

New Age Autonomic Computing- Linking Performance Monitors and Automation Solutions

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Abstract

- **In many of today's Complex Data Center Environments, Customers are refining their Workload Manager Service Policies, Implementing Intelligent Resource Director (IRD), and investigating Enterprise WLM (EWLM), to help enhance their Continuous Availability and High Performance Environments. But, utilizing just these tools may not be enough to achieve the desired results. This session looks at some Autonomic Processes to link your currently installed Performance Monitors and Automation Solutions to increase the effectiveness for Self-Monitoring, Self-Configuring, and Self-Healing of Critical Business Applications.**

Agenda

- **New Age Parallel Sysplex**
- **Intelligent Resource Director and Workload Manager**
- **Application Clusters**
- **System Status Manager**
- **Performance Status Manager**
- **Connecting the Solutions**
- **New Age Scenarios**
- **Session summary**

New Age Sysplex

➤ Sysplexes established for:

- ❖ High Availability**
- ❖ Continuous Availability**
- ❖ Scalability**
- ❖ Business Resiliency (Failover)**
- ❖ Facilitate OS Maintenance and Rollout**
- ❖ Disaster Recovery**

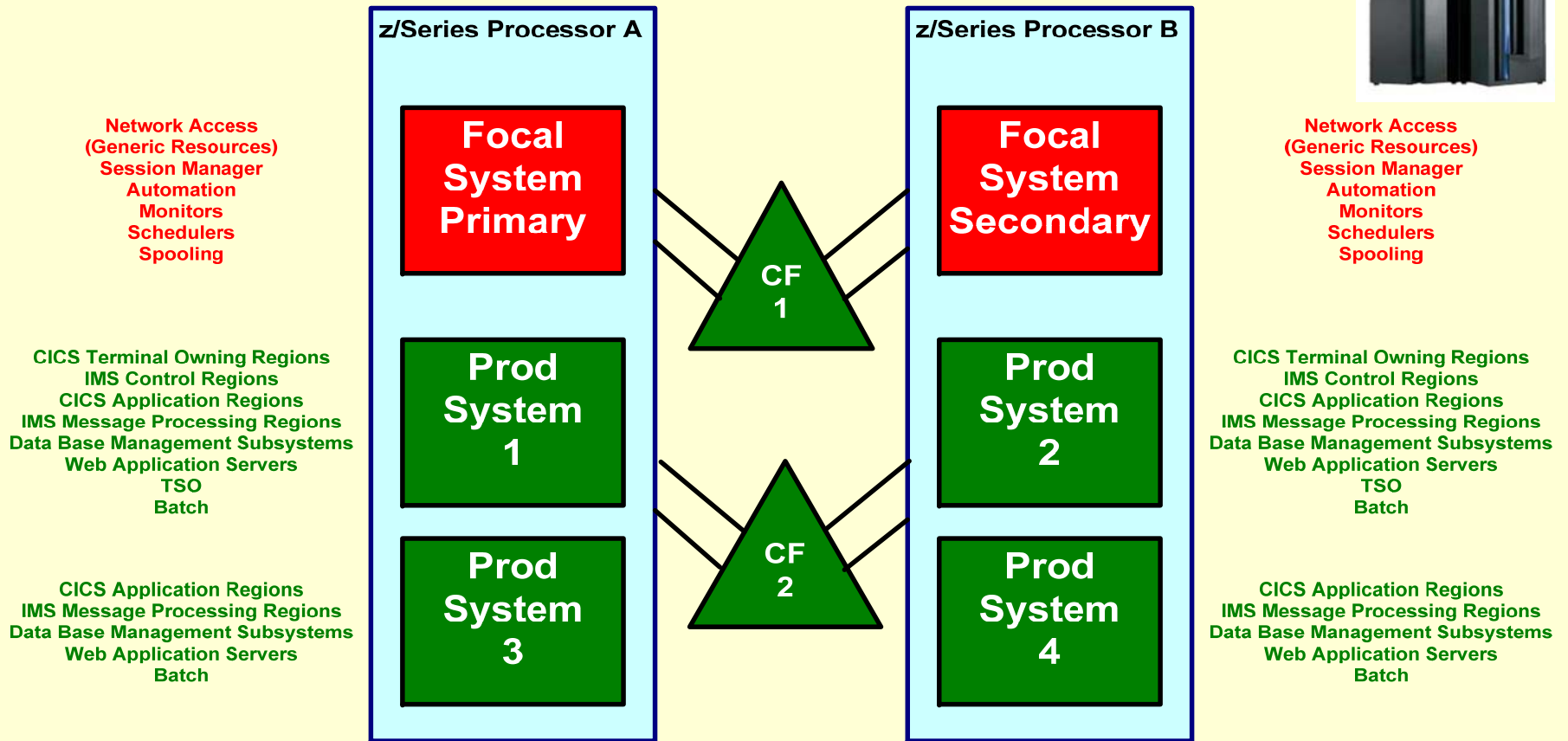
New Age Sysplex

➤ System Images established for:

- ❖ Facilitate OS Maintenance and Rollout**
- ❖ Facilitate Virtual Outages**
- ❖ Licensing Opportunities**
- ❖ Variable Workload Licensing Capping**
- ❖ Consolidated DASD Management**
- ❖ Facilitate Automation and Scheduling Processes**

New Age Sysplex

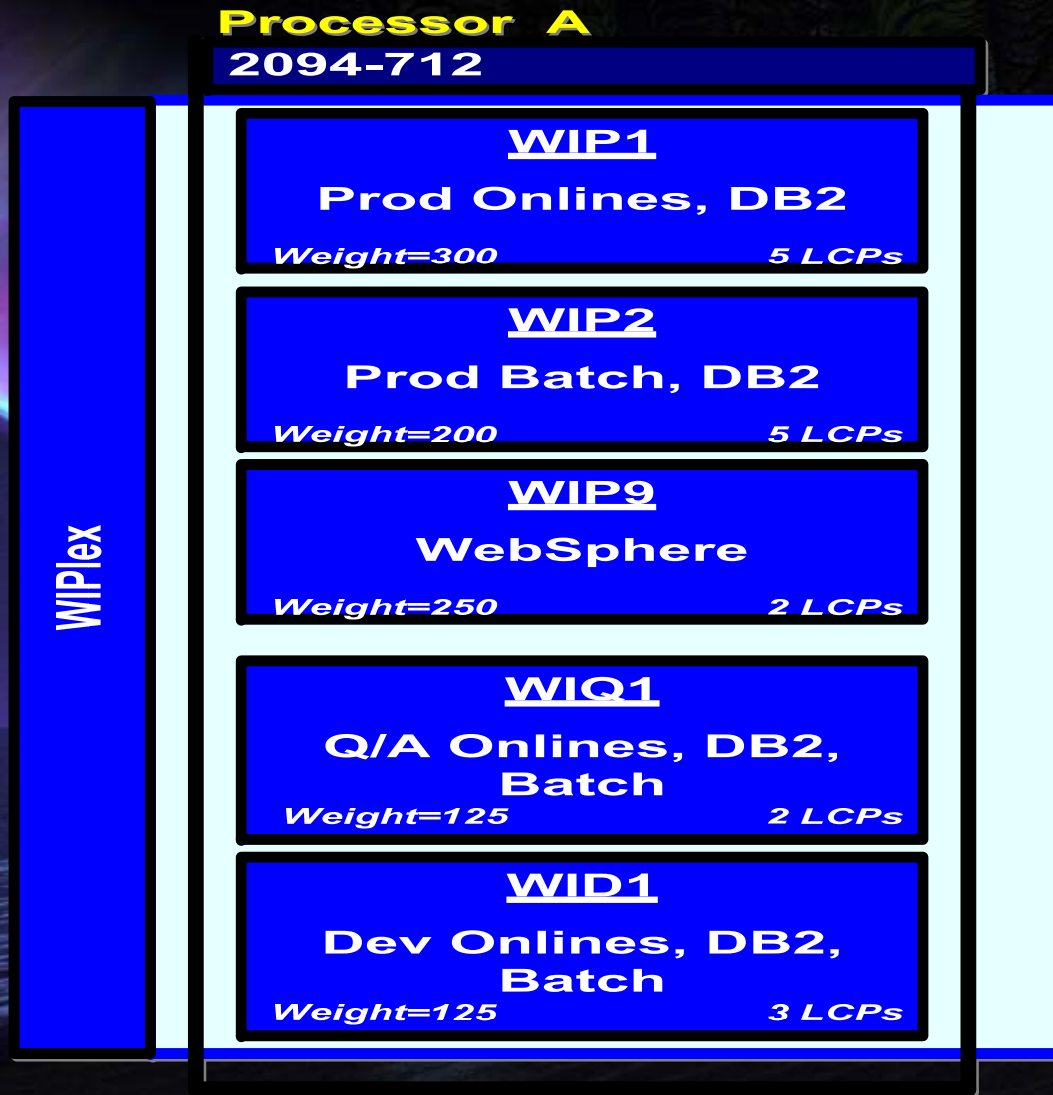
PRODPLEX



Intelligent Resource Director (IRD) and Workload Manager

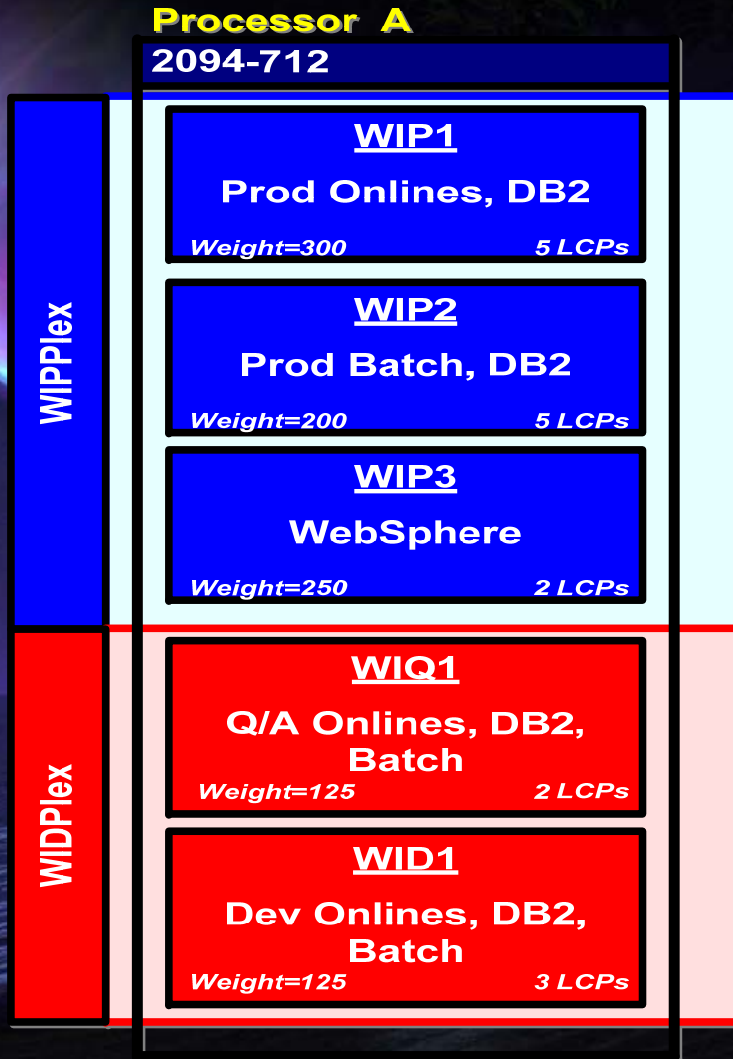
- **IRD moves Resources to an LPAR rather than move Work to other LPARs**
 - ❖ **Workload Manager Controls by Performance Index of a Service Class**
 - ❖ **Resources Moved within Defined Limits**
 - ❖ **Negative Adjustment occurs before the Positive Adjustment**
- **Challenges with IRD**
 - ❖ **IRD only works within a physical CPC**
 - ❖ **IRD only works within a Sysplex Cluster**
 - ❖ **Application May Exceed Capacity of Single Engine**
 - ❖ **Larger sites with complex environments may not meet the IRD Configuration Requirements**

Typical IRD Configuration



IRD may move Resources to each LPAR in the same Sysplex Cluster by: Adjusting the Weights of each LPAR, Varying the Number of LCPs in a LPAR, or Assigning Additional Channels to each LPAR

