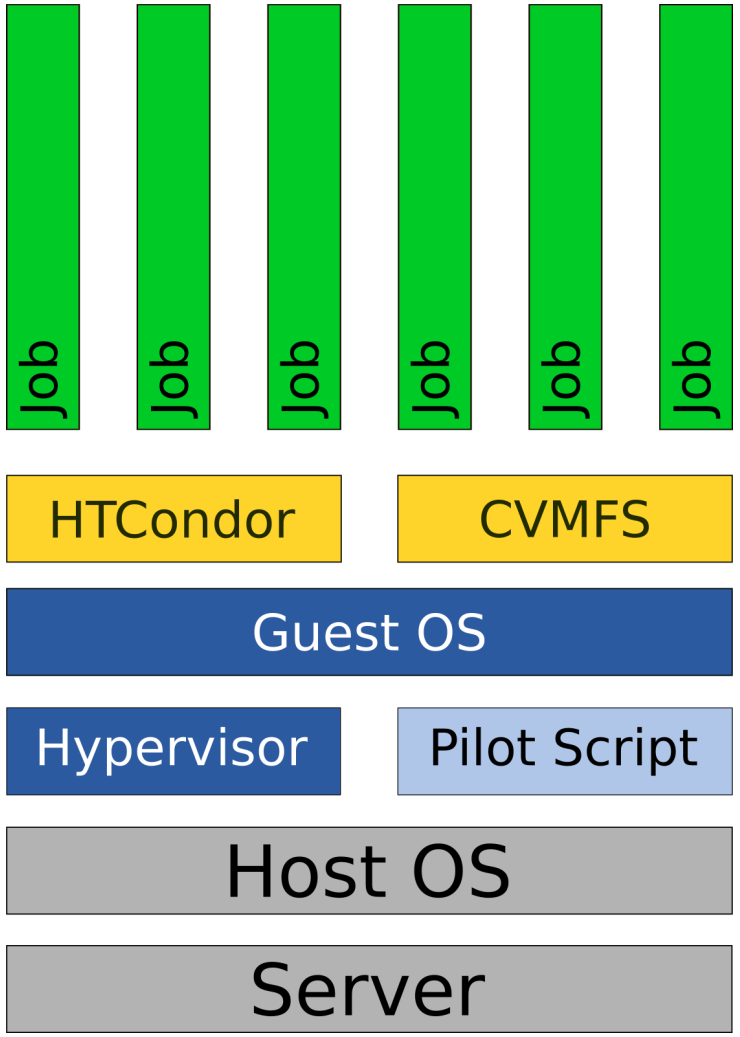
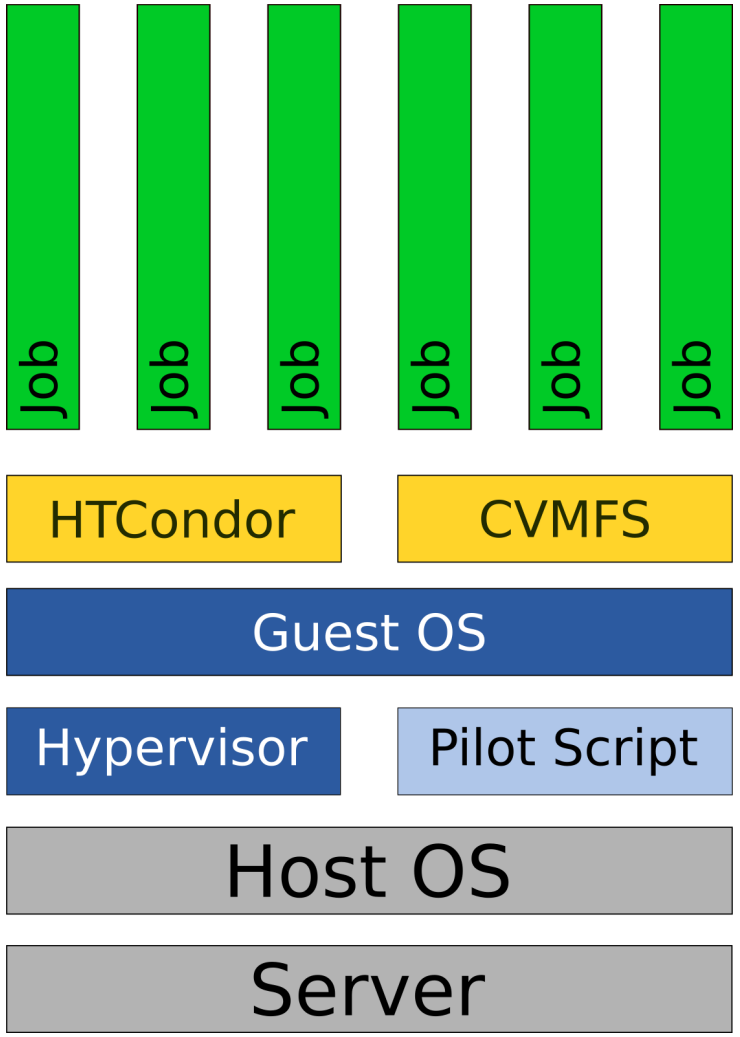
HEP Software Environment

