Tivoli Workload Automation

Improving IT efficiency, performance, and costs to accelerate and sustain business growth
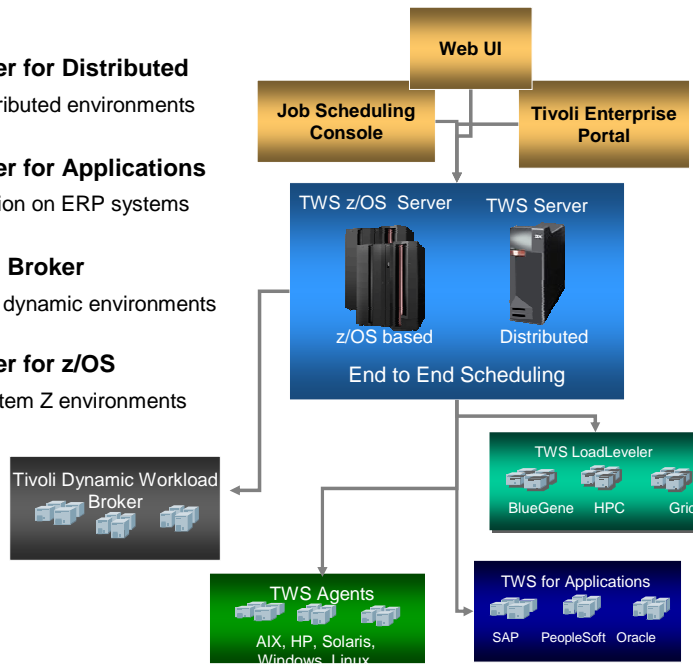
András Tóth
Tivoli Brand manager

Agenda

- **Tivoli Workload Automation family**
- **Key Workload Automation features**
  - Event driven workload automation
  - Dynamic workload optimization and virtualization
  - Centralized workload monitoring
  - Forecasting, reporting and compliance
  - End to end support of hetereogeneous workload
  - Integrations in service management landscape
- **Architecture**

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Tivoli Workload Automation products family

- **Tivoli Workload Scheduler for Distributed**
  - Controls scheduling on distributed environments

- **Tivoli Workload Scheduler for Applications**
  - Provides workload automation on ERP systems

- **Tivoli Dynamic Workload Broker**
  - Runs and balances jobs on dynamic environments

- **Tivoli Workload Scheduler for z/OS**
  - Controls scheduling on System Z environments

