DB2 技術優勢與各行業應用

IBM軟體事業處

DB2 技術優勢

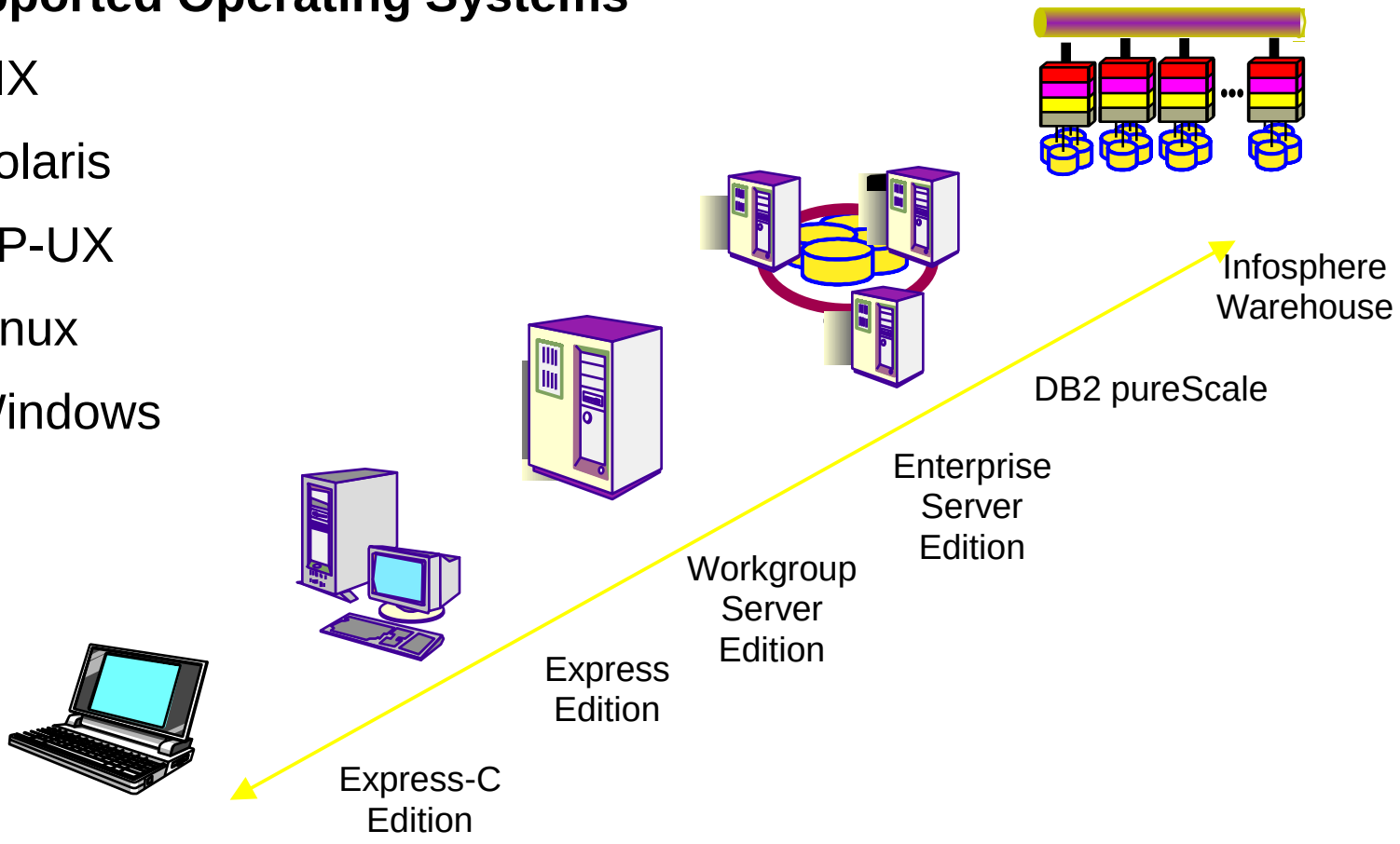
- **資料庫自主管理功能**
  - 自主調整記憶體、自主重整、自主備份
  - 讓 DBA 工作更容易
- **業界唯一以原生樹狀結構儲存 XML 資料**
  - 最佳 XML 儲存效率與存取效能
  - 支援各種業界標準：HL7、XBRL、……
- **業界最佳資料庫壓縮技術**
  - 50 – 75% 壓縮比
  - 減少磁碟空間用量、降低維護成本、增進效能
- **Active-Active Database Architecture**
  - DB2 PureScale 採用 IBM z/OS Sysplex 技術理念，達到最佳的高可用度與擴充性
- **支援 Oracle 應用系統**
  - 支援 Oracle 程式語言與資料型態
  - 降低軟體成本與維護成本。
- **極佳的穩定度與高可用度**
  - DB2廣泛被採用於各行業的核心 Mission Critical System

完整的資料庫附加功能

- **與異質資料庫的整合與資料交換**
  - 透通存取異質資料庫（Oracle、Sybase、SQL Server、Teradata）等資料庫
  - 與異質資料庫（Oracle、Sybase、SQL Server ）雙向資料複製（Data Replication）
- **完整的資料庫管理以及效能監控工具**
- **完整的資料庫應用系統安全稽核**
- **完整的資料生命週期管理工具**
- **豐富的資料模型**

適用於不同用途的各種版本

- **Supported Operating Systems**
  - AIX
  - Solaris
  - HP-UX
  - Linux
  - Windows

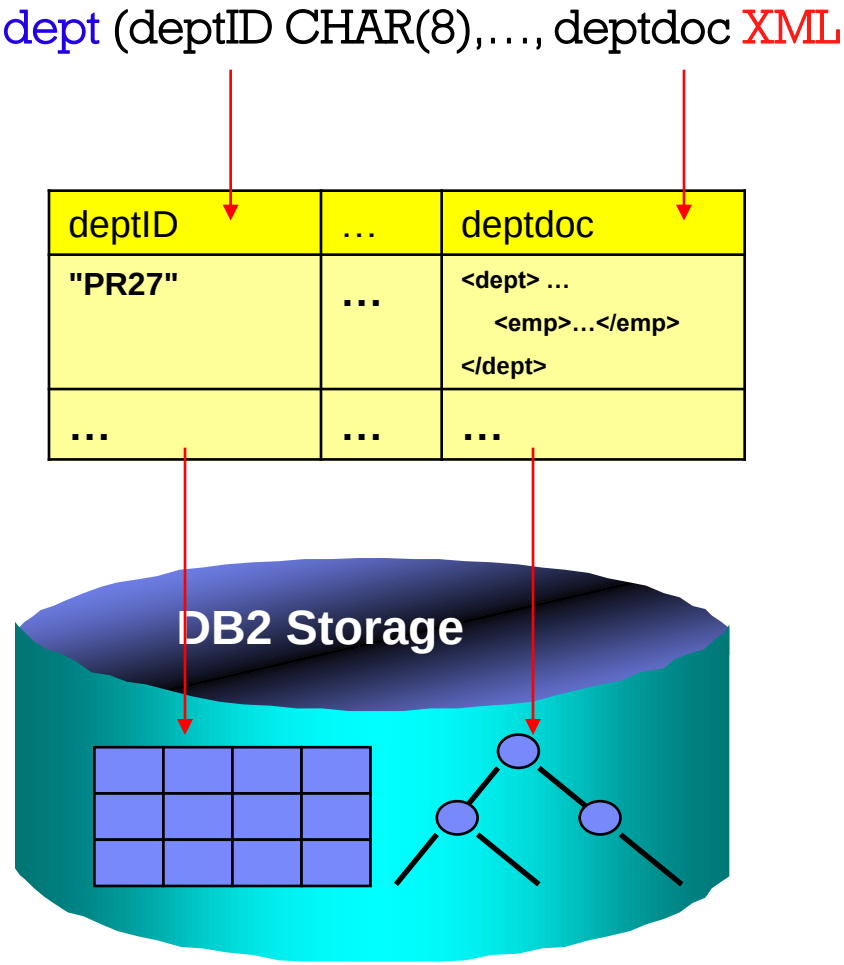


支援各種業界標準

- **ANSI/ISO SQL**
- **JDBC**
- **Open Geospatial Consortium (OGC)**
- **ODBC**
- **.NET**
- **X/OPEN XA**
- **X/OPEN CLI**
- **DRDA**
- **SQL/XML**
- **XQuery**
- **SSL**
- **…….**

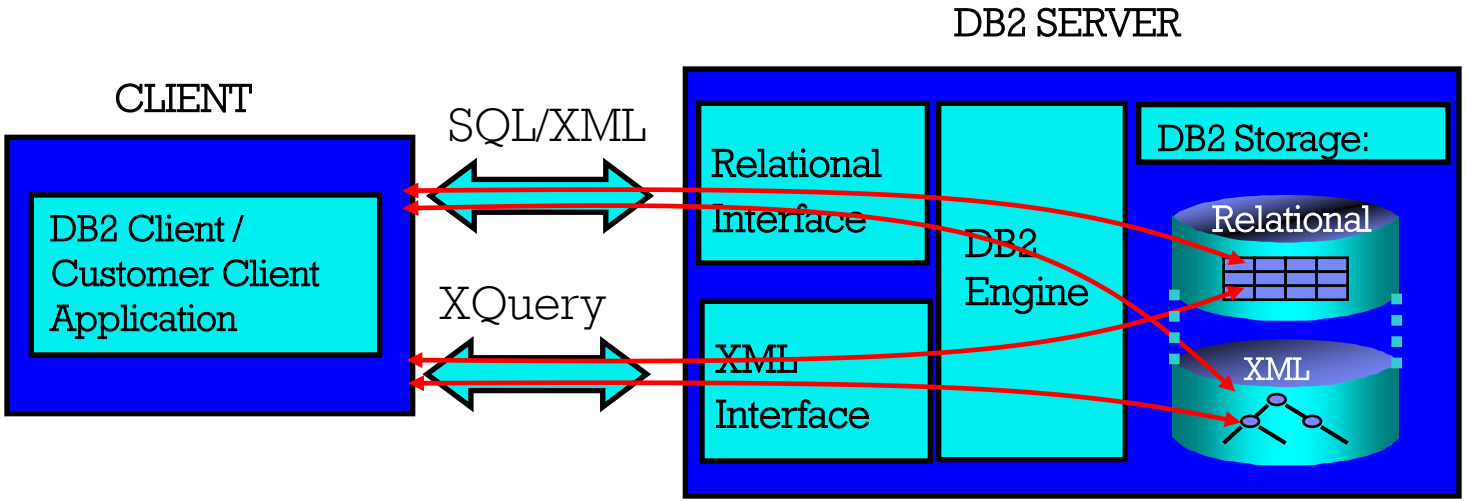
DB2 Leading Technology - PureXML

- **Native XML support**
  - Stores XML doc in natural format
    - Tree structure
    - Not CLOB, No shredding
  - Native XML data type
  - Relational columns are stored in relational format (tables)
  - **No XML parsing for query evaluation!**



