



Session # 15277

Monitoring IMS Performance for Faster Problem Solving

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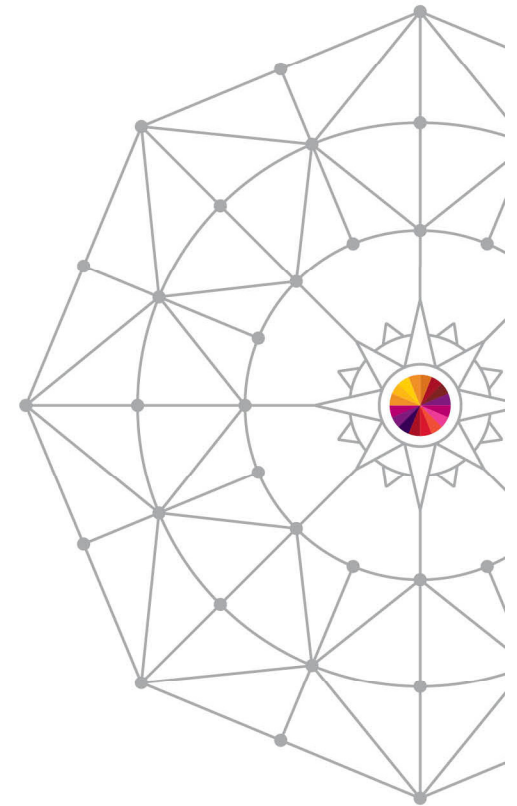
March 13, 2014
9:30 a.m. – 10:30 a.m.
Orange County Salon 1



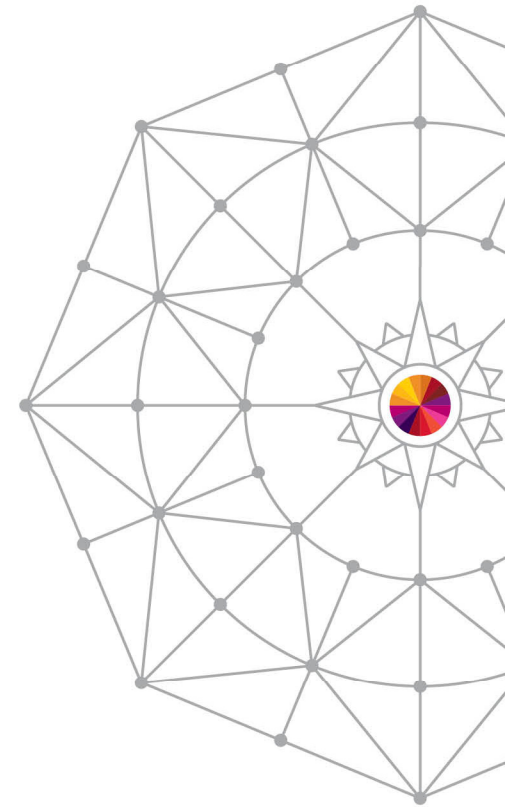
Agenda



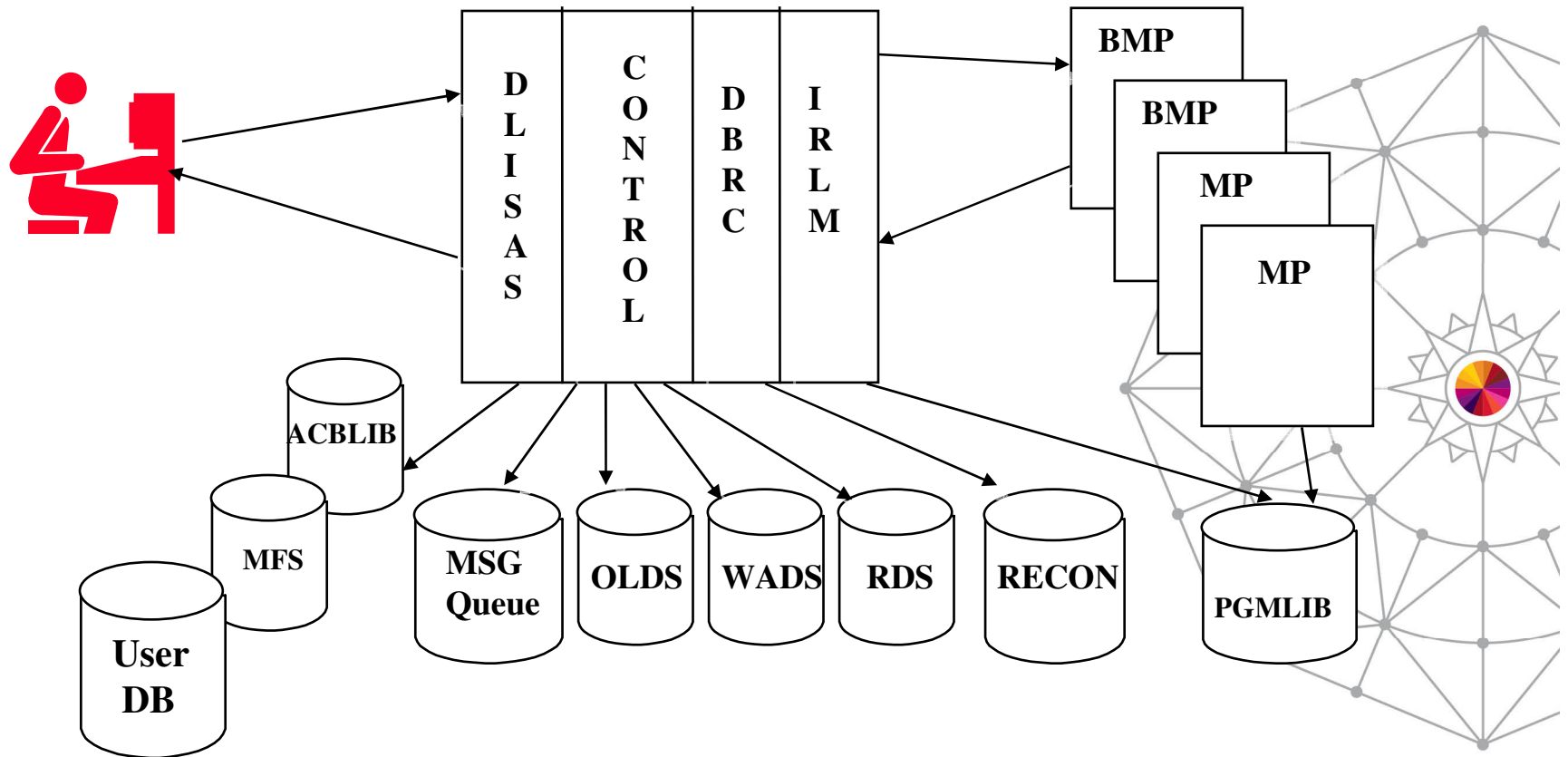
- Introduction
 - IMS Overview
 - Performance Basics
- IMS Transaction Flow
 - Key Performance Indicators
- Case Study
- Summary



Introduction

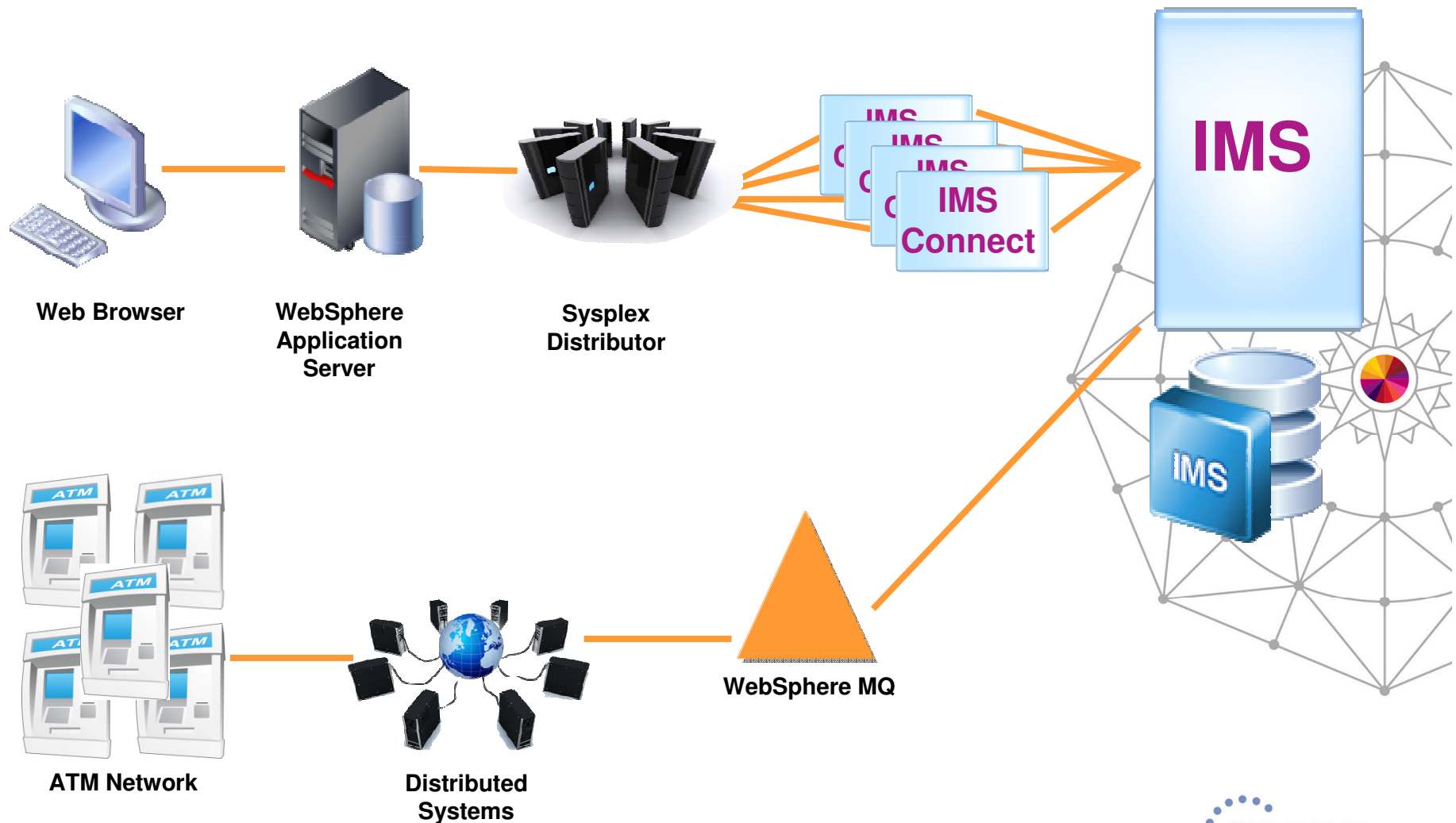


IMS TM and DB Overview

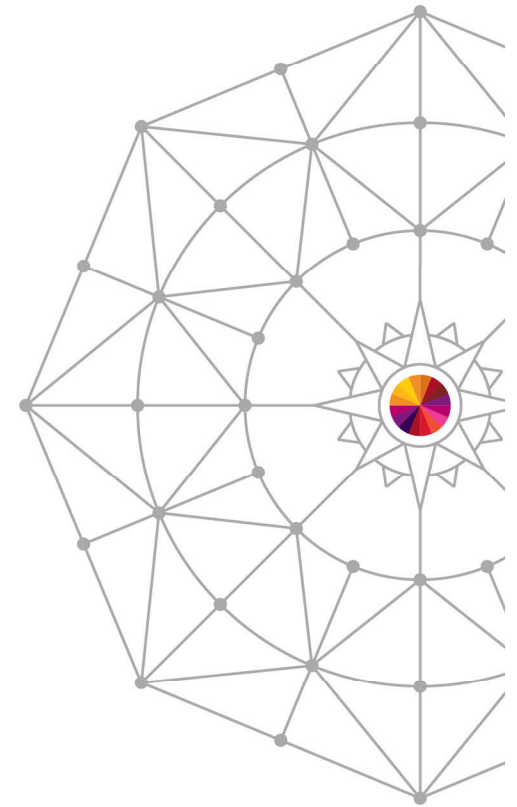


KPI: CPU, Memory, I/O, Network, Locking

Emergence of Online – All Roads Lead to IMS

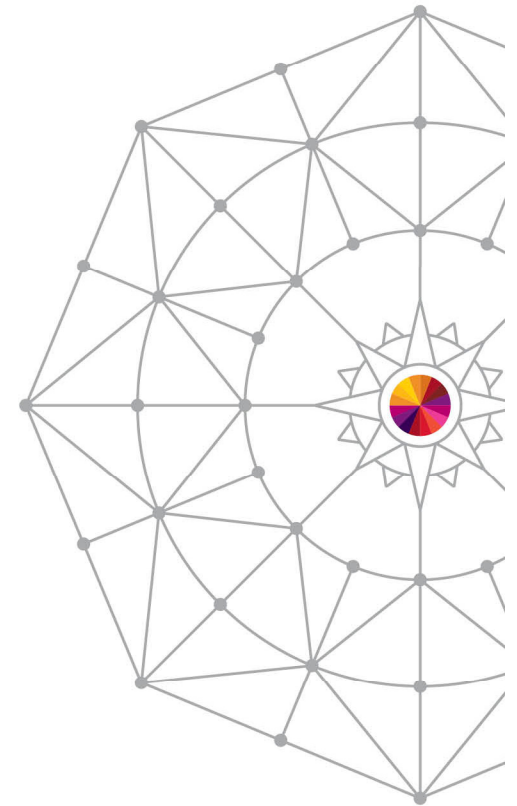


What to Monitor?

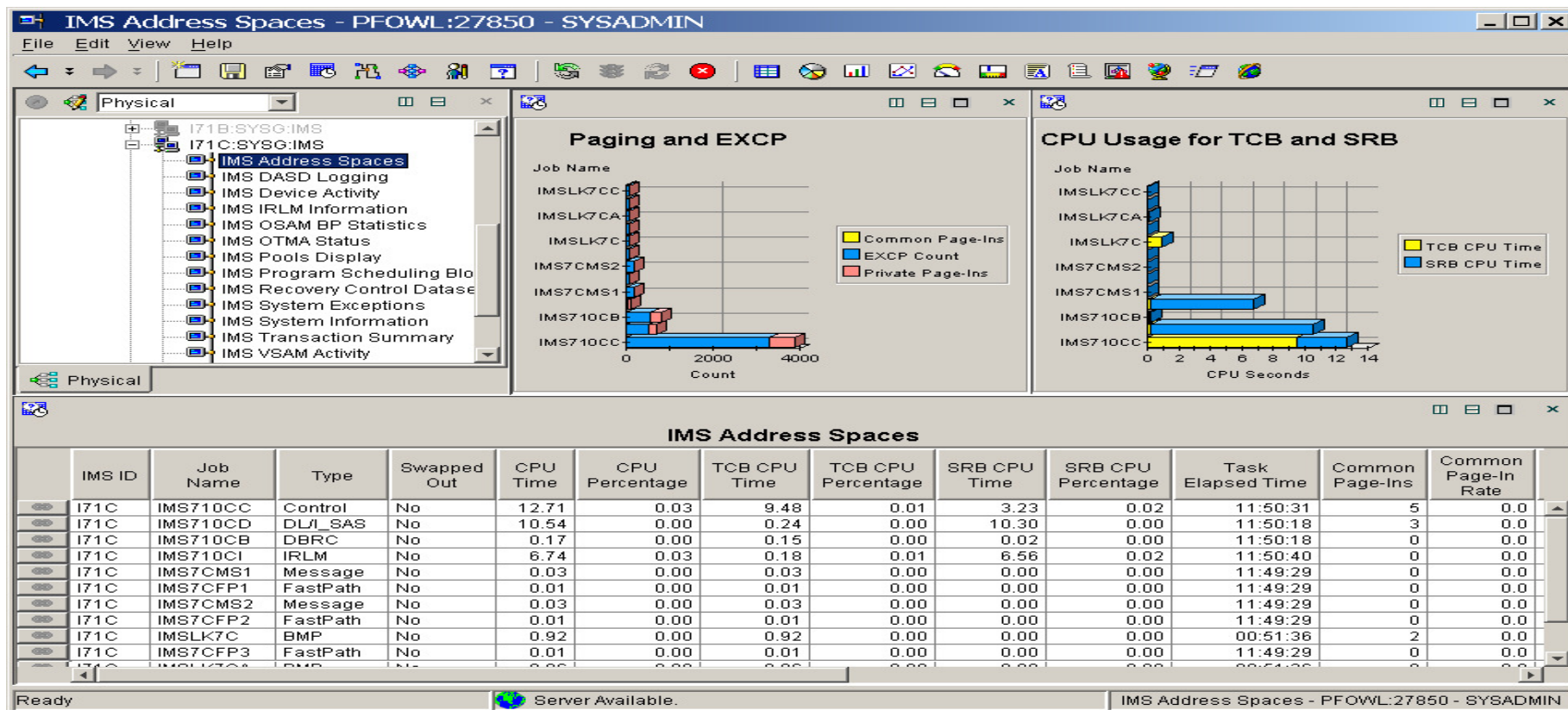


Performance Basics

- CPU
- Memory
- I/O
- Network
- Locking
- Storage
- Applications

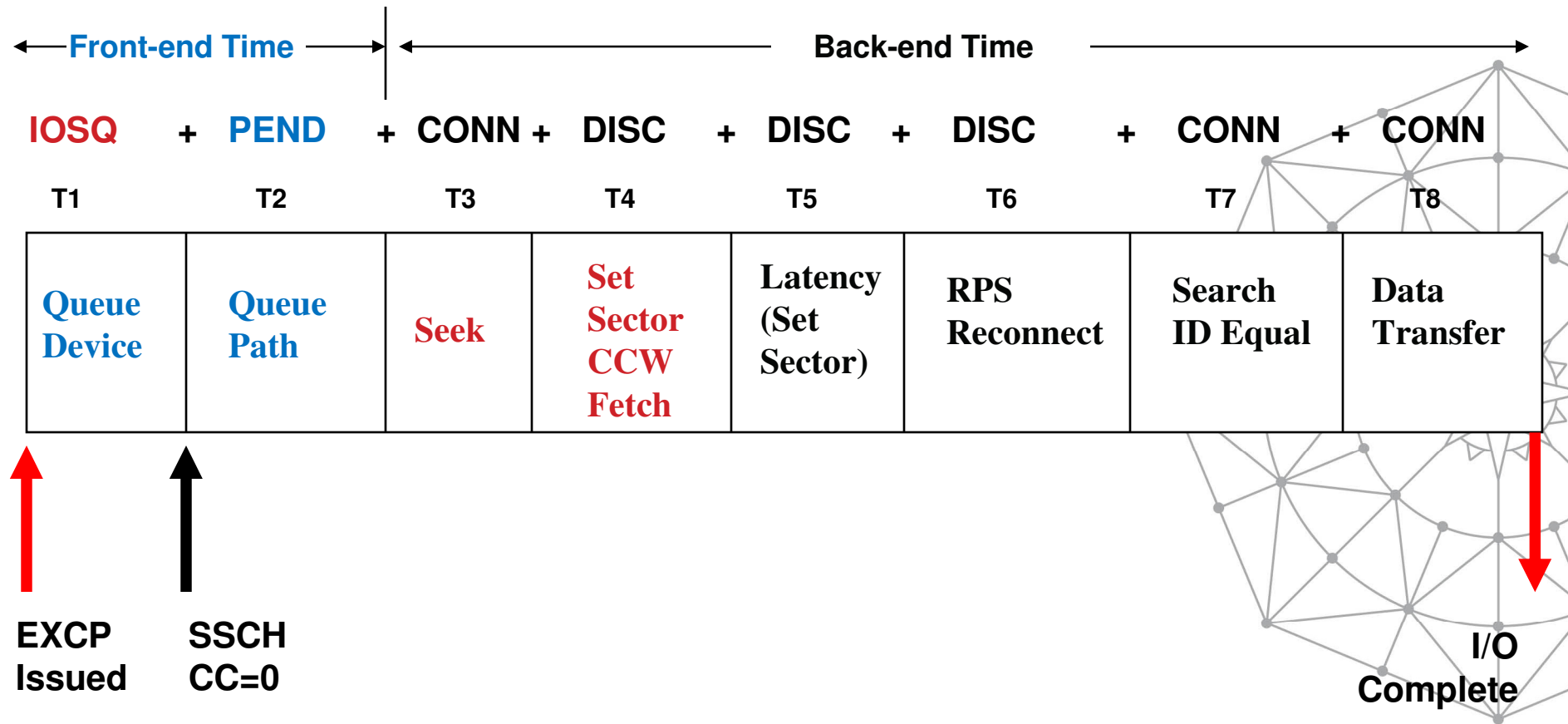


IMS System Health At-a-Glance



- IMS Health Indicators
- CPU, I/O, Paging
- Alerts and Drill-down for Root Cause Analysis

