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IBM Tivoli Workload Automation Process-Driven Delivery of Cross-Enterprise Services for System z-Centric Enterprises



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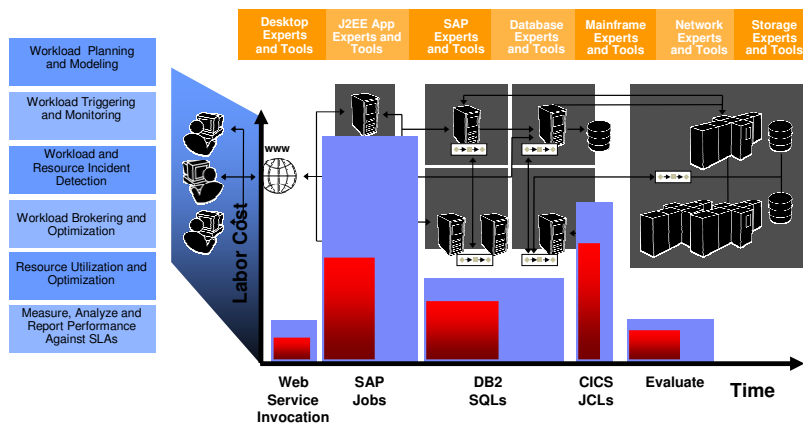
Agenda

- IBM Tivoli Workload Automation portfolio
- IBM Tivoli Workload Scheduler for z/OS
- IBM Tivoli Workload Scheduler for distributed systems
- IBM Tivoli Workload Scheduler for Applications
- IBM Tivoli Dynamic Workload Broker
- End-to-End Workload Automation
- Integration points



Enterprise Dilemma: Consolidating, Controlling and Optimizing the Delivery of Services Across Silos

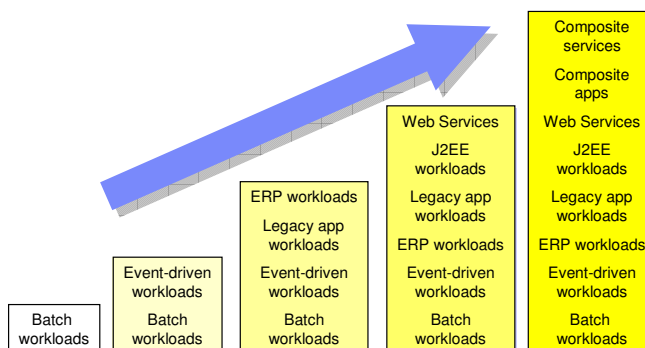
- Many enterprises struggle to plan, choreograph, manage and optimize the delivery of services across application, system and organizational silos





IBM's evolution from Scheduling to Workload Automation

- Workload Automation isn't just scheduling unattended, legacy batch jobs!
- IBM provides an enterprise backbone that
 - Aggregates and consolidates the planning, scheduling, execution and optimization of mixed, cross-enterprise workloads and services
 - Drives cross-enterprise workloads according to business demands, policies and process-related events, while resolving cross-system dependencies
 - Adapts the delivery of scheduled processes around planned and unplanned incidences



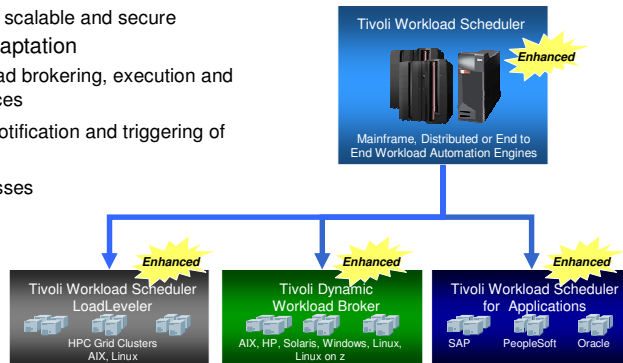
Tivoli Workload Automation is a highly autonomic enterprise backbone

