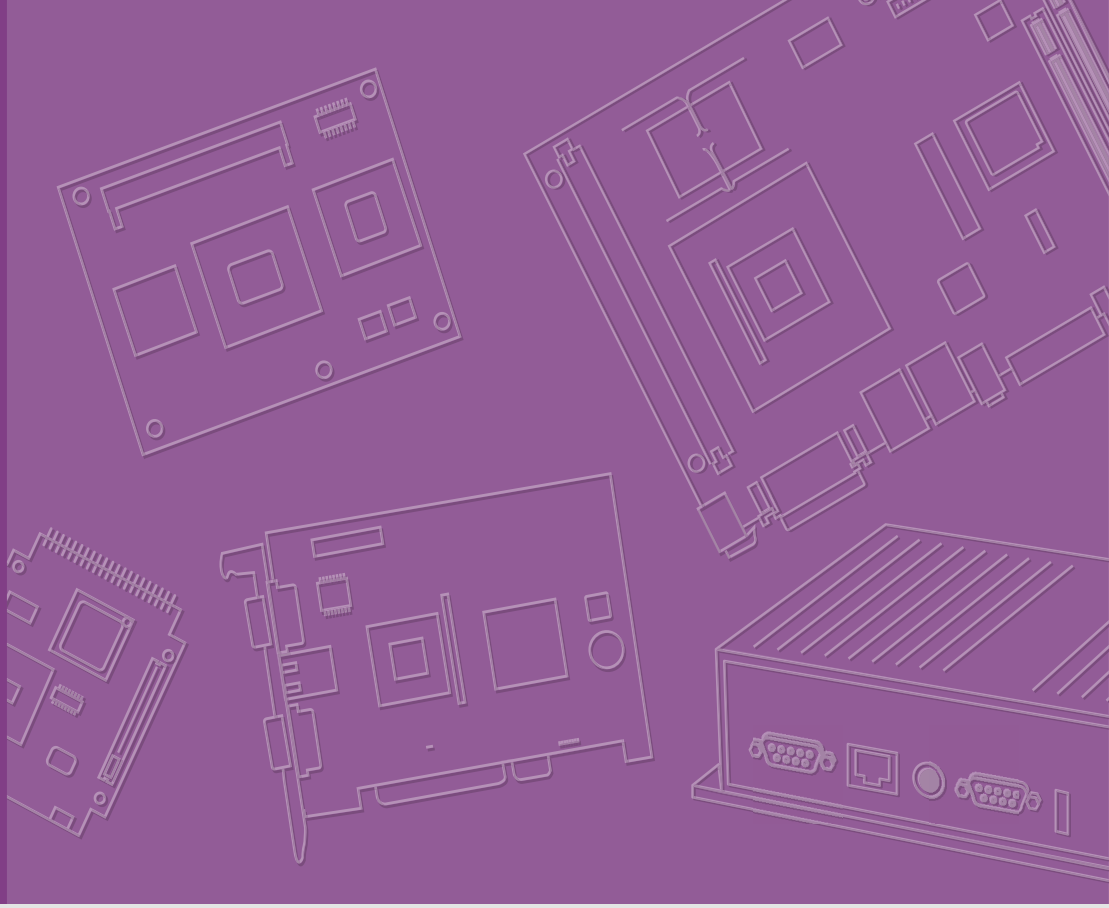

User Manual

EPD Device
EPD-230, EPD-232
System Solution

Wireless ePaper Display Solution

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

Part No. 2006D23000 Edition 1

May 2021

Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Note! *If some optional modules are offered with the system, additional system certificates may be required in certain regions/countries. Please check with Advantech Sales or Product Manager for certificate application services.*

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

FOR MOBILE DEVICE USAGE (>20cm/low power)

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

FOR COUNTRY CODE SELECTION USAGE (WLAN DEVICES)

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all Wi-Fi product marketed in US must fixed to US operation channels only.

USER MANUAL OF THE END PRODUCT

In the user manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the user manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: M82-EPD-023-053 ".

If the labelling area is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

NCC

低功率電波輻射性電機管理辦法

- 第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
- 第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Technical Supports and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- EPD-230, EPD-232 System Device

Ordering Information

Part No.	Description
EPD-023B2AG-NTC02	2.9" Black and White EPD solution in 2.4G
EPD-023B2AG-NTC12	2.9" Black and White EPD solution in 2.4G (MOQ 50pcs up, Honeycomb box)
EPD-232-001	2.9" R,B,W EPD solution in 2.4G
EPD-232-011	2.9" R,B,W EPD solution in 2.4G (MOQ 50pcs up, Honeycomb box)
EPD-230-001	2.9" Black and White EPD solution in 2.4G for upgrade certification
EPD-230-011	2.9" Black and White EPD solution in 2.4G (MOQ 50pcs up, Honeycomb box) for upgrade certification

Optional Accessories

Part No.	Description
1760002692-01	4 pcs CR2450 Panasonic Battery
1760002692-02	4 pcs CR2450 Toshiba Battery
1990036330T000	Mounting Bracket for 2.9" ePaper device
1990036333T000	Fastener Rubber 65x25.4x0.85 for 2.9" ePaper device

* The battery is consumables material, so it is not in 2 years warranty.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacture. Discard used batteries according to the manufacturer's instructions.
    - replacement of a battery with an incorrect type that can defeat a safeguard (for example, in the case of some lithium battery types);
    - disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, that can result in an explosion;
    - leaving a battery in an extremely high temperature surrounding environment that can result in an explosion or the leakage of flammable liquid or gas;
    - a battery subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Consignes de Sécurité

