

DOAG 2018

ORACLE ↔ TERADATA

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MÜNCHEN**

Wer bin ich ...

- Freiberuflicher IT Consultant
 - in der IT seit mehr als 25 Jahren
- Studium Mathematik
- IT Projekte im Bereich:
 - Oracle-DB (Beratung/Administration/Performance)
 - Oracle Data Guard / Unified Directory (OUD)
 - Data Warehousing
 - UNIX/Linux/Windows/Cloud
 - RZ Infrastruktur Management
 - RZ Automation z. B. CA / Automic UC4 / Dollar Universe
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Agenda

- OLTP ↔ OLAP
- Oracle - Architektur
- Teradata - Architektur
- Datenbank Komponenten
- Datenbank Vergleich
- Migration: Teradata ↔ Oracle
- Fazit

OLTP ↔ OLAP

- OLTP: Online Transactions Processing
 - Oracle
 - Teradata: architektonisch nicht geeignet
 - Realtime Transaktionen
- OLAP: Online Analytical Processing
 - Teradata und Oracle (z. B. Exadata)
 - Data Warehousing
 - Komplexe analytische Auswertungen

OLTP ↔ OLAP

	OLTP	OLAP
Daten	Datenhaltung in der DB	Unterschiedliche Datenquellen
Dateninhalt	Fundamentale Businessdaten Realtime Prozessdaten	Planning, Decision Support Multidimensionale Views
Insert / Update	End-User initiierte schnelle SQLs	Periodische Langläufer
Queries	Einfache SQLs, wenige Ergebniszeilen	Komplexe SQLs mit Aggregationen
SQL- Laufzeit	Sehr schnell	Datenabhängig, Batch- Langläufer bis zu Stunden
Storage	Weniger Platzbedarf, Historisierung	Hoher Platzbedarf

OLTP ↔ OLAP

	OLTP	OLAP
DB Design	Viele Tabellen, hoher Normalisierungsgrad	Wenige Tabellen, kaum normalisiert, Star-Schemas
Backup / Recovery	Dateninhalte sind sehr kritisch, PIT-Recovery essentiell, kritisch für Business-Anwendungen	Wichtig, aber OLTP Daten können meist durch Nachladen wieder hergestellt werden
Anzahl User/Session	+++++++	++

Oracle Datenbank - Architektur

- „shared everything“ Ansatz
- Objekt-relationales Model
- Daten
 - sind auf shared Disks gespeichert
 - Partitionierung möglich
- OLTP und OLAP möglich
- Datenhaltung mit mehreren DB-Rechnern (RAC)
- Parallelität (Conditional und unpredictable)

