SAP HANA Accelerator for SAP ASE

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Financial Services

Businesses are accelerating

Pushing transaction processing systems to extreme speed & scale

Wall Street

Average number of transactions processed has increased from 53,000 to 500,000 per second since 2006. *Nasdaq*

Telco

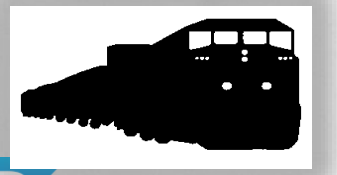
Global telecom service providers will reach 30 billion autonomously connected end points by 2020. IDC

Retail

36.8 million items ordered on Cyber Monday. *Amazon*

Health Care

State websites buckle under massive signups for healthcare under Affordable Care Act.



Transportation

9 million average daily tickets sold with multiple transactions per ticket. *China Academy of Railway Sciences*

What is SAP HANA Accelerator for SAP ASE

HANA accelerator for ASE provides access to HANA capabilities for ASE custom built reports. ASE queries are transparently executed against HANA.

- No code changes / (or minimal) are required in ASE. Customer reports run unchanged.
- ASE reports are accelerated via A4A tens to hundreds* of times in comparison to equivalent reports running against ASE reporting servers.

* data based on customer POC results

Sample Acceleration Tests Results

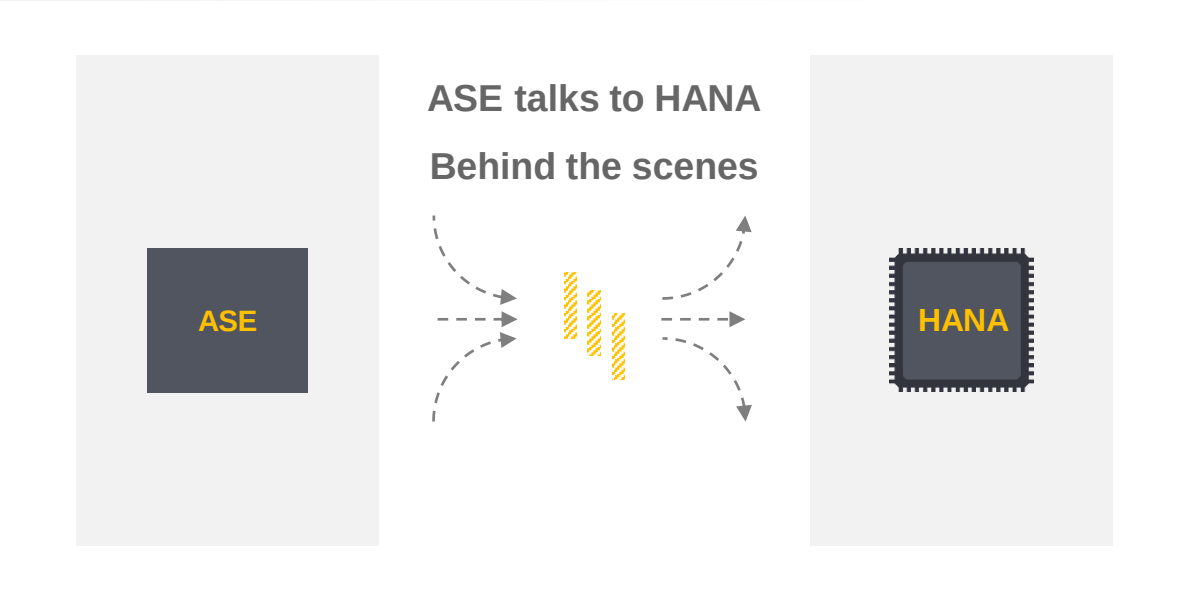
Test Query	Execution time in ASE (min)	Execution time in HANA (via ASE) (min)	Performance Improvement
Q02	13.90	0.38	36x
Q03	10.13	1.50	7x
Q07	6.78	0.62	11x
Q08	13.69	0.47	29x
Q09	22.83	10.71	2x
Q11	69.39	0.73	94x
Q16	1.92	0.64	3x
Q17	17.37	0.17	97x
Q19	4.77	0.13	36x
Q22	2.32	0.51	5x

- Test results based on internal sample queries
- Query Execution Time = Time to ship query to HANA + **Execution time in HANA** + Time to return results to ASE
- Several show significant enhancement
- Key is to avoid bringing data back to ASE for execution, or executing logic in ASE

Why SAP HANA Accelerator for SAP ASE

- ASE customers run multiple copies of ASE for reporting.
- Data growth or SLAs have changed
- Rewriting these applications is not an option. { expertise / time/ money/ risk }
- SAP provides a solution that minimizes cost & effort, while accelerating SAP ASE reporting apps by leveraging SAP HANA
  - Minimal or No code changes is required
  - Fits into customers existing landscape without disruption
  - Provides a path to faster query and report acceleration
  - Provides a path for innovation

