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IBM Enterprise IT Automation Services

Dynamic Automation in the Age of Cognitive, Dynamic Learning and Self-healing Systems

Firas Bouz

Hemang Dave

Infrastructure Solutions

IBM

Redguide

Executive overview

For decades, the IT industry has focused on ways to automate processes to increase IT productivity and efficiency and to reduce human errors. However, the focus is quickly shifting to enhance business productivity and outcomes and to provide innovation and faster speed to market. These improvements help to capture new markets and beat the competition in today's business and technology race. Driving down cost and improving efficiency are key elements to achieve these goals because they help to free funds and resources to make strategic investments. Likewise, making sure that IT staff is focusing on innovation in the core areas of the business, continuing to work through complex problems, and improving productivity is of paramount importance. Thus, automation is becoming ever more critical.

Traditional process automation relies on scripts that combine various commands that typically work only on a single platform or for specific product. Thus, traditional process automation usually involves creating multiple versions of the same thing. This type of process automation is becoming a thing of the past. Instead, solutions that use *analytics-based automation*, such as IBM® Enterprise IT Automation Services, are becoming the cornerstone of the next generation of enterprise IT systems. Organizations that take advantage of these technologies are seen as industry leaders.

The typical IT environment of today's enterprise includes multivendor technologies as well as various sourcing strategies and delivery models that span several platforms and products. In this modern and sophisticated IT environment, fixing operational issues, regardless of severity, becomes a challenge. Even problems caused by the simplest issues, such as password resets or a disk becoming full because of an error log file, can grow out of control or can take many hours to identify and fix. These types of events can cause outages or can severely degrade performance and can, as a result, impact the business revenue.

The IBM Enterprise IT Automation Services offering from IBM Global Technology Services® (GTS) includes the *dynamic automation* capability. IBM Enterprise IT Automation Services identifies potential problems in IT systems and automatically fixes these problems before they become critical. IBM Enterprise IT Automation Services constantly monitors a system to keep it healthy and error free.

IBM Enterprise IT Automation Services uses analytics and virtual engineering technology to identify potential problems in IT environments and automatically fix these issues before they become critical. It provides an end-to-end solution from event capturing through automation to measurement and continuous improvement.

IBM Enterprise IT Automation Services provides the following key benefits:

- Identifies and fixes 40-45% of the incoming problem tickets, freeing IT staff to concentrate on more complex issues.
- Reduces the mean time to recovery (MTTR) from days and hours to minutes, preventing severity 3 and 4 events from becoming severity 1 events.
- Provides granular, transparent, and thorough level of details that can be analyzed to identify patterns and to provide insights to make continuous improvements in the environment.
- Helps with rapid resolution of incidents, combined with the scalability of virtual engineers and elimination of human errors.
- Is fully auditable and compliant with today's IT security requirements.

This IBM Redguide™ publication gives an IBM services perspective of automation in the era of cognitive, dynamic learning, and self-healing systems. It provides an overview of the journey that organizations go through to adopt IBM Enterprise IT Automation Services and the continual services improvement process they follow after the initial implementation.

IBM Enterprise IT Automation Services: Automating outcomes versus automating processes

IBM Enterprise IT Automation Services includes several key components:

- The *virtual engineer* is a software component that uses algorithms to asses and automatically take action on problems that can impact the system, without human intervention. The virtual engineer monitors the system for irregularities, and when it spots an irregularity, it goes through a series of programmed actions that are specific to the situation in order to remediate the issue. The virtual engineer is also programmed to collect data on issues that it currently does not know how to fix. In these cases, the virtual engineer sends the data to a human, who can analyze and fix the error and reprogram the virtual engineer as appropriate. Based on data and insights, the virtual engineer is also programmed to handle new capabilities.
- *Patterns* describe the behavior that virtual engineers must follow to respond to an incident. There are standard patterns, client-specific patterns, and new patterns that are developed based on insights discovered by analytics.
- *Analytics* help to identify what can be automated next, monitor the behavior of the automation, learn from IBM global experience, and so on. Analytics is used to measure the effectiveness of automation and patterns and to feed information that can be used for new development, changes, or root problem determination.
- IBM Enterprise IT Automation Services is *deployed as a service* on the IBM SoftLayer® cloud infrastructure. Thus, it requires minimal effort and infrastructure commitments on an organization's IT environment.

