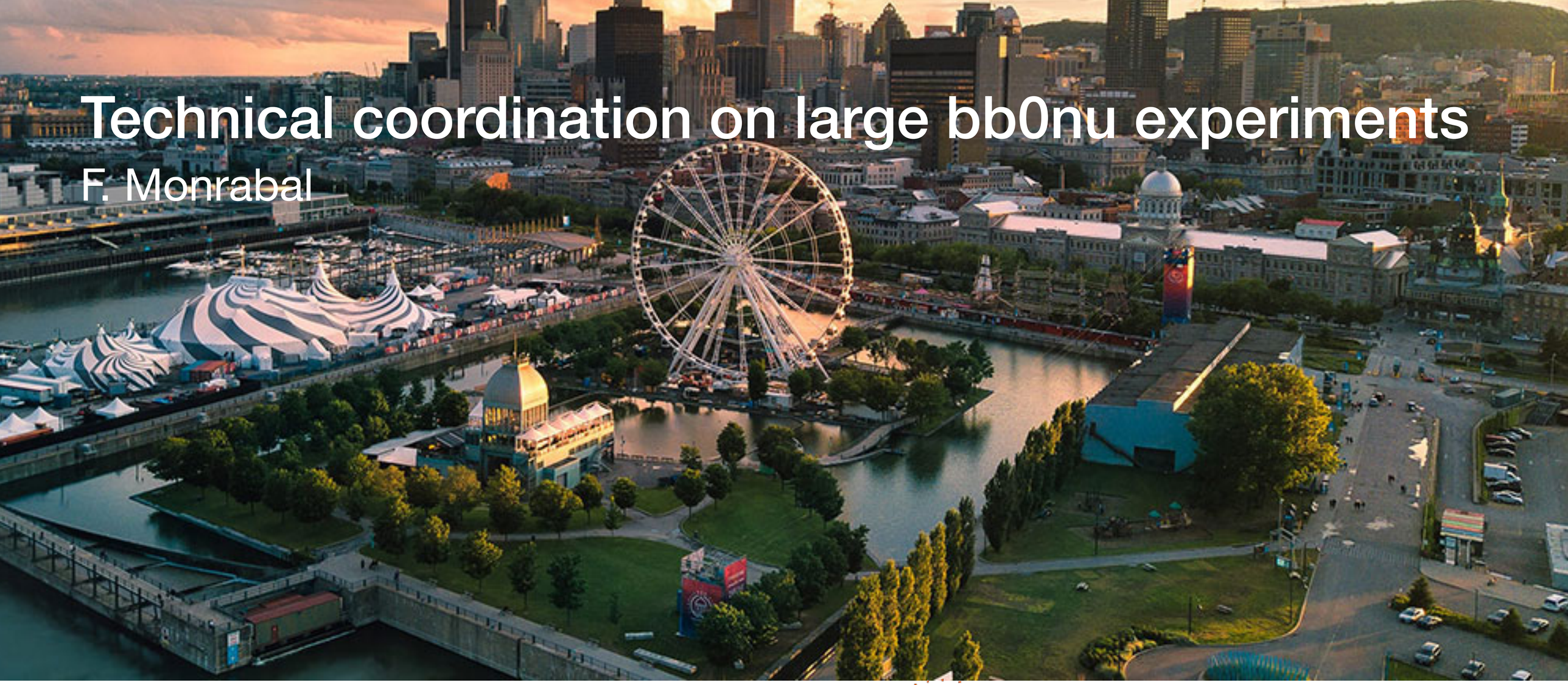
Technical coordination on large bb0nu experiments

F. Monrabal



ikur estrategia

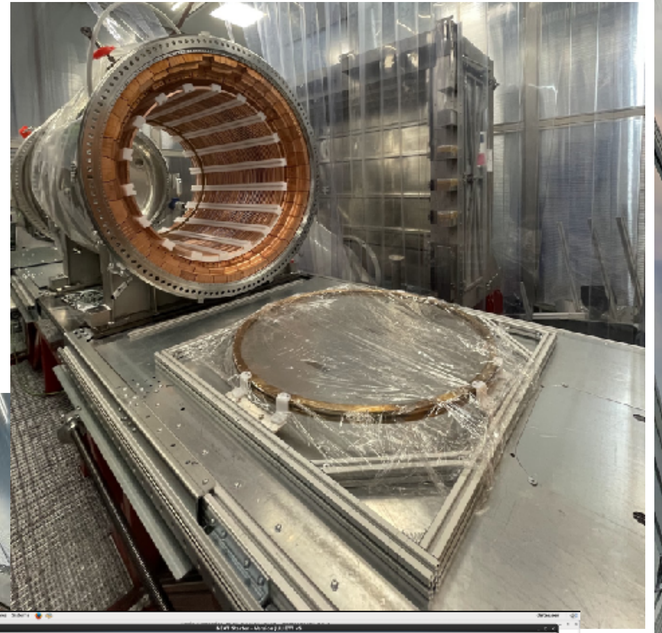
European Research Council
Established by the European Commission

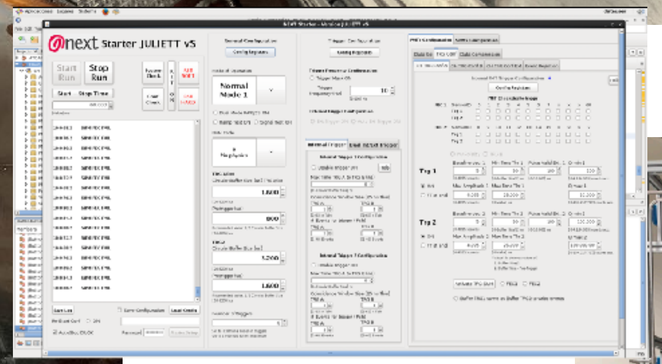
ikerbasque
Basque Foundation for Science