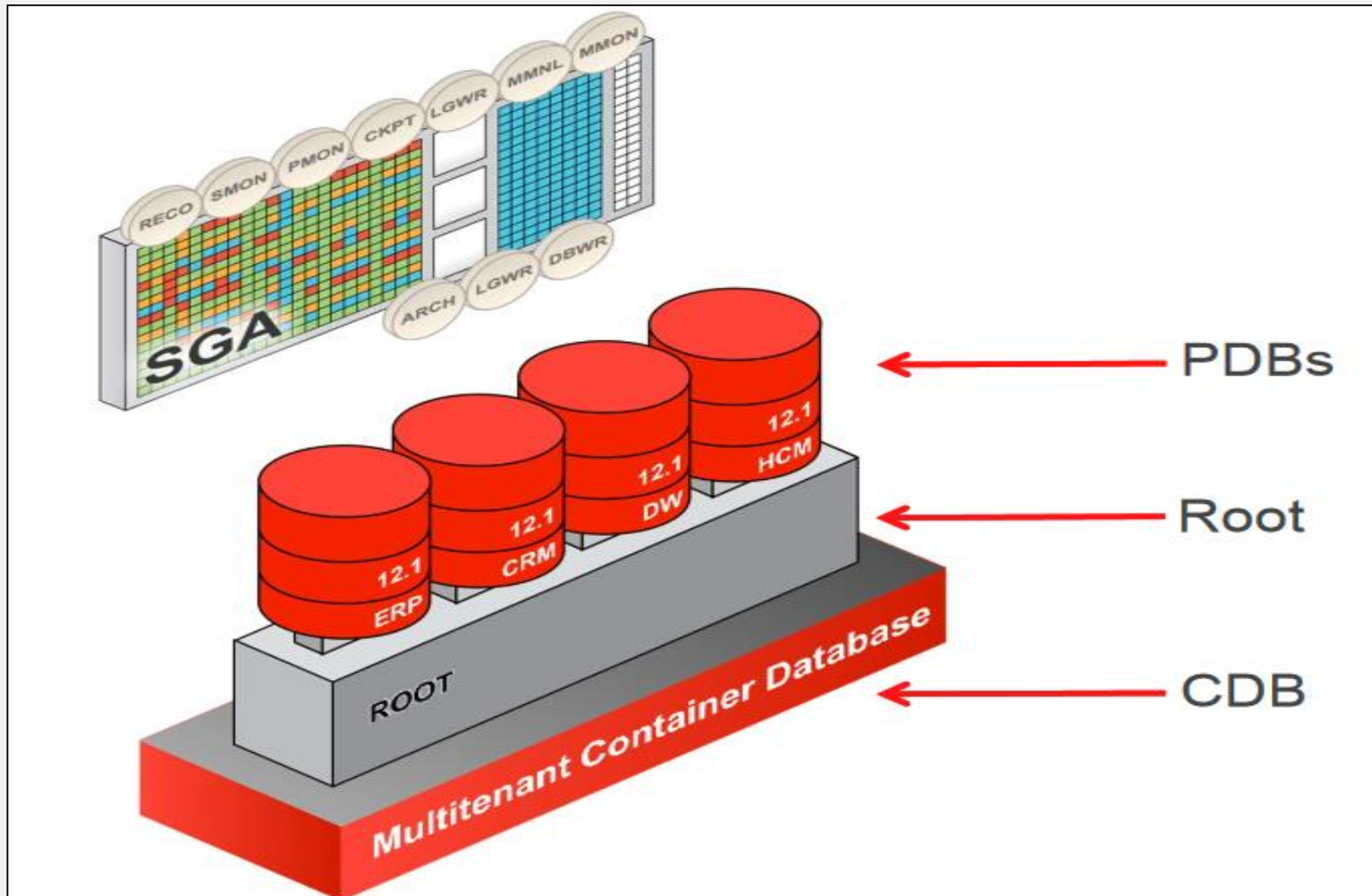
Oracle Datenbank - Überblick

Key Database Features

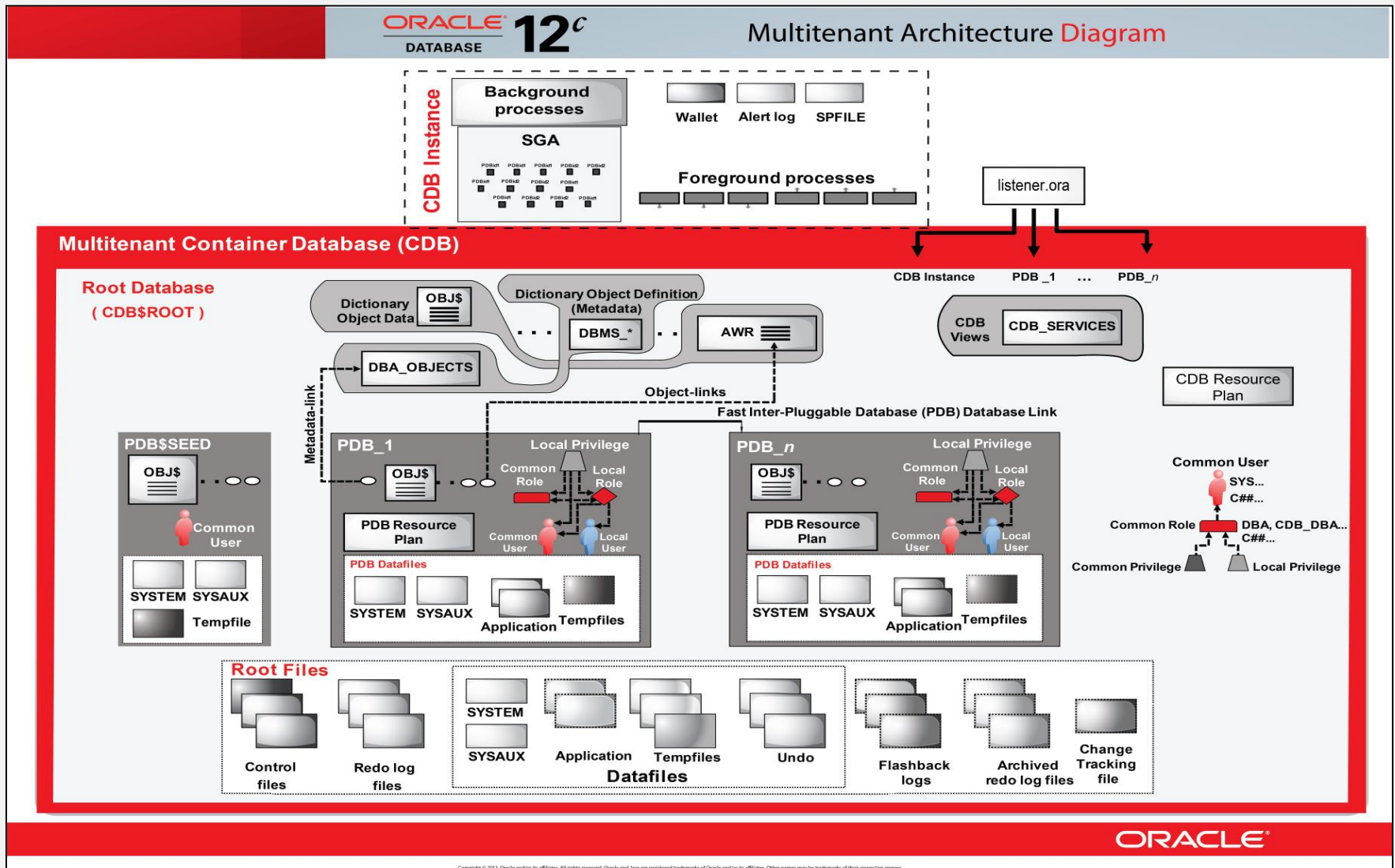
Oracle Database 12c offers a wide range of features to help customers meet specific requirements in the areas of performance and scalability, high availability, security and compliance, data warehousing and big data, and manageability, both on-premises and on Oracle Cloud.

- Active Data Guard
- Advanced Analytics
- Advanced Compression
- Advanced Security
- Database In-Memory
- Database Vault
- TimesTen Application-Tier Database Cache
- Label Security
- Management Packs
- Multitenant
- Online Analytical Processing (OLAP)
- Partitioning
- Real Application Clusters
- Real Application Clusters One Node
- Real Application Testing
- Spatial and Graph

Oracle Datenbank - Architektur



Oracle Datenbank - Architektur



Teradata - Architektur

- „shared nothing“ Ansatz
- Relationales Modell
- Daten
 - sind pro Server gespeichert
 - partitioniert
 - jeder Server ist für die zugehörigen Daten verantwortlich
- Linear skalierbar
- „unconditional“ Parallelität, „always on“
- kein OLTP

Teradata Datenbank - Überblick

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

