TERADATA

Teradata Database –
Enabling Business Outcomes with Technology

Customer
Experience

Finance
Transformation

Product
Innovation

Risk
Mitigation

Supply Chain
Intelligence
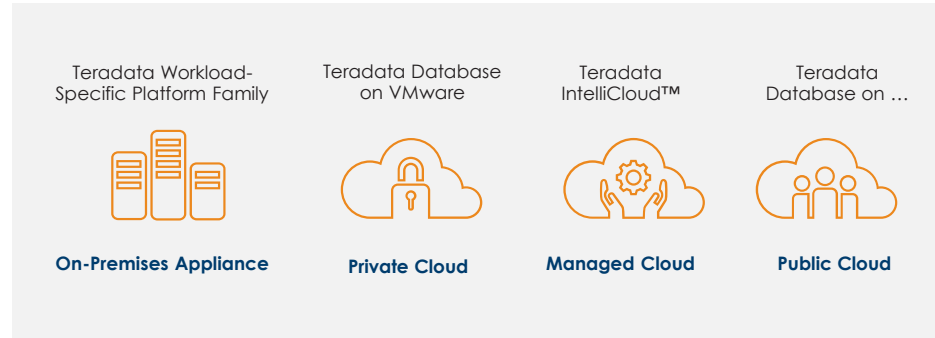
Assets
Optimization

Agenda

- New Bundling model for Teradata Database

- Shifting to new Cadence in our database release schedule

- New MAPS capability to provide higher performance and minimize downtimes

Accelerate and Simplify

Teradata Everywhere

- Deployment flexibility
  - Fully featured Teradata Database
  - Same database across platforms
  - MPP scalability

- Design for data gravity
  - Co-locate with source data to minimize data movement and duplication

- Employ multi-system architectures
  - High availability, disaster recovery, workload distribution and shifting

- As your business changes, so can your deployment choice

Teradata Workload-Specific Platform Family	Teradata Database on VMware	Teradata IntelliCloud™	Teradata Database on …
On-Premises Appliance	**Private Cloud**	**Managed Cloud**	**Public Cloud**

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Teradata Everywhere drives new capability

	Cloud		On-Premises		
	Public	IntelliCloud	VMware	2xxx/ IntelliBase	6xxx/ IntelliFlex
Enterprise					
Advanced					
Base					Not Applicable
Developer		Not Applicable		Not Applicable	Not Applicable

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Bundled Features
Now develop how you want, deploy where you need

	Developer	Base	Advanced	Enterprise
Columnar	Included	Included	Included	Included
Temporal	Included	Included	Included	Included
Row-level Security	Included	Included	Included	Included
Secure Zones	Included	Included	Included	Included
Workload Management	Not Applicable	Not Applicable	TIWM	TASM

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If the business needs:

- Rapid performance on selective columns

- If your business captures lots of attributes but uses selectively or in groups for specific applications

- If data is fairly static with targeted access

- Performance relief for large user communities or I/O constrained systems

- Chargeback relief of data storage with automatic compression

Teradata Columnar

Columnar Examples

- Telecom
  - Call Detail Records stored in wide fact table with hundreds of columns
  - Analytic queries typically hit a subset of columns, 10 -12

- Airline / Transportation
  - PNR has extensive detailed for each passenger
  - Often only need Date, Origin, Destination

- Health Care
  - EHR contains details about vitals and visit care
  - Typically need patient and code for analytics

- Results:
  - Significantly reduces I/O and saves CPU cycles
  - Dramatically speeds response time
  - Reduces storage needs with auto-compression
  - Gets even better results if combined with row partition elimination
  - Allows data to be kept integrated without performance degradation

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Columnar Basics

- This is an optimization technique, of how the database manages the data. It is not a "query feature"

- Hybrid Columnar, not an all or nothing approach

- Can be used in conjunction with Row Partitioning

- Can create JI with Columnar format on a row base table

- Major enhancement in 15.10
  - NoPI restriction lifted
  - Qualified update or delete in place

- Like any other optimization technique, there are pros and cons

- Implemented in the "Create Table" statement

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If the business needs:

- Ability to compare past, present and future patterns of changing hierarchies

- Ability to align multiple hierarchies and data changes to run analytics

- Ability to understand and analyze change over time

- Ability to certify and prove what was known and when it was known

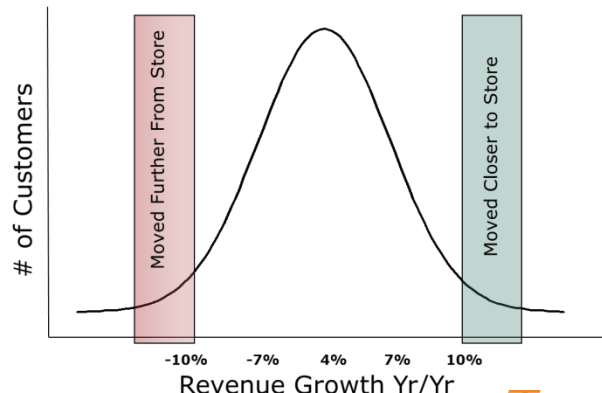- Ability to go beyond just "begin and end dates" but also understand effective dates to changes

Teradata Temporal

Temporal Examples

Temporal Basics

- Automatically manages time periods with table updates

- Simplifies ETL coding process

- Provides Bi-temporal support

- Simplifies queries for time based analytics

- "Normalizes" adjacent ranges

- Improves quality and consistency of data and queries

- Retains historical context for business operations

- Talk to your BI vendor for further support

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If the business needs:

- Distinct data visibility based on user certification

- Requires Mandatory Access Control (MAC)compliance

- Security at the data row level not via views

- Additional auditability
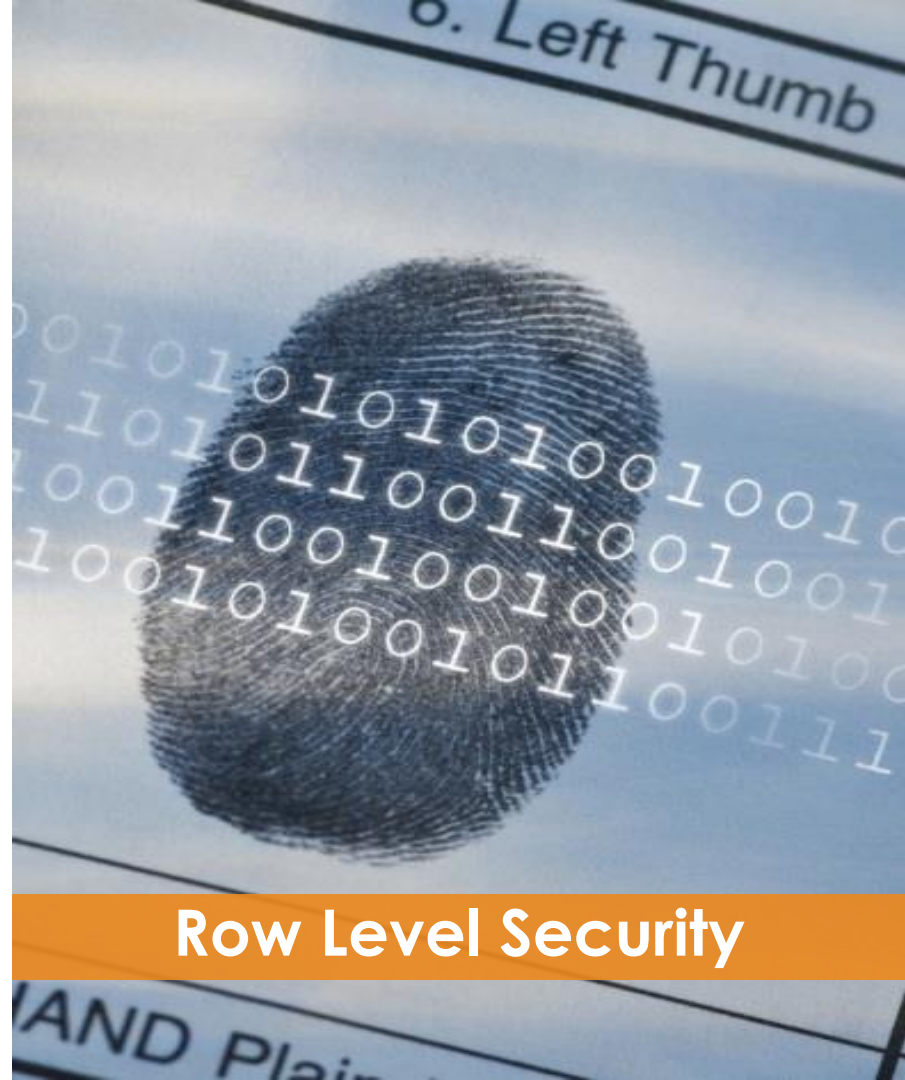
Row Level Security

