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Troubleshooting Patterns
장애 패턴 분석 및 대응방법

KHAN [apm] – Monitoring 기능

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KHAN [apm] - 클라우드 지원 아키텍처

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KHAN [apm] = Ah ! Provisioning + Monitoring

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전문가 수준의 구성 품질 ❯ 장애 사전 예방 ❯ 성능 보장 ❯ 안정된 운영

설치	구성	튜닝	모니터링	진단/조치
•리눅스만 설치되어 있으면 WAS 와 웹서버 등 웹시스템 구축에 필요한 소프트웨어를 자동설치	•WAS 클러스터링, 데이터그리드 , 운영 스크립트 등 난이도 높은 구성을 지원 •개발자/관리자를 위한 운영 가이드 자동 생성	•전문가 수준의 튜닝 (리눅스 커널, 웹서버/ Java/WAS 튜닝)	•시스템과 OS 에 대한 모니터링 뿐만 아니라 Java 나 WAS 까지 포괄적으로 지원 • Openshift/Docker 컨테이너 모니터링	•Threaddump , 네트워크 상태, 웹서버 상태를 분석할 수 있는 진단 도구 제공 • OS/Container 시스템에 대한 연관 분석

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KHAN [apm] Use Cases

KHAN [apm]

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미들웨어 트러블 슈팅의 유형

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- 미들웨어 기반 서비스에서 흔히 발생하는 문제의 유형에 대해서 실제 문제를 분석한 사례를 통해 원인 및 해결 방법을 파악합니다.

Server Slowdown 현상

서버가 갑자기 느려지는 현상에 대한 원인 분석 방법, 대부분 스레드 덤프 분석을 활용

서버 환경 설정 이슈

서버의 환경 설정값 때문에 발생하는 다양한 문제에 대한 원인 분석

서비스 품질 / 오류 모니터링

사용자가 서비스에 만족하는지 서비스 모니터링, 사용자가 겪는 서비스 오류 모니터링

SQL 쿼리 이슈

SQL 쿼리가 느리거나, 쿼리 오류가 발생할 때 원인 분석

JVM 메모리 Leak

JVM 메모리가 부족하여 발생하는 문제의 원인 분석 방법

Hacking 공격 분석

서비스를 공격하는 해커들의 공격 분석

시스템 메모리 등 자원 고갈

시스템 메모리가 부족할 때 원인 분석

Java Daemon 모니터링

WAS 뿐만 아니라 Java Daemon에 대한 모니터링

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미들웨어 트러블 슈팅의 실제 Use Cases

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- 미들웨어 기반 서비스에서 흔히 발생하는 문제의 유형에 대해서 실제 문제를 분석한 사례를 통해 원인 및 해결 방법을 파악합니다.

Server Slowdown 현상

#1 웹사이트 멈춤 현상
#2 응답속도 느려짐
#3 #20 느려져 스레드 덤프분석
#13 인스턴스 하나만 문제 발생

서비스 품질 / 오류 모니터링

#4 서비스 품질/오류모니터링
#5 #6 애플리케이션 오류 모니터링

JVM 메모리 Leak

#7 웹사이트 지연현상
#8 Native Thread OOM 오류

시스템 메모리 등 자원 고갈

#9 시스템 메모리 자원 고갈
#10 시스템 TCP 자원 고갈

서버 환경 설정 이슈

#11 아파치 웹서버 다운
#12 쿼리는 빠르지만, 수행시간이 느림

SQL 쿼리 이슈

#14 쿼리가 느린 경우
#15 대용량 쿼리로 메모리 이슈
#16 쿼리가 느린 경우
#17 데이터베이스 관련 다양한 오류들

Hacking 공격 분석

#18 해킹 시도 분석

Java Daemon 모니터링

#19 Java 데몬 사용자 메소드 수행시간 측정

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#1
웹사이트 멈춤 현상

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#1 – 웹사이트가 멈추었습니다.

Server Slowdown 현상

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1 Queue 에 224 개 쌓임

2 www01 인스턴스에 쌓임

3 APDEX 지수 50% 이하

4 평균응답시간 136 초

5 JVM Heap Usage 가 거의 100%

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#1 – JVM Heap Memory

Server Slowdown 현상

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- 15일간의 메모리 사용량의 추세를 분석하면, 아래와 같이 점차적으로 증가
- JVM Full GC에 걸리는 시간이 점차적으로 늘어나는 상황

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#1 – JVM Heap Memory

Server Slowdown 현상

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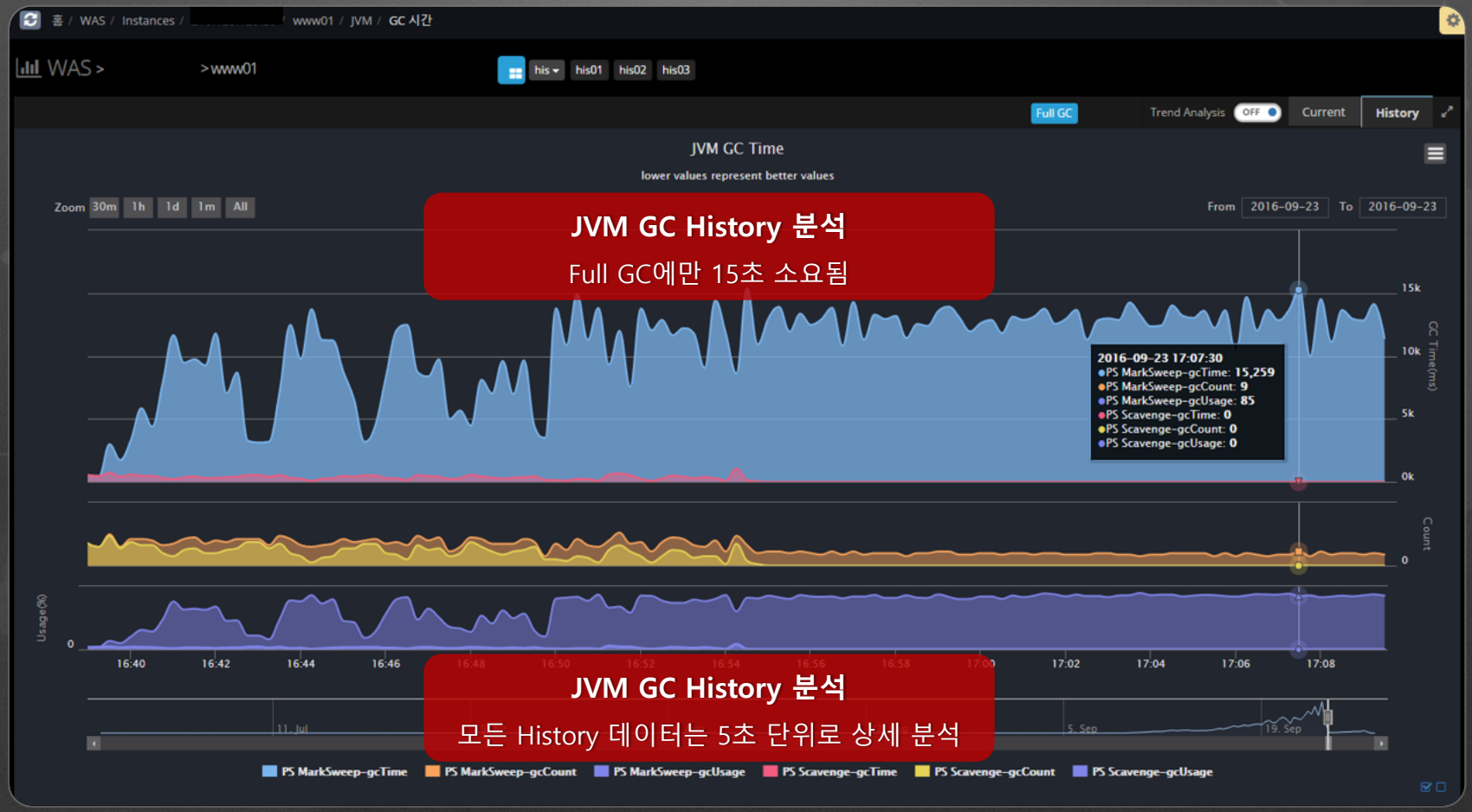
- 장애시점에서는 JVM에서 Full GC만 발생하고 있어, 다른 요청이 전혀 처리되지 못하는 상황으로 Full GC에 만 10~15초 가량 소요.



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#1 원인 - Tomcat의 TagHandlerPool

Server Slowdown 현상

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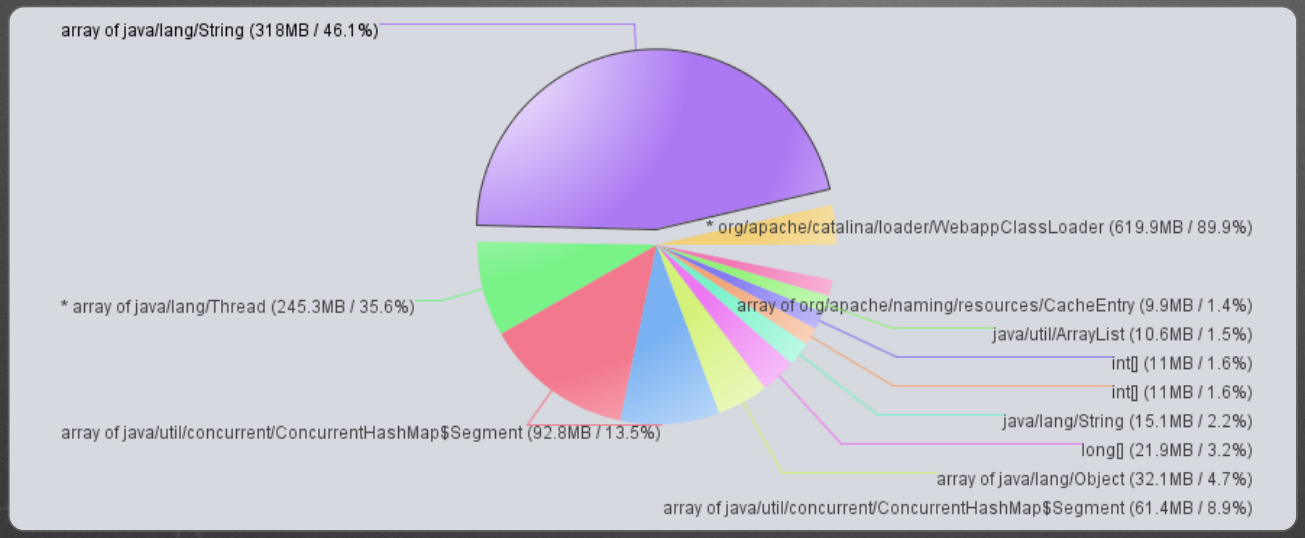
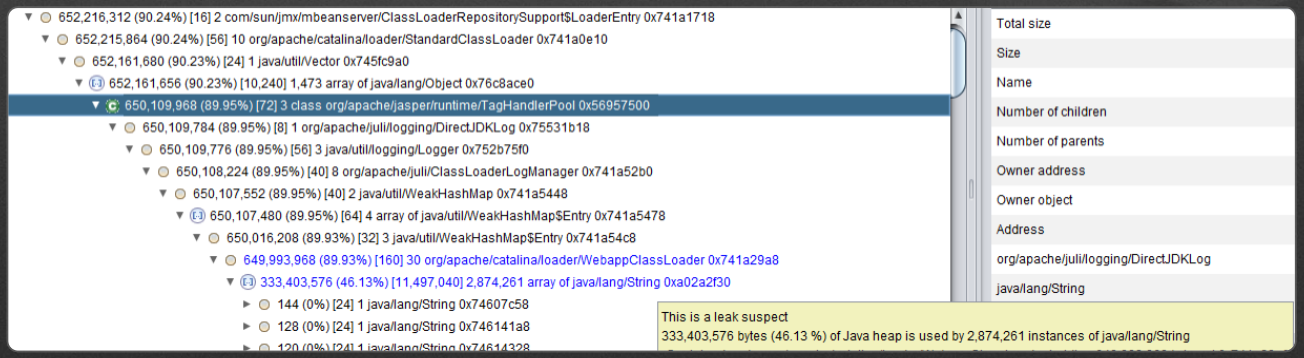
- 88.95%의 메모리를 Tomcat의 TagHandlerPool에서 점유하고 있음.
- Tomcat Logger에서 사용하는 287만개의 String 객체가 46.13%의 메모리를 점유





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#2
응답속도가 갑자기 늦어짐

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#2 – Pending Transaction이 급증

Server Slowdown 현상

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1 거의 모든 인스턴스에서 Queue 에 쌓임

2 처리시간이 오래 걸린 요청들이 많은 상태임

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#2 - 인스턴스의 스레드 덤프 분석

Server Slowdown 현상

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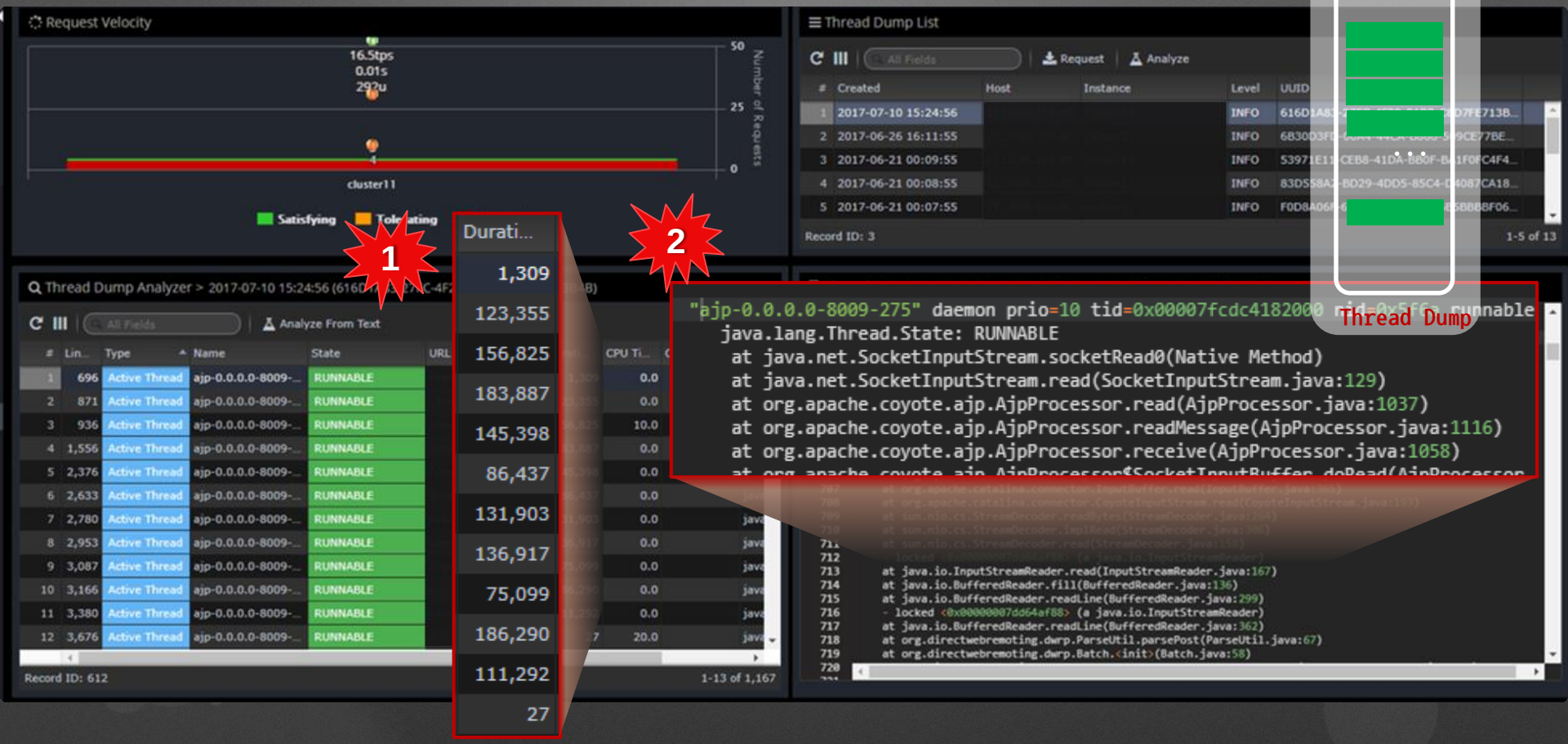

1
- 해당 인스턴스의 스레드 덤프를 분석
- 현재 수행중인 스레드가 최대 180초 가량 수행중인 상태

2
- 지연되고 있는 트랜잭션(Active Thread)는 대부분 AJP
- 데이터를 읽고 있는 상태(socketRead)임

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#3– 시스템 점검 보고서에서 Native 적용 권장

Server Slowdown 현상

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1

Native 사용 점검

점검 항목	권장값	설명
Tomcat Native Component 적용여부	적용 안됨	lib 디렉토리에 파일들이 설치되어 있는지 확인한다.

※ APR(Apache Portable Runtime)가 설치되면 빠른 성능을 낼 수 있다.

5.2 Thread Pool 점검

파라미터	권장값	현재 설정값	설명
AJP Connector	maxThread=250	기본값 200	AJP 로 사용되는 스레드 풀의 개수
HTTP Connector	maxThread=250	기본값 200	HTTP 연결시 사용되는 스레드 풀의 개수

- 운영환경에서의 처리량에 따라 스레드 풀의 개수를 설정한다.

$SERVER_NAME/conf/server.xml

```
<Connector protocol="HTTP/1.1" port="8080" address="${jboss.bind.address}"
           connectionTimeout="20000" redirectPort="8443" URIEncoding="utf-8" />
<Connector protocol="AJP/1.3" port="8009" address="${jboss.bind.address}"
           redirectPort="8443" URIEncoding="utf-8" />
```

오픈나루 16 opennaru.com

2

JVM 옵션	GC 옵션 명시 필요
Tomcat Native(APR)	거래량이 많을 경우 APR 을 적용하는 것이 효율적임

9. 점검 종합

구분	내용
TCP 파라미터	설정 값 유형 필요
JVM 옵션	GC 옵션 명시 필요
Tomcat Native(APR)	거래량이 많을 경우 APR 을 적용하는 것이 효율적임
웹서버 설정	Static Content 분리 필요(웹폰트, 영상 파일)
어플리케이션 소스	.xml 404 호출에 대한 어플리케이션 소스 확인
오류율	오류율에 대한 개선 필요
DB Query	느린 쿼리에 대한 개선 포인트 분석 필요

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#3
웹사이트 지연 현상

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#3 - Pending Transaction이 급증

Server Slowdown 현상

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KHAN [apm]

Administrator

WAS

- 대시보드
- Instances
- 애플리케이션
  - [redacted]
    - 만족도 지수(APDEX)
    - 실시간 요청 모니터링
    - 트랜잭션 맵(T-Map)
    - 초당처리수(TPS)
    - 액티브 사용자수
    - 지연 트랜잭션
    - 평균응답시간
    - 응답시간
    - JVM 메모리 비교
    - 액티브 DB 연결
    - 호출 통계
    - 느린 URL 검색
    - 오류율
    - 오류 통계
- 실시간 요청 모니터링
- 액티브 사용자수
- JVM 메모리 비교

홈 / WAS / 애플리케이션 / [redacted] / 지연 트랜잭션

Sum [redacted] cluster11 cluster12 cluster13 cluster14 cluster21 cluster22 cluster23 cluster24 cluster31 cluster32

WAS > [redacted] >

Trend Analysis OFF Current History

Pending Transactions

Zoom 30m 1h 1d w 2w

From 2017-08-23 To 2017-08-23

15:20분부터 대부분의 인스턴스에 Pending Transaction이 증가하여 16:20에 대부분 지연되고 있는 상황

애플리케이션 그룹별 모니터링 항목

업무별 인스턴스 그룹에 대한 모니터링

2017-08-23 16:20:00
*-satisfying: 3.1
*-tolerating: 14.9
*-frustrating: 122.8
Total: 140.8

Number of Active Transactions

125 100 75 50 25 0

14:50 15:00 15:10 15:20 15:30 15:40 15:50 16:00 16:10 16:20 16:30

26. Jun 10. Jul 24. Jul 7. Aug 21. Aug 4. Sep

*-satisfying *-tolerating *-frustrating

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#3 - 개별 인스턴스로 분석

Server Slowdown 현상

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토글 버튼으로 애플리케이션 그룹내의 개별 인스턴스 분석

인스턴스 별로 확인하면, cluster11, cluster12, cluster14, cluster23에 지연되고 있었음

KHAN [apm]

Administrator

WAS

- 대시보드
- Instances
- 애플리케이션
- 만족도 지수 (Apdex)
- 실시간 요청 모니터링
- 트랜잭션 맵(T-Map)
- 초당처리수(TPS)
- 액티브 사용자수
- 지연 트랜잭션
- 평균응답시간
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- JVM 메모리 비교
- 액티브 DB 연결
- 호출 통계
- 느린 URL 검색
- 오류율
- 오류 통계
- 실시간 요청 모니터링
- 액티브 사용자수
- JVM 메모리 비교

홈 / WAS / 애플리케이션 / [redacted] / 지연 트랜잭션

Each [redacted] cluster11 cluster12 cluster13 cluster14 cluster21 cluster22 cluster23 cluster24 cluster31 cluster32

WAS > [redacted] >

Trend Analysis OFF Current History

Pending Transactions

higher values represent higher usages

1d 1w 2w 1m All

From 2017-08-23 To 2017-08-23

2017-08-23 16:15:00
- cluster11-satisfying: 0.0
- cluster11-tolerating: 0.0
- cluster11-frustrating: 256.0
- cluster12-satisfying: 1.0
- cluster12-tolerating: 16.6
- cluster12-frustrating: 69.8
- cluster13-satisfying: 0.0
- cluster13-tolerating: 0.0
- cluster13-frustrating: 19.6
- cluster14-satisfying: 0.0
- cluster14-tolerating: 0.0
- cluster14-frustrating: 251.0
- cluster21-satisfying: 3.8
- cluster21-tolerating: 10.6
- cluster21-frustrating: 55.4
- cluster22-satisfying: 1.8
- cluster22-tolerating: 11.2
- cluster22-frustrating: 47.4
- cluster23-satisfying: 0.0
- cluster23-tolerating: 0.0
- cluster23-frustrating: 256.0
- cluster24-satisfying: 0.0
- cluster24-tolerating: 0.0
- cluster24-frustrating: 22.0
- cluster31-satisfying: 0.0
- cluster31-tolerating: 0.0
- cluster31-frustrating: 0.0
- cluster32-satisfying: 0.0
- cluster32-tolerating: 0.0
- cluster32-frustrating: 0.0

Total: 1,022.2

Number of Active Transactions: 250, 200, 150, 100, 50, 0

14:50 15:00 15:10 15:20 15:30 15:40 15:50 16:20

26. Jun 10. Jul 24. Jul 7. Aug 4. Sep

cluster11-satisfying, cluster11-tolerating, cluster11-frustrating, cluster12-satisfying, cluster12-tolerating, cluster12-frustrating, cluster13-satisfying, cluster13-tolerating, cluster13-frustrating, cluster14-satisfying, cluster14-tolerating, cluster14-frustrating, cluster21-satisfying, cluster21-tolerating, cluster21-frustrating, cluster22-satisfying, cluster22-tolerating, cluster22-frustrating, cluster23-satisfying, cluster23-tolerating, cluster23-frustrating, cluster24-satisfying, cluster24-tolerating, cluster24-frustrating, cluster31-satisfying, cluster31-tolerating, cluster31-frustrating, cluster32-satisfying, cluster32-tolerating, cluster32-frustrating

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#3 - 인스턴스의 스레드 덤프 분석

Server Slowdown 현상

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cluster11 인스턴스의 스레드 덤프를 분석함

Active Thread : 현재 수행중인 스레드, 최대 120초 가량 수행중인 상태임

DB에서 Property 정보를 읽어오기 위해 lock 0x0000000078d31a7c8을 기다리는 중

문제가 발생한 시점에 자동 수집

경고정책에 설정한 임계치에 도달하면 자동수집

KHAN [apm]에서 제공하는 스레드 덤프 분석기를 사용하여 직접 분석

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#3 - 인스턴스의 스레드 덤프 분석

Server Slowdown 현상

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해당 스레드에서 DB 연결을 기다리는 Lock

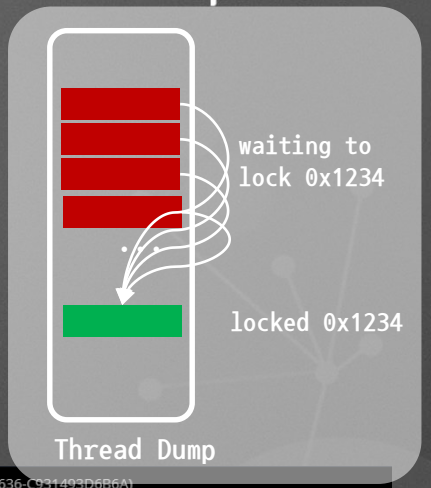
```
15005
15006  "ajp-0.0.0.0-8009-29" daemon prio=10 tid=0x00007fc84cac9000 nid=0x5f52 waiting for monitor entry [0x00007fc8067
15007     java.lang.Thread.State: BLOCKED (on object monitor)
15008        at org.jboss.resource.adapter.jdbc.local.LocalManagedConnectionFactory.createManagedConnection(LocalManage
15009        - waiting to lock <0x00000007895c5bf0> (a org.jboss.resource.adapter.jdbc.local.LocalManagedConnectionFacto
15010        at org.jboss.resource.connectionmanager.InternalManagedConnectionPool.createConnectionEventListener(Interna
15011        at org.jboss.resource.connectionmanager.InternalManagedConnectionPool.getConnection(InternalManagedConnecti
15012        at org.jboss.resource.connectionmanager.JBossManagedConnectionPool$BasePool.getConnection(JBossManagedConnec
15013        at org.jboss.resource.connectionmanager.BaseConnectionManager2.getManagedConnection(BaseConnectionManager2
15014        at org.jboss.resource.connectionmanager.TxConnectionManager.getManagedConnection(TxConnectionManager.java:
15015        at org.jboss.resource.connectionmanager.BaseConnectionManager2.allocateConnection(BaseConnectionManager2.j
15016        at org.jboss.resource.connectionmanager.BaseConnectionManager2$ConnectionManagerProxy.allocateConnection(Ba
15017        at org.jboss.resource.adapter.jdbc.WrapperDataSource.getConnection(WrapperDataSource.java:96)
15018        at org.springframework.jdbc.datasource.LazyConnectionDataSourceProxy.afterPropertiesSet(LazyConnectionDatas
15019        at org.springframework.beans.factory.support.AbstractAutowireCapableBeanFactory.invokeInitMethods(Abstract
15020        at org.springframework.beans.factory.support.AbstractAutowireCapableBeanFactory.initializeBean(Abst
15021        at org.springframework.beans.factory.support.AbstractAutowireCapableBeanFactory.doCreateBean(Abstra
15022        at org.springframework.beans.factory.support.AbstractAutowireCapableBeanFactory.createBean(Abstract
15023        at org.springframework.beans.factory.support.AbstractBeanFactory$1.getObject(AbstractBeanFactory.ja
15024        at org.springframework.beans.factory.support.DefaultSingletonBeanRegistry.getSingleton(DefaultSingl
15025        - locked <0x00000007c2841b50> (a java.util.concurrent.ConcurrentHashMap)
15026        at org.springframework.beans.factory.support.AbstractBeanFactory.doGetBean(AbstractBeanFactory.java
15027        at org.springframework.beans.factory.support.AbstractBeanFactory.getBean(AbstractBeanFactory.java:1
15028        at org.springframework.beans.factory.support.BeanDefinitionValueResolver.resolveReference(BeanDefin
15029        at org.springframework.beans.factory.support.BeanDefinitionValueResolver.resolveValueIfNecessary(Be
15030        at org.springframework.beans.factory.support.AbstractAutowireCapableBeanFactory.applyPropertyValues
```

```
15066        at org.springframework.beans.factory.support.AbstractBeanFactory.getBean(AbstractBeanFactory.java:84)
15067        at org.springframework.beans.factory.support.DefaultListableBeanFactory.preInstantiateSingletons(Defa
15068        at org.springframework.context.support.AbstractApplicationContext.finishBeanFactoryInitialization(Abst
15069        at org.springframework.context.support.AbstractApplicationContext.refresh(AbstractApplicationContext.j
15070        - locked <0x00000007c2841c50> (a java.lang.Object)
15071        at org.springframework.context.support.ClassPathXmlApplicationContext.<init>(ClassPathXmlApplicationCo
15072        at org.springframework.context.support.ClassPathXmlApplicationContext.<init>(ClassPathXmlApplicationCo
15073        at com.wbsoft.common.CommonUtil.getXMLBean(CommonUtil.java:6090)
15074        at com.wbsoft.framework.locale.ReloadableDbMessageSource.loadDbProperties(ReloadableDbMessageSource.ja
15075        at com.wbsoft.framework.locale.ReloadableDbMessageSource.refreshDbProperties(ReloadableDbMessageSource
15076        at com.wbsoft.framework.locale.ReloadableDbMessageSource.getDbProperties(ReloadableDbMessageSource.jav
15077        - locked <0x000000078d31a7c8> (a java.util.HashMap)
15078        at com.wbsoft.framework.locale.ReloadableDbMessageSource.resolveCode(ReloadableDbMessageSource.java:68
15079        at com.wbsoft.framework.locale.LocaleAccessor._getMessage(LocaleAccessor.java:118)
15080        at com.wbsoft.framework.locale.LocaleAccessor.getMessage(LocaleAccessor.java:79)
15081        at com.wbsoft.common.taglib.MessageTag.getMessage(MessageTag.java:102)
15082        at com.wbsoft.common.taglib.MessageTag.doEndTag(MessageTag.java:69)
15083        at org.apache.jsp.WEB_002dINF.jsp.front.common.btobLogin_jsp._jspx_meth_wbtag_005fmessage_005f0(btobLogin_
15084        at org.apache.jsp.WEB_002dINF.jsp.front.common.btobLogin_jsp._jspService(btobLogin_jsp.java:304)
15085        at org.apache.jasper.runtime.HttpJspBase.service(HttpJspBase.java:70)
15086        at javax.servlet.http.HttpServlet.service(HttpServlet.java:717)
15087        at org.apache.jasper.servlet.JspServletWrapper.service(JspServletWrapper.java:369)
15088        at org.apache.jasper.servlet.JspServlet.serviceJspFile(JspServlet.java:467)
15089        at org.apache.jasper.servlet.JspServlet.service(JspServlet.java:397)
15090        at javax.servlet.http.HttpServlet.service(HttpServlet.java:717)
15091        at org.apache.catalina.core.ApplicationFilterChain.internalDoFilter(ApplicationFilterChain.java:290)
15092        at org.apache.catalina.core.ApplicationFilterChain.doFilter(ApplicationFilterChain.java:206)
15093
```

애플리케이션에서 기다리는 Lock

DB 연결을 하기 위해 잡은 Lock

MariaDB의 응답을 기다리는 중



Thread Dump Text > 2017-08-23 16:01:25 (AC8F9A35-D5BF-4616-8636-C931493D6B6A)

```
18416
18417  "JCA PoolFiller" prio=10 tid=0x00007fc83d154000 nid=0x5632 runnable [0x00007fc8b0836000]
18418     java.lang.Thread.State: RUNNABLE
18419        at java.net.SocketInputStream.socketRead0(Native Method)
18420        at java.net.SocketInputStream.read(SocketInputStream.java:129)
18421        at java.io.BufferedInputStream.fill(BufferedInputStream.java:218)
18422        at java.io.BufferedInputStream.read1(BufferedInputStream.java:258)
18423        at java.io.BufferedInputStream.read(BufferedInputStream.java:317)
18424        - locked <0x00000007bf390f70> (a java.io.BufferedInputStream)
18425        at org.mariadb.jdbc.internal.common.packet.buffer.ReadUtil.readFully(ReadUtil.java:82)
18426        at org.mariadb.jdbc.internal.common.packet.buffer.ReadUtil.readFully(ReadUtil.java:92)
18427        at org.mariadb.jdbc.internal.common.packet.RawPacket.nextPacket(RawPacket.java:77)
18428        at org.mariadb.jdbc.internal.common.packet.SyncPacketFetcher.getRawPacket(SyncPacketFetcher.java:67)
18429        at org.mariadb.jdbc.internal.mysql.MySQLProtocol.connect(MySQLProtocol.java:392)
18430        at org.mariadb.jdbc.internal.mysql.MySQLProtocol.connect(MySQLProtocol.java:671)
18431        at org.mariadb.jdbc.internal.mysql.MySQLProtocol.<init>(MySQLProtocol.java:264)
18432        at org.mariadb.jdbc.Driver.connect(Driver.java:110)
18433        at org.jboss.resource.adapter.jdbc.local.LocalManagedConnectionFactory.getLocalManagedConnection(LocalManag
18434        at org.jboss.resource.adapter.jdbc.local.LocalManagedConnectionFactory.createManagedConnection(LocalManage
18435        - locked <0x00000007895c5bf0> (a org.jboss.resource.adapter.jdbc.local.LocalManagedConnectionFactory)
18436        at org.jboss.resource.connectionmanager.InternalManagedConnectionPool.createConnectionEventListener(Interna
18437        at org.jboss.resource.connectionmanager.InternalManagedConnectionPool.fillToMin(InternalManagedConnectionPo
18438        at org.jboss.resource.connectionmanager.PoolFiller.run(PoolFiller.java:74)
18439        at java.lang.Thread.run(Thread.java:662)
18440
18441     Locked ownable synchronizers:
```

스레드 덤프의 Lock 정보를 Hyper Link로 클릭하여 Root Cause 분석

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Application Performance Management

#4
서비스 품질/오류 모니터링

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#4 - 서비스 품질(만족도 지수) - 1개월간 현황

서비스 품질 / 오류 모니터링

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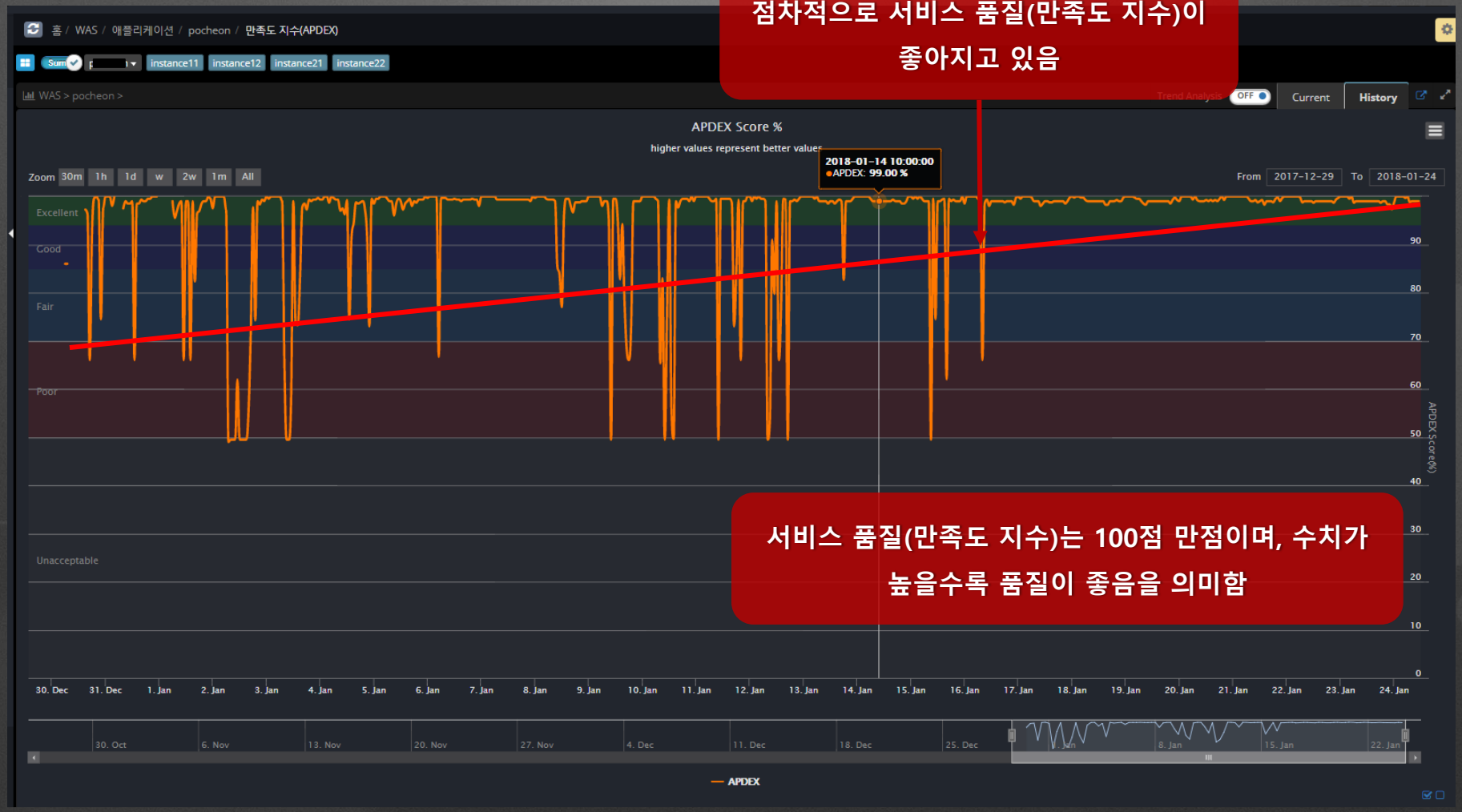
점차적으로 서비스 품질(만족도 지수)이 좋아지고 있음



