



# Business Central Performance Toolkit

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10 YEAR ANNIVERSARY  
10 YEAR ANNIVERSARY

www.bctechdays.com

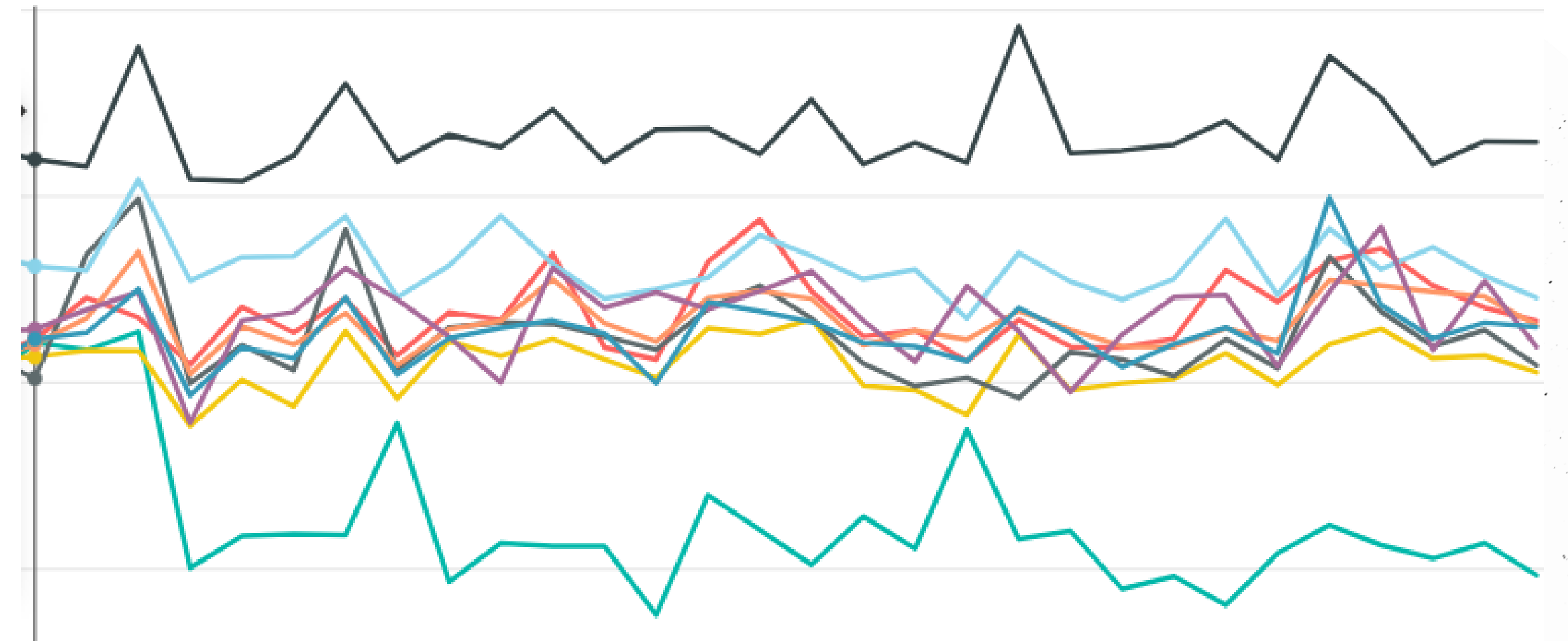


# Agenda

- INTRODUCTION
- CUSTOMER STORY
- ANALYSIS
- SUMMARY

# Why invest in Performance testing?

- Microsoft Dynamics Business Central use Performance test.
- Locking can be difficult to detect.
- Diverse vertical solutions, table extensions, external services...
- Impact Release over Release.
- Performance test can be reused.
- Support Engineering.
- 'What if' – scenarios.



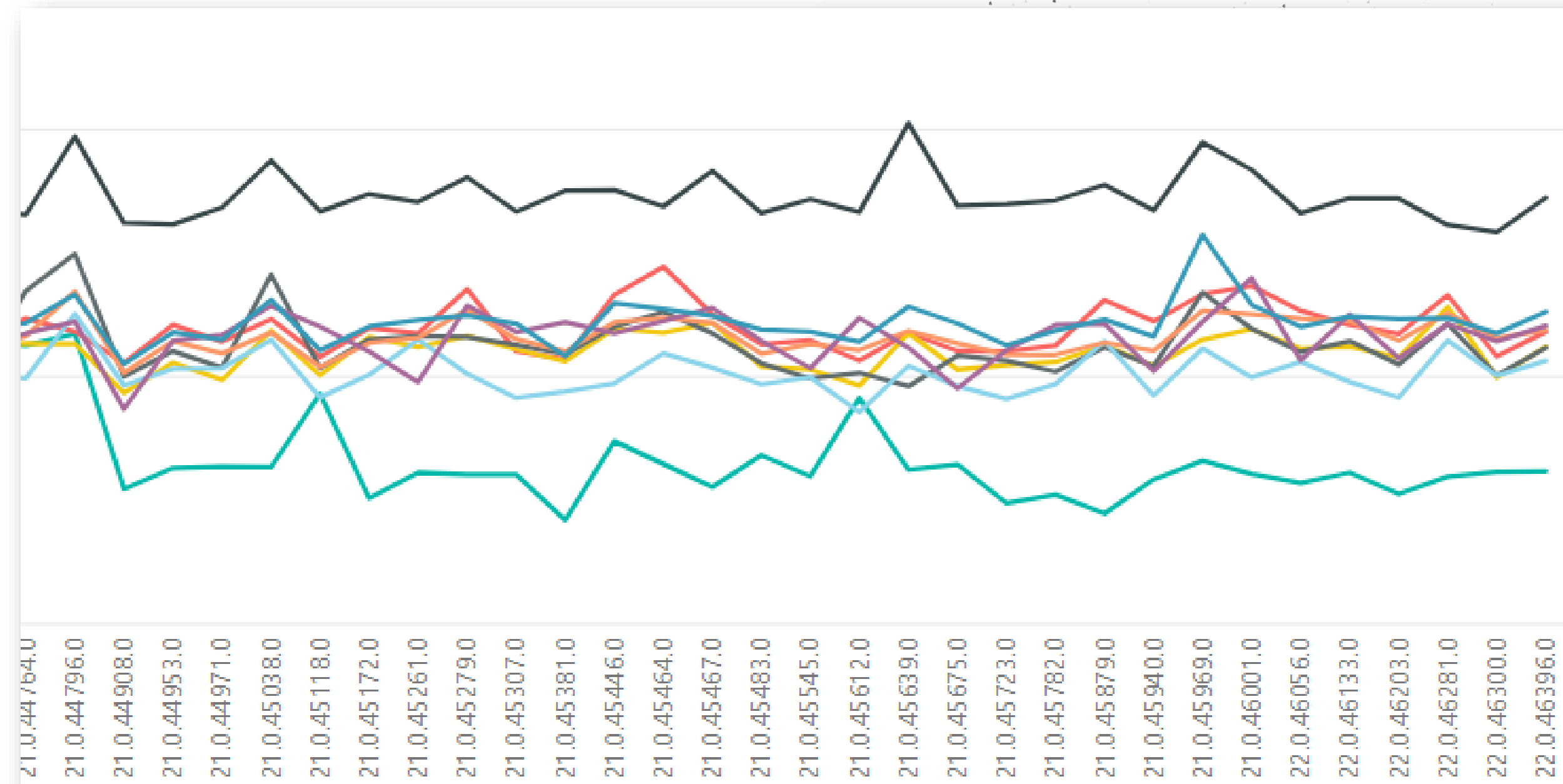
# We use it internally at Microsoft

- CI/CD
  - Every Pull Request
- Build over build
  - Version over Version

## Performance SQL Analysis Overview - (Beta)

The following test has regressed based on your changes, please review and take appropriate actions. For more information on how to investigate and mitigate please look [here](#).

Test Name	SQL Query Count	SQL HIT Count	Regression %
TestPostedSalesInvoicePrintPerformance	190/180	196/186	5.38 %
TestPrintPostedSalesCreditMemoPerformance	158/148	164/154	6.49 %



# When to use Business Central Performance Toolkit

- Is solution performant enough for the Cloud?
- What is the performance impact from current & future customizations?
- What is the performance impact between major upgrades?
- Can the system handle posting 20.000 invoices per day?
- Can the system handle 700 concurrent users?



# Reuse from first extension to a complete company simulation & CI/CD.

App1 > HelloWorld.al > TableExtension 50103 "Customer Ext" > fields

```
0 references
1 tableextension 50103 "Customer Ext" extends Customer
2 {
3     fields
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26 }
```

2 references

```
field(50100;"Reward ID";Code[30])
{
    // Set links to the "Reward ID" from the Reward table.
    TableRelation = Reward."Reward ID";

    // Set whether to validate a table relationship.
    ValidateTableRelation = true;

    // "OnValidate" trigger executes when data is entered in a field.
    trigger OnValidate();
    begin
        // If the "Reward ID" changed and the new record is blocked, an error is thrown.
    end;
}
```

Workflows

New workflow

All workflows

Showing runs from all workflows

Filter workflow runs

3 workflow runs

- ✓ Create a new performance test app  
Create a new performance test app #1: Manually run by henrikrovst
- ✓ Updated project  
CI/CD #1: Commit ecba886 pushed by henrikrovst
- ✓ Create a new app  
Create a new app #1: Manually run by henrikrovst