- Scientific Linux 6 (based on RedHat 6) as Operation System
- CERN Virtual Machine File System (CVMFS) to provide software
- Both are not provided by custom HPC-Centers
  => Virtualisation to provide the HEP software environment



Software Environment Provisioning

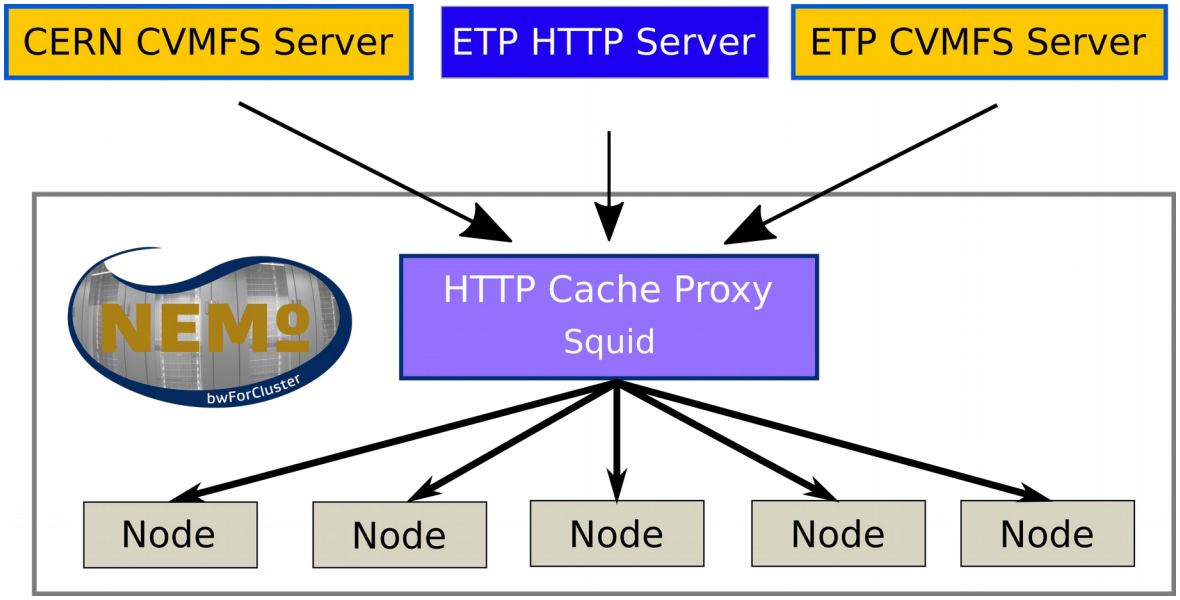
- Pilot script requests a VM and reserve resources on the batch system
- Guest OS (SLC6) includes CVMFS and HTCondor
- Batch System HTCondor starts job inside the VM
- Jobs has access to CVMFS



CERN Virtual Machine File System

- Read-only file system
- HTTP based protocol
- Proxy caches files from server

- ETP CVMFS Server to provide our own software
- HTTP Server for files with short changing cycles