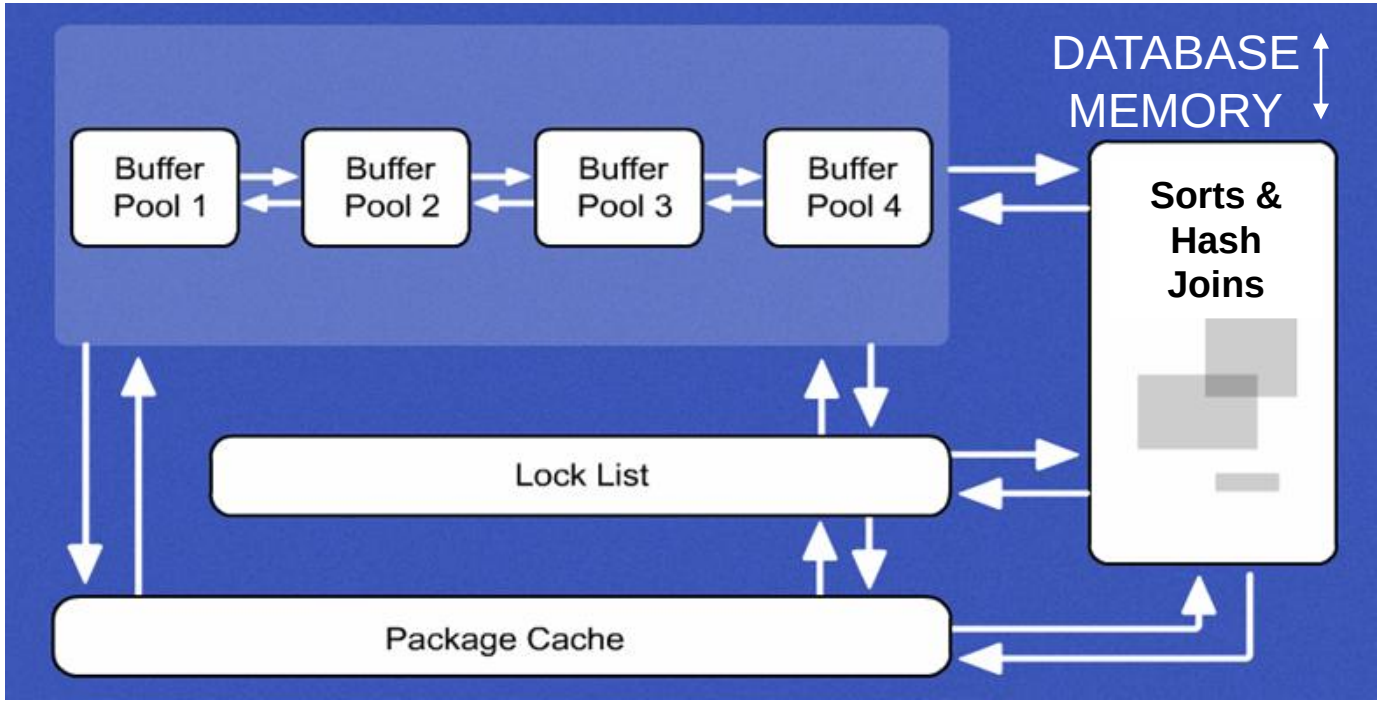
DB2 Leading Technology - PureXML

- **Native XML support**
  - Support SQL/X and XQuery
  - XML Schema Registration
    - XML Doc validation
  - XML Indexing



Automatic Database

- **DB2 Self-Tuning Memory Management**
  - Automatically adjust database shared memory according to workload



Automatic Database

Self-Managing Example :: *Automatic Object Maintenance*

- **Enabled/disabled through database configuration parameter hierarchy**
- **AUTO_MAINT is the master on/off switch**
- **Individual Child parameters can be set to ON/OFF and the settings are persisted in the database configuration file.**

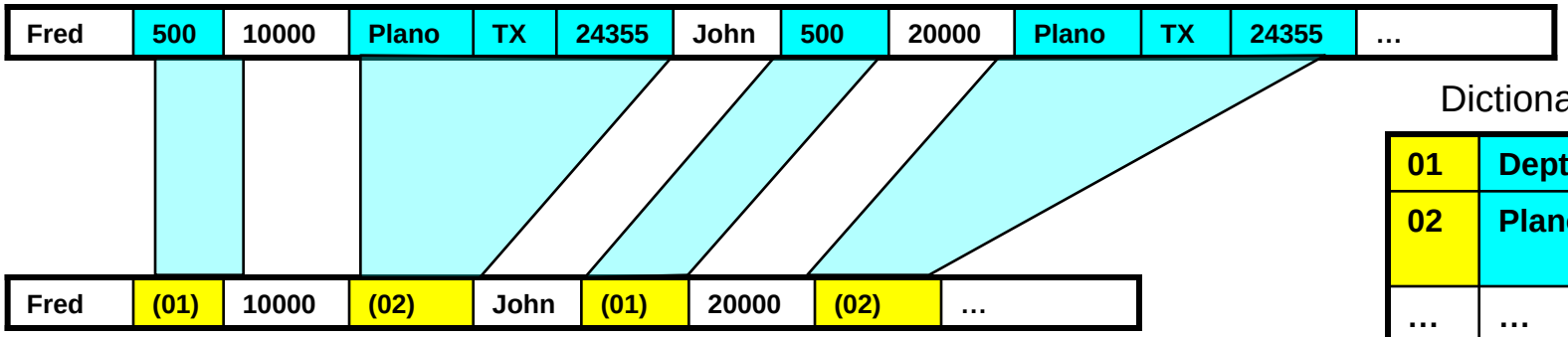
- `AUTO_MAINT (ON)`
  - `AUTO_DB_BACKUP (OFF)` — *Auto Backup*
  - `AUTO_TBL_MAINT (ON)`
    - `AUTO_RUNSTATS (ON)` — *Auto Runstats*
      - `AUTO_STMT_STATS (OFF)`
    - `AUTO_STATS_PROF (OFF)` — *Auto Stats Profiling*
      - `AUTO_PROF_UPD (OFF)`
    - `AUTO_REORG (OFF)` — *Auto Reorg*

- **Integrated with Health Monitoring**

DB2 Leading Technology

- **Data Compression**
  - Lempel-Ziv (LZ) dictionary based compression technology

Name	Dept	Salary	City	State	ZipCode
Fred	500	10000	Plano	TX	24355
John	500	20000	Plano	TX	24355

