



# How to measure your performance in Business Central with the Performance Toolkit

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# Speaker's intro

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# What to expect?

- What is the Performance Toolkit?
- Why should I use it?
- Investigate the scenario's
- Writing test scenario's
- Start the test
- VS Code extension
- Analyse your results






Does my solution for Business Central support X number of users doing this, that, and the other thing at the same time?



How many orders can Business Central process per hour?


# What is the Performance Toolkit?

- Extension in Business Central
- Framework to define test scenario's and run it in parallel
- Only in Sandbox or in Docker
- Simulate max 500 user sessions



**Performance Toolkit**

Microsoft

 Business Central

The Performance Toolkit is used for running performance test scenarios.

★ 3.0 (1 ratings)

[Get it now](#) ☆

← BCPT Suite

## TEST

▶ Start ▶ Start in Single Run mode ■ Stop ↻ Refresh 📄 Log Entries

### General

Code ..... TEST

Description ..... Test DoC

Tag .....

Duration (minutes) .....

Default Min. User Delay (ms) .....

Default Max. User Delay (ms) .....

Work date starts at ..... 4/10/2023

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BCPT Suite Lines | ✨ New ▶ Start this line in foreground 🔄\* New Line 🗑️

	Codeunit ID	Codeunit Name	Parameters
→	50020	BCPT Post Purch. Inv.	Lines=10



# Why should I use it?

■ Helps customers get confidence

■ Test your development

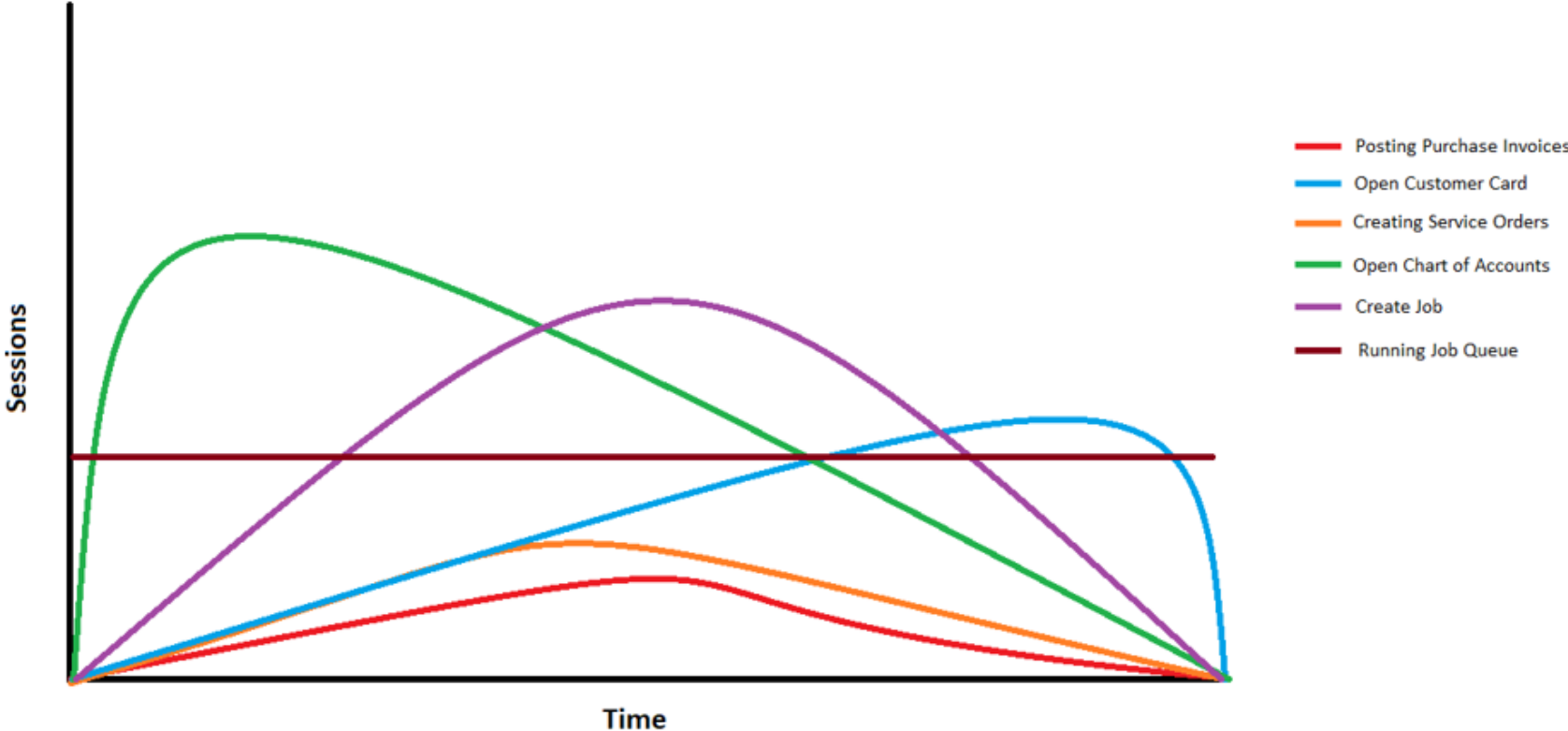
■ Test your solution

<http://aka.ms/bcall> - Telemetry and Performance

Why?

# Investigate the scenario's

What are users doing all day?





# Investigate the scenario's

No.	Codeunit ID	Description	Parameters	Company	Total time BCF	100%	75%	50%	Iterations per day	Total iterations p	Waiting tin	Delay Type
2	81009	PTK Open Project Control 4PS		Inrichtingsbedrijfs	300	40	43	7	160	100.0	180.0	Fixed
3	81013	PTK Add Extension Contract 4PS		Inrichtingsbedrijfs	300	40	43	7	1274	796.2	120.0	Fixed
7	81021	PTK Add Project Prognosis 4PS		Inrichtingsbedrijfs	300	40	43	7	1	0.6	28800.0	Fixed
11	81004	PTK Add Service Order 4PS		Inrichtingsbedrijfs	300	40	43	7	102	63.7	282.6	Fixed