Anatomy of an I/O Request



Monitoring I/O Response Time



DASD MVS Devices

Page: 1 of 6

Address	Volume	Storage Group	Response	I/O Rate	Cache Status	Percent Reserve	PAV Count	Dev Allocations	I/O Queue Time	I/O Pending Time	I/O Connect Time	I/O Disconnect Time	Cache Read Hit Percent	Dev Busy Delay Time
0X065D	DMPS05	N/A	2.2	3.3	Active	0.0	0	15.0	0.3	0.4	1.1	0.0	100.0	0.
0X0700	DMPRES	N/A	1.7	9.9	Active	0.0	0	630.0	0.2	0.2	1.2	0.0	100.0	0.
0X0664	DMPP16	PRIMARY	1.7	11.3	Active	0.0	0	56.0	0.1	0.2	1.3	0.0	100.0	0.
0X066A	DMPP26	PRIMARY	1.2	18.1	Active	0.0	0	28.0	0.1	0.3	0.7	0.0	100.0	0.
0X067A	DMTP12	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X0679	DMED12	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X0678	DMED11	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X0677	DMEP15	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X0676	DMEP14	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X0675	DMPP25	PRIMARY	2.0	0.9	Active	0.0	0	110.0	0.0	0.6	1.3	0.0	100.0	0.
0X0674	DMPP24	PRIMARY	1.2	20.2	Active	0.0	0	34.0	0.0	0.2	0.9	0.0	100.0	0.
0X0673	DMPP23	PRIMARY	1.7	5.2	Active	0.0	0	76.0	0.0	0.3	1.4	0.0	100.0	0.
0X0672	DMPP22	PRIMARY	2.7	0.4	Active	0.0	0	12.0	0.0	0.4	2.2	0.1	100.0	0.
0X0671	DMPP21	PRIMARY	1.3	0.5	Active	0.0	0	34.0	0.0	0.2	1.0	0.0	100.0	0.
0X0670	BAKEXT	N/A	1.0	0.0	Active	0.0	0	0.0	0.0	0.0	1.0	0.0	100.0	0.
0X066F	DMPA09	DLGROUP	1.0	0.0	Active	0.0	0	0.0	0.0	0.2	0.8	0.0	100.0	0.
0X066E	DMPP30	PRIMARY	1.4	0.5	Active	0.0	0	28.0	0.0	0.3	1.0	0.0	100.0	0.
0X066D	DMPP29	PRIMARY	1.0	0.5	Active	0.0	0	23.0	0.0	0.2	0.7	0.0	100.0	0.
0X066C	DMPP28	PRIMARY	1.5	3.3	Active	0.0	0	15.0	0.0	0.4	1.0	0.0	100.0	0.
0X066B	DMPP27	PRIMARY	2.4	2.0	Active	0.0	0	17.0	0.0	0.3	2.0	0.0	100.0	0.
0X0669	DMPC06	CANDLE	1.4	1.9	Active	0.0	0	1.0	0.0	0.5	0.8	0.0	100.0	0.
0X0668	DMPTSO	TSOGROUP	1.0	0.0	Active	0.0	0	0.0	0.0	0.3	0.7	0.0	100.0	0.

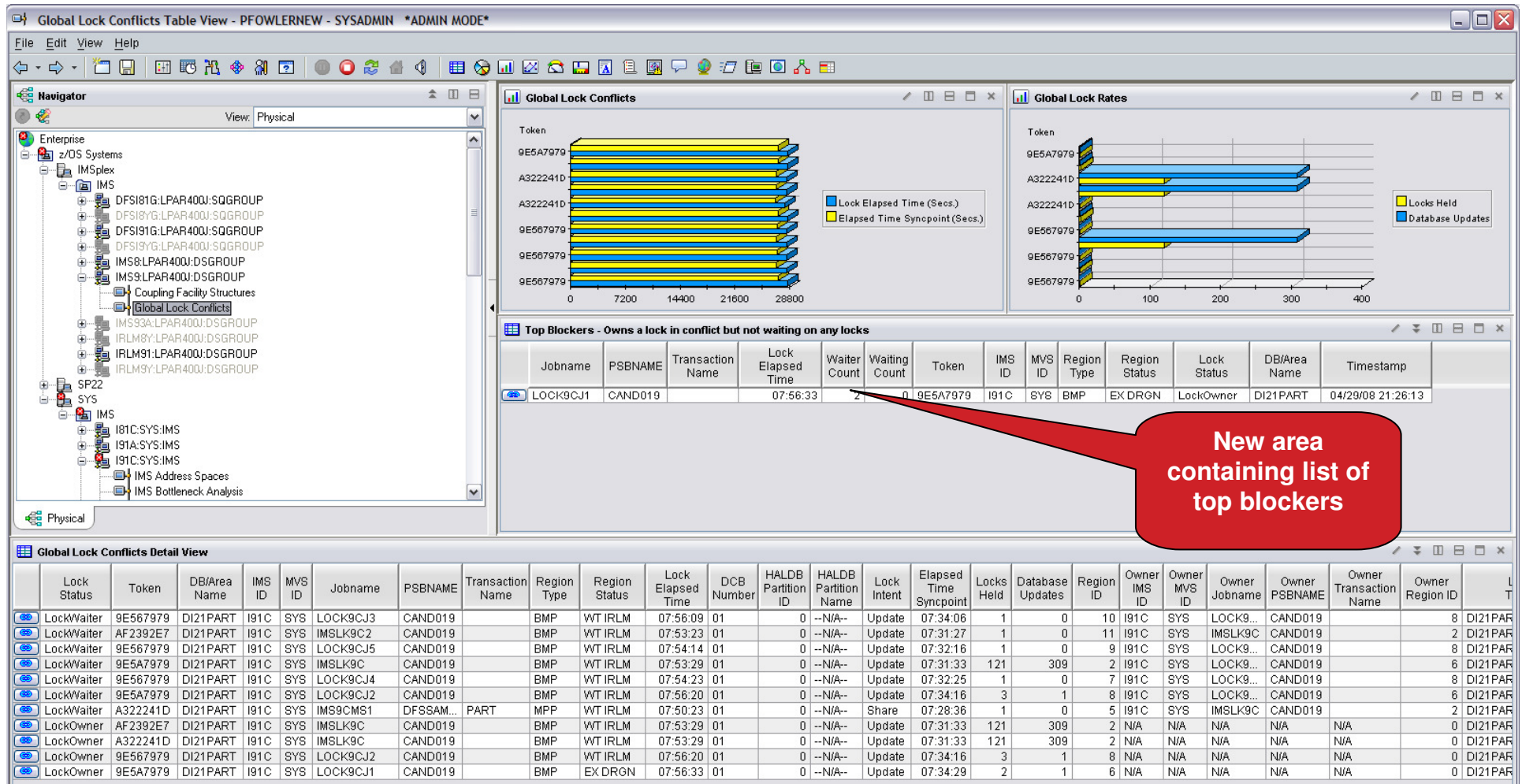
I/O Response Time = IOSQ + PEND + CONN + DISCONNECT

Monitoring TCP/IP Connections

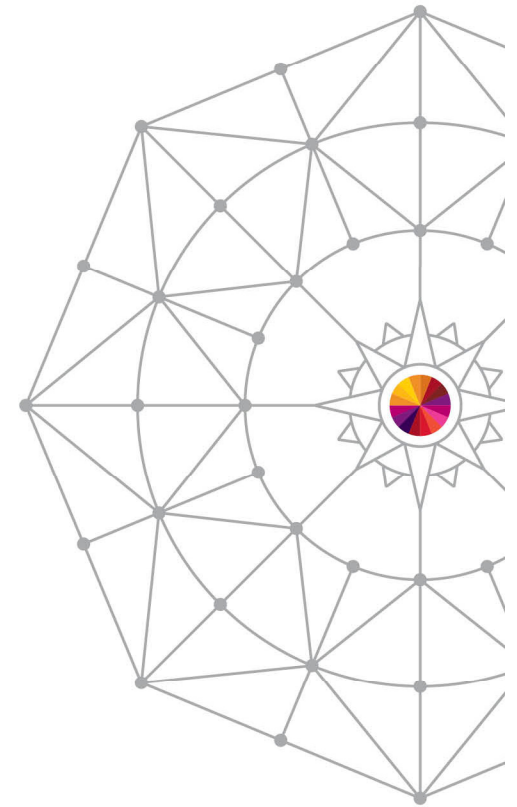


	Collection Time	Application Name	Connection Count	Active Connections	Accepted Connections	Connection Rate	Active Connection High Water Mark	Time stamp for Active Connections High Water Mark	Idle Time Since Last Accept	Time Since Last Activity	Server Up Time	Connections in Backlog	Backlog Connections Rejected	Total Backlog Connections Rejected	Backlog Connections Rejected Time Stamp	Transmit Byte Rate	Re E F
	04/14/10 16:20:07	\$FTPL1	1	0	0	0	1	04/14/10 13:25:07	0.79	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SDF	17	3	0	0	3	04/14/10 11:30:07	81.17	262.92	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SDSST	28	14	0	0	14	04/14/10 11:30:07	52.61	128.16	81.28	0	0	0		1236	
	04/14/10 16:20:07	\$L4SHL	11	2	0	0	2	04/14/10 11:30:07	81.29	1,263.01	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SMV	11	2	0	0	2	04/14/10 11:30:07	81.25	334.42	81.25	0	0	0		0	
	04/14/10 16:20:07	\$L4SM2	18	3	0	0	3	04/14/10 11:30:07	81.29	1,263.01	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SN3	11	2	0	0	2	04/14/10 11:30:07	81.29	25.36	81.29	0	0	0		266	
	04/14/10 16:20:07	\$NDLL1	1	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$PORTL	2	0	0	0	0		11.54	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$SMTPL	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$TNL	7	6	0	0	6	04/14/10 15:45:07	0.14	207.39	81.29	0	0	0		0	
	04/14/10 16:20:07	BFXOINIT	1	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	D830L21L	6	1	0	0	1	04/14/10 12:40:07	3.71	6,163.35	3.71	0	0	0		0	
	04/14/10 16:20:07	D71EDIST	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	D91ADIST	9	7	2	0	7	04/14/10 12:30:07	0.03	17.03	81.28	0	0	0		331	
	04/14/10 16:20:07	D91CDIST	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	IMS8FCON	2	0	0	0	0		81.28	0.00	81.28	0	0	0		0	
	04/14/10 16:20:07	IMS9FCON	192	1	749	149	1	04/14/10 14:30:07	0.00	0.04	81.22	1	0	0		3780	
	04/14/10 16:20:07	IMS9WCON	3	0	0	0	0		81.25	0.00	81.25	0	0	0		0	
	04/14/10 16:20:07	INETS1	2	0	0	0	0		81.25	0.00	81.25	0	0	0		0	
	04/14/10 16:20:07	IOBSNMP	1	0	0	0	0		0.00	0.00	0.00	0	0	0		0	
	04/14/10 16:20:07	L3IAC5L6	13	2	0	0	2	04/14/10 11:30:07	66.85	14.91	66.85	0	0	0		8240	
	04/14/10 16:20:07	L3IAMQL6	13	2	0	0	2	04/14/10 11:30:07	66.87	49.35	66.87	0	0	0		5472	
	04/14/10 16:20:07	L3IAN3L6	13	2	0	0	2	04/14/10 11:30:07	66.81	450.41	66.81	0	0	0		0	
	04/14/10 16:20:07	L3ITDSL5	78	53	0	0	64	04/14/10 15:30:07	0.90	0.00	1.40	0	0	0		296722	39
	04/14/10 16:20:07	L3ITDSL6	24	10	0	0	13	04/14/10 11:30:07	3.29	8.59	3.45	0	0	0		4736	
	04/14/10 16:20:07	M5GBRMTL	11	2	0	0	2	04/14/10 11:30:07	81.24	1,062.97	81.29	0	0	0		0	

