MXChange for Melsec Medoc plus 2.40

Additional Manual
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Publication history

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1999</td>
<td>1.0</td>
<td>First edition</td>
</tr>
</tbody>
</table>
1 MXChange

By default the MXChange functionality is enabled in MELSEC MEDOC plus from version 2.40a onwards.

1.1 Global tools

1.1.1 Super Project Manager

The Super Project Manager provides an overview of the project, allowing convenient browsing and editing all configuration elements. The Super Project Manager administrates the super-project and runs on a 32-bit PC.

1.1.2 MXChange interface tag editor

The tag editor can be accessed from any configuration program and from the Super Project Manager. The tag editor is included in the Super Project Manager and can add tags for any or all packages. MM+ 2.40 can access the tag editor to ask for details needed in other configuration packages by using an MXChange interface call.

1.2 MXChange update MM+ 2.40 <-> MXChange server

1.2.1 Moments of MXChange updates

The MXChange update is cogent:
- when starting MM+ 2.40 or opening an MXChange project respectively
- when saving an MXChange project

The MXChange update is optional:
while running MM+2.40 with an MXChange project (e.g. indicated by a timer or certain actions for example saving the GVL. It is also possible that the user determines the update moment (forced update).

1.2.2 The online flag

Each application can set the online flag. If the online flag has been set, the application will be informed automatically by the MXChange server when any tag used by the application has been changed. If the online-flag is not set, the application must ask the MXChange server for changing any tag.

1.2.3 Transaction logging

All transactions taken by MM+ 2.40 will be stored in a local audit-log. All audit-logs must have a time stamp and will provide the name of the user who has taken the transaction (if available). This is done by the MXChange server.

1.2.4 Offline synchronisation

If the MXChange server is not available, the Super Project Manager and the MXChange interface tag editor will terminate and display an error message. However, MM+ 2.40 still allows to change MXChange tags. The changes are stored in the local MM+ 2.40 database of the project and they are updated when the MXChange server is online again.
1.3 Import and export

1.3.1 ASCII import and export

An ASCII import or export of the additional MXChange data is possible because the additional
MXChange data is used also in other projects. Note the following:
• the additional import or export can be disabled to stay compatible with old formats.
• old export files can be imported also.

1.3.2 Import of Profi-MAP-POU-blocks → MM+ 2.40

Profi-Map-POU-blocks can be transferred automatically to the corresponding MM+ 2.40 project. These
blocks exchange PLC data with a profibus DP master station. The objects are described in the
following.

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Unique identifier for this node in the hierarchy</td>
</tr>
<tr>
<td>Description</td>
<td>Text</td>
<td>254</td>
<td>POU block description</td>
</tr>
<tr>
<td>POU block</td>
<td>Long binary</td>
<td></td>
<td>ASCII POU block file for mapping, stored in full.</td>
</tr>
</tbody>
</table>

1.4 MM+ 2.40 objects

In the following all objects are listed which MM+ 2.40 knows (in MXChange database format). How to
map these objects to MM+ 2.40 will be described later.

1.4.1 PLC information

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by the Super Project Manager</td>
</tr>
<tr>
<td>Project name</td>
<td>Text</td>
<td>254</td>
<td>File name of the MM+ 2.40 project (DOS naming conventions)</td>
</tr>
<tr>
<td>Home PC</td>
<td>Text</td>
<td>60</td>
<td>Network name of the PC where the project is located</td>
</tr>
<tr>
<td>Online flag</td>
<td>Boolean</td>
<td></td>
<td>If set to TRUE, changes are dealt with while running</td>
</tr>
<tr>
<td>Password</td>
<td>Text</td>
<td>30</td>
<td>Password for the project</td>
</tr>
</tbody>
</table>

1.4.1.1 Serial communication card

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by configuration programs</td>
</tr>
<tr>
<td>SlotNo</td>
<td>Integer</td>
<td></td>
<td>Slot number in the PLC</td>
</tr>
<tr>
<td>StationNo</td>
<td>Integer</td>
<td></td>
<td>Station number for the serial communication card in the master PLC (range between 0 and 31)</td>
</tr>
</tbody>
</table>

1.4.1.2 Ethernet communication card

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by configuration programs</td>
</tr>
<tr>
<td>SlotNo</td>
<td>Integer</td>
<td></td>
<td>Slot number in the PLC</td>
</tr>
<tr>
<td>TCPAddr</td>
<td>Text</td>
<td>30</td>
<td>TCP/IP address of the card, e.g. 193.1.1.1</td>
</tr>
<tr>
<td>Port</td>
<td>Long</td>
<td></td>
<td>Port number to use (range between 256 and 65536)</td>
</tr>
</tbody>
</table>

1.4.1.3 MELSEC-NET communication card (serial master)

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by configuration programs</td>
</tr>
<tr>
<td>SlotNo</td>
<td>Integer</td>
<td></td>
<td>Slot number in the PLC</td>
</tr>
<tr>
<td>StationNo</td>
<td>Integer</td>
<td></td>
<td>Station number for the serial communication card in the master PLC</td>
</tr>
</tbody>
</table>
1.4.1.4 MELSEC-NET communication card (Ethernet master)

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by configuration programs</td>
</tr>
<tr>
<td>SlotNo</td>
<td>Integer</td>
<td></td>
<td>Slot number in the PLC</td>
</tr>
<tr>
<td>TCPaddr</td>
<td>Text</td>
<td>30</td>
<td>TCP/IP address of the card, e.g. 193.1.1.1</td>
</tr>
<tr>
<td>Port</td>
<td>Long</td>
<td></td>
<td>Port number to use (range between 256 and 65536)</td>
</tr>
<tr>
<td>StationNo</td>
<td>Integer</td>
<td></td>
<td>Station number for the serial communication card in the master PLC</td>
</tr>
<tr>
<td>PLCaddr</td>
<td>Integer</td>
<td></td>
<td>Slave address (range between 0 and 64)</td>
</tr>
</tbody>
</table>