Row Level Security Examples

- Security Labels
  - Associated with subjects (users) and objects (tables, rows)
  - Two parts
    - *Classification* - a single, hierarchical level

      e.g., military classification: TOP SECRET, SECRET, CONFIDENTIAL, UNCLASSIFIED
    - *Compartments* – (optional) nonhierarchical - represent distinct areas of information

      e.g., Region or Department: HR, FIN, SALES, MKT, CS

Label	Users	Rows (Data)	Label
			SECRET [HR]
SECRET [HR]			CONFIDENTIAL [HR]
			CONFIDENTIAL [HR, FIN]
			SECRET [FIN]
CONFIDENTIAL [FIN]			TOP SECRET [HR]

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Row Level Security Basics

- Need to consider View usage versus row level usage

- Requires UDF to be created which defines handling rules

- Tables need new column to contain labels

- CAUTION: Results may vary depending on what you can see

- Better logging, reporting, and auditing than with views

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If the business needs:

- Security between user groups and data content

- Isolation from administrative role versus access and analysis role

- To host Multiple independent applications within single platform

- "Virtual Data Warehouses" with controlled cross data access

- Physically, not logically, manage data tables
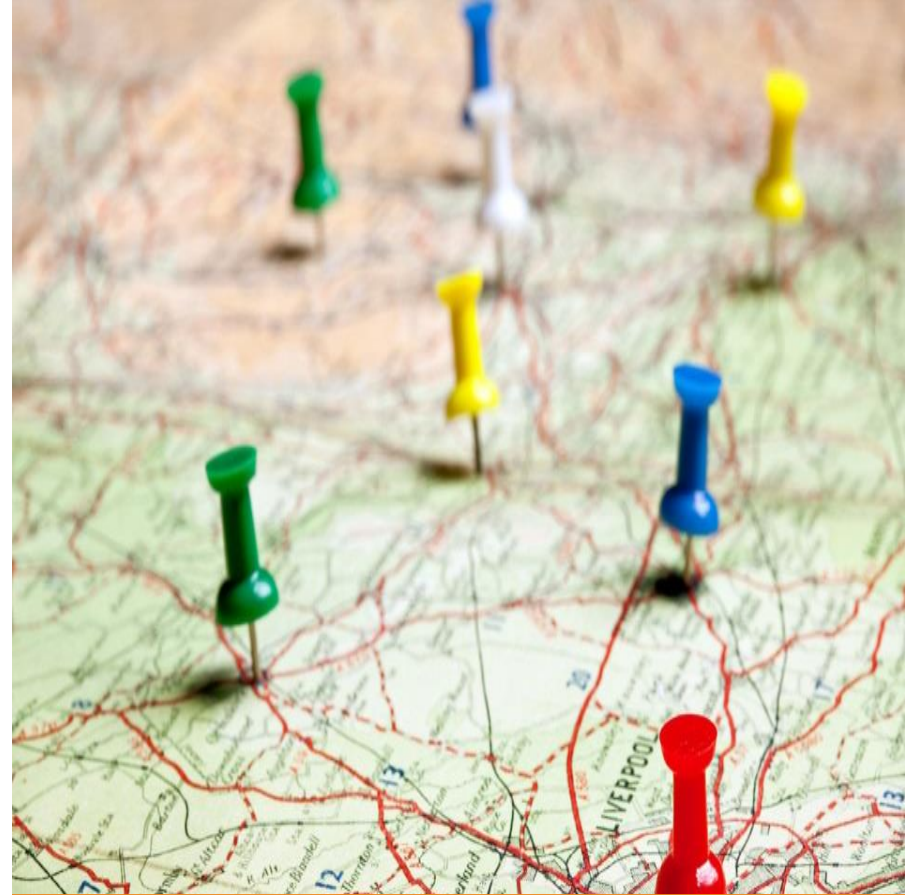
Secure Zones

Secure Zone Examples

Multi Tenant Hosting

System Admin

System DBA

Tenant Zone 1 — Users — Zone 1 DBA

Tenant Zone 2 — Users — Zone 2 DBA

Tenant Zone 3 — Users — Zone 3 DBA

Corporate Isolation

Corporate Zone

System Admin

Users

Tenant Zone 1 — Users — Zone 1 DBA

Tenant Zone 2 — Users — Zone 2 DBA

Tenant Zone 3 — Users — Zone 3 DBA

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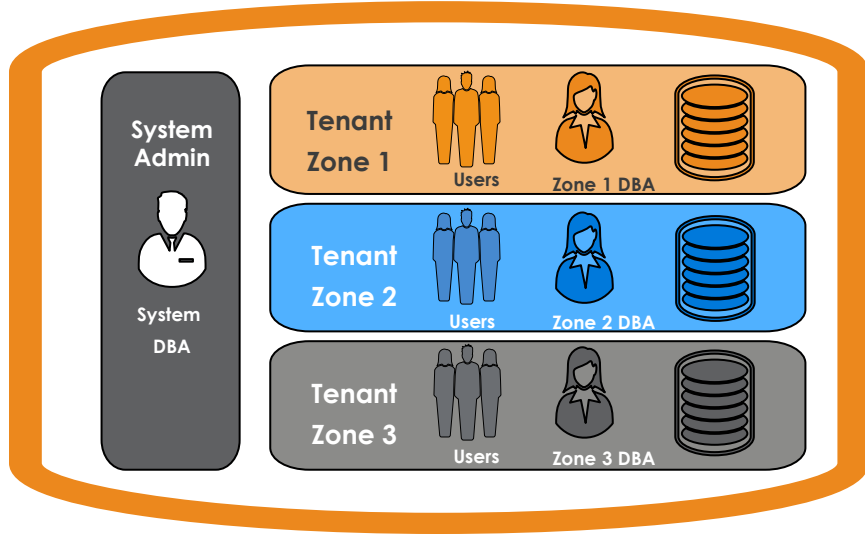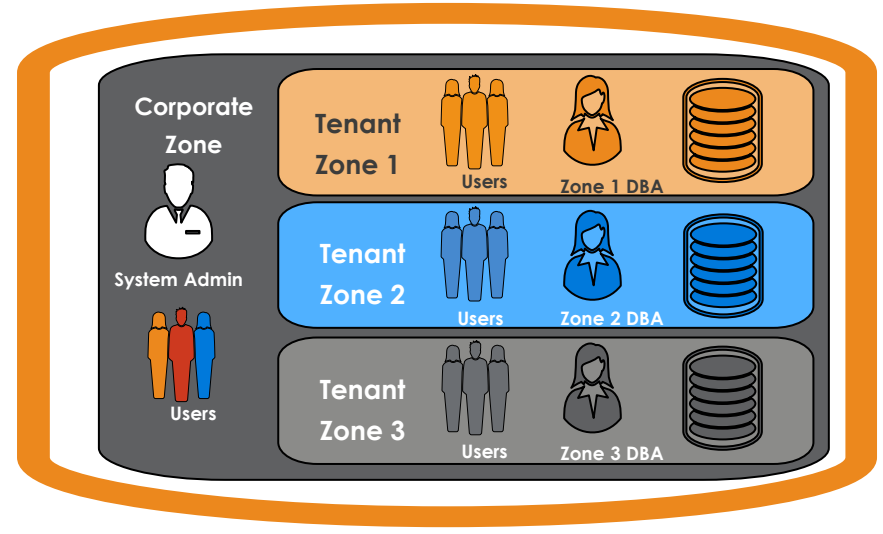
Secure Zone Basics

