Innominate Device Manager

User's Manual

IDM Release 1.3.1
Document Rev. 10

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The source code for these software components is contained on the *Innominate Device Manager* CD.

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Contents

1 Introduction

Thank your for choosing **Innominate Device Manager.**

Please read this document for information on

- the installation of Innominate Device Manager,
- how to efficiently generate configurations for your Innominate mGuards, and
- how to upload configurations to your Innominate mGuards.

Overview

The **Innominate Device Manager** enables the convenient management of Innominate mGuard security appliances. The tool offers a template mechanism that allows to centrally configure and manage up to 10.000 Innominate mGuard devices.

With a click of your mouse you can generate the desired firewall rules, NAT settings, etc., and upload the generated configurations to the devices in the network, deploying in an instant your desired device configurations.

IDM is a client-server application, the client offering full control of all IDM features, the server storing the configuration in a database, generating configuration files, and uploading those files to the devices upon request.

If a configuration is uploaded to a device, IDM generates a configuration file which is transferred via SSH to the device and is subsequently taken into operation. Furthermore IDM can generate configuration files to be used for the configuration pull feature of the Innominate mGuard. Additionally, IDM can trigger firmware upgrades and deploy device licenses.

Supported devices

IDM 1.3 supports Innominate mGuard firmware 4.2 and newer.

Supported mGuard features

The *Innominate Device Manager* supports all features of mGuard firmware 5.0 and newer. The following features of mGuard firmware 4.2 are supported:

- Router mode / Stealth mode / PPPoE mode
- Stealth modes: automatic, static, and multiple-client
- VLAN configuration
- Firewall rules
- NAT: Masquerading, Port forwarding, and 1:1 NAT
- Server configuration: Syslog, NTP, and DNS
- Rollout support
- VPN

Related documentation

Detailed information on the Innominate mGuard can be found in the following documents:

- Innominate mGuard manual
- Application note “Rollout support”

2 Installation

2.1 System requirements

	IDM Client	IDM Server	IDM CA
Hardware	• A minimum of 512 MB RAM • 500 MB free hard disk space • Color monitor with at least 1280 x 1024 resolution	• A minimum of 2 GB RAM • 4 GB free hard disk space	• A minimum of 512 MB RAM • 500 MB free hard disk space
Software	• Windows 2000 SP 2 (or higher) / Windows XP or Linux • Java Runtime Environment JRE SE 6	• Windows 2000 SP 2 (or higher) / Windows XP or Linux • Java Runtime Environment JRE SE 6 • PostgreSQL Version 8.1 or later	• Windows 2000 SP 2 (or higher) / Windows XP or Linux • Java Runtime Environment JRE SE 6 • PostgreSQL Version 8.1 or later

The PostgreSQL database does not support the FAT32 file system. In case you would like to install the PostgreSQL database on a system with FAT32 file system, it is strongly recommended to convert the file system to NTFS by using the *convert.exe* command before installing PostgreSQL. For more information on the convert-tool please enter `help convert` on the command line.

Download

Contact the Innominate Sales Department for information on how to obtain the software and a license. Please visit the web site **http://www.innominate.com/** and click on the “Contact” menu.

2.2 Updating from a previous IDM release

To update IDM from an older version please follow these steps:

1. First shut down the current IDM server.
2. **Important**: Make a backup of the current database (please refer to the database documentation, e.g. under Windows use the graphical front-end *pgAdmin III*) and a backup of your current *preferences.xml* file (if applicable).
3. Install the new version of IDM as described in the following chapters over your current installation. You can delete old IDM jar files. **Important**: Do **not** de-install the current PostgreSQL database and do **not** install a new PostgreSQL database.
4. Upgrade the database to the new IDM version with the following command:
   ```
   java -Xmx256m -jar idm-server-1.3.1.jar update
   ```
5. Proceed as described in Chapter 2.6.

2.3 Installation of the IDM client, the IDM server and the database

This section describes the installation of the Innominate Device Manager. Prior to the installation please make sure that your system fulfills the system requirements (see Chapter 2.1).

Client-server communication

IDM is a client-server application, i.e. the communication path between the client and the server must not be blocked by a firewall or a NAT device. In case you are using a NAT router in your environment, configure your environment in a way that the communication between client and server can proceed.

The *service port* configured in the login window of the client (please refer to Chapter 3.1 and Chapter 2.5) is used to communicate with the IDM server. In a NAT scenario you have to make sure that this port on the server is accessible from the client.

The communication between client and server is encrypted using the SSL protocol.

Communication between IDM and mGuard

The configuration is uploaded from the IDM server to the device using SSH or pulled by the mGuard using HTTPS. Please make sure that the communication between the server and the mGuard is not blocked by a firewall or a NAT device.

2.3.1 Installation on Windows

Required components

For a full installation of IDM you need the following files and components:

- Java Runtime Environment JRE SE 6
- PostgreSQL installation files: *postgresql-8.3.4.zip*
- IDM server: *idm-server-1.3.1.zip*
- IDM client: *idm-client-1.3.1.zip*
- License file: *idm_license.dat*
- IDM-CA: *idm-ca-1.3.1.zip* (optional)
- OpenSSL (optional)

Except for the license file, these components are contained on the IDM CD-ROM.

Database installation

Install the PostgreSQL database first. PostgreSQL is distributed with an installer for *Windows*. Please follow the instructions of the PostgreSQL-installer. The IDM server and the database can be be installed on different computers.

☞ PostgreSQL can only be installed only using an account with administrative privileges. But the PostgreSQL service has to run with non-administrative privileges. For this purpose please create an appropriate account, use one of the existing accounts, or let the PostgreSQL installer automatically create an account for you (install option).

☞ During the installation this account will get the “Log on as a service” permission.

If the access rights of the drive onto which you are planning to install or upgrade the PostgreSQL database are limited to special groups only, ensure that the Windows Users group has also the following access rights to this drive:

- Read
- Read & Execute
- List Folder Contents

These access rights are only required temporarily during the installation process and can be removed once the installation has been completed. If these access rights are not set prior to installation, then the installation process will fail to complete and display the error message:

```
Failed to run initdb: 1!
```

To check or set access rights for a drive/folder:

1. In Windows Explorer, right-click on the drive you are checking.
2. Select **Properties** from the right-click menu.

3. In the *Properties* window, click on the *Security* tab. If this tab is not present, then you have to disable the simple file sharing:
   a.Click **Start**, and then click **My Computer**.
   b.On the Tools menu, click **Folder Options**, and then click the **View** tab.
   c.In the Advanced Settings section, clear the **Use simple file sharing (Recommended)** check box.
4. Select the Users group or the user from the list. The current access rights for the Users group or the user will be displayed in the bottom half of the dialog box. If the Users group is not listed, click on the **Add...** button to add it.
5. Make any necessary changes, then click **Apply**.

Use the following options for the installation:

- If you would like to get error and system messages in a language other than English, please select **National Language Support** in the *Installation Options* as additional package to be installed.
- In the *Service configuration* please enter the login information of the account to be used for PostgreSQL. If you have not yet created an account and you would not like to use an existing account, the installer can also create an account for you.
- Please confirm to grant the permission **Log in as a service**.
- If the IDM server and PostgreSQL are to be installed on different computers, please select the option **Accept connections on all addresses, not just localhost** in **Initialize database cluster**.
  Please enter a password for the internal database superuser, to prevent unauthorized access to the database.
- Accept the default settings in the following windows and start the installation process.

Here are some common recommendations, in case you encounter problems during the installation. They were copied from the „Running & Installing PostgreSQL On Native Windows FAQ“, which can be found at: *http://pginstaller.projects.postgresql.org/faq/FAQ_windows.html*.
In case the following hints cannot solve your problems, please check the FAQ for more detailed information.

☞ If you cannot install PostgreSQL using mstsc, use

```
mstsc /console
```

(You cannot use a Terminal Server console to install PostgreSQL, but only a local console.)

☞ If you decide to create the user account to run the PostgreSQL service manually, make sure that the account has **Log on as a service** and **Log on locally rights**. The **Log on locally** is only required for the install part, and can be removed once the installation is completed if security policies require it. (Rights are granted and revoked using the *Local Security Policy* MMC snapin. **Log on locally** is default, and **Log on as a service** will normally be granted automaticalliy by the installer). Note that if your computer is a member of a domain, the settings of the security policies may be controlled at the domain level using Group Policy.

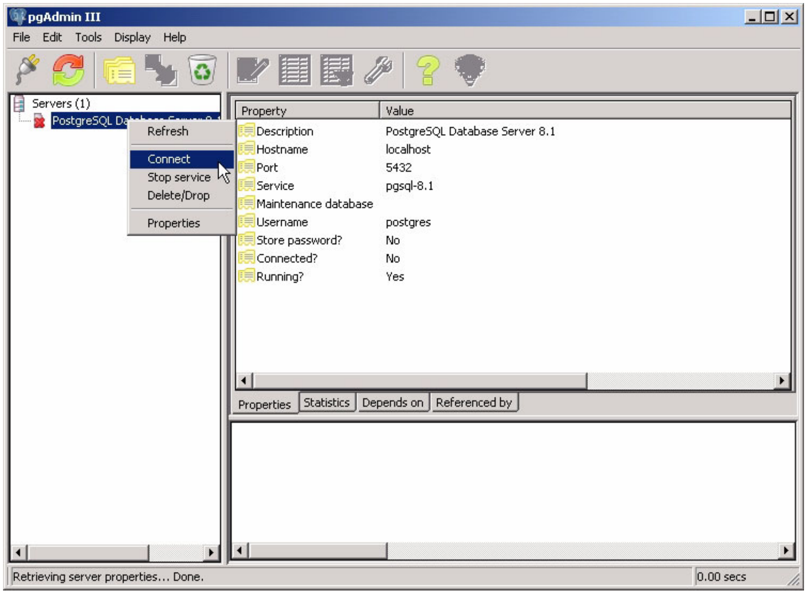
☞ Make sure that the specific postgres account has the correct access rights for the PostgreSQL installation directory:
The PostgreSQL service account needs read permissions on all directories leading up to the service directory. It needs write permissions on the *data* directory only. Specifically, it should not be granted anything other than read permissions on the directories containing

binary files. (All directories below the installation directory are set by the installer, so unless you change something, there should be no problem with this).
PostgreSQL also needs read permissions on system DLL files like kernel32.dll and user32.dll (among others), which is normally granted by default, and on the CMD.EXE binary, which may in some scenarios be locked down and need opening.

PostgreSQL initialization

After the installation the database has to be created and initialized:

1. To initialize the database, start *pgAdmin III* (*All programs » PostgreSQL 81/pgAdmin III)* which has been installed with PostgreSQL.
2. Connect to the database by opening the context menu in the menu tree on the left and by selecting **Connect**.

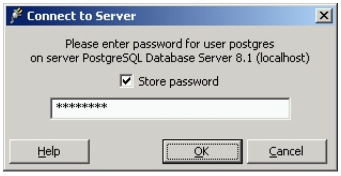


Property	Value
Description	PostgreSQL Database Server 8.1
Hostname	localhost
Port	5432
Service	pgsql-8.1
Maintenance database	
Username	postgres
Store password?	No
Connected?	No
Running?	Yes

Retrieving server properties... Done. 0.00 secs

Figure 1: Connecting to the PostgreSQL database with pgAdmin III

3. Enter your login data.



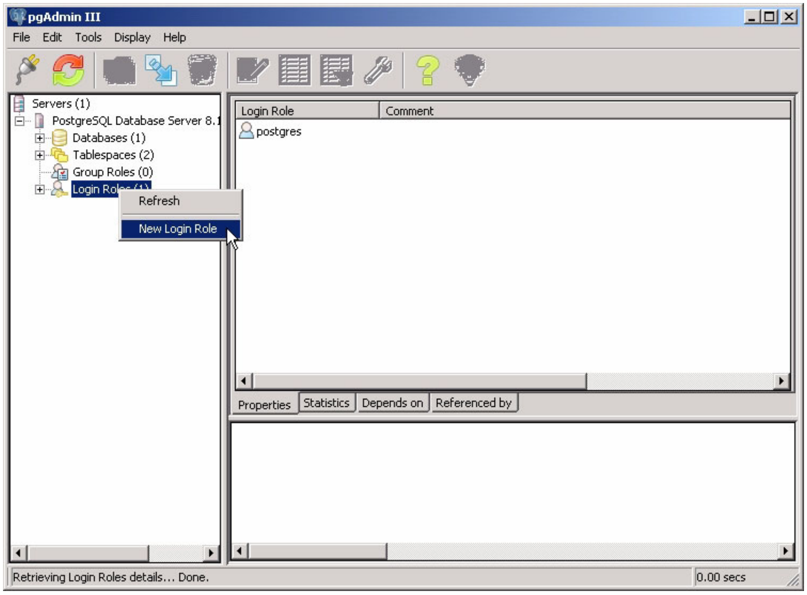
Please enter password for user postgres
on server PostgreSQL Database Server 8.1 (localhost)

☑ Store password

****

Figure 2: Login to the PostgreSQL database with pgAdmin III

4. Create a new login role by selecting **New login role** from the context menu. Please make sure that the values *your_user* and *your_password* are identical to the values specified in the preference file of the IDM server (see Chapter 2.5):
   - User: *your_user*
   - Password: *your_password*



Retrieving Login Roles details... Done.

0.00 secs

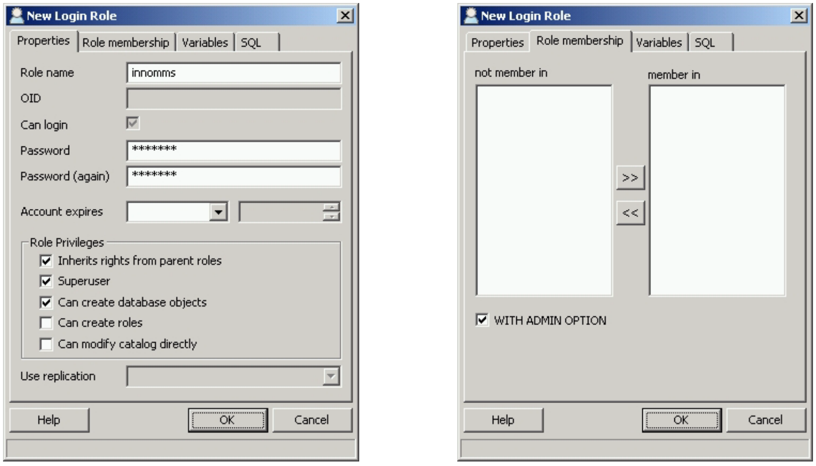
Figure 3: PostgreSQL initialization: create a new login role

5. Select the rights:
   - *Inherits rights ...*

   in the tab **Properties**

   and select the option
   - *With admin option*

   in the tab **Role memberships**.



Role name: innomms

OID:

Can login ☑

Password: *******

Password (again): *******

Account expires:

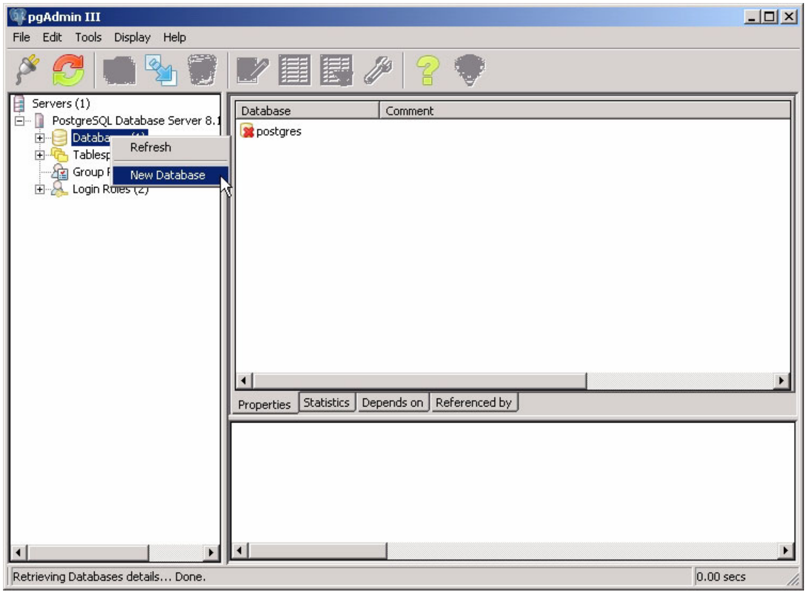
Role Privileges
- ☑ Inherits rights from parent roles
- ☑ Superuser
- ☑ Can create database objects
- ☐ Can create roles
- ☐ Can modify catalog directly

Use replication:

☑ WITH ADMIN OPTION

Figure 4: PostgreSQL installation: Configure the new login role

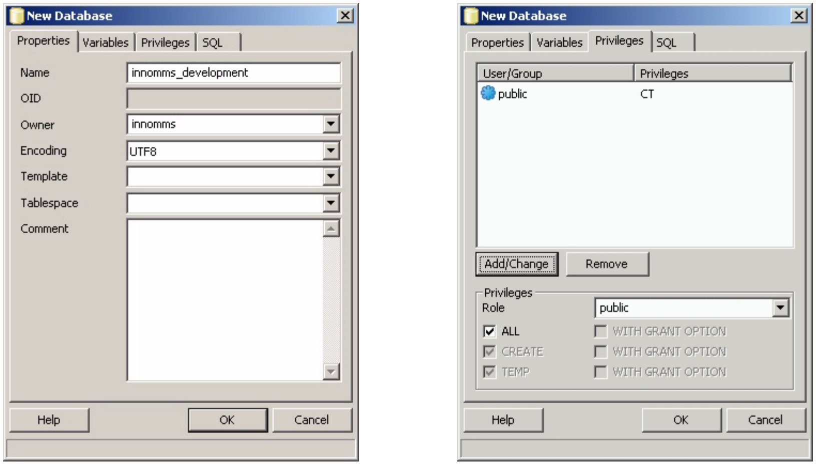
6. Create a database by selecting **New database** in the context menu:



Retrieving Databases details... Done.

Figure 5: PostgreSQL installation: Create a new database

7. Enter *your_user* as owner and *your_database_name* as name, set the *Encoding* to *UTF8,* grant all privileges, and close the dialog by clicking on **OK**. Make sure that the values *your_user* and *your_database_name* are identical to the values specified in the preference file of the IDM server (see Chapter 2.5).



Name: innomms_development
Owner: innomms
Encoding: UTF8

User/Group	Privileges
public	CT

Role: public
☑ ALL
☑ CREATE
☑ TEMP

Figure 6: PostgreSQL installation: Configure the new database

Securing the communication with the database

If you install the database and the IDM server or the IDM CA on differerent computers it is highly recommended to encrypt the communication between the components. Please refer to Chapter 2.10 on how to setup a secure connection to the database server.

Server installation

Create a directory *Innominate* in your standard software installation directory (e.g.: *C:\Program Files\Innominate*) and unpack the file *idm-server-1.3.1.zip* into that directory.

Complete the server installation by configuring the server (Chapter 2.5) and by creating entries in the registry if you would like to start the server automatically (Chapter 2.6).

Finally initialize the database: Make sure that the preferences file matches the values you used when installing the database. To initialize the database you have to start the IDM server with the *init* option:

```
java -Xmx256m -jar idm-server-1.3.1.jar init preferences.xml
```

Remarks:

- You have to add the full path for *idm-server-1.3.1.jar* and *preferences.xml*.
- Make sure that the environment variables containing passwords are initialized (see Chapter 2.5).

Client installation

Create a directory *Innominate* in your standard software installation directory (e.g.: *C:\Program Files\Innominate*) and unpack the file *idm-client-1.3.1.zip* into that directory.

2.3.2 Installation on Linux

Required components

For a full installation of IDM you need the following files and components:

- Java Runtime Environment JRE SE 6
- PostgreSQL installation files: *postgresql-8.3.4.zip*
- IDM server: *idm-server-1.3.1.zip*
- IDM client: *idm-client-1.3.1.zip*
- License file: *idm_license.dat*
- IDM-CA: *idm-ca-1.3.1.zip* (optional)
- OpenSSL (optional)

Except for the license file, these components are contained on the IDM CD-ROM.

Database installation

Please install the PostgreSQL database first. Choose the installation method that is suitable for your distribution, e.g. for *Debian* use *aptitude* or *Synaptic*. You will also find installation packages for *Fedora* and *Red Hat* on *www.postgresql.org*.

PostgreSQL initialization

After the installation of PostgreSQL the IDM database has to be created and initialized.

1. If the IDM server and the database will not be installed on the same computer, add the following line to the configuration file *pg_hba.conf* in the PostgreSQL directory (e.g. for Debian:*/etc/postgresql/8.3/main)*:

   host your_database_name your_user 0.0.0.0 0.0.0.0 md5

   Please make sure that the values *your_database_name* and *your_user* are identical to the values specified in the preference file of the IDM server (see Chapter 2.5).
2. Restart the PostgreSQL service:
   ```
   /etc/init.d/postgresql-8.3 restart
   ```
3. Enter the following commands (in a single line each) as superuser. Make sure that the values *your_user*, *your_database_name*, *your_password* are identical to the values specified in the preference file of the IDM server (see Chapter 2.5):
   - `su postgres`
   - `createdb your_database_name`
   - `createuser --no-adduser --no-createdb your_user`
   - `echo "ALTER USER \"your_user\" WITH PASSWORD 'your_password' ;" | psql your_database_name`
   - `echo "GRANT ALL ON DATABASE \"your_database_name\" TO \"your_user\" ;" | psql your_database_name`

Securing the communication with the database

If you install the database and the IDM server or the IDM CA on different computers it is highly recommended to encrypt the communication between the components. Please refer to Chapter 2.10 on how to setup a secure connection to the database server.

Server installation

First create a new user, e.g. *idm*.

Unpack the file *idm-server-1.3.1.zip* into the home directory of the user *idm*.

If you would like to start the server when the system is started, please include a script in the */etc/init.d* directory. It is also necessary to create symbolic links in system specific directories; please consult the documentation of your Linux distribution for details.

The SQL database and the IDM server can be installed on different computers.

Finally initialize the database:

Make sure that the preferences file matches the values you used when installing the database. To initialize the database you have to start the IDM server with the *init* option. Enter the following command in a single line:

☞
```
java -Xmx256m -jar idm-server-1.3.1.jar init
preferences.xml
```

Remarks:

- You have to add the full path for *idm-server-1.3.1.jar* and *preferences.xml*.
- Make sure that the environment variables containing passwords are initialized with the correct values (see Chapter 2.5).

Client installation

Unpack the file *idm-client-1.3.1.zip* into your home directory.

2.4 Installation of the license

Copy the license file to a folder of your choice and configure the path in the *preferences.xml* file (see next chapter). If you do not specify a path for the license file in the *preferences.xml* file, IDM assumes the license file to be in the same directory as the IDM server. Install the license file prior to the start of the server.

2.5 IDM server configuration

In order to operate properly, the server requires an XML preferences file as a configuration file, which can be specified during server start-up (see Chapter 2.6).

A default configuration file (*preferences.xml*) is contained in the *idm-server-1.3.1.zip* file. Please unpack the ZIP file to get access to the *preferences.xml* file.

☞ There are several passwords to be configured in the *preferences.xml* file. The respective keys accept the *ENV:VARNAME* pattern as value to take the password from the environment variable with name *VARNAME*. If you decide to use this pattern, please make sure that the respective environment variables are initialized *before* starting the server.

The entries in the preferences file are:

Node *license*

Key *licenseFile*

Name and path of the license file.

Node *device*

Node *licenseServer*

Key *proto*
The protocol to be used to access the license server (default: *http*). Please do not change this value.

Key *address*
The address of the license server (default: *online.license.innominate.com*). Please do not change this value.

Key *port*
The port to be used to access the license server (default: *80*). Please do not change this value.

Key *reqPage*
The CGI script to be called when requesting licenses (default: *cgi-bin/autoreq.cgi*). Please do not change this value.

Key *refPage*
The CGI script to be called when refreshing licenses (default: *cgi-bin/autorefresh.cgi*). Please do not change this value.

Key *retries*
The number of retries to contact the license server (default: *3*). Please do not change this value.

Key *timeout*
The timeout in seconds when contacting the license server (default: *60*). Please do not change this value.

Node *connection*

Key *useProxy*
Here you can configure whether a proxy should be used to contact the license server (default: *false*).

Key *proxyAddress*
The address of the proxy to contact the license server (default: *127.0.0.1*).
Key *proxyPort*
The port of the proxy to be used to access the license server (default: *3128*).

Key *proxyRequiresAuthentication*
Boolean defining whether the proxy requires authentication (default: *false*).

Key *proxyAuthenticationUsername*
Key *proxyAuthenticationPassword*
Key *proxyAuthenticationRealm*
The credentials to be used, if the proxy requires authentication (default: empty).

Node *service*

Key *address*
The IP address designating the network interface on which the server is listening for client connections. If you specify *0.0.0.0,* the server is listening on all interfaces (default: *127.0.0.1*).

Key *port*
The port number on which the server is listening for client connections (default: *7001*).

Key *backlog*
Number of log entries to be stored (default: *50*).

Key *storage*
The storage to be used (default: *database*).

Node *security*

Key *keyStore*
Name and path of the keystore file (see Chapter 2.10.1 and Chapter 2.7).

Key *keyStoreType*
Format of the keystore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *keyStorePassword*
Password for the keystore file (see Chapter 2.10.1 and Chapter 2.7). The special value *ENV:PASSWORD_SSL* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_SSL*; the name *PASSWORD_SSL* is just an example and can be changed if desired.

Key *trustStore*
Name and path of the truststore file (see Chapter 2.10.2 and Chapter 2.7).

Key *trustStoreType*
Format of the truststore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *trustStorePassword*
Password for the truststore file (see Chapter 2.10.2 and Chapter 2.7). The special value *ENV:PASSWORD_SSL* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_SSL*; the name *PASSWORD_SSL* is just an example and can be changed if desired.

Node *session*

Key *maxInactiveInterval*
The maximum time interval of inactivity (in seconds) that the server will keep a session open between client accesses.
A negative or zero time (default) indicates a session should never time out.

☞ Please note that this timeout will be reset only, if there is an interaction between client and server. Actions that are local to the client, i.e. scrolling in a table or changing between the device, template or pool tab will not reset the inactive timeout.

Key *maxConcurrentSessions*
The maximum number of concurrent sessions (= connected clients). A negative or zero count (default) indicates that the upper limit of the number of concurrent sessions is defined by the license.

Node *storage*

Node *database*

Key *host*
The IP address (or host name) IDM should connect to to get access to the PostgreSQL database (default: *127.0.0.1*).

Key *port*
The port that IDM should use to connect to the database (default: *5432*).

Key *name*
The name of the database (default: *innomms*).

Key *user*
The user of the database (default: *innomms).*

Key *password*
The password to be used to connect to the database (default: *ENV:PASSWORD_DB).*The special value *ENV:PASSWORD_DB* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_DB*; the name *PASSWORD_DB* is just an example and can be changed if desired.

☞ Please make sure that the values for *port*, *name*, *user* and *password* match the values you specified during the PostgreSQL installation.

Key *ssl*
Enable/disable secure connection between the IDM server and the PostgreSQL server. Please note that enabling this option requires additional installation steps, see Chapter 2.10 (default: *false).*

Node *update*

Node *scheduler*

Key *tries*
Maximum number of attempts for an upload or export of a device configuration. If this maximum is reached, IDM will stop trying to upload a configuation to the device (default: *5*).

Key *timeout*
Maximum number of seconds until an upload of the device configuration is cancelled. After the timeout is reached, IDM will stop trying to upload a configuation to the device (default: *600*).

Key *rescheduleDelay*
Number of seconds between upload attempts (default: *45*).

