OBJECT-RELATIONAL COMPONENT APPROACHES: A COMPARISON

**Database & Client/Server World
Chicago
Tuesday, December 9, 1997
11:00 A.M.-12:15 P.M.**

**David McGoveran
Alternative Technologies
13150 Highway 9, Suite 123
Boulder Creek, CA   95006
Telephone: 408/338-4621
www.AlternativeTech.com**

PLEASE REMEMBER TO FILL OUT YOUR EVALUATIONS... *Thank you!*

OVERVIEW

- **Definition**

- **Some Approaches**

- **Fundamental Issues**

- **A Framework for Evaluation**

- **Comparison of IBM, Informix, Oracle, and Sybase**

- **Design, Development, and Maintenance Issues Along the Way**

DEFINITION

DBMS Components

A *DBMS component* is re-usable and packageable component which can be invoked from a DBMS. It can contain complex logic for manipulating complex data.

SOME APPROACHES

- **Communications Architectures**

  – **ORACLE'S NETWORK COMPUTING / COMMUNICATIONS ARCHITECTURE**

- **Physical Data Store Extensions**

  – **SYBASE'S ADAPTIVE COMPONENTS ARCHITECTURE**

  – **IBM'S UNIVERSAL SERVER**

- **Model-based Extensions**

  – **INFORMIX UNIVERSAL SERVER**

BLOCK DIAGRAM

-

DBMS

INSTALLATION?
REGISTRATION?
STORAGE?

INVOCATION

COMPONENT

DATA?

?

???

WORLD
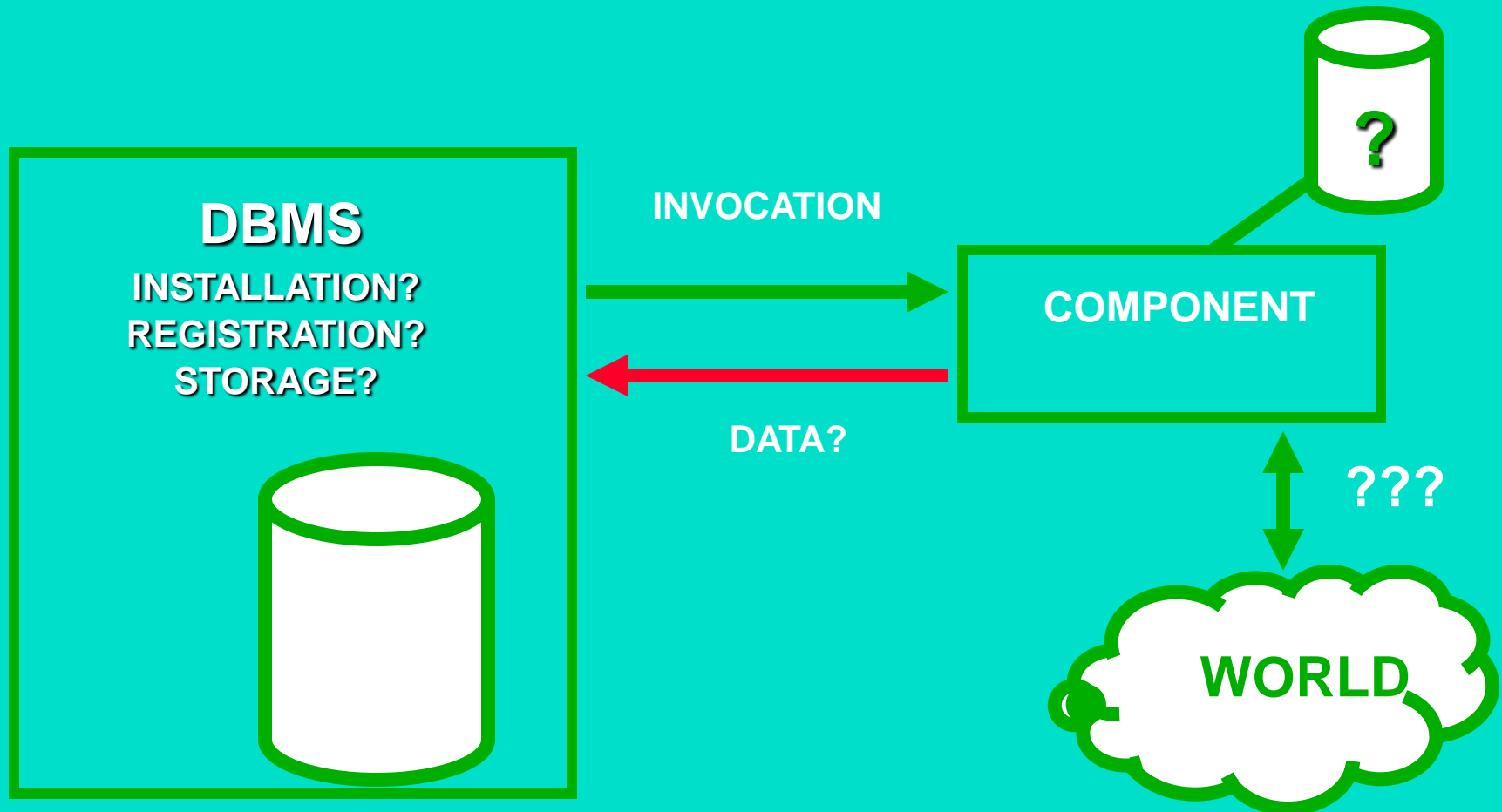
FUNDAMENTAL ISSUES

- **Logical Transparency**

  - **SYNTACTIC, RELATIONAL OPERATIONS, RELATIONAL STRUCTURES (TABLE, COLUMN, VIEW), RELATIONAL INTEGRITY (ATOMICITY, COMPARISONS, CONSTRAINTS)**

