Distributed object technologies

Introduction

Who Am I?

Gleb Radchenko

- Ph.D. in Physics and Mathematics
- Dean of the Faculty of Computational Mathematics and Informatics
- Associate Professor of System Programming Department

Syllabus and grade

- 18 lectures
- 9 labs
- Attestation:
  - All Labs (20 points)
  - Intermediate tests (10 points)
  - Exam Test (70 points)
  - Report (20 additional points max)
- Tests, Lectures, Labs, Additional materials:
  - http://edu.susu.ru/

Mark	Grade
2 (bad)	0-50
3 (satisfactory)	50.01-65
4 (good)	65.01-75
5 (excellent)	75.01-100

Reports

- You can prepare and provide a 20-30 min. report on a topic of Distributed Computing Systems.
- It would give you additional grade (20 points)
- Topics:
  - Amazon Elastic Compute Cloud Platform: architecture, offered capabilities.
  - Microsoft Azure Platform: architecture, offered capabilities.
  - Google Cloud Platform: architecture, offered capabilities.
  - A technology of Internet computing. BOINC platform.
  - Windows Communication Foundation Platform: architecture, examples of the development of service-oriented applications.
- To assign for a report you should:
  - Define a topic in the Report topics forum
  - Define a date of your report in the Reports calendar

The main topics of the course

1. Fundamentals of Distributed Computing Systems
2. Multi-tier client-server architecture
3. Organization of interaction of distributed systems
4. Service-oriented architecture (SOA)
5. Cloud computing

References

- **A. Tanenbaum, M. van Steen.** Distributed systems. The principles and paradigms.
- **Robert Daigneau.** Service Design Patterns: Fundamental Design Solutions for SOAP/WSDL and RESTful Web Services. Addison-Wesley Professional, 2011. 352 p. http://books.google.ru/books?id=wljJZbEO8ZQC
- **Paul Butcher.** Seven Concurrency Models in Seven Weeks: When Threads Unravel.

Fundamentals of Distributed Computing Systems

Definition 1

"**A distributed system** is one in which the failure of a computer you didn't even know existed can render your own computer unusable"

Leslie Lamport,

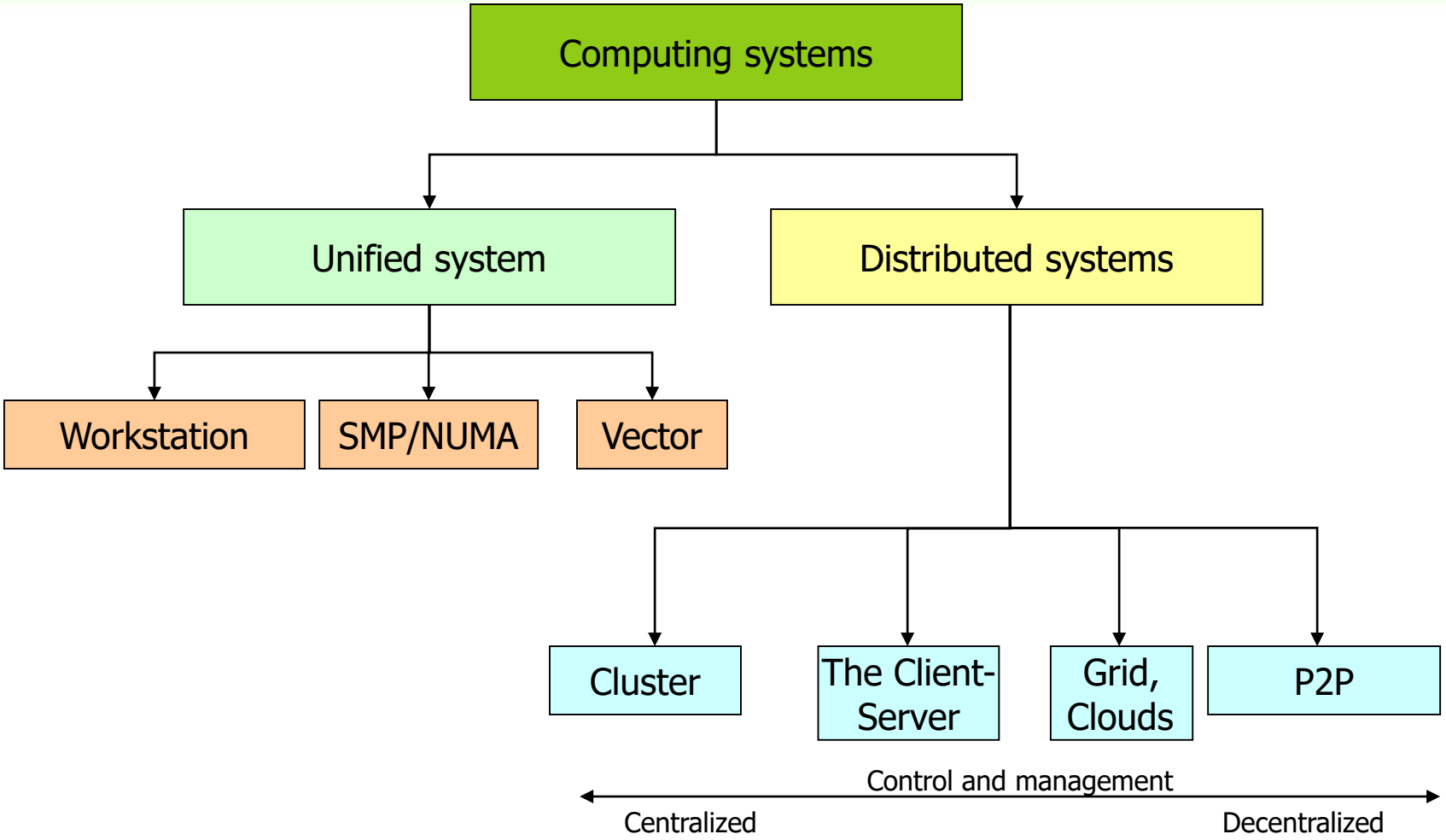
28 May 1987, in letter about electrical problem in the machine room
(Systems Research Center of DEC)

