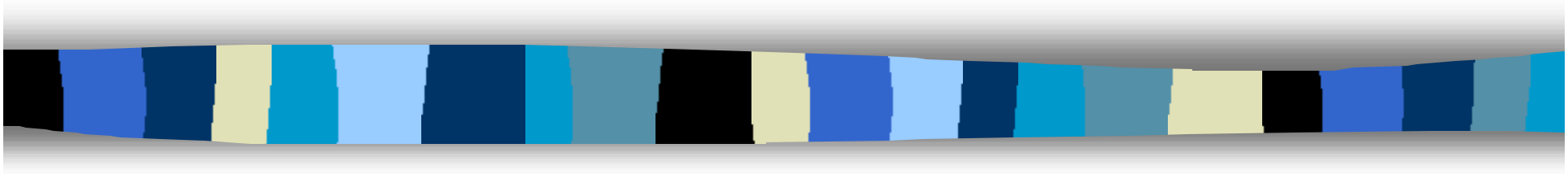
The Five-Day *i*DBA



by *Jason Couchman*

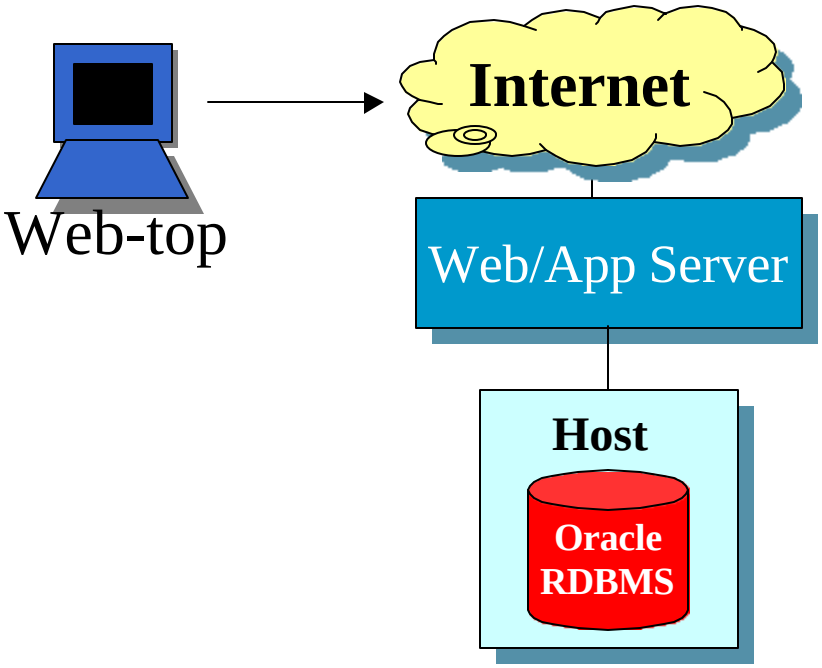
Independent Systems Architecture Consultant

Author of Eight Oracle Press Books

Fool Your Boss! Amaze Friends!

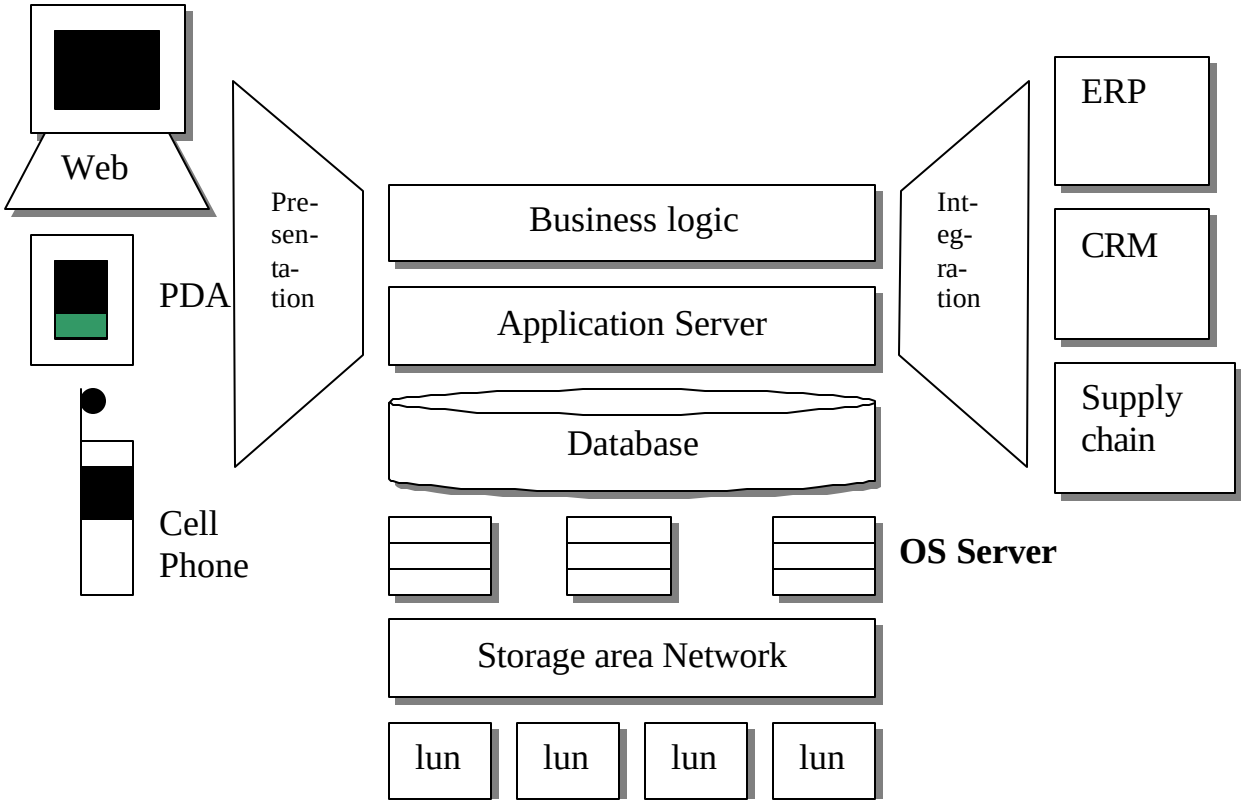
- *Everyone knows you can tune an SGA.*
- *But did they know you can be an iDBA?*
- *The process takes five days, you say?*
- *YES! You're only a vocabulary away!*

E-Biz Infrastructure 1.0



But doesn't it only support Web browsers?

E-Biz Infrastructure 2.0



Yours for the low, low price of only $1,999,999.95!

