
Is My z/VM System Full?

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Abstract

From time to time customers ask us whether their z/VM systems are "full." In other words, can the system absorb any more work? Does it have any capacity remaining? Could I do more with my system without adding hardware?

Answering this question requires looking at the capacity and utilization of each of a number of different physical resource types. For example, how much processor capacity is there, and how utilized is it? The same questions can be asked about memory, I/O, networking, and ISFC links.

In this presentation we use z/VM Performance Toolkit ("Perfkit") screens to explore systems' capacities and utilizations in a number of different categories of resource. Sample screen shots illustrate which Perfkit screens to consult, which columns are especially helpful, and what values in those columns represent "full."

Agenda

- What does “full” mean?
- Full on processors
- Full on memory
- Full on I/O
- Full on networking
- Full on CTCs and ISFC (SSI) links
- Summary

What Does “Full” Mean?

Some Various Meanings of “Full”

- Cores and processors
 - Is the physical machine full?
 - Is a physical type-pool full?
 - Is my partition full?
 - Is a guest full?
- Memory
 - Is central memory full?
 - Is the paging space full?
 - Are the paging devices keeping up?
 - Are we out of SXS space?
 - Is a particular guest full?
- I/O
 - Is an I/O device full?
 - Is a chpid full?
 - Is dump space full?
 - Is spool space full?
 - Is T-disk space full?
- Networking
 - Is a network adapter full?
 - Is the z/VM TCP/IP stack CPU-bound?
 - Are the SSL servers CPU-bound?
- ISFC
 - Is a CTC full?
 - Is an ISFC logical link full?

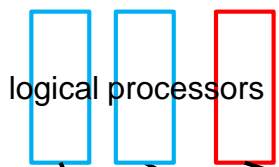
Are My Processors Full?

Vocabulary

A non-SMT partition has **logical processors**.

PR/SM dispatches them **alone** on physical cores.

The other half of the physical core goes unused.

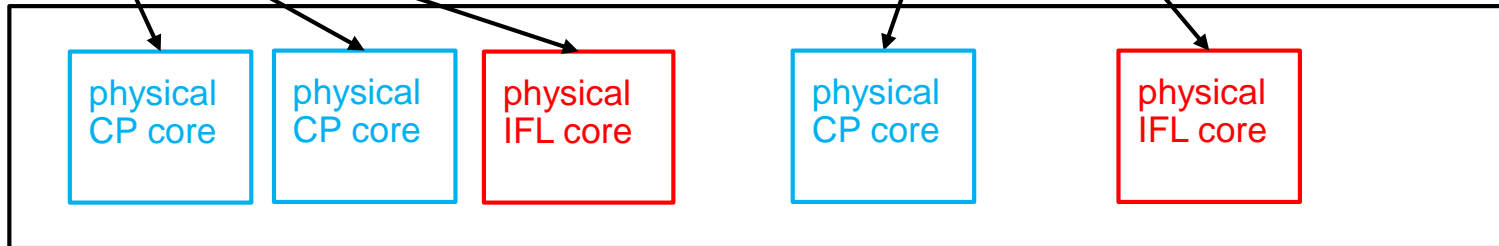
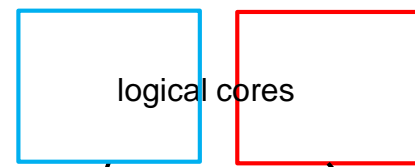


An SMT-enabled partition has **logical cores**.

At SMT-1 each logical core has one logical processor.

At SMT-2, in z/VM the logical IFL cores have two logical processors and all other types of logical cores have one logical processor.

PR/SM dispatches logical cores on physical cores.



The machine has **physical cores**.
Each physical core contains two **physical processors**.

Do Not Let The Support Element (SE) Confuse You

M73: Primary Support Element Workplace (Version 2.14.1) - Mozilla Firefox

https://9.12.16.138/hmc/connects/mainuiFrameset.jsp

IBM Support Element

Home Customize/Delete Activati... [X]

Customize Image Profiles: MPRF1 : MPRF1 : Processor

- MPRF1
 - MPRF1
 - General
 - Processor**
 - Security
 - Storage
 - Options
 - Load
 - Crypto

Group Name <Not Assigned>

Logical Processor Assignment

- Dedicated central processors
- Dedicated integrated facility for Linux
- Not dedicated central processors
- Not dedicated integrated facility for Linux

Not Dedicated Processor Details

Initial processing weight 1 to 999 Initial capping

Enable workload manager

Minimum processing weight

Maximum processing weight

Absolute Capping None

Number of processors (0.01 to 255.0)

Number of processors - Initial Reserved

On this screen you are working with CORES.

Different Ways We Run Out of “Processor”

Situation	Core or Processor?	Primary indicators	Secondary indicators
The CPC has no more power to give.	core	FCX302 PHYSLOG	FCX239 PROCSUM Diag 9C FCX304 PRCLOG %Susp FCX299 PUCFGLOG
Our partition is being dispatched by PR/SM as much as it can be.	core	FCX126 LPAR	
All our logical processors are full.	processor	FCX304 PRCLOG	FCX104 PRIVOP Diag x'44' FCX104 PRIVOP Diag x'9C' FCX164 USTATLOG FCX114 USTAT FCX315 USTMPLOG FCX225 SYSSUMLG
A guest is running completely busy.	processor	FCX112 USER FCX162 USERLOG FCX288 USRMPLOG	

Processor: Is the CPC Full? (Core-busy)

1FCX302 Run 2019/03/20 13:15:32

PHYSLOG
Real Core Utilization Log

From 2019/03/11 06:52:16

To 2019/03/11 07:12:16

For 1200 Secs 00:20:00

Result of 2U0C021D Run

Interval	<PhCore>	Shrd	Total								
End Time	Type	Conf	Ded	Log.	Weight	%Lgc1C	%Ovrhd	LCoT/L	%LPmgt	%Total	TypeT/L
>>Mean>>	CP	80	0	467	210	1963.8	54.650	1.028	58.987	2077.4	1.058
>>Mean>>	IFL	81	0	417	350	7212.3	33.116	1.005	56.743	7302.2	1.012
>>Mean>>	ICF	4	0	1	10	.044	.010	1.235	2.696	2.750	62.935
>>Mean>>	ZIIP	4	0	1	10	.007	.006	1.889	.012	.024	3.629
>>Mean>>	>Sum	170	0	886	580	9176.2	87.782	1.010	118.44	9382.4	1.022

FCX302 PHYSLOG shows core-busy in each physical type pool.

“Full” = (%Total / 100) is close to Conf.

In this example, the IFL pool is closing in on full.

Processor: Dispatch of Our Own Partition (Core-busy)

1FCX126 Run 2019/03/20 13:15:32

LPAR
Logical Partition Activity

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D Run

LPAR Data, Collected in Partition MSTL1

Processor type and model : 3906-M05
Nr. of configured partitions: 30
Nr. of physical cores : 170
Dispatch interval (msec) : dynamic

<I have removed a lot of stuff>

Partition	Nr.	Upid	#Core	weight	wait-C	Cap	%Load	CID	%Busy	%Ovhd	---	---	---	Type
MSTL1	7	29	80	60	NO	NO	37.1	0	47.6	.2	---	---	---	IFL
				60		NO	...	1	48.2	.2	---	---	---	IFL
				60		NO	...	2	48.5	.1	---	---	---	IFL
				60		NO	...	3	48.4	.1	---	---	---	IFL
				60		NO	...	4	48.4	.1	---	---	---	IFL
				60		NO	...	5	48.3	.1	---	---	---	IFL
				60		NO	...	6	97.1	.2	---	---	---	IFL
				60		NO	...	7	48.3	.1	---	---	---	IFL