- **What**
 - Define the business or IT service, its priority and its relationship to other services
 - Define process-related events needed to drive services
- **When**
 - Determine when the service is executed based on time-driven or process-driven plans, or IT resource availability
- **Where**
 - Determine which resource or pools of resources will execute the services based on service demands and priority, and IT resource availability and utilization policies
- **What-if**
 - Know the impact on critical services of planned changes and unplanned incidences, and determine how to adapt the delivery of services



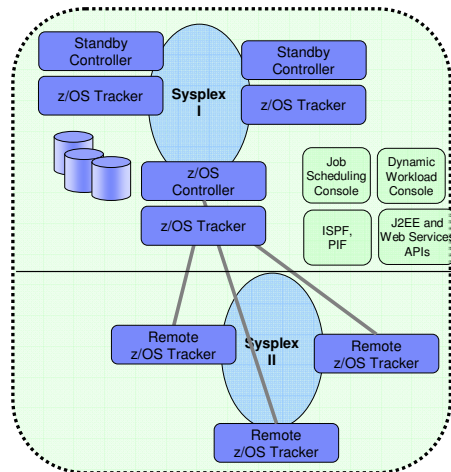
Tivoli Workload Automation portfolio components

- Visibility
 - End-to-end monitoring, reporting and auditing
- Governance
 - End-to-end planning, coordination and management
 - Highly available, scalable and secure
- Optimization and Adaptation
 - Adaptive workload brokering, execution and delivery of services
 - Event alerting, notification and triggering of workloads
 - Recovery processes



Mainframe workload automation

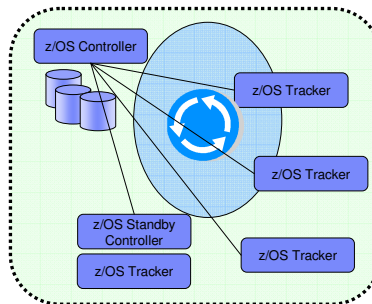
- Components
 - Controller
 - Planning and scheduling engine
 - Can employ a single controller for multiple Sysplexes
 - Automatic failover to any Tracker
 - Trackers
 - Monitor resources, submit workloads, report status back to Controller
 - Automatic restart and recovery
 - User interfaces
 - Web-based Dynamic Workload Console
 - Java-based Job Scheduling Console
 - ISPF, PIF, etc
 - Programmatic interfaces
 - Published Java and Web Services APIs
- Key features
 - z/OS subsystem
 - Highly scalable and fault tolerant
 - Process-driven
 - Resource aware





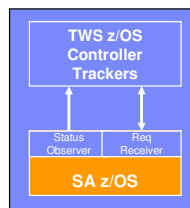
TWS z/OS Workload Brokering and Load Balancing

- TWS checks WLM Scheduling Environment (SE) availability status before jobs submission
- TWS routes jobs to MVS systems in the Sysplex (or in multiple Sysplexes) based on best available resources and Service Class priorities
- Jobs are automatically re-submitted if SE availability status changes
- Jobs are promoted to a higher WLM Service Class if they are on the Critical Path



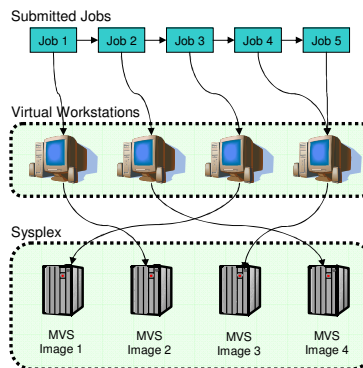
TWS z/OS Integration with System Automation for z/OS

- Advanced data center automation through integration with IBM Tivoli System Automation for z/OS
- Intuitive way for TWS operators to issue SA commands according to business and operational demands
- New TWS z/OS user and programmatic interfacing dedicated to scheduling SA commands
- Ability to start/stop/move applications and resources in a controlled fashion from within TWS
- Eliminates error-prone and time-consuming manual efforts to schedule SA commands via batch or command interfaces
- Greater visibility and control of System Automation from within TWS



