

Our Research Focus

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&

Chief Investigator

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Education

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Acknowledgement

- Centre for Advanced Computing Research and Education (CARE) that is sponsored by DIT, Government of India

Agenda

- Our Research Experience
- Current Research
- Conclusion



Our Research Contributions

- Technology Partner to GARUDA Grid
- Contribution to Globus, Gridway etc...
- Consultancy to Honeywell Technology Solutions
- Collaboration with MIMOS
- Joint activity with Athabasca University
- Training Faculty and Students
- Developing Utilities for beginners
- Collaborative research activities

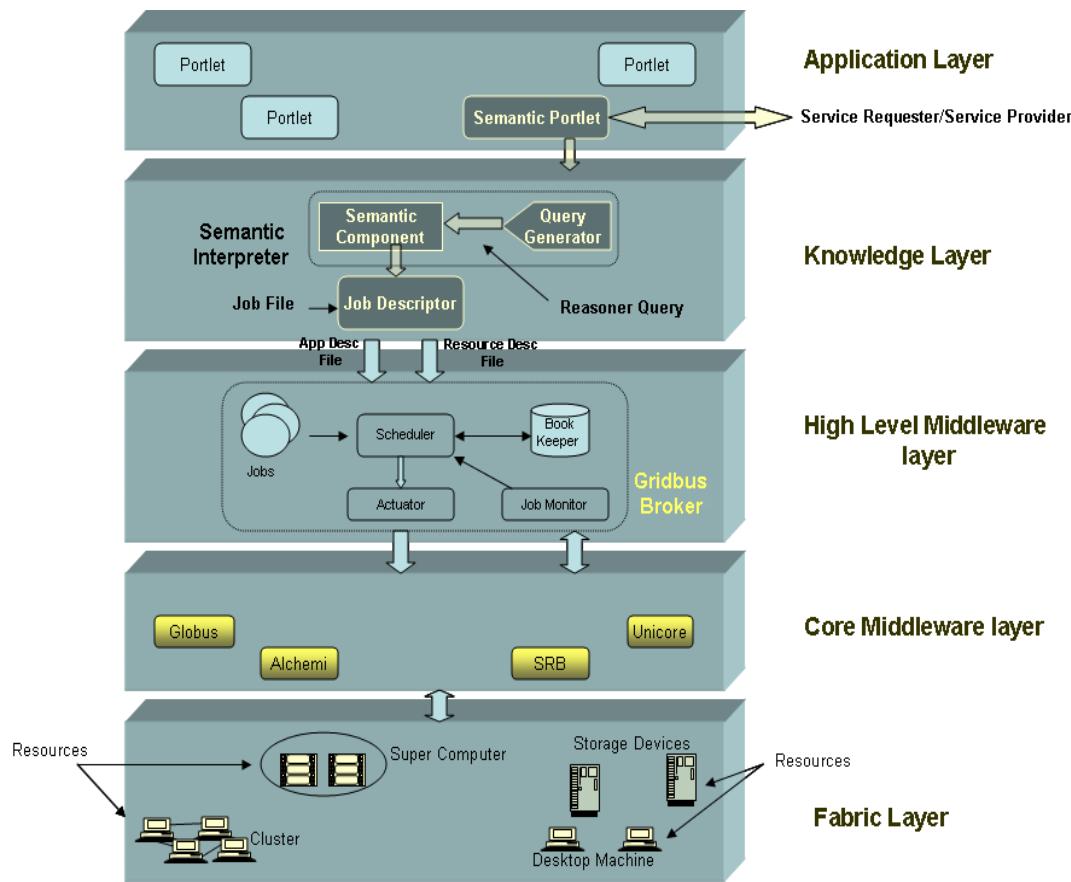
Technology partner to GARAUDA - India Grid

Aggregation of heterogeneous
and geographically distributed
resources such as computing,
Storage and special equipment
from various research labs and
Academic institutions across the
Country

CDAC – PARAM PADMA

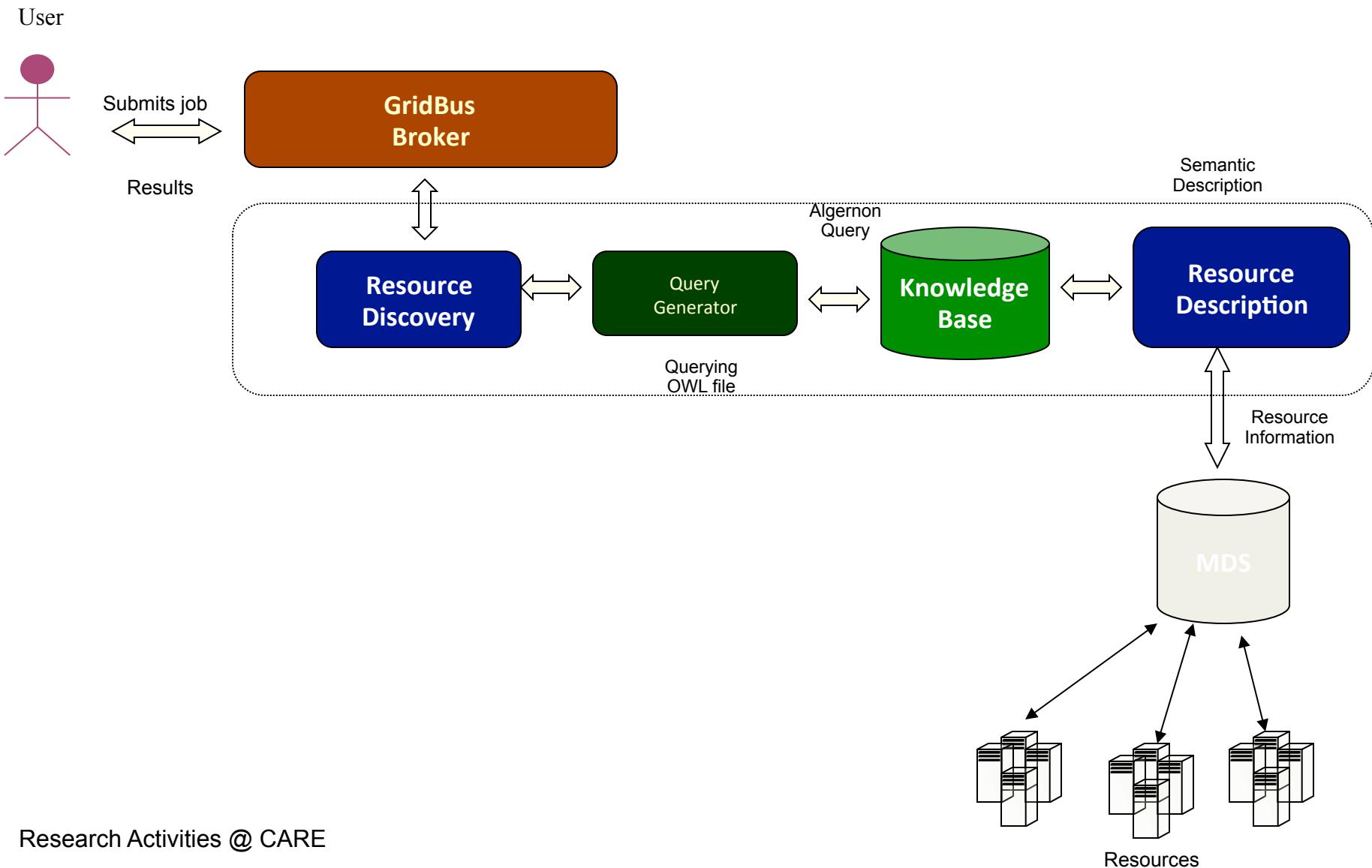


Semantic Description and Discovery of Grid Resources



- Semantic Component enables semantic description and discovery of grid resources.
- Protégé-OWL APIs are used to create knowledge base of grid resources using a resource ontology template.
- MDS is used to aggregate resource information
- We use Algernon Inference Engine to discover suitable resource
- This module has been successfully integrated With Garuda, a National Grid Computing Initiative

