CallidusCloud Commissions: Migration to SAP HANA in Record Time

Carina Kern, SAP & Rob Verschoor, SAP

Session ID: 84475

About the Speakers

Rob Verschoor

- SAP
- Vice President & Global Database Migration Lead
- Arrived at SAP via Sybase
- Global SAP Advanced SQL Migration tool program

Carina Kern

- Product & Solution Marketing Manager, SAP
- Products included e.g. SAP Big Data, SAP HANA, SAP HANA Blockchain Service, SAP ASE, and SAP Database Migration Program

Agenda

- What is the CallidusCloud Commissions application?
- Challenges for migration to SAP HANA
- How migration to SAP HANA was achieved
- SAP Resources for DBMS Migration

CallidusCloud - an SAP Company

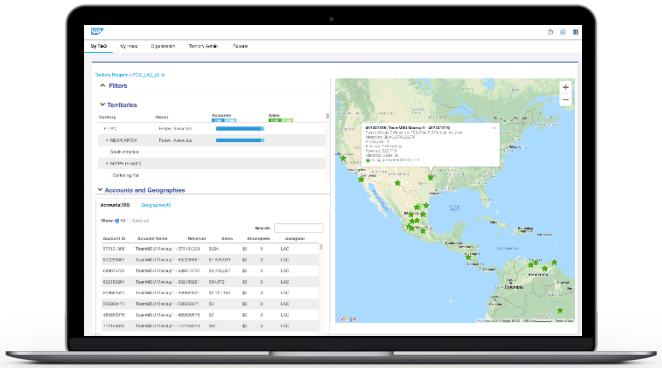
- Founded in 1996; public in 2003; based in Dublin, CA
- Cloud-based solutions for sales effectiveness & sales performance management
- Acquired by SAP in January 2018
- Main application: **Commissions** – now named **SAP Commissions**

SAP Commissions

Intelligent sales performance management

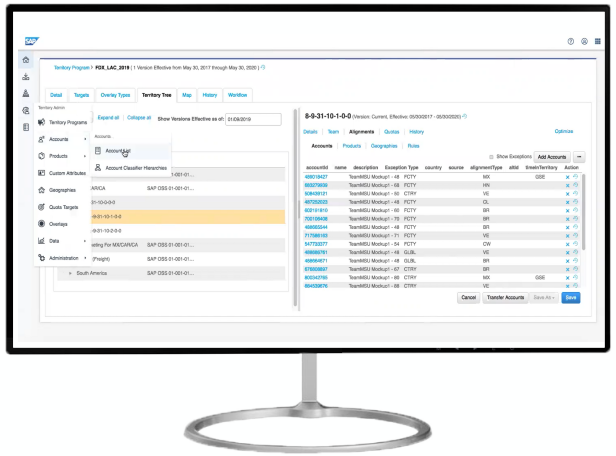
Sales Alignment

- Territory balancing
- Market optimization
- Resource mapping



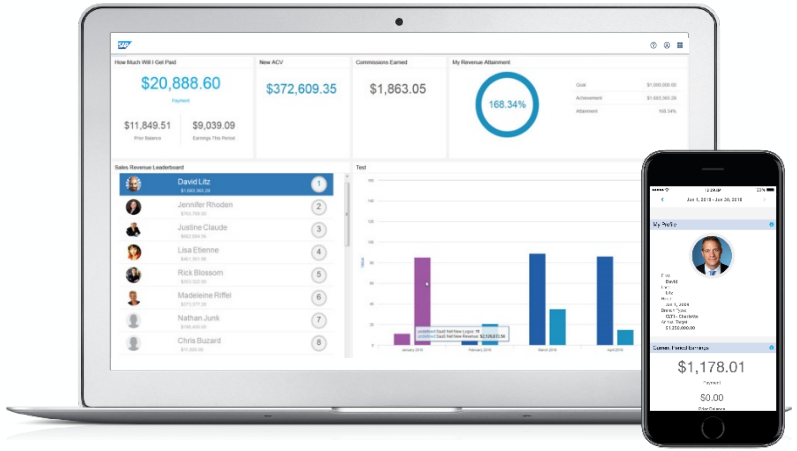
Sales Planning

- Quota harmonizing
- Financial planning
- Goal assignment



Sales Incentives

- Compensation modeling
- Incentive optimization
- Plan allocation



Benefits of SAP Commissions

- ✓ Saves **time** and **money** by automating the complete sales comp process
- ✓ Design and adjust **effective** incentive plans to increase revenue, boost targeted products
- ✓ Achieve corporate goals by **aligning** individual incentives throughout the organization
- ✓ Manage and measure multiple, **complex** plans
- ✓ Reduces **errors** and **overpayments**
- ✓ Decrease **disputes**, and speed plan **acceptance**.
- ✓ Provides **visibility** into quota attainment, and commissions payouts. Ends “shadow accounting”
- ✓ Grow channel and partner revenue

What does SAP Commissions do?

