

# LANCOM Wireless ePaper Server

## User Manual

11/2022

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# 1 Introduction

LANCOM Wireless ePaper Displays provide a variety of options for displaying information. You can automatically and remotely update the calendar schedule for your conference rooms, you can create dynamic notices and direction signs, or you can control the price labels of goods on your shelves from a central location in real time. The wide range of different settings allows you to set up your very own customized use case.

The Wireless ePaper Displays are battery powered and radio controlled, so they operate independent of any external power supply or physical network connection. This allows a highly flexible use. The graphical display offers a high-contrast image with a very wide viewing angle, while at the same time consuming an extremely low level of energy. Data transmission is protected by 128-bit encryption.

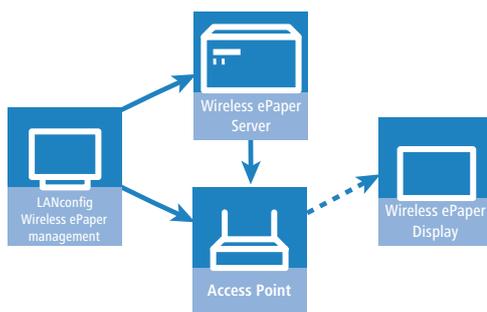
The associated LANCOM E-series access points provide not only the wireless connection to the Wireless ePaper Displays: They also support a full WLAN infrastructure and also the iBeacon technology. By integrating all of these technologies into a single device, they all operate in parallel without interfering with one another.

This User Manual helps you with the steps required to commission the Wireless ePaper Server for centralized management and monitoring of your Wireless ePaper infrastructure.

## 1.1 How it works

The LANCOM Wireless ePaper solution consists of four components:

- LANconfig allows the management and configuration of access points, includes the Wireless ePaper management feature, and facilitates the configuration of the Wireless ePaper Server
- The Wireless ePaper Server creates the graphics and transmits the information to the access point
- The access point connects to the Wireless ePaper Displays via radio
- The Wireless ePaper Display shows the desired content



The software consists of LANconfig and the Wireless ePaper Server. LANconfig manages the access points, facilitates their configuration, and invokes the Wireless ePaper management. The Wireless ePaper Server receives the instructions from the Wireless ePaper Management, computes the content to be rendered, and transfers this to the access points. The access points forward the content to the Wireless ePaper Displays by radio.

### Wireless ePaper Display

A Wireless ePaper Display is based on ePaper technology for the display of any information in the form of graphics and text. It can be used, for example, as room signage in the appropriate corporate design, or to display information about an article. The information on display is automatically updated via radio when the content changes, unlike any printed signs.

**LANCOM E-series access points**

E-series access points communicate with Wireless ePaper Displays using radio frequencies in the 2.4-GHz ISM band and a proprietary protocol. They offer a choice of 11 radio channels.

Depending on the size of the area where the radio-controlled Wireless ePaper Displays are installed, more than one access point may be required to provide coverage over the entire area. If more than one access point is available, each Display automatically selects the access point with the best signal quality.

Further technical details on the LANCOM E-series access points can be taken from the data sheet.

**LANCOM Wireless ePaper Server**

The LANCOM Wireless ePaper Server is a software program required for the management of the LANCOM access points and Wireless ePaper Displays. The Wireless ePaper Server runs as a background service on an on-site Windows or Linux PC. It does not provide a graphical user interface.

The Wireless ePaper Server generates the graphics, which are transmitted to and shown on the Displays when there is a change of information.

**LANconfig and Wireless ePaper management**

The software LANconfig is required to operate the access points, with regard to both the WLAN and the Wireless ePaper solutions. Please use the appropriate User Manual for the installation and setup of LANconfig.

Monitoring and configuration of the Wireless ePaper infrastructure is available in LANconfig in the form of the Wireless ePaper management, which provides a graphical user interface. The Wireless ePaper management connects to the Wireless ePaper Server. The server can be installed on the same computer or on any other computer that is accessible on the network.

## 2 Installation and setup

Before you can access a Display, you first need to install and set up the various components. Go to the LANCOM website and download the latest version of LANconfig and the current installation packages for the Wireless ePaper Server. The Wireless ePaper management is integrated into LANconfig, so no separate installation is required.

The necessary steps are explained below:

- > Install the Wireless ePaper Server software on a computer available locally in the network
- > Set up the license for the Wireless ePaper Server
- > Connect the access point to the local network and configure it
- > Register the Displays with the Wireless ePaper Server

The Wireless ePaper management indicates whether the Wireless ePaper Server, access point and LANconfig are communicating correctly. It is accessible in LANconfig under **Tools > Start Wireless ePaper management**. The Wireless ePaper management opens in a new window in the system's default browser.

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 The Wireless ePaper management is a part of LANconfig and does not require separate installation.

### 2.1 Installing the Wireless ePaper Server

Install the Wireless ePaper Server on a central computer in the network with constant access to the Wireless ePaper Displays.

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 Only one Wireless ePaper Server should be installed on a network, otherwise conflicts could arise.

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 However, in the interests of system latency, the Wireless ePaper Server and the E-series access points should be connected over the same local network.

#### System requirements

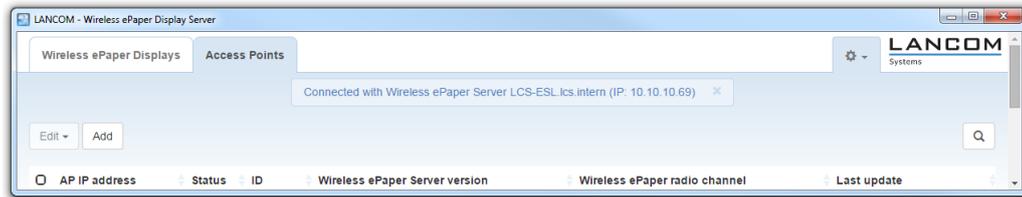
The number of displays and their size directly affect the amount of RAM required. The required disk space may increase over time depending on the number of tasks and transmitted images.

- > Intel dual core processor or equivalent
- > 2 GB RAM (512 MB for the server)
- > 100 MB hard disk space for the server installation
- > Windows Vista or later, Windows Server 2003 or later, Linux (x86- and x64-architecture are supported)
- > Java Runtime Environment Version 7 or later (x86- and x64-JRE-versions are supported)

#### Installation

On computers with the Windows operating system, the software is installed with the supplied installation routine. This directly installs and starts the Wireless ePaper Server as a service. In principle, the software runs outside of Windows on any computer with Java. You will find the corresponding ".jar" files in the download area of the LANCOM website.

To manage the Wireless ePaper Displays, the Wireless ePaper Server has to be started and running. To see whether the server is correctly installed and configured, look under the Wireless ePaper management for "Connected with server: [Server name] (IP: x.x.x.x)".



