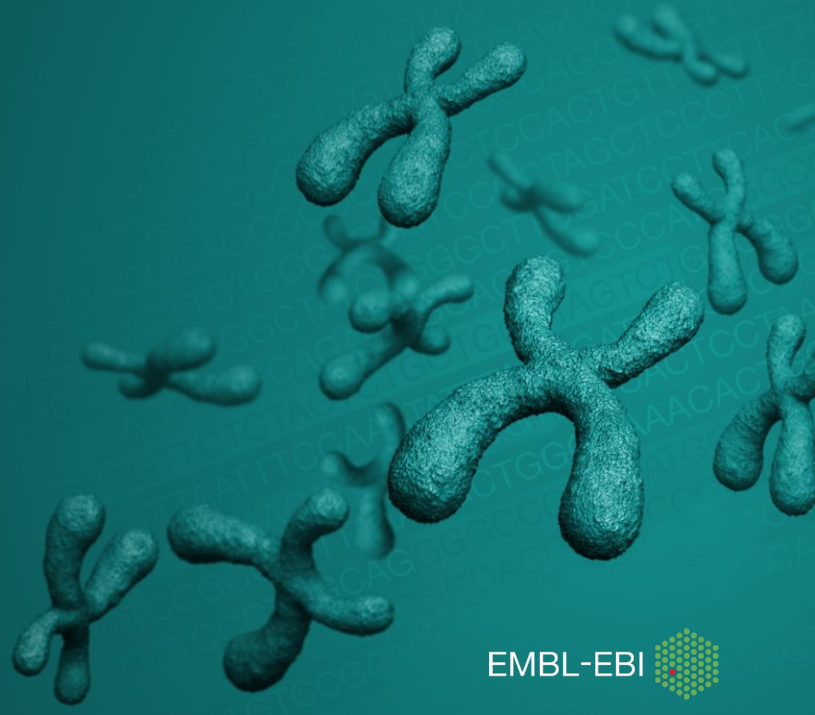
Helix Nebula - The Science Cloud
The EMBL Experience and other bits

Dario Vianello (@vianello_d)
Cloud Bioinformatics Application Architect
Technology and Science integration team
EMBL-EBI



EMBL-EBI

What is EMBL-EBI?

- Europe's home for biological data services, research and training
- A trusted data provider for the life sciences
- Part of the European Molecular Biology Laboratory, an intergovernmental research organisation
- International: 600 members of staff from 57 nations
- Home of the ELIXIR Technical hub.

HNSciCloud Joint Pre-Commercial Procurement

Procurers: CERN, CNRS, DESY, EMBL-EBI, ESRF, IFAE, INFN, KIT, STFC, SURFSara
Experts: Trust-IT & EGI.eu

The group of procurers have committed:

- Procurement **funds**
- **Manpower** for testing/evaluation
- **Use-cases** with applications & data
- **In-house** IT **resources**

Resulting services will be made available to end-users from many research communities

