



# Experiences using Java and CORBA in the development of a large-scale Customer Care application for the Telecommunications Industry

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# Topics

- ♦ LHS - The Company
- ♦ The Mercury Research Project
- ♦ Results and Experiences

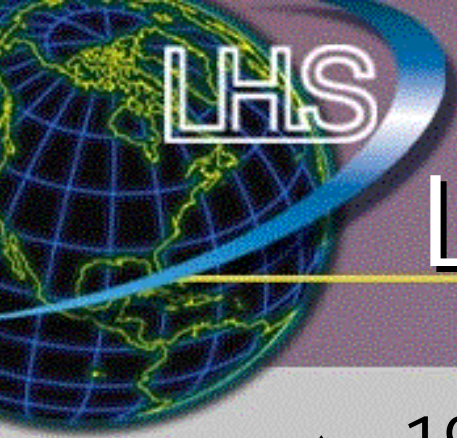




# LHS - The company

LHS is a leading global provider of convergent customer care and billing software and services for the telecommunications industry





# LHS - Milestones

- ♦ 1990 Company founded in Frankfurt/Germany
- ♦ 1992 BSCS introduced
- ♦ 1995 US Headquarters established in Atlanta
- ♦ 1997 Trading at NASDAQ and Neuer Markt
- ♦ 1998 Offices in Frankfurt, Atlanta, Zürich, Stockholm, London, Kuala Lumpur, Miami
- ♦ 1998 more than 1000 employees





# BSCS - The Product

- ♦ more than 120 installations
- ♦ in 60 countries
- ♦ UNIX/MS-Windows based client/server architecture
- ♦ Oracle database
- ♦ supports wireless (GSM,...) and wireline technologies
- ♦ covers all business-processes





# Mercury - The Research Project

*Can we build mission-critical  
business software based on  
multiple tiers, Java and CORBA ?*



# WANTED ! Mission Critical Software Product

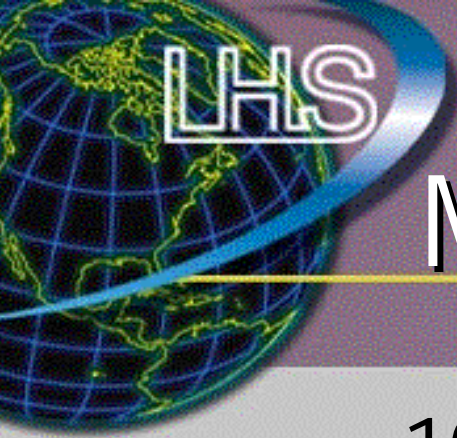


- ♦ Maximum performance
- ♦ Highly configurable
- ♦ Maximum flexibility
- ♦ Open



- ♦ Users > 5.000
- ♦ Records/Table > 10 mio.
- ♦ Support for Multiple Platforms
- ♦ Reliability 24\*7



