Requirements Review – Technology Profile

***Before you begin, please note:***

* This information allows ESnet to analyze the needs of the science collaboration in the context of the network footprint, and distributed capabilities
* Consider all contributions as a ***draft*** that can be changed/discussed at any point before the case study is finalized
* Please direct any questions about this process directly to the ESnet Science Engagement Team ([engage@es.net](mailto:engage@es.net))

PLEASE ENTER YOUR LABORATORY OR FACILITY’S NAME/TITLE

Please enter all author names that contributed to the report, their institution(s) names or abbreviations, and their email addresses:

* e.g., Jason Zurawski, Energy Sciences Network (ESnet), [zurawski@es.net](mailto:zurawski@es.net)

# 1. Facilities Operated and Supported

***What facilities do you operate or directly support?***

*These could be data centers, analysis facilities, or the generalized IT infrastructure for specific DOE SC User Facilities. Please briefly describe the facilities and their capabilities, including any plans for major upgrades. If applicable, describe resources that are made available to support the scientific mission (e.g., remote access to instruments or computation, etc.).*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

<RESPONSE>

# 2. Network and Data Architecture

***What is the network architecture and available bandwidth at your institution?***

*It is critical for ESnet to understand the network resources used to move data from the data source location to the wider facility/campus network, and to external collaborators or other data resources. Please describe in as much detail as you can:*

* *The Local Area Network (LAN), Metro Area Network (MAN) and Wide Area Network (WAN) capabilities that connect your facility/data source to external resources and collaborators.*
* *The local network configuration*
* *Network bandwidth connection speed(s)*
* *Any other relevant network capabilities or services (e.g., network monitoring, security devices, etc.)*

***NOTE: Please provide network diagrams where possible in high-resolution (print quality). You may place the original files directly in your case study directory.***

*Please include information on whether or how the following tools are integrated into your network architecture, or if such tools are desired in the future:*

* *New network architectures (e.g.,* [*Science DMZ*](http://fasterdata.es.net/science-dmz/)*)*
* *High-performance data transfer technology (e.g.,* [*DTNs*](https://fasterdata.es.net/DTN/)*,* [*Globus*](https://www.globus.org/)*)*
* *Network performance management tools (e.g.,* [*perfSONAR*](https://www.perfsonar.net/)*)*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

<RESPONSE>

# 3. Computational and Storage Infrastructure

***What cyberinfrastructure components (hardware and software) do you make available to scientific users at your laboratory to perform routine activities?***

*Cyberinfrastructure can include clusters, clouds, and other forms of computational tools; these can also be attached to short- and long-term storage resources. If applicable, list any software components that are available to assist users with managing their workflow (e.g., data mobility tools like Globus, schedulers for cluster environments, etc.).*

*Please include descriptions of hardware and software that perform the following tasks.* ***Note: If commercial or open-source software is being utilized, please indicate this:***

* *Tools that locally or remotely manages data resources.*
* *Tools that facilitate the mobility of data sets from or to remote collaborators (e.g., Globus, rclone, ftp, scp, Aspera, etc.)*
* *Tools that are used to schedule and manage computational resources*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

***If this question is outside of your scope of work, experience, or understanding, please either recommend a contact from your institution or collaboration that can help directly, or let the ESnet Science Engagement Team (***[***engage@es.net***](mailto:engage@es.net)***) know.***

<RESPONSE>

# 4. Cloud Services

***If applicable, what cloud services do you make available, or plan to?***

*Please describe current or planned use of cloud services for data analysis, storage, computing, or other purposes at your institution. ESnet is interested in understanding the role of these resources from the informational technology support perspective: which services were purchased, and how they are supported. Please specify what type of cloud service(s) you are using or intend to use, the cloud provider(s) you are using or intend to use for those services, and if your plans include leveraging ESnet to reach these resources. This question is meant to help understand the external use of resources to a facility over time. If possible, please describe the following in detail:*

* *How you connect to and access your cloud resources (general internet connectivity, VPN, Direct connection)*
* *Approximate total number of users directly accessing cloud resources through the Cloud provided console UI or through programmatic API access*
* *If applicable, describe any training you received to use the cloud (e.g. home institution IT staff, cloud vendor, etc.)*
* *How are the cloud services integrated into the overall workflow of your users?*