Web UI

Job Scheduling Console

Tivoli Enterprise Portal

TWS z/OS Server

TWS Server

z/OS based

Distributed

End to End Scheduling

Tivoli Dynamic Workload Broker

TWS LoadLeveler

BlueGene   HPC   Grid

TWS Agents

AIX, HP, Solaris, Windows, Linux

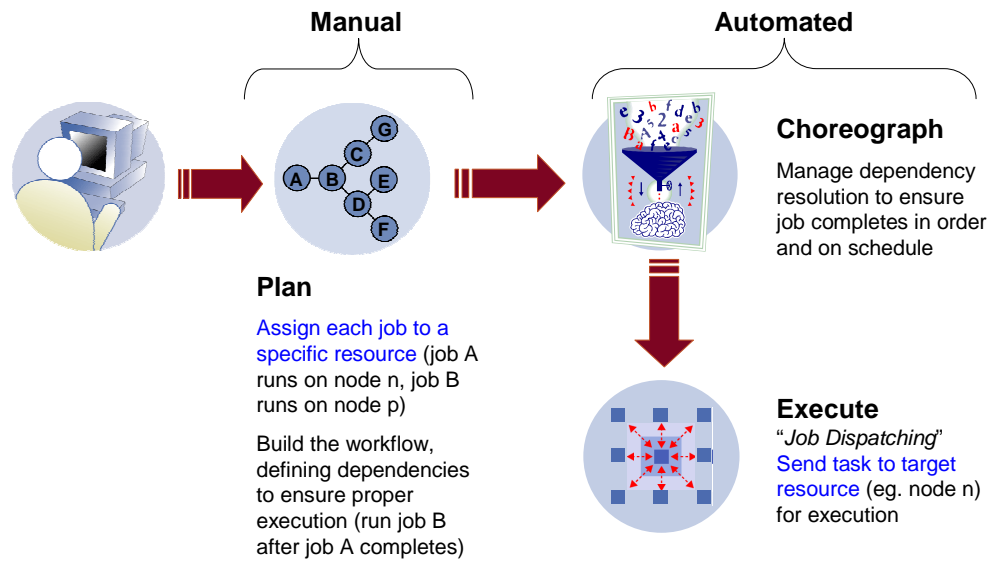TWS for Applications

SAP   PeopleSoft   Oracle

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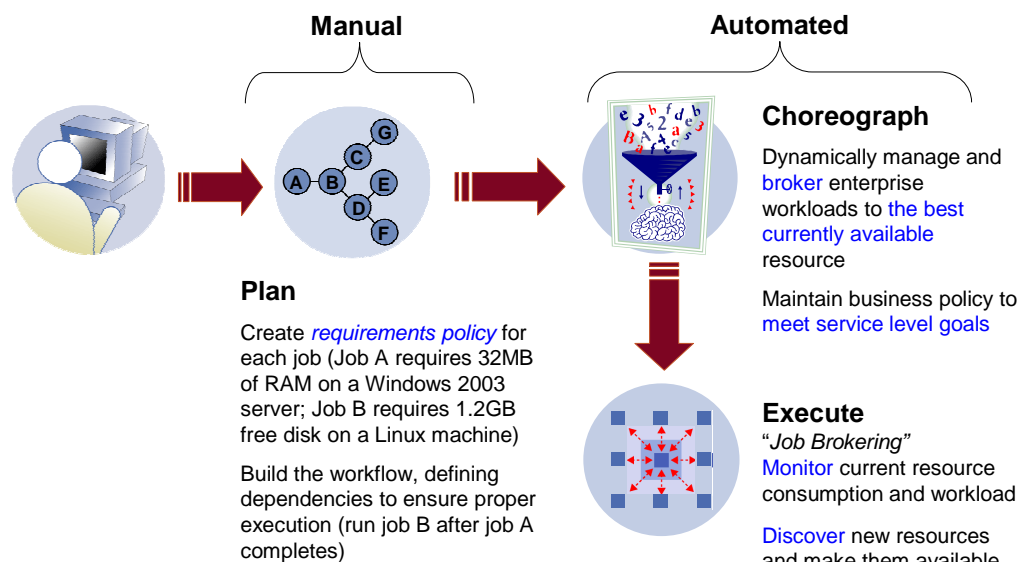 - Integrations in service management landscape
- **Architecture**

Classic Workload automation

Manual

Automated
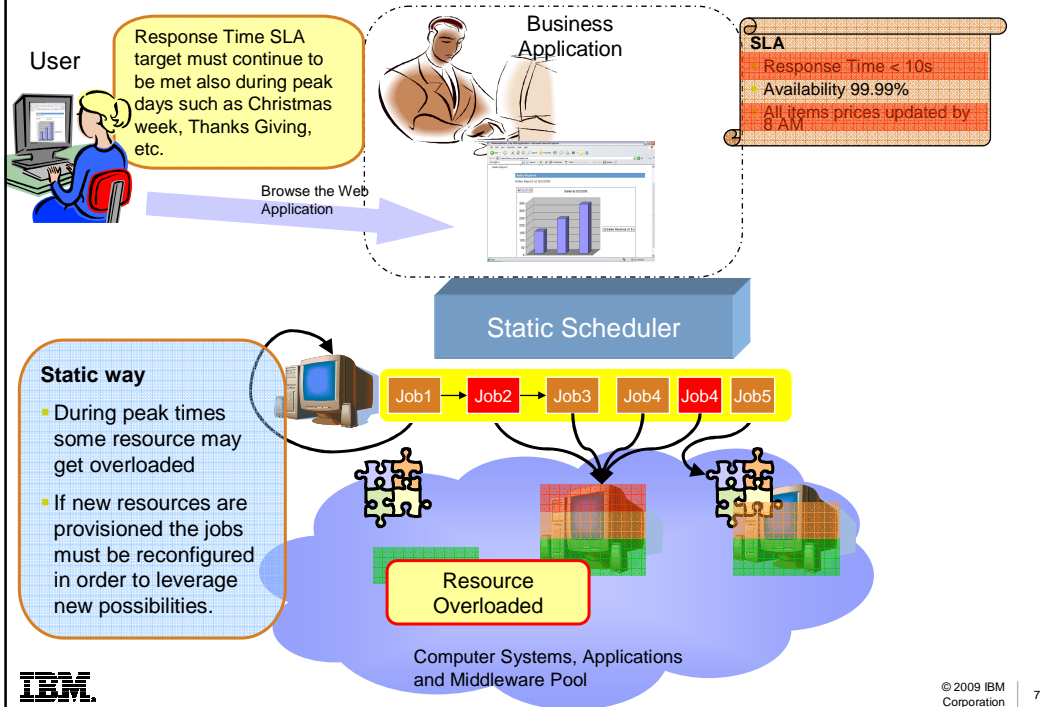
Choreograph

Manage dependency resolution to ensure job completes in order and on schedule

Plan

Assign each job to a specific resource (job A runs on node n, job B runs on node p)