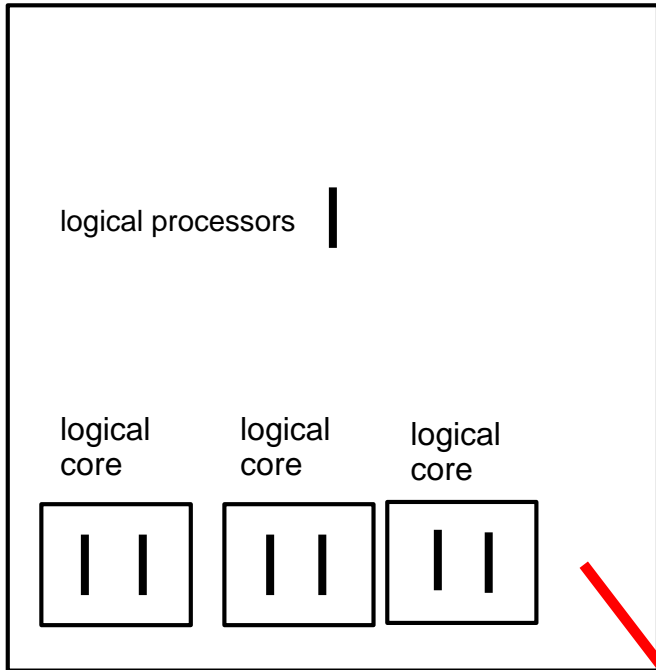
FCX126 LPAR shows the core-busy of each of our logical cores.

“Full” = %Busy+%Ovhd is approaching 100% for each logical core.

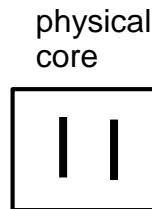
Exception: dedicated LPARs: unparked cores 100%, parked cores < 100%.

Processor: "Core Dispatch" and Core-Busy vs. Processor-Busy

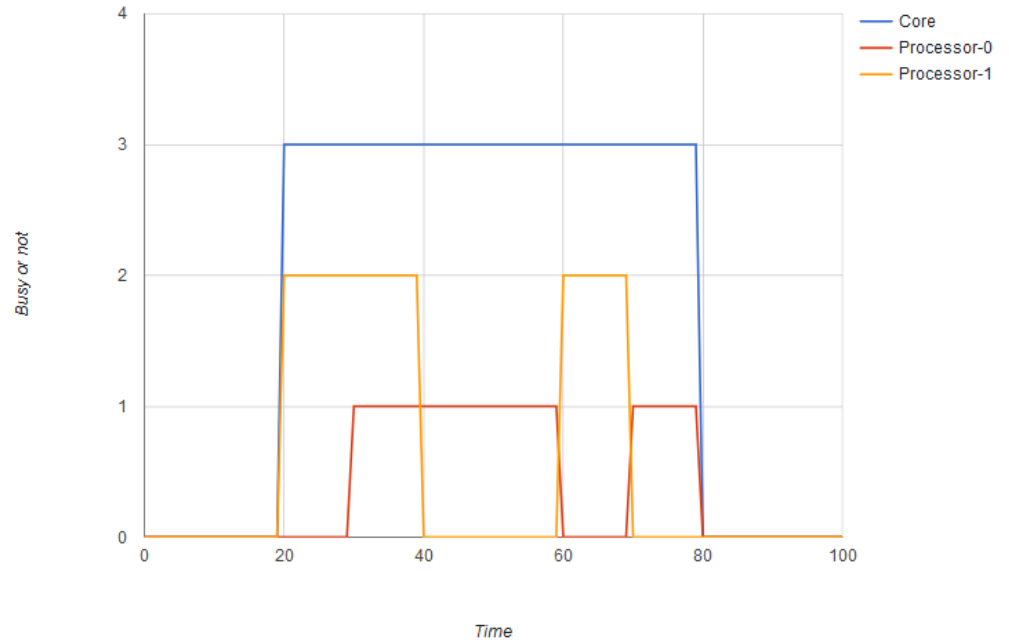
GDLMPRF1 SMT-2



PR/SM dispatches logical core onto physical core



Example 1: Logical Processor Busy as f(time)



(The heights are meaningless; it's just 0=idle or >0=busy)

During the time a logical core is dispatched, its logical processors can run and wait independently. This concept is very important in SMT-2 deployments. Check it out:

<http://www.vm.ibm.com/perf/tips/smtutil.html>

Reports: Core-Busy Reports vs. Processor-Busy Reports

Core-Busy Reports

- FCX302 PHYSLOG
- FCX126 LPAR
- FCX202 LPARLOG
- FCX306 LSHARACT
- FCX299 PUCFGLOG

Processor-Busy Reports

- FCX144 PROCLOG
- FCX304 PRCLOG
- FCX225 SYSSUMLG
- FCX112 USER
- FCX162 USERLOG
- FCX288 USRMPLOG

Processor: Logical Processor Busy (Processor-busy)

1FCX304 Run 2019/03/20 13:15:32

PRCLOG

Processor Activity, by Time

From 2019/03/11 06:52:16

To 2019/03/11 07:12:16

For 1200 Secs 00:20:00

Result of 2U0C021D Run

<--- Percent Busy ---->

Interval	C	P	U	Type	PPD	Ent.	DVID	Pct Park	%Susp	Total	User	Syst	Emul
>>Mean>>	0	IFL	vh	100	0000	0	1.6	94.6	82.7	11.9	73.3		
>>Mean>>	1	IFL	vh	100	0001	0	1.0	96.0	87.0	9.0	79.7		
>>Mean>>	2	IFL	vh	100	0002	0	.9	96.7	88.0	8.7	82.2		
>>Mean>>	3	IFL	vh	100	0003	0	.9	96.5	87.8	8.7	81.6		

FCX304 PRCLOG shows the processor-busy of each of our logical processors. “Full” = “Total” approaching 100% for each logical processor.

This is a good time to explain the columns:

- Emul Percent pure guest time
- User Emul + percent induced time in the Control Program (e.g., simulation)
- Syst Percent non-induced Control Program time (e.g., cutting monitor records)
- Total** **User + Syst**
- Park Percent spent parked
- Susp Percent spent suspended (PR/SM simulation or PR/SM dispatch contention)

Breaking Down High FCX304 PRCLOG Busy

Component	What a High Value Means
Emul	The guests are really busy, running their own work. Are they looping?
User – Emul	CP is doing a lot of simulation for the guests. Are the guests heavy on VSWITCH activity? I/O activity? Other stuff CP has to simulate for guests?
Syst	CP is busy doing overhead work it can't charge to specific guests. Is memory really tight? Is z/VM paging a lot?
Susp	Is CP doing stuff PR/SM has to simulate? Host Diag x'9C's, for example? OR, is PHYSLOG showing high physical core utilization? OR, is there a VH/VM/VL configuration problem?
Park	We didn't want to use the core on which that processor resides, so we parked the core.

Processor: Is a Guest Busy? (Processor-busy)

1FCX112 Run 2019/03/20 13:15:32

USER
General User Resource Utilization

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D Run

Userid	CPU Load				virtual IO/s				UR	Pg/s	User Status
	%CPU	TCPUs	VCPUs	T/V Ratio	Total	DASD	Avoid	Diag 98			
WDB00002	175	2102	2095	1.00	.0	.0	.0	.0	.0	296	EME,CL3,DISP
WDB00001	88.4	1061	1056	1.00	.0	.0	.0	.0	.0	3.4	EME,CL3,DISP
LX00002	88.2	1058	1057	1.00	.1	.0	.0	.0	.0	1.0	EME,CL3,DISP
LX00004	88.1	1057	1044	1.01	.1	.0	.0	.0	.0	1.1	EME,CL3,DISP
LXI01629	87.9	1055	1053	1.00	.0	.0	.0	.0	.0	5.0	EME,CL0,DISP

FCX112 USER shows percent-busy by guest. A value of 100% = one processor's worth of power.

