IBM Software Group

Understanding The Impact Of The Network On z/OS Performance

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Session #16737

Wednesday, March 4th: 11:15 AM - 12:15 PM

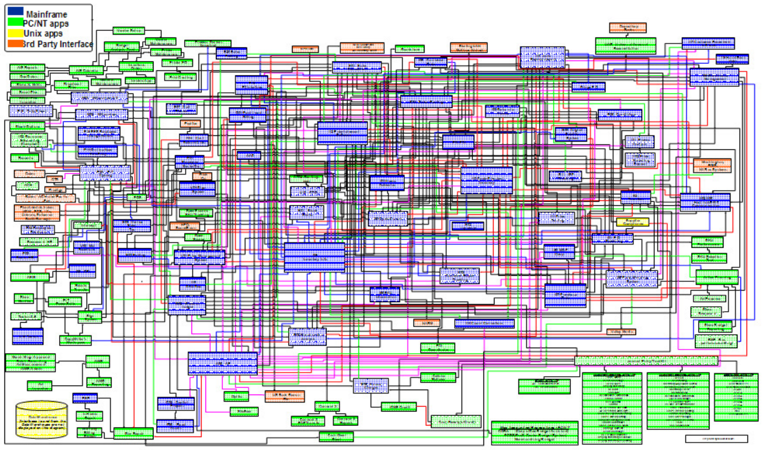
Agenda

- Introduction
- Looking at the application time line
- Why monitor mainframe networks
  - What are the typical concerns
- Examples of mainframe/network interaction
  - Examples for various subsystems
- Defining a consistent monitoring strategy

The Challenges Of Performance And Availability Management Of Complex Systems

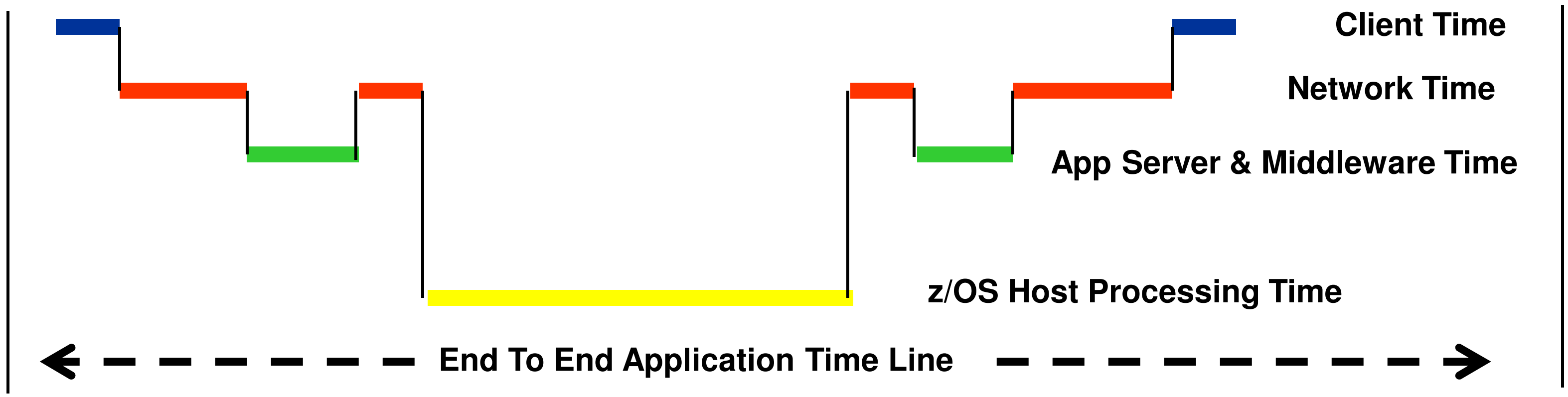
- Most new applications are composite by design
  - Applications cross multiple subsystems and platforms
  - Integration and utilization of multiple core technologies
  - Pose challenges from a management and monitoring perspective

- Common Technical Challenges
  - Multiple platforms
  - Potentially multiple DB systems
  - Middleware considerations
  - One or multiple network hops



- *Is the problem the network, the host, the DB, the client, or somewhere in between?*

The Network And The Application Time Line



- Portions of response time may reside in any of the following
  - End user client processing, the application server or middleware level, the database, or other aspects of host z/OS application processing
  - Potential for bottlenecks at multiple points
- The network will impact the overall application time line
  - Time is required to send messages across the network
  - Overhead processing, including communication subsystem session management
  - Network hardware, traffic, connections, connection pools

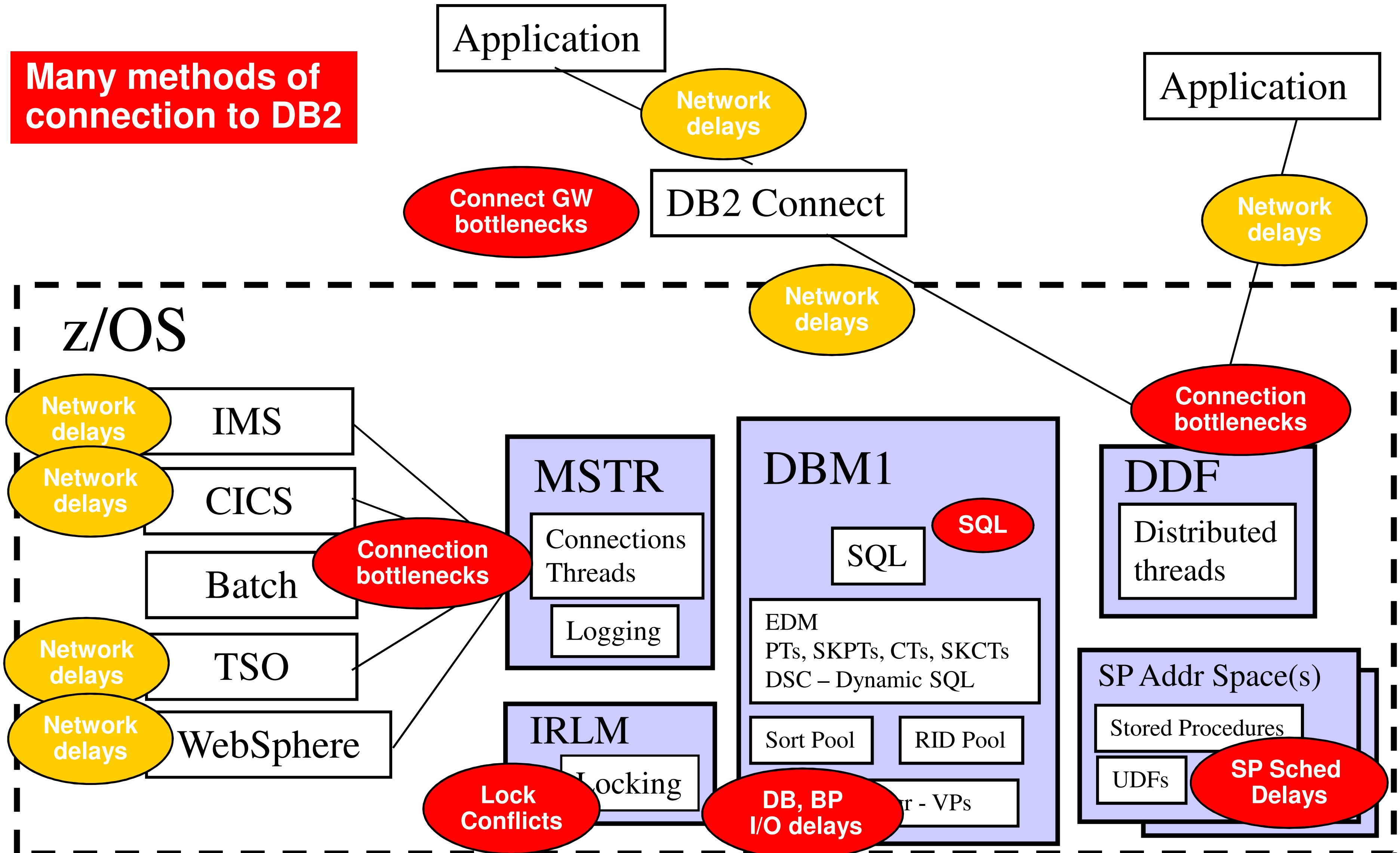
The Impact Of The Network On Critical z/OS Components

- The network has impact on z/OS workload in many ways
- Speed of the network – network congestion and bottlenecks
- Each z/OS application or component subsystem has unique network considerations
  - IMS, DB2, CICS, MQSeries, WebSphere, FTP
- Keep in mind that z/OS application/subsystem configuration and logic may also impact the network
  - Subsystem configuration options and settings impact network interaction
  - Application logic potentially impacts network usage and performance

