Business Central Performance Toolkit

Findings from the pilot project

Goal

Present findings from the pilot project done by MS with partners

Introduction - Speakers

Danny Hellemons

Schouw / Aptean

Olaf Jorritsma

To Increase

(former FTE Schouw / Aptean)

Bert Verbeek

4PS

Agenda

- Managerial overview – Danny
- Functional insights – Olaf
- Technical overview and demo – Bert

Managerial overview – Danny

Performance Testing and the PRT Framework

- Setting the Scene, expectations
- What and How?
- Pain and Gain, a developers perspective
- Usability and Automation
- Difference with telemetry

Expectations…

This is **not** a unit, **nor** an integration **nor** a performance load test.

No SLA based measurement; **telemetry** would be better suited.

Understand performance problems before going live.

Discover **Regressions** during development. **Tune** code.

Simulate: user **behaviour** and **concurrent** users.

What and How?

Data Setup to prepare data

Ability to act independent upon data but shares the same base data set.
No clean-up logic.
Code unit to setup data for PRT runs for App.
Microsoft is working on embedding this as part of the test suite definition.

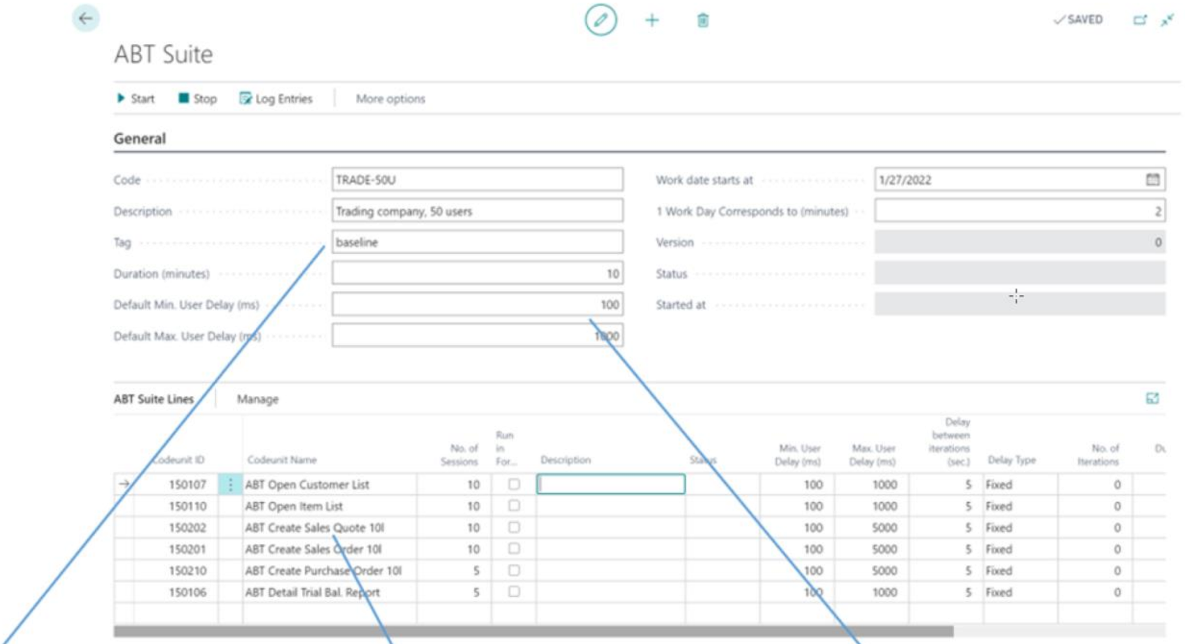
User task and process simulation

Simulate a working day: operational scenarios and multiple user sessions.
Not repeating to test the logic.
Embed user waits because this reflects real life user behaviour. + executes commit.
Critical scenarios versus normal scenarios. Identify both, start minimal viable/most important.

Set Baseline, compare 2-to-3 runs

Use a dedicated, same-state VM.
Compare #SQL statements, be aware of caching.
Identify regressions ‘relative’ in duration and peek durations.

Suite definition



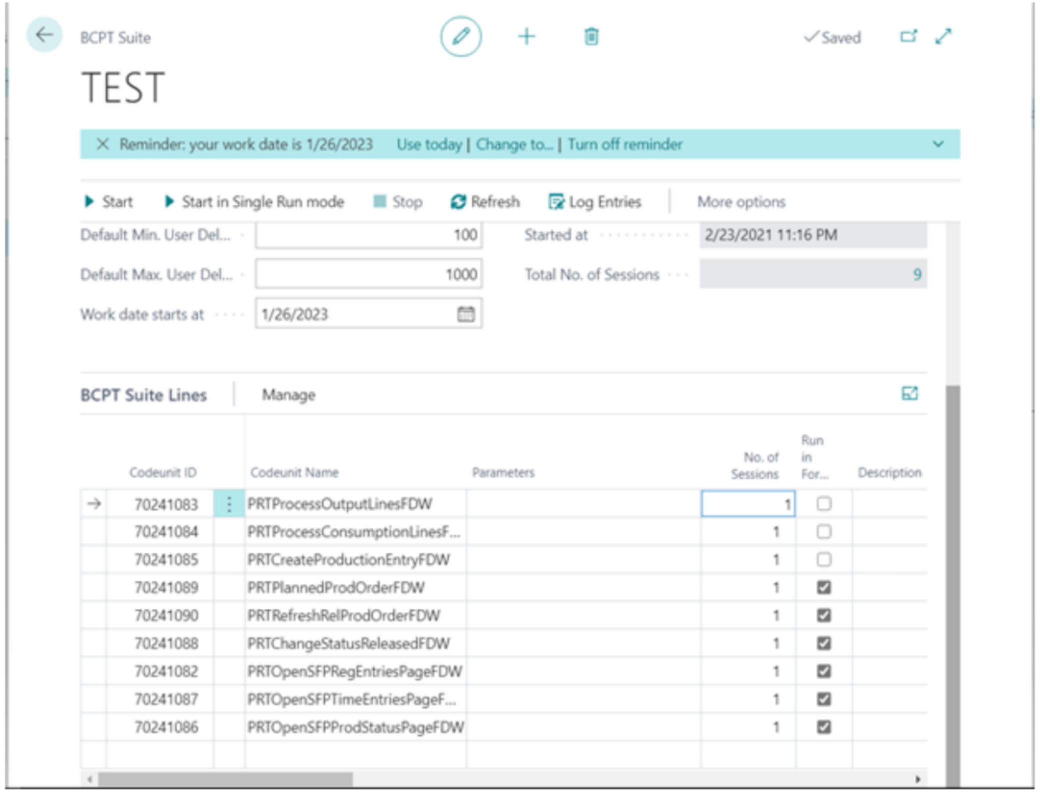
ABT Suite

General

Code	TRADE-50U	Work date starts at	1/27/2022
Description	Trading company, 50 users	1 Work Day Corresponds to (minutes)	2
Tag	baseline	Version	0
Duration (minutes)	10	Status	
Default Min. User Delay (ms)	100	Started at	
Default Max. User Delay (ms)	1000		

ABT Suite Lines Manage

Codeunit ID	Codeunit Name	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	Du
150107	ABT Open Customer List	10	□			100	1000	5	Fixed	0	
150110	ABT Open Item List	10	□			100	1000	5	Fixed	0	
150202	ABT Create Sales Quote 10l	10	□			100	5000	5	Fixed	0	
150201	ABT Create Sales Order 10l	10	□			100	5000	5	Fixed	0	
150210	ABT Create Purchase Order 10l	5	□			100	5000	5	Fixed	0	
150106	ABT Detail Trial Bal. Report	5	□			100	1000	5	Fixed	0	



BCPT Suite

TEST

✕ Reminder: your work date is 1/26/2023 Use today | Change to... | Turn off reminder

Default Min. User Del...	100	Started at	2/23/2021 11:16 PM
Default Max. User Del...	1000	Total No. of Sessions	9
Work date starts at	1/26/2023		

