

Session z104138

Container Pricing: So easy even Frank can do it!

—

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Please note

IBM's Container Pricing strategy consists of two parts: pricing options, and z/OS enhancements that are used by the pricing options. The objective of these changes is to greatly simplify the process of associating workloads with pricing options. No more reading TBs of SMF records to create your own CSV files. The building blocks are familiar and relatively simple, but there are lots of caveats to consider. In this session, Cheryl Watson provides advice on the gotchas to watch out for before you dive in the deep end. This is a follow-on to session 104137 from yesterday.

Introduction

Thank you for coming.

Who are we?

- Cheryl Watson, President of Watson & Walker Inc. since 1986, working on IBM mainframes since 1965
- Frank Kyne, Editor and Technical Consultant since 2014, worked with IBM, most recently in ITSO for 28 years
- We publish Cheryl Watson's Tuning Letter (since 1991)
- We teach classes, consult, and have three software products: BoxScore, BoxScore II, GoalTender
- Our latest SCRTPro Service Offering processes SCRT reports and helps to control your IBM Software costs
- z/OS evangelists, Subject Matter Experts in Software pricing, Parallel Sysplex, and Workload Manager.
- For another session, see session z104139 tomorrow – *The Watson & Walker zRoadshow*

What we are going to talk about today:

- Container Pricing – so easy, even Frank can do it!

Feel free to ask questions and make this session as interactive as possible.



Container Pricing

Introduction

- This session is for the system programmer who is lucky enough to implement this or the pricing person who gets to review the SCRT reports.
- Or the capacity planning or performance analysts who need to understand if containers can be controlled.
- Or the managers who need to understand it all.
- You lucky dogs you!

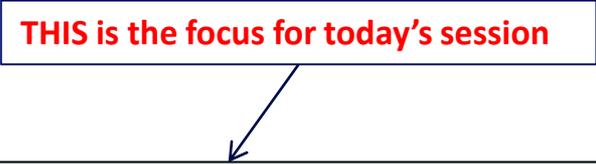
Container Pricing

Some very important points before we get into details about Container Pricing:

- Container Pricing has **NOTHING** to do with Docker Containers!
- Most existing pricing options deliver savings by reducing the number of MSUs that your bill is based on.
- Two of the three currently-announced Container Pricing “Solutions” involve fixed costs for the Solution.
- In some scenarios, the Container Pricing Solution will be the most cost effective (or the most attractive for some other reason). In other scenarios, one of the existing pricing options might be the most cost-effective.
- IBM has not withdrawn the existing pricing options – Container Pricing gives you a *additional* choices.
- In order to select the best option, you **must** understand the basics of software pricing and the Rolling 4 Hour Average.

Container Pricing

THIS is the focus for today's session



There are **two** parts to Container Pricing:

- Set of infrastructure enhancements that will enable simpler and far more flexible software pricing on z:
 - The enhancements are intended to let you add new workloads to a z/OS environment with “no” impact on the MLC cost of the existing z/OS applications.
 - Over the longer term, the enhancements will enable software billing based on many different metrics, not just peak R4HA.
- New pricing options, called ‘Solutions’, that exploit the infrastructure.
 - Three Solutions are available since December 2017.
 - We described them in Session z104137 yesterday.