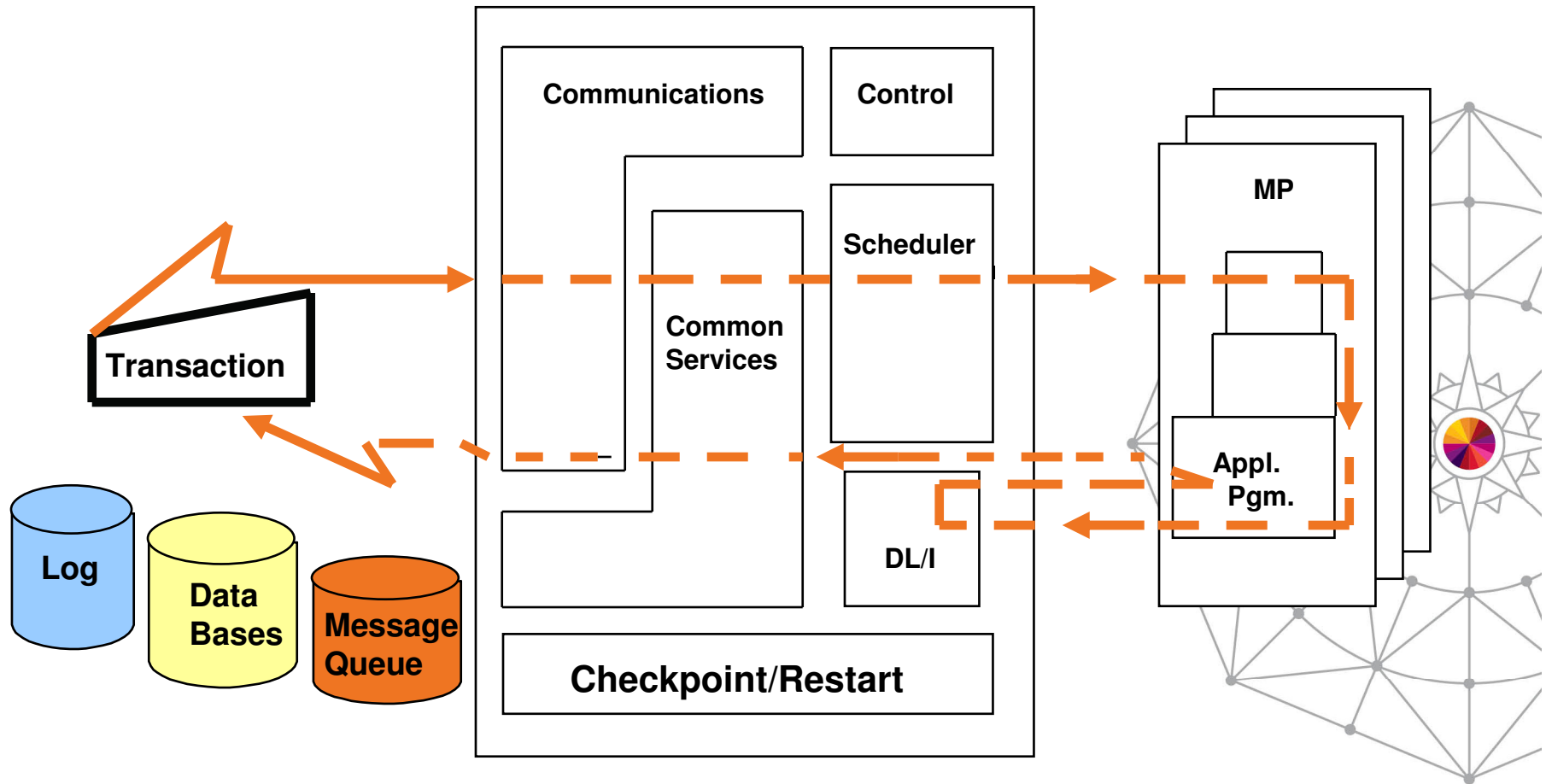
Global Locking – Top Blocker



IMS Transaction Flow and Key Performance Indicators

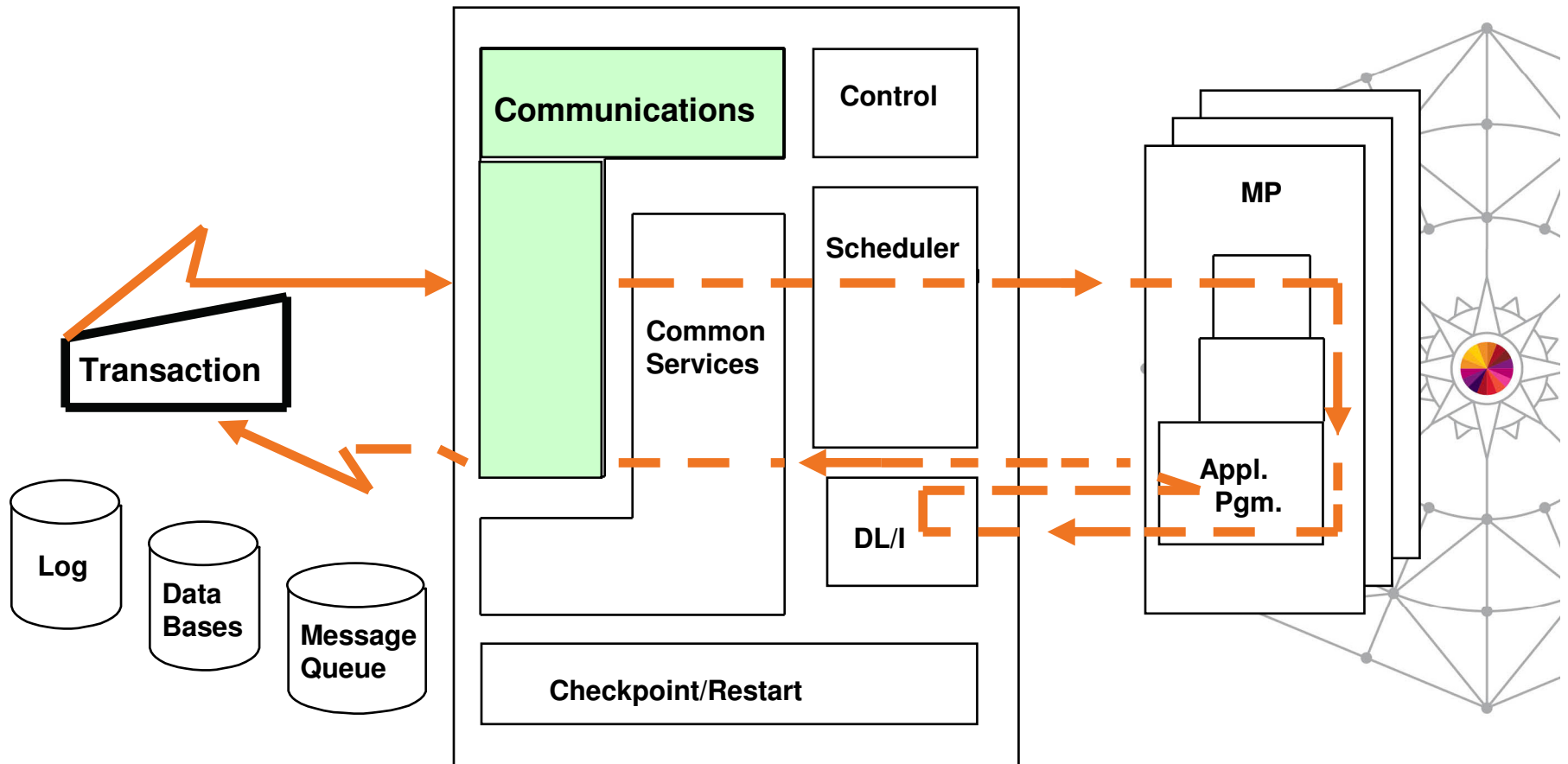


IMS Transaction Flow

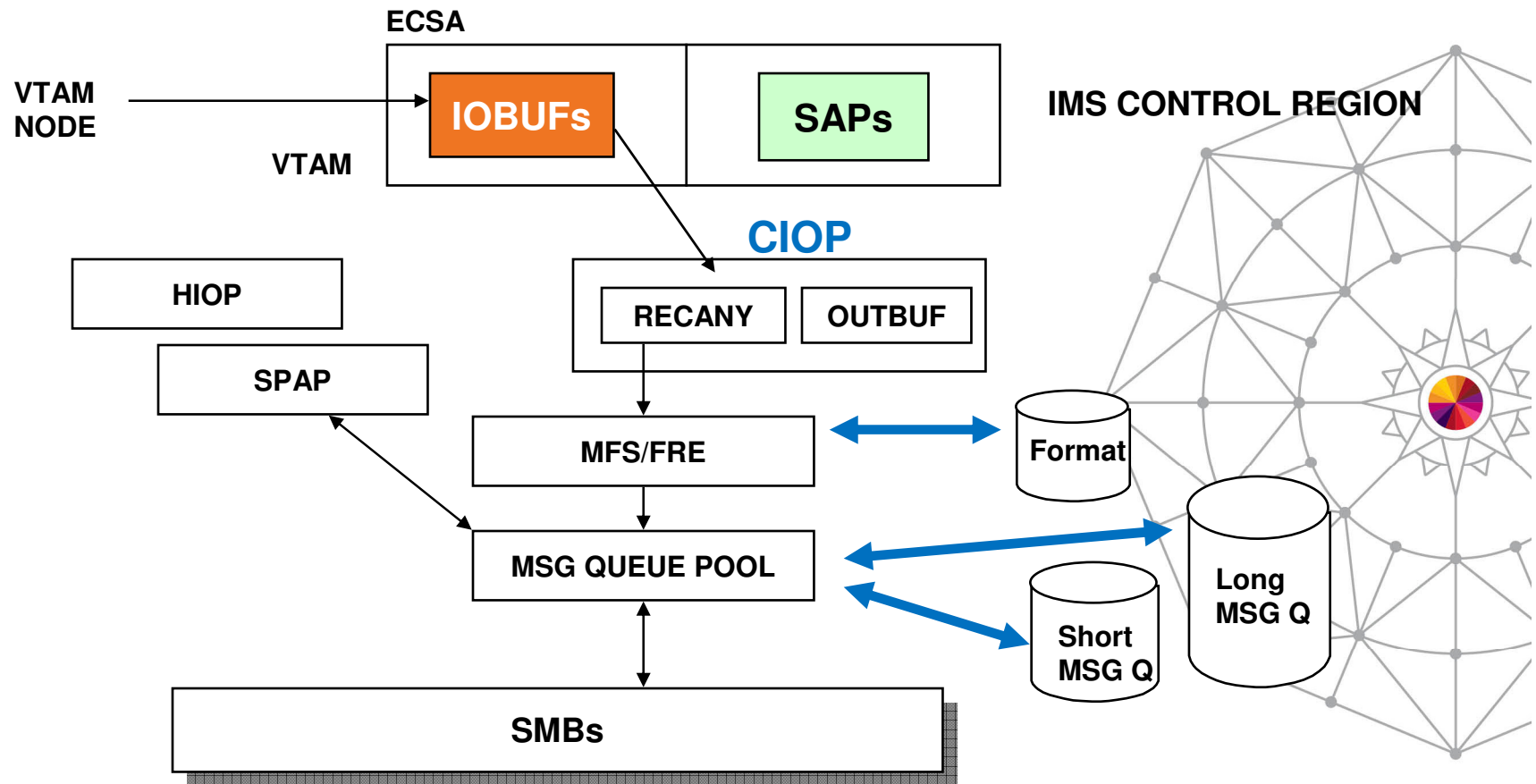


- Transaction arrival rate, Transaction stopped
- Database stopped, ACB stopped
- DB I/O, Logging, Message Queue datasets

IMS Communication Overview



Communication Pools



*SAP – Save Area Prefix, FRE – Fetch Request Element,
CIOP – Communication I/O Pool, HIOP – High I/O Pool (outbound messages),
SPAP – Scratch Pad Area Pool (for conversational messages)*

Selective Dispatching

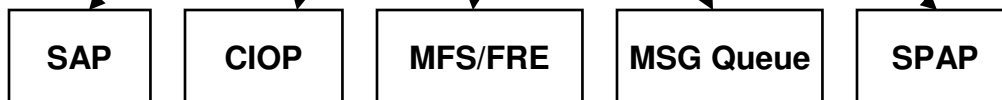


10/27/12 9:09:45

IMS Status

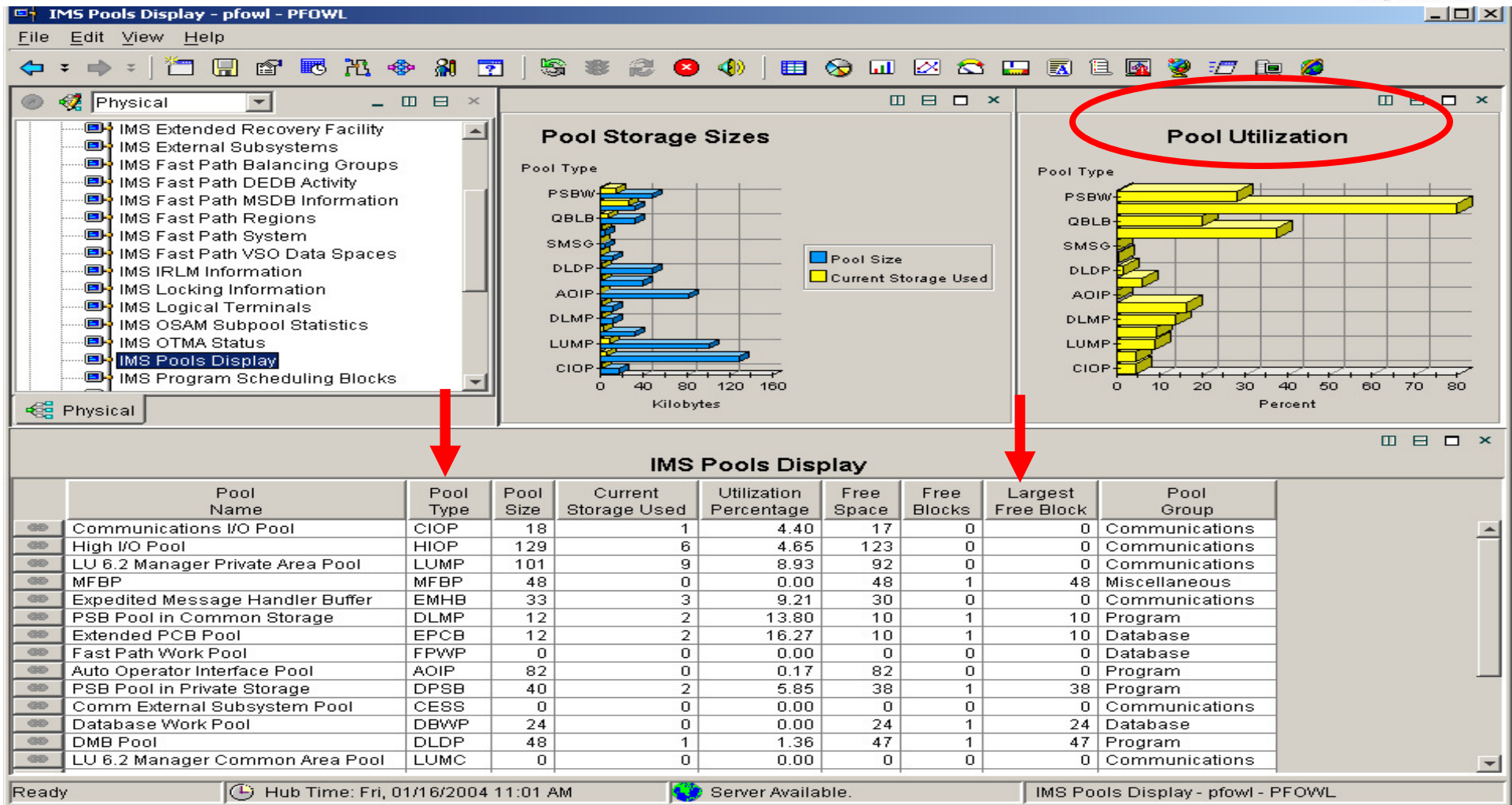
I11A

IMS restart date . . . : 05.297	IMS restart time : 08:48:11
Checkpoints taken . . : 3	Current checkpoint id . . : 05297/143735
MPPs active : 1	BMPs active : 0
Msg enqueue rate . . . : .00/sec	Msg dequeue rate : .00/sec
Transactions queued : 778	Selective dispatch . . . : Inactive
VTAM authorize Path : Active	VTAM ACB : Open
START DC : Performed	Logtape write-ahead . . : Active

