THE OPENPOWER FOUNDATION FOR PHYSICAL SCIENCE WORKGROUP

A. Bulgarelli (INAF) - INAF technical representative
+ all people involved in the openpower@inaf.it mailing list
+ all authors of the charter (A. De Rosa, L. Graziani, R. Schneider, U. Becciani, V. Fioretti, L. Clavien, C. Carniel)
+ all people of the OpenPOWER for Physical Science subcommittee
+ all people of the OpenPOWER for Physical Science working group
+ IBMers: C. Bekas (IBM Zurich Labs), and C. Carniel, A. Negro (IBM Italia)
+ CERN people (F. Carminati, J. Apostolakis, M. Bandieramonte, A. Gheata)

Thanks to Direzione Scientifica INAF (A. Antonelli, R. Smareglia and F. M. Zerbi - primary representative) and OPF Technical Steering Committee for their support.

OpenPOWER @ INAF

- Web site and mailing list: openpower@inaf.it
- The **OpenPOWER workgroup for Physical Science (see this talk)**
- **You can register yourself at** https://openpowerfoundation.org **and follow the work of the working groups.**

COLLABORATION WITH IBM AND OPENPOWER

- **February 2015**: **POWER:** Technical meeting in Bologna (IBM Italia, Bruce Wile, Brian Allison, IASFBO, VARGROUP)
- **April 2015: INAF** in the **OpenPOWER Foundation** (Academic Membership, **no fee**)
- **June 2015**: **OpenPOWER**: organisation of a internal workgroup. First call **IBM**/**INAF**
- **July 2015**: **ISC2015** (Frankfurt)
  - **OpenPOWER** meeting with D. Turek, C. Redmond, D. Piccarozzi, M. Quartly, A. Bulgarelli, R. Smareglia
- **December 2015**: Data Intensive Science Client Tour EMEA / IBM Team with INAF
- **May 2016**: **OpenPOWER:** setup of OPF WG for Physical Science charter subcommittee (IBM, Group T2i, INAF first three members)
- **May 2016** charter submitted to OPF members
- **August 2016** BOD charter approval
- **October 2016**: OPF for Physical Science WG KO meeting

MEMBERSHIP LEVELS

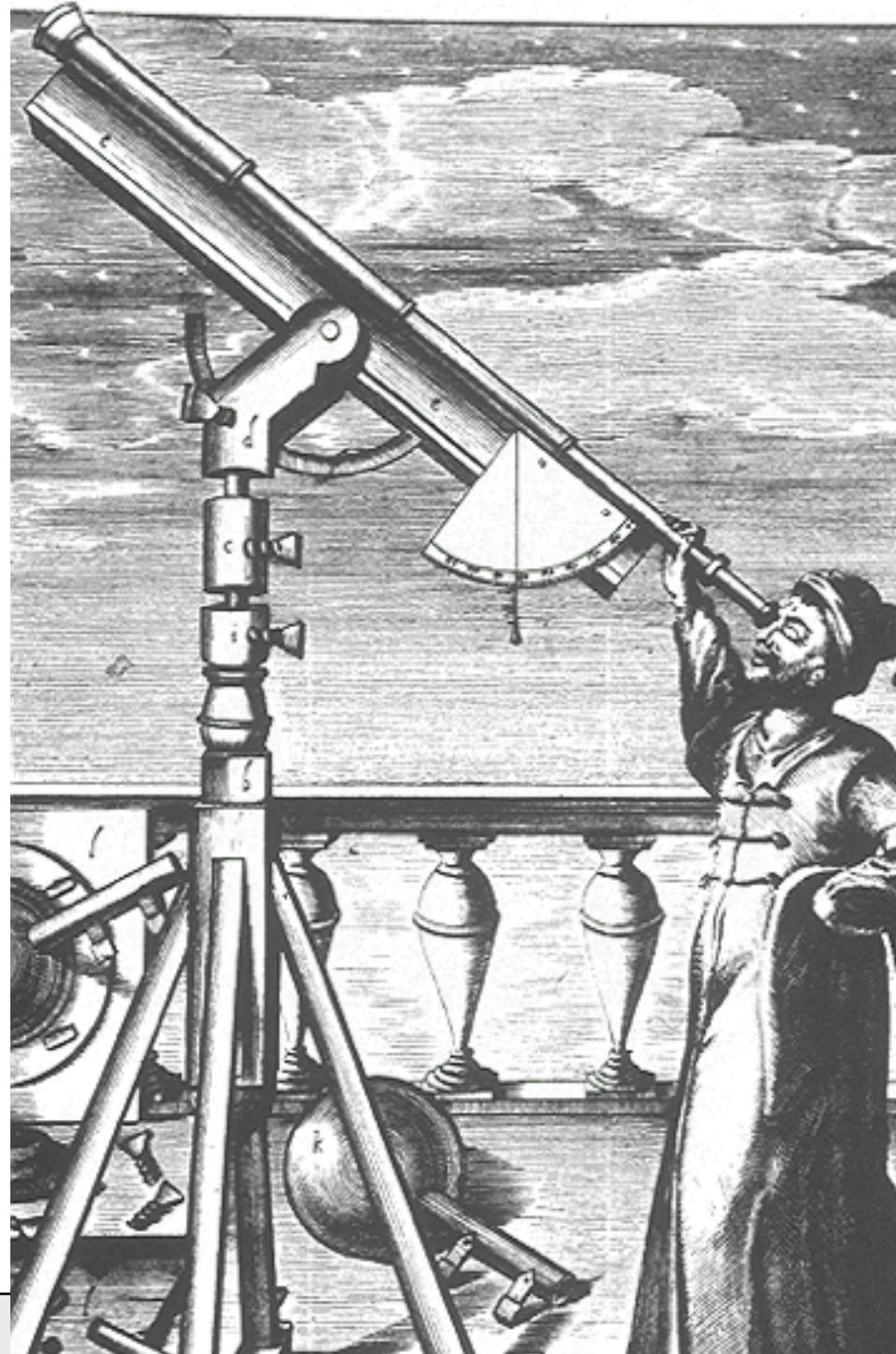
Membership Level	Annual Fee*	FTEs	Technical Steering Committee	Board/Voting Position
Platinum	$100K	10	One seat per member not otherwise represented	Includes Board position. Includes TSC position
Gold	$60K	3	May be on TSC if Work Group Lead	Gold members may elect up to one BOD member per three Gold members
Silver	$20K ($5K if <300 employees) ($0 if ISV Community <300 employees)	0	May be on TSC if Work Group Lead	One Board seat elected by all Silver members
Associate & Academic	$0	0	May be on TSC if Work Group Lead	May be elected to one community observer, non-voting Board seat