1. Lisez attentivement ces instructions de sécurité.
2. Conservez ce manuel de l'utilisateur pour référence ultérieure.
3. Débranchez cet appareil de toute prise secteur avant le nettoyage Utilisez un chiffon humide. N'utilisez pas de détergents liquides ni en spray pour le nettoyage
4. Pour les équipements enfichables, la prise de courant doit être située à proximité de l'équipement et doit être facilement accessible.
5. Gardez cet équipement à l'abri de l'humidité.
6. Placez cet équipement sur une surface fiable lors de son installation
7. Les ouvertures de l'enceinte sont destinées à la convection de l'air. Protégez le matériel contre la surchauffe. NE COUVREZ PAS LES OUVERTURES.
8. Assurez-vous que la tension de la source d'alimentation est correcte avant de connecter l'équipement à la prise de courant.
9. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus. Ne placez aucun objet sur le cordon
10. Toutes les mises en garde et avertissements sur l'équipement doivent être notés
11. Si l'appareil n’est pas utilisé pendant une longue période, débranchez-le de la source d'alimentation pour éviter les dommages causés par des surtensions transitoires.
12. Ne jamais verser de liquide dans une ouverture sous peine de provoquer un incendie ou un choc électrique
13. Ne jamais ouvrir l'appareil.Pour des raisons de sécurité, cet équipement ne doit être ouvert que par du personnel qualifié
14. Si l'une des situations suivantes se produit, faites vérifier l'équipement par le personnel de service:
    - Le cordon d'alimentation ou la fiche est endommagé.
    - Un liquide a pénétré dans l'appareil.
    - L'équipement a été exposé à l'humidité.
    - L'équipement ne fonctionne pas bien ou vous ne pouvez pas le faire fonctionner conformément au manuel d'utilisation.
    - Equipment L'équipement est tombé et a été endommagé.
    - Equipment L'équipement présente des signes évidents de rupture.

AVERTISSEMENT: Cet ensemble d'instructions est donné conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans le.

Contents

Chapter 1

Product Overview

1.1 Introduction

EPD-230, EPD-232 is an ePaper device which Supportss ultra low power 2.4GHz RF wireless integrated with a 2.9” EPD with an ARM Cortex-M3 processor. The device is designed for hospital, pharmacy, factory, warehouse and retail applications. With optimization on power consumption and device management, low data rate applications can achieve years of battery life and thousand of device connections. Advantech’s EPD-230, EPD-232 provides multiple interface for application control which is highly integrated with a low power consumption system. EPD-230, EPD-232 can auto join and bind the network with the Router (WISE-3240). Data can be quickly and easily acquired and transformed into different formats to communicate with the DeviceOn/ePaper Server.

The main features of EPD-230, EPD-232 are:

- ARM Cortex-M3 Core Processor
- Supports IEEE 802.15.4 / 2.4 G networks
- 2.9" e-Paper panel display
- Low power consumption and years of battery life
- Multiple I/O with 3 buttons & 3 LEDs
- Supports temperature ranges: 0 ~ 50 °C
- High Performance integrated system with RTOS
- Supports over-the-air upgrades (OTA)
- Available solution kit for various application deployments
- Supports with Colors Black/White in EPD-230 or Black/White/Red in EPD-232

1.2 Specifications

Computing System	MCU	TI 32-bit ARM Cortex-M3 Processor
	Memory	RAM 28KB
Display	Screen Size	79 x 36.7 mm
	Resolution	296 x 128 pixels
Storage	Internal	Flash: 128 KB
	External	SPI Flash: 512KB
Network	Standard	IEEE 802.15.4
	Frequency Band	2.4-GHz
	Channels	11~26
	Channel Separation	5MHz
	Transmit Power	-21dBm~ +5dBm
	Receiver Sensitivity	-100dBm
	RF Data Rate	250 Kbps
	Function	End node
	Antenna	On-board Antenna
Interface	LED x3 Function Key x3	
Power	Battery	CR2450 x4
Color	Red/Black/White	
	Black/White	

Environment	Operation Temperature	B/W: 0 ~ 40 °C, R/B/W: 0~40 °C
	Non-Operational Temp.	-25 ~ 60 °C
	Operating Humidity	5 ~ 80% Relative Humidity, non-condensing
Physical Characteristics	Dimensions	100 x 47 x17.9 mm
	Weight	80g
Operating System	RTOS	

Note! *Image for EPD needs to follow these instructions.*

1. *Image needs to set as 296 x 128 pixels, do not resize which will cause jaggy edges*
2. *24 bit / BMP format for EPD-230, EPD-232*
3. *Black: (0,0,0) / White (255, 255, 255)/ Red (255,0,0)*

1.3 System implementation

The EPD device can be applied to different applications and system integrators can control the RESTful APIs to design for different scenarios.

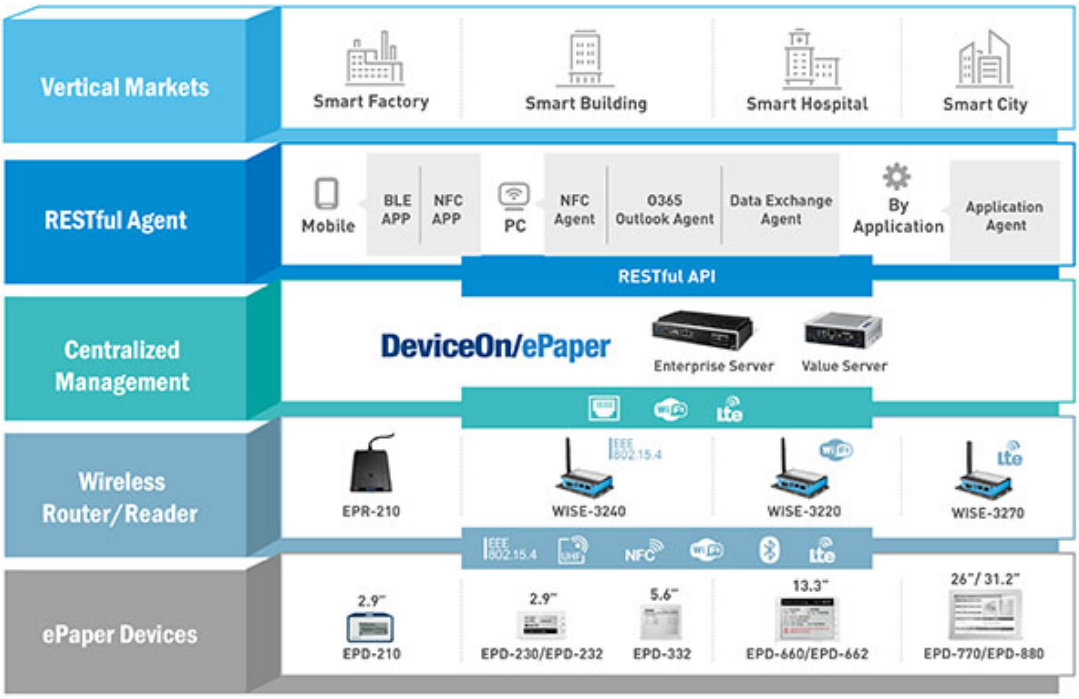
1.3.1 Advantech EPD-230, EPD-232 & DeviceOn/ePaper Solution

Wireless EPD System consists of DeviceOn/ePaper, Router and EPD device.