### Files and folders of the Wireless ePaper Server installation:

|                              |                                                                         |
|------------------------------|-------------------------------------------------------------------------|
| <b>config/</b>               | Contains files used for the configuration of the Wireless ePaper Server |
| <b>data/</b>                 | Contains runtime data such as templates                                 |
| <b>db/</b>                   | Local mounted database (created when you first start)                   |
| <b>lib/</b>                  | External libraries required by your application                         |
| <b>plugins/</b>              | Folder with user-specific plugins                                       |
| <b>derby.log</b>             | Database-related logging (created when you first start)                 |
| <b>import.log</b>            | All logs of the import connections (created when you first start)       |
| <b>install_service.bat</b>   | Batch file for the installation of the server as a Windows service      |
| <b>level1.jar</b>            | Program code for operating the server on integration tier 1             |
| <b>prunsvr.exe</b>           | Required to run the Java application as a Windows service               |
| <b>server.jar</b>            | Main executable file to launch the application                          |
| <b>server.log</b>            | All logs of the Wireless ePaper Server (created when you first start)   |
| <b>uninstall_service.bat</b> | Batch file for the installation of the server as a Windows service      |

### Updating the Wireless ePaper Server

In order to retain the database and configuration of your existing installation, simply copy the folder **db** and all modified files in the folders **config** and **data** to the new installation.

### Starting the Wireless ePaper Server

You start the Wireless ePaper Server by double-clicking on the `server.jar` file. The Wireless ePaper Server requires a current Java Runtime Environment installed on the system. Furthermore, ".jar" files need to be associated with Java. When started from the `server.jar`, the Wireless ePaper Server does not run as a service.

⚠ By default, this server uses TCP connections on port 8000 (for Wireless ePaper management requests) and 8001 (for web services) and UDP connections on port 8000 (for detecting access points). Communication with the access points takes place via ports 7354 and 7353. Make sure that these ports are not blocked by a firewall or used by other applications.

When starting for the first time, the Wireless ePaper Server automatically creates a local database.

⚠ It is not possible to start two instances of the Wireless ePaper Server at the same time on the same computer, because the database is locked and the TCP port is busy with the other instance. Additional configuration work is necessary in order to run multiple installations on the same computer.

## 2 Installation and setup

### Operating the Wireless ePaper Server as a background service

The Wireless ePaper Server can be run as a normal application, as described above. However, a productive system usually requires the application to start automatically and without a login user. To achieve this, the Wireless ePaper Server is registered as a Windows service. The Wireless ePaper Server then starts automatically.

The batch file `install_service.bat` is provided in order to start the Wireless ePaper Server as a Windows service. When this file is executed with administrator privileges, it installs the Wireless ePaper Server from the same directory but as a Windows service named `EPE_SERVICE`.

The file `uninstall_service.bat` removes the Windows service when it is executed with administrator privileges.

## 2.2 Setting up the license

In order to operate the Wireless ePaper Server, you first need to register it. On purchasing a Wireless ePaper Server license, you receive a license number that first has to be activated before use.

To activate your license, open your web browser and go to the [LANCOM website for registering licences](#).

The option to activate your license is under **Wireless ePaper Servers**. Enter the serial number of your Wireless ePaper Server and the license number you purchased. If successful, you will receive an activation code for your license.

 This is how to find the serial number of your Wireless ePaper Server: Go to the Wireless ePaper management, open the menu in the top right-hand corner next to the LANCOM logo and click on **License**.

### Registrations: LANCOM Wireless ePaper Server

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Please use this form to activate your LANCOM Wireless ePaper Server license. When you send the registration, you will receive the activation code for your LANCOM Wireless ePaper Server.

Please note that the LANCOM Wireless ePaper Server license adheres strictly to the specified device after its activation. An activation of the same license for any other LANCOM Wireless ePaper Server installation is not possible. Therefore, take care to fill in the serial number without any mistake.

In case your registration was not successful or you have other problems during the registration you can trustfully turn to our [support](#) ».

LANCOM Wireless ePaper Server serial number

[Where will I find the LANCOM Wireless ePaper Server serial number?](#)

LANCOM Wireless ePaper Server license number

Please verify your data before you continue.

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To complete the registration of your license, you will find the option in the Wireless ePaper management in the menu in the top right-hand corner. Open the menu next to the LANCOM logo and click **License**.

Wireless ePaper licenses

Licensed access points: 5

Managed access points: 5

Licensed displays: 500

Managed displays: 29

Serial number: 2170108440111025

Used licenses: A21014488-10CA-7010-4010-1025

Enter the activation code you received after activating your license on the LANCOM website.

Add license:  Send

Close

Once you have successfully registered your license on the LANCOM website and have received your activation code, enter this into the field **Add license** and then click **Send**. If your entries are correct, your license will be displayed. Under **Licensed access points** you can see the maximum number of access points that can be operated by the Wireless ePaper Server. To find the number of access points currently in operation, see **Managed access points**. The number of **Licensed Displays** and **Managed Displays** is shown in a similar manner. If you wish to operate more access points or displays than your current license allows, please contact LANCOM.

! If you have not set up a license, any commands sent to the display will be faulty and do not run.

## 2.3 General settings

In the upper-right corner of the Wireless ePaper management, click on the gear-wheel icon and then **Settings** to access the general settings for the Wireless ePaper Server.

Settings

Encryption key:

Number of transmission attempts:

Refresh view in seconds:

Language: English

Wireless ePaper protocol version: 2.0 (TCP-based, recommended as 1)

1.0 (UDP-based, legacy)

2.0 (TCP-based, recommended as from LCOS 10.32)

Save Cancel

**Encryption key**

Change the encryption passphrase used for the AES-128 encrypted communication between the Wireless ePaper Server and the managed Displays. You should change this for your installation first.



This key is stored to the Displays when they are registered. Should you want to change the key for a running installation, you need to reset all of the Displays to their factory settings beforehand (see [Reset Display](#) on page 20).

**Number of transmission attempts**

Number of transmission attempts to the displays if no success message came from them after the data transmission.

**Refresh view in seconds**

Set the frequency at which the Wireless ePaper management display is updated.

**Language**

The preferred language for the Wireless ePaper management.

**Wireless ePaper protocol version**

- > Protocol version 1.0 (UDP-based, legacy)
- > Protocol version 2.0 (TCP-based, recommended from LCOS 10.32)

The Wireless ePaper Server supports “protocol version 2.0” from version 1.91. This protocol version ensures efficient and reliable communications between the Wireless ePaper server and access points. Thanks to the support of this new protocol, your LANCOM Wireless ePaper Displays can now be managed remotely from the Wireless ePaper Server at your data center and controlled via VPN. The new protocol will be used if both ends support the protocol and it is enabled on the Wireless ePaper server.

Use **Info** under the gear-wheel icon to get the version number of the Wireless ePaper Server and a link to the LANCOM website.

