

**OSGi Device Management
Load & Volume Test Results
Clustered mPRM System**

Table of Contents

1. Introduction	3
1.1 Test Goals	3
1.2 Test Approach	3
2. Test Cases Description	3
3. Test Environment	4
3.1 mPRM Environment	4
3.2 Clients Environment	5
4. Load Test Results	5
4.1 Test Results	5
4.2 Analysis of the Test Result	6

1. Introduction

1.1 Test Goals

This document contains a summary of the load and volume test procedures covering basic OSGi Device Management actions over a **clustered** mPRM system. The tests aim to measure how is the performance of the system influenced by the number mPRM servers included in a clustered mPRM system.

1.2 Test Approach

The tests consists of performing the same set of test procedures (test cases) over fixed number of simultaneously connected OSGi devices with different mPRM configurations (1,2,3,4-host mPRM cluster) and to compare the time for execution of each operation shown by the different mPRM configurations.

The requirements for the number of OSGi device that should be connected simultaneously to the mPRM server for the needs of the tests highly exceed the number of hosts that can be used during the testing procedures. For this purpose a special simulation environment has been developed that allows a single OSGi framework running on a PC to behave as multiple OSGi devices.

The multi-OSGi simulation PC opens multiple management sessions to the mPRM, each session having a different ID, so the mPRM is treating them as separate distinct devices.

These tests are performed with multiple such PCs each simulating up to 1000 (configurable) simultaneously connected OSGi frameworks or unlimited number of subsequently connecting devices.

2. Test Cases Description

TC Name	Description
1.1. Simultaneous session establishment	<p>Measure the system performance for establishing the management session. All devices are initially disconnected and begin to connect to the mPRM server simultaneously. During the establishment of the management session the mPRM performs synchronization of the configuration of the current device state with the data in backend database. The successful end of this test case is when all of the devices become online in the mPRM.</p>
1.2. Simultaneous session establishment with pending commands	<p>This test case is similar to the TC 1.1 above, but there in addition there are two management operations scheduled over all registered devices, which are executed right after session establishment (and state synchronization) over each of the devices.</p> <p>The two management commands scheduled over the devices are:</p> <ul style="list-style-type: none"> • A simple command for changing of one system property • A command for downloading and installing of a relatively small (~20K) OSGi bundle. <p>The successful end of this test case is when all of the devices become online in the mPRM and when the above two management operations are executed over each of the devices.</p>

1.3. Simple Commands Execution	<p>This test case measures the performance for instant execution of a simple management operation while all devices are connected to the system. The command is used in the test changes the value of one system property in the target OSGi frameworks.</p> <p>The successful end of this test case is when the command is executed over each of the devices the corresponding device configuration change is updated in the mPRM DB.</p>
1.4. Installing of a single bundle	<p>This test case measures the performance for instant execution of a management operation for downloading and installation of a single OSGi bundle with size ~100 K, while all devices are connected to the system.</p> <p>The successful end of this test case is when the command is executed over each of the devices the corresponding device software configuration change is updated in the mPRM DB.</p>
1.5. "Smart" bundle installation of multiple bundles	<p>This test case performs smart installation of a bundle, which depends of other 3 bundles. Smart installation means that mPRM will evaluate the dependencies of this bundle and each of bundles which it depends on and are not currently available on the device - will be installed as well. This results in installing of total of four bundles over each device. The total size of the bundles used for this test is ~250 K.</p> <p>The successful end of this test case is when the command is executed over each of the devices the corresponding device software configuration change is updated in the mPRM DB.</p>
1.6. Uninstall by scripted filter	<p>Execution of a management operation over a set of bundles specified by a filtering condition. This means that mPRM will search the configuration of each device for bundles matching this filter and will perform the action over them. For this test the operation is the following:</p> <pre>UNINSTALL ("Bundle-Category" == "wap")</pre> <p>which means that mPRM will install all bundles, which bundle category property is "WAP". Since the previous test case (TC 1.5) has installed 4 such bundles, this TC should uninstall them from all devices.</p> <p>The successful end of this test case is when the command is executed over each of the devices the corresponding device software configuration change is updated in the mPRM DB.</p>

Note: this document contains only a more representative sub-set of all test procedures performed over each configuration, in order to keep it relatively short.

3. Test Environment

3.1 mPRM Environment

MPRM Configuration	Single-host mPRM configuration & clustered (single-MS) configurations with 3 and 4 mPRM hosts.
Hardware	Intel Pentium 4 - 1,8 GHz.

	1G RAM
OS	Windows 2000
JVM	1.5.0_08
RDBMS & Hardware	MySQL 5.0.37 running on a separate machine than the mPRM servers - Intel Core2 Duo 2.13 MHz, 2G RAM. Network connection between the mPRM servers and the DB machine – 100 Mbit Ethernet.

3.2 Clients Environment

Hardware	20 PC - Intel P4 – 1800 – 3000 MHz, 1G RAM
OS	Windows 2000
JVM	JDK 1.4.*, JDK 1.5.*, JDK 6.0.*
OSGi Framework	mBS 6.1 Professional, standard initial bundle configuration + mPRM management agents: 22 bundles initially.
Network Connectivity	100 Mbit Ethernet – star topology, i.e. all test PCs and mPRM server are connected directly to an Ethernet switch. The OSGi devices are configured with the TCP Transport protocol without secured connection enabled.

4. Load Test Results

4.1 Test Results¹

The tests outlined in the table below are performed with 10,000 simultaneously connected OSGi devices (10 PCs each simulating 1000 OSGi devices).

Test Case	Single-Host mPRM	2-Host mPRM Cluster	3-Host mPRM Cluster	4-Host mPRM Cluster
1.1. Simultaneous session establishment	0:24:41/ 0:00.148	0:15:11/ 0:00.091	0:11:57/ 0:00.072	0:07:24/ 0:00.044
1.2. Simultaneous session establishment with pending commands	0:29:42/ 0:00.178	0:17:35/ 0:00.105	0:13:19/ 0:00.079	0:08:55/ 0:00.053
1.3. Simple Command Execution (set system property)	0:02:08/ 0:00.013	0:01:26/ 0:00.009	0:00:55/ 0:00.006	0:00:53/ 0:00.005
1.4. Install bundle (100 K) with predefined configuration	0:17:17/ 0:00.104	0:11:02/ 0:00.066	0:07:02/ 0:00.42	0:04:51/ 0:00.029
1.5. Smart bundle install (4 bundles - total 250 K)	0:35:39/ 0:00.214	0:21:23/ 0:00.128	0:14:40/ 0:00.088	0:09:16/ 0:00.055
1.6. Uninstall by scripted filter (uninstall all bundles with Bundle-Category = WAP)	0:07:48/ 0:00.047	0:05:18/ 0:00.032	0:03:49/ 0:00.023	0:03:08/ 0:00.019

¹ Times are in the format <total time for all devices> / <time per single device>. The total time is in the format hours:mins:sec, while time per device is in the format: min:secs.millis.

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4.2 Analysis of the Test Result

The test results show that mPRM performance increases with each additional mPRM server added to the mPRM system. The total time for execution of each test case decreases nearly proportional with increasing the number of servers (at least between 1 and 4 mPRM servers).