Container Pricing

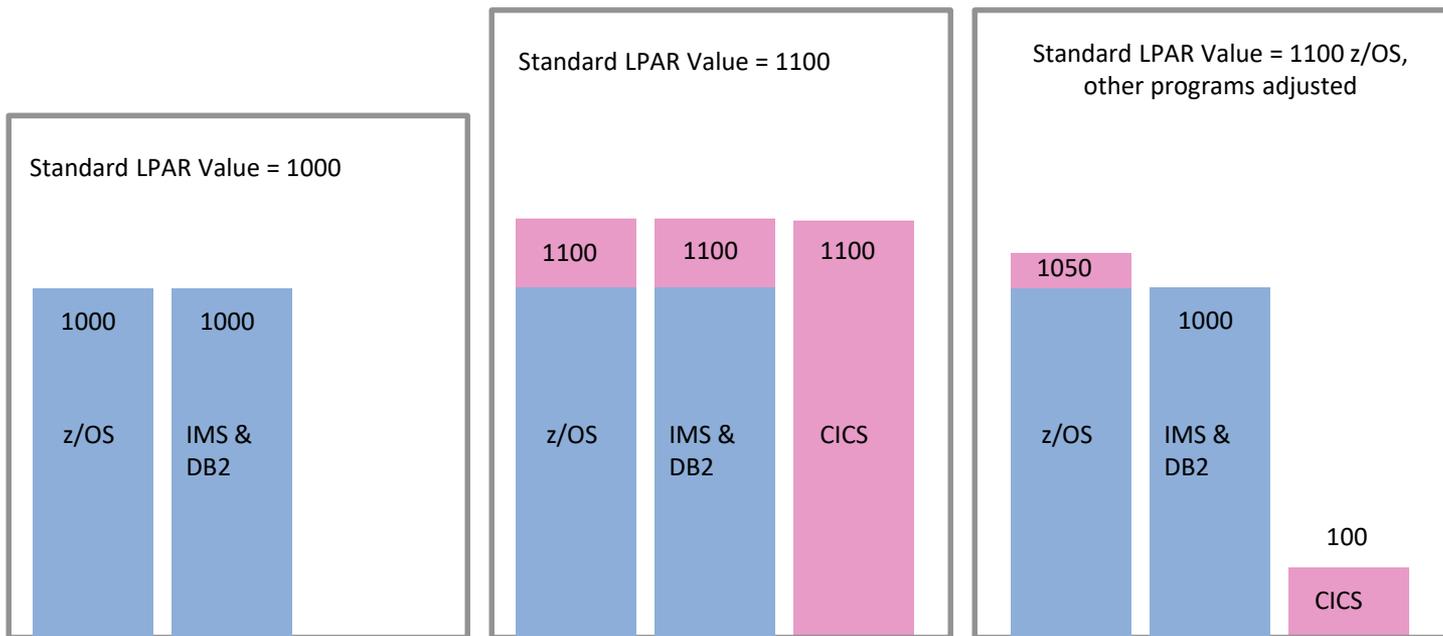
At the time of writing, IBM has announced three Container Pricing based Solutions:

- Application Dev/Test Solution ([217-490](#), [218-324](#))
- New Application Solution
 - Using R4HA ([217-519](#))
 - Using Solution Consumption License Charges (SCLC) ([218-325](#))
- Payments Processing Solution ([217-518](#))

There are also rumors that more Solutions are on the way.

What is Collocated?

Example of zCAP or container pricing application that is the first user of CICS in an IMS/DB2 shop (assumes all products have peak R4HA at same time).



Container Pricing

Now back to
the
infrastructure.
There are a
number of
objectives:

- Get the *system* to associate work with a pricing option, gather information about the resource consumption of the work and save it to SMF, pass that to SCRT, and have SCRT deduct that capacity from the total R4HA.
- Make it easier to define the qualifying workload to WLM.
- Make it easier to associate a given workload with a particular pricing option.
- Give customers the option to place the application in its own LPAR, *or* in shared LPARs, *or* in both.
- Allow the customer to limit the resource consumption of the new workload.

Container Pricing

How does
it achieve
these
wondrous
things?

- IT DEPENDS! (Remember that more flexibility usually results in more complexity).
- If the workload is running in a dedicated LPAR, you simply associate the Solution ID with that LPAR using SCRT control statements.
- IF the workload is collocated with other work (shared LPAR), then you use the new z/OS infrastructure enhancements that have been added for Container Pricing support.
- **NOTE:** Use of the new WLM constructs is **ONLY** required for collocated applications.

Container Pricing

What is a Container?