BCPT Suite Lines Manage

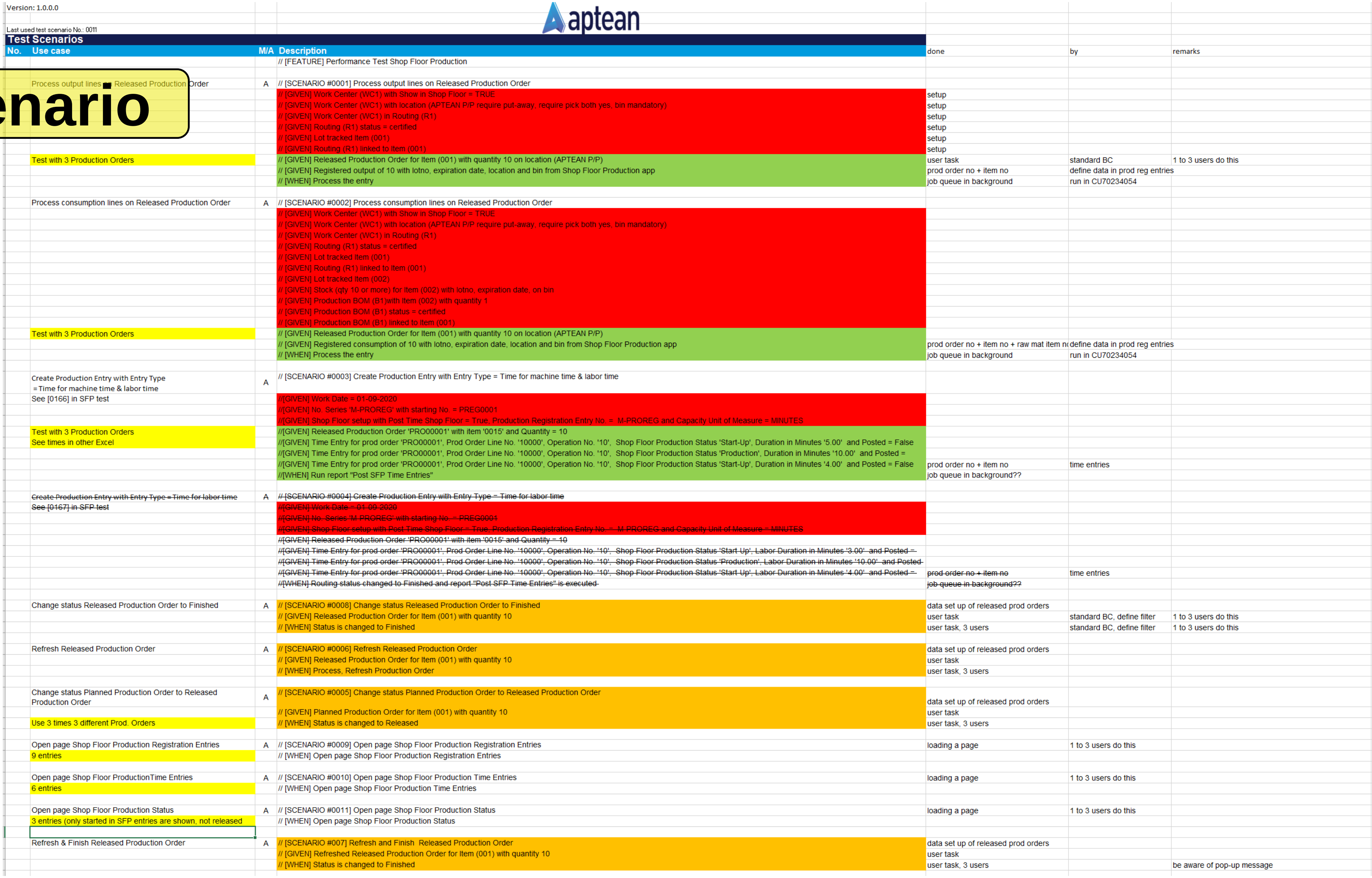
Codeunit ID	Codeunit Name	Parameters	No. of Sessions	Run in For...	Description
70241083	PRTProcessOutputLinesFDW		1	□	
70241084	PRTProcessConsumptionLinesF...		1	□	
70241085	PRTCreateProductionEntryFDW		1	□	
70241089	PRTPlannedProdOrderFDW		1	☑	
70241090	PRTRefreshRelProdOrderFDW		1	☑	
70241088	PRTChangeStatusReleasedFDW		1	☑	
70241082	PRTOpenSFPRegEntriesPageFDW		1	☑	
70241087	PRTOpenSFPTimeEntriesPageF...		1	☑	
70241086	PRTOpenSFPProdStatusPageFDW		1	☑	

The ‘Tag’ field is copied to the log entries that are generated.
When you run the same suite multiple times, but with different conditions or parameters, such as with or without certain extensions installed, you can use the ‘Tag’ field to distinguish the log entries from each other.

Each line corresponds to a simulated user doing a specific task. A ‘task’ or ‘scenario’ corresponds to a codeunit that is run again and again for the duration of the simulation . To ease the setup, you can specify “No. of Sessions” of the same type, so you can enter e.g. 10 to have the system start 10 identical user sessions.

The two User Delay fields specify how fast or slow the simulated user is.
When filling in fields in a page, ABT will calculate a random sleep time based on the min. and max. values.
The values on the header serve as default values for the lines.