This is a good time to explain the columns:

- %CPU Total percent-busy for the guest (100 = one processor's worth of power)
- TCPUs Total CPU seconds consumed (pure-guest plus induced-CP)
- VCPUs Virtual CPU seconds consumed (pure-guest only)
- T/V ratio TCPUs / VCPUs

When could %CPU > 100?

Secondary Indicators We Might Be Full

Column	What It Means
FCX104 PRIVOP diag x'44' diag x'9C'	MP guests are sensing their virtual processors are having difficulty running. There could be lots of reasons: no CPU power available, etc.
FCX239 PROCSUM diag x'9C'	CP is sensing its logical processors are having difficulty running. There could be lots of reasons: no CPU power available, etc.
FCX299 PUCFGLOG LCei > UpCap	CP's workload ceiling estimate is higher than its available power estimate. You probably see parking. The CPC probably does not have enough physical core capacity. OR, there is something wrong with the weight-vs.-cores relationship.
FCX114 USTAT %CPU >> 0	Guests are ready to run but CP is not running them. Is PRCLOG reporting high total busy?
FCX304 PRCLOG %Susp >> 0	CP is sensing its logical processors are having a hard time running. Maybe the type-pool is overworked. OR, maybe CP is doing a lot of things PR/SM has to simulate.

Is My Memory Full?

Different Ways We Run Out of Memory

Situation	Primary indicators	Secondary indicators
We run low on storage < 2 GB.	FCX294 AVLB2GLG	FCX143 PAGELOG
We run low on storage > 2 GB.	FCX295 AVLA2GLG	FCX143 PAGELOG
We run out of System Execution Space (SXS).	FCX261 SXS AVAIL	
We run out of space for page management blocks.	FCX134 DSPACESH	
We run out of memory to use for MDC.	FCX138 MDCACHE FCX178 MDCSTOR	
We run out of paging space.	FCX109 DEVICE CPOWNER	
The paging DASD just can't do any more I/O.	FCX109 DEVICE CPOWNER FCX329 VOLUME FCX327 HPALIAS	
A guest fills its primary address space.	FCX292 UPGUTL FCX290 UPGACT	FCX147 VDISK FCX134 DSPACESH

Memory: Full Below 2 GB Bar?

1FCX294 Run 2019/03/20 13:15:32

AVLB2GLG
Available List Data

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D

Interval	<----- Storage ----->						<--Times-->	
	<Available>	<Requests/s>		<Returns/s>		<-Empty/s->		
End Time	Sing	Cont	Sing	Cont	Sing	Cont	Sing	Cont
>>Mean>>	375K	601K	107K	3291	106K	17033	1.1	.0
06:53:16	240K	780K	116K	5052	121K	23142	.0	.0
06:54:16	188K	832K	122K	6281	126K	27648	.0	.0
06:55:16	272K	748K	86767	4642	97348	17545	.0	.0
06:56:16	304K	716K	93594	3686	98K	16862	.0	.0
06:57:16	412K	608K	115K	4164	124K	17749	.0	.0
06:58:16	376K	644K	109K	2662	108K	14882	.0	.0

These values are AMOUNTS. "601K" = 601 KB free. (aka 150 4-KB frames)

"Times Empty" = request rate at which CP wanted memory < 2 GB and there wasn't any.

SXS pages sometimes need to be backed with < 2 GB frames.
If < 2 GB fills, operations needing SXS < 2 GB will not work.

Memory: Full Above 2 GB Bar?

1FCX295 Run 2019/03/20 13:15:32

AVLA2GLG
Available List Data

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D

Interval	<----- Storage ----->				<--Times-->			
	<Available>	<Requests/s>		<Returns/s>		<-Empty/s->		
End Time	Sing	Cont	Sing	Cont	Sing	Cont	Sing	Cont
>>Mean>>	2422K	4388K	102M	841K	103M	4502K	70.5	.0
06:53:16	1936K	3992K	102M	872K	104M	3980K	91.2	.0
06:54:16	896K	4440K	100M	953K	101M	5731K	68.9	.0
06:55:16	320K	6836K	85M	918K	85M	7394K	46.6	.0
06:56:16	1940K	4912K	91M	1085K	91M	8642K	39.4	.0
06:57:16	1684K	5384K	107M	972K	108M	5173K	44.1	.0
06:58:16	2824K	3760K	95M	807K	97M	3483K	76.4	.0
06:59:16	2920K	4004K	106M	864K	107M	3702K	40.9	.0

These values are AMOUNTS. “4388K” = 4388 KB free. (aka 1097 4-KB frames)

“Times Empty” = request rate at which CP wanted memory > 2 GB and there wasn’t any.

NB: How much central memory is in the partition? FCX103 STORAGE, “Total available”.

Memory: No Room for Page Management Blocks?

1FCX134 Run 2019/03/20 13:15:32

DSPACESH

Shared Data Spaces Paging Activity

From 2019/03/11 06:52:16

To 2019/03/11 07:12:16

For 1200 Secs 00:20:00

Result of 2U0C021D Run

Owning Userid	Data Space Name	Users Permt	Pgstl	Pgrds	Pgwrt	X-rds	X-wrt	X-mig	Total	Resid
>System<	139	0	.110	.860	.220	.000	.000	.000	1011k	27423
SYSTEM	FULL\$TRACK\$CACHE\$1	0	.000	.000	.000	.000	.000	.000	524k	0
SYSTEM	ISFCDATASPACE	0	.000	.000	.000	.000	.000	.000	524k	2
SYSTEM	PTRM000A	0	.097	6.678	.193	.000	.000	.000	1049k	110k
SYSTEM	PTRM000B	0	.598	1.492	1.197	.000	.000	.000	1049k	94833
SYSTEM	PTRM000C	0	.043	.392	.085	.000	.000	.000	1049k	10388

A “page management block” (PGMBK) is a CP-owned data structure involved in DAT mappings.

PGMBKs reside in address spaces called “PTRM spaces”.

CP creates 128 PTRM address spaces for its use.

You can see PTRM stats on FCX134 DSPACESH.

We did relief on this a while back. The probability of running out of PTRM address space is now very small.

Memory: System Execution Space (SXS) Full?

```

1FCX261  Run 2019/03/20 13:15:32          SXS AVAIL
                                           System Execution Space Page Queues Manag
From 2019/03/11 06:52:16
To   2019/03/11 07:12:16
For   1200 Secs 00:20:00                  Result of 2U0C021D Run
  
```

Interval	<-- Backed <2GB Page Queue -->					<-- Backed >2GB Page Queue -->					<----
End Time	Avail	<-Pages/s-->	<Preferred>	Used	Empty	Avail	<-Pages/s-->	<Preferred>	Used	Empty	Avail
>>Mean>>	Pages	Taken	Return	Used	Empty	Pages	Taken	Return	Used	Empty	Pages
>>Mean>>	14	8.634	8.614	8.633	1.113	5	10.63	10.63	10.61	8.559	290391
06:53:16	29	6.367	6.400	6.367	.000	1	10.70	10.70	10.70	9.717	291009
06:54:16	24	6.517	6.433	6.517	.000	1	10.72	10.72	10.72	9.000	291298
06:55:16	26	6.267	6.300	6.267	.000	1	10.22	10.22	10.22	2.300	291085

There are 524,288 ADDRESSABLE PAGES in the SXS. (It's a 2 GB address space.)

These values are in PAGES.

CP backs the SXS with a mix of frames < 2 GB and frames > 2 GB.

What we are really worried about here is "Avail Pages". Those are the SXS pages not yet backed.

This system has plenty of SXS.

