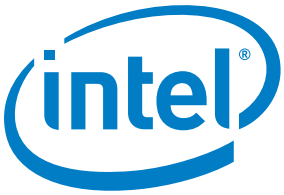

Industrial Edge Insights SW for Buildings (EIB)

Installation Guide

January 2019

Document Number: 601554

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Revision History

Date	Revision	Description
January 2019	1.0	Added 2GB swap area information during OS installation
December 2018	1.0	Beta1 Release
November 2018	0.8	First Release - Alpha

1.0 Introduction

The Industrial Edge Insights SW for Buildings (EIB) is a platform/IOT gateway that gives building management applications easy access to building's data and "things".

Hereafter, Industrial Edge Insights SW for Buildings will be called Edge Insights for Buildings or EIB, unless otherwise stated.

1.1 Purpose

This Installation Guide describes how to install EIB on a gateway device.

1.2 Audience

This guide is intended for Independent Software Vendors and System Integrators.

1.3 Terminology

Table 1. Terminology

Term	Description
BIOS	Basic Input / Output System
Gateway	A gateway is hardware that can physically (wirelessly or wired) connect different devices in a building to a common network.
EIB	Edge Insights for Buildings is software that acquires device data (using various device protocols) and then forwards the data over a network to the cloud. It also helps protect the gateway from network cyber threats.
IP	Intellectual Property
IoT	Internet of Things
OS	Operating System
OTA	Over The Air
TPM	Trusted Platform Module

1.1 Reference Documents

Table 2. Reference Documents

Document	Document No./Location
Edge Insights for Buildings – Haystack API Guide	603906
Edge Insights for Buildings– Modbus API Guide	603907
Edge Insights for Buildings– Secure Boot Guide	603905
Edge Insights for Buildings– OTA Update Guide	601556
Edge Insights for Buildings– Developer Guide	601555
Edge Insights for Buildings– BACnet API Guide	603908

2.0 Platform Overview

2.1 Edge Insights for Buildings

Edge Insights for Buildings (EIB) comes with pre-integrated building protocol stacks (BACnet IP & Modbus IP) that make it easier to connect diverse building subsystems and IoT sensors to one platform.

2.2 Gateway Requirements for Installation

The EIB is deployed on building management gateways, often in the field.

Table 3. Gateway System Requirements

Processor Architecture	The EIB system has been verified on Intel Atom®, Core™ and Xeon® powered gateways, as a representative platform device.
Disk Space Requirement	Intel EIB installation will require a minimum of 10 GB of free disk space on the target hardware.
Gateway Internet Access	The gateway must have internet access
Gateway Operating System	A clean installation of the Ubuntu* 16.04 Server (LTS) 64-bit Operating System
OTA OS Configuration	Over-the-air updates, with rollback, are only supported on a btrfs based OS installation. **SOTA rollback is NOT supported on ext4 file system**

2.2.1 Supported Protocols

The EIB supports:

- Modbus v1.1
- TCP/IP Master
- BACnet PR19,
- BACnet/IP client profile.

2.2.1.1 Modbus Details

EIB supports Modbus v1.1, TCP/IP Master.

Modbus is a serial communication protocol used for transmitting information over serial lines between electronics devices.

Modbus is typically used to transmit signals from instrumentation and control devices back to a main controller or data gathering system.

2.2.1.2 BACnet Details

EIB supports BACnet PR19 and BACnet/IP client.

BACnet is a data communication protocol for building automation and control networks

BACnet defines the services used to communicate between building automation end-devices and building control systems. It defines how data is represented on the network and the services that are used to move data from one BACnet node to another.

BACnet also brokers messages that identify data and network nodes such as Who-Is, I-Am, Who-Has, and I-Have.

2.3 OS Install Options for OTA Updates

Over-the-air updates, with rollback, are supported when the Gateway Operating System (Ubuntu Server 16.04 LTS) is installed with the btrfs file structure.

Otherwise a standard install based on the ext4 file structure is sufficient.

