



ANDROID

HMI Application for Omron PLC

Oct. 4-5 2011 – **UPDATE 05/2012**
Régis Couchoud - OEEF



INTRODUCTION

- Omron provides web based remote HMI (NS Web, Cx Supervisor)
- Not adapted to reduced screen size of mobile devices
- Need specific hardware / software
- Idea is to provide a dedicated HMI application for mobile devices
- Easy to set up, without programming

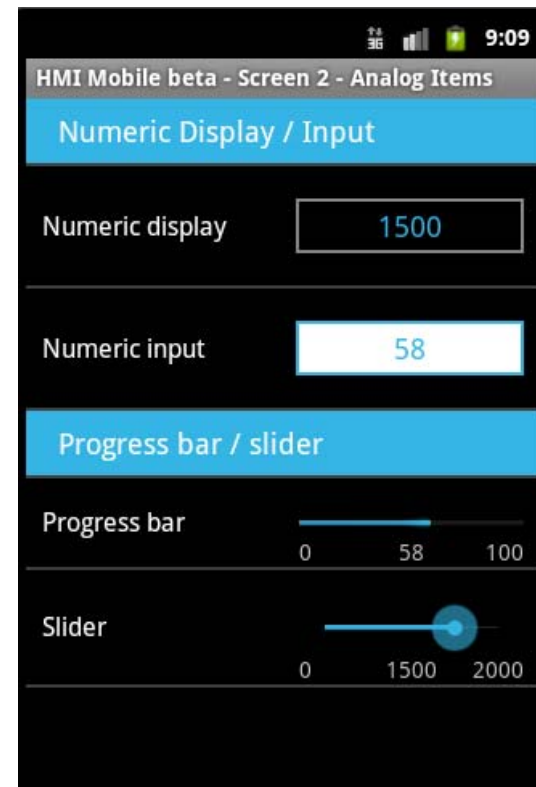
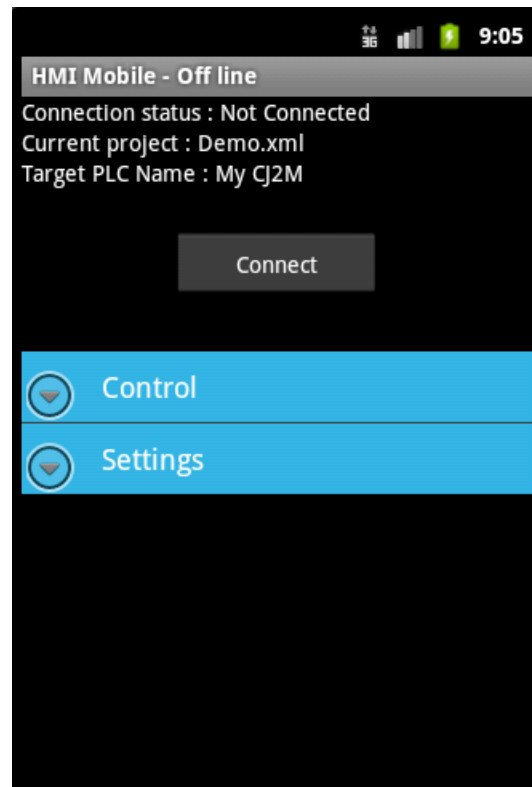


FEATURES

- Basic HMI for Android devices
- Easy to set up with XML configuration files
- Predefined graphical objects
- Supports multi projects files
- Supports FINS/TCP (with FINS routing) and ETHERNET/IP (UCMM) connection