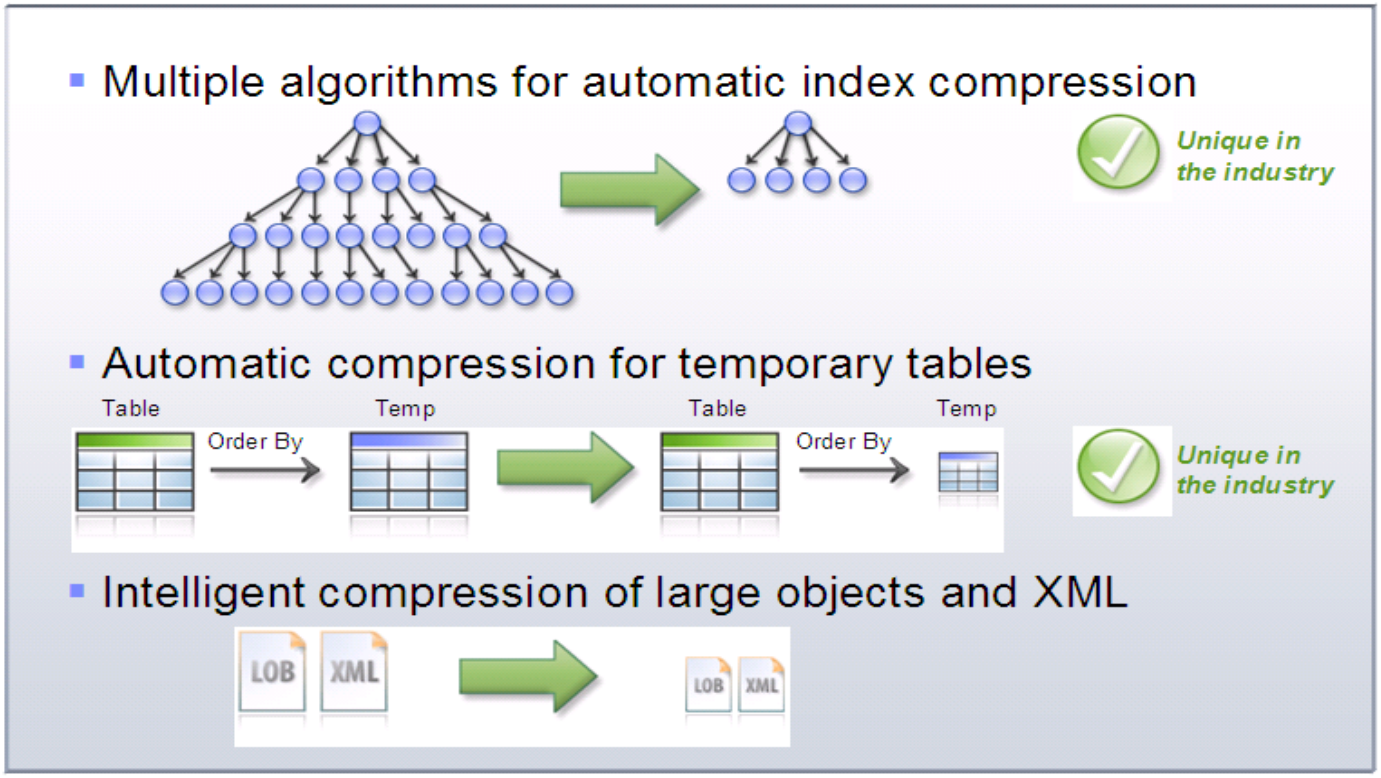


Dictionary

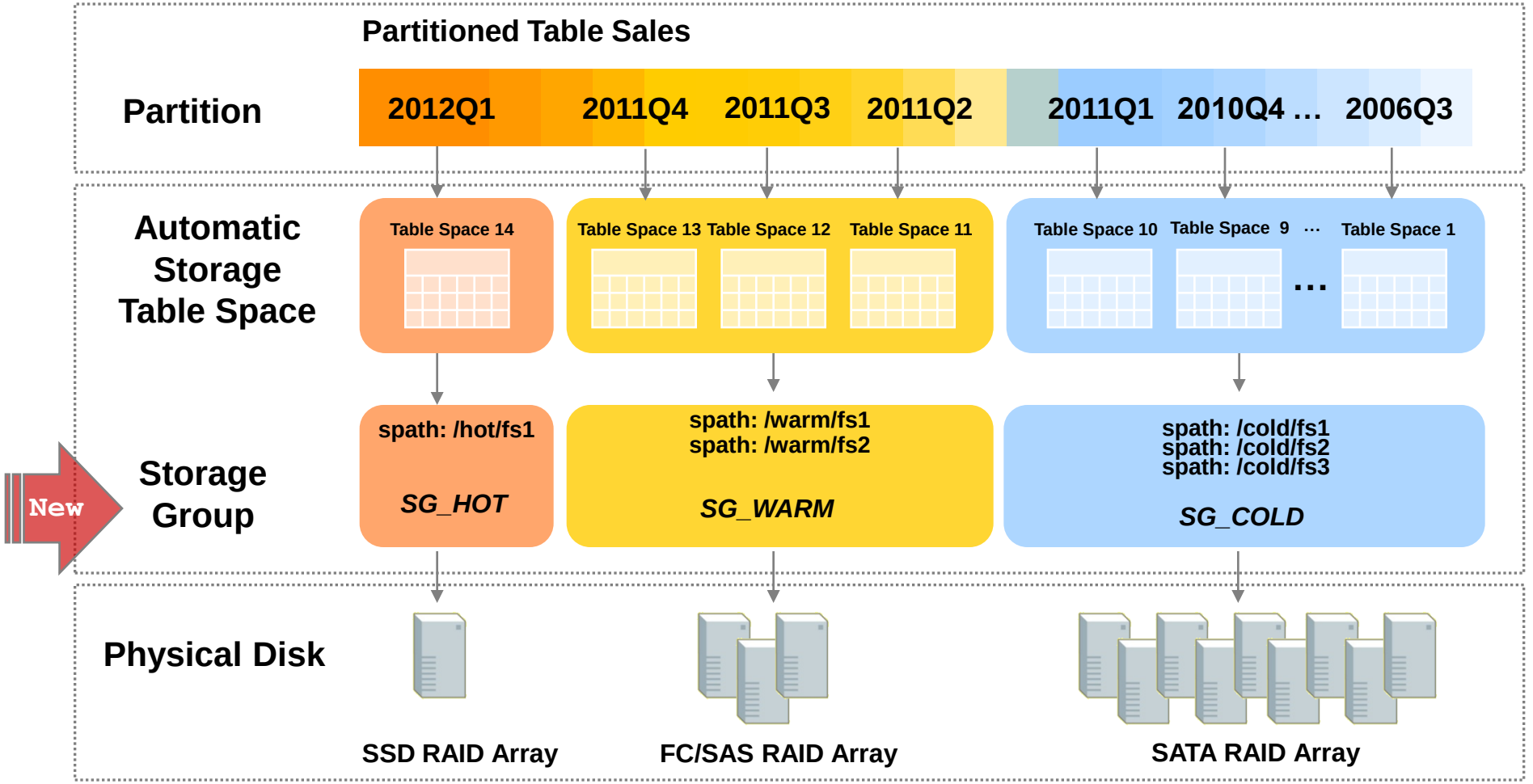
01	Dept 500
02	Plano, TX, 24355
…	…

DB2 Compression

- **Table, Index, Temporary Table, XML Compression**
- **Benefits**
  - Save Storage
  - Reduce Backup/Restore time
  - Improve I/O



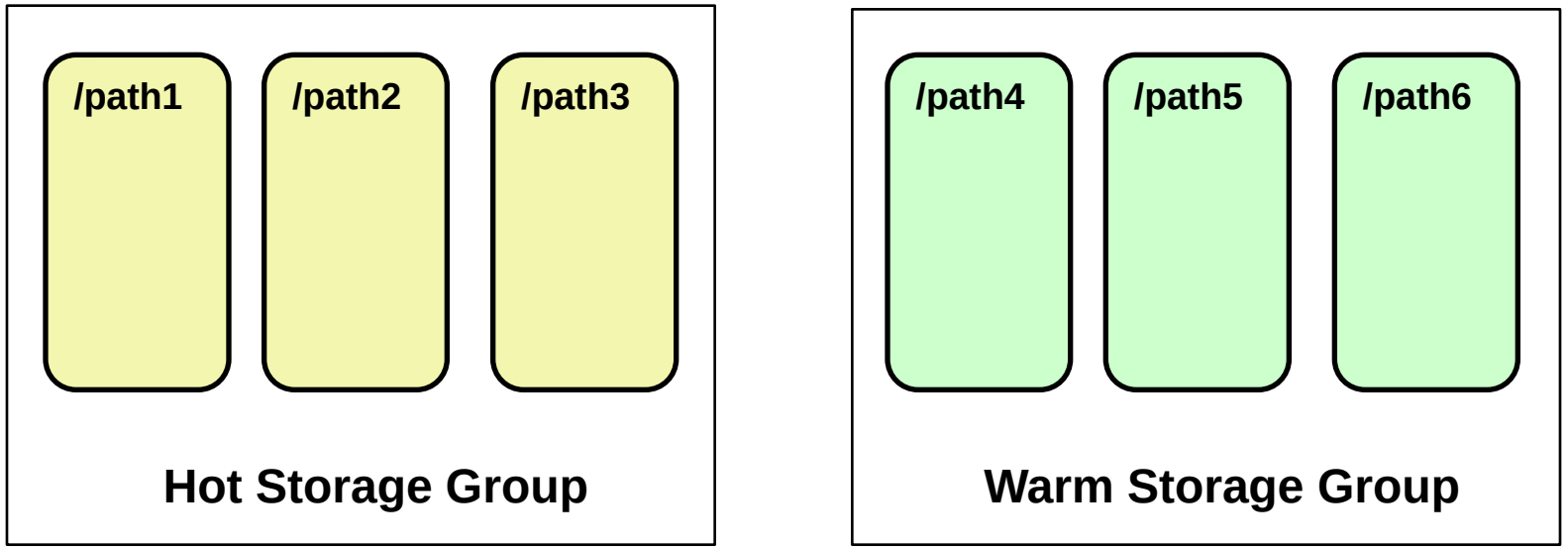
Multi-Temperature Data Management



How to Change the Temperature of Your Data

- Use `ALTER TABLESPACE` to change data temperature of table space
- Implicit `REBALANCE` occurs when table space moved between storage groups

```
ALTER TABLESPACE TbSpc USING STOGROUP sg_target
```



- Monitor the progress of the `REBALANCE` by using the new monitoring table function `MON_GET_REBALANCE_STATUS`

Time Travel Query

Lower Costs and Risks with Less Code

- **Optimized for meeting audit and compliance inquires**
- **Point-in-time queries without the burden of changing application**
- **Standardized support for temporal insert, update, and delete operations**
- **Reduce risks, lower costs, and save time**

employees

EmpID	Dept	System_start	System_end
12345	M15	05/31/2000	12/31/9999

employees_history

EmpID	Dept	System_start	System_end
12345	J13	11/15/1995	01/31/1998
12345	M24	01/31/1998	05/31/2000
67890	K25	11/15/1995	03/31/2000

Which department is employee 12345 in?

```
SELECT Dept FROM employees
    WHERE EmpID=12345
```

Which department was employee 12345 in on 12/01/1997?

```
SELECT Dept FROM employees
    FOR SYSTEM_TIME AS OF '12/01/1997'
  WHERE EmpID=12345
```

Create Historical Queries with Less Effort and Reduced Costs

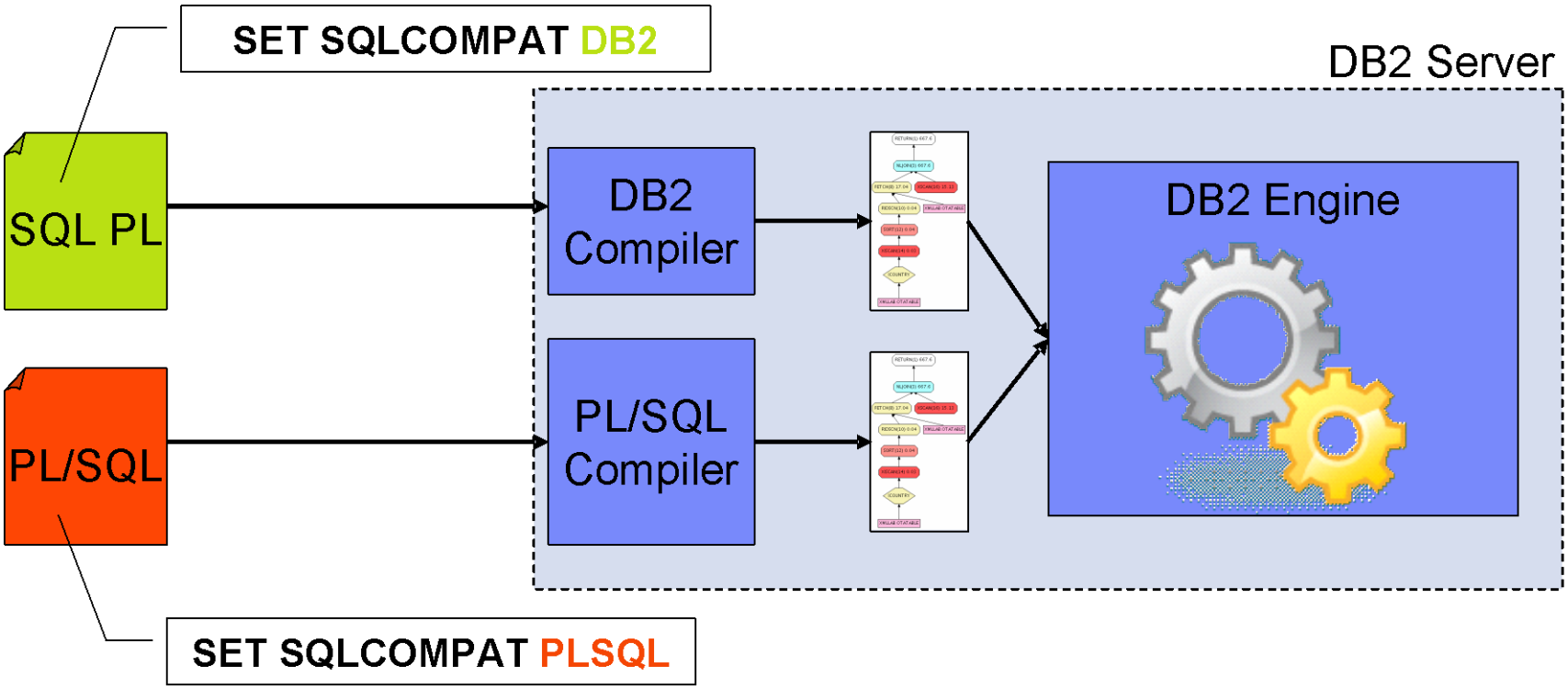
Switching to DB2

Oracle	→	DB2
Concurrency Control	→	Native support
SQL	→	Native support
PL/SQL	→	Native support
Packages	→	Native support
Built-in packages	→	Native support
OCI	→	Native support
JDBC	→	Native support
Online schema changes	→	Native support
SQL*Plus Scripts	→	Native support

Changes are the exception, not the rule.
This is why we call it “enablement” not “migration”.