2.3.1 BIOS Settings

1. While installing Ubuntu, CSM configuration should be set to UEFI ONLY.

BIOS -> Advanced -> CSM Configuration -> Boot Option Filter – UEFI ONLY

2. Secure boot Mode should be Customized

BIOS -> Security -> Secure Boot -> Secure Boot Mode (Customized)

3. Secure boot should be enabled.

BIOS -> Security -> Secure Boot -> Attempt Secure Boot (Enabled)

2.3.2 Installing with btrfs (SOTA rollback supported)

1. Click on **Manual in Partition Disks** and select the hard disk
2. Create new empty partition table **Yes.**
3. Select **create a new partition** and size : **1 GB**, select **Beginning** and use as **EFI System Partition**
4. Select the free space on hard disk
5. Select create a new partition and size: **2 GB**, select **Beginning** and use as **swap area**
6. Select the free space on hard disk
7. Select **create a new partition** with **size** : remaining size, and **partition** as **btrfs journaling file system**
8. Select **Finish partitioning disks and write changes to disk**
9. Select **No** when asks you to return to partitioning menu
10. Write the changes to disk? **Yes**
11. Once OS is installed, run the following commands

```
sudo apt-get update
sudo apt-get upgrade
```

12. Install unzip

```
sudo apt-get install unzip
```

2.3.3 Installing with ext4 (SOTA rollback unsupported)

1. Choose “Guided – use entire disk” in Partition disks dialog box.
2. Select your hard drive. Usually this will be sda, and a second drive will appear as sdb and be identified as a flash drive.
3. WARNING: this will wipe your gateway’s partition table and reformat new partitions. Choose Yes to write the changes to disk.
4. The system will begin installing. This may take several minutes.
5. Once OS is installed, run the following commands

```
sudo apt-get update
sudo apt-get upgrade
```

6. Install unzip

```
sudo apt-get install unzip
```

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3.0 Pre-Requisites and Installer Overview

This section outlines the steps to install the EIB software on a gateway device with a clean Operating System installation and internet access.

EIB system setup is performed in three phases:

1. Pre-requisite installation
2. Optional step to establish Telit account and get org token
3. EIB installation

Note: Pre-requisite installation is not required if all necessary components are already present and configured correctly on the gateway.

3.1 Pre-Requisite Installer Script

This is a helper script to install all third-party components that are required for EIB to install and operate. The following installations are part of the script:

- Python-Dev (2.7)
- Pip (9.0.1)
- Setuptools (38.5.1)
- Unzip (Latest)
- Unrar(Latest)
- HTTPS Download Transport for APT (Latest)
- Common CA Certificates (Latest)
- Curl (Latest)
- Software Properties Common (Latest)
- Docker (18.03 CE)
- Docker Compose (1.21.2)
- Auditd (Latest)
- Mosquitto (Latest)
- Mosquitto-Client (Latest)
- Snapper (Latest)
- Device Cloud

Note: Third party services may require additional end-user license agreements.

3.1.1 Run Pre-Requisite script

1. Download the EIB installer zip file to the target gateway device:

```
sftp <user>@esft.intel.com:<path_given_by_intel>.zip
```

2. Please verify that you have the correct package by checking the md5sum. Wherever the command is in <>, replace with your own values without the brackets Use the following command and compare it to the md5sum provided in the zip file:

```
md5sum bmpv2_<version>.zip
```

3. The output of the above command should match the md5.txt file that comes with the zip file. If not, your installer zip file has been tampered with and should be replaced with a new file that has a matching sum.
4. Unzip the files to a destination folder of choice:

```
unzip bmpv2_<version>.zip -d <destination_folder>
```

5. Delete zip file after unzipping:

```
rm bmpv2_<version>.zip
```

6. Change directory to “destination_folder”:

```
cd <destination_folder>
```

7. Install pre-requisites without proxy like below:

```
sudo ./pre-requisite_installer.sh
```

When behind a proxy run this with address proxy.org.com and port <#>

```
sudo ./pre-requisite_installer.sh http_proxy <http://proxy-
address:port> https_proxy <https://proxy-address:port>
```

8. Complete help for the installer can be accessed by using –help flag while executing the script.

```
sudo ./pre-requisite_installer.sh -help
```

9. Follow section 3.2 for OTA update support or jump straight to section 4.0 to install EIB.

3.2 Establish Telit Access and Org Token (optional - for OTA update support)

EIB can be installed without Telit connectivity. Creating a Telit account and getting the org token from Telit is an optional step that is required to enable Over the Air updates from the Intel® Edge Insights for Buildings.