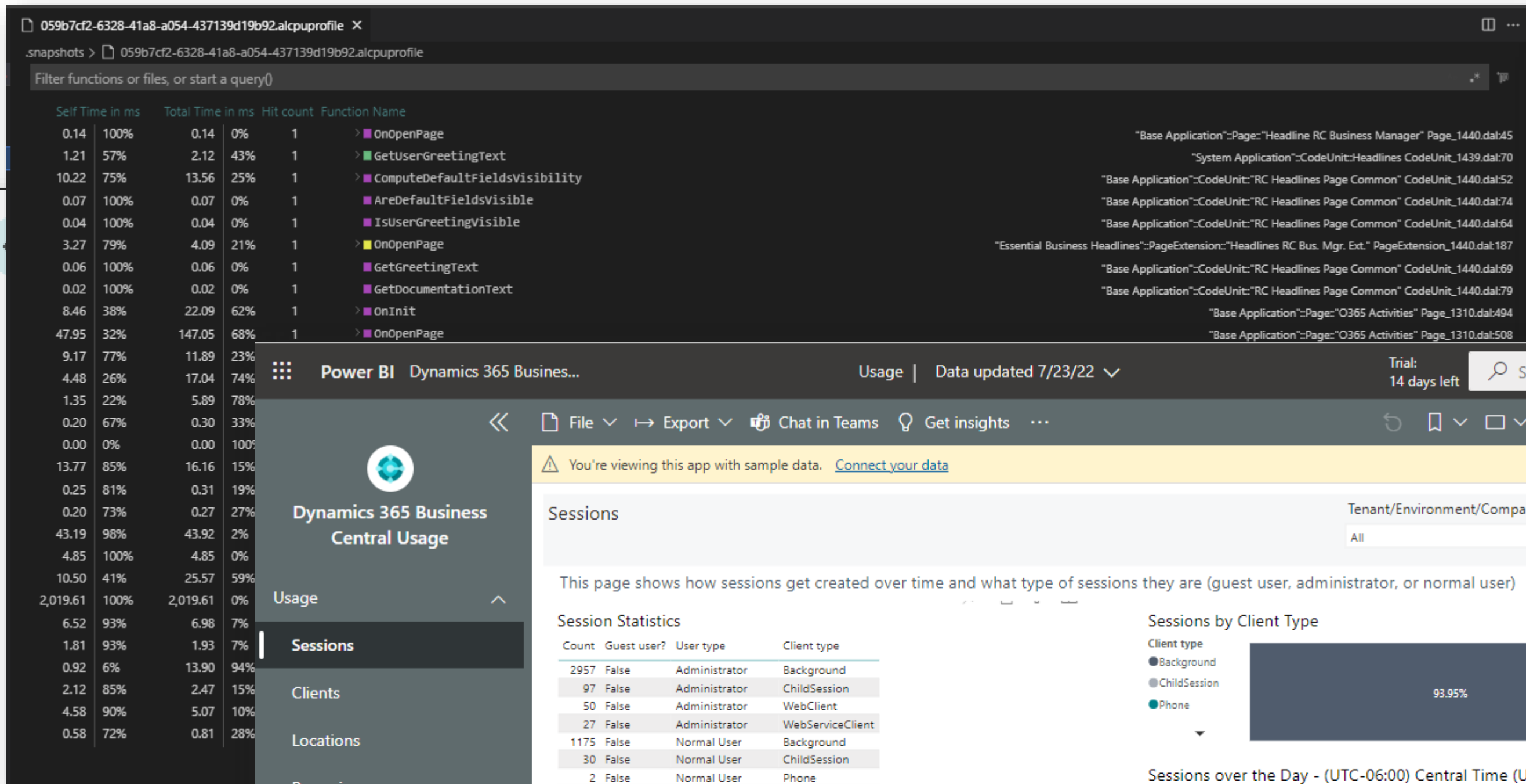
Workflow actions:

- Add existing app or test app
- CI/CD
- Create Online Dev. Environme...
- Create a new app
- Create a new performance tes...
- Create a new test app
- Create release
- Increment Version Number
- Publish To Environment
- Test Current
- Test Next Major
- Test Next Minor
- Update AL-Go System Files

Number of users (sessions)										Total iterations per day	Duration (min)	Total iterations per session	Delay Between iterations (sec)
Test scenario	Actions	Target value	100%	75%	50%	25%	Estimates average numbers						
1. Create Customer	Creation 15-20 sec.						30.000 per year; 150 per day				150	30	9,38
2. Create Service Location	Creation 15-20 sec.												
3. Create Service Order	Creation 15-20 sec.												
1. Create Customer	Creation 15-20 sec.												
2. Create Service Location	Creation 15-20 sec.												
3. Create Service Order	Creation 15-20 sec.												
1. Open Service Order Card	Card 2-5 sec												
2. Go to Service Order	Card 2-5 sec												
No actions defined	Card 2-5 sec												
1. Create employee	Creation 15-20 sec.												
2. Open Timesheet	Card 2-5 sec												
3. Create Timesheet	Creation 15-20 sec.												
4. Navigate to Timesheet	Card 2-5 sec												
5. Generate Timesheet	Process 15-20 sec.												
No actions defined	Process 15-20 sec.												
1. Create Customer	Creation 15-20 sec.												
2. Create Service Contract	Creation 15-20 sec.												
3. Create Installment	Creation 15-20 sec.												
4. Generate Service Contract Inv. Prop.	Creation 15-20 sec.												
5. Open Invoice Proposal	Card 2-5 sec												
6. Navigate to Invoice Proposal	Card 2-5 sec												
7. Post Invoice Proposal	Process 15-20 sec.												
1. Create Vendor	Creation 15-20 sec.												
2. Create Purchase Order	Creation 15-20 sec.												
3. Create Purchase Invoice	Creation 15-20 sec.												
4. Open Purchase invoice	Card 2-5 sec												
5. Navigate to Purchase Invoice	Card 2-5 sec												
6. Post Purchase Invoice	Process 15-20 sec.												
1. Create General Journal Lines	Creation 15-20 sec.												
2. Post General Journal Lines	Card 2-5 sec												



# Useful with the rest of the toolbox



## #16 Add a performance test app to an existing project

Prerequisites: A completed [scenario 1](#)

1. On [github.com](#), open Actions on your solution, select **Create a new performance test app** and then choose **Run workflow**. Enter values for **name**, **publisher**, and **ID range** and choose **Run workflow**

Actions - freddyk/app1

https://github.com/freddyk/app1/actions/workflows/CreatePerformanceTestApp.yaml

### Create a new performance test app

CreatePerformanceTestApp.yaml

Filter workflow runs

0 workflow runs

This workflow has a workflow\_dispatch event trigger.

Run workflow

Use workflow from

Branch: main

Project name if the repository is setup for multiple projects

Name

app1.PerformanceTest

Publisher

Freddy

ID range

50000.99999

Include Sample code (Y/N)

Y

Include Sample BCPI Suite (Y/N)

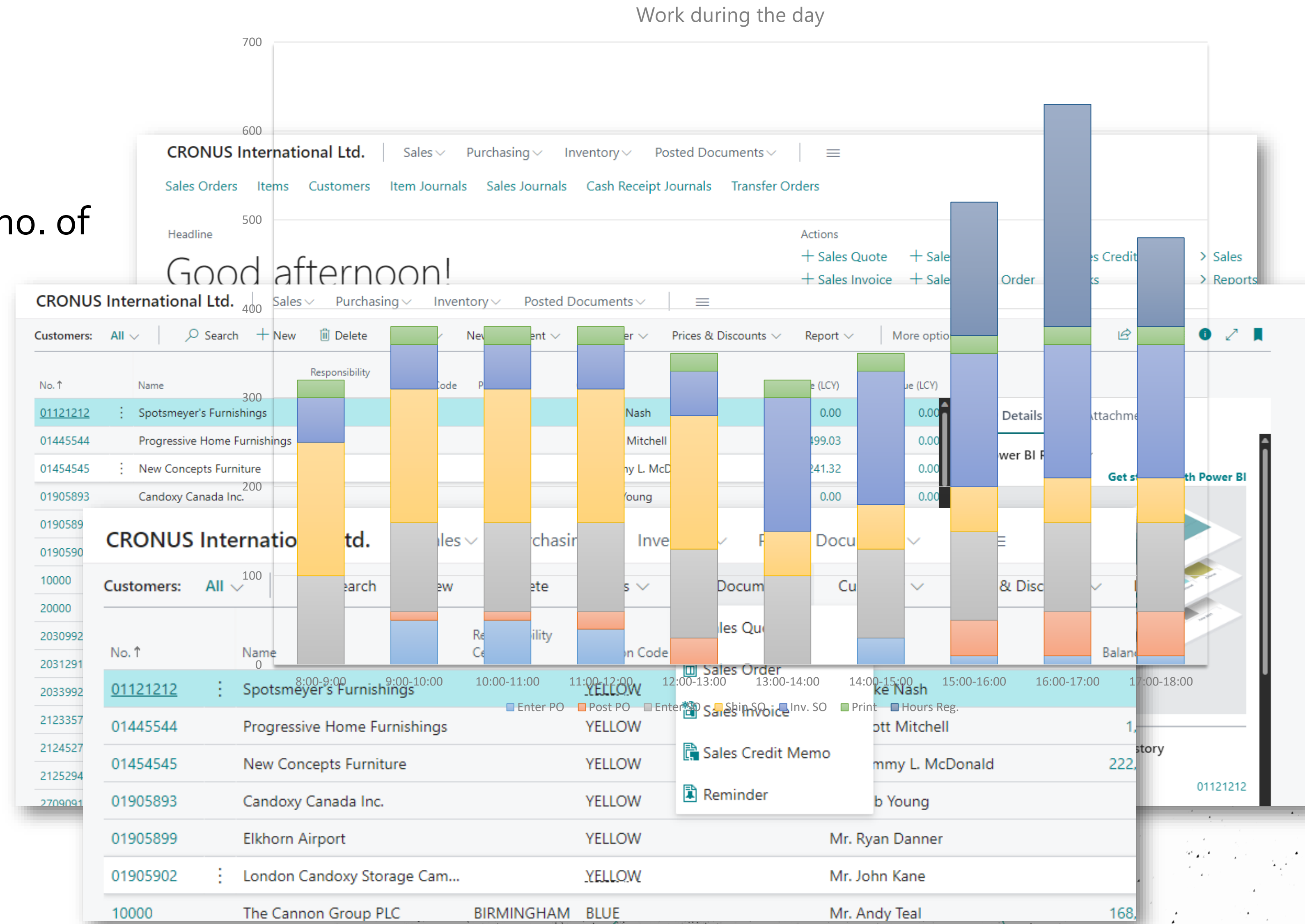
Y

Direct COMMIT (Y/N)

Run workflow

# Company Simulation

- Determine scenarios.
- A scenario could be
  - User goes to Role Center.
  - Opens Customer List.
  - Select Create Sales Order with X no. of lines.
  - Release Sales Order.
  - Post & Sends an invoice.
- What peak hours during a day?
- What are acceptable numbers?
- Environment.
- Test runs.
- Investigations.





# How to

BCPT Suite

TEST

▶ Start ▶ Start in Single Run mode ■ Stop ↺ Refresh 📋 Log Entries

## General

Code ..... TEST

Description .....

Tag .....

Duration (minutes) .....