Node *firmwareUpgradeScheduler*

Key *tries*
Maximum number of connections IDM should attempt to get feedback from the device on the result of the firmware upgrade. If

this maximum is reached, IDM will stop trying to contact the device (default: *5*).

Key *timeout*
Maximum number of seconds until IDM stops to contact a device for the result of a firmware upgrade. After the timeout is reached, IDM will indicate that the firmware upgrade failed (default: *3600*).

Key *rescheduleDelay*
Intervall in seconds between two attempts to obtain the result of a firmware upgrade from the device (default: *300*).

Node *ssh*

Key *connectTimeout*
Timeout for the initial SSH connect to a device (default: *60*).

Key *socketTimeout*
Timeout for the SSH connection TCP/IP socket, e.g. lost connection (default: *120*).

Key *deadPeerDetectionTimeout*
This timeout will get activated, if a device did not answer a command started on the device (default: *120*).

Node *pull*

Node *export*

Key *directory*
The export base directory on the server where the configuration files should be exported to (e.g. for the configuration pull). Please note that the configuration files are always exported by the server and not the client, i.e. the client does not have any access to the files. The specified directory pathname should have the appropriate format of the respective OS (default: the default temporary directory of your installation, e.g. */tmp* for Linux).

Key *filenames*
A comma-separated list of naming schemes for pull configuration exports.
dbid: A unique ID (automatically assigned) is used as filename and the files are written to the export base directory.
serial: The serial number is used as filename and the files are written to the *serial/* subdirectory of the export base directory.
mgntid: The Management ID is used as filename and the files are written to the *mgntid/* subdirectory of the export base directory (default: *dbid,serial,mgntid*).

Node *feedback*

Key *port*
The mGuards can to pull their configuration from an HTTPS server. Since the HTTPS server is a separate application, IDM does not get any direct feedback about the result of a configuration pull. To enable the feedback mechanism, IDM has to be configured as a Syslog server in the HTTPS server settings. IDM will then receive and analyze the HTTS server

syslog messages and display the result of configuration pulls in the client.

It is recommend to use an unprivileged port (above 1024) so that the server can be run without administrator/root privileges (default: *7514*).

Node *locale*

Country and language specific settings. Please leave the defaults, since these settings are not fully supported yet.

Node *logging*

Key *maxLogEntries*
The number of log entries that will be kept in the server logs (default: *1000*).

Key *logLevel*
Defines granularity of the logging messages the IDM server will produce; acceptable values are:

- *OFF*
- *SEVERE* (highest value)
- *WARNING*
- *INFO*
- *CONFIG*
- *FINE*
- *FINER*
- *FINEST* (lowest value)
- *ALL*.

Key *debug*
Internal use only.

Node *CA*

These settings are required only if the IDM CA is installed and used.

Key *protocol*
The protocol to be used to connect to the IDM CA (only *https* should be used due to security reasons).

Key *host*
The IP address (or host name) IDM should connect to to get access to the IDM CA (default: *localhost*).

Key *port*
The port that IDM should use to connect to the IDM CA (default: *7070*).

Key *requestDirectory*
Internal use only. Please do not change.

Key *revocationDirectory*
Internal use only. Please do not change.

2.6 Start the IDM server and the IDM client

☞ To configure the IDM server a preferences file is required. A standard preferences file (*preferences.xml*) is contained in the *idm-server-1.3.1.zip* file. Please unpack the ZIP file to get access to the *preferences.xml* file.

☞ In general the server is started with the following command (in a singe line):

```
java -Xmx1024m -jar idm-server-1.3.1.jar start
preferences.xml
```

Remarks:

- You have to add the full path for *idm-server-1.3.1.jar* and *preferences.xml*.
- Make sure that the environment variables containing passwords are initialized (see Chapter 2.5).

Memory allocation You should also specify the size of the memory allocation pool using the *-Xmx* and *-Xms* options.

Initial size of the memory allocation pool

Use the option *-Xms to* specify the *initial size*, in bytes, of the memory allocation pool. This value must be a multiple of 1024. Append the letter *k* or *K* to indicate kilobytes, or *m* or *M* to indicate megabytes. The default value is 2 MB. Examples:

```
-Xms33554432
-Xms32768k
-Xms32m
```

Maximum size of the memory allocation pool

Use the option *-Xmx* to specify the *maximum size*, in bytes, of the memory allocation pool. This value must be a multiple of 1024. Append the letter *k* or *K* to indicate kilobytes, or *m* or *M* to indicate megabytes. The default value is 64 MB. Examples:

```
-Xmx268435456
-Xmx262144k
-Xmx256m
```

☞ For the client a value of 384 MB (`-Xmx384m`) is recommended, especially if IDM is used to configure VPN connections.

☞ The server should generally have as much memory as possible, so that it can make efficient use of its caching mechanisms, but not so much that the machine starts swapping. Recommended is a value between 50% and 75% of the physical RAM size, depending on which other applications are running on the same machine.

Windows **Server**

In case you would like to start the server as a service, two tools from the Windows Resource Kit (can be downloaded from www.microsoft.com) are required:

- srvany.exe
- instsrv.exe

Please download and install the Windows Resource Kit.

The required installation steps for running the IDM Server as Windows service are:

1. Execute the command:
   `instsrv <Service name> <Path to srvany.exe>`
   e.g.: `instsrv IDM_Server_1.3 c:\ntreskit\srvany.exe`

2. Open the registry editor and navigate to the key:
   `HEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\<Service name>`
   e.g. `HEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IDM_Server_1.3`

3. Create a new key called *Parameters.*

4. Beneath *Parameters*, create the following three REG_SZ entries: *Application, AppDirectory, AppParameters*

5. Assign the following values to the entries:
   `Application = <Full path to java.exe>`
   e.g. `Application=C:\Program Files\Java\jre1.6.0_06\bin\java.exe`

   `AppDirectory = <Path in which idm-server-1.3.1.jar is located>`
   e.g. `AppDirectory=C:\Program Files\Innominate\IDM\Server`

   `AppParameters=<application arguments>`
   e.g. `AppParameters=-Xmx1024m -jar C:\Program Files\Innominate\IDM\Server\idm-server-1.3.1.jar start c:\Inno\IDM\preferences.xml`

6. To start the service from the command line, execute:
   `net start <Service name>`
   e.g. `net start IDM_Server_1.3`
   ☞ The service appears to be running if the the "wrapper service" *srvany* has been started successfully. It could therefore be possible that the IDM server has not been started, even if the service is running.

7. To stop the service from the command line, execute:
   `net stop <Service name>`
   e.g. `net stop IDM_Server_1.3`

8. To remove the service, execute:
   `instsrv <Service name> remove`
   e.g. `instsrv IDM_Server_1.3 remove`

If you would like to run the server as an application, but start it automatically with the login, add the following *REG_SZ* value to the `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run` folder of your registry:

name: `IDM_Server`
value: `"full_path\\java.exe" -Xmx1024m -jar full_path\idm-server-1.3.1.jar start full_path\preferences.xml`
e.g.:

```
"C:\\Program Files\\Java\\jre1.6.0_06\\bin\\java.exe" -Xmx1024m
    -jar C:\Program Files\Innominate\idm-server-1.3.1.jar
    start C:\Program Files\Innominate\preferences.xml
```

Client
You can start the client either with the command line:
full_path\java -Xmx384m -jar idm-client-1.3.1.jar
or with a double-click on *idm-client-1.3.1.jar* in the Explorer-Window.

Linux

Server
The server can be started manually with the command (in a single line):

```
full_path/java -Xmx1024m
-jar full_path/idm-server-1.3.1.jar start
full_path/preferences.xml
```

Client
You can start the client by entering the command:

```
full_path/java -Xmx384m -jar idm-client-1.3.1.jar
```

2.7 IDM Certification Authority (CA) installation

IDM provides its own Certification Authority (CA). The IDM CA is a separate server instance. The CA is used to issue machine certificates for the mGuards, e.g. if you would like to use X.509 authentication for your VPN tunnels. Please refer to Chapter 4.5 on how to request certificates for an mGuard using the CA.

If you are not going to configure VPN tunnels with IDM or if you would like to use your own CA or pre-shared keys (PSK), the installation of the IDM-CA is not required.

2.7.1 Overview

The purpose of the IDM CA is to issue certificates, which are requested by the IDM server to be used as machine certificates for mGuards.

The IDM CA is implemented as a stand alone server. Its interface to the IDM server is a servlet driven web server (HTTP), which can be secured with SSL (HTTPS) and which can enforce client authentication. Especially in production environments Innominate highly recommends to use HTTPS with client authentication, because only then is it assured that the IDM CA will issue certificates to authenticated clients only.

The configuration file of the IDM CA server allows to configure different keystores (isolation) for the generation of certificates (CA-keystore) and for the SSL authentication (SSL-keystore, SSL-truststore). This assures that the CA private key (intended for issuing machine certificates) is not accidentally used for SSL authentication.

The IDM CA stores all required information in a PostgreSQL database. The communication between the IDM CA and the database should be also secured using SSL.

All the required keys and certificates to secure the communication between IDM CA, IDM server and the database have to be generated, installed in the file system and configured in the *ca-preferences.xml* file of the CA component and also in the *preferences.xml* file of the IDM server.

There are many tools to create and manage keys and certificates. This document describes the usage of the *OpenSSL* tools, which are available for Linux and Windows (e.g. as stand-alone binary or as part of the *cygwin* package). The tools to create the certificates, keys, and keystores need not be installed on the IDM CA target system.

☞ The use of OpenSSL 0.9.8 or newer is recommended, due to the support of SHA-256.

☞ Certificate Revocation Lists (CRLs) are not supported by mGuard 4.2, but are supported with mGuard firmware 5.0 and newer. If using mGuard 4.2 it is recommended to include the CRL distribution points (CDP) information already in the certificates when rolling out a PKI, since then an exchange of the certificates will not be required when updating to a newer mGuard firmware.

Chapter 2.7.2 contains an overview over the installation procedure.

Chapter 2.7.3 describes how to use the *demoCA* scripts contained in the installation archive *idm-ca-1.3.1.zip* to create the required keys and certificates.

Chapter 2.7.4 provides detailed information on how to manually create and install the keys and certificates.

2.7.2 Installation procedure

1. Create an OS user for the IDM CA server. The user for the IDM server could be reused though that is not recommended (isolation).
2. Unpack *idm-ca-1.3.1.zip* into that user's home directory.
3. Make sure the PostgreSQL database 8.1 is installed (see Chapter 2.3). The IDM CA can use the same database instance as the IDM server but for separation of name spaces it is required to create a different database schema (= user) for the CA, e.g. *idmca*.
4. Create the database schema from scratch analogous to the IDM server but instead of initializing the database using the *init* option of the IDM server use the script *idmca.sql* from the archive *idm-ca-1.3.1.zip* (see below).
   For Windows please refer to the section *Database installation* in Chapter 2.3.1. For Linux refer to the section *Database installation* in Chapter 2.3.2.
   To initialize the database schema on Linux please enter the following command in a single line:
   ```
   psql -h 127.0.0.1 -f idmca.sql your_database_name your_CA_user
   --password
   ```
   To initialize the database schema on Windows please start *pgAdmin III* as described in Chapter 2.3.1. Select the database schema you just created in the previous steps and click on the icon, select **File » Open** in the menu of the query-window, select the IDM initialization script *idmca.sql* in the file chooser and finally start the query by clicking on the icon in the query window. The database is initialized now.
5. Adapt the *database* node of the *ca-preferences.xml* file (see Chapter 2.7.5) to your environment.
6. Either create the required keys and certificates automatically using the *demoCA* scripts (see Chapter 2.7.3) or follow the instructions in Chapter 2.7.4 (manual creation). After this step the keys, certificates and keystores should be located in your file system.
7. If required, change further keys of the *ca-preferences.xml* file not mentioned in the previous step (for an explanation of all keys refer to Chapter 2.7.5).
8. Start the CA server (see Chapter 2.7.6)

2.7.3 Creation of the keys and certificates using the demoCA scripts

Instead of manually creating the keys and certificates you can also use the scripts provided in the installation archive *idm-ca-1.3.1.zip*. This chapter describes how to adapt the scripts and configuration files to meet your requirements. If you prefer to create the certificates and keys manually you can skip this chapter and continue with Chapter 2.7.4. However, if you are interested in detailed information about creating keys and certificates please refer to Chapter 7.

☞ The scripts generate all required keys, keystores and certificates, including the CA certificates and the SSL certificates, i.e. after following the steps described in this chapter the communication paths between the IDM components are already secured (see Chapter 2.10).

☞ If you would like to use an OpenSSL version older than the recommended version 0.9.8 you have to change the digest algorithm in the scripts to an algorithm supported by your OpenSSL version. The digest algorithm is configured in the files *set-env.bat*/*set-env.sh*.

Installation under Windows

The *demoCA* directory contains scripts to be used with Linux and with Windows. The names of the scripts for the different OS are alike, just the extension differs: *.sh* for Linux and *.bat* for Windows.

Contents of the *demoCA* directory

The following files are contained in the *demoCA* directory:

Tools

- *ImportKey.class, ImportKey.java*
  Java tool to create and manage keystores.

General purpose scripts

- *gen-all.bat, gen-all.sh*
  These scripts generate all required keys and certificates.
- *gen-dirs.bat, gen-dirs.sh*
  These scripts create the sub directories in your target directory (see section *Running the scripts* below) in which the certificates and keys are stored.
- *set-env.bat, set-env.sh*
  These scripts contain the initialization of the environment variables that are used in the subsequent scripts.

Scripts to generate the CA certificates

- *gen-template.bat, gen-template.sh*
  Scripts to generate the template certificate.
- *gen-ca.bat, gen-ca.sh*
  Scripts to generate the intermediate CA certificate and keys.
- *gen-root.bat, gen-root.sh*
  Scripts to generate the root CA certificate and keys.

OpenSSL configuration files (to be used for the generation of the CA certificates)

- *caCert.conf*
- *rootCert.conf*
- *templateCert.conf*

Scripts to generate the SSL certificates

- *gen-ssl.bat, gen-ssl.sh*
  Scripts to generate all required SSL certificates.
- *gen-ssl-idm-ca.bat, gen-ssl-idm-ca.sh*
  Scripts to generate the IDM CA certificates.
- *gen-ssl-idm-server.bat, gen-ssl-idm-server.sh*
  Scripts to generate the IDM server certificates.
- *gen-ssl-postgres.bat, gen-ssl-postgres.sh*
  Scripts to generate the certificates for the PostgreSQL database.

Adapting the scripts

The scripts have to be adapted to your environment:

Default passwords

The passwords in the scripts *set-env.bat,set-env.sh* have to be changed:

```
PASSWORD_ROOT='geheimRoot'
PASSWORD_CA='geheimCA'
PASSWORD_SSL='geheimSSL'
```

Please use your own, secure passwords.

Location of OpenSSL

If you are using Windows, you might have to adapt the installation path for *openssl.exe* in the file *set-env.bat* to your environment.

OpenSSL configuration files

☞ For further information on certificate extensions and on the *Subject Distinguished Name* please refer to Chapter 7.2.

In all three configuration files (*caCert.conf, rootCert.conf, templateCert.conf*) the section which determines the *Subject Distinguished Name* has to be adapted to your environment:

```
C= DE
O= Innominate Security Technologies AG
OU= Research & Development
CN= Test Root CA
```

Furthermore in the extension section of the files *caCert.conf* and *templateCert.conf* the entries `crlDistributionPoints` and `authorityInfoAccess` have to be adapted to your environment:

```
crlDistributionPoints=URI:http://ca.example/ca.crl
authorityInfoAccess=OCSP;URI:http://ca.example/ocsp/ca
```

Running the scripts

The *gen-all* scripts require as argument the target directory, e.g.

```
gen-all my_directory_incl_full_path
```

If a target directory is omitted a subdirectory named *security* will be automatically created in the IDM installation directory. All generated scripts and certificates will be created in subdirectories of the target directory.

Using the output of the scripts

The *gen-all* script creates all required files in the target directory. The location of the files has to be manually configured in the preferences file of the respective IDM component.

☞ The names used for certificates and keys in the following sections refer to the names introduced in Figure 7 and in Chapter 7.2.1.

☞ The preferences files support the construct ENV:*MY_PASSWORD* for passwords, i.e. the password is read from the environment variable *MY_PASSWORD* (the name of the environment variable is just an example and can be changed if desired).

Subdirectory *idm_ca*

- *ca-keystore.jks*
  A keystore in JKS format containing the certificate chain up to the root certificate (CA_{cert}, $CA_{rootCert}$) and CA_{key}.
    - The filename of this keystore (including the absolute or relative path) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStore***.
    - The password to access the keystore (default: *ENV:PASSWORD_CA*) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStorePassword***.
    - The format of this keystore (JKS) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStoreType.***
    - The password to access the private key (default: *ENV:PASSWORD_CA*) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyPassword.***
    - The alias (default: *ca*) of the key has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyAlias.***

- *https-keystore.jks*
  A keystore containing IC_{cert} and IC_{key} .
    - The full pathname of this keystore has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » keyStore_**
    - The format of this keystore (JKS) has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » keyStoreType_**
    - The password to access the keystore (default: *ENV:PASSWORD_SSL*) has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » keyStorePassword_**
- *https-truststore.jks*
  A keystore containing IS_{cert} .
    - The filename including the path of this keystore has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » trustStore_**
    - The format of this keystore (JKS) has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » trustStoreType_**
    - The password to access the keystore (default: *ENV:PASSWORD_SSL*) has to be configured in the *ca-preferences.xml* file in the node **_httpServer » https » trustStorePassword_**
- *database-truststore.jks*
  A keystore containing DB_{cert}.
    - The location of this keystore has to be configured in the *ca-preferences.xml* file in the node **_certificateFactory » storage » database » security » trustStore_**
    - The format of this keystore (JKS) has to be configured in the *ca-preferences.xml* file in the node **_certificateFactory » storage » database » security » trustStoreType_**
    - The password to access the keystore (default: *ENV:PASSWORD_SSL*) has to be configured in the *ca-preferences.xml* file in the node **_certificateFactory » storage » database » security » trustStorePassword_**
- *templateCert.pem*
  This file contains $CA_{templCert}$.
  The location of this file has to be configured in the *ca-preferences.xml* file in the node **_certificateFactory » certTemplate_**

Subdirectory *idm_server*

- *keystore.jks*
  A keystore containing IS_{cert} and IS_{key} .
    - The location of this keystore has to be configured in the *preferences.xml* file of the IDM server in the node **_service » security » keyStore_**
    - The format of this keystore (JKS) has to be configured in the *preferences.xml* file of the IDM server in the node **_service » security » keyStoreType_**

  - The password to access the keystore (default: *ENV:PASSWORD_SSL*) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » keyStorePassword***
- *truststore.jks*
  A keystore containing DB_{cert} and IC_{cert}
  - The location of this keystore has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStore***
  - The format of this keystore (JKS) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStoreType***
  - The password to access the keystore (default: *ENV:PASSWORD_SSL*) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStorePassword***

Subdirectory *postgres-server*

- *server.crt*
- *server.key*
  These are the files containing DB_{cert} and DB_{key} . The files have to be copied to the PostgreSQL data directory (i.e. the subdirectory of the PostgreSQL directory usually named *pgdata*).

Subdirectory archive

This directory contains certificates and keys that were created during the process, but are not required for the installation. Please do not delete this directory since it contains e.g. the root key which might be required when signing further intermediate CA certificate requests.

Further keys in the configuration files

To enable the SSL communication the following keys of the configuration files have to be configured as well:

- *ca-preferences.xml*
  - ***certificateFactory » storage » database » ssl = true***
  - ***httpServer » protocol = https***
  - ***httpServer » https » clientAuth = true***
- *preferences.xml*
  - ***server » storage » database » ssl = true***
  - ***ca » protocol = https***

2.7.4 Manual creation of the CA keys and certificates

This section explains how to manually create and install the keys and certificates required for the CA. If you are not familiar with *OpenSSL* it is highly recommended to read Chapter 7 first, which introduces some of the basic concepts and explains the process in detail. The requirements for the certificates are summarized in Chapter 7.2.3.

Follow these steps to manually create the IDM CA keys and certificates:

1. Generate $\text{CA}_{\text{rootCert}}$ and a matching private key $\text{CA}_{\text{rootKey}}$ as described in Chapter „Create the root certificate” on page 92.
2. Generate the CA certificate CA_{cert} and the corresponding private key CA_{key} as described in Chapter „Create the CA certificate” on page 94.
3. Generate the template certificate $\text{CA}_{\text{templCert}}$ as described in Chapter „Create a certificate template” on page 97. The template certificate is used by the CA as template for creating the mGuard certificates.

4. Create the CA keystore and configure the preferences file of the IDM CA as described in Chapter „Create the keystores” on page 99.
5. Secure your communication paths and configure the preferences files of the IDM components as described in Chapter 2.10.

2.7.5 Configuration of the IDM CA

This chapter describes the contents of the configuration file *ca-preferences.xml* contained in the installation archive *idm-ca-1.3.1.zip.* Please adapt *ca-preferences.xml* according to your environment.

Node *certificateFactory*

Key *validityPeriodDays*
Number of days certificates issued by the IDM CA shall be valid (i.e. each certificate will be valid for the specified number of days starting from the time of its issuance).

Key *certTemplate*
Name and path of a certificate file to be used as template for new VPN certificates issued by the IDM CA.

Key *keyStore*
Name and path of the keystore file (see Chapter 2.10.1 and Chapter 2.7).

Key *keyStoreType*
Format of the keystore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *keyStorePassword*
Password for the keystore file (see Chapter 2.10.1 and Chapter 2.7). The special value *ENV:PASSWORD_CA* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_CA*; the name *PASSWORD_CA* is just an example and can be changed if desired.

Key *keyAlias*
Name of the entry within the keystore, where the private key and associated public key certificate can be found (the keystore may contain more than one entry) - default matches the one from the example scripts described in Chapter 2.7.3. To find out the alias names in a *.p12* file please use the command:

```
openssl pkcs12 -in <filename>.p12 -nodes
```

The alias is shown as *Friendly Name* in the output.
To find out the alias names in a *JKS* file please use the command:

```
keytool -list filename
```

Key *keyPassword*
Password to decrypt the RSA private key contained within the keystore (see entry *keyAlias)*; the special value *ENV:PASSWORD_CA* will cause the IDM CA server to read this password upon startup from the environment variable named *PASSWORD_CA*; the name *PASSWORD_CA* is just an example and can be changed if desired.

Key *crlExportDirectory*
The path to the directory that is used by the IDM CA to export the files containing the CRLs (Certificate Revocation Lists). Each file contains a *PEM* encoded X.509 CRL of revoked certificates from a single issuer. The filename of each CRL file is composed of the hash value of the issuer with a *crl* extension, e.g. *5E84D566026616ED32169580A913661499FA6B03.crl*. Please make sure that the files contained in this directory are accessible from the mGuards. To configure the CRL URL on the mGuards please navigate to **Authentication »**

Certificates » CRLs in the *Device* or *Template Properties Dialog* (mGuard 5.0 or newer only) and add the correct URL to the CRL table. Please refer to Chapter 4.6.1 for more details on certificate revocation (default: *security/crl).*

Node *storage*

Node *database*

Key *host*
The IP address (or host name) the IDM CA should connect to to get access to the PostgreSQL database (default: *127.0.0.1*).

Key *port*
The port that the IDM CA should use to connect to the database (default: *5432*).

Key *name*
The name of the database (default: *idmca*).

Key *user*
The user of the database (default: *idmca).*

Key *password*
The password to be used to connect to the database; the default value *ENV:PASSWORD_DB* will cause the IDM CA server to read this password upon startup from the environment variable named *PASSWORD_DB*; the name *PASSWORD_DB* is just an example and can be changed if desired.

☞ Please make sure that the values for *port*, *name*, *user*, and *password* match the values you specified during the database initialization.

Key *ssl*
Enable/disable secure connection between the IDM CA and the PostgreSQL server. Use the value *true* to enable secure connections (see Chapter 2.10.1).

Key *loglevel*
Internal use only. Please do not change (default: *0*).

Node *security*

Key *trustStore*
Name and path of the truststore file containing the trusted certificate of the database server.

Key *trustStoreType*
Format of the truststore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *trustStorePassword*
Password for the truststore file (see Chapter 2.10.2 and Chapter 2.7). The special value *ENV:PASSWORD_SSL* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_SSL*; the name *PASSWORD_SSL* is just an example and can be changed if desired.

Node *certificationRequestHandler*

Key *maxRequestLength*
Number of bytes *PKCS#10* certification requests can have at most; longer requests will be rejected to defend against simple DoS attacks (default: *102400*).

Node *revocationRequestHandler*

Key *maxRequestLength*
Number of bytes revocation requests must have at most; longer requests will be rejected to defend against simple DoS attacks (default: *10240*).

Node *httpServer*

Key *host*

IP address or host name of the interface to listen on with the IDM CA's servlet interface; value *0.0.0.0* means to listen on any interface (default: *127.0.0.1*).

Key *port*
Port number the server should listen on for incoming connections (default: *7070*).

Key *minThreads*
Minimum number of instantiated HTTP server threads the IDM CA shall maintain in its pool (default: *2*).

Key *lowThreads*
Internal use only. Please do not change.

Key *maxThreads*
Maximum number of instantiated HTTP server threads the IDM CA shall keep in its pool (default: *5*).

Key *protocol*
The protocol the IDM CA's servlet interface should use; either *http* or *https.* To enable secure communication, *https* should be used.

Node *https*
The configuration in this node is used only if ***protocol*** in node ***httpServer*** is *https*.

Key *keyStore*
Name and path of the keystore file.

Key *keyStoreType*
Format of the keystore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *keyStorePassword*
Password for the keystore file. The special value *ENV:PASSWORD_SSL* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_SSL*; the name *PASSWORD_SSL* is just an example and can be changed if desired.

Key *keyPassword*
The password required to decrypt the SSL private key contained in the keystore for the HTTPS server.

Key *clientAuth*
Boolean value; *true* means clients need to authenticate via SSL too (not just the server); *false* means clients do not need to authenticate. This value should be set to *true*.

Key *trustStore*
Name and path of the truststore file containing the trusted certificates for the SSL connection from the clients.

Key *trustStoreType*
Format of the truststore, either *JKS* (Java JRE keytool, default) or *PKCS12* (OpenSSL).

Key *trustStorePassword*
Password for the truststore file (see Chapter 2.10.2 and Chapter 2.7). The special value *ENV:PASSWORD_SSL* will cause the IDM server to read this password upon startup from the environment variable named *PASSWORD_SSL*; the name *PASSWORD_SSL* is just an example and can be changed if desired.

Node *logging*

Key *file*
The base name of the rotated log file the IDM CA will produce; the file name may be used with a relative or absolute path name. The suffix *n.log* will be appended to the base name, with *n* being a non-negative integer.

Key *limit*
Maximum number of bytes a log file of the IDM CA can reach; when it grows beyond this number, it will be rotated.

Key *count*
Maximum number of rotated log files the IDM CA should keep.

Key *level*
Defines granularity of the logging messages the IDM CA will produce; acceptable values are:

- *OFF*
- *SEVERE* (highest value)
- *WARNING*
- *INFO*
- *CONFIG*
- *FINE*
- *FINER*
- *FINEST* (lowest value)
- *ALL*

2.7.6 Starting the CA

Start the CA with the following command in a single line (please note that the CA has its own preferences file *ca-preferences.xml*, as described above):

```
java -Xmx384 -jar full_path/idm-ca-1.3.1.jar
full_path/ca-preferences.xml
```

☞ Prior to starting the CA you should set the environment variables that contain the passwords:

```
PASSWORD_CA='your_CA_password'
PASSWORD_SSL='your_SSL_password'
PASSWORD_DB='your_DB_password'
```

☞ Depending on your settings for the keys in the *ca-preferences.xml,* different environment variables than the examples above need to be used.