- Global uniqueness on naming objects (this is being addressed)

- Users are assigned to single zone but can have "guest access" to other zones

- About access not resources

- Integrated with Studio for administration tasks

- Combine with TASM / TIWM for complete management

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If the business needs:

- Mixed workloads with consistent response times

- Tactical workloads with guaranteed resources available

- Virtual platforms with defined resources commitments

- Periodic or Scheduled prioritization

Workload Management

Teradata Workload Management Example
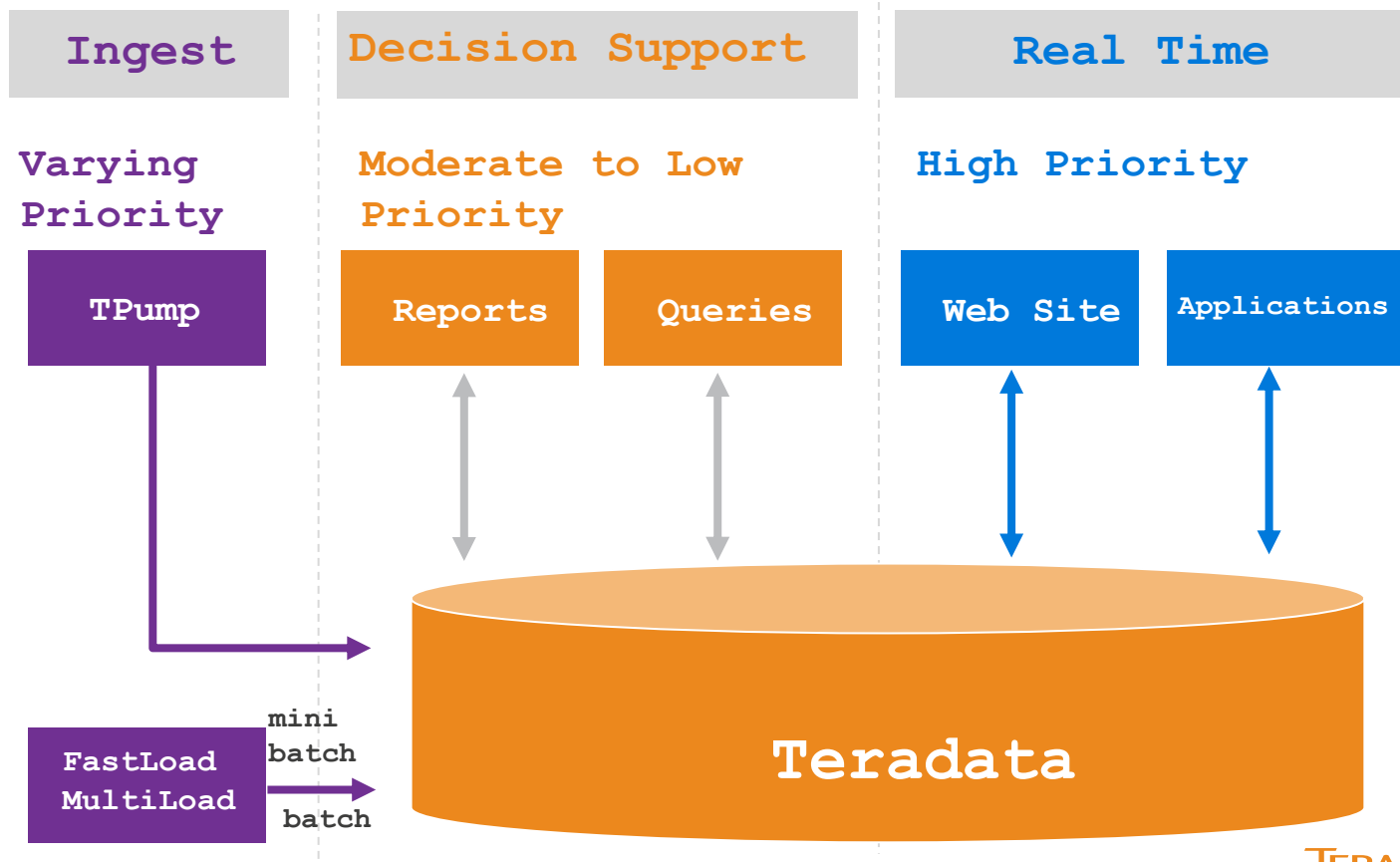
Workload Management Basics

Teradata Workload Management Features	Teradata Integrated Workload Management	Teradata Active System Management (TASM)
Workload Classification	Source, Target, Query Characteristics, QueryBand, Utility	
Workload Priority Management	Tactical and Timeshare	Tactical, **SLG Tiers**, and Timeshare
Resource Management	CPU and I/O and Memory	
Virtual Partitions	One Virtual Partition	**Multiple** Virtual Partitions
Filters and Throttles	Filters, Workload and System Throttles	**Flex Throttles**
Exceptions	Tactical Exceptions and Timeshare Decay	Tactical and **Workload Exceptions,** and Timeshare Decay
State / State Matrix	Operating Periods	Operating Periods and **Health Conditions**

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Getting Started --

- Be aware of business needs
  - Fit into current environment
  - Compliment with new feature
- Prove the value
  - Define the "quick" and the "win"
  - Key user group with real pain
- Document and Market
  - Highlight the success
  - Measure productivity, cost, or time improvements
- Repeat and Extend
  - Add a new level of complexity
  - Extend to new users and use cases

GREAT IDEA

Further Reading and References

- Teradata.com
  - [William McKnight White Paper](#)
  - [Video: A Smarter Way To Do Analytics](#)
  - [Teradata.com page on columnar](#)
  - [Enabling Temporal White Paper](#)
  - [Article: Multiple Data Warehouses in One System](#)
  - [Smart Recommendations for Small Businesses at Network Solutions®](#)
  - [On the fast track towards advanced analytics](#)

- Techbytes
  - [Secure zones](#)

- DevX or Partner
  - [Temporal and OBIEE](#)
  - [Temporal and Microstrategy](#)

- TEN (Teradata Education Network)
  - [WBT: Introduction to Temporal](#)
  - [Webcast: Advanced Temporal](#)
  - [ILT: History, Time Variance, and Temporal](#)
  - [Teradata Secure Zones: Implementation Basics](#)
  - [Workload Management Tips and Techniques](#)
  - [Workload Management Technical Overview](#)

- T@YS - Orange books
  - 541-0009036-B02 TERADATA COLUMNAR FOR TERADATA DATABASE 15.10
  - 541-0010639A02 TERADATA SECURE ZONES
  - 541-0009217-A03 TERADATA ROW LEVEL SECURITY
  - TDN0001776 TERADATA ACTIVE SYSTEM MANAGEMENT TERADATA DATABASE 16.0
  - TDN0001728 - 3.0 TERADATA INTEGRATED WORKLOAD MANAGEMENT TERADATA DATABASE 16.0

