NonStop SQL & Beyond

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Forward-looking statements
This is a rolling (up to three year) Roadmap and is subject to change without notice.

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Today’s Agenda

NonStop SQL
• Strategy & Roadmap
• What’s new and newer?
• Looking ahead

Key takeaways
Strategy
NonStop SQL Strategy

- Focus on clustered OLTP database markets
- Lead with a scalable SQL architecture
- Lead in mission critical availability
- Continue handling of extreme high volumes of data
- Exceed SLAs for handling data velocity
NonStop SQL: Invest for the Future

• Meet the needs of existing customers
  • Invest in security, performance, and enabling features
  • Continue to support SQL/MP
• Acquire new applications and customers
  • Enable low cost ports from other clustered databases
NonStop SQL/MX Roadmap

SQL/MX 2.1.1 – G06.27 September 2005, mature and supported

SQL/MX 2.3 – H06.10 May ’07

SQL/MX 2.3.1 – H06.13/J06.03 Feb. ’08

SQL/MX 2.3.2 – H06.16/J06.05 Nov. ’08

SQL/MX 2.3.3 – H06.19/J06.08 Aug ’09

SQL/MX 2.3.4 – H06.20/J06.09 Feb ’10

SQL/MX 3.0 – H06.22/J06.11 Feb ’11

SQL/MX 3.1 – H06.23/J06.12 Oct ’11

SQL/MX 3.2 – H06.25/J06.14 Aug ’12

SQL/MX - Future Revisions

This is a rolling (up to three year) Statement of Direction and is subject to change without notice.
HP NonStop SQL 2.3.4

February 2010, H06.20, J06.09

All Modern
Embedded SQL in DLLs
Cascaded Updates and Deletes

All NonStop
Performance enhancements
Quality improvements

All Standard
Thread aware OSS ODBC/MX Driver
HP NonStop SQL 3.0

February 2011, H06.22, J06.11

All Modern
- 32k row limits
- 2k key limits
- 128 digits extended numeric precision

All NonStop
- Optimizer enhancements
- Executor performance improvements

All Standard
- 64 bit ODBC and JDBC Drivers
All Modern
Separation of Duties, Change ownership
Table Rename
Preprocessor enhancements
MFC Support for ExecDirect
32k row size support for LOB/CLOB in JDBC Drivers
NVL, Decode, Coalesce
TRIM, LTRIM, RTRIM
To_Char (numeric | datetime)

All NonStop
Compiler and Connectivity performance improvements

All Standard
SSL Support in Connectivity Clients
NSM/Web Firewall Access
All Modern
Extended numeric precision from embedded apps and MFC
Stored procedures in AFTER TRIGGERS
Multi-commit DELETE

All NonStop
HP Database Manager
Remote mxci
Cleanup utility
Backup/Restore DDL with >3000 characters

All Standard
New Datetime Arithmetic functions
Self-referencing updates
ODBC/MX Driver for Linux
What is new in SQL/MX?

Catching up with some cool features
Separation of duties

Introduced in SQL/MX release 3.1

- Establishes the concept of a **security administrator** to NonStop SQL
  - The security administrator(s) may grant and revoke privileges on objects without having any privileges on those objects.
  - Purpose is to limit the power held by one individual and strengthen overall security.
- Is integral to regulatory mandates such as Sarbanes-Oxley (SOX) and Gramm-Leach-Bliley Act (GLBA).

- Limits super.super, unless explicitly overridden.
- Retains ANSI-92 security features.
- Requires Metadata version 3100 and up.
Separation of duties

The SYSTEM_SECURITY_SCHEMA

• A new schema introduced with R3.1
  – In the system catalog of your NonStop node.
  – PRIVILEGED_USERS
    • The system administrators
  – MGM_PRIVILEGES
    • The users on the node who can create catalogs and schemas

```sql
>>select user(grantor) grantor , user(grantee) grantee ,
to_char(converttimestamp(grant_time ), 'DD/Mon/YYYY') granted
from PRIVILEGED_USERS;

GRANTOR                  GRANTEE                  GRANTED
-------------------------------  ----------------------------------------------  -------------
SQL.USER4                  SQL.USER2                  10/Oct/2011
SUPER.SUPER                SQL.USER4                  10/Oct/2011
SUPER.SUPER                HP.FJONGMA                04/Oct/2011
SUPER.SUPER                SUPER.SUPER                04/Oct/2011

--- 4 row(s) selected.
```
Change ownership of objects

