RMF and Coupling Facility Health

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Agenda

- Importance of CF Health
- Structure of Report
- Data Analysis Path
- Highlights of the CF Activity Report
- Tool for Analyzing CF Report
- Closing

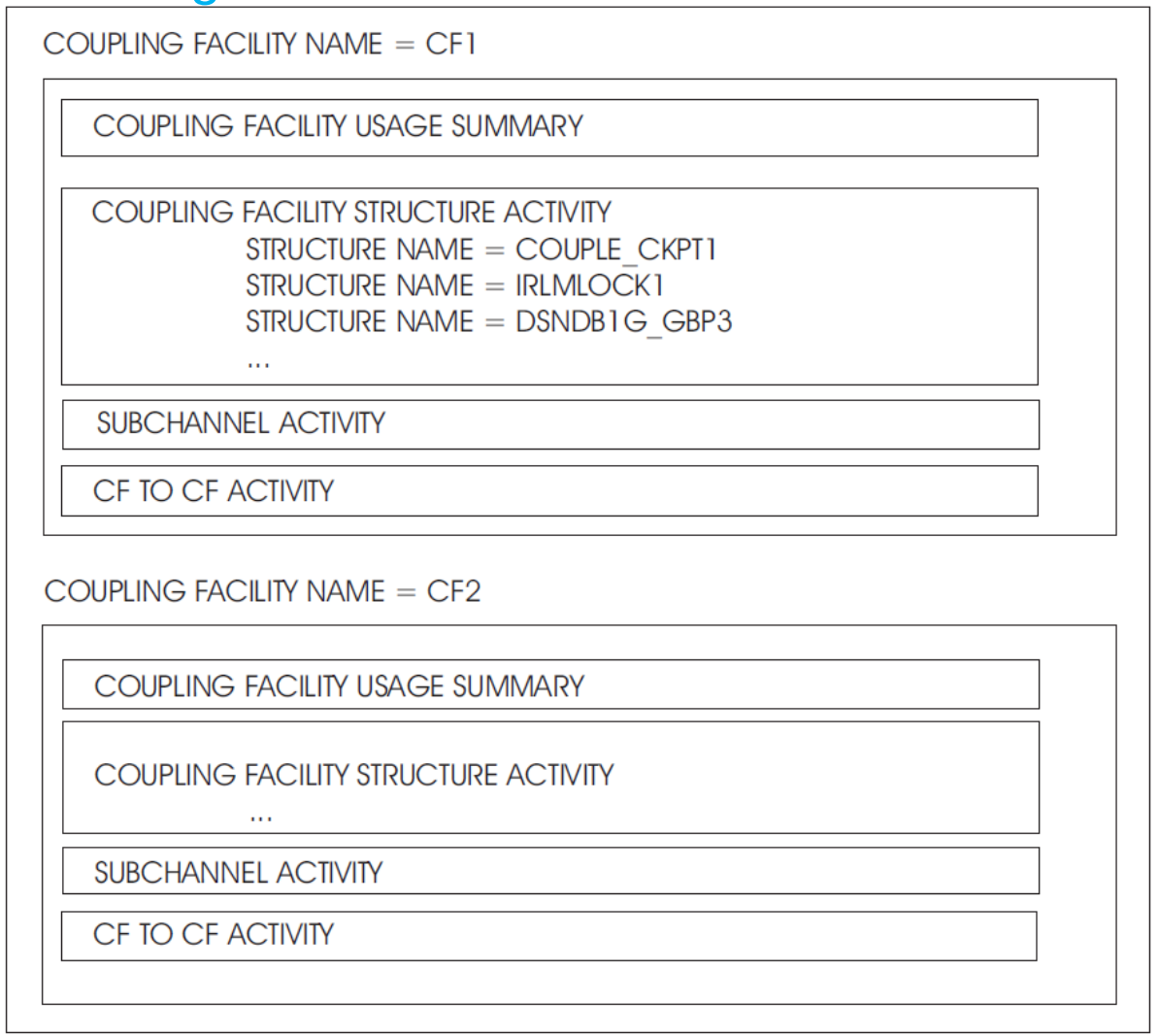
Importance of CF Health

- Every system in sysplex will be affected negatively if response time of CF requests is abnormally slow
- Adding capacity, storage, links to a CF to ensure top performance is, by comparison, relatively inexpensive to ensure proper response times for requesting applications
- Performance bottlenecks during regular production periods can become exacerbated if there is unplanned outage of production CF
  - Requests that were spread across several links are, in many cases, now all sharing the same two paths
  - Same with CF processor utilization and storage demands

CF Activity Report Structure

- Several sections with relevant data
- Structure Activity section groups structures by type in a specific order
  - LIST
  - LOCK
  - CACHE
  - SCM
  - Unknown
- CF to CF Activity only used with CF Duplexing

Single Interval:



Data Analysis Path – AKA – Where Do I Start?

- When checking CF performance, always start with the basics
  - All of the following should add up so that all requests, utilization, and storage could fit on a single CF in the event of CF outage (planned or unplanned)
    - CF Utilization for each CF
    - Allocated and used storage on each CF
    - Total requests for each CF
- Average SYNC and ASYNC times for each CF
  - By structure as well as overall
- Look at top structure to determine service times
  - Number of delayed requests
- Must include data from all systems in sysplex for accurate reports