These four tiers span the deployment options, so that where you want to run Teradata Database is no longer limited by what deployment option you choose. The four tiers range from a free Developer license all the way up to our Enterprise license which features Teradata's world class workload management and most advanced memory optimizations.

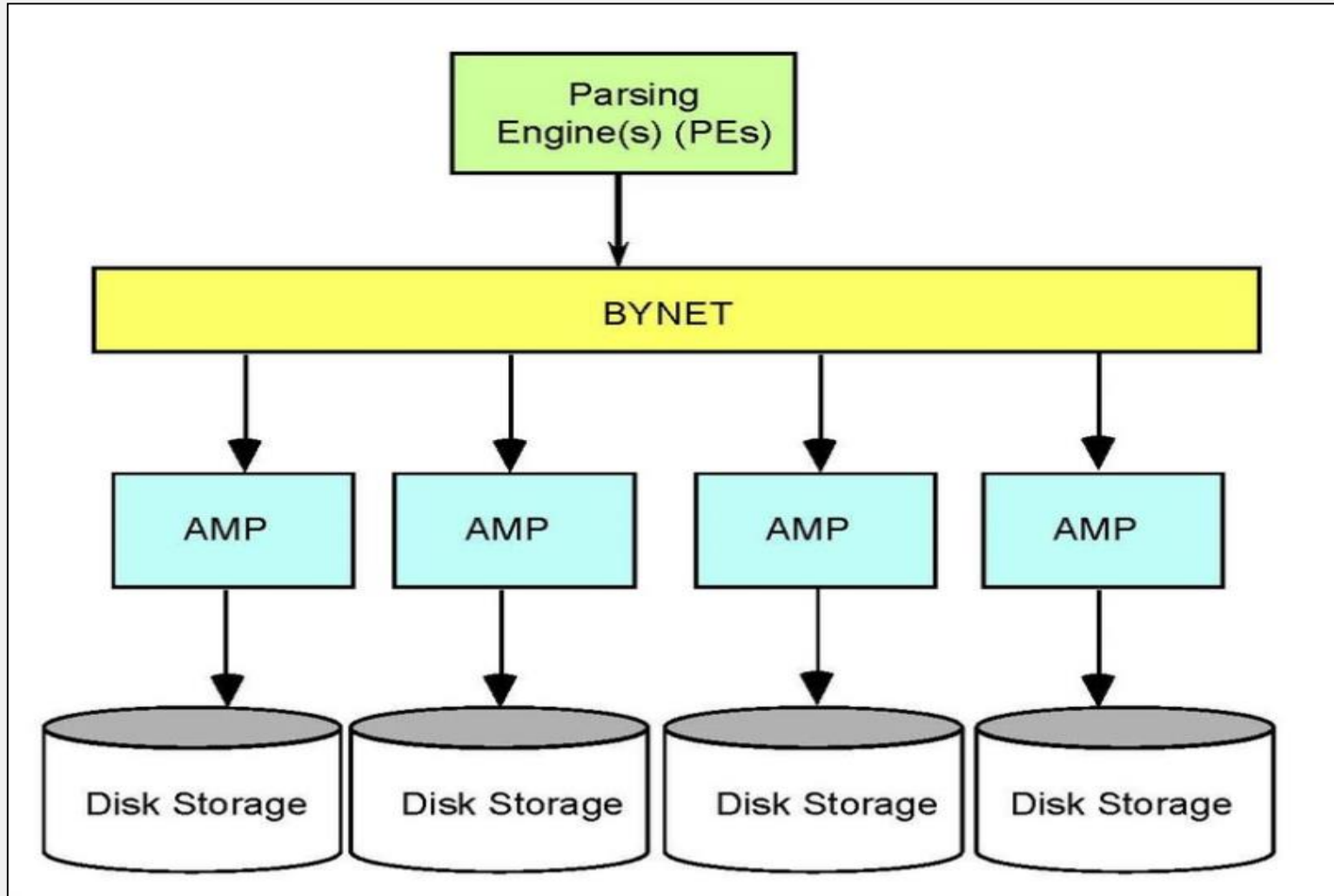
- **Developer** — Designed specifically for customers that are developing new applications. It is a free tier for deployment in a non-production environment. Developer is available in software-only versions on public cloud or as VMware to run on non-Teradata hardware.
- **Base** — Designed for low concurrency, entry-level data warehouses. It is available on cloud and on-premises. It is not on the 6xxx/IntelliFlex integrated data warehouse platform as the feature set is not applicable for the advanced capabilities of that platform.
- **Advanced** — Supports high-concurrency production mixed workload environments. It includes the Integrated Workload Management and Intelligent Memory features. This option is available on-premises and on every cloud option.
- **Enterprise** — This top-tier plan includes a more robust [Teradata Active System Management](#), [In-Memory Optimization](#), as well as the [Intelligent Memory](#) optimizations. Enterprise is available with on-premises and on every cloud option.

