

Performance testing before go-live with the Performance Toolkit



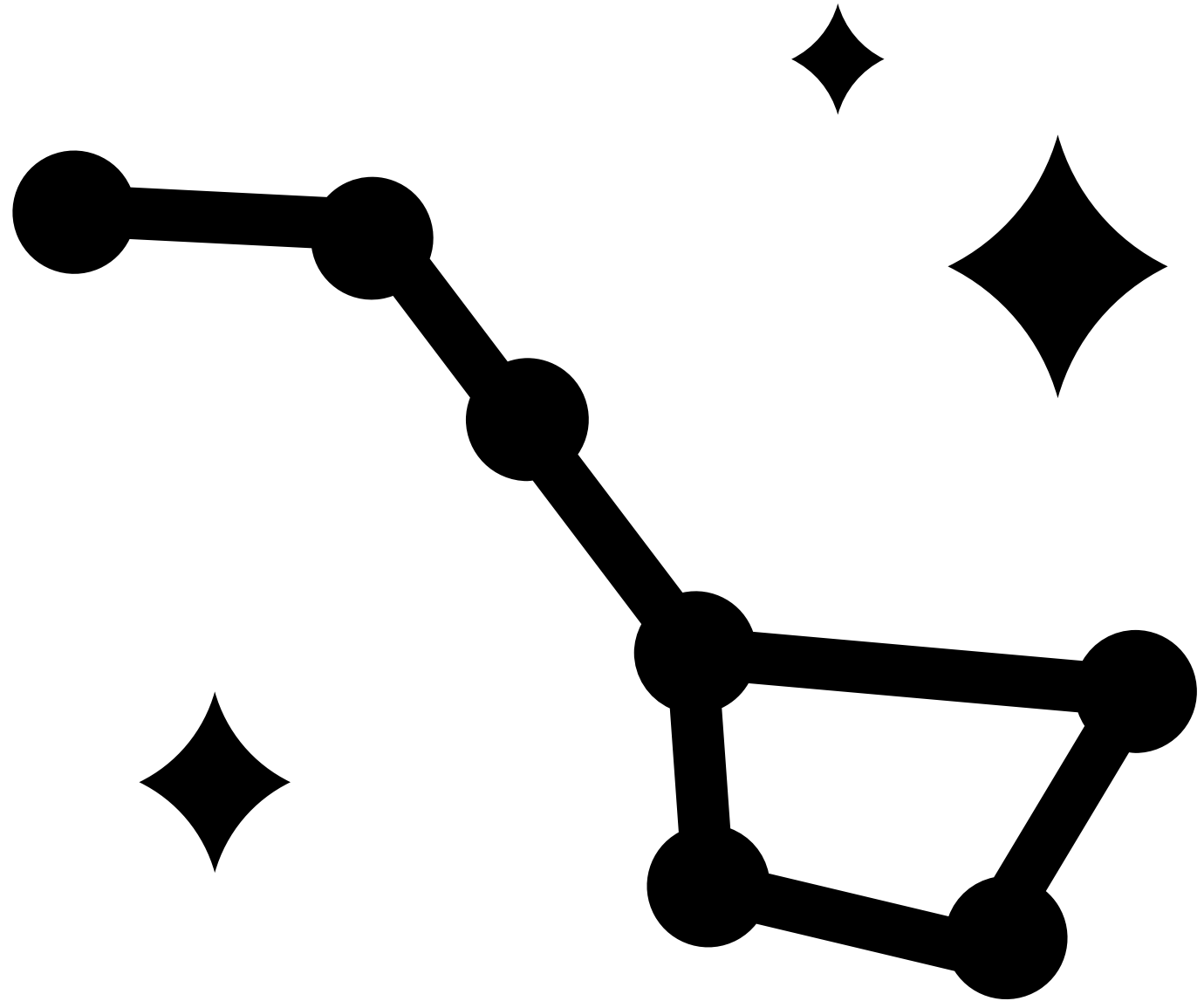
Agenda

- A better world
- Pro-Go live
- Performance Toolkit in DevOps
- Open-source test suites
- How to analyze results
- Future direction of Performance Toolkit (BCPT)
- Learning resources
- Go-dos

A better world

An abstract graphic design featuring a dark navy blue background. On the right side, there are large, overlapping geometric shapes. A light blue semi-circle is positioned in the upper right. Below it, a white rounded rectangle overlaps with a light blue rounded rectangle. The overall composition is minimalist and modern.

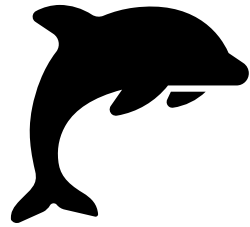
In a galaxy quite the
distance away...



... we meet some aliens working with ERPUULX (ERP)



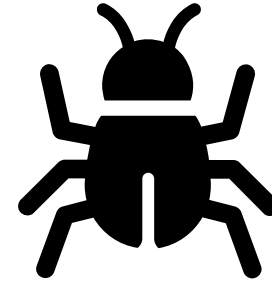
Snuullx
Account manager



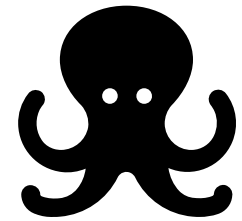
Druullx
Product Owner



Tjuullx
Developer



Quullx
Operations manager



Druullx
Product Owner



BTW, I just ran a performance test on the suggested load from the customer: we are good

Snuullx

Account manager



Just got an alert on teams. Seems like we have a performance regression in version 42.

Druullx
Product Owner



Ha ha ha. Concurrency testing my code is fun. It breaks Xulls code when running with 15 users.

Tjuullx
Developer



Business Central runs slower on customer Blooz on upcoming version 256 (rolling out next month). Let's investigate.

Quullx
Operations manager



Before *go-live*, I tested that the system scales with the expected number of uullxers (users) and what they're supposed to do in the system.

Xuullx

Project manager



**Meanwhile, back on
earth...**



Business Central Performance Toolkit (BCPT)