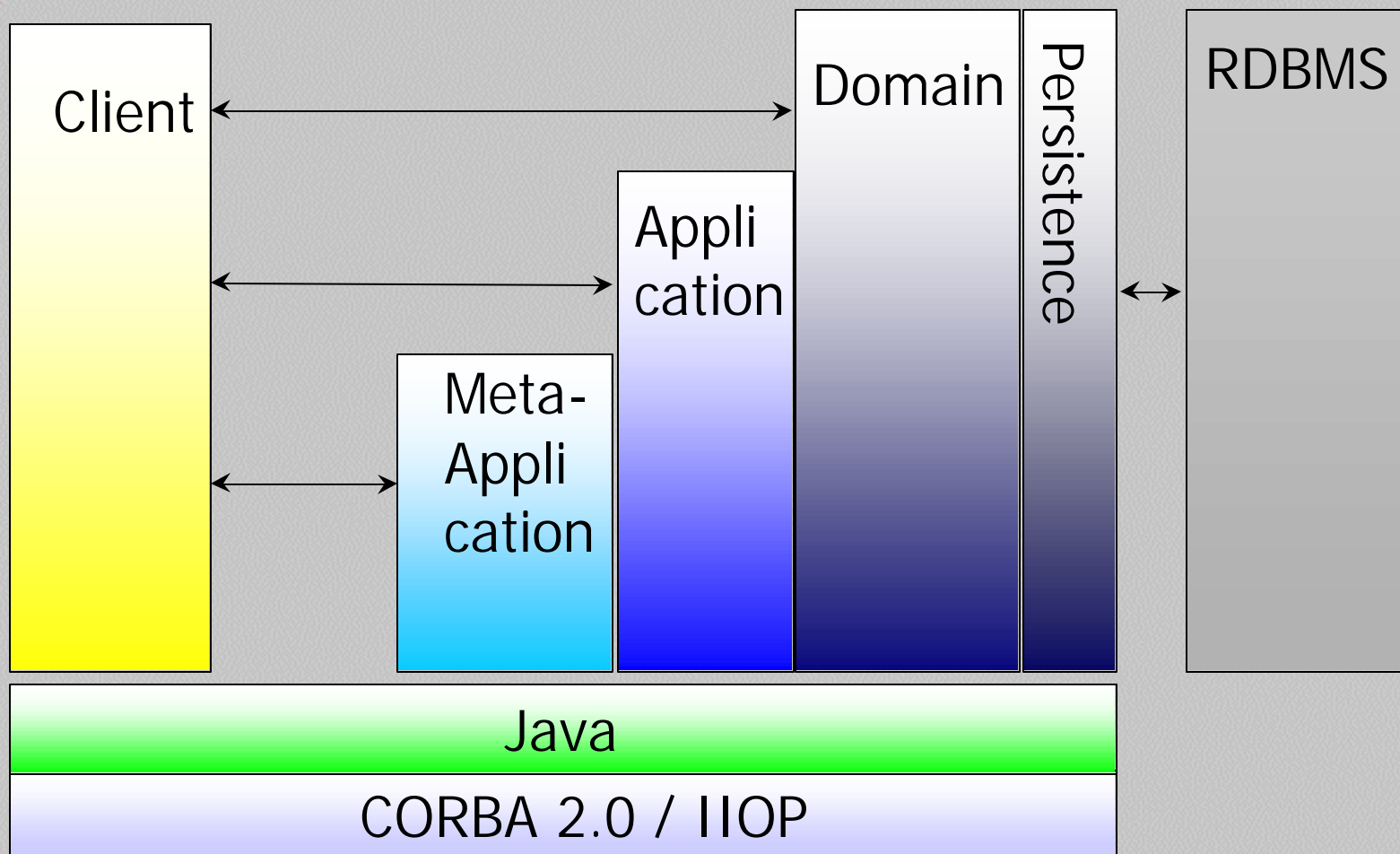


# Mercury - Milestones

- ♦ 10/97 - Decision for Java
- ♦ 12/97 - Tools and environment set up
- ♦ 07/98 - Proof of concept
- ♦ 12/98 - Pilot application



# Architecture





# Results and Experiences

- ♦ Environment
- ♦ CORBA IDL Interfaces
- ♦ Memory Management
- ♦ Java Portability



