



GRIPSI 2007

GRid Programming Some Indications we are we Heading

Betatesting Group, C-DAC, Pune

C-DAC's FIRST Technology Training Programme

at

C-DAC Hyderabad

Date : November 19-22, 2007

Let us know Some Questions

What is Grid Computing ?

What is GRIPSI ?

Can I use GRIPSI to write Programs for e-science or Health Informatics ?

What are the concepts I should know to design Grid programs?

Are there people using these or is it still in research labs?

What are the important features of Grid Middleware (Globus Toolkit)?

Been hearing about it a lot. Can I see something for real on Grid Computing

Let us Know Heterogeneous Resources



Let us Know “What is a Grid?”

A grid seems to be an operating system across administrative domains.
Any standard definitions?



Let us Know “Computing”

- **Evolving role of the network**
 - Big room single machine (Single big Machine)
 - Big room many machines (Local Network)
 - Many big rooms (Distributed Network)
 - Many organizations (Wide Area network)
- Grid Computing ???



Future lies in
Multi-Core

Let us Know :The “Grid” Vision



“What is a Grid?”

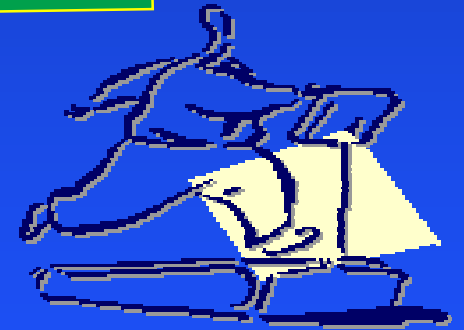
Three point check-list for a grid:

- *“Coordinates resources that are not subject to centralized control*
- *Uses standard, open, general-purpose protocols and interfaces*
- *Delivers non-trivial qualities of service.”*

Coordinated resource sharing and problem solving in dynamic, multi-institutional virtual organizations

“What is a Grid?”

Until the *experts* come up with a standard definition, we mortals can say – “A Grid is *like* a WAN Operating System that coordinates transparent confluence of hardware, software and services across administrative domains based on local and global policies.”



“What is a Grid?”

While the academia has been stressing the “inter-organizational” part with multiple administrative domains, commercial companies have their own definitions based on their products & data .



What is meant
by Data



What type of data?

- **Unstructured data sets (“File-like”)**
 - Images
 - Movies
 - E-Mail
 - Why “file-like”? – Each digital entity can have its own meta data, can be part of multiple collections with many replicas. (It is not the case in traditional file systems)
- **Data Streams**
- **Semi-structured data**
 - Result of an SQL query to a database (dynamically)
- **Structured data**
 - Pre-defined meta-data schema

Why they Require Data Grids?

- Inter/Intra Organizational Sharing
- Inter/Intra Organizational Data Storage Utility
- Data Storage Resource Plug-n-play provisioning
- Data Preservation (Technology Migration)
- Information Lifecycle Management (ILM)
- **Collaborative data lifecycle management**

GRIPSI 2007 Overview

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Centre for Development of Advanced Computing (C-DAC)
Technology Training Programme
 Venue : C-DAC - Hyderabad, JNTU campus, Hyderabad November 19-22, 2007

**Technology Training Programme on
 GRIPSI 2007 GRId Programming Some Indications Where are we Heading**

Overview *GRId Programming Some Indications where are we Heading
 (GRIPSI 2007)*

Tech Prog

Grid Lab

Hands-On

Faculty

Feedback

About Us

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Dates : November 19-22, 2007 **Venue :** C-DAC JNTU Campus, Hyderabad

Day-1 (Monday November 19, 2007)

Time (Hrs)	Title / Activity
0915-0930	Registration & Inaugural Session
0930-1015	Introduction to Grid Computing : What is grid computing? What is Grid Middleware ? What is Globus Tool Kit ? Who is using the Globus Toolkit ? How to enable my application using Grid computing ? Types of Grid Computing : Computational, Data, Science, Access, and knowledge More.....download gripsi-2007-day01-gridcomp-introduction.pdf
1015-1100	An Overview Globus Toolkit 2.X and Layered Grid Architecture (Ideal Grid Architecure) What is in the Globus Tool kit 2.X ? An overview of Globus Toolkit 2.X/4.X, GRAM (Globus Resource Allocation Manager); GSS (Global Security Services); Monotoring & Discovering Service (MDS); Description of Five layered Grid Architecture - Fabric, Connectivity, Resource, Collective and Applications; Definitions - Grid Services More.....download gripsi-2007-day01-globus-overview-part-I.pdf More.....download gripsi-2007-day01-globus-overview-part-II.pdf

