Microsoft Dynamics 365

Dynamics 365 FastTrack Architecture Insights

Performance Best Practices
for finance and operations apps

February 15, 2023

Haytham Said
Rich Black

Agenda

- The Performance Testing Approach
- Tools
- Best practices
- Q&A

The Performance Testing Approach

Why

- Ensure Scalability

What

- Throughput
- Overlapping Workload
- Response Times
- Cutover
- Peak Hour

Where

- Pre-Production Scalability
- Production Load Validation

When

- Early
- Late
- With Time to Tune…
- Ongoing

Performance is not our responsibility; it is a cloud solution.

- A customer who will likely move the Go-Live date

Performance Contributions

Customer

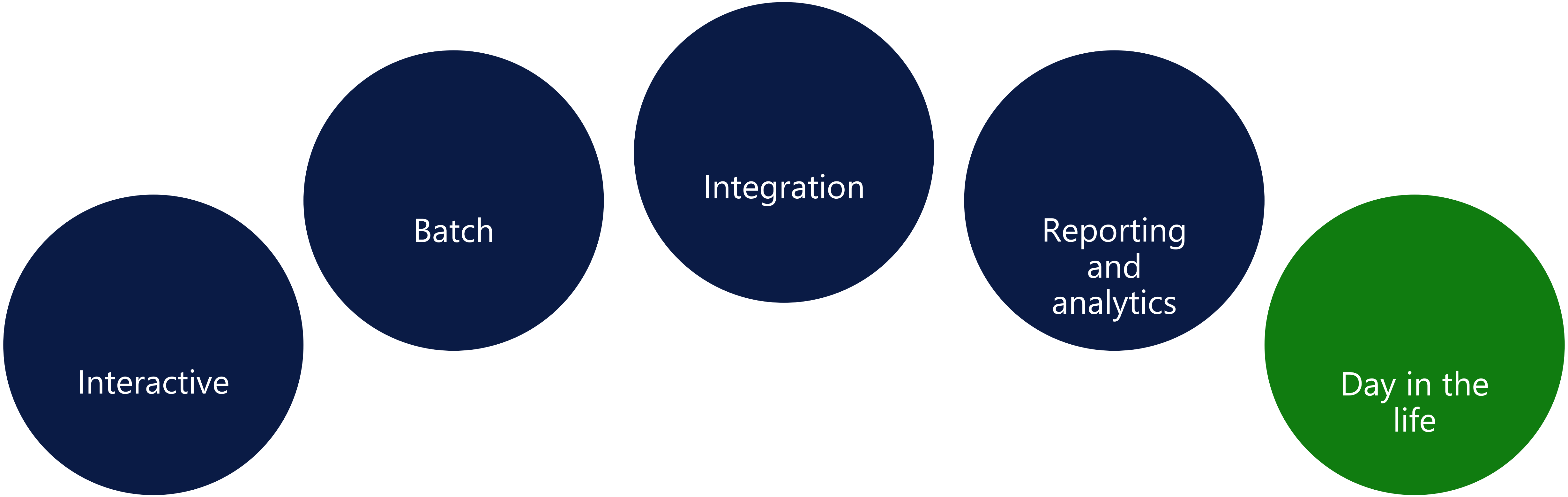
- Processes and Operations
- Users
- Analytics and Reporting
- Integrations
- Customizations
- Data
- Devices
- Independent Software Vendors (ISV)

Microsoft

- Azure Infrastructure
  - Database
  - Services
  - Network
- Standard Solution

We have tested performance of the integration, this is sufficient. We don’t need day-in-the-life tests.

A customer who will likely face performance issues
with realistic workloads post Go-Live



Interactive

Batch

Integration

Reporting and analytics

Day in the life

The common types of scenarios

DAY IN THE LIFE SCENARIO

Simulating tasks/activities as they would happen during working hours post Go-Live

Activities like it would happen post Go-Live in PRODUCTION

One unique task tested in isolation works, but testing shouldn't stop there. What if all tasks are initiated at the same time?

We know that tasks and processes will be executed concurrently post Go-Live. If you only test those tasks and processes in isolation, then you are ensuring that you will only discover issues with concurrent task execution in production. (This is not a Good Idea.) It is important to introduce concurrency into your testing!

(i.e. test the interactive, batch, integration and reporting scenarios at the same time, like it would happen during peak hours)

Performance testing is important

- Make it is part of the project plan; this underlines its importance and relevance for the success of the project

- There are multiple dependencies, like resources (environments, people, …), **Go-live criteria**

- It is critically important to define clear goals and non-functional requirements

- Volumes and their mix on a timeline is key

Performance awareness is key

- Call for performance feedback
- Train users to give valid feedback
- Have NFRs to validate against
- Make work items part of the backlog and iterations and define acceptance criteria
- Know the critical areas to allow proper prioritization

Plan iterations

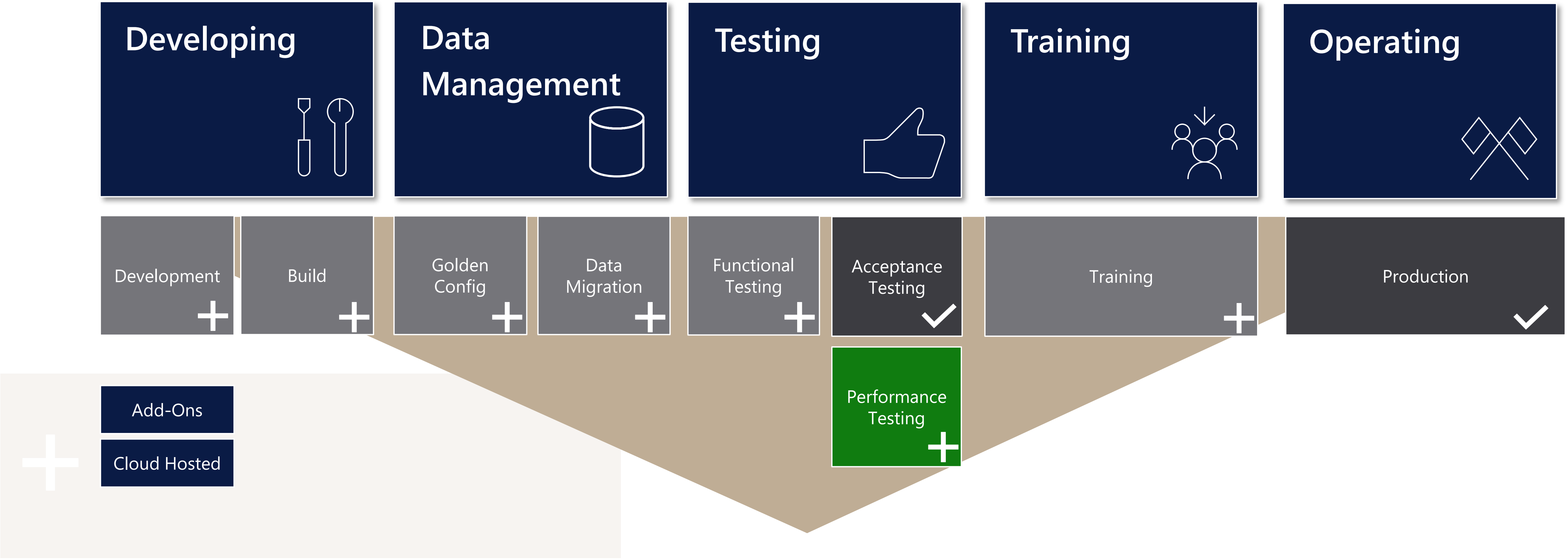
- Performance testing is not a one-step exercise
- There will be findings and questions raised, which need (planned) time, fixes and mitigations need validation and thus, further test executions
- Leverage existing performance metrics (e.g., review as exit criteria)
- Consider one-time activities, like month-end invoicing, year-end activities, and create test scenarios for these, too
- Make sure your sizing estimate is regularly updated and as accurate as possible (after Go-Live)

We will use the PRODUCTION environment for performance testing / stress testing.

A customer who will likely move the Go-Live date

Working in the Right Environment

Environments support a variety of implementation needs



Developing

Data Management

Testing

Training

Operating

Development +

Build +

Golden Config +

Data Migration +

Functional Testing +

Acceptance Testing ✓

Performance Testing +

Training +

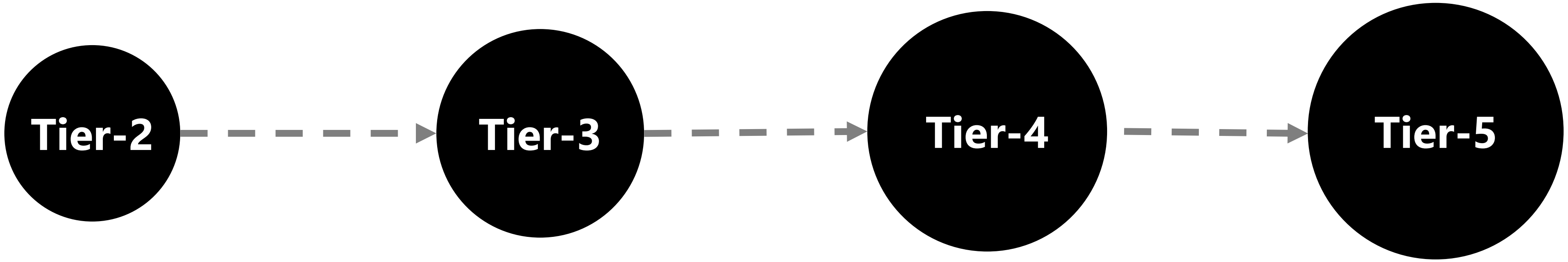
Production ✓

+

Add-Ons

Cloud Hosted

Selecting the correct Tier-2+ for performance testing



Tier-2	Tier-3	Tier-4	Tier-5
Standard Acceptance Test	Premier Acceptance Test	Standard Performance Test	Premier Performance Test
30-40 users or **3,000 transaction lines per hour****	**40-70 users** or **7,000 transaction lines per hour****	**70-150 users** or **20,000 transaction lines per hour****	**Above 150 users** or **above 20,000 transaction lines per hour****

Rely on your **partner** to adjust this **baseline** considering the specific **business scenarios** (type of users/complexity/volumes/…)

**Note: Transaction lines can be found after uploading a usage profile in the Subscription Estimator

Environment planning - Finance & Operations | Dynamics 365 | Microsoft Docs

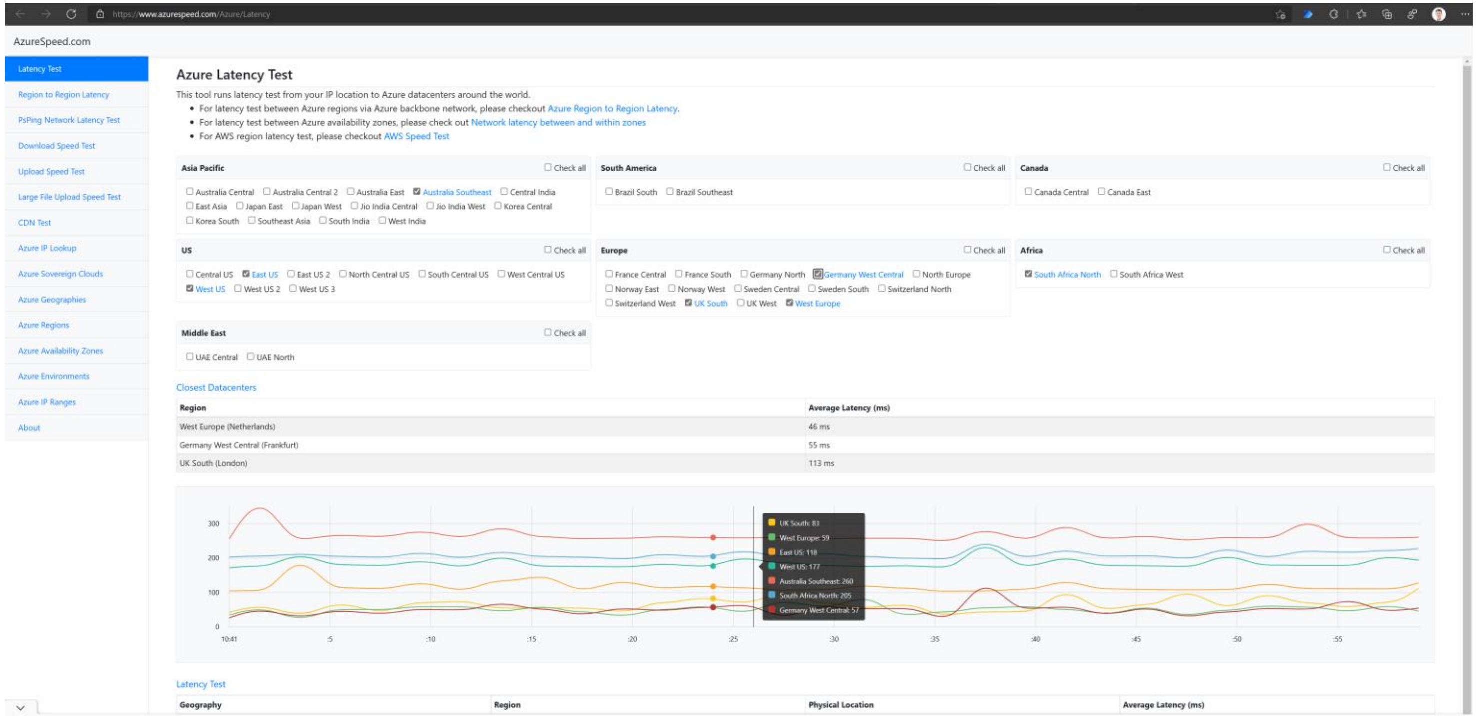
Tools

Latency Test

There are handy websites like AzureSpeed.com that help with latency testing.