IBM GTS has implemented automation solutions in hundreds of enterprise clients worldwide, automatically fixing problems in their production, development, and test environments and learning in the process. The IBM Enterprise IT Automation Services offering is designed to monitor and fix problems on various deployment models. This service offering can be delivered as a service and integrated with your organization's existing event management system.

IBM Enterprise IT Automation Services integrates IPcenter technology by IPsoft with several hundreds patterns and with existing processes in the enterprise—for example by interfacing

with incident, problem, and change (IPC) management systems—to handle problem tickets and to change management tasks, and in this way provides an overall solution. The solution is fully auditable and compliant with today's security requirements. This proven solution consistently demonstrates value by reducing the time that it takes to respond to events and fix issues from days and hours to minutes. Data shows that on average IBM Enterprise IT Automation Services handles directly 40-45% of the incoming problem tickets, thus freeing IT staff to concentrate on more complex issues.

Automation spans across various layers and processes of the IT stack, from creation to lifecycle management to the sunset of IT resources. Various tools and methodologies can be involved when introducing automation in the entire lifecycle of the IT stack.

Using orchestration to create patterns: *Orchestration* automates the creation of patterns at the onset of the creation of various IT stack patterns. These patterns then can be deployed on various hybrid IT platforms using orchestration. Several orchestration tools exist for various platforms. Note, however, that this paper does *not* address the orchestration topic.

What IBM Enterprise IT Automation Services can do for you

Enterprises of any size and across all industries rely on IT today more than ever. Internal and customer-facing applications serve as the heart of the business, and the underlying IT infrastructure is the backbone necessary for its survival. The typical IT infrastructure includes servers (operating systems), data storage, databases, middleware applications, and core networks that tie the components together. Optimizing and keeping these components running and in sync is the prerequisite for ensuring continuity in the business applications.

To achieve this goal, the following key attributes must be present:

- Resilient design, where if a component fails other components can pick up the work
- Preemptive and ongoing maintenance to provide diligent upkeep of software and hardware currency
- Autonomous resolution of issues in response to incidents, requests, insights, or schedules (which is the topic of this paper)

Irrespective of how good and resilient the IT infrastructure design is and how thorough and proactive the maintenance plan is, problems will occur. The dependency on IT operations staff to "keep the lights on" represents an exposure that still remains. Robust processes and staffing models do not eliminate the time elapsed as operations technicians respond to incidents or requests. The slightest delays for certain types of incidents, or in certain types of application, can have catastrophic impact. The remedy for this exposure is having autonomous monitoring and actions to minimize the delay between the time of the failure and the action taken to fix the problem.

IBM Enterprise IT Automation Services is a default capability within an IBM managed services scope. In addition, it is available as a stand-alone service offering, IBM Enterprise IT Automation Services, for deployment on non-IBM scope, for both new and existing clients. IBM has employed IBM Enterprise IT Automation Services capabilities across its traditional managed services portfolio. It is also available for use outside of these traditional environments as a service. At the time of writing, IBM Enterprise IT Automation Services has been integrated into hundreds of different enterprise IT environments worldwide, automating the response to millions of incidents on nearly 300,000 devices and counting. The rich best practices, reusable assets, and lessons learned from this growing global experience are the

core of the offering, to introduce value, efficiencies, and quality into an enterprise IT operation.