1.4.2 MM+ 2.40 tag information

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Long</td>
<td></td>
<td>Reserved to be used by configuration tools.</td>
</tr>
<tr>
<td>Position</td>
<td>Integer</td>
<td></td>
<td>Position, to be used with structures</td>
</tr>
<tr>
<td>CDE_name</td>
<td>Text</td>
<td>68</td>
<td>MXChange tag name</td>
</tr>
<tr>
<td>CDE_parent</td>
<td>Long</td>
<td></td>
<td>Parent hierarchy ID (for structures).</td>
</tr>
<tr>
<td>CDE_ID</td>
<td>Long</td>
<td>-</td>
<td>Hierarchy ID of the MXChange tag (for efficiency)</td>
</tr>
<tr>
<td>Variable name</td>
<td>Text</td>
<td>68</td>
<td>Variable identifier (16 characters max.)</td>
</tr>
<tr>
<td>Description</td>
<td>Text</td>
<td>128</td>
<td>Variable description</td>
</tr>
<tr>
<td>Function block</td>
<td>Text</td>
<td>32</td>
<td>Function block identifier</td>
</tr>
<tr>
<td>Function instance</td>
<td>Text</td>
<td>32</td>
<td>Function block instance identifier</td>
</tr>
<tr>
<td>Variable Class</td>
<td>Integer</td>
<td></td>
<td>VAR, VAR_CONSTANT, VAR_INPUT, VAR_OUTPUT, VAR_IN_OUT, VAR_EXTERNAL, VAR_EXTERNAL_CONSTANT, VAR_GLOBAL, VAR_GLOBAL_CONSTANT</td>
</tr>
<tr>
<td>IO-type</td>
<td>Integer</td>
<td></td>
<td>BOOL, INT, DINT, WORD, DWORD, READ, TIME</td>
</tr>
<tr>
<td>IO-dev</td>
<td>Text</td>
<td>4</td>
<td>I/O-device, e.g. D, TC</td>
</tr>
<tr>
<td>IO-addr</td>
<td>Long</td>
<td></td>
<td>I/O address, e.g. 100</td>
</tr>
<tr>
<td>IO-bit</td>
<td>Integer</td>
<td></td>
<td>Bit within the I/O address, otherwise –1</td>
</tr>
<tr>
<td>Data size</td>
<td>Long</td>
<td></td>
<td>Size of data - normally 1, but it may be longer for arrays</td>
</tr>
</tbody>
</table>

1.4.3 Mapping from ProfiMap I/O references

The Super Project Manager maps ProfiMap structures to single MM+ 2.40 variables.

Automatic conversion:
- ProfiMap to MM+ 2.40
  - SD0-SD255 to D9000-D9255
  - SM0-SM255 to M9000-M9255

1.5 Network communication

To establish the connection to the MXChange server, MM+ 2.40 prompts for the necessary settings. Connection settings can be the MXChange server name, network name, or the TCP/IP address of the server's PC. These data should refer to a single project to be able to establish a connection to different MXChange servers including different projects. To ease the handling, a default connection setting can be included in the INI file.

MM+ 2.40 uses the API interface to provide a local TCP/IP listener. In case of timeouts (default 10 seconds) MM+ 2.40 repeats the request once. If there is still an error, the connection shuts down.
1.6  MXChange tag types

1.6.1  PLC parameters and online settings

The MXChange Super Project Manager contains information about communication cards (serial communication card, Ethernet communication card, MELSEC-NET communication card). Some of the data necessary to define these objects are included in the PLC parameters and the online settings (Transfer setup).

1.6.2  Global variables

All entries in the GVL can be defined to be MXChange tags. The GVL entries can be shared to the following types:
- normal variables
- arrays of normal variables
- global DUTs
- global FBs

1.6.3  POU blocks of MM+ 2.40

1.6.3.1  Example: POU block

(* Created by MELSEC ProfiMap *)
(* PROFIBUS DP Configuration = POU.DP *)
PLC_CONFIG
END_PLC_CONFIG

PROGRAM POU
'IL'
BODY

WORKSPACE
  NETWORK_LIST_TYPE := NWTYPEIL ;
  ACTIVE_NETWORK := 0 ;
END_WORKSPACE

NET_WORK
  NETWORK_TYPE := NWTYPEUSR1 ;
  NETWORK_LABEL := ;
  NETWORK_TITLE := ;
  NETWORK_HEIGHT := 14
  NETWORK_BODY

TABINFO 6, 14
(* Exchange PLC data with Profibus DP *)

LD  X1B
AND  X1D
TO  H00 K960 K2Y80 K1
TO  H00 K992 K4YA0 K1
TO  H00 K1008 D16 K16
OUT  Y00
AND  X00
FROM  H00 K0 K2X80 K1
FROM  H00 K16 K4X90 K1
FROM  H00 K48 D0 K16
1.6.3.2 Automatic transfer within MXChange

By implementing MXChange exporting and importing POU blocks will be eased. The POU block is stored in the MXChange database and can be fetched by MM+ 2.40 by a user command or automatically during the normal updates.

1.7 Mapping from or to MXChange nodes

The data structures used within the MXChange server differ from the data structures used in MM+ 2.40. Some data structures are even not available in one of the communication partners. Therefore, it is necessary to convert the data structures when exchanging these data. The following chapter describes how to convert data structures.

1.7.1 PLC information

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ProjectName</td>
<td>Project directory name of MM+ 2.40</td>
<td>MM+ 2.40 project name must be limited (DOS naming conventions)</td>
</tr>
<tr>
<td>HomePC</td>
<td>-</td>
<td>Can be extracted using the WINSOCK.DLL</td>
</tr>
<tr>
<td>OnlineFlag</td>
<td>Project data</td>
<td>Must be defined in MM+ 2.40</td>
</tr>
<tr>
<td>PLCtype</td>
<td>Project data</td>
<td>Convert from the internal PLC type setting</td>
</tr>
</tbody>
</table>

**Conclusion**

To get the necessary information, additional dialogs must be defined. The OnlineFlag and the Password can be fixed for a single project. The name of the HomePC can be extracted using the WINSOCK.DLL.

1.7.2 Serial communication card

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SlotNo</td>
<td>(-)</td>
<td>MM+ 2.40 does not provide any information about the slot numbers of serial communication modules. Only the user can define a name for the special modules, so MM+ 2.40 cannot decide which module is a serial communication card.</td>
</tr>
<tr>
<td>StationNo</td>
<td>-</td>
<td>MM+ 2.40 does not provide any information about the station number. The station number must be fixed on the module itself.</td>
</tr>
</tbody>
</table>
Conclusion
MM+ 2.40 does not provide any information about serial communication cards.

1.7.3 Ethernet communication card

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SlotNo</td>
<td>-</td>
<td>MM+ 2.40 does not provide any information about the slot numbers of Ethernet communication modules. Only the user can define a name for the special modules, so MM+ 2.40 cannot decide which module is an Ethernet communication card.</td>
</tr>
<tr>
<td>TCPaddr</td>
<td>BYTE IPAddress1</td>
<td>The settings must be transformed to a string and back.</td>
</tr>
<tr>
<td></td>
<td>BYTE IPAddress2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYTE IPAddress3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYTE IPAddress4</td>
<td></td>
</tr>
<tr>
<td>Port</td>
<td>long PortNo</td>
<td></td>
</tr>
<tr>
<td>(long)</td>
<td>long PortNo</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
These settings are included in the online setup data of MM+ 2.40, but they are only valid if the Ethernet communication card is used for program download. Otherwise these data will contain default values.