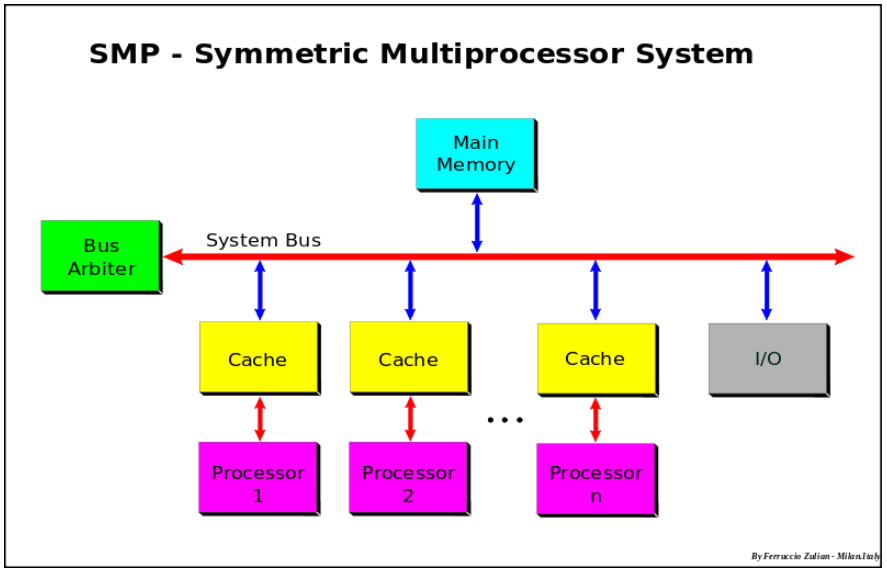
Definition 2

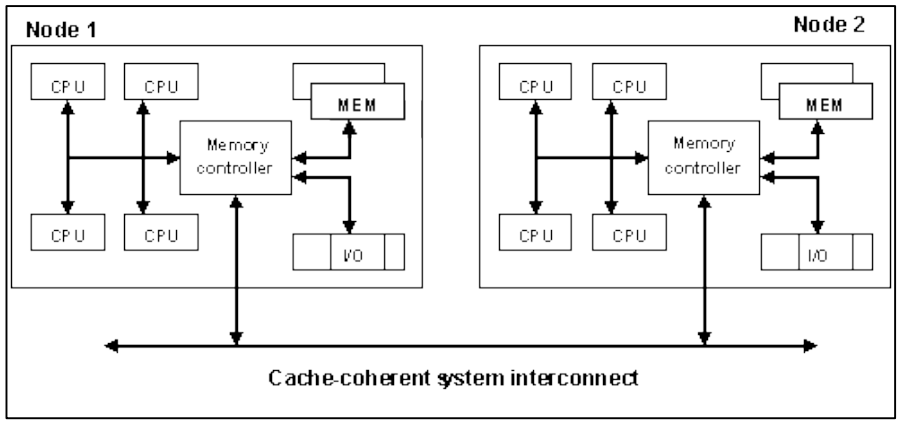
"**A distributed system** is a collection of independent computers that appears to its users as a single coherent system"