Multiple Sysplex Clusters

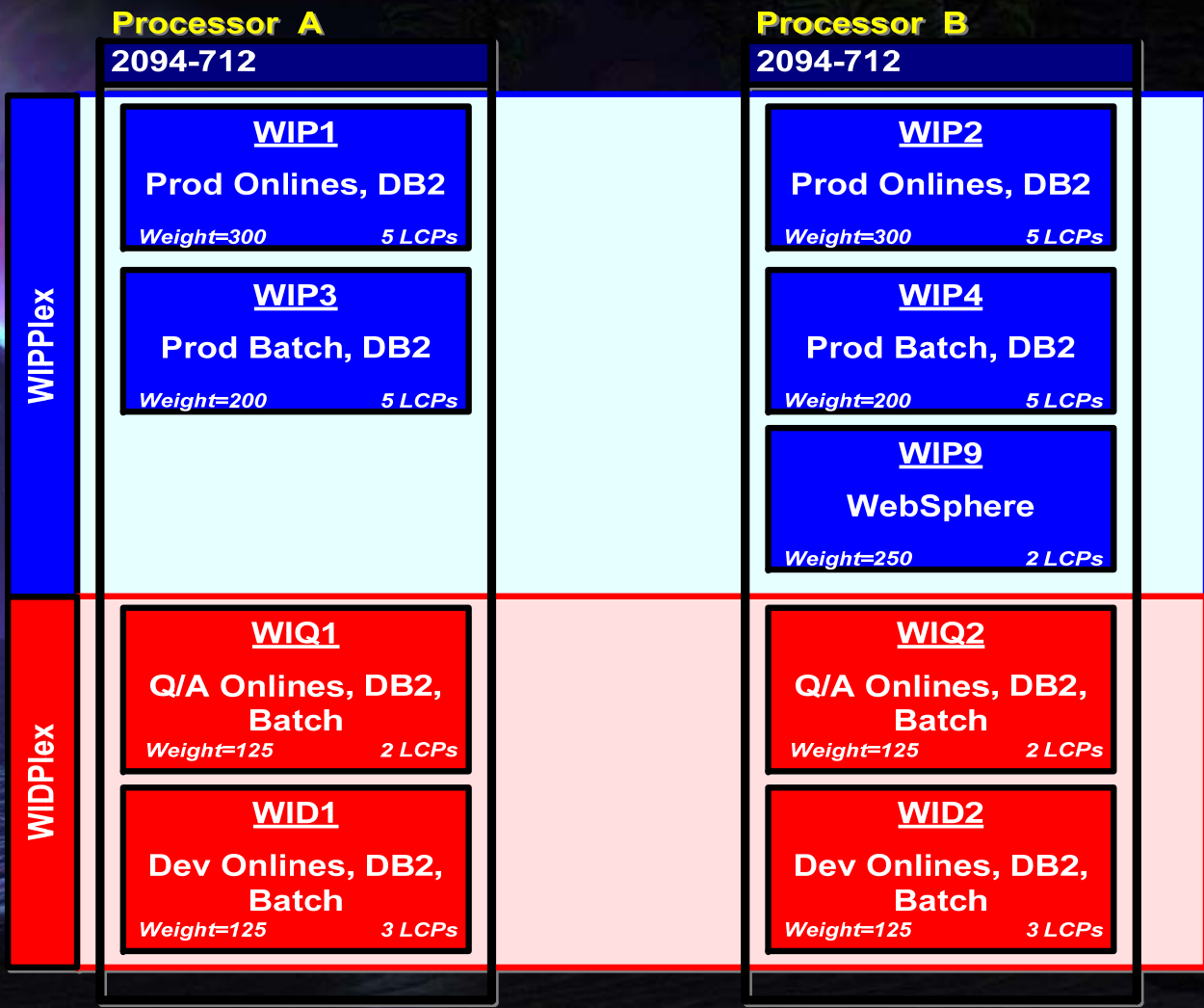


IRD may move Resources to each LPAR in the same Sysplex Cluster by:

Adjusting the Weights of each LPAR, Varying the Number of LCPs in a LPAR, or Assigning Additional Channels to each LPAR

**But,
NOT Between
the Clusters**

Multiple Clusters, Multiple Sysplexes, Multiple Processors



IRD may move Resources to each LPAR in the same Sysplex Cluster by:

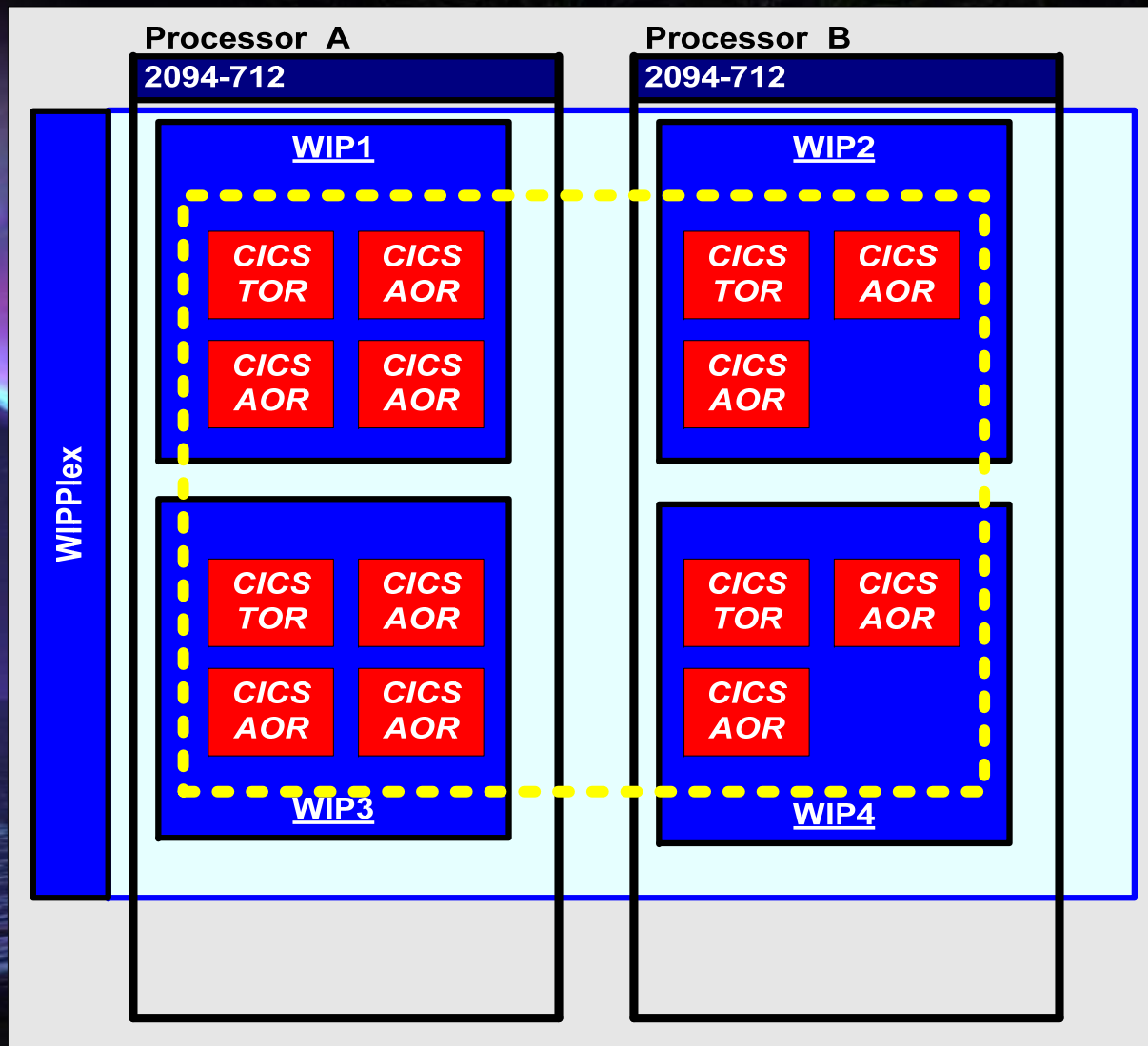
- Adjusting the Weights of each LPAR, Varying the Number of LCPs in a LPAR, or Assigning Additional Channels to each LPAR



SubSystem Clusters

- **Groups of related Application SubSystem Clusters may be created across multiple LPARs, multiple SYSPLEXes, and Processors**
 - **CICSPIlex, IMSPIlex, MUFPIlex, IDMSPIlex Clusters**
 - **BATCHPIlex Clusters (not WLM-managed)**
 - **Websphere Application Clusters**
 - **And so on**
- **Service Level Agreements are needed to support Performance Requirements**
- **Service Level Objectives may be needed for Optimal Performance Requirements**
 - ❖ **Real Storage, Paging, I/O**

Sample CICSplex Cluster



CICSplex Clusters are comprised of all the unique types of Regions necessary to establish a Continuous Availability Environment.

Clusters reside on multiple LPARS and on multiple CPCs.

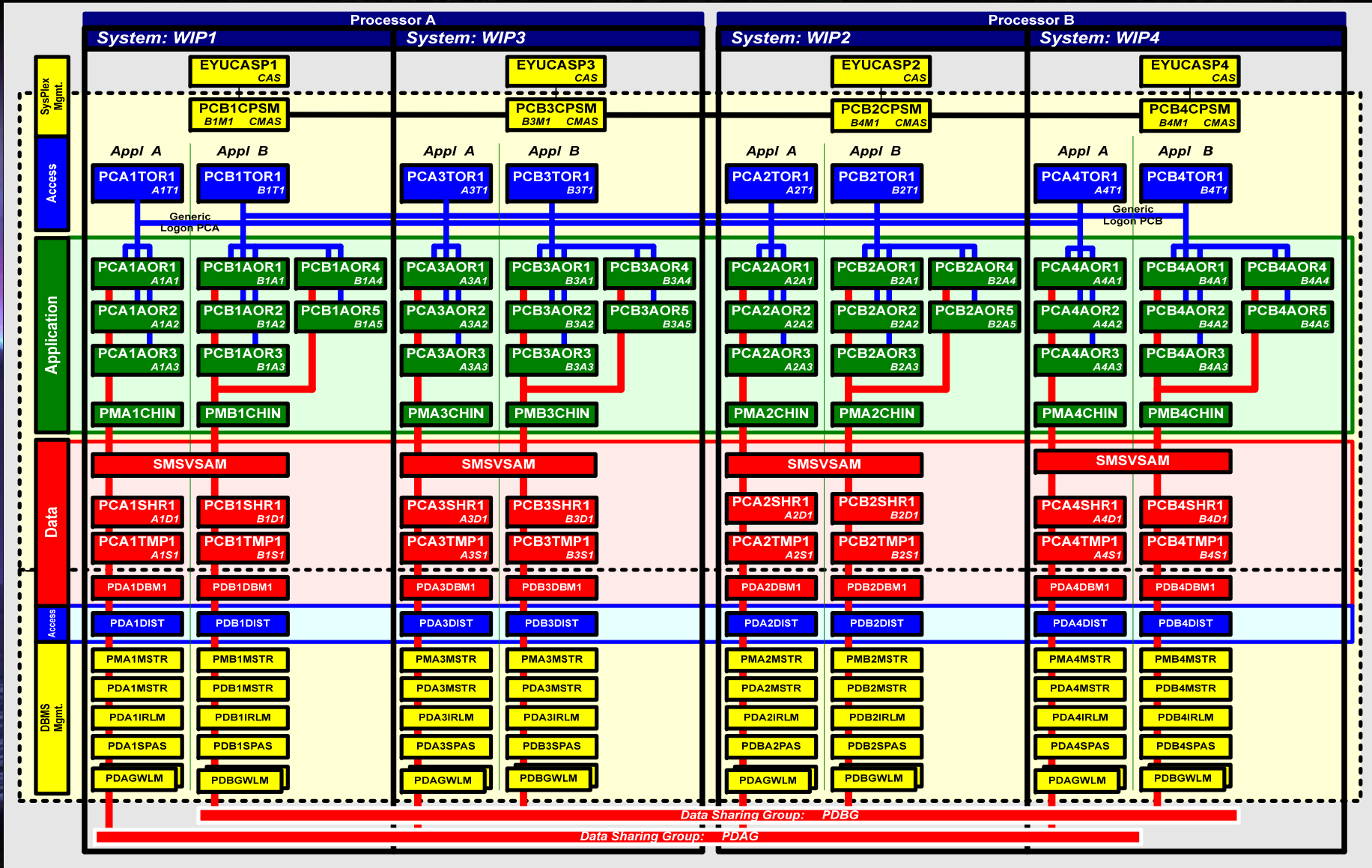
Processors may reside in different Data Centers for D/R purposes.

