

# Tuning Transactional Replication

Level: Intermediate

Paul Ou Yang

[paulouyang.blogspot.com](http://paulouyang.blogspot.com)

# What would you do?

The screenshot shows the 'Replication Monitor' application window. The left pane displays a tree view under 'My Publishers' with a folder 'BOWSQLTEST2016A\BOMSSTEST20...'. It contains several sub-items, each with a yellow warning icon and a green arrow icon. The right pane shows the 'Tracer Tokens' tab, which includes a description of tracer tokens, an 'Insert Tracer' button, a 'Time inserted' dropdown menu, and a table of subscriptions.

Replication Monitor

File Action Go Help

Replication Monitor

My Publishers

BOWSQLTEST2016A\BOMSSTEST20...

- [tpcc\_pub\_paul\_1]: all\_tables
- [tpcc\_pub\_paul\_1]: customer
- [tpcc\_pub\_paul\_1]: district
- [tpcc\_pub\_paul\_1]: new\_order
- [tpcc\_pub\_paul\_1]: order\_line
- [tpcc\_pub\_paul\_1]: orders
- [tpcc\_pub\_paul\_1]: stock
- [tpcc\_pub\_paul\_1]: warehouse
- [tpcc\_pub\_paul\_2]: all\_exec
- [tpcc\_pub\_paul\_3]: all\_tables
- [tpcc\_pub\_paul\_4]: all\_tables
- [tpcc\_pub\_paul\_5]: all\_tables
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- [tpcc\_pub\_paul\_7]: all\_tables
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Last refresh: 9/9/2017 9:13:04 PM

All Subscriptions Tracer Tokens Agents Warnings

Tracer Tokens measure latency from Publisher to Distributor, Distributor to Subscriber, and the total latency. Click [here](#) for more information.

Insert Tracer Time inserted: 9/9/2017 9:12:57 PM

	Subscription	Publisher to Distributor	Distributor to Subscri...	Total Latency
	[BOWSQLTEST20...	Pending...	Pending...	Pending...
	[BOWSQLTEST20...	Pending...	Pending...	Pending...
	[BOWSQLTEST20...	Pending...	Pending...	Pending...

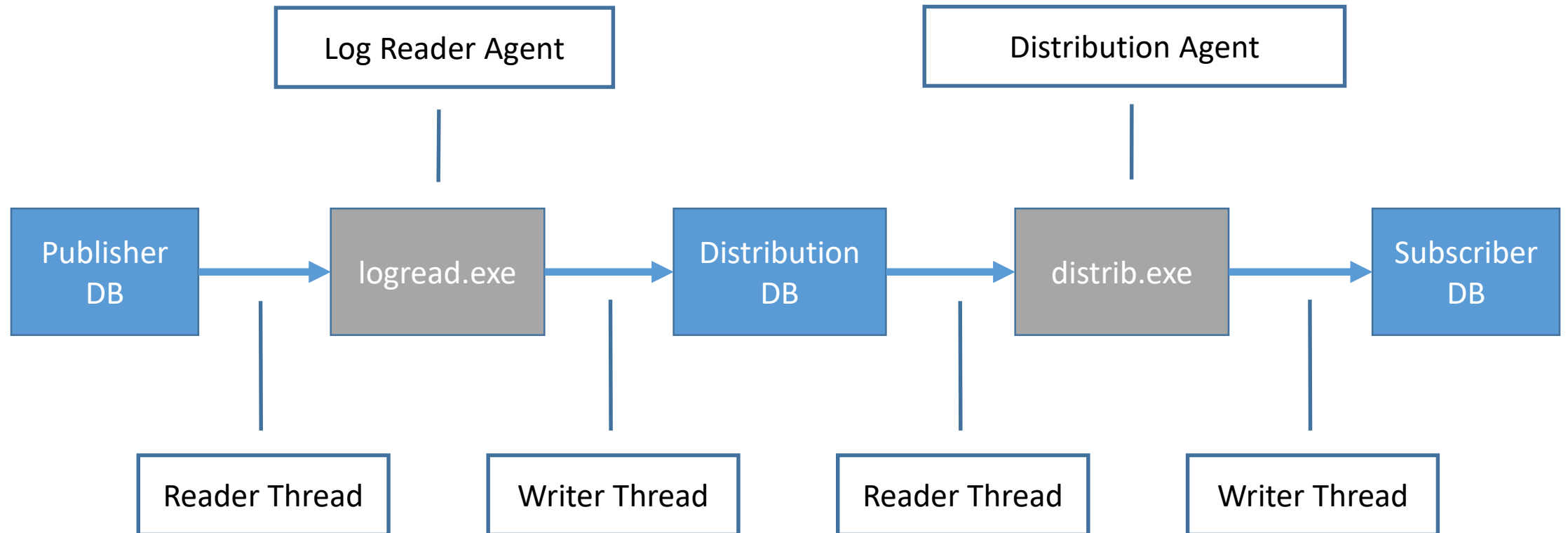
# Agenda

- The Moving Parts
- The Bottlenecks
- The Tuning Knobs
- Take Away

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# Moving Parts



Task Manager

File Options View

Processes Performance Users Details Services

Name	0% CPU	26% Memory
SQL Server Replication Distribution Agent	0%	4.9 MB
SQL Server Replication Distribution Agent	0%	5.7 MB
SQL Server Replication Distribution Agent	0%	5.1 MB
SQL Server Replication Distribution Agent	0%	8.1 MB
SQL Server Replication Distribution Agent	0%	8.5 MB
SQL Server Replication Distribution Agent	0%	7.2 MB
SQL Server Replication Distribution Agent	0%	8.2 MB
SQL Server Replication Distribution Agent	0%	7.6 MB
SQL Server Replication Logreader Agent	0%	7.6 MB
SQL Server Replication Logreader Agent	0%	8.5 MB
SQL Server Replication Logreader Agent	0%	7.3 MB
SQL Server Replication Logreader Agent	0%	7.8 MB
SQL Server Replication Logreader Agent	0%	7.6 MB
SQL Server Replication Logreader Agent	0%	7.6 MB
SQL Server Replication Logreader Agent	0%	8.2 MB

^ Fewer details

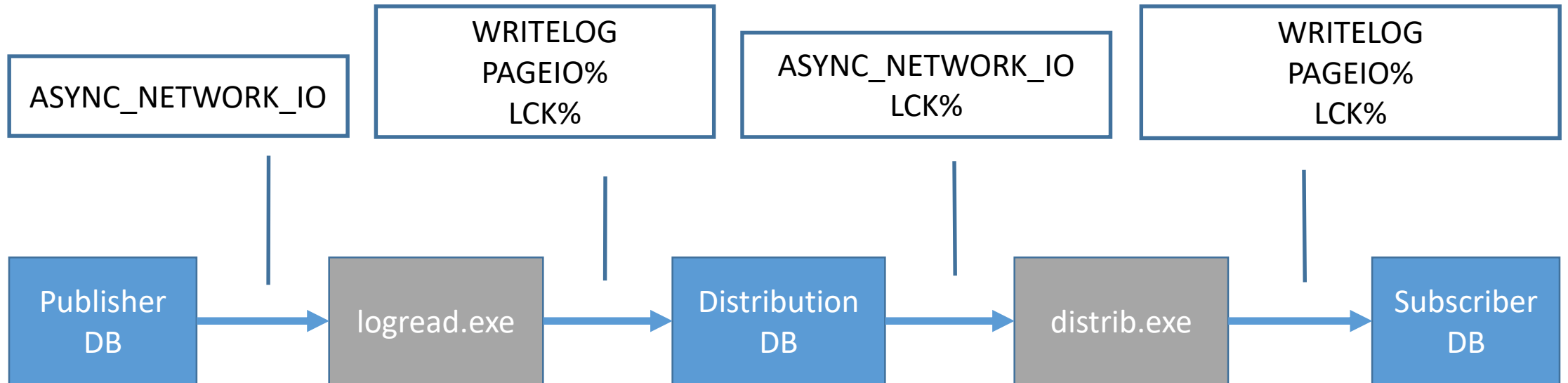
End task

Agent job executables

# Agenda

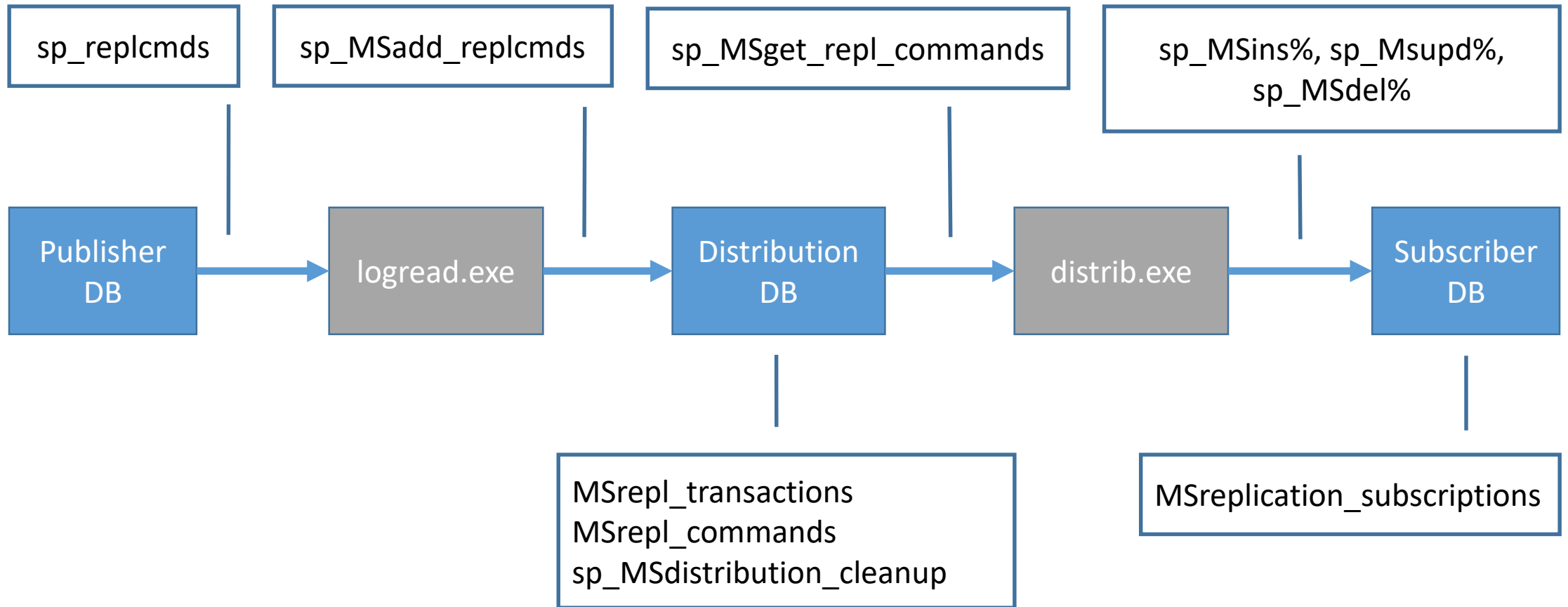
- The Moving Parts
- **The Bottlenecks**
- The Tuning Knobs
- Take Away

