BOSCO Architecture

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Goals

- We want an easy to use method for users to do computational research

- It should be easy to install, use, and maintain

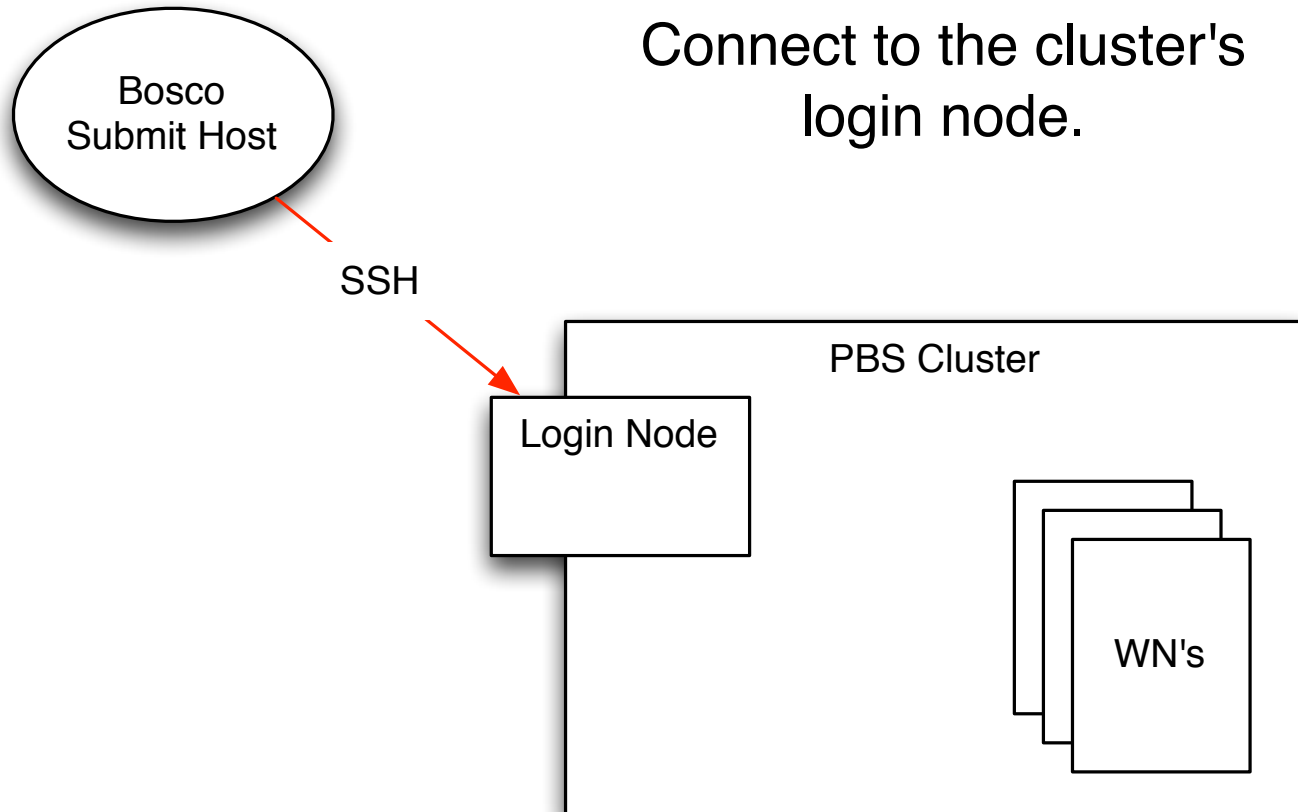- It should be simple for the user

Methods

- Use what's already at clusters
  - Their identity management
  - Their access methods

