SENSE

(Orchestration, Visualization, Workflow Services)

TNC21 BoF "Orchestration, Automation and Virtualisation: Focusing on the user"

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SENSE Team

ESnet · ENERGY SCIENCES NETWORK · Caltech · UNIVERSITY OF MARYLAND · NeRSC · Berkeley Lab · Argonne NATIONAL LABORATORY · MAX MID-ATLANTIC CROSSROADS · Fermilab
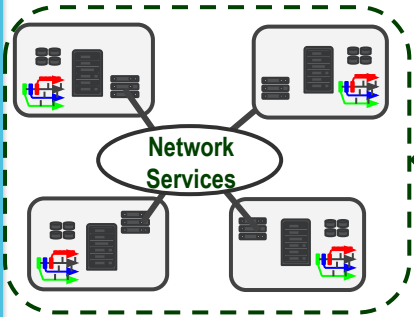
U.S. DEPARTMENT OF ENERGY
Office of Science

Advanced Scientific Computing Research (ASCR)
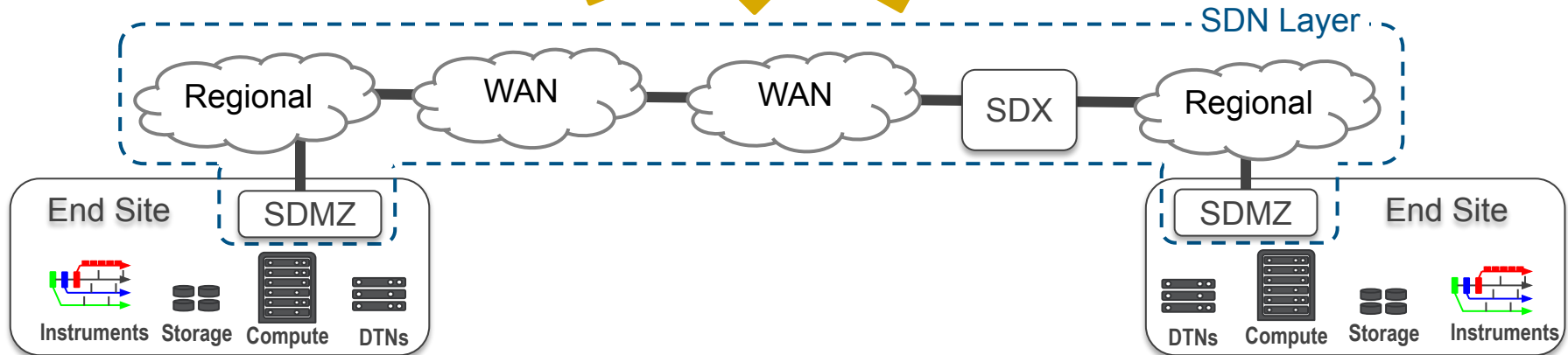
SENSE - Filling in the Gaps