Source: Metagroup.com website

Oracle's E-Biz Infrastructure

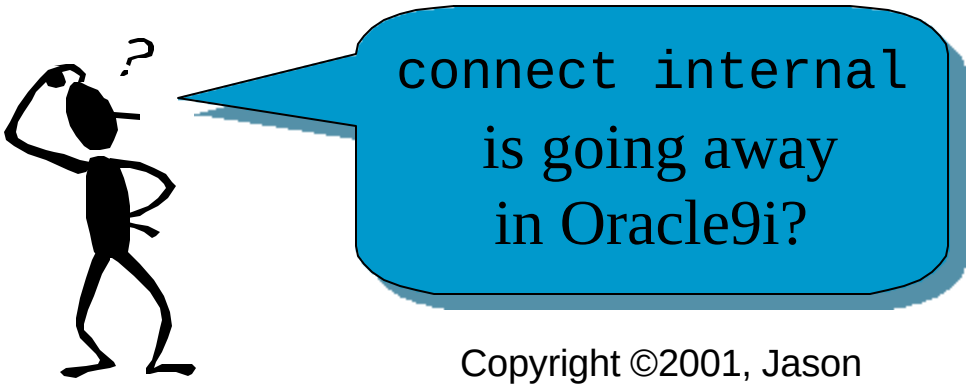
- Security Components to Protect Data
- High Availability to Minimize Downtime
- Performance / Scalability Features
- Integration Middleware
- Monitoring Tools for E-Business

E-Business Security: GAP Analysis at Light-Speed

- **TCP/IP -** A stateless, packet-switched network protocol
  - packets transmitted in plain text!
- **Robust Security -** Authenticated, state-full communication
  - Encryption a must!

Oracle Security Components

- Authentication for Data Access
- Auditing Data Access
- Encryption of Data Accessed
- Control over Who Accesses What



Solutions: Old and New

- Old World: Server-based authentication
  - `create user identified by`
    - OK for client/server
    - Requires monolithic view of RDBMS
- Old World: host-based authentication
  - `create user OPS$x identified externally`
    - Good for mainframe-like connectivity
    - Requires monolithic view of RDBMS

Solutions: Old and New

- Neither server-based nor host-based authentication really provides for security in stateless connections like TCP/IP.
  - TCP/IP: Every request is a transaction
    - Authenticating every transaction is bad

Solutions: Old and New

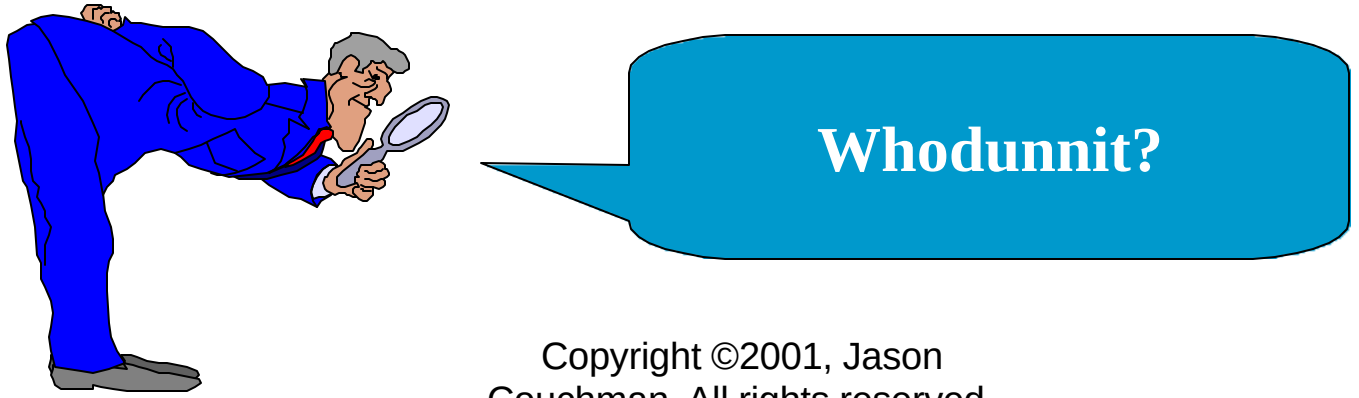
- New World: N-Tier Authentication
  - Users communicate with database from application server via single connection
    - Requires coding overhead via OCI calls
    - Still monolithic view of RDBMS
- New World: Certificate Authentication
  - Oracle Advanced Security Option
    - Public-key single sign-on for all components

N-Tier vs. Certificates: A Primer

- Example - E-Biz Book Retailer
  - N-tier: AR, INV, stats collection, etc. all in one database
    - Reality - sometimes these are in many systems, each of which requires own sign-on
  - Certificates: AR, INV, stats collection can be in different databases
    - Single sign-on for all systems

Monitoring Activity via AUDIT

- We've seen this one before…
  - by object, user, type of access, etc
  - Lots of data generated if iDBA not careful
  - SYS.AUD$ must be secured
  - ***Flat file audit possible too???***



Data Encryption

- Oracle Advanced Security offers DES encryption between client and server via Net8
- Oracle8i GIOP and 9i Application Server supports encryption via SSL

Access Control: Old and New

- Old: `grant` and `revoke`
- Newer: MLS Labels via Oracle Label Security (think Trusted Oracle)
- New: DBMS_RLS for Virtual Private Database

Oracle Label Security

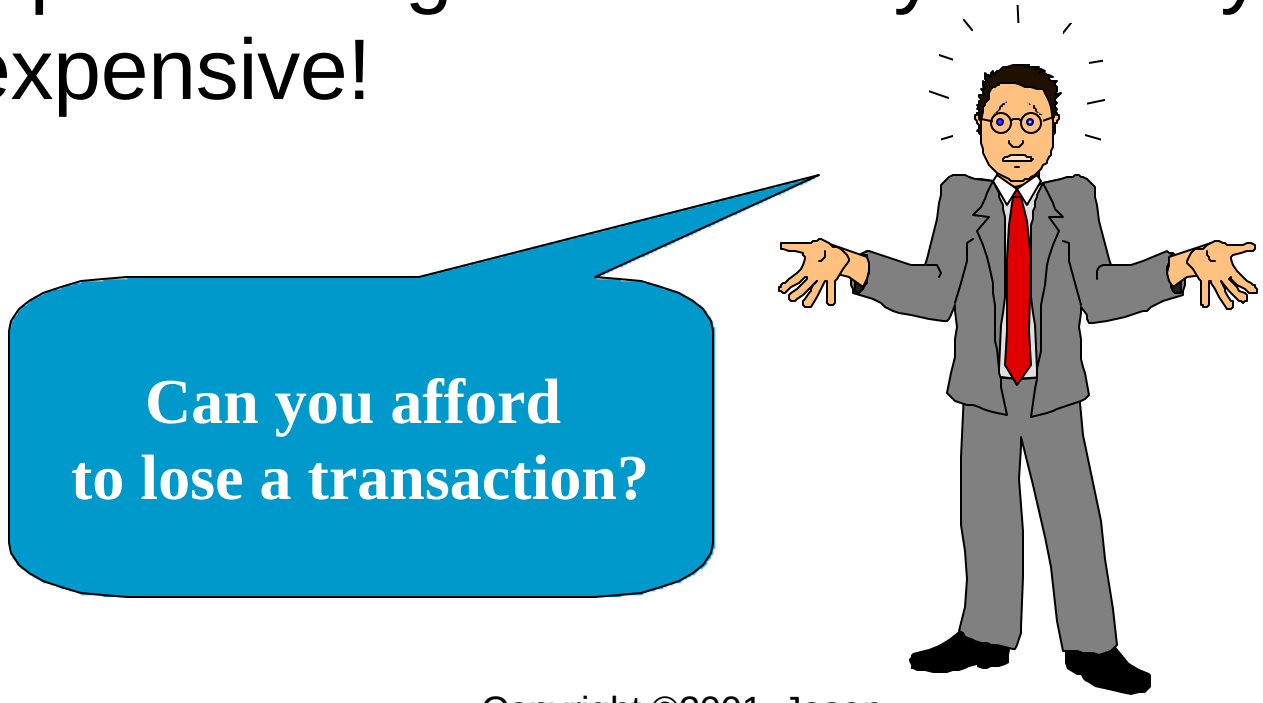
- Oracle Label Security is a powerful row level security solution in Oracle8i Enterprise Edition based on labeling concepts used by government and defense organizations to protect sensitive information and provide data separations.
- Oracle Policy Manager is the new Oracle Enterprise Manager-based GUI for managing Oracle Label Security.

