



BigData Express: Toward Predictable, Schedulable, and High-Performance Data Transfer

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BigData Express



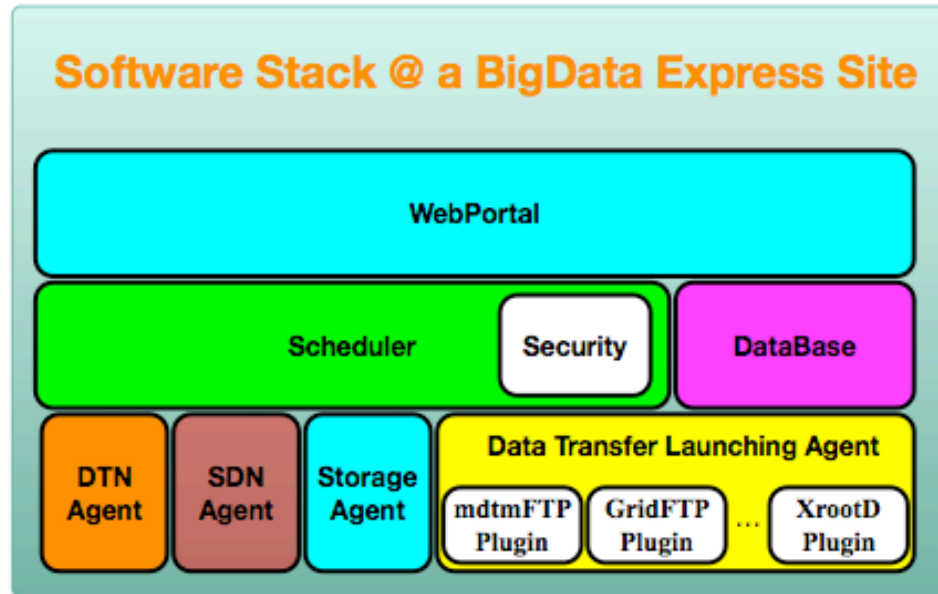
- BigData Express: a schedulable, predictable, and high-performance data transfer service
 - A peer-to-peer, scalable, and extensible data transfer model
 - A visually appealing, easy-to-use web portal
 - A high-performance data transfer engine
 - On-demand provisioning of end-to-end network paths with guaranteed QoS
 - Robust and flexible error handling
 - CILogon-based security (certificate version)
 - A rich set of REST APIs to support scientific workflows