12	81005	PTK Open Serv. Order Card 4PS		Inrichtingsbedrijfs	300	50	54	9	306	191.1	120.0	Fixed
14	81010	PTK Add&Post Purch. Order 4PS		Inrichtingsbedrijfs	300	40	43	7	1274	796.2	120.0	Fixed
17	81029	PTK Open Post. Puch. Inv. 4PS		Inrichtingsbedrijfs	300	40	43	7	328	204.8	120.0	Fixed
18	81034	PTK Open Purch. Order Card 4PS		Inrichtingsbedrijfs	300	60	64	10	258	161.4	120.0	Fixed
19	81015	PTK Open Chart of Accounts 4PS		Inrichtingsbedrijfs	300	40	43	7	100	62.5	288.0	Fixed
20	81017	PTK Post Gen. Jnl. Entry 4PS		Inrichtingsbedrijfs	300	50	54	9	13,137	8210.5	120.0	Fixed
21	81027	PTK Open Vend Open Entries		Inrichtingsbedrijfs	300	30	32	5	52	32.3	557.3	Fixed
22	81028	PTK Open Cust Open Entries		Inrichtingsbedrijfs	300	50	54	9	631	394.4	120.0	Fixed
23	81036	PTK Add&Post Sales Inv. 4PS		Inrichtingsbedrijfs	300	40	43	7	13,137	8210.5	120.0	Fixed
24	81030	PTK Open Post. Sales Inv. 4PS		Inrichtingsbedrijfs	300	60	64	10	1314	821.1	120.0	Fixed
25	81023	PTK Add&Post Time Sheet 4PS		Inrichtingsbedrijfs	300	100	107	17	2	4.0	4500.0	Fixed
50	81003	PTK Create Service Call 4PS		Inrichtingsbedrijfs	300	60	64	10	1000	625.0	120.0	Fixed



# Writing test scenario's

- Each test codeunit can exist of multiple scenario's
- Keep it simple
- Use the librarians in the Test Framework

```
1 reference
procedure CreateAndPostPurchaseInvoice()
var
    PurchaseHeader: Record "Purchase Header";
    VendorNo: Code[20];
begin
    if NoOfLinesToCreate < 0 then
        NoOfLinesToCreate := 0;
    if NoOfLinesToCreate > 10000 then
        NoOfLinesToCreate := 10000;


    //Find a random vendor
    VendorNo := SelectRandomVendor();

    BCPTTestContext.StartScenario('Create Purchase Invoice');
    CreatePurchaseInvoiceForVendorNo(PurchaseHeader, VendorNo);
    BCPTTestContext.EndScenario('Create Purchase Invoice');

    BCPTTestContext.StartScenario('Post Purchase Invoice');
    CODEUNIT.Run(CODEUNIT::"Purch.-Post (Yes/No)", PurchaseHeader);
    BCPTTestContext.EndScenario('Post Purchase Invoice');
end;
```


```
1 reference
local procedure SelectRandomVendor(): Code[20]
var
    Vendor: Record Vendor;
begin
    Vendor.SetRange(Blocked, Vendor.Blocked::" ");
    Vendor.Next(SessionId() MOD Vendor.Count());
    exit(Vendor."No.");
end;
```