Teradata Datenbank - Überblick

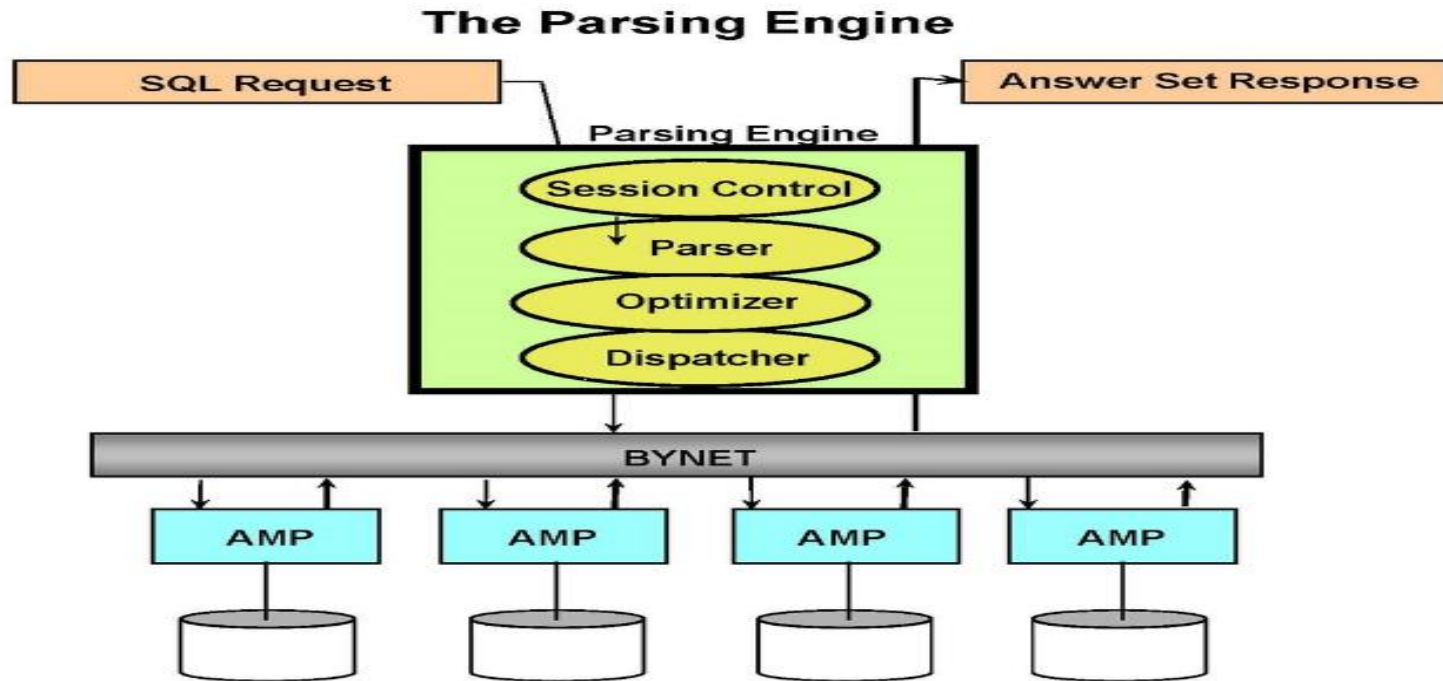
Software Tiers

	Developer	Base	Advanced	Enterprise
In-Memory Optimization	Not Applicable	Not Applicable	Not Offered	Included
Intelligent Memory	Not Applicable	Not Applicable	Included	Included
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