CF Activity Usage Summary Report Example

1 C O U P L I N G F A C I L I T Y A C T I V I T Y PAGE 1

z/OS V2R1 SYSPLEX WSCZPLEX DATE 02/19/2015 INTERVAL 005.00.000
RPT VERSION V2R1 RMF TIME 14.25.00 CYCLE 01.000 SECONDS

COUPLING FACILITY NAME = CF1
TOTAL SAMPLES(AVG) = 300 (MAX) = 300 (MIN) = 300

COUPLING FACILITY USAGE SUMMARY

GENERAL STRUCTURE SUMMARY

TYPE	STRUCTURE NAME	STATUS CHG	ALLOC SIZE	% OF CF STOR	# REQ	% OF ALL REQ	% OF CF UTIL	AVG REQ/ SEC	LST/DIR ENTRIES TOT/CUR	DATA ELEMENTS TOT/CUR	LOCK ENTRIES TOT/CUR	DIR REC/ DIR REC XI'S
LIST	DB2X_SCA	ACTIVE	32M	0.0	786	3.6	4.5	2.62	40K	79K	N/A	N/A
									178	479	N/A	N/A
	IXCSTR1	ACTIVE	59M	0.0	16195	74.2	64.3	53.98	12K	12K	N/A	N/A
									1	18	N/A	N/A
	IXCSTR3	ACTIVE	59M	0.0	2847	13.0	12.3	9.49	12K	12K	N/A	N/A
									1	16	N/A	N/A
LOCK	ISGLOCK	ACTIVE	64M	0.0	1950	8.9	6.6	6.50	0	0	4194K	N/A
									0	0	1066	N/A
CACHE	DB2X_GBP0	ACTIVE	125M	0.1	28	0.1	2.3	0.09	104K	21K	N/A	0
									23	17	N/A	0
	SYSIGGCAS_ECS	ACTIVE	5M	0.0	14	0.1	0.1	0.05	853	841	N/A	0

- Tells which structures are active and defined in each CF, how much CF storage used, and total number of requests to see which structures are driving CF Utilization
- ACTIVE PRIM and ACTIVE SE shows up for duplexed structure. May not show up if data from some systems are missing
- DIR REC are indicators of short on storage for structure
- DIR REC XI's are indicator of structure performance problem, more detail in structure section

Overall CF Usage

- Below structure detail
- Overall CF Utilization
  - CFLEVEL
  - DYNDISP
  - CPs defined
- CF Storage defined and used

```
1                                C O U P L I N G   F A C I L I T Y   A C T I V I T Y                                PAGE    2

     z/OS V2R1              SYSPLEX WSCZPLEX           DATE 02/19/2015          INTERVAL 005.00.000
                            RPT VERSION V2R1 RMF       TIME 14.25.00            CYCLE 01.000 SECONDS

-------------------------------------------------------------------------------------------------------------------------------
COUPLING FACILITY NAME = CF1
TOTAL SAMPLES(AVG) =   300  (MAX) =   300  (MIN) =   300
-------------------------------------------------------------------------------------------------------------------------------
                                          COUPLING  FACILITY  USAGE  SUMMARY
-------------------------------------------------------------------------------------------------------------------------------
STORAGE SUMMARY
-------------------------------------------------------------------------------------------------------------------------------

                                          ALLOC      % OF CF      ------- DUMP SPACE -------
                                          SIZE       STORAGE     % IN USE    MAX % REQUESTED

TOTAL CF STORAGE USED BY STRUCTURES        370M        0.3
TOTAL CF DUMP STORAGE                       10M        0.0          0.0              0.0
TOTAL CF AUGMENTED SPACE                     0K        0.0
TOTAL CF STORAGE AVAILABLE                132260M       100
                                          -------
TOTAL CF STORAGE SIZE                     132640M


                                          ALLOC      % ALLOCATED
                                          SIZE

TOTAL CONTROL STORAGE DEFINED             132640M        0.3
TOTAL DATA STORAGE DEFINED                     0K        0.0


                                          ASSIGNED   % IN USE     SUM MAX SCM

TOTAL CF STORAGE CLASS MEMORY                0K        0.0            0K

PROCESSOR SUMMARY
-------------------------------------------------------------------------------------------------------------------------------

COUPLING FACILITY         2964        MODEL N96      CFLEVEL  20          DYNDISP OFF

AVERAGE CF UTILIZATION  (% BUSY)           0.1      LOGICAL PROCESSORS:   DEFINED   2    EFFECTIVE    2.0
                                                                          SHARED    0    AVG WEIGHT   0.0
```

Structure Activity

- Detailed information for each structure defined to each CF
  - broken out by system and total
- Requests changed due to heuristic algorithm are not included in CHNGD requests
- Service times can vary significantly from structure to structure. Size and type of data sent/received can affect overall performance even with there are no delays
- SYNC service time should always be shorter than ASYNC service times
- Watch for CHNGD requests as this can be indicator of shortage of subchannels
- Watch for significant number of delayed requests

```
COUPLING FACILITY NAME = CF1

                                        COUPLING  FACILITY  STRUCTURE  ACTIVITY

STRUCTURE NAME = DB2X_SCA          TYPE = LIST   STATUS = ACTIVE
          # REQ    -------------- REQUESTS --------------   -------------- DELAYED REQUESTS -------------
SYSTEM    TOTAL                 #     % OF  -SERV TIME(MIC)-    REASON    #    % OF  ---- AVG TIME(MIC) -----
NAME      AVG/SEC               REQ    ALL     AVG   STD_DEV             REQ    REQ   /DEL     STD_DEV   /ALL

SYSD        786    SYNC    786     100    10.1      3.3     NO SCH    0    0.0    0.0         0.0    0.0
           2.62    ASYNC     0     0.0     0.0      0.0     PR WT     0    0.0    0.0         0.0    0.0
                   CHNGD     0     0.0  INCLUDED IN ASYNC   PR CMP    0    0.0    0.0         0.0    0.0
                   SUPPR     0     0.0                      DUMP      0    0.0    0.0         0.0    0.0
-------------------------------------------------------------------------------------------------------
TOTAL       786    SYNC    786     100    10.1      3.3     NO SCH    0    0.0    0.0         0.0    0.0
           2.62    ASYNC     0     0.0     0.0      0.0     PR WT     0    0.0    0.0         0.0    0.0
                   CHNGD     0     0.0                      PR CMP    0    0.0    0.0         0.0    0.0
                   SUPPR     0     0.0                      DUMP      0    0.0    0.0         0.0    0.0

STRUCTURE NAME = IXCSTR1           TYPE = LIST   STATUS = ACTIVE
          # REQ    -------------- REQUESTS --------------   -------------- DELAYED REQUESTS -------------
SYSTEM    TOTAL                 #     % OF  -SERV TIME(MIC)-    REASON    #    % OF  ---- AVG TIME(MIC) -----
NAME      AVG/SEC               REQ    ALL     AVG   STD_DEV             REQ    REQ   /DEL     STD_DEV   /ALL

SYSD      16195    SYNC      0     0.0     0.0      0.0     NO SCH    0    0.0    0.0         0.0    0.0
          53.98    ASYNC    16K    100    16.9     16.9     PR WT     0    0.0    0.0         0.0    0.0
                   CHNGD     0     0.0  INCLUDED IN ASYNC   PR CMP    0    0.0    0.0         0.0    0.0
                   SUPPR     0     0.0                      DUMP      0    0.0    0.0         0.0    0.0
-------------------------------------------------------------------------------------------------------
TOTAL     16195    SYNC      0     0.0     0.0      0.0     NO SCH    0    0.0    0.0         0.0    0.0
          53.98    ASYNC    16K    100    16.9     16.9     PR WT     0    0.0    0.0         0.0    0.0
                   CHNGD     0     0.0                      PR CMP    0    0.0    0.0         0.0    0.0
                   SUPPR     0     0.0                      DUMP      0    0.0    0.0         0.0    0.0
```