Oracle application enablement made easy

- **New DB2 Cobra's Compatibility Features**
  - New Registry variable: DB2_COMPATIBILITY_VECTOR
  - PL/SQL language is supported by DB2 interface
    - SET SQLCOMPAT PLSQL – command to setup the CLP environment so that it can compile PL/SQL code



Migration/Porting Before DB2 9.7

- **Map schema and data types (with DB2 MTK)**
- **Move data (with DB2 MTK)**
- **Translate (semi-automated)**
  - Triggers
  - Procedures
  - Functions
  - Anonymous blocks
- **Translate SQL in application logic (manual)**
- **Debugging**
- **Test and Tuning (including selective redesign)**

- **→ Repeat for every new release of the application**

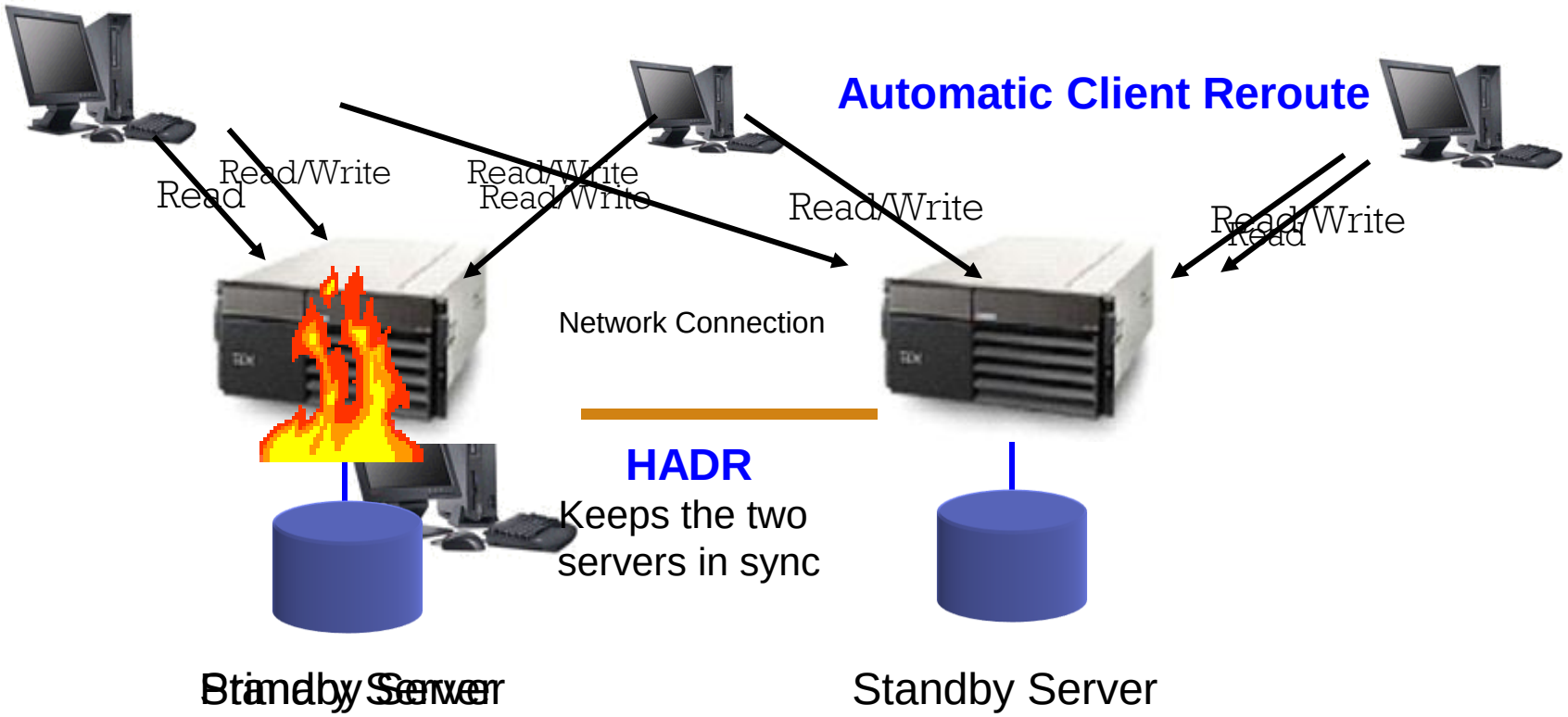
Migration/Porting with DB2 Now

- **Map schema and data types (with DB2 MTK)**
- **Move data (with DB2 MTK)**
- **Native Support**
  - Triggers
  - Procedures
  - Functions
  - Anonymous blocks
- **Translate SQL in application logic (manual)**
- **Debugging**
- **Test and Tuning**

- → **Repeat for every new release of the application**

DB2 HADR

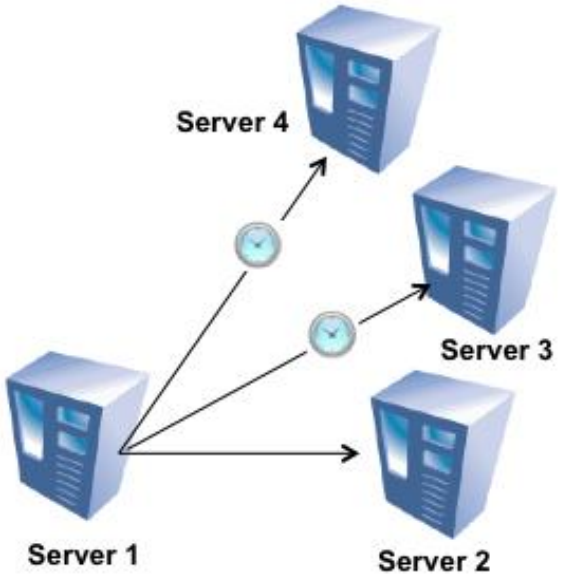
- Redundant copy of the database to protect against site or storage failure
- Support for Rolling Upgrades
- Bufferpool primed on Standby with recent updates
  - Reduces restart recovery time on standby



HADR Multiple Stand-by

Improving Availability

- **Multiple Stand-by**
  - Will allow for more than one stand-by server in an HADR group
  - System is redundant even after 1st failure
- **Time-Delayed Apply**
  - Apply of transactions can be delayed for a period of time
  - Used to protect against rogue transactions

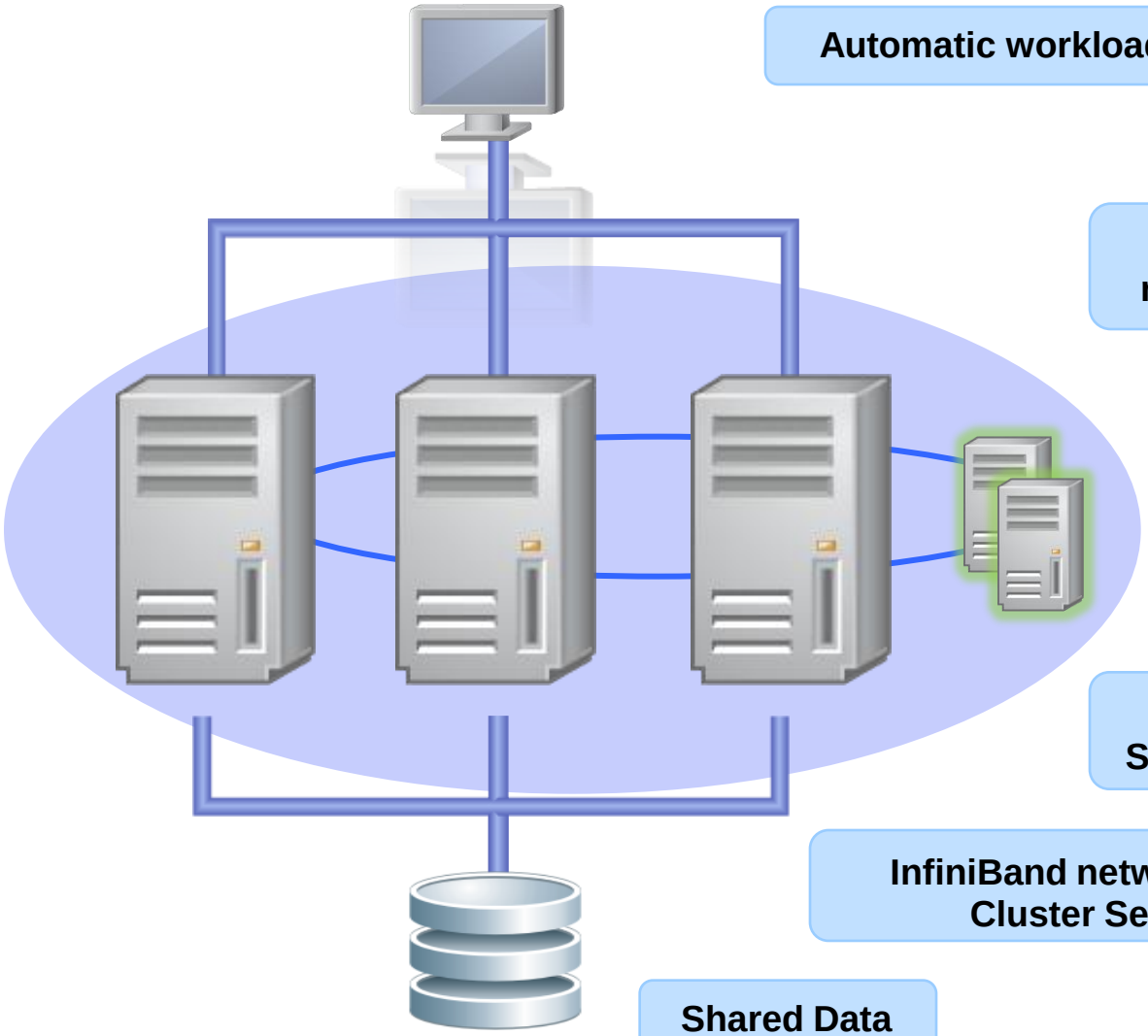


Enhancing Disaster Recovery Options

Complete DBMS Solutions for Various Environments

solidDB	DB2 pureScale	DB2 Enterprise	ISAS	Netezza
Extreme short and fast transaction in-memory DB	Multi server cluster for high volume OLTP workload	Single SMP server for mixed OLTP and DW workload	Multi server cluster for ODS and DW workload	High data volume DW solution