Teradata - Architektur



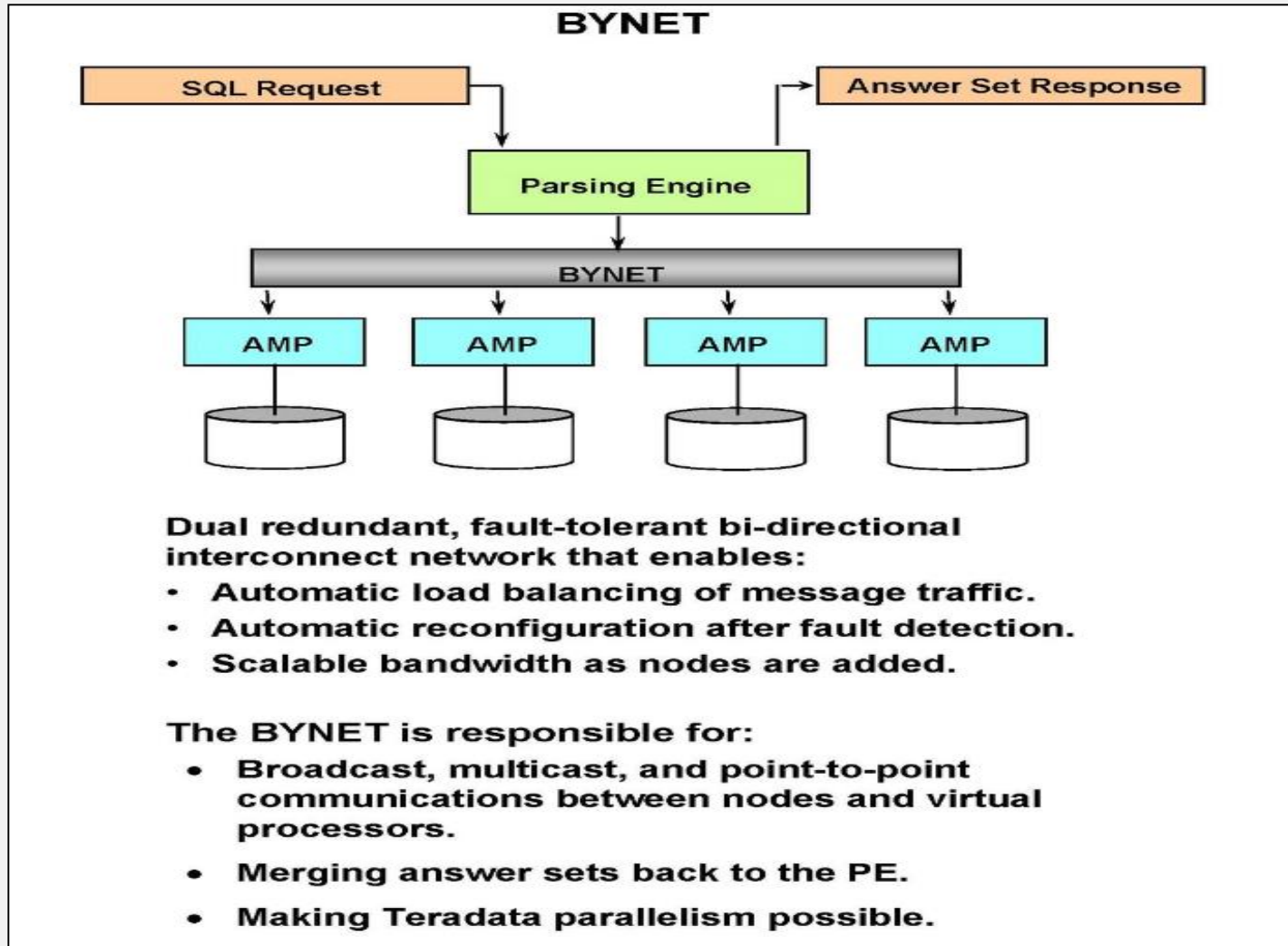
Teradata - Architektur



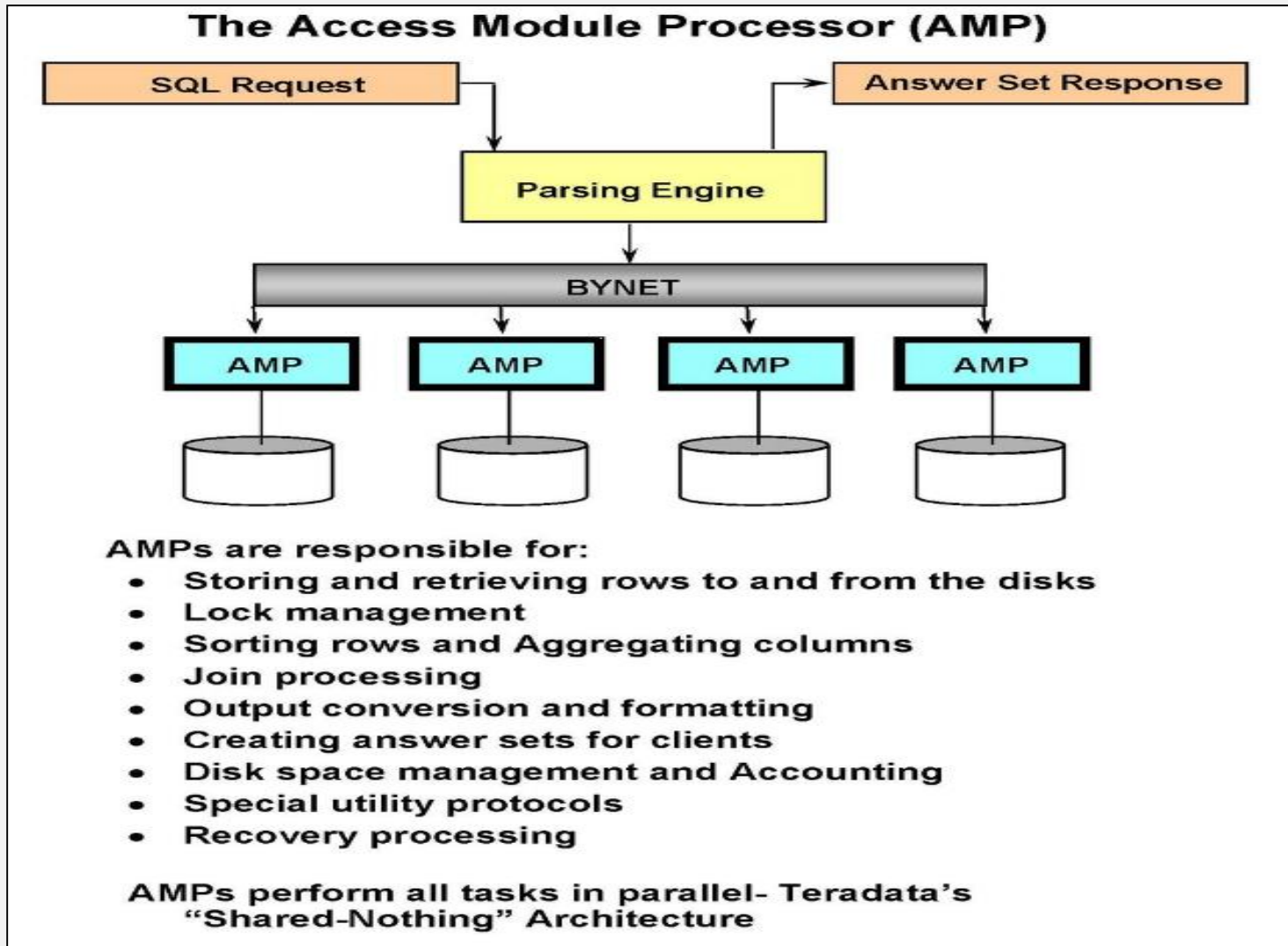
The Parsing Engine is responsible for:

- **Managing individual sessions (up to 120)**
- **Parsing and optimizing your SQL requests**
- **Dispatching the optimized plan to the AMPs**
- **ASCII / EBCDIC conversion (if necessary)**
- **Sending the answer set response back to the requesting client**