Lock Structure Example

```
---------------------------------------------------------------------------------------------------------------------------------
COUPLING FACILITY NAME = CF1
---------------------------------------------------------------------------------------------------------------------------------
                                                COUPLING  FACILITY  STRUCTURE  ACTIVITY
---------------------------------------------------------------------------------------------------------------------------------

STRUCTURE NAME = ISGLOCK              TYPE = LOCK   STATUS = ACTIVE
          # REQ     -------------- REQUESTS -------------   -------------- DELAYED REQUESTS -------------
SYSTEM    TOTAL                 #     % OF  -SERV TIME(MIC)-    REASON     #    % OF  ---- AVG TIME(MIC) -----  EXTERNAL REQUEST
NAME      AVG/SEC               REQ    ALL     AVG   STD_DEV              REQ    REQ   /DEL    STD_DEV   /ALL   CONTENTIONS

SYSD       1950    SYNC    1950     100     4.1      1.6     NO SCH     0    0.0    0.0        0.0    0.0   REQ TOTAL      1951
           6.50    ASYNC      0     0.0     0.0      0.0     PR WT      0    0.0    0.0        0.0    0.0   REQ DEFERRED     11
                   CHNGD      0     0.0  INCLUDED IN ASYNC   PR CMP     0    0.0    0.0        0.0    0.0   -CONT            11
                   SUPPR      0     0.0                                                                    -FALSE CONT       4
```

- Same information as List structure, added information on external request contentions
- If deferred due to contention, DBA may need to be involved as high numbers are affecting overall system performance
  - Should be less than 5% of overall requests.
- False contention is indicator structure is too small and should be larger
  - Should be less than 2% of all requests

Cache Structure Example

```
STRUCTURE NAME = DB2X_GBP0          TYPE = CACHE   STATUS = ACTIVE
          # REQ    -------------- REQUESTS -------------   -------------- DELAYED REQUESTS -------------
SYSTEM    TOTAL                 #     % OF   -SERV TIME(MIC)-    REASON     #    % OF   ---- AVG TIME(MIC) -----
NAME      AVG/SEC               REQ    ALL      AVG    STD_DEV              REQ     REQ    /DEL     STD_DEV    /ALL

SYSD         28     SYNC       27    96.4      7.1       3.0     NO SCH     0     0.0     0.0         0.0     0.0
           0.09     ASYNC       1     3.6     63.0       0.0     PR WT      0     0.0     0.0         0.0     0.0
                    CHNGD       0     0.0   INCLUDED IN ASYNC   PR CMP     0     0.0     0.0         0.0     0.0
                    SUPPR       0     0.0                       DUMP       0     0.0     0.0         0.0     0.0

-------------------------------------------------------------------------------------------------------------------------------
TOTAL        28     SYNC       27    96.4      7.1       3.0     NO SCH     0     0.0     0.0         0.0     0.0    -- DATA ACCESS ---
           0.09     ASYNC       1     3.6     63.0       0.0     PR WT      0     0.0     0.0         0.0     0.0    READS            7
                    CHNGD       0     0.0                       PR CMP     0     0.0     0.0         0.0     0.0    WRITES           5
                    SUPPR       0     0.0                       DUMP       0     0.0     0.0         0.0     0.0    CASTOUTS         5
                                                                                                                    XI'S             5
```

- CASTOUTS is number that were written to DASD
- Significant number of Cross Invalidations (XIs) can be reduced by increasing structure size
  - Or decreasing local group buffer pools in each system of the sysplex (not recommended!)

