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Using Replication to Build High Performance Distributed Systems

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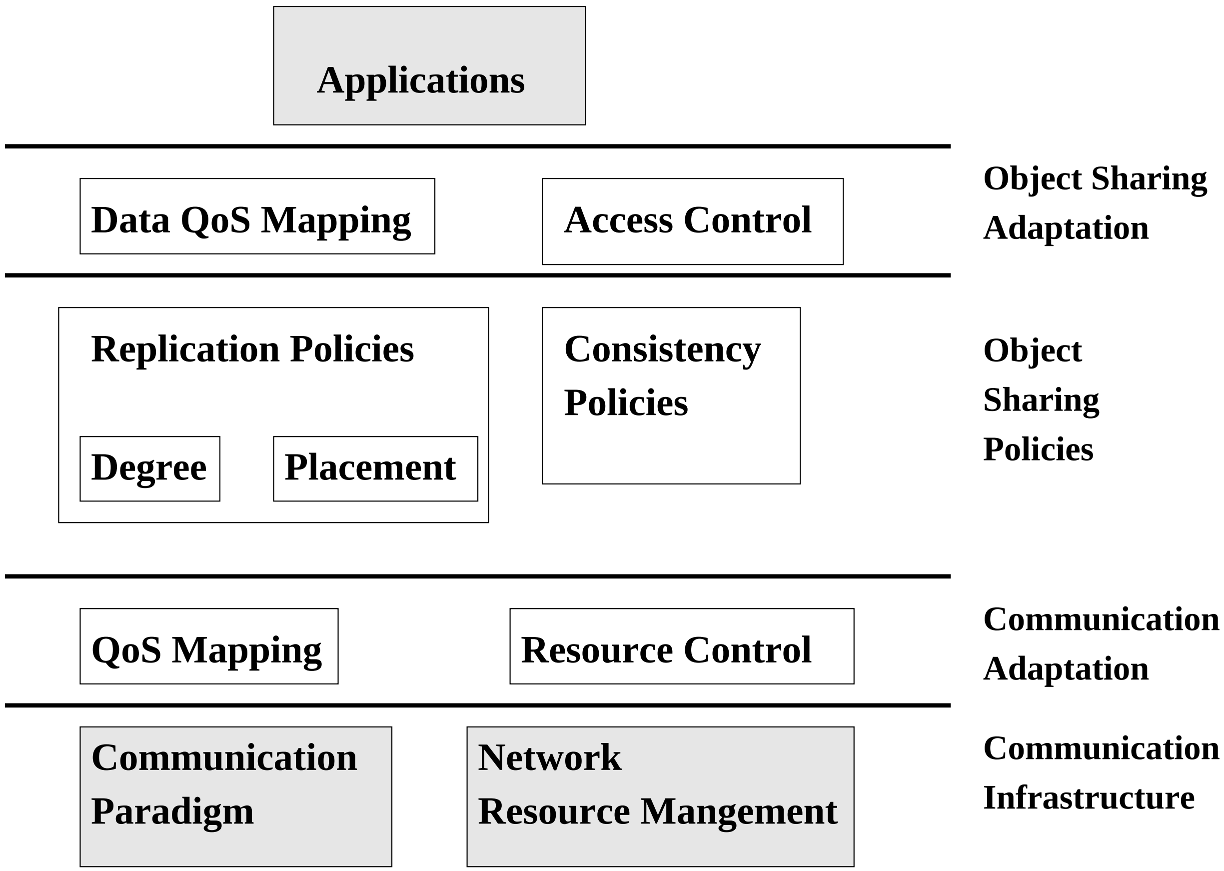
Replication in High Performance Distributed Object Systems

- Replication at server nodes
  - Improved availability
  - Better load distribution
- Replication at clients (e.g., client caching)
  - Reduced latency
  - Locality of access leads to reduced communication and software overhead

Managing Replicated Objects

- Flexible notions of consistency
  - Precise model for characterizing various levels of consistency
  - Strong and causal consistency models
- Scalable consistency maintenance algorithms
  - Lifetime based mutual consistency scheme
  - Processing and communication overheads only depend on local accesses
- Effective communication support
  - Scalable multicast communication

System Architecture



Catamaran: A Prototype System

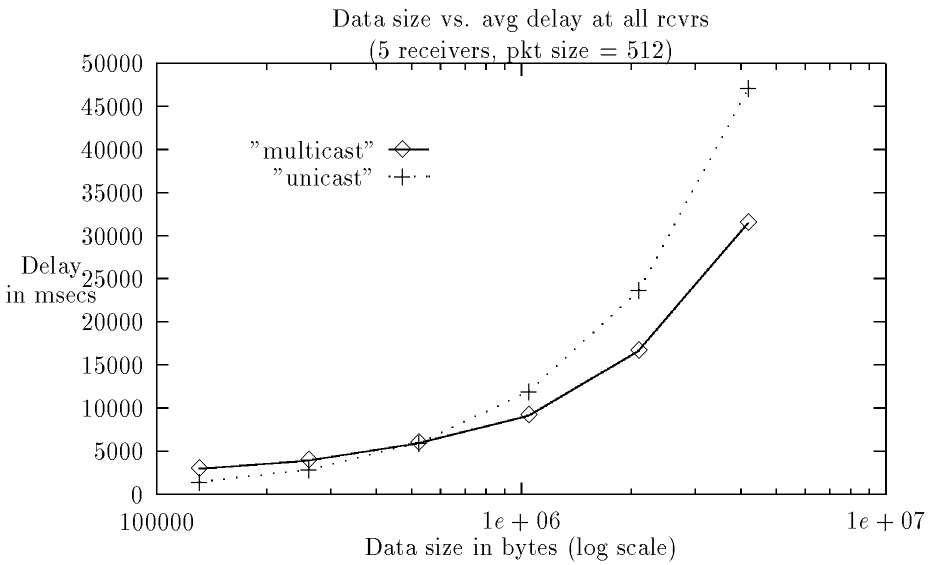
- A replicated distributed object system
  - Based on Fresco/SunOS
  - Provides CORBA compliant objects
  - Enhanced by addition of a replication framework
  - Matches application requirements by supporting multiple levels of consistency
- Scalable multicast
  - A reliable multicast transport protocol
  - A novel single connection emulation architecture

Preliminary Performance Measurements

- Object Invocations

Null RPC	30.6 msecs
Proxy Invocation	31.8 msecs
Method invocation on a cached object	0.54 msecs
Invalidating an existing object	24.2 msecs
Validating a cached object	87.5 msecs

Communication Subsystem Performance



Current and Planned Work

- Integration of replication framework with communication subsystem
- Evaluation using *Distributed Laboratories* applications
- Mechanisms for building efficient object systems
- Replication and commercial ORB and object services