Giving the Business:

- ~ 90% reduction in system expansion downtime

- Cloud elasticity; expand/shrink your Teradata system

- More consistent tactical query performance

- Higher query concurrency
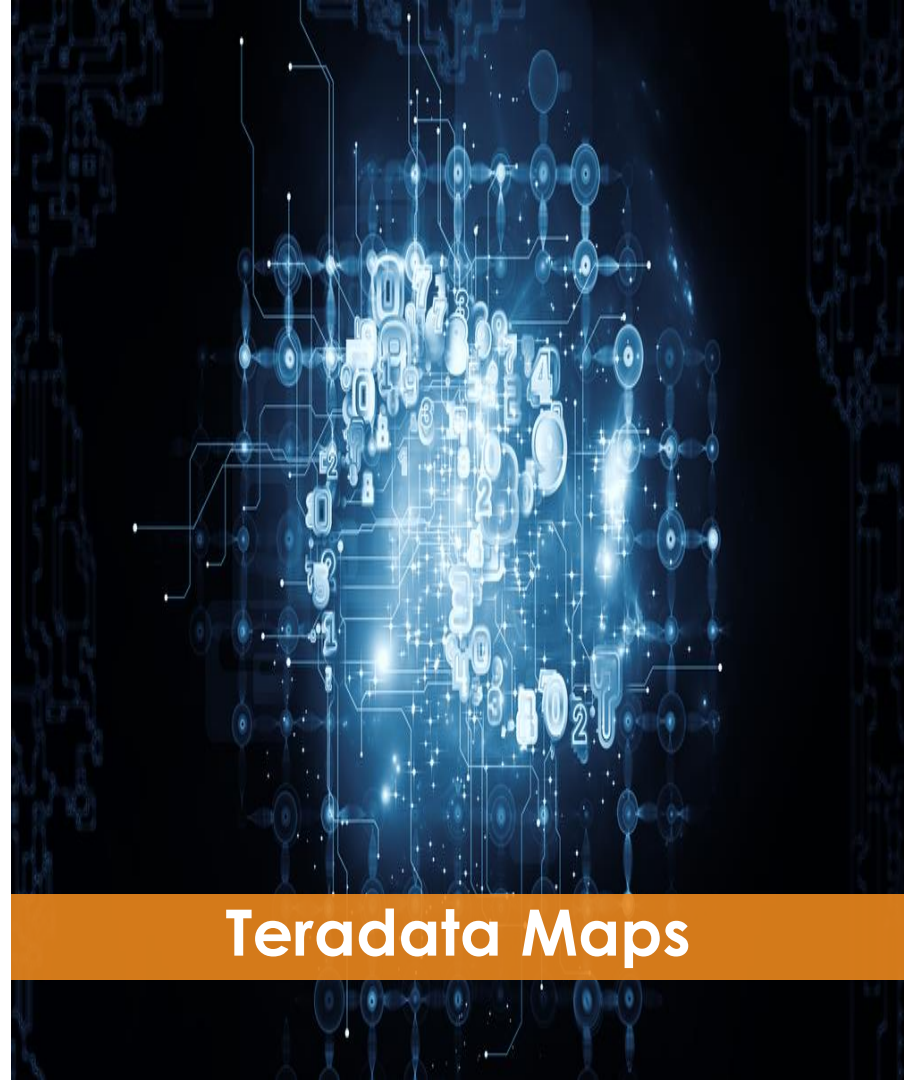
Teradata Maps

Hash Map

- Maps (i.e., translates) which hash buckets go on each AMP

Primary Index value (e.g., OrderKey)

Hash function

Hash value

1,048,576 buckets

Hash Map

Bucket	AMP
1	1
2	1
…	…
	2
	2
…	…
1,048,576	N (16,200 max)

Parser Parser
AMP AMP
AMP AMP
SMP Node

Expanding the System

Start	Add	Reconfig	Run
Almost full			Balanced

ViewPoint
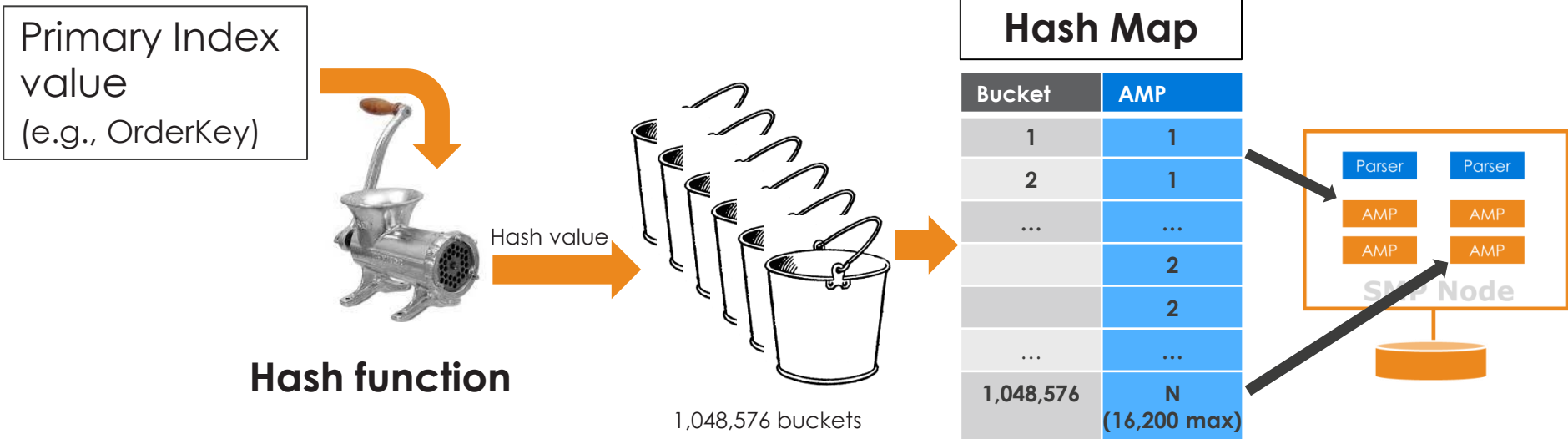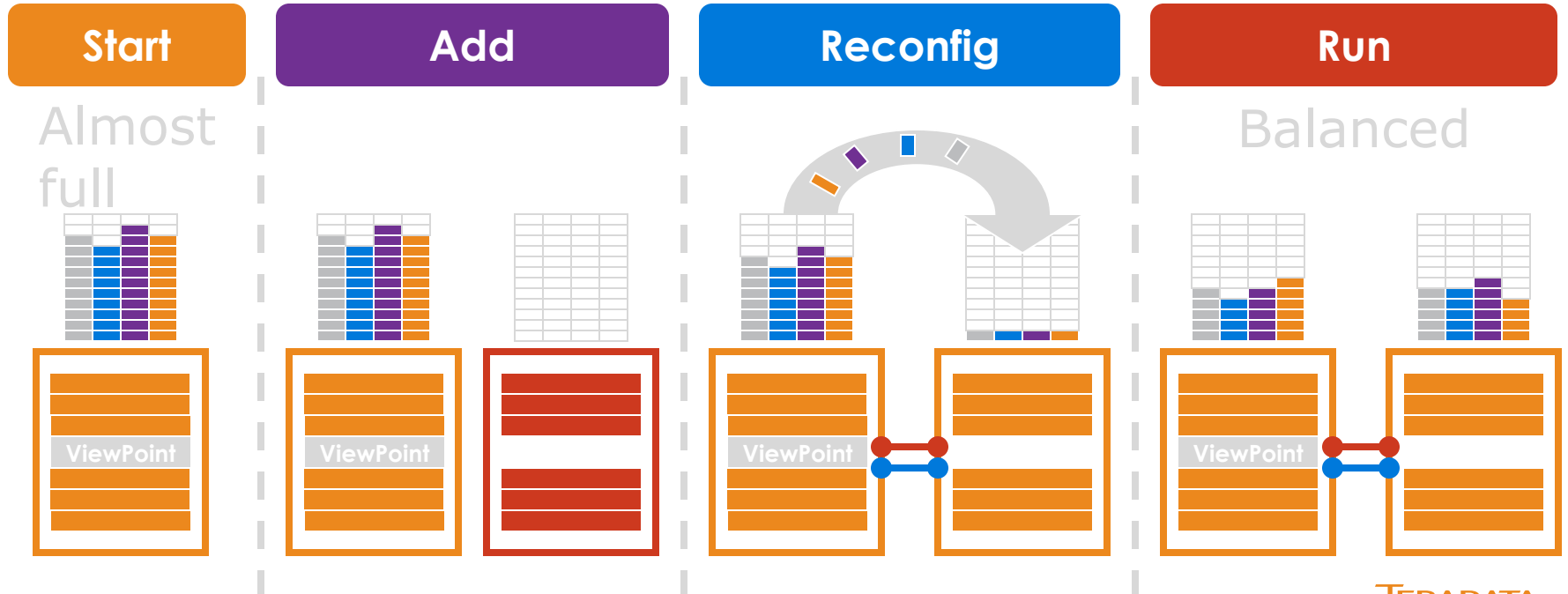
MAPS: Enabling Multiple Hash Maps