Keeping the lights on and gaining insights for improvement

IBM Enterprise IT Automation Services provides the ability to fix problems immediately as they occur. In the process, it tracks and logs everything it does, providing granular, transparent, and thorough details. This data can be analyzed to identify patterns and to provide insights to make continuous improvements.

Let's look at an example to illustrate the concepts associated with IBM Enterprise IT Automation Services.

A software bug in a customer fulfillment application or an unanticipated usage pattern floods the application's underlying data storage capacity, rendering its order processing capability useless. The first order of business is to immediately fix the problem so that the application keeps running. As an analogy, if a problem causes an assembly line to stop, the immediate need is to fix the issue as quickly as possible to make sure that the assembly line progresses again.

In this example, the remedy entails to allocate additional storage capacity, map it to the operating system image hosting the application, and resize the application's database tables to take advantage of this new capacity. These are all simple activities but are dependent on the availability of three different skill sets and their synchronized engagement. Most IT operations technicians have assets at their disposal to automate such fulfillment steps. However, the engagement of these technicians is required first, so that they can isolate the root cause, identify its associated automation capability (for example, a Shell script), and then invoke it. What if the problem happens when support staff is at the lowest numbers, or in the midst of peak demand? Even if the software bug occurs during optimal staff availability, the delays associated with engaging the right skills, diagnosing the issue, identifying the resolution, and fulfilling its remediation can leave the business exposed. Only instantaneous autonomous execution of the required remediation steps can contain this exposure.

To "keep the lights on," IBM Enterprise IT Automation Services from IBM GTS provides enterprise IT operations with the ability to take advantage of deterministic self-healing capabilities based on the business policies of the organization, best practices from IBM, or both. Deterministic self-healing capabilities guarantee that the virtual engineers will immediately fix the problem following the behavior that has been programmed based on runbooks, standard operating procedures (SOPs), and so on. This behavior is predictive and will never change unless it is reprogrammed.

To gain insights for improvements, the IBM Enterprise IT Automation Services capability includes thorough tracking and logging of everything it ever does and analytics applications to help identify new patterns and improvements to prevent the issues for taking place in the future. The analytics applications associated with IBM Enterprise IT Automation Services:

- Mine data from the environment to determine what can be automated next, that is, detect patterns that are meaningful for automation.
- Monitor the behavior of the automation. For example, detect a virtual engineer failure and identify its dependencies so it never fails again.
- Learn from IBM global experience. This analytics capability allows IBM clients to take advantage of the richness and breadth of IBM global experience, always the best of breed. Analytics applications help to identify patterns that have been successfully deployed on clients around the world and can be applied to a new client.

- Continuously monitor the environment of an organization to detect new patterns. The goal is not to stop at the first pattern identification but to continue looking for additional opportunities for improvements. At the same time, remove old patterns that are no longer used.
- Detect patterns to which virtual engineers are responding successfully. This information is important to address and fix the root cause even for those problems that are being handled quickly by automation without human intervention.

Cognitive analytics over massive historical data recommends preventive actions. Cognitive analytics is used to discover insights and produce recommendations but not to make changes. The organization keeps full control on the environment. Cognitive analytics can provide the following value:

- Delivers prioritization on what to tackle first.
- Identifies at risk application environments which helps to prevent high-impact incidents.
- Increases availability through targeted refreshes.

The enablement journey

IBM Enterprise IT Automation Services slots into the enterprise IT operations as a step in the support flows in lieu of human (technicians) engagements. Technicians are engaged only if automation fails to complete the task or if the triggering event is identified to be a problem, for example more than seven occurrences of the same incident take place on the same server in two days.

IBM Enterprise IT Automation Services integrates into an organization's environment without requiring any changes to tools or previous automation investments. It simply interfaces with key IT service management systems to automate use cases across the organization's configuration items (CIs). In scope CIs are platforms, database, middleware and groupware applications, storage devices, network devices, and some business applications.

The enablement journey consists of the following work streams:

- Bridging the IBM Enterprise IT Automation Services application into the organization's event management and IPC management systems, as shown in Figure 1 on page 6.