- **Physical Transparency**

  - **INSTALLATION, COMMUNICATIONS, SPACE MANAGEMENT, PERFORMANCE MANAGEMENT**

- **Duplicates**

  - **DEFINING AND IMPLEMENTING EQUIVALENCE OPERATIONS**

  - **SORTING (OR ORDERING IN N-DIMENSIONS)**

FUNDAMENTAL ISSUES

- **Relational Fidelity**

- **Optimization**

- **Access Methods (one or many)**

- **Transaction Management**

  – **LOGGING, ISOLATION & LOCKING, RECOVERY**

- **Utility integration**

 – **BACKUP, RESTORE, IMPORT, EXPORT, RECOVERY**

RELATIONAL STRUCTURE ISSUES

- **Data Type Designation**

  - **REGISTRATION**

- **Intra-Domain Operators**

  - **ROUTINES, AGGREGATES, ERROR MESSAGES, COMPARISONS (=, >, <,..), NEGATION,…**

- **Inter-Domain Operators**

  - **CASTS, TYPE CONVERSIONS**

- **Are all domain operations defined and destroyed with the component?**

  - **IS DOMAIN INTEGRITY MAINTAINED?**

RELATIONAL STRUCTURE ISSUES

- **Are multiple versions of same object prevented or discouraged by the tools?**

- **Can encapsulation be broken?**
  - **IS DATA ACCESSIBLE WITHOUT THE DBMS**

- **Respects the Information Principle**

- **No Restrictions on Number of Appearances Per Row**

- **Relational Views**

- **… and if you must use them, *NULL*s (yech!)**
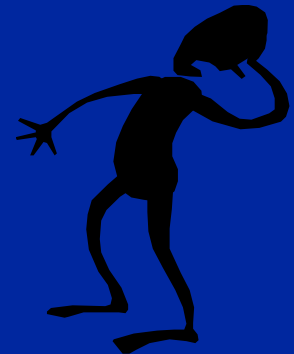
RELATIONAL ISSUES

- **Relational Operation Support**

  - **JOIN, PROJECTION, RESTRICTION**

  - **UNION, INTERSECTION,SET DIFFERENCE**

  - **SELECT, UPDATE, DELETE, INSERT**

  - **SUBQUERIES, EXISTS, GROUP BY**

- **Relational Integrity Support**

  - **DOMAIN CONSTRAINTS, COLUMN CONTRAINTS**

  - **ROW CONSTRAINTS, MULTI-ROW CONSTRAINTS**

  - **MULTI-TABLE CONSTRAINTS, TRIGGERS**

TRANSACTION MANAGEMENT ISSUES

- **ACID Properties**

- **Transaction Isolation**
  - **READ**
  - **WRITE**

- **Logging Granularity**
  - **FULL VALUE**
  - **DELTA**

- **Are invocations transactional?**

PERFORMANCE ISSUES

- **Statistics**

- **Optimization Cost Functions**

- **Are relative function costs taken into account?**

- **Multiple Access Methods**
    - INDEX MEHTODS

- **User Performance Tuning**

- **Invocations**
    - PER INSTANCE (VALUE), PER QUERY, PER REFERENCE
    - IS INVOCATION COST TAKEN INTO ACCOUNT IN OPTIMIZATION

DB ADMINISTRATION ISSUES

- **Backup**

- **Restore**

- **Synchronizing Backup / Recovery?**

- **Import and Export**

- **Recovery**

- **Security (can DB security be subverted?)**

- **Storage**

  - **REMOTE OR LOCAL**

  - **PLACEMENT CONTROL**

  - **COMPRESSION AND EFFICIENCY**

MEMORY SUPPORT ISSUES

- **Thread Safety**

- **Mutex for global access?**

- **Does cacheing work?**

  - **CAN DATA SIZE OVERRUN DBMS CACHE?**

  - **SEPARATE CACHE?**

  - **PRE-FETCH?**

- **Shared Memory**

  - **CAN LEAD TO CORRUPTED MEMORY, EXHAUSTED STACKS**

COMMUNICATION ARCHITECTURE ISSUES

- **With what does the component communicate?**
  - DBMS ENGINE, OTHER COMPONENTS, APPLICATIONS, OTHER SERVERS