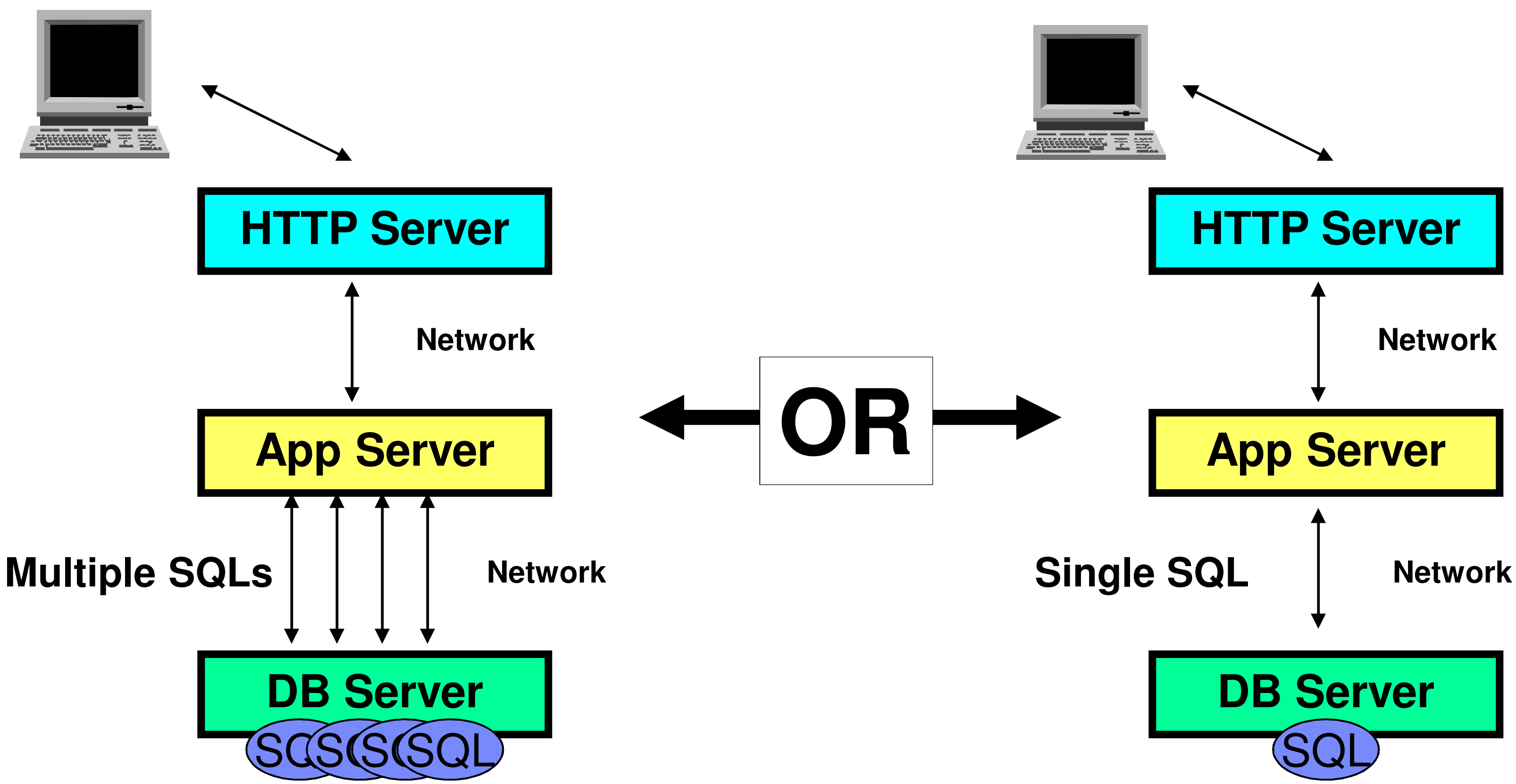
Categories Of z/OS Network Concerns
Why Monitor z/OS Network Activity?

- It's important to monitor and see the full picture
  - Monitor the z/OS host and it's subsystems
  - Monitor network activity from the z/OS perspective
    - Don't rely on another group to monitor network activity
- Categories of issues
  - Application logic and design issues
    - How (and how efficiently) does the application interact?
  - Subsystem and configuration issues
    - Are optimal subsystem options being used?
  - Network congestion issues
    - Is the issue inside the network itself?

Example Scenarios - DB2 Has Several Potential Bottlenecks



Example – Application Logic And Network Concerns



- The trade-off – the cost of network interaction versus quantity of data
  - Do more with SQL to eliminate redundant back/forth activity
  - Crossing more layers will mean more overhead
  - However – larger results will mean more network time

An Application Logic Example
DB2 Statistics Trace Data For The DB2 Subsystem
How Much Data is Sent And Received?

```
>                    DISTRIBUTED DATA FACILITY STATISTICS
 DFST
+ Collection Interval:   REALTIME                          Start:   06/04 13:40:46
+ Report Interval:        4 sec                              End:   06/04 13:40:49
+
                                          DCDB203     DDF Status                =    ACTIVE
                                          .0%         Dist Allied Threads       =         0
+ Active DB  s                  =            3        Inactive DBATs            =         0
+ DDF Send Rate                 =      0K/sec         DDF Receive Rate          =    0K/sec
+ Resync Attempts               =            0        Resync Successes          =         0
+ Cold Start Connect   ns       =            0        Warm Start Connections    =         0
+ DBAT Queued                   =            0        Conversations Dealloc     =         0
+ HWM All DBATs                 =            5        HWM Active DBATs          =         5
+ Max DB Access (MAXDBAT)=                 500        HWM Inactive DBATs        =         0

                                      RDA REMOTE LOCS
+
+ Conversations Queue           =            0        Binds for Remote Access =           0
+ Message Buffer Rows           =       174874        Block Mode Switches     =           0
+ Commits/Remote                =            0        Rollbacks/Remote        =           0
+ Indoubts/Remote               =            0
+
+          Tran      SQL      Row Message      Byte   Commit    Abort     Conv   Blocks
+       -------- -------- -------- -------- --------- -------- -------- -------- --------
+ Sent         0        0   174927     2486  43164569        0        0        0     1746
+ Recv        55     1714        0     2285    238429      363        8       55        0
+
```

Thread creation queues?

HWM of DBAT usage

Is buffering occurring?

Recv – received into DB2
Sent – out to client/apps

Bytes and messages
sent and received

Looking At The DB2 Application Thread Level DB2 Accounting Information Analysis

```
>                             DISTRIBUTED THREAD DETAIL
 PLAN
+ Thread:  Plan=DISTSERV  Connid=SERVER   Corrid=db2bp.exe    Authid=DNET581
+ Dist   :  Type=DATABASE ACCESS, Luwid=G941491B.PC10.090604182432=169
+ Location  :  9.65.73.27
 rsum
+                           Distributed TCP/IP Data
+Location          IP Addr  Port Ctbuser  Srvclsnam  Prod ID  Workstation Name
+----------------- -------- ---- -------- ---------- -------- ------------------
+9.65.73.27        0941491B  448 dnet581  NT         SQL09013 IBM-1E47754C52F
+
+ Transaction name: db2bp.exe
+ TCP/IP Userid:    dnet581
+
+                                               Statistics
+
+ Remote Loc                                    Remote Location Luname =
+
+ Protocol Used         =                       Conversations Queued    =        0
+ Block Mode Switches   =               0       Message Buffer Rows     =    33280
+ Bind Remote Access    =               0       Max Allocated Conv      =        0
+ Conv Allocated        =               0       Conv Deallocated        =        0
+ Indoubt/Remote        =               0       Commit/Remote           =        0
+ Rollback/Remote       =               0
+
+        Tran      SQL      Row Message     Byte  Commit   Abort    Conv  Blocks
+      -------- -------- -------- -------- -------- -------- -------- -------- --------
+ Sent        0        0    33280      270  8457981       0        0       0     260
+ Recv        1      264        0      270    26329       2        0       1       0
+
+                                    ast 2-Phase                  Commit Backout
+ 2-PHASE COMMIT          Prepare    gent    Commit  Backout   Forget    Resp    Resp
+                         -------- -------- -------- -------- -------- -------- --------
+               ent             0        0        0        0        0        0
+             Recv             0        0        0        0        0        0
================================================================================
```

Note the quantity of data being sent

Note row versus message/block counts to determine blocking

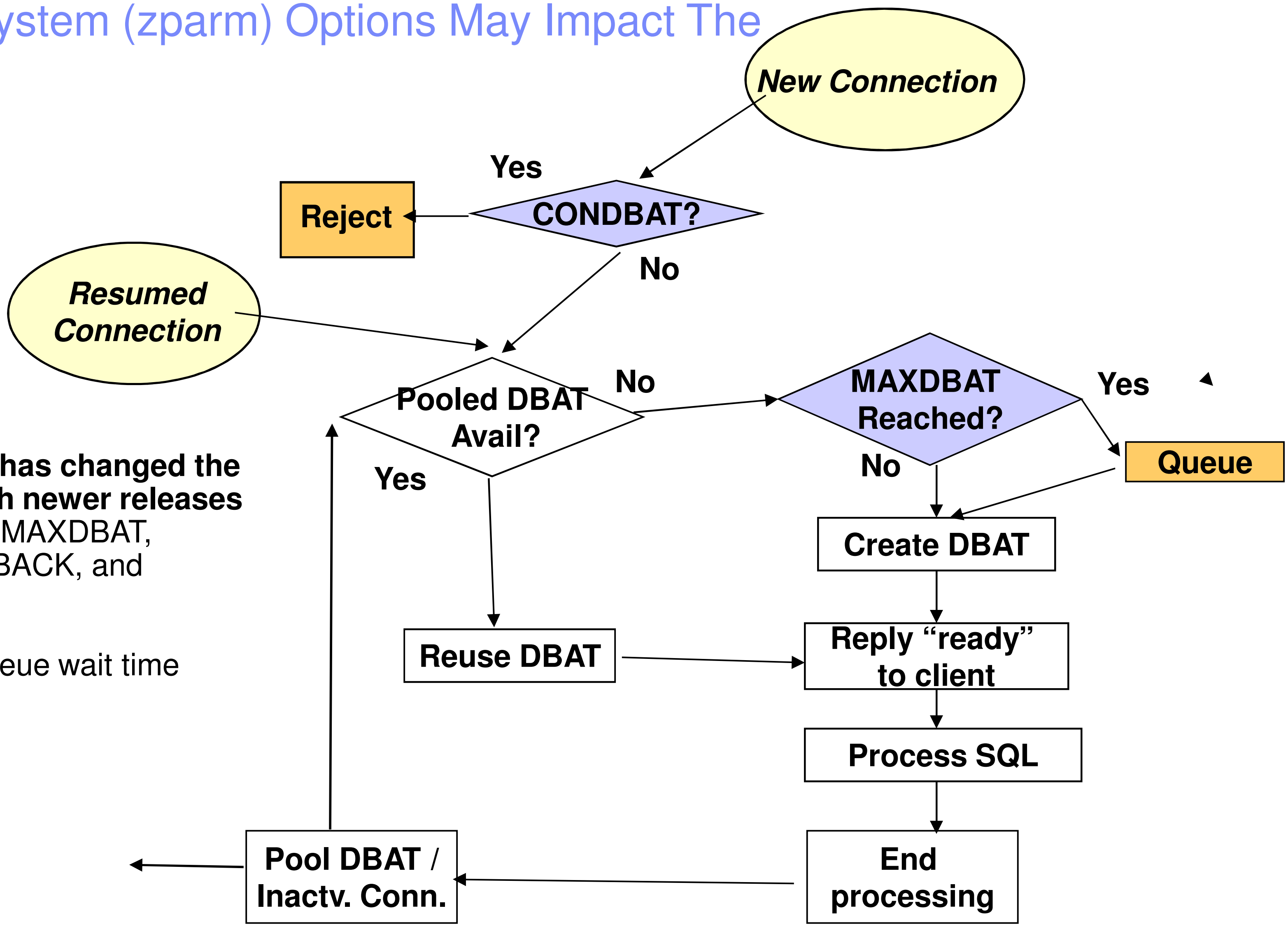
Recv – received into DB2
Sent – out to client/app

SQL calls

of messages sent

DRDA blocks for queries

DB2 Subsystem Configuration Example
How Subsystem (zparm) Options May Impact The Workload



Note – DB2 has changed the settings with newer releases
Increases in MAXDBAT, IDFORE, IDBACK, and CTHREAD.

zparm for queue wait time

Monitoring For Subsystem Configuration Issues
Are There Connections In Backlog Or Rejected?