2.8 Pre-configuration of the mGuards

Please follow the steps described in the device manual for starting up and configuring the device (IP addresses of the interfaces etc.).

Enable SSH access

The IDM installs the configuration files on the mGuards using SSH. Therefore SSH access has to be permitted on the mGuards if IDM is using the external (untrusted) interface to upload the configuration.

Select **Management » System settings » Shell access** in the menu of the Web user interface and enable SSH remote access. For more detailed information on SSH remote access please consult the *mGuard User's Manual*.

☞ If you enable remote SSH access, make sure that you change the default admin and root passwords to secure passwords.

☞ IDM is using the admin password to log into the Innominate mGuard. If the password was changed locally on the device please change the password setting in IDM accordingly using the **Set Current Device Passwords** option in the context menu of the device overview table. Otherwise IDM is not able to log into the device.

☞ The current root password is part of the configuration file. If the password was changed locally on the device please change the password setting in IDM accordingly. Otherwise the mGuard will reject the configuration.

2.9 Installation of an HTTPS-configuration-pull server

To transmit information on the configuration status of an mGuard, the HTTPS pull server has to send SYSLOG messages to the IDM server (pull feedback).

Please make sure that neither the communication between the HTTPS server and the IDM server nor the communication between the HTTPS pull server and the mGuards is blocked by a firewall or a NAT device.

2.10 Securing the communication between IDM components

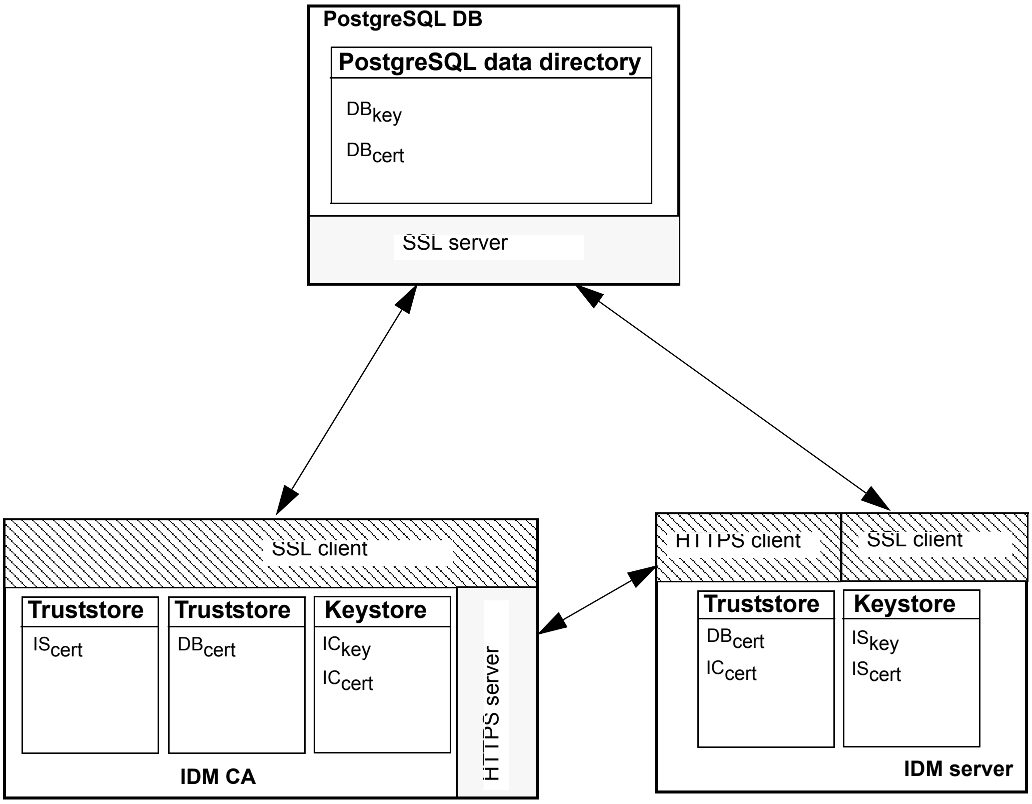
Since critical information is exchanged between the IDM components it is highly recommended to secure the communication paths. This chapter describes the required steps to manually create the keys and certificates required for SSL.

☞ If you prefer to use the *demoCA* scripts, instead of manually creating and installing the required components, you can skip this chapter and read Chapter 2.7.3 instead.

If you are not familiar with *OpenSSL* it is highly recommended to read Chapter 7 first, which introduces some of the basic concepts and the usage of the *OpenSSL* command line tool.

Figure 7 shows an overview over the IDM components and their communication paths.

☞ Please note that the truststore and the keystore of the CA shown in Figure 7 are used for SSL communication only. The certificates and keys used to issue certificates are stored in a different keystore.



IC_{cert}	CA certificate (Important: This is not the root certificate of the CA.)
IC_{key}	Private key of the CA (Important: This is not the key used to sign certificate requests.)
IS_{cert}	IDM server certificate
IS_{key}	Private key of the IDM server
DB_{cert}	DB server certificate
DB_{key}	Private key of the DB server

Figure 7: Communication paths between IDM components

2.10.1 Create the private key and the keystore for each component

It is recommended to create a working directory, e.g. named *security* in your IDM installation directory, where all the keys, certificates and keystores are located.

PostgreSQL

The PostgreSQL database does not need a keystore, the key and the certificate are located in the filesystem.

1. First create a self-signed certificate (DB_{cert}) and an unencrypted private key (DB_{key}) for the database server as described in Chapter 7.1. Please do not encrypt DB_{key} (see Chapter 7.1 for details).
2. The database server is looking for the certificate and the private key in the PostgreSQL data directory (i.e. the subdirectory of the PostgreSQL directory usually named *pgdata*), therefore copy the files *serverCert.pem* (DB_{cert}) and *privkey.pem* (DB_{key}) to this directory.
3. Edit the PostgreSQL configuration file *postgresql.conf* so that it contains the following line:

```
ssl = on
```

4. Restart the PostgreSQL server.

IDM server

1. First create an unencrypted private key (IS_{key}) as described in Chapter 7.1:

   ```
   openssl genrsa -des3 -passout pass:yourSSLPW
   -out idm-https-client-key.pem 2048
   ```

2. Create the self-signed certificate (IS_{cert}) as described in Chapter 7.1:

   ```
   openssl req -batch -new -x509
   -key idm-https-client-key.pem -keyform PEM
   -passin pass:yourSSLPW -sha256 -outform PEM
   -out idm-https-client-cert.pem
   Create the keystore as described in Chapter 7.1:

   openssl pkcs8 -topk8 -in idm-https-client-key.pem
   -passin pass:yourSSLPW -inform PEM -nocrypt -outform DER |
   java -cp . ImportKey -alias idm -storetype JKS
   -keystore idm-keystore.jks -storepass pass:yourSSLPW
   -keypass pass:yourSSLPW -chain idm-https-client-cert.pem
   ```

There should be 3 additional files in your directory:

- *`idm-https-client-key.pem`*
- *`idm-https-client-cert.pem`*
- *`idm-keystore.jks`*

Please store the key and the certficate at a secure location. Only the keystore is used by the IDM server, therefore copy it to its final destination. Then the preferences file of the IDM server has to be configured:

- The location of the keystore has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » keyStore***
- The format of the keystore (JKS) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » keyStoreType***
- The password to access the keystore (in the example: *`yourSSLPW`*) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » keyStorePassword***

To enable the SSL communication to the IDM CA and to the database the following keys of the *preferences.xml* file have to be configured:

- ***server » storage » database » ssl = true***
- ***ca » protocol = https***

IDM CA

1. First create an unencrypted private key (IC_{key}) as described in Chapter 7.1:

   ```
   openssl genrsa -des3 -passout pass:yourSSLPW
   -out ca-https-client-key.pem 2048
   ```

2. Create the self-signed certificate (IC_{cert}) as described in Chapter 7.1:

   ```
   openssl req -batch -new -x509
   -key ca-https-client-key.pem -keyform PEM
   -passin pass:yourSSLPW -sha256 -outform PEM
   -out ca-https-client-cert.pem
   ```

3. Create the keystore as described in Chapter 7.1:

   ```
   openssl pkcs8 -topk8 -in ca-https-client-key.pem
   -passin pass:yourSSLPW -inform PEM -nocrypt -outform DER |
   java -cp . ImportKey -alias ca -storetype JKS
   -keystore ca-keystore.jks -storepass pass:yourSSLPW
   -keypass pass:yourSSLPW -chain ca-https-client-cert.pem
   ```

There should be 3 additional files in your directory:

- *`ca-https-client-key.pem`*
- *`ca-https-client-cert.pem`*
- *`ca-keystore.jks`*

Please store the key and the certficate at a secure location. Only the keystore is used by the CA server, therefore copy it to its final destination. Then the preferences file of the CA server has to be configured:

- The location of the keystore has to be configured in the *ca-preferences.xml* file of the IDM server in the node ***httpServer » https » keyStore***
- The format of the keystore (JKS) has to be configured in the *ca-preferences.xml* file of the IDM server in the node ***httpServer » https » keyStoreType***
- The password to access the keystore (in the example: `yourSSLPW`) has to be configured in the *ca-preferences.xml* file of the IDM server in the node ***httpServer » https » keyStorePassword***

To enable the SSL communication to the IDM server and to the database the following keys of the *ca-preferences.xml* file have to be configured:

- ***certificateFactory » storage » database » ssl = true***
- ***httpServer » protocol = https***

To enable client authentication the following key has to be set to *true*:

- ***httpServer » https » clientAuth = true***

2.10.2 Create the truststores

Each component except for the database has a truststore containing the certificates of the trusted peers.

IDM server

1. Create the truststore and add DB_{cert} as described in Chapter „Import a certificate” on page 88:

```
java -cp . ImportKey -alias postgres -storetype JKS
-file serverCert.pem -storepass pass:yourSSLPW
-keystore idm-truststore.jks
```

2. Add IC_{cert} as described in Chapter „Import a certificate” on page 88 to the truststore:

```
java -cp . ImportKey -alias ca -storetype JKS
-file ca-https-client-cert.pem
-storepass pass:yourSSLPW -keystore idm-truststore.jks
```

3. Copy the truststore to its final location and configure the preferences file *preferences.xml* of the IDM server:
   - The location of the truststore has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStore***
   - The format of the truststore (JKS) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStoreType***
   - The password to access the truststore (in the example: *yourSSLPW*) has to be configured in the *preferences.xml* file of the IDM server in the node ***service » security » trustStorePassword***

IDM CA

The certificates of the database and the IDM server are stored in different truststores:

1. Create the database truststore and add DB_{cert} as described in Chapter „Import a certificate” on page 88:

```
java -cp . ImportKey -alias postgres -storetype JKS
-file serverCert.pem -storepass pass:yourSSLPW
-keystore ca-database-truststore.jks
```

2. Copy the truststore to its final location and configure the preferences file *ca-preferences.xml* of the IDM CA:
    - The location of the truststore has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » storage » database » security » trustStore***
    - The format of the truststore (JKS) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » storage » database » security » trustStoreType***
    - The password to access the truststore (in the example: *yourSSLPW*) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » storage » database » security » trustStorePassword***
3. Create the IDM server truststore and add IS$_{cert}$ as described in Chapter „Import a certificate” on page 88:

```
java -cp . ImportKey -alias idm -storetype JKS
-file idm-https-client-cert.pem -storepass pass:yourSSLPW
-keystore ca-idm-truststore.jks
```

4. Copy the truststore to its final location and configure the preferences file *ca-preferences.xml* of the IDM CA:
    - The name including the path of the truststore has to be configured in the *ca-preferences.xml* file in the node ***httpServer » https » trustStore***
    - The format of the truststore (JKS) has to be configured in the *ca-preferences.xml* file in the node ***httpServer » https » trustStoreType***
    - The password to access the truststore (in the example: *yourSSLPW*) has to be configured in the *ca-preferences.xml* file in the node ***httpServer » https » trustStorePassword***

3 IDM client overview

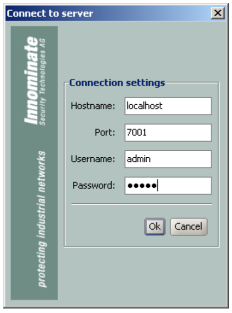
The IDM client is the graphical front-end to access all features of IDM. It allows to create and manage devices and templates, initiates the upload of configurations to devices or initiates the export of configuration files to the file system.

For information on how to start and stop the client, please refer to Chapter 2.6.

3.1 Login

Before connecting to the server, you have to authenticate yourself in the login-window. Furthermore the server IP/hostname and the server port to be used can be configured in the login-window.

The following screenshot shows the login dialog:



Hostname: localhost

Port: 7001

Username: admin

Password: •••••

Figure 8: The login window

There are three predefined user accounts: *root*, *admin* and *audit*. *root* can access all settings, *admin* can by default modify all configuration settings and read user management settings, whereas *audit* has read-only permission by default, i.e. the *audit* user cannot change any settings, except for his password. The permissions for the users can be changed, if desired (see Chapter 3.10). The default passwords for user *admin* is **admin**, the default password for user *audit* is **audit**, the default password for *root* is **root**.

☞ It is highly recommended to change the default passwords after installation, please refer to Chapter 3.10 (subsection *Changing user settings*) for more information.

Using multiple clients

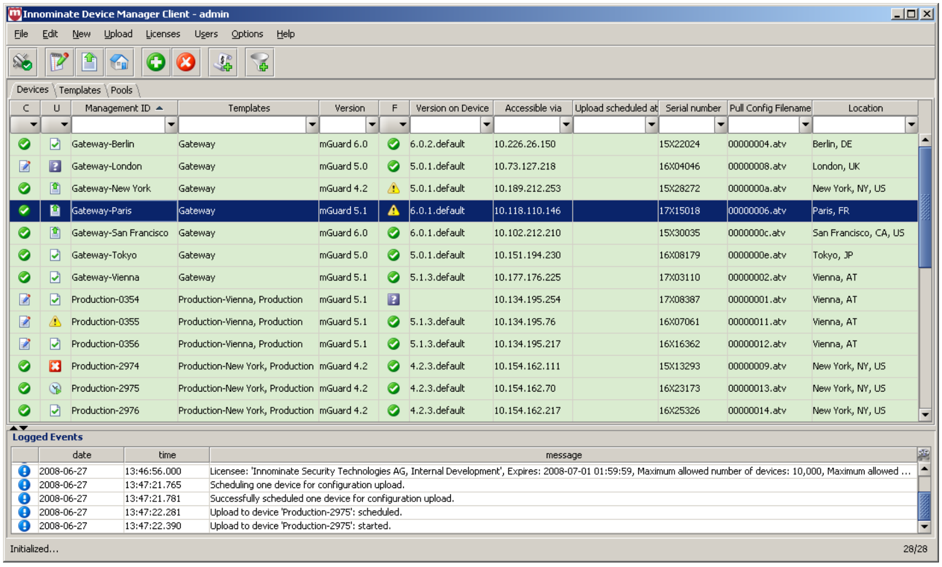
It is possible to connect to the server with multiple clients at the same time. If a client opens the *Device Properties Dialog* the device and also the associated template (if applicable) will be locked and cannot be opened by another user. If another user tries to open the device or the template an error message will be displayed. If a client opens a *Template Properties Dialog*, then the template and all devices referencing this template will be locked and cannot be opened by another user.

The same is true for pools.

In case the connection between a client and a server is interrupted and cannot be terminated gracefully, the device/template/pool that was locked by that client will get released after an inactivity timeout (can be configured in the server configuration, see Chapter 2.5, key *maxInactiveInterval*), i.e. it could happen that certain settings cannot be accessed until the inactivity timeout is reached.

3.2 The IDM main window

The following screenshot shows the IDM main window:


Innominate Device Manager Client - admin
File Edit New Upload Licenses Users Options Help
Devices
Templates
Pools
Logged Events
Initialized…
28/28

C	U	Management ID	Templates	Version	F	Version on Device	Accessible via	Upload scheduled at	Serial number	Pull Config Filename	Location
✓	✓	Gateway-Berlin	Gateway	mGuard 6.0	✓	6.0.2.default	10.226.26.150		15X22024	00000004.atv	Berlin, DE
✎	?	Gateway-London	Gateway	mGuard 5.0	✓	5.0.1.default	10.73.127.218		16X04046	00000008.atv	London, UK
✓	↑	Gateway-New York	Gateway	mGuard 4.2	⚠	5.0.1.default	10.189.212.253		15X28272	0000000a.atv	New York, NY, US
✓	↑	Gateway-Paris	Gateway	mGuard 5.1	⚠	6.0.1.default	10.118.110.146		17X15018	00000006.atv	Paris, FR
✓	↑	Gateway-San Francisco	Gateway	mGuard 6.0	✓	6.0.1.default	10.102.212.210		15X30035	0000000c.atv	San Francisco, CA, US
✓	✓	Gateway-Tokyo	Gateway	mGuard 5.0	✓	5.0.1.default	10.151.194.230		16X08179	0000000e.atv	Tokyo, JP
✓	✓	Gateway-Vienna	Gateway	mGuard 5.1	✓	5.1.3.default	10.177.176.225		17X03110	00000002.atv	Vienna, AT
✎	✓	Production-0354	Production-Vienna, Production	mGuard 5.1	?		10.134.195.254		17X08387	00000001.atv	Vienna, AT
✎	⚠	Production-0355	Production-Vienna, Production	mGuard 5.1	✓	5.1.3.default	10.134.195.76		16X07061	00000011.atv	Vienna, AT
✎	✓	Production-0356	Production-Vienna, Production	mGuard 5.1	✓	5.1.3.default	10.134.195.217		16X16362	00000012.atv	Vienna, AT
✓	☒	Production-2974	Production-New York, Production	mGuard 4.2	✓	4.2.3.default	10.154.162.111		15X13293	00000009.atv	New York, NY, US
✓	⏲	Production-2975	Production-New York, Production	mGuard 4.2	✓	4.2.3.default	10.154.162.70		16X23173	00000013.atv	New York, NY, US
✓	✓	Production-2976	Production-New York, Production	mGuard 4.2	✓	4.2.3.default	10.154.162.217		16X25326	00000014.atv	New York, NY, US

	date	time	message
ℹ	2008-06-27	13:46:56.000	Licensee: 'Innominate Security Technologies AG, Internal Development', Expires: 2008-07-01 01:59:59, Maximum allowed number of devices: 10,000, Maximum allowed …
ℹ	2008-06-27	13:47:21.765	Scheduling one device for configuration upload.
ℹ	2008-06-27	13:47:21.781	Successfully scheduled one device for configuration upload.
ℹ	2008-06-27	13:47:22.281	Upload to device 'Production-2975': scheduled.
ℹ	2008-06-27	13:47:22.390	Upload to device 'Production-2975': started.

Figure 9: The IDM main window

The IDM main window is divided into a tab area for the device/template/pool overview tables and a log window. It also contains a tool bar and the main menu. The different sections and their functionality are explained in the following chapters.

3.3 Device overview table

Please select the **Device** tab to access the device overview table.

Device table columns

The device overview table contains the following columns:

☞ The column width can be changed by placing the cursor on the header of the table at the border of two columns and dragging the border to the desired location. The order of the columns can be changed by dragging the column header to a different location.

Status *C*

The column labeled with **C** shows the configuration status of the device, which indicates whether the configuration on the Innominate mGuard differs from the configuration of the device in IDM.
The configuration status can take the following values:

- Unknown ?
  IDM is not able to determine whether the configuration of your Innominate mGuard is up-to-date.
- OK ✓
  The configuration in IDM is identical to the current configuration of your mGuard.
- Changed ✎
  The configuration in IDM is different to the current configuration of your mGuard, i.e. the changes made with IDM have not yet been uploaded to the device.

- Locked
  The configuration is locked by another user. This can happen if another user opens the *Device Properties Dialog* or the *Template Properties Dialog* of an assigned template.

☞ Please note that configuration changes performed by other means than IDM cannot be detected, i.e. the configuration status is displayed correctly only if solely the *netadmin* user changes the mGuard configuration locally on the device.

☞ If a template is changed the configuration status of **all** mGuards using this template is set to *out-of-date*, no matter whether the template change affected the device configuration or not.

☞ Please refer to Chapter 3.7.1 if you would like to manually reset the configuration status to *up-to-date*.

Status *U*

The column labled with **U** shows the upload status of the device, which indicates the status of a pending upload or the result of the last upload. Please refer to Chapter 3.8 on how to upload configurations to the devices.
The upload status can take the following values:

- Unknown
  IDM could not determine the status yet, since no upload has taken place.

- Up to date
  The configuration on the device has not changed because it already was up to date.

- Updated
  The configuration on the device has been updated.

- Configuration exported
  The configuration files have been successfully exported to the file system.

- Pull feedback received
  The IDM server has received a configuration pull feedback from the HTTPS server, but it could not be determined whether the configuration on the device is now up to date. This status indicates that the device has pulled a configuration file, but has not yet applied it, or that the configuration is outdated, because it has been changed in IDM after the export to the HTTPS server.

- SSH hostkey reset
  Indicates that an SSH host key reset was performed.

- Configuration invalid
  IDM indicates that the current configuration is invalid, e.g. a **None** value (see Chapter 4.2.1) in the template has not been overriden in the device.

- Upload or export error
  A permanent error has occured and IDM could not recover from the error or the maximum number of retries for the SSH configuation push has been reached without accessing the mGuard. The cause of the error is displayed in the log window.

  - Host authentication failed
    This error indicates that the SSH host authentication failed. This can be an indicator of an attack, but most likely it is due to the fact that a failing device was replaced. Before you continue please make sure that the devices in question was indeed replaced. To continue remove the device´s active SSH hostkey with the option **Reset SSH Hostkey** in the context menu of the device overview table. The new SSH hostkey will be set with the next SSH connection.
  - User authentication failed
    This error indicates that the user credentials – username *admin* and the password stored in the devices *active password* – were not accepted. It can also indicate that the SSH authentication method *password* was not accepted by the mGuard.
  - I/O failed / Upload failed
    This error indicates that an input/ouput (I/O) failure has occurred. In the case of SSH uploads this is probably a transient error and a retry should be scheduled. In the case of filesystem output (pull config) the failure is probably not transient and the cause should be examined by the user.
  - Concurrent configuration upload
    This indicates that another upload is currently active for the same device. An example is an SSH upload that detects a running pull config script. The usual way to handle this is to reschedule this update.
  - Configuration rejected
    This indicates that the device has rejected the configuration as invalid.

- Upload timeout
  This indicates that the SSH connection to the device has timed out, i.e. the device has no reacted to the commands initiated by the IDM within a given (configurable) time frame. If the configuration contains a large number of VPN connections, it might be necessary to increase the timeout; see Chapter 2.5, node ***service » storage » update » ssh » deadPeerDetectionTimeout***.

- License could not be installed
  This indicates that an mGuard license file could not be installed on the device.

- Pull configuration rolled back
  This indicates that a configuration pulled by the device was rolled back.

- Pull configuration blocked due to previous rollback
  This indicates that configuration is blocked due to a previous rollback.

- Saving configuration for rollback failed
  This indicates that saving the rollback configuration failed, the configuration was not applied.

- Pulled configuration invalid
  This indicates the device detected an invalid pull configuration and therefore the configuration was not applied.

- Firmware upgrade failed U
  The scheduled firmware upgrade failed.
- Queued for upload or export 🕐
  The device is currently in the upload queue. Depending on the settings for the *configuration push retries* and the *waiting time between retries* the device might stay in the queue for a while.
- Upload or export running 🕐
  The device has been accessed and the configuration file is currently being uploaded.
- Requeued for upload or export 🕐
  If the device is not accessible, then it will be requeued and after *waiting time between retries* the upload will start again. If after *configuration push retries* the device has not been accessed an error is shown. This icon is also shown during an ongoing firmware upgrade, since IDM will periodically poll the device for the result of the firmware upgrade.

Management ID

The Management ID of the device.

Templates

A comma-separated list of the device’s ancestor templates. The first item in the list is the immediate parent template.

Version

The firmware version currently selected in IDM for this device.

Status *F*

Firmware status:

- Unknown ?
- OK ✓
  The firware upgrade was successful and the firmware version configured in IDM corresponds to the firmware version on the device.
- Upgrade scheduled 🕐
- Upgrade running ☕
- Version mismatch ⚠
  Firmware version configured in IDM and firmware version on device do not match.
- Error ☒
  An error occured during firmware upgrade.

Version on device

The firmware version currently installed on the device. Please refer to Chapter 4.3 for more information.

Accessible via

The IP address or host name which is used by IDM to access the device. This address can be configured in the **General settings** of the *Device Properties Dialog* (see Chapter 4.3). Without an **Accessible via** address it is not possible to push configurations to the device or open the Web GUI of the device. Please note that this address might not correspond to the internal or external address of the mGuard if NAT is involved.

Upload scheduled at

The date/time the next configuration upload is scheduled for this device.

Serial number

The serial number of this device. Please refer to Chapter 4.3.

Pull config filename

If the configuration is exported to the file system, a unique ID is used as name of the configuration file. The filename of the configuration file is shown in this column.

Location

In this column the value of the variable *SYS_LOCATION* is shown.

Filtering and sorting the table

The header of the table can be used to sort the table entries. A click on a header of a column will activate the (primary) sort based on this column. This is indicated by the arrow in the column header. A second click on the same header will reverse the sort order. Clicking on another column header activates the sort based on this new column, the previously activated column will be used as secondary sorting criterion.

The first row of the table accepts the input of regular expressions (please refer to Chapter 6, *Regular expressions*), which can be used to efficiently filter the table entries. Filtering based on regular expressions is not used for columns that do not contain text (columns **C**, **U** or **F**).

The filter history will be saved for the current user and can be accessed using the drop down functionality of the filter fields.

Creating devices

There are several ways to create new devices:

1. Open the context menu by clicking on the device table with the right mouse button. To open the *Device Properties Dialog* for a new mGuard please select **Add** in the context menu.
2. Select the **Device** tab and click on the ⊕ icon in the menu bar to open the *Device Properties Dialog* for a new mGuard.
3. Select **New » Device** in the main menu to open the *Device Properties Dialog* for a new mGuard.
4. Select **New » Device Import** in the main menu to import new devices.

Editing devices

There are several ways to edit a device:

1. Double-click with the left mouse button on the device in the table to open the *Device Properties Dialog*.
2. Select the device with the left mouse button and open the context menu by pressing the right mouse button. Then select **Edit** to open the *Device Properties Dialog*.
3. Select the device to be modified in the device table. Select **Edit » Configuration Dialog** in the main menu to open the *Device Properties Dialog*.

   ☞ The **Edit** entry in the context menu and the **Edit** button in the toolbar are only enabled if exactly one device is selected in the device table.

Deleting devices

There are several methods to delete devices:

1. Select the device(s) in the device table and open the context menu by clicking with the right mouse button. To delete the devices please select **Delete** in the context menu.
2. Select the devices to be deleted in the table and click on the ⊗ icon in the menu bar.

3.3.1 The device context menu

Add

Create a new device and open the *Device Properties Dialog* of the new device.

Edit

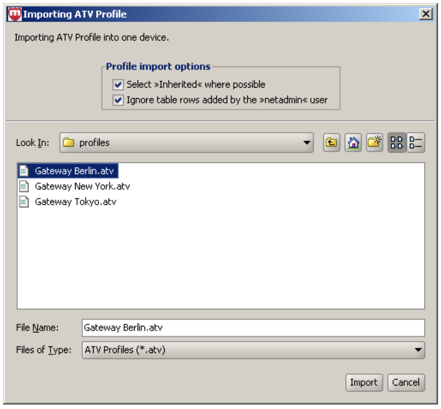
Edit the selected device (only active if exactly one device is selected in the overview table)

Duplicate

To create a duplicate of a device please open the context menu by clicking with the right mouse button on the device in the device table. Select **Duplicate** in the context menu. IDM will create a copy of the device and append the string *_copy<n>* (<n> is a number) to the Management ID of the new device. Please note that the **Duplicate** menu entry is only enabled if exactly one device is selected in the device table.