TWS z/OS Virtual Workstations

- Traditionally, workloads were assigned to one workstation, which has only one “destination”
 - Jobs 1-5 were submitted to one workstation and a single MVS image, although they may be executed in other images
- New “virtual” workstations allow multiple destinations and availability info with automatic distribution of workloads to different destinations
- Workloads are now assigned to virtual workstations, and automatically distributed to destinations currently active and connected to the Controller
 - Jobs 1-5 now submitted to several virtual workstations and dynamically brokered and submitted to MVS images
 - Alternate workstation implicitly implemented

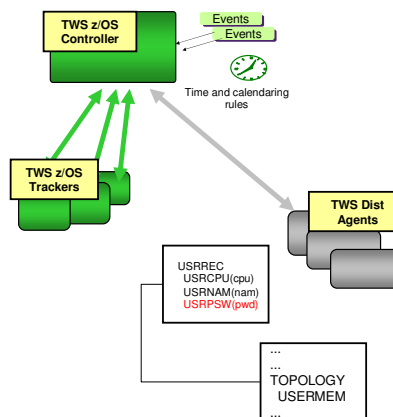


TWS z/OS NOERROR Enhancement

- “NOERROR” feature provides the ability to monitor condition codes
- NOERROR LIST (error code entry, ... , error code entry)
 - General entry: nnnn, Sxxx, Uxxx
 - Specific entry: jobname.stepname.procstepname.errorcode
- NOERROR enhanced
 - Relational operators in NOERROR statements
 - New specific entry: jobname.stepname.procstepname.errorcode.operator
 - Easy way to specify a range (ex. twsjob.step01.proc01.0004.GT, tws.step01.proc01.0032.LT)
 - New FLSH error code
 - New extended status

TWS z/OS NT Password Encryption in End-to-End environments

- 2 options available
- Centralized encryption through the Controller
 - Windows passwords encrypted and stored on the mainframe
 - Same Windows user to run jobs on all Windows machines
- Decentralized, local agent encryption
 - Windows passwords encrypted and stored on local machines
 - Different Windows users for each local machine
 - User selects local encryption method
 - Mainframe checks on User and Passwords are skipped and a local user file on Windows is searched if Users and Passwords are not found in the Symphony file

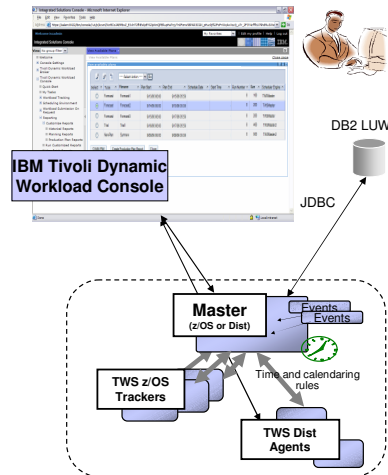


TWS z/OS TCP/IP Connectivity

- Traditionally supported communication protocols
 - Shared DASD, XCF, and SNA (ACF/VTAM) protocols between the Controller and Trackers
 - ACF/VTAM protocol used for the Controller to communicate with a remote z/OS APPC server to allow users to run ISPF dialogs and PIF's from remote systems
 - XCF and ACF/VTAM protocols are used between the Controller and the Data Store
 - TCP/IP protocol is used between Controller and distributed agents in end-to-end environments, and the old Tracker Agents
 - TCP/IP protocol is used between the Controller and Graphical User Interfaces
- New, additional TCP/IP support for customers switching from SNA to TCP/IP
 - TWS z/OS Controller and z/OS Trackers
 - Remote ISPF Dialogs and PIF
 - TWS z/OS Controller and Data Store
- New TCP/IP support implemented in compliance with the following
 - Virtual Internet Protocol Addressing (VIPA)
 - IPv6
 - Secure Sockets Layer (SSL)
 - New parameters provided to define the TCP/IP communication and activate SSL support