- **Remarkable reduction of incoming traffic**

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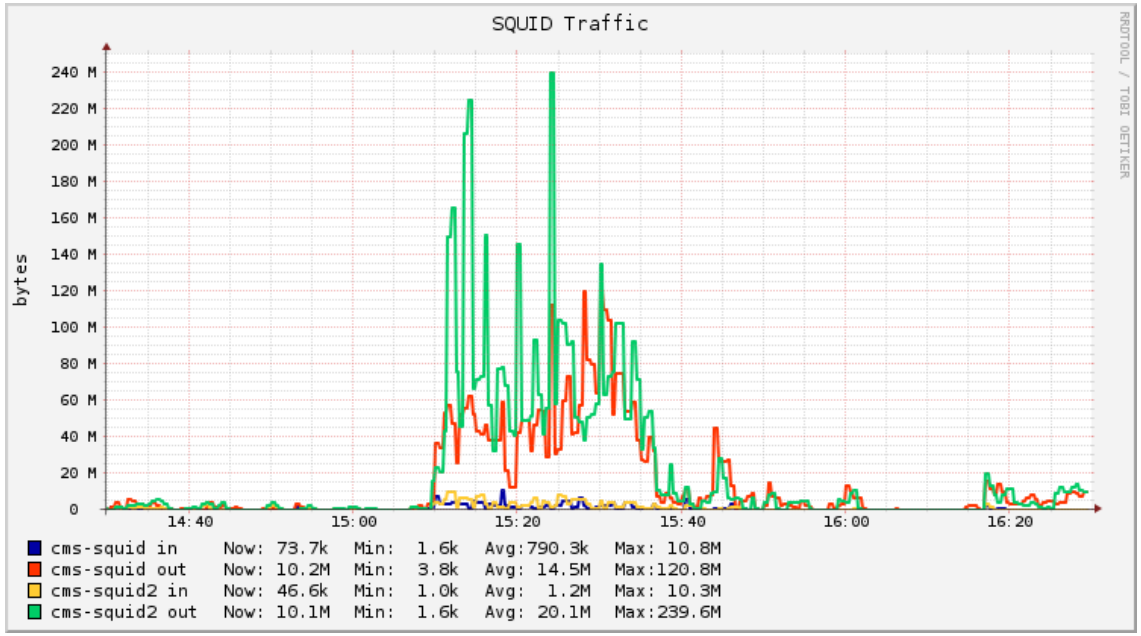
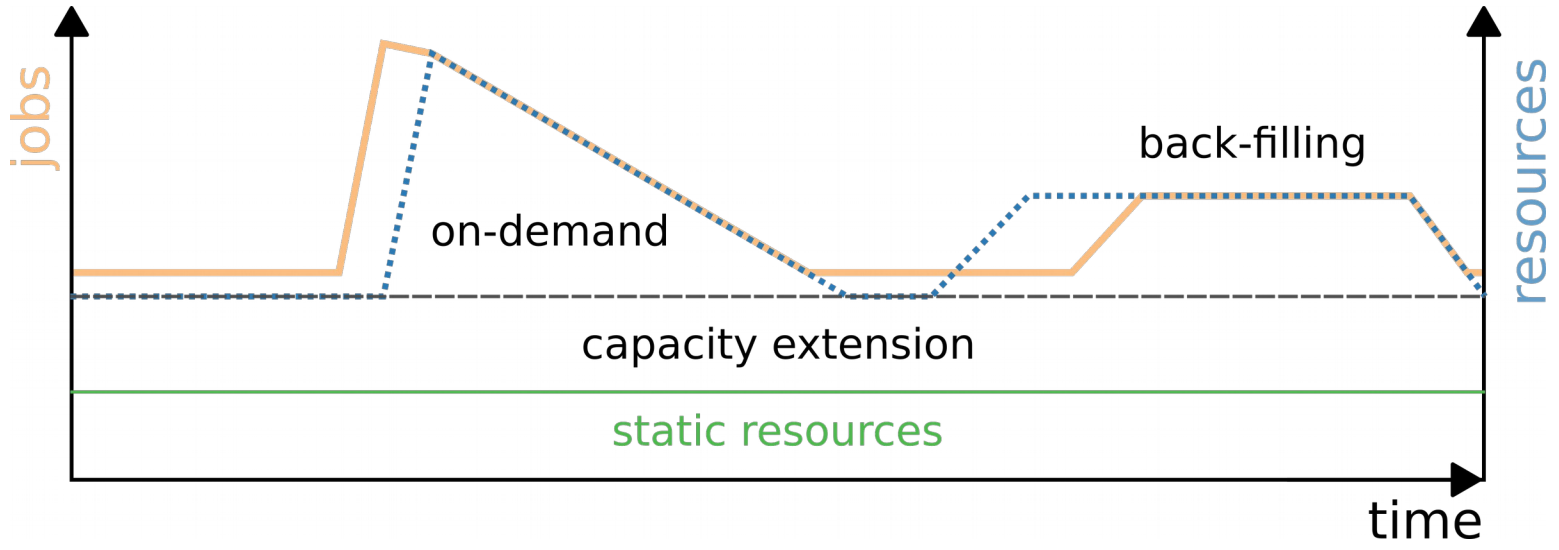