DBMS_RLS and VPDs

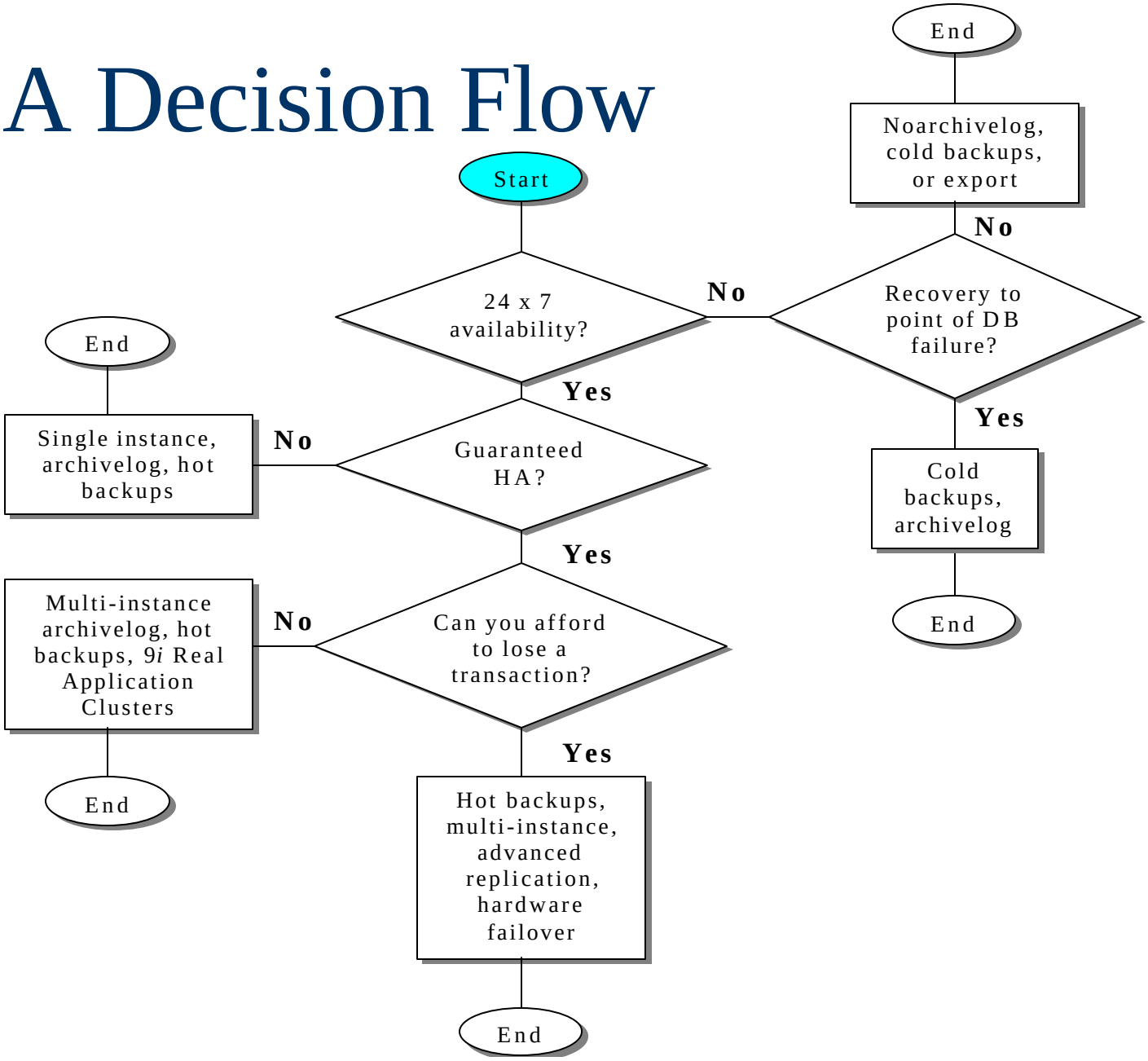
- The DBMS_RLS package combined with Oracle8i query rewrite allows you to attach security rules to a table that cause Oracle to automatically rewrite SQL according to the security clearance of the user issuing the SQL. All data remains stored in a single table, amounting to a virtual private database.

High Availability for E-Biz

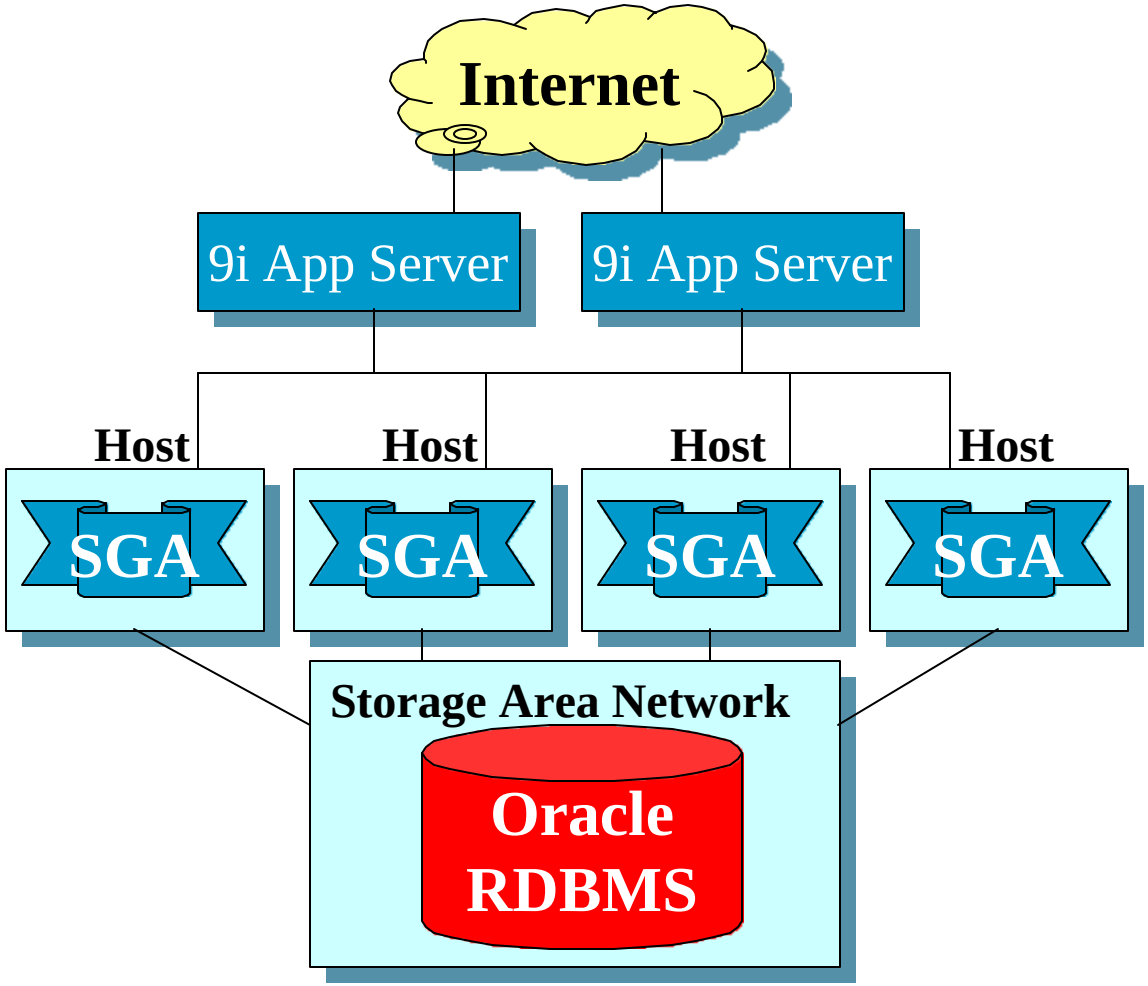
- Support for users around the world
- Options range from mildly to wildly expensive!