Memory: Minidisk Cache (MDC) Full?

```

1FCX178  Run 2019/03/20 13:15:32          MDCSTOR
                                           Minidisk Cache Storage Usage

From 2019/03/11 06:52:16
To   2019/03/11 07:12:16
For   1200 Secs 00:20:00                Result of 2U0C021D Run
  
```

Interval	<----- Main Storage Frames ----->			Min Set	Max Set	Page Del/s	Steal Invokd/s	Bias
	Ideal	<--Actual--> <2GB	>2GB					
>>Mean>>	130224	0	2	0	1049k	27	19.49	1.00
06:53:16	12	0	0	0	1049k	29	19.00	1.00
06:54:16	12	0	12	0	1049k	24	16.08	1.00
06:55:16	12	0	0	0	1049k	27	17.15	1.00
06:56:16	12	0	0	0	1049k	27	17.03	1.00
06:57:16	12	0	0	0	1049k	23	15.37	1.00

FCX178 MDCSTOR discusses memory being used for MDC.

The book [z/VM CP Planning and Admin](#) tells how to plan the memory being used for MDC.

To control the storage used by MDC, use the command CP SET MDCACHE STORAGE.

FCX108 DEVICE shows, per-device, whether MDC is being effective.

FCX112 USER shows, per-user, whether MDC is being effective.

Memory: Is z/VM Paging?

1FCX225 Run 2019/03/20 13:15:32

SYSSUMLG

System Performance Summary by Time

From 2019/03/11 06:52:16

To 2019/03/11 07:12:16

For 1200 Secs 00:20:00

Result of 2U0C021D Run

Interval	<----- CPU ----->				<--Users-->		<---I/O--->		<Stg>	<-Paging-->	
	Pct	<--Ratio-->			On-	Log-	SSCH	DASD	Users	<-Rate/s-->	
End Time	Busy	T/V	User	line	ged	Activ	+RSCH	Resp	in	PGIN+	Read+
>>Mean>>	87.1	1.17	.9266	72.1	297	275	3171	9.1	.0	.0	37061
06:53:16	91.1	1.06	.9662	64.0	297	274	2788	9.0	.0	.0	38476
06:54:16	91.4	1.07	.9656	64.0	297	276	2896	9.8	.0	.0	38149
06:55:16	90.9	1.07	.9676	64.0	297	276	2527	9.0	.0	.0	31193

There are several places to see z/VM paging activity.

- FCX225 SYSSUMLG shows overall paging rate as f(time).
- FCX143 PAGELOG shows a breakdown of kinds of paging, as f(time).
- FCX109 DEVICE CPOWNERD shows paging rate per-paging-volume.

There are also several places to see the activity of the memory manager.

- FCX296 STEALOG shows percent-CPU-busy spent doing frame stealing.
- FCX297 AGELLOG shows activity done managing the global available list.

Memory: Paging Space Full?

1FCX109 Run 2019/03/20 13:15:32

DEVICE CPOWNED
Load and Performance of CP Owned Disks

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 secs 00:20:00

Result of 2U0C021D Run

Page / SPOOL Allocation Summary

PAGE slots available	935899k	SPOOL slots available	71140k
PAGE slot utilization	57%	SPOOL slot utilization	14%
T-Disk space avail. (MB)	.....	DUMP slots available	0
T-Disk space utilization	...%	DUMP slot utilization	..%

< Device Descr. ->						<----- Rate/s ----->					
Addr	Devtyp	Serial	Area	Area	Used	<--Page-->		<--Spool-->		Total	SSCH
			Extent		%	P-Rds	P-Wrt	S-Rds	S-Wrt		+RSCH
D227	3390-A	TMD227	PAGE	11793600	57	247.4	220.8	...	...	468.2	35.5
9756	3390-3	S31P03	PAGE	1-3338	100	17.6	16.3	...	...	33.9	3.0
9762	3390-3	S31P04	PAGE	1-3338	100	18.4	17.5	...	...	35.9	3.5
D210	3390-A	TMD210	PAGE	11793600	57	248.5	220.1	...	...	468.6	35.4
D20B	3390-A	TMD20B	PAGE	11793600	57	246.9	221.8	...	...	468.7	39.1

FCX109 DEVICE CPOWNED discusses how full the paging space is.

The book [z/VM CP Planning and Admin](#) tells how to plan how much paging space you need.

Memory: Paging DASD Just Can't Do Any More, 1 of 3

1FCX109 Run 2020/04/14 11:17:08

DEVICE CPOWNERD
Load and Performance of CP Owned Disks

Page 35

From 2020/04/08 09:34:29
To 2020/04/08 10:01:29
For 1620 Secs 00:27:00

Result of 2U0C913C Run

2U0C913C
CPU 8561-T01 SN DEE58
z/VM V.7.2.0 SLU 0000

Page / SPOOL Allocation Summary			
PAGE slots available	747868k	SPOOL slots available	39847k
PAGE slot utilization	10%	SPOOL slot utilization	53%
T-Disk space avail. (MB)	.....	DUMP slots available	6659940
T-Disk space utilization	...%	DUMP slot utilization	66%

< Device Descr. ->		Rate/s								I/O		Serv		MLOAD		Block		%Used	
Addr	Devtyp	Serial	Type	Area	Area	Used	<---Page--->		<---Spool--->		SSCH	Inter	Queue	Time	Resp	Page	Size	Alloc	for O
				Extent		%	P-Rds	P-Wrt	S-Rds	S-Wrt	Total	+RSCH	feres	Lngth	/Page	Time			M
AC24	3390-A	JMAC24	PAGE	23239440		9	3633	2964	...	...	6596	965.4	0	99.96	1.7	110.5	14	100	T
AC25	3390-A	JMAC25	PAGE	23239440		9	3636	2961	...	...	6597	961.5	0	85.54	1.4	82.9	14	100	T
AC1C	3390-A	JMAC1C	PAGE	23239440		9	3344	2968	...	...	6312	956.4	0	82.11	1.7	51.6	14	100	T
AC1D	3390-A	JMAC1D	PAGE	23239440		9	3363	2962	...	...	6325	956.6	0	81.04	1.7	55.8	14	100	T
AC35	3390-A	JMAC35	PAGE	23239440		9	3240	2963	...	...	6203	1098	0	74.54	1.6	26.9	15	100	T
AC28	3390-A	JMAC28	PAGE	23239440		9	3629	2970	...	...	6598	980.0	0	73.32	1.5	42.2	14	100	T

Here we are looking at column "Queue Lngth".

This is the number of pages (PIOBKs) either waiting or in-flight, read or write. When QL>0, paging I/O is standing in line.

Let's investigate.

Memory: Paging DASD Just Can't Do Any More, 2 of 3

1FCX329 Run 2020/04/21 07:57:36

VOLUME
DASD Volume Performance Report

From 2020/04/08 09:34:29
To 2020/04/08 10:01:32
For 1622 Secs 00:27:02

Result of 2U0C913C Run

<---- Volume ---->		LCU		Mdisk	<----- volume Times (msec) ----->										Req.	Pct	<-Serv-->	
Addr	Label	WA	SSID	T	Links	I/O	AIOR	Pend	Disc	Conn	Serv	Wait	Resp	CUwt	Qued	Busy	Base	Alias
AC1C	JMAC1C	CP	0803	H	0	957	1.77	1.01	.135	1.72	2.87	.260	3.13	1.23	.29	274	1.85	3.44
AC1D	JMAC1D	CP	0803	H	0	957	1.78	1.00	.136	1.70	2.84	.254	3.10	1.21	.30	272	1.86	3.39
AC1E	JMAC1E	CP	0803	H	0	944	1.78	.989	.139	1.75	2.88	.245	3.13	1.26	.33	272	1.87	3.45
AC1F	JMAC1F	CP	0803	H	0	944	1.82	1.00	.140	1.79	2.93	.252	3.19	1.29	.31	277	1.92	3.49
AC20	JMAC20	CP	0803	H	0	950	1.83	1.02	.144	1.80	2.96	.260	3.22	1.30	.29	281	1.93	3.52
AC21	JMAC21	CP	0803	H	0	948	1.87	1.01	.142	1.84	3.00	.256	3.25	1.34	.30	284	1.97	3.55
AC22	JMAC22	CP	0803	H	0	949	1.82	.992	.144	1.79	2.92	.245	3.17	1.29	.30	277	1.92	3.47

FCX329 VOLUME is a recently new Perfkit report.
It tells us how the *volume* is doing, accounting for contributions by aliases.