Semantic Component for Gridbus Broker – Rajkumar Buyya



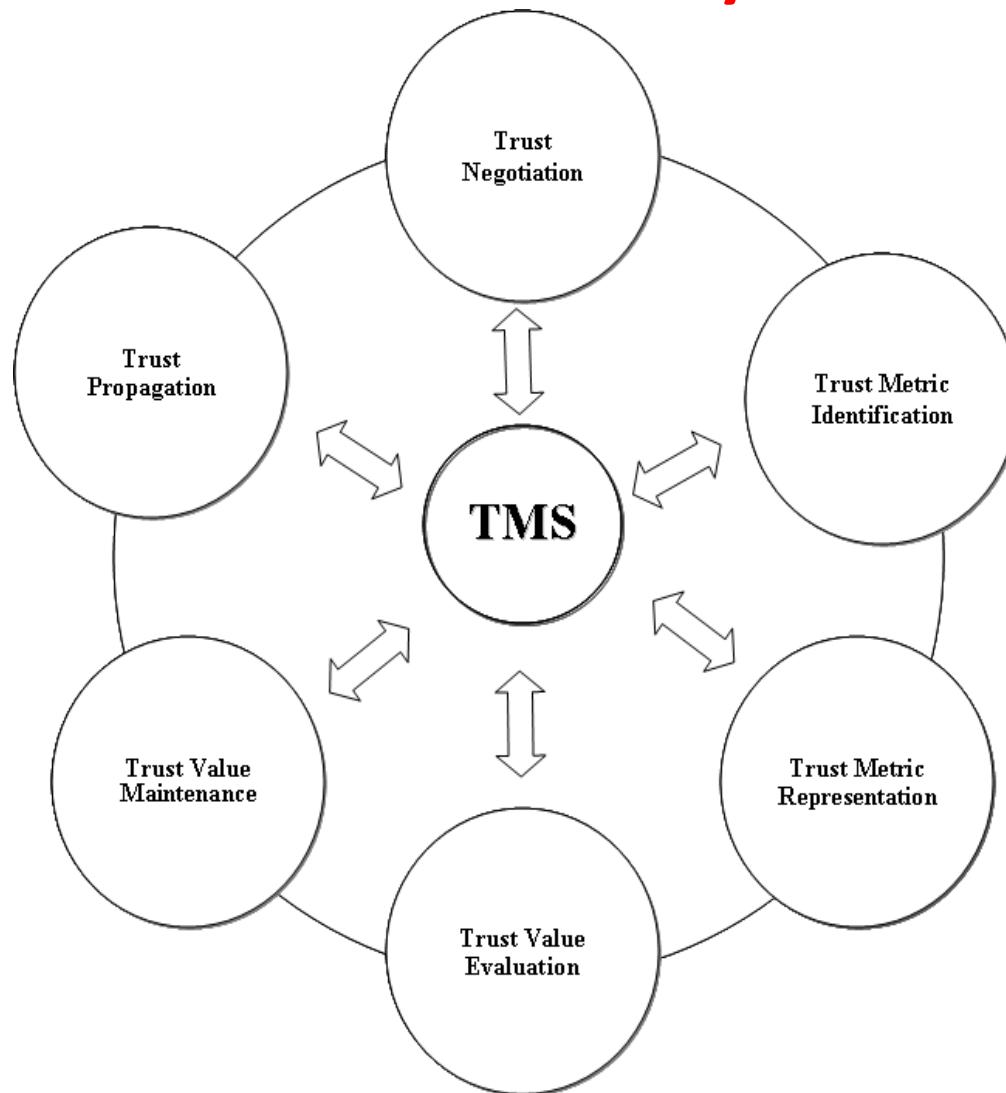
Features

- Describe Grid resources using Ontological representation
- Uses Inference engine for information retrieval from ontology knowledge base
- Integrated with Gridbus Broker
- With necessary modification, integrated with Garuda Grid portal as Advanced Search facility

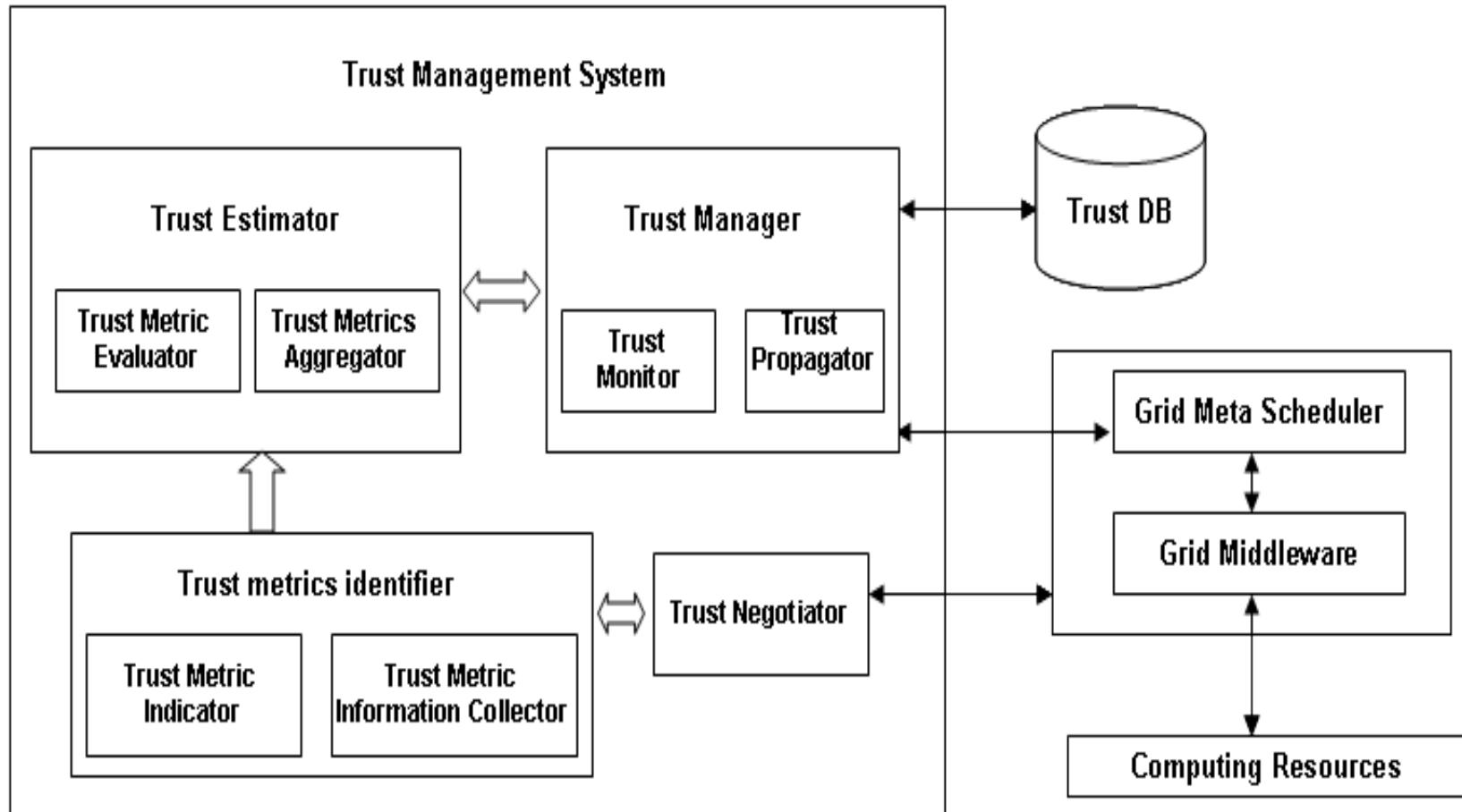
Trust Component

A two year project funded by DIT, India

Trust Lifecycle



Trust Management System



Features

- Computes trustworthiness of every grid resource
- Considers “objective” parameters such as availability, success rate, and bandwidth
- Integrated with Gridway and to select grid resources based on trust value

Integrated with Gridway Meta Scheduler

<http://www.gridway.org/doku.php?id=ecosystem:relatedsoftware>

GridWay + Google Maps web interface	The goal is to develop a web interface with a geographical representation of the GridWay resources using a GoogleMaps mashup, including useful information such as statistics of usage, workload, pending jobs, queue size, etc. It also contains options so the user can filter and select which information is relevant (where are the user's active jobs, or what is the situation of the submitted jobs).	Google Summer of code 2009-Globus Alliance/UCM	Carlos Martín Sánchez
TIGRE-GW-Client	It enables an alternative deployment, giving the possibility to have a thin client for GridWay with fewer requisites, basically just a gsish client. The TIGRE-GW-Client offers the full functionality available in the standard GridWay deployments, including arrays and workflows. Please find examples and a README file explaining howto use this component inside the tarball.	TIGRE	Ping Luo
 GW GUI	It provides a graphical interface for the GridWay metascheduler users. It offers the possibility to design workflows locally and then send input files and job template to a remote GridWay server, where the workflow will be launched. The task definition is very detailed, so basically you can construct complete GridWay job templates and easily define dependencies between them.		Iván Fernández Hernández
 Trust Management	It provides GridWay with a mechanism to evaluate the trust of the computational resources. The Trust module consists of modified host attribute parsers and match-making algorithms. Additionally the Trust module needs to modify the information providers of Grid resources.	Madras Institute of Technology	Prof Dr.S.Thamarai Selvi

 Login

ecosystem/relatedsoftware.txt · Last modified: - 2010/01/26, 11:53 - by Alejandro Lorca

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Please send comments to [webmaster](#)

PATENT

- Filed Application for patent (**Patent application No.593/CHE/2007 A**)
- Title of Invention:
A System and a method to assess the trustworthiness of a resource provider
- International Classification:G06F 17/30
- Patent Received in 2010

Virtual Cluster Development Environment

- Deploy a virtual cluster on the fly
- Globus Toolkit has been used as middleware
- Incubator project from Globus
 - GT AUTOINSTALL Utility



- Welcome
- List of projects
- Guidelines
- Infrastructure
- How to contribute
- Project ideas
- Mailing lists
- Globus events
- Recent changes
- dev.globus FAQ

common runtime projects

- C Core Utilities
- C WS Core
- CoG jglobus
- Core WS Schema
- Java WS Core
- Python Core
- XIO

data projects

- Data Replication
- GridFTP
- OGSA-DAI
- Reliable File Transfer
- Replica Location

execution projects

- GRAM

[page](#)[discussion](#)[view source](#)[history](#)

Incubator/GT Auto Install

Globus Toolkit AutoInstall Utility (GT Auto Install) is an Incubator Project related to the automated installation and configuration of the core components of Globus Toolkit 4.X It can be extended further to enable the automated installation of any other globus module. For more information, see <http://www.annauniv.edu/care>.