1.7.4 MELSEC-NET communication card (serial master)

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SlotNo</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>StationNo</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>PLCaddr</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
MM+ 2.40 does not know whether the master PLC of a MELSEC NET configuration has a serial communication card.

1.7.5 MELSEC NET communication card (Ethernet master)

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SlotNo</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TCPaddr</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Port</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>PLCaddr</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
MM+ 2.40 does not know whether the master PLC of a MELSEC NET configuration has an Ethernet communication card.
### 1.7.6 Tag information

The tag information objects (Local-I/O tags) will be mapped to global variables in MM+ 2.40.

<table>
<thead>
<tr>
<th><strong>MXChange type</strong></th>
<th><strong>MM+ 2.40 type (declaration)</strong></th>
<th><strong>Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Posn</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CDE_name</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CDE_parent</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CDE_ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Variable name</td>
<td>szName</td>
<td>Must be limited to 16 chars when mapping to MM+ 2.40 type</td>
</tr>
<tr>
<td>Description</td>
<td>pszComment</td>
<td>The description in MXChange is only 64 chars long. Therefore, pszComment must be limited when mapping to MXChange nodes.</td>
</tr>
<tr>
<td>FunctionBlock</td>
<td>-</td>
<td>Case of FBs</td>
</tr>
<tr>
<td>FunctionInstance</td>
<td>-</td>
<td>Case of FBs</td>
</tr>
<tr>
<td>VariableClass</td>
<td>pszClass</td>
<td>Must be transformed from string to integer and vice versa</td>
</tr>
<tr>
<td>IOType</td>
<td>pszType</td>
<td>Must be transformed from string to integer and vice versa</td>
</tr>
</tbody>
</table>
| IOdev             | pszAddress                      |pszAddress must be shared to Text[2] (e.g. M), a long value, and a bit-offset  
Example:  
pszAddress: D10.1  
IOdev: D  
IOaddr: 10  
IObit: 1 (-1 if no bit addressing) |
| IOaddr            |                                |           |
| IObit             |                                |           |
| iIOelemsize       | pszType                         | Size of a single element |
| iIOelems          | pszType                         | Used for arrays. |

#### 1.7.6.1 Mapping of simple variables

A simple variable is a variable of one of the following types BOOL, INT, DINT, WORD, DWORD, REAL, or TIME. A simple variable does not include arrays of the types mentioned above nor STRING.

**Mapping specials**
- Posn: not used, 0 ?
- FunctionBlock always empty
- FunctionInstance always empty
- iIOelemsize size of a single element (depending on the type)
- iIOelems always 1

#### 1.7.6.2 Mapping of strings

To have the option to include arrays of strings in later implementations, the string length will be stored in iIOelemsize rather than in iIOelems.
Mapping specials

- Posn: not used, 0 ?
- FunctionBlock always empty
- FunctionInstance always empty
- iOelemsize string length
- iOelems always 1

1.7.6.3 Mapping of arrays

The arrays can be of one of the types mentioned above.

Mapping specials

- Posn: not used, 0 ?
- FunctionBlock always empty
- FunctionInstance always empty
- iOelemsize size of a single element (depending on the element type)
- iOelems specifies the array size, must be taken off pszType maximum is 65535.

1.7.6.4 Mapping of FBs

MM+ 2.40 does not know any addresses of global FBs until the project has been compiled. Therefore, MM+ 2.40 can provide only FB addresses of compiled projects. Since the FB addresses may change after each compiling, other applications or the tag editor are not allowed to change FB I/O data or the FB structure.

The Super Project Manager displays an FB in the following way:

```
<table>
<thead>
<tr>
<th>PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>+-- LOCAL I/O</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
|    | +-- "a simple variable"
```
**Mapping specials**

<table>
<thead>
<tr>
<th>Tag entry</th>
<th>FB node</th>
<th>1&quot; FB member</th>
<th>Last FB member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent-ID</td>
<td>PLC</td>
<td>FB node</td>
<td>FB node</td>
</tr>
<tr>
<td>Posn</td>
<td>-</td>
<td>0 (1)</td>
<td>count (count-1)</td>
</tr>
<tr>
<td>VariableName</td>
<td>FB instance name</td>
<td>name of 1&quot; member</td>
<td>name of last member</td>
</tr>
<tr>
<td>FunctionName</td>
<td>FB name</td>
<td>FB name</td>
<td>FB name</td>
</tr>
<tr>
<td>FunctionInstance</td>
<td>FB instance name</td>
<td>FB instance name</td>
<td>FB instance name</td>
</tr>
<tr>
<td>iIOelemsize</td>
<td>1</td>
<td>depends on the type</td>
<td>depends on the type</td>
</tr>
<tr>
<td>iIOelems</td>
<td>1</td>
<td>1, if no array</td>
<td>1, if no array</td>
</tr>
</tbody>
</table>

**1.7.6.5 Mapping of DUTs**

The Super Project Manager displays a DUT in the following way:

```
PLC
|--- LOCAL I/O
|    |--- "Name of the DUT instance"
|    |    |--- "1st member of DUT"
|    |    |    |--- ... |
|    |--- "Last member of DUT"
|    |--- "a simple variable"
```

**Mapping specials**

<table>
<thead>
<tr>
<th>Tag entry</th>
<th>DUT node</th>
<th>1&quot; member of DUT</th>
<th>Last member of DUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent-ID</td>
<td>PLC</td>
<td>DUT-node</td>
<td>DUT node</td>
</tr>
<tr>
<td>Posn</td>
<td>-</td>
<td>0 (1)</td>
<td>count (count -1)</td>
</tr>
<tr>
<td>VariableName</td>
<td>DUT instance name</td>
<td>name of 1&quot; member</td>
<td>name of last member</td>
</tr>
<tr>
<td>FunctionName</td>
<td>DUT name</td>
<td>DUT name</td>
<td>DUT name</td>
</tr>
<tr>
<td>FunctionInstance</td>
<td>DUT instance name</td>
<td>DUT instance name</td>
<td>DUT instance name</td>
</tr>
<tr>
<td>iIOelemsize</td>
<td>1</td>
<td>depends on the type</td>
<td>depends on the type</td>
</tr>
<tr>
<td>iIOelems</td>
<td>1</td>
<td>1, if no array</td>
<td>1, if no array</td>
</tr>
</tbody>
</table>

**1.7.7 Profi-MAP POU-blocks**

<table>
<thead>
<tr>
<th>MXChange type</th>
<th>MM+ 2.40 type FB</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Description (Text 127)</td>
<td>pszComment</td>
<td></td>
</tr>
<tr>
<td>POUblock (long binary)</td>
<td>The binary data can be imported into MM+ 2.40 using the standard MM+ 2.40 ASCII import mechanism.</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

The binary data provided by the MXChange server can be imported into MM+ 2.40 using the standard import mechanism of MM+ 2.40. A task will be created containing the imported POU. The import mechanism is one way only (MXChange $\rightarrow$ MM+ 2.40), because it does not make sense to change anything by means of MM+ 2.40 and store it back to the MXChange server. MP+ is responsible for the POU block.