Here we are looking at column Pct Busy.
We see Pct Busy > 100%.
We are depending upon HyperPAV aliases to accomplish our paging I/O.

Let's check FCX327 HPALIAS for the affected LCU (here, SSID 0803).

Memory: Paging DASD Just Can't Do Any More, 3 of 3

```

1FCX327 Run 2020/04/21 07:57:36          HPALIAS
                                           HyperPAV Alias Activity Data
From 2020/04/08 09:33:39
To   2020/04/08 10:01:32
For   1673 Secs 00:27:53                Result of 2U0C913C Run

```

SSID	Pool	Base	Alias	SYSTEM	Tries	Rate/s	Fail	Low	WhenLow	Available Alias	Extremes	High	WhenHigh
0205	2	16	6	0	0	0	0	...	.....	.....	.....	.....	.....
062B	3	100	156	0	0	0	0	...	.....	.....	.....	.....	.....
0633	4	19	156	0	0	0	0	...	.....	.....	.....	.....	.....
063C	1	60	164	164	0	0	0	...	.....	.....	.....	.....	.....
0803	0	61	195	195	32715.0	15551.6		0	2020/04/08,09:58:32		193	2020/04/08,09:51:30	

FCX327 HPALIAS is a recently new Perfkit report. It tells us how the HyperPAV alias pools, per-LCU resources, are doing.

Here we are looking at column Fails. For the affected LCU we see Fails > 0. We want more help from our HyperPAV aliases than we are getting. **Tip:** check FCX108 DEVICE for the HyperPAV alias devices. 100% busy!

This explains why FCX109 DEVICE CPOWNED shows queueing.

Memory: Is z/VM Demand Scan Completely Busy?

```

1FCX296  Run 2019/03/20 13:15:32          STEALLOG
                                           Frame Steal Statistics, by Ti
From 2019/03/11 06:52:16
To   2019/03/11 07:12:16
For   1200 Secs 00:20:00                Result of 2U0C021D Run
  
```

Interval	Pct Time	Total	Write	Storage/s						
End Time	Actv	Stoln	OnDmd	<--User-->		<-Shared-->		<Pvt Vdisk>		AgeL
>>Mean>>				Inval	Reval	Inval	Reval	Inval	Reval	Reval
06:53:16	77.1	80M	38025	602M	168M	290K	143K	.0	.0	419M
06:54:16	79.7	78M	9284	615M	170M	285K	136K	.0	.0	430M
06:55:16	76.3	64M	.0	560M	146M	234K	105K	.0	.0	404M
06:56:16	79.3	69M	21436	568M	152M	201K	81784	.0	.0	404M
06:57:16	89.0	86M	16248	611M	174M	288K	145K	.0	.0	416M

“Demand scan” is the process of running the CP real memory manager. Demand scan can run on only one logical processor at a time. Thus when it gets to 100% busy (one processor’s worth of power), that’s all it can do.

Memory: Is z/VM Paging a Specific Guest?

```

1FCX290 Run 2019/03/20 13:15:32          UPGACT
                                           User Page Activity

From 2019/03/11 06:52:16
To   2019/03/11 07:12:16
For  1200 Secs 00:20:00                  Result of 2U0C021D Run
  
```

Userid	Stl	Transition/s						Storage		Movement/s		Migrate/s		Nr of Users
		Wt	Inst	Relse	Inval	Reval	Ready	NoRdy	PGIN	PGOUT	Reads	Write	MWrit		Xrel
>>Mean>>	1.0	25707	25327	2056k	2018k	263k	68.0	.0	.0	261k	236k	.0	.0	297
LXI01600	1.0	1601	1601	2935k	2867k	2911k	549.5	0	0	2999k	2832k	0	0	
LXI01601	1.0	4840	3826	3016k	2881k	3102k	617.8	0	0	3137k	3016k	0	0	
LXI01602	1.0	7615	3704	2990k	2884k	3064k	617.8	0	0	3172k	2944k	0	0	
LXI01603	1.0	7209	3017	3013k	2899k	3072k	768.0	0	0	3178k	2969k	0	0	
LXI01604	1.0	832.9	1106	3093k	3268k	3106k	474.5	0	0	3448k	3076k	0	0	

There are several places to see z/VM paging activity per-user. Be careful!

- FCX290 UPGACT – those columns are in units of BYTES per second
- FCX113 UPAGE – those columns are in units of PAGES per second

There are also places to see how z/VM's paging is affecting the guests.

- FCX114 USTAT %PGW – percent of samples where the guest is observed to be in page-wait
- FCX164 USTATLOG, FCX315 USTMPLOG – similar to FCX114 USTAT

Memory: Is a Guest Paging Itself?

1FCX147 Run 2019/03/22 06:50:22

VDISKS

Virtual Disks in Storage: Activity and Paging

From 2019/03/21 17:38:12

To 2019/03/21 17:49:12

For 660 Secs 00:11:00

Result of AP1Z00D Run

Owning	<---- Virtual Disk	----> P	<---- Data Space, Rate per Sec. ---->					<----- Nr of Pages ----->					
Userid	Devno Blocks LINKS	IO/s V	Pgstl	Pgrds	Pgwrt	X-rds	X-wrt	X-mig	Resid	IBR	Lockd	XSTOR	DASD
>System<	.... 4144k 1	.000 -	56.45	.000	56.35	.000	.000	.000	16721	724	0	0	66315
LNSMASTR	2222 4144k 1	.000 N	56.45	.000	56.35	.000	.000	.000	16721	724	0	0	66315

If the guest uses a vdisk for its paging device, check FCX147 VDISKS.

If the guest uses a real disk for its paging device, check FCX108 DEVICE.

Is My I/O Full?

Different Ways We Run Out of I/O

Situation	Primary indicators	Secondary indicators
A device becomes completely busy.	FCX108 DEVICE FCX282 DEVICE HPF	
We run out of HyperPAV aliases in an LCU.	FCX327 HPALIAS	
A FICON or FCP chpid becomes completely busy.	FCX215 FCHANNEL	
An FCP device becomes completely busy.	FCX251 QDIO	
A PCI function becomes completely busy.	FCX381 PCIACT	
An EDEV becomes completely busy.	FCX249 SCSI FCX250 SCSILOG	
A DASD controller runs out of cache.	FCX177 CACHEXT	
A DASD controller becomes completely CPU-busy.	FCX108 DEVICE	
The CPC's I/O processors (SAPs) become completely busy.	FCX232 IOPROCLG	
We run out of SPOOL, DUMP, or T-DISK space.	FCX109 DEVICE COWNED	

I/O: Is Some Device Completely Busy?

```

1FCX108 Run 2019/03/20 13:15:32          DEVICE
                                           General I/O Device Load and Performance

From 2019/03/11 06:52:16
To   2019/03/11 07:12:19
For   1203 Secs 00:20:03

                                           Result of 2U0C021D Run
  
```

<-- Device	Descr. -->	Mdisk	Pa-	<-Rate/s->		<----- Time (msec) ----->						Req.	<Percent>		
Addr	Type	Label/ID	Links	ths	I/O	Avoid	Pend	Disc	Conn	Serv	Resp	CUwt	Qued	Busy	READ
>> All	DASD	<<	....	..	1.6	.0	.120	7.77	1.24	9.12	11.5	.532	.00	1	85
D117	3390-A	TMD117 CP	0	2	28.3	.0	.113	7.26	.242	7.62	7.62	.029	.00	22	89
D109	3390-A	TMD109 CP	0	2	28.2	.0	.112	7.19	.244	7.55	7.56	.026	.00	21	89
D103	3390-A	TMD103 CP	0	2	28.0	.0	.113	7.33	.240	7.68	7.69	.027	.00	22	89
D123	3390-A	TMD123 CP	0	2	27.8	.0	.121	7.40	.235	7.76	7.77	.022	.00	22	89

Device percent-busy: percent of elapsed time the device is busy actually doing I/O

When a device becomes 100% busy, it can't do any more I/Os per second.