Introduced in SQL/MX release 3.1

• Change ownership of a catalog
  – GIVE CATALOG mycat TO “DBA.newbie”

• Change ownership of a schema
  – GIVE SCHEMA myschema TO “DBA.newbie” [CASCADE]

• Change ownership of other objects, eg.
  – TABLE
  – TRIGGER
  – VIEW
  – PROCEDURE
Renaming objects

Introduced in SQL/MX release 3.1

- Renaming of Tables, Indexes and Views
- ANSI rename
  - Part of ALTER statement
  - Gives an object another name, but Metadata ID’s remain the same
  - CASCADE option in ALTER TABLE
    - Also alters system generated names for indexes, constraints
  - ANSI Rename affects dependent objects
    - Views point to renamed table
    - New name will appear in Constraint text if CASCADE option is used
    - New name will appear in trigger texts
Renaming objects

Introduced in SQL/MX release 3.1

- Renaming of Tables, Indexes and Views
- GUARDIAN rename
  - Part of MODIFY utility command
  - Renames the Guardian location of TABLES or INDEXES
  - Wildcards on file names are possible for mass-renames
    - Note that physical location (volume / subvolume) remains the same

```sql
>> modify table my_objects rename location $FC202.ZSDFJ000.FRZXFL00 to MYOBJ S00;

--- SQL operation complete.

>> modify table frans.perf.my_objects rename location $*.ZSDFJ000.M* map names to T????????

--- SQL operation complete.
```
New compatibility functions

Introduced in SQL/MX release 3.1

- Added “standard” features
- Easier to port applications. Some examples are:
  - NVL (EXPR1, EXPR2)
    - If EXPR1 is NULL return EXPR2, ELSE return EXPR1
  - NVL2 (EXPR1, EXPR2, EXPR3)
    - IF (EXPR1 is NULL return EXPR3, ELSE return EXPR2
  - COALESCE function
    - COALESCE returns the value of the first expression in the list that does not have the NULL value
  - DECODE function
    - Similar (but more compact) to CASE statement.
    - DECODE(expr,test_expr,retval [,test_expr2, retval2... ] [,default])
Identity Columns

Introduced in SQL/MX release 3.1

- Introduced the concept of Sequence Generators (SG)s;
- SQL/MX 3.1 supports Internal SG; External SGs (aka Sequences) will be introduced later (*);
- An Internal Sequence Generator is associated with a IDENTITY column and is used to generate unique values for that column across all partitions of the table.

```
create table T (  
    ID largeint GENERATED BY DEFAULT AS IDENTITY  
    (start with 100 Increment by 10 MINVALUE 20 MAXVALUE 2000) not null  
    , NAME char(256) not null  
    , primary key (ID));
--- SQL operation complete.
insert into T values (DEFAULT, 'first row');  
--- 1 row(s) inserted.
insert into T values (DEFAULT, 'second row');  
--- 1 row(s) inserted.
```

```
>>select * from T;  
ID        NAME  
---------- ----------------  
100        first row  
110        second row  
>>insert into T values (45, 'third');  
--- 1 row(s) inserted.
>>select * from T;  
ID        NAME  
---------- ----------------  
45         third  
100        first row  
110        second row
```
More in Release 3.2
Improvements to Cleanup

Introduced in SQL/MX release 3.2

- Repair of damaged objects required use of licensed mxci or goaway
- **Cleanup** utility now:
  - Allows to remove metadata if partitions no longer exist on disk
    - *** ERROR[1181] Label \NODE.$DATA12.ZSDLN3M8.DLX2PT01 could not be dropped (file error 11).
  - Allows to remove files no longer referenced by metadata
    - `>>drop table T_ORPHAN;
      *** ERROR[1004] Object CAT.SCH.T_ORPHAN does not exist or object type is invalid for the current operation.`
  - **Verify** utility can create input to cleanup for files without metadata (orphaned objects)
    - `$> mxtool verify -oo \$DATA12.ZSDLN3M8.* -f=orphans`
    - `$> mxtool cleanup -oo -f=orphans;`
Improvements Upgrade/Downgrade