Import ATV Profile

Import an ATV profile into the selected device(s):



Importing ATV Profile into one device.

Profile import options
☑ Select »Inherited« where possible
☑ Ignore table rows added by the »netadmin« user

Look In: profiles

Gateway Berlin.atv
Gateway New York.atv
Gateway Tokyo.atv

File Name: Gateway Berlin.atv
Files of Type: ATV Profiles (*.atv)

Figure 10: ATV import

There are two options when importing a profile:

Select Inherited where possible

If this option is selected, variables for which the imported value (i.e. the value in the ATV profile) is the same as the inherited value are set to **Inherited**. Otherwise, all variables contained in the profile are set to **Custom**, regardless of their value.

Ignore table rows added by the *netadmin* user

Tables rows that were created by the local *netadmin* user on the mGuard are not imported.

A few configuration variables cannot be imported and must be set manually if necessary: the passwords of the *root* and *admin* users, the passwords of the user firewall users, and certificate revocation lists (CRLs). ATV profiles downloaded from an mGuard either do not contain these variables at all or contain them in encrypted (hashed) form. Please note that IDM does import the password of the *netadmin* user if it is found in the ATV profile, but a profile downloaded from an mGuard does **not** contain it.

Open Web Page

Open the Web GUI of the device, if the device is accessible (see also **Accessible via** address in Chapter 4.3)

☞ Any change made with the Web GUI will be overwritten by the next IDM configuration upload (except for changes made as *netadmin* to local variables).

Delete

Delete the selected devices.

Set Firmware Version

Upgrade the firmware version to a new version. Please refer to Chapter 3.11 for more details.

Assign Template

Open the *Assign template* dialog and assign a template to the selected devices.

Upload

Open the Upload dialog. Please refer to Chapter 3.8 for more details.

Cancel Upload

Cancel the scheduled upload for the selected devices.

Set Upload State

The upload status will never be set to *successfully uploaded* automatically if no push upload is performed and no pull feedback from the configuration server is received (e.g. in a usage scenario where the exported configuration profiles are installed manually on the devices). You can use this option to set the upload state to *successfully uploaded* manually. Please select the device in the device table, open the context menu with a right click and then select **Set upload state**.

☞ If a device is in a state in which an upload would fail (e.g. if a **None** value has not been overridden, cf. Chapter 4.2.1), it is not possible to set the upload state to *successfully uploaded*.

Upload History

Display an overview over the last upload actions.

Set current device passwords

If the currently active passwords on the mGuard do not match those in your IDM configuration, you can set the current passwords with this option. Please select the device in the device table, open the context menu with a right click and then select **Set current passwords**. IDM will use the current passwords to login to the mGuard.

Reset SSH hostkey

IDM stores the SSH key of an mGuard after the initial contact. In case an mGuard has been replaced, the SSH keys do not match and IDM will refuse any connection to the replaced device. In this case the key has to be deleted manually by selecting the device in the device table and then selecting **Reset SSH hostkey** in the context menu of the device table.

Generate License

Please refer to Chapter 3.9 for details regarding the license management.

Refresh License

Please refer to Chapter 3.9 for details regarding the license management.

Schedule upgrade to latest patches

Schedule a firmware upgrade to the latest available patches. Please refer to Chapter 3.11 for more details.

Schedule upgrade to latest minor release

Schedule a firmware upgrade to the latest available minor release. Please refer to Chapter 3.11 for more details.

Schedule upgrade to next major version

Schedule a firmware upgrade to the next major version. Please refer to Chapter 3.11 for more details.

Unschedule upgrade

Unschedule a firmware upgrade.

Request additional certificate

Request a machine certificate for the device and append it to the list of existing machine certificates. Please refer to Chapter 4.6.1 for more details.

Request replacement certificate

Request a machine certificate for the device and replace any existing machine certificates with the new one. Please refer to Chapter 4.6.1 for more details.

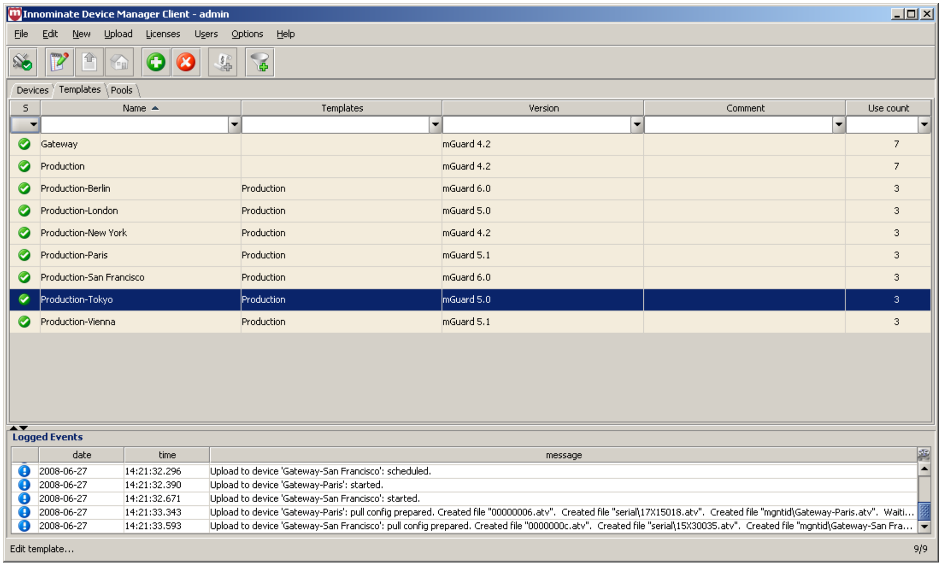
> ☞ All existing machine certificates in the device are deleted, even if they have been imported manually. As a result, the device has a single machine certificate (the newly requested one). This function is therefore most useful for devices which contain a single machine certificate.

Select All

Select all devices not excluded by the table filter.

3.4 Template overview table

Please select the **Template** tab to access the template overview table.


Innominate Device Manager Client - admin
File Edit New Upload Licenses Users Options Help
Devices Templates Pools

S	Name ▲	Templates	Version	Comment	Use count
✓	Gateway		mGuard 4.2		7
✓	Production		mGuard 4.2		7
✓	Production-Berlin	Production	mGuard 6.0		3
✓	Production-London	Production	mGuard 5.0		3
✓	Production-New York	Production	mGuard 4.2		3
✓	Production-Paris	Production	mGuard 5.1		3
✓	Production-San Francisco	Production	mGuard 6.0		3
✓	Production-Tokyo	Production	mGuard 5.0		3
✓	Production-Vienna	Production	mGuard 5.1		3

Logged Events

```
date        time          message
2008-06-27  14:21:32.296  Upload to device 'Gateway-San Francisco': scheduled.
2008-06-27  14:21:32.390  Upload to device 'Gateway-Paris': started.
2008-06-27  14:21:32.671  Upload to device 'Gateway-San Francisco': started.
2008-06-27  14:21:33.343  Upload to device 'Gateway-Paris': pull config prepared. Created file "00000006.atv".  Created file "serial\17X15018.atv".  Created file "mgntid\Gateway-Paris.atv".  Waiti...
2008-06-27  14:21:33.593  Upload to device 'Gateway-San Francisco': pull config prepared. Created file "0000000c.atv".  Created file "serial\15X30035.atv".  Created file "mgntid\Gateway-San Fra...
```

Edit template... 9/9

Figure 11: The IDM main window with template table

Template table columns

The template overview table contains the following columns:

> ☞ The column width can be changed by placing the cursor on the header of the table at the border of two columns and dragging the border to the desired location. The order of the columns can be changed by dragging the column header to a different location.

Name

The name assigned to the template. The name can be set in the **General Settings** of the *Template Properties Dialog* (see Chapter 4.2).

Templates

A comma-separated list of the template's ancestor templates. The first item in the list is the immediate parent template.

Version

The mGuard firmware version that is used for the template.

Comment

Optional comment. The comment can be set in the **General Settings** of the *Template Properties Dialog* (see Chapter 4.2).

Use count

This column shows the number of devices or other templates using this template.

Filtering and sorting the table

The header of the table can be used to sort the table entries. A click on a header of a column will activate the (primary) sort based on this column. This is indicated by the arrow in the column header. A second click on the same header will reverse the sort order. Clicking on another column header activates the sort based on this new column, the previously activated column will be used as secondary sorting criterion.

The first row of the table accepts the input of regular expressions (please refer to Chapter 6, *Regular expressions*), which can be used to efficiently filter the table entries. Filtering based on regular expressions is not used for the column that does not contain text (i.e. column **S**).

The filter criterion for the **Use count** column is not interpreted as a regular expression, but as a comma-separated list of numbers or number ranges (e.g. 0,2-3).

The filter history will be saved for the current user and can be accessed using the drop down functionality of the filter fields.

Creating templates

There are several ways to create new templates:

1. Open the context menu by clicking on the template table with the right mouse button. To open the *Template Properties Dialog* for a new template please select **Add** in the context menu.
2. Select the **Template** tab and click on the ⊕ icon in the menu bar to open the *Template Properties Dialog* for a new template.
3. Select **New » Template** in the main menu to open the *Template Properties Dialog* for a new template.

Editing templates

There are several ways to edit a template:

1. Double-click with the left mouse button on the template in the table to open the *Template Properties Dialog*.
2. Select the template with the left mouse button and open the context menu by pressing the right mouse button. Then select **Edit** to open the *Template Properties Dialog*.
3. Select the template to be modified in the template table. Select **Edit » Configuration Dialog** in the main menu to open the *Template Properties Dialog*.

   ☞ The **Edit** entry in the context menu and the **Edit** button in the toolbar are only enabled if exactly one template is selected in the template table.

Deleting templates

There are several methods to delete templates:

1. Select the template(s) and open the context menu by clicking with the right mouse button. To delete the templates please select **Delete** in the context menu.
2. Select the templates to be deleted in the template table and click on the ⊗ icon in the menu bar.

   ☞ Please note that templates that are still assigned to devices or other templates cannot be deleted.

3.4.1 The template context menu

The following entries are available in the context menu of the template overview table:

Add

Create a new template and open the *Template Properties Dialog* of the new template.

Edit

Edit the selected template (only active if exactly one template is selected in the overview table)

Duplicate

To create a duplicate of a template please open the context menu by clicking with the right mouse button on the template in the template table. Select **Duplicate** in the context menu. IDM will create a copy of the template and append the string *_copy<n>* (<n> is a number) to the name of the new template. Please note that the **Duplicate** menu entry is only enabled if exactly one template is selected in the template table.

Import ATV Profile

Import an ATV profile into the selected template(s). This works analogous to the ATV profile import into devices; please refer to Chapter 3.3.1 for details.

Delete

Delete the selected templates.

Set Firmware Version

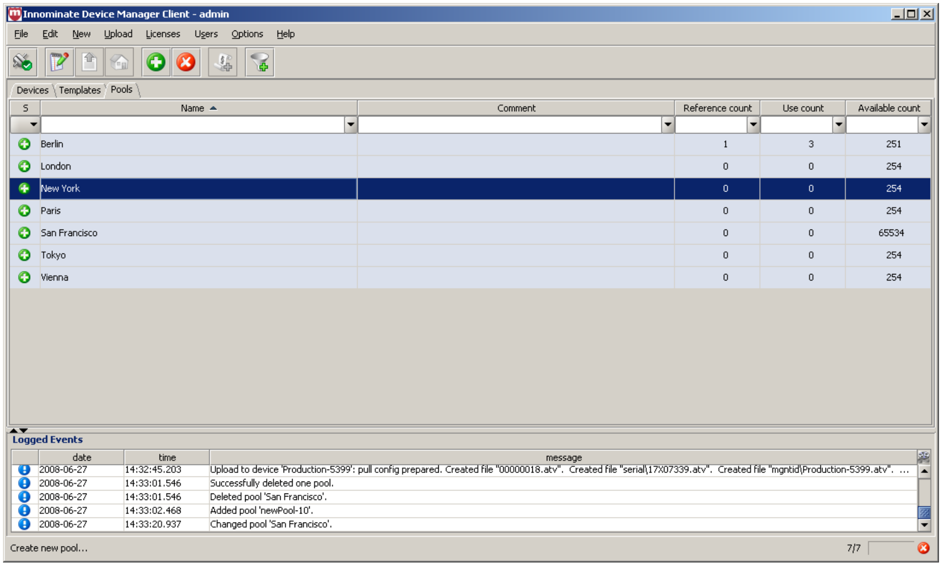
Upgrade the firmware version to a new version. Please refer to Chapter 3.11 for more details.

Select All

Select all templates not excluded by the table filter.

3.5 Pool value overview table

Please select the **Pool** tab to access the pool overview table. A pool defines a range of network addresses which can be automatically assigned to variables. For detailed information on pools and their usage please refer to Chapter 4.4.


Innominate Device Manager Client - admin
File Edit New Upload Licenses Users Options Help
Devices Templates Pools

S	Name	Comment	Reference count	Use count	Available count
⊕	Berlin		1	3	251
⊕	London		0	0	254
⊕	New York		0	0	254
⊕	Paris		0	0	254
⊕	San Francisco		0	0	65534
⊕	Tokyo		0	0	254
⊕	Vienna		0	0	254

Logged Events

	date	time	message
!	2008-06-27	14:32:45.203	Upload to device 'Production-5399': pull config prepared. Created file "00000018.atv". Created file "serial\17X07339.atv". Created file "mgntid\Production-5399.atv". ...
!	2008-06-27	14:33:01.546	Successfully deleted one pool.
!	2008-06-27	14:33:01.546	Deleted pool 'San Francisco'.
!	2008-06-27	14:33:02.468	Added pool 'newPool-10'.
!	2008-06-27	14:33:20.937	Changed pool 'San Francisco'.

Create new pool... 7/7

Figure 12: The IDM main window with pool table

Pool table columns The pool overview table contains the following columns:

☞ The column width can be changed by placing the cursor on the header of the table at the border of two columns and dragging the border to the desired location. The order of the columns can be changed by dragging the column header to a different location.

Status

The status icon shows whether the pool definition is valid.

Name

The name assigned to the pool.

Comment

Optional comment.

Reference count

This column shows how many variables reference this pool (see Chapter 4.4).

Use count

This column shows how many values have been used from the pool (see Chapter 4.4).

Available count

This number shows how many values are still available in the pool (see Chapter 4.4).

Filtering and sorting the table

The header of the table can be used to sort the table entries. A click on a header of a column will activate the (primary) sort based on this column. This is indicated by the arrow in the column header. A second click on the same header will reverse the sort order. Clicking on another column header activates the sort based on this new column, the previously activated column will be used as secondary sorting criterion.

The first row of the table accepts the input of regular expressions (please refer to Chapter 6, *Regular expressions*), which can be used to efficiently filter the table entries. Filtering based on regular expressions is not used for the column that does not contain text (i.e. column **S**).

The filter criterion for the three **count** columns is not interpreted as a regular expression, but as a comma-separated list of numbers or number ranges (e.g. 0,2-3).

The filter history will be saved for the current user and can be accessed using the drop down functionality of the filter fields.

Creating pools

There are several ways to create new pools:

1. Open the context menu by clicking on the pool table with the right mouse button. To open the *Pool Properties Dialog* for a new pool please select **Add** in the context menu.
2. Select the **Pool** tab and click on the ⊕ icon in the menu bar to open the *Pool Properties Dialog* for a new pool.
3. Select **New » Pool** in the main menu to open the *Pool Properties Dialog* for a new pool.

Deleting pools

There are several methods to delete pools:

1. Select the pool(s) and open the context menu by clicking with the right mouse button. To delete the pools please select **Delete** in the context menu.

2. Select the pools to be deleted in the pool table and click on the ✖ icon in the menu bar.

   ☞ Please note that pools that are still referenced by variables cannot be deleted.

Editing pools

There are several ways to edit a pool:

1. Double-click with the left mouse button on the pool in the table to open the *Pool Properties Dialog*.
2. Select the pool with the left mouse button and open the context menu by pressing the right mouse button. Then select **Edit** to open the *Pool Properties Dialog*.
3. Select the pool to be modified in the pool table. Select **Edit » Configuration Dialog** in the main menu to open the *Pool Properties Dialog*.

   ☞ The **Edit** entry in the context menu and the **Edit** button in the toolbar are only enabled if exactly one pool is selected in the pool table.

3.6 Log window

The log window shows the following events:

- Upload results
- Creation, Deletion, Modification of a device, a template, or a pool.
- Connect / Disconnect of the client

Export / Clear the log entries

To export or delete the log entries please open the context menu of the log window by clicking on the log window with the right mouse button.

Please select **Export** to export the current log entries to a file, or **Clear** to delete the current log entries. Clearing the log applies to the current client only, i.e. other clients are not affected.

Increase verbosity level

If you would like to get detailed log messages, please open the context menu of the log window by clicking on the log window with the right mouse button. Select the **Increase verbosity level** option in the context menu to get detailed log messages.

Stop scrolling in log window

To stop the scrolling of the log messages in the log window please click on the icon in the upper right corner of the log window. Click again to enable scrolling.

3.7 The IDM main menu and tool bar

3.7.1 The IDM main menu

File

Connect/Disconnect

Disconnects from or connect to the server.

Exit

Exits the client.

Edit

Configuration Dialog

Opens the *Properties Dialog* of the currently selected item (device, template, or pool) in the overview table.

Web Configure

Opens the Web GUI for the selected devices in the device table.

☞ Only active if at least one device in the device table is selected.

☞ The **Accessible via** address is required for this option. It can be configured in the **General settings** of the *Device Properties Dialog* (see Chapter 4.3)

Cut

Cuts the marked text in the currently active table filter field to the clipboard.

Copy

Copies the marked text in the currently active table filter field to the clipboard.

Paste

Pastes the clipboard contents to the currently active table filter field .

Select All

Selects all entries in the currently active overview table.

New

Device

Creates a new device and opens the *Device Properties Dialog* of a new device.

Template

Creates a new template and opens the *Template Properties Dialog* of a new template.

Pool

Creates a new pool and opens the *Pool Properties Dialog* of a new pool value definition.

Device Import

Opens a window that allows to select an import file.

With the device import option, you can import an automatically (e.g. with a script) generated file of devices. This can be used to create a large number devices in IDM without going through the process of creating them manually.

The import file must be *comma-separated value* (CSV) formatted. Either a comma (,) or a semicolon (;) can be used as a field separator. Each record (line) in the file describes a single device and consists of the following fields:

Field	Description
#0	Management ID
#1	Firmware Version
#2	Template Name
#3	“Reachable via” address

Field	Description
#4	Serial Number
#5	Flash ID
#6...#n	Variable assigments

The *Management ID* and *Firmware Version* (fields #0 and #1) are mandatory, all other fields are optional. If a field is empty or non-existent, the corresponding attribute is not set.

The *Firmware Version* field must be a supported firmware version (without patchlevel) as it would appear in the **Version** column of the device overview table, e.g. *mGuard 6.1***.**

The *Template Name* must either be the name of an existing template, which is assigned to the new device, or empty, in which case no template is assigned.

Scalar variables (i.e. variables that store a single value and are not contained in a table) can be set with an assignment of the form *<VARIABLE_NAME>=<VALUE>*.

Example record:

```
My Device,mGuard 6.1,,192.168.2.3,17X46201,,ROUTERMODE=router,
MY_LOCAL_IP=192.168.2.3
```

(Please note that the record must be contained in a single line.)

If a record is not valid, it is skipped and an error message is logged.

Upload

For an overview of the configuration upload process and the different upload methods please refer to Chapter 3.8.

Selected

Uploads configurations to the devices currently selected in the device table.

Changed

Uploads configurations to the devices with a configuration status of *out-of-date*.

All

Uploads configurations to all devices.

Licenses

Please refer to Chapter 3.9 for information on how to manage licenses and vouchers.

Users

Change Own Password

Opens a dialog that enables the current user to change the password.

Manage Users

Please refer to Chapter 3.10 for details on how to manage users.

Options

Default Browser

Please specify a command line to be used to start the browser. The command line should start with the full path and the name of the binary. Append the string *{url}*, which will be replaced with the URL of the mGuard, e.g. on Windows enter:

C:\Program Files\Firefox\Firefox.exe {url}

Default Firmware Version

This is the firmware version that will be used when creating a new device or template.

Filter

The filter in the device, template and pool table can be switched on and off using this option.

3.7.2 *The IDM tool bar*

The tool bar offers short-cuts to some of the functions in the main menu or the context menu:

No connection to server; if clicked: connect to server.

Connection established; if clicked: disconnect from server.

Edit the selected entry (device, template or pool).

Upload the configuration to the selected devices.

Open the Web GUI of the selected devices in the device table.

Add an entry (device, template or pool) and open its *Properties Dialog*.

Delete the currently selected entries.

Open a dialog to generate/request licenses from the Innominate license server for the selected devices.

Filter of the current overview table (device, template or pool) is active. If clicked: deactivate the filter.

Filter of the current overview table (device, template or pool) is inactive. If clicked: activate the filter.

3.8 Uploading configurations to the mGuards

Upload methods

IDM offers several methods to upload the configuration files to the mGuards:

SSH push

The IDM server accesses the mGuards using the SSH protocol. Subsequently the configuration file is copied to the device and put into operation. Any failures during the upload process are shown in the log window. To use this method the following requirements have to be met:

- In the **General Settings** of the *Device Properties Dialog* an IP address or a hostname has to be set for the field **Accessible via.**
- The mGuard has to be accessible from the IDM server using the **Accessible via** address, i.e. a firewall must not block the traffic and a NAT device in the communication path has to be configured appropriately to allow the communication between the IDM server and the mGuard.
- In case the mGuard is accessed on the untrusted interface, the SSH remote access from the IDM server has to be enabled on the mGuard.
- The passwords to access the device have to be set correctly. For uploading the device configuration to the mGuard, IDM logs in as user *admin*. In case of a password change there are 2 passwords involved: the old password, which is used to access the device and the new password, which will be set after logging in. Therefore IDM automatically keeps track of the active password to be used to access

the device and does *not* use the password configured in the *Device Properties Dialog* for this purpose. If you would like to manually change the active password you can use the option **Set Current Device Password** in the context menu of the device table.

If a device is not accessible IDM will retry the connection after a waiting time. As soon as the maximum count of retries is reached IDM will stop trying to upload the configuration and will show an error in the log.

☞ If a configuration change causes the mGuard to reboot (e.g. when switching from stealth to router mode), IDM is not immediately informed whether the configuration has been successfully applied. It will therefore reaccess the device after a waiting time. Adapt the Accessible via setting after the initial upload if necessary. Alternatively the configuration state can be set manually with the option **Set Upload State** in the context menu of the device overview table.

☞ If you change the password in the *Device Properties Dialog* and a subsequent upload of the device configuration fails, it may happen that the password change was applied on the mGuard but IDM was not able to keep track of the succesful change. In this case you have to manually set the active password in IDM using the option **Set Current Device Password** in the context menu of the device overview table, otherwise IDM will not be able to log in for the next upload.

☞ Due to this potential issue it is recommend to apply (upload) password changes separately from extensive configuration changes.

Manual configuration upload

In case there are only a few devices to be configured and the devices cannot be accessed by IDM, it is possible to export the configuration files to the file system and upload them manually to each device using the Web GUI of the respective device. Each device is identified by a unique identifier which is automatically assigned by IDM. This identifier (8-digit hex string with lower case characters) is used as file name for the export. The convention for the exported configuration file is: *<identifier>.atv*. The filename for each configuration file is shown in the **General settings** of the *Device Properties Dialog* and in the device table.

To export configuration files the following requirements have to be met:

- An export directory has to be configured in the preferences file of the IDM server (see Chapter 2.5). Please note that it is not possible to export the files locally on the client side. The files are always exported on the server side to the export directory configured in the server preferences file.
- The export directory has to be accessible and writeable from the server.
- There has to be enough disk space to export the files.

Configuration pull

The mGuards are able to pull configuration files from an HTTPS server. mGuards running firmware version 5.0 or newer can additionally pull license files.

To use the configuration pull feature please refer to the section *Manual configuration upload* above for a description how to export configuration and license files. Additionally the following requirements have to be met:

- An HTTPS configuration pull server has to be configured (see Chapter 2.9).

- The configuration pull has to be configured on the mGuards (please refer to the mGuard manual).
  Additionally the mGuards have to be configured with the 2 following commands to pull their configuration according to the IDM file name convention:
  ```
  gaiconfig --set GAI_PULL_HTTPS_DIR <your_directory>
  gaiconfig --set GAI_PULL_HTTPS_FILE <identifier>.atv
  ```
- In case that the IDM server and the configuration server are installed on different machines you have to make sure that the IDM export files are synced to the file system of the configuration server.
- Additional steps are necessary if you would like to get a feedback whether or not the configuration pull was successful. IDM is able to receive Syslog messages on port UDP 7514 in order to detect the configuration status of a device if IDM is configured as Syslog server in the configuration server settings.
  Remark: The pull request contains information about the current configuraton status of the mGuard. This information will be sent as Syslog message from the configuration server to IDM. The port on which IDM listens for Syslog messages can be configured in the preferences file of the IDM server (see Chapter 2.5).

Performing an upload

You have the following options to initiate an upload of the configuration to the devices:

- Open the menu **Upload** in the main menu (Chapter 3.7.1) and select which devices should be uploaded (**All**, **Selected** or **Changed**, i.e. all devices with a configuration status of *out-of-date*).
- Select the entry **Upload** in the context menu (right-click on the device table). This will schedule all currently selected devices in the device table for upload.
- Click on the ⬆ icon in the tool bar to initiate an upload for the currently selected devices in the device table.

After initiating the upload please specify which upload method you prefer:

Push upload via SSH

IDM tries to upload all scheduled devices using SSH push.

☞ For SSH upload there has to be an IP address or a hostname specified in the field **Accessible via** in the **General settings** of the *Device Properties Dialog* (see Chapter 4.3). If this is not the case, an error will be displayed in the log window and the upload status will be set to error.

☞ If IDM cannot login to the device due to wrong SSH authentication information, an error will be displayed in the log window and the upload status will be set to error.

☞ If the mGuard is not accessible, IDM will retry to upload the configuration. After the maximum retry count is reached an error message will be displayed in the log window and the upload status will be set to error.

Prepare pull configuration

The configuration of all scheduled devices will be exported to the file system.

☞ The export directory can be configured in the preferences file of the server (see Chapter 2.5).

☞ The filename for each configuration file is shown in the **General settings** of the *Device Properties Dialog* and in the device table.

☞ In case the files cannot be written to the file system (no permission, disk capacity exceeded, export directory not existent, etc.), IDM displays an error in the log and the upload status will be set to error.

Auto

Depending on whether or not **Accessible via** in **General settings** is set, IDM will either perform an SSH upload or an export of the configuration to the file system.

Upload time

You can specify time and date of your upload in case you would like to perform the upload at a later time.

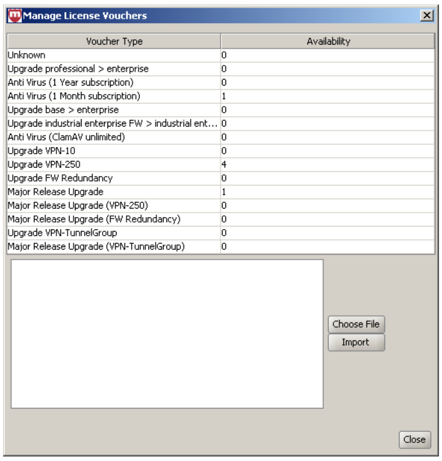
Upload history Shows the upload history. The upload history contains details on the last upload actions and their results for each device. To review the upload history for a device, please select the mGuard in the device overview table and open the context menu with a click with the right mouse button. Select **Upload History** to open a window with the upload history.