## 2.4 Installing and configuring the access points

Access points of the E-series act as an interface between the Wireless ePaper Server and the Displays. Before content can be shown on the Display, you must have set up at least one access point on your network. For instructions on the basic installation and configuration of LANCOM access points, please refer to the relevant Quick Reference Guide.

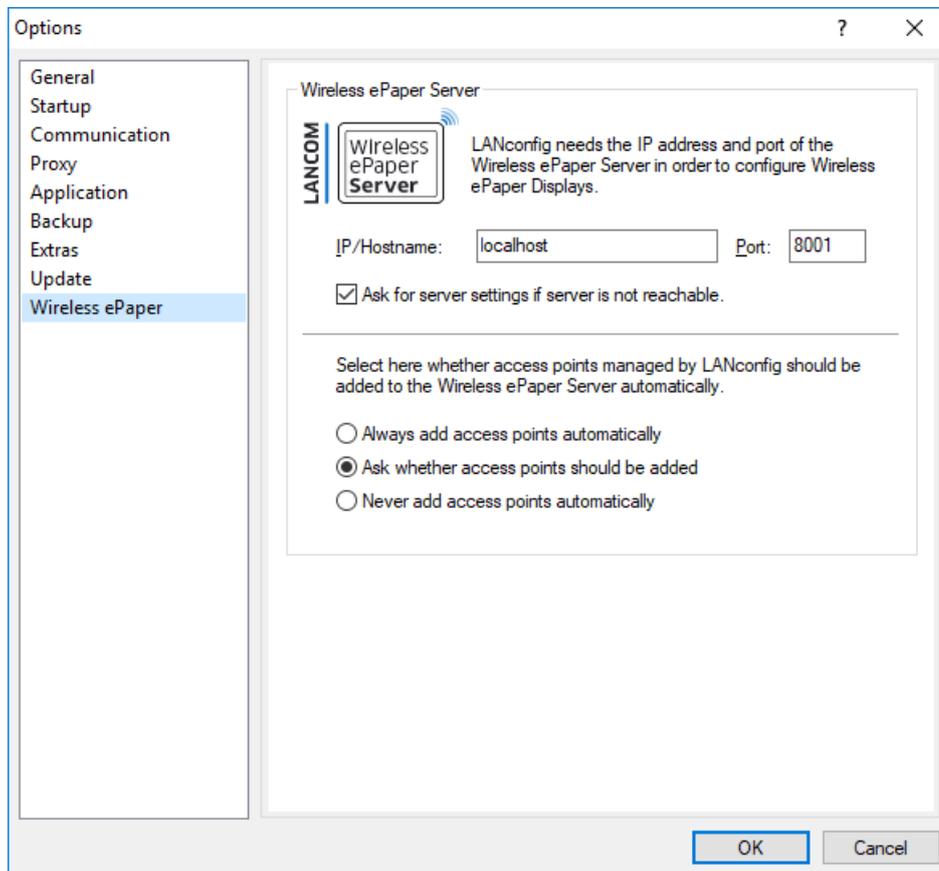
**Installing LANconfig**

LANconfig is supplied with an automatic installation routine that is tailored to your access point. To install the application, execute the file with the extension `.exe` and select the folder of your choice.

**Opening LANconfig**

Start LANconfig either from the Start menu, the desktop shortcut, or by double-clicking on the file `lanconfig.exe`.

The settings for operating Wireless ePaper Displays are to be found in LANconfig under **Tools > Options > Wireless ePaper**. Under IP/Hostname you enter the IP address and the port of the Wireless ePaper Server. The recommended port number is 8001.



### Opening WEBconfig

To access the WEBconfig user interface for the access point, open your web browser and enter the access point IP address into the address bar. You will find the settings and status information for the Wireless ePaper Displays in the menu items **LCOS menu tree > Setup** and **LCOS menu tree > Status** under **Wireless-ePaper**.

### Opening the Wireless ePaper management

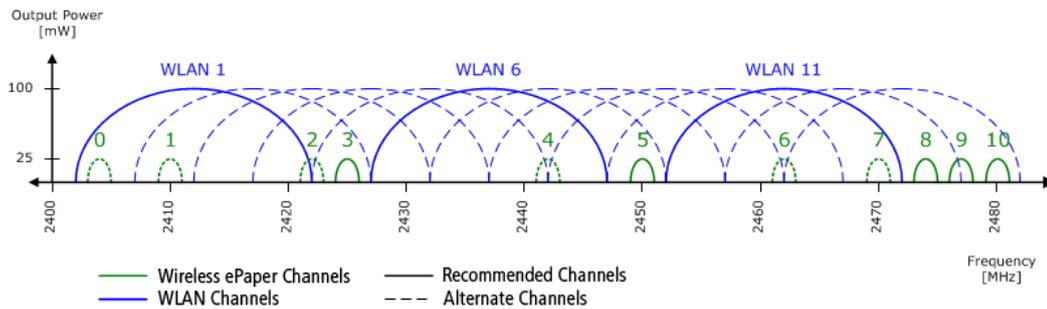
To start the Wireless ePaper management in LANconfig, click **Tools > Start Wireless ePaper management**.

### Channel selection

For a functioning installation, a channel must be selected on each access point in the network. There are 11 non-overlapping channels, which are reserved for communication with the Displays. Five of these channels should be preferred because the Displays connect to the access points more quickly. If your WLAN installation operates on the channels 1, 6 and 11, then in all cases the channels 3, 5, 8, 9 and 10 should be selected. If there is another WLAN installation operating at 2.4 GHz (IEEE 802.11b/g/n), or another wireless technology operating on the 2.4-GHz ISM band, then you select the channels with the least overlap with the existing installation. The transmission continues to function even if the channels overlap, but this can result in loss of speed in the WLAN and for the communication with the Displays.

The radio channel is set using WEBconfig for the access point under **LCOS menu tree > Setup > Wireless-ePaper**. The channels 1 – 11 are available in the frequency range 2404 MHz to 2480 MHz. If possible, use the channels 3, 5, 8, 9 and 10, as these are scanned more frequently and do not cause interference with the usual WLAN channels (1, 6, and 11).

## 2 Installation and setup



⚠ Do not select the same channel for two access points that are in the same area. This causes interference and prevents Displays from joining the network. It is possible to set the same channel on two access points if you are sure that each display is only within range of one of these access points.