Applications Summary Table

Application Name	Connection Count	Active Connections	Accepted Connections	Connection Rate	Connections in Backlog	Active Connection High Water Mark	Backlog Connections Rejected	Total Backlog Connections Rejected	Backlog Connections Rejected Time Stamp
CXEGDSST	48	25	0	0	0	26	0	0	
CXEGD5	20	3	0	0	0	3	0	0	
CXEGGW	23	4	0	0	0	4	0	0	
CXEGI2	27	21	0	0	0	21	0	0	
CXEGI5	22	4	0	0	0	4	0	0	
CXEGMC	16	3	0	0	0	3	0	0	
CXEGM2	13	2	0	0	0	2	0	0	
CXEGN3	19	3	0	0	0	3	0	0	
CXEGON	1	0	0	0	0	0	0	0	
CXEGO2	6	0	0	0	0	0	0	0	
DB1IDIST	4	0	0	0	0	0	0	0	
DB1RDIST	3	0	0	0	0	0	0	0	
DSNADIST	3	1	0	0	0	7	0	0	
DSNBDIST	2	0	0	0	0	4	0	0	
DSNCDIST	2	0	0	0	0	0	0	0	
DSNTDIST	3	0	0	0	0	4	0	0	

- Connection activity, connection counts, connection backlogs
  - Look for applications with connection failures and backlogs

What About Potential Network Issues?

Applications Summary Table

Application Name	Transmit Byte Rate	Receive Byte Rate	Byte Rate	Transmit Datagram Rate	Receive Datagram Rate	Datagram Rate	Transmit Segment Rate	Receive Segment Rate	Segment Rate	Total Bytes Sent (in GB)	Total Bytes Sent	Total Bytes Received (in GB)	Total Bytes Received
DSNADIST	0	0	0	0	0	0	12	0	12	0	2987473	0	7213606
DSNBDIST	0	0	0	0	0	0	0	0	0	0	50204	0	33852
DSNCDI...	0	0	0	0	0	0	0	0	0	0	0	0	0
DSNTDIST	0	0	0	0	0	0	0	0	0	0	29199[illegible]	0	1688383

Total Segments	Segments Sent	Segments Received	Segments Sent or Received	Out of Order Segments	Total Out of Order Segments	Percent Out of Order Segments	Segments Retransmitted	Total Segments Retransmitted	Percent Segments Retransmitted	Retransmission Rate
177020	12	0	12	0	0	0	0	6	0	0
5291	0	0	0	0	0	0	0	8	0	0
0	0	0	0	0	0	0	0	0	0	0
21075	0	0	0	0	0	0	0	33	0	0

Total Datagrams Sent	Total Datagrams Received	Total Datagrams	Datagrams Sent	Datagrams Received	Datagrams Sent or Received	Datagrams Queued	Datagrams Discarded	Percent Datagrams Discarded	Queued Datagram Bytes
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

- Look for indicators, such as Retransmission, Discard, and Fragmentation counts
  - Note – Example from OMEGAMON for Mainframe Networks

NETSTAT Connection Detail

netstat all (port 448)

```
EZZ2350I MVS TCP/IP NETSTAT CS V1R10        TCPIP Name: TCPIP          19:16:24
EZZ2550I Client Name: DSNCDIST                  Client Id: 0000C90E
EZZ2551I Local Socket: 9.39.68.147..448         Foreign Socket: 9.65.73.27..4255

EZZ2552I   Last Touched:         19:14:58          State:              Establsh
EZZ2577I   BytesIn:              0000006973        BytesOut:           0008457981
EZZ2574I   SegmentsIn:           0000003423        SegmentsOut:        0000006614
EZZ2553I   RcvNxt:               3808791478        SndNxt:             2538223807
EZZ2554I   ClientRcvNxt:         3808791478        ClientSndNxt:       2538223807
EZZ2555I   InitRcvSeqNum:        3808784504        InitSndSeqNum:      2529765825
EZZ2556I   CongestionWindow:     0000017349        SlowStartThreshold: 0000002620
EZZ2557I   IncomingWindowNum:    3808824236        OutgoingWindowNum:  2538289289
EZZ2558I   SndWl1:               3808791478        SndWl2:             2538223807
EZZ2559I   SndWnd:               0000065482        MaxSndWnd:          0000131070
EZZ2560I   SndUna:               2538223807        rtt_seq:            2538223753
EZZ2561I   MaximumSegmentSize:   0000001310        DSField:            00
EZZ2563I   Round-trip information:
EZZ2564I     Smooth trip time:   184.000           SmoothTripVariance: 84.000
EZZ2565I   ReXmt:                0000000002        ReXmtCount:         0000000000
EZZ2572I   DupACKs:              0000000284        RcvWnd:             0000032758
EZZ2566I   SockOpt:              8D                TcpTimer:           00
EZZ2567I   TcpSig:               04                TcpSel:             40
EZZ2568I   TcpDet:               EC                TcpPol:             00
EZZ2537I   QOSPolicy:            No
EZZ2542I   RoutingPolicy:        No
EZZ2570I   ReceiveBufferSize:    0000016384        SendBufferSize:     0000065536
EZZ2538I   ReceiveDataQueued:    0000000000
EZZ2539I   SendDataQueued:       0000000000
```

