

**Memorandum of Understanding**

**Between**

**Centre for Development of Advanced Computing,  
An Autonomous Scientific Society  
of the  
Department of Information Technology  
Ministry of Communication and Information Technology  
Govt. of India**

**ERNET India  
An Autonomous Scientific Society  
Of the  
Department of Information Technology  
Ministry of Communication and Information Technology  
Govt. of India**

**and**

**(Grid Partner Institution)**

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**Version: 3.3  
Dated: 19/11/2008**

## 1.0 The MOU

This Memorandum of Understanding made at \_ \_ \_ \_ \_ on this \_ \_ day of \_ \_ \_ \_ \_ 2008 has been signed between the following parties

1.1 **Centre for Development of Advanced Computing**, an autonomous scientific society registered under Societies Registration Act, 1860 and Bombay Public Trust Act, 1950, of Department of Information Technology (hereinafter referred to as DIT), Ministry of Communication and Information Technology (hereinafter referred to as MCIT), Government of India and having its registered address as Pune University Campus, Pune- 411 007 represented by its Director General and hereinafter referred to as ‘C-DAC’ (which expression shall unless excluded by or repugnant to the context be deemed to include its successor in office or assignee)

1.2 **ERNET India** an autonomous scientific society registered under Societies Registration Act, 1860 of DIT, MCIT, Government of India, and having its registered office at Electronics Niketan, 6, C.G.O. Complex, Lodi Road, New Delhi – 110 003 represented by its Executive Director and hereinafter referred to as ‘ERNET’ (which expression shall unless excluded by or repugnant to the context be deemed to include its successor in office or assignee)

1.3 Corporate/Registration details of <Organization Name >  
\_\_\_\_\_registered  
under \_\_\_\_\_Act\_\_\_\_\_, and having its  
registered office at  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_represented by \_\_\_\_\_and  
hereinafter referred to as “Grid Partner” (which expression shall unless  
excluded by or repugnant to the context be deemed to include its successor in  
office or assignee)

## 2.0 Context of the MOU

2.1 **C-DAC**, in furtherance of its activities in undertaking technology, productization, provision of skill-sets and services in a number of application domains and facilities management in High Performance Computing (HPC) and associated solutions areas for the benefit of scientific and engineering community, has identified Grid Computing as a major thrust area for future. As part of the same, it had implemented a “Proof of Concept (PoC) phase of National Grid Computing Initiative: Garuda”. The Major components of GARUDA are computational resources, high speed communication fabric, resource management and scheduling, program development environment, collaboration environment, data management and grid monitoring. Access portals and specialised problem solving environments will provide seamless access to the grid . The fabric component will provide high speed access to the grid resources, from 17 cities across the country (Annexure-1). The Grid has also, in the process enabled a collaborative problem-solving environment for the partners. The Grid has been successfully deployed during PoC Garuda phase and is operational. The PoC phase of the project has been completed on 31<sup>st</sup> March 2008 and this MoU deals with the activities relating to the GARUDA project beyond 1<sup>st</sup> April 2008.

2.2 **ERNET India** in collaboration with leading academic and research institutions in the country (such as IITs, IISc., UGC, AICTE, ICAR, etc.) has been building and operating a computer network for R&D Institutions and Academia (including universities), with introduction of variety of applications and services from time to time. Access to high-end computing resources, provision of collaborative problem solving environment, sharing of Digital Library resources, on-line learning materials and country-wide classroom are some of the areas of strong interest for ERNET. Provision of such facilities and services to its community will make them stronger in meeting the aspirations of students, faculty, educational administrators, researchers and

funding agencies. ERNET is also connected with European Educational and Research Network “GEANT” thereby facilitating the Universities and Research institutions connected on its network to have a peer-to-peer connectivity with their counterparts in Europe, USA and ASEAN Countries. Considering ERNET’s skills in establishing and maintaining large-scale network services across the country, DIT in its administrative approval of Garuda Grid Project directed ERNET to undertake the deployment of the communication fabric component of the project.

2.3 <Grid Partner to indicate HPC and other relevant research activities of their institution here.> \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2.4 Recognizing the synergy between the activities of C-DAC, ERNET & Grid Partner, the respective organizations would like to enter into an MOU, which states the overall scope of work and broad guidelines to facilitate the organizations to collaborate on HPC and Grid computing.