1.8 User interface

1.8.1 Marking MXChange tags in MM+ 2.40

The only tags which can be marked specially as MXChange tags are variables included in the GVL. The mark is a simple flag ("X") as known from the marking of Autoexternal variables. The column is named MXChange and located next to the Autoexternal column. The MXChange column is available only if the current project is an MXChange project (MXChange has been enabled) and within the GVL editors (not the header editors). In GVL editors of user libraries the MXChange column is available, too, but it does not have any function yet.

1.8.2 Update with the MXChange database

The MXChange update will be performed when saving the MM+ 2.40 project. This additional function is available only if the project currently loaded is an MXChange project. If it is not an MXChange project, no update is performed.

When you are not logged in the MXChange server, no update with the MXChange database is possible. In this case the following message appears:

![Message]

When you are logged in the MXChange server, MM+ 2.40 informs the MXChange server about relevant changes made in MM+ 2.40 since the last successful update. The progress status will be indicated by a status bar and the comment ... updating MXChange database.
After that MM+ 2.40 asks the server whether there are any changes relevant for the MM+ 2.40 project currently loaded. If there are relevant changes, MM+ 2.40 receives these changes and integrates them into the loaded project. The progress status will be indicated by a status bar and the comment *... getting changes from MXChange database.*

1.8.3 Special MXChange menu commands

1.8.3.1 New menu commands

**Project**

...  
Enable MXChange  
MXChange actions → Log on  
Show Changes  
Call Tag-editor  
Global Adjust  
Change Password  
Disable MXChange

**Extras**

...  
Declare MXChange tags  
Delete MXChange tags  
...

1.8.3.2 Availability of the MXChange menu items

<table>
<thead>
<tr>
<th></th>
<th>Project closed</th>
<th>Non-MXChange project open</th>
<th>MXChange project open and logged on</th>
<th>MXChange project open and not logged on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable MXChange</td>
<td>D</td>
<td>E</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Disable MXChange</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Log on</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Show Changes</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Call MXChange-tag editor</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Global Adjust</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Change password</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
</tbody>
</table>

D = menu item disabled  
E = menu item enabled
1.8.3.3 Project menu

1.8.3.3.1 Enable MXChange

The item Enable MXChange is available only if the current project is a non-MXChange project. The function does not work if any GVL editor is open at the moment. In this case an error message appears:

If all GVL editors are closed, you are asked to insert the TCP/IP address or the network name of the machine the MXChange server is running on. Furthermore, the login details are required.

Use Local Address

The button Use Local Address inserts the TCP/IP address of the PC MM+ 2.40 is running on. In some cases the TCP/IP address cannot be determined, e.g. if the PC is not running in a network. If this is the case, you are asked whether the local host address should be used instead (which is 127.0.0.1 by define).

Yes: The local host address (127.0.0.1) is inserted into the address field.
No: Nothing is inserted into the address field.
**Browse**
The button **Browse** opens a list box where you can select a server to connect. The timeout used to connect the servers is 3000 ms by default. This value can be modified by an entry in the **INI** file. In the following example the timeout is set to 5000 ms.

```
[MXChange]
...
BrowseServerTimeout=5000
...
```

**Possible error messages:**
- Error while looking for MXChange servers.
- Too many servers found. Not all can be displayed.

---

**OK:**
The dialog will be closed and the selected server address is inserted into the field **MXChange server** of the **logon** dialog.

**Cancel:**
Return to the **logon** dialog

**Automatic Update After Logon**
If the item **Automatic Update After Logon** is selected, the MXChange data will be updated immediately after each logon (similar to **Project->Save**).

**Show Message if MXChange data has been Modified by other Applications**
If this item is selected, MM+ 2.40 will display a message if any other application has changed MXChange data of the current MM+ 2.40 project. This message appears the first time when a change has been made after the last update (project save), i.e. it does not appear for each change.
**OK:**
The dialog will be closed and the address of the selected server is inserted into the field *MXChange server* of the *logon* dialog.

**Show Changes:**
A dialog will be opened to display the changes made by other applications. This dialog is described in section 1.8.3.3.3: MXChange action → Show Changes.

The last state of this flag is stored in the *INI* file of MM+ 2.40...

[MXChange]
... 
AutomaticUpdate = TRUE 
...

**Leaving with Cancel**
The dialog will be closed.

**Leaving with OK**
MM+ 2.40 checks the connection to the MXChange server. If no connection is available, one of the following error messages will appear:

**Possible error messages:**
- The connection to the MXChange server timed out!
- The MXChange server has been disconnected!
- A not specified MXChange interface error occurred!

After the error message has been acknowledged the dialog appears again. The user can now decide to try it once again, to modify the parameters, or to cancel the action.

After a connection to the MXChange server has been established successfully there are two possible cases:

1. **The PLC project does not exist in the selected MXChange server**

   In this case MM+ 2.40
   - adds a new PLC node to the MXChange database. The new PLC node is named according to the MM+ 2.40 project.
   - adds a new Global Variables node below the PLC node.
   - creates additional DB objects in the local MM+ 2.40 database needed for MXChange.
   - inserts a new column to the GVL editors lists.
   - logs on to the MXChange server.
Possible error messages:
- The connection to the MXChange server timed out!
- The MXChange server has been disconnected!
- A not specified MXChange interface error occurred!
- Failed while trying to add nodes!

2. The PLC project still exists within the MXChange server

This case occurs if the Super Project Manager includes already a PLC node which has the same name as the MM+ 2.40 project. A message appears and you can decide whether you want to use this project node and import all data into the current project.

No:
The introduction of MXChange to the MM+ 2.40 project will be cancelled and the logon dialog appears again. You have the opportunity to establish a connection to another server.

Yes:
- All MM+ 2.40 tags of the corresponding PLC node will be imported into the GVL of the current MM+ 2.40 project.
- ProfiMap POU blocks will be integrated.
- For each imported POU block a corresponding task will be created.

Possible error messages:
- The connection to the MXChange server timed out!
- The MXChange server has been disconnected!
- A not specified MXChange interface error occurred!
- The item number was outside the range of available items!
- More data available!
- An error occurred while importing MXChange data to MM+ 2.40!

If the MXChange database contains an MXChange tag with the same name as a declaration still existing the following message appears:
Yes:
The MM+ 2.40 declaration will be overwritten.
No:
The MM+ 2.40 declaration will not be overwritten, but will be declared as an MXChange tag.
During the next updating the MXChange server will be forced to adapt its MXChange tag to the corresponding MM+ 2.40 declaration.
Yes all: Yes for all declarations.
No all: No for all declarations.

