

Novel Network Services for Supporting Big Data Science Research

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Website: <http://www.atlanticwave-sdx.net/>

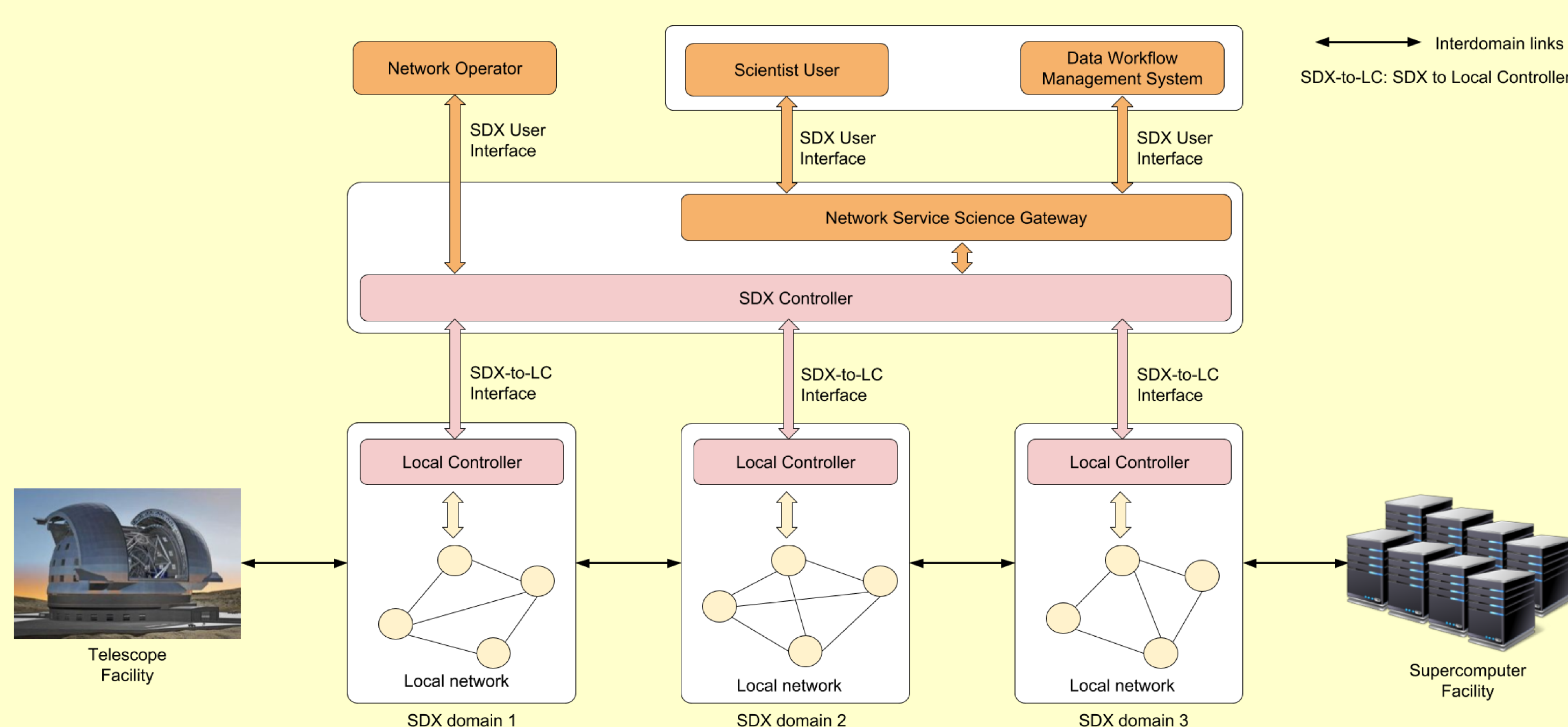
Introduction and Motivation

- Research and Education (R&E) networks allow experimenters to establish dedicated connections between research facilities for transferring large amounts of data.
- R&E networks have started using Software-Defined Networking (SDN) and Software-Defined Exchanges (SDX) for deploying dedicated network connections.
- AtlanticWave/SDX is a response to the growing demand to support end-to-end science network services spanning multiple SDN domains.

Limitation of the Current Model

- Interfaces of R&E networks have been developed *by* network operators *for* network operators, making more challenging the process of requesting science network services for domain-expert scientists that are not networking experts.
- Reservations are defined by duration and bandwidth, so the scheduling of resources is not flexible; that is, a reservation request will fail if the exact amount of bandwidth is not available within the specified time frame, which forces the scientist into a cycle of trial and error until a suitable time frame is found.

AtlanticWave/SDX Architecture



AtlanticWave/SDX User Interface

The screenshot shows the AtlanticWave/SDX User Interface. The header includes the AtlanticWave logo and navigation links: Topology, Requests (active), About Us, and sdonovan. The main heading is 'Request a Data Transfer'. Below it, a message states: 'Users can request for a data transfer based on their requirements and role'. A dropdown menu shows 'Network Engineers Scientists'. The form includes fields for Source, Destination, Deadline (mm/dd/yyyy --:-- --), and Size (bytes). There are 'Preview' and 'Submit' buttons, and a link to 'View all rules'.

Use Cases

- **Domain-expert scientist interfaces for requesting data transfers:** an experimenter may reserve network resources through AtlanticWave/SDX, the SDX controller evaluates whether a path that meets the end-to-end requirements can be formed, and request it on behalf of the scientist.
- **Bandwidth calendaring:** experimenter selects at what hours of the day she will need a reservation, and AtlanticWave/SDX will provision resources dynamically.
- **Predictive reservation services:** use machine learning (ML) on data transfer patterns and historical reservation data to generate reservation suggestions.
- **Green path:** science network services based on proximity of dataset repositories or network congestion.

Ongoing Research

- Study the composition of end-to-end services at the SDX controller and how these services should be exposed to users and applications through the user/application interface.
- Rule translation from user-level, local controller-level, and switch-level abstractions.
- Identity and access management (IAM) systems for AtlanticWave/SDX.
- Deployment of the AtlanticWave/SDX infrastructure in the three initial locations (i.e., Atlanta, Miami, and Sao Paulo).
- Study the ways that domain-expert scientists interact with the AtlanticWave/SDX controller.

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References

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