Performance Engineering of Distributed E-Business Systems - Bridging the Gap between Theory and Practice

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Motivation

- Modern e-business systems gaining in size and complexity

- A number of competing e-business platforms on the market (e.g. MS .NET vs. J2EE-based application servers, such as BEA WebLogic, IBM WebSphere, Oracle AS 10g, JBoss, Sun ONE, Borland Enterprise Server, Sybase EAServer, etc)

- System architects/deployers faced with questions such as:
    - Which deployment platform would provide the best scalability and cost/performance ratio for a given project?
    - Are there potential hardware or software bottlenecks?
    - How much hardware resources (servers, CPUs, memory, etc) are needed to meet service-level agreements?
    - For a given deployment, what would be the avg. response time, throughput and utilization under the expected workload?

Roadmap

- Design and develop realistic workloads for performance and scalability analysis of e-business platforms, i.e. benchmarks
- Exploit mathematical performance models for performance prediction and capacity planning
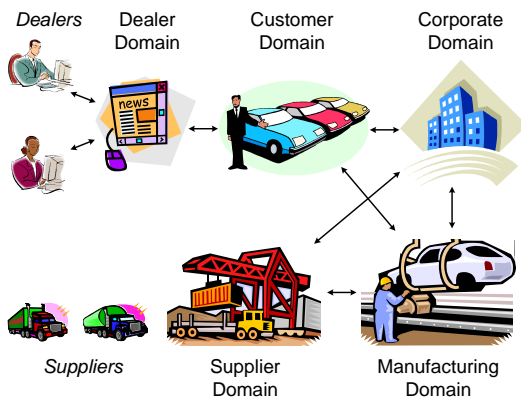
Benchmarking E-Business Platforms

- Active participation in SPEC's OSG Java Subcommittee:

    IBM   Sun microsystems   intel.   TECHNISCHE UNIVERSITÄT DARMSTADT   bea

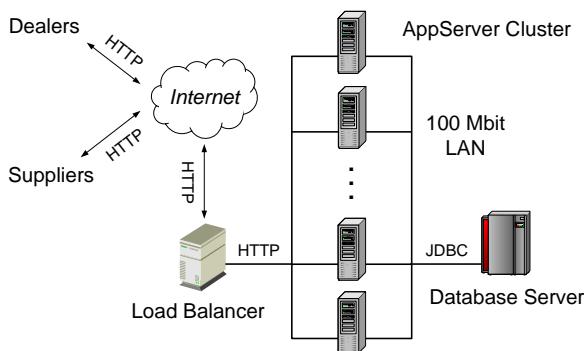   Borland   SYBASE   ORACLE   hp invent   PRAMATI

- Design and development of industry-standard benchmarks for measuring the performance and scalability of J2EE application servers (SPECjAppServer2001/2002 and SPECjAppServer2004)

Business Domain

Dealers — Dealer Domain — Customer Domain — Corporate Domain

Suppliers — Supplier Domain — Manufacturing Domain

Deployment

Performance Modeling

- Exploit Queueing Network and Queueing Petri Net (QPN) models
- Model analysis through analytical and simulation techniques
- Main contributions:
    - Modeling of realistic distributed e-business applications (ECperf, TPCW, SPECjAppServer2001, SPECjAppServer2002 and SPECjAppServer2004)
    - Exploiting Queueing Petri Nets for integration of hardware and software aspects of system behavior into the same model. Modeling of simultaneous resource possession, blocking, synchronization, asynchronous processing and software contention
    - Analysis of Queueing Petri Net models by means of simulation to circumvent the state-space explosion problem (SimQPN)