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Overview

GRIPSI-2007 Hands-On-Session

The Hands-on session will be conducted on Grid Laboratory which consists of set of Linux based computing Systems. The objective is to to create the large and powerful computer out of large collection of connected heterogenous systems sharing various combinations of resources. Participants will understand critical issues on usage of *Globus* toolkit APIs to enable applications for Grid Computing with hands-on experience. All the example programs use **The Globus Tool Kit 4.0** which is the *de facto* standard for building grid infrastructures and Applications. The example program suite and the user's manual serve as a preliminary user's guide to simplify the development of Grid applications. The test suite provide foundation for distributed workflow applications, which are first specified using a novel high-level abstract workflow language that shields the user from any Grid middleware implementation or technology details.

RSL Globus **Perl Globus** **C - Globus** **C++ - Globus**

Java CoG **Perl CoG** **Python CoG**

Web Services **Grid Probes** **Grid FTP**

Examples using different programming languages such as C /C++ /Java and CoG Kits using Globus APIs are implemented and these provide starting step to understand Grid computing Environment /Grid Programming aspects. These examples can be used as guide and as a scale to use grid computing to solve all life and business problems successfully. The example programs check the basic grid capabilities such as remote job submission, validation of proxy, mutual authentication etc using rich set of Globus APIs, which mimic the various application characteristics. The suites can be

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**GRIPSI-2007 :
An Overview of Grid Computing**

- Overview
- Tech Prog
- Grid Lab
- Hands-On
- Faculty
- Feedback
- About Us
- Download

The Grid concept is based on coordinated resource sharing and problem solving in dynamic multi-institutional virtual organizations. An overview of Grid computing developments have been discussed. Grid computing is required to facilitate highly flexible sharing relationships among them, ranging from client to servers.

[Grid Computing Introduction](#) [Grid Computing Challenges](#) [Categories of Applications](#)

[Grid Middleware](#) [Globus Toolkit 2.x/4.X](#) [UNICORE](#) [Legion](#) [GridBus](#)

[About Grid Programming](#) [Global Compilation System](#) [Grid Meta Scheduling](#)

[Grid GARUDA](#) [Grid-Test-Suites](#)

References : [Grid Projects](#) [Prog. Env.](#) [Middleware](#) [Probes](#) [CoG Kit](#) [Survey](#) [Web Services](#)

Home

Grid Computing Introduction

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The diagram illustrates a network architecture. At the top, a cloud labeled 'High Speed Interconnect' is connected to several server icons: 'server4', 'server3', 'server2', 'server1', 'octopus', 'cmpt11', and 'cmpt12'. Below this cloud, two desktop computer icons labeled 'client1' and 'client2' are connected to the cloud. At the bottom, a large yellow oval labeled 'Local Network' is connected to the cloud. On the left side of the page, there is a vertical menu with buttons for 'Overview', 'Tech Prog', 'Grid Lab', 'Hands-On', 'Faculty', 'Feedback', and 'About Us', and a 'Download' button at the bottom.

Done

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GRIPSI-2007 : Class Room Lectures

- An Overview of Grid Computing
- An Overview of Globus Tool Kit
- An Overview of Grid Programming
- Software architects ()
- Software developers ()
- Savy users ()

