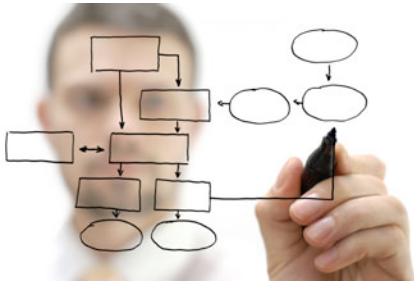## Education & Training in Grid and Cloud Computing

Help educate a new generation of students in the latest area of computing. Add Parallel, Distributed and Cloud Computing into your curriculum. We provide teaching tools, software and examples to get your program up and running quickly.

The advent and adoption of the Internet in the 90s changed the way the ICT industry functions, permanently.

Lowering costs in computation and communication is driving the focus from personal to DataCenter-centric computing. Although, parallel and distributed computing has been around for several years, in its new forms as, Multi-core, Grid and Cloud Computing, has brought about a sweeping change in the industry. These trends are pushing industry focus from developing applications for PCs to Data Centers and Clouds that enable millions of users make use of software simultaneously. ICT services are billed to be delivered as "computing utilities" over shared delivery networks akin

services.

With this sweeping change, there is a demand for new skill sets in parallel and distributed computing. Universities play an important role in this regard in training the next generation of ICT professionals and equipping them with the necessary tools and knowledge to tackle the challenges. In addition to the research being done in this field, there are several courses on offer on Parallel, Grid and Distributed computing. Complementing these are network based parallel and distributed computing technologies such as Manjrasoft's Aneka, which offer low cost solution for teaching and learning in this field.

Manjrasoft, which was born out of The University of Melbourne's Cloud Computing and Distributed Systems (CLOUDS) Laboratory, has been doing significant work in this area and has implemented relevant

Build
Aneka includes a Software Development Kit (SDK) which includes a combination of APIs and Tools to enable you to express your application. Aneka also allows you to build different run-time environments and build new applications.

Accelerate
Aneka supports Rapid Development and Deployment of Applications in Multiple Run-Time environments. Aneka uses physical machines as much as possible to achieve maximum utilization in local environment.

Manage
Management includes a Graphical User Interface (GUI) and APIs to set-up, monitor, manage and maintain remote and global Aneka compute clouds. Aneka also has an accounting mechanism while managing priorities and scalability based on SLA/QoS which enables dynamic provisioning.

to the water, electricity, gas and telephony

courses to prepare the students for the real

"Help Introduce Latest Computer Technology to your Students!"

world. Manjrasoft's flagship product Aneka, enables one to build virtual supercomputer or an enterprise Cloud out of LAN-connected desktop computers under Windows /.NET environment and provide remote access to this capability as Cloud services. After successful validation of the technology in the market, Aneka is being offered to educational institutions to help students gain knowledge on the practical implementation of the technology.

Manjrasoft offers a seminar and training program aimed at introducing and covering topics ranging from fundamental concepts to using state of the art Aneka technology and how to adopt them to teaching parallel and distributed computing. Manjrasoft would like to work with educational institutions to develop courseware in emerging areas of parallel and distributed computing (multi-core programming, Grid and Cloud computing) and enable them to train next-

generation ICT professionals.

In educational environment, Manjrasoft's Aneka technology is used to:

1. Setup a Lab by building an enterprise Grid or "on premise" Cloud using existing LAN-connected desktop computers.
2. Teach concepts of parallel and distributed programming using models such as Task, Thread, and MapReduce.
3. Conduct Lab classes and mount student projects in parallel and distributed computing
4. Teach concurrent programming using the Thread model on multi-core desktop computers or servers.
5. Teach and demonstrate Cloud computing concepts by deploying on public Clouds such as Amazon EC2 by renting the computing infrastructure.

Students are encouraged to write applications on

- Parallel data mining
- Parallel searching algorithms
- Parallel sorting algorithms
- Mass document searching

Aneka middleware is used for research on:

- Parallel programming models
- Scheduling algorithms search
- SLA-oriented resource allocation

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