- Present a consistent interface to users

- If demand increases, expand organically, cluster to cluster
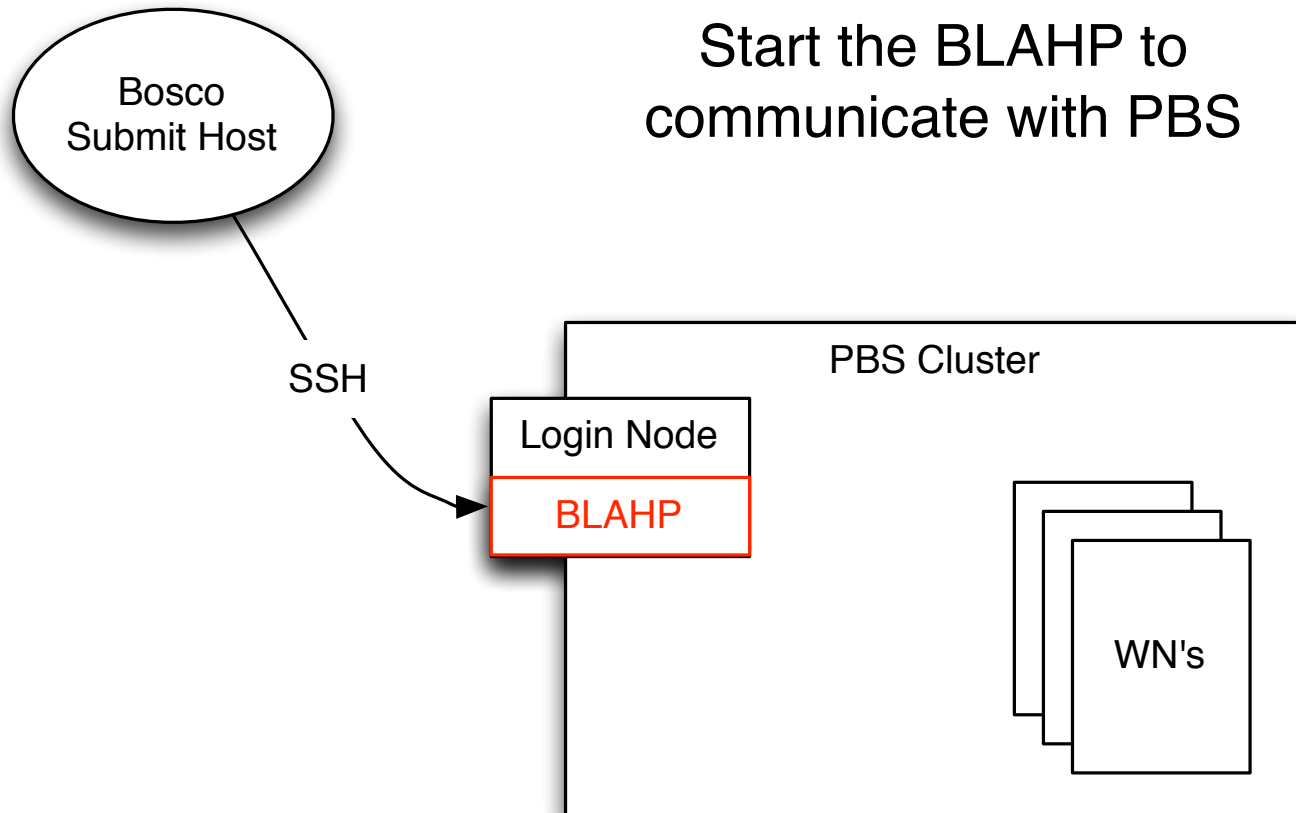
User Scenario 1

- What they have:
  - A computer
  - Access to one cluster
  - Processing for their research
- What they want:
  - Simple job submission / management
  - Their processing to be completed… now!

