Evolving Data sources...

Manual

Corporate
- Sales, Customers

Government
- Demographics
- Health, Crime, etc.

Connected

Corporate
- Sales, Customers

Government
- Demographics
- Health, Crime, etc.

Personal
- Emails, IM/Chat
- Social Networks

Automated

Corporate
- Sales, Customers

Government
- Demographics
- Health, Crime, etc.

Personal
- Emails, IM/Chat
- Social Networks
- Audio, Video, Pictures Smart Devices
- Cellphones
- Smart Cars
- IOT sensors
- Wearables

1980   1990   2000   2010   2020

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...and changing expectations from Data

Descriptive
[Reports]

Diagnostic
[Interactive Dashboards]

Predictive
[Machine Learning]

Prescriptive
[Recommendations & Automation]

What happened?

Why did it happen?

What will happen?

What should I do?

Insight
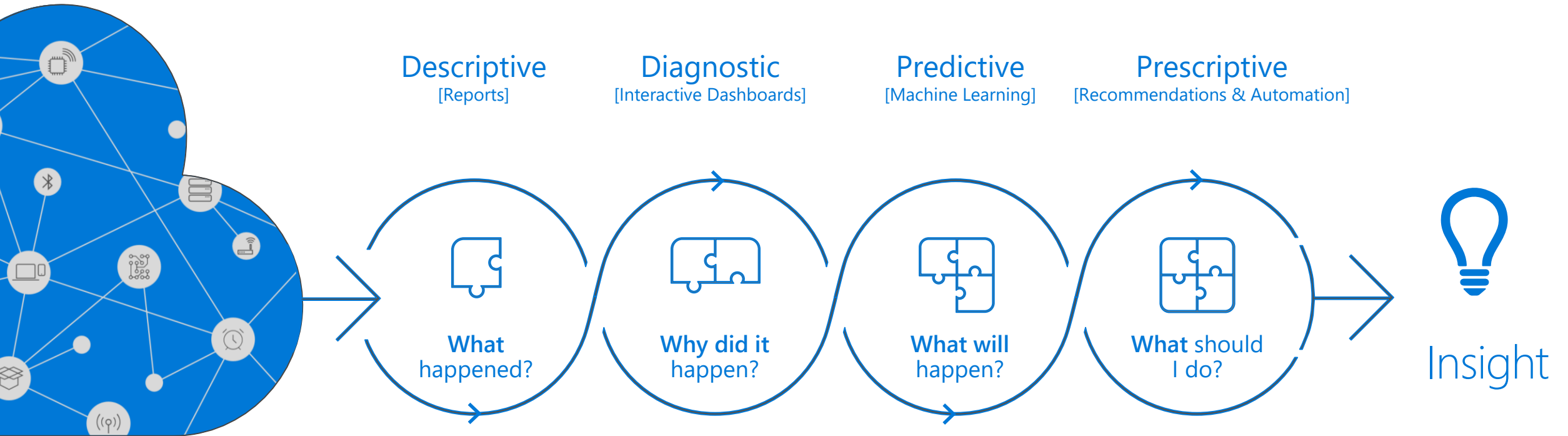
What do you want to offer to customers

Data Storage & Management

- $46B market, growing at 5% CAGR

- Strong competition, low opportunity for differentiation

- Considered utility by customers, shrinking margins

- Low customer stickiness, easy to transition

Business Intelligence

- $20B market, 12% CAGR

- High opportunity for services attach and differentiation

- Deepen customer connect, sell beyond IT

- Cross-sell other products and services (Power BI, LOB, etc.)

Data Driven Business

- $2B market, >100% CAGR

- Digital Transformation partner, $4.5T addressable market

- Business enabler, high customer stickiness

- Cross-sell to profit centers across the organization

SQL Server

Platform for
Data-Driven Intelligence

SQL Server

The platform of choice

Announcing SQL Server on Linux

SQL Server ♥ Linux

Posted March 7, 2016 By Scott Guthrie - *Executive Vice President, Cloud and Enterprise Group, Microsoft*

It's been an incredible year for the data business at Microsoft and an incredible year for data across the industry. This Thursday at our Data Driven event in New York, we will kick off a wave of launch activities for SQL Server 2016 with general availability later this year. This is the most significant release of SQL Server that we have ever done, and brings with it some fantastic new capabilities. SQL Server 2016 delivers:

- Groundbreaking security encryption capabilities that enable data to always be encrypted at rest, in motion and in-memory to deliver maximum security protection
- In-memory database support for every workload with performance increases up to 30-100x

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This week at Microsoft Ignite, we showed how we are ... *Read more »*

The next milestone in Microsoft's AI journey

This week at Microsoft Ignite, we showed how we are ... *Read more »*

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We have all heard the mind-blowing statistics around growth in ... *Read more »*

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Last week's big AI announcements eclipsed a lot of other ... *Read more »*

Microsoft Ventures: A portfolio with impact

With the official debut of Microsoft Ventures in late May, ... *Read more »*

Microsoft increases European cloud investment to $3 billion, unveils cloud policy recommendations

Attract more customers

101
001
010
010

Any data

T-SQL   PHP
Java   Node.js
C/C++   Python
C#/VB.NET Ruby

Any application

Anywhere

Windows Server

Linux

Choice of platform

SQL Server 2016
Delivers unparalleled performance

Provide a better experience, better leverage your hardware

#1 OLTP Performance	#1 DW Performance	#1 Price/Performance	Unparalleled App Performance
Leader in TPC-E	#1 in 30TB, 3TB, 1TB TPC-H **Windows Server 2016**	#1 in TPC-E & 1TB, 3TB, 10TB, 30TB TPC-H **Windows Server 2016**	100x faster analytics

Performance gains just by upgrading!

7x faster throughput
10x faster queries
4x faster reporting

TPC results as of April 2016 http://www.tpc.org/default.asp

SQL Server 2016 SP1
Common Programmability Surface

Enterprise

MISSION CRITICAL IN-MEMORY PERFORMANCE AND SCALE, SECURITY AND HIGH AVAILABILITY

- ✓ **Mission-critical high availability**

- ✓ **Enhanced in-memory** performance for all workloads

- ✓ Unparalleled data security with **AlwaysEncrypted, Row-Level Security, Data Masking**

- ✓ PB scale data warehousing

- ✓ **End-to-end mobile BI** with rich visualizations on all major platforms

- ✓ **In-database advanced analytics** built-in at scale with R plus in-memory; 1M predictions/second

- ✓ Enhanced hybrid scenarios including **Stretch Database**, HA, DR and backup

Standard

FULLY FEATURED DATABASE FOR MID-TIER APPLICATIONS AND DATA MARTS

- ✓ Highly available database with **Basic AlwaysOn**

- ✓ Most secure database with **AlwaysEncrypted**

- ✓ **Basic in-memory** performance for all workloads

- ✓ **Basic advanced analytics**

- ✓ Basic reporting

- ✓ Enhanced hybrid scenarios including **Stretch Database**, HA, DR and backup

Express

SMALL-SCALE APPLICATIONS

- ✓ Development and management tools

- ✓ Easy backup and restore to Microsoft Azure

SQL Server 2016 SP1 features by edition

Category	Feature		Standard	Enterprise
OLTP Performance	Maximum number of cores	New	24 cores	Unlimited
	Maximum memory utilized per instance		128 GB	OS Max
	Maximum size		524 PB	524 PB
	Basic high availability (2-node single database failover, non-readable secondary)	New	●	●
	Enterprise data management (Master Data Services, Data Quality Services)			●
	Advanced OLTP (In-memory OLTP, Operational analytics)	New	●	●
	Advanced HA (Always On - multi-node, multi-db failover, readable secondaries)			●
Security	Security (Always Encrypted, row-level security, data masking, basic auditing, separation of duties)	New	●	●
	Transparent Data Encryption	New		●
Data Warehousing	Fuzzy grouping and look ups			●
	Data warehousing (In-Memory ColumnStore, partitioning, data compression, change data capture, database snapshot)	New	●	●
Business Intelligence	Basic data integration (SSIS, built-in connectors)		●	●
	Basic Corporate Business Intelligence (Multi-dimensional models, Basic tabular model)	New	●	●
	Mobile BI (Datazen)	New		●
	Advanced Corporate Business Intelligence (Advanced tabular model, Direct query, in-memory analytics, advanced data mining)	New		●
Advanced Analytics	Basic "R" integration (Connectivity to R Open, Limited parallelism for RRE)	New	●	●
	Advanced "R" integration (Full parallelism for RRE)	New		●
Hybrid Cloud	Stretch Database	New	●	●
Programmability	Programmability (T-SQL, CLR, Service Broker, JSON, XML)	New	●	●