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

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

Work date starts at ..... 4/11/2022

BCPT Suite Lines

Manage

## Lookup Codeunits

	ID ↑ ▼	Name
→	149103	BCPT Create PO with N Lines
	149104	BCPT Create SO with N Lines
	149105	BCPT Create SQ with N Lines
	149107	BCPT Detail Trial Bal. Report
	149108	BCPT Make Web Call
	149109	BCPT Open Chart of Accounts
	149110	BCPT Open Customer List
	149111	BCPT Open Item List
	149112	BCPT Open Purch. Invoice List
	149113	BCPT Open RoleCenter SOP
	149114	BCPT Open Sales Invoice List
	149115	BCPT Open Vendor List
	149116	BCPT Sleep 1s
	149117	BCPT SQL Ping

✓ Saved

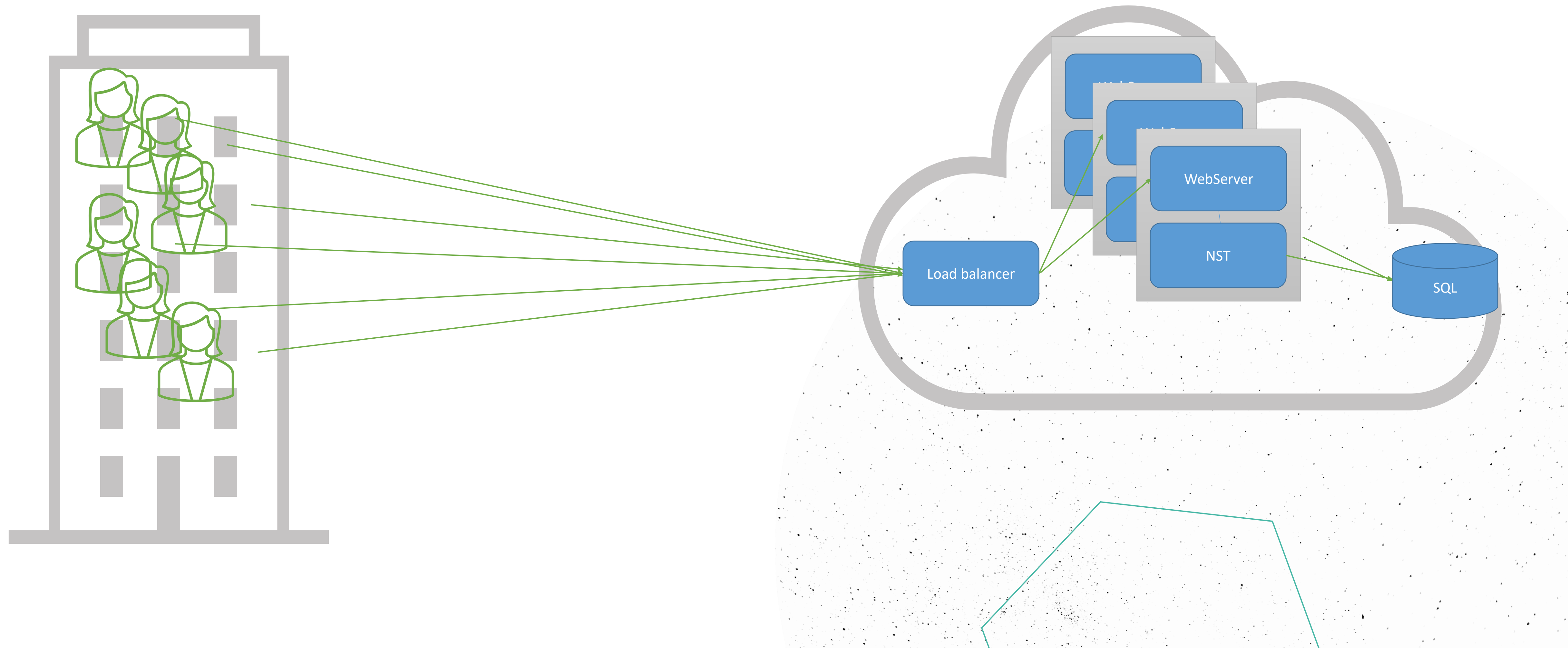
```
NAVPS C:\> $Credential = New-Object PSCredential -ArgumentList JohnDoe@microsoft.com,(ConvertTo-SecureString -String 123P@@s -AsPlainText -Force)
NAVPS C:\> RunBCPTTests.ps1 -Environment PROD -AuthorizationType AAD -Credential $Credential -SandboxName <sandbox name> -TestRunnerPage 149002 -SuiteCode "TRADE-SOU"
```

Cancel

No. of  
Iterations

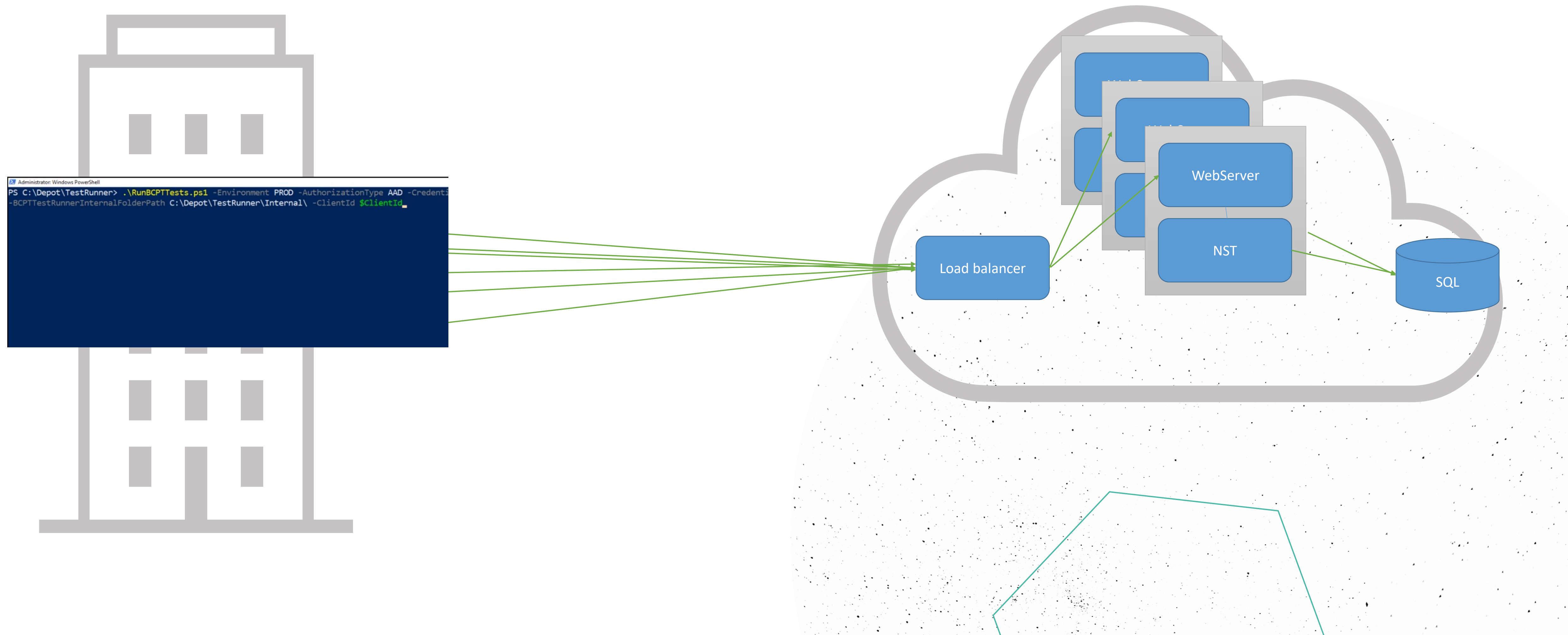
1  
0  
0  
0

# Client sessions





# Simulation of client sessions



# Getting Started

- Installing as Extension
  - Docker
  - On-Prem
  - SaaS

The image shows two overlapping screenshots. The background screenshot is the GitHub repository for `microsoft / ALAppExtensions`. It displays the repository's main page with a file explorer showing the directory structure: `main` branch, `ALAppExtensions / Modules / DevTools /`, and a list of files/folders including `BusinessCentralPerformanceToolkit Tests`, `BusinessCentralPerformanceToolkit`, `TestFramework`, and `BusinessCentralPerformanceToolkit.code-workspace`. The foreground screenshot is a Business Central interface showing the 'Setup & Extensions' menu. It lists several extensions, with 'Performance Toolkit' by Microsoft highlighted. The 'Performance Toolkit' extension is associated with 'Business Central' and is currently installed. Below it, 'Performance Toolkit Samples' is also listed.



# Getting started the easy way

- VSCode extension for BCPT
- Coming soon....

This is a sandbox environment for test, demo, or development purposes only. Don't show this again.

Get started

Hi, meet Business Central!

You're all set to try out our demo company, Cronus. Go explore on your own, or take a quick tour first.