### 2.4.1 Adding access points

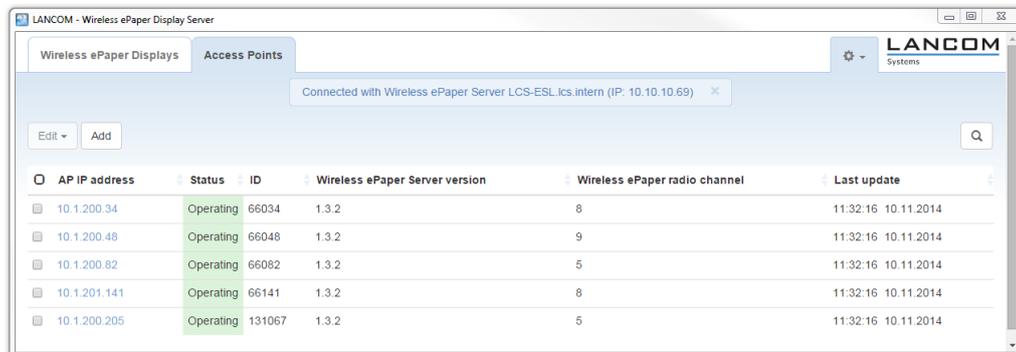
To assign an access point to a Wireless ePaper Server, two options are available to you.

Option 1: Open the Wireless ePaper management under LANconfig. To do this, open the context menu of the desired access point in LANconfig and select **Add Wireless ePaper Server**.

Option 2: In the Wireless ePaper management, go to the tab **Access points** and click the button **Add** to open the dialog for adding new access points.

Select the desired device from the list. The rest of the information is usually entered automatically. The IP address of the access point is displayed in LANconfig next to the discovered LANCOM devices. The access point ID is a unique ID that you will find either on the label of the access point or in LANmonitor. The port number is also to be found in the configuration settings of the access point. The default port is 4713, the setting is located in the configuration menu for the access point under **LCOS menu tree > Setup > Wireless ePaper**. A message informs you whether the action was a success. If an access point was added successfully but does not immediately show up in the list, you can refresh the display with F5.

If an access point was added correctly, it is displayed in the Wireless ePaper management list. The information displayed includes the IP address of the access point, its status, the ID, the version of the Wireless ePaper Server, the ePaper radio channel being used, and the time of the last update.



The screenshot shows the LANCOM management interface with the 'Access Points' tab selected. A table lists five access points with the following data:

| AP IP address | Status    | ID     | Wireless ePaper Server version | Wireless ePaper radio channel | Last update         |
|---------------|-----------|--------|--------------------------------|-------------------------------|---------------------|
| 10.1.200.34   | Operating | 66034  | 1.3.2                          | 8                             | 11:32:16 10.11.2014 |
| 10.1.200.48   | Operating | 66048  | 1.3.2                          | 9                             | 11:32:16 10.11.2014 |
| 10.1.200.82   | Operating | 66082  | 1.3.2                          | 5                             | 11:32:16 10.11.2014 |
| 10.1.201.141  | Operating | 66141  | 1.3.2                          | 8                             | 11:32:16 10.11.2014 |
| 10.1.200.205  | Operating | 131067 | 1.3.2                          | 5                             | 11:32:16 10.11.2014 |

The list of access points contains the following values:

#### AP address

The IP address of the E-series access point

#### Status

The current connection status of the access point

#### ID

The unique ID of the access point

#### Wireless ePaper Server version

The version of the Wireless ePaper Server that the access point is connected to

#### Wireless ePaper radio channel

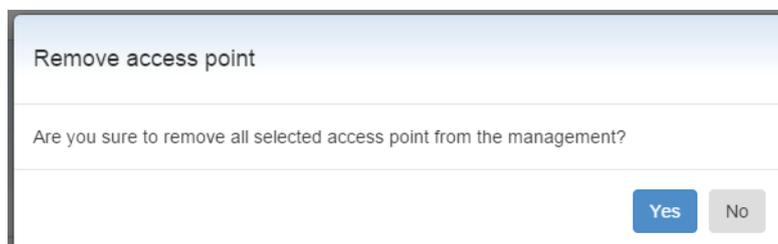
The Wireless ePaper radio channel selected for this access point

#### Last update

The time that the server last attempted to reach the access point

## 2.4.2 Removing access points

You can remove an access point from the Wireless ePaper management. In the **Access points** tab, select the relevant access point by placing a check mark in the appropriate selection box. Then click **Edit > Remove**, and confirm your selection with **Yes**.



## 2.5 Installation and Configuration of a Wireless ePaper USB

### 2.5.1 Mounting Instructions

#### Wall- or ceiling mounting for the operation with a compatible non-Wi-Fi LANCOM product

Connect the Wireless ePaper USB stick either directly to the compatible LANCOM product, or use the provided USB extension cable.

When using the USB extension cable, first slide the Wireless ePaper USB stick into the enclosed bracket. Pay attention to the correct positioning of the LED and the antenna connector.

Then place the mounting bracket at the desired location at a wall or ceiling within the reach of the USB extension cable.

Transfer the positions of the drill holes in the bracket to the wall or ceiling and fasten the bracket using appropriate screws and dowels, if any (not included).

#### Wall- or ceiling mounting for the operation with a compatible Wi-Fi LANCOM product

For pre-mounting, operate as stated in the above paragraph.

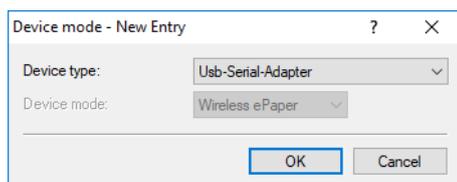
Then use in any case the provided USB extension cable, and, with the cable plugged-in, establish the maximum possible distance between the Wireless ePaper USB stick and the compatible LANCOM product to grant a noise-free coexistence between the product's own, internal 2.4 GHz Wi-Fi network and the Wireless ePaper USB radio network.

Transfer the positions of the drill holes in the bracket to the wall or ceiling and fasten the bracket using appropriate screws and dowels, if any (not included).

### 2.5.2 Configuration

If the LANCOM Wireless ePaper USB is connected to the LANCOM product as described in the instructions, the red LED indicates that the LANCOM Wireless USB is ready for operation.

Using LANconfig as of LCOS 10.32, open the configuration of the LANCOM product and navigate to **Miscellaneous Services > COM Ports > Device mode**. Add a new entry to the **Device mode** table. Set the **Device type** to "USB serial adapter" and the **Device mode** to "Wireless ePaper".



Confirm the entries with **OK** and write the new configuration back to the LANCOM product.

Add the LANCOM Wireless ePaper USB as described in [Adding access points](#) on page 12. For the **Access point** select "New device". Set the **IP address** to that of the LANCOM device that the LANCOM Wireless ePaper USB is connected to. For the **Access point ID**, use the "AP ID" on the label on the LANCOM Wireless ePaper USB. The **Port** determines which Wireless ePaper port is used to communicate between LANCOM Wireless ePaper Server and the Wireless ePaper product (default: 7353).

The LED on the LANCOM Wireless ePaper USB changes from red to orange to blue. The blue color of the LED indicates an active connection between the Wireless ePaper Server and the LANCOM Wireless ePaper USB. The system is ready for operation, the configuration of the LANCOM Wireless ePaper USB is complete.