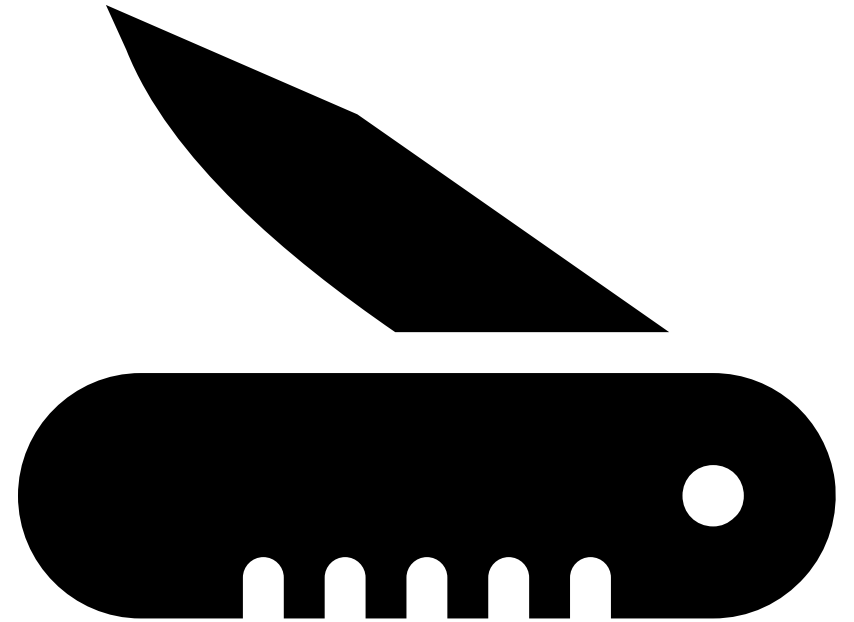
Multi-user Benchmark Tool

Simulate multiple users running simultaneously

Measure Performance

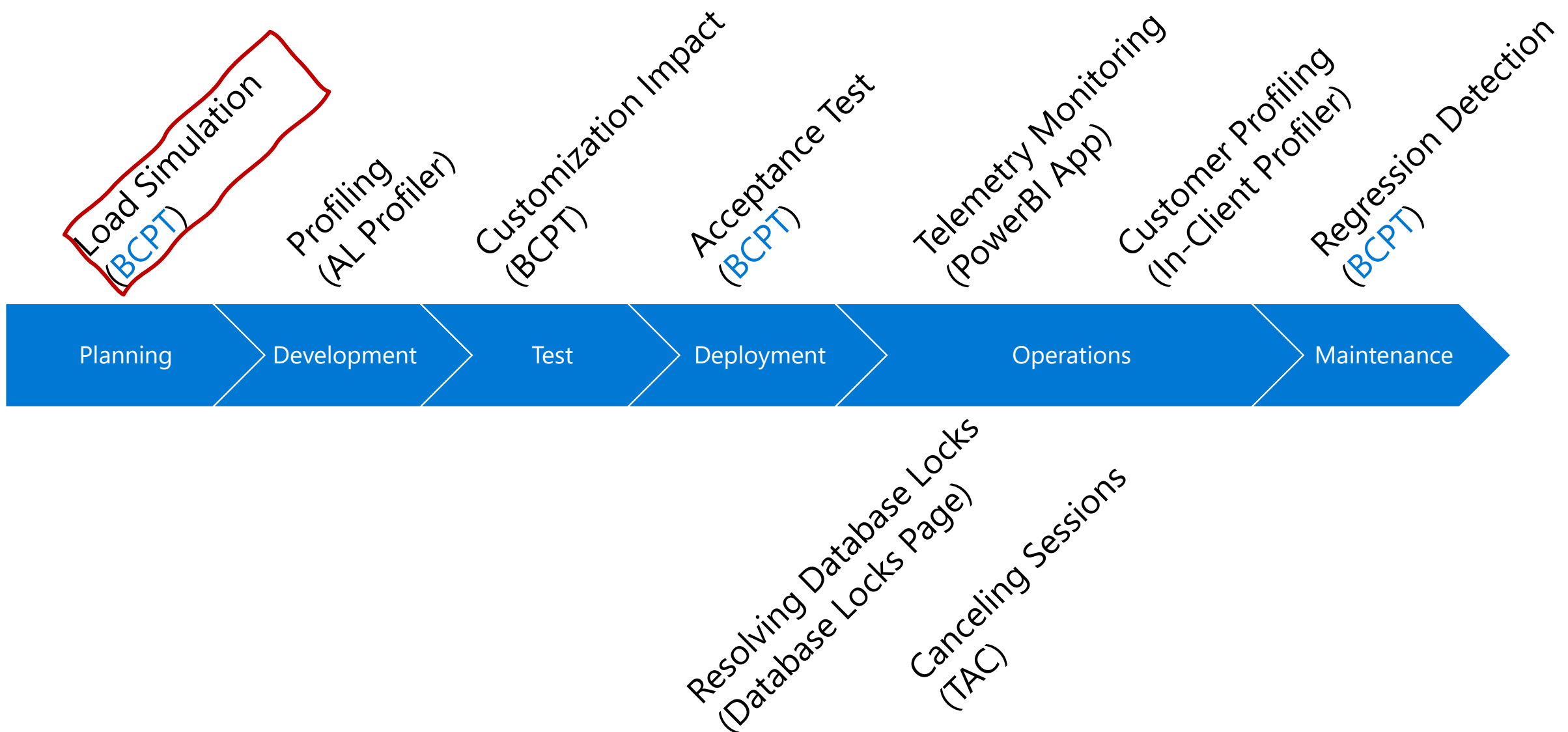
Detect Locking Issues

Test usage on a "system under load"



Performance Activities

In every phase of a project (also for an app)



Pro Go Live

Testing performance before go-live: As simple as 1, 2, 3...



plan and setup



run tests



analyze and react

Testing performance before go-live – plan and setup

Together with the project sponsor on the customer side, identify the key *scenarios* that must be tested.

Copy the production environment to a sandbox.

Set up telemetry on the environment (to get clean data, set up a new Application Insights resource for this test only)

Get open-source scenario code from GitHub

Write scenario code for things not covered there (and submit a PR)

Testing performance before go-live – run tests

Install and configure the BCPT AL extension with the scenarios you need and in the expected use pattern.

or

Set up scenarios as part of a devops pipeline (maybe work on automating parts of this process for easier repeatability).

Run the scenarios

Testing performance before go-live – **analyze and react**

Install and configure the Power BI app on telemetry

Look at the results in Performance report.

Consider setting up alerts on regressions.

Performance Toolkit in DevOps

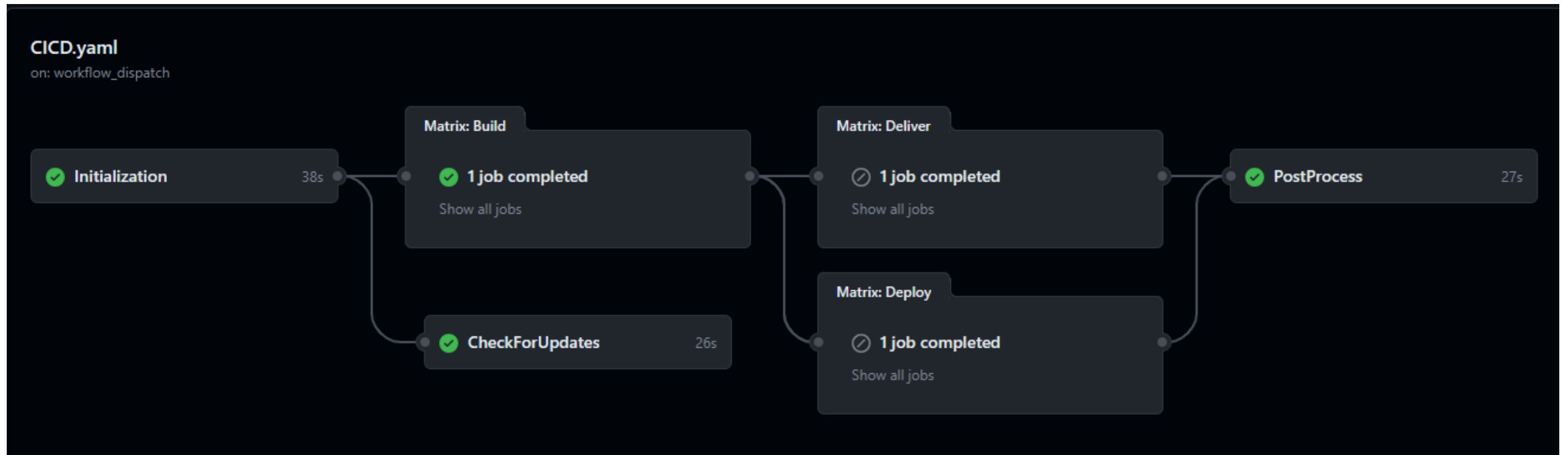
The background features a dark navy blue field. On the right side, there is a large, light blue semi-circle. In the lower right, a white rounded rectangle is partially visible, overlapping the light blue semi-circle and the dark blue background.

BCPT can now run as part of AL-Go for Github

Just add a BCPT Test app and add to
bcptTestFolders to run BCPT tests in workflows.

Compare to a baseline.

Running a BCPT workflow



See test results in the pipeline

Compare to baseline.

Was there a difference?

Performance test results

BCPT Suite	Codeunit ID	Codeunit Name	Operation	Status	Duration (ms)	Duration base (ms)	Duration diff (ms)	Duration diff	SQL Stmts	SQL Stmts base	SQL Stmts diff	SQL Stmts diff
10USERTEST	60003	BCPT Create PO with N Lines	Add Order	✓	7	7	0	0%	9	9	0	0%
			Enter Account No.	✓	9	9	0	0%	8	8	0	0%
			Enter Line Item No.	✓	8	8	0	0%	3	3	0	0%
			Enter Line Quantity	✓	8	9	-1	-11%	6	6	0	0%
			Scenario	✓	344	368	-24	-7%	211	211	0	0%
	60007	BCPT Detail Trial Bal. Report	Scenario	✓	6635	7007	-372	-5%	5	5	0	0%
	60005	BCPT Create SQ with N Lines	Add Order	✓	7	7	0	0%	8	8	0	0%
			Enter Account No.	✓	12	12	0	0%	10	10	0	0%
			Enter Line Item No.	✓	7	7	0	0%	4	4	0	0%
			Enter Line Quantity	✓	16	17	-1	-6%	12	12	0	0%
			Scenario	✓	357	338	+19	+6%	230	230	0	0%
	60004	BCPT Create SO with N Lines	Add Order	✓	9	10	-1	-10%	9	9	0	0%
			Enter Account No.	✓	11	13	-2	-15%	11	11	0	0%
			Enter Line Item No.	✓	9	10	-1	-10%	7	7	0	0%
			Enter Line Quantity	✓	15	14	+1	+7%	12	12	0	0%
			Scenario	✓	439	409	+30	+7%	281	281	0	0%