Accelerating ASE Apps without changes



Leverages ASE CIS Functionality

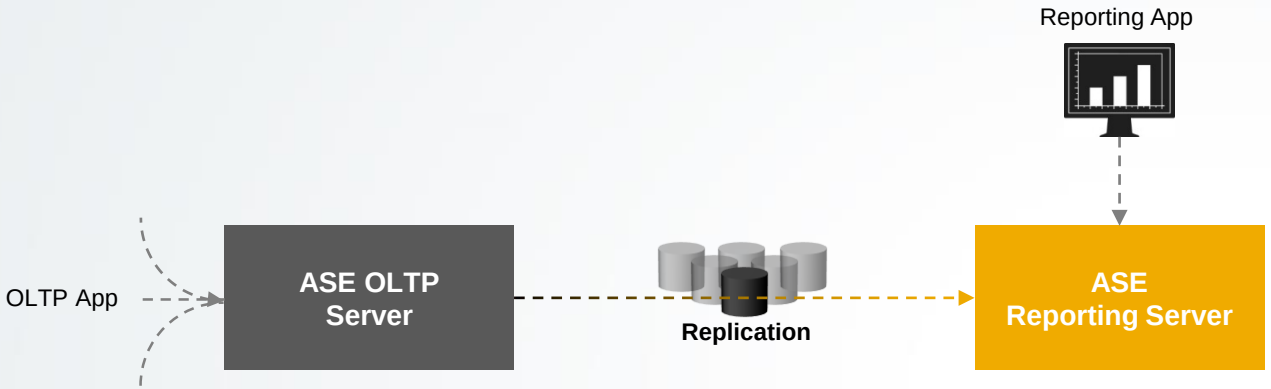
- CIS allows A4A to HANA access via ODBC
- ASE proxy tables, point to HANA physical tables
- ASE provides functional compensation, functional translation, and data type mapping (ASE-HANA, and HANA-ASE)

A4A capabilities

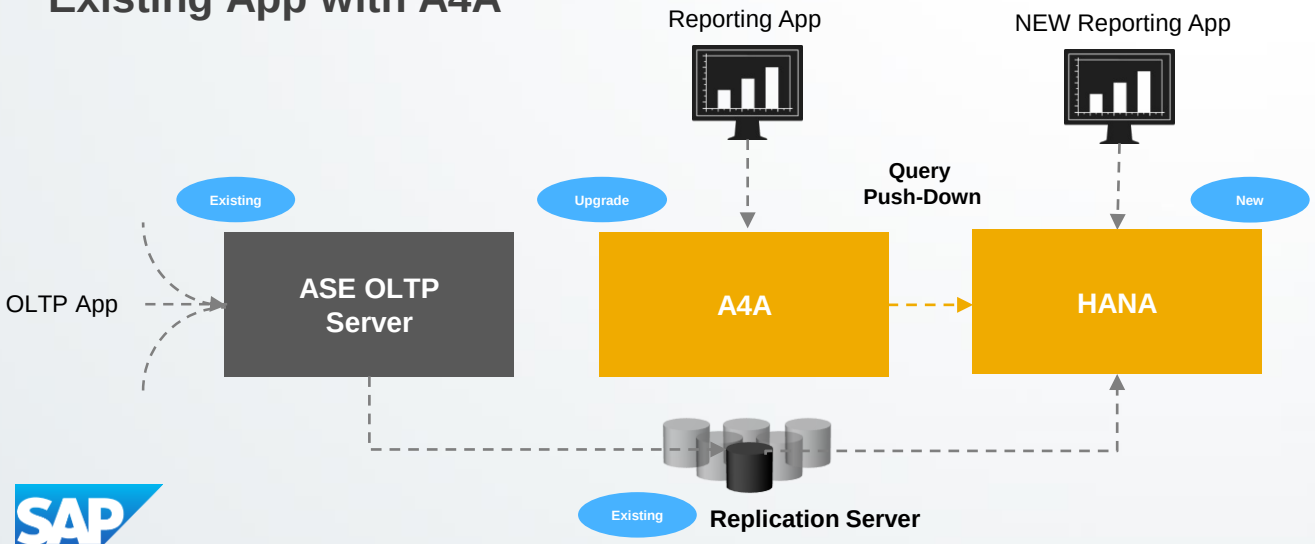
- ASE-to-HANA pushdown, via transformation of ASE built-in function syntax to HANA (isnull, convert, char-Length,charindex,like,contatenation)
- More pushdowns of SQL, such as CASE, UNION with constants
- Enable temp table creation in HANA
- Enable full-push down via simple configuration
- Data in HANA can be kept in sync with ASE, via replicating from ASE to HANA using Smart Data Integration

Accelerating ASE Apps using HANA, without changes

Existing App



Existing App with A4A



- **HANA runs new OLAP apps**
- **Existing ASE reporting apps to run faster in HANA, with no code changes**

What's New

- More ASE-to-HANA pushdown, via transformation of ASE built-in function syntax to HANA (isnull, convert, char-Length,charindex,like,contatenation)
- More pushdowns of SQL, such as CASE, UNION with constants
- Enable temp table creation in HANA
- Enable full-push down via configuration
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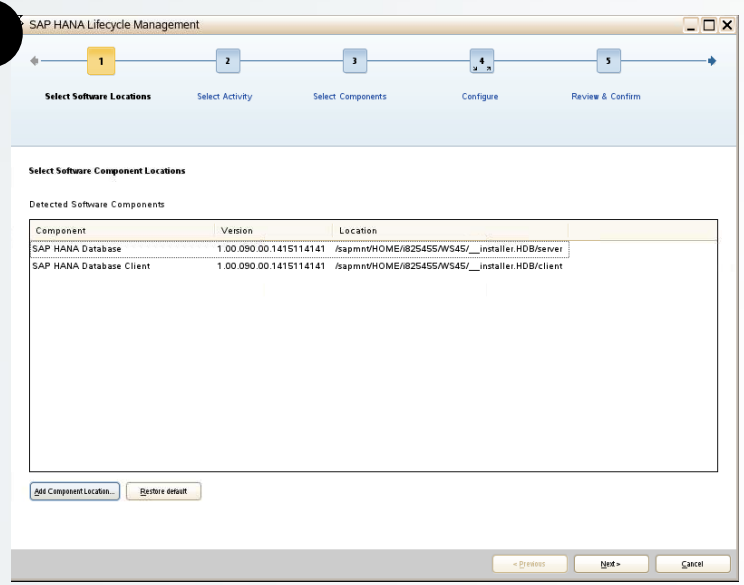
Unified Installation