Scenario



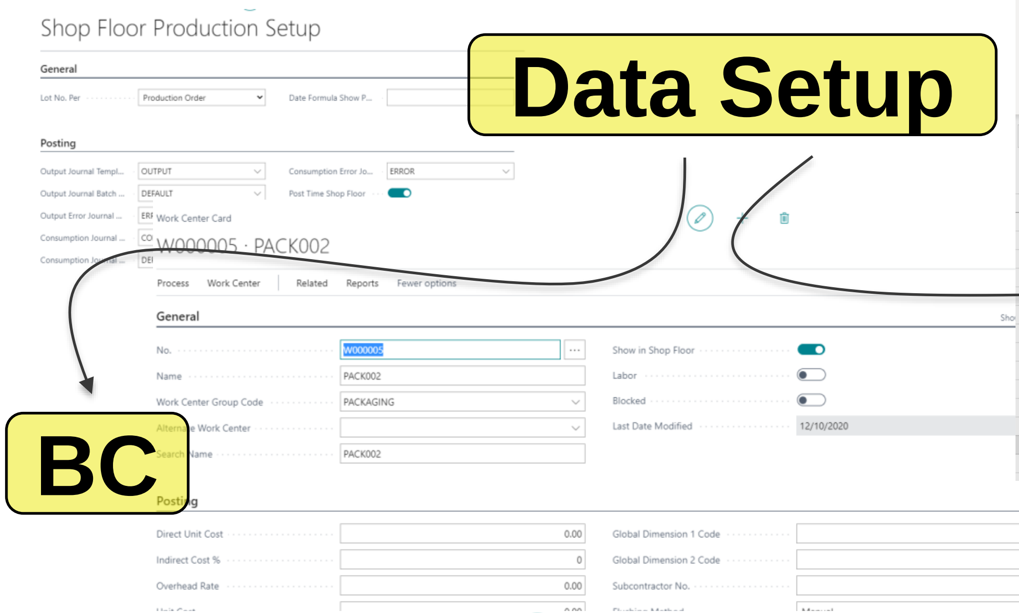
Version: 1.0.0.0

Last used test scenario No.: 0011

Test Scenarios

No.	Use case	M/A	Description	done	by	remarks
			// [FEATURE] Performance Test Shop Floor Production			
	Process output lines on Released Production Order	A	// [SCENARIO #0001] Process output lines on Released Production Order			
			// [GIVEN] Work Center (WC1) with Show in Shop Floor = TRUE	setup		
			// [GIVEN] Work Center (WC1) with location (APTEAN P/P require put-away, require pick both yes, bin mandatory)	setup		
			// [GIVEN] Work Center (WC1) in Routing (R1)	setup		
			// [GIVEN] Routing (R1) status = certified	setup		
			// [GIVEN] Lot tracked Item (001)	setup		
			// [GIVEN] Routing (R1) linked to Item (001)	setup		
	Test with 3 Production Orders		// [GIVEN] Released Production Order for Item (001) with quantity 10 on location (APTEAN P/P)	user task	standard BC	1 to 3 users do this
			// [GIVEN] Registered output of 10 with lotno, expiration date, location and bin from Shop Floor Production app	prod order no + item no	define data in prod reg entries	
			// [WHEN] Process the entry	job queue in background	run in CU70234054	
	Process consumption lines on Released Production Order	A	// [SCENARIO #0002] Process consumption lines on Released Production Order			
			// [GIVEN] Work Center (WC1) with Show in Shop Floor = TRUE			
			// [GIVEN] Work Center (WC1) with location (APTEAN P/P require put-away, require pick both yes, bin mandatory)			
			// [GIVEN] Work Center (WC1) in Routing (R1)			
			// [GIVEN] Routing (R1) status = certified			
			// [GIVEN] Lot tracked Item (001)			
			// [GIVEN] Routing (R1) linked to Item (001)			
			// [GIVEN] Lot tracked Item (002)			
			// [GIVEN] Stock (qty 10 or more) for Item (002) with lotno, expiration date, on bin			
			// [GIVEN] Production BOM (B1)with Item (002) with quantity 1			
			// [GIVEN] Production BOM (B1) status = certified			
			// [GIVEN] Production BOM (B1) linked to Item (001)			
	Test with 3 Production Orders		// [GIVEN] Released Production Order for Item (001) with quantity 10 on location (APTEAN P/P)			
			// [GIVEN] Registered consumption of 10 with lotno, expiration date, location and bin from Shop Floor Production app	prod order no + item no + raw mat item no	define data in prod reg entries	
			// [WHEN] Process the entry	job queue in background	run in CU70234054	
	Create Production Entry with Entry Type = Time for machine time & labor time	A	// [SCENARIO #0003] Create Production Entry with Entry Type = Time for machine time & labor time			
	See [0166] in SFP test		//[GIVEN] Work Date = 01-09-2020			
			//[GIVEN] No. Series 'M-PROREG' with starting No. = PREG0001			
			//[GIVEN] Shop Floor setup with Post Time Shop Floor = True, Production Registration Entry No. = M-PROREG and Capacity Unit of Measure = MINUTES			
	Test with 3 Production Orders		//[GIVEN] Released Production Order 'PRO00001' with item '0015' and Quantity = 10			
	See times in other Excel		//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Start-Up', Duration in Minutes '5.00' and Posted = False			
			//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Production', Duration in Minutes '10.00' and Posted =			
			//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Start-Up', Duration in Minutes '4.00' and Posted = False	prod order no + item no	time entries	
			//[WHEN] Run report "Post SFP Time Entries"	job queue in background??		
	~~Create Production Entry with Entry Type = Time for labor time~~	A	~~// [SCENARIO #0004] Create Production Entry with Entry Type = Time for labor time~~			
	~~See [0167] in SFP test~~		~~//[GIVEN] Work Date = 01-09-2020~~			
			~~//[GIVEN] No. Series 'M-PROREG' with starting No. = PREG0001~~			
			~~//[GIVEN] Shop Floor setup with Post Time Shop Floor = True, Production Registration Entry No. = M-PROREG and Capacity Unit of Measure = MINUTES~~			
			~~//[GIVEN] Released Production Order 'PRO00001' with item '0015' and Quantity = 10~~			
			~~//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Start Up', Labor Duration in Minutes '3.00' and Posted =~~			
			~~//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Production', Labor Duration in Minutes '10.00' and Posted~~			
			~~//[GIVEN] Time Entry for prod order 'PRO00001', Prod Order Line No. '10000', Operation No. '10', Shop Floor Production Status 'Start Up', Labor Duration in Minutes '4.00' and Posted =~~	~~prod order no + item no~~	time entries	
			~~//[WHEN] Routing status changed to Finished and report "Post SFP Time Entries" is executed~~	~~job queue in background??~~		
	Change status Released Production Order to Finished	A	// [SCENARIO #0008] Change status Released Production Order to Finished	data set up of released prod orders		
			// [GIVEN] Released Production Order for Item (001) with quantity 10	user task	standard BC, define filter	1 to 3 users do this
			// [WHEN] Status is changed to Finished	user task, 3 users	standard BC, define filter	1 to 3 users do this
	Refresh Released Production Order	A	// [SCENARIO #0006] Refresh Released Production Order	data set up of released prod orders		
			// [GIVEN] Released Production Order for Item (001) with quantity 10	user task		
			// [WHEN] Process, Refresh Production Order	user task, 3 users		
	Change status Planned Production Order to Released Production Order	A	// [SCENARIO #0005] Change status Planned Production Order to Released Production Order			
				data set up of released prod orders		
			// [GIVEN] Planned Production Order for Item (001) with quantity 10	user task		
	Use 3 times 3 different Prod. Orders		// [WHEN] Status is changed to Released	user task, 3 users		
	Open page Shop Floor Production Registration Entries	A	// [SCENARIO #0009] Open page Shop Floor Production Registration Entries	loading a page	1 to 3 users do this	
	9 entries		// [WHEN] Open page Shop Floor Production Registration Entries			
	Open page Shop Floor ProductionTime Entries	A	// [SCENARIO #0010] Open page Shop Floor Production Time Entries	loading a page	1 to 3 users do this	
	6 entries		// [WHEN] Open page Shop Floor Production Time Entries			
	Open page Shop Floor Production Status	A	// [SCENARIO #0011] Open page Shop Floor Production Status	loading a page	1 to 3 users do this	
	3 entries (only started in SFP entries are shown, not released		// [WHEN] Open page Shop Floor Production Status			
	Refresh & Finish Released Production Order	A	// [SCENARIO #007] Refresh and Finish Released Production Order	data set up of released prod orders		
			// [GIVEN] Refreshed Released Production Order for Item (001) with quantity 10	user task		
			// [WHEN] Status is changed to Finished	user task, 3 users		be aware of pop-up message

Data Setup



Shop Floor Production Setup

General

Lot No. Per	Production Order	Date Formula Show P...	

Posting

Output Journal Templ...	OUTPUT	Consumption Error Jo...	ERROR
Output Journal Batch ...	DEFAULT	Post Time Shop Floor	●
Output Error Journal ...	ERI		
Consumption Journal ...	CO		
Consumption Journal ...	DEI		

Work Center Card

W000005 · PACK002

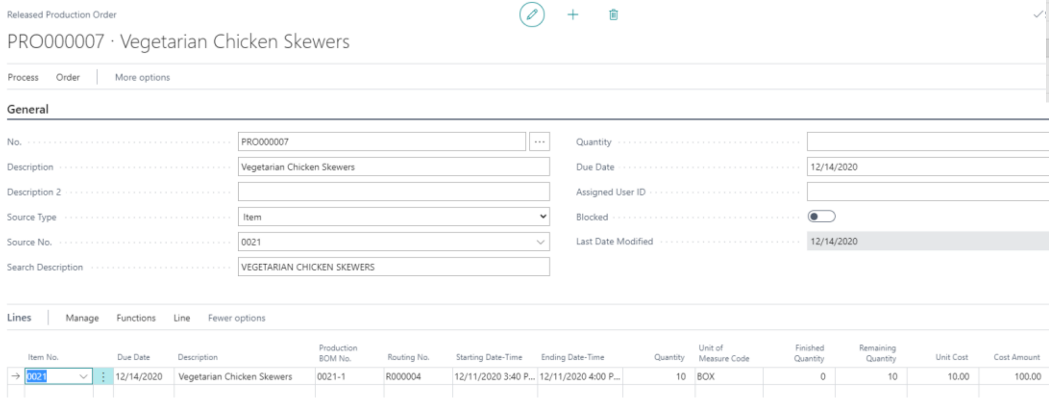
General

No.	W000005	Show in Shop Floor	●
Name	PACK002	Labor	○
Work Center Group Code	PACKAGING	Blocked	○
Alternate Work Center		Last Date Modified	12/10/2020
Search Name	PACK002		

Posting

Direct Unit Cost	0.00	Global Dimension 1 Code	
Indirect Cost %	0	Global Dimension 2 Code	
Overhead Rate	0.00	Subcontractor No.	