- This is purely a pricing construct. It is the set of TRGs and dedicated LPARs that have the same Solution ID.
- It is used mainly in SCRT:
 - For dedicated LPARs, to assign the Solution ID associated with that LPAR.
 - For all Solutions, to assign a name that is a little more user-friendly than the 64-byte Solution ID.
 - In SCRT Report sections that are related to Solutions (SCRT uses the term 'Containers' rather than 'Solutions').

Container Pricing

What is a Container?

- The container is the z/OS representation of the Solution. The combined R4HA of the TRGs AND the dedicated LPAR(s) (where appropriate) in the Container represents the CPU consumption of the workloads in the Solution.
- The Solution will have an agreed size (specified in the contract with IBM). If the Container peak R4HA exceeds that size, additional charges will be applied.
- You can define a cap for each TRG, but there is no way to specify a cap at the container level (assuming that there are multiple TRGs in the container).

Tenant Resource Groups

Tenant Resource Groups

- Tenant Resource Groups (TRGs) and Tenant Resource Classes (TRCs) provide the ability to run a container or part of a container without a dedicated LPAR.
- But TRGs can be combined with LPARs in a single container.

Tenant Resource Groups

How does
it achieve
these
wondrous
things?

- All the definition, tracking, and gathering for collocated applications is consolidated into WLM – this is becoming the focal point for software pricing controls as well as performance controls.
- Objective is that you define the work *once* in WLM, and everything after that (all the way through to sending the information to IBM) happens with minimal intervention.
- To provide this, WLM ([OA52312](#)), SMF ([OA53033](#)), RMF ([OA52694](#)), SDSF ([PI82528](#)), SCRT 25.2 (now a component of z/OS 2.3), and z/OSMF ([PI89361](#) & [PI89935](#)) have all been updated to support Container Pricing.
- SCRT 26.1 (available on 10/10/2018) is needed for the newest features, and required starting with all runs from now on!

Tenant Resource Groups

Tenant Resource Groups (TRGs)

- Tenant Resource Groups (TRG) (think traditional WLM Resource Groups with a few new frills). These are used to track resource usage by qualifying work.
- Even though we are used to using Resource Groups as a way to limit the capacity used by some workload, it is NOT necessary to cap a TRG. It is just a mechanism for tracking the resource consumption of all the work in that TRG.
- When you define a TRG to WLM, you MUST specify a 'Solution ID' that you get from IBM if you want to test this capability or if you have signed a Solution contract. The Solution ID is uniquely associated with a specific Solution in your company. The Solution ID is like a tag that can be used to identify which Solution used how much CPU time.

Tenant Resource Groups

Tenant Resource Groups (TRGs)

- While you *can* have multiple TRGs associated with a single Solution, this is not necessary unless you want to use capping and don't want to cap all parts of the Solution.
- The SMF type 70 record has new Tenant Resource Group data sections, 1 per TRG – this information comes from a new IWM4QTNT WLM interface. The new section contains most of the info from the TRG definition, plus SUs for zAAP, zIIP, and GCPs, plus the GCP R4HA MSUs for that TRG.
- RMF PP Reporting on TRGs is based on the existing WLM Resource Groups reporting. The RMF Overview reports have been enhanced to support the new Type 70 fields.

Tenant Resource Groups

```
Tenant-Resource-Group  Notes  Options  Help
-----
                                Create a Tenant Resource Group
Command ==> _____

Enter or change the following information:

Tenant Resource Group Name  TESTTRG_  (required)
Description . . . . . Test TRG
Tenant ID . . . . . _____
Tenant Name . . . . . _____
Solution ID . . . . . _____
D9F4555-114E99A-2BE9DC541E-4D5664C9-409A-4AA8-9D47-7B017E-10A2DF

Define Capacity: 4  1. In Service Units (Sysplex Scope)
                   2. As Percentage of the LPAR share (System Scope)
                   3. As a Number of CPs times 100 (System Scope)
                   4. In accounted workload MSU (Sysplex Scope)
Maximum Capacity . . . . . 30
Include Specialty Processor Consumption NO  (YES or NO)

Selection List empty. Define a Tenant Resource Group. (IWMAM530)
```

Tenant Resource Groups

Tenant Report Classes (TRC)

- Traditionally, work is assigned to a WLM Resource Group indirectly – the service class is assigned to the RG, and work is assigned to the Service Class.
- This would not work for Solutions because single address spaces (DB2DBM1, for example) can be shared between your traditional workloads AND by work in the Solution. If you assigned the Service Class to the TRG, you would pick up more work than is qualified.
- To get around this, IBM created Tenant Report Classes (TRCs). A TRC is associated with one, and only one, TRG.
- Work is assigned to the TRC using the WLM classification rules.