3.9 Managing license vouchers and device licenses

IDM enables you to centrally manage your license vouchers and device licenses. The main menu contains two entries: **Licenses » Manage Device Licenses** and **Licenses » Manage License Vouchers** which are explained in detail in the following sections.

Managing License Vouchers

To open the *Voucher Management Window* please select **Licenses » Manage License Vouchers** from the main menu.



Voucher Type	Availability
Unknown	0
Upgrade professional > enterprise	0
Anti Virus (1 Year subscription)	0
Anti Virus (1 Month subscription)	1
Upgrade base > enterprise	0
Upgrade industrial enterprise FW > industrial ent...	0
Anti Virus (ClamAV unlimited)	0
Upgrade VPN-10	0
Upgrade VPN-250	4
Upgrade FW Redundancy	0
Major Release Upgrade	1
Major Release Upgrade (VPN-250)	0
Major Release Upgrade (FW Redundancy)	0
Upgrade VPN-TunnelGroup	0
Major Release Upgrade (VPN-TunnelGroup)	0

Figure 13: The Voucher Management Window

The window shows the available number of vouchers per voucher type. To import vouchers either paste the voucher information into the import field, or select a file that contains the voucher data and then click on *Import*. Only CSV is supported as import format, i.e. each line of the import data has to contain the following information:

<serial number>,<voucher key>

Requesting/ generating licenses

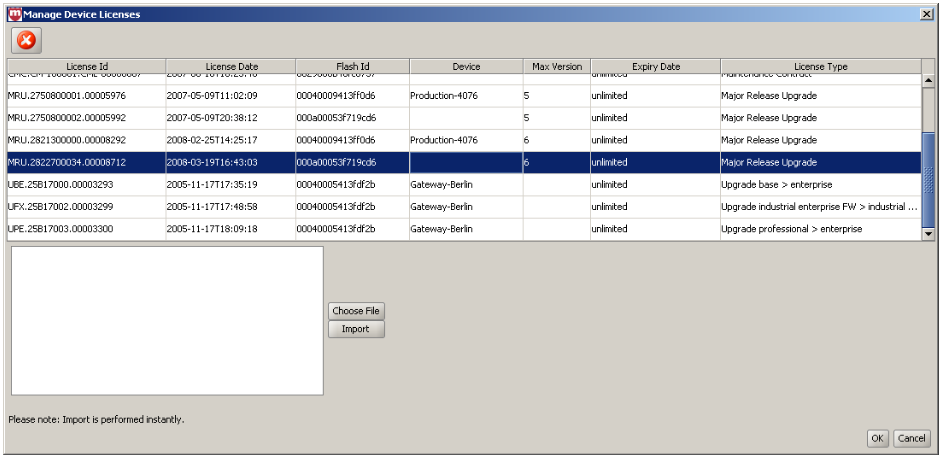
At least one voucher of the corresponding type (major release upgrade, VPN etc.) has to be imported into IDM before requesting a device license. Furthermore the flash ID and the serial number are required for the license request, i.e. the numbers have to be supplied in the **General Settings** of the device. These identification numbers may be entered manually or are automatically requested from the device during the push or pull upload procedure.

To request licenses, select the devices in the device overview table and either press the icon in the tool bar or select **Generate License** from the context menu. The generated licenses are subsequently shown in the *License Management Window* and on the **Management » Licensing** page in the *Device Properties Dialog* and will be installed on the device with the next upload. The result of the license request is also shown in the log window.

☞ IDM has to be able to connect to the Innominate license server in order to generate/request licenses.

Managing Device Licenses

To open the *License Management Window* please select **Licenses » Manage Device Licenses** from the main menu. All licenses managed by IDM and their licenses details are shown in the *License Management Window*. In addition to license requested/generated by the procedure described in the previous section, existing licenses can be imported. To import licenses either type or paste the filenames of the license files (one filename per line) into the import field and click on *Import* subsequently, or click on the *Choose File* button and select one or more files in the dialog.



Manage Device Licenses

License Id	License Date	Flash Id	Device	Max Version	Expiry Date	License Type
MRU.2750800001.00005976	2007-05-09T11:02:09	00040009413ff0d6	Production-4076	5	unlimited	Major Release Upgrade
MRU.2750800002.00005992	2007-05-09T20:38:12	000a00053f719cd6		5	unlimited	Major Release Upgrade
MRU.2821300000.00008292	2008-02-25T14:25:17	00040009413ff0d6	Production-4076	6	unlimited	Major Release Upgrade
MRU.2822700034.00008712	2008-03-19T16:43:03	000a00053f719cd6		6	unlimited	Major Release Upgrade
UBE.25B17000.00003293	2005-11-17T17:35:19	00040005413fdf2b	Gateway-Berlin		unlimited	Upgrade base > enterprise
UFX.25B17002.00003299	2005-11-17T17:48:58	00040005413fdf2b	Gateway-Berlin		unlimited	Upgrade industrial enterprise FW > industrial …
UPE.25B17003.00003300	2005-11-17T18:09:18	00040005413fdf2b	Gateway-Berlin		unlimited	Upgrade professional > enterprise

Please note: Import is performed instantly.

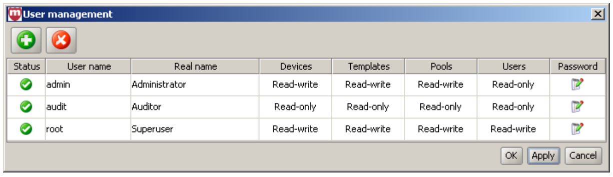
Figure 14: The License Management Window

- ☞ A double-click on a license (row) in the table opens the *Device Properties Dialog* of the corresponding device (if any).
- ☞ All licenses managed by IDM will be installed on the devices with every upload.
- ☞ The licenses are automatically assigned to the devices by using the flash ID contained in the license, i.e. without a flash ID in the *General settings* of the device an assignment of the licenses is not possible.

Refreshing licenses To refresh all licenses in IDM for a device you can select the option **Refresh Licenses** in the context menu of the device overview table. IDM will contact the Innominate license server and retrieve all licenses that were bought for this device. The licenses will be installed with the next configuration upload. You can use this option, if you accidentally deleted licenses in IDM or if you would like to manage an mGuard that has already licenses installed that are not yet managed by IDM.

3.10 Managing users and user permissions

IDM allows to create/delete users and to manage the permissions for each user. To access the user management window select **Users » Manage Users** from the main menu. Figure 15 shows the user management window:



User management

Status	User name	Real name	Devices	Templates	Pools	Users	Password
✓	admin	Administrator	Read-write	Read-write	Read-write	Read-only	✎
✓	audit	Auditor	Read-only	Read-only	Read-only	Read-only	✎
✓	root	Superuser	Read-write	Read-write	Read-write	Read-write	✎

Figure 15: The User Management Window

By default the user accounts for *root*, *admin* and *audit* are set up. As you can see in Figure 15, by default only *root* is allowed to modify users and their permissions. Therefore you first have to login as *root* if you would like to modify the user settings. IDM allows to set permissions (*read-write*, *read-only*) for the following classes of data:

- Devices
- Templates
- Pools

- Users (for *Users* it is additionaly possible to set *no access* as permission)

It is not possible to set up permission for individual devices, templates, pools or users.

☞ IDM user accounts are not related to mGuard users.

☞ The user *root* can neither be deleted nor the permissions of *root* can be changed.

☞ An account that has read-write permission for *Users* can change the password of other accounts without knowing their current password.

☞ Each user can change his own password with the option **Users » Change Own Password** in the main menu, independent from his permission setting for *Users*. To change the current password using the option **Users » Change Own Password** the current password has to be known.

Adding/Deleting users

To add a user, click on the ⊕ icon. To delete a user, select the user in the table and click on the ✖ icon.

Changing user settings

To change a setting, double click on the respective entry in the table; e.g. to change the password of a user, double click on the ✎ icon of the respective user in the *Password* column.

Resetting the root password

If the password for *root* is lost, it is possible to reset it with the following psql command:

```
UPDATE mgnt_system_users SET "password" =
'WNd6PePC4QrGiz2zeKv6bQ==' WHERE "username" = 'root';
```

3.11 Managing firmware upgrades with IDM

IDM supports the management of the firmware of your mGuards. The firmware itself is not uploaded to the device by IDM. IDM instructs the device during the configuration upload to download a firmware upgrade package from an upgrade server and apply it.

Prerequisites

- An upgrade server has to be set up and the required update packages etc. have to be put on the server. The upgrade server has to be accessible from the devices (and not necessarily from IDM).
- The server has to be configured in the device configuration (or in the template configuration). For 4.2 devices please navigate in the *Properties Dialog* to **Management » Firmware upgrade » Upgrade servers** or for 5.0 devices or newer navigate to **Management » Update » Firmware upgrade » Upgrade servers** to add your upgrade server to the configuration.
- If you use the automatic firmware upgrade (see section below) together with a pull upload, make sure that the field **Firmware Version on Device** (see Chapter 4.3) has a valid value. The value can either be entered manually or alternatively IDM will automatically fill in this information after the initial push upload or pull configuration feedback. If entered manually the **Firmware Version on Device** field must *exactly* match the string shown in the icon in the upper-left corner of the mGuard's web interface, e.g. *6.1.0.default*.

Scheduling a firmware upgrade

There are two ways to schedule a firmware upgrade:

- Explicitly specify the target firmware
  To do so please navigate in the *Device Properties Dialog* to **Management » Firmware upgrade » Schedule firmware upgrade** for 4.2 devices or navigate to **Management » Update » Firmware upgrade » Schedule**

firmware upgrade for 5.0 or newer devices. Enter the name of the package in the field **Package set name** and set **Install package set** to **Yes**.

- Perform an automated upgrade
  If you wish to use the automatic upgrade please navigate in the *Device Properties Dialog* to **Management » Firmware upgrade » Schedule firmware upgrade** for 4.2 devices or navigate to **Management » Update » Firmware upgrade » Schedule firmware upgrade** for 5.0 devices. Select one of the following options in **Automatic upgrade**:
  - Install latest patches
    This option will upgrade your device to the latest available patch release, e.g. from release 4.2.1 to release 4.2.3.
  - Install latest minor release
    This option will upgrade your device to the latest available minor release, e.g. from release 5.0.1 to release 5.1.0.
  - Install next major version
    This option will upgrade to the next major release, e.g. from release 4.2.3 to release 5.1.0.
    Please make sure that the major upgrade licenses for the devices are present in IDM (see Chapter 3.9) prior to initiating a major release upgrade.

  Alternatively you can schedule the automatic firmware upgrade for one or more devices using the context menu of the device overview table. Please open the context menu by right-clicking on the device table, then select the desired upgrade option.

  ☞ To finally initiate the firmware upgrade the configuration has to be uploaded to the devices, after performing the steps above.

Canceling the scheduled firmware upgrade

You can unschedule a scheduled firmware upgrade with the option **Unschedule upgrade** in the context menu of the device overview table.

Upgrade process

When performing an upgrade it is important to follow the correct order of the steps. Let us assume you would like to upgrade a device from release 4.2.3 to 5.1.0. The current firmware version configured (in the field **Firmware Version** in the *Device Properties Dialog*) in IDM is 4.2 corresponding to the firmware version on the device, which is also a 4.2 version. This should be indicated in the **Version on Device** field in the device overview table (see Chapter 3.3). Make sure that all required prerequisites (see section *Prerequisites* above) are fulfilled and start a configuration upload for the device (see section *Scheduling a firmware upgrade* above). First the icon in the **Version on Device** column will change to ⏰, indicating that a firmware upgrade has been scheduled with the next upload. As soon as the configuration upload is started, the icon changes to ☕, indicating that a firmware upgrade is ongoing on the device (the ☕ icon is only shown when performing a push upload). IDM polls the device periodically to get a feedback on the result of the firmware upgrade, which will finally be shown in the **Version on Device** field in the device overview table and in the **U** column of the device overview table. The **Version on Device** field should now indicate a firmware mismatch, since the device has been upgraded to 5.1.0, but the IDM configuration for the device is still set to version 4.2. Therefore you should change the firmware version for the device to match the currently installed firmware. This has to be performed *after* the firmware upgrade on the device took place. You can change the firmware version in the field **Firmware Version on Device** in the *Device Properties Dialog* or using the context menu of the device overview table. You can now start to configure features introduced with the new firmware version.

Monitoring the firmware upgrade

The firmware upgrade progress and the result is indicated by the icon in the column **Version on device** in the device overview table. Please refer to Chapter 3.3 for more information.

4 Template, device and pool configuration

4.1 General remarks

The *Device Properties Dialog*, the *Template Properties Dialog* and the *Pool Value Properties Dialog* are used to configure devices, templates, or pools. The device and template dialogs are very similar, therefore the common parts are described in this chapter. Chapter 4.2 and Chapter 4.3 discuss the differences between the two dialogs. The pool configuration is explained in Chapter 4.4. For detailed information on the template and inheritance concept please refer to Chapter 5.

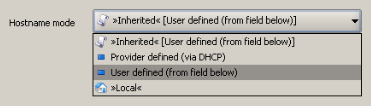
Navigation tree

On the left side of the dialog you can find the navigation tree, which resembles the menu structure of the mGuard Web GUI. Compared to the mGuard GUI the navigation tree contains an additional entry **General Settings**, which contains template and device parameters only used in IDM. For more information on the **General Settings** please refer to the following chapters. The navigation tree also has a context menu, which can be opened by clicking on the tree with the right mouse button. The context menu contains various entries to fold/unfold parts of the tree. Furthermore the context menu shows the key shortcuts to access the menu entries.

mGuard configuration

The navigation tree allows to navigate conveniently to the mGuard variables. If you click on a “leaf” of the tree, the corresponding mGuard variables and the associated settings are shown in the right area of the *Properties Dialog*.

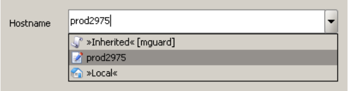
Depending on the variable, different value types can be selected (exemplarily shown for the *Device Properties Dialog)*:



Hostname mode: »Inherited« [User defined (from field below)]

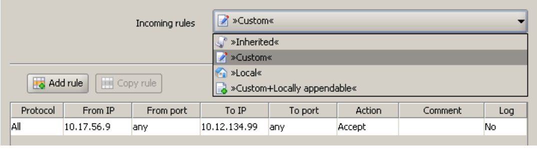
»Inherited« [User defined (from field below)]
Provider defined (via DHCP)
User defined (from field below)
»Local«

Figure 16: Value types of an mGuard variable with a fixed value set



Hostname: prod2975

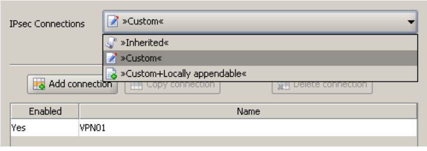
Figure 17: Value types of an mGuard variable with an editable value



Incoming rules: »Custom«

Protocol	From IP	From port	To IP	To port	Action	Comment	Log
All	10.17.56.9	any	10.12.134.99	any	Accept		No

Figure 18: Value types of an mGuard table variable



IPsec Connections: »Custom«

Enabled	Name
Yes	VPN01

Figure 19: Value types of an complex mGuard table variable

Variables with a fixed value set

Variables with a fixed value set allow the following choices:

- **Inherited**
  Set the variable to the default value or to the value defined in an assigned template (if applicable). The usage of templates and inherited values is further explained in Chapter 4.2 and Chapter 5.
- **Local**
  The mGuard supports (among others) two roles, the *admin* who is able to change all mGuard variables and the *netadmin* who is able to change only local variables. The **Local** value determines whether a variable is local, i.e. whether or not it can be managed by the *netadmin* on the mGuard. If a variable is local, it will ***not be managed by IDM anymore*** in order to avoid conflicts between IDM and the *netadmin*.
- **Fixed values**
  A number of fixed values which can be selected for this variable. The selectable values depend on the variable. In the example above (Figure 16) the fixed values are: **Provider defined** and **User defined** for the variable **Hostname mode**.

Variables with an editable value

Variables with an editable value allow the following choices:

- **Inherited**
  See above.
- **Local**
  See above.
- **Custom**
  If you select the **Custom** value entry, the combo box becomes editable and you can enter a specific value for the variable, e.g. **prod2975** in the example in Figure 17. The value you entered is subsequentely shown as available selection in the combo box.

Table variables (e.g. incoming firewall rules)

Table variables allow the following choices (for more information on tables please see below in the Chapter *Modifying mGuard table variables*):

- **Inherited**
  Set the variable to the default rows or to the rows defined in an assigned template (if applicable). The inherited rows are shown at the beginning of the table in a different color and are not editable or selectable. The usage of templates and inherited values is further explained in Chapter 4.2 and Chapter 5.
- **Local**
  See above.
  If you set a table variable to **Local** and IDM shows an error, please check whether *May append* is set as permission in the template (if any). If *May append* is selected as permission for the table in the template, it is only allowed to append rows in the *Device Properties Dialog*, therefore the selection of **Local** results in an error.
- **Custom**
  If you select **Custom** the table and its associated menu elements become enabled. Table rows defined in a template are copied from the template to the device and can be deleted or edited in the *Device Properties Dialog* (please note that deleting or editing the rows does not change the rows in the template). You may also add new rows to the table.

☞ Please note that it is possible to switch between **Custom** and the other value types without losing any data. But if you switch from **Custom** to e.g. **Inherited** and then apply your settings and leave the dialog, all custom rows you entered will be lost.

- **Custom + locally appendable (***Device Properties Dialog* **only)**
  Basically the same as **Custom**, but this option allows the user *netadmin* on the mGuard to add further rows. (The rows defined in IDM cannot be edited or deleted by the user *netadmin* on the mGuard.)

Complex table variables (e.g. VPN connections)

Contrary to “normal” table variables, adding a row to or deleting a row from a complex table variable additionally adds or deletes a node from the navigation tree. An example for a complex table variable are the VPN connections: a VPN connection is represented by a table row in the overview table and by an additional node in the navigation tree, in which the settings for the connection can be made. Please note that the table cells of complex tables are not editable, i.e. all settings have to be made in the leafs of the navigation tree node.

Complex table variables allow the following choices (for more information on tables please see below in the Chapter *Modifying mGuard table variables*):

- **Inherited**
  The behaviour is basically the same as described for the “normal” table variables above. Inherited rows from a template which also appear as navigation tree nodes are all set to read-only if **Inherited** is selected for the complex table variable. The usage of templates and inherited values is further explained in Chapter 4.2 and Chapter 5.
- **Custom**
  If you select **Custom** the table and its associated menu elements become enabled. Contrary to “normal” table variables the inherited table rows are *not* copied from the template to the device when switching to **Custom**. Inherited rows cannot be deleted, but can be edited if **Custom** is selected. Please note that changing or editing the rows does not change the rows in the template. You may also add new rows (nodes) to the table.

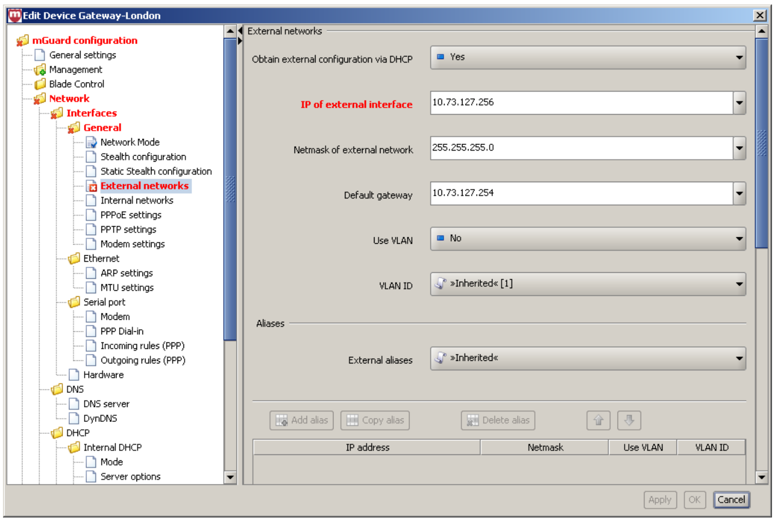
  ☞ Please note that it is possible to switch between **Custom** and **Inherited** without losing any data while the *Properties Dialog* is open. But if you switch from **Custom** to **Inherited**, apply your settings, and then leave the dialog, all custom rows you entered will be lost.

Additional configuration in the template

In the *Template Properties Dialog* you can find additional settings for the variables. These settings are explained in Chapter 4.2.

Indication of invalid input

Invalid input will be immediately indicated by a red variable name and by error icons in the navigation tree, as shown in the following figure for the external IP address:



Edit Device Gateway-London

External networks

Obtain external configuration via DHCP: Yes

IP of external interface: 10.73.127.256

Netmask of external network: 255.255.255.0

Default gateway: 10.73.127.254

Use VLAN: No

VLAN ID: »Inherited« [1]

Aliases

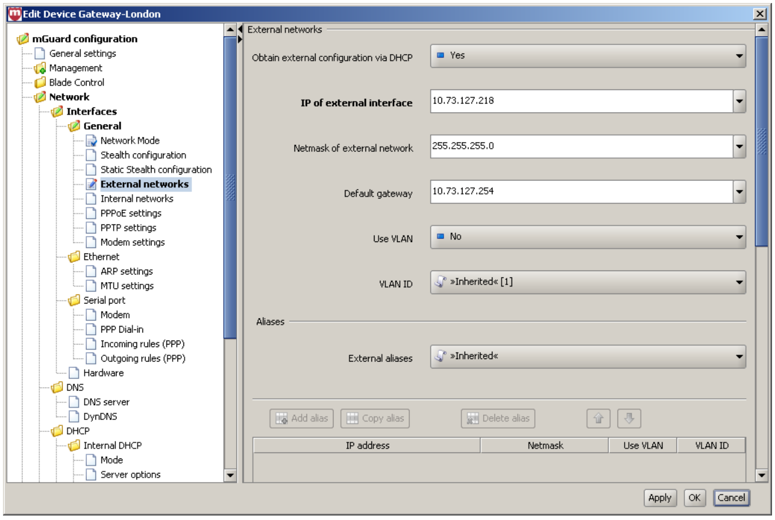
External aliases: »Inherited«

IP address	Netmask	Use VLAN	VLAN ID

Figure 20: Input verification / invalid input

Indication of changed values

The 📝 icon in the leafs of the navigation tree (see the following figure) indicates that a change has been made to a variable in the leaf but has not been applied yet.



Edit Device Gateway-London

External networks

Obtain external configuration via DHCP: Yes

IP of external interface: 10.73.127.218

Netmask of external network: 255.255.255.0

Default gateway: 10.73.127.254

Use VLAN: No

VLAN ID: »Inherited« [1]

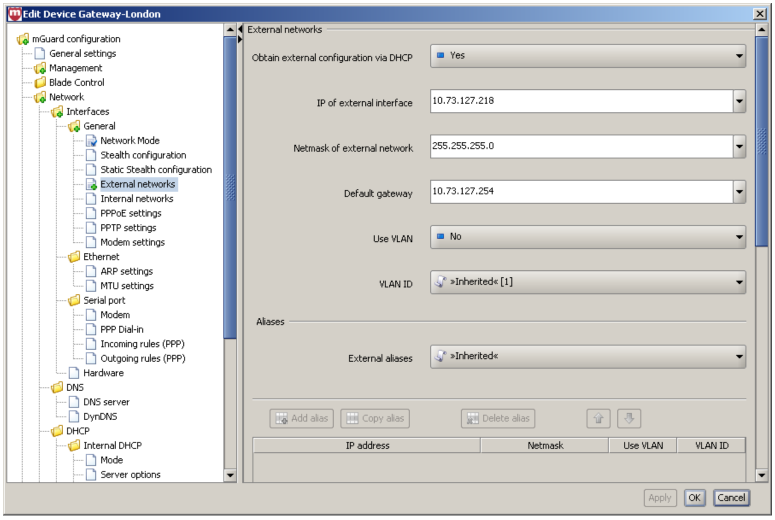
Aliases

External aliases: »Inherited«

IP address	Netmask	Use VLAN	VLAN ID

Figure 21: Indication of non-applied changes

The icon in the leafs of the navigation tree (see the following figure) indicates that settings have been changed in the respective leaf and have been applied.



Edit Device Gateway-London

External networks

Obtain external configuration via DHCP	Yes
IP of external interface	10.73.127.218
Netmask of external network	255.255.255.0
Default gateway	10.73.127.254
Use VLAN	No
VLAN ID	»Inherited« [1]

Aliases

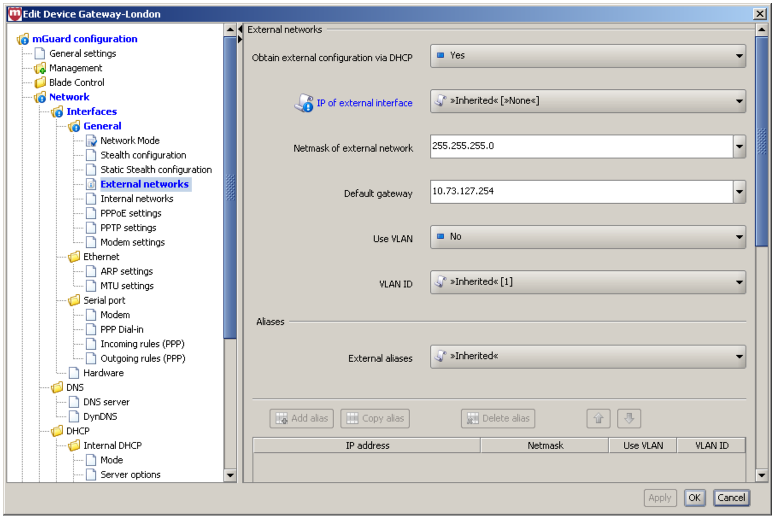
External aliases	»Inherited«

IP address	Netmask	Use VLAN	VLAN ID

Figure 22: Indication of applied changes

Indication of *None* value

The icon in the leafs of the navigation tree (see the following figure) indicates that a **None** value which has not been overridden (set) in the template hierarchy yet is selected in one of the ancestor templates.



Edit Device Gateway-London

External networks

Obtain external configuration via DHCP	Yes
IP of external interface	»Inherited« [»None«]
Netmask of external network	255.255.255.0
Default gateway	10.73.127.254
Use VLAN	No
VLAN ID	»Inherited« [1]

Aliases

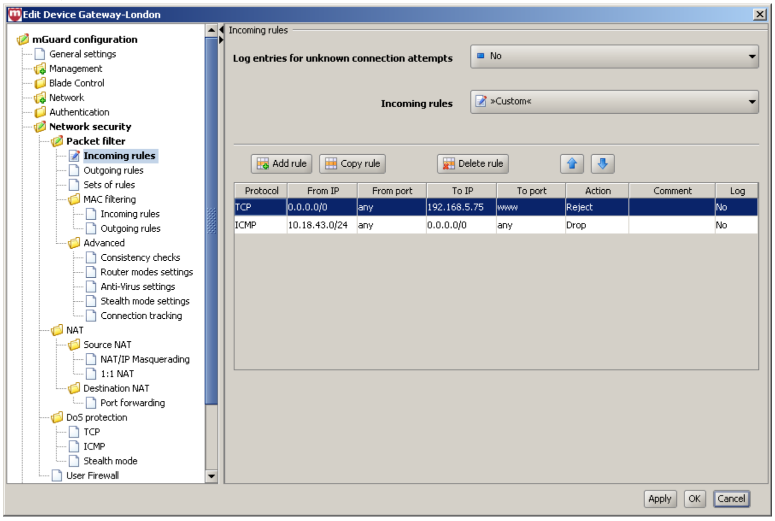
External aliases	»Inherited«

IP address	Netmask	Use VLAN	VLAN ID

Figure 23: Indication of ***None*** *value*

Modifying mGuard table variables

The following figure shows an example of a table variable (incoming firewall rules):



Incoming rules

Log entries for unknown connection attempts: No

Incoming rules: »Custom«

Protocol	From IP	From port	To IP	To port	Action	Comment	Log
TCP	0.0.0.0/0	any	192.168.5.75	www	Reject		No
ICMP	10.18.43.0/24	any	0.0.0.0/0	any	Drop		No

Figure 24: Modifying table variables

Add, delete, copy, or move rows

To add, delete, copy, or move rows, please use the respective buttons.