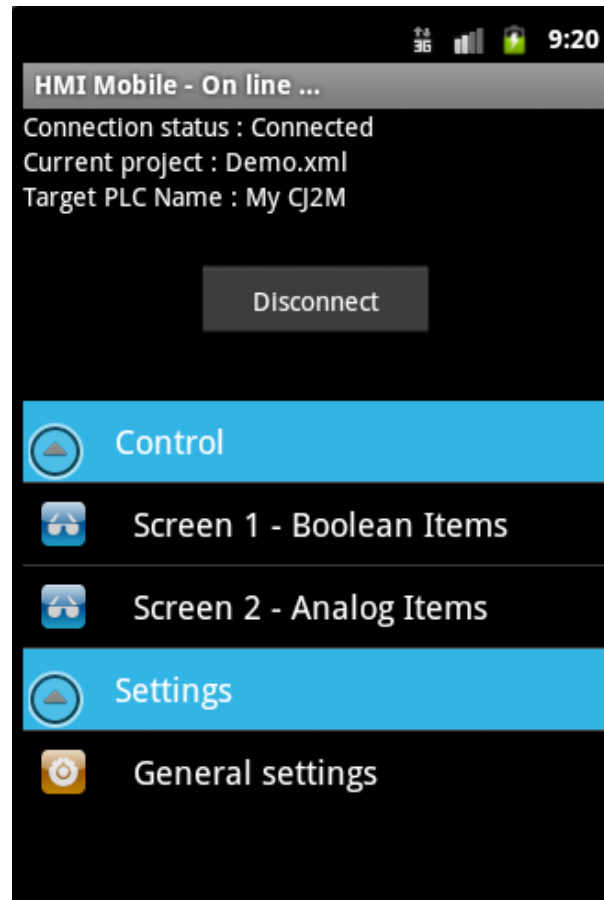
USER INTERFACE DESCRIPTION

- Consists on 2 screens (2 Activities)
- Screens are based on the powerful ListView object :



HOME SCREEN

- Project description, “Connect” button and screen list from config file
- Access to Control screens and General settings screen

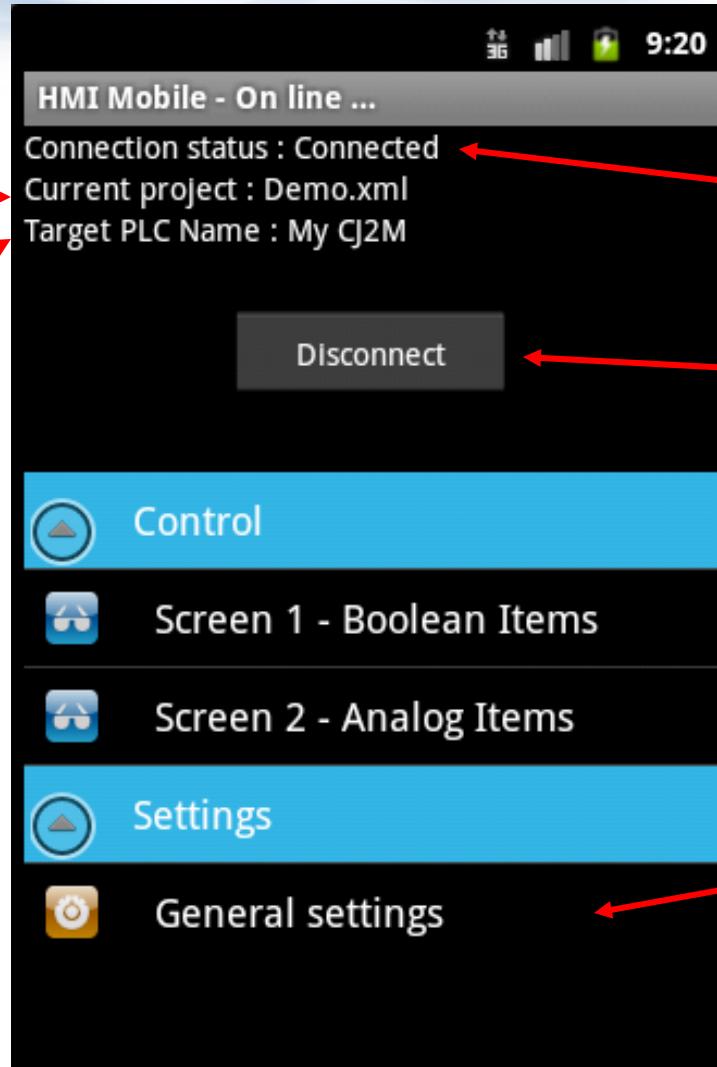


HOME SCREEN

Project configuration filename

PLC Name

Screen list (scrollable)