Introduced in SQL/MX release 3.2

- Upgrade / downgrade to new metadata version now possible per catalog
  - (instead of upgrading all catalogs on the system)

- UPGRADE ALL METADATA IN CATALOG <catalog>
  [ RESTRICT | CASCADE ]

- DOWNGRADE ALL METADATA IN CATALOG <catalog>
  TO VERSION <target version>
  [ RESTRICT | CASCADE ]

- RECOVER ALL METADATA IN CATALOG <catalog>
  [ RESUME | CANCEL ]

- More information is in the NonStop SQL/MX Installation and Upgrade Guide
Self-referencing updates

Introduced in SQL/MX release 3.2

• Selecting rows from a table and execute Update/Delete/Insert statements
• Say goodbye to:
  – ERROR[4026] Reading from and inserting into, or updating in, or deleting from the same table, CAT.SCH.T, is not currently supported.
• Copy extra data into existing table
  – Add to T01 some rows based on existing values from T01
    – Insert into t01 select c1 + 10, c2 from t01 where c2 < 200;
• Delete from T01 rows based on some value in T01
  – Delete from t01 where amount1 < (select avg(amount) from t01);
• System will make sure that rows are “touched” only once
Update of primary key

Introduced in SQL/MX release 3.2

- Unique primary key can now be updated
- UPDATE will be translated into Delete and Insert
  - Remember, a row can move from Partition A to Partition B as a result of the update
    - No Cursor updates of primary key
    - No Stream updates of primary key in Pub/Sub and triggers

```sql
>>explain options 'f' update t set id = 101 where id = 45;
```

<table>
<thead>
<tr>
<th>LC</th>
<th>RC</th>
<th>OP</th>
<th>OPERATOR</th>
<th>OPT</th>
<th>DESCRIPTION</th>
<th>CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>.</td>
<td>7</td>
<td>root</td>
<td>o</td>
<td>r</td>
<td>1.00E+000</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>6</td>
<td>tuple_flow</td>
<td>o</td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>4</td>
<td>.</td>
<td>5</td>
<td>partition_access</td>
<td>o</td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
<td>4</td>
<td>insert</td>
<td>ol</td>
<td>T</td>
<td>1.00E+000</td>
</tr>
<tr>
<td>2</td>
<td>.</td>
<td>3</td>
<td>sort</td>
<td></td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td></td>
<td>partition_access</td>
<td>o</td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>.</td>
<td>1</td>
<td></td>
<td>unique_delete</td>
<td>ol</td>
<td>T</td>
<td>1.00E+000</td>
</tr>
</tbody>
</table>

--- SQL operation complete.
Multi Commit Delete

Introduced in SQL/MX release 3.2

- Long-running delete operations may cause
  - TMF Auto-abort due to exceeding the TMF time-limit
  - Lock escalation, inhibiting concurrent access
  - Exceed of audittrail capacity; possible rollback requires the Audit to be available
  - One ESP per partition committing every N rows
    - Transactions are smaller, shorter, locking less rows

```
>>delete with multi commit every 1000 rows from T10p where PD_CODE = 'COMPLETE';
```

<table>
<thead>
<tr>
<th>LC</th>
<th>RC</th>
<th>OP</th>
<th>OPERATOR</th>
<th>OPT</th>
<th>DESCRIPTION</th>
<th>CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>.</td>
<td>3</td>
<td>root</td>
<td></td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>1</td>
<td>.</td>
<td>2</td>
<td>esp_exchange</td>
<td>1:10(hash1)</td>
<td></td>
<td>1.00E+000</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
<td>1</td>
<td>exe_long_running</td>
<td></td>
<td></td>
<td>1.00E+000</td>
</tr>
</tbody>
</table>

--- SQL operation complete.
More use for Triggers

Introduced in SQL/MX release 3.2

- AFTER triggers now support calling SPJs. This is useful to implement more complex logic
  - Is used by SQLWays to convert PL/SQL to SPJ
  - These SPs cannot return results to the trigger
  - (but they can e.g. send email)

```sql
create trigger salesalert
  after update of (c2) on B
  referencing new  as newr , old as oldr
  for each row
  when ( newr.c2 >  500 )
  insert into alerts (keyval, colval, alert )
  values (oldr.c1,newr.c2, 'Exceeds 500');

create trigger salesalertSP
  after update of (c2) on B
  referencing new  as newr , old as oldr
  for each row
  when ( newr.c2 >  500 )
  CALL SPalerts (oldr.c1,newr.c2, 'UPDATE');
```
New Date functions

