SNS COLLEGE OF TECHNOLOGY

COIMBATORE - 35

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

19CSE310- GRID AND CLOUD COMPUTING

Unit I – INTRODUCTION TO GRID

Topic : Introduction to Grid Architecture and standards

Criteria for a Grid

Coordinates resources that are not subject to centralized control.

Uses standard, **open, general-purpose protocols** and interfaces.

Delivers nontrivial qualities of service.

Benefits

Exploit Underutilized resources

Resource load Balancing

Virtualize resources across an enterprise

Data Grids, Compute Grids

Enable collaboration for virtual organizations

Grid Applications

Data and computationally intensive applications:

➢This technology has been applied to **computationally-intensive scientific, mathematical**, and academic problems like **drug discovery, economic forecasting, seismic analysis back office data processing** in support of ecommerce

➢ A chemist may utilize hundreds of processors to screen thousands of compounds per hour.

➢ Teams of engineers worldwide pool resources to **analyze terabytes of structural data**.

Meteorologists seek to **visualize and analyze petabytes of climate data** with enormous computational demands.

Resource sharing

Computers, storage, sensors, networks, …

Sharing always conditional: issues of trust, policy, negotiation, payment

Grid Topologies

- **Intragrid**

  Local grid within an organization

  Trust based on personal contracts

- **Extragrid**

  Resources of a consortium of organizations connected through a (Virtual) Private Network

  Trust based on Business to Business contracts

- **Intergrid**

  Global sharing of resources through the internet

  Trust based on certification

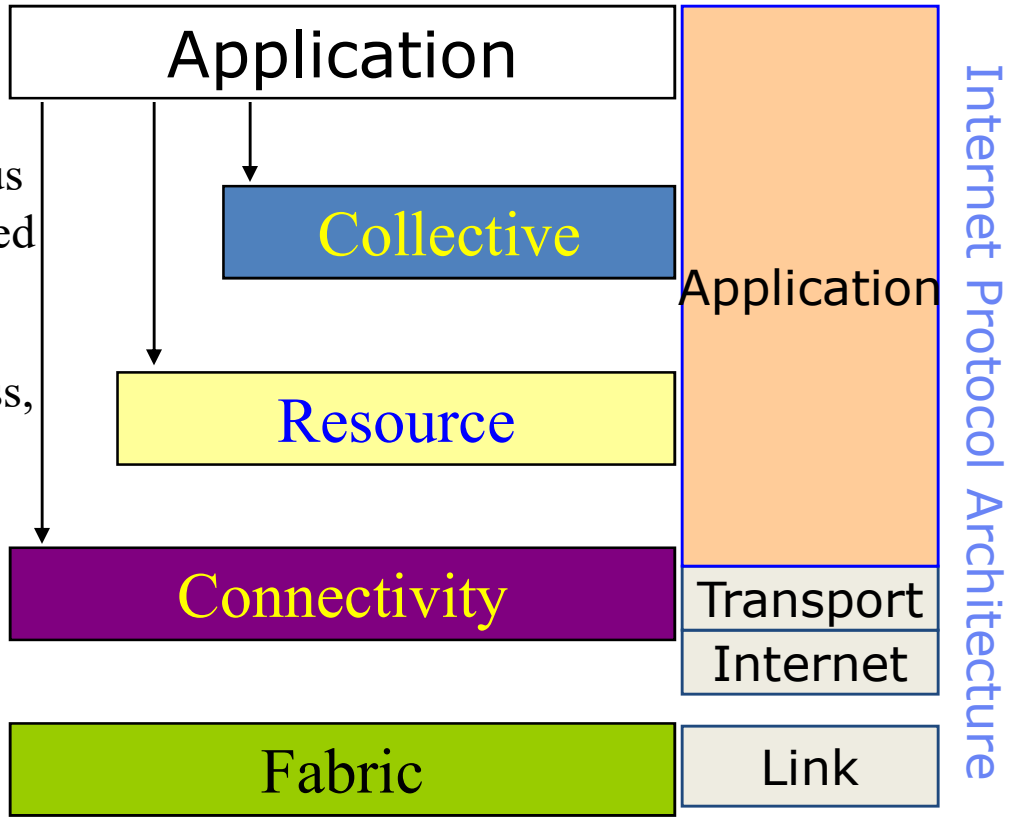
Layered Grid Architecture
(By Analogy to Internet Architecture)

