Grid Computing
Unit - 1

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Introduction

- The innovative approach to computing can be compared with large **power “Utility” grid**.
- Grid computing openly seeks and is capable of **adding** infinite number of computing devices, adding the computing capability and problem resolution tasks.

Use case scenarios

- Financial Organizations
- Study of atmospheric ozone layer by scientists
- Online multiplayer game scenarios
- Studying natural disaster by Government

Grid Computing provides

- Highly scalable
- Highly secure
- Extremely high performance mechanisms

For discovering, negotiating access to remote computing resources in a seamless manner.

Grid computing utilities are available

“On Demand”

Definition

- “A Computational Grid is a hardware and software infrastructure that provides dependable, consistent, pervasive and inexpensive access to high end computational capabilities”

- There are open standards throughout the grid implementation, which also accommodate a variety of other open standards based protocols and frameworks.

Foundations of Grid Computing

- Coordinated Resources
  - Avoid Centralized control
  - Provide infrastructure for coordination based on policies and SLA
- Open Standards protocols & frameworks
  - Interoperability and integration facilities
  - Standards applied for resource discovery, access & Coordination
- Quality of Service (QoS)

Early Grid activities

- Derivatives of Grids
  - Compute Grids
  - Data Grids
  - Science Grids
  - Access Grids
  - Knowledge Grids
  - Cluster Grids
  - Tera Grids
  - Commodity Grids

Key value of Grid

- User Satisfaction

  Measured based on

  - Availability
  - Performance
  - Simplicity of access
  - Management aspects
  - Business values
  - Flexibility in pricing

Functional areas

- Data

  The Core functional data requirements for Grid computing applications are

  • the ability to integrate multiple distributed, heterogeneous and independently managed data sources

  • the ability to provide efficient data transfer mechanisms

  • the ability to provide data checking, replication mechanism to reduce network traffic

  • the ability to provide necessary data discovery mechanisms

  • the ability to implement data encryption and integrity checks

  • the ability to provide backup / restore mechanism

- Computation

  The core functional computational requirements for grid applications are

  • the ability to allow for independent management of computing resources

  • the ability to provide mechanisms that can be intelligently and transparently select computing resources

  • the understanding of current and predicted loads, resource availability, dynamic resource configuration and provisioning

  • Failure detection and Failover mechanisms

  • Ensure appropriate security mechanisms

Current Grid Activities

- **Virtual Organization**
  - This application concept of coordinated resource sharing includes any resource available within a virtual organization, including computing power, data, hardware, software and applications, networking services and any other forms of computing resource attainment
  - The virtual organizations manage their resources and typically will provision additional resources on an “as needed” basis

Requirements needed for Grid computing architectures utilized by virtual organizations

- Resource categories
  1. The need for dynamic discovery of computing resources
  2. The immediate allocation and provisioning of these resources
  3. The management of these resources to meet the required SLA’s
  4. The provisioning of multiple autonomic features like self diagnosis, self healing, self configuring and self management
  5. The provisioning of secure access methods

Requirements needed for Grid computing architectures utilized by virtual organizations

- Virtual Organizations must be capable of providing facilities
  1. The formation of virtual task forces or groups
  2. The dynamic collection of resources from heterogeneous providers
  3. The dynamic identification and automatic problem resolution
  4. The dynamic provisioning and management capabilities of resources
  5. The formation of secured federation and common management model
  6. The secure delegation of user credentials and identity mapping to the local domains
  7. The management of resources including utilizations and allocation to meet a budget and other economic criteria

Requirements needed for Grid computing architectures utilized by virtual organizations

- User applications must be able to perform
  1. The clear unambiguous identification of problem
  2. The identification and mapping of resources
  3. The ability to sustain the required level of QoS
  4. The capability to collect feedback regarding the resources

An Overview of Grid Business Areas

- Business benefits
  1. Acceleration of implementation time frames
  2. Improved productivity
  3. Allowing widely dispersed departments to create VO to share data
  4. Robust and infinitely flexible infrastructures
  5. Providing instantaneous access to massive computing and data resources
  6. Leveraging existing capital expenditures investments and operational expenditure investments
  7. Avoiding common pitfalls of over provisioning and incurring excess costs