Build the workflow, defining dependencies to ensure proper execution (run job B after job A completes)

Execute

"*Job Dispatching*"
Send task to target resource (eg. node n) for execution

Dynamic workload automation

Manual

Automated

Choreograph

Dynamically manage and broker enterprise workloads to the best currently available resource

Maintain business policy to meet service level goals

Plan

Create *requirements policy* for each job (Job A requires 32MB of RAM on a Windows 2003 server; Job B requires 1.2GB free disk on a Linux machine)

Build the workflow, defining dependencies to ensure proper execution (run job B after job A completes)

Execute

"*Job Brokering*"
Monitor current resource consumption and workload

Discover new resources and make them available for processing

Find best target for tasks

Example: Workload SLAs in Dynamic Computing Environment

User

Response Time SLA target must continue to be met also during peak days such as Christmas week, Thanks Giving, etc.

Business Application

Browse the Web Application

SLA
- Response Time < 10s
- Availability 99.99%
- All items prices updated by 8 AM

Static Scheduler

Static way
- During peak times some resource may get overloaded
- If new resources are provisioned the jobs must be reconfigured in order to leverage new possibilities.

Job1 → Job2 → Job3 → Job4 → Job4 → Job5

Resource Overloaded

Computer Systems, Applications and Middleware Pool

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Example: Workload SLAs in Dynamic Computing Environment

The Response Time SLA target must continue to be met also during peak days such as Christmas week, Thanks Giving, etc.

Business Application

Browse the Web Application

SLA
- Response Time < 10s
- Availability 99.99%
- All items prices updated by 8 AM

Policy: Loadbalance Jobs on server pool

Tivoli Dynamic Workload Broker

TDWB
- Load balancing provides load distribution across resource pool.
- Resource allocation provides load distribution over time
- New resources just provisioned are immediately discovered
- Jobs automatically run on those resources

Job1 → Job2 → Job3 → Job4 → Job4 → Job5

Balanced Resource Usage

Computer Systems, Applications and Middleware Pool

New Resource Provisioned
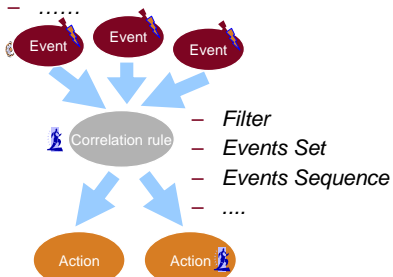
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Event-driven workload automation

- *"filex is created"*
- *"message xyz issued in a log-file"*
- *Jobx abended with RC=12" ;*
- *"TWS agent unlinked";*
- *"An email is received"; "*
- *Event xyz issued on SAP*
- *......*

Event Event Event

Correlation rule
  – *Filter*
  – *Events Set*
  – *Events Sequence*
  – *....*

Action   Action

- *Submit a TWS job/jobStream*
- *Start any TWS command*
- *"Send an e-mail",*
- *"Send An event to T/EC",*
- *Write a message in msg log*
- *....*
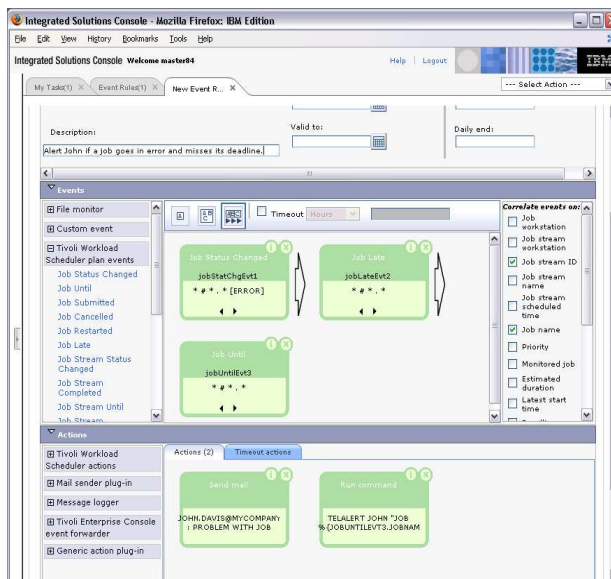
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Single point of control from WEB interface