  This integration gives automation the chance to intercept actionable events for remote autonomous resolution, with no human intervention. If the enterprise has not invested in an event management system, such as IBM Tivoli® Netcool/OMNIbus Gateways or BMC ProactiveNet Performance Management, automation can be triggered by assigning incident tickets to a special queue in the IPC management system.
- Bridging IBM Enterprise IT Automation Services into the organization's IPC management system.

  This integration gives automation the chance to resolve and close tickets when appropriate and to escalate the tickets to humans when needed. Tickets are always updated with the detailed steps that were performed by automation and the results it encountered.
- Building a secure network tunnel into the enterprise to facilitate the connectivity of IBM Enterprise IT Automation Services into each CI in scope.

  A simple connectivity relay, represented as a *jump host* in Figure 1 on page 6, serves as the landing spot for IBM Enterprise IT Automation Services on the organization's network. With the appropriate enterprise network and firewall rules, IBM Enterprise IT Automation Services connects from the jump host securely into every CI within its scope as needed.

- Provisioning service user IDs on every CI for automation to use at run time.

  Automation credentials are provisioned in a similar fashion to the credentials of the human engineers supporting the environment. For example, standard login on UNIX systems with appropriate sudo rules. Security and entitlement credentials are assigned to a single person for storage in an encrypted password vault available for checkout only when IBM Enterprise IT Automation Services is invoked to fix an issue. IBM Enterprise IT Automation Services can interface with an organization's vaulting solution, such as CyberArk, in lieu of its own.

- Identifying the initial set of automation use cases.

  IBM starts the service by taking advantage of the standard list of automation patterns in the portfolio across the technologies in scope. Each automation is carefully reviewed for applicability and for compliance with the organization's policies. The behavior and definition of the automation is updated to account for the organization's SOPs (for example, the type of files that can be deleted when freeing up disk space on servers or the conditions under which a system service can be recycled).

Figure 1 provides a high-level view of how IBM Enterprise IT Automation Services integrates with the IT environment of an organization, enabling the virtual engineer to detect, diagnose, and either fix the problem or escalate it to a human engineer for resolution.

