

A Study on System and Application Performance Monitoring System Using Mass Processing Engine(ElasticSearch)

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대량 처리 엔진(ElasticSearch)을 이용한 시스템 및 어플리케이션 성능 모니터링 시스템에 관한 연구

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Abstract Infrastructure is rapidly growing as Internet business grows with the latest IT technologies such as IoT, BigData, and AI. However, in most companies, a limited number of people need to manage a lot of hardware and software. Therefore, Polestar Enterprise Management System(PEMS) is applied to monitor the system operation status, IT service and key KPI monitoring. Real-time monitor screening prevents system malfunctions and quick response. With PEMS, you can see configuration information related to IT hardware and software at a glance, and monitor performance throughout the entire end-to-end period to see when problems occur in real time.

Key Words : IoT(Internet of Things), BigData, AI(Artificial Intelligence), Performance Monitoring System, Polestar Enterprise Management System(PEMS), NoSQL(Non Structured Query Language)

요 약 사물인터넷(IoT), 빅데이터(BigData) 및 인공지능(AI)과 같은 최신 IT 기술로 인터넷 비즈니스가 성장함에 따라 인프라가 빠르게 성장하고 있습니다. 그러나 대부분의 회사에서는 제한된 수의 사람들이 많은 하드웨어와 소프트웨어를 관리해야 합니다. 따라서 시스템 운영 상태, IT 서비스 및 주요 핵심성과지표(KPI, Key Performance Indicator)를 모니터링하기 위한 PEMS (Polestar Enterprise Management System)을 적용합니다. 실시간 모니터 스크리닝은 시스템 오작동 및 빠른 응답을 방지합니다. PEMS를 사용하면 IT 하드웨어 및 소프트웨어와 관련된 구성 정보를 한눈에 볼 수 있으며 전체 종단 간 성능을 모니터링하여 문제가 실시간으로 발생하는 시기를 확인할 수 있습니다.

주제어 : IoT, BigData, AI(Artificial Intelligence), Performance Monitoring System, Polestar Enterprise Management System(PEMS), NoSQL

1. Introduction

Infrastructure is rapidly growing as Internet business grows with the latest IT technologies

such as IoT[1], BigData[2], and AI[3]. However, in most companies, a limited number of people need to manage a lot of hardware and software.

In many industries, the necessity of an integrated

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monitoring system using various communication protocols is gradually increasing and research on this is continuing.[4]

In addition, solutions that manage IT infrastructure are designed to provide as much detail and variety of information as possible, resulting in too much information being chased by administrators. Systems and application performance monitoring systems have emerged to address these challenges for IT managers. It reconfigures scattered information into a single screen, and shows the IT manager at a glance an integrated view of the information they need.

In addition, it provides effective management environment by informing the status of the whole infrastructure and the occurrence of faults in a timely manner so that faults can be handled. Because of this, system application performance monitoring systems[5] are becoming an integral part of large data centers.

Targets which will be collected. We can have a thorough grasp of Application Server's whole system through S/W architecture that describes the organic relationship between application's operation conditions, functional module and external library.

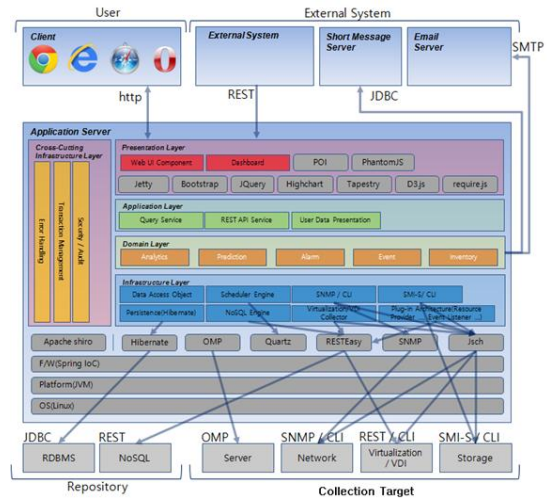


Fig. 1. S/W The map of whole architecture

2. Solution

2.1 Definition

The "POLESTAR Enterprise Management System (PEMS)"[6], a system and application performance monitoring system, provides real-time Performance monitoring for the infrastructure resources and applications to be managed and integrates, analyzes and manages many events occurring in various heterogeneous infrastructures.

System administrators intuitively grasp and manage the overall operation status of the system and analyze the factors of performance deterioration to prevent trouble and quick action.

2.2 S/W Architecture whole map

As shown in Fig. 1, S/W architecture whole map is for an application server[7] consisting five physical parts that are User(Client), External System, Application Server, Repository,

2.3 Application Server system map

The Application Server system map is shown in Table 1.

Table 1. Application Server system map

Category	Description
User	Demonstrate user environment. Users can access to this system with web browser featuring HTML5[8] called modern browser. No installations of other Device Plug-ins are required. The browsers offering stable UI of this system are Chrome(recommended), IE(above 10), Safari, Opera.
External System	External linkage systems are short message server, e-mail server, and an external system which can receive data managed by this system(system, performance, alarm information). The system such as a portal site in the data centre and the integration server of North Bound, for instance, receives data through protocol considering this system as a collection server.
Repository	Define Application Server's storing space featuring JDBC[9] and NoSQL[10]
Collection Target	The objects managed by this systems. The objects of managing are Server, Network, Storage, Virtualization, VDI.[11] Most objects are collecting information through self-support management protocol. However, in terms of data collection, servers employ this system's agent for collecting detailed information.

Application Server	This is a Spring-based web application server that is advanced application featuring the services and function this system offers. This server includes a library for interfacing with collection target and includes various UI component to implement Presentation Layer.
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As shown in Fig. 2, Application Server consists of 5 layers as follows.