**Fee in US Dollars*

Platinum Level

Gold Level

THE OPENPOWER FOR PHYSICAL SCIENCE WORKGROUP



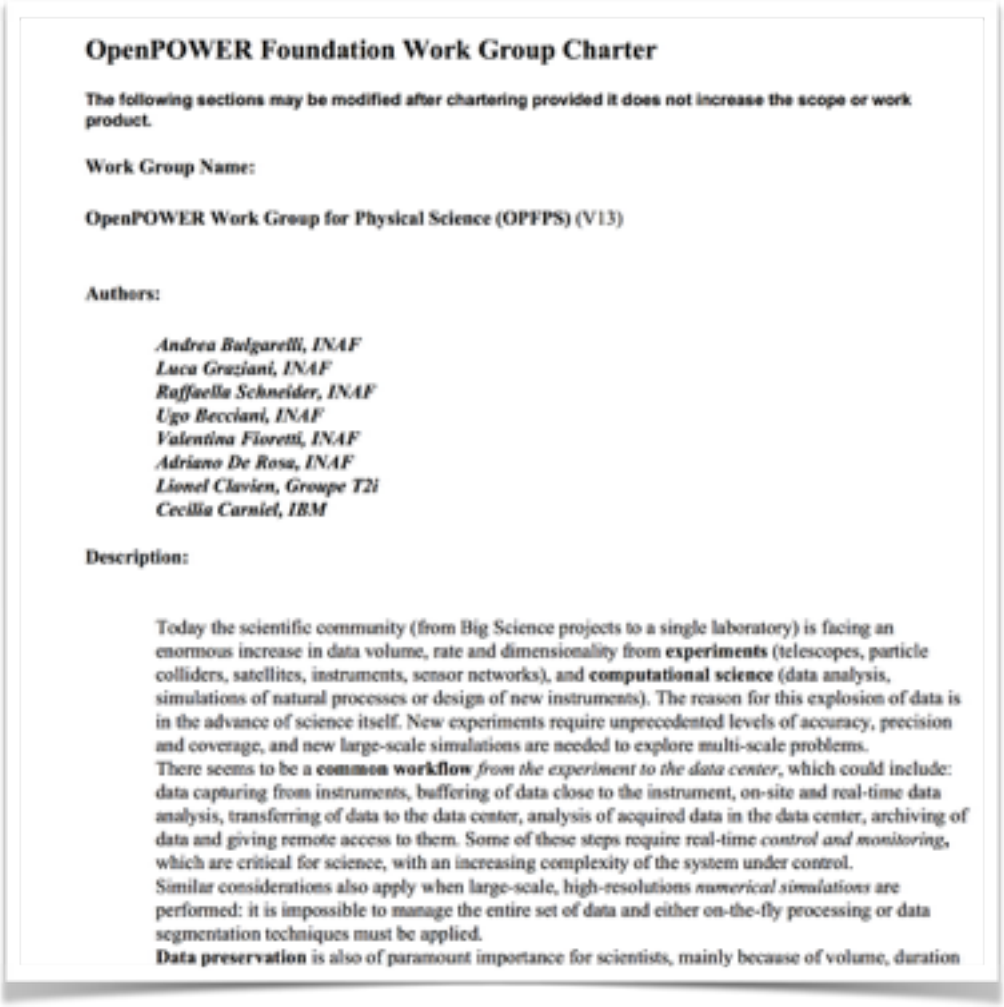
CHARTER SUB-COMMITTEE MEMBERS

Physical Science Charter Sub-Committee Members

Name	Company	Email Address	Joined Workgroup	Status	Role(s)
				Active Member	
Altoe, Piero	E4 Computer Engineering SPA		May 10, 2016	Active Member	Workgroup Member
Bozzo-Rey, Mehdi	IBM		Apr 29, 2016	Active Member	Workgroup Member
Brown, Jeff	IBM	jeffdb@us.ibm.com	Apr 29, 2016	Active Member	Workgroup Member
Brown, Jeff	University of Hawaii - MHPCC	brownjr@hawaii.edu	May 16, 2016	Active Member	Workgroup Member
Bulgarelli, Andrea	INAF - Istituto Nazionale di Astrofisica		Apr 29, 2016	Active Member	Workgroup Chair
Carniel, Cecilia	IBM		May 16, 2016	Active Member	Workgroup Member
Chien, Dominic	A*STAR		Apr 29, 2016	Active Member	Workgroup Member
Clavien, Lionel	Groupe T2i SA		Apr 29, 2016	Active Member	Workgroup Member
Eshelman, Eliot	Microway, Inc.		Apr 29, 2016	Active Member	Workgroup Member
George, Alan	University of Central Florida		May 16, 2016	Active Member	Workgroup Member
Kobayashi, Hiroaki	Tohoku University		May 16, 2016	Active Member	Workgroup Member
Michalewicz, Marek	Individual Member		May 3, 2016	Active Member	Workgroup Member
Pleiter, Dirk	ForschungszentrumJuelichGmbH		Apr 29, 2016	Active Member	Workgroup Member
Quartly, Mandie	IBM		May 3, 2016	Active Member	Workgroup Member
Schreiber, Martin	Individual Member		Apr 29, 2016	Active Member	Workgroup Member
Zoli, Andrea	INAF - Istituto Nazionale di Astrofisica		May 5, 2016	Active Member	Workgroup Member

FINAL VERSION OF THE CHARTER (V13)

- https://members.openpowerfoundation.org/wg/OPFPS/documentRevision/download/1457



OpenPOWER Foundation Work Group Charter

The following sections may be modified after chartering provided it does not increase the scope or work product.