BC



Released Production Order

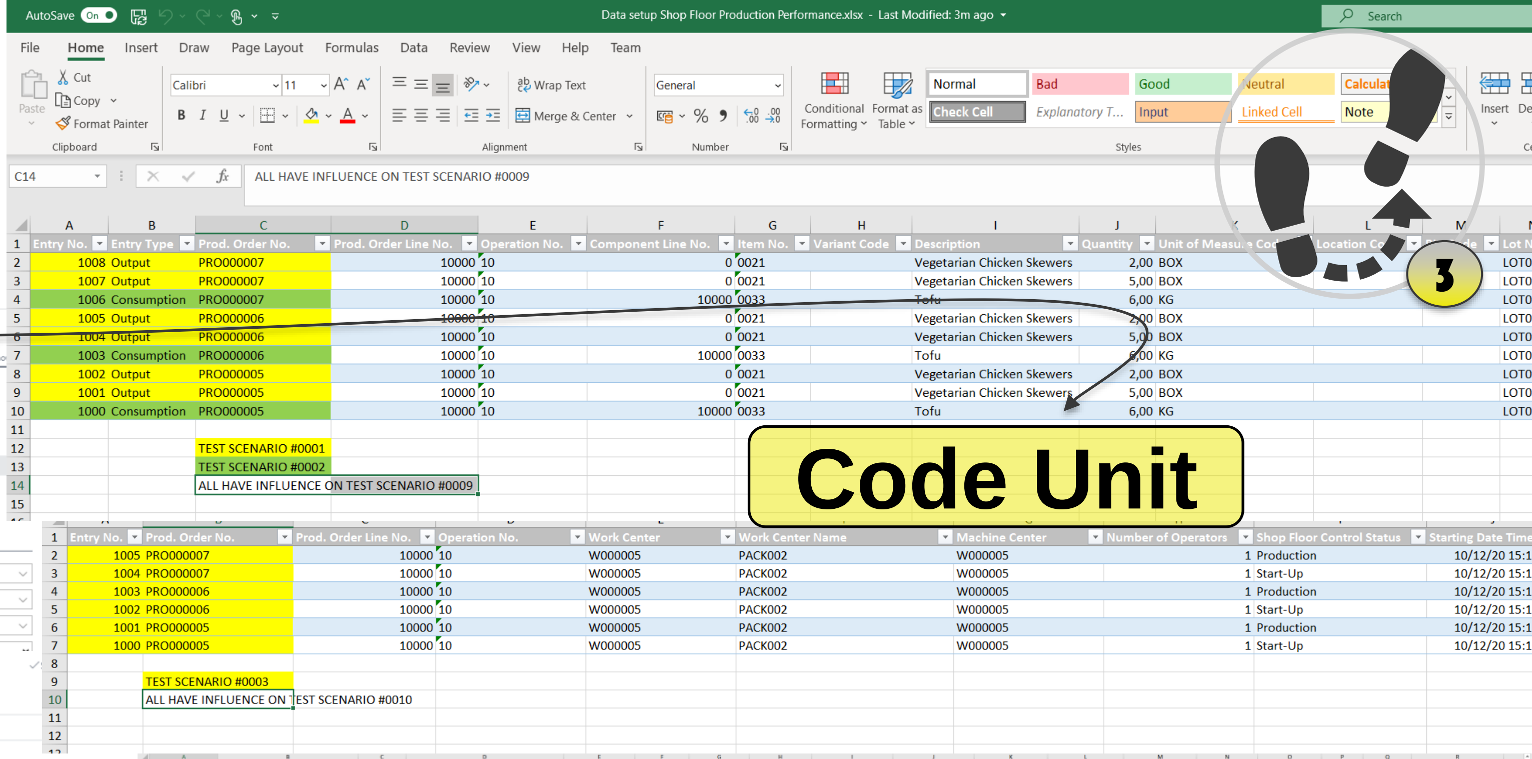
PRO000007 · Vegetarian Chicken Skewers

General

No.	PRO000007	Quantity	10
Description	Vegetarian Chicken Skewers	Due Date	12/14/2020
Description 2		Assigned User ID	
Source Type	Item	Blocked	○
Source No.	0021	Last Date Modified	12/14/2020
Search Description	VEGETARIAN CHICKEN SKEWERS		

Lines

Item No.	Due Date	Description	Production BOM No.	Routing No.	Starting Date-Time	Ending Date-Time	Quantity	Unit of Measure Code	Finished Quantity	Remaining Quantity	Unit Cost	Cost Amount	Production Scenario Code
0021	12/14/2020	Vegetarian Chicken Skewers	0021-1	R000004	12/11/2020 3:40 P...	12/11/2020 4:00 P...	10	BOX	0	10	10.00	100.00	_

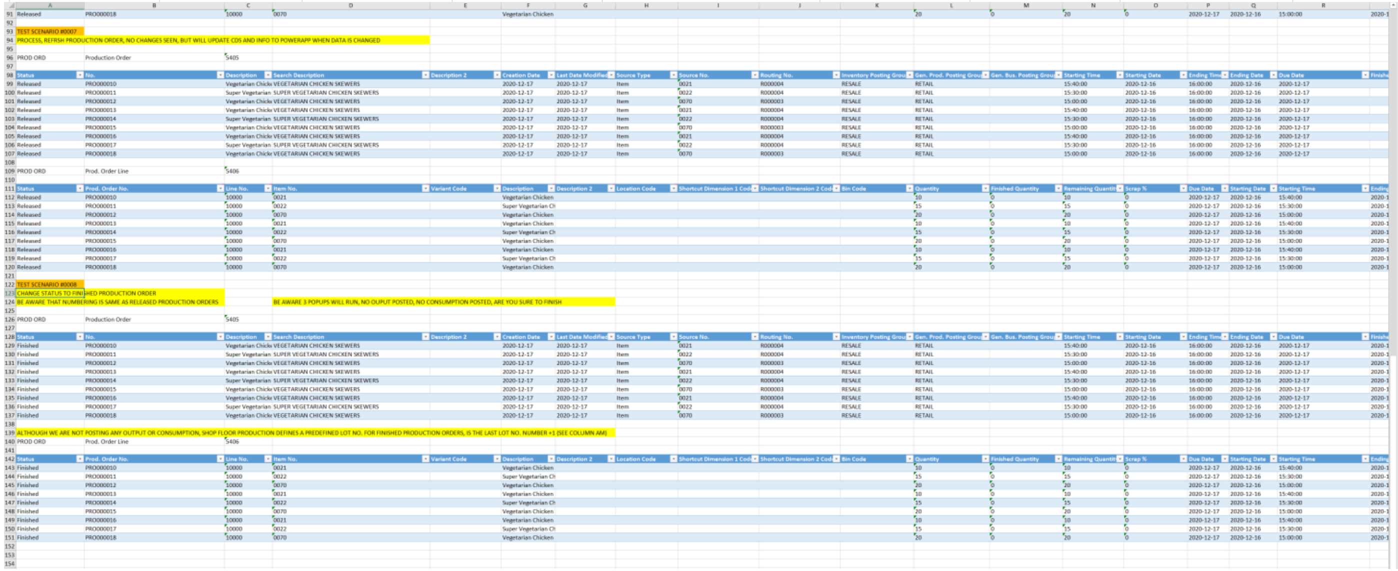


C14 ALL HAVE INFLUENCE ON TEST SCENARIO #0009

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Entry No.	Entry Type	Prod. Order No.	Prod. Order Line No.	Operation No.	Component Line No.	Item No.	Variant Code	Description	Quantity	Unit of Measure Code	Location Co	...de	Lot N
2	1008	Output	PRO000007	10000	10	0	0021		Vegetarian Chicken Skewers	2,00	BOX			LOTO
3	1007	Output	PRO000007	10000	10	0	0021		Vegetarian Chicken Skewers	5,00	BOX			LOTO
4	1006	Consumption	PRO000007	10000	10	10000	0033		Tofu	6,00	KG			LOTO
5	1005	Output	PRO000006	10000	10	0	0021		Vegetarian Chicken Skewers	2,00	BOX			LOTO
6	1004	Output	PRO000006	10000	10	0	0021		Vegetarian Chicken Skewers	5,00	BOX			LOTO
7	1003	Consumption	PRO000006	10000	10	10000	0033		Tofu	6,00	KG			LOTO
8	1002	Output	PRO000005	10000	10	0	0021		Vegetarian Chicken Skewers	2,00	BOX			LOTO
9	1001	Output	PRO000005	10000	10	0	0021		Vegetarian Chicken Skewers	5,00	BOX			LOTO
10	1000	Consumption	PRO000005	10000	10	10000	0033		Tofu	6,00	KG			LOTO
11														
12			TEST SCENARIO #0001											
13			TEST SCENARIO #0002											
14			ALL HAVE INFLUENCE ON TEST SCENARIO #0009											
15														

	A	B	C	D	E	F	G	H	I	J
1	Entry No.	Prod. Order No.	Prod. Order Line No.	Operation No.	Work Center	Work Center Name	Machine Center	Number of Operators	Shop Floor Control Status	Starting Date Time
2	1005	PRO000007	10000	10	W000005	PACK002	W000005	1	Production	10/12/20 15:1
3	1004	PRO000007	10000	10	W000005	PACK002	W000005	1	Start-Up	10/12/20 15:1
4	1003	PRO000006	10000	10	W000005	PACK002	W000005	1	Production	10/12/20 15:1
5	1002	PRO000006	10000	10	W000005	PACK002	W000005	1	Start-Up	10/12/20 15:1
6	1001	PRO000005	10000	10	W000005	PACK002	W000005	1	Production	10/12/20 15:1
7	1000	PRO000005	10000	10	W000005	PACK002	W000005	1	Start-Up	10/12/20 15:1
8										
9		TEST SCENARIO #0003								
10		ALL HAVE INFLUENCE ON TEST SCENARIO #0010								
11										
12										

