PLANNING AND EXECUTING A SUCCESSFUL SQL SERVER DATABASE MIGRATION

Presented By: Carlos Colón | November 12, 2016

Presentation Topics

- Typical SQL Server Migration Plan
- Key Deliverables
- Database Migration Steps
- Brief Overview of SQL Server Migration Assistant Tool (SSMA)
- Common Problems in Database Migrations

What is NOT Covered

- Detailed SSMA Tutorial
- DBMS Specific Migration Information
- How to Build Target SQL Server System

Goals

By the end of the presentation you will:

- Understand at a high level how to migrate a database to SQL Server
- Know how to avoid surprises by better planning
- Leverage SSMA as both a planning and a migration tool

Presenter Info

- 20 years of experience in database development, administration, and project management
- B.S. in Management of Information Systems – USF
- Dobler Consulting lead of DBA Managed Services practice

SQL Server Migration Challenges

- All database migration projects are unique
  - Differences in DBMS, configurations, SQL code, front-end applications, third-party tools, etc.

- Not all database system components can be migrated
  - In most cases, logins cannot be migrated
  - Third-party applications may not be compatible with SQL Server
  - Embedded and dynamic SQL code has to be migrated manually
  - Applications may require new drivers/connectors

- Scope of database migration project can be quite large
  - Migration effort can include thousands of database objects and lines of code
  - Not enough time to perform full regression/performance testing

Steps for Overcoming Challenges

- Thoroughly analyze existing database system
  - Identify all components that must exist in target SQL Server environment

- Develop an approach for each component that will require manual migration
  - Consider grouping components by categories that will implement the same approach (i.e. replace current transactional replication and failover solutions with AlwaysOn).
  - Evaluate risks and contingency options

- Include adequate time for migration testing
  - Plan to execute your database migration as many times as possible in your test environment
  - Develop test approach to minimize risks
  - Practice makes perfect!

Typical SQL Server Migration Plan

I. Analysis
II. Planning
III. Build
IV. Migrate, Test, Fix, Repeat
V. Deployment
VI. Support

Analysis Deliverables

- System Architecture Diagrams
  - Map all components of AS-IS and TO-BE systems
- System Configurations
  - Operating System, DBMS, Applications and Third Party tool versions
  - For database, look for Collation, ANSI defaults, Quoted Identifier settings
- Hardware Specifications
  - Identify server and storage requirements for target system
  - Unless you are migrating to an existing SQL Server, you will need to order new hardware early in the project

Planning Deliverables

- Environment Plan
  - Outline of environments to be used in migration project
  - States what components from AS-IS and TO-BE systems will be included
  - Document who will use the environment and when

- Project Schedule
  - Leverage SSMA Migration Reports for estimating effort

Planning Deliverables

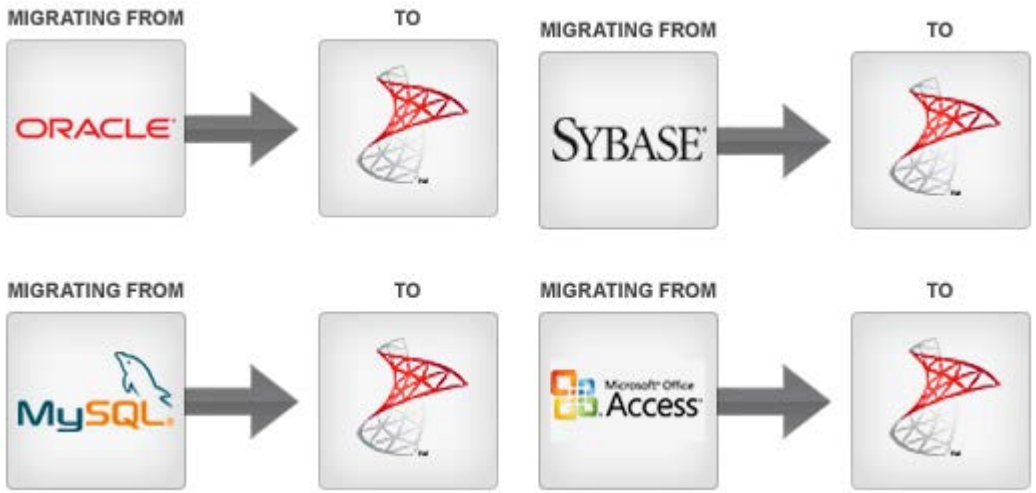
- Change/Source Code Version Management Plan
  - Change happens, and you better be ready for it
  - Develop a strategy to incorporate changes to source system without disrupting migration schedule
  - Create new source code repository for migrated database objects

- Production Contingency/Back out Plan
  - Get management buy-in early in the project
  - Agree on checkpoints and who makes GO/NO-GO decisions
  - Agree on criteria to implement contingency plan

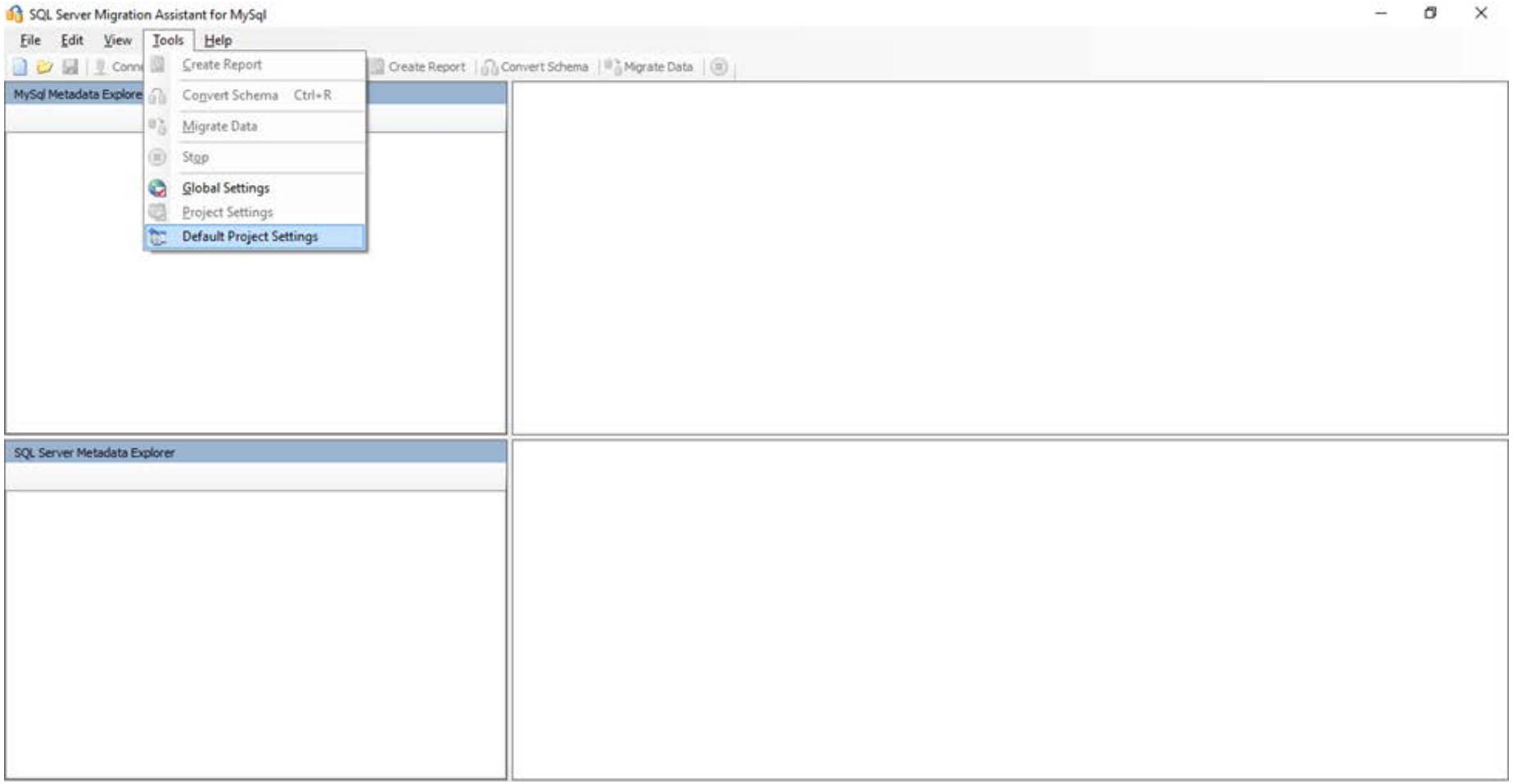
Intro to SSMA Tool

- SQL Server Migration Assistant Overview
  - Provides detailed migration assessment report with effort estimates
  - Automates schema and data migration
  - Available for five DBMS: Oracle, Sybase, MySQL, Access, and DB2
  - Capable of migrating source DBMS to SQL Server 2005 or higher and to SQL Azure

NEW!



SSMA Configuration



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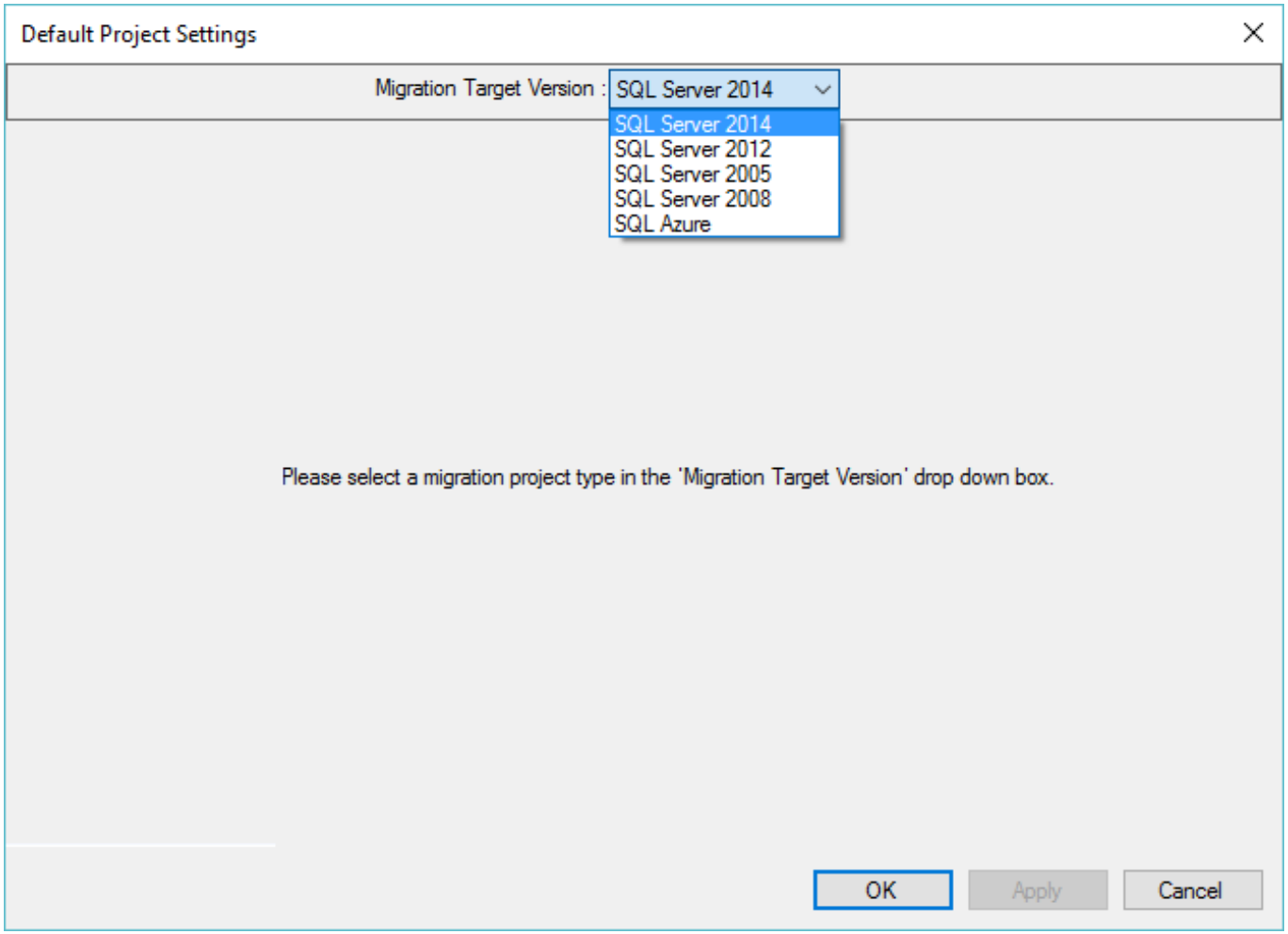