"Coordinating multiple resources": ubiquitous infrastructure services, app-specific distributed services

"Sharing single resources": negotiating access, controlling use

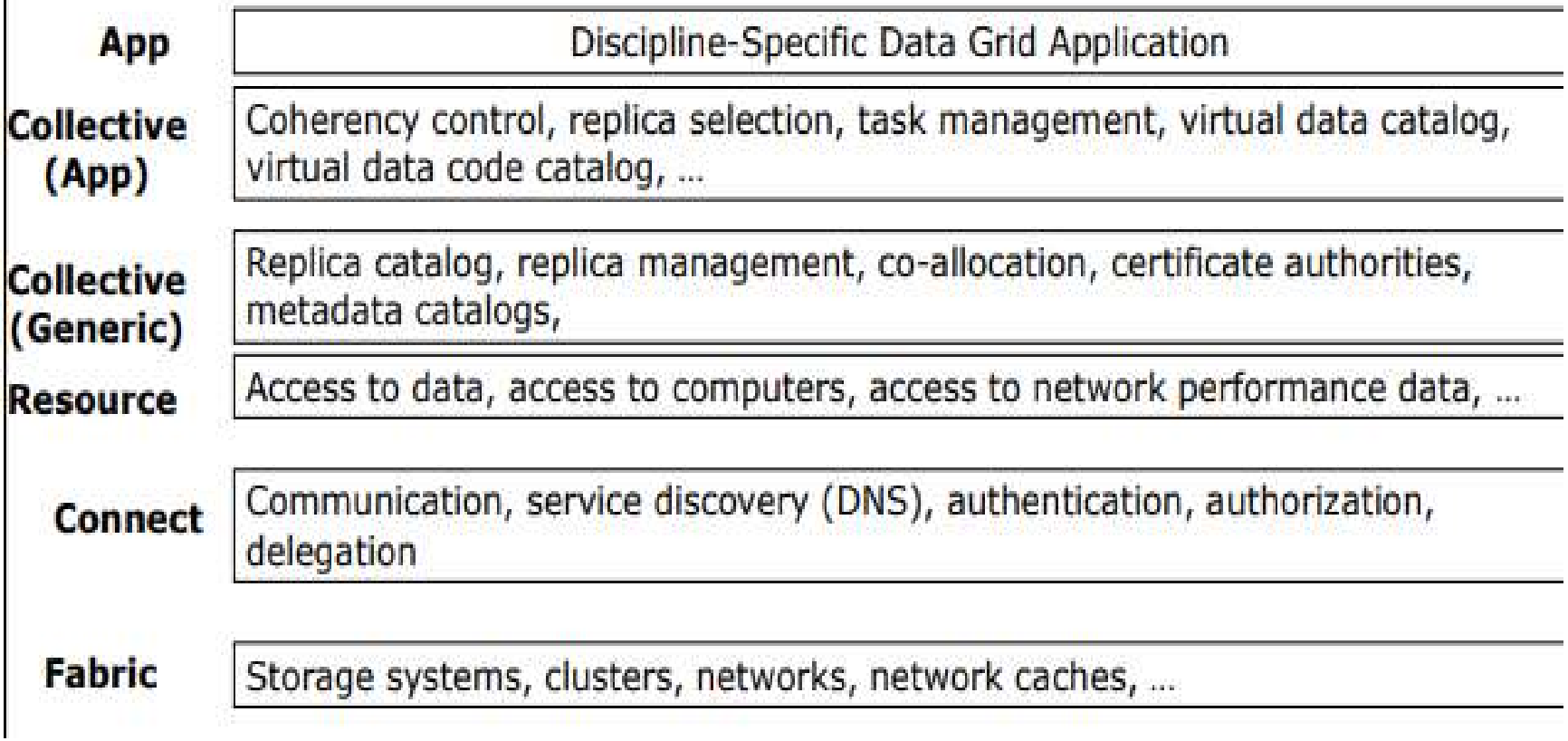
"Talking to things": communication (Internet protocols) & security