- **Single Web-based control point for the entire enterprise workload automation network**
  - Monitor the workload through customizable views or dashboards
  - Manage workload
  - Create and browse forecast plans
  - Create reports and statistics on historical activity
  - Built-in notifications capabilities, through
    - Email
    - Event to T/EC and TEP
    - Message in a log file
    - User plugins

Single point of control from Tivoli Enterprise Portal (ITM)
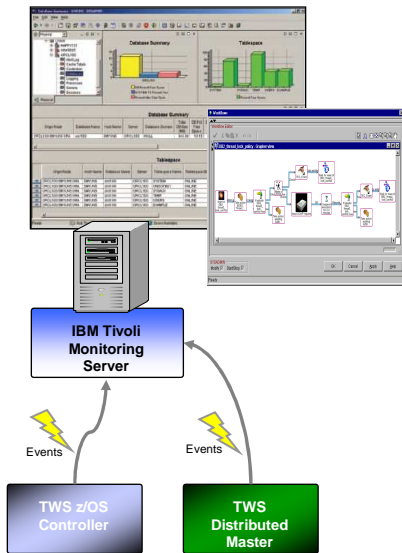
- **Monitor critical jobs and resources status from TEP together with other monitoring events from disparate resources**

- **Provide user specified messages based on events and alerts**

  – Job related events for pre-defined jobs
    • Job start
    • Job end
    • New job added to the Current Plan

  – Alerts for all jobs, based on user policies
    • Ended in error jobs
    • Long duration
    • Late jobs
    • Special Resource time out

  – Subtask and agents related events
    • Subtask Ended in error
    • Exceeding queues thresholds
    • Agent linked/unlinked
    • Agent started/stopped

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Proactive Monitoring and Workload Service Assurance

- User identification of critical jobs and their deadline
- Views (ISPF, JSC, WEB UI and TEP views) for Critical Jobs and Critical Paths
- Critical Path is dynamically recalculated when unexpected delays occur on jobs outside the original Critical Pathy or for jobs dynamically added to the plan
- Graphical and dashboard views of critical Jobs and their risk to miss deadline (High, Potential, no-risk), with drill-down navigation to predecessor jobs causing the risk.
- Automatic promotion of jobs on critical path for critical jobs in high or potential risk, by
  – Increase of internal scheduling priority
  – Boost OS priority using the "nice" command (Unix jobs)
 – Move jobs to higher WLM Service Classes (z/OS jobs)

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TWS forecast planning and historical reporting
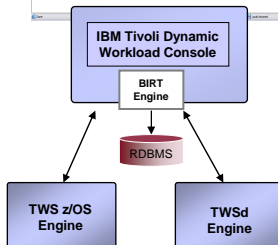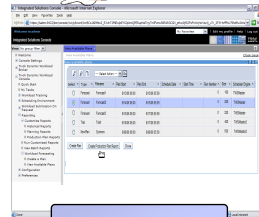
- **From the TWS WEB-UI or from a batch CLI user can:**
  - Create forecast plans for future dates/periods and view them graphically or as text reports
  - Export TWSd plans into Excel or Microsoft Project
- **Historical scheduling data are consolidated into an RDBMS**
  - Allows users to create their own personalized reports (SLAs, Sarbanes-Oxley, capacity planning, etc..)
- **BIRT technology embedded in TWS WEB-UI allows to**
  - Produce highly customizable Reports
  - Develop new reports without code changes
  - Use TWS pre-canned reports
    - Job Run History
    - Job Run Statistics
    - Workstation workload summary
    - Workstation workload runtime
    - Custom SQL reports

IBM Tivoli Dynamic Workload Console

BIRT Engine

RDBMS

TWS z/OS Engine

TWSd Engine

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End-to-End support – Heterogeneous workload environments

Built in support for scheduling the following type of workload

- ❑ SAP SAP R/3
- ❑ PeopleSoft
- ❑ Oracle e-Business Suite
- ❑ LoadLeveler, IBM Grid Toolbox
- ❑ Tivoli Storage Manager
- ❑ z/OS (CA7, JES, TWS for z/OS)
- ❑ Agent-less scheduling via "ssh/rsh"
- ❑ J2EE (EJB and JMS)