- **Cleans data** properly
- Reduce **manual errors**
- Pay the **right people** for every sale
- Balances territories
- Establishes fair quotas
- Reduces payment errors
- Process complex **splits** correctly
- Process **repayments** accurately

We support:

- Bonuses, **SPIFs**, rewards
- Splits
- Accelerators
- Draws - **recoverable & non-recoverable**
- Draw-downs
- Multi-dimensional rates
- Step-rate and tiered-rate tables
- Any territory configuration

Largest Customer:

>1M

Payees

Yearly transactions:

278+

Trillion

Average calculation runtime

13

Minutes

Gartner Magic Quadrant Leader

X6

Consecutive years

Lenovo utilizes [SAP] Commissions and gains better service delivery to its customers

REDUCED
multiple platforms to 1
for 4 global groups

REDUCED
commissions cycle from
months to once per week

60 countries
10K transactions per month
3,000 sales people

CHALLENGE:

Because Lenovo is a global company, they were challenged to find a consistent and common platform for managing sales plans, attainment, and payments across all geographies.

PRODUCT:

SAP Commissions

SOLUTION:

Lenovo turned to [SAP] and the Commissions solution to deliver one sales performance system globally that works across business units. With the Commissions component of the quote-to-cash solution, Lenovo can process commissions once a week, not just in one central office, but in several countries.

Lenovo

Scott Ottman
VP Sales Operations,
North America

“SAP gives us a much more robust solution and helps our business run faster and better.”

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Our customers range from startups to Fortune 500 companies

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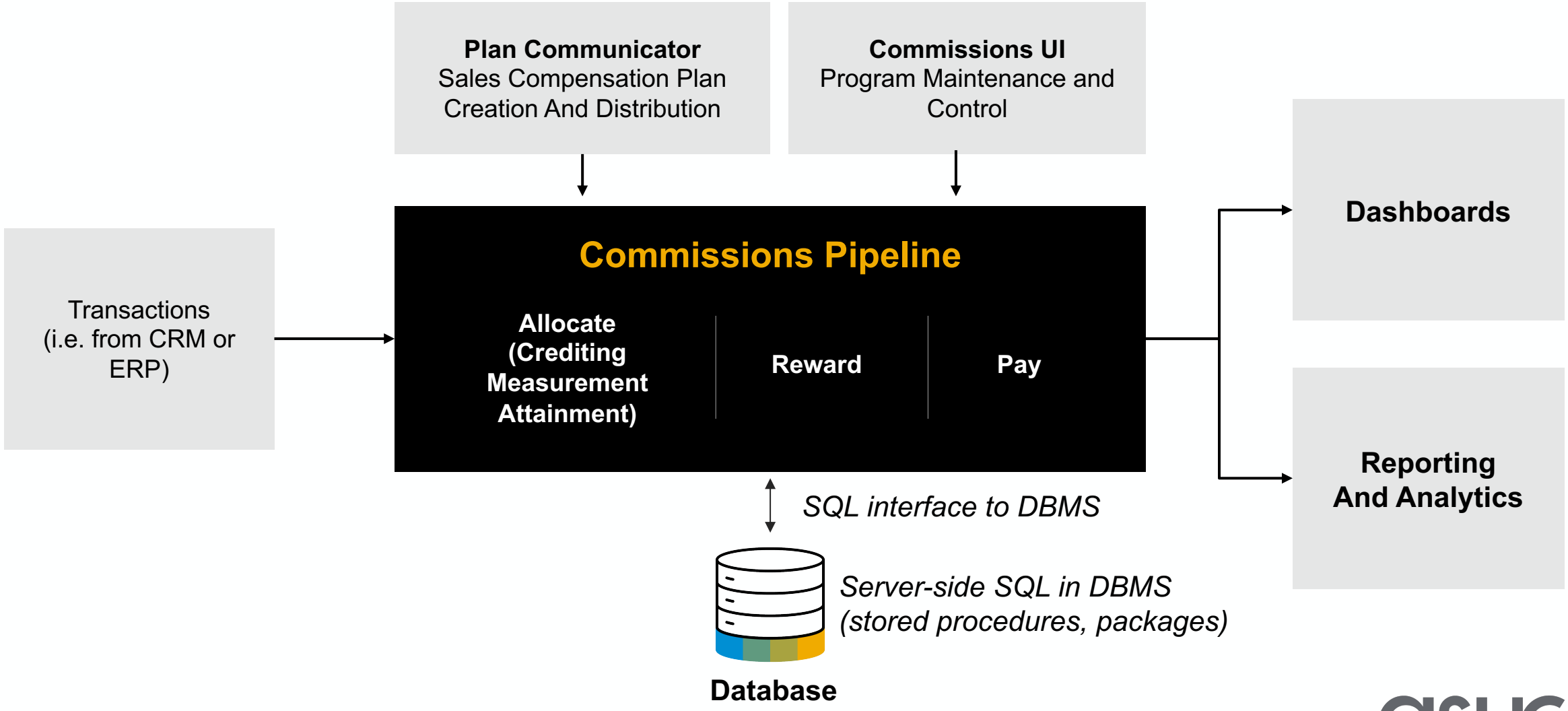
SAP Commissions Structure