- The DeviceOn/ePaper on ARK-2250L & ARK-1123H provide Web GUI to management the wireless EPD system.
- The Router (built-in WISE-3240) can extend wireless range.
- The EPD device is a device with ePaper, EPD controller and wireless connectivity.

Advantech provides a total solution for development to select the different architecture according to the end customer's system requirements.

EPD-230, EPD-232 is the end node of the system. Developers can apply Advantech WISE-3240 to connect to DeviceOn/ePaper which is installed in Advantech's Embedded Computer /EPD-Server.



Chapter 2

EPD-230, EPD-232 Network Specification

2.1 System Architecture

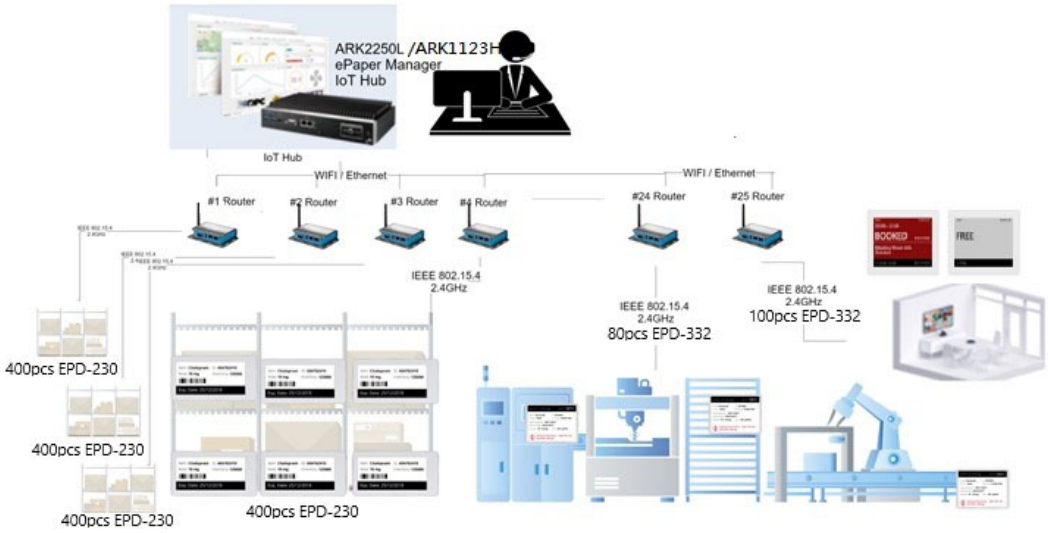


Figure 2.1 EPD-230, EPD-232 Network Topology

2.1.1 System Environment

No	Device1	OS	Version
1	ARK 2250L/DeviceOn/ePaper	Ubuntu	18.04
4	WISE Router: WISE3240	OpenWRT	15.05.1
6	EPD Device CC2650	TI RTOS	zstack 1.2.2a

2.2 System Specification

1. One single network can be built by WISE-3240.
2. One WISE-3240 can support up to 400 EPD devices in one channel.
3. Supports 11 channels in this system.
4. Supports up to 10000 EPD devices in one system by 25 pcs routers.
5. System supports whitelists to join the system from DeviceOn/ePaper.
6. Supports changeable encrypted keys.

2.2.1 DeviceOn/ePaper

- GUI operate the system, EPD device and Router.
- Through RESTFul API, the external system can operate the whole system as shown below:
  1. DeviceOn/ePaper can perform WISE Router actions and control WISE Router.
  2. DeviceOn/ePaper can perform EPD device actions and control EPD series device.
  3. DeviceOn/ePaper can import the EPD device onto the whitelist to join the network.
  4. DeviceOn/ePaper can deliver the image/firmware to EPD device through WISE Router.
  5. Device can periodically report status back to DeviceOn/ePaper.

2.2.2 EPD Device

- A device can join the router when a corespondent LQI values can be detected and qualified.
- Supports router re-scan: if an EPD device fails to join after 2 mins the EPD device will start to look for new router.
- Supports status reports every 1 mins after a device joins the network.
- Supports sending data requests every 20 secs after a device joins the network.
- Supports emergency and event status reports every 1 mins after joining the network
  - Battery status report
  - Hardware malfunction reports for panel errors and external-flash errors
  - exception handling: image CRC failing
- Device Battery: CR2450 x 4 pcs
  - The Battery life time can re-fresh images on screen 35000 times for EPD-230, EPD-232 to transfer images from the router to the EPD device (under a typical 25 degree environment.)
- Supports multi-image storage.
  - Full size image: EPD-230, EPD-232: 20 pages in total. The first 3 pages are mapped to the 3 buttons. The other 17 pages can be controlled from the DeviceOn/ePaper directly.
  - Supports de-compression on the device side.
- Supports execute device action from the router.

