



Information On Demand

Beyond DB2 Viper

Technology Trends and Directions



ON DEMAND BUSINESS™

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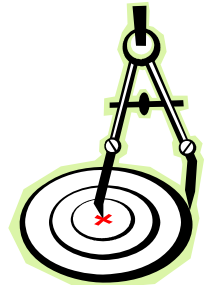
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Key Requirements that Drive Product Plans

- **Customer Feedback and Requirements**
 - Add features requested by customers
 - Focus in on high maintenance activities
- **ISV Enablement**
 - Add facilities and features that ease the migration effort to DB2
- **SAP Relationship**
 - Continuing enhancing DB2 to support SAP applications
- **XML Exploitation**
 - New and improved XML functionality in the engine
- **Warehousing**
 - Faster algorithms and new optimization techniques for large query workloads



Product Requirements

- ***Installation***
- ***Database Control and Administration***
- ***Manageability***
- ***XML***
- ***Scalability and Performance***
- ***Optimizer***
- ***ISV Enablement***
- ***Workload Management and Monitoring***
- ***Regulatory Compliance***
- ***Problem Determination***
- ***Application Development***



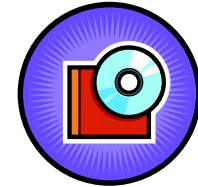
Installation Requirements

- **Non-root Installation**

- Capability to install and service a non-root DB2 on Unix or Linux
- May still require that some root-based features (e.g. OS authentication) be enabled post-install by a root user

- **Fix Pack Installation**

- Eliminate the instance update phase
- Two high-maintenance activities that need to be eliminated
 - Automatic execution of db2iupdt and dasupdt after a fix pack has been deployed
 - Automatic binding of packages against the database using auto rebind for all utilities

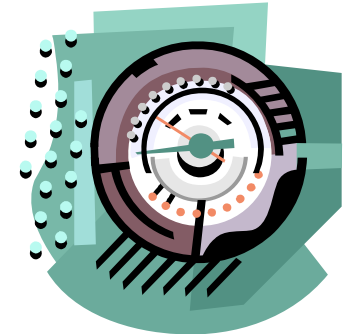


- **Fix Pack Only**

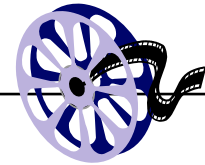
- No migration from one point release to another via a fix pack
- Eliminate “side-effect” of moving to a new release just to get product fixes
- Continue a separate maintenance stream for each Version and Release level

Database Control Requirements

- **Reduce Administrative Console Requirements**
 - Move to a complimentary web based Operational Console model
 - Remove requirements for specific Operating System to run console
 - Decouple Console delivery from data server release
- **Focus on Operation Administration and Problem Determination**
 - Day to day operational tasks
 - Add common view and tools across all DB2 data servers including
 - DB2 for Linux, Unix, Windows, DB2 for z/OS, IDS
- **Console Prototype**

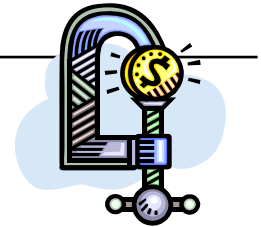


Manageability Requirements



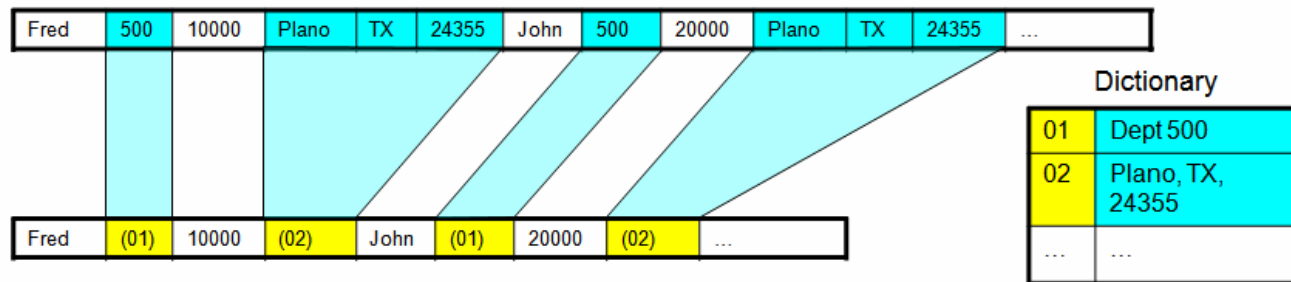
- ***Single system view for Database Partition Facility***
 - Various commands need to “view” the database as one entity rather than multiple partitions
 - Backup database, Update configuration parameters
- ***Simplify Backup Administration***
 - Automatically delete expired backup images and log files
 - Add additional options for automated backup
 - Compression, incremental and delta backups, log files in backup
- ***Support Fully integrated flash copy support***
 - Automate the manual steps currently required for backup and restore with flash copy
- ***Automatic Storage Enhancements***
 - Allow user to free unused space at the end table
- ***Integrated High Availability and Disaster Recovery solution (automated takeover)***
 - Support integrated install, setup, maintenance and uninstall of TSA with DB2
 - Allow DB2 to maintain the cluster configuration of TSA for both HADR and non-HADR failover scenarios

