INAF AND OPENPOWER

A. BULGARELLI, R. SMAREGLIA, U. BECCIANI, P. CARAVEO (INAF)
C. CARNIEL, A. NEGRO (IBM)

https://www.ict.inaf.it/indico/event/294/

INAF HQ, Rome, December 2, 2015

1

INAF, OPENPOWER AND IBM

COLLABORATION WITH IBM

- Collaboration with **IBM** started in **July 2014 in Bologna**:

  - **CTA** Real-Time Analysis

    - IBM Labs

  - **February 2015**: **POWER:** Technical meeting in Bologna (IBM Italia, Bruce Wile, Brian Allison, IASFBO, VARGROUP)

  - **April 2015: INAF in the OpenPOWER Foundation** (Academic Membership)

  - **June 2015**: **OpenPOWER**: first call IBM/INAF: https://www.ict.inaf.it/indico/event/143/

  - **June 2015**: **INAF/CTA Italia and IBM Italia + Bruce Elmegreen meeting + DESY/CTA**

  - **July 2015**: **ISC2015** (Frankfurt)

    - **OpenPOWER** meeting with D. Turek, C. Redmond, D. Piccarozzi, M. Quartly, A. Bulgarelli, R. Smareglia

  - **October 2015**: **OpenPOWER**: Meeting ICT INAF (IBM invited)

- IBM ITALIA:

  - A. Negro

  - C. Carniel

  - C. Fadda

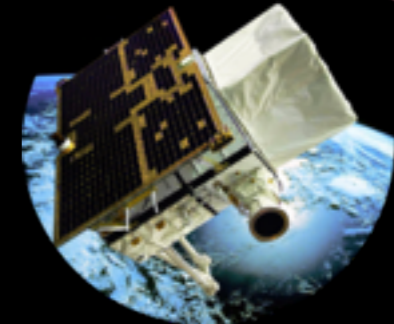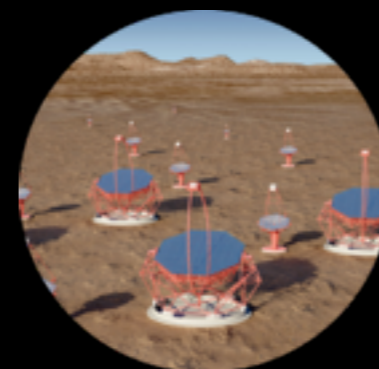 - F. Renzi

  - A. Agnello

  - D. Piccarozzi

  - A. Damigella

  - G. Richelli

  - …

S824L SERVER + GPU NVIDIA + FPGA NALLATECH @ INAF/IASFBO

- CTA: Development of software on Intel/Power8/GPU/FPGA, to compare the results (in progress).

- Collaboration with IBM Labs on CTA data compression

- Collaboration with AGILE Team

COGNITIVE COMPUTING

- A work in progress with IBM to try to understand how to use the Cognitive Computing (IBM Watson) in the field of Astronomy and Astrophysics

    - IBM Italia and IBM Zurich Labs

    - A discussion within INAF is started

OPENPOWER @ INAF

- Web site and mailing list

- Organisation of an **INAF workgroup** of astrophysical projects that could benefit from the POWER architecture.

- In this context

  - **Collaboration with IBM** on

    - performance optimisation

    - porting of astrophysical code on Power systems.

  - Collection of **use cases**

    - organisation of a "**Use Case day@INAF**" (2016)

We want to move this experience and astrophysics needs to the OPF

- The proposal about **OPF WG on Physical Science**

OpenPOWER and INAF

OpenPOWER is an open development community using the Power Architecture to serve the evolving needs of customers and of the research institutes. In brief INAF has an academic membership (free of charge), i.e. non-profit technical membership.

OpenPOWER is "open source" and "open hardware":
- to create an open ecosystem using POWER architecture
- to share expertise: participation of work groups within the OpenPOWER foundation
- access to technical information for POWER systems

We could use this wiki to collect information and to discuss about astrophysical projects and OpenPOWER technology.