- **Science Workflow**
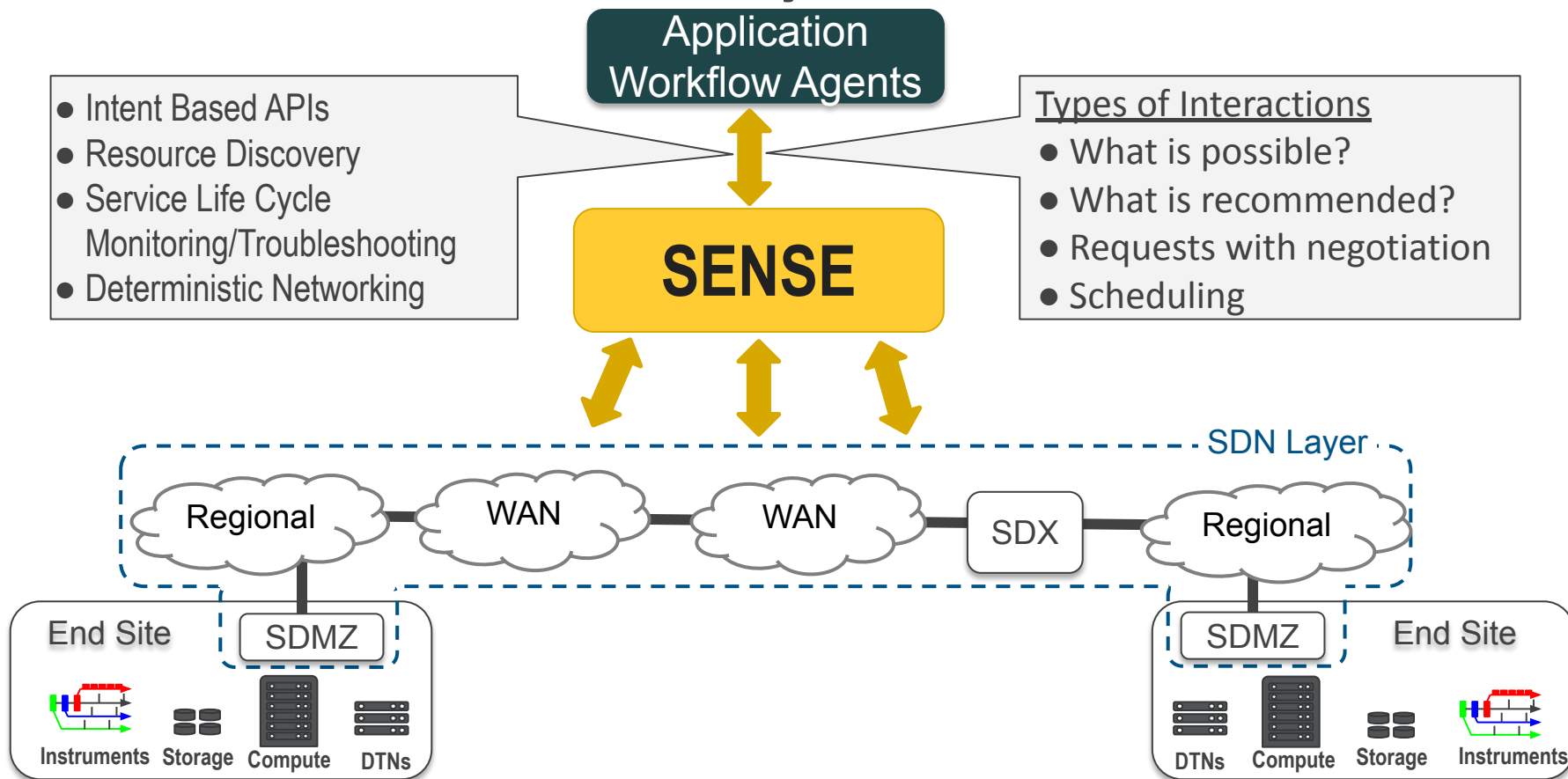