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- 1 GT Auto Install Overview
 - 1.1 About CARE
- 2 Incubator Product Metadata
 - 2.1 Status
 - 2.2 Roadmap
- 3 Incubator Project Metadata
- 4 Project Chair
 - 4.1 Dr.S.Thamarai Selvi
 - 4.2 Mentor
 - 4.2.1 Dr. Ruben Santiago Montero
 - 4.3 Committers
 - 4.4 Mailing Lists
 - 4.5 FAQ
 - 4.6 Policies
 - 4.6.1 Guidelines for committers
 - 4.6.2 Guidelines for individual contributors
 - 4.7 Contributors



- Virtual Workspaces
- VOMS
- WEEP
- CoG_Workflow (Hibernating)
- DDM (Hibernating)
- Dynamic_Accounts (Hibernating)
- LRMA (Hibernating)
- MEDICUS (Hibernating)
- OGRO (Hibernating)
- ServMark (Hibernating)

deprecated

- Pre-WS MDS (MDS2)

search
toolbox

- What links here
- Related changes
- Special pages
- Printable version

Incubator Project Metadata

Project Chair

Dr.S.Thamarai Selvi

Dean & Professor,
Madras Institute of Technology,
Anna University,
Chennai 600044
Tamil Nadu
INDIA
Email : stselvi@annauniv.edu

Mentor**Dr. Ruben Santiago Montero**

Associate Professor at Universidad Complutense de Madrid
Spain
Email: rubensm@dacya.ucm.es

Committers

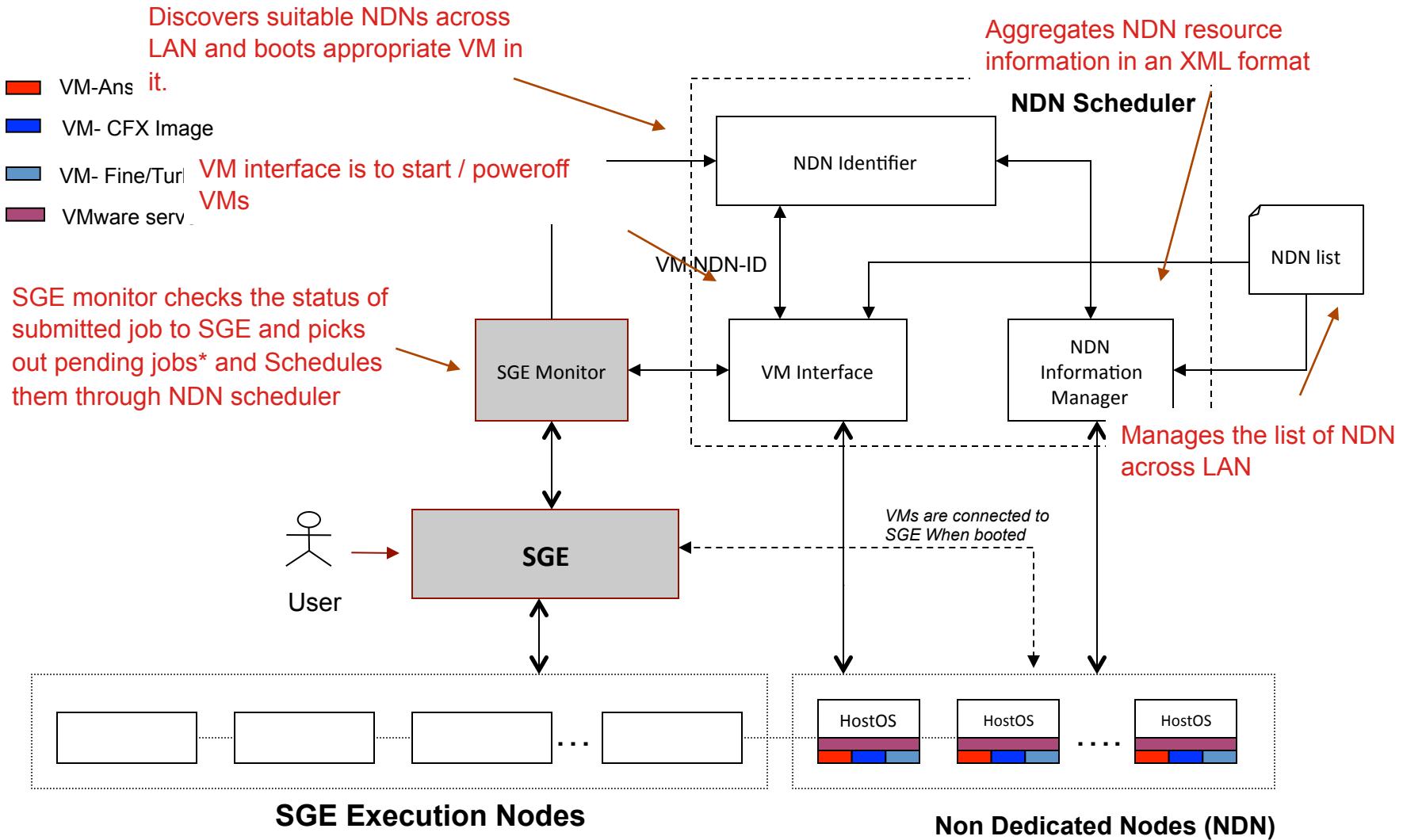
If you would like to become a committer, guidelines are [[here](#)].

G.Kannan (kannan.gridlab@gmail.com)

Honeywell Technology

- Using virtualization technology, utilize the underutilized resources for testing CFD applications

Architecture



* Research Activities © CARE
Jobs that are in pending state due to non availability of slots

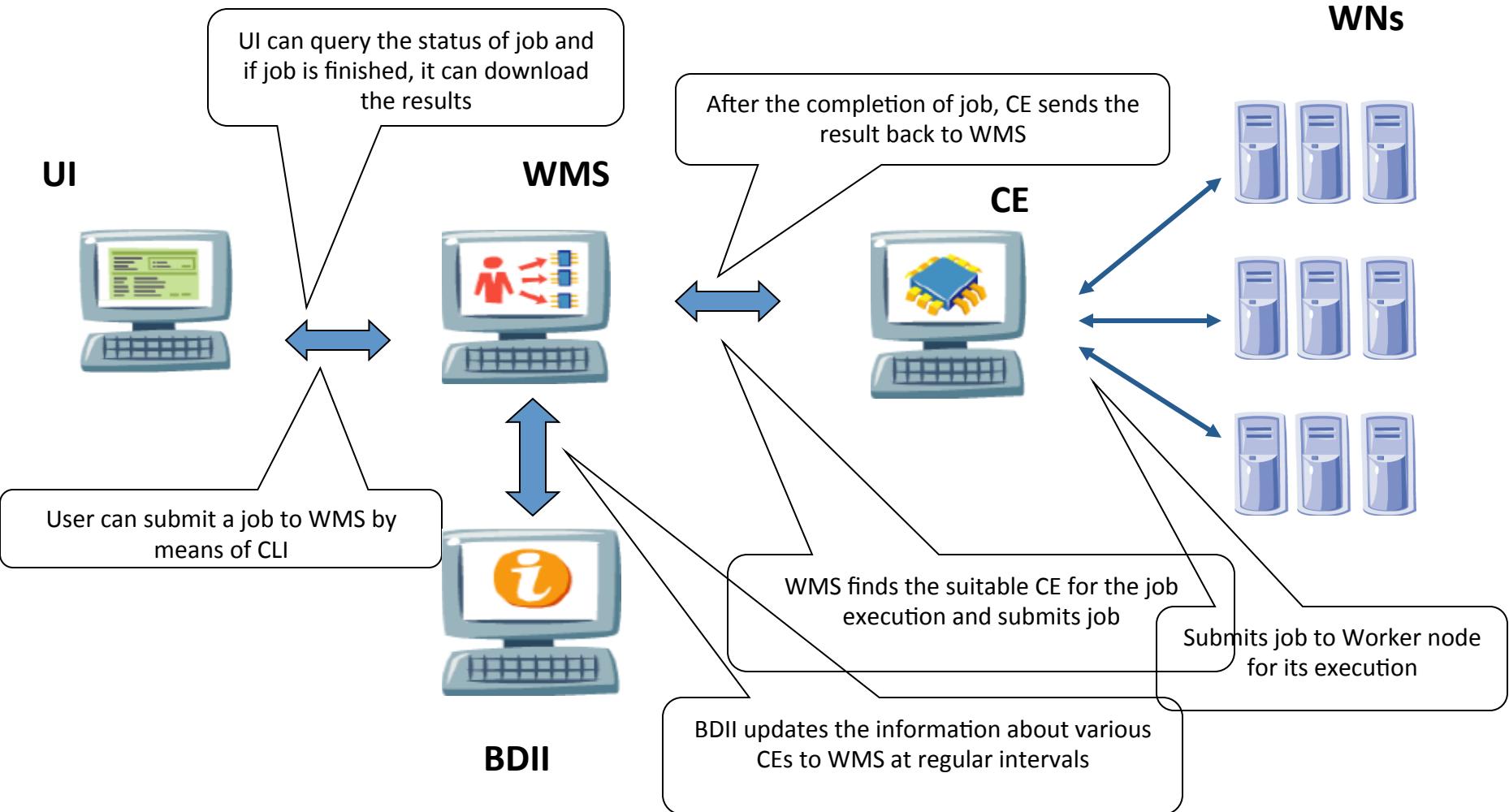
MIMOS - Malaysia

- Description
 - The gLite infrastructure of MIMOS possess high end servers which could be utilized for the execution of jobs realizing virtualization technique.

Virtual Machine Deployment – Phase I

- Objective
 - To identify the physical server in which required number of worker nodes can be created as virtual machines
 - To dynamically deploy and manage worker node in the form of virtual machines on EGEE gLite infrastructure.