High latency can influence UX negatively.

Review System requirements for cloud deployments (Docs)for latency and bandwidth requirements.



https://www.azurespeed.com/Azure/Latency

AzureSpeed.com

- Latency Test
- Region to Region Latency
- PsPing Network Latency Test
- Download Speed Test
- Upload Speed Test
- Large File Upload Speed Test
- CDN Test
- Azure IP Lookup
- Azure Sovereign Clouds
- Azure Geographies
- Azure Regions
- Azure Availability Zones
- Azure Environments
- Azure IP Ranges
- About

Azure Latency Test

This tool runs latency test from your IP location to Azure datacenters around the world.

- For latency test between Azure regions via Azure backbone network, please checkout Azure Region to Region Latency.
- For latency test between Azure availability zones, please check out Network latency between and within zones
- For AWS region latency test, please checkout AWS Speed Test

Asia Pacific ☐ Check all

☐ Australia Central ☐ Australia Central 2 ☐ Australia East ☑ Australia Southeast ☐ Central India
☐ East Asia ☐ Japan East ☐ Japan West ☐ Jio India Central ☐ Jio India West ☐ Korea Central
☐ Korea South ☐ Southeast Asia ☐ South India ☐ West India

South America ☐ Check all

☐ Brazil South ☐ Brazil Southeast

Canada ☐ Check all

☐ Canada Central ☐ Canada East

US ☐ Check all

☐ Central US ☑ East US ☐ East US 2 ☐ North Central US ☐ South Central US ☐ West Central US
☑ West US ☐ West US 2 ☐ West US 3

Europe ☐ Check all

☐ France Central ☐ France South ☐ Germany North ☑ Germany West Central ☐ North Europe
☐ Norway East ☐ Norway West ☐ Sweden Central ☐ Sweden South ☐ Switzerland North
☐ Switzerland West ☑ UK South ☐ UK West ☑ West Europe

Africa ☐ Check all

☑ South Africa North ☐ South Africa West

Middle East ☐ Check all

☐ UAE Central ☐ UAE North

Closest Datacenters

Region	Average Latency (ms)
West Europe (Netherlands)	46 ms
Germany West Central (Frankfurt)	55 ms
UK South (London)	113 ms

Latency Test

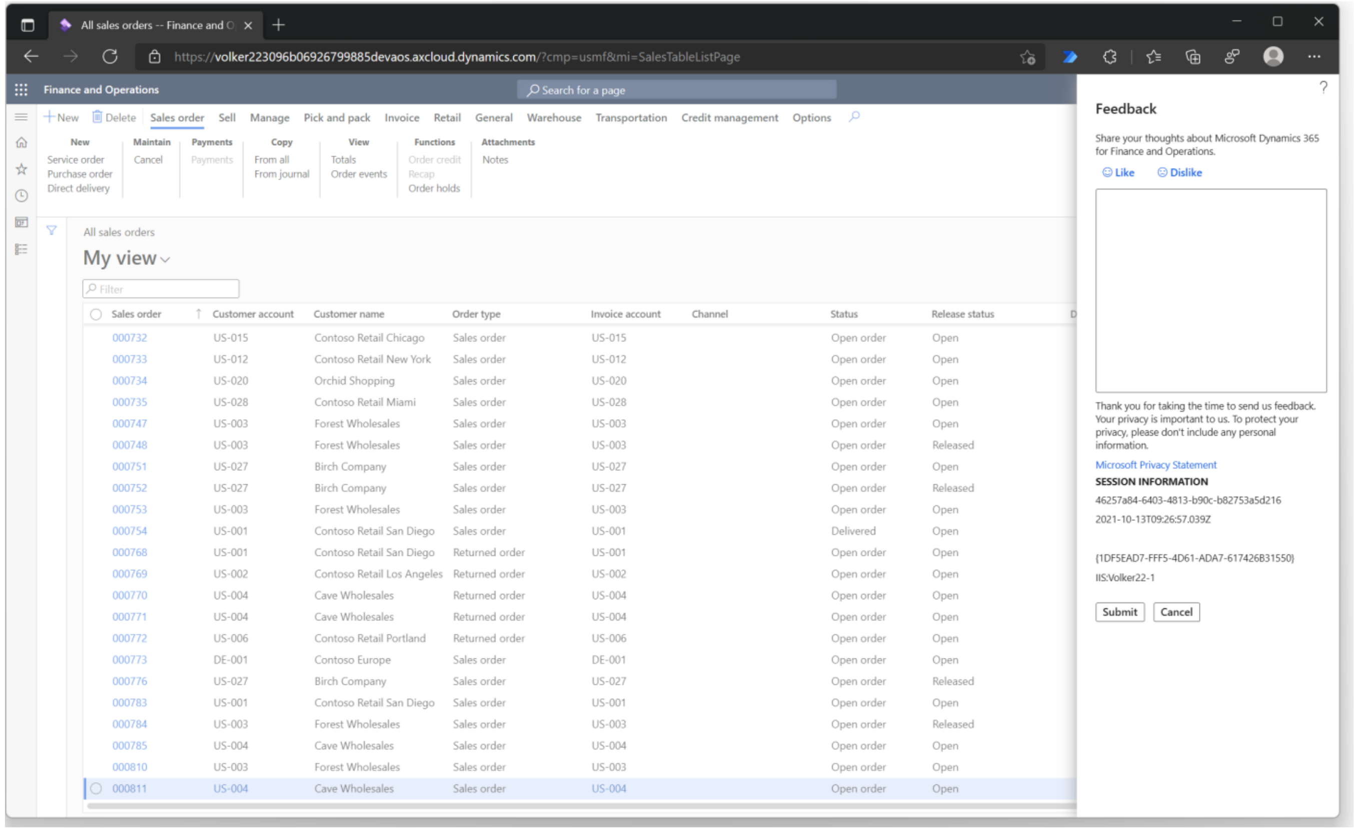
Geography	Region	Physical Location	Average Latency (ms)

Session information

The *Feedback* dialog gives you session and activity Ids.

On Tier-2+ and Production environments, you can use these to investigate telemetry using Lifecycle Services.

These information are crucial to provide when opening support tickets with Microsoft Support too.



Sales order	Customer account	Customer name	Order type	Invoice account	Channel	Status	Release status
000732	US-015	Contoso Retail Chicago	Sales order	US-015		Open order	Open
000733	US-012	Contoso Retail New York	Sales order	US-012		Open order	Open
000734	US-020	Orchid Shopping	Sales order	US-020		Open order	Open
000735	US-028	Contoso Retail Miami	Sales order	US-028		Open order	Open
000747	US-003	Forest Wholesales	Sales order	US-003		Open order	Open
000748	US-003	Forest Wholesales	Sales order	US-003		Open order	Released
000751	US-027	Birch Company	Sales order	US-027		Open order	Open
000752	US-027	Birch Company	Sales order	US-027		Open order	Released
000753	US-003	Forest Wholesales	Sales order	US-003		Open order	Open
000754	US-001	Contoso Retail San Diego	Sales order	US-001		Delivered	Open
000768	US-001	Contoso Retail San Diego	Returned order	US-001		Open order	Open
000769	US-002	Contoso Retail Los Angeles	Returned order	US-002		Open order	Open
000770	US-004	Cave Wholesales	Returned order	US-004		Open order	Open
000771	US-004	Cave Wholesales	Returned order	US-004		Open order	Open
000772	US-006	Contoso Retail Portland	Returned order	US-006		Open order	Open
000773	DE-001	Contoso Europe	Sales order	DE-001		Open order	Open
000776	US-027	Birch Company	Sales order	US-027		Open order	Released
000783	US-001	Contoso Retail San Diego	Sales order	US-001		Open order	Open
000784	US-003	Forest Wholesales	Sales order	US-003		Open order	Released
000785	US-004	Cave Wholesales	Sales order	US-004		Open order	Open
000810	US-003	Forest Wholesales	Sales order	US-003		Open order	Open
000811	US-004	Cave Wholesales	Sales order	US-004		Open order	Open

Feedback

Share your thoughts about Microsoft Dynamics 365 for Finance and Operations.

☺ Like ☹ Dislike

Thank you for taking the time to send us feedback. Your privacy is important to us. To protect your privacy, please don't include any personal information.

Microsoft Privacy Statement

SESSION INFORMATION

46257a84-6403-4813-b90c-b82753a5d216

2021-10-13T09:26:57.039Z

{1DF5EAD7-FFF5-4D61-ADA7-617426B31550}

IIS:Volker22-1

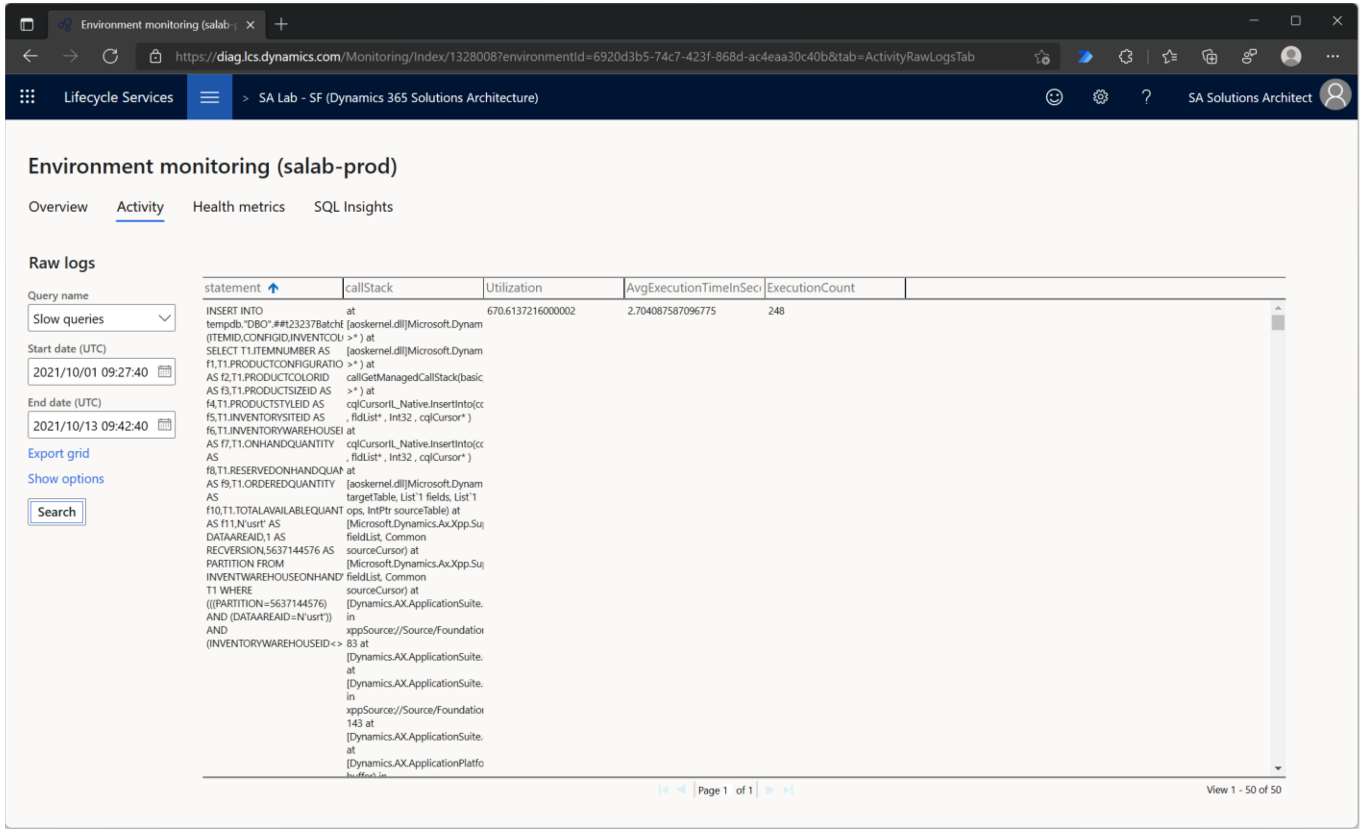
Submit Cancel

Lifecycle Services Monitoring and Diagnostics

The tools available on LCS might be more powerful than you think!

You can track sessions, activities, look at summarized information like Slow queries, and many other useful metrics.

See [Monitoring and diagnostics tools in Lifecycle Services (LCS)]() on Docs for further information and start utilizing.