# Bottlenecks





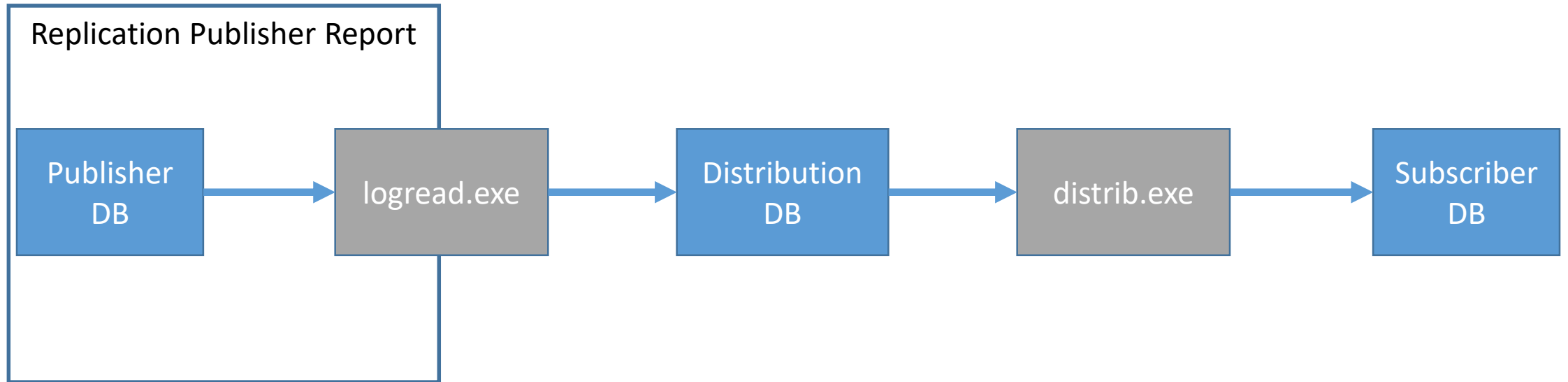
# Commands



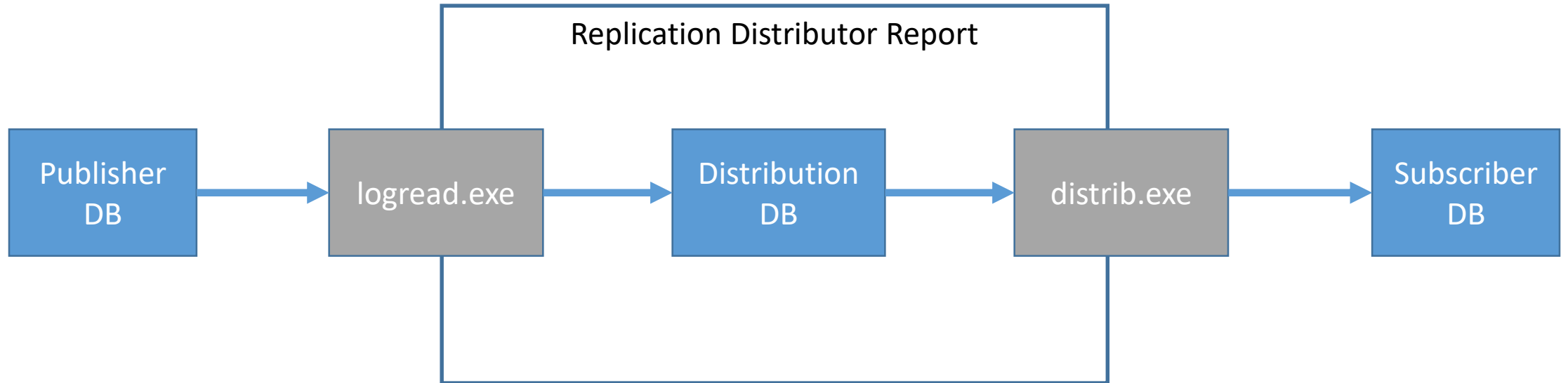
# SSMS Reports

- Download link
- <https://github.com/paulouyang2/SSMSReplicationReports>

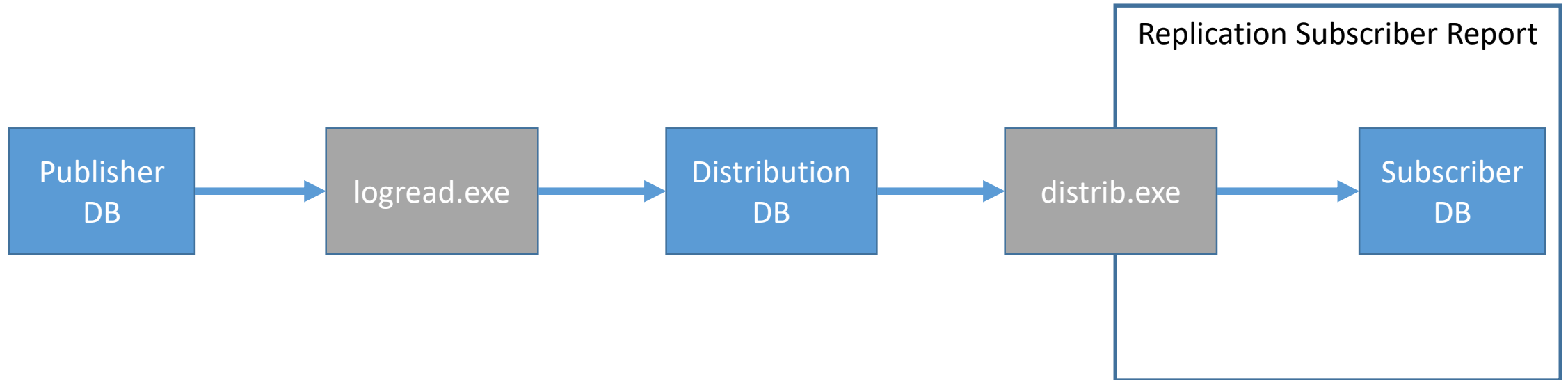
# SSMS Reports



# SSMS Reports



# SSMS Reports



# Demo

# Agenda

- The Moving Parts
- The Bottlenecks
- **The Tuning Knobs**
- Take Away

# Tuning Knobs Latency Benchmark

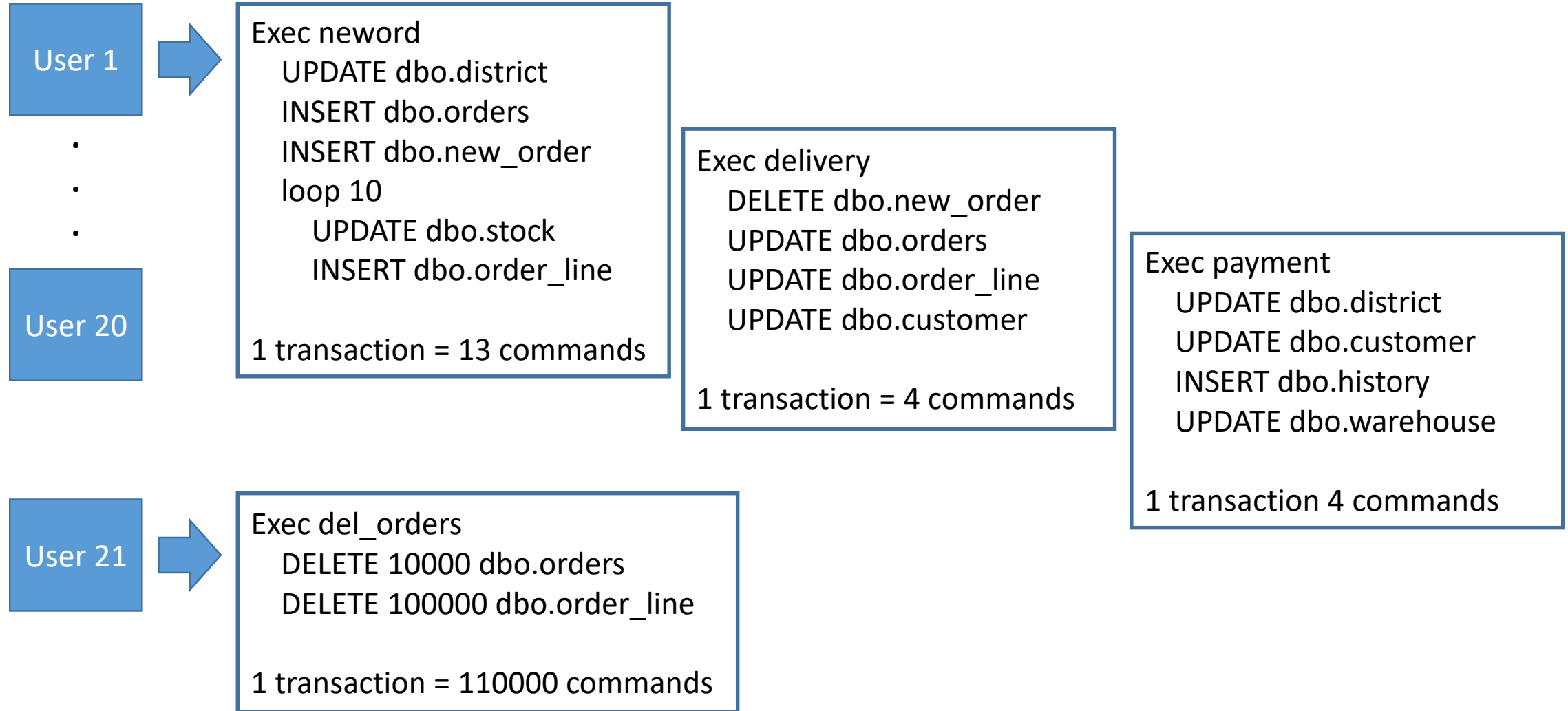
- Test Workload
- Distribution Agent
  - Isolation level: Read Committed vs Snapshot
  - Properties: Commit Batch Size vs Stored Procedure Execution vs Subscription Streams
  - Topology: One vs Multiple Publications vs Multiple Publication DBs
  - Subscription Type: Push vs Pull
- Log reader Agent
  - Topology: One vs Multiple Publication DBs



