

EPCC IN 2017: HPC AND DATA

Professor Mark Parsons

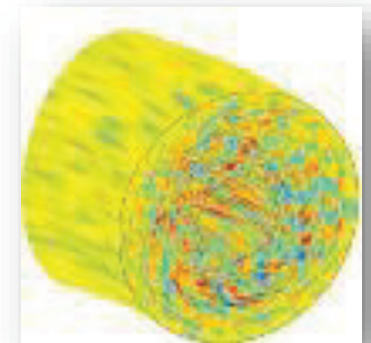
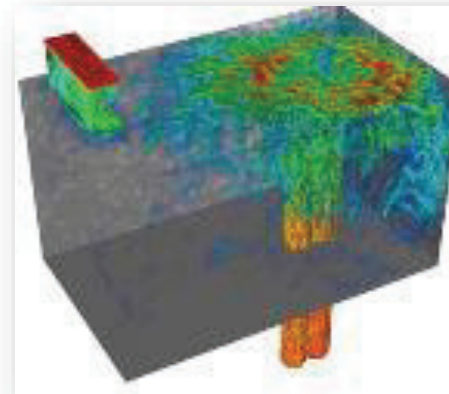
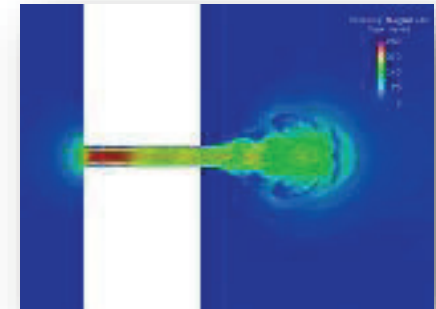
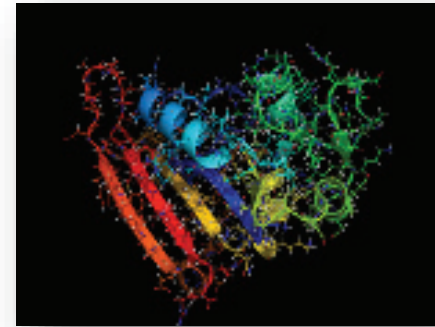
EPCC Director

Associate Dean for e-Research



EPCC in 2017

- One of Europe's top Supercomputing centres
- 27 years old – ~100 staff
- Fully self-sustaining - £13m turnover in FY16/17
- UK National HPC Service provider
- Wide range of work from HPC to Data Analytics and Cloud
- Two MSc programmes – “HPC” and “HPC with Data Science”
- Known worldwide for our industry collaboration programmes in HPC and Data Analytics
- **Well over a thousand companies since 1990**