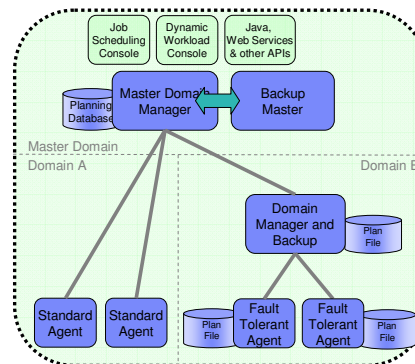
TWS z/OS Dynamic Workload Console and Reporting

- Customize, generate, view, print and save TWS-related reports
- Report types
 - Job Run History
 - Late jobs, missed deadlines, rerun indicators
 - Job Run Statistics
 - Success/error rates, min/max/average duration, late and long duration statistics
 - Workstation workload summary
 - Workload by workstation, aggregated by hour, day, etc.
 - Workstation workload runtime
 - Job run times and durations on the workstation
 - Custom SQL reports
- Data for reporting is extracted from a DB2 LUW



Tivoli Workload Scheduler

- Components
 - Master Domain Manager
 - Planning and scheduling engine
 - Domain Manager
 - Separates a single Master network into multiple domains
 - Agents
 - Fault Tolerant Agents hold plans, continue to execute plans during network outages
 - Standard Agents are lighter weight, don't hold plans
 - Agentless triggering for low workload volume environments
 - User interfaces
 - Web-based Dynamic Workload Console
 - Java-based Job Scheduling Console
 - Programmatic interfaces
 - Published Java and Web Services APIs
- Key features
 - Service-oriented architecture
 - Highly scalable and fault tolerant
 - Event-driven





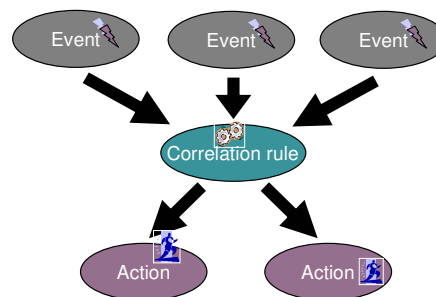
What's new for TWS

- Automation
 - Process and event-driven alerting, notification and execution of workloads
 - Trial and forecast planning through the Web-based Dynamic Workload Console
 - Agentless, remote triggering of workloads
 - TWS Agents connect directly to z/OS Controllers in end-to-end configurations
 - Option to install Oracle database
- Security and network connectivity
 - Full firewall support for secure, reliable execution across firewalls
 - SSL authentication to protect TWS domains and workstations
 - Centralized or decentralized user security and authentication models
 - Support for LDAP and IPv6
- Graphical user interfacing
 - New Web-based Dynamic Workload Console with reporting
- Service-oriented architecture
 - Open, published J2EE and Web Services APIs



TWS Event-Driven Workload Automation

- The main concept of the event-driven scheduling/notification architecture is the Event Rule
- The Event Rule object is a composition of:
 - Events
 - Events Correlation Conditions
 - Actions
- The Event Rule can be associated to:
 - Validity time interval
 - Status: draft or active





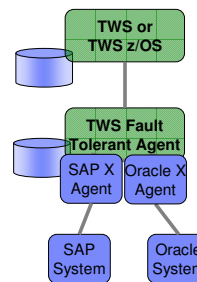
TWS Event-Driven Workload Automation

- The following Events, Correlation and Actions are available
- Events :
 - File event (transfer, creation, update, deletion)
 - Message in log
 - Status of TWS objects including job/jobstream status changes, return code conditions
 - Status of TWS agents including linked/unlinked and started/stopped
 - CPU utilization threshold
 - Generic, custom events
 - SAP base event
- Correlation Rules :
 - Set
 - Sequence
 - Filters
 - Timeout
 - Correlations
- Actions :
 - Submit Job, Jobstream, ad-hoc
 - Answer a prompt
 - Send an email
 - Send an EIF event to a monitoring solution (Tivoli Enterprise Portal) or event correlation engine (Tivoli Enterprise Console)
 - Write a message in a log
 - Time out actions, for example an action planned by the user in case a certain number of events are not received within a specified timeframe



