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About the customer

The customer is an American multinational automotive corporation, and among the world’s largest automakers by vehicle unit sales. The company produces cars and trucks in 31 countries, owning more than 11 automobile brands and doing business in more than 150 countries globally.

About TCS

Tata Consultancy Services is an IT services, consulting, and business solutions organization that delivers real results to global business, ensuring a level of certainty. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled infrastructure, engineering, and assurance services. This is delivered through its unique Global Network Delivery Model, recognized as the benchmark of excellence in software development. A part of the Tata Group, India’s largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India. For more information, visit tcs.com.

Relationship highlights

• 250+ team members across the globe supporting end-to-end infrastructure services
• Six major locations supported by TCS (USA, Canada, Singapore, Korea, Australia, and India)
• 15+ data centers managed by TCS globally for customers
• Network operation centers (NOCs) at two locations: onsite on the east coast of the USA and offshore in Chennai, India
• Volume: 5000+ servers, 1200+ databases, 1000+ network devices, 100+ firewalls, 2000+ virtual servers
• Critical application support included the customer’s dotcom infrastructure, SAP infrastructure, custom in-house developed applications for engineering support, and SharePoint® portals
• $ 1.5 million in savings over three years

Business requirement and challenge

The main objectives of the project were to:
1. Eliminate manual processes for operating system (OS) provisioning
2. Reduce the time taken for provisioning processes and standardize large-scale operations
3. Provide catalog-based services along with service-level agreements (SLAs) and business approval-driven workflows

The project was code named “quick provisioning and resource management” (QPRM). The key business requirement was to adhere to four-hour SLAs from the time a user request is approved to the time the user request is closed successfully.

The customer wanted to evolve with a complete service request (SR) lifecycle and provide users with a service portal that manages the OS provisioning process. The end goal was to automate workflows and streamline the fulfillment and approval process, so IT can efficiently fulfill requests, reduce costs, and improve customer satisfaction.
**TCS solution overview**

The TCS engineering and architecture team did a detailed study along with the customer’s architect and HP engineers to come up with a solution based on the HP Automation platform, which encompasses HP Server Automation software, HP Network Automation software, and HP Operations Orchestration software, along with integration to the HP Service Management platform.

For the provisioning automation solution, this paper includes a summary of the various components used, such as a service request portal, service catalogs that were defined, and associated workflows, along with a run-book automation tool and integrations to the VMware application programming interface (API).

**Provisioning highlights (sample report)**

- **In detail**
  - 312 requests were received for quick provisioning.
  - 203 requests were handled manually by the provisioning team.
  - 109 requests were handled by the end-to-end automated solution.
• Automated provisioning was enabled for Windows® and the SUSE Linux platform.
• The number of requests received for provisioning:
  - 57 – Windows
  - 52 – SUSE Linux

![Automation Request - OS Platform](image)

Provisioning success rates:
• 98 requests succeeded.
• 11 requests failed (due to wrong inputs provided in the service request).

![Automation Provisioning - End Results](image)

<table>
<thead>
<tr>
<th>Type</th>
<th>Service request</th>
<th>Turnaround time (in hours)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated</td>
<td>109</td>
<td>&lt;4</td>
<td>&lt;=4 hours SLA for each service request</td>
</tr>
<tr>
<td>Manual</td>
<td>203</td>
<td>8.526</td>
<td>=&gt;42 hours per request for the end-to-end manual provisioning process</td>
</tr>
</tbody>
</table>
Solution components

1. Service Catalog Module to define available services for the profile of the user logged in (based on the user’s entitlements)
2. Service Request Portal for workflow, authorization, and approvals based on the HP Service Manager platform
3. Workflow Automation using HP Operations Orchestration
4. VMware API, VMware vSphere PowerCLI, and custom scripts

Provisioning automation solution

Characteristics of the provisioning automation solution include:

- On-demand services with standardized offerings and tiered SLAs, actively managed and governed throughout the lifecycle, and with end-user access via a self-service portal
- The ability to provide automated, user-controlled provisioning and de-provisioning of hardware, software, storage, and network components based on demand-defined standard operating environments
- The overall workflow is defined at a high level as shown below:
- The end user raises a service request for provisioning a virtual machine by mentioning the OS flavor and the desired sizing option (such as small, medium, or large).
- On submission of the service request (SR), automated notifications are sent to approvers. On approval the workflow starts automatically through a Web Services call.
- The IP address, domain name, and additional information required for systems are picked up based on geography and the data center where the servers are being provisioned. For a pre-populated database table, all used hostnames, IP addresses, and other parameters are marked as used after successful provisioning.
- The workflow automatically checks for desired versus existing capacity prior to the start of the provisioning process.
- Any failure is duly notified to the TCS NOC (Command Center Operations), the end user, and business users. On correction of the failure by the L1 (Level 1) help desk associate based on pre-existing knowledge scripts, the workflow continues with the rest of the provisioning process.

Detailed solution workflow

Figure 1. Service request lifecycle
<table>
<thead>
<tr>
<th>Flow sequence</th>
<th>Lifecycle of workflow</th>
<th>Description of processing</th>
<th>Status change at front-end service request portal</th>
</tr>
</thead>
</table>
| 1             | Fetch service request details. | • Identifies pending service request in queue  
• Gathers data and stores data  
• Creates parallel queue for execution | Successfully fetched service requests are marked WIP (work in progress). |
| 2             | Fetch data center and RAS details. | Collects geographic location, vCenter, data center name, cluster, and resource pool details | Applies to lines 2–12:  
• The status of the service request remains WIP until the execution solution success or failure.  
• On success, the service request will be closed.  
• On failure, the service request turns to “pending other.” |
| 3             | Free space in datastore. | Validates the free space in data source connected to the ESX server | |
| 4             | Check resource pool existence. | Checks the availability of resource pool details in the cluster/data center | |
| 5             | Deploy VM using template. | • Selects template based on platform  
• Initiates and progresses cloning  
• Completes cloning and moves to the next step | |
| 6             | Edit VM settings. | • Enables the hot add options for the virtual machine | |
| 7             | Power on VM. | • Turns on the virtual machine  
• Checks the limitation of vCPU, vMemory | |
| 8             | Set vCPU, vMemory, and vDisk. | • Fetches sizing details from the service request  
• Modifies the hardware configuration for the virtual machine | |
| 9             | Check and upgrade VMware tools. | • Assigns the IP address as given in the service request | |
| 10            | Set the IP address. | • Turns on the virtual machine  
• Checks the limitation of vCPU, vMemory | |
| 11            | Change host name and join to domain. | • Sets the hostname  
• Joins the server to the desired domain | |
| 12            | Fetch the date and time. | • Fetches the date and time | |
| 13            | Close the service request. | On successful completion of execution, the service request will be closed. | Service request closed. |
| 14            | Send notification of completion. | Email notification will be sent along with service request details and time of completion. | Service request closed. |
| 15            | Send notification of failure of execution. | If the execution of the flow fails, notification will be sent to the technical team. | Service request closed. |
**Service portal**

Based on the business/functional requirements, the end user raises a request for a server operating system. Currently Windows®, SUSE Linux, and Red Hat Enterprise Linux (RHEL) are supported in our customer environment. Additional operating systems are due for release in the next cycle.

| VM type | Small, Medium, Large—ranging from 1 vCPU, 4 GB RAM, 40 GB HDD up to 16 vCPU, 64 GB RAM, 1 TB HDD |
| Packages | • OS only (Windows, SUSE Linux, RHEL)  
• OS with additional packages, such as IIS, Apache Tomcat  
• Other custom packages, such as agents, patches |

Below are the packages available to end users based on their logged-in profiles in the service request portal. Figure 7 shows a sample email notification text to the technical team/end user on the success of VM provisioning.

