R & D High Performance Computing

January 8, 2009

Leslie Hart
ESRL/GSD/ITS/HPCS
http://rdhpcs.noaa.gov/boulder

NOAA R&D HPCS

- Previously, managed locally by NCEP, GFDL, and FSL (ESRL/GSD)
- Now a NOAA-wide support program
  - Managed under the Environmental Modelling Program (EMP)
  - Oversight by OCIO and NOAA HPC Board
  - Resources intended to be shared across NOAA
- Research & Operations

NOAA R&D HPCS

- **Operations (NCEP)**
  - Two redundant sites: Gaithersburg, MD and Fairmont, WV
    - Focus on high reliability

- **Research (R & D HPCS)**
  - Princeton, NJ (hosted by GFDL) supports mostly climate research

  - Gaithersburg, MD (hosted by NCEP) supports mostly transition to operations

  - Boulder, CO (hosted by ESRL) supports a variety of research
    - ***Allocations managed through HPC Board and EMP Lead***
      - ***Resources requested through PPBES***

EMP Projects

- Advanced Data Assimilation R & D
- Air Quality
- Climate (Boulder)
- Local Grants
- WRF DTC
- Global Reanalysis

- Hydrometeorological Testbed
- Satellite Data Assimilation
- Global Modeling (e.g. FIM)
- Rapid Refresh
- Regional Reanalysis

Projects/Organizations

- ESRL (all divisons)
- AOML
- ARL
- GFDL
- GLERL
- PMEL
- NWS/SWPC
- NOS
- NCAR
- NESDIS/NGDC
- Universities