서비스 품질(만족도 지수)는 100점 만점이며, 수치가 높을수록 품질이 좋음을 의미함

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#4 - 일일 서비스 품질(만족도 지수) 현황

서비스 품질 / 오류 모니터링

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사용량이 많은 출근시간(8시 45분, 9시 15분),
점심시간전(11시 45분), 퇴근시간전
서비스 품질(만족도 지수)이 나쁜 상황

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#4 - 일일 응답시간 및 오류 분포도(T-Map)

서비스 품질 / 오류 모니터링

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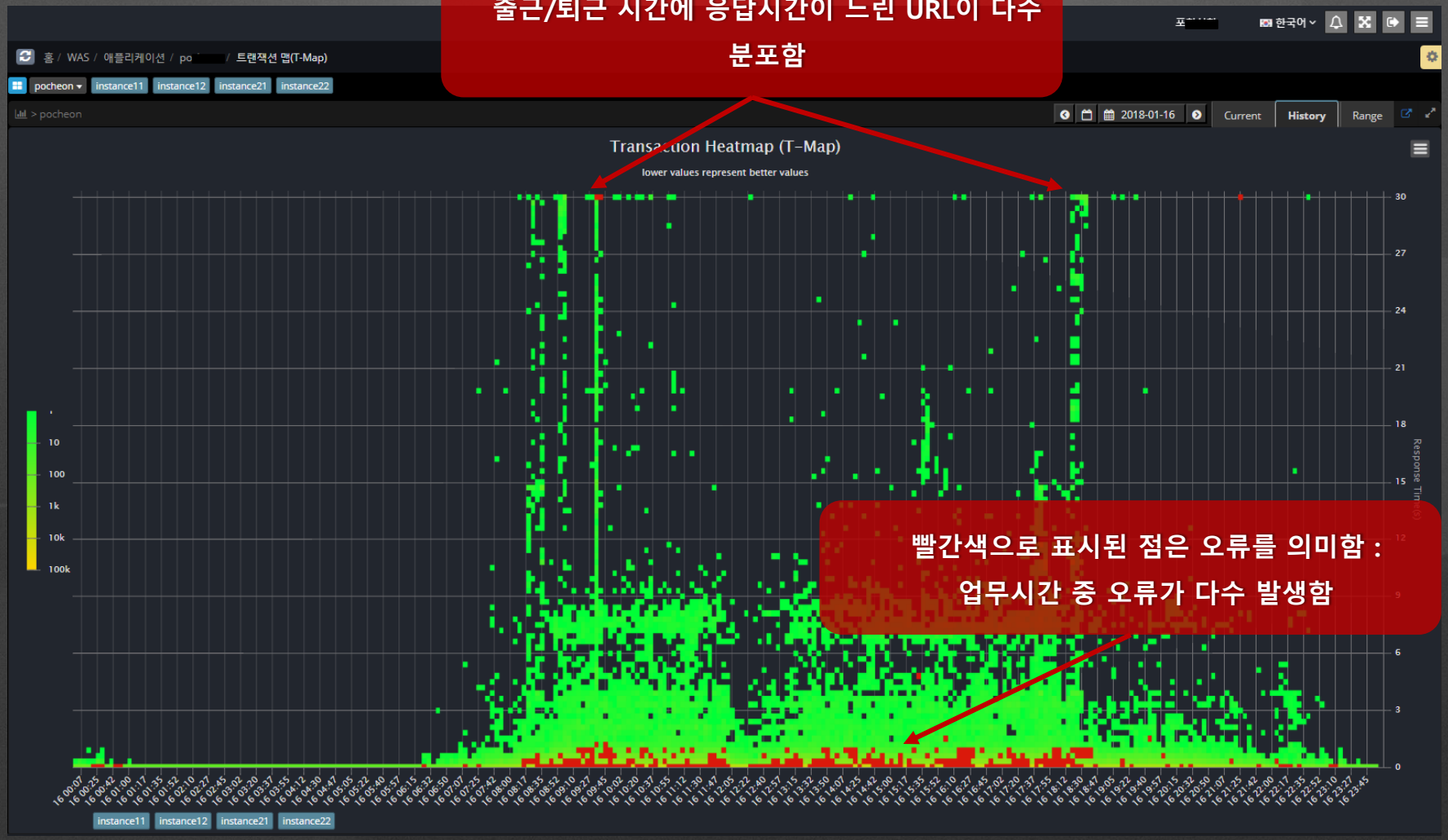
출근/퇴근 시간에 응답시간이 느린 URL이 다수 분포함



빨간색으로 표시된 점은 오류를 의미함 : 업무시간 중 오류가 다수 발생함

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#4 - 서비스 오류 건수 일일 700~800여건

서비스 품질 / 오류 모니터링

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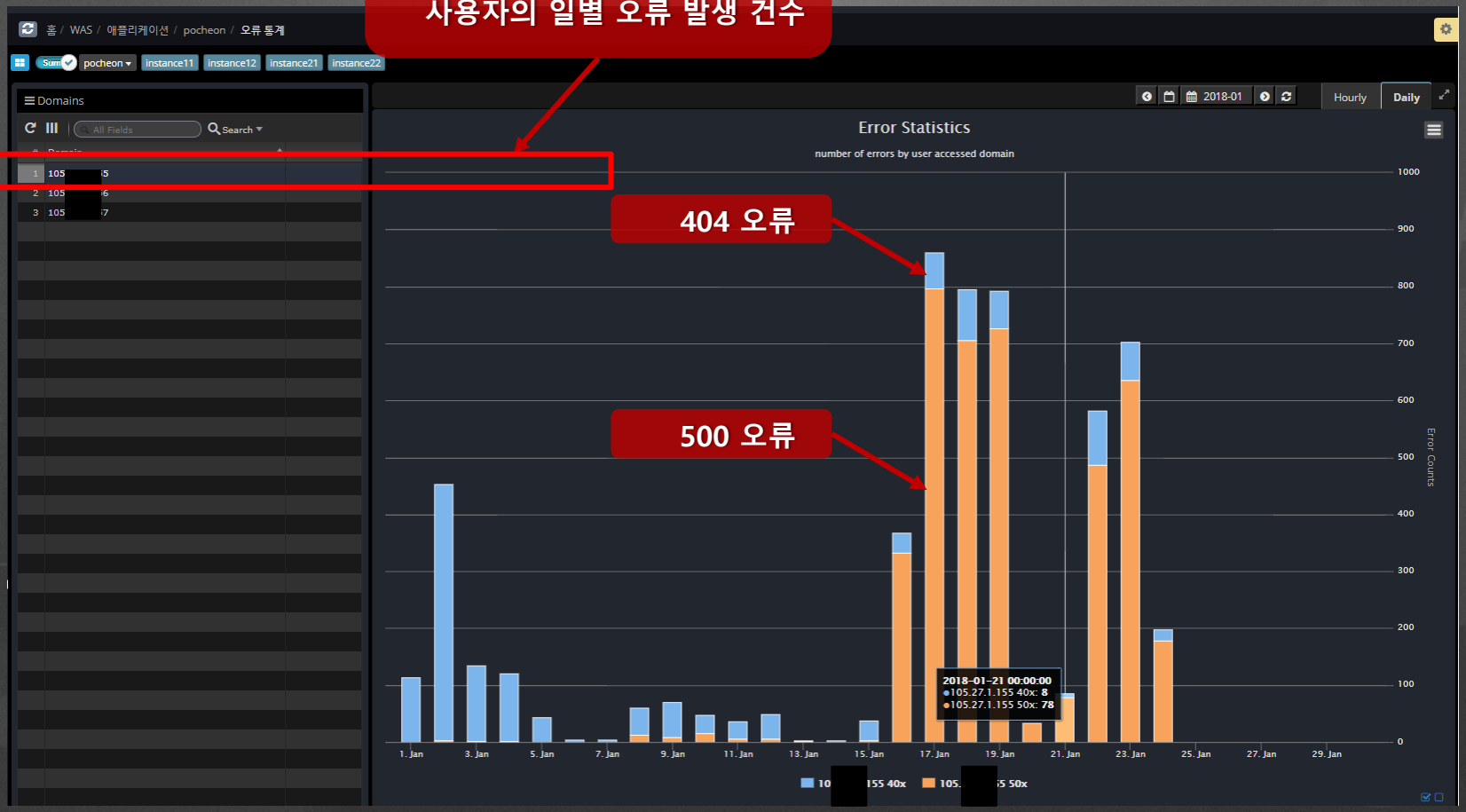
105.xx.xx.155 로 접속한
사용자의 일별 오류 발생 건수



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#4 - 서비스 오류 상세 : JSP 오류 패턴 #1

서비스 품질 / 오류 모니터링

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Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	10[redacted].156	10[redacted]73.8	instance12	/bms/dct/docpathview.do	500	23,749	0	0	0	0	13.64	2018-01-24 10:21:22.731
WAS	10[redacted]156	10[redacted].216	instance12	/bms/dct/viewreport.do	500	1,754	405	5	57	0	194.00	2018-01-24 11:18:58.449
WAS	10[redacted]156	10[redacted]3.23	instance11	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,327	258	2	44	0	57.52	2018-01-24 10:54:35.703
WAS	10[redacted]157	10[redacted]107	instance22	/bms/wct/sendExcel.do	500	1,257	55	7	45	0	105.93	2018-01-24 09:21:12.665
WAS	10[redacted]156	10[redacted].216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,108	305	4	47	0	55.80	2018-01-24 10:37:26.892
WAS	10[redacted]157	10[redacted]1.4	instance22	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,063	259	4	44	0	64.33	2018-01-24 08:50:43.556
WAS	10[redacted]157	10[redacted].9	instance22	/bms/com/todoportlet.do	500	1,058	1,037	0	40	0	35.89	2018-01-24 08:33:50.325
WAS	10[redacted]156	10[redacted].216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	964	191	4	41	0	49.24	2018-01-24 10:32:51.798
WAS	10[redacted]156	10[redacted].29	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	952	339	1	38	0	86.03	2018-01-24 07:45:50.215
WAS	10[redacted]156	10[redacted].216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	943	155	2	47	0	49.16	2018-01-24 10:37:06.733

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XXXSetOReportPathCU.jsp의 31번째 라인에서 오류 발생

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	POST /bms/dct/docpathview.do View URL	Params	
Request Host	105[redacted].55 View Page	Status Code	500
Client IP	105[redacted].8 User Location	User Agent	Mozilla/5.0 (Windows NT 6.1; Trident/7.0; rv:11.0) like Gecko
Start Time	2018-01-24 10:21:22.731	End Time	2018-01-24 10:21:46.480
Duration (ms)	23,749	CPU Time (ms)	13.64
JDBC Time (ms)	0	Latency (ms)	0
Thread Name	http-thread-pool-threads - 44	Thread ID	383
IP	105.27.1.156	Instance ID	instance12
Agent Type	WAS	Transaction ID	16125bd9383-1b7db34408666c5413ec

Error Message

```
JBWEB004038: An exception occurred processing JSP page /WEB-INF/jsp/dct/submit/BmsSetOReportPathCU.jsp at line 31

28:     boolean isFormPath    = param.getBoolean("formFlag");                                  //보고경로그룹 지정화면 여부
29:     boolean isAdmin     = param.getBoolean("adminFlag") && (loginVO.getVGroup().contains("4001") || loginVO.getVGroup().contains("4002"));
30:                                                                                                                    //관리자 권한여부
31:     int currentOrder    = !isGrpPath && !isFormPath ? param.getInt("currentOrder") : 1;                                    //처리된 경로수
32:     int lastOrder       = !isGrpPath && !isFormPath ? param.getInt("lastOrder", 1) : 1;                                    //처리완료된 마지막 보고경로
33:     int orgPathLength   = orgPath.length();
34:
```


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#4 - 서비스 오류 상세 : JSP 오류 패턴 #2

서비스 품질 / 오류 모니터링

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Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	105.27.1.156	105.27.173.8	instance12	/bms/dct/docpathview.do	500	23,749	0	0	0	0	13.64	2018-01-24 10:21:22.731
WAS	105.27.1.156	105.27.88.216	instance12	/bms/dct/viewreport.do	500	1,754	405	5	57	0	194.00	2018-01-24 11:18:58.449
WAS	105.27.1.156	105.27.173.23	instance11	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,327	258	2	44	0	57.52	2018-01-24 10:54:35.703
WAS	105.27.1.157	105.27.4.107	instance22	/bms/wct/sendExcel.do	500	1,257	55	7	45	0	105.93	2018-01-24 09:21:12.665
WAS	105.27.1.156	105.27.88.216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,108	305	4	47	0	55.80	2018-01-24 10:37:26.892
WAS	105.27.1.157	105.27.171.4	instance22	/bms/dctenf/BmsDctEnfMultiAccept.do	500	1,063	259	4	44	0	64.33	2018-01-24 08:50:43.556
WAS	105.27.1.157	105.27.56.9	instance22	/bms/com/todoportlet.do	500	1,058	1,037	0	40	0	35.89	2018-01-24 08:33:50.325
WAS	105.27.1.156	105.27.88.216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	964	191	4	41	0	49.24	2018-01-24 10:32:51.798
WAS	105.27.1.156	105.27.80.29	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	952	339	1	38	0	86.03	2018-01-24 07:45:50.215
WAS	105.27.1.156	105.27.88.216	instance12	/bms/dctenf/BmsDctEnfMultiAccept.do	500	943	155	2	47	0	49.16	2018-01-24 10:37:06.733

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Transaction Detail | Trace | StackTrace

XXXTodoCntPortlet.jsp의 102번째 라인에서 오류 발생

Client IP	105.27.56.9 User Location	User Agent	Mozilla/5.0 (Windows NT 6.1; Trident/7.0; rv:11.0) like Gecko
Start Time	2018-01-24 08:33:50.325	End Time	2018-01-24 08:33:51.383
Duration (ms)	1,058	CPU Time (ms)	35.89
JDBC Time (ms)	1,037	Latency (ms)	0
Thread Name	http-thread-pool-threads - 104	Thread ID	399
IP	105.27.1.157	Instance ID	instance22
Agent Type	WAS	Transaction ID	161255b1e23-18490c6f2c7c7a9a01a1

Error Message

```
JBWEB004038: An exception occurred processing JSP page /WEB-INF/jsp/com/BmsTodoCntPortlet.jsp at line 102

99:         < %
100:              int pageCount = 0;
101:              for ( int i = 0; i <  itemVO.length; i++ ) {
102:                if("5".equals(itemVO[i].getItem2()) && "5".equals(itemSysVO[i].getItem2()) && "008".equals(itemVO[i].getConfigitemid())) {
103:                pageCount++; height +=20;%>
104:         < li>
105:                < span><a href="#" onclick="parent.load_lnb('MGRP_ONLINE', 'DCT_DCH_WIL'); return(false);">발송대기함 : < /a>


Stacktrace:
     at org.apache.jsp.WEB_002dINF.jsp.com.BmsTodoCntPortlet_jsp._jspService(BmsTodoCntPortlet_jsp.java:288)
     at org.apache.jasper.runtime.HttpJspBase.service(HttpJspBase.java:69)
     at javax.servlet.http.HttpServlet.service(HttpServlet.java:847)
     at org.apache.jasper.servlet.JspServletWrapper.service(JspServletWrapper.java:365)
```


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Application Performance Management

#5, #6
오류 모니터링

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#5 - 404 오류가 다수 발생

서비스 품질 / 오류 모니터링

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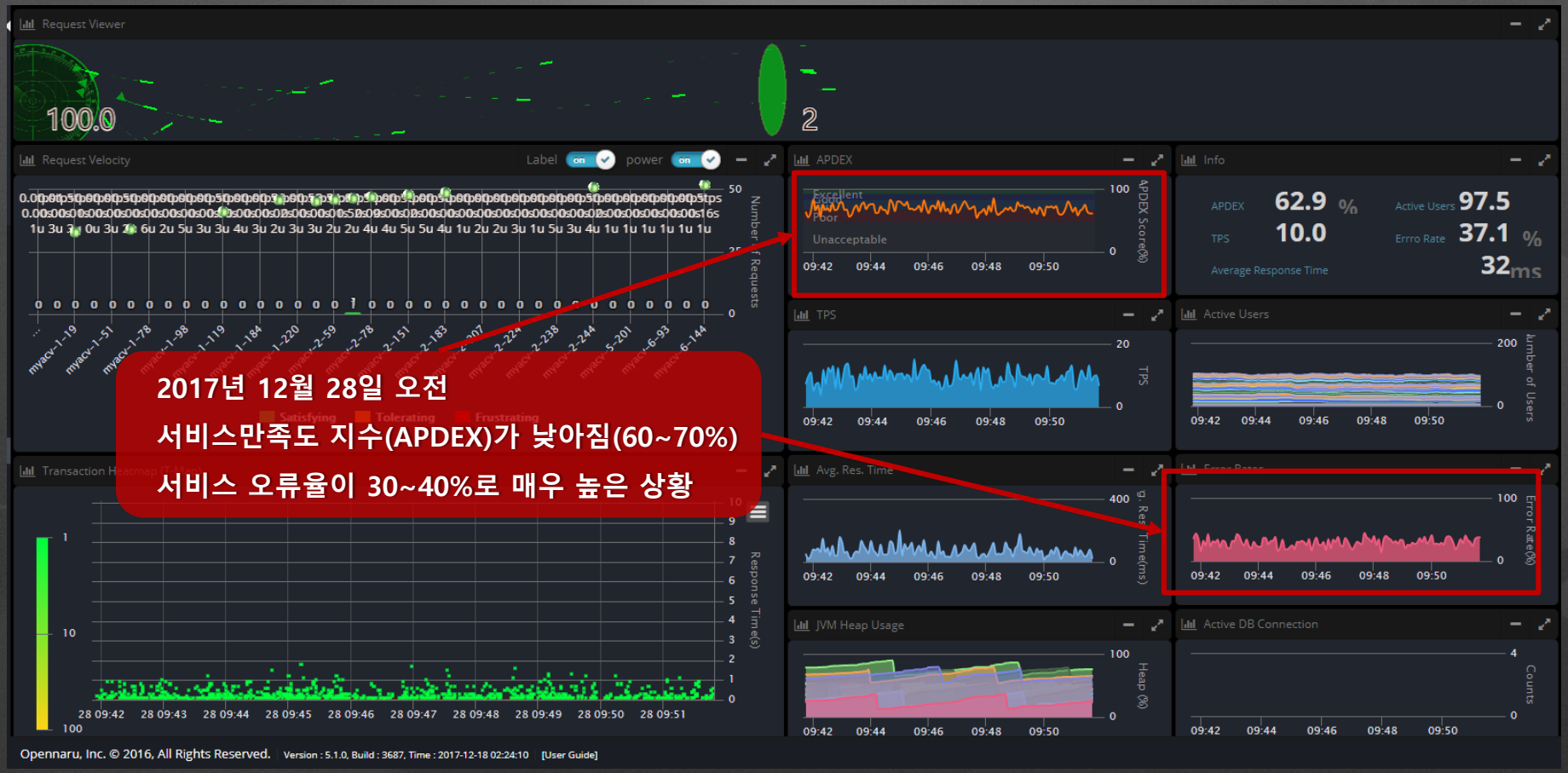

2017년 12월 28일 오전

서비스만족도 지수(APDEX)가 낮아짐(60~70%)

서비스 오류율이 30~40%로 매우 높은 상황

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#5 - 404 오류 발생의 원인

서비스 품질 / 오류 모니터링

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Transactions > 2017-12-28 00:50:08 ~ 2017-12-28 00:50:56 > 0ms ~ 468ms

Export to Excel tid :

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192[redacted]125	210.[redacted]0.26	myacv-1-1[redacted]5	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:10.584
WAS	192[redacted]241	42.8[redacted]96	myacv-2-2[redacted]1	/.well-known/apple-app-site-association	404	16	0	0	0	0	15.63	2017-12-28 09:50:11.506
WAS	169[redacted]44.198	203.[redacted]3.86	myacv-144-19[redacted]	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:11.570
WAS	192[redacted]90	61.1[redacted]39	myacv-1-9[redacted]	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:11.571
WAS	192[redacted]151	203.[redacted]3.86	myacv-2-[redacted]51	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:11.681
WAS	192[redacted]238	61.1[redacted]39	myacv-[redacted]238	/.well-known/apple-app-site-association	404	15	0	0	0	0	15.63	2017-12-28 09:50:11.714
WAS	169[redacted]44.198	42.8[redacted]96	myacv-144-19[redacted]	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:11.757
WAS	192[redacted]60	175.[redacted]3.134	myacv-2-6[redacted]	/.well-known/apple-app-site-association	404	0	0	0	0	0	0.00	2017-12-28 09:50:12.498

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Transaction Detail | Trace | StackTrace

Request URL: GET /.well-known/apple-app-site-association View URL

Referer URL: myacv.com View Page

Start Time	2017-12-28 00:50:11.506	End Time	2017-12-28 00:50:11.522
Duration (ms)	16	CPU Time (ms)	15.63
JDBC Time (ms)	0	Latency (ms)	0
Thread Name	http-bio-80-exec-266	Thread ID	4721
IP	192.168.2.241	Instance ID	myacv-2-241
Agent Type	WAS	Transaction ID	1609a990dcb-13a449f73ce7bced84ef

Name	Value
Params	
Status Code	404
User Agent	swcd (unknown version) CFNetwork/893.14.2 Darwin/17.3.0

Method Traces

```
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                    Method Call
[   1][00:50:11.506|      16| 100|        0|      0|    15.6]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][00:50:11.506|      16| 100|        0|     16|    15.6] + com.ace.filter.CORSFilter.doFilter()
[   3][00:50:11.506|      16| 100|        0|     16|    15.6]  + com.ace.utils.admin.XssFilter.doFilter()
[   4][00:50:11.506|      16| 100|        0|     16|    15.6]   + org.apache.tomcat.websocket.server.WsFilter.doFilter()
[   5][00:50:11.506|      16| 100|        0|     16|    15.6]    + org.springframework.web.servlet.FrameworkServlet.service()
```

iPhone App에서 유니버셜 링크(Deep Link)를 위하여 호출하는 URL

참고: https://docs.adjust.com/ko/universal-links/

해결책 : 목적에 맞게 well-known 디렉터리에 파일을 만들어야 함

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#6 – 서비스 500 오류 발생

서비스 품질 / 오류 모니터링

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2017년 12월 19일 : 다수의 인스턴스에서 500 오류가 발생

오류율이 증가하며, T-Map에 오류를 표시하는 빨간색 점들이 표시됨

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#6 - 정규식 패턴 그룹 검색시 500 오류 발생

서비스 품질 / 오류 모니터링

opennaru

Transactions > 2017-12-21 01:30:04 ~ 2017-12-21 01:30:40 > 1020ms ~ 6410ms

Export to Excel tid :

클라이언트 IP가 동일함

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.[redacted].85	223.[redacted]0.241	myacv-1-85	/log/tracking	500	3,219	0	0	0	0	0.00	2017-12-21 10:30:02.310
WAS	192.[redacted].128	223.[redacted]0.241	myacv-2-128	/log/tracking	500	2,906	0	0	0	0	0.00	2017-12-21 10:30:02.481
WAS	192.[redacted].195	223.[redacted]0.241	myacv-1-195	/log/tracking	500	1,969	0	0	0	0	15.63	2017-12-21 10:30:05.308
WAS	192.[redacted].147	223.[redacted]0.241	myacv-2-147	/log/tracking	500	1,437	0	0	0	0	0.00	2017-12-21 10:30:05.959
WAS	192.[redacted].21	223.[redacted]0.241	myacv-1-21	/log/tracking	500	3,813	0	0	0	0	15.63	2017-12-21 10:30:06.280
WAS	192.[redacted].174	223.[redacted]0.241	myacv-1-174	/log/tracking	500	1,188	0	0	0	0	15.63	2017-12-21 10:30:07.410
WAS	192.[redacted].51	223.[redacted]0.241	myacv-2-51	/log/tracking	500	2,829	0	0	0	0	0.00	2017-12-21 10:30:07.850
WAS	192.[redacted].254	223.[redacted]0.241	myacv-2-254	/log/tracking	500	[illegible]	0	0	0	0	0.00	2017-12-21 10:30:08.218

View 1 - 19 of 1

2017년 12월 19일 : 다수의 인스턴스에서 500 오류가 발생
/log/tracking URL에서 HTML 결과를 정규식을 이용하여 처리하려다 정규식 그룹이 존재하지 않아 오류가 발생함 → 코드 수정 필요함

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	POST /log/tracking View URL	Params	
Request Host	my.acuvue.co.kr View Page	Status Code	500
Client IP	223.33.160.241 User Location	User Agent	okhttp/3.3.1
Start Time	2017-12-21 01:30:02.481	End Time	2017-12-21 01:30:05.387
Duration (ms)	2,906	CPU Time (ms)	0.00
JDBC Time (ms)	0	Latency (ms)	0
Thread Name	http-bio-80-exec-412	Thread ID	7846
IP	192.168.2.128	Instance ID	myacv-2-128
Agent Type	WAS	Transaction ID	16076b1059c-2b02c2d1541c7af7e1be

Error Message

```
Request processing failed; nested exception is java.lang.IllegalArgumentException: Illegal group reference
 at java.util.regex.Matcher.appendReplacement(Matcher.java:808)
 at com.ace.utils.admin.HTMLInputFilter.validateEntities(HTMLInputFilter.java:458)
 at com.ace.utils.admin.HTMLInputFilter.filter(HTMLInputFilter.java:186)
 at com.ace.utils.admin.RequestWrapper.filter(RequestWrapper.java:46)
 at com.ace.utils.admin.RequestWrapper.getParameterValues(RequestWrapper.java:20)
```

해결책 :
1. 문제가 발생할 때 해당 HTML을 로깅하여 원인 확인
2. 해당 애플리케이션에서 정규식 오류가 발생하는 경우에 대한 오류 처리 보강

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Application Performance Management

#7, #8
웹사이트 지연 현상

KHAN
[apm]

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#7 - JVM 메모리 17일간의 History 현황

JVM 메모리 Leak

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메모리 Leak 현상

Java 인스턴스의 Heap 메모리가 점차 증가함

홈 / WAS / Instances / 210.9[redacted]181 / homepage11 / JVM / 메모리 크기

ALL | elearning11 | elearning12 | elearning21 | elearning22 | homepage11 | homepage12 | homepage13 | homepage14

WAS > 210.[redacted].181 > homepage11 >

Full GC | Trend Analysis OFF | Current | History

JVM Heap & Perm Size

lower values represent better values

Zoom 30m 1h 1d w 2w 1m All

From 2017-10-31 To 2017-11-16

2017-11-15 12:00:00
Heap Size: 4,095.50 MB
Used Heap: 2,990.86 MB
Perm Size: 560.00 MB
Used Perm: 161.63 MB

4G
0G
Heap (bytes)
500M
250M
0M
Perm (bytes)

1. Nov 2. Nov 3. Nov 4. Nov 5. Nov 6. Nov 7. Nov 8. Nov 9. Nov 10. Nov 11. Nov 12. Nov 13. Nov 14. Nov 15. Nov 16. Nov

28. Aug 11. Sep 25. Sep 9. Oct 23. Oct 6. Nov

Heap Size | Used Heap | Perm Size | Used Perm

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#7 - JVM 메모리를 점유한 객체 분석

JVM 메모리 Leak

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java_pid3316.hprof Analysis View

Summary | Analysis | Chart | Leak Suspect | ClassLoader Analysis

Analysis

30 Leak Suspects

LeakSize	TotalSize	Size	Analysis
3,326,470...	3,326,470...	320	3,326,470,040 bytes (71.1 %) of java heap is used by 33 instances of org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData Contains 7 instances of the following leak suspects: - array of java/lang/Object holding 474,980,328 bytes at 0x7cea782a8 - array of java/lang/Object holding 474,983,976 bytes at 0x75af2e3a8

TagHandlerPool의 객체가 전체 메모리의 71%를 점유하고 있음

Reference Tree

Leak Suspect(s) Suspects by Category Go to Bookmark Remove Bookmark

- 3,326,470,128 (71.1%) [56] 3 org/apache/jasper/runtime/PerThreadTagHandlerPool 0x707eead78
  - 3,326,470,072 (71.1%) [32] 1 java/util/Vector 0x707eeada0
    - 3,326,470,040 (71.1%) [320] 33 array of java/lang/Object 0x72ae920b0
      - 475,078,464 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7eddd4070
      - 474,986,056 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x75ceb36c0
      - 474,986,056 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7764fe128
      - 474,986,056 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x743e7e558
      - 474,982,408 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7d0a4ead8
      - 474,982,408 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7b59ea240
      - 474,982,184 (10.15%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x725893670
      - 103,336 (0%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x72ab60100
      - 63,976 (0%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7d3d59e88
      - 63,288 (0%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7d24f73d8
      - 63,288 (0%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x799004698
      - 63,288 (0%) [24] 1 org/apache/jasper/runtime/PerThreadTagHandlerPool$PerThreadData 0x7082e9210

Custom Tag중에 TryCatchFinally를 구현하지 않은 Tag들이 재사용되지 않아 문제의 원인이 됨

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#8 - OutOfMemory 오류 발생 – Native Thread

JVM 메모리 Leak

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Transactions > 2017-12-19 07:05:06 ~ 2017-12-19 07:05:27 > 0ms ~ 984ms

Export to Excel tid :

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.[redacted]130	211.2[redacted]7.178	myacv-6-130	/ecpWeb/w2/getProductInfo	500	31	0	0	0	0	15.63	2017-12-19 16:05:20.611

View 1 - 1 of 1

2017년 12월 19일 : 다수의 인스턴스에서 OutOfMemory 오류가 발생

MS SQL JDBC 드라이버에서 OS 스레드를 생성하지 못하여 발생함

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	POST /ecpWeb/w2/getProductInfo View URL	Params	
Request Host	Ecp-App-PRD-3[redacted]9.ap-northeast-1.elb.amazonaws.com View Page	Status Code	500
Client IP	211.2[redacted].178 User Location	User Agent	
Start Time	2017-12-19 07:05:20.611	End Time	2017-12-19 07:05:20.642
Duration (ms)	31	CPU Time (ms)	15.63
JDBC Time (ms)	0	Latency (ms)	0
Thread Name	http-bio-80-exec-1020	Thread ID	748158
IP	192.168.6.130	Instance ID	myacv-6-130
Agent Type	WAS	Transaction ID	1606d97363d-fdc6b45c13c9e603896

Error Message

```
Handler processing failed; nested exception is java.lang.OutOfMemoryError: unable to create new native thread
 at java.lang.Thread.start0(Thread.java:-2)
 at java.lang.Thread.start(Thread.java:691)
 at com.microsoft.sqlserver.jdbc.TimeoutTimer.start(IOBuffer.java:5539)
 at com.microsoft.sqlserver.jdbc.TDSCommand.startResponse(IOBuffer.java:6137)
 at com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.doExecutePreparedStatement(SQLServerPreparedStatement.java:402)
```


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#8 - OutOfMemory 오류 발생 – Native Thread

JVM 메모리 Leak

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Transactions > 2017-12-19 07:05:06 ~ 2017-12-19 07:05:27 > 0ms ~ 984ms

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)
WAS	192.[redacted]130	211.2[redacted].178	myacv-6-130	/ecpWeb/w2/getProductInfo	500	31

2017년 12월 19일 : 다수의 인스턴스에서 OutOfMemory 오류가 발생

MS SQL JDBC 드라이버에서 OS 스레드를 생성하지 못하여 발생함

쿼리 실행 중에도 발생함

Transaction Detail | Trace | StackTrace

```
==========================================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                    Method Call
----------------------------------------------------------------------------------------------------------
[   1][07:05:20.611|      31| 100|       15|      0|    15.6]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][07:05:20.611|      16|  52|        0|     16|    15.6] + com.ace.filter.CORSFilter.doFilter()
[   3][07:05:20.611|      16|  52|        0|     16|    15.6]  + com.ace.utils.admin.XssFilter.doFilter()
[   4][07:05:20.611|      16|  52|        0|     16|    15.6]   + org.apache.tomcat.websocket.server.WsFilter.doFilter()
[   5][07:05:20.611|      16|  52|        0|     16|    15.6]    + org.springframework.web.servlet.FrameworkServlet.service()
[   6][07:05:20.611|      16|  52|       16|      0|    15.6]     + org.springframework.web.servlet.DispatcherServlet.doService()
[   7][07:05:20.627|       0|   0|        0|      0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerConnection.prepareStatement()
[   8][07:05:20.627|       0|   0|        0|      0|     0.0]       + com.microsoft.sqlserver.jdbc.SQLServerConnection.prepareStatement()
                                                                  > Query :         SELECT
            A.AccountNumber AS AccountNumber, A.OutletNumber AS OutletNumber, AccountPwd, A.AccountId AS Account
            ISNULL(AddressLine2, '') AS AddressLine2, ISNULL(AddressLine3, '') AS AddressLine3, B.AccountInfo AS
            GoogleMapX, GoogleMapY, EmailAddress, PhoneNumber, MobileNumber, FaxNumber, StoreNumber
        FROM Account A LEFT OUTER JOIN AccountInfo B ON A.AccountId = B.AccountId
         WHERE (A.ACMSConvertYN = 'Y' OR A.OutletNumber IN ('7777784'))

                    AND A.OutletNumber = ?
[   9][07:05:20.627|       0|   0|        0|      0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.execute()
                                                                  > DB    :         URL: jdbc:sqlserver://52.193.49.249:1433;authenticationScheme=nativeAuthentication;xopenStates=false;s
onseBuffering=adaptive;packetSize=8000;multiSubnetFailover=false;loginTimeout=15;lockTimeout=-1;lastUpdateCount=true;encrypt=false;disableStatementPooling=true;databaseNam
                                                                  > Query :         SELECT A.AccountNumber AS AccountNumber, A.OutletNumber AS OutletNumber, AccountPwd, A.AccountId AS Ac
ine2, '') AS AddressLine2, ISNULL(AddressLine3, '') AS AddressLine3, B.AccountInfo AS AccountInfo, GoogleMapX, GoogleMapY, EmailAddress, PhoneNumber, MobileNumber, FaxNumb
 = 'Y' OR A.OutletNumber IN ('7777784')) AND A.OutletNumber = ?
                                                                  > Params:         '6243918'
                                                                  > Mapped:         SELECT A.AccountNumber AS AccountNumber, A.OutletNumber AS OutletNumber, AccountPwd, A.AccountId AS Ac
ine2, '') AS AddressLine2, ISNULL(AddressLine3, '') AS AddressLine3, B.AccountInfo AS AccountInfo, GoogleMapX, GoogleMapY, EmailAddress, PhoneNumber, MobileNumber, FaxNumb
 = 'Y' OR A.OutletNumber IN ('7777784')) AND A.OutletNumber = '6243918'
                                                                  > SQLERR:         unable to create new native thread
[  10][07:05:20.627|       0|   0|        0|      0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerConnection.close()
```