Memory core and limitations for SE

Improve DW and BI with Column-Store indexes

Clustered ColumnStore Index

Column Store (CS)

Deleted Bitmap

Row Store (RS)

Space Consumption

91% savings

- Table with customary indexing
- Table with customary indexing (page compression)
- Table with no indexing
- Table with no indexing (page compression)
- Table with columnstore index
- Clustered columnstore
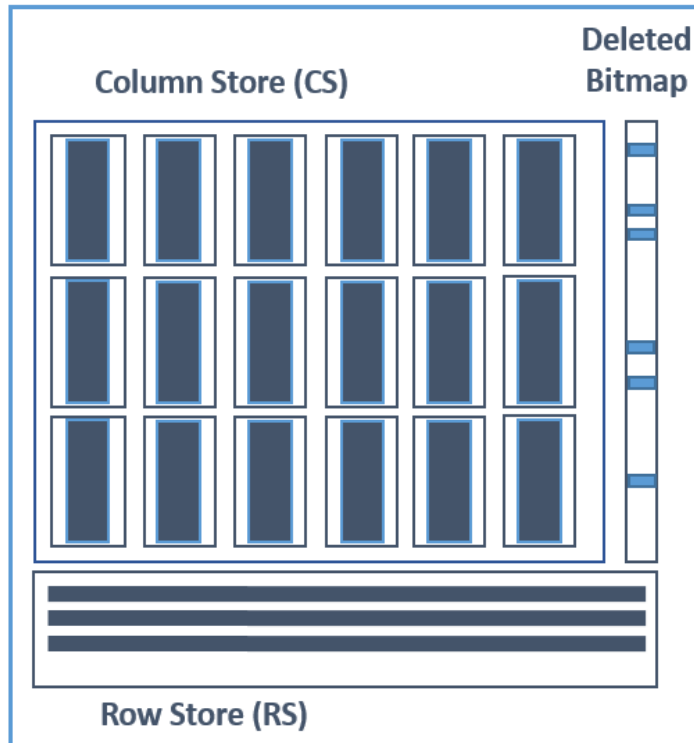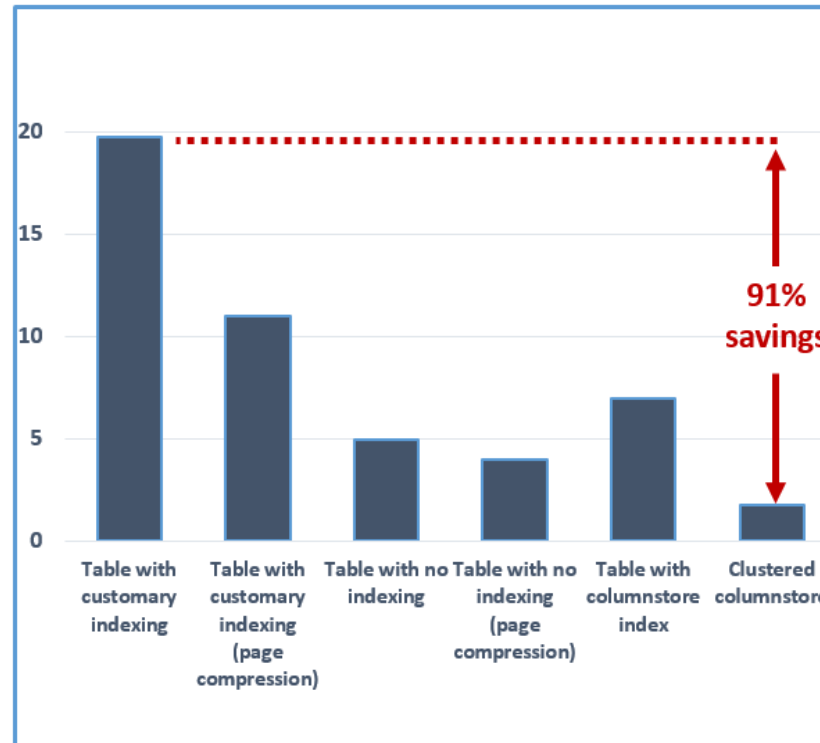
Performance Characteristics

Improvement (X times)

TPDS Queries
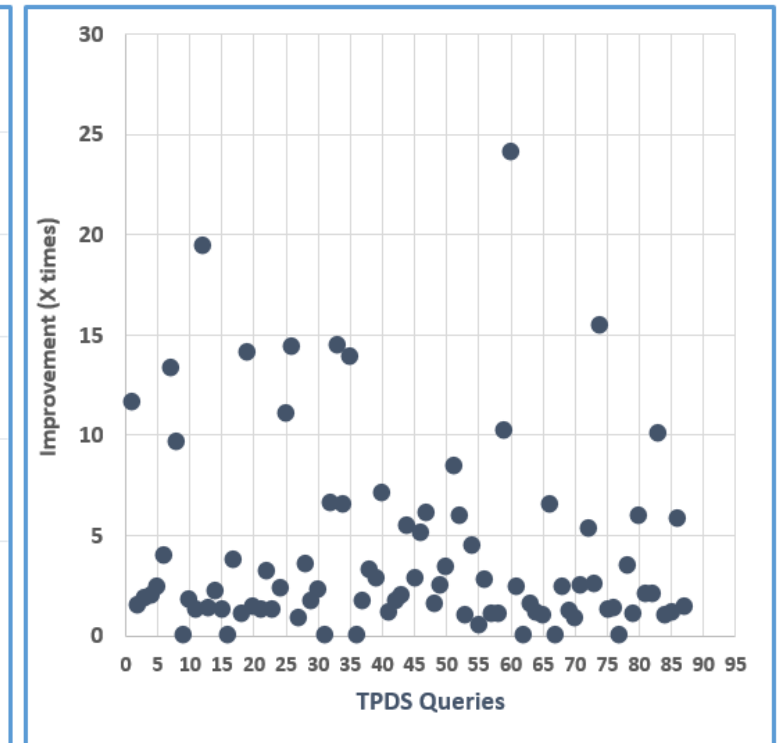
- Update-able columnstore
- Partition level statistics

- 5-10X data compression
- Additional archival compression

- Next generation query processing
- 5-10X improvement

Build real-time intelligent apps
SQL Server with R built-in

Intelligent apps need to be able to:

Ingest data in real-time

Query across historical and real-time data

Analyze patterns and make predictions with machine learning

Ingest real-time train data:
Brakes are hot!

Query across historical data:
They've been hot for 4 hours!

