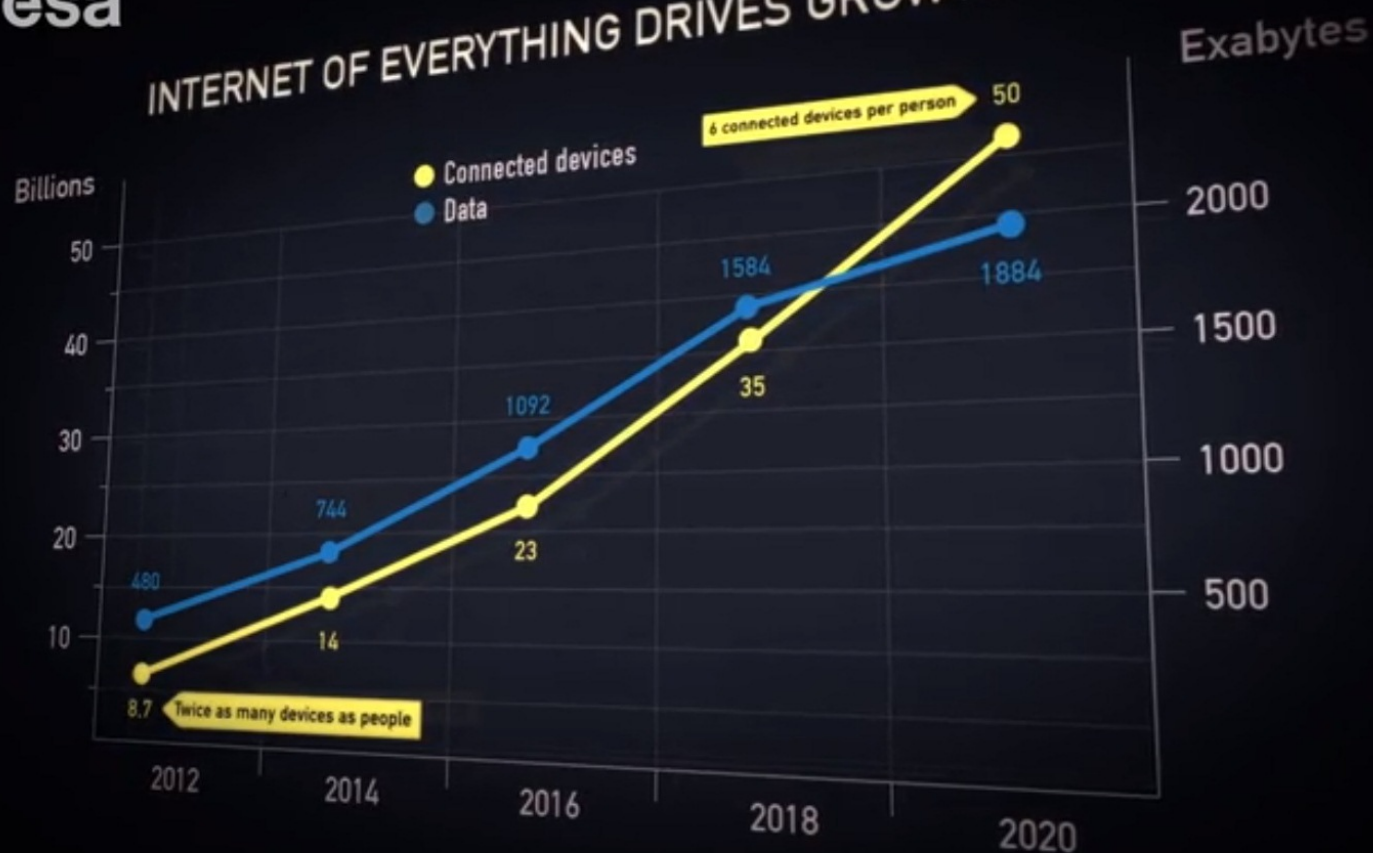
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# Challenges & Opportunities: the growth is out there...

## INTERNET OF EVERYTHING DRIVES GROWTH



# Drop in and see us!

(Photo courtesy of Harwell Campus)



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