DB2 pureScale Architecture



Automatic workload balancing

Cluster of DB2 nodes running on Power servers

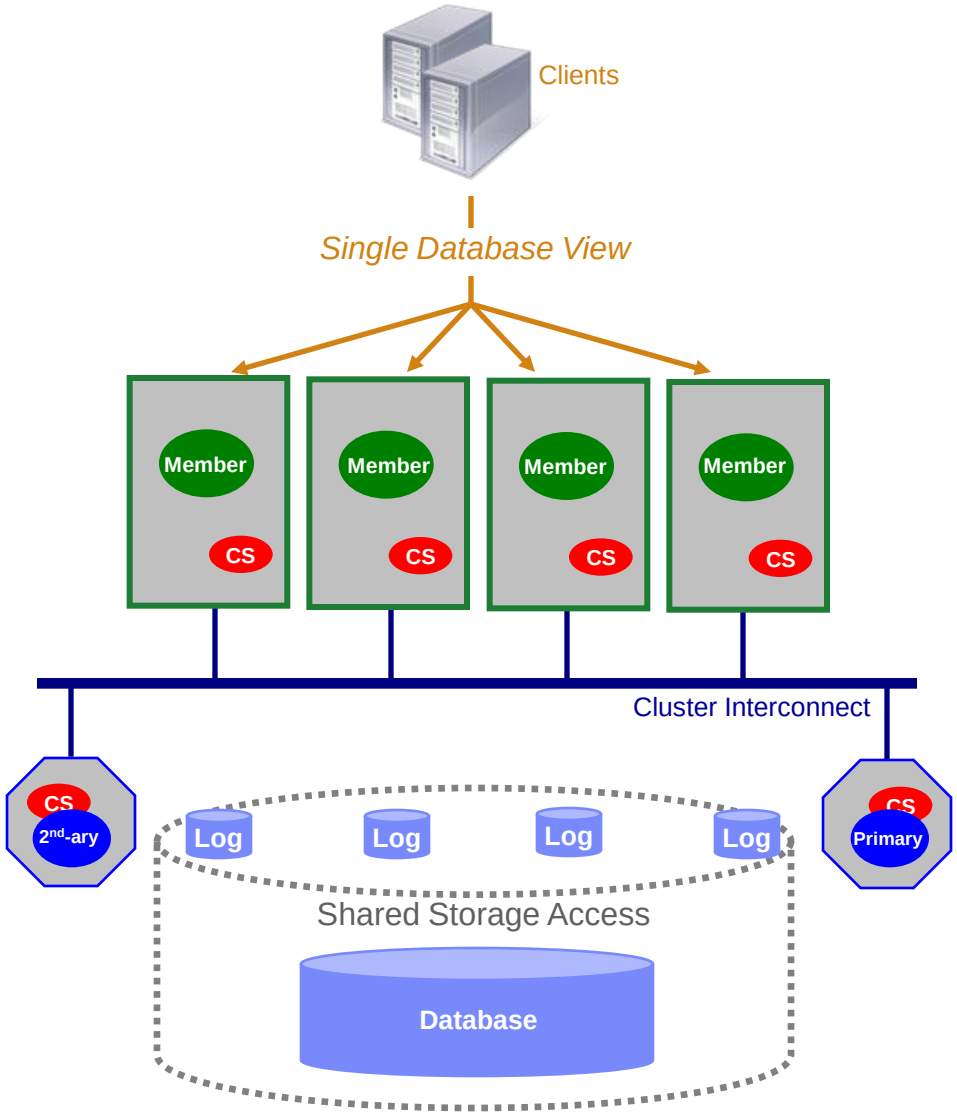
Leverages the global lock and memory manager technology from z/OS

Integrated Tivoli System Automation

InfiniBand network & DB2 Cluster Services

Shared Data

DB2 pureScale : Technology Overview



Clients connect anywhere,… … see single database

- Clients connect into any member
- Automatic load balancing and client reroute may change underlying physical member to which client is connected

DB2 engine runs on several host computers

- Co-operate with each other to provide coherent access the database from any member

Integrated cluster services

- Failure detection, recovery automation, cluster file system
- In partnership with STG and Tivoli

Low latency, high speed interconnect

- Special optimizations provide significant advantages on RDMA-capable interconnects (e Infiniband)

PowerHA pureScale technology

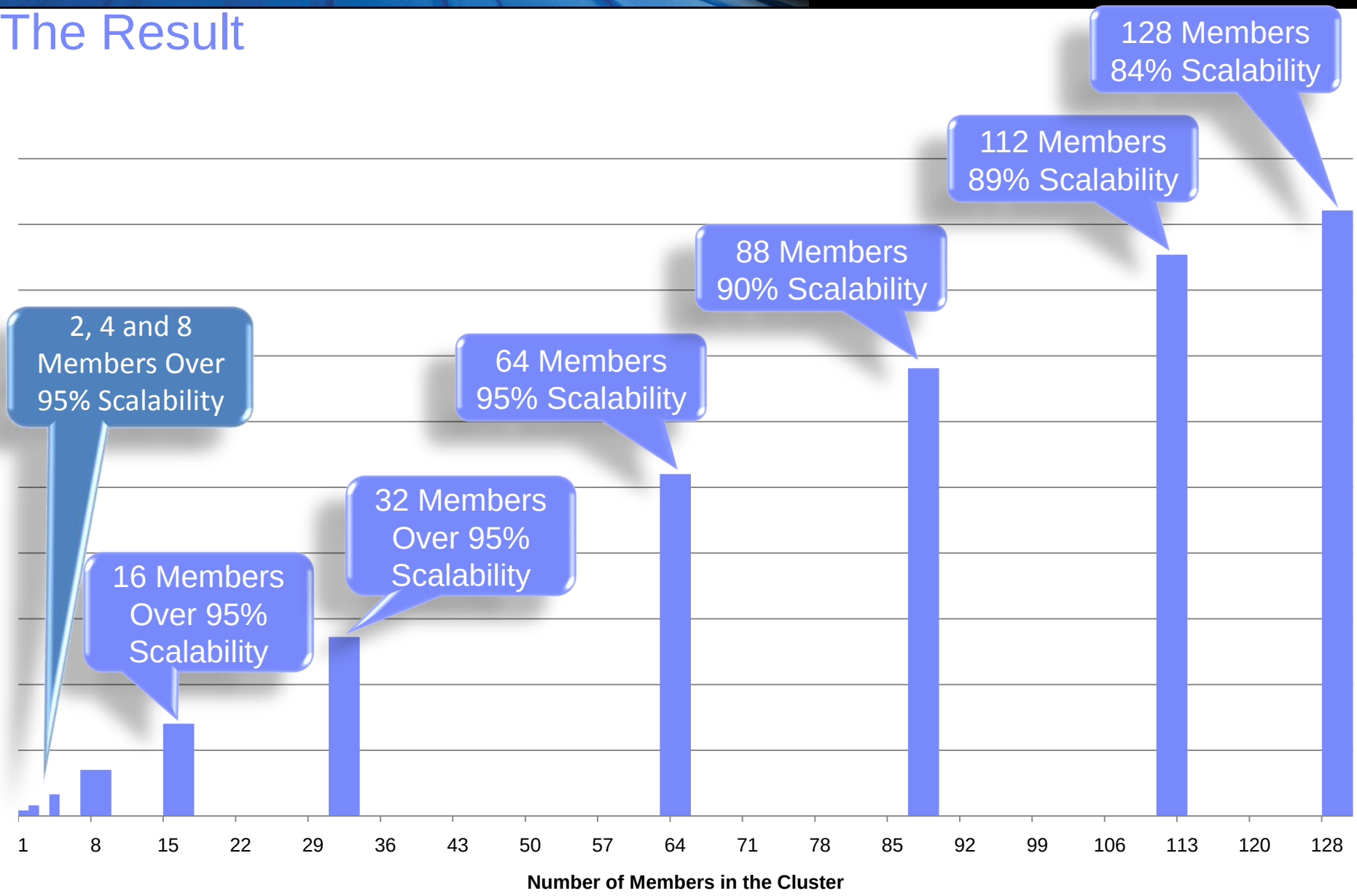
Efficient global locking and buffer management

- Synchronous duplexing to secondary ensures availability

Data sharing architecture

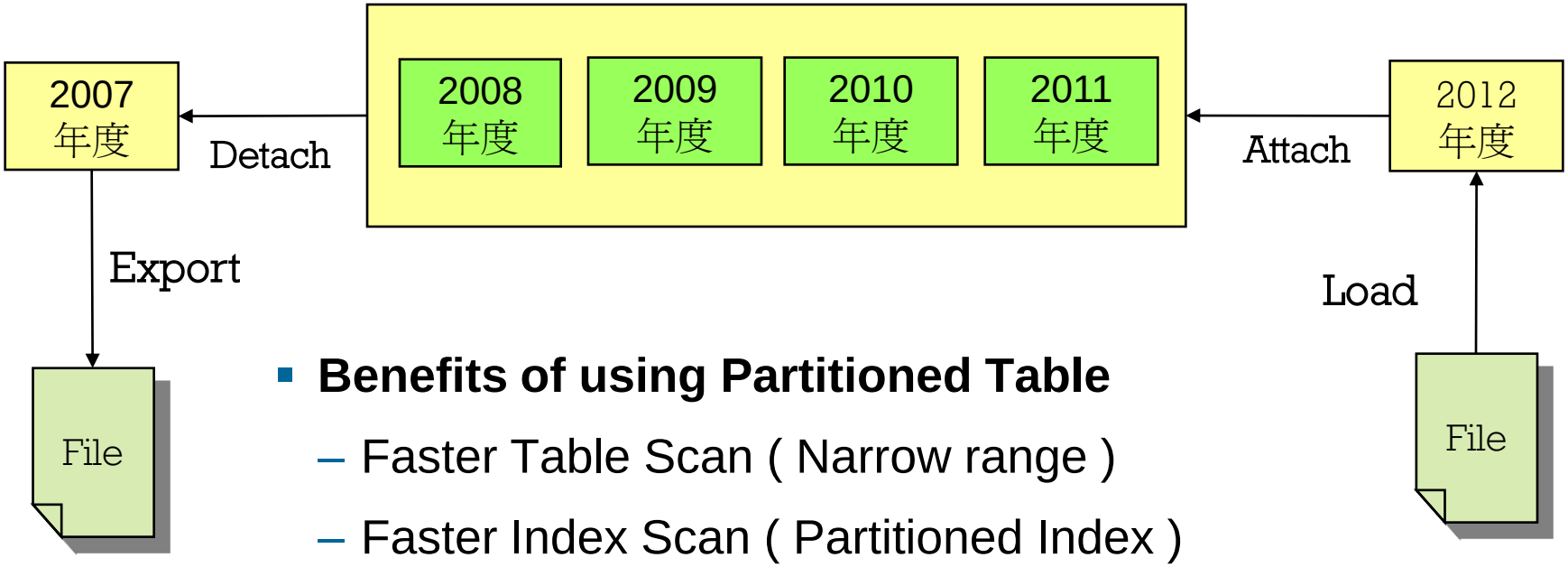
- Shared access to database
- Members write to their own logs
- Logs accessible from another host (used during recovery)

The Result



Validation testing includes capabilities to be available in future releases.