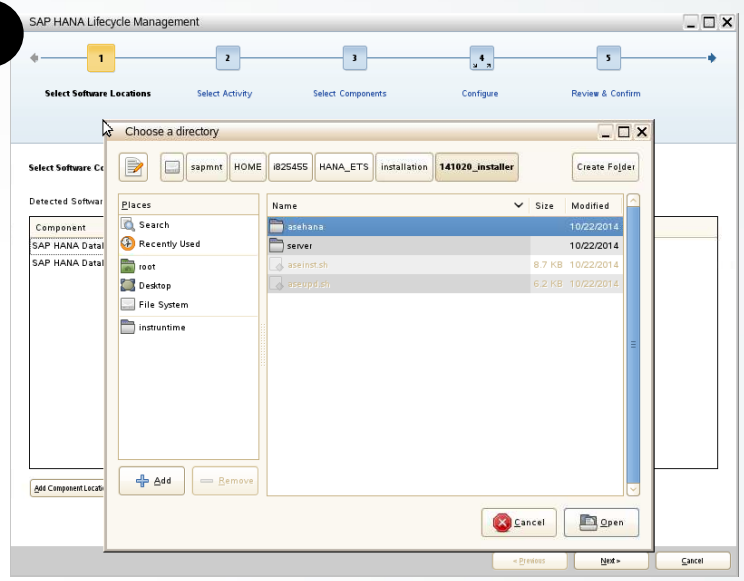
Simplified and Integrated Installation for SAP HANA and SAP ASE

1



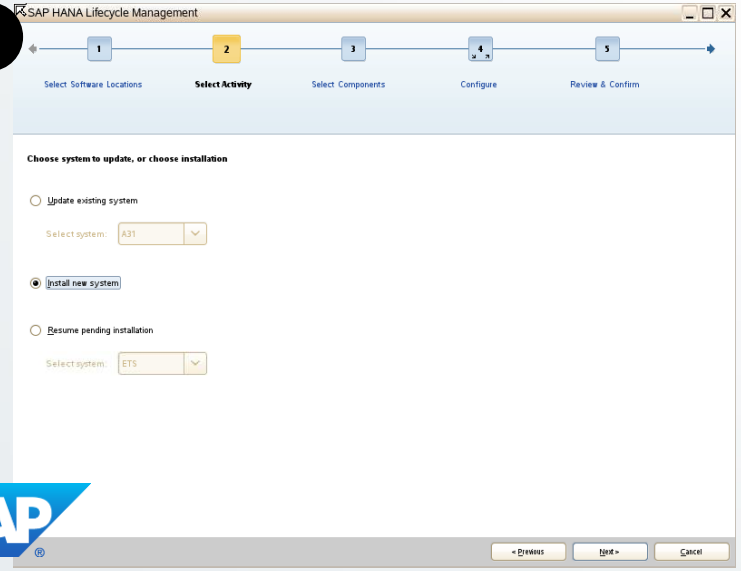
Selection of HANA related components to install – using HANA Lifecycle Management