If the database includes empty or destroyed POU blocks, a message box appears which asks you whether you want to continue.
Yes: The POU block will be ignored and the import will be continued.
No: The import will be aborted.

1.8.3.3.2 MXChange action → Logon

If you are logged in when selecting the menu command logon, a logoff is performed. If you are logged off when selecting the menu command logon, a logon is performed.

The logon status is shown by a \ in front of the menu item.
The menu command logon is available only if an MXChange project is open.
The logon procedure

![MXChange Server -- Log On dialog box]

**Cancel**
The dialog will be closed.

**OK**
MM+ 2.40 logs on to the specified MXChange server using the given user name and password. The following error messages may appear:

**Possible error messages:**
- The connection to the MXChange server timed out!
- The MXChange server has been disconnected!
- A not specified MXChange interface error occurred!
- The password is incorrect!
- The MXChange server has no open database.

If the logon procedure does not find the project in the selected MXChange database (for example if the PLC node has been deleted within the Super Project Manager, the following message will be displayed:

![MXChange message dialog box]

**Yes:**
A new project node will be created in the MXChange database. During the next update (when saving the MM+ 2.40 database) all MXChange tags stored in the MM+ 2.40 database will be exported to the new project node.
No:
The logon will be cancelled.

During each logon the MM+ 2.40 project node is updated with the current data (project path, home PC etc.).

The logoff procedure

Possible error messages:
The connection to the MXChange server timed out!
The MXChange server has been disconnected!
A not specified MXChange interface error occurred!
You are not logged in!

1.8.3.3.3 MXChange action → Show Changes

The menu item **Show Changes** opens a window indicating the changes made by other applications. The list includes all changes concerning the project node and its child nodes which have to be considered by MM+ 2.40.

<table>
<thead>
<tr>
<th>Class</th>
<th>Name</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>TASK_CRITICAL</td>
<td>deleted</td>
</tr>
<tr>
<td>Declaration</td>
<td>TaskRunning</td>
<td>modified</td>
</tr>
<tr>
<td>Declaration</td>
<td>TESTMODE</td>
<td>added</td>
</tr>
<tr>
<td>PLC data</td>
<td>_PM</td>
<td>modified</td>
</tr>
<tr>
<td>POU-Block</td>
<td>udo</td>
<td>modified</td>
</tr>
</tbody>
</table>

The list is sorted alphabetically and includes three different classes: declarations, POU blocks, and the PLC data. Each item has one of the three change flags: deleted, added, or modified..

1.8.3.3.4 MXChange action → Call Tag editor

The menu item **Call Tag editor** calls the global MXChange tag editor. To use this function a connection to the MXChange server must be available and the current status must be logged on.
Possible error messages:
The connection to the MXChange server timed out!
The MXChange server has been disconnected!
A not specified MXChange interface error occurred!

1.8.3.3.5 MXChange action → Global Adjust

It might be that both databases (MM+ 2.40 and MXChange) do not have exactly the same tags or data or some tags differ by single items.

The following reasons are possible for that:
• using a backup version of the MXChange database
• using an older MM+ 2.40 project, i.e. you do not use the current MM+ 2.40 project
• malfunction of the normal update mechanism

The standard update mechanism does not note these cases. To realise an acceptable update duration, only data which has been changed is updated.

Starting the Global Adjustment
The global adjustment is an extra command.
By means of the global adjustment you can select either MM+ 2.40 or MXChange to include the more recent data.
If you decide that

1. MM+ 2.40 includes the more recent data,
   • all tags not defined in MM+ 2.40 but in MXChange must be imported to MM+ 2.40.
   • all tags not defined in MXChange but in MM+ 2.40 must be exported to MXChange.
   • tags defined in MXChange and MM+ 2.40 will be adjusted to the tags defined in MM+ 2.40, i.e. the tags in MXChange will be overwritten.

2. MXChange includes the more recent data,
   • all tags not defined in MM+ 2.40 but in MXChange must be imported to MM+ 2.40.
   • all tags not defined in MXChange but in MM+ 2.40 must be exported to MXChange.
   • tags defined in MXChange and MM+ 2.40 will be adjusted to the tags defined in MXChange, i.e. the tags in MM+ 2.40 will be overwritten.

After you have selected the menu item Global Adjust,
• update the MM+ 2.40 and MXChange databases if they are not consistent
• select the database including the more recent state of data (MM+ 2.40 project database or MXChange database)
• select Cancel or OK
Save Project
The menu command **Save Project** includes also the standard update mechanism necessary to ensure that all changed data have been exported or imported respectively. After the update the project will be saved. Now the global adjustment may start.

