



# B85

## High Availability for IMS and DB2 on z/OS and Linux

H. Dennis Sample

**IMS**  
**Technical Conference**

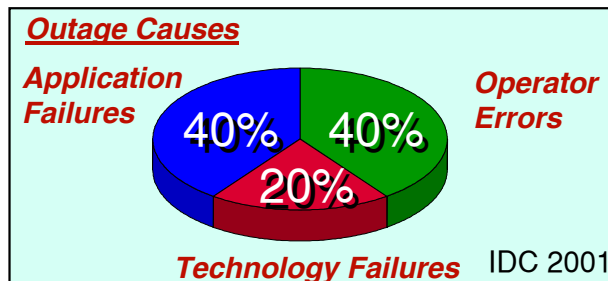
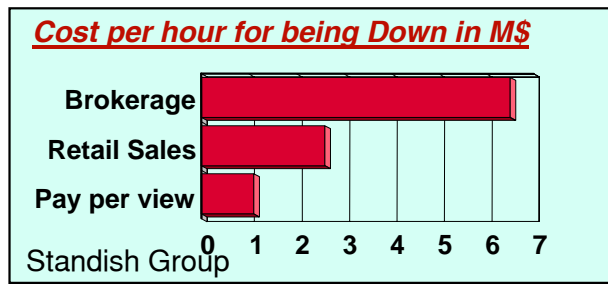
Sept. 27-30, 2004

Orlando, FL

# Agenda

- Business Issue
- Tivoli architecture
- Tivoli System Automation for z/OS
  - Concepts and Components
  - The Power Behind Automated Policies
  - Out-of-the-box Automation for IMS
  - Client Success Stories
- GDPS
- SA z/OS V2.3
- Directions
- Summary

# Business Issue



- **Loss** of business
- **Loss** of customers – the competition is just a mouse click away
- **Loss** of credibility, brand image and stock value

- On demand challenges
  - Downtime unaffordable
  - Heterogeneous by nature
  - Complex to manage
- Customer pressures
  - Application availability
  - Operations complexity and costs
  - Automation implementation and maintenance costs
  - Education requirements related to automation
  - Rapid change of I/T infrastructure, new workloads



# IBM Automation Blueprint – Tivoli software is key

## Business Service Management

Tivoli Business Systems Manager  
Tivoli Decision Support for OS/390

Tivoli Service Level Advisor

## Policy Based Orchestration



### Availability

Tivoli Monitoring Family  
Tivoli Enterprise Console  
Tivoli NetView for z/OS  
Tivoli System Automation  
Tivoli Risk Manager  
Tivoli SAN Manager  
Tivoli Storage Mgr Family

### Security

Tivoli Identity Manager  
Tivoli Access Manager  
Tivoli Privacy Manager  
IBM Directory Server  
IBM Directory Integrator

### Optimization

Tivoli Storage Resource Mgr  
Tivoli Monitoring for  
Transaction Performance  
Tivoli Monitoring for  
Network Performance  
Tivoli Workload Scheduler

### Provisioning



Tivoli Provisioning Manager  
Tivoli Identity Manager  
Tivoli Storage Resource Mgr  
Tivoli Configuration Mgr  
Tivoli License Manager

WebSphere software

Software Resources

## Virtualization

System Resources

Rational software DB2 Information Management Software

IBM TotalStorage™



# System Automation Within Performance & Availability

## IBM Tivoli System Automation for z/OS and for Multiplatforms

- The cornerstone for building comprehensive automation
- An integral part of the IBM autonomic computing portfolio

## Business Impact Management

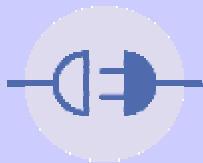
- Align IT management with business objectives
- Assure customer service levels
- Improve cost efficiency via proactive IT planning
- Turn data into business information

## Event Correlation & Automation

- Understand cross domain interdependencies
- Improve availability with rapid problem resolution
- Elimination of potential points of failure

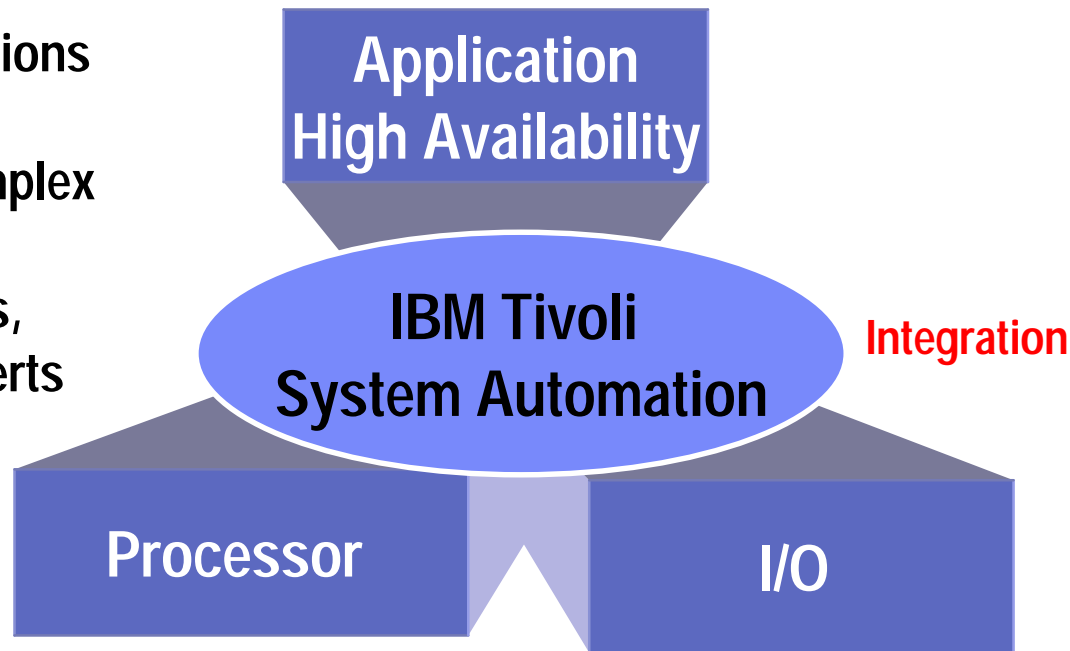
## Systems and Applications Monitoring

- Proactively identify, notify, and cure problems at their source
- Auto-discovery of critical resources
- Automated problem resolution
- Response time analysis