TWS Extended-Agent is an Open and published interface for implementing access methods to support execution of any type of external workload
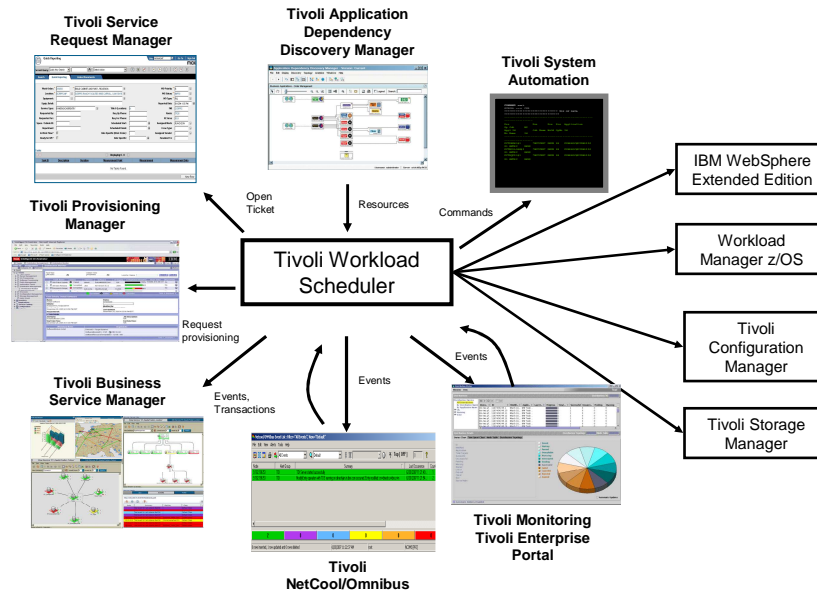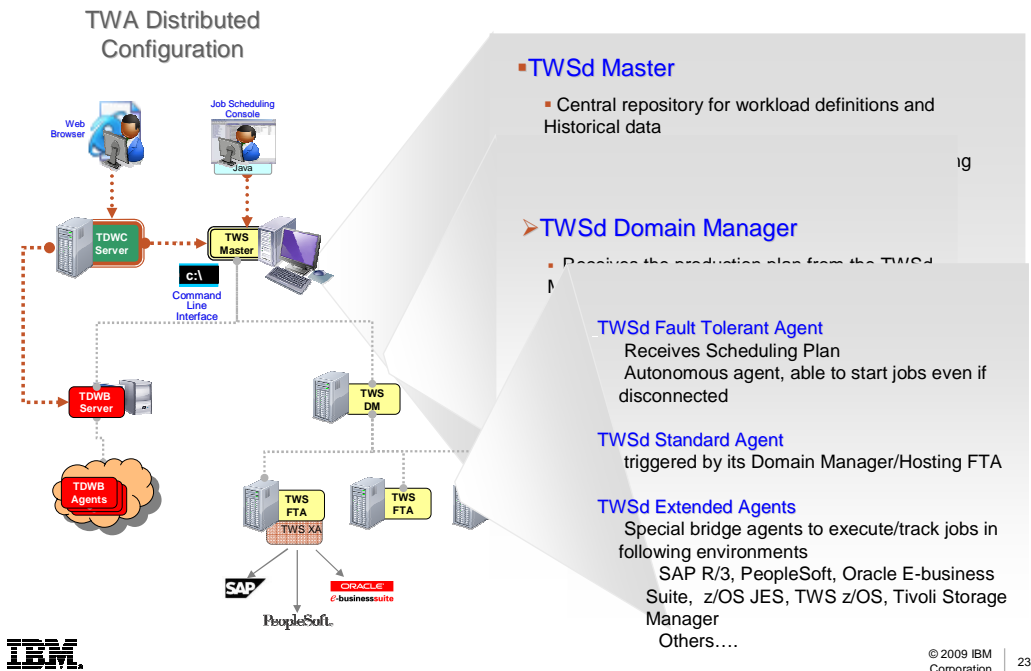
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Integration in the System Management Landscape

