A Full-Domain Intelligent Operation and Maintenance Platform System Postprint

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Abstract

In the Internet+ era, technologies in the IT domain have developed rapidly, particularly the technological innovations in emerging services such as cloud computing, mobile internet, Internet of Things, big data, and artificial intelligence, which have brought greater opportunities and challenges to IT operations. Data center operations are evolving from passive IT management toward proactive IT service management and business value management. End-to-end business monitoring, flexible and rapid service provisioning, and global policy-based resource scheduling have become key trends for IT operations platforms. In this context, there is a need for a business-scenario-oriented, business-service-focused operations approach that provides integrated monitoring of all-domain IT resources and automated orchestration capabilities to comprehensively support enterprise IT business operations.

Full Text

Preamble

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Abstract: In the Internet+ era, IT technologies have developed rapidly, particularly with innovations in emerging services such as cloud computing, mobile internet, IoT, big data, and artificial intelligence, which have brought both opportunities and challenges to IT operations. Data center operations are evolving from passive IT management toward proactive IT service management and business value management. End-to-end business monitoring, flexible and rapid service provisioning, and global policy-based resource scheduling have become key trends for IT operations platforms. In this context, a business-scenario-oriented

and service-targeted operations approach is required, providing unified monitoring and automated orchestration for all-domain IT resources to comprehensively support enterprise IT business operations.

Keywords: cloud computing; IT operations; configuration management database; IT service management; ITIL; DevOps

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1. Challenges in the New IT Operations Landscape

The rapid development of IT technologies in the Internet+ era—particularly cloud computing, big data, IoT, smart cities, and mobile internet—has continuously driven the advancement of IT operations management objectives, scope, and depth. To adapt to new operations management requirements and support agile, stable, and innovative business development, there is an urgent need for an intelligent operations platform that can integrate "cloud-network-edge" resources across all domains and provide unified management and monitoring.

This transformation presents numerous challenges from both methodological and technical perspectives:

First, hardware and software resources are becoming increasingly complex, encompassing servers, mainframes, storage, switches, routers, FC switches, firewalls, IPS, load balancers, virtual machines, containers, cloud computing, SDN, NFV, various operating systems, databases, middleware, terminals, and numerous business applications. Unified management of these diverse resources represents a critical challenge for IT operations.

Second, while new technologies have enabled richer business scenarios, fragmented and siloed IT resource management modules make it difficult to diagnose issues when problems arise. Existing IT operations tools struggle to provide end-to-end intelligent analysis capabilities oriented toward business services, hindering rapid problem identification and resolution.

Third, as digital transformation progresses across industries, IT services are proliferating. Efficient and agile business operations have become essential for competitive advantage. The key challenge lies in bridging resource allocation, full-stack monitoring, automation, process collaboration, and data analysis across hybrid architectures to enhance IT operations efficiency.

In summary, as the core of enterprise IT operations, the operations platform must provide comprehensive management capabilities for various data center resources, enabling unified IT resource operations; deliver end-to-end business

monitoring capabilities to perceive business status and application experience while rapidly identifying root causes; and offer efficient process management and flexible automated operations tools to enhance DevOps agile delivery capabilities, achieving end-to-end business provisioning and operational deployment.

2. Overall Requirements for a Global Intelligent Operations Platform

2.1 Integrated Resource Monitoring

The platform must provide unified management and monitoring capabilities for all-domain resources, covering environmental systems, networks, security, computing, storage, virtualization, containers, cloud resources, and terminals across the entire IT architecture. It should enable end-to-end operations monitoring from application level down to chip level.

2.2 Intelligent Business Operations

The platform should provide a vertical business perspective, establishing logical connections from business services to underlying resources. Through data correlation, it must deliver integrated comprehensive analysis capabilities for intuitive business status monitoring and rapid fault localization. Additionally, the platform should leverage a business message bus and automated scheduling engine to achieve intelligent linkage and automatic closed-loop resolution of scenario-specific problems across its monitoring modules, process modules, and automation modules.

2.3 Full-Scenario Coverage On-Premises and Cloud

The management scope should cover integrated infrastructure resources for applications and operations organizations throughout the entire business flow and all operations scenarios, with deep analysis of industry-specific operations requirements and scenario-based needs.

2.4 Sustainable Extensibility

The platform should employ a microservices architecture to ensure powerful extensibility, enabling elastic scaling of platform functions, processing capabilities, and management capacity. Simultaneously, through open interfaces and an integration bus, it should achieve integrated management with various business systems.

2.5 Visualization

The platform should provide high-resolution customized operational display views that showcase business logic and status, offering role-based views for applications, networks, and devices.

3. Platform Architecture

As illustrated, the global intelligent operations platform should comprise three layers: a resource management layer, a business service layer, and a presentation layer.

The resource management layer includes the Integrated Infrastructure Operations Management (IOM) and Automation Orchestration Management (AOM) modules. These domain-related components implement management and operations characteristics aligned with their technical architectures through distributed management components, ensuring stable and healthy IT professional resources to meet business requirements and support operations.

The business service layer includes the Business Service Management (BSM), Configuration Management Database (CMDB), and IT Service Management (ITSM) modules. Based on interfaces from the resource management layer, this layer conducts comprehensive business analysis, process management, and service quality analysis, providing unified full-lifecycle integrated operations capabilities.

The presentation layer customizes operations monitoring scenarios according to different business perspectives, integrates with various business systems through an integration bus, constructs business correlation relationships, and provides multiple business operation interfaces through different views. Through scenario-based models, it deeply reflects operations characteristics across different business lines and domains, eliminating differences, improving operations efficiency, and enhancing user experience.

