

# Managing multi-instrument data streams in secure environments

Godfrey Sauti   Benjamin D. Jensen   Emilie J. Siochi

Advanced Materials and Processing Branch, NASA Langley Research Center, Hampton, VA 23681

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## Outline

- 1 Introduction: Why does data management matter to NASA?
- 2 Multi-instrument data streams
- 3 Challenges of operating in a secure environment
- 4 Closing

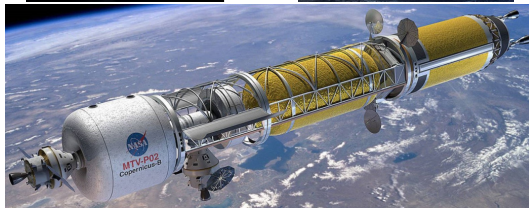
**All Image Credits: NASA**

## The mission



Safe?

Not Safe?

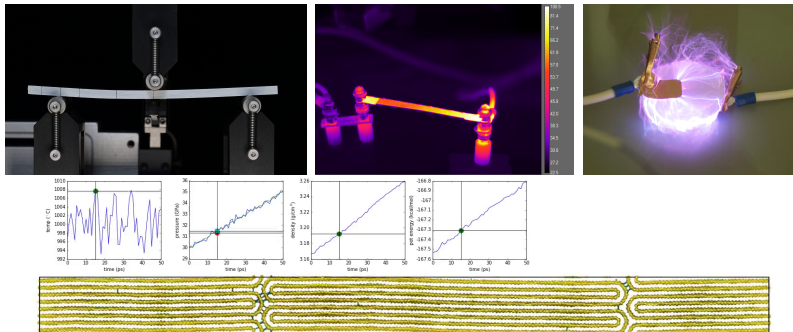


👍 Can fly/will Fly?

👎 Can't fly/won't fly?

Complete, accurate, and timely data is required to help answer these questions!

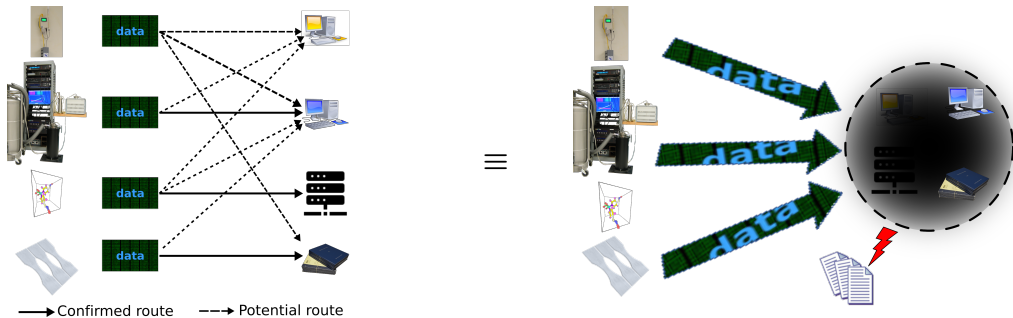
## The mission need: A materials and processing perspective



Mechanical, thermal, electrical, chemical, optical, ... properties and performance of materials in a range of environments and usage conditions including high radiation, high strain rate, high loading, extreme heat, extreme cold, ultra-high vacuum, dusty, ultra-high vacuum & dusty, ....



## Data flows in current laboratory practice: Where is the data?

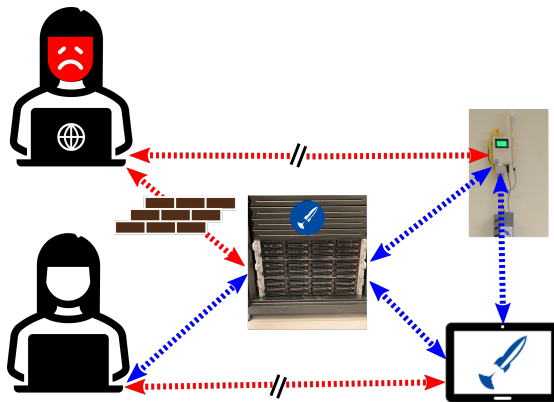


Most of the ground level experiment and simulation data (original content) gathered at great effort ends up spread out, degraded (e.g. loss of context information) and inaccessible with only partial insights reported.