Environment monitoring (salab-
https://diag.lcs.dynamics.com/Monitoring/Index/1328008?environmentId=6920d3b5-74c7-423f-868d-ac4eaa30c40b&tab=ActivityRawLogsTab
Lifecycle Services
> SA Lab - SF (Dynamics 365 Solutions Architecture)
SA Solutions Architect

Environment monitoring (salab-prod)

Overview | Activity | Health metrics | SQL Insights

Raw logs

Query name: Slow queries

Start date (UTC): 2021/10/01 09:27:40

End date (UTC): 2021/10/13 09:42:40

Export grid

Show options

Search

statement ↑	callStack	Utilization	AvgExecutionTimeInSec	ExecutionCount
INSERT INTO tempdb."DBO".##t23237BatchE (ITEMID,CONFIGID,INVENTCOL SELECT T1.ITEMNUMBER AS f1,T1.PRODUCTCONFIGURATIO AS f2,T1.PRODUCTCOLORID AS f3,T1.PRODUCTSIZEID AS f4,T1.PRODUCTSTYLEID AS f5,T1.INVENTORYSITEID AS f6,T1.INVENTORYWAREHOUSEI AS f7,T1.ONHANDQUANTITY AS f8,T1.RESERVEDONHANDQUAN AS f9,T1.ORDEREDQUANTITY AS f10,T1.TOTALAVAILABLEQUANT AS f11,N'usrt' AS DATAAREAID,1 AS RECVERSION,5637144576 AS PARTITION FROM INVENTWAREHOUSEONHAND' T1 WHERE (((PARTITION=5637144576) AND (DATAAREAID=N'usrt')) AND (INVENTORYWAREHOUSEID<>	at [aoskernel.dll]Microsoft.Dynam >*) at [aoskernel.dll]Microsoft.Dynam >*) at callGetManagedCallStack(basic >*) at cqlCursorIL_Native.InsertInto(cc , fldList* , Int32 , cqlCursor*) at cqlCursorIL_Native.InsertInto(cc , fldList* , Int32 , cqlCursor*) at [aoskernel.dll]Microsoft.Dynam targetTable, List`1 fields, List`1 ops, IntPtr sourceTable) at [Microsoft.Dynamics.Ax.Xpp.Su fieldList, Common sourceCursor) at [Microsoft.Dynamics.Ax.Xpp.Su fieldList, Common sourceCursor) at [Dynamics.AX.ApplicationSuite. in xppSource://Source/Foundatio 83 at [Dynamics.AX.ApplicationSuite. at [Dynamics.AX.ApplicationSuite. in xppSource://Source/Foundatio 143 at [Dynamics.AX.ApplicationSuite. at [Dynamics.AX.ApplicationPlatfo buffer) in	670.6137216000002	2.704087587096775	248

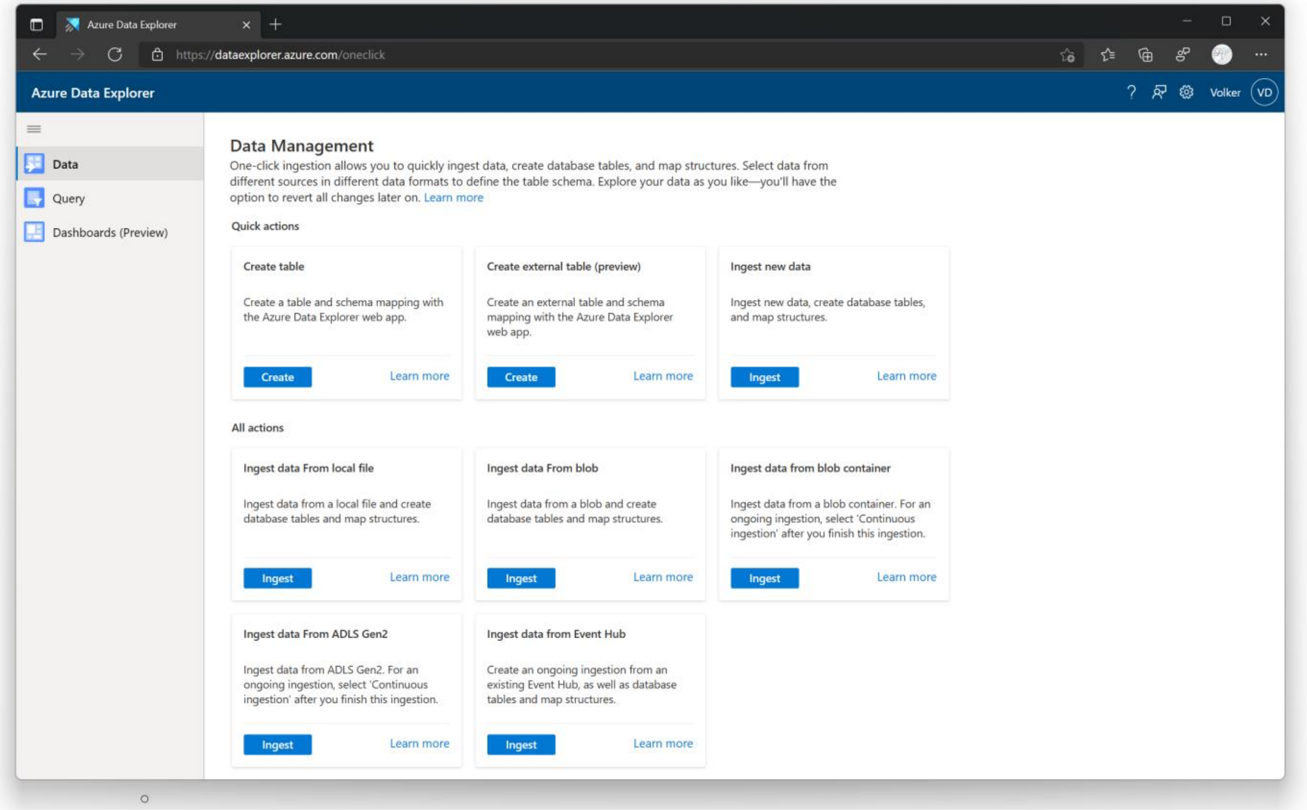
Page 1 of 1

View 1 - 50 of 50

Azure Data Explorer

Freshly documented, there is a handy way to ingest the log data from LCS into an Azure Data Explorer Cluster and use KQL (Kusto Query Language) to do more complex, custom querying on the telemetry data.

See the Use Azure Data Explorer to query raw information logs tutorial on Docs.



Data Management

One-click ingestion allows you to quickly ingest data, create database tables, and map structures. Select data from different sources in different data formats to define the table schema. Explore your data as you like—you'll have the option to revert all changes later on. Learn more

Quick actions

Create table

Create a table and schema mapping with the Azure Data Explorer web app.

Create external table (preview)

Create an external table and schema mapping with the Azure Data Explorer web app.

Ingest new data

Ingest new data, create database tables, and map structures.

All actions

Ingest data From local file

Ingest data from a local file and create database tables and map structures.

Ingest data From blob

Ingest data from a blob and create database tables and map structures.

Ingest data from blob container

Ingest data from a blob container. For an ongoing ingestion, select 'Continuous ingestion' after you finish this ingestion.

Ingest data From ADLS Gen2

Ingest data from ADLS Gen2. For an ongoing ingestion, select 'Continuous ingestion' after you finish this ingestion.

Ingest data from Event Hub

Create an ongoing ingestion from an existing Event Hub, as well as database tables and map structures.

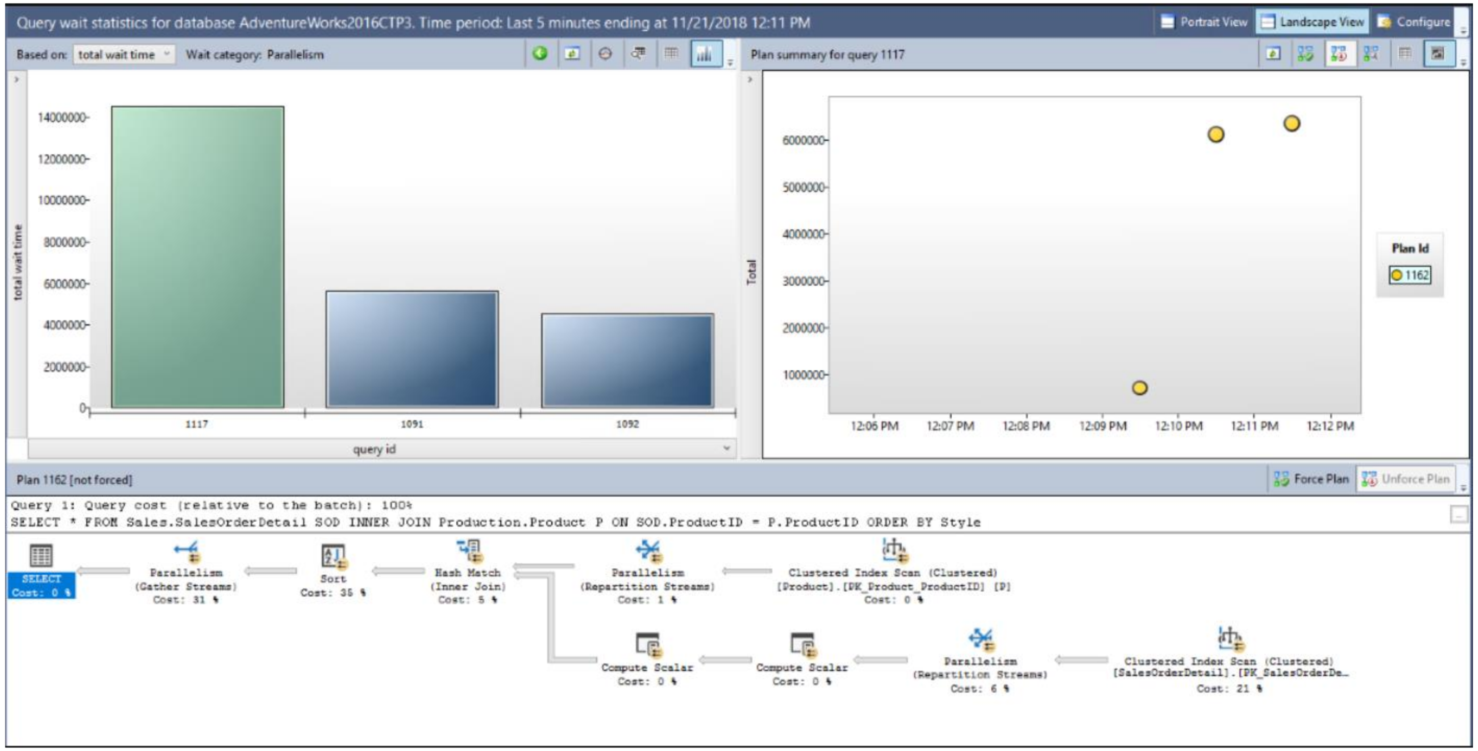
SQL Server Tools

- SSMS & Query Store [link]
- Database Engine Tuning Advisor [link]
- Profiler [link]

Query Store gets copied from Production. Use LCS to allowlist your IP and get JIT access.

Database Engine Tuning Advisor can be useful as input, but keep in mind it is not aware of the typical database schema of Finance and Operations apps.

Profiler is most useful on dev boxes.



Query wait statistics for database AdventureWorks2016CTP3. Time period: Last 5 minutes ending at 11/21/2018 12:11 PM

Based on: total wait time   Wait category: Parallelism

Plan summary for query 1117

Plan 1162 [not forced]

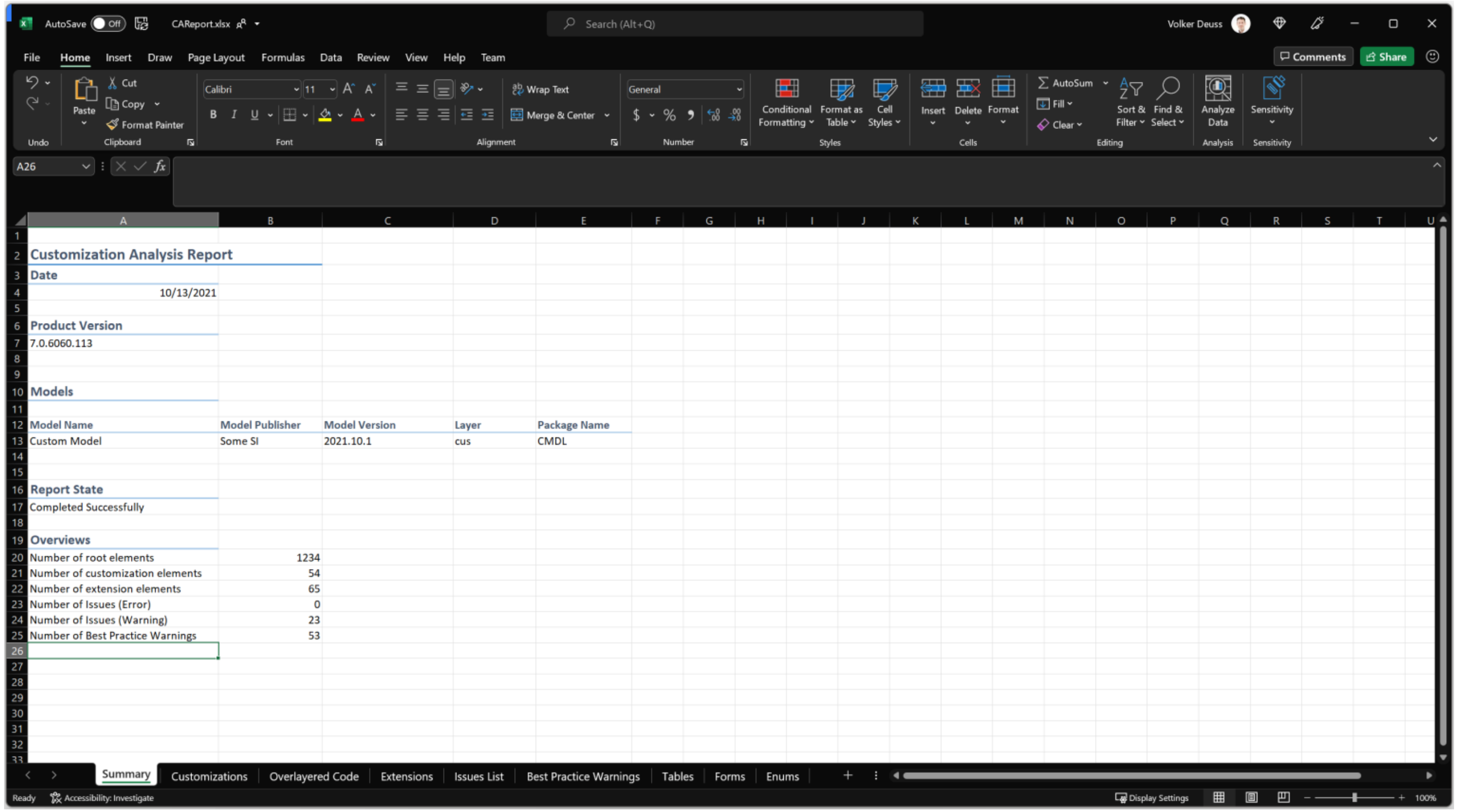
```
Query 1: Query cost (relative to the batch): 100%
SELECT * FROM Sales.SalesOrderDetail SOD INNER JOIN Production.Product P ON SOD.ProductID = P.ProductID ORDER BY Style
```

Customization Analysis Report

Many issues and warnings listed in the CAR relate to potential performance impacts.