Tenant Resource Groups

```
Tenant-Report-Class  Notes  Options  Help
-----
Create a Tenant Report Class

Command ==> _____

Enter or change the following information:

Tenant Report Class Name . . . . TESTTRC_ (Required)
Description . . . . . Tenant Report Class for testing_

Tenant Resource Group Name . . . . TESTTRG_ (Required; name or ?)
```

Tenant Report Class MUST be assigned to a TRG

```
Press EXIT to save your changes or CANCEL to discard them. (IWMAM970)
```

Tenant Resource Groups

```
Subsystem-Type  Xref  Notes  Options  Help
-----
Modify Rules for the Subsystem Type          Row 1 to 1 of 1
Command ==> _____ Scroll ==> PAGE

Subsystem Type . : STC          Fold qualifier names?  Y  (Y or N)
Description . . . Started Tasks

Action codes:   A=After      C=Copy      M=Move      I=Insert rule
                B=Before     D=Delete row R=Repeat   IS=Insert Sub-rule
                                           More ==>

-----Qualifier-----
Action  Type      Name      Start
-----Class-----
                Service      Report

DEFAULTS:
_____ 1 TN          FPKCP1  _____  SYSSTC      IESTTRC
***** BOTTOM OF DATA *****

Reuses existing Report Class code in WLM – an address space can't
have both a traditional Report Class AND a Tenant Report Class

Press EXIT to save your changes or CANCEL to discard them. (IWMAM970)
```

Tenant Resource Groups

There is generally no need to create new WLM service classes for the Solution workload

- Remember the RoT to have not > 30 active service class periods in a system.
- We were concerned that potentially having a subset of the work in a service class capped (if you cap the associated TRG) could cause a problem. To avoid potential performance issues, we recommend splitting off a new service class IF you have work that you will assign to a heavily capped TRG.

Tenant Resource Groups

There is generally no need to create new WLM service classes for the Solution workload

- Service classes that are assigned to a traditional WLM Resource Group must not contain work that is assigned to a TRC.
- You can specify an upper limit (cap) for a TRG, but not a minimum limit.
- IBM recommends that you avoid capping a TRG unless it is really necessary.
- You can also specify a memory limit for TRGs. See Dieter Wellerdiek's session 103487 WLM Update from Monday for information on this feature.

Container Pricing Considerations

Considerations for TRCs

- Work can only be assigned to a TRC at the address space or independent enclave level.
 - This means that you cannot use shared CICS regions with Solutions.
 - On the other hand, if it is worth going to the trouble to get the application qualified, then it is probably large enough to justify its own region(s).
 - This has the added benefit that *all* of the CICS processing, including the 'overhead' associated with those transactions, is included in the container.

Container Pricing Considerations

Considerations for TRCs

- You should get confirmation from IBM as to which WLM subsystem types can be assigned to a TRC.
- IBM recommends having a different TRC for each service class that has work in the container.
- Never EVER classify heterogeneous work to the same TRC. If you try to do this, WLM will issue a warning message, but you *can* ignore that and proceed – but DON'T!

Tenant Resource Groups

RMF considerations

- TRGs and RGs are reported in the same RMF report, so use Descriptions that make it easier to identify the TRGs...