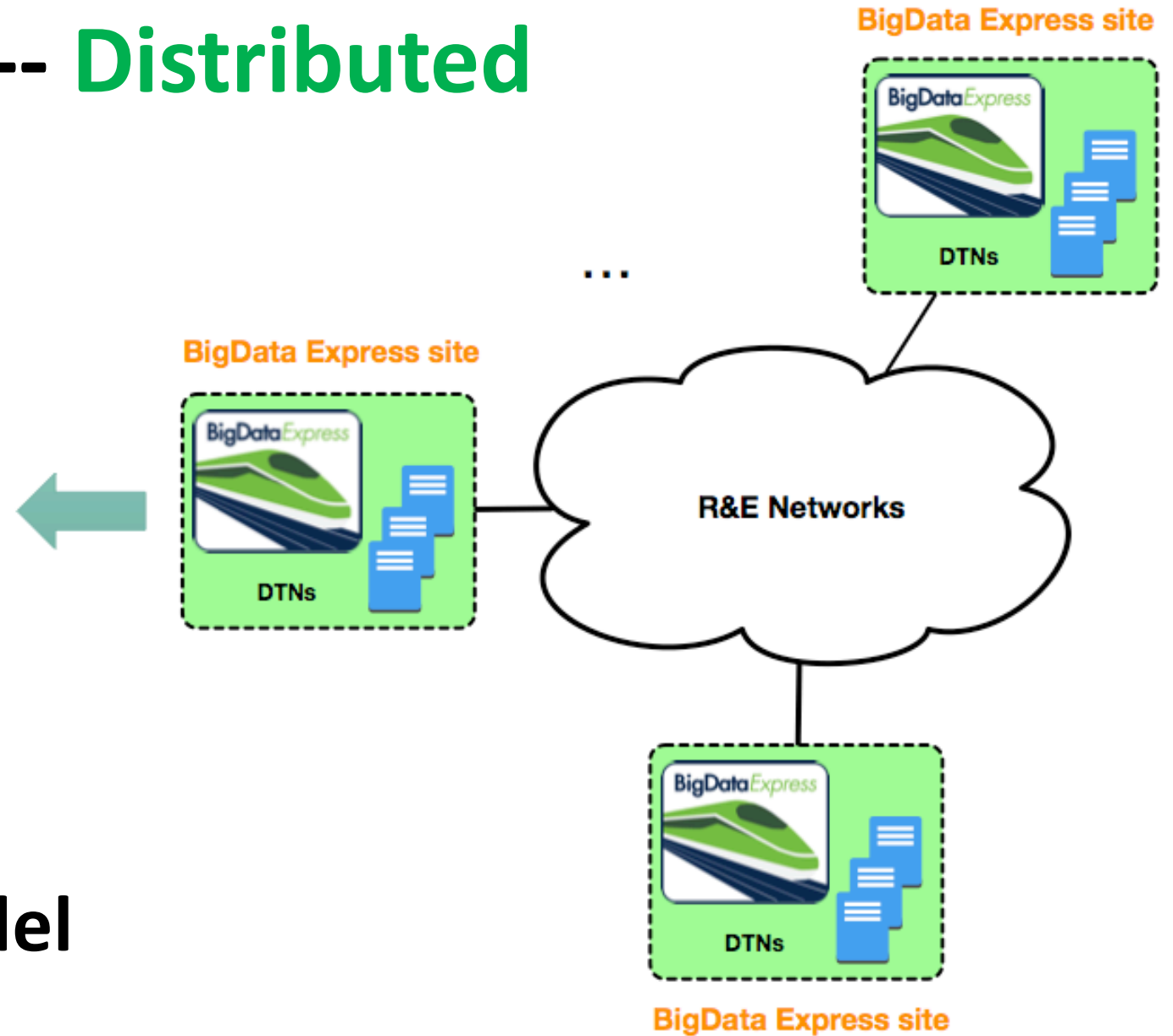
BigData Express Major Components

- **BigData Express Web Portal**
 - Access to BigData Express services
- **BigData Express Scheduler**
 - Time-constraint-based scheduler
 - Co-scheduling DTN, storage, & network
- **AmoebaNet**
 - Network as a service
 - Rate control
- **mdtmFTP**
 - High-performance data transfer engine
 - <http://mdtm.fnal.gov>
- **DTN Agent**
 - Manage and configure DTNs
 - Collect & report DTN configuration and status
- **Storage Agent**
 - Manage and configure storage systems
 - I/O estimation
- **Data Transfer Launching Agent**
 - Launch data transfer jobs
 - Support different data transfer protocols