- Tivoli Business Service Manager
- Tivoli Service Request Manager
- WebSphere Service Registry & Repository
- Tivoli INFOMAN
- WebSphere Application Server
- WebSphere Extended Deployment
- Tivoli Enterprise Portal
- Tivoli CCMDB
- Web Services and J2EE
- Tivoli OMEGAMON
- SAP Systems
- Tivoli Monitoring
- Oracle Systems
- Tivoli Netcool OMNIbus
- PeopleSoft Systems
- Tivoli Enterprise Console
- Workload Manager
- **Tivoli Workload Automation**
- Tivoli System Automation z/OS & Multiplatforms
- Tivoli Storage Manager
- Tivoli NetView
- Tivoli Provisioning Manager
- Open Grid Services Architecture
- Tivoli Configuration Manager

- Process Management Services
- Performance Management Services
- Infrastructure Services
- Business & Application Services

Major Integrations

Tivoli Service Request Manager

Tivoli Application Dependency Discovery Manager

Tivoli System Automation

IBM WebSphere Extended Edition

Tivoli Provisioning Manager

Tivoli Workload Scheduler

Open Ticket

Resources

Commands

Workload Manager z/OS

Tivoli Configuration Manager

Request provisioning

Tivoli Storage Manager

Tivoli Business Service Manager

Events, Transactions

Events

Events

Tivoli Monitoring Tivoli Enterprise Portal

Tivoli NetCool/Omnibus

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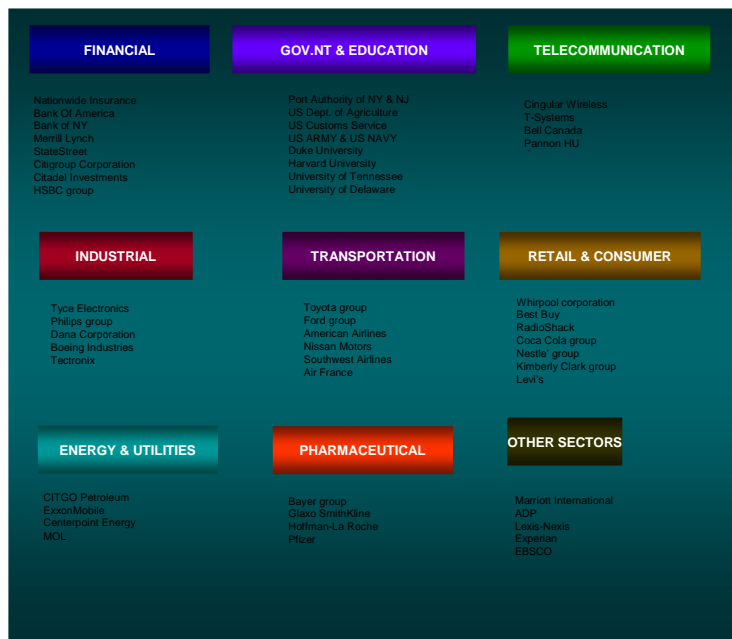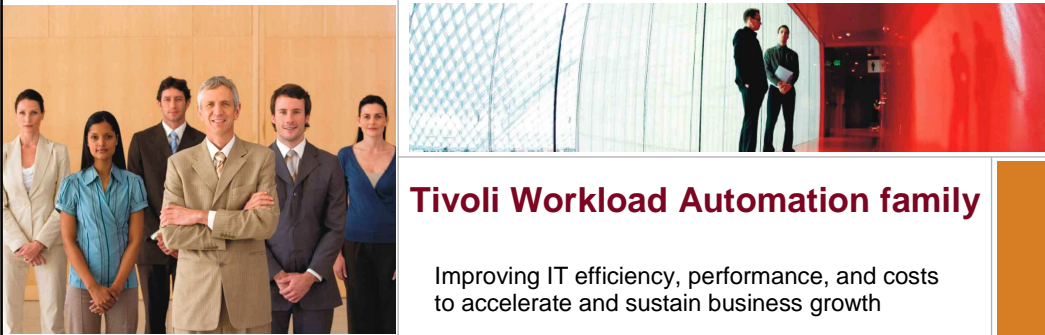 - Integrations in service management landscape
- **Architecture**

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TWA physical architecture – TWS distributed Scheduler

TWA Distributed Configuration

- **TWSd Master**
  - Central repository for workload definitions and Historical data

- **TWSd Domain Manager**
  - Receives the production plan from the TWSd

  TWSd Fault Tolerant Agent
  Receives Scheduling Plan
  Autonomous agent, able to start jobs even if disconnected

  TWSd Standard Agent
  triggered by its Domain Manager/Hosting FTA

  TWSd Extended Agents
  Special bridge agents to execute/track jobs in following environments
  SAP R/3, PeopleSoft, Oracle E-business Suite, z/OS JES, TWS z/OS, Tivoli Storage Manager
  Others….