2



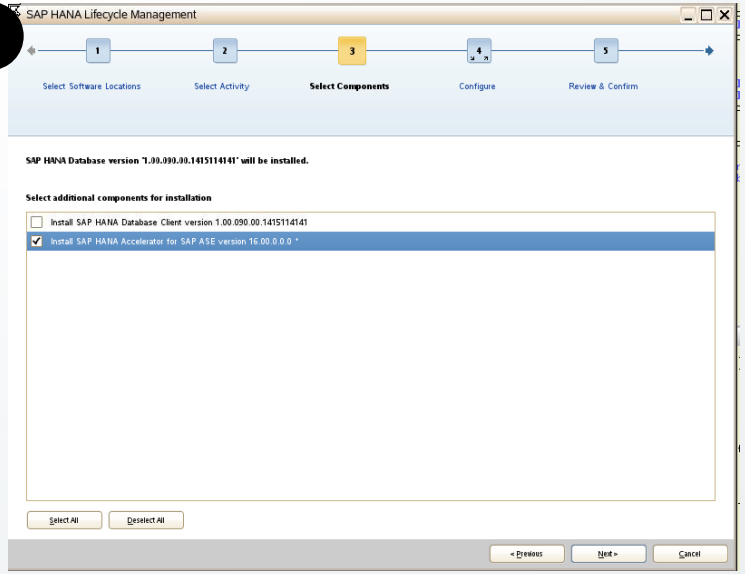
Choose location for installing

3



Choice of new installation or update of an existing one

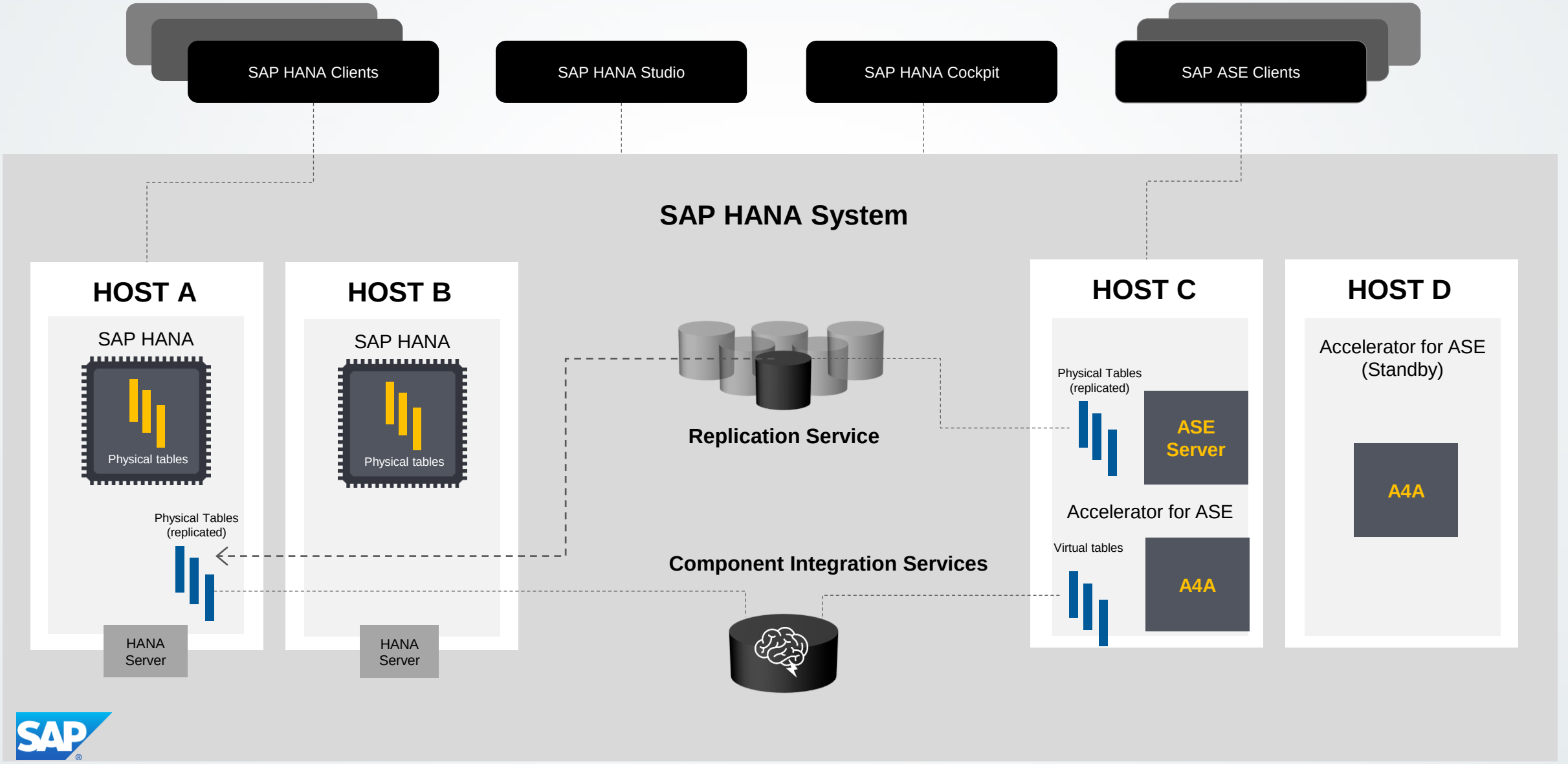
4



Additional components to be installed. In this case SAP HANA Accelerator for SAP ASE (SAP ASE) is chosen.

SAP HANA Accelerator for SAP ASE

Architecture



Millennium Partners: Radical Acceleration of their Global Accounting With HANA Accelerator for ASE

Company
Millennium Partners

Headquarters
New York, New York

Industry
Financial Services Capital Markets

Products and Services
Hedge Funds, Portfolio Management

Employees
2100

Assets
Manages approximately $34.42 billion in assets as of December 2016

AE
Ed Cushing

Web Site
www.mlp.com

Objectives

- Millennium executes ~3 Million trades/day and wanted to calculate P&L in real-time for opportunistic insights into cash positions to better manage reserves
- Increase profitability on a daily basis
- Simplify their environment while enabling development of innovative applications without disruption.

Resolution

- Enables scalability of a single source of truth while enabling innovation of new system capabilities and analytics
- Safeguards existing proprietary applications by enabling the automatic pushdown of existing procedure logic into HANA with < 1% code change.
- Provides an enterprise data management framework for visibility across the organization and the ability to develop intelligent, learning applications for deeper market penetration.
- Enables future scalability with reduced hardware, maintenance and overall risk.

Benefits

- Real-time P&L permits better understanding of the balance sheet to facilitate trading / liquidity.
- Better pre-trade controls aligned with P&L
- More time for analysis to determine Fixed Income premiums / discounts in times of stress.
- Deeper analytics to assess risk-adjusted profitability against systemic risk in corporate bond credit spreads, pattern effects of global trade, emerging market performance, debt-financed investments, volatility of interest rates across maturities, frequencies, etc.