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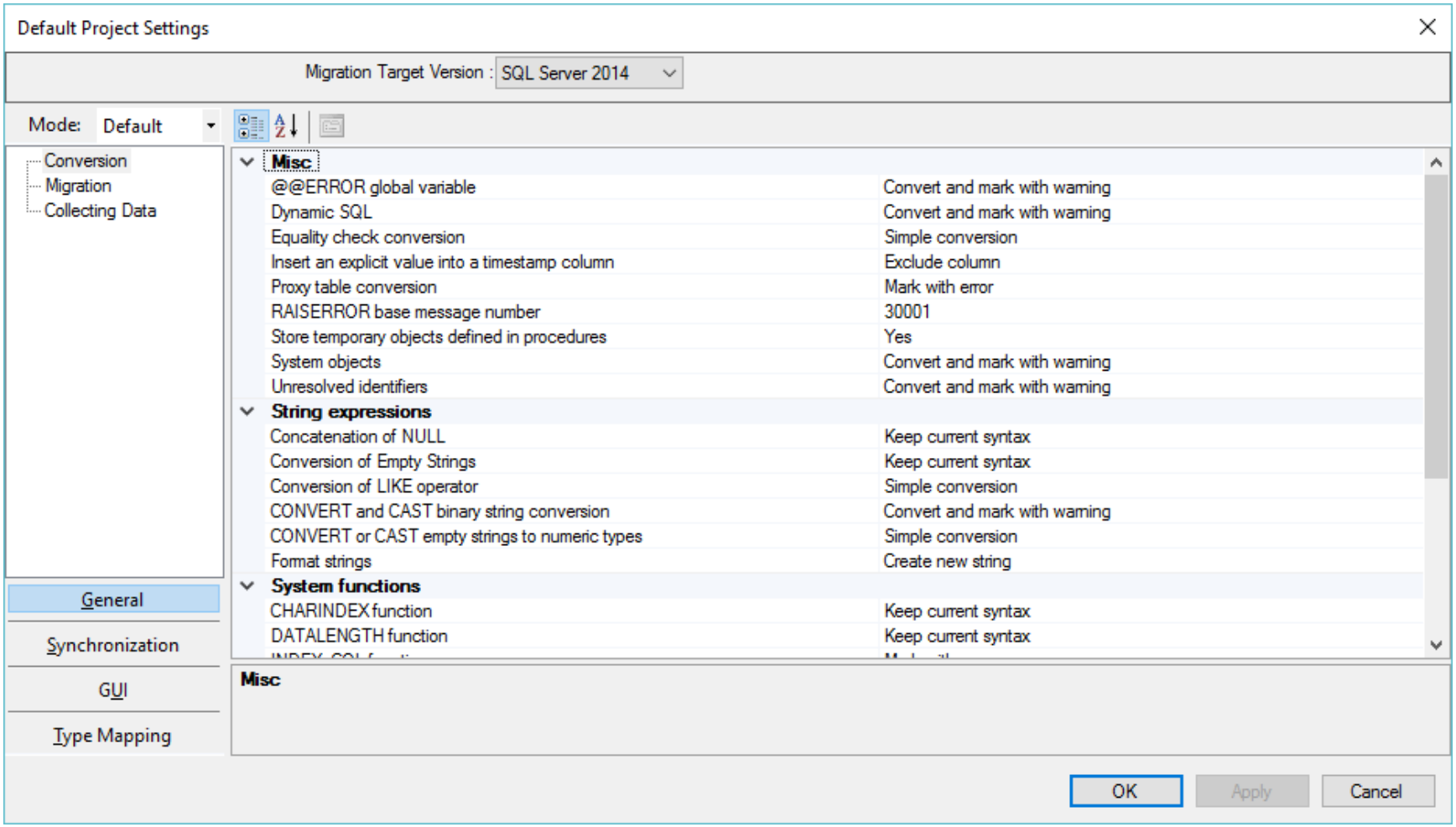

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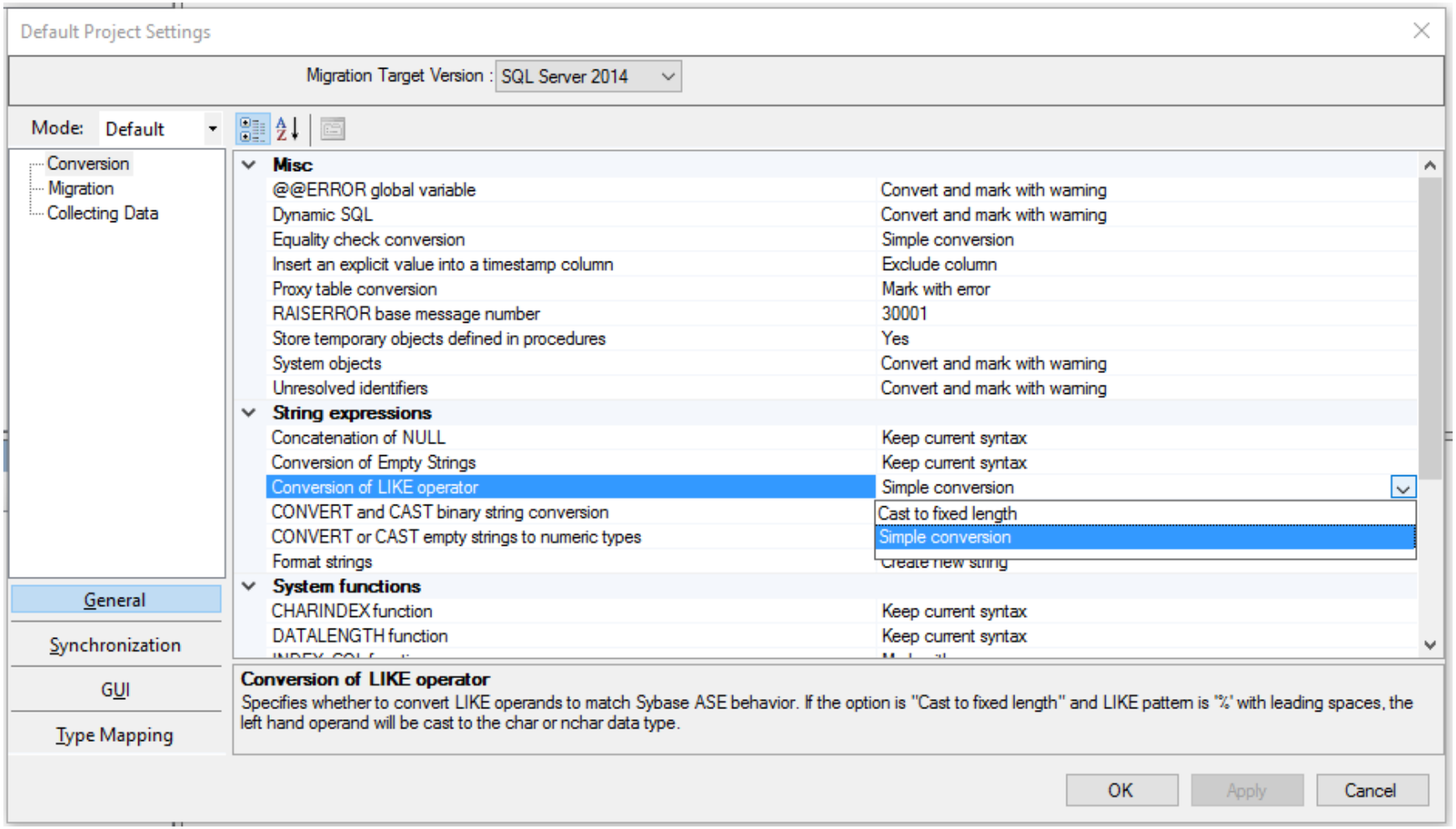

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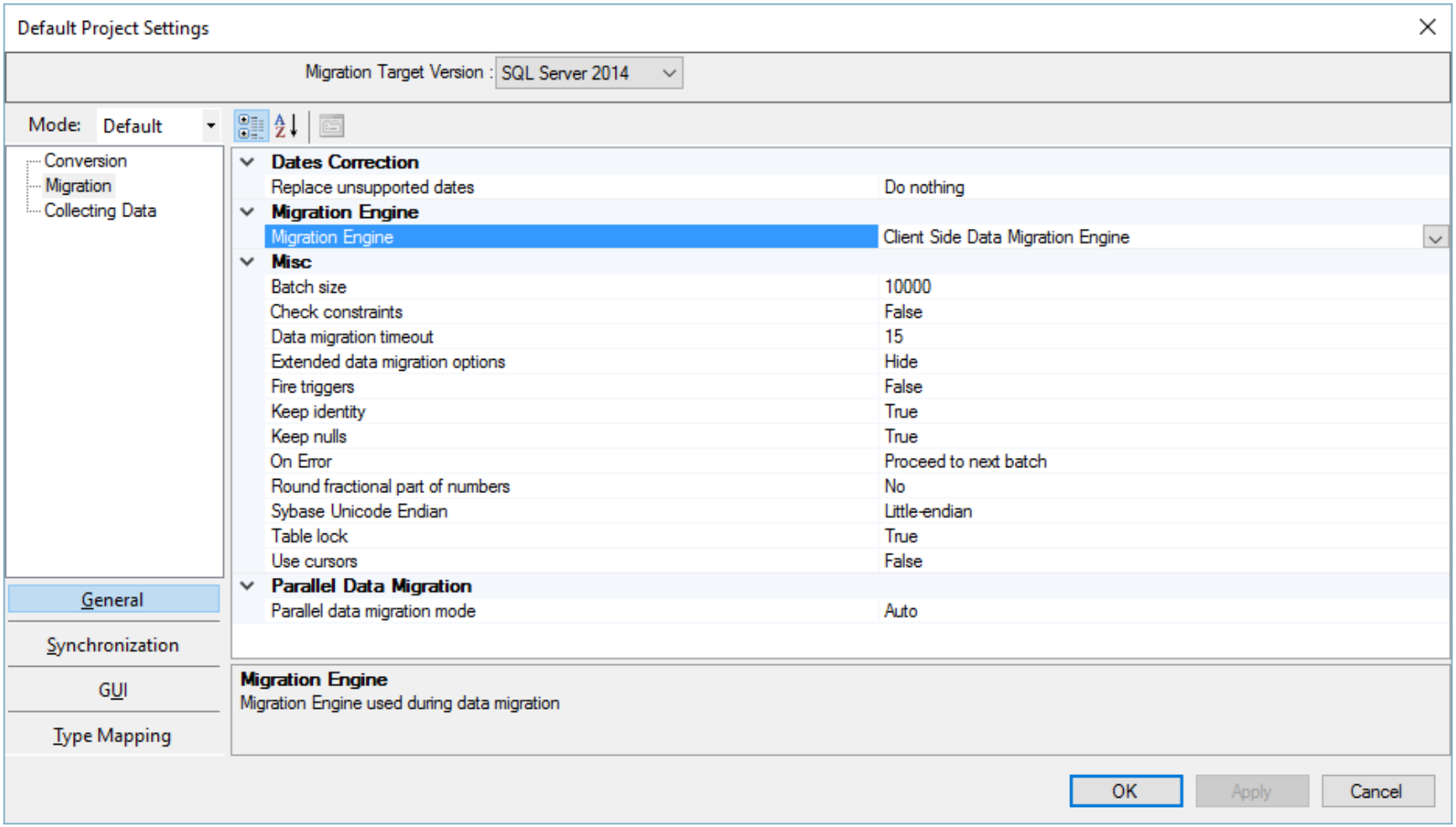