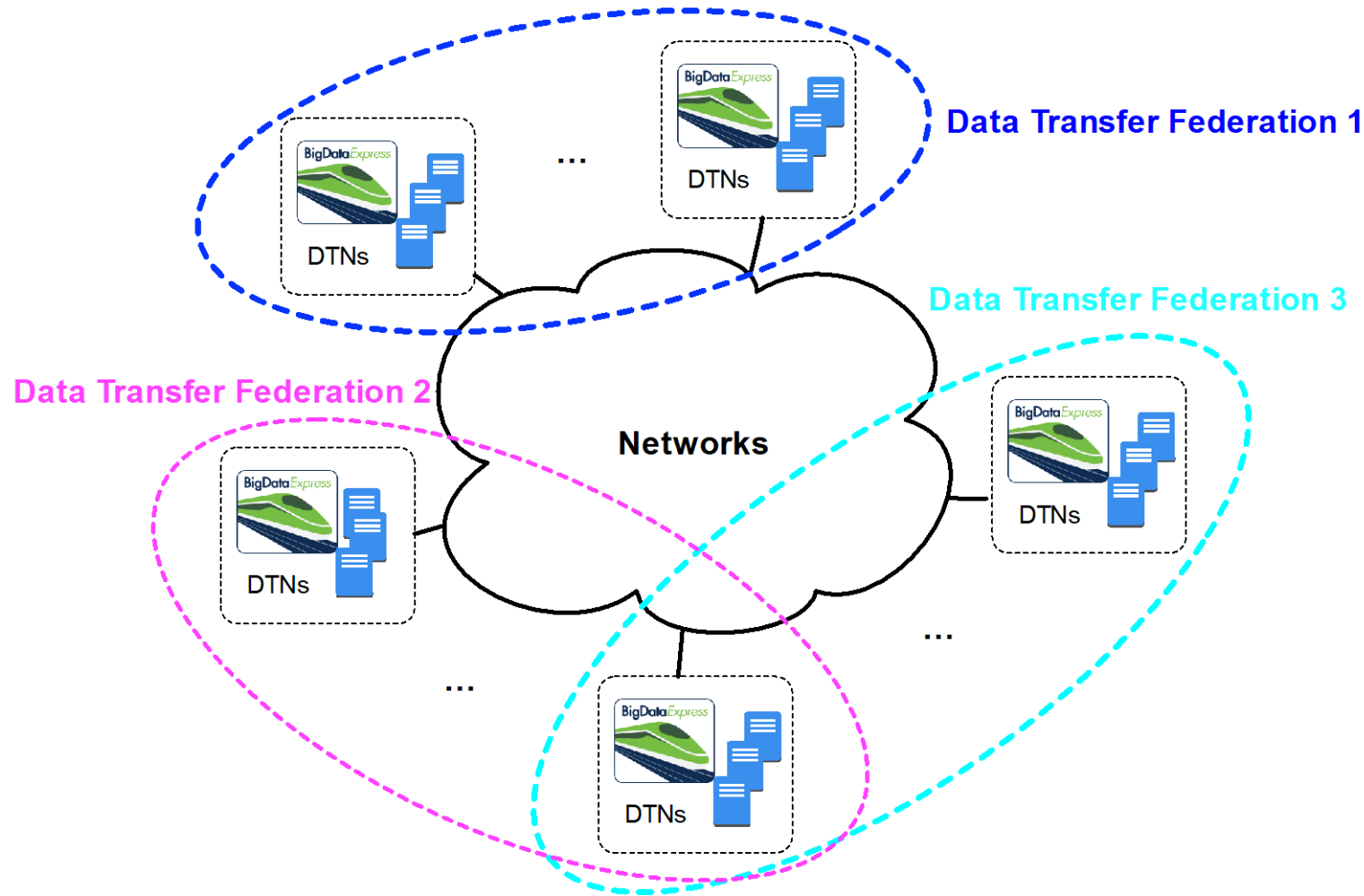
BigData Express -- Distributed



A Peer-to-Peer model