**3.0 Scope of MOU**

3.1 This MOU shall outline the collaborative arrangements between C-DAC, ERNET and Grid Partner in promoting research and engineering of technologies, architectures, standards and applications in HPC and Grid Computing.

**NOW THIS MEMORANDUM WITNESSETH and is hereby agreed to by and between the parties hereto as follows.**

**4.0 Joint Responsibilities of C-DAC, ERNET & Grid Partner**

- 4.1 C-DAC, ERNET and Grid partner shall collaborate with each other as well as with other partners of the Grid initiative in Research, Design, Development and Engineering of Technologies, Architectures, Standards and Applications in HPC and Grid Computing.
- 4.2 C-DAC, ERNET and Grid Partner shall acknowledge each others roles/contributions as well as usage of their resources in all relevant publications and also submit copies of the publications to the respective institutions.
- 4.3 C-DAC, ERNET, and Grid Partner shall facilitate wide spread usage of HPC resources on the Grid including access to the external user community as allowed by the individual organization's policies.
- 4.4 C-DAC, ERNET and Grid Partner shall specify a single point/nodal contact for further communication; management & monitoring of the Grid setup (Annexure-5).
- 4.5 C-DAC, ERNET & Grid Partner will bear expenditures for their respective staff in terms of other relevant resources, efforts, travel, time schedule, etc.

## **5.0 Roles and Responsibilities of C-DAC**

- 5.1 C-DAC shall assist the Grid Partner, where requested, in deploying the Grid tools and services to facilitate seamless access to the nationwide Garuda Grid resources, subject to terms mutually accepted.
- 5.2 C-DAC shall assist the Grid Partner, where requested, in the integration of their resources including Compute, Data, Storage, Software, and Scientific Instruments into the nationwide Garuda Grid framework, subject to terms mutually accepted.
- 5.3 C-DAC shall provide access to its HPC resources on the Grid (NPSF & CTSF resources at Pune & Bangalore centres and Grid resources from Chennai &

Hyderabad C-DAC centres). Grid Partner access to these C-DAC's resources is detailed in Annexure3.

## **6.0 Roles and Responsibilities of ERNET**

- 6.1 ERNET shall establish at the Grid partner premises connectivity to the high-speed communication fabric with reference to the requirement of foundation phase of the Garuda Grid project.
- 6.2 ERNET shall be responsible for the supply, installation and configuration of relevant Customer Premise network Equipments (CPE) (like switches and routers) and their further maintenance.
- 6.3 ERNET shall be responsible for the operation, maintenance and management of the networking part of the said High Speed Communication Fabric (HSCF) and its related issues for the initial period of one year of the foundation phase or thereafter, as mutually agreed to by C-DAC, ERNET and the Grid Partner

## **7.0 Roles and Responsibilities of the Grid Partner**

- 7.1 Grid Partner shall provide adequate space, air conditioning and regulated and uninterrupted power supply for the equipments as detailed in Annexure-2 and for co-locating networking components for connecting to the high-speed communication fabric.
- 7.2 The Grid Partner shall be responsible for setting up and making available the Grid facility as detailed in Annexure-2
- 7.3 Grid Partner shall provide the right of way for the last-mile networking cables and also access to the personnel from the network service provider (as identified by C-DAC & ERNET for the implementation of the communication fabric) to install and maintain the equipments.

- 7.4 Grid Partner shall contribute to the aggregation of the resources in the Grid as per organizational policy (Grid resources include but are not restricted to compute, data, storage, software and scientific instruments)
- 7.5 Grid Partner shall provide necessary permissions and assistance and assistants to C-DAC's Grid administration team to administer the local Grid node setup as and when required.
- 7.6 Grid Partner shall ensure availability of system administrators to manage and monitor the local setup at their premises.
- 7.7 Grid Partner shall upgrade/enhance infrastructure/h-w/s-w etc. as and when required by C-DAC for smooth and efficient Grid functioning/operation of the grid.

## **8.0 Grid Partner Categories & Annual Membership Fees**

- 8.1 Based on their participation in the Garuda National Grid Computing initiative, partner institutions will be classified as in Annexure-3. The annual membership fees, benefits and Grid Partner responsibilities as per category are also detailed in this annexure. Any duties/levies/taxes/cess etc. shall be borne and paid by the Grid partner.
- 8.2 Alternatively, the Grid Partners, in lieu of the annual membership fee for various categories of partnership, can make available a High Performance Computational Cluster, as described in Annexure-4, and host the said system on the Garuda network and agree to make available to the Garuda users at least 50% of its computational cycles.