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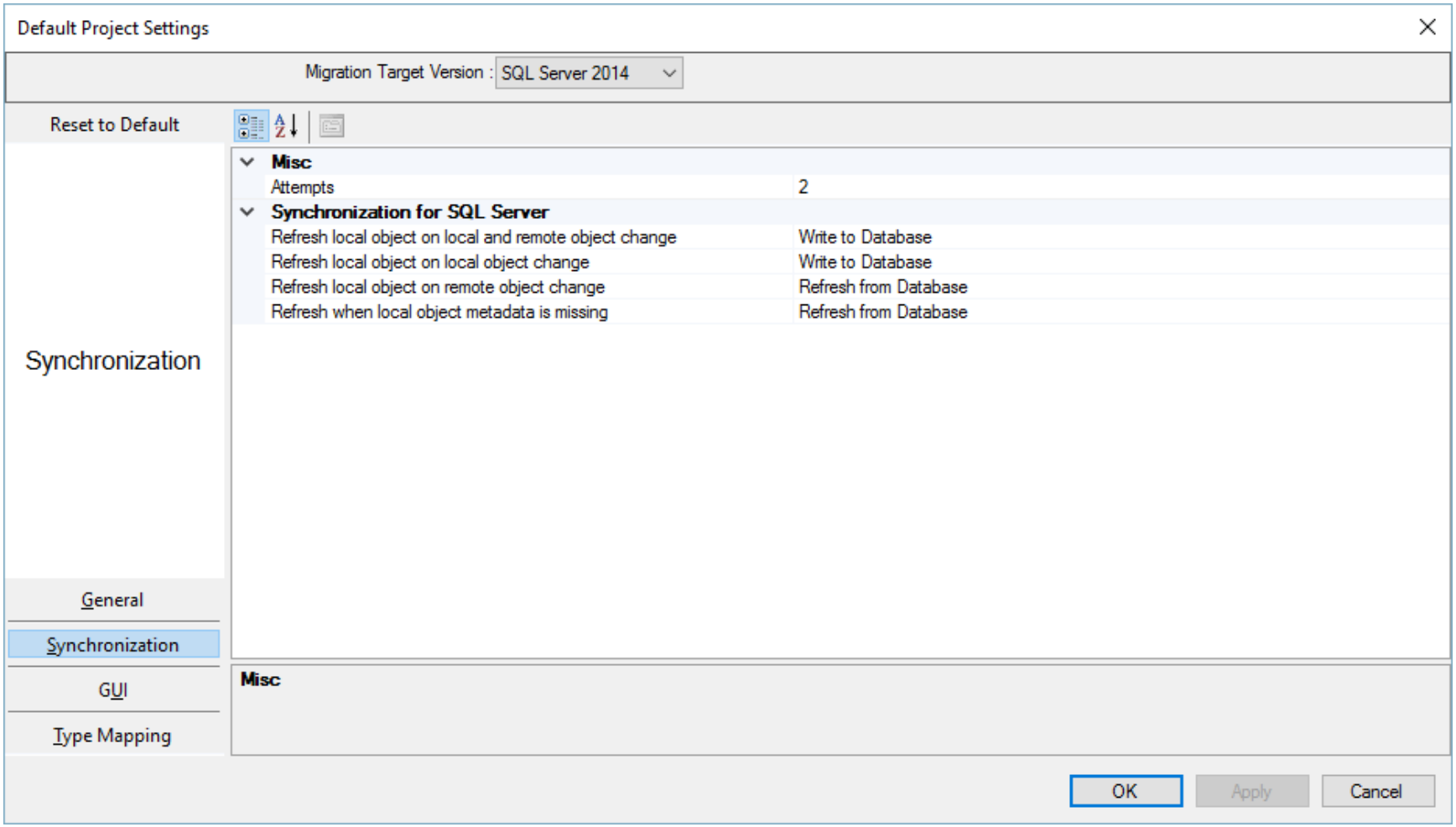

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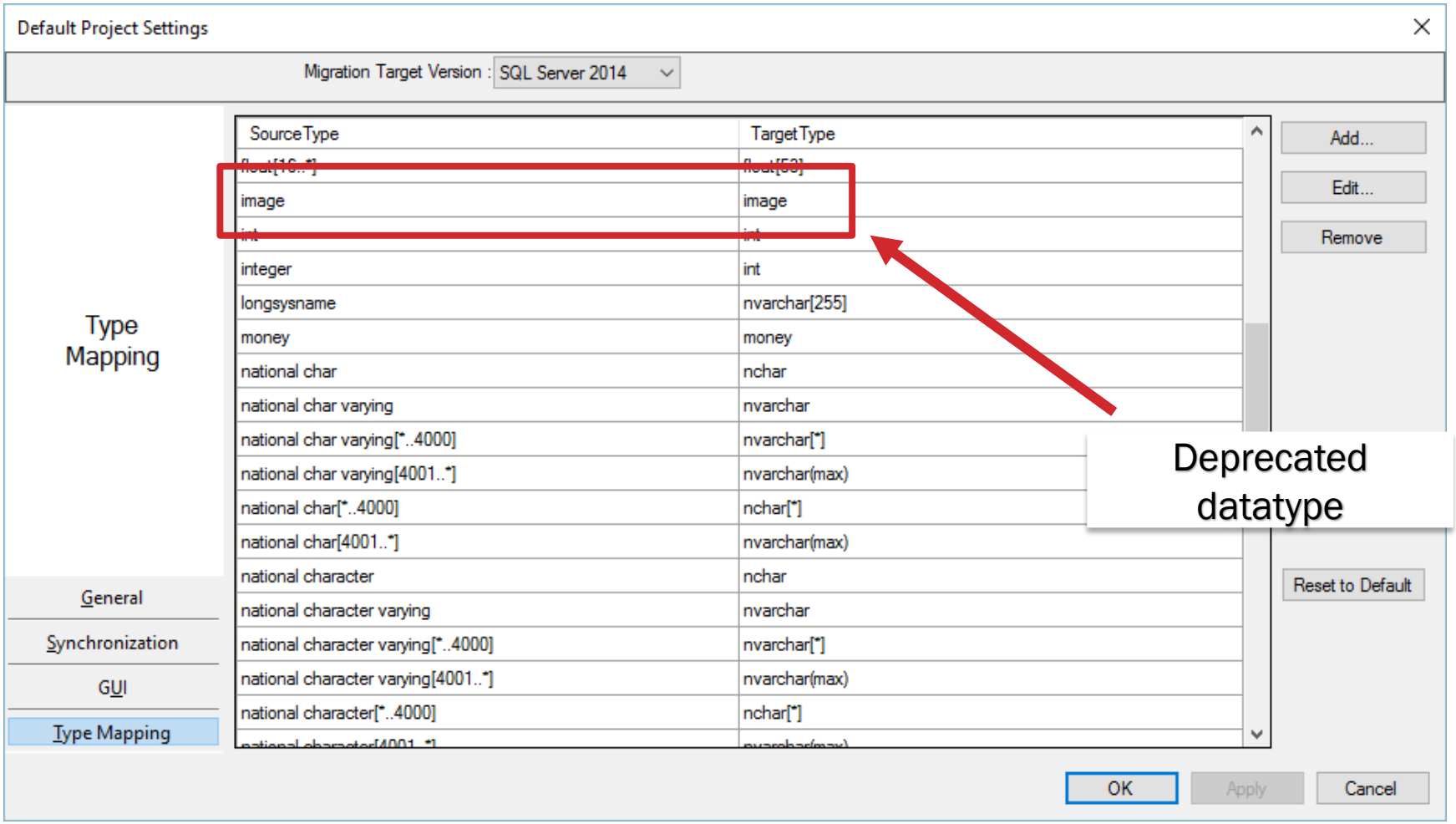
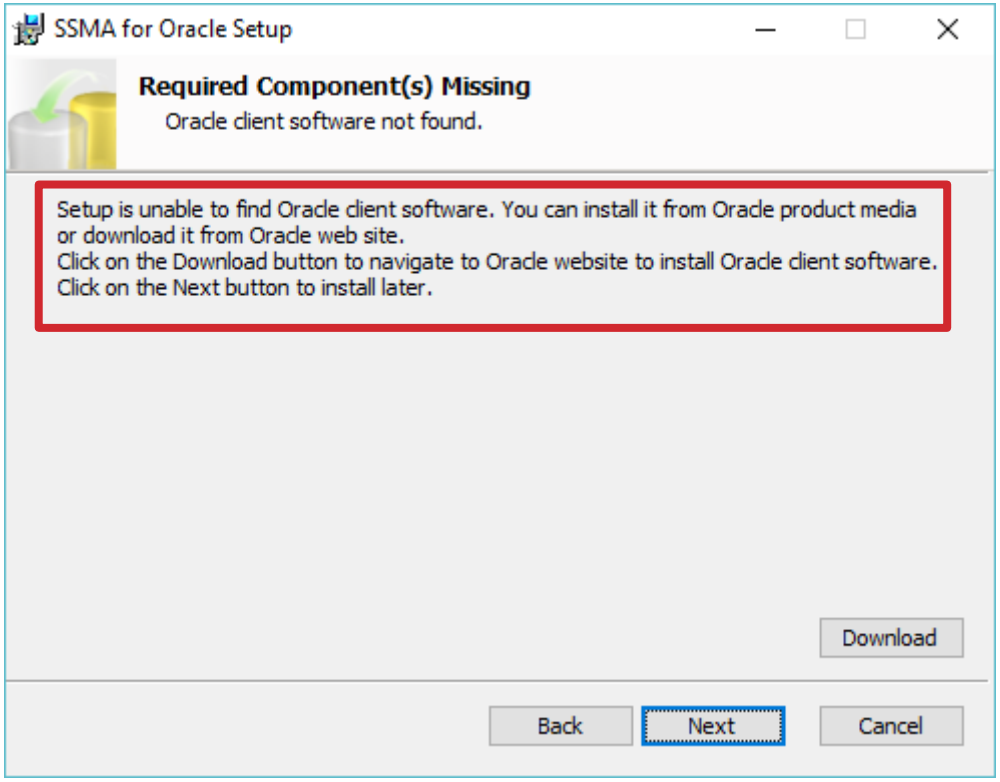


Verify Drivers



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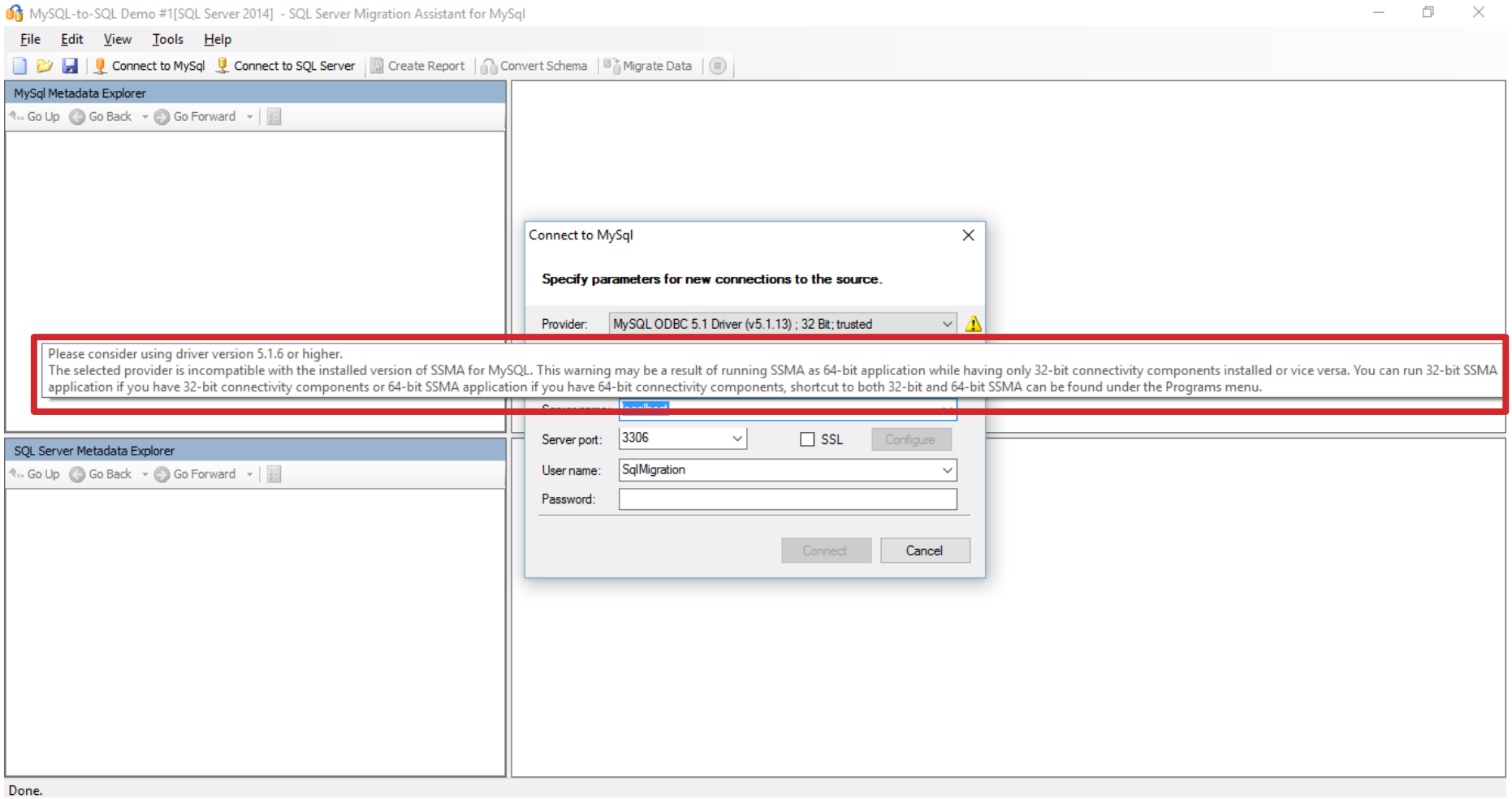