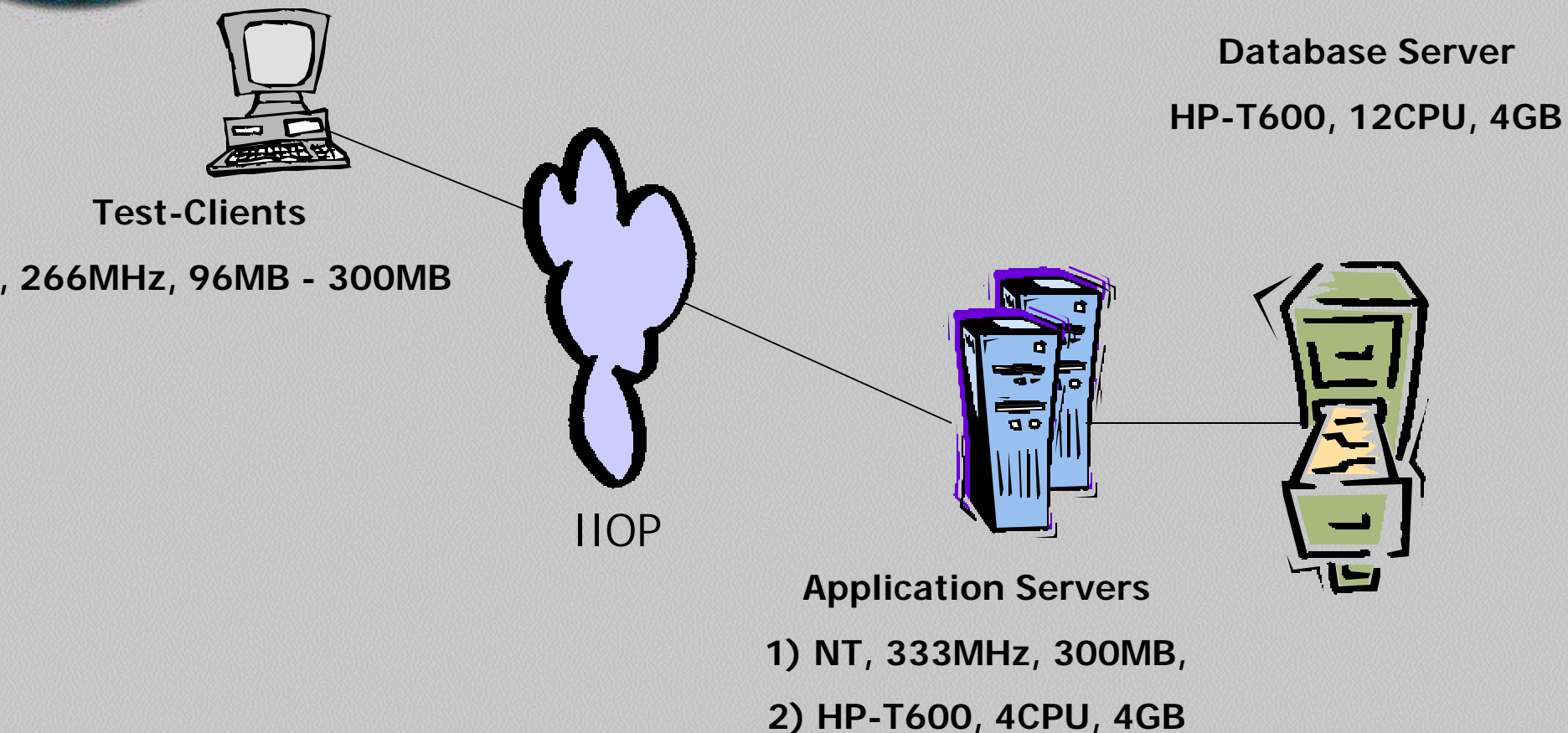


# Software Environment

- ♦ Rational Rose for Java
- ♦ JDK 1.1.6
- ♦ Visual Age for Java
- ♦ VisiBroker for Java
- ♦ TOPLink for Java
- ♦ Oracle 8.0.4 / OCI-/ ThinClient-Driver



