IBM Worklight

IBM Worklight and Mobile Platform V6.0.0

Scalability and Hardware Sizing

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About this document

This document contains information about scalability-related parameters of the IBM® Worklight® Mobile Platform, and the scalability tests performed. It serves as a guide to the included hardware sizing calculator that is used to determine the required hardware for an IBM Worklight deployment.

This document is not a replacement for the IBM Worklight Information Center, which describes an IBM Worklight Server architecture, server setup, and daily maintenance requirements.

1 Architecture

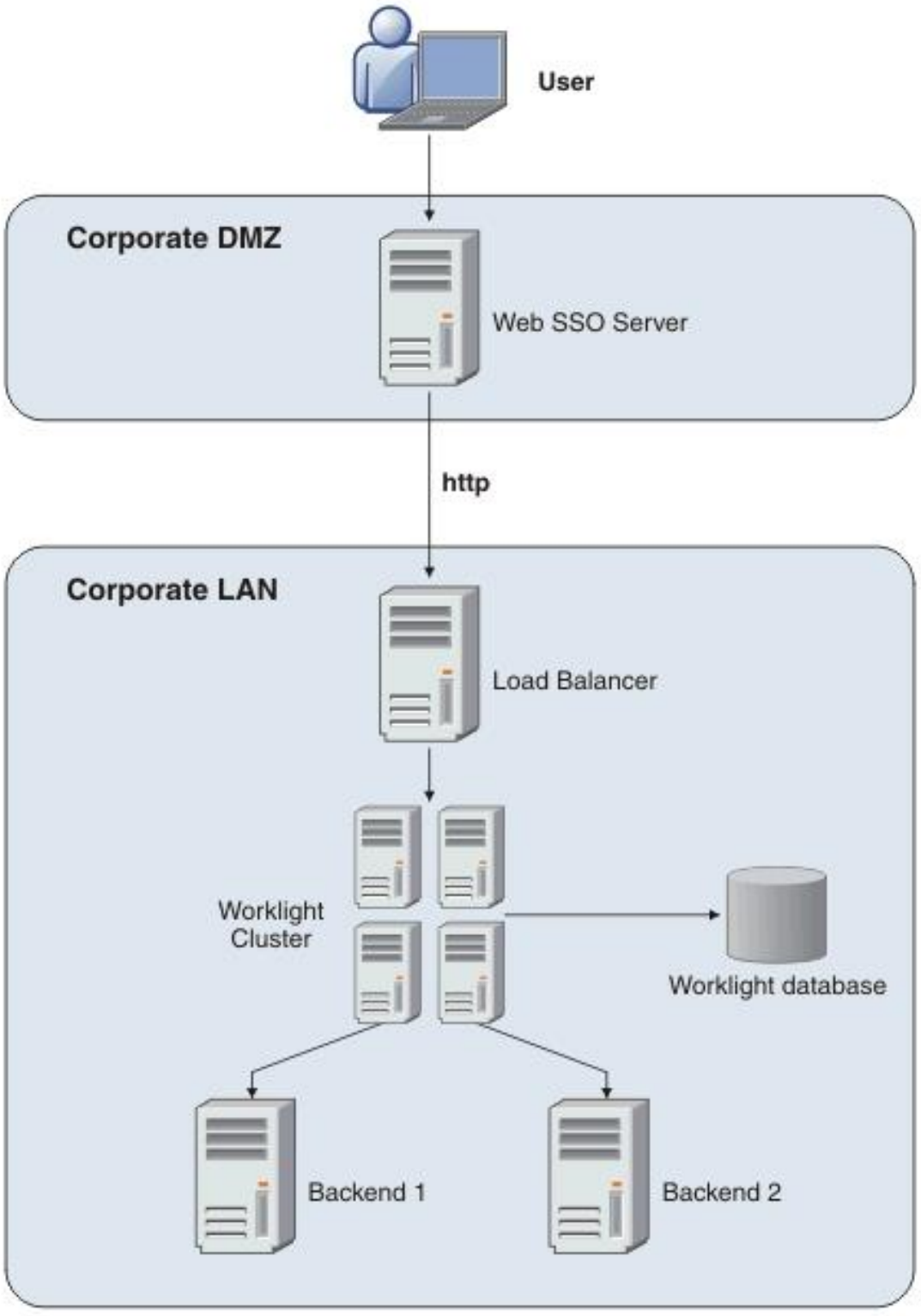

Figure 1-1: Typical IBM Worklight topology

The IBM Worklight topology is based on the following principles:

- Worklight® Server is installed in the organization LAN, connecting to various enterprise back-end systems.
- Worklight Server can be clustered for high availability and scalability.
- Worklight Server uses a database. The database is used for storing push notification information, and statistics for reporting and analytics. The database is also used to store metadata required by the server at run time. A single instance of the database is shared by all IBM Worklight servers. It is possible to cluster the database by using the tools and methods that are provided by the database vendor.
- Worklight Server is installed behind a web authentication infrastructure (Web SSO) acting as a reverse proxy, and providing SSL.

There can be different topologies, depending on the corporate network architecture, disaster recovery, different back-end systems, and so on.

2 Scalability Tests

IBM conducted a series of scalability tests before releasing IBM Worklight®. The following table contains a short summary of the tests performed.

2.1 Tests

#	Test	Goal
1	Single user performance test	This test creates a performance baseline for future tests by using a typical user scenario.
2	Basic stability	This test checks the basic stability and endurance of the server under some load. No crashes, memory leaks, or errors for 12 hours.
3	Regression from former version	This test verifies that the system performs at least as well as the former version.
4	Multiple user performance test	This test checks the performance of a typical user scenario under typical load.
5	Scalability tests	This test proves that IBM Worklight can linearly scale to multiple servers under a single database.
6	Endurance testing	This test proves that the server can stay up without memory leaks for a duration of 72 hours under a typical load scenario.
7	Stress testing	This test increases the load until the server reaches 100% CPU and starts failing. Reduce the load and see that the server is recovering.
8	Recoverability	This test stops various components of the IBM Worklight solution (internet, database, and back end). It starts components again and ensures that the server has recovered.

Table 2-1: Scalability tests performed

2.2 Test Flow

The test, which is run repeatedly, involves the following actions:

1. A typical banking application is simulated. It logs in, makes multiple calls for account list and transaction lists, and then logs out.
2. The IBM Worklight application server uses an HTTP adapter to call a simulated back end. On average, a client-IBM Worklight server call generates 1.1 requests that are sent to the back end.
3. The back end is called via HTTP and returns with a predefined response.

2.3 Hardware

The following hardware was used for IBM Worklight Application Server:

- 2 x Intel (R) Xeon E5540 2.53 GHz (4C, Hyper-Threading)

Note: With the specified number of cores, IBM Worklight performs thousands of transactions per second. If your throughput is low, you can use fewer cores than the specified number.

- 18 GB 1066 DDR3 ECC RAM

Note: Not all RAM was used. Use the accompanying calculator to compute required RAM.

- NetExtreme II BCM5790 Gigabit Ethernet
- 500 GB SAS HDD 6 GB/s

The following hardware was used during testing for the IBM Worklight database:

- 2 Intel Xeon 8C 2.3 GHz/20 MB
- 20 GB DDR3 RAM
- 6-7 500 GB 7.2 Krpm SATA disks
- 1 RAID 5 controller

IBM Worklight Client:

- Simulated by seven virtual machines that run multiple client threads. Running Ubuntu 10.04 64-Bit 4 GB RAM.
- The client load is achieved with jMeter, an open source server performance testing tool by Apache.

2.4 Results

Tests were successful in achieving the goals that are defined in Table 2.1. Specifically, the final test on a single IBM Worklight server ran for three days, without memory loss or performance loss. Throughput was measured at 2,000 requests per second per server with an average CPU usage of 50%.

3 Using the Hardware Planning Calculator

3.1 About sizing

The hardware sizing calculator is based on a scenario that was tested in IBM Labs. This scenario is based on a real customer scenario.

However, Worklight Server is a platform that is augmented with server-side developer code. Therefore, the sizing is largely influenced not only by client calls, but also by the efficiency of the server-side code. Hence, you must consider the calculator as a baseline from which you can proceed to customer-specific scalability tests.

