

Introduction to SQL Server Machine Learning Services

CodeStock
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About Me

- ▶ Career
- ▶ Family
- ▶ Speaker
- ▶ Current employment
- ▶ Not a data scientist

Session Summary

- ▶ What is SQL Server Machine Learning Services?
- ▶ Installing and Configuring SQL ML
- ▶ Architecture of SQL ML
- ▶ Passing input and receiving output
- ▶ Baseball example
- ▶ Conclusion

Session Motivation

- ▶ High-level introduction to a machine learning option not commonly used
- ▶ Demonstrate basic architecture and usage
- ▶ Give pros and cons to consider in deciding whether to use

What is SQL Server ML?

- ▶ Machine learning components that sit side-by-side with the SQL Server Process
- ▶ Keeps the data involved in machine learning computations local to the server
- ▶ Useful for
 - ▶ Large volumes of data - no need to move across the network
 - ▶ Secure / sensitive data
- ▶ Runs on both Windows and Linux versions of SQL

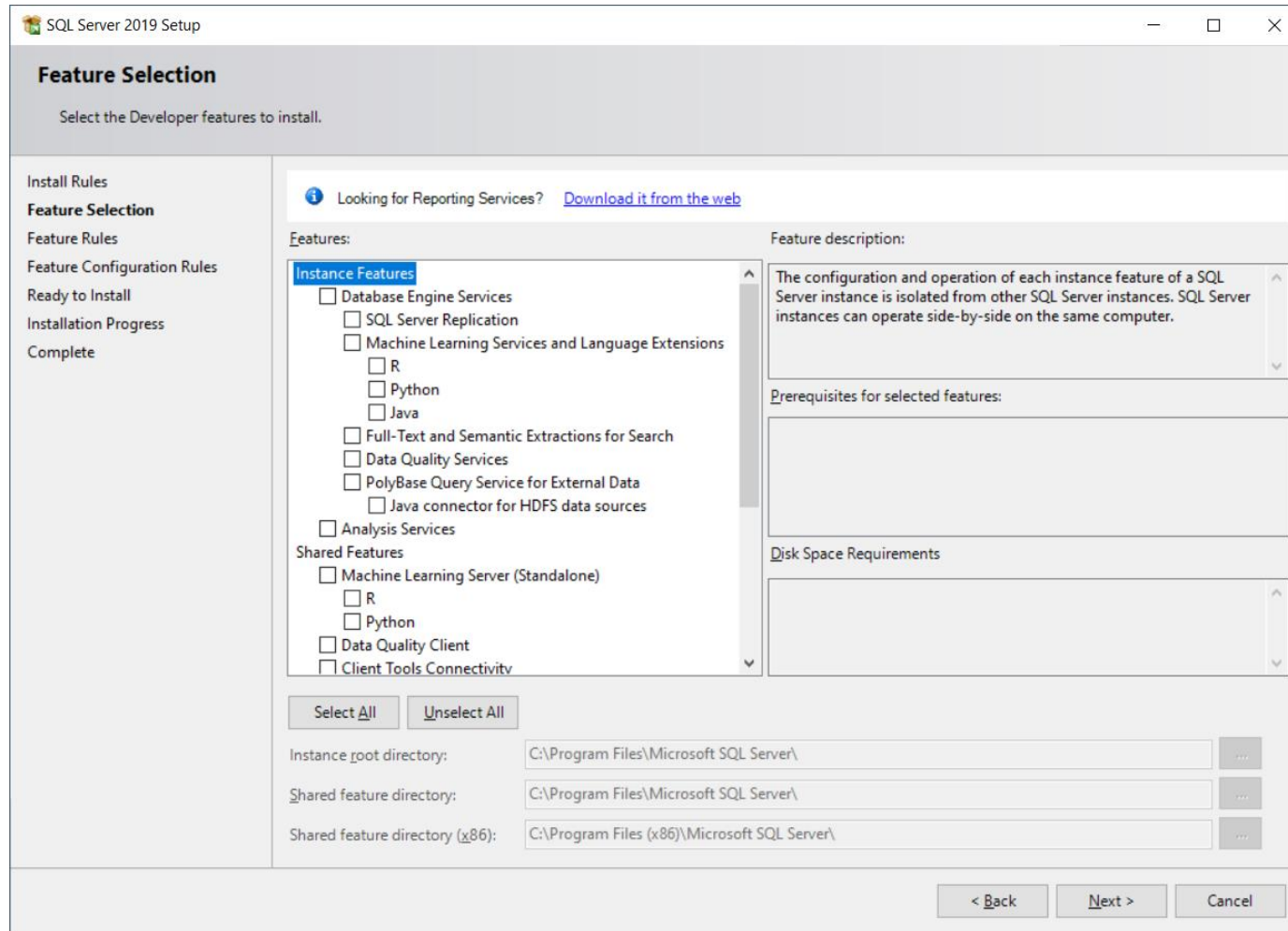
Software versions

SQL Version	Python	R
SQL 2019	3.7.1	3.5.2
SQL 2017 CU22+	3.5.2 and 3.7.2	3.3.3 and 3.5.2
SQL 2017 through CU21	3.5.2	3.3.3