Full CICSplex Topology

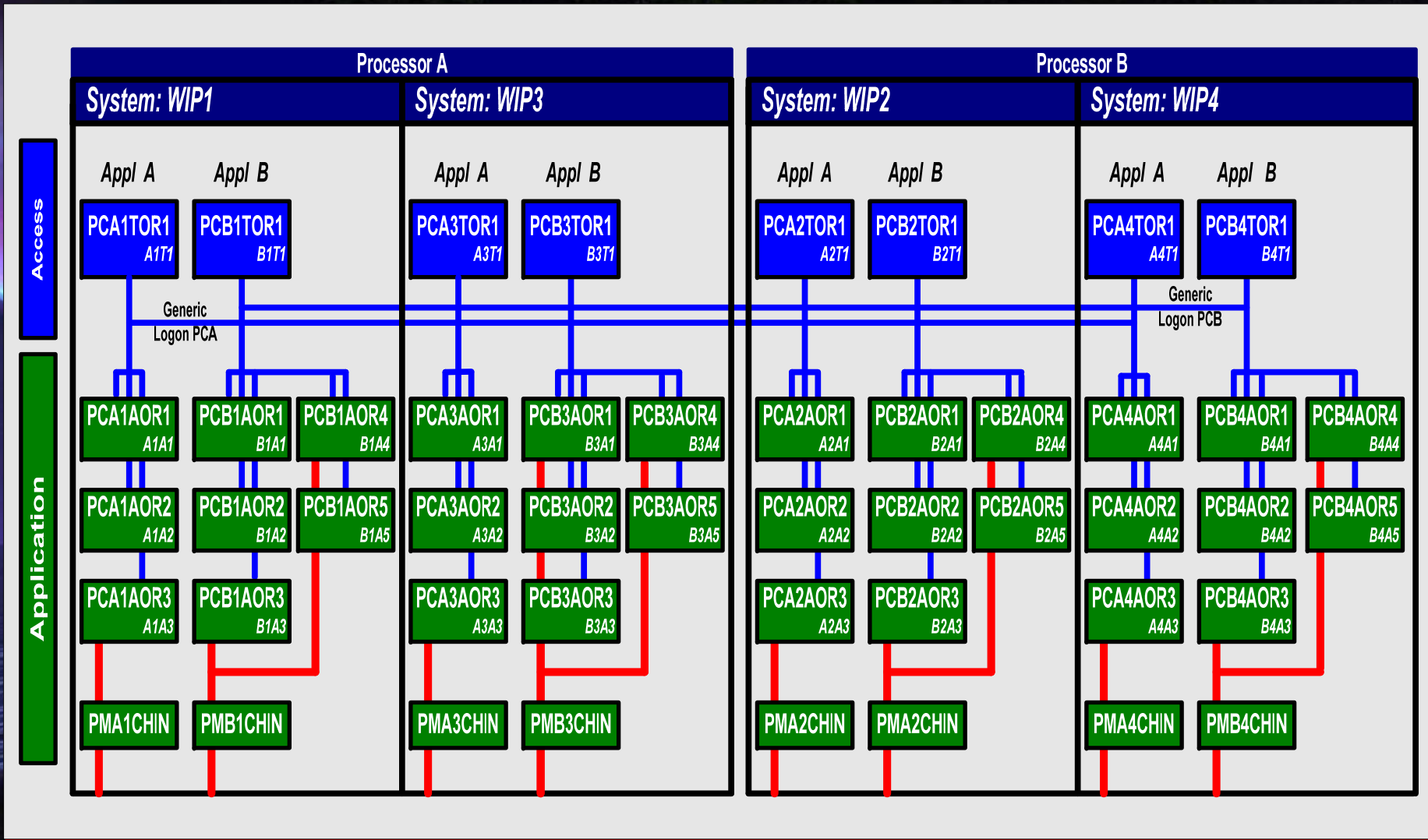
- **VTAM Generic Resources**
- **TCP/IP Sockets**
- **CICSplex/SM Regions**
- **Terminal Owning Region (TOR)**
- **Application Owning Regions (AOR)**
- **Queue Owning Region (QOR) or MQ/Series connection**
- **Temp Storage Owning Region (TSOR)**
- **CF Shared Data Owning Region (CFOR)**
- **Print Owning Region (maybe)**
- **NO File Owning Region (FOR)**
- **Connection to SMSVSAM**
- **Connection to DB2Plex or IMSplex (DB/DC or DBCTL) with Data Sharing Group**



Sample Environment



Abbreviated Sample Environment



System Status Manager

- **Automation Solution keeps track of the State or Status of System and Application Tasks**
 - ❖ **IPL Startup, and Shutdown is part of a different process**
- **Time of Day Scheduling and Calendaring May be defined**
- **Various States may be valid at any given Time**
 - ❖ **Up, Down, ABENDeD**
- **All Possibilities may need to be Accounted for, including Restart Processes**

System Status Manager

➤ Tracking Items for Started Tasks or Jobs

Task Or Job	Current State	Desired State	Appl Type	Appl Group	System	Sysplex
PCICPRA1	Up, Down, Coming Up, Going Down, ABENDING	Up, Down	CICS, IMS, DB2, Datacom, IDMS, Batch, Web	Payroll1	WIP1	WIPPLEX

System Status Manager

➤ Other Items may need to be defined

Task Or Job	Current System	Preferred Systems	Available Systems	Current Sysplex	Preferred SYSPLEXes	Available SYSPLEXes
PCICPRA1	WIP1	WIP1 WIP3	WIP1 WIP2 WIP3 WIP4	WIPPLEX	WIPPLEX	WIPQPLEX



Performance Status Manager

- **Automation Solution keeps track of the Performance State or Status of System and Application Tasks**
- **Interaction among the Automation Solution, the Performance Solutions, and possibly Other System Management Solutions needs to be established**
- **Various States may be valid at any given Time**
 - ❖ **Current State**
 - ❖ **Desired State**
 - ❖ **Factors**

Performance Status Manager

➤ Tracking Items for Performance of Started Tasks or Jobs

Task Or Job	Current State	Current Progress	Appl Group	Exception
PCICPRA1	Normal, Exceeding Normal, Normal-to-Warning, Warning, Warning-to-Critical, Critical	Action-in-Progress, Monitor-in-Progress	Payroll1	Threshold Exceeded, Transaction Processor Rate, Transaction Processor Time, Transaction-I/O-Rate, Transaction-I/O-Time, Transaction-Storage-Utilization, Transaction-Paging-Rate

What else is needed?

- **Process to keep status on LPARs, CPCs, and Target Regions**
 - LPAR up? LPAR down? LPAR failing? LPAR IPL-ing
 - CPC available?
 - All Regions up? Some Regions up?
- **Process to accept Exceptions and Reverse Exceptions (including Persistence)**
- **Process to access Performance data (Real-time and Historical)**
 - OS
 - CICS or IMS
 - DB2 or IMS
 - Network
- **Process to access WLM data per System and per Sysplex**
- **Process to Define Application and Subsystem Topology**
- **Process to interface to Automation and Status Process**

Applications and Subsystem Topology

- **Name and Relationship of Subsystem Regions need to be defined**
- **Status of Each Region must be maintained**
 - ❖ **Up, Down, Available (to be Brought Up)**
- **Various Regions Represent the Entire Application Environment**
- **Various Systems Represent the Entire Shared Environment (MRO)**

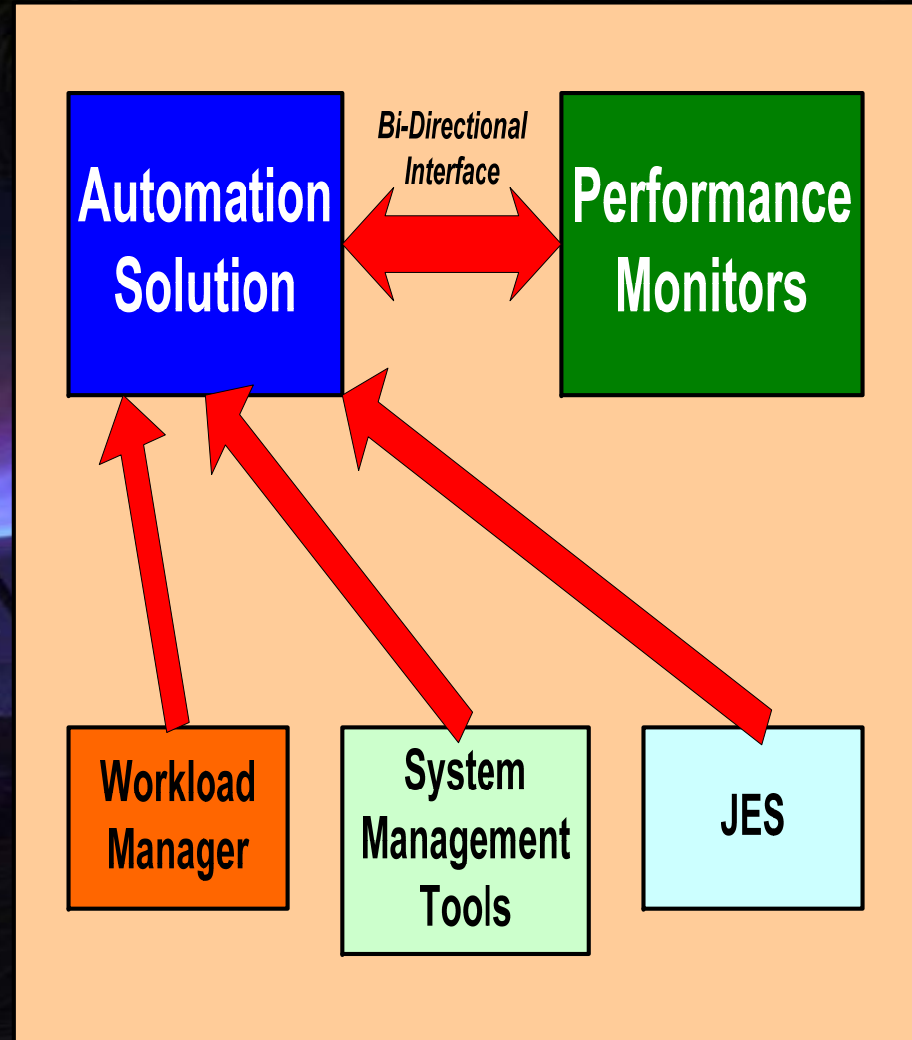
Topology Status Manager

➤ Tracking Regions Availability for Automation Actions

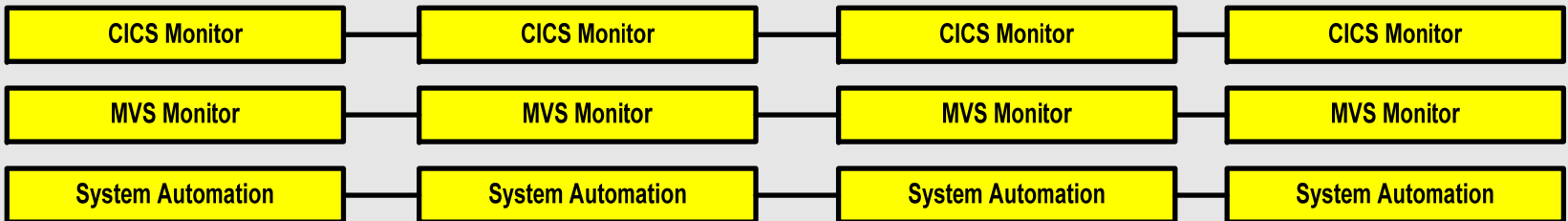
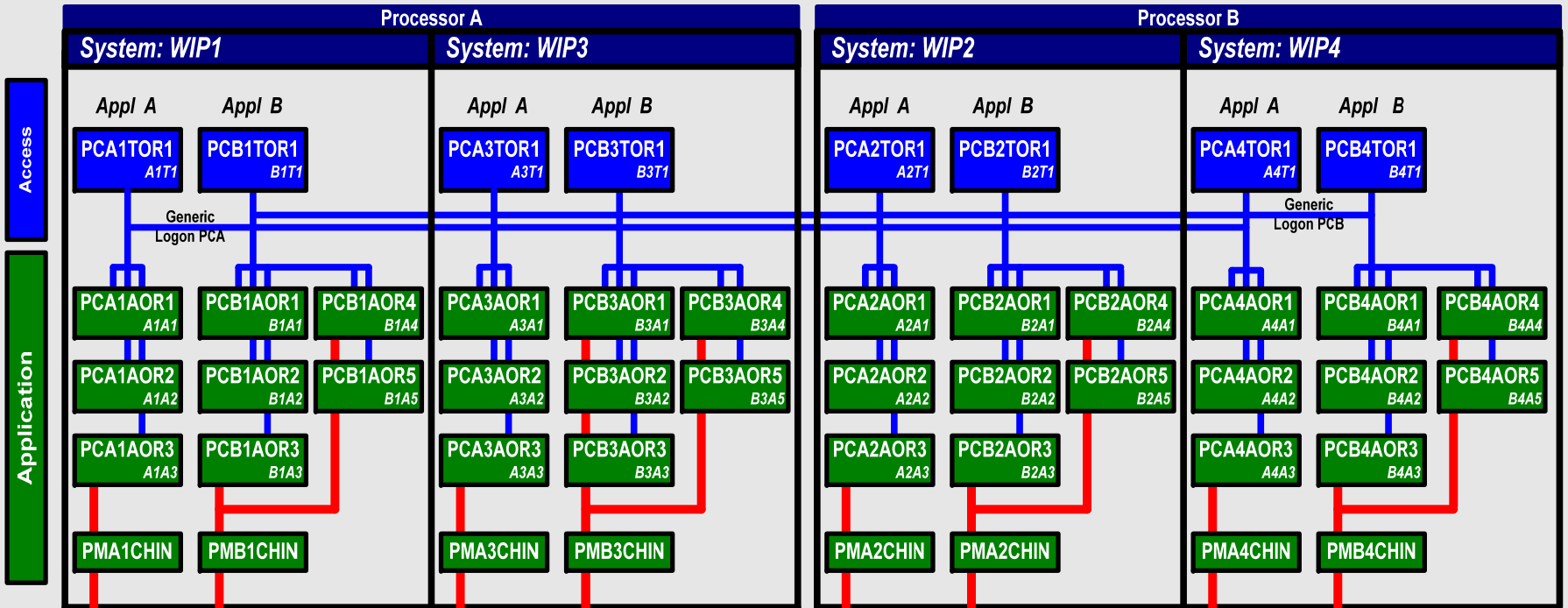
Region	Dependency Level	Current Status	Performance Status	System
PCICTAA1	1	Up	Up	WIP1
PCICSAA1	2	Up	Up	WIP1
PMQCAA1	3	Up	Up	WIP1
PCICAAA1	4	Up	Up	WIP1
PCICAAA2	4	Up	Up	WIP1
PCICAAA3	4	Down	Available	WIP1
PCICAAA4	4	Down	Available	WIP1
PCICTBA1	1	Up	Up	WIP2
PCICSBA1	2	Up	Up	WIP2
PMQCBA1	3	Up	Up	WIP2
PCICABA1	4	Up	Up	WIP2
PCICABA2	4	Down	Available	WIP2
PCICABA3	4	Down	Available	WIP2
PCICABA4	4	Down	Available	WIP2