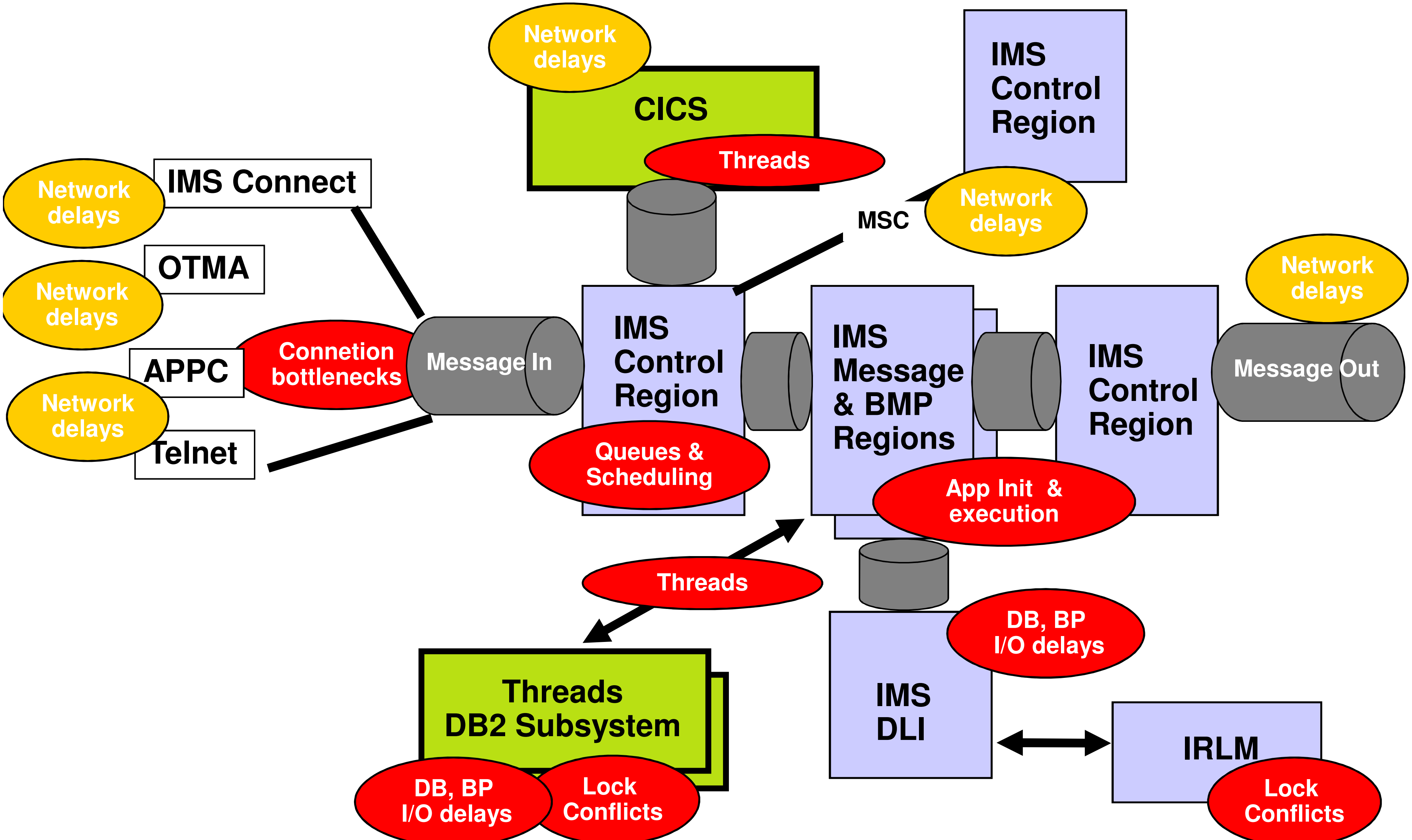
Byte counts

Network segment counts

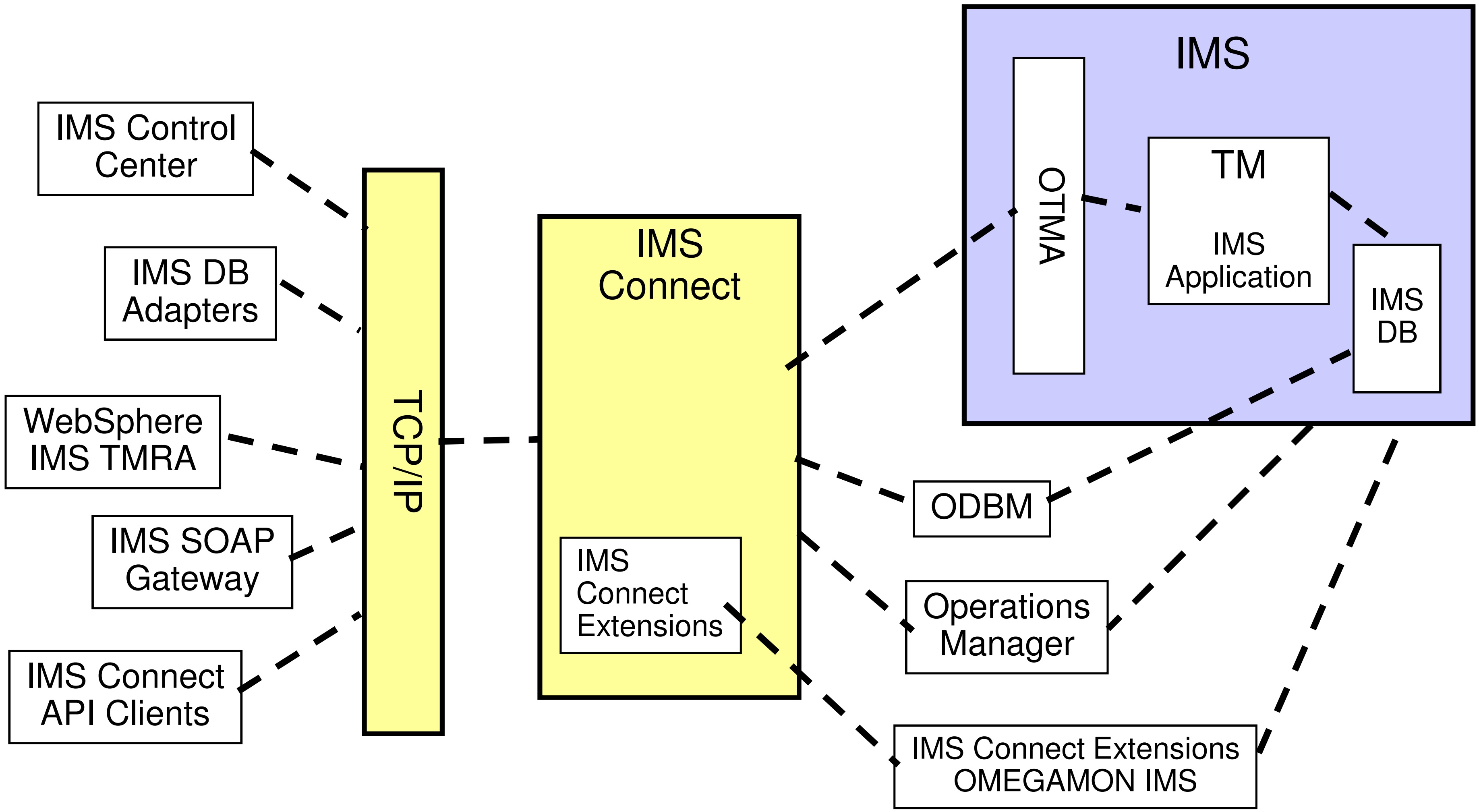
Network response time info

Retransmission count

IMS Has Many Potential Bottlenecks (Including Network)



IMS Connect And The Interaction With TCP/IP



IMS Connect
Types Of Connections & Message Considerations

- IMS Connect – types of connections
  - Non-Persistent socket
    - Closes after each send to the ICON client
  - Transaction socket
    - Close after each transaction or conversation - The default
    - Has connect/disconnect overhead for each message
  - Persistent socket
    - Read/writes for multiple transactions
    - Typically more efficient
    - Will keep the socket open – make sure you have enough sockets
- Message considerations
  - General ROT – use one send for the entire message
  - If doing multiple writes then specify NODELAYACK on PORT statement in z/OS
    - If not specified then may wait up to 300ms for each transmission

IMS Network
Examples Of Relevant Options And Parameters

- PROFILE.TCPIP parameters
  - PORT
    - Reserve ports for IMS Connect
      - Include the NODELAYACK parameter for multi-message applications
      - Example benchmark
        - http://www-01.ibm.com/support/docview.wss?uid=swg21079911
  - SOMAXCONN
    - Controls the queue depth for listening sockets at the LPAR level
      - Works in conjunction with TCPIPQ parm
- IMS Connect parameter MAXSOC
  - Total number of sockets IMS Connect supports across all ports at the same time
  - IMS Connect issues warning message HWSS0772W when the number of sockets reaches the default warning threshold of 80 percent of MAXSOC
  - When the number of sockets reaches the MAXSOC limit, IMS Connect refuses any new connections and issues message HWSS0771W
- TCPIPQ – configure the depth of the queue for connection requests

IMS Connect Monitoring
An Example

Response Time Detail for Transaction PART

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Tran Code	Target Datastore	Client ID	Port Number	User ID	Collection Level	Message Received Time	Response Time	Input Pre-OTMA Time	Input Read Socket Time	Input Read Exit Time	Input Read Exit Name	Input SAF Time	Process OTMA Time	Output Confirm Time	Output Post-OTMA Time	XMIT Exit Time	X
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000139	0.065653	0.000021	0.026154	HWSIMSO0	0.000000	0.118476	0.000000	0.000629	0.000025	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000062	0.000110	0.000018	0.000039	HWSIMSO0	0.000000	0.007838	0.000000	0.000342	0.000015	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000098	0.000089	0.000028	0.000013	HWSIMSO0	0.000000	0.009208	0.000000	0.000587	0.000020	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000113	0.000124	0.000018	0.000016	HWSIMSO0	0.000000	0.023006	0.000000	0.000614	0.000026	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000244	0.000117	0.000019	0.000016	HWSIMSO0	0.000000	0.007549	0.000000	0.000588	0.000020	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000096	0.000123	0.000030	0.000016	HWSIMSO0	0.000000	0.010288	0.000000	0.000622	0.000020	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000093	0.000124	0.000020	0.000018	HWSIMSO0	0.000000	0.008585	0.000000	0.000601	0.000020	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000080	0.000108	0.000016	0.000016	HWSIMSO0	0.000000	0.010068	0.000000	0.000550	0.000017	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000078	0.000115	0.000018	0.000014	HWSIMSO0	0.000000	0.008033	0.000000	0.000620	0.000018	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000082	0.000105	0.000018	0.000014	HWSIMSO0	0.000000	0.008343	0.000000	0.000542	0.000017	HW
PART	91Y	ICTDRVR	4713	JMAHE	Maximum	01/14/09 12:08:06	0.000123	0.000124	0.000019	0.000018	HWSIMSO0	0.000000	0.009186	0.000000	0.000647	0.000029	HW
PART	91Y																

Response Time Detail for Transaction PART

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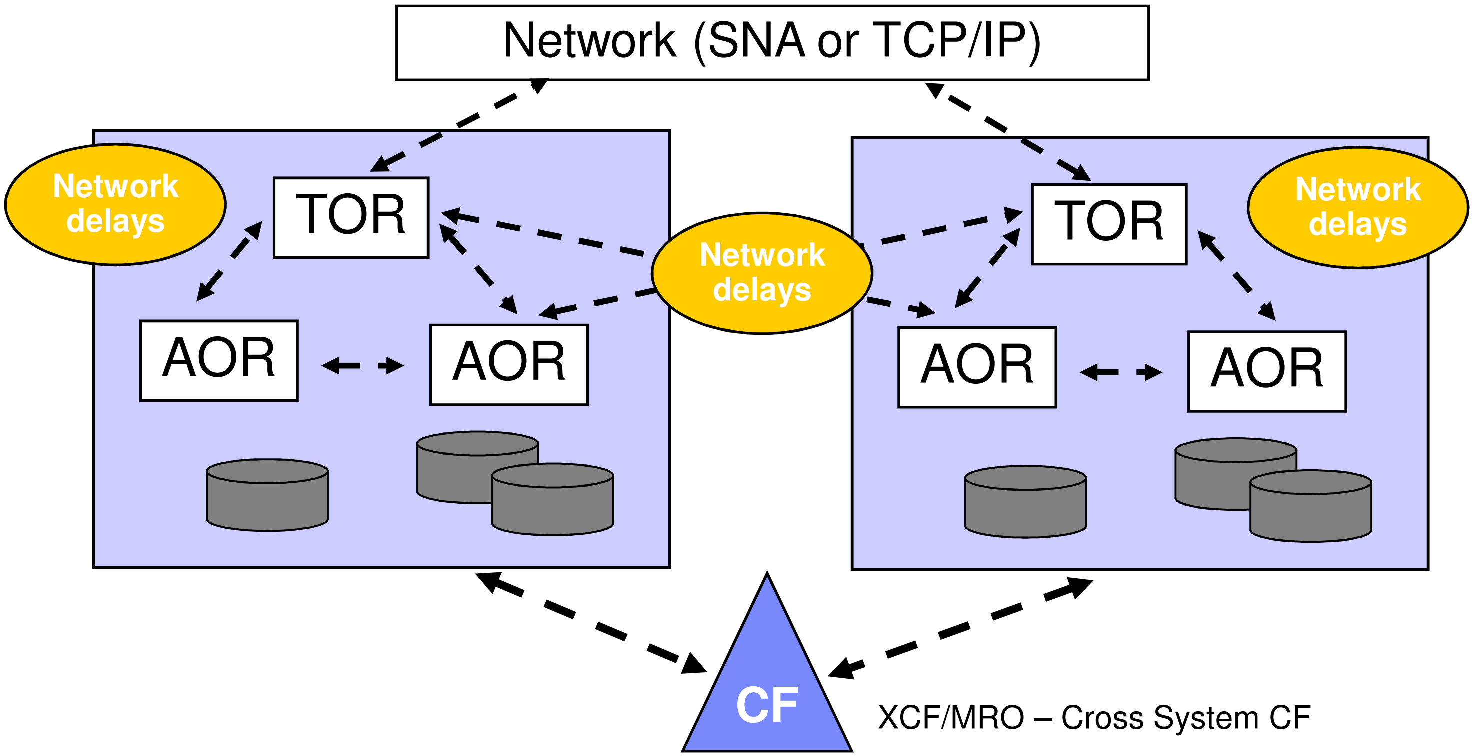
Tran Code	Target Datastore	Client ID	Port Number	User ID	Collection Level	Message Received Time	MIT Exit Name	Time Outs	Commit Mode	Synchronization Level	NAK Count	OTMA NAK Sense Coc	Client IP Address	Client IP Port	Timestamp	Sysplex Name
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	2999	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3000	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3001	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3002	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3003	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3004	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3005	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3006	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3007	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3008	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3009	1/14/09 12:13:04	LPAR400J
PART	I91Y	CTDRVR	4713	JMAHE	laximum	01/14/09 12:08:06	/SIMSO0	0	CM1	None	0	N/A	9.42.46.28	3010	1/14/09 12:13:04	LPAR400J

