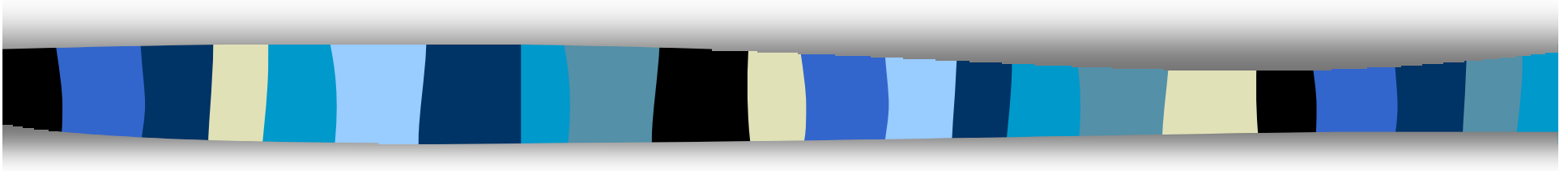# SYSTEM MODELS

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2.1 Introduction

- Systems that are intended for use in real world environments should be designed to function correctly in the widest possible range of circumstances and in the face of many possible difficulties and threats (widely varying modes of use, wide range of system environments, internal problems, external threats)

2.2 Architectural Models

- The architecture of a system is its structure in terms of separately specified components. The overall goal is to ensure that the structure will meet present and likely future demands on it. Major concerns are to make the system reliable, manageable, adaptable and cost-effective.

2.2.1 Software Layers

Applications, Services

Middleware

Operating System   Platform

Computer and Network Hardware

2.2.2 System Architectures

- ## Client-Server Model
  - The simple structure in which client processes interact with individual cerver processes in separate host computers in order to access the shared resources that they manage.
- ## Services provided by multiple servers
- ## Proxy servers and caches
- ## Peer processes

2.2.3 Variations on the client-server model

- Mobile code
- Mobile agents
- Network computers
- Thin clients
- Mobile devices and spontaneous networking
- The X-11 window system

2.2.4 Interfaces and objects

- The set of functions available for invocation in a process (whether it is a server or a peer process) is specified by one or more *interface definitions*. In object oriented language, distributed processes can be constructed in a more object oriented manner. Many objects can be encapsulated in server or peer processes, and references to them are passed to other processes so that their methods can be accessed by remote invocation.

2.2.5 Design requirements for distributed architectures

The factor motivating the distribution of objects and processes in a distributed system are numeroues and their significance is considerable.

- Performance issues
- Quality of service
- Use of caching and replication
- Dependability issues

2.3 Fundamental Models

- Interaction: Delays, accuracy, difficulty of maintaining

- Failure: The Correct operation of a distributed system is threatened whenever a fault occurs in any of the computers on which it runs or in the network that connects them.

- Security: The modular nature of distributed systems and their openness exposes them to attack by both external and internal agents.

2.3.1 Interaction model

- Performance of communication channels
- Computer clocks and timing events
- Two variants of the interaction model
- Event ordering
- Agreement in pepperland

Failure Model

- Omission failures
- Failure detection
- Impossibility of reaching agreement in the presence of failures
- Arbitrary failures
- Timing failures
- Masking failures
- Reliability of one-to-one communication

Security model

- Protecting objects
- Securing processes and their interactions
- The enemy
- Defeating security threats
- Other possible threats from an enemy
- The uses of security models