CLABBY ANALYTICS

Research Report

Tivoli Workload Automation with Cloud ─ Automating Complex Applications and Dynamic Distributed Workloads in the Cloud

Introduction

Running applications and workloads in virtualized/cloud environments presents new challenges for information technology (IT) managers and administrators. These IT executives are now being called upon to manage applications that span the virtual and physical; the public cloud and the private cloud; and the mainframe and distributed systems. *In this context, job scheduling is becoming a more dynamic discipline, combining advanced automation with new workload types and cloud delivery models*.

> ***Think about a typical application today. That application probably has a web-based front-end, links several web services, and may use a cloud service while making several hops through distributed and mainframe infrastructure to access data in a DB2 database on the back-end. The application probably runs at least 5-10 jobs to get the data and report back successfully.***

In this new, dynamic cross-cloud world, many workloads have become complex "composite" applications that are comprised of functionality drawn from several sources. These composite applications need access to many and varied resources as they wend their way through distributed cloud environments. For example, a business flow, which runs in support of business reports generation, can connect processes where a file is transferred, it's loaded into Hadoop, data is manipulated through Big Data, then an SAP program uses the data for financial processing, and business reports are generated.

Human labor can be used to schedule these resources ─ but the cost of this labor is high, and the complexity of scheduling resources across distributed environments is time consuming. Further, using human labor introduces the chance of error which can result in performance problems, workload failures, and costly troubleshooting.

To reduce the costs and complexity of managing these composite cloud applications, IT managers and administrators need advanced tools that can handle job scheduling and resource allocation. More specifically, they need tools that can:

- Provision resources on-demand ─ allowing these resources to be dynamically expanded or shrunk based on business need;
- Integrate composite workloads across multiple platforms and applications; and,
- Automate activity scheduling and management tasks.

Further, these tools should be easy to use, featuring a common graphical user interface across distributed and mainframe cloud environments. And these tools should also allow for some user controls ─ such as the ability to provide self-service portals.

IBM's Tivoli Workload Automation environment offers several tools for managing complex composite workloads across mainframe and distributed environments. In this *Research Report*, *Clabby Analytics* examines IBM's *Tivoli Workload Automation with Cloud*, a dynamic environment for running unattended workloads and applications across System z, distributed and cloud environments.

Tivoli Workload Automation with Cloud ─ A Closer Look

IBM's Tivoli Workload Automation with Cloud is a bundled solution that includes IBM's Tivoli Workload Scheduler (TWS) for z/OS, IBM's Tivoli Workload Scheduler for Distributed, and IBM's SmartCloud Workload Automation.

Tivoli Workload Automation with Cloud is a powerful solution for automating composite and complex workloads in near real-time across heterogeneous systems and private and public cloud environments. It performs on-demand physical and virtual server provisioning (and de-provisioning) transparently ─ serving to support changing business needs while still maintaining SLAs. This solution also features a flexible pay-per-use licensing model that avoids fixed license costs for small workloads.

Managing Composite Applications: The Tivoli Dynamic Workload Console

IBM's Tivoli Workload Automation with Cloud features a centralized, web-based interface known as the Tivoli Dynamic Workload Console, (TWDC) that provides monitoring and collaboration facilities across mainframe and distributed systems. Workloads can be launched both from distributed and z/OS servers, and with TWDC, scheduling activities across the enterprise can be managed from a single point of operational control. TDWC allows for single sign-on and authentication to one or many schedulers, with real-time monitoring and management of the entire scheduling network and across firewalls. As a web application, it reduces the deployment costs, leveraging a single installation vs. a "fat" deployment of clients on all operators' machines, and encourages the reuse of shared assets, such as reports, or common monitoring filters. By improving workload coordination and consolidating management, IT organizations can improve performance on workload scheduling and lower administrative costs, reducing overall application management costs.

The Workload Scheduler

Using schedule management facilities, workload management can be automated, taking the burden off of already-too-busy IT managers and administrators. Further, by automating management, and by using these dynamic workload management facilities, workloads can be better optimized for performance.

Latest enhancements to the portfolio provide important capabilities that simplify scheduling and management, increase automation, enhance high-availability and improve the ability to meet service level agreements (SLAs).

These include:

- Modeling facility that allows for workload simulation and forecasting ─ helping IT executives better understand workload resource demands before moving into a production cycle.
- Plan mirroring capability (distributed systems only) allows IT managers to use a common DB schema for better resilience and more flexible reports.
- "Run-Cycle Group" object decouples scheduling logic from scheduling jobs for improved maintenance and flexibility;
- User-defined criteria to link jobs and map complex business flows;
- Pre-defined action to anomalous behaviors for distributed jobs;
- Proactive alerting supports SLAs;
- Enhanced forecasting capabilities and "what-if' analysis on TWS distributed;
- Support for a broad range of applications, including Big Data, ETL applications (Datastage, Netezza) and Business Analytics (Cognos)
- Automatic mechanisms for upgrades, fix pack installations, and rollbacks with Tivoli Endpoint Manager; and,
- High-availability with automatic failover of all components.