Global Adjustment
The update mechanism depends on the database which has been selected: MM+ 2.40 is master or MXChange is master.

```c
//----- direction MM+ Æ MXChange
For (all MXChange tags defined in MM+)
{
    If(Add to MXChange successful)
    {
        break;
    }
    else if (MM+ is master)
    {
        try to modify the tag
    }
}

//----- direction MXChange Æ MM+
Fetch all nodes defined below the MXChange project node
For (all tags)
{
    if(found in MM+)
    {
        if(MXChange is master)
            replace tag in MM+
        else
            do nothing
    }
    else //not found in MM+
    {
        import MXChange data to MM+
    }
}
Technical details

Update MM+ 2.40 → MXChange

For (all MXChange items defined in MM+)
Item->IsDefined
   |--- OK --- Adjust MM+ --- Item->CDEModify
   |--- Adjust MXC --- nothing
   +-- OK --- Adjust internal lists
   +-- No Memory --- Error Message, Abort Global Adj
   +-- Interface error --- Error Message, Abort Global Adj
   +-- Not Found --- Err:Could not Modify, go on with next
   +-- General --- Err:Could not Modify, go on with next

--- Interface Error, abort Global Adjust
--- default, do nothing
--- Not Found ------
--- Not Supported---- Item->CDEAdd
   +-- OK --- Adjust internal lists
   +-- No Memory --- Error Message, Abort Global Adj
   +-- Interface error --- Error Message, Abort Global Adj
   +-- General --- Err:Could not Add,
      Ask user to delete item in MM+
      YES: delete item
      remove item from list
      NO: do nothing
      go on with next

Update MM+ 2.40 → MXChange

Adjust MM+ ------- ImportAllMXChangeData (Do not overwrite anything in MM+)
Adjust MXChange -- ImportAllMXChangeData (overwrite all in MM+)

1.8.3.3.6 MXChange action → Change Password

Cancel:
The dialog will be closed.

OK:
- MM+ 2.40 checks whether the new password and the retyped password are identical. If they are not identical, the following error message appears: Re-entered password is not the same as first password! Now you can correct the inputs.
- MM+ 2.40 tries to change the password by calling MXChange server functions. If this is not successful, one of the following error messages appears:
  The old password is incorrect!
  The connection to the MXChange server timed out!
  The MXChange server has been disconnected!
  A not specified MXChange interface error occurred!
1.8.3.3.7 MXChange actions ➔ Disable MXChange

The menu item Disable MXChange is available only if the project currently loaded is an MXChange project. Disable MXChange removes all MXChange data from the project database and the MXChange column in the GVL. Via this menu item the PLC project will not be removed from the Super Project. This has to be done using the Super Project Manager. To disable MXChange all GVL editors must be closed. Otherwise the following message appears:

To ensure that you really want to delete all MXChange data, the following message box appears:

Yes:
All MXChange data included in the MM+ 2.40 database will be deleted.
No:
The window will be closed.

1.8.3.4 Extra menus

Declare MXChange tags

The menu item Declare MXChange tags is available only if the GVL editor is open and has the input focus and at least one declaration is selected. For non-MXChange projects Declare MXChange tags is not available.

All marked declarations will be defined as MXChange tags (see also section Declaring as MXChange tag on page 26). Declarations already defined as MXChange tags will not be influenced by this.

Delete MXChange tags

The menu item Delete MXChange tags is available only if the GVL editor is open and has the input focus and at least one declaration is selected. For non-MXChange projects Delete MXChange tags is not available.

All declarations that are defined as MXChange tags will be declared to be non-MXChange tags (see also section Deleting an MXChange tag on page 27). The other declarations will not be influenced.

1.8.4 New toolbar icon: Logon

MM+ 2.40 includes a new toolbar icon: Logon. However, this toolbar icon is visible only if MXChange is enabled via the file MM+.INI (see below). Otherwise it is not visible.
The logon icon does the same as the corresponding menu item. It can have one of the following states:

*Disabled if...*
- no project is open.
- the open project is a non-MXChange project.

*Pushed if...*
- the status is logged on.

*Normal if...*
- the status is not logged on.

Tool tip: **Logon/Logoff to MXChange Server**

1.8.5  **GVL declaration editor**

If the current project is an MXChange project, another column named MXChange is added to the GVL. If the current project is not an MXChange project, the appearance will not be modified. An X in the MXChange column indicates that this variable is declared to be an MXChange tag. User library GVLs cannot declare variables as MXChange tags although they include also the additional column. If you click into the MXChange field, a system beep will be generated.

1.8.5.1  **Declaring as MXChange tag**

To declare a variable as MXChange tag, click into the field using the left mouse button or press **SPACE** within this field. There are variables which cannot be declared as MXChange tags. There are the following restrictions:

1. The variable declaration must be valid. Otherwise the following message appears:
2. The variable type must be of the following types: BOOL, INT, STRING, DINT, WORD, DWORD, REAL, TIME, or ARRAYS of the types mentioned before. Otherwise the following message appears:

If you try to change an MXChange tag type into a type not allowed in MXChange, the change is not accepted and the tag type which has been valid before entering the invalid type will be valid again when leaving the edit field.

1.8.5.2 Deleting an MXChange tag
To delete an MXChange tag, remove X from the MXChange column in the GVL. During the next update (when saving the MM+ 2.40 project) this information will be given to the MXChange server. If you delete a variable which is an MXChange tag, it will also be removed from the MXChange database.

1.8.5.3 Restrictions
It is not allowed to change the name of a, MXChange declaration in the GVL editor. If you try to open the edit field of the variable name a message beep will be generated.

1.8.6 ASCII Import and Export
1.8.6.1 Import and Export of the MXChange flag
To be compatible to lower MM+ versions '~C' is appended to the comment string of variables if it is an MXChange tag as well. The example below shows the export of a GVL containing two MXChange variables (aInt, aInt2).

(*SOFTCONTROL:
 VERSION:2.03.09*)
CONFIGURATION scConfiguration
 RESOURCE scResource ON scResourceType

VAR_GLOBAL
 aInt AT %MW0.11: INT:=0;
 (*A Comment~C*)
 aInt2 AT %MW0.11: INT:=0;
 (*A Comment~C*)

END_VAR

END_RESOURCE
END_CONFIGURATION
1.8.6.2 Import of MXChange variables into an MXChange project

When importing MXChange variables into an MXChange project, the variables will be flagged as MXChange tags. During the next update with the MXChange database the MXChange variables will be transferred to the MXChange server.

1.8.6.3 Import of MXChange variables into a non-MXChange project

When importing MXChange variables into a non-MXChange project, the MXChange flag will be ignored.

1.8.7 User actions influenced by MXChange

This section describes how standard MM+ 2.40 user actions will be influenced by MXChange.

1.8.7.1 Save Project

Before saving the MM+ 2.40 project database it will be updated with the MXChange server. The following dialog indicates the progress of the MXChange update.

The user can cancel the update by pressing the Cancel button. To check whether the user really wants to break the update, the following message box appears:

Yes: The update will be cancelled.
No: The update continues.

Before starting the update MXChange checks whether there are no duplicate names in the GVL. If there are duplicate names, the update will be cancelled and the following error message appears:
If the server is not available at the moment, a warning will be displayed.

The MM+ 2.40 project database will be updated during the next **Save Project**.

### 1.8.7.2 **Save Project as ...**

The user command **Save Project as ...** is allowed only if you are not logged in the MXChange server. **Save Project as ...** might cause problems, because the project name and its relation to the Super Project Manager will change. If you are logged in when saving the project as ..., the following message appears:

If you are not logged in and the message does not appear, the project will be saved including the new name. When you log in next time, MXChange notes the new project name and if the new project name is not available in the MXChange server, you will be asked to create a new project node.

The same will happen if an MXChange project has been renamed, restored, or copied under a new name.

### 1.8.7.3 **ASCII import and export**

It is not allowed to export data which must keep their changes made by means of MM+ 2.40 since an MXChange server connection could not be established during the last MM+ 2.40 session. These data represent a time dependent state which could be completely different when importing. The flags indicating MXChange variables are imported or exported respectively.

### 1.8.7.4 **Change of the PLC type**

The PLC type is stored in the MXChange database. Therefore, MXChange must be informed of the change of the PLC type in the current MM+ 2.40 project. This update will be done during the next logon. To ensure that MXChange is informed of the change, log off the MXChange server to change the PLC type.

If you are logged in the MXChange server when changing the PLC type, the following message will appear:
1.9 Database

1.9.1 Handling

The additional MXChange data will be added to each project that is opened by means of the MXChange version of MM+ 2.40. However, it is also possible to open an MXChange project with a non-MXChange version of MM+ 2.40.23.

1.9.2 Database objects

1.9.2.1 Status information

The status information contains information about the current project status. The project name is needed to decide whether the project name has changed (Project [] Import, Project [] Save as, Project [] Restore, Project [] Rename, Project [] Copy).

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fIsCDEproject</td>
<td>Boolean</td>
<td>1</td>
<td>TRUE: project is an MXChange project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FALSE: project is not an MXChange project</td>
</tr>
<tr>
<td>lCDEversion</td>
<td>Unsigned long</td>
<td>1</td>
<td>MXChange version of the project</td>
</tr>
<tr>
<td>SzMM+ProjectName</td>
<td>Text</td>
<td>256</td>
<td>Project name</td>
</tr>
<tr>
<td>SzLastUserName</td>
<td>Text</td>
<td>256</td>
<td>Name of the last user who has logged into the server.</td>
</tr>
</tbody>
</table>

1.9.2.2 Connection settings

The connections settings contain all information necessary to connect the MXChange server.

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>szCDEServerName</td>
<td>Text</td>
<td>256</td>
<td>Connection string</td>
</tr>
<tr>
<td>szCDEServerNetworkName</td>
<td>Text</td>
<td>256</td>
<td>Not used</td>
</tr>
<tr>
<td>TCP/IP-address</td>
<td>Unsigned long</td>
<td>1</td>
<td>Not used</td>
</tr>
<tr>
<td>Timeout</td>
<td>Unsigned long</td>
<td>1</td>
<td>Timeout in seconds. Not used</td>
</tr>
<tr>
<td>LFlags</td>
<td>Unsigned long</td>
<td>1</td>
<td>Bit 0 = 1 → online updates allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bit 0 = 0 → online updates not allowed</td>
</tr>
</tbody>
</table>
1.9.2.3 MXChange tag list

1.9.2.3.1 Frame

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>Long</td>
<td>1</td>
<td>Number of MXChange tags stored</td>
</tr>
<tr>
<td>Element 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element n</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.9.2.3.2 Element structure

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lMM+Id</td>
<td>ID</td>
<td>1</td>
<td>ID of the MM+ database object</td>
</tr>
<tr>
<td>lSPNodeId</td>
<td>Long</td>
<td>1</td>
<td>ID of the corresponding super project node</td>
</tr>
<tr>
<td>lNodeClass</td>
<td>Long</td>
<td>1</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDE_CLS_PLC_MM+LUS_TAG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDE_CLS_PLC_TCP_CARD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDE_CLS_PLC_SERIAL_CARD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDE_CLS_PLC_MELSEC_CARD_SERIAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDE_CLS_PLC_MELSEC_CARD_ETH</td>
</tr>
<tr>
<td>UserModifications</td>
<td>Word</td>
<td>1</td>
<td>Bit 0 == 1: user wants to delete this node</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bit 1 == 1: user wants to add this node</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bit 2 == 1: user wants to modify this node</td>
</tr>
</tbody>
</table>

1.9.2.4 Clear-flags list

The clear-flag lists are arrays of Super Project node IDs. The flags of these nodes have to be cleared when the server is online again. For each deletion, addition, and modification there is a separate list. These lists will be stored in the following way.

Addition list

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>Long</td>
<td>1</td>
<td>ID numbers that will follow</td>
</tr>
<tr>
<td>SP IDs</td>
<td>Long</td>
<td></td>
<td>Number of elements</td>
</tr>
</tbody>
</table>

Modification list

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>Long</td>
<td>1</td>
<td>ID numbers that will follow</td>
</tr>
<tr>
<td>SP IDs</td>
<td>Long</td>
<td></td>
<td>Number of elements</td>
</tr>
</tbody>
</table>

Deletion list

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>Long</td>
<td>1</td>
<td>ID numbers that will follow</td>
</tr>
<tr>
<td>SP IDs</td>
<td>Long</td>
<td></td>
<td>Number of elements</td>
</tr>
</tbody>
</table>
1.10 MXChange update mechanisms

1.10.1 General behaviour of MM+ 2.40

MM+ 2.40 performs a general update during project saving. If the MXChange server is not available during the update, the changes will be stored only in the local MM+ 2.40 database. Additionally the changes are marked to be handled during next update. Changes made by the MM+ 2.40 user will not be immediately reported to the MXChange server. They are handled during the next general update.

Changes made by other applications or the Super Project Manager will be accepted immediately if the online flag is set. Before any changes are made the MM+ 2.40 user will be informed of the change. MM+ 2.40 clears only the acknowledge flags, i.e. other flags are not cleared by MM+ 2.40. They will be cleared after the project has been saved.

1.10.2 UserModification flags

The local database in the additional MXChange data (for details see Fehler! Verweisquelle konnte nicht gefunden werden. on page Fehler! Textmarke nicht definiert.) includes information about all MXChange tags used in the MM+ 2.40 project. Each entry has three flags to indicate changes made by the MM+ 2.40 user after the last MXChange-server update. The flags indicate whether an MXChange tag was deleted, new created, or modified. Only one flag can be set at the same time.

If some changes concerning MXChange have been made within the GVL but have not been saved when closing the GVL, the changes made to the UserModification flags will not be saved neither.

The flags will be set in the following way.

The user marks a non-MXChange variable as MXChange variable

<table>
<thead>
<tr>
<th>Before user action</th>
<th>After user action</th>
</tr>
</thead>
<tbody>
<tr>
<td>new</td>
<td>delete</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

The user modifies an MXChange variable

<table>
<thead>
<tr>
<th>Before user action</th>
<th>After user action</th>
</tr>
</thead>
<tbody>
<tr>
<td>new</td>
<td>delete</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
The user removes the MXChange mark from a variable

<table>
<thead>
<tr>
<th>Before user action</th>
<th>After user action</th>
</tr>
</thead>
<tbody>
<tr>
<td>new delete modify</td>
<td>new delete modify</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

The user creates a new project node of an existing MXChange project

You can create a new project node of an existing MXChange project when you establish a connection to another MXChange server. You will be asked whether you want to create a new project node. In this case the flags of all existing MXChange tags have to be adapted:

- Remove the deletion tags from the list.
- Convert all modified flags into added flags.
- Do not change the added flags.
- All other tags have to be flagged as added.

1.10.3 Order of events

1.10.3.1 General update

The general update starts integrating MM+ 2.40 changes into the MXChange server. After this the MXChange server changes will be transferred into the MM+ 2.40 database. All necessary MXChange API calls will be done using synchronous calls.

The general update will be done according to the following order:
1. MM+ 2.40 → MXChange, deleted nodes
2. MM+ 2.40 → MXChange, modified nodes
3. MM+ 2.40 → MXChange, added nodes
4. MXChange → MM+ 2.40, deleted nodes
5. MXChange → MM+ 2.40, modified nodes
6. MXChange → MM+ 2.40, added nodes

1.10.3.2 Project save

Perform "General update"

SaveProjectDB

1.10.3.3 Project enable MXChange

IF(Project still exists in MXChange-server)
  IF(user wants to use this one)
    add new Database object to MM+ project
    modify GVL-editor
    add MXChange-menu to MM+
    import all relevant MXChange-data to MM+ project
    save project database
  ELSE
    do nothing
  ENDIF
ELSE
  do nothing
ENDIF
add new Database object to MM+-project
modify GVL-editor
add MXChange-menu to MM+
add new PLC-node to the super-project
save project database

1.10.4 Update MM+ 2.40 → MXChange

MM+ 2.40 checks whether the MXChange data include local modification flags. If this is the case, MM+ 2.40 informs the MXChange server of the changes. The flags will be cleared when the MXChange server has accepted the changes.

1.10.4.1 Delete nodes

The event Delete nodes uses the API call DeleteNodes. When using this API call with numerous node IDs problems might be caused. For this reason one call can delete a maximum of 30 nodes. If more than 30 nodes have to be deleted, at least two API calls will be performed.

The starting point of this event is a list of all IDs to be deleted. As mentioned above this list must be divided into packages of 30 IDs. For these packages the following events will be done:

while (all Nodes handled)
DeleteNodes (with a list of IDs)
CDE_ERR_OK: remove IDs from MM+ internal lists
CDE_ERR_NOTFOUND: see in the error list which nodes returned which error code
CDE_ERR_NOTFOUND: remove from MM+ internal lists
CDE_ERR_OK: call DeleteNodes again to avoid rollback by the MXChange server
CDE_ERR_XXX: 90% interface error
error message
exit update function

1.10.4.2 Modify nodes

For all Nodes to be modified
FetchNodesList (WorkOutSize of the node)
OK: FetchNodesList (real fetch)
OK: ModifyNodes
OK: update MM+ internal lists
ERR: Interface Error?
YES: "MXChange server not available any more. Update was cancelled"
- cancel whole update
- exit function
NO: CDE_ERR_NOTFOUND || CDE_ERR_NOTEMPTY
YES: "Node '???' was not found in the MXChange database.\nDelete this node in MM+ as well? (YES/NO?)
YES: remove ID from MM+ internal lists
- delete reference in MM+ DB
NO: do nothing
NO: "Error while trying to modify '???'"
ERR: Interface Error?
YES: "MXChange server not available any more. Update was cancelled"
- cancel whole update
- exit function
NO: show fetch nodes error
- cancel only for this node
- go on with next node
ERR: Interface Error?
YES: "MXChange server not available any more. Update was cancelled"
- cancel whole update
- exit function
NO: show fetch nodes error
- cancel only for this node
- go on with next node
1.10.4.3 Add nodes

1.10.4.3.1 Restrictions

The following table shows in which cases double names of MXChange tags are allowed.

<table>
<thead>
<tr>
<th></th>
<th>Tags in different projects</th>
<th>Tags in the same project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same addresses or types, different names</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Different addresses or types, same names</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Same addresses or types, same name</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

1.10.4.3.2 MXChange tag with same name already defined

If the MXChange database includes already a tag with the same name but a different address or type, the following dialog appears. You can select to overwrite the MM+ 2.40 declaration or to overwrite the MXChange tag.

1.10.4.3.3 Order of events

Input: list of CDETagInfo of all tags to be added. For each tag the following has to be performed.