If none of the rows is selected then a click on the **Add** button will add the row at the beginning of the table. If one or more rows are selected, a new row will be added after the last selected row.

The **Delete** button is enabled only if at least one row is selected. It deletes the selected rows.

The **Copy** button is enabled only if at least one row is selected. It copies the selected rows and inserts them after the last selected row.

The **Move** buttons are enabled only if at least one row is selected. To move the current selection up one row press the ⇧ button; to move it down please press the ⇩ button.

☞ The **Add**, **Delete**, **Copy,** and **Move** buttons are enabled only if either **Custom** or **Custom + locally appendable** is selected. Please refer to the Section *mGuard configuration* above.

Selecting table rows

By clicking on a table row with the left mouse button you select it. Multiple rows can be selected as a contiguous block of rows either by first selecting the upper or lower row of the block and then selecting the opposite row with a left click while holding the <*Shift*> key.

Rows can be added to the selection or removed from the selection by clicking with the left mouse button on the row while pressing the <*Ctrl*> key.

Changing a table cell

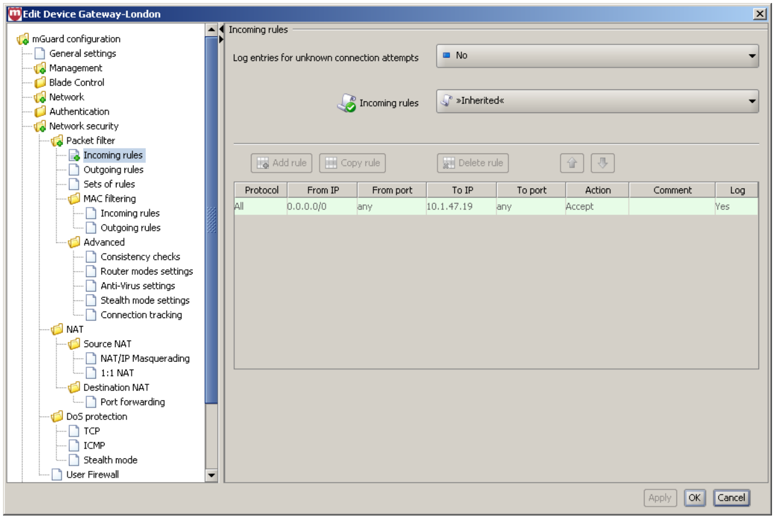
To edit a table cell please double click on the cell with the left mouse button. (A single click selects the table row).

Invalid values in tables

An invalid value in a table will not be indicated in the navigation tree, but the cell will be marked red. If you enter an invalid value in a table cell, and leave the cell e.g. by clicking on another navigation tree node, the last applied (valid) value will replace the invalid input.

Row colors

The rows of a table may have different colors, depending on the type of row. Inherited rows from an ancestor template are colored red, green or grey:



Log entries for unknown connection attempts: No

Incoming rules: »Inherited«

Protocol	From IP	From port	To IP	To port	Action	Comment	Log
All	0.0.0.0/0	any	10.1.47.19	any	Accept		Yes

Figure 25: Table row colors

A green row indicates that the row is editable, a red row indicates that the row cannot be edited or deleted and a grey row indicates that this is an inherited default row (which can be changed).

☞ To change a green or grey row it is necessary to switch the value of the table from **Inherited** to **Custom**.

Context menu

Tables can also be edited using the context menu. Please click on the table with the right mouse button. The following menu will appear:

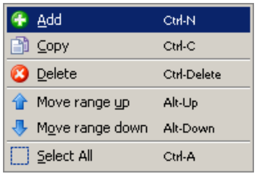
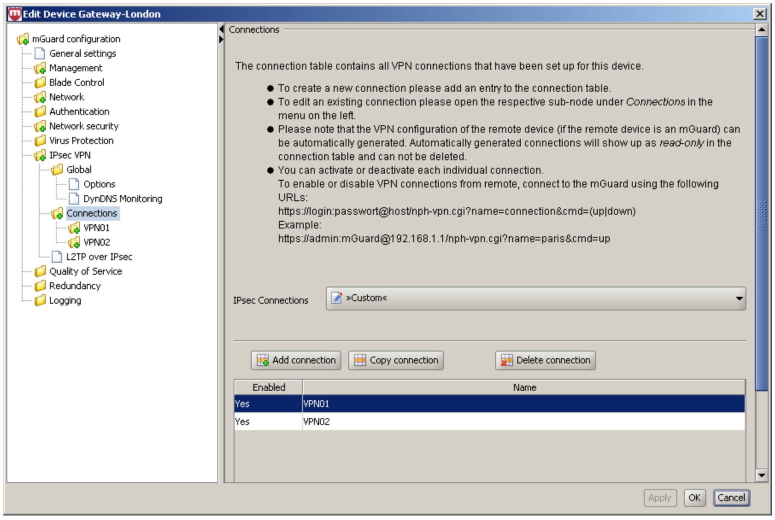


Figure 26: Context menu

Modifying complex table variables

For the definition of a complex table variable please refer to the section *mGuard configuration* above. Basically the previous section also applies to complex table variables. However there are some differences that the user should be aware of.

The following figure shows an example of a complex table variable (VPN connections):



The connection table contains all VPN connections that have been set up for this device.

- To create a new connection please add an entry to the connection table.
- To edit an existing connection please open the respective sub-node under *Connections* in the menu on the left.
- Please note that the VPN configuration of the remote device (if the remote device is an mGuard) can be automatically generated. Automatically generated connections will show up as *read-only* in the connection table and can not be deleted.
- You can activate or deactivate each individual connection.
  To enable or disable VPN connections from remote, connect to the mGuard using the following URLs:
  https://login:passwort@host/nph-vpn.cgi?name=connection&cmd=(up|down)
  Example:
  https://admin:mGuard@192.168.1.1/nph-vpn.cgi?name=paris&cmd=up

IPsec Connections: »Custom«

Enabled	Name
Yes	VPN01
Yes	VPN02

Figure 27: Modifying complex table variables

A complex table does not allow to move rows (the respective buttons are missing). Furthermore the cells of complex tables cannot be edited. Adding a row to a complex table also results in adding a node to the navigation tree (see Figure 27).

☞ The **Add, Copy,** and **Delete** buttons are enabled only if **Custom** or **Custom+Locally appendable** is selected. Please refer to the Section *mGuard configuration* above.

Applying changes to the configuration

Changes made to the configuration are permanently stored with the **Apply** button (at the bottom of the dialog). If you make any changes without applying them, you can discard your changes by closing the dialog with the **Cancel** button. You can also apply your changes by closing the dialog with the **OK** button.

☞ Please note that the configuration is **not** automatically transferred to the mGuard after applying a change. To transfer the configuration to an mGuard, you have to upload the configuration file (please refer to Chapter 3.8) to the mGuard.

4.2 The *Template Properties Dialog*

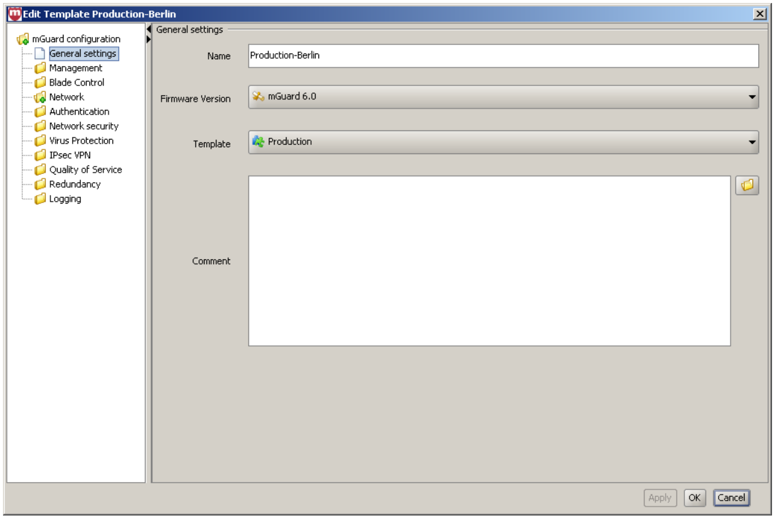
Templates offer a powerful mechanism to conveniently configure and manage a large number of devices.

By assigning a template to a device (cf. Chapter 4.3), the device inherits the template settings and will use the values that are defined in the template. Depending on the permission settings, the template settings might be overridden in the device configuration.

Please read this chapter for an introduction to the template concept and refer to Chapter 5 for detailed information on templates and inheritance.

For information on how to create, delete, or edit templates please refer to Chapter 3.2.

The following screenshot shows the *Template Properties Dialog*:



Edit Template Production-Berlin

General settings

Name: Production-Berlin

Firmware Version: mGuard 6.0

Template: Production

Comment:

Figure 28: The IDM Template Properties Dialog

General settings

Similar to the *Device Properties Dialog* (see Chapter 4.3) the *Template Properties Dialog* contains a menu corresponding to the mGuards Web GUI structure on the left side of the window.

Additionally the *Template Properties Dialog* contains the entry **General settings** for the configuration of parameters related to IDM:

Name

The name of the template.

Firmware version

Since different firmware versions of the mGuard have different sets of variables, the firmware version (or variable set) the template should use, has to be selected here.

☞ It is not possible to downgrade to an older release. So please be very careful when changing the firmware version. See Chapter 5.2.2 for more details.

☞ For more information on how to manage firmware upgrades of your devices with IDM please refer to Chapter 3.11.

Template

The parent template of this template.

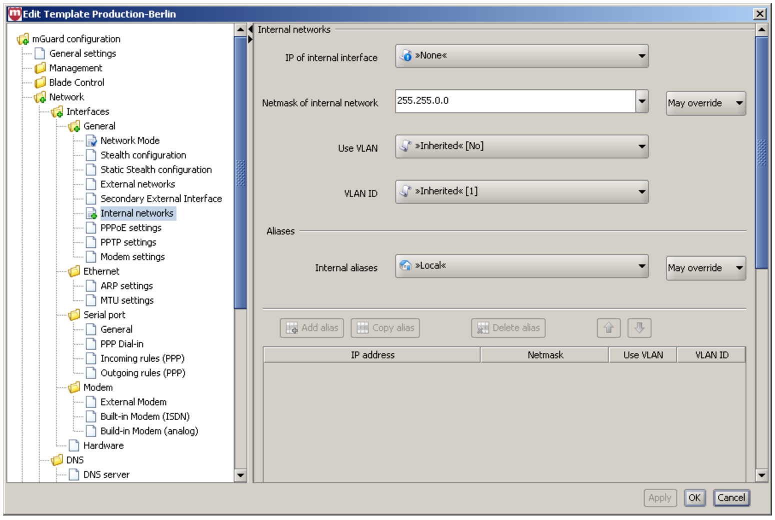
Comment

An additional optional comment which is also shown in the template table of the main window.

4.2.1 Template configuration

As explained above, the navigation tree on the left side of the *Template Properties Dialog* resembles the mGuard menu structure.

Figure 29 shows an example of the configuration for the external interface.



Internal networks

IP of internal interface: »None«

Netmask of internal network: 255.255.0.0 — May override

Use VLAN: »Inherited« [No]

VLAN ID: »Inherited« [1]

Aliases

Internal aliases: »Local« — May override

IP address	Netmask	Use VLAN	VLAN ID

Figure 29: Template configuration

Compared to the *Device Properties Dialog* there are additional settings in the template configuration which are explained in the following sections.

For detailed information on the template and inheritance concept please refer to Chapter 5.

None value type

In the template **None** can be selected as value, as you can see in the variable **Netmask of internal network** in Figure 29. This means that the template designer does not want to define a value in the template, but wants to make sure the value is overridden in an inheriting template or device. Any attempt to upload a device in which a **None** value has not been overridden or has been overridden with a **Local** value results in an error.

Permission setting

In Figure 29 the variable **Netmask of internal network** has an additional permission setting. The permission controls whether and how an inheriting device or template can override the settings. The permission settings can be assigned on a per-variable basis.

☞ Please note that the permission combo box is not visible if **Inherited** or **None** is selected as value.

The following permissions can be selected:

May override

The value can be changed (overridden) in an inheriting template or device.

No override

The value cannot be changed in an inheriting template or device.

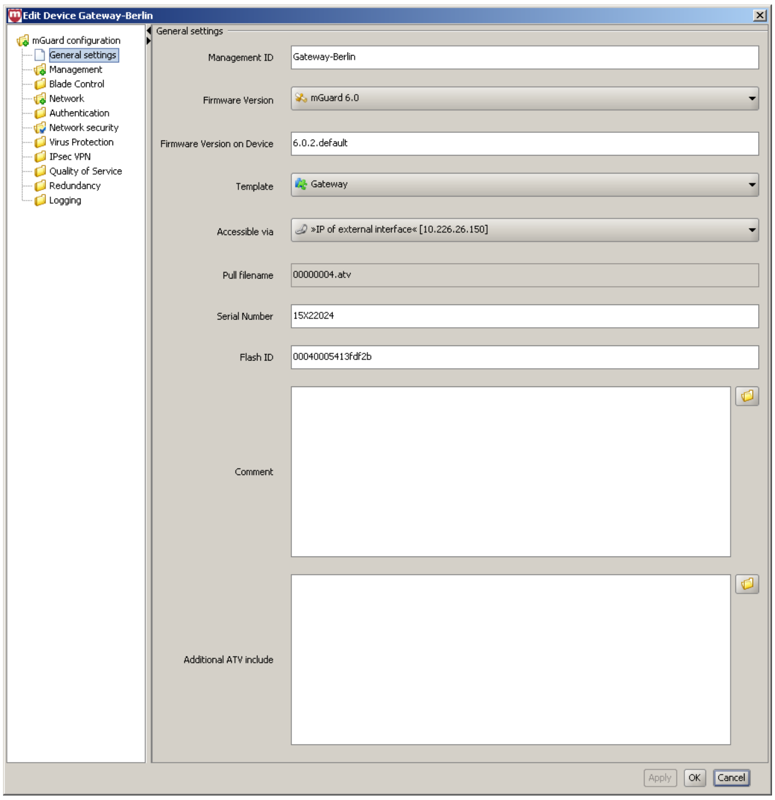
May append

This setting is only available for tables (e.g. firewall rules). If a table variable is set to **May append**, additional table rows can be appended in an inheriting device or template, but the inherited rows cannot be changed or removed.

If **Local** is selected as value and **May append** as permission, new entries can be added in an inheriting device or template, as well as on the mGuard by the *netadmin* user.

4.3 The *Device Properties Dialog*

The *Device Properties Dialog* allows to configure the mGuard variables and their associated settings for a device.
For information on how to create, delete or edit devices please refer to Chapter 3.2.



Edit Device Gateway-Berlin

General settings

Management ID: Gateway-Berlin

Firmware Version: mGuard 6.0

Firmware Version on Device: 6.0.2.default

Template: Gateway

Accessible via: »IP of external interface« [10.226.26.150]

Pull filename: 00000004.atv

Serial Number: 15X22024

Flash ID: 00040005413fdf2b

Comment:

Additional ATV include:

Figure 30: The IDM Device Properties Dialog

Similar to the *Template Properties Dialog* (see Chapter 4.2) the *Device Properties* dialog contains a navigation tree on the left side that resembles the menu structure of the mGuard Web GUI. The navigation tree allows you to conveniently navigate to each mGuard variable.

General settings

The *Device Properties Dialog* contains the entry **General settings** for the configuration of additional parameters related to IDM. The following parameters can be set in the **General settings**:

Management ID

This ID is used to identify the device within IDM. The Management ID must be unique.

Firmware Version

Since different releases of the mGuard software have different sets of variables, the firmware version corresponding to the installed firmware on the mGuard has to be selected here.

☞ It is not possible to downgrade to an older release. So please be very careful when changing the firmware version. See Chapter 5.2.2 for more details.

☞ For more information on how to manage firmware upgrades of your devices with IDM please refer to Chapter 3.11.

Firmware Version on Device

This field represents the firmware version currently installed on the device. It can be manually set, but is overridden with the value found on the device every time a push upload is performed or a pull feedback is received.

Template

The parent template of the device.

Accessible via

This is the address used by the IDM server to access the mGuard for an SSH push of the configuration or to open the web interface. Please refer to Chapter 3.8 for more information on the upload procedure. The following values are available for *Accessible via*:

- Not online manageable
  The device is not managed via SSH push.
- Internal interface (1.1.1.1)
  IDM accesses the mGuard using the address 1.1.1.1 (address of internal interface in stealth mode).
- Stealth management IP address
  IDM accesses the external or internal interface of the mGuard in stealth mode.
- IP of external interface
  IDM accesses the external interface of the mGuard in router mode.
- IP of internal interface
  IDM accesses the internal interface of the mGuard in router mode.
- Custom value
  A custom value might be required to access the mGuard in NAT scenarios. If necessary, you can additionally specify a port number:
  <IPaddress>:<port number> or
  <hostname>:<port number>

Pull filename (read only)

If the configuration is exported to the file system, a unique ID, which is automatically assigned and cannot be changed, is used as name for the configuration file. The filename is shown in this field. Optionally, additional export files following a different naming scheme can be generated; please refer to Chapter 2.5 for more information.

Serial number

The serial number of the device. The serial number is required for the license handling. It can be manually set, but is overridden with the value found on the device every time a push upload is performed or a pull feedback is received. If no push upload is ever performed and no pull feedback is ever received (e.g. in a usage scenario where the exported configuration profiles are installed manually on the devices), the serial number has to be entered here if you would like to create pull configuration filenames containing the serial number.

Flash ID

The flash ID of the device. The flash ID is required for the license handling. This field can be manually set, but is overridden with the value found on the device every time a push upload is performed or a pull feedback is received.

Comment

An optional comment.

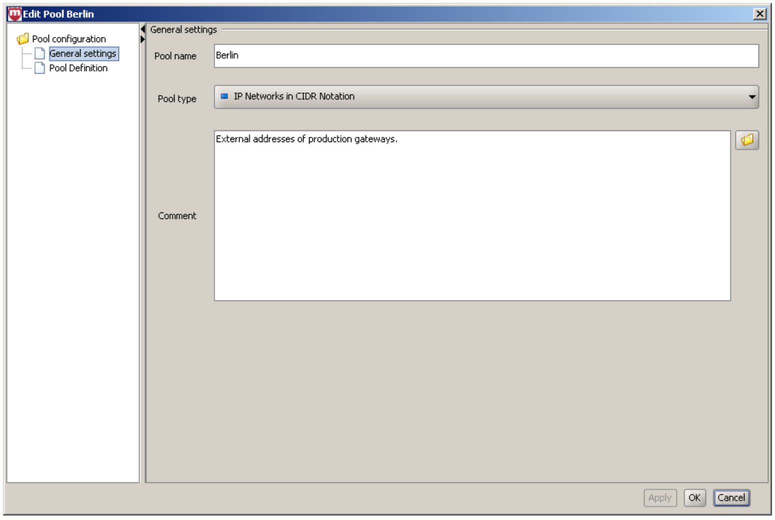
Additional ATV include

This is a text field for additional settings that should be included in the configuration file of the mGuard. The input has to adhere to the mGuard configuration file conventions. You can also import the contents of a text file in the field by selecting a file with the *File Chooser* icon.

☞ Please note that the included configuration will be appended to the generated IDM settings, and therefore settings for the same variable in the include field will override settings generated by IDM.

4.4 The *Pool Properties* Dialog

The *Pool Properties Dialog* allows to define value pools, which can be used to automatically configure certain variables (e.g. the virtual address for VPNs). Currently IDM allows to define address range pools (CIDR notation), see below for an example.



Pool name: Berlin

Pool type: IP Networks in CIDR Notation

Comment: External addresses of production gateways.

Figure 31: The IDM Pool Properties Dialog

General settings

The entry **General settings** contains the following parameters for the pool:

Name

A name for the pool. This name will be used when referencing the pool in a variable (see section *Pool values usage in variables* below).

Pool type

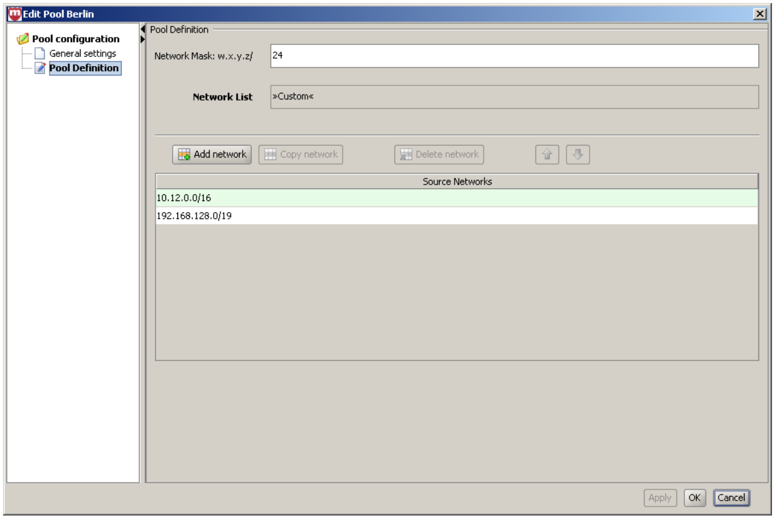
Currently only the pool type *IP Networks in CIDR Notation* is available.

Comment

A comment (optional).

Pool definition

The entry **Pool Definition** allows to define the value range of the pool and the address range of the values to be taken out of the pool. The following figure contains an example of a pool definition:



Pool Definition

Network Mask: w.x.y.z/ 24

Network List »Custom«

Source Networks
10.12.0.0/16
192.168.128.0/19

Figure 32: Definition of a CIDR pool

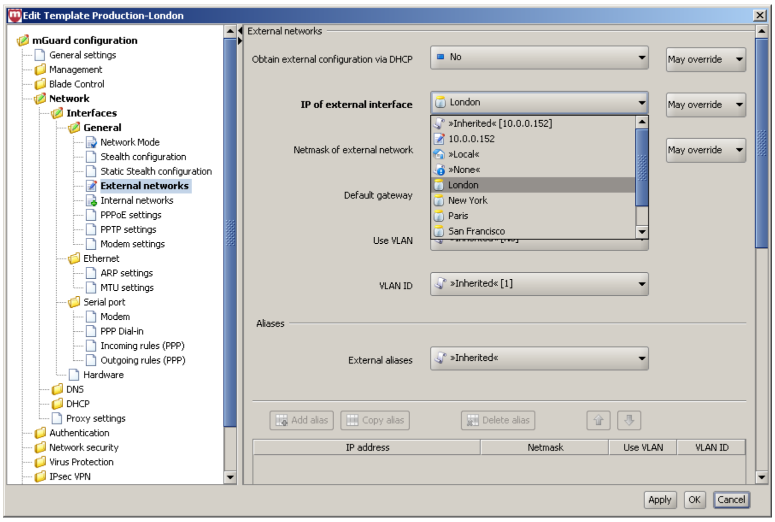
The CIDR pool in the example contains all addresses defined in the table **Network List**. The field **Network Mask** defines the range of single values to be taken out of the pool, i.e. when using this pool in a variable, IDM will automatically assign an IP address range with a mask of 24 out of the available Source Networks to that variable.

E.g. if the pool is used for the template variable **Remote network** (in a VPN connection), then IDM will automatically assign a value to the variable **Remote network** of all devices using the respective template. The pool overview table in the main window shows how many values have been taken out of the pool (*Use count*) and how many values are still available in the pool (*Available count*)

☞ Please note that once defined, it is not possible to change or delete the source address ranges and the network mask in the pool any more, e.g. it is not possible to decrease the network range 10.12.0.0/16 to 10.12.0.0/19 in the example above. It is only possible to add further ranges to the pool, i.e. increase the pool value range. Please carefully plan the definition of the pool ranges in advance.

Pool value usage in variables

Pool values can only be used in templates. For certain variables you can choose the pool you would like to use from the drop down box, e.g. in Figure 33 a number of pools (*London, New York, Paris,* etc.) are available to be used for the variable *IP of external interface*. Only pools that match the variable type (e.g. CIDR pool and variable of type IP address) are shown in the drop down box. If a pool is used in a template, no value is assigned to the respective variable, the pool is only referenced at this point. Therefore the *Reference count* in the pool table will be increased by one. If a value is assigned to a variable (which happens on device level, not on template level) the *Use count* is increased by one. This assignment happens automatically either if the *Device Properties Dialog* for the respective device is opened, or if the configuration for the device is uploaded to the mGuard.



External networks

Obtain external configuration via DHCP: No — May override

IP of external interface: London — May override

Netmask of external network — May override

Default gateway

Use VLAN

VLAN ID: »Inherited« [1]

Aliases

External aliases: »Inherited«

IP address	Netmask	Use VLAN	VLAN ID

Figure 33: Usage of pool values

The following should be kept in mind when working with pools:

- ☞ In a variable that requires an IP address (not an IP network) only pools with a network mask of *32* can be referenced.
- ☞ If you decide to override a pool value in a device, the assigned pool value is not returned to the pool (i.e. the *use count* is not decreased), but remains assigned “in the background”, in case you decide to use the inherited value again.
- ☞ Pools must be large enough to provide a value for every device that inherits from the template in which the pool is referenced, even if some of the devices override their respective pool value (see above).

4.5 VPN configuration

With IDM you can easily generate the configuration for a large number of VPN tunnels. In general, the information contained in Chapter 4.1, Chapter 4.2, Chapter 4.3 and Chapter 5 applies also to the VPN configuration. But VPNs require some special settings to be taken into consideration, which are explained in this chapter, e.g. the automatic configuration of the VPN peer. You can find the VPN configuration in the node **IPsec VPN** of the navigation tree.

Adding and editing VPN connections

To add, change or delete VPN connections, please open the node **IPsec VPN » Connections**. To create a new connection, create a new table row (see Chapter 4.1, *Modifying table entries*). As soon as you create a connection, it appears as node in the navigation tree. To edit the connection, open its node in the navigation tree and navigate to the desired settings. The structure of the connection node resembles the menu structure on the mGuard.

- ☞ The connection table is read-only, i.e. you have to navigate to the respective node to make changes to the connection, e.g. change the name of the connection or disable a connection.
- ☞ Please note that the permission setting of the connection table in a template applies to the table only, and not to the contents of the connections. If you set the table to *No override*, the settings of the VPN connection can still be modified on a device which uses this template,

but the user on the device level is not allowed to add further connections to the table.

