Maui High Performance Computing Center Overview

March 2013

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MHPCC Director of Outreach
& Program Development
University of Hawaii
Agenda

- Background
- Strategy
- Resources
- Clients
- Summary
Background
Cooperative Agreement

Year 1993
Year 2001
Year 2011
Scope
…manage and provide for computational support, research, development, maintenance, operations, and management (RDOM) for the Maui High Performance Computing Center, Maui, Hawai‘i…

Vision
Become a **self-sustaining national asset** to the United States providing **world-class parallel computing capability** to the research, science, and warfighter communities.

Goals
Lead the world in parallel computing technology…
…provide computing resources to **DoD HPCMP**
…maximize yearly revenue from external customers … **self-sustainment**
Task Order Contract

Maximum Estimated Ordering Value = $251,000,000

Performance-Dependent Term, Maximum Ordering Period = 10 Years
4 Year Base Period with 2, 3-Year Term Awards

Task Areas

Operations and Maintenance
Program Management/
Business Development
Directed Technical Program
Phase-in

Phase-in: Jul – Sep 2001
Operations: Oct 2001
Re-Competition: RFP Jun 2011, Award TBD
Extension: through 31 Mar 2013
HPC Modernization Program

Mission
Accelerate development and transition of advanced defense technologies into superior war fighting capabilities by exploiting and strengthening US leadership in supercomputing, communications and computational modeling.

Vision
A pervasive culture existing among DoD’s scientists and engineers where they routinely use advanced computational environments to solve the most demanding problems.

Tools for Discovery
A DoD Supercomputing Resource Center

**Deputy Assistant Secretary of the Army for Research and Technology**

**U.S. Army Corps of Engineers**

**Engineer Research and Development Center**

**High Performance Computing Modernization Program**

### DoD Supercomputing Resource Centers
- Air Force Research Laboratory (AFRL)
- Army Research Laboratory (ARL)
- Engineer Research and Development Center (ERDC)
- **Maui High Performance Computing Center (MHPCC)**
- Navy (Navy)

### Affiliated Resource Centers
- Air Force Research Laboratory, Information Directorate (AFRL/RI)
- Naval Research Laboratory (NRL)
- Space and Missile Defense Command (SMDC)
- SPAWAR Systems Center San Diego (SSC-SD)

### Dedicated HPC Project Investments
- Air Force Research Laboratory, Directed Energy Directorate (AFRL/RD)
- Air Force Research Laboratory, Information Directorate (AFRL/RI)
- Army Research Laboratory (ARL)
- Army Test and Evaluation Command (ATEC)
- MIT Lincoln Laboratory (MIT-LL)
- Naval Air Warfare Center (NAWCP)
- Naval Research Laboratory Monterey (NRL-MRY)
- Naval Undersea Warfare Center (NUWCN)
Strategy
Identified Focus Areas

Image and Signal Processing

Modeling and Simulation

Scalable Computing Technology
Resources
Infrastructure

Main Building
- 32,000 ft² Dedicated Facility
- 4,600 ft² Computer Room
- 1,600 ft² SCIF
- Network Communications
- Presentation Center
- Collateral Secure Facilities
- Conference and Training Facilities

Anchor Tenant in the Maui Research and Technology Park
MHPCC Data Center

Data Center
- 8,300 ft² Facility
- 5,100 ft² Computer Room
- Data Center Architecture
- Power Upgrades
- Cooling Upgrades
- Backup Power
MHPCC DSRC Computing Resources

December 2012

HPC RESOURCES

APPRO SYSTEMS
- Appro 1326

DELL SYSTEMS
- PowerEdge M610
- PowerEdge 200
- PowerEdge 1850
- PowerEdge 1950
- PowerEdge 1955
- PowerEdge 2950

HP SYSTEM
- DL380G4

IBM SYSTEM
- X3550

COMPUTING CAPABILITY
- 12,246 PROC
- 135 TFLOPS

MEMORY
- 40 TB

STORAGE
- 2.1 PB DISK STORAGE
- 600 TB ON-LINE TAPE STORAGE
MHPCC Computing Resources

- 1,152 Power Edge M610 Compute Nodes
  - Intel Xeon Nehalem Quad-Core Processors
  - 9,216 Cores
  - Dual Data Rate Infiniband, Gig-E Interconnect
  - Linux Red Hat OS
  - 400 TB Direct-Attached Storage
  - 103 TFLOPS Peak