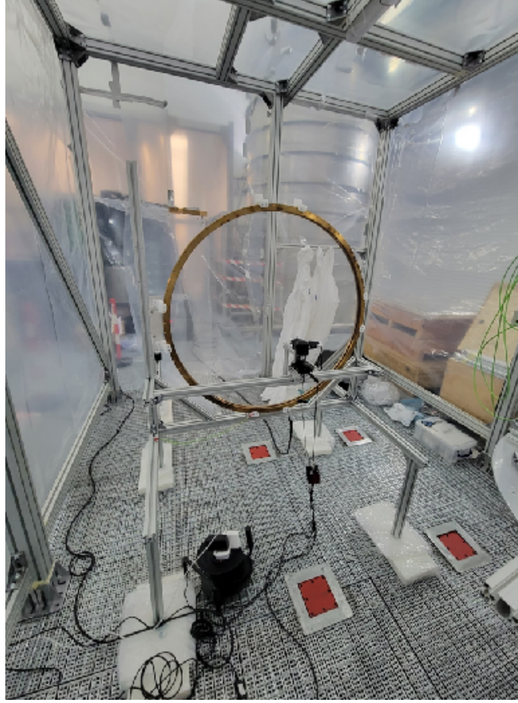
About this talk

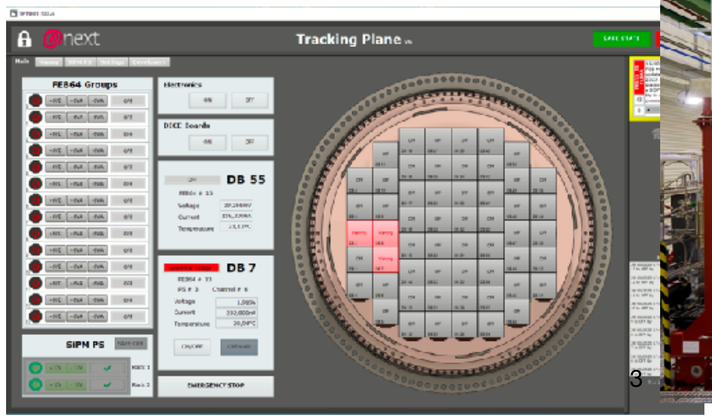
- Level of complexity from the technical point of view.
- Different groups, countries and funding agencies
- Responsibilities & incentives (Skin in the game)
- Communication, coordination and logistics
- And more…

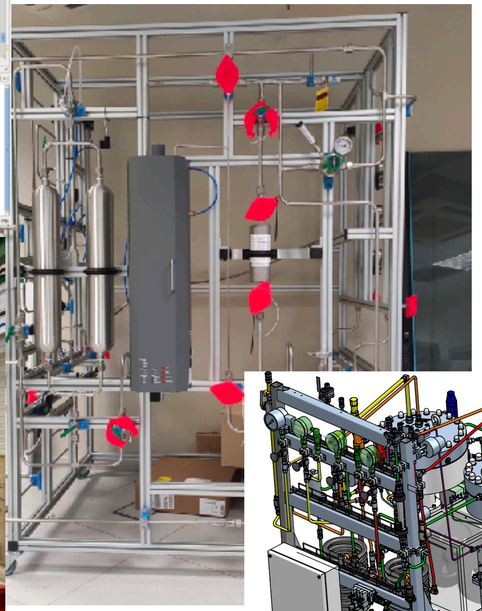
Level of complexity

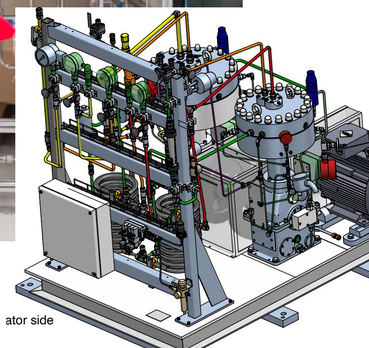












ator side

Level of complexity

- Several systems interconnected:
  - Sensor planes
  - Field Cage
  - High Voltage Feedthrough
  - Pressure vessel
  - Shielding
  - Gas system
  - Electronics
  - Slow Controls
  - DAQ

Design of one part of the experiment depends on the **details** of other systems.

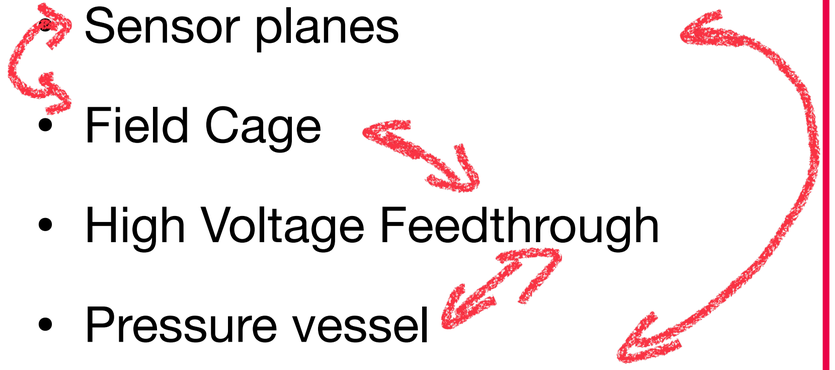
Constant **communication** between different teams.

Definition of **requirements** and **interfaces** is crucial but need to be periodically updated.

Design decisions needs to be shared with the rest of the team as they can have **implications for other systems**.

Level of complexity

- Several systems interconnected:
  - Sensor planes
  - Field Cage
  - High Voltage Feedthrough
  - Pressure vessel
  - Shielding
  - Gas system
  - Electronics
  - Slow Controls
  - DAQ



Design of one part of the experiment depends on the **details** of other systems.

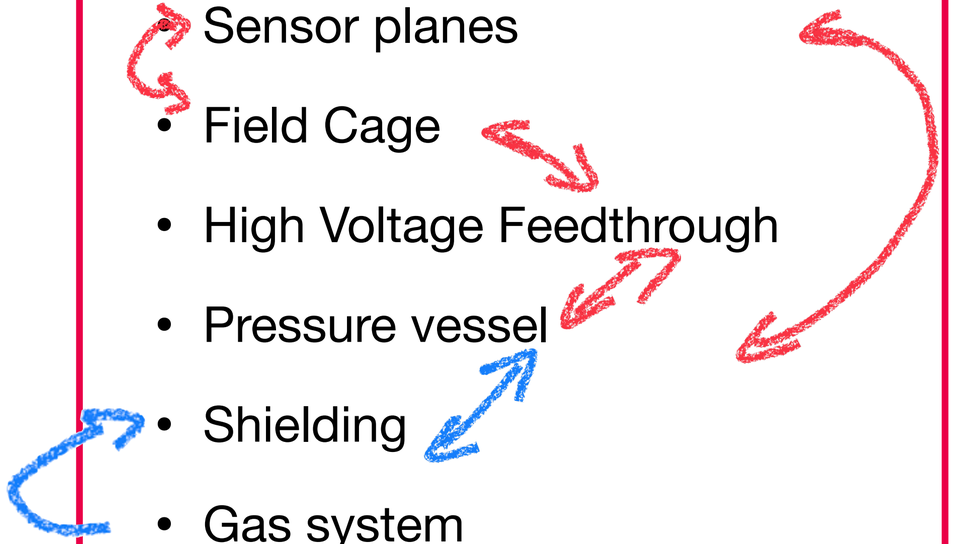
Constant **communication** between different teams.

Definition of **requirements** and **interfaces** is crucial but need to be periodically updated.

Design decisions needs to be shared with the rest of the team as they can have **implications for other systems**.