Cloud Ready Features

Tivoli Workload Automation with Cloud provides the flexibility to automate workloads and applications running in private and public clouds. These features support the basic cloud principles of *standardization, virtualization and automation* ─ allowing the implementation of standard solutions that can be automatically deployed on virtual systems in order to automate business processes.

> ***Workloads in the cloud are able to link with one another using workload aware processes with workload aware environment definitions ─ enabling these workloads to work seamlessly and cooperatively across distributed systems as well as z/OS platforms.***

What Makes Tivoli Workload Automation with Cloud Special: Patterns and a Standard Cloud

The ability to provision and manage workloads in a consistent manner across mainframe and distributed systems environments is pretty impressive. But we are even more impressed with the way IBM integrates workloads with underlying cloud services using workload "patterns".

IBM uses the term "pattern" to describe the expert functionality used to build and tune IBM's PureSystem environments. This same pattern concept has been applied to Tivoli Workload Automation with Cloud ─ expert knowledge has been employed to simplify the deployment of applications by facilitating collaboration and sharing of built-in user expertise and experience.

> ***A pattern is a collection of elements that describes a complete software solution, potentially involving multiple interconnected systems, as a single entity. All of the knowledge to create, configure, and support every aspect of the solution is included in the pattern. Once created, these patterns can be easily shared and reused by others who don't have (and now don't need) the same level of expertise. Source: IBM***

IBM's Tivoli Workload Automation with Cloud uses "workload application templates" (patterns) which act as containers for all TWS assets needed to run a TWS solution (jobs, job-streams, run-cycles, variables, dependencies). Patterns, therefore, contain a set of TWS objects needed to implement a common business service. The software defines the objects and repacks them in a single stack. Import and export facilities are used to move these templates through the development, test and production cycles. Once created, these templates can be shared with other users, enabling workloads and applications to be deployed more quickly, improving time-to-value and reducing administrator time.

IBM envisions the creation of an ecosystem of business partners and system integrators who can rapidly enrich the collection of patterns at the pace of the business demand.

A Web-based Services Catalog

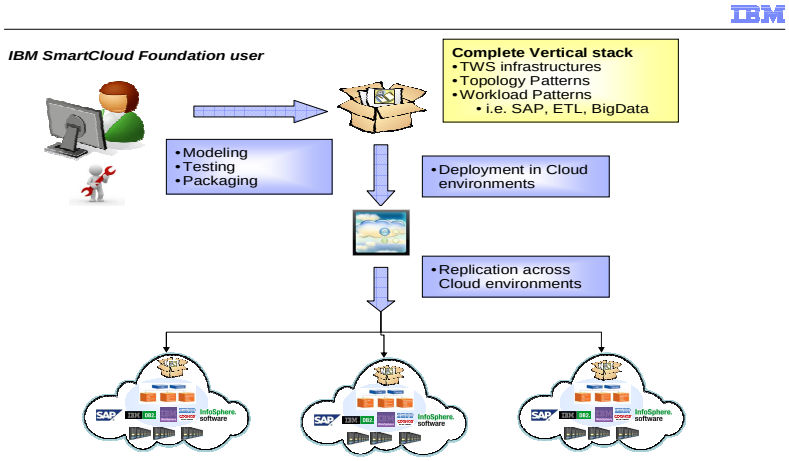
IBM also supplies a web-based service catalog interface, supported on both z/OS and distributed systems, that enables users to easily select and monitor business services, as well as display service levels. Business services and reports can be initiated from anywhere (including iPhones, smartphones and other mobile devices) at any time, allowing self-service and autonomy for business users and offloading IT administrators for revenue-generating activities.

Integration with the IBM SmartCloud Foundation

Once the template has been created, it needs access to cloud services. Tivoli Workload Automation with Cloud complements IBM SmartCloud Foundation (a set of technologies for building and managing virtualized infrastructures and private and hybrid clouds) with capabilities to deploy workload templates and automate business services in the Cloud. The result is a complete pre-packaged solution, including TWS images and template of workflows.

As an example, consider a workload pattern that has been integrated with the IBM SmartCloud Orchestrator. IBM's customers can quickly deploy a workload pattern and tie it to underlying topology patterns (gaining access to underlying cloud services). And all of this can be done automatically. By making use of this pattern approach, IBM customers can easily deploy business services across cloud environments and take advantage of a standardized implementation for common scenarios (see Figure 1 below).