Open-source test suites

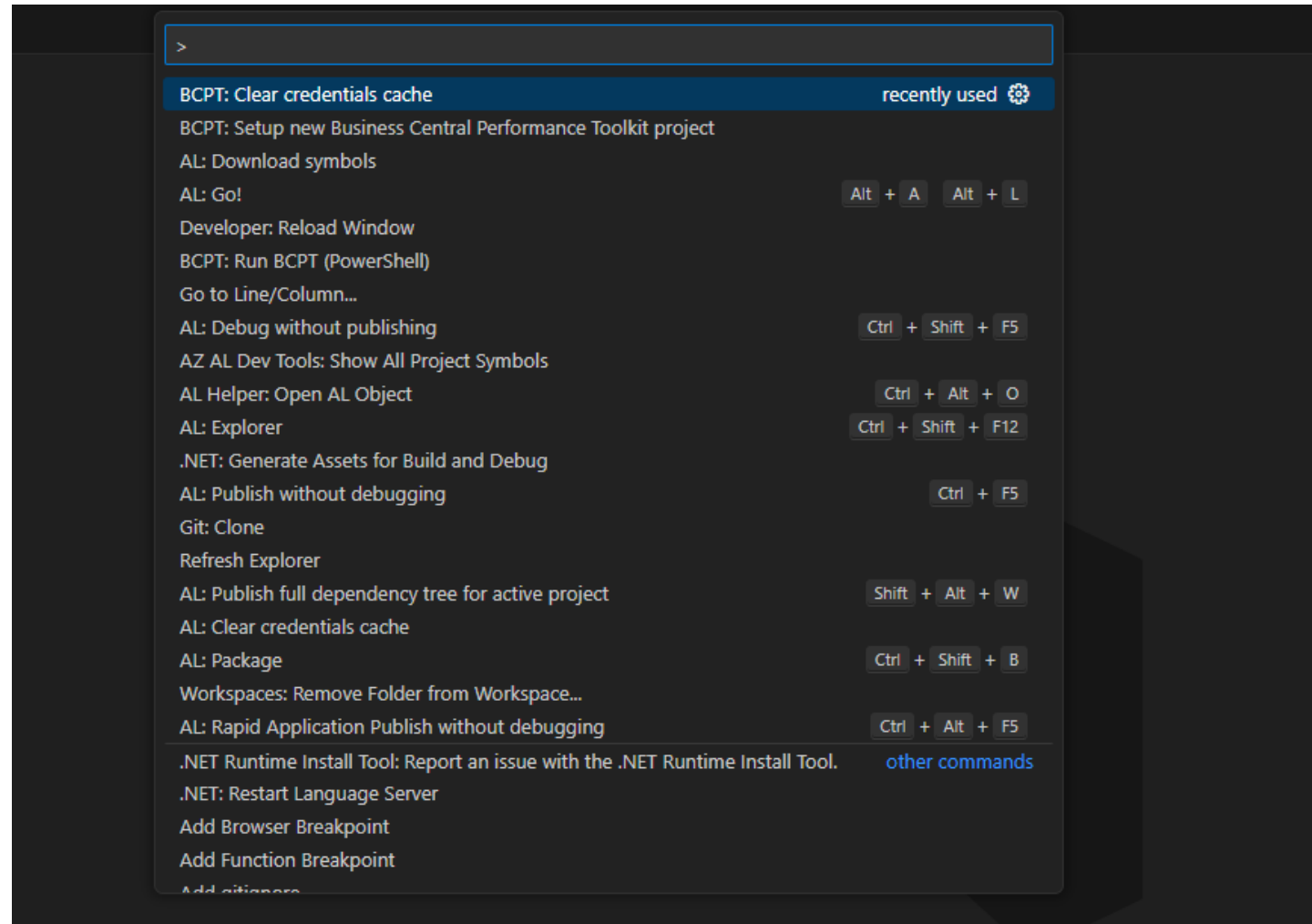


BCPT can now source test code from Github

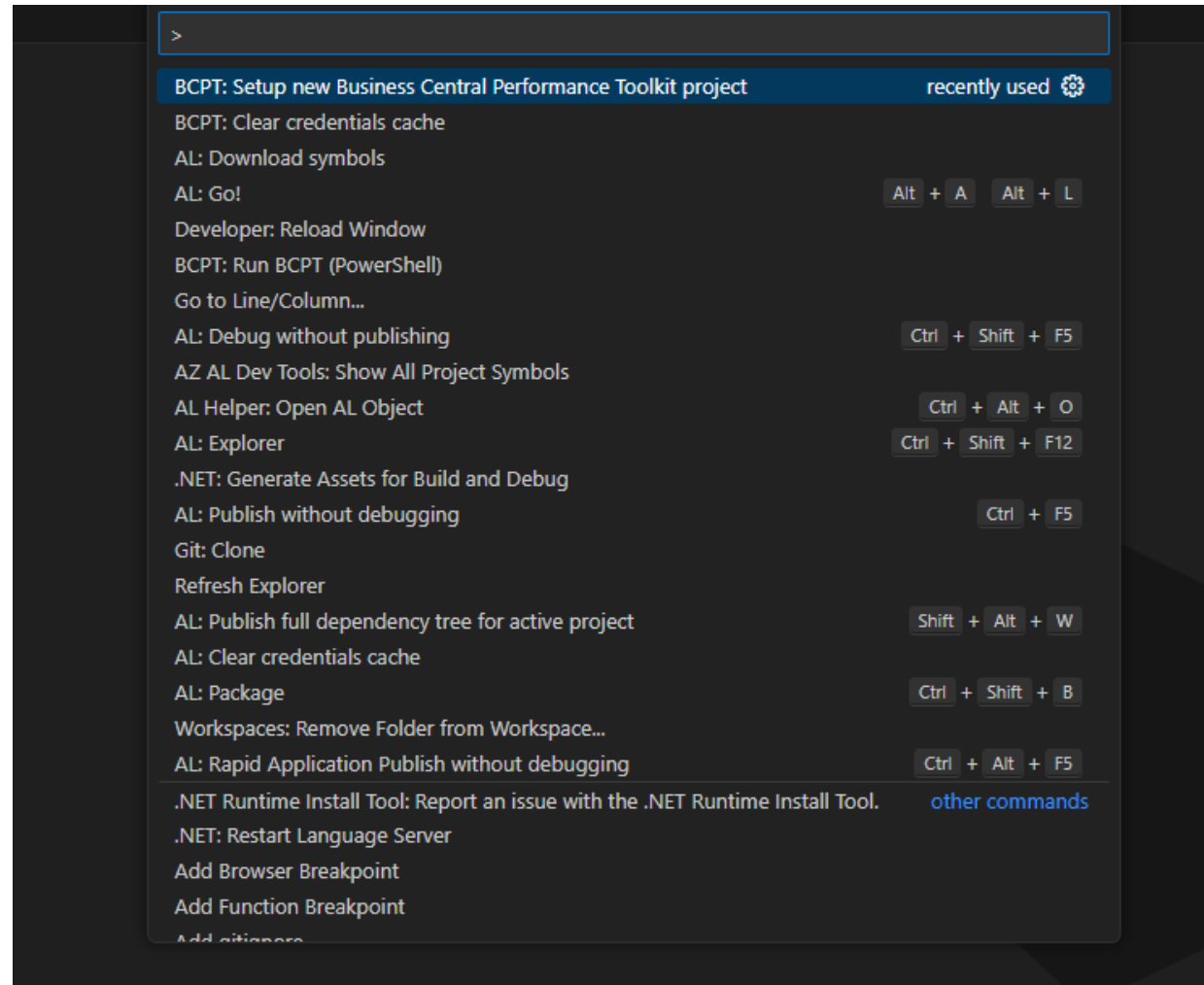
Before (v22 and earlier), BCPT had test code built-in.

Now (v23), BCPT can read test code from Github.