3.2.1 Access to Telit Services

Connection to Telit can only be made if the user has a group/organization on the service; visit the devicewise domain to create an account and get an “org” or “tenant”

http://help.devicewise.com/display/M2MOpen/Module+Part+1+-+Creating+your+account

3.2.2 Getting the Telit Org Token

Within the Telit portal, view the **Developer** Tab and click **Applications** from the menu on the left. Copy and retain the token, it is a required parameter of the installation scrip.

3.3 Trusted Platform Module and BIOS Settings

If the system is TPM2.0 (Trusted Platform Module) capable, and TPM is enabled, then a TPM clear action must be performed before installing EIB software.

Follow these steps prior to installing the EIB package as TPM factory settings must be cleared and TPM must be properly enabled.

1. Press and hold the Delete key on start up to enter the BIOS.
2. Select Advanced > Trusted Computing > Security Device Support > [Enabled].
3. Select Advanced > Trusted Computing > Pending Operation > [TPM Clear].
4. Return to the main BIOS screen and save your changes.
   Select Save and Exit > Save Changes and Exit.

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4.0 Install EIB

The Intel® Edge Insights for Buildings installation package installs the EIB Manageability framework. It also installs and launches containerized services and makes a connection between the Gateway and the Telit service; if so configured.

The installation package also includes these support scripts and files:

Table EIB installation support scripts

Script Name	Function
Proxy Update Script	Script to update proxy settings (if needed) after installation.
Telit Connection Script	A helper script to connect the gateway to Telit (to be used if token not provided with the EIB installer script) Before starting the installation, the user may set up a Telit account / tenant and provide the token during the install of EIB.
Version Files	Files containing EIB and EIB installer versions
EULA	File containing End User License Agreement

4.1 EIB Installer Package Contents

The following components are installed with the EIB Installer script:

- Containerized EIB services
- Container compose files and manifests for launch of containerized services
- EIB Service file and EIB Service binary
- Configuration file for EIB Service
- Authorization certificates
- EIB Manageability binaries
- Configuration file for EIB Manageability
- Script to install EIB Manageability
- Script to update proxy environment
- Script to connect to Telit

4.2 Trusted Repositories

Trusted repositories are locations that host files for EIB to scan for updates.

Ubuntu apt source locations are Ubuntu package repositories for EIB to use.

If Over-The-Air updates using Telit are desired, then trusted repositories and Ubuntu apt source sections need to be defined within the provided configuration file before installing EIB.

```
/etc/intel_manageability_user.conf
```

For example, add the Ubuntu apt source like this:

```
<ubuntuAptSource>

      http://{ubuntuAptSource_path}

</ubuntuAptSource>
```

Add the trusted repo like this:

```
<trustedRepositories>

     http://{trusted_repo_path}

</trustedRepositories>
```

If Telit will not be used, you do not need to update the configuration file.

Post EIB installation, the trusted repo can be added in:

```
/etc/intel_manageability.conf
```

Services should be restarted as follows:

```
systemctl restart dispatcher configuration
```

Note: Please refer to the reference documents section for additional sources of information.

4.2.1.1 Update proxy

If running behind proxy, setting it is required for AOTA:

```
sudo ./update_proxy.sh set http_proxy_host <proxy_URL>
http_proxy_port <port> https_proxy_host <proxy_URL>
https_proxy_port <port>
```

4.3 Install with TelitToken (OTA update support)

1. Use the token from section 3.2.2 and run the installer if behind no proxy:

```
sudo ./intel_bmp_installer.sh telit <TelitTOKEN>
```

Note: If behind a proxy, run:

```
sudo ./intel_bmp_installer.sh telit <TelitTOKEN> proxy_host
<proxy.org.com> proxy_port <port>
```

2. Once the installation is complete, reboot your system.
3. If your thing is not visible on Telit, check for the key and run the telit connect script:

```
sudo ./telit_connect.sh telit <TelitToken>
```

Or if behind proxy:

```
sudo ./telit_connect.sh telit <TelitToken> proxy_host
<proxy.org.com> proxy_port <port>
```

4.4 Install without TelitTOKEN (OTA updates not supported):

1. Install EIB using:

```
sudo ./intel_bmp_installer.sh
```

Note: If behind a proxy, run:

```
sudo ./intel_bmp_installer.sh proxy_host <proxy.org.com>
proxy_port <port>
```

2. Accept the EULA by pressing 'Enter' until you reach the Y|N prompt and press 'Y'.

If you installed without a TelitTOKEN you can establish Telit connectivity later.