- Maps (i.e., translates) which hash buckets go on each AMP
- Use different Hash Maps for different tables or table partitions

Primary Index value
(e.g., OrderKey)

Hash function

Hash value

1,048,576 buckets

Tables 1, 2, 4, 5

Table 3

Hash Maps

Hash Map 1

Hash Map 2

Bucket	AMP
1	1
2	1
...	...
	4
	4
...	...
1,048,576	80 (16,200 max)

Parser   Parser

AMP   AMP

AMP   AMP

SMP Node

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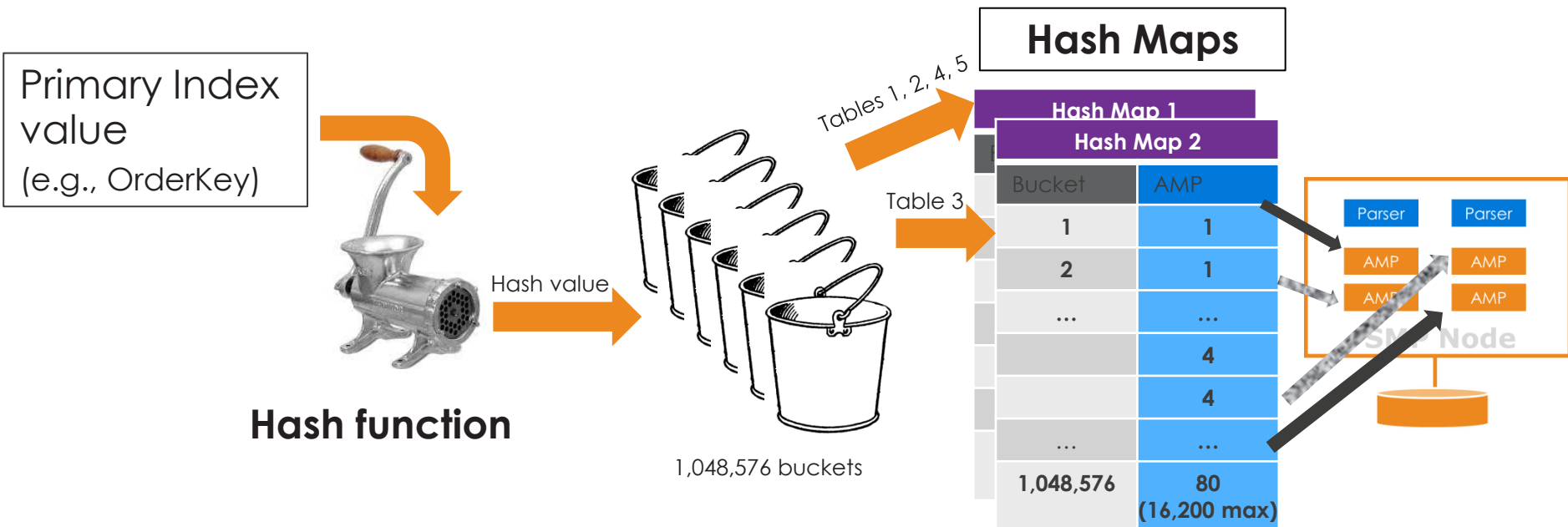
MAPS Provides New Flexibility

- Very large system expansion reconfigs
  - High availability and reduced planned outage by scheduling movement of data to expansion hardware
  - Move only specified data when desired
  - Complete flexibility on how data is spread for optimum performance, system utilization, and availability for business needs

- Small tables (number of rows relative to number of AMPs)
  - Inefficient to involve every AMP for small table or few rows/AMP

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Sparse Map

TD_Map1 – Contiguous Map

Table X → TD_Map1

```
CREATE TABLE Stores,
MAP = FiveAmpMap as StoreMap
(column definitions)
PRIMARY INDEX (Store_Id);
```
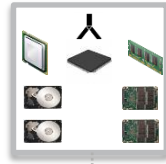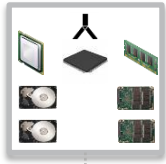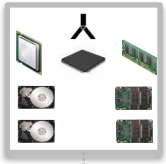
My_5AMP_Map – Sparse Map

Table Stores → FiveAmpMap

Table co-location
- ✓ *same sparse map*
- ✓ *same map alias_name*
- ✓ *same Primary Index*