Co-funded via H2020 Grant Agreement 687614

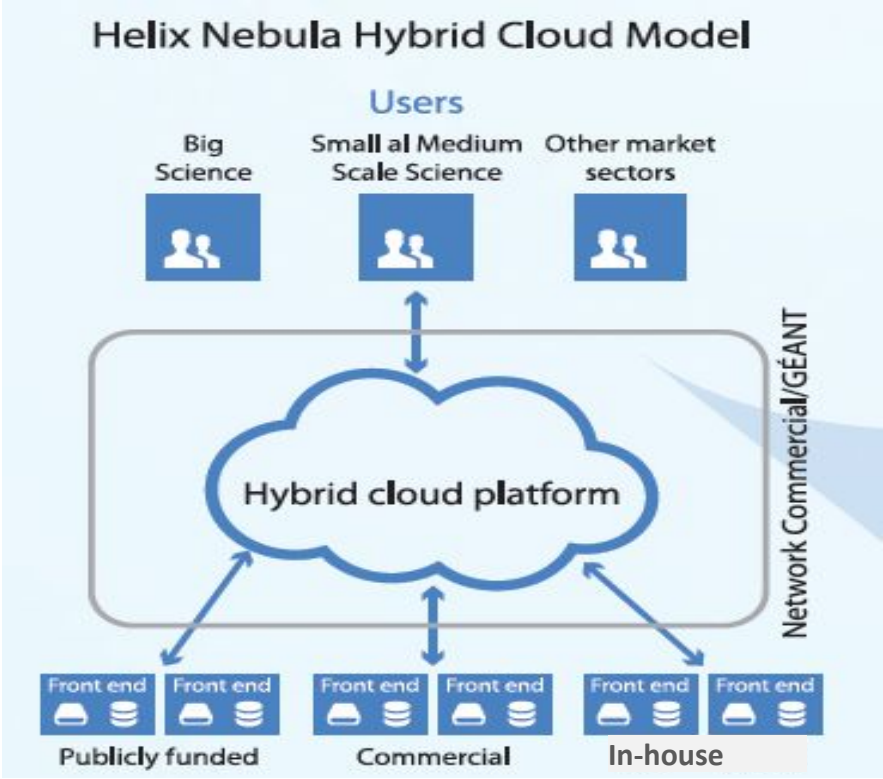
Total procurement budget >5M€

The Hybrid Cloud model

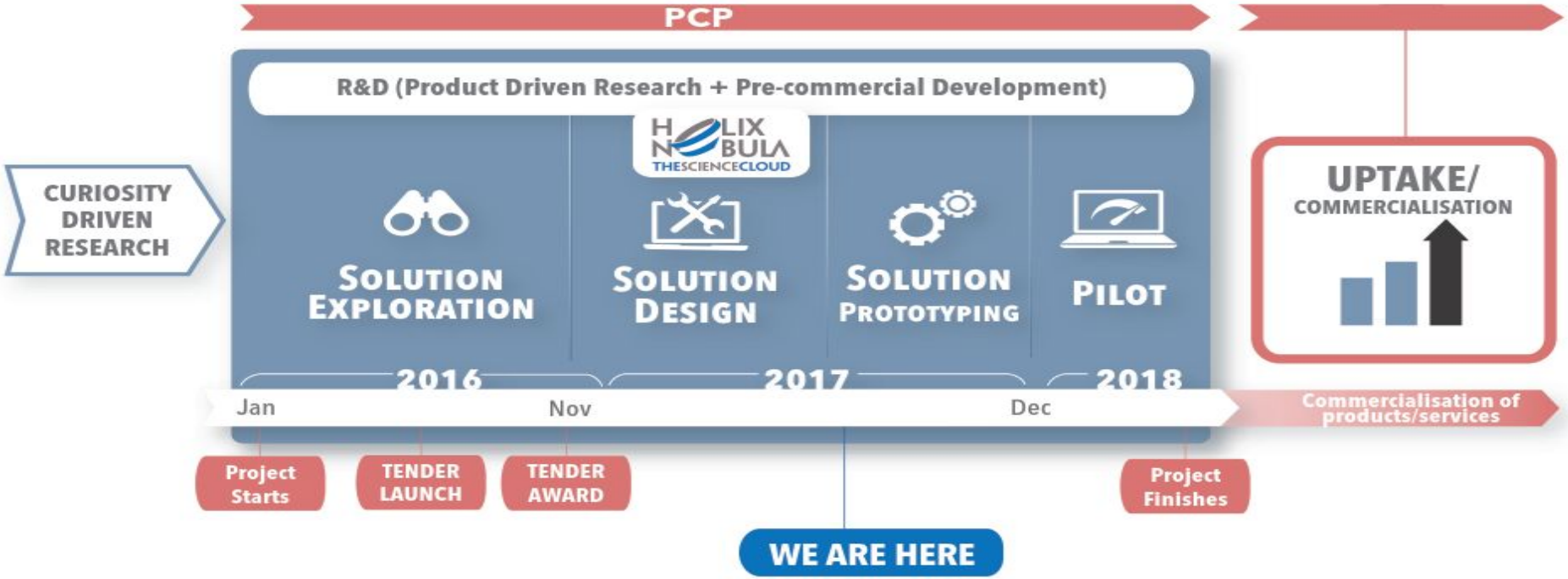
Brings **together**:

- Research Organisations
- Data providers
- Publicly funded e-infrastructures
- Commercial cloud service providers

In a **hybrid cloud** with procurement and governance approaches suitable for the dynamic cloud market



The Pre-Commercial Procurement process



HNSciCloud @ EMBL

3 EMBL use-cases:

- **PanCancer**
  Builds a dataset to enable researchers to compare data across cancer types, ~ 2800 samples

- **EuroBioImaging**
  Image data repositories and analysis tools

- **ELIXIR - Long Tail of Science**
  To simplify access to quality-controlled data, services and tools for researchers in all life-science disciplines.

Strategically: why clouds?

- As data increases, have the community bring their compute to data
  - *But not all their compute to our data centre!*

- Need to push relevant data sets and services out to cloud providers
  - *EMBL-EBI Embassy Cloud → ELIXIR → EOSC → AWS/GCP/MSA → ?*

- Hybrid cloud an approach to optimise EMBL-EBI CapEx vs. OpEx
  - *Allow CapEx to lag demand & use OpEx to manage peaks*

How to make data and workloads fly to the clouds?