Subchannel Activity

SUBCHANNEL ACTIVITY

SYSTEM NAME	# REQ TOTAL AVG/SEC	-- CF LINKS -- TYPE	GEN	USE	PTH BUSY	REQUESTS	# REQ	-SERVICE TIME(MIC)- AVG	STD_DEV	DELAYED REQUESTS	# REQ	% OF REQ	AVG TIME(MIC) /DEL	STD_DEV	/ALL
SYSD	32498	CIB	2	2	0	SYNC	889	11.1	10.5	LIST/CACHE	0	0.0	0.0	0.0	0.0
	108.3	SUBCH	14	14		ASYNC	28605	31.3	14.0	LOCK	0	0.0	0.0	0.0	0.0
						CHANGED	0	INCLUDED IN ASYNC		TOTAL	0	0.0			
						UNSUCC	0	0.0	0.0						

CHANNEL PATH DETAILS

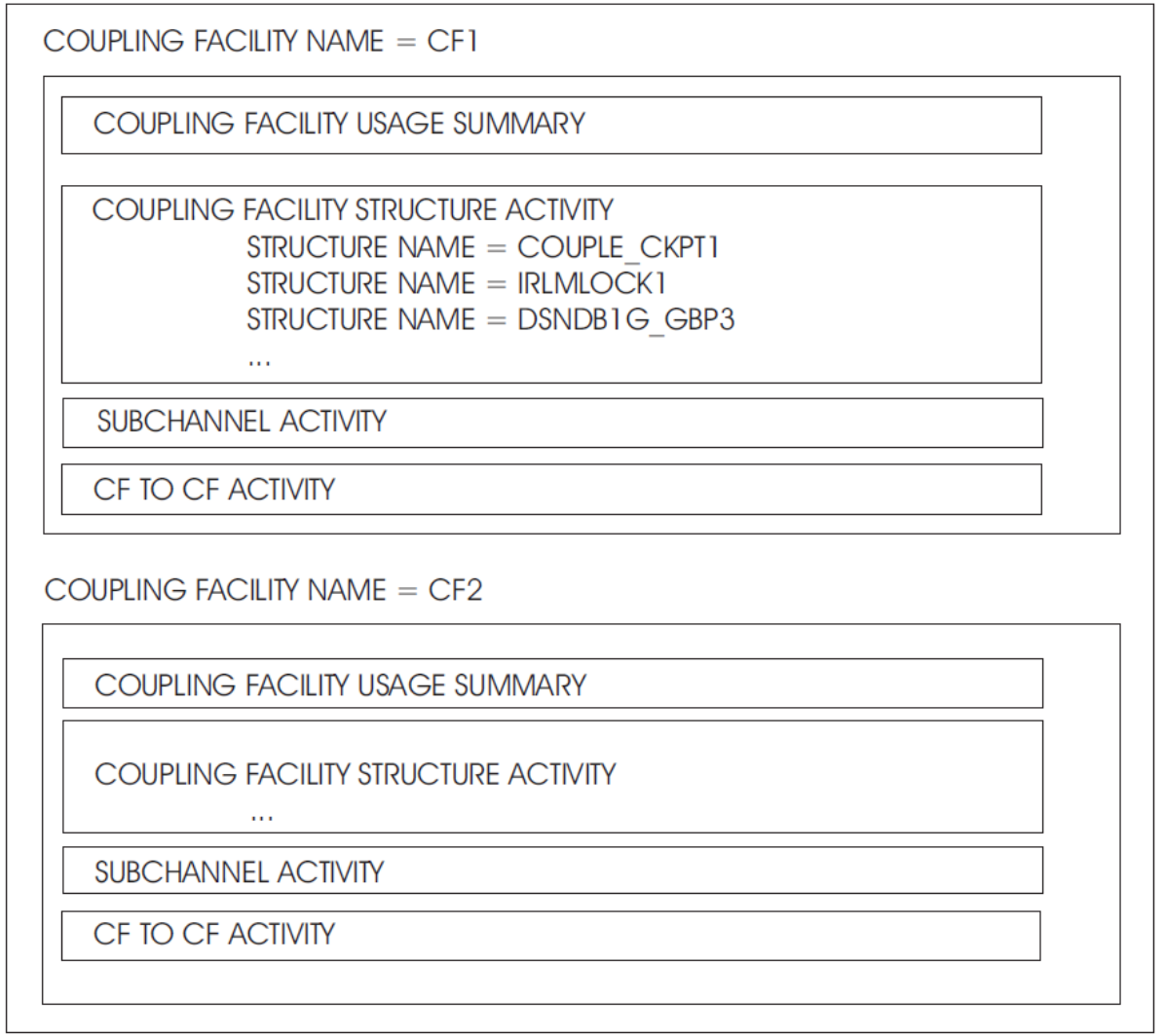
SYSTEM NAME	ID	TYPE	OPERATION MODE	DEGRADED	DISTANCE	PCHID	AID	PORT	IOP IDS
SYSD	00	CIB	12X IFB3 HCA3-O	N	<1	500	000F	01	0D
	02	CIB	12X IFB3 HCA3-O	N	<1	502	0007	01	03

- Number and type of links from each system, as well as links between CFs
  - Watch for PTH BUSY numbers increasing, number of CF requests rejected from this system because all paths were busy
- Channel Path Details
  - Check if running in degraded status