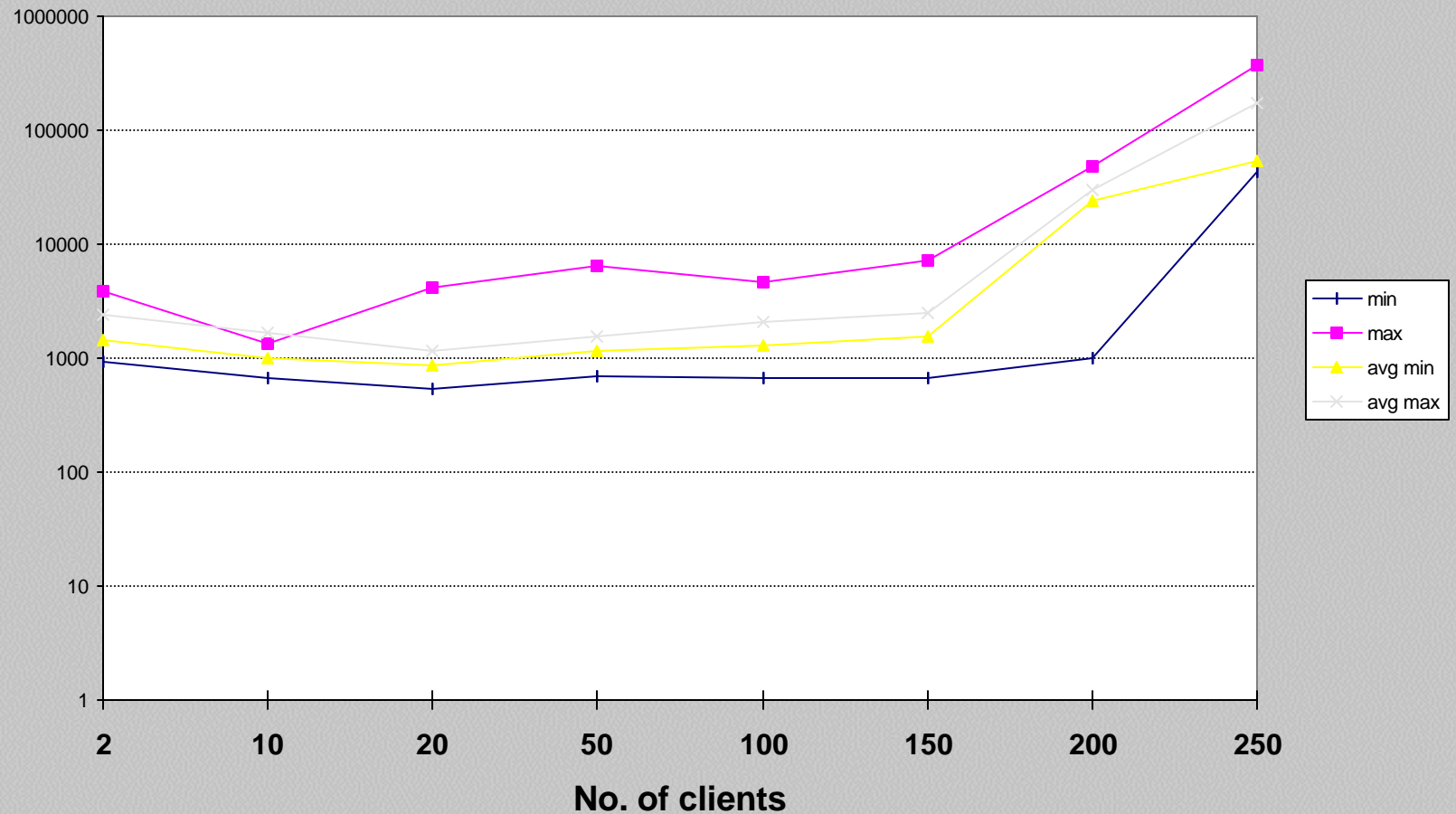
# Hardware Environment







# Results: Scalability



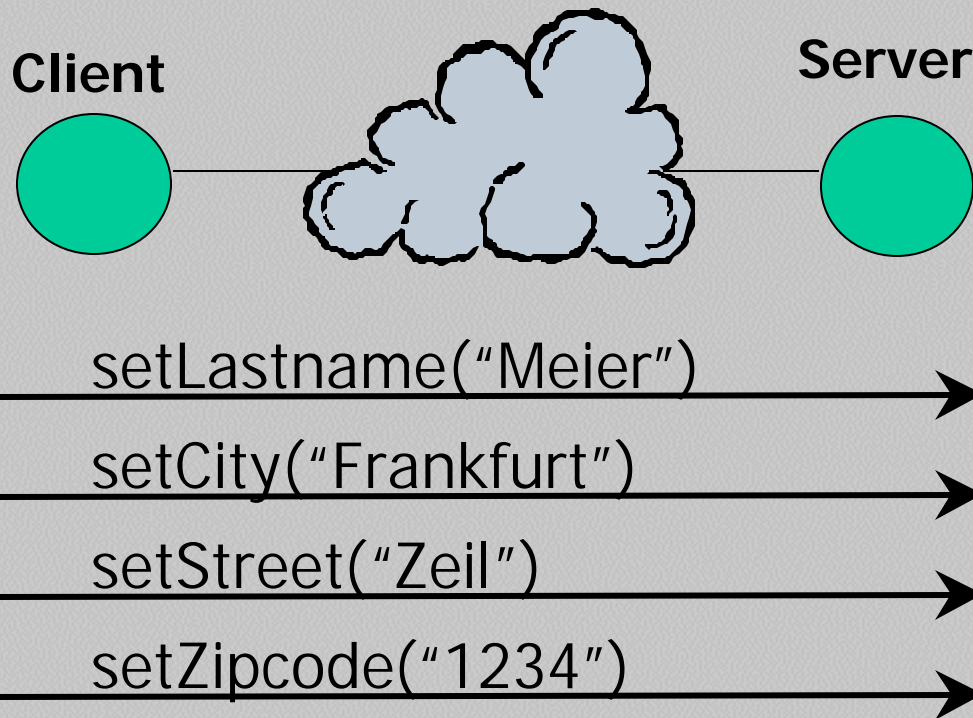


# CORBA IDL Interfaces

- ♦ Cross-network communication is a key factor that affects performance
- ♦ Message Handling Strategies
  - Individual
  - Structured
  - Generic