You can now switch on the Wireless ePaper radio system with the setting under **IoT > Wireless ePaper > Radio module operation mode**.

## 2.6 Managing Wireless ePaper Displays

### Opening the Wireless ePaper management

To invoke the Wireless ePaper management, start LANconfig and click on **Tools > Start Wireless ePaper management**. The tab **Wireless ePaper Displays** contains the setting options for the Displays.

### Display ID

Displays are identified by their unique Display ID, which is an 8-digit hexadecimal number (e.g. B3010A4F) printed on the back of the display or shown on the Display itself (factory settings).

If a display is not registered, it does not join the network and any commands sent to it will fail with an error message. In order to register a display, a valid license must be installed first. Just how the licensing works is explained in [Setting up the license](#) on page 8. After registration, it may take some time until all registered displays join the network (up to two hours depending on the number of access points and channels used). A Display cannot be registered on multiple Wireless ePaper Server installations at the same time. It connects to one of these installations only.

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 Displays that are not yet registered remain in sleep mode. Individual channels are scanned every 30 or 120 minutes and, depending on the choice of channel, it can take up to 2 hours for a device to be registered by the Wireless ePaper Server.

### The list of Wireless ePaper Displays contains the following values:

#### Display ID

The unique identifier of the display

#### Display status

Current status of the Display. Communication with the Display is only possible when the status shows that this is secure.

#### Slot

The page that is currently shown in the Display

#### Tag

A marking used to group individual or multiple Displays or to indicate the location

#### Type

The Display type

#### AP address

The IP address of the selected access point

#### Signal strength

The signal strength of the last communication with the Display (from the perspective of the access point)

#### Battery

The last reported charge of the internal batteries

#### Last task

The last task xml:lang="en" sent to the Display

#### Last status

Indicates whether the last command was completed or is still being processed

## 2 Installation and setup

## Last update

Time and date of the last task xml:lang="en"sent to the Display

| Display ID | Encryption | Slot | Tag          | Type    | AP address   | Signal strength | Battery | Last task        | Last status | Last update         |
|------------|------------|------|--------------|---------|--------------|-----------------|---------|------------------|-------------|---------------------|
| D1002D3C   | Secure     | 1    | AACHEN...    | WDG 7.4 | 10.1.200.48  | RSSI: -79       |         | Image upload     | Successful  | 12:00:54 20.11.2014 |
| D1002D9C   | Secure     | -    | KONFERENZ... | WDG 7.4 | 10.1.201.141 | RSSI: -70       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002DBD   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -65       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002DFD   | Secure     | -    |              | WDG 7.4 | 10.1.200.48  | RSSI: -78       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002E5C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -64       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002E7C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -73       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002E7D   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -79       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002E9C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -75       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002EDC   | Secure     | 1    | KONFERENZ... | WDG 7.4 | 10.1.200.34  | RSSI: -61       |         | Image upload     | Successful  | 16:30:48 20.11.2014 |
| D1002EFD   | Secure     | -    |              | WDG 7.4 | 10.1.200.48  | RSSI: -82       |         | Register display | Successful  | 09:58:04 20.11.2014 |

10 Entries per page

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## 2.6.1 Add Wireless ePaper Display

The following prerequisites must be met in order to add a new Wireless ePaper Display:

- The Wireless ePaper Server software is installed and running.
- The access point is connected to the server.
- The display is within radio range of the access point.

In the Wireless ePaper management, the tab **Wireless ePaper Displays** features the button **Register**, which leads to the following dialog.

**Register Wireless ePaper Display**

Here you can register your new displays at the Wireless ePaper Server. Please enter the registration code as given on the display and select register.



Using a recommended Wireless ePaper radio channel, the initial connection of a display with the server can take between 30 minutes. [Overview of Wireless ePaper radio channels](#)

**Registration code:**

**Register** **Cancel**

Enter the registration code shown on the Display.

- i** The registration code is not the same as the display ID. The registration code is only shown for Displays in their factory settings. The ID uniquely identifies the Display, also during normal operation. For more information about the ID, please see [Managing Wireless ePaper Displays](#) on page 15

## 2.6.2 Tasks and functions

A number of functions are available for managing the Wireless ePaper Displays, and these are explained in detail here.

These functions are invoked in the Wireless ePaper management under **Wireless ePaper Displays > Edit**.

| Display ID | Encryption | Slot | Tag          | Type    | AP address   | Signal strength | Battery | Last task        | Last status | Last update         |
|------------|------------|------|--------------|---------|--------------|-----------------|---------|------------------|-------------|---------------------|
| D1002D3C   | Secure     | 1    | AACHEN...    | WDG 7.4 | 10.1.200.48  | RSSI: -79       |         | Image upload     | Successful  | 12:00:54 20.11.2014 |
| D1002D9C   | Secure     | -    | KONFERENZ... | WDG 7.4 | 10.1.201.141 | RSSI: -70       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002DBD   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -65       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002DFD   | Secure     | -    |              | WDG 7.4 | 10.1.200.48  | RSSI: -78       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002E5C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -64       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002E7C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -73       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002E7D   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -79       |         | Register display | Successful  | 09:58:04 20.11.2014 |
| D1002E9C   | Secure     | -    |              | WDG 7.4 | 10.1.200.34  | RSSI: -75       |         | Register display | Successful  | 09:58:05 20.11.2014 |
| D1002EDC   | Secure     | 1    | KONFERENZ... | WDG 7.4 | 10.1.200.34  | RSSI: -61       |         | Image upload     | Successful  | 16:30:48 20.11.2014 |
| D1002EFD   | Secure     | -    |              | WDG 7.4 | 10.1.200.48  | RSSI: -82       |         | Register display | Successful  | 09:58:04 20.11.2014 |

## Upload image

The easiest way to display content on the Display is to send it an image file.

To display an image file, go to the Wireless ePaper management, select the tab **Wireless ePaper Displays**, select the desired Display, click **Edit** and select **Upload image**. In the following menu, select **Add**.

**Send image** ✕

Select an image in the appropriate size to add it the selected display slot. Alternatively, select an exemplary image.

**Display size:** 2.7 (264x176)

**Display slot:** 1

**Show after upload:** Yes

**Image file:** Exemplary images

Open image editing

**Add** **Cancel**

The display size is detected automatically. You select the desired image using "Image file (PNG, BMP)". LANCOM Wireless ePaper Displays support monochrome bitmaps in BMP or PNG format. The images need to have the same resolution as the Display. The image is displayed within approx. 10 seconds.