Andrew Tanenbaum

Types of computer systems





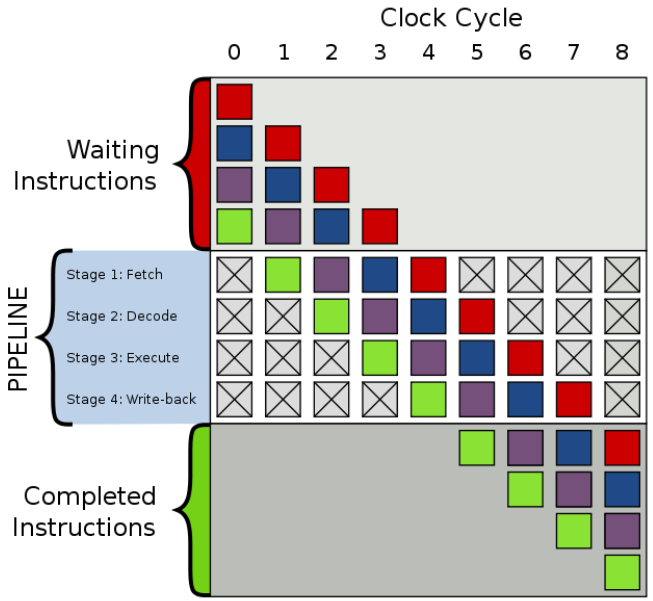


Non-uniform memory access (NUMA) is a computer memory design used in multiprocessing, where the memory access time depends on the memory location relative to a processor.

wikipedia

VECTOR COMPUTING

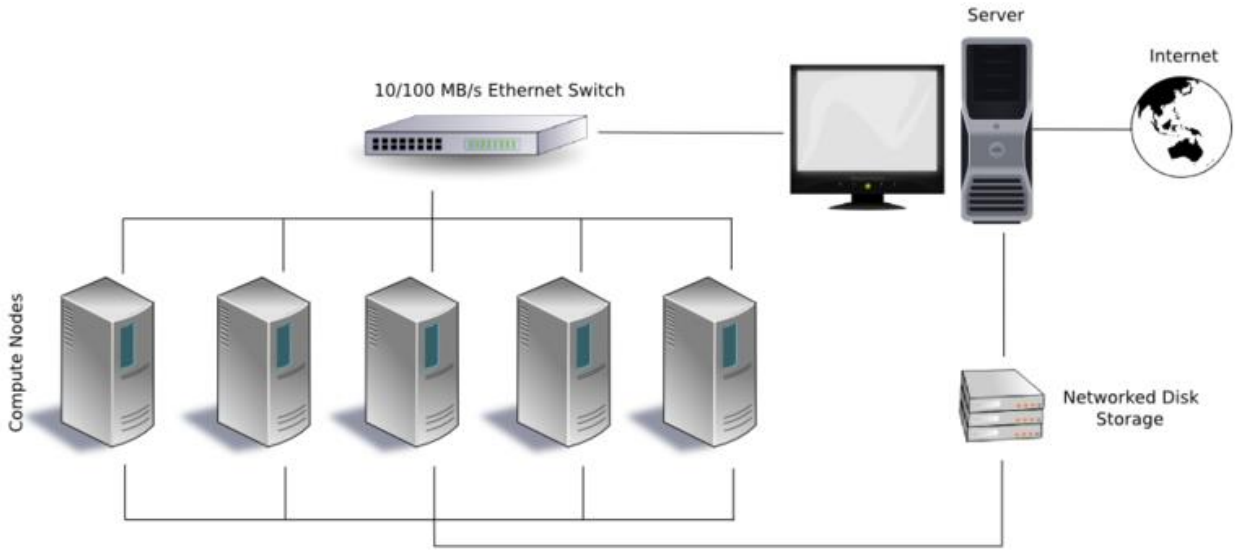
- A vector processor (array processor) implements an instruction set containing instructions that operate on one-dimensional arrays of data called vectors.