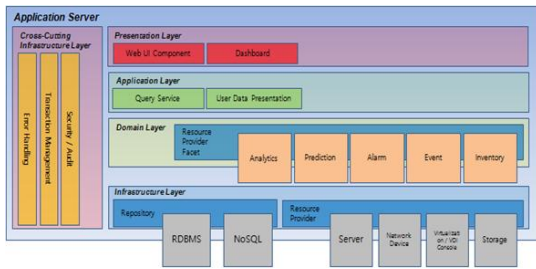


Fig. 2. Application Server system map

2.3.1 Infrastructure Layer

This is a layer doing normalisation and saving for original data. This layer is divided into Repository and Resource Provider, and respectively doing saving and collecting / normalisation. Repository part is hybrid type offering RDBMS[12] for quick responses and NoSQL for managing the mass volume of data.

Resource Provider part consists of a plug-in collecting modules, offering Server, Network, Virtualization, VDI, storage plug-in which can give users options of installation depending on user environment for optimisation through getting rid of unnecessary plug-ins.

- Resource Provider

This Includes architectures which can be plug-in with Collective modules represented by Resource Provider and Event Listener such as Trap, Syslog. The mutual interface between Provider and Domain Layer work through Resource Provider Facet.

- Repository

Data requiring transaction process such as system information is saved in RDBMS, but a mass volume of data and a series of event data are saved in NoSQL DB storing space.

2.3.2 Cross-Cutting Infrastructure Layer

The security which should be applicable to the all layers (ACL, Audit) and a transaction management feature are implemented by AOP(Aspect Oriented Programming)[13] technology.

This AOP technology facilitates to add, modify, eliminate features which can be commonly applicable without the amendment for existing layers.

2.3.3 Domain Layer

Forms Alarm, Analytics and Prediction information Based on Inventory, measurement data and event data collected from collection target and saves them in Repository to generate data for Application Layer and Presentation Layer.

This layer is playing a role in the heart of application level in Polestar and includes domain information and business objects. This layer forms analytics, prediction, event, alarm, inventory data with the data collected and normalised from infrastructure layer, and delivers them to presentation layer through applications layer. Moreover, the layer generates valuable information to users with collected data and delivers to the user upon requisition.

The function of domain layer is to the plug-in by functional unit through Pluggable Facet Interface. Domain layer offers this feature through Facet interface once Resource provider in infrastructure layer generates the Facet which will be used in the domain layer.

2.3.4 Applications Layer

This is a thin layer controlling application's activation. Business logics are not included. The status of the subject of a business is not saved but it contains processing status of applications.

- Query Services

Services for data queries from user requisition are included. Not only from a domain, from collecting information from multitude domains like reporting query. Elastic Search[14] Query Service, PQL(Polestar Query Language) Query Service, Reporting Service involved.

- User Data Persistence

The subject which temporarily saves the UI information session that users have set in the web page.

2.3.5 Presentation Layer

The user interface(UI) is offered by Polestar Web UI and Dashboard.

2.4 Main Functions

As shown in Figure 3, accurate and detailed analysis is possible in case of failure detection and future failure analysis by collecting and monitoring performance indicators of core components of infrastructure resources and applications in real time.



Fig. 3. Real-time monitoring in seconds

As shown in Fig. 3, the NoSQL-based mass processing engine (ElasticSearch) can be applied to process large amounts of data accumulated in statistics, event logs, and real-time performance in real time.

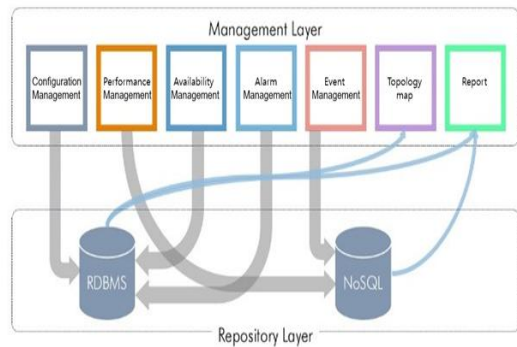


Fig. 4. Big data processing analysis

As shown in Fig. 4, real-time monitoring and trend analysis of resource status and performance information is performed through the monitoring tab of each resource and the top-level performance statistics menu. Detailed resource performance analysis is possible through inquiry for specific period.



Fig. 5. Performance statistics

Analysis of resources as shown in Figure. 5, it is possible to compare the log and occurrence frequency before and after the occurrence of the service fault alarm generated by the server, and to analyze the cause of the fault by linkage analysis through the correlation analysis HeatMap of the performance statistics function.

3. Application of system

A monitor screening system has been established for monitoring whole system

including controlling infrastructure, systematic monitoring, user section, WPM,[15] DB for to the systems of L conglomerate's subsidiaries and partner companies.

3.1 Key features of the employed system

- Integrate and synchronise infrastructure control tools operated separately in a flow.
- Reinterpretation both IT infrastructure and IT service in the context of a business
- Real-time error monitoring for Server / Network / DB / WAS / Applications
- Efficient operations by unified administration and capacity administration for virtual machines
- Data centre operations Automation under multi-platform environment such as Mainframe, Unix

3.2 Impact of establishing the system

- Monitoring the status of system, IT service, Key KPI
- Turn system monitoring which has been set for respective resources into the one from the view of managers.
- Make it easy to identify problems by End-to-End performance monitoring (User-Network-WAS-DB, all section)



Fig. 6. Established system's display in L corporate

4. Conclusion

PEMS enables to know the configuration information related to IT hardware and software at a glance, and enables monitoring performance over the entire end-to-end period, so that it can be grasped in real time when a trouble occurs.

This will be an effective system management tool for managing large data center infrastructure resources.

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