"Controlling things locally": Access to, & control of, resources

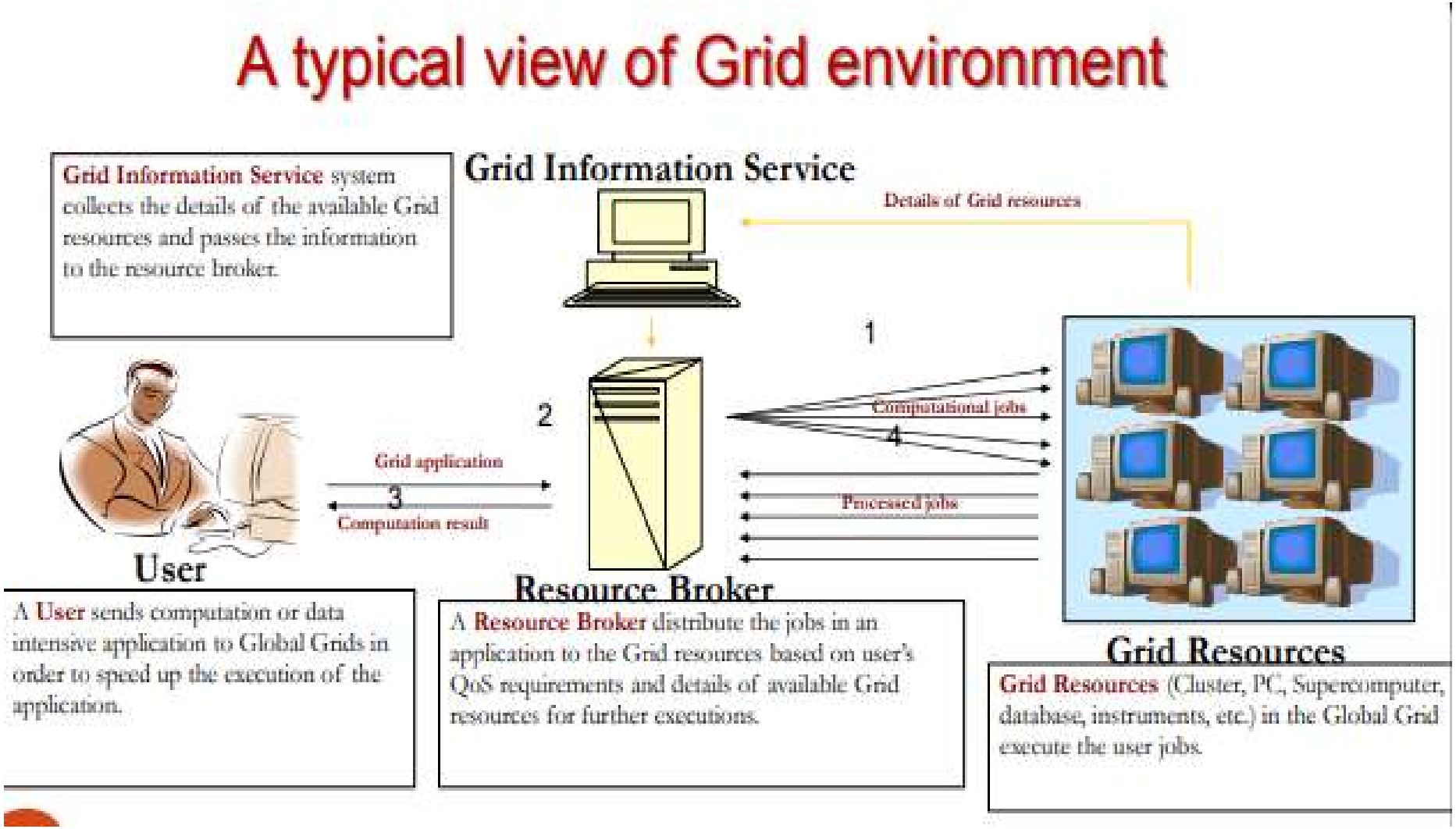


Grid Architecture - Example

Example:
Data Grid Architecture



An Example


A typical view of Grid environment
Grid Information Service system collects the details of the available Grid resources and passes the information to the resource broker.
Grid Information Service
Details of Grid resources
1
Computational jobs
2
4
Grid application
3
Computation result
Processed jobs
User
A User sends computation or data intensive application to Global Grids in order to speed up the execution of the application.
Resource Broker
A Resource Broker distribute the jobs in an application to the Grid resources based on user's QoS requirements and details of available Grid resources for further executions.
Grid Resources
Grid Resources (Cluster, PC, Supercomputer, database, instruments, etc.) in the Global Grid execute the user jobs.

Grid Computing Standards

a) OGSA (Open Grid Service Architecture):

Define a basic framework of a grid application structure. Architecture combines different aspects from grid computing with advantages from Web Services.

b) OGSA Services:

4 broad groups: i) Core Services ii) Data Services iii)Program Execution Services and iv) Resource Management Services.

c) OGSI (Open Grid Service Infrastructure):

OGSA defines a Grid Application and what a Grid Service should be able to do. OGSI specifies a Grid Services in detail

d) WSRF (Web Service Resource Framework):

WSRF is a derivative of OGSI. A first implementation -GT4 (Global Toolkit 4). WS-Resource approach to modeling and managing state in a Web services context

Elements of Grids

Grid computing combines **elements** such as **distributed computing, high-performance computing and disposable computing** depending on the application of the technology and the scale of operation.

Grids can create a **virtual supercomputer** out of the existing servers, workstations and personal computers.