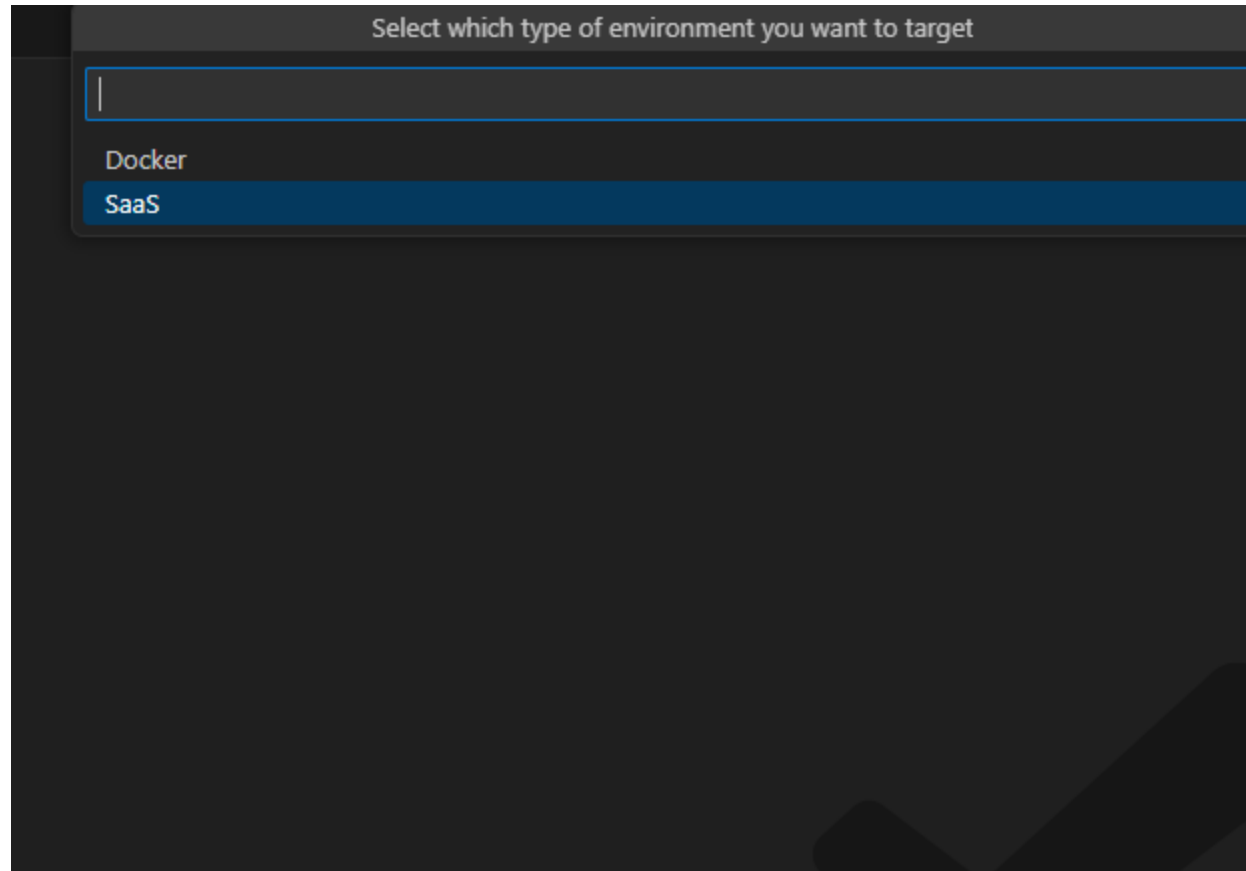
1. Clear the credentials cache



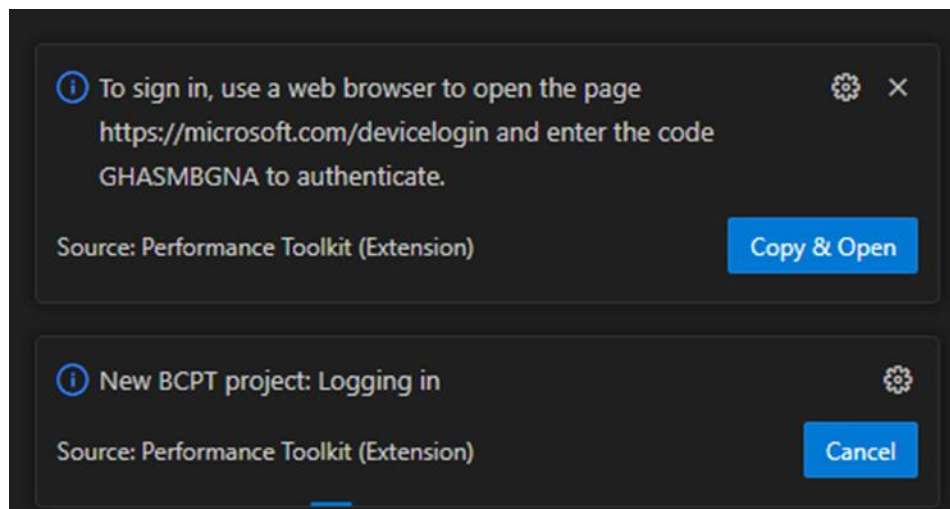
2. Start the Wizard



3. Select the environment



4. Login



admin@

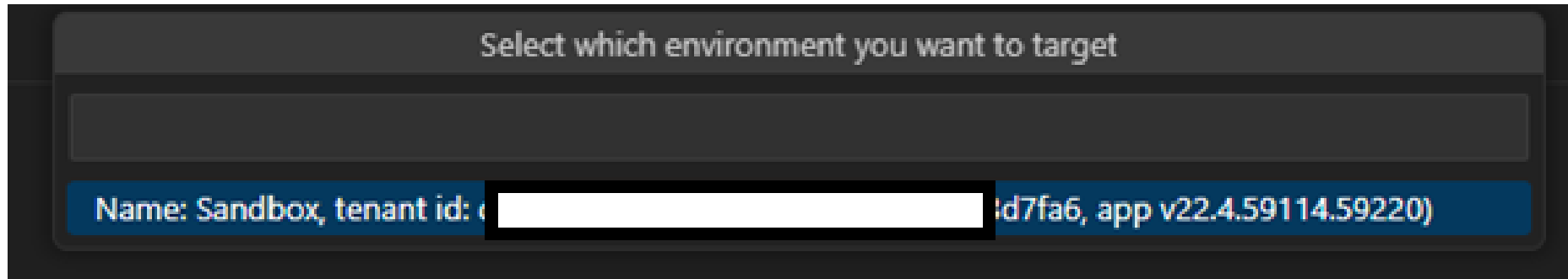
**Are you trying to sign in to
Dynamics 365 Business Central
Performance Toolkit Client?**

Only continue if you downloaded the app from a
store or website that you trust.