Inter-connecting System Management Solutions

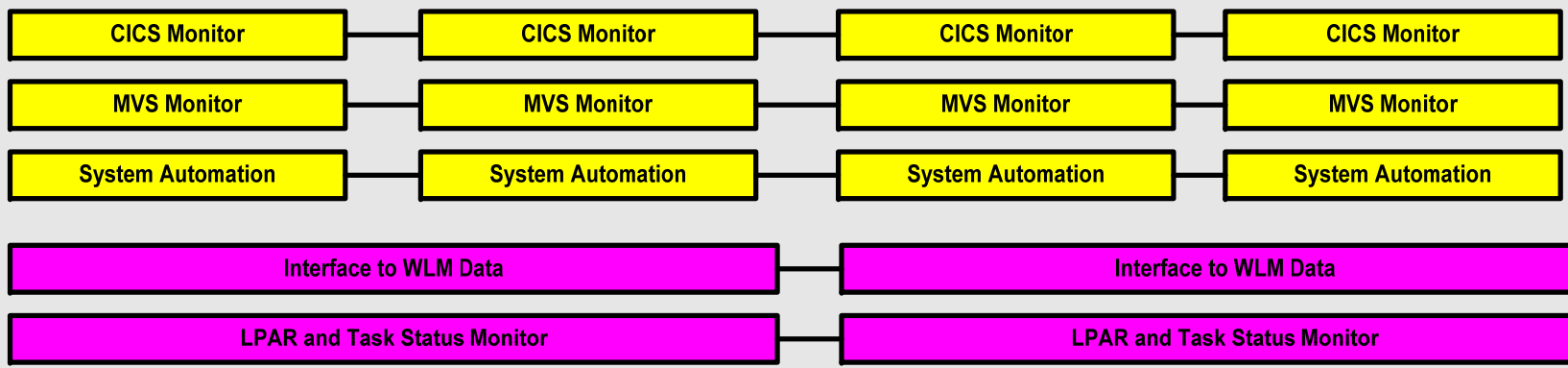
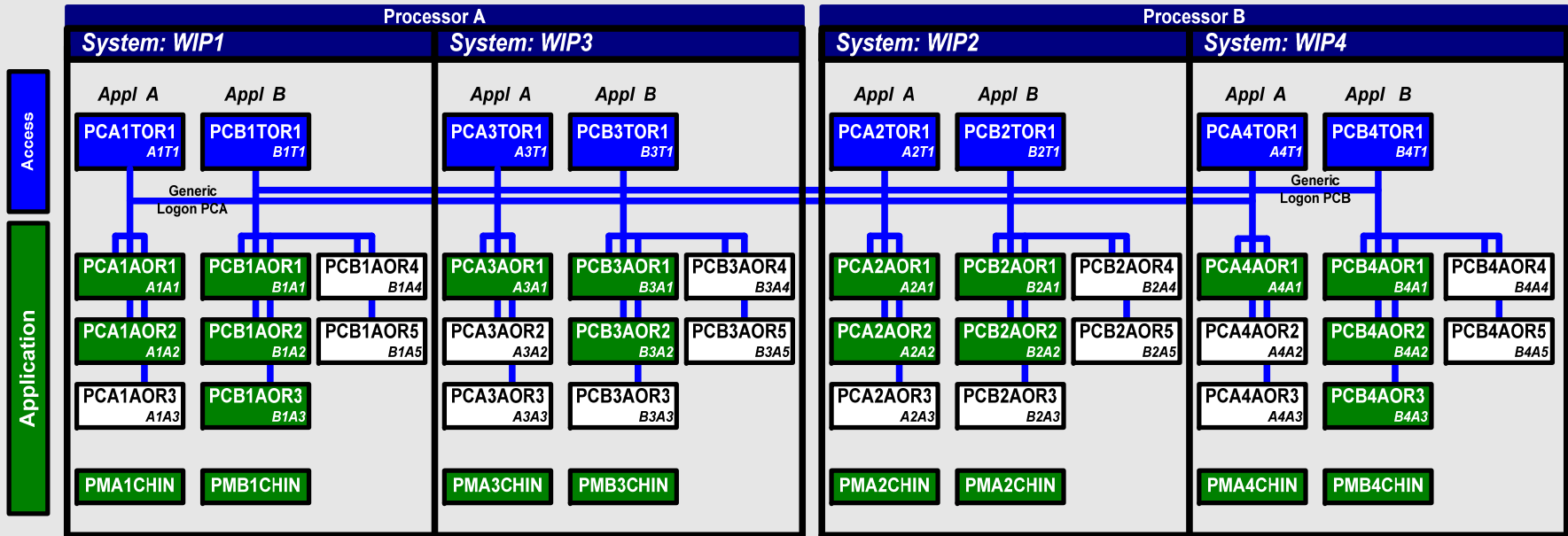
- **Bi-Directional Interface between Automation Solution and Performance Tools**
- **Status Information may be provided from WLM, Other System Management Tools, and JES**



Sample Environment with Installed Monitors and System Automation



Sample Prototype



Scenarios

- **SLA for Application B is 90% < 2 sec for trivial transaction and 80% < 10 sec for non-trivial transactions and 70% < 30 sec for long-running transactions; no specific SLA for extremely long-running Ad-Hoc transactions**

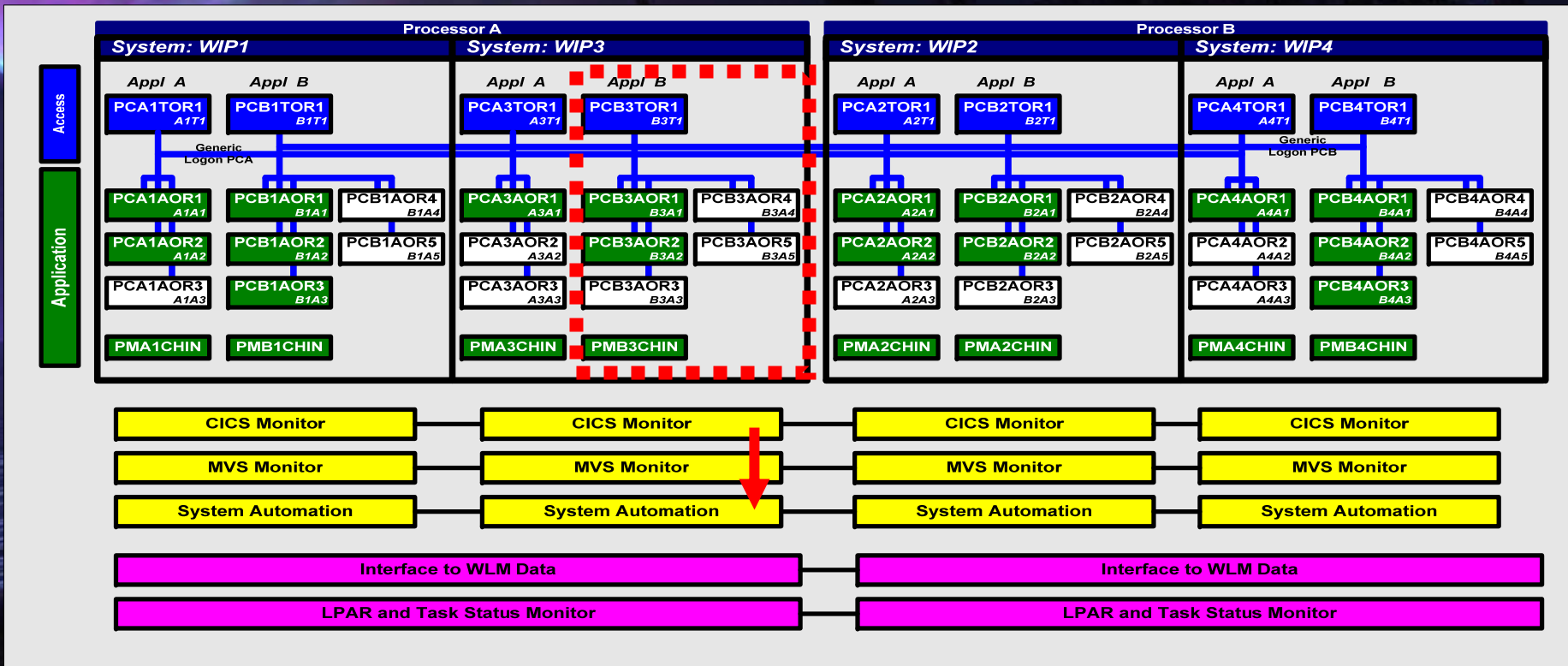
- ❖ **RESPTIME**

- **Application B averages 75 Trans/sec and peaks at 150 Trans/sec**

- ❖ **TRANRATE**

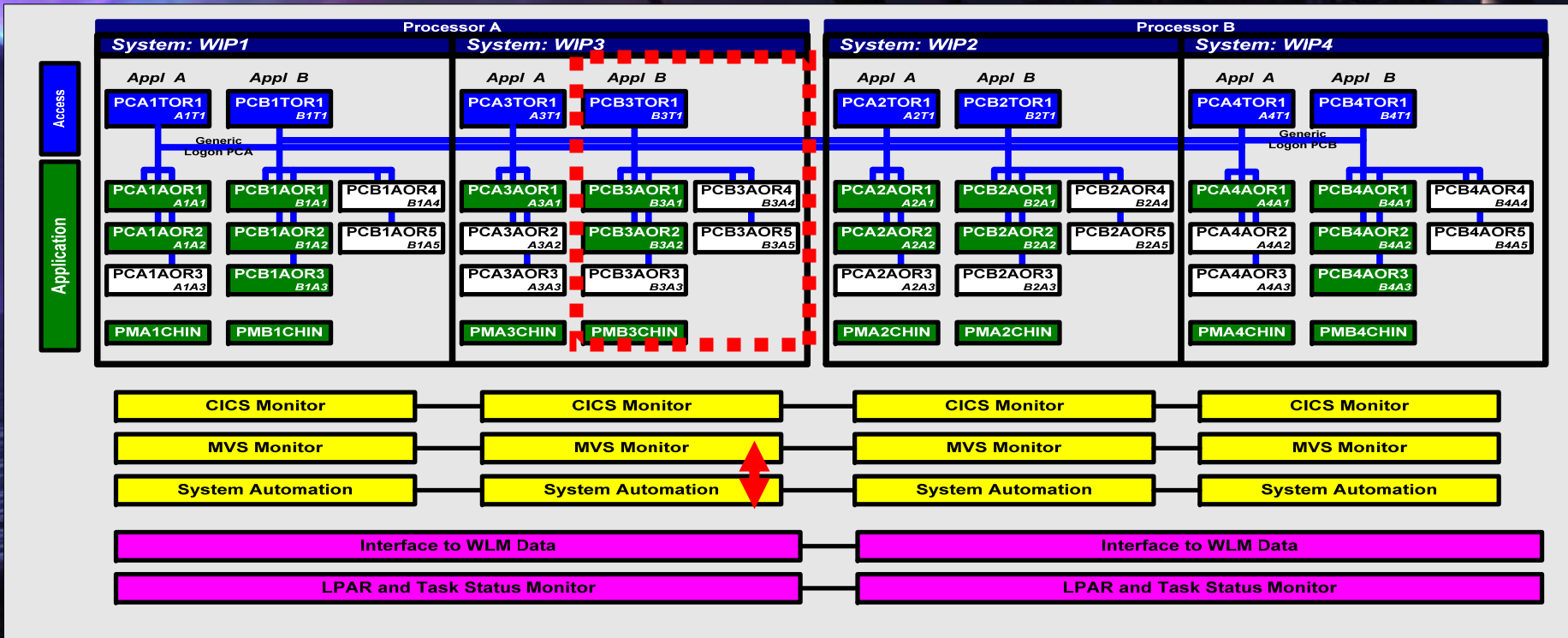
Scenario 1

➤ CICS Performance Monitor on WIP3 signals Automation Solution that Application B's Trivial Response Time Threshold has exceeded 10 seconds over several intervals (1 minute)