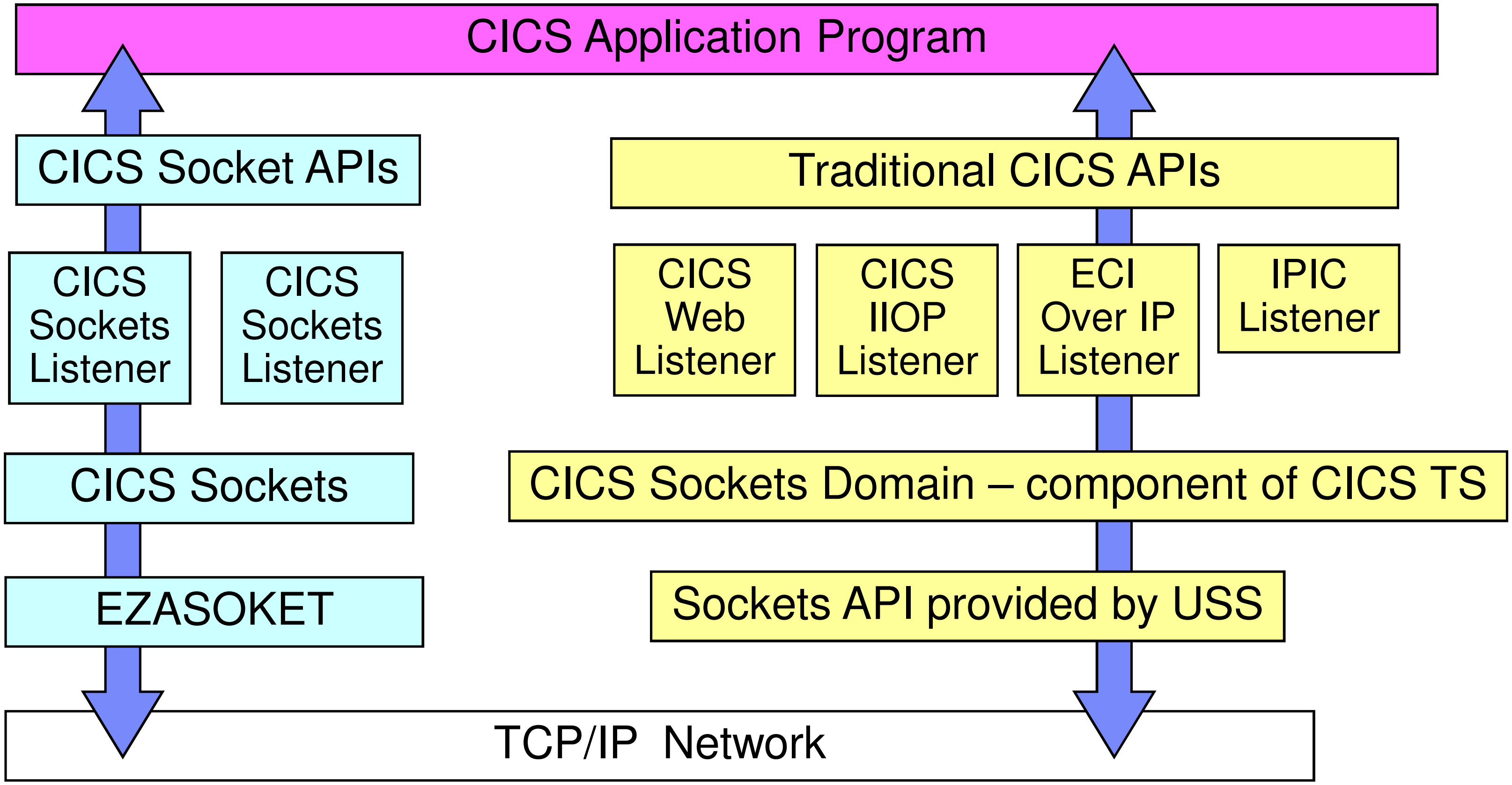
Note – This display requires IMS Connect Extensions And OMEGAMON IMS

The Network Impacts CICS Processing



- Network potentially impacts CICS in a variety of ways
  - Connections to CICS – connections via a variety of means
  - Communication within CICS - ISC and MRO
    - InterSystems Communication - system to system, Multi-Region Operation - region to region, and IPIC – IP InterCommunications

CICS Sockets Versus CICS Sockets Domain

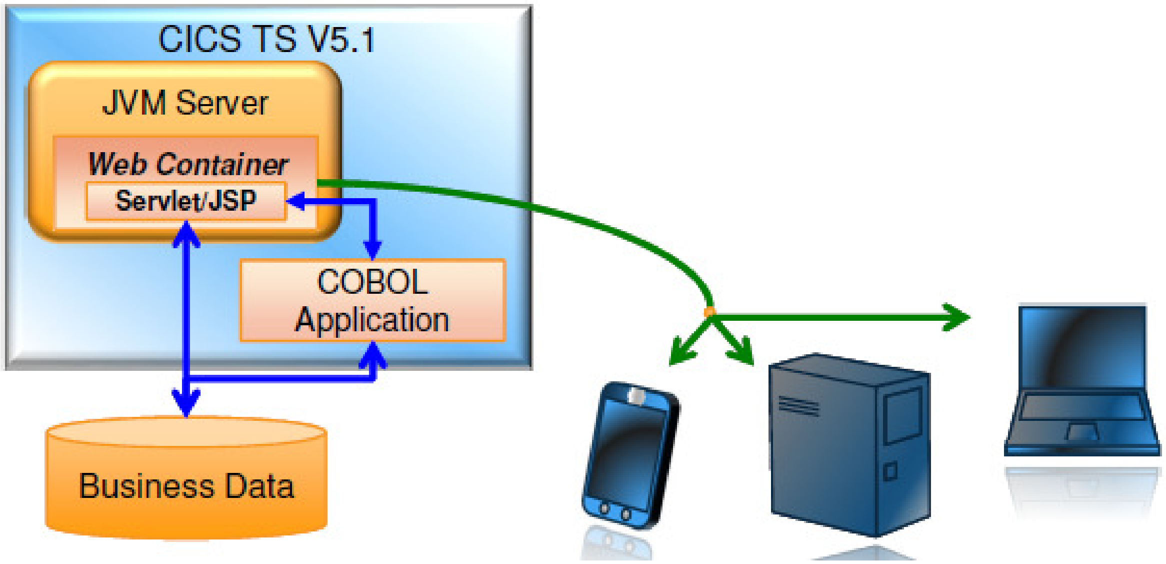


- **CICS Sockets – a component of Communications Server for z/OS**
  - General purpose socket API for use by CICS programmers
- **CICS Sockets Domain – a component of CICS TS**
  - Does not have direct access to the socket
  - Communicates with CICS Socket Domain Services

CICS Network
Examples Of Relevant Parameters

- TCPIPSERVICE (TCPDEF) parameter defines services
  - ECI over TCP/IP (for CICS Clients), IIOP, CICS Web support (HTTP), IPIC (ISC)
  - For use only with the CICS-provided TCP/IP services, and have nothing to do with the z/OS Communications Server IP CICS Sockets interface
- SOCKETCLOSE parameter
  - Set to NO (the default) or a time interval to avoid socket creation overhead
- BACKLOG parameter
  - Specifies the maximum number of inbound TCP/IP connection requests that can be queued in TCP/IP for CICS processing
  - When the maximum number is reached, TCP/IP rejects additional connection requests
- MAXSOCKETS – CICS SIT parameter
  - Maximum number of IP sockets that can be managed by the CICS sockets domain
  - If the CICS region userid does not have superuser authority, the maximum possible value is the value of the MAXFILEPROC parameter in SYS1.PARMLIB member BPXPRMxx.
  - MAXSOCKETS and maximum tasks (MXT)
    - Recommendation - MAXSOCKETS should not be a subset of MXT
    - http://www-01.ibm.com/support/docview.wss?uid=swg21596250&myns=swgother&mynp=OCSSGMGV&mync=R