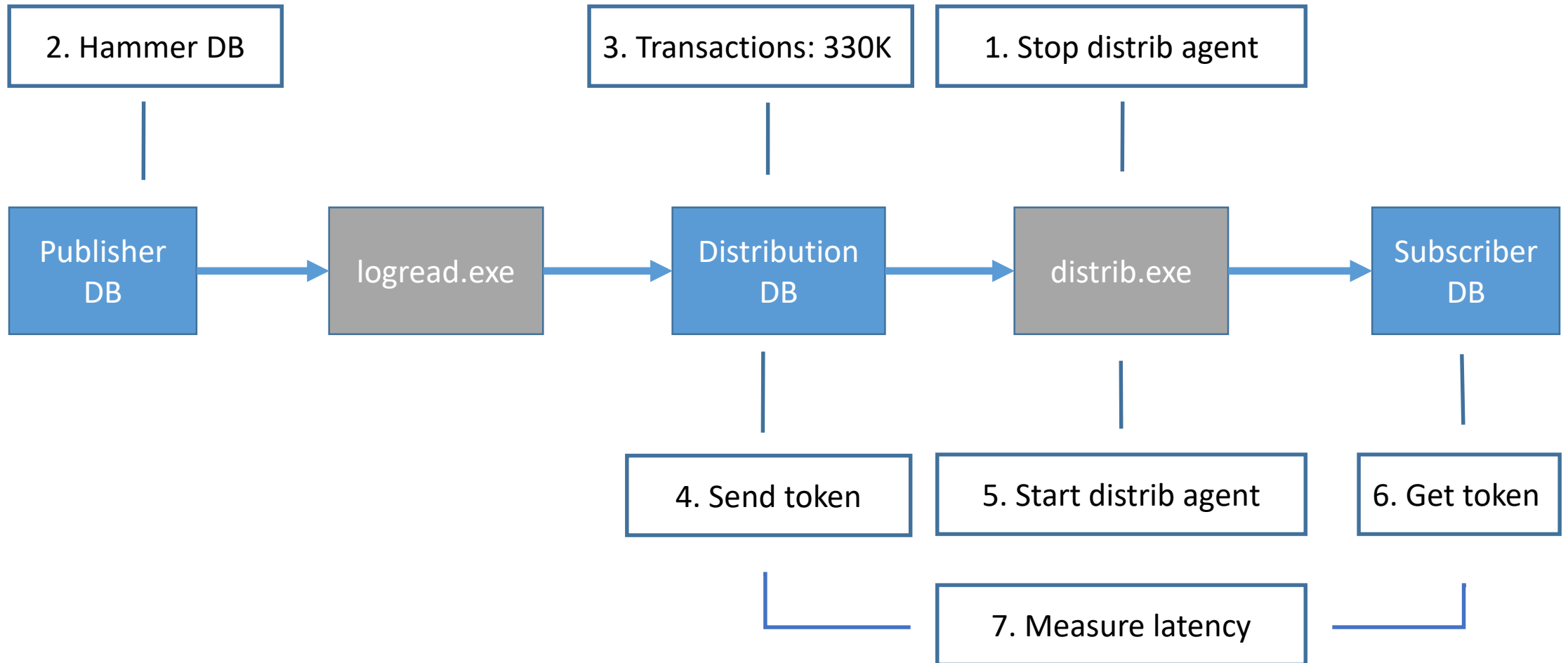
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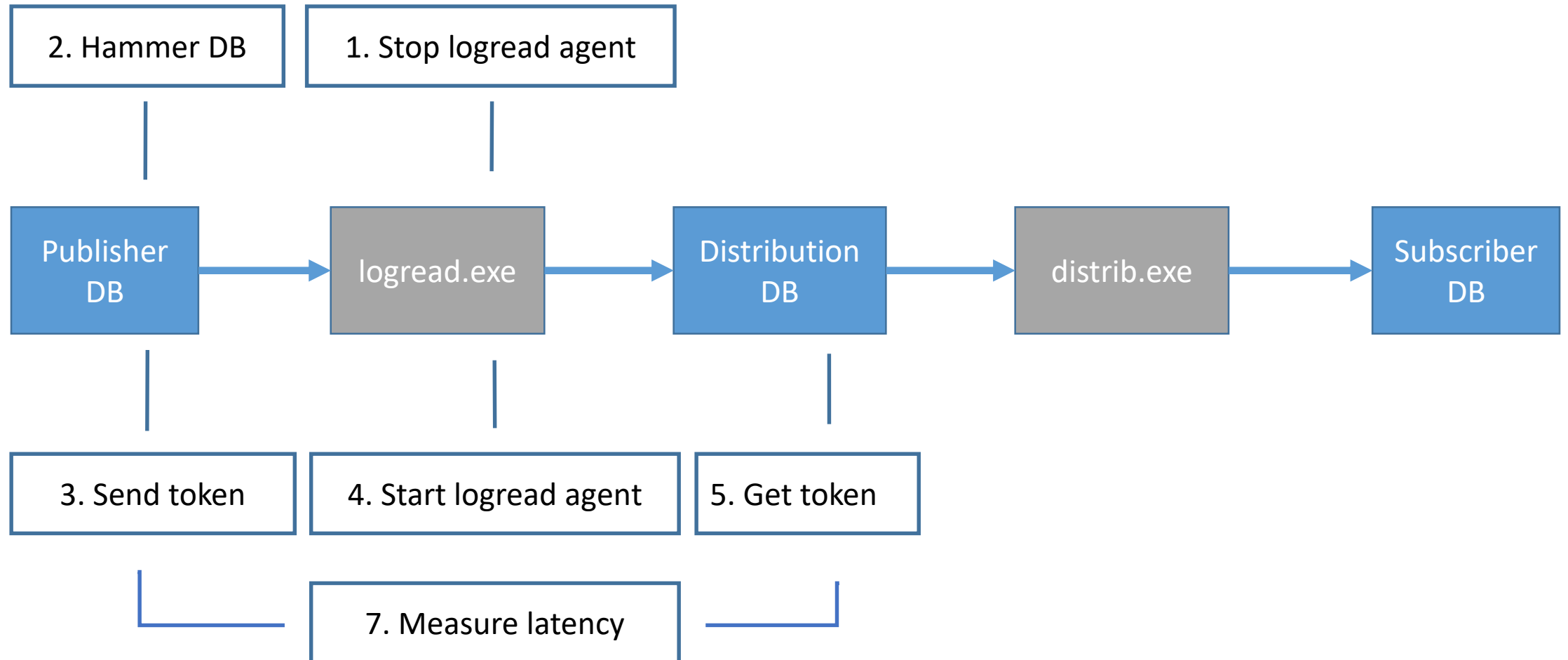
# Hammer DB TPC-C Test Workload