> 15X +
Application Performance Improvement

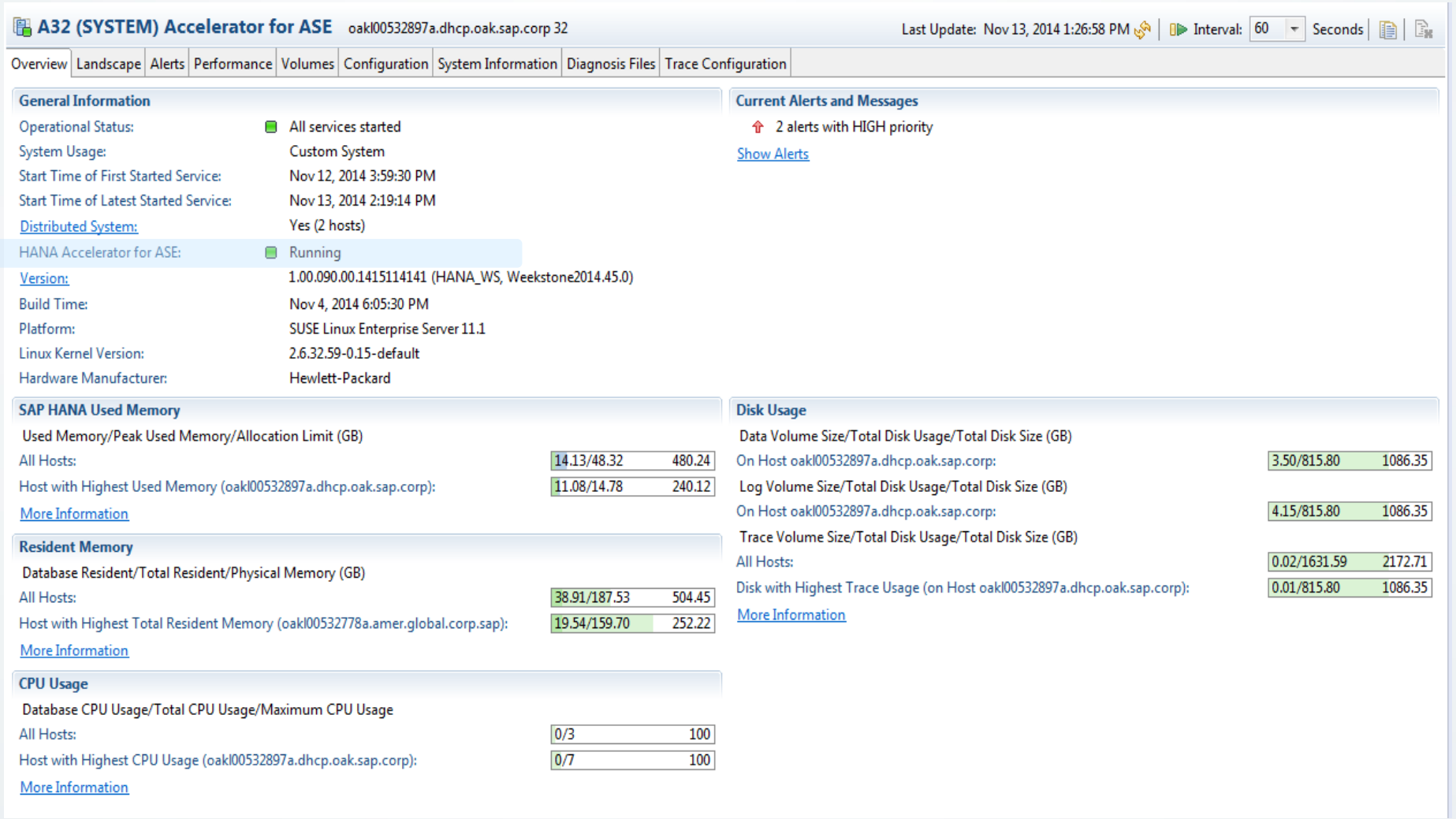
Zero to < 1%
Procedure Code Change

MP
MILLENNIUM PARTNERS

THANK YOU

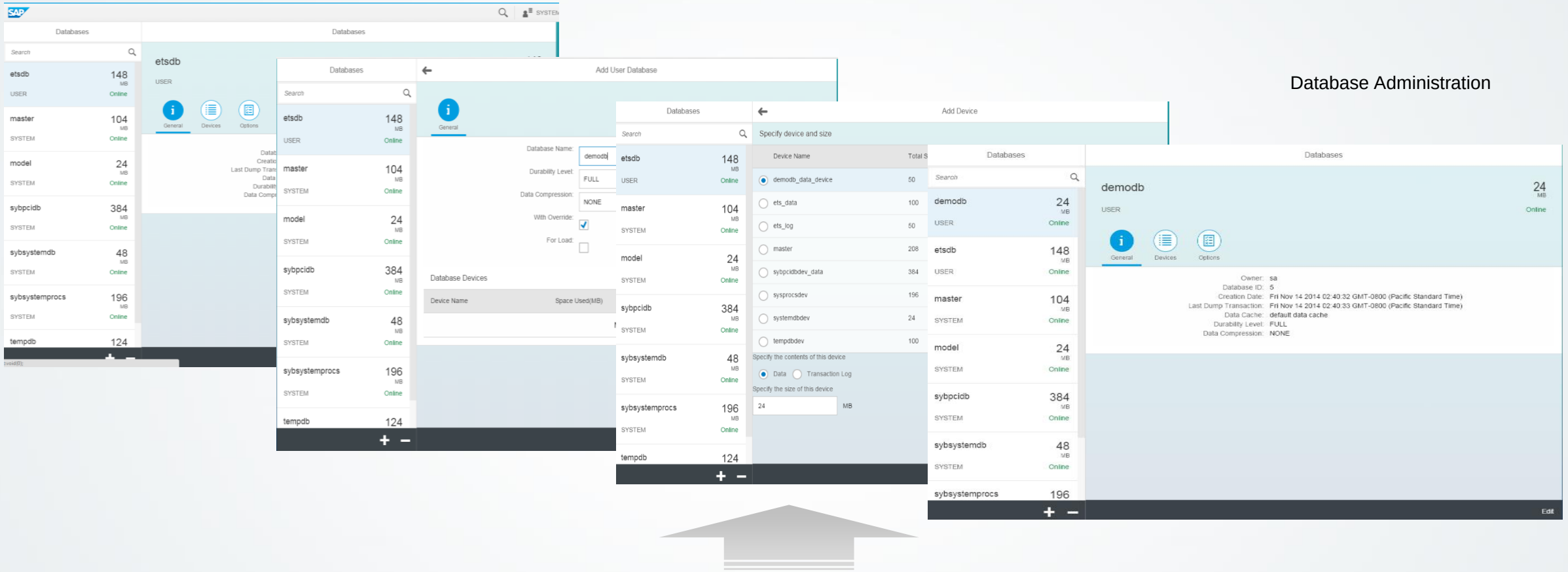
HANA Studio

Administration and Monitoring for SAP HANA Accelerator for SAP ASE

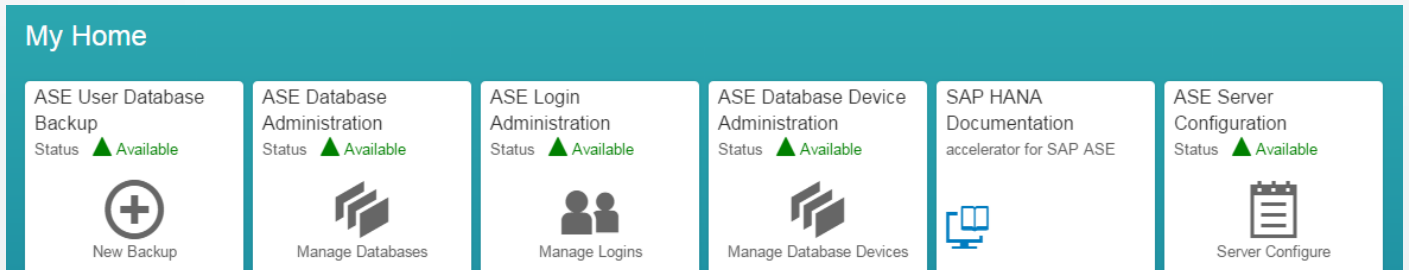


HANA Cockpit