HA Decision Flow



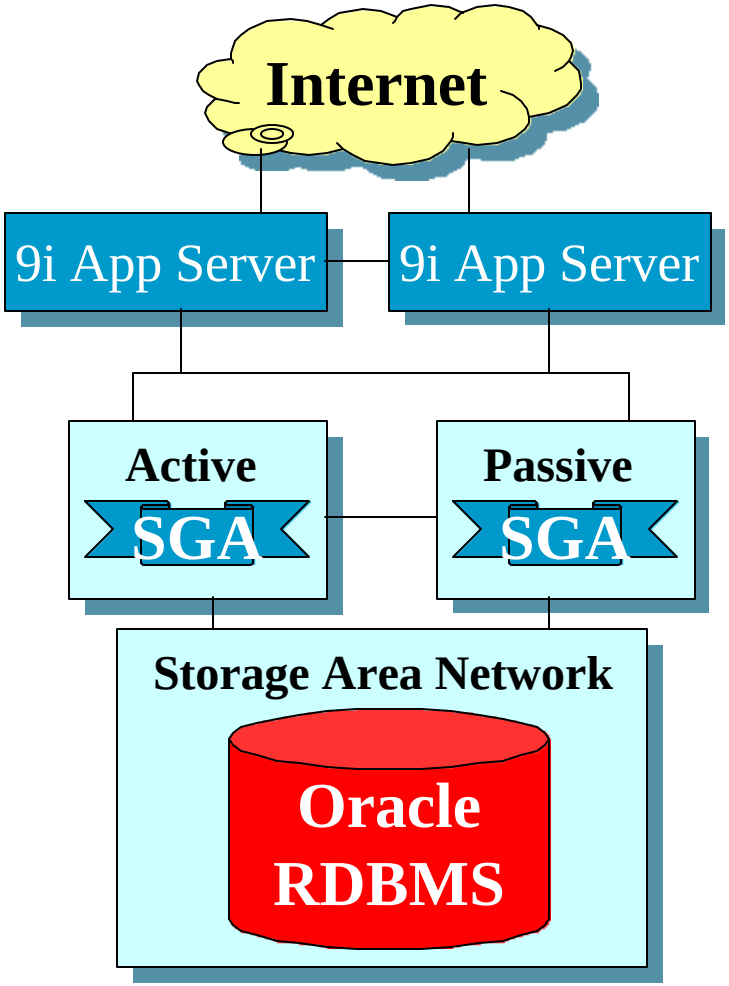
HA Architectures: Parallel Server



Real Application Clusters (OPS)

- Pros
  - True HA for those who can't afford to lose a single transaction (99.999% available)
  - 9i improves usability via Cache Fusion
  - Near-linear scalability
- Cons
  - Expensive (*N*.2X *N*-instance)
  - App must be built for RAC from ground up

HA Architectures: Failover



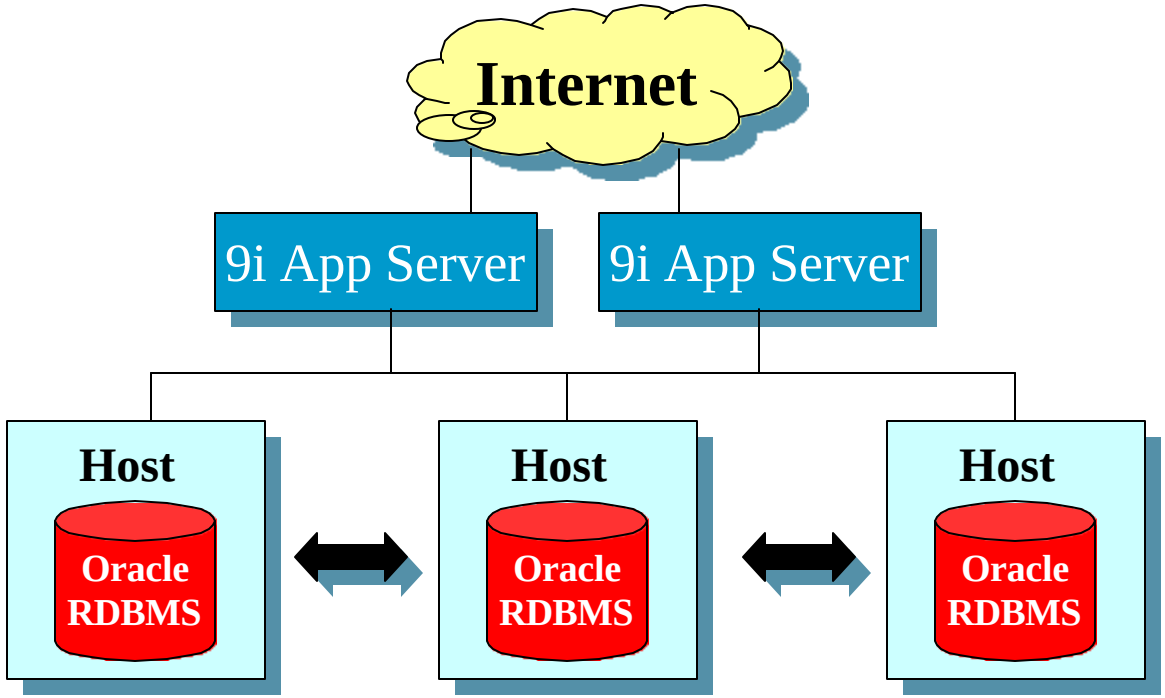
HA Failover Configuration

- Pros
  - Good HA uptime (99.9% available)
  - Cost-effective alternative to RAC (OPS)
  - Easier to configure and manage
- Cons
  - You will lose transactions
  - Scalability limited by SMP

Failover Software Players

- Oracle FailSafe (NT/2000)
- Veritas Cluster System (Solaris) (Requires Veritas Volume Manager)
- MC Service Guard (HP-UX)