CICS Transaction Server 5.2 And Liberty

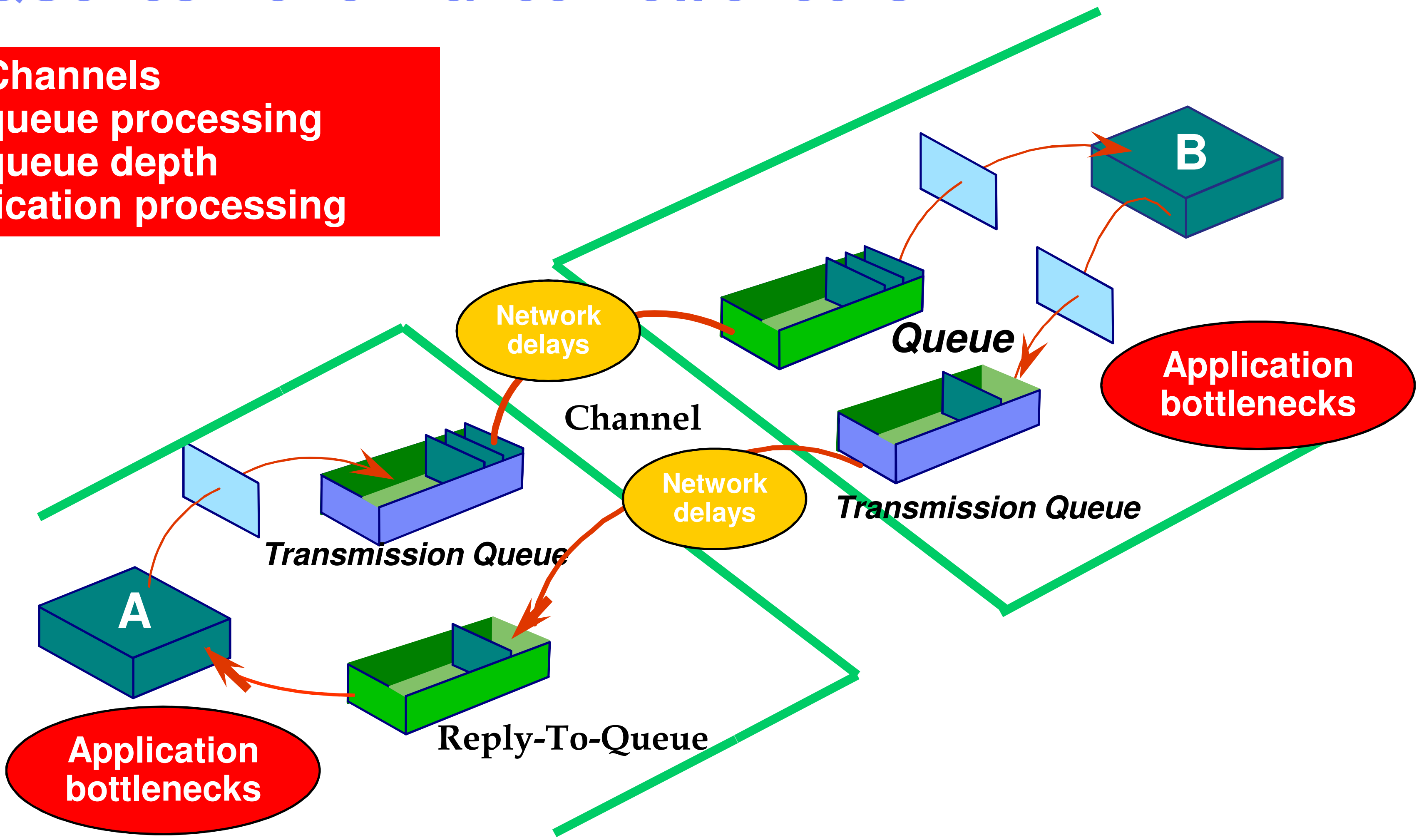


- Liberty
  - Initially introduced in CICS 51
  - Light weight web container
  - Provides Servlets and JSPs support for CICS
  - Runs in a JVMServer
  - Access to remote DB2 resources with T4 driver (JDBC 1.0)

CICS may access DB2 remote databases - Network implications?

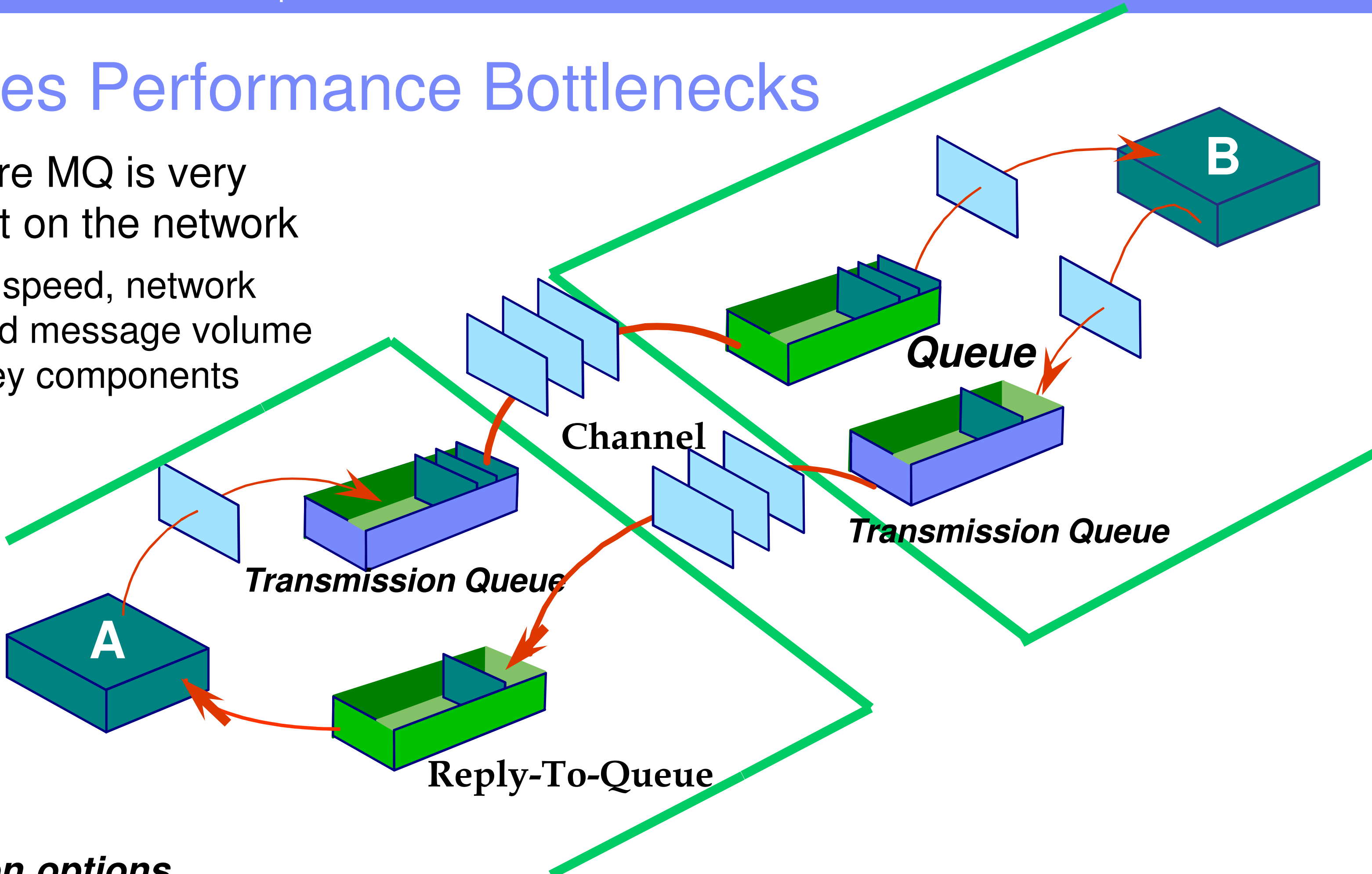
MQSeries Performance Bottlenecks

MQ Channels
MQ queue processing
MQ queue depth
Application processing



MQSeries Performance Bottlenecks

- WebSphere MQ is very dependent on the network
  - Network speed, network traffic and message volume are all key components



Optimization options

Increase network speed
Compress messages - decreases network transmission by reducing the size of the message.
Channel parameters

Batch size defines the maximum number of messages sent within a batch.
Reduces the amount of channel processing required.
Note – batching for small applications may result in delays and spikes

MQ Series
Configuration/Application Options And Network Impact

- Consider MQCONN and MQPUT patterns
  - MQCONN connects the application program to the MQ queue manager
    - Note - Cost of MQCONN high
  - MQPUT puts a message on a queue that was opened using MQOPEN
  - Similar to DB2 SQL call scenario
    - Consider cost of back and forth activity versus application logic
- Channel parameters
  - Batchsz – defines the maximum number of messages sent within a batch
    - Reduces the amount of channel processing required
  - Channel message compression
    - Some compression can be CPU heavy - how compressible is the data?
- Persistent versus non-persistent messages
  - Persistent messages are written to logs and queue data files
    - May be recovered by the queue manager after restart from failure
    - Persistent messages may have I/O and logging bottlenecks
  - Non-persistent messages are discarded after a failure
- Fast non-persistent messages
  - NPMSPEED – specifies speed at which non-persistent messages are sent

Defining A Monitoring Strategy
Many Factors May Impact z/OS Application Processing

- Host processing bottlenecks
  - Transaction bottlenecks, application failures/stopped resources, high I/O and poor BP ratios, transaction/message queues, concurrency/lock conflicts
- Network performance
  - Network congestion, data fragmentation, data retransmission
- Network hardware issues
  - Adapter hardware errors, hardware configuration errors, hardware congestion issues
- Application subsystem connection issues
  - Application errors, subsystem configuration errors
- Application issues
  - Application design and logic problems

Defining A Monitoring Strategy
Monitoring At Multiple Levels

- Monitor at the host application subsystem level
  - IMS, CICS, DB2, WebSphere, WebSphere MQ
  - Response time, transaction rates, message rates, queues
- Monitor host application network connection activity
  - Connection activity, connection counts, connection backlogs
- Monitor at the interface level
  - OSA adapters, error counts, fragmentation counts, retransmission counts
- Monitor at the network connection level
  - Response time, traffic counts, error counts, fragmentation counts, retransmission counts
- Integrate host and network monitoring
- Monitor from an end-to-end perspective

Subsystem Monitoring

Both

Network Monitoring

Dashboard level monitoring

Composite level monitoring

Example – Monitoring At The Application Level

Mainframe network monitoring

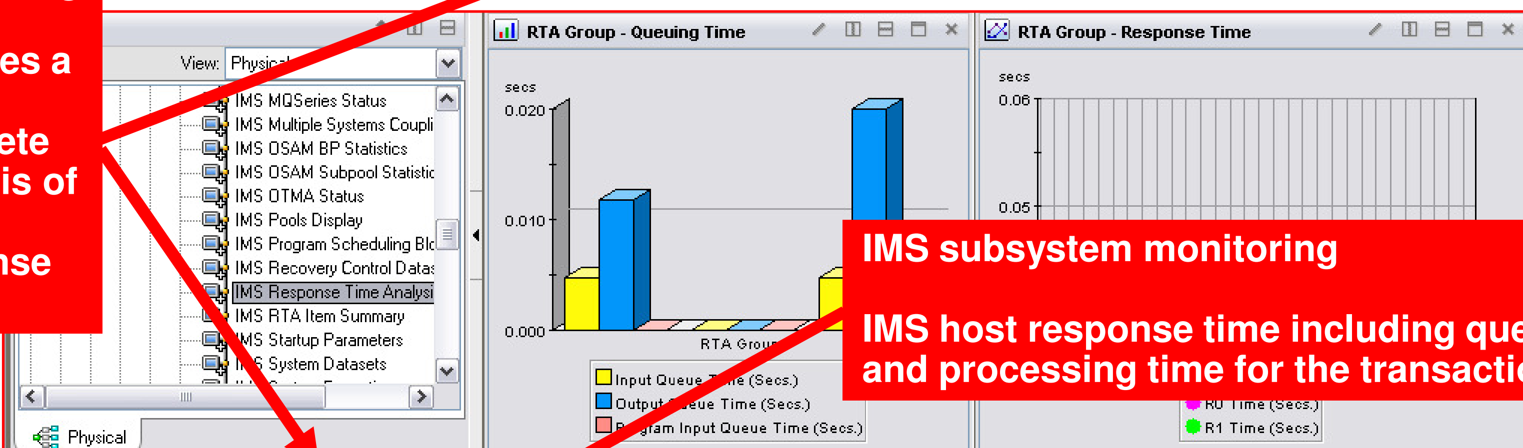
Network time for IMS transactions

Connections Summary Table

Page: 1 of 8

Total Bytes Received	Total Bytes Sent (in GB)	Total Bytes Sent	Total Bytes (in GB)	Total Bytes	Bytes Received	Bytes Sent	Bytes Sent or Received	Time Since Last Activity	Byte Rate	Response Time	Response Time Variance	Telnet Appl Name	Telnet LU Name	Seg Retra
670	0	6906	0	7576	291	2402	2693	[illegible].00	53	0.98	0.02	IMSACB	TCP00012	
[illegible]	[illegible]	298402	0	306704	105	5123	5228	80.66	104	1.13	0.11	DDCTSO03	TCP00010	
[illegible]	[illegible]	11737	0	815097	0	0	0	243,022.19		0.01	0.01			
[illegible]	[illegible]	0	0	3	0	[illegible]	0	651,449.87	0	0.82	11.24			
[illegible]	[illegible]	0	0	3	[illegible]	0	0	759,051.09	0	1.03	11.24			