Introduced in SQL/MX release 3.2

- DATE_ADD and DATE_SUB
  - Add a time interval to a given date
- DATEADD
  - Add units instead of intervals
    - E.g. weeks, quarters
- DATEDIFF
  - Returns the number of units between dates or timestamps

```sql
>>select date_add (current_date, interval '3' day) from dual;

(EXPR)
---------
2012-09-27
--- 1 row(s) selected.

>>select date_sub (current_date, interval '1' month) from dual;

(EXPR)
---------
2012-08-24
--- 1 row(s) selected.

>>select current_date today, dateadd(week, 5, current_date) future from dual;

<table>
<thead>
<tr>
<th>TODAY</th>
<th>FUTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-09-24</td>
<td>2012-10-29</td>
</tr>
</tbody>
</table>

--- 1 row(s) selected.
```
Manageability features

Introduced in SQL/MX release 3.2

- Remote mxci
  - Java-based command interface
  - Requires JDBC Type4 connection
  - Supports scripting
    - IF ... ELSE ... GOTO
  - Parallel execution of scripts with ‘prun’
  - Supports invocation from perl, python

```sql
--> rmxci
Welcome to the NonStop(TM) SQL/MX Remote Conversational Interface
(c) Copyright 2011-2012 Hewlett-Packard Development Company, LP.

Host Name/IP Address[:Port Number]: nsk-taurus:35000
User Name: frans
Password:
Data Source Name [TDM_Default_DataSource]:

Connected to Data Source: TDM_Default_DataSource

SQL> set schema frans.perf;
--- SQL operation complete.

SQL> show schemas;
SCHEMA NAMES
-----------------------------------------------
PERF DEFINITION_SCHEMA_VERSION_3100

SQL>
```
Manageability features

Introduced in SQL/MX release 3.2

- SQL/MX Database Manager (MXDM)
  - Manage database objects
  - Manage MXCS
  - View EMS Logs
  - SQL Whiteboard
  - Launch remote MXCI
  - Requires ODBC connection
  - Requires JDBC connection for rmxci and other Java-plugins
Looking ahead

(but no promises)
HP NonStop SQL Future Revision Candidates

**All Modern**
- External Sequence
- Materialized Views
- Improved connect/disconnect times

**All NonStop**
- MDAM enhancements
- SPJ Debug and Profiling
- Enhanced DBA Tools

**All Standard**
- 64 bit Support for embedded apps

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# HP NonStop SQL Future Revision Candidates

<table>
<thead>
<tr>
<th>All Modern</th>
<th>All NonStop</th>
<th>All Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Defined Functions</td>
<td>Online mxci help</td>
<td>ODBC/MX Driver for AIX</td>
</tr>
<tr>
<td>SPCs</td>
<td>MXDM integration with VQA, NSKBUSY, Listlocks</td>
<td>Native SSL Support in MXCS</td>
</tr>
<tr>
<td>Table Maintain</td>
<td>Parallelism in Utilities like Fastcopy, DUP, Import</td>
<td>JDBC 4.0 standard</td>
</tr>
<tr>
<td>SQL Statement Logging</td>
<td></td>
<td>ODBC 3.8 standard</td>
</tr>
<tr>
<td>SPJ Debug and Profiling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To_Date, Last_Day, Months-Between</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numerous Customer RFEs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Conclusions
Key takeaways

NonStop SQL has momentum
- New applications
- New customers
- New partners

NonStop SQL is positioned for a takeoff
- Strong roadmap
- Investing for the future
Thank you

frans.jongma@hp.com
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Subtitle (18 pt. HP Simplified)

• Put your first-level bullet here. Try to keep bullet lists simple. (14 pt. HP Simplified)
  – Put your second-level bullet here. Use no more than you need to explain your point.
    (14 pt. HP Simplified)
  • Put your third-level of copy here. Use no more than you need to explain your point.
    (14 pt. HP Simplified)
    – Put your fourth-level of copy here. Use no more than you need to explain your point.
      (14 pt. HP Simplified)
    • Put your fifth-level of copy here. Use no more than you need to explain your point.
      (14 pt. HP Simplified)