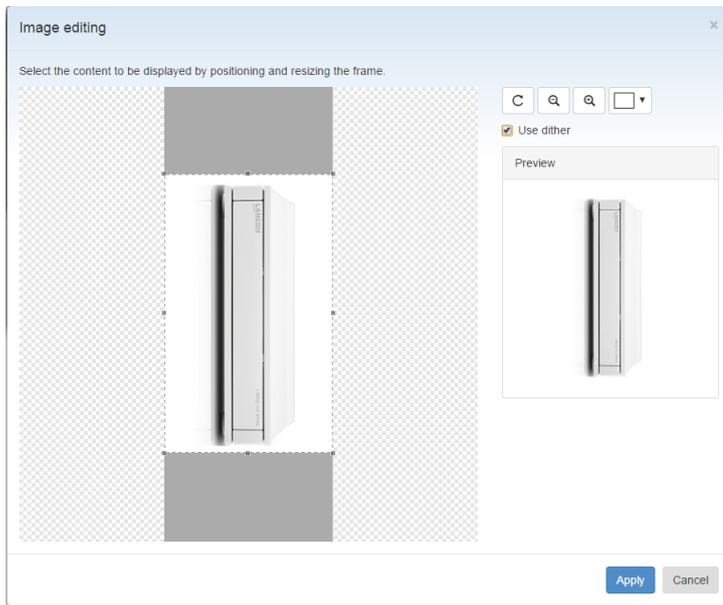
You can upload up to 12 images. Only the most recently added image appears on the display. You can enter different images into the various items under **Display slot**.

The function **Show after upload** sets which images are to be displayed subsequently. If this item is not selected, the image is transmitted to the Display but is not shown. The slot can be selected later with the option **Switch display slots**.

The item **Open image editing** allows you to select a portion of the image to be displayed. Select the area simply by moving the selection box. Click **Apply** to confirm your selection.

Additionally, you have the option of rotating or resizing your image. You can also choose to perform a dithering.

 Dithering serves best for simulating greyscales within a picture. Thus, it is not recommended for images displaying alphanumerics.



| Display size | Image resolution             |
|--------------|------------------------------|
| 12,2"        | 768 × 960 pixels (landscape) |
| 7,4"         | 480 × 800 pixels (portrait)  |
| 4,2" / 4,4"  | 400 × 300 pixels (landscape) |
| 2,4"         | 264 × 176 pixels (landscape) |

### Switching slots

When you upload an image, you can tag it to be displayed immediately or at a later time with the option **Show after upload**. The slot to be displayed can be switched in the Wireless ePaper management with **Wireless ePaper Displays > Edit > Switch display slot**. You select the required slot from the list here.



### Set tag

Tags are useful markers for the individual Displays, e.g. to collect them into groups or to record their location.

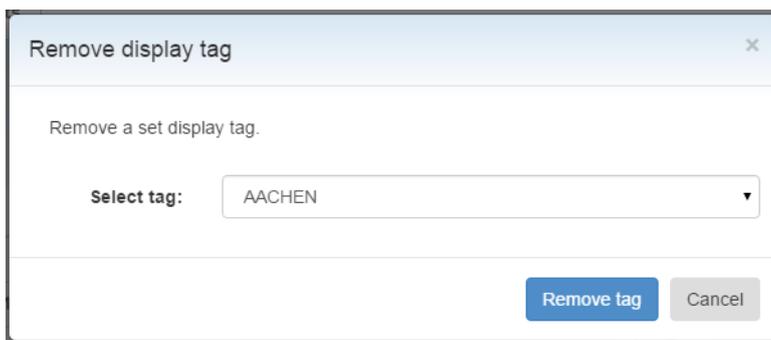
To assign a particular tag to a Display, enter the Wireless ePaper management and click **Wireless ePaper Displays > Edit > Set tag** and enter the desired tag into the menu that appears. The QuickFinder offers a convenient way of finding individual or multiple displays by conducting a tag-based search in the Wireless ePaper management.



The dialog box titled "Assign display tag" has a close button (X) in the top right corner. Below the title bar, there is a text area with the instruction: "Here you can set a tag for the selected display. Enter the desired tag description and select set tag". Below this text is a text input field labeled "Tag:" with a vertical cursor inside. At the bottom right, there are two buttons: "Set tag" (highlighted in blue) and "Cancel" (greyed out).

### Removing tags

To remove an existing tag, go to **Wireless ePaper Displays > Edit > Remove tag** and select the appropriate tag from the drop-down menu.

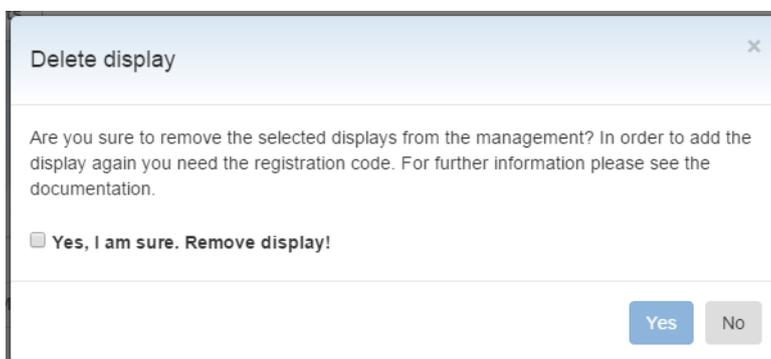


The dialog box titled "Remove display tag" has a close button (X) in the top right corner. Below the title bar, there is a text area with the instruction: "Remove a set display tag.". Below this text is a dropdown menu labeled "Select tag:" with "AACHEN" selected. At the bottom right, there are two buttons: "Remove tag" (highlighted in blue) and "Cancel" (greyed out).

### Remove

To remove a Wireless ePaper Display from the management program, go to **Wireless ePaper Displays > Edit > Remove**, confirm your selections by marking the check box and click **Yes**.

 Although this method removes the display from the management, it is still assigned to the corresponding Wireless ePaper Server. To assign the Display to another server, you need to reset the Display to its factory settings. Refer to section [Reset Display](#) on page 20 for information on this.



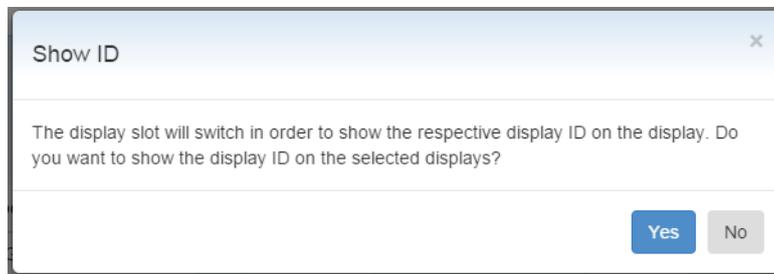
The dialog box titled "Delete display" has a close button (X) in the top right corner. Below the title bar, there is a text area with the instruction: "Are you sure to remove the selected displays from the management? In order to add the display again you need the registration code. For further information please see the documentation.". Below this text is a checkbox labeled "Yes, I am sure. Remove display!". At the bottom right, there are two buttons: "Yes" (highlighted in blue) and "No" (greyed out).