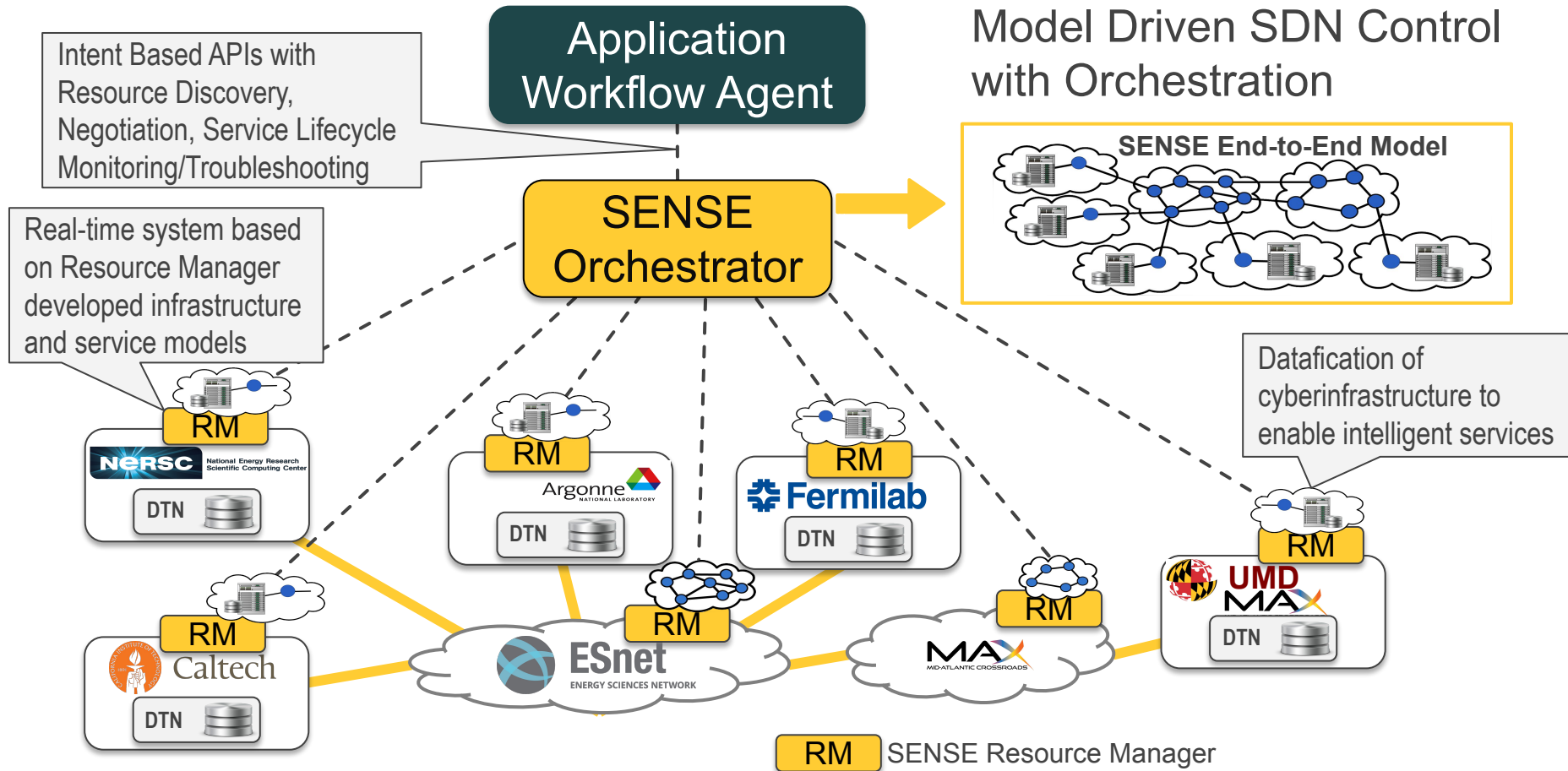- **Specific Topology and Services**