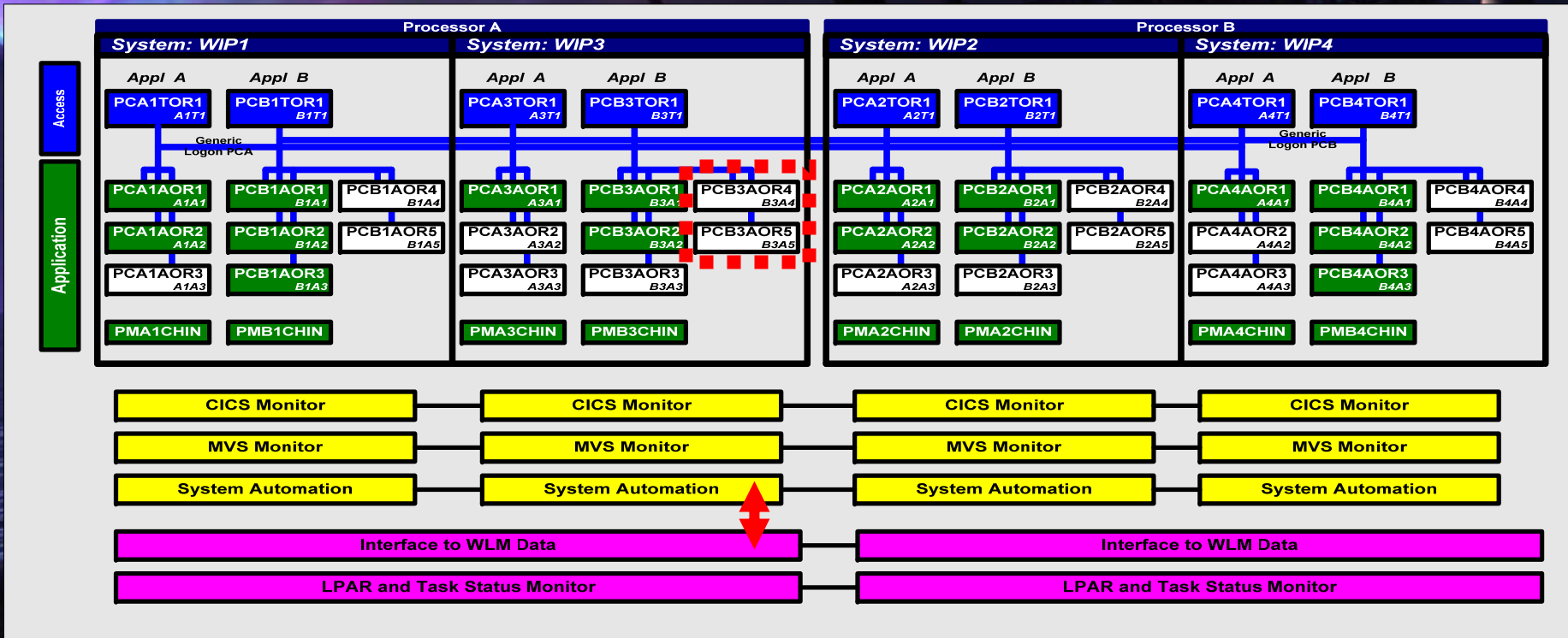
Scenario 1

- Automation Solution requests LPAR Performance Data from MVS Performance Monitor
- MVS Performance Monitor indicates that the System is running at 65% busy, and that the Physical LPAR is running at 60% busy (over the last several intervals)



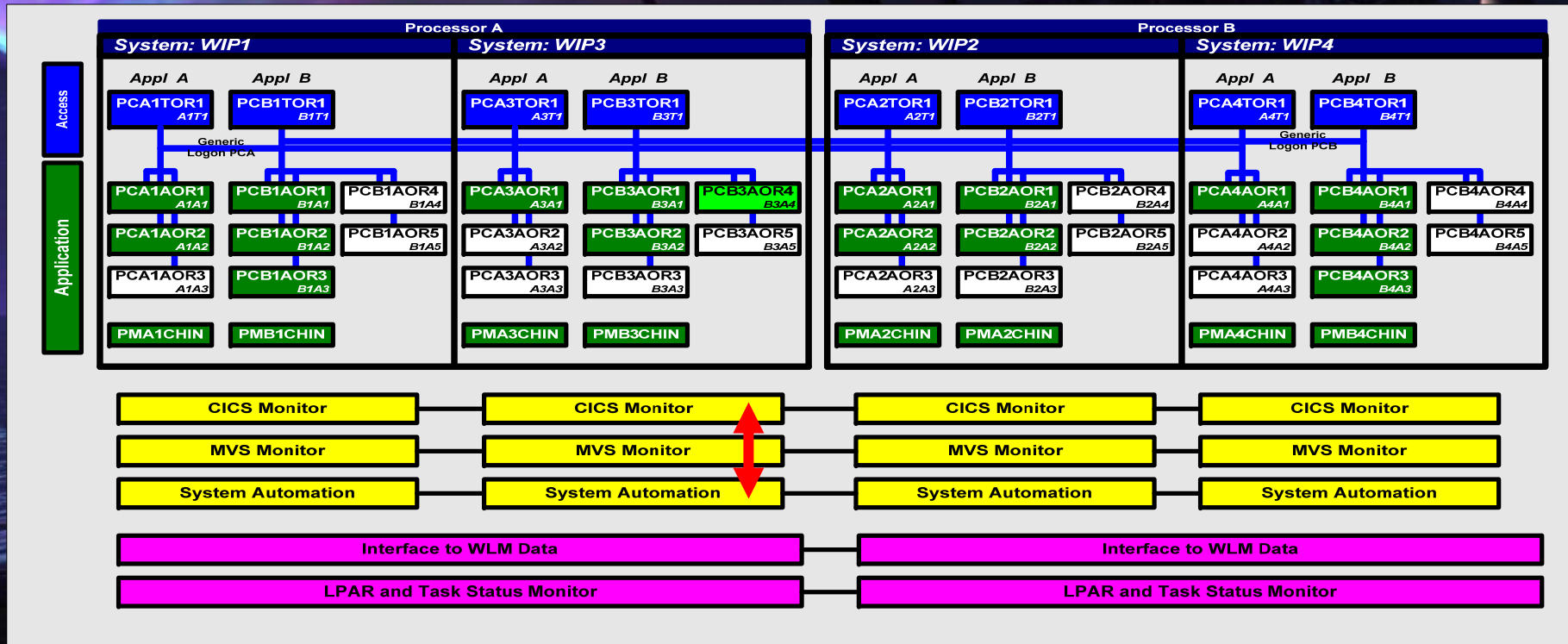
Scenario 1

- Automation Status Monitor indicates that AOR Regions PCB3AOR4 and 5 are down and available to be brought up on WIP3
- Automation Solution requests WLM and Real Storage Data from MVS Performance Monitor



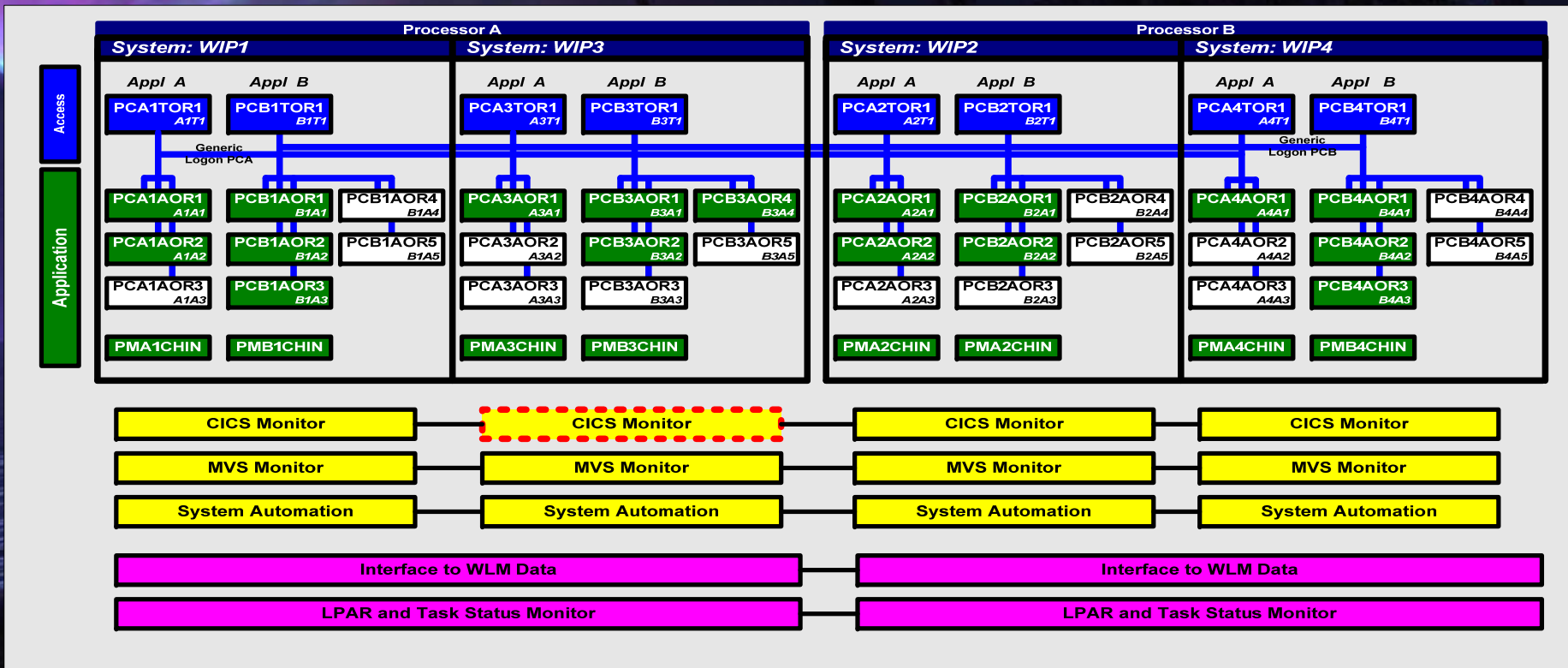
Scenario 1

- System Automation brings up AOR Region PCB3AOR4 and updates appropriate status
- Automation Solution requests Performance Data from CICS Performance Monitor



Scenario 1

- Application B's Trivial Response Time returns to under 2 seconds, and is being monitored



Scenarios

- **SLA for Application B is 90% < 2 sec for trivial transaction and 80% < 10 sec for non-trivial transactions and 70% < 30 sec for long-running transactions; no specific SLA for extremely long-running Ad-Hoc transactions**