People are our most important asset ... not computers



Almost all of these people have worked for EPCC over the past 25 years

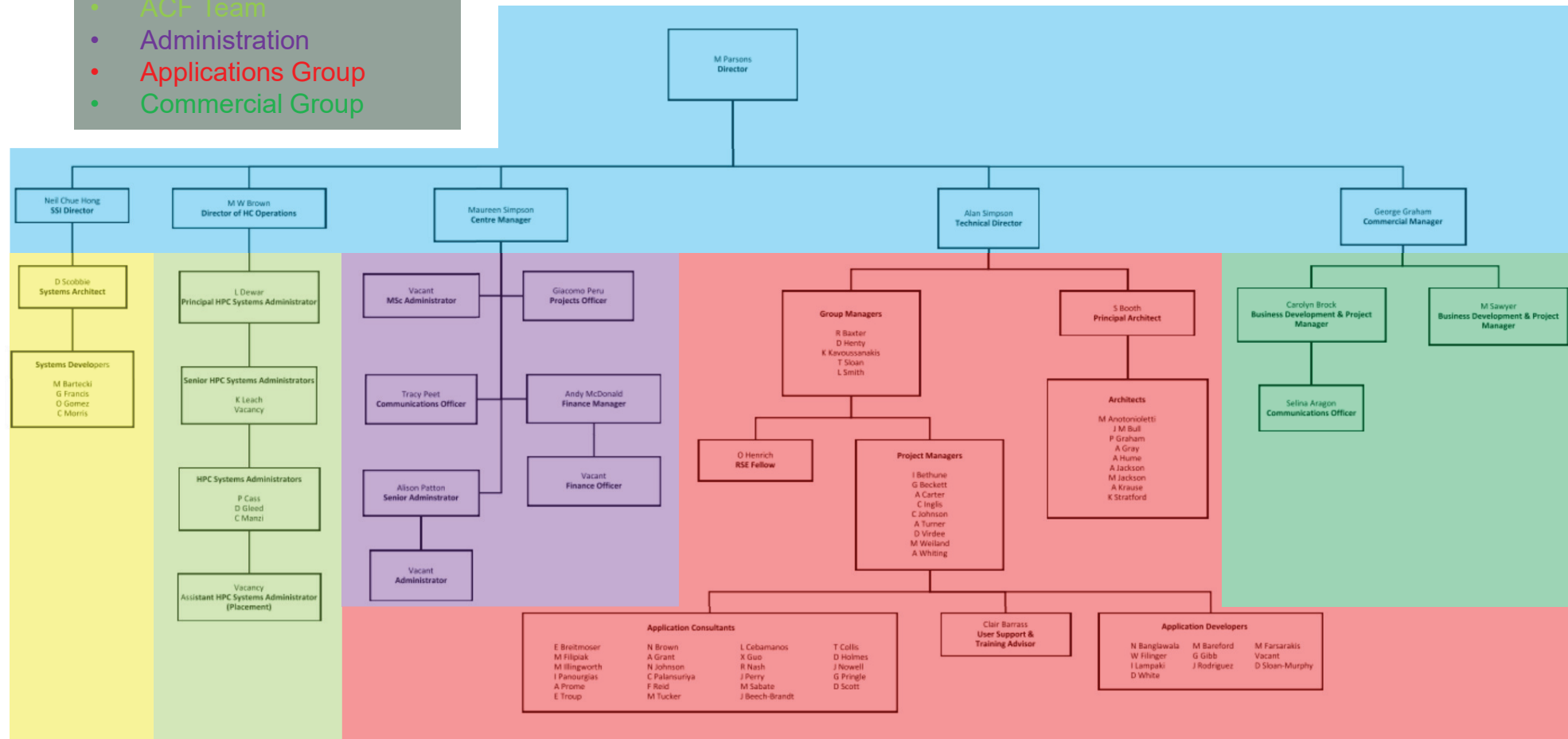
Bayes Centre for Data Technologies

- New £43 million building in central Edinburgh
- EPCC has taken whole floor
- Room for 130 people
- Next to School of Informatics
- Brings together many data related activities under one roof
- First time EPCC has moved in 27 years ...



EPCC structure in 2017

- Senior Management
- System Developer Team
- ACF Team
- Administration
- Applications Group
- Commercial Group



Principal services

- ACF houses variety of leading edge systems and infrastructures
 - UK national services
 - ARCHER 118,080 cores (Cray XC30)
 - DiRAC 98,304 cores (Cray XC30)
 - UK Research Data Archive
 - Cirrus – Tier 2 HPC and storage
 - Scottish National Data Centre
 - Local services
 - ULTRA – SGI UV2000
 - ECDF – Compute and data store clusters for University researchers

- Funded by EPSRC and NERC
- Service opened in 2013
- 5,053 users since opening
- 3,494 users in past 12 months