Major Business areas

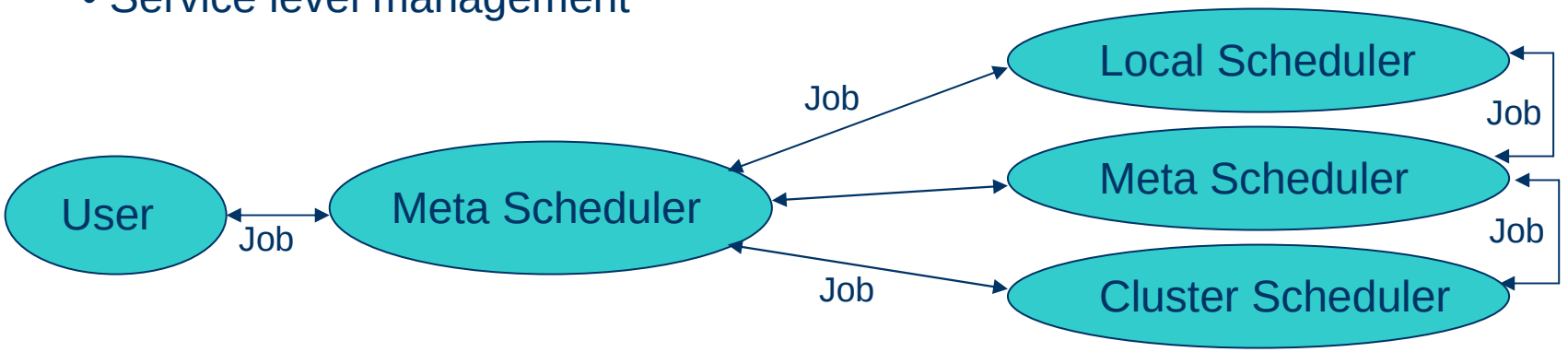
- Life sciences
- Financial services
- Higher education
- Engineering services
- Government
- Collaborative games

Grid Applications

- Schedulers
- Resource Brokers
- Load balancing
- Grid Portals
- Integrated Solutions

Schedulers

- Management of Jobs
  - Allocating resources
  - Partitioning of jobs
  - Data Management
  - Event Correlation
  - Service level management



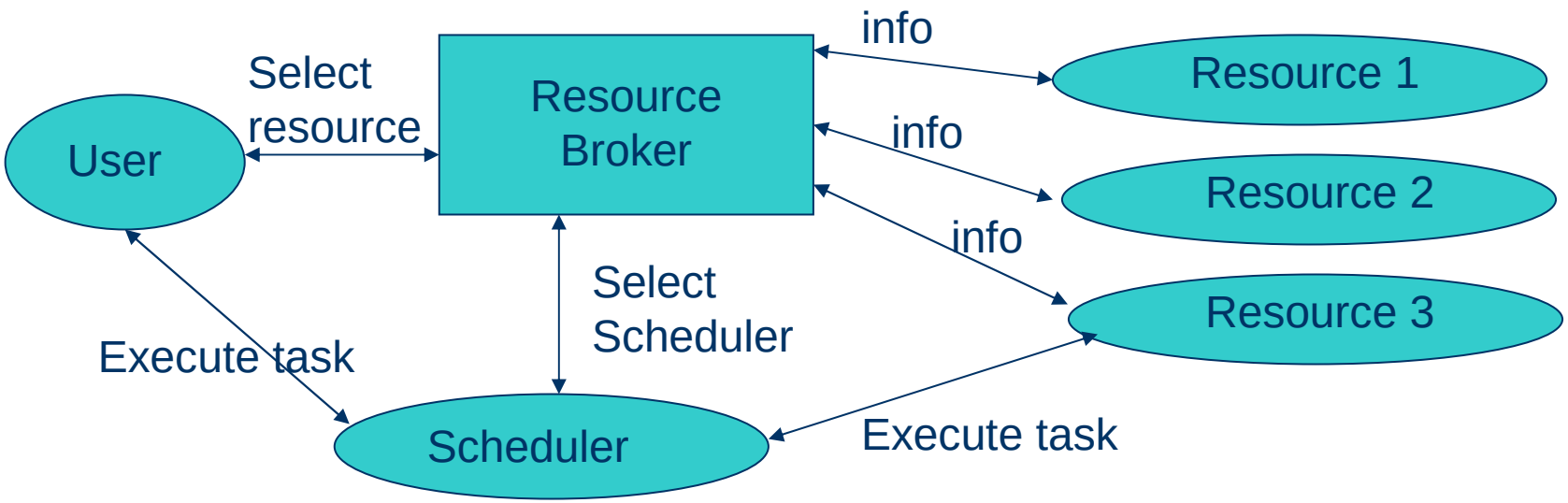
Schedulers

- Schedulers must provide capabilities for
  - Advanced resource reservation
  - SLA validation and enforcement
  - Job and resource policy Management and enforcement for best turnaround times
  - Monitoring job executions and status
  - Rescheduling and corrective actions of partial failover situations

Resource Broker

- Provides pairing services between service requesters and service providers
- Pairing enables the selection of best available resources from service provider
- The resource brokers collect information and use this in pairing process (info. – resource availability, usage models, capabilities and pricing info)

Resource Broker



Load Balancing

- Avoid processing delays, commitment of resources
- Failure detection and management

Grid Portals

- Similar to Web portals
- Personalized Graphical user interface

THANK YOU