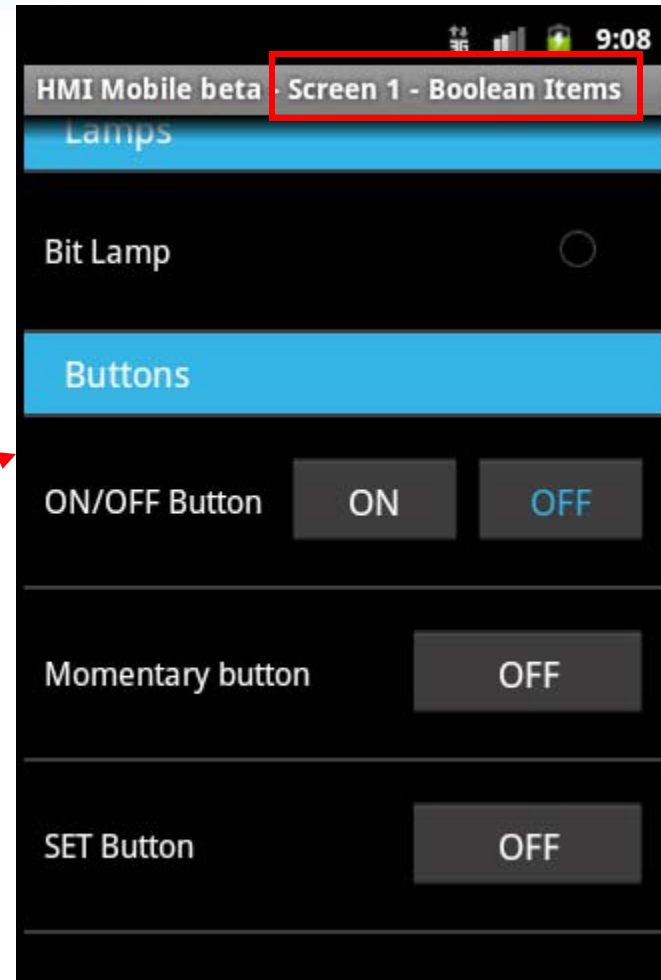
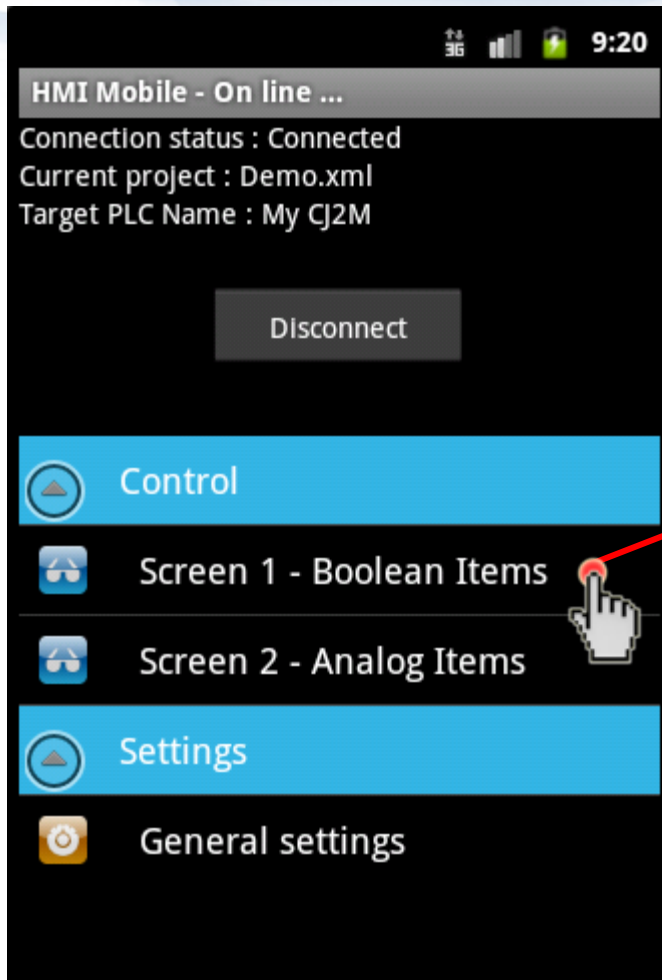