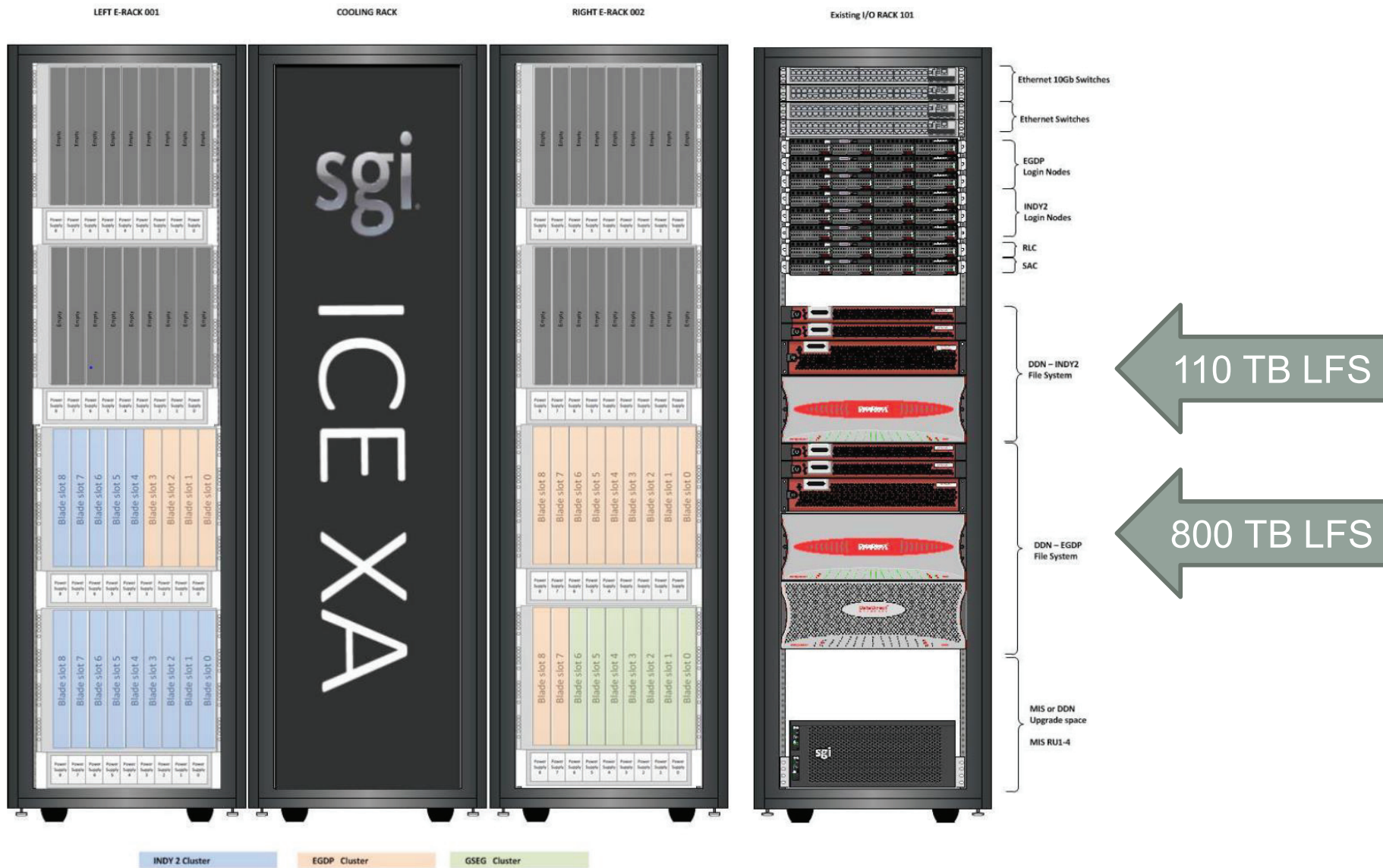


Newest system – Cirrus

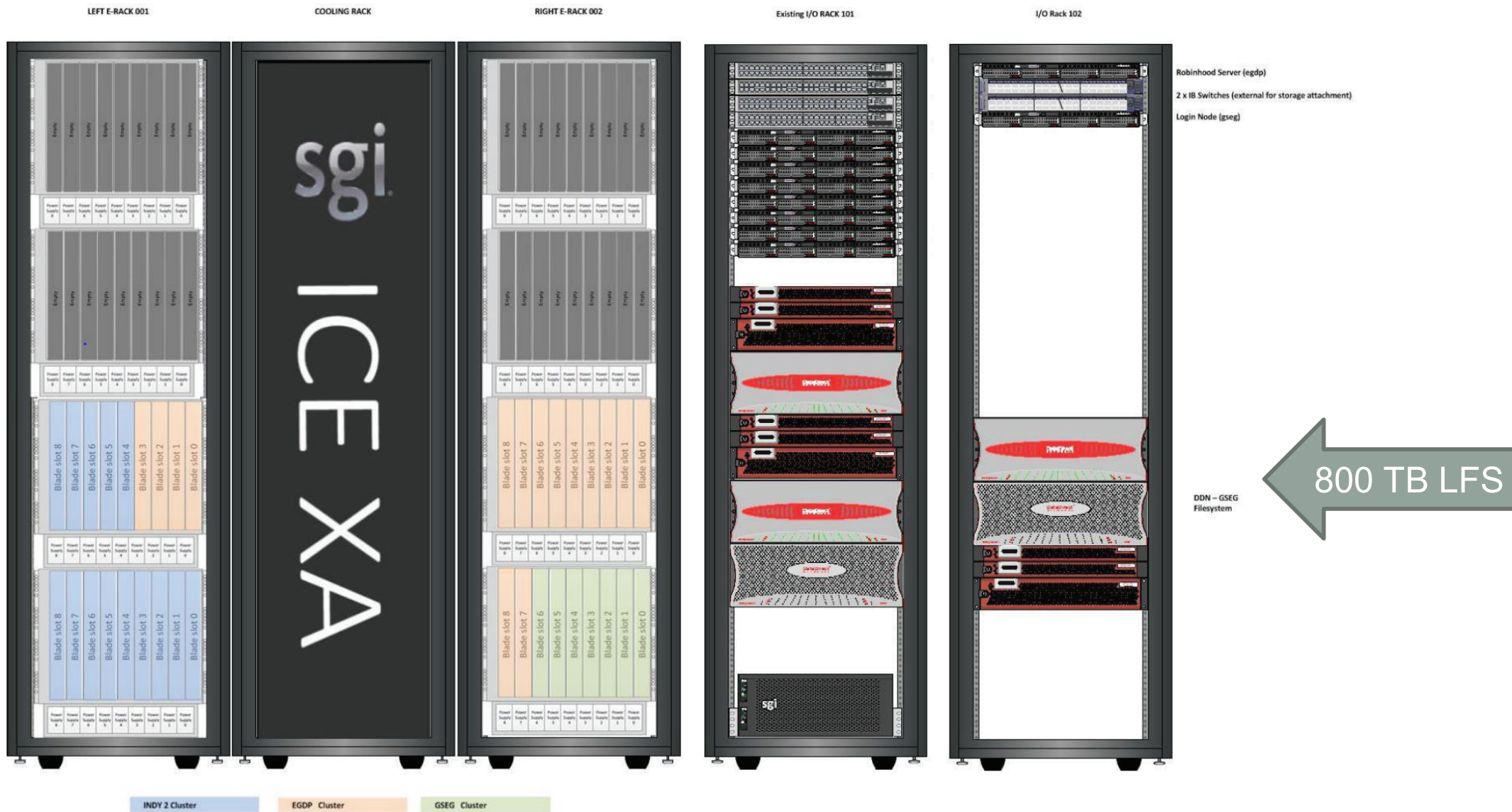
- New SGI ICE XA system
 - Now called an HPE 8600
- Bought for
 - **EPCC industry activities**
 - Edinburgh Genomics – Scotland’s “Whole Human Genome Factory”
- Expanded in March 2017 to 13,000+ cores as part to become EPSRC **National Tier 2 HPC service**
- Includes new Tier 2 data store