# Starting the test

 Use always a warmup test

 PowerShell script

Also for CI/CD

 VS Code for developers

```
Test URL: https://dockeragent06.4ps.nl/perftester
```

```
The passed path for -BCPTTestRunnerInternalFolderPath seem to be rel  
Absolute path is C:\bcartifacts.cache\onprem\20.1.39764.39901\platfo  
Importing AL Test Runner from C:\bcartifacts.cache\onprem\20.1.39764  
WARNING: The names of some imported commands from the module 'ALTest  
make them less discoverable. To find the commands with unapproved v  
Verbose parameter. For a list of approved verbs, type Get-Verb.
```

Id	Name	PSJobTypeName	State	HasMoreData
--	----	-----	----	-----
8	Job8	BackgroundJob	Running	True
10	Job10	BackgroundJob	Running	True
12	Job12	BackgroundJob	Running	True
14	Job14	BackgroundJob	Running	True
16	Job16	BackgroundJob	Running	True
18	Job18	BackgroundJob	Running	True
20	Job20	BackgroundJob	Running	True
22	Job22	BackgroundJob	Running	True
24	Job24	BackgroundJob	Running	True
26	Job26	BackgroundJob	Running	True
28	Job28	BackgroundJob	Running	True
30	Job30	BackgroundJob	Running	True
32	Job32	BackgroundJob	Running	True
34	Job34	BackgroundJob	Running	True
36	Job36	BackgroundJob	Running	True
38	Job38	BackgroundJob	Running	True
40	Job40	BackgroundJob	Running	True
42	Job42	BackgroundJob	Running	True
44	Job44	BackgroundJob	Running	True
46	Job46	BackgroundJob	Running	True
48	Job48	BackgroundJob	Running	True
50	Job50	BackgroundJob	Running	True

# Starting the test - PowerShell

- PowerShell to simulate multiple users
- For BC Online create an “App registration”

```
##Standard BC
$Credential = New-Object PSCredential -ArgumentList '<user>@<domain>',
(ConvertTo-SecureString -String '<password>' -AsPlainText -Force)
C:\Users\bverbeek\Documents\AL\TestRunner\RunBCPTTests.ps1
    -ClientId dd52e8d1-d969-414f-8ce2-26ed233ba75c
    -Environment DOC -AuthorizationType AAD
    -Credential $Credential
    -TestRunnerPage 149002
    -SuiteCode 01
    -BCPTTestRunnerInternalFolderPath
C:\Users\bverbeek\Documents\AL\TestRunner\Internal
    -SandboxName bc22
```

```
## Container
$Credential = New-Object PSCredential '<loginname>',(ConvertTo-
SecureString -String '<password>' -AsPlainText -Force)
C:\Users\bverbeek\Documents\AL\TestRunner\RunBCPTTests.ps1
    -Environment OnPrem
    -AuthorizationType NavUserPassword
    -Credential $Credential
    -TestRunnerPage 149002
    -SuiteCode TEST
    -BCPTTestRunnerInternalFolderPath
C:\Users\bverbeek\Documents\AL\TestRunner\Internal
    -ServiceUrl https://NextMajor/BC/?tenant=default
```

+ Add a permission ✓ Grant admin consent for Contoso

API / Permissions name	Type	Description	Admin consent req...	Status
▼ Dynamics 365 Business Central (1) ...				
Financials.ReadWrite.All	Delegated	Access Dynamics 365 Business Central as the signed-in...	No	✓ Granted for Contoso ...



# VS Code extension

- Setup New Business Central Performance Toolkit Project
- Run BCPT (PowerShell)

nv.Codeunit.al 1    Extension: Performance Toolkit    AL TestCodeunitsWith

## Performance Toolkit

Microsoft [microsoft.com](https://microsoft.com) | 434 | ★★★★★

Performance development tools for Dynamics 365 Business Central

[Disable](#) | [Uninstall](#) | ⚙️

This extension is enabled globally.