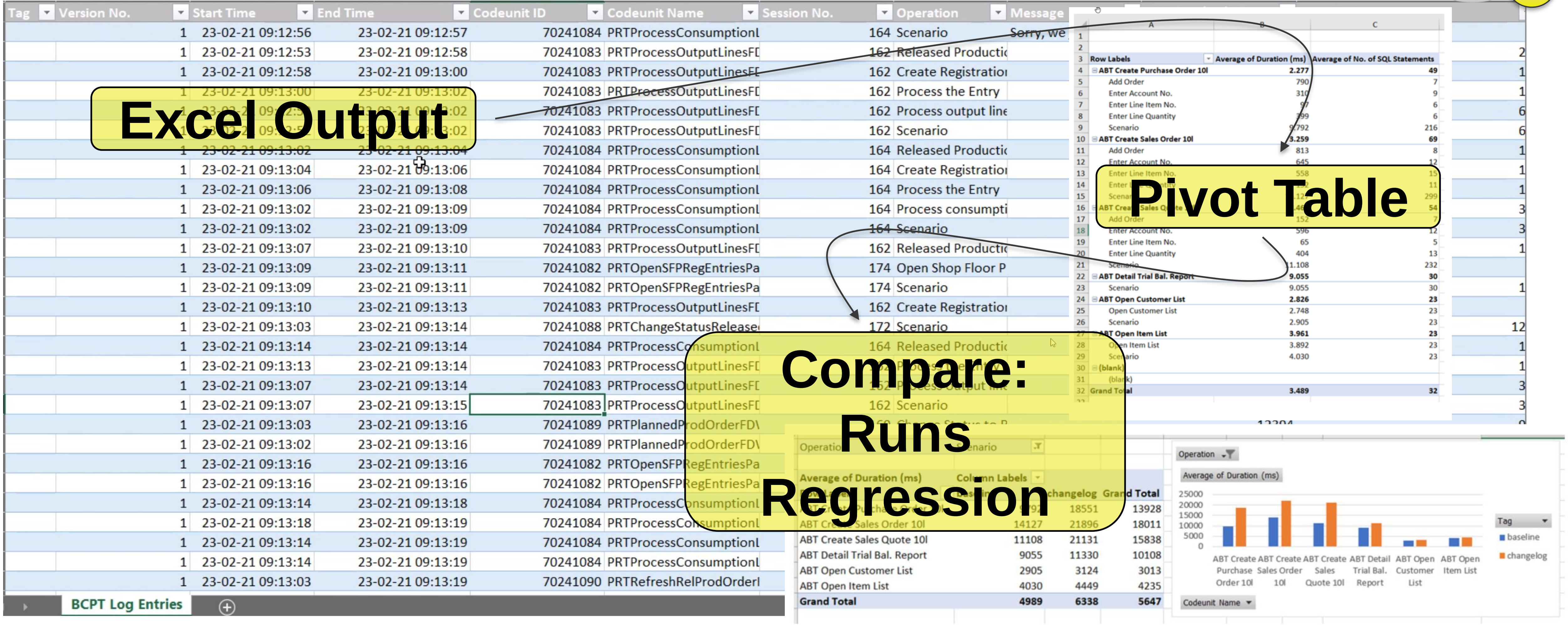
Code Unit



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
91	Released	PRO000018	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
92																			
93	TEST SCENARIO #0007																		
94	PROCESS, REFRSH PRODUCTION ORDER, NO CHANGES SEEN, BUT WILL UPDATE CDS AND INFO TO POWERAPP WHEN DATA IS CHANGED																		
95																			
96	PROD ORD	Production Order	5405																
97																			
98	Status	No.	Description	Search Description	Description 2	Creation Date	Last Date Modified	Source Type	Source No.	Routing No.	Inventory Posting Grou	Gen. Prod. Posting Grou	Gen. Bus. Posting Grou	Starting Time	Starting Date	Ending Time	Ending Date	Due Date	Finishe
99	Released	PRO000010	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
100	Released	PRO000011	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
101	Released	PRO000012	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
102	Released	PRO000013	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
103	Released	PRO000014	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
104	Released	PRO000015	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
105	Released	PRO000016	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
106	Released	PRO000017	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
107	Released	PRO000018	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	
108																			
109	PROD ORD	Prod. Order Line	5406																
110																			
111	Status	Prod. Order No.	Line No.	Item No.	Variant Code	Description	Description 2	Location Code	Shortcut Dimension 1 Code	Shortcut Dimension 2 Code	Bin Code	Quantity	Finished Quantity	Remaining Quantity	Scrap %	Due Date	Starting Date	Starting Time	Ending
112	Released	PRO000010	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
113	Released	PRO000011	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
114	Released	PRO000012	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
115	Released	PRO000013	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
116	Released	PRO000014	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
117	Released	PRO000015	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
118	Released	PRO000016	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
119	Released	PRO000017	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
120	Released	PRO000018	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
121																			
122	TEST SCENARIO #0008																		
123	CHANGE STATUS TO FINISHED PRODUCTION ORDER																		
124	BE AWARE THAT NUMBERING IS SAME AS RELEASED PRODUCTION ORDERS			BE AWARE 3 POPUPS WILL RUN, NO OUPUT POSTED, NO CONSUMPTION POSTED, ARE YOU SURE TO FINISH															
125																			
126	PROD ORD	Production Order	5405																
127																			
128	Status	No.	Description	Search Description	Description 2	Creation Date	Last Date Modified	Source Type	Source No.	Routing No.	Inventory Posting Grou	Gen. Prod. Posting Grou	Gen. Bus. Posting Grou	Starting Time	Starting Date	Ending Time	Ending Date	Due Date	Finishe
129	Finished	PRO000010	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
130	Finished	PRO000011	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
131	Finished	PRO000012	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
132	Finished	PRO000013	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
133	Finished	PRO000014	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
134	Finished	PRO000015	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
135	Finished	PRO000016	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0021	R000004	RESALE	RETAIL		15:40:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
136	Finished	PRO000017	Super Vegetarian	SUPER VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0022	R000004	RESALE	RETAIL		15:30:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
137	Finished	PRO000018	Vegetarian Chick	VEGETARIAN CHICKEN SKEWERS		2020-12-17	2020-12-17	Item	0070	R000003	RESALE	RETAIL		15:00:00	2020-12-16	16:00:00	2020-12-16	2020-12-17	2020-1
138																			
139	ALTHOUGH WE ARE NOT POSTING ANY OUTPUT OR CONSUMPTION, SHOP FLOOR PRODUCTION DEFINES A PREDEFINED LOT NO. FOR FINISHED PRODUCTION ORDERS, IS THE LAST LOT NO. NUMBER +1 (SEE COLUMN AM)																		
140	PROD ORD	Prod. Order Line	5406																
141																			
142	Status	Prod. Order No.	Line No.	Item No.	Variant Code	Description	Description 2	Location Code	Shortcut Dimension 1 Code	Shortcut Dimension 2 Code	Bin Code	Quantity	Finished Quantity	Remaining Quantity	Scrap %	Due Date	Starting Date	Starting Time	Ending
143	Finished	PRO000010	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
144	Finished	PRO000011	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
145	Finished	PRO000012	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
146	Finished	PRO000013	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
147	Finished	PRO000014	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
148	Finished	PRO000015	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
149	Finished	PRO000016	10000	0021		Vegetarian Chicken						10	0	10	0	2020-12-17	2020-12-16	15:40:00	2020-1
150	Finished	PRO000017	10000	0022		Super Vegetarian Ch						15	0	15	0	2020-12-17	2020-12-16	15:30:00	2020-1
151	Finished	PRO000018	10000	0070		Vegetarian Chicken						20	0	20	0	2020-12-17	2020-12-16	15:00:00	2020-1
152																			
153																			
154																			

Output Analysis

Logs and Excel output



Excel Output

Tag	Version No.	Start Time	End Time	Codeunit ID	Codeunit Name	Session No.	Operation	Message	
	1	23-02-21 09:12:56	23-02-21 09:12:57	70241084	PRTProcessConsumptionL	164	Scenario	Sorry, we	
	1	23-02-21 09:12:53	23-02-21 09:12:58	70241083	PRTProcessOutputLinesFD	162	Released Productic		2
	1	23-02-21 09:12:58	23-02-21 09:13:00	70241083	PRTProcessOutputLinesFD	162	Create Registratior		1
	1	23-02-21 09:13:00	23-02-21 09:13:02	70241083	PRTProcessOutputLinesFD	162	Process the Entry		1
	1	23-02-21 09:12:5[illegible]	23-02-21 09:13:02	70241083	PRTProcessOutputLinesFD	162	Process output line		6
	1	23-02-21 09:12:5[illegible]	23-02-21 09:13:02	70241083	PRTProcessOutputLinesFD	162	Scenario		6
	1	23-02-21 09:13:02	23-02-21 09:13:04	70241084	PRTProcessConsumptionL	164	Released Productic		1
	1	23-02-21 09:13:04	23-02-21 09:13:06	70241084	PRTProcessConsumptionL	164	Create Registratior		1
	1	23-02-21 09:13:06	23-02-21 09:13:08	70241084	PRTProcessConsumptionL	164	Process the Entry		1
	1	23-02-21 09:13:02	23-02-21 09:13:09	70241084	PRTProcessConsumptionL	164	Process consumpti		3
	1	23-02-21 09:13:02	23-02-21 09:13:09	70241084	PRTProcessConsumptionL	164	Scenario		3
	1	23-02-21 09:13:07	23-02-21 09:13:10	70241083	PRTProcessOutputLinesFD	162	Released Productic		1
	1	23-02-21 09:13:09	23-02-21 09:13:11	70241082	PRTOpenSFPRegEntriesPa	174	Open Shop Floor P		
	1	23-02-21 09:13:09	23-02-21 09:13:11	70241082	PRTOpenSFPRegEntriesPa	174	Scenario		1
	1	23-02-21 09:13:10	23-02-21 09:13:13	70241083	PRTProcessOutputLinesFD	162	Create Registratior		
	1	23-02-21 09:13:03	23-02-21 09:13:14	70241088	PRTChangeStatusRelease	172	Scenario		12
	1	23-02-21 09:13:14	23-02-21 09:13:14	70241084	PRTProcessConsumptionL	164	Released Productic		1
	1	23-02-21 09:13:13	23-02-21 09:13:14	70241083	PRTProcessOutputLinesFD	162	Process the Entry		1
	1	23-02-21 09:13:07	23-02-21 09:13:14	70241083	PRTProcessOutputLinesFD	162	Process output line		3
	1	23-02-21 09:13:07	23-02-21 09:13:15	70241083	PRTProcessOutputLinesFD	162	Scenario		3
	1	23-02-21 09:13:03	23-02-21 09:13:16	70241089	PRTPlannedProdOrderFDV	160	Change Status to R		0
	1	23-02-21 09:13:02	23-02-21 09:13:16	70241089	PRTPlannedProdOrderFDV				
	1	23-02-21 09:13:16	23-02-21 09:13:16	70241082	PRTOpenSFPRegEntriesPa				
	1	23-02-21 09:13:16	23-02-21 09:13:16	70241082	PRTOpenSFPRegEntriesPa				
	1	23-02-21 09:13:14	23-02-21 09:13:18	70241084	PRTProcessConsumptionL				
	1	23-02-21 09:13:18	23-02-21 09:13:19	70241084	PRTProcessConsumptionL				
	1	23-02-21 09:13:14	23-02-21 09:13:19	70241084	PRTProcessConsumptionL				
	1	23-02-21 09:13:14	23-02-21 09:13:19	70241084	PRTProcessConsumptionL				
	1	23-02-21 09:13:03	23-02-21 09:13:19	70241090	PRTRefreshRelProdOrderl				