## **9.0 Confidentiality & Non-Disclosure**

- 9.1 Any software/hardware design, architecture, material, product specifications, designs, financial information, technical documents etc, shall be deemed to be in private domain and it shall not be made public or shared with any other

party without the prior written consent of the party which owns it. Data, including text, messages, graphs etc. exchanged through grid will also be kept confidential.

The material shall be treated as confidential for a minimum period of two years after this MOU comes to an end or as agreed from time to time

## **10.0 Intellectual Property Rights Sharing**

- 10.1 Any research publication and commercially exploitable innovations (including algorithms and software patents if any) or any other intellectual property arising out of the joint effort will be jointly shared, published or patented as appropriate. Parties shall sign/execute necessary applications, documents and papers for registration/protection of any IP arising out of joint efforts.
- 10.2 IPR ownership (and resultant revenue if any) sharing will be decided depending upon contributions of Grid Partner & C-DAC to the project on case-to-case basis and will be decided by mutual discussion keeping in mind the spirit of this MOU.

## **11.0 Force Majeure**

- 11.1 Neither party shall be held responsible for non-fulfillment of their respective obligations under this agreement due to the exigency of one or more of the force majeure events such as but not limited to flood, earthquakes, acts of GOD, war, strike, lockouts, epidemics, riots, civil commotion etc provided on the occurrence and cessation of any such events, the party affected thereby shall give a notice in writing to the other party within ten working days of such occurrence or cessation. If the force-majeure condition continues beyond six months, the parties shall then mutually decide about the future course of action.

## **12.0 Arbitration**

12.1 In the event of any dispute or difference between the parties hereto, such disputes or differences shall be resolved amicably by mutual consultation or through the good offices of empowered agencies of the Government of India. If such resolution is not possible, then, the unresolved dispute or difference shall be referred to arbitration of an arbitrator to be nominated by Secretary, DIT. The Arbitration Act 1996 shall not be applicable to the arbitration under this clause. The award of the Arbitrator shall be binding upon parties to the dispute. Provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to DIT whose decision shall bind the parties finally and conclusively.

## **13.0 Termination of MOU**

13.1 Grid Partner/C-DAC may terminate this MOU, prior to expiry with three months' written notice and with the written consent of the Head of Grid Partner institution, Director General, C-DAC and Executive Director, ERNET. All the intellectual property will be returned to the respective organization on such termination.

13.2 The termination by either party by giving a notice of at least three calendar months is to enable the parties hereto assess the monetary impact and such other related factors impinging on the interest of the parties.

13.3 All parties shall honour their respective technical and financial commitments on the date of notice.

## **14.0 Communication**

14.1 Any formal communication or notice or intimation shall be addressed to the Nodal contacts of the respective parties with a copy sent to the Head of the organization and the Registrar. In addition, a registered post copy shall also be invariably sent to the nodal contacts.

**15.0 Effective Date and Duration of the MOU**

15.1 This MOU shall be effective from the date of signing of MOU and valid for a period of two years

15.2 The validity of the MOU may be extended by mutual agreement.

**16.0 Documents**

16.1 This MOU has been executed in three originals, one of which shall be retained by Grid Partner, the other one by C-DAC and the third original by ERNET.

16.2 The Annexure 1, 2, 3, 4, 5, 6 & 7 are integral part of this MOU

**17.0 Partners Contribution.**

"Please complete applicable clauses as mutually agreed with CDAC:

A. We agree to partner with CDAC in this national initiative as \_\_\_\_\_(Partner category - GP1/GP2/GP3) and remit a sum of Rupees \_\_\_\_\_as membership fees.

**OR**

B. We agree to partner with CDAC in this national initiative as \_\_\_\_\_(Partner category - GP1/GP2/GP3) and will make available the following computing resources as in annexure 6 of this MoU.

**OR**

C. We agree to partner with CDAC in this national initiative as \_\_\_\_\_(Partner category - GP1/GP2/GP3) and will make available the following scientific instruments as in annexure 6 of this MoU.

