

IceCube Maintenance & Operations Common Fund Status Report and 2010 plans

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Introduction

The IceCube M&O Common Fund was created in April 2007, the start of formal operations, to enable collaborating institutions to contribute to the costs of maintaining the computing hardware and software required to manage experimental data prior to processing for analysis. Each institution contributes to the Common Fund based on the total number of the institution's Ph.D. authors.

The Collaboration updates the Ph.D. author count twice a year at the Collaboration meetings in conjunction with the update to the IceCube Memorandum of Understanding for M&O. Effective April 1, 2010, the established rate per Ph.D. author was increased by 50% from \$9,100 to \$13,650.

Initial 3 years of M&O Common Fund

Common Fund Contributions

The following table summarizes the Common Fund (CF) contributions for the first three years of IceCube Maintenance and Operations:

**Table 1. Planned and Actual CF Contributions (\$000)
For the Initial Three Years of M&O – April 2007 - March 2010**

| | PhD. authors Apr-07 | 2007 Planned | PhD. authors Apr-08 | 2008 Planned | PhD. authors Apr-09 | 2009 Planned |
|-------------------------------|---------------------------|-----------------|---------------------------|-----------------|---------------------------|-----------------|
| Total CF Planned | 122 | \$1,110 | 115 | \$1,047 | 124 | \$1,128 |
| U.S. Contribution | 73 | \$664 | 73 | \$664 | 73 | \$664 |
| Non-U.S. Contribution | 49 | \$446 | 42 | \$382 | 51 | \$464 |
| | | Actual | | Actual | | Actual |
| Total CF Contributions | | \$1,110 | | \$948 | | \$1,119 |
| U.S. Cash Transfer | | \$664 | | \$664 | | \$664 |
| Non-U.S. Cash Transfer | | \$360 | | \$243 | | \$417 |
| Non-U.S. In-Kind | | \$86 | | \$41 | | \$38 |
| Balance | | \$0 | | -\$99 | | -\$9 |

Actual Common Fund contributions were equal to the plan for 2007, are still \$99k less than planned for 2008, and only \$9k less than planned for 2009. It is anticipated that eventually all of the expected contributions for the initial three years of IceCube M&O will be fulfilled.

Common Fund Expenditures

The M&O activities identified as appropriate for support from the Common Fund are those core activities that are agreed to be of common necessity for reliable operation of the IceCube detector and computing infrastructure. The activities directly support the functions of winter over technical support at South Pole, hardware and software systems for acquiring and filtering data at the South Pole, hardware and software systems for transmitting data via satellite and tape to the UW data center, systems for archiving the data in the central data warehouse at UW and UW Data Center Operations as listed in the Cooperative Agreement with NSF.

The Common Fund expenditures are divided into two categories: U.S. Common Fund and Non-U.S. Common Fund. This division was made to ensure that Non-U.S. CF is only used for hardware, software, and materials and supplies. The cumulative status of funding available and expenditures is provided in the following table:

**Table 2. Status of Common Fund Expenditures (\$000)
April 1, 2007 – June 30, 2010**

| | U.S. Common Fund | Non-U.S. Common Fund |
|-----------------|-----------------------------|---------------------------------|
| Funds Available | \$1,993 | \$1,019 |
| Expenditures | \$1,897 | \$1,003 |
| Balance | \$96 | \$16 |

A detailed list of the Common Fund expenditures under both U.S. and Non U.S. accounts, for the period of April 1, 2007 – June 30, 2010, is included in *Attachment 1*.