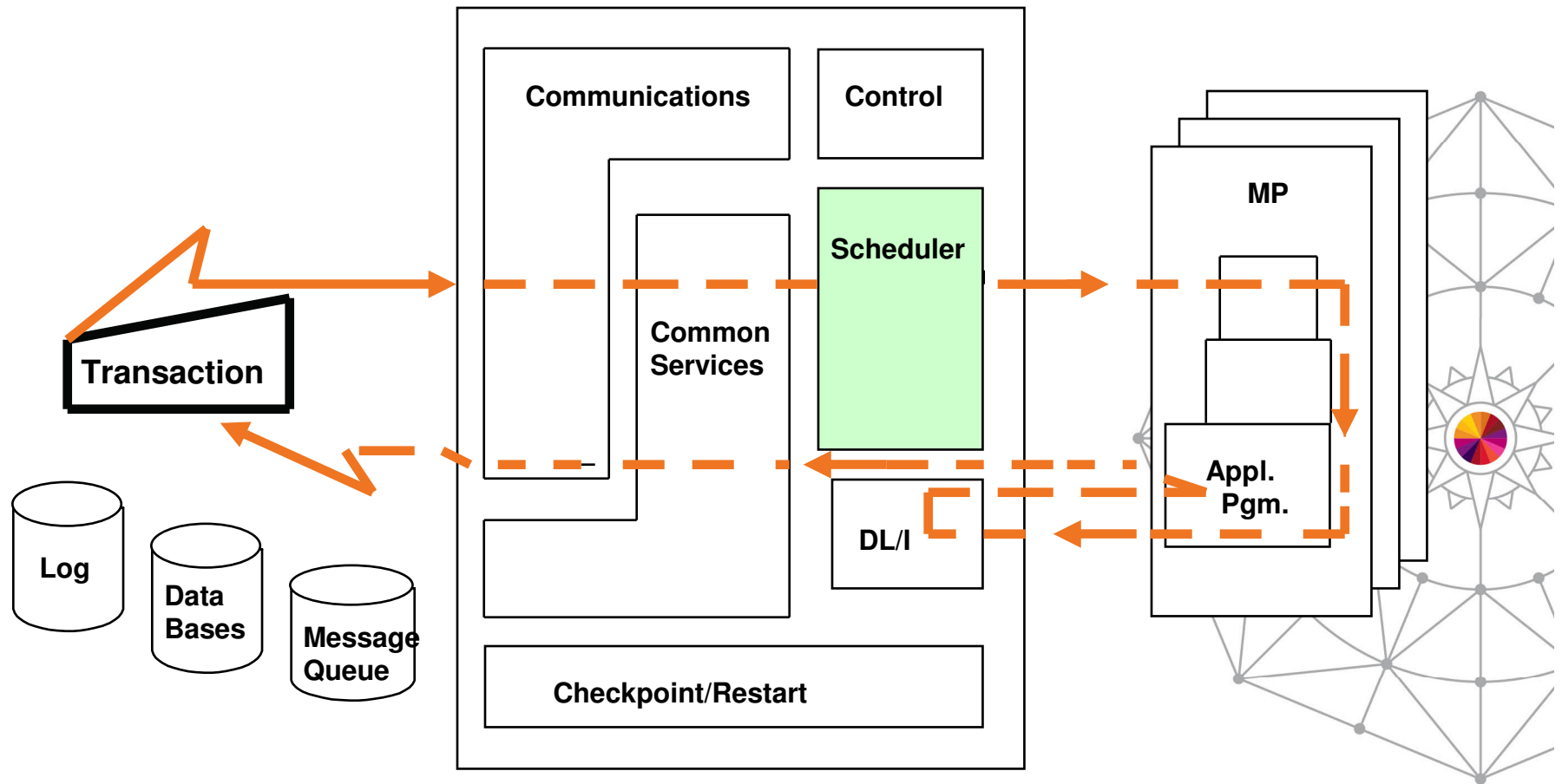


******* ITASK must wait
when the resource shortage is detected**

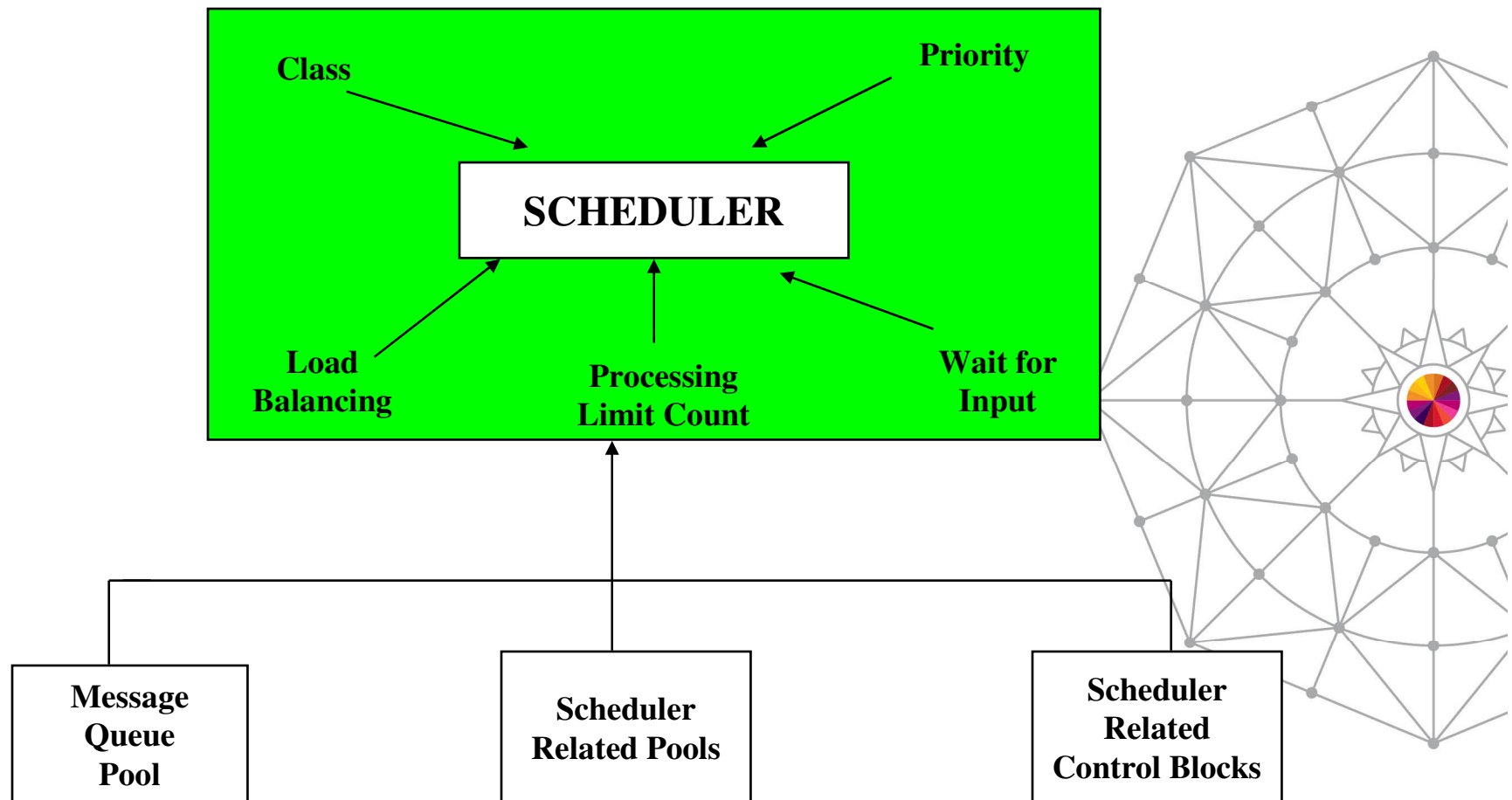
Storage Pool Information



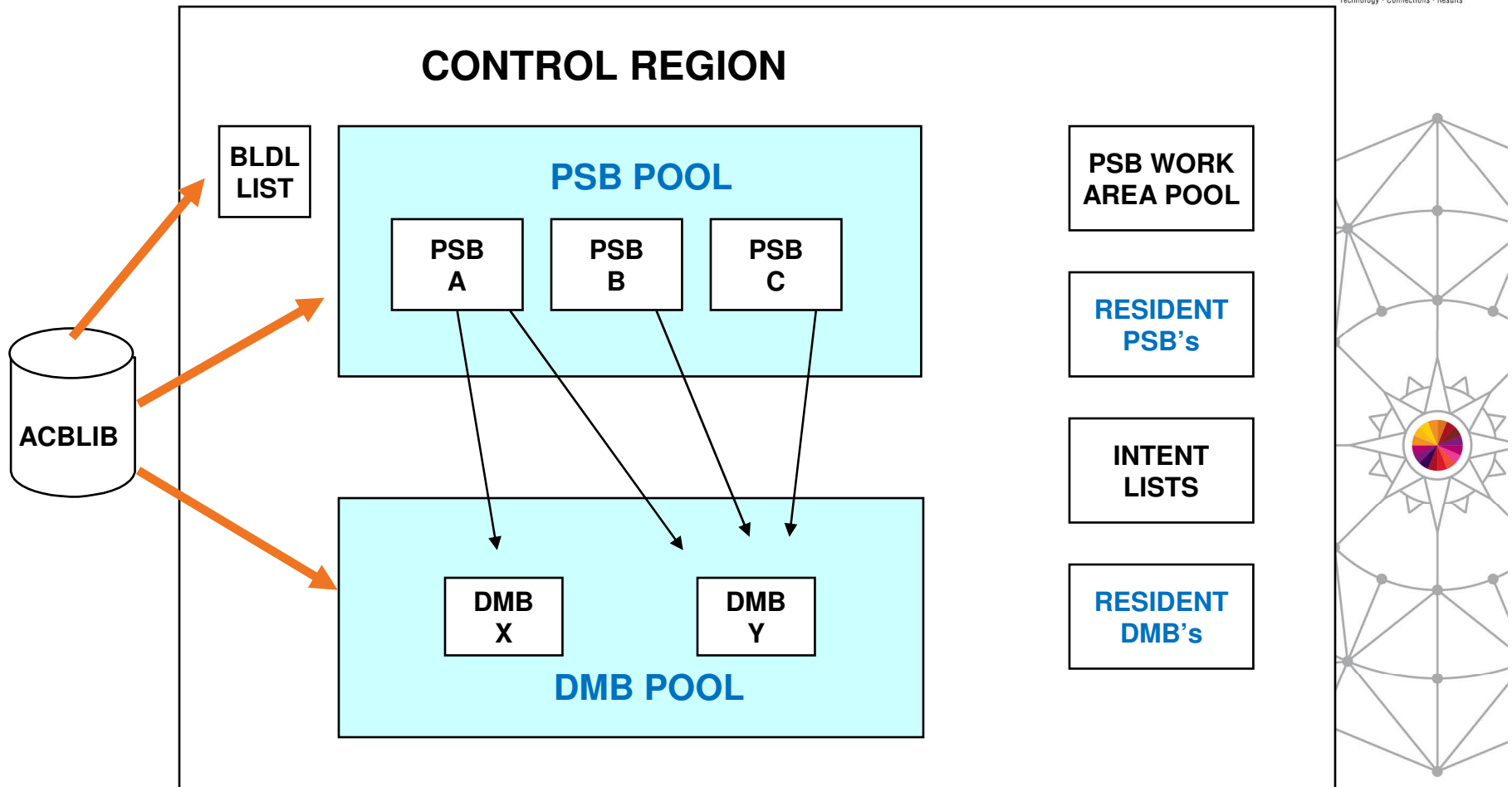
IMS Scheduler Overview



Scheduling Facility



Scheduling Waits



***** If **DMB** space is unavailable, the least recently referenced DMB in the pool is flushed, all of its data sets have to be CLOSED → OPEN / CLOSE overhead, performance degradation.

***** If **PSB** pool space is unavailable, the least recently referenced PSB is removed, next time that PSB must be reloaded from ACBLIB when requested.

PSB Status - Clean Up The Unusable

IMS Program Scheduling Blocks													
	PSB Name	Job	Arrival Count	Processed Count	DL1-SAS Storage	PSB-Pool Storage	PSB Size	Scheduling State	Trace Status	PSB Resident Status	Intent List Resident Status	Scheduling Type	Language
	DRC\$CTL0	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	NGIMRFP	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	DRC\$NRSP	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	CANDLE1	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Serial	NotInMemory
	DRC\$RESP	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	IWXNOQUE	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	IWXADMIN	...	0	0	NotInMemory	104	0	Not_Found	Off	NotInMemory	NotInMemory	Parallel	NotInMemory
	DFSIVP5	...	0	0	AIICSA	104	512	Not_Schedulable	Off	Resident	Resident	Serial	ASM-COBOL
	DFSIVP4	...	0	0	AIICSA	104	512	Not_Schedulable	Off	Resident	Resident	Serial	ASM-COBOL
	DBFSAMP3	...	0	0	NotInMemory	3560	3520	Not_Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	EPSI01	...	1	0	NotInMemory	3240	3200	Program Stopped	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM07	...	0	0	NotInMemory	3624	3584	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM06	...	0	0	NotInMemory	3432	3392	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM05	...	0	0	NotInMemory	3432	3392	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM04	...	0	0	NotInMemory	3432	3392	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM03	...	0	0	457120	3624	3584	Schedulable	Off	InMemory	Resident	Serial	ASM-COBOL
	DFSSAM02	...	3	3	NotInMemory	3240	3200	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSSAM01	...	0	0	NotInMemory	3624	3584	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP9	...	0	0	NotInMemory	3880	3840	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP8	...	0	0	NotInMemory	552	512	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP7	...	0	0	NotInMemory	2728	2688	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP65	...	0	0	NotInMemory	2920	2880	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP64	...	0	0	NotInMemory	2920	2880	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory
	DFSIVP62	...	0	0	NotInMemory	2920	2880	Schedulable	Off	NotInMemory	Resident	Serial	NotInMemory

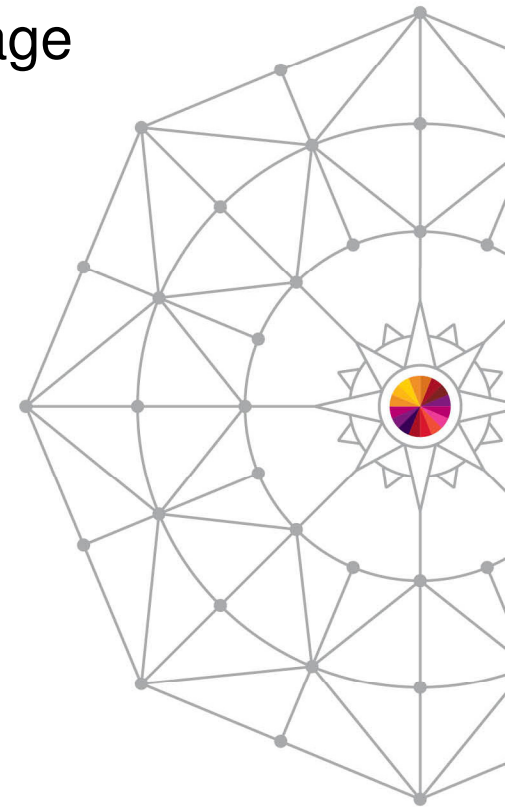
Hub Time: Mon, 08/28/2006 07:40 PM

Server Available

IMS Program Scheduling Blocks - hqndt2.demopkg.ibm.com - DNET386

Schedule End to First DL/I Call

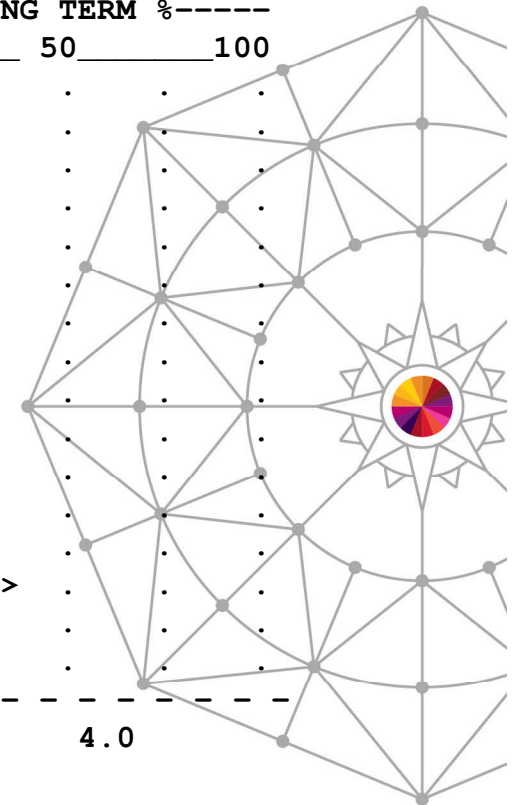
- Time before the first DL/I call to retrieve a message
 - Loading the application program
 - Initializing the program
 - Opening any non-DL/I files
 - Issuing any database calls



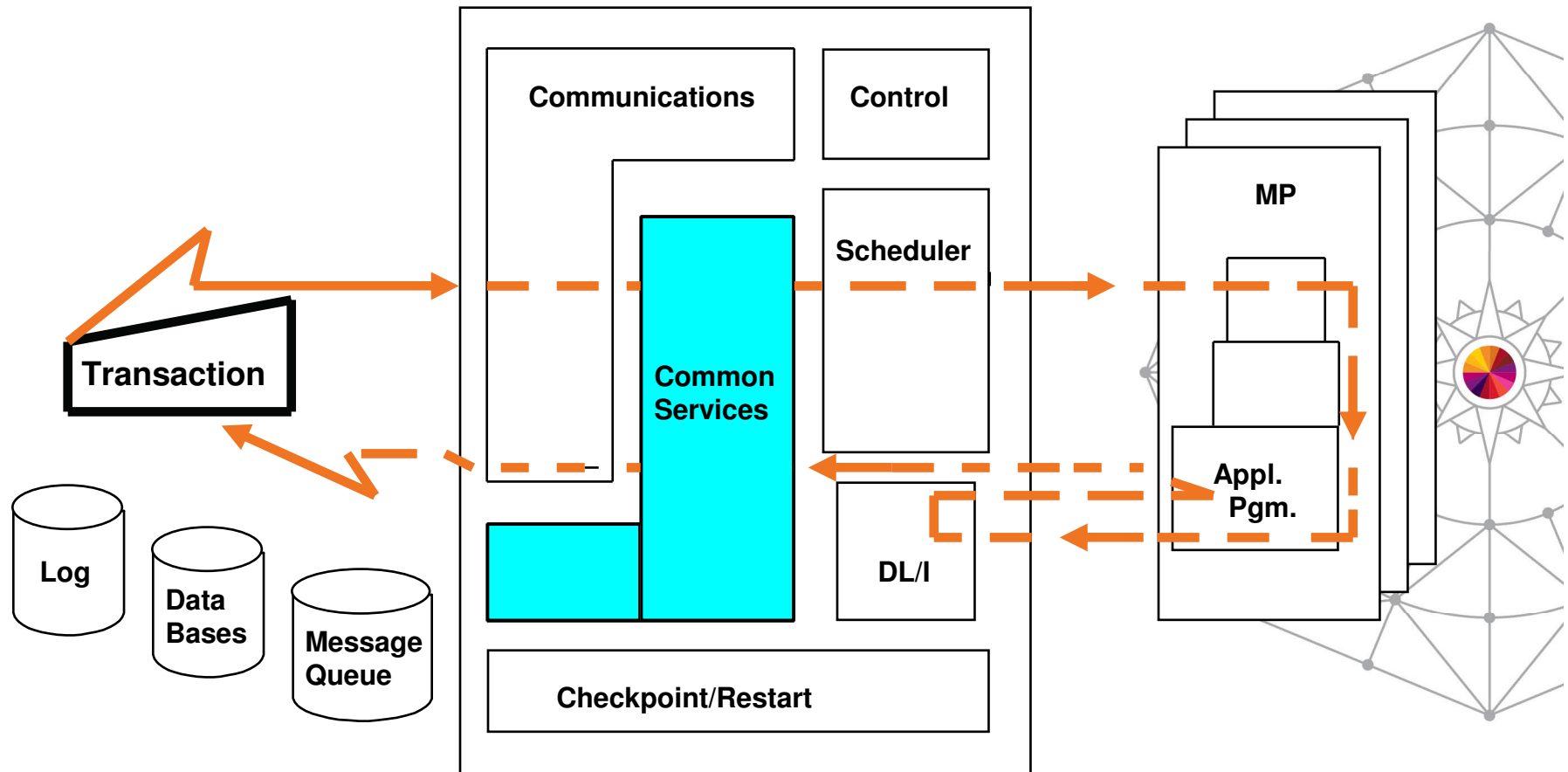
Monitor Non-DL/I Wait

PDEX	-----SHORT TERM %-----			-----LONG TERM %-----		
+ (ELAPSED TIME= 1:41 MN)	% 0	50	100	% 0	50	100
➤ USING CPU:	21.0 --->.	.	.	20.5 --->.	.	.
+ USING CPU IN APPL	(11.2) --> .	.	.	(11.0) ->- .	.	.
+ USING CPU IN IMS	(9.8) --> .	.	.	(9.5) -> .	.	.
➤ SCHEDULING WAITS:	2.8 > .	.	.	2.0 > .	.	.
+ WAIT FOR MPP	(0.2) > .	.	.	(0) > .	.	.
+ WAIT FOR GU	(2.6) > .	.	.	(2.0) > .	.	.
+ IMS ACTIVITY:	16.5 --> .	.	.	15.5 --> .	.	.
➤ SPA I/O	(1.2) > .	.	.	(1.2) > .	.	.
+ SYNC POINT WAIT	(5.6) > .	.	.	(5.6) > .	.	.
+ ISWITCHED TO CTL	(9.7) -> .	.	.	(8.7) -> .	.	.
➤ DATABASE I/O WAITS	26.7 ----->	.	.	21.7 ----->	.	.
+ ADA221	(15.4) --> .	.	.	(11.4) --> .	.	.
+ ADA021S	(11.3) -> .	.	.	(10.3) -> .	.	.
➤ MVS WAITS:	35.8 ----->	.	.	30.8 ----->	.	.
+ CPU WAIT (MPP/BMP)	(13.7) --> .	.	.	(10.7) --> .	.	.
➡ PROGRAM FETCH I/O	(22.1) --->	.	.	(20.1) --->	.	.

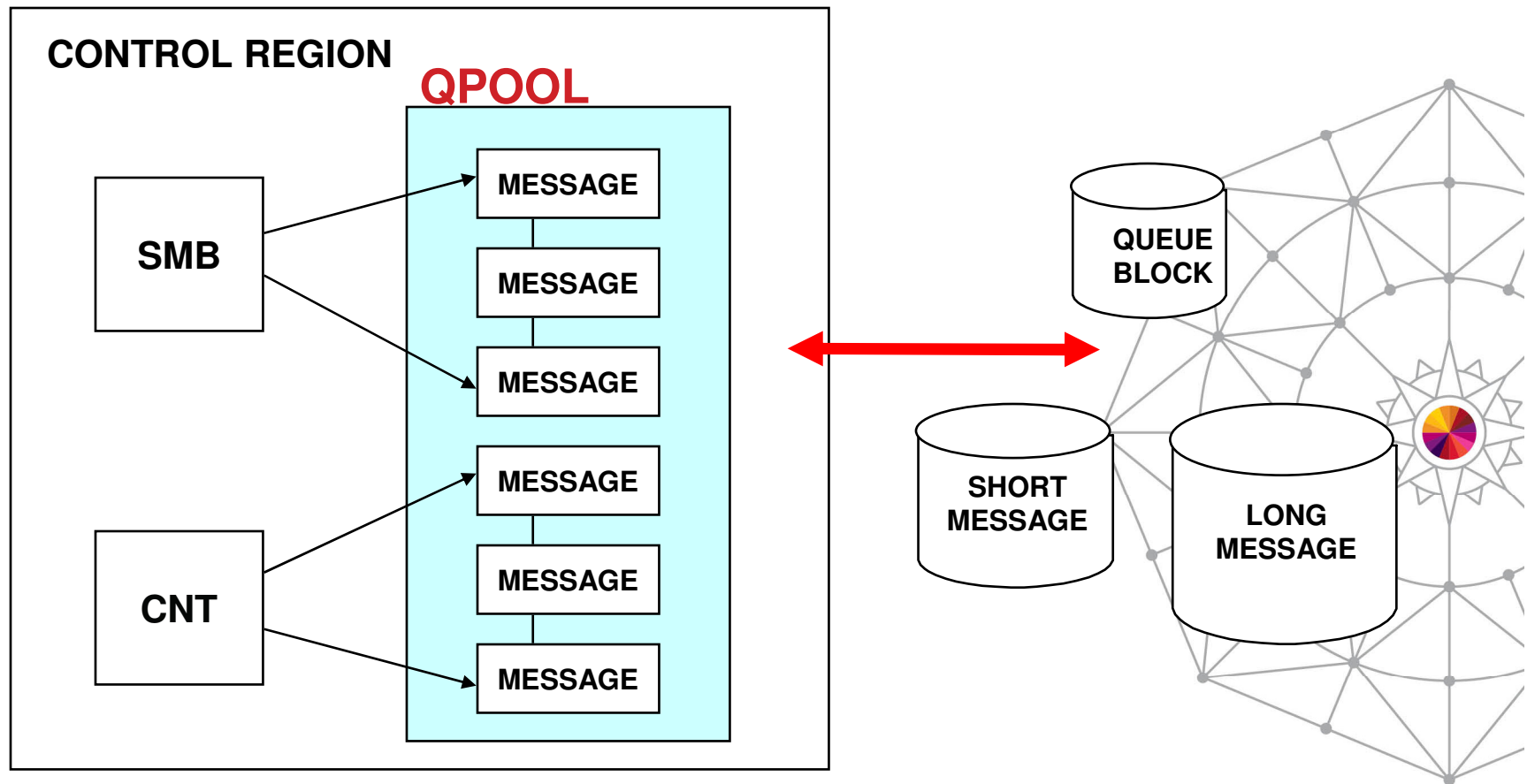
+ Avg. Trans Executing:		5.3			4.0	



IMS Message Queuing



Input/Output Messages



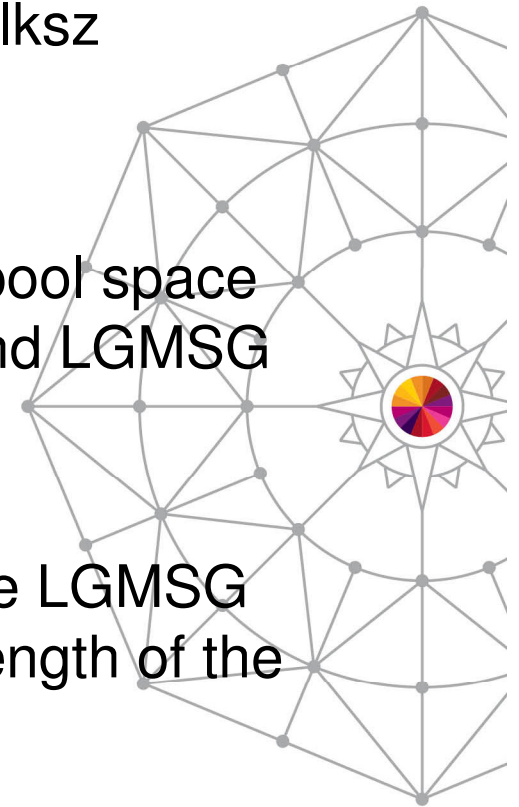
SMB – Scheduler Message Block built at IMS SYSGEN, a list of all valid transaction codes – TRANSACT Macro

CNT – Communication Name Table, built at IMS SYSGEN, a list of all valid logical terminal names – NAME macro

QPOOL – IMS uses QPOOL to hold both input and output messages in-core.