**OR**

D. We agree to partner with C-DAC in this national Initiative as \_\_\_\_\_  
\_\_\_\_\_(Partner category - GP1/GP2/GP3) and will make available a combination of \_\_\_\_\_ (Computing Resources as in annexure

6), \_\_\_\_\_ (Scientific Instruments/Resources as in annexure 7) and remit a sum of \_\_\_\_\_ rupees \_\_\_\_\_ as membership fees.

#### 17.1 Access to Global Access Networks

ERNET can also provide high speed connectivity to research networks in Europe & USA for enabling collaborative research in HPC & Grid computing. Partner institution has to bear the cost of connectivity from their institute to ERNET's nearest Point of Presence (POP). The payment terms and conditions are to be decided mutually between ERNET and the partner.

### 18.0 Disclaimer

C-DAC reserves the right to determine the level of participation (GP1/GP2/GP3) of the partner. C-DAC at its discretion may choose to determine conditions set for the partnership without giving any reason thereof.

*In witness whereof, the parties hereto have signed this MOU  
on the \_\_\_\_\_ day, \_\_\_\_\_ month and \_\_\_\_\_ year.*

**PARTIES**

For and on behalf of  
C-DAC.

For and on behalf of  
ERNET

For and on behalf of  
Grid Partner

Signature : \_\_\_\_\_  
Authorized Signatory  
Name & Designation

Signature : \_\_\_\_\_  
Authorized Signatory  
Name & Designation

Signature : \_\_\_\_\_  
Authorized Signatory  
Name & Designation

**Witnesses (Name& Address)**

**C-DAC**

**ERNET**

**Grid Partner**

1.

1.

1.

2.

2.

2.

**Annexure-1**

**List of Cities connected by the National Grid Initiative**

1. Bangalore
2. Chennai
3. Hyderabad
4. Pune
5. Mumbai
6. Ahmedabad
7. Delhi
8. Chandigarh
9. Roorkee
10. Kanpur
11. Lucknow
12. Allahabad
13. Varanasi
14. Kharagpur
15. Kolkata
16. Guwahati
17. Trivandrum

**Annexure-2**

**Grid Setup at Partner Site**

1. Make available a ‘User Terminal Room’ (Approximately 20 x 20 ft floor area)
2. Make available few dedicated user terminals with standard desktop PC configuration connected to local LAN with a gateway to head node.
3. Make available a dedicated Grid Head node compatible with the Grid Head Node at C-DAC centres as shown in Table-1

**Table-1 Configuration of Grid Head Nodes at C-DAC Centres**

Sl. No	System Configuration
1.	<ul style="list-style-type: none"> <li>• Single/Dual Processor Xeon 3.6GHz or above</li> <li>• 1GB memory per CPU</li> <li>• 2 x 146GB hot swappable SCSI HDD</li> <li>• 52x CDROM / Combo Drive</li> <li>• Ethernet ports Copper GB 10/100/1000</li> <li>• Built in (on-board) Ultra 320 SCSI with SCSI External ports</li> <li>• Built in Redundant Power Supply</li> </ul>
2.	<ul style="list-style-type: none"> <li>• RedHat EL AS 3/AS 4</li> </ul>

In addition partners can also set up Video Conference facility as well as can make available minimum three terminals for the external R&D users. (Including one graphic terminal and one emergency support/backup terminal).

**Annexure-3**

**Grid Partner Categories & Annual Membership Fees**

Grid Partner Categories	Explanation	Annual Membership Fees*	Benefits	Responsibilities of Grid Partner
GP-1	Enthusiastic Grid Partner	Rs. 10 lacs	<p>Access at 100Mbps to the Grid resources.</p> <p>Priority access to C-DAC's resources on the Grid.</p> <p>Priority support and maintenance for local Grid deployment.</p> <p>Onsite training on local Grid deployment.</p> <p>Confirmed Participation in Garuda Grid events.</p> <p>Access to Garuda Grid research papers.</p>	<p>Active participation in Garuda Grid R&amp;D initiatives.</p> <p>Make available &amp; setup User Terminal Room and local Grid configuration as per recommended configuration given in Annexure-2</p> <p>Contribution of resources to the Grid. (Optional)</p> <p>Dedicated system administrators for local Grid deployment (if any resource contribution).</p>
GP-2	Active Grid Partner	Rs 5 lacs	<p>Access at 10Mbps to the Grid resources.</p> <p>Priority access to C-DAC's resources on the Grid.</p> <p>Regular support and maintenance for local Grid deployment</p> <p>Training on local Grid deployment at C-DAC Grid centres.</p> <p>Confirmed Participation in Garuda Grid events.</p> <p>Access to the Garuda Grid research papers.</p>	<p>Active participation in Garuda Grid R&amp;D initiatives.</p> <p>Make available &amp; setup User Terminal Room and local Grid configuration as per recommended configuration given in Annexure-2</p> <p>Contribution of resources to the Grid (optional).</p> <p>Dedicated system administrators for local Grid deployment (if any resource contribution).</p>