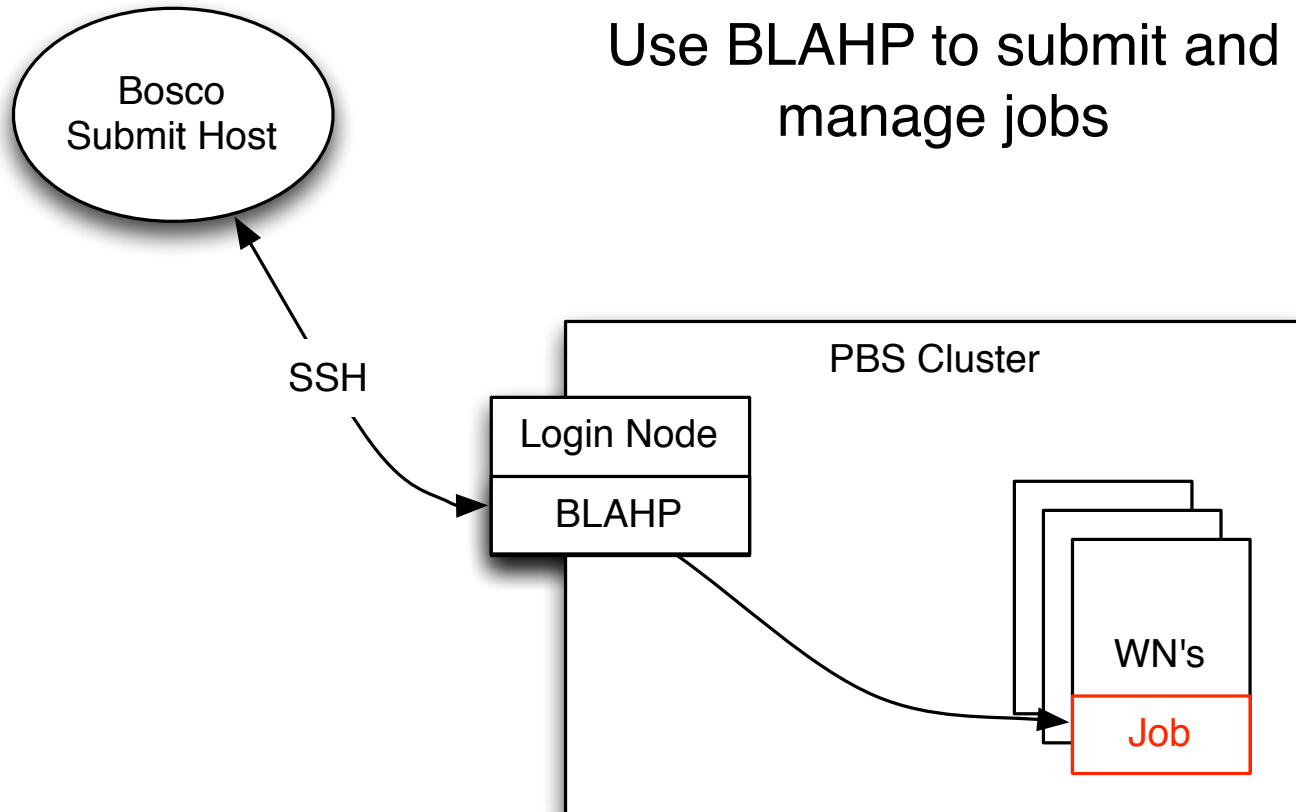# Bosco Working

Connect to the cluster's login node.

