



NonStop SQL & Beyond

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Forward-looking statements

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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



Roadmap



NonStop SQL/MX Roadmap

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

Integrity NonStop

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



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



HP NonStop SQL 3.1

October 2011, H06.23, J06.12

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



HP NonStop SQL 3.2

August 2012, H06.25, J06.14

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

```
>>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

```
>>modify table my_objects rename location $FC202.ZSDFJ000.FRZXFL00 to MYOBS00;

--- 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)
- COALSECE function
 - COALESCE returns the value of the first expression in the list that does not 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

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

LC	RC	OP	OPERATOR	OPT	DESCRIPTION	CARD
6	.	7	root	o	r	1.00E+000
3	5	6	tuple_flow			1.00E+000
4	.	5	partition_access	o		1.00E+000
.	.	4	insert	ol	T	1.00E+000
2	.	3	sort			1.00E+000
1	.	2	partition_access	o		1.00E+000
.	.	1	unique_delete	ol	T	1.00E+000

```
--- SQL operation complete.
```

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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';
```

LC	RC	OP	OPERATOR	OPT	DESCRIPTION	CARD
2	.	3	root			1.00E+000
1	.	2	esp_exchange		1:10(hash1)	1.00E+000
.	.	1	exe_long_running			1.00E+000

```
--- 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)

```
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

```
>>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;

TODAY          FUTURE
-----
2012-09-24    2012-10-29
--- 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

```
~> 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

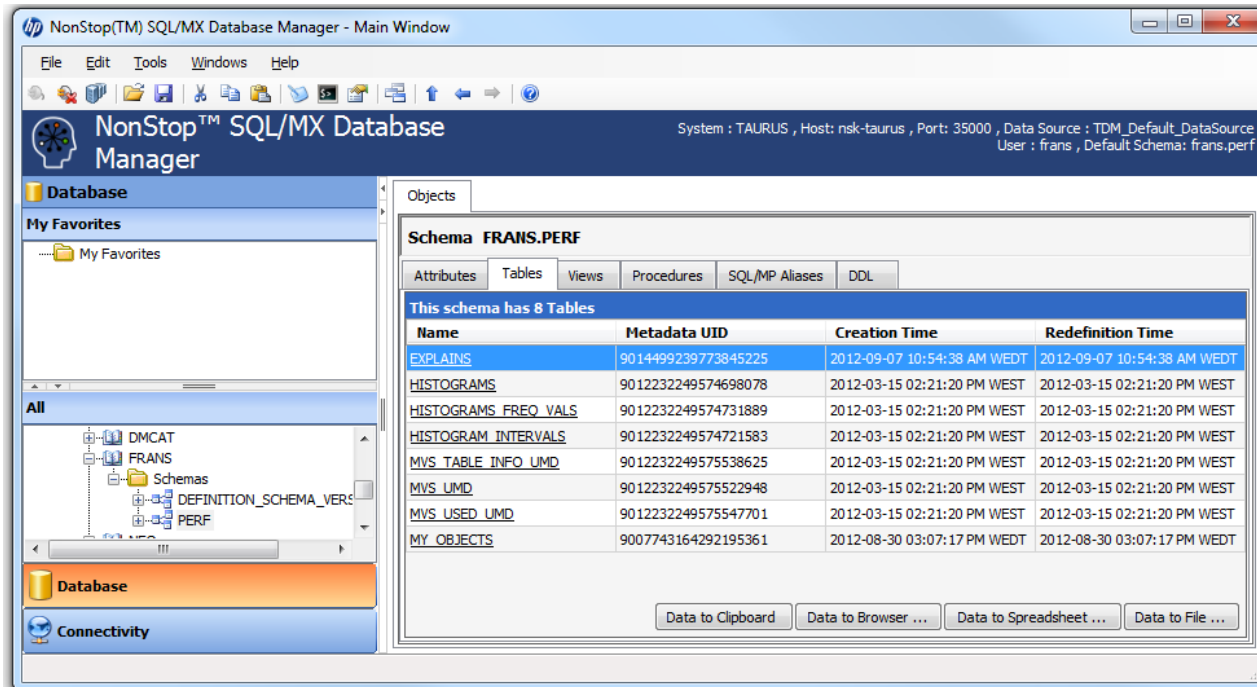
SQL>
```



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 rmxc 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

HP NonStop SQL Future Revision Candidates

All Modern

User Defined Functions

SPCs

Table Maintain

SQL Statement Logging

SPJ Debug and Profiling

To_Date, Last_Day,

Months-Between

Numerous Customer RFEs

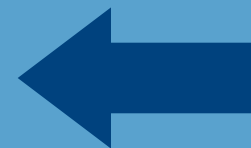


All NonStop

Online mxci help

MXDM integration with VQA,
NSKBUSY, Listlocks

Parallelism in Utilities like
Fastcopy, DUP, Import



All Standard

ODBC/MX Driver for
AIX

Native SSL Support
in MXCS

JDBC 4.0 standard

ODBC 3.8 standard

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

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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)