Manageability Requirements



▪ **Enhance row compression**

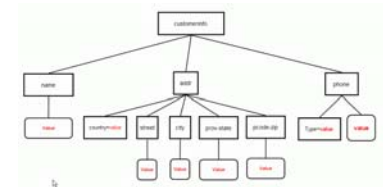
- Automatically Compress a Table without DBA intervention
 - Once a predetermined table size is reached then automatically create a dictionary based on sampling and data
 - All data that is inserted or accessed after the dictionary creation will be compressed
- Removes need for DBA to manually run INSPECT or reorganize all tables



XML Requirements

■ XML Functions

- A number of key functions still required for full XML support
 - XMLRow: Publish rows as a sequence of elements
 - XMLGroup: Publish table as a document
 - XSLTransform: Extensible Style sheet Language Transformation (XSLT)



■ Check constraints on XML Column

- Need to manage the validation of XML values and columns through the use of XML Schema(s)

■ Parameter passing to SQLQuery

- XQuery lacking the capability to call SQL with parameters

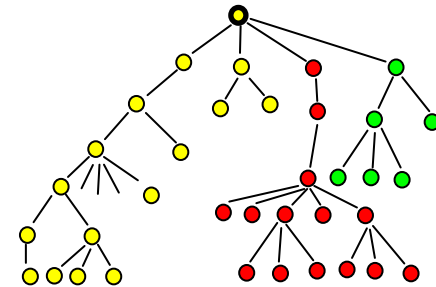
```

XQUERY
for $docid in (1,2,3),
    $j in db2-fn:sqlquery('select xmlcol from t1 where docid = parameter(1)',
                        $docid)/bib/book
where count($j/author) > 1
return $j;
  
```

XML Requirements

- **XML Replication**
 - Support replication of XML data to other databases
- **Trigger Support on XML columns**
 - Enable before trigger on new XML data for validation against schema
 - Removes the requirement for explicit validation with every insert statement
- **Sub-document update**
 - New draft specification for Xquery Update language support
 - Provide more support for structural modifications to XML documents
 - Replace section, append section, add description, etc.
 - Use internal DB2 implementation rather than external stored procedures

```
update T set doc = XMLQuery ('
  transform
    copy $r := $doc
  do
    delete {$r/score},
    replaceValue of {$r/salary} with $r/salary * 1.1,
    insert {<d>Ph.D.</d>} into $r//emp,
    rename ($r/status[1]) to "state"
  return $r'
  passing doc as "doc",
  cast (? as double) as "raise",
  id as "i");
```



Scalability and Performance Requirements

■ **Remove Process-Model Limitations**

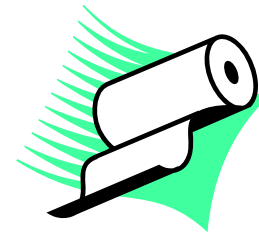
- Move to a threaded engine architecture
 - Provide basic execution parallelism independent of server type
 - Provide a single memory parameter for an entire DB2 node
 - control total memory allocated in DBMS, DB, and private memory.
- Eliminate most agent-level configuration parameters and automate the remainder (i.e., maxagents, numpoolagents, numinitagents)
- Reduce agent memory consumption

■ **Faster MDC Rollout**

- Index maintenance for the deleted rows can take too long
- Do delete processing of indexes as a background process

■ **Faster Offline Redistribute**

- Improve overall end to end performance.
- Reduce active log space requirement without requiring extra container storage
- Introduce table level control and improve progress monitoring during redistribution.



Optimization Requirements



- ***Just in Time Statistics***
 - Provide on-line statistics needed by query optimizer
 - Analyze the query, discover statistics which are beneficial for the query which don't exist and collect them before optimizing the query to help optimizer to generate a good access plan
- ***Improve Query Performance Stability***
 - Avoid risky plans through specific heuristics
 - Favor fully qualified unique indexes
 - Improve list prefetch planning
 - Avoid risky Nested-Loop Joins / Table Scan plans
 - Avoid risky Merge Join that account for the overlap of inner and outer streams
 - Improved Cardinality Estimation

ISV Application Requirements

- ***Improved performance of LOB management***
 - Improve the performance when returning many rows containing LOB data
- ***Database Roles***
 - Role membership is assigned to a user or group and role privileges are available for use in any and all activities under taken by the connection user.
 - The existence of roles will allow for SQL objects like views, packages, or triggers to be created by users who acquire the needed privileges through roles assigned to them.
- ***Application Programming Support***
 - Support a ARRAY data type for use within Procedures and applications
 - Simplify parameter passing
 - Global Variables
 - Use SET, SELECT INTO, and VALUES INTO statement to manipulate variables
 - Larger Identifier Support
 - Increase all identifiers to 128 bytes accept for a few:
 - Bufferpool, table space, index extension, ADT transform group, type mapping