Automatic configuration of the VPN peer

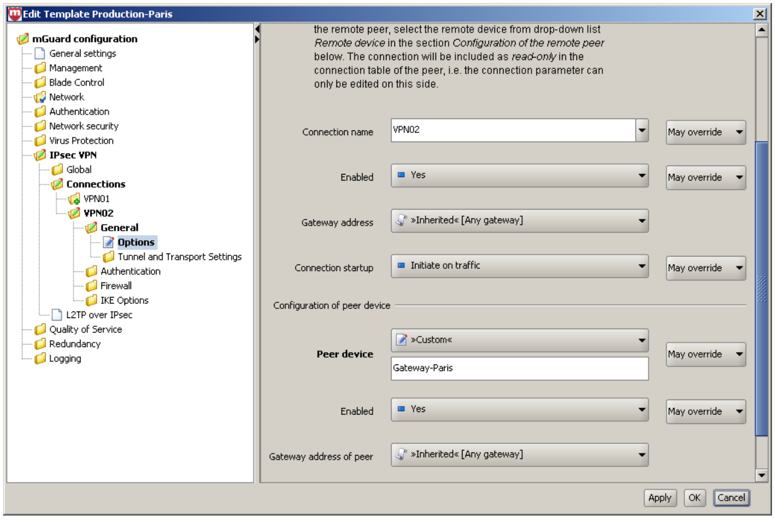
You can automatically generate the VPN configuration for the peer device (see Figure 34): Place the cursor in the field **Peer device** and press the *Cursor Down* key. A list of available devices appears. You can limit the number of devices in the list by entering the first characters of the Management ID of the desired device. If you select a device, the VPN configuration for this device will be automatically generated.

☞ Not all settings of the peer can be automatically generated, therefore you have to enter parts of the configuration manually. Please check the subnodes of the VPN connection for those settings, they are in the relevant subnodes separated from the other settings by the text **Configuration of peer device** (for an example see Figure 34).

☞ The automatically generated VPN connections show up as read-only in the peer connection table, i.e. you cannot change the configuraton on the peer side.

☞ If the VPN gateways have different firmware versions the configuration of a peer is only possible in the *Properties Dialog* of the device with the *older* firmware version. If you configure the peer in the *Properties Dialog* of the device with newer firmware the connection will not be generated in the device with the older firmware. There will be no error or warning displayed.

☞ The automatically generated VPN connections can be used as alternative to the mGuard *Tunnel Group* feature (mGuard 5.0 or newer), see comments in section *Hints for VPN configurations* below.



the remote peer, select the remote device from drop-down list *Remote device* in the section *Configuration of the remote peer* below. The connection will be included as *read-only* in the connection table of the peer, i.e. the connection parameter can only be edited on this side.

Connection name: VPN02 — May override

Enabled: Yes — May override

Gateway address: »Inherited« [Any gateway]

Connection startup: Initiate on traffic — May override

Configuration of peer device

Peer device: »Custom« Gateway-Paris — May override

Enabled: Yes — May override

Gateway address of peer: »Inherited« [Any gateway]

Figure 34: Automatic configuration of VPN peer

Hints for VPN configurations

These hints are useful if the tunnel group feature is not used and the VPN connections are explicitly defined:

☞ In 1:N VPN configurations it is recommended to define the VPN connection in a template and select the central device in the **Peer device** field (See section *Automatic configuration of peer* above). If you assign this template to the devices IDM will automatically generate the N connection configurations for the central device.

☞ In a 1:N VPN configuration it is required for the configuration of the peer to specify the gateway address of the current device (see Figure 34, **Configuration of peer device » Gateway address of peer**). If certificates are used *%any* (as shown in Figure 34) can be used as address in the template, but if PSK authentication is used, *%any* is not allowed. If PSK authentication is used, the external address (if no NAT us used) has to be entered into the field **Configuration of peer device » Gateway address of peer** for each device.

4.6 Managing X.509 certificates

The functionality of the certificate management depends on the mGuard release. Beginning with mGuard firmware release 5.0 it is possible to:

- manage multiple machine certificates (prior to release 5.0 only one machine certificate was supported)
- manage CA certificates (prior to release 5.0 CA certificates were not supported)
- manage connection certificates at a central location (prior to 5.0 the connection certificate was part of the VPN connection only; beginning with 5.0 the connection certificates can be managed centrally and then be referenced for SSH or HTTPS authentication)
- manage CRLs (prior to release 5.0 CA CRLs were not supported)

Exporting Certificates

You can export certificates, e.g. if you would like to use the machine certificate as connection certificate for a VPN connection. To export a certificate please navigate to the respective certificate table (see below for more information) and click on the **Export** button. You can export the certificate to a folder of your choice.

4.6.1 Machine certificates

You can either import a machine certificate (*PEM* or *PKCS#12* file) or, if you would like to use the IDM CA, you can request a certificate from the CA.

☞ In a template it is not possible to request or import a machine certificate. (It is only possible to import the connection certificate of the peer).

☞ The file to be imported can be in *PEM* format containing the unencrypted private key and the certificate, or in *PKCS#12* format protected by a password. The file type is automatically detected. When importing a *PKCS#12* file, a dialog asking for the password is displayed.

You can convert a *PKCS#12* file to *PEM* using the command:

```
openssl pkcs12 -in inputfile.p12 -nodes -out
outputfile.pem
```

Requesting a machine certificate

☞ In order to request a certificate from the IDM CA, the CA component has to be installed (see Chapter 2.7).

Prior to requesting a certificate make sure that the certificate attribute fields contain the desired values (for mGuard firmware 4.2 navigate to **IPsec VPN » Global » Machine certificate » Certificate attributes**, for mGuard firmware 5.0 or newer navigate to **Authentication » Certificates » Certificate settings** and **Certificate attributes**).

To request a certificate select the device in the device overview table and select **Request additional certificate** or **Request replacement certificate** from the context menu. The difference is that **Request additional certificate** will append the new certificate to the list of existing certificates while **Request replacement certificate** will replace the existing certificates with the new one, so that the device ends up with a single machine certificate.

The IDM server will request certificate(s) from the CA and will assign them to the device(s).

☞ OCSP and CRLs are not supported by mGuard 4.2. Nevertheless, if you would like to use firmware releases newer than 4.2 with CRL/OCSP support, you should configure values for these attributes.

Importing a machine certificate (mGuard firmware 4.2)

To import a certificate navigate to **IPsecVPN » Global » Machine certificate » Machine certificates** and click on the **Import** button (the **Import** button is only enabled if **Custom** or **Custom+Locally appendable** is selected as value for the machine certificate table). Select the file containing the machine certificate and click on **Open**. The machine certificate is subsequently shown in the table if the import was successful, otherwise an error message will be displayed.

☞ Only the first entry of the machine certificate table is used as machine certificate.

Importing a machine certificate (mGuard firmware 5.0 or newer)

To import a certificate navigate to **Authentication » Certificates » Machine Certificates** and click on the **Import** button (the **Import** button is only enabled if **Custom** or **Custom+Locally appendable** is selected as value for the machine certificate table). Select the file containing the machine certificate and click on **Open**. The machine certificate is subsequently shown in the table if the import was successful, otherwise an error message will be displayed.

Deleting machine certificates

To delete a machine certificate, navigate to **Authentication » Certificates » Machine Certificates,** select the certificate in the certificate table and click on the **Delete certificate** button.

☞ Deleting a certificate does not automatically revoke the certificate.

Revoking machine certificates

To revoke a machine certificate, navigate to **Authentication » Certificates » Machine Certificates,** select the certificate and click on the button **Revoke certificate**. This button is enabled only if exactly one machine certificate is selected. After revoking a certificate the text *** *REVOKED* *** is automatically shown in the corresponding info field of the table. Any time a certificate is revoked, the IDM CA exports a new file containing all revoked certificates of this issuer. For more information on the export of CRL files please refer to Chapter 2.7.5.

☞ CRLs are only supported by mGuard firmware 5.0 and newer.

☞ Revoking a certificate does not delete the certificate from the table.

4.6.2 CA certificates (mGuard firmware 5.0 or newer)

Importing CA certificates

Beginning with mGuard release 5.0 CA certificates (root or intermediate) are supported. To import a CA certificate navigate to **Authentication » Certificates » CA Certificates** and click on the **Import** button (the **Import** button is only enabled if **Custom** or **Custom+Locally appendable** is selected as value for the CA certificate table). Select the file containing the CA certificate and click on **Open**. The CA certificate is subsequently shown in the table if the import was successful, otherwise an error message will be displayed.

4.6.3 Remote certificates (mGuard firmware 5.0 or newer)

Importing remote certificates

To import a remote certificate navigate to **Authentication » Certificates » Remote Certificates** and click on the **Import** button (the **Import** button is only enabled if **Custom** or **Custom+Locally appendable** is selected as value for the remote certificate table). Select the file containing the remote certificate and click on **Open**. The remote certificate is subsequently shown in the table if the import was successful, otherwise an error message will be displayed.

4.6.4 Connection certificates

Importing connection certificates

The connection certificate can only be imported in a VPN connection. To import the certificate navigate to **IPsec VPN » Connections »** ***connection_name*** **» Authentication.** To import a certificate select **Custom** as value for the **Remote X.509 certificate** and click on the 📁 icon. Select the file containing the certificate and click on **Open**. Subsequently the content of the file is shown in the certificate field. The validity of the data is checked when uploading the configuration to the mGuard.

4.7 Using X.509 certificates (mGuard firmware 5.0 or newer)

The certificates which are managed in the tables discussed in Chapter 4.6 can be used for the configuration of SSH and HTTPS authentication. The usage is exemplarily explained for the SSH authentication. Please navigate in the *Device Properties Dialog* to **Management » System settings » Shell access » X.509 authentication**. To use a certificate, e.g. a CA certificate, you have to select **Custom** for the CA certificate table and then click on **Add certificate**. Please enter the *short name* of the certificate as specified in the CA certificate table in **Authentication » Certificates » CA Certificates**. IDM does not check whether the *short name* of the certificate exists.

4.8 Rollback support

Configuration rollback is supported on devices with firmware version 5.0 or newer. A rollback is performed by the device if it cannot access the configuration pull server after applying a pull configuration (this is interpreted by the device as misconfiguration). To enable rollback for a device please navigate in the *Properties Dialog* to **Management » Configuration Pull** and set the option **Rollback misconfigurations** to **Yes**.

5 Working with templates

Changes made to a template can potentially affect a large number of devices or other templates. Therefore please keep the following rules in mind when working with templates:

- Before making changes to a variable in a template, make sure that the effect on inheriting templates or devices is really desired.
- In particular, changes to a variable permission can have an irreversible effect on inheriting templates or devices. E.g. if a permission is changed from **May override** to **No override**, the value of the variable is discarded in all inheriting templates and devices.
- Templates that are still assigned to devices or other templates cannot be deleted.

This chapter gives more detailed information on the template mechanism.

5.1 Inheritance

Templates are the means to efficiently configure a large number of devices. Templates contain the common aspects of a group of devices or a group of child templates. By assigning a template to a child (this may be a device or another template) the child “inherits” the parent template’s settings and may optionally override some of the settings (if the permission in the parent template allows this). Any change made to the parent template will potentially have an impact on all inheriting templates and devices, depending on the setting of the value and permission in the parent template.

The permission setting in a template limits the choices in inheriting templates and devices.

Whether or not a child inherits settings from an ancestor template is indicated by an icon in front of the variable name in the *Properties Dialog*. If no icon is shown, then either there is no template assigned, or the variable has the value **Inherited** in all ancestor templates, i.e. no restrictions are defined for this variable.

According to the permissions listed in Chapter 4.2.1 the following icons are shown in front of the variable name:

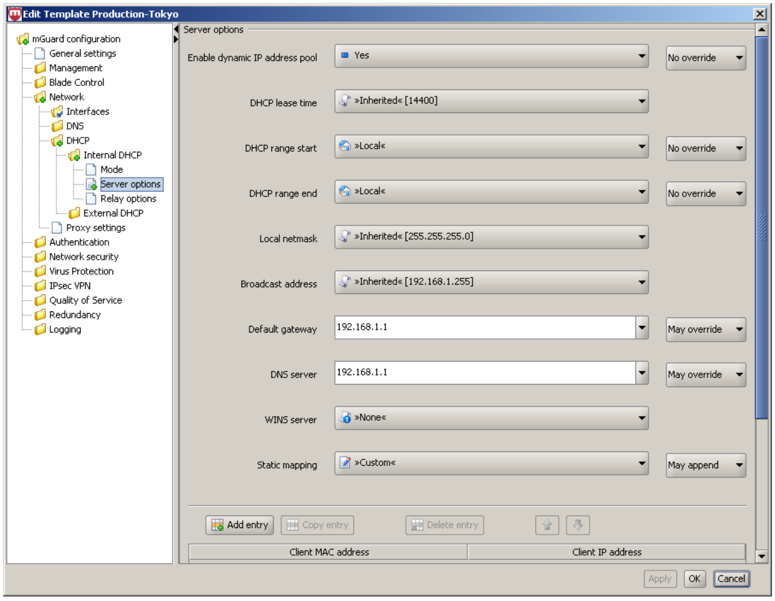
✓ May override.

☒ No override.

+ May append (tables only).

ℹ No value defined (value = **None**), i.e. the value has to be set in the *Device Properties Dialog* or in one of the intermediate templates.

The following figures illustrate the inheritance mechanism. Figure 35 shows the settings for the *DHCP server options* in the parent template.



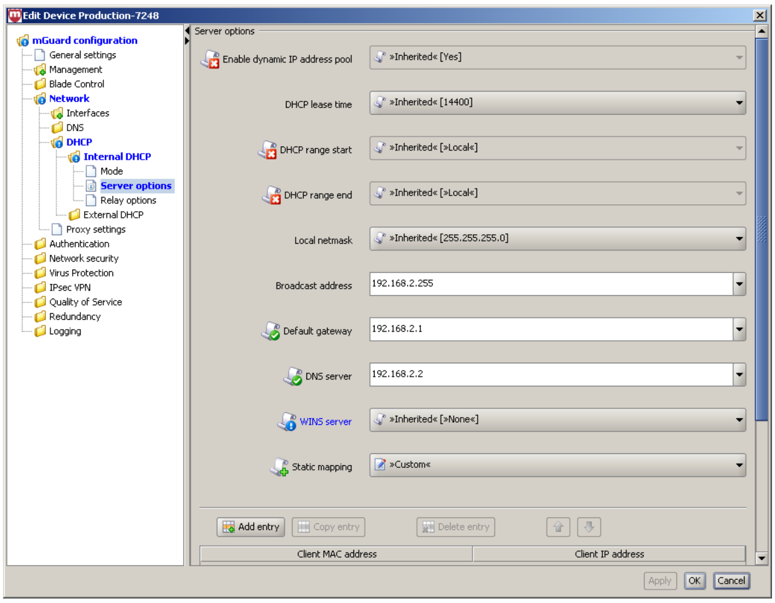
Server options

Enable dynamic IP address pool	Yes	No override
DHCP lease time	»Inherited« [14400]	
DHCP range start	»Local«	No override
DHCP range end	»Local«	No override
Local netmask	»Inherited« [255.255.255.0]	
Broadcast address	»Inherited« [192.168.1.255]	
Default gateway	192.168.1.1	May override
DNS server	192.168.1.1	May override
WINS server	»None«	
Static mapping	»Custom«	May append

Client MAC address	Client IP address

Figure 35: Settings in the parent template

Figure 36 shows the settings in the device configuration (child). They are the result of values and permissions inherited from the parent template and modifications made in the device.



Server options

Enable dynamic IP address pool	»Inherited« [Yes]
DHCP lease time	»Inherited« [14400]
DHCP range start	»Inherited« [»Local«]
DHCP range end	»Inherited« [»Local«]
Local netmask	»Inherited« [255.255.255.0]
Broadcast address	192.168.2.255
Default gateway	192.168.2.1
DNS server	192.168.2.2
WINS server	»Inherited« [»None«]
Static mapping	»Custom«

Client MAC address	Client IP address

Figure 36: Settings in the inheriting device

Enable dynamic IP address pool

This variable is set to **Yes** in the template and the permission is set to **No override**. Therefore the value of the variable cannot be changed in the device configuration. This is indicated by the disabled controls and by the ☒ icon in front of the variable name in the *Device Properties Dialog*.

DHCP range start, DHCP range end

These variables are set to **Local** and the permission is set to **No override**, i.e. the **Local** setting cannot be changed in the device configuration. These values have to be set by the *netadmin* of the mGuard and are not managed by IDM.

Local netmask, Broadcast address

There are no restrictions for these variables defined in the template, indicated by the missing icon in front of the variable name in the *Device Properties Dialog*. In the example the device configurator decided to use a custom value for **Broadcast address** and the (inherited) default value for **Local netmask**.

Default gateway

The value of this variable is set in the template and the permission is set to **May override**. Therefore the value of the variable can be changed in the device configuration. This is indicated by the enabled controls and by the ✓ icon in front of the variable name. In the example the value from the template is overridden with a custom value.

DNS server

The value of this variable is set in the template and the permission is set to **May override**. Therefore the value of the variable can be changed in the device configuration. This is indicated by the enabled controls and by the ✓ icon in front of the variable name. In this example the value from the template is overridden in the device configuration with a custom value.

WINS server

The value of this variable is set to **None** in the template. Therefore a value for this variable ***has to be assigned*** in the device configuration. This is indicated by the ℹ icon in front of the variable name and the blue-colored label. If a device for which **None** values have not been assigned is uploaded, an error occurs.

Static mapping

In the template, the table **Static mapping** is set to **Custom** and its permission is set to **May append**. As Figure 36 shows, rows can be added to the table in the device configuration after switching the table variable to **Custom**. Rows inherited from the template cannot be changed.

5.2 Miscellaneous

5.2.1 *Complex table variables and permissions*

The permission setting for complex table variables (see Chapter 4.1) in the parent template applies to the table itself, but not to the contents of the rows. If the table is set to **No Override**, it is not possible to add or delete rows in the child configuration, but it might be possible to change the value of variables in the inherited rows in the child. Each variable of a row (node) has a separate permission setting in the parent template that determines whether the variable can be overridden in the child. The permission setting of the table and the permission setting of a single variable within the table are completely independent.

5.2.2 *Firmware release settings and inheritance*

Certain restrictions apply to the **Firmware Version** setting in the **General Settings** of the child and the parent template:

- A child cannot inherit from a parent template that has a newer firmware version than the child itself.
- It is possible to change the firmware version of a parent template to a newer version only if all childs inheriting from the parent template are already set to the new firmware version.

6 Glossary

admin / netadmin (on the mGuard)

The user *admin* (mGuard user) can change all settings of the mGuard, whereas the user *netadmin* can change only local variables.

AIA

The certificate extension called Authority Information Access (AIA) indicates how to access CA information and services for the issuer of the certificate in which the extension appears. Such an extension is used to identify the OCSP server which provides current revocation status information for that certificate. IDM supports the inclusion of an AIA extension containing the URL of a single OCSP server. For detailed information on the AIA extension please refer to RFC 3280.

CDP

The certificate extension called CRL Distribution Points (CDP) identifies how CRL information is obtained for the certificate the extension is included in. IDM supports the creation of certificates containing the CDP extension with a single *http://* URL enclosed therein. The URL specifies the download location of the actual CRL. For more detailed information on CRL Distribution Points please refer to RFC 3280.

CRL

A Certificate Revocation List (CRL) is issued regularly by a Certification Authority (CA) to provide (public) access the revocation status of the certificates it issued. A CRL is a list of revoked certificates identified by serial number. Once a certificate is revoked, it is considered to be invalid. A revocation becomes necessary in particular, if associated private key material has been compromised. For more detailed information on CRLs please refer to RFC 3280.

Local (mGuard) variables

Local mGuard variables are not managed by IDM, but only by the *netadmin* locally on the mGuard. Within IDM (in the *Template Properties Dialog* or the *Device Properties Dialog*) each variable can be defined as local variable by selecting **Local** as value.

Inherited value

Devices or templates using a parent template “inherit” the values defined in the parent template. Depending on the permission setting, the inherited value can or cannot be overridden in the inheriting devices and templates.

Management ID

A unique logical identifier independent of the physical hardware that identifies each device, as opposed to an identifier of the physical device, e.g. the serial number.

OCSP

The Online Certificate Status Protocol (OCSP) specifies the message format for a service responding with actual revocation status information on individual certificates upon request. Such a service is conventionally embedded within an HTTP server. Thus most OCSP servers use HTTP as transport layer for the OCSP messages. Such an OCSP server is operated by some Certification Authorities as alternative to or replacement for CRLs. For detailed information on OCSP please refer to RFC 2560.

Permissions

The permissions in a template determine whether the user configuring an inheriting device or template can override/modify the settings of the parent template.

Regular expressions

Regular expressions are text strings to match portions of a field using characters, numbers, wildcards and metacharacters. Regular expressions can be used in IDM to filter the device, template, or pool table. For detailed information on regular expressions please refer to *www.regular-expressions.info*.

Template

A set of mGuard variables and the corresponding values and permissions. The template can be used (i.e. inherited from) by a device or another template. A change in the template applies to all inheriting devices and templates, depending on the access privilege settings. The template is used in IDM only, but not on the mGuard.
See also *Inherited value* and *Permissions*.

X.509 certificates

Digital certificates have been specified in the standard X.509 issued by the ITU-T. A profile of that standard is published as RFC 3280. Such certificates certify the identity of an entity. The certificate includes the entity's public key and an electronic signature from the Certification Authority (CA). X.509 certificates are organized hierarchically: A root CA creates a self signed trust anchor which needs to be configured as such for applications verifying digital signatures or certificates. The identity and trustworthyness of the intermediate CAs is certified with a CA certificate issued by the root CA respectively the upstream intermediate CA. The identity of the end entities is certified with a certificate issued by the lowest CA. Each certificate can contain extensions for the inclusion of arbitary additional information. The IDM supports the creation of end entity certificates for VPN connection end points and the optional inclusion of the CDP and AIA extensions. For detailed information on digital certificates please refer to RFC 3280.

7 Creating and managing certificates

It is assumed that the reader has a basic knowledge of certificates and public key encryption.

This chapter explains the usage of *OpenSSL* to create certificates.

It is important to note that IDM requires two different types of certificates and keys:

- Certificates and keys used to secure the communication between the IDM components.
- Certificates and keys used for the PKI.

How to create certificates and keys to be used for the SSL communication is explained in Chapter 7.1. The certificates and keys used in a PKI are described in Chapter 7.2.

☞ Please note that the process described in this section to create certificates is just one example of the usage of OpenSSL. There are also alternative ways to create your certificates. If you are not familiar with *OpenSSL* you should *exactly* follow the instructions below.

☞ The use of OpenSSL 0.9.8 or newer is recommended, due to the support of SHA-256. If you would like to use an OpenSSL version older than the recommended version 0.9.8 you have to use a digest algorithm supported by your version in the commands.

Keystores

Certificates and keys are stored in databases called keystores. A keystore is a file, containing the certificates and keys in encrypted form. To access the information in a keystore a passphrase is required. Keystores can have different formats, common formats are e.g. *PKCS#12* or the proprietary Java Keystore format (JKS). The encryption algorithm can usually be selected when creating the keystore. 3DES is recommended.

The *OpenSSL* configuration file

OpenSSL uses default values specified in the configuration file *openssl.cnf* (the directory where this file is located depends on your distribution, e.g. check in the directory */usr/ssl* or */usr/lib/ssl*).

If you omit mandatory arguments of a command, OpenSSL uses the default settings defined in the configuration file. If possible, all mandatory arguments for the example commands below are explicitly stated, i.e. if you use the commands as described below the important information is taken from the command line and not from the configuration file. If the configuration file is required for the respective command it is explicitly mentioned in the text.

For further information about the syntax and content of the configuration files, please refer to OpenSSL's documentation, particularly to the manual pages genrsa(1ssl), req(1ssl), ca(1ssl) and openssl(1ssl).

7.1 Certificates and keys for SSL

To set up a secure connection between entities (e.g.: ET1, ET2) usually the following components are required

- a private key for each entity participating in the communication:
  - $\mathrm{ET1}_{\mathrm{key}}$
  - $\mathrm{ET2}_{\mathrm{key}}$

  The term *private key* already implies that it is important to keep these keys private and store them at a location only accessible to the administrator.

- and the corresponding certificates:
  - $ET1_{cert}$
  - $ET2_{cert}$

  The certificates contain among other information
  - the public key of the entity
  - information about the entity, e.g. the name and/or the IP address
  - further information about the certificate, e.g. the intended usage

  The certificate is either digitally signed with the private key of the respective entity (self-signed) or with a CA key.

  The certificates are public and can be distributed to anyone participating in the communication.

ET1 will use the public key contained in $ET2_{cert}$ to encrypt the data sent to ET2. This assures that only ET2 is able to decrypt the data. If $ET2_{cert}$ is self-signed it is assured that public key contained in $ET2_{cert}$ corresponds to $ET2_{key}$. If $ET2_{cert}$ is signed by a CA it is assured that the public key contained in $ET2_{cert}$ really belongs to ET2 (authentication).

Create the private key

ET_{key} has to be created first using the following command:

```
openssl genrsa -des3 -passout pass:yourSSLPW
-out privkey.pem 2048
```

Explanation of the arguments:

genrsa

genrsa instructs *OpenSSL* to generate an RSA key.

-des3

Use 3DES to encrypt the key.

-passout pass:*password*

The password used to encrypt the private key (in the example: *yourSSLPW). yourSSLPW* is just an example and should be replaced by a secure password.

-out *filename*

Name of the file containing ET_{key} (in the example: `privkey.pem`).

2048

The length of the key.

The command above generates one output file:

- *privkey.pem*

  This file contains ET_{key} in *PEM* format. The key is encrypted with the 3DES-algorithm. To access the key you have to know the passphrase specified above (in the example: *yourSSLPW*). Please use your own, secure password to encrypt the private key.

  ☞ Sometimes it is necessary to create an unencrypted key. In this case just omit the *-des3* and the *-passout* option in the command above.

Create the certificate

The certificate is created with the following command:

```
openssl req -batch -new -x509 -key privkey.pem
-keyform PEM -passin pass:yourSSLPW -sha256
-outform PEM -out serverCert.pem
```

Explanation of the arguments:

req

req instructs *OpenSSL* to generate a certificate request (default) or a certificate.

-batch

Non interactive mode.

-new
Create a new request or a new certificate.

-x509
Create a self signed certificate instead of a certificate request.

-key *filename*
The corresponding private key (in the example: `privkey.pem`).

-keyform PEM
The private key is in *PEM* format.

-passin pass:*password*
Password required to decrypt the private key (in the example: *yourSSLPW*).

-sha256
Use the SHA256 algorithm to create the message digest for the signature (recommended).

-outform PEM
The format of the output file is *PEM*.

-out *filename*
The name of the output file, i.e. the certificate (in the example `serverCert.pem`).

The command above generates one output file:

- `serverCert.pem`
  This file contains the self-signed certificate $\mathrm{ET}_{\mathrm{cert}}$.

Create a keystore

The keys and certificates have to be included in keystores. The installation archive *idm-ca-1.3.1.zip* contains the (proprietary) java tool *ImportKey* in the *democA* directory which can be used to create and manage keystores. Please copy the file *ImportKey.class* to your working directory.

First $\mathrm{ET}_{\mathrm{key}}$ has to be converted to *PKCS#8* format and both $\mathrm{ET}_{\mathrm{key}}$ and $\mathrm{ET}_{\mathrm{cert}}$ have to be included in a keystore. In the example, Java keystore format *JKS* is used. This can be accomplished with the tool *ImportKey*. *ImportKey* does accept the (unencrypted) key on standard input only, therefore the output of the *pkcs8* command has to be piped as follows:

```
openssl pkcs8 -topk8 -in privkey.pem
-passin pass:yourSSLPW -inform PEM -nocrypt -outform DER |
java -cp . ImportKey -alias yourAlias -storetype JKS
-keystore serverKeystore.jks -storepass pass:yourSSLPW
-keypass pass:yourSSLPW -chain serverCert.pem
```

Explanation of the *openssl* arguments:

pkcs8
The *pkcs8* command is used to process private keys in *PKCS#8* format.