Message Queue Considerations

- Allocate sufficient **QBUFs**
 - MSGQUEUE macro defines #QPOOL bufs, blksize
 - IMS control region JCL parm QBUF=
- Optimize LRECL sizes to make efficient use of pool space and balance I/O activity between the SHMSG and LGMSG datasets
- If large SPAs are defined, allocate the size of the LGMSG LRECL to include the size of the SPA plus the length of the input message
- Use fixed length SPAs



Monitor Message Queue I/O

08/28/12 14:39:10 I91A

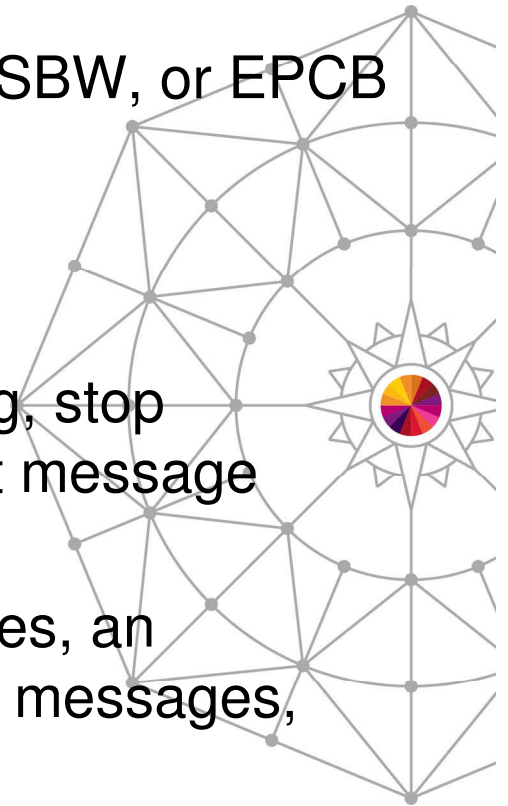
Message Queue Buffers and Datasets

Message Queue	Total	Short	Long	QBLKS	Free
No. of Buffers	5	2	2	1	0
Percentage		40.0%	40.0%	20.0%	.0

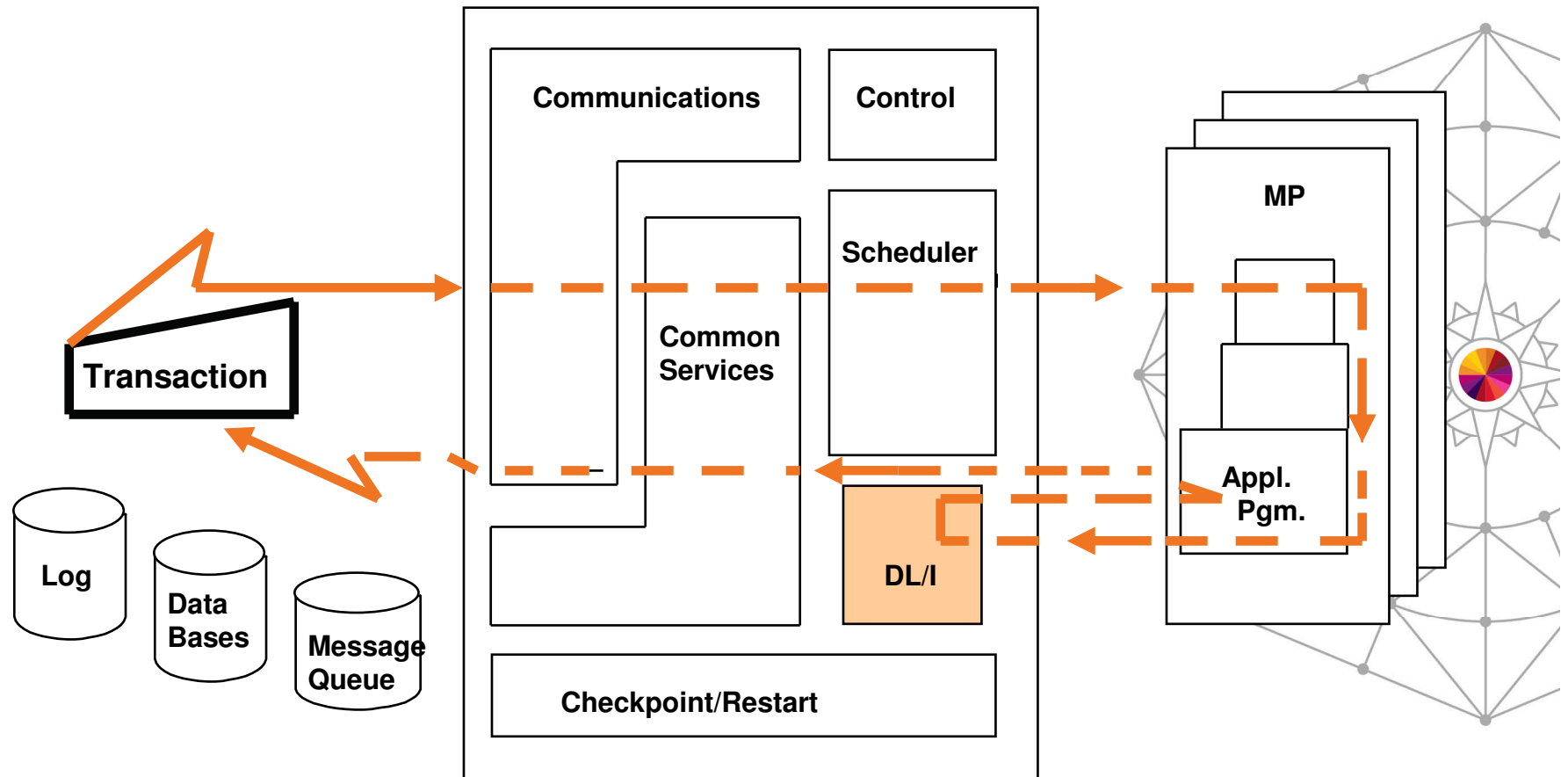
Dataset	% Used	Shutdown	I/O Rate
Short	14.36%, 968 of 6740	98.53%	.00 per second
Long	.96%, 6 of 620	86.11%	.00 per second
QBLKS	.24%, 32 of 13100	99.24%	.00 per second

What If MSG-Q BUF# Became Low...

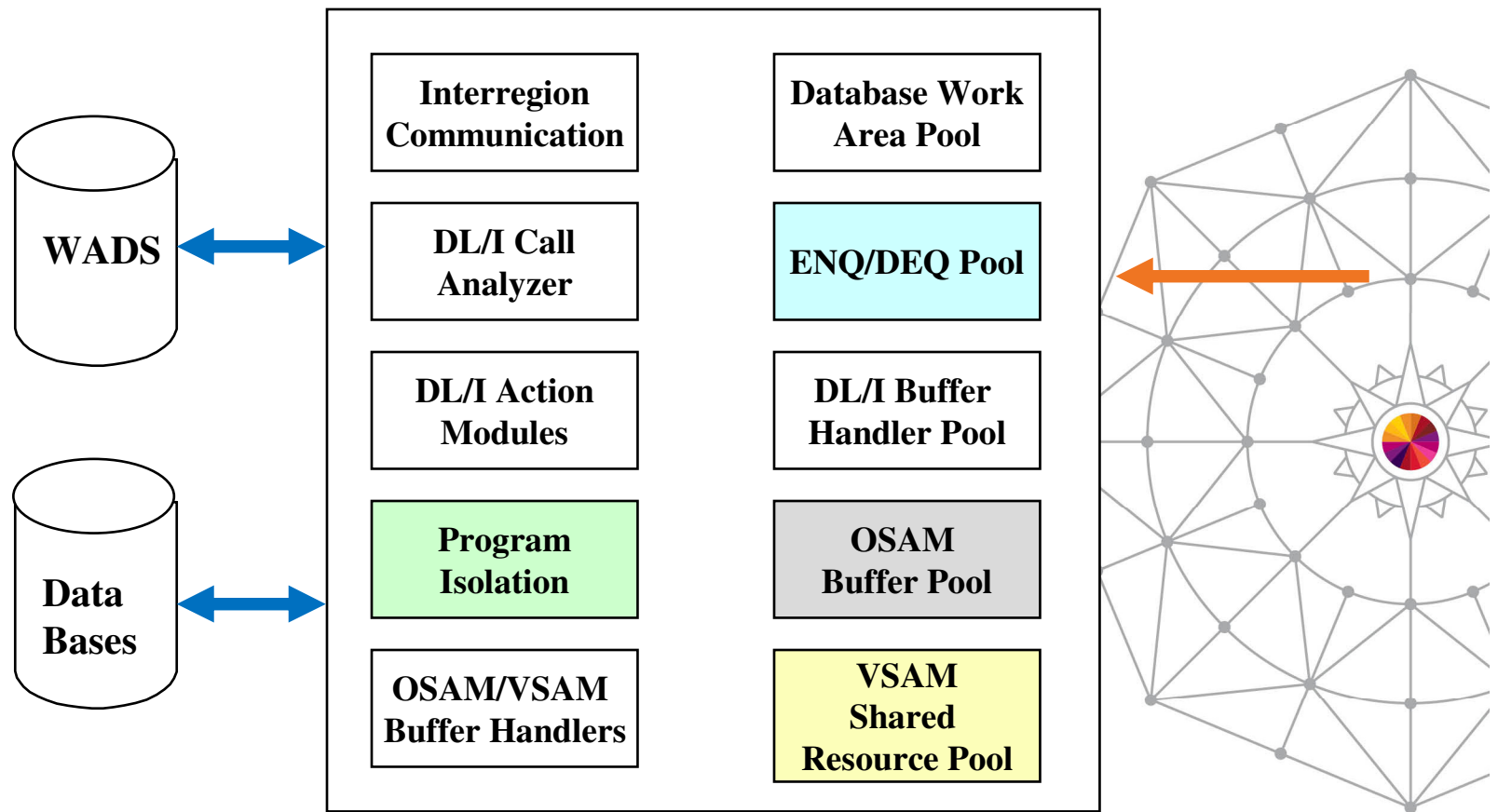
- Enough active MP regions?
- Scheduling Delayed because of short on PSB, PSBW, or EPCB pools?
- Remote printers are active?
- Increase **QBUF**= in control region JCL
- If region is stopped but messages are still coming, stop transactions. Otherwise the % utilization of short message dataset will increase.
- If the % **used of long message dataset** increases, an application may be looping while inserting output messages, stop the region (especially if it's BMP).



DL/I Interface

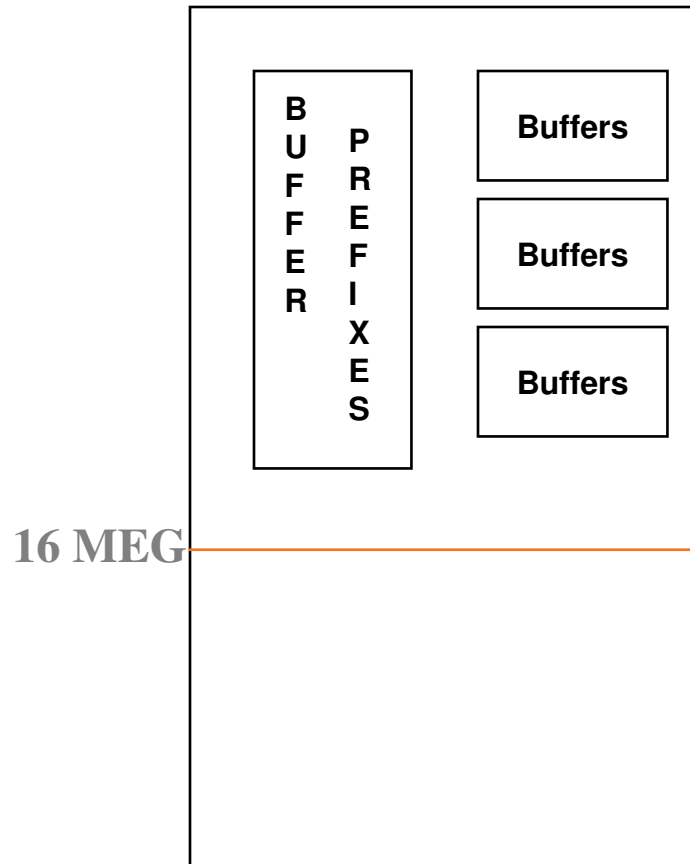


Online Database Operations

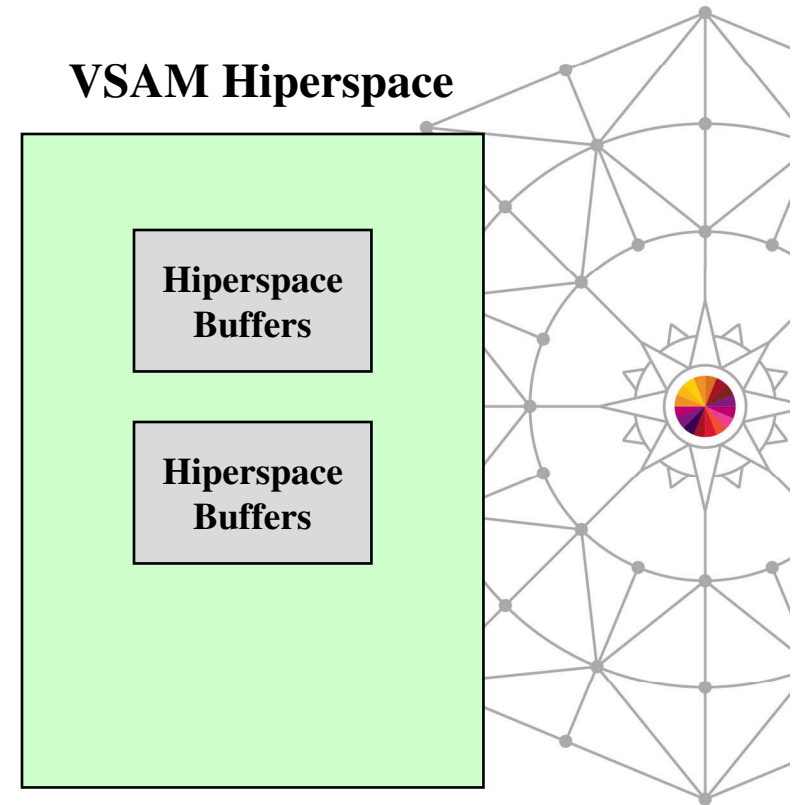


VSAM Hiperspace

DLISAS



VSAM Hiperspace



VSAM Buffer Pool

----- 08/28/12 14:48:08

VSAM Buffer Pools Status I11A

Lines 1 to 11 of 11

Subpool	Number of Buffers	Size of Buffers	Hit Ratio	Buffers Page-Fixed?	Blocks Page-Fixed?
1	5	512	.0%	YES	YES
2	15	1024	92.0%	YES	YES
3	20	2048	90.0%	YES	YES
4	5	4096	.0%	YES	YES
5	55	4096	70.0%	YES	NO
6	5	4096	.0%	YES	NO
7	3	32768	.0%	YES	YES
8	5	2048	.0%	YES	YES
9	5	512	.0%	YES	YES
10	5	1024	.0%	YES	YES
11	5	1024	.0%	YES	YES

Optimal Index Hit Ratio > = 90%
Data Hit Ratio > = 80%

OSAM Buffer Pool

- 4 Gig limit
- Page fix only the buffer
- Sequential Buffering
- **DFSVSMxx** member in **IMSVS.PROCLIB**

IOBF=(length, number, fix1, fix2), for ex.,

- *IOBF=(4096,50,N,Y)*
- *IOBF=(6144,8)*

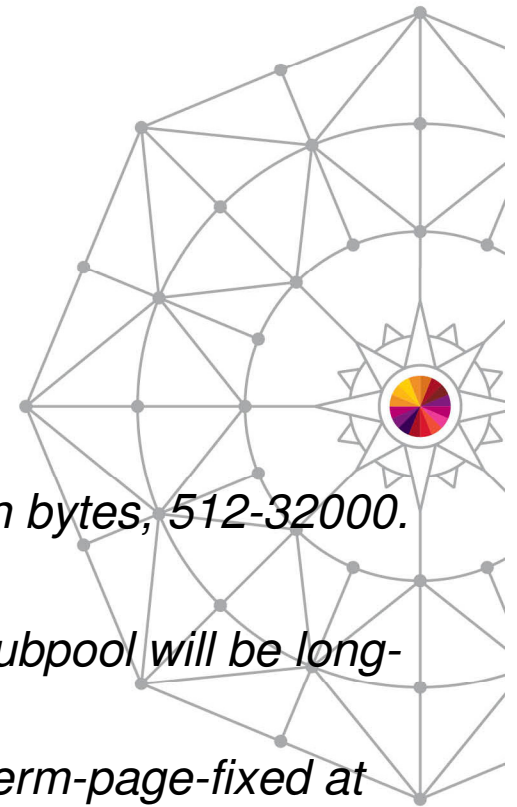
***Length** specifies the length of the buffers in the subpool in bytes, 512-32000.*

***Fix1** specifies the buffers long-term-page-fixing option*

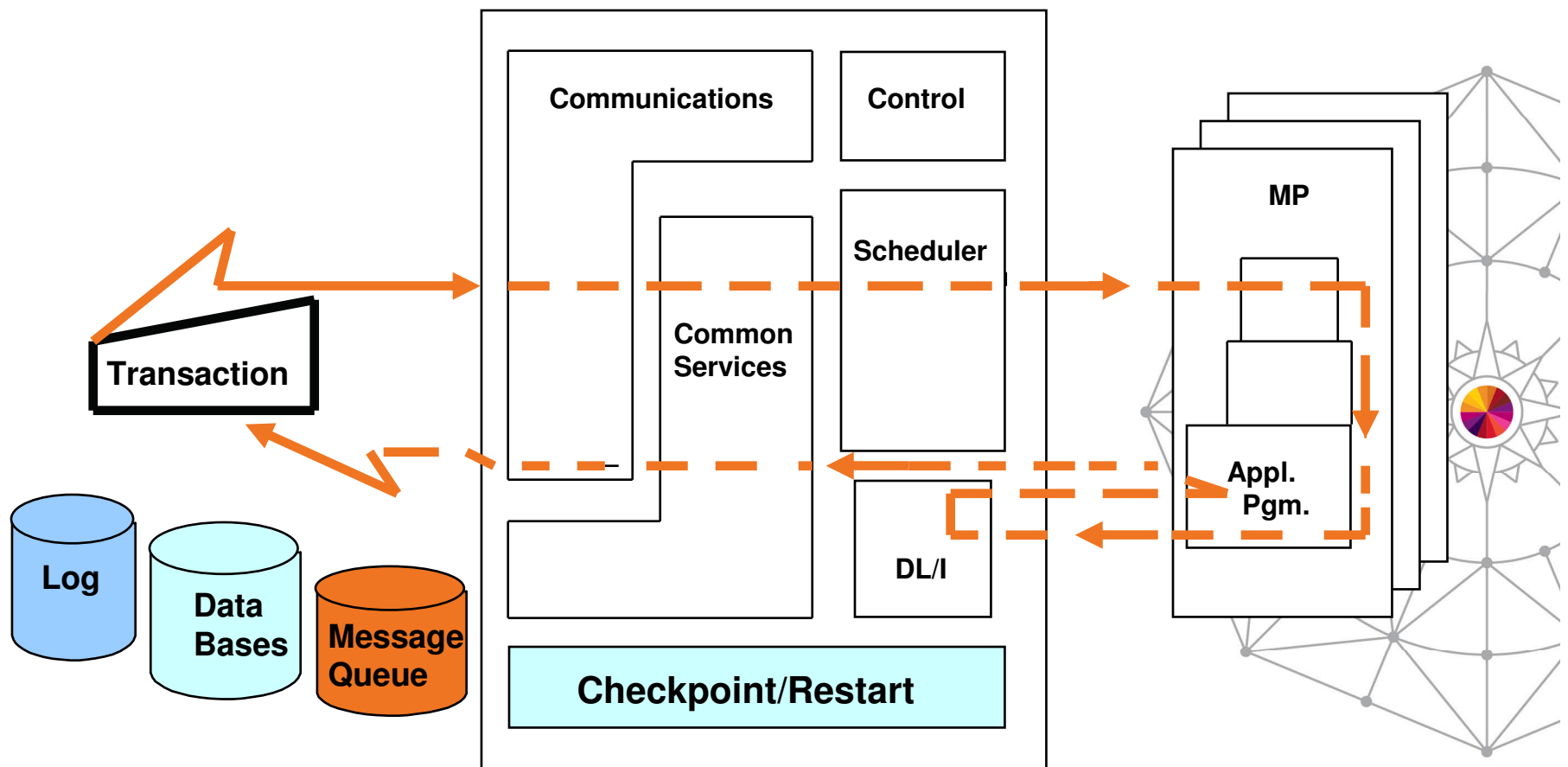
Y – all buffers and buffer prefixes associated with this subpool will be long-term-page-fixed at initialization of the subpool.