Cancel

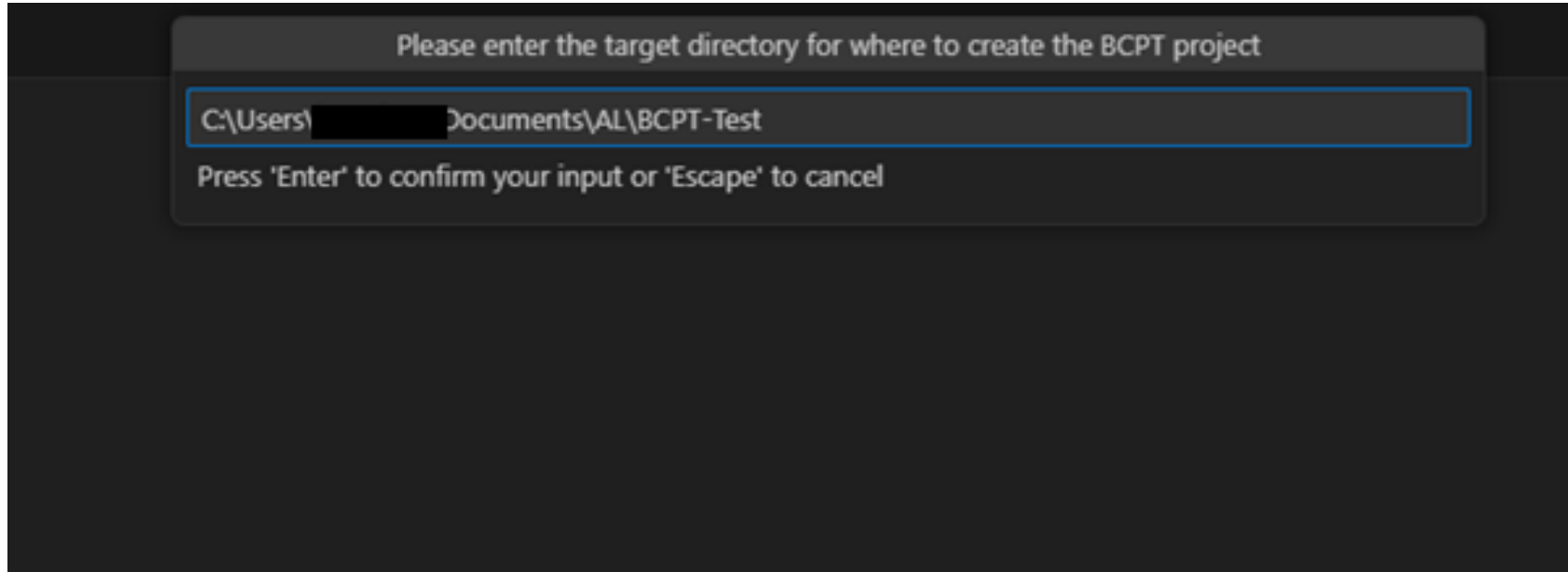
Continue

5. Select the Tenant ID (environment) to test on

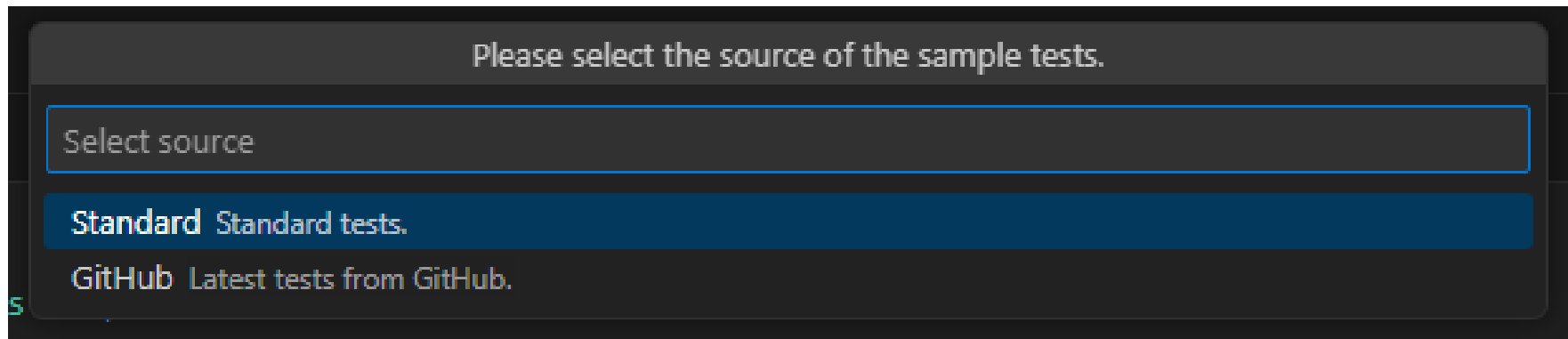


A screenshot of a terminal window with a dark background. At the top, a light gray bar contains the text "Select which environment you want to target". Below this is a dark gray rectangular input field. Underneath the input field is a blue bar containing the text "Name: Sandbox, tenant id: c[redacted]id7fa6, app v22.4.59114.59220)".

6. Select a location for the new BCPT project



7. Select where to get the test code from



Please select the source of the sample tests.

Select source

Standard Standard tests.

GitHub Latest tests from GitHub.

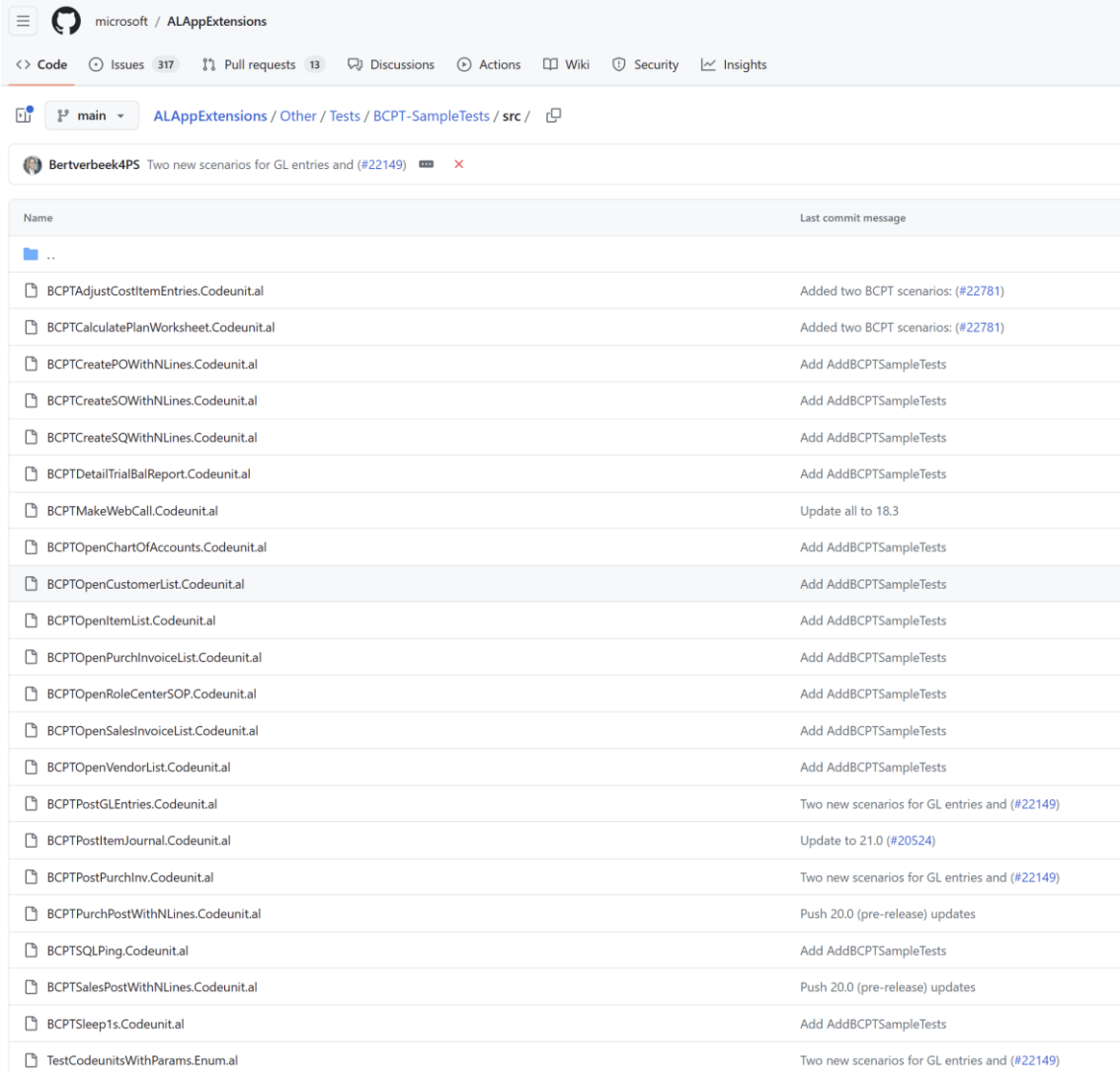
The image shows a dark-themed dialog box with a title bar that says "Please select the source of the sample tests." Below the title bar is a list of two options. The first option is "Standard" followed by "Standard tests." and it is highlighted with a blue background. The second option is "GitHub" followed by "Latest tests from GitHub." and it is not highlighted. The text "Select source" is visible above the list of options.

BCPT open source scenarios

22 scenarios available

Many more to come

- From Microsoft
- From partners
- From you?



The screenshot shows the GitHub repository for Microsoft's ALAppExtensions. The breadcrumb navigation indicates the path: `ALAppExtensions / Other / Tests / BCPT-SampleTests / src /`. A commit by Bertverbeek4PS is highlighted, titled "Two new scenarios for GL entries and (#22149)". Below the commit information is a table listing 22 scenarios, each with a file icon, a name, and a link to the last commit message.

Name	Last commit message
..	
BCPTAdjustCostItemEntries.Codeunit.al	Added two BCPT scenarios: (#22781)
BCPTCalculatePlanWorksheet.Codeunit.al	Added two BCPT scenarios: (#22781)
BCPTCreatePOWithNLines.Codeunit.al	Add AddBCPTSampleTests
BCPTCreateSOWWithNLines.Codeunit.al	Add AddBCPTSampleTests
BCPTCreateSQWithNLines.Codeunit.al	Add AddBCPTSampleTests
BCPTDetailTrialBalReport.Codeunit.al	Add AddBCPTSampleTests
BCPTMakeWebCall.Codeunit.al	Update all to 18.3
BCPTOpenChartOfAccounts.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenCustomerList.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenItemList.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenPurchInvoiceList.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenRoleCenterSOP.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenSalesInvoiceList.Codeunit.al	Add AddBCPTSampleTests
BCPTOpenVendorList.Codeunit.al	Add AddBCPTSampleTests
BCPTPostGLEntries.Codeunit.al	Two new scenarios for GL entries and (#22149)
BCPTPostItemJournal.Codeunit.al	Update to 21.0 (#20524)
BCPTPostPurchInv.Codeunit.al	Two new scenarios for GL entries and (#22149)
BCPTPurchPostWithNLines.Codeunit.al	Push 20.0 (pre-release) updates
BCPTSQLPing.Codeunit.al	Add AddBCPTSampleTests
BCPTSalesPostWithNLines.Codeunit.al	Push 20.0 (pre-release) updates
BCPTSleep1s.Codeunit.al	Add AddBCPTSampleTests
TestCodeunitsWithParams.Enum.al	Two new scenarios for GL entries and (#22149)

Analyzing test results



Analyzing BCPT test results

Install and configure the Power BI app on telemetry

Look at the *Performance* report.