3.2 Sizing parameters

This document is accompanied by a Microsoft Office Excel spreadsheet. The purpose of this spreadsheet is to help organizations calculate the required hardware for an IBM Worklight deployment.

The following table lists the main parameters that are required by the hardware planning calculator:

Parameter	Description	Effect
Application Server	Name of the server that is used: • "Tomcat" for Apache Tomcat • "WebSphere Application Server" for WebSphere® Application Server Full Profile • "Liberty" for WebSphere Application Server Liberty Profile	Server memory footprint for Tomcat is smaller.
Peak Throughput	Peak transactions/sec rate that is required by the customer.	Affects both CPU consumption and server memory.
Complexity	Worklight Server runs code that is written by the customer by using Worklight Studio. An estimate is required regarding the complexity of the server-side code that is written for the customer, when compared to a baseline.	CPU consumption

Parameter	Description	Effect
Peak number of active user sessions	A session is an object that is stored in the server memory for each connecting device. Among other things, it stores authentication information. Active sessions are determined by the number of sessions that are opened versus the number of sessions that time out because of a lack of activity. The default session timeout is 10 minutes, and must be configured. Customers typically set this session timeout to anywhere from 5 to 10 minutes. The mobile client has a "heartbeat" property. By using this property, the mobile client can ping the server while the app is in the foreground so that the session does not time out. When a mobile app moves into the background, it no longer interacts with the server or sends a “heartbeat”, leading to the server session dropping after the specified server session timeout. Example: If 1,000 users start a session against the server every minute, even if they exit the application after 3 minutes their session remains active on the server for 10 minutes, resulting in 10 x 1,000 = 10,000 sessions.	Server memory footprint
Per-session data added to the server by the developer	Worklight Server runs code that is written by the customer by using Worklight Studio. The server-side code can store per-session data.	Server memory footprint
Back-end delay (millisecond)	Average roundtrip time for a call to the back end of the organization.	Worklight Server latency
Reporting mechanism used	There are two reporting mechanisms in IBM Worklight: 1. The classic reporting mechanism, which is database-based. 2. IBM WebSphere Analytics Platform. This reporting mechanism is based on file storage rather than database storage. Only the first mechanism affects the database size.	Database size
Reporting history required before purge (days)	IBM Worklight creates significant amounts of raw reporting data that must be purged after aggregation. Otherwise, the system might slow down and disk space consumption might increase dramatically. Typically, the amount of time between purges is 1 - 3 days.	Database size

Parameter	Description	Effect
Average Throughput as % of peak	The average throughput as compared to the peak throughput defined earlier. This throughput reflects on the raw reporting data size.	Database size
Active hours/day	The number of active hours per day, used to compute the number of transactions per day, and hence the reporting data size.	Database size
Number of users that subscribe to push notifications	The number of users that are expected to require push notifications to their device.	Database size

Table 3-1: Hardware planning calculator parameters

The calculator computes:

- The number of required servers. The server hardware baseline spec is defined in the preceding test.
- The amount of RAM required for each server.
- The Worklight Server average request latency.
- The required database size.
- The push notification throughput.

4 Push Notification

4.1 What is a push notification?

A push notification is an alert indicating a change or an update that the Worklight Server sends to users' mobile devices. Push notifications are popular with all mobile operating systems. IBM Worklight has APIs that maintain the lists of users and mobile devices, and send push notifications. IBM Worklight supports push notifications for the following vendors:

- Android – GCM
- Apple – APNS
- Microsoft, Windows Phone – MPNS

IBM Worklight does not currently support push notification API for BlackBerry or Windows 8.

4.2 Possible architectures for push notifications

Two architectures are possible for push notifications, which differ by the method that the enterprise backend uses to provide push notification data to the Worklight Server:

- The Worklight Server pulls data by using a Worklight JMS adapter. The enterprise backend puts the push notifications in the JMS queue.
- Push notifications are sent to the Worklight Server by invoking an IBM Worklight procedure.

For more information about these alternate architectures, see the IBM Worklight blog.

