BROOKHAVEN
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StorNet

Brookhaven National Laboratory
Lawrence Berkeley National Laboratory

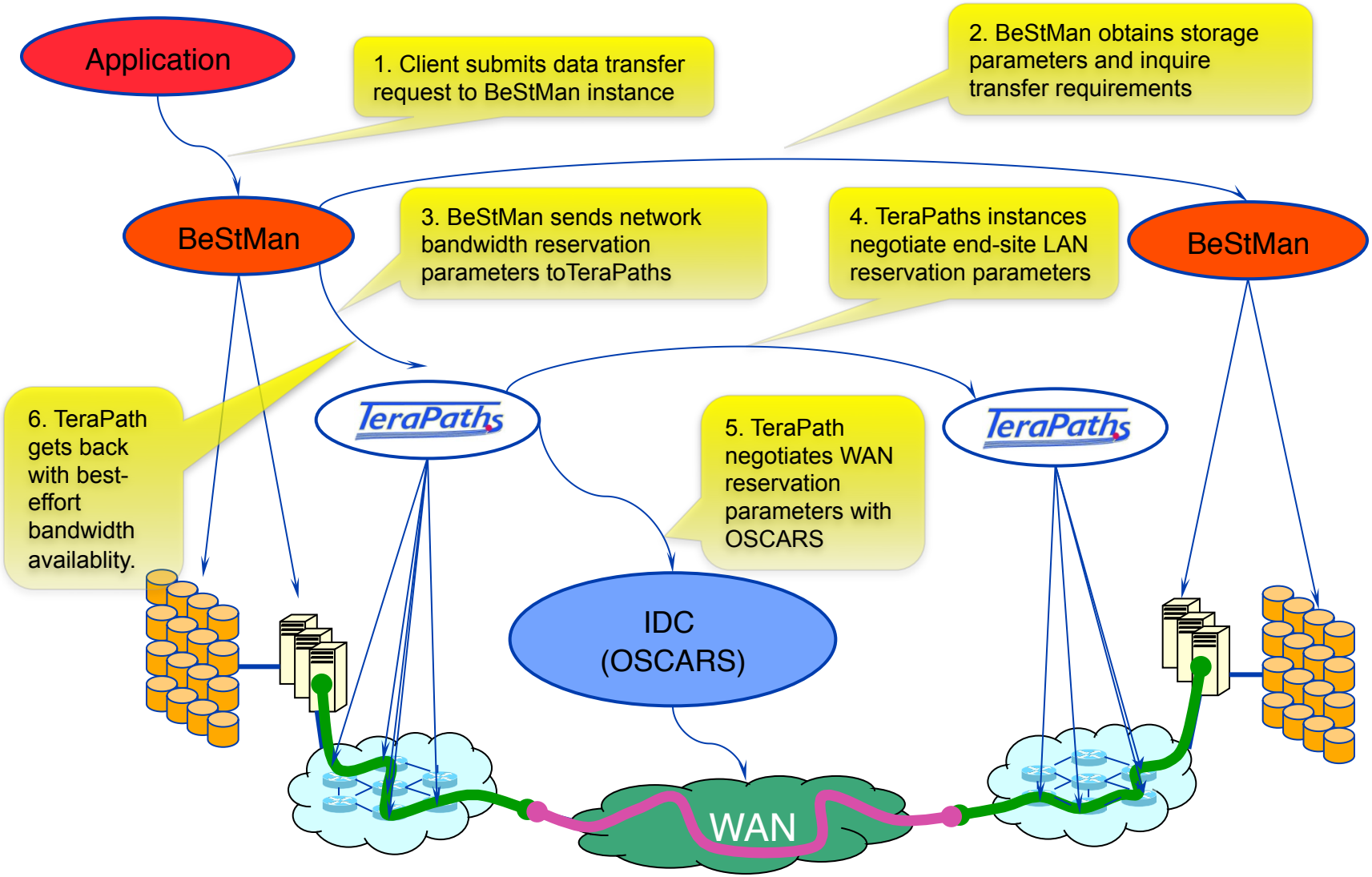
People involved

- BNL - TeraPaths
  - Dantong Yu
  - Dimitrios Katramatos
  - Xin Liu
- LBNL – BeStMan/SRM
  - Arie Shoshani
  - Junmin Gu
  - Vijaya Natarajan
  - Alex Sim

StorNet Project Overview

- **Project Goals:**
  - Design and develop an integrated end-to-end resource provisioning system for high performance data transfers
  - Improve resource utilization by co-scheduling network and storage resources and ensure data transfer efficiency
  - Support end-to-end data transfers with a negotiated transfer completion timeline.
- **Impact of StorNet on Science**
  - Scheduling Network and Storage as a 1st Class Resource through Virtualization
  - Provide a holistic approach for DOE data-intensive applications to share data
  - Provide data management capabilities commensurate with exascale computing

StorNet: System Design and Implementation Integration of TeraPaths with BeStMan (SRM)