Job flow in gLite infrastructure



UI - User Interface

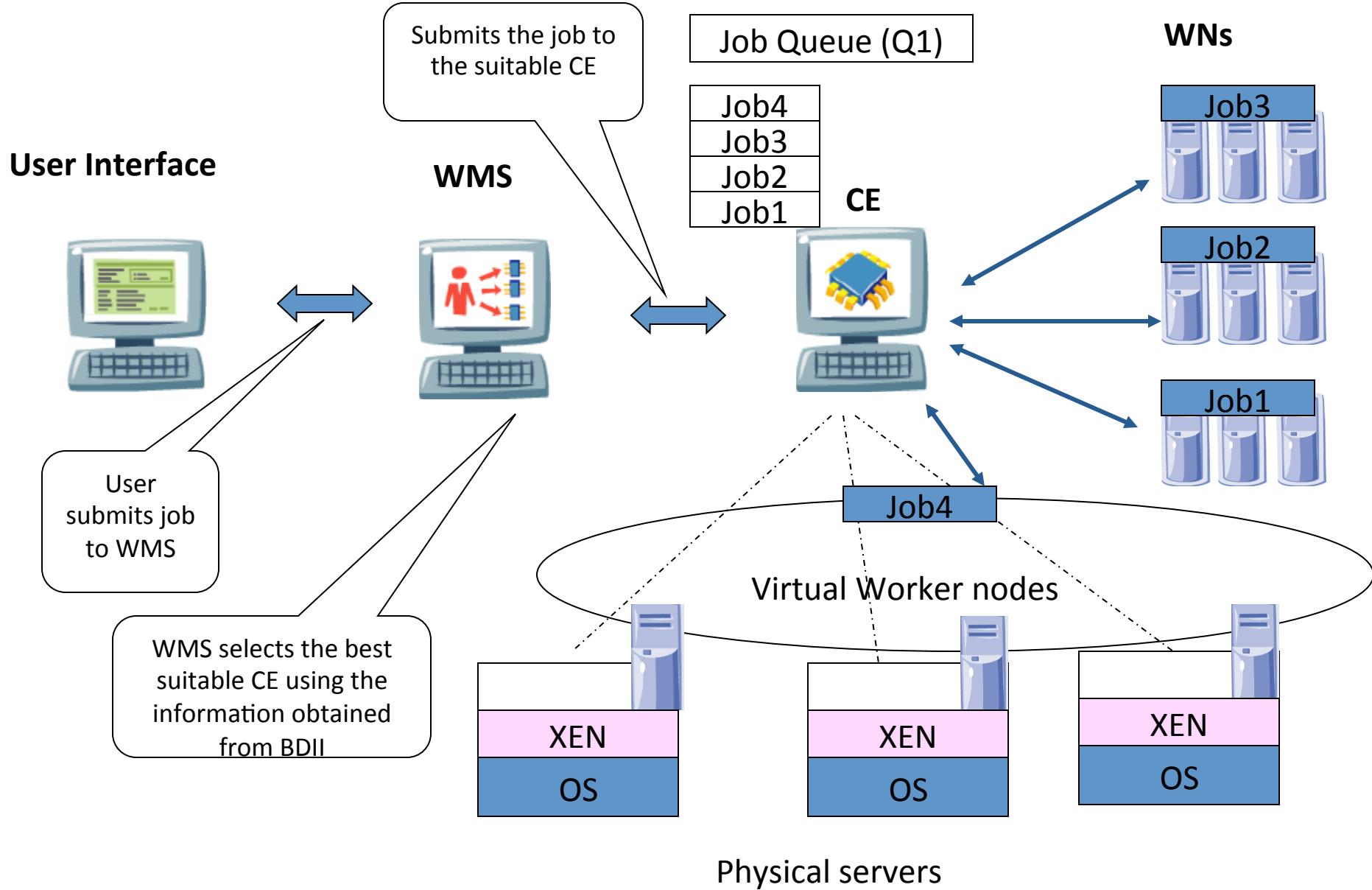
WMS - Workload Management System

BDII - Berkley Database Information Index

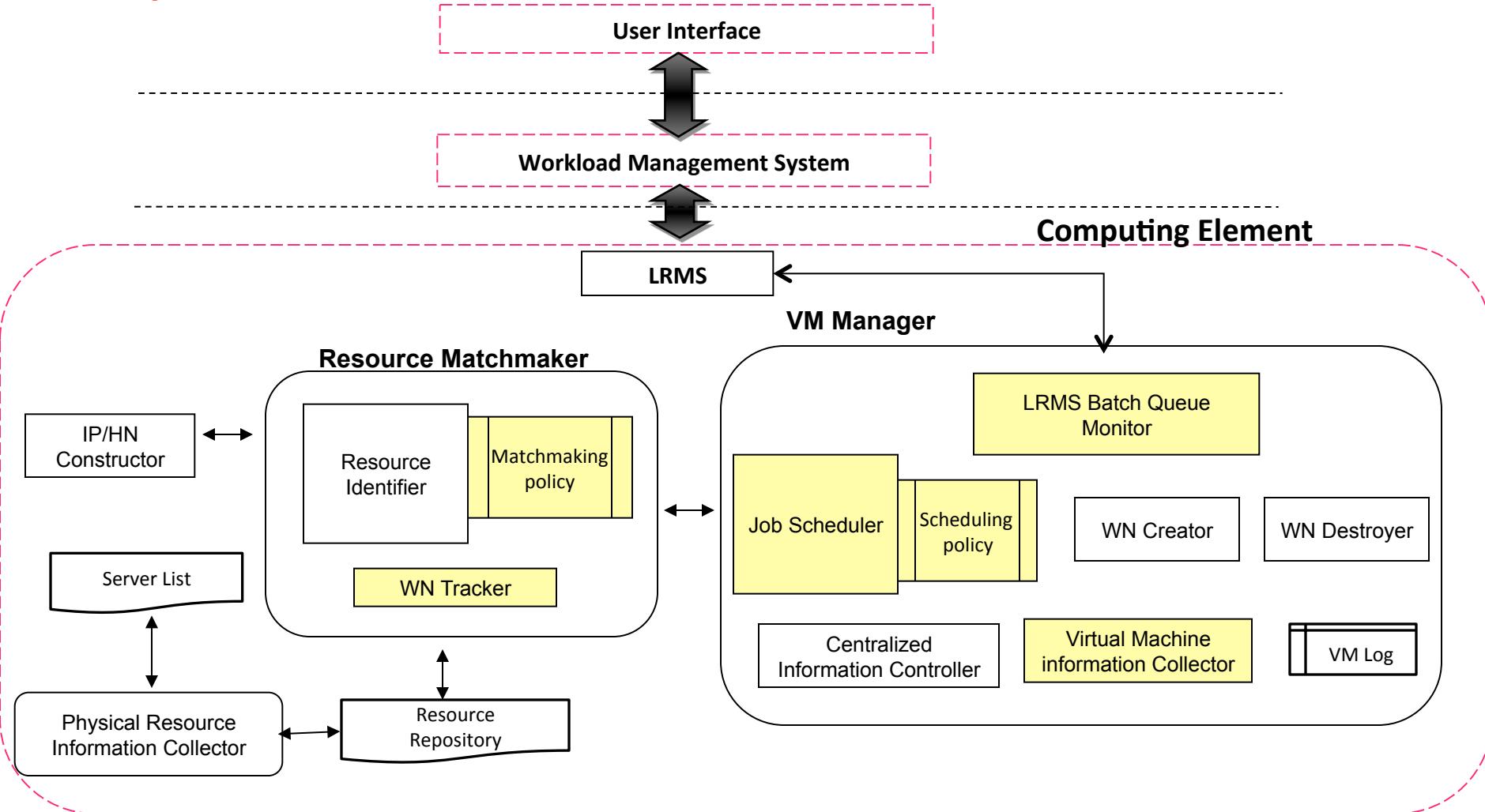
CE - Computing Element

WN - Worker Node

Job flow - Virtual machine deployment



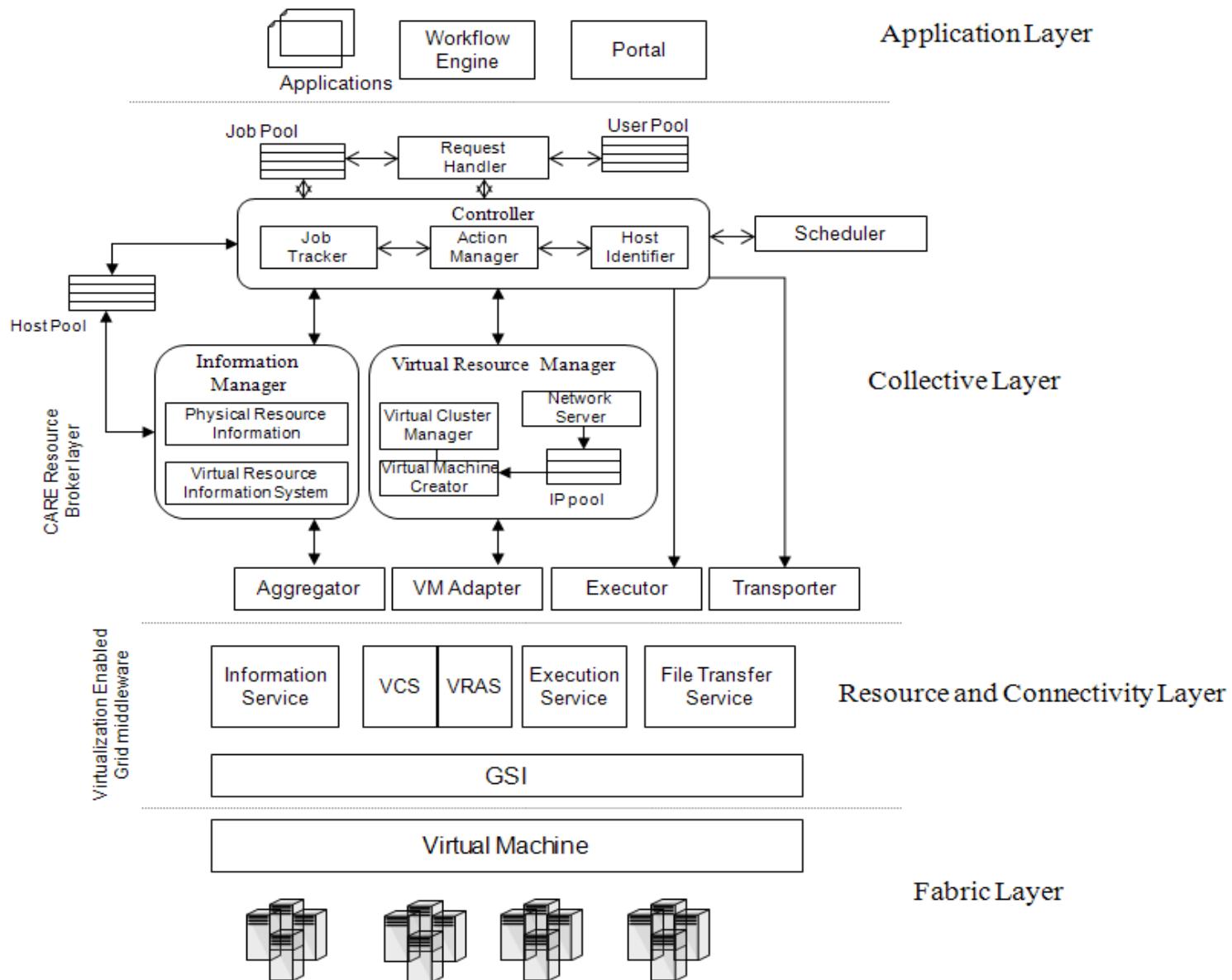
Proposed Architecture for Phase II



Our CARE Resource Broker

- Semantic description of resources
- SLA Negotiation
- Heuristic Scheduling
- Trust management Integration
- Virtual resource provisioning

Layered Architecture



Cloud for DHAKSHA

- Our department of Aeronautical engineering has Avionics Division
- Faculty and students developed Unmanned Aerial Vehicle (UAV) System
- Successfully completed UAV Forge entry test conducted by NASA



UAV Forge Entry

Dhaksha UAV Forge entry tested successfully by team MIT India | sUAS News - Mozilla Firefox

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Dhaksha UAV Forge entry tested success... +

www.suasnews.com/2012/01/11605/dhaksha-uav-forge-entry-tested-successfully-by-team-mit-india/ Google

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sUAS News

Home Community The Shed Podcast FAA Test Sites Civil Police Military Multirotor UAS Directory Regs Training ePubs Papers Americas Asia Australasia EU Russia Competitions Events UGT Contacts Advertise

 Macro Thermal Performance for Micro Payloads

Dhaksha UAV Forge entry tested successfully by team MIT India