- Real-time regional forecasts
- Global forecasts
- Seasonal/Interannual
- Magnetosphere/Ionosphere
- Ocean modeling
- Hurricane modeling
- Air Quality/Atmospheric Chemistry
- Solar winds
- Space weather
- Software engineering
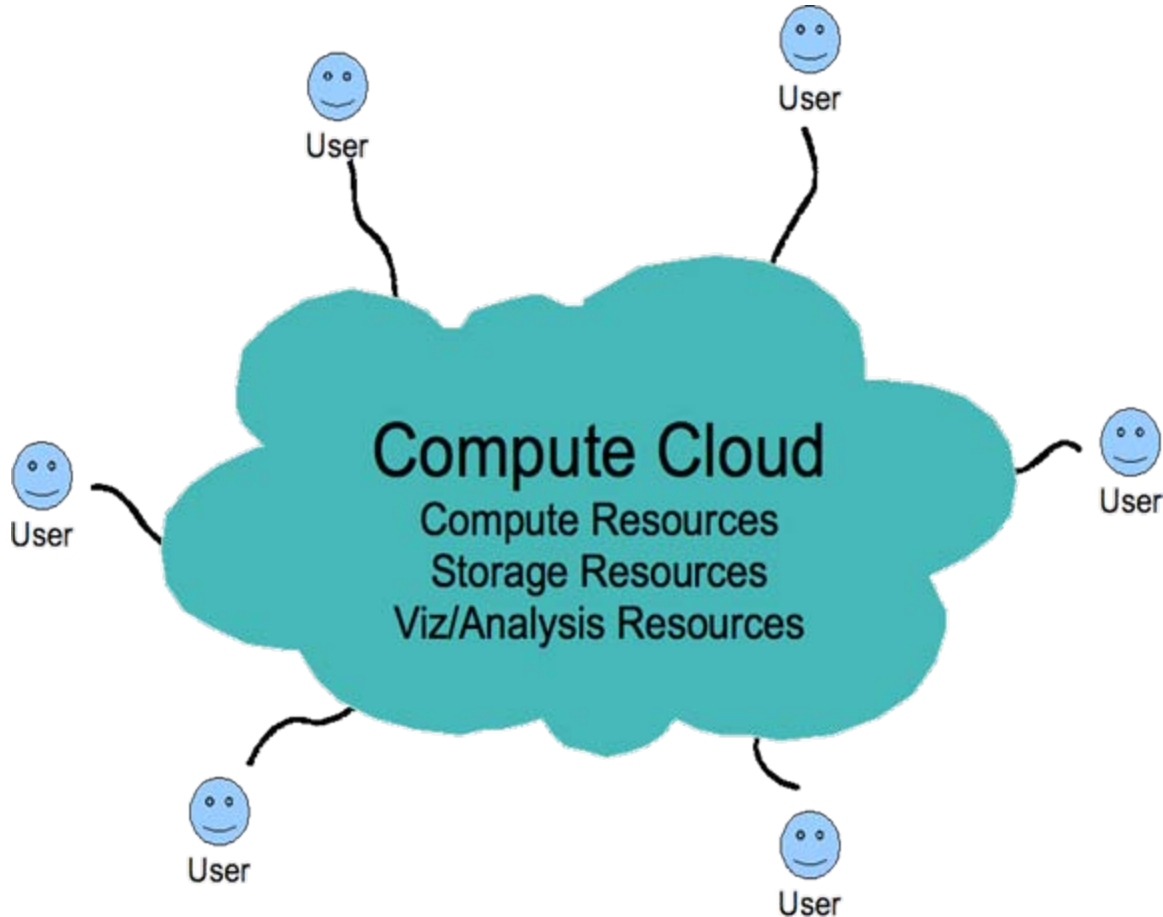
Boulder Architectural Detail
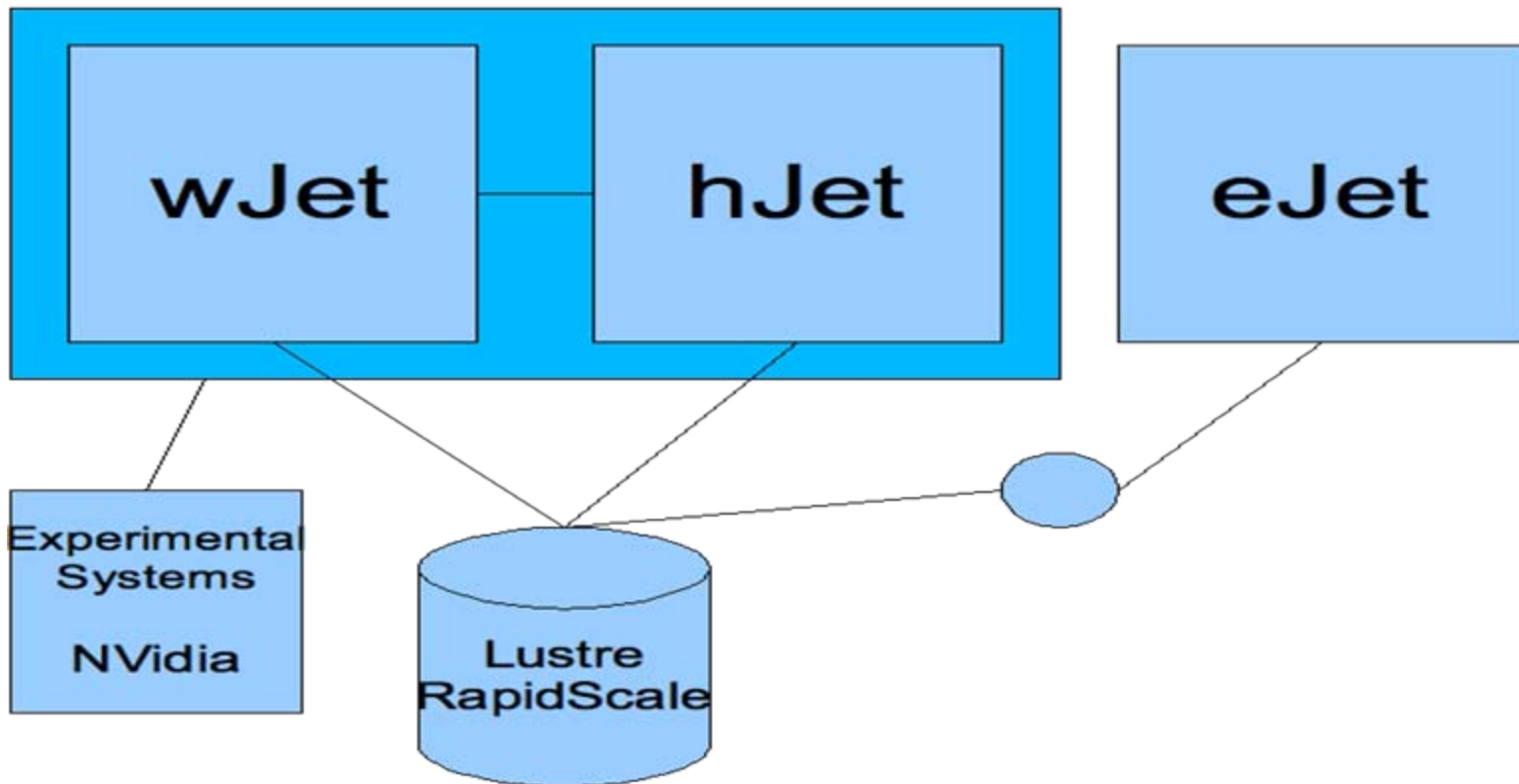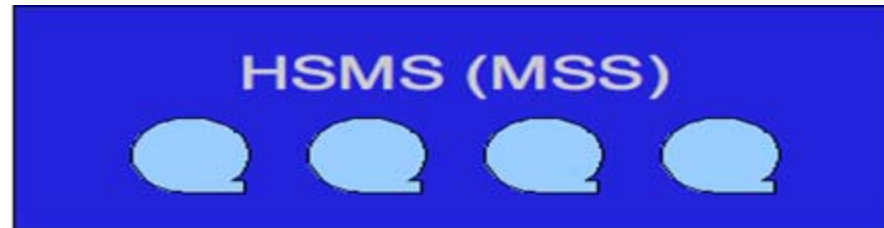
NOAA Architecture Current State
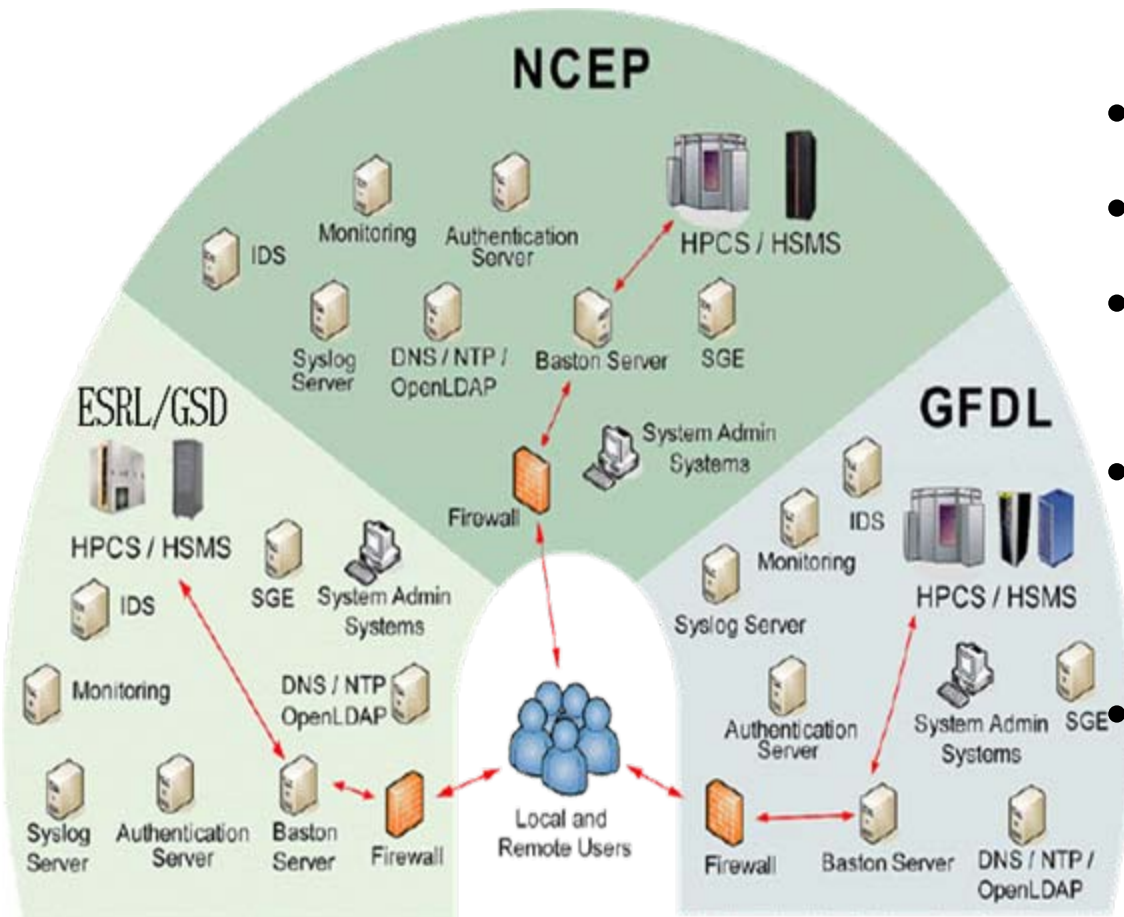
- Three sites
- One Security Package
- Coordinated Management
- Some sharing of support staff resources via contractor
- No sharing of batch jobs

NOAA Architecture Target State

- Location of system(s) is irrelevant
- Sharing of batch system
- Potentially local visualization and analysis resources
- Storage resources may or may not be collocated with compute resources

HPC Software

- Systems are difficult to program
  - Portability
  - Performance
  - Distributed memory architecture
- New/Novel Architectures
  - Highly parallel (1000's of cores)
  - Non-traditional (GPU's)
  - Many-core architectures
  - Hybrid programming models