RESOURCE GROUPS			---CPU CONSUMPTION---			-----CPU CAPACITY-----			----MEMORY----	
--NAME--	-----DESCRIPTION-----	-SYSTEM-	#CPS	MSU	SU/SEC	MIN	MAX	DEFINED AS	USAGE	LIMIT
BATCHVEL	Velocity and resptime batch work	SYSD	0.63	71	50K	0	1000K			
		SYSE	0.01	1	472				132M	20G
	-----SERVICE CLASSES									
		HOTBAT	0.62	70	49K				190M	
		PRBBAT	0.00	0	69					
		TSTBAT	0.62	70	49K					
			0.01	1	783					
REGTSO	Non-priority TSO work	SYSE	0.23	27	19K*	3.33		NUMBER OF CPs	764M	4G
	-----SERVICE CLASSES									
		HOTTSO	0.23	27	19K					
			0.23	27	19K					
TRGCLLOUD	Tenant Resource Group for Cloud	SYSD	0.87	101	71K	500		MSU		
		SYSE	0.29	34	24K				1340K	
	-----REPORT CLASSES								6208K	
		CLOUD001	0.58	67	47K					
		CLOUD002	0.36	42	29K					
			0.51	59	42K					

Tenant Resource Groups

SCRT Considerations:

- Now that you have everything set up, the information is saved in the new TRG sections of the SMF 70.1 and 89 records, and then processed by SCRT.
- SCRT contains a number of new reports specifically in support of Container Pricing

```
==Q7=====
Container Product Grid Snapshot
```

Product Name	Product ID	SYS1 TGCICS21	SYS2 TGCICS21	SYS4 TGCICS21	SYS5 TGCICS21
z/OS V2	5650-Z0S	0.60%	0.60%	0.60%	0.60%
CICS TS for z/OS V5	5655-Y04	0.60%	0.60%	0.60%	0.60%

- New Q7 section reports on which products were used in which TRGs. This can be used to help you verify that your understanding of which products are being used in each TRG is accurate.

Tenant Resource Groups

SCRT Considerations:

- The T4 report shows the Container Max Contributors for the container shown on the last line – CPS1 in this example.
- This report shows that TRG TGCICS21 was active in 4 LPARs, however it only consumed enough capacity in the SYS1 LPAR to make a contribution to the LPARs R4HA.

==T4=====

CONTAINER MAX CONTRIBUTORS

	TRG	Highest	Date/Time	Contribution to Highest
SYS2	TGCICS21			0
SYS4	TGCICS21			0
SYS1	TGCICS21			14
SYS5	TGCICS21			0

CPS1 14 25 Sep 2017 - 15:00

Tenant Resource Groups

SCRT Considerations:

- The final report shows the total MSUs consumed by each TRG in each LPAR over the reporting period. Note that this is the total, not the peak. SCLC (available 11/23/2018 will use consumed MSUs).

```
==T6=====
CONTAINER MSU CONSUMPTION CONTRIBUTORS

CPS1      Z194E15-#####-#####-#####-####-####-####-#####-#####

          TRG          Contribution to Total Consumed

LPAR1     TRG1          26712
LPAR1     TRG2          48081
LPAR1     TRG3          16027
LPAR2     TRG4          29383
LPAR2     TRG5          48081
LPAR3     *           16027

CPS1          184311
```

MSU Consumption



SCLC

- Announced last week - NewApp container Solution Consumption License Charge (SCLC) for new applications to z/OS.
- Not based on R4HA, but on total MSUs consumed during the month
- There are two versions: pay-as-you-go (love it!) and committed baseline with discount

MSU Consumption

- SCRT Considerations:
 - In SCRT 25.3.1, new N7 section with Total MSU consumed by LPAR.

==N7=====				
DETAIL LPAR USAGE DATA SECTION				
	Total MSU Consumed	Peak Hour Consumption	Date/Time	OS
LPAR1	300		3 02 Aug 2018 - 02:00	z/OS
LPAR2	500		6 04 Aug 2018 - 04:00	z/OS
LPAR3	400		2 06 Aug 2018 - 06:00	z/OS
CPC	1200		6 04 Aug 2018 - 04:00	

MSU Consumption

- SCRT Considerations:
 - In SCRT 26.1.0, new V6 section with Missing Minutes; added z/OS to N7 session.