Database complexity largely determined by SQL: SQL Metrics of the SAP Commissions application

Technically, database complexity is largely determined by SQL aspects

From a server-side SQL perspective, the SAP Commissions application looks like this:

- 1016 tables, 37 views; 13262 columns
- 397 indexes, 1538 constraints(905 CHECK, 391 PRIMARY KEY, 103 REFERENCES, 139 UNIQUE)
- 1 datatype definition, 4 sequences
- Procedural objects:
  - 105 PL/SQL packages
  - 1 PL/SQL function
  - 5 PL/SQL stored procedures
  - 2 triggers
- Total >200,000 lines of PL/SQL code in procedural objects

The challenge: migrate SAP Commissions to SAP HANA

- **Objective:** SAP Commissions application to run on the SAP HANA database
- **Why migrate:** Benefit from SAP HANA capabilities
- Generally, migrating complex SQL applications to a different DBMS is a complex, non-trivial activity
  - Complexity is primarily in conversion of existing SQL code to the SQL dialect of SAP HANA
  - Especially procedural server-side SQL code (stored procedures, packages, triggers)
    - Arbitrary complexity, arbitrary length (e.g. 1000's of lines of SQL code)
    - Differences between SQL dialects: syntax, but also semantics
  - …but plenty of other challenges too (data migration, HA/DR, operational procedures, connectivity, tools…)
- Converting 200,000 lines of SQL code is a huge challenge, by any standard

The challenge: migrate SAP Commissions to SAP HANA

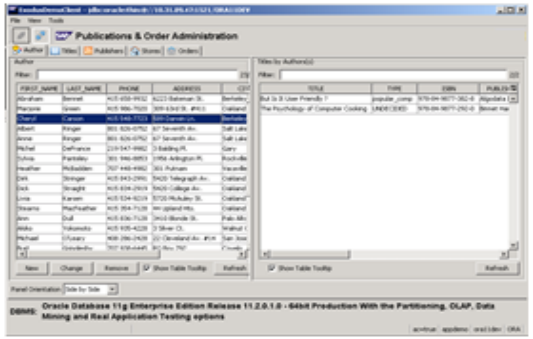
- 200,000+ lines of SQL code was reduced to 187,000 lines by eliminating non-required parts
  - Still huge!
- Initial estimate for migrating the application to SAP HANA was 18-24 months
  - So, is this really feasible?

Migration of custom (non-SAP) DBMS apps to SAP HANA

DBMS migration of custom apps involves many aspects

Current

Custom non-SAP app running on non-SAP database



MSSQL / Oracle / DB2 / Teradata / Netezza

COMPLEXITY!