You create it the CAR using the command line in a development environment.

See Customization Analysis Report on Docs for further information.



	A	B	C	D	E
2	Customization Analysis Report				
3	Date				
4	10/13/2021				
6	Product Version				
7	7.0.6060.113				
10	Models				
12	Model Name	Model Publisher	Model Version	Layer	Package Name
13	Custom Model	Some SI	2021.10.1	cus	CMDL
16	Report State				
17	Completed Successfully				
19	Overviews				
20	Number of root elements	1234			
21	Number of customization elements	54			
22	Number of extension elements	65			
23	Number of Issues (Error)	0			
24	Number of Issues (Warning)	23			
25	Number of Best Practice Warnings	53			

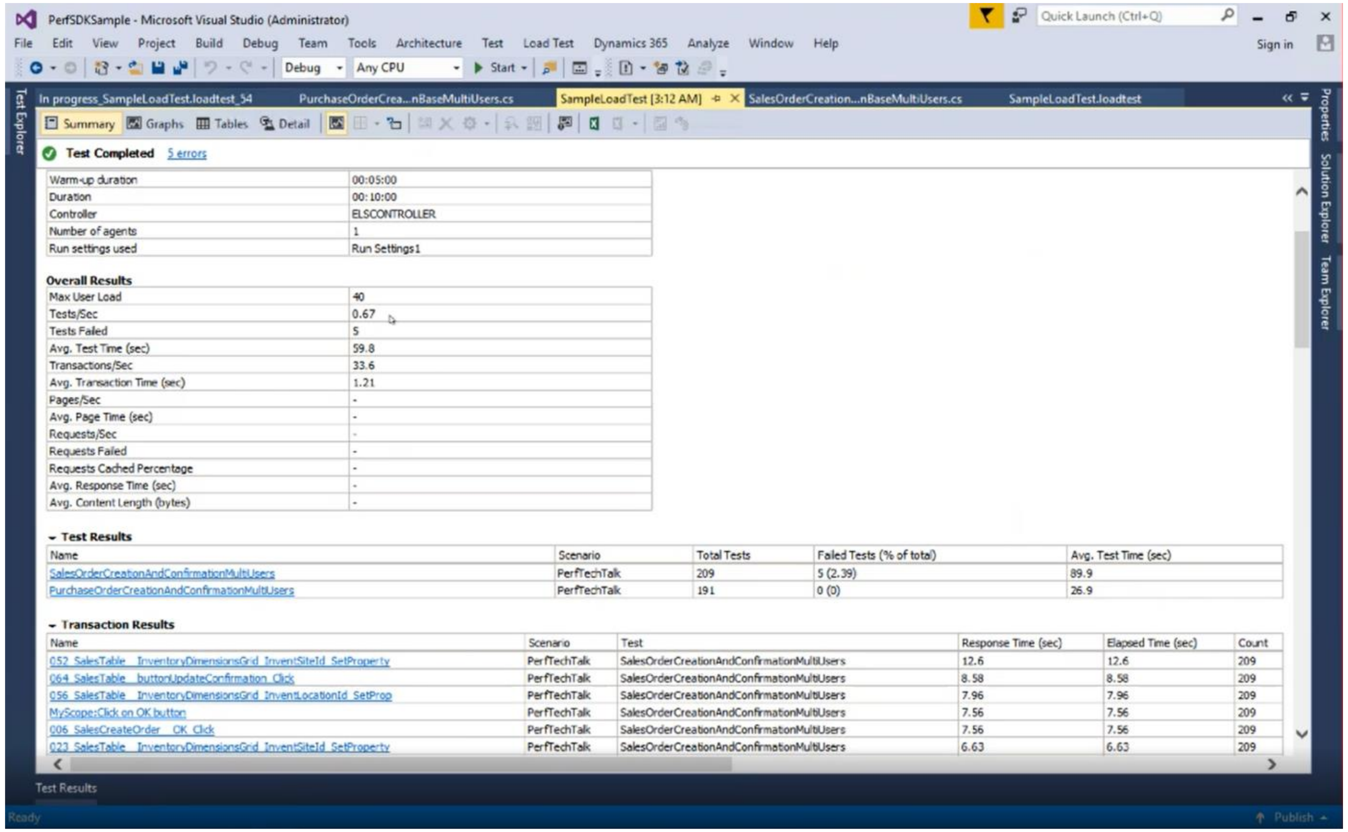
Load Test Automation

Performance SDK is one example and tool* to automate performance testing and benchmarking.

Load test automation helps you to validate, monitor, and optimize scalability of the solution.

Resources:

- TechTalk Performance Benchmark
- Docs Pages



PerfSDKSample - Microsoft Visual Studio (Administrator)
Quick Launch (Ctrl+Q)
File Edit View Project Build Debug Team Tools Architecture Test Load Test Dynamics 365 Analyze Window Help
Sign in
Debug
Any CPU
Start
In progress_SampleLoadTest.loadtest_54
PurchaseOrderCrea...nBaseMultiUsers.cs
SampleLoadTest [3:12 AM]
SalesOrderCreation...nBaseMultiUsers.cs
SampleLoadTest.loadtest
Test Explorer
Properties
Solution Explorer
Team Explorer
Summary
Graphs
Tables
Detail
Test Results
Ready
Publish

Test Completed 5 errors

Warm-up duration	00:05:00
Duration	00:10:00
Controller	ELSCONTROLLER
Number of agents	1
Run settings used	Run Settings1

Overall Results

Max User Load	40
Tests/Sec	0.67
Tests Failed	5
Avg. Test Time (sec)	59.8
Transactions/Sec	33.6
Avg. Transaction Time (sec)	1.21
Pages/Sec	-
Avg. Page Time (sec)	-
Requests/Sec	-
Requests Failed	-
Requests Cached Percentage	-
Avg. Response Time (sec)	-
Avg. Content Length (bytes)	-

Test Results

Name	Scenario	Total Tests	Failed Tests (% of total)	Avg. Test Time (sec)
SalesOrderCreationAndConfirmationMultiUsers	PerfTechTalk	209	5 (2.39)	89.9
PurchaseOrderCreationAndConfirmationMultiUsers	PerfTechTalk	191	0 (0)	26.9

Transaction Results

Name	Scenario	Test	Response Time (sec)	Elapsed Time (sec)	Count
052_SalesTable__InventoryDimensionsGrid_InventSiteId_SetProperty	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	12.6	12.6	209
064_SalesTable__buttonUpdateConfirmation_Click	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	8.58	8.58	209
056_SalesTable__InventoryDimensionsGrid_InventLocationId_SetProp	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	7.96	7.96	209
MyScope:Click on OK button	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	7.56	7.56	209
006_SalesCreateOrder__OK_Click	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	7.56	7.56	209
023_SalesTable__InventoryDimensionsGrid_InventSiteId_SetProperty	PerfTechTalk	SalesOrderCreationAndConfirmationMultiUsers	6.63	6.63	209

*Basically, it is just a library and set of tools on top of Visual Studio Load Test capabilities.

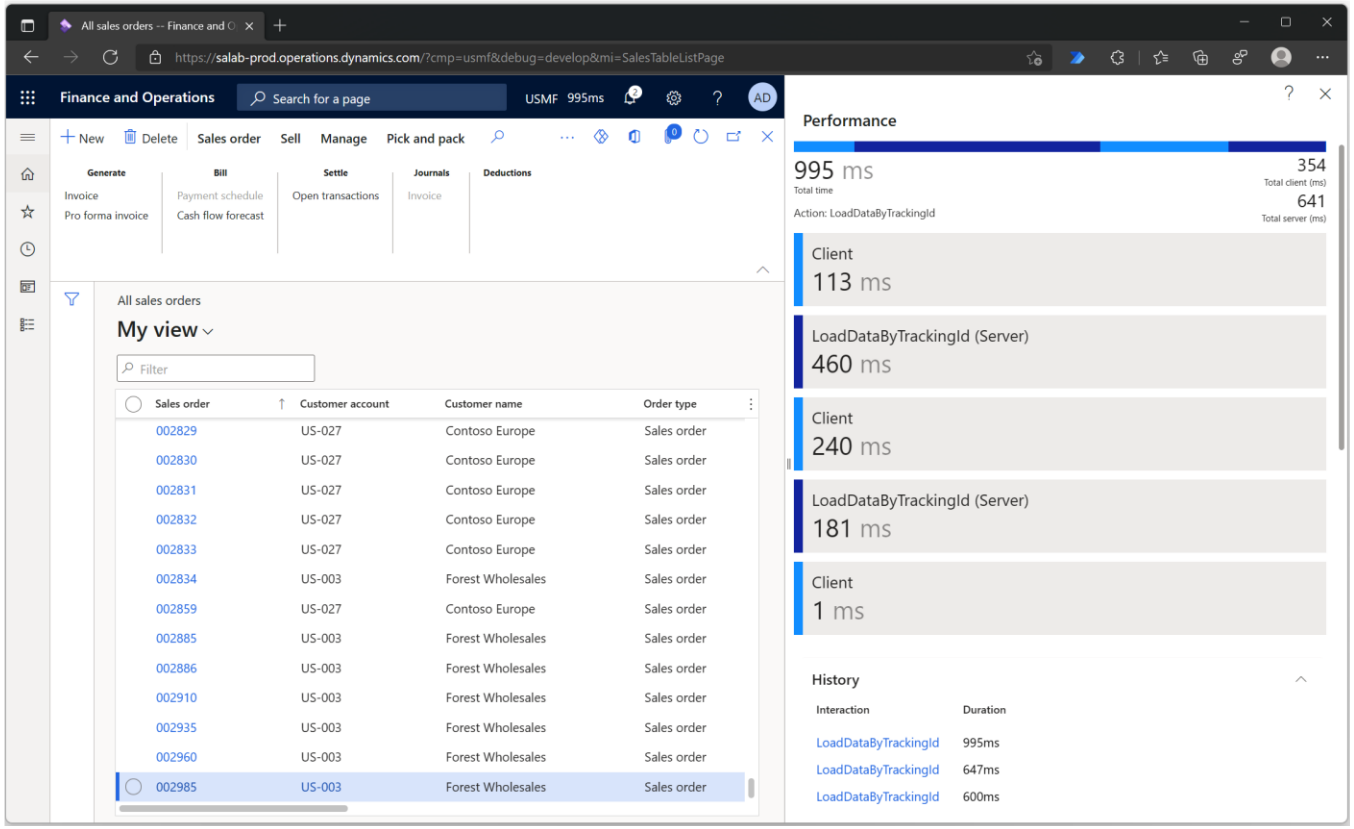
Performance Timer

Add &debug=develop to URL.

Built-in tooling that can help you to get an understanding of where the time is spent.

Note: Using it has negative impact on the session's performance.