BCPT Log Entries

Pivot Table

	A	B	C
1			
2			
3	Row Labels	Average of Duration (ms)	Average of No. of SQL Statements
4	**⊟ ABT Create Purchase Order 10l**	**2.277**	**49**
5	Add Order	790	7
6	Enter Account No.	310	9
7	Enter Line Item No.	97	6
8	Enter Line Quantity	399	6
9	Scenario	9.792	216
10	**⊟ ABT Create Sales Order 10l**	**3.259**	**69**
11	Add Order	813	8
12	Enter Account No.	645	12
13	Enter Line Item No.	558	15
14	Enter Line Quantity	1[illegible]2	11
15	Scenario	[illegible].127	299
16	**⊟ ABT Create Sales Quote 10l**	**[illegible].46[illegible]**	**54**
17	Add Order	152	7
18	Enter Account No.	596	12
19	Enter Line Item No.	65	5
20	Enter Line Quantity	404	13
21	Scenario	11.108	232
22	**⊟ ABT Detail Trial Bal. Report**	**9.055**	**30**
23	Scenario	9.055	30
24	**⊟ ABT Open Customer List**	**2.826**	**23**
25	Open Customer List	2.748	23
26	Scenario	2.905	23
27	**⊟ ABT Open Item List**	**3.961**	**23**
28	Open Item List	3.892	23
29	Scenario	4.030	23
30	⊟ (blank)		
31	(blank)		
32	**Grand Total**	**3.489**	**32**

Compare: Runs Regression

Operation	Scenario		
Average of Duration (ms)	Column Labels		
Row Labels	baseline	changelog	Grand Total
ABT Create Purchase Order 10l	9792	18551	13928
ABT Create Sales Order 10l	14127	21896	18011
ABT Create Sales Quote 10l	11108	21131	15838
ABT Detail Trial Bal. Report	9055	11330	10108
ABT Open Customer List	2905	3124	3013
ABT Open Item List	4030	4449	4235
Grand Total	**4989**	**6338**	**5647**

Pain and Gain, a developer's perspective

Provide Insights

- estimated duration
  - durations can differ / dedicated VM
- #SQL statements
  - initial load versus caching

Be aware

- #scenarios = #code units
  - …separate in parallel running tasks
- Setup test duration in the test suite: the test will run for the entire duration or repeat the same test until the duration is finished.

Plan for execution

- …run 1st, 2nd and 3rd test
- online sandbox or On Premise
- #concurrent sessions + test duration can cause locking and memory issues. Plan for the machine it runs on, the necessary memory and the test suite definition.

Usability and automation

Run

Run on an online sandbox and on a container using PowerShell script.
Log entries are also in Application Insights, use Excel for analysis or use Power BI.

Reuse & Output

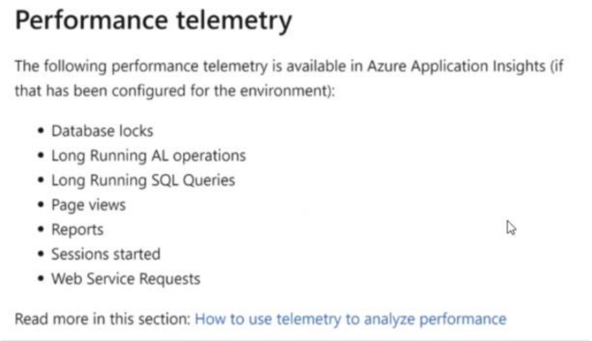
Reuse Test Suite definitions for a consecutive run: BCPT Suites - XMLPort 149001 "BCPT Import/Export"
Output results: BCPT Log Entry - XMLPort 149000 "BCPT Log Entries" (Export Only)

Mostly valuable for developers

Pipeline automation?!

- Build a container on a dedicated VM to maximize consistency of results (duration)
- Import the BCPT suite*
- Run the setup code unit for the App to initialize data (DIY)
- Run the PowerShell script to run the test at least 3 time of the same setup (using different tags, effect of caching on SQL statement and duration).
- Export the BCPT log entries (missing the operation attribute)*
- Compare results from different pipeline build/test manually using the Excel output capability or automated with threshold values. The latter would have to be developed.

* this will become part of the BCContainerHelper



Performance telemetry

The following performance telemetry is available in Azure Application Insights (if that has been configured for the environment):

- Database locks
- Long Running AL operations
- Long Running SQL Queries
- Page views
- Reports
- Sessions started
- Web Service Requests

Read more in this section: How to use telemetry to analyze performance

Telemetry is something else…

- Enable ISV Application Insights on Apps
- Add custom telemetry (LogMessage) during development
- Establish reports and alerts as part of QA practise (regression analysis)
- Reuse reports and alerts when in production (regression monitoring)
- Use Trouble Shooting Guides (TSGs /Jupyter Notebooks) for proactive support

Q&A

Functional Insights

Olaf Jorritsma

What is it about?

- It is simulating a company to see how the performance changes with each version
- It is not validating data

How do you simulate a company?

- Look from user perspective.
- Simulate users as close as possible.
- Do what real user would do.
- Use realistic users.
- A real user will open a page and start using this page.

User load definition

Define which users you need for the performance test.

Do they work sequentially or simultaneously?

Different functions is different users:

- Production schedulers; let’s say 2 users.
- Production employees which post output; let’s say 10 production lines, so 10 users.
- Warehouse employees which pick materials for production orders; let’s say 3 users.
- Production employees which post consumption; let’s say 10 production lines, so 10 users.

Simulating a day at a Manufacturing Company

1. 2 users are creating released production orders.
2. 3 users are picking the materails for these released production orders
3. 10 users are posting consumption on these released production orders
4. 10 users are posting output on these released production orders
5. 2 users change the status to “Finished” on these released production orders**

** a tricky one as you probably want to finish a released production order after steps 2 to 4 are done

Test Scripts

- Each code unit should simulate a task for a user
- Be sure your setup is in place, write a code unit to do the setup, run this prior to running the PRT tests
- User steps, after every ‘normal’ key entry add a user wait
- Limit on the dependencies, one user creates a production order, another user finds/uses it through another way (no passthrough of variables) e.g. filter a page on the newest
- Also determine whether it ‘normally’ runs concurrently or not…

Any questions?