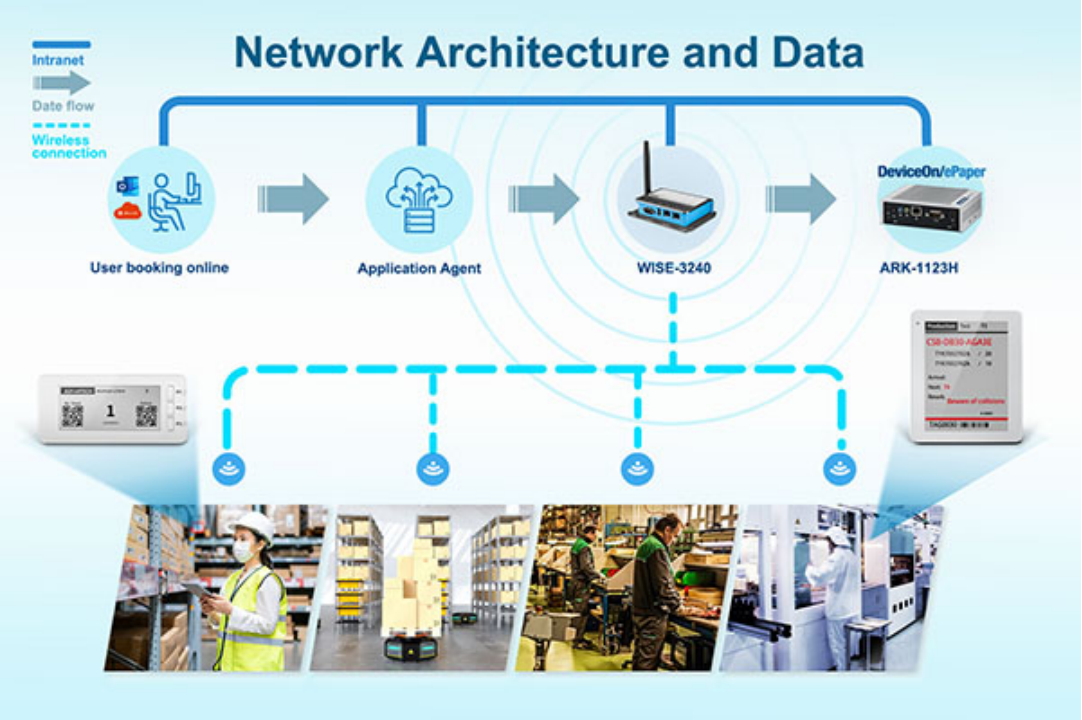
2.3 System Network Specification

- Physical transmission data rate is 250 Kbps
- Network join performance
  a. 1 pcs EPD device takes 6 secs to join the network.
  b. 400 pcs EPD device join network in 30 minutes by 1 host WISE-1840 on WISE-3240.
- Data transfer performance from Router
  - Update 400pcs EPD-230, EPD-232 in 1 hours
  - 2 way communication
  - Communication with encrypted AES128

Note! *The performance will be adjusted according the environmental limitations.*

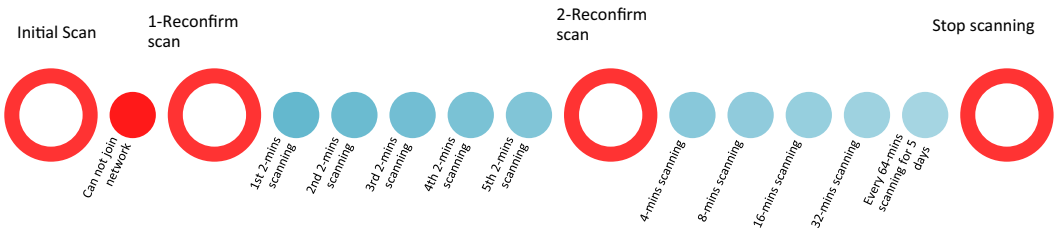
2.4 EPD System-Initial Flow on Device Side

This section will explain how the end device joins, registers, and communicates with the router. Users may change some parameters to fit their own scenario.



2.4.1 EPD Device Scan for Router

- **Initial scan:** EPD device scans each available channel. If the EPD device still can't find the router after 2 mins, it will change the status to "lost connection".
- **Reconfirm scan:** The device will start to scan the channel to look for another router every 2 mins. If a device still can't find the router after 5 attempts, it will re-scan the channel every 4, 8, 16, 32 mins, then every 64 mins for 5 days. Finally the device will move to deep sleep mode after scanning for 5 days continuously.
- **Stop scanning and deep sleep:** If the EPD device still can't find the router, it will stop RF Scanning and go back to deep sleep mode until the button of the device has been pressed. The device will start scanning from the beginning.



2.4.2 Registration

- Router
  - Router Power on
  - System gets EPD Hub Configure from webpage
  - Router connects to DeviceOn/ePaper
- EPD Device
  - Default setting for shipping: Supports 11 channels.
  - Power on auto check if a router exists and asks to join the network.
  - Router permits EPD device to join if it is on the whitelist.
  - EPD device joins the network

2.4.3 Status report

- Router (WIS-3240) will report status every 1 mins.
- EPD device will report status every 1 mins.

2.4.4 Execute actions Cmd

- Router will receive action commands from the router in real-time.
- EPD device sends data requests every 20 secs from sleep mode to router to check if there are any action commands.
- EPD device will send back the ACK turn result if the action command is executed.

2.5 Whitelist mechanism

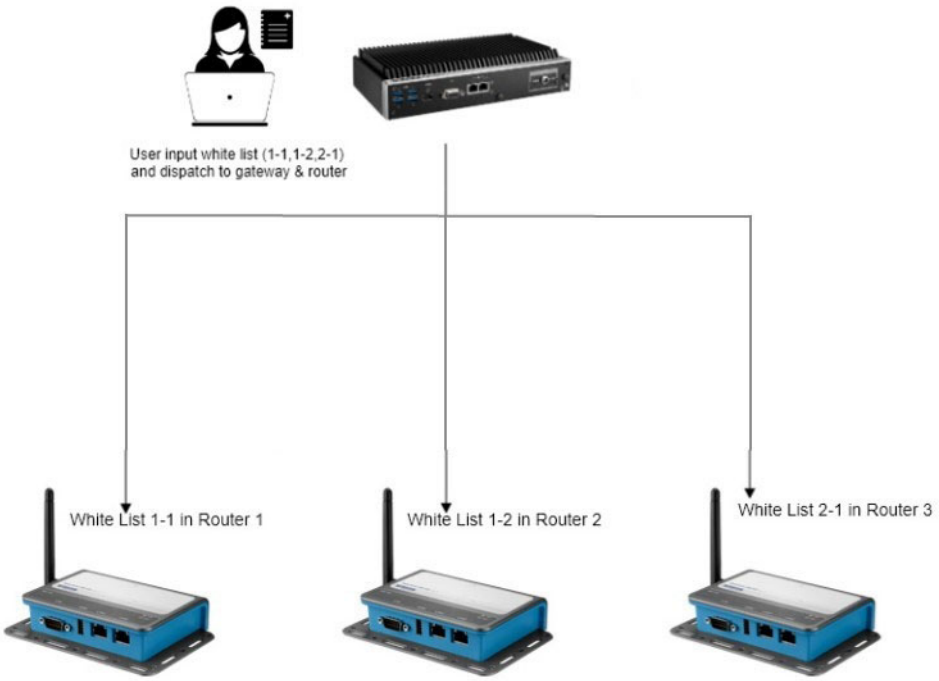
Before importing the whitelist, the user needs to setup a router channel which can provide optimal performance. Users can setup the channel from DeviceOn/ePaper and the router channels are: 11 13 14 15 20 21 22 23 24 25 26. If the channel has not been set, the router will be set to the default channel of 15.