You can get most of the
Globus APIs & Example
Programs

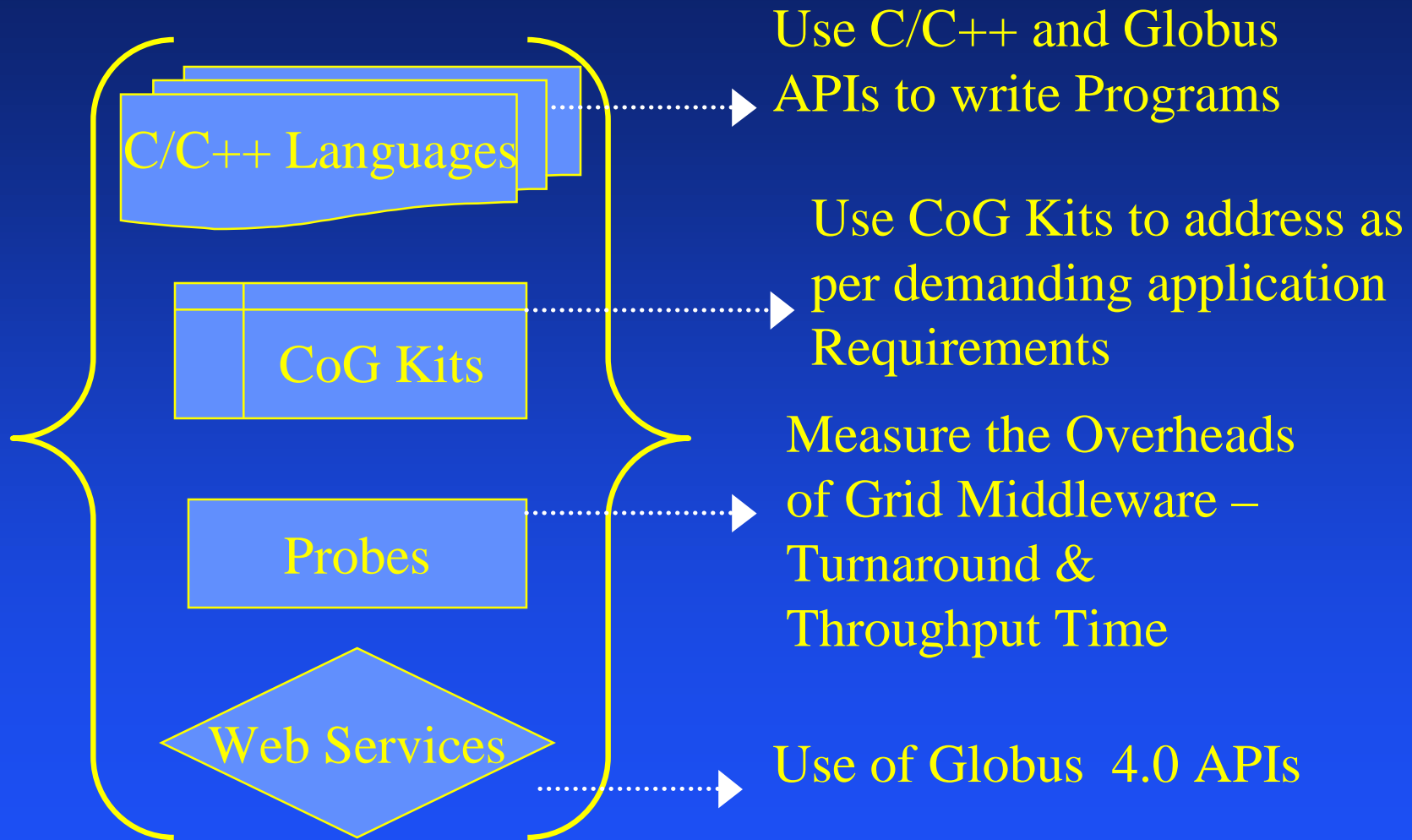
There are around 100 slides. We don't plan to go through each of them. Just need to make sure all of us get the most out of this class when we leave this room

GRIPSI Outline

- Introduction to Grid Computing
- Globus Toolkit Design Philosophies
- Grid Computing – Categories of Applications
- Hands on Experience / Demo
- Ongoing Activities or Suggested Research
- Open Q&A and Discussion

Still Problem solving = Input ⌘ Process ⌘ Output :

GRIPSI-2007 :Hands-on Session



GRIPSI-2007: "CoG Kits" Programs



Project1

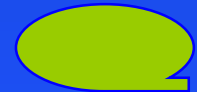
Project2



Storage the data

Visualize the Data

Compute



When more heterogeneous components with different services & protocols – Use Perl CoG Kit, Java CoG Kit, Python CoG Kit to enable applications for Grid Computing using Globus Tool Kit

GRIPSI-2007: Example Programs (More than 50)

- Globus RSL
- C lang & Globus APIs
- C++ Lang & Globus APIs
- Perl Scripts & Globus APIs
- Python CoG Kits
- Perl CoG Kits
- Java CoG Kits
- Web Services & Grid Services
- Grid Probes