# What Can You Automate With SA z/OS?

- Automate applications
- Automate many repetitive and complex tasks
- Monitor processes, messages, and alerts

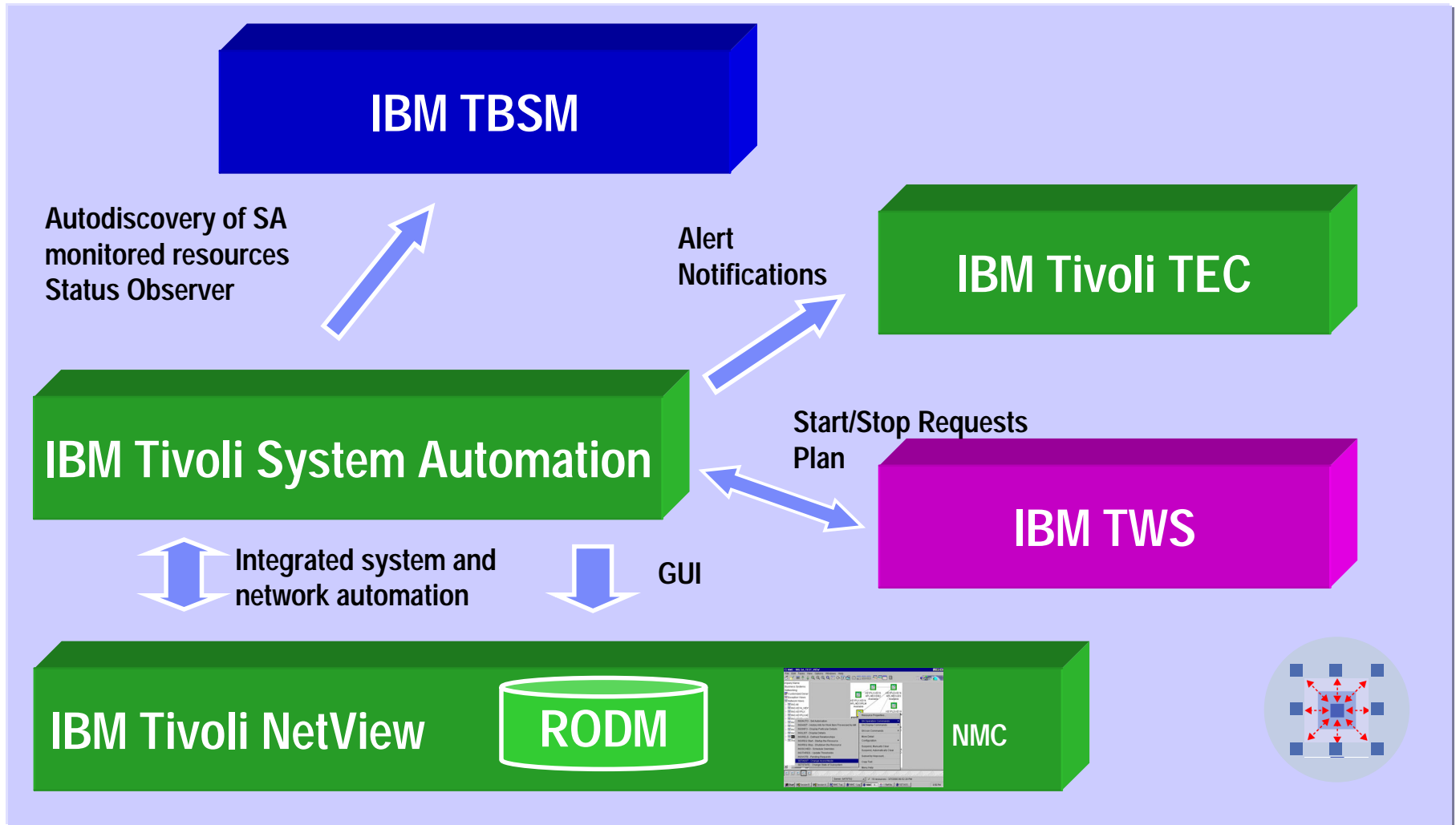


1 product!  
1 price!

- Initialize, configure, recover, and shut down servers
- External monitoring and automation from a Single Point of Control