After the software has been successfully installed the user will see this message. At this point, you should be able to use the EIB on the gateway device.

```
BMP service launched. Exiting Installer
```

4. Once the installation is complete, reboot your system.

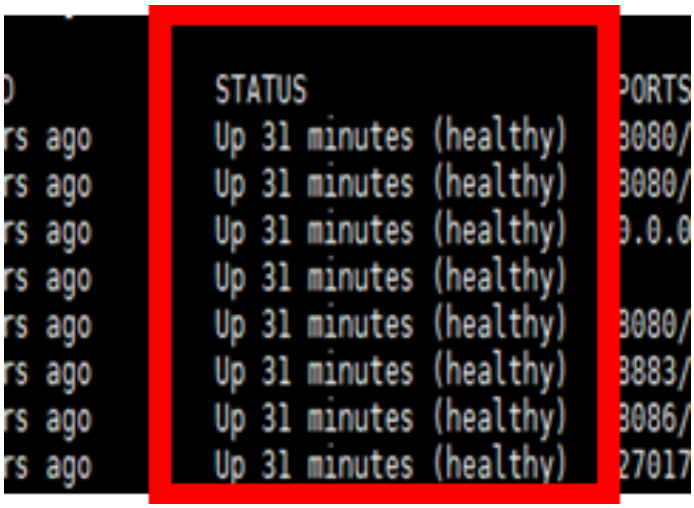
4.5 Installation verification

Once the EIB system is setup on a target gateway, all the EIB services should be up and running. This can be verified by checking the process status of docker. The command should list the status of all containers are healthy.

```
sudo docker ps –a
```

Figure Installation Verification in Terminal Window

```
bmp@gw-3117:~$ sudo docker ps -a
CONTAINER ID        IMAGE                                COMMAND                  CREATED             STATUS                    PORTS                                        NAMES
157d74b2612d        tagging-utility:0.7.4                "catalina.sh run"        23 hours ago        Up 31 minutes (healthy)   8080/tcp, 0.0.0.0:443->8443/tcp              tagging-utility
6a2ef884beff        haystack-service:0.7.4               "catalina.sh run"        23 hours ago        Up 31 minutes (healthy)   8080/tcp, 0.0.0.0:8087->8443/tcp             haystack-service
5bba9816f05c        modbus-service:0.7.4                 "/bin/sh -c './Modbu…"   23 hours ago        Up 31 minutes (healthy)   0.0.0.0:8089->9090/tcp                       modbus-service
3a726cda4a80        bacnet-service:0.7.4                 "/bin/sh -c './BACne…"   23 hours ago        Up 31 minutes (healthy)                                                bacnet-service
71e356842403        authentication-service:0.7.4         "catalina.sh run"        23 hours ago        Up 31 minutes (healthy)   8080/tcp, 0.0.0.0:8078->8443/tcp             authentication-service
6ab83e6339f6        platform-bus:0.7.4                   "/usr/sbin/mosquitto…"   23 hours ago        Up 31 minutes (healthy)   8883/tcp                                     platform-bus
d0fa901b64ac        datastore-influxdb:0.7.4             "/entrypoint.sh infl…"   23 hours ago        Up 31 minutes (healthy)   8086/tcp                                     influxdb
e33e6f48c6be        datastore-mongodb:0.7.4              "docker-entrypoint.s…"   23 hours ago        Up 31 minutes (healthy)   27017/tcp                                    mongodb
```



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5.0 Telit Configuration Guidance

The Telit* website provides instructions for navigating the user interface to complete the steps of importing a thing definition and performing required configuration tasks.

The following steps are generalized, as the name and placement of specific buttons and menus within the Telit website can change without notice.