N – no buffer associated with this subpool will be long-term-page-fixed at initialization of the subpool.

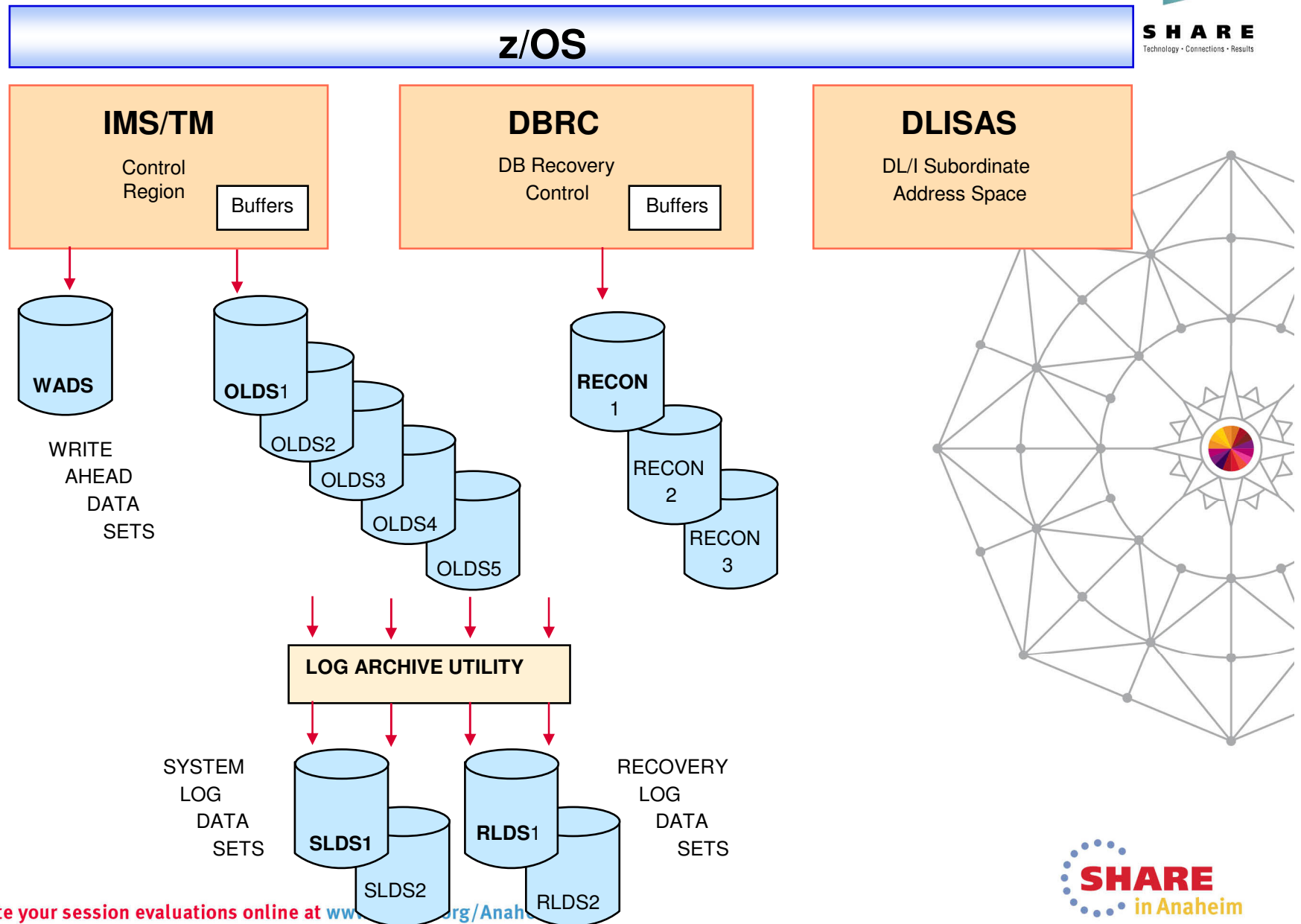
***Fix2** specifies the buffer-prefix long-term-page-fixing option.*



IMS Checkpoint Processing



Common Logging Facility



Logging I/O

08/28/12 7:15:47
I11A

Logging Buffers and Statistics

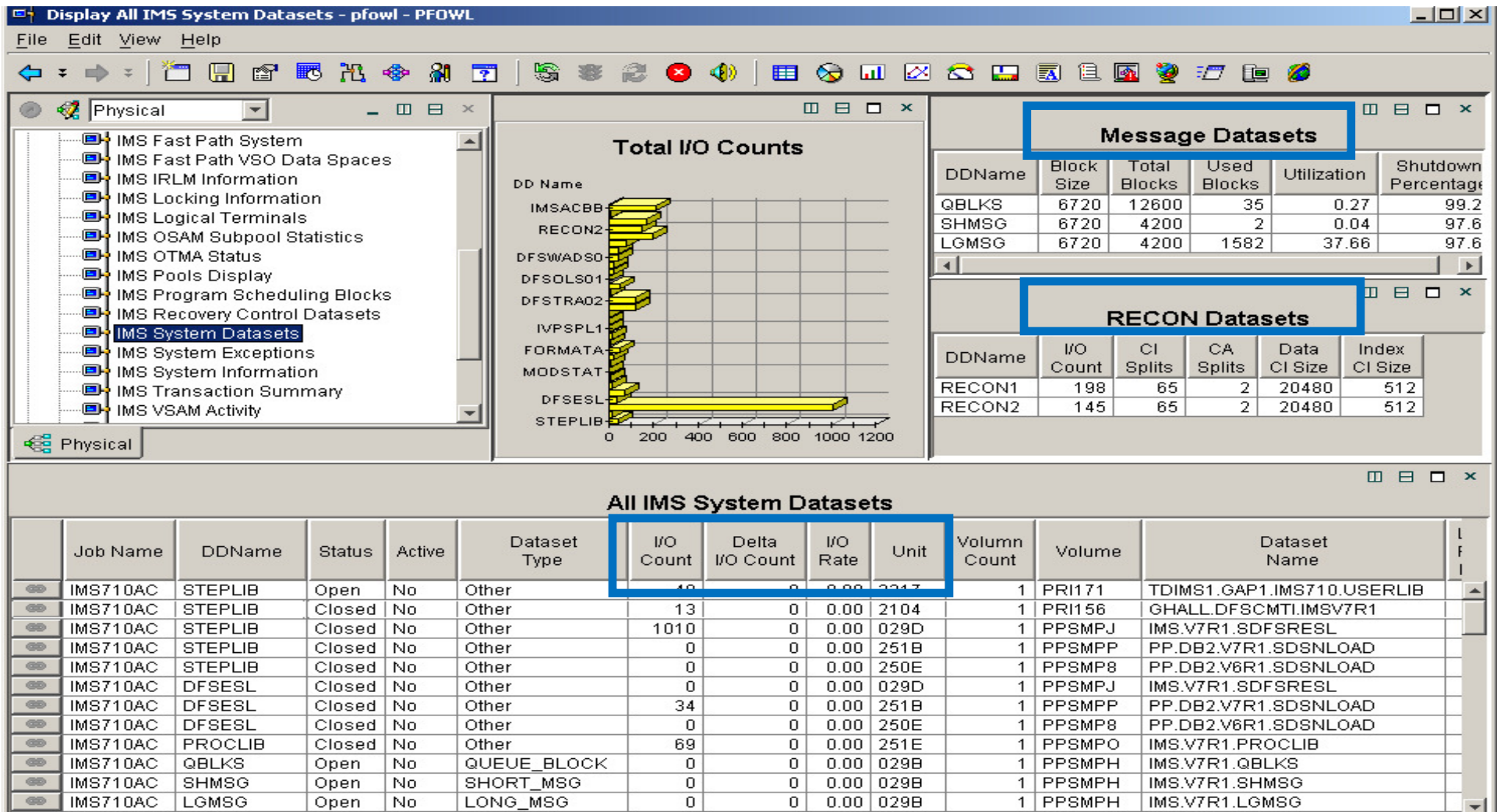
Size : 22 K	Number of Buffers : 25	Number Available : 4
-------------	------------------------	----------------------

I/O Type	Rate/sec	0.....
OLDS writes . . :	225	.00
OLDS reads . . :	0	.00
WADS 2K writes :	1058	.00
WADS EXCPVRS . :	234	.00

BMP Abending?

***** If WADS I/O rate is too high, check the dataset and volume response time, application checkpoint frequency, and re-evaluate OLDS buffer size.

Monitor IMS System Datasets



Cross Reference – Part 1



Reference: IMS Performance Guide Redbook, SG24-4637-00

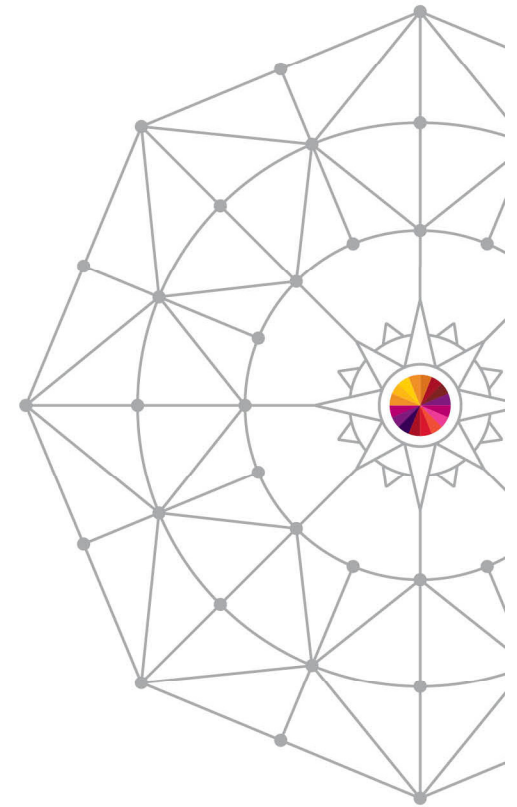
EVENT	ACTIVITY	POOLs/LISTs	DATASETs
Message Input	TP MFS SPA GET QUEUING	CIOP RECANY MFP SPAP/CWAP QBUF LOG	LINEs FORMAT MSGQs IMSLOG
Scheduling	Scheduling PSB Load DMB Load	QBUF PSBP DMBP LOG	MSGQs ACBLIB ACBLIB IMSLOG
Schedule End to First DL/I Call	Program Load Initialization	BLDL VLF/LLA PRELOAD	STEPLIBs



Cross Reference – Part 2

EVENT	ACTIVITY	POOLs/LISTs	DATASETs
Program Elapsed	DC Calls	QBUF	MSGQs
DL/I Elapsed	DB Calls	OSAM VSAM LOG	Databases Databases IMSLOG
IWAIT Elapsed	SPA Insert	SPAP/CWAP LOG	IMSLOG
Termination	Sync Point	OSAM VSAM QBUF LOG	Databases Databases MSGQs IMSLOG
Message Output	Dequeuing MFS TP	QBUF MFP CIOP/HIOP LOG	MSGQs FORMAT LINEs IMSLOG

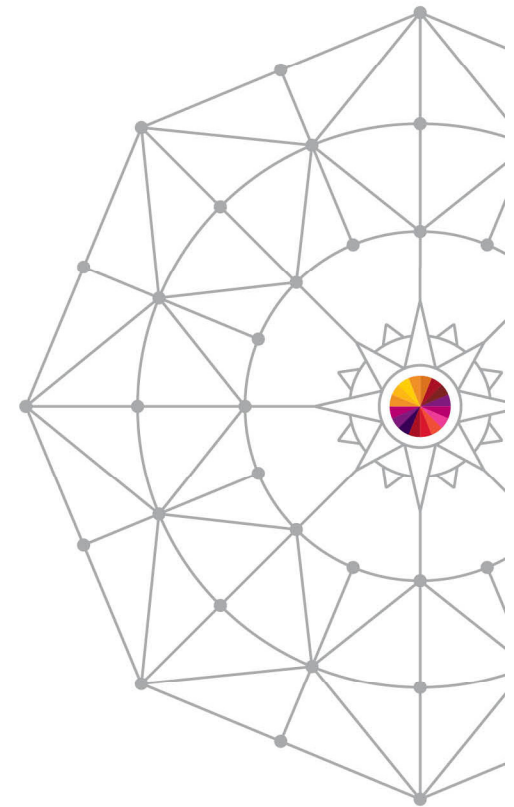
Monitoring IMS Connect



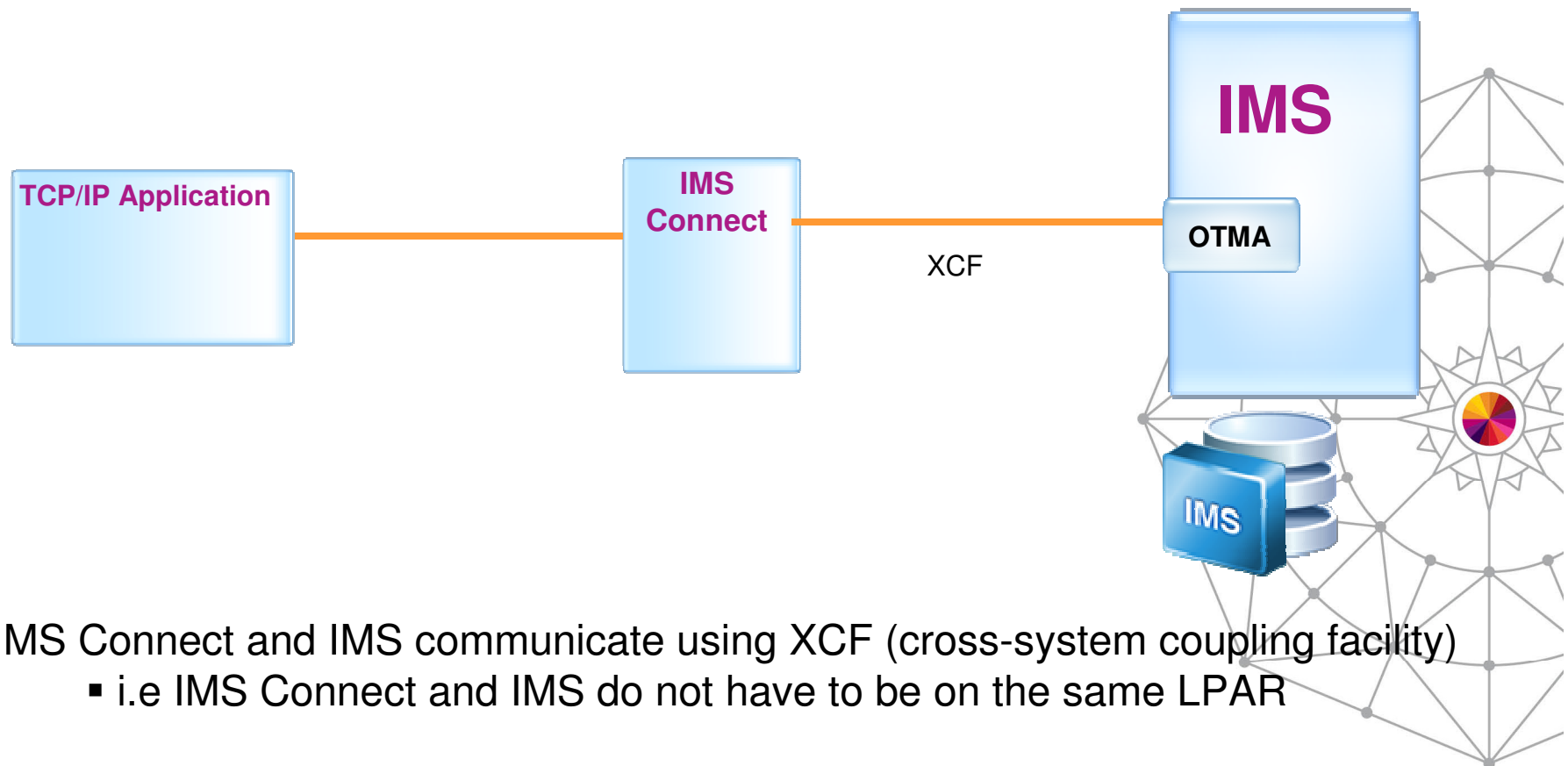
IMS Connect



- **IMS Connect is the TCP/IP interface for IMS**
 - IMS Connect is delivered with IMS
 - IMS Connect runs in a separate address space
 - IMS Connect is a TCP/IP Server
 - IMS Connect is used for:
 - Submitting IMS transaction messages over TCP/IP
 - Accessing IMS data (IMS Open Database) over TCP/IP
 - MSC, ISC over TCP/IP
 - Application Remote Messaging