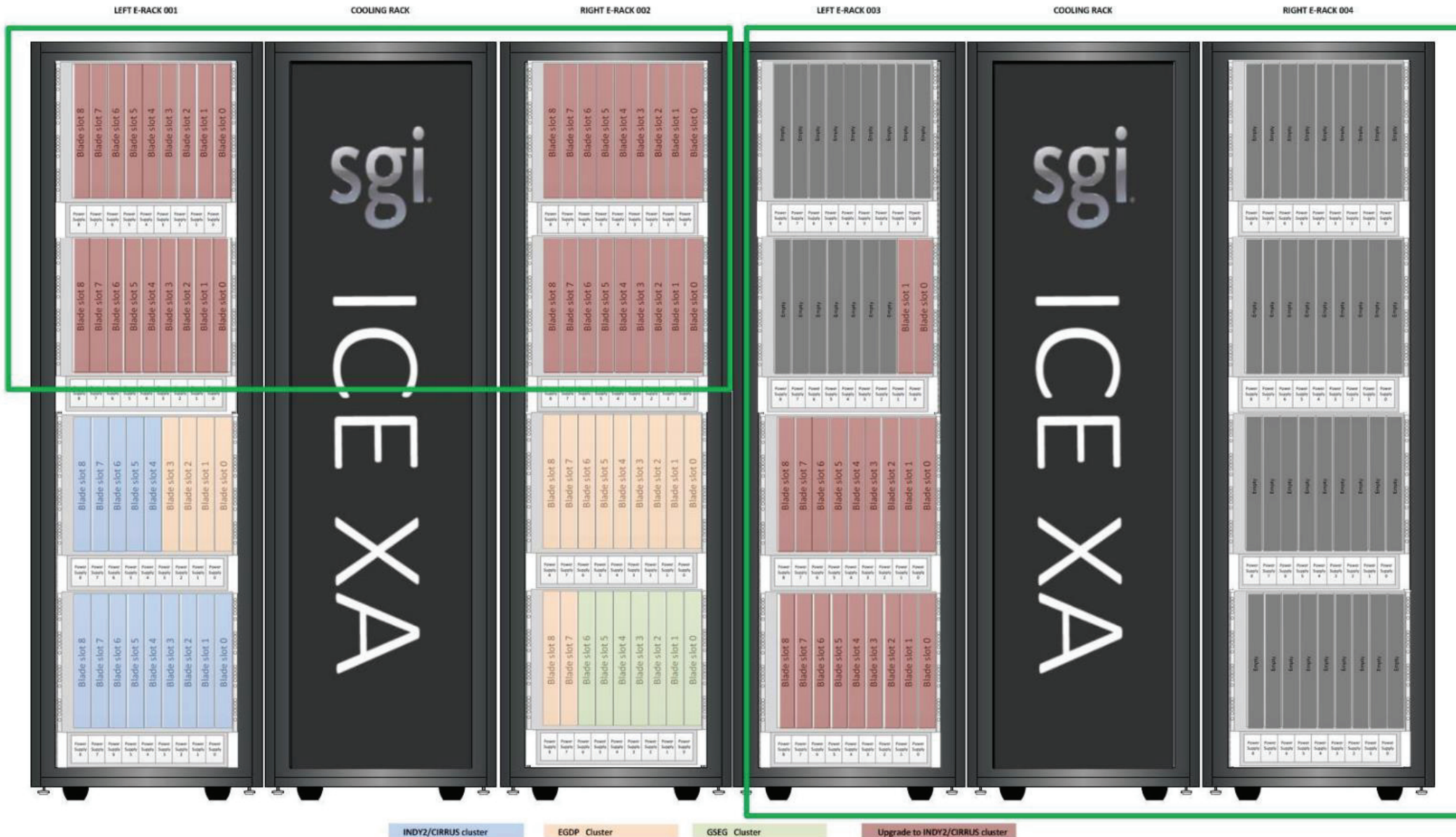
Systems grow very quickly – Schematic layout April 2016