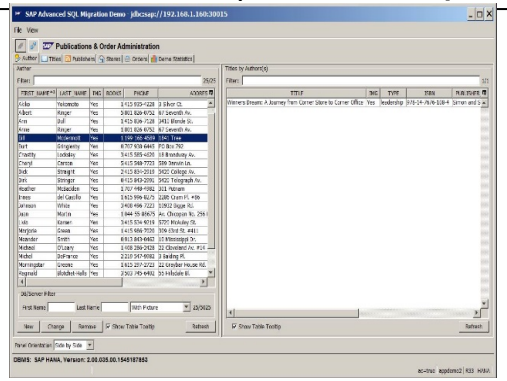
Aspects to consider:

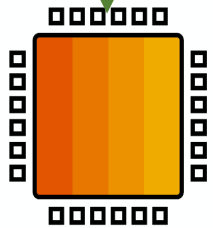
- Schema conversion
- SQL conversion
- Data migration
- Client/server connectivity
- Functional testing
- Performance testing

- Client app migration
- HA/DR
- Operational readiness
- Project Management
- Tech-skilled staff
- Cost, Risk, Duration

Target

Same custom non-SAP app on SAP database (cloud / on-prem)





SAP HANA

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Migration of Custom (non-SAP) DBMS Apps to SAP HANA

Success factors for DBMS migration

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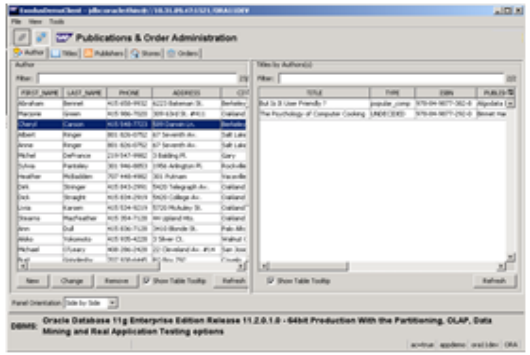
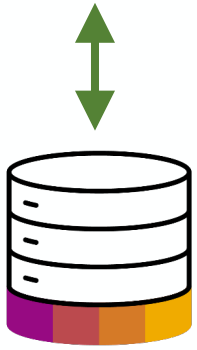




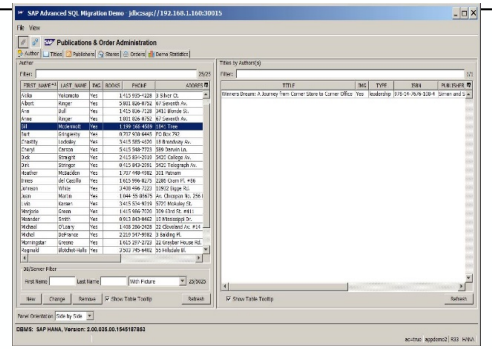
MSSQL / Oracle / DB2 / Teradata / Netezza

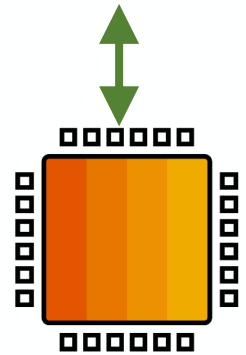
Success factors for DBMS migration:

- ✓ Highly automated conversion of schema and SQL code
- ✓ Deep technical SQL skills (source & target SQL dialect)
- ✓ Detailed application knowledge ("why was it done that way?")
- ✓ Migration project experience
- ✓ Availability of application test environment
- ✓ Customer commitment
- ✓ Executive sponsorship
- ✓ Project management skills
- ✓ Consulting services at acceptable price point

Target

Same custom non-SAP app on SAP database (cloud / on-prem)





SAP HANA

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SAP Advanced SQL Migration tool

A highly automated SQL conversion to SAP HANA

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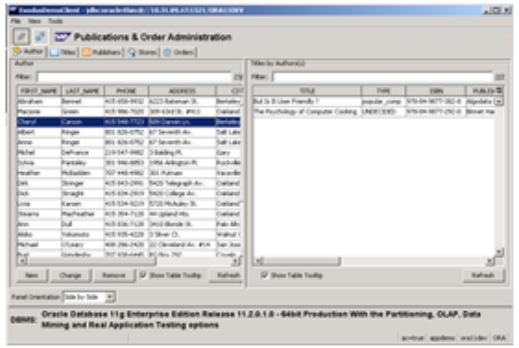
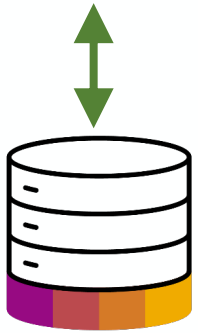
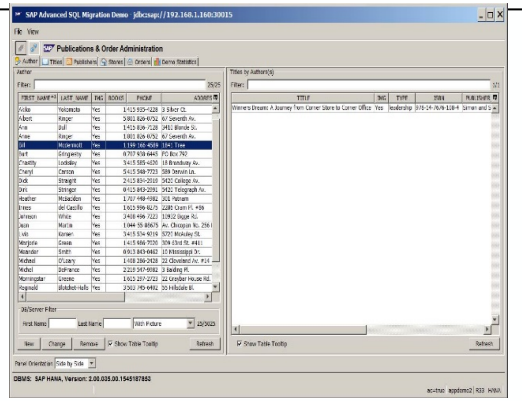