Future Plans for M&O Funds and Expenditures

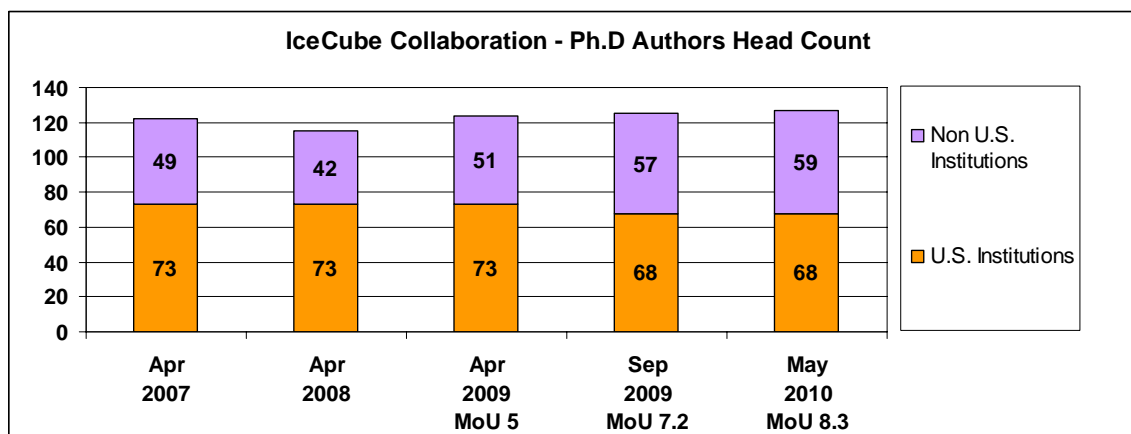
Common Fund Contributions

The planned contributions during the fourth year of IceCube operations is larger than in preceding years primarily due to the 50% increase approved by the collaboration and supported by the funding agencies. There are also additional Ph.D. authors contributing to the total increase. The following table is a summary of the anticipated contributions.

**Table 3. Planned CF Contributions (\$000)
For Year 4 of M&O, April 1st, 2010 – March 31st, 2011**

| M&O Year4 | PhD. Authors, May2010 | Planned |
|-------------------------|------------------------------|----------------|
| Total CF Planned | 127 | \$1,734 |
| U.S. Contribution | 68 | \$928 |
| Non-U.S. Contribution | 59 | \$805 |

The following bar chart presents the Ph.D. Authors headcount profile over the last three years. There is less than a ten percent increase in the number of Ph.D. authors since the start of Common Fund.



The following table provides a more detailed breakdown of the authors' headcount including faculty, scientists and postdocs, and PhD. Students.

**Table 4. IceCube Collaboration – Authors Head Count
Based on the Institutional Memorandum of Understanding v8.3 (May 2010)**

| | Total Ph.D. Authors | Faculty | Scientists / Post Docs | PhD. Students |
|----------------------------------|---------------------|-----------|------------------------|---------------|
| Non-U.S. Institutions Subtotal | 59 | 34 | 25 | 64 |
| U.S. Institutions Subtotal | 68 | 32 | 36 | 29 |
| Total U.S. & Non-U.S. | 127 | 66 | 61 | 93 |

NSF M&O Proposal Budget, FY2011-FY2015

A revised IceCube M&O proposal which covers Federal Fiscal Years 2011 – 2015 (October 1, 2010 – September 30, 2015), was submitted to NSF on April 26, 2010. The total budget requested over the five-year period was \$34,500,000. A summary of the revised proposed budget can be found in *Attachment 2*.

IceCube M&O Computing Infrastructure – Upgrade Plan for Year 4

A list of major purchases for the FY2010/2011 South Pole System (SPS) upgrade, the 2010 South Pole Test System (SPTS) upgrade, and for the 2010 UW Data Warehouse and UW Data Center upgrades is provided in *Attachment 3*.

Attachment 1: Common Fund Expenditures

U.S. Common Fund Expenditures through June 30, 2010

(Including open commitments)