Level of complexity

- Several systems interconnected:
  - Sensor planes
  - Field Cage
  - High Voltage Feedthrough
  - Pressure vessel
  - Shielding
  - Gas system
  - Electronics
  - Slow Controls
  - DAQ



Design of one part of the experiment depends on the **details** of other systems.

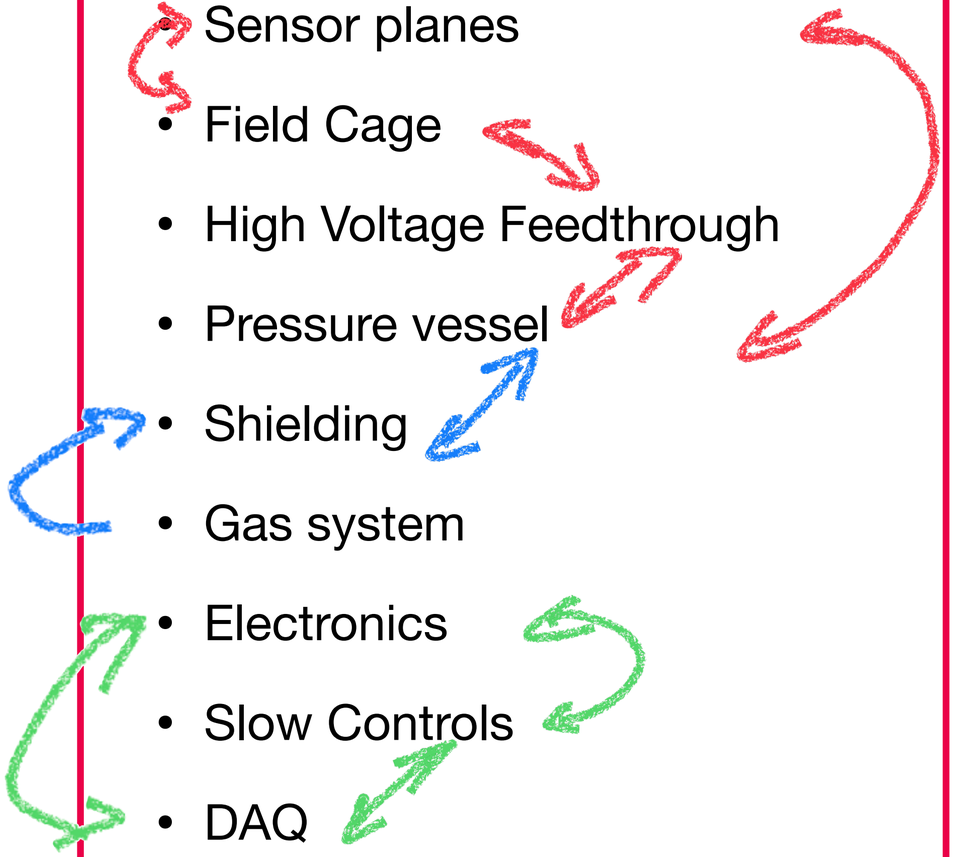
Constant **communication** between different teams.

Definition of **requirements** and **interfaces** is crucial but need to be periodically updated.

Design decisions needs to be shared with the rest of the team as they can have **implications for other systems**.

Level of complexity

- Several systems interconnected:
  - Sensor planes
  - Field Cage
  - High Voltage Feedthrough
  - Pressure vessel
  - Shielding
  - Gas system
  - Electronics
  - Slow Controls
  - DAQ



Design of one part of the experiment depends on the **details** of other systems.

Constant **communication** between different teams.

Definition of **requirements** and **interfaces** is crucial but need to be periodically updated.

Design decisions needs to be shared with the rest of the team as they can have **implications for other systems**.

Level of complexity

Design of one part of the experiment depends on the **details** of other systems.

Constant **communication** between different teams.

Definition of **requirements** and **interfaces** is crucial but need to be periodically updated.

Design decisions needs to be shared with the rest of the team as they can have **implications for other systems**.

All this part is usually carried by a technical team (engineers).

Integration and management of engineers is different in the different groups and countries.

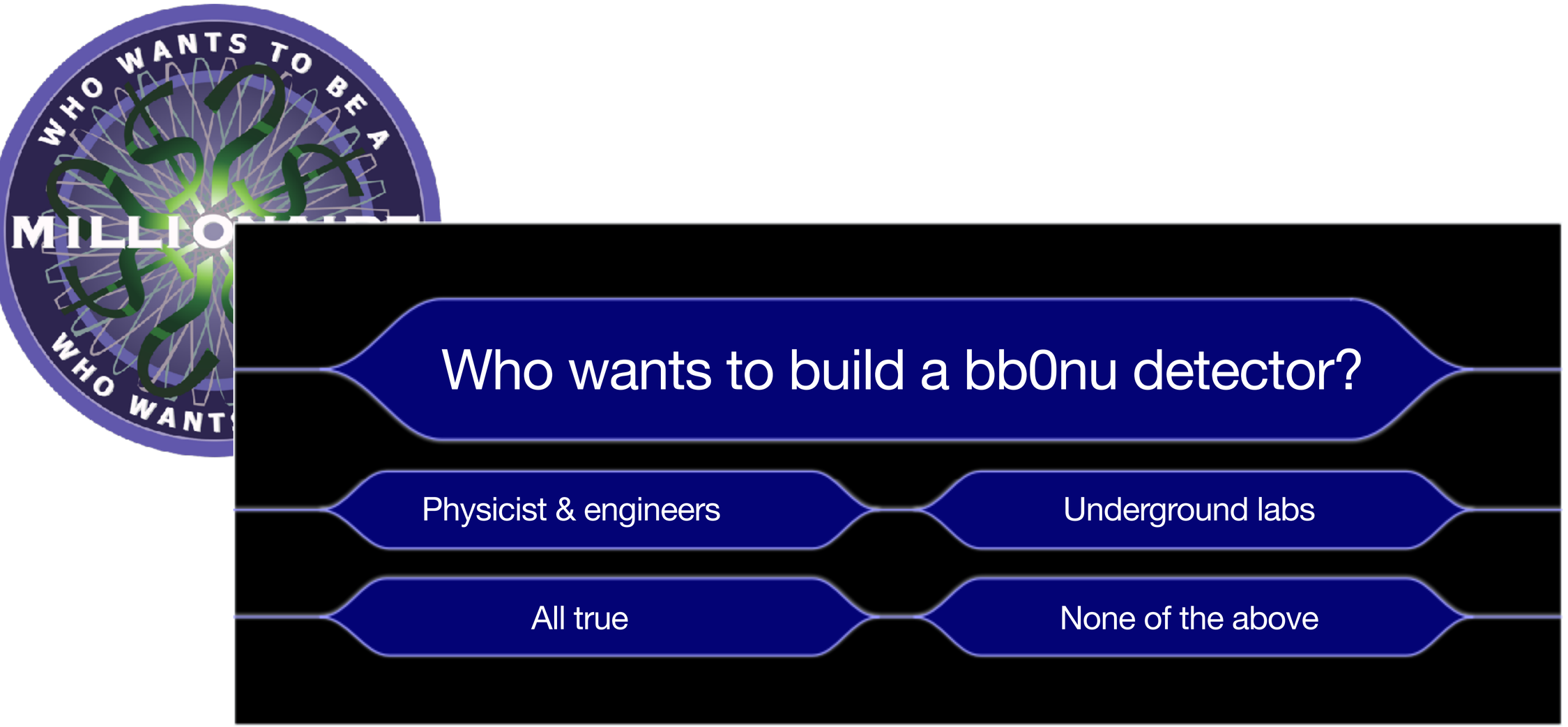
Sometimes is not even easy to talk directly with the person doing the job.