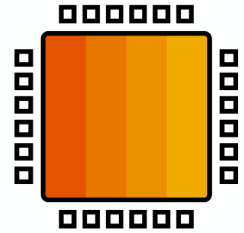


MSSQL / Oracle / DB2 / Teradata / Netezza

Target

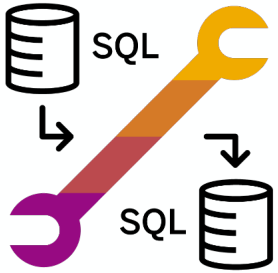
Same custom non-SAP app on SAP database (cloud/on-prem)





SAP HANA

- Available to SAP Partner Edge Partners and SAP employees



- Pre-migration Complexity Assessment
- Schema conversion
- SQL code analysis/conversion
- Gap analysis source vs. target DBMS

SAP Advanced SQL Migration tool

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The results: migrated SAP Commissions to SAP HANA

- With the SAP Advanced SQL Migration tool, SAP Commissions migration was completed in 6 months
- 93% of all SQL code converted automatically by SAP Advanced SQL Migration tool
- Migration project staffed by CallidusCloud team with support from the SAP HANA team
- CallidusCloud Commissions is now **SAP Commissions**, part of **SAP Sales Cloud**
  - New SAP Commissions customers will run on SAP HANA platform
  - Existing SAP Commissions customers to be migrated gradually to SAP HANA platform
- Benefits: cost reduction, performance, additional functionality

SAP Commissions

Runs Faster on SAP HANA

SAP Commissions on SAP HANA has been optimized to process transactions and analytics faster, for increased agility and real-time insights

Sales Territory Identification	**4X Faster**
Pipeline Calculation Run Time	**14% Faster**
Upload & Data Validation	**13X Faster**

How it was done: migrating SAP Commissions to SAP HANA

SAP Advanced SQL Migration tool

- Key technology enabler: SAP Advanced SQL Migration
- The SAP Advanced SQL Migration tool for Hana is new: released in July 2018
  - Requires Hana 2 Rev31 as minimum version
  - Supports migration from: MS SQL Server, Oracle, Teradata, DB2 UDB(LUW); under construction: Netezza
- The SAP Advanced SQL Migration tool is exclusively aimed at "custom non-SAP" applications
  - As opposed to traditional SAP applications based on ABAP/Netweaver -- migration practices already exist for those
- No other feasible custom-app migration tools for Hana available
- Custom applications often used server-side SQL (stored procedures etc.) - most complex aspect of SQL migration

How it was done: migrating SAP Commissions to SAP HANA

Complexity Assessment

- Step 1: pre-migration complexity assessment of original SQL application
  - ✓ Analyze schema and SQL code
  - ✓ Result: detailed report of all SQL features used in the application
  - ✓ Identify which features cannot be migrated automatically to the target DBMS, and require manual intervention
  - ✓ Migration challenges categorized by impact level:
    - "may require redesign" : biggest impact
    - "may require rewrite" : less impact, can be resolved locally
    - "needs manual verification or correction" : smaller things, least impact

Example: Identifying all SQL features/constructs used

(actual migration tool output)

```
[…]                                                                    Effort estimate
   Nested procedure/function declaration : 1                           -to be determined-
      Verify identifiers, parameters, declarations after de-nesting
   Overloaded procedure/function : 520                                 -to be determined-
      Verify renamed procedure/function declarations/calls
      Procedure call, resolved/renamed : 442
      Procedure declaration : 71
      SQL Function call, resolved/renamed : 4
      SQL Function declaration : 3
   SELECT statement : 1569                                  0          Fully converted
   SELECT-INTO statement : 3115                             0          Fully converted
      BULK COLLECT INTO : 13
   SELECT subquery : 721                                    0          Fully converted
   INSERT statement : 761                                   0          Fully converted
      INSERT..RETURNING : 49
      INSERT..SELECT : 60
      INSERT..VALUES : 698
   UPDATE statement : 769                                   0          Fully converted
   DELETE statement : 754                                   0          Fully converted
[…]
```