해결책 : OS의 사용자의 Max Native 스레드 갯수를 확인해야 함

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Application Performance Management

#9
시스템 자원 고갈

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[apm]

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#9 – System 메모리

시스템 자원 고갈

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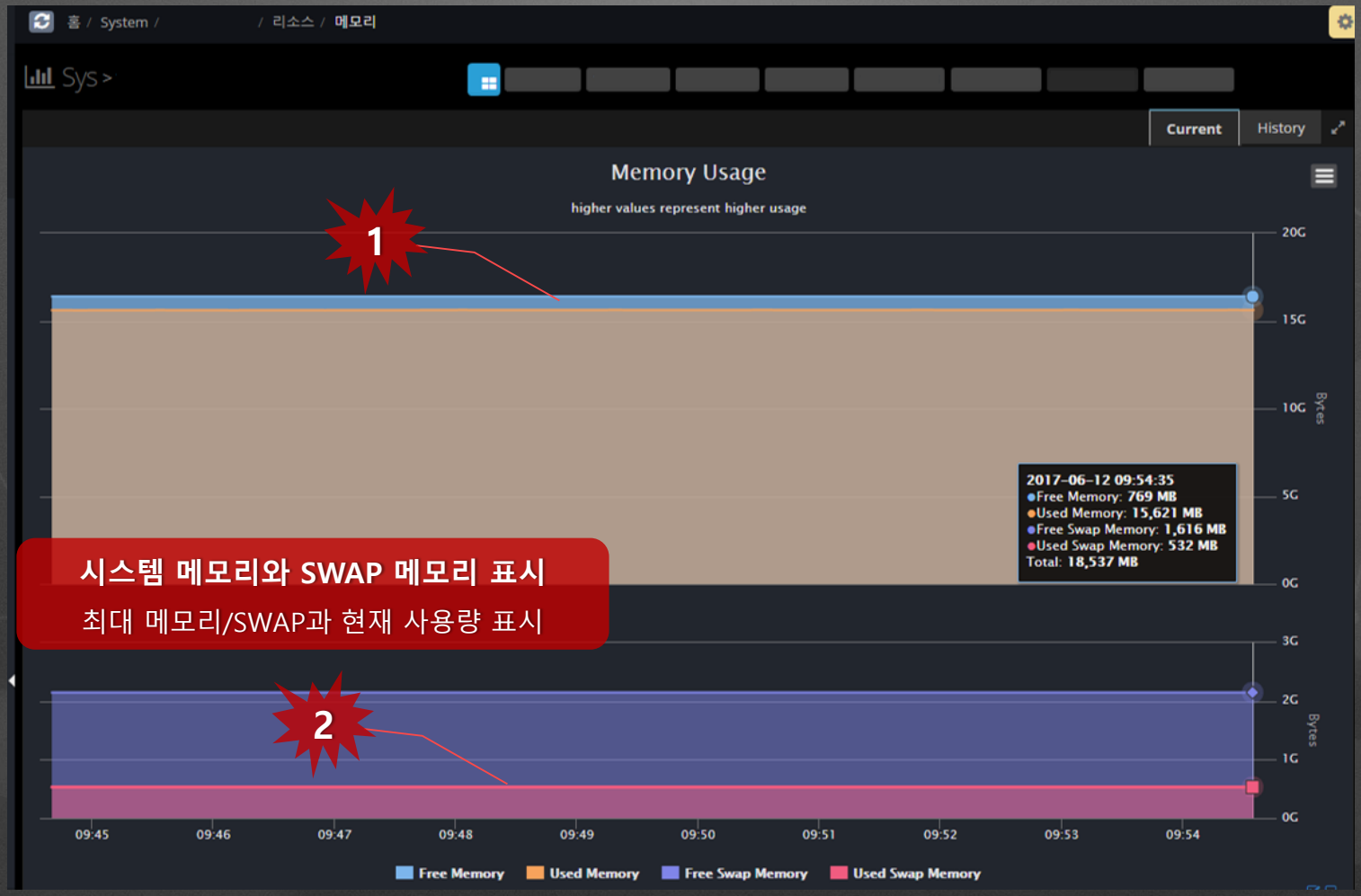

시스템 메모리와 SWAP 메모리 표시

최대 메모리/SWAP과 현재 사용량 표시

1 사용 가능한 메모리를 거의 소진

2 Swap 메모리를 500MB 사용

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#9 – System 메모리

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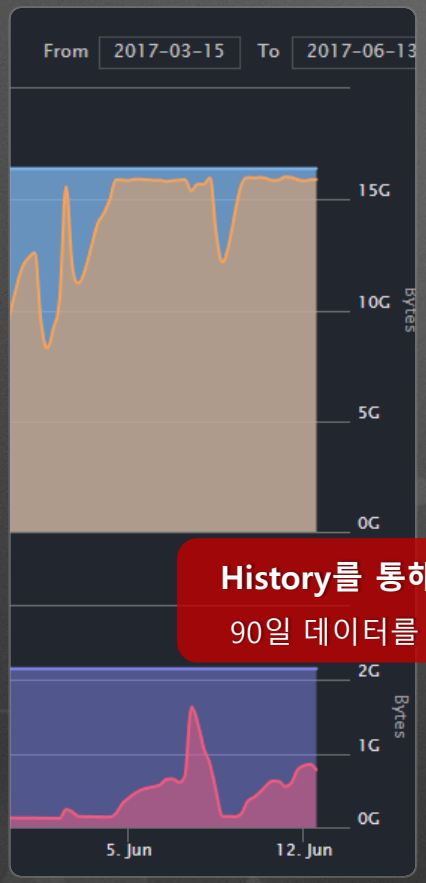

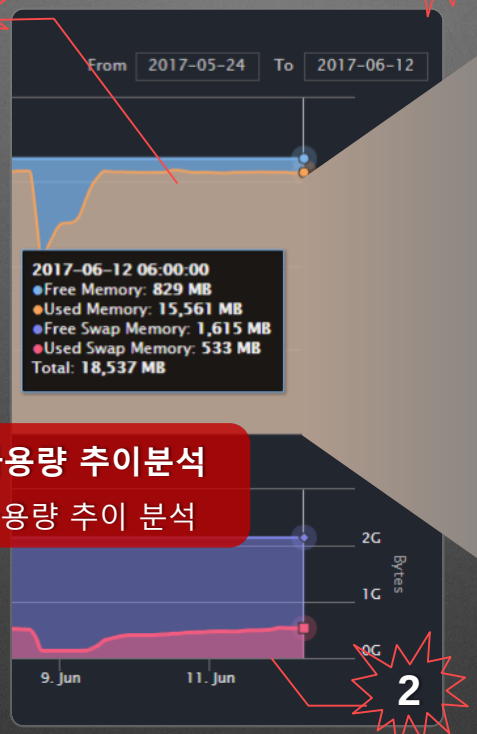

3

```
[root@cnet-naru-was03 ~]# cat /proc/meminfo
MemTotal:        16005268 kB
MemFree:           173784 kB
MemAvailable:     4107456 kB
Buffers:             7592 kB
Cached:            281896 kB
SwapCached:        110236 kB
Active:          10058144 kB
Inactive:        [illegible] kB
Active(anon):     9907128 kB
Inactive(anon):   1524664 kB
Active(file):      151016 kB
Inactive(file):    132716 kB
Unevictable:            0 kB
Mlocked:                0 kB
SwapTotal:        2097148 kB
SwapFree:         1461308 kB
Dirty:                180 kB
Writeback:              0 kB
AnonPages:       11389316 kB
Mapped:             22120 kB
Shmem:              [illegible] kB
Slab:             3937136 kB
SReclaimable:     3903356 kB
SUnreclaim:       [illegible] kB
```

History를 통해 메모리 사용량 추이분석

90일 데이터를 보관하여 사용량 추이 분석

1 리눅스 운영체제의 가용 메모리가 829MB밖에 없는 상황

2 리눅스 운영체제의 SWAP 메모리를 533MB가량 사용하고 있음

3 /proc/meminfo 를 확인하여 상세 메모리 사용량 조사

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#9 - [참조] 리눅스 명령으로 메모리 모니터링

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```
top - 13:18:19 up 1 day, 15:17,  5 users,  load average: 2.26, 2.04, 1.93
Tasks: 554 total,   1 running, 541 sleeping,   0 stopped,  12 zombie
Cpu(s): 28.5%us,  9%sy,  0.0%ni, 65.5%id,  0.0%wa,  0.0%hi,  0.4%si,  0.0
Mem:  57643[illegible] 57279644k used,   364012k free,  4860000k buffers
Swap: 16777212k total,    43076k used, 16734136k free, 14568280k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
26803 topasibe  20   0 10.2g 2.5g  10m S 185.2  4.6 270:23.91 java
27292 topasibe  20   0  9.9g 2.5g  10m S 150.4  4.6 270:20.61 java
28969 topasibe  20   0 9918m 2.4g  10m S 45.4  4.4  86:25.93 java
28415 topasibe  20   0 9984m 2.4g  10m S 43.1  4.3  86:52.44 java
29459 topasibe  20   0 9919m 2.4g  10m S 39.1  4.3  87:40.68 java
27824 topasibe  20   0 9919m 2.4g  10m S 30.8  4.3  85:39.91 java
 2233 topasibe  20   0 8883m 1.5g  10m S 29.5  2.6   7:05.36 java
 1132 topasibe  20   0 8948m 1.5g  10m S  9.9  2.7   7:21.24 java
 5389 khar      20   0 2360m 167m 9952 S  3.6  0.3 120:38.31 java
29700 daemon    20   0 [illegible]
 9606 daemon    20   0 [illegible] 2178 S  1.3  0.0   0:03.62 http
32692 topasibe  20   0 7984m 1.7g  10m S  1.3  3.1  22:24.71 java
28496 daemon    20   0 2019m [illegible] S  1.0  0.0   6:41.77 http
  729 topasibe  20   0 [illegible]
 1667 topasibe  20   0 9208m 1.4g  10m S  0.7  2.6   6:51.70 java
29329 root      20   0 15424 1596  928 R  0.7  0.0   0:00.09 top
30208 topasibe  20   0 9099m 620m 9856 S  0.7  1.1  17:25.62 java
30483 topasibe  20   0 9057m 313m 9828 S  0.7  0.6  13:00.58 java
30818 topasibe  20   0 9059m 622m 9864 S  0.7  1.1  16:46.74 java
31036 topasibe  20   0 9099m 422m 9832 S  0.7  0.7  14:54.65 java
   13 root      20   0     0    0    0 S  0.3  0.0   0:23.32 ksoftirqd/2
 1282 topasibe  20   0 7254m 1.6g  10m S  0.3  2.9   9:28.78 java
 2180 root      20   0     0    0    0 S  0.3  0.0   5:12.36 kondemand/0
 2181 root      20   0     0    0    0 S  0.3  0.0   3:51.14 kondemand/1
 2182 root      20   0     0    0    0 S  0.3  0.0   3:28.49 kondemand/2
 2183 root      20   0     0    0    0 S  0.3  0.0   3:10.82 kondemand/3
 2184 root      20   0     0    0    0 S  0.3  0.0   3:06.81 kondemand/4
 2185 root      20   0     0    0    0 S  0.3  0.0   7:53.11 kondemand/5
```

리눅스 운영체제의 가용 메모리는

Free + Buffers + Cached로 파악해야 함

```
root@was:/root> free -m
             total       used       free     shared    buffers     cached
Mem:         56292      55970        322          1       4746      14251
-/+ buffers/cache:      36972      19320
Swap:        16383         42      16341
root@was:/root>
```

Linux 메모리 관리방식

- Linux 커널에서는 Disk I/O를 줄여 성능을 향상시키기 위해 가용한 메모리를 최대한 캐시 용도로 사용함(used)
- used는 필요시 즉시 해제하여 사용할 수 있는 buffers 및 cached등을 포함하여 계산됨
- 리눅스에서는 일정 시간 후 메모리의 95% 이상이 used로 표시됨
- Linux에서의 가용 메모리는 free + buffers + cached로 파악해야 함

1. free 메모리가 약 3.6G 표시됨
2. 사용가능한 buffers, cache가 각각 4.8G, 14.5G로 표시
3. free -m 명령으로 보면 free 메모리가 322M 가량으로 표시됨
4. buffers, cached가 각각 4.7G, 14.251G 표시됨

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#9 - [참조] 리눅스 명령으로 메모리 모니터링

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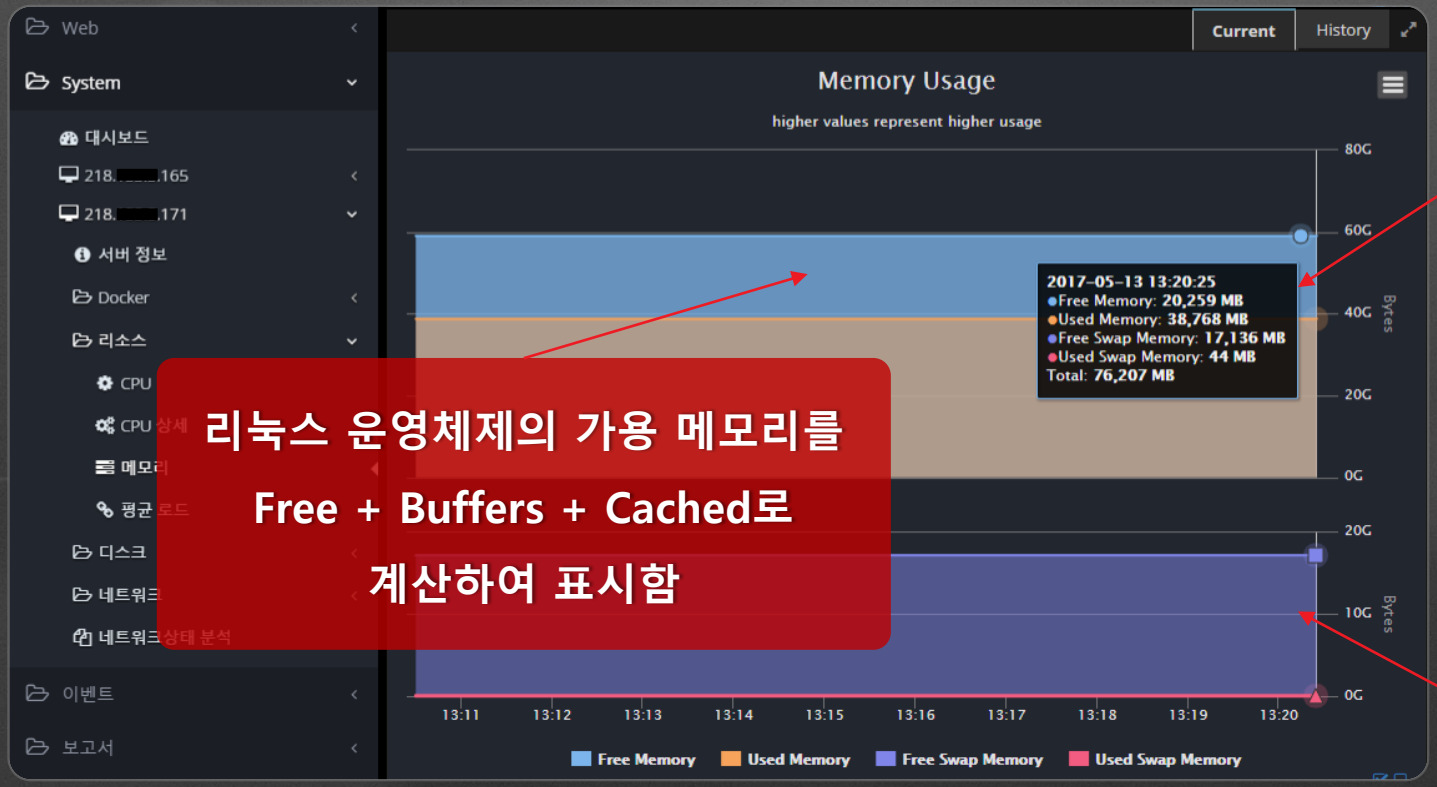

리눅스 운영체제의 가용 메모리를
Free + Buffers + Cached로
계산하여 표시함

물리적 메모리를 실제 애플리케이션 사용한 메모리와 가용한 메모리로 표현

Swap 메모리를 사용한 메모리와 가용한 메모리로 표현

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#9 – System 메모리

시스템 자원 고갈

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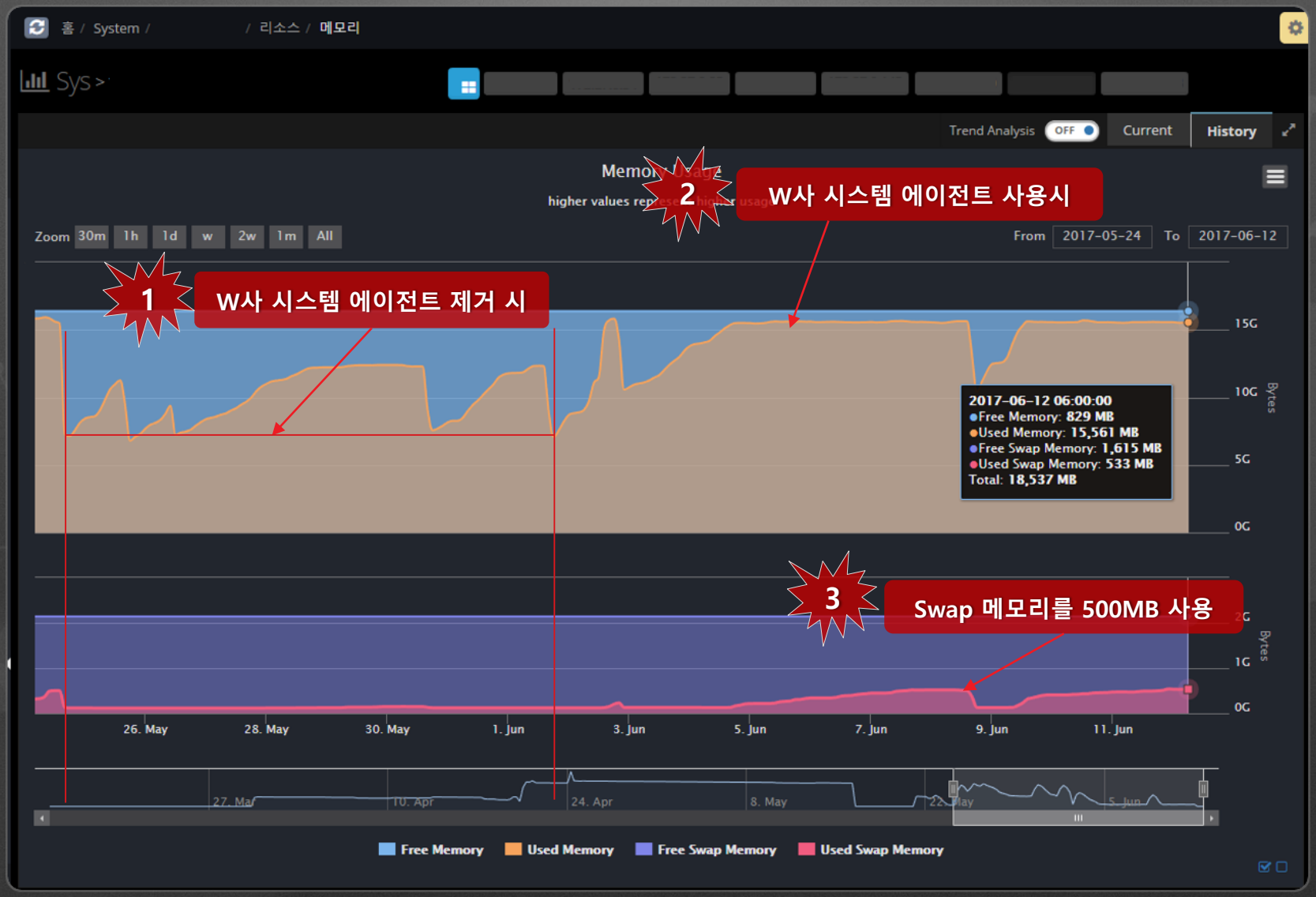

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#9 – System 메모리

시스템 자원 고갈

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시스템 Load Average를 모니터링

1,5,15분 Load Average값을 모니터링

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#9 – Linux 커널 캐시 메모리 상태(slabtop)

시스템 자원 고갈

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```
[root@cnet-naru-was03 ~]# cat /proc/meminfo
MemTotal:        16005268 kB
MemFree:           173784 kB
MemAvailable:     4107456 kB
Buffers:             7592 kB
Cached:            281896 kB
SwapCached:        110236 kB
Active:          10058144 kB
Inactive:         1657380 kB
Active(anon):     9907128 kB
Inactive(anon):   1524664 kB
Active(file):     [illegible] kB
Inactive(file):   [illegible] kB
Unevictable:           0 kB
Mlocked:               0 kB
SwapTotal:       2097148 kB
SwapFree:        [illegible] kB
Dirty:               180 kB
Writeback:             0 kB
AnonPages:       11389316 kB
Mapped:             22120 kB
Shmem:               5652 kB
Slab:             3937136 kB
SReclaimable:     3903356 kB
SUnreclaim:         33780 kB
KernelStack:        20144 kB
PageTables:         30152 kB
NFS_Unstable:           0 kB
Bounce:                 0 kB
WritebackTmp:           0 kB
CommitLimit:     10099780 kB
Committed_AS:    11402420 kB
VmallocTotal:    34359738367 kB
VmallocUsed:        41780 kB
VmallocChunk:    34359690748 kB
HardwareCorrupted:      0 kB
AnonHugePages:    8792064 kB
HugePages_Total:        0
HugePages_Free:         0
HugePages_Rsvd:         0
HugePages_Surp:         0
Hugepagesize:        2048 kB
DirectMap4k:        61440 kB
DirectMap2M:     16707584 kB
```

리눅스 커널 메모리중 slab 메모리를 3.9GB 사용하고 있음

→ slabtop으로 분석 필요

```
Active / Total Objects (% used)    : 9165609 / 9198068 (99.6%)
Active / Total Slabs (% used)      : 403490 / 403490 (100.0%)
Active / Total Caches (% used)     : 73 / 99 (73.7%)
Active / Total Size (% used)       : 3736800.07K / 3753067.05K (99.6%)
Minimum / Average / Maximum Object : 0.01K / 0.41K / 8.00K

  OBJS ACTIVE  USE OBJ SIZE  SLABS OBJ/SLAB CACHE SIZE NAME
4461219 4460718  99%    0.19K 212439       21    849756K dentry
4442184 4441608  99%    0.64K 185091       24   2961456K proc_inode_cache
 31232  31232 100%    0.01K     61      512       244K kmalloc-8
 25344  25344 100%    0.02K     99      256       396K kmalloc-16
 22032  22032 100%    0.11K    612       36      2448K sysfs_dir_cache
 17920   7855  43%    0.57K    640       28     10240K radix_tree_node
 17472  14212  81%    0.06K    273       64      1092K kmalloc-64
 16000  15165  94%    0.03K    125      128       500K kmalloc-32
 11832  11832 100%    0.08K    232       51       928K selinux_inode_security
 11520  11520 100%    0.03K     90      128       360K jbd2_revoke_record_s
 10633   5897  55%    1.03K    343       31     10976K nfs_inode_cache
 10323   9494  91%    0.21K    279       37      2232K vm_area_struct
  9690   9690 100%    0.05K    114       85       456K shared_policy_node
  8364   8264  [illegible]                      extent_status
  8184   5195  63%    1.02K    264       31      8448K ext4_inode_cache
  7911   7790  [illegible]                      [illegible]
  7552   5679  75%    0.06K    118       64       472K anon_vma
  7488   6487  86%    0.25K    234       32      1872K kmalloc-256
  7182   6580  91%    0.09K    171       42       684K kmalloc-96
  6825   3848  56%    0.10K    175       39       700K buffer_head
  6464   6464 100%    0.06K    101       64       404K ext4_free_data
  6290   6290 100%    0.12K    185       34       740K fsnotify_event
  6272   6272 100%    0.07K    112       56       448K Acpi-ParseExt
  4672   3848  82%    0.12K    146       32       584K kmalloc-128
  4137   3914  94%    0.19K    197       21       788K kmalloc-192
  2560   2329  90%    0.50K     80       32      1280K kmalloc-512
  2448   2448 100%    0.04K     24      102        96K Acpi-Namespace
  2336   2236  95%    1.00K     73       32      2336K kmalloc-1024
  2028   2028 100%    0.10K     52       39       208K blkdev_ioc
  1825   1796  98%    0.62K     73       25      1168K sock_inode_cache
  1440   1440 100%    0.66K     60       24       960K shmem_inode_cache
  1404   1224  87%    0.11K     39       36       156K jbd2_journal_head
```

리눅스 커널 메모리중 dentry 840MB 와 proc_inode_cache 2960MB를 사용하고 있음

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#9 – 시스템 CPU 사용률

시스템 자원 고갈

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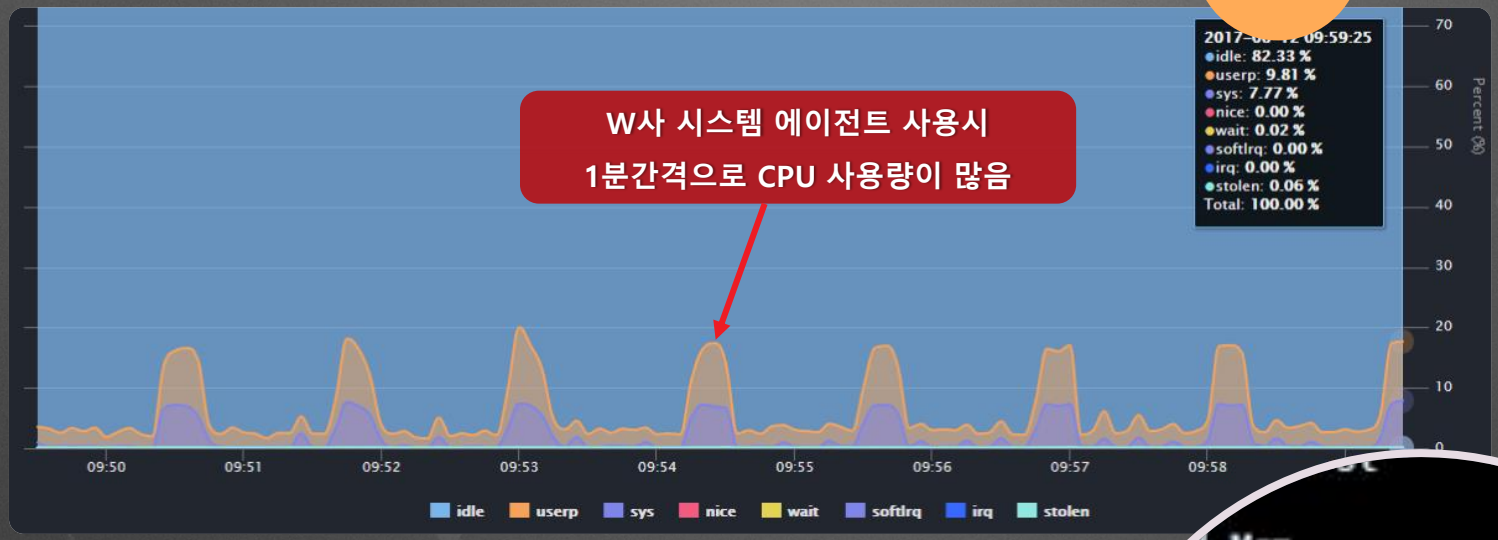

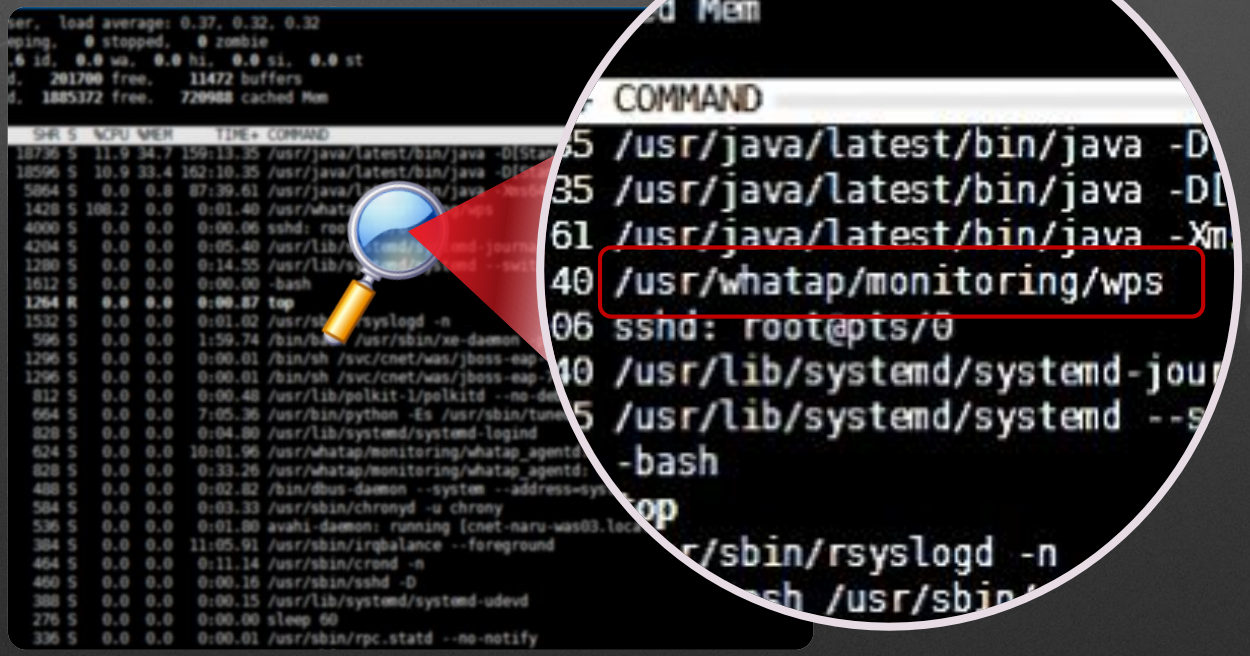

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#10 - 머신의 TCP 연결 상태(3개월간)

시스템 자원 고갈

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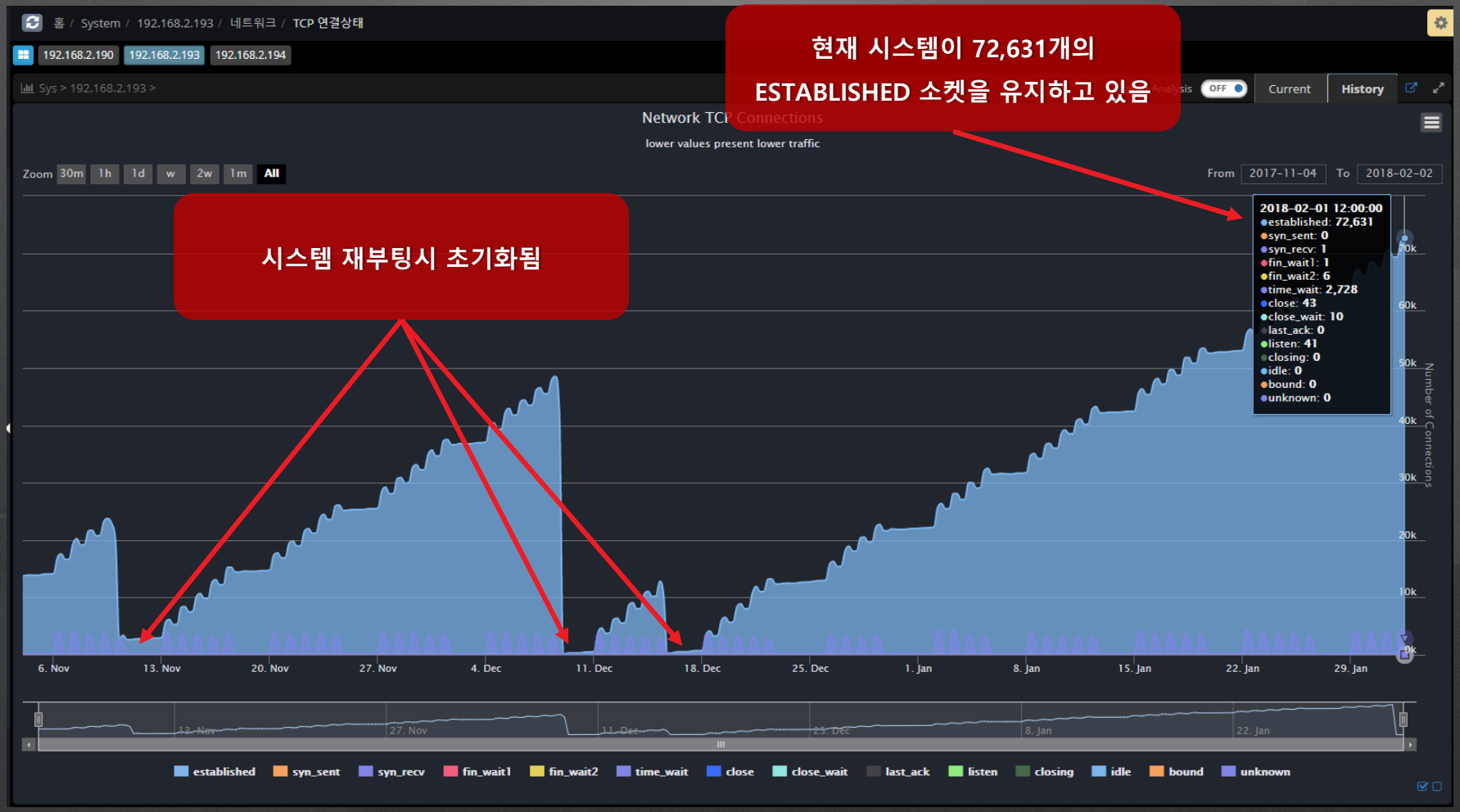

현재 시스템이 72,631개의 ESTABLISHED 소켓을 유지하고 있음

시스템 재부팅시 초기화됨

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#10 - JVM 인스턴스의 파일 오픈수(3개월간)