30 January 2012 By Tiaan Roux



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sUAS News NOAA Unmanned Systems A.

8:54 AM 3/22/2013

Dhaksha team at USA



DHAKSHA :UAV of Madras Institute of Technology, Anna University





**CONSTRUCTION
SITE MONITORING**



**TRAFFIC
MONITORING**



360_{DEG} CAMPUS VIEW



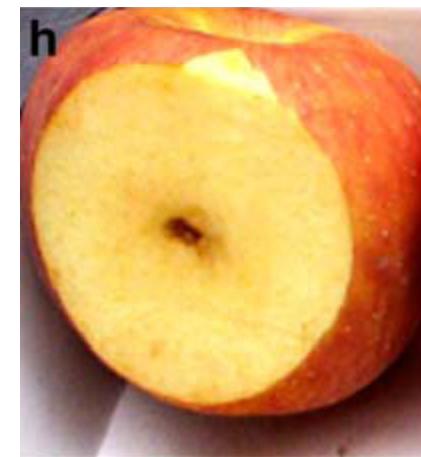
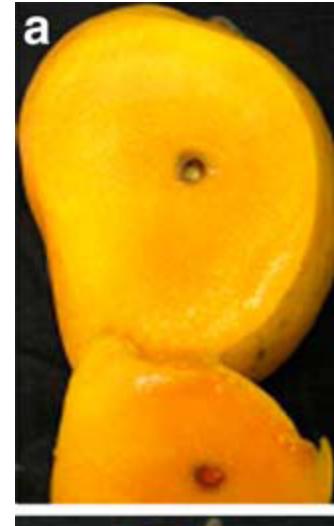
TARGET TRACKING

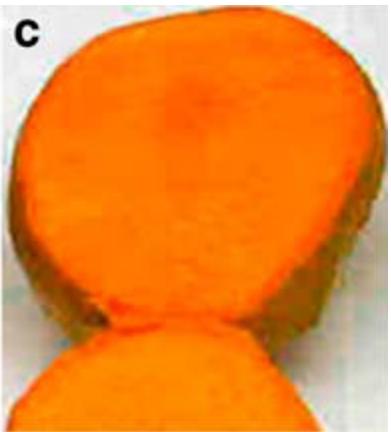
Our focus in DHAKSHA

- Proposing cloud services for traffic monitoring
- Police Bandobast
- Agriculture applications

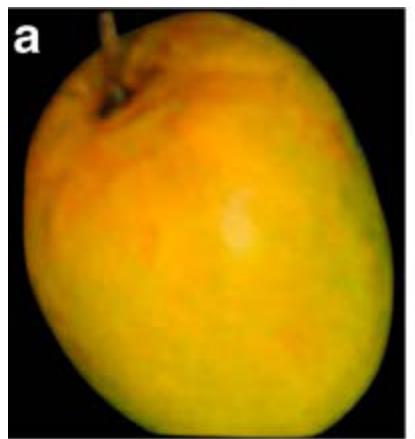
Agricultural Application

- Agriculture and IT fields are merged
 - Defect detection in Mango Fruits
 - Alphonso Famous in Konkan from Maharashtra
 - *Agricultural university in Konkan, Maharashtra and CEERI had worked in spongy tissue problem*

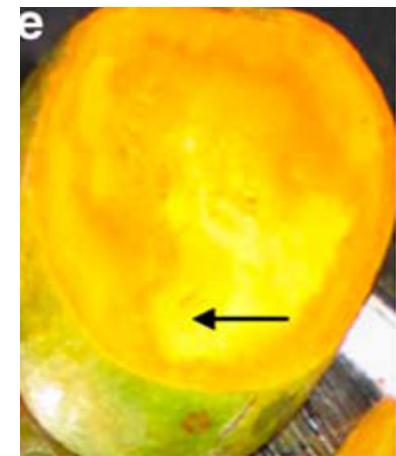




Non spongy fruit



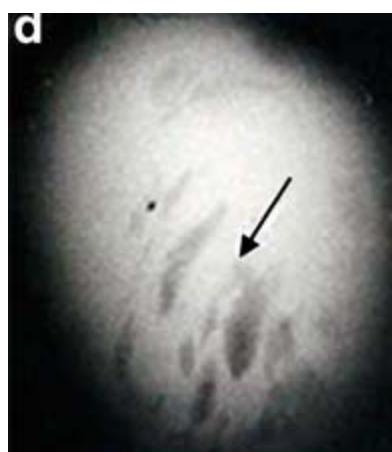
Whole spongy fruit



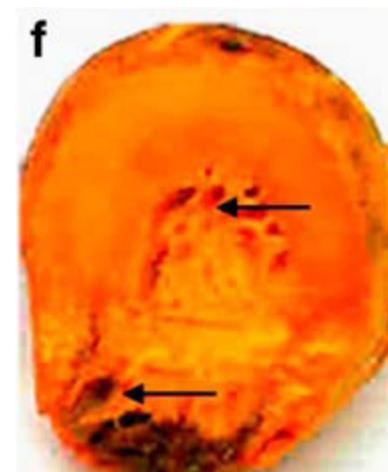
Alphonso - spongy fruit



X Ray-Non spongy fruit



X Ray- spongy fruit



spongy fruit with air cavity

Application – A Trial @CEERI

(Centre for Electrical and Electronics Research Institute)

- Detection of defects in Fruits
- Application is already available as a sequential one
- MPI code has been developed and tested in our test bed.
- Increase in throughput has been achieved by creating virtual machines and executing the code in parallel .