# Distribution Agent Workload Flow



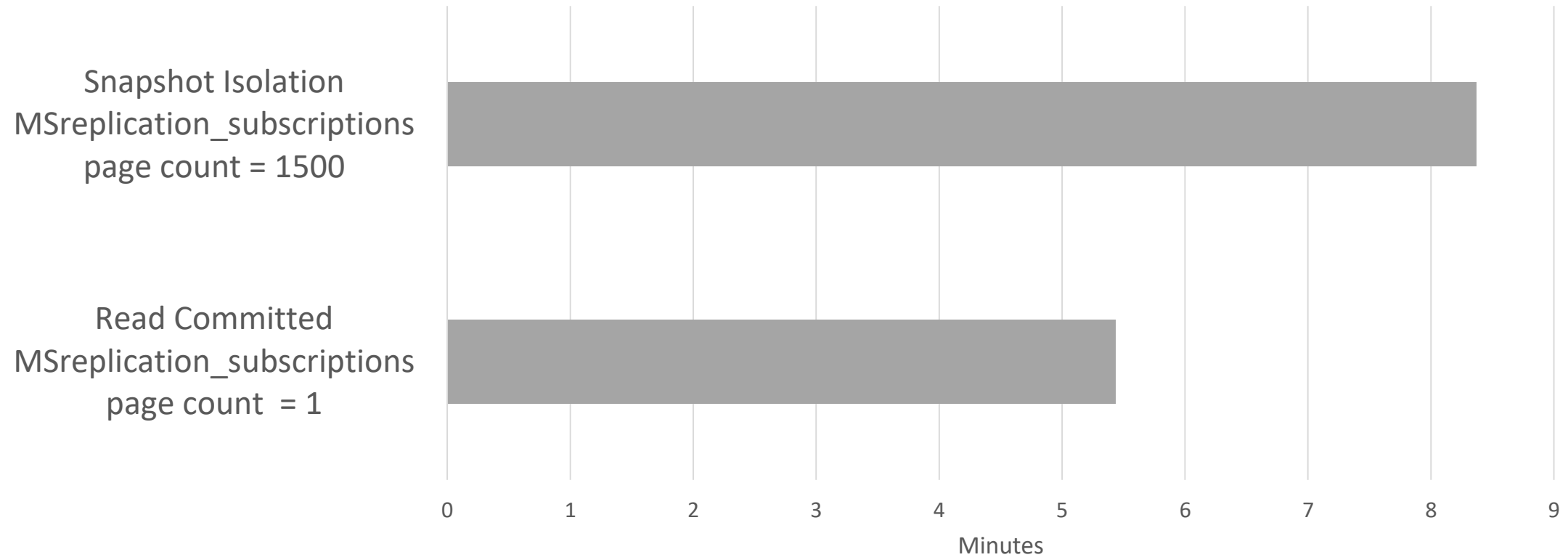
# Log Reader Agent Workload Flow



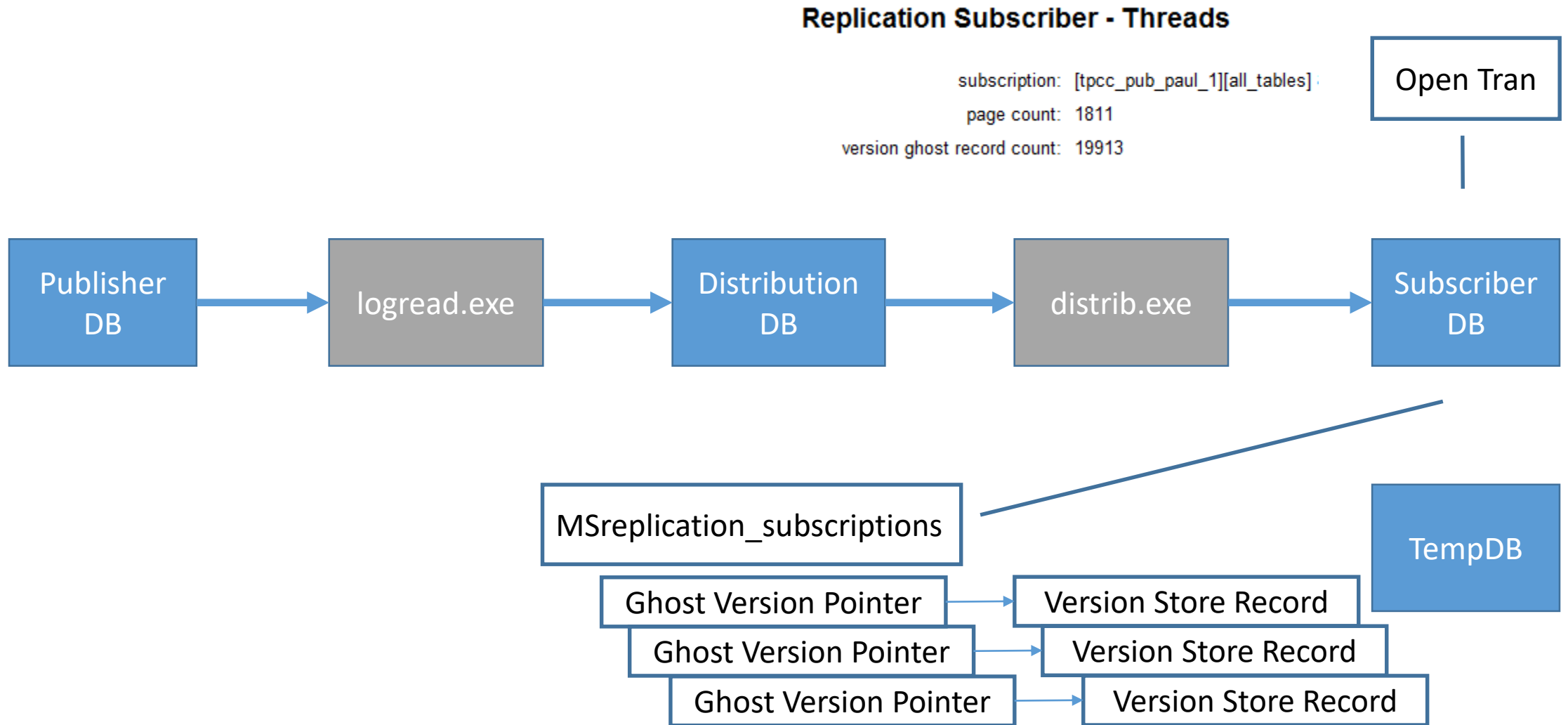
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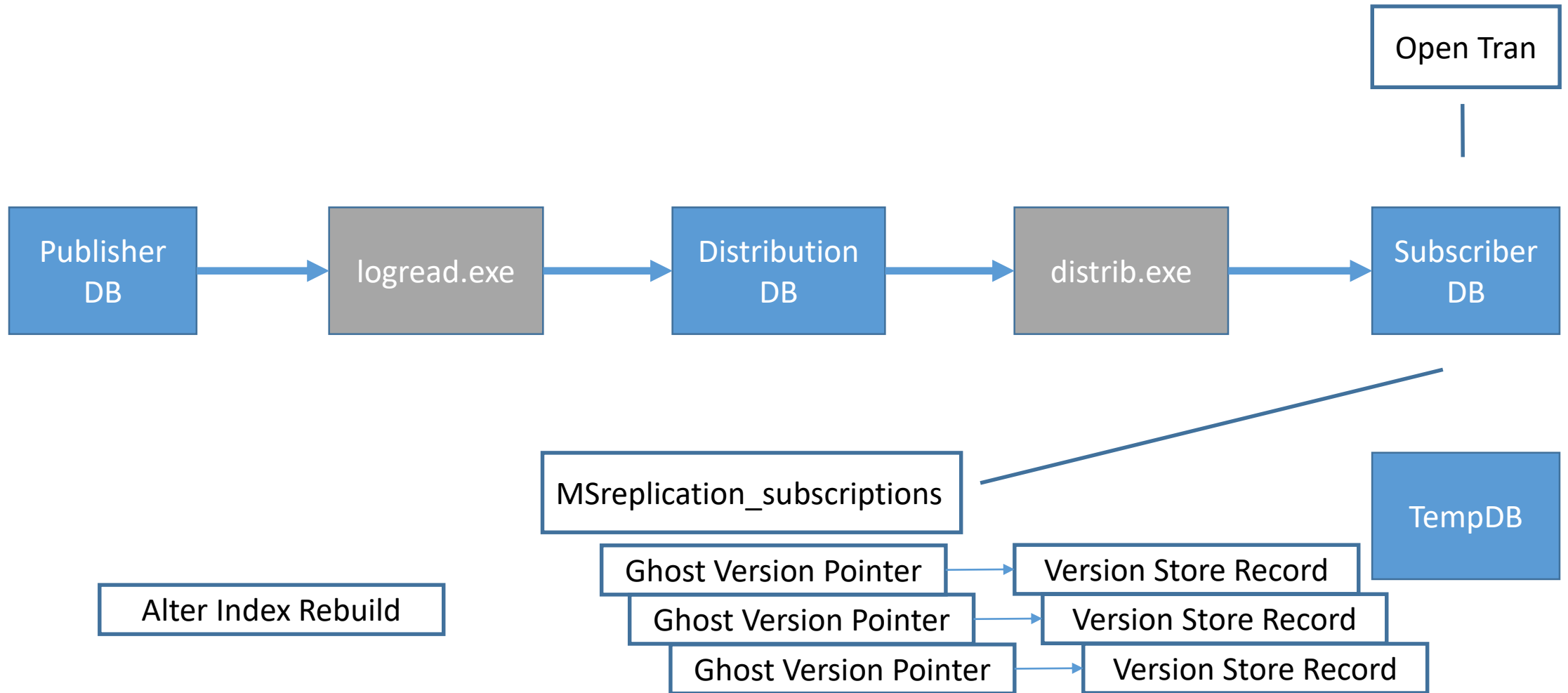
# Isolation Level Latency Benchmark



# Snapshot Isolation Side Effect



# Force Ghost Cleanup Workaround



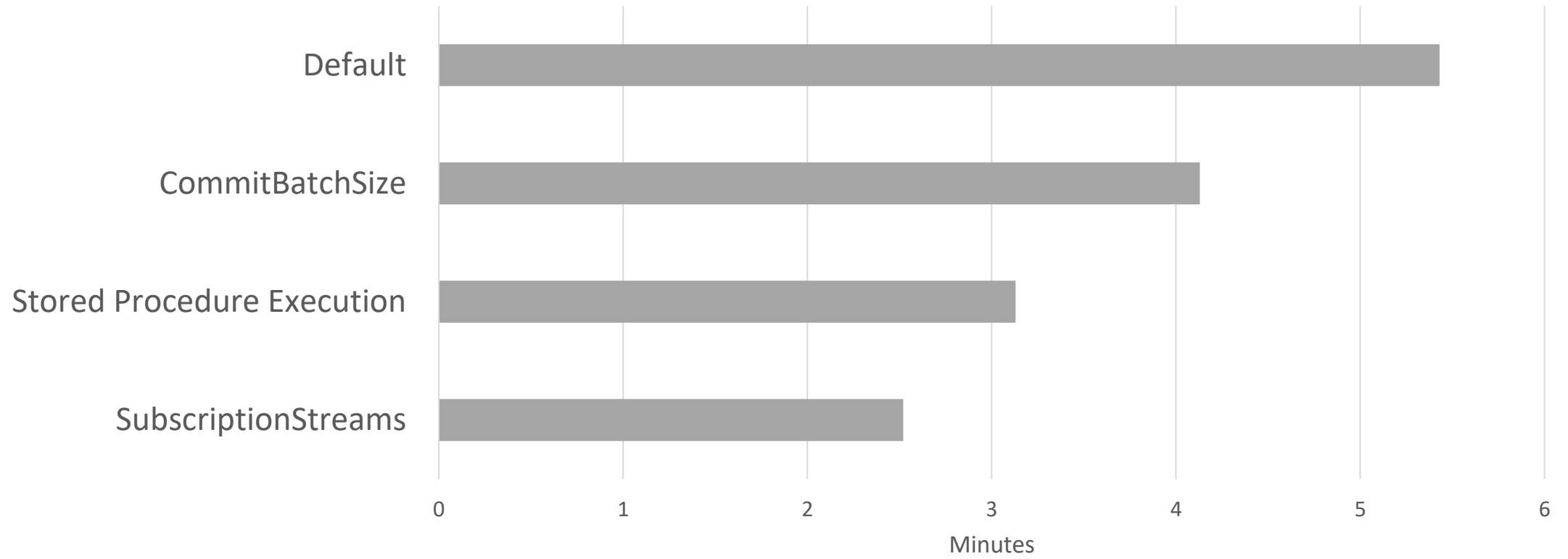


# Demo

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# Distribution Agent Properties Latency Benchmark