See Performance timer on Docs for further information.



https://salab-prod.operations.dynamics.com/?cmp=usmf&debug=develop&mi=SalesTableListPage

Sales order	Customer account	Customer name	Order type
002829	US-027	Contoso Europe	Sales order
002830	US-027	Contoso Europe	Sales order
002831	US-027	Contoso Europe	Sales order
002832	US-027	Contoso Europe	Sales order
002833	US-027	Contoso Europe	Sales order
002834	US-003	Forest Wholesales	Sales order
002859	US-027	Contoso Europe	Sales order
002885	US-003	Forest Wholesales	Sales order
002886	US-003	Forest Wholesales	Sales order
002910	US-003	Forest Wholesales	Sales order
002935	US-003	Forest Wholesales	Sales order
002960	US-003	Forest Wholesales	Sales order
002985	US-003	Forest Wholesales	Sales order

Performance

995 ms
Total time

354
Total client (ms)

641
Total server (ms)

Action: LoadDataByTrackingId

Client
113 ms

LoadDataByTrackingId (Server)
460 ms

Client
240 ms

LoadDataByTrackingId (Server)
181 ms

Client
1 ms

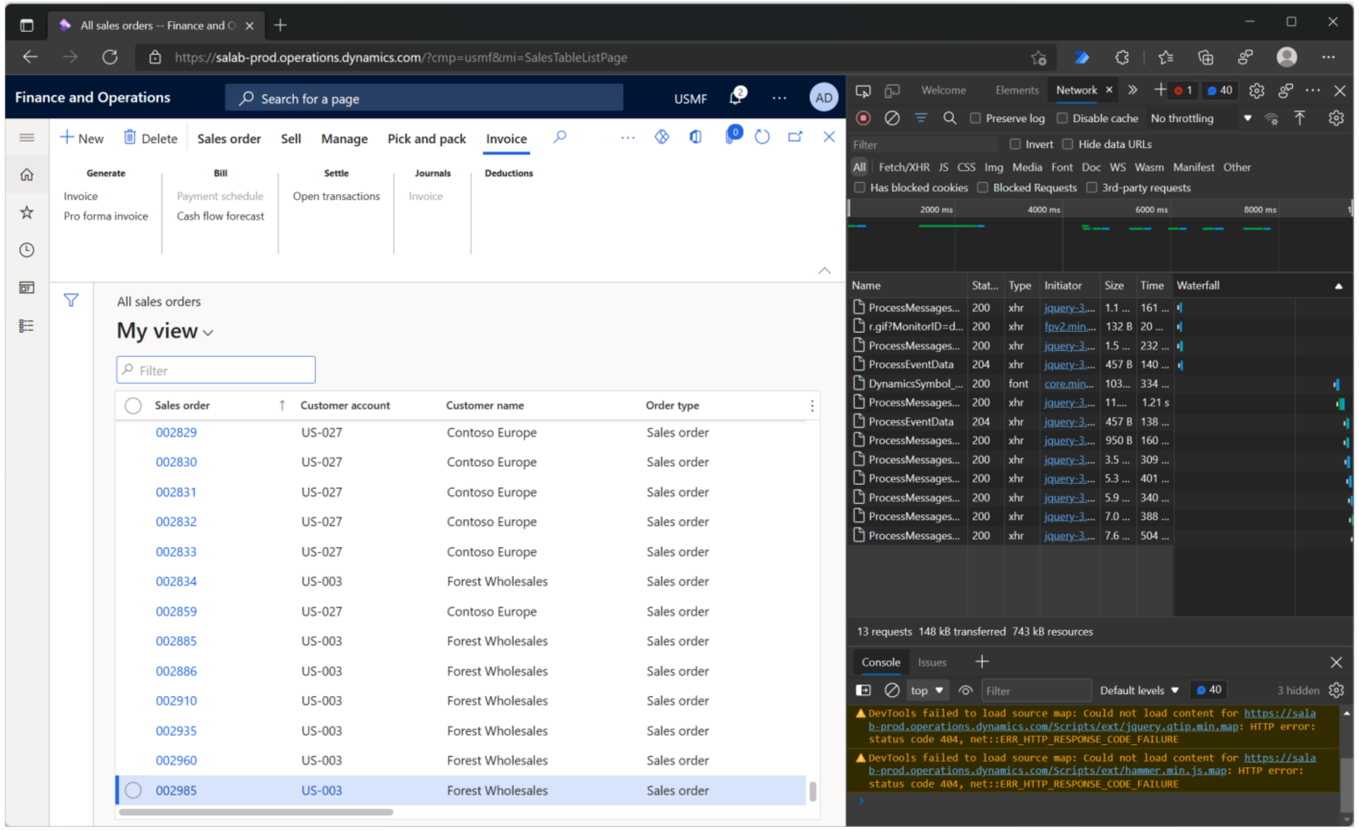
History

Interaction	Duration
LoadDataByTrackingId	995ms
LoadDataByTrackingId	647ms
LoadDataByTrackingId	600ms

F12 Dev Tools

Modern browsers like Edge or Chrome have powerful tooling available to analyze performance aspects from the client. Typically, pressing F12 opens them.

See [Microsoft Edge Developer Tools overview]() on Docs for Edge documentation.



Sales order	Customer account	Customer name	Order type
002829	US-027	Contoso Europe	Sales order
002830	US-027	Contoso Europe	Sales order
002831	US-027	Contoso Europe	Sales order
002832	US-027	Contoso Europe	Sales order
002833	US-027	Contoso Europe	Sales order
002834	US-003	Forest Wholesales	Sales order
002859	US-027	Contoso Europe	Sales order
002885	US-003	Forest Wholesales	Sales order
002886	US-003	Forest Wholesales	Sales order
002910	US-003	Forest Wholesales	Sales order
002935	US-003	Forest Wholesales	Sales order
002960	US-003	Forest Wholesales	Sales order
002985	US-003	Forest Wholesales	Sales order

Name	Stat...	Type	Initiator	Size	Time	Waterfall
ProcessMessages...	200	xhr	jquery-3....	1.1 ...	161 ...	
r.gif?MonitorID=d...	200	xhr	fpv2.min....	132 B	20 ...	
ProcessMessages...	200	xhr	jquery-3....	1.5 ...	232 ...	
ProcessEventData	204	xhr	jquery-3....	457 B	140 ...	
DynamicsSymbol_...	200	font	core.min....	103...	334 ...	
ProcessMessages...	200	xhr	jquery-3....	11....	1.21 s	
ProcessEventData	204	xhr	jquery-3....	457 B	138 ...	
ProcessMessages...	200	xhr	jquery-3....	950 B	160 ...	
ProcessMessages...	200	xhr	jquery-3....	3.5 ...	309 ...	
ProcessMessages...	200	xhr	jquery-3....	5.3 ...	401 ...	
ProcessMessages...	200	xhr	jquery-3....	5.9 ...	340 ...	
ProcessMessages...	200	xhr	jquery-3....	7.0 ...	388 ...	
ProcessMessages...	200	xhr	jquery-3....	7.6 ...	504 ...	

13 requests 148 kB transferred 743 kB resources

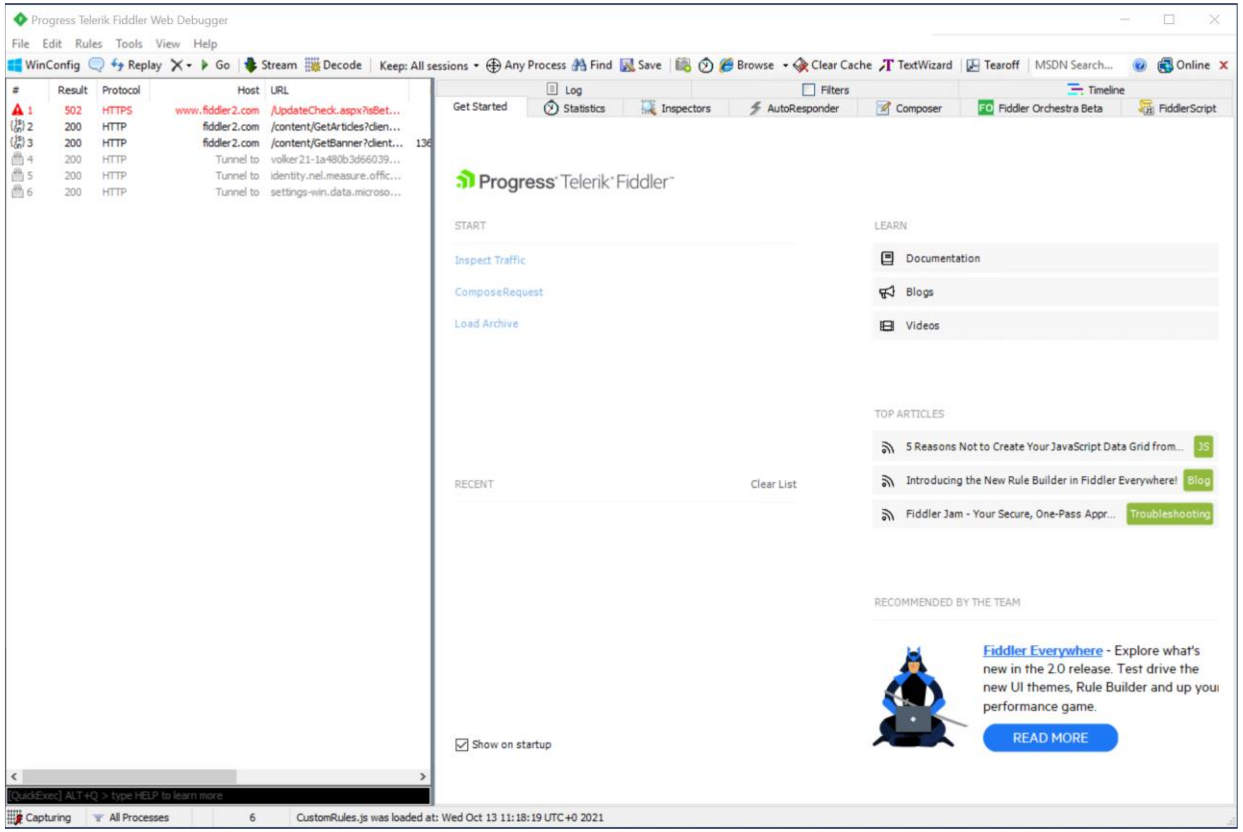
```
⚠DevTools failed to load source map: Could not load content for https://sala
b-prod.operations.dynamics.com/Scripts/ext/jquery.qtip.min.map: HTTP error:
status code 404, net::ERR_HTTP_RESPONSE_CODE_FAILURE
⚠DevTools failed to load source map: Could not load content for https://sala
b-prod.operations.dynamics.com/Scripts/ext/hammer.min.js.map: HTTP error:
status code 404, net::ERR_HTTP_RESPONSE_CODE_FAILURE
```

Fiddler

Powerful, widely used tool to capture and analyze traffic.

It is a 3rd party tool, available at [Fiddler | Web Debugging Proxy and Troubleshooting Solutions (telerik.com)](telerik.com).

We have a bunch of examples related to Finance and Operations apps on Docs. See [Search | Microsoft Docs](Microsoft Docs).



#	Result	Protocol	Host	URL
1	502	HTTPS	www.fiddler2.com	/UpdateCheck.aspx?isBet...
2	200	HTTP	fiddler2.com	/content/GetArticles?clien...
3	200	HTTP	fiddler2.com	/content/GetBanner?client...
4	200	HTTP	Tunnel to	volker21-1a480b3d66039...
5	200	HTTP	Tunnel to	identity.nel.measure.offic...
6	200	HTTP	Tunnel to	settings-win.data.microso...

5 Reasons Not to Create Your JavaScript Data Grid from...

Introducing the New Rule Builder in Fiddler Everywhere!

Fiddler Jam - Your Secure, One-Pass Appr...

Fiddler Everywhere - Explore what's new in the 2.0 release. Test drive the new UI themes, Rule Builder and up your performance game.

[QuickExec] ALT+Q > type HELP to learn more

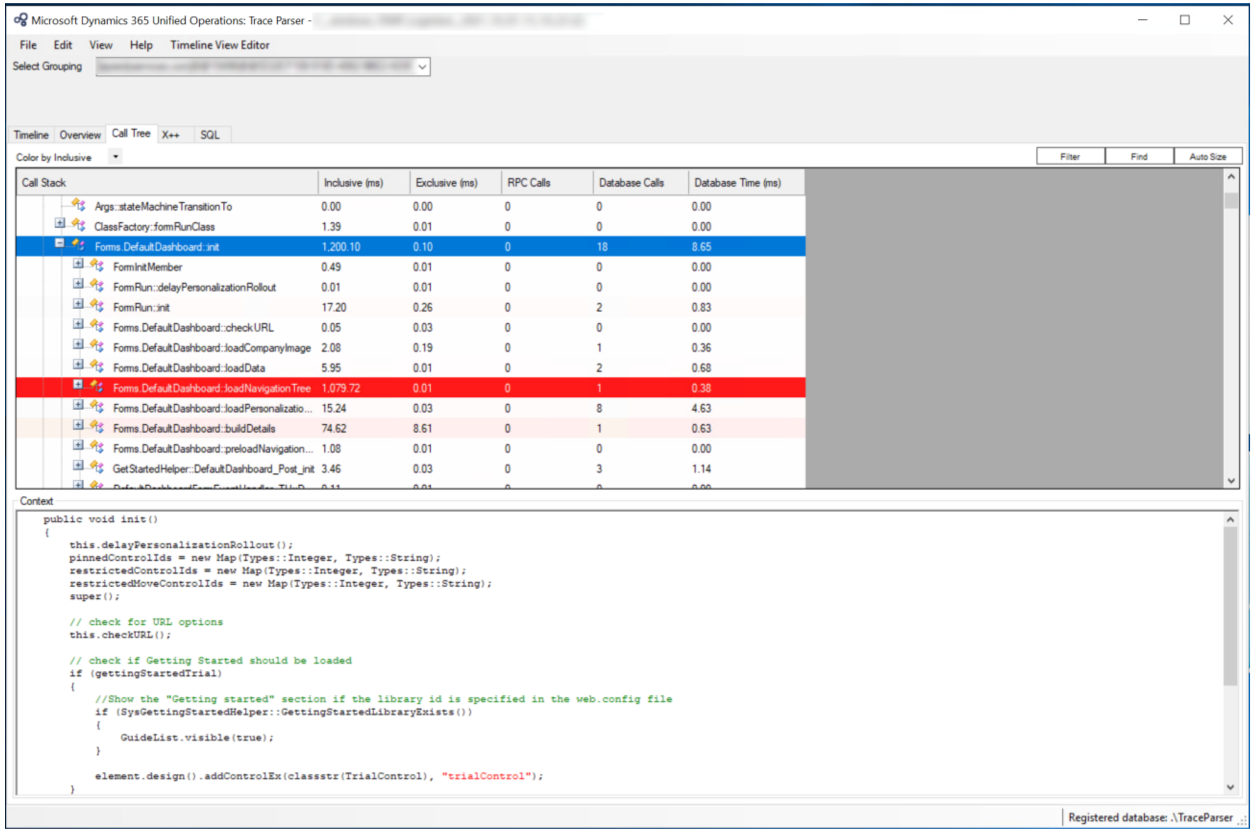
6 CustomRules.js was loaded at: Wed Oct 13 11:18:19 UTC+0 2021

Trace Parser

Take a trace using the built-in tool available under

Help & Support / Trace

Then, use Trace Parser (installed on development machines) to analyze call trees, summarized method calls, SQL statement data, etc.