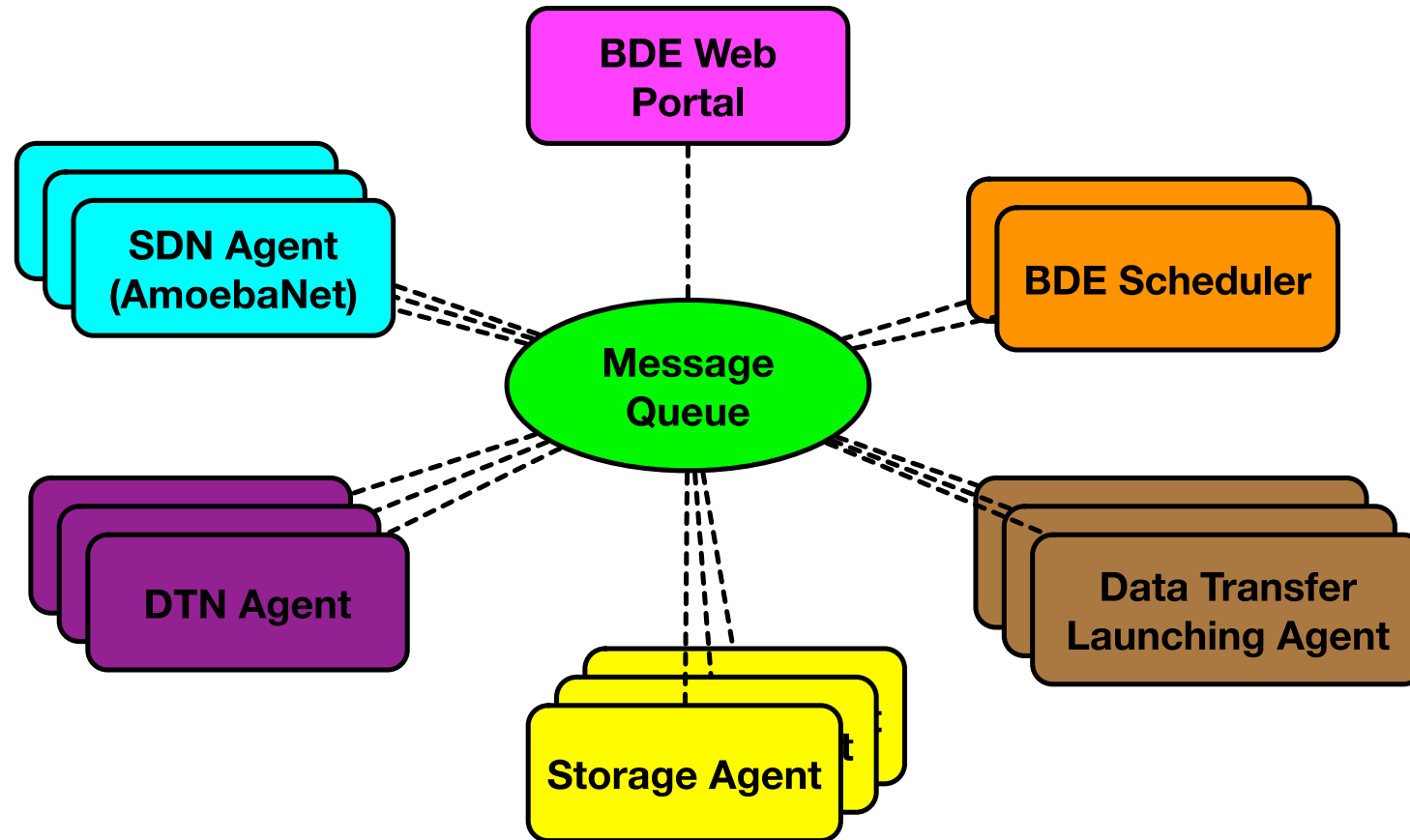


BigData Express -- Flexible



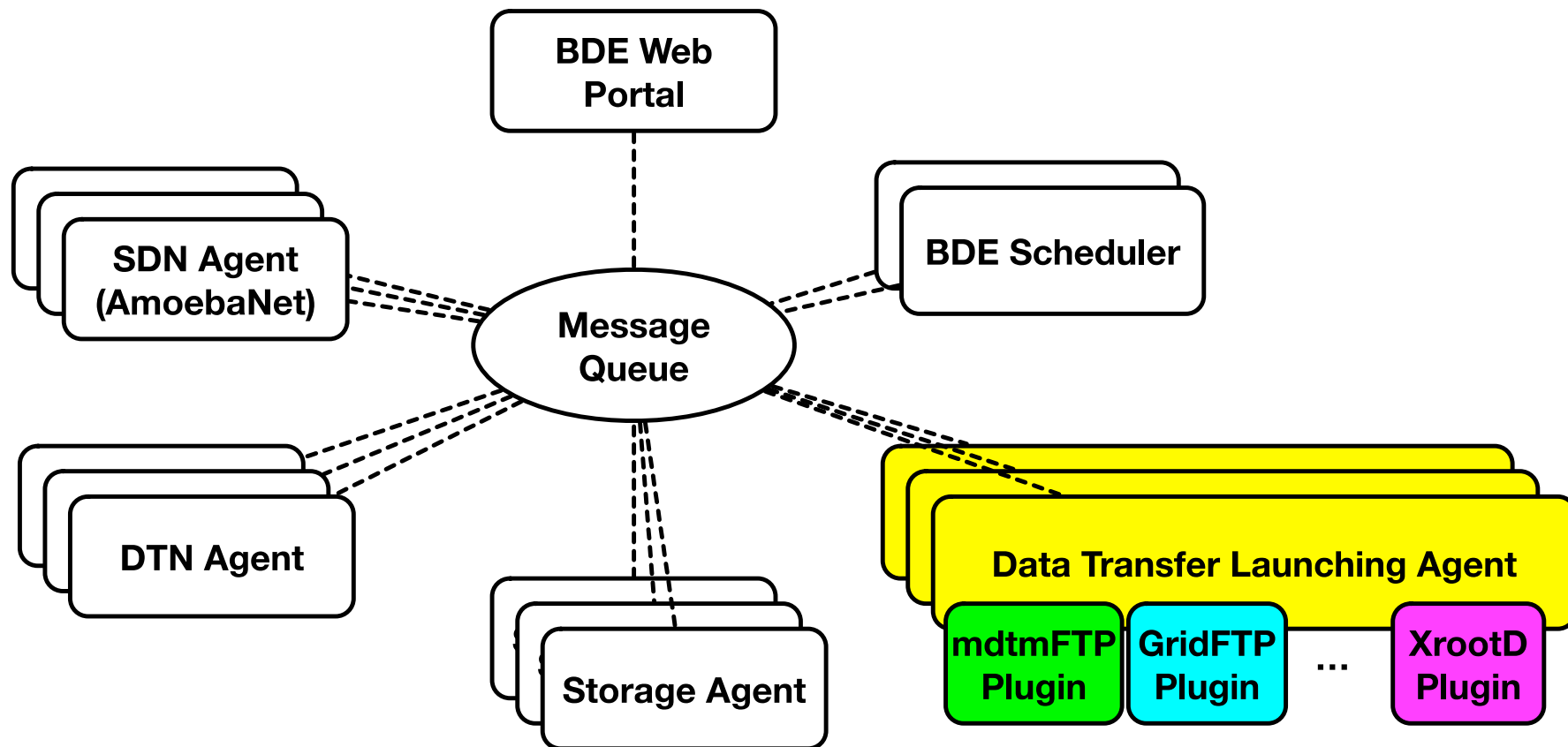
- Flexible to set up data transfer federations
- Providing inherent support for incremental deployment