Analyze global trends:
Could lead to accident

STOP

Support real-time BI directly on the database

Insert into <transactions>

values ('<upc-code>', 'flowers', $20.00)

Select ProduceName, ExpiryDate, SUM (inventory – item_sold)
From <transactions>
where [Date] >= DATEADD(day, -1, GETDATE())
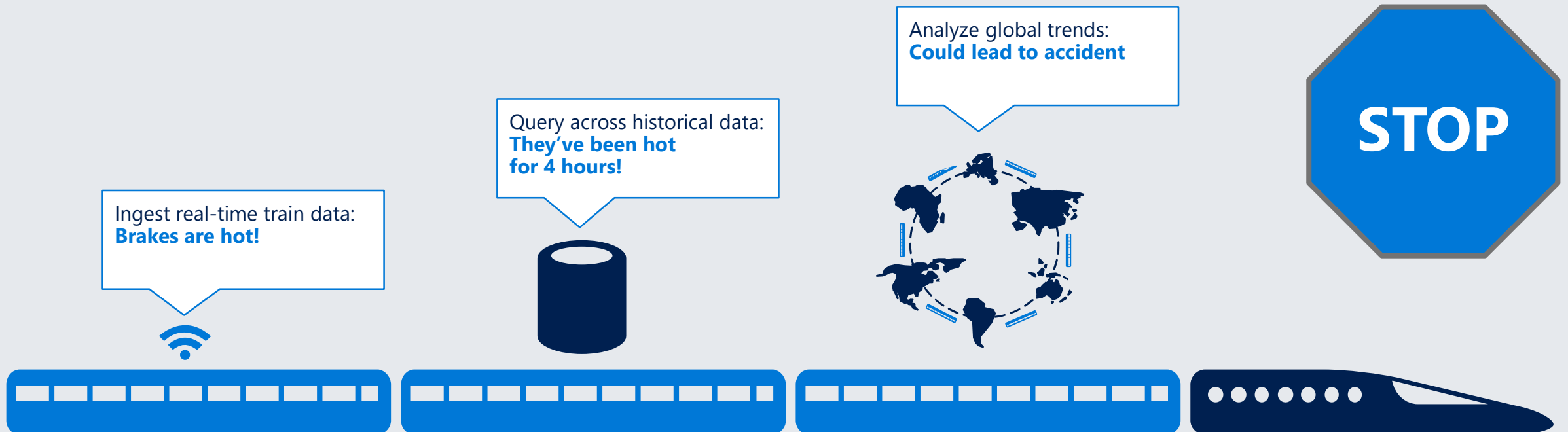Group by ProductName, ExpiryDate, DATEPART(HOUR, [Date])

Presentation Layer

IIS Server

Application Tier

BI and analytics

Dashboards   Reporting

**SQL Server
Analysis Server**
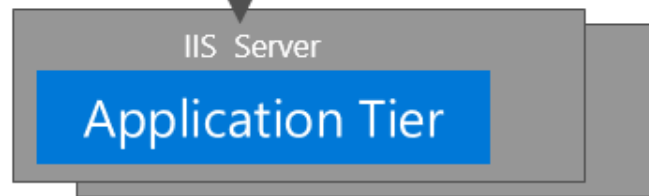
SQL Server

Add non-clustered
column store index

Database
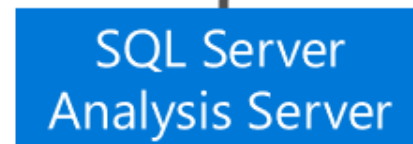
Benefits

- No Separate DW
- No ETL
- No Data Latency
- Minimal Impact on OLTP workload

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SQL Server 16
Increases business continuity

Higher Availability	• 3 Automatic Failover Replicas • Disaster Recovery to Azure
Scalability	• Load Balancing of Read Workloads
Lower cost	• Basic AlwaysOn in SQL Standard Edition

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3 Automatic Failover Replicas

- Maintain availability despite 2 failed replicas
- Applications routed transparently to primary

Listener

Replica1
(Secondary)

Replica2
(Secondary)

Replica3
(Primary)

(Optionally in Azure)
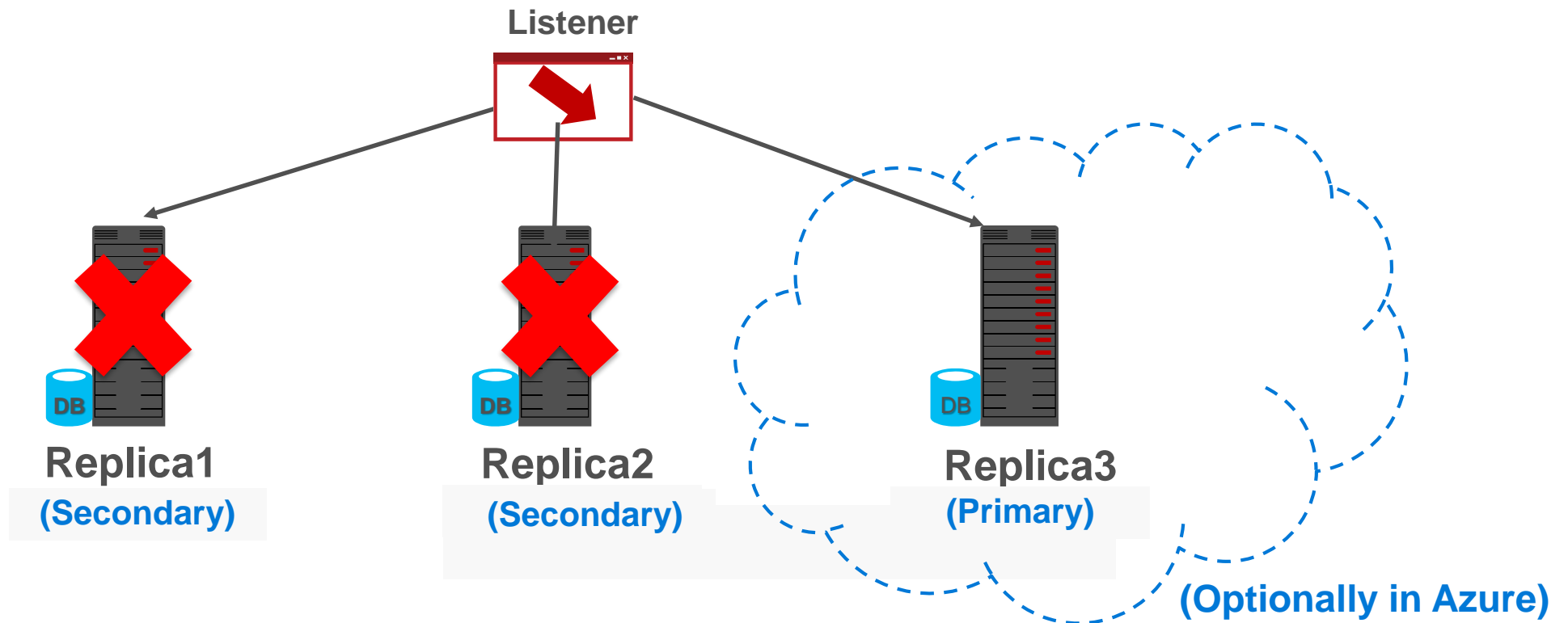
SQL Server 2016 is more Secure!
Most secure database

Support more sensitive apps

Control Access
- SQL Authentication
- Windows Authentication

Monitor activity
- SQL Server Auditing

Control access
- Row-level Security *new*
- Dynamic Data Masking *new*

Protect data
- Always Encrypted *new*
- Transparent Data Encryption
- Connection Encryption