←=== AMPS ===→

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Expansion

TD_Map1 – Contiguous Map

Table X → TD_Map1

TD_Map2 – Contiguous Map

Table Z → TD_Map2

←=== AMPS ===→

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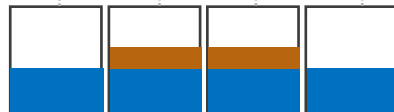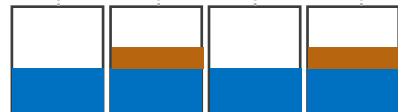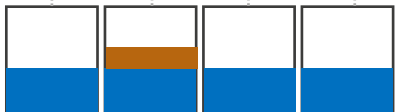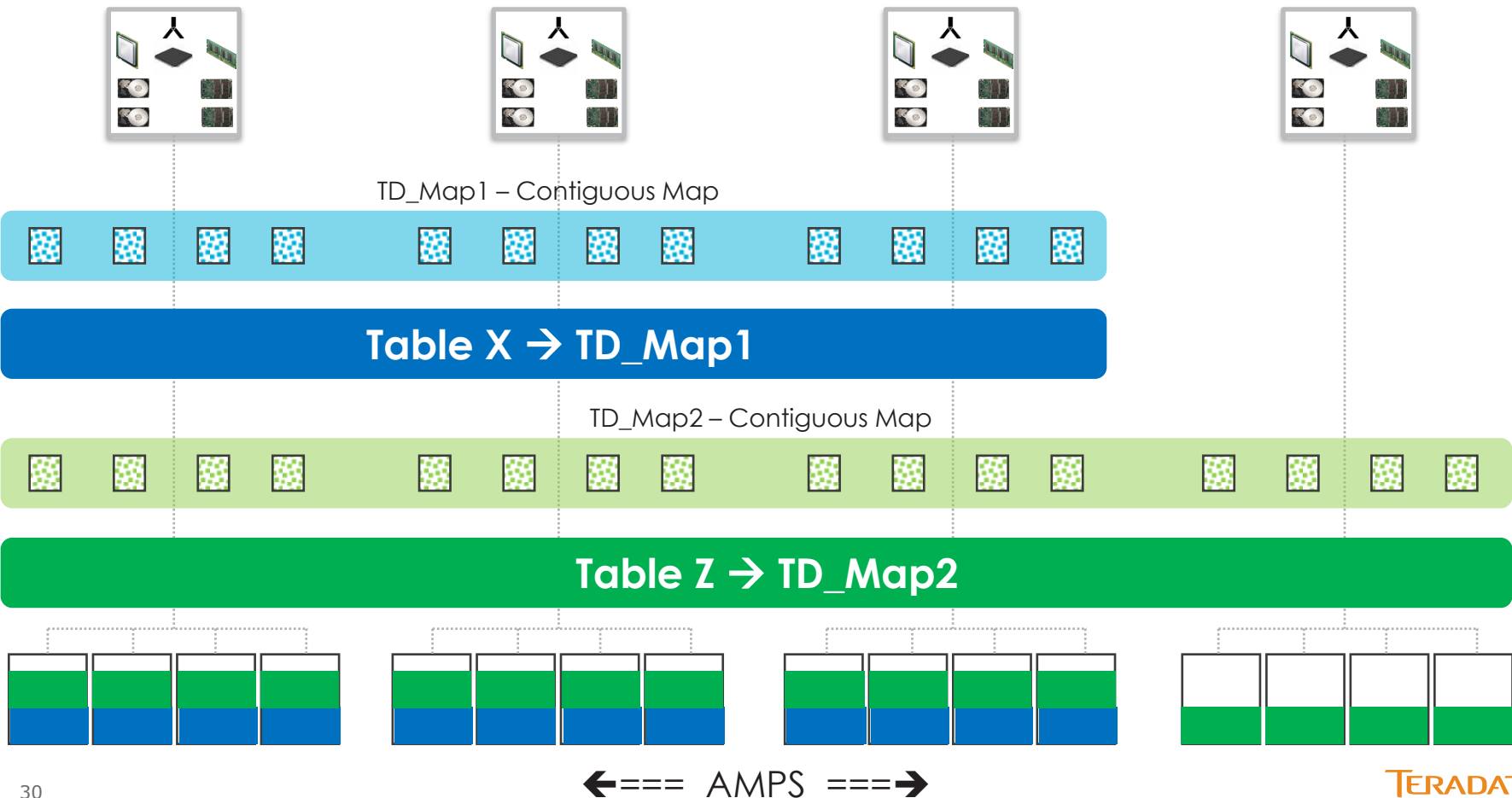
MAPS Provides System Flexibility and Agility
Expanding the System

Table-at-a-time, at your convenience

Start	Add	Reconfig	Run

Almost full

Balanced

ViewPoint

ViewPoint

ViewPoint

ViewPoint

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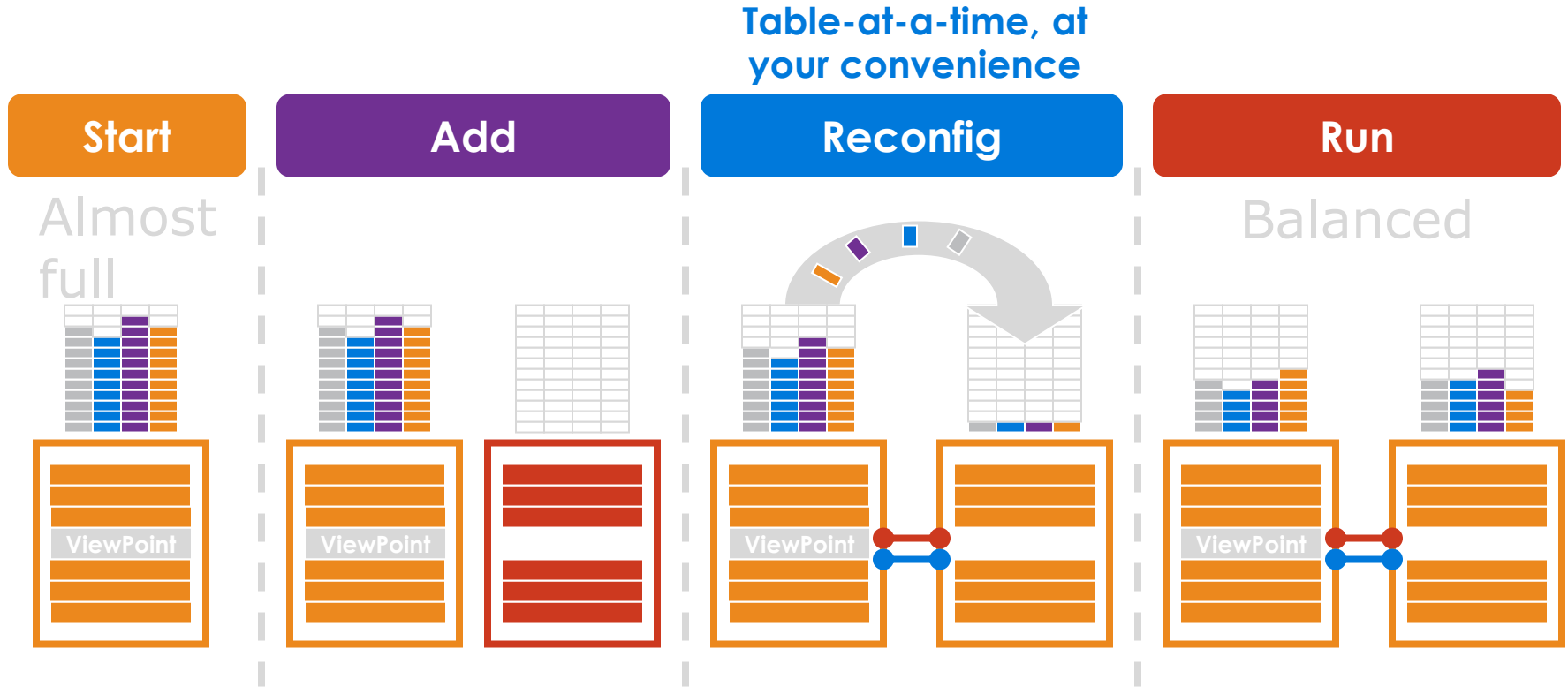
Giving the Business:

- New features available faster
  - No longer have to wait for major feature and 12-18 month release cycle
  - Customer feature enhancement requests can be accommodated sooner
  - Database capabilities stay leading edge delivered in smaller increments

- Upgrade planning becomes more predictable and stable
  - More frequent and consistent release schedule

- Reduced risk when adopting a critical feature
  - Smaller amount of change in EACH release reduces risk and makes testing easier

- At forefront of industry direction

Teradata Release Cadence

Teradata Labs and Teradata Database Becoming *More Agile*

- Teradata Database, Teradata Tools and Utilities, and most UDA Ecosystem releases generally every four months beginning in 2017

- Product planning and requirements process becoming agile

Current Database Release Cadence

- 12-18 months gap between releases
- A typical release adds around 150-200 features, mix of small to large features
- Dictionary changes in XX.00 releases
- Maintenance releases and efix support for 3 years

Minor Release **15.10**

Major Release **15.00.00** **15.00.01** **15.00.02**

Maintenance Releases for 3 years

Minor Release **14.10.00** **14.10.01** **14.10.02** **14.10.03** **14.10.04** **14.10.05**