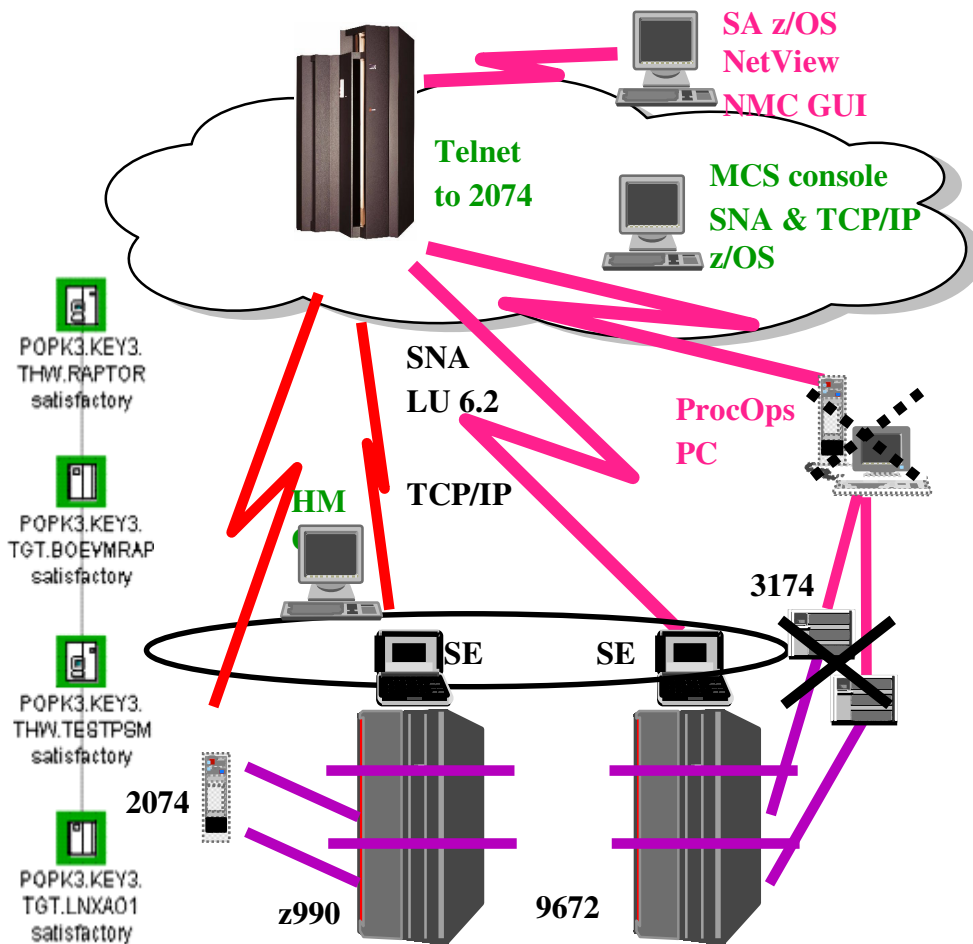
- Change I/O configuration on the fly
- Safe through system-integrated switching
- Manage ESCON & FICON Directors

# How is SA z/OS Integrated with Tivoli Products?



# SA z/OS Component Processor Operations Complements Consoles and Provides Automation

## Focal Point SA z/OS with Processor Operations



## External Automation

- At IML & NIP time
- At runtime (status update)

## Single Point Of Control

- 1 platform
- For eServer consoles

## Easy to Configure

- by SA customization dialog

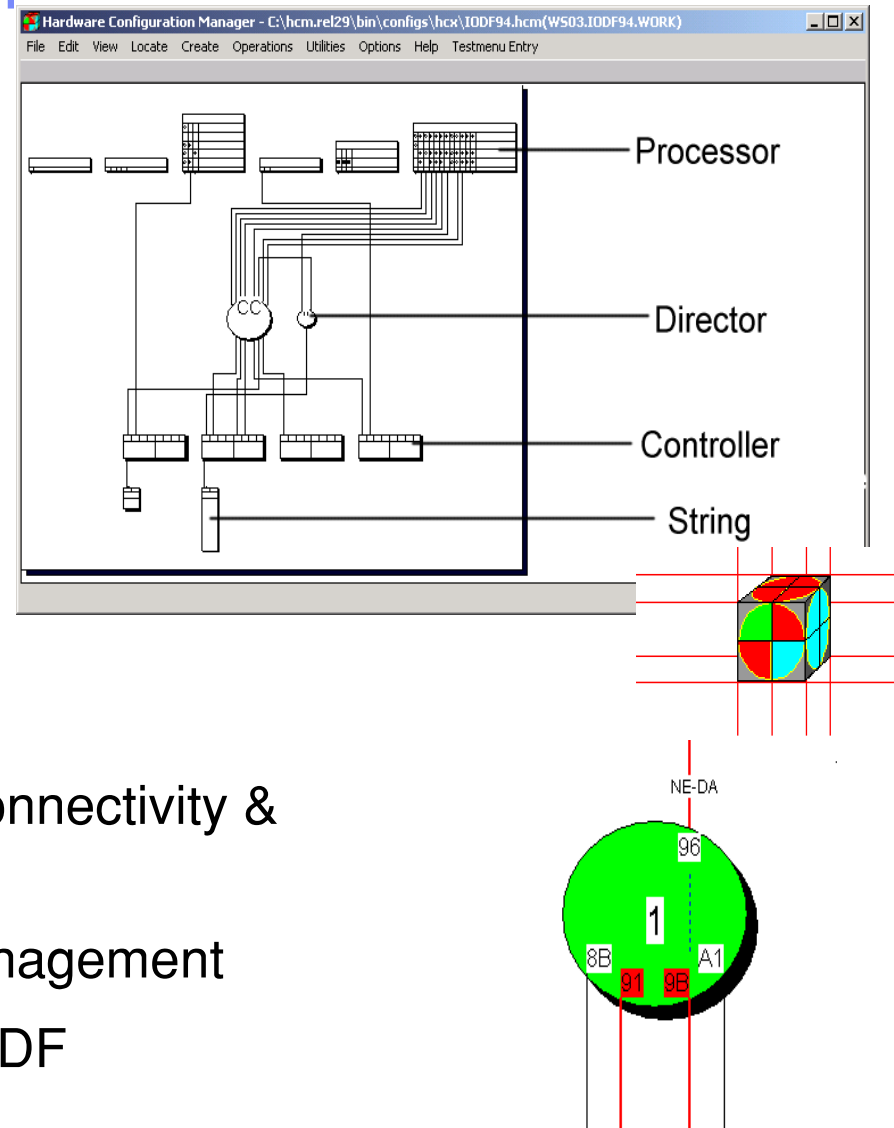
## Ease of Use

- Common commands for all supported hardware and OS: z/OS, **Linux**, z/VM, OS/390, VSE, TPF