| Category | Line Description | Vendor | Quantity | Amount |
|--|------------------------------------|---------------------|----------|--------------------|
| Equipment | SUN X2270-H1-AA | SUN MICROSYSTEMS | 50 | \$186,689 |
| | HP PROLIANT DL380 | HEWLETT PACKARD | 11 | \$53,439 |
| | PROMISE ARRAY PACKAGE | CAMBRIDGE COMPUTING | 1 | \$11,160 |
| | HP 300-330GB 10-15K ULTRA | HEWLETT PACKARD | 17 | \$9,466 |
| | HP LTO-4 ULTARIUM 1.6 TB | HEWLETT PACKARD | 2 | \$5,000 |
| | HP OTHER | HEWLETT PACKARD | 11 | \$4,498 |
| | OTHER EQUIPMENT | OTHER VENDORS | 1 | \$3,099 |
| Equipment Total | | | | \$273,351 |
| Computers Supplies | HP ULTRIUM 800 GB | HEWLETT PACKARD | 61 | \$62,540 |
| | HP LTO-4 ULTARIUM 1.6 TB | HEWLETT PACKARD | 27 | \$39,214 |
| | LTO-3 400GB/800GB - tape media | CAMBRIDGE COMPUTING | 700 | \$38,096 |
| | POWER & COOLING | 5NINES DATA, LLC | 1 | \$30,982 |
| | HP R5500 VA SYSTEMS | HEWLETT PACKARD | 4 | \$13,843 |
| | HP MANAGEMENT CARD | HEWLETT PACKARD | 37 | \$9,632 |
| | SYS. 2801CT CONFIGURED T400S | LENOVO DIRECT | 2 | \$5,054 |
| | IRIDIUM MODEM | NAL RESEARCH | 4 | \$3,719 |
| | HP OTHER | HEWLETT PACKARD | 21 | \$6,187 |
| | OTHER SUPPLIES | OTHER VENDORS | 1 | \$9,468 |
| Computers Supplies Total | | | | \$218,734 |
| Wages | WINTER OVERS, SPS and SPTS SUPPORT | UW – Madison | 1 | \$1,215,632 |
| WAGES Total | | | | \$1,215,632 |
| Service Agreement | CISCO SMARTNET MAINTENANCE | INACOM INFORMATION | 1 | \$73,461 |
| | CISCO SMARTNET ANNUAL MAINTENA | CORES BTS INC | 1 | \$37,760 |
| | AEMPO BASIC SOFTWARE RENEWAL | CAMBRIDGE COMPUTING | 3 | \$25,059 |
| | SPECTRA LOGIC SUPPORT RENEWAL | CAMBRIDGE COMPUTING | 1 | \$19,958 |
| | HP R5500 VA SYSTEMS | HEWLETT PACKARD | 10 | \$10,511 |
| | OTHER SERVICE | OTHER VENDORS | 6 | \$3,320 |
| Service Agreement Total | | | | \$170,069 |
| License | REDHAT SATELLITE SERVER ACADEM | DLT SOLUTIONS | 1 | \$11,025 |
| | REDHAT ENTERPRISE LINUX SITE L | DLT SOLUTIONS | 500 | \$7,350 |
| | ILO ADVPACK NONBL SW | HEWLETT PACKARD | 4 | \$1,074 |
| License Total | | | | \$19,449 |
| Total U.S. Common Fund Expenditures | | | | \$1,897,235 |

Non-U.S. Common Fund Expenditures through June 30, 2010
(Including open commitments)