시스템 자원 고갈

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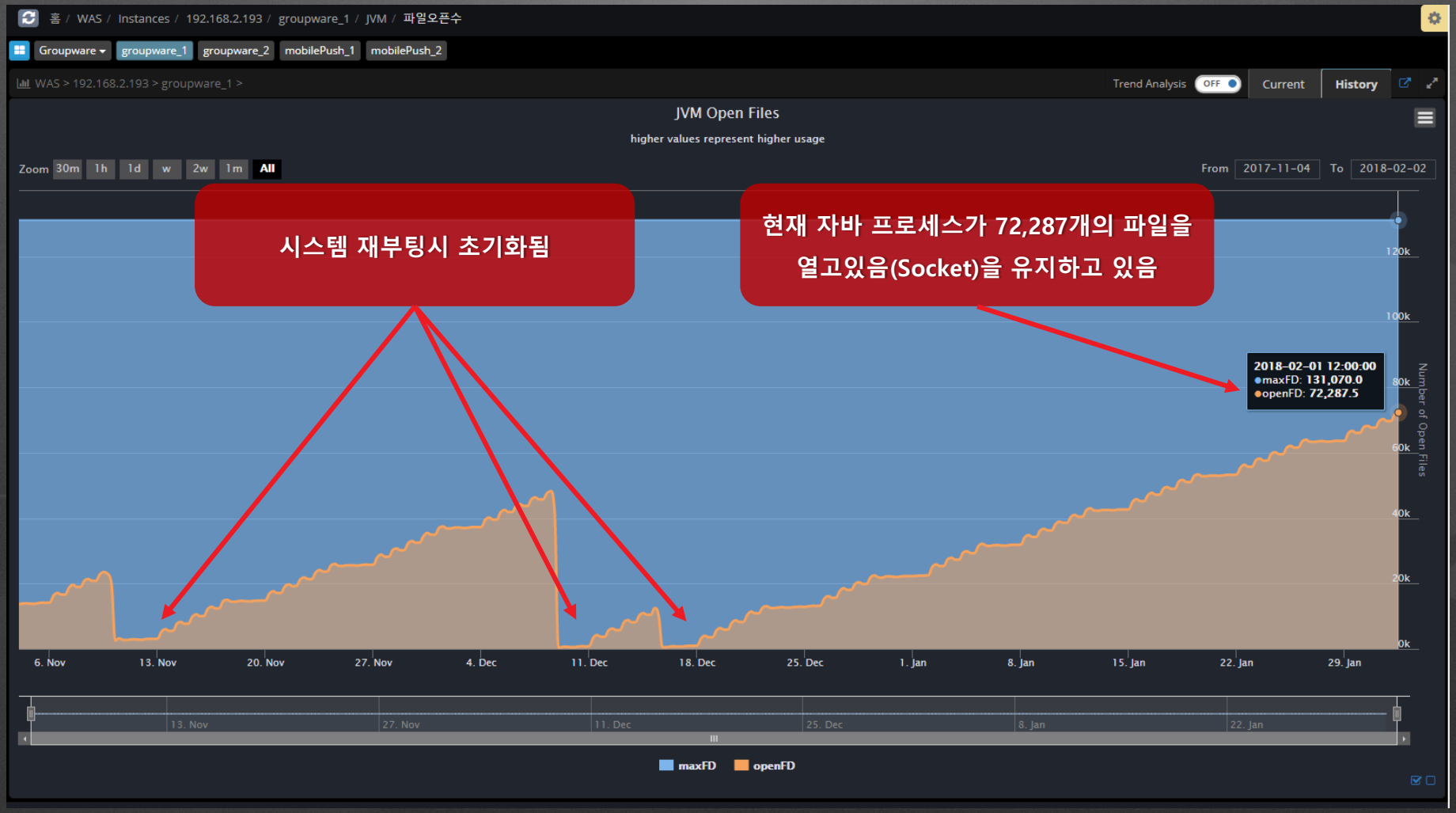

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Application Performance Management

#11, #12
서버 환경 설정 이슈

KHAN
[apm]

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#11 - 현상 : WAS로 사용자가 들어오지 못함

서버 환경 설정 이슈

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서비스에 사용자가 들어오지 못하는 현상 발생

KHAN [apm]

Administrator

WAS

- Dashboards
- Instances
- 애플리케이션
  - ALL
  - ELE[redacted]NG
    - 만족도 지수(APDEX)
    - 실시간 요청 모니터링
    - 트랜잭션 맵(T-Map)
    - 초당처리수(TPS)
    - 액티브 사용자수
    - 지연 트랜잭션
    - 평균응답시간
    - 응답시간
    - JVM 메모리 비교
    - 액티브 DB 연결
    - 호출 통계
    - 느린 URL 검색
    - 오류율
    - 오류 통계
    - 시스템 CPU 사용률
    - 시스템 메모리 사용률

홈 / WAS / 애플리케이션 / ELEARNING / 액티브 사용자수

ELE[redacted]NG | elearning11 | elearning12 | elearning21 | elearning22

WAS > ELEARNING >

History

Active Users

higher values represent higher usages

Zoom 30m 1h 1d w 2w 1m All

From 2017-11-07 To 2017-11-07

2017-11-07 09:00:00
210.90.107.182-elearning11 199.8
210.90.107.182-elearning12 230.2
210.90.107.183-elearning21 222.8
210.90.107.183-elearning22 192.2

Number of Users

210.[redacted].182-elearning11 | 210[redacted].182-elearning12 | 210.[redacted].183-elearning21 | 210[redacted]7.183-elearning22

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#11 - 원인 : Apache 웹 서버 다운

서버 환경 설정 이슈

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Apache 웹 서버 모니터링 기능

Requests Per Second, Traffic, Worker 상태, 연결상태 모니터링,

mod_jk / mod_cluster 워커 상태 모니터링 및 유입제어 기능 제공

Apache 웹서버 다운

오류 메시지 : Resource temporarily unavailable: AH03142: apr_thread_create: unable to create worker thread

원인 : OS의 사용자 limit 값이 부족하여 발생함

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WEB 서버 모니터링 – 실시간 View

서버 환경 설정 이슈

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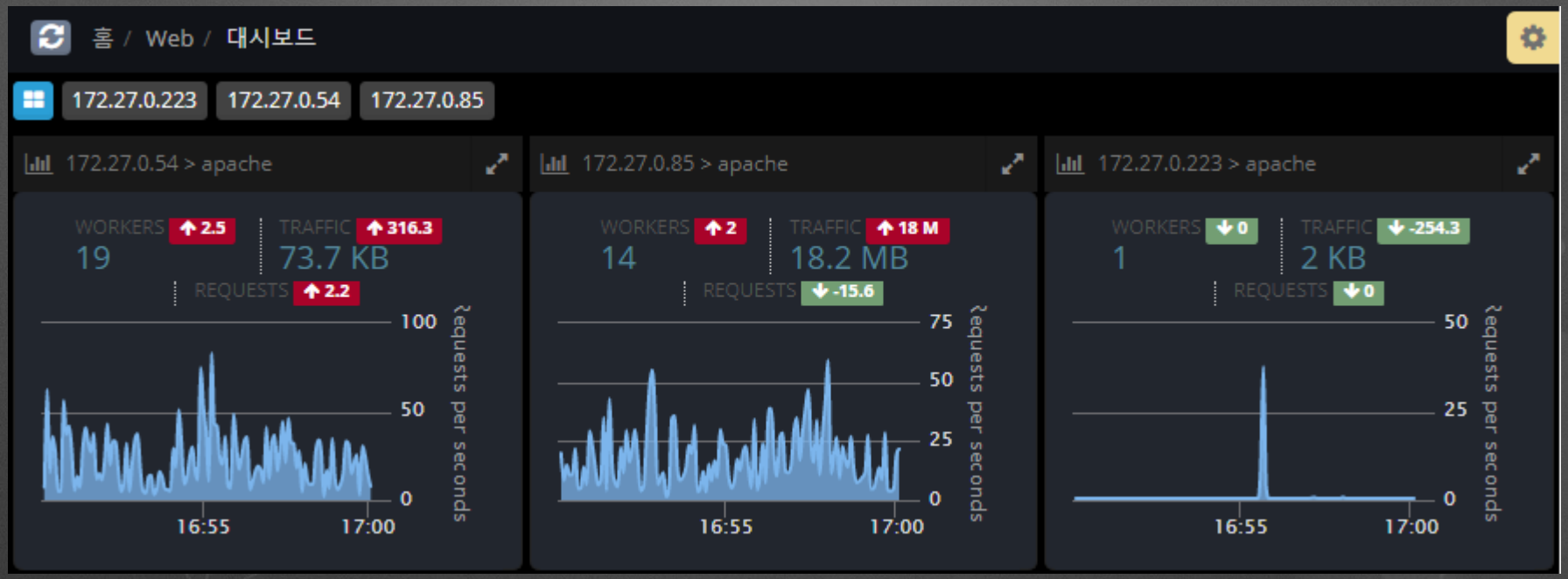

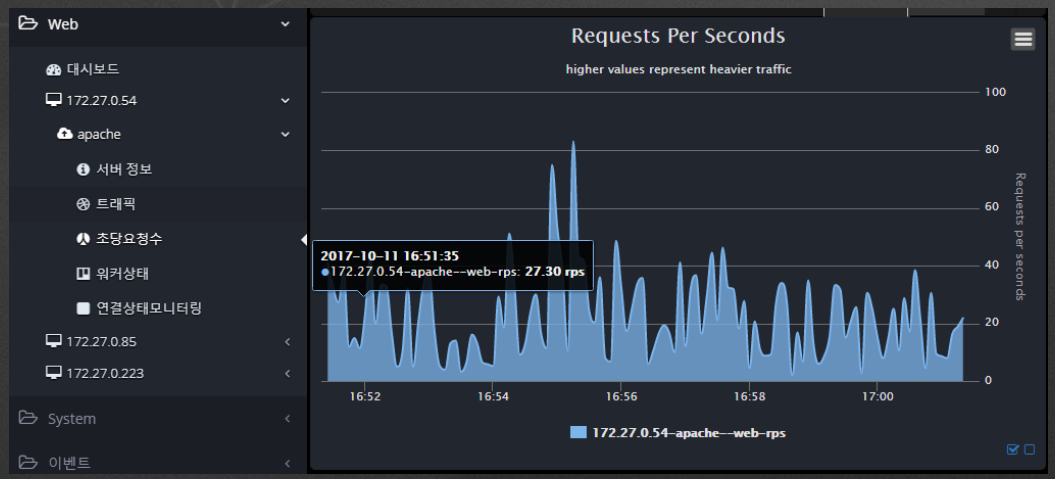

서버정보
트래픽
TPS
워커 상태
연결 상태 모니터링

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#12 - SQL 쿼리는 빠르지만, 수행시간이 느림

서버 환경 설정 이슈

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Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	105[redacted]156	10[redacted]2.33	instance11	/blg/message/messageAlarm.do	200	2,835,203	7	0	2	0	61.95	2018-01-10 08:24:07.480
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,789,633	215	3	34	0	57.73	2018-01-10 08:33:38.342
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,787,458	211	3	38	0	18.89	2018-01-10 08:33:40.512
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,784,973	201	4	34	0	18.63	2018-01-10 08:33:42.988
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,784,267	214	3	34	0	18.33	2018-01-10 08:33:43.706
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,759,587	100	2	34	0	19.28	2018-01-10 08:34:08.274
WAS	105[redacted]156	10[redacted]2.5	instance11	/bms/dctlist/ctrldeptviewsource.do	200	2,758,458	206	10	34	0	18.28	2018-01-10 08:34:09.514

SQL 쿼리수행시간은 7~200ms 가량이지만, 전체 URL 실행시간이 2,800초 가량 실행되는 경우

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	GET /blg/message/messageAlarm.do View URL		CT,NCT&lastEventId=&r=8679720828103905
Request Host	105[redacted]156 View Page		
Client IP	105[redacted]33 User Location	User Agent	Mozilla/5.0 (MSIE 9.0;IPMS/210C1869-159EE7BFE9E-00000005346; Windows NT 6.1; Trident/7.0; rv:11.0) like Gecko
Start Time	2018-01-10 08:24:07.480	End Time	2018-01-10 09:11:22.683
Duration (ms)	2,835,203	CPU Time (ms)	61.95
JDBC Time (ms)	7	Latency (ms)	0
Thread Name	http-thread-pool-threads - 204	Thread ID	503
IP	105.27.1.156	Instance ID	instance11
Agent Type	WAS	Transaction ID	160dd38b541-e427e1f23a9cde52e2c

Method Traces

```
==========================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
------------------------------------------------------------------------------------------
[   1][08:24:07.480|2,835,203| 100|2,835,195|      0|     62.0]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][09:11:22.675|       8|   0|       0|      8|      1.3] + org.springframework.web.servlet.FrameworkServlet.service()
[   3][09:11:22.675|       8|   0|       1|      7|      1.3]  + org.springframework.web.servlet.DispatcherServlet.doService()
[   4][09:11:22.675|       0|   0|       0|      0|      0.0]   + org.jboss.jca.adapters.jdbc.WrapperDataSource.getConnection()
[   5][09:11:22.675|       0|   0|       0|      0|      0.0]   + org.jboss.jca.adapters.jdbc.WrappedConnection.prepareStatement()
[   6][09:11:22.675|       3|   0|       1|      2|      0.1]   + org.jboss.jca.adapters.jdbc.WrappedPreparedStatement.execute()
                                                  > DB    :     URL: jdbc:cubrid:105.27.1.164:34000:onnaracommon_db:::?althost=105.27.1.165:34000&charset=utf-8
                                                  > Query :     SELECT COUNT(*) FROM bms_com_message_blg WHERE menu_type = 'NCT' AND TO_CHAR(SYSDATETIME, 'yyyyMMddhh24miss') BETWEEN SUBSTR(msg_title, -29 , 14) AND SUBSTR(msg_
title, -14)
                                                  > Mapped:     SELECT COUNT(*) FROM bms_com_message_blg WHERE menu_type = 'NCT' AND TO_CHAR(SYSDATETIME, 'yyyyMMddhh24miss') BETWEEN SUBSTR(msg_title, -29 , 14) AND SUBSTR(msg_
title, -14)
[   7][09:11:22.676|       2|   0|       0|      2|      0.1]    + org.jboss.jca.adapters.jdbc.CachedPreparedStatement.execute()
```


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#12 - SQL 쿼리는 빠르지만, 수행시간이 느림

서버 환경 설정 이슈

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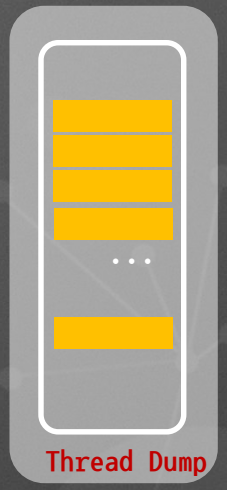
- 서비스 지연 상황
  - 일시 : 2018-01-19T13:29:33
  - Instance : instance11

서비스 지연시점에 자동으로 생성된 Thread Dump를 이용하여 분석함



85초~100초 가량 실행 중인 상황

Static 컨텐츠(.gif)가 WAS로 유입되고 있음
Web 서버에서 처리될 수 있도록 분리해야 함

Thread Dump Analyzer > None

Search | Analyze From Text | Load from URL

#	Line#	Type	Name	State	URL	Durati...	CPU Ti...	Class
5	1,218	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left.gif	86,057	0.1	
6	1,968	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/close.gif	86,060	0.1	
7	2,014	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_right.gif	95,687	0.1	
8	2,140	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_right2.gif	55,384	0.1	
9	2,202	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left2.gif	76,025	0.1	
10	2,280	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left.gif	55,384	0.1	
11	2,342	Active Thread	http-thread-pool-	WAITING	/blg/message/messageAlarm...	90,807	0.1	
12	2,388	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_right.gif	54,834	0.2	
13	2,482	Active Thread	http-thread-pool-	WAITING	/bms/dctlist/ctrldeptviewsour...	100,253	0.1	
14	2,624	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left2.gif	86,058	0.1	
15	2,718	Active Thread	http-thread-pool-	TIMED_WAITIN	/bms/dctlist/ctrldeptviewsour...	104,763	2.9	
16	2,980	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/close.gif	76,025	0.1	
17	3,010	Active Thread	http-thread-pool-	WAITING	/bms/dctlist/ctrldeptviewsour...	35,109	0.1	
18	3,088	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left2.gif	95,690	0.1	
19	3,358	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/close.gif	55,386	0.1	
20	3,708	Active Thread	http-thread-pool-	WAITING	/ref/images/cal/ico_left.gif	76,024	0.1	

Record ID: 703 5-21 of 1,048

Thread Dump Text > None

```
2716      - None
2717
2718  "http-thread-pool-threads - 140" prio=10 tid=0x00007f4cbc0cd000 nid=0x13ce waiting on condition [0x00007f4b
2719     java.lang.Thread.State: TIMED_WAITING (parking)
2720      at sun.misc.Unsafe.park(Native Method)
2721      - parking to wait for  <0x00000007d4a5a370> (a java.util.concurrent.locks.AbstractQueuedSynchronizer$Co
2722      at java.util.concurrent.locks.LockSupport.parkNanos(LockSupport.java:226)
2723      at java.util.concurrent.locks.AbstractQueuedSynchronizer$ConditionObject.await(AbstractQueuedSynchroniz
2724      at org.jgroups.blocks.Request.responsesComplete(Request.java:197)
2725      at org.jgroups.blocks.Request.execute(Request.java:89)
2726      at org.jgroups.blocks.MessageDispatcher.cast(MessageDispatcher.java:337)
2727      at org.jgroups.blocks.mux.MuxRpcDispatcher.cast(MuxRpcDispatcher.java:110)
2728      at org.jgroups.blocks.MessageDispatcher.castMessage(MessageDispatcher.java:249)
2729      at org.jgroups.blocks.RpcDispatcher.callRemoteMethods(RpcDispatcher.java:165)
2730      at org.jboss.as.clustering.impl.CoreGroupCommunicationService.callMethodOnCluster(CoreGroupCommunicatio
2731      at org.jboss.as.clustering.lock.AbstractClusterLockSupport.lock(AbstractClusterLockSupport.java:151)
2732      at org.jboss.as.clustering.lock.SharedLocalYieldingClusterLockManager.lock(SharedLocalYieldingClusterLo
2733      at org.jboss.as.clustering.impl.CoreGroupCommunicationDispatchedBlockingMembership$Dispatcher$Map$Entry
2734      at org.jboss.as.web.session.ClusteredSession.acquireSessionOwnership(ClusteredSession.java:520)
2735      at org.jboss.as.web.session.ClusteredSession.access(ClusteredSession.java:488)
2736      at org.apache.catalina.connector.Request.doGetSession(Request.java:2638)
2737      at org.apache.catalina.connector.Request.getSession(Request.java:2382)
2738      at org.jboss.as.web.security.SecurityContextAssociationValve.invoke(SecurityContextAssociationValve.jav
2739      at org.apache.catalina.core.StandardHostValve.invoke(StandardHostValve.java:150)
2740      at org.apache.catalina.valves.ErrorReportValve.invoke(ErrorReportValve.java:97)
2741      at org.apache.catalina.core.StandardEngineValve.invoke(StandardEngineValve.java:102)
2742      at com.opennaru.khan.stuckthread.StuckThreadDetectionValve.invoke(StuckThreadDetectionValve.java:205)
2743      at org.apache.catalina.connector.CoyoteAdapter.service(CoyoteAdapter.java:344)
2744      at org.apache.coyote.ajp.AjpAprProcessor.process(AjpAprProcessor.java:475)
2745      at org.apache.coyote.ajp.AbstractAjpProtocol$AjpConnectionHandler.process(AbstractAjpProtocol.java:454)
2746      at org.apache.tomcat.util.net.AprEndpoint$SocketWithOptionsProcessor$1.run(AprEndpoint.java:2562)
2747      at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1145)
2748      at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:615)
2749
```

WAS 세션을 찾으려 대기중인 상황
(사용자 요청 분배 문제 : Sticky Session)

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#12 - 운영 서버 시스템 구성 변경 방안

서버 환경 설정 이슈

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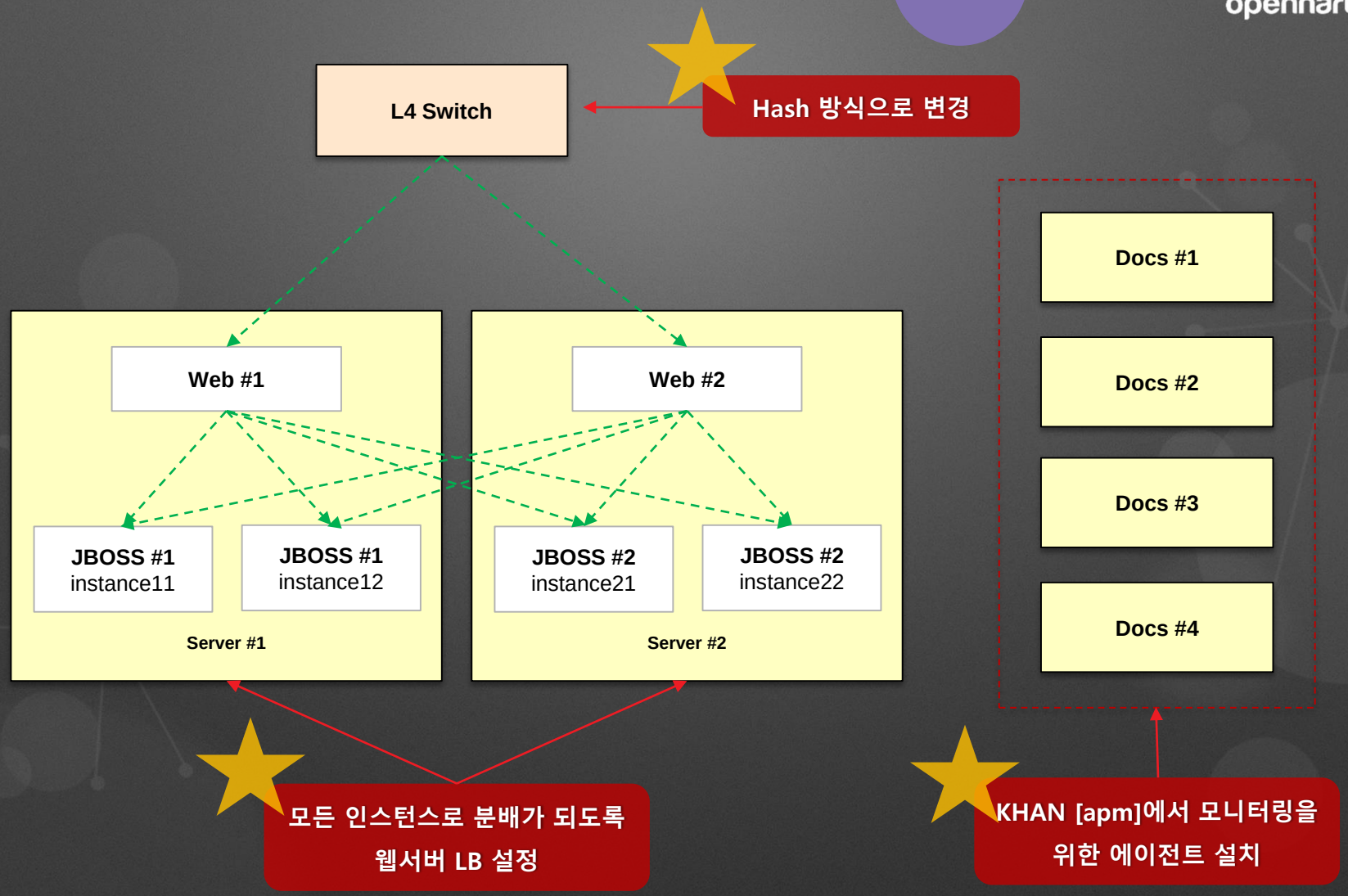

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#12 - 참고] L4의 Load Balancing 알고리즘

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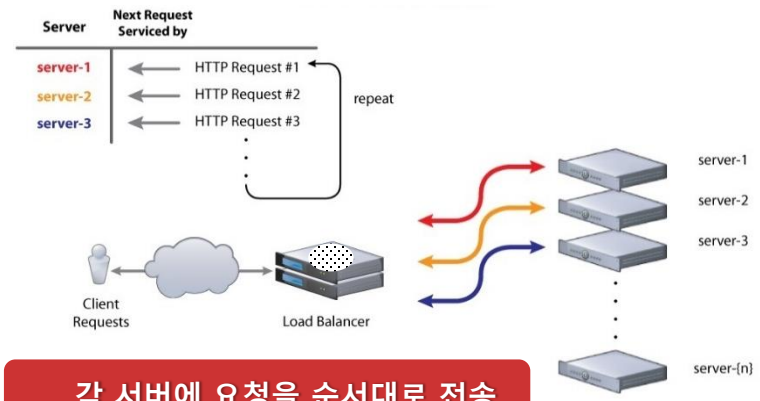
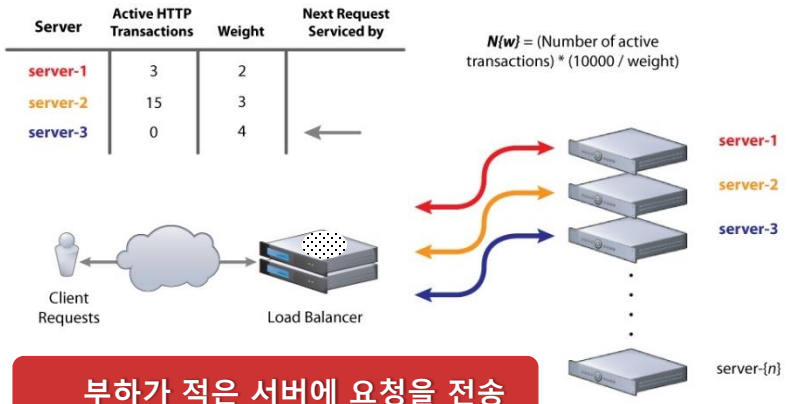
Round Robin 방식



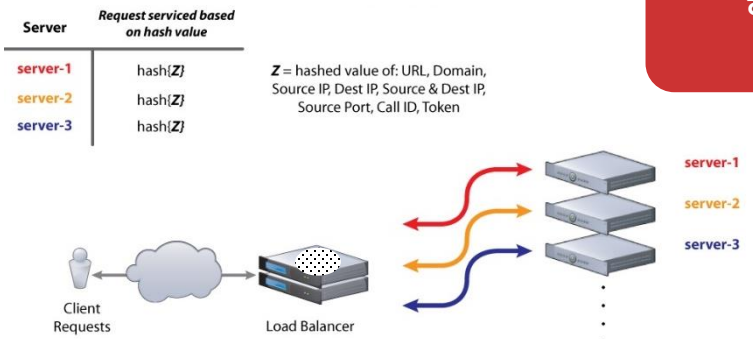
각 서버에 요청을 순서대로 전송

Least Connection 방식



부하가 적은 서버에 요청을 전송

Hash 방식



요청자 IP를 Hash하여 동일한 User는 동일한 서버에 요청을 전송

사용자 세션을 유지(로그인)해야 하는 경우에는 반드시 Hash 방식으로 설정해야 함

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Application Performance Management

#13
인스턴스 하나만 문제가

KHAN
[apm]

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#13 - 현상 : 한 인스턴스에만 요청이 쌓임

- 일시 : 2017년 6월 15일 오전 10:30분
- 현상
  - 22 인스턴스에 Pending이 쌓이며 처리가 늦어지는 현상
- 의문?
  - 웹서버를 통한 요청이 제대로 분배되는가?

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#13 - 인스턴스별 사용자 현황

Server Slowdown 현상

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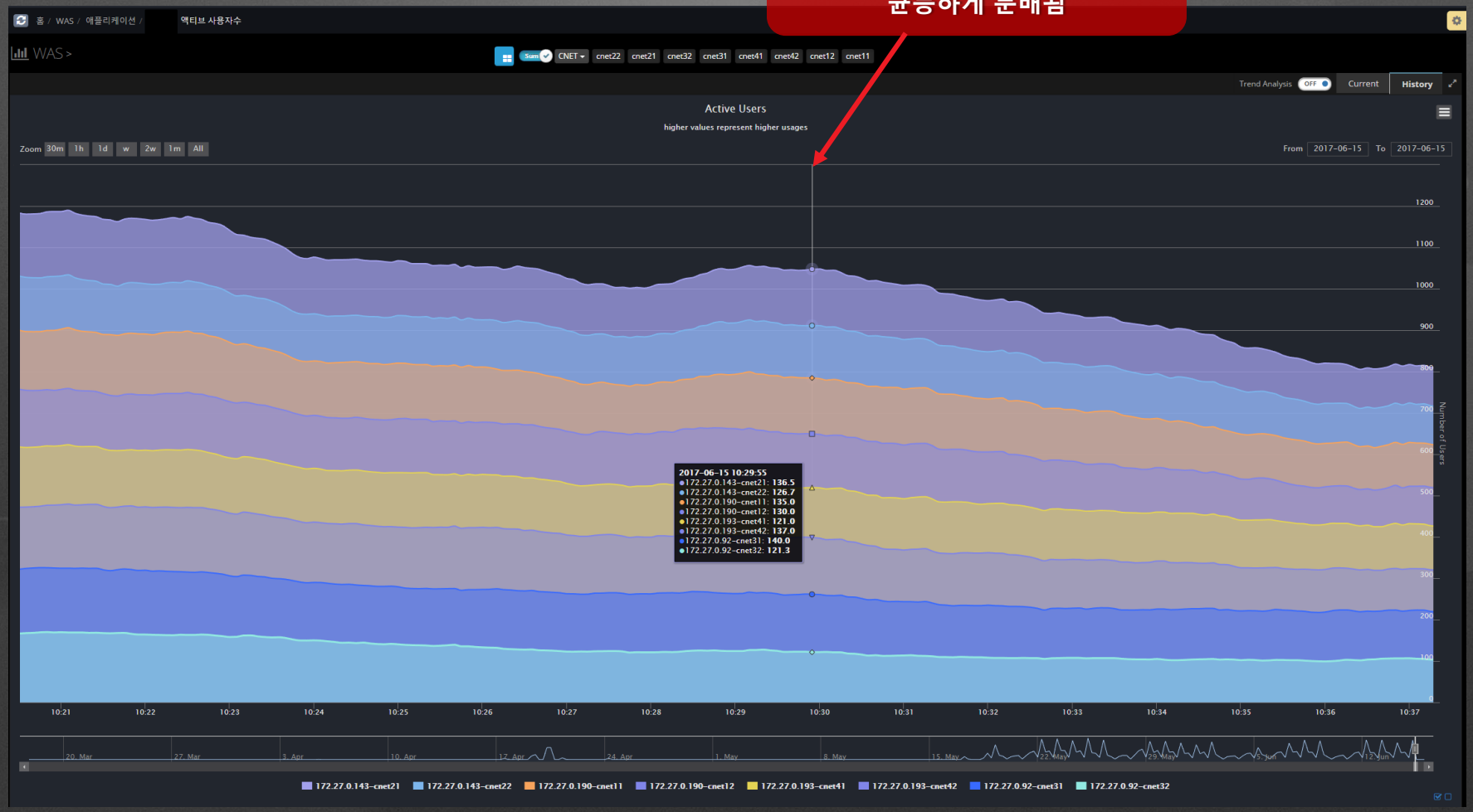
사용자가 인스턴스 별로
균등하게 분배됨



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#13 - 인스턴스별 평균 응답시간 현황

Server Slowdown 현상

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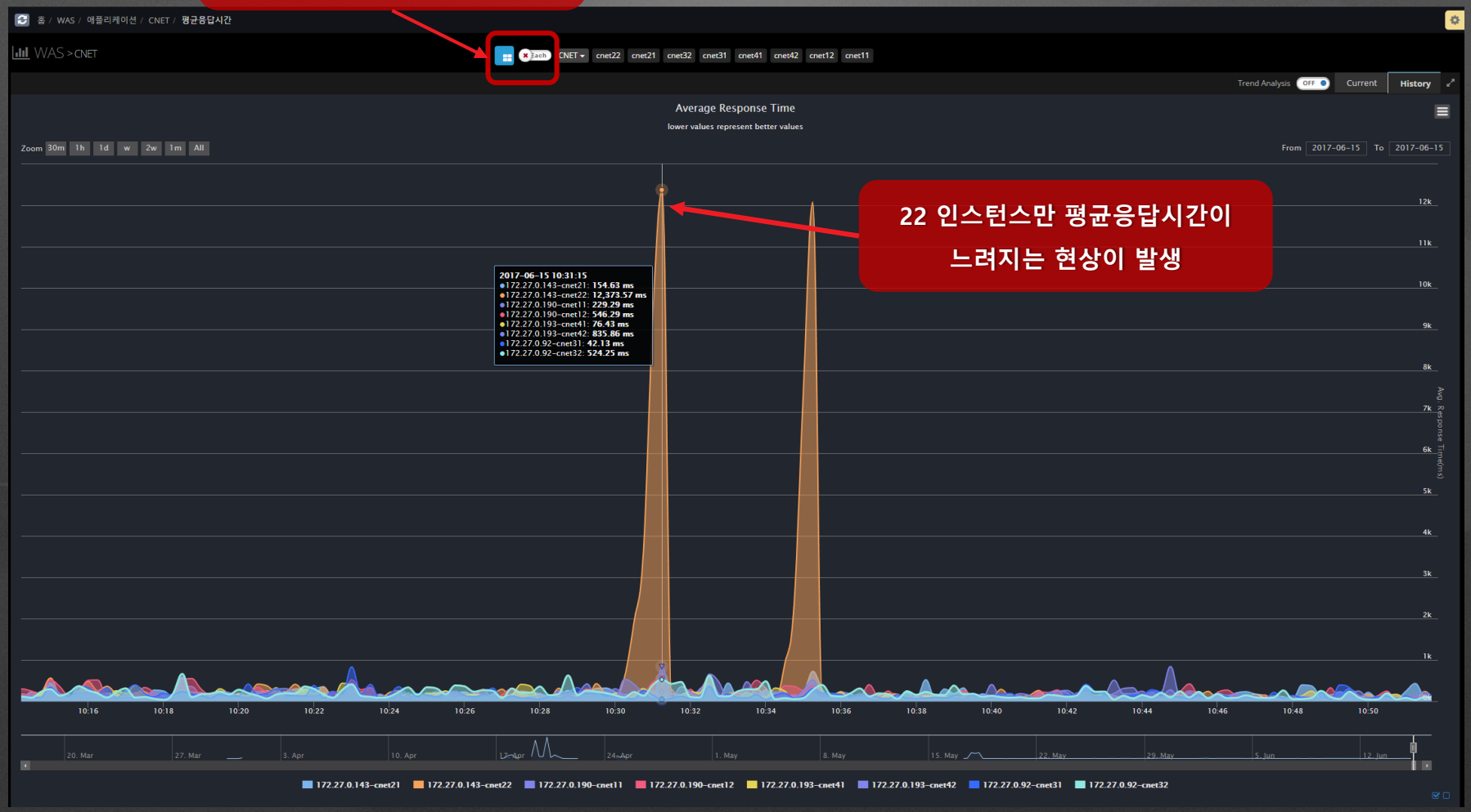
토글 버튼으로 애플리케이션
그룹내의 개별 인스턴스 분석



22 인스턴스만 평균응답시간이
느려지는 현상이 발생

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#13 - 인스턴스별 Pending Request 현황 분석

Server Slowdown 현상

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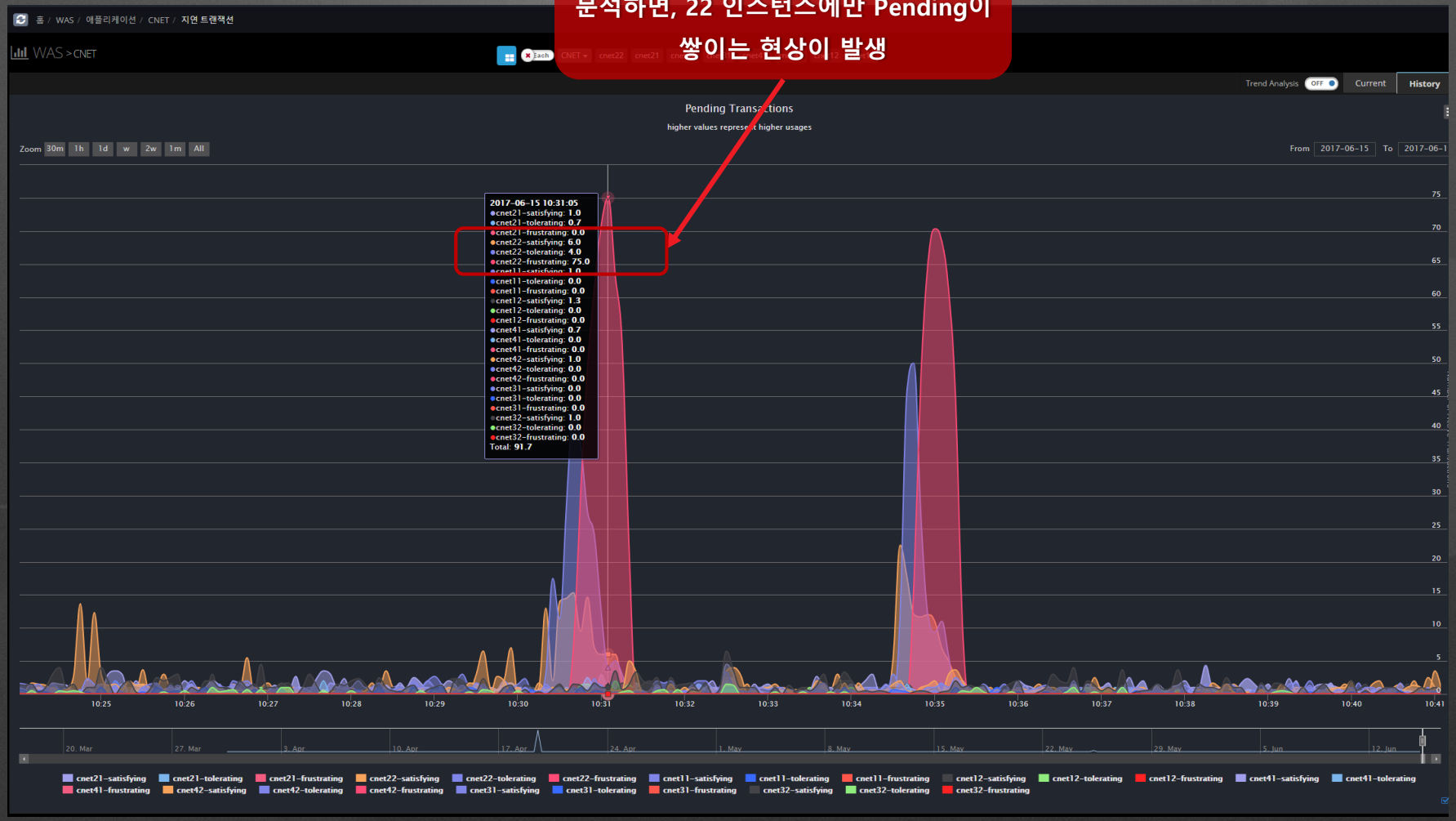
애플리케이션 그룹의 인스턴스별로 분석하면, 22 인스턴스에만 Pending이 쌓이는 현상이 발생



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#13 - 인스턴스 스레드 덤프 분석(자동생성)

Server Slowdown 현상

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WAS > 172.27.0.143 > cnet22

CNET | cnet22 | cnet21 | cnet32 | cnet31 | cnet41 | cnet42 | cnet12 | cnet11

Request Velocity

4.0tps
0.05s
95u

Satisfying | Tolerating | Frustrating

Thread Dump List

#	Created	Host	Instance	Level	UUID
1	2017-06-15 10:31:20	172.27.0.143	cnet22	INFO	E52CF04A-558F-43A5-8E56-3321F479E1C...
2	2017-04-20 10:58:30	172.27.0.143	cnet22	INFO	8168474D-21B5-4702-9979-540CF36648...
3	2017-04-20 10:58:29	172.27.0.143	cnet22	INFO	857213B9-C51C-4DC0-86BB-A3D138464...
4	2017-04-20 10:57:30	172.27.0.143	cnet22	INFO	15487387-750C-4E34-8A54-E46EBD...663...
5	2017-04-20 10:57:29	172.27.0.143	cnet22	INFO	93EB4D0B-D343-4B34-9F18-5A4...29F938...