Maintenance Releases for 3 years

Efixes

Major Release **14.00.00** **14.00.01** **14.00.02** **14.00.03** **14.00.04** **14.00.05** **14.00.06**

Maintenance Releases for 3 years

2012 **2013** **2014** **2015**
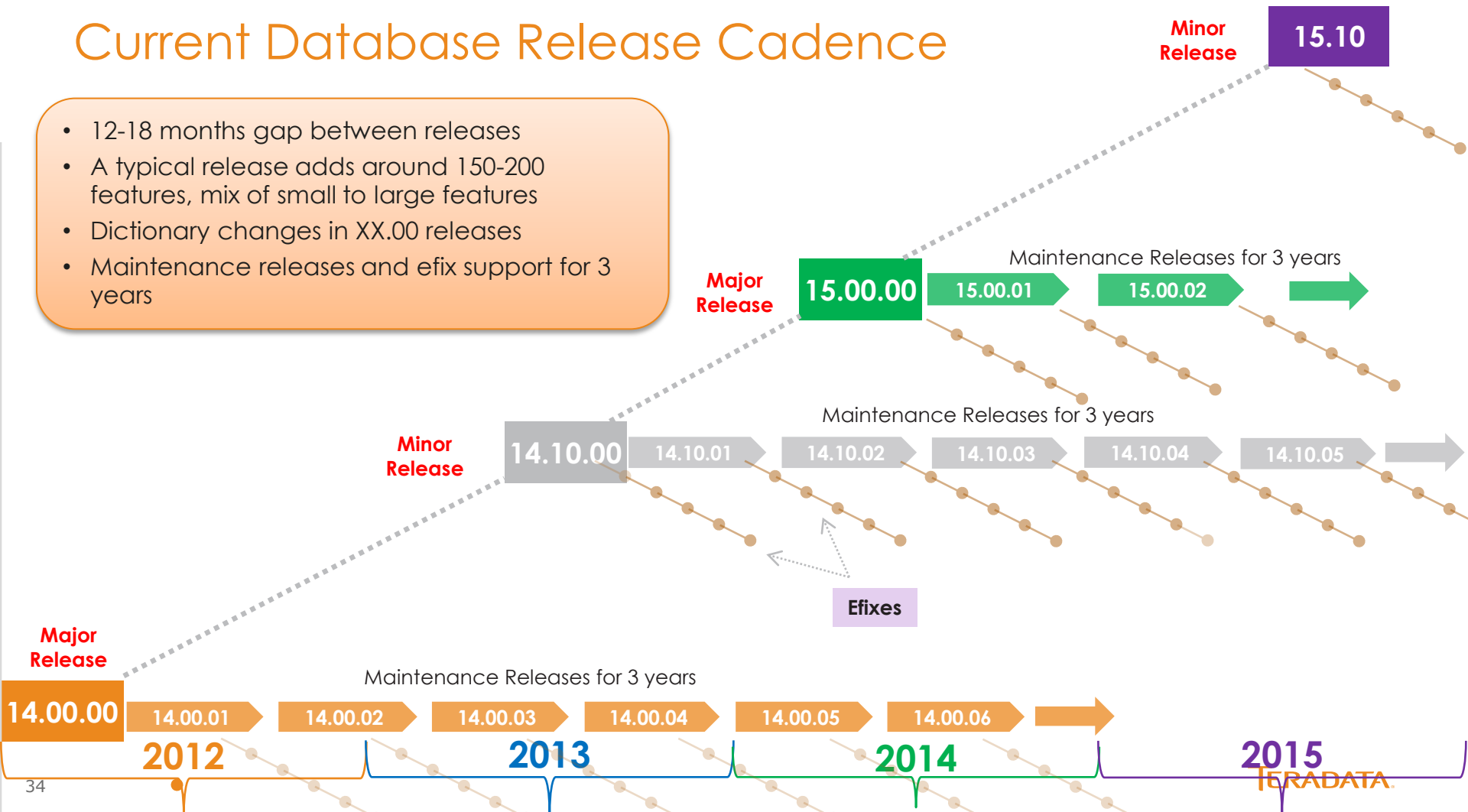
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Agile Evolution
Migrating to a Four Month Release Cadence

2017	2018

16.0	16.10	16.20	16.50	16.60	16.70

Major Series

Minor Series
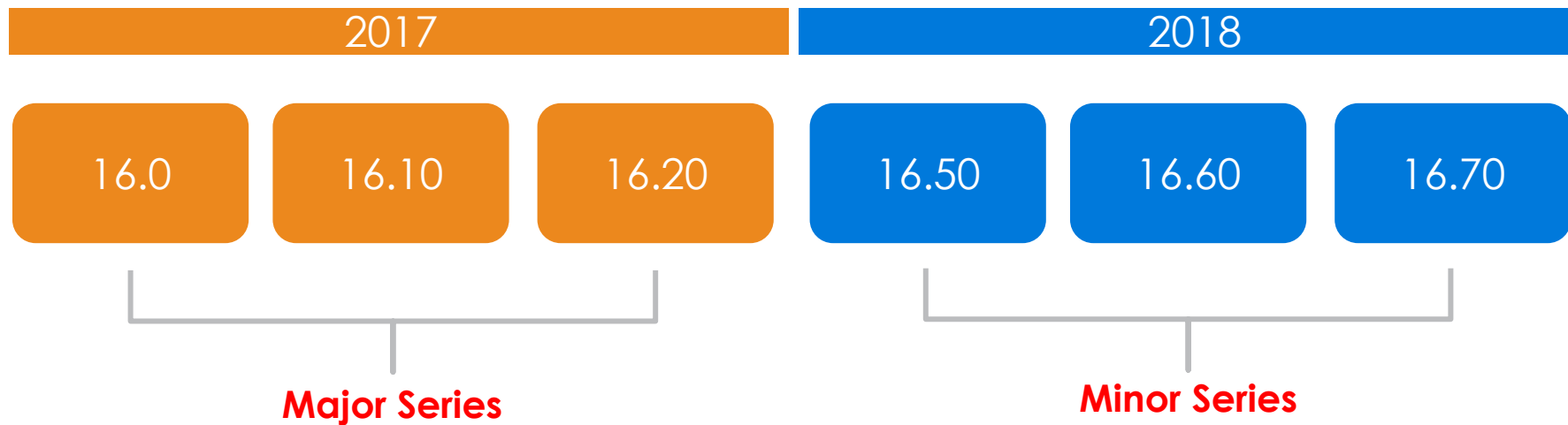
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Four Month Database Release Cadence