How to compare intervals

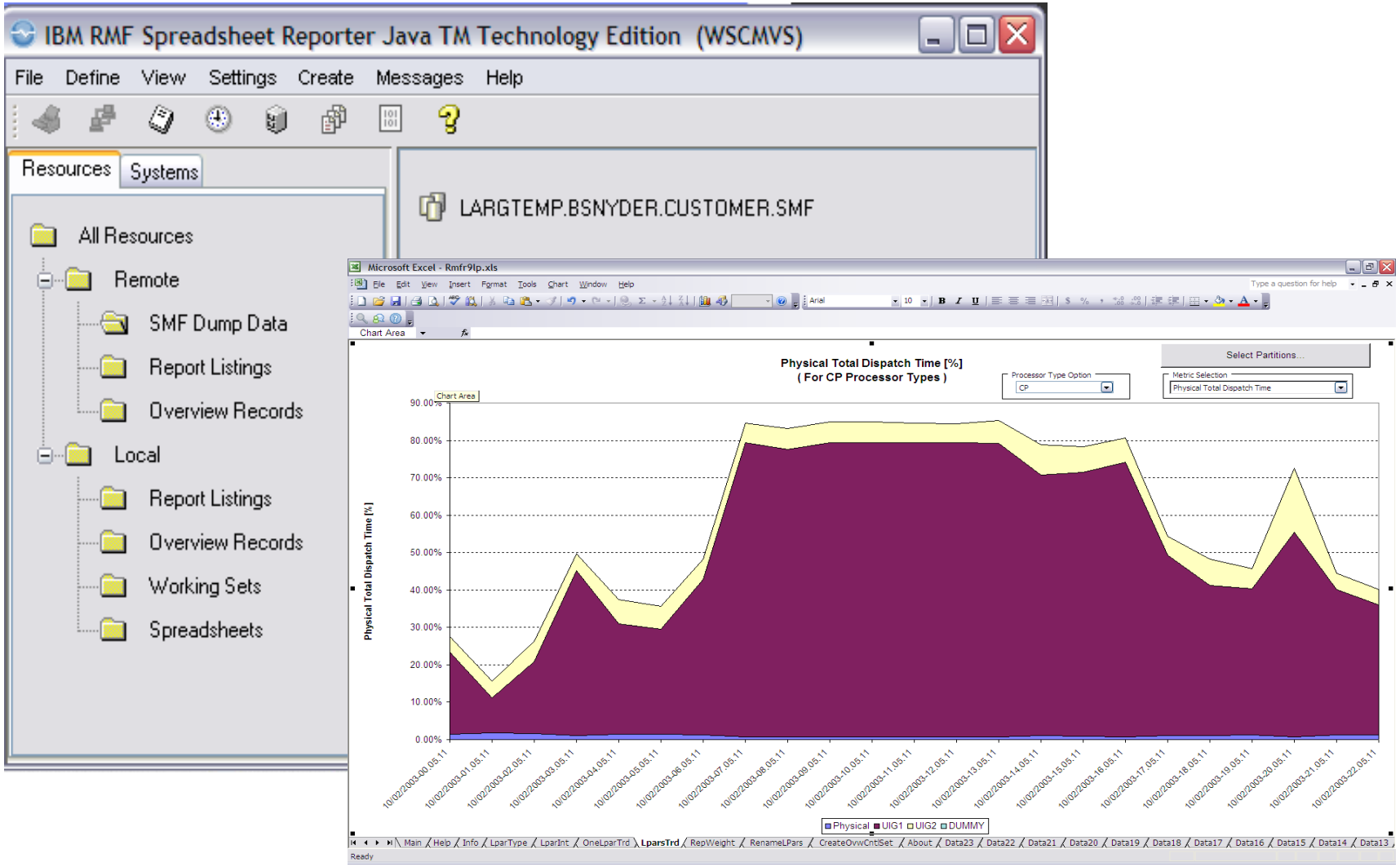
- Check the structure again
- Fine for figuring out what happened at a specific time
- How do we find out what happened to a single structure over time, or CF utilization, or any other data point when trying to compare multiple intervals?
- Can use RMF overview records, or….

RMF Spreadsheet Reporter!!