5.1 Import EIB as a Thing

1. Login to Telit at https://portal.telit.com/app/login
2. Ensure the correct org on the top right corner, left of the gear wheel.
3. Select the Developer Tab along the top bar
4. Select “Thing Definitions” button at the bottom left-side bar menu
5. Within the Things sub-screen, find the Import button in the upper right corner
6. Click “Attach File” and select the
   Docker_Compose_Thing_Definition_For_Telit.json

   file and Import. This file is included with the EIB package and adds docker-compose up/down functionality to Telit.

   If docker import, load or snapshot is needed for your solution, use the
   Docker_Thing_Definition_For_Telit.json

   file included with the EIB package.

   These configurations can be switched in Telit at any time
7. The new thing definition should now be visible within the Telit list of things under “Things definitions” under the “Developer” tab.

5.2 Verify thingKey with device_id

1. Select the Things icon along the top bar of the Telit portal. The Intel Management Framework should now be listed as a named thing with a unique id string or label.

2. The 'thingKey' can be obtained by running the following command on the gateway:

```
cat /usr/share/dispatcher-agent/device_id
```

or

```
journalctl –u dispatcher | grep thingKey
```

The device id will match the 'thingKey' on the Telit portal.

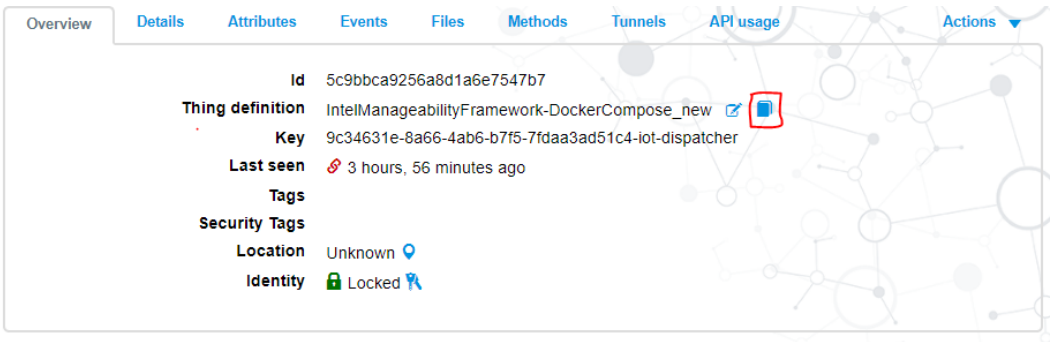
Note: All devices running EIB Manageability are associated with this 'thingKey'

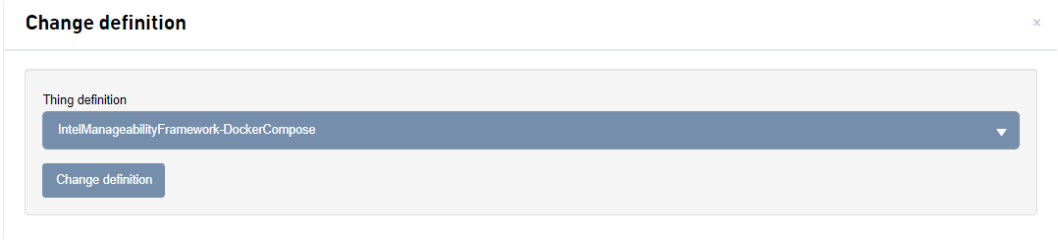
3. If the thing is not visible on Telit, check the key and connect again as below:

```
sudo ./telit_connect.sh telit <thingKey>
```