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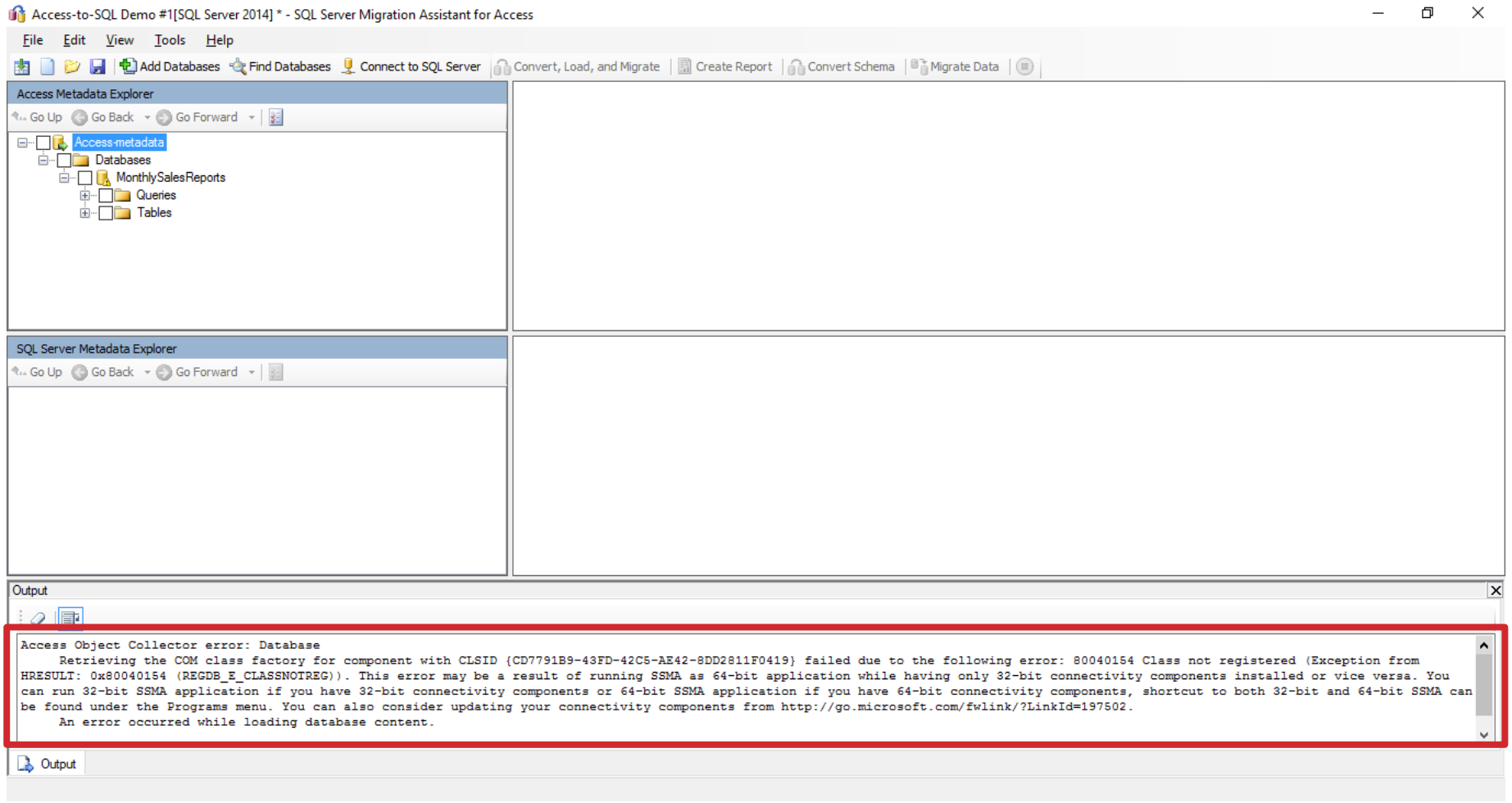
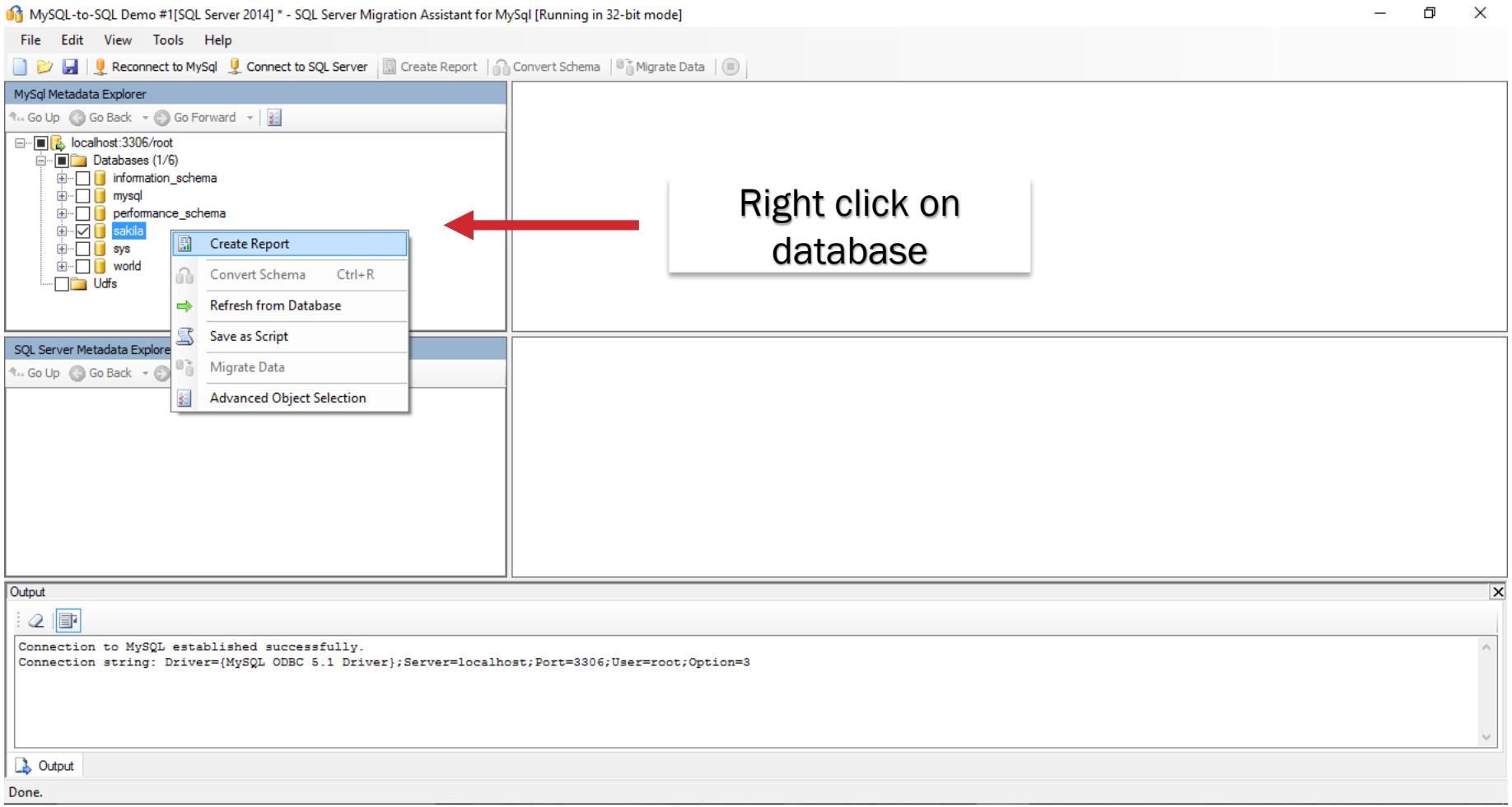


SSMA as a Planning Tool

- SSMA features a Database Migration Assessment Report
  - The report lists all database objects that will require manual effort for conversion
  - Indicates the reason objects cannot be migrated automatically
  - Provides rough estimates on manual effort

- Perform a test conversion to uncover additional issues
  - SSMA may not catch all possible migration issues
  - Errors may appear when loading migrated objects to SQL Server (i.e. improper use of quoted identifiers, computed columns, etc.)
  - Do a test conversion to get a full picture of migration assessment

SSMA Migration Assessment Report



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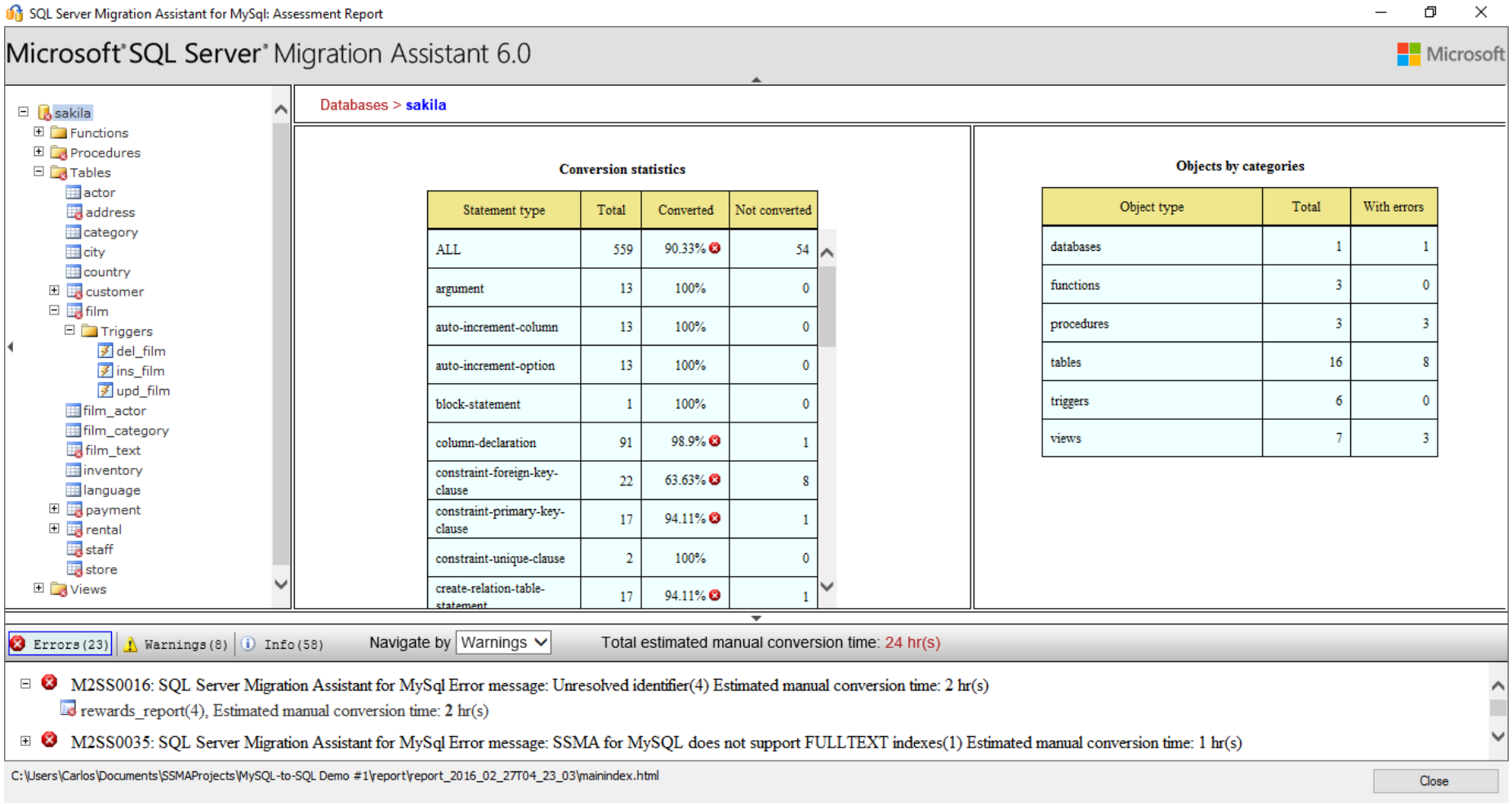