Secure Code
- Secure development lifecycle
- Least vulnerable last 6 years

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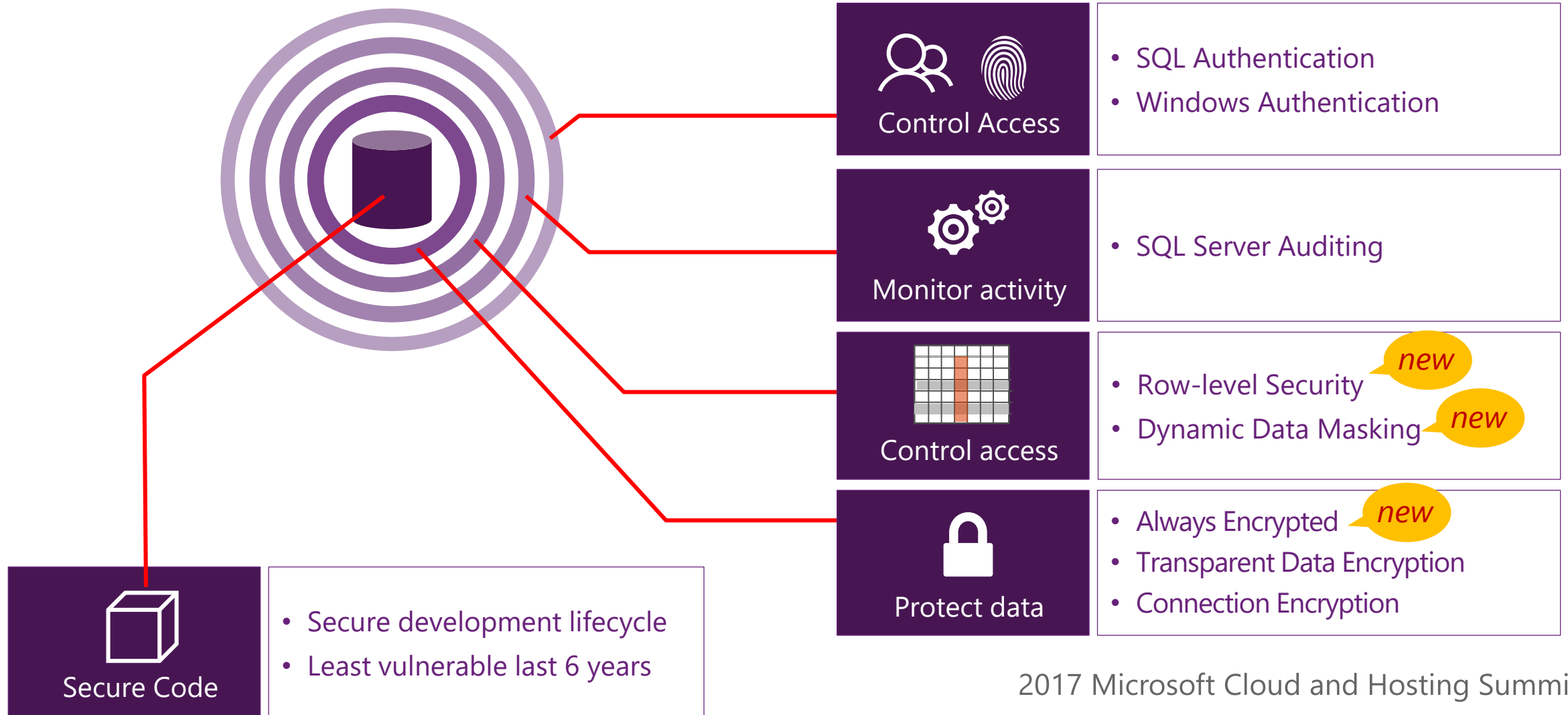
Always Encrypted
Most secure database

Support more sensitive apps

Encrypted data never decrypted by SQL Server

Client

```
"SELECT Name FROM Customers
WHERE SSN = @SSN","111-22-3333"
```

Result Set

Name
Wayne Jefferson

ADO .NET

trust boundary

SQL Server or SQL Database

```
"SELECT Name FROM Customers
WHERE SSN =
@SSN",0x7ff654ae6d
```

ciphertext

Result Set

Name
0x19ca706fbd9a

dbo.Customers

Name	SSN	Country
0x19ca706fbd9a	0x7ff654ae6d	USA

ciphertext
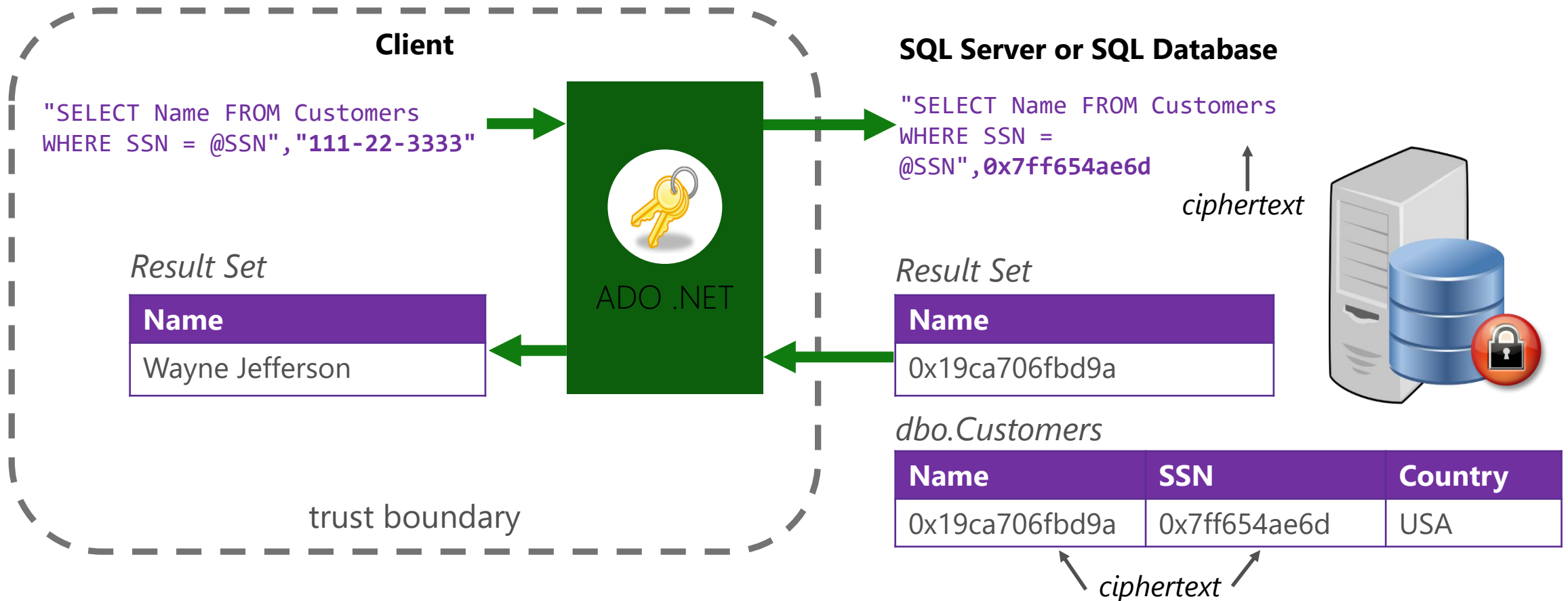
JSON and Hadoop
End-to-end mobile BI

```
[
  {
    "Number":"SO43659",
    "Customer":"MSFT",
    "Price":59.99,
    "Quantity":1
  },
  {
    "Number":"SO43661",
    "Customer":"Nokia",
    "Price":24.99,
    "Quantity":3
  }
]
```

Number	Customer	Price	Quantity
SO43659	MSFT	59.99	1
SO43661	Nokia	24.99	3

T-SQL query

Quote:

****
****
****
****
****
****
****

$658.39

SQL Server   Hadoop

Name	DOB	State
Denny Usher	11/13/58	WA
Gina Burch	04/29/76	WA

@ Support big data scenarios
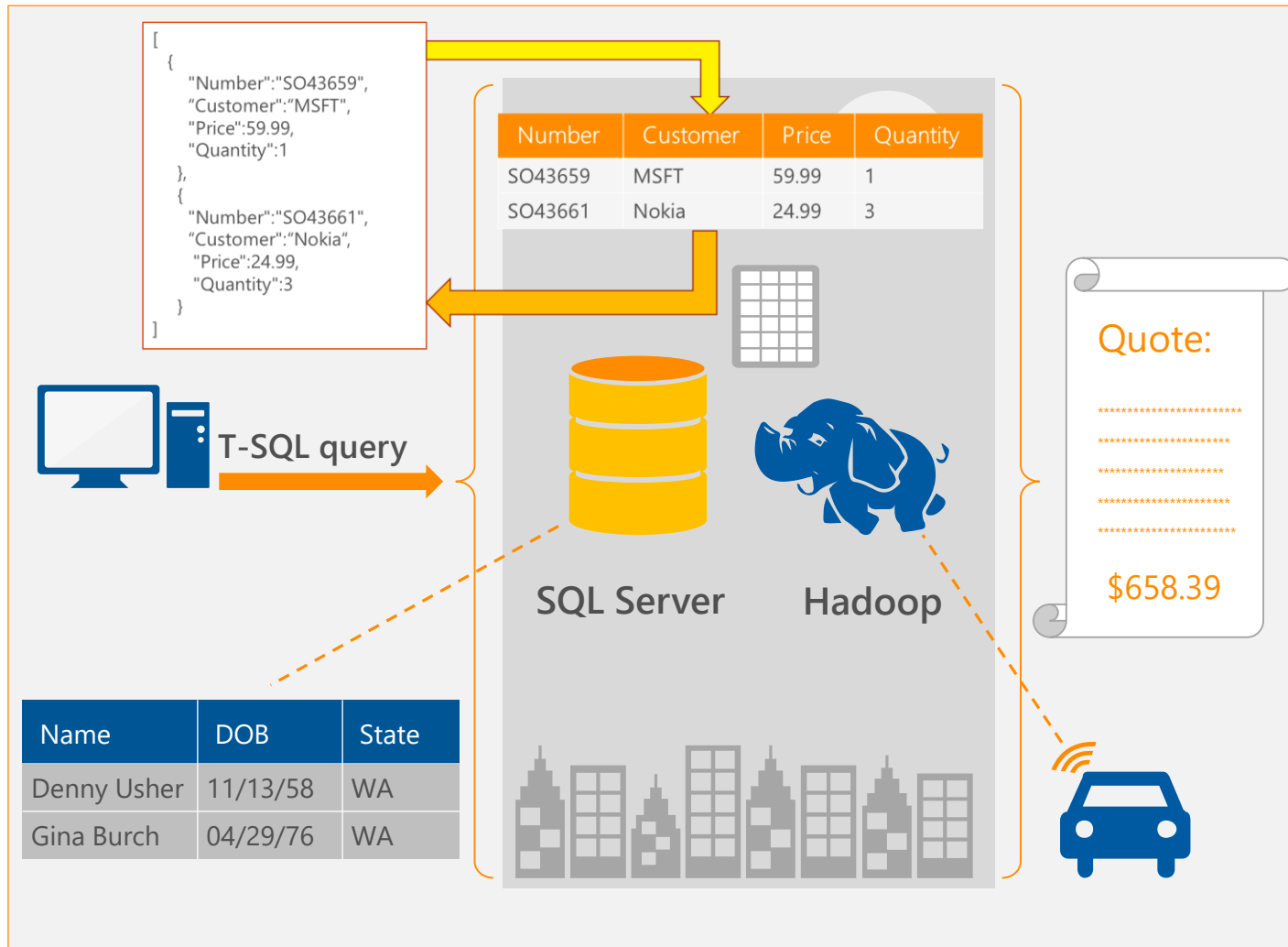
Combine structured & **unstructured data**

➡ Store/Query JSON data
Import, Export, Parse, Query

➡ Query Hadoop data
Apache, Cloudera, HDInsight

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SQL Server vNext

On the platform of your choice
SQL Server v.Next
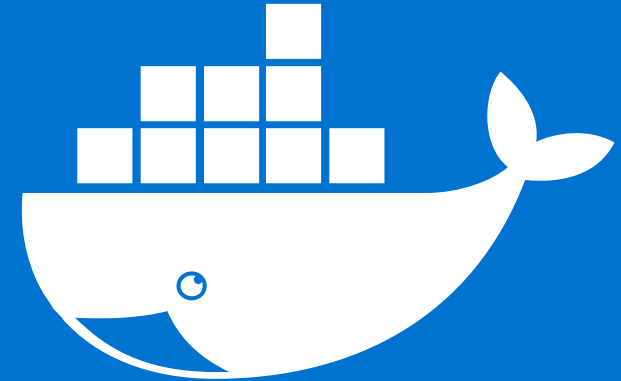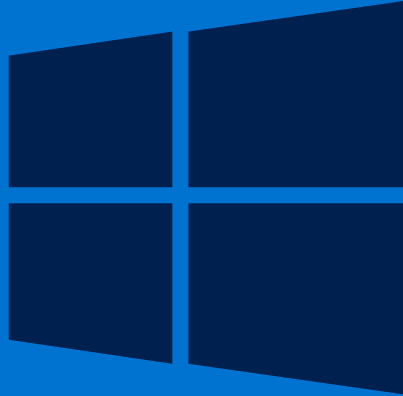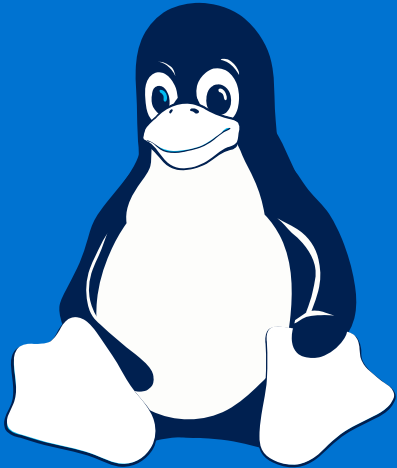
SQL Server v.Next GA*

Targeting CY2017

*SQL Server v.Next Public Preview available now on Linux, Windows, and Docker.