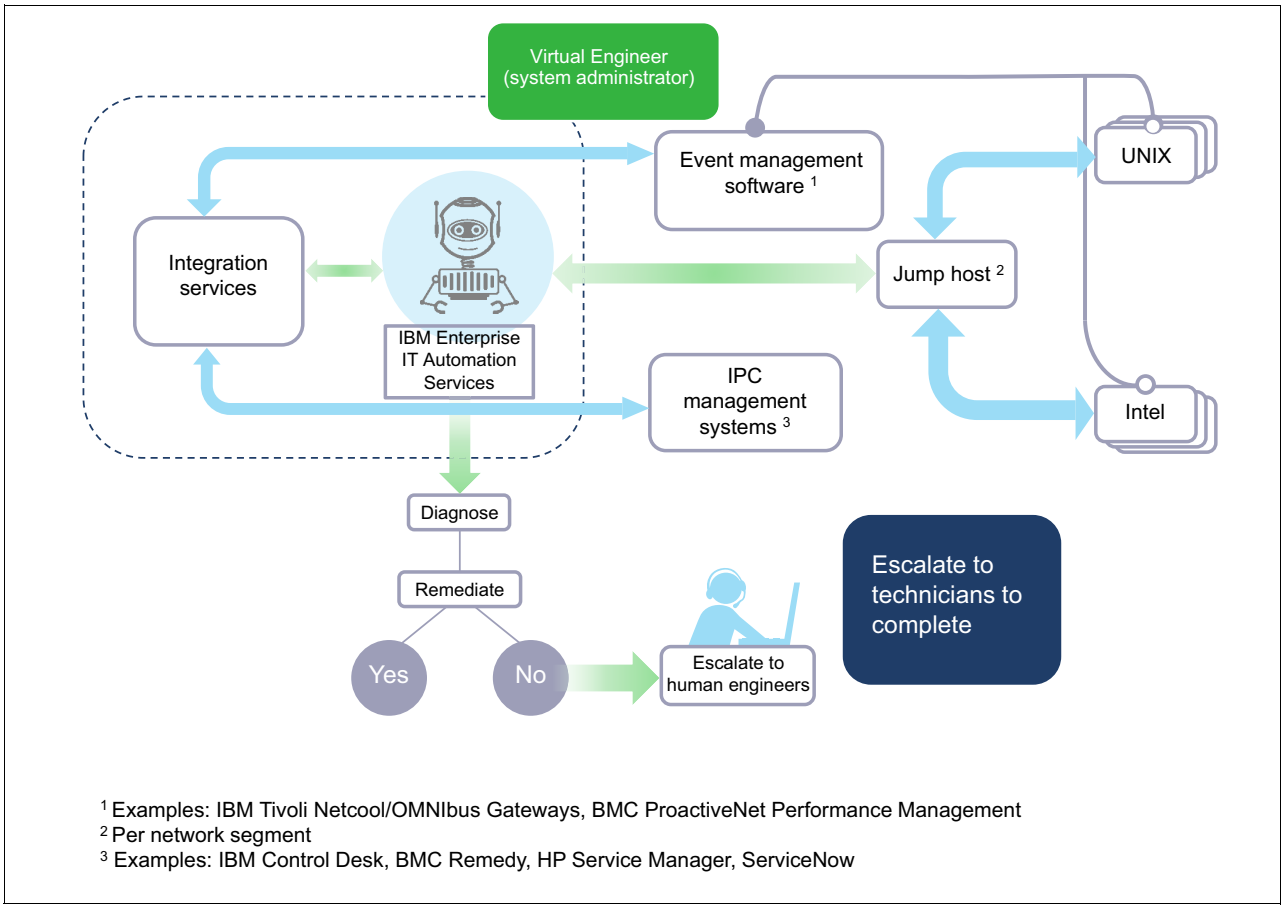

Figure 1 IBM Enterprise IT Automation Services integration into an organization's IT environment

In the example outlined in "Keeping the lights on and gaining insights for improvement" on page 4, an infrastructure monitoring agent, such as IBM Tivoli Monitoring or BMC Patrol, can detect the storage capacity exceeding a predefined utilization threshold and trigger an alert. Traditionally, the alert is translated into a ticket that is assigned to a technician to address the

problem. IBM Enterprise IT Automation Services, through its integration into the event management and IPC management systems, intercepts the alert instead of engaging a technician. If the enterprise policy and SOPs dictate that storage capacity must be made available by reducing the current utilization, IBM Enterprise IT Automation Services adheres to that policy to make more storage available. It deletes the types of files that are allowed to delete, clears the content of file system directories that are permitted to clear, and so on. If the policy allows for allocating additional storage, IBM Enterprise IT Automation Services will abide. Always connecting into systems securely and executing the steps defined by the organization's SOPs, acting exactly as technicians would under the same conditions.

In summary, the enablement journey is a one-time setup that integrates the IBM Enterprise IT Automation Services capabilities with the organization's IT environment and gets automation up and running in the environment. It is similar to adding a new systems administrator to support the environment. It does not transform the existing environment. The investment in tools and other automation capabilities is protected.

Continual service improvement

The one-time implementation journey represents simply the starting point. From this point on, there are virtually no limits for automation and improvements with the help of the analytics capabilities from IBM Enterprise IT Automation Services.