```c
LookUpCdeTags(Heuristic)
  case CDE_ERR_OK
    switch(LookUpCdeTags(Name)
      case CDE_ERR_OK
        - to be sure insert new SPid into MM+-internal lists
        - update MM+ internal lists
      case CDE_ERR_NOTFOUND
        - fall through to Heuristic CDE_ERR_NOTFOUND
    default
      Interface Error ?
      YES: "MXChange server not available any more. Update was cancelled"
      cancel whole update
      exit function
      NO: "Error while trying to add '%s"
      Try to remove the MXChange flag
```
if ok update lists
cancel this node
going on with next node
case CDE_ERR_NOTFOUND
  - fill AddCdeTag-struct
  - perform API call AddCdeTags
  - create new CDETagInfo and replace this in internal list
default
  Interface Error ?
  YES: "MXChange server not available any more.
  Update was cancelled"
  cancel whole update
  exit function
  NO: "Error while trying to add '%s"
  Try to remove the MXChange flag
  if ok update lists
  cancel this node
  going on with next node

default
  Interface Error ?
  YES: "MXChange server not available any more.
  Update was cancelled"
  cancel whole update
  exit function
  NO: "Error while trying to add '%s"
  Try to remove the MXChange flag
  if ok update lists
  cancel this node
  going on with next node

A new procedure especially for GVL declarations is given in the following:

```c
if(! try to add the tag)
{
  if(LookUpName == OK)
  {
    Ask user which tag should be overwritten
    case OVERWRITE MM+
      modify the MM+-tag (import MXChange tag data, save decl)
      break
    case OVERWRITE MXChange
      modify the MXChange tag (fillMXChangeTag struct, ModifyNode in MXC)
      break
    try to add the tag again
  }
  else
    error "cannot add tag to MXChange"
}
else
  everything ok
```

### 1.10.4.4 POU blocks

POU blocks cannot be added, modified, or deleted by MM+ 2.40.

### 1.10.5 Update MXChange → MM+ 2.40

#### 1.10.5.1 Deleted nodes

##### 1.10.5.1.1 GVL declarations

To delete GVL declarations, take the following steps:

- Get the declaration.
- Remove the MXChange flag.
- Save the declaration.
- Remove the entry of this tag from the tag list.
1.10.5.1.2 POU blocks
To delete POU blocks, take the following steps:

- Delete corresponding task and POU in the MM+ 2.40 database.
- Remove the entry from the tag list.

1.10.5.2 Added nodes
If the MXChange server reports an added node, a new GVL variable marked as MXChange tag will be created. The new variable will be inserted into the MXChange object of MM+ 2.40. New POU blocks will be handled in the same way.

1.10.5.2.1 GVL declarations
At first MM+ 2.40 searches for a declaration with the same name. If MM+ 2.40 finds a declaration with the same name, you will be asked to overwrite this declaration.

Yes: load decl, modify decl, store decl
No: create new decl, modify decl, store decl

If the type of the imported MXChange tag is not allowed in MM+ 2.40, the type will be set to "". Additionally this declaration is marked as modified to be updated during the next update MM+ 2.40ÆMXChange.

1.10.5.3 Modified nodes

1.10.5.3.1 GVL declarations
For modified nodes there are the following GVL declarations: load decl, modify decl, store decl

If the type of the imported MXChange tag is not allowed in MM+ 2.40, the type will be set to "". Additionally this declaration is marked as modified to be updated during the next update MM+ 2.40ÆMXChange.

1.10.5.3.2 POU blocks

- Delete corresponding task and POU in the MM+ 2.40 database
- ASCII import of the POU block binary data

1.10.6 Restrictions
When updating the MXChange server there is a maximum of 4500 tags which can be added, modified, or deleted at the same time.