- **Remarkable reduction of incoming traffic**

Provisioning Types

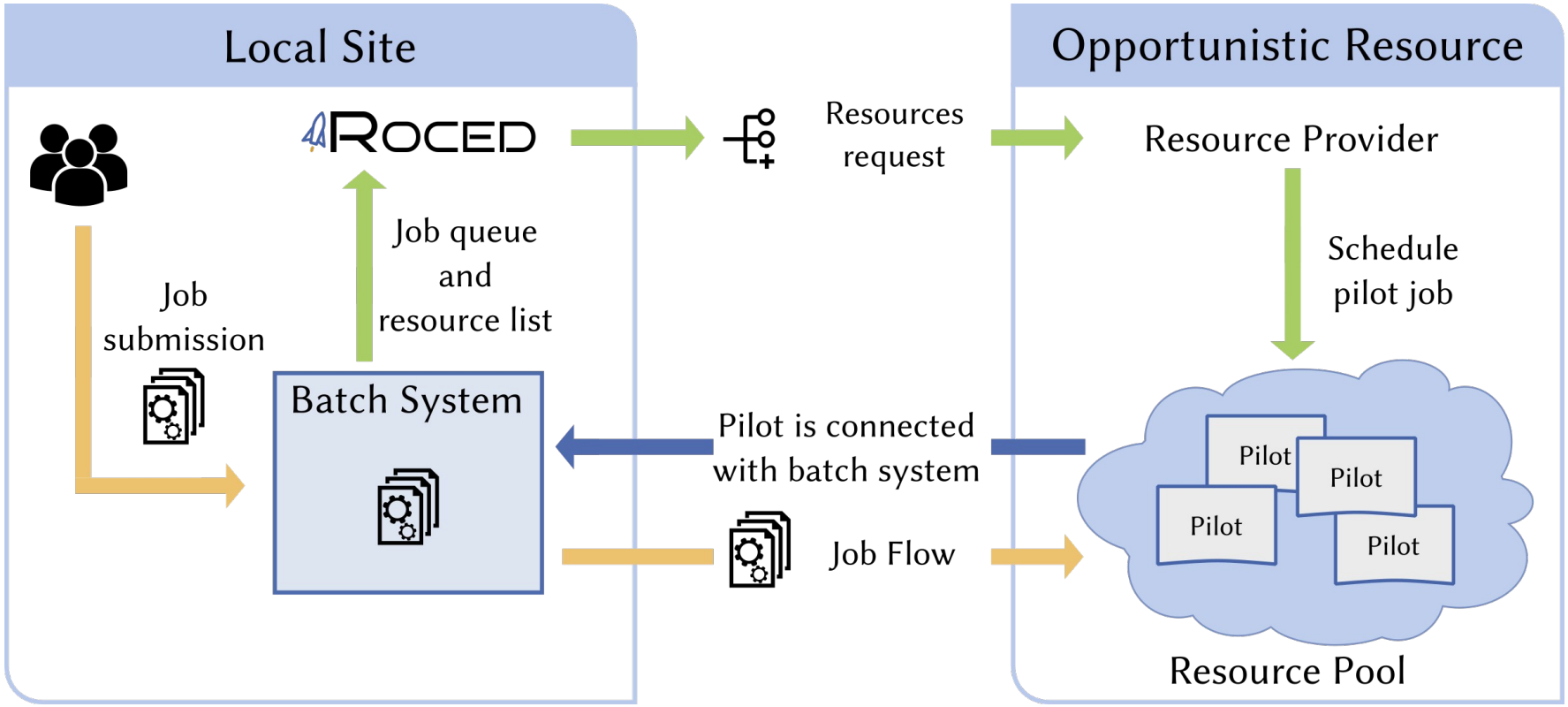
- Resource dependent provisioning of opportunistic resources
  - Back-filling of unused resources
  - On-demand booking for job peak loads
  - Constant capacity extension