Database Administration for SAP HANA Accelerator



Database Administration



Summary

SAP HANA Accelerator for SAP ASE

For ASE customers only

Enables Analytics for ASE Customers

Integrated Experience

Installation, configuration, monitoring

Easy Data Movement, Real-time

Via SDA or Replication

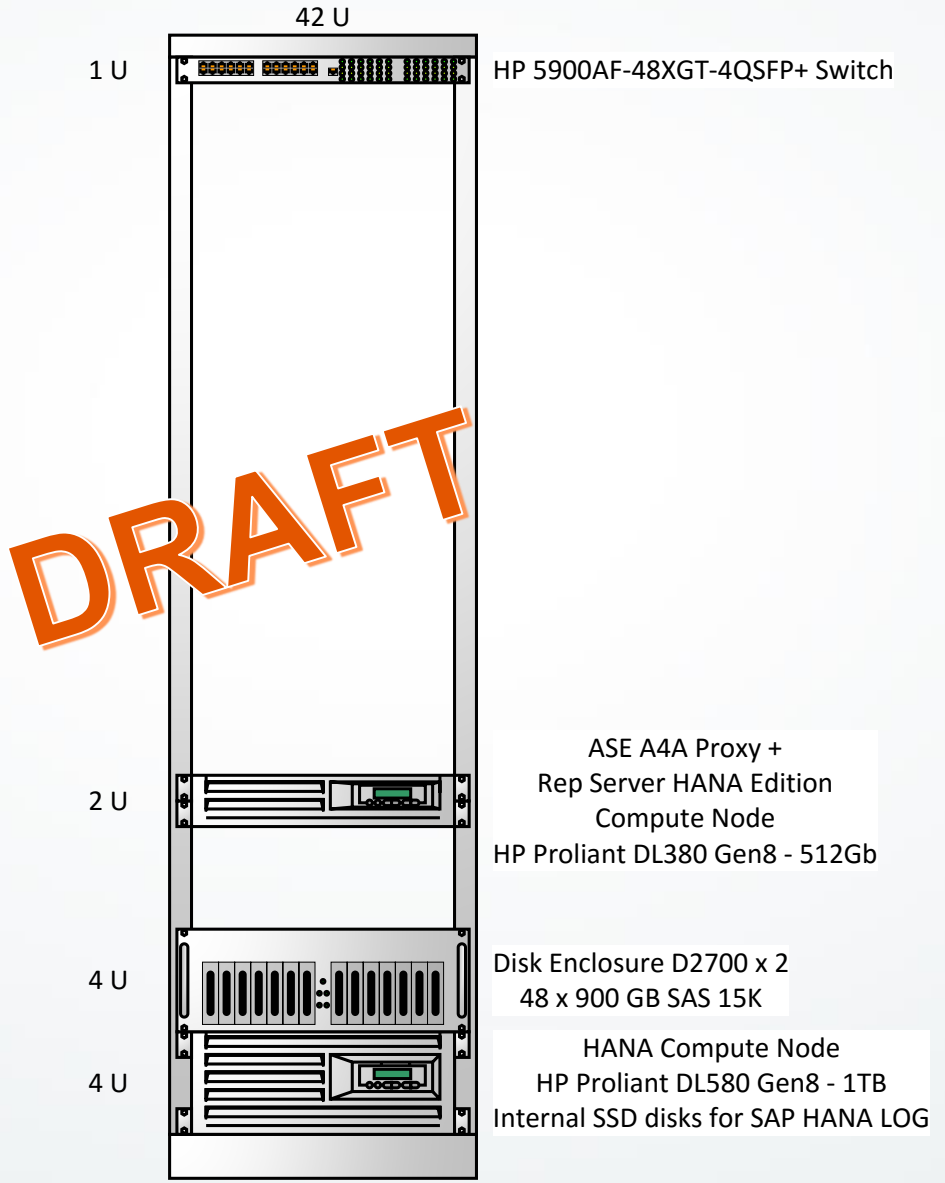
Future Direction

More seamless experience