Work Group Name:

OpenPOWER Work Group for Physical Science (OPFPS) (V13)

Authors:

Andrea Bulgarelli, INAF
Luca Graziani, INAF
Raffaella Schneider, INAF
Ugo Becciani, INAF
Valentina Fioretti, INAF
Adriano De Rosa, INAF
Lionel Clavien, Groupe T2i
Cecilia Carniel, IBM

Description:

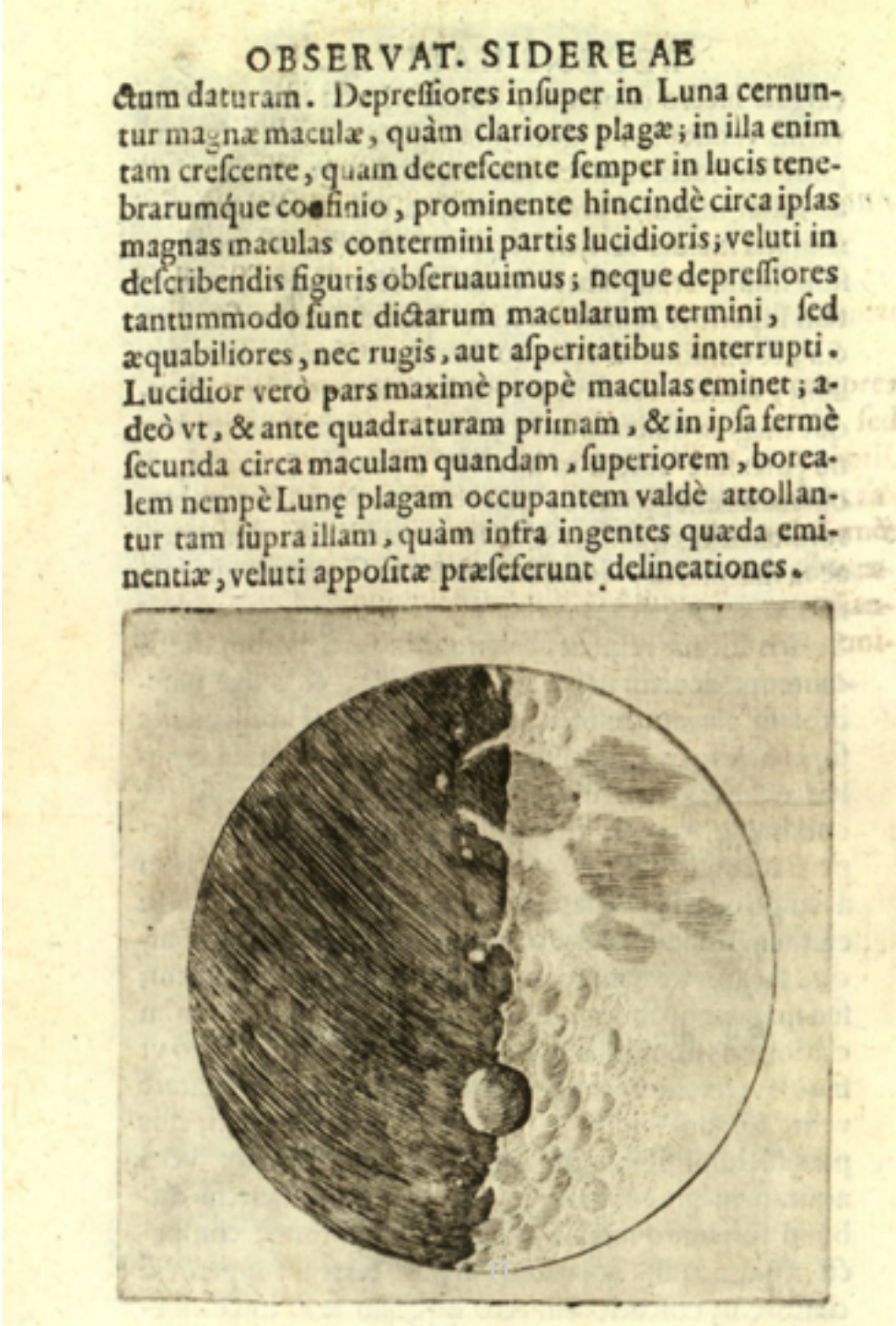
Today the scientific community (from Big Science projects to a single laboratory) is facing an enormous increase in data volume, rate and dimensionality from **experiments** (telescopes, particle colliders, satellites, instruments, sensor networks), and **computational science** (data analysis, simulations of natural processes or design of new instruments). The reason for this explosion of data is in the advance of science itself. New experiments require unprecedented levels of accuracy, precision and coverage, and new large-scale simulations are needed to explore multi-scale problems.
There seems to be a **common workflow** *from the experiment to the data center*, which could include: data capturing from instruments, buffering of data close to the instrument, on-site and real-time data analysis, transferring of data to the data center, analysis of acquired data in the data center, archiving of data and giving remote access to them. Some of these steps require real-time *control and monitoring*, which are critical for science, with an increasing complexity of the system under control.
Similar considerations also apply when large-scale, high-resolutions *numerical simulations* are performed: it is impossible to manage the entire set of data and either on-the-fly processing or data segmentation techniques must be applied.
Data preservation is also of paramount importance for scientists, mainly because of volume, duration

