



**Hewlett Packard
Enterprise**

ACCELERATE YOUR DIGITAL TRANSFORMATION WITH SQL/MX

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AGENDA

- The unique value of NonStop SQL/MX
- A mainstream database user experience (common standards)
- The digital transformation
- Secure database management
- Reduce your costs with NonStop SQL Cloud Edition



THE SQL/MX UNIQUE VALUE

What differentiates SQL/MX
from other databases?

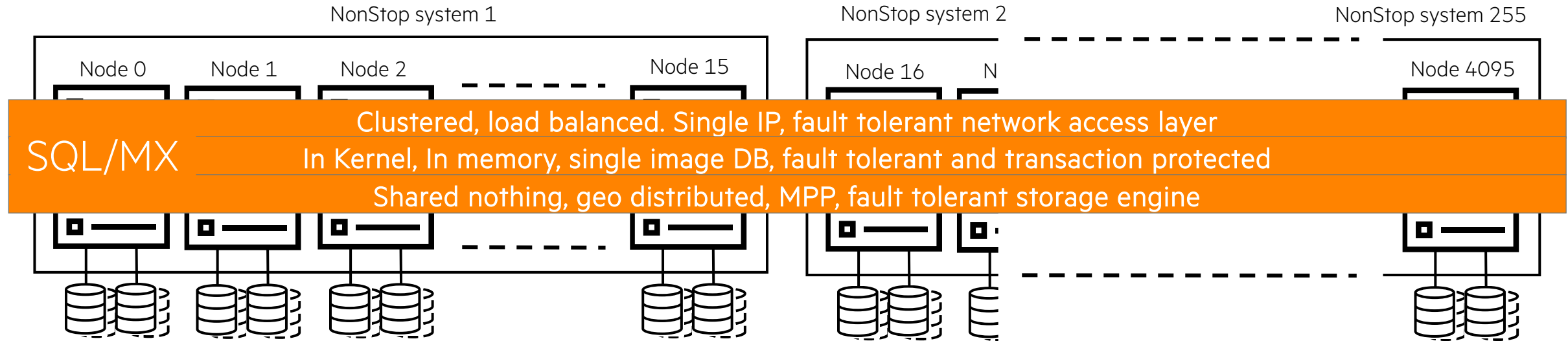
DATA INTEGRITY AT SCALE

NonStop SQL/MX was designed to scale like NoSQL but without giving up strong data integrity



FAULT TOLERANT, DISTRIBUTED, TRANSACTIONAL, ALL BUILT-IN

An RDBMS that was explicitly designed for a cluster of servers

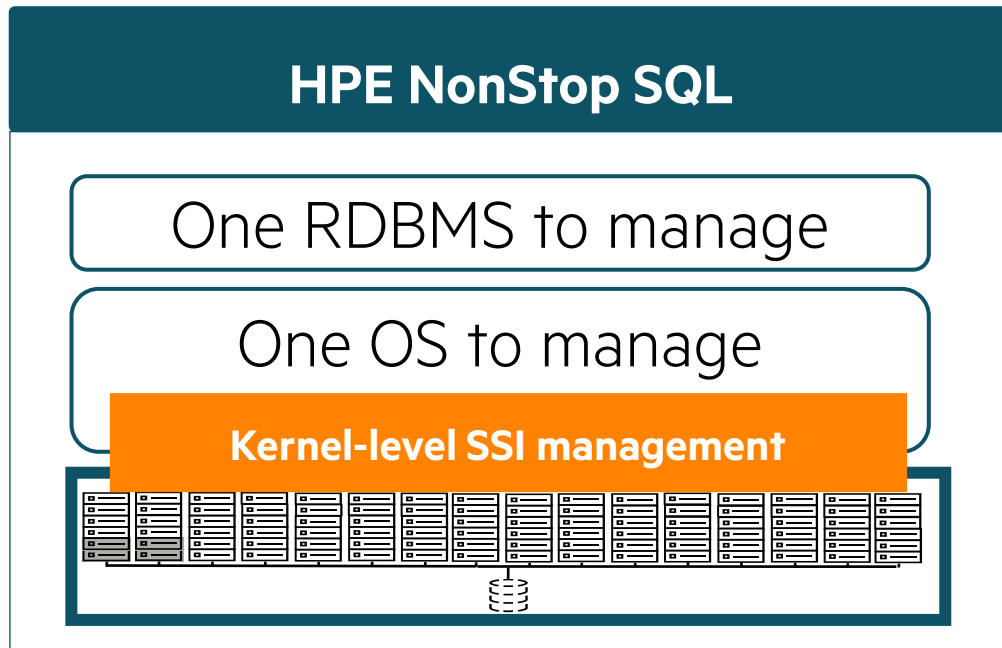


- Auto-provisioned & auto-managed clustering of storage, kernel, transaction engine and database
- The database is highly available without using replication
- Workloads and data are load-balanced and distributed across the nodes of a local or geographical cluster
- All nodes are put to work and participate in massively parallel execution of queries (MPP)
- No system failover, instead processes from a failing node are redistributed across remaining nodes
- Data access is fault tolerant (no visible application impact on any storage failure) with storage process mirrors

HPE NONSTOP SQL ADDRESSES COMPLEXITY LIKE NO OTHER

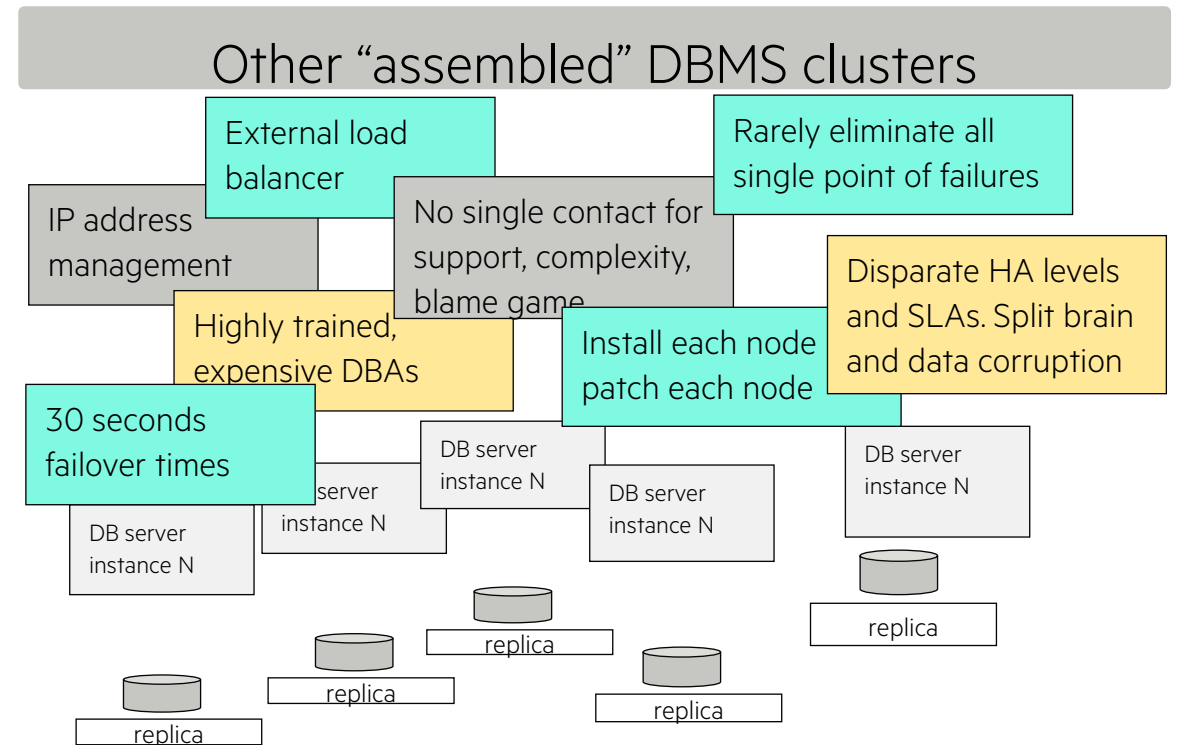
So that you can get the scale and availability of clusters without the complexity and risks

Simple



Kernel-level SSI management is the most desirable solution to manage clusters (*)

Complicated



Unpredictable TCO and high probability for failures due to complexity

(*) Gregory F. Pfister "In search of clusters" (1998).

THE SQL/MX UNIQUE VALUE

Unique value

- Data Integrity at scale
- Fault tolerant, distributed, transactional, all built-in
- HPE NonStop SQL addresses complexity like no other

What differentiates SQL/MX
from other databases?

A MAINSTREAM DATABASE USER EXPERIENCE

How do you make SQL/MX easy to adopt?

SQL/MX 3.8 (DELIVERED WITH L21.11) + NSDA 1.3

Compatibility

- Native blobs and clobs
 - DDL/DML
 - JDBC type 4 driver
 - PL/MX
 - Utilities
- PL/MX
 - System packages, DBMS_LOB, UTL_RAW
 - Global types, arrays, sub-programs
 - Cursors attributes
 - Enhanced before triggers
 - functions

Compatibility Security

- Built-in functions
 - Length()
 - Instr()
 - Next_day()
 - Dual
 - to_number()
- [Var]binary
 - update
- DDL auditing

Manageability Productivity Performance

- WMS
 - Unique query switch
 - Increased query limit to 64k
 - SQL/MX metadata management
 - Extended API
- Row count
- NSDA 1.3
 - Alerts
 - Installation improvements
 - Tenant logon

PL/MX: DBA'S PREFERRED AND MOST USED LANGUAGE!

Features

- Natural extension of the SQL language
- Secured sandbox and full security governance for DBAs
- Portable to other databases (Compatible with Oracle PL/SQL)

Benefits

- Immediate onboarding for Oracle users to manage SQL/MX
- Data transformation such as ETL
- Automate data maintenance
- Reduce porting effort for migration from Oracle to SQL/MX
- Can reduce network traffic and allow faster execution
- Create customized SQL functions

PL/MX versus SPJs

- Full DB storage and governance of program source
- Optimized performance with execution in master when applicable
- Library of specialized ready to use APIs (packages)

Tip!

<http://www.sqlines.com/online>

Free tool to translate T-SQL to PL/SQL very easily!

SQL/MX 3.8: PL/MX, PACKED WITH NEW FEATURES

New PL/MX features in SQL/MX 3.8

- Collections
- Cursor declarations in package specifications with parameters.
- Cursor attributes.
- REF Cursors.
- Default UDR arguments.
- NOCOPY parameter attribute.
- Global types.
- Subprogram name overloading.
- Subtypes.
- Nested subprograms.
- BLOB, CLOB, and RAW Datatypes
- BULK COLLECT
- FOR ALL
- New System Packages (DBMS_LOB, UTL_RAW)
- Master Executor Execution

A system package example: DBMS_LOB

- APPEND – Appends one LOB to the end of another LOB.
- CLOSE – Closes a previously opened LOB.
- COMPARE – Compares two LOBs.
- CONVERTTOBLOB – Converts CLOB character data to a BLOB.
- CONVERTTOCLOB – Converts BLOB data to a CLOB.
- COPY – Copies LOB data to another LOB.
- CREATETEMPORARY - Creates a temporary LOB.
- ERASE - Erases LOB data.
- FREETEMPORARY - Frees a temporary LOB.
- GETCHUNKSIZE - Returns the amount of space used to store the LOB.
- GETLENGTH - Returns the length of a LOB.
- GET_STORAGE_LIMIT – Returns the storage limit of a LOB.
- INSTR - Returns the position of an occurrence of a pattern in a LOB.
- ISOPEN – Returns true if the LOB has been opened.
- ISTEMPORARY – Returns true if the LOB is temporary.
- LOADFROMFILE – Reads data from a file into a LOB.
- OPEN – Opens a LOB.
- READ – Returns data from a LOB.
- SUBSTR - Returns LOB data starting at a specified offset.
- TRIM – Truncates a LOB value to a specified length.
- WRITE – Inserts data into a LOB.

SQL/MX 3.8 – NATIVE BLOBS AND CLOBS

A universal datatype often used for application encryption in addition to large media files

Native Lob features

- Support for BLOB, CLOB, NCLOB datatypes
- Automatic LOB table management on DDL/DML including partitioning
- Uniform and built-in support from SQL utilities and security
- Migration from JDBC non-native blobs to JDBC native blobs

Native LOBs benefits

- Unstructured and semi-structured data (media, encryption, xml, JSON,...)
- Scales linearly along with base tables such as other data types
- DDL and DML compatibility with Oracle and other implementations
- Addresses limitations of the previous JDBC only implementation

Example

```
CREATE TABLE MYTABLE
(
  COL1      INT NOT NULL,
  ...
  COLX      BLOB (10 GB),
  ...
);
```

Requires Schema version 3800

A MAINSTREAM DATABASE USER EXPERIENCE

Common standards

- Standard languages, SQL, PL/MX
- Common datatypes and functions
- Standard connectivity and protocols ODBC, JDBC

How do you make SQL/MX easy to adopt?

THE DIGITAL TRANSFORMATION

An underwater photograph showing sunlight filtering through the water surface, creating a bright sunburst at the top and rays of light illuminating the scene. The water is dark blue, and there are some green plants or rocks visible at the bottom.

How do you transform
to a data driven
Enterprise?

SQL/MX VERSUS SQL/MP

Available only in SQL/MX	tables
DbaaS, multi-tenancy, database compatibility	MX table only
Unicode, 32k rows, 2k key size, 128 digits precision	MX table only
Triggers, Referential integrity	MX table only
Identity columns, Sequence generators, [VAR]binary, blobs and clobs	MX table only
Hash partitioning, automatic partitioning (POS) for hash partitions	MX table only
ANSI GRANT/revoke, privilege groups, separation of duties	MX table only
Primary key update, multi commit delete, fastcopy,	MX table only
Python, PL/MX, Workload management and NSDA, remote mxci	MP or MX table
Scalable ODBC connectivity (MXCS), Off platform JDBC connectivity (JDBC type 4 driver)	MP or MX table
Stored procedures, Publish/subscribe, C++ embedded SQL	MP or MX table
ANSI SQL-99 and partial 2003 compliance	MP or MX table

FROM DATA CREATION TO DATA VALUE

Data Creation

Data Driven

Data Value

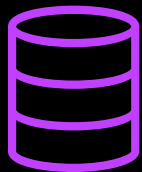


On premises

Other clouds



Edge



HPE NonStop
and Other sources

Real-time, continuous data movement

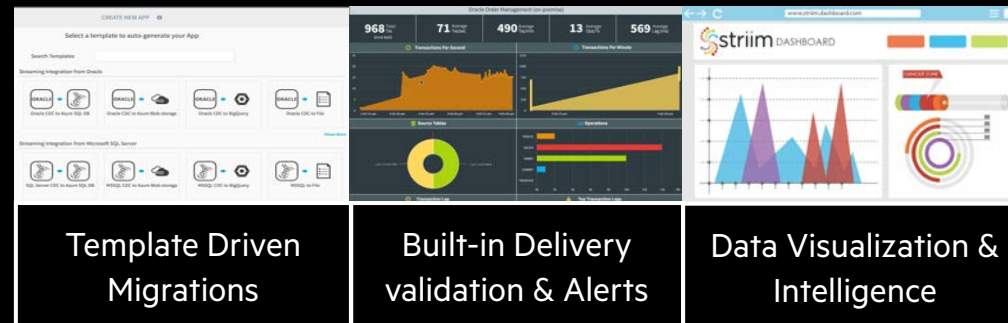


With in-line de-normalization and transformations

Analytics

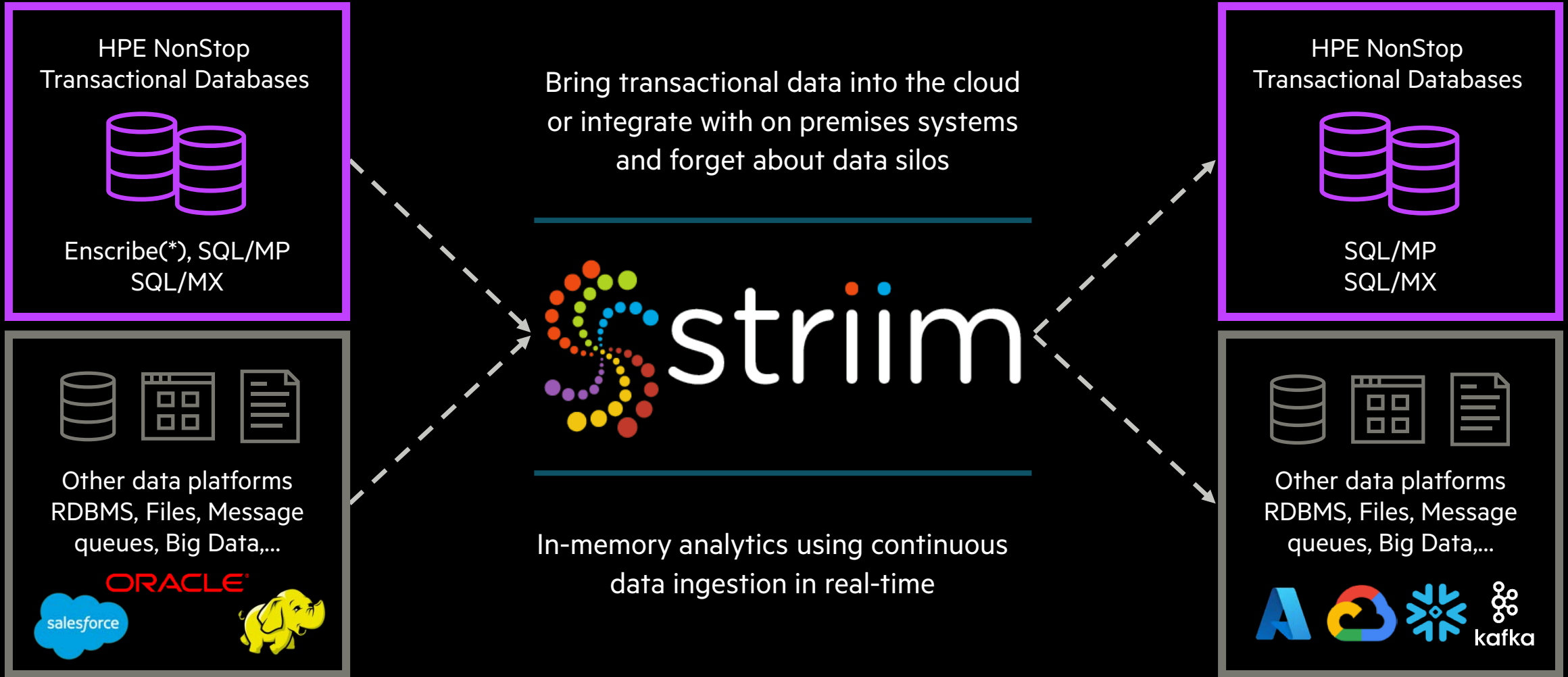


AI/ML

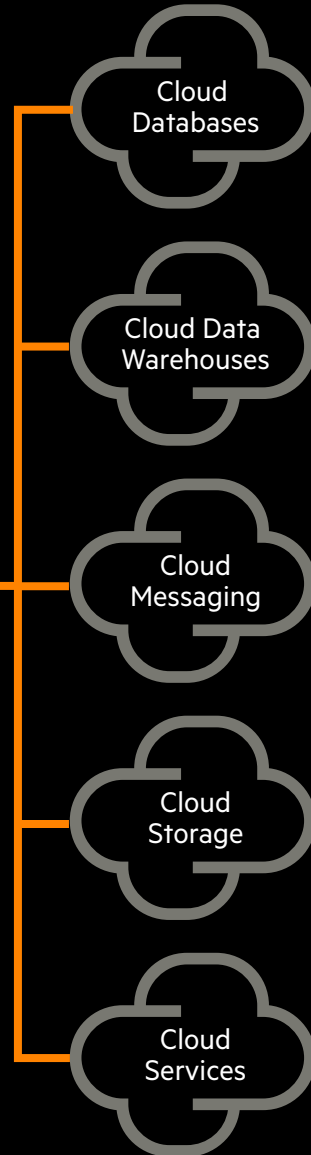






Source: Striim

A COMPLETE DATA INTEGRATION SOLUTION FOR HPE NONSTOP



HPE NONSTOP TO CLOUD



 Azure		 Google Cloud
SQL DB Azure DB Cosmos DB Synapse	RDS Aurora Redshift	Cloud SQL Cloud Spanner BigQuery
 snowflake®		
Event Hubs Data Lake Storage HDInsight	Kinesis S3 EMR	Cloud Pub/Sub Cloud Storage Cloud Data Proc

THE DIGITAL TRANSFORMATION

How do you transform
to a data driven
Enterprise?

Digital transformation

- From SQL/MP to SQL/MX
- Data Integration with solutions such as Striim

SECURE DATABASE MANAGEMENT

How do you secure
your data?

SECURE DATABASE MANAGEMENT

RBAC

A more productive way to secure privileges

MFA

Multi-Factor Authentication against password brute force attack

Auditing

Detect, analyze, address and avoid security breaches

SIEM

Enterprise security integration to streamline and simplify security

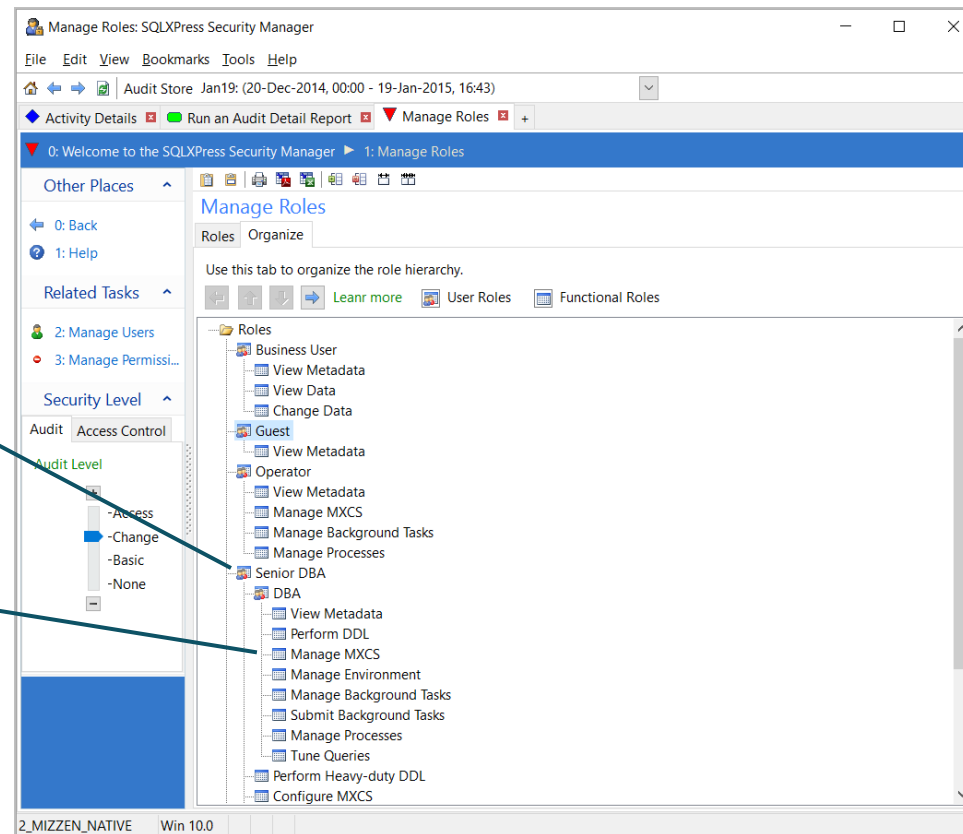
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USE RBAC FOR DBA ACTIVITIES

- SQLXPress includes an extensive role-based access control implementation
- Includes roles hierarchy
- Includes concepts of user roles and function roles

User role
"Senior DBA"

Function role
"Manage MXCS"



Access Control

SQLXPress 3.7 & later



Benefit examples



Fine grained roles and functions to prevent elevation of privilege
Easier security management than raw ACLs

MULTI-FACTOR AUTHENTICATION

Access Control

- SQLXPress is the most comprehensive GUI based administration solution for SQL/MX (as well as SQL/MP)
- No configuration required for SQLXPress:
 - SQLXPress detects if XUA is setup for MFA
 - If enabled SQLXPress will use MFA
- MFA setup in XUA
 - Requires RSA SecurID or Radius Authentication server
 - In a UAGROUP element define the types of authentication required by a given user (other criteria available)
 - NonStop user IDs are mapped to external user IDs (i.e. RSA SecurID ID)

SQLXPress 3.7 & later

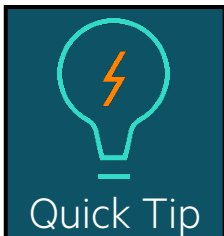


Benefit examples



Prevents brute force password attack

Prevents elevation of privilege



Quick Tip

Access to mxci in OSS can also be protected using MFA. This can be enforced at the user level when using SSH with the attribute
REQUIRED-AUTHENTICATIONS

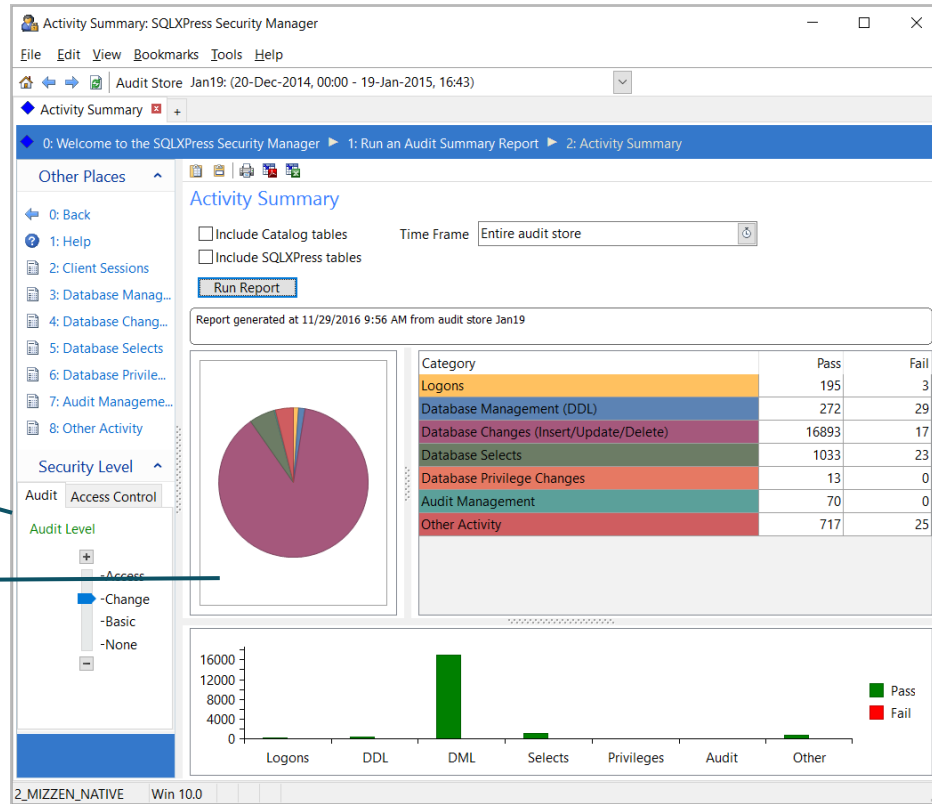
ENABLE AUDITING OF DBA ACTIVITIES

Prevent data tampering

- Audit activity of SQLXPress users
- Audits logons, SQL statements, scripts
- Includes audit levels
- Include audit reports

Set audit level

Get instant report



SQLXPress 3.7 & later

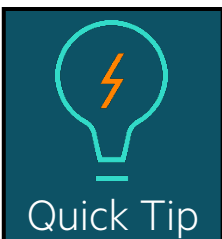


Benefit examples



Non repudiation

Detect security breach attempts

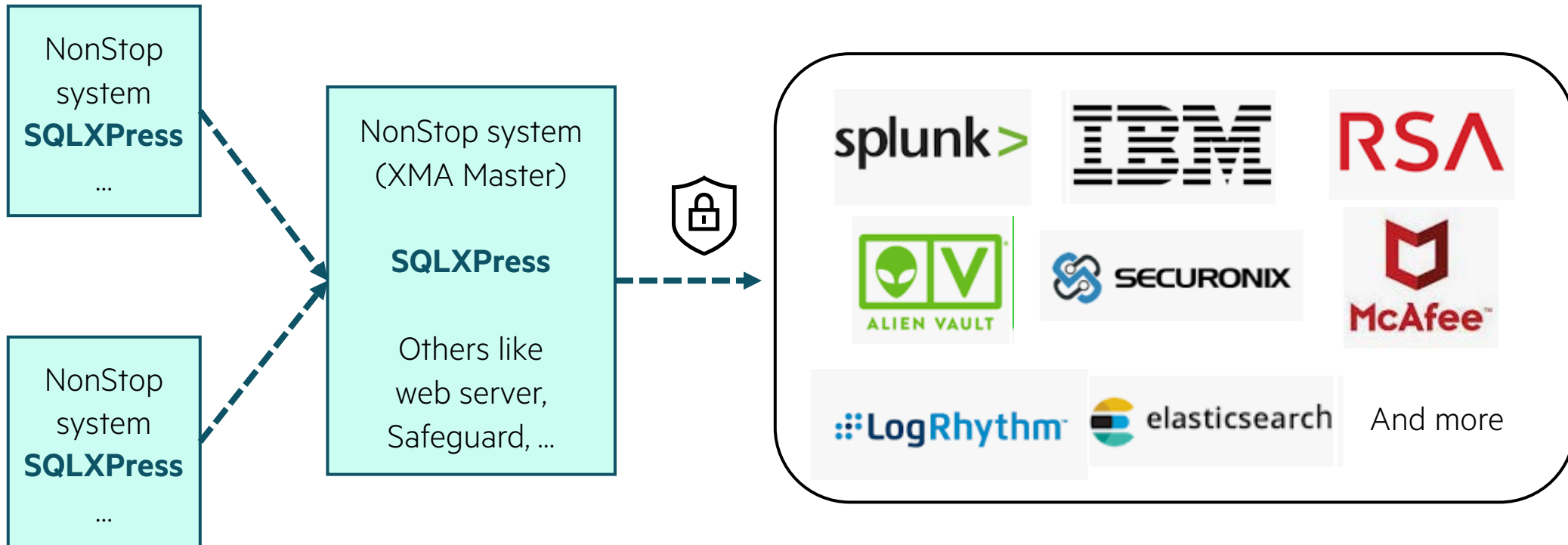


Quick Tip

With SQL/MX 3.8 we introduce a new DDL auditing feature native to SQL/MX that can be leveraged by 3rd party tools

SECURITY INFORMATION AND EVENT MANAGEMENT (SIEM)

- SQLXPress security events are forwarded to a NonStop XMA (Xygate Merged Audit) Master node
- For reasons that include security compliance, such acquired data needs to be sent off platform in a repository (aka SIEM) such as Splunk, ElasticSearch or others....
- XMA is part of the OS and provides filters for both incoming data into the XMA database and what is sent to a SIEM



NONSTOP SQL OUT OF THE BOX SECURITY FEATURES

	NonStop SQL/MP	NonStop SQL/MX	NonStop SQL Cloud Edition
SQL memory protection	✓	✓	✓
Guardian RWEF	✓	N/A	N/A
Posix read, write, execute	N/A	✓	✓
ANSI Grant/Revoke	-	✓	✓
Privilege groups	-	✓	✓
Security admin	-	✓	✓
SSL (odbc/jdbc)	-	✓	✓
PL/MX SQL governance	-	✓	✓
DBS reduced attack surface	-	✓	✓
RBAC	optional	optional	✓
DBA MFA authentication	optional	optional	✓
DBA auditing	optional	optional	✓
Enterprise security integration	optional	optional	✓

SECURED DATABASE MANAGEMENT

How do you secure
your data?

Secure DB

- Secure DB management
- More security with NonStop SQL Cloud Edition

REDUCE YOUR COSTS

How do you reduce
your costs?

HPE NONSTOP SQL CLOUD EDITION

HPE NonStop SQL Cloud Edition

HPE NonStop SQL/MX

HPE NonStop
SQLXPress

HPE NonStop Database
Analyzer

NonStop SQL Cloud Edition is available at the same price as SQL/MX but with the essential manageability tools included



The complete HPE NonStop SQL/MX Software product with all features such as high-availability, scale and multi-tenancy already included that let you **focus on the application**



HPE NonStop SQLXPress, a management solution that makes each DBA task **easy** while maintaining the **highest level of security**



HPE NonStop Database Analyzer (NSDA), an advanced real-time monitoring of your database workload that does not require any DBA skills and shows business metrics to drive **insights** and **optimize** your workloads

SQL/MX DATABASE SERVICES - ONE CLICK API

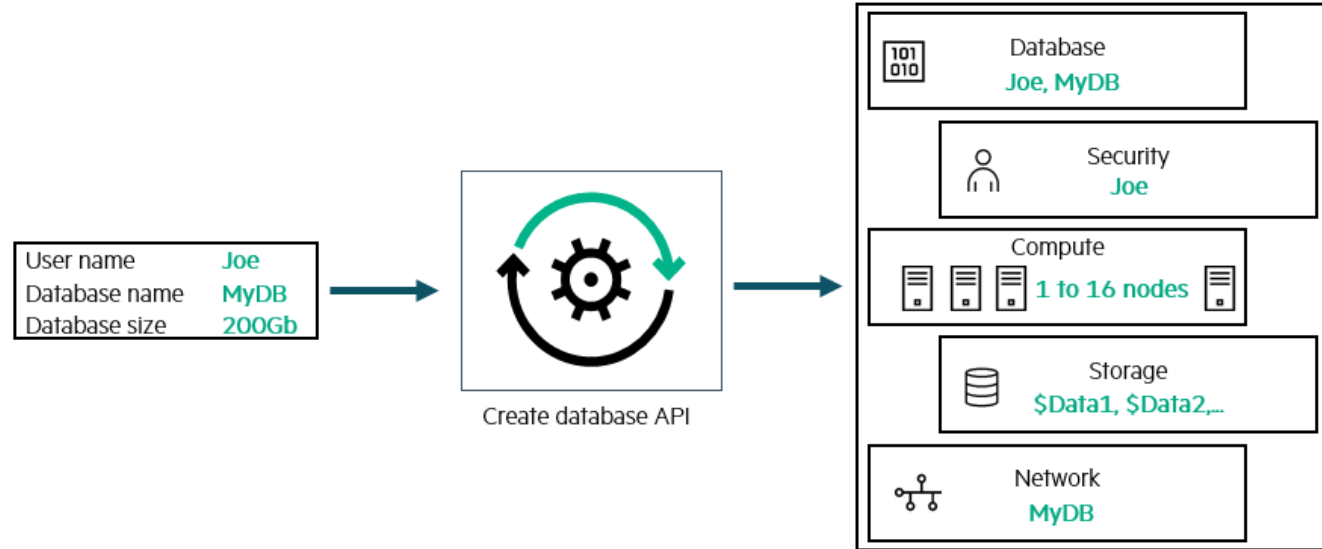
Your PASS to increased agility, reduced cost and business continuity for all

No training costs, exposing a simple, vendor agnostic API which in the backgrounds takes care of everything for you

Self service Portal

Apps

DevOps



SQL/MX

- Fault-tolerance built-in
- Turn key scale out
- Simplified architecture
- Dynamic scale up
- Multi-tenancy

It takes less DBAs to operate SQL/MX

Bare x86

VMware

SQLXPRESS: SIMPLIFY, ACCELERATE AND KEEP EVERYTHING SECURED!

Simplify

One tool instead of 10 for basic DBA functions

Tasks

Database objects creation/update/deletes ; Query whiteboard; MXCS management; View/update data in a table; Import csv data into a table; Export data into a csv table; Show Graphical Query plans (Embedded SQL); Capture runtime statistics (Embedded SQL); Partition management; Lock analysis, scripting; process and transaction information; task manager

Tools required

MXDM, mxci, rmxc, DB Visualizer, OSS import, VQP, FUP, pstate, tmfcom, netbatch

Accelerate

Only in SQLXPress

Tasks

Visual Query tuner (w/ metadata acquisition); Partition analysis and management; Create queries graphically; Histograms management ; Compare tables and DDL ; Disk space management; Database report

Secure

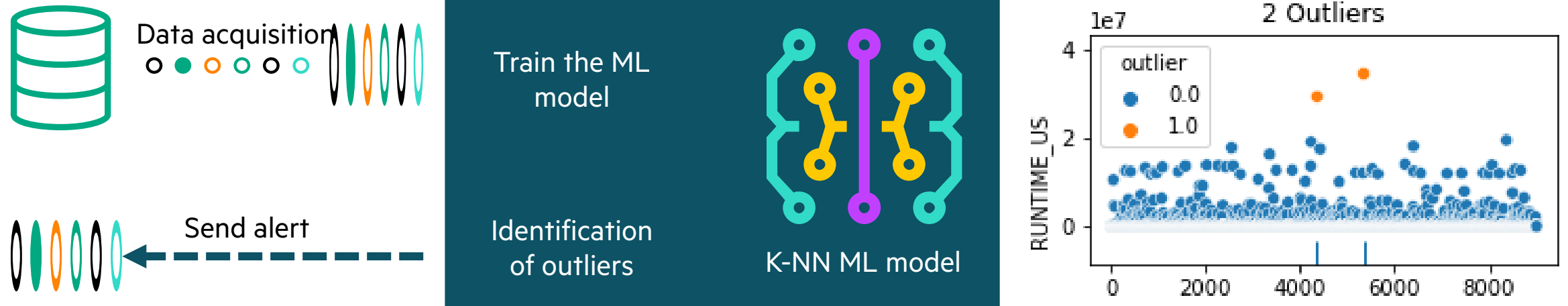
Zero trust ready

Tasks

MFA authentication, full RBAC capabilities, auditing, signed code, native encryption, security admin, SIEM integration

NSDA 1.3 – INTRODUCING MACHINE LEARNING INTO NSDA

Threshold or machine learning based alerts



NSDA 1.3 new features

- Threshold based alerts: i.e. Alert me if there are any queries taking more than 1 minute of CPU time, reading a million rows, or running for 10 hours
- Machine learning based: Alert me if they are outliers
- Generates an email and alert on the dashboard

Benefits

- Alerts help avoid costly violation of SLAs
- Maintain database health and take quick action without constantly monitoring

REDUCE YOUR COSTS

How do you reduce
your costs?

Reduced costs

- NonStop SQL Cloud Edition SQL/MX + SQLXPress + NSDA
- Automation and productivity tools

THE SQL/MX TOTAL VALUE

HPE continues to heavily invest into HPE NonStop SQL

Unique value

- Data Integrity at scale
- Fault tolerant, distributed, transactional, all built-in
- HPE NonStop SQL addresses complexity like no other

Common standards

- Standard languages, SQL, PL/MX
- Common datatypes and functions
- Standard connectivity and protocols ODBC, JDBC

Digital transformation

- From SQL/MP to SQL/MX
- Data Integration with solutions such as Striim

Secure DB

- Secure DB management
- More security with NonStop SQL Cloud Edition

Reduced costs

- NonStop SQL Cloud Edition SQL/MX + SQLXPress + NSDA
- Automation

THANK YOU

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