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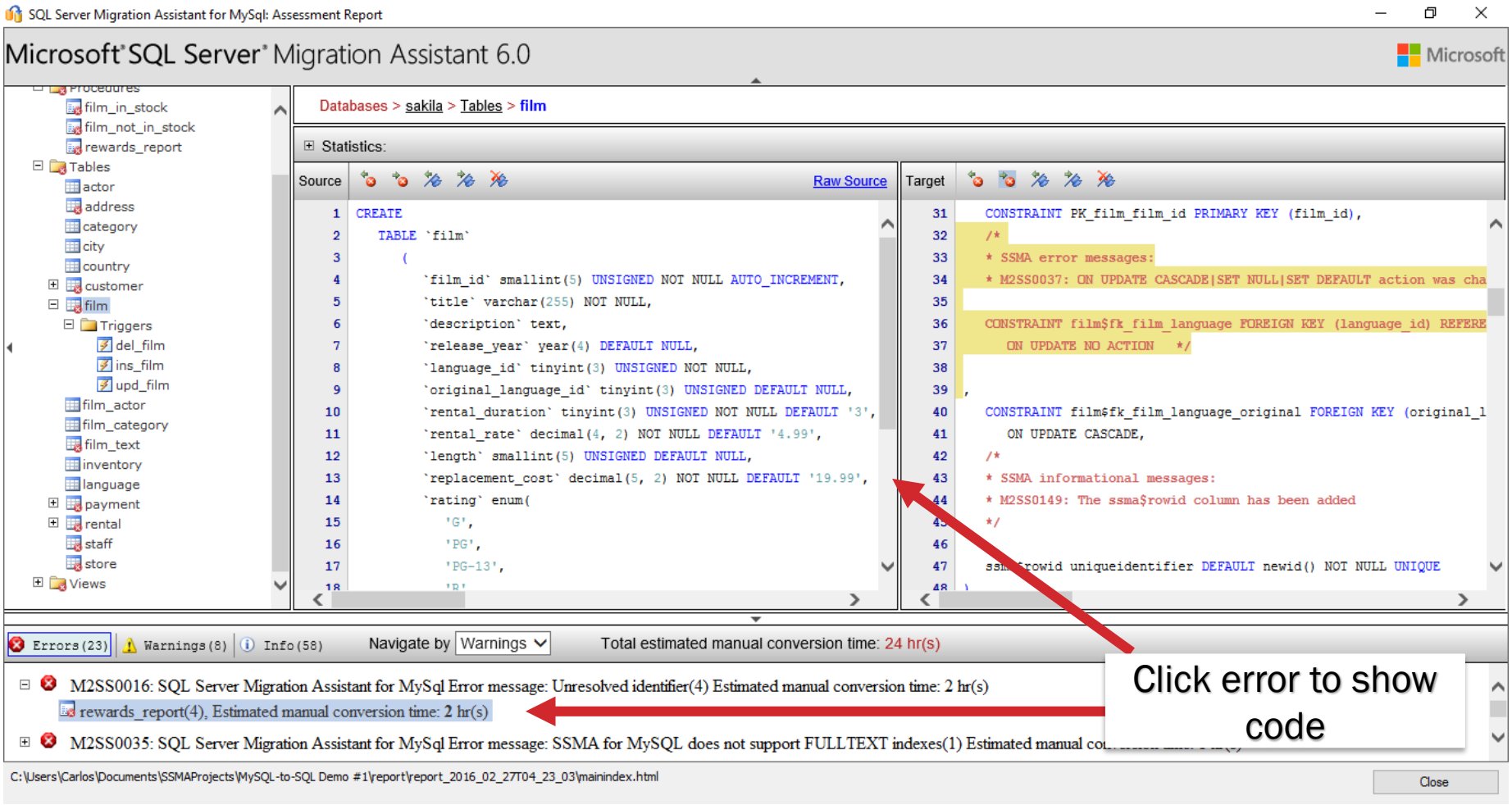
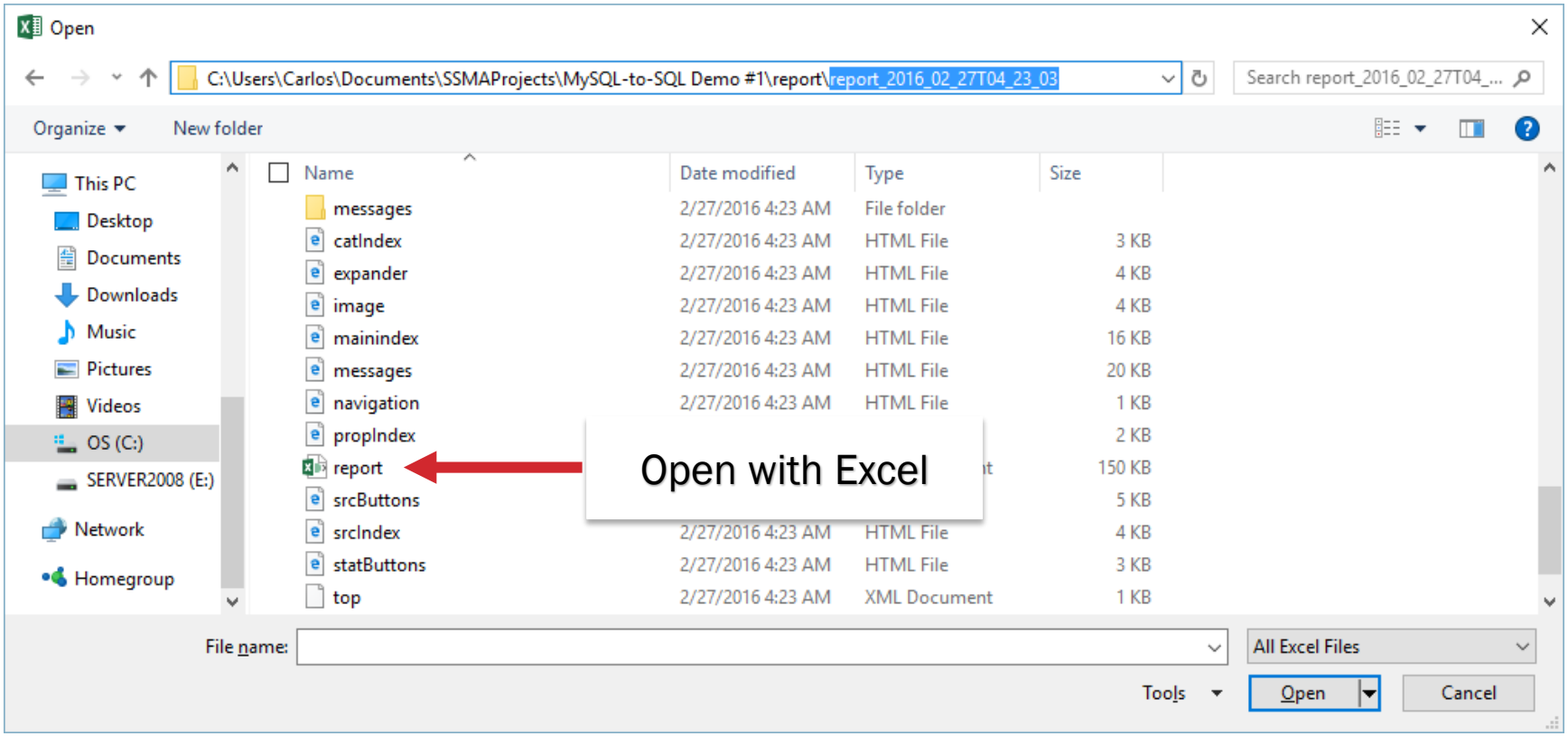


How to Access Saved Report



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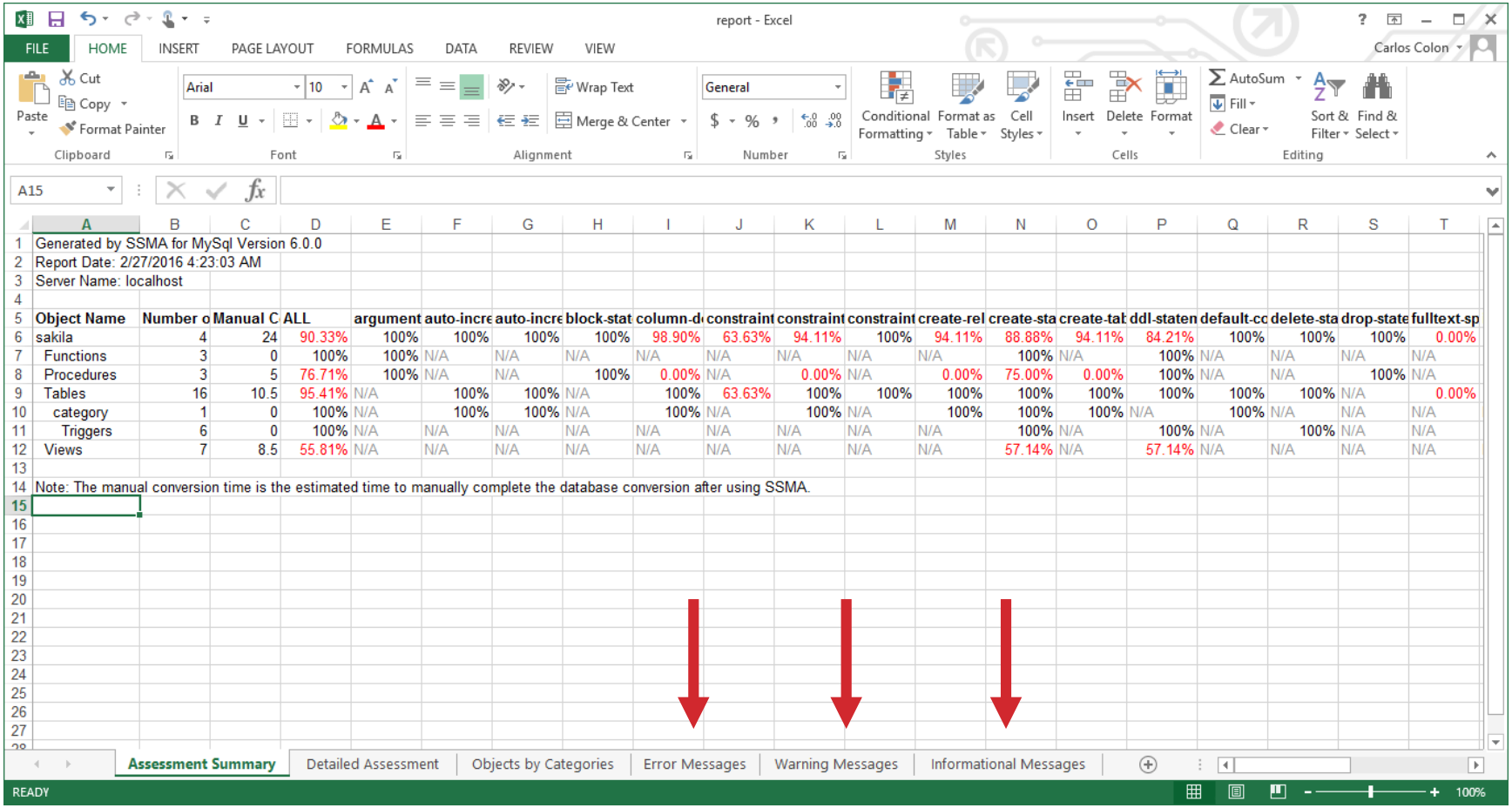

Object Name	Number o	Manual C	ALL	argument	auto-incre	auto-incre	block-stat	column-d	constraint	constraint	constraint	create-rel	create-sta	create-tal	ddl-staten	default-cc	delete-sta	drop-state	fulltext-sp
sakila	4	24	90.33%	100%	100%	100%	100%	98.90%	63.63%	94.11%	100%	94.11%	88.88%	94.11%	84.21%	100%	100%	100%	0.00%
Functions	3	0	100%	100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%	N/A	100%	N/A	N/A	N/A	N/A
Procedures	3	5	76.71%	100%	N/A	N/A	100%	0.00%	N/A	0.00%	N/A	0.00%	75.00%	0.00%	100%	N/A	N/A	100%	N/A
Tables	16	10.5	95.41%	N/A	100%	100%	N/A	100%	63.63%	100%	100%	100%	100%	100%	100%	100%	100%	N/A	0.00%
category	1	0	100%	N/A	100%	100%	N/A	100%	N/A	100%	N/A	100%	100%	100%	N/A	100%	N/A	N/A	N/A
Triggers	6	0	100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%	N/A	100%	N/A	100%	N/A	N/A
Views	7	8.5	55.81%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	57.14%	N/A	57.14%	N/A	N/A	N/A	N/A