Show demo tours



Activities

Sales This Month

\$1,906

> See more

Overdue Sales Invoice Amount

\$63,890

> See more

Overdue Purch. Invoice Amount

\$49,422

> See more

Sales Invoices Predicted Overdue

0

> See more

Ongoing Sales

Sales Quotes

2

>

Sales Orders

4

>

Sales Invoices

7

>

Ongoing Purchases

Purchase Orders

5

>

Ongoing Purch. Invoices

3

>

Purch. Invoices Next Week

0

>

Payments

Unprocessed Payments

1

>

Average Collection Days

5.8

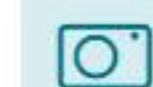
>

Outstanding V. Invoices

13

>

Scan documents



Create Incoming Documents from Camera

Incoming Documents

My Incoming Documents

1

>

Shopify Activities

Shopify Shop info



# Samples

## Page Testability

```
BCPTTestContext.StartScenario('Add Order');
SalesOrder.OpenNew();
SalesOrder."No.".SetValue('');
BCPTTestContext.EndScenario('Add Order');
BCPTTestContext.StartScenario('Enter Account No. ');
SalesOrder."Sell-to Customer No.".SetValue(Customer."No.");
BCPTTestContext.EndScenario('Enter Account No. ');
BCPTTestContext.UserWait();
for i := 1 to NoOfLinesToCreate do begin
    SalesOrder.SalesLines.Type.SetValue(SalesLine.Type::Item);
    BCPTTestContext.UserWait();
    if i = 1 then
        BCPTTestContext.StartScenario('Enter Line Item No. ');
    SalesOrder.SalesLines."No.".SetValue(Item."No.");
    if i = 1 then
        BCPTTestContext.EndScenario('Enter Line Item No. ');
    BCPTTestContext.UserWait();
    if i = 1 then
        BCPTTestContext.StartScenario('Enter Line Quantity');
    SalesOrder.SalesLines.Quantity.SetValue(1);
    if i = 1 then
        BCPTTestContext.EndScenario('Enter Line Quantity');
    BCPTTestContext.UserWait();
```

```
codeunit 149105 "BCPT Create SQ with N Lines" implements "BCPT Test Param. Provider"
```

```
{
    SingleInstance = true;
```

```
codeunit 149103 "BCPT Create PO with N Lines" implements "BCPT Test Param. Provider"
```

```
{
    SingleInstance = true;
```

```
codeunit 149104 "BCPT Create SO with N Lines" implements "BCPT Test Param. Provider"
```

```
{
    SingleInstance = true;
```

```
Initialized then begin
    t();
    alized := true;
```

```
Order(BCPTTestContext
```

```
text: Codeunit "BCPT
ed: Boolean;
Create: Integer;
ParamLbl: Label 'Lines
tionErr: Label 'Para
```

```
InitTest();
```

```
Record "Sales & Rec
e: Record "No. Serie
```

```
Get();
TestField("Order Nos
e.SetRange("Series C
e.findset(true, true
```

```
riesLine."Ending No.
eriesLine."Ending No
eriesLine.Validate("
eriesLine.Modify(tru
```

```
commit();
until NoSeriesLine.Next() = 0;
commit();
```

```
if Eval
end;
```

```
if Evaluate(NoOfLinesToCreate, BCPTTestContext.GetParameter(NoOfLinesParamLbl)) then;
end;
```

```
BCPTTestContext.StartScenario('Add Order');
SalesHeader.Init();
SalesHeader."Document Type" := SalesHeader."Document Type"::Order;
SalesHeader.Insert(true);
Commit();
BCPTTestContext.EndScenario('Add Order');
BCPTTestContext.UserWait();
BCPTTestContext.StartScenario('Enter Account No. ');
SalesHeader.Validate("Sell-to Customer No.", Customer."No.");
SalesHeader.Modify(true);
Commit();
BCPTTestContext.EndScenario('Enter Account No. ');
BCPTTestContext.UserWait();
SalesLine."Document Type" := SalesHeader."Document Type";
SalesLine."Document No." := SalesHeader."No.";
for i := 1 to NoOfLinesToCreate do begin
    SalesLine."Line No." += 10000;
    SalesLine.Init();
    SalesLine.Validate(Type, SalesLine.Type::Item);
    SalesLine.Insert(true);
    BCPTTestContext.UserWait();
    if i = 1 then
        BCPTTestContext.StartScenario('Enter Line Item No. ');
```

# Simulating A User

- Procedurally
- TestPages

```
SalesHeader: Record "Sales Header";  
SalesLine: Record "Sales Line";  
SalesOrder: TestPage "Sales Order";
```

```
BCPTestContext.StartScenario('Add Order');  
SalesHeader.Init();  
SalesHeader."Document Type" := SalesHeader."Document Type"::Order;  
SalesHeader.Insert(true);  
Commit();  
BCPTestContext.EndScenario('Add Order');  
BCPTestContext.UserWait();  
BCPTestContext.StartScenario('Enter Account No.');
```

```
SalesHeader.Validate("Sell-to Customer No.", Customer."No.");  
SalesHeader.Modify(true);  
Commit();  
BCPTestContext.EndScenario('Enter Account No.');
```

```
BCPTestContext.UserWait();  
SalesLine."Document Type" := SalesHeader.  
SalesLine."Document No." := SalesHeader.  
for i := 1 to NoOfLinesToCreate do begin  
    SalesLine."Line No." += 10000;  
    SalesLine.Init();  
    SalesLine.Validate(Type, SalesLine.T  
    SalesLine.Insert(true);  
    BCPTestContext.UserWait();  
    if i = 1 then  
        BCPTestContext.StartScenario('E  
    SalesLine.Validate("No.", Item."No."  
    if i = 1 then  
        BCPTestContext.EndScenario('Ent  
BCPTestContext.UserWait();  
    if i = 1 then  
        BCPTestContext.StartScenario('E  
    SalesLine.Validate(Quantity, 1);  
    SalesLine.Modify(true);  
    if i = 1 then  
        BCPTestContext.EndScenario('Ent  
BCPTestContext.UserWait();
```

```
BCPTestContext.StartScenario('Add Order');  
SalesOrder.OpenNew();  
SalesOrder."No.".SetValue('');  
BCPTestContext.EndScenario('Add Order');
```

```
BCPTestContext.StartScenario('Enter Account No.');
```

```
SalesOrder."Sell-to Customer No.".SetValue(Customer."No.");  
BCPTestContext.EndScenario('Enter Account No.');
```

```
BCPTestContext.UserWait();  
for i := 1 to NoOfLinesToCreate do begin  
    SalesOrder.SalesLines.Type.SetValue(SalesLine.Type::Item);  
    BCPTestContext.UserWait();  
    if i = 1 then  
        BCPTestContext.StartScenario('Enter Line Item No.');
```

```
SalesOrder.SalesLines."No.".SetValue(Item."No.");  
    if i = 1 then  
        BCPTestContext.EndScenario('Enter Line Item No.');
```

```
BCPTestContext.UserWait();  
    if i = 1 then  
        BCPTestContext.StartScenario('Enter Line Quantity');
```

```
SalesOrder.SalesLines.Quantity.SetValue(1);  
    if i = 1 then  
        BCPTestContext.EndScenario('Enter Line Quantity');
```

```
BCPTestContext.UserWait();
```



# Log files

BCPT Log Entries | Work Date: 5/7/2022

Search Delete entries within filter Show errors Show sessions run...e same time as this Open in Excel

	A	B	C	D	E	F	Session No.	Operation	Message	Duration (ms)	No. of SQL Statements	Status
1	Operation	Scenario					Lines	1203	Add Order	0	3	Success
2							Lines	1202	Enter Line Item No.	0	7	Success
3	Average of Duration (ms)	Column Labels					Lines	1203	Enter Account No.	0	7	Success
4	Row Labels	baseline	ChangeLog	CustExt	MoreUsers	Grand Total	Lines	1202	Enter Line Quantity	0	7	Success
5	BCPT Create SO with N Lines	329	431	352	405	384	Lines	1203	Enter Line Item No.	16	7	Success
6	BCPT Open Customer List	313	377	340	341	342	Lines	1204	Add Order	16	3	Success
7	BCPT Open Item List	555	628	557	559	572	Lines	1203	Enter Line Quantity	17	7	Success
8	Grand Total	416	489	431	430	439	Lines	1204	Enter Account No.	0	7	Success
9							Lines	1204	Enter Line Item No.	0	7	Success
10	Operation						Lines	1205	Add Order	4	3	Success
11	Average of Duration (ms)						Lines	1204	Enter Line Quantity	0	7	Success
12							Lines	1205	Enter Account No.	0	7	Success
13							Lines	1205	Enter Line Item No.	0	7	Success
14							Lines	1205	Enter Line Quantity	13	7	Success
15							Lines	1206	Add Order	16	3	Success
16							Lines	1206	Enter Account No.	0	7	Success
17							Lines	1206	Enter Line Item No.	0	7	Success
18							Lines	1206	Enter Line Quantity	16	7	Success
19							st	1207	Scenario	408	22	Success
20							Lines	1199	Scenario	408	194	Success
21							Lines	1200	Scenario	434	194	Success
22							st	1209	Scenario	385	22	Success
23							st	1211	Scenario	348	22	Success
24							Lines	1199	Add Order	0	3	Success
25							st	1207	Scenario	316	16	Success
26							Lines	1199	Enter Account No.	0	7	Success
							Lines	1201	Scenario	382	194	Success
							st	1214	Scenario	355	22	Success
								1200	Add Order	0	3	Success
								1199	Enter Line Item No.	12	7	Success
								1199	Enter Line Quantity	16	7	Success

Tag

baseline ChangeLog CustExt MoreUsers

Codeunit Name

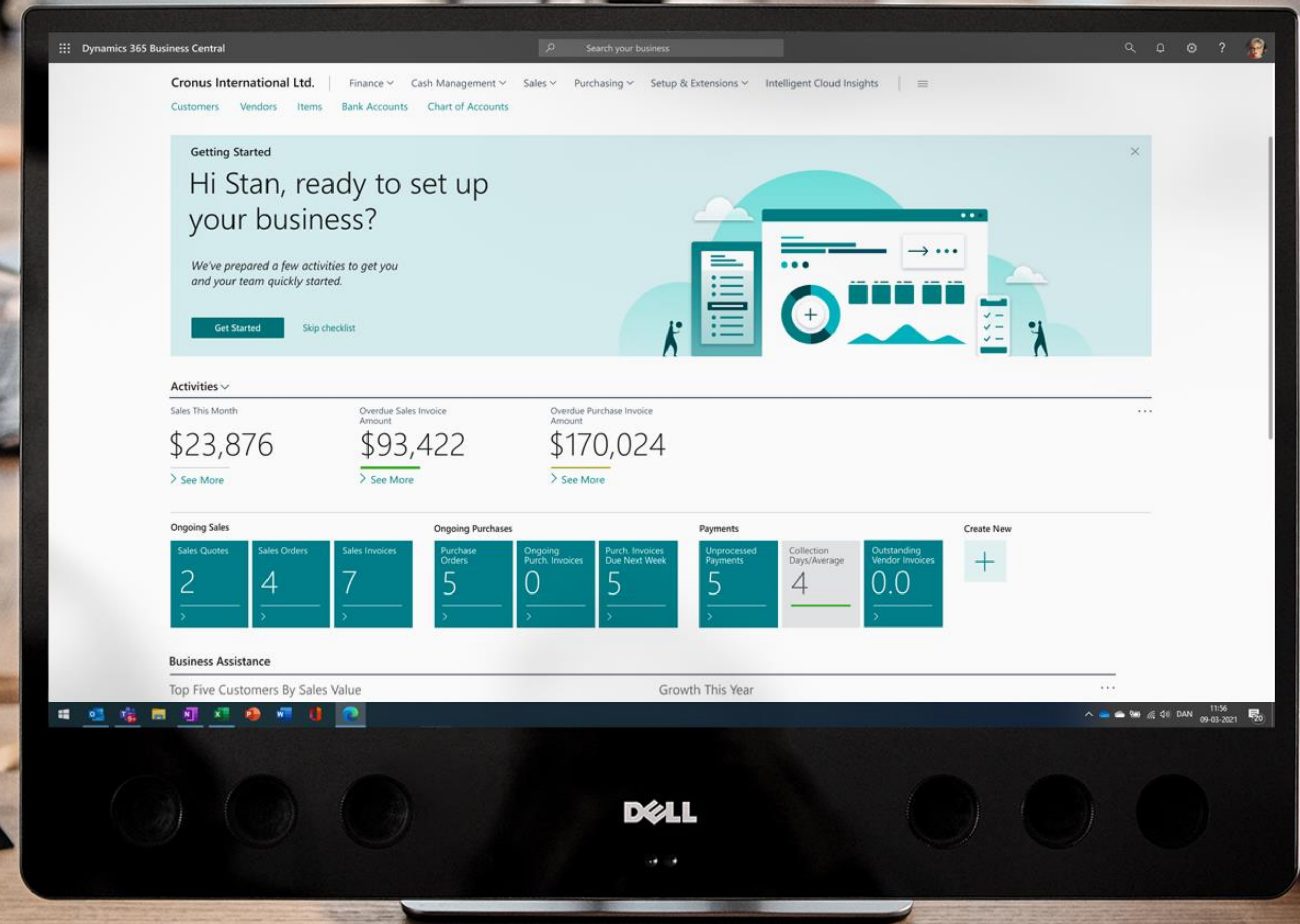
MoreUsers 7 9/24/2020 5:55 PM 9/24/2020 5:55 PM 149104 BCPT Create SO with N Lines

