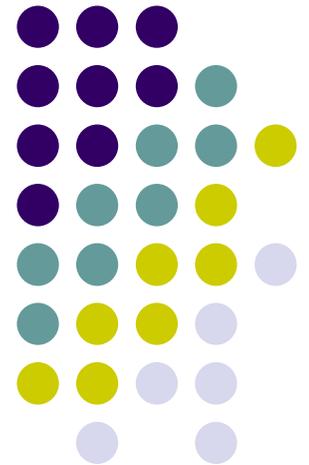# Using CORBA for Automated Stock Trading

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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

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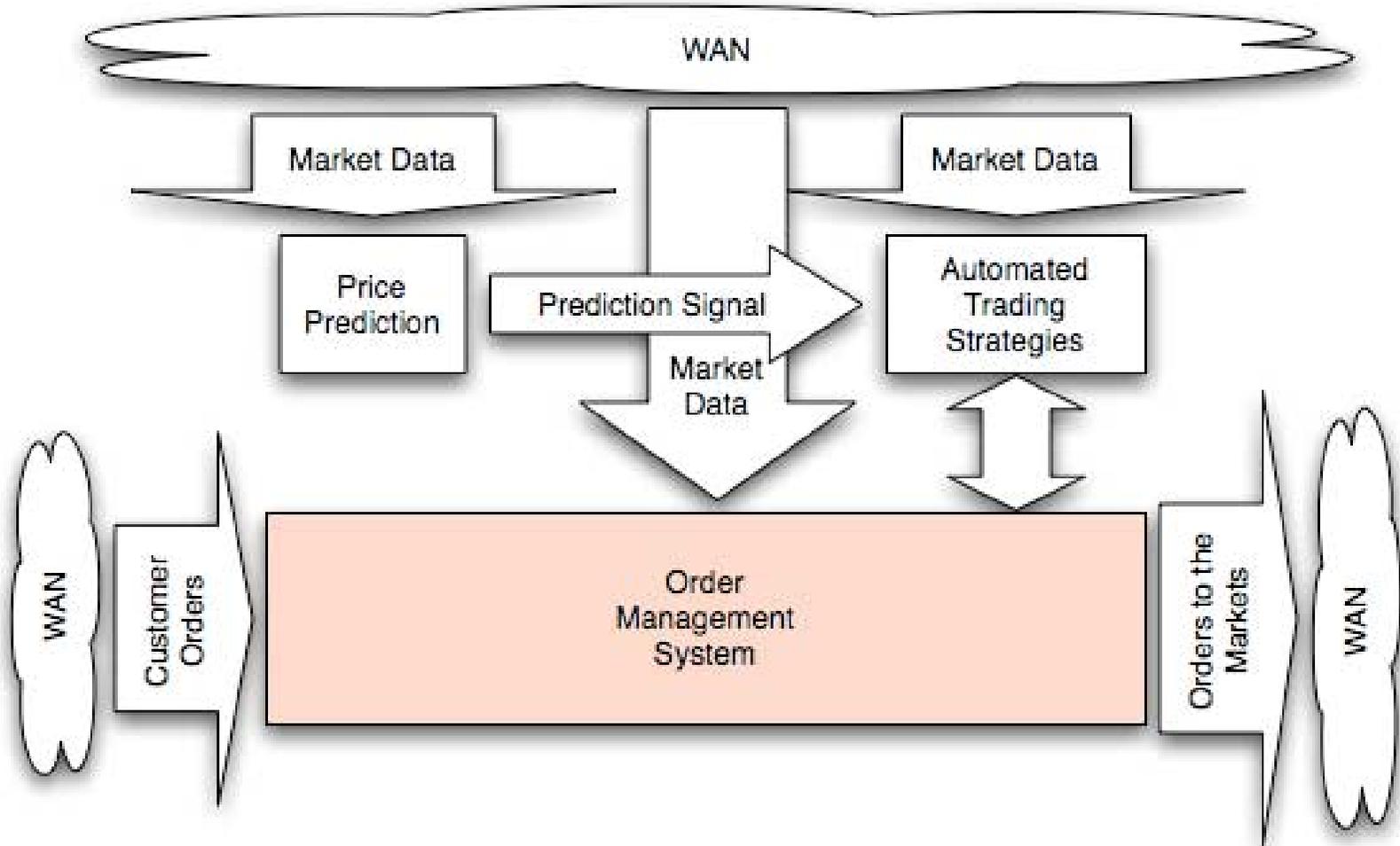
Where does ATD use CORBA?

- 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 oneways 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

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