[DETAILS](#)   [FEATURE CONTRIBUTIONS](#)   [CHANGELOG](#)   [RUNTIME STATUS](#)

### Overview

Welcome to the Performance Toolkit extension for Microsoft Dynamics 365 Business Central.

This extension makes it easy to set up a new Business Central Performance Toolkit environment, and it lets you run your BCPT suites from VSCode.

This extension includes:

- Scaffold a new BCPT AL project targeting your environment:
  - Install the Performance Toolkit in your Business Central environment.
  - Set up configurations for your new AL project.
  - Use provided sample tests, which are renumbered automatically.



EXPLORER

- BCPT
  - .alpackages
  - .snapshots
  - .vscode
    - launch.json
    - rad.json
    - scripts
    - app.json
  - BCPTAdjustCostItemEntries.Codeunit.al
  - BCPTCalculatePlanWorksheet.Codeunit.al
  - BCPTCreatePOWithNLines.Codeunit.al 3
  - BCPTCreateSOWWithNLines.Codeunit.al 5
  - BCPTCreateSQWithNLines.Codeunit.al 3
  - BCPTDetailTrialBalReport.Codeunit.al
  - BCPTMakeWebCall.Codeunit.al
  - BCPTOpenChartOfAccounts.Codeunit.al
  - BCPTOpenCustomerList.Codeunit.al
  - BCPTOpenItemList.Codeunit.al
  - BCPTOpenPurchInvoiceList.Codeunit.al
  - BCPTOpenRoleCenterSOP.Codeunit.al
  - BCPTOpenSalesInvoiceList.Codeunit.al
  - BCPTOpenVendorList.Codeunit.al
  - BCPTPostGLEntries.Codeunit.al
  - BCPTPostItemJournal.Codeunit.al 3
  - BCPTPostPurchInv.Codeunit.al 1
  - BCPTPurchPostWithNLines.Codeunit.al 3
  - BCPTSalesPostWithNLines.Codeunit.al 6
  - BCPTSleep1s.Codeunit.al
  - BCPTSQLPing.Codeunit.al
  - Default Publisher\_BCPT Performance Tests\_1....
  - OUTLINE
  - TIMELINE
  - AL OUTLINE

BCPTPostPurchInv.Codeunit.al 1 X BCPTPostItemJournal.Codeunit.al 3 BCPTOpenItemList.Codeunit.al

BCPTPostPurchInv.Codeunit.al

```

1 codeunit 50020 "BCPT Post Purch. Inv." implements "BCPT Test Param. Provider"
2
3 7 references
4   NoOfLinesToCreate: Integer;
5
6
7 1 reference
8   local procedure InitTest();
9   var
10    PurchasesPayablesSetup: Record "Purchases & Payables Setup";
11    NoSeriesLine: Record "No. Series Line";
12
13 begin
14    PurchasesPayablesSetup.Get();
15    PurchasesPayablesSetup.TestField("Invoice Nos.");
16    PurchasesPayablesSetup."Ext. Doc. No. Mandatory" := false;
17    PurchasesPayablesSetup.Modify();
18
19    NoSeriesLine.SetRange("Series Code", PurchasesPayablesSetup."Invoice Nos.");
20    NoSeriesLine.findset(true, true);
21    repeat
22      if NoSeriesLine."Ending No." <> '' then begin
23        NoSeriesLine."Ending No." := '';
24        NoSeriesLine.Validate("Allow Gaps in Nos.", true);
25        NoSeriesLine.Modify(true);
26      end;
27    until NoSeriesLine.Next() = 0;
28    commit();
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

```

PROBLEMS 41 OUTPUT DEBUG CONSOLE TERMINAL AZURE Filter (e.g. text, \*\*/\*.ts, !\*\*/node\_modules/\*\*)