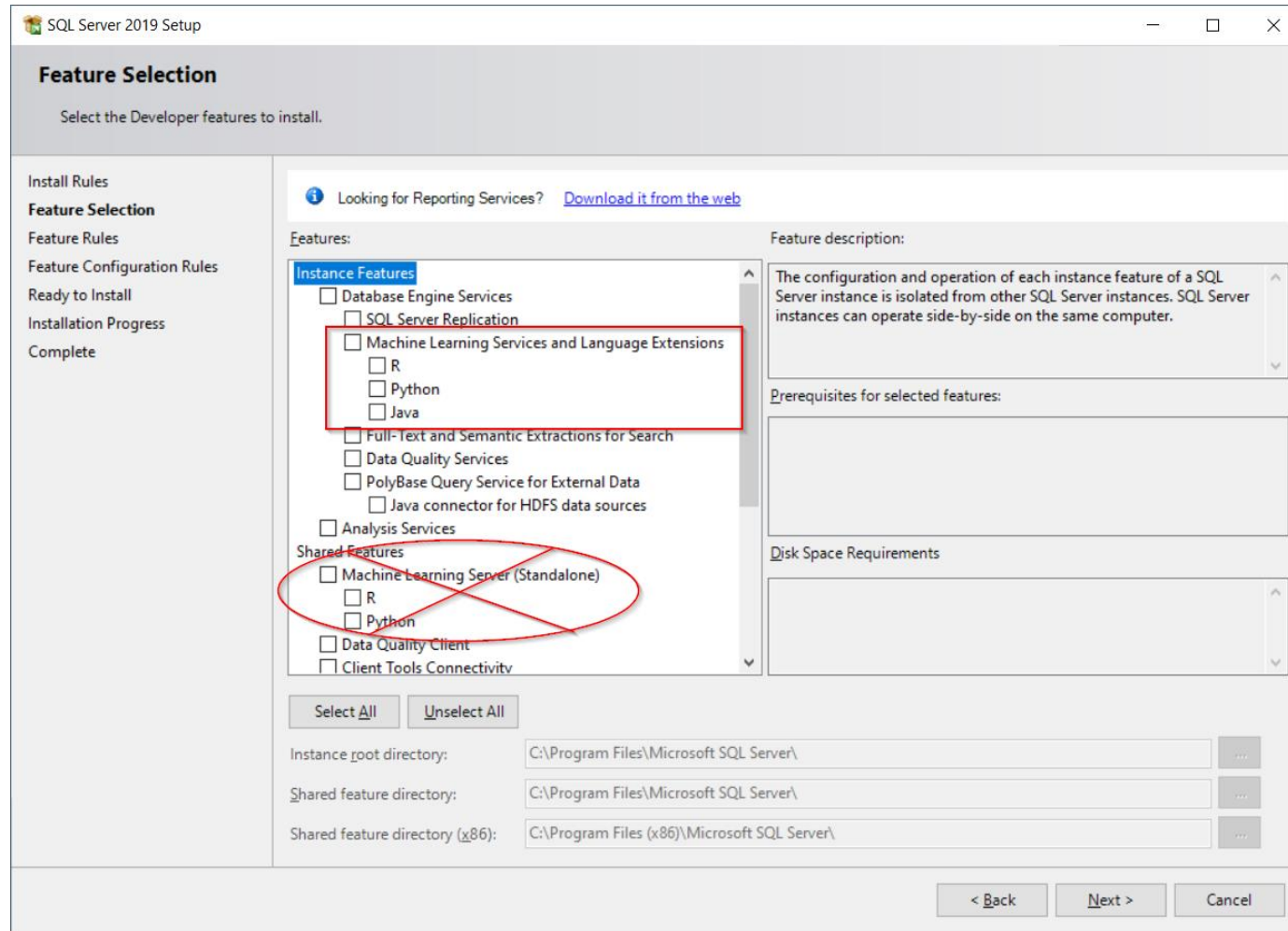
Microsoft packages

Python	R
revoscalepy	RevoScaleR
microsoftml	Microsoft ML (R)
	olapR
	Sqlrutils
	Microsoft R Open