Record ID: 10 | 1-5 of

Thread Dump Analyzer > 2017-06-15 10:31:20 (E52CF04A-558F-43A5-8E56-3321F479E1CB)

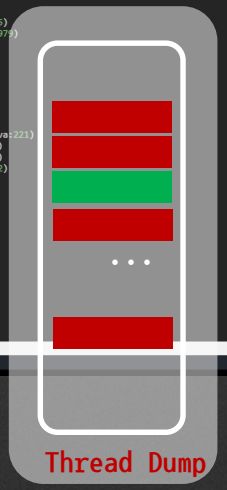
#	Lin...	Type	Name	State	URL	Durati...	CPU Ti...	Class	At	Addr...
1	650	Active Thre...	default task-246	RUNNABLE	/cnet/front/exame...	14,403	352.9		java.net.So...	0x000...
2	924	Active Thre...	default task-238	BLOCKED	/cnet/front/exame...	33,986	693.4		org.apache...	0x000...
3	1,061	Active Thre...	default task-236	BLOCKED	/cnet/front/exame...	33,058	628.9		org.apache...	0x000...
4	1,181	Active Thre...	default task-235	BLOCKED	/cnet/front/exame...	39,877	745.3		org.apache...	0x000...
5	1,588	Active Thre...	default task-215	BLOCKED	/cnet/front/exame...	38,246	745.2		org.apache...	0x000...
6	1,737	Active Thre...	default task-212	BLOCKED	/cnet/front/exame...	32,150	637.7		org.apache...	0x000...
7	1,983	Active Thre...	default task-204	BLOCKED	/cnet/front/exame...	30,869	627.5		org.apache...	0x000...
8	2,117	Active Thre...	default task-202	BLOCKED	/cnet/front/exame...	38,711	757.2		org.apache...	0x000...
9	2,314	Active Thre...	default task-196	BLOCKED	/cnet/front/exame...	30,347	608.5		org.apache...	0x000...
10	2,498	Active Thre...	default task-193	BLOCKED	/cnet/front/exame...	38,861	757.6		org.apache...	0x000...
11	2,620	Active Thre...	default task-191	BLOCKED	/cnet/front/exame...	32,901	655.2		org.apache...	0x000...
12	2,772	Active Thre...	default task-188	RUNNABLE	/cnet/front/exame...	34,560	673.6		java.securi...	0x000...
13	3,143	Active Thre...	default task-176	BLOCKED	/cnet/front/exame...	31,438	613.1		org.apache...	0x000...
14	3,281	Active Thre...	default task-174	BLOCKED	/cnet/front/exame...	25,674	559.1		org.apache...	0x000...
15	3,419	Active Thre...	default task-172	RUNNABLE	/cnet/front/exame...	40,398	766.5		java.net.So...	0x000...
16	3,633	Active Thre...	default task-168	BLOCKED	/cnet/front/exame...	26,471	502.3		org.apache...	0x000...
17	4,007	Active Thre...	default task-151	BLOCKED	/cnet/front/exame...	29,606	589.9		org.apache...	0x000...
18	4,144	Active Thre...	default task-149	BLOCKED	/cnet/front/exame...	26,854	555.2		org.apache...	0x000...
19	4,278	Active Thre...	default task-147	BLOCKED	/cnet/front/exame...	27,212	564.5		org.apache...	0x000...
20	4,400	Active Thre...	default task-146	BLOCKED	/cnet/front/memb...	1,145	11.3		org.apache...	0x000...
21	4,577	Active Thre...	default task-143	BLOCKED	/cnet/front/exame...	37,405	694.4		org.apache...	0x000...
22	5,179	Active Thre...	default task-110	BLOCKED	/cnet/front/exame...	28,692	618.0		org.apache...	0x000...
23	5,302	Active Thre...	default task-109	BLOCKED	/cnet/front/exame...	12,069	282.6		org.apache...	0x000...
24	5,589	Active Thre...	default task-98	BLOCKED	/cnet/front/exame...	31,622	630.8		org.apache...	0x000...
25	5,738	Active Thre...	default task-95	BLOCKED	/cnet/front/exame...	38,526	743.0		org.apache...	0x000...
26	5,917	Active Thre...	default task-90	BLOCKED	/cnet/front/exame...	28,350	612.5		org.apache...	0x000...
27	6,265	Active Thre...	default task-74	BLOCKED	/cnet/front/exame...	37,662	743.6		org.apache...	0x000...
28	6,496	Active Thre...	default task-66	BLOCKED	/cnet/front/exame...	27,470	557.1		org.apache...	0x000...

Record ID: 598 | 1-28 of 1,080

Thread Dump Text > 2017-06-15 10:31:20 (E52CF04A-558F-43A5-8E56-3321F479E1CB)

```
648      - None
649
650  "default task-246" #656 prio=5 os_prio=0 tid=0x00007fe94012d800 nid=0x2a4d runnable [0x00007fe82a440000]
651     java.lang.Thread.State: RUNNABLE
652      at java.net.SocketInputStream.socketRead0(Native Method)
653      at java.net.SocketInputStream.socketRead(SocketInputStream.java:116)
654      at java.net.SocketInputStream.read(SocketInputStream.java:170)
655      at java.net.SocketInputStream.read(SocketInputStream.java:141)
656      at oracle.net.ns.Packet.receive(Packet.java:311)
657      at oracle.net.ns.DataPacket.receive(DataPacket.java:105)
658      at oracle.net.ns.NetInputStream.getNextPacket(NetInputStream.java:305)
659      at oracle.net.ns.NetInputStream.read(NetInputStream.java:249)
660      at oracle.net.ns.NetInputStream.read(NetInputStream.java:171)
661      at oracle.net.ns.NetInputStream.read(NetInputStream.java:89)
662      at oracle.jdbc.driver.T4CSocketInputStreamWrapper.readNextPacket(T4CSocketInputStreamWrapper.java:123)
663      at oracle.jdbc.driver.T4CSocketInputStreamWrapper.read(T4CSocketInputStreamWrapper.java:79)
664      at oracle.jdbc.driver.T4CMAREngineStream.unmarshalUB1(T4CMAREngineStream.java:429)
665      at oracle.jdbc.driver.T4CTTIfun.receive(T4CTTIfun.java:397)
666      at oracle.jdbc.driver.T4CTTIfun.doRPC(T4CTTIfun.java:257)
667      at oracle.jdbc.driver.T4C8Oall.doOALL(T4C8Oall.java:587)
668      at oracle.jdbc.driver.T4CPreparedStatement.doOall8(T4CPreparedStatement.java:225)
669      at oracle.jdbc.driver.T4CPreparedStatement.fetch(T4CPreparedStatement.java:1066)
670      at oracle.jdbc.driver.OracleStatement.fetchMoreRows(OracleStatement.java:3716)
671      at oracle.jdbc.driver.InsensitiveScrollableResultSet.fetchMoreRows(InsensitiveScrollableResultSet.java:1015)
672      at oracle.jdbc.driver.InsensitiveScrollableResultSet.absoluteInternal(InsensitiveScrollableResultSet.java:979)
673      at oracle.jdbc.driver.InsensitiveScrollableResultSet.next(InsensitiveScrollableResultSet.java:579)
674      - locked <0x00000007b7a2a530> (a oracle.jdbc.driver.T4CConnection)
675      at org.jboss.jca.adapters.jdbc.WrappedResultSet.next(WrappedResultSet.java:2689)
676      at sun.reflect.GeneratedMethodAccessor111.invoke(Unknown Source)
677      at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
678      at java.lang.reflect.Method.invoke(Method.java:498)
679      at org.apache.ibatis.logging.jdbc.ResultSetLogger.invoke(ResultSetLogger.java:46)
680      at com.sun.proxy.$Proxy368.next(Unknown Source)
681      at org.apache.ibatis.executor.resultset.FastResultSetHandler.shouldProcessMoreRows(FastResultSetHandler.java:221)
682      at org.apache.ibatis.executor.resultset.FastResultSetHandler.handleRowValues(FastResultSetHandler.java:212)
683      at org.apache.ibatis.executor.resultset.FastResultSetHandler.handleResultSet(FastResultSetHandler.java:186)
684      at org.apache.ibatis.executor.resultset.FastResultSetHandler.handleResultSets(FastResultSetHandler.java:152)
685      at org.apache.ibatis.executor.statement.PreparedStatementHandler.query(PreparedStatementHandler.java:57)
686      at org.apache.ibatis.executor.statement.RoutingStatementHandler.query(RoutingStatementHandler.java:70)
687      at org.apache.ibatis.executor.ReuseExecutor.doQuery(ReuseExecutor.java:54)
688      at org.apache.ibatis.executor.BaseExecutor.queryFromDatabase(BaseExecutor.java:267)
689      at org.apache.ibatis.executor.BaseExecutor.query(BaseExecutor.java:141)
690      at org.apache.ibatis.executor.BaseExecutor.query(BaseExecutor.java:124)
691      at sun.reflect.GeneratedMethodAccessor119.invoke(Unknown Source)
692      at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
693      at java.lang.reflect.Method.invoke(Method.java:498)
694      at org.apache.ibatis.plugin.Invocation.proceed(Invocation.java:46)
695      at egovframework.cnet.common.mybatis.QueryLogExecutor.intercept(QueryLogExecutor.java:269)
696      at org.apache.ibatis.plugin.Plugin.invoke(Plugin.java:57)
697      at com.sun.proxy.$Proxy367.query(Unknown Source)
698      at org.apache.ibatis.session.defaults.DefaultSqlSession.selectList(DefaultSqlSession.java:101)
699      at org.apache.ibatis.session.defaults.DefaultSqlSession.selectList(DefaultSqlSession.java:95)
700
```

Oracle DB의 응답을 기다리는 스레드



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#13 - 인스턴스 스레드 덤프 분석

Server Slowdown 현상

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Log4j Console Appender가 잡은 Lock이

풀리기를 기다리는 스레드가 대부분

default task-238 스레드에서 기다리는 Lock

스레드 덤프의 Lock 정보를 Hyper Link로

클릭하여 Root Cause 분석

default task-196 스레드에서 잡은 Lock

Lock의 Owner인 Log4j

Console Appender

waiting to lock 0x1234

locked 0x1234

Thread Dump

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Application Performance Management

#14
SQL 쿼리이슈

KHAN
[apm]

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#14 – 서비스 대시보드 현황

SQL 쿼리 이슈

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Pending이 쌓이는 현상

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#14 – 트랜잭션 분석

SQL 쿼리 이슈

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Transactions > 2017-11-09 11:33:27 ~ 2017-11-09 11:34:49 > 9392ms ~ 9999999ms

Export to Excel tid :

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	**172[redacted].105**	**j[redacted]a13**	**/edutrn/list.do**	**200**	**32,484**	**32,378**	**3**	**206**	**0**	**52.74**	**2017-11-09 11:33:55.169**
WAS	172[redacted]11	j[redacted]23	/main/main.do	200	32,451	32,363	3	106	7	37.46	2017-11-09 11:33:52.164
WAS	172[redacted]11	j[redacted]23	/edutrn/list.do	200	32,125	32,034	5	206	0	44.64	2017-11-09 11:33:50.279
WAS	172[redacted]11	j[redacted]23	/edutrn/list.do	200	31,179	31,074	3	206	0	45.54	2017-11-09 11:34:00.988
WAS	172[redacted]105	j[redacted]13	/edutrn/list.do	200	31,015	30,905	6	206	0	55.92	2017-11-09 11:34:01.419
WAS	172[redacted]105	j[redacted]13	/edutrn/list.do	200	30,622	30,500	5	206	0	57.68	2017-11-09 11:34:03.639
WAS	172[redacted]11	j[redacted]23	/main/main.do	200	30,479	30,376	3	106	8	37.26	2017-11-09 11:33:49.768
WAS	172[redacted]11	j[redacted]23	/main/main.do	200	29,153	29,059	0	104	8	35.10	2017-11-09 11:33:54.270

Page 1 of 5 View 1 - 100 of 471

30~32초가량 응답시간중 SQL 쿼리가 30~32초
대부분 SQL 쿼리의 응답시간이 느림

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	GET /edutrn/list.do View URL	Status Code	
Request Host	dev[redacted]a.net View Page	User Agent	Mozilla/5.0 (Windows NT 6.2; WOW64; Trident/7.0; rv:11.0) like Gecko
Client IP	222.[redacted]133 User Location		
Start Time	2017-11-09 11:33:55.169	End Time	2017-11-09 11:34:27.653
Duration (ms)	32,484	CPU Time (ms)	52.74
JDBC Time (ms)	32,378	Latency (ms)	0
Thread Name	ajp-bio-28009-exec-4	Thread ID	83
IP	172.27.0.105	Instance ID	jobaba13
Agent Type	WAS	Transaction ID	15f9ea06ee1-3f9a757e1bdb1d73003b

Method Traces

```
==========================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
------------------------------------------------------------------------------------------
[   1][11:33:55.169|  32,484| 100|        0|      0|    52.7]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][11:33:55.169|  32,484| 100|        0| 32,484|    52.2] + com.BnlSoft.cmmn.filter.XSSFilter.doFilter()
[   3][11:33:55.169|  32,484| 100|        0| 32,484|    52.2]   + org.apache.tomcat.websocket.server.WsFilter.doFilter()
```


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#14 – 트랜잭션 상세 분석

SQL 쿼리 이슈

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Transactions > 2017-11-09 11:33:27 ~ 2017-11-09 11:34:49 > 9392ms ~ 9999999ms

Export to Excel tid :

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	17[redacted]105	jc[redacted]3	/edutrn/list.do	200	32,484	32,378	3	206	0	52.74	2017-11-09 11:33:55.169
WAS	17[redacted]11	jc[redacted]3	/main/main.do	200	32,451	32,363	3	106	7	37.46	2017-11-09 11:33:52.164
WAS	17[redacted]11	jc[redacted]3	/edutrn/list.do	200	32,125	32,034	5	206	0	44.64	2017-11-09 11:33:50.279
WAS	17[redacted]11	jc[redacted]3	/edutrn/list.do	200	31,179	31,074	3	206	0	45.54	2017-11-09 11:34:00.988
WAS	17[redacted]105	jc[redacted]3	/edutrn/list.do	200	31,015	30,905	6	206	0	55.92	2017-11-09 11:34:01.419
WAS	17[redacted]105	jc[redacted]3	/edutrn/list.do	200	30,622	30,500	5	206	0	57.68	2017-11-09 11:34:03.639
WAS	17[redacted]11	jc[redacted]3	/main/main.do	200	30,479	30,376	3	106	8	37.26	2017-11-09 11:33:49.768
WAS	17[redacted]11	jc[redacted]3	/main/main.do	200	29,153	29,059	0	104	8	35.10	2017-11-09 11:33:54.270

View 1 - 100 of 471

대부분의 쿼리가 2~3초, 10초가량 걸리는 쿼리는
cmmnBBs.selectBbsList에서 실행한 쿼리
데이터 Fetch 건수는 2개

Transaction Detail | Trace | StackTrace

```
[ 458][11:34:07.839|      0|   0|      0|      0|    0.1]    + org.apache.tomcat.dbcp.dbcp.DelegatingConnection.prepareStatement()
[ 459][11:34:07.839|      0|   0|      0|      0|    0.1]     + org.apache.tomcat.dbcp.dbcp.PoolingConnection.prepareStatement()
[ 460][11:34:07.839|  10,934|  34|      0| 10,934|    0.4]    + org.apache.tomcat.dbcp.dbcp.DelegatingPreparedStatement.execute()
[ 461][11:34:07.839|  10,934|  34|      0| 10,934|    0.3]     + org.apache.tomcat.dbcp.dbcp.DelegatingPreparedStatement.execute()
[ 462][11:34:07.839|  10,934|  34|      0| 10,934|    0.5]       + org.apache.tomcat.dbcp.dbcp.DelegatingPreparedStatement.execute()
[ 463][11:34:07.839|  10,934|  34|  10,934|      0|    0.2]        + com.mysql.jdbc.PreparedStatement.execute()
                                                    > DB    :          URL: jdbc:mysql://10.64.49.70:3306/tkjfdb?autoReconnect=true, User: tkjf
                                                    > Query :          SELECT /*+cmmnBbs.selectBbsList*/ A.* , GET_CODE_NM('CMMN_27', A.OPNP_YN) AS OPNP_YN_NM , GET_CODE_NM('CMMN_42', A.ANSW_YN) AS ANSW_Y
N_NM , GET_CODE_NM('CMMN_50', A.CNFM_YN) AS CNFM_YN_NM FROM ( SELECT A.* FROM ( SELECT A.SEQ , A.CNTNTS_SE_CD , B.CMN_NM AS CNTNTS_SE_NM , A.CNTNTS_SEQ , CASE WHEN A.CNTNTS_SE_CD = '01' THEN (SELECT MAIN_
TITLE FROM TB_SPRTPLCY WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '02' THEN (SELECT MAIN_TITLE FROM TB_EVTIFO WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '03' THEN (SELECT MAIN_TITLE FROM TB_GEOI
NFO WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '07' THEN (SELECT MAIN_TITLE FROM TB_EDUTRN WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '09' THEN (SELECT BSNS_NM FROM TB_FNTN_INFO WHERE SEQ = A.CN
TNTS_SEQ) END AS CNTNTS_SJ , '' AS CNTNTS_TAB_SEQ , '' AS TAB_MENU_NM , A.SJ , A.CNTS , '' AS MVP_URL , '' AS MVP_URL_YN , 'Y' AS CNFM_YN , A.OPNP_YN , A.ALL_NTC_YN , A.NTC_YN , '' AS ANSW_YN , '' AS ANSW
_CNT , A.RDCNT , '' AS INTRST_CNT , '' AS SHARE_CNT , '' AS WRTER , '' AS WRTER_NM , A.REG_DT , A.REG_USR , (SELECT NM FROM TB_MBER WHERE SEQ = A.REG_USR) AS REG_USR_NM , (SELECT ENCPT_FILE_NM FROM TB_ATF
L WHERE DEL_YN = 'N' AND USE_YN = 'Y' AND REFRN_CD = 'UPLOAD35' AND REFRN_SEQ = A.REG_USR) AS REG_USR_IMG , A.UPD_DT , A.UPD_USR , A.USE_YN , A.DEL_YN FROM TB_BBS_NTC A LEFT OUTER JOIN TB_CODE B ON (B.GRP
_CD = 'CMMN_43' AND B.DEL_YN = 'N' AND B.USE_YN = 'Y' AND B.CMN_CD = A.CNTNTS_SE_CD) WHERE A.USE_YN = 'Y' AND A.DEL_YN = 'N' ) A WHERE 1=1 AND A.ALL_NTC_YN = ? AND A.NTC_YN = ? AND A.OPNP_YN = ? ORDER BY
 SEQ DESC LIMIT ?, ? ) A
                                                    > Mapped:          SELECT /*+cmmnBbs.selectBbsList*/ A.* , GET_CODE_NM('CMMN_27', A.OPNP_YN) AS OPNP_YN_NM , GET_CODE_NM('CMMN_42', A.ANSW_YN) AS ANSW_Y
N_NM , GET_CODE_NM('CMMN_50', A.CNFM_YN) AS CNFM_YN_NM FROM ( SELECT A.* FROM ( SELECT A.SEQ , A.CNTNTS_SE_CD , B.CMN_NM AS CNTNTS_SE_NM , A.CNTNTS_SEQ , CASE WHEN A.CNTNTS_SE_CD = '01' THEN (SELECT MAIN_
TITLE FROM TB_SPRTPLCY WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '02' THEN (SELECT MAIN_TITLE FROM TB_EVTIFO WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '03' THEN (SELECT MAIN_TITLE FROM TB_GEOI
NFO WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '07' THEN (SELECT MAIN_TITLE FROM TB_EDUTRN WHERE SEQ = A.CNTNTS_SEQ) WHEN A.CNTNTS_SE_CD = '09' THEN (SELECT BSNS_NM FROM TB_FNTN_INFO WHERE SEQ = A.CN
TNTS_SEQ) END AS CNTNTS_SJ , '' AS CNTNTS_TAB_SEQ , '' AS TAB_MENU_NM , A.SJ , A.CNTS , '' AS MVP_URL , '' AS MVP_URL_YN , 'Y' AS CNFM_YN , A.OPNP_YN , A.ALL_NTC_YN , A.NTC_YN , '' AS ANSW_YN , '' AS ANSW
_CNT , A.RDCNT , '' AS INTRST_CNT , '' AS SHARE_CNT , '' AS WRTER , '' AS WRTER_NM , A.REG_DT , A.REG_USR , (SELECT NM FROM TB_MBER WHERE SEQ = A.REG_USR) AS REG_USR_NM , (SELECT ENCPT_FILE_NM FROM TB_ATF
L WHERE DEL_YN = 'N' AND USE_YN = 'Y' AND REFRN_CD = 'UPLOAD35' AND REFRN_SEQ = A.REG_USR) AS REG_USR_IMG , A.UPD_DT , A.UPD_USR , A.USE_YN , A.DEL_YN FROM TB_BBS_NTC A LEFT OUTER JOIN TB_CODE B ON (B.GRP
_CD = 'CMMN_43' AND B.DEL_YN = 'N' AND B.USE_YN = 'Y' AND B.CMN_CD = A.CNTNTS_SE_CD) WHERE A.USE_YN = 'Y' AND A.DEL_YN = 'N' ) A WHERE 1=1 AND A.ALL_NTC_YN = 'Y' AND A.NTC_YN = 'Y' AND A.OPNP_YN = 'Y' ORD
ER BY SEQ DESC LIMIT 0, 2 ) A
[ 464][11:34:18.773|      0|   0|      0|      0|    0.0]    + com.mysql.jdbc.ResultSetImpl.next-close()
                                                    > Fetch :          [Fetch Count: 2, Gab Time: 0ms ]
```


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#14 – DB 서버 CPU 사용률

SQL 쿼리 이슈

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#14 – DB 서버 CPU 사용률

SQL 쿼리 이슈

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부하테스트시 DB-Test-Master 서버의
mysqld 프로세스가 CPU 를 전부 사용함

aster / 프로세스 상태 분석

-TEST-Master | DB-TEST-Slave | WEB-TEST | jobaba-apm | WEB02-TEST

Analysis Process Info > 2017-11-09 11:

Created	2017-11-09 11:34:24	Uptime	8 days 23:38:33	Load Avg	9.4, 2.8, 0.9 (1m, 5m, 15m)
Processes	273 Total / 273 Sleeping, 0 Running, 0 Zombie, 0 Stopped				
CPU Usage	User : 80.0% , System : 10.0% , Nice: 0.0 %, Wait: 0.0% , Idle: 10.0 %				
Mem Usage	Total: 33.5 GB, Used: 18.1 GB, Free:	Swap	Total: 2.1 GB, Used: 0 Byte, Free: 2.1 GB		

All Fields | Search | Excel Export

#	PID	User	Start Time	Mem	RSS Mem	Shared ...	State	CPU Time	CPU...	MEM...	Command
1	12,343	mysql	2017-10-31 14:49...	11.8 GB	1.9 GB	12.2 MB	Sleeping	03:09:06.1	1,445...	5.7%	/usr/local/mysql/bin/mysqld
3	11,278	root	2017-10-31 14:46...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:04.4	0.9%	0.0%	jbd2/dm-0-8
4	1	root	2017-10-31 11:55...	19.7 MB	1.5 MB	1.3 MB	Sleeping	00:00:00.1	0.0%	0.0%	/sbin/init
5	2	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:00.0	0.0%	0.0%	kthreadd
6	3	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:09.3	0.0%	0.0%	migration/0
7	4	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:12.8	0.0%	0.0%	ksoftirqd/0
8	5	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:00.0	0.0%	0.0%	migration/0
9	6	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:01.0	0.0%	0.0%	watchdog/0
10	7	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:11.0	0.0%	0.0%	migration/1
11	8	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:00.0	0.0%	0.0%	migration/1
12	9	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:06.5	0.0%	0.0%	ksoftirqd/1
13	10	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:00.9	0.0%	0.0%	watchdog/1
14	11	root	2017-10-31 11:55...	0 Byte	0 Byte	0 Byte	Sleeping	00:00:11.0	0.0%	0.0%	migration/2

150 / 100 / 50 / 0 — Percent (%)

20:08 20:10 20:12

ys nice wait softirq irq

Request | Analyse | Diff Analyse

UUID

9DA1DE57-02F7-4A29-A2D2-46...
9E1F4A75-D28B-4587-BD5C-F3...
99FD89C2-088D-4C67-A27D-BF...
66A6513D-1C83-441C-B9B4-7F...

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Application Performance Management

#15
SQL 쿼리 이슈

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[apm]

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#15 - 인스턴스 메모리 사용량(History 분석)

SQL 쿼리 이슈

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14시 41분부터 cluster13 인스턴스 JVM 메모리 사용량이 급증함

Administrator

WAS

대시보드

Instances

[redacted]

cluster11

cluster12

cluster13

서버 정보

애플리케이션

통계

JVM

메모리 사용률

메모리 크기

GC 시간

파일오픈수

스레드상태

클래스오픈수

JVM CPU 시간

데이터소스

스레드 덤프 분석

오픈파일 분석

네트워크상태 분석

cluster14

211.206.126.86

애플리케이션

홈 / WAS / Instances / [redacted] / cluster13 / JVM / 메모리 크기

WAS >: [redacted] > cluster13

Full GC

Trend Analysis OFF

Current

History

JVM Heap & Perm Size

lower values represent better values

Zoom 30m 1h 1d w 2w 1m All

From 2017-07-07 To 2017-07-07

2 000M

1 500M

1 000M

500M

0M

Heap (bytes)

200M

0M

Perm (bytes)

14:29 14:30 14:31 14:32 14:33 14:34 14:35 14:36 14:37 14:38 14:39 14:40 14:41 14:42 14:43 14:44 14:45 14:46

17. Apr 1. May 15. May 29. May 12. Jun 26. Jun

Heap Size Used Heap Perm Size Used Perm

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#15 - 인스턴스 JVM GC 현황(History 분석)

SQL 쿼리 이슈

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14시 41분부터 cluster13 인스턴스 JVM 메모리 Full GC 횟수가 급증하였음
Full GC에만 20초가량 소요됨

KHAN [apm]

Administrator

WAS

대시보드

Instances

[redacted]

cluster11

cluster12

cluster13

서버 정보

애플리케이션

통계

JVM

메모리 사용률

메모리 크기

GC 시간

파일오픈수

스레드상태

클래스오픈수

JVM CPU 시간

데이터소스

스레드 덤프 분석

오픈파일 분석

한국어

cluster12 cluster13 cluster14 cluster21 cluster22 cluster23 cluster24

Full GC | Trend Analysis OFF | Current | History

JVM GC Time

lower values represent better values

Zoom 30m 1h 1d w 2w 1m All

From 2017-07-07 To 2017-07-07

2017-07-07 14:41:45
PS MarkSweep-gcTime: 11,305
PS MarkSweep-gcCount: 3
PS MarkSweep-gcUsage: 94
PS Scavenge-gcTime: 0
PS Scavenge-gcCount: 0
PS Scavenge-gcUsage: 0

GC Time(ms) 20k 15k 10k 5k 0k

Count 0

Usage(%) 0

14:20 14:25 14:30 14:35 14:40 14:45 14:50 14:55 15:00 15:05

17. Apr 1. May 15. May 29. May

PS MarkSweep-gcTime PS MarkSweep-gcCount PS MarkSweep-gcUsage PS Scavenge-gcTime PS Scavenge-gcCount PS Scavenge-gcUsage

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#15 - JVM 메모리 관련 이벤트

SQL 쿼리 이슈

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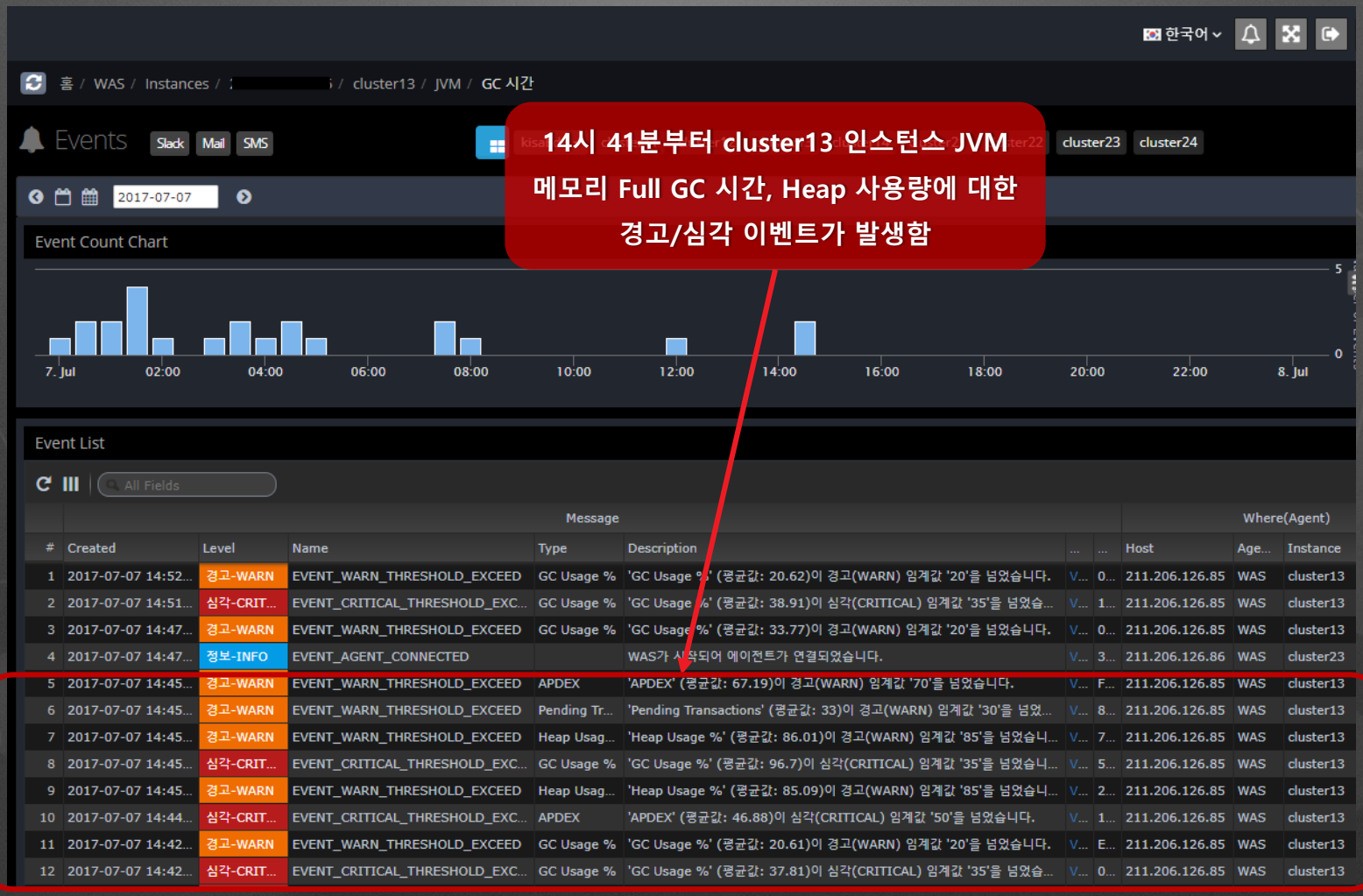

14시 41분부터 cluster13 인스턴스 JVM 메모리 Full GC 시간, Heap 사용량에 대한 경고/심각 이벤트가 발생함

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#15 - 인스턴스에서 호출된 URL 조사

SQL 쿼리 이슈

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Transactions > 2017-07-07 14:35:27 ~ 2017-07-07 15:22:19 > 5696ms ~ 999999ms