## 2 Installation and setup

### Show ID

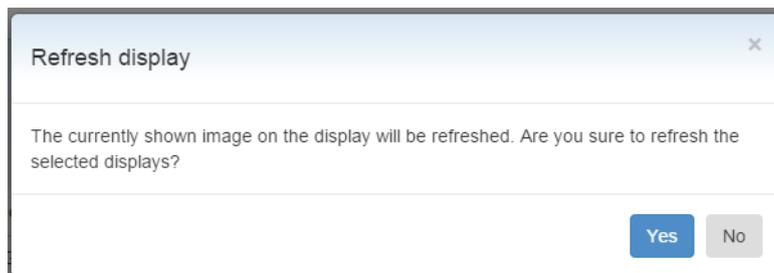
The ID of a display is printed on the back of the device.

To display the ID on the Display itself, go to the Wireless ePaper management, click **Wireless ePaper Displays > Edit > Show ID** and confirm with **Yes**.



### Refresh display

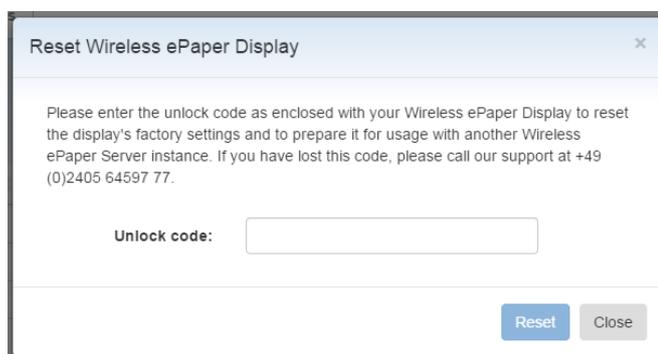
To refresh the Display, use the Wireless ePaper management function under **Wireless ePaper Displays > Edit > Refresh display** and click **Yes**.



### 2.6.3 Reset Display

To reset a Display to its factory settings, click on the gear-wheel icon in the upper-right corner and select the item **Reset**. In this menu, enter the unlock code supplied with your Wireless ePaper Display. If you no longer have the unlock code, please contact LANCOM Service at +49 (0)2405 499 36 210.

Restoring the factory settings is necessary if you wish to assign a Wireless ePaper Display to another Wireless ePaper Server.



If a Display is reset after it was already associated with another Wireless ePaper Server, it must first be registered with the new server. Then it must be reset, deleted and registered again.

## 2.6.4 Controlling the LED

Some displays are equipped with one or more LEDs. These LEDs can be used to signal user-specific events as triggered by web service calls. For example, the LANCOM Wireless ePaper WDG-3 displays are equipped with an RGB LED including a white LED. The LED can be controlled via the API of the LANCOM Wireless ePaper Server and gives the room-signage solutions a further option for optical signaling, for example when the content on a display changes.

The LED on individual labels can be controlled using a flashing task which, like all other tasks, is transferred to the core service. Options include selecting a supported color, flash pattern, and duration. The supported colors and patterns may differ depending on the display. If a color or a pattern is not supported, the task results in an ERROR status with the error code 31 (not acknowledged by label).

There are two ways to set the duration of the flashing: Either by specifying the exact number of pattern repetitions (used for short flashing intervals), or by specifying the approximate total flashing time in minutes. When specified in minutes, not all intervals are supported by the system, so it automatically selects the closest available time. The maximum supported duration is 36 hours.

 Note that excessive illumination of the LEDs will reduce battery life.

Any flashing sequence is stopped when the display receives a new flashing task. If no duration is specified (the `repeatCount` and `durationInMinutes` attributes are omitted or set to 0), flashing continues with the same color and pattern or until a new task is received. To stop the flashing, you can send a flashing task with the special color value OFF. All other attributes are ignored in this case.

To control the LED, an XML control file is sent to the Wireless ePaper Server by means of the command-line program `curl`:

```
curl -X POST -d @File.xml http://<Server-IP>:8001/service/task --header "Content-Type:application/xml"
```

The XML control file is structured as follows:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<TaskOrder title="LED Flashing">
  <FlashingTask labelId="LABEL ID" taskPriority="NORMAL">
    <BasicLED color="Farbe" pattern="Muster" durationInMinutes="n" repeatCount="Wiederholungen"/>
  </FlashingTask>
</TaskOrder>
```

Available colors: WHITE, RED, GREEN, BLUE, YELLOW, CYAN, MAGENTA, OFF

**Table 1: Available patterns of LANCOM Wireless ePaper WDG-3 Displays**

| Pattern   | Type of flashing                  |
|-----------|-----------------------------------|
| PATTERN_1 | Slow / 1x every 4 seconds         |
| PATTERN_2 | Medium / 1x every 2 seconds       |
| PATTERN_3 | Fast / 1x every second            |
| PATTERN_4 | Always on / 1 second continuously |
| PATTERN_5 | Very fast / 8x per second         |

The parameter `durationInMinutes` is optional and causes the LED to flash for the specified number of minutes. The possible input values are listed in the table below. An input value that is not listed will be rounded up to the next highest.

|                 |    |    |     |     |     |     |     |     |
|-----------------|----|----|-----|-----|-----|-----|-----|-----|
| 1-minute steps  |    | 1  | 2   | 3   | 4   | 5   | 6   | 7   |
| 5-minute steps  | 10 | 15 | 20  | 25  | 30  | 35  | 40  | 45  |
| 30-minute steps | 60 | 90 | 120 | 180 | 240 | 300 | 360 | 420 |

## 2 Installation and setup

|                |     |     |     |      |      |      |      |      |
|----------------|-----|-----|-----|------|------|------|------|------|
| 4-minute steps | 480 | 720 | 960 | 1200 | 1440 | 1680 | 1920 | 2160 |
|----------------|-----|-----|-----|------|------|------|------|------|

The parameter `repeatCount` indicates the number of repetitions.

### Examples

The LED briefly flashes in blue every 4 seconds for one minute.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<TaskOrder title="LED Flashing Blue/1min/Pattern_0">
  <FlashingTask labelId="D312F7D5" taskPriority="NORMAL">
    <BasicLED color="BLUE" pattern="PATTERN_1" durationInMinutes="1" repeatCount="0"/>
  </FlashingTask>
</TaskOrder>
```