In particular these three pages

Performance Toolkit results

Deadlocks (find it in the *Error* report)

Database lock timeouts

Track performance test results – also over time

The screenshot displays the Dynamics 365 Performance Toolkit (BCPT) interface. The left sidebar contains navigation options: Performance events, Sessions, OnCompanyOpen, Pageviews, Reports, Long Running SQL Queries, Database lock timeouts, Long Running AL methods, Incoming webservice calls, Outgoing webservice calls, Job Queue, Task Scheduler, Configuration packages, App Updates, Environment Updates, Performance Toolkit (BCPT) (highlighted with a red arrow), and About the report. The main content area is titled 'Performance Toolkit (BCPT)' and includes a search bar and a dropdown for 'Tenant/Environment/Company' set to 'All'. Below this, a message states: 'This page shows you data from the performance toolkit (BCPT) runs.'

Performance Test runs across Environments

Date / time	AAD Tenant Id	Environment Name	Environment Type	Company Name
05/04/2023 10:25:09	c17619aa-4729-4dbb-9bd8-07aa663d7fa6	Sandbox	Sandbox	CRONUS USA, Inc.
05/04/2023 10:25:49	c17619aa-4729-4dbb-9bd8-07aa663d7fa6	Sandbox	Sandbox	CRONUS USA, Inc.

Performance Test runs

Test Suite / run type / run id	Duration (in min)	Sessions
PROFILE	4	4
SIMPLE	2	5
Total	6	9

Performance Test Scenario Run Statistics

Count	Operation	Min Duration (in ms)	Avg Duration (in ms)	Median Duration (in ms)	Max Duration (in ms)
24842	Add Order	0	64	31	
24842	Enter Account No.	0	66	31	

Performance Run Scenarios by completion status

Any test runs that take a long time?

What are the timings for the different scenarios?

Troubleshoot deadlock issues

Errors

Confidential\Microsoft Extended

Search

Trial: 55 days left

19

?

File

Export

Chat in Teams

Get insights

Subscribe to report

Dynamics 365 Business Central Usage 18/09/2023

Usage

Errors

Dashboard

Login errors

Error dialogs

Permission Errors

Error messages

Feature Errors

Azure function errors

Job Queue errors

Task Scheduler errors

Report errors

Configuration package e...

Database deadlocks

About the report

Performance

Administration

Go back

Database Deadlocks

Tenant/Environment/Company

All

Which customers experience deadlocks?

Database Deadlocks by Environment

Count	Domain	AAD Tenant Id	Environment Name
14		9f8669d5-d9d8-456c-bd8b-92c729f98798	Production
14			

All14Database Deadlocks

Last 7 days0Database Deadlocks

Since Yesterday0Database Deadlocks

Database Deadlocks by Extension Type

Code Ownership

Microsoft00.00%

Who got the error?

Database Deadlocks by Extension Publisher

Publisher

Microsoft

Which apps and objects do deadlocks arise?

User details (which user experienced the deadlock)

User Telemetry Id

1597b339-8394-4e4e-adc5-264b65cfc898

App Details (in which app does the deadlock come from)