- BCPTCreatePOWithNLines.Codeunit.al 4
  - Variable 'ParamValidationErr' with placeholders should have a comment explaining their content. AL(AA0470) [Ln 18, Col 9]
  - 'FindSet' is being deprecated in the versions: '11.0' or greater. This warning will become an error in a future release. AL(AL0667) [Ln 30, Col 9]
  - The name of the parameter 'BCPTTestContext' is identical to a global variable. AL(AA0244) [Ln 43, Col 45]
  - The name of PurchaseSetup is not valid. The name of variables and parameters must be suffixed with the type or object name. AL(AA0072) [Ln 24, Col 9]
- BCPTCreateSOWWithNLines.Codeunit.al 6
  - Variable 'ParamValidationErr' with placeholders should have a comment explaining their content. AL(AA0470) [Ln 19, Col 9]
  - 'FindSet' is being deprecated in the versions: '11.0' or greater. This warning will become an error in a future release. AL(AL0667) [Ln 30, Col 9]

▶ Start ▶ Start in Single Run mode ■ Stop ↻ Refresh 📄 Log Entries More options

Code	TEST_DOC	1 Work Day Corresponds to (minutes)	10
Description	Test VS Code	Version	1
Tag		Base Version	0
Duration (minutes)	1	Status	Completed
Default Min. User Delay (ms)	100	Started at	5/17/2023 1:44 PM
Default Max. User Delay (ms)	1000	Total No. of Sessions	2
Work date starts at	4/10/2023		

BCPT Suite Lines ✳ New ▶ Start this line in foreground ✳ New Line ✳ Delete Line

Codeunit ID	Codeunit Name	Parameters	No. of Sessions	Run in For...	Description	Status	Min. User Delay (ms)	Max. User Delay (ms)	Delay between iterations (sec.)
50007	BCPT Open Item List		3	☑		Completed	100	1000	5
→ 50011	BCPT Open Vendor List		2	☑		Completed	100	1000	5
50005	BCPT Open Chart of Accounts		3	☑			100	1000	5





# Analyze the results

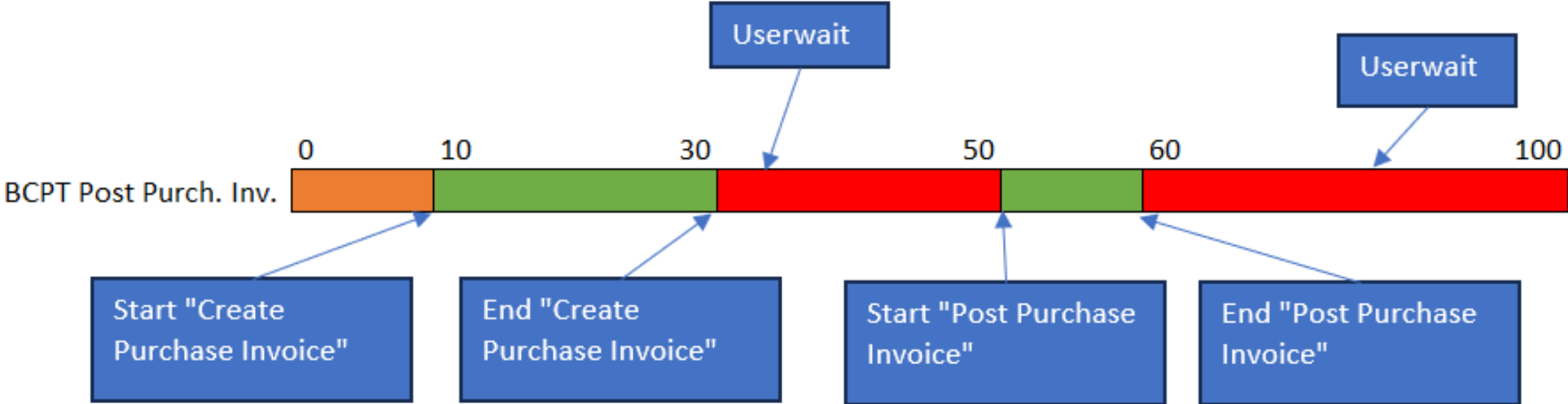
- From inside Business Central
- or export to Excel or use the analyze view