- Maintenance
  - Hot and Cold Spares Onsite
  - Onsite Engineering Support

- Phase Two Option
  - Executed May 2009
  - Integration August 2009
  - IOC 24 August 2009

- Associated Infrastructure P3I
  - Electrical and HVAC

Doubles Previous Jaws Capacity
The Next MHPCC HPC Technology

✓ IBM 1350 iDataPlex Cluster
  • Intel Xeon Sandy Bridge Micro-architecture
  • 12,096 Cores/756 Nodes
  • ~ 250 TFLOPS

✓ Direct Water Cooling
  • Energy Efficiency

✓ Maintenance
  • Hot and Cold Spares Onsite
  • Onsite Engineering Support

✓ Associated Infrastructure P^3I
  • Water Cooling and Electrical

2.5 X Previous Mana Capacity

Delivered 31 January 2013
MHPCC Connectivity

- Defense Research and Engineering Network (DREN) (OC-12)
- Hawaiʻi Wide Area Network (OC-12)
Clients
User Population
1QFY13

Total Number of Accounts = 246

HPCMP = 165

Government = 20

MHPCC Staff = 61
Computational Research and Engineering Acquisition Tools and Environment (CREATE)

CREATE, Radio Frequency (RF)
CREATE, Air Vehicles (AV)-FIREBOLT
CREATE, Air Vehicles (AV)-HELIOS
CREATE, Air Vehicles (AV)-SHADOW OPS
CREATE, Air Vehicles (AV)-KESTREL
Joint Strike Fighter-SHIP INTEGRATION
FY12 HPCMP Challenge Projects

- Virtual Prototyping of Directed Energy Weapons, Air Force Research Laboratory
- Complex Ferroelectrics and Multiferroics from First Principles, Office of Naval Research
- Computational Analysis for Air and Ship Integration, Naval Air Warfare Center
- Aero-optical Distortions In Directed Energy Applications, United State Air Force Academy
# MHPCC Directed Technical Tasks

<table>
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<tr>
<th>Task Number</th>
<th>Task Description</th>
<th>Responsible Agency</th>
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<td>04</td>
<td>MSSS Data Fusion</td>
<td>AFRL/RD</td>
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<td>05</td>
<td>Non-Imaging Space Object Identification</td>
<td>AFRL/RD</td>
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<tr>
<td>06</td>
<td>Non-Linear Algorithm Development</td>
<td>AFRL/RD</td>
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<td>07</td>
<td>Project Albert</td>
<td>MCWL</td>
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<td>08</td>
<td>PACOM Image Processing Exploitation - PIPES</td>
<td>NGA</td>
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<td>09</td>
<td>Joint Medical Asset Repository – JMAR</td>
<td>DMLSS</td>
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<td>10</td>
<td>Missile Defense Agency Multi-Sensor Fusion – MDA</td>
<td>MDA</td>
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<td>11</td>
<td>Advanced Communications and Sensor Testing</td>
<td>ONR</td>
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<td>12</td>
<td>DE/Tactical Operational Systems Simulator – DE/TOSS</td>
<td>AFRL/RD</td>
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<tr>
<td>13</td>
<td>Joint Warfare Systems – JWARS</td>
<td>CINCPAC</td>
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<td>14</td>
<td>Novel Programming Development (R&amp;D)</td>
<td>AFRL/RD</td>
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<td>15</td>
<td>Temporal Aperture Synthesis Imaging (R&amp;D)</td>
<td>AFRL/RD</td>
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<td>16</td>
<td>Photoisomer Dynamics and Materials Development (R&amp;D)</td>
<td>AFRL/RD</td>
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<td>17</td>
<td>Environment for Marine Vehicle Design – ENDEAVOR</td>
<td>ONR</td>
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<td>18</td>
<td>Theater Undersea Warfare – TUSW</td>
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<td>19</td>
<td>Airborne Laser (ABL) Weather Modeling</td>
<td>USAF</td>
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<td>Pan-STARRS</td>
<td>AFRL/RD</td>
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<td>Studies and Support Projects</td>
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<tr>
<td>A)</td>
<td>Turtle Boat</td>
<td>ONR</td>
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<tr>
<td>B)</td>
<td>U.S. Forest Service Weather Modeling and Fire Prediction</td>
<td>USFS</td>
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<tr>
<td>C)</td>
<td>High Accuracy Network Determination System – HANDS</td>
<td>AFRL/RD</td>
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<tr>
<td>D)</td>
<td>Roving Island Initiation</td>
<td>ONI</td>
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<tr>
<td>E)</td>
<td>Gunslinger (Albert)</td>
<td>MCWL</td>
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<td>F)</td>
<td>LRALT</td>
<td>MDA</td>
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<td>G)</td>
<td>CST/PIF</td>
<td>NAVAIR</td>
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<td>H)</td>
<td>Hawaii Super Ferry</td>
<td>AFRL/RD</td>
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<td>I)</td>
<td>Combat XXI</td>
<td>TRAC</td>
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<td>22</td>
<td>Roving Island – Cargo Tracking</td>
<td>ONI</td>
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**Current Tasks**