Level of complexity

On top of all that…

- Many parts of the detector are very specific and hard to produce:
  - Vessel, sensors, electronics
  - Xenon
- How many companies produce xenon, sipms, vessels of meters, meshes,…?
- Use radio pure materials and screening times.
- Finding companies that are willing to work with us is not always easy, much more under the bureaucratic chaos that we carry.

So… who wants to build a bb0nu detector?



Distribution of responsibilities and design of incentives

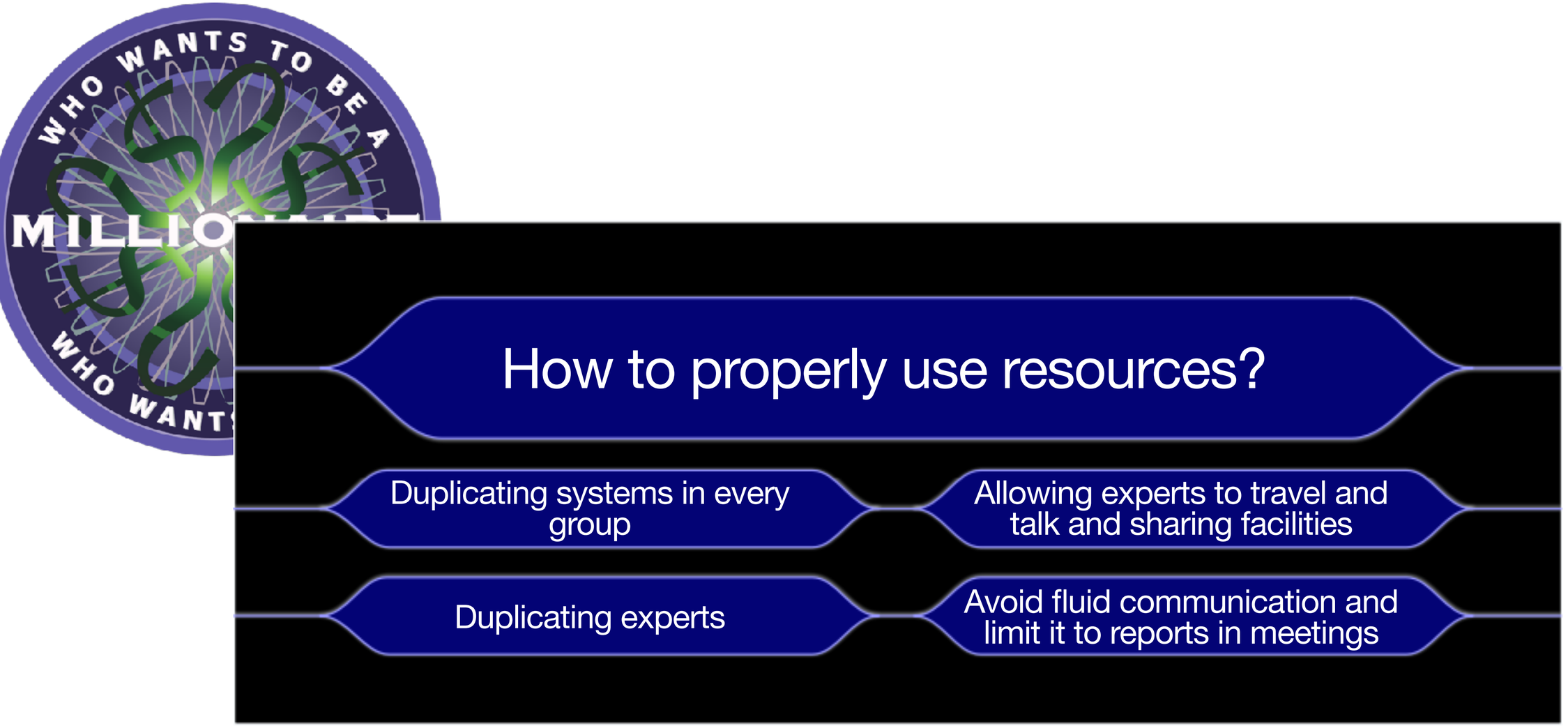
Distribution of responsibilities and design of incentives

- Proper design of **incentives** it is crucial to reach the objectives assigned to each group.
- Ideally, all groups should have “**skin in the game**”.
  - Their project should be **one of the main projects** in which the group is involved.
  - In that sense, distribution of responsibilities should take into account who is making **larger investments on the experiments**.
  - The collaboration should have a **plan in case a group fails** in deliver their responsibilities.
    - At the cost level of next generation experiments, **involvement of the different funding agencies** will be relevant.

Distribution of responsibilities and design of incentives

- The same applies to companies:
  - We should find companies for which this **project becomes relevant** and interesting.
  - Companies that are **willing to invest time** in testing different materials or changing a little the way they usually do things.
- We have done this is in the past but it is not easy.
  - Dedicated effort to this is necessary.