==V6=====				
SUB-HOUR DATA COLLECTION DETAILS - MINUTES MISSING				
Date/Time	LPAR1	LPAR2	LPAR3	
05 Aug 2018 -	10		0	0
07 Aug 2018 --			10	0
21 Aug 2018 --			20	0
22 Aug 2018 --			0	10

Container Pricing Considerations



Things To
Think About

Container Pricing Considerations

Resource Group capping

- If you want to cap the Solution, remember that the Container size is based on the Rolling 4-Hour Average, but the Resource Group caps (both traditional Resource Groups and Tenant Resource Groups) are based on rolling 60-second intervals.
- Even the new type 4 MSU caps are based on these 60-second intervals.

Container Pricing Considerations

Resource Group capping

- Effectively, Resource Group caps behave in a similar way to absolute caps. If you set the Resource Group cap to the same value as the Container size, it is unlikely that the Container R4HA will ever reach the agreed Container size, unless it is CPU bound for a long time.

Container Pricing Considerations

Effects of Collocation

- Even though Container Pricing allows both dedicated and collocated options, there are some things to remember about the collocated option:
 - Adding work to an LPAR *will* generate more work for system components – for example, Master, SMF, XCF, GRS, Catalog, batch scheduler, JES, etc. It is not possible to apportion out the system work caused by the Container workload back to the TRGs.
 - Similarly, while DB2 charges back most of its CPU time to requesters of its services, about 20% remains in DB2. If the DB2 is shared between a new Solution and traditional applications, the subsystem cannot be assigned to a TRG.

Container Pricing Considerations

Effects of Collocation

- Therefore, adding collocated work to an LPAR *will* result in some increase in MSUs for the traditional part of the system.
- Additionally, IBM's guidance is that every 10% increase in physical CPC utilization results in an increase of between 3% and 5% in the CPU consumption of work running in that system. This applies regardless of whether the new workload is collocated or in its own LPAR – it is a result of running more work on the same CPC.

Container Pricing

Summary

- You CAN get started with Container Pricing without making any changes in WLM if the workload will run in dedicated LPARs.
- In parallel with that, it would be a good idea to set up some 'dummy' TRGs, just to get experience with this new capability.
- IBM has provided a set of sample Solution IDs that can be used for testing. For more information about the sample Solution IDs, see <https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=ZSL03543USEN&>
- Make sure that you use the IGNORE CONTAINER statement to exclude the impact of test Solution IDs before sending the SCRT file to IBM

Container Pricing

Summary

- IBM is putting a lot of time and money into this initiative – this is not just yet another pricing option.
- This is a little like z/OSMF – it will grow in function and pervasiveness over time, so don't ignore it.
- The infrastructure changes are long overdue, but will enable many different pricing models in the future and also make it easier to exploit the available options.
- IBM has not yet removed any of the previously-available pricing options, so you currently have fixed price and variable price options - one of them can very likely save you money.

Container Pricing

Summary

- It is not possible to make a blanket statement about which is the best option – it really does depend on many variables specific to your environment and software stack, so you need to evaluate the options using *your* numbers and projections for the future.
- Review our z104137 session from yesterday for more information about the different types of options.

Container Pricing

For more information about Container Pricing, refer to:

- Announcement letters:
- Container Pricing preview - [117-044](#).
- Application Development and Test Solution - [217-490](#).
- New Application Solution - [217-519](#).
- Payments Processing Solution - [217-518](#).
- Application Development and Test Solution Update - [218-324](#).
- New Application Solution Consumption License Charges (SCLC) - [218-325](#).
- Container Pricing White Paper [WP102719](#).
- [List of sample Solution IDs](#)
- [SCRT User's Guide](#)
- SHARE in Sacramento Session [22548](#), *Container Pricing Overview and Sub-Capacity Reporting*, by **Andrew Sica**.
- *Cheryl Watson's Tuning Letter 2018 No. 1*



Summary

We think that about 90% of our clients will be using containers at some point in their future. You can learn it now or learn it later.

Please complete the session survey!

Z104138