5.3 Changing a Thing Definition or Setting

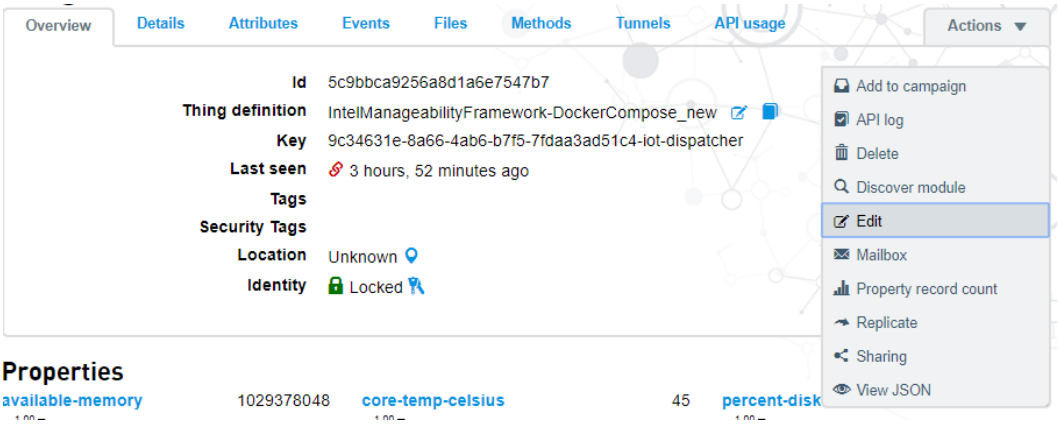
1. Select the Things button along the top bar of the Telit portal
2. To add EIB Thing definition into your thing (or device), locate your Thing using the thingKey as described in section 6.2.
3. Click the eye icon next to your thing.
4. Once inside your Thing, from the overview tab, select the "change definition" button at the end of "Thing definition".
5. Once the Change definition box appears, select the file from the drop down menu and hit "Change definition". Click submit once prompted on the screen showing the differences.





6. The key definition provided by Intel will enable “Methods” tab to do OTAs.

7. You can also change the name of your thing by clicking Actions > Edit and changing the “Name” field.



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6.0 Recommendations and Troubleshooting

This section provides some additional information, see the reference documents section for a list of other resources for the Intel® Building Maintenance Platform.

6.1 Ethernet Port Connectivity

The primary interface should be set to network facing control system side. EIB installer takes the primary interface information while configuring interface for BACnet.

6.2 Gateway Security

- Lockdown unused ports

Note: The following ports are used by EIB services and should remain open for proper Telit functionality and REST API usage: 443, 502, 1883, 2321, 2322, 8078, 8087, 8089, 9090, 47808

- Remove all unnecessary packages from the system
- If SSH is enabled, consider the following:
    - Disable root login
    - Enable remote login with SSH key only
    - Lockdown unused I/O such as USB ports
    - Configure SSH to use strong keys
        - Recommended key exchange algorithms: curve25519-sha256@libssh.org, diffie-hellman-group-exchange-sha256
        - Recommended MACs: hmac-sha2-512-etm@openssh.com, hmac-sha2-256-etm@openssh.com, umac-128-etm@openssh.com, hmac-sha2-512, hmac-sh2-256, umac-128@openssh.com
        - Recommended ciphers: chacha20-poly1305@openssh.com, aes256-gcm@openssh.com, aes-128-gcm@openssh.com, aes192-ctr, aes128-ctr
- Additional security guidelines are available here

6.3 Cannot get lock on dpkg process error message

The **Could not get lock /var/lib/dpkg/lock-open (11 Resource temporarily unavailable)** error appears when another process is using the dpkg

The process must be killed or allowed to finish and be released.

6.4 How to Update Proxy after Installation

When run using the proxy flag, **pre-requisite_installer.sh** will set the proxy for docker service variables and add the DNS server information to the Docker Daemon.

The environment EIB will be deployed in may be different than the one it was installed in (i.e. different proxy settings). The **update_proxy.sh** script provides a means of resetting proxy settings, or reconfiguring the proxy after installation.

To reset the changes, execute the update_proxy.sh script with reset flag:

```
sudo ./update_proxy.sh reset
```

Revise this example to change the proxy to a different server (proxy.org.com port 81).

```
sudo ./update_proxy.sh set proxy_host proxy.org.com proxy_port 81
```

6.5 How to Update Telit Proxy Configuration after Installation

To change telit connection or proxy configuration, add telit flag followed by a valid telit token. Use the following command to reset the proxy for both docker and telit

```
sudo ./update_proxy.sh reset telit <TELITTOKEN>
```

6.6 How to Update Telit Token after Installation

If the user needs to either update their telit token to a new one or connect to Telit after EIB installation, they can use **telit_connect** script to create the connection.

If behind a network without proxy:

```
sudo ./telit_connect.sh telit <TELITTOKEN>
```

If behind a network with a proxy:

```
sudo ./telit_connect.sh telit <TELITTOKEN> proxy_host
<proxy.org.com> proxy_port <port>
```

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