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	[redacted]	cluster13	/back/StudentManager.do	500	272,141	11,013	3,102	63,715	0	6,940.00	2017-07-07 14:41:19.503
WAS	[redacted]	cluster13	/back/StudentManager.do	500	253,124	1,630	454	10,935	0	1,160.00	2017-07-07 14:41:47.374
WAS	[redacted]	cluster13	/back/StudentManager.do	500	174,747	11,773	26,159	10,935	0	1,130.00	2017-07-07 14:41:49.938
WAS	[redacted]	cluster13	/back/StudentManager.do	500	233,556	1,566	480	10,935	0	1,120.00	2017-07-07 14:42:04.070
WAS	[redacted]	cluster13	/back/StudentManager.do	500	230,824	1,626	511	10,935	0	1,180.00	2017-07-07 14:42:04.071
WAS	[redacted]	cluster13	/back/StudentManager.do	500	203,400	1,672	8,681	10,935	0	1,150.00	2017-07-07 14:42:28.612
WAS	[redacted]	cluster13	/back/Member.do	200	198,910	0	0	0	0	20.00	2017-07-07 14:42:32.773
WAS	[redacted]	cluster13	/back/Member.do	200	132,464	0	0	0	0	10.00	2017-07-07 14:42:35.337

Page [redacted] of 1 | View 1 - 76 of 7

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	/back/StudentManager.do View URL	Params	
Request Host	admin.esafe.or.kr View Page	Status Code	500
Client IP	175.198.111.3 User Location	[illegible]	[illegible]
Start Time	2017-07-07 14:41:19.503	[illegible]	[illegible]
Duration (ms)	272,141	CPU Time (ms)	6,940.00
JDBC Time (ms)	11,013	Latency (ms)	[illegible]
Thread Name	ajp-0.0.0.0-8209-48	Thread ID	1503
IP	211.206.126.85	Instance ID	cluster13
Agent Type	WAS	Transaction ID	15d1b90c01b-20c9dac2d38b8deb0cf2

Error Message

```
java.lang.IllegalStateException: getOutputStream() has already been called for this response
 at org.apache.catalina.connector.Response.getWriter(Response.java:621)
 at org.apache.catalina.connector.ResponseFacade.getWriter(ResponseFacade.java:198)
 at javax.servlet.ServletResponseWrapper.getWriter(ServletResponseWrapper.java:112)
 at org.apache.jasper.runtime.JspWriterImpl.initOut(JspWriterImpl.java:125)
 at org.apache.jasper.runtime.JspWriterImpl.flushBuffer(JspWriterImpl.java:118)
 at org.apache.jasper.runtime.PageContextImpl.release(PageContextImpl.java:180)
 at org.apache.jasper.runtime.JspFactoryImpl.internalReleasePageContext(JspFactoryImpl.java:118)
```

14시 41분부터 cluster13 인스턴스에 6만 3천건, 1만 건을 가져오는 쿼리가 다수 호출되어 JVM 메모리를 소진한 것으로 판단됨

'/back/StudentManager.do' URL에서 호출됨

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#15 - URL을 호출한 사용자 정보

SQL 쿼리 이슈

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Transactions > 2017-07-07 14:30:01 ~ 2017-07-07 15:50:18 > 3840ms ~ 999999ms

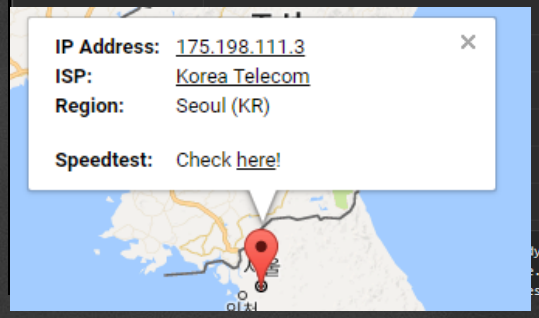
Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	[redacted]	cluster13	/back/StudentManager.do	500	272,141	11,013	3,102	63,715	0	6,940.00	2017-07-07 14:41:19.503
WAS	[redacted]	cluster13	/back/StudentManager.do	200	114,452	9,533	2,935	63,715	0	6,740.00	2017-07-07 14:51:09.190
WAS	[redacted]	cluster13	/back/StudentManager.do	200	5,543	1,794	541	11,353	0	1,160.00	2017-07-07 14:46:23.519
WAS	[redacted]	cluster13	/back/StudentManager.do	200	5,229	1,711	432	11,240	0	1,140.00	2017-07-07 15:13:46.008
WAS	[redacted]	cluster13	/back/StudentManager.do	200	9,039	3,401	479	10,935	0	1,050.00	2017-07-07 14:46:26.115
WAS	[redacted]	cluster13	/back/StudentManager.do	500	233,556	1,566	480	10,935	0	1,120.00	2017-07-07 14:42:04.070
WAS	[redacted]	cluster13	/back/StudentManager.do	500	230,824	1,626	511	10,935	0	1,180.00	2017-07-07 14:42:04.071
WAS	[redacted]	cluster13	/back/StudentManager.do	500	253,124	1,630	454	10,935	0	1,160.00	2017-07-07 14:41:47.374

Page 1 of 1 | View 1 - 99 of 9

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	/back/StudentManager.do View URL	Params	
Request Host	admin.esafe.or.kr View Page	Status Code	500
Client IP	175.198.111.3 User Location	User Agent	Mozilla/5.0 (compatible; MSIE 7.0; Windows NT 6.1; Trident/7.0; SLCC2; .NET CLR 2.0.50727; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media Center PC 6.0; .NET4.0C; .NET4.0E; SMJB)
Start Time	2017-07-07 14:41:19.503	End Time	2017-07-07 14:45:51.554
		CPU Time (ms)	6,940
		Latency (ms)	0
		Thread ID	1502
		Instance ID	cluster13
		Transaction ID	15d1b90c01b-20c9dac2d38b8deb0cf2

admin.xxx.co.kr로 접속하여
'/back/StudentManager.do' URL을 호출한 사용자는
'175.198.111.3' IP를 사용함
KT 망을 사용하며, 위치는 '서울'



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Application Performance Management

#16~#22
SQL 쿼리 이슈

KHAN
[apm]

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#16 - 트랜잭션 맵(T-Map) 현황

SQL 쿼리 이슈

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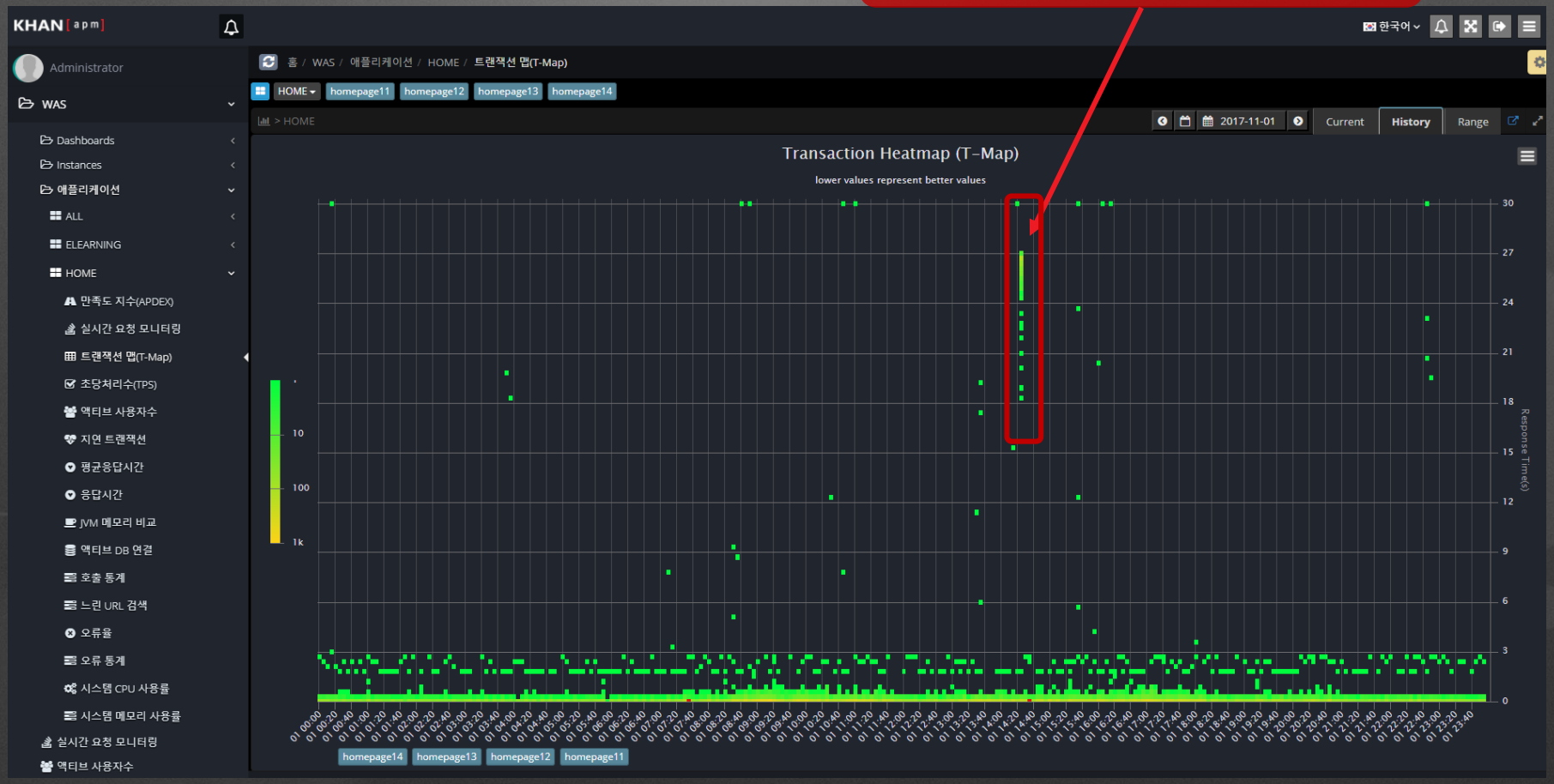
느린 트랜잭션 분포 현황



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#16 - 느린 URL의 현황

SQL 쿼리 이슈

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Transactions > 2017-11-01 13:39:13 ~ 2017-11-01 14:59:46 > 24321ms ~ 9999999ms

Export to Excel tid :

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	21[redacted]181	homepage11	/common/attachfile/FileDown.do	200	86,267	2	0	1	0	247.82	2017-11-01 14:22:38.459
WAS	21[redacted]181	homepage11	/common/attachfile/FileDown.do	200	55,607	2	0	1	0	292.75	2017-11-01 14:23:41.809
WAS	21[redacted]181	homepage11	/member/index.do	200	26,309	25,907	385	87	0	30.99	2017-11-01 14:28:54.141
WAS	21[redacted]181	homepage13	/member/index.do	200	25,605	25,112	481	87	0	28.42	2017-11-01 14:28:54.142
WAS	21[redacted]181	homepage14	/member/index.do	200	27,010	26,739	253	91	0	29.12	2017-11-01 14:28:54.142
WAS	21[redacted]181	homepage14	/member/index.do	200	26,081	25,545	517	87	0	31.88	2017-11-01 14:28:54.142
WAS	21[redacted]181	homepage11	/member/index.do	200	26,743	26,382	329	87	0	26.77	2017-11-01 14:28:54.145
WAS	21[redacted]181	homepage11	/member/index.do	200	26,637	26,267	354	87	0	27.38	2017-11-01 14:28:54.146

Page 1 of 3 View 1 - 100 of 291

전체 수행시간 26-27초 중 DB관련 수행시간이 25-26초임, 데이터 Fetch 건수는 많지 않음

Transaction Detail | Trace | StackTrace

Name	Value		
Request URL	GET /member/index.do View URL	Params	
Request Host	2[redacted]181 View Page	Status Code	
Client IP	2[redacted]81 User Location	User Agent	
Start Time	2017-11-01 14:28:54.141	End Time	2017-11-01 14:29:20.450
Duration (ms)	26,309	CPU Time (ms)	30.99
JDBC Time (ms)	25,907	Latency (ms)	0
Thread Name	http-thread-pool-threads - 147	Thread ID	380
IP	210.90.107.181	Instance ID	homepage11
Agent Type	WAS	Transaction ID	15f760f993b-138a566c04dcec75b8cd

Method Traces

```
==========================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
------------------------------------------------------------------------------------------
[   1][14:28:54.141|  26,309| 100|        1|      0|    31.0]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][14:28:54.141|  26,308| 100|      397| 25,911|    30.1] + org.springframework.web.servlet.DispatcherServlet.doService()
[   3][14:28:54.144|       0|   0|        0|      0|     0.0]  + com.ibatis.sqlmap.engine.impl.SqlMapClientImpl.openSession()
[   4][14:28:54.144|       0|   0|        0|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrapperDataSource.getConnection()
[   5][14:28:54.144|       0|   0|        0|      0|     0.0]  + org.jboss.jca.adapters.jdbc.WrappedConnection.prepareStatement()
```


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#16 - 느린 SQL 현황

SQL 쿼리 이슈

opennaru

Transactions > 2017-11-01 13:39:13 ~ 2017-11-01 14:59:46 > 24321ms ~ 9999999ms

Export to Excel tid :

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	210.90.107.181	homepage11	/common/attachfile/FileDown.do	200	86,267	2	0	1	0	247.82	2017-11-01 14:22:38.459
WAS	210.90.107.181	homepage11	/common/attachfile/FileDown.do	200	55,607	2	0	1	0	292.75	2017-11-01 14:23:41.809
WAS	210.90.107.181	homepage11	/member/index.do	200	26,309	25,907	385	87	0	30.99	2017-11-01 14:28:54.141
WAS	210.90.107.181	homepage13	/member/index.do	200	25,605	25,112	481	87	0	28.42	2017-11-01 14:28:54.142
WAS	210.90.107.181	homepage14	/member/index.do	200	27,010	26,739	253	91	0	29.12	2017-11-01 14:28:54.142
WAS	210.90.107.181	homepage14	/member/index.do	200	26,081	25,545	517	87	0	31.88	2017-11-01 14:28:54.142
WAS	210.90.107.181	homepage11	/member/index.do	200	26,743	26,382	329	87	0	26.77	2017-11-01 14:28:54.145
WAS	210.90.107.181	homepage11	/member/index.do	200	26,637	26,267	354	87	0	27.38	2017-11-01 14:28:54.146

View 1 - 100 of 291

느린 쿼리 23.9초 실행됨

SQL을 튜닝해야 함, Fetch 건수는 15개로 많지 않음

Transaction Detail | Trace | StackTrace

```
[ 106][14:28:56.098|      0|   0|      0|      0|     0.0]  + oracle.jdbc.driver.InsensitiveScrollableResultSet.next-close()
                                                  > Fetch :    [Fetch Count: 4, Gab Time: 0ms]

[ 107][14:28:56.098|      0|   0|      0|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrappedConnection.close()
[ 108][14:28:56.098|      0|   0|      0|      0|     0.0]  + com.ibatis.sqlmap.engine.impl.SqlMapClientImpl.openSession()
[ 109][14:28:56.098|      0|   0|      0|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrapperDataSource.getConnection()
[ 110][14:28:56.098|      0|   0|      0|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrappedConnection.prepareStatement()
[ 111][14:28:56.098|      0|   0|      0|      0|     0.1]  + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[ 112][14:28:56.098|  23,917|  91|      1| 23,916|     0.7]  + org.jboss.jca.adapters.jdbc.WrappedPreparedStatement.execute()
[ 113][14:28:56.099|  23,916|  91|      0| 23,916|     0.6]   + org.jboss.jca.adapters.jdbc.CachedPreparedStatement.execute()
[ 114][14:28:56.099|  23,916|  91|  23,916|      0|     0.5]    + oracle.jdbc.driver.OraclePreparedStatement.execute()
                                                  > DB     :      URL: jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS_LIST=(LOAD_BALANCE=ON)(ADDRESS=(PROTOCOL = TCP)(HOST=10.101.34.35)(PORT=1521))(ADDRESS=(PROT
OCOL=TCP)(HOST=10.101.34.37)(PORT = 1521)))(CONNECT_DATA=(SERVER = DEDICATED)(SERVICE_NAME = EDUNIER)))
                                                  > Query :      /* memberDAO.mainBoardList */ SELECT BOARD_ID, REG_DT, BOARD_MST_ID, TIT, FILE_ID, REPLACE(REGEXP_REPLACE(CONTENT, '<[^>]*>', ''), ' ', '
 ') CONTENT FROM ( SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1, 36) TIT, CONTENT, (SELECT FILE_ID FROM TN_ATT_FILE WHERE FILE_REF_ID = TB.BOARD_ID AND FILE_GRP = 'image1' AND ROWNU
M = 1) FILE_ID FROM TN_BOARD TB WHERE BOARD_MST_ID = 'EhrdNotice' AND OPEN_YN = 'Y' ORDER BY BOARD_ID DESC) WHERE ROWNUM <= 5 UNION ALL SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1,
 36) TIT, CONTENT, (SELECT FILE_ID FROM TN_ATT_FILE WHERE FILE_REF_ID = TB.BOARD_ID AND FILE_GRP = 'image1' AND ROWNUM = 1) FILE_ID FROM TN_BOARD TB WHERE BOARD_MST_ID = 'MinwonFaq' AND OPEN_YN = 'Y' ORDE
R BY ORDER_NUM DESC) WHERE ROWNUM <= 5 UNION ALL SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1, 36) TIT, CONTENT, TFN.FILE_ID FROM TN_BOARD TB LEFT OUTER JOIN TN_ATT_FILE TFN ON TB.B
OARD_ID = TFN.FILE_REF_ID AND TFN.FILE_GRP = 'file1' AND ROWNUM = 1 WHERE BOARD_MST_ID = 'DataEduNews' AND OPEN_YN = 'Y' ORDER BY ORDER_NUM DESC) WHERE ROWNUM <= 5 )
                                                  > Mapped:      /* memberDAO.mainBoardList */ SELECT BOARD_ID, REG_DT, BOARD_MST_ID, TIT, FILE_ID, REPLACE(REGEXP_REPLACE(CONTENT, '<[^>]*>', ''), ' ', '
 ') CONTENT FROM ( SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1, 36) TIT, CONTENT, (SELECT FILE_ID FROM TN_ATT_FILE WHERE FILE_REF_ID = TB.BOARD_ID AND FILE_GRP = 'image1' AND ROWNU
M = 1) FILE_ID FROM TN_BOARD TB WHERE BOARD_MST_ID = 'EhrdNotice' AND OPEN_YN = 'Y' ORDER BY BOARD_ID DESC) WHERE ROWNUM <= 5 UNION ALL SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1,
 36) TIT, CONTENT, (SELECT FILE_ID FROM TN_ATT_FILE WHERE FILE_REF_ID = TB.BOARD_ID AND FILE_GRP = 'image1' AND ROWNUM = 1) FILE_ID FROM TN_BOARD TB WHERE BOARD_MST_ID = 'MinwonFaq' AND OPEN_YN = 'Y' ORDE
R BY ORDER_NUM DESC) WHERE ROWNUM <= 5 UNION ALL SELECT * FROM (SELECT BOARD_ID, REG_DT, BOARD_MST_ID, SUBSTR(TIT, 1, 36) TIT, CONTENT, TFN.FILE_ID FROM TN_BOARD TB LEFT OUTER JOIN TN_ATT_FILE TFN ON TB.B
OARD_ID = TFN.FILE_REF_ID AND TFN.FILE_GRP = 'file1' AND ROWNUM = 1 WHERE BOARD_MST_ID = 'DataEduNews' AND OPEN_YN = 'Y' ORDER BY ORDER_NUM DESC) WHERE ROWNUM <= 5 )
[ 115][14:29:20.391|      0|   0|      0|      0|     0.0]  + oracle.jdbc.driver.InsensitiveScrollableResultSet.next-close()
                                                  > Fetch :    [Fetch Count: 15, Gab Time: 376ms ]

[ 116][14:29:20.391|      1|   0|      1|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrappedConnection.close()
[ 117][14:29:20.392|      0|   0|      0|      0|     0.0]  + com.ibatis.sqlmap.engine.impl.SqlMapClientImpl.openSession()
[ 118][14:29:20.392|      0|   0|      0|      0|     0.1]  + org.jboss.jca.adapters.jdbc.WrapperDataSource.getConnection()
[ 119][14:29:20.392|      0|   0|      0|      0|     0.0]  + org.jboss.jca.adapters.jdbc.WrappedConnection.prepareStatement()
```


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#16 - SQL 쿼리 실행이 느린 경우

SQL 쿼리 이슈

opennaru

Transactions > 2018-01-10 06:53:50 ~ 2018-01-10 11:06:44 > 9545ms ~ 9999999ms

Export to Excel tid :

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	105.27.1.156	105.27.8.115	instance11	/bms/dctlist/ctrldeptviewsource.do	200	260,195	260,181	1	32	0	45.10	2018-01-10 08:31:20.982
WAS	105.27.1.156	105.27.68.4	instance11	/bms/dctlist/ctrldeptviewsource.do	200	162,137	162,119	2	22	0	28.10	2018-01-10 10:25:22.209
WAS	105.27.1.156	105.27.68.4	instance11	/bms/dctlist/ctrldeptviewsource.do	200	151,840	151,825	1	22	0	28.41	2018-01-10 10:25:32.514
WAS	105.27.1.156	105.27.56.32	instance12	/bms/dctlist/receivepublicdoclist.do	200	136,386	136,380	1	34	0	16.94	2018-01-10 09:22:52.353
WAS	105.27.1.156	105.27.8.113	instance11	/bms/dctlist/receivedlistview.do	200	81,905	81,887	3	34	0	29.11	2018-01-10 08:21:32.201
WAS	105.27.1.156	105.27.56.52	instance11	/bms/dctlist/receivedlistview.do	200	66,044	66,031	3	34	0	19.76	2018-01-10 09:17:33.386
WAS	105.27.1.156	105.27.88.1	instance12	/bms/dctlist/ctrldeptviewsource.do	200	58,429	58,412	5	49	0	21.71	2018-01-10 09:27:23.326
WAS	105.27.1.156	105.27.32.32	instance12	/bms/dctlist/ctrldeptviewsource.do	200	55,193	55,171	3	34	0	23.99	2018-01-10 09:40:00.142
WAS	105.27.1.156	105.27.32.51	instance12	/bms/dctlist/receivedlistview.do	200	47,473	47,454	4	34	0	21.96	2018-01-10 09:04:40.221
WAS	105.27.1.156	105.27.68.109	instance11	/bms/dctlist/ctrldeptviewsource.do	200	46,423	46,405	1	34	0	21.35	2018-01-10 10:18:48.521
WAS	105.27.1.156	105.27.68.4	instance11	/bms/dctlist/ctrldeptviewsource.do	200	41,532	41,518	1	25	0	20.98	2018-01-10 10:26:13.858
WAS	105.27.1.156	105.27.18.24	instance11	/bms/dctlist/ctrldeptviewsource.do	200	35,155	35,141	2	18	0	15.71	2018-01-10 09:58:04.371
WAS	105.27.1.156	105.27.18.24	instance11	/bms/dctlist/ctrldeptviewsource.do	200	33,623	33,607	0	18	0	20.67	2018-01-10 09:21:20.565
WAS	105.27.1.156	105.27.18.24	instance11	/bms/dctlist/ctrldeptviewsource.do	200	33,550	33,535	1	18	0	17.32	2018-01-10 09:21:19.337
WAS	105.27.1.156	105.27.18.24	instance11	/bms/dctlist/ctrldeptviewsource.do	[illegible]	33,056	33,041	0	18	0	20.15	2018-01-10 09:21:23.830
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	20.81	2018-01-10 09:57:56.133

SQL Fetch 건수는 18~34건 정도이지만, SQL 쿼리 수행시간이 35~260초 가량 소요됨

Transaction Detail | Trace | StackTrace

```
[ 63][10:25:32.540|      2|  0|      0|  2|   0.0]  + org.jboss.jca.adapters.jdbc.CachedPreparedStatement.execute()
[ 64][10:25:32.540|      2|  0|      2|  0|   0.0]   + cubrid.jdbc.driver.CUBRIDPreparedStatement.execute()
[ 65][10:25:32.542|      0|  0|      0|  0|   0.0]  + cubrid.jdbc.driver.CUBRIDConnection.commit()
                                                  > Fetch :    [Fetch Count: 1]

[ 66][10:25:32.542|      0|  0|      0|  0|   0.0]   + cubrid.jdbc.driver.CUBRIDConnection.commit()
[ 67][10:25:32.542|      0|  0|      0|  0|   0.0]  + org.jboss.jca.adapters.jdbc.WrappedConnection.close()
[ 68][10:25:32.543|      0|  0|      0|  0|   0.0]  + org.jboss.jca.adapters.jdbc.WrapperDataSource.getConnection()
[ 69][10:25:32.543|      9|  0|      0|  9|   0.2]  + org.jboss.jca.adapters.jdbc.WrappedConnection.prepareStatement()
[ 70][10:25:32.543|      0|  0|      0|  0|   0.1]   + cubrid.jdbc.driver.CUBRIDConnection.prepareStatement()
[ 71][10:25:32.552|  50,949|  34|      0| 50,949|   3.4]  + org.jboss.jca.adapters.jdbc.WrappedPreparedStatement.execute()
[ 72][10:25:32.552|  50,949|  34|      0| 50,949|   3.3]   + org.jboss.jca.adapters.jdbc.CachedPreparedStatement.execute()
[ 73][10:25:32.552|  50,949|  34|  50,949|  0|   3.0]    + cubrid.jdbc.driver.CUBRIDPreparedStatement.execute()
                                                  > DB     :    URL: jdbc:cubrid:105.27.1.164:33000:onnara_db:::?althost=105.27.1.165:33000&charset=utf-8, User: onsadmin
                                                  > Query :    /* deptlistview_count */ SELECT COUNT (*) FROM ( SELECT a.docid FROM bms_dct_mtg_rdoc a WHERE a.moveflag = 'N' AND a.delflag = 'N' AND a.batchseq = 0 AND a.doc
noseq > 0 AND a.authordeptid = ? AND a.reportdt BETWEEN ? AND ? AND a.docid IN (SELECT p.docid FROM bms_dct_mtg_path p WHERE p.docid = a.docid AND p.processdt BETWEEN ? AND ? AND p.objname LIKE '%' || ? || '%' ESCAPE '\' ) UNIO
N ALL SELECT a.docid FROM bms_dct_rdoc a USE INDEX (IX_BMS_DCT_RDOC_03) WHERE a.moveflag = 'N' AND a.delflag = 'N' AND a.batchseq = 0 AND a.state IN ('DRDS3', 'DRDS4', 'DRDS5', 'DRDS6') AND a.docnoseq > 0 AND a.authordeptid = ?
 AND a.reportdt BETWEEN ? AND ? AND a.docid IN (SELECT p.docid FROM bms_dct_path p USE INDEX(IX_BMS_DCT_PATH_05) WHERE p.docid = a.docid AND p.state IN ('DCST1', 'DCST2', 'DCST3', 'DCST4', 'DCST5') AND p.reportdt BETWEEN ? AND
 ? AND p.objname LIKE '%' || ? || '%' ESCAPE '\' ) UNION ALL SELECT /*+ ORDERED */ a.docid FROM (SELECT DISTINCT docid rdocid FROM bms_dct_map_dept a WHERE docgubun = 'A' AND a.deptid = ? AND a.reportdt BETWEEN ? AND ? ) da, bm
s_dct_rdoc a WHERE da.rdocid = a.docid AND a.moveflag = 'Y' AND a.delflag = 'N' AND a.batchseq = 0 AND a.state IN ('DRDS3', 'DRDS4', 'DRDS5', 'DRDS6') AND a.docnoseq > 0 AND a.docid IN (SELECT p.docid FROM bms_dct_path p USE IN
DEX(IX_BMS_DCT_PATH_05) WHERE p.docid = a.docid AND p.state IN ('DCST1', 'DCST2', 'DCST3', 'DCST4', 'DCST5') AND p.reportdt BETWEEN ? AND ? AND p.objname LIKE '%' || ? || '%' ESCAPE '\' ) UNION ALL ( SELECT a.enfdocid FROM bms_
dct_enf_doc a WHERE a.moveflag = 'N' AND a.delflag = 'N' AND a.docstatus IN ('EDS05', 'EDS06', 'EDS10', 'EDS07', 'EDS11', 'EDS08', 'EDS12' ) AND a.acceptdeptid = ? AND a.acceptdt BETWEEN ? AND ? AND a.enfdocid IN ( SELECT b.enf
docid FROM bms_dct_enf_path b WHERE b.enfdocid = a.enfdocid AND b.acceptdt BETWEEN ? AND ? AND b.actername LIKE ? || '%' ESCAPE '\' ) ) UNION ALL SELECT a.enfdocid FROM (SELECT /*+ ordered */ a.enfdocid FROM (SELECT DISTINCT do
cid rdocid FROM bms_dct_map_dept a WHERE docgubun = 'E' AND a.deptid = ? AND a.reportdt BETWEEN ? AND ? ) da, bms_dct_enf_doc a WHERE da.rdocid = a.enfdocid AND a.moveflag = 'Y' AND a.delflag = 'N' AND a.docstatus IN ('EDS05',
 'EDS06', 'EDS10', 'EDS07', 'EDS11', 'EDS08', 'EDS12' ) AND a.acceptdt BETWEEN ? AND ? ) a WHERE 1 = 1 AND a.enfdocid IN ( SELECT b.enfdocid FROM bms_dct_enf_path b WHERE b.enfdocid = a.enfdocid AND b.acceptdt BETWEEN ? AND ? A
ND b.actername LIKE ? || '%' ESCAPE '\' ) )
                                                  > Params:    5600090 , 20170101000000 , 20180110235959 , 20170101000000 , 20180110235959 , 김영욱 , 5600090 , 20170101000000 , 20180110235959 , 2
0180110235959', '김영욱', '5600090', '20170101000000', '20180110235959', '20170101000000', '20180110235959', '김영욱', '5600090', '20170101000000', '20180110235959', '20170101000000', '20180110235959', '김영욱', '5600090', '20170
101000000', '20180110235959', '20170101000000', '20180110235959', '20170101000000', '20180110235959', '김영욱'
```

쿼리에 대한 튜닝이 필요함

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#17 – ResultSet Fetch 건수가 많음

SQL 쿼리 이슈

opennaru

일시 : 11월 30일 21시 55분

/member/mobile/select/SelectBoardView.do

URL 에서 Too Many Resultset Fetch 발생

DB Resultset Fetch건수가

264,056건

~ 2017-11-30 21:55:19 > 27702ms ~ 9999999ms

Instance ID			Duration(ms)	SQL Time		
homepage14	/common/attachfile/FileDown.do	200	36,288	2	0	1
homepage14	/common/attachfile/FileDown.do	200	58,465	2	0	1
homepage14	/common/attachfile/FileDown.do	200	47,184	3	0	1
homepage14	/common/attachfile/FileDown.do	200	46,991	2	0	1
homepage14	/member/mobile/select/SelectBoardView.do	200	82,793	481	15,740	264,056
homepage14	/member/mobile/select/SelectBoardView.do	200	28,983	581	15,957	264,056
homepage14	/member/mobile/select/SelectBoardView.do	200	46,552	576	25,220	264,056
homepage14	/member/mobile/select/SelectBoardView.do	200	138,530	606	66,329	264,056

Transaction Detail | Trace | StackTrace

IP	210.90.107.181	Instance ID	
Agent Type	WAS	Transaction ID	

Warning Message

```
- Too many resultset fetch [count:100000,  elapsed:28647]
- Too many resultset fetch [count:200000,  elapsed:45694]
```

Method Traces

다음 SELECT 쿼리의 수행시간은 600ms

이지만, ResultSet Fetch건수가

264,056건으로 66.3초 수행되었음

```
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
[   1][20:53:56.120| 138,530| 100|        2|      0| 7,843.9]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][20:53:56.121| 138,528| 100|   66,333| 72,195| 7,842.8] + org.springframework.web.servlet.DispatcherServlet.doService()
[   3][20:53:56.122|       0|   0|        0|      0|     0.0]  + com.ibatis.sqlmap.engine.impl.SqlMapClientImpl.openSession()
[   4][20:53:56.123|       0|   0|        0|      0|     0.0]  + org.apache.commons.dbcp.BasicDataSource.getConnection()
[   5][20:53:56.123|       0|   0|        0|      0|     0.0]   + org.apache.commons.dbcp.PoolingDataSource.getConnection()
[   6][20:53:56.123|       0|   0|        0|      0|     0.1]  + org.apache.commons.dbcp.DelegatingConnection.prepareStatement()
[   7][20:53:56.123|       0|   0|        0|      0|     0.0]   + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[   8][20:53:56.124|     606|   0|        0|    606|     0.5]  + org.apache.commons.dbcp.DelegatingPreparedStatement.execute()
[   9][20:53:56.124|     606|   0|      606|      0|     0.4]   + oracle.jdbc.driver.OraclePreparedStatement.execute()
                                                   > DB     :    URL: jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS_LIST=(LOAD_BALANCE=ON)(ADDRESS=(PROTOCOL = TCP)(HOST=10.101.34.35)(PORT=1521
                                                   > Query :     /* eduschCourseDAO.selectPopupList */ SELECT A.COURSESEQNO , B.COURSENAME , A.NAME , A.SEX , A.JOBPHONE , A.JOBADDR , A.J
 IN(0, 1, 9) ORDER BY A.REGDATE DESC
                                                   > Mapped:     /* eduschCourseDAO.selectPopupList */ SELECT A.COURSESEQNO , B.COURSENAME , A.NAME , A.SEX , A.JOBPHONE , A.JOBADDR , A.J
 IN(0, 1, 9) ORDER BY A.REGDATE DESC
[  10][20:55:03.059|       0|   0|        0|      0|     0.0]  + oracle.jdbc.driver.OracleResultSetImpl.next-close()
                                                   > Fetch :    [Fetch Count: 264056, Gab Time: 66,329ms ]

[  11][20:55:03.059|       0|   0|        0|      0|     0.1]  + org.apache.commons.dbcp.PoolableConnection.close()
[  12][20:55:03.060|  71,589|  52|        3| 71,586| 2,192.3]  + org.apache.jasper.servlet.JspServlet.service()
[  13][20:55:03.063|  71,586|  52|   71,586|      0| 2,188.7]   + org.apache.jsp.WEB_002dINF.jsp.egovframework.member.mobile.select.SelectBoardView_jsp._jspService()
```


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#17 - 많은 DB ResultSet fetch로 OOM 발생 감지

SQL 쿼리 이슈

opennaru

Transactions > 2017-12-11 08:54:22 ~ 2017-12-11 10:14:53 > 28810ms ~ 9999999ms

Export to Excel tid :

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.168.1.25	110.70.56.200	myacv-1-25	/member/auth	500	178,684	93	178,543	92,982	0	3,203.13	2017-12-11 18:30:47.754
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/member/auth	200	146,325	9,265	0	2	0	31.25	2017-12-11 18:31:19.925
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/member/auth	200	143,590	0	0	2	0	31.25	2017-12-11 18:31:22.660
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/log/tracking	200	134,481	0	0	0	0	15.63	2017-12-11 18:31:31.785
WAS	192.168.1.25	220.94.248.31	myacv-1-25	/log/tracking	200	129,779	0	0	0	0	46.88	2017-12-11 18:31:36.503
WAS	192.168.1.25	110.70.56.200	myacv-1-25	/member/auth	200	127,184	4,093	0	1	0	46.88	2017-12-11 18:31:39.066
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/log/tracking	200	124,559	37,827	0	0	0	31.25	2017-12-11 18:31:41.691
WAS	192.168.1.25	219.248.121.3	myacv-1-25	/member/firstAct	200	119,107	0	0	1	0	78.13	2017-12-11 18:31:47.128