CEERI Lab

Surface Defects



Peel Defects



Line Defects



Mechanical Defects

Educational World is changing

- **On site Teaching /Learning**
 - Gurukulum
 - Class room
- **On line Teaching / Learning**
 - Distance Education
 - On line courses
 - Short term Training
 - Certificate Courses

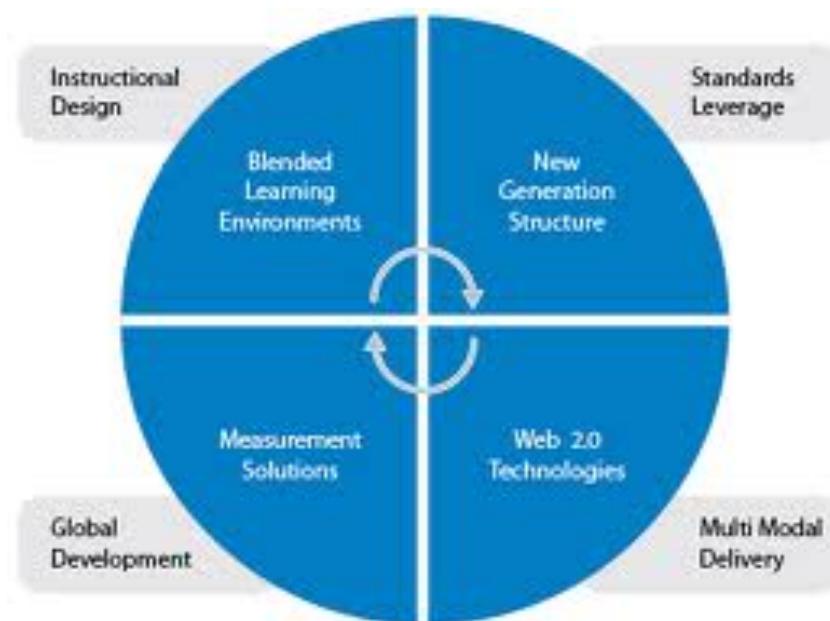


Gurukulum teaching(Guru-Sishyan)

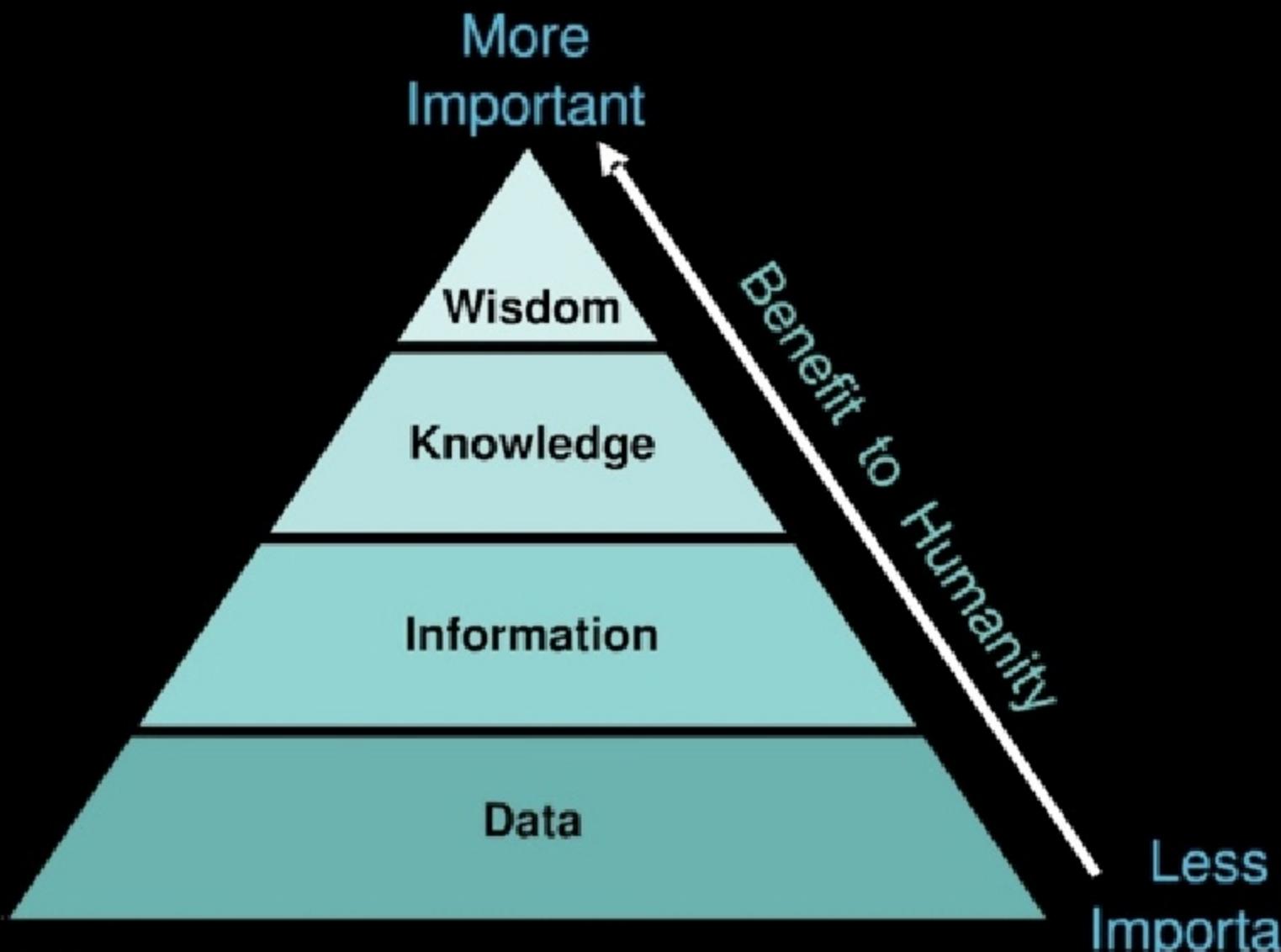
- Learner has to follow the instructions of Guru
- Guru is the authority of evaluation
- No standard syllabi or curriculum or evaluation
- Guru centered
- Knowledge oriented



Smart Learning



The Opportunity: Turning Data into Wisdom



A photograph showing three people in an office setting. A man in a blue shirt is leaning over a woman in a grey sweater who is seated at a desk, both looking at a computer monitor. Another woman in a black shirt is also seated at the desk, looking towards the screen. They appear to be engaged in a collaborative task.

*Use of intelligent data,
learner-produced data,
and analysis models to
discover information
and social connections
for predicting and
advising people's
learning.*

Learner Analytics

Our Current research Focus

- E learning, M learning and U learning
- Gurukula Teaching was our ancient method of teaching
- We follow that conceptual idea for our current teaching / learning process

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Athabasca University- Canada

- Open University in Canada
- We are working with Athabasca University to perform Learner Analytics
- Proof of concept is over

File Edit View Go Bookmarks Tools Help

Back Forward Stop Home http://localhost:8080/2210jobclidemo/detachable/detachable/index.jsp Go

Red Hat Red Hat Magazine Red Hat Network Red Hat Support

welcome to e-learning

SEARCH

Search

powered by Google™

Step into the world of knowledge by logging in!!!

USER NAME

guser01

PASSWORD

MYPROXYSERVER

arcluster.care.mit.in

MYPROXYPORT

7512

LIFETIME(hour:min)

5 00

LOGIN

Done



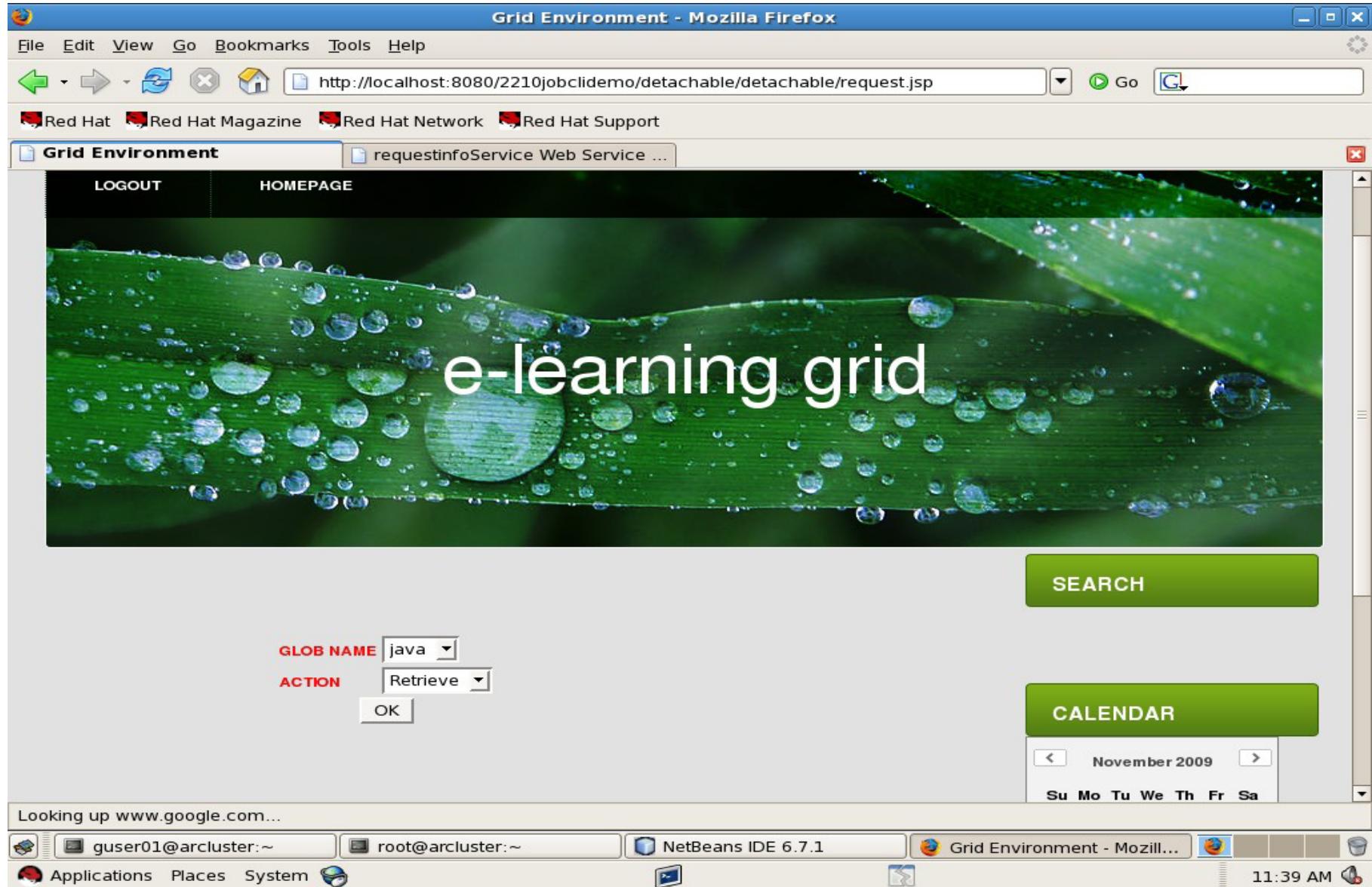
CALENDAR

< November 2009 >

Su Mo Tu We Th Fr Sa

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12

12:43 PM



Development of U-Learning Framework

- We develop an U-Learning Framework in collaboration with Athabasca University
- We developed the metadata based on SCORM standard (Shareable Content Object Reference Model).
- Framework uses multitenant approach and It is based on metadata driven architecture