WG MEMBERS (CURRENT)

Name	Company	Email Address	Joined Workgroup	Status	Role(s)	Email Setting	Voter Type
Ashworth, Mike	Hartree Centre, Science & Technologies Facilities Council		Sep 1, 2016	Active Member	Workgroup Member	Individual Emails	Primary Voter
Bozzo-Rey, Mehdi	IBM		Sep 26, 2016	Active Member	Workgroup Member	Individual Emails	Non-voter
Brown, Jeff	IBM	jeffdb@us.ibm.com	Apr 29, 2016	Active Member	Workgroup Member	Individual Emails	Non-voter
Bulgarelli, Andrea	INAF - Istituto Nazionale di Astrofisica		Sep 6, 2016	Active Member	Workgroup Chair	Individual Emails	Primary Voter
Carniel, Cecilia	IBM		Sep 13, 2016	Active Member	Workgroup Member	Individual Emails	Primary Voter
Chen, Yunju	Wistron Corporation		Sep 18, 2016	Active Member	Workgroup Member	Daily Digest	Non-voter
Clavien, Lionel	Groupe T2i SA		Aug 31, 2016	Active Member	Workgroup Member	Individual Emails	Primary Voter
De Cesare, Giovanni	INAF - Istituto Nazionale di Astrofisica		Sep 6, 2016	Active Member	Workgroup Member	Individual Emails	Non-voter
Gregori, Daniele	E4 Computer Engineering SPA		Sep 20, 2016	Active Member	Workgroup Member	Individual Emails	Primary Voter
Pleiter, Dirk	ForschungszentrumJuelichGmbH		Sep 16, 2016	Active Member	Workgroup Member	Individual Emails	Primary Voter
Smareglia, Riccardo	INAF - Istituto Nazionale di Astrofisica		Sep 29, 2016	Active Member	Workgroup Member	Individual Emails	Non-voter

+ CERN people (F. Carminati, J. Apostolakis, M. Bandieramonte, A. Gheata) - thanks to Ugo Becciani

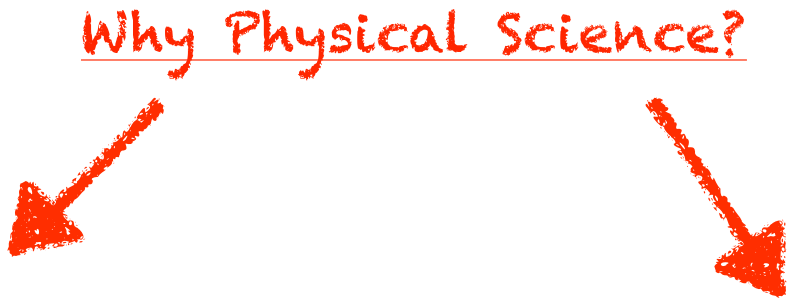
WORKGROUP MOTIVATION


OBSERVAT. SIDEREAE

ctum daturam. Depreſſiores inſuper in Luna cernuntur magnæ maculæ, quàm clariores plagæ; in illa enim tam creſcente, quam decreſcente ſemper in lucis tenebrarumque confinio, prominente hincindè circa ipſas magnas maculas contermini partis lucidioris; veluti in deſcribendis figuris obſeruauimus; neque depreſſiores tantummodo ſunt dictarum macularum termini, ſed æquabiliores, nec rugis, aut aſperitatibus interrupti. Lucidior verò pars maximè propè maculas eminet; adeò vt, & ante quadraturam primam, & in ipſa fermè ſecunda circa maculam quandam, ſuperiorem, borealem nempè Lunę plagam occupantem valdè attollantur tam ſupra illam, quàm infra ingentes quædam eminentiæ, veluti appoſitæ præſeferunt delineationes.

PHYSICAL SCIENCE @ OPENPOWER /1

- The work of a dedicated **workgroup for Physical Science needs** within the **OpenPOWER Foundation** is started



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'.