ISV Application Requirements



■ **Identity Assertion**

- Provide a means whereby the end-user identity in a three-tier environment can be easily and efficiently propagated to the database server
- Introduce concept of a trusted context between a database server and a specific application tier

■ **Decimal Floating Point**

- New data type to represent base10 numbers accurately
 - DECFLOAT(16) => 16 digits and 8 bytes of storage
- Encoding and operations on decimal float are specified by IEEE

■ **Optimistic Locking**

- Provide a means to avoid maintaining long lived locks to ensure updates are only made to rows which haven't changed since the original query
 - ROWID: will be used to return the same physical location in the table
 - ROW CHANGE TOKEN : will validate that the row has not change by comparison with the provided token
 - Can be used to quickly determine the target of an update

Workload Management Requirements



- ***Introduce concept of a Service Class, Workload, Work Action Set, Concurrency and Database Activity Limits***
 - Service Class
 - User defined entity that acts as a point of resource control and activity monitoring for a set of database activities
 - Workload
 - User defined entity used to identify and manage a set of work
 - Work Action Sets
 - A user defined entity that is used to discriminate between database activities for service class mapping and activity limit assignment
 - Concurrency Thresholds
 - A user defined entity that controls how many database activities may be processing at any one time
 - Database Activity Thresholds
 - A user defined entity that controls the behavior of database activities based on predictive and reactive elements

Monitoring Requirements



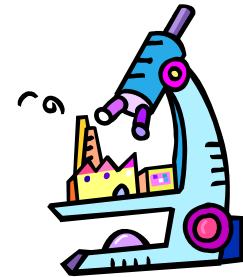
■ **Monitoring and Control**

- Need table functions to allow quick ad hoc access to internal information via SQL from service classes and workload occurrences
 - Can provide information from one or more database partitions with one invocation
 - Type of information: statistics and current activities
- New event monitors required to:
 - allow capture of detailed information of SQL statements from database or service classes
 - allow capture of detailed information of SQL statements from activity limits
 - allow capture of service class statistical information at regular intervals
- New stored procedures
 - To cancel a database activity
 - To capture detailed information on a database activity (i.e. SQL statement)

Regulatory Compliance

- ***Enhance the Audit Facility***

- Need new audit records for the actual execution of dynamic and static SQL statements complete with SQL text with compilation environment (where appropriate) and, optionally, input data values
- Improve the audit log file infrastructure to support configuration of location and maximum file size
- Implement Fine grained audit control based on
 - inclusion lists of user, group, or role authorization IDs
 - table object based audit indicators
 - trusted context audit indicator
- Improve audit performance
- Increase family compatibility with DB2 for zOS



Improve Problem Determination




- **Focus on top 10 SQL Codes**
 - Improve error messages, filtering and error information for top 10 SQL codes (e.g. SQL1042)
- **Improve Diagnostic Messages**
 - Improve message and information for top 50 db2diag and admin log messages
- **Data Consistency Diagnostic Checks**
 - Enhance INSPECT with additional data consistency checks
- **Dramatically improve the Problem Determination Guide**
 - Document investigation scenarios in detail (e.g. how to investigate a memory leak)
 - Document the basic OS based problem determination tools (e.g. truss, pstack)
- **Consolidate data collection tools**
 - Provide standard set of tools and enhance around investigation scenarios

Unicode Database Enhancements

- ***Enhance Unicode***
 - Create Unicode databases by default
 - provide collation compatibility for customers moving from non-Unicode databases to Unicode databases
- ***Character sensitive functions***
 - Update many of the existing string based functions to understand character semantics

Common AD and Tooling Requirements

- ***Common Application Development and Tooling in support of DB2 LUW, DB2 for z/OS, IDS, but decoupled from the Data Server release schedules***
- ***AD technologies included:***
 - Java Common Client (JCC), .NET, LinQ, PHP, Ruby, EGL, WebSphere persistence, AD tooling, open source AD offerings, CLI common client

- 
- ***Differentiate IBM databases in the market through common APIs and Tooling***
 - ***Foster portable customer skills across our products through common User Experience***
 - Leverage Eclipse for client intense use cases (analysis, development)
 - ***Lower cost of development and service through reuse and support of common components***
 - ***Uniform experience for IBM's Data Server customers and ISV's***

Java Application Development Requirements

- **Description:**
 - Support application development and execution for the Java platform
- **Provide the ability to ...**
 - Update JDBC standard level
 - Improve on XML and SOA tooling support
 - Improve Java capabilities for all servers
- **Key technology components:**
 - Python server support and IDS integration
 - JDBC 4 Compliance
 - Integrated Xquery builder and SOA web services tooling support
 - Integrate new unified Visual Explain



Non-Java Application Development Requirements

- **Description:**
 - Support application development and execution for the Microsoft and Open Source specific models
- **Provide the ability to ...**
 - Extend support for Open Source programming languages
 - Improve .NET capabilities for all servers
- **Key technology components:**
 - 64 bit .NET enablement and support for all servers
 - Support new server data types
 - Ruby on Rails support and PHP enhancements
 - Python server support
 - Integrated XQuery builder and support for SOA

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