U-Learning Framework

- We make use of Moodle, Eclipse, VPL, JESS tutors and Hackystat sensor for the implementation
- We make use of HDFS for storing big data of learners data
- We use Learning traces for Teaching /Learning

Trace

- Trace – History of user actions collected in real time from his/her interactions with the computer environment
- Action may be
 - Opening a file
 - Clicking a hyperlink
 - Coding and compiling
 - Posting a message in forum, etc

Formalization - Trace

- Trace $T = \langle u, \text{task}, (O_1, O_2, \dots, O_n) \rangle$
- u -user
- task-description of user task
- O_i -observed element, (A_i, M_i)
 - A_i : action, with a defined structure
 - M_i : modality; $M_i = \langle d, L \rangle$, d -interaction device, L -interaction language

Model Tracing

- Intelligent Tutoring Systems that track learner progress at each step of a problem-solving process are called Model Tracing Tutors
- E.g., www.algebratutor.org
- Each step in algebraic problem solving is tracked and mapped onto a model
- Feedback can be offered when learners veer away from correct pathways

Model Trace

- Set of instructions is predefined for each part of the course
- The learner is monitored for the individual step as per the given instruction and is corrected for the mistakes committed
- It is the atomic level of monitoring each instruction in the learning process

Knowledge Tracing

- Model students' changing knowledge state during skill acquisition.
- An ideal student model is defined in terms of production rules.
- As the student works, the tutor also maintains an estimate of the probability that the student has learned each of the rules in the ideal model, in a process called *knowledge tracing*.
- E.g., ACT Programming Tutor (APT)
 - ACT - Adaptive Character of Thought
 - ACT -R *Adaptive Character of Thought* - Rational

APT is a problem solving environment in which students learn to write short programs in Lisp, Pascal or Prolog.

Learning Traces

- We define learning trace as observable information about the learner, the type of learning, what had been learned, how effectively it had been learned, evidence of learning, and learning resources.
- Learning trace tutors do not pre-define models of competencies or skills as in model-tracing and knowledge-tracing tutors. Instead, they generate competency models dynamically from observed learner interactions.

Learning Traces

- Example: Online activities of a novice programmer in the context of an assignment can be traced in terms of
 - the UML design of the solution
 - coding efforts of the solution in a programming language
 - debugging efforts
 - testing efforts
 - documenting efforts
 - code optimisation efforts
- Thus, learning traces capture information about the entire learning process and pathways (correct or otherwise) the learner has taken so far.

Learning Traces Example – letter writing for 7th grade learners

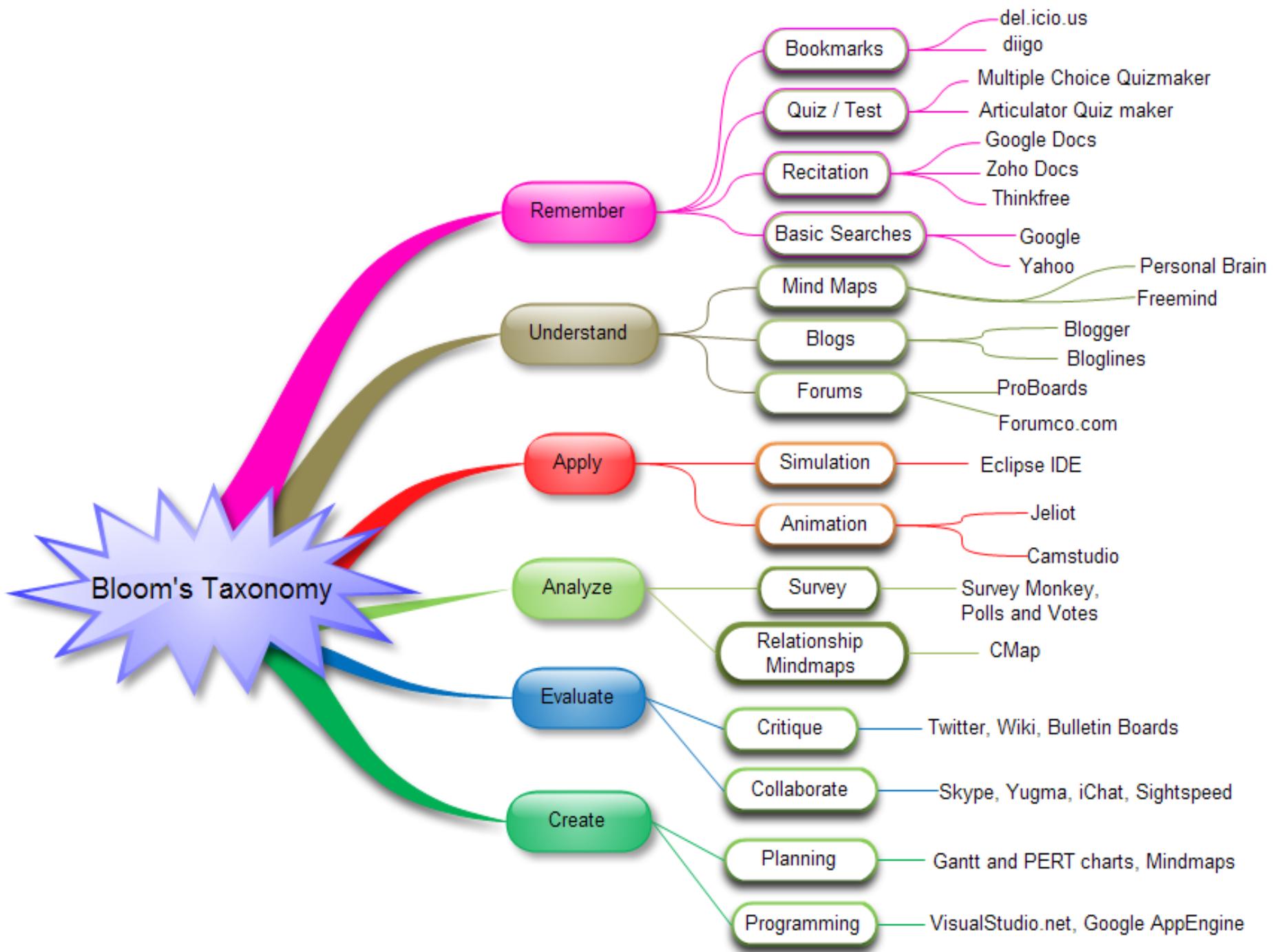
Learner A	Learner B
Sessions/sentences modified or created: 68 14 188 74 2 289 87 45 41 22	Sessions/sentences modified or created: 454 12
Number of grammar mistakes corrected immediately, while writing the letter vs. corrected later : 23 vs. 112	Number of grammar mistakes corrected immediately, while writing the letter: 68 vs. 20
Number of times sentences or phrases were moved around: 145	Number of times sentences or phrases were moved around: 69
Number of spelling mistakes :-corrected immediately vs. yet to be corrected: 78 vs. 5	Number of spelling mistakes :-corrected immediately vs. yet to be corrected: 33 vs. 8
Marks scored : 85%	Marks scored: 70%

Learning Traces

- These raw data can be mapped onto skeletal structures corresponding to various educational theories or instructional models
- This mapping can happen dynamically, as and when learners study
- This mapping can be causal in nature

Advantages of Learning Traces

- Dynamic model of traces enable learners to cover most of the possible mistakes and errors in learning
- Repeated exercise on tracing different sets of learners helps in refining the model each time and may stabilize over a period of time
- The models evolved across institutions may reflect the customs and culture of learners.
- Standard models are to be pruned out of potential models.