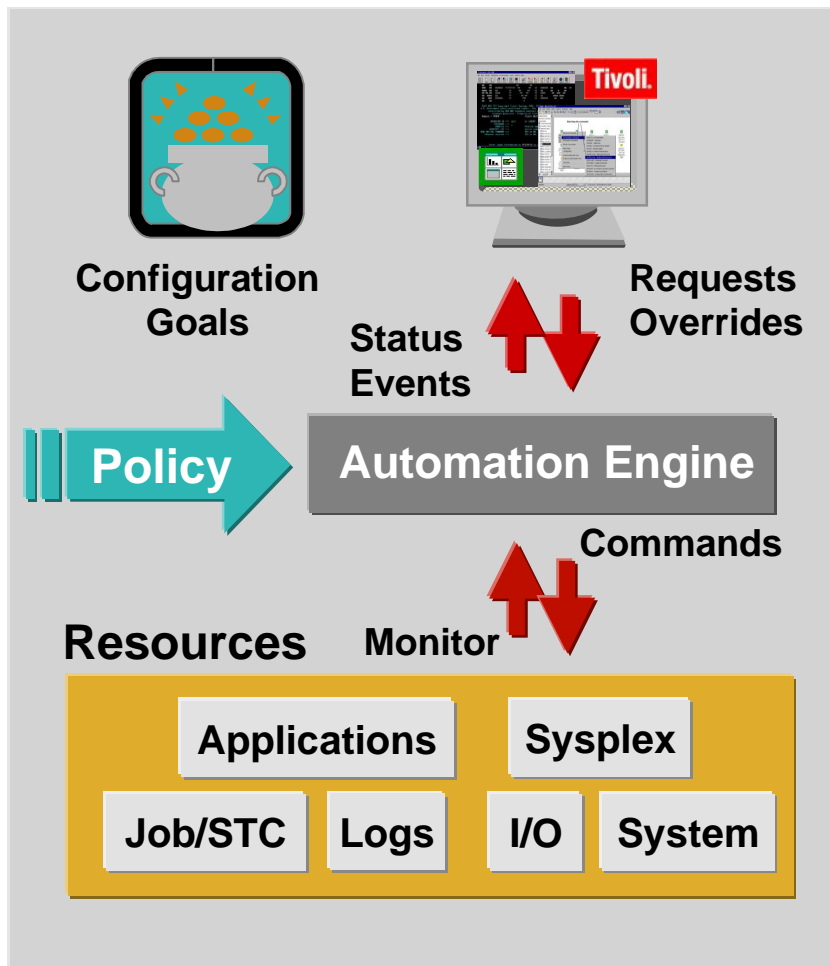


# SA z/OS Component I/O Operations

- **Change I/O configuration on the fly safely**
  - System-integrated switching
  - CHPIDs, switches, devices
- **Single point of control**
  - Parallel Sysplex
  - Multi-system device and CHPID manipulation
- **z/OS HCD/HCM integration**
  - HCM provides I/O Ops GUI, connectivity & status
  - ESCON & FICON Director Management
  - Sense NED data and prime IODF



# SA z/OS Component System Operations



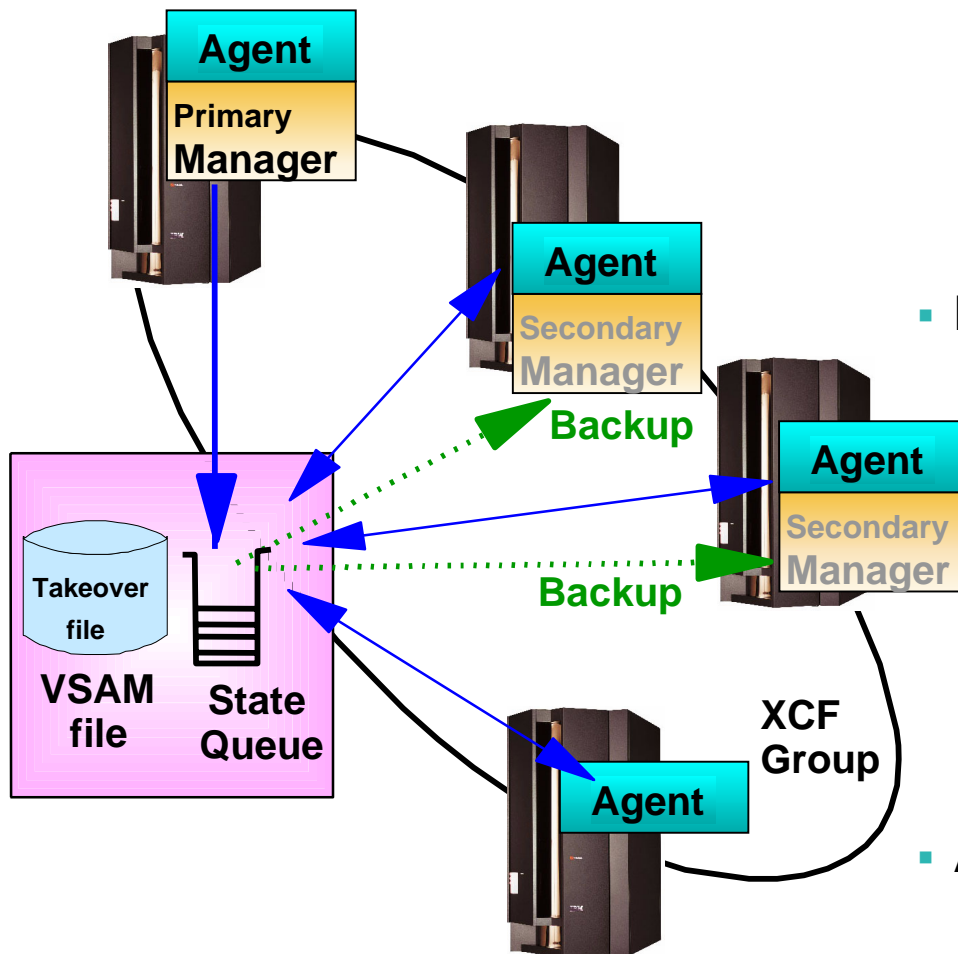
## Automation

- Start, recover and termination
- Manage applications
- Operator task automation
- Message monitoring & response
- Prevent outages of critical resources (WTO buffers, spool)
- CICS, IMS, DB2, TWS, mySAP, WebSphere automation