(1). When a user receives the goods, it comes with an EPD device whitelist. Users need to import the list from DeviceOn/ePaper.

(2).DeviceOn/ePaper can dispatch the list to the connected system daemon in the Router.

(3) EPD device can auto join the network after the whitelist has been properly setup in DeviceOn/ePaper and Router.

Note! *End users need to be aware which 2.4Ghz wi-fi channels have been used to avoid to using the same channels.*



2.6 Secure Key Mechanism

Advantech EPD-230, EPD-232 asks users to change the secure key when data exchanges between devices. Users can setup a new secure key from DeviceOn/ ePaper and the router will start passing the new key to connected devices. As long as the key has been changed, the device can not operate in the original system which has a different secure key setting.

- Data communication is encrypted by AES128
- Users can define a 128 bit secure key
- The Router exchanges keys to devices automatically

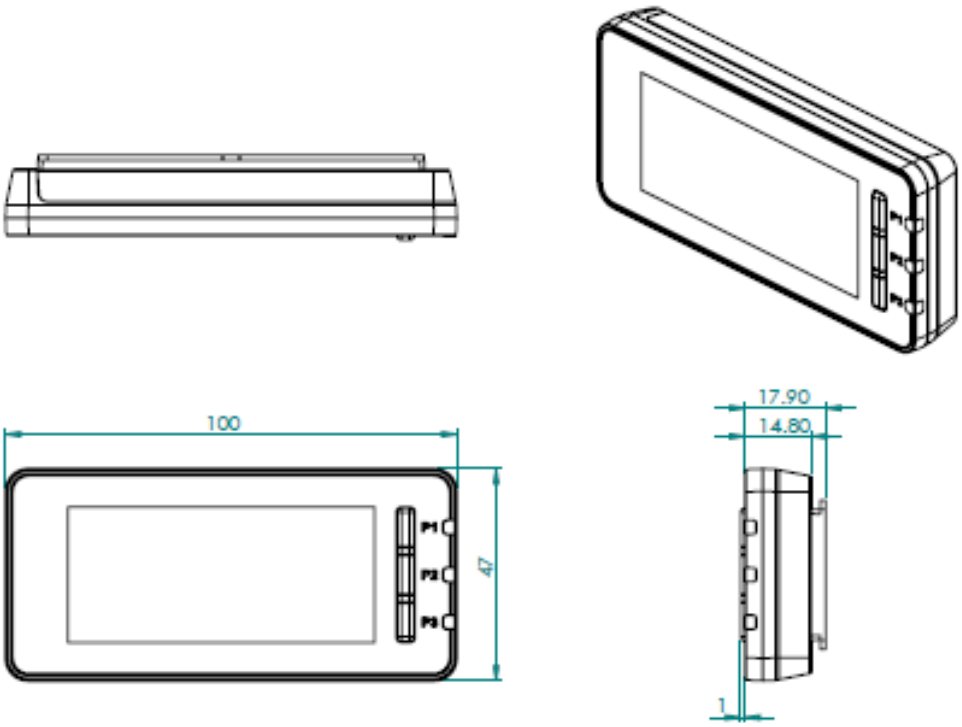
Chapter 3

Hardware Specification

3.1 System Specification

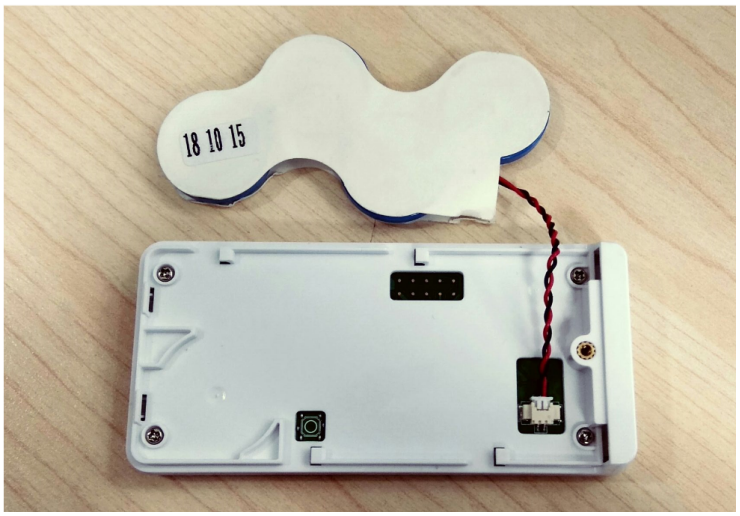
EPD-230, EPD-232 is designed for customers to directly install on the application side.