Example: Identifying all SQL features/constructs used

(actual migration tool output)

	Effort estimate	
[…]		
TRUNCATE TABLE statement : 3	0	Fully converted
MERGE statement : 6	-to be determined-	
Additional manual conversion may be required		
Common Table Expression(WITH...AS) : 1	0	Fully converted
UNION operator : 151	0	Fully converted
UNION ALL operator : 10	0	Fully converted
MINUS/EXCEPT operator : 7	0	Fully converted
Oracle Outer Join query (+) : 138	-to be determined-	
Verify correct conversion to ANSI OJ syntax		
Outer join predicate : 391		
OLAP query : 1	0	Fully converted
SELECT..OVER : 1		
ROWID pseudo-column : 10	0	Fully converted
ROWNUM pseudo-column : 38	0	Fully converted
ROWNUM => LIMIT : 38		
Cursor declaration : 605	0	Fully converted
Parametrized cursor declaration : 46		
Cursor FETCH : 547	0	Fully converted
Cursor OPEN/CLOSE : 2870	0	Fully converted
[…]		

`0` : automatically converted, expected to be functionally correct

`-to be determined-` : not automatically converted, some sort of effort required

How it was done: migrating SAP Commissions to SAP HANA

Complexity Assessment

- Step 2: evaluate pre-migration complexity assessment
  - ✓ Identify "redesign" parts and find solution direction
  - ✓ Identify (and remove) obsolete parts of the application
  - ✓ Rough effort assessment (difficult!)
- Step 3: Go/no Go decision
- Step 4: Assemble team with required skills
  - ✓ Commissions application architects
  - ✓ HANA SQLScript specialists
  - ✓ PL/SQL specialists
  - ✓ Project management
  - ✓ Migration tool support

How it was done: migrating SAP Commissions to SAP HANA

SQL code conversion

- Step 5: start the migration project
  - ✓ Conversion to HANA SQL/SQLScript code with SAP Advanced SQL Migration
    - Migration tool generates ready-to-run scripts, can be executed directly against a HANA server
    - Some iterations to determine optimal configuration settings in the migration tool
  - ✓ First execution of generated HANA SQL (out-of-the-box):
    - all 532 tables created without error
    - 25 of 37 views created without error
    - stored procedures/functions: 482 of 1574 (31%) created without error; 1092 syntax errors to be resolved (~25% are follow-up errors)
  - ✓ From here, handover to manual migration phase - the "real" project starts

How it was done: migrating SAP Commissions to SAP HANA

Manual migration phase

- Implement workarounds for "redesign" issues
- Fix the "rewrite" issues
- Fix remaining syntax errors
- Manually convert dynamically generated SQL statements
- Data migration
- Perform functional application testing
- Apply required changes to client-side SQL queries
- Migrate client-server connectivity (JDBC)
- Adjust operational/production procedures
- Go live

Specific technical conversions: some examples

Automatically converted by SAP Advanced SQL Migration

- Oracle outer join syntax (`WHERE a(+) = b`) converted to ANSI OJ syntax (28 cases)
- Date/time arithmetic (200+ cases)
  - Oracle: `vStartDate + (nIndex - 1) * 13 * 7`
  - Hana: `ADD_SECONDS(vStartDate , (86400*(CAST(((:nIndex - 1) * 13 * 7) AS INT))))`
- ROWNUM pseudo-column: converted to `LIMIT` or `ROW_NUMBER() OVER ()` (400+ cases)
- Catalog queries: converted to Hana equivalent (100+ cases)
  - e.g. `USER_TABLES` ➔ `SYS.M_TABLES`
- Nested or overloaded declarations/calls of procedures/functions (2000+ cases)
- Built-in functions with no direct functional Hana equivalent, converted to custom-written SQL functions (1000+ cases)
  - e.g. `TRUNC(<datetime>), SYS_CONTEXT(), NVL2(), NEXT_DAY(), REVERSE(), TABLE()`
- SQL code generated to compensate for HANA semantics for concatenation of NULL strings

Redesign/rewrite issues: some examples

- Collection datatypes and -operations
  - ✓ Converted by the migration tool, but preferable to redesign
- Table-in-table structures
- UTL_FILE package calls
- CONNECT BY
- Dynamically declared SELECT statement in cursor
- DELETE..RETURNING, UPDATE..RETURNING