Tivoli Workload Scheduler for Applications

- Components
 - Extended Agent for SAP business applications and data warehouse
 - Extended Agent for Oracle e-Business applications
 - Extended Agent for Oracle PeopleSoft business applications
 - Extended Agent for MVS systems and non-IBM z/OS schedulers
- Key features
 - Extends TWS to external applications and environments to aggregate and drive cross-enterprise workloads
 - Fault Tolerance provided by FTA hosting eXtended-agent(s)
 - More than one eXtended-agent can be hosted by the same FTA





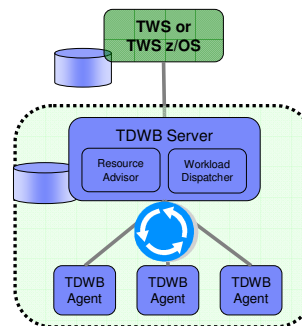
What's New for TWS for Applications

- SAP systems
 - SAP certification to provide full integration from the TWS Job Scheduling Console and Tivoli Dynamic Workload Console
 - SAP BC-XBP 2.0
 - SAP BW-SCH 3.0
 - New SAP-specific panels in the Job Scheduling Console to create, modify and delete SAP jobs
 - Submit SAP workloads through TWS
 - Monitor and manage SAP jobs whether created in SAP or in TWS
 - Preservation of all SAP job attributes
 - Management and resubmission of intercepted SAP jobs to ensure they are launched at optimal times
 - Enhanced parent-child feature to monitor and track instances when SAP jobs spawn child processes
 - Kill running SAP jobs and associated child processes
 - Deletion of SAP jobs and defined in SAP system
 - SAP Business Information Warehouse integration
 - Create, modify, delete, etc
 - Placeholders, replaced at runtime
 - SAP factory calendar integration with TWS
 - Import SAP calendars into TWS plans
 - Automatic updates for SAP calendars
 - SAP load balancing
 - Fine-tune SAP load balancing across server groups
- Oracle and PeopleSoft systems
 - Extended OS platform support for Oracle and PeopleSoft eXtended agents to Solaris and HP-UX
 - Simplified installation and configuration
- All components
 - Event automation for dynamic alerting, notification and triggering of jobs based on application and system events
 - IPv6, FIPS 140-2 standards



Tivoli Dynamic Workload Broker

- Components
 - Tivoli Dynamic Workload Broker Server
 - Matches incoming workload requirements and attributes to IT resource attributes and availability
 - Distributes workloads to best available resources on demand and according to policies
 - Tivoli Dynamic Workload Broker Agents
 - Monitors local virtual and physical IT resources and submits workloads
 - Automatically discovers resource configuration changes
- Key features
 - Transforms TWS networks into virtual, adaptive and optimized enterprise computing environments





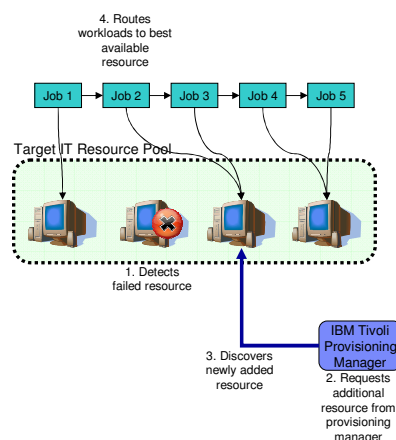
What's New for TDWB

- Manages the matching and dispatching of workloads to best available resources
 - Based on workload requirements, resource performance and attributes and business policies
 - Physical resources
 - Logical resources
- Optimizes the utilization of IT resources based on user-defined policies
 - Enable maximum throughput of high priority workloads when multiple workloads are competing for limited resources
 - Physical and virtual memory size and utilization
 - CPU architecture, quantity, speed and utilization
 - Operating system type and version
 - Logical resources
 - File systems required for running workloads
- Enables user-defined optimization objectives including minimums, maximums and exact values
- Provides automatic discovery and integration of newly added resources into the workload matching pool
- Full distributed OS platform support including AIX, Linux, Linux on z, Windows, Solaris and HP-UX
- Support for VMWare virtual machine environments
- Option to install Oracle database
- Enhanced audit logging for easier compliance report generation