If the device is not an ECKD disk, you're stuck.

If the device is an ECKD disk, maybe you can use HyperPAV aliases to do more I/Os per second to the disk *volume*.

I/O: Are We Running Out of HyperPAV Aliases?

```

FCX327 Run 2018/03/14 11:50:50          HPALIAS
                                           HyperPAV Alias Activity Data
From 2016/09/15 08:19:55
To   2016/09/15 08:37:25
For  1050 Secs 00:17:30                "This is a performance report"
  
```

		<-----Counts----->				<---Rate/s--->		<-----Available Alias----->		<-----Extremes----->	
SSID	Pool	Base	Alias	SYSTEM	Tries	Fails	Low	whenLow	High	whenHigh	
0600	0	16	128	4	875.4	763.6	0	2016/09/15,08:30:25	4	2016/09/15,08:30:25	

When Fails >> 0 we might want to correct it somehow:

- Add more aliases?
- Reorganize our data into different LCUs?
- Change how our application behaves?
- Adjust MDC?

There might be other choices.

I/O: QDIO, FICON, or FCP Chpid Completely Busy?

1FCX215 Run 2019/03/20 13:15:32

FCHANNEL
FICON Channel Load

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D Run

```

----- FICON Channel Utilization % -----
<---Total for System --> <-Own Partition-->
Channel      Bus  Work <Data Units>  Work <Data Units>  <--- Transfer rate, byte/s --->
Path         Cycle Units Write  Read  Units Write  Read  <---Total Data--> <---Maximum--->
ID          Shrd  T_BCy T_WUn T_DUW  T_DUR  L_WUn L_DUW  L_DUR  Write/s  Read/s M_Write M_Read
10          Yes   0     0     0     0     0     0     0     0       0       763M  763M
11          Yes   3     5     4     5     1     2     2    29304K  38159K  763M  763M
  
```

Ways a FICON or FCP chpid can fill up:

1. Bus cycles becomes 100%.
2. Work units, whole CEC, becomes 100%.
3. Data units read or written, whole CEC, becomes 100%
4. Work units, the reporting partition, becomes 100%.
5. Data units read or written, the reporting partition, becomes 100%.
6. Data transfer rate, read or written, is close to what the chpid claims it can do.

Cautions.

1. Certain families of FICON/FCP ExpressXX cards have buggy whole-CEC counters.
2. Total Data Write/s and Read/s are based on the whole-CEC counters.

I/O: QDIO or FCP Device Completely Busy?

1FCX251 Run 2019/03/20 13:15:32

QDIO
QDIO Device Activity

From 2019/03/11 06:52:16

To 2019/03/11 07:12:16

For 1200 Secs 00:20:00

Result of 2U0C021D Run

Device	<-Attached-->	QDIO	<Queues>	<----- SIGA Instructions/sec ----->									<----- Data Transfer/sec ----->			
				<-- By Guest --->			<----- By CP ----->						<-- Written ->		<-- Read ----->	
Number	Userid	Vdev	Fmt	In	Out	Gst-r	Gst-w	Gst-s	CP-r	CP-w	CP-s	WBuffer	WBytes	RBuffer	RBytes	
>> All	QDIO	<<	----	---	---	62.61	.000	254.4	.000	70.21	.000	77.96	354915	76.00	616	
1D0D	WDB00002	0253	FCP	1	1	.000	.000	.000	.000	.000	.000	1.393	17091	1.322	0	
1D3C	WDB00001	0253	FCP	1	1	.000	.000	.000	.000	.000	.000	.412	3353	.396	0	

Look for WBytes or RBytes to approach the card's capacity.

Usually I estimate the card's bytes/sec capacity to be its bit capacity / 10.

For example, a 16 Gb/sec (gigabit) FICON card can move about 1.6 GB (gigabytes) / sec.

I/O: EDEV Gets Too Busy

```

1FCX249 Run 2019/03/20 13:15:32          SCSI
                                           SCSI device performance data

From 2019/03/11 06:52:16
To   2019/03/11 07:12:16
For   1200 Secs 00:20:00                Result of 2U0C021D Run
  
```

Device Number	Bytes per block	Trans kByte	Activity/sec fers	Seeks	Read	Written	Percent Connect	EDEV Attr
01FD	512	3	.769	.000	.020	6.133	0	XIV
01FE	512	3	.824	.000	.027	6.567	0	XIV
01FF	512	4	1.049	.000	.007	8.387	0	XIV

Look for percent-connect close to 100. This is the EDEV analogue to FCX108 DEVICE percent-busy.

I/O: DASD Controller Runs Out of Cache

1FCX177 Run 2019/03/20 13:15:32

CACHEXT
Cache Extended Functions Performance

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From 2019/03/11 06:52:16
To 2019/03/11 07:12:19
For 1203 Secs 00:20:03

Result of 2U0C021D Run

2U0C021D
CPU 3906-M05 SN DA1F7
z/VM V.7.1.0 SLU 0000

Device Descr		Stg	C	D	D	Rate/s				Percent																
Addr	Type	VOLSER	ID	C	W	L	ST	Total	Total	Read	Read	Write	Hits		DFW		CFW		DFW		BYP		Time			
				A	F	U		Cache	SCMBK	N-Seq	Seq	FW	Read	Tot	RdHt	Wrt	DFW	CFW	%DFW	%CFW	Norm	%Seq	DeSt	Byps	+ICL	Outs
D218	3390-A	TMD218	0633	A	A	-	00	55.9	40.4	44.4	1.9	9.6	83	55	46	100	100	..	100	0	65	14	38	0	0	
D109	3390-A	TMD109	062B	A	A	-	00	55.7	1046	44.2	1.9	9.6	83	55	46	100	100	..	100	0	65	14	38	0	0	

1FCX176 Run 2019/03/20 13:15:32

CTLUNIT
Cached Control Units Overall Performance

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From 2019/03/11 06:52:16
To 2019/03/11 07:12:19
For 1203 Secs 00:20:03

Result of 2U0C021D Run

2U0C021D
CPU 3906-M05 SN DA1F7
z/VM V.7.1.0 SLU 0000

Sub-system		Cache Size		DASD Load Data				Cache Utilization Data																
ID	Unit	Conf	Avail	NV-Cf	NV-AV	Cache	SCMBK	Busy	Pend	Disc	Conn	Serv	Resp	N-Seq	Seq	FW	Read	%DFW	%CFW	RdHt	Wrt	DFW	CFW	
062B	2107-E8	123	109	4096	4096	2113	5541	46	.138	6.99	1.12	8.25	8.25	1669	70.9	373.1	82	100	0	45	100	100	..	
0633	2107-E8	123	109	4096	4096	2173	1554	15	.120	8.52	1.06	9.70	9.72	1718	71.8	383.3	82	100	0	45	100	100	..	

FCX177 CACHEXT is by-volume.
FCX176 CTLUNIT is by-LCU (control unit).

What we are mostly looking for here is hit rates << 100.