Microsoft Dynamics 365 Unified Operations: Trace Parser - [redacted]

Select Grouping [redacted]

Color by Inclusive

Call Stack	Inclusive (ms)	Exclusive (ms)	RPC Calls	Database Calls	Database Time (ms)
Args::stateMachineTransitionTo	0.00	0.00	0	0	0.00
ClassFactory::formRunClass	1.39	0.01	0	0	0.00
Forms.DefaultDashboard::init	1,200.10	0.10	0	18	8.65
FormInitMember	0.49	0.01	0	0	0.00
FormRun::delayPersonalizationRollout	0.01	0.01	0	0	0.00
FormRun::init	17.20	0.26	0	2	0.83
Forms.DefaultDashboard::checkURL	0.05	0.03	0	0	0.00
Forms.DefaultDashboard::loadCompanyImage	2.08	0.19	0	1	0.36
Forms.DefaultDashboard::loadData	5.95	0.01	0	2	0.68
Forms.DefaultDashboard::loadNavigationTree	1,079.72	0.01	0	1	0.38
Forms.DefaultDashboard::loadPersonalizatio...	15.24	0.03	0	8	4.63
Forms.DefaultDashboard::buildDetails	74.62	8.61	0	1	0.63
Forms.DefaultDashboard::preloadNavigation...	1.08	0.01	0	0	0.00
GetStartedHelper::DefaultDashboard_Post_init	3.46	0.03	0	3	1.14

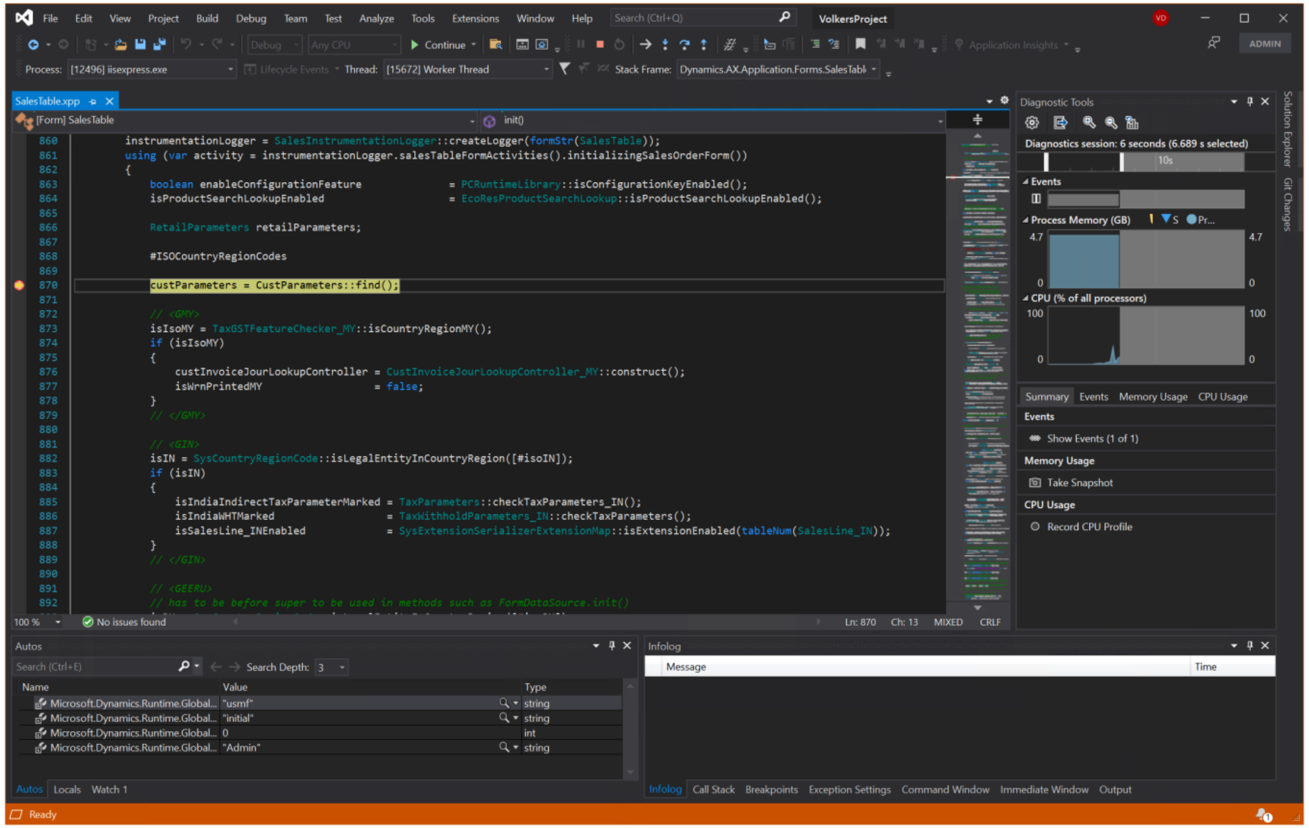
Context

```
public void init()
{
    this.delayPersonalizationRollout();
    pinnedControlIds = new Map(Types::Integer, Types::String);
    restrictedControlIds = new Map(Types::Integer, Types::String);
    restrictedMoveControlIds = new Map(Types::Integer, Types::String);
    super();

    // check for URL options
    this.checkURL();

    // check if Getting Started should be loaded
    if (gettingStartedTrial)
    {
        //Show the "Getting started" section if the library id is specified in the web.config file
        if (SysGettingStartedHelper::GettingStartedLibraryExists())
        {
            GuideList.visible(true);
        }

        element.design().addControlEx(classstr(TrialControl), "trialControl");
    }
```

Registered database: .\TraceParser

Visual Studio / Debugger

Finally, sometimes you can get to the bottom of a performance issue best by just reading the code or debugging it. It is the hard way most of the times though.



```
        instrumentationLogger = SalesInstrumentationLogger::createLogger(formStr(SalesTable));
        using (var activity = instrumentationLogger.salesTableFormActivities().initializingSalesOrderForm())
        {
            boolean enableConfigurationFeature            = PCRuntimeLibrary::isConfigurationKeyEnabled();
            isProductSearchLookupEnabled                  = EcoResProductSearchLookup::isProductSearchLookupEnabled();

            RetailParameters retailParameters;

            #ISOCountryRegionCodes

            custParameters = CustParameters::find();

            // <GMY>
            isIsoMY = TaxGSTFeatureChecker_MY::isCountryRegionMY();
            if (isIsoMY)
            {
                custInvoiceJourLookupController = CustInvoiceJourLookupController_MY::construct();
                isWrnPrintedMY                  = false;
            }
            // </GMY>

            // <GIN>
            isIN = SysCountryRegionCode::isLegalEntityInCountryRegion([#isoIN]);
            if (isIN)
            {
                isIndiaIndirectTaxParameterMarked = TaxParameters::checkTaxParameters_IN();
                isIndiaWHTMarked                  = TaxWithholdParameters_IN::checkTaxParameters();
                isSalesLine_INEnabled             = SysExtensionSerializerExtensionMap::isExtensionEnabled(tableNum(SalesLine_IN));
            }
            // </GIN>

            // <GEERU>
            // has to be before super to be used in methods such as FormDataSource.init()
```

100 % No issues found Ln: 870 Ch: 13 MIXED CRLF

Autos

Search (Ctrl+E) Search Depth: 3

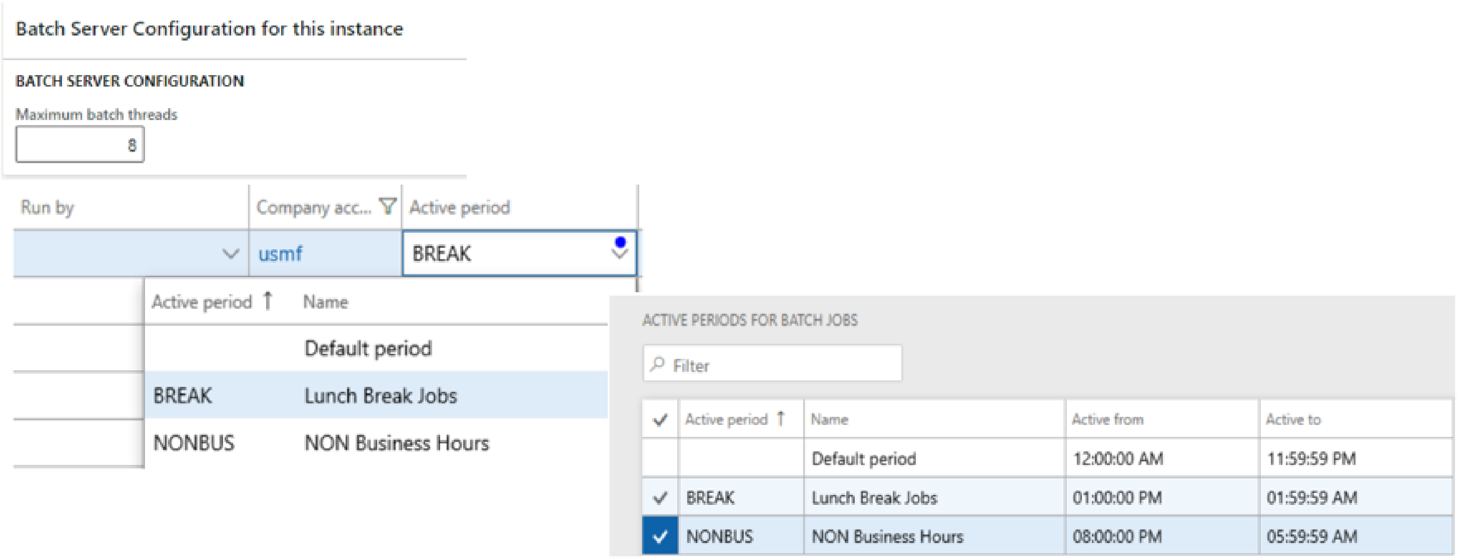
Name	Value	Type
Microsoft.Dynamics.Runtime.Global...	"usmf"	string
Microsoft.Dynamics.Runtime.Global...	"initial"	string
Microsoft.Dynamics.Runtime.Global...	0	int
Microsoft.Dynamics.Runtime.Global...	"Admin"	string

Autos Locals Watch 1

Best practices

Batch framework

In Self-Service deployment topologies, batch and interactive AOS's are isolated



Batch Server Configuration for this instance

BATCH SERVER CONFIGURATION

Maximum batch threads: 8

Run by	Company acc...	Active period
	usmf	BREAK

Active period ↑	Name
	Default period
BREAK	Lunch Break Jobs
NONBUS	NON Business Hours

ACTIVE PERIODS FOR BATCH JOBS

Filter

✓	Active period ↑	Name	Active from	Active to
		Default period	12:00:00 AM	11:59:59 PM
✓	BREAK	Lunch Break Jobs	01:00:00 PM	01:59:59 AM
✓	NONBUS	NON Business Hours	08:00:00 PM	05:59:59 AM

Tune your batch framework

- Create a 24-hour timetable to get an overview which heavy (batch) processes are running at a specific timeframe

- Define different active periods and assign batch jobs to decide in which time of the day the batch job can start (and when it must not)