- Vector processors can greatly improve performance on certain workloads, notably numerical simulation and similar tasks.
- Vector machines appeared in the early 1970s and dominated supercomputer design through the 1970s into the 90s, notably the various Cray platforms. The rapid rise in the price-to-performance ratio of conventional microprocessor designs led to the vector supercomputer's demise in the later 1990s.

wikipedia

CLUSTER



A **computer cluster** consists of a set of loosely connected or tightly connected computers that work together so that in many respects they can be viewed as a single system.

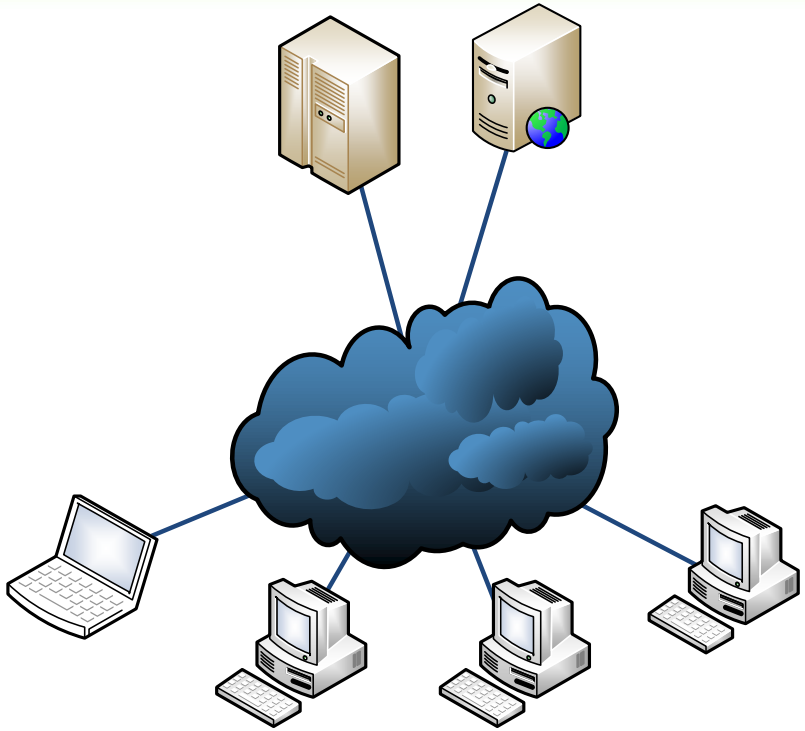
The components of a cluster are usually connected to each other through fast local area networks, with each node (computer used as a server) running its own instance of an operating system. Computer clusters emerged as a result of convergence of a number of computing trends including the availability of low cost microprocessors, high speed networks, and software for high performance distributed computing.