HA: Advanced Replication



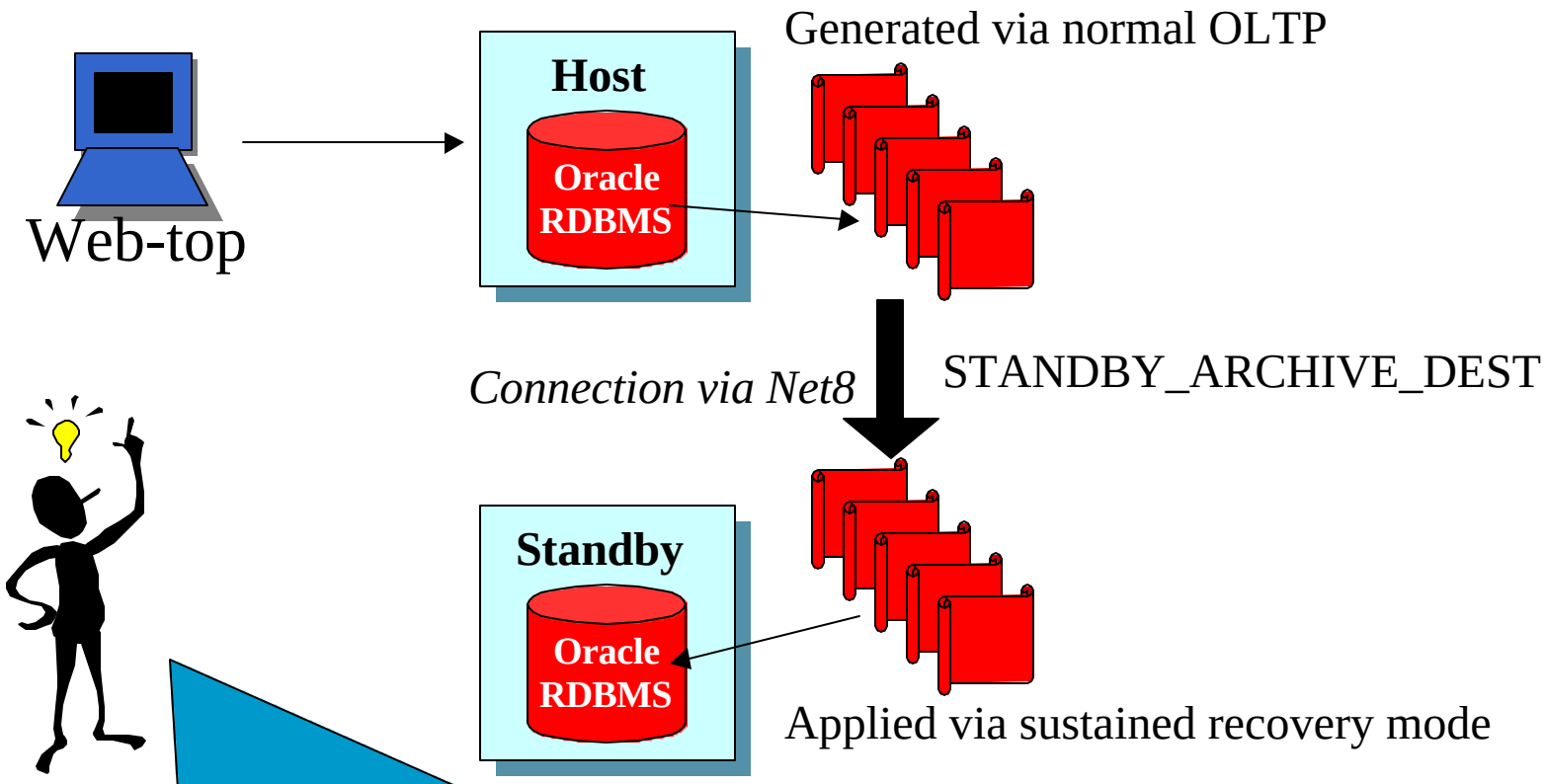
Advanced Replication for HA

- Pros
  - Design implies HA
  - Far less expensive than failover or RAC
  - Can work in conjunction with failover
- Cons
  - Processing overhead for replication
  - Works best for static data
  - HA not guaranteed

Ideas in HA Backup / Recovery

- Options available include:
  - Oracle Standby Database (9i: Data Guard)
  - Hot backups in conjunction with high-speed SAN mirroring (ie, EMC BCVs)
  - RMAN supports multi-channel tape drives
  - Partitioning tables, indexes, etc.
  - Transportable Tablespaces
  - LogMiner (9i: DDL and DML)

Oracle Standby Database



Oracle Data Guard

- Protects from human errors by
  - Provides GUI for standby configuration
  - Automating switch to standby and back
  - Automated failure and problem detection
  - Provides redundancy in storing redo transported from production to standby

Managing Host Resources

- Oracle-supplied packages for
  - Designing consumer groups
  - Determining how much resource each consumer group is allowed to use
  - Assigning users to consumer groups
    - ie, OLTP daytime users vs. batch processing
  - Enforcing restrictions on host usage

Scalability and Performance

- Real Application Clusters (OPS) and Advanced Replication
  - Scalability by adding new nodes
    - 9i Cache Fusion treats SGAs on many nodes as one virtual SGA
- Failover via Veritas or MC SVC Guard
  - Scalability by upgrading SMP capacity of host machine (ie, Sun UE3500 to UE6500)

The Importance of SANs

- Storage Area Networks, or SANs, are the cornerstone of true high availability and top performance.
  - I/O memory cache for high I/O throughput
  - Every component mirrored - fault tolerant
  - Third LUN mirror moveable between two machines - creates all kinds of flexibility for HA, backup/recovery, data warehousing.

SAN Market Players

- EMC (Symmetrix and Clariion)
- HP (Hitachi XP256)
- StorageTek (9176)
- IBM (Enterprise Storage Servers)
- Sun (Keeps changing)

Web Application Scalability

- If Java stored in JServer, Java scalability achieved through:
  - JServer Accelerator native compilation
  - Increasing Java Memory: JAVA_POOL_SIZE
  - Minimizing end-of-call migration
  - Using MemStat

Other Oracle Performance Areas

- Oracle8i 8.1.6 introduces OEM StatsPack
  - Basically a repackaging of Tuning Pack with new utilities for gathering performance statistics.
  - Roughly akin to UTLBSTAT / UTLESTAT, but collects more detailed statistics and separates collection from report generation.

What is JServer?

- JServer is Oracle's name for the related components supporting use of Java within the Oracle database:
  - JDBC
  - JVM
  - Support for CORBA, EJB
  - And lots, lots more!