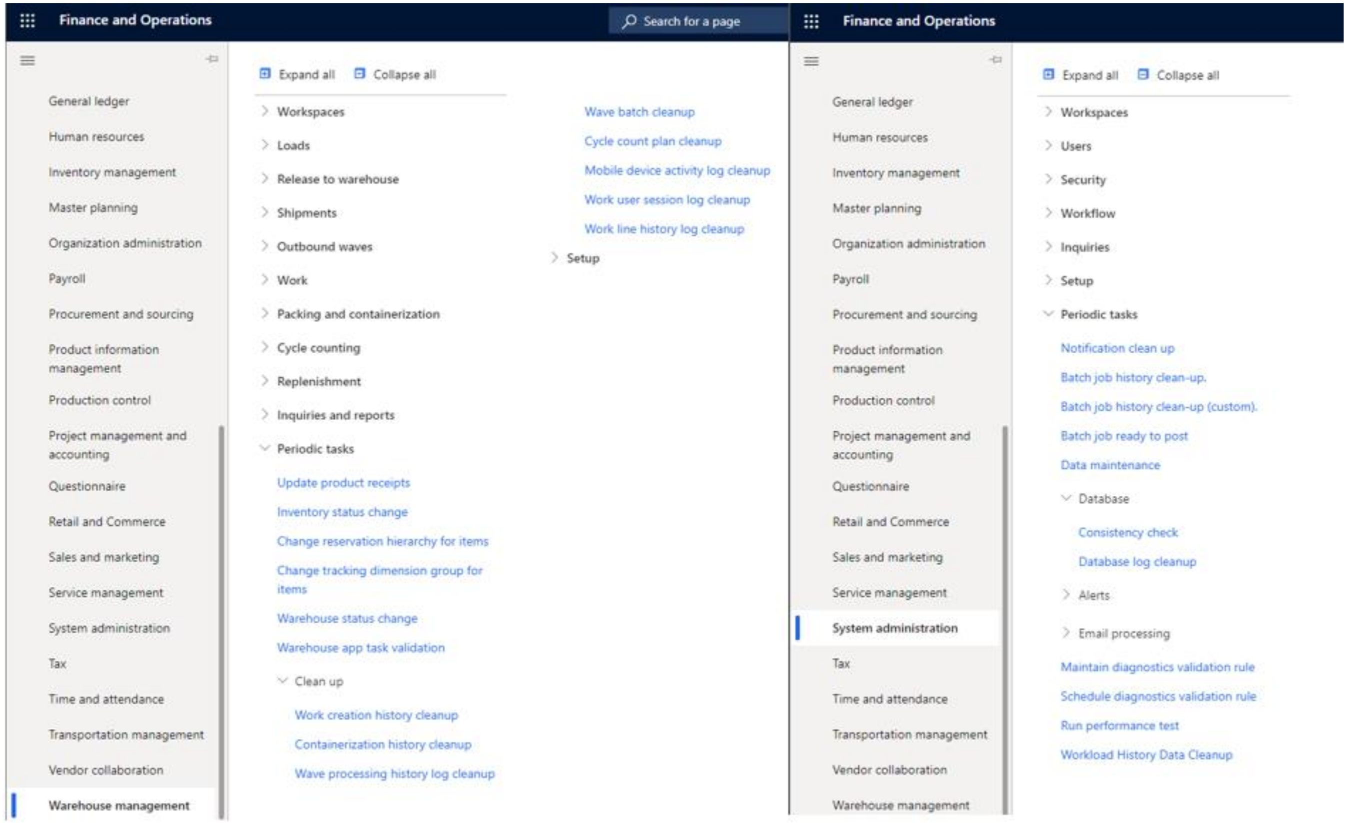
- Do not increase the Max Batch Threads without testing (recommended value range is 8-12)

- Consider implementing automatic retries on your batch jobs

- Plan and update the scheduling priority for each batch group so that it represents the relative priorities according to business requirements for the related batch jobs and their related business using Priority based batch scheduling

Cleanup routines

- Crucial for system health and database storage
- Directly impact your system performance
- Should be run only after the business has done detailed analysis and confirmed that the data is no longer required
- Always test each cleanup routine in a test environment before you run it in a production environment



Regular cleanup routines

- Batch history tables (BatchHistory, BatchJobHistory, BatchConstraintsHistory)
  - System administration > Periodic tasks > Batch job history clean-up

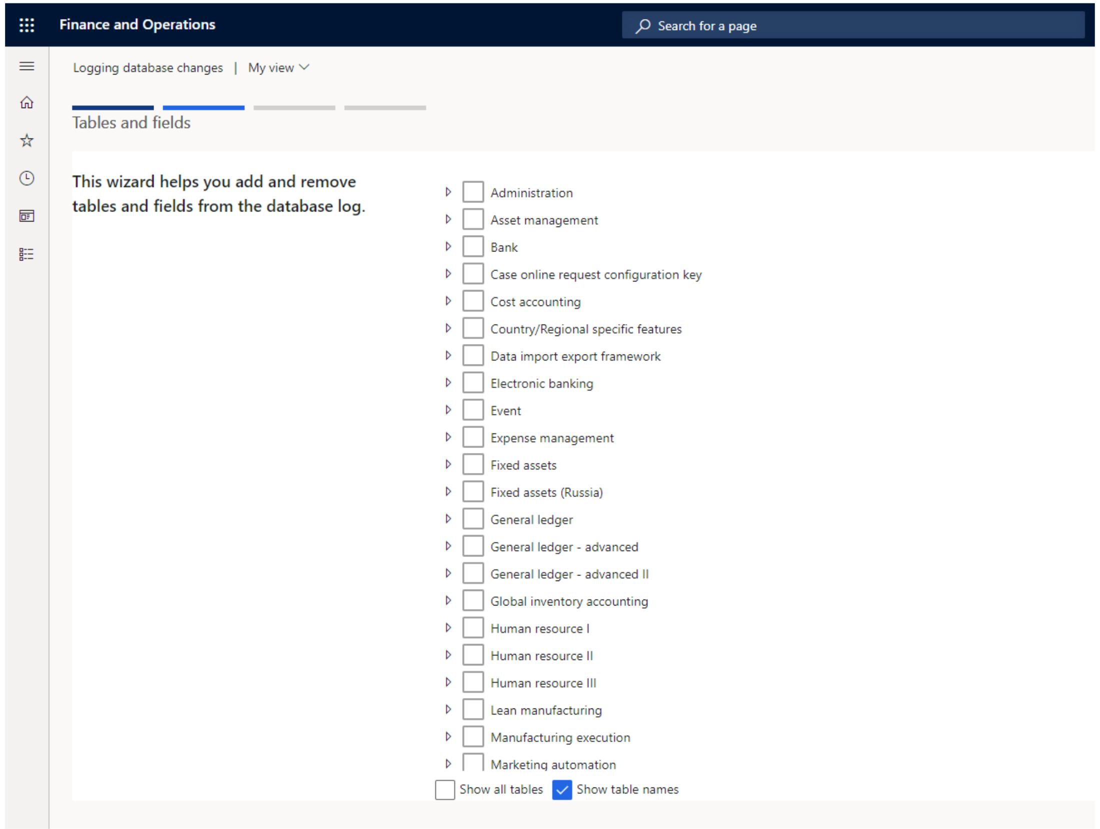
- Notification tables (EventInbox, EventInboxData)
  - System administration > Periodic tasks > Notification clean up

- DMF Staging tables and Custom tables that holds temporary data
  - you must turn on the **Execution history cleanup feature** in Feature management. In Data management, this routine must be used to schedule a periodic cleanup of the execution history. It replaces the earlier Staging cleanup routine, which is now obsolete (deprecated).
  - Design a cleanup job for your temp tables

- Journal cleanup routines
  - General Ledger > Periodic tasks > Clean up ledger journals
  - Inventory management > Periodic tasks > Clean up > Inventory journals cleanup
  - Production control > Periodic tasks > Clean up > Production journals cleanup

Database Log

Database logging can be valuable from a business perspective, but it can also be expensive regarding resource use and management.



Finance and Operations

Search for a page

Logging database changes | My view

Tables and fields

This wizard helps you add and remove tables and fields from the database log.

- □ Administration
- □ Asset management
- □ Bank
- □ Case online request configuration key
- □ Cost accounting
- □ Country/Regional specific features
- □ Data import export framework
- □ Electronic banking
- □ Event
- □ Expense management
- □ Fixed assets
- □ Fixed assets (Russia)
- □ General ledger
- □ General ledger - advanced
- □ General ledger - advanced II
- □ Global inventory accounting
- □ Human resource I
- □ Human resource II
- □ Human resource III
- □ Lean manufacturing
- □ Manufacturing execution
- □ Marketing automation

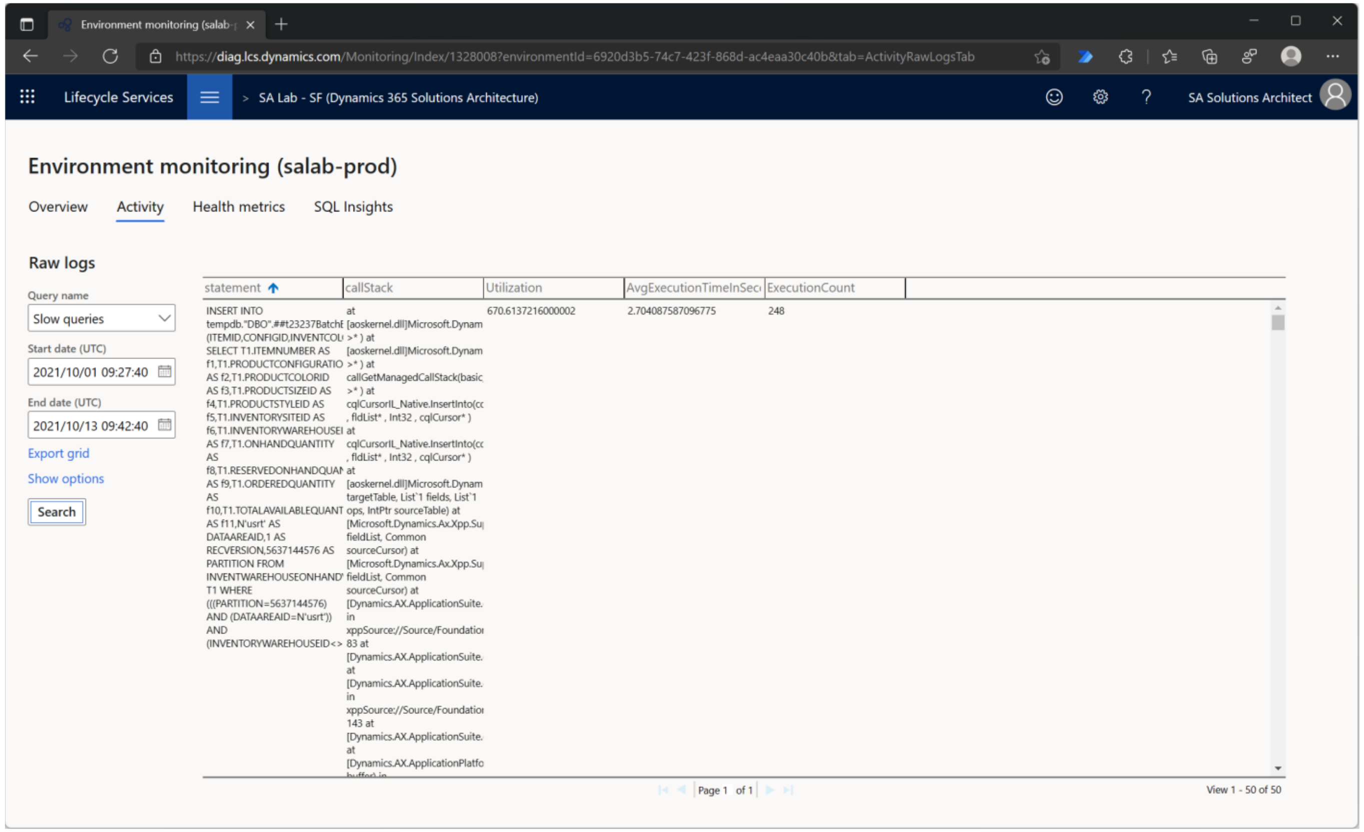
□ Show all tables ☑ Show table names

Database logging and performance

- Facts
  - The database log table can grow quickly and can increase the size of the database.
  - Database logging can adversely affect long-running automated processes, such as inventory close, calculations for bills of materials (BOMs), master planning, and long-running data imports.
  - When logging is turned on for a table, all set-based database operations are downgraded to row-based operations.
- Recommendations
  - Create a plan for how long you will retain logged data, and how you will archive or delete data
  - Limit log entries and help improve performance by selecting specific fields to log instead of whole tables,
  - Log setup data and master data and minimize logging on transactional tables.