Connection status

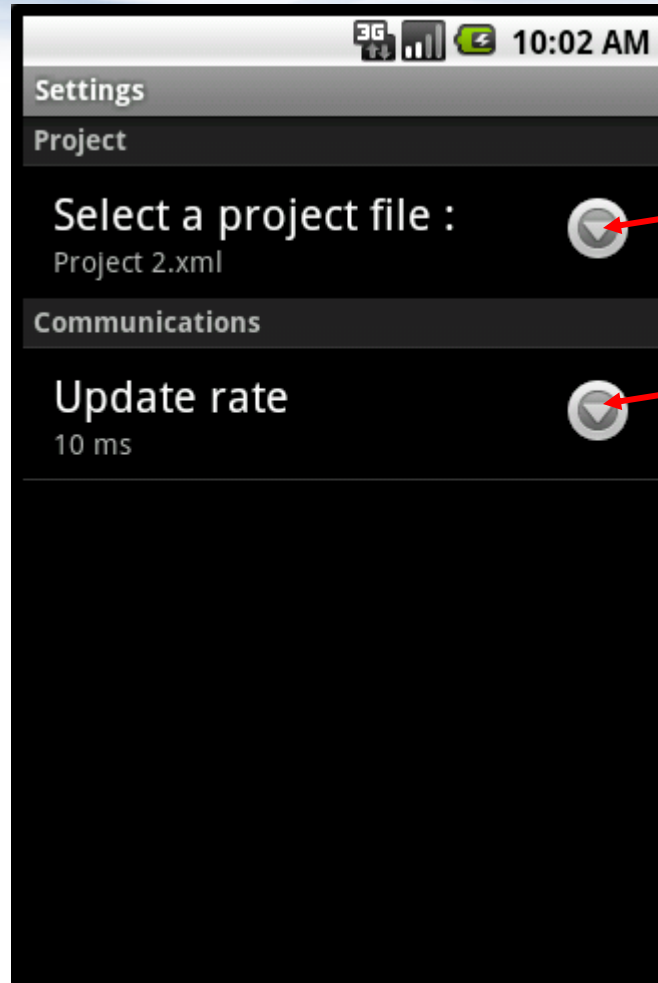
Connect / Disconnect button

Access to general settings

HOME SCREEN



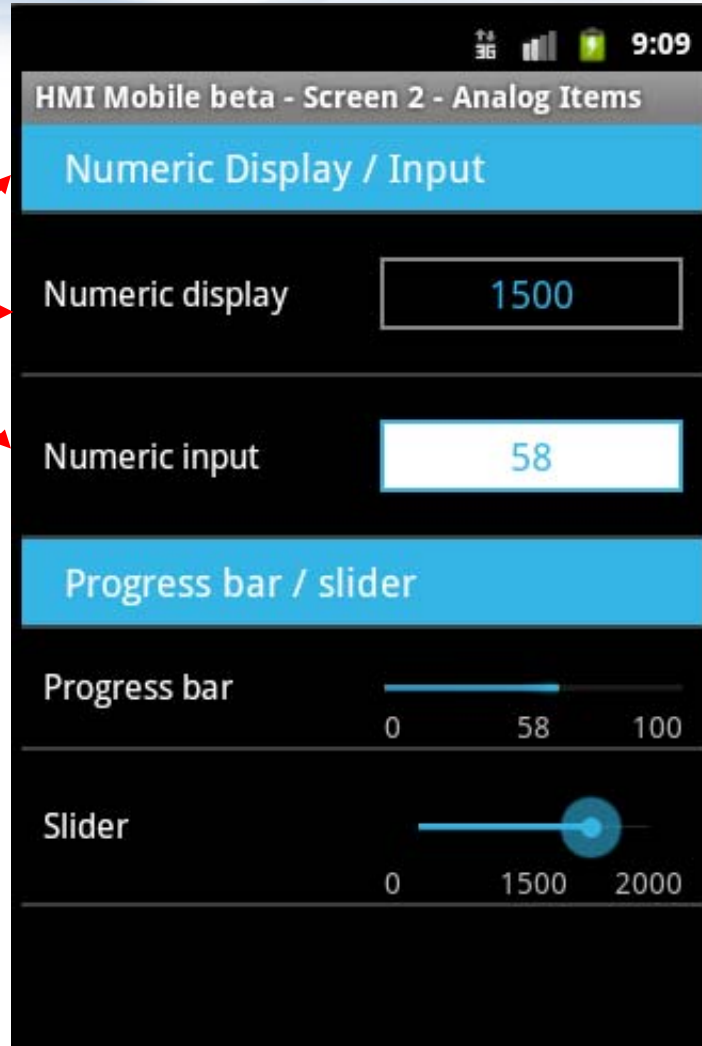
SETTINGS SCREEN



Configuration file
selection list

Update rate setting
(MUST BE IMPROVED !)