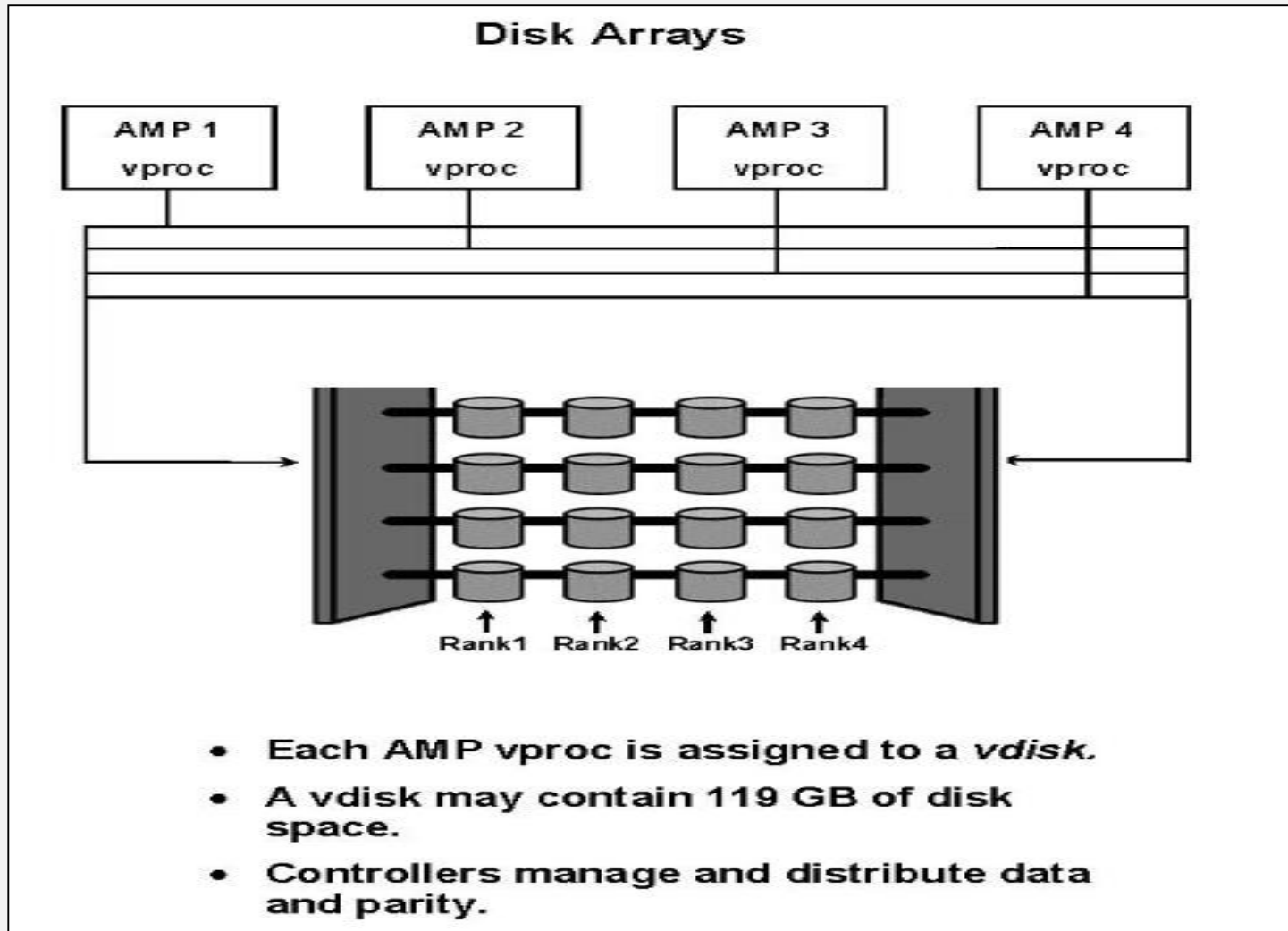
Teradata - Architektur



Teradata - Architektur

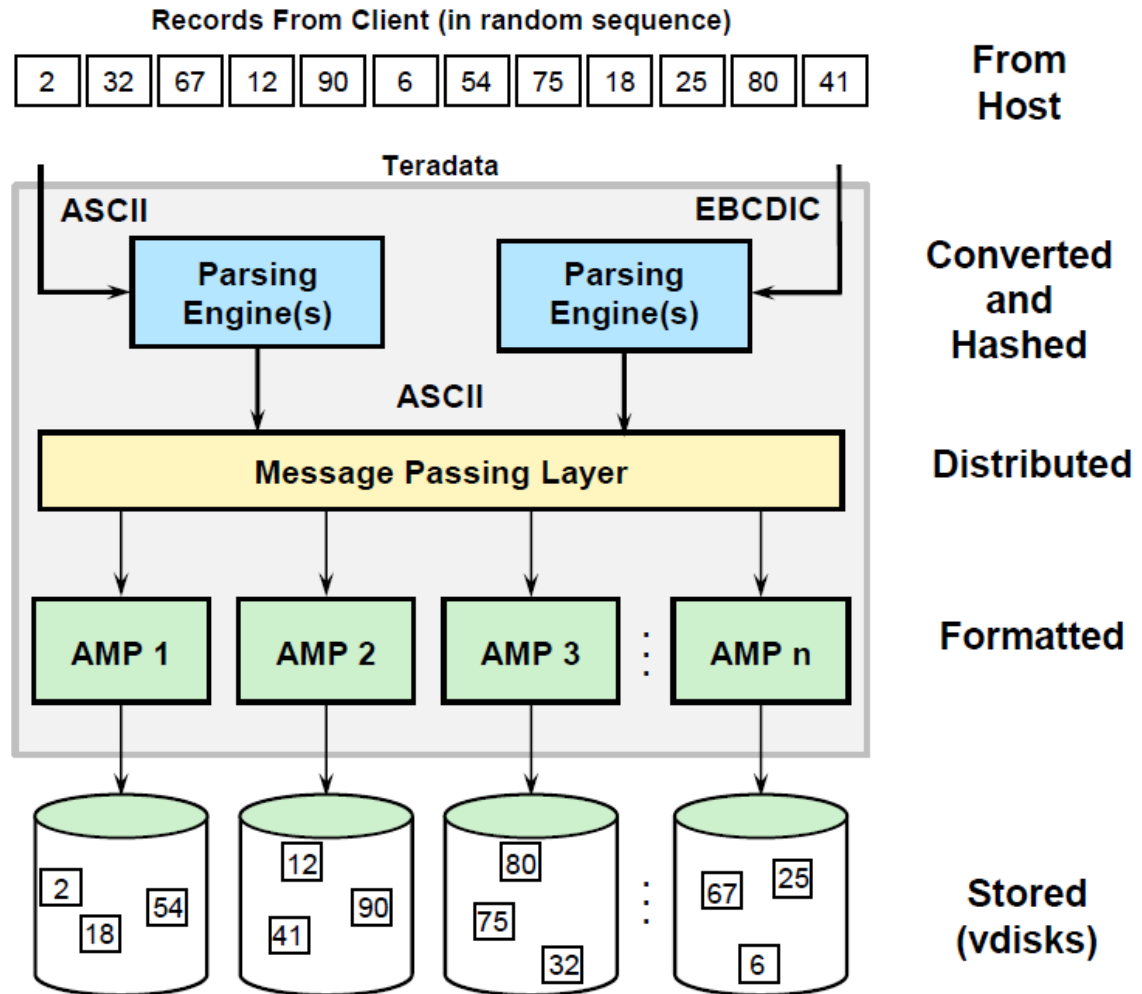


Teradata - Architektur

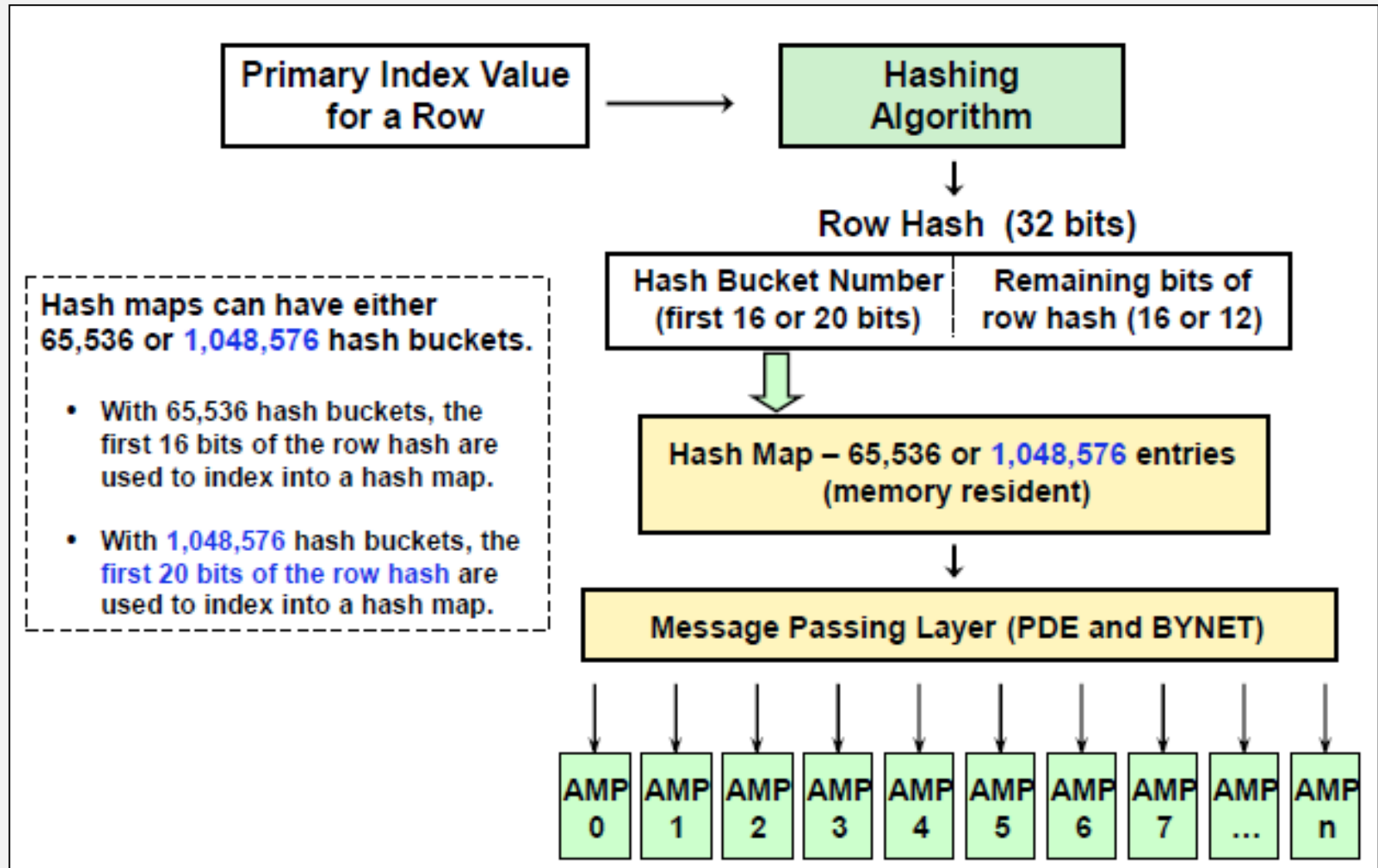


Teradata - Architektur

Data distribution is dependent on the hash value of the primary index for a table with a PI.