Including network monitoring detail provides a more complete analysis of IMS response time



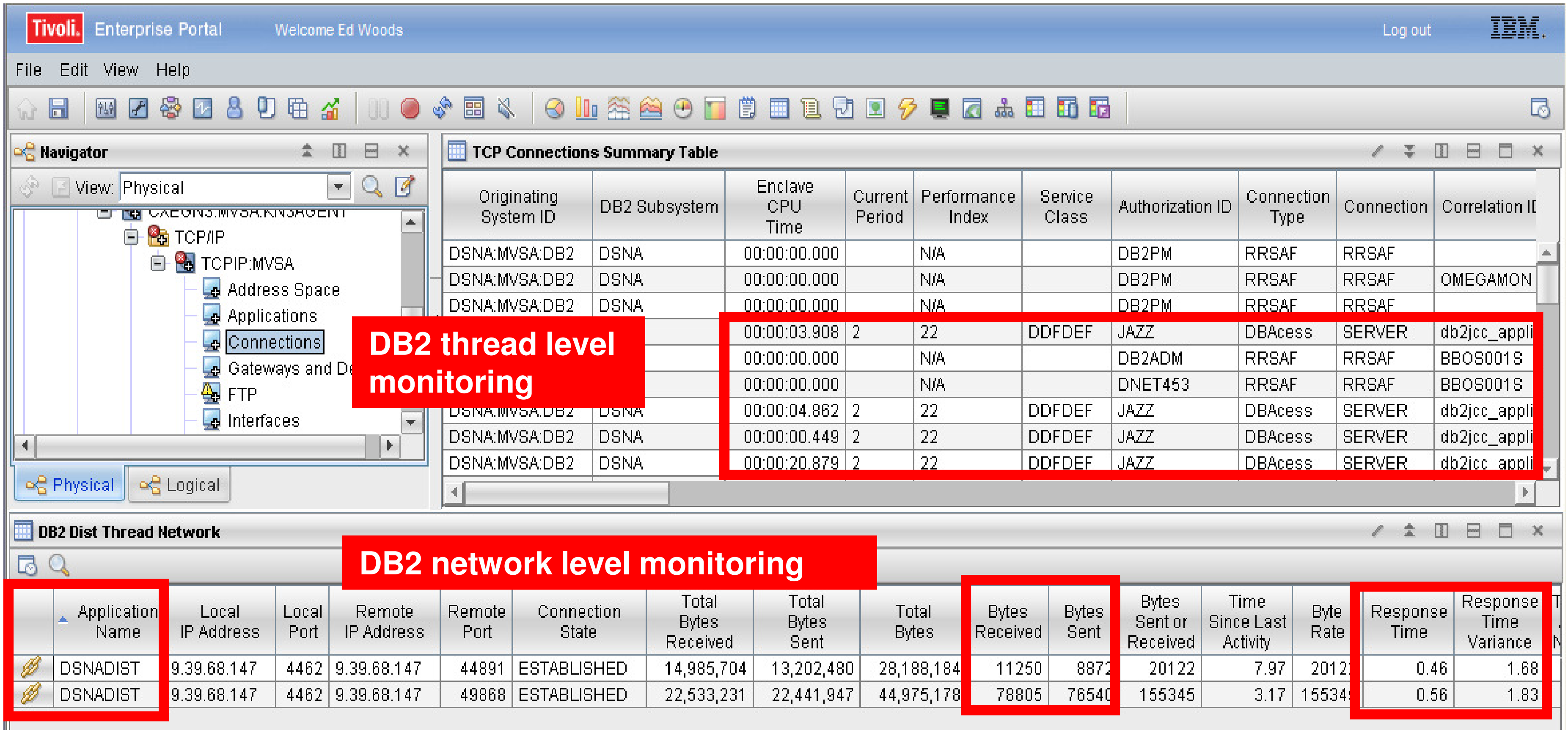
IMS subsystem monitoring

IMS host response time including queue and processing time for the transaction

Response Time Analysis - Group Summary

RTA Group Name	RTA Group Number	Input Queue Time (Secs.)	Program Input Queue Time (Secs.)	Processing Time (Secs.)	R0 Time (Secs.)	Output Queue Time (Secs.)	R1 Time (Secs.)	Timestamp
SYSTEM	0	0.0047	0.0000	0.0410	0.0458	0.0117	0.0458	01/17/09 11:43:46
OTHER	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	01/17/09 11:43:46
CLASS 1	1	0.0047	0.0000	0.0410	0.0458	0.0200	0.0458	01/17/09 11:43:46

Another Example
Monitoring At The Application Level – DB2



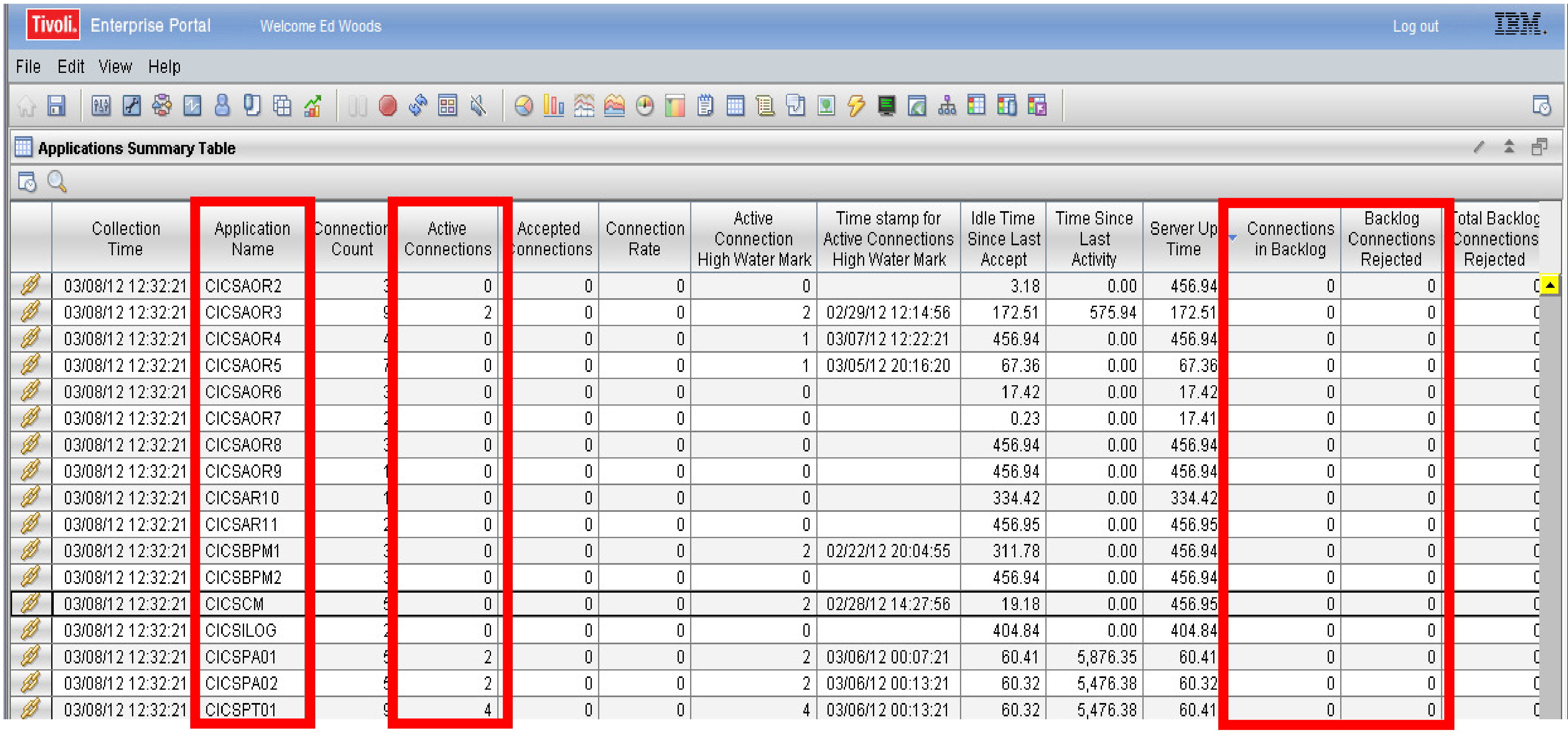
TCP Connections Summary Table

Originating System ID	DB2 Subsystem	Enclave CPU Time	Current Period	Performance Index	Service Class	Authorization ID	Connection Type	Connection	Correlation ID
DSNA:MVSA:DB2	DSNA	00:00:00.000		N/A		DB2PM	RRSAF	RRSAF	
DSNA:MVSA:DB2	DSNA	00:00:00.000		N/A		DB2PM	RRSAF	RRSAF	OMEGAMON
DSNA:MVSA:DB2	DSNA	00:00:00.000		N/A		DB2PM	RRSAF	RRSAF	
		00:00:03.908	2	22	DDFDEF	JAZZ	DBAcess	SERVER	db2jcc_appli
		00:00:00.000		N/A		DB2ADM	RRSAF	RRSAF	BBOS001S
		00:00:00.000		N/A		DNET453	RRSAF	RRSAF	BBOS001S
DSNA:MVSA:DB2	DSNA	00:00:04.862	2	22	DDFDEF	JAZZ	DBAcess	SERVER	db2jcc_appli
DSNA:MVSA:DB2	DSNA	00:00:00.449	2	22	DDFDEF	JAZZ	DBAcess	SERVER	db2jcc_appli
DSNA:MVSA:DB2	DSNA	00:00:20.879	2	22	DDFDEF	JAZZ	DBAcess	SERVER	db2jcc_appli