CONTROL SCREEN



Items are displayed in the order of XML file

Scrollable Items List

XML CONFIGURATION FILE

- Application works like a interpreter of the XML configuration file
- 3 levels : PLC, Screen, Item

```
<PLC Parameter1 = "... " Parameter2 = "... " ... >
```

```
<Screen Parameter1 = "... ">
```

```
<Item Parameter1 = "... " Parameter2 = "... ">
```

```
</Item>
```

```
<Item Parameter1 = "... " Parameter2 = "... ">
```

```
</Item>
```

```
</Screen>
```

```
<Screen Parameter1 = "... ">
```

```
<Item Parameter1 = "... " Parameter2 = "... ">
```

```
</Item>
```

```
</Screen>
```

```
</PLC>
```



XML CONFIGURATION FILE

- PLC Section configuration – FINS/TCP

```
<PLC Protocol="FINS" Name="FINS_Project" IP="192.168.250.1" FINS_PORT="9600" SNA="0" DNA="0" DA1="0">
```

```
.  
. .  
. .  
. .  
. .
```

```
</PLC>
```

- Protocol="FINS"
- IP Address, FINS Port No, Source Network Address, Destination Network Address, Destination Node No

XML CONFIGURATION FILE

- PLC Section configuration – Ethernet/IP (UCMM)

```
<PLC Name="My CJ2M" Protocol="EIP" IP="192.168.1.10">
```

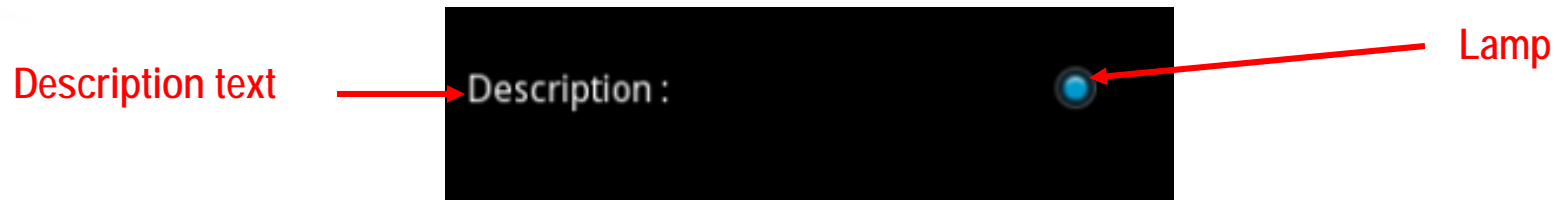
```
.  
. .  
. .
```

```
</PLC>
```

- Protocol="EIP", IP Address
- Uses standard Ethernet/IP Port 44818

PREDEFINED ITEMS

- Bit lamp



- XML Description :

```
<Item  
Type="11"  
Description="W100.0"  
Fb_Address="W100.0">  
</Item>
```

Annotations for the XML code:

- Red arrow from "Bit lamp ID number" points to the value "11" in the Type attribute.
- Red arrow from "Feedback address" points to the value "W100.0" in the Fb_Address attribute.

PREDEFINED ITEMS

- On/Off button



- XML Description :

```
<Item  
Type="10"  
Description="W100.1"  
W_Address="W100.1">  
</Item>
```

Annotations for the XML code:

- Red arrow pointing to "10": ON/OFF Button ID number
- Red arrow pointing to "W100.1": Write address

PREDEFINED ITEMS

- Momentary button, Set button, Reset button, Toggle button



- XML Description :

```
<Item  
Type="12"  
Description="This is a button"  
W_Address="W100.0"  
Fb_Address="W100.1">  
</Item>
```