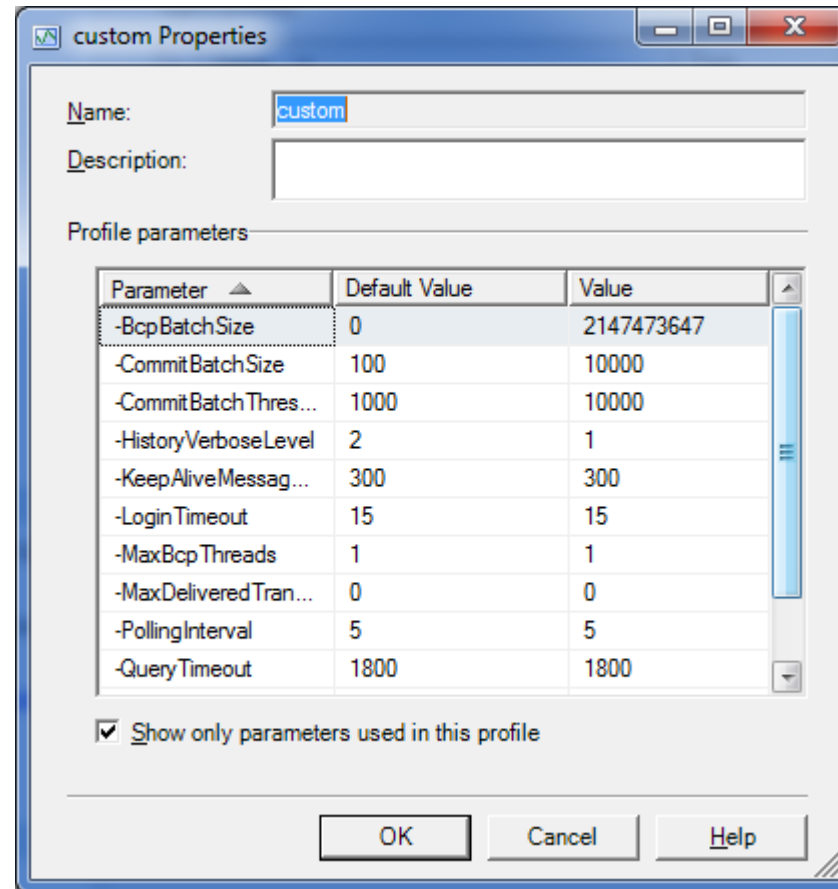
# Default



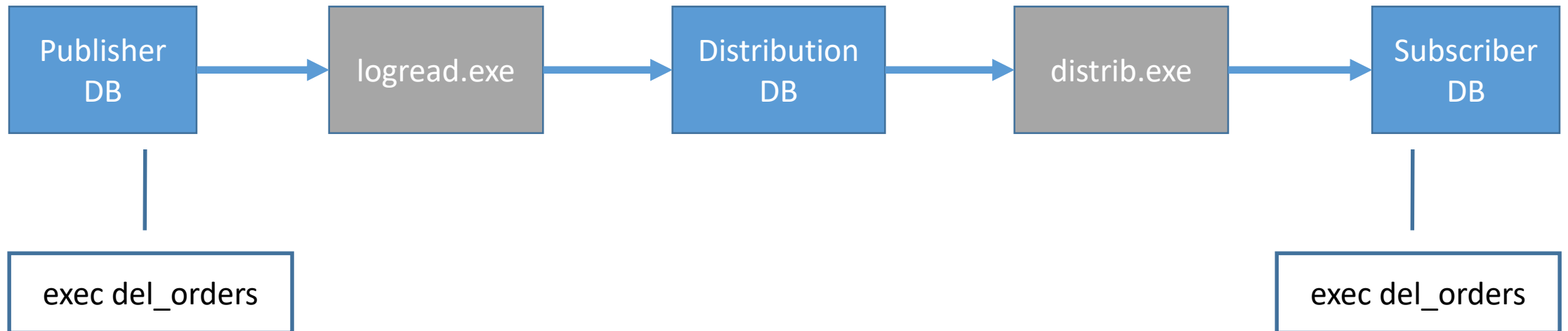
# Commit Batch Size



# Commit Batch Size Configuration

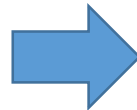


# Stored Procedure Execution



# Default is to Replicate Row by Row

```
create proc del_orders
as
delete dbo.order_line
from dbo.order_line ol
join #orders t
on t.o_id = ol.ol_o_id
and t.o_d_id = ol.ol_d_id
and t.o_w_id = ol.ol_w_id
```



37  
38 `sp_browsereplcmds`

100 %

Results Messages

	xact_seqno	command	command_id
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (21961,4,2,7)}	112272
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (21959,8,2,4)}	112274
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (24593,9,4,7)}	112276
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (14368,5,22,9)}	112278
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (30081,3,19,9)}	112280
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (14041,9,20,4)}	112282
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (20757,4,21,2)}	112284
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (25027,7,8,7)}	112286
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (12699,7,15,2)}	112288
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (22053,2,2,14)}	112290
1...	0x00000162001030C00003	{CALL [sp_MSdel_dboorder_line] (25466,9,28,4)}	112292

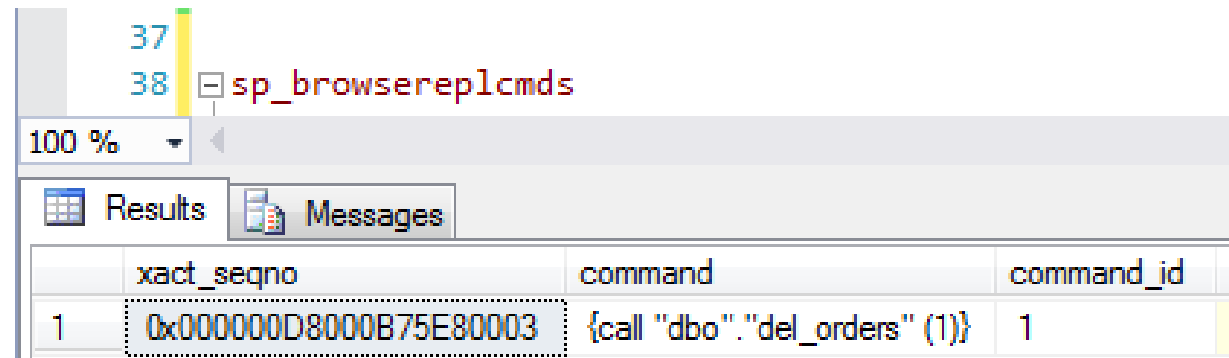
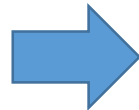
1 transaction

100K commands



# Replicate Stored Procedure Exec

```
create proc del_orders  
as  
  
delete dbo.order_line  
from dbo.order_line ol  
join #orders t  
on t.o_id = ol.ol_o_id  
and t.o_d_id = ol.ol_d_id  
and t.o_w_id = ol.ol_w_id
```



37  
38 sp\_browsereplcmds

100 %

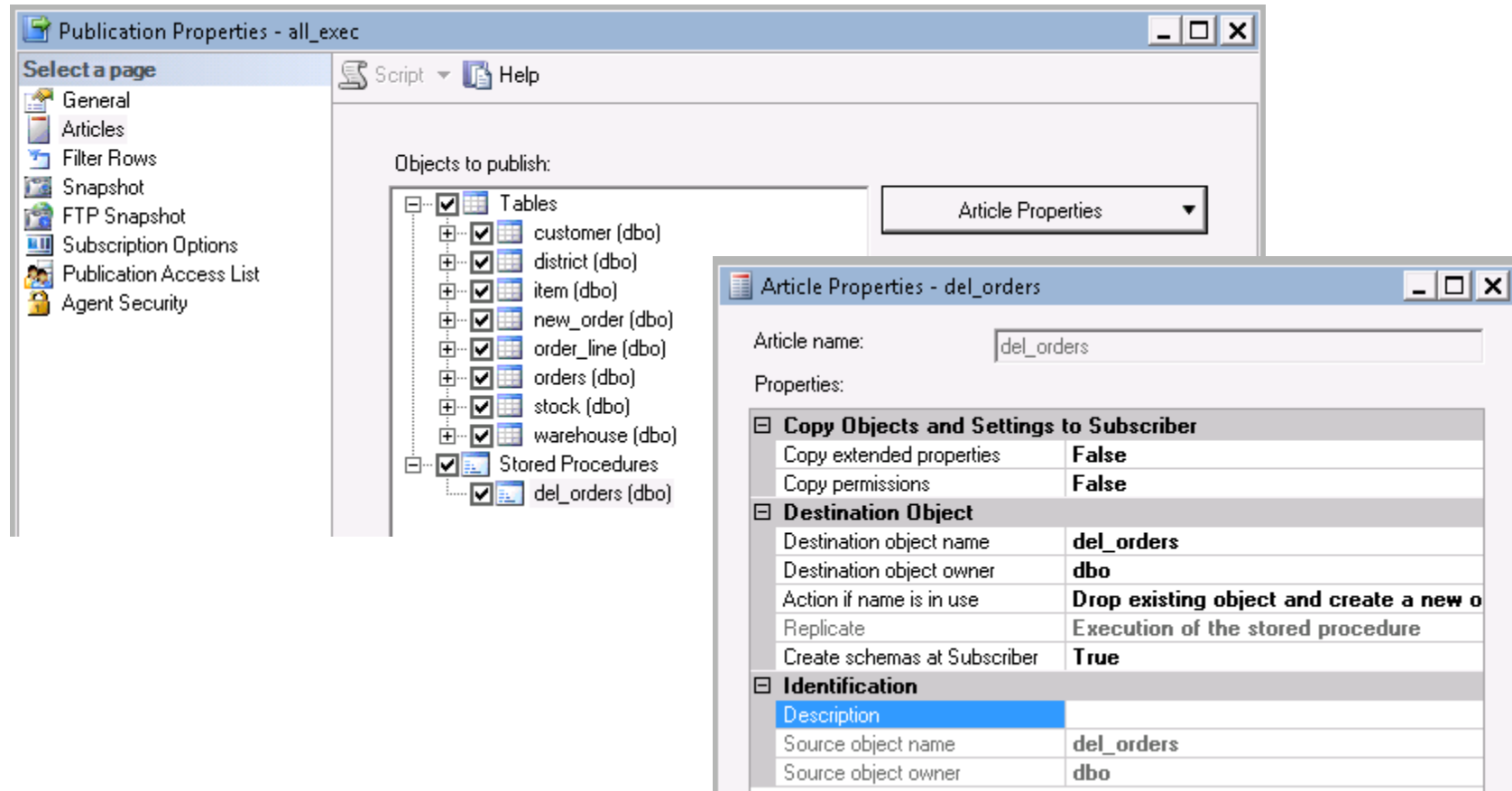
Results Messages

	xact_seqno	command	command_id
1	0x000000D8000B75E80003	{call "dbo"."del_orders" (1)}	1