-topk8
Use a traditional format private key as input and write a key in *PKCS#8* format key.

-in *filename*
The name and the location of the input file (in the example: *privkey.pem*).

-passin pass:*password*
Password required to decrypt the input (in the example: *yourSSLPW*).

-inform PEM
The input format of the key is *PEM*.

-nocrypt
The output (the key) is not encrypted.

-outform DER

The ouput format is DER.

Explanation of the *ImportKey* arguments:

-alias *name*

A keystore can contain multiple entries. The alias identifies the entry and therefore has to be unique in the keystore. Aliases are case-insensitive.

-keystore *filename*

The file containing the keystore (in the example: `serverKeyStore.jks`).

-storetype JKS

Use JKS as format for the keystore.

-storepass pass:*password*

Password required to decrypt the contents of the keystore (in the example: *yourSSLPW*).

-keypass pass:*password*

Additional password required to decrypt the private key in the keystore.

-chain *filename*

The certificate (in the example *serverCert.pem*).

The command above creates one output file:

- *serverKeyStore.jks*
  This is the keystore containing the certificate and the private key.

Import a certificate

After creating the keystore it is sometimes necessary to import additional certificates into the keystore. This can be accomplished by using the following command:

```
java -cp . ImportKey -alias yourAlias -storetype JKS
-file additionalCertificate.pem -storepass pass:yourSSLPW
-keystore serverKeystore.jks
```

Explanation of the *ImportKey* arguments:

-alias *name*

A keystore can contain multiple entries. The alias identifies the entry and therefore has to be unique in the keystore. Aliases are case-insensitive.

-keystore *filename*

The file containing the keystore (in the example: `serverKeyStore.jks`).

-storetype JKS

The format for the keystore.

-storepass pass:*password*

Password required to decrypt the contents of the keystore (in the example: *yourSSLPW*).

-file *filename*

The certificate to be imported (in the example `additionalCertificate.pem`).

7.2 Certificates and keys for a PKI

When rolling out a Private Key Infrastructure (PKI), which is basically your intent when using the IDM CA, there are more requirements to be taken into account than mentioned in the previous chapter. This chapter first describes some of the PKI basics and then the usage of *OpenSSL* to roll out a PKI.

☞ Please note that the certificates described in this section are not used for SSL.

☞ Please note that the certificates and keys described in this section are not stored in the SSL-keystore of the IDM CA, but in the CA-keystore.

PKI basics

Among others the main reasons for using a PKI are:

- Authentication
  When communicating using data networks it is in most cases not possible to "see" the entity on the remote side (exception: video telephony), i.e. one cannot be sure that the entity on the remote side is the one it claims to be. The usage of a PKI assures the authenticity of the entities communicating with each other.
- Data confidentiality
  This is the reason VPNs are used to exchange data: The data packets are sent "in the public" (Internet), but unauthorized entities are prevented from accessing the information contained in the packets.
- Data integrity
  The assurance that the information received is identical to the information sent by the other entity. This prevents information to be altered by an entity "in the middle" which is not authorized to participate in the communication.

It is beyond the scope of this document to describe all components and their interactions involved in a complete PKI, therefore only the most important are mentioned here:

- Certificates and private keys
  Certificates are the means in a PKI to assure authentication. The identity of the certificate owner is approved by a CA by signing the certificate request of the respective owner. The public and private keys are used to encrypt/decrypt data and therefore assure data confidentiality.
- Certification Authority (CA)
  A *Certification Authority* is a component in a PKI which assures authenticity of the participating entities by signing certificate requests (i.e. issuing certificates). Usually there are multiple CAs in a PKI organized in a hierarchical structure with one root CA at the top.
- CRL Distribution Points (CDP)
  See the following section *Certificate extensions*.
- Entities communicating with each other
  The entities using a PKI use certificates to authenticate themselves and use the public/private key pairs to encrypt/decrypt the exchanged data. The entities request certificates from the CA. Usually a *Registration Authority* (RA) is also part of a PKI. The RA is responsible for the initial registration of entities that would like to use the PKI. An RA is not required in the IDM usage scenario.

Contents of a certificate

As mentioned in the previous chapter a certificate contains the following information:

- the public key of the entity
- information about the entity, e.g. the name and/or the IP address
- further information, e.g. about the certificate and the infrastructure

The following sections explain the contents in more detail.

The Subject Distinguished Name

The *Subject Distinguished Name* is a unique identifier of the certificate and its owner. It is composed of several components:

Abbreviation	Name	Explanation
CN	Common Name	Identifies the person or object owning the certificate. For example: CN=server1
E	E-mail Address	Identifies the e-mail address of the owner.
OU	Organizational Unit	Identifies a unit within the organization. For example: OU=Research&Development
O	Organization	Identifies the organization. For example: O=Innominate
L	Locality	Identifies the place where the entity resides. The locality can e.g. be a city: L=Berlin
ST	State	Identifies the state. For example: ST=Berlin
C	Country	Two letter code identifying the country. For example: C=DE (for Germany)

Depending on your policy, not all of the components are mandatory, but if the extension *Subject Alternative Name* is not included in the certificate, at least one component that can be used as identifier has to be included, typically this is the *Common Name* (CN). Please note that currently the IDM CA cannot handle certificates with *Subject Alternative Name* extensions.

Certificate extensions

Information about the certificate or the infrastructure is contained in the so called certificate extensions. Basically anyone can define its own extensions, but the standard extensions (X.509version3) are defined in RFC 3280 *Internet X.509 Public Key Infrastructure - Certificate and CRL Profile*. Here is a short description of the extensions that are important for the IDM CA:

Critical Bit

The *Critical Bit* is not an extension but used to force the usage of extensions in the certificate. The *Critical Bit* can be set for any extensions in the certificate. Applications verifying a certificate must be able to interpret an extension with the *Critical Bit*. If the application is not able to interpret the extension, the certificate must be rejected.

Basic Constraints

The *Basic Constraints* extension is used to indicate whether the certificate is a CA certificate or not. *Basic Constraints* consists of 2 fields:

- *cA* field of type BOOLEAN and
- *pathLenConstraint* field (optional) of type INTEGER

For CA certificates the *cA* field must be set to *true*. *pathLenConstraint* is only used if the *cA* field is set to true and specifies the number of CA levels allowed below this certificate. *Basic Constraints* should be always marked as critical.

Please refer to Chapter 7.2.3 for requirements regarding the *Basic Constraints* extension.

Key Usage

Key Usage controls the intended use of the certificate's corresponding keys. A key can be e.g. used to sign Certificate Revocation Lists (CRL), encrypt data or to sign certificates.

Please refer to Chapter 7.2.3 for requirements regarding the *Key Usage* extension.

Subject Alternative Name

The extension *Subject Alternative Name* can be used to add more identifiers to the certificate. *Subject Alternative Name* can contain e.g. e-mail addresses, domain names etc. It can be used as substitute for the *Subject* as well, which must be empty in this case. Please note that the IDM CA is currently not able to handle *Subject Alternative Name* extensions.

CRL Distribution Points (CDP)

Certificates can be revoked, e.g. if a private key was compromised or if it is no longer valid. Usually an application has to check whether a certificate is still valid, by checking the validity period and/or by retrieving revocation information from a CRL distribution point (CDP). To retrieve the information either *Certificate Revocation Lists* (CRL) can be used or a dedicated protocol like OCSP. However, the certificate should contain the information, which CDP should be contacted.

Authority Information Access

Authority Information Access is not an X.509 standard extension, but an extension defined by the PKIX working group (http://www.ietf.org/html.charters/pkix-charter.html). *Authority Information Access* contains information about the issuing CA, e.g. policies, further root certificates or where to retrieve the higher certificates in the chain, if the complete chain is not contained in the certificate.

Depending on the settings of these extensions the receiver (not the owner) of a certificate accepts or denies the communication with the peer, thus preventing any misuse of certificates and creating a higher level of security.

7.2.1 Create the CA certificates

Depending on your existing infrastructure the IDM CA needs the following certificates:

- A self-signed root certificate ($CA_{rootCert}$) and the matching private key ($CA_{rootKey}$).

  If you have another upstream (root) CA in place, there is no need to generate the root certificate and the matching private key.

  The (self-signed) root certificate is distributed to all entities participating in the communication. It is used by the entities to verify the authenticity of the communication peer and of any intermediate CAs in the certificate chain. The private key $CA_{rootKey}$ is used to sign the self-signed root certificate.
- A CA certificate (CA_{cert}) and the matching private key (CA_{key}). This is the certificate used by the CA to authenticate itself to other entities. This certificate has to be signed with the root private key, i.e. either with $CA_{rootKey}$ or with the key of your existing root CA. The private key CA_{key} is used to sign the certificate request sent by the IDM server, i.e. it is used to issue certificates for the mGuards.

- A template certificate ($CA_{templCert}$) which is used by the CA as template when issuing end entity (mGuard) certificates.

Figure 37 shows the certificate hierarchy:

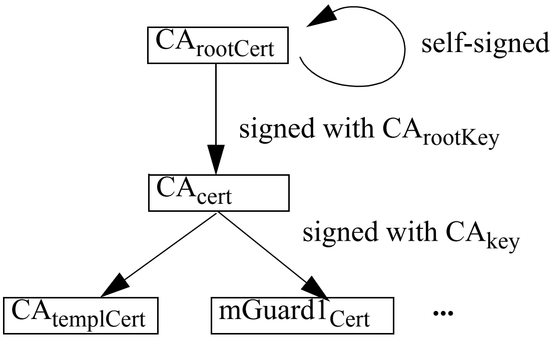


Figure 37: IDM CA certificate hierarchy

In the following it is assumed that there is no other root CA in place and that the IDM CA is used as root CA.

☞ **Important**: Please keep the private key(s) at a secure location. In particular this is required for the root CA's private key.

☞ It is recommended to create a working directory, e.g. called *security* in the IDM installation directory, where all the certificates and keys created during the following process are located.

Create the root certificate

The following *OpenSSL* commands require input from the *OpenSSL* configuration file *openssl.cnf* (the directory where this file is located depends on your distribution, e.g. check in the directory */usr/ssl* or */usr/lib/ssl*). Instead of changing the standard configuration file of your *OpenSSL* installation, it is recommend to use the example configuration files provided in the IDM CA installation archive *idm-ca-1.3.1.zip* and adapt those files to your needs. You can instruct *OpenSSL* to use the provided configuration files instead of the standard configuration file.

Adapt the OpenSSL configuration file

Please copy the file *rootCert.conf* provided in the installation archive *idm-ca-1.3.1.zip* to your working directory. Adapt the `[ root_dn ]` section of the file, which contains the *Subject Distinguished Name* of your root CA certificate:

```
[ root_dn ]
C= DE
O= Innominate Security Technologies AG
OU= Research & Development
CN= Test Root CA
```

Please note also the `[ root_ext ]` section of the configuration file, which is important for the proper generation of the root certificate (please refer to Section *Certificate extensions* for an explanation):

```
[ root_ext ]
keyUsage= cRLSign, keyCertSign
basicConstraints= critical, CA:true, pathlen:1
```

Generate the private key

$CA_{rootKey}$ has to be created first using the following command:

```
openssl genrsa -des3 -passout pass:rootPW
-out rootKey.pem 2048
```

Explanation of the arguments:

genrsa

genrsa instructs *OpenSSL* to generate an RSA key.

-des3

Use 3DES to encrypt the key.

-passout pass:*password*

The password used to encrypt the private key (in the example: *rootPW*). *rootPW* is just an example and should be replaced by a secure password.

-out *filename*

Name of the file containing $CA_{rootKey}$ (in the example: `rootKey.pem`).

2048

The length of the key.

The command above generates one output file:

- *rootKey.pem*

This file contains $CA_{rootKey}$ in *PEM* format. The key is encrypted with the 3DES-algorithm. To access the key you have to know the passphrase specified above (in the example: *rootPW*). Please use your own, secure password to encrypt the private key.

Generate the root certificate

The OpenSSL command used to generate $CA_{rootCert}$ is:

```
openssl req -batch -new -config rootCert.conf -x509
-key rootKey.pem -keyform PEM -passin pass:rootPW -sha256
-days 5479 -outform PEM -out rootCert.pem
```

Explanation of the arguments:

req

req instructs *OpenSSL* to generate a certificate request (default) or a certificate.

-batch

Non interactive mode.

-new

Create a new request or a new certificate.

-config *filename*

The name and the location of the openssl configuration file (in the example: `rootCert.conf`).

-x509

Create a self signed certificate instead of a certificate request.

-key *filename*

The corresponding private key (in the example: `rootKey.pem`).

-keyform PEM

The private key is in *PEM* format.

-passin pass:*password*

Password required to decrypt the private key (in the example: *rootPW*).

-sha256

Use the SHA256 algorithm to create the message digest for the signature (recommended).

-days *5479*

The period for which the certificate will be valid.

-outform PEM

The format of the output file is *PEM*.

-out ***filename***

The name of the output file, i.e. the certificate (in the example `rootCert.pem`).

The command above generates one output file:

- `rootCert.pem`
  This file contains the self-signed root certificate $CA_{rootCert}$.

Create the CA certificate

The intermediate CA certificate CA_{cert} is not self-signed but will be issued (signed) by the root CA. Therefore you first have to create a private key and a corresponding certificate request and then “send” this certificate request to the root CA. The root CA will in return issue CA_{cert}.

First the configuration file has to be adapted to your needs, as described in the previous section.

Adapt the OpenSSL configuration file and the environment

Please copy the file *caCert.conf* contained in the installation archive *idm-ca-1.3.1.zip* to your working directory. Adapt the [ca_dn] section of the file, which contains the *Subject Distinguished Name* of your root CA certificate:

```
[ ca_dn ]
C= DE
O= Innominate Security Technologies AG
OU= Research & Development
CN= Test CA
```

Please adapt also entries `crlDistributionPoints` and `authorityInfoAccess` of the [ca_ext] section of the configuration file (please refer to Section *Certificate extensions* for an explanation):

```
[ ca_ext ]
crlDistributionPoints=URI:http://ca.example.com/ca-
ca.crl
authorityInfoAccess=OCSP;URI:http://ca.example.com/ocsp/
ca-ca
```

The configuration file contains some parameters, which cannot be entered on the command line. The entries specify files that *have* to be present in the file system. Therefore the files have to be created manually first (the filenames are also used in the configuration file *caCert.conf* , therefore please use exactly the file names as stated below):

- Create a subdirectory *archive* in your working directory
  (Linux: `mkdir ./archive`)
- Create a file named *serial* containing a valid serial number for the certificate in the subdirectory *archive*
  (Linux: `echo 1234 > archive/serial`)
- Create an empty file to be used as openssl database.
  (Linux: `touch archive/index.txt`
  Windows: `copy NUL: archive/index.txt`)

Generate a private key

The private key CA_{key} has to be created first using the following command:

```
openssl genrsa -des3 -passout pass:caPW
-out caKey.pem 2048
```

Explanation of the arguments:

genrsa

genrsa instructs *OpenSSL* to generate an RSA key.

-des3

Use 3DES to encrypt the key.

-passout pass:*password*

The password used to encrypt the private key (in the example: *caPW*). *caPW* is just an example and should be replaced by a secure password.

-out *filename*

Name of the file containing the private key (in the example: `caKey.pem`).

2048

The length of the key.

This command creates one output file:

- *caKey.pem*
  This file contains CA_{key} in *PEM* format. The key is encrypted with the 3DES-algorithm. To access the key you have to know the passphrase specified above (in the example: *caPW*). Please use your own, secure password to encrypt the private key.

Generate a certificate request

To create a certificate request enter the following command:

```
openssl req -batch -new -config caCert.conf
-key caKey.pem -keyform PEM -passin pass:caPW -sha256
-out caCertReq.pem -outform PEM
```

Explanation of the arguments:

req

req instructs *OpenSSL* to generate a certificate request (default) or a certificate.

-batch

Non interactive mode.

-new

Create a new request.

-config *filename*

The name and the location of the openssl configuration file (in the example: `caCert.conf`).

-key *filename*

The corresponding private key (in the example: `caKey.pem`).

-keyform PEM

The private key is in *PEM* format.

-passin pass:*password*

Password required to decrypt the private key (in the example: *caPW*).

-sha256

Use the SHA256 algorithm to create the message digest for the signature (recommended).

-outform PEM

The format of the output file is *PEM*.

-out *filename*

The name of the output file, i.e. the certificate (in the example `caCertReq.pem`).

The command above generates one output file:

- *caCertReq.pem*
  This file contains the certificate request.

Request the CA certificate

The request has to be sent to the root CA. Since the IDM CA is the root CA in the example you can issue the certificate with the following command:

```
openssl ca -batch -config caCert.conf -days 3653
-in caCertReq.pem -cert rootCert.pem -keyfile rootKey.pem
-passin pass:rootPW -md sha256 -notext -out caCert.pem
-outdir .
```

Explanation of the arguments:

ca

The *ca* command is a minimal CA application. It can be used to sign certificate requests and generate CRLs.

-batch

Non interactive mode.

-config *filename*

The name and the location of the openssl configuration file (in the example: `caCert.conf`).

-days *3653*

The period for which the certificate will be valid.

-in *filename*

The name of the file containing the certificate request (in the example: `caCertReq.pem`).

-cert *filename*

The name of the file containing the root certificate (in the example: `rootCert.pem`).

-keyfile *filename*

The name of the file containing the key used to sign the certificate request (in the example: `rootKey.pem`).

-passin pass:*password*

Password required to decrypt the private key (in the example: *rootPW*).

-md sha256

Use the SHA256 algorithm to create the message digest for the signature (recommended).

-notext

openssl has an option to include human readable, explanatory text in the certificate. But this would create problems later in the process when creating the keystores, therefore do not include any text in the certificate.

-outdir *directoryName*

The output directory (in the example the current working directory “.”).

The command above generates one output file:

- *caCert.pem*
  This file contains CA_{cert}.

☞ The file *caCertReq.pem* is not required any more and should be deleted.

Create a certificate template

The purpose of the CA is to issue certificates. To do so the CA needs instructions how the certificates to be issued should look like, e.g. which extensions should be included. This can be accomplished by providing the CA with a certificate template ($\mathrm{CA}_{\mathrm{templCert}}$). $\mathrm{CA}_{\mathrm{templCert}}$ is a certificate issued by the CA. To issue a certificate you first have to adapt an OpenSSL configuration file again.

Adapt the OpenSSL configuration file

Please copy the file *templateCert.conf* contained in the installation archive *idm-ca-1.3.1.zip* to your working directory. Adapt the entries `crlDistributionPoints` and `authorityInfoAccess` of the [template_ext] section of the configuration file (please refer to Section *Certificate extensions* for an explanation):

```
[ template_ext ]
crlDistributionPoints=URI:http://ca.example.com/ca-
ee.crl
authorityInfoAccess=OCSP;URI:http://ca.example.com/ocsp/
ca-ee
```

☞ Please note that the configuration file *templateCert.conf* expects files to be existent that have to be manually created. (see previous section *Create the CA certificate*, subsection *Adapt the OpenSSL configuration file and the environment*).

Generate a private key

The private key has to be created first using the following command:

```
openssl genrsa -des3 -passout pass:caPW
-out templateKey.pem 2048
```

Explanation of the arguments:

genrsa

genrsa instructs *OpenSSL* to generate an RSA key.

-des3

Use 3DES to encrypt the key.

-passout pass:*password*

The password used to encrypt the private key (in the example: *caPW*). *caPW* is just an example and should be replaced by a secure password.

-out *filename*

Name of the file containing the private key (in the example: `templateKey.pem`).

2048

The length of the key.

This command creates one output file:

- *templateKey.pem*
  This file contains the encrypted private key.

Generate a certificate request

To create a certificate request enter the following command:

```
openssl req -new -batch -config templateCert.conf
-key templateKey.pem -keyform PEM -passin pass:caPW
-sha256 -outform PEM -out templateCertReq.pem
```

Explanation of the arguments:

req

req instructs *OpenSSL* to generate a certificate request (default) or a certificate.

-batch

Non interactive mode.

-new

Create a new request or a new certificate.

***-config** filename*

The name and the location of the openssl configuration file (in the example: `templateCert.conf`).

***-key** filename*

The corresponding private key (in the example: `templateKey.pem`).

-keyform PEM

The private key is in *PEM* format.

-passin pass:*password*

Password required to decrypt the private key (in the example: *caPW*).

-sha256

Use the SHA256 algorithm to create the message digest for the signature (recommended).

-outform PEM

The format of the output file is *PEM*.

-out *filename*

The name of the output file, i.e. the certificate (in the example `templateCertReq.pem`).

The command above generates one output file:

- *templateCertReq.pem*
  This file contains the certificate request.

Request the template certificate

The request has to be sent to the (intermediate) CA. You can sign the certificate request (issue the certificate) with the following command:

```
openssl ca -batch -config templateCert.conf -days 1826
-md sha256 -in templateCertReq.pem -keyfile caKey.pem
-cert caCert.pem -passin pass:caPW -notext
-out templateCert.pem -outdir .
```

Explanation of the arguments:

ca

The *ca* command is a minimal CA application. It can be used to sign certificate requests and generate CRLs.

-batch

Non interactive mode.

-config *filename*

The name and the location of the openssl configuration file (in the example: `templateCert.conf`).

-days *1826*

The period for which the certificate will be valid.

-in *filename*

The name of the file containing the certificate request (in the example: *templateCertReq*`.pem`).

-cert *filename*

The name of the file containing the root certificate (in the example: `caCert.pem`).

-keyfile *filename*

The name of the file containing the key used to sign the certificate request (in the example: `caKey.pem`).

-passin pass:*password*

Password required to decrypt the private key (in the example: *caPW*).

-md sha256

Use the SHA256 algorithm to create the message digest for the signature (recommended).

-notext

openssl has an option to include human readable, explanatory text in the certificate. But this would create problems later in the process when creating the keystores, therefore do not include any text in the certificate.

-outdir *directoryName*

The output directory (in the example the current working directory “.”).

The command above generates one output file:

- *templateCert.pem*
  This file contains $CA_{templCert}$. The file should be copied to its final destination, the location must be configured in *ca-preferences.xml* in the node

  certificateFactory » certTemplate

  ☞ The files *templateCertReq.pem* and *templateKey.pem* are not needed any more and should be deleted.

7.2.2 Create the keystores

After following the steps described in Chapter 7.2.1 you should find the following files in your working directory:

- *templateCert.pem*
  This file contains $CA_{templCert}$, signed with CA_{key}.
- *caCert.pem*
  This file contains CA_{cert}, signed with$CA_{rootKey}$.
- *caKey.pem*
  This file contains CA_{key}.
- *rootCert.pem*
  This file contains the self-signed root certificate $CA_{rootCert}$.
- *rootKey.pem*
  This file contains the encrypted private root key $CA_{rootKey}$.

Some of those files have to be included in keystores. The installation archive *idm-ca-1.3.1.zip* contains the (proprietary) java tool *ImportKey* in the demoCA directory which can be used to create and manage keystores. Please copy the file *ImportKey.class* to your working directory.

First the intermediate CA certificate and the root certificate have to be merged into one file (create a certificate chain):

```
cat caCert.pem rootCert.pem > caCertWithChain.pem
```

Then the key `caKey.pem` has to be converted to *PKCS#8* format and both CA_{key} and the certificate chain have to be included in a *PKCS#12* keystore. This can be accomplished with the tool *ImportKey*. *ImportKey* does accept the (unencrypted) key on standard input only, therefore the output of the *pkcs8* command has to be piped as follows:

```
openssl pkcs8 -topk8 -in caKey.pem -passin pass:caPW
-inform PEM -nocrypt -outform DER |
java -cp . ImportKey -alias ca -keystore ca-keystore.jks
-storetype JKS -storepass pass:caPW -keypass pass:caPW
-chain caCertWithChain.pem
```

Explanation of the *openssl* arguments:

pkcs8
The *pkcs8* command is used to process private keys in *PKCS#8* format.

-topk8
Use a traditional format private key as input and write a key in *PKCS#8* format key.

-in *filename*
The name and the location of the input file (in the example: *caKey.pem*).

-passin pass:*password*
Password required to decrypt the input (in the example: *caPW*).

-inform PEM
The input format of the key is *PEM*.

-nocrypt
The output (the key) is not encrypted.

-outform DER
The output format is DER.

Explanation of the *ImportKey* arguments:

-alias *name*
A keystore can contain multiple entries. The alias identifies the entry and therefore has to be unique in the keystore. Aliases are case-insensitive.

-keystore *filename*
The file containing the keystore (in the example: `ca-keystore.jks`).

-storetype JKS
Use JKS as format for the keystore.

-storepass pass:*password*
Password required to decrypt the contents of the keystore (in the example: *caPW*).

-keypass pass:*password*
Additional password required to decrypt the private key in the keystore.

-chain *filename*
The certificate chain including the root certificate.

The command above creates one output file:

- *ca-keystore.jks*
  This is the keystore for your CA containing the certificate chain and the private CA key. Please copy the keystore to its final destination.
    - The filename including the absolute or relative path of this keystore has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStore***.
    - The password to access the keystore (in the example *caPW*) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStorePassword***.
    - The format of this keystore (JKS) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyStoreType.***
    - The password to access the private key (in the example *caPW*) has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyPassword.***
    - The alias (*ca*) of the key has to be configured in the *ca-preferences.xml* file in the node ***certificateFactory » keyAlias.***

☞ The file *caCertWithChain.pem* is not needed any more and should be deleted.

7.2.3 Requirements for certificates

For proper function of the VPN certificates also with future versions of the mGuard firmware and the IDM, the certificates have to satisfy the following requirements:

1. The private key should have a length of at least 1024 bits. Innominate recommends a key length of 2048 bits for long term security.
2. Any certificate must conform to RFC 3280.
3. Any CA certificate must contain a *Basic Constraints* extension marked as critical and with the boolean *cA* field set to *true*.
4. Innominate strongly recommends to include the *pathLenConstraint* field in any CA certificate's *Basic Constraints* extension. It must be set to one less than the number of descendant CA certificates. So for a typical scenario where a certification chain is made up of one root CA certificate, a single intermediate CA certificate and an end entity certificate (VPN certificate in this case), the *pathLenConstraint* must be one (1) for the root CA certificate and zero for the intermediate CA certificate.
5. The template VPN certificate must have a *Basic Constraints* extension marked as critical with the boolean *cA* field set to *false* and without a *pathLenConstraint* field.
6. Any CA certificate must contain a *Key Usage* extension marked as critical with the bit *keyCertSign* set. It is recommended to have the bit *cRLSign* set as well.
7. The template VPN certificate does not need to contain any *Key Usage* extension.
8. Any intermediate CA certificate must contain one or both of the extensions *CRL Distribution Points* and *Authority Information Access*, if it is planned to distribute revocation information online with a future release of the IDM and the mGuard firmware. The extensions must be marked as non-critical. The former extension is required if it is intended to use Certificate Revocation Lists (CRLs) in the future. The latter extension is required if it is intended to use the Online Certificate Status Protocol (OCSP, see RFC 2560) in the future. Any of the extensions must contain HTTP URLs only.
9. The template VPN certificate should contain one or both of the extensions *CRL Distribution Points* and *Authority Information Access*, described above, if it is planned to distribute revocation information online in the future. Alternatively, the IDM server can be instructed to include them within the certification request sent to the IDM CA. The latter is more flexible, because this way the location of the revocation information (CRL) respectively information service (OCSP) can be set for groups of devices or even for individual devices.
   Please note: If the template VPN certificate already includes any of the extension and the IDM is instructed to include it within the certification request as well, the extension from the request overrides the one found within the template. The issued certificate will contain the extension copied from the request.
10. The keystore containing the certificates has to contain the complete certificate chain up to and including the root certificate.

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