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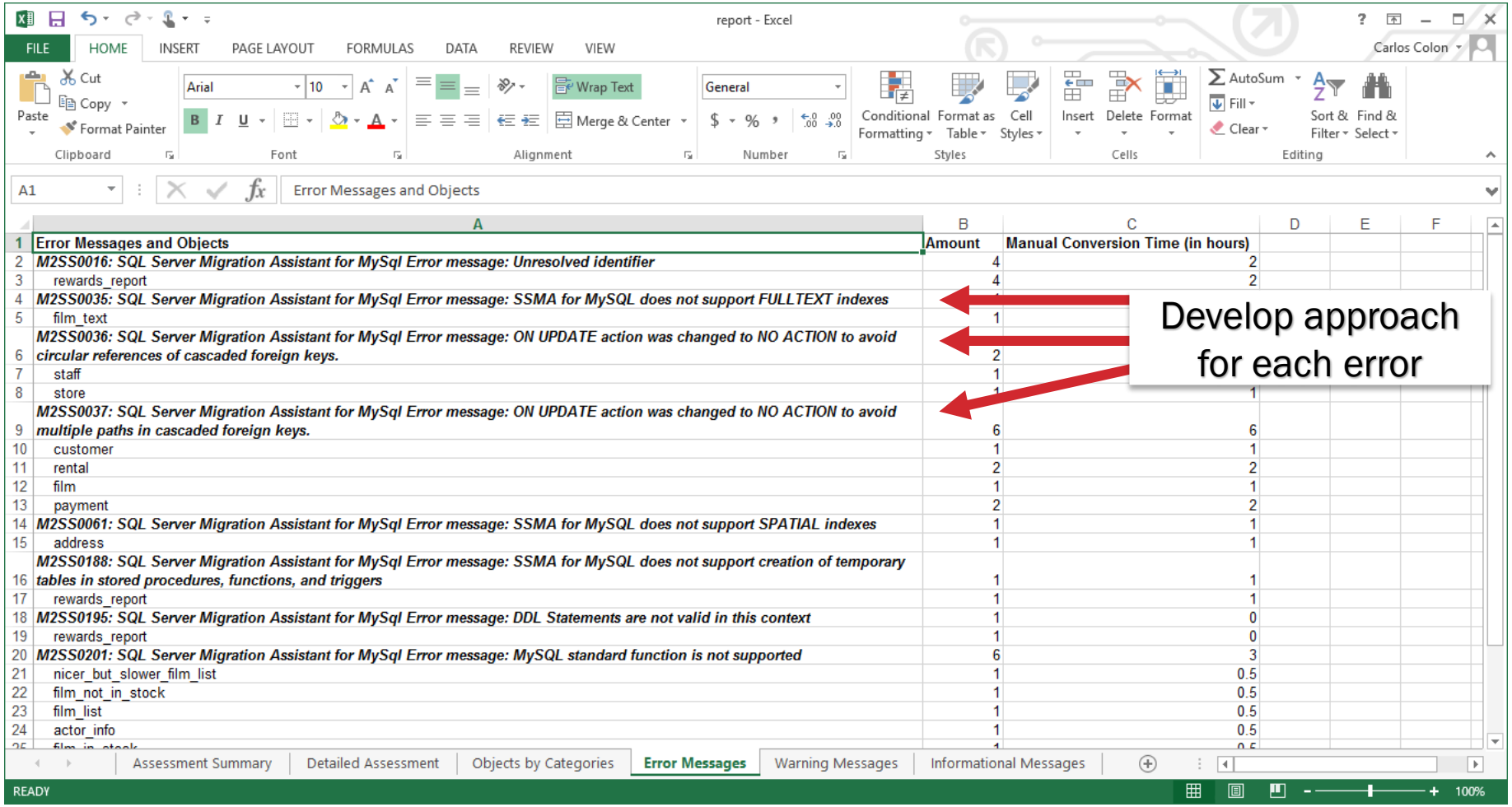


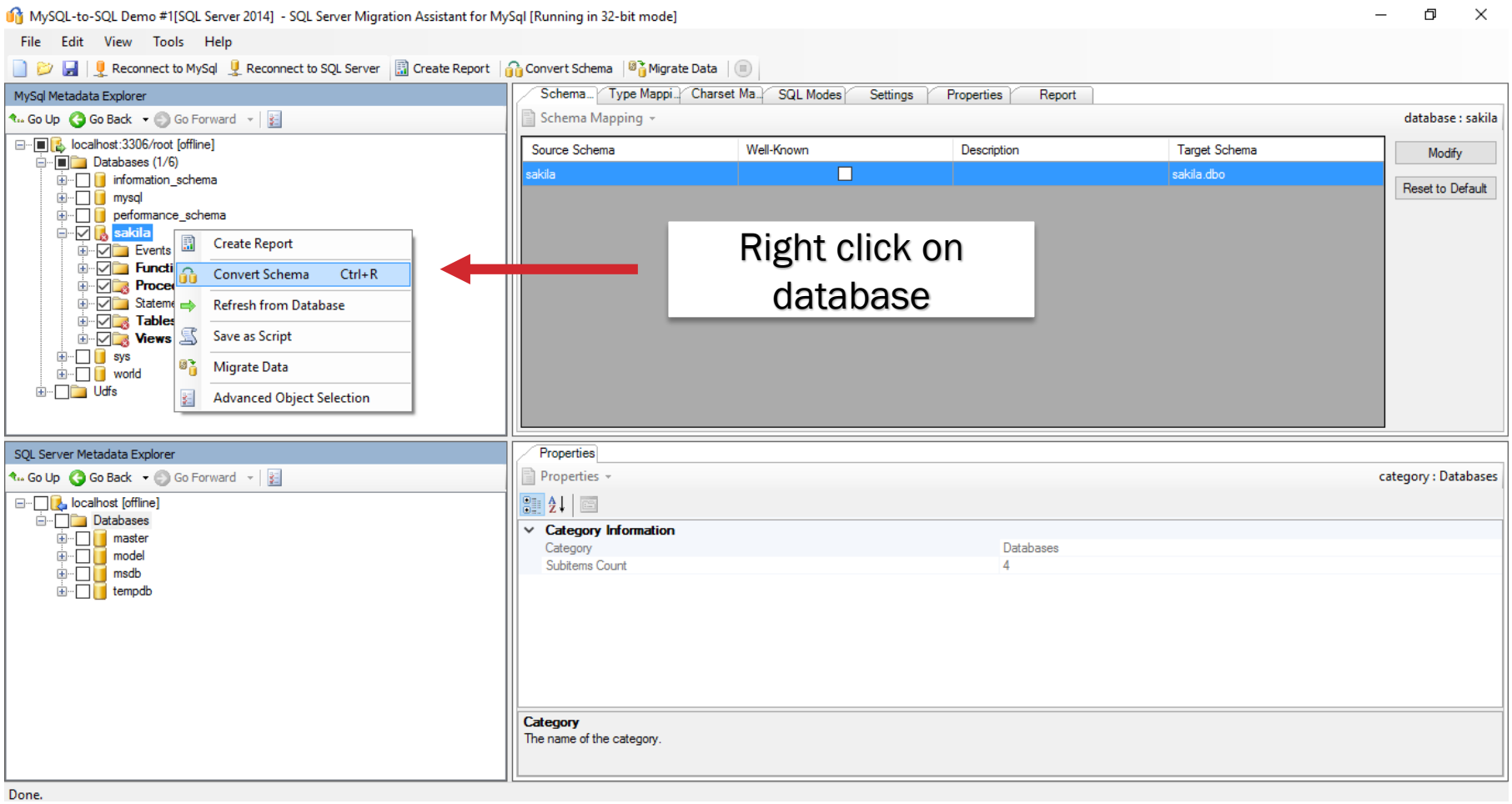
	A	B	C
1	Error Messages and Objects	Amount	Manual Conversion Time (in hours)
2	*M2SS0016: SQL Server Migration Assistant for MySql Error message: Unresolved identifier*	4	2
3	rewards_report	4	2
4	*M2SS0035: SQL Server Migration Assistant for MySql Error message: SSMA for MySQL does not support FULLTEXT indexes*		
5	film_text	1	
6	*M2SS0036: SQL Server Migration Assistant for MySql Error message: ON UPDATE action was changed to NO ACTION to avoid circular references of cascaded foreign keys.*	2	
7	staff	1	
8	store	1	1
9	*M2SS0037: SQL Server Migration Assistant for MySql Error message: ON UPDATE action was changed to NO ACTION to avoid multiple paths in cascaded foreign keys.*	6	6
10	customer	1	1
11	rental	2	2
12	film	1	1
13	payment	2	2
14	*M2SS0061: SQL Server Migration Assistant for MySql Error message: SSMA for MySQL does not support SPATIAL indexes*	1	1
15	address	1	1
16	*M2SS0188: SQL Server Migration Assistant for MySql Error message: SSMA for MySQL does not support creation of temporary tables in stored procedures, functions, and triggers*	1	1
17	rewards_report	1	1
18	*M2SS0195: SQL Server Migration Assistant for MySql Error message: DDL Statements are not valid in this context*	1	0
19	rewards_report	1	0
20	*M2SS0201: SQL Server Migration Assistant for MySql Error message: MySQL standard function is not supported*	6	3
21	nicer_but_slower_film_list	1	0.5
22	film_not_in_stock	1	0.5
23	film_list	1	0.5
24	actor_info	1	0.5

Develop Migration Scripts

- Develop scripts to execute schema migration
  - Complete manual object migration in SQL Server
  - Generate full set of scripts after SQL code is complete

- Recommended scripts:
  - Create database scripts
  - Create tables, views, functions, stored procedures
  - Create triggers
  - Create clustered indexes, primary key constraints
  - Create non-clustered indexes
  - Create foreign key constraints
  - Create logins, roles, permissions
  - Post migration scripts (i.e. computed columns)

SSMA Schema Migration



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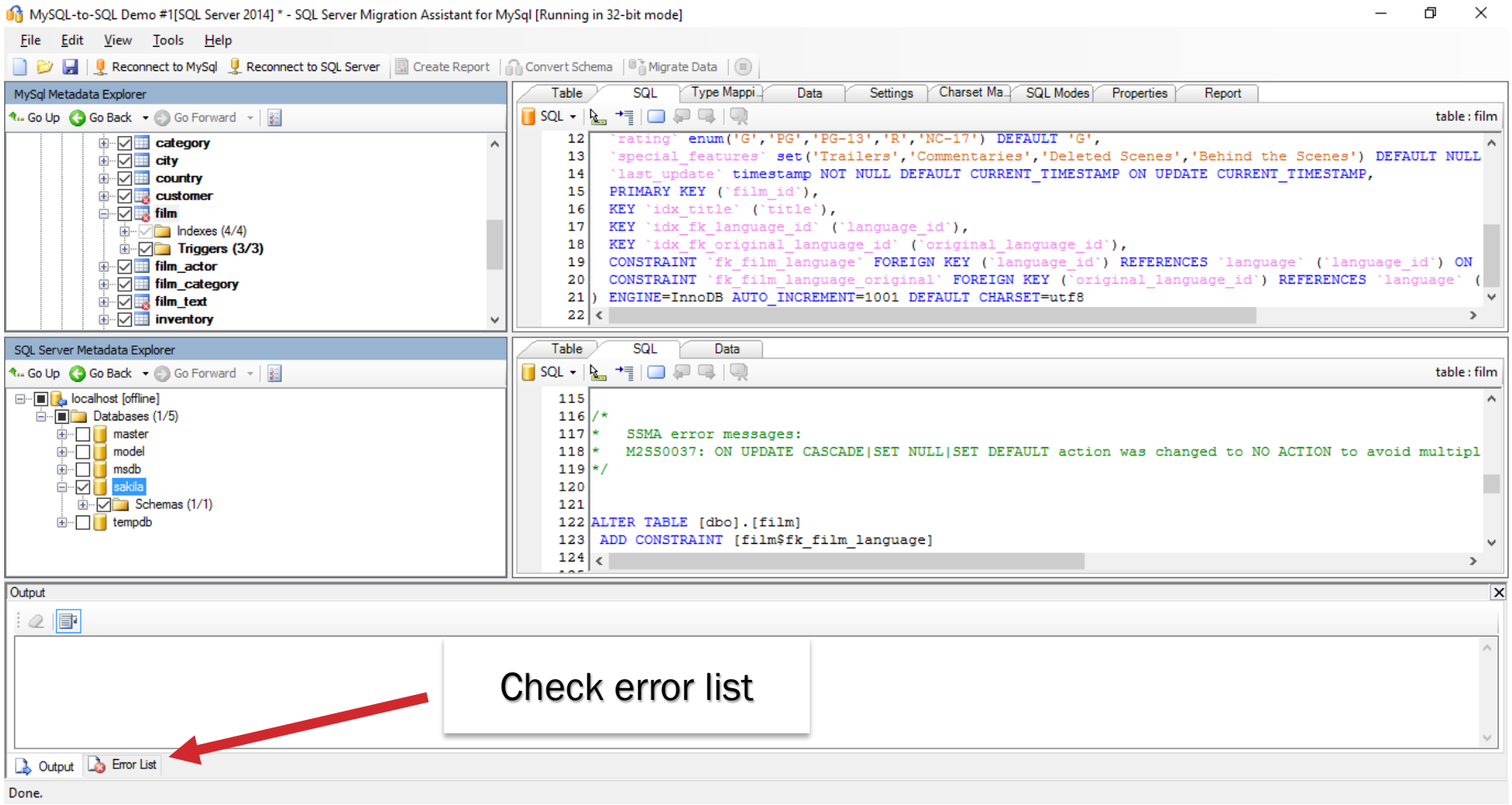