MoreUsers 7 9/24/2020 5:55 PM 9/24/2020 5:55 PM 149104 BCPT Create SO with N Lines

MoreUsers 7 9/24/2020 5:55 PM 9/24/2020 5:55 PM 149104 BCPT Create SO with N Lines



# Partner story





# 4PS had a prospect with 700+ users in SaaS

## Partner

- 4PS is a NL ISV
- 20+ years in business
- Specialized in Construction industry
- Medium-to-large Customers

## Customer

- 700+ users
- Specialized in deliveries to construction companies
- Subsidiary of a large group

# Workshops with the Customer

- How many Concurrent users?
- What Business Processes to include?
- External applications (via web services)
- What are acceptable response times?
- How many documents, transactions, views and reports per day?



# Planning together with the customer

	A	B	C	D	E	F	G	H	I	J	K	L	M
1			Number of users (sessions)										
2	N	Test scenario	Actions	Target value	100%	75%	50%	25%	Estimates average numbers	Total iterations per day	Duration (min)	Total iterations per session	Delay Between Iterations (sec)
3			1. Create Customer	Creation 15-20 sec.									
4			2. Create Service Location	Creation 15-20 sec.									
5	1	Create service order - background	3. Create Service Order	Creation 15-20 sec.	1	1	1	1	30.000 per year; 150 per day	150	30	9,38	192
6			1. Create Customer	Creation 15-20 sec.									
7			2. Create Service Location	Creation 15-20 sec.									
8	2	Create service order	3. Create Service Order	Creation 15-20 sec.	149	112	75	37	6.000 per year; 30 per day	30	30	1,88	960
9			1. Open Service Order Card	Card 2-5 sec									
10	3	Open Service Order Card	2. Go to Service Order	Card 2-5 sec	149	112	75	37	N.A.	180	30	11,25	160
11	4	Open price books	No actions defined	Card 2-5 sec	30	23	15	8	N.A.	180	30	11,25	160
12			1. Create employee	Creation 15-20 sec.									
13			2. Open Timesheet	Card 2-5 sec									
14			3. Create Timesheet	Creation 15-20 sec.									
15			4. Navigate to Timesheet	Card 2-5 sec									
16	5	Register hours	5. Generate Timesheet	Process 15-20 sec.	1000	750	500	250	N.A.		30		1800
17	6	Approve hours	No actions defined	Process 15-20 sec.	90	68	45	23	N.A.		30		1800
18													
19													
20													
21													
22	7	Process hours	No actions defined	Process 15-20 sec.	1	1	1	1	N.A.		30		
23	8	Open Chart of Accounts	No actions defined	List page 2-5 sec.	18	14	9	5	N.A.		30		240
24			1. Create purchase order	Creation 15-20 sec.									
25	9	Create purchase order	2. Create purchase order lines	Creation 15-20 sec.	77	58	39	19	65.000 per year, 325 per day	325	30	20,31	89
26			1. Create Project	Creation 15-20 sec.									
27			2. Create Budget Lines	Creation 15-20 sec.									
28	10	Create project prognosis	3. Create Prognosis	Creation 15-20 sec.	30	23	15	8	900 per year, 5 per day	5	30	0,31	5760
29	11	Open project control	No actions defined	Extended list 5-10 sec	149	112	75	37	N.A.				600
30			1. Create Project	Creation 15-20 sec.									
31			2. Generate Budget Lines	Creation 15-20 sec.									
32			3. Generate Installments	Creation 15-20 sec.									
33			4. Generate Sales Invoice	Creation 15-20 sec.									
34			5. Open Sales Invoices list	Card 2-5 sec									
35			6. Navigate to Sales Invoice	Card 2-5 sec									
36	12	Create and Post Project Invoice	7. Post Sales Invoice	Process 15-20 sec.	3	2	2	1	39.000 per year, 200 per day	200	30	12,50	144
37			1. Create Customer	Creation 15-20 sec.									
38			2. Create Service Contract	Creation 15-20 sec.									
39			3. Create Installment	Creation 15-20 sec.									
40			4. Generate Service Contract Inv. Prop.	Creation 15-20 sec.									
41			5. Open Invoice Proposal	Card 2-5 sec									
42			6. Navigate to Invoice Proposal	Card 2-5 sec									
43	13	Create and Post Invoice Proposal	7. Post Invoice Proposal	Process 15-20 sec.	12	9	6	3	39.000 per year, 200 per day	200	30	12,50	144
44			1. Create Vendor	Creation 15-20 sec.									
45			2. Create Purchase Order	Creation 15-20 sec.									
46			3. Create Purchase Invoice	Creation 15-20 sec.									
47			4. Open Purchase invoice	Card 2-5 sec									
48			5. Navigate to Purchase Invoice	Card 2-5 sec									
49	14	Create and Post Purchase Invoice	6. Post Purchase Invoice	Process 15-20 sec.	3	2	2	1	80.000 per year, 400 per day	400	30	25,00	72
50			1. Create General Journal Lines	Creation 15-20 sec.									
51	15	Post General Journal Entry	2. Post General Journal Lines	Card 2-5 sec	89	67	45	22		20	30	1,25	1440

# Planning together with the customer

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				Number of users (sessions)									
2	N	Test scenario	Actions	Target value	100%	75%	50%	25%	Estimates average numbers	Total iterations per day	Duration (min)	Total iterations per session	Delay Between Iterations (sec)
24			1. Create purchase order	Creation 15-20 sec.									
25	9	Create purchase order	2. Create purchase order lines	Creation 15-20 sec.	77	58	39	19	65.000 per year, 325 per day	325	30	20,31	89
9													
10	3	Open Service Order Card	1. Open Service Order Card	Card 2-5 sec									
11	4	Open price books	2. Go to Service Order	Card 2-5 sec	149	112	75	37	N.A.			180	30
12			No actions defined	Card 2-5 sec	30	23	15	8	N.A.			180	30
13			1. Create employee	Creation 15-20 sec.									
14			2. Open Timesheet	Card 2-5 sec									
15			3. Create Timesheet	Creation 15-20 sec.									
16	5	Register hours	4. Navigate to Timesheet	Card 2-5 sec									
17	6	Approve hours	5. Generate Timesheet	Process 15-20 sec.	1000	750	500	250	N.A.			30	1800
18			No actions defined	Process 15-20 sec.	90	68	45	23	N.A.			30	1800
19													
20													
21													
22	7	Process hours	No actions defined	Process 15-20 sec.	1	1	1	1	N.A.			30	
23	8	Open Chart of Accounts	No actions defined	List page 2-5 sec.	18	14	9	5	N.A.			30	240
24			1. Create purchase order	Creation 15-20 sec.									
25	9	Create purchase order	2. Create purchase order lines	Creation 15-20 sec.	77	58	39	19	65.000 per year, 325 per day			325	30
26			1. Create Project	Creation 15-20 sec.									
27			2. Create Budget Lines	Creation 15-20 sec.									
28	10	Create project prognosis	3. Create Prognosis	Creation 15-20 sec.	30	23	15	8	900 per year, 5 per day			5	30
29	11	Open project control	No actions defined	Extended list 5-10 sec	149	112	75	37	N.A.				0,31
30			1. Create Project	Creation 15-20 sec.									5760
31			2. Generate Budget Lines	Creation 15-20 sec.									600
32			3. Generate Installments	Creation 15-20 sec.									
33			4. Generate Sales Invoice	Creation 15-20 sec.									
34			5. Open Sales Invoices list	Card 2-5 sec									
35			6. Navigate to Sales Invoice	Card 2-5 sec									
36	12	Create and Post Project Invoice	7. Post Sales Invoice	Process 15-20 sec.	3	2	2	1	39.000 per year, 200 per day			200	30
37			1. Create Customer	Creation 15-20 sec.									12,50
38			2. Create Service Contract	Creation 15-20 sec.									144
39			3. Create Installment	Creation 15-20 sec.									
40			4. Generate Service Contract Inv. Prop.	Creation 15-20 sec.									
41			5. Open Invoice Proposal	Card 2-5 sec									
42			6. Navigate to Invoice Proposal	Card 2-5 sec									
43	13	Create and Post Invoice Proposal	7. Post Invoice Proposal	Process 15-20 sec.	12	9	6	3	39.000 per year, 200 per day			200	30
44			1. Create Vendor	Creation 15-20 sec.									
45			2. Create Purchase Order	Creation 15-20 sec.									
46			3. Create Purchase Invoice	Creation 15-20 sec.									
47			4. Open Purchase invoice	Card 2-5 sec									
48			5. Navigate to Purchase Invoice	Card 2-5 sec									
49	14	Create and Post Purchase Invoice	6. Post Purchase Invoice	Process 15-20 sec.	3	2	2	1	80.000 per year, 400 per day			400	30
50			1. Create General Journal Lines	Creation 15-20 sec.									25,00
51	15	Post General Journal Entry	2. Post General Journal Lines	Card 2-5 sec	89	67	45	22				20	30