Installing SQL Server ML? (on-prem)



Installing SQL Server ML? (on-prem)

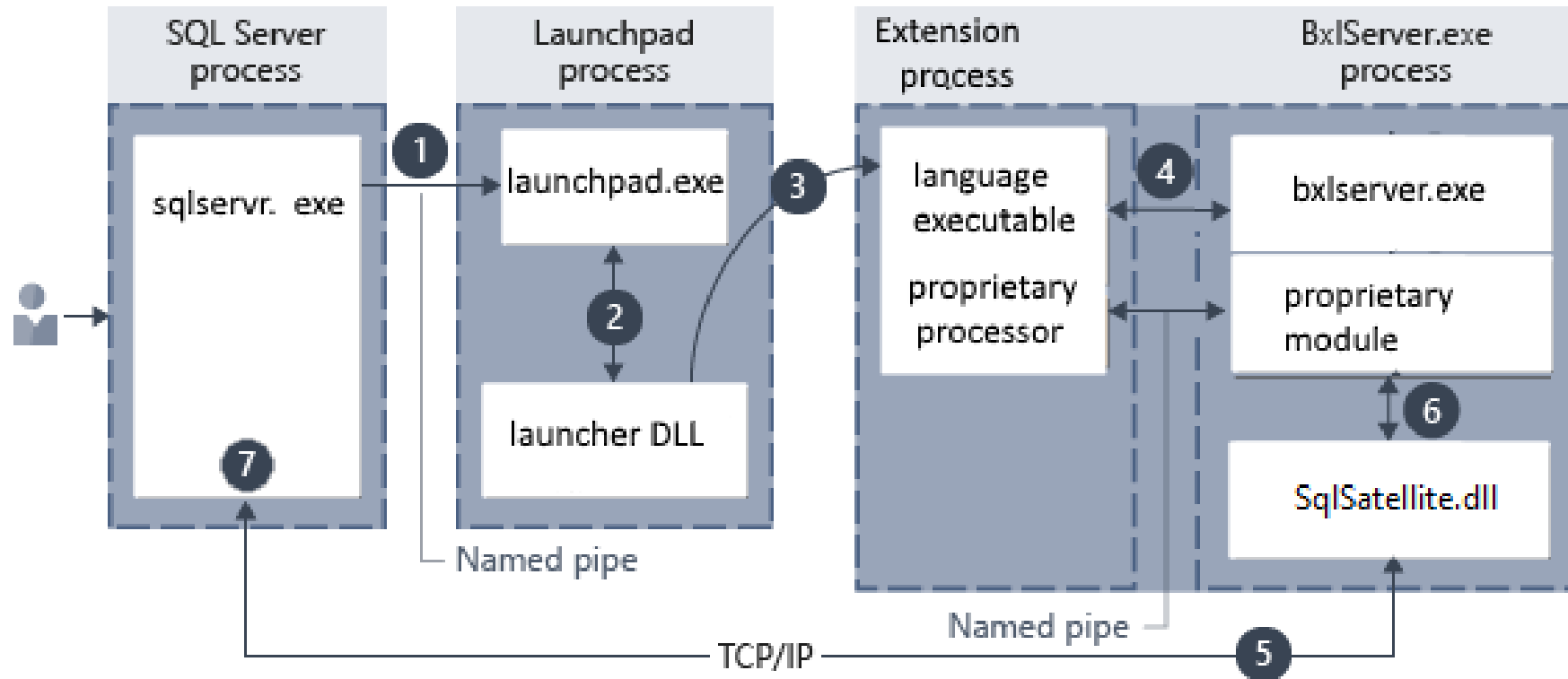


Configuring SQL Server ML

- ▶ Both on-prem and Azure SQL MI

```
EXEC sp_configure  
    'external scripts enabled', 1;  
RECONFIGURE WITH OVERRIDE;
```

Architecture



Source: <https://docs.microsoft.com/en-us/sql/machine-learning/concepts/extensibility-framework?view=sql-server-ver15>

Invoking a script

- ▶ Special stored procedure to execute a script

```
exec sp_execute_external_script
    @language = N'Python', -- or N'R',
    @script = N'<script text>',
    @input_data_1 = N'<select statmnt>';
```