# Individual Get-/Set-Methods



- ♦ Marshalling Overhead
- ♦ Simple Types
- ♦ Network latency



# Structured Get-/Set-Methods



- ♦ Minimum Network Round-trips
- ♦ Structured Type
- ♦ Flexibility Lost



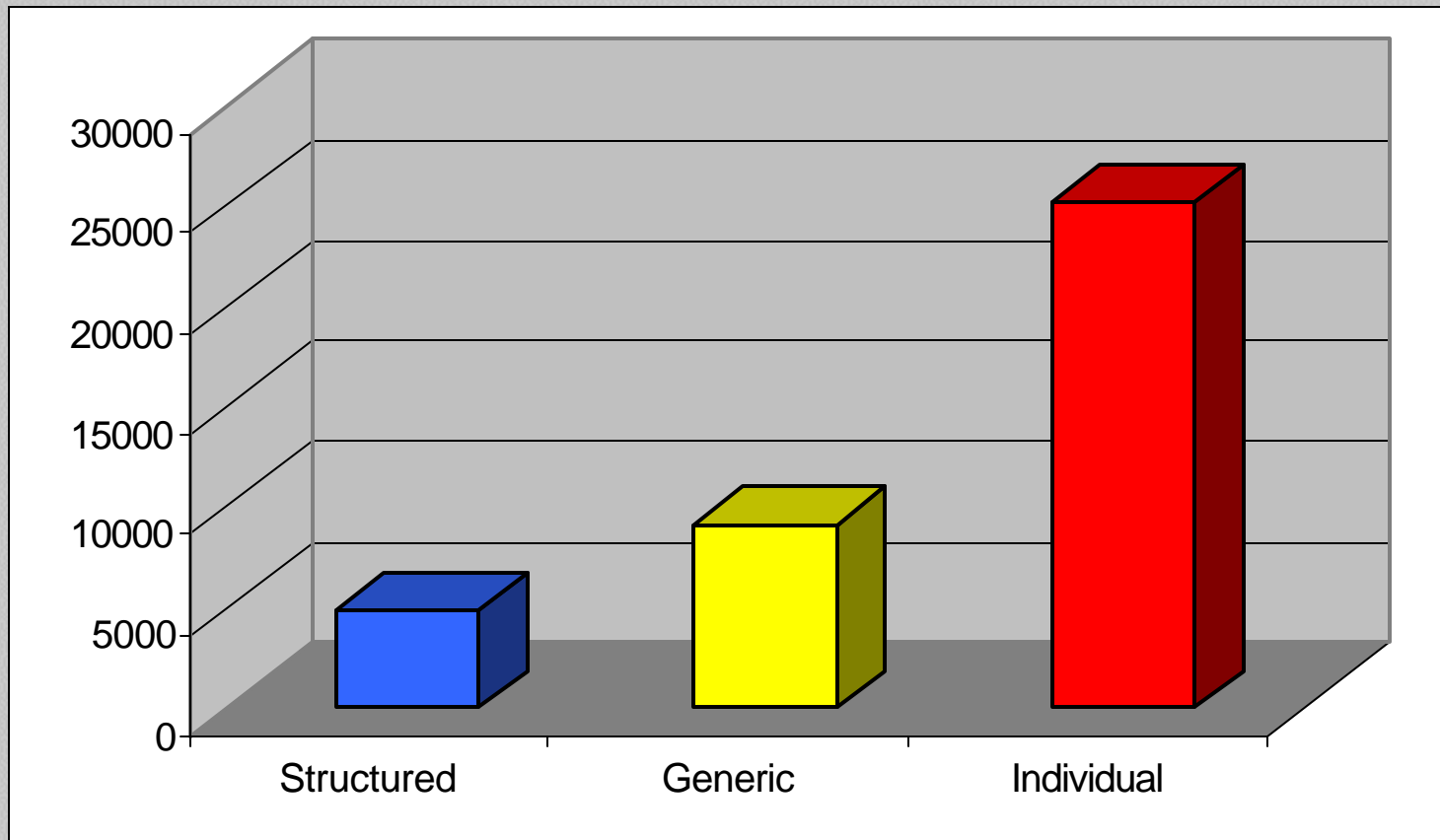
# Generic Get-/Set-Methods



- ♦ Minimum Network Round-trips
- ♦ ANY-Type
- ♦ Maximum Flexibility



# Results: Interface Policies





# Memory Management

*Java garbage collection cannot be utilized in a CORBA environment*

- All CORBA objects must be explicitly deactivated at the ORB
- How does the server know about un-referenced objects?