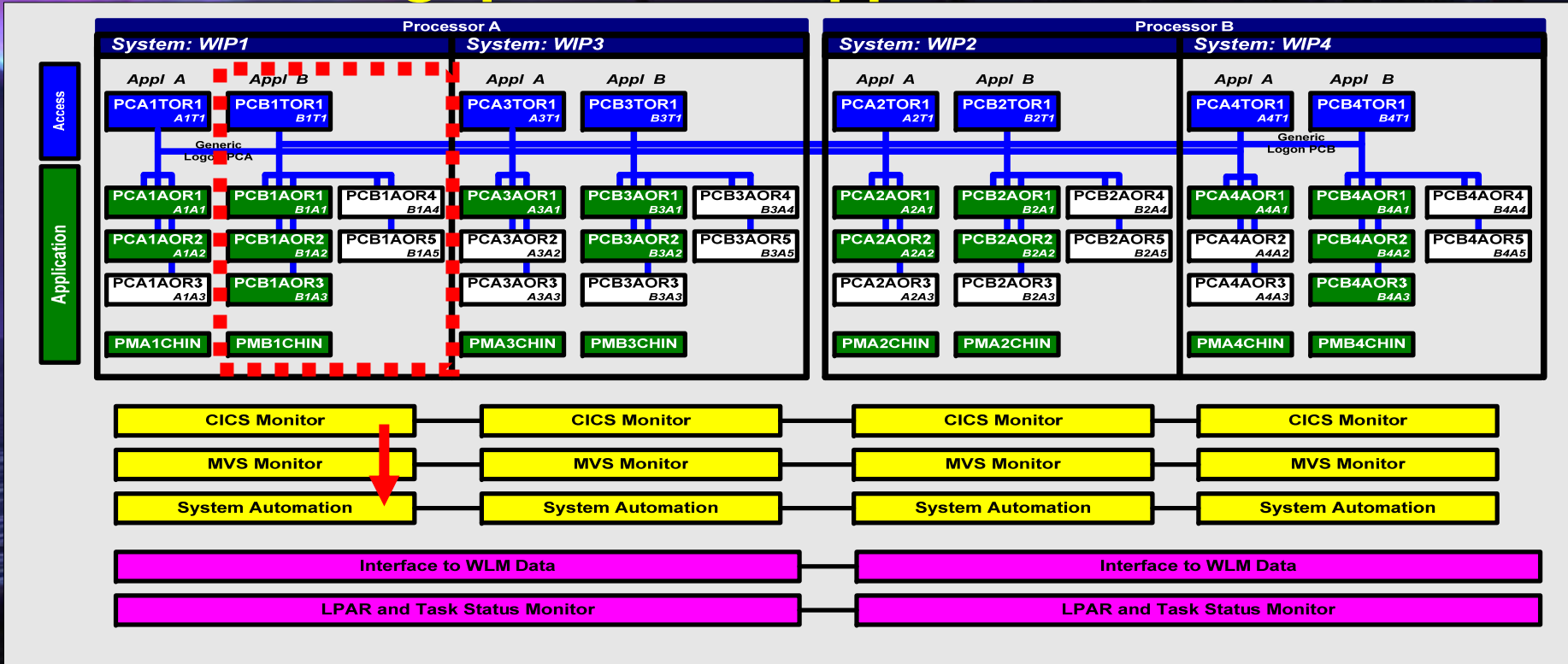
- ❖ **RESPTIME**

- **Application B averages 75 Trans/sec and peaks at 150 Trans/sec**

- ❖ **TRANRATE**

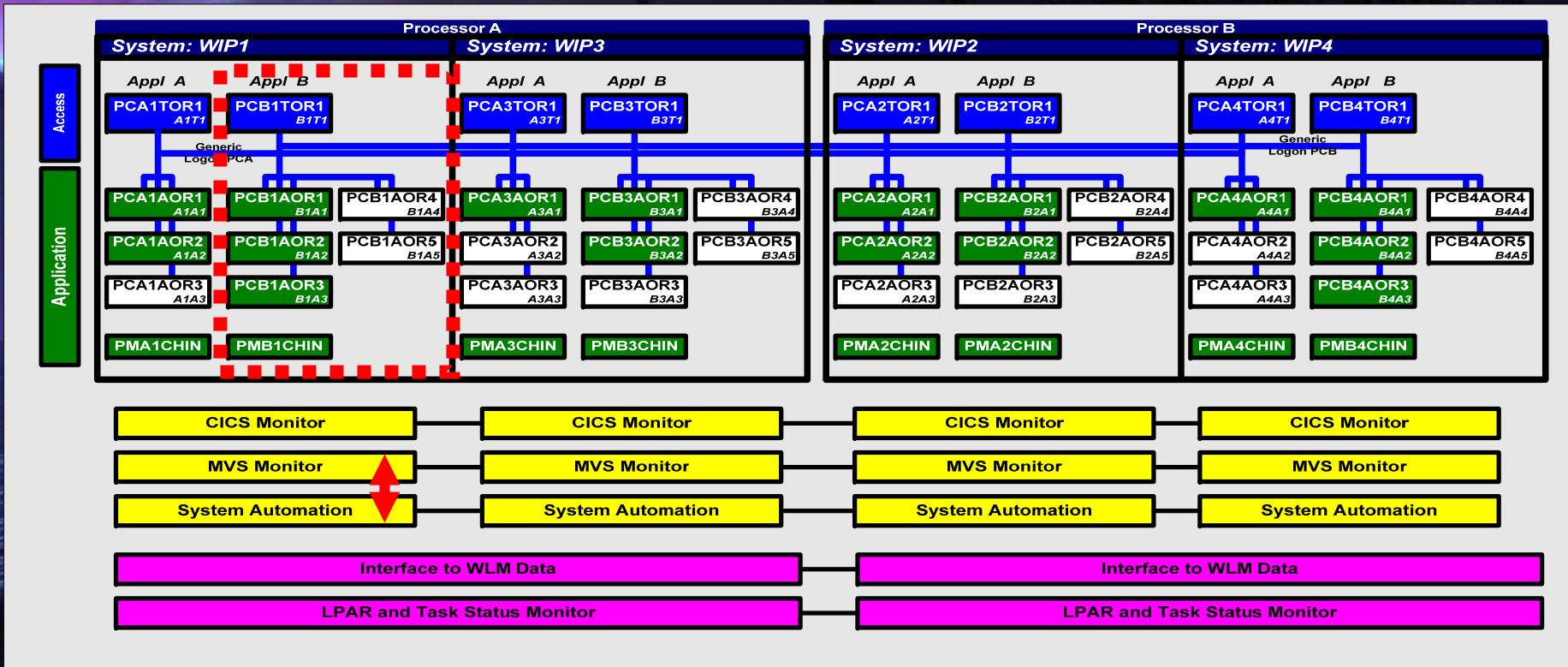
Scenario 2

- CICS Performance Monitor on WIP1 signals Automation Solution that Application B's Trivial Response Time Threshold has exceeded 5 seconds over several intervals (1 minute) and that Throughput has dropped to 50 Trans/sec



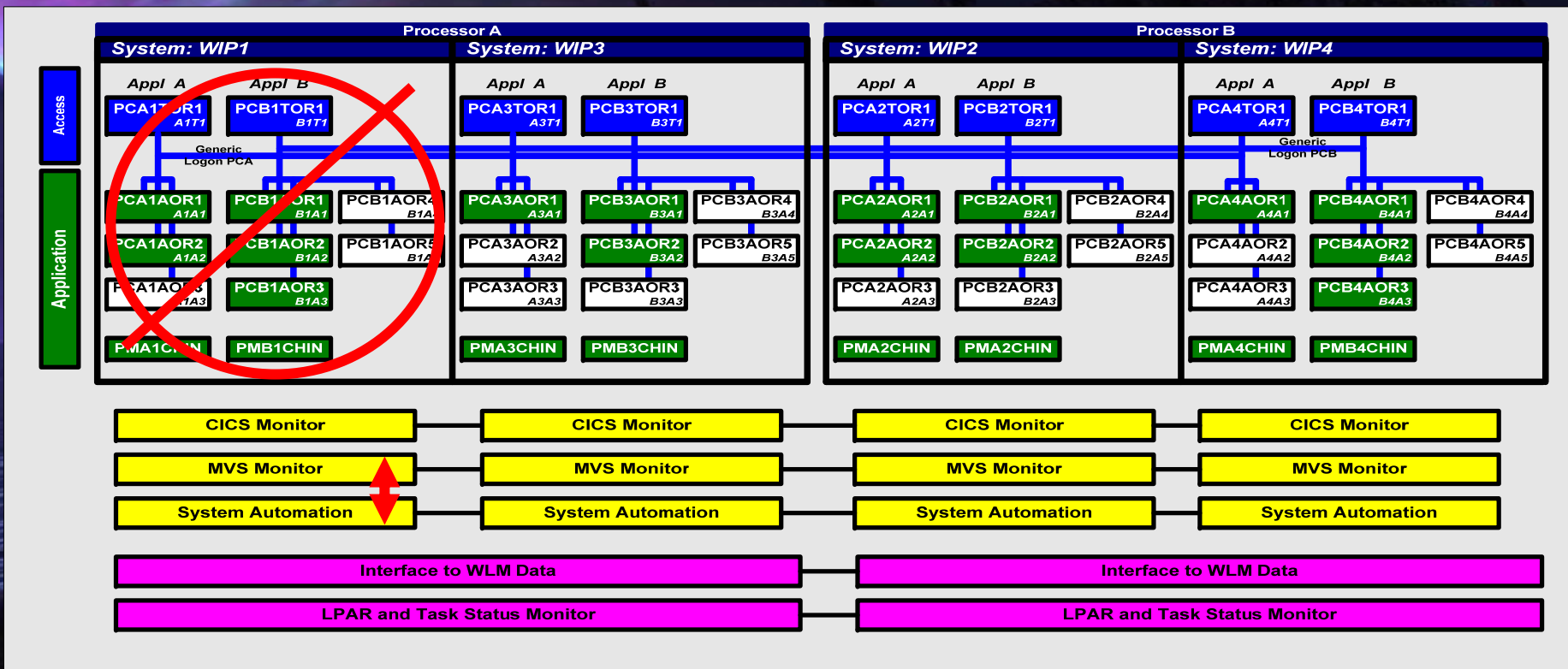
Scenario 2

- Automation Solution would like to start another AOR on WIP1
- Automation Solution requests LPAR Performance Data from MVS Performance Monitor



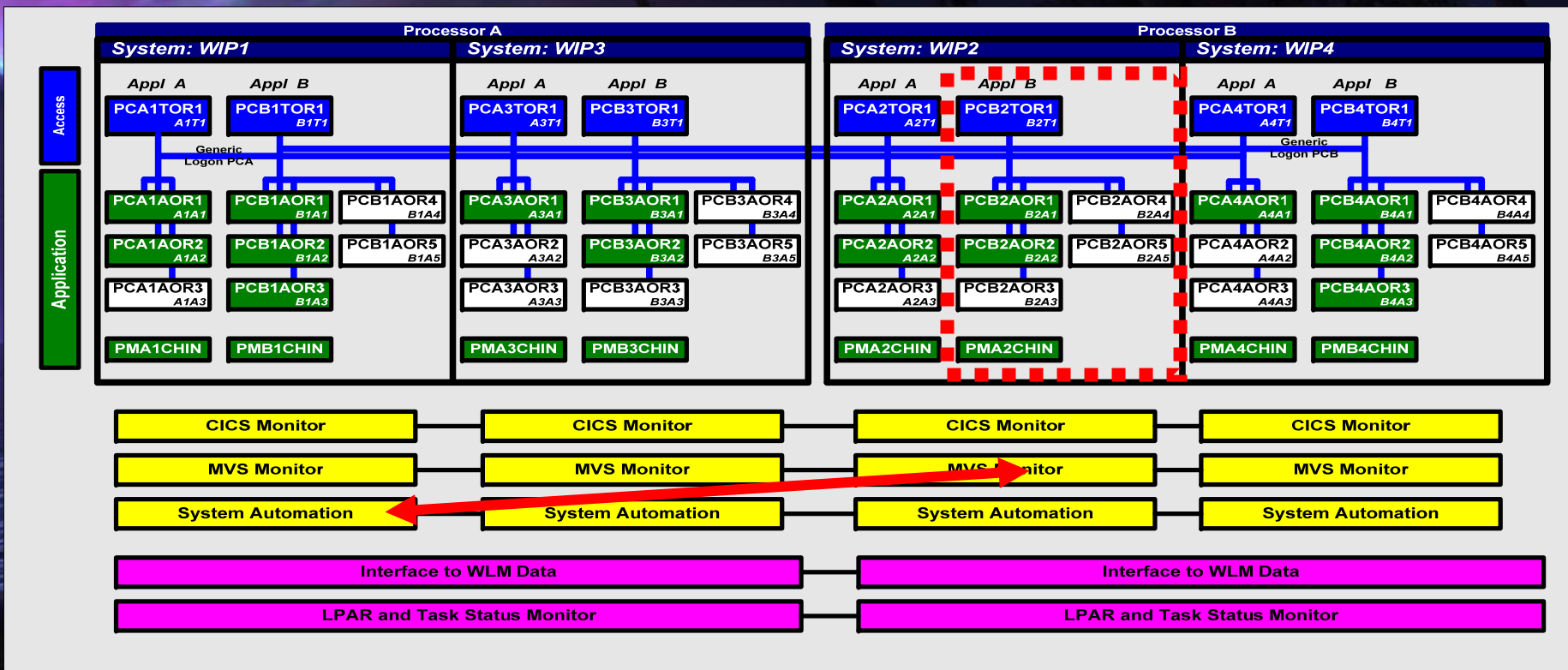
Scenario 2

- MVS Monitor indicates that the System WIP1 is running at 95% busy, the Physical LPAR is running at 90% busy, and the Real Storage is constrained (over the last several intervals)