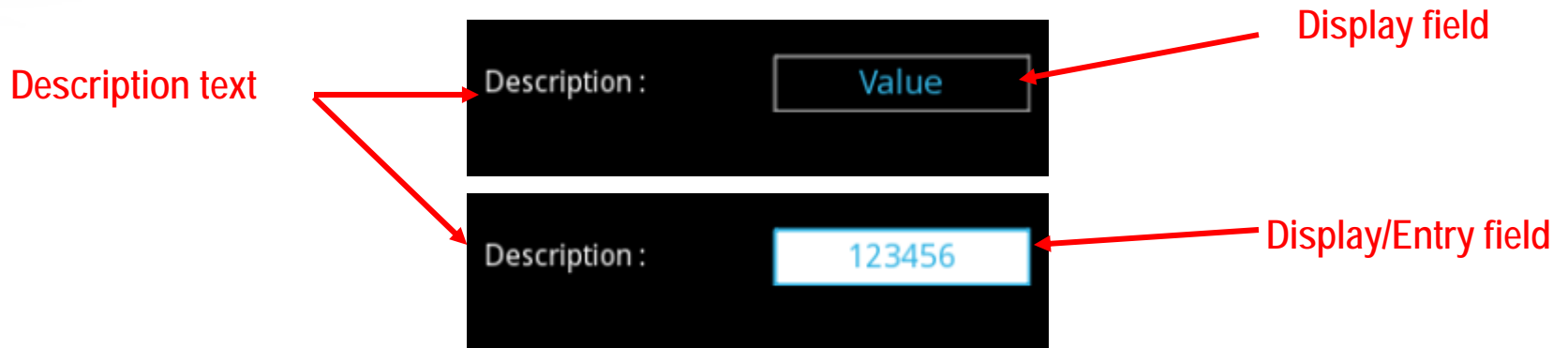
- ID number :
12=momentary button
13=Set button
14=Reset button
15=Toggle button

Write address

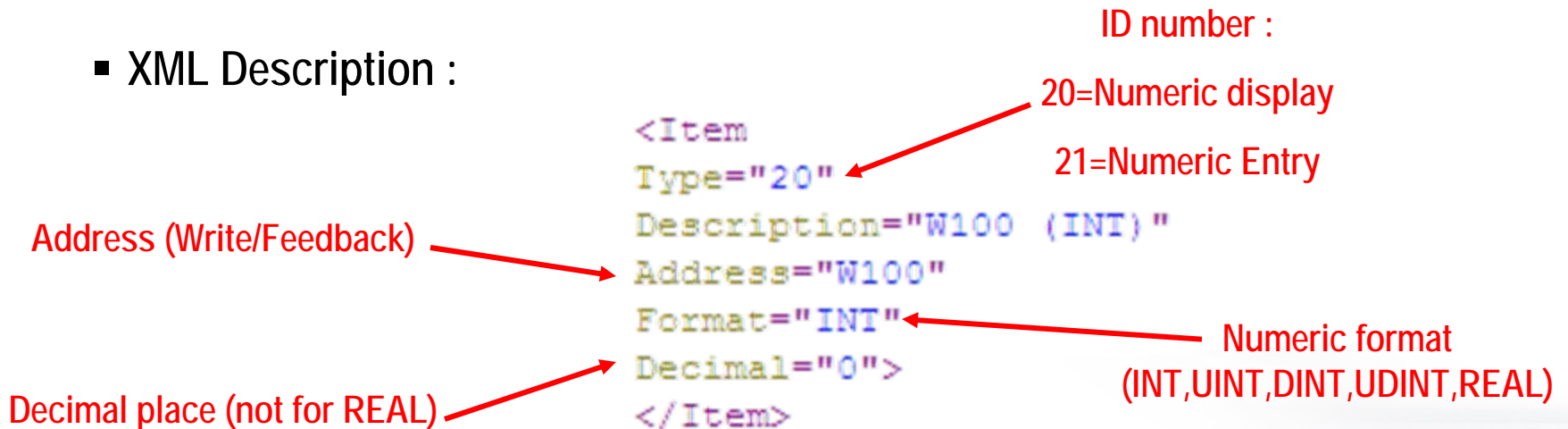
Feedback address

PREDEFINED ITEMS

- Numeric display / input

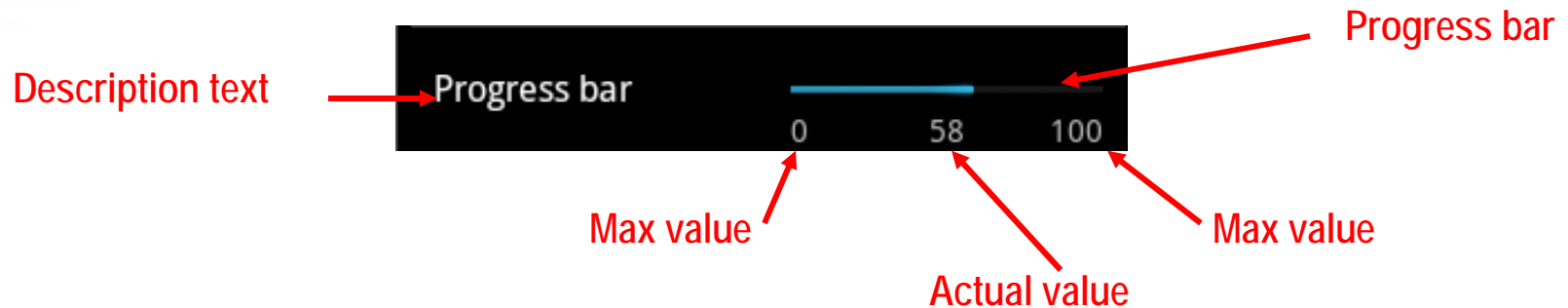


- XML Description :