Indexing and query performance

You can track Slow queries in LCS logs and in the SQL query store on your Tier-2 Sandbox



Environment monitoring (salab-
https://diag.lcs.dynamics.com/Monitoring/Index/1328008?environmentId=6920d3b5-74c7-423f-868d-ac4eaa30c40b&tab=ActivityRawLogsTab
Lifecycle Services
> SA Lab - SF (Dynamics 365 Solutions Architecture)
SA Solutions Architect

Environment monitoring (salab-prod)

Overview | Activity | Health metrics | SQL Insights

Raw logs

Query name: Slow queries

Start date (UTC): 2021/10/01 09:27:40

End date (UTC): 2021/10/13 09:42:40

Export grid

Show options

Search

statement	callStack	Utilization	AvgExecutionTimeInSec	ExecutionCount
INSERT INTO tempdb."DBO".##t23237BatchE (ITEMID,CONFIGID,INVENTCOL SELECT T1.ITEMNUMBER AS f1,T1.PRODUCTCONFIGURATIO AS f2,T1.PRODUCTCOLORID AS f3,T1.PRODUCTSIZEID AS f4,T1.PRODUCTSTYLEID AS f5,T1.INVENTORYSITEID AS f6,T1.INVENTORYWAREHOUSEI AS f7,T1.ONHANDQUANTITY AS f8,T1.RESERVEDONHANDQUAN AS f9,T1.ORDEREDQUANTITY AS f10,T1.TOTALAVAILABLEQUANT AS f11,N'usrt' AS DATAAREAID,1 AS RECVERSION,5637144576 AS PARTITION FROM INVENTWAREHOUSEONHAND' T1 WHERE (((PARTITION=5637144576) AND (DATAAREAID=N'usrt')) AND (INVENTORYWAREHOUSEID<>	at [aoskernel.dll]Microsoft.Dynam >*) at [aoskernel.dll]Microsoft.Dynam >*) at callGetManagedCallStack(basic >*) at cqlCursorIL_Native.InsertInto(cc , fldList* , Int32 , cqlCursor*) at cqlCursorIL_Native.InsertInto(cc , fldList* , Int32 , cqlCursor*) at [aoskernel.dll]Microsoft.Dynam targetTable, List`1 fields, List`1 ops, IntPtr sourceTable) at [Microsoft.Dynamics.Ax.Xpp.Su fieldList, Common sourceCursor) at [Microsoft.Dynamics.Ax.Xpp.Su fieldList, Common sourceCursor) at [Dynamics.AX.ApplicationSuite. in xppSource://Source/Foundatio 83 at [Dynamics.AX.ApplicationSuite. at [Dynamics.AX.ApplicationSuite. in xppSource://Source/Foundatio 143 at [Dynamics.AX.ApplicationSuite. at [Dynamics.AX.ApplicationPlatfo buffer) in	670.6137216000002	2.704087587096775	248

Page 1 of 1

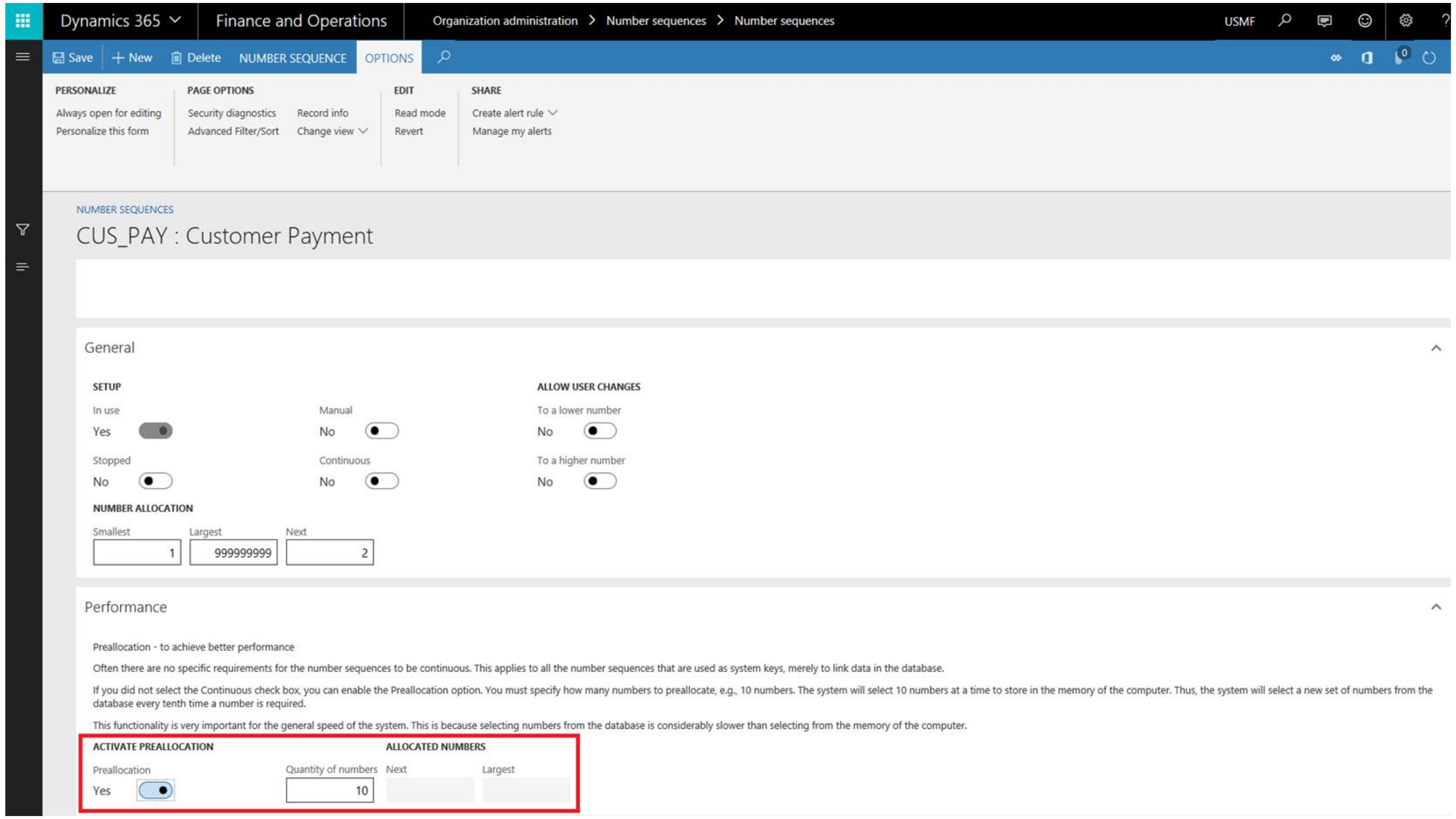
View 1 - 50 of 50

SQL performance

- Facts
  - Index scans can have negative effect on your performance and can cause blockings even by selects running in a context of a transaction, a proper index can greatly increase the query execution time .
  - Our automated microservices will take care of index maintenance jobs by rebuilding indexes when required without creating blockings and also updating statistics without the tradeoff between improving plans and the time it takes to recompile queries.
- Recommendations
  - Compare and analyze Query execution time in LCS and query store (in some cases Execution time in LCS > execution time in SQL)
  - Make sure you have the right indexes in place and that each table has a clustered index
  - Test your query execution with different data sets (different LE's…etc)

Number sequence

Consider enabling Prealloaction



NUMBER SEQUENCES

CUS_PAY : Customer Payment

General

SETUP

In use: Yes

Stopped: No

Manual: No

Continuous: No

ALLOW USER CHANGES

To a lower number: No

To a higher number: No

NUMBER ALLOCATION

Smallest	Largest	Next
1	999999999	2

Performance

Preallocation - to achieve better performance

Often there are no specific requirements for the number sequences to be continuous. This applies to all the number sequences that are used as system keys, merely to link data in the database.

If you did not select the Continuous check box, you can enable the Preallocation option. You must specify how many numbers to preallocate, e.g., 10 numbers. The system will select 10 numbers at a time to store in the memory of the computer. Thus, the system will select a new set of numbers from the database every tenth time a number is required.

This functionality is very important for the general speed of the system. This is because selecting numbers from the database is considerably slower than selecting from the memory of the computer.

ACTIVATE PREALLOCATION

Preallocation: Yes

Quantity of numbers: 10

ALLOCATED NUMBERS

Next:

Largest:

Number sequence

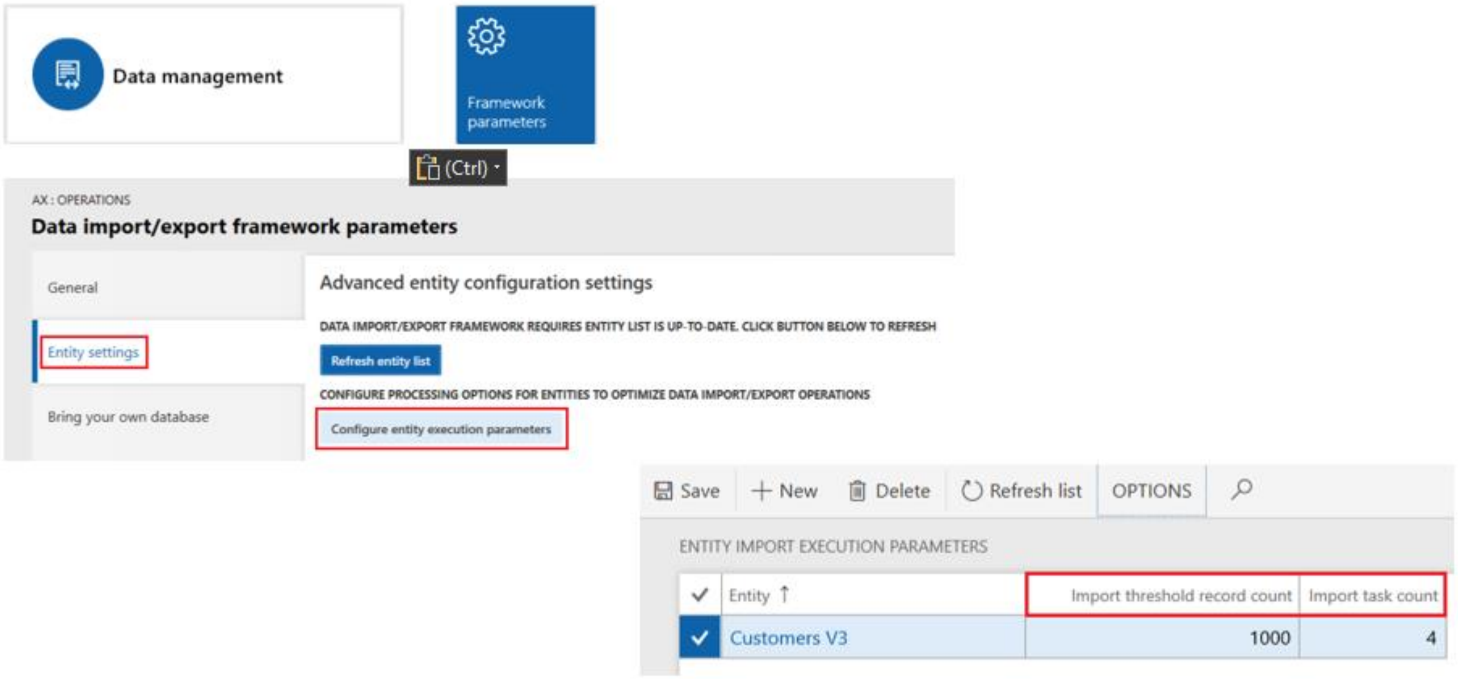
- Recommendations
  - Review and adjust as early in the project
  - Consider enabling Preallocation on the Performance FastTab
  - Minimize the use of the continuous number sequence as much as possible
- Pre-allocation will apply only to non-continuous Number Sequence.
  - 100 might be appropriate when 75,000+ numbers are being used each day
  - 20-50 might be appropriate when 25,000+ numbers are being used each day
  - 10 might be appropriate when 10,000+ numbers are being used each day

Data migration

Not all standard entities have been optimized for data migration.

If a required entity can't be optimized to meet the performance requirements, we recommend that you create a new optimized entity.

A developer can accelerate this process by duplicating an existing entity.



AX : OPERATIONS

Data import/export framework parameters

Advanced entity configuration settings

DATA IMPORT/EXPORT FRAMEWORK REQUIRES ENTITY LIST IS UP-TO-DATE. CLICK BUTTON BELOW TO REFRESH

CONFIGURE PROCESSING OPTIONS FOR ENTITIES TO OPTIMIZE DATA IMPORT/EXPORT OPERATIONS

ENTITY IMPORT EXECUTION PARAMETERS

✓	Entity ↑	Import threshold record count	Import task count
✓	Customers V3	1000	4

Optimize data migration

- Plan iterations of increasing size / volume
- Use delta loading and break up large files into smaller chunks. This approach gives the SQL optimizer time to determine whether a new query plan will be optimal.
- Optimize the performance parameters of the data entities for large imports; do not assume DMF entities are tuned for performance out of the box
- Clean up staging tables regularly
- Disable change tracking
- Enable set-based processing (not all entities support it)
- Create a data migration batch group and use batch mode to import to avoid single threading
- If contention is identified in the batch framework, ensure priority-based batch scheduling priorities are configured
- Update statistics
- Make sure you are using an entity that supports multithreading and configure entity execution parameters (Import record count, task count, validations as appropriate)

Resources

- Enable Batch retry Enable automatic retries on batch jobs - Finance & Operations | Dynamics 365 | Microsoft Docs
- Batch Active Periods Active batch periods - Finance & Operations | Dynamics 365 | Microsoft Docs
- Priority based batch scheduling Priority-based batch scheduling - Finance & Operations | Dynamics 365 | Microsoft Docs
- Cleanup routines Cleanup routines in Dynamics 365 Finance and Dynamics 365 Supply Chain Management - Finance & Operations | Dynamics 365 | Microsoft Docs
- Database Log Configure database logging - Finance & Operations | Dynamics 365 | Microsoft Docs
- Throttling Priority-based throttling - Finance & Operations | Dynamics 365 | Microsoft Docs
- Throttling FAQ Priority-based throttling FAQ - Finance & Operations | Dynamics 365 | Microsoft Docs
- Data Migration Optimize data migration for Finance and Operations apps - Finance & Operations | Dynamics 365 | Microsoft Docs
- Set based operations conversion Conversion of operations from set-based to record-by-record - Finance & Operations | Dynamics 365 | Microsoft Docs

- **TechTalks: Performance Testing in Microsoft Dynamics 365 TechTalk Series - Microsoft Dynamics Blog**
- See also previous sessions in this series such as Best Practices: Performance Troubleshooting | Microsoft Learn

Q&A

Microsoft Dynamics 365

© Copyright Microsoft Corporation. All rights reserved.