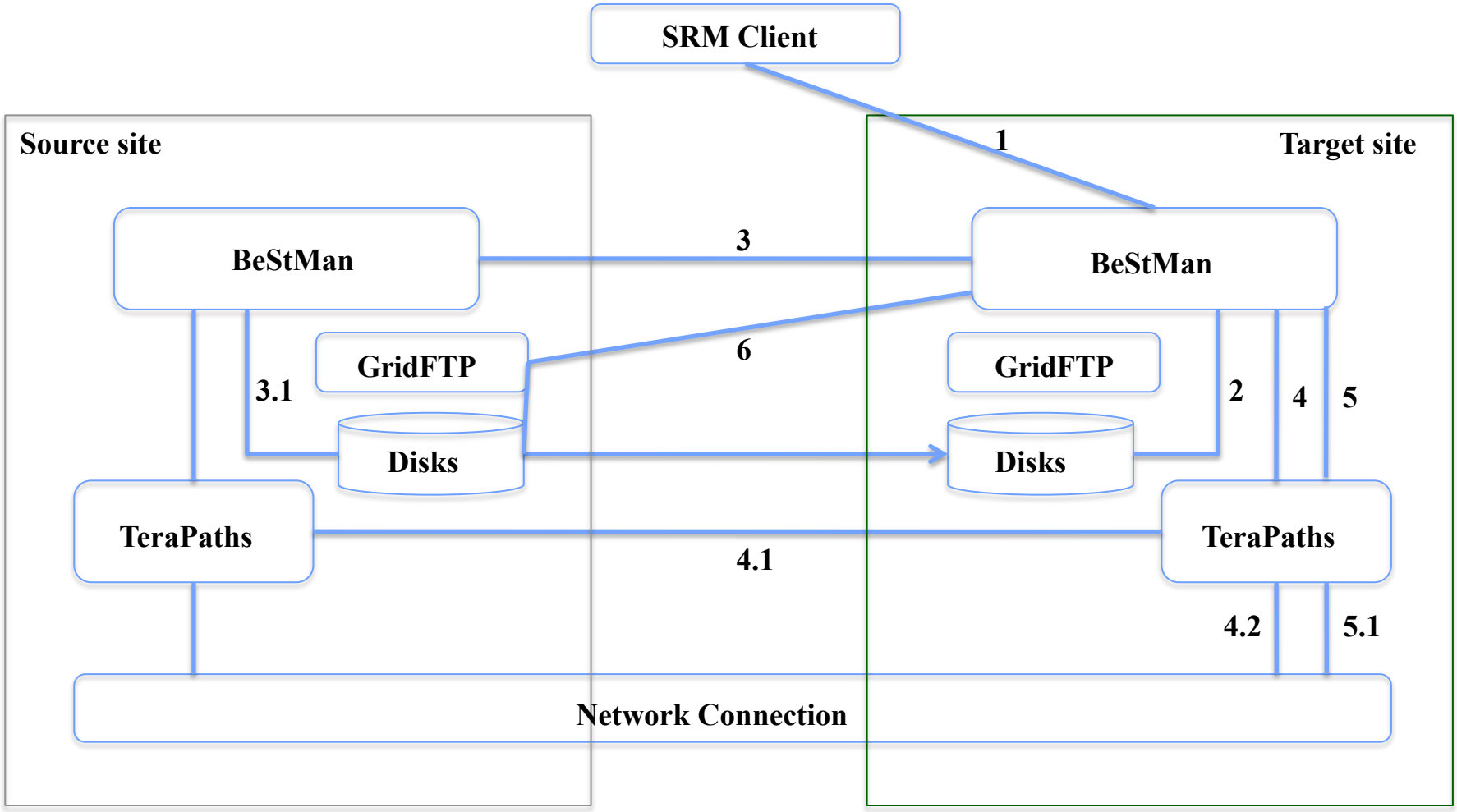
Enhancements Needed for StorNet

- **BeStMan enhancements to:**
  - Keep track of bandwidth commitments for multiple requests
    - Both storage and network bandwidths
    - Backend database support
  - Coordinate between source and target BeStMan instances for storage space and bandwidth
  - Support advanced reservation for future time window commitments
  - Communicate and coordination with underlying TeraPaths
- **TeraPaths enhancements to:**
  - Receive network bandwidth requests from BeStMan with inputs (volume, max-bandwidth, max-completion-time)
  - Negotiate with OSCARS for "best" time window
    - "best" can be earliest completion time, or shortest transfer time
  - If success, return to BeStMan and commit reservation if BeStMan desires.
  - If failure, find closest suggestion and return to BeStMan

BeStMan-TeraPaths API

- **Main functions:**
  - reserveRequest()
    - Input: flow specs (source/destination IPs and ports), bandwidth, start time, end time, transfer volume
    - Output: request token, reservation ids
  - commitRequest()
    - Commits the network reservation.
  - cancelRequest()
- **Auxiliary functions**
  - statusRequest()
  - extendTimeoutRequest()
    - Extends timeout if additional time is needed before committing
  - modifyRequest()
    - Modifies request parameters – primarily needed when flow specs are not known at time of reserve request

Workflow in StorNet



- 6.1 Target BeStMan initiates and completes GridFTP transfer from source disk.

Year 1 Status

- **Year 1:**
  - Analysis of storage/network co-scheduling requirements
  - BeStMan/TeraPaths integration: design of StorNet API
  - Design and implementation of enhancements to BeStMan and TeraPaths
  - Implementation of StorNet API
  - Deployment and testing of basic functionality on the BNL and UMich TeraPaths testbed

Year 1 Accomplishments

- **LBNL Accomplishments**
  - Coordination and management of the end-to-end storage resource and bandwidth reservation
  - Coordination with network resource provisioning service (TeraPaths) for advanced network reservations
  - Management of the negotiated end-to-end storage and network resources
- **BNL Accomplishments**
  - Design and implementation of intelligent multi-domain bandwidth allocation algorithms
  - Management of the end-to-end network resource negotiation and configuration

Year 2 Plan

- **Implementation:**
  - Additional support required for aux. calls
    - Request modifications - modifyRequest()
    - Request status query - statusRequest()
    - Request timeout extension - extendTimeoutRequest()
  - Detection/resolution of flow spec conflicts
  - Reservation negotiation
  - Support for multiple-window requests
- **Testbed:**
  - Further deployment at LBNL
- **Testing:**
  - Multiple requests with overlapping windows

Information

- StorNet
  - http://sdm.lbl.gov/stornet/
- E-mail
  - stornet@lbl.gov