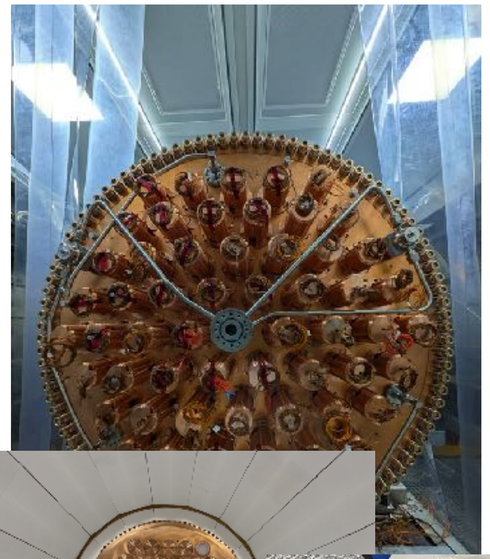
Communication, coordination, logistics

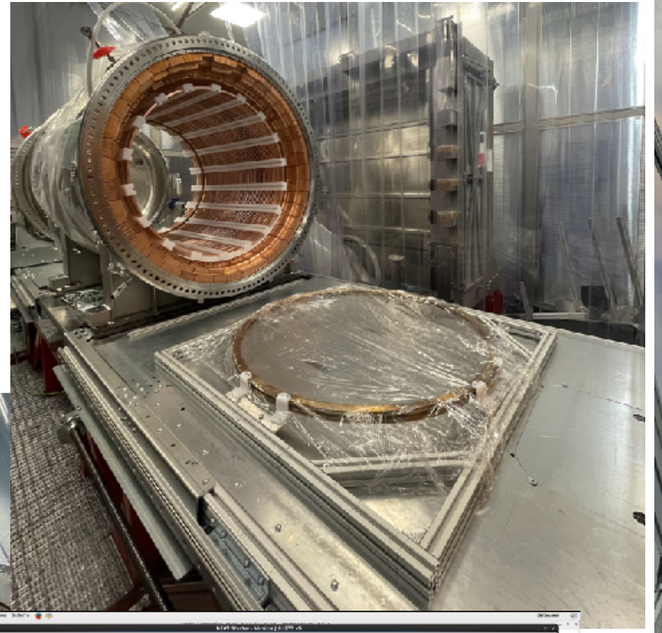


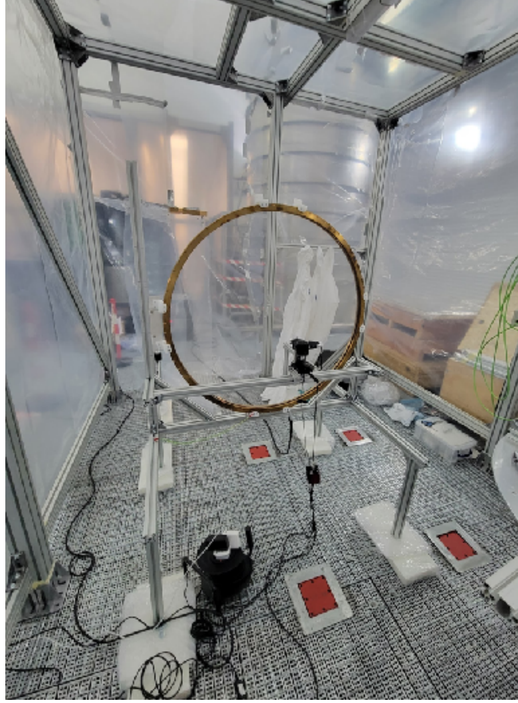
Communication, coordination, logistics

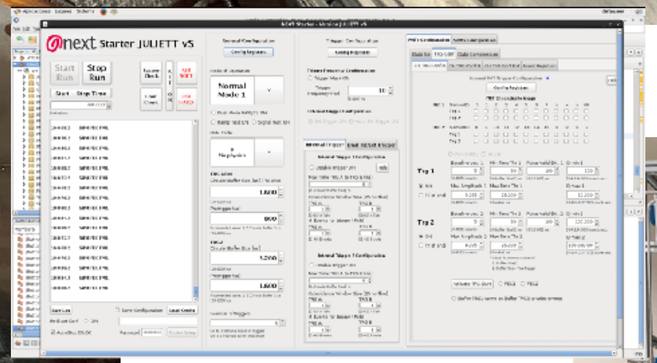
- On the other hand, expertise is never distributed evenly across different groups.
- Many times it is more efficient to share resources, perform tests in different groups, use facilities in different places,…
- Needs coordination not only at the technical level but also in logistics
  - Shipments
  - Working teams
  - Facilites
  - Customs
  - Coordination with the lab.
- At least one person should be 100% dedicated to this task (probably more).