PREDEFINED ITEMS

■ Progress Bar



■ XML Description :

```

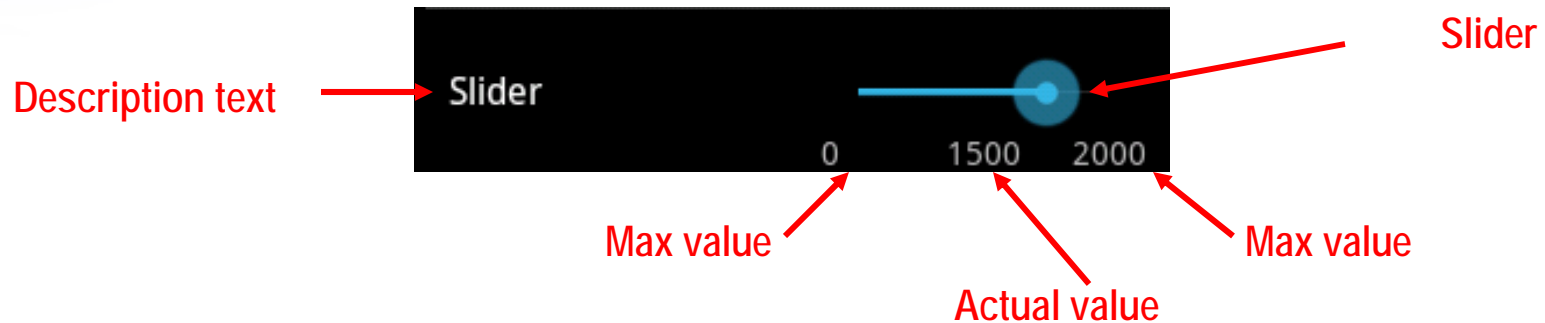
<Item
Type="30"
Description="W100 (INT) "
Address="W100"
Format="INT"
Decimal="0"
Min="0"
Max="100">
</Item>

```

Numeric format
(INT,UINT,DINT,UDINT,REAL)

PREDEFINED ITEMS

■ Slider



■ XML Description :

```
<Item
Type="30"
Description="W100 (INT) "
Address="W100"
Format="INT"
Decimal="0"
Min="0"
Max="100">
</Item>
```

Numeric format
(INT,UINT,DINT,UDINT,REAL)

PREDEFINED ITEMS

- List separator (Static Item)



Description text



- XML Description :

```
<Item  
Type="0"  
Description="Separator">  
</Item>
```

Type="0"



Description text



ETHERNET /IP Tags

- In xml file, use TagName instead of FINS Address
- Supports Arrays, Structures, Nesting...
- Eg : MyArray[12], MyStruct.MyBool, MyStruct.MyArray[2]
- Supported data types :
BOOL, INT, UINT, DINT, UDINT, REAL, STRING



INSTALLATION ON MOBILE DEVICE

- 1 – Install the application package (.apk file)
- 2 – Create a folder \HMI_Mobile on the device's SD card *
- 3 – Copy your xml configuration files in that folder (1file / project)
- 4 – Run the application

* This folder is now created at launch if not exists on SD card



HOW DOES IT WORK ? Database

- XML file is read and parsed to build an internal database :
- PLC data, screens data and Item data are organized in multilevel Arrays



HOW DOES IT WORK ? Communications

- Communications are handled by a background process (thread)
- For each Item in the ListView, FINS 0104 is sent
- Returned value is stored in the item object's value property
- A refresh request is sent to the UI after each polling cycle
- Ethernet/IP UCMM messaging doesn't support multiple data read. Performances must be improved in future.



HOW DOES IT WORK ? Communications

- Handling writing events :
- When a writing request happens, polling cycle must be paused properly before sending FINS 0102
- Writing events are queued in a stack. If the stack is not empty, polling cycle is paused and writing requests are processed