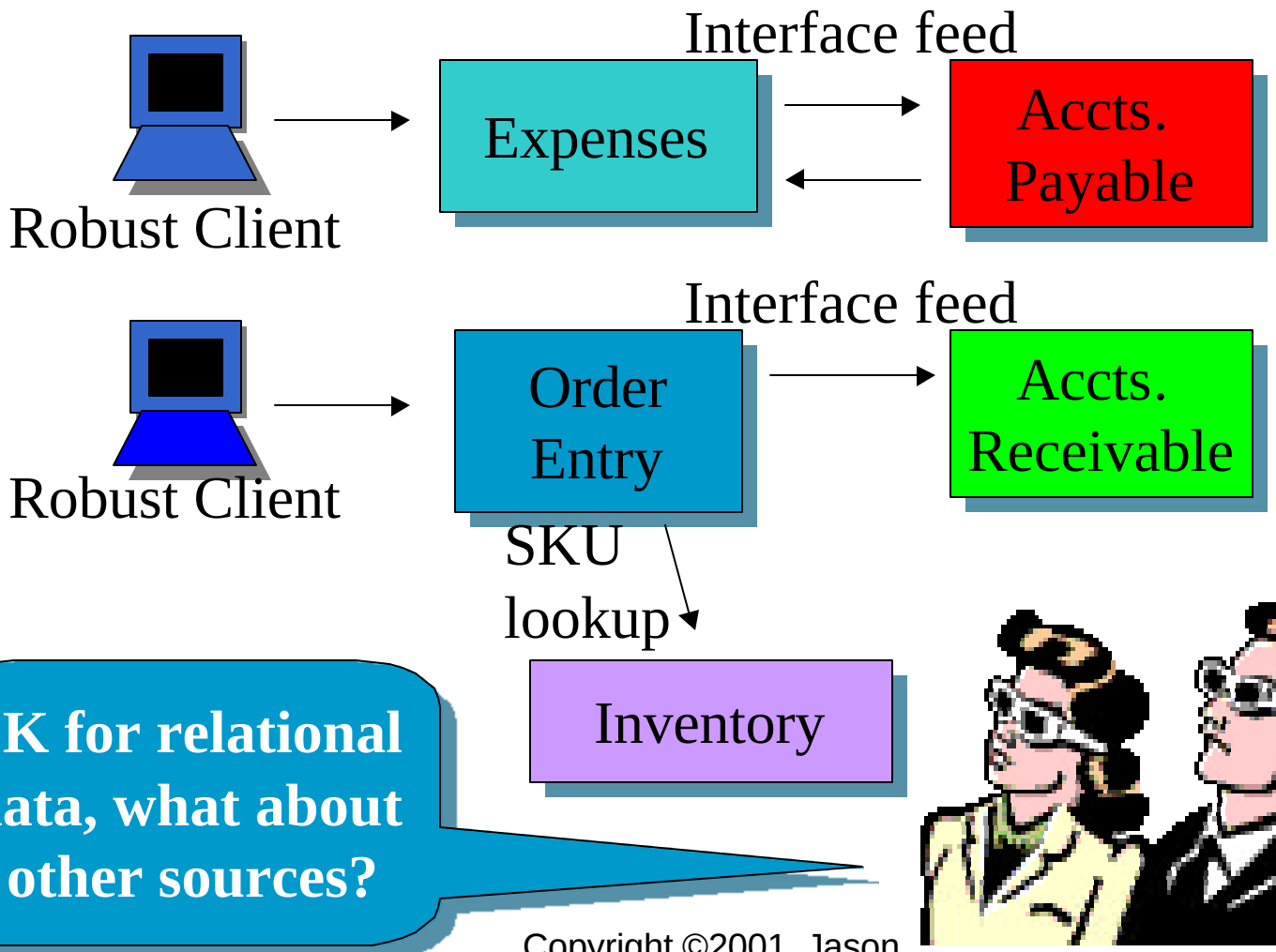
Integration: Concepts

- Oracle never lives in a vacuum
  - Old way of thinking - put everything in one gigantic database
  - New way of thinking - come up with a system that integrates every source of data into one virtual application

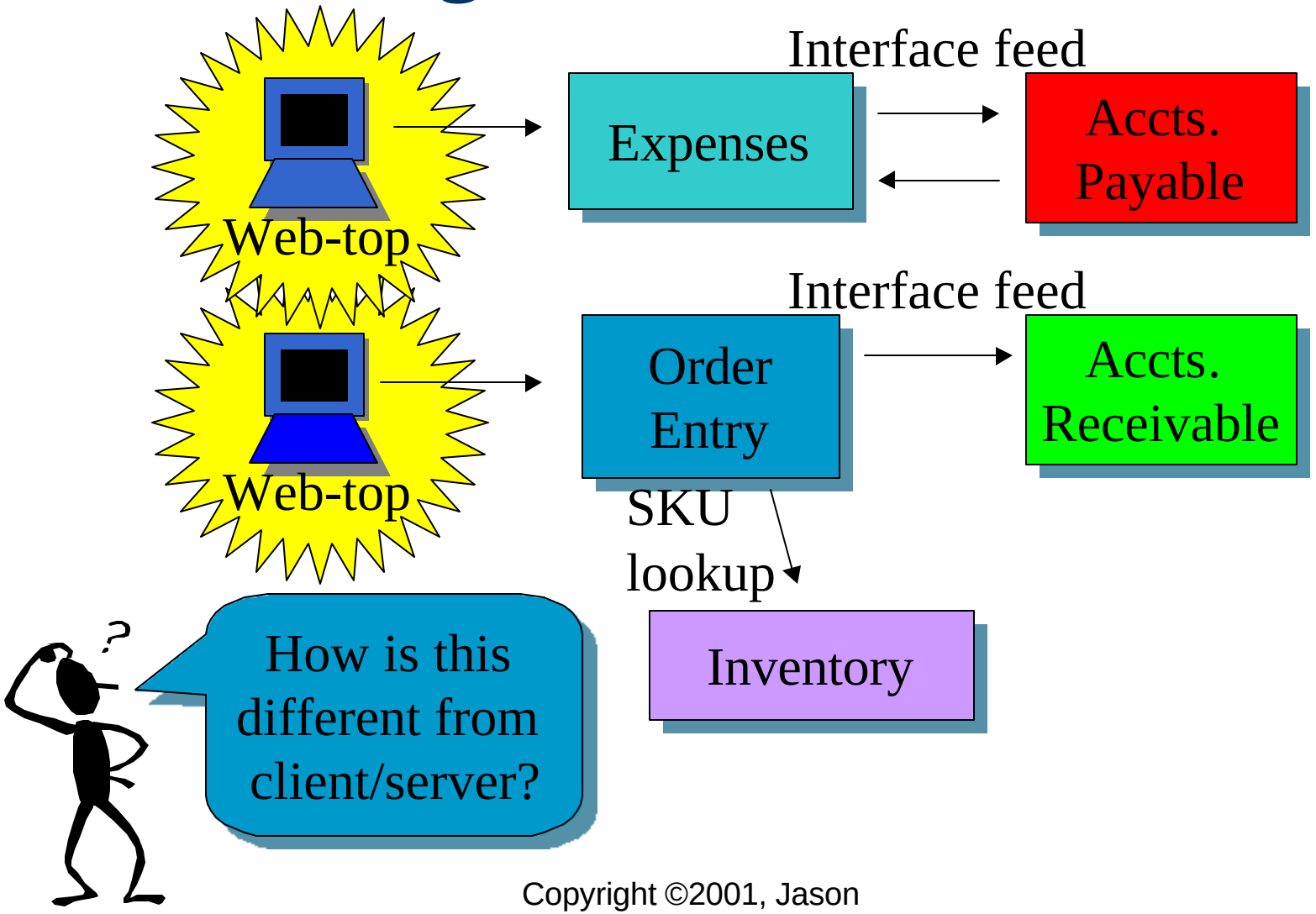
Two Types of Integration

- **Enterprise Application Integration**
  - Tying together all applications within a company using integration messaging
    - ie, Inventory, Order Entry, AR/AP
- **Inter-Enterprise Integration**
  - Vertically integrating a supply chain between several companies
    - ie, Amazon.com to Ballantine Books