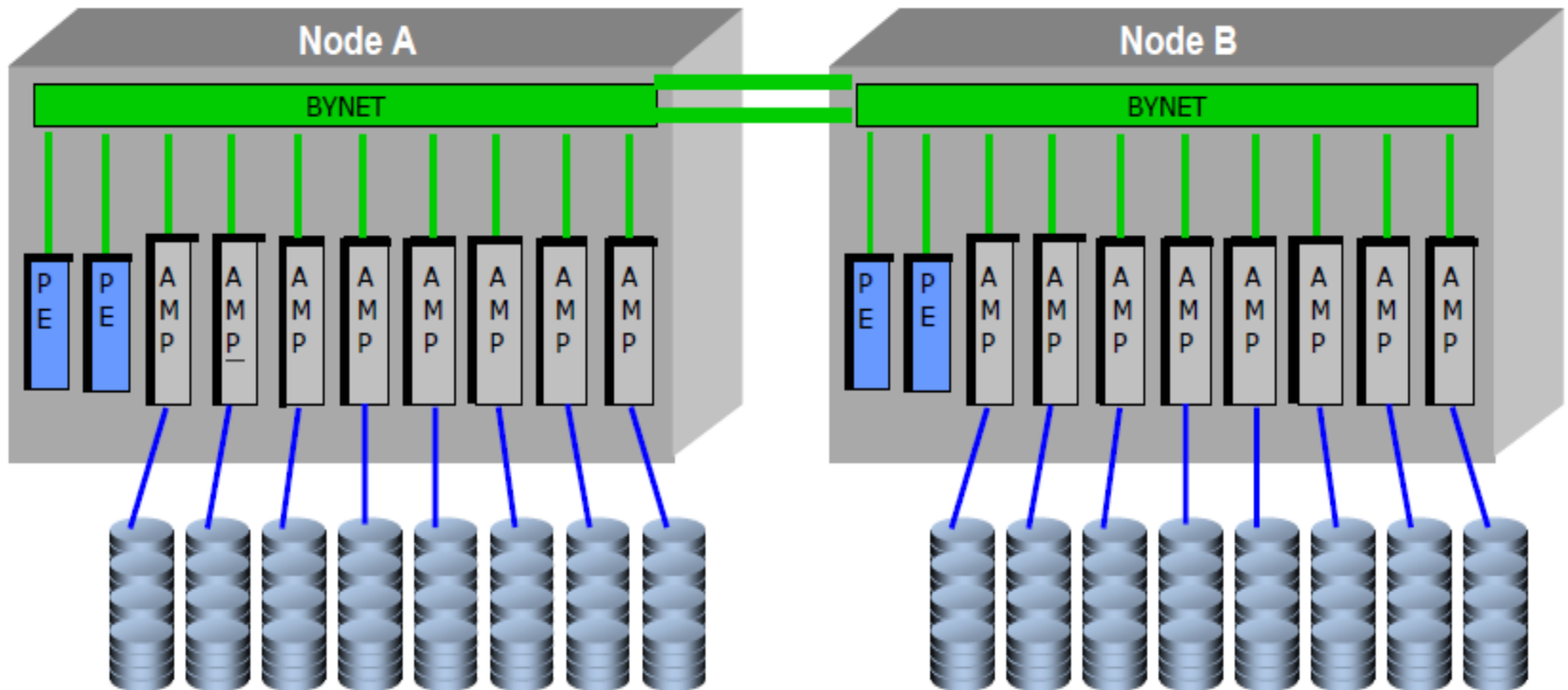


Teradata - Architektur

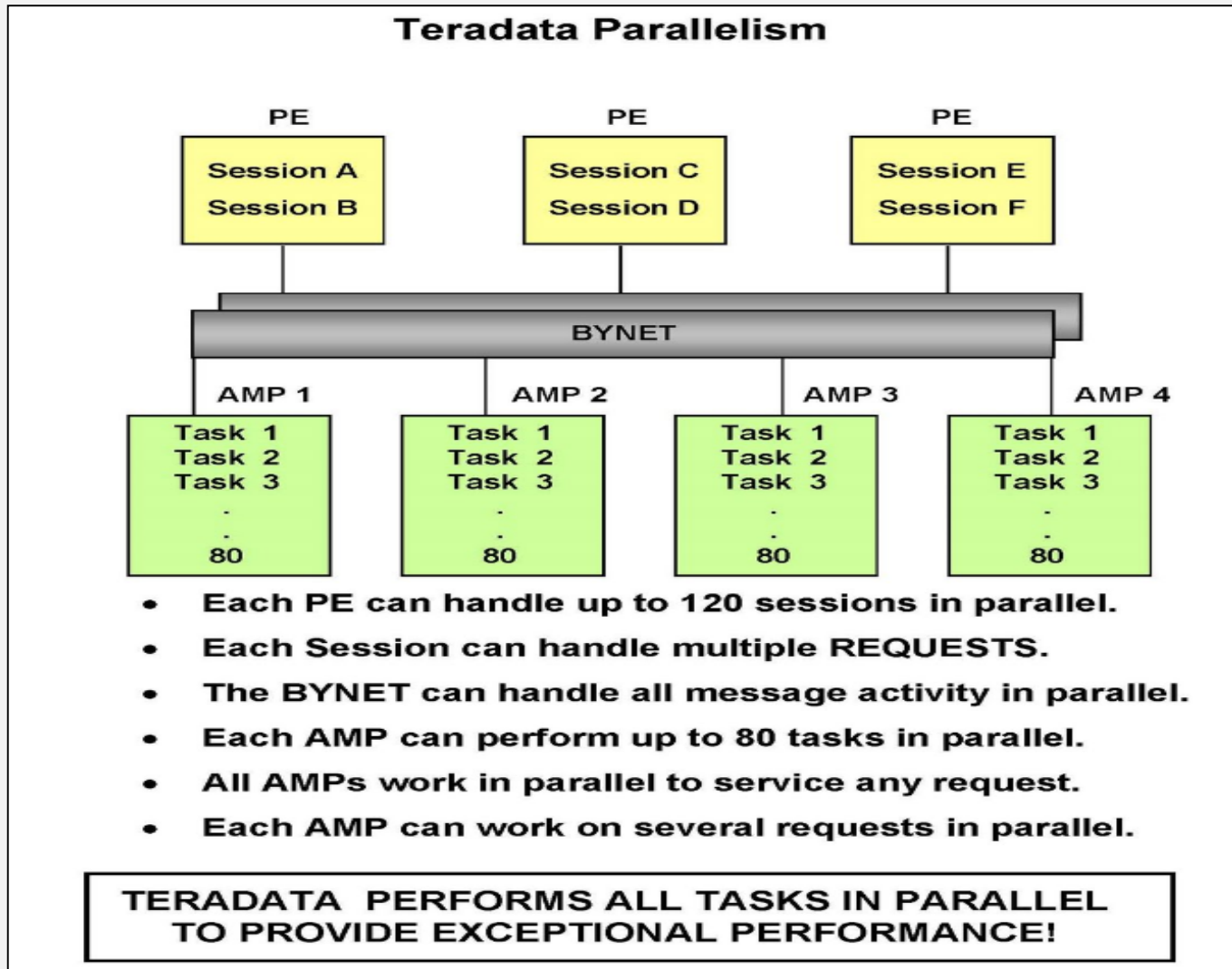


Teradata - Architektur

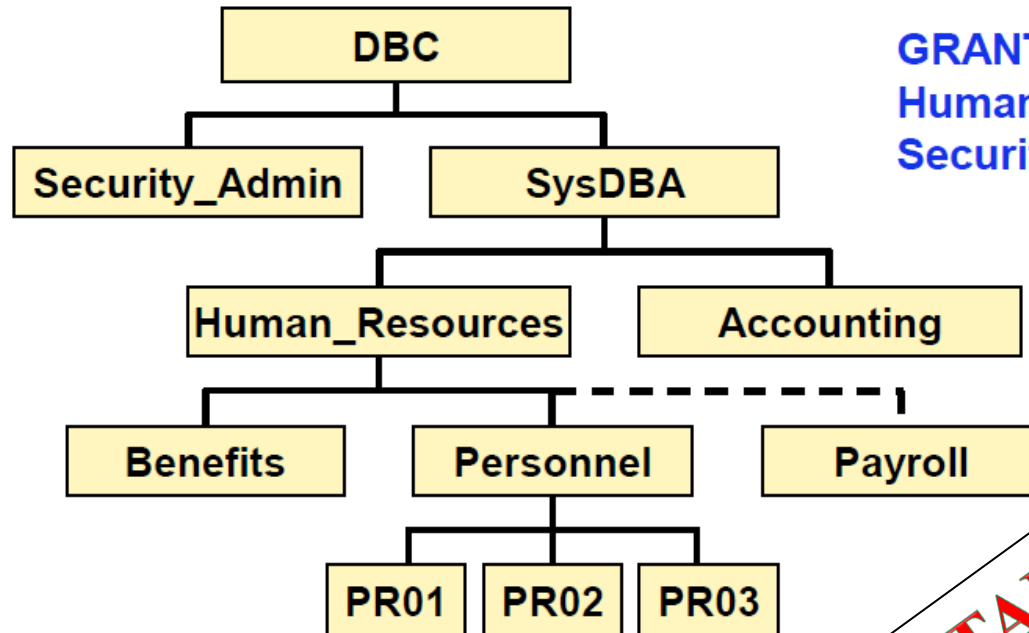
„shared nothing“



Teradata - Architektur



Teradata - Datenbank



GRANT DATABASE ON
Human_Resources TO
Security_Admin

CREATE DATABASE
Payroll FROM
Human_Resources
AS...

- The creator is the user who submits the **CREATE** statement.
- Every object has one and only one creator.
- A user (if authorized) may create databases or other users from someone else's space.

Datenbank-Komponenten

Database Creation Task	Oracle	Teradata
Script(s) to Create Catalog/Data Dictionary Tables and Views	Catalog.sql, Catclust.sql, Catproc.sql	DIP
Manage "In-Flight Transactional Data	Rollback/Undo Segments	Transient Journal
Database Logs	Redo Logs	Permanent Journal
Temporary Space/Work Space	Temp Space	Spool Space
Default Permanent Space	Default Tablespace	Default Database
Table Block Size	System-wide blocksize setting Optional different table blocksize setting requiring sizing and creation of bufferpools for each additional different blocksize	System-wide blocksize setting optional different table blocksize setting Teradata manages the different blocksizes automatically
Database Startup Information	Spfile, init.ora, OS environment variables, control files, ASM instance information	XCTL, Vconfig.out

Datenbank-Komponenten: Beispiel: Tabellen

- Oracle: Tabellen befinden sich im Tablespace, einem Schema zugehörig, unterschiedliche Spaceverwaltung möglich
- Teradata: Tabellen befinden sich in einer Datenbank, Space allokiert und verwaltet eigenständig das System

Oracle – Teradata: Vergleich (create table)

```
CREATE MULTISET TABLE Table_1, Fallback, DATABLOCKSIZE = 127 KBYTES, FREESPACE = 10 PERCENT,
MERGEBLOCKRATIO = 60 PERCENT, BLOCKCOMPRESSION = ALWAYS,
BLOCKCOMPRESSIONALGORITHM = ZLIB, BLOCKCOMPRESSIONLEVEL = 4,
MAP = TD_1AmpSparseMap_1Node COLOCATE USING Colocation_Name
(column1      INTEGER      NOT NULL,
 column2      CHAR(5)      NOT NULL,
 CONSTRAINT   table_constraint CHECK (column1 > 0)
)
PRIMARY INDEX (column1)
INDEX         (column2);
```

SET	Don't allow duplicate rows	FREESPACE = integer [PERCENT] Percent of freespace to keep on cylinder during load operations (0 - 75%)
MULTISET	Allow duplicate rows (ANSI default)	

DATABLOCKSIZE = BYTES or KBYTES	Maximum multi-row block size for table in: BYTES Rounded to nearest sector (512) KILOBYTES (or KBYTES) Increments of 1024
MINIMUM DATABLOCKSIZE	(7168)
MAXIMUM DATABLOCKSIZE	(1,048,064 BYTES possible in TD 14.10)
IMMEDIATE	May be used to immediately re-block the data with ALTER.

DEFAULT MERGEBLOCKRATIO	The merge block ratio to be used for this table when
MERGEBLOCKRATIO = integer [PERCENT]	when Teradata combines smaller data blocks into a single
NO MERGEBLOCKRATIO	larger data block (13.10). Typical system default is 60%.

BLOCKCOMPRESSION = ALWAYS	The table (and all qualifying subtables) will be compressed
BLOCKCOMPRESSIONALGORITHM = value	even if query band options or DBSControl defaults indicate
BLOCKCOMPRESSIONLEVEL = [1 – 9]	otherwise (16.0).