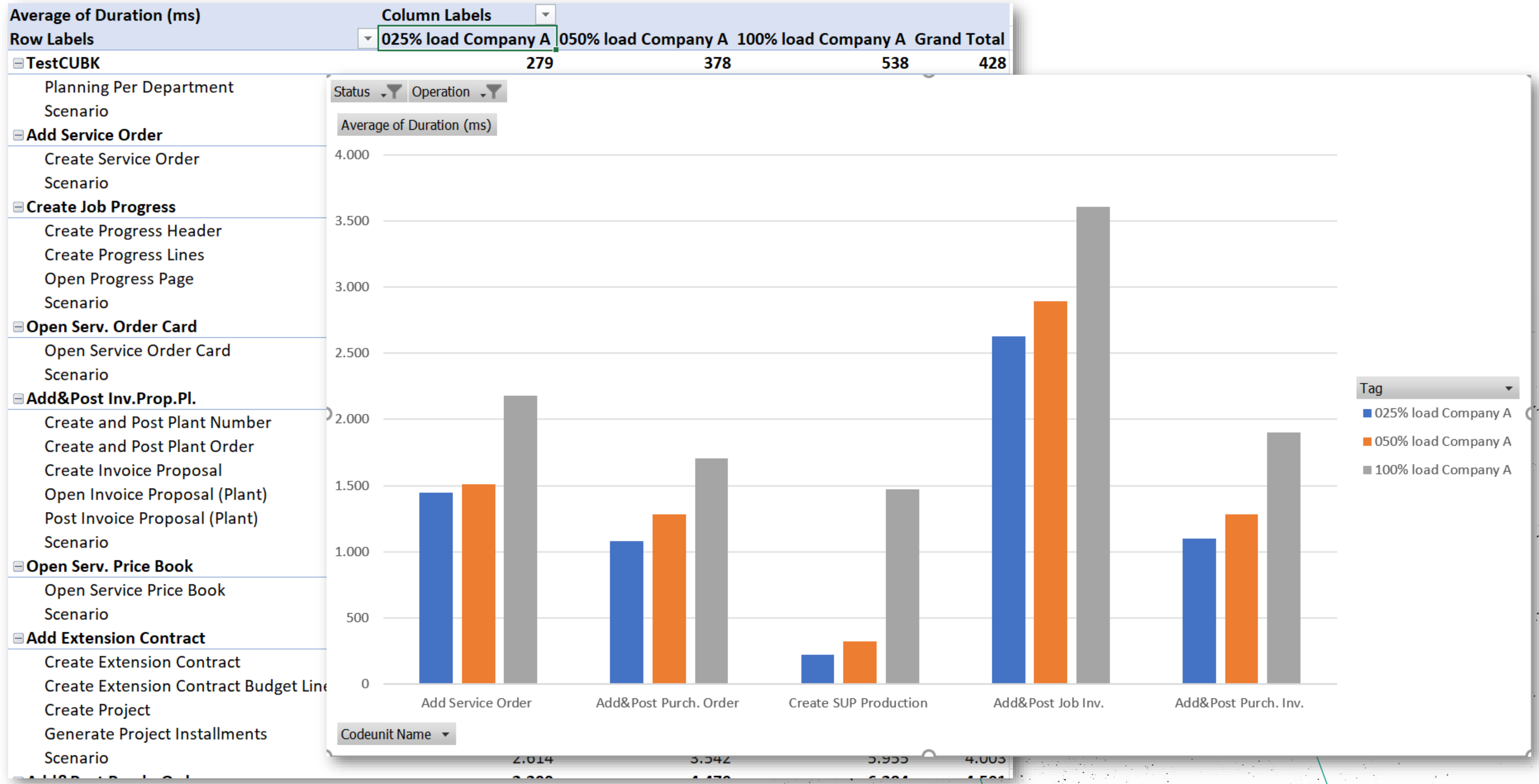


# 4PS Suite Scenarios (excerpt)

Codeunit Name	Parameters	No. of Sessions	Delay between iterations (sec.)	Delay Type
Add Service Order	Post=True,UseExistingData=True,Function=CreateServiceOrderWithLocation	1	192	Fixed
Add Service Order	Post=True,UseExistingData=True,Function=CreateServiceOrderWithLocation	25	480	Fixed
Create Job Progress	Post=True,UseExistingData=True,Approve=False,WorkflowCode=	5	480	Fixed
Add Extension Contract	Post=True,UseExistingData=True,Approve=False,WorkflowCode=	3	480	Fixed
Open Serv. Order Card		1	160	Fixed
Add&Post Inv.Prop.Pl.	Post=True,UseExistingData=True,Approve=False,WorkflowCode=	3	480	Fixed
Open Serv. Price Book		1	160	Fixed
Add&Post Purch. Order	Post=False,UseExistingData=True,Approve=True,WorkflowCode=TEST-01	25	89	Fixed
Create SUP Production		10	480	Fixed
Work Order Job Repeat		2	480	Fixed
Add Plant Request	Post=True,UseExistingData=True,Approve=False,WorkflowCode=	5	480	Fixed
Open SO Monitor		1	160	Fixed
Open Post. Puch. Inv.		1	160	Fixed
Add&Post Job Inv.	BudgetLines=60,Installments=20,UseExistingData=True	1	144	Fixed
Add Service Order	Function=CreateServiceOrderWithLocation,Post=True,UseExistingData=True	25	480	Fixed
Create Purchase Quote	Post=True,UseExistingData=True,Approve=False,WorkflowCode=	3	480	Fixed
Open Serv. Contr. Card		1	160	Fixed
Open Serv. Order Card		1	160	Fixed

...  
~790

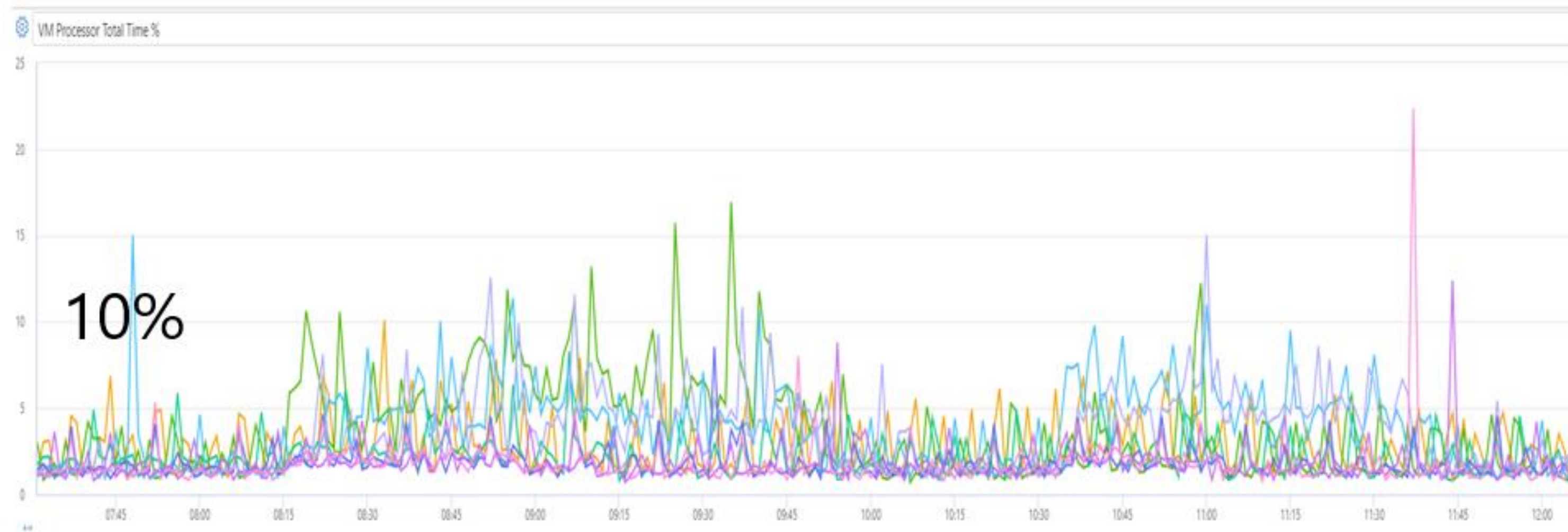
# Results (25%, 50% and 100% load)