- Resource scheduler to enable dynamic resource provisioning and controlling

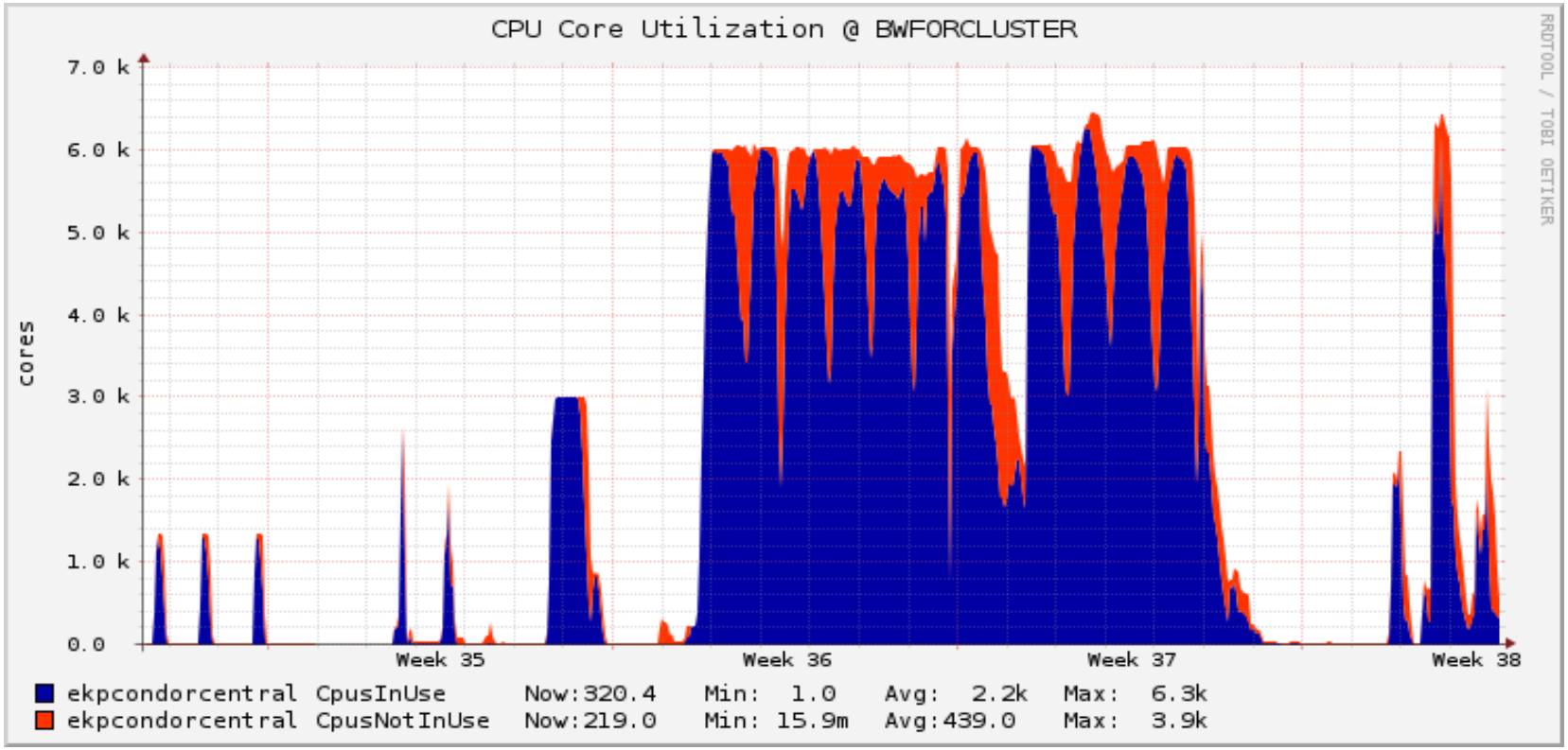
Resource Scheduler: ROCED

- Lightweight management solution developed at KIT
- Support for multiple batch systems and resource providers
- https://github.com/roced-scheduler/ROCED