# Analyze the results

Duration (ms) how does it work

Measure	Time
Create Purchase Invoice	20
Post Purchase Invoice	50
Scenario	40



# Analyze the results

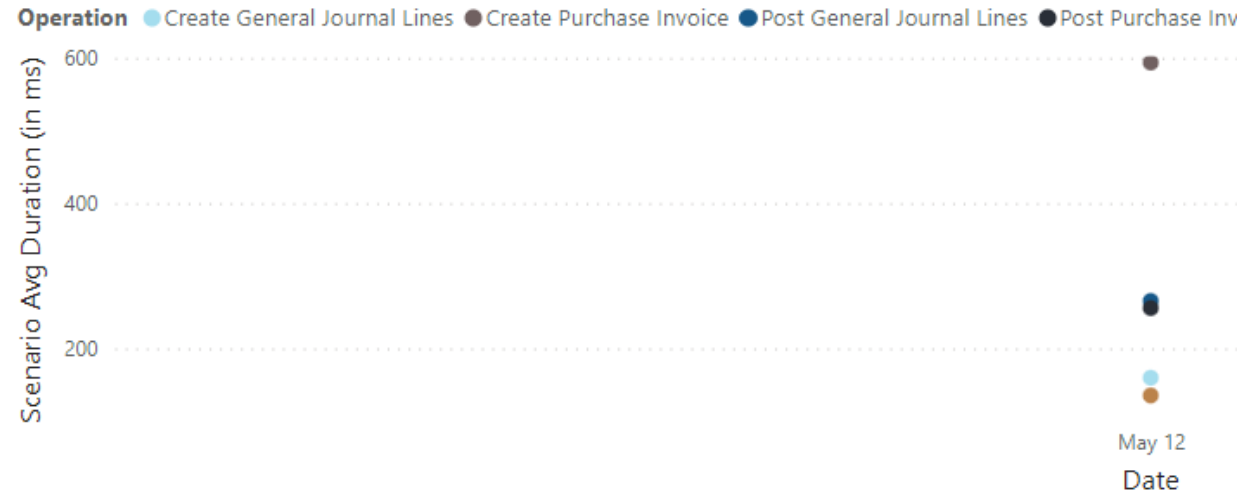
Application Insights

EventId	Message
AL0000DHR	Performance Toolkit run started
AL0000DHS	Performance Toolkit run finished
AL0000DHT	Performance Toolkit run cancelled
AL0000DGF	Performance Toolkit - {BCPT Header code} - {BCPT Scenario code} - {BCPT Line status}