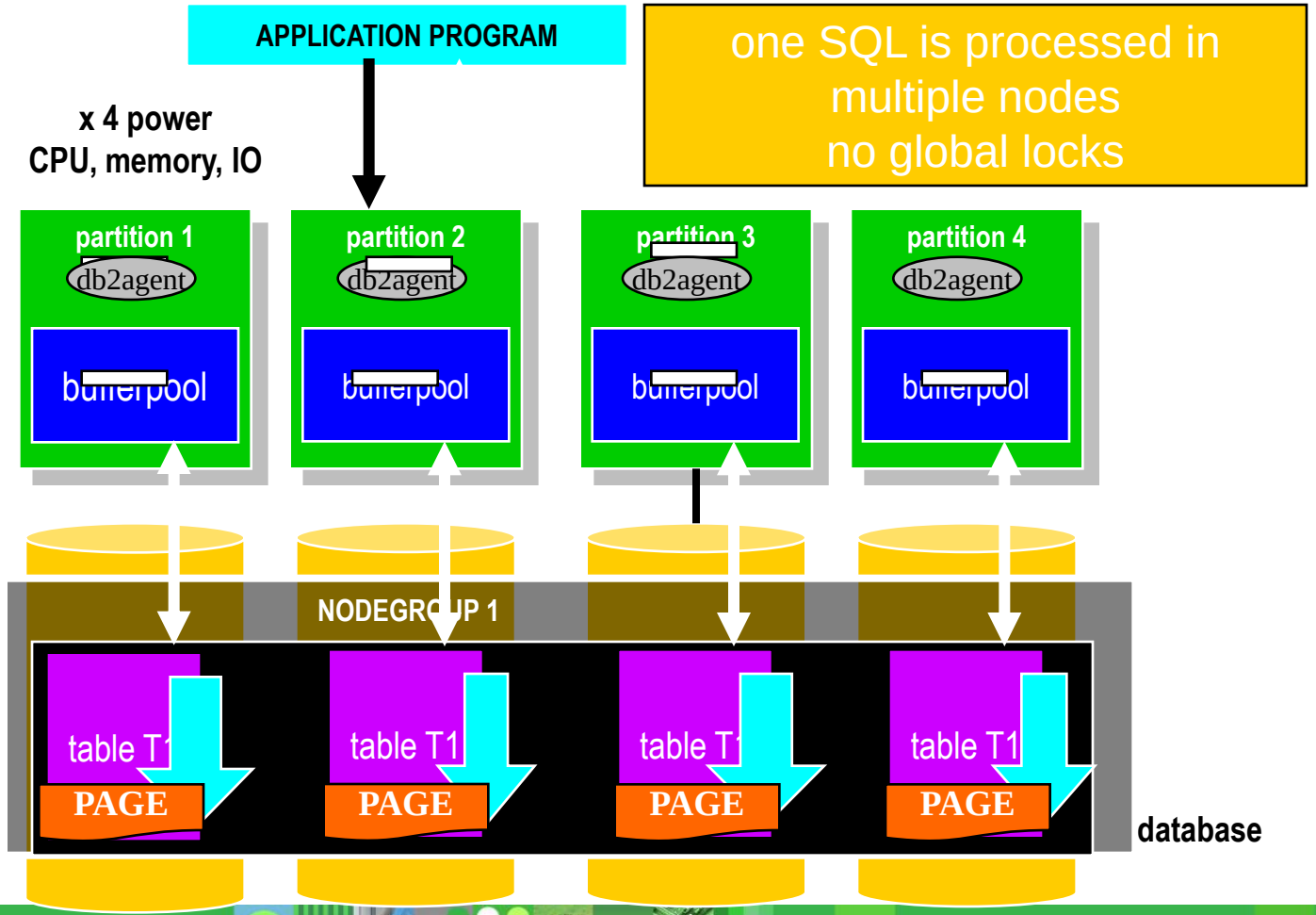
Partitioned Table



- **Benefits of using Partitioned Table**
  - Faster Table Scan (Narrow range)
  - Faster Index Scan (Partitioned Index)
  - Faster Roll-in Roll-out maintenance
    - Attach and Detach partition