Automation growth opportunities are sought by using the following pillars:

- Volume by adding more CIs to the automation scope. By connecting automation into more end nodes, the rich of automation spans and more use cases are captured.
- Disciplines by introducing automation use cases to different functional disciplines (towers). The first automation use cases usually involve platforms (operating system support). Examples of these use cases include resetting processes and freeing up disk space. Next, the use cases move up the stack: databases, middleware applications, groupware (collaborative) applications, business applications, network devices, and firewalls. Practically anything and everything that can be interfaced with programmatically across the network and what must be done can be described as a standard operating procedure (SOP).
- Triggers by kicking off automation in response to not just events but other triggers, for example, service requests, change requests, analytics, nondeterministic cognitive capabilities, and so on. Start by capturing insights from incident alerts (something is broken and then automate the remediation to it). But now the ability exists to do the same based on user-initiated requests, approved changes, cognitive capabilities, analytics (for example, log analytics and intrusion detection). The only requirement is the ability to create simple API calls back into the automation framework.

An analytics-driven continual service improvement process is instated to propose new automation use cases and updates to those deployed already by using:

- Trends in the behavior of active (deployed) automation.
- New trends in the organization's environment, for example, new type of incidents, service requests and so on.
- Lessons learned from IBM global implementations.

The scope of IBM Enterprise IT Automation Services and its impact will continuously grow using this methodology. The net of its potential impact and reach is summarized by the following questions:

- Is the system on which automation should run reachable across the network?
- Is it possible to interact with the system programmatically by using APIs or shells?
- Is it possible to describe what must be done on the system as an SOP?

If the answer is “yes” to all of these questions, automation is applicable. With this philosophy and framework in place, we are limited only by our collective imagination!

Efficiencies and improvements vary from one implementation to another, based on the baselines and penetration rates. The persistent pattern, however, across all is an improvement in the form of reduced response and resolution time, improved quality of service, and a reduction in outages. IBM targets 40-60% automation of incident response. One North American client observed 90% reduction of severity 1 outages for the period following the deployment of dynamic automation capabilities when compared to historical metrics. Resolving lower severity incidents instantaneously, before they graduate into greater severity issues or outages, was the reason.

Service level and quality improvements

The immediate benefit of introducing IBM Enterprise IT Automation Services capabilities into IT operations is service level improvements. The instantaneous autonomous dispatching of virtual engineers to address issues as they occur is invaluable. IBM Enterprise IT Automation Services dramatically reduces the MTTR by removing the dependency on the human engineers to handle a large percentage of the issues. It also improves quality by removing the chances for human error in the remediation of the problems that virtual engineers are programmed to fix.

Even if service is not fully restored by automation, invaluable insights, in the form of first failure data capture (FFDC), tremendously enrich the subsequent response of technicians as they diagnose and remediate the condition. Often times the delays associated with the response of the technicians can mask artifacts that are crucial for root cause determination, resulting in elongated outages and greater business impact.

Greater infrastructure availability has been observed following IBM Enterprise IT Automation Services deployments. The rapid resolution to incidents, combined with the scalability of virtual engineers and elimination of human errors, is to credit. Gone are the days when a technician applies a change to the “wrong server”!

Making the IT staff more efficient and effective

IBM Enterprise IT Automation Services provides enterprises with the simple ability to do more with less. A quantifiable return on the investment (ROI) can be calculated depending on the current baselines and the potential automation scope. An indirect, and inevitable, cost benefit is in the form of improved service levels and greater availability.

Another indirect, and also inevitable, soft benefit revolves around IT operations resources. Technicians are no longer distracted by a large number of simple severity 3 and 4 issues and they can concentrate on fixing the complex severity 1 and 2 problems more effectively. Reductions in operations personnel attrition and improvement in morale are observed across global IBM Enterprise IT Automation Services deployments. Technicians are freed to

contribute to higher value tasks and become less involved in reacting to daily (and after hours) fires.