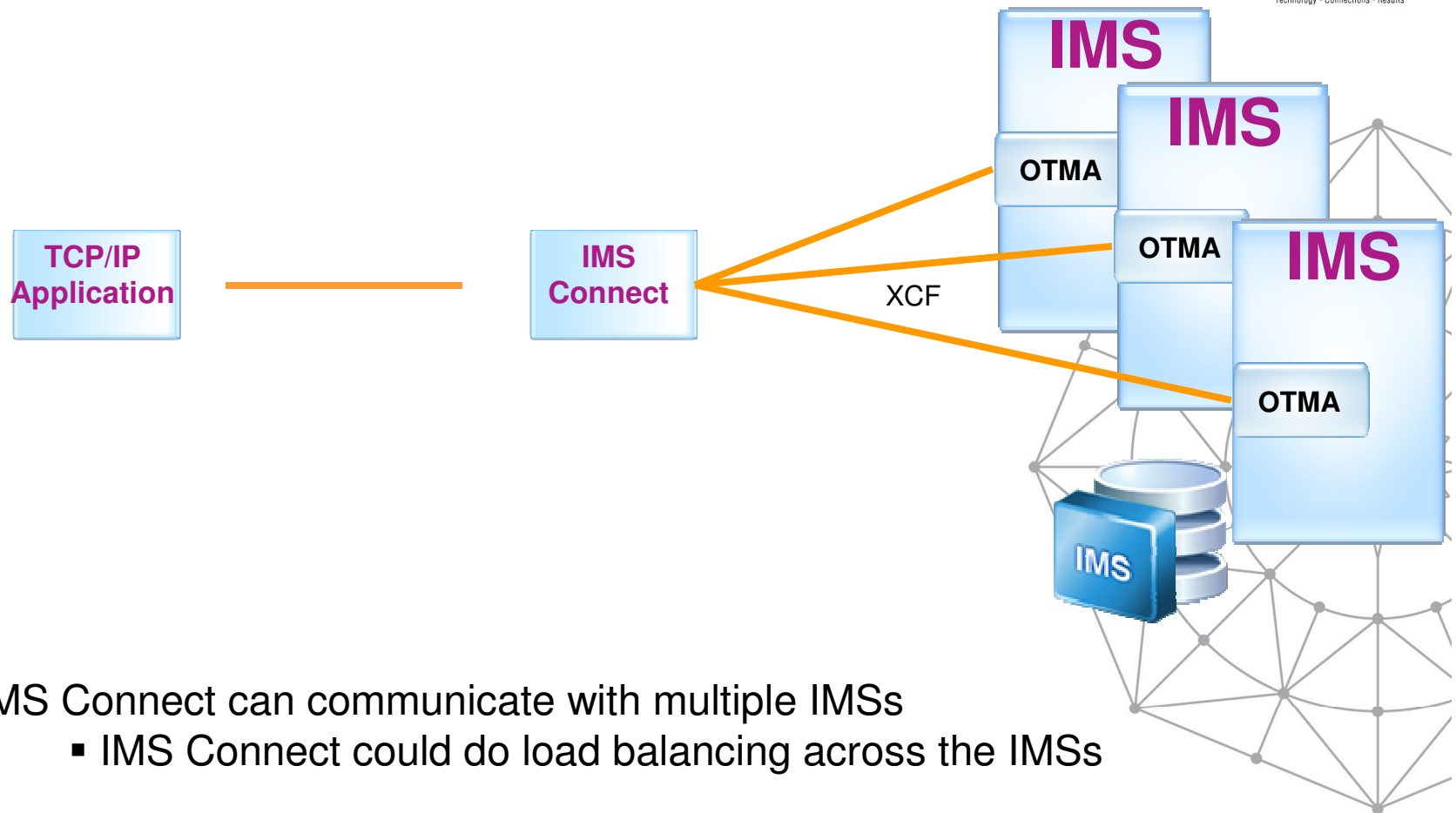


Invoke IMS Transactions over TCP/IP



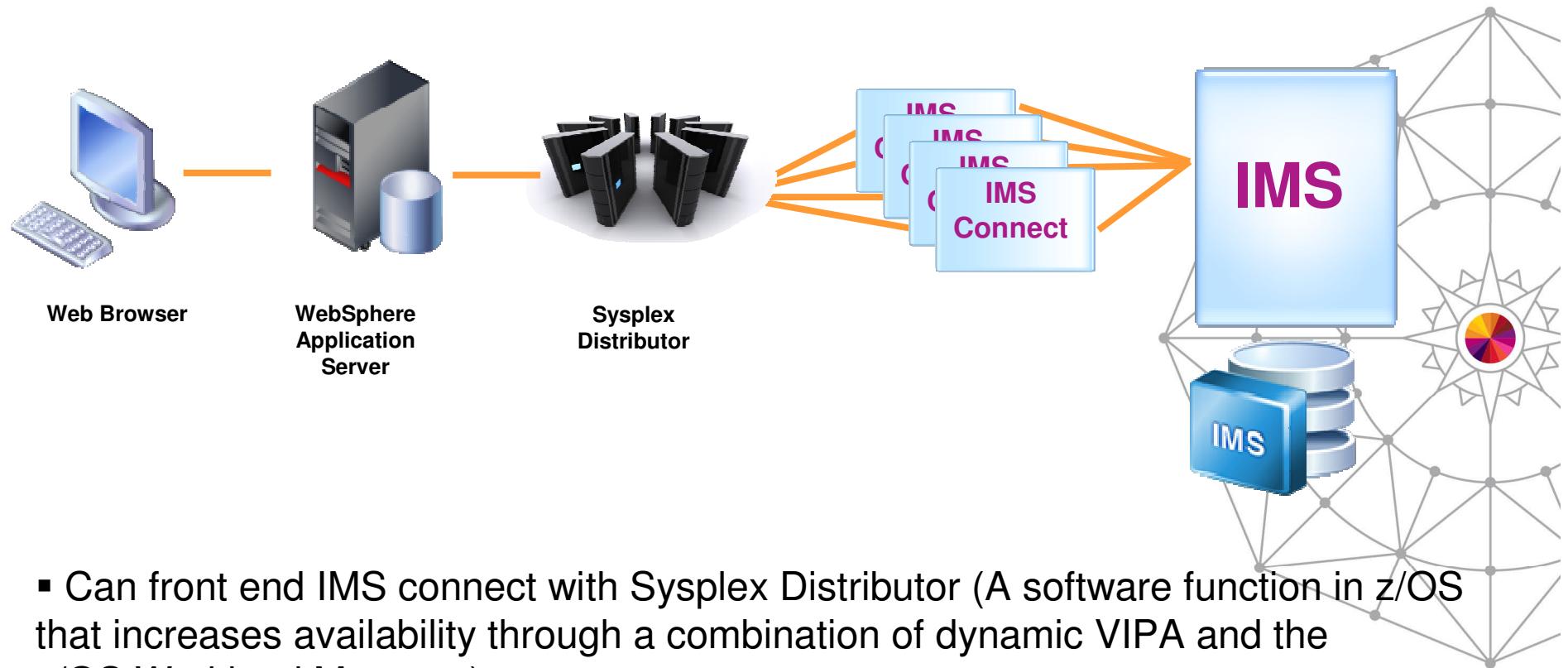
- IMS Connect and IMS communicate using XCF (cross-system coupling facility)
 - i.e IMS Connect and IMS do not have to be on the same LPAR
- IMS Connect and IMS interface thru OTMA (Open Transaction Manager Access)
- IMS Connect provides exit routines for transaction message formatting

One IMS Connect to Many IMSs



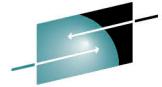
- IMS Connect can communicate with multiple IMSs
 - IMS Connect could do load balancing across the IMSs
- IMS Connect can know the status of the IMSs
 - So if an IMS is unavailable, IMS connect could re-direct the transaction to another IMS

IMS Connect with Sysplex Distributor



- Can front end IMS connect with Sysplex Distributor (A software function in z/OS that increases availability through a combination of dynamic VIPA and the z/OS Workload Manager).

Monitoring TCP/IP Connections



Applications - MGOUV - SYSADMIN

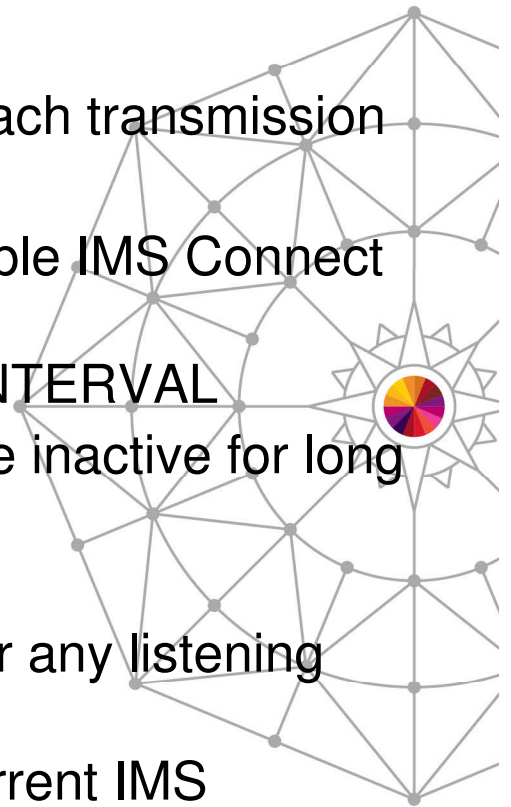
File Edit View Help

Applications Summary Table

	Collection Time	Application Name	Connection Count	Active Connections	Accepted Connections	Connection Rate	Active Connection High Water Mark	Time stamp for Active Connections High Water Mark	Idle Time Since Last Accept	Time Since Last Activity	Server Up Time	Connections in Backlog	Backlog Connections Rejected	Total Backlog Connections Rejected	Backlog Connections Rejected Time Stamp	Transmit Byte Rate	Ref
	04/14/10 16:20:07	\$FTPL1	1	0	0	0	1	04/14/10 13:25:07	0.79	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SDF	17	3	0	0	3	04/14/10 11:30:07	81.17	262.92	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SDSST	28	14	0	0	14	04/14/10 11:30:07	52.61	128.16	81.28	0	0	0		1236	
	04/14/10 16:20:07	\$L4SHL	11	2	0	0	2	04/14/10 11:30:07	81.29	1,263.01	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SMV	11	2	0	0	2	04/14/10 11:30:07	81.25	334.42	81.25	0	0	0		0	
	04/14/10 16:20:07	\$L4SM2	18	3	0	0	3	04/14/10 11:30:07	81.29	1,263.01	81.29	0	0	0		0	
	04/14/10 16:20:07	\$L4SN3	11	2	0	0	2	04/14/10 11:30:07	81.29	25.36	81.29	0	0	0		266	
	04/14/10 16:20:07	\$NDLL1	1	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$PORTL	2	0	0	0	0		11.54	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$SMTPL	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	\$TNL	7	6	0	0	6	04/14/10 15:45:07	0.14	207.39	81.29	0	0	0		0	
	04/14/10 16:20:07	\$PRYCNIT	1	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	D83DL21L	6	1	0	0	1	04/14/10 12:40:07	3.71	6,163.35	3.71	0	0	0		0	
	04/14/10 16:20:07	D71EDIST	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	D91ADIST	9	7	2	0	7	04/14/10 12:30:07	0.03	17.03	81.20	0	0	0		331	
	04/14/10 16:20:07	D91CDIST	2	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	IMS8FCON	2	0	0	0	0		81.28	0.00	81.28	0	0	0		0	
	04/14/10 16:20:07	IMS9FCON	192	1	749	149	1	04/14/10 14:30:07	0.00	0.04	81.22	1	0	0		3780	
	04/14/10 16:20:07	IMS9WCON	3	0	0	0	0		81.25	0.00	81.25	0	0	0		0	
	04/14/10 16:20:07	INETD4	2	0	0	0	0		81.25	0.00	81.25	0	0	0		0	
	04/14/10 16:20:07	IOBSNMP	1	0	0	0	0		0.00	0.00	0.00	0	0	0		0	
	04/14/10 16:20:07	L3AMQL5	13	2	0	0	2	04/14/10 11:30:07	66.85	14.91	66.85	0	0	0		8240	
	04/14/10 16:20:07	L3IAMQL6	13	2	0	0	2	04/14/10 11:30:07	66.87	49.35	66.87	0	0	0		5472	
	04/14/10 16:20:07	L3IAN3L6	13	2	0	0	2	04/14/10 11:30:07	66.81	450.41	66.81	0	0	0		0	
	04/14/10 16:20:07	L3ITDSL5	78	53	0	0	64	04/14/10 15:30:07	0.90	0.00	1.40	0	0	0		296722	39
	04/14/10 16:20:07	L3ITDSL6	24	10	0	0	13	04/14/10 11:30:07	3.29	8.59	3.45	0	0	0		4736	
	04/14/10 16:20:07	M5GBRMTL	11	2	0	0	2	04/14/10 11:30:07	81.24	1,062.97	81.29	0	0	0		0	
	04/14/10 16:20:07	M5S042RL	17	5	0	0	5	04/14/10 11:30:07	56.25	7.21	56.31	0	0	0		9287	
	04/14/10 16:20:07	OSNMPDL	2	0	0	0	0		81.29	0.00	81.29	0	0	0		18217	
	04/14/10 16:20:07	SNMPQEL	3	0	0	0	0		81.29	0.00	81.29	0	0	0		0	
	04/14/10 16:20:07	VCN3H@@L	31	23	0	0	31	04/14/10 12:40:07	3.71	662.98	81.29	0	0	0		0	
	04/14/10 16:20:07	VDC5H@@L	10	2	0	0	2	04/14/10 11:30:07	4.91	55.17	4.91	0	0	0		589	
	04/14/10 16:20:07	VDDFH@@L	9	2	0	0	2	04/14/10 11:30:07	4.92	3,163.11	4.92	0	0	0		0	
	04/14/10 16:20:07	VDHAH@@L	33	21	0	0	21	04/14/10 14:50:07	1.57	7.28	4.93	0	0	0		7549	
	04/14/10 16:20:07	VDHLH@@L	10	2	0	0	2	04/14/10 11:30:07	3.01	7.28	4.91	0	0	0		1380	
	04/14/10 16:20:07	VDI2H@@L	5	1	0	0	1	04/14/10 11:30:07	4.92	3,163.11	4.92	0	0	0		0	
	04/14/10 16:20:07	VDI5H@@L	13	2	0	0	2	04/14/10 11:30:07	4.93	62.40	4.89	0	0	0		1404	

TCP/IP.PROFILE Definitions

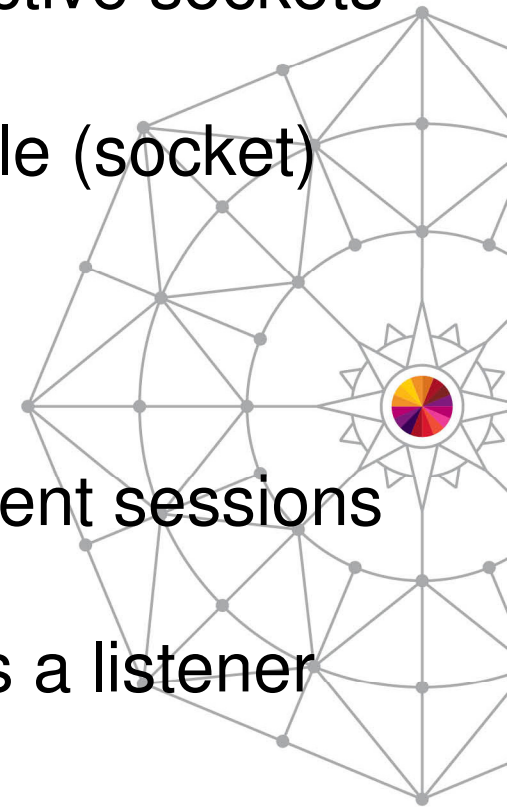
- PORT statement: IMS Connect PORT set to **NODELAYACKS**
 - Allows ACKS to be sent immediately
 - Default is to wait for up to 200ms before ACKing each transmission
- SHAREPORT
 - Allows IMS Connect PORTS to be shared by multiple IMS Connect instances on the same TCP/IP stack
- TCPCONFIG INTERVAL or **KEEPALIVEOPTIONS** INTERVAL
 - Allows TCP/IP to maintain a connection that can be inactive for long periods of time
- **SOMAXCONN**
 - Specifies the max. connection requests **queued** for any listening socket. Default is **10**.
 - Must be defined large enough for maximum concurrent IMS Connect requests



Customizing Unix System Services



- SYS1.PARMLIB (BPXPRMxx)
 - **MAXSOCKETS** sets total number of active sockets per stack
 - **MAXFILEPROC** sets total number of file (socket) descriptors for process
- IMS Connect – HWSCFGxx Option
 - **MAXSOC** sets total number of concurrent sessions for this IMS Connect.
 - One connection per port is reserved as a listener connection. Default is 50



Network Key Indicators to Watch



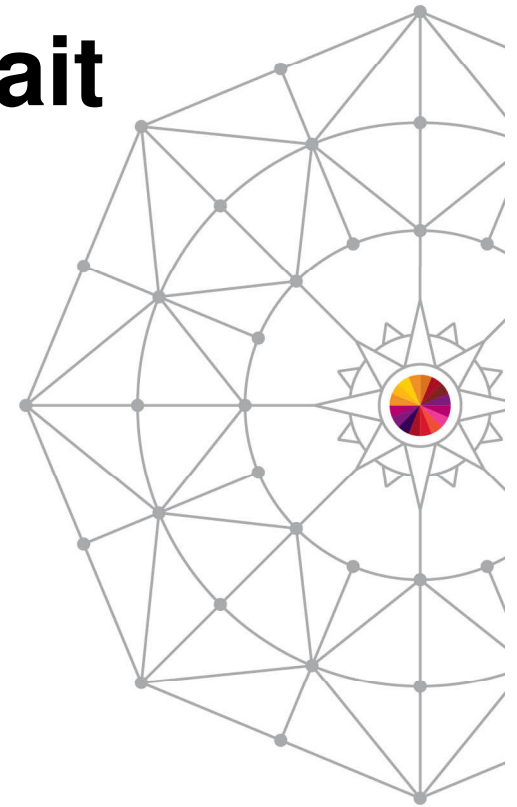
TCP/IP Active Connection
FTP long running jobs
VTAM Buffer Pools

Backlog Connection Rejected
Packet Retransmission Rate
OSA Adapter Performance

Listeners with active connections - All LPARS

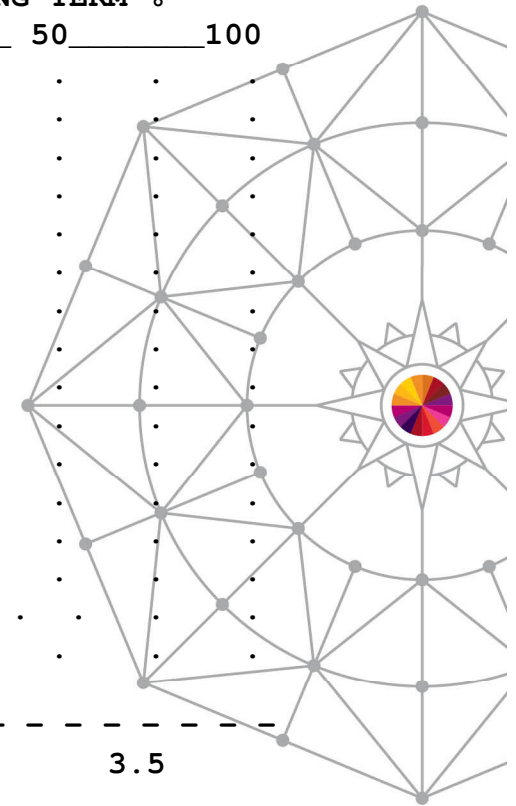
	System ID	Application Name	Local Port	Active Connections	Idle Time Since Last Accept	Connections in Backlog	Backlog Connections Rejected	Backlog Limit	Total Backlog Connections Rejected	Hex Connection Number	Local IP Address	Accepted Connections	Connection Rate	Act Conne High Wa
	SYS	I5D0B8IP	1920	41	29.57	0	0	10	0	0X0000...	::	0	0	
	SP22	N3D0AG22	1920	38	33.14	0	0	10	0	0X0000...	::	0	0	
	SYS	I5D0IP00	1920	37	29.57	0	0	10	7	0X0016...	127.0.0.1	0	0	
	SP22	VHBC5I@L	1920	35	33.14	0	0	10	0	0X0003...	127.0.0.1	0	0	
	SP13	N3D0AG13	1920	23	57.35	0	0	10	0	0X0000...	::	0	0	
	SP13	M530DSST	1920	19	57.35	0	0	10	12	0X000A...	127.0.0.1	0	0	
	SYS	M5D0HAHB	11757	16	9.89	0	0	10	0	0X0000...	9.42.46.1...	0	0	
	SYS	VHBGWG@L	10715	10	54.96	0	0	1	0	0X0027...	127.0.0.1	0	0	
	SP22	L3ITDSW8	36230	9	33.16	0	0	10	0	0X000C...	0.0.0.0	0	0	
	SP13	V9CTW@L	33333	9	160.58	0	0	10	0	0X0000...	0.0.0.0	0	0	
	SP22	TSS0DSH1	14731	8	29.65	0	0	10	0	0X0004...	9.42.46.22	0	0	
	SP22	\$TN22	23	7	16.83	0	0	10	0	0X0000...	::	0	0	
	SYS	N3D0DSMG	61757	7	31.36	0	0	10	0	0X0004...	0.0.0.0	0	0	
	SYS	D91SDIST	5096	7	0.10	0	0	10	0	0X0000...	::	0	0	
	SP22	VHBDSI@L	25104	7	134.63	0	0	10	0	0X0000...	9.42.46.22	0	0	
	SYS	\$TNG	23	6	7.91	0	0	10	0	0X0000...	::	0	0	
	SP22	BCD1DSST	21618	6	135.17	0	0	10	0	0X0000...	0.0.0.0	0	0	
	SP22	BCD1DSST	2764	5	135.16	0	0	1	0	0X0000...	127.0.0.1	0	0	
	SYS	S8HUBLL	3658	5	55.17	0	0	1	0	0X0031...	127.0.0.1	0	0	
	SP22	M5GBHUB1	43082	5	160.83	5	0	5	12567	0X0000...	0.0.0.0	0	0	
	SP22	\$22SDSST	1183	5	155.82	0	0	1	0	0X0000...	127.0.0.1	0	0	
	SYS	I5D0B8IP	1920	5	106.45	0	0	10	0	0X0000...	0.0.0.0	0	0	