## Graphical interface

- Applications, systems, events, critical Sysplex resources
- Command interface

# SA OS/390 V2 Overview: Automation Manager/Agent Concept



## ▪ Sysplex-wide automation

- As distributed as possible, as central as needed
- Works also for single systems
- Groups, even business applications
- Goal-driven automation
- Powerful x-system relationship types

## ▪ Decision making Automation Manager

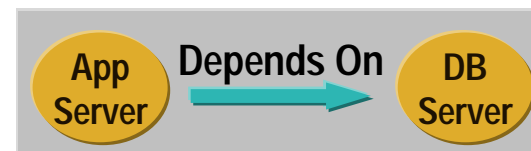
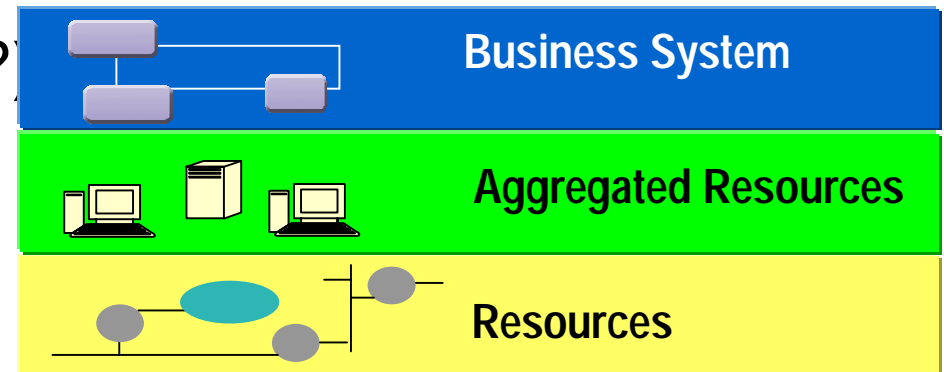
- Central awareness of all resources and their relationships
- Each resource has unique name
  - eg: TSO/APL/SYS1 or IMS/APG
- 5 states for each resource
  - observed, desired, automation,
  - startability, compound
- State changes of observed/desired state drive automation

## ▪ Automation execution by agents

- **NetView** infrastructure.
- Message processing

## The Power Behind Automated Policies

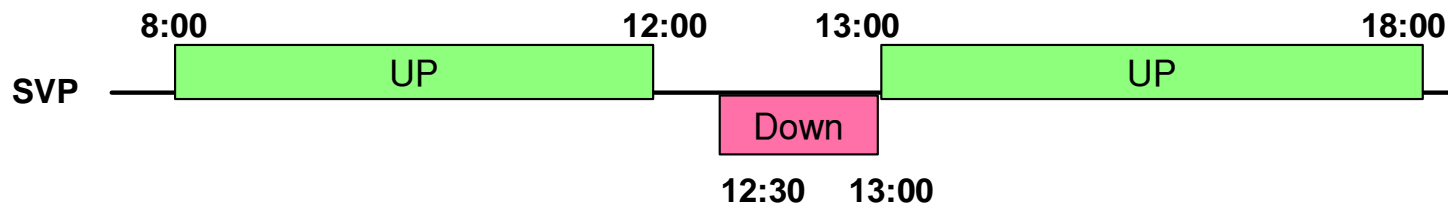
- Group resources to manage at the business level
  - Status aggregation (e.g. Is mySAP available?)
  - Command propagation (e.g. Shutdown mySAP)
  - Groups of groups
- All resource relationships & criterias are automatically established



**Example:** Before an application server can be started make sure that the database server is available or if resource X is available, stop resource Y.

# Goal Driven Automation

- Administrator defines the "goals" for the application according to business requirements
  - Goals relate to desired state, availability schedule and preferred system
  - Relationships between resources and groups
  - Service Periods:



- System Automation Manager tries to keep the system in line with goals
- Easy, exception oriented operation
  - Operator can "override" the policy goals by overrides or start/stop requests
- Responsibility moves from the operation to automation administrator

# Integrated IMS Automation & Management

- Startup and shutdown with triggers and service periods including dependent regions
- Support for XRF and FDR(sysplex).
- Extended automation using IMS automation operator exit
- State dependant automation (State/action table)
- Recovery of OLDS, MSC-links, transactions, programs and regions
  - Thresholds, codes
- Single point of control operator interface
- Alerting to SDF and NMC
- Broadcast



## IMS Automation

- Start and stop IMS address spaces
- Understands the IMS address space relationships
  - Knows what an IMS Control Region is and how it relates to dependent regions.
  - Knows about FDR, CQS, CSL regions and can be configured to take into account their relationships during startup and shutdown
- Monitors OLDS dataset usage
- Monitors RECON dataset usage
- Monitors VTAM Application ID
- TCO: initiate, change, start, or stop time-driven procedures for any IMS operation.