1 transaction

1 command

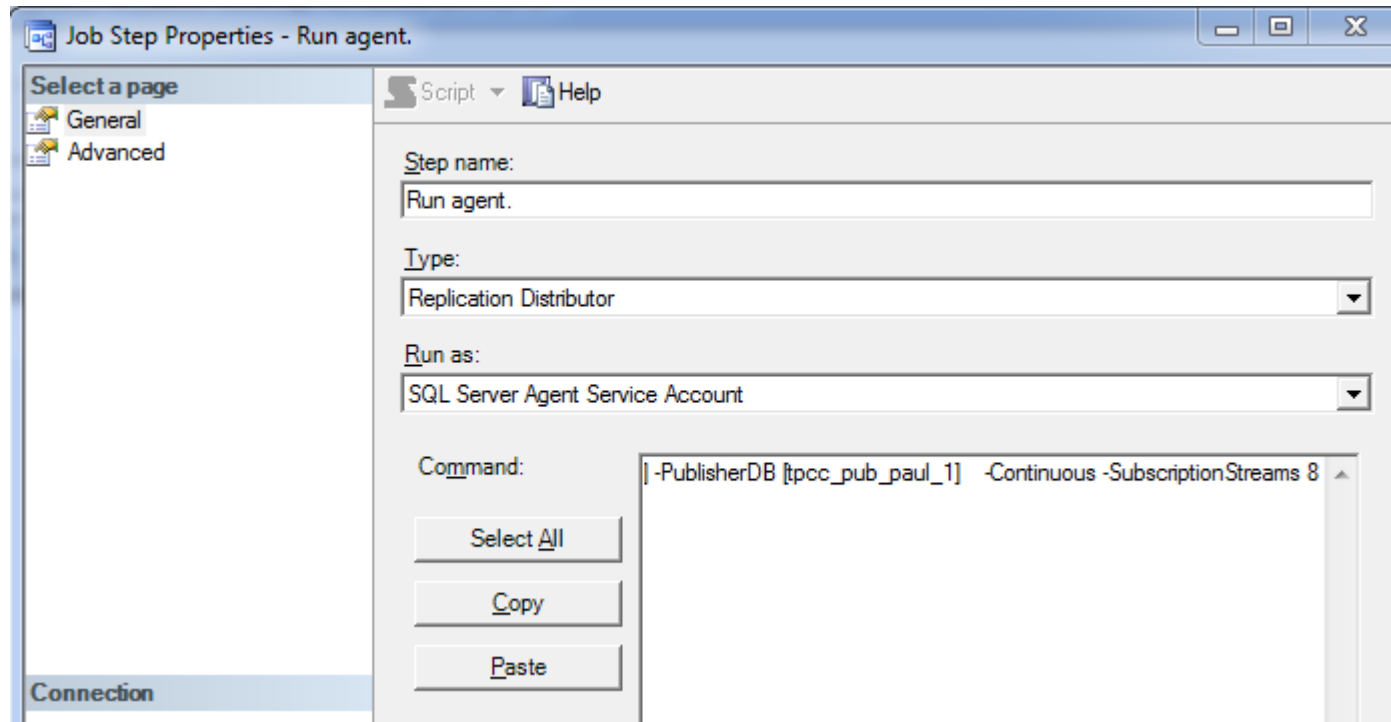
# Stored Procedure Configuration



# Subscription Streams



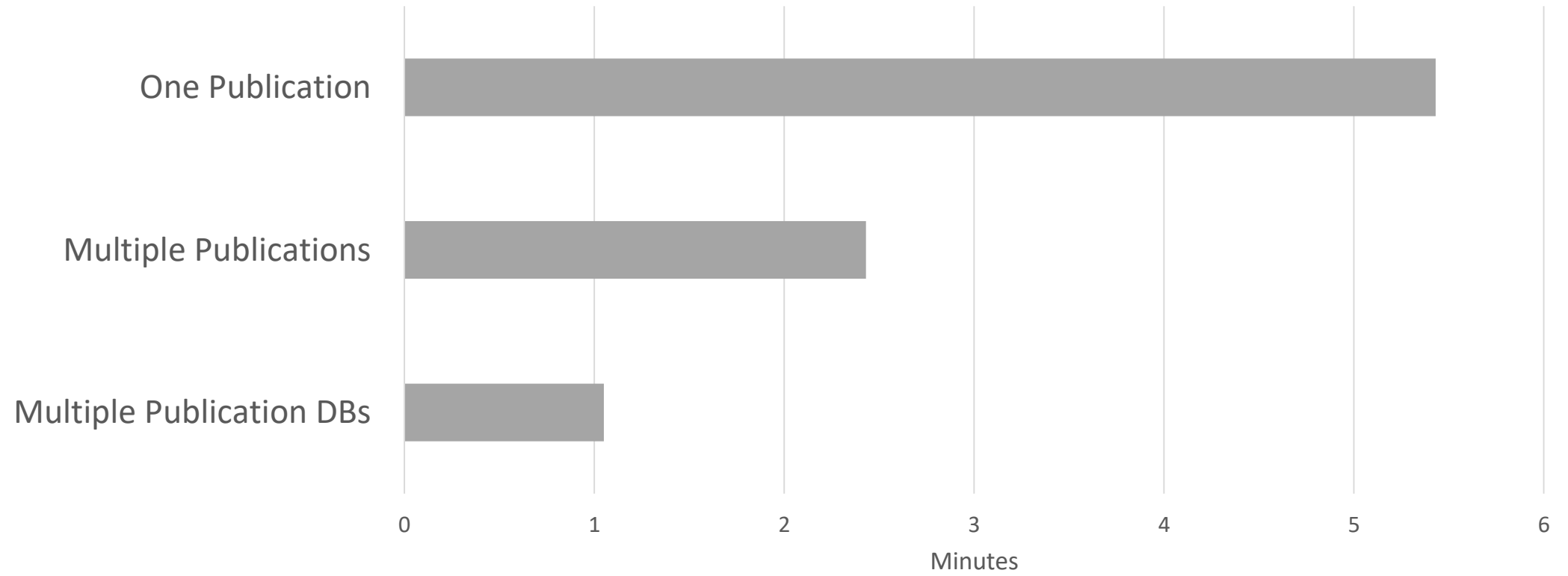
# Subscription Streams Configuration



# Tuning Knobs Latency Benchmark

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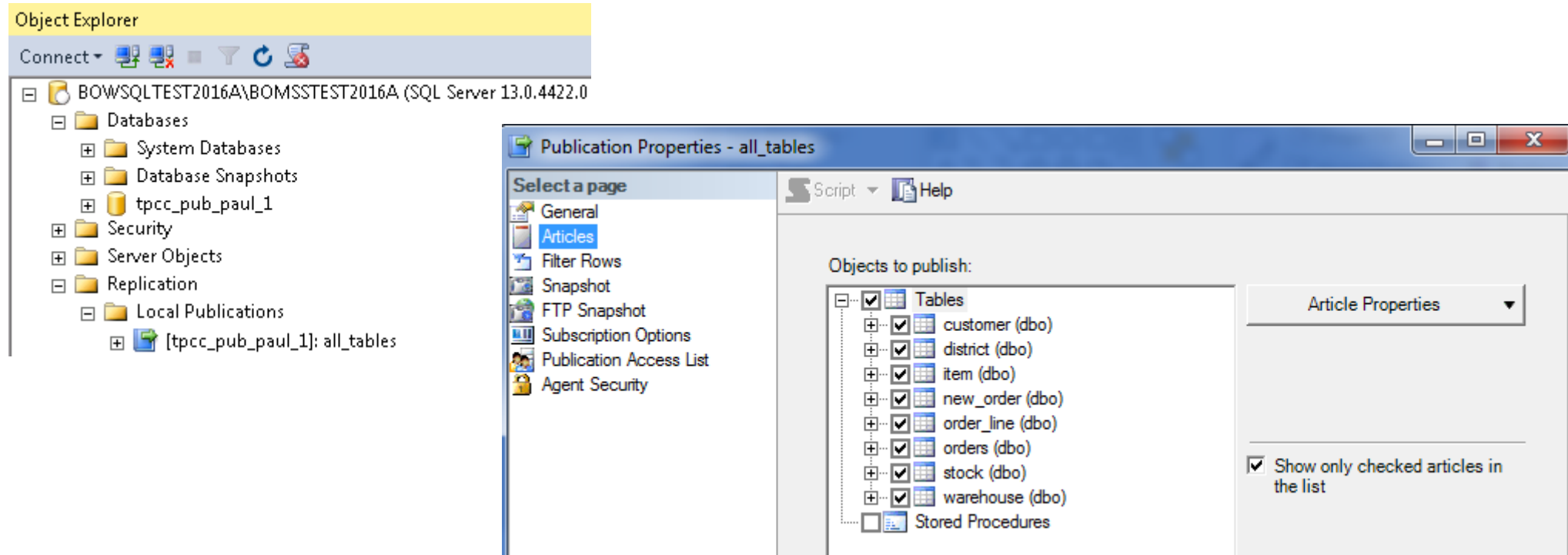
# Distribution Agent Topology Latency Benchmark



