Environment and Climate Change Canada HPC Renewal Project: Procurement Results

17th Workshop on HPC in meteorology
ECMWF, Reading, UK
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Outline

• Background
• History
• Scope
• RFP
• Outcome
HPC Renewal for ECCC Background

- Environment Canada highly dependent on HPC in delivery of mandate: simulation of Environmental Forecasts for health, safety, security and economic well-being of Canadians.

- Contract with IBM expiring with few remaining options to extend

- Linked to Meteorological Service of Canada (MSC) Renewal Treasury Board Submission
  - Component 1: Monitoring Networks
  - Component 2: Supercomputing capacity
  - Component 3: Weather Warnings and Forecast System

- Joint ECCC-SSC submission for Supercomputing Capacity
New player: Shared Services Canada

- Created in 2012, to take responsibility of email, networks and data center for the whole Government of Canada.
- Supercomputing IT people working for ECCC transferred to SSC.
- Scope of the HPC team expanded to all science departments
- As in any reorganization, there are challenges and opportunities!
Shared Services Canada was formed to consolidate and streamline the delivery of IT infrastructure services, specifically email, data centre and network services. Our mandate is to do this so that federal organizations and their stakeholders have access to reliable, efficient and secure IT infrastructure services at the best possible value.

SSC will Innovate, ensure full Value for Money and achieve Service Excellence!
A Bit of History

- ECCC has been using a supercomputer for weather forecasting and atmospheric science for more than half a century.
A Bit of (More Recent) History

• Request for Information (Fall 2012,
• Invitation to Qualify (Fall 2013, 4 bidders qualified)
• Review Refine Requirements (Summer 2014)
• Requests for Proposal (November 2014 – June 2015)
• Treasury Board Approval (April 2016)
• Contract Award (May 27 2016)
# Scope

<table>
<thead>
<tr>
<th>Scope</th>
<th>In replacement of</th>
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<tbody>
<tr>
<td>Supercomputer clusters</td>
<td>Two 8192 P7 cores clusters</td>
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<tr>
<td>Pre/Post-Processing clusters (PPP)</td>
<td>Two 640 X86 cores custom clusters</td>
</tr>
<tr>
<td>Global Parallel Storage (Site-Store)</td>
<td>CNFS and ESS clusters</td>
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<tr>
<td>Near-Line Storage (HP-NLS)</td>
<td>StorNext based archiving cluster</td>
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<tr>
<td>Home directories</td>
<td>Netapp home directories</td>
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**As well as**
- Hosting of the Solution
- High Performance Interconnects
- Software & tools
- Maintenance & Support
- Training & Conversion support
- On-going High Availability
EC CCC Supercomputing Procurement Requirements

- Contract for Hosted HPC Solution: 8.5 years + one 2.5 year option (Transition year + two upgrades + one optional)
- Connectivity between HPC Solution Data Halls and Dorval
- No more than 70km between Hall A, Hall B & Dorval
- Flexible Options for additional needs
High Level Architecture

One Team – One Culture – One Purpose – One SSC
Outcome

• IBM was awarded the contract
  ▪ Evaluation based on benchmark performance on a fixed budget
• IBM's Proposal for initial system
  ▪ Supercomputer: Cray XC-40, Intel Broadwell, Sonexion Lustre Storage
  ▪ PPP: Cray CS-400, Intel Broadwell
  ▪ Site-Store and Homes: IBM Elastic Storage Server (ESS, GPFS-based)
  ▪ HP-NLS: based on IBM High Performance Storage System (HPSS)
Sizing

• Computing
  ▪ About 35,000 Intel Broadwell cores per Data Hall
    ♦ Super and PPP combined

• More than 40PB of disk storage
  ▪ 2.5 PB scratch storage per supercomputer (one per data hall)
  ▪ 18 PB site store per data hall
  ▪ 1.1 PB disk cache to the archive per data hall

• More than 230 petabytes of tape storage (two copies)
Comparison

Increase Factors

- HP-NLS storage (vs current tape capacity), petabytes
- Site-Store, homes storage (vs current), petabytes
- Scratch storage (vs p7), petabytes
- Sustained TFlops Supercomputer and PPP (vs P7, current PPP)
- Peak TFlops Supercomputer and PPP (vs P7, current PPP)
- Cores count Supercomputer and PPP (vs P7, current PPP)
The Newest Addition to a Long History

Historical Performance, EC Supercomputers (Flops)
Resulting Architecture

One Team – One Culture – One Purpose – One SSC
HPC Implementation Milestones: Delivery to Acceptance

- Data Hall and Hosting Site Certification
- Functionality Testing (IT infra)
- Security Accreditation
- Performance testing
- Conversion of Operational codes (Automated Environmental Analysis & Production (AEAPPs))
- Meeting the above triggers a 30 day availability test
Challenge

• Change the Supercomputer clusters, PPP clusters, archiving system and homes. All at once. Never been done
  ▪ A lot of preparation work has been done ahead of time
    ♦ Most codes have already been ported to Intel architecture
    ♦ Our General Purpose Science Clusters available for PPP migration work
      – Linux containers are being leveraged to smooth the transition
Thank you!
Questions?