Schematic layout September 2016

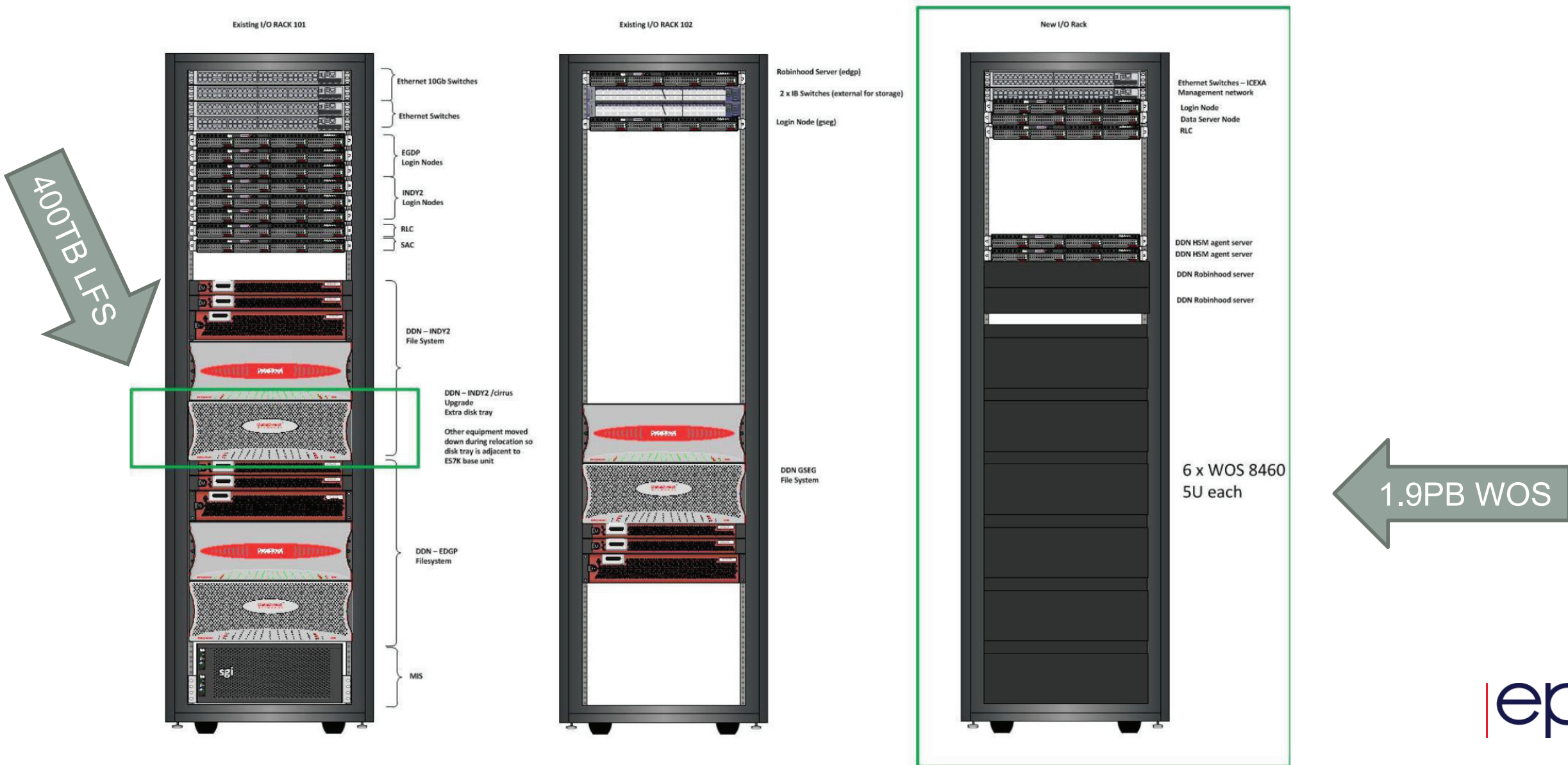


Schematic layout March 2017 - compute



From
5,184 cores
To
13,248 cores

Schematic layout March 2017 - storage



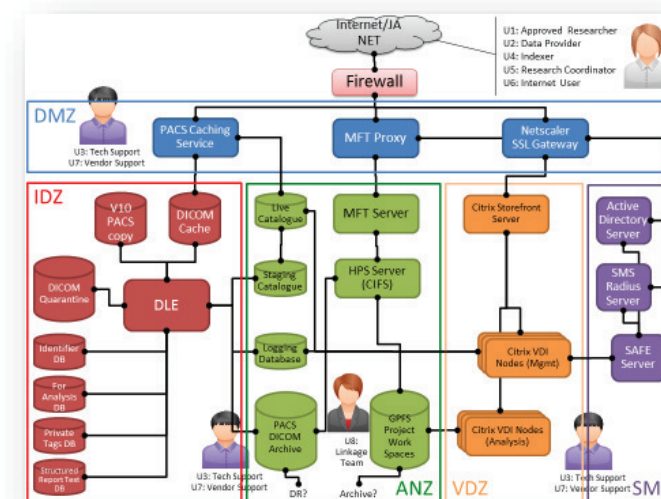
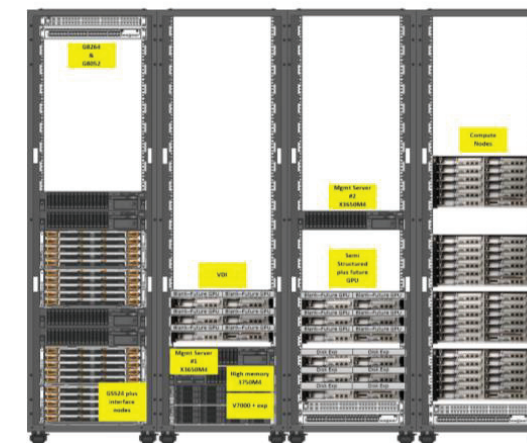
Data hosting – building capacity and skills