Discussions and open points
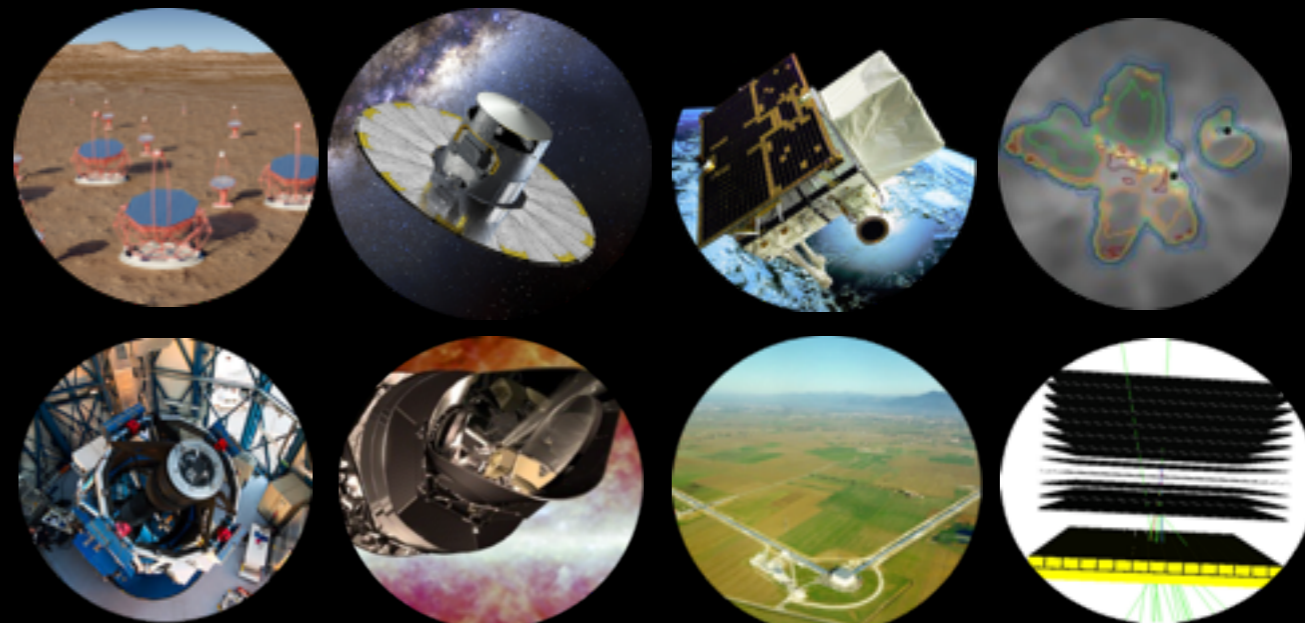
There are three main open point of discussion:
1. Organization of an INAF **workgroup** that will collect the need of current and future astrophysical projects within INAF that could benefit of the Power architecture. We could provide a list of astrophysical projects and they need. This could be the starting point of the discussion.
   - The wiki of interested AstrophysicalProjects.
   - IBM-Italia could provide access to Segrate and Montpellier facilities to test astrophysical software
2. Porting of astrophysical software and libraries (PortingAstroLibraries) on PowerLinux systems.
3. Organization of a dedicated workgroup (OpenPOWERAstroWG) for astrophysics needs (future observatories, simulations) within the OpenPOWER foundation:
   - This work group (WG) aims at addressing the challenges of future astrophysical projects by identifying the specific requirements of the main astrophysical data processing systems. The WG will work closely with other OpenPOWER WGs to understand how the work in progress within relevant WGs can address these requirements.

Main links

- Home page: http://openpowerfoundation.org
- Mailing list: http://www.sedecentrale.inaf.it/mailman/listinfo/openpower
- Twitter with last news from OpenPOWER world useful for astrophysical projects: https://twitter.com/powertechnews

Activities

- 27-04-2015: the Media INAF news (in italian): http://www.media.inaf.it/2015/04/27/inaf-openpower
- 04-06-2015: First call IBM/INAF: https://www.ict.inaf.it/indico/event/143/

ASTROPHYSICS @ OPENPOWER FOUNDATION

- We are proposing a **workgroup for Physical Science needs** within the OpenPOWER Foundation

Why Physical Science?

