Using CORBA for Automated Stock Trading

Carlos O’Ryan
CTO
Automated Trading Desk, LLC
Background

● ATD is a wholesale execution services company
  ● An online or full service broker provides retail execution services

● ATD is fully automated
  ● 99.9% of our trades are handled without human intervention

● We are a single stop shop for all US equities
  ● In early 2006 we approximately executed 6% of Nasdaq, 5% of NYSE, 10% of AMEX, by volume
Background
Where does ATD use CORBA?

- ATD uses CORBA in its Order Management System (OMS)
- This is the system responsible for:
  - Receiving orders from our customers
  - Enforcing market regulations
  - Implementing risk controls
  - Communicating with the markets to place, monitor and cancel orders
  - Keep track of the company’s inventory
Key requirements (1/2)

- The OMS must have adequate performance
  - We estimate that 40 msecs can cost hundreds of thousands of dollars in lost opportunity
  - We need to process millions of messages per day
  - With peaks in the 3000 msgs/second
  - The good news is that the problem parallelizes well
Key Requirements (2/2)

- The system cannot fail
  - Every crash can be directly mapped to monetary losses
  - And, more importantly, loss of good will
- The system cannot drop customer messages
  - But it can timeout orders to the market
  - ATD assumes risk when that happens
- The users of the system should not need to speak CORBA
Monitoring the Health of the System

- The system needs to detect process termination and crashes
  - Each node runs one process to monitor existing applications
  - Nodes monitors gossip information using a modified event channel
- This event channel uses:
  - Standard timeouts to detect crashed consumers
  - SyncScope to control how oneway messages are delivered
Delivering customer messages

- To guarantee that all customer messages are delivered we use a modified event channel
  - With persistent message semantics
- We are exploring the use of DDS as an alternative to our custom message delivery
  - Partially through frustration with multicast failure modes
Internal OMS communication

- The OMS uses regular CORBA calls for most of its communication
  - Interestingly, all the calls in the critical path use AMI to improve parallelism
- The OMS also uses SyncScope extensions to control message buffering
Load balancing external links

- External links to the markets are load balanced to improve throughput and latency.
- The load information is propagated through the event channel with multicast extensions.
- The load decisions reside in the client.
  - We would like to use a service for this.
Failover mechanisms (1/2)

- We use multiple network cards for network redundancy
- The ORB creates multiple profiles to failover the link if necessary
  - But we have found that bonding the networks is easier to manage!
Failover mechanisms (2/2)

- To continue trading after a process or machine crash we use:
  - The object monitor to detect the crash
  - Master-slave replication to failover
- But the failover is implemented using smart pointers in the client
  - Basically our ORB did not have mature fault-tolerance features
Questions?

• You can reach me later for other questions at:
  • coryan@atdesk.com

• Automated Trading Desk, LLC (ATD) is the sole owner of Automated Trading Desk Brokerage Services, LLC (ATDB) and Automated Trading Desk Financial Services, LLC (AUTO), both NASD members and Members SIPC. ATD does not offer any brokerage services and is not a NASD member. All brokerage services, trading functions, execution of order flow and related matters are performed through ATDB and AUTO utilizing ATD's proprietary technology and software. Any reference to ATD trading, ATD trading services, ATD trading performance, ATD orders, we, us, our or other such usage refers to the services and trading activities of ATDB and AUTO utilizing ATD's proprietary technology and software. Periods of market volatility or other system delays may adversely affect trade execution and related services.