View 1 - 22 of 2

2017년 12월 11일 : 다수의 인스턴스에서 OutOfMemory 오류가 발생

사용자 인증시 데이터베이스 Fetch를 92,982건 호출함

Transaction Detail | Trace | StackTrace

Name	Value	Name	Value
Request URL	POST /member/auth View URL	Params	
Request Host	my.acuvue.co.kr View Page	Status Code	500
Client IP	110.70.56.200 User Location	User Agent	Variables/2.0.7 (iPhone; iOS 10.3.3; Scale/3.00)
Start Time	2017-12-11 09:30:47.754	End Time	2017-12-
Duration (ms)	178,684	CPU Time (ms)	3,203.13
JDBC Time (ms)	93	Latency (ms)	0
Thread Name	http-bio-80-exec-67	Thread ID	1819

OutOfMemory 오류가 발생함

```
Handler processing failed; nested exception is java.lang.OutOfMemoryError: GC overhead limit exceeded
```

Error Message

```
Handler processing failed; nested exception is java.lang.OutOfMemoryError: GC overhead limit exceeded
```

Method Traces

```
==========================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
------------------------------------------------------------------------------------------
```


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#17 – 너무 많은 DB ResultSet fetch 감지

SQL 쿼리 이슈

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Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.168.1.25	110.70.56.200	myacv-1-25	/member/auth	500	178,684	93	178,543	92,982	0	3,203.13	2017-12-11 18:30:47.75
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/member/auth	200	146,325	9,265	0	2	0	31.25	2017-12-11 18:31:19.92
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/member/auth	200	143,590	0	0	2	0	31.25	2017-12-11 18:31:22.66
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/log/tracking	200	134,481	0	0	0	0	15.63	2017-12-11 18:31:31.78
WAS	192.168.1.25	220.94.248.31	myacv-1-25	/log/tracking	200	129,779	0	0	0	0	46.88	2017-12-11 18:31:36.50
WAS	192.168.1.25	110.70.56.200	myacv-1-25	/member/auth	200	127,184	4,093	0	1	0	46.88	2017-12-11 18:31:39.06
WAS	192.168.1.25	223.62.8.206	myacv-1-25	/log/tracking	200	124,559	37,827	0	0	0	31.25	2017-12-11 18:31:41.69
WAS	192.168.1.25	219.248.121.3	myacv-1-25	/member/firstAct	200	119,107	0	0	1	0	78.13	2017-12-11 18:31:47.12

View 1 - 22 of

2017년 12월 11일 : 다수의 인스턴스에서 OutOfMemory 오류가 발생

로직에 따라 SQL 쿼리의 WHERE 조건절에 필요한 조건이 빠져 테이블 Full Scan이 발생함

Transaction Detail

```
SELECT
  A.contactId AS contactId , A.membershipNo AS membershipNo, A.userId AS userId, A.userPwd AS userPwd, A.name AS name,
  A.mobileNumber AS mobileNumber, A.gender AS gender, A.dob AS dob, A.registeredFrom AS registeredFrom, A.smsAcceptYN AS smsAcceptYN, A.emailCloseYN AS emailCloseYN,
  A.isSubmitted AS isSubmitted, A.pushYN AS pushYN, A.status AS status, A.grade AS grade, A.grandPoint AS grandPoint, A.usePoint AS usePoint, A.totalPoint AS totalPoint,
  A.deviceToken AS deviceToken, A.deviceType AS deviceType, A.accessToken AS accessToken, A.accessType AS accessType, A.membershipPoint AS membershipPoint,
  A.secretToken AS secretToken, A.authToken AS authToken, A.authTokenTime AS authTokenTime, ISNULL(A.barcodeImage, '') AS barcodeImage, A.virtualCardNumber AS virtualCardNumber,
  ISNULL(A.diopterL, '') AS diopterL, ISNULL(A.diopterR, '') AS diopterR, ISNULL(A.astiYN_L, '') AS astiYN_L, ISNULL(A.astiYN_R, '') AS astiYN_R, ISNULL(A.CylinderInfoL, '') AS cylinderInfoL, ISNU
LL(A.CylinderInfoR, '') AS cylinderInfoR,
  ISNULL(A.AxisInfoL, '') AS axisInfoL, ISNULL(A.AxisInfoR, '') AS axisInfoR, A.uuid AS uuid,
  A.acuvueUserNo AS acuvueUserNo, A.acuvueMemberSeq AS acuvueMemberSeq, A.acuvueChangeDate AS acuvueChangeDate, A.acuvuePointUptDate AS acuvuePointUptDate,
  A.createdDate AS createdDate, A.modifiedDate AS modifiedDate, CONVERT(VARCHAR(10), DATEADD(DAY, 30, A.modifiedDate), 20) AS modDate, CONVERT(VARCHAR(10), DATEADD(YY, 1, A.modifiedDate), 20) AS y
yDate,
  A.firstPaymentDate AS firstPaymentDate, A.firstChargeDate AS firstChargeDate,
  A.cardExpiryDate AS cardExpiryDate, A.cardRegDate AS cardRegDate, A.loginFailCount AS loginFailCount, A.lastLoginDate AS lastLoginDate, A.aceAuthYN as aceAuthYN,
  A.acuvueChangePoint AS acuvueChangePoint, A.acuvueCardNo AS acuvueCardNo, A.MktPushYN AS mktPushYN, A.ThirdPartyYN AS thirdPartyYN, A.ACMSConvertYN AS acmsConvertYN, A.MemberSeg AS memberSeg
FROM Contact A WITH(NOLOCK)
 WHERE 1=1

        AND A.Status = 'D'
        AND ISNULL(A.CsStatus,'')!= 'delete'


            /*mobileNumber is null*/
ORDER BY ContactId DESC
[  14][09:30:47.786|      93|   0|       93|      0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerPreparedSta
                                                  > DB    :        URL: jdbc:sqlserver://52.193.49.249:1433;authentic
rCertificate=false;sendStringParametersAsUnicode=false;selectMethod=direct;responseBuffering=adaptive;packetSize=8000;
false;disableStatementPooling=true;databaseName=ACE;applicationName=Microsoft JDBC Driver for SQL Server;applicationIn
                                                  > Query :        /* MemberDao.selectList */ SELECT A.contactId AS contactId, A.accountId AS accountId , A.membershipNo AS membershipNo, A.userId AS user
Id, A.userPwd AS userPwd, A.name AS name, A.mobileNumber AS mobileNumber, A.gender AS gender, A.dob AS dob, A.registeredFrom AS registeredFrom, A.smsAcceptYN AS smsAcceptYN, A.emailCloseYN AS emailCloseY
N, A.isSubmitted AS isSubmitted, A.pushYN AS pushYN, A.status AS status, A.grade AS grade, A.grandPoint AS grandPoint, A.usePoint AS usePoint, A.totalPoint AS totalPoint, A.deviceToken AS deviceToken, A.d
```

해결책 : 사용자가 선택한 값이 없을 때에도 WHERE 조건절이 생성되도록 애플리케이션을 변경해야 함

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#17 - Database Deadlock 오류 발생

SQL 쿼리 이슈

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Transactions > 2017-12-21 14:08:44 ~ 2017-12-21 14:11:34 > 3276ms ~ 9999999ms

Export to Excel tid :

클라이언트 IP가 동일함

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.168.2.101	223.62.10.94	myacv-2-101	/myAccount/visitBooking	200	7,266	7,172	0	3	0	15.63	2017-12-21 23:09:56.831
WAS	192.168.2.101	223.62.10.94	myacv-2-101	/myAccount/visitBooking	200	11,703	11,578	0	5	0	62.50	2017-12-21 23:09:56.833
WAS	192.168.2.101	223.62.10.94	myacv-2-101	/myAccount/visitBooking	200	9,765	9,672	0	3	0	15.63	2017-12-21 23:09:56.849
WAS	192.168.2.101	223.62.10.94	myacv-2-101	/myAccount/visitBooking	200	9,327	9,249	0	3	0	46.88	2017-12-21 23:09:59.193
WAS	192.168.2.101	223.62.10.94	myacv-2-101	/myAccount/visitBooking	200	3,406	3,328	0	3	0	31.25	2017-12-21 23:10:04.474

View 1 - 5 of 5

2017년 12월 21일 : Database DeadLock 오류 발생함

MS SQL Server 52.XX.XX.XX, DB에서 UPDATE 실행시 Dead Lock 발생

> SQLERR : Transaction was deadlocked on lock resources ...

Transaction Detail | Trace | StackTrace

```
                BookingTime = ?,
                ProductCode = ?,
                ModifiedDate = GETDATE(),
                PushOn = ?
        WHERE contactId = ? AND id = ?
[  10][14:09:56.878|    7,141|    98|    7,141|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.execute()
                                                > DB     :        URL: jdbc:sqlserver://52.193.49.249:1433;authenticationScheme=nativeAuthentication;xopenStates=false;sendTimeAsDatetime=true;trustServe
rCertificate=false;sendStringParametersAsUnicode=false;selectMethod=direct;responseBuffering=adaptive;packetSize=8000;multiSubnetFailover=false;loginTimeout=15;lockTimeout=-1;lastUpdateCount=true;encrypt=
false;disableStatementPooling=true;databaseName=ACE;applicationName=Microsoft JDBC Driver for SQL Server;applicationIntent=readwrite;
                                                > Query :        /* MyCouponDao.couponRequest */ UPDATE CouponContact SET AccountId = ?, RequestDate = GETDATE(), BookingDate = ?, BookingTime = ?, Prod
uctCode = ?, ModifiedDate = GETDATE(), PushOn = ? WHERE contactId = ? AND id = ?
                                                > Params:        '8399', '2017-12-23 23:59', '', '1MA', '', '3312934', '10368248'
                                                > Mapped:        /* MyCouponDao.couponRequest */ UPDATE CouponContact SET AccountId = '8399', RequestDate = GETDATE(), BookingDate = '2017-12-23 23:59',
 BookingTime = '', ProductCode = '1MA', ModifiedDate = GETDATE(), PushOn = '' WHERE contactId = '3312934' AND id = '10368248'
                                                > SQLERR:        Transaction (Process ID 60) was deadlocked on lock resources with another process and has been chosen as the deadlock victim. Rerun the
 transaction.
[  11][14:10:04.019|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerConnection.commit()
[  12][14:10:04.019|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerConnection.setAutoCommit(true)
[  13][14:10:04.019|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServerConnection.close()
[  14][14:10:04.050|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServer
[  15][14:10:04.050|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServer
[  16][14:10:04.050|       0|    0|       0|     0|     0.0]      + com.microsoft.sqlserver.jdbc.SQLServer
                                                > Query :        /* MemberDao.selectOne */
        SELECT
          A.contactId AS contactId, A.accountId AS accountId, CONVERT(VARCHAR(10),A.accountRegDate,121) AS accountRegDate, C.ShippingName AS shippingName , A.membershipNo AS membershipNo, A.userId AS user
Id, A.userPwd AS userPwd, ISNULL(D.name, A.name) AS name
```

해결책 : 해당 테이블에 대한 INSERT와 UPDATE를 조정하여 쿼리를 튜닝하여야 함

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#17 - Database 쿼리 Timeout 오류 발생

SQL 쿼리 이슈

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Transactions > 2017-12-19 08:00:48 ~ 2017-12-19 08:01:36 > 8983ms ~ 9999999ms

Export to Excel tid :

Agent Type	Server IP	Client IP	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.[redacted]224	211.2[redacted]7.178	myacv-5-224	/ecpWeb/w2/getCustomerInfo	200	33,499	32,218	0	1	0	31.25	2017-12-19 17:00:23.784
WAS	192.[redacted]239	211.2[redacted]7.178	myacv-6-239	/ecpWeb/w2/getCustomerInfo	200	30,953	30,782	0	1	0	0.00	2017-12-19 17:00:32.396
WAS	192.[redacted]191	211.2[redacted]7.178	myacv-5-191	/ecpWeb/w2/getCustomerInfo	200	30,687	30,515	0	1	0	0.00	2017-12-19 17:00:38.643
WAS	192.[redacted]224	211.2[redacted]7.178	myacv-5-224	/ecpWeb/w2/getCustomerInfo	200	10,96[redacted]	10,765	0	103	0	15.63	2017-12-19 17:00:43.330
WAS	192.[redacted]52	211.2[redacted]7.178	myacv-6-52	/ecpWeb/w2/getCustomerInfo	200	11,031	10,812	0	5	0	0.00	2017-12-19 17:00:44.269
WAS	192.[redacted]191	211.2[redacted]7.178	myacv-5-191	/ecpWeb/w2/getCustomerInfo	200	15,343	15,125	0	103	0	62.50	2017-12-19 17:00:54.612

View 1 - 6 of 6

2017년 12월 19일 : Database 쿼리 Timeout 오류 발생함

MS SQL Server 52.xxx.xxx.249, ACE DB에서 SELECT 실행시 쿼리 Timeout 발생

Transaction Detail | Trace | StackTrace

```
r, Convert(varchar, A.CreatedDate, 121) as CreatedDate, /* ?? ?? ??? */ Convert(varchar, DATEADD(MONTH, 1, ISNULL(AcuvueChangeDate, A.CreatedDate)), 121) AS ACMSExpireDate, /* ACMS????? ?? ?? CreatedDate
 -> AcuvueChangeDate? ??(2015.10.21) */ Convert(varchar, GETDATE(), 121) AS CurrentDate, /* ???? */ Convert(varchar, C.EcpEyeInfoDate, 121) AS EcpEyeInfoDate, /* ????? */ Convert(varchar, DATEADD(YEAR , 1
 , C.EcpEyeInfoDate) , 121) AS EcpEyeInfoLastDate, /* ?? ????? */ Replace(convert(VARCHAR(8), GETDATE(), 112)+CONVERT(varchar(8), GETDATE(), 114), ':', '') AS SearchStartTime, /* ???? */ A.MembershipExpir
e AS MembershipStartTime, /* ??? ??? ?? ??*/ '1' AS searchType /* ?? ??? ??? ?? type - ?? SM ??(17.10.02)*/ FROM contact A WITH(NOLOCK) LEFT OUTER JOIN contactInfo B WITH(NOLOCK) ON A.ContactId = B.Contac
tId LEFT OUTER JOIN contactLife C WITH(NOLOCK) ON A.ContactId = C.ContactId WHERE 1=1 AND (C.Name LIKE N'%' + ? + '%' OR A.Name LIKE N'%' + ? + '%') AND A.Status = 'N' ORDER BY A.AceAuthYn DESC
                                                    > Params:        ???, ???
                                                    > Mapped:        /* EcpTrade4CustomerDao.getCustomerInfo */ SELECT A.ContactId, /* ??????   */ A.AccountId, /*    */ A.MembershipNo, /*   */ A.AcuvueCar
dNo, /* ACMS  */ ISNULL(C.Name , A.Name) AS Name, /*   */ C.Birth_YYYY, /*  */ C.Birth_MM, /*  */ C.Birth_DD, /*  */ C.Birth_YYYY + '-' + C.Birth_MM + '-' + C.Birth_DD AS BirthDay, A.MobileNumber, /*   */
 A.UserId, /*  Id */ CASE WHEN ISNULL(C.Gender , A.Gender) = 'M' THEN N'' WHEN ISNULL(C.Gender , A.Gender) = 'F' THEN N'' END AS Gender, /*  */ A.GrandPoint, /*    */ A.UsePoint, /*    */ A.TotalPoint, /*
    (     ) */ ISNULL(A.MembershipPoint, 0) MembershipPoint, /*   */ A.DiopterL, /* diopter  */ A.DiopterR, /* diopter  */ A.AstiYN_L, /* astigmatism  */ A.AstiYN_R, /* astigmatism  */ A.CylinderInfoL, /*
 Cylinder  */ A.CylinderInfoR, /* Cylinder  */ A.AxisInfoL, /* Axis  */ A.AxisInfoR, /* Axis  */ A.DeviceToken, /*     */ A.UUID, /*  UUID */ ISNULL(A.DeviceType, 'acms') AS DeviceType, /*  Type Android,
 iOS */ A.SecretToken, /*    ( ) */ A.AcuvuePointUptDate, /*   */ A.VirtualCardNumber, /*    */ A.CardExpiryDate, /*     */ A.CardRegDate, /*     */ A.AccessType, /*  sns (facebook, kakao, naver, app) */
 A.AcmsConvertYn, /* ACMS    YN */ A.AceAuthYn, /* ACE    YN */ ISNULL(B.DeviceIdType, '') DeviceIdType, ISNULL(B.DeviceId, '') DeviceId, ISNULL(B.DeviceVer, '') DeviceVer, Convert(varchar, A.CreatedDate,
 121) as CreatedDate, /*    */ Convert(varchar, DATEADD(MONTH, 1, ISNULL(AcuvueChangeDate, A.CreatedDate)), 121) AS ACMSExpireDate, /* ACMS   CreatedDate -> AcuvueChangeDate (2015.10.21) */ Convert(varcha
r, GETDATE(), 121) AS CurrentDate, /*  */ Convert(varchar, C.EcpEyeInfoDate, 121) AS EcpEyeInfoDate, /*  */ Convert(varchar, DATEADD(YEAR , 1 , C.EcpEyeInfoDate) , 121) AS EcpEyeInfoLastDate, /*   */ Repl
ace(convert(VARCHAR(8), GETDATE(), 112)+CONVERT(varchar(8), GETDATE(), 114), ':', '') AS SearchStartTime, /*  */ A.MembershipExpire AS MembershipStartTime, /*    */ '1' AS searchType /*     type -  SM (1
7.10.02)*/ FROM contact A WITH(NOLOCK) LEFT OUTER JOIN contactInfo B WITH(NOLOCK) ON A.ContactId = B.ContactId LEFT OUTER JOIN contactLife C WITH(NOLOCK) ON A.ContactId = C.ContactId WHERE 1=1 AND (C.Name
 LIKE N'%' +  + '%' OR A.Name LIKE N'%' +  + '%') AND A.Status = 'N' ORDER BY A.AceAuthYn DESC
                                                    > SQLERR:        The query has timed out.
                                                    > CallAt:
    at com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.execute(SQLServerPreparedStatement.java:334)
    at org.apache.ibatis.executor.statement.PreparedStatementHandler.query(PreparedStatementHandler.java:59)
    at org.apache.ibatis.executor.statement.RoutingStatementHandler.query(RoutingStatementHandler.java:73)
    at org.apache.ibatis.executor.SimpleExecutor.doQuery(SimpleExecutor.java:60)
    at org.apache.ibatis.executor.BaseExecutor.queryFromDatabase(BaseExecutor.java:267)
    at org.apache.ibatis.executor.BaseExecutor.query(BaseExecutor.java:137)
    at org.apache.ibatis.executor.CachingExecutor.query(CachingExecutor.java:96)
    at org.apache.ibatis.executor.CachingExecutor.query(CachingExecutor.java:77)
    at org.apache.ibatis.session.defaults.DefaultSqlSession.selectList(DefaultSqlSession.java:108)
```

해결책 : 쿼리를 튜닝하여야 함

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Application Performance Management

#18
해킹 공격시도 분석

KHAN
[apm]

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#18 - OOO 서비스의 대시보드 : 오류가 급증함

해킹 공격분석

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오류가 급증하며 서비스 품질(APDEX)이
급격이 나빠지고 있음

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#18 – 서비스 오류 통계 분석(일별, 시간별 분석)

해킹 공격분석

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7월 3일 오류 발생 건수가 급증

[일별 오류통계]

사용자가 접속한 도메인별로
400, 500 오류의 일별 / 시간별
통계 분석 가능

7월 3일 11시 오류 발생 건수가 급증
1,262건의 오류가 발생
[7월 3일 시간별 오류통계]

바차트를 클릭하여 해당 오류 내용을
상세하게 분석 가능

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#18 - 호출 URL 파라미터와 UserAgent 분석

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Transactions > 2017-07-03 00:00:00 ~ 2017-07-04 00:00:00 > 0ms ~ 999999ms

Agent Type		Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	[redacted]	manager11	/manage/lecture/mentor/status/excel.list.do	500	542	207	299	156	0	259.39	2017-07-03 08:43:18.569
WAS	[redacted]	school11	/school/lecture/lectureTotal/ajax.lectureList.do	500	396	35	0	2	0	30.35	2017-07-03 11:21:15.580
WAS	[redacted]	school21	/school/lecture/lectureTotal/ajax.lectureList.do	500	281	38	0	2	0	32.70	2017-07-03 11:23:51.715
WAS	[redacted]	school11	/school/lecture/lectureTotal/ajax.lectureList.do	500	264	58	0	2	0	30.01	2017-07-03 11:22:22.902
WAS	[redacted]	school21	/school/lecture/lectureTotal/ajax.lectureList.do	500	261	40	0	2	0	30.78	2017-07-03 11:24:31.148
WAS	[redacted]	school11	/school/lecture/lectureTotal/ajax.lectureList.do	500	257	39	0	2	0	29.75	2017-07-03 11:23:52.031
WAS	[redacted]	school21	/school/lecture/lectureTotal/ajax.lectureList.do	500	256	39	0	2	0	30.78	2017-07-03 11:22:23.456
WAS	172.27.0.204	school21	/school/lecture/lectureTotal/ajax.lectureList.do	500	255	38	0	2	0	30.37	2017-07-03 11:23:50.406

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View 1 - 100 of 1,2

애플리케이션 검색 파라미터에 SQL 쿼리를 입력하여 공격 시도하고 있음

Transaction Detail | Trace | StackTrace

Name	Value
Request URL	/school/lecture/lectureTotal/ajax.lectureList.do View URL
Request Host	mentoring.career.go.kr View Page
Client IP	211.253.133.37 User Location
Start Time	2017-07-03 11:21:15.580
Duration (ms)	396
JDBC Time (ms)	[illegible]
Thread Name	default task-42
IP	[illegible]
Agent Type	WAS
Error Message	

Name	Value
Params	currentPageNo=1&recordCountPerPage=9&schoolGrd=&searchStDate=2017-07-03%27%29%20UNION%20ALL%20SELECT%20NULL%2CNULL%2CNULL%2CNULL%2CNULL%2CNULL%2CNULL--%20hmCN&searchEndDate=2017-07-11&grpNo=&lectTime=&lectType=&jobChrstcList=&jobNo=&lectStatCd=101543&orderBy=asc&listType=1&consonantsVal=&searchKey=%EA%B5%90%EB%8F%84%EA%B4%80&isMore=false&ms=%5Bobject%20Object%5D&_=1499047901941
Status Code	500
User Agent	sqlmap/1.0.9.1#dev (http://sqlmap.org)
End Time	2017-07-03 11:21:15.976
CPU Time (ms)	30.35
Latency (ms)	12.925
Thread ID	[illegible]
Instance ID	school11
Transaction ID	15d0640493f-6fee1c1d970b75a5da7

Load Balancer에서 'X-Forwarded-For' 헤더를 설정하면 Client IP를 수집할 수 있음

sqlmap tool을 사용함

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#18 - 공격에 사용된 도구 - sqlmap

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sqlmap®

Automatic SQL injection and database takeover tool

; Introduction();--

sqlmap is an open source penetration testing tool that automates the process of detecting and exploiting SQL injection flaws and taking over of database servers. It comes with a powerful detection engine, many niche features for the ultimate penetration tester and a broad range of switches lasting from database fingerprinting, over data fetching from the database, to accessing the underlying file system and executing commands on the operating system via out-of-band connections.

```
$ python sqlmap.py -u "http://debiandev/sqlmap/mysql/get_int.php?id=1" --batch
                          {1.0.5.63#dev}
                          http://sqlmap.org

[!] legal disclaimer: Usage of sqlmap for attacking targets without prior mutual consent i
s illegal. It is the end user's responsibility to obey all applicable local, state and fed
eral laws. Developers assume no liability and are not responsible for any misuse or damage
 caused by this program

[*] starting at 17:43:06

[17:43:06] [INFO] testing connection to the target URL
[17:43:06] [INFO] heuristics detected web page charset 'ascii'
[17:43:06] [INFO] testing if the target URL is stable
[17:43:07] [INFO] target URL is stable
[17:43:07] [INFO] testing if GET parameter 'id' is dynamic
[17:43:07] [INFO] confirming that GET parameter 'id' is dynamic
[17:43:07] [INFO] GET parameter 'id' is dynamic
[17:43:07] [INFO] heuristic (basic) test shows that GET parameter 'id' might be injectable
 (possible DBMS: 'MySQL')
```

; Features();--

- Full support for **MySQL, Oracle, PostgreSQL, Microsoft SQL Server, Microsoft Access, IBM DB2, SQLite, Firebird, Sybase, SAP MaxDB, HSQLDB and Informix** database management systems.
- Full support for six SQL injection techniques: **boolean-based blind, time-based blind, error-based, UNION query-based, stacked queries and out-of-band**.

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Application Performance Management

#19
Java 데몬: 사용자 메소드 추적

KHAN
[apm]

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#19 - 그룹웨어 메일 발송 URL의 속도가 느림

Java 데몬 모니터링

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그룹웨어의 메일 발송 URL의 속도가 느림

Transactions > 2017-07-14 06:11:19 ~ 2017-07-14 19:52:56 > 23204ms ~ 999999ms

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	[redacted]	groupware_2	/ekp/inc/eml/insertSendMail	200	59,540	2	0	4	0	34.14	2017-07-14 11:29:36.212
WAS	[redacted]	mobilePush_2	/MobilePush/broadcast/login.do	200	58,721	58,509	2	3	0	590.00	2017-07-14 09:59:50.602
WAS	[redacted]	groupware_1	/ekp/inc/emlCfg/deleteAllMail	200	49,557	6	0	3	0	34.49	2017-07-14 10:22:34.755
WAS	[redacted]	groupware_2	/ekp/inc/eml/insertSendMail	200	43,334	6	2	4	0	120.51	2017-07-14 14:15:35.616
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	42,616	783	2	7	0	305.82	2017-07-14 14:08:54.062
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	42,615	692	3	7	0	410.15	2017-07-14 14:08:54.061
WAS	[redacted]	groupware_1	/ekp/inc/eml/insertSendMail	200	36,497	4	0	4	0	63.03	2017-07-14 14:07:10.170
WAS	[redacted]	mobilePush_2	/MobilePush/broadcast/login.do	200	32,694	32,478	0	3	0	590.00	2017-07-14 11:10:03.475

Page [redacted] of 1 View 1 - 14 of

그룹웨어의 메일 발송(smtp) 메일 전송 API 속도가 느림

Transaction Detail | Trace | StackTrace

```
IL JOIN DEPT_JOB DJ ON E.EMP_ID = DJ.EMP_ID JOIN COMPANY CMP ON MU.CMP_ID = CMP.CMP_ID JOIN POSITION POS ... DJ.DEPT_ID = 'D170102006' AND DJ.JOB_TYPE >= '10000' AND E.EMP_STATU
S != 'D'
[  59][14:15:35.683|      0|  0|      0|    0|    0.0]          + oracle.jdbc.driver.OracleResultSetImpl.next-close()
                                                > Fetch :          [Fetch Count: 1, Gab Time: 1ms ]

[  60][14:15:35.683|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$100()
[  61][14:15:35.683|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$100()
[  62][14:15:35.683|  42,344| 98|  42,344|    0|   22.4]        + com.naon.biz.gw.email.connector.EmlSmtp.sendMail()
[  63][14:15:18.037|      1|  0|      1|    0|    0.0]        + com.naon.biz.gw.email.connector.EmlConfig.getEmlConfigDetail()
[  64][14:16:18.034|      3|  0|      0|    3|    1.4]        + org.mybatis.spring.SqlSessionTemplate.selectOne()
[  65][14:16:18.034|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$100()
[  66][14:16:18.034|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$200()
[  67][14:16:18.034|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$300()
[  68][14:16:18.034|      3|  0|      0|    3|    1.3]        + org.apache.ibatis.session.defaults.DefaultSqlSession.selectOne()
[  69][14:16:18.034|      3|  0|      0|    3|    1.3]        + org.apache.ibatis.session.defaults.DefaultSqlSession.selectList()
[  70][14:16:18.034|      3|  0|      2|    1|    1.3]        + org.apache.ibatis.session.defaults.DefaultSqlSession.selectList()
[  71][14:16:18.034|      0|  0|      0|    0|    0.0]        + org.apache.ibatis.session.defaults.DefaultSqlSession.wrapCollection()
[  72][14:16:18.035|      0|  0|      0|    0|    0.1]        + org.apache.tomcat.dbcp.dbcp.DelegatingConnection.prepareStatement()
[  73][14:16:18.035|      0|  0|      0|    0|    0.0]        + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[  74][14:16:18.035|      1|  0|      0|    1|    0.7]        + org.apache.tomcat.dbcp.dbcp.DelegatingPreparedStatement.execute()
[  75][14:16:18.035|      1|  0|      0|    1|    0.7]        + org.apache.tomcat.dbcp.dbcp.DelegatingPreparedStatement.execute()
[  76][14:16:18.035|      1|  0|      1|    0|    0.6]        + oracle.jdbc.driver.OraclePreparedStatement.execute()
                                                > DB    :          URL: jdbc:oracle:thin:@192.168.2.196:1521:mgdb
                                                > Query :          SELECT * FROM EML_COMPANY_PROPERTY WHERE CMP_ID = ? AND PROPERTY_NAME = ?
                                                > Params:          'C100150521', 'admin_mail_security_use'
                                                > Mapped:          SELECT * FROM EML_COMPANY_PROPERTY WHERE CMP_ID = 'C100150521' AND PROPERTY_NAME = 'admin_mail_security_use'
[  77][14:16:18.037|      0|  0|      0|    0|    0.0]          + oracle.jdbc.driver.OracleResultSetImpl.next-close()
                                                > Fetch :          [Fetch Count: 1, Gab Time: 1ms ]

[  78][14:16:18.037|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$100()
[  79][14:16:18.037|      0|  0|      0|    0|    0.0]        + org.mybatis.spring.SqlSessionTemplate.access$100()
[  80][14:16:18.037|    908|  2|    908|    0|   20.5]        + com.naon.biz.gw.email.connector.EmlImap.addMessages()
```


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#19 - 메일 발송 데몬의 메소드별 수행시간 추적

Java 데몬 모니터링

opennaru

메일 발송 Java Mail 데몬에 추가 User Interceptor를 구성하여 메소드 추적

Transactions > 2017-07-14 07:54:45 ~ 2017-07-14 20:27:24 > 12976ms ~ 999999ms

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	42,616	783	2	7	0	305.82	2017-07-14 14:08:54.062
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	42,615	692	3	7	0	410.15	2017-07-14 14:08:54.061
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	30,397	62	4	7	0	647.63	2017-07-14 16:58:39.501
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	17,208	647	3	7	0	220.14	2017-07-14 11:30:17.732
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	16,967	50	0	7	0	108.24	2017-07-14 15:31:08.226
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	16,591	276	0	7	0	133.17	2017-07-14 14:24:46.105
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	15,044	62	4	7	0	687.73	2017-07-14 11:27:04.240
WAS	[redacted]	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	14,944	936	3	7	0	178.22	2017-07-14 17:03:03.561

View 1 - 9

메일 발송 Java Mail 데몬의 추가 Interceptor를 구성하여 메소드 추적

Transaction Detail | Trace | StackTrace

Agent Type: WAS

Method Traces

```
==========================================================================================
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
------------------------------------------------------------------------------------------
[   1][14:08:54.062|  42,616| 100|   41,826|      0|   305.8]+ com.naonsoft.james.transport.mailets.LocalDelivery.storeMail()
[   3][14:08:54.075|       0|   0|        0|      0|     0.3]  + org.apache.commons.dbcp.BasicDataSource.getConnection()
[   4][14:08:54.075|       0|   0|        0|      0|     0.3]   + org.apache.commons.dbcp.PoolingDataSource.getConnection()
[   5][14:08:54.075|       0|   0|        0|      0|     0.2] + org.apache.openjpa.lib.jdbc.DelegatingConnection.prepareStatement()
[   6][14:08:54.075|       0|   0|        0|      0|     0.2]  + org.apache.commons.dbcp.DelegatingConnection.prepareStatement()
[   7][14:08:54.075|       0|   0|        0|      0|     0.1]   + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[   8][14:08:54.076|       4|   0|        2|      2|     3.4] + org.apache.openjpa.lib.jdbc.DelegatingPreparedStatement.executeQuery()
[   9][14:08:54.077|       2|   0|        1|      1|     1.0]  + org.apache.commons.dbcp.DelegatingPreparedStatement.executeQuery()
[  10][14:08:54.078|       1|   0|        0|      1|     0.8]   + org.apache.commons.dbcp.DelegatingPreparedStatement.executeQuery()
[  11][14:08:54.078|       1|   0|        1|      0|     0.5]    + oracle.jdbc.driver.OraclePreparedStatement.executeQuery()
                                                  > DB    :      URL: jdbc:oracle:thin:@192.168.2.196:1521:mgdb, User: EKPNAON_MEDIAWILL
                                                  > Query :      SELECT t0.BACKUP_YN, t0.BACKUP_STATUS, t0.PWD_HASH_ALGO, t0.BACKUP_QUOTA_SIZE, t0.BACKUP_USE_SIZE, t0.CMP_ID, t0.NAME, t0.IMAP_USE_YN, t
0.PWD, t0.POP3_USE_YN, t0.QUOTA_SIZE, t0.USER_STATUS FROM EML_MAIL_USER t0 WHERE t0.EMAIL = ?
                                                  > Params:      'soyoungs@mediawill.com'
                                                  > Mapped:      SELECT t0.BACKUP_YN, t0.BACKUP_STATUS, t0.PWD_HASH_ALGO, t0.BACKUP_QUOTA_SIZE, t0.BACKUP_USE_SIZE, t0.CMP_ID, t0.NAME, t0.IMAP_USE_YN, t
0.PWD, t0.POP3_USE_YN, t0.QUOTA_SIZE, t0.USER_STATUS FROM EML_MAIL_USER t0 WHERE t0.EMAIL = 'soyoungs@mediawill.com'
[  12][14:08:54.081|       0|   0|        0|      0|     0.0] + oracle.jdbc.driver.OracleResultSetImpl.next-close()
                                                  > Fetch :   [Fetch Count: 1, Gab Time: 0ms ]

[  13][14:08:54.081|       1|   0|        1|      0|     1.0] + org.apache.openjpa.lib.jdbc.DelegatingConnection.close()
[  14][14:08:54.081|       0|   0|        0|      0|     0.0]  + org.apache.openjpa.lib.jdbc.DelegatingConnection.close()
[  15][14:08:54.083|     199|   0|        0|    199|     0.3] + org.apache.openjpa.lib.jdbc.DelegatingDataSource.getConnection()
```


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#19 - 메일 발송 시간차

Java 데몬 모니터링

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Transactions > 2017-07-19 08:36:58 ~ 2017-07-19 11:04:05 > 3228ms ~ 999999ms

Agent Type	IP address	Instance ID	URL	Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.168.2.194	groupware_2	/ekp/inc/eml/insertSendMail	200	12,632	5	0	4	0	21.82	2017-07-19 10:46:57.086
WAS	192.168.2.193	groupware_1	/ekp/inc/eml/selectMailWrite	200	4,176	6	1	3	0	13.49	2017-07-19 10:47:00.304
WAS	192.168.2.193	groupware_1	/ekp/inc/eml/insertSendMail	200	12,360	3	0	4	0	17.75	2017-07-19 10:47:05.699
WAS	192.168.2.193	groupware_1	/ekp/inc/eml/insertSendMail	200	9,573	3	0	4	0	15.41	2017-07-19 10:47:11.122
WAS	192.168.2.194	groupware_2	/ekp/inc/eml/selectMailWrite	200	[illegible]	[illegible]	[illegible]	3	0	15.85	2017-07-19 10:47:11.826
WAS	192.168.2.191	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	3,764	46	0	7	0	133.98	2017-07-19 10:47:15.856
WAS	192.168.2.191	james1	com.naonsoft.james.transport.mailets.LocalDelivery	200	5,179	1,001	1	7	0	132.50	2017-07-19 10:47:20.256
WAS	192.168.2.194	groupware_2	/ekp/inc/eml/insertSendMail	200	21,733	3	1	4	0	19.51	2017-07-19 10:47:22.957