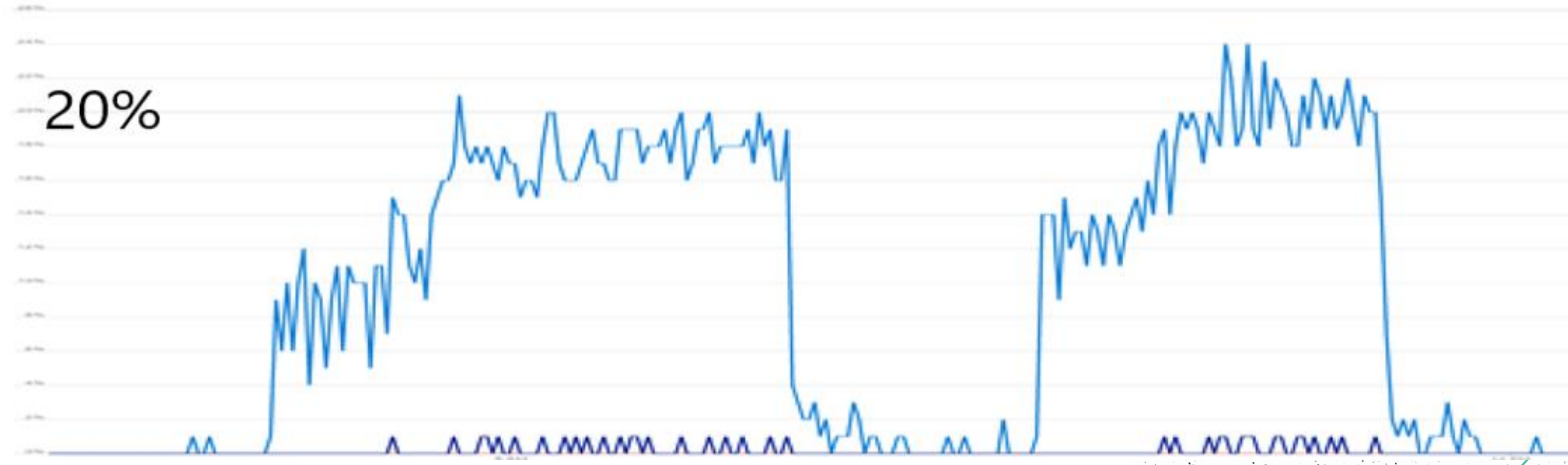


# CPU load during Tests

## NSTs

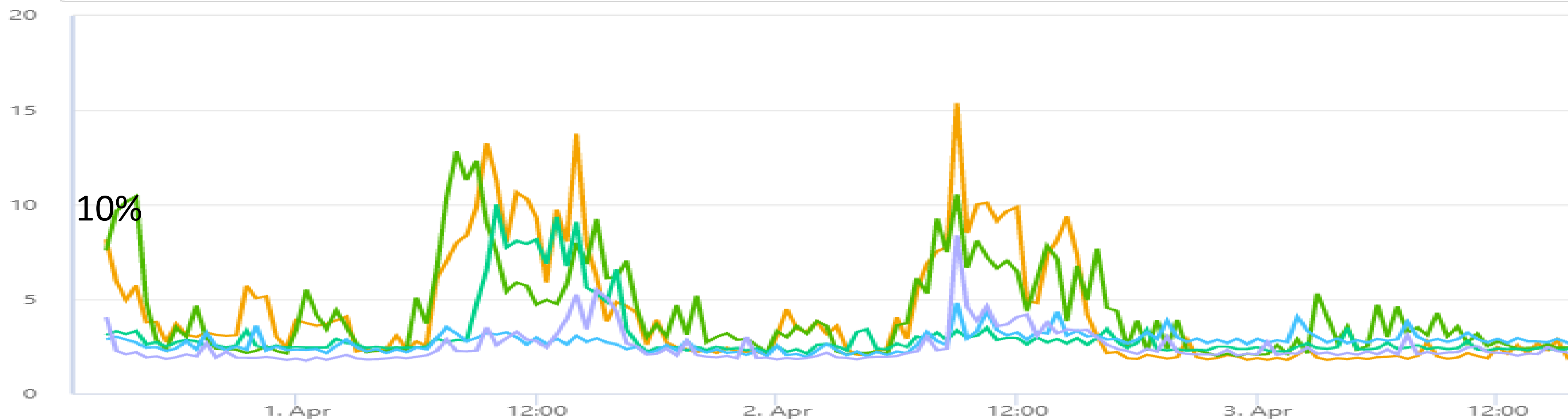


## Database

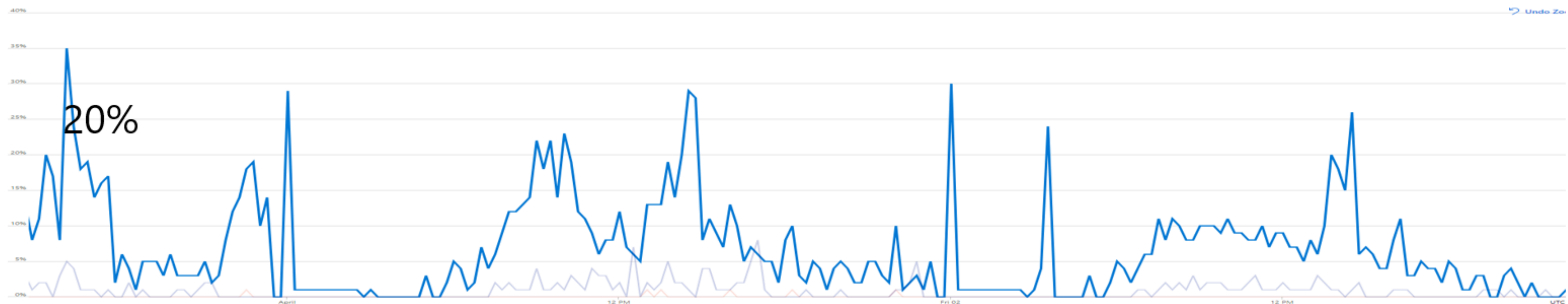


# Data from Live system (April 1. – 2.)

NSTs

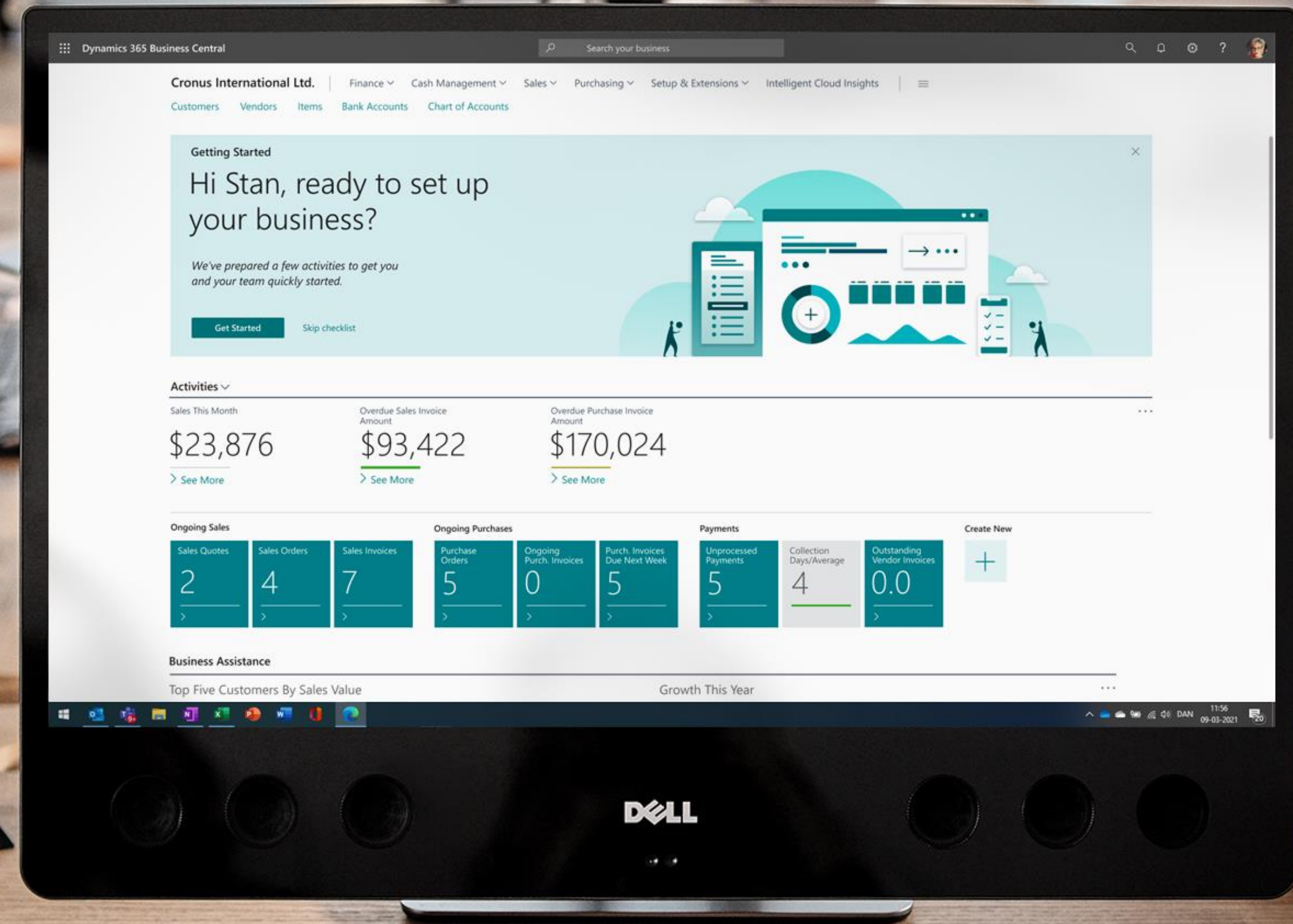


Database



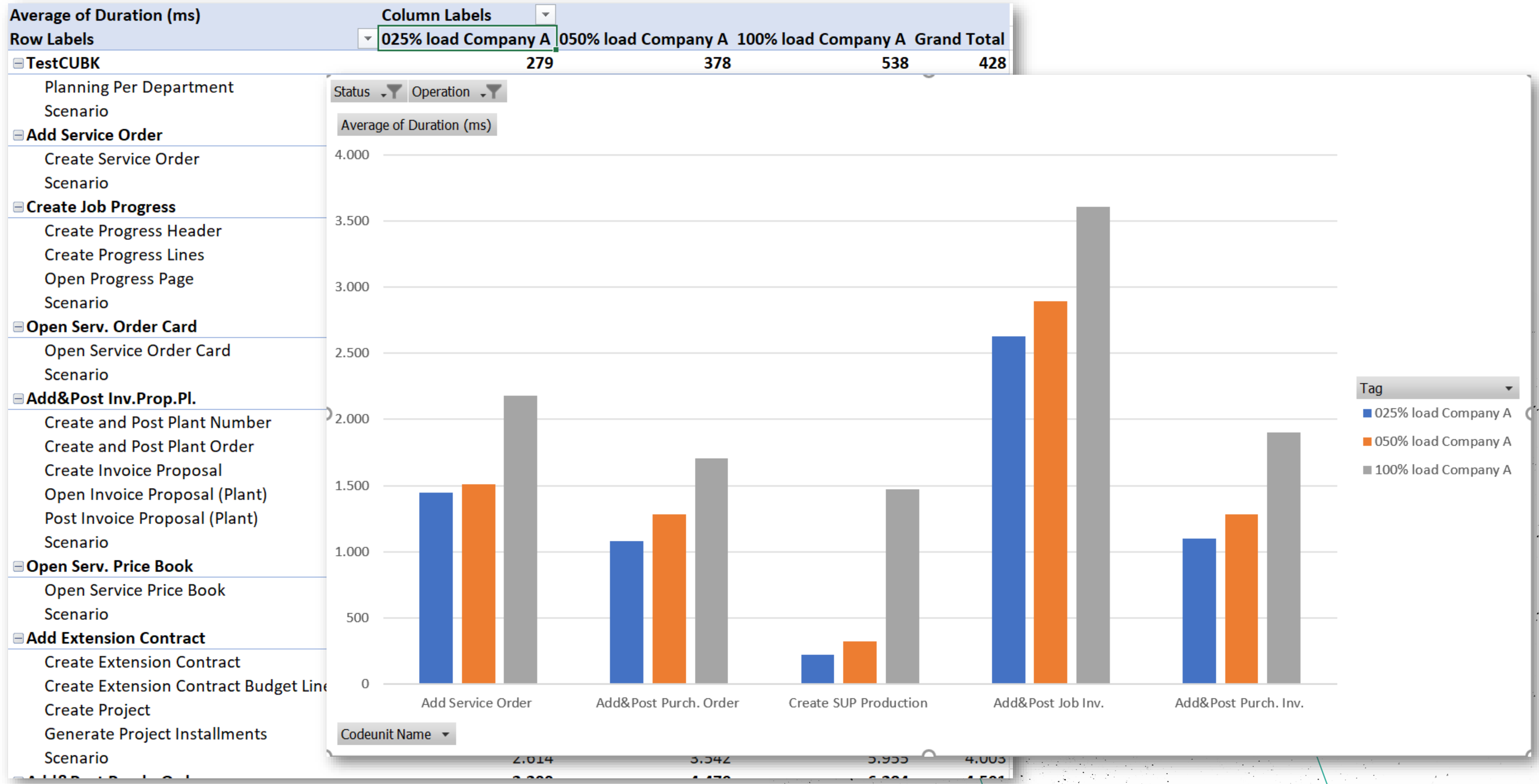


# Analysis





# Results (25%, 50% and 100% load)



# Log Entries

Tag	Version No. ▼	Start Time	End Time	Codeunit ID	Codeunit Name	Session No.	Operation	Message	Duration (ms)	No. of SQL Statements	Status
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149116	BCPT Sleep 1s	27	Scenario		1124	0	Success
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149105	BCPT Create SQ with N Lines	24	Add Order		908	20	Success
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149103	BCPT Create PO with N Lines	22	Enter Account No.		748	32	Success
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149104	BCPT Create SO with N Lines	23	Enter Account No.		795	43	Success
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149105	BCPT Create SQ with N Lines	24	Enter Account No.		685	37	Success
Baseline	1	4/6/2021 9:32 AM	4/6/2021 9:32 AM	149109	BCPT Open Chart of Accounts	20	Scenario		3318	86	Success