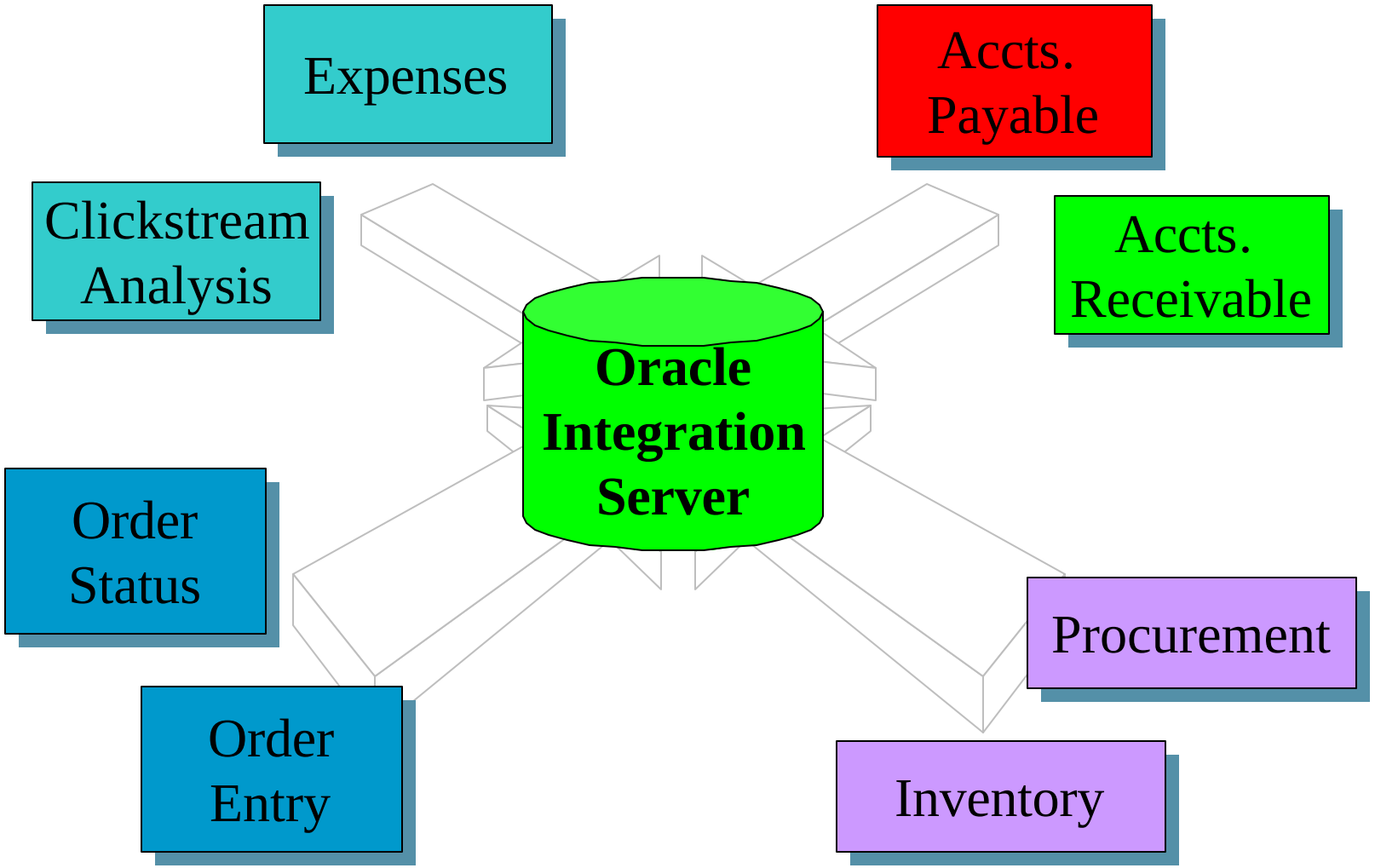
Typical Client/Server Integration



E-Biz Integration - 1.0



E-Biz Integration - 2.0



Integration Via Messaging

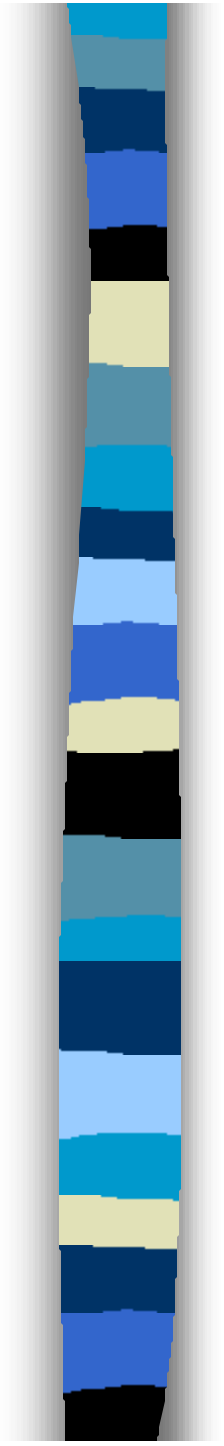
- CORBA-compliant messages float between systems to handle various tasks formerly handled by batch routines, database links, or programmatic methods
  - Action-oriented messages tell recipient to do work without specifying how.
  - Recipient knows what work to do.

Features of Oracle Integration Server

- **Application Messaging Services -** Oracle Message Broker provides a scalable and open Java Message Service (JMS)-based infrastructure to enable inter-application messaging. Oracle Message Broker supports a number of industry queuing systems using direct drivers, including Oracle Advanced Queuing (AQ), IBM MQSeries, and TIBCO Rendezvous.
- **Business Process Coordination Services -** Delivered through Oracle Workflow, these provide business process modeling and execution to enable application integration at the business process level.
- **Queuing Services -** Provided by Oracle8i Advanced Queuing (AQ), these services support asynchronous application communications.

Features of Oracle Integration Server

- **Data Transformation Services -** Tools are provided to map data between application-specific formats, and between XML formats. Both design-time and run time data transformation support are provided.
- **Application Adapter Services -** Enable the integration of packaged and custom applications using the adapter toolkit and services. Out-of-the-box adapters are available to integrate Oracle Customer Relationship Management (CRM) products with Enterprise Resource Planning (ERP) applications including SAP R/3 and Oracle Applications.
- **Directory Services -** Provided by Oracle Internet Directory, the LDAP-compliant directory service that enable access control to the company's applications and resources.



Players in Integration Market

- Oracle (AQ and Integration Server)
- Microsoft (MSMQ)
- IBM (MQSeries)
- BEA Systems (Tuxedo)
- Tibco (Rendevous)

Manageability

- With multiple E-Biz components comes the need for tools that manage all components of the infrastructure.
  - OEM headed in that direction
  - HP Openview already there

HP Openview At-A-Glance

- Not a tool, but an SMTP-compliant framework for managing IT components
  - IT Operations (w/Oracle Plugin)
  - Network Node Manager (networking)
  - OmniBack (backup/recovery)
  - GlancePlus (performance)
  - Many others

Quick Review
Oracle's E-Biz Infrastructure

- Security Components to Protect Data
- High Availability to Minimize Downtime
- Performance / Scalability Features
- Integration Middleware
- Monitoring Tools for E-Business

*i*DBA Lexicon

- **Presentation Server –** A technology enabling on-the-fly creation of the interface used on the client to access application information. First generation e-business applications often only provided for presentation via a web interface, just as traditional client/server applications provided presentation in a robust client interface. Later generations will provide the interface in a manner appropriate to the client device – PDA, cell phone, pager, web browser, etc. Some appropriate Oracle products to know about in this space are Oracle Portal, Forms Server, Reports Server, eMail Server, JServer, and *i*FS.
- **Oracle Integration Server –** Oracle's product for interconnectivity between the E-business application server and other applications in your enterprise whose data is required for E-business, including supply chain, CRM, and ERP.