- Since 2015 have hosted the National Data Safe Haven for Scotland

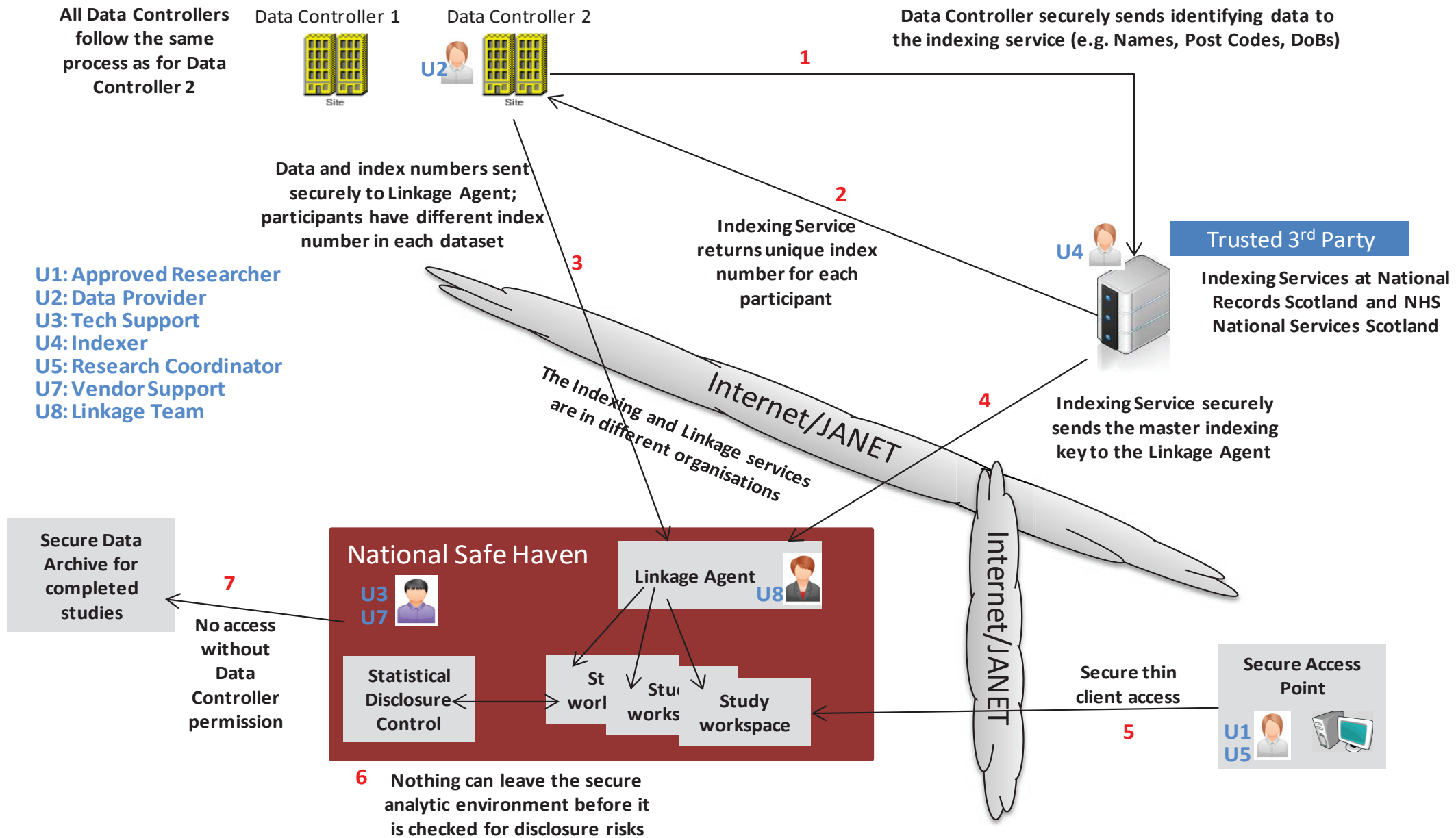
- Multiple datasets



- Enables safe research with unconsented personal data e.g. health records
- Controlled by Scottish Government's "public benefit and privacy" policy

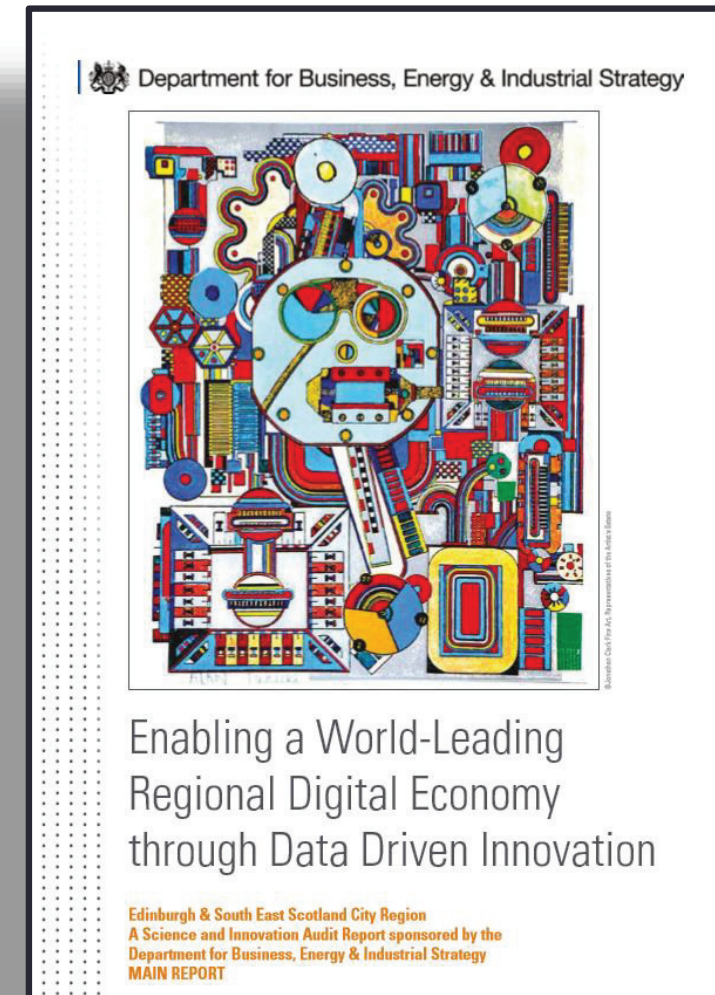


National Safe Haven – pseudo-anonymisation process



Edinburgh Region City Deal – a key part of our future

- In 2016 EPCC helped develop a “Science and Innovation Audit”
- Identified strengths in our region for Data Driven Innovation
- City Deals are funding from UK and Scottish Governments
- Aim is to stimulate economic growth
- £1.1 billion Edinburgh Region City Deal announced in summer 2017