PERFORMANCE TOOLKIT

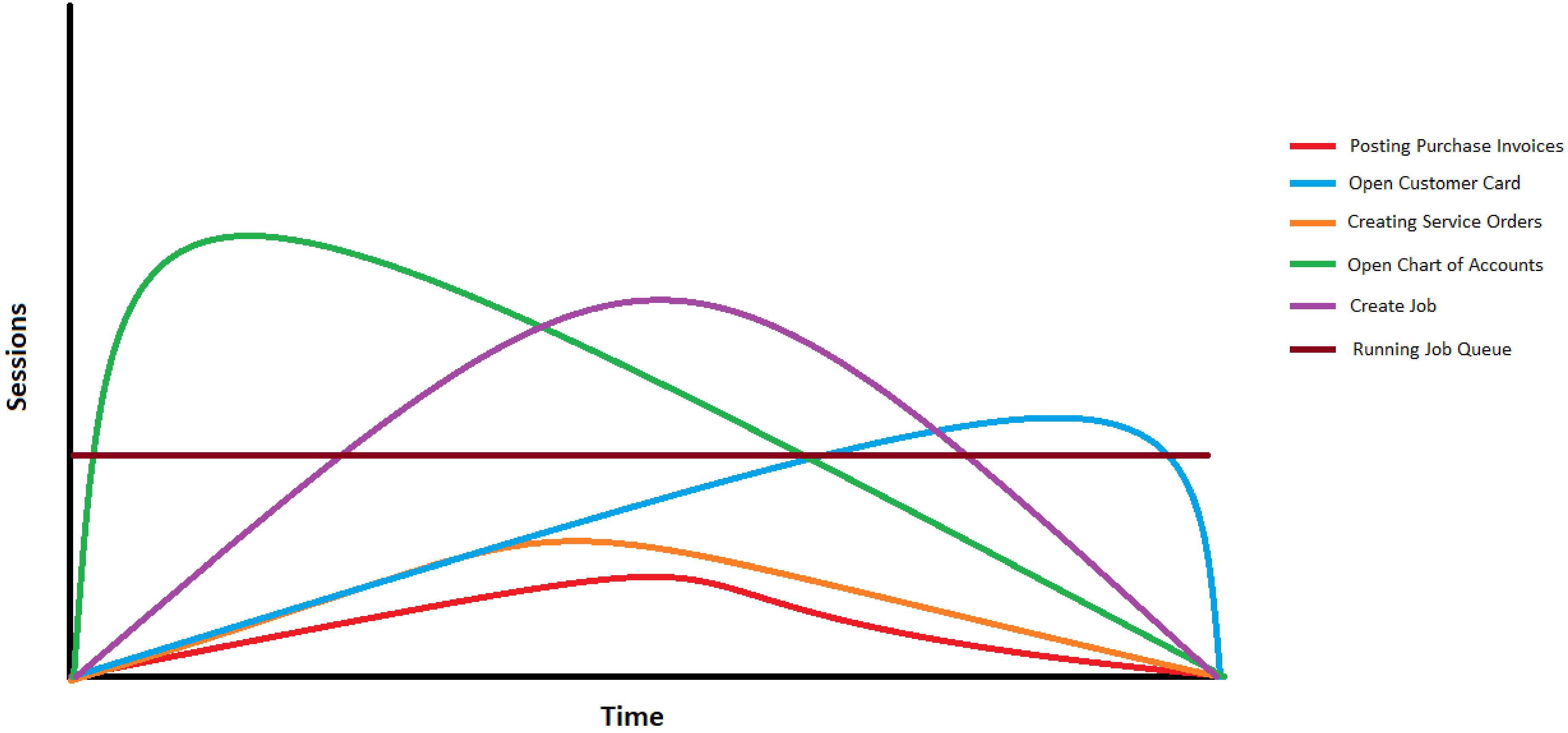
Technical overview and demo

Bert Verbeek

PERFORMANCE TOOLKIT

WHICH SCENARIOS? (1)

- What are users doing all day?



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PERFORMANCE TOOLKIT

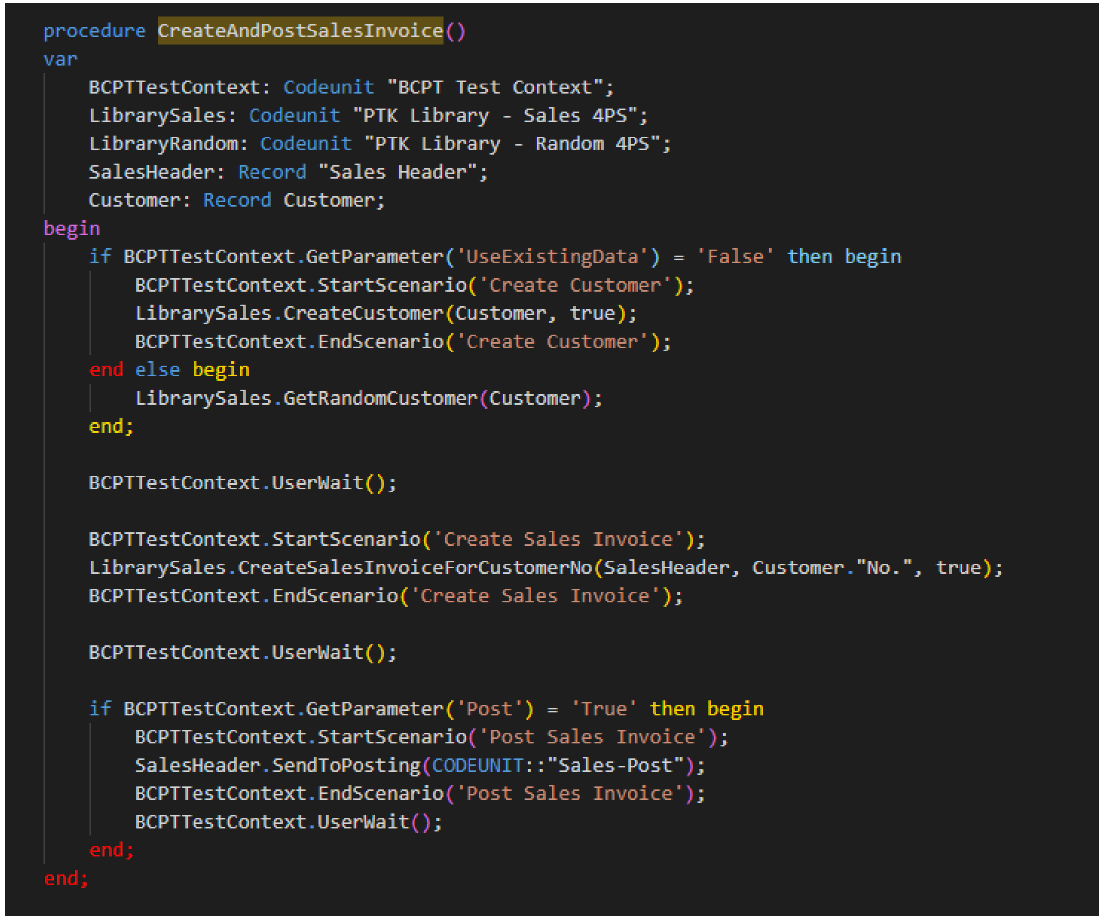
WHICH SCENARIOS? (2)

Number	Test scenario	Actions	Target value	Number of test users (100%)	75%	50%	25%	Total iterations per day	Total performance time	Total iterations per session	Waiting time in Sec
1	Create and Post Purchase Invoice (8xxx)	1. Create Vendor	Creation 15-20 sec.	10	8	5	3				
		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.					250	30	15,63	115
2	Open chart of accounts (8xxxx)	No actions defined	List page 2-5 sec.	18	14	9	5	10	30	0,63	2880
3	Create service order (8xxxx)	1. Create Customer	Creation 15-20 sec.	149	112	75	37				
		2. Create Service Order	Creation 15-20 sec.					20	30	1,25	1440

PERFORMANCE TOOLKIT

CREATING A TEST CODEUNIT

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



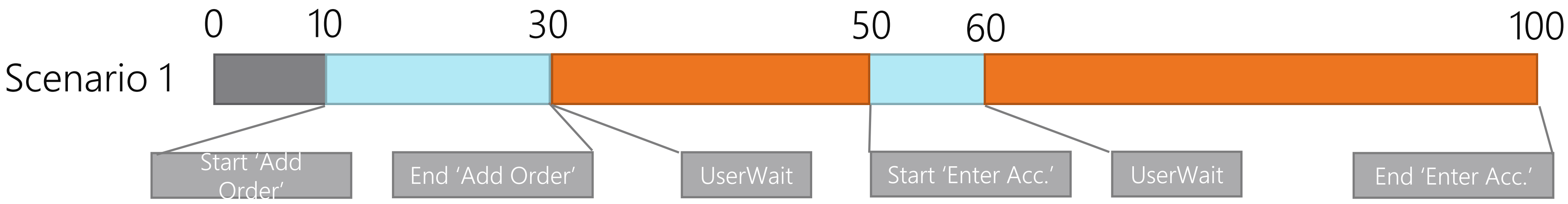
```
procedure CreateAndPostSalesInvoice()
var
    BCPTTestContext: Codeunit "BCPT Test Context";
    LibrarySales: Codeunit "PTK Library - Sales 4PS";
    LibraryRandom: Codeunit "PTK Library - Random 4PS";
    SalesHeader: Record "Sales Header";
    Customer: Record Customer;
begin
    if BCPTTestContext.GetParameter('UseExistingData') = 'False' then begin
        BCPTTestContext.StartScenario('Create Customer');
        LibrarySales.CreateCustomer(Customer, true);
        BCPTTestContext.EndScenario('Create Customer');
    end else begin
        LibrarySales.GetRandomCustomer(Customer);
    end;

    BCPTTestContext.UserWait();

    BCPTTestContext.StartScenario('Create Sales Invoice');
    LibrarySales.CreateSalesInvoiceForCustomerNo(SalesHeader, Customer."No.", true);
    BCPTTestContext.EndScenario('Create Sales Invoice');

    BCPTTestContext.UserWait();

    if BCPTTestContext.GetParameter('Post') = 'True' then begin
        BCPTTestContext.StartScenario('Post Sales Invoice');
        SalesHeader.SendToPosting(CODEUNIT::"Sales-Post");
        BCPTTestContext.EndScenario('Post Sales Invoice');
        BCPTTestContext.UserWait();
    end;
end;
```