Datenbank-Komponenten: Beispiel: Tabellen

- Teradata:

```
select * from DBC.TABLESIZEV  
WHERE TableName like 'testtable' order by Vproc;
```

Vproc	DataBaseName	AccountName	TableName	CurrentPerm
0	temp	DBC	testtable	4096,00
1	temp	DBC	testtable	8192,00
2	temp	DBC	testtable	4096,00
3	temp	DBC	testtable	4096,00
...	...	...	...	...

Datenbank-Komponenten: Beispiel: Tabellen

■ Teradata:

```
SELECT DATABASENAME, TABLENAME,  
SUM(CURRENTPERM)/(1024*1024) AS CURRENTPERM_MB,  
(100 - (AVG(CURRENTPERM)/MAX(CURRENTPERM)*100)) AS SKEWFACTOR  
FROM DBC.TABLESIZEV  
WHERE TABLENAME like 'testtable'  
GROUP BY 1,2  
HAVING SKEWFACTOR >10  
ORDER BY SKEWFACTOR desc;
```

DataBaseName	TableName	CURRENTPERM_MB	SKEWFACTOR
temp	testtable	6748,14	58,49

Oracle – Teradata: Vergleich

	Oracle	Teradata
Version	18c	16
Utilities	SQL*Plus, SQL*LOADER, Data Pump	Multiload, Fastload, T pump, FastExport & Teradata parallel transporter(TPT)
Transactional Management	Rollback	Transient Journal
Space Management	Tablespace	Database
Temporary Space	Temp Space	Spool Space
Monitoring	Oracle Enterprise Manager	Teradata Viewpoint
Index Einsatz	OLTP erfordert meist viele Indexe	Ja, aber wenige

Oracle – Teradata: Vergleich

	Oracle	Teradata
Partitioning	Range, Hash, Composite Range, List, Composite List, Range-Range, Range-Hash, range-list, list-range, list-hash, list-list interval, reference	Teradata Partitioned Primary Index and Teradata Multilevel Partitioned Primary Index
Managing Large Volumes of Data	++++	+++++
Analytical/ Aggregate Function	+++++	+++++

Oracle – Teradata: Datentypen

Oracle

- CHAR
- VARCHAR2
- NCHAR
- NCHAR2
- NUMBER
- LONG
- LONGRAW
- RAW
- DATE
- BLOB
- CLOB
- NCLOB
- BFILE
- ROWID
- UROWID

Teradata

- CHAR
- VARCHAR
- CHAR VARYING
- LONG VARCHAR
- NUMERIC
- DECIMAL
- DOUBLE PRECISION
- FLOAT
- INTEGER
- SMALLINT
- BYTEINT
- BYTE
- VARBYTE
- GRAPHIC
- VARGRAPHIC
- LONG VARGRAPHIC
- DATE
- REAL

Oracle: Limits

<https://docs.oracle.com/en/database/oracle/oracle-database/12.2/refrn/database-limits.html#GUID-ED26F826-DB40-433F-9C2C-8C63A46A3BFE>

A Database Limits A.1 Datatype Limits A.2 Physical Database Limits A.3 Logical Database Limits A.4 Process and Runtime Limits B SQL Scripts C Oracle Wait Events D Oracle Enqueue Names E Statistics Descriptions F Background Processes	BLOB	Maximum size: (4 GB - 1) * DB_BLOCK_SIZE initialization parameter (8 TB to 128 TB)
	CHAR	Maximum size: 2000 bytes
	CHAR VARYING	Maximum size: 4000 bytes
	CLOB	Maximum size: (4 GB - 1) * DB_BLOCK_SIZE initialization parameter (8 TB to 128 TB)
	Literals (characters or numbers in SQL or PL/SQL)	Maximum size: 4000 characters

Teradata: Limits

https://www.info.teradata.com/HTMLPubs/DB_TTU_16_00/Database_Management/B035-1093-160K/bxw1472240589578.html#2240589578.html#

 Teradata System Limits	
Overview	
System Limits	
Database Limits	
Session Limits	
 Performance Management: All DBAs	
 Considerations for Administering a System with Unity Director: All DBAs	

Spool Space Limits	
Parameter	Value
Maximum internal spool row size. ~ 1MB	
BLOB, CLOB, XML, and Related Limits	
Parameter	
Maximum BLOB object size	
Maximum CLOB object size	

Oracle – Teradata: Utilities

Oracle

SQL*LOADER

- **Conventional Path**
- **Direct Path**
- **Manually Parallelized through Multiple Load Processes**
 - Multiple Utility Output Files
 - Multiple Input Files

External Table

- Non-database files defined to the database with DDL so they can be accessed with SQL
- Data source for **CREATE TABLE ... AS SELECT...**
- You set data access/load parallelism through DDL/SQL

Data Pump

- **Import/Export Utility**
- **Parallel**
- **Dependent upon Streams**

Teradata

FASTLOAD

- **One Load Process**
 - Can read multiple input files
 - One script, One Set of Output files
 - Optimized, parallelized, block oriented operations
 - Checkpoint restartable
- **Teradata Manages Utility Parallelism Automatically**

Multiload

- Inserts, Updates, “Upserts”, Deletes
- Checkpoint restartable

TPump

- **Bulk Transactions - Inserts, Updates, Deletes**
- **“Trickled In” to Table Over Time**
 - Allows throttling/controlling the Rate of Change
- Checkpoint restartable

Oracle – Teradata: SQL

- Vieles ist gleich, jedoch jede Menge Eigenheiten
 - Beispiel: Hierarchische und rekursive Abfragen:

```
select ..., level, ... from ... start with ... connect by ... ;
```

```
with recursive temp_table (... , depth, ...) as ...  
  ( select ... from root_table where ...  
    union all  
    select ... from temptable direct, roottable indirect ...  
  )  
  select ... from temptable ... ;
```

Teradata → Oracle: Migration

- SQL Developer
- Supported Migration Objects
 - Tables
 - Constraints
 - Indexes
 - Users
 - Views
- Automatically converts column data types to appropriate Oracle data types

Teradata → Oracle: Migration

- Automatically resolves object name conflicts, such as conflicts with Oracle reserved words.
- Stores database metadata in a repository where you can make changes.
- Retrieves source database information via online capture or offline capture.
- Provides advanced customization capabilities such as the ability to change data type mappings, delete and rename objects.

Teradata → Oracle: Migration

- Generates reports about the status of the migration.
- Generates the DDL scripts for the creation of the destination Oracle database.
- Generates scripts for data movement.
- Allows you to migrate objects to existing Oracle tablespaces.
- Displays informational, error and warning messages about the migration in a progress window.

Oracle → Teradata: Migration

Teradata Migration Accelerator (Oracle-to-Teradata Tool)

- > Used for ETL Processes, SQL and PL/SQL scripts, and Applications
- > Translates PL/SQL and Oracle SQL to Teradata SQL
- > Translates Oracle SQLPlus scripts to Bteq scripts
- > Does Cursor to Set Code Conversion
- > Used to extract data from Oracle using Oracle's OCI layer
- > Does auto data type conversion
- > Loads data into Teradata using Teradata's Parallel Transport
- > Reads the Oracle catalogs and handles DDL creation and execution of new target tables and objects
- > GUI Based collaborative work environment

Fazit

- Oracle ist weitverbreitet
- Teradata kann „nur“ OLAP
- Datenbank-Vergleich nur bedingt möglich
„Oracle is best in its own space and Teradata in other”
- Architekturen sind sehr unterschiedlich

Oracle – Teradata

Danke für Ihre Aufmerksamkeit

Fragen ...