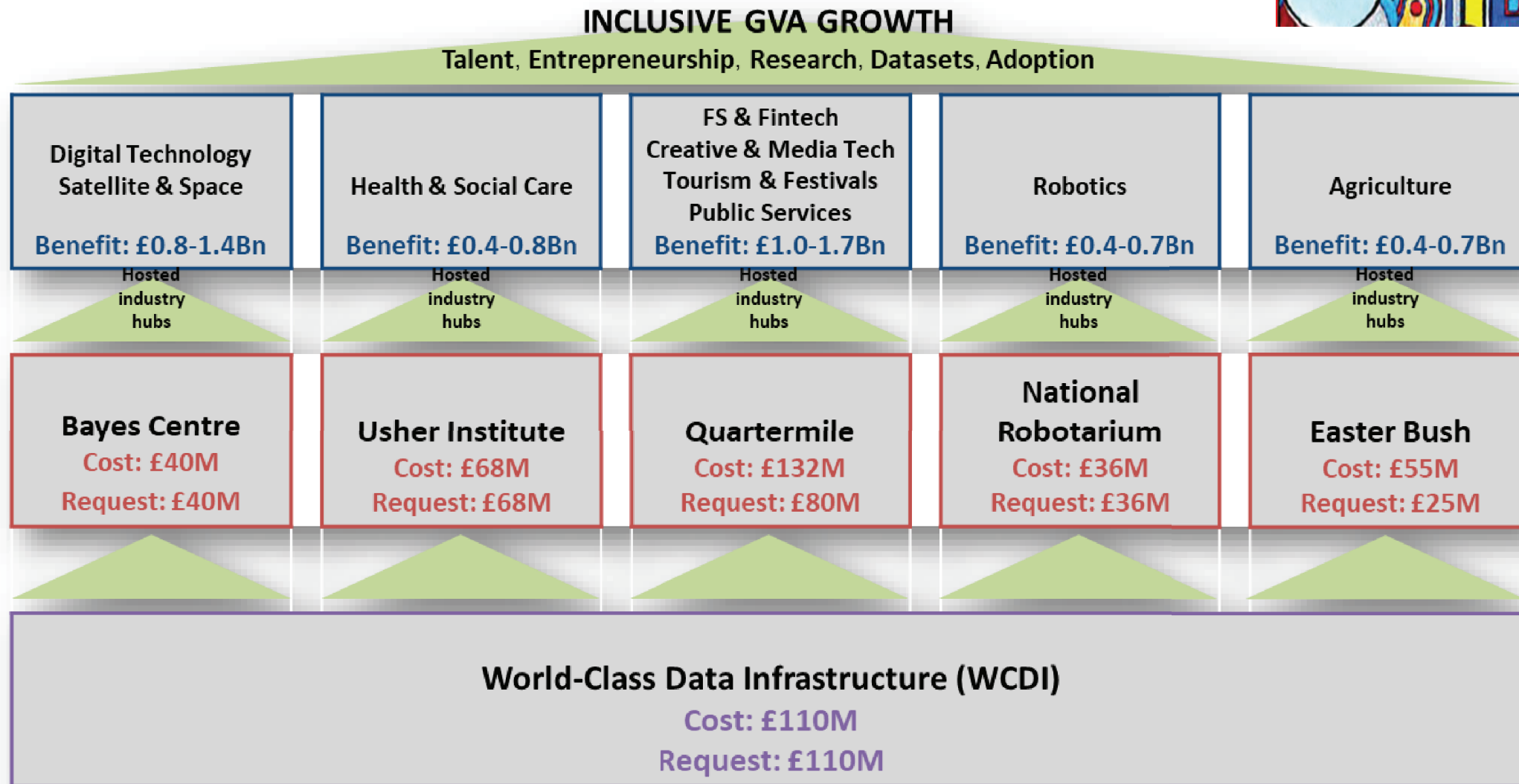


Aims of City Deal



- Capitalise on our expertise in Data Driven Innovation
- Make Edinburgh City Region the “Data Capital of Europe”
- Create a trusted public-private-third sector partnership
- Unlock economic opportunities worth £5 billion+
- Train 100,000 people in data technologies
- Develop an underpinning infrastructure – the World Class Data Infrastructure (WC DI)

City Deal outline



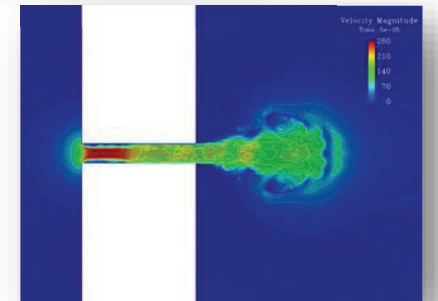
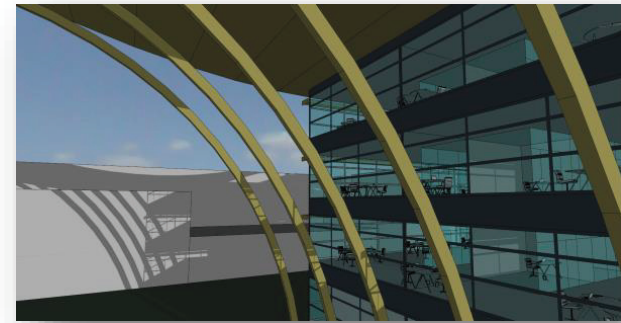
World Class Data Infrastructure



- City Deal includes capital investment in WCDI
- New high resiliency data centre room, computers, storage, networking and software
- Will support work with complex, high volume, real-time datasets from across City Region and beyond
- Already demand - FinTech community, GCHQ, DSTL, NRS, HSBC ...
- All 10 sectors targeted through City Deal will need access
 - Including Local Authorities, local companies etc
- Building a data hub, creating new applications ... and companies