EMBL-EBI & Public clouds

In the *last 2 years*:

- Established an EMBL-EBI Benchmarking Suite
- Basic and now ***advanced*** PoCs with several Cloud Providers

Summer 2016, first EMBL-EBI "Cloud Tender": GCP, MSA, UKCloud
September 2016, Hybrid Cloud Working group is established
May 2017, first results coming out of the *(many)* pilots

EMBL-EBI & The Clouds

Our "Science" take home messages

- The Cloud is a cool place: *virtually unlimited resources* & *unlimited scalability*
- **True**, but **easy** to achieve only for **cloud-native** workloads
- Porting **"ground-flying"** pipelines isn't that easy
- Need DevOps / **ResOps** approach

  *Pipelines deployment must be **on demand**, as compute*
- Build a playground, **monitor** everything, and then iterate

HNSciCloud - what next?

- Now in **Prototype** phase (end December 2017)

- Requires an ***interesting*** amount of involvement from all the parties

- Once completed, will hopefully lower the entry barriers to the Cloud:
  - ***Data transparency layer***
  - ***Federated AAI***
  - ***Procurement frameworks***

EMBL-EBI - what next?

From an EMBL-EBI perspective

- **Expand** the breadth of our pilots
- Training, training, and ***some more training***
- **Fully** port applications to the cloud: ***investment*** needed!
- Contribute & pull in any outstanding results out of:
  - *Helix Nebula - The Science Cloud*
  - *EOSCpilot*

Thank you!

The Embassy Cloud

- Built & operated by EMBL-EBI
- 92 compute nodes
- Which provide a total of **6,000 vCPU**
- 4GB RAM per vCPU
- All hosts have 2x10Gb network in chassis
- 40Gb network from chassis to storage networks

openstack™

EMBASSY cloud

The European Molecular Biology Laboratory

80+ nationalities | **>1600 personnel** | **6 sites in Europe**

Heidelberg, Germany

Main Laboratory

Hinxton, Cambridge, UK

Bioinformatics

Grenoble, France

Structural Biology

Barcelona, Spain

Tissue Biology, Disease Modeling

Monterotondo, Rome, Italy

Mouse Biology

Hamburg, Germany

Structural Biology

EMBL-EBI & The Clouds

Our "Science" take home messages

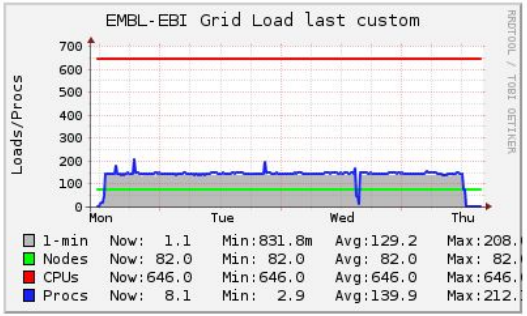
EMBL-EBI Grid (1 sources) (tree view)

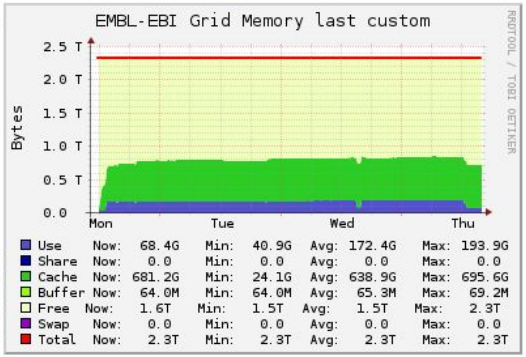
CPUs Total:	**646**
Hosts up:	**82**
Hosts down:	**0**

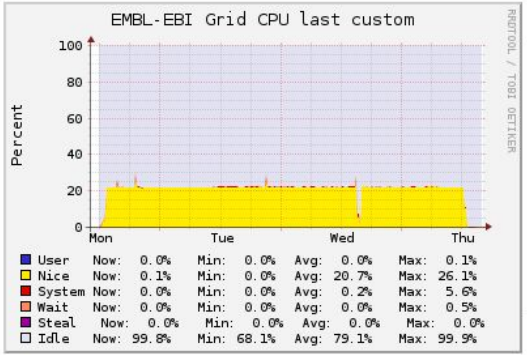
Current Load Avg (15, 5, 1m):
1%, 0%, 0%

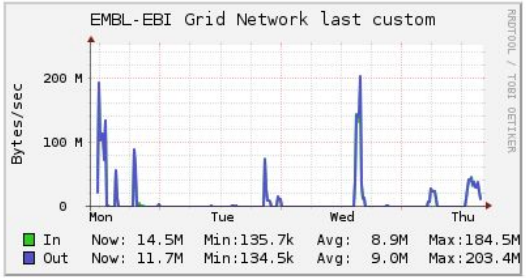
Avg Utilization (last custom):
20%

Localtime:
2017-04-27 14:57









EMBL-EBI & The Clouds

Our "Science" take home messages