- Data movement, security, etc

Easier application development

A4A Proof of Concept – Reference Architecture

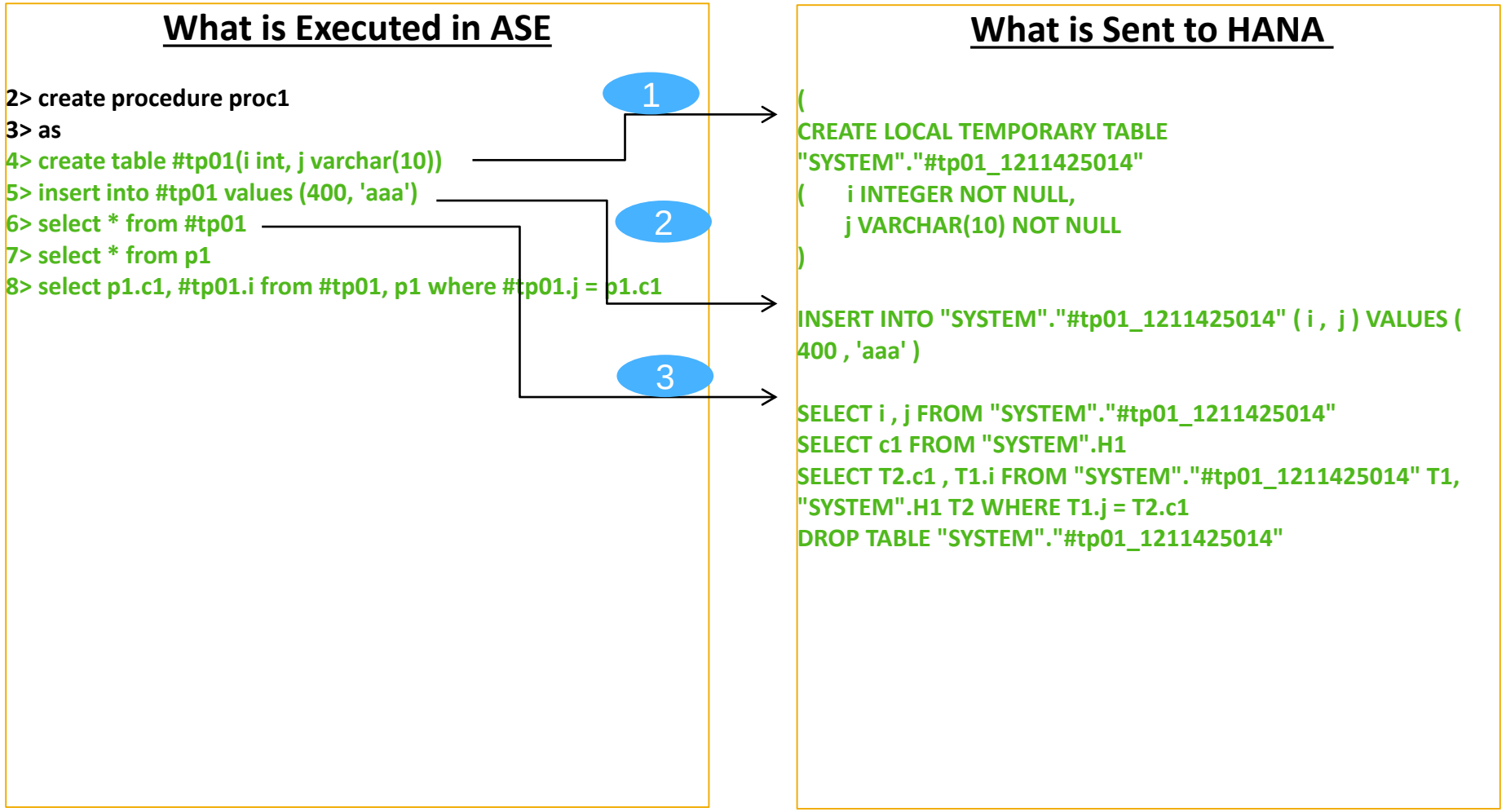


APPENDIX

SAP HANA Server Setup

1. HANA Server and Table Configurations
   - Tables in HANA are configured as column tables
   - Temporary tables created in HANA (by ASE), are created as row tables