3.1 IOM Management Module (Infrastructure Operations Management)

IOM serves as the cornerstone of the intelligent operations platform, providing comprehensive IT operations monitoring. With corresponding components, it can cover: facility monitoring, network monitoring, server and storage monitoring, application monitoring, mobile internet monitoring, and big data monitoring, achieving "cloud-network-edge" resource monitoring across all domains.

IOM should support monitoring of mainstream vendors' equipment and applications, providing comprehensive surveillance of infrastructure operations. It should support the following management functions: - Data center power and environment equipment monitoring - Network monitoring - Server in-band and out-of-band monitoring - Storage monitoring - VMware, Hyper-V, CAS, KVM, and PowerVM monitoring - Docker and Kubernetes monitoring - Big data monitoring - Database, middleware, and application-level monitoring, displaying service invocation relationships - Wireless network monitoring with precise location capabilities

3.2 AOM Management Module (Automation Orchestration Management)

Operations automation is a critical means to improve operations efficiency and agility, representing the necessary path for IT operations management evolution. The Automation Orchestration Engine (AOM) enables rapid composition of automated operations scenarios through intuitive drag-and-drop configuration, facilitating quick business automation implementation. It supports operations automation scenarios for networks, servers, cloud and virtualization, databases, and middleware, enabling rapid application deployment, patch management, hybrid cloud, disaster recovery, and user management.

The orchestration engine supports heterogeneous device automation integration, providing comprehensive automated lifecycle management for servers, virtualization, storage, networks, and applications. It also integrates with Jenkins and Docker to implement complete CI/CD automation pipelines.

AOM should support the following functions: - X86 bare-metal operating system installation - VMware/HyperV/KVM resource scheduling - Cloud-native application resource scheduling - Deployment and control of mainstream databases and middleware - Automated application deployment - Configuration file backup and change detection for operating systems, applications, and networks - Patch management for Linux and Windows - Network and application business inspection - Emergency/disaster recovery automation - Unified operating system user management - Batch script execution and configuration push for servers, storage, and networks

3.3 CMDB Management Module (Configuration Management Database)

IT asset and configuration management (CMDB) is a centralized, integrated information management platform for assets and configurations. Through CMDB, operations engineers can globally grasp enterprise IT asset distribution, status, relationships between assets and configuration items, inventory, and supplier information, enabling full-lifecycle management of assets and configuration items and unified, effective management of all IT resources, spare parts, and configuration item information.

CMDB can also serve components such as ITSM and IOM by providing configuration information to support resource updates, fault localization, and change impact analysis.

The CMDB module should support the following functions: - Graphical configuration item and relationship modeling, supporting bulk CMDB operations - Configuration baseline control - Asset statistics and reporting - Asset change auditing - Change impact analysis - Assisted fault localization

3.4 BSM Management Module (Business Service Management)

Enterprise IT business systems consist of business applications and supporting IT infrastructure (for example, an ERP system comprises operating systems, Oracle databases, WebSphere middleware, ERP software, and associated servers, storage, and network connectivity). BSM focuses on IT business services, establishing connections between IT services and IT infrastructure to map IT resources to the business services they support. It provides comprehensive monitoring, correlation, and statistics, delivering business service quality health analysis, risk prediction, and comprehensive assessment.

The BSM module should support the following functions: - Business service quality monitoring - Business capacity management - Business health inspection and compliance - Business event comprehensive analysis - Business impact analysis - Global security operations

3.5 IT Service Management Module ITSM (IT Service Management)

As a critical tool for implementing IT management consulting, the IT Service Management (ITSM) component is business-centered and process-oriented. ITSM implements core processes including incident management, problem management, change management, configuration management, and release management, based on establishing a comprehensive and correlated business resource configuration management database. It achieves association and integration between CMDB data items and core processes, using standardized process management methods to institutionalize every rule and regulation involved in operations service management, transforming previously complex and disorderly operations management work into standardized and orderly processes.

The ITSM service module should support: - Process design - Service request management - Service level management - Duty management - Incident and problem management - Change and release management - Knowledge management - Project management

3.6 CVC Unified Operations Portal (Customized Visualization Center)

As enterprise IT business heterogeneity increases, IT support systems are multiplying. In the operations domain alone, there may be multiple platforms for network monitoring, server monitoring, ITSM, visualization, cloud management, and automation. These platforms are often fragmented, requiring repeated logins to multiple systems and preventing maximum intuitive information exchange.

A unified visualization system is therefore needed to implement unified user login, user management, and permission management. Through user views and scenario views, it can deeply integrate into business usage scenarios, simplify daily operations for engineers, and improve operations efficiency.

CVC should support the following capabilities: - Single sign-on and portal integration - Professional view design for different roles - Professional views and report statistical analysis for different industry business scenarios - Large-screen view customization - Lightweight operations through WeChat and mobile apps - Remote collaborative maintenance services and remote expert support

Conclusion

A global intelligent operations management platform covering data center facilities, infrastructure, networks, data, applications, and security—with visualization, automation, and process capabilities—can effectively reduce inspection pressure on duty personnel, provide managers with a comprehensive visual management platform, proactively identify defects in business operation cycles, and shift from reactive firefighting to proactive prevention. This saves data center operations costs and achieves automated, intelligent, and scientific operations from business to equipment to edge.

References: [1] Li Ying, Deng Xiang, Wang Zicong, Zhang Jingzhen. Practical Exploration of Intelligent Network Operations Management Platforms [J]. Information System Engineering, 2019(12): 64-65. [2] Men Peiyu. Research and Implementation of Intelligent Network Operations Management Platforms [J]. China Management Informationization, 2017(02): 62-63.

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Note: Figure translations are in progress. See original paper for figures.