The primary difference between the two methods is that the first method is limited to a single server, which is pulling data from the JMS queue. With the second method, invoking procedures in the Worklight Server is done through a load balancer. Therefore, the architecture can scale to more than one server.

4.3 Testing assumptions

- Push providers were simulated with a delay that is typical to these services:
  - APNS: 1-2 milliseconds
  - GCM: 20-25 milliseconds
  - MPNS: 20-25 milliseconds
- IBM Worklight can associate multiple devices per user. On average, each user is assumed to have 1.1 devices.

4.4 Test results

A server can push 350 notifications per second when it is under load. The load includes 2,400 regular transactions per second, as well as proportional device calls for subscribing and unsubscribing from the push service.

The CPU and the memory are mostly unaffected. The database is also unaffected, except for the storage of users and devices, as mentioned in section *6. Database usage and size*.

4.5 Version notes

Testing was done with Worklight 6.0.0.

Customers who use earlier versions of IBM Worklight must be aware of a number of known scalability issues. Some of these issues have workarounds. Therefore, if you intend to use push notifications with earlier versions of IBM Worklight, contact IBM customer support.

5 Reporting

IBM Worklight contains the following reporting mechanisms:

- Database-based reporting.
- Reports that are based on IBM WebSphere Analytics Platform.

You can find a comparison between the two options in section Comparison of operational analytics and reports features in the Information Center.

Note: These reports are not enabled by default. Customers must decide which of these mechanisms they want to use.

5.1 Database-based reports

Database-based reports are the older IBM Worklight reports. The database-based reports use a single table to store large quantities of raw data in the database. This table is then aggregated periodically to produce reports.

Sizing for these reports is provided in section 6, *Database usage and size*.

5.2 IBM WebSphere Analytics Platform

WebSphere Analytics Platform is an IBM product that is bundled with the Worklight Server.

The IBM WebSphere Analytics Platform runs on a different server, and is based on file-system storage rather than database storage.

The section Installing and configuring the IBM WebSphere Analytics Platform in the IBM Worklight Information Center describes the system requirements of the IBM WebSphere Analytics Platform.

The basic production-ready architecture requires the following equipment:

- Two servers that run in “stand-alone” mode and that are load-balanced via an HTTP load balancer.

Note: the documentation in the IBM Worklight Information Center might propose more servers.

- Each node must use 4 CPU Cores. 2 CPU cores can be considered for smaller loads.
- At least 100 GB of disk space.

Important note: As of now, IBM WebSphere Analytics Platform supports only Red Hat Enterprise Linux Server.

6 Database usage and size

6.1 IBM Worklight database usage profile

The IBM Worklight database consists of three databases:

- `WRKLGHT`: Main IBM Worklight database
- `WLREPORT`: Reports

Note: this database is used only with the classic IBM Worklight reports. For more information, see section 5, *Reporting*.

- `APPCNTR`: Application Center, if used

For Oracle and DB2, you can use three schemas instead of three actual database instances.

The IBM Worklight database contains mostly metadata and is rather small, with a number of exceptions:

- Push notification information: the list of users and devices who registered for push notification.
- SSO state information: SSO (Single Sign-On) is the ability for business customers to have multiple apps from the same organization. When they log in with one app, they automatically log in to the other device. Turning on the SSO feature puts a larger load on the database because SSO state information is read and updated to the database at the start of each client access to the server.
- The Reports database contains a single table that is called `APP_ACTIVITY_REPORT`, which is append-oriented. Each transaction that is called from a mobile device generates an `INSERT` statement into this single table. This data feed accumulates a large amount of data on what the user does. The data is aggregated at specific intervals (by default, the interval is 20 minutes).

6.2 Database size

Database size is determined almost solely by the size of the data feed that is described earlier. The hardware sizing calculator attempts to help you determine the expected size of this feed, as well as push notifications and SSO.

Notes on the report tables:

- The application developer might also choose to add custom log messages, in which case the table size becomes bigger.
- The size of the aggregated tables is negligible when compared to the raw data.

Important note: It is the responsibility of the customer to purge reporting data regularly, typically every 1-2 days.

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