Adaptive COTS Middleware for Distributed & Embedded Real-time Mission-Critical Systems

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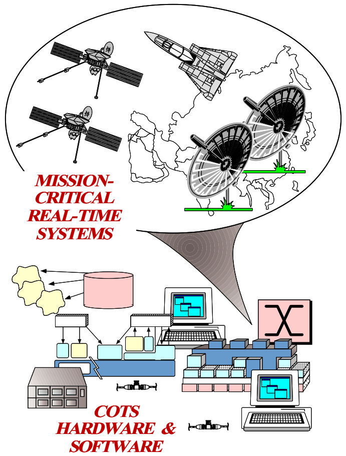
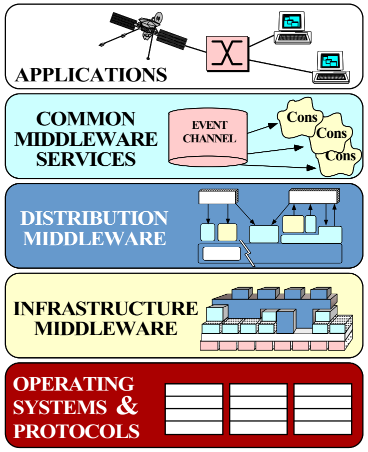
Motivation: the COTS Hardware & Software Crisis



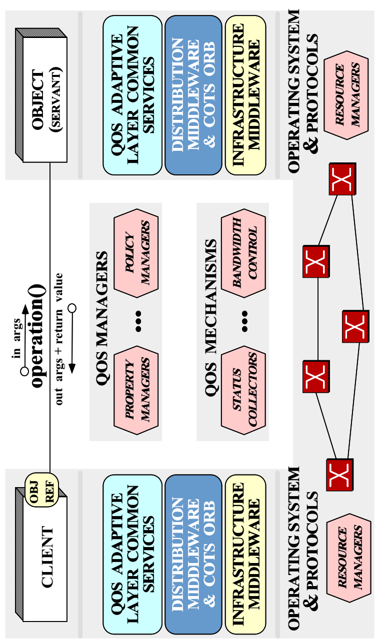
- **Context**
  - Adopting ***COTS hardware & software*** is increasingly essential for real-time mission-critical systems
- **Problems**
  - ***Inherent*** and ***accidental*** complexity
  - ***Integration*** woes
- **Solution Approach**
  - ***Standards-based adaptive COTS middleware***

Problem: Lack of QoS Support in COTS Middleware



- Many applications require QoS guarantees
  - *e.g.*, avionics, telecom, WWW, medical, high-energy physics
- Building these applications manually is hard
- Existing middleware doesn't support QoS effectively
  - *e.g.*, CORBA, DCOM, DCE, Java
- Solutions must be integrated horizontally & vertically

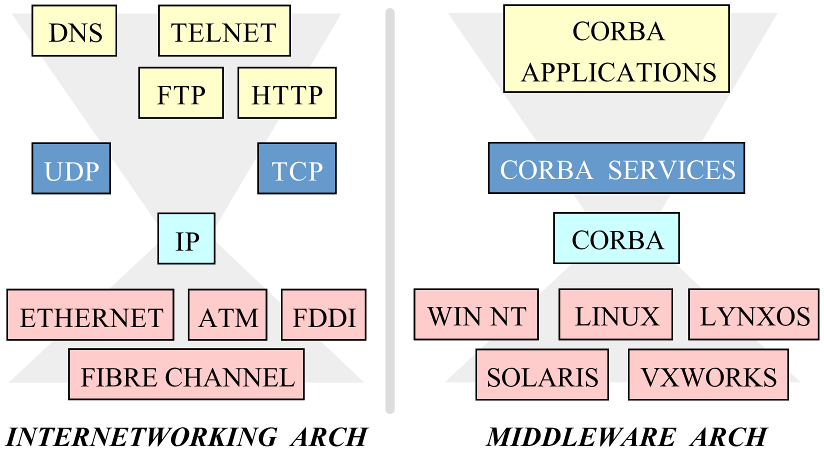
Solution Approach: Adaptive Middleware



Key Themes

- Decouple *functional* path from *QoS* path
- Emphasize integration and configuration

Long-term Vision: Establish Vibrant Middleware Research Community



Concluding Remarks

- Researchers and developers of distributed and embedded real-time mission-critical applications confront many common challenges
  - *e.g.*, service initialization and distribution, error handling, flow control, scheduling, event demultiplexing, concurrency control, persistence, fault tolerance
- Successful researchers and developers apply *patterns*, *frameworks*, and *components* to resolve these challenges
- Careful application of patterns can yield efficient, predictable, scalable, *and* flexible middleware
  - *i.e.*, middleware performance is largely an "implementation detail"
- Next-generation adaptive middleware will be highly QoS-enabled, though many research challenges remain