To find "members"

A **forum** between 'scientists' of **different fields.**

The proposed workgroup aims at **addressing the challenges of Physical Science projects.**

To share experiences and solutions with other 'scientists'.

- We are proposing a **workgroup for Physical Science needs** within the OpenPOWER Foundation

Why with OPF?

Because we are
members

a **forum** between 'scientists', and
'hw/sw developers'/'vendors'

The WG will work closely with
other OpenPOWER WGs

OpenPOWER: a **forum** of 'scientists' and
'(technological) developers' at the same
level around a technological solution
(Power architecture and Linux).

- a direct connection with hw/sw
  developers
- a direct and different connection
  with the market

9

- We are proposing a **workgroup for Physical Science needs** within the OpenPOWER Foundation
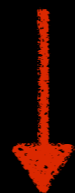
Why a focused effort on science?

Scientist are customers, but the focus is the research, not the business

Specific requirements

CURRENT PROJECTS

FUTURE PROJECTS

Accelerate the rate of the scientific discoveries

Feasibility of new projects.

10

data rate: from kB/s to GB/s

data generated/stored: from GB/night to tens of TBs/night

catalogs of **billions of objects**

data **preservation** for tens of years

Requirements span of orders of magnitudes

Astrophysics: a basic **common workflow** but also **big differences and strong requirements**

A S T R O P H Y S I C S

Data Acquisition
Streaming
Monitor and control
Archiving
Access
-
Real-time science
On-Site science
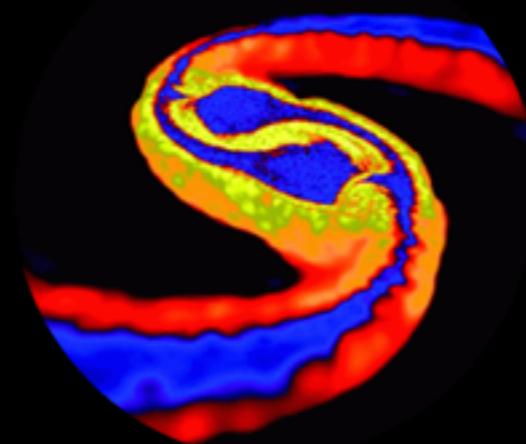
Data Analysis
Data mining
Simulations

EXPERIMENTAL SCIENCE

COMPUTATIONAL SCIENCE

- We are proposing a **workgroup for Physical Science needs** within the OpenPOWER Foundation