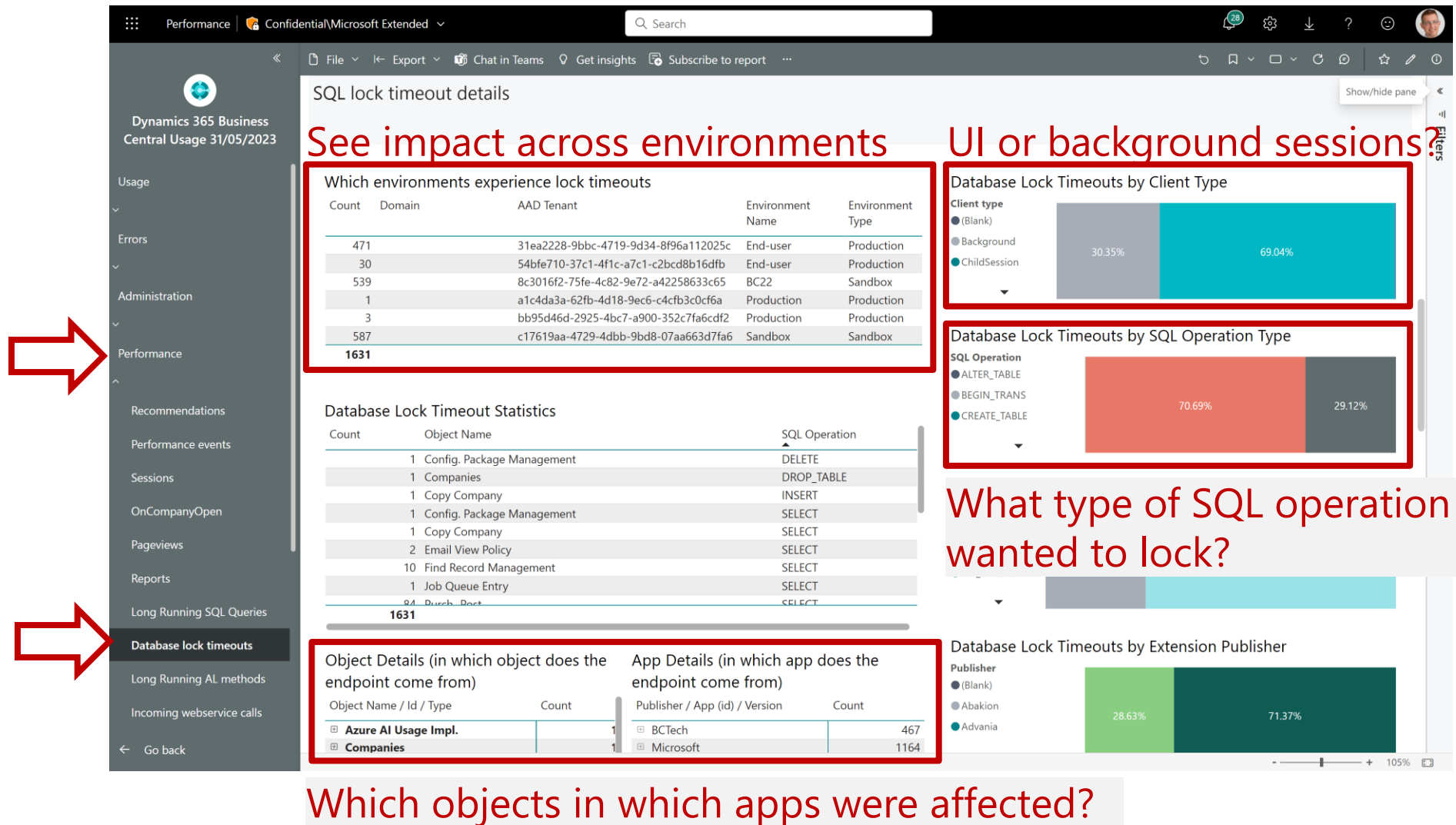
Publisher / App / App Id / Version

Count

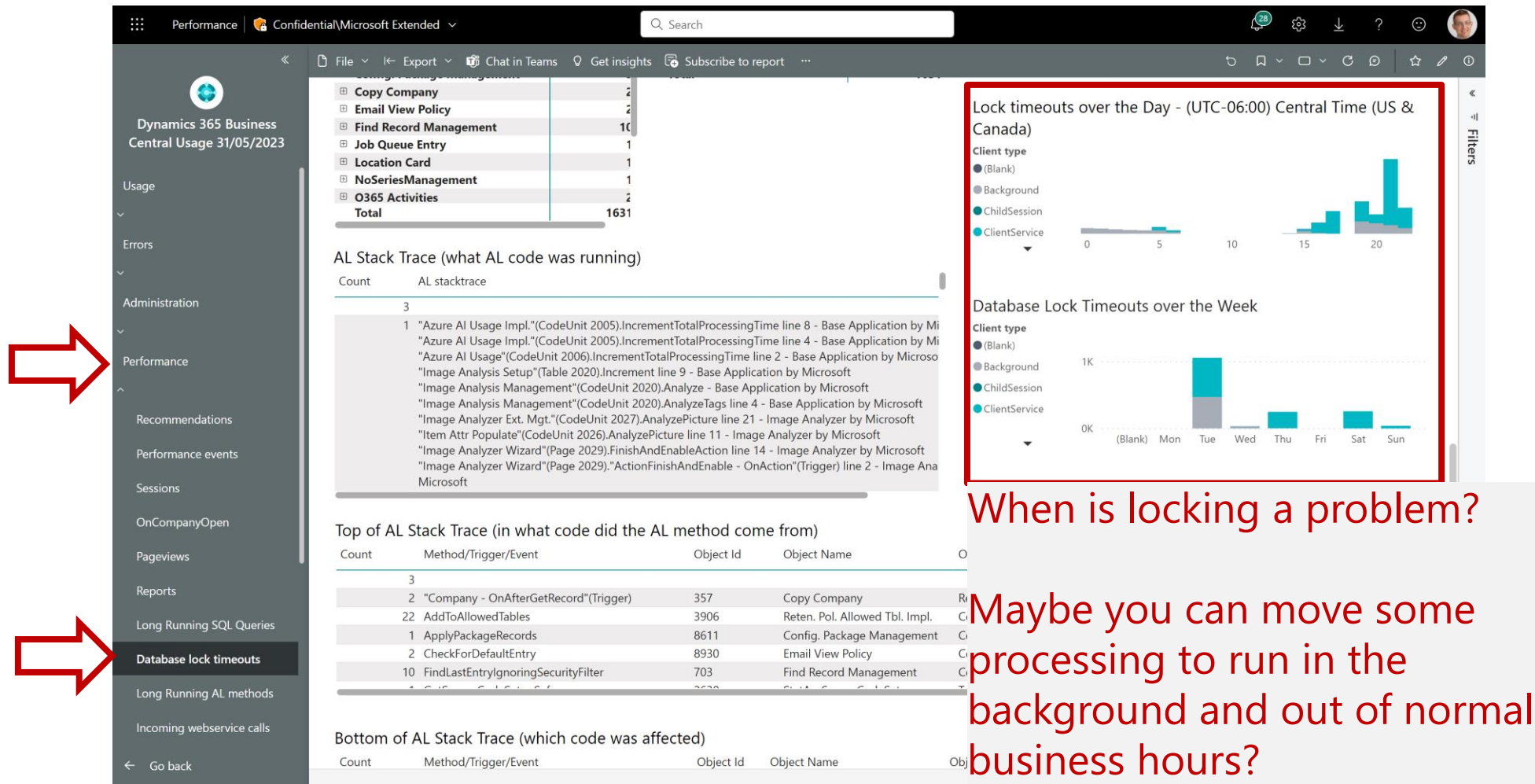
Deadlocks

US & Canada

Analyzing database locks - 1



Analyzing database locks - 2



Analyzing database locks - 3

Performance | Confidential\Microsoft Extended

Search

File | Export | Chat in Teams | Get insights | Subscribe to report

Dynamics 365 Business Central Usage 31/05/2023

Usage

Errors

Administration

Performance

Recommendations

Performance events

Sessions

OnCompanyOpen

Pageviews

Reports

Long Running SQL Queries

Database lock timeouts

Long Running AL methods

Incoming webservice calls

Go back

AL Stack Trace (what AL code was running)

Count	AL stacktrace
3	
1	"Azure AI Usage Impl."(CodeUnit 2005).IncrementTotalProcessingTime line 8 - Base Application by Microsoft
1	"Azure AI Usage Impl."(CodeUnit 2005).IncrementTotalProcessingTime line 4 - Base Application by Microsoft
1	"Azure AI Usage"(CodeUnit 2006).IncrementTotalProcessingTime line 2 - Base Application by Microsoft
1	"Image Analysis Setup"(Table 2020).Increment line 9 - Base Application by Microsoft
1	"Image Analysis Management"(CodeUnit 2020).Analyze - Base Application by Microsoft
1	"Image Analysis Management"(CodeUnit 2020).AnalyzeTags line 4 - Base Application by Microsoft
1	"Image Analyzer Ext. Mgt."(CodeUnit 2027).AnalyzePicture line 21 - Image Analyzer by Microsoft
1	"Item Attr Populate"(CodeUnit 2026).AnalyzePicture line 11 - Image Analyzer by Microsoft
1	"Image Analyzer Wizard"(Page 2029).FinishAndEnableAction line 14 - Image Analyzer by Microsoft
1	"Image Analyzer Wizard"(Page 2029).ActionFinishAndEnable - OnAction*(Trigger) line 2 - Image Analyzer by Microsoft

Top of AL Stack Trace (in what code did the AL method come from)

Count	Method/Trigger/Event	Object Id	Object Name	Object Type	Extension Name	Publisher	Top of stack Line
3							
2	"Company - OnAfterGetRecord"(Trigger)	357	Copy Company	Report	Base Application	Microsoft	"Copy Company"(R
22	AddToAllowedTables	3906	Reten. Pol. Allowed Tbl. Impl.	CodeUnit	System Application	Microsoft	"Reten. Pol. Allowec
1	ApplyPackageRecords	8611	Config. Package Management	CodeUnit	Base Application	Microsoft	"Config. Package M
2	CheckForDefaultEntry	8930	Email View Policy	CodeUnit	System Application	Microsoft	"Email View Policy"
10	FindLastEntryIgnoringSecurityFilter	703	Find Record Management	CodeUnit	Base Application	Microsoft	"Find Record Mana

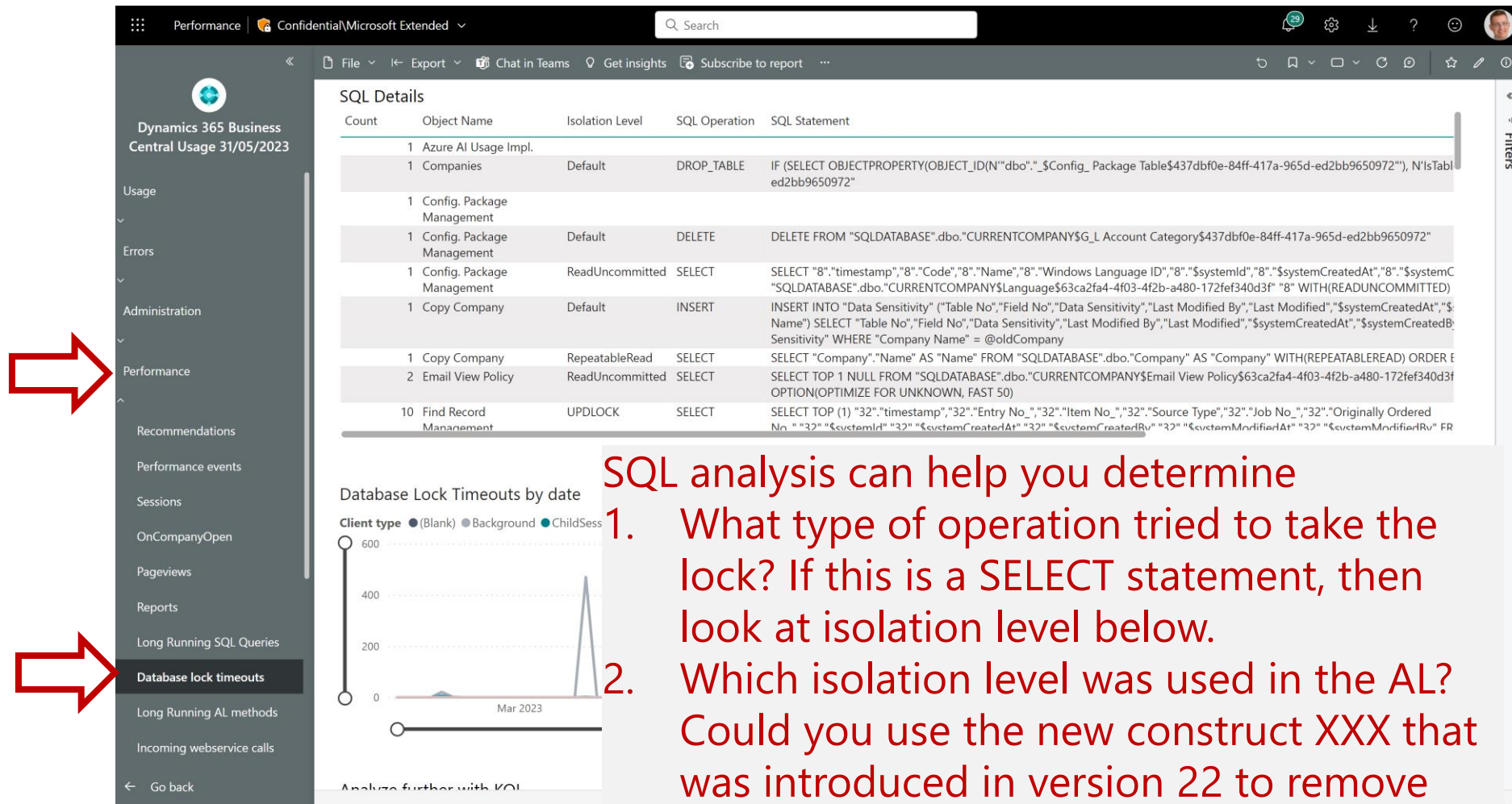
Bottom of AL Stack Trace (which code was affected)