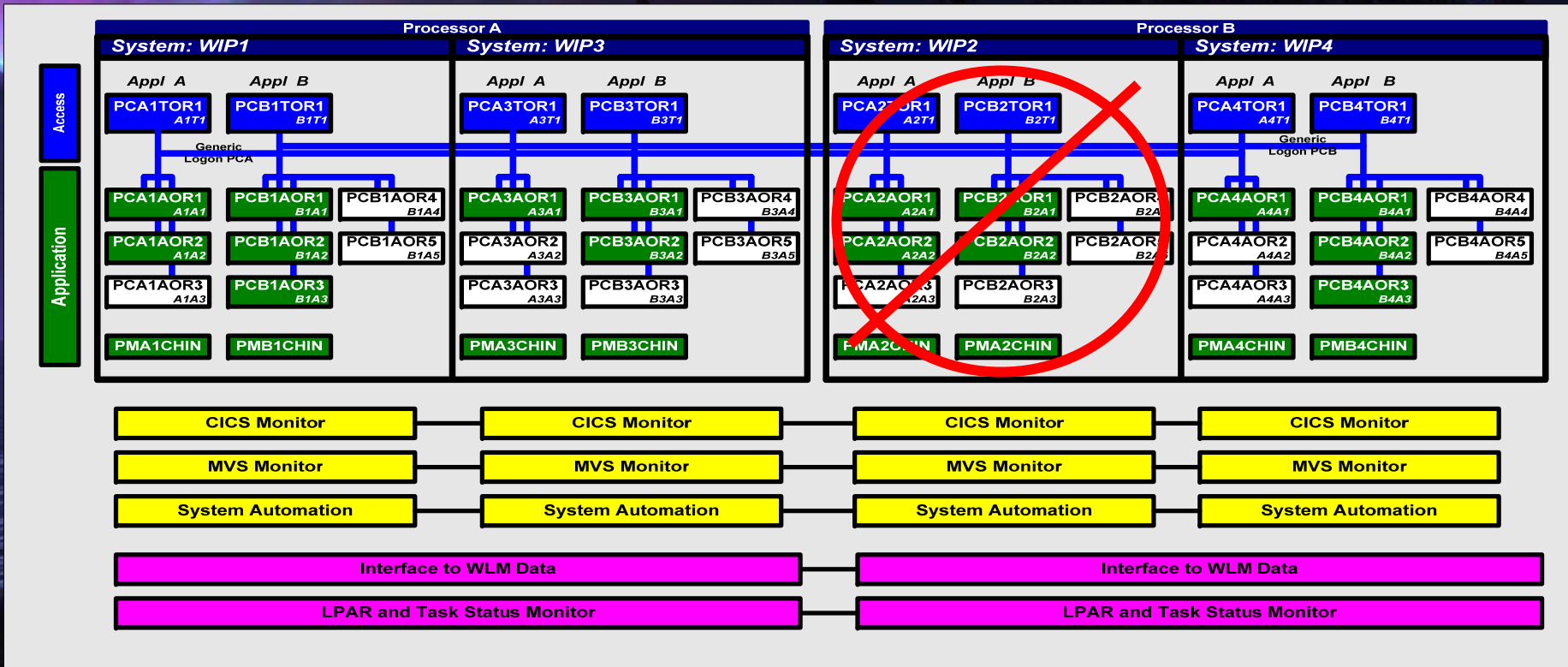
Scenario 2

- Automation Solution would like to start another AOR on WIP2
- Automation Solution requests LPAR Performance Data from MVS Performance Monitor



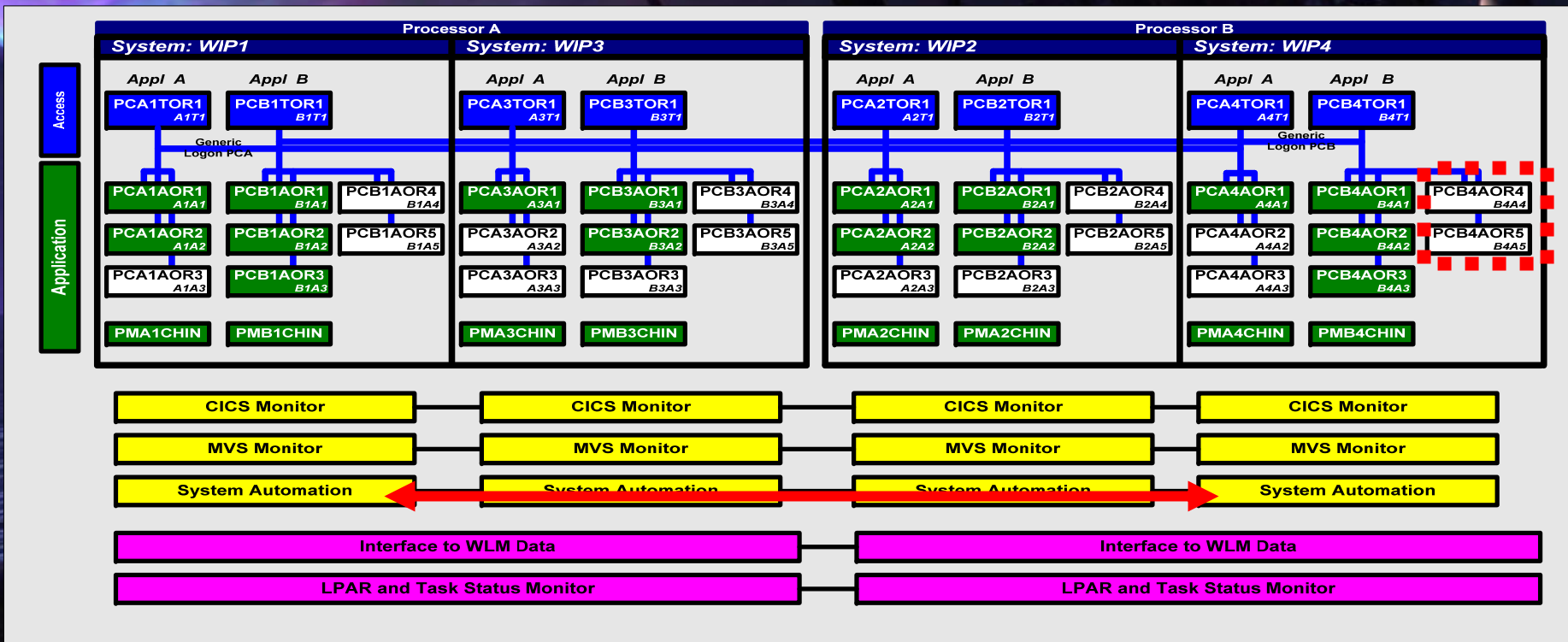
Scenario 2

- MVS Monitor indicates that the System WIP2 is running at 90% busy, the Physical LPAR is running at 90% busy, and the Real Storage is constrained (over the last several intervals)



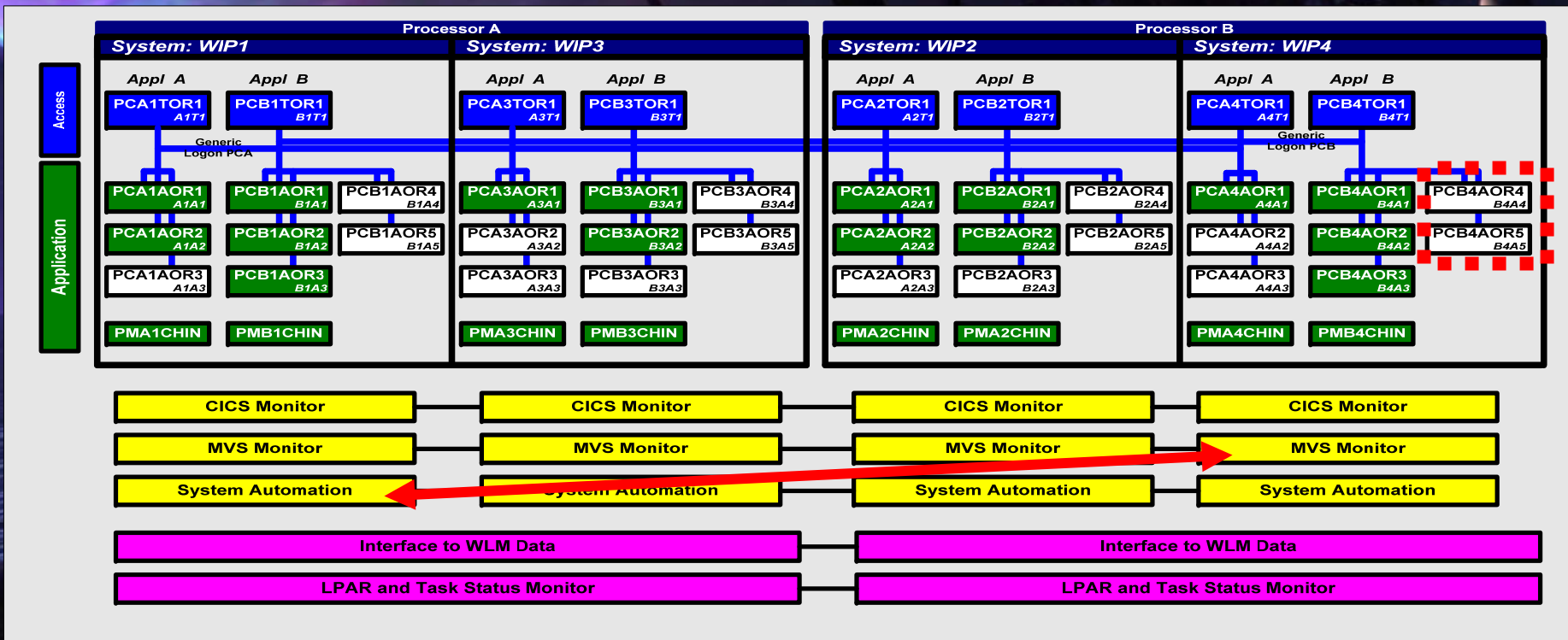
Scenario 2

- Automation Status Monitor indicates that AOR Regions PCB4AOR4 and 5 are down and available to be brought up on WIP4



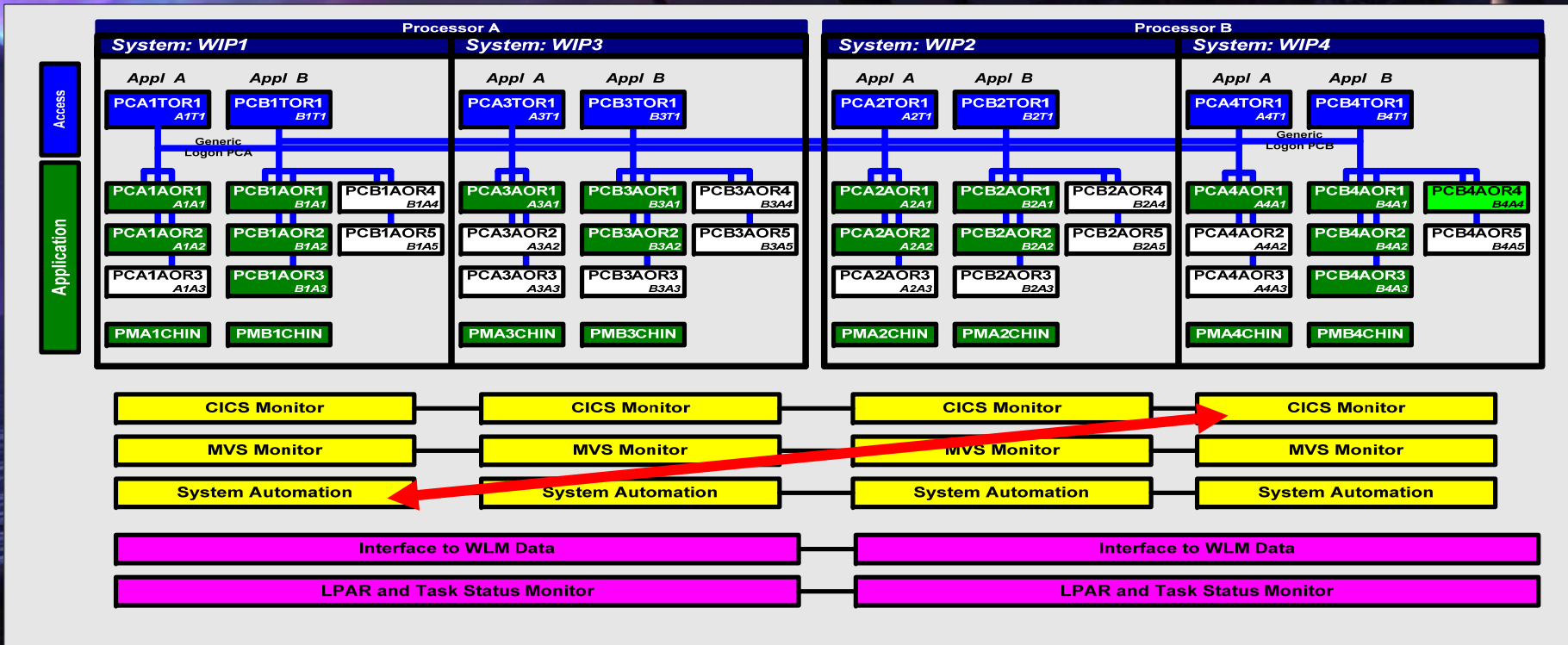
Scenario 2

- Automation Solution requests LPAR Performance Data from MVS Performance Monitor
- MVS Monitor indicates that WIP4 is only 60% busy, the Physical LPAR is on 65% busy, and that Real Storage is not stressed