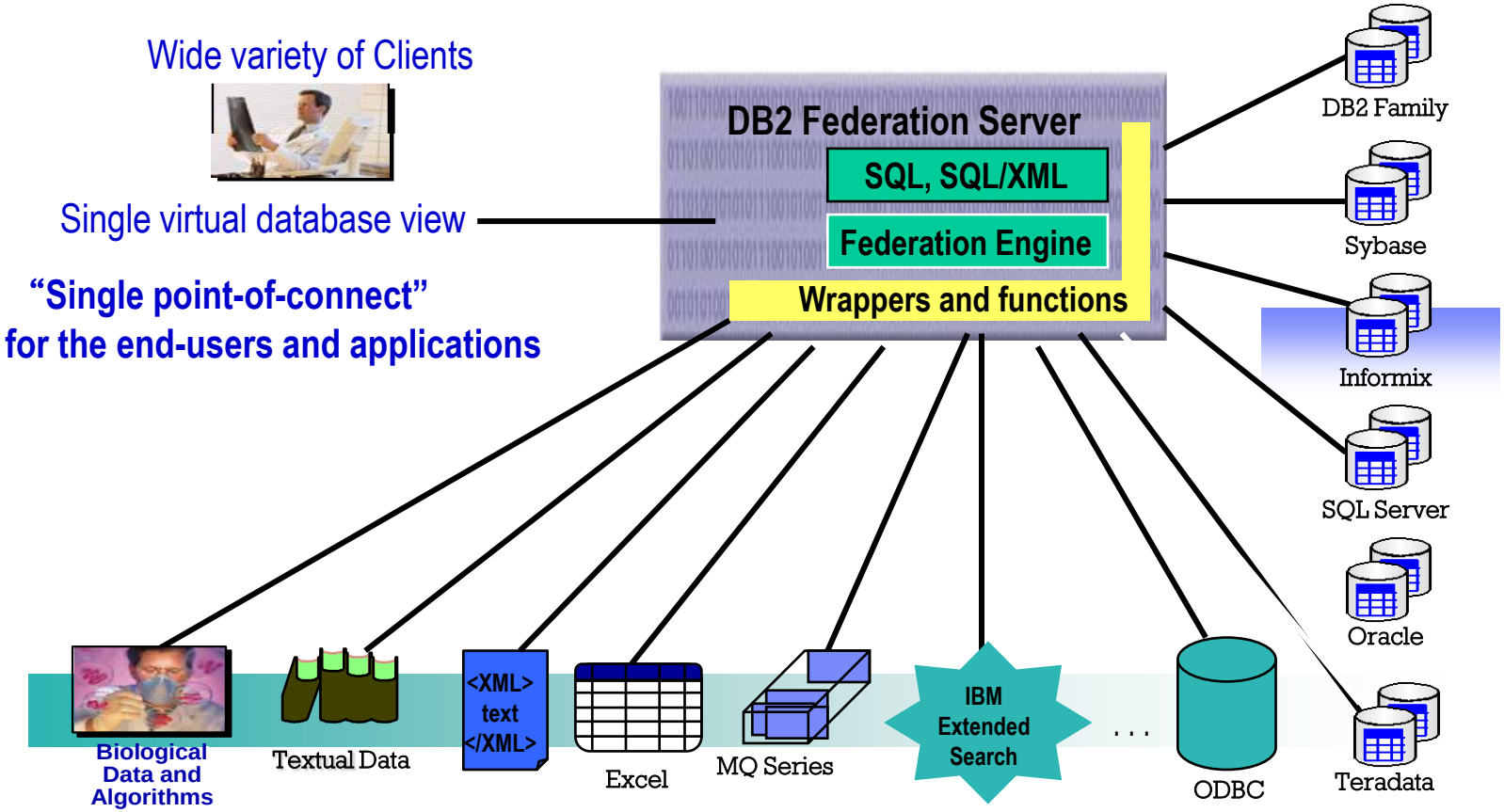
Partitioned Database for DW

- **SELECT … FROM T1 WHERE … GROUP BY ORDER BY**



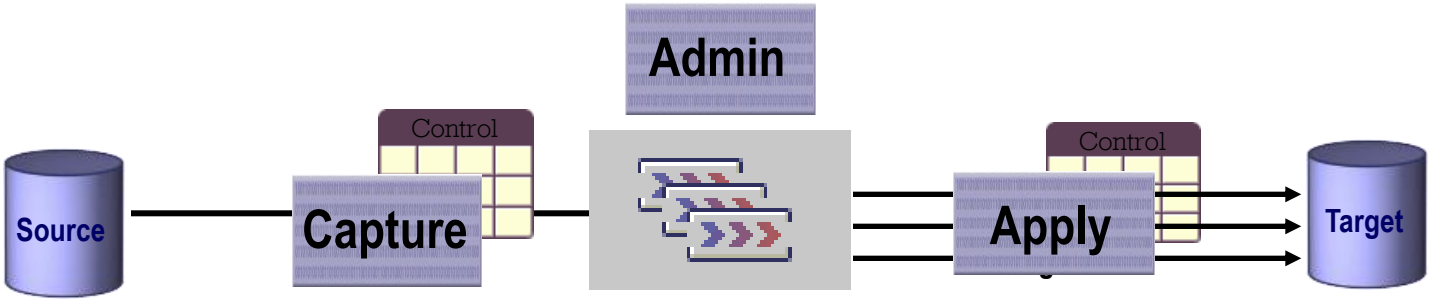
DB2 Leading Technology

- **Infosphere Federation Server**
  - Heterogeneous Database Access

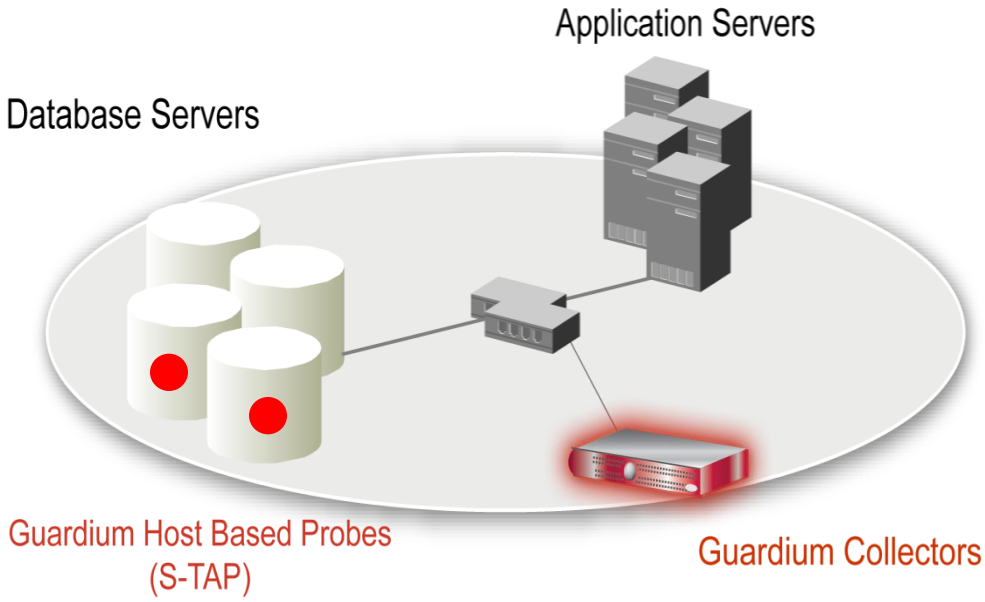


DB2 Leading Technology

- **Infosphere Replication Server**
  - Log-based change capture – Minimum performance impact
  - Q-based data transmission – High performance, long distance, guarantee delivery
  - XML format option for publishing
  - Highly parallel apply process



IBM 資料庫系統安全稽核 - Guardium

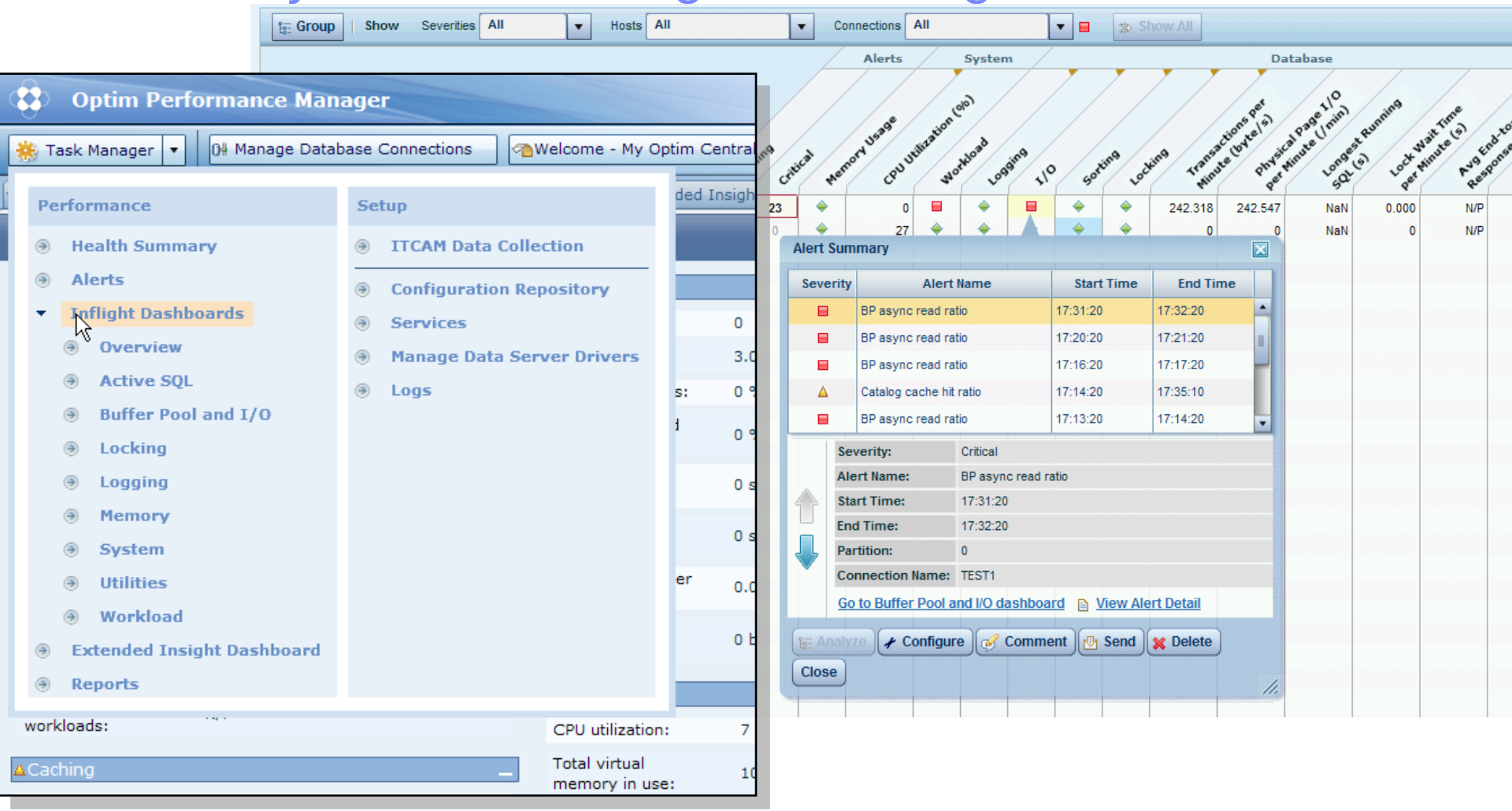


ORACLE
IBM DB2
SQL Server
TERADATA
SYBASE
MySQL
Informix

- Non-invasive architecture
  - Outside database
  - Minimal performance impact (2-3%)
  - No DBMS or application changes
- Cross-DBMS solution
- 100% visibility including local DBA access

- Enforces separation of duties
- Does not rely on DBMS-resident logs that can easily be erased by attackers, rogue insiders
- Granular, real-time policies & auditing
  - *Who, what, when, how*
- Automated compliance reporting, sign-offs & escalations (SOX, PCI, NIST, etc.)

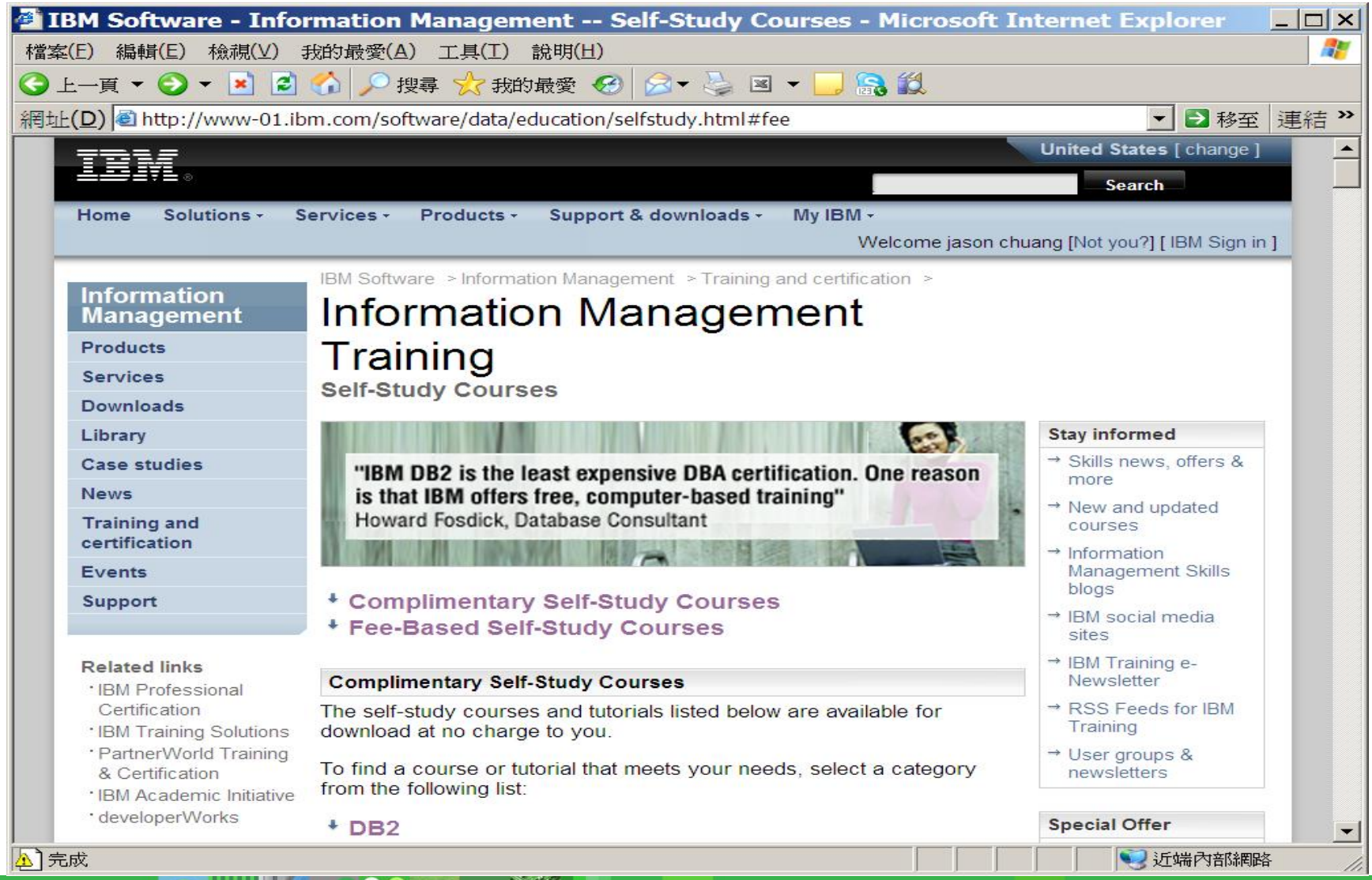
Optim Performance Manager – for DB2 System Monitoring and Tuning