3.1.1 ID Dimensions

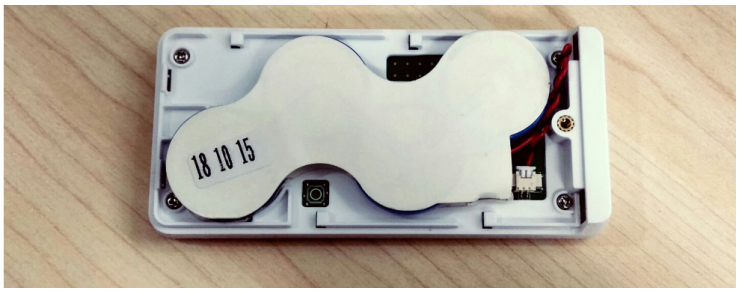


3.1.2 Battery Installation

1. Connect the power connector into the board connector.



2. Put the battery back into the housing.



3. Replace the back cover.

4. Screw it back on to finish.

3.2 Device LED Button Behavior

3.2.1 EPD-230, EPD-232 button behaviors:

item	Status	Action	Result
1	SW1 (P1) no press	Press button for 0.5 sec and release button	Refresh EPD to Page 1
2	SW2(P2) no press	Press button for 0.5 sec and release button	Refresh EPD to Page 2
3	SW3 (P3) no press	Press button for 0.5 sec and release button	Refresh EPD to Page 3
4	Press SW1(P1) & SW3(P3)	Step1: Long press button (SW1 & SW3) when LED1,LED2 and LED3 off Step2: LED2 flash (0.5 sec toggle LED2) after hold SW1& SW3 for 5 sec Step3: LED2 on after hold SW1 & SW3 for 10 sec Step4: Release SW1 & SW3 keys then LED2 off	Reset to default and reboot Note: All images and settings in the device will be deleted.
5	If device loses connection, press either SW1\SW\SW3	Press and release button.	Leave sleep mode and try to connect to a network .

3.2.2 EPD-230, EPD-232 LED behavior

Remote control commands from the Router.

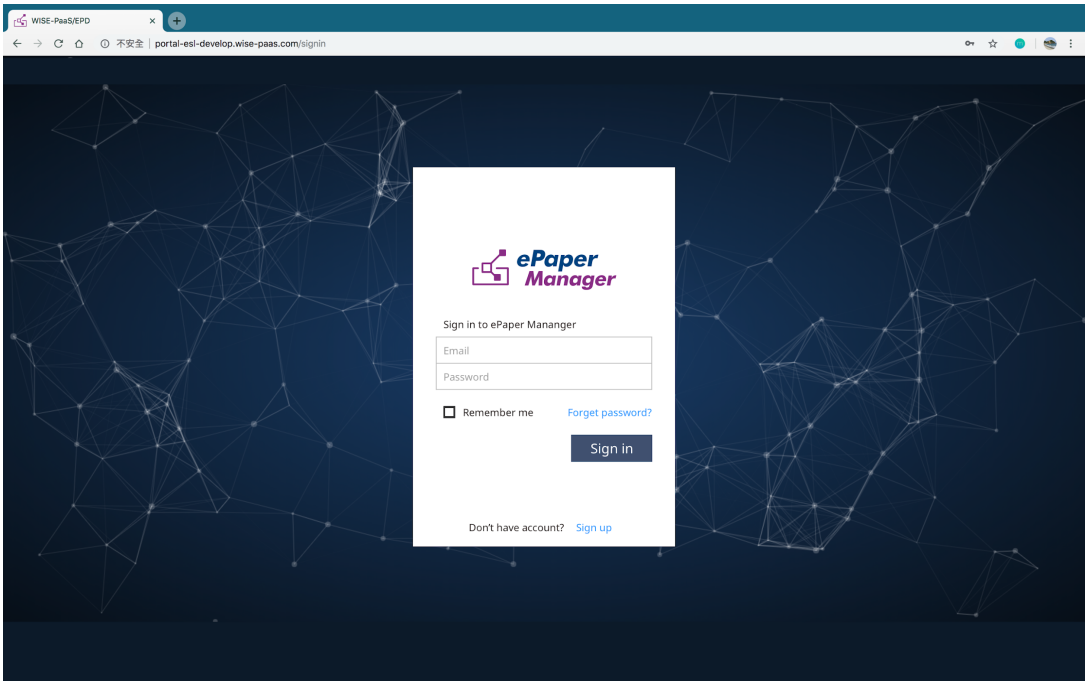
Item	Status	Action	Result
1	LED1	Remote Control by DeviceOn/ePaper API	On/Off/Blink
2	LED2	Remote Control by DeviceOn/ePaper API	On/Off /Blink
3	LED3	Remote Control by DeviceOn/ePaper API	On/Off/Blink

Chapter 4

EPD-230, EPD-232 in DeviceOn/ePaper

4.1 EPD-230, EPD-232 with DeviceOn/ePaper Solution

Previously, we looked at EPD-230, EPD-232 as an end device. To build up a solution, we need a router to connect to our CMS: DeviceOn/ePaper provides a complete solution to help you import device data, design templates and manage devices easily. This user manual will help you to build a total solution system.



DeviceOn/ePaper provides a complete solution to help you easily import device data, design device templates, and manage devices. The main features are listed below.

Table 4.1: DeviceOn/ePaper main feature list

Item	Name	Description
1	Overview	System dashboard
2	EPD controller	Control & manage EPD device and association with target
3	Item data	Data management and Target product data
4	Device list	Router / EPD devices management & import
5	Template	EPD image design and generation
6	Whitelist setting	EPD whitelist
7	OTA	Firmware upgrade
8	Settings	System management including user account, device group, server activation, and email notify
9	Document	Online document and the testing tool for RESTful API

4.2 Preparation

4.2.1 Hardware Component List

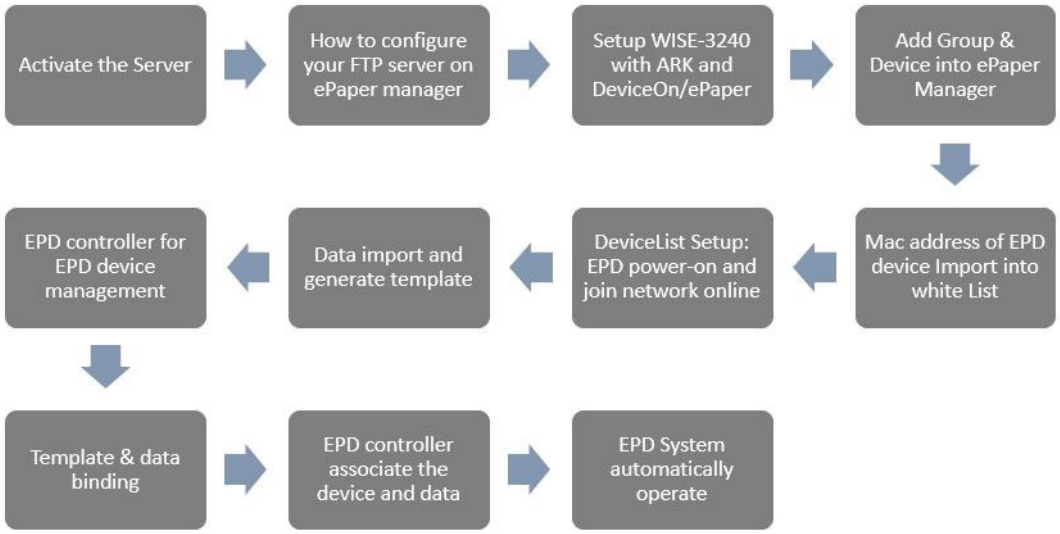
1. Advantech Embedded Computer: ARK-2250L or ARK-1123H
2. Advantech IoT Router: WISE-3240 & Advantech EPD devices.