- **Standards versus Proprietary**

- **Methods**
  - MESSAGE AND QUEUE SUPPORT, DLL, RPC

- **Standard API**
  - PROPRIETARY (OPTIMIZED FOR DBMS INTEGRATION?) OR OPEN

- **DB Connectivity**
 - ODBC, JDBC, ACTIVEX, CORBA, COM, DCOM

PROCESS MODEL

- **Process-based Architecture**

- **Thread-based Architecture**

- **Serial Processing**

- **Parallel Processing**

- **Multi-threaded**

  – **CONTEXT SWITCH OVERHEAD OR SHARED MEMORY OR PROCESSOR AFFINITY**

- **Data Partitioning**

DESIGN, DEVELOPMENT, AND IMPLEMENTATION

- **Development**
  - WHAT LANGUAGE(S) IS (ARE) USED
    - » JAVA, C/C++, VB, SQL, COBOL, …
  - WHAT TOOLS ARE AVAILABLE
    - » DEBUG, SOURCE CODE, INSTALL, REGISTER, ...
- **Language**
  - JAVA, JSQL,
- **Registration and Un-registration**
- **Installation and Un-install**
- **Portability**
- **16, 32, 64 Bit Versions**

EVALUATING AND COMPARING THE PRODUCTS

- **IBM Universal Server**

  – **RELATIONAL EXTENDERS**

- **INFORMIX Universal Server**

  – **DATABLADES**

- **ORACLE8**

  – **DATA CARTRIDGES**

- **SYBASE Adaptive Server**

  – **ADAPTIVE COMPONENTS**
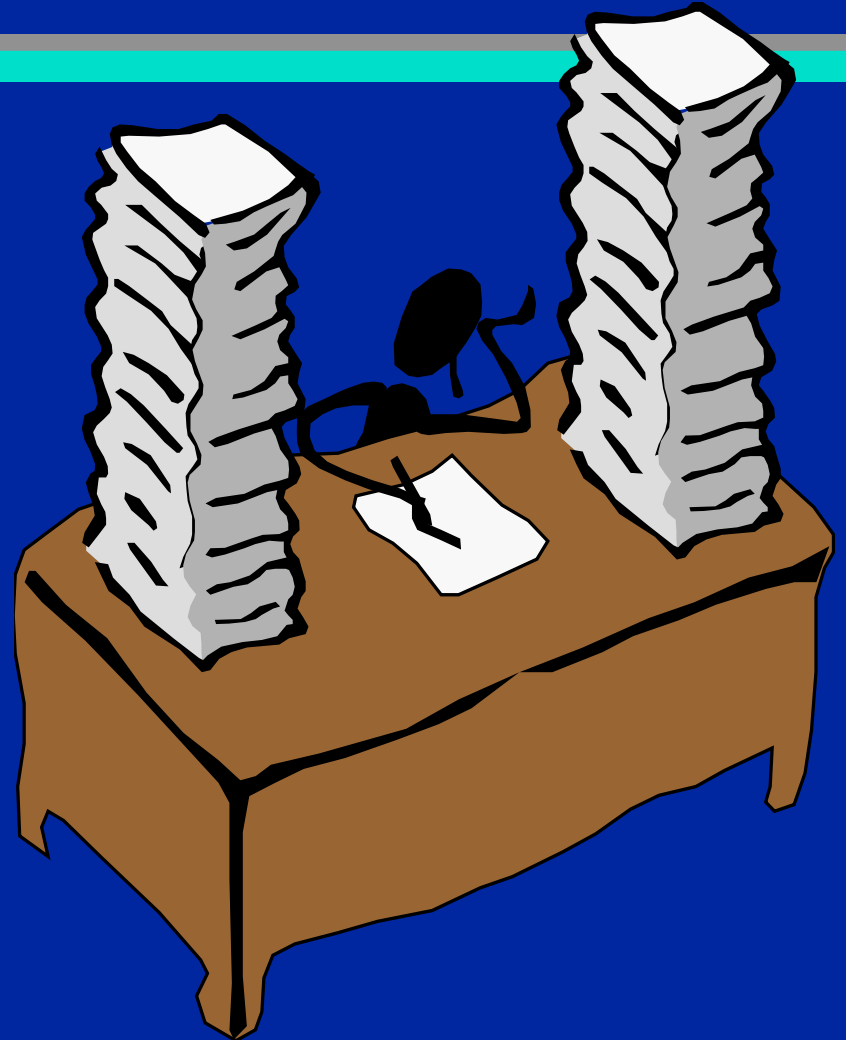
EVALUATING AND COMPARING THE PRODUCTS

- **Relational Support**

- **Transaction Management**

- **Performance**

- **DB Administration**

- **Memory Management**

- **Communication Architecture**

- **Process Model**

- **Design, Development, and Implementation**

EXAMINE DETAILS

BIOGRAPHY

- **David McGoveran is a well-known relational database consultant and president of Alternative Technologies (Boulder Creek, CA), specialists in solving difficult relational applications problems since 1981. He publishes <u>The Database Product Evaluation Report Series</u>; authored (with Chris Date) <u>A Guide to SYBASE and SQL Server</u>; and is completing <u>Advanced Client /Server: Design Concepts, Techniques, and Principles</u>.   Portions of this presentation are based on his workshops: <u>The Client/Server University: Product Evaluation Techniques</u>.**

PLEASE FILL OUT YOUR EVALUATIONS...
Thank you!