The LED lights up constantly in red for one second.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<TaskOrder title="LED Flashing Red/1/Pattern_4">
  <FlashingTask labelId="D312F7D5" taskPriority="NORMAL">
    <BasicLED color="RED" pattern="PATTERN_4" repeatCount="1"/>
  </FlashingTask>
</TaskOrder>
```

## 3 Rendered graphics: Creation and display

Compared to image files, rendered graphics provide better options for management and editing as the content and presentation can be handled independently of one another. The Wireless ePaper Server renders graphics by processing the content and formatting information as provided by XML and XSL files.

The content of a displayed graphic could be, for example, the calendar schedule for a conference room, or the name of a product and its price. It is stored in XML format, which makes it editable as text.

The Server reads a template for the formatting information of the graphic, such as the font style or size. The template is available as an XSL file. To make changes to the template, you will need knowledge of the programming language XSL (Extensible Stylesheet Language). Sample templates for your use are available on the [LANCOM Homepage](#).

There are a number of features that are available from a template:

- › Various fonts and styles
- › Tables, lines, and other graphic elements
- › Barcodes (1D and 2D)
- › All special characters (covered by UTF-8)
- › Insertion of images or parts of images
- › Loops and conditions
- › Text transformation (e.g. transformation into capital letters)
- › Automatic scaling and compression of the text to best make use of the available space.

In order to send the graphics to the Wireless ePaper Server, you need a command-line utility such as cURL. As an example, you send the command to the Server by entering the following into cURL: `curl -X POST -d @template_task_Wireless_ePaper_Solutions.xml http://ePaperServer:8001/service/task xml:lang="en"--header "Content-Type:application/xml"`. This recognizes the XML file and its reference to the XSL file with the formatting.

### 3.1 Example of a template

This XSL template is based on a potential meeting-room signage concept `xml:lang="en"` for the LANCOM Systems GmbH. This code can be used, for example, to access a calendar management system (e.g. Google Calendar, Domino, iCalendar, or Microsoft Office 365) to send automatic updates with the latest meeting information to the Wireless ePaper Displays. Line numbering is not a part of the code and is for purposes of clarity only.

```
001 <?xml version="1.0" encoding="UTF-8"?>
002 <!--The template is provided for 7.4" Displays mounted in the landscape orientation.-->
003 <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">
004
005 <xsl:template match="Record">
006
007 <!-- Rendering information for 7.4" Displays -->
008 <image height="480" width="800" rotation="90" font-family="Verdana">
009
010 <!-- Room -->
011 <field height="108" width="780" x="10" y="20">
012 <text align="center" font-size="40" font-weight="bold">
013 <utils method="toUpperCase">
014 <xsl:value-of select="room/@roomName"/>
015 </utils>
016 </text>
017
```

### 3 Rendered graphics: Creation and display

```

018 <!-- Date -->
019 <text align="center" font-size="35" font-weight="bold" padding-top="10">
020 <xsl:value-of select="room/field[@key='date']/@value"/>
021 </text>
022 </field>
023
024 <line thickness="2" x-from="0" x-to="800" y-from="130" y-to="130"/>
025
026 <!-- Time1 -->
027 <field height="50" width="780" x="20" y="150">
028 <text align="left" font-weight="bold" font-size="40">
029 <xsl:value-of select="room/field[@key='time1']/@value"/>
030 </text>
031 </field>
032
033 <!-- Purpose1 -->
034 <field height="50" width="780" x="20" y="200">
035 <text align="left" font-size="40" condense="1, 0.8, 0.6, 0.5">
036 <xsl:value-of select="room/field[@key='purpose1']/@value"/>
037 </text>
038 </field>
039
040 <!-- Chair1 -->
041 <field height="40" width="770" x="20" y="250">
042 <text align="left" font-weight="bold" font-size="30">
043 <xsl:value-of select="room/field[@key='chair1']/@value"/>
044 </text>
045 </field>
046
047 <!-- Time2 -->
048 <field height="35" width="780" x="20" y="320">
049 <text align="left" font-size="28">
050 <xsl:value-of select="room/field[@key='time2']/@value"/>
051 </text>
052 </field>
053
054 <!-- Purpose2 -->
055 <field height="35" width="780" x="20" y="355">
056 <text align="left" font-size="28" condense="1, 0.8, 0.6, 0.5">
057 <xsl:value-of select="room/field[@key='purpose2']/@value"/>
058 </text>
059 </field>
060
061 <!-- Chair2 -->
062 <field height="30" width="770" x="20" y="390">
063 <text align="left" font-size="20">
064 <xsl:value-of select="room/field[@key='chair2']/@value"/>
065 </text>
066 </field>
067
068 <!-- LANCOM Logo -->
069 <field align="right" height="60" width="780" x="10" y="410">
070 </img>
071 </field>
072 </image>
073 </xsl:template>
074 </xsl:stylesheet>

```

## 3.2 Interaction between template, XML information and Wireless ePaper Displays

This chapter uses an example to describe the interaction between the template, XML information and the actual representation on the Wireless ePaper Display.

### Step 1:

When an update is triggered by the Notes agent, the Wireless ePaper Server receives XML information with the following content: (Line numbering is not a part of the code and is for purposes of clarity only.)

```

001 <?xml version="1.0" encoding="UTF-8" standalone="yes"?>
002 <TaskOrder title="Refresh D1001BF6 for Aachen B2.100">

```

```

003 <TemplateTask xml:lang="en" labelId="D1001BF6" externalId="4711" template="lcsconference_landscape.xsl">
004 <room roomName="Aachen B2.100">
005 <field key="date" value="16.09.2014"/>
006 <field key="time1" value="10:00 - 11:30"/>
007 <field key="purpose1" value="Marketing Project Coordination"/>
008 <field key="chair1" value="Alec Coad"/>
009 <field key="time2" value="11:30 - 13.00"/>
010 <field key="purpose2" value="Team Meeting Controlling"/>
011 <field key="chair2" value="Emily Kirby"/>
012 </room>
013 </TemplateTask>
014 </TaskOrder>

```

**Step 2:**

The Wireless ePaper Server processes the received information line by line. This sets the relevant label and the required template. Based on the template, the Server now creates the data set used to render the image. The layout is set according to the template and then the information from the XML is inserted.

Two content elements are described here for illustrative purposes: The chairperson of the next meeting and the company logo.

The chairperson for the subsequent meeting is formatted according to the template as follows:

```

061 <!-- Chair2 -->
062 <field height="30" width="770" x="20" y="390">
063 <text align="left" font-size="20">
064 <xsl:value-of select="room/field[@key='chair2']/@value"/>
065 </text>
066 </field>

```

The information necessary for the representation can be seen in the XML below:

```

011 <field key="chair2" value="Emily Kirby"/>

```

Access to the image specified in the template does not require access to the XML information. The path is evaluated instead.

```

068 <!-- LANCOM Logo -->
069 <field align="right" height="60" width="780" x="10" y="410">
070 </img>
071 </field>

```

3 Rendered graphics: Creation and display

**Step 3:**

The image is rendered and sent to the Wireless ePaper Display. The Display appears as shown below. The chairperson of the subsequent meeting (1) and the image (2) are highlighted in color.