I/O: DASD Controller Becomes Too CPU-Busy

1FCX108 Run 2020/04/21 07:57:36

DEVICE
General I/O Device Load and Performance

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From 2020/04/08 09:34:29
To 2020/04/08 10:01:32
For 1622 Secs 00:27:02

Result of 2U0C913C Run

2U0C913C
CPU 8561-T01 SN DEE58
z/VM V.7.2.0 SLU 0000

<--	Device	Descr.	-->	Mdisk	Pa-	<--Rate/s-->	<-----	Time (msec)	----->	Req.	<Percent>	SEEK	Recov	<--Throttle-->	Devs/						
Addr	Type	Label/ID		Links	ths	I/O	Avoid	Pend	Disc	Conn	Serv	Resp	CUwt	Qued	Busy	READ	Cyls	SSCH	Set/s	Dly/s	SSID
AC1A	3390-A	JMAC1A	..	19	3	126	.0	3.27	.214	2.19	5.68	47.8	.000	5.33	71	100	15267	0	...	...	0803
AC15	3390-A	JMAC15	..	19	3	125	.0	3.28	.214	2.19	5.68	47.7	.000	5.26	71	100	15211	0	...	...	0803
AC17	3390-A	JMAC17	..	19	3	124	.0	3.31	.216	2.20	5.73	48.5	.000	5.36	71	100	15268	0	...	...	0803
AC1B	3390-A	JMAC1B	..	19	3	124	.0	3.32	.216	2.22	5.75	48.4	.000	5.29	71	100	15143	0	...	...	0803
AC18	3390-A	JMAC18	..	19	3	123	.0	3.33	.214	2.21	5.75	48.9	.000	5.42	71	100	15172	0	...	...	0803
AC16	3390-A	JMAC16	..	19	3	123	.0	3.34	.213	2.21	5.76	48.6	.000	5.34	71	100	15199	0	...	...	0803
AC19	3390-A	JMAC19	..	19	3	122	.0	3.35	.218	2.21	5.78	48.7	.000	5.27	71	100	15311	0	...	...	0803
AC0F	3390-A	JMAC0F	..	19	3	120	.0	3.43	.216	2.19	5.84	48.8	.000	5.25	70	100	15094	0	...	...	0803

No field in monitor or Perfkit directly reports the CPU-busy of the DASD control unit.

The only indication or clue we have is when Pend >> 0.

Pend is the time from when the host sends the I/O to when the host receives the control unit's initial response (IR).

When the control unit is experiencing high CPU-busy, it can take a while for the control unit to send IR.

There are other reasons Pend will elevate.

In general, any Pend >>0 is bad.

I/O: System Assist Processors (SAPs) Busy?

1FCX232 Run 2019/03/20 13:15:32

IOPROCLG
I/O Processor Activity by Time

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 Secs 00:20:00

Result of 2U0C021D Run

Interval	Proc	<-Activity/Sec-->		Proc	<- Busy conditions per SSCH ->			
End Time	Number	Beg_SSCH	I/O_Int	%Busy	Channel	Switch	CU	Device
>>Mean>>	0	325.1	653.8	1.965	.000	.000	.000	.000
>>Mean>>	1	325.0	3.2	1.958	.000	.000	.000	.000
>>Mean>>	2	325.1	3.5	2.075	.000	.000	.000	.000
>>Mean>>	3	325.0	.0	5.280	.000	.000	.000	.000
>>Mean>>	4	325.0	.0	3.711	.000	.000	.000	.000
>>Mean>>	5	325.1	.1	2.524	.000	.000	.000	.000

The SAPs are the processors where the channel subsystem runs.
 Very rarely will you see a SAP more than a few percent CPU-busy.
 Channel-busy > 0 probably means not enough chpids (paths) to the control unit.
 I have never seen the other three > 0.

I/O: Spool, Dump, T-Disk Full?

1FCX109 Run 2019/03/20 13:15:32

DEVICE CPOWNERD
Load and Performance of CP Owned Disks

From 2019/03/11 06:52:16
To 2019/03/11 07:12:16
For 1200 secs 00:20:00

Result of 2U0C021D Run

Page / SPOOL Allocation Summary

PAGE slots available	935899k	SPOOL slots available	71140k
PAGE slot utilization	57%	SPOOL slot utilization	14%
T-Disk space avail. (MB)	.....	DUMP slots available	0
T-Disk space utilization	...%	DUMP slot utilization	..%

< Device Descr. ->		----- Rate/s -----										
Addr	Devtyp	Serial	Type	Area	Extent	Used	<--Page-->		<--Spool-->		SSCH	
						%	P-Rds	P-Wrt	S-Rds	S-Wrt	Total	+RSCH
D227	3390-A	TMD227	PAGE	11793600		57	247.4	220.8	...	...	468.2	35.5
9756	3390-3	S31P03	PAGE	1-3338		100	17.6	16.3	...	...	33.9	3.0
9762	3390-3	S31P04	PAGE	1-3338		100	18.4	17.5	...	...	35.9	3.5
D210	3390-A	TMD210	PAGE	11793600		57	248.5	220.1	...	...	468.6	35.4
D20B	3390-A	TMD20B	PAGE	11793600		57	246.9	221.8	...	...	468.7	39.1

FCX109 DEVICE CPOWNERD discusses how full these spaces are.

The book z/VM CP Planning and Admin tells how to plan how much you need.

Is My Networking Full?

Different Ways We Run Out of Networking

Situation	Primary indicators	Secondary indicators
We run out of capacity on an OSA chpid	FCX215 FCHANNEL	
We run out of capacity on an OSA device	FCX251 QDIO	
We run out of capacity on a VSWITCH	FCX240 VSWITCH	
Critical guests (e.g., SSL workers) become CPU-bound	FCX112 USER	

Networking: OSA Chpid Full?

```

1FCX215  Run 2019/01/11 16:17:52          FCHANNEL
                                           FICON Channel Load
From 2019/01/11 14:57:27
To   2019/01/11 15:02:27
For   300 Secs 00:05:00                    Result of SRB0111 Run
  
```

----- FICON Channel Utilization % -----												
<-- Total for System --> <-Own Partition-->												
Channel	Path	Bus	Work	<Data	Units>	Work	<Data	Units>	<--- Transfer rate, byte/s --->			
		Cycle	Units	Write	Read	Units	Write	Read	<---Total Data-->	<---Maximum-->		
52	Yes	61	34	93	0	32	93	0	1164M	6001794	1250M	1250M

The card's data bus is 61% busy.
 The card is writing 93% of its stated capacity.

“Total for System” means the whole CPC. (Remember, chpids can be shared across partitions.)
 “Own Partition” means traffic of the reporting partition.

In my experience, max byte rate achievable = (card's stated bit rate / 10) * 0.85 or so.

Networking: OSA Device Full?

```

1FCX251  Run 2019/01/11 16:17:52          QDIO
                                           QDIO Device Activity
From 2019/01/11 14:57:27
To   2019/01/11 15:02:27
For   300 Secs 00:05:00                  Result of SRB0111 Run
  
```

Device <-Attached-->			QDIO	<Queues>		<----- SIGA Instructions/sec ----->						<----- Data Transfer/sec ----->			
Number	Userid	Vdev	Fmt	In	Out	<-- By Guest ---->			<----- By CP ----->			<-- Written ->		<-- Read ----->	
						Gst-r	Gst-w	Gst-s	CP-r	CP-w	CP-s	WBuffer	WBytes	RBuffer	Rbytes
6760	TCPCB1	6760	QDIO	1	1	.000	.000	.000	.000	61058	.000	35858	1176M	9227	5898K

This device is an OSA Express16S, so I would expect about $1.6 \text{ GB/sec} * 0.85 = 1.36 \text{ GB/sec}$ from it.