**Completed Tasks**
# MHPCC Directed Technical Tasks

## ONR Studies and Support Projects

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<th>Task Description</th>
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<td>Maritime Synthetic Range – MSR</td>
<td>ONR</td>
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<tr>
<td>23</td>
<td>Theater Undersea Warfare – TUSW</td>
<td>ONR</td>
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<tr>
<td>23</td>
<td>UHF Electronically Scanned Array – UESA</td>
<td>ONR</td>
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<tr>
<td>23</td>
<td>Mobile Modular Command Center – M2C2</td>
<td>ONR</td>
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<td>23</td>
<td>GMid-Pac UMN/UH Contractor Support</td>
<td>ONR</td>
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<tr>
<td>23</td>
<td>Maritime Domain Awareness</td>
<td>ONR</td>
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<td>23</td>
<td>IMEA Procurement</td>
<td>ONR</td>
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## Generic Studies

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<th>Task Description</th>
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<tr>
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<td>Millimeter Wavelength Imaging</td>
<td>AFRL/RD</td>
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<td>24</td>
<td>Computational Chemistry</td>
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## Generic Support

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<td>25</td>
<td>PMRF Support for Huinalu Jr.</td>
<td>PMRF</td>
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<tr>
<td>25</td>
<td>HANDS</td>
<td>AFRL/RD</td>
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<tr>
<td>25</td>
<td>Civil Maritime Analysis and Advisement</td>
<td>ONI</td>
</tr>
<tr>
<td>25</td>
<td>HSAI SSA Quick Start</td>
<td>HPCMP</td>
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## Open Source Exploitation

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<td>Open Source Exploitation – OSE</td>
<td>PACOM</td>
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<td>Data Integrity</td>
<td>AFRL/DE</td>
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<td>General MASINT Service</td>
<td>DIA</td>
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<td>29</td>
<td>Photoisomer Dynamics</td>
<td>AFOSR</td>
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<td>30</td>
<td>Unmanned Systems Test Bed – USTB</td>
<td>DOD/T&amp;E</td>
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<tr>
<td>31</td>
<td>MSSS Support</td>
<td>AFRL</td>
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<tr>
<td>32</td>
<td>CST PIF</td>
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<td>32</td>
<td>IMA</td>
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<td>Sudden Spirit</td>
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## HSAI-SSA

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<td>33</td>
<td>HSAI-SSA</td>
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## Roving Island II

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<tr>
<td>34</td>
<td>Roving Island II</td>
<td>ONI</td>
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**DISTRIBUTION A.** Approved for public release; distribution is unlimited.
MHPCC Directed Technical Tasks

35 Generic Support
A) HANDS  AFRL/RD
B) INDEX  AFRL/RD
C) T2P  JFCOM
D) Modeling & Sim Environment  AFRL/RD
E) CREATE  HPCMP
F) ACE-09  AFRL/RD
G) MEII Support  AFRL/RD
H) GNET  HPCMP
I) MCiS Support  AFRL/RD
J) Research Planning for Akamai  AFRL/RD
K) Future Task Order Research  AFRL/RD

36 Air Cargo Tracking  AFIAA
37 Secure Skies  AFRL/RD
38 TIMECOP  NGA
39 CRSTAL  AFIIA
40 Mana Follow-on  AFRL/RD
41 AMOS Support  AFRL/RD
42 Phase-out/Transition  AFRL/RD

DISTRIBUTION A. Approved for public release; distribution is unlimited.
Summary
A Valuable National Resource

Partner in AFRL Presence on Maui

University of Hawai‘i

Key Member of the Hawai‘i State Science and Technology Community