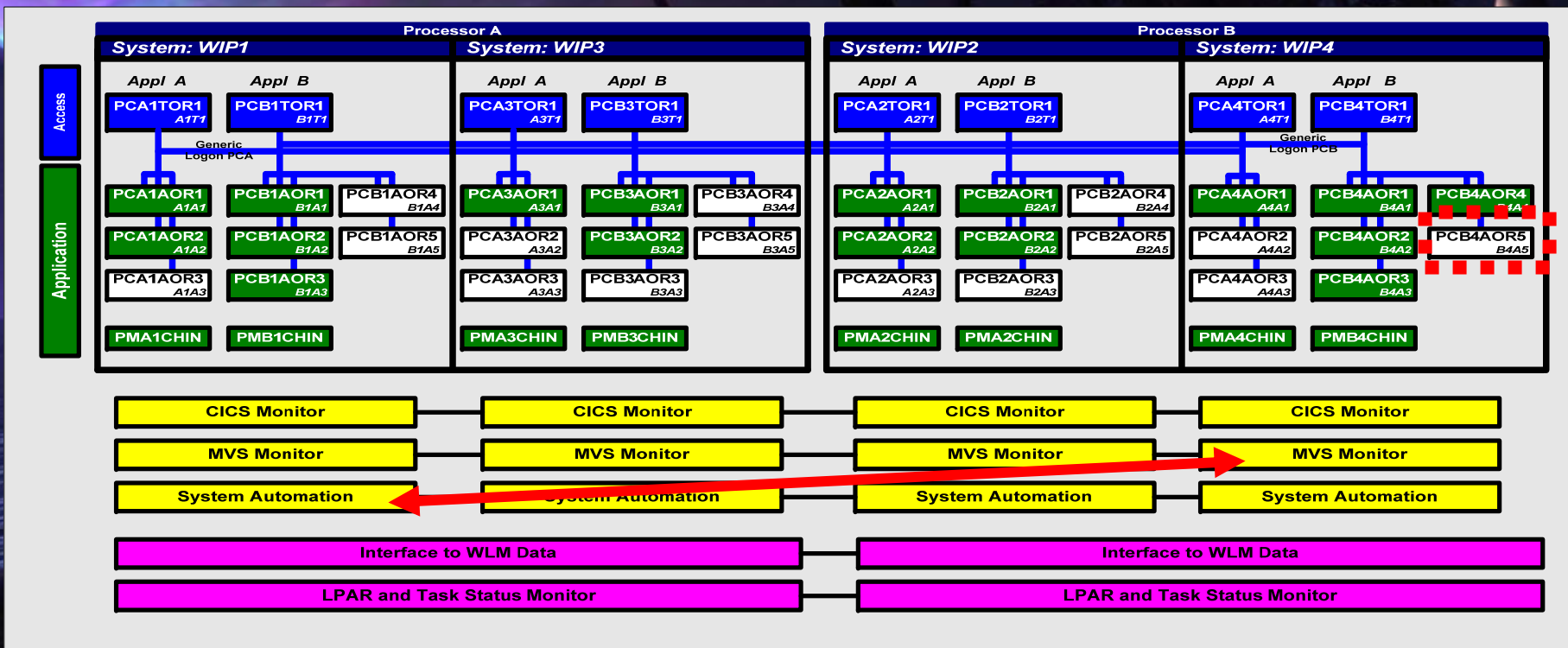
Scenario 2

- Automation Solution brings up AOR Region PCB4AOR4 on WIP4 and updates the appropriate status
- Automation Solution requests Performance Data from CICS Performance Monitor
- Application B's Trivial Response Time returns to under 2 seconds and Throughput has increased to *only* 70 Trans/sec



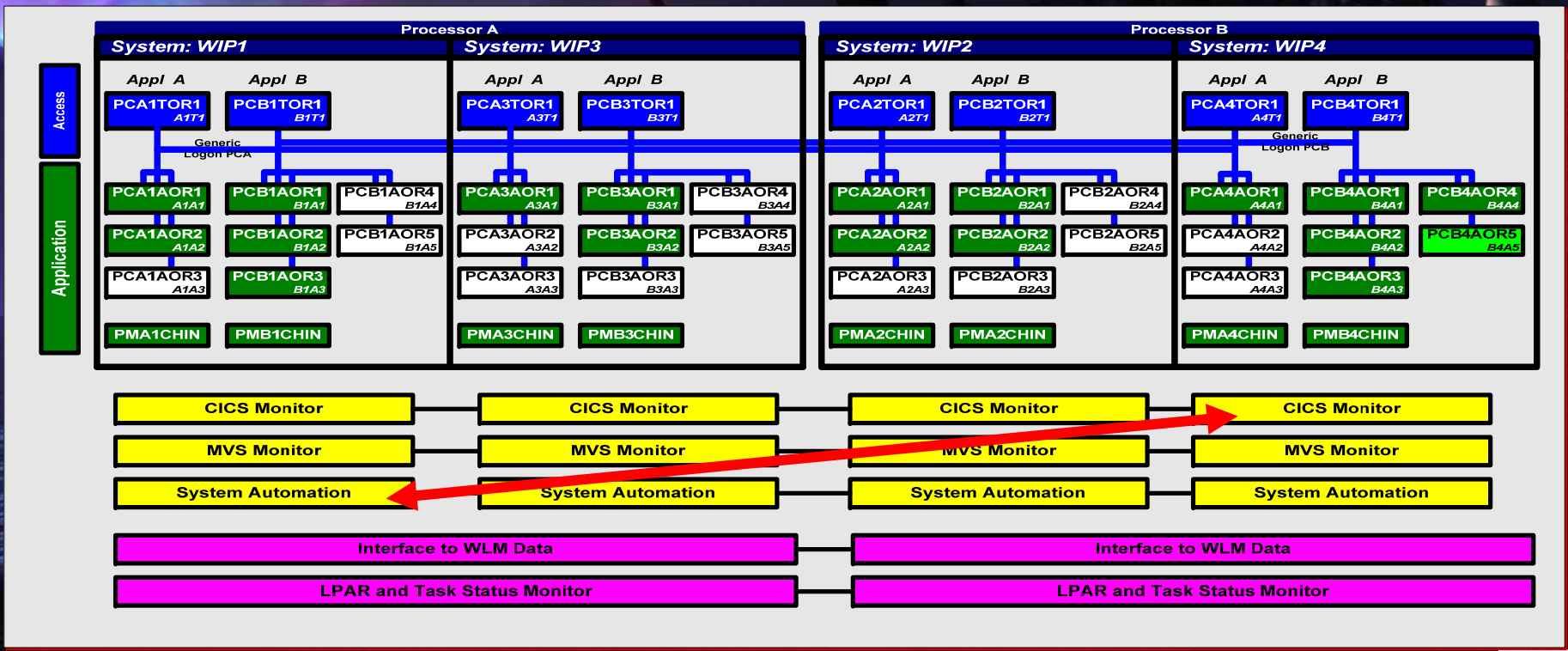
Scenario 2

- Automation Solution would like to start another AOR on WIP4
- Automation Solution requests WLM and Real Storage Data from MVS Performance Monitor
- MVS Monitor indicates that WIP4 is only 70% busy, the Physical LPAR is only 75% busy, and Real Storage is not stressed



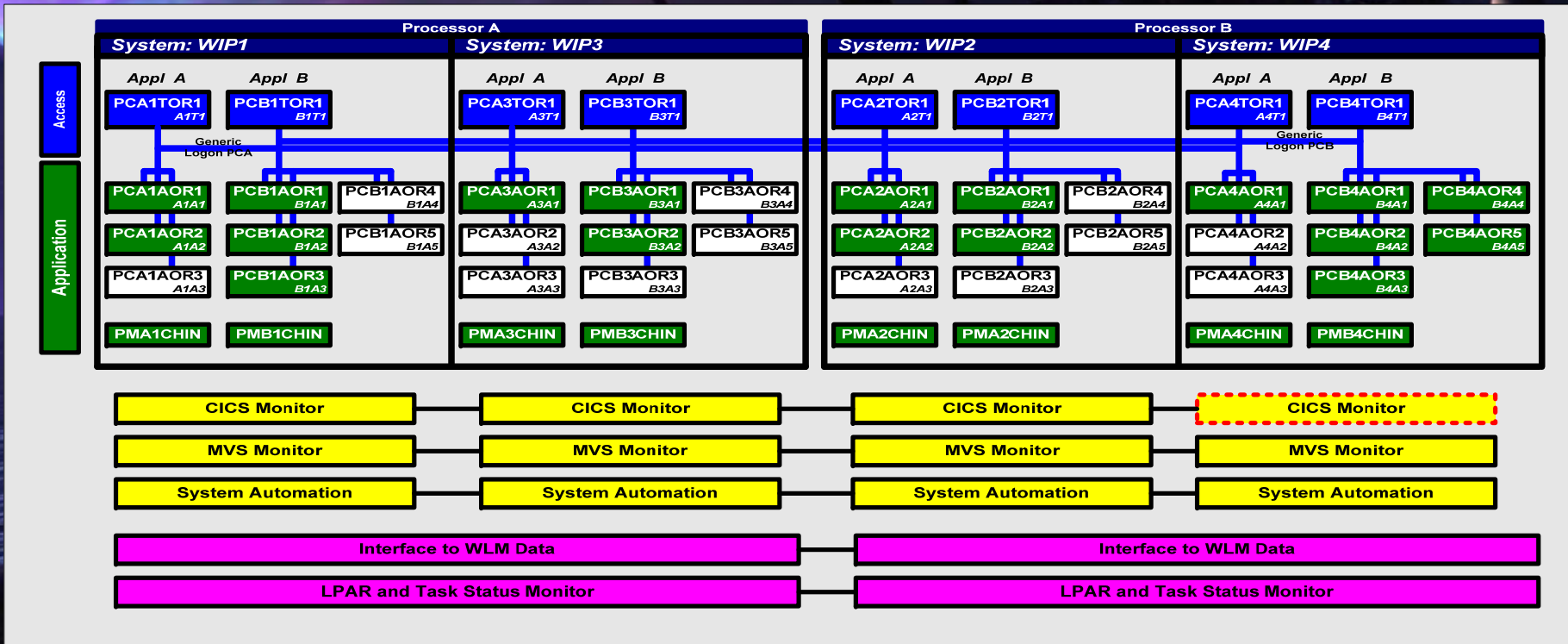
Scenario 2

- Automation Solution brings up AOR Region PCB4AOR5 on WIP4 and updates appropriate status
- Automation Solution requests Performance Data from CICS Performance Monitor



Scenario 2

- Application B's Trivial Response time returns to under 2 seconds and Throughput has increased to 85 Trans/sec, and is being monitored
- The galaxy is at peace, again!



More Complex Scenarios

- **Bring Down Lower Importance Work that May be Utilizing Real Storage and Make Room for More Online Regions**
- **Bring Down Lower Importance Non-Production LPARs to Bring Up Another Production Image**
- **Re-assign Online Applications from One Data Center to Another (Business Resiliency)**
- **Re-assign High-Importance Work from One Site to Another, based on Hardware Failures**

Other Possibilities

➤ **Batch Job Performance**

❖ **JES-Managed Initiators**

- **Not WLM-Managed**
- **Not Scheduling Environment Managed**

❖ **Real Tape Mount Requirements**

➤ **Transaction and Data Base Management Performance**

❖ **Datacom**

❖ **IDMS**

❖ **Gateways**

❖ **Oracle**

Summary

- **Linking Performance Monitoring and Automation Solutions may enhance current Hardware and Operating System Solutions**
- **New Age Performance Monitoring is Highly Dependent of Exception Processing and Automation Solutions may provide New Age Autonomic Possibilities**
- **Stay Tuned! More of these Concepts are Evolving to Reflect the More Complex Environments**

Thank You!

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