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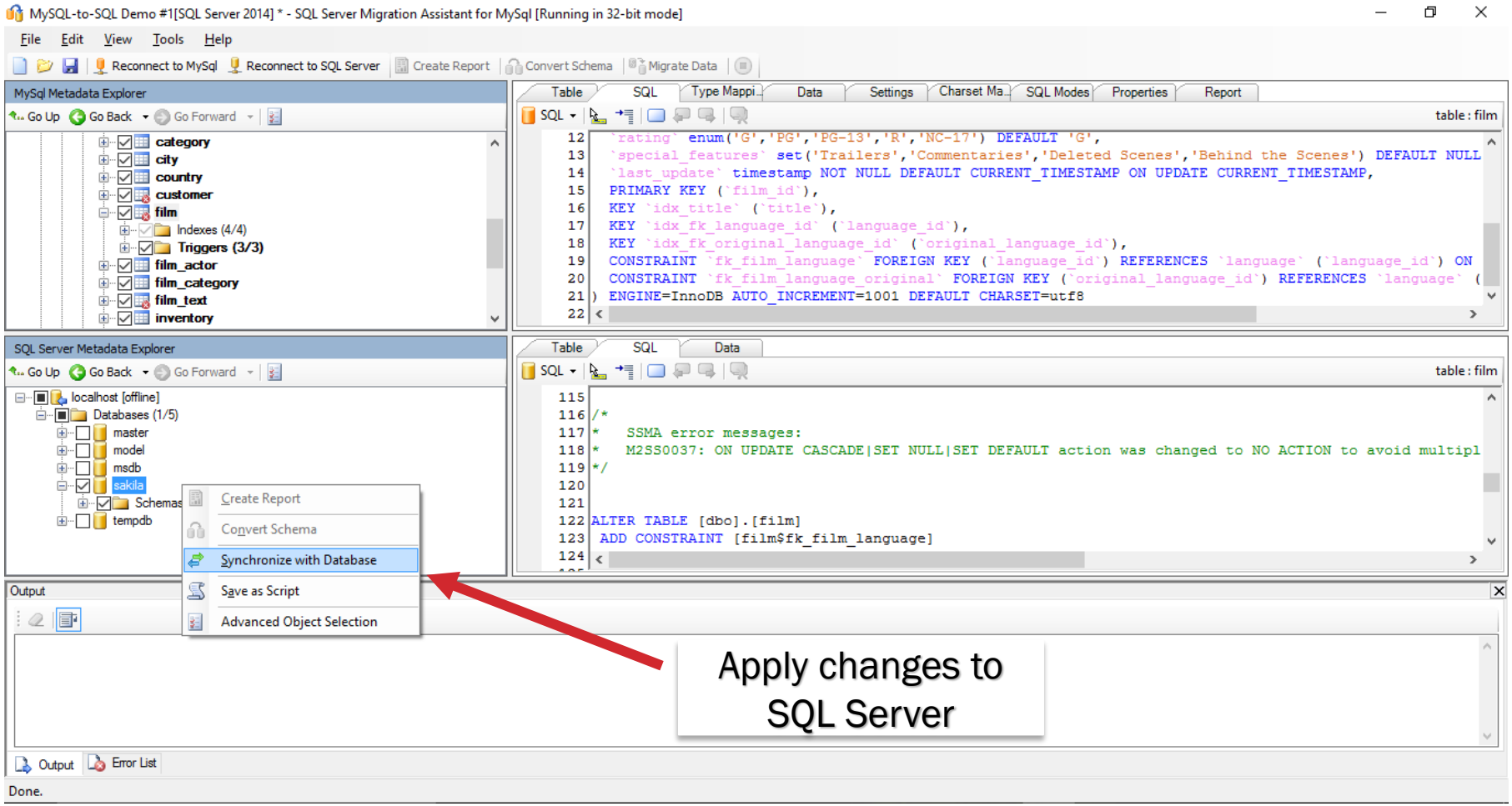

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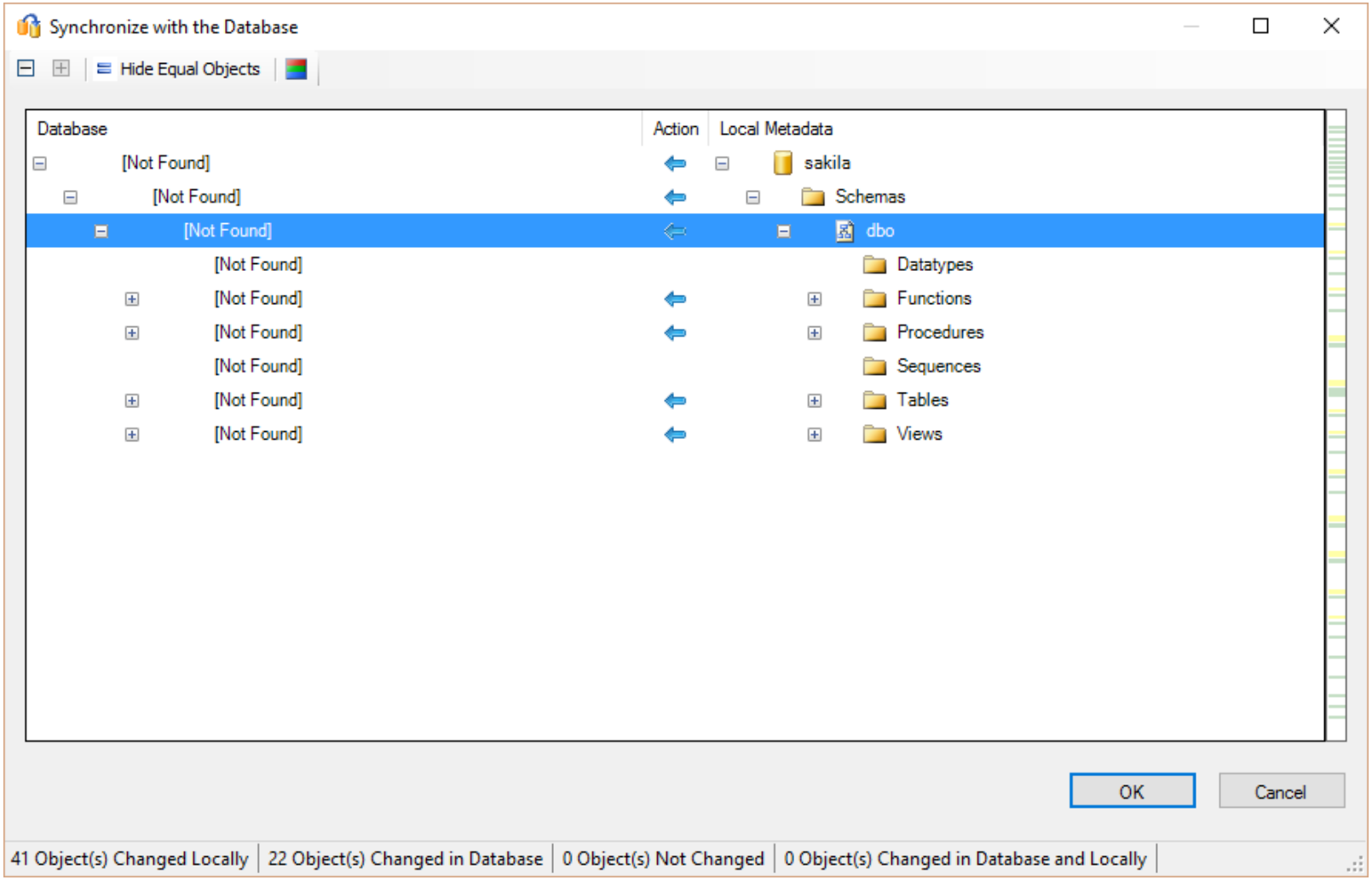

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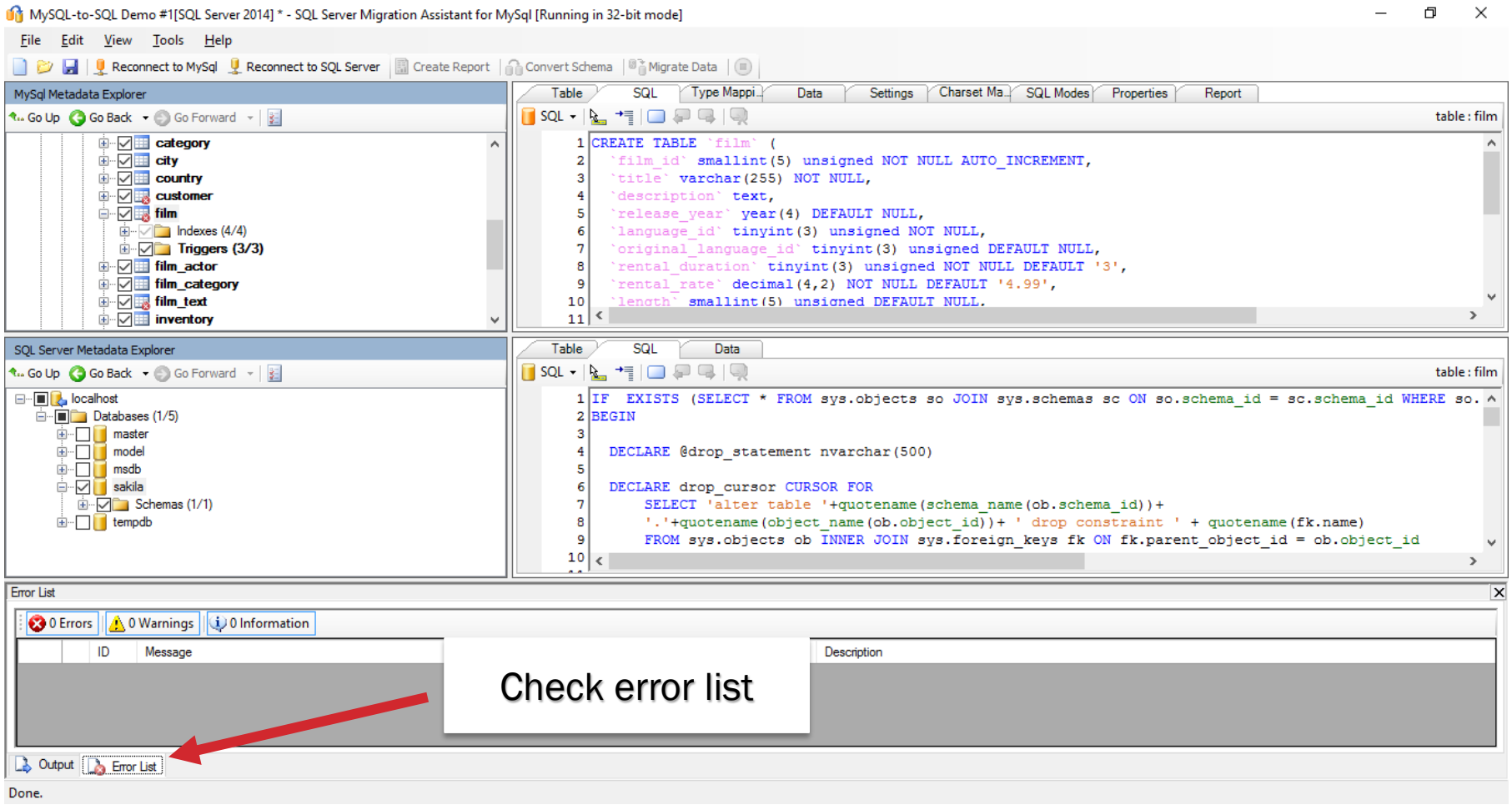
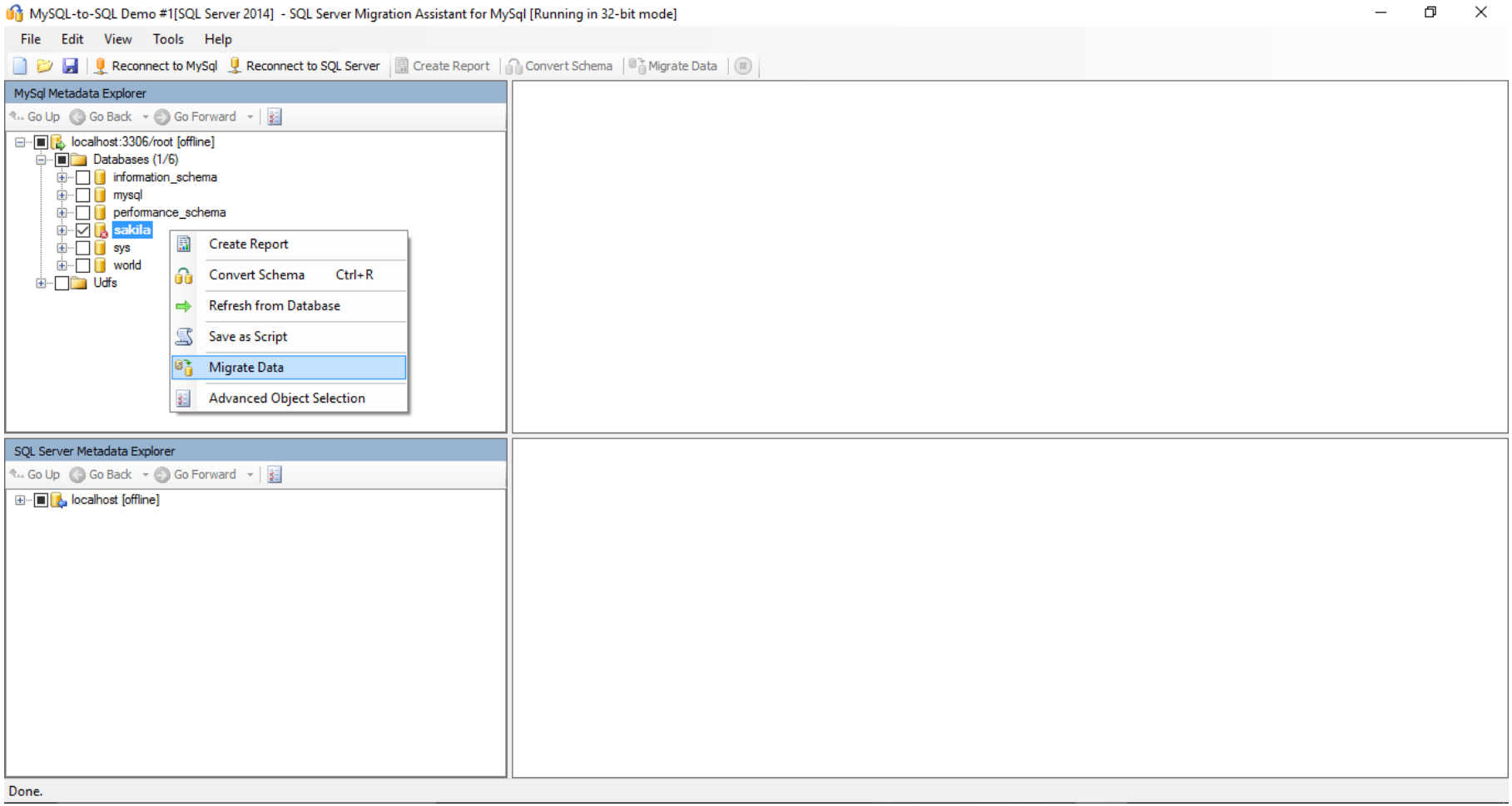