Bosco Submit Host

SSH

PBS Cluster

Login Node

WN's

Bosco Working

Open Science Grid

Bosco
Submit Host

Start the BLAHP to
communicate with PBS

SSH

PBS Cluster

Login Node

BLAHP

WN's

Bosco Working

Use BLAHP to submit and manage jobs

Technology

- Uses HTCondor job submission for user jobs

- Uses SSH to connect to clusters

- Uses Glite's BLAHP for interface to cluster scheduler

- Auto detection of remote cluster OS and appropriate BOSCO installation
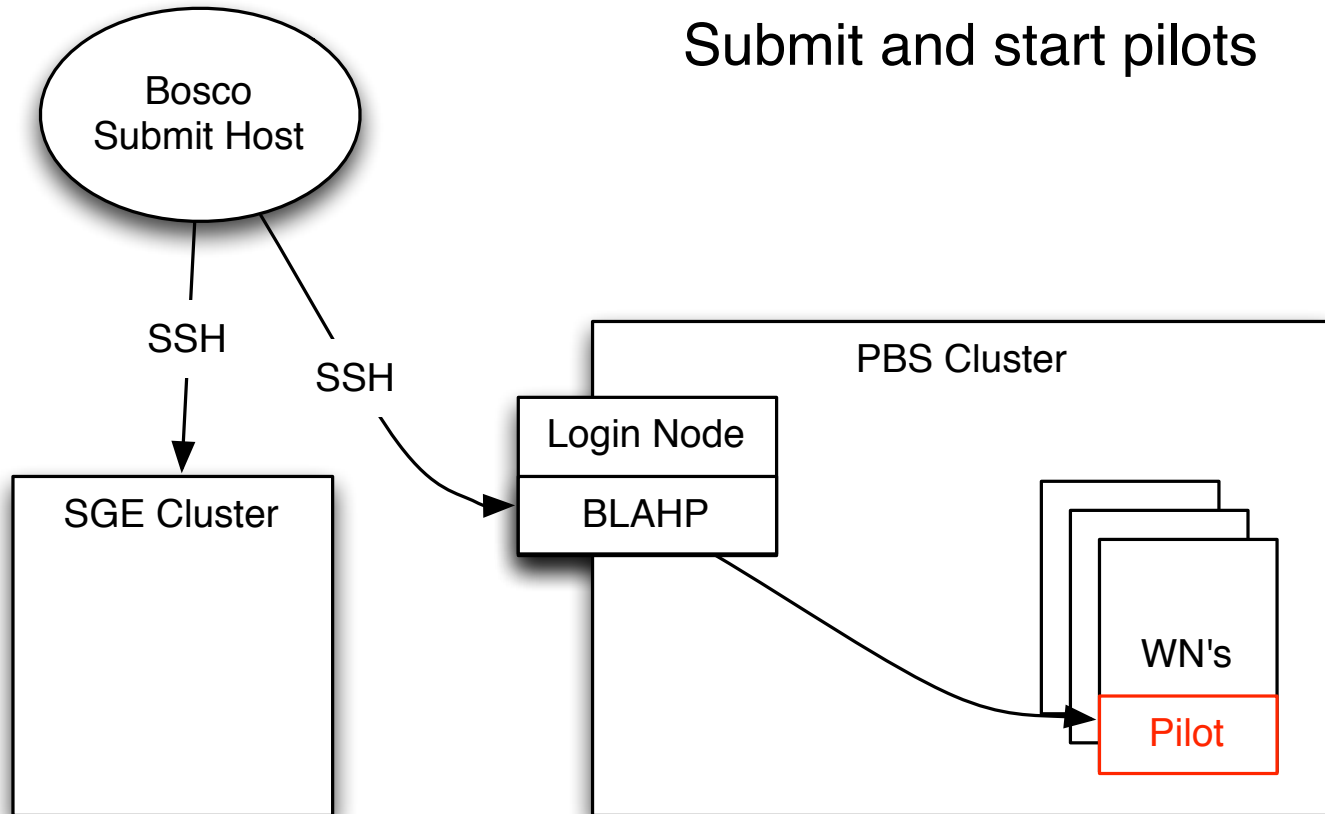
User Benefits from BOSCO

1. Throttled submission to remote cluster
   - Automatically detected

2. Job data transferred back to local computer after job completion

3. Do not care about remote OS version
   - Automatically detect and install

User Scenario 2

- What they have:
    - A computer
    - Access to one **(or more)** clusters
    - Processing for their research
- What they want:
    - Simple job submission / management
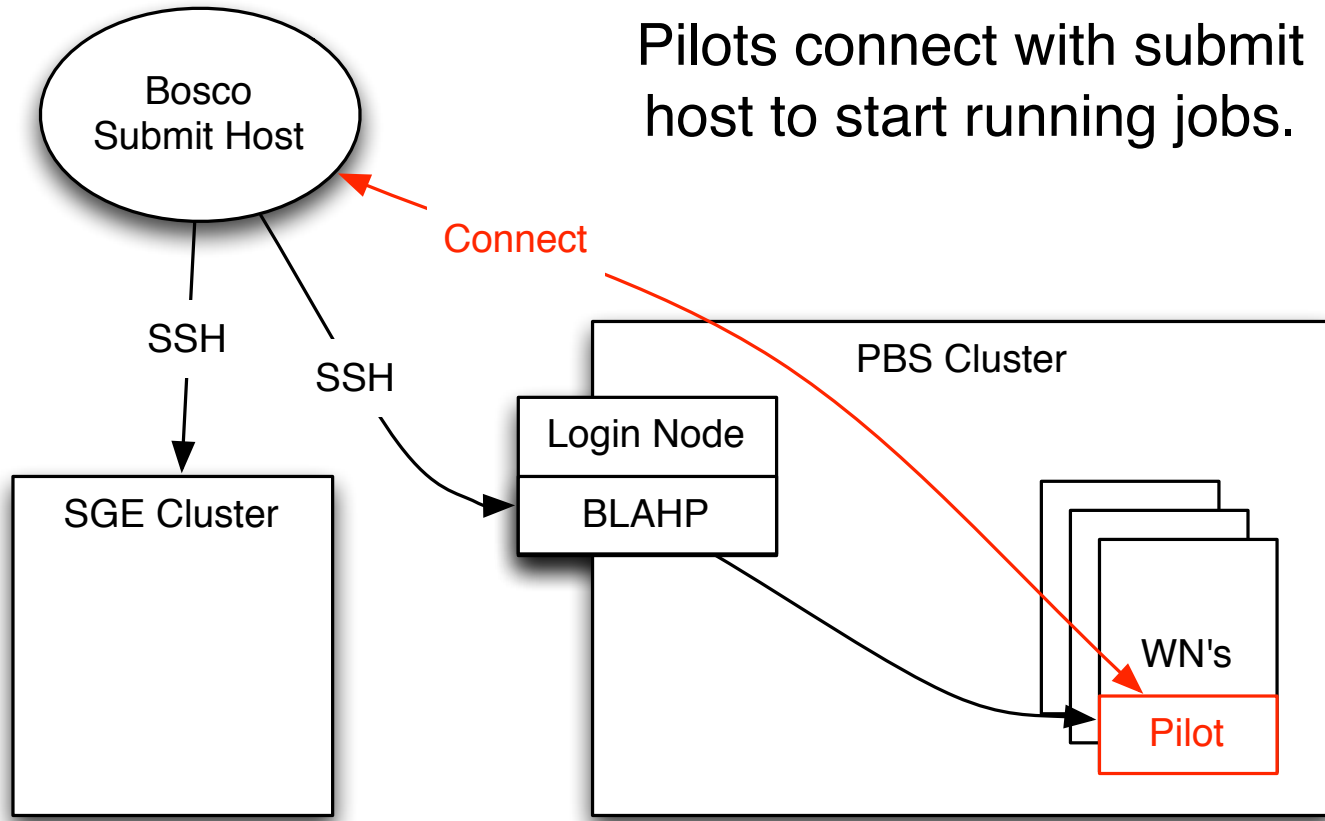   - Their processing to be completed… now!