Case Study: Database I/O Wait



Database I/O Wait

PDEX	-----SHORT TERM %-----				-----LONG TERM %-----			
+ (ELAPSED TIME= 1:41 MN) % 0	50	100		% 0	50	100		
+ USING CPU:	21.0 --->.	.	.	.	20.5 --->.	.	.	
+ USING CPU IN APPL	(11.2) -->.	.	.	.	(11.0) -->.	.	.	
+ USING CPU IN IMS	(9.8) -->.	.	.	.	(9.5) -->.	.	.	
+ SCHEDULING WAITS:	2.8 >.	.	.	.	2.5 >.	.	.	
+ WAIT FOR MPP	(0) >.	.	.	.	(0.2) >.	.	.	
+ WAIT FOR GU	(2.8) >.	.	.	.	(2.3) >.	.	.	
+ IMS ACTIVITY:	16.5 -->.	.	.	.	12.5 -->.	.	.	
+ SPA I/O	(1.2) >.	.	.	.	(1.0) >.	.	.	
+ SYNC POINT WAIT	(5.6) >.	.	.	.	(5.2) >.	.	.	
+ SWITCHED TO CTE	(9.7) ->.	.	.	.	(6.3) --->.	.	.	
+ DATABASE I/O WAITS	35.7 ----->	.	.	.	26.7 ----->	.	.	
+ PAY221	25.4 ----->	.	.	.	(15.4) -->.	.	.	
+ ADA021S	(10.3) ->.	.	.	.	(11.3) ->.	.	.	
+ MVS WAITS:	25.8 ----->	.	.	.	22.7 --->.	.	.	
+ CPU WAIT (MPP/EMP)	(13.7) -->.	.	.	.	(12.6) -->.	.	.	
+ PROGRAM FETCH I/O	(12.1) ->.	.	.	.	(10.1) ->.	.	.	
+ ----								
+ - - - - -								
+ Avg. Trans Executing:		5.3				3.5		



Database Status

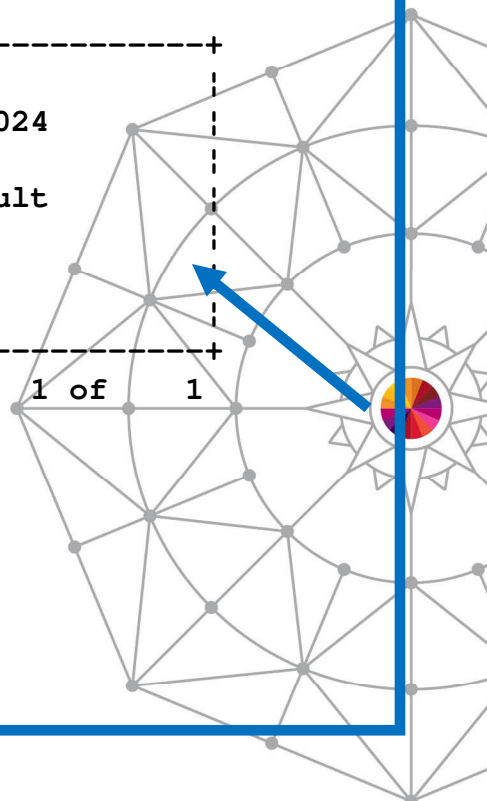
Details for Database : PAY221
08/28/12 14:44:25 I91A

Status : Available Residency Status : Resident Recoverability . : Recoverable	Block size : 1024 Buffer Subpool . . : Default Type : OSAM
---	--



Lines	
Volser	Unit
PPSMPN	4E8

1 to 1 of 1

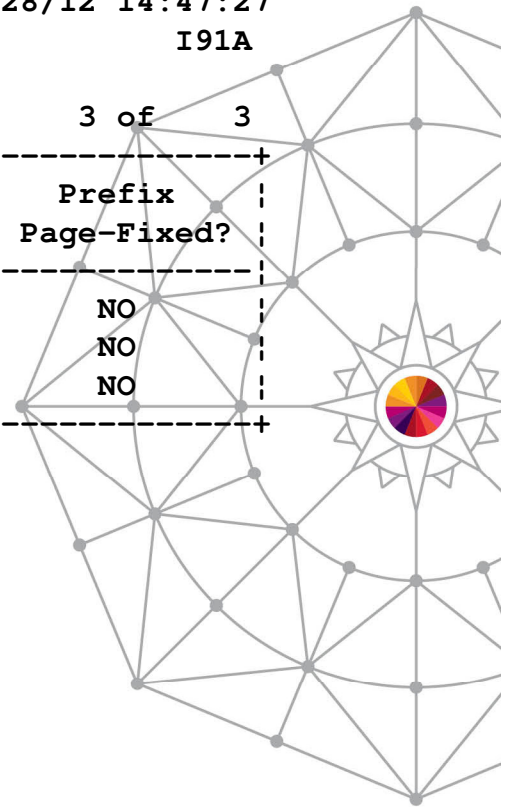


Database Buffer Pool Status

----- 08/28/12 14:47:27
OSAM Buffer Pools Status I91A

Lines 1 to 3 of 3

Subpool	Subpool Id	Number of Buffers	Hit Ratio	Size of Buffers	Buffers Page-Fixed?	Prefix Page-Fixed?
1	none	64	62.5%	1024	NO	NO
2	none	32	62.0%	2048	NO	NO
3	none	16	41.3%	4096	NO	NO



Volume Response Time

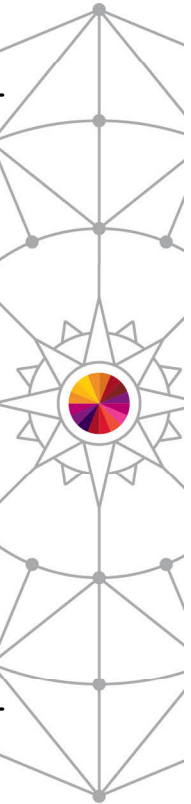
08/28/12 14:47:32
I91A

Device Statistics
Lines 1 to 7 of 7

Volser	Unit	Response Time	IOSQ Time	Pend Time	Conn Time	Disc Time	I/Os per sec		Queue Length	% Busy
							Total	IMS		
PPSMPE	14E	7.5	.0	3.2	2.6	1.6	.7	.0	.00	.7
CAN001	2A4	7.2	.0	1.5	2.1	3.5	.5	.0	.00	2.5
CAN009	2B9	6.8	.0	1.0	2.7	2.9	.4	.0	.00	.4
PPSMPI	4E1	4.8	.0	2.6	1.5	.6	30.9	.0	.00	3.4
PPSMPI	4E5	15.0	.0	3.5	1.1	10.2	.0	.0	.00	.0
PPSMPI	4E7	7.6	.0	.6	3.0	4.0	.6	.0	.00	.2
PPSMPI	4E8	54.7	34.3	1.3	14.5	4.6	7.8	.0	.02	11.5

Dataset Response Time

Actions	Options	Index	View	Help	SMF ID: SYSA - 08/28/12 14:47:36	
KDFS0450		Dataset Details			Status:	
Dataset PRODIMS.PAYROLL.DATA						
S=Show details						
+-----+-----+-----+-----+						
Volser : PPSMPN		Device type . . : 3390		Volume MSR . . . : 54.7		
Data class . . .				Creation date . . : 05/09/09		
Mgmt class . . . NOACTION				Last reference . . : 08/28/12		
Storage class . . DATABASE				Expiration date . . : None		
+-----+-----+-----+-----+						
DSORG : VS		RECFM . : U		Response Time Data		Cache Statistics
LRECL : 4089		BLKSIZE : 4096				
Key length . . : 0				I/O Count . . : 3		Eligible % . . : 100.0
Key position . : 0				I/O per sec . . : 0.0		Inhibit % . . : 0.0
				Avg. IOSQ . . : 33.3		Bypass % . . : 0.0
Alloc . . : 13		Used : 13		Pending . . : 0.3		Total hit % . . : 50.0
Volumes : 1		% Used : 100.0		Disconnect . . : 12.5		Read hit % . . : 50.0
Secondary value : 13				Connect . . : 1.7		Write hit % . . : 0.0
Secondary unit : Track				I/O service . . : 14.6		Read % . . . : 100.0
No. of extents . 1				Total MSR . . : 47.9		Seq'l I/O % . . : 0.0
+-----+-----+-----+-----+						



Who Has I/O?

> Profile of the DASD Device

DEV 4E8 Volser=PPSMPN Online Alloc

=====

dp1t01 _____ OMEGAMON Peek at Unit=4E8 Volser=PPSMPN _____

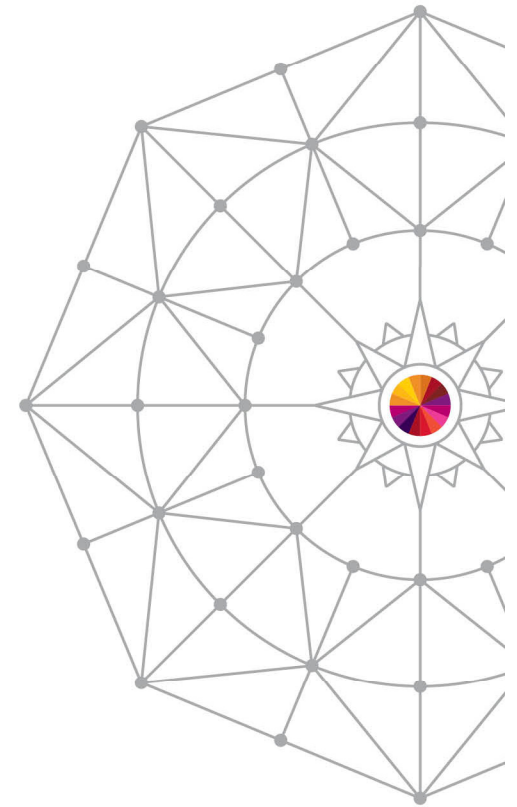
+	DBsy	DDDDD	DDDDDDDDDDDDDDDDDDDD	DDDDDDDDDDDDDDDDDDDD	DDDDDDDD	Samples:	50
+	IOQ					Interval:	2
+	I/O#	>27		>28	>29	I/O's:	3
+	CPU						
+	User	>D81ADBM1					
+	Cyl	>217					
+	Nrdy						
+	Resv						

=====



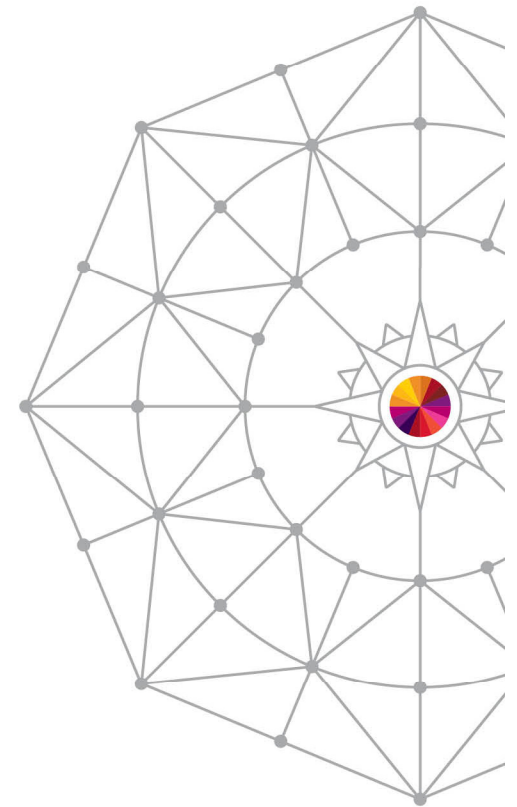
What if DB2 data was placed
on the same pack with an
IMS database?

Summary



Steps to Managing Performance

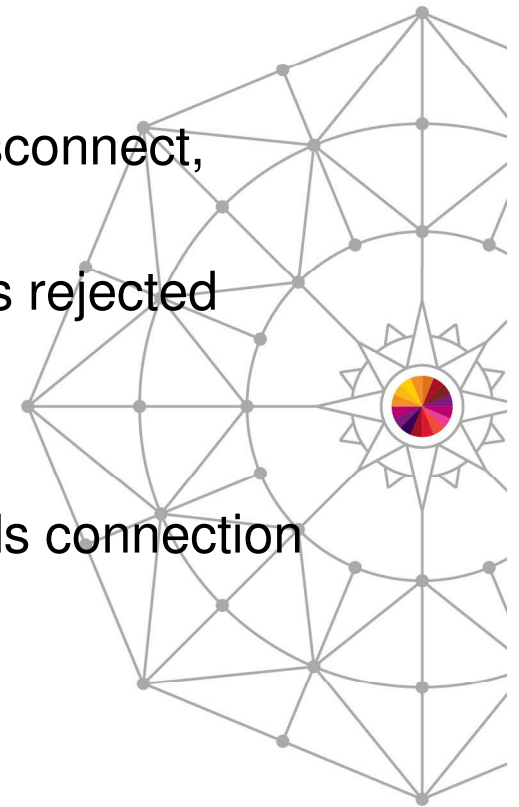
- Set up objectives
- Monitor transaction response time
 - Snap shot and trending
- Pinpoint the bottleneck
 - Message flooding
 - Locking contention
 - Database I/O
 - Logging and DBRC
 - Network congestion
- Correct the problem



Correlate Metrics with z/OS, TCP, DB2, SMS

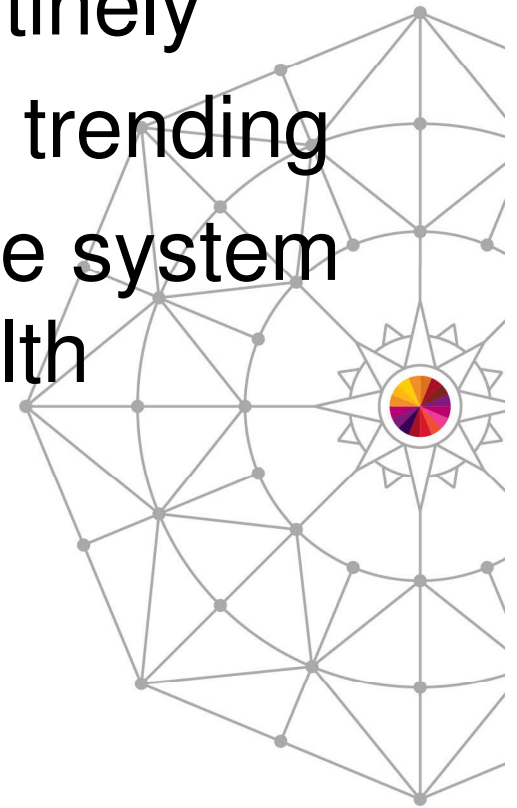


- **CPU** – top CPU Consumers, looping Jobs, excessive CPU tasks, GCP, zIIP
- **Memory** / Storage – ECSA/CSA storage leaks
- **I/O** – high volume response time, IOSQ, pending, disconnect, connect Times
- **TCP/IP** - timeouts, backlog limit, backlog connections rejected
- **WLM** - Performance Index >1
- **Sysplex** - Coupling Facility
- **Unix System Services** – processes, files I/O, threads connection pooling for distributed systems
- **FTP Jobs** – long holding a dataset
- **Batch Jobs** - delay, long waits, back-out issues
- **DB2** – lockouts, timeouts
- ...and monitor third party gateway / connectors



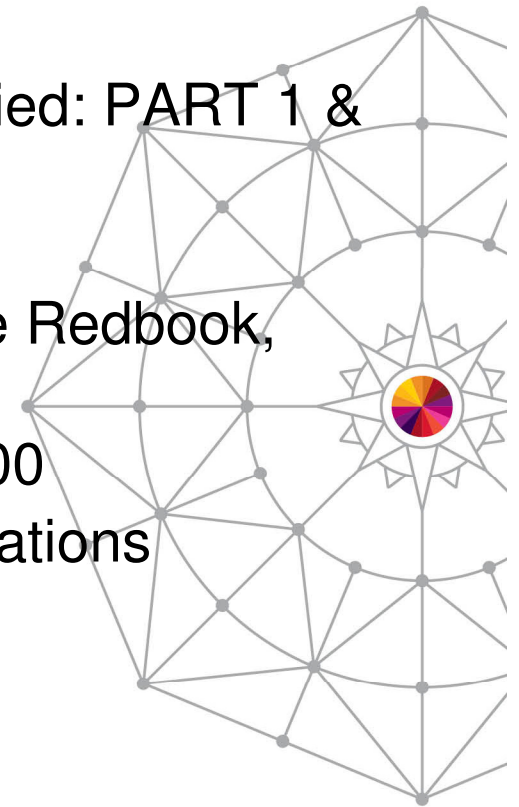
Summary

- Monitor and measure system routinely
- Understand workloads, priorities, trending
- Obtain a global view of your entire system and application performance health



References

- IMS product documentation
- IMS Webcasts by Deepak Kohli
 - IMS regions simplified, clarified and demystified: PART 1 & PART 2 (Aug 27 & Oct 15, 2013)
 - Replay URL: <http://ibm.co/16WNtBE>
- IMS Performance Monitoring and Tuning Update Redbook, SG24-6404-00
- IMS Performance Guide Redbook, SG24-4637-00
- IMS Slideshare and SHARE conference presentations
- IBM OMEGAMON XE for IMS User's Guide
- www.ibm.com/ims



Thank You!