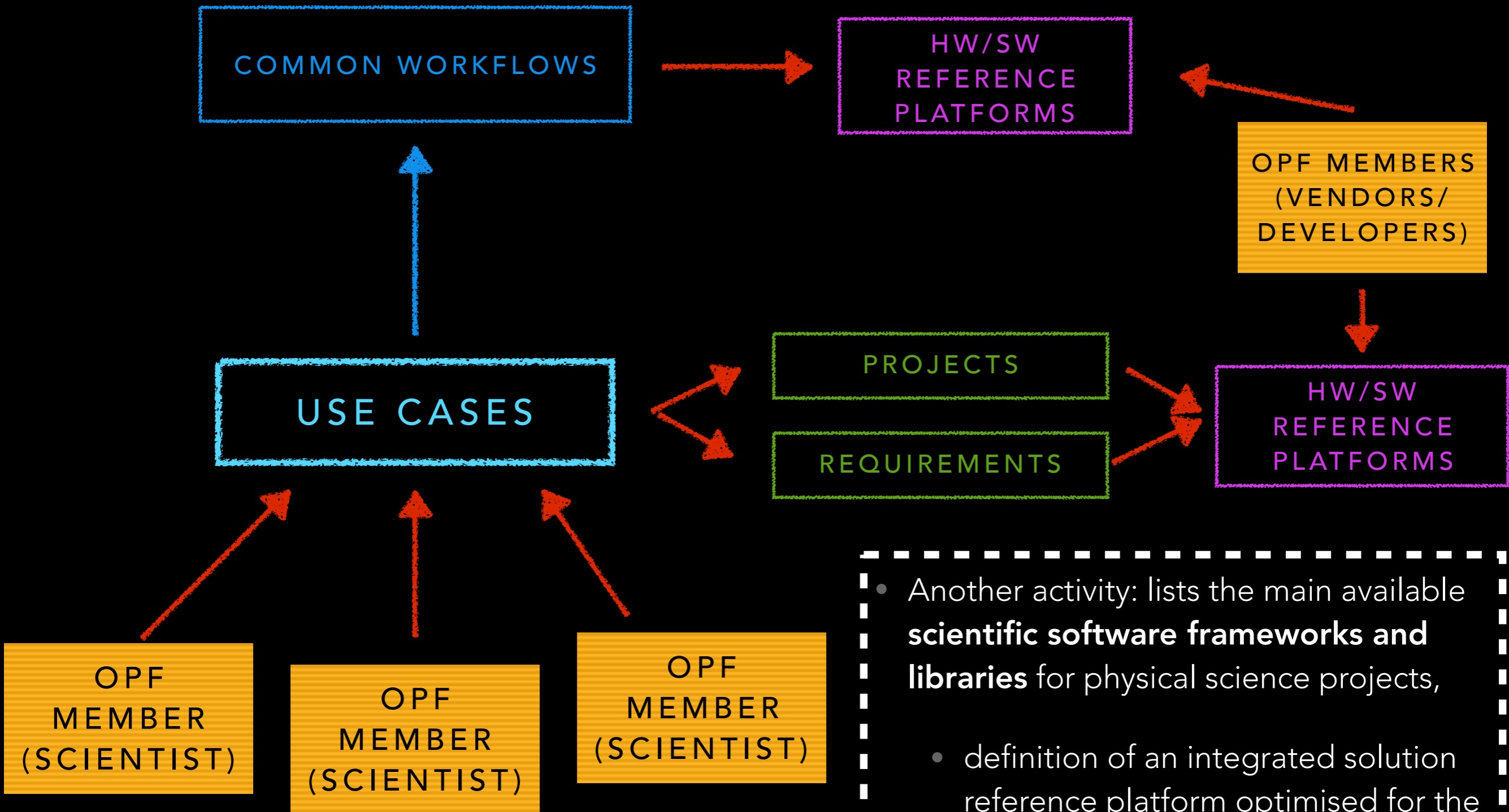**How? The focus is on use cases.**

Why?

OPF is a 'free' organisation. The amount of time spent for OPF is 'free'

The discussion will be driven by who will make some efforts

The 'prize' is the focus on your use case.

Use Cases: we need to resolve the problems of INAF and OPF members, not the problems of the ICT (i.e. of the World)

WORKFLOW: A BOTTOM-UP APPROACH

- A **bottom-up approach**:
  - we start from needs of members, as use cases
  - from collected use cases, we will try to analyse possible common workflows.

COMMON WORKFLOWS

HW/SW REFERENCE PLATFORMS

OPF MEMBERS (VENDORS/ DEVELOPERS)

USE CASES

PROJECTS

REQUIREMENTS

HW/SW REFERENCE PLATFORMS

OPF MEMBER (SCIENTIST)