Fortissimo's Goal & Ambition

- **Goal:** provide SMEs with **easy** and **cost-effective** access to **advanced simulation services** through a **Cloud infrastructure** consisting of **HPC resources**, software applications, expertise, and tools
- **Ambition:** become **THE** portal of choice for **HPC and HPDA** expertise and service provision, delivered by Europe's major HPC technology providers



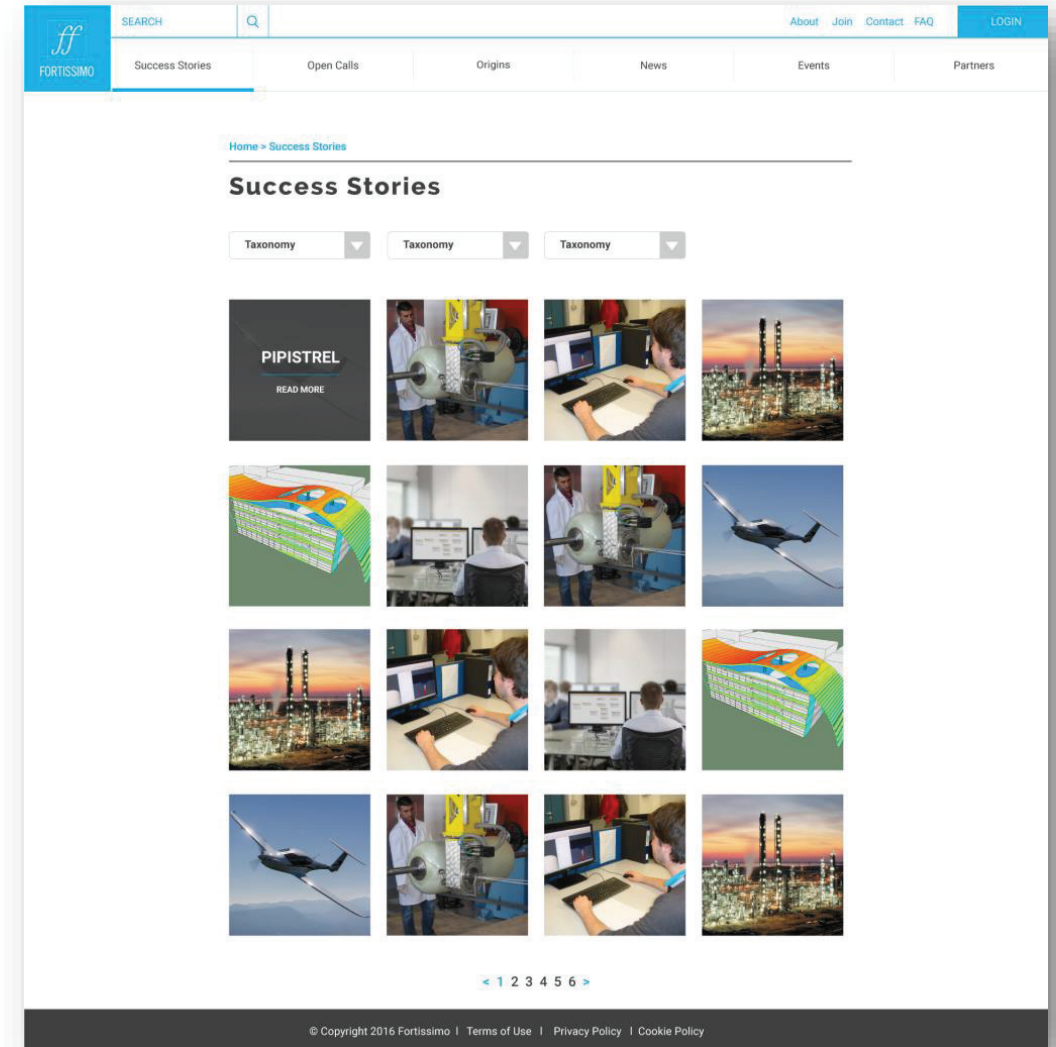
Fortissimo projects in numbers



- Fortissimo - €22m FP7 project – ended 12/2016
 - 122 partners
 - 53 ‘experiments’ in three tranches **delivering real impact**
 - Focus on **HPC enabled modelling and simulation** for **manufacturing SMEs and Mid Caps**
- Fortissimo 2 - €11m H2020 project – ends 10/2018
 - 93 partners
 - 39 ‘experiments’ currently running
 - Fortissimo focus plus **High Performance Data Analytics**
- Lots of effort to help SMEs take part
 - Particularly with respect to IPR management and finance

Similar model for both projects

- Small set of core partners
 - Almost identical for both projects
- Initial set of ‘experiments’
- Two Open Calls for experiments
 - At Month 6 and Month 12
- Experiments last 18 months and involve 3-5 partners and funding up to €250,000



Cloud-based simulation of continuous casting

- CFD modelling liquid steel pouring from ladle to tundish
- Aim to minimise slag transfer
- Fast return on investment
- Medium sized steel plant produces 1m tons steel per year
- Operating costs of €300 million
- **Estimated €3 million annual saving**
- Now being exploited by Ergolines



Cloud-based CFD simulation for hypercars

- Koenigsegg are EU Hypercar manufacturer ... and an SME
- In-house CFD too expensive
 - Cloud is compelling option
- Impressive results
 - 250% increase in downforce with only 15% increase in drag at 250kph
- 30% saving in design costs plus 50% reduction in wind tunnel and physical testing
- Development savings of €90K per year PLUS 30% decrease in time to market
- **€4m benefit to company over 5 years**