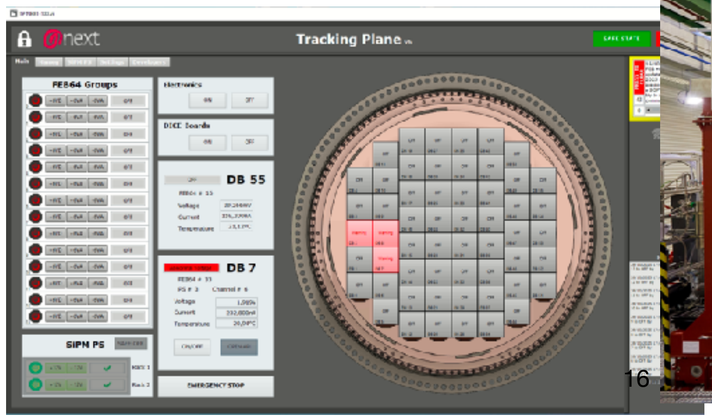
Level of complexity

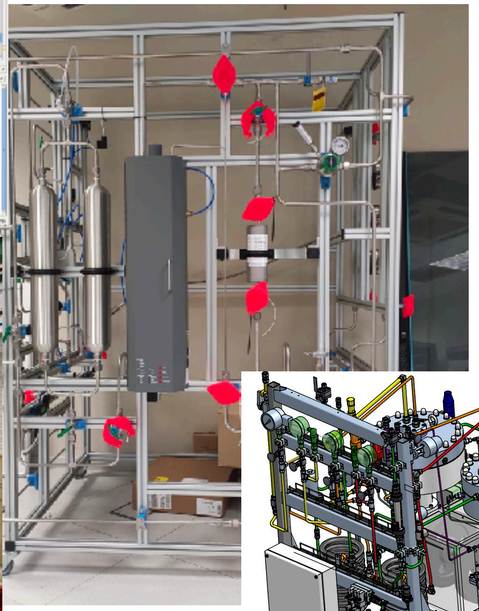


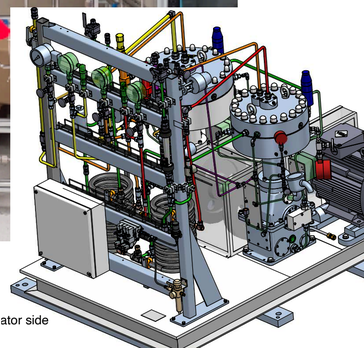






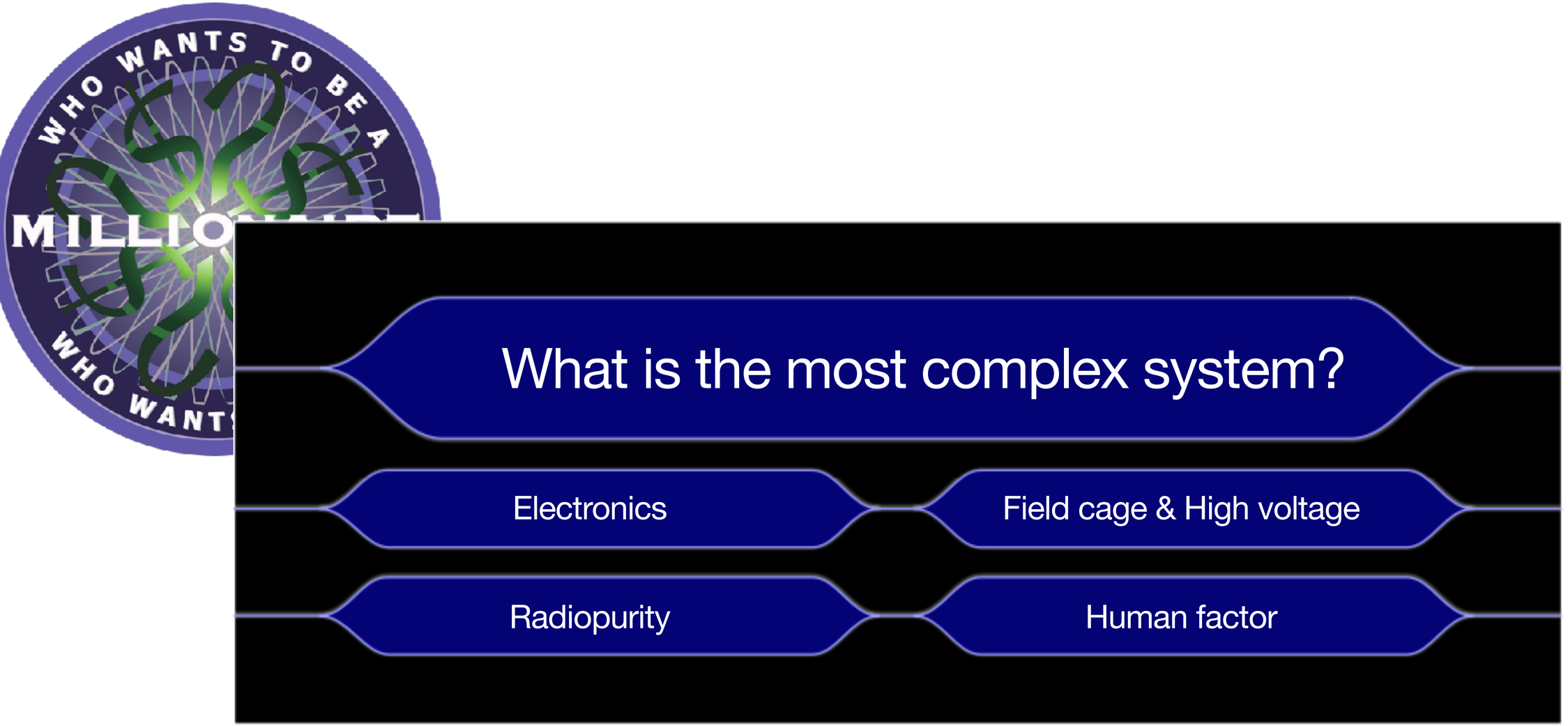






ator side

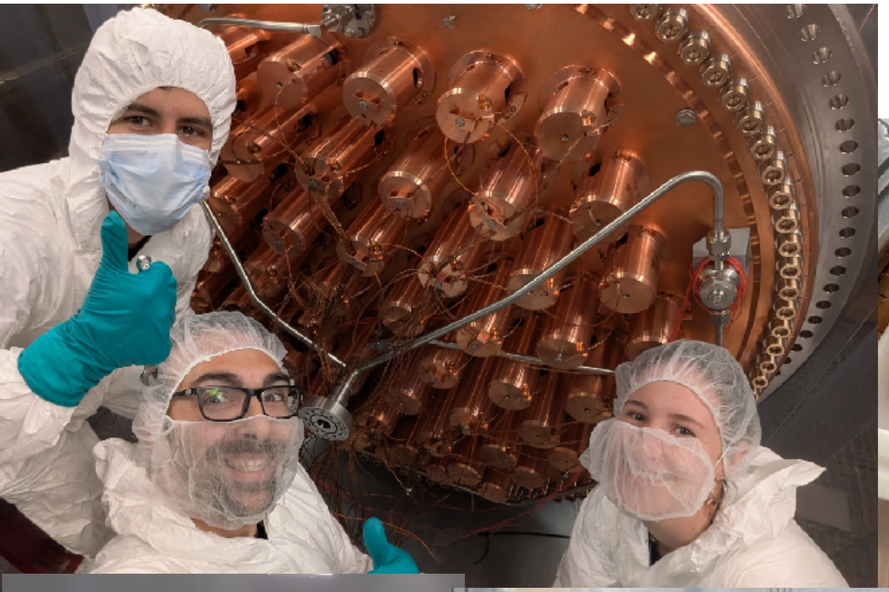
Communication, coordination, logistics

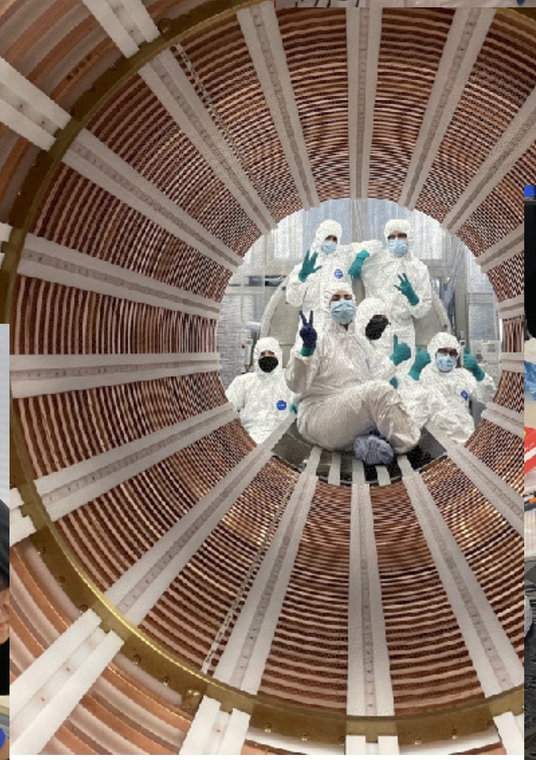


About this talk