# Strategies

- ♦ Rely on the operating system
  - very memory intensive
- ♦ Garbage collection of CORBA objects (OMG rfp)
- ♦ Let the objects take care of themselves





# Reference Counting

- ♦ A cooperative approach
  - The client tells when he is done with the object
  - The server provides containers to support the client
- ♦ The object deletes itself when it is no longer in use
- ♦ How can we clean up after client breakdowns ?

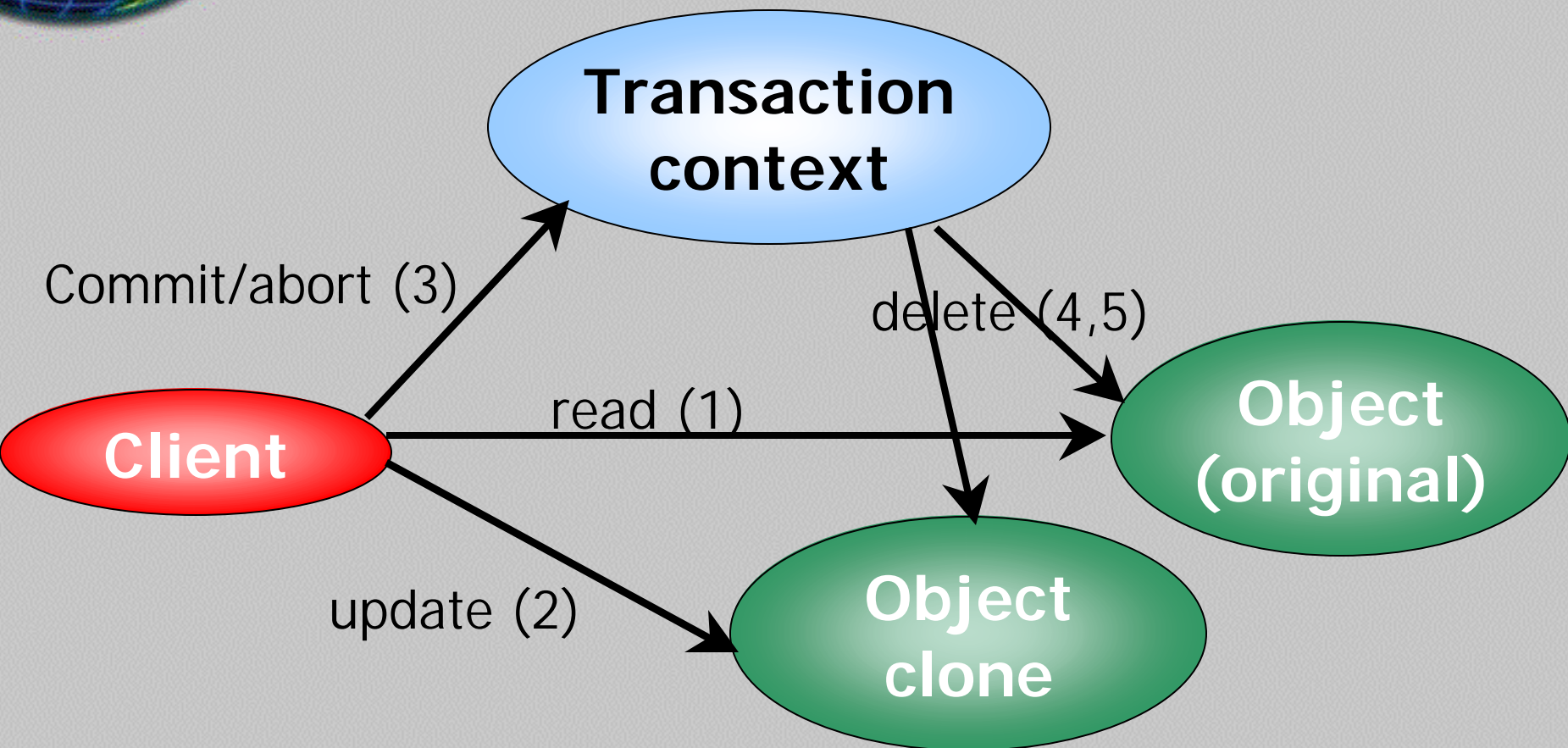


# Object Types

- ♦ Persistent, “read-only”
  - read at server start-up
  - deleted at server shutdown
- ♦ Persistent, transactional objects
  - have to be removed as the real object-state is in the database
  - are shared among clients