**Annexure No 3**

**Grid Partner Categories & Fees....Cont**

Grid Partner Categories	Explanation	Annual Membership Fees*	Benefits	Responsibilities of Grid Partner
GP-3	Grid Partner	Rs 2.5 lacs	<p>Access at 10Mbps to the Grid resources.</p> <p>Regular access to C-DAC's resources on the Grid.</p> <p>Regular support and maintenance for local Grid deployment</p> <p>Training on local Grid deployment at C-DAC Grid centres.</p> <p>Confirmed Participation in Garuda Grid events.</p> <p>Access to the Garuda Grid research papers.</p>	<p>Participation in Garuda Grid R&amp;D initiatives (optional).</p> <p>Make available &amp; setup User Terminal Room and local Grid configuration as per minimum configuration given in Annexure-2</p> <p>Contribution of resources to the Grid (Optional).</p> <p>Dedicated system administrators for local Grid deployment (if any resource contribution).</p>

\*The membership fees is to be paid within 30 days of signing of MoU or on terms agreed upon with C-DAC prior to the commissioning of the network connection at the partner site. Payments are to be made in the form of Demand Draft in favour of Centre for Development of Advanced Computing, Bangalore payable at Bangalore. All fees are non refundable and non transferable. In lieu of the annual membership fee Partners can contribute resources as indicated in Annexure-4. The annual membership fee indicated is for the first year only. The Operation of the fabric after the first year and the membership fees after the first year will be as mutually agreed to by C-DAC, ERNET & the Grid Partner.

**Annexure-4**
**Alternate Membership Options**

<b>Grid Partner</b>	<b>Expected Contribution</b>	<b>Expected Peak Performance</b>
GP-1	64 CPU Cluster	400 Giga Flops
GP-2	32 CPU Cluster	200 Giga Flops
GP-3	16 CPU Cluster	100 Giga Flops

C-DAC is deploying Linux Clusters at its Pune, Hyderabad & Chennai centres. The Clusters of the Grid Partner are expected to be compatible with these resources. The node configuration details of C-DAC clusters at these centres is as follows:

<b>Server:</b>	Dual Xeon Class 3.6 GHz with E7525 Chipset
<b>Cache:</b>	L2 cache 2MB
<b>Memory:</b>	4GB DDRII 400/533 MHz SDRAM ECC
	On board 2 Nos. Gigabit Ethernet ports
	On board Ultra320 SCSI with 1x73GB HDD
	CDROM/DVD Drive
	Redundant power supply
	Support for RedHat EL-3/4-x86-64
<b>Ethernet Switch:</b>	24/48/64 port Gigabit switch with 2 Gbps uplink
<b>Storage:</b>	2-4TB of Mass Storage (SAN/NAS/DAS)

## Annexure-5

## Nodal Contact

C-DAC	ERNET	Grid Partner
Dr. Subrata Chattopadhyay Head CTSF C-DAC Knowledge Park # 1, Old Madras Road Byappanahalli Bangalore-560 038 Tel : 080-25244059 Fax: 080-25247724 <a href="mailto:subratac@cdac.in">email:subratac@cdac.in</a>	Shri Deepak Singh Director ERNET India Electronics Niketan # 6, C.G.O. Complex Lodhi Road New Delhi – 110 003 Tel : 011-24361701 Fax : 011 – 24362924 <a href="mailto:deepak@eis.ernet.in">email:deepak@eis.ernet.in</a>	

Additional information can be found at [www.garudaindia.in](http://www.garudaindia.in)

**Annexure-6**

**Details of Compute Resources made available through GARUDA**

**Annexure-7**

**Details of Scientific Instruments made available through GARUDA**