Tivoli Workload Automation

- **25+ years**

- **2500+ customers**

- **Many Fortune 500 and Global 2000, across all sectors**

- **40+ Customer References**

- **400.000+ jobs**

FINANCIAL	GOV.NT & EDUCATION	TELECOMMUNICATION
Nationwide Insurance	Port Authority of NY & NJ	Cingular Wireless
Bank Of America	US Dept. of Agriculture	T-Systems
Bank of NY	US Customs Service	Bell Canada
Merrill Lynch	US ARMY & US NAVY	Pannon HU
StateStreet	Duke University	
Citigroup Corporation	Harvard University	
Citadel Investments	University of Tennessee	
HSBC group	University of Delaware	

INDUSTRIAL	TRANSPORTATION	RETAIL & CONSUMER
Tyce Electronics	Toyota group	Whirpool corporation
Philips group	Ford group	Best Buy
Dana Corporation	American Airlines	RadioShack
Boeing Industries	Nissan Motors	Coca Cola group
Tectronix	Southwest Airlines	Nestle' group
	Air France	Kimberly Clark group
		Levi's

ENERGY & UTILITIES	PHARMACEUTICAL	OTHER SECTORS
CITGO Petroleum	Bayer group	Marriott International
ExxonMobile	Glaxo SmithKline	ADP
Centerpoint Energy	Hofman-La Roche	Lexis-Nexis
MOL	Pfizer	Experian
		EBSCO

Tivoli Workload Automation family

Improving IT efficiency, performance, and costs to accelerate and sustain business growth
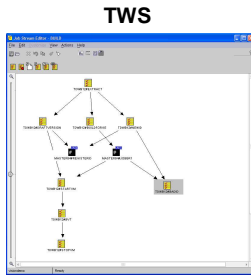
András Tóth
Tivoli Brand Manager

Major integrations – TADDM, CCMDB, TSRM

- **TDWB integration with TADDM**
  - Discovery assets (i.e. servers and applications) from CCMDB
  - Automatically adapt execution to IT configuration changes

- **TWSd integration with TADDM**
  - Schedule TADDM discoveries and synchronizations
  - Export TWS workstations topology to CCMDB
  - Used for change management scenarios to evaluate impact of changes to batch environment

- **TWSd Integration with TSRM Service desk**
  - Automatically open incident tickets to "TSRM Service Desk"

TADDM

Application Server Resources are imported from TADDM

TDWB

TDWB submits jobs to the requested TADDM resources

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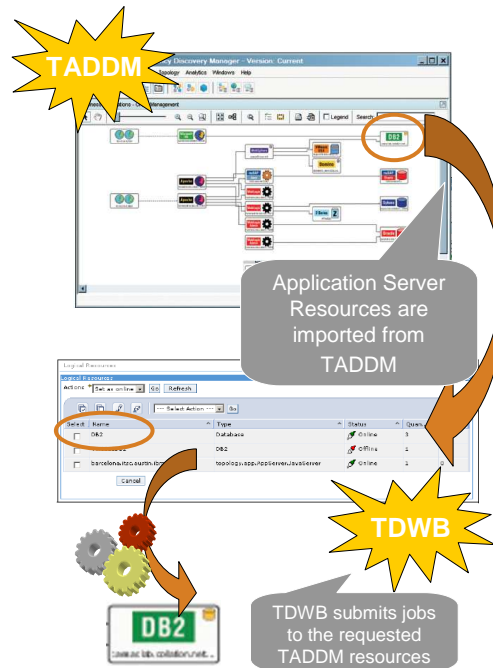
Major integrations – Tivoli Storage Manager

TWS

TSM 5.4

Control TSM backups and
Administrative tasks within
TWS batch flows scheduled
with complex calendar rules
or based on events