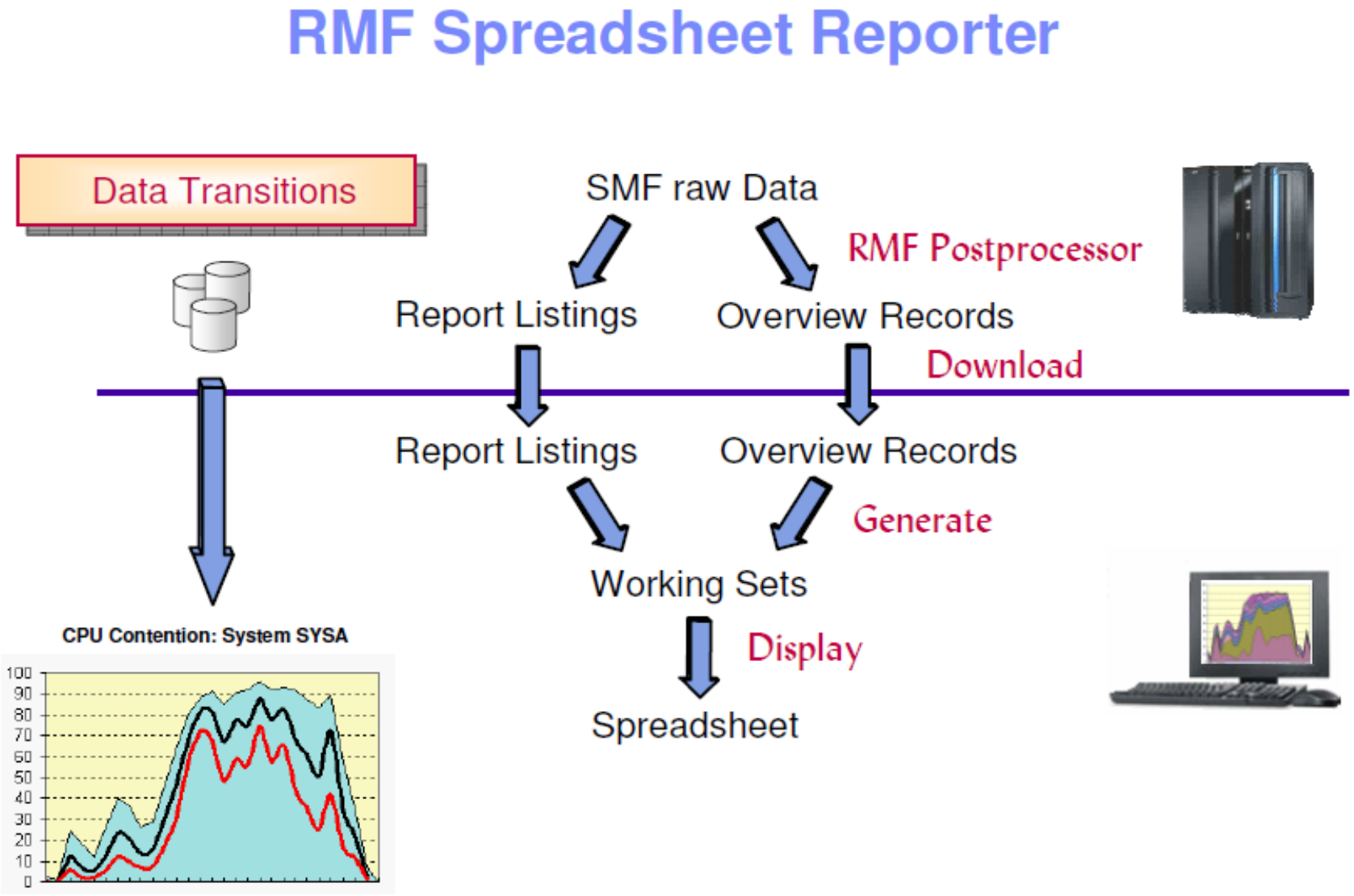


RMF Spreadsheet Reporter

- Copy of tool included in z/OS
- Latest version can be downloaded from www.ibm.com