Count	Method/Trigger/Event	Object Id	Object Name	Object Type	Extension Name	Publisher	Bottom of stack Line
3							
2	"CopyCompany - OnAction"(Trigger)	357	Companies	Page	Base Application	Microsoft	Companies(Page 3
1126	"StartNext - OnAction"(Trigger)	149002	BCPT CommandLine Card	Page	Performance Toolkit	Microsoft	"BCPT CommandLi
1	"Statistical Account No. - OnValidate"(Trigger)	2631	Statistical Acc. Journal Line	Table	Statistical Accounts	Microsoft	"Statistical Acc. Jou
24	OnCompanyOpenCompleted(Event)	2000000003	Company Triggers	CodeUnit			"Company Triggers
1	OnInsert(Trigger)	5766	Warehouse Activity Header	Table	Base Application	Microsoft	"Warehouse Activi

AL stacktrace analysis can help you determine

1. Which AL method tried to take locks?
2. Which AL method was interrupted by the lock timeout (this is what the user was doing)

Analyzing database locks - 4



SQL analysis can help you determine

1. What type of operation tried to take the lock? If this is a SELECT statement, then look at isolation level below.
2. Which isolation level was used in the AL? Could you use the new construct XXX that was introduced in version 22 to remove this lock or reduce the impact of it?

Analyzing database locks - 5

SQL Details

Count	Object Name	Sum time (sec)	Max Time (ms)	Explanation	Number Of Columns	Outer Appls	Joins	Take Locks	Search Query	IsEmpty AL Statement	SQL Operation	SQL Statement
2906	Graph Mgt - Sales Order Buffer	5963	21109	Takes database locks (might make other queries slow because they need to wait for this to finish).	0	0	0	True	False	False	INSERT	INSERT INTO "SC Code","Posting G _","Line Discount Dimension 2 Coc Invoiced","Shipm: Prod_ Posting Gr Code","VAT Claus Order No_","Blan Reference","Prep VAT Identifier","P VAT","Prepm: Ai Discount Amoun

Long running SQL queries by date

Client type: Background, ChildSession, ClientService, Phone, WebClient, WebServiceClient

8K

NB! This is the *Long Running SQL Statements* page

SQL analysis on this page can help you determine what other SQL statements were running at the same time as the statement that timed out? Note that you need to look at the timestamp 30 seconds prior to the lock timeout event.

Take Locks

is True

Filter type: Basic filtering

☒ Select all

☐ (Blank)

☐ False 1390

☒ True 600

Future direction of Performance Toolkit



Ingredients (not a prioritized list)

Remove friction

Change the culture

Collaborate with the community

Enrol ambassadors

Better readiness material



Resources





Filter by title

▾ Extension lifecycle

Overview

Extension types and scope

Moving between extension scopes

> Migration

> Translation

▾ Testing

Overview

Test codeunits and test methods

Handler methods (for tests)

Test runner codeunits

Test pages

UI handlers

Application testing example

The performance toolkit extension

FAQ about testing your Business Central app

... / Developer / Development / Extension lifecycle / Testing /



The Performance Toolkit extension

Article • 09/19/2023 • 8 contributors

[Feedback](#)

In this article

[How can I use the Performance Toolkit?](#)

[How can I answer the question "Can Business Central handle a specific load for prospect customer"?](#)

[How can I analyze BCPT data?](#)

[Performance Toolkit Terms and definitions](#)

[Components of the Performance Toolkit extension](#)

[Before you start](#)

[Get started](#)

[Test performance](#)

[Analyze the results](#)

[BCPT FAQ](#)

[See also](#)

[Show less](#)

Personas and scenarios

How to setup and use

Analyze with Power BI

Everything You Always Wanted to Know About BCPT*

*) But Were Afraid to Ask

Filter by title

Development and administration

New and planned

> Get started

> Administration

Administration overview

> Understand Business Central online

> Admin center

> Entitlements and permissions

> Prepare Business Central

> Onboard your customers

> Monitor and analyze telemetry

Overview

Available telemetry

Enable telemetry

Control telemetry cost

Analyze telemetry with Power BI

Analyze telemetry with KQL

Alert on telemetry

/ Developer and Admin / Administration / Monitor and analyze telemetry /



Analyze and Monitor Telemetry with Power BI

Article • 04/14/2023 • 4 contributors

Feedback

In this article

About the reports in the app

Get the apps

Connect to Azure Application Insights for the first time

Configure an app after initial setup

Install, share, and update apps

Share the app with coworkers and others

Use the app

No-code alerting with Power BI Metrics

See also

Show less

To make it simple to analyze Business Central telemetry, we've developed two Power BI apps available from Microsoft AppSource. One app is for telemetry on environments. The other one is for

Go dos

Find *your* BCPT usage scenario

Your role has a need for BCPT.

Built BCPT in

Pick a process.

Use BCPT.

Start small and expand.

Embrace open source

If your org has to do it all, testing using BCPT will be a tax.

What if 3000+ partners contribute a little bit every day...

Learn a bit of git

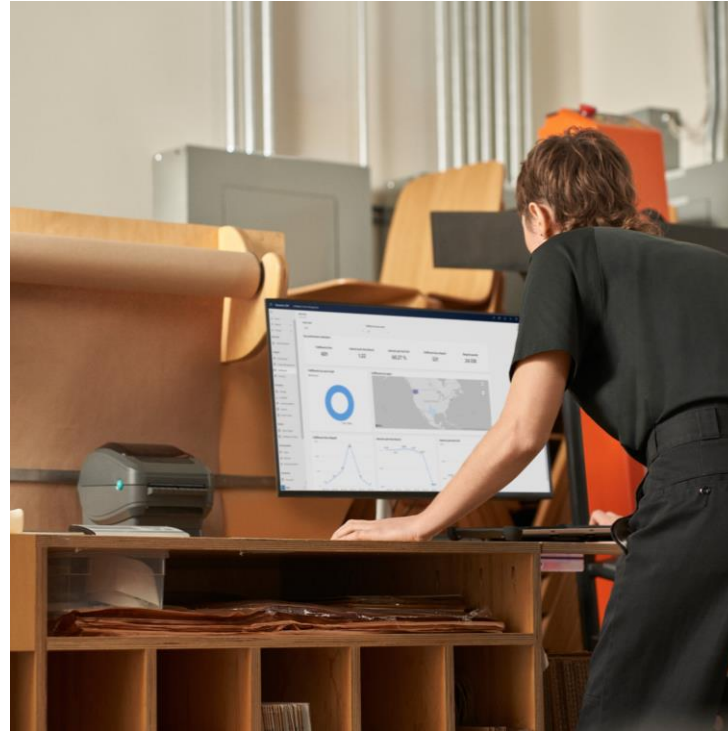
The basics is not that hard.

Spend 10 every morning in a week learning just that.

Watch other relevant launch event sessions



What's new: Creating customer centric onboarding experiences



What' new in AL-Go for GitHub



What's new in Power BI and reporting (for developers)

General Business Central resources, **learn more!**

Join the
conversation

[twitter.com/
MSDyn365BC](https://twitter.com/MSDyn365BC)



Have a
question?

aka.ms/BCYammer



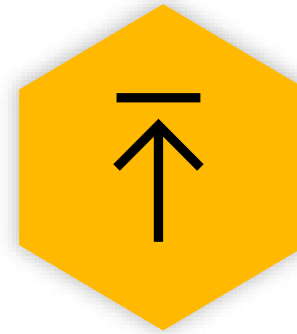
Submit
your ideas

aka.ms/BCIdeas



Looking for
resources?

aka.ms/BCAll



Join the office
hours

aka.ms/BCOfficeHours

Thank you