Two platforms – one SQL Server

```
Microsoft SQL Server vNext (CTP1) - 14.0.1.246 (X64)
        Nov  1 2016 23:24:39
        Copyright (c) Microsoft Corporation
        on Linux (Ubuntu 16.04.1 LTS)
```

```
Microsoft SQL Server vNext (CTP1) - 14.0.1.246 (X64)
        Nov  1 2016 23:24:39
        Copyright (c) Microsoft Corporation
        Enterprise Evaluation Edition (64-bit) on Windows Server 2016
        Datacenter 6.3 <X64> (Build 14393: ) (Hypervisor)
```
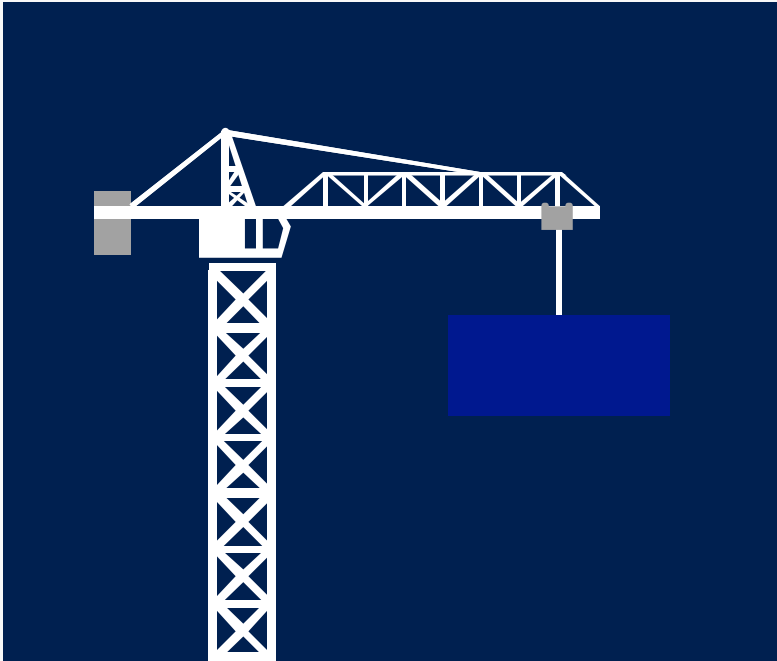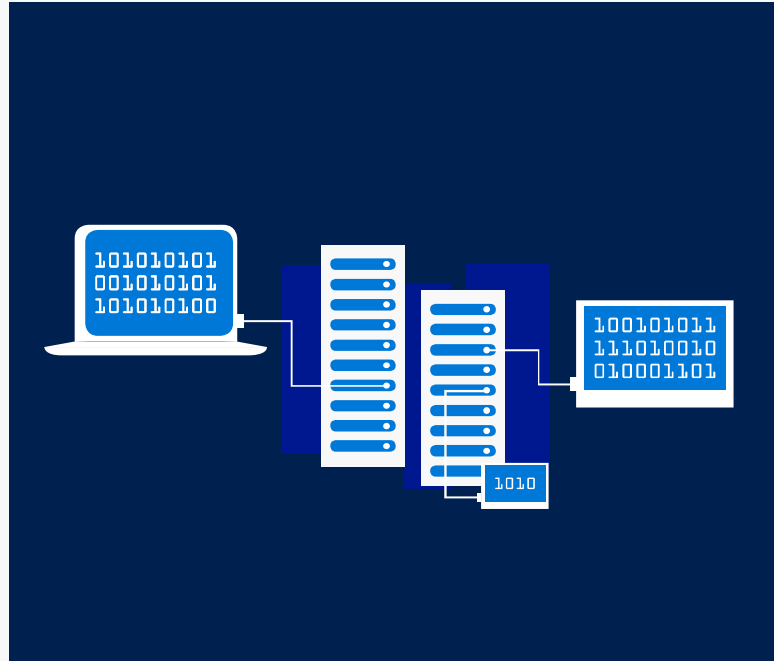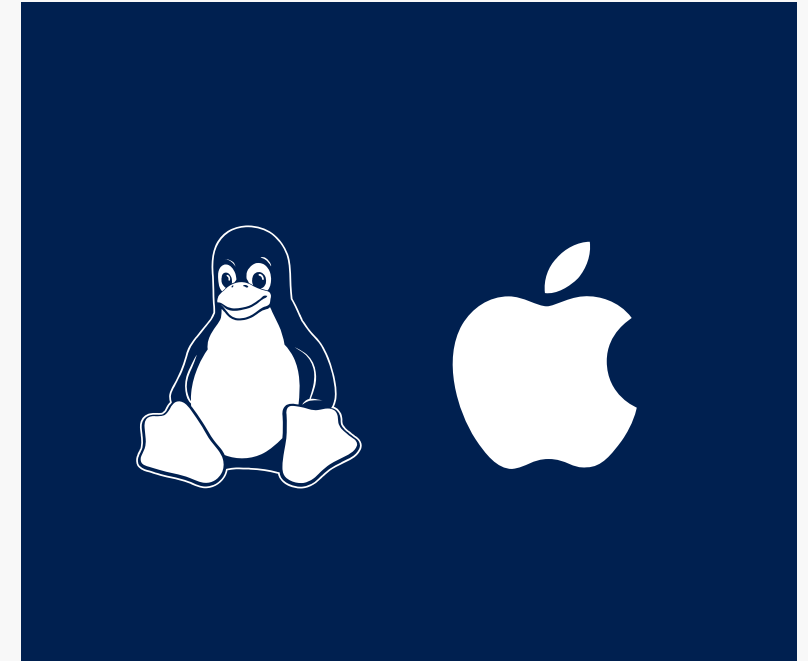
Prioritization principles

Performance and scale

Cross-OS compatibility
Same app code runs across platforms

Native user experience
On Linux and macOS (server & tools)

What's working already?

Operations Features

- Support for RHEL, SUSE, Ubuntu, Docker
- Package based installs, Docker image
- Support for Open Shift, Docker Swarm
- Failover Clustering through Pacemaker
- Backup/Restore
- Replication
- Log Shipping
- Transparent Data Encryption
- SCOM Management Pack
- DMVs
- Always On Availability Groups (coming in February)
- **SQL Agent (coming in March)**
- Full Text Search (coming in February)

Programming Features

- All major language driver compatibility
- In memory OLTP and ColumnStore
- Compression
- Always Encrypted, Row Level Security, and Data Masking
- Service Broker
- Change Data Capture
- Partitioning
- Auditing
- Common Language Runtime (CLR) - .NET Framework
- JSON, XML

...and more!

Supported platforms

Linux

Containers

Windows

Windows Server

Windows 10

- SUSE Enterprise Linux (SLES) v12 SP2

- RedHat Enterprise Linux (RHEL) 7.3

- Ubuntu 16.04, 16.10

- Possibly other Linux distributions

- Docker: Windows & Linux containers

- Windows Server / Windows 10

- Package based installation

  Example: zypper install mssql-server

What's coming in SQL Server vNext for Linux
Tools and programmability
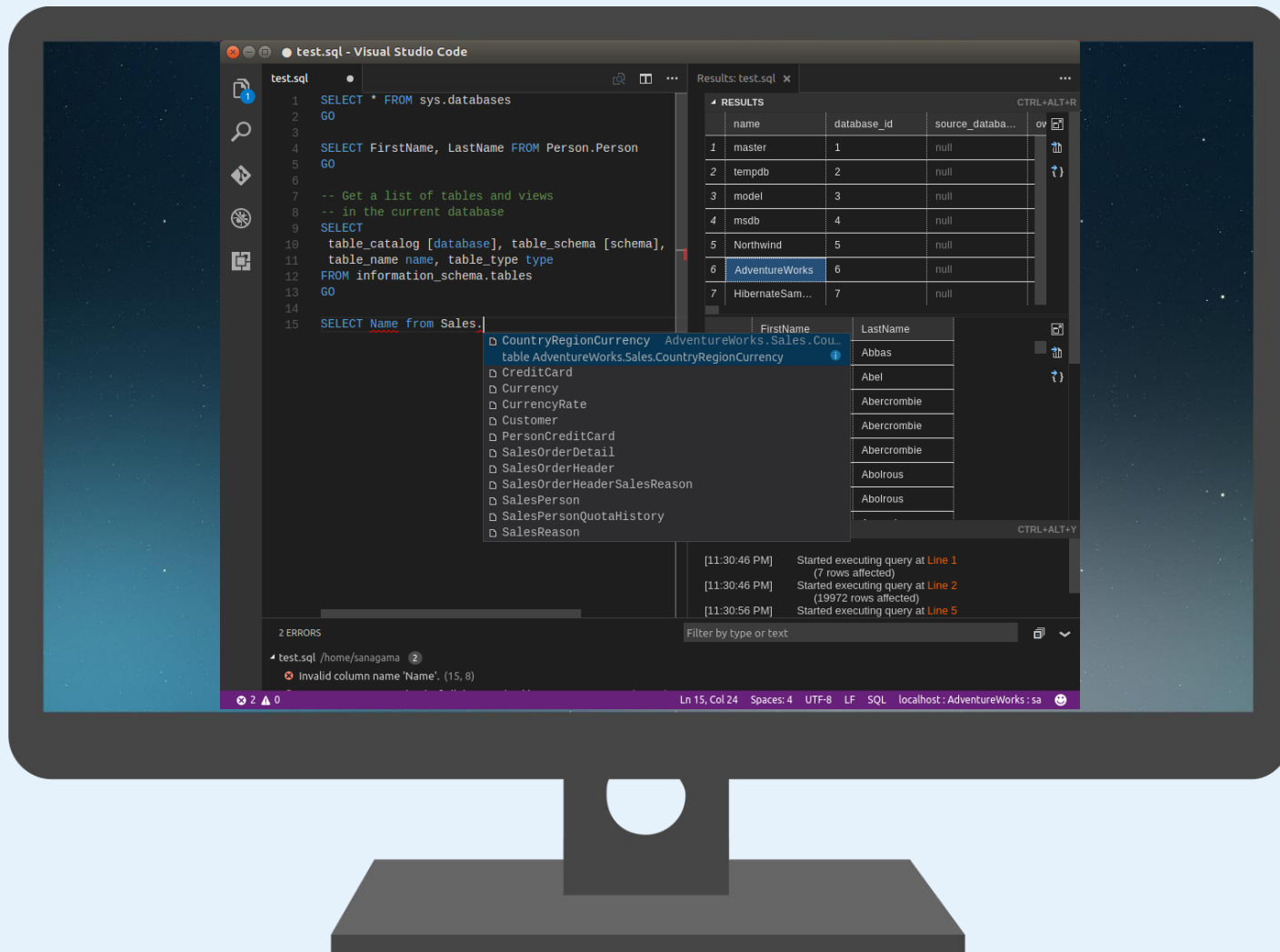
- Windows-based SQL Server tools like SSMS, SSDT, Profiler work when connected to SQL Server on Linux