| Category | Line Description | Vendor | Quantity | Amount |
|--|--------------------------------------|----------------------|-----------------|--------------------|
| Equipment | AMS2000 2TB SATA 7.2K RPM HDD | TRANSOURCE COMPUTERS | 200 | \$187,686 |
| | DELL R710 STORAGE SERVERS | DELL | 20 | \$126,100 |
| | SATABEAST FC-SATA 42 BAY 42X50 | CAMBRIDGE COMPUTERS | 2 | \$63,742 |
| | AMS200 HI DENS STOR EXP UNIT | TRANSOURCE COMPUTERS | 5 | \$62,304 |
| | CONFIGURATION: X2270-H1-AA | SUN MICRO | 1 | \$59,743 |
| | XSERVE RAID W 14X750GB DRIVES | DOIT (MAC) | 4 | \$52,643 |
| | STORM T3000 1TB RAID DUAL | CAMBRIDGE COMPUTERS | 1 | \$40,700 |
| | HP STORAGEWORKS | HEWLETT PACKARD | 24 | \$31,908 |
| | | MNJ TECHNOLOGIES | 10 | \$14,400 |
| | LTO-3 DRIVE, SUPPLIES | CAMBRIDGE COMPUTERS | 2 | \$29,000 |
| | HP PROLIANT DL380 G6 SERVER | HEWLETT PACKARD | 6 | \$28,460 |
| | DELL R610 SERVERS | DELL | 5 | \$24,589 |
| | SPECTRA T950 STORAGE | CAMBRIDGE COMPUTERS | 18 | \$18,947 |
| | HITACHI CHASSIS | TRANSOURCE COMPUTERS | 1 | \$14,282 |
| | HP XW6600 WORKSTATION | HEWLETT PACKARD | 6 | \$13,764 |
| | SAIT1-500 SONY S-AIT 1-500 GB | DISYS | 100 | \$13,600 |
| | CATALYST 4948, IPB S/W, 48-POR, | INACOM INFORMATION | 2 | \$13,194 |
| | IBM X3650 M2 SERVER | IBM CORP | 2 | \$12,204 |
| | NETWORK SWITCHES AND TRANSCEIVERS | CORES BTS | 2 | \$11,400 |
| | | SERVER TEC | 1 | \$1,551 |
| | DELL POWEREDGE R805 /710 | MDS | 2 | \$10,717 |
| | QUANTUM SUPERLOAD | MNJ TECHNOLOGIES | 2 | \$9,660 |
| | HP R5500 VA UPS NA/JPN | HEWLETT PACKARD | 4 | \$8,928 |
| | NETCLOCK GPS RECEIVER | SPECTRACOM | 2 | \$8,160 |
| | SANBOX 5602 16X4GB FC RPS | CAMBRIDGE COMPUTERS | 1 | \$7,692 |
| | SECOND FIBRE RAID CONTROLLER | CAMBRIDGE COMPUTERS | 1 | \$7,575 |
| | PROMISE VTRAK E610FD | MNJ TECHNOLOGIES | 1 | \$7,164 |
| | HP LCD MONITORS | HEWLETT PACKARD | 7 | \$6,331 |
| | OTHER | OTHER VENDORS | 26 | \$24,714 |
| | Equipment Total | | | |
| Computing Supplies | RED HAT SATELLITE SE | DLT SOLUTION | 3 | \$17,980 |
| | LTO ULTRIUM 3 - 400 GB | MNJ TECHNOLOGIES | 190 | \$7,695 |
| | OTHER | OTHER VENDORS | 25 | \$17,078 |
| Computing Supplies Total | | | | \$42,753 |
| Service Agreement | SMARTNET MAINTAINENCE | INACOM INFORMATION | 1 | \$23,848 |
| | SERVICE CONTRACT MAINTENANCE | CAMBRIDGE COMPUTERS | 2 | \$15,421 |
| | SLV-HSM-66TP/200TP-LNX ANNUAL | CAMBRIDGE COMPUTERS | 1 | \$9,781 |
| Service Agreement Total | | | | \$49,050 |
| Total Non U.S. Common Fund Expenditures | | | | \$1,002,962 |

Attachment 2: IceCube M&O - NSF Proposal, FY2011-FY2015

Revised Budget Summary

The revised IceCube five-year M&O proposal submitted on April 26, 2010 covered the period of Federal Fiscal Years 2011-2015 (October 1, 2010 – September 30, 2015). The total budget requested over the five-year period was \$34,500,000 (\$6,900,000 per year). The expectation is that annual increases typically expected due to escalation will be off set by efficiencies in the program.

IceCube M&O – NSF Proposal - Labor (FTE)

| | FY11 | FY12 | FY13 | FY14 | FY15 |
|-------------------|--------------|--------------|--------------|--------------|--------------|
| Labor Plan | 31.51 | 32.01 | 30.35 | 29.45 | 28.50 |

IceCube M&O – NSF Proposal - Cost by WBS Level 2 (in \$k)

| WBS Level 2 | FY11 | FY12 | FY13 | FY14 | FY15 |
|---|----------------|----------------|----------------|----------------|----------------|
| Computing & Data Management | \$2,624 | \$2,609 | \$2,675 | \$2,707 | \$2,741 |
| Detector Operations & Maintenance | \$2,386 | \$2,411 | \$2,408 | \$2,428 | \$2,455 |
| Engineering, Software, Mgmt. Support | \$1,540 | \$1,523 | \$1,502 | \$1,495 | \$1,428 |
| Data Quality, Reconstruction & Simulation Tools | \$294 | \$302 | \$286 | \$270 | \$277 |
| Triggering and Filtering | \$55 | \$56 | \$29 | \$0 | \$0 |
| IceCube M&O NSF Core Total | \$6,900 | \$6,900 | \$6,900 | \$6,900 | \$6,900 |