# One Publication

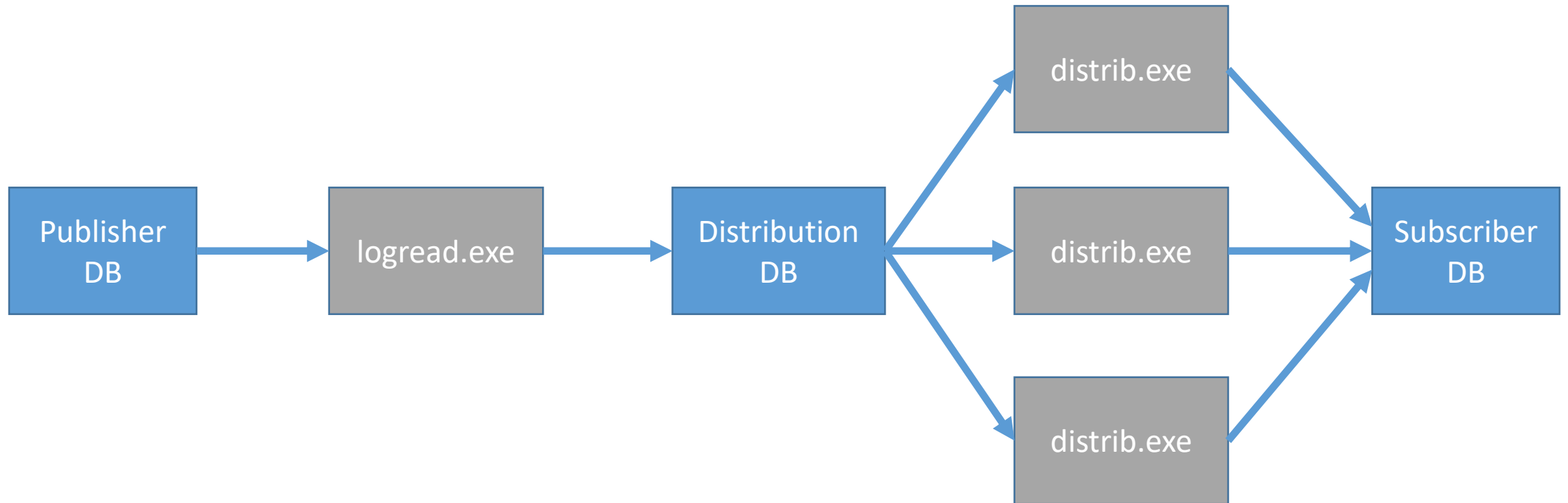


# One Publication Configuration

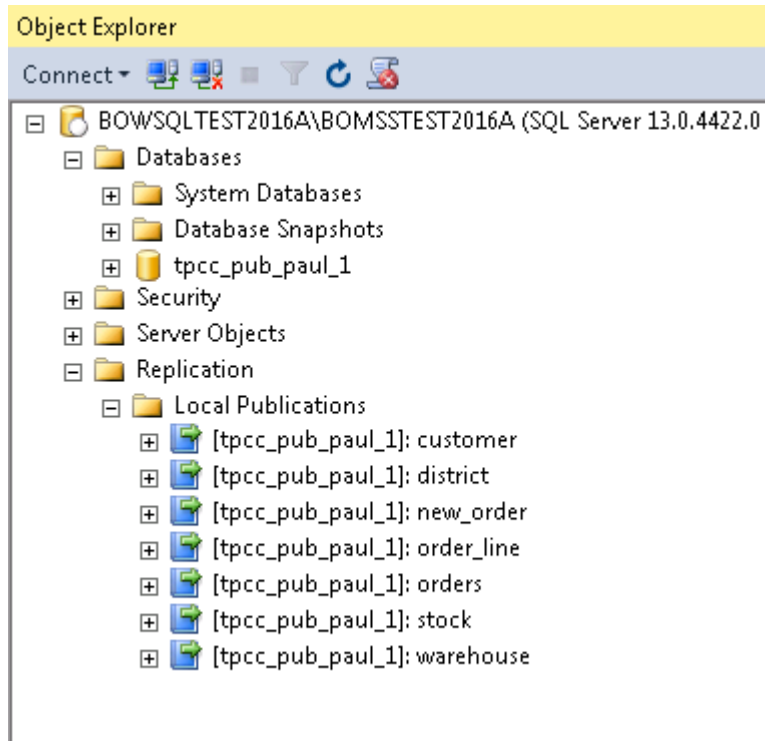




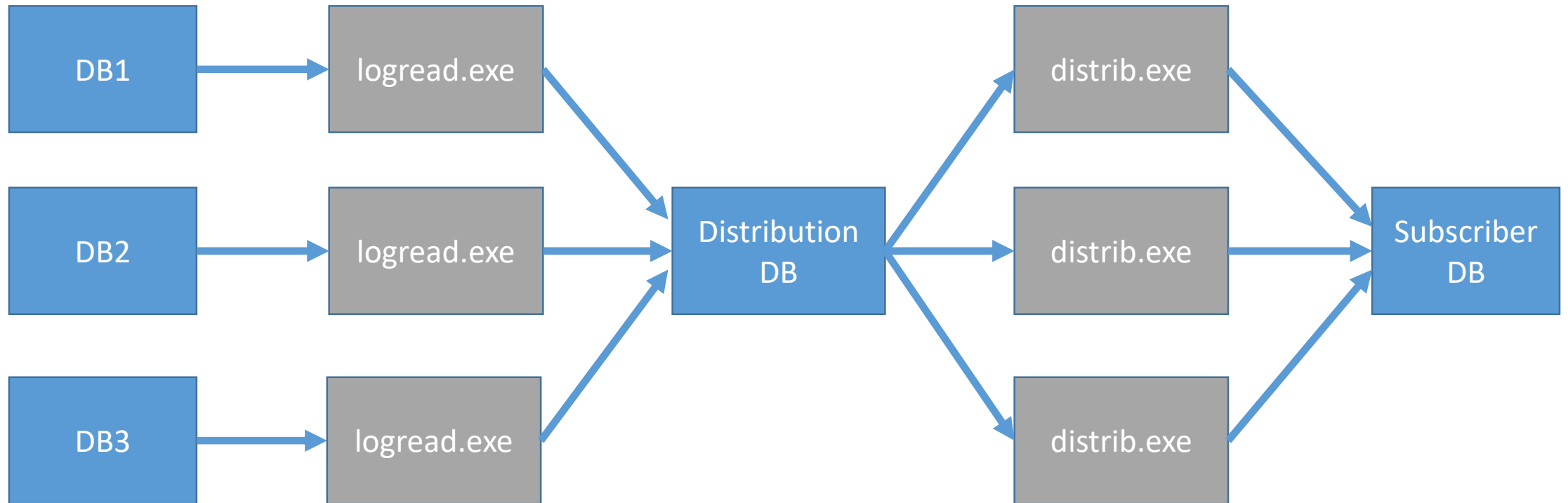
# Multiple Publications



# Multiple Publications Configuration



# Multiple Publication DBs



# Multiple Publication DBs Configuration

The screenshot displays the SQL Server Enterprise Manager interface with the following components:

- Object Explorer:** Shows the server hierarchy for 'BOWSQLTEST2016A\BOMSTEST2016A (SQL Server 13.0.4422.0)'. The 'Replication' folder is expanded, showing 'Local Publications' with eight entries: [tpcc\_pub\_paul\_4]: all\_tables, [tpcc\_pub\_paul\_5]: all\_tables, [tpcc\_pub\_paul\_6]: all\_tables, [tpcc\_pub\_paul\_7]: all\_tables, and [tpcc\_pub\_paul\_8]: all\_tables.
- Publication Properties - all\_tables:** The 'Articles' tab is selected. Under 'Objects to publish', the 'Tables' folder is expanded, listing: customer (dbo), district (dbo), item (dbo), new\_order (dbo), order\_line (dbo), orders (dbo), stock (dbo), and warehouse (dbo). All are checked for publication.
- Article Properties - customer:** The 'Properties' tab is shown for the 'customer' article. The 'Article name' is 'customer'. The 'Destination Object' section is expanded, showing the following configuration:

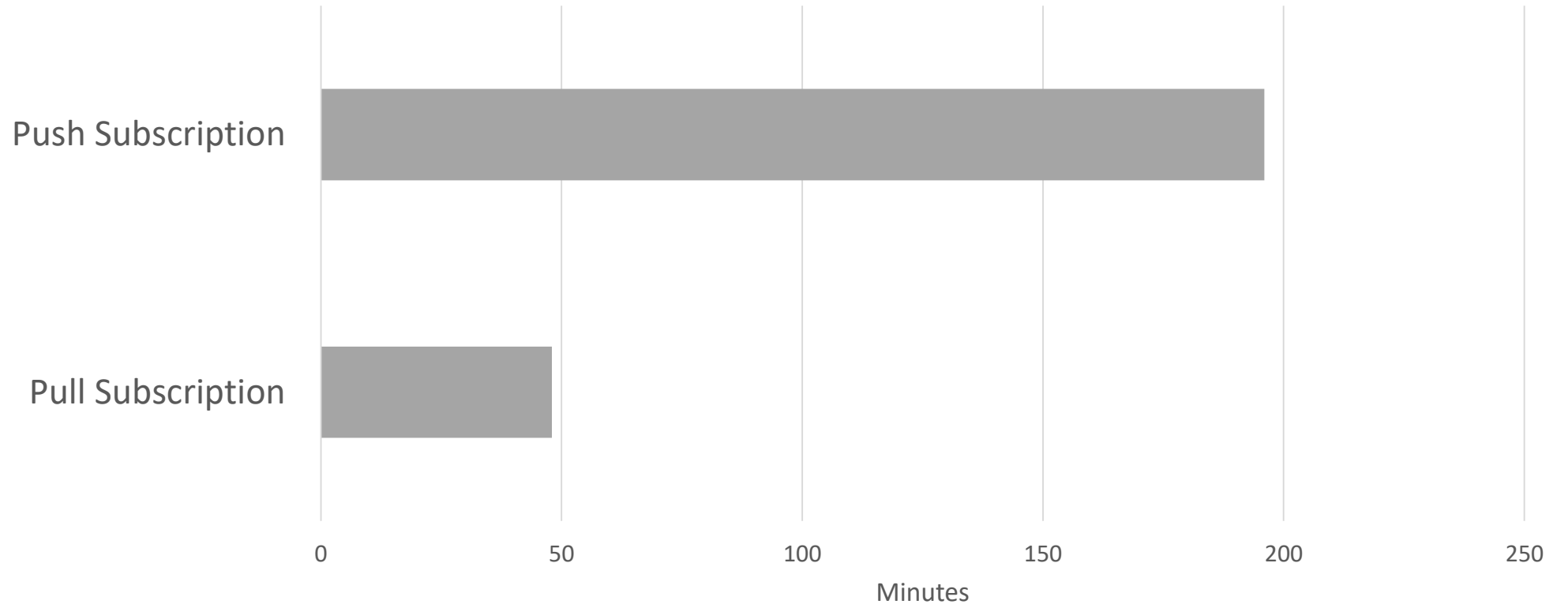
Property	Value
Copy filtered nonclustered columns	False
<b>Destination Object</b>	
Destination object name	customer_4
Destination object owner	dbo
Action if name is in use	Truncate all data in the existing object
Convert data types	False
Convert TIMESTAMP to BINARY	False
Create schemas at Subscriber	True
Convert XML to NTEXT	False
Convert MAX data types to NTEXT	False

# Tuning Knobs Latency Benchmark

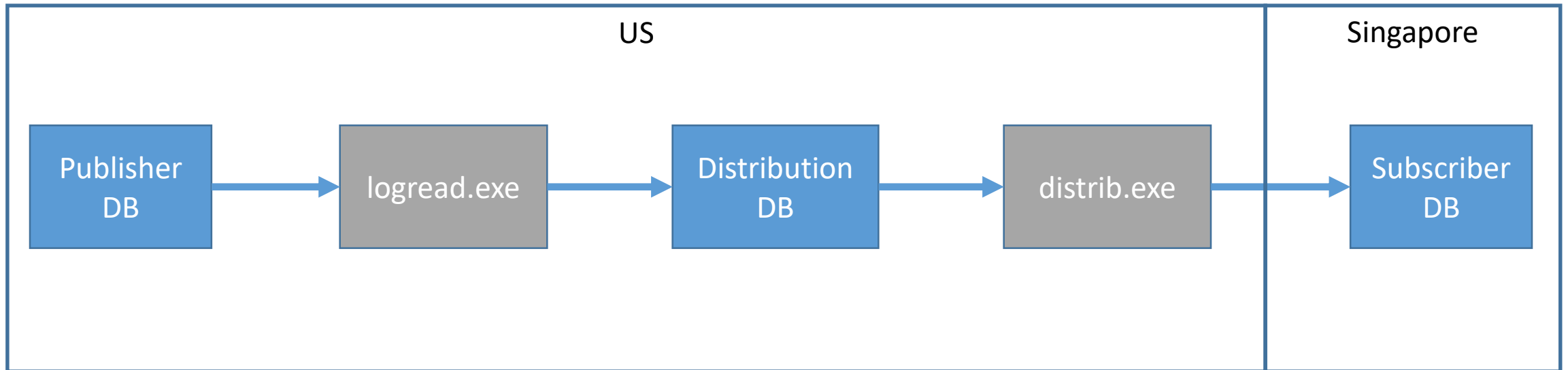
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# Subscription Type Latency Benchmark