Dr. Howard Gardner

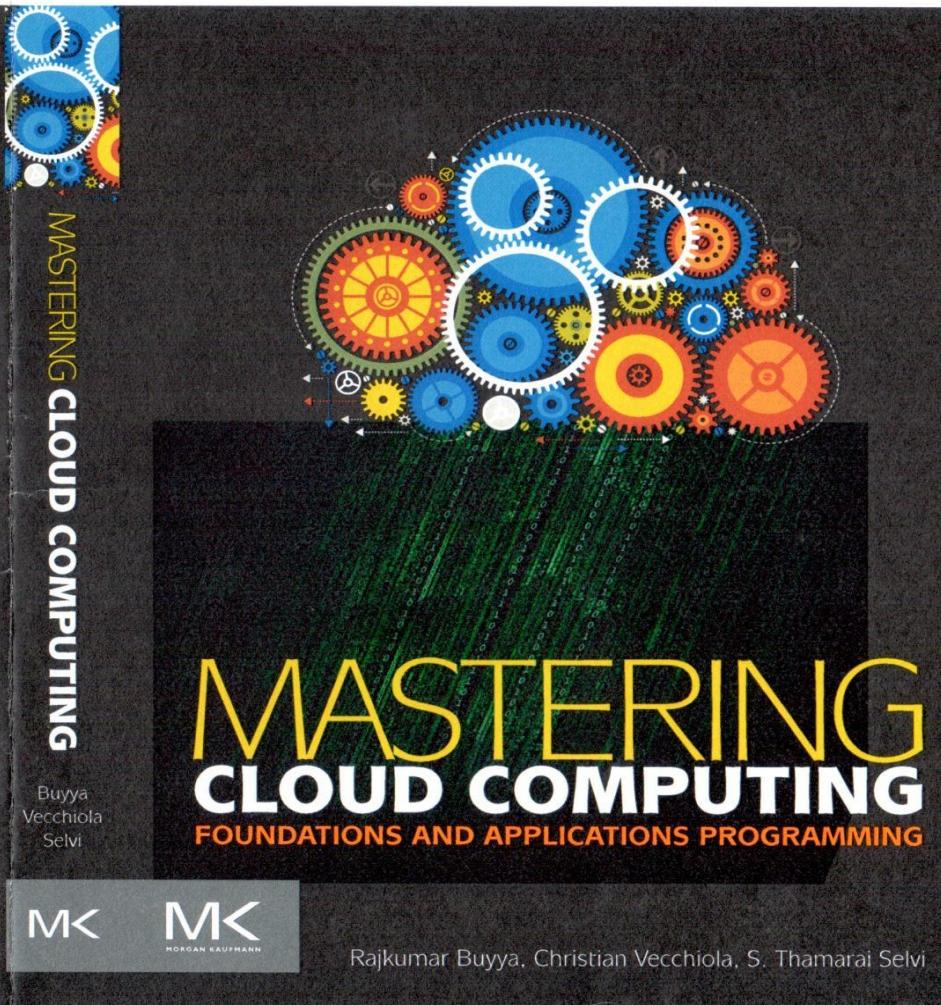
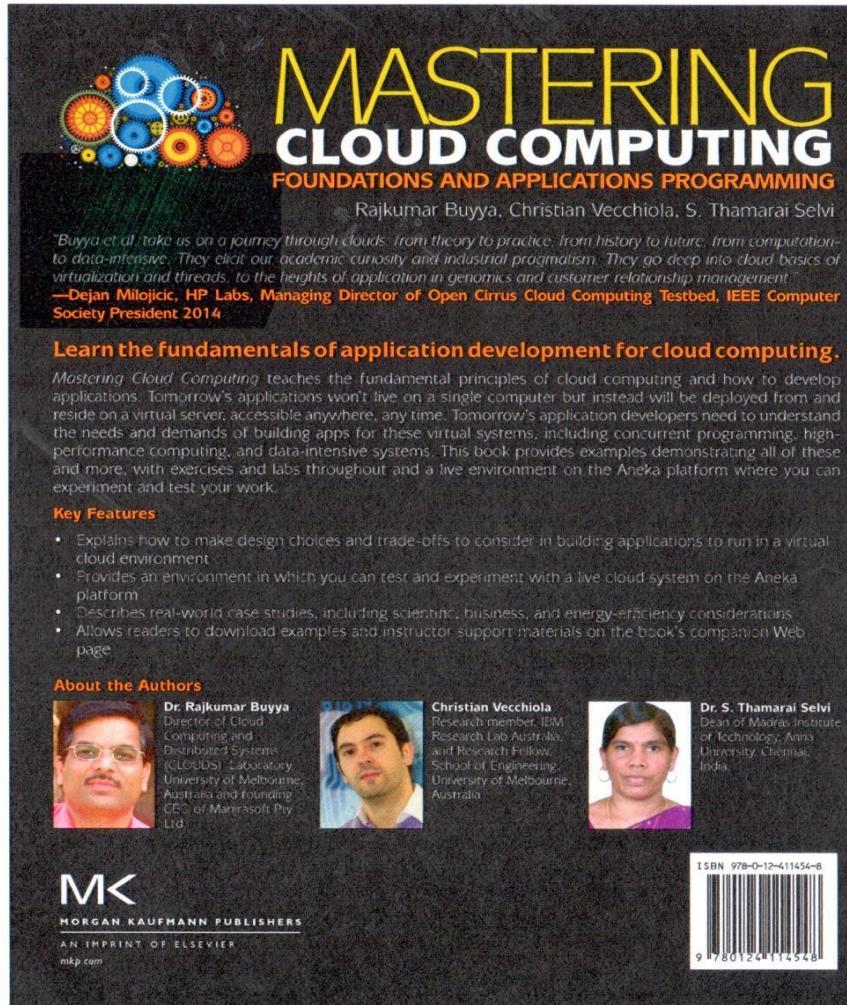
Source:
www.ThomasArmstrong.com

Applications

- It is possible to compare the quality of education across the Institutions.
- Quality of education may be standardized based on the competency achieved
- Accreditation may be based on the models conceived by Learning Traces

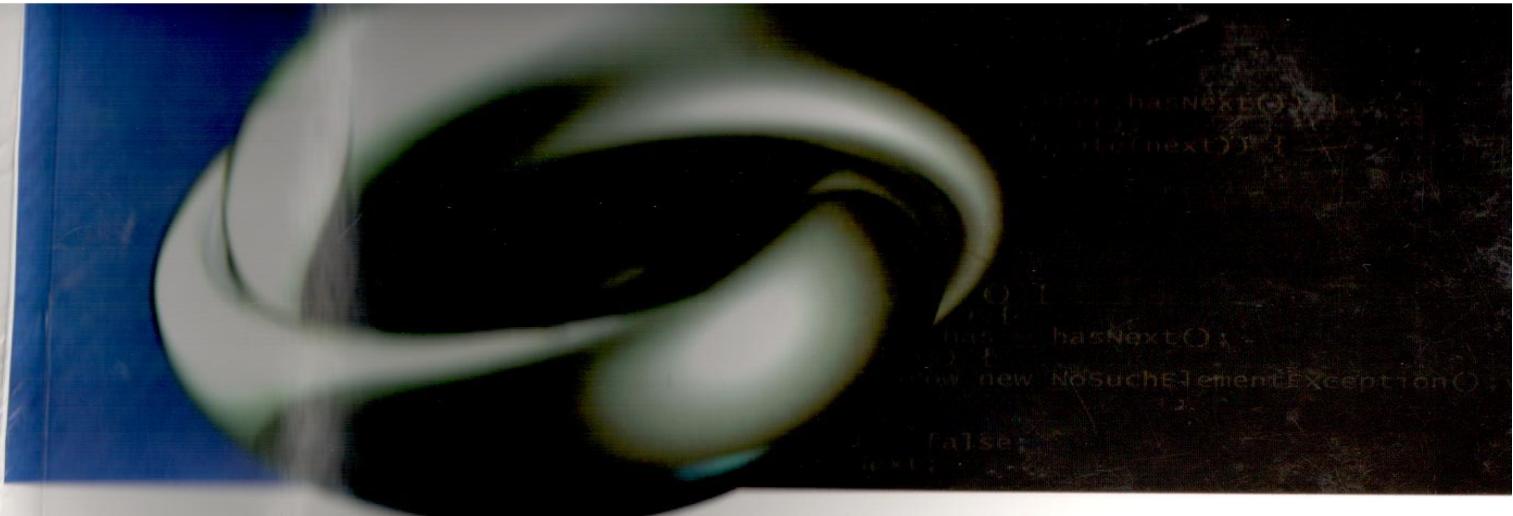
Authoring Books

1. **S. Thamarai Selvi**, R. Murugesan, “**Text Book on C#**”, Pearson Education 2003.
2. Rajkumar Buyya, **S. Thamarai Selvi**, Xingchen Chu, “**Object Oriented Programming with Java Essentials and Applications**”, Tata McGraw Hill, New Delhi, 2009.
3. **S. Thamarai Selvi**, R. Murugesan, “**Test Your Skills in C**”, Tata McGraw Hill, New Delhi, 2009. 2009 (Revised).
4. **S. Thamarai Selvi**, R. Murugesan, “**C for All**”, Anuradha Publishers 2010 (Revised).
5. Rajkumar Buyya, Christian, **S. Thamarai Selvi**, “**Mastering Cloud Computing**” Morgan Kaufmann, USA, 2013.



Oriented
ing with **JAVA**
Essentials and Applications

Buyya | Selvi | Chu



Object-Oriented Programming with **JAVA**

Essentials and Applications



Rajkumar Buyya | S Thamarai Selvi | Xingchen Chu

A Textbook on C#

A Textbook on C#

**A Systematic
Approach to
Object-Oriented
Programming**

S. Thamarai Selvi

R. Murugesan

Selvi
Murugesan

PEARSON
Education

Test Your Skills

in



Second Edition

THAMARAI SELVI
MURUGESAN

1982 - 2007

PACIFIC
OCEAN



FOR ALL

**S. Thamarai Selvi
R. Murugesan**

Our Research Collaborations

- CDAC, Bangalore
 - Garuda Grid - Semantic Resource Discovery
- CEERI, India
 - Surface/Inner Defect Identification of Fruits
- Athabasca University, Canada
 - E-Learning
- University of Madrid, Spain
 - Gridway and OpenNebula – Part of Scheduling
- MIMOS, Malaysia
 - Virtualizing Computing Element
- Honeywell, Bangalore, India
 - Intelligent creation of Virtual Machines

Conclusion

- Our research focus had been discussed
- We are interested in having collaborative research with PRAGAMA in Cloud applications



Suggestions and Clarifications



Thank You for your attention