Minor Series

17.70.00

17.60.00

17.50.00

Major Series

17.20.00 | 17.20.01 | 17.20.02 | 17.2

17.10.00

17.00.00

Minor Series

16.70.00 | 16.70.01 | 16.70.02 | 16.70.03 | 16.70.04 | 16.70.05

16.60.00

16.50.00

MRs on 5 month cycle

Major Series

16.20.00 | 16.20.01 | 16.20.02 | 16.20.03 | 16.20.04 | 16.20.05 | 16.20.06

16.10.00

E-fixes

16.00.00

2017   **2018**   **2019**   **2020**

36
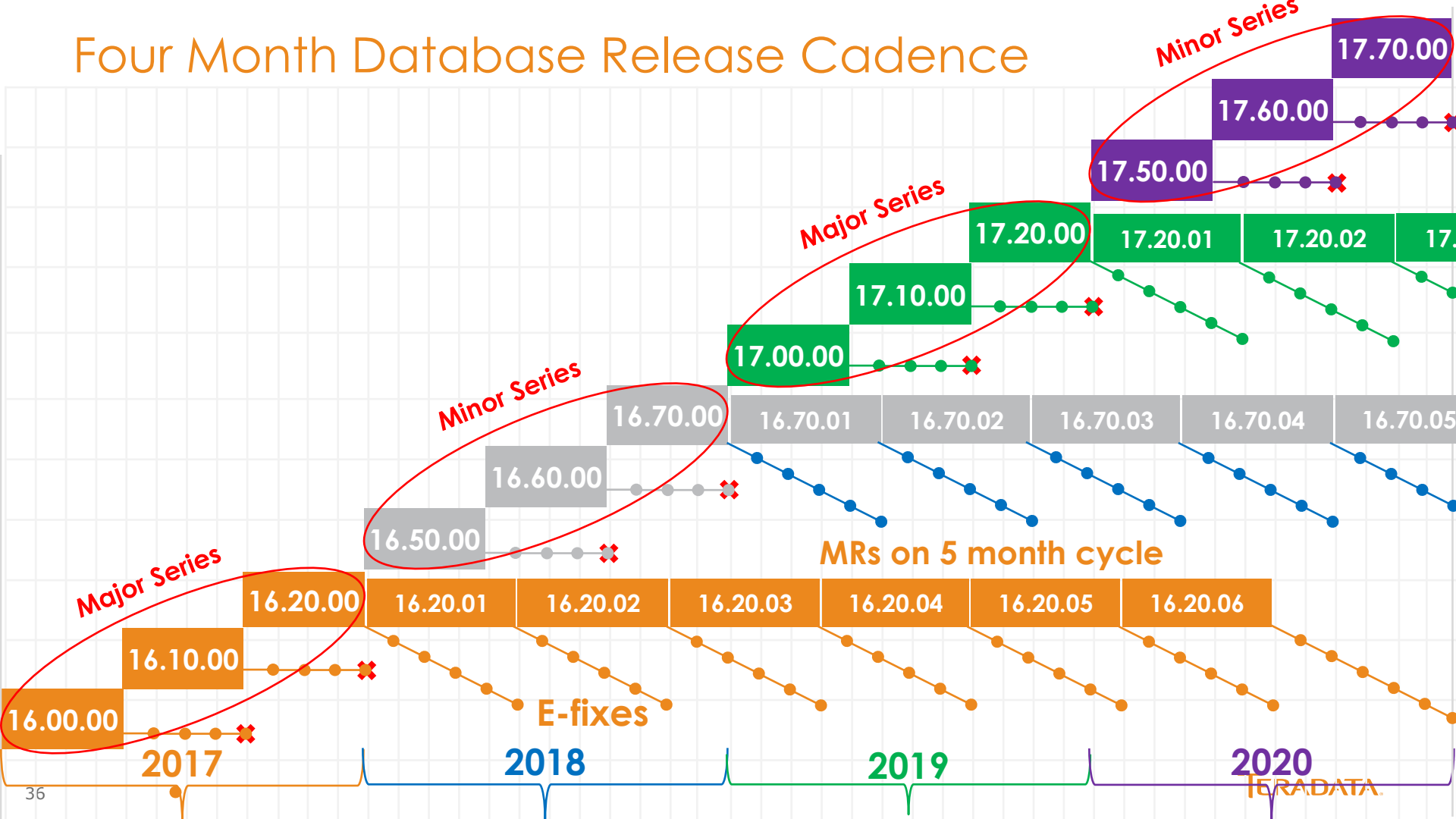
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Teradata Database Implementation Details

- Frequent releases
  - Generally every 4 months
  - Some cycle variation

- All releases have same "importance" (e.g., second as significant as others)

- XX.00 release at beginning of every other release series has "major release restrictions"
  - Possible data dictionary changes
  - No back-down once upgrade to this release

- Efix/Maintenance releases
  - XX.00, XX.10, XX.50, XX.60 releases (first two releases of series) receive efixes for 4 months (or until next release GCA if longer)
  - XX.20 and XX.70 releases (last release of series) receive maintenance releases and efixes for 3 years
  - Updated support policy posted
    - refer to the Teradata Support Policy "Teradata Database Software Support Lifecycle" section
      http://www.teradata.com/Teradata-Product-Support-Policies/

- Simplifying Beta process
  - Customer can participate in Beta for future releases without repeat contract work

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Release Cadence Back-up Detail

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Teradata Tools and Utilities (TTU) Implementation Details

- Released in concert with each Teradata Database release
  - Generally every four months
  - Monthly rollup maintenance releases

- Release numbers consistent with Teradata Database releases
  - In exception cases of additional minor TTU release, second point digit used (e.g., 16.11)

- Forward and backward compatibility with Teradata Database
  - No change from previous policy
  - Forward and backward compatible with whole Teradata Database release series
  - Partner certification with the latest TTU release will suffice for the series

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TTU Compatibility With Teradata Database

- 2 forward and 4 backward major or minor Teradata Database release series
  - Consistent with current policy

- TTU 15.10
  - TD13.10, 14,00, 14.10, 15.00, **15.10,** 16.00-16.20, 16.50-16.70

- TTU 16.00/16.10/16.20
  - TD14.00, 14.10, 15.00, 15.10, **16.xx**, 16.50-16.70,17.00-17.20

- TTU 16.50/16.60/16.70
  - TD14.10, 15.00, 15.10, 16.00-16.20, **16.xx**, 17.00-17.20, 17.50-17.70

- TTU 17.00/17.10/17.20
  - TD15.00, 15.10, 16.10-16.20, 16.50-16.70, **17.XX**, 17.50-17.70, 18.00-18.20

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UDA Ecosystem Product Implementation Details

- UDA Ecosystem Products
  - Data Mover, Ecosystem Manager, Studio, Viewpoint, Data Lab, Data Stream Architecture (DSE/DSU), Unity

- Releases with each Teradata Database release
  - Generally every four months
  - Maintenance releases and efixes as necessary
  - QueryGrid is distinct
    - Remains on separate quarterly release schedule
    - Remains on separate release number sequence

- Release numbers consistent with Teradata Database releases

- Maintenance Policy
  - Policy remains the same
  - *Maintenance releases and efixes for these Products are only supplied on the most current UDA product released version. Customers on earlier versions should upgrade to the most current application version to obtain fixes.*

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UDA Products Compatibility With Teradata Database

- UDA compatibility with Teradata Database remains the same
  - "Current database + 4-back"
  - "Current" however is now defined as a series (e.g., 16.00, 16.10, 16.20)

- UDA Product 16.00
  - TD 14.00, 14.10, 15.00, 15.10, 16.00

- UDA Product 16.10
  - TD 14.00, 14.10, 15.00, 15.10, (16.00, 16.10)

- UDA Product 16.20
  - TD 14.00 14.10, 15.00, 15.10, (16.00, 16.10, 16.20)

- UDA Product 16.50
  - TD 14.10, 15.00, 15.10, 16.20, 16.50

- UDA Product 16.60
  - TD 14.10, 15.00, 15.10, 16.20, (16.50, 16.60)

- And so on …

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Partner Validation of New Teradata Release Cadence

- ISV partners expected to perform validation testing on at least one Teradata Database release per year

- ISV partners expected to declare interoperability support for all releases in the cadence series (e.g. 16.00-16.20, 16.50-16.70, 17.0-17.20)
  - Enabled by two Teradata policies
    - Client software to be compatible across all database releases in a series
    - Teradata Database to maintain SQL and data dictionary compatibility throughout a release series

- Partners to support all Teradata Database deployment options (e.g., appliance, cloud)
  - Enabler: Teradata Everywhere

- Teradata expects ISV partners will increase validation testing frequency
  - Long-term goal
  - Automation and simplification of test processes

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