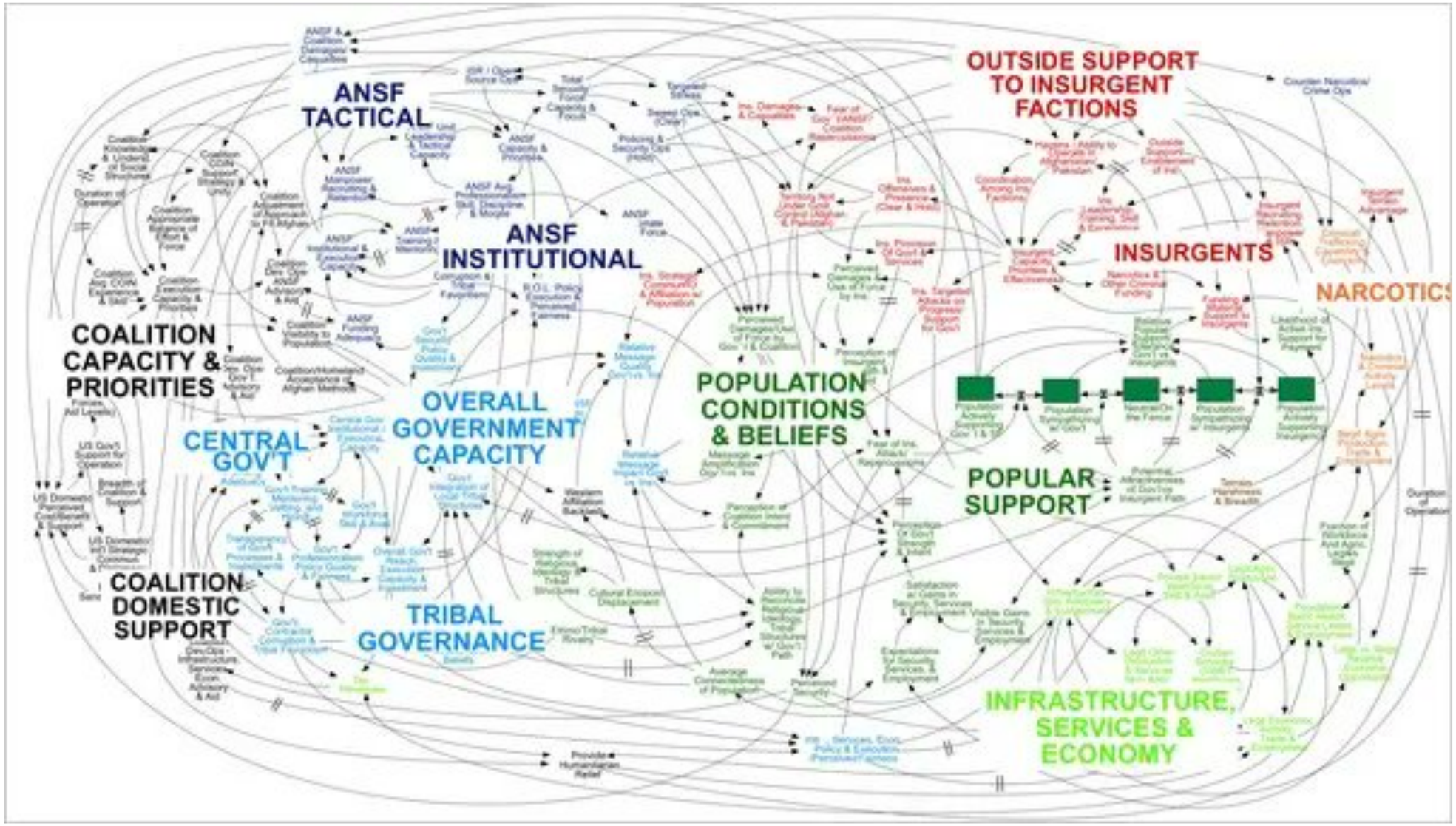
- Context:
  - Level of complexity from the technical point of view.
  - Different groups, countries and funding agencies
  - Responsibilities & incentives (Skin in the game)
- Communication, coordination and logistics
- **Human factor**—> Not totally chaotic but with some predictability that can be managed (?).