Figure 1-Workload Patterns on IBM SmartCloud Foundation

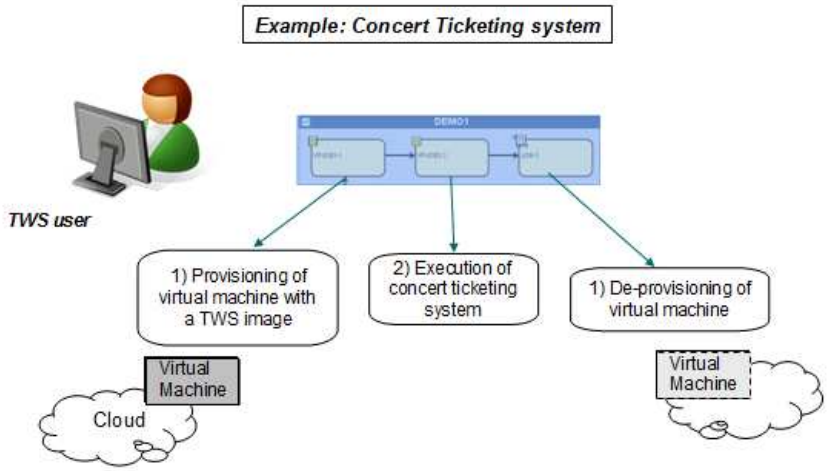


Source: IBM 2013

Running Workloads on Just-in-Time Cloud Resources

We are also impressed by the automated underlying cloud provisioning environment. Because Tivoli Workload Automation with Cloud workloads have access to IBM's SmartCloud Provisioning, provisioning requests can be launched such that all virtual resources required for a workflow are made available. This enables the integration of end-to-end applications spanning physical machines, virtual machines, private cloud and public clouds ─ as well as the tight integration of both mainframe and distributed components. And the best part: this can all be done automatically (TWS brings the "unattended execution" of background workloads/applications into the Cloud). Dynamic provisioning and deprovisioning of a various workload environment enable information systems to dynamically adjust workloads to handle peak loads while keeping service level commitments. The elastic nature of the cloud ensures that resources are available in real-time based on business need, but are returned to the pool once that business need has been satisfied (see Figure 2 below).

Figure 2 – Dynamic Provisioning and Deprovisioning



Source: IBM 2013

The end result of all of this automated workload management, job scheduling, and provisioning/-deprovisioning activity is that IT managers and administrators will spend less time dealing with infrastructure issues. This concept is now being called "IT without infrastructure". IT without infrastructure reduces overall IT costs because utilization of physical resources is increased as assets are used, returned and reused. Applications and workloads are deployed more quickly and with fewer errors by automating the provisioning and deprovisioning process.

An Open Cloud Standard

As mentioned earlier, IBM's TWS Distributed supports various standards that are expected to lead to the creation of open cloud environments. Open Services for Lifecycle Collaboration (OSLC) is one such standard ─ a standard for the link and exchange of data across OSLC-enabled applications. With OSLC, TWS is easily integrated with other OSLC-enabled applications to easily map Business Service Management scenarios in cloud environments. TWS can both provide and consume its own services to remotely automate and control workflows on other TWS systems.

Summary Observations

During the course of our research we speak with many enterprises who are building "cloud" environments. Some of the clouds are simply homogenous server environments that have been virtualized ─ while other clouds are full-fledged, highly automated consolidated/virtualized/automatically provisioned environments that use advanced workload management tools to balance workloads within the cloud. Unfortunately, we run into far more siloed, homogeneous, virtualized clouds that we do integrated heterogeneous environments…

> ***IT buyers who implement homogeneous silos are missing an opportunity to drive down their cost of computing by using the right information systems to process the right jobs. They are also missing the opportunity to unify systems, programs, and data across their organizations. Both of these are big mistakes that drive up computing costs while inhibiting organizations from being able to quickly respond to changing business conditions.***

Tivoli Workload Automation with Cloud illustrates what can be achieved when an enterprise implements a strategy of running the right workloads on the right servers ─ and then invests in the software needed to drive utilization rates up while driving management costs down. This Tivoli environment minimizes the need of managers and administrators to become embroiled in sorting out infrastructure-related issues ─ and, instead, let's them focus on more important things like deploying new applications or streamlining business processes.

What we like most about this environment is its use of workload patterns that create systems images that can be easily deployed and managed in the cloud. These patterns are replicable ─ so administrators do not have to constantly build system images. And these patterns are easily integrated with a standards-based cloud.

We also like the way that IBM has created an end-to-end solution that spans both mainframe and distributed environments. For customers with mixed environments who are looking to consolidate workload automation solutions, Tivoli Workload Automation provides a platform to do just that.

By continuing to enhance workload automation solutions to improve standardization, virtualization and automation IBM continues to drive down costs by improving efficiency, productivity and usability. With a unified solution that spans distributed and mainframe environments as well as public and private cloud environments, IBM's Tivoli Workload Automation with Cloud illustrates what highly-efficient, workload optimized, heterogeneous cloud environments should really look like.

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April, 2013

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