It's almost full.

Handy tip: Perfkit suffixes: k, m, g are powers of 10; K, M, G are powers of 2.

Networking: Vswitch Full?

1FCX240 Run 2019/01/11 16:17:52

VSWITCH
VSWITCH Activity

From 2019/01/11 14:57:27
To 2019/01/11 15:02:27
For 300 Secs 00:05:00

Result of SRB0111 Run

Addr	Name	Controlr	Q	Time	S	Out	<--- Outbound/s --->			<--- Inbound/s ---->		
			V	Sec	T_Byte	T_Pack	T_Disc	Bytes	<--Packets-->	Bytes	<--Packets-->	R_Disc
>>	System (	5)	<<	8	300	246m	27306	3	820980	12089	0	0
4003	VSWPRF1	DTCVSW1	8	300	0	0	0	0	0	0	0	0
4006	VSWPRF2	DTCVSW2	8	300	0	0	0	0	0	0	0	0
4009	VSWPRF3	DTCVSW1	8	300	0	0	0	0	0	0	0	0
400C	VSWPRF4	DTCVSW2	8	300	0	0	0	0	0	0	0	0
6760	CCBVSU1	TCPCB1	8	300	1228m	137k	14	4105k	60443	0	0	0

This is pretty much an alternate expression of FCX251 QDIO. Observe:

FCX240 VSWITCH: $T_Byte = 1228m = 1228 * 1000000 = 1\,228\,000\,000$

FCX251 QDIO: $Wbytes = 1176M = 1176 * 1048576 = 1\,233\,125\,376$

IIRC the difference is due to what exactly is counted, such as framing bytes.

FCX240 VSWITCH does not count the intra-vswitch traffic. It counts only the uplink port traffic.

Networking: Critical Guests CPU-bound?

1FCX112 Run 2019/02/04 11:31:29

USER
General User Resource Utilization

From 2018/11/12 15:28:36
To 2018/11/12 15:33:06
For 270 Secs 00:04:30

"This is a performance report for SYSTE

Userid	CPU Load				virtual IO/s				UR	Pg/s	User Status
	%CPU	TCPU	VCPU	Ratio	Total	DASD	Avoid	98			
TCPIP	.62	1.687	1.045	1.61	6.2	.1	.0	.0	.0	.0	ESA,CL0,DISP
FTPSERVE	.00	.000	.000	.00	.0	.0	.0	.0	.0	.0	XC, ---,DORM
SSLDCSSM	.00	.005	.005	1.00	.0	.0	.0	.0	.0	.0	ESA,---,DORM
SSL00001	10.1	27.36	27.18	1.01	8.0	.0	.0	.0	.0	.0	ESA,CL0,DISP
SSL00002	.00	.006	.005	1.20	.1	.0	.0	.0	.0	.0	ESA,---,DORM
SSL00003	.00	.006	.005	1.20	.1	.0	.0	.0	.0	.0	ESA,---,DORM
SSL00004	.00	.006	.005	1.20	.1	.0	.0	.0	.0	.0	ESA,---,DORM
SSL00005	.00	.006	.005	1.20	.1	.0	.0	.0	.0	.0	ESA,---,DORM

FCX112 USER illustrates the TCP/IP stack guest, the SSL guests, the FTP guest, etc.

Are My CTCs or ISFC Links Full?

Different Ways We Run Out of CTC

Situation	Primary indicators	Secondary indicators
We run out of bus capacity on a FICON adapter	FCX215 FCHANNEL	
We run out of fiber capacity on a FICON adapter	FCX215 FCHANNEL	
A CTC rdev becomes 100% busy	FCX108 DEVICE	

We have already discussed FCX215 FCHANNEL.

Let's look at FCX108 DEVICE and FCX275 ISFLCONF.

CTCs or ISFC: CTC Full?

1FCX108 Run 2019/03/26 09:58:52

DEVICE
General I/O Device Load and Performance

From 2011/10/14 04:51:43

To 2011/10/14 04:55:43

For 240 Secs 00:04:00

Result of H001709C Run

Addr	Device Type	Descr. Label/ID	Mdisk Links	Pa-ths	<-Rate/s-> I/O	Avoid	<----- Pend	Time (msec) Disc	Conn	Serv	Resp	CUwt	Req. Qued	<Per Busy
6000	CTCA	..... ..	...	1	61.8	...	.507	1.86	13.4	15.8	15.8	.000	.00	98
6001	CTCA	..... ..	...	1	61.7	...	.509	1.85	13.5	15.8	15.8	.000	.00	98
6002	CTCA	..... ..	...	1	61.7	...	.513	1.85	13.5	15.8	15.8	.000	.00	98
6003	CTCA	..... ..	...	1	61.7	...	.516	1.88	13.4	15.8	15.8	.000	.00	98
6020	CTCA	..... ..	...	1	61.5	...	.488	1.85	13.5	15.9	15.9	.000	.00	98
6021	CTCA	..... ..	...	1	61.5	...	.489	1.85	13.5	15.9	15.9	.000	.00	98
6022	CTCA	..... ..	...	1	61.4	...	.494	1.89	13.5	15.9	15.9	.000	.00	98
6023	CTCA	..... ..	...	1	61.3	...	.499	1.87	13.5	15.9	15.9	.000	.00	98
6040	CTCA	..... ..	...	1	171	...	.364	1.99	3.11	5.46	5.46	.000	.00	93
6041	CTCA	..... ..	...	1	170	...	.369	2.01	3.10	5.48	5.48	.000	.00	93
6042	CTCA	..... ..	...	1	.8	...	.310	.142	1.16	1.61	1.61	.000	.00	0
6043	CTCA	..... ..	...	1	472	...	.243	.075	.888	1.21	1.21	.000	.00	57

Use FCX108 DEVICE, just as you would for a DASD. Look for %Busy approaching 100.

What functional areas use CTC links?

- ISFC (SSI) and TSAF
- z/VM TCP/IP point-to-point links
- PVM point-to-point links
- RSCS point-to-point links

Networking: ISFC Logical Link Full?

```

1FCX275  Run 2019/03/26 10:03:57      ISFLCONF
                                           ISFC Logical Link Configuration
From 2011/10/14 04:50:43
To   2011/10/14 04:55:43
For   300 Secs 00:05:00              Result of H001709C Run
  
```

Initial status on 2011/10/14 at 04:50:43

```

Partner  Devs  Rdevs
GDLBOFVM  12   6000 6001 6002 6003 6020 6021 6022 6023 6040 6041 6042 6043
  
```

Use FCX275 ISFLCONF to find out which CTC RDEVs belong to your logical link.

Then use FCX108 DEVICE to inspect each of those CTC RDEVs. (FC DEVGROUP?)

Feel free to add more CTC RDEVs, up to the limit of 16.

Configuration notes:

- The minimum recommended configuration is two CTC RDEVs. This is so as to avoid write collisions.
- Best performance happens when there are two CTC RDEVs per CTC chpid.
- Best utilization of CTC chpid resource happens when there are four CTC RDEVs per CTC chpid.

Summary

Summary

- “Is my system full?” is a really difficult question
 - Which resource are we talking about?

- Different resource types require different reports and techniques
 - Processors
 - Memory
 - I/O
 - Networking
 - ISFC

- Go forth and measure

References

- z/VM Version 7 Release 1 Performance Toolkit Reference, IBM file number SC24-6303.
- z/VM Version 7 Release 1 Performance Toolkit Guide, IBM file number SC24-6302.
- SMT vocabulary: <http://www.vm.ibm.com/perf/tips/smtvocab.html>
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- Understanding z/VM CPU utilization: <http://www.vm.ibm.com/perf/tips/lparinfo.html>
- z/VM Version 7 Release 1 CP Commands and Utilities, IBM file number SC24-6268.