4.2.2 Software Component List

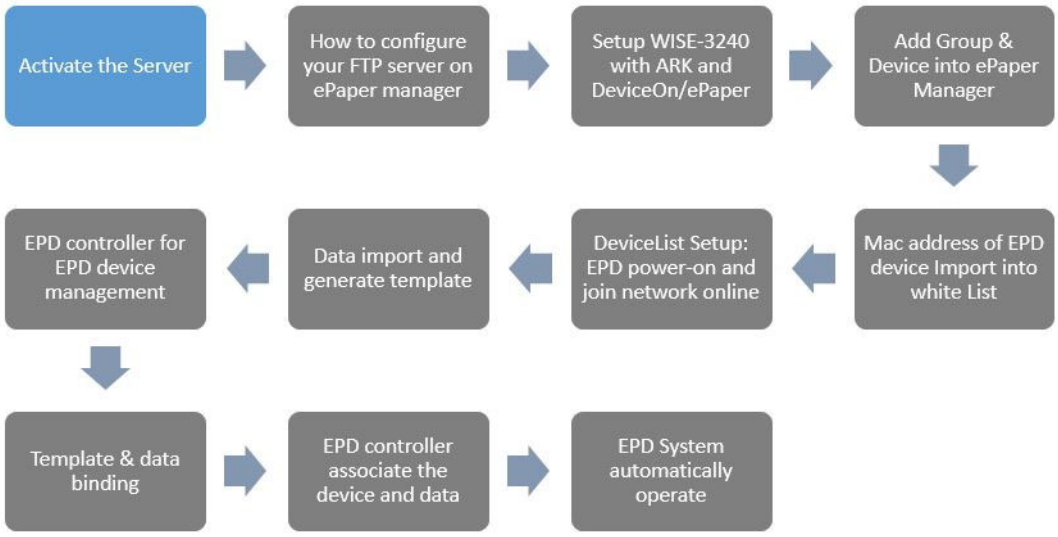
1. Ubuntu 18.4 for ARK-2250L & ARK-1123H
2. DeviceOn/ePaper Installation & License on ARK-2250L & ARK-1123H
3. 500 connection licenses on ARK-2250L & ARK-1123H.

4.2.3 DeviceOn/ePaper setup on ARK

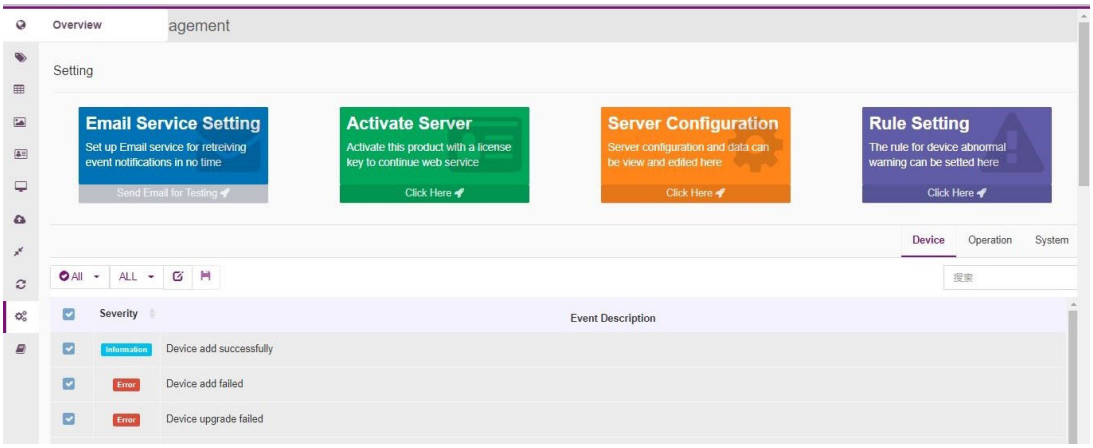
The following diagram demonstrates the process of ePaper Manager operation.



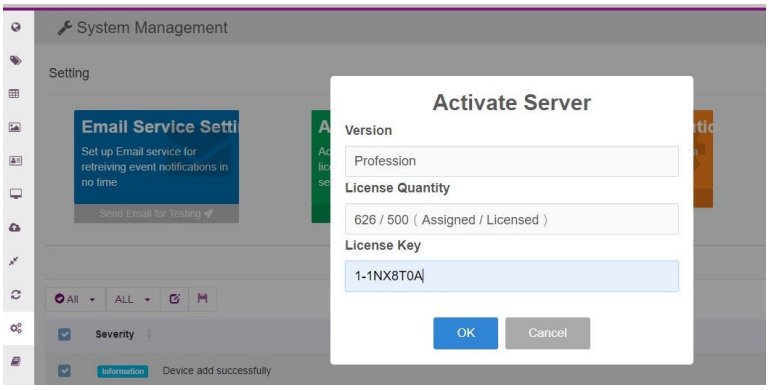
4.2.3.1 Activate the Server

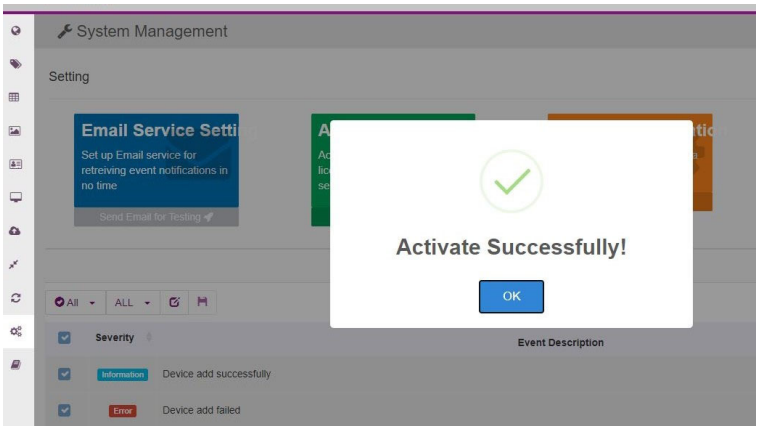


1. Click the System in Setting.

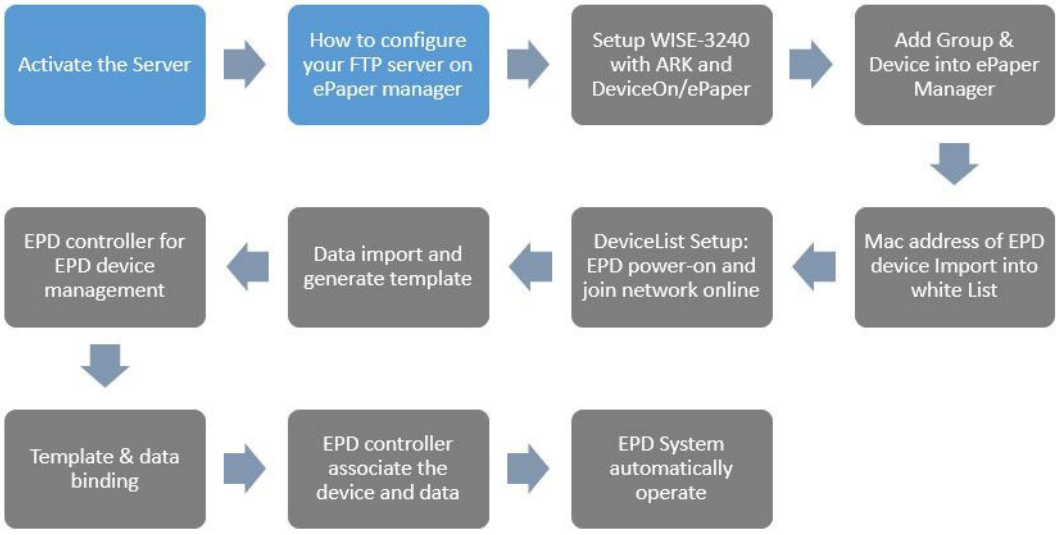


2. Click the Activate Server and enter the License Key provided in our sales package.

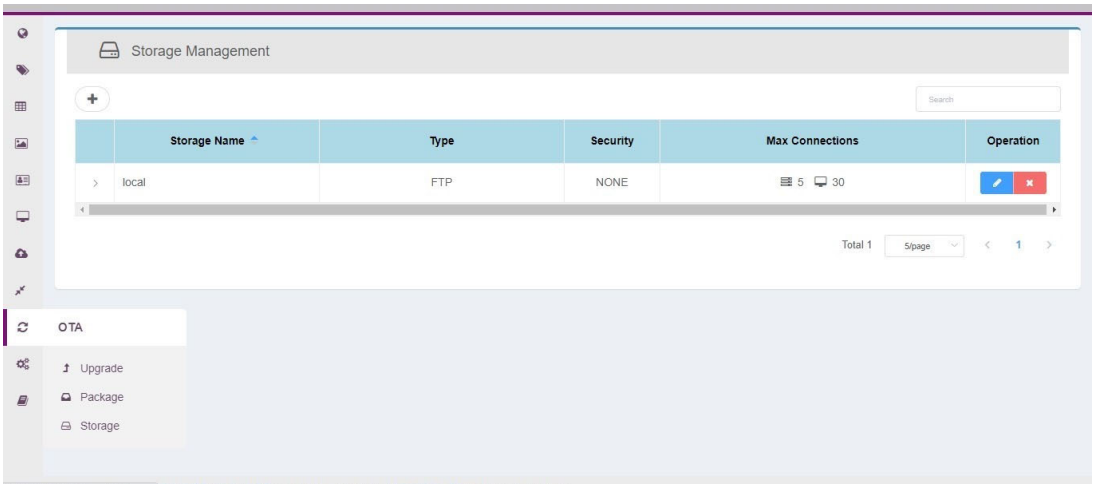




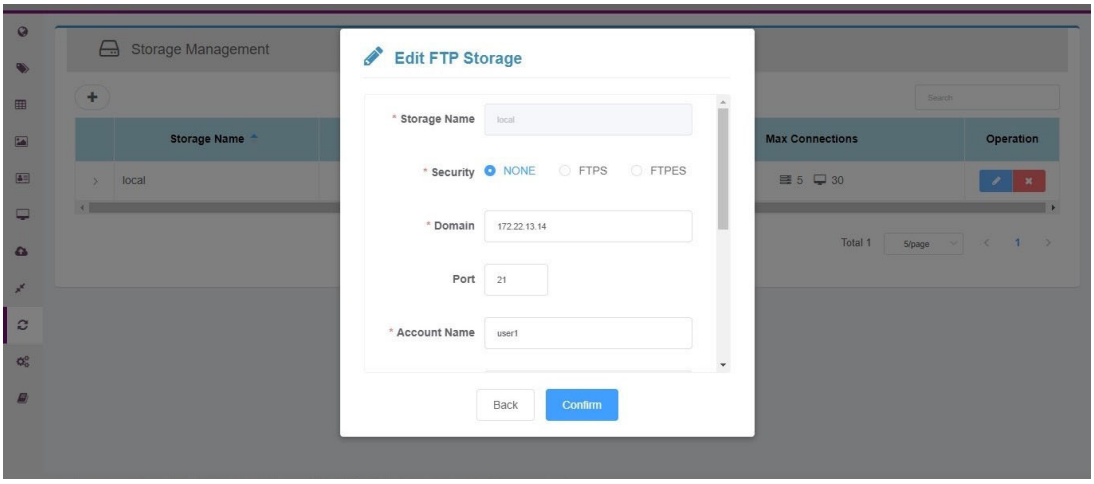
4.2.3.2 How to configure your FTP server on DeviceOn/ePaper