THE CONTEXT

- **Experimental** and **theoretical science** are the primary research paradigms to understand natural phenomena. The experiments determine whether **observations** agree with or conflict with the **predictions** derived from a ***hypothesis***, i.e. a possible explanation of a natural phenomenon, usually in the form of mathematical models.
- With the advent of computers, **computational science** is the paradigm of the scientific process that complements observations and theory.
  - **Data analysis and algorithms**
  - **Simulations**: simulation of mathematical models of natural and artificial processes.
    - Simulations could be carried out to understand complex theories, to predict the behaviour of a natural or artificial system, to design instruments for new experiments, and to characterize the statistical behaviour of complex phenomena.

COMMON PROBLEMS

- There seems to be a **common workflow** from the experiment to the data center, which could include:
  - **data capturing** from instruments,
  - **buffering** of data close to the instrument,
  - **transferring of data** to the data center,
  - **simulations**,
  - **archiving of data**
  - **remote access** to them
    - data federation and collaboration
  - The **reproducibility of results**, in particular in parallel computing environment, is another key aspect of Physical Science.
- Some of these steps require real-time control and monitoring

COMMON PROBLEMS/2

- **science in real-time**: the data could be acquired, stored and processed on-the-fly during the observation to provide correlation between different telescopes and/or to provide a real-time science alert system that generates alerts from astrophysical sources when unexpected events occur
- **science on-site**: The location of the experiments (e.g. under the sea or on top of a mountain) can make things even more challenging, limiting the power budget.

PHYSICAL SCIENCE @ OPENPOWER /2

Because we are members

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

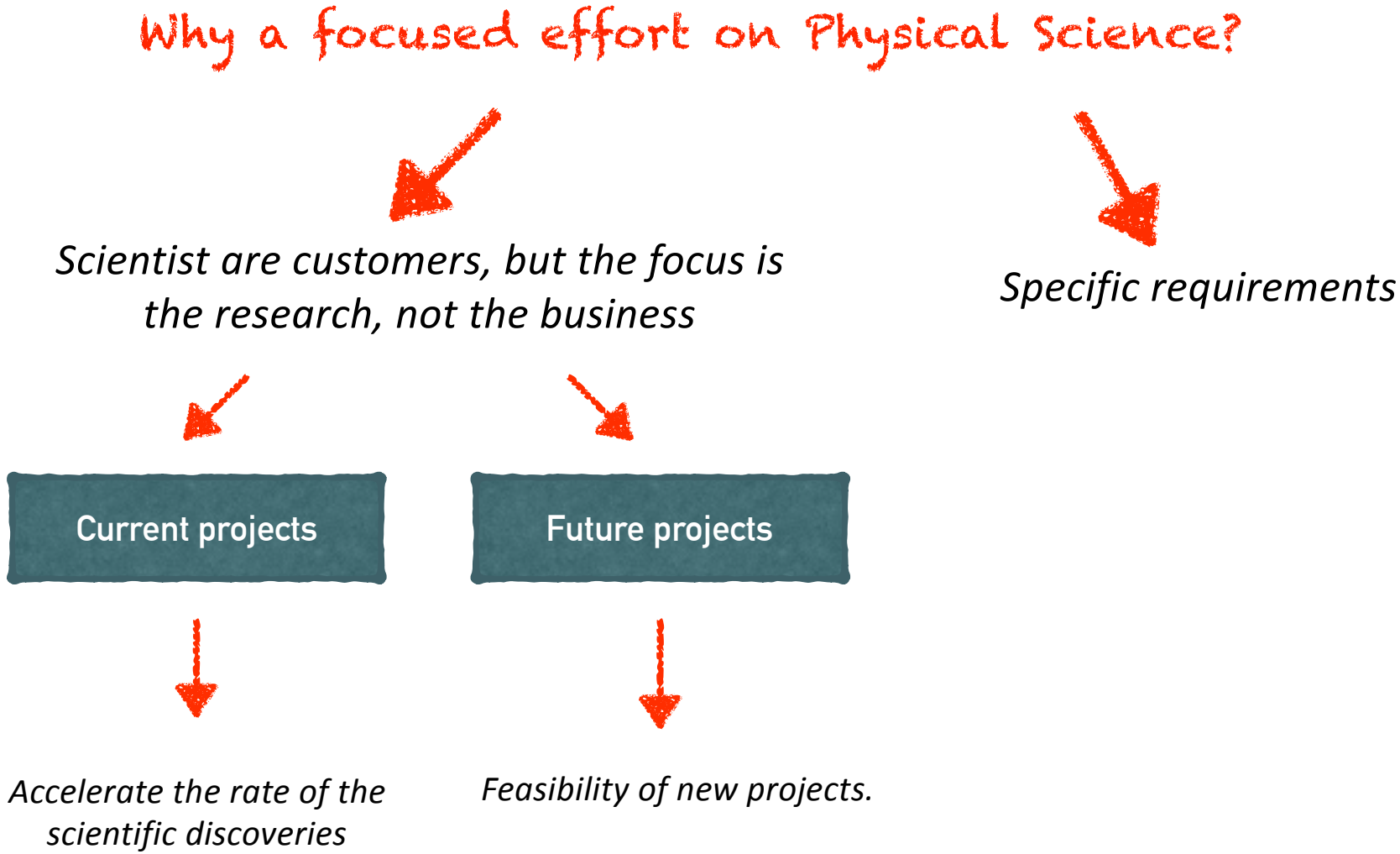
The WG will work closely with ***other OpenPOWER WGs***

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

OPF for Physical Science WG: a **forum** of 'scientists' and '(technological) developers' at the same level around a technological solution **(Power architecture and Linux)**.