SAP Customer Offerings for DBMS Migration

How SAP helps you migrate your custom DBMS applications

- Custom-app DBMS migration is not trivial
- Historically, SAP was not active in the custom-app space and did not offer solutions
- SAP now provides two main elements to assist customers/partners:

1. Technology: the **SAP Advanced SQL Migration** tool
   - Cracks the problem of converting between SQL dialects
   - Tool available to SAP Partner Edge partners; free of charge (but some paperwork required)
   - Contact: Advanced_SQL_Migration@sap.com
2. Delivery capability**: SAP Global Database Migration Factory**
   - Connects SAP services partners with customers, for doing migration projects
   - Contact: migrationfactory@sap.com

SAP Advanced SQL Migration tool

A highly automated SQL conversion to SAP HANA

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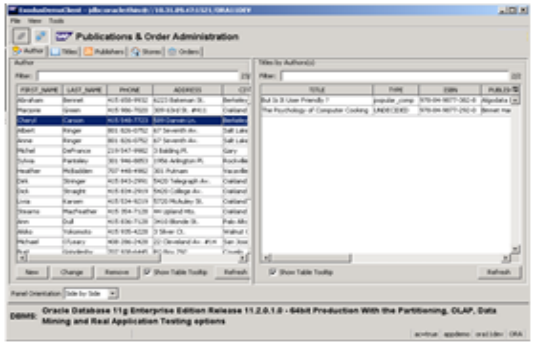
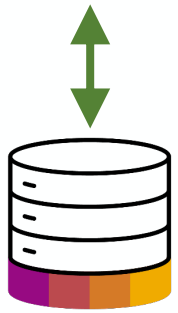
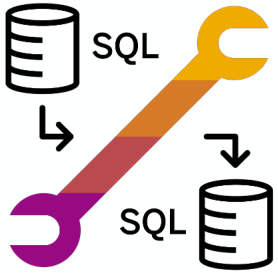




MSSQL / Oracle / DB2 / Teradata / Netezza

- Available to SAP Partner Edge Partners and SAP employees



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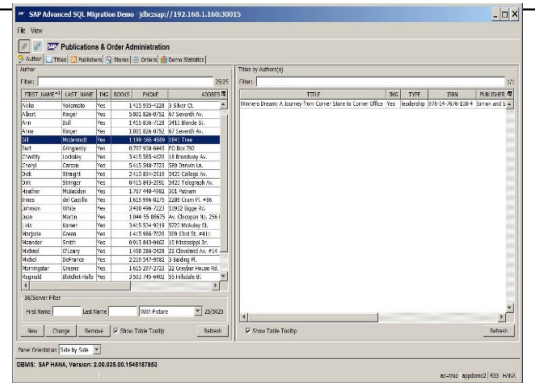

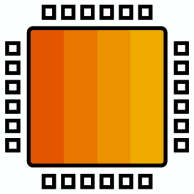

SAP HANA

SAP Advanced SQL Migration tool

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Skills & Staffing for Custom App DBMS Migrations

Where to find skilled resources for PoCs or projects

Current

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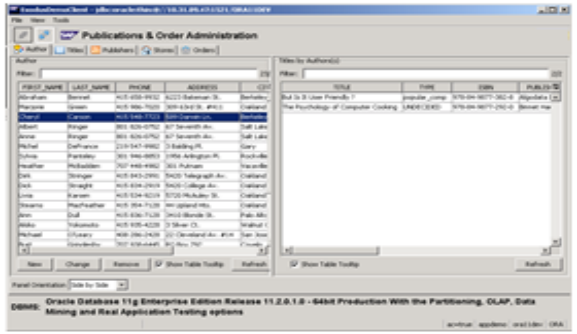

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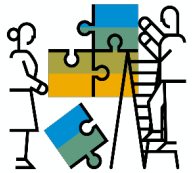
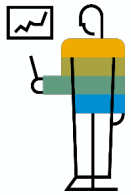
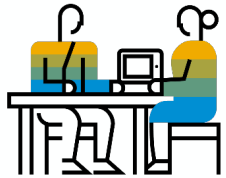


MIGRATION PROJECT





- ✓ SAP Global Database Migration Factory
- ✓ SAP Services Partners
- ✓ SAP Consulting / SAP Services
- ✓ SAP Presales/CoE