PERFORMANCE TOOLKIT

USER WAITS

- Use “User Waits” for real live simulation

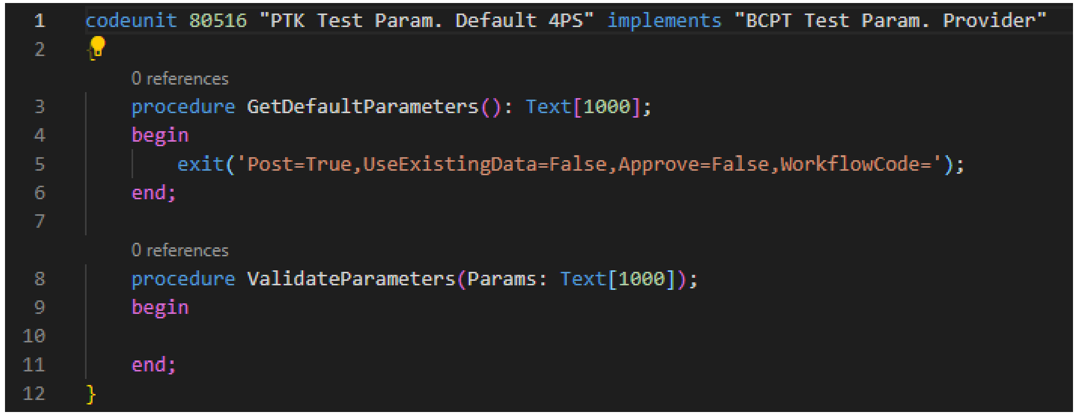
Measure	Time
Add Order	20
Enter Acc.	50
Scenario	40



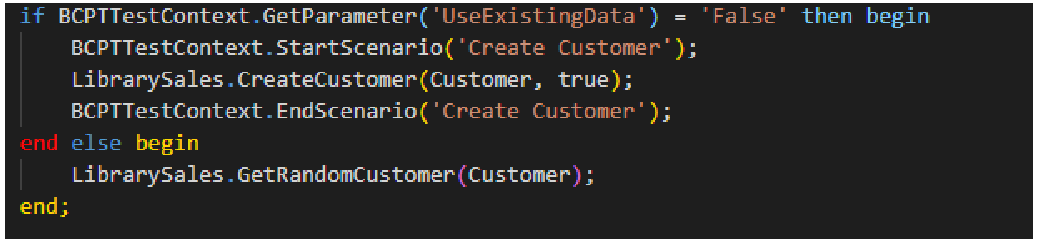
PERFORMANCE TOOLKIT

USE OF PARAMETERS

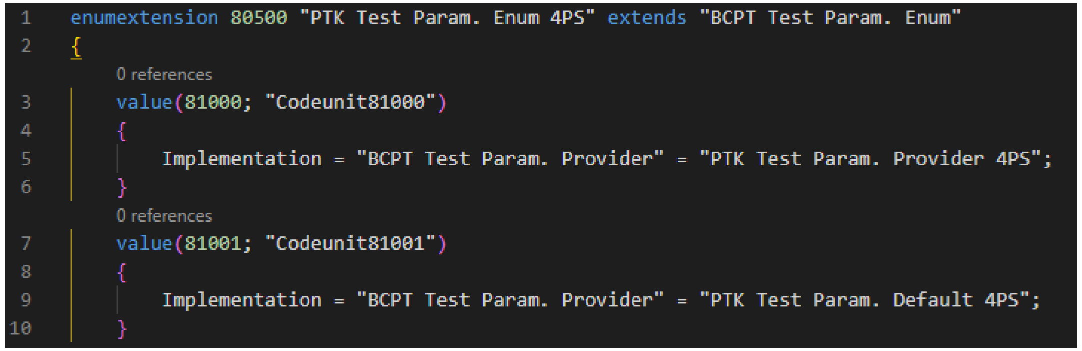
- Create a codeunit that implements “BCPT Test Parm. Provider”
- Create an Enum
  - Value must be the codeunit no.
- Use it



```
codeunit 80516 "PTK Test Param. Default 4PS" implements "BCPT Test Param. Provider"

    0 references
    procedure GetDefaultParameters(): Text[1000];
    begin
        exit('Post=True,UseExistingData=False,Approve=False,WorkflowCode=');
    end;

    0 references
    procedure ValidateParameters(Params: Text[1000]);
    begin

    end;
}
```



```
if BCPTTestContext.GetParameter('UseExistingData') = 'False' then begin
    BCPTTestContext.StartScenario('Create Customer');
    LibrarySales.CreateCustomer(Customer, true);
    BCPTTestContext.EndScenario('Create Customer');
end else begin
    LibrarySales.GetRandomCustomer(Customer);
end;
```



```
enumextension 80500 "PTK Test Param. Enum 4PS" extends "BCPT Test Param. Enum"
{
    0 references
    value(81000; "Codeunit81000")
    {
        Implementation = "BCPT Test Param. Provider" = "PTK Test Param. Provider 4PS";
    }
    0 references
    value(81001; "Codeunit81001")
    {
        Implementation = "BCPT Test Param. Provider" = "PTK Test Param. Default 4PS";
    }
```

PERFORMANCE TOOLKIT

SETTING UP THE PERFORMANCE TOOLKIT

- Maximum of 125 sessions
- Only in Sandbox or on-premise environment
- Foreground and background
  - Foreground = run in sequence
  - Background = run in parallel
- Delay between iterations (fixed or random)
- Show BCPT suite

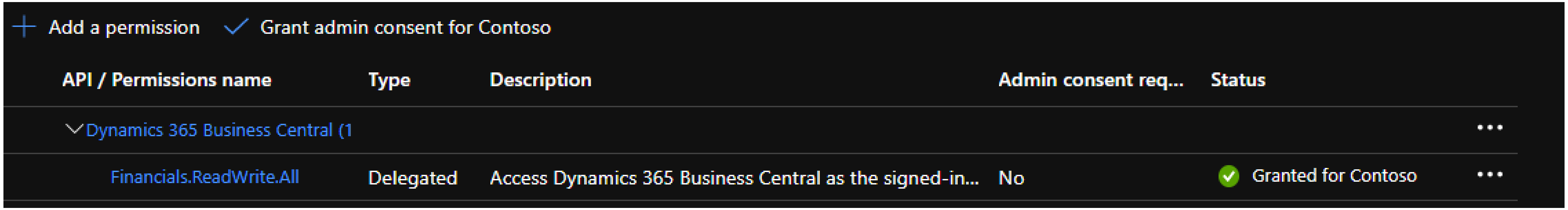
PERFORMANCE TOOLKIT

STARTING THE TEST

- Always perform a warmup test
- Use PowerShell to simulate multiple users

```
 ## Container
$Credential = New-Object PSCredential 'admin',(ConvertTo-SecureString -String ‘admin' -AsPlainText -Force)
C:\Users\bverbeek\Documents\AL\TestRunner\RunBCPTTests.ps1 -Environment OnPrem -AuthorizationType NavUserPassword -Credential $Credential -TestRunnerPage 149002
-SuiteCode TEST -BCPTTestRunnerInternalFolderPath C:\Temp\TestRunner\Internal -ServiceUrl https://preview2019/BC/?tenant=default

##BC Online
$Credential = New-Object PSCredential -ArgumentList 'admin@tenant.onmicrosoft.com', (ConvertTo-SecureString -String ‘password' -AsPlainText -Force)
C:\Users\bverbeek\Documents\AL\TestRunner\RunBCPTTests.ps1 -ClientId applicationID -Environment PROD -AuthorizationType AAD -Credential $Credential -
TestRunnerPage 149002 -SuiteCode TEST -BCPTTestRunnerInternalFolderPath C:\Temp\TestRunner\Internal -SandboxName Test
```

- For BC online create a “App registration” in your Azure Portal.



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

PERFORMANCE TOOLKIT

ANALYZING THE RESULTS

- In BC through “Log Entries”
- In application insights
  - Live example in Application Insights

?

QUESTIONS?

Thanks