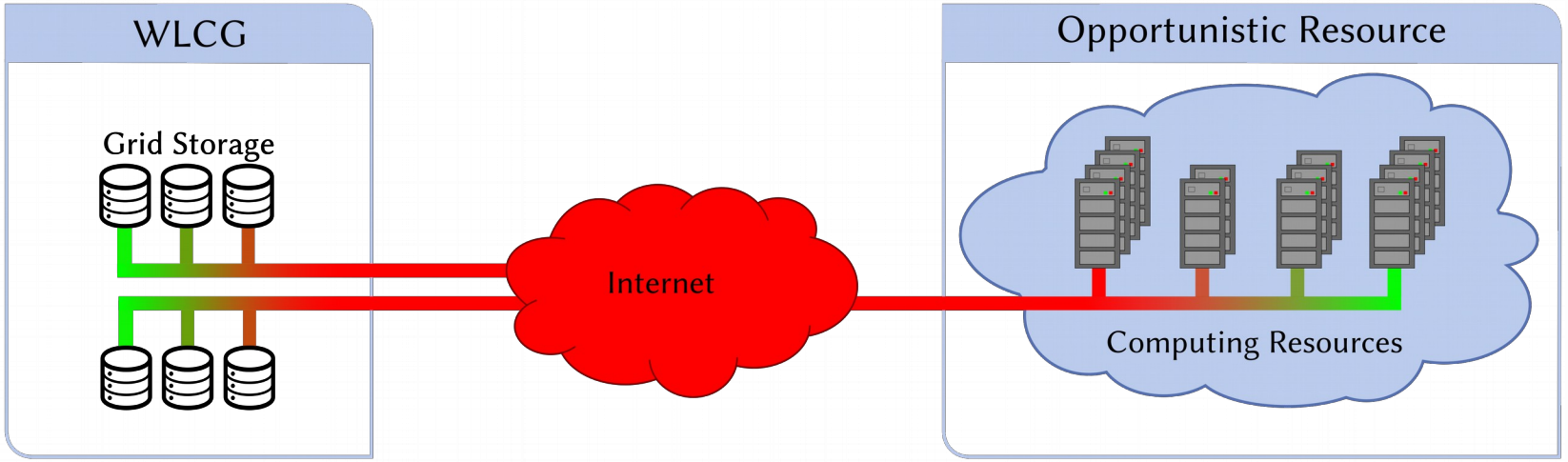
HPC NEMO Usage

- Dynamic on-demand provisioning of VMs
- Integration into local batch system
- Scalability up to 8k Cores proven



Challenges for Data Intensive Jobs

- Persistent storage only located at HEP sites
- Storage performance usually designated for one Grid site
- Network shared at opportunistic resource
- Variable utilization of storage and network



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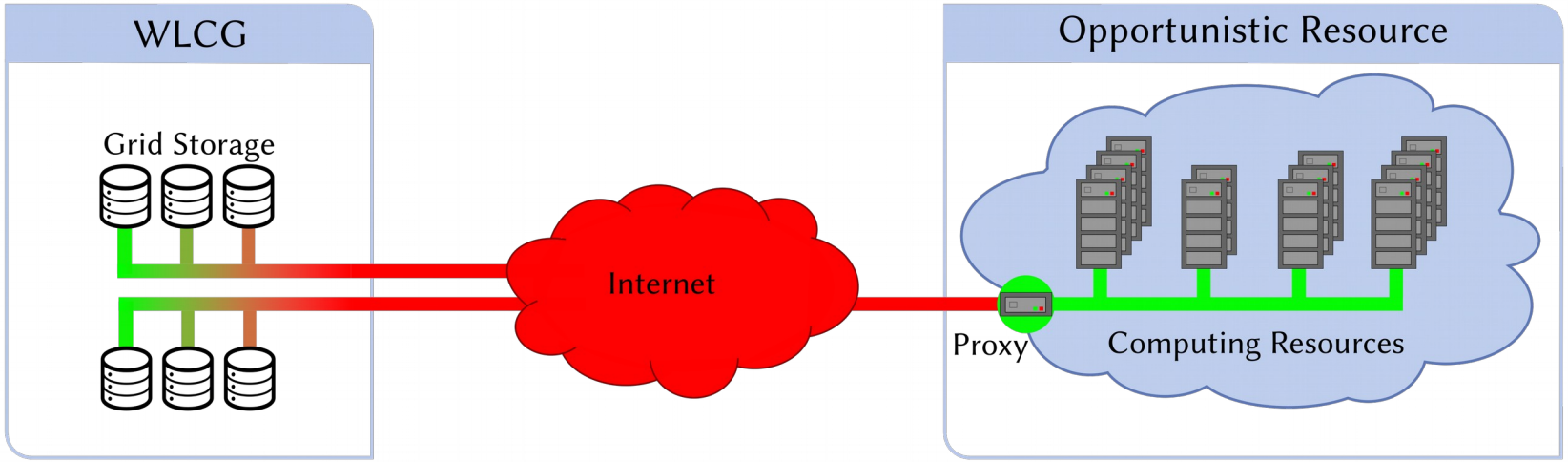

Proxy for HEP file transfer protocol needed to reduce incoming traffic