Passing data to and from a script

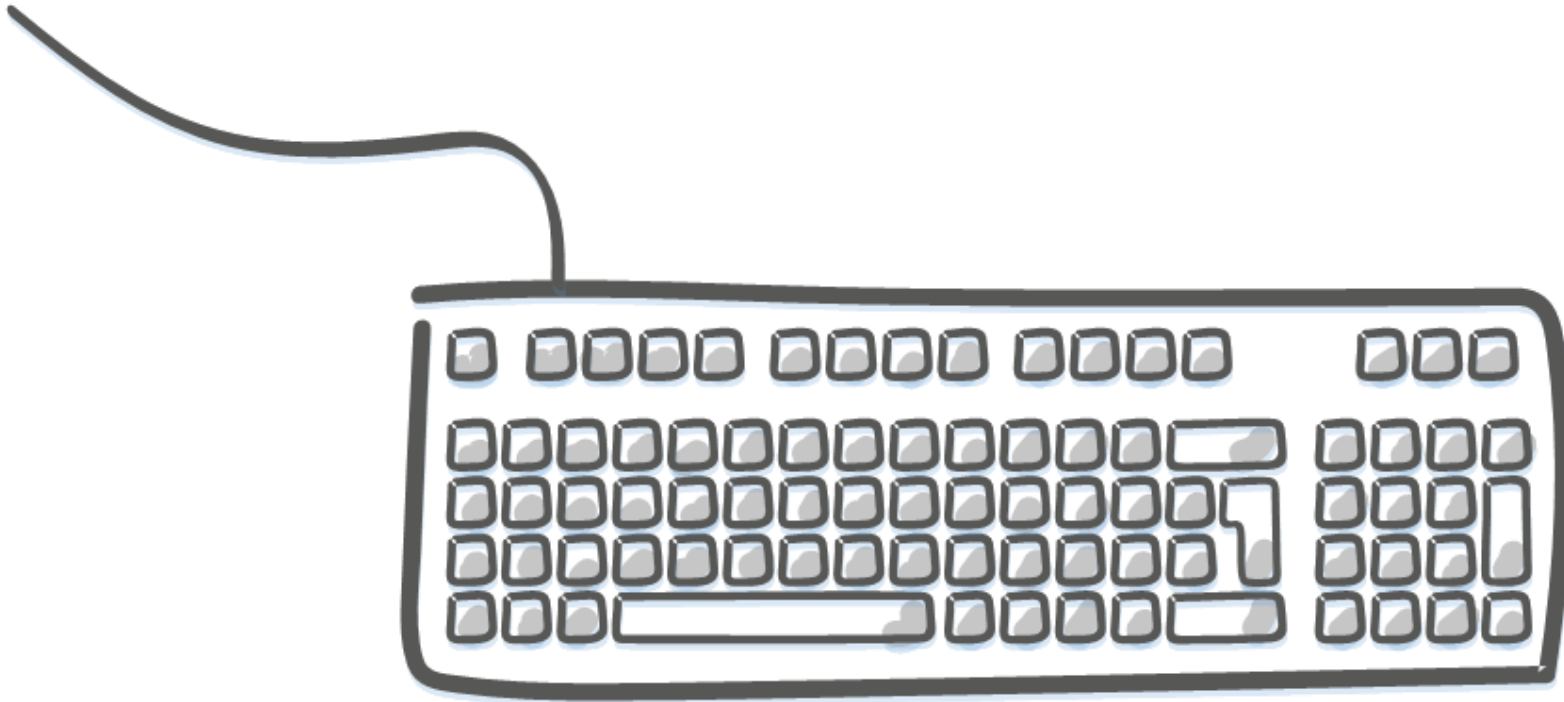
- ▶ Input_data_1 parameter sends data to script

```
exec sp_execute_external_script  
    @language = N'Python', -- or N'R',  
    @script = N'<script text>',  
    @input_data_1 = N'<select statmnt>';
```

- ▶ The script received a DataFrame in a variable called InputDataSet.
- ▶ The script can set a DataFrame in the OutputDataSet variable to pass results back to the caller
- ▶ Console output will be printed to the messages tab

Demo

- ▶ Basic MLB machine learning example



Pros and Cons on SQL ML Services

▶ Pros:

- ▶ Machine learning happens closer to the data storage
 - ▶ Less network traffic
 - ▶ Helps protect sensitive data

▶ Cons:

- ▶ Limited capacity on Standard Edition
- ▶ Uses resources on an expensive server

Conclusion

- ▶ SQL Server Machine Learning Services is a little-known option for integrating machine learning with the database engine.
- ▶ The trade-offs involved may not make it a suitable choice for some environments.
- ▶ Once scripts have been developed and tested (perhaps by data science teams), DBA can operationalize (perhaps by wrapping inside stored procs)

Thank You

- ▶ This presentation and supporting materials can be found at www.tf3604.com/sqlml.
 - ▶ Slide deck
 - ▶ Scripts

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