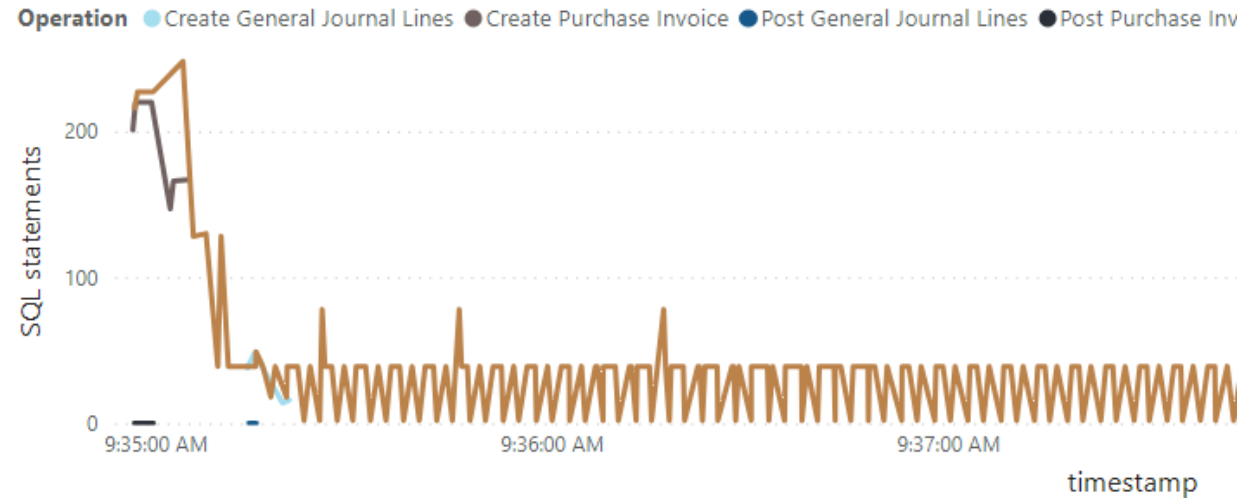
Power BI report

Total

### Scenario Avg Duration (in ms) by Date and Operation



### SQL statements by timestamp and Operation





Analyze further with KQL

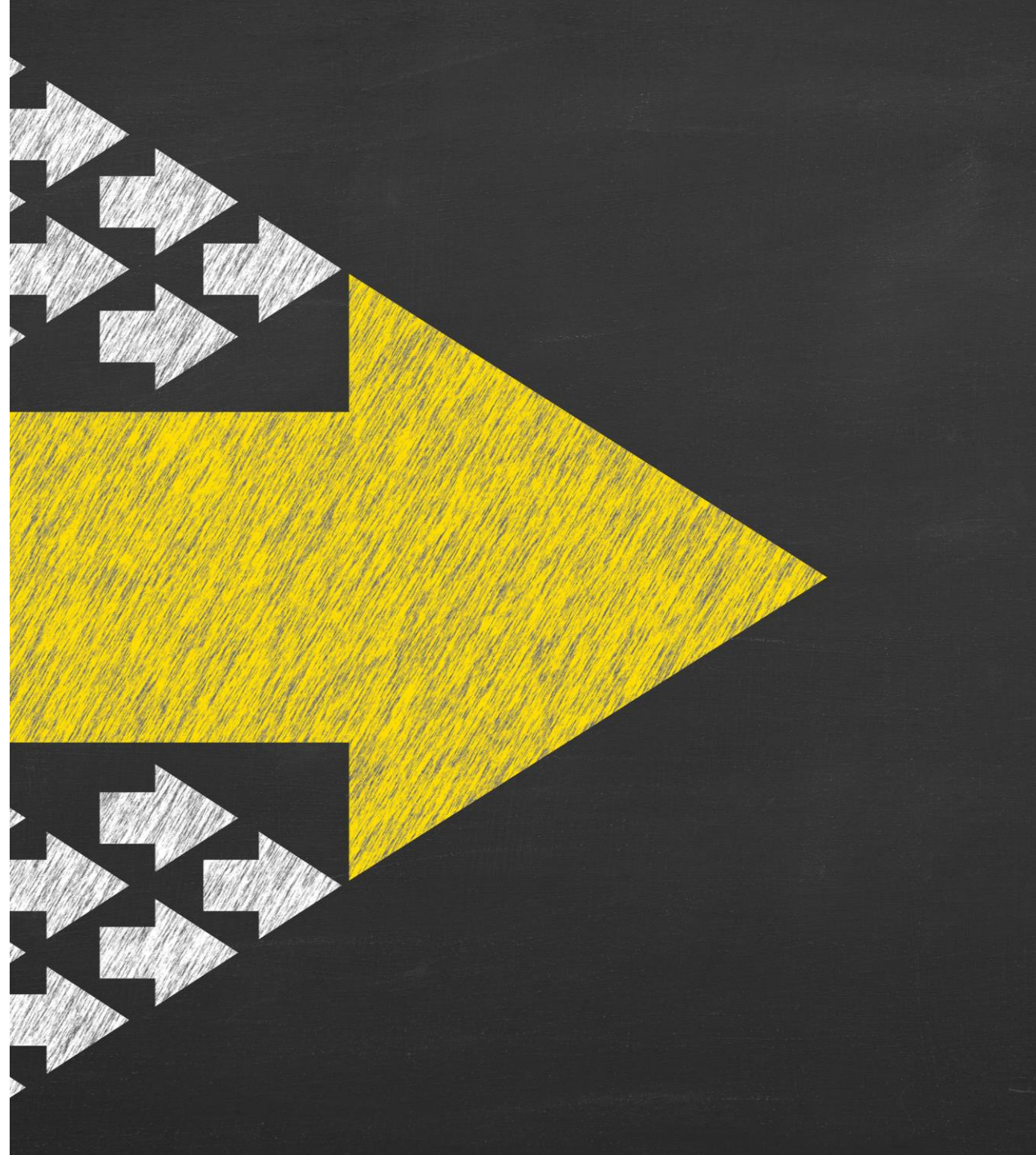
Open in Application Insights (if you have set parameters) | KQL Query (if you want to copy it)

// change lookback limit as needed



# Call to action

-  Visit:  
[Performance Toolkit Extension - Business Central | Microsoft Learn](https://learn.microsoft.com/en-us/performance-toolkit/extension-business-central)
-  Contribute to test samples  
[ALAppExtensions/Other/Tests/BCPT-SampleTests at main · microsoft/ALAppExtensions · GitHub](https://github.com/microsoft/ALAppExtensions/tree/main/Other/Tests/BCPT-SampleTests)





# Thank you !

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