## IMS Automation

- Start IMS address spaces
  - Start types of COLD, AUTO, NORM, WARMSDBL, BUILDQ, BACKUP, MANUAL supported
  - Can reply to outstanding WTOR's
  - Uses EMCS consoles to issue commands to IMS via the IMS Control region command prefix.
  - Policy based startup



## IMS Automation

- Stop IMS Address spaces
  - Supports stop types of NORM, IMMED, FORCE
  - NORM
    - Issue checkpoint, orderly shutdown. Cancellation of message regions and control region after predetermined time delay.
  - IMMED
    - Issue checkpoint. Immediate cancellation of message regions. Cancellation control region after predetermined time delay.
  - FORCE
    - Immediate flushing of all regions

# IMS Automation

- Operator Interfaces
  - INGIMS Command processor, fullscreen and line mode operation
  - DISPINFO shows status information
  - IMS panels for detailed information
  - Status on SDF and NMC

# IMS Automation

```

x3270-3 key/Invdirect
File Options
EVIK0000 SA OS/390 - Command Dialogs
Domain ID = IPSFM ----- IMS ----- Date = 09/06/02
Operator ID = KAT Time = 10:48:08

Resource => _____ Format: name/type/system
System => _____ System name, domain ID or sysplex name

1. Inquire Display detailed status of an IMS subsystem
2. Start Start an IMS subsystem INGREQ REQ=START
3. Shutdown Shutdown an IMS subsystem INGREQ REQ=STOP
4. Triggers Display trigger conditions DISPTRG
5. Service Periods Perform scheduling functions INGSCHED
6. Master Terminal Perform Master Terminal Cmds INGIMS REQ=CMD
7. Critical messages Display critical messages
8. Broadcast Send message to users INGIMS REQ=BROADCAST
9. TCO Management Load/Start/Stop TCO
99. Local Functions Provide access to user defined local functions

Command ==>
PF1=Help PF2=End PF3=Return PF6=Roll

:00.5 005/023
    
```

# IMS Automation

```

x3270-3 key1mvdirect
File Options
-----
EVIKYCMD          SA OS/390 - Command Dialogs          Line 1 of 15
Domain ID = IPSFM ----- INGIMS -----          Date = 08/21/02
Operator ID = KAT                                     Time = 11:08:10

Resource          => IMS711C4/APL/KEY1          Format: name/type/system
System            => _____          System name, domain ID or sysplex name
Request           => CMD                      CMD, BROADCAST or INFO
IMS Command       => DIS A
IMS Route         => _____
IMS Message       => _____

REGID JOBNAME      TYPE   TRAN/STEP PROGRAM  STATUS      CLASS
  1  IMS711M1      TP    IMS711M1  EVISPP11  WAITING     1
  2  IMS711PP      BMP   IMS711PP  EVISPP11
  4  IMS711F1      FPM   NO MSG.   DFSIVP4
      DBTRGN      DBT   NONE
      IMS711RC    DBRC
      IMS711DL    DLS

VTAM ACB OPEN          -LOGONS ENABLED
IMSLU=N/A.N/A          APPC STATUS=DISABLED TIMEOUT= 0
DTMA GROUP=N/A        STATUS=NOTACTIVE
APPLID=IPSAMI71       GRSNAME=IMS7      STATUS=ACTIVE
LINE ACTIVE-IN -      1 ACTIV-OUT -      0
NODE ACTIVE-IN -      0 ACTIV-OUT -      0
LINK ACTIVE-IN -      0 ACTIV-OUT -      0
*02233/110808*

Command ==> █
PF1=Help      PF2=End      PF3=Return   PF4=DISPINFO  PF6=Roll
               PF9=Refresh  PF12=Retrieve
    
```

# IMS Automation

```

x3270-3 key1nvdirect
File Options
ADFKINFO SA OS/390 - Command Dialogs Line 55 of 348
Domain ID = IPSFM ----- DISPINFO ----- Date = 05/02/03
Operator ID = KAT Time = 10:54:23

Subsystem ==> IMS712CX System ==> KEY1 System name, domain ID
or sysplex name

IMS Information :
Version : 7.1
CQS Name : None
FDR Name : None
MVS sub-system ID : M712

IMS OLDS Information :
Minimum Available : 2 Spares : 3
Active : 1 Number : 7
Archive

DDNAME Status Job Num. Error
DFSOLP00 INUSE
DFSOLS00 INUSE
DFSOLP01 AVAILABLE
DFSOLS01 AVAILABLE
DFSOLP02 AVAILABLE
DFSOLS02 AVAILABLE
DFSOLP03 AVAILABLE
DFSOLS03 AVAILABLE
DFSOLP04 ARCHIVETIMER IMSGNKYX SPARE
DFSOLS04 ARCHIVETIMER SPARE
DFSOLP05 AVAILABLE SPARE

Command ==>
PF1=Help PF2=End PF3=Return PF4=INGINFO PF6=Roll
PF7=Back PF8=Forward PF9=Refresh PF10=IMS Info PF12=Retrieve

```

# IMS Automation

```

x3270-3 key1Invdirect
File Options
EVIKQI00      IMS Automation: Subsystem Information
Resource/Domain => IMS712CX/APL/KEY1      Date: 05/02/03
                                           (? for list) Time: 11:02
                                           Domain: IPSFM

Subsystem status . . . : UP                Since . . . . . : 11:02      04/28/03
Job . . . . . : IMS712CX                  Job number . . . : 22934
NetView domain . . . : IPSFM              CQS name . . . . :

VTAM information
Specific appl. name: IPSAMI71             DC status . . . . : UP
Generic appl. name : KEYIMS7              XRF . . . . . : YES
Active sessions . . : 0                   XRF mode . . . . : ACTIVE
Pending sessions . . : 0                  XRF status . . . : ACTIVEDOWN

Last start
Initiated : 04:37:29      03/25/03      Last shutdown
Completed : --:--:--      --/--/--      Initiated . . . : 18:06:22      03/26/03
Start type: AUTO          Completed . . . : 18:06:29      03/26/03
Next start : 03:30      05/05/03      Abend code . . :
                                           Next shutdown . : 00:00      05/03/03

Command ==>
F1=Help      F2=End      F3=Return    F4=IMS Menu  F5=Refresh   F6=Roll
    
```

## Existing Automation Tools

### Existing automation tools require some level of in-house development.

- Prone to errors, very complex
- Labor intensive
- Yours to maintain
- Limited skilled resources
- Increases your “total cost of ownership” (TCO)