## Getting to the data: Expectations, reality and concerns

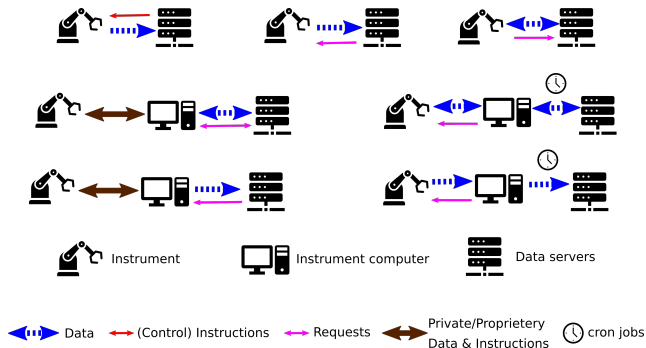


## The solution: Traffic control



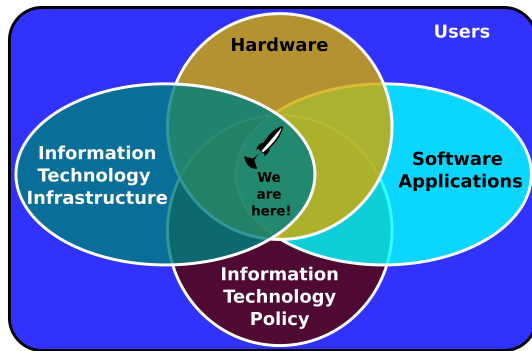
Access control through Software Defined Networks, Firewall Rules, Zero Trust Network Security Postures.

## Why it is hard to do (I): Hardware and software capabilities/limitations



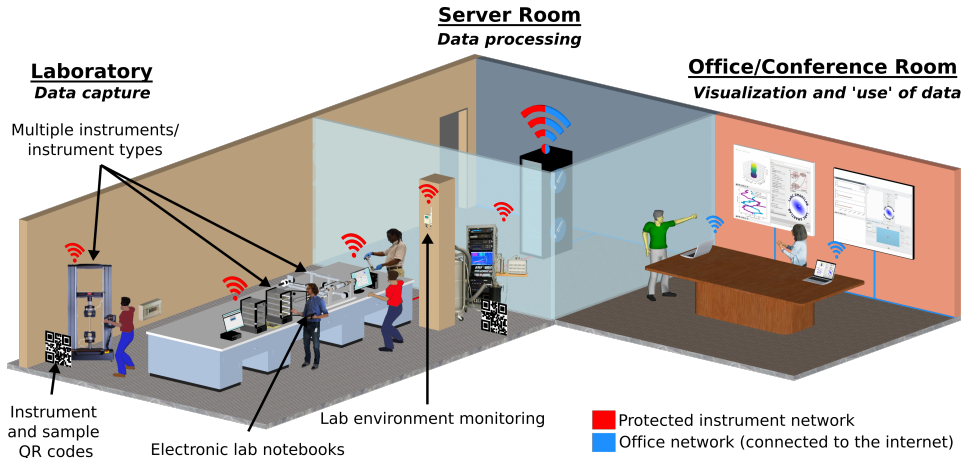
Instruments with different software and hardware capabilities and access (e.g. proprietary formats).

## Why it is hard to do (II): Stakeholder expectations and requirements



Multiple stakeholders with different requirements, expectations, capabilities and authorities.

## SmartLab: Our attempt at resolving the challenges





## SmartLab: Where are we?

*A work in-progress...some battles won, many more to come!*

- Policy
  - Helped formulation and advocacy for policy to use more flexible network architecture by providing concrete use cases.
  - Advocacy reached up to NASA Headquarters as policy impacts the entire Agency.
  - Worked with Information Technology (IT) Security Plan owners to set rules and procedures for device connectivity
- Implementation
  - Network switch configuration and enabling the physical connection points
  - Device registration and configuration to use the network infrastructure
  - Software development to take advantage of the newly available instrument connectivity

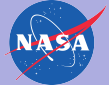
**Engagement with stakeholders ranging from policy formulators and implementers to users, hardware configuration and deployment, software development and deployment, we have had to do bits of it all!**



## Acknowledgements

- Multiple interns
- Colleagues in the Advanced Materials and Processing Branch at NASA Langley Research Center (NASA LaRC) as well as in other branches and directorates at NASA LaRC who gave us information on SmartLab use cases in their domains to add to the advocacy.
- Cyber Security, Network Infrastructure and Data Center teams in the NASA LaRC, NASA Marshall Spaceflight Center and NASA Headquarters Office of the Chief Information Officer (OCIO) and the NASA LaRC Research Directorate.
- The NASA LaRC Research Directorate and NASA Langley Transformation.





Questions?