Target

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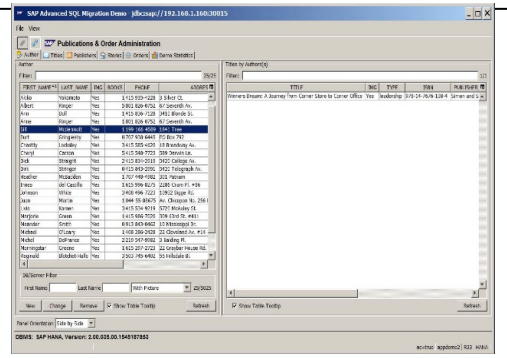

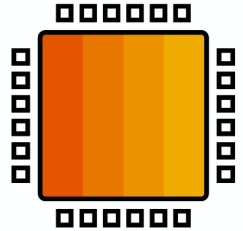

SAP HANA

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SAP Advanced SQL Migration: Supported databases

— SAP Advanced SQL Migration currently supports (v.3.x, Q1 2019):

Source DBMS types

- Oracle (v.9/10/11/12); >80-90% automatic conversion ratio
- Microsoft SQL Server (v.2000-2012); >90-95% automatic conversion ratio
- IBM DB2 UDB (LUW, v.9.x); >75-85% automatic conversion ratio
- Teradata; >75-90% automatic conversion ratio (only SAP Hana as target)
- Netezza; under construction (only SAP Hana as target)

Target DBMS types

- SAP Hana (requires Hana 2 SP03 Rev31)
- SAP ASE
- SAP SQL Anywhere
- SAP IQ

SAP Advanced SQL Migration is **Unicode-enabled** for the migrated SQL code/schema

- API is in English only

NB: conversion ratios shown above reflect typical averages in observed cases; results may vary.
NB2: More recent source database versions than listed above, should generally work fine as well

DBMS migration aspects supported by SAP Advanced SQL Migration

A. Pre-migration complexity/risk assessment → decision to proceed

B. Schema migration
- Performed by migration tool; migrated schema consistent with migrated SQL

C. Data migration (currently no migration tool support)
- Use ETL tools, SAP/Sybase ECDA/DirectConnect; SAP/Sybase Replication Server; SAP Data Services (etc.)

D. Server-side SQL migration
- Vendor-specific source SQL (PL/SQL, T-SQL) converted to the target DBMS SQL dialect (SQLScript, T-SQL, Watcom SQL)
  - Stored procedure, functions, packages, etc.
- 90%+ of migration effort goes into SQL migration
- Most migration overruns and failures occur here

E. Client-side (application-generated) SQL migration (migration tool support for ad-hoc SQL query conversion)
- Client-side SQL may or may not be hard to capture or locate in app source code - "it depends"
- Fortunately, most application-submitted SQL code is usually quite simple

F. Client application specifics, Client-Server connectivity (no migration tool support)
- Java/JDBC? Native OCI? Oracle Forms?

G. DBA tools (partial migration tool support)
- Catalog queries partly converted

H. Application testing (functional, performance) (no migration tool support)

What SAP Advanced SQL Migration is NOT

The SAP Advanced SQL Migration tool:

- Is not an SAP product
- Is not for migrating SAP applications (e.g. Business Suite/ERP/ECC, BW, R/3, S/4) - only for custom non-SAP applications
- Is not charged for
  - SAP Revenue comes from licenses for SAP databases, and services
  - Partner revenue comes from services
- Is not downloadable
- Does not provide any guarantees
- Unlikely to always deliver 100% automatic SQL migration coverage
- Does not attempt to optimize the application's architecture or algorithms, but rather aims to convert to a 1-to-1 functional equivalent in the target DBMS
- Is not a full-service migration tool covering all aspects of a migration
  - Does not support data migration (use Replication Server, ECDA, Data Services, etc.)
  - Does not support migration of client applications, DBA tools
  - Does not support GUI migration
  - Does not provide automated testing
- Is not an application development lifecycle tool
- Not required to run against a production database (does not access any data)
  - For Teradata/Netezza, database connection not supported, so must use reverse-engineered scripts
- Is designed for use by SQL Experts - strong SQL skills required!

Database Migration Resources

Rob Verschoor
Vice President & Global Database Migration Lead
Rob.Verschoor@sap.com

For more information:

www.sap.com/database-migration

SAP Advanced SQL Migration: Advanced_SQL_Migration@sap.com (Rob Verschoor)

SAP Global Database Migration Factory: migrationfactory@sap.com (Trilok Rajesh)

Q&A

For questions after this session, contact us at rob.verschoor@sap.com and carina.kern@sap.com

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http://info.asug.com/2019-ac-slides

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