Application Workflow Agents

SENSE

SENSE operates between the automation layer controlling the individual networks/end-site resources, and science workflow agents/middleware

SDN Layer

Regional — WAN — WAN — SDX — Regional

End Site — SDMZ

Instruments Storage Compute DTNs

SDMZ — End Site

DTNs Compute Storage Instruments

Workflows can "coordinate" with End-to-End Networked Cyberinfrastructure

Application Workflow Agents

- Intent Based APIs
- Resource Discovery
- Service Life Cycle Monitoring/Troubleshooting
- Deterministic Networking

SENSE

Types of Interactions
- What is possible?
- What is recommended?
- Requests with negotiation
- Scheduling

SDN Layer

Regional — WAN — WAN — SDX — Regional

End Site
SDMZ

Instruments   Storage   Compute   DTNs

SDMZ
End Site

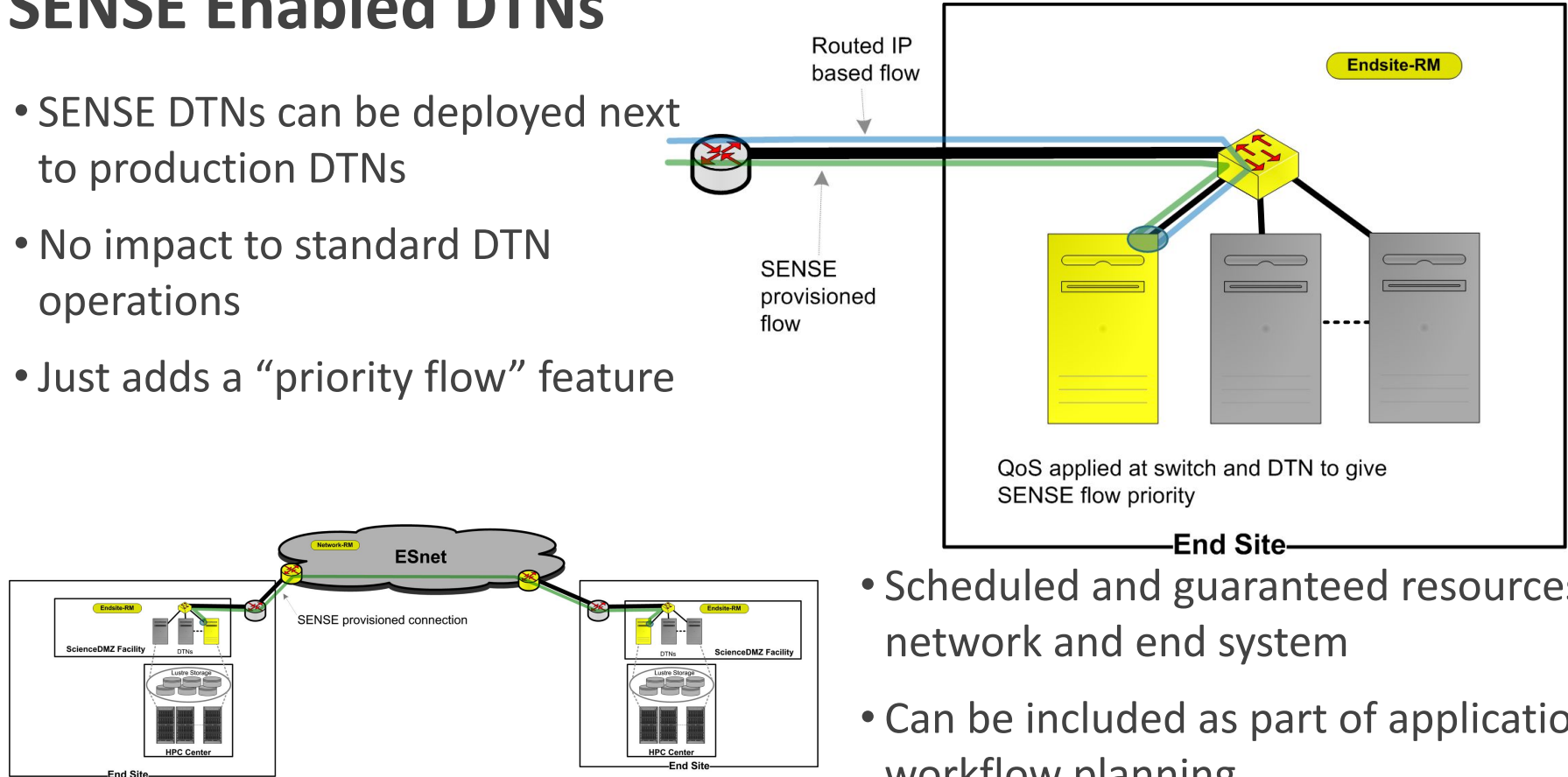DTNs   Compute   Storage   Instruments

SENSE Architecture

SENSE Enabled DTNs

- SENSE DTNs can be deployed next to production DTNs