TDWB Illustration on Autonomic Adaptability

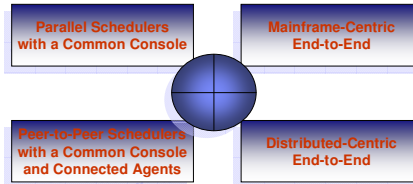
- Optimize capacity of IT infrastructure to execute more workload with less hardware
 - Jobs can be submitted to the less loaded resource
 - Similarly a load policy can be configured to use a given amount of available resource
- Improve Business Efficiency and reduce TCO by automatically adapting execution to environment changes
 - Distribute workloads to "best available" resource across dynamically shifting, cross-enterprise resource pool
 - Provides Automatic Routing: job can be routed to any available node that matches the resource requirement
 - Automatic discovery of newly available servers as part of the pool of possible job targets



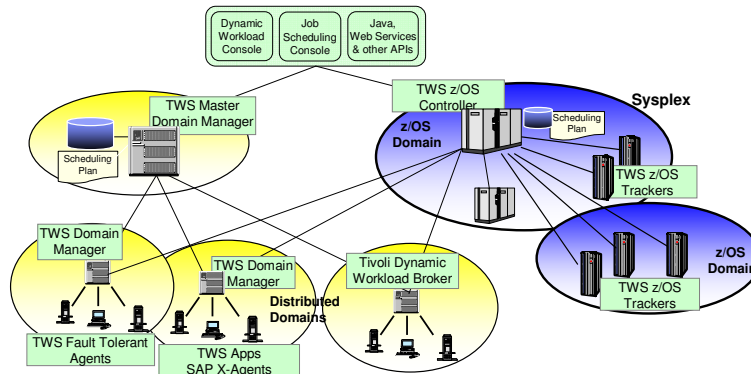


Tivoli Workload Automation End-to-End Solutions

- Tivoli Workload Automation components can be deployed into different solutions, to accommodate any customer need and organization requirement
- Maximum flexibility without feature limitations
- Meets any customer organization requirements
- High Availability, scalability and fault tolerance
- Any deployment scenario can leverage dynamic workload brokering
- All the different solutions can be monitored by a single Web-based user interface



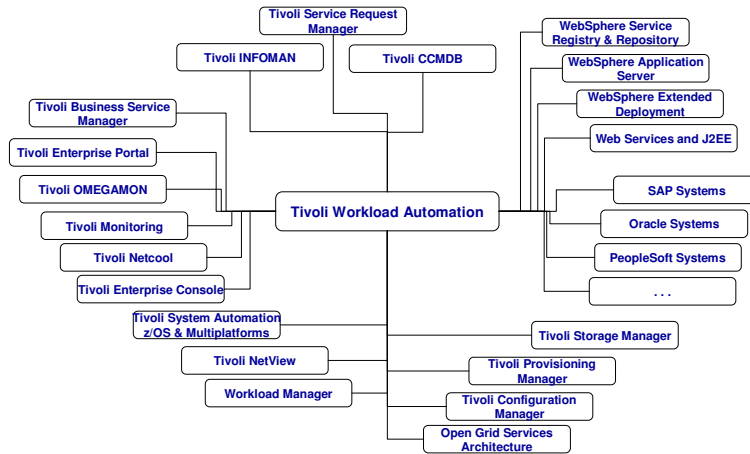
Tivoli Workload Automation End-to-End Illustration



- Peer-to-peer configuration
- Centralized planning, monitoring and control of cross-enterprise workloads



Tivoli Workload Automation Integration Points



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