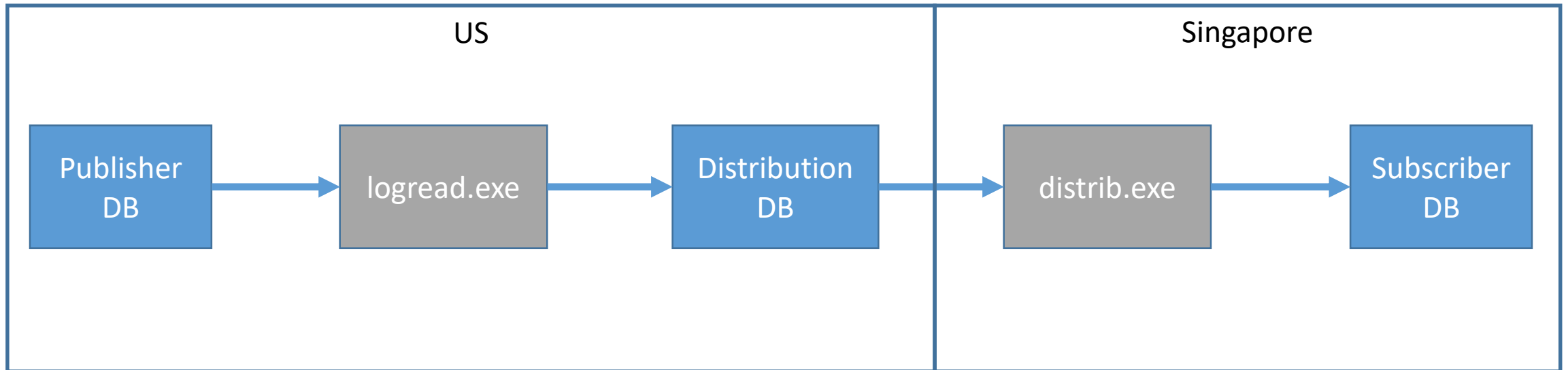
## US to Singapore



# Push Subscription

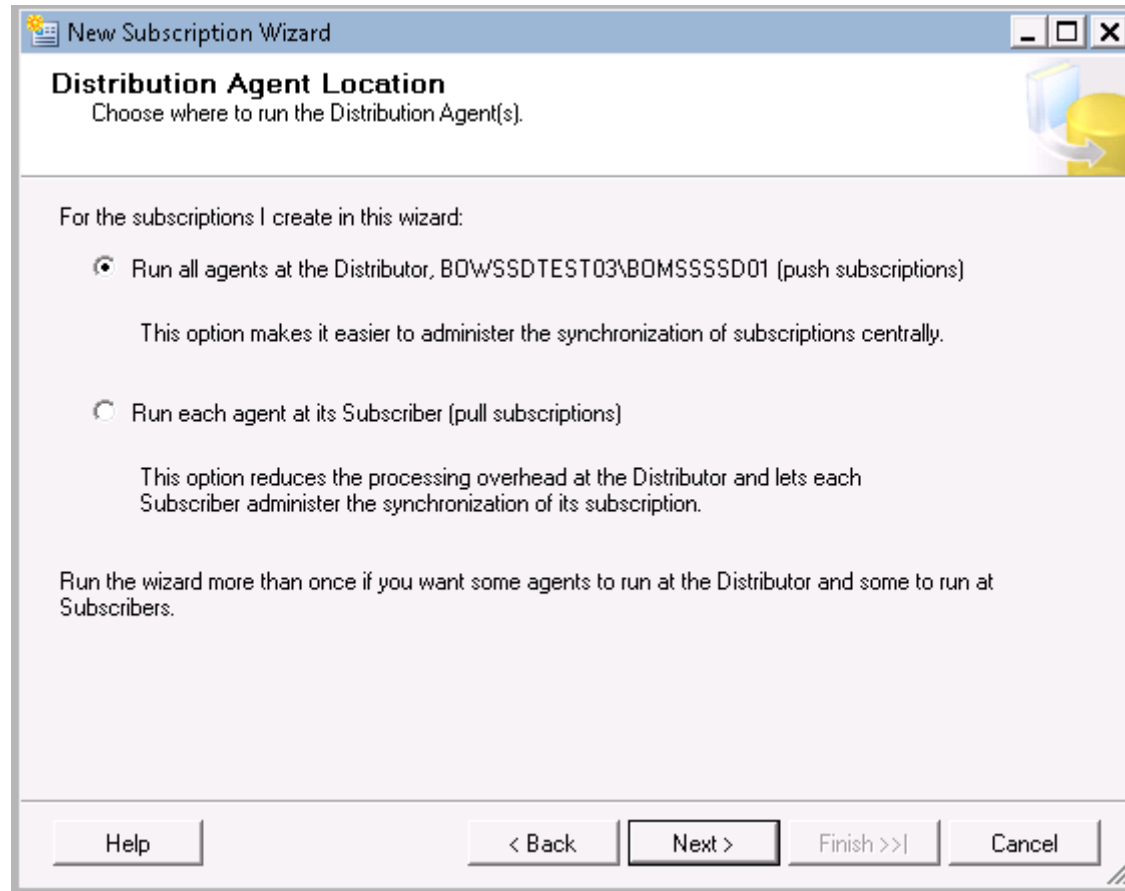


# Pull Subscription





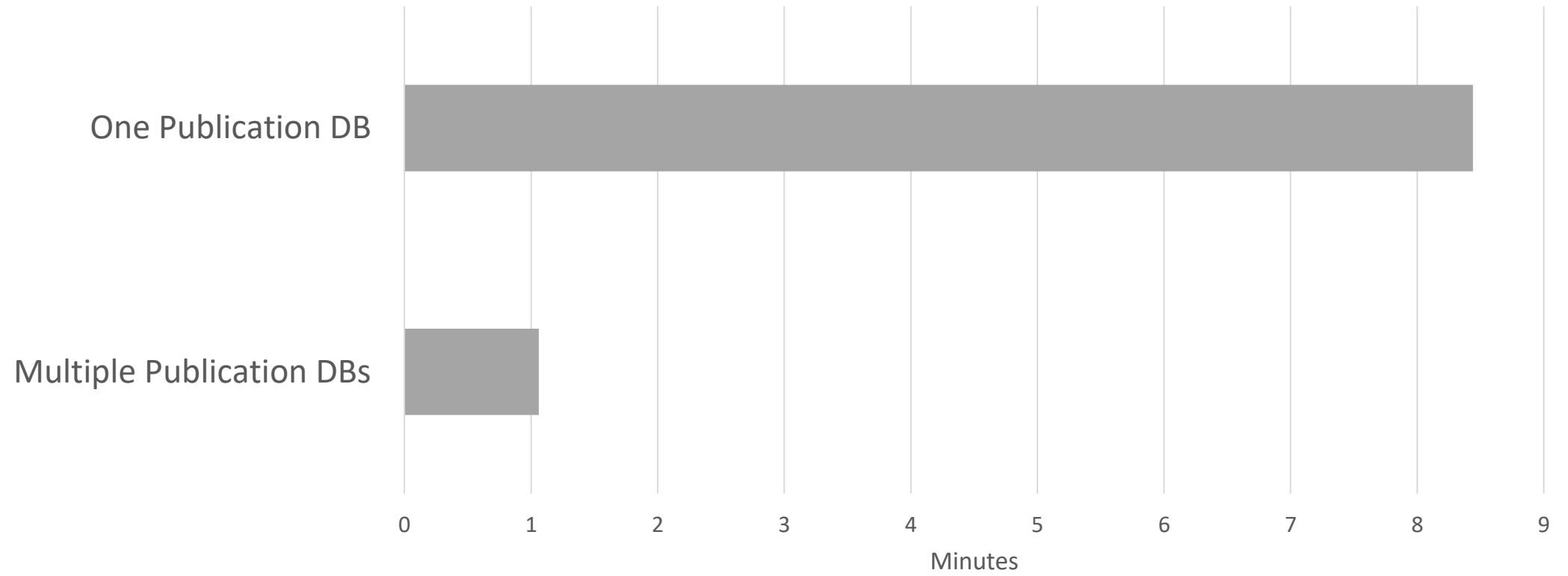
# Push / Pull Subscription Configuration



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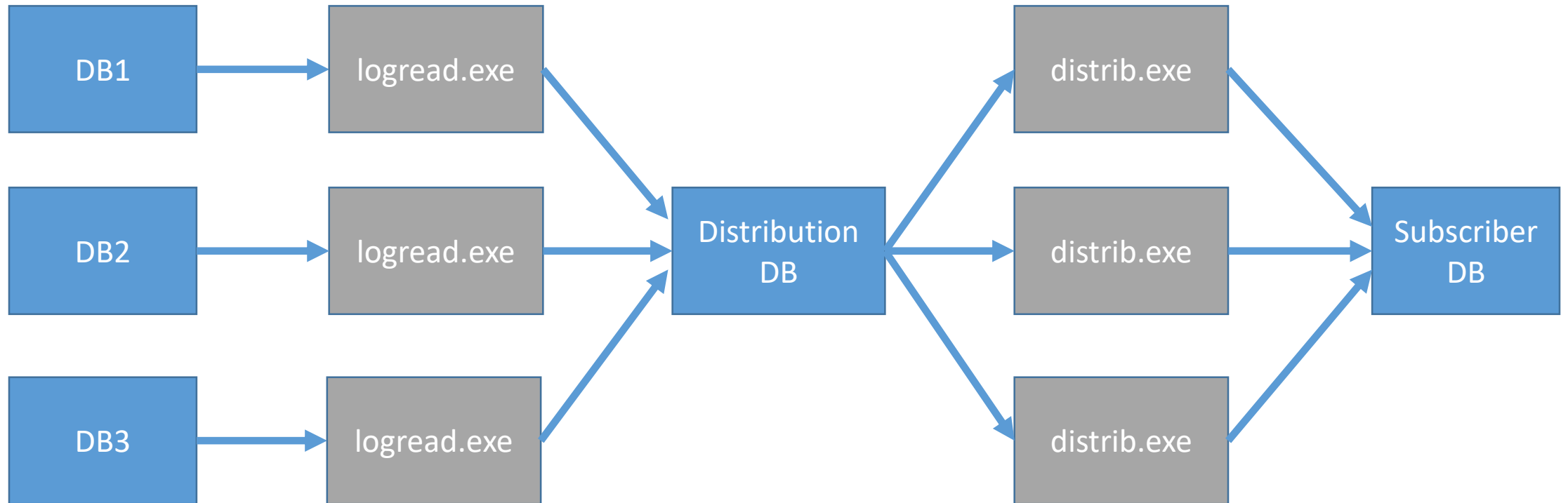
# Log Reader Agent Topology Latency Benchmark



# One Publication DB



# Multiple Publication DBs



# Agenda

- The Moving Parts
- The Bottlenecks
- The Tuning Knobs
- Take Away

# Take Away

- Understand the limitations
- Know your workload
- Change properties or topology to meet your workload

# What would you do?

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Insert Tracer Time inserted: 9/9/2017 9:12:57 PM

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	[BOWSQLTEST20...	Pending...	Pending...	Pending...
	[BOWSQLTEST20...	Pending...	Pending...	Pending...