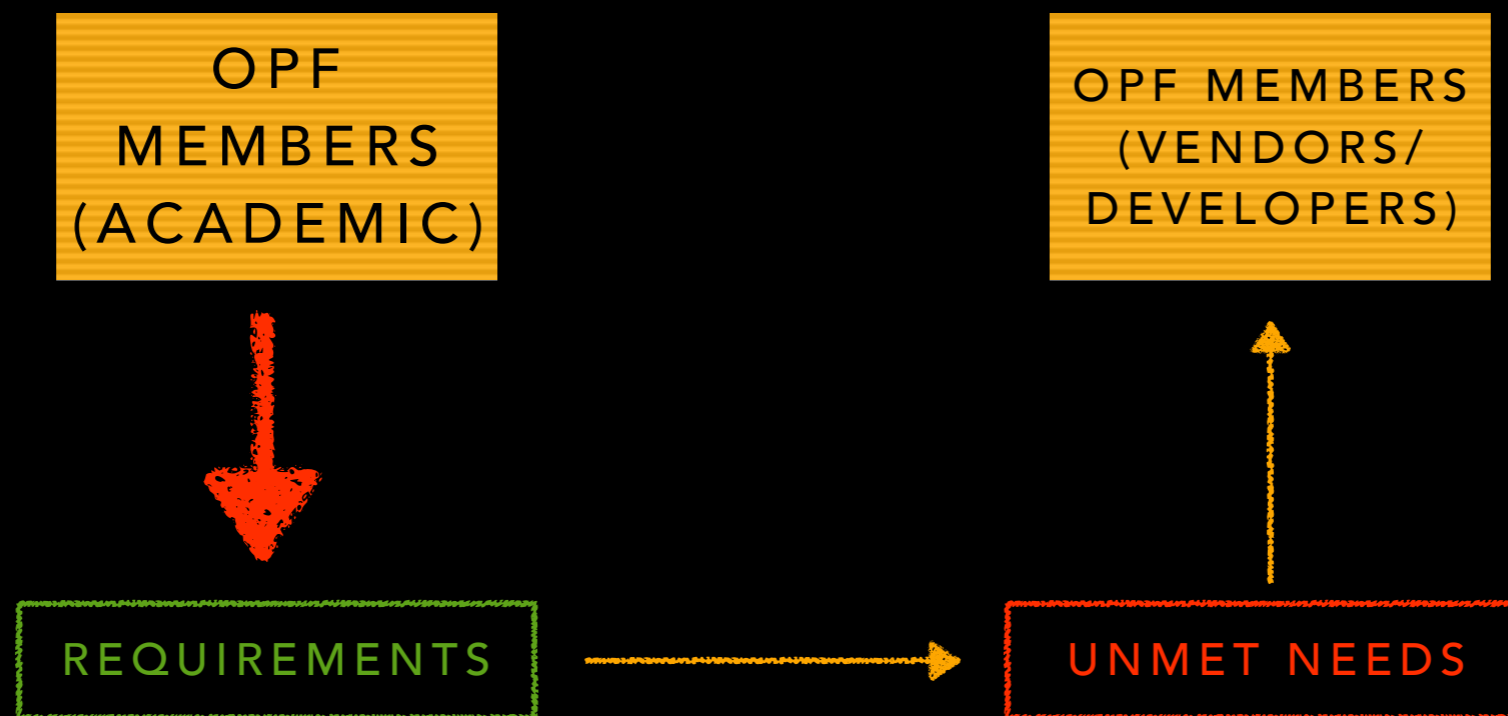OPF MEMBER (SCIENTIST)

OPF MEMBER (SCIENTIST)

- Another activity: lists the main available **scientific software frameworks and libraries** for physical science projects,
  - definition of an integrated solution reference platform optimised for the data processing needs

The results will be publicly available

13

And if there is no a solution?

- Focus of OPF members (developers) on scientific requirements that are not covered by current solutions

```
┌─────────────────┐                        ┌─────────────────┐
│      OPF        │                        │  OPF MEMBERS    │
│    MEMBERS      │                        │   (VENDORS/     │
│  (ACADEMIC)     │                        │  DEVELOPERS)    │
└────────┬────────┘                        └────────▲────────┘
         │                                          │
         ▼                                          │
┌─────────────────┐       ───────►       ┌─────────────────┐
│  REQUIREMENTS   │                       │  UNMET NEEDS    │
└─────────────────┘                       └─────────────────┘
```

CONCLUSION

- A **Use Case day meeting@INAF** is planned for the beginning of the next year.

- **Status of the OPF WG for Physical Science proposal**. A dedicated WG:

  - Charter ready. IBM and INAF are "Eligible member". We need another member to propose the WG. Asked other representatives

  - We are looking for a collaboration with the Academia WG

- The purpose is to **focus OPF members on "Physical Science" use cases** to

  - define common hardware and software platforms (projects, use cases, software frameworks)

  - derive common workflows

  - focus on unmet requirements

The proposed workgroup aims at **addressing the challenges of Physical Science projects.**

OpenPOWER: a **forum** of 'scientists' and '(technological) developers' at the same level around a technological solution **(Power architecture and Linux)**.

Astrophysics: a basic **common workflow** but also **big differences** and **strong requirements.**

Use Cases: we need to resolve the problems of INAF and OPF members, not the problems of the ICT (i.e. of the World).

"Thank you"