BigData Express -- Scalable



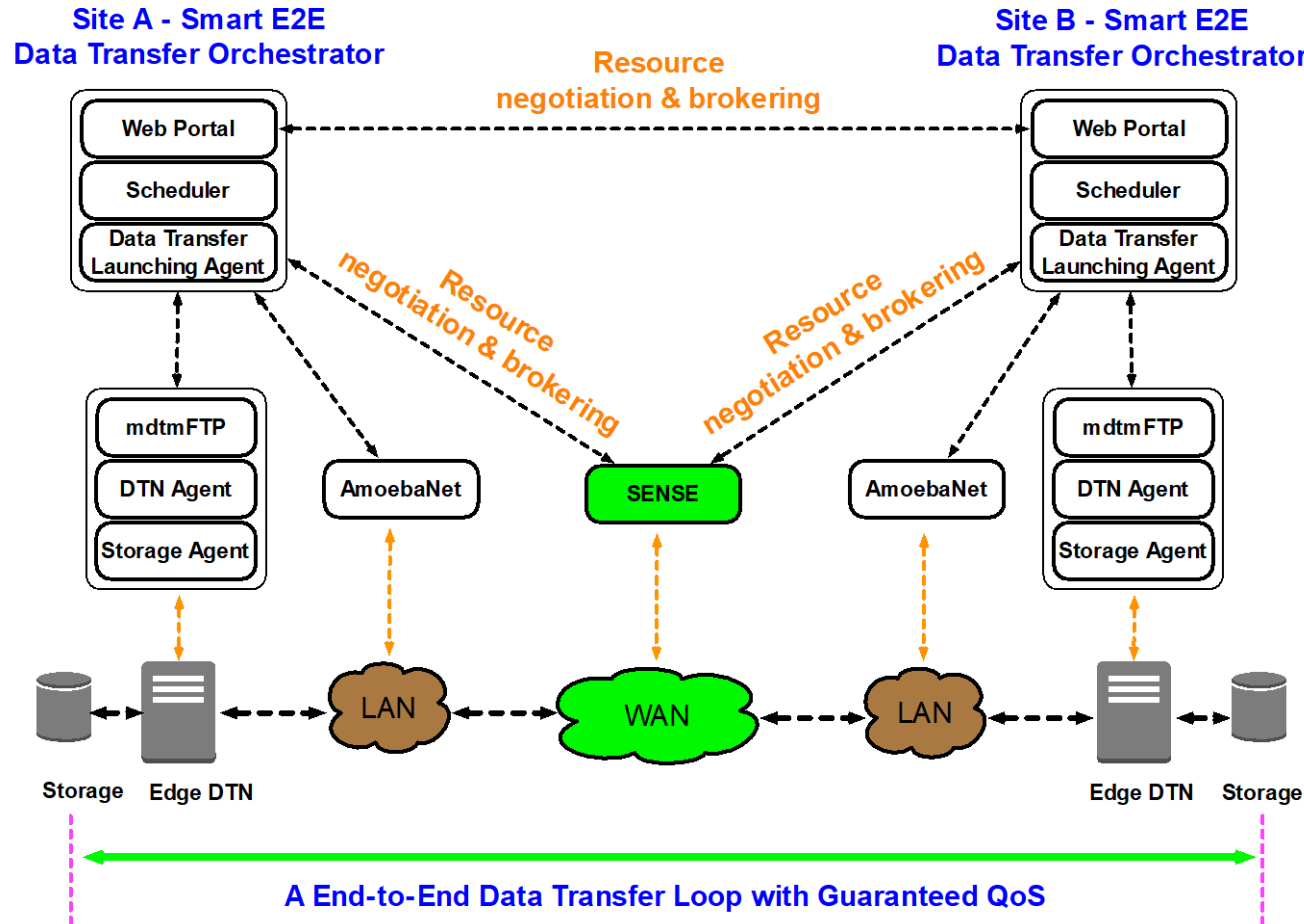
- BigData Express scheduler manages site resources through agents
- Use MQTT as message bus

BigData Express -- Extensible



- **Extensible Plugin framework to support various data transfer protocols**
 - **mdtmFTP, GridFTP, XrootD, ...**

BigData Express -- End-to-End Data Transfer Model



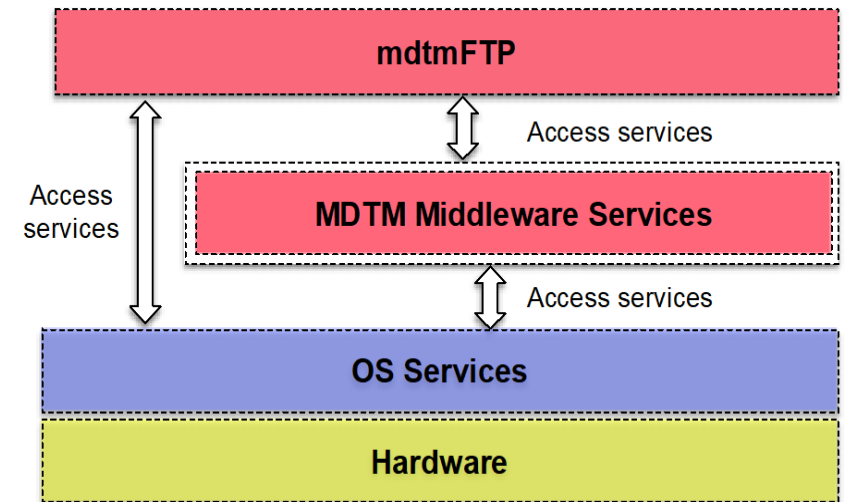
- Application-aware network service
 - On-demand programming
- Fast-provisioning of end-to-end network paths with guaranteed QoS
- Distributed resource negotiation & brokering

mdtmFTP

A high-performance data transfer tool

- Pipelined I/O-centric design to streamline data transfer
- Multicore-aware data transfer middleware (MDTM) optimizes use of underlying multicore system
- Extremely efficient in transferring of Lots Of Small Files
- Various optimization mechanisms
 - Zero copy
 - Asynchronous I/O
 - Batch processing