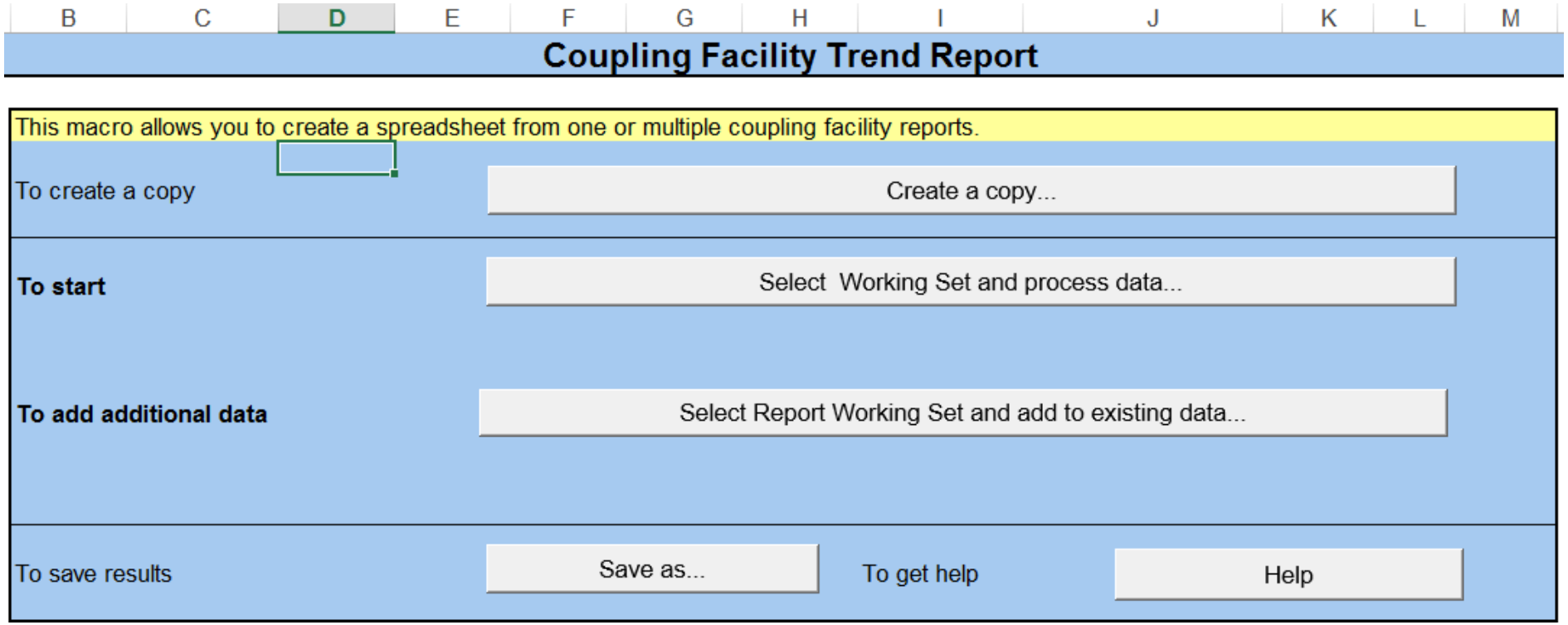


RMF Spreadsheet Reporter Data Flow



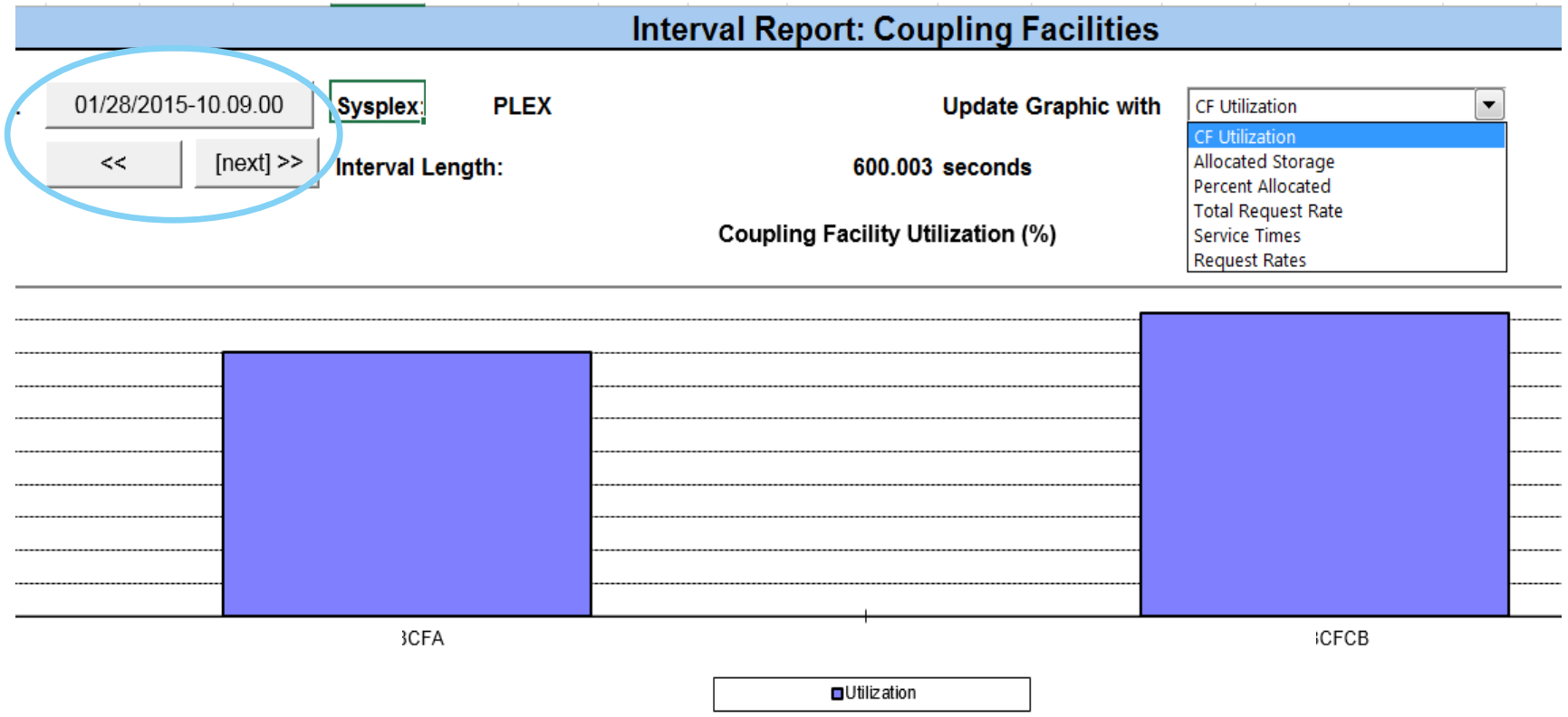
Long Term Analysis

- Spreadsheet macro will read in working set created by RMF Spreadsheet Reporter
- Can create new spreadsheet, or add data to existing spreadsheet



CF Interval Report

- First tab in CF Activity Report shows information on every CF at specific intervals
  - CF Utilization
  - Allocated Storage
  - Percent Allocated
  - Total Req. Rate
  - Service Times
  - Request Rates (by type)

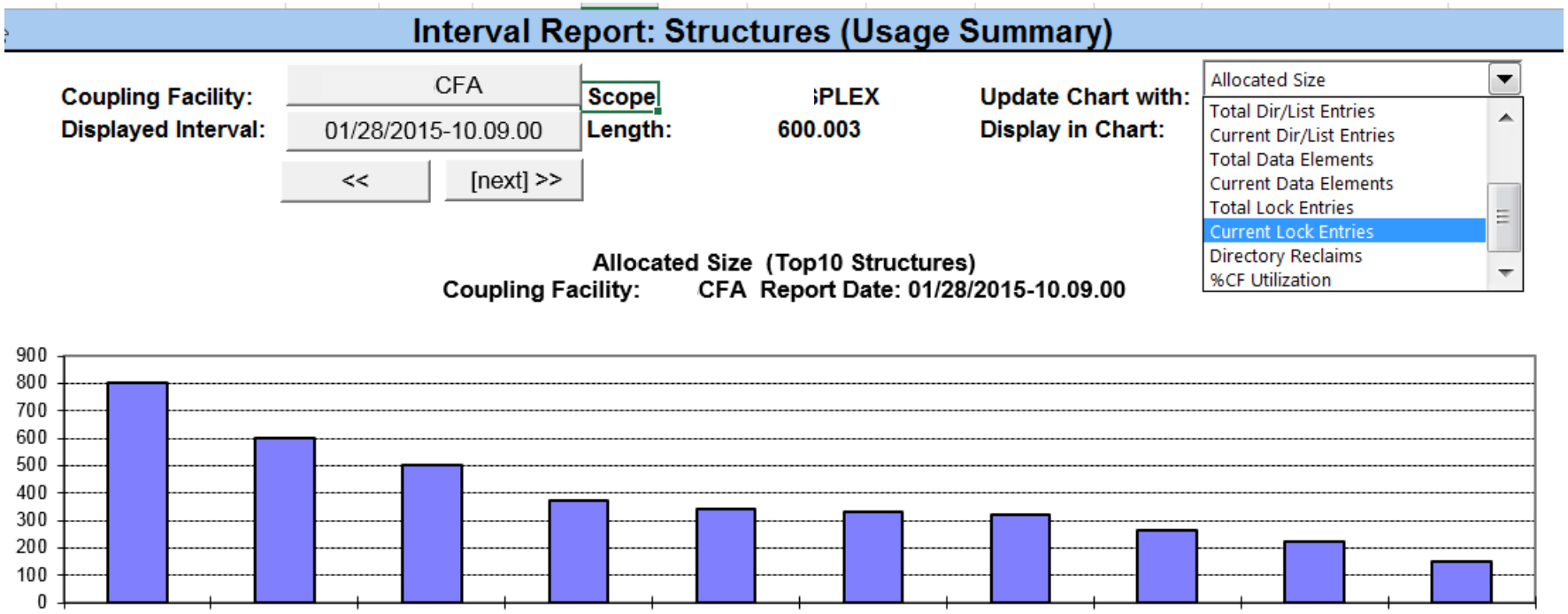


all Storage Numbers are in MB, all Service Times are in microseconds

ling Facility ----------> Version	Level	Average Utilization	<----Logical Processors Defined	Effective	Shared	DynDisp	----> Storage Avg.Wgt	Total Size (Mb)	<---- Structure Summary ----> Numof	Storage (Mb)	%Alloc	<---------- Request Rates (1/sec) ----- Total	Sync	Async	ch
n/a	17	8	1	1	0	OFF	0	24135	88	6347.5	26.299999	12698.2	5048.9	7526.0	
n/a	17	9.2	1	1	0	OFF	0	24135	142	6468.2	26.799999	13217.6	5196.7	7918.0	