wikipedia

TORNADO SUSU
COMPUTING CLUSTER

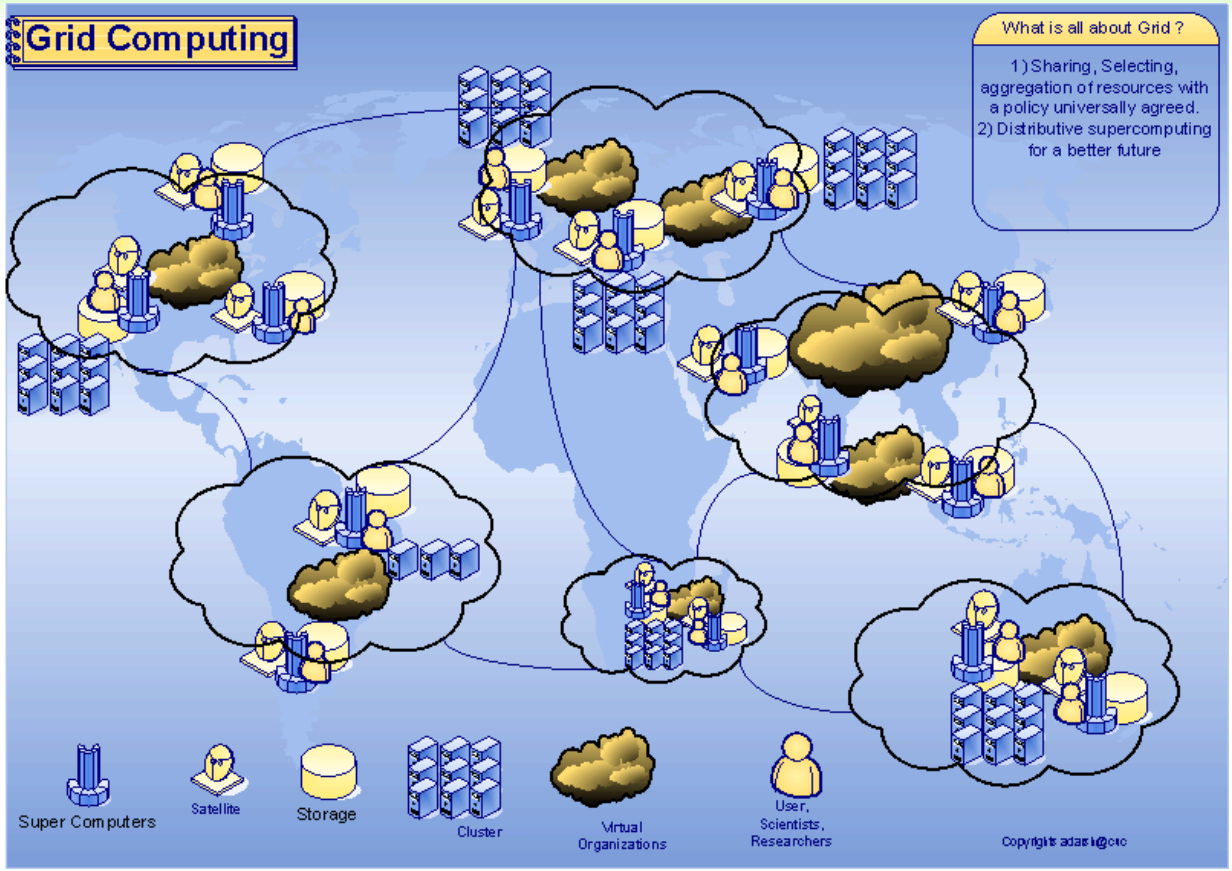
TORNADO SUSU
COMPUTING NODE

Client-Server



The client–server model is a distributed application structure in computing that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients

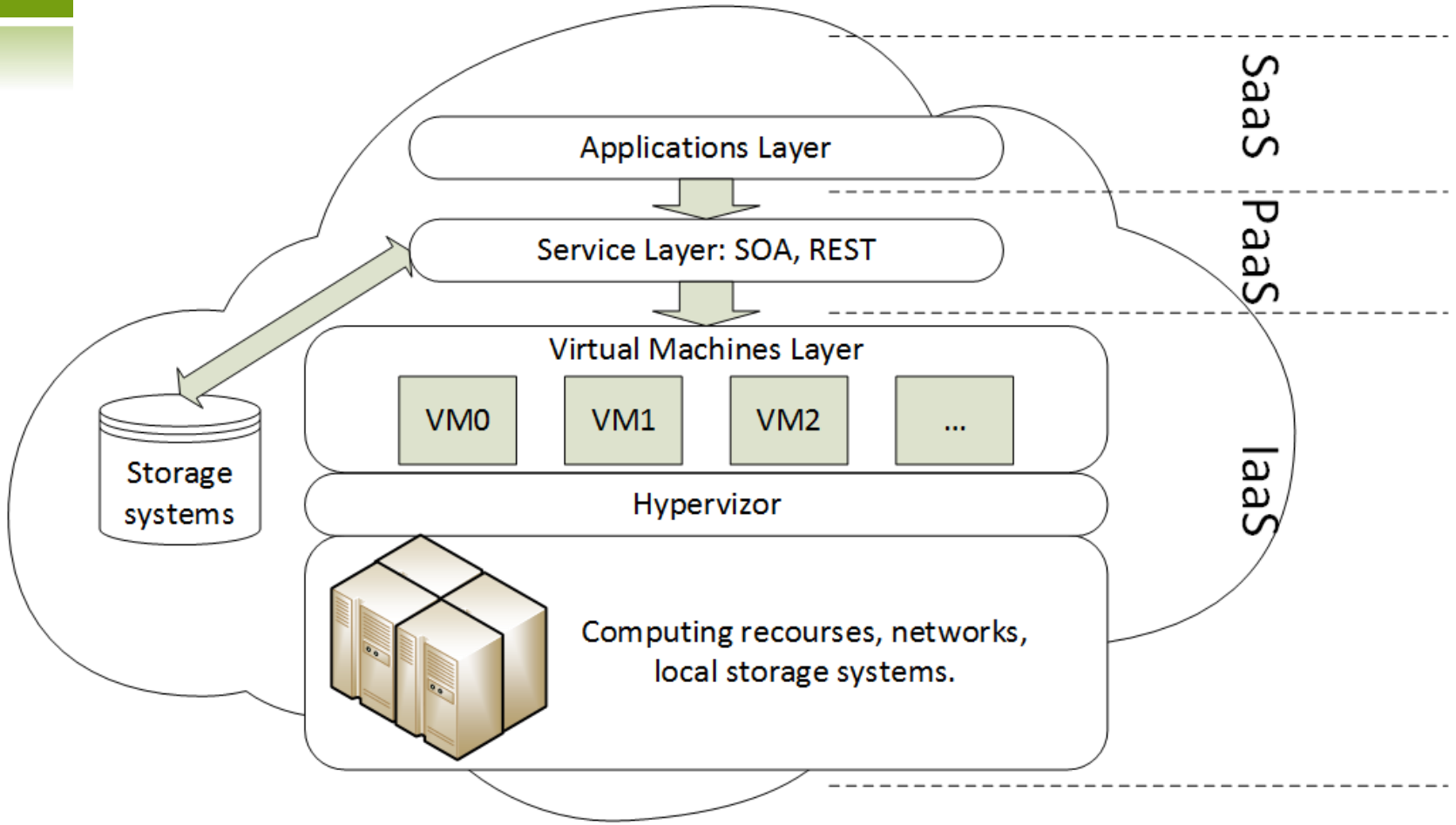
Grid computing



Grid Computing - Availability and use of computing power in a way analogous to the provision of water and electricity in modern utility grids

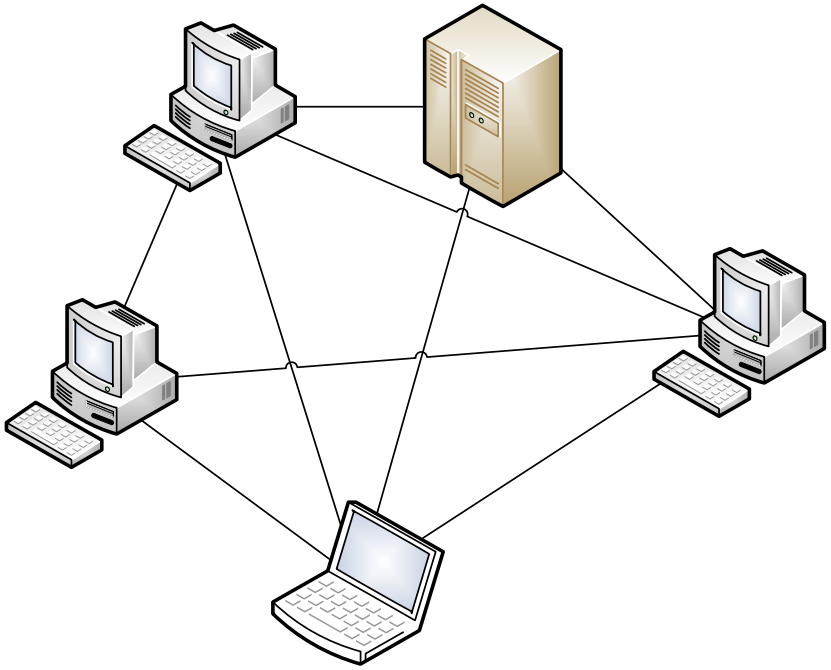
Adarsh Grid Computing Research http://www.adarshpatil.com/newsite/research.htm

Cloud computing



Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

P2P COMPUTING



A **peer-to-peer (P2P)** network is a type of decentralized and distributed network architecture in which individual nodes in the network (called "peers") act as both suppliers and consumers of resources, in contrast to the centralized client–server model where client nodes request access to resources provided by central servers.