- No impact to standard DTN operations

- Just adds a "priority flow" feature

Routed IP based flow

Endsite-RM

SENSE provisioned flow

QoS applied at switch and DTN to give SENSE flow priority

End Site

Network-RM
ESnet

Endsite-RM

ScienceDMZ Facility

DTNs

SENSE provisioned connection

Endsite-RM

DTNs

ScienceDMZ Facility

Lustre Storage

HPC Center

Lustre Storage

HPC Center

End Site

End Site

- Scheduled and guaranteed resources, network and end system

- Can be included as part of application workflow planning

Superfacility Automation Ideas/Options
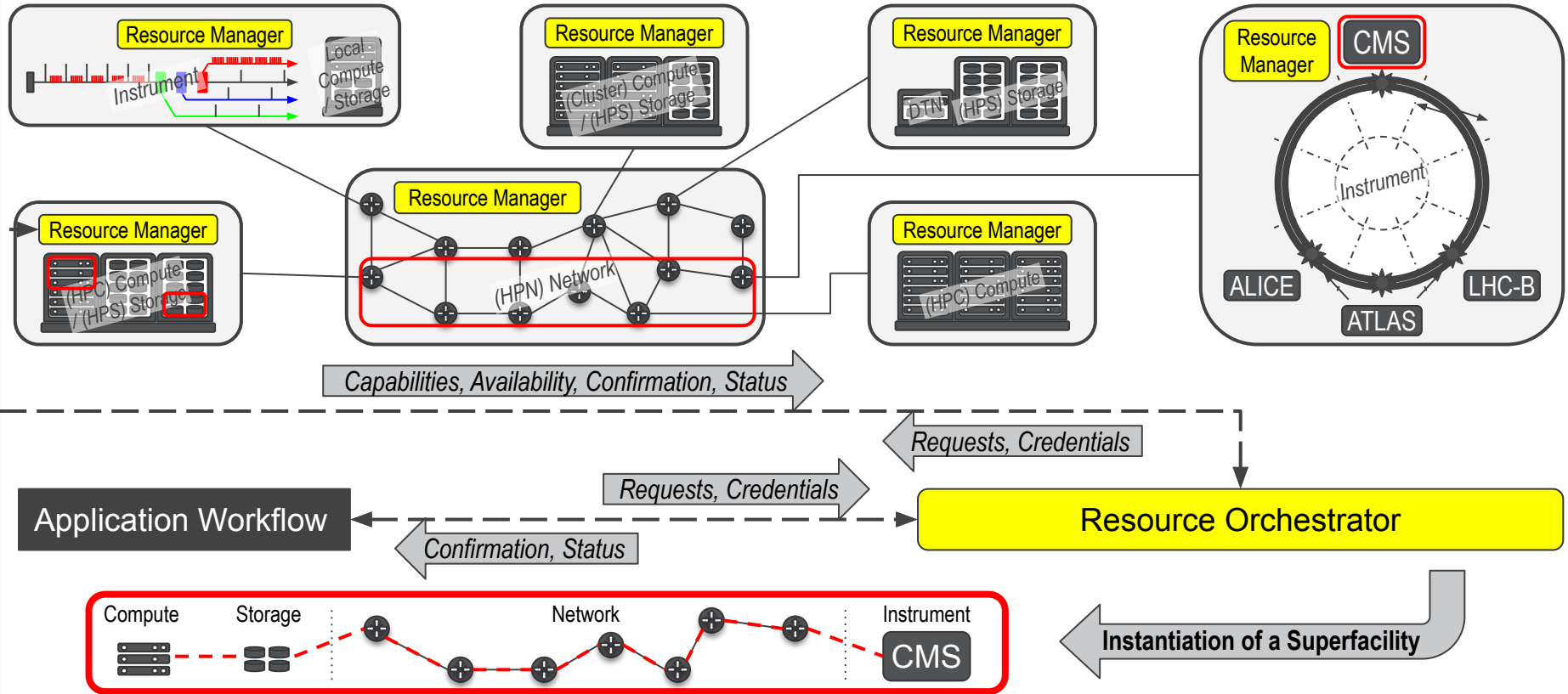
SENSE is part of ESnet's collaboration with NERSC as part of their Superfacility project

SENSE Paper

- Software-Defined Network for End-to-end
  Networked Science at the Exascale, Elsevier
  Future Generation Computer Systems, Volume
  110, September 2020, Pages 181-201,
  https://doi.org/10.1016/j.future.2020.04.018

Thanks