A DOE/SC/ASCR-sponsored research project
Software is available at: <http://mdtm.fnal.gov>



BigData Express – Development Package

- A command line tool called “**bdeworkflow**” is provided
 - to invoke BigData Express REST APIs
- A rich set of REST APIs to provide the BigData Express services

```
Usage:  ./bdeworkflow [Options] [site URL]
```

```
Options are:
```

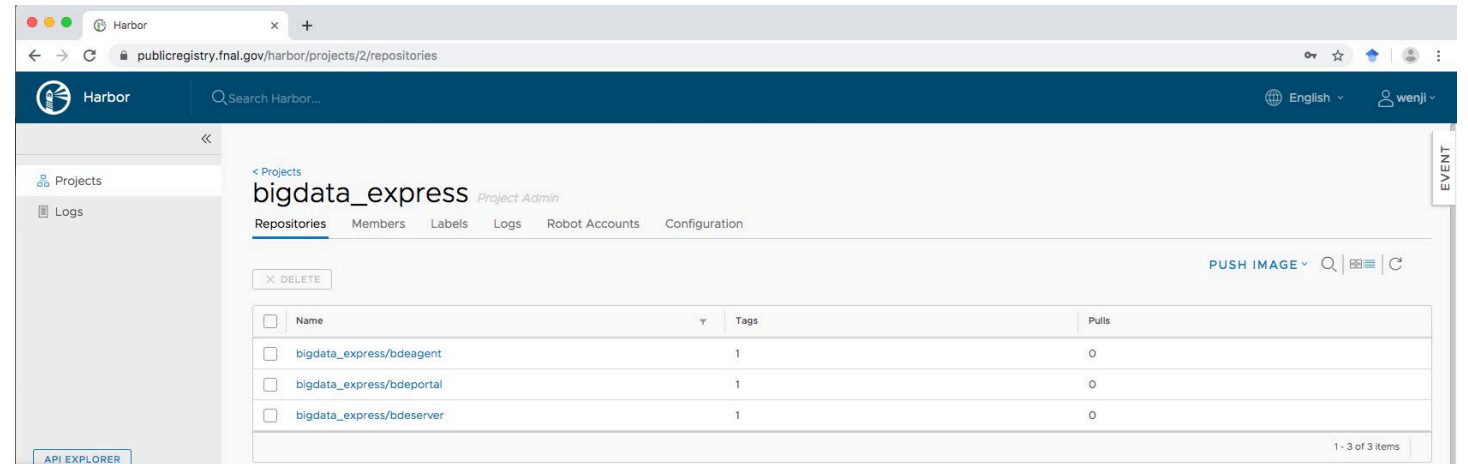
```
-k [API key]  
-a [actions] (available: reg_cert, submit, jobstatus, list_storages, list_files, list_dtns)  
-p [parameter json file]
```

```
Example: ./bdeworkflow -k xxxx-xxxx-xxxx -a submit -p params.json https://yosemite.fnal.gov:5000
```

Ready to support scientific workflows!

BigData Express Release

- License
 - Apache 2.0
- Docker release
 - Repository
 - publicregistry.fnal.gov
 - Docker images
 - bdeagent:1.5-xenial
 - bdeserver:1.5-xenial
 - bdeportal:1.5-xenial
 - Pull instruction
 - <https://bigdataexpress.fnal.gov/Releases.html>
- Source code package release
 - Available



BigData Express Documents

- BigData Express Admin Manual
 - https://bigdataexpress.fnal.gov/admin_manual/index.html
- BigData Express Design and Architecture
 - https://bigdataexpress.fnal.gov/design_manual/index.html
- BigData Express Web Portal User Manual
 - https://bigdataexpress.fnal.gov/portal_manual/index.html



More information about BigData Express

<http://bigdataexpress.fnal.gov>

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