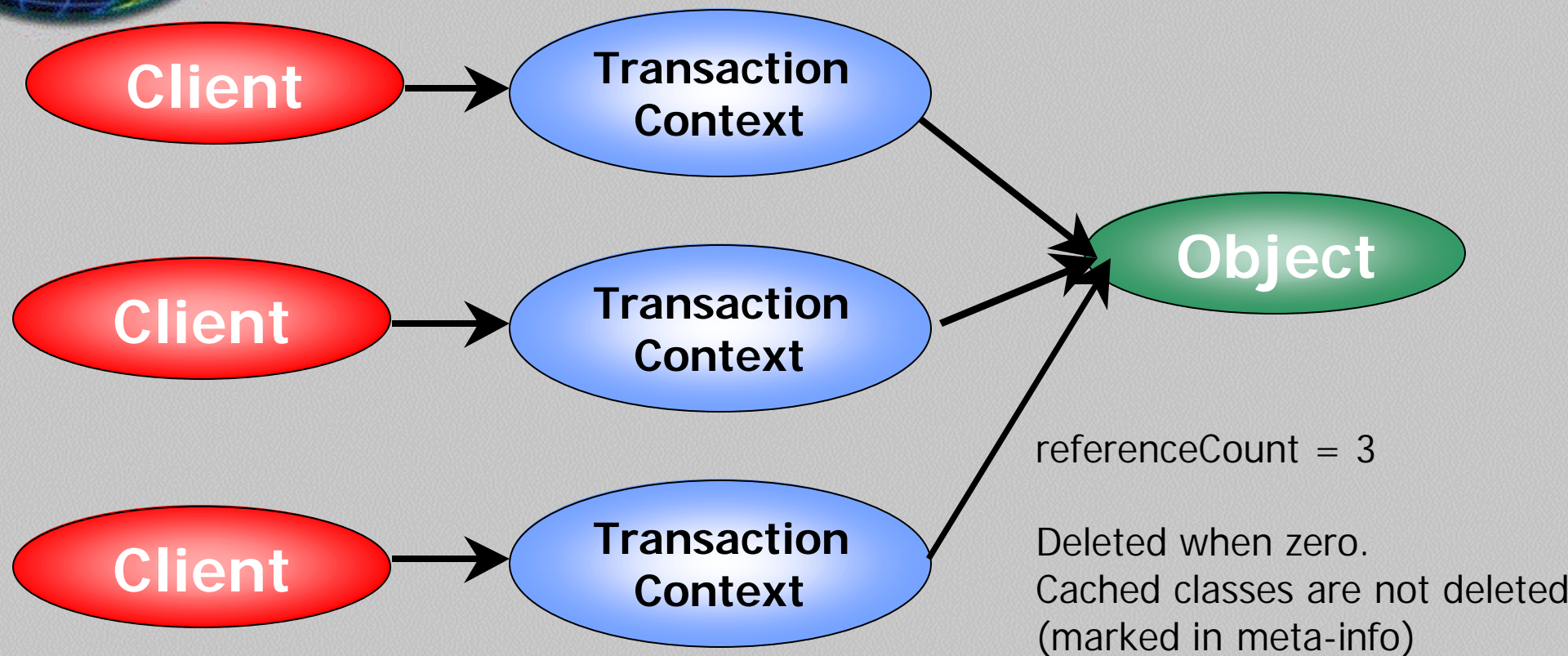


# Transactional Objects





# Shared Objects







# Summary (I)

- ♦ All messages have explicit transaction context
- ♦ Transaction context used as container for memory management
- ♦ Shared objects count client references
  - deleted when count is zero for un-cached classes
  - instances of cached classes remain in server



# Summary (II)

- ♦ Clients release transaction context via commit/abort
- ♦ The transaction context is a container for all objects touched by the client (within the context)
- ♦ Context releases all contained objects
- ♦ Use Visibroker event to catch broken connections - each client session contains a collection of all open transaction contexts - these are “deleted” for the lost client