Bosco Working

Submit and start pilots

Bosco
Submit Host

SSH

SSH

SGE Cluster

PBS Cluster

Login Node

BLAHP

WN's

Pilot

Bosco Working

Pilots connect with submit host to start running jobs.

Bosco Submit Host

Connect

SSH

SSH

SGE Cluster

PBS Cluster

Login Node

BLAHP

WN's

Pilot

Technology

- Everything as before plus…

- Submit Glideins to remote clusters
  - Glideins are dynamic HTCondor worker nodes
  - Provides consistent interface for user jobs
  - Full output transferred back

User Benefits from BOSCO 2

1. Throttled submission to remote cluster
   - Automatically detected
2. Job data transferred back to local computer after job completion
3. Do not care about remote OS version
4. Transparent multi-cluster load balancing
5. Consistent interface to worker nodes
6. Ability to Flock remote HTCondor clusters

Job Throttling

- Detection and throttle of submitted jobs

- Detects the number of jobs that can be submitted to a PBS cluster

- Uses HTCondor to throttle the number of jobs that can be submitted to that cluster

Mobile

- Can suspend laptop and Bosco will survive

- When Bosco starts back up, it will resume checking the status of the job.

- Can submit jobs offline to be submitted when the network is available again.

Job Data Transferred

- Job data is transferred to and from to submit host

- The submit host could be a laptop, output data transferred back to the reseacher's home!

- Important if further analysis is needed on the data

Multi-Cluster

- Submitting glideins to multiple clusters at once

- Jobs are load balanced between the clusters

- Clusters can be spread out across institutional boundries:
  - Example: Clusters at Nebraska and Wisc.

Multi-OS Support

- Remote OS detected at install time

- BOSCO version installed from the 'cloud'

- All OS's can communicate with each other through the GAHP protocol.

Requirements

- Requirements on clusters are limited
  - Running PBS, LSF, HTCondor, or SGE
  - Shared home file system
  - Outbound internet connectivity

- Requirements on submit host
  - For scenario 1, none
  - For scenario 2
    - Public IP address
    - 1 port open (11000)

Compatibility

- Tested by Pegasus team to be compatible

- Can use Dagman workflow management

- If it can run on HTCondor, it can run on BOSCO

Benefits

- Joe the Biologist Benefits
  - Simple access to campus clusters from laptop
  - Cluster configuration is transparent

- Power User Benefits
  - Built-in pilot factory for load balancing across multiple clusters

Future

- We've found users don't want to see HTCondor, they want to see Matlab, R, Galaxy, …

- Bosco is now integrating directly with software projects

- Starting with R, specifically the GridR package

Where to learn more?

- Visit bosco.opensciencegrid.org

- Bosco is integrated into HTCondor relelases.
  - If you have HTCondor 7.9.4+, you have Bosco!