***“Without IBM Tivoli System Automation for OS/390, we would not be able to manage our OS/390 operations. A non-IBM automation product couldn't do the job...”***

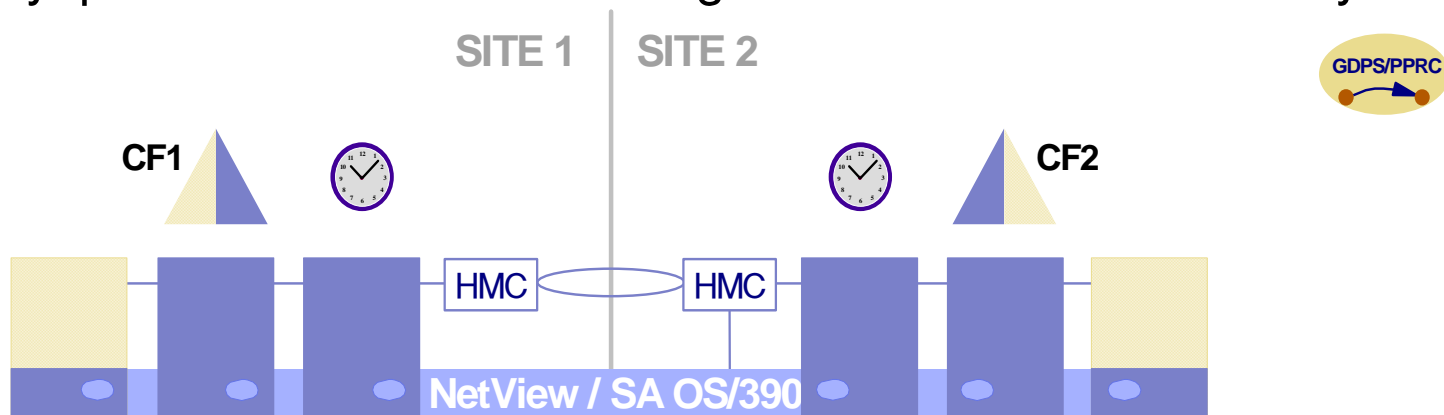
*- Frank Beckers*

**Sparkassen Informatik** 

***Sparkassen Informatik Köln provides savings bank services, handling 1500 transactions per second on 5 IMS systems.***

# Disaster Recovery with GDPS (Geographically Dispersed Parallel Sysplex) & System Automation for z/OS

- Multi-site sysplex
- Remote data mirroring (disk & tape)
- **System Automation for z/OS** provides:
  - Automation infrastructure
  - Move of applications to site 2
  - Processor Operations
  - Sysplex automation like CF mgmt and removal of failed system





## Making Administration Easier

- Gateway communication uses XCF or RMTCCMD and supports both SNA and IP
- NMC Performance Enhancements: XCF/RMTCCMD is used for status forwarding to NMC focal point
- Easy message management automatically generates:
  - NetView Automation Tables from policy database
  - MPF exits
  - AT refreshed when Configuration refreshed
- In-flight repair of takeover file
- Separation of policy items into a system part and a user part
- Smart defaults for parameters for generic routines
- Miscellaneous

## Making Policy Definition Easier

- Policy database (PDB) import
- Entries and subsystem names in a PDB can be renamed
- User descriptions can be added to &AOCCLONE variables for better documentation and clearer understanding
- Separation of policy items into a system part and a user part
- Enhanced policy database samples
- Many more changes in customization dialog like automatic defaulting of jobname

## Making Operation Easier

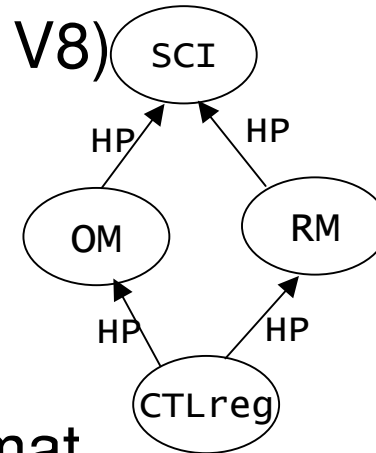
- The INGRELS command allows you to easily navigate through the dependency graph;
- INGREQ parameters can be overwritten through the enhanced installation exit AOFEXC01
- The INGNTFY command is enhanced to incorporate the display function provided by DISPNTFY
- INGVOTE can display the requests/votes from a particular source/user
- INGVARs command allows you to share variables sysplex-wide
- Online help for Common + Utility Commands
- NLS Support: messages, message help, command help and panel help information is also available in Kanji

## Making Automation Easier

- VM Guest Machine Support to automate Linux images
  - Start, stop and monitor
  - XAUTOLOG, LOGOFF, IPL, START, STOP, SYSRESET, RESTART
- Better control if and how groups are to be moved to images within a Sysplex
- Satisfactory Target Range for Server Groups
- Health and Performance Monitoring
- Up to 3 WLM resource names for an application
- Owner info to identify person to contact in case of problem