Major integrations – Tivoli Monitoring solutions
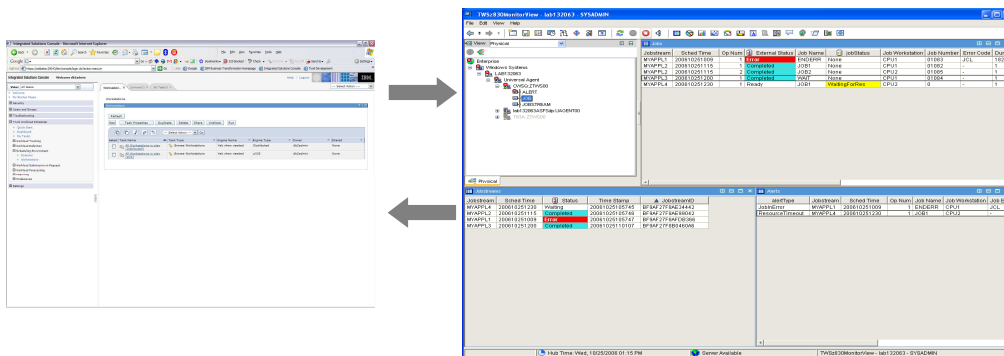
- Monitor TWS jobs and infrastructure events from "Tivoli Enterprise Portal" and "Tivoli Business Service Manager" console

- Use the TWS event-driven feature to
  – Send events from TWS to ITM based on job events correlation rules
  – Automate TWS actions (e.g. jobs submission, jobs deletion, etc..) based on events coming from ITM

Major integrations – Service Oriented Architecture

TWS

Launch bulk EJB execution

Launch TWS flows as part
of BPEL Business Process

WebSphere Process Server

WebSphere Extended Edition (WAS XD)
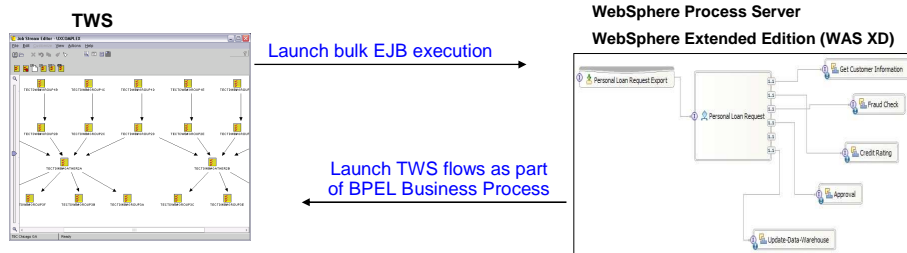
Two-way communication between TWA and Websphere suite

– Launch WAS-XD jobs from TWS
  • Take advantage of WAS-XD for efficient Java batch execution

– Launch TWS jobs/jobstreams from WebSphere Process server as part of a
  BPEL business process
  • Present legacy batch as a service
  • Provide the automation layer to manage the life cycle of composite applications

---

TWS pre-canned reports - *Job Run History*

Job Run History

Report Description: The report collects the historical job execution data during a time interval. It will allow to detect which jobs ended in error as
well late jobs, missed deadline, long duration, rerun indicators for reruns, etc.
Report Date: Tuesday, February 27, 2007 5:21:34 PM UTC
Report Type: JobRunHistory
Total Rows: 6

Job Run History Listing

Job Name:	Workstation (Job)	Job Stream Name	Workstation (Job Stream)	Scheduled Time	Actual Start Time	Started Late (delay hh:mm)	Ended Late (delay hh:mm)	Status	Rerun type
JOB1	FCARTER5	JS1	FCARTER5	Monday, February 5, 2007 4:00:00 AM UTC	Monday, February 5, 2007 3:43:00 PM UTC			Successful	Regular Job
JOB2	FCARTER5	JS1	FCARTER5	Monday, February 5, 2007 4:00:00 AM UTC	Monday, February 5, 2007 3:43:00 PM UTC			Error	Regular Job
JOB3	FCARTER5	JS1	FCARTER5	Monday, February 5, 2007 4:00:00 AM UTC	Monday, February 5, 2007 3:43:00 PM UTC			Successful	Regular Job
JOB4	FCARTER5	JS2	FCARTER5	Monday, February 5, 2007 4:00:00 AM UTC	Monday, February 5, 2007 3:43:00 PM UTC			Successful	Regular Job
JOB4	FCARTER5	JS2	FCARTER5	Monday, February 5, 2007 4:00:00 AM UTC	Monday, February 5, 2007 3:45:00			Successful	Job Every

TWS pre-canned reports - *Job Run Statistics*

TWS pre-canned reports - *Workstation workload summary*

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TWS pre-canned reports - *Workstation workload runtimes*

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