Don't forget to
write Programs

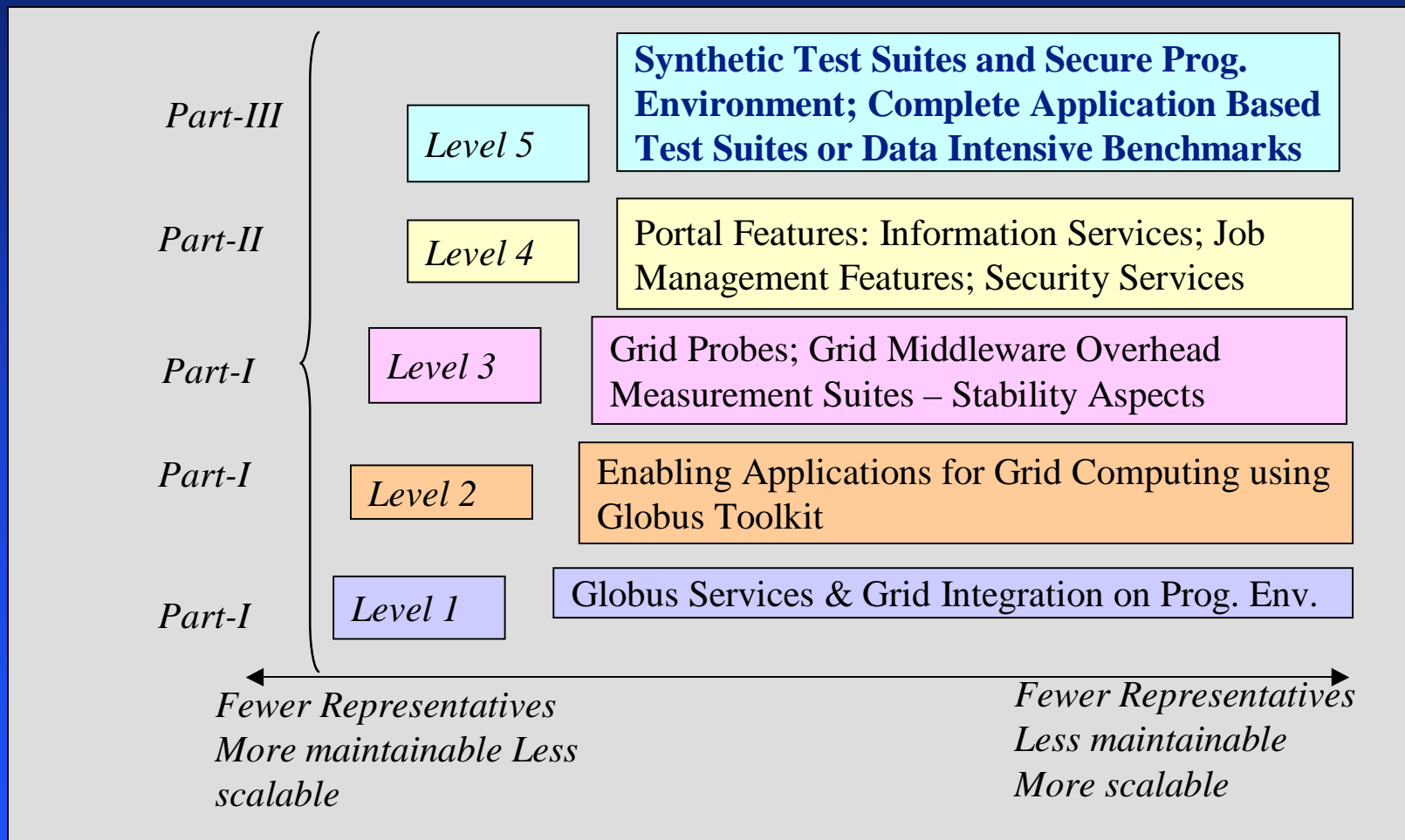
GRIPSI-2007 : Open Source Software

C-DAC Grid Test suites Open Source Software : GITeMS v1.0

- **SPAGMOS v1.0** : Software on Probes for Assessment of Grid Middleware Overheads
- **INPEAG-v1.0** : INtegrated Perl Script to Enable Applications for Grid computing with Globus)
- **GEAGUL-C v1.0** : Grid Software-Enabling Applications for Grid Computing Using GLobus and C-Language
- **GOPAEAG-v1.0** : Globus and Object Oriented Programming Approach to Enable Applications for Grid Computing.

GRIPSI-2007 :Open Source Software

An overview of GTeMS v1.0 : The idea is to *provide a common ground to test GARUDA* [6] deployed grid; some of them monitor the operational issues of GARUDA sites, and others estimate the overheads associated with grid middleware, focusing on services at various layers.



Representation of test suites (Level, 1, Level 2, Level 3, Level 4, Level 5)

GRIPSI-2007 :Open Source Software

C-DAC Grid Test suites Open Source Software GITeMS v1.0

- **JAGEAG-v1.0** : JAVa CoG Kit and Globus to Enable Applications for Grid Computing
- **PerICEAG-v1.0** : Perl CoG Kit to Enable Applications for Grid Computing
- **PyCEAG-v1.0** : PythonCoG Kit to Enable Applications for Grid Computing

GITeMS v1.0 : GARUDA Integrated Testing Methodology-Suites

Grid Test Suites /Grid Probes Using Globus 2.4.3/Globus 4.0

Download software

www.cdac.in/html/npsf/gridcomputing/npsfgrid.asp

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