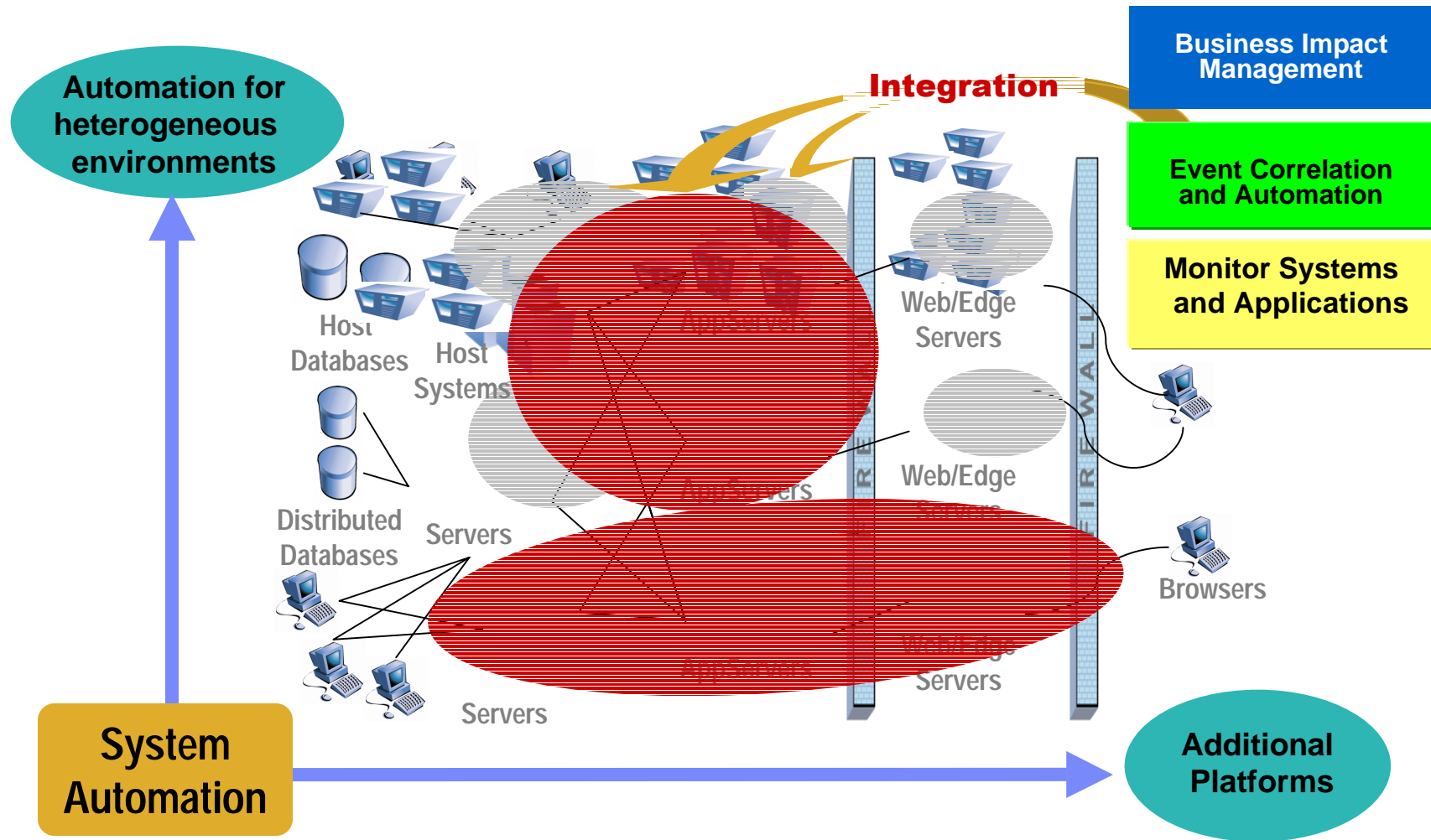
# IMS Enhancements

- Support for new address spaces (IMS V8)
  - Structured Call Interface
  - Resource Manager
  - Operations Manager
- Help panels converted to standard format
- IMSRCMD made Pipeable by converting to “command slave” concept and exploiting RMTCMD/XCF as communication method.
  - Slave automatically sent to downlevel system





`IMSRCMD NAME=name,[RESP=YES|ACK,][OPER=operator,]CMD=cmd`

# end-to-end automation of e-business applications



## IBM Tivoli System Automation Summary

- On demand business requires high availability (HA)
  - Downtime can cause lost sales and customer shifts to competitors
- SA provides **high availability** for z/OS applications through self-healing
- **Policy-based** automation reduces costs and implementation time
  - Comprehensive out-of-the-box automation
- **Lowered complexity** through resource **relationships** and **grouping**
  - Define and operate a complex on demand application as a single group
- **SA makes zSeries the best platform for on demand business**
  - **mySAP** and **WebSphere** automation 
  - Disaster Recovery with **GDPS** 
- V2.3 invests in **ease of use, time to value, integration, client requirements**
- Future **automation** of heterogeneous on demand applications
- IBM's strategic HA solution



## More Information

### Internet Home Pages:

- [ibm.com/zseries/software/sa](http://ibm.com/zseries/software/sa) and
- [ibm.com/software/tivoli/products/system-automation-390](http://ibm.com/software/tivoli/products/system-automation-390)
- **Product Flyer** <ftp://ftp.software.ibm.com/software/tivoli/datasheets/ds-system-automation-390.pdf>
- **General information manual - GC33-7036** <http://www.ibm.com/servers/eserver/zseries/software/sa/bkserv/>
- **SAUSERS forum at yahoo** <http://groups.yahoo.com/group/SAUsers/>
- **z/OS and OS/390 Hot Topics newsletter covering "On the up and up! System Automation for OS/390 offers a high availability solution for WebSphere for z/OS":**
  - <http://publibz.boulder.ibm.com/epubs/pdf/e0z2n132.pdf> (on page 24)
- **SA OS/390 high-availability solution for WebSphere** [white paper](#)
  - [ftp://ftp.software.ibm.com/eserver/zseries/sa/WAS\\_HA.pdf](ftp://ftp.software.ibm.com/eserver/zseries/sa/WAS_HA.pdf)
- **Four "redbooks,"** <http://publib-b.boulder.ibm.com/cgi-bin/searchsite.cgi?query=System+Automation>
- **IBM Tivoli System Automation for Multiplatforms home page:**
  - <http://www.ibm.com/software/tivoli/products/sys-auto-linux>
- **Technical Evangelist Joachim Schmalzried**
  - email: [JSM@DE.IBM.COM](mailto:JSM@DE.IBM.COM) Phone: +49 (0)7031 16-2552