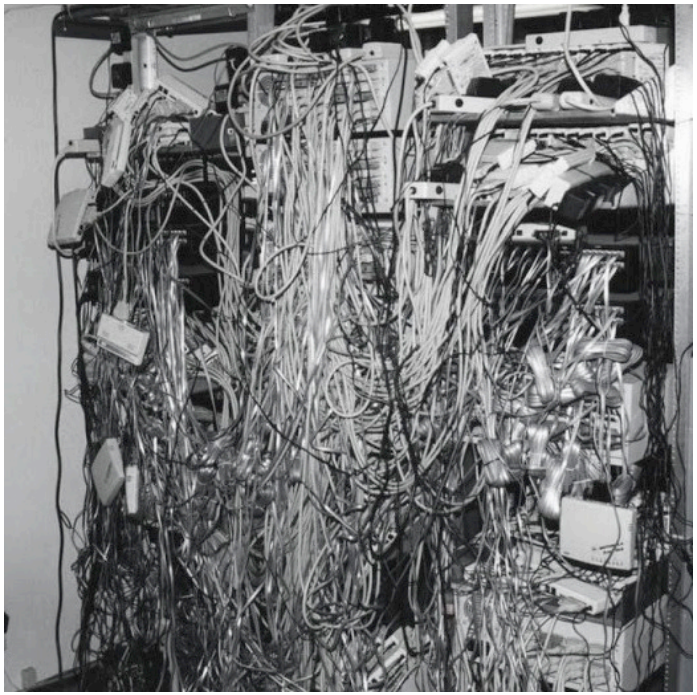

Distributed Real Time Systems

Part 1: Real Time Environment

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Overview

- Describing the environment of real-time computer systems from various perspectives
- Definition of a real-time system with discussion of functional and metafunctional requirements
- Emphasis on temporal requirements derived from control applications; satisfying performance criteria in control applications; quality of control
- Difference between hard and soft real-time systems
- Soft real-time systems may follow a less rigorous design approach, accepting failure under peak load conditions due to economic arguments
- In hard real-time systems failure is unacceptable; safety of a design under all circumstances must often be demonstrated to a certification agency
- Automobiles as assembly of many dedicated real-time systems

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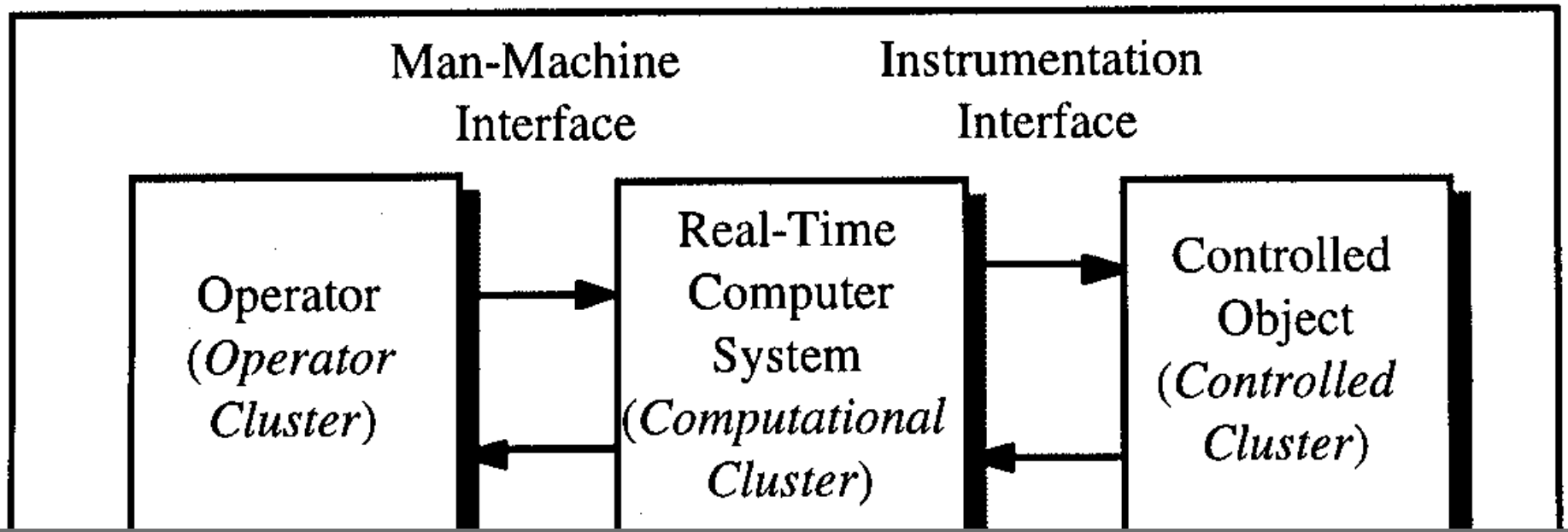
When is a Computer System Real-Time?

A real-time computer system is a computer system in which the correctness of the system behavior depends not only on the logical results of the computations, but also on the physical instant at which these results are produced

A real-time computer system is always part of a larger system, the real-time system.

We decompose a real-time system into a set of subsystems called clusters.



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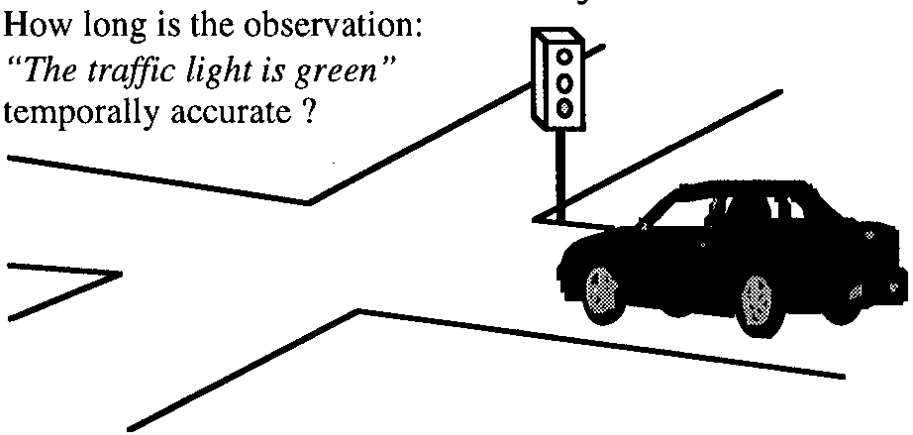
When is a Computer System Real-Time?

A distributed real-time computer system consists of a set of computer nodes interconnected by a real-time communication network.



A real-time computer system must react to stimuli from the controlled object or operator within time intervals dictated by the environment. The instant at which the result must have been produced is called a deadline.

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Soft deadline: result has some utility passed this instant in time.
Firm deadline: result has no or very little utility past this instant in time.
Hard deadline: catastrophic failure when result is produced past this instant in time.
Hard real-time computer system or safety-critical real-time computer system:

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