Expanding the horizons of automation through integration

Although extremely effective, with significant service level, quality improvements, and cost reduction, IBM Enterprise IT Automation Services remains a deterministic automation capability that is based on runbooks and SOPs. Its non-transformative, low touch implementation nature allows enterprises to reap the benefits of automation with little to no disruptions to the IT infrastructure and operations. The enterprise's investment in tools and other automation capabilities is protected. In two to four months, and with simple systems integration and access, an enterprise can begin injecting virtual engineers into its IT operations for specific deterministic use cases that can grow in rapid fashion.

Additionally, this enablement journey represents the commencement of a continuum of capabilities playing in concert. Insights from IBM capabilities or tools from other vendors can be seamlessly integrated into dynamic automation for autonomous response when needed. For example, anomalies detected by IBM Operations Analytics - Log Analysis have been integrated into IBM Enterprise IT Automation Services for preemptive autonomous resolution of brewing problems ahead of their manifestation as outages at the operating system or application level. Decisions made by the IBM Watson™ Agent Assist application have resulted in autonomous fulfillment of infrastructure tasks by dynamic automation when deemed by Watson as the resolution to a problem. In a similar fashion, insights from an intrusion detection tool (from IBM or other vendors) can be captured for instantaneous actions of the virtual engineers to contain the damage and remediate.

Dynamic automation capabilities represent the foundation and building blocks of a world of possibilities on the journey to a cognitive data center and IT operations.

Auditing, security, and compliance adherence

IBM Enterprise IT Automation Services includes extensive audit logging capabilities. All actions taken, including on route to the IPcenter infrastructure, automations run, and activities performed are captured and logged. This level of activity collation and logging goes beyond anything currently in place to track and monitor the behavior of human engineers.

IBM Enterprise IT Automation Services is security and compliance focused. It takes a secure and compliant approach to automation which meets these criteria as thoroughly as the manual approaches it is replacing. IBM Enterprise IT Automation Services is designed to work with the required topology segregation between the IBM and the client's networks, to manage existing application, network, and software.

IBM Enterprise IT Automation Services reduces human access. Authority is provided instead to the virtual engineer which operates precisely and repetitively doing exactly what it is programmed to do and nothing more.

Summary

Today's world of hybrid IT needs IBM Enterprise IT Automation Services to:

- Drive better business outcomes

- Improve quality of service
- Act with increased speed throughout the enterprise

IBM Global Technology Services can help organizations worldwide to implement IBM Enterprise IT Automation Services solutions in their production, development, and test environments to achieve these outcomes.

For more information about how IBM Enterprise IT Automation Services can help your organization, contact the offering manager:

Darcy Bufalini
Executive Solution Architect
bufalini@us.ibm.com

Other resources for more information

- Automation services for enterprise IT form IBM

  http://www.ibm.com/services/us/en/it-services/systems/enterprise-it-automation/
- How It Works: Dynamic Automation

  https://www.youtube.com/watch?v=mw4aV7PMH_0
- IBM Enterprise IT Automation Services announcement letter
  - US

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Authors

This guide was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO).

Firas Bouz is the Director of Complex Solutions in IBM Global Technology Services, United States. Firas leads the Technical Solutions Management team in creating compelling, value

add, cost effective, and innovative services solutions for IBM clients. Firas holds Bachelor and Master of Science degrees in Computer Science. He has held numerous Robotics Research, Software Engineering, and Application Architecture positions in and outside of IBM. He has seven patent filings and is the coauthor of three IBM publications.

Hemang Dave is the Chief Innovation Officer for IBM Global Technology Services in North America. In his current role, Hemang is responsible for driving pro-active innovation that matters to IBM clients. Over the past three years, he has been instrumental in driving both innovation for the client (IT and services-centric innovation) and innovation with the client (business innovation) to over 80 multinational clients. Hemang has also led the culture of innovation as an IBM initiative. Hemang graduated from the University of Texas at Austin, majoring in Computer Science with a minor in Mathematics. Hemang has held several leadership positions both within IBM and outside of IBM.

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Rakesh Gulati
IBM Enterprise IT Automation Services Global Portfolio Marketing Manager

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