Figure 2. Service request form
Main flow

The main flow of the provisioning process is depicted in Figure 3. It uses the Web Services invoke method to instantly provision VMs or create a parallel queue based on the load on the systems involved, such as a central server, VMware vCenter Server, Web Services, and database servers.

Figure 3. Main flow

Figure 4. Main workflow
**Web Services invoke method**

On approval in the service request portal, the workflow starts immediately using Web Services-based integration.

The Web Services invoke method is used to automatically fetch service request details on approval from business owners. The function allows the workflow to start immediately upon request approval, as shown in the Figure 5 diagram.

*Figure 5. Invoice method*
Sub-flows within the main flow

There are many sub-flows within the main flow, such as changing storage, checking storage availability, adding a host to a domain, and changing an IP address and NIC. In the Figure 6 pictorial representation, each of the sub-flows is custom developed. This figure depicts a sub-flow for checking storage space at the datastore level even before starting the provisioning process, and hence reducing the failure rate through checks and balances.

Figure 6. Sub-flow

Notification

TCS has developed a custom notification engine to enable relevant notifications at each stage of the provisioning process, such as work in progress, success, and failure. This engine helps ensure that due actions can be taken by the command center (L1/helpdesk) team members and also that a copy of the notification is sent to the end user/business user.

Figure 7 shows a sample email notification text to the technical team/end user on the success of VM provisioning.

Figure 7. Email notification
## Detailed list of tools, APIs, and scripts used

<table>
<thead>
<tr>
<th>Versions</th>
<th>Function</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **HP Service Manager** 9.2 | Enable the end-user service request portal and all ITSM processes. | • Provide a front-end portal for end users.  
• Reduce overall call volume to service desk/command center by 60% for request management. |
| **HP Operations Orchestration** 9.3 | • Integrate into the VMware Virtual Infrastructure (VI) and HP Service Manager.  
• The actual logic of server provisioning and update of service request will happen here. | • Automate server provisioning and update the service request.  
• Reduce the overall provisioning lifecycle from 5 to 10 business days to 4 hours.  
• Reduce manual effort, removing the requirement for human intervention during the entire provisioning process. |
| **Web Services (WSDL)** 1.0 | • Enable transmitting data over the Internet and allow programmatic access to that data using standard Internet protocols.  
• Web Services allow the business logic of many different systems to be exposed over the web. | • Integrate with HP Service Manager, fetch the details of the service request, change the status of the service request, and update the remarks automatically.  
• No human intervention is required. |
| **VMware vSphere Power CLI** 5.0.1 | • VMware vSphere PowerCLI is a command-line tool that lets you automate all aspects of vSphere management, including network, storage, VM, guest OS, and more. | • Enable automatic and remote virtual machine provisioning.  
• Control virtual machine states.  
• Administer virtual machines and virtual network devices.  
• No human intervention is required. |
| **Custom scripts (VB Script, Power Shell)** 5.8, 2.0 | Enable administrative activities on Windows and the execution of Power CLI cmdlets. | Configure the User IP, BUR IP, Subnetmask, default gateway, DNS; change system name and add it to the domain. |
Benefits summary

In this implementation, the customer achieved a wide range of business and IT benefits. In particular, the customer:

• Reduced the time taken for the provisioning process from 5 to 10 business days to less than four hours
• Reduced human effort by up to 98%
• Redeployed TCS L2 (Level 2) virtualization technical team members to perform L3 (Level 3) activities (for the architecture and planning of a newer virtualization platform) and moved provisioning monitoring to L1 (provisioning monitoring and re-submission of jobs is done by command center/L1 resources)
• Enhanced the service delivery experience with increased end-user satisfaction
• Achieved $1.5 million in estimated cost savings due to ready-for-business/rapid turnaround times

Resources, contacts, or additional links

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hp.com/go/operationsmanagement