BCPT Suite | Work Date: 1/26/2023

DEMO

Start Start in Single Run mode Stop Refresh Log Entries Actions Fewer options

General

Code DEMO Default Max. User Delay (ms) 1000 Status Completed

Description Directions Demo Work date starts at 1/26/2023 Started at 4/6/2021 9:32 AM

Tag Baseline 1 Work Day Corresponds to (minutes) 10 Total No. of Sessions 14

Duration (minutes) 1 Version 1

Default Min. User Delay (ms) 100 Base Version 0

BCPT Suite Lines Manage

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.)	Delay Type	No. of Iterations	Total Duration (ms)	Average Duration (ms)	No. of SQL Statements	Avg. No. of SQL Statements	No. of Iterations Base
149103	BCPT Create PO with N Lines	Lines=10	1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	3	5678	1892	803	267	0
149104	BCPT Create SO with N Lines	Lines=10	1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	3	5678	1892	1066	355	0
149105	BCPT Create SQ with N Lines	Lines=10	1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	4	5789	1447	1021	255	0
149107	BCPT Detail Trial Bal. Report		1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	9	26610	2956	671	74	0
149108	BCPT Make Web Call		1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	13	460	35	0	0	0
149109	BCPT Open Chart of Accounts		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	2	3386	1693	157	78	0
149110	BCPT Open Customer List		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	2	1365	682	169	84	0
149111	BCPT Open Item List		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	2	1079	539	95	47	0
149112	BCPT Open Purch. Invoice List		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	2	468	234	60	30	0
149113	BCPT Open RoleCenter SOP		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	2	343	171	140	70	0
149114	BCPT Open Sales Invoice List		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	1	294	294	31	31	0
149115	BCPT Open Vendor List		1	<input checked="" type="checkbox"/>		Completed	100	1000	5	Fixed	1	625	625	78	78	0
149116	BCPT Sleep 1s		1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	11	11171	1015	0	0	0
149117	BCPT SQL Ping		1	<input type="checkbox"/>		Completed	100	1000	5	Fixed	13	223	17	23	1	0

```
BCPTTestContext.StartScenario('Add Order');
SalesHeader.Init();
SalesHeader."Document Type" := SalesHeader."Document Type"::Order;
SalesHeader.Insert(true);
Commit();
BCPTTestContext.EndScenario('Add Order');
BCPTTestContext.UserWait();
BCPTTestContext.StartScenario('Enter Account No. ');
SalesHeader.Validate("Sell-to Customer No.", Customer."No.");
SalesHeader.Modify(true);
Commit();
BCPTTestContext.EndScenario('Enter Account No. ');
BCPTTestContext.UserWait();
SalesLine."Document Type" := SalesHeader."Document Type";
SalesLine."Document No." := SalesHeader."No.";
for i := 1 to NoOfLinesToCreate do begin
    SalesLine."Line No." += 10000;
```



# How to get good data

- What do we want to measure?
  - UI responsiveness
  - Scenario duration
- Think of what we want to see in Excel (or PowerBI)
  - Field validation times
  - Page opening times
  - Use 'generic' scenario names, e.g. 'Validate Quantity' or 'Validate No.' to enable cross-test analysis

# Excel – PivotTable Demo

	A	B
1	Operation	Scenario
2		
3	Row Labels	Average of Duration (ms)
4	BCPT Create PO with N Lines	1893
5	BCPT Create SO with N Lines	1893
6	BCPT Create SQ with N Lines	1447
7	BCPT Detail Trial Bal. Report	2957
8	BCPT Make Web Call	35
9	BCPT Open Chart of Accounts	1693
10	BCPT Open Customer List	683
11	BCPT Open Item List	540
12	BCPT Open Purch. Invoice List	234
13	BCPT Open RoleCenter SOP	172
14	BCPT Open Sales Invoice List	294
15	BCPT Open Vendor List	625
16	BCPT Sleep 1s	1016
17	BCPT SQL Ping	17
18	Grand Total	929

	A	B
1	Operation	Enter Account No.
2		
3	Row Labels	Average of Duration (ms)
4	BCPT Create PO with N Lines	249
5	BCPT Create SO with N Lines	275
6	BCPT Create SQ with N Lines	181
7	Grand Total	230

	A	B
1	Operation	Enter Line Quantity
2		
3	Row Labels	Average of Duration (ms)
4	BCPT Create PO with N Lines	1
5	BCPT Create SO with N Lines	177
6	BCPT Create SQ with N Lines	13
7	Grand Total	59



# Gotcha!

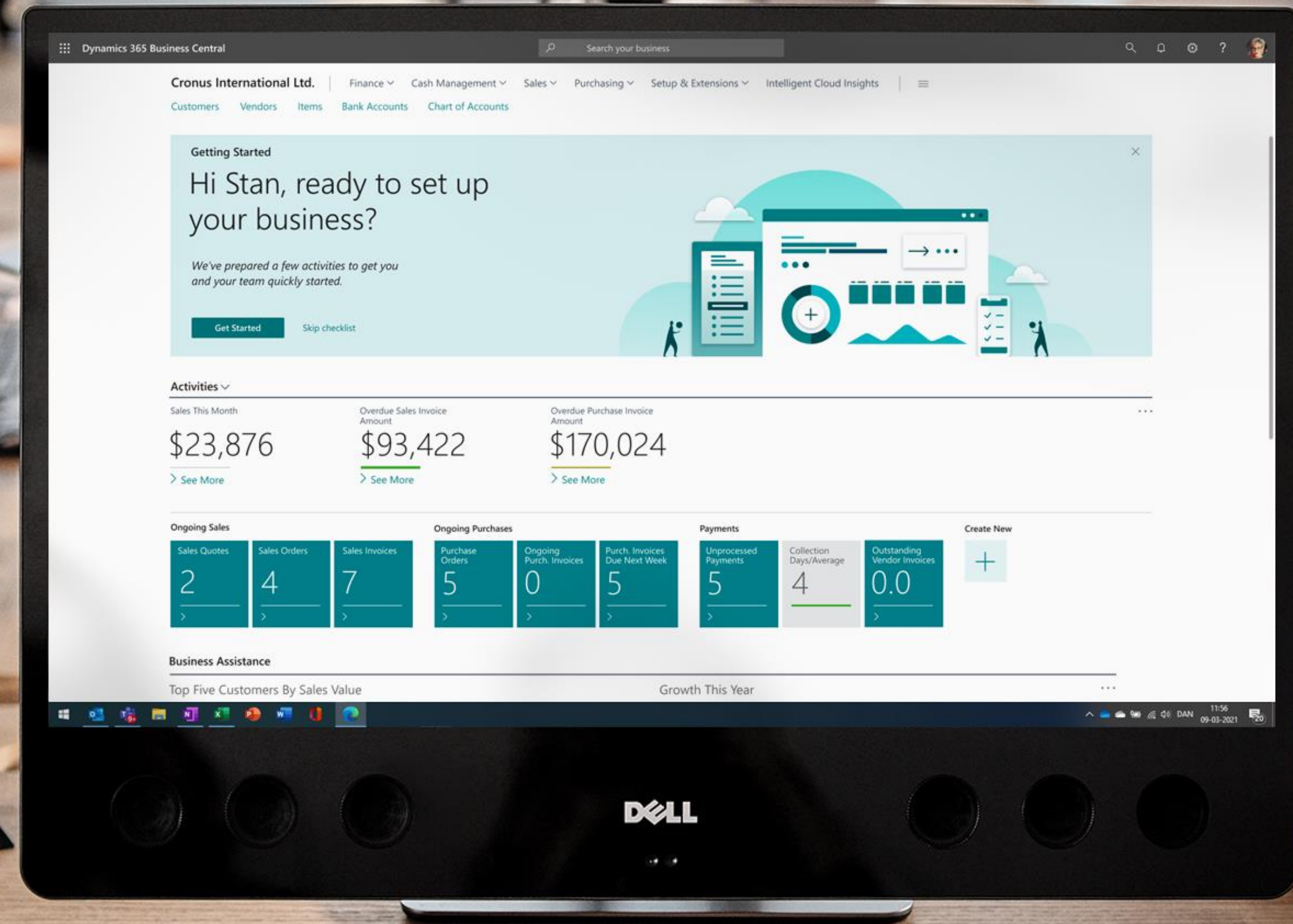
- Demo company quickly runs out of No. Series
  - Start by extending the number-ranges
- Locking
  - Most often in the test code itself(!) – Sprinkle a lot of `commit()` / `UserWait()` over the code.
  - No. Series
  - SIFT keys
- Over-estimating user activity
  - We tend to think “*we want 10 users to create a purchase order every 10s*”. Really?
- Under-estimating user activity
  - We tend to forget “the other stuff”, e.g. batch jobs, external apps / web services, search and filtering, report requests, etc.

# Non-typical findings ;-)

- Starting remote UI sessions from a PC also puts a load on the PC. 800 UI sessions maxes it out – 4PS had to split the client load to two machines.
- Test Pages: Conditional / random / parameterized execution makes test pages more unpredictable and can sometimes raise messages or dialogs, which breaks test due to UI handlers



# Summary





# Conclusion

- Business Central Performance Toolkit can help you evaluate whether a customer case is feasible
- Equally important: It can tell you if the case is *not* feasible
- The tool can help you identify locking issues across scenarios – something that can be difficult to find



# Resources and Call to Action

[Performance Toolkit Extension - Business Central | Microsoft Docs](#)

[Get started with Business Central Performance Toolkit \(docs\)](#)

Try out [Business Central Performance Toolkit App Source](#)

[Contribute to samples published on GitHub](#)

Share your [experiences and feedback in yammer conversation](#) on  
Business Central Performance Toolkit





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Q&A

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