- **Open hardware (many vendors)**
- **Open source**
- **The format is a 'foundation', a place where is possible to discuss with developers**

PHYSICAL SCIENCE @ OPENPOWER /3



WORKGROUP RULES

PARTICIPATION MODE

- Participation mode: **public**
- Participation in the WG shall be open to Eligible and non-Eligible people **(i.e. non OPF people,** as defined in the OPF IPR Policy)
- **WG participants (Authorised participants):**
  - **Eligible** people
  - **non-Eligible** non-OPF people may participate in WGs (must sign Contribution/Feedback License (Appendix A))
    - their attendance does not count for quorum and they can not become "voting" members of the WG or chair the WG.
    - Beyond that there are no restrictions on their participation or **feedback/contribution** to provide **Use Cases**

CONFIDENTIALITY MODE

- **Not confidential**
  - contributions and feedbacks are not subject to any requirement of confidentiality

IPR (Intellectual Property Rights) MODE: CODE

- **Our deliverables: notes**
- only a WG operating under the Code IPR mode may include members that are not-Eligible people
  - but, only **code and related documentation** may be generated and released as a Deliverable under this IPR Mode while specifications, standards and other non-Code related documentation shall not be released as a Deliverable by the WG." (Section 10.3 of "OPF IPR Policy")
- We formally request an exemption from this limitation as part of the charter. The BOD has approved it.

OPEN SOURCE SOFTWARE

- The **Open Source Software (OSS) Licensing Mode:** Apache License V2.0.
- **OSS Communities**: No specific OSS communities are targeted at the time of chartering

WORKGROUP EXPECTED DELIVERABLES

PHYSICAL SCIENCE @ OPENPOWER

How? The focus is on use cases.

Why?

OPF is an open organisation. The amount of time spent for OPF is 'free' (at least for Academic)

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 focus on problems of Physical Science people.

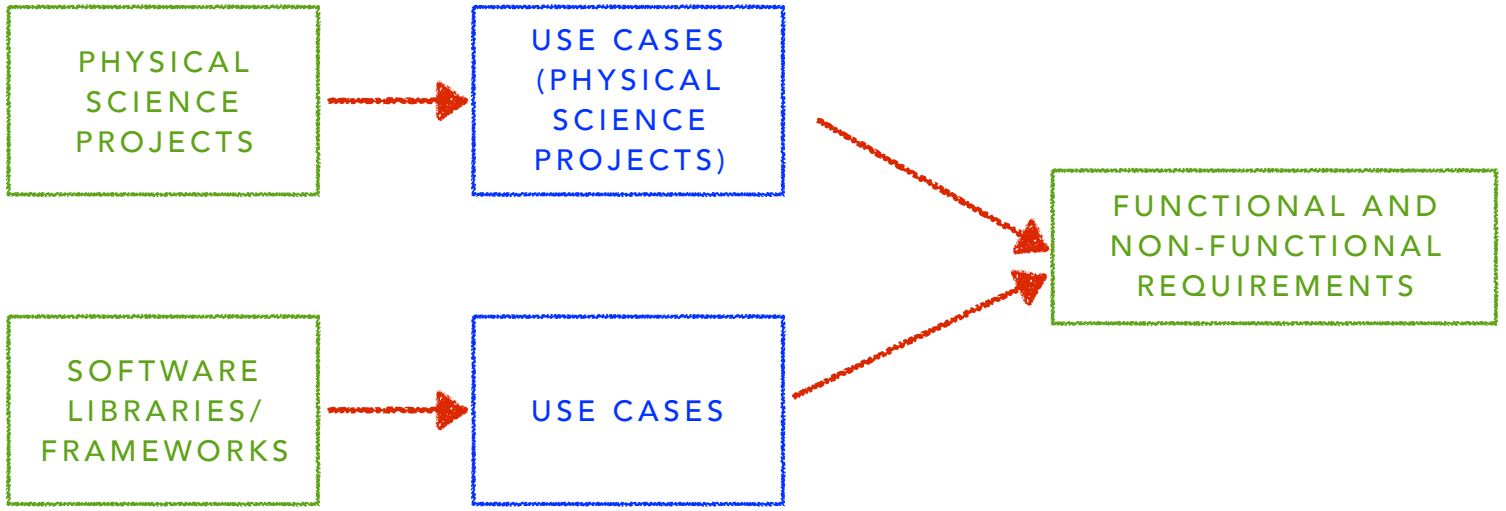
PROJECTS

- (1) **Current and future Physical Science projects use cases, requirements, common workflows and reference solutions**. Collection of use cases and related requirements. Based on these requirements, identification of common workflows and possible reference solutions in collaboration with other OPF WGs.
- (2) **Scientific software frameworks and libraries.** Identification of widely used software frameworks and libraries used in the Physical Science (based on the experience of WG members), status of the porting to OpenPOWER solutions. Based on the contribution of WG members, execution of performance tests. Usage of proprietary software already developed or available in participating scientific groups.