메일 서버에 실제 메일을 요청하는
부분으로 추정됨
'10:47:11.134'에 메일 발송 요청

메일 서버 데몬에서 실제 메일 발송하는 부분
'10:47:15.856'에 메일 발송 시작
발송 요청과 발송 시작 : 4.7초 차이
요청 : '10:47:11.134'
시작 : '10:47:15.856'

Transaction Detail | Trace | StackTrace

```
[ 62][10:47:11.134|  6,929| 70|  6,929|    0|    1.6]      + com.naon.biz.gw.email.connector.Eml5mtp.sendMail()
```

WAS	192.168.2.191	james1	com.naonsoft.james.transport.mailets.LocalDelivery	10:47:15.856
WAS	192.168.2.191	james1	com.naonsoft.james.transport.mailets.LocalDelivery	10:47:20.256
WAS	192.168.2.194	groupware_2	/ekp/inc/eml/insertSendMail	10:47:22.957

Transaction Detail | Trace | StackTrace

```
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
[   1][10:47:15.856|   3,764| 100|    3,711|      0|   134.0]+ com.naonsoft.james.transport.mailets.LocalDelivery.storeMail()
[   3][10:47:15.869|      0|  0|        0|      0|     0.1]  + org.apache.commons.dbcp.BasicDataSource.getConnection()
[   4][10:47:15.869|      0|  0|        0|      0|     0.1]   + org.apache.commons.dbcp.PoolingDataSource.getConnection()
[   5][10:47:15.869|      0|  0|        0|      0|     0.2] + org.apache.openjpa.lib.jdbc.DelegatingConnection.prepareStatement()
[   6][10:47:15.869|      0|  0|        0|      0|     0.2]  + org.apache.commons.dbcp.DelegatingConnection.prepareStatement()
[   7][10:47:15.869|      0|  0|        0|      0|     0.0]   + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[   8][10:47:15.869|      5|  0|        3|      2|     4.9] + org.apache.openjpa.lib.jdbc.DelegatingPreparedStatement.executeQuery()
[   9][10:47:15.871|      2|  0|        0|      2|     1.5]  + org.apache.commons.dbcp.DelegatingPreparedStatement.executeQuery()
[  10][10:47:15.871|      2|  0|        2|      0|     1.0]   + org.apache.commons.dbcp.DelegatingPreparedStatement.executeQuery()
[  11][10:47:15.872|      0|  0|        0|      0|     0.4]    + oracle.jdbc.driver.OraclePreparedStatement.executeQuery()
                                                            > DB    :      URL: jdbc:oracle:thin:@192.168.2.196:1521:mgdb, User: EKPNAON_MEDIAWILL
                                                            > Query :      SELECT t0.BACKUP_YN, t0.BACKUP_STATUS, t0.PWD_HASH_ALGO, t0.BACKUP_QUOTA_SIZE, t0.BACKUP_USE_SIZE, t0.CMP_ID, t0.NAME, t0.IMAP_USE_YN, t
0.PWD, t0.POP3_USE_YN, t0.QUOTA_SIZE, t0.USER_STATUS FROM EML_MAIL_USER t0 WHERE t0.EMAIL = ?
                                                            > Params:      'mwadmin@mediawill.com'
                                                            > Mapped:      SELECT t0.BACKUP_YN, t0.BACKUP_STATUS, t0.PWD_HASH_ALGO, t0.BACKUP_QUOTA_SIZE, t0.BACKUP_USE_SIZE, t0.CMP_ID, t0.NAME, t0.IMAP_USE_YN, t
0.PWD, t0.POP3_USE_YN, t0.QUOTA_SIZE, t0.USER_STATUS FROM EML_MAIL_USER t0 WHERE t0.EMAIL = 'mwadmin@mediawill.com'
[  12][10:47:15.874|      0|  0|        0|      0|     0.0] + oracle.jdbc.driver.OracleResultSetImpl.next-close()
                                                            > Fetch :   [Fetch Count: 1, Gab Time: 0ms ]

[  13][10:47:15.874|      2|  0|        2|      0|     1.3] + org.apache.openjpa.lib.jdbc.DelegatingConnection.close()
[  14][10:47:15.874|      0|  0|        0|      0|     0.0]  + org.apache.openjpa.lib.jdbc.DelegatingConnection.close()
[  15][10:47:15.877|      0|  0|        0|      0|     0.2] + org.apache.openjpa.lib.jdbc.DelegatingDataSource.getConnection()
[  16][10:47:15.877|      0|  0|        0|      0|     0.1]  + org.apache.commons.dbcp.BasicDataSource.getConnection()
[  17][10:47:15.877|      0|  0|        0|      0|     0.1]   + org.apache.commons.dbcp.PoolingDataSource.getConnection()
[  18][10:47:15.877|      0|  0|        0|      0|     0.2] + org.apache.openjpa.lib.jdbc.DelegatingConnection.prepareStatement()
[  19][10:47:15.877|      0|  0|        0|      0|     0.2]  + org.apache.commons.dbcp.DelegatingConnection.prepareStatement()
[  20][10:47:15.877|      0|  0|        0|      0|     0.0]   + oracle.jdbc.driver.T4CDriverExtension.allocatePreparedStatement()
[  21][10:47:15.877|      4|  0|        3|      1|     3.5] + org.apache.openjpa.lib.jdbc.DelegatingPreparedStatement.executeQuery()
```


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#19 - 메일서버 데몬의 JVM CPU 사용율

Java 데몬 모니터링

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아무런 작업이 없어도 JVM CPU를
30~40%가량 사용하고 있음

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#19 - 메일서버 데몬의 스레드 개수 분석

Java 데몬 모니터링

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아무런 작업이 없어도
실행중인 스레드가 6,414개이며,
대기중인 스레드가 4,173개.
총 10,624개의 스레드를 사용중

KHAN [apm]

Opennaru

WAS

- 대시보드
- Instances
  - 192.168.2.191
    - james1
      - 서버 정보
      - 애플리케이션
      - 통계
      - JVM
        - 메모리 사용률
        - 메모리 크기
        - GC 시간
        - 파일오픈수
        - 스레드상태
        - 클래스오픈수
        - JVM CPU 시간
      - 데이터소스
      - 스레드 덤프 분석
      - 오픈파일 분석
      - 네트워크상태 분석
  - 192.168.2.193
  - 192.168.2.194
- 애플리케이션
- 실시간 요청 모니터링
- 액티브 사용자수
- JVM 메모리 비교

홈 / WAS / Instances / 192.168.2.191 / james1 / JVM / 스레드상태

WAS > 192.168.2.191 > james1

한국어

Current | History

JVM Threads

higher values represent higher usages

2017-07-13 21:15:20
new: 0.0
blocked: 0.0
deadLock: 0.0
runnable: 6,414.0
terminated: 0.0
timedWaiting: 37.0
waiting: 4,173.0
Total: 10,624.0

Number of Threads

new | blocked | deadLock | runnable | terminated | timedWaiting | waiting

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#19 - 메일 서버 데몬의 스레드 덤프 분석

Java 데몬 모니터링

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총 6403개의 Netty의 New I/O worker 스레드

데이터 처리를 기다리는 상태(RUNNING)

Thread Dump Analyzer > None

All Fields | Analyze From Text

#	Lin...	Type	Name	State	URL
6140	1,155	Thread	New I/O worker #6395	RUNNABLE	
6141	1,131	Thread	New I/O worker #6396	RUNNABLE	
6142	1,107	Thread	New I/O worker #6397	RUNNABLE	
6143	1,083	Thread	New I/O worker #6398	RUNNABLE	
6144	1,059	Thread	New I/O worker #6399	RUNNABLE	
6145	153,...	Thread	New I/O worker #64	RUNNABLE	
6146	139,...	Thread	New I/O worker #640	RUNNABLE	
6147	1,035	Thread	New I/O worker #6400	RUNNABLE	
6148	1,011	Thread	New I/O worker #6401	RUNNABLE	
6149	987	Thread	New I/O worker #6402	RUNNABLE	
6150	139,...	Thread	New I/O worker #641	RUNNABLE	
6151	139,...	Thread	New I/O worker #642	RUNNABLE	
6152	139,...	Thread	New I/O worker #643	RUNNABLE	
6153	139,...	Thread	New I/O worker #644	RUNNABLE	
6154	139,...	Thread	New I/O worker #645	RUNNABLE	
6155	139,...	Thread	New I/O worker #646	RUNNABLE	
6156	139,...	Thread	New I/O worker #647	RUNNABLE	
6157	139,...	Thread	New I/O worker #648	RUNNABLE	
6158	139,...	Thread	New I/O worker #649	RUNNABLE	
6159	153,...	Thread	New I/O worker #65	RUNNABLE	

Record ID: 29939 6,139-6,166 of 40,570

Thread Dump Text > None

```
985      - <0x00000006dada3ff8> (a java.util.concurrent.ThreadPoolExecutor$Worker)
986
987  "New I/O worker #6402" #10885 prio=5 os_prio=0 tid=0x00007f40ededd800 nid=0xf58 runn
988     java.lang.Thread.State: RUNNABLE
989      at sun.nio.ch.EPollArrayWrapper.epollWait(Native Method)
990      at sun.nio.ch.EPollArrayWrapper.poll(EPollArrayWrapper.java:269)
991      at sun.nio.ch.EPollSelectorImpl.doSelect(EPollSelectorImpl.java:79)
992      at sun.nio.ch.SelectorImpl.lockAndDoSelect(SelectorImpl.java:86)
993      - locked <0x00000006dad775b0> (a sun.nio.ch.Util$2)
994      - locked <0x00000006dad775a0> (a java.util.Collections$UnmodifiableSet)
995      - locked <0x00000006dad77488> (a sun.nio.ch.EPollSelectorImpl)
996      at sun.nio.ch.SelectorImpl.select(SelectorImpl.java:97)
997      at org.jboss.netty.channel.socket.nio.SelectorUtil.select(SelectorUtil.java:68)
998      at org.jboss.netty.channel.socket.nio.AbstractNioSelector.select(AbstractNioSelec
999      at org.jboss.netty.channel.socket.nio.AbstractNioSelector.run(AbstractNioSelector
1000     at org.jboss.netty.channel.socket.nio.AbstractNioWorker.run(AbstractNioWorker.jav
1001     at org.jboss.netty.channel.socket.nio.NioWorker.run(NioWorker.java:178)
1002     at org.jboss.netty.util.ThreadRenamingRunnable.run(ThreadRenamingRunnable.java:10
1003     at org.jboss.netty.util.internal.DeadLockProofWorker$1.run(DeadLockProofWorker.ja
1004     at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1142
1005     at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:617
1006     at java.lang.Thread.run(Thread.java:745)
1007
1008    Locked ownable synchronizers:
1009     - <0x00000006dad772a0> (a java.util.concurrent.ThreadPoolExecutor$Worker)
1010
1011 "New I/O worker #6401" #10884 prio=5 os_prio=0 tid=0x00007f40edeb2000 nid=0xf57 runna
1012    java.lang.Thread.State: RUNNABLE
1013     at sun.nio.ch.EPollArrayWrapper.epollWait(Native Method)
1014     at sun.nio.ch.EPollArrayWrapper.poll(EPollArrayWrapper.java:269)
1015     at sun.nio.ch.EPollSelectorImpl.doSelect(EPollSelectorImpl.java:79)
1016     at sun.nio.ch.SelectorImpl.lockAndDoSelect(SelectorImpl.java:86)
1017     - locked <0x00000006dad77e78> (a sun.nio.ch.Util$2)
1018     - locked <0x00000006dad77e68> (a java.util.Collections$UnmodifiableSet)
1019     - locked <0x00000006dad77d50> (a sun.nio.ch.EPollSelectorImpl)
1020     at sun.nio.ch.SelectorImpl.select(SelectorImpl.java:97)
1021     at org.jboss.netty.channel.socket.nio.SelectorUtil.select(SelectorUtil.java:68)
1022     at org.jboss.netty.channel.socket.nio.AbstractNioSelector.select(AbstractNioSelec
1023     at org.jboss.netty.channel.socket.nio.AbstractNioSelector.run(AbstractNioSelector
1024
```


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#19 - 메일 서버 데몬의 스레드 덤프 분석

Java 데몬 모니터링

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총 4095개의 ActiveMQ Consumer 스레드

데이터 처리를 기다리는 상태(WAITING)

Thread Dump Analyzer > None

All Fields | Analyze From Text

#	Lin...	Type	Name	State	URL
9979	155,...	Thread	Remote delivery thread (4084)	WAITING	
9980	155,...	Thread	Remote delivery thread (4085)	WAITING	
9981	155,...	Thread	Remote delivery thread (4086)	WAITING	
9982	155,...	Thread	Remote delivery thread (4087)	WAITING	
9983	155,...	Thread	Remote delivery thread (4088)	WAITING	
9984	155,...	Thread	Remote delivery thread (4089)	WAITING	
9985	210,...	Thread	Remote delivery thread (409)	WAITING	
9986	155,...	Thread	Remote delivery thread (409)	WAITING	
9987	155,...	Thread	Remote delivery thread (409)	WAITING	
9988	155,...	Thread	Remote delivery thread (409)	WAITING	
9989	155,...	Thread	Remote delivery thread (409)	WAITING	
9990	155...	Thread	Remote delivery thread (409)	WAITING	
9991	155,...	Thread	Remote delivery thread (4095)	WAITING	
9992	210,...	Thread	Remote delivery thread (41)	WAITING	
9993	210,...	Thread	Remote delivery thread (410)	WAITING	
9994	210,...	Thread	Remote delivery thread (411)	WAITING	
9995	210,...	Thread	Remote delivery thread (412)	WAITING	
9996	210,...	Thread	Remote delivery thread (413)	WAITING	
9997	210,...	Thread	Remote delivery thread (414)	WAITING	

Record ID: 36383

Thread Dump Text > None

```
155373      - <0x00000006d3783dd0> (a java.util.concurrent.ThreadPoolExecutor$Worker)
155374
155375  "Remote delivery thread (4095)" #4286 prio=5 os_prio=0 tid=0x00007f4a52aea800 nid=0
155376     java.lang.Thread.State: WAITING (on object monitor)
155377      at java.lang.Object.wait(Native Method)
155378      at java.lang.Object.wait(Object.java:502)
155379      at org.apache.activemq.SimplePriorityMessageDispatchChannel.dequeue(SimplePrior
155380      - locked <0x0000000796ddc298> (a java.lang.Object)
155381      at org.apache.activemq.ActiveMQMessageConsumer.dequeue(ActiveMQMessageConsumer.
155382      at org.apache.activemq.ActiveMQMessageConsumer.receive(ActiveMQMessageConsumer.
155383      at org.apache.james.queue.jms.JMSMailQueue.deQueue(JMSMailQueue.java:110)
155384      at com.naonsoft.james.transport.mailets.RemoteDelivery.run(RemoteDelivery.java:
155385      at java.lang.Thread.run(Thread.java:745)
155386
155387     Locked ownable synchronizers:
155388      - None
155389
155390  "Remote delivery thread (4094)" #4285 prio=5 os_prio=0 tid=0x00007f4a52ae8800 nid=0
155391     java.lang.Thread.State: WAITING (on object monitor)
155392      at java.lang.Object.wait(Native Method)
155393      at java.lang.Object.wait(Object.java:502)
155394      at org.apache.activemq.SimplePriorityMessageDispatchChannel.dequeue(SimplePrior
155395      - locked <0x000000076e902910> (a java.lang.Object)
155396      at org.apache.activemq.ActiveMQMessageConsumer.dequeue(ActiveMQMessageConsumer.
155397      at org.apache.activemq.ActiveMQMessageConsumer.receive(Active[illegible]mer.
155398      at org.apache.james.queue.jms.JMSMailQueue.deQueue(JMSMailQue[illegible]
155399      at com.naonsoft.james.transport.mailets.RemoteDelivery.run(Re[illegible]java:
155400      at java.lang.Thread.run(Thread.java:745)
155401
155402     Locked ownable synchronizers:
155403      - None
155404
155405  "Remote delivery thread (4093)" #4284 prio=5 os_prio=0 tid=0x000[illegible] nid=0
155406     java.lang.Thread.State: WAITING (on object monitor)
155407      at java.lang.Object.wait(Native Method)
155408      at java.lang.Object.wait(Object.java:502)
155409      at org.apache.activemq.SimplePriorityMessageDispatchChannel.d[illegible]rior
155410      - locked <0x00000007863be080> (a java.lang.Object)
155411      at org.apache.activemq.ActiveMQMessageConsumer.dequeue(ActiveMQMessageConsumer.
```

Thread Dump

Thread가 너무 많아 Thread간의 Context Switching 비용이 너무 큼

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Application Performance Management

#20
URL 호출이 느림

KHAN
[apm]

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#20 - 서비스 대시보드의 처리 현황

Server Slowdown 현상

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응답시간이 느려져
만족도 지수가 급격히 낮아짐

처리시간이 오래 걸린 요청들이 많은 상태

서비스의 오류율이
급격하게 증가

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#20 - 인스턴스의 Pending Request 급증

Server Slowdown 현상

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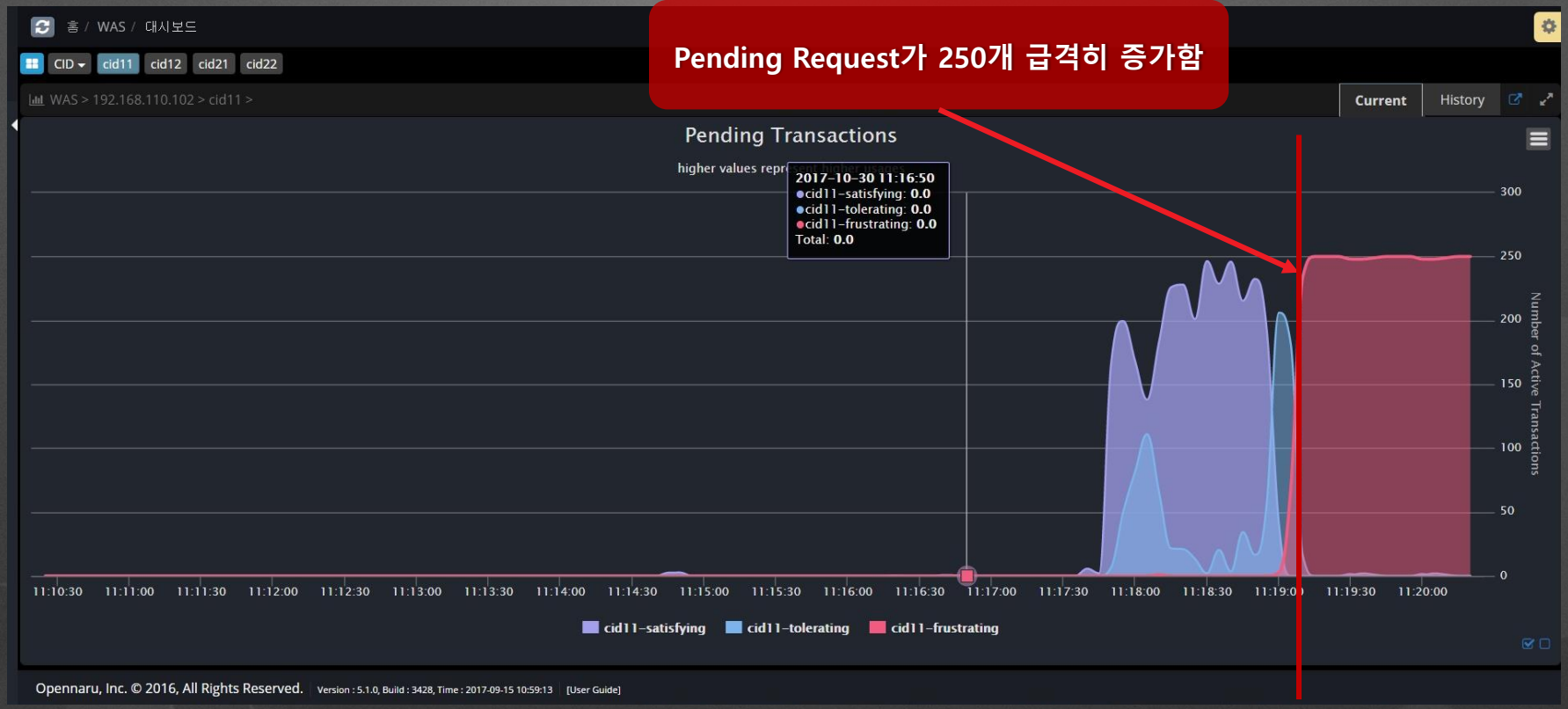

Pending Request가 250개 급격히 증가함

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#20 - 특정 URL 에서 느린 것을 확인

Server Slowdown 현상

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/popup/simple/xxx/send.do URL에서

500초 이상 수행

Slowest Transaction

Agent Type	IP address	Instance ID		Status	Duration(ms)	SQL Time(ms)	Fetch Gab	Fetch Count	External Time	CPU Time(ms)	Start Time
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	546,577	273	0	3	0	9.76	2017-10-30 11:18:54.160
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	545,970	321	0	3	0	10.61	2017-10-30 11:18:54.093
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	517,356	324	1	3	0	8.77	2017-10-30 11:18:53.357
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	516,302	48	0	3	0	12.76	2017-10-30 11:18:53.734
WAS	192.168.110.102	cid11	/popup/simple/certification/result.do	200	487,126	299	0	3	0	10.22	2017-10-30 11:18:53.557
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	486,414	247	1	3	0	10.44	2017-10-30 11:18:53.599
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	457,148	303	0	3	0	10.83	2017-10-30 11:18:53.525
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	456,510	4	0	3	0	10.81	2017-10-30 11:18:53.483
WAS	192.168.110.102	cid11	/popup/simple/certification/send.do	200	427,301	143	0	3	0	10.82	2017-10-30 11:18:53.340

Agent Type: WAS

Transaction ID: 15f6b131750-3c9d7c9c90b89c66a3fb

Method Traces

```
[Num.][ Start Time | Elapsed|  % |  Exclusi|  A-Gab| CPUTime]                Method Call
[   1][11:18:54.160| 546,577| 100|        0|      0|     9.8]+ org.apache.catalina.connector.CoyoteAdapter.service()
[   2][11:18:54.160| 546,577| 100|        0|546,577|     9.4] + kcb.core.filter.CorsFilter.doFilter()
[   3][11:18:54.160| 546,577| 100|        0|546,577|     9.4]  + org.springframework.boot.web.support.ErrorPageFilter.doFilter()
[   4][11:18:54.160| 546,577| 100|        0|546,577|     9.2]   + kcb.core.xss.XssWhitelistFilter.doFilter()
[   5][11:18:54.160| 546,577| 100|        0|546,577|     9.2]    + kcb.core.filter.MultiReadHttpServletRequestFilter.doFilter()
[   6][11:18:54.160| 546,577| 100|        0|546,577|     9.1]     + org.springframework.web.servlet.FrameworkServlet.service()
[   7][11:18:54.160| 546,577| 100|  546,304|    273|     9.0]      + org.springframework.web.servlet.DispatcherServlet.doService()
[   8][11:18:54.161|     272|   0|        0|    272|     0.2]       + net.sf.log4jdbc.Log4jdbcProxyDataSource.getConnection()
[   9][11:18:54.161|     272|   0|        0|    272|     0.2]        + org.apache.commons.dbcp2.BasicDataSource.getConnection()
[  10][11:18:54.161|     272|   0|      270|      2|     0.1]         + org.apache.commons.dbcp2.PoolingDataSource.getConnection()
[  11][11:18:54.431|       2|   0|        2|      0|     0.1]          + oracle.jdbc.driver.OraclePreparedStatement.executeQuery()
                                                                          URL: jdbc:oracle:thin:@192.168.110.23:1521:TPINS
                                                                          SELECT 1 FROM DUAL
```

Opennaru, Inc. © 2016, All Rights Reserved. Version : 5.1.0, Build : 3428, Time : 2017-09-15 10:59:13 [User Guide]

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#20 - 문제 인스턴스의 URL 호출 분석

Server Slowdown 현상

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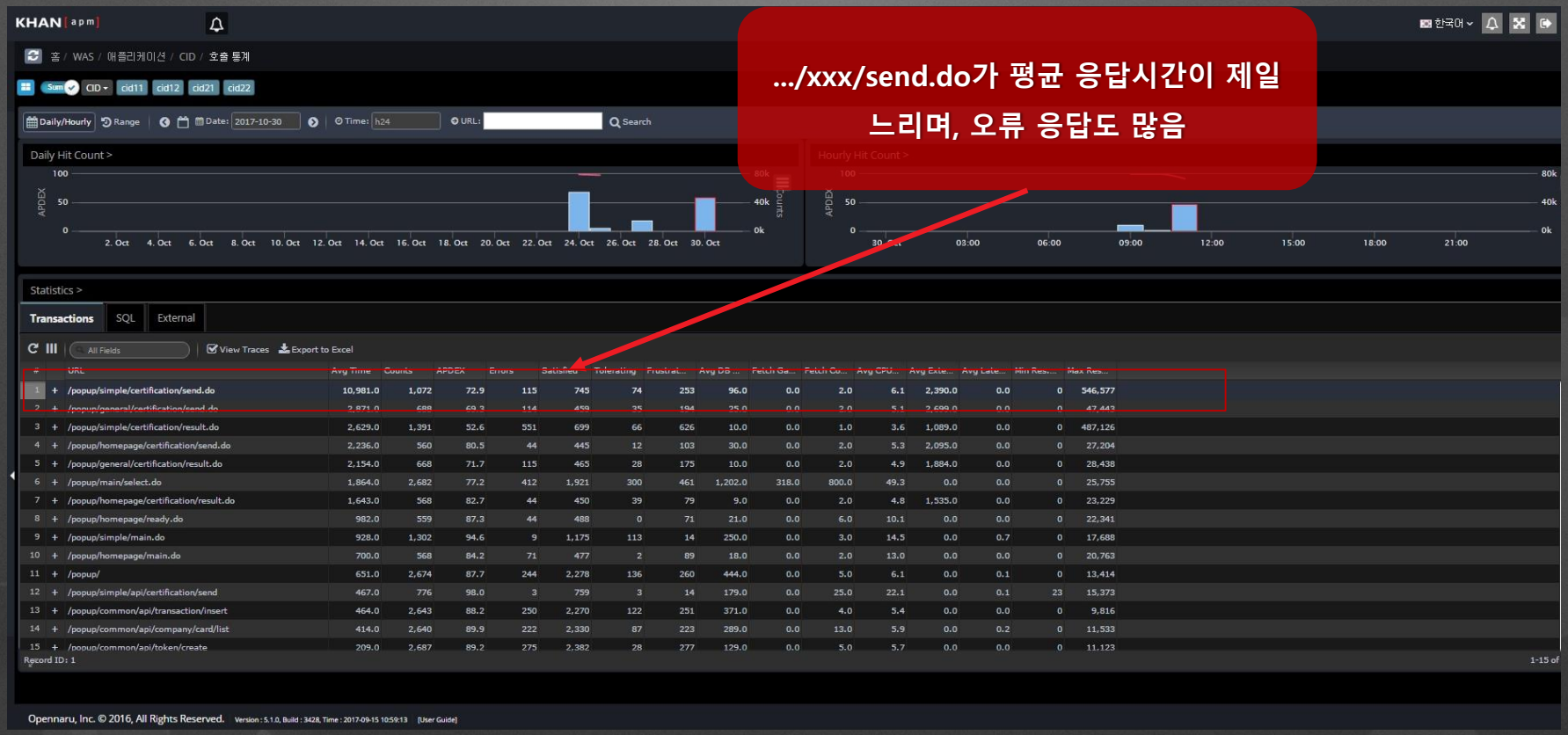

#		URL	Avg Time	Counts	APDEX	Errors	Satisfied	Tolerating	Frustrat...	Avg DB ...	Fetch Ga...	Fetch Co...	Avg CPU...	Avg Exte...	Avg Late...	Min Res...	Max Res...
1	+	/popup/simple/certification/send.do	10,981.0	1,072	72.9	115	745	74	253	96.0	0.0	2.0	6.1	2,390.0	0.0	0	546,577
2	+	/popup/general/certification/send.do	2,871.0	688	69.3	114	459	35	194	25.0	0.0	3.0	5.1	2,699.0	0.0	0	47,443
3	+	/popup/simple/certification/result.do	2,629.0	1,391	52.6	551	699	66	626	10.0	0.0	1.0	3.6	1,089.0	0.0	0	487,126
4	+	/popup/homepage/certification/send.do	2,236.0	560	80.5	44	445	12	103	30.0	0.0	2.0	5.3	2,095.0	0.0	0	27,204
5	+	/popup/general/certification/result.do	2,154.0	668	71.7	115	465	28	175	10.0	0.0	2.0	4.9	1,884.0	0.0	0	28,438
6	+	/popup/main/select.do	1,864.0	2,682	77.2	412	1,921	300	461	1,202.0	318.0	800.0	49.3	0.0	0.0	0	25,755
7	+	/popup/homepage/certification/result.do	1,643.0	568	82.7	44	450	39	79	9.0	0.0	2.0	4.8	1,535.0	0.0	0	23,229
8	+	/popup/homepage/ready.do	982.0	559	87.3	44	488	0	71	21.0	0.0	6.0	10.1	0.0	0.0	0	22,341
9	+	/popup/simple/main.do	928.0	1,302	94.6	9	1,175	113	14	250.0	0.0	3.0	14.5	0.0	0.7	0	17,688
10	+	/popup/homepage/main.do	700.0	568	84.2	71	477	2	89	18.0	0.0	2.0	13.0	0.0	0.0	0	20,763
11	+	/popup/	651.0	2,674	87.7	244	2,278	136	260	444.0	0.0	5.0	6.1	0.0	0.1	0	13,414
12	+	/popup/simple/api/certification/send	467.0	776	98.0	3	759	3	14	179.0	0.0	25.0	22.1	0.0	0.1	23	15,373
13	+	/popup/common/api/transaction/insert	464.0	2,643	88.2	250	2,270	122	251	371.0	0.0	4.0	5.4	0.0	0.0	0	9,816
14	+	/popup/common/api/company/card/list	414.0	2,640	89.9	222	2,330	87	223	289.0	0.0	13.0	5.9	0.0	0.2	0	11,533
15	+	/popup/common/api/token/create	209.0	2,687	89.2	275	2,382	28	277	129.0	0.0	5.0	5.7	0.0	0.0	0	11,123

Record ID: 1

1-15 of

.../xxx/send.do가 평균 응답시간이 제일 느리며, 오류 응답도 많음

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#20 - 인스턴스의 스레드 덤프 분석

Server Slowdown 현상

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KHAN [apm]

홈 / WAS / 대시보드

CID cid11 cid12 cid21 cid22

Request Velocity

0.0tps
0.00s
2u
250

cid11

Satisfying Tolerating Frustrating

Number of Requests

Thread Dump List

#	Created				Level	UUID
1	2017-10-30 11:25:45	192.168.110.1...	cid11	INFO	CB5F3F56-6AF...	...E42019B
2	2017-10-30 11:25:44	192.168.110.1...	cid11	INFO	ED1EEAE7-10...	...9455D7
3	2017-10-30 11:24:45	192.168.110.1...	cid11	INFO	CC93D779-6B...	...CFD8EF
4	2017-10-30 11:24:44	192.168.110.1...	cid11	INFO	313CA30C-FAC6-4DEB-82A1-3CF833F06...	
5	2017-10-30 11:23:27	192.168.110.1...	cid11	INFO	6B39CEFF-3115-4D74-953F-82D6D8A96...	

Record ID: 20

Thread Dump

Thread Dump Analyzer > 2017-10-30 11:25:45 (CB5F3F56-6AF3-4973-8E43-48FEF2019B60)

All Fields | Search | Analyze From Text | Load from URL

#	Lin...	Type	Name	State	URL	Duration(ms)	CPU
1	323	Active Thread	http-thread-pool-threads - 250	WAITING	/popup/simple/cer...	408,302	
2	456	Active Thread	http-thread-pool-threads - 249	WAITING	/popup/simple/cer...	406,944	
3	589	Active Thread	http-thread-pool-threads - 248	WAITING	/popup/simple/cer...	410,976	
4	722	Active Thread	http-thread-pool-threads - 247	WAITING	/popup/simple/cer...	411,456	
5	855	Active Thread	http-thread-pool-threads - 246	WAITING	/popup/simple/cer...	411,474	
6	988	Active Thread	http-thread-pool-threads - 245	WAITING	/popup/simple/cer...	406,328	
7	1,121	Active Thread	http-thread-pool-threads - 244	WAITING	/popup/simple/cer...	405,695	
8	1,254	Active Thread	http-thread-pool-threads - 243	WAITING	/popup/simple/cer...	410,276	
9	1,387	Active Thread	http-thread-pool-threads - 242	WAITING	/popup/simple/cer...	406,761	
10	1,520	Active Thread	http-thread-pool-threads - 241	WAITING	/popup/simple/cer...	406,228	

Thread Dump Text > 2017-10-30 11:25:45 (CB5F3F56-6AF3-4973-8E43-48FEF2019B60)

```
33442      - <0x0000000789e645c8> (a java.util.concurrent.ThreadPoolExecutor$Worker)
33443
33444  "http-thread-pool-threads - 1" prio=10 tid=0x00007f26f40b7000 nid=0x4bfc waiting on condition [0x0
33445     java.lang.Thread.State: WAITING (parking)
33446      at sun.misc.Unsafe.park(Native Method)
33447      - parking to wait for  <0x0000000788bf5578> (a java.util.concurrent.locks.AbstractQueuedSynchr
33448      at java.util.concurrent.locks.LockSupport.park(LockSupport.java:186)
33449      at java.util.concurrent.locks.AbstractQueuedSynchronizer$ConditionObject.await(AbstractQueued
33450      at org.apache.http.pool.AbstractConnPool.getPoolEntryBlocking(AbstractConnPool.java:377)
33451      at org.apache.http.pool.AbstractConnPool.access$200(AbstractConnPool.java:67)
33452      at org.apache.http.pool.AbstractConnPool$2.get(AbstractConnPool.java:243)
33453      - locked <0x00000007935133e8> (a org.apache.http.pool.AbstractConnPool$2)
33454      at org.apache.http.pool.AbstractConnPool$2.get(AbstractConnPool.java:191)
33455      at org.apache.http.impl.conn.PoolingHttpClientConnectionManager.leaseConnection(PoolingHttpCl
33456      at org.apache.http.impl.conn.PoolingHttpClientConnectionManager$1.get(PoolingHttpClientConnec
33457      at org.apache.http.impl.execchain.MainClientExec.execute(MainClientExec.java:191)
33458      at org.apache.http.impl.execchain.ProtocolExec.execute(ProtocolExec.java:185)
33459      at org.apache.http.impl.execchain.RetryExec.execute(RetryExec.java:89)
33460      at org.apache.http.impl.execchain.RedirectExec.execute(RedirectExec.java:111)
33461      at org.apache.http.impl.client.InternalHttpClient.doExecute(InternalHttpClient.java:185)
33462      at org.apache.http.impl.client.CloseableHttpClient.execute(CloseableHttpClient.java:83)
```

Pending Reqeust가 Apache Commons Http Client Pool에서 Connection을 가져오려고 기다리고 있음

HttpClient Pool의 개수 조절 필요

HttpClient Pool의 Timeout 설정 필요

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Application Performance Management

" IF YOU CAN'T MEASURE IT
YOU CAN'T MANAGE IT. "

- Peter Drucker

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Application Performance Management

감사합니다.

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[apm]

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제품이나 서비스에 관한 문의

콜 센터 : 02-469-5426 (휴대폰 : 010-2243-3394)

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