*i*DBA Lexicon

- **Enterprise Application Integration (EAI) –** The primary focus of Oracle Integration Server, it is a type of integration server that allows for connectivity between the many application components of your E-business infrastructure.
- **Inter-Enterprise Integration (IEI) –** The primary focus of other products such as Extricity, Ariba, or Webmethods, this type of intregration server is designed to create a virtual marketplace between suppliers and consumers to streamline the procurement process.
- **Lightweight Directory Access Protocol (LDAP) –** A technical protocol designed for storing a variety of address and other user information for high-speed, internet-enabled access.

*i*DBA Lexicon

- **Component Object Request Broker Architecture (CORBA)** – a framework for developing modular applications based on the premise that each component is a separate module, and that component interconnectivity takes place through action-oriented messaging.
- **Internet Intra-ORB Protocol (IIOP)** – The protocol used for action-oriented messaging between CORBA-compliant applications. Oracle's implementation of IIOP on Oracle8i allows for open connectivity between a Java-based client application and the database server without Net8, thereby increasing application performance.
- **Enterprise Java Bean (EJB)** – a framework for developing modular E-business applications in the Java programming language.

*i*DBA Lexicon

- **Portal –** a website or page that conglomerates access to other pages, as a corporate homepage might conglomerate all departmental pages in an Intranet.
- **Public Key Infrastructure (PKI)** A framework for security on the internet where a message is encoded and decoded using a public key known to both sender and recipient parties and private key known to the sender.
- **DES –** the most common standard for public key infrastructure.
- **3DES –** a future standard for public key infrastructure that is more secure than DES.
- **JServer –** Oracle's name for Java virtual machine and other components living inside the Oracle database to support Java programming.

*i*DBA Lexicon

- **Certificate Authentication –** a process by which users are verified using an external service that issues certificates to users. Users then show their certificate to other components in the E-business infrastructure in order to gain access to their information.
- **X.509 –** the main standard for issuing and developing around certificate authentication.
- **Oracle Wallet Manager –** The tool Oracle offers for management of a certificate for a user in the Oracle E-business architecture.
- **Internet Application Server –** a tool in the Oracle E-business infrastructure for developing the application logic used to dynamically render content on an E-business website. Supports PL/SQL as well as Java.

*i*DBA Lexicon

- **Storage Area Network –** a unit of hardware containing disks, memory, and software for high-speed storage and retrieval of data shared by multiple machines.
- **Oracle Fail Safe –** A product available from Oracle that supports failover of an Oracle database between clustered NT machines. This product is similar to products like Veritas Cluster and MC Service Guard from HP that support failover between UNIX nodes.
- **Advanced Replication Option –** An option for the Oracle database that allows you to copy data between two or more databases at high speeds and regular intervals. Good for distributing data to eliminate single points of failure for an E-business infrastructure.

*i*DBA Lexicon

- **Real Application Clusters –** Formerly Oracle Parallel Server, a product from Oracle that allows multiple instances to mount a single version of the Oracle database, access and update information in that database simultaneously, and share cache information between each instance for high-performance execution of same tasks.
- **ARCHIVELOG and NOARCHIVELOG –** Oracle's two modes of operation for data recoverability. ARCHIVELOG means that redo log information must be archived or saved in order to recover information to point of database failure. NOARCHIVELOG means the exact opposite.
- **Hot Backups –** Backups that are taken while the database is still online so that users enjoy uninterrupted access to Oracle data while the save is being made.

*i*DBA Lexicon

- **Online Reorganization –** Features in Oracle that permit restructuring of information stored in indexes (and tables in Oracle9*i*) so that the need for planned downtime can be minimized.
- **Partitioning –** A feature in the Oracle database that allows for subdividing unusually large tables into multiple database objects so that the need for planned downtime can be minimized and so that parallel I/O operations can be used to improve performance.
- **Oracle Data Guard –** A set of enhancements to Oracle Standby Database feature to improve high availability by allowing increased access to data in the standby database and easing the management of that standby database.

*i*DBA Lexicon

- **Oracle Flashback Query –** A utility in Oracle that permits point-in-time access to data in the database after changes are committed or rolled back by the altering transaction.
- **Oracle Migration Workbench –** A utility in Oracle that permits migration of SQL Server databases into Oracle quickly, including conversion of T-SQL into PL/SQL.
- **LogMiner -** A tool in the Oracle8i database that takes redo log entries and reverse-engineers the SQL statements that made the entry.
- **Transportable Tablespaces -** A feature in Oracle8i that allows you to take a tablespace from one Oracle8i database and attach it to another Oracle8i database.

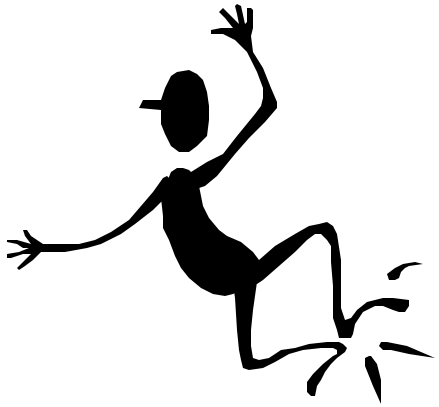
Handy Bibliography

- **The Oracle.com website** – Oracle's website has a great many important white papers that can help you dig deeper into many areas on literally every topic I discussed (including EMC and XP256!).
- **Oracle9*i* Partner Accelerator Kit** – Available from OTN, this resource essentially amounts to dozens of hours of free training on many important iDBA topics as well as on how to use the Oracle Migration Workbench for migrating from SQL Server to Oracle
- **Cisco: A Beginners Guide –** this book covers the basics of network infrastructure, a key component of every DBA's reading list as you transform yourself from DBA to iDBA.
- **The EMC.com website -** I wish I could find a good book on storage area networks. Until I do, I'll use the EMC website.

Handy Bibliography

- **Futurize Your Enterprise** – this book covers the basics of website development around customers, the fundamental tenet of E-business.
- **The NetworkWorld.com website** – a handy place to learn more about Oracle and other vendors in the emerging E-business marketplace. Also a great place to look up terms related to the E-business infrastructure.
- **The Metagroup.com website** – a great resource for getting analysis as well as news about the development of E-business in the world today.
- **The HP.com website -** great resource for learning more about HP Openview.

Conclusions



- DBA to iDBA: Evolution, not Revolution
  - Learn the lexicon for the five components
  - Start with the features you've implemented
  - Expand scope to include HA infrastructure configurations, Java in the database, and Storage Area Networks
  - Top off with Oracle Integration Server or other IEI and AEI integration efforts