Types of Grids

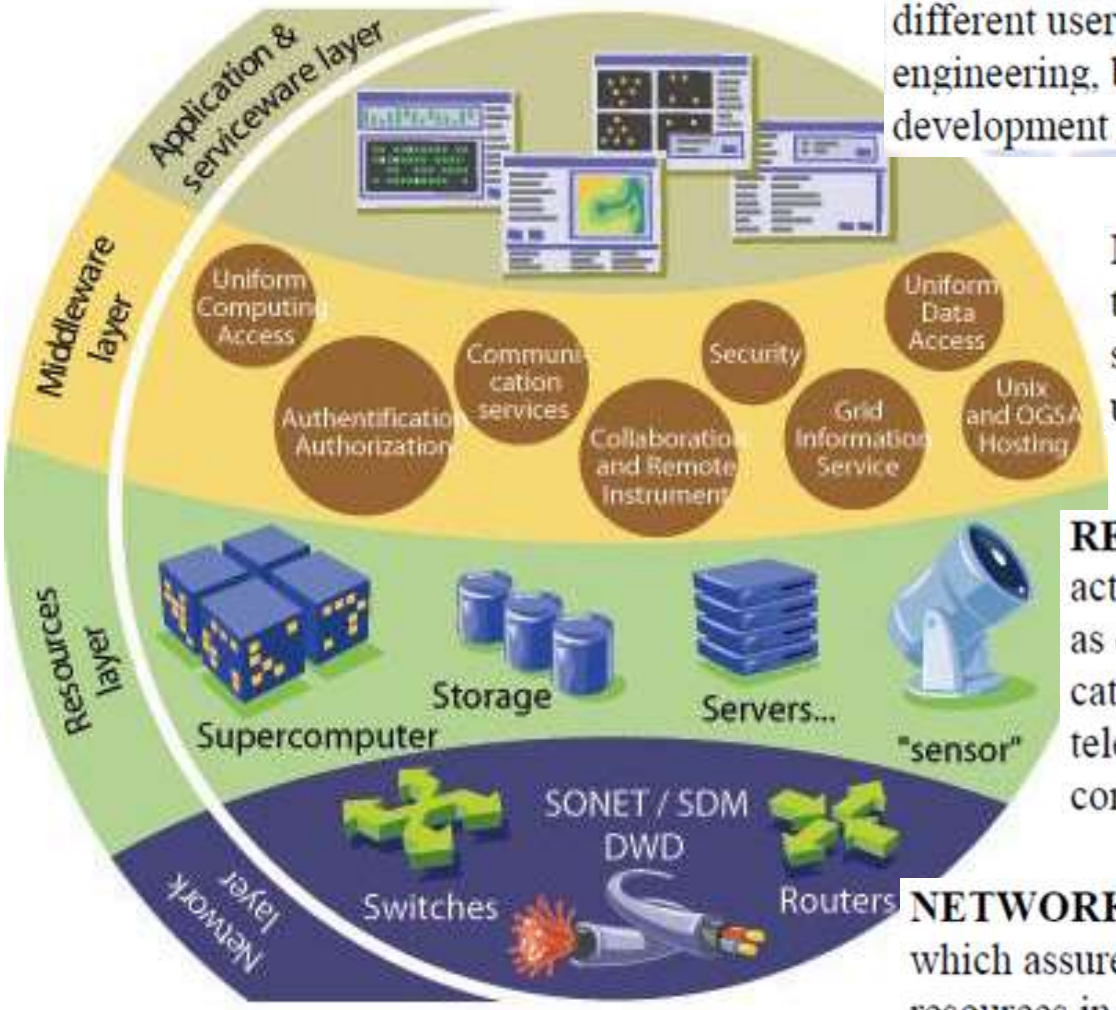
- **Computational grids**, in which machines will set aside resources to "number crunch" data or provide coverage for other intensive workloads

- **Scavenging grids,** commonly used to find and harvest machine cycles from idle servers and desktop computers for use in resource-intensive tasks

- **Data grids**, which provide a unified interface for all data repositories in an organization, and through which data can be queried, managed and secured.

- **Market-oriented grids,** which deal with price setting and negotiation, grid economy management and utility driven scheduling and resource allocation.

Overview of Grid Architecture



APPLICATION LAYER: In which includes different user applications (science, engineering, business, financial), portal and development toolkits-supporting applications.

MIDDLEWARE LAYER: It provides the tools that enable various elements (servers, storage, networks, etc.) to participate in a unified grid environment.

RESOURCE LAYER: It is made up of actual resources that are part of the grid, such as computers, storage systems, electronic data catalogues, and even sensors such as telescopes or other instruments, which can be connected directly to the network.

NETWORK LAYER: It is the bottom layer which assures the connectivity for the resources in the grid.

Main Characteristics of Grid

- **Large scale:** A grid must be able to deal with a number of resources ranging from just a few to millions.
- **Geographical distribution:** Grid resources may be spread geographically.
- **Heterogeneity:** A grid hosts both software and hardware resources that can be ranging from data, files, software components or programs to sensors, scientific instruments, display devices, personal digital organizers, computers, super-computers and networks.
- **Resource sharing and coordination:** Resources in a grid belong to different organizations that allow other organizations (i.e. users) to access them. The resources must be coordinated in order to provide aggregated computing capabilities.
- **Multiple administrations:** Each organization may establish different security and administrative policies under which resources can be accessed and used.
- **Accessibility attributes:** Transparency, dependability, consistency, and pervasiveness are attributes typical to grid resource access. A grid should be seen as a single virtual computing environment and must assure the delivery of services under established Quality of Service requirements.