Level of complexity





Level of complexity

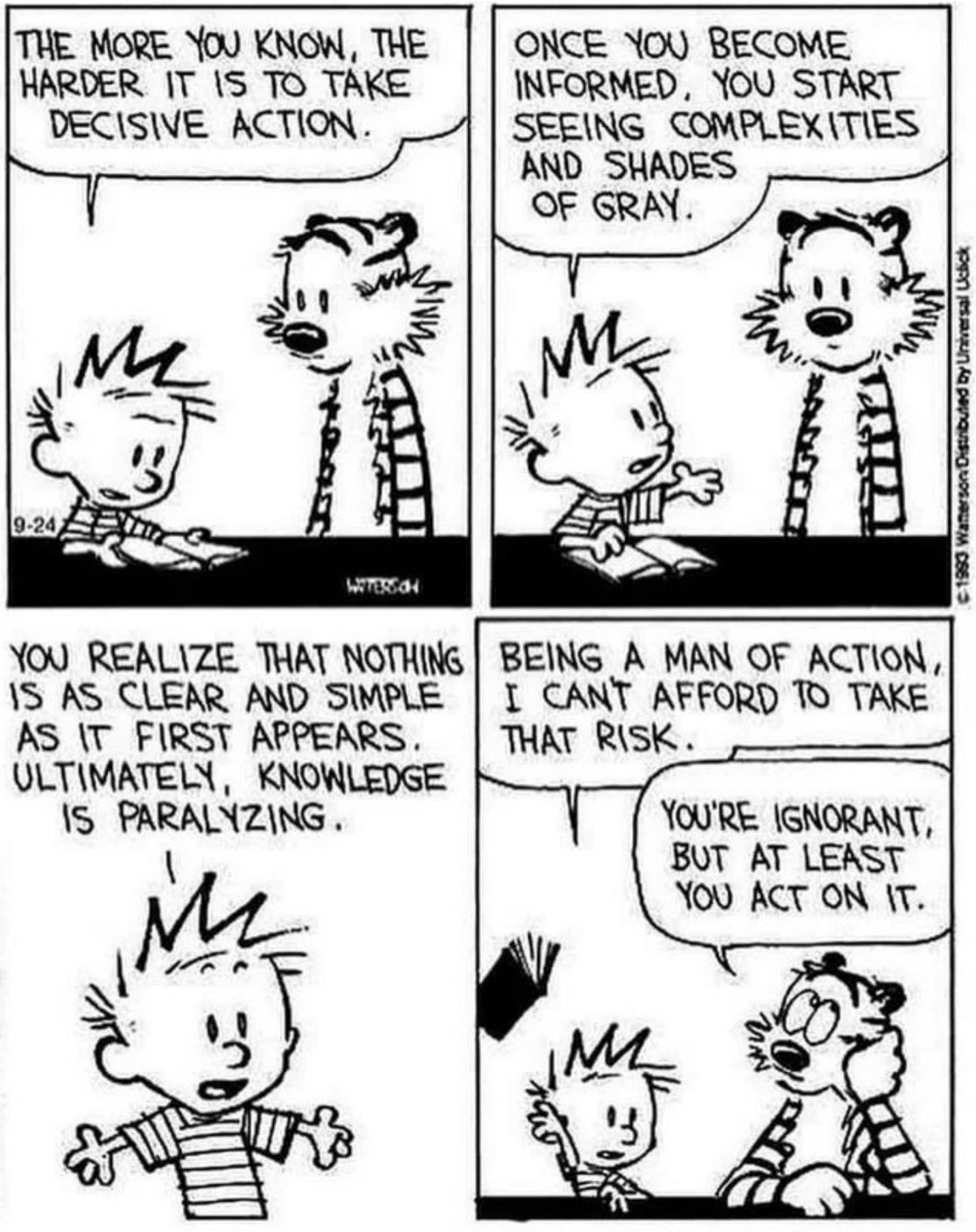


Human factor

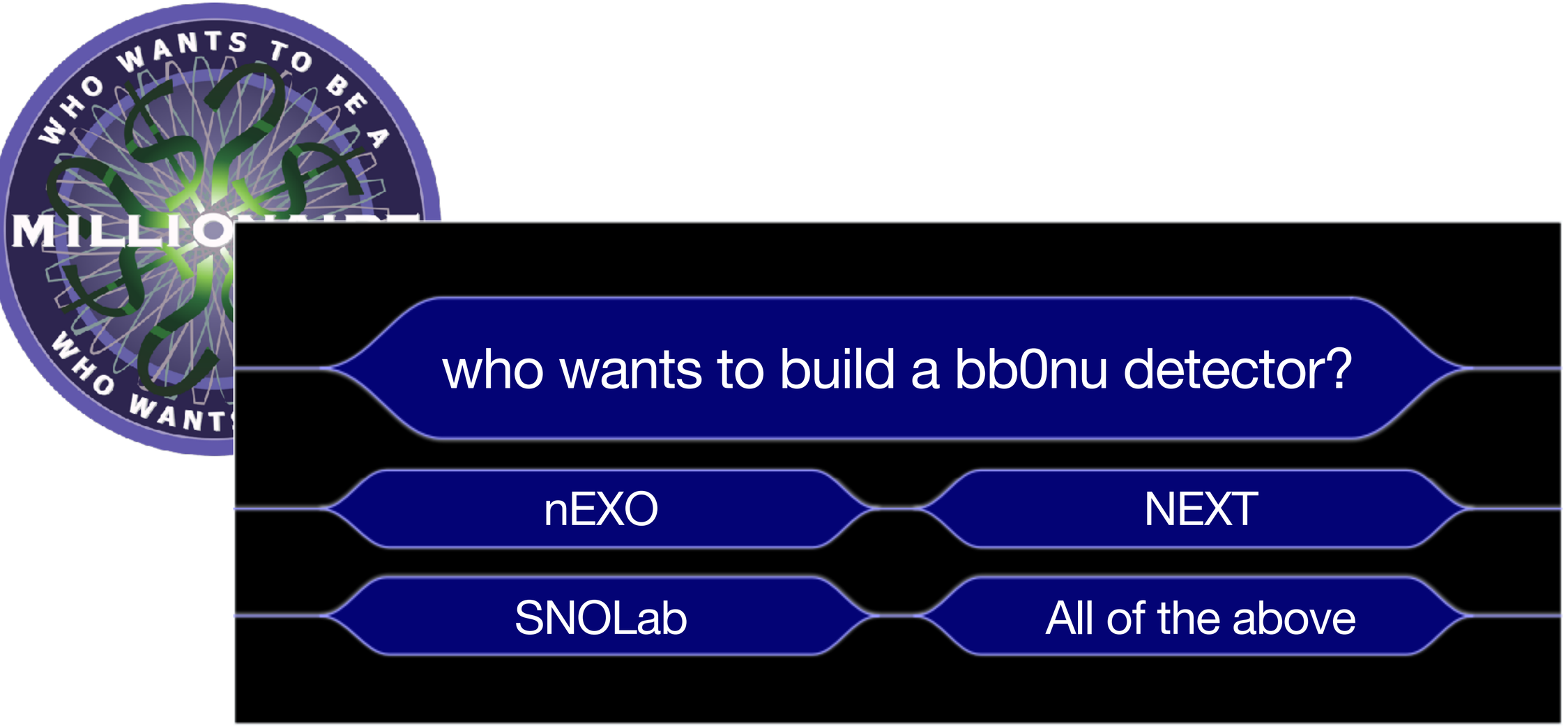
- Everything described before needs to be **implemented by humans** (at least for the moment)
- Configuration of the components of each group should be **defined by the problem to solve**
  - Some of the problems can not be solved in a linear way, need for a team that can **work on non-predefined environments**.
  - Combination of specialists with **non-pure profiles** that can provide of a wider view on the problem.
  - Each person in the group has different profiles and interests: engineers, students, post-docs, PIs, …
  - Designing **incentives** for all these different profiles is a challenge that needs to be addressed by the collaboration as a whole
    - Career options for students and post-docs, stability for the technical team, …
    - Visibilization of their work
    - Everyone would have a combination of different personal interests.
    - Finding the **right incentives** is an important task to keep a team motivated for the **years needed** to build and operate such a large detector

Human factor

- On top of all that…
  - Incentives may (will) collide.
  - Some people won’t get along with others
  - Schedule of some groups will affect others
- All that could create an unmotivated environment.
  - Communication starts failing
  - Minor mistakes accumulate
- We should find tools to keep communication and motivation in a several years project.


THE MORE YOU KNOW, THE HARDER IT IS TO TAKE DECISIVE ACTION.
9-24
WATTERSON
ONCE YOU BECOME INFORMED, YOU START SEEING COMPLEXITIES AND SHADES OF GRAY.
©1993 Watterson Distributed by Universal Uclick
YOU REALIZE THAT NOTHING IS AS CLEAR AND SIMPLE AS IT FIRST APPEARS. ULTIMATELY, KNOWLEDGE IS PARALYZING.
BEING A MAN OF ACTION, I CAN'T AFFORD TO TAKE THAT RISK.
YOU'RE IGNORANT, BUT AT LEAST YOU ACT ON IT.

Conclusions

- Building large experiments in the frontier of the technology is not easy (in case you didn’t know)
- It requires a strong technical team.
- But not only technical, also non-pure profiles are needed.
- All the groups with a relevant responsibility in the detector should have “skin in the game”.
- Assignment of responsibilities should take this into account on top of the technical capabilities of the groups.
- Design of working teams based on the problem to solve, not finding the problem that fits my team…
- Design of incentives for the group and, more important, for the humans in the group.
- People within the collaboration diagnosing communication, motivation,… and helping on improving this.
- Last… weather forecast illusion
  - Having the capability of understandings all these issues and problematics may not make us capable to solve all of them, we should be prepared for the rain.
  - Agreements within the groups and with the funding agencies describing what to do in case anything fails.

So… who wants to build a bb0nu detector?