Optimizations - Temporary Table Creation In HANA



Visualizing The Query Plan and SQL Statement Sent to HANA

```
1>  Use traceflag to see what's  sent to HANA - traceflag 11277
2> dbcc traceon(3604,11277)
DBCC execution completed. If DBCC printed error messages, contact a user with System Administrator (SA) role.
1>
2> set showplan on
1>
2> select name + ' - ' + RTRIM(name) from proxytab

QUERY PLAN FOR STATEMENT 1 (at line 2).
   STEP 1
      The type of query is EXECUTE.
      Executing a previously cached statement (SSQL_ID = 1307709764).

QUERY PLAN FOR STATEMENT 1 (at line 1).
Optimized using Parallel Mode

   STEP 1
      The type of query is SELECT.

           1 operator(s) under root

     |ROOT:EMIT Operator (VA = 1)
     |
     |   |REMOTE SCAN Operator (VA = 0)
     |   | SERVER: odbchana
     |   |    SELECT (name || ' - ' ) || (RTRIM(name ) ) FROM "SYSTEM".h1
     |   |    1

SELECT (name || ' - ' ) || (RTRIM(name ) ) FROM "SYSTEM".h1
 ----------------------
 aaa - aaa
```

Traceflag

Set showplan on

Executed Query Plan

SQL Statement Sent to HANA

Enable Temporary Table Creation In HANA

- **Using the sp_hana_admin system procedure enables automatic creation of remote temporary tables in SAP HANA.**

  sp_hana_admin <remote_server_name>, sds_temp, {enable | disable}

  Step 1: Enable temp table creation in HANA

  sp_hana_admin <remote_server_name>, sds_temp_schema, <schema_name>

  Step 2: Specify the HANA schema where temp table can be created

  Where:

  <remote_server_name> – is the name of the remote HANA server in which you are creating the temporary tables.
  sds_temp – indicates you are creating a remote temporary table.
  sds_temp_schema – identifier for a specific table schema.
  <schema_name> – name of the HANA schema.
  enable | disable – enables or disables the remote temporary table creation.

Example”:

1. Enable the remote temporary table creation on SAP HANA: sp_hana_admin HANA_server_name, sds_temp, enable

2. Add the table schema: sp_hana_admin HANA_server_name, sds_temp_schema, HANA_schema

- Restart the accelerator for SAP ASE server.
- Subsequent queries that use the temporary tables pass the query directly to SAP HANA
- After enabling automatic creation of remote temporary tables, enable cis pushdown for HANA.

Optimizations - Enable Pushdown For HANA

- **Enable HANA Pushdown Optimization**
- Use sp_configure to enable HANA pushdown optimization for SAP ASE to SAP HANA mapping.
- Once HANA pushdown optimization is enabled, SAP ASE maps the SAP ASE functions, expressions, and operators to their SAP HANA equivalents.
- **The syntax is: sp_configure 'cis pushdown for HANA', [1 | 0]**

Enables push down of queries to HANA

- By default, cis pushdown for HANA is disabled. You must restart the accelerator for SAP ASE server, to enable the change.
- **ASE does function mapping, expression mapping, SQL dialect mapping, etc.**

Function Mapping

- **Transact-SQL functions that are not supported in SAP HANA are mapped to equivalent SAP HANA functions**
- **SAP ASE maps the following SAP ASE functions to their SAP HANA equivalents**

SAP ASE Function	Equivalent SAP HANA Function
abs	abs
ascii	ascii
atan	atan
cast	cast
ceiling	ceiling, ceil
char_length	length
charindex	locate
convert	cast
cos	cos
exp	exp
floor	floor
isnull	ifnull
lower	lower, lcase
ltrim	ltrim
month	month
power	power
right	right
round	round
rtrim	rtrim
sign	sign
sin	sin
sqrt	sqrt
substring	substring
tan	tan
upper	upper, ucase
year	year

Expression Mapping

- **SAP ASE expressions that are not supported in SAP HANA are mapped to an SAP HANA equivalent**
- **Once you enable optimization, SAP ASE maps the following SAP ASE expressions to their SAP HANA equivalents**

SAP ASE Expression	SAP ASE Example	SAP HANA Expression	SAP HANA Example
+ (string)	select '123' + '32243'	||	select '123' || '32243' from dummy
like	like '%h_' like 'a[_]%' like 'a[^0-9]%'	like	like '%h_' like_regexpr ‘a[_].*$’ like regexpr ‘a[^0-9].*$’
case	select case when i>0 then 1 else -1 end from tb01	case	SELECT CASE WHEN i > 0 THEN 1 ELSE -1 END FROM tb01