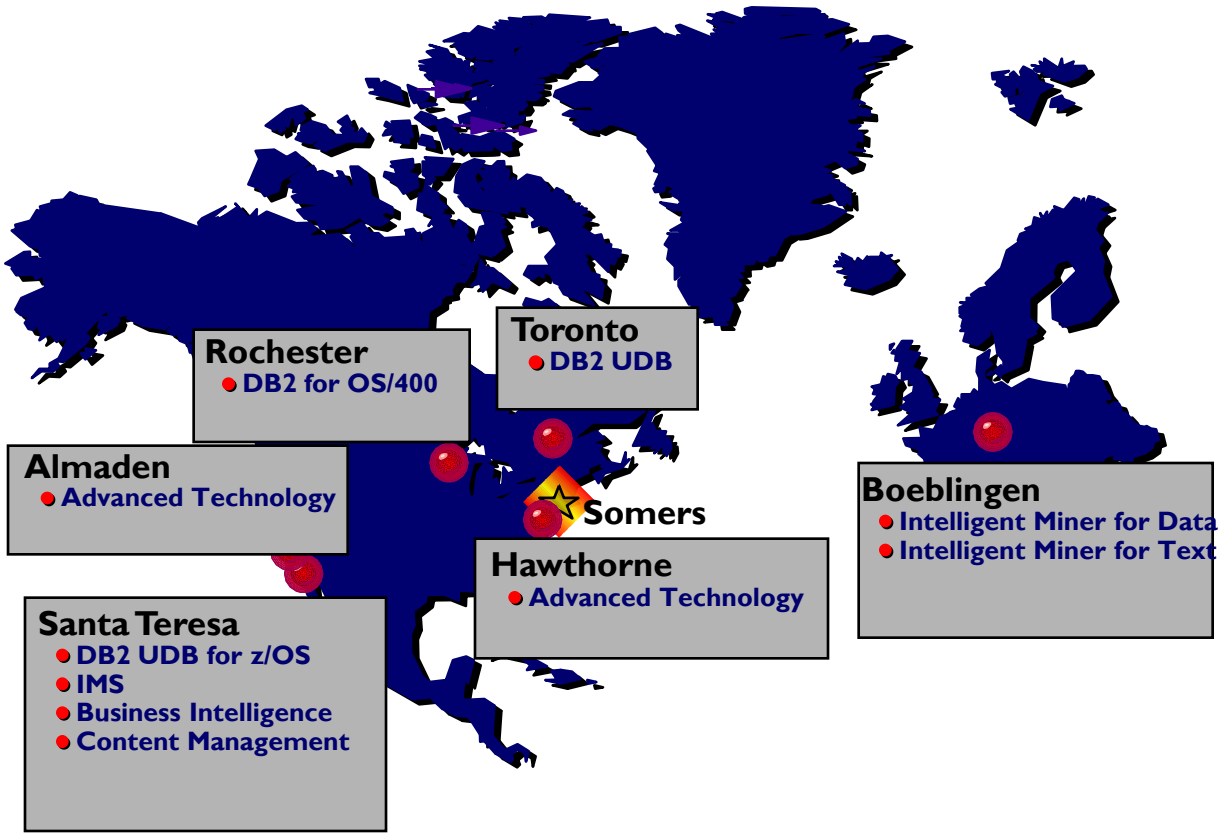
Trainings and Educations

- **DB2 Fundamentals**
- **DB2 SQL Workshop**
- **DB2 Advanced SQL Workshop**
- **DB2 Application Programming Workshop**
- **DB2 Administration Workshop**
- **DB2 Advanced Administration Workshop**
- **DB2 Monitoring and System Tuning**
- **DB2 Administration for Oracle DBA**

Certification, Self-Study, and other Training Resources



IBM Data Management 研發實驗室



堅強的技術支援團隊

- 台灣 IBM DB2 支援團隊
  - Development/Testing Team
    - DB2 產品中文化、整合測試
  - Software Product Team
    - DB2 產品售前技術支援
  - Enablement Service Team
    - DB2 Skill/Usage Enabling Service
  - Professional/Consulting Service Team
    - DB2 Advanced Usage/Design Consultation Service
  - Product Service Team
    - DB2 Product Usage/Defect Support
- DB2 Business Partners
  - 產品經銷代理
  - 開發加值應用軟體

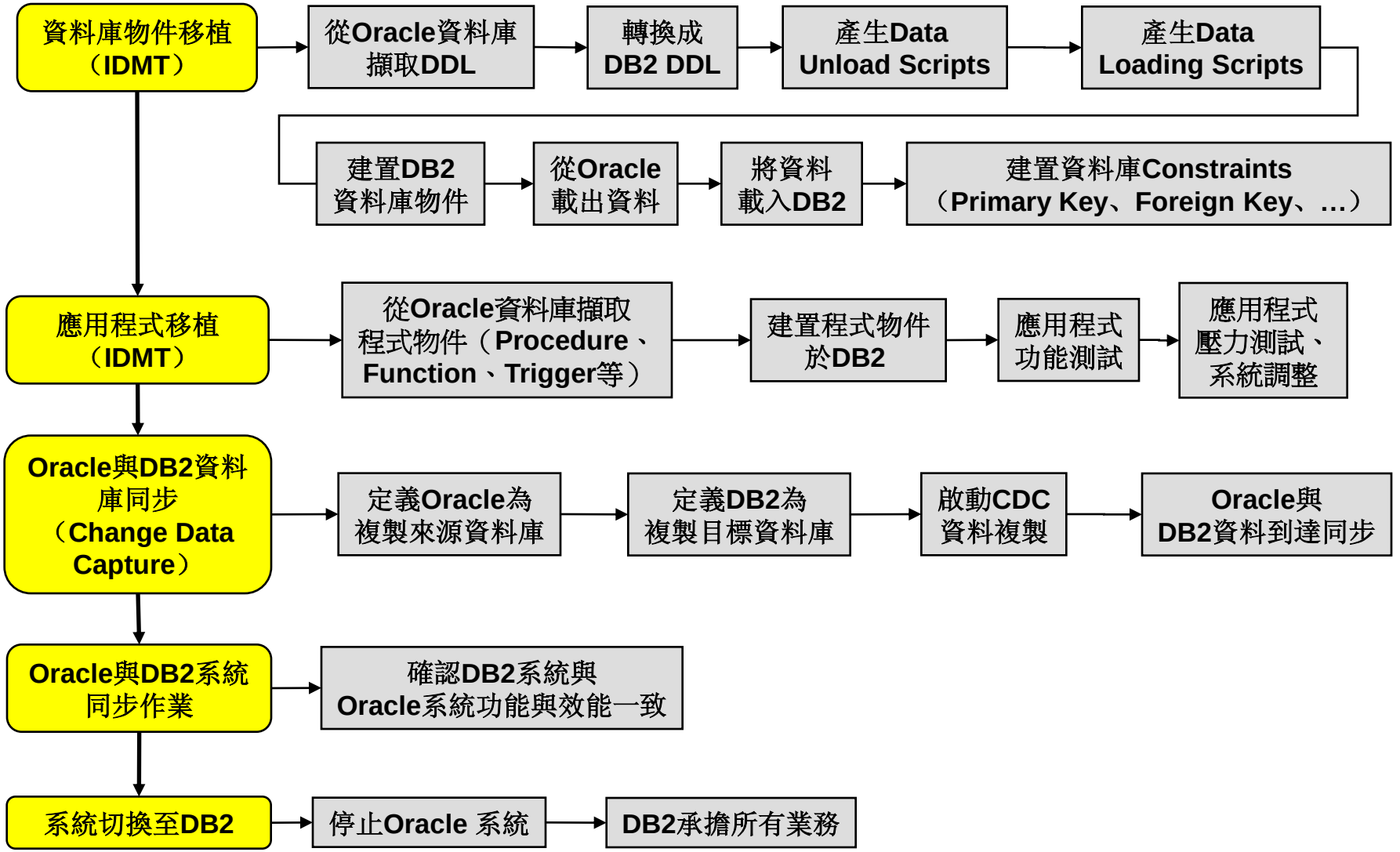
世界第一流的研發團隊

- IBM Almaden Research Lab
  - 關連式資料庫理論的發源地
  - 研發最新一代資料庫技術
  - 擁有關連式資料庫業界眾多知名大師級學者
    - Don Chamberlin（SQL 語言的發明人）
    - R.F. Boyce（SQL 語言的發明人）
    - Guy Lohman（Query Optimization理論發明人）
    - Don Haderle（DB2 產品總設計師）
- IBM Santa Teresa Lab
  - 建立世界第一個關連式資料庫原型（System R）
  - 開發 DB2/z、Content Manager、Infosphere 等產品
- IBM Toronto Lab
  - 開發 DB2 Linux/Unix/Windows 等產品
- IBM 擁有 SQL Optimization 與 Parallel Processing 等資料庫先進技術多項專利，遠超過競爭友商。

以 DB2 爲核心的各行業應用

- 半導體與電子面版製造核心系統
- 金融信用查核系統
- 銀行核心交易系統、分行系統、網路銀行系統
- 證券網路下單系統
- 保險核心系統、催收系統、團險系統
- 物流零售系統
- 醫療門診、掛號、住院系統
- 運輸配送系統
- 證券集中保管系統

資料庫移植程序


資料庫物件移植（IDMT）
從Oracle資料庫擷取DDL
轉換成DB2 DDL
產生Data Unload Scripts
產生Data Loading Scripts
建置DB2資料庫物件
從Oracle載出資料
將資料載入DB2
建置資料庫Constraints（Primary Key、Foreign Key、…）
應用程式移植（IDMT）
從Oracle資料庫擷取程式物件（Procedure、Function、Trigger等）
建置程式物件於DB2
應用程式功能測試
應用程式壓力測試、系統調整
Oracle與DB2資料庫同步（Change Data Capture）
定義Oracle為複製來源資料庫
定義DB2為複製目標資料庫
啟動CDC資料複製
Oracle與DB2資料到達同步
Oracle與DB2系統同步作業
確認DB2系統與Oracle系統功能與效能一致
系統切換至DB2
停止Oracle 系統
DB2承擔所有業務

Cost Down

- 具有優勢的計價方式
  - N+1 license for HA
  - Flexible MA
  - AYCE v.s. ULA
  - leasing