Data Migration Options

- Easiest option is to use SSMA to perform data migration
  - Test performance to determine best drivers to use

- For some DBMS source systems, SSMA offers Client-Side or Server-Side migration
  - Client-Side migration typically offers more driver options, data migration occurs on computer running SSMA
  - Client-Side migration not recommended if running SSMA remotely
  - Server-Side migration runs data migration on target database server, but typically is more restrictive on driver options
  - Test data migration the same way you would run it on Production!

SSMA Data Migration



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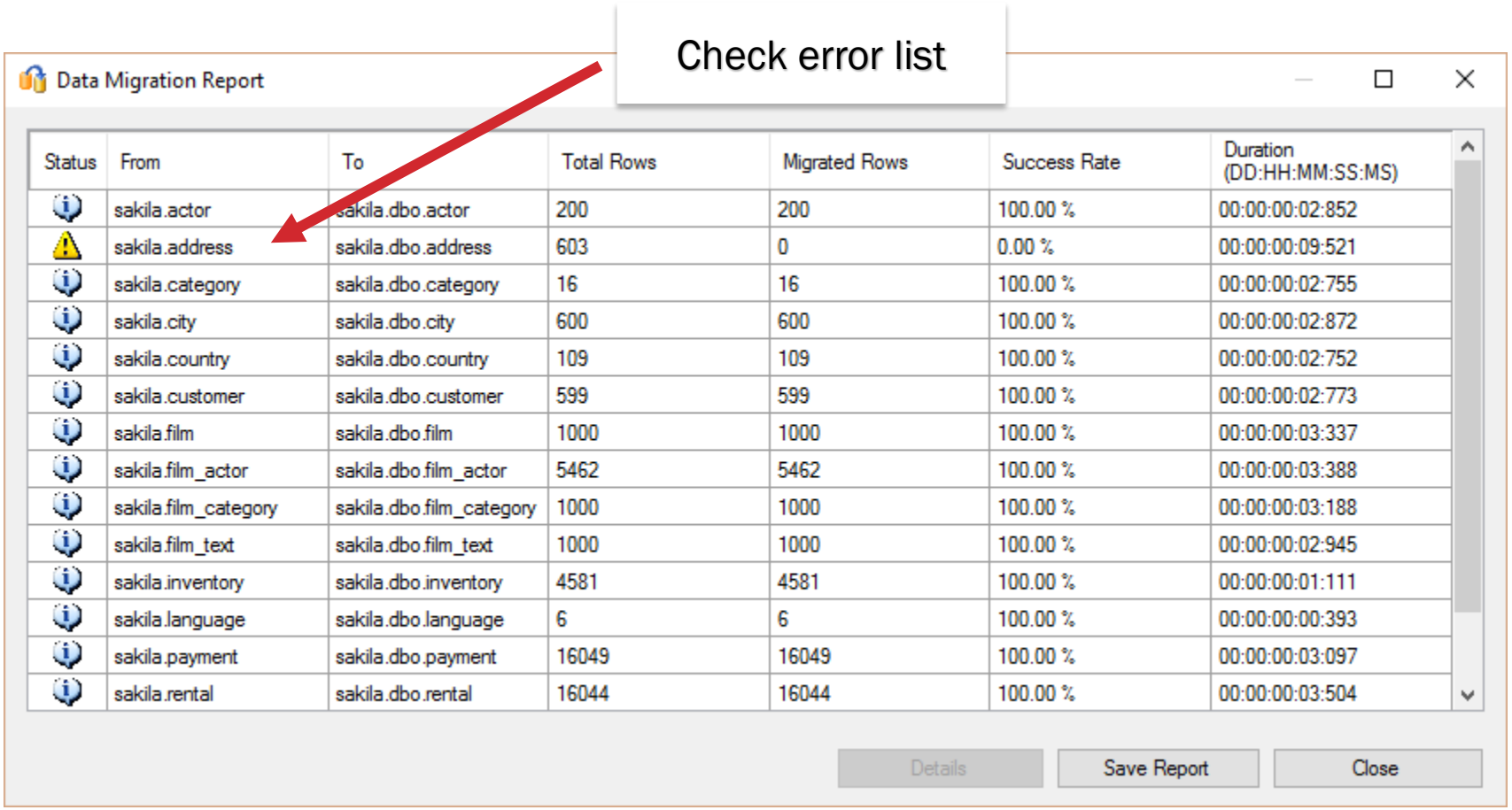

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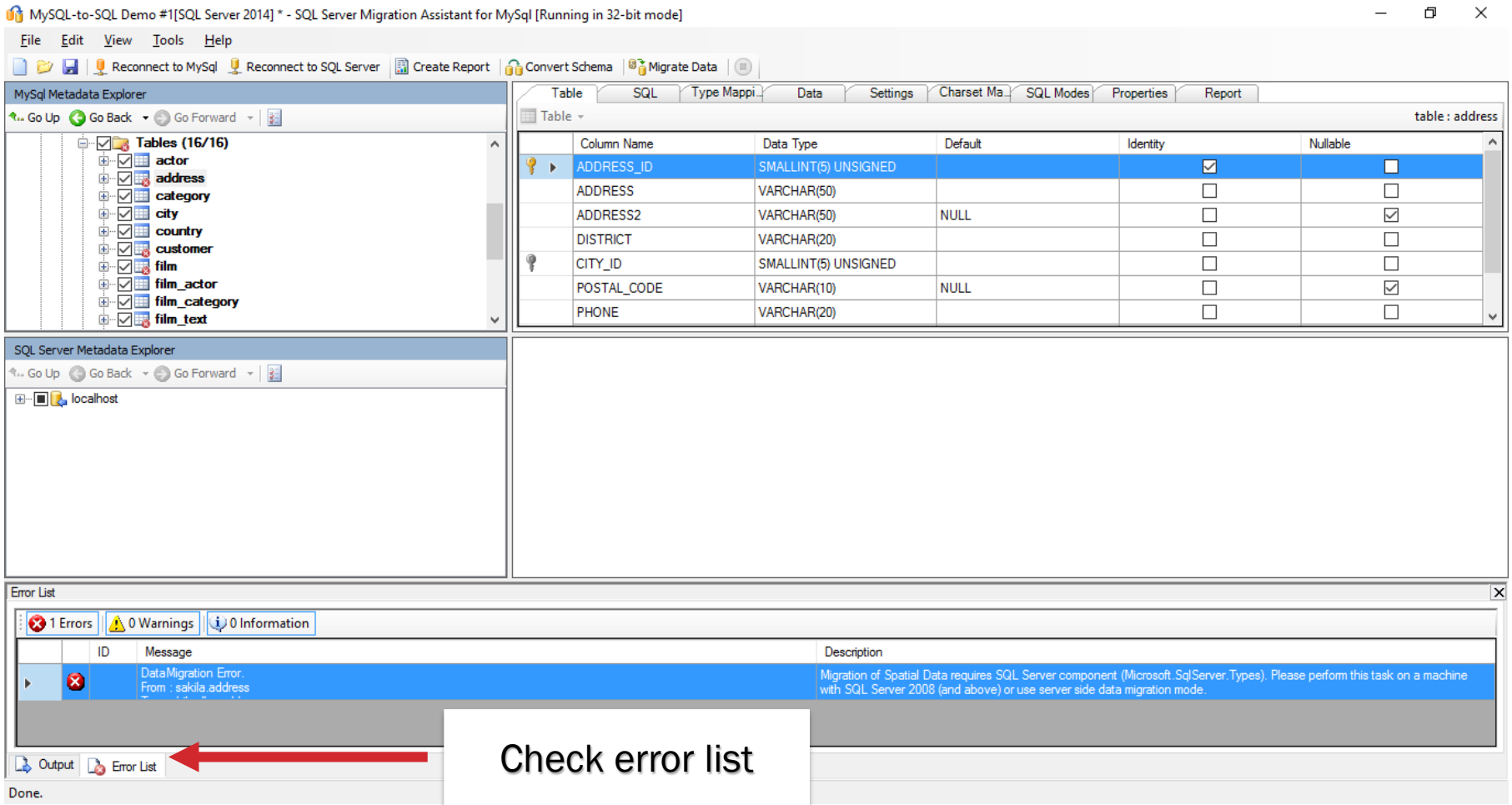

Testing Converted Database Objects

- Develop a test approach focused on minimizing risk
  - Full regression testing may be impractical on large systems
  - Recommended approach is to unit test each database object
  - Run each object on source and target system and compare output
  - For objects where output does not match, perform additional testing and fix as needed
  - Consider production parallel testing if possible

- Schedule UAT and Performance testing on target Production hardware
  - Baseline performance of source system for critical functions and compare timings to target system
  - Before final deployment, perform user acceptance on target Production hardware

Test Database Migration Cycles

- Schedule time to run database migration steps multiple time
  - At a minimum, run through the database migration steps when setting up the test, QA test, and UAT environments
  - Additional test migrations can be scheduled when refreshing test environments and when doing code drops
  - Executing the migration steps multiple times provides more opportunities to uncover issues and to fine tune the process

Final Deployment

- Schedule a change moratorium prior to the final deployment
  - Allows for migration scripts to be in a stable state prior to deployment
  - Schedule one final test migration with the finalized scripts
  - Any emergency fixes to source system can be applied to target system after final deployment
  - All enhancements and non-critical fixes should be worked on new system

- Develop deployment plan
  - Include contact information and hours when people need to be available
  - Migration steps can take a long time, so schedule checkpoint meetings where people can get status information
  - Consider having a dedicated person to coordinate communications

Contingency Plans

- Have a detailed plan ready to enable source system
  - Preserve the state of source system to ensure back out plan is successful
  - Do not make changes on SQL Server that will make back out plan harder
  - Determine in advance the criteria for back out and who is responsible for making the decision
  - Plan your final deployment with a back out plan in mind (do not make changes that will make backing out more difficult)

- Plan for an extended post-production support
  - Some issues may arise days after the final deployment
  - Plan to set aside time for support team to address any emergency fixes

Decommission Source System

- Before decommissioning source system consider:
  - Script all database objects and archive in source code repository
  - Create backups and determine retention plan
  - Consider having a system available where source system can be restored if needed