DB2 Dist Thread Network

Application Name	Local IP Address	Local Port	Remote IP Address	Remote Port	Connection State	Total Bytes Received	Total Bytes Sent	Total Bytes	Bytes Received	Bytes Sent	Bytes Sent or Received	Time Since Last Activity	Byte Rate	Response Time	Response Time Variance
DSNADIST	9.39.68.147	4462	9.39.68.147	44891	ESTABLISHED	14,985,704	13,202,480	28,188,184	11250	8872	20122	7.97	2012	0.46	1.68
DSNADIST	9.39.68.147	4462	9.39.68.147	49868	ESTABLISHED	22,533,231	22,441,947	44,975,178	78805	76540	155345	3.17	15534	0.56	1.83

Monitor At The Subsystem Level – Configuration And Backlogs



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
03/08/12 12:32:21	CICSAOR2	3	0	0	0	0		3.18	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSAOR3	9	2	0	0	2	02/29/12 12:14:56	172.51	575.94	172.51	0	0	0
03/08/12 12:32:21	CICSAOR4	4	0	0	0	1	03/07/12 12:22:21	456.94	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSAOR5	7	0	0	0	1	03/05/12 20:16:20	67.36	0.00	67.36	0	0	0
03/08/12 12:32:21	CICSAOR6	3	0	0	0	0		17.42	0.00	17.42	0	0	0
03/08/12 12:32:21	CICSAOR7	2	0	0	0	0		0.23	0.00	17.41	0	0	0
03/08/12 12:32:21	CICSAOR8	3	0	0	0	0		456.94	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSAOR9	1	0	0	0	0		456.94	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSAR10	1	0	0	0	0		334.42	0.00	334.42	0	0	0
03/08/12 12:32:21	CICSAR11	2	0	0	0	0		456.95	0.00	456.95	0	0	0
03/08/12 12:32:21	CICSBPM1	3	0	0	0	2	02/22/12 20:04:55	311.78	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSBPM2	3	0	0	0	0		456.94	0.00	456.94	0	0	0
03/08/12 12:32:21	CICSCM	5	0	0	0	2	02/28/12 14:27:56	19.18	0.00	456.95	0	0	0
03/08/12 12:32:21	CICSILOG	2	0	0	0	0		404.84	0.00	404.84	0	0	0
03/08/12 12:32:21	CICSPA01	5	2	0	0	2	03/06/12 00:07:21	60.41	5,876.35	60.41	0	0	0
03/08/12 12:32:21	CICSPA02	5	2	0	0	2	03/06/12 00:13:21	60.32	5,476.38	60.32	0	0	0
03/08/12 12:32:21	CICSPT01	9	4	0	0	4	03/06/12 00:13:21	60.32	5,476.38	60.41	0	0	0

- Connection activity, connection counts, connection backlogs
  - Look for applications with connection failures and backlogs

Monitor For Network Issues
Monitor At The Interface Level

Tivoli. Enterprise Portal Welcome Ed Woods Log out IBM.

File Edit View Help

Interfaces Summary Table

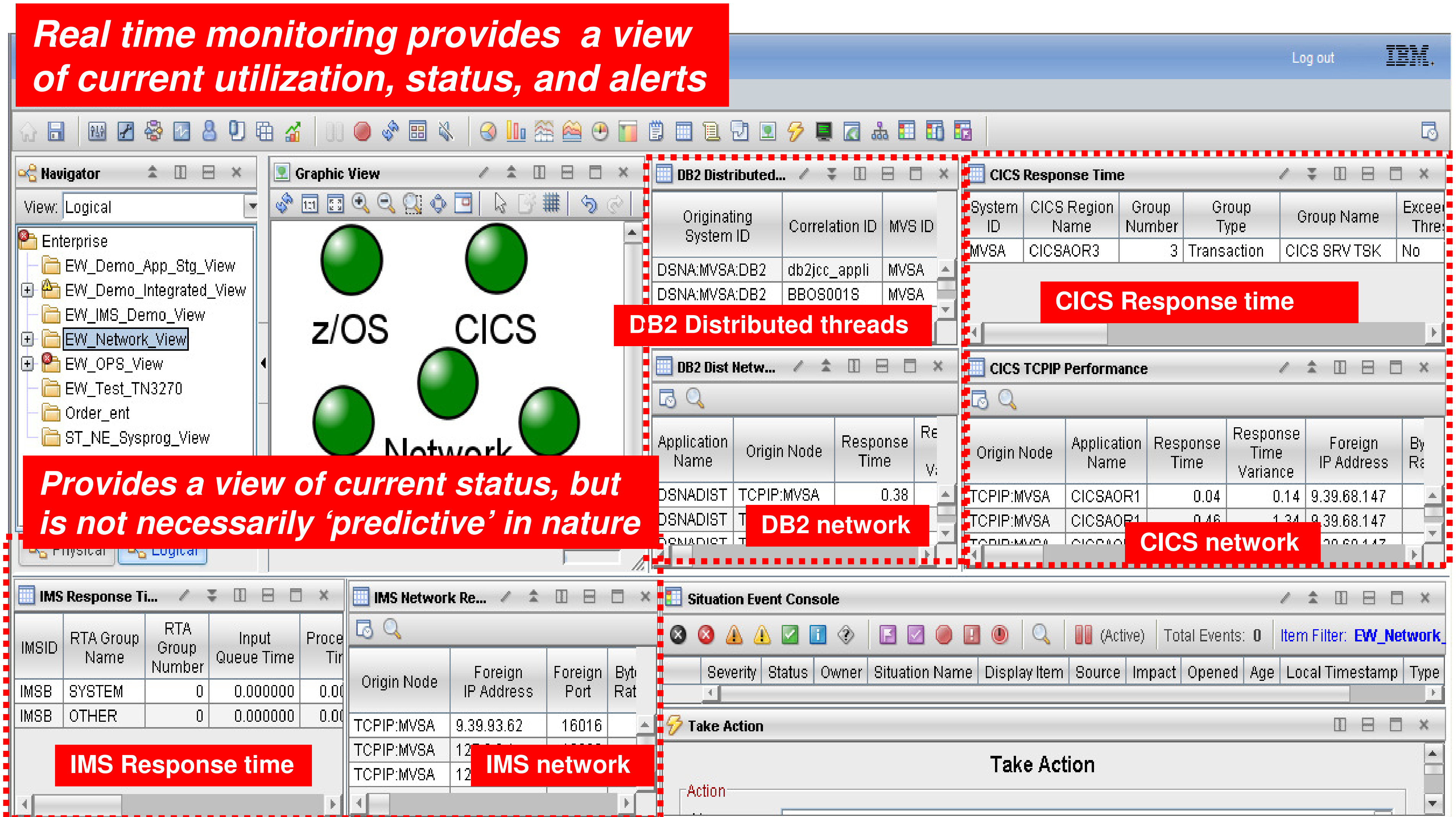
Interface Name	Interface Type	Current State	Transmit Packet Rate	Receive Packet Rate	Transmit Bandwidth Utilization	Receive Bandwidth Utilization	Bandwidth Utilization	Inbound Packets Discarded	Inbound Packet Discard Rate	Outbound Packets Discarded	Outbound Packet Discard Rate	Percent Packets Discarded	Outbound Packets in Error	Transmit Error Rate
LOOPBACK	Loopback	Up	76779	76779	0	0	0	0	0	0	0	0	0	0
LOOPBACK6	Loopback	Up	0	0	0	0	0	0	0	0	0	0	0	0
EZ6OSM01	OSA_QDIO_ethernet_OSM	Up	0	0	0	0	0	0	0	0	0	0	0	0
EZ6OSM02	OSA_QDIO_ethernet_OSM	Up	0	0	0	0	0	0	0	0	0	0	0	0
EELINK1	Static_virtual	Up	0	0	0	0	0	0	0	0	0	0	0	0
OSAFBC0L	OSA_QDIO_ethernet_OSD	Up	611	524	0	0	0	0	0	0	0	0	0	0
OSX3200P	OSA_QDIO_ethernet_OSX	Up	0	0	0	0	0	0	0	0	0	0	0	0
OSX3400P	OSA_QDIO_ethernet_OSX	Up	0	0	0	0	0	0	0	0	0	0	0	0
HIPERLF5	Hipersocket	Down	0	0	0	0	0	0	0	0	0	0	0	0
EZASAMEMVS	MPC_ptp_samehost	Up	0	0	0	0	0	0	0	0	0	0	0	0
IQDIOLNKC0A80193	Hipersocket	Up	0	0	0	0	0	0	0	0	0	0	0	0
EZAXCFS2	MPC_ptp_xcf	Up	0	0	0	0	0	0	0	0	0	0	0	0
EZAXCFS3	MPC_ptp_xcf	Up	0	0	0	0	0	0	0	0	0	0	0	0

- Monitor for interface status, bandwidth utilization, and errors
- Look for potential problems at the interface level

Dashboard Level Monitoring
Creating An Integrated Performance Interface

- Creating an integrated performance management display allows for the easy inclusion of network detail into various mainframe monitoring displays
- Integrated monitoring takes several forms
  - Integrated displays pulling together performance detail from multiple sources (host and network monitoring)
  - Integrated cross monitoring tool navigation
  - History integrated with real time performance information
  - Integrated alerts, alert correlation, and corrective actions

Dashboard Level Monitoring
Integrate Host And Network Monitoring



Summary

- Monitor the network from the z/OS perspective
- The network is an essential part of the overall mainframe application time line
  - Each network application/subsystem has interactions with the network
- It's important to understand how the mainframe interacts with the network
  - Application/subsystem configuration and options
- It is useful to have an integrated monitoring strategy that pulls together core mainframe and network monitoring information
  - Integrated dashboard views, integrated analysis, integrated alerts and automated corrections
  - Defining an end to end analysis strategy

Thank You!

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