*Please note: “Cloud” in this case could include research & education computing clouds such as* [*Chameleon*](https://www.chameleoncloud.org/)*,* [*Cloud Lab*](https://www.cloudlab.us/)*,* [*FABRIC*](https://portal.fabric-testbed.net/)*,* [*JetStream*](https://jetstream-cloud.org/)*, or others along with “commercial” clouds such as Amazon, Google, or Microsoft.*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

***If this question is outside of your scope of work, experience, or understanding, please either recommend a contact from your institution or collaboration that can help directly, or let the ESnet Science Engagement Team (***[***engage@es.net***](mailto:engage@es.net)***) know.***

<RESPONSE>

# 5. Artificial Intelligence and Machine Learning

***How has the laboratory adapted to the growing need to supply resources for scientific use of AI and ML in the process of science?***

*Please discuss how the laboratory or facilities have invested in AI/ML technologies to support your scientific users. This could be the purchase and operation of on-site capabilities that are available for use, or it can be partnerships with other remote entities (R&E, commercial, etc.). Discuss If you are using, or planning to use, AI/ML to assist with technology operations (e.g., network configuration or measurement). If possible, please share the architecture of the AI/ML hardware and how it relates to the overall computing infrastructure. How is this changing your data flows and collaboration structure?*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

***If this question is outside of your scope of work, experience, or understanding, please either recommend a contact from your institution or collaboration that can help directly, or let the ESnet Science Engagement Team (***[***engage@es.net***](mailto:engage@es.net)***) know.***

<RESPONSE>

# 6. Wireless Capabilities

***Does your laboratory or facility make use of wireless capabilities to support the scientific mission space?***

*How do you use, or obtain, wireless services in your environment? Examples include:*

* *Cellular/wifi to connect to sensors or measurement systems*
* *Mobile robotic systems to support beamline calibration*
* *Automated sample management and location tracking systems*
* *UAV or mobile sensor platforms*
* *Wireless data loggers*

*Are you planning, or do you know, about changes which may occur in your use of wireless capabilities to support your science? Are there any problems or challenges in terms of how you obtain these wireless data mobility services, or do you face constraints in how you do science because of constraints on how you can move data or where you have to place sensors? If you do envision a need for improved wireless data options, are there contractual, technical or other constraints, which if removed would assist your science program?*

*Please frame response to represent the following time frames:*

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***If this question is outside of your scope of work, experience, or understanding, please either recommend a contact from your institution or collaboration that can help directly, or let the ESnet Science Engagement Team (***[***engage@es.net***](mailto:engage@es.net)***) know.***

<RESPONSE>

# 7. Data-Related Resource Constraints

***Please name any current or future network or data-related (e.g., computing, storage) constraints to your work?***

*Please describe any current or anticipated future constraints that impact scientific productivity. Examples might include:*

* *Insufficient data transfer performance*
* *Insufficient storage system space or performance characteristics*
* *Difficulty finding or accessing data in community data repositories*
* *Unmet computing needs*
* *Policies that do not facilitate easy access to technology to assist with data mobility*

*Please frame response to represent the following time frames:*

* *Present-2 years (current budget horizon)*
* *Next 2-5 years (current technology horizon)*
* *Beyond 5 years (strategic planning)*

<RESPONSE>

# 8. Data Mobility Endpoints

***How are you enabling the sharing of research data?***

*Please describe your data sharing architecture and workflow, including physical locations and networking links. Please also detail ad-hoc flows and why they are needed.*

*If your facility has a Globus (or other form of data transfer software) endpoint for data sharing, please list the hostname(s)/IP address subnets/endpoint title(s).* [*ESnet maintains a set of well-tuned test endpoints*](https://fasterdata.es.net/science-dmz/learn-more/2019-2020-data-mobility-workshop-and-exhibition/data-mobility-exhibition-archive/)*, and recommends that facilities evaluate their performance against these resources. ESnet will follow-up during the requirements process to test and evaluate the capabilities of the facility, and suggest tuning steps to improve performance. ESnet can integrate your facility’s performance metrics into our* [*performance portals*](https://www.es.net/portals/portaloverview/) *on request.*

<RESPONSE>

# 9. Outstanding Issues

***What have we missed?***

*Please use this space to address or discuss any challenges, barriers, or concerns that aren’t discussed elsewhere in the case study. In particular, if there are current network or data transfer performance problems, issues with access to or adoption of technology, or policies that may impact scientific productivity, please describe them.*

<RESPONSE>