DELIVERABLES

- **WP1 (method)**. The writing of a Note (or creation of wiki pages) on **methodologies for describing use cases**, to document use cases in a way useful for people that are not an expert in the domain area of the Physical Science projects. This help to link the activities of this WG to those of other WGs and to manage in an effective way the requirements inception.
- **WP2 (Use Cases)**. The writing of Note(s) (or creation of wiki pages) identifying specific **use cases of Physical Science Projects** (from Big Science projects as well as projects at laboratory level), the area (e.g. experimental or computational science), **the workflow and related requirements**. The selection of use cases will depend on the experience and availability of the WG members.
- **WP3 (Software)**. The writing of Note(s) (or creation of wiki pages) that lists the **main available scientific software frameworks and libraries** (both proprietary and open source) for Physical Science projects identified within WP2, and t**he status of the porting** of them on OpenPOWER platforms. The selection of framework and libraries will depend on the experience and availability of the WG members.
- **WP4 (Solutions): Those Notes will identify common workflows and possible platforms (HW and SW)**

CONTRIBUTIONS FROM WG PARTICIPANTS



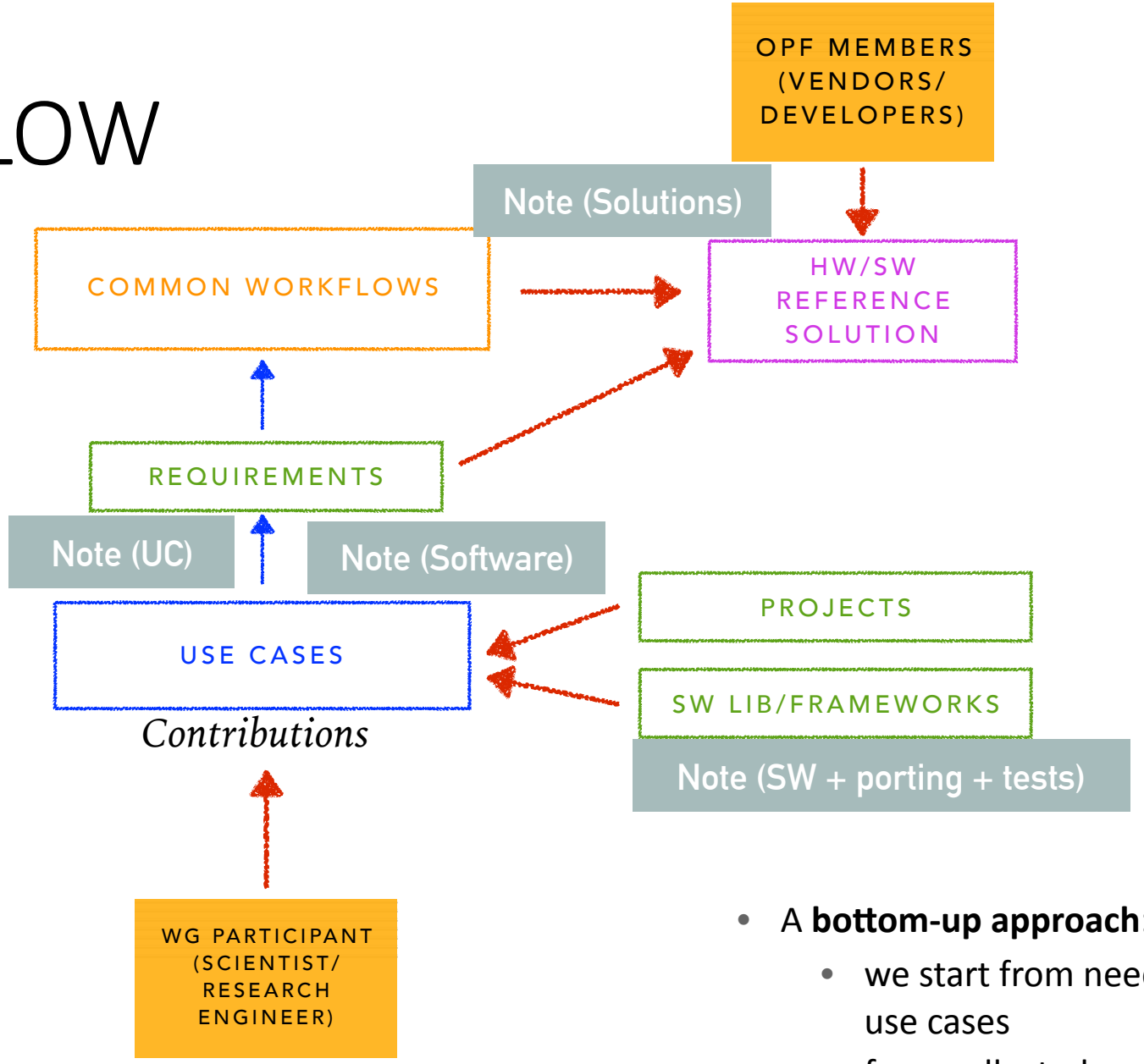
Participation mode: public

Confidentiality mode:

not confidential

WORKGROUP METHOD

WORKFLOW



Participation: Public

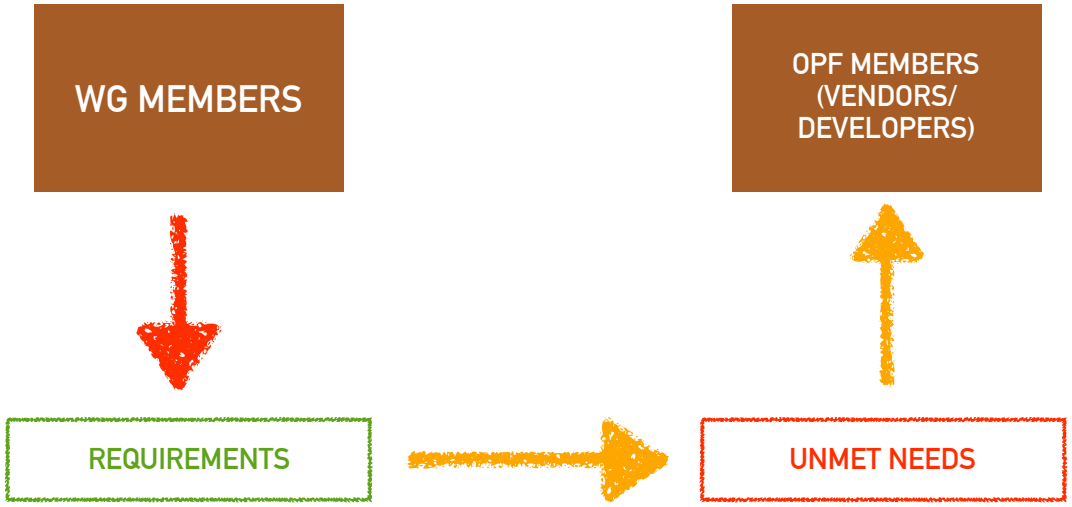
Confidentiality: no confidentiality

IPR mode: code

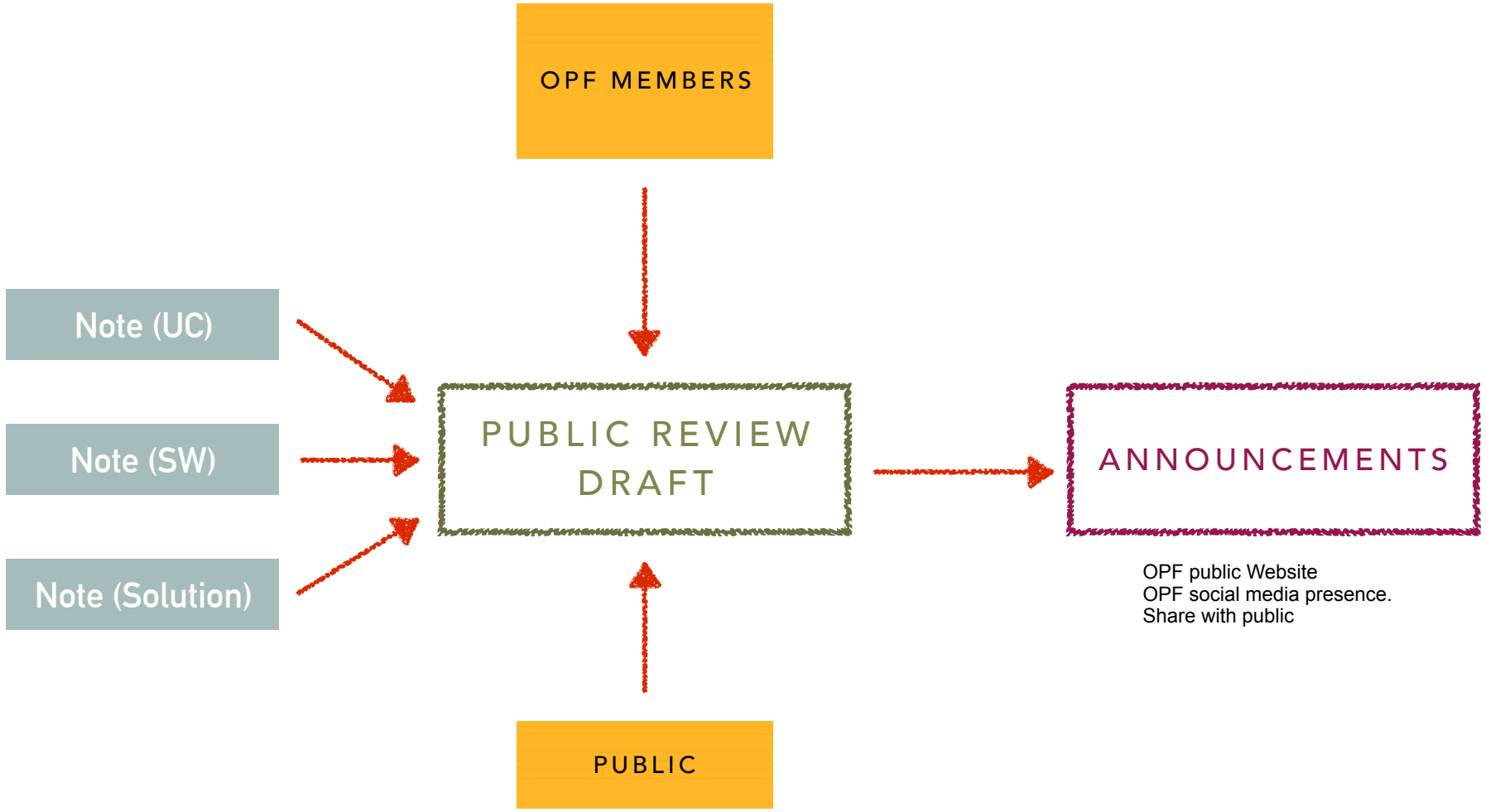
- A **bottom-up approach**:
  - we start from needs of members, as use cases
  - from collected use cases, we will try to analyse possible common workflows.

AND IF THERE IS NOT A SOLUTION?

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



REVIEW OF DELIVERABLES



The results will be publicly available

CONCLUSIONS

- The purpose is to **<u>focus OPF members on "Physical Science" use cases</u>** to
  - define common hardware and software solutions
  - derive common workflows
  - focus on unmet requirements
- **We need to start the collection of Astrophysical USE CASES**