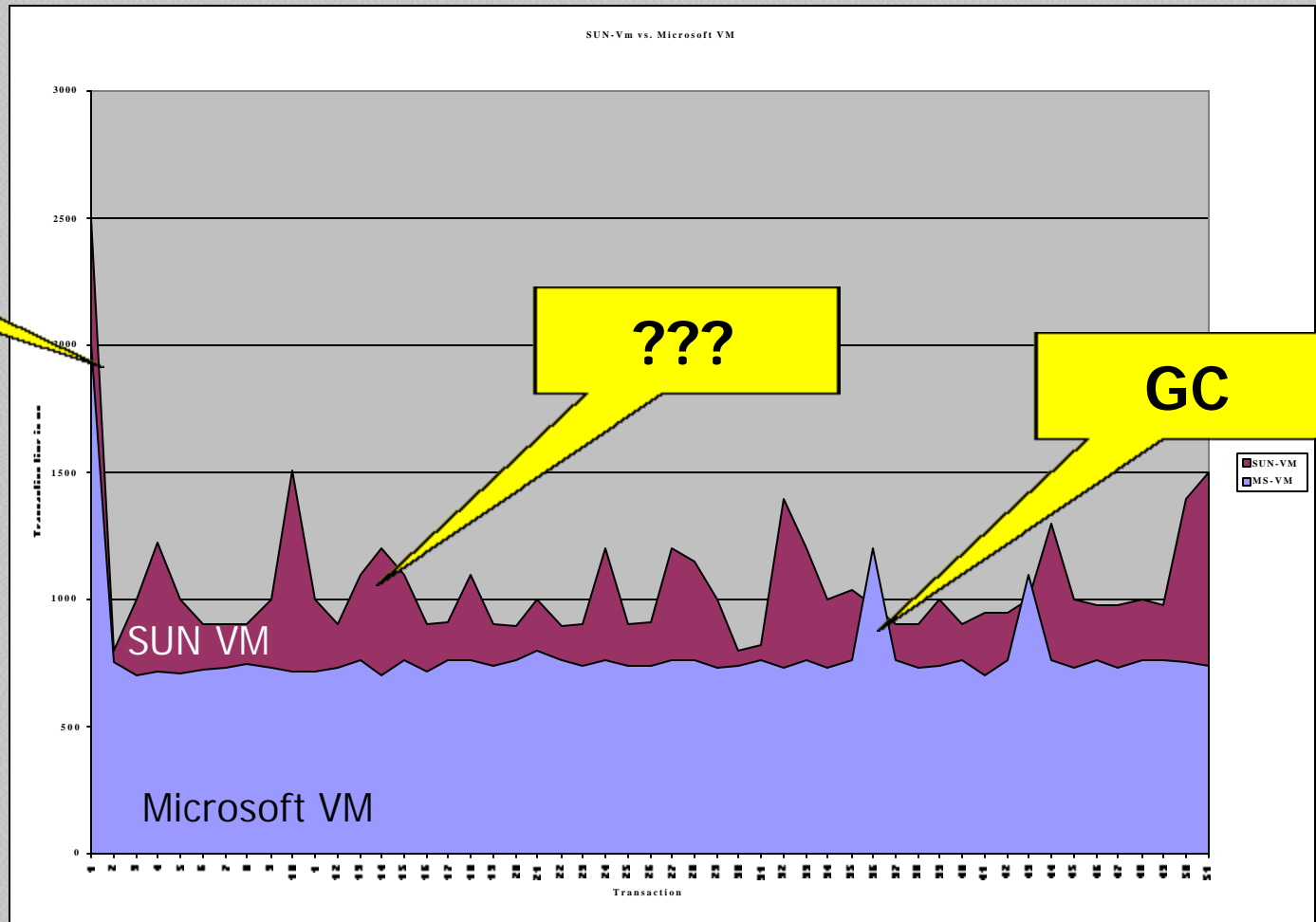


# Java 'write once, run...'

- ♦ Server Target Platforms
  - NT, HP-UX, IBM-AIX, DEC- , SUN-Solaris
  - Test only on NT, HP, SUN
- ☺ No Code changes had been necessary
- ☹ Drastic performance differences
- ☹ Native compilers not available or immature
- ☹ Bugs in virtual machines



# Bugs in Virtual Machines





# Thank You



## Questions

now

or

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