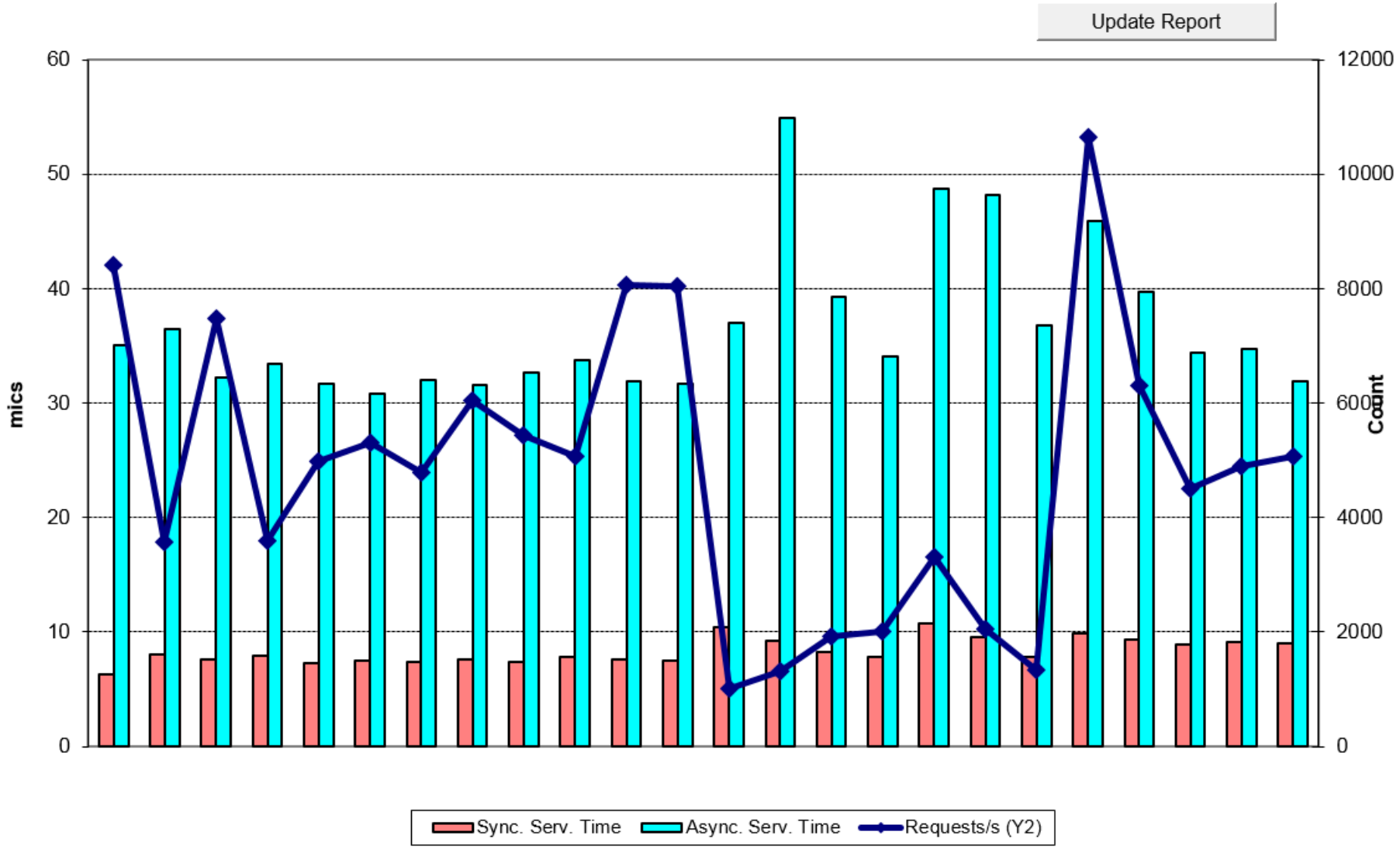
Structure Interval Report

- Can look at all structures, certain types of structures, and chart interested data in order to get feel of what is active and where problem areas may be by interval



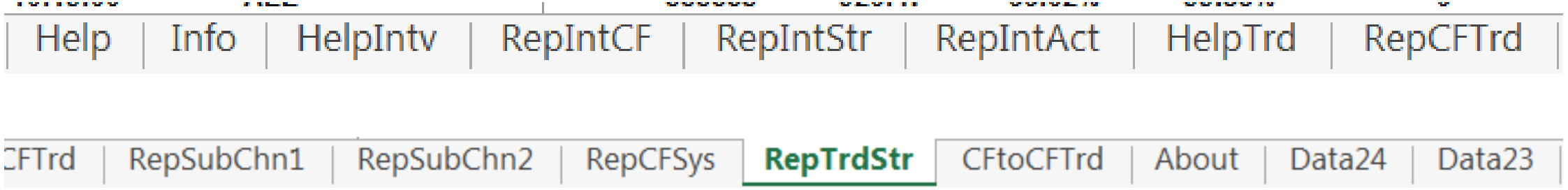
Structure and Busy Rates

- Trend Analysis lets you look at several points of data in a single chart
  - Here, overall request rate from specific system with average sync and async times included



Analysis Available in RMF Spreadsheet Reporter

- Several pre-built macros that give different views of all the data in the CF report
- All data in RMF CF Report contained in DATAxx tabs
  - One tab for each report interval
  - Someone good with EXCEL macros could build their own tabs using the data in the DATAxx tabs



Questions??