IceCube M&O – NSF Proposal - Cost by Categories (in \$k)

| Cost Category | FY11 | FY12 | FY13 | FY14 | FY15 |
|--|----------------|----------------|----------------|----------------|----------------|
| Labor | \$5,043 | \$5,236 | \$5,156 | \$5,195 | \$5,203 |
| Capital Equipment (*) | \$80 | \$45 | \$45 | \$45 | \$45 |
| Materials & Supplies | \$874 | \$818 | \$838 | \$874 | \$806 |
| Travel | \$204 | \$218 | \$209 | \$205 | \$208 |
| Service Agreement (Computing) | \$638 | \$582 | \$652 | \$580 | \$638 |
| Overhead on first \$25K of 5 subawards | \$61 | \$0 | \$0 | \$0 | \$0 |
| IceCube M&O NSF Core Total | \$6,900 | \$6,900 | \$6,900 | \$6,900 | \$6,900 |

(*) Annual Capital Equipment expenditures for computing infrastructure are mostly covered under the Non U.S. Common Fund.

Attachment 3: Computing Infrastructure – Year 4 Upgrade Plan

The following list includes the major IceCube purchases for the FY2010/2011 South Pole System (SPS) upgrade, for the 2010 South Pole Test System (SPTS) upgrade and for the 2010 UW Data Warehouse and UW Data Center upgrades.

| System upgrade | Item | Vendor | Line Items | Cost Category | Purchase amount (including indirect) |
|---|--------------|--|--|--------------------|--------------------------------------|
| South Pole System (SPS) and South Pole Test System (SPTS) | Servers | DELL | 81 DELL R710 Servers | Capital Equipment | \$438 K |
| | | | 5 DELL R610 Servers | Capital Equipment | \$25 K |
| | | | Service upgrade for DELL R610/R710 Servers | Service Agreements | \$79 K |
| | | | Spare parts for DELL servers | M&S | \$30 K |
| | UPS | HP | 2 HP R5500 XR UPS | Capital Equipment | \$5 K |
| | | | 2 HP R5500 XR UPS (spare) | M&S | \$7 K |
| | | | 12 batteries for HP 5500XR UPS | M&S | \$9 K |
| | Disk Storage | HP | 8 HP Storage Works LTO-4 Ultrium 1840 – SPS | Capital Equipment | \$28 K |
| | | | 2 HP Storage Works LTO-4 Ultrium 1840 - SPS (spare) | M&S | \$10 K |
| | | DELL | 70 146 GB SCSI 2.5inch Hard Drive | M&S | \$21 K |
| | Tape drives | MNJ | 2 Quantum SUPERLOADER 3 LTO5 TAPE 1DR | Capital Equipment | \$10 K |
| | Tapes Media | DELL | Tape Media for LTO4-120, 100 Pack | M&S | \$45 K |
| | | | Tape Media for LTO5 Cus 100 Pack | M&S | \$45 K |
| Rack Switches | Core BTS | Cisco 48-port rack switch to support SPTS buildup. | Capital Equipment | \$13 K | |
| Data Warehouse Storage | Disk Storage | Storage IT solutions | AMS2500 dual controllers populated with 200 x 2 TB SATA drives | Capital Equipment | \$263 K |
| | | | 4 years hardware service | Service Agreements | \$45 K |
| | | | Software | M&S | \$6 K |
| | | | Software Service | Service Agreements | \$3 K |
| UW Data Center | Redhat | DLT Solutions | Renewal of Redhat Satellite Server and RedHat Enterprise Linux | M&S | \$18 K |
| | UPS | HP | 4 HP R5500 XR UPS and Mgmt Cards | Capital Equipment | \$10 K |
| | | HP | 27 Batteries for HP 5500XR UPS | M&S | \$21 K |
| Grand Total | | | | | \$1,130 K |