- 3rd party tools continue to work

- Native command line tools: sqlcmd, bcp, sqlpackage

- Visual Studio Code extension

- New cross-platform DB admin GUI tool (planned)

- All existing drivers and frameworks supported

System Architecture

Everything else

System Resource & Latency Sensitive Code Paths

| RDBMS | IS | AS | RS |

SQL Platform Abstraction Layer (SQLPAL)

Windows Host Ext.

Linux Host Extension

Windows

Linux

SQL Platform Abstraction Layer (SQLPAL)

Win32-like APIs

SQL OS API

SQL OS v2

Host Extension mapping to OS system calls (IO, Memory, CPU scheduling)
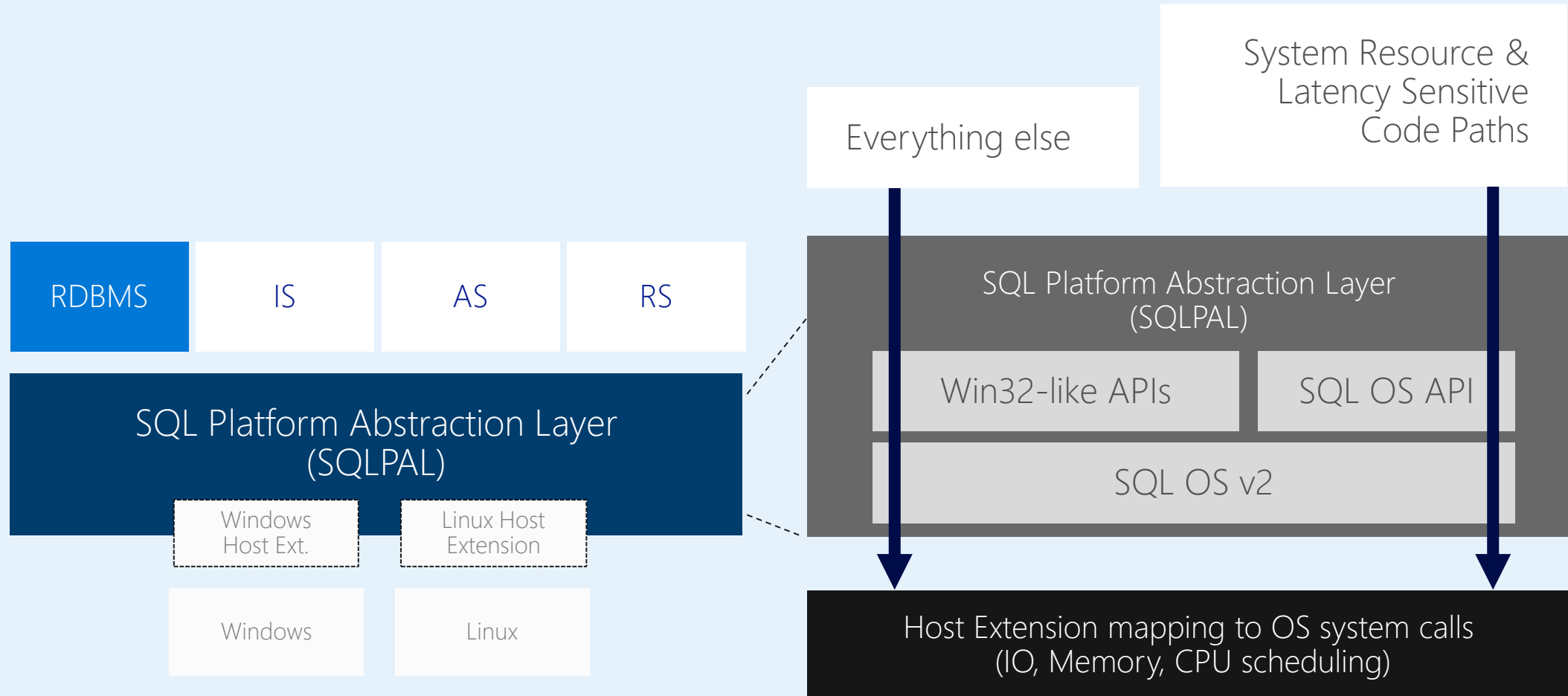
SQL Server on Linux Performance

- Use SQL Server on Red Hat, SLES, and Ubuntu without tuning kernel parameters

- SQL Server long standing design goal is to reduce complexity/number of parameters to be tuned out of the box

- SQL Server on Linux will be on par with SQL Server running on Windows by GA

- Will be reflected by TPC benchmarks

Docker ♥ Databases

- Many of the most popular images are databases
  - Postgres: 10M+ pulls
  - MySQL: 10M+ pulls
  - Redis: 10M+ pulls
  - Mongo: 10M+ pulls

- SQL Server on Linux has had 900K+ pulls in the first 5 months

Persisting Storage

- ## Mount a volume to the host
  - ### Local storage
  - ### Remote storage

  ```
  docker run … -v /my/host/dir:/my/container/dir …
  ```

- ## Mount a container volume

  ```
  docker create -v /mydata --name mydatacontainer …
  docker run --volumes-from mydatacontainer …
  ```

https://docs.docker.com/engine/tutorials/dockervolumes/

Build & Test Locally in Dev Environment

Windows

- **Linux Docker containers using Docker for Windows**
- **Windows containers on Windows 10 Anniversary Edition+**

macOS

- **Linux Docker containers using Docker for Mac**

Linux

- **Use Docker Engine natively**

Testing & Release

- ## Use Docker Engine natively

- ## Use a container management platform (aka "orchestrator")

  - Kubernetes
  - Red Hat OpenShift (based on Kubernetes)Docker Swarm
  - Mesosphere DC/OS
  - Etc.

Real World Example

SQL Server Engineering Team uses Kubernetes in Azure VMs for automated testing of SQL Server on Linux

- Automated build process creates the container image
- Extended existing test system to handle provisioning and test execution/targeting
- ~700 containers per test run, usually once per day
- 150 VM hosts in Azure; 128 GB/8 cores
- 20+ containers/VM in some cases
- High density, each SQL Server container listens on a different port

Bootcamp: SQL on Linux
April 6 & 7, 2017 | Redmond, WA

Microsoft

Hosted by the Microsoft Cloud & Enterprise Partner marketing team.

Deep dive & learn

Gain business and technical understanding of SQL deployed on Linux platform for hosting and managed services practices

Who should attend?

- System Administrators
- Product Managers

R.S.V.P. today! Email SPDP@Microsoft.com

Agenda Day 1 - Thursday

Microsoft's Vision on Data & SQL v.Next

- Features & Capabilities
- Supported Distributions
- Provisioning Details
- Recommended Hardware and Configuration
- Security

Agenda Day 2 - Friday

SQL on Linux:

- Making Money with SQL on Linux
- Hands on Lab

Partner Showcase

Joshua Lee

Director, Global Alliances - Microsoft
joshua.lee@brillio.com

Brillio is a global technology and business services firm focused on digital transformation. Brillio develops and deploys disruptive solutions which help our clients compete more effectively and capture business value faster

Digital | IoT | Wearables | Mobile | Cloud | Analytics

Based in **Silicon Valley**

Seattle
New Jersey
Oslo
London
Santa Clara
Washington DC
Los Angeles
Dallas
Mumbai
Bangalore
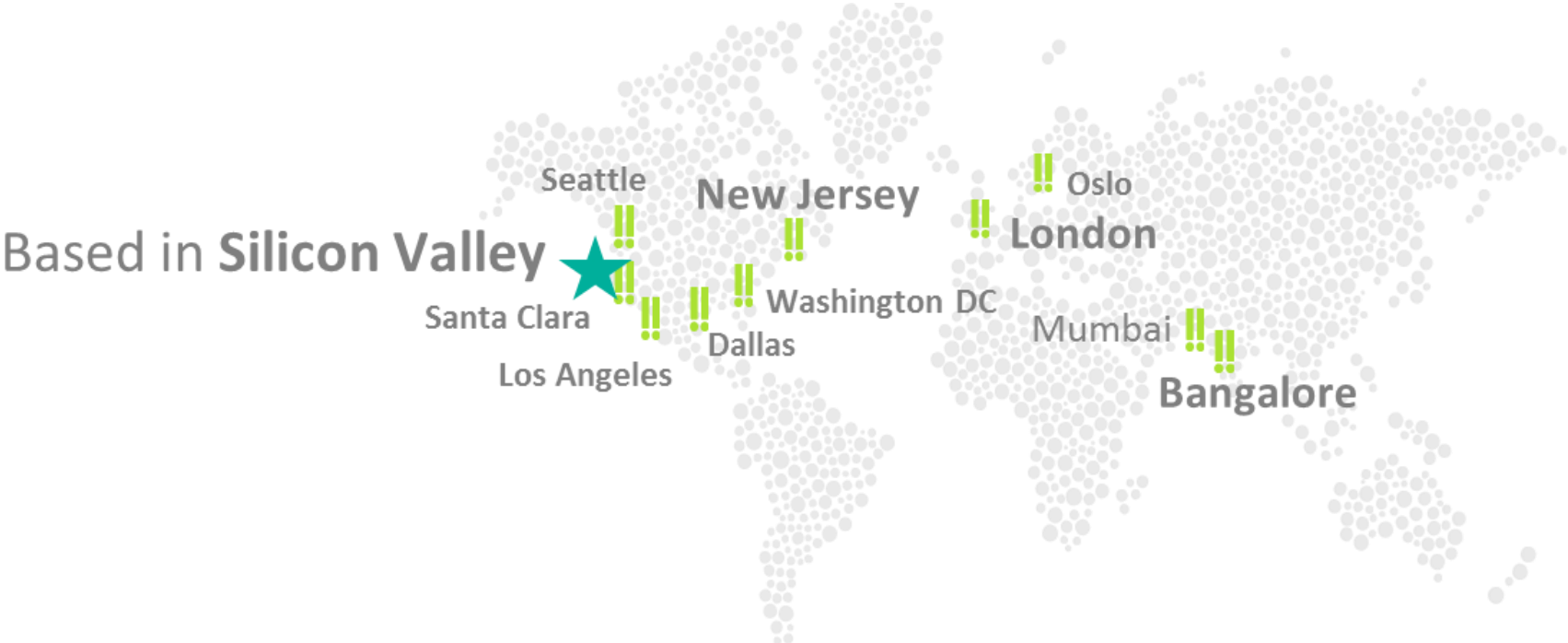
2,500+ employees globally

10 global offices and 2 Global Innovation labs

350+ clients served worldwide (incl. 50 Fortune 500)

30+ enterprise solutions, 6 platforms, 9+ Patents issued

Ambitious Social Responsibility program: "Bringing Smiles" to 10,000+ underprivileged children globally

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Brillio Big Data Platform (BDP)

Data Ingestion & Storage — 1

Massive amounts of data (diverse sources, internal and external) is ingested from lots of sources in as real time basis as needed and stored **on premise, cloud** or **hybrid**

Processing — 2

Pre-built modules brings library of routines specifically for CPG/FMCG to map/match different file sources, perform set of QA routines, cascading of information across different aggregation levels and enrich database

MAPPING AND MATCHING MODULE

QUALITY ASSESSMENT (500+ RULES)

CASCADING/ALLOCATION MODULE

DATA ENRICHMENT MODULE

Publishing — 3

Data Cubes are updated (Dynamically/Real Time) for **reporting** / **visualization** purposes

Lego Blocks Approach

Flexible Data Service Offerings

Bringing in the best of tools, technologies combined with Brillio accelerators

Domain Specific Solution Templates

Advanced Visualization as a Service

Data Scientist with Analytics Toolbox

Big Data Management Platform

brillio®

Focus on Customer Use Scenarios

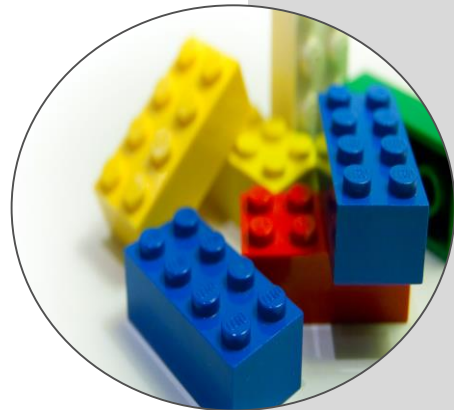✔ Foundational (green) ✔ Nice to Have (gold)

General Use Cases	Account Sell-Out	Online Intelligence	Internal Financials	Promotion Calendar	Brochure Analytics	CRM/ Loyalty	Social	Marketing	Other
Revenue Growth Management Revenue/product/ brand/ mix, P&L drill-downs, Geo, Competitive	✔ (Foundational)	✔ (Nice to Have)	✔ (Nice to Have)	Optional	Optional	Optional			Optional
Price Optimization Price Elasticity, Forecasting	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	Optional	Optional	Optional			Optional
Assortment optimization Product/ Attribute map, demand transfer, cross-elasticity	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	Optional	Optional	Optional	Optional	Optional	
Promotion Effectiveness Trade Investment, Promo ROI, Dead-Net Cost comparison	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	Optional	Optional	Optional	
Behavioral Segmentation Persona identification, Targeting/ Re-targeting	✔ (Foundational)	✔ (Nice to Have)	✔ (Foundational)	Optional	Optional	✔ (Foundational)	✔ (Nice to Have)	Optional	Surveys
Marketing Analysis Digital Marketing, MMM, Market insights	✔ (Foundational)	✔ (Nice to Have)	✔ (Foundational)	✔ (Foundational)	✔ (Foundational)	✔ (Nice to Have)	✔ (Foundational)	✔ (Foundational)	Macro

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Brillio Value Proposition

At scale End-To-End provider in Data Analytics

- At Scale Business & IT services with Data+Analytics+Visualization with **220+ Data Engineers** and **160+ Data Scientists/ Analytics Consultants** with extensive **Domain** and **Visualization experience**

Experts in **Data Poor** Environments

- Extensive **experience** for with proprietary platforms and techniques to extract reliable insights in Data Poor environments

Speed

- Our **accelerators** and expertise can match and beat any other vendor, guaranteed

Partnership model

- We are willing to discuss fees at risk based on financial impact or satisfaction

Flexibility

- We build our solutions in a **highly modular** way with **ability to adapt** to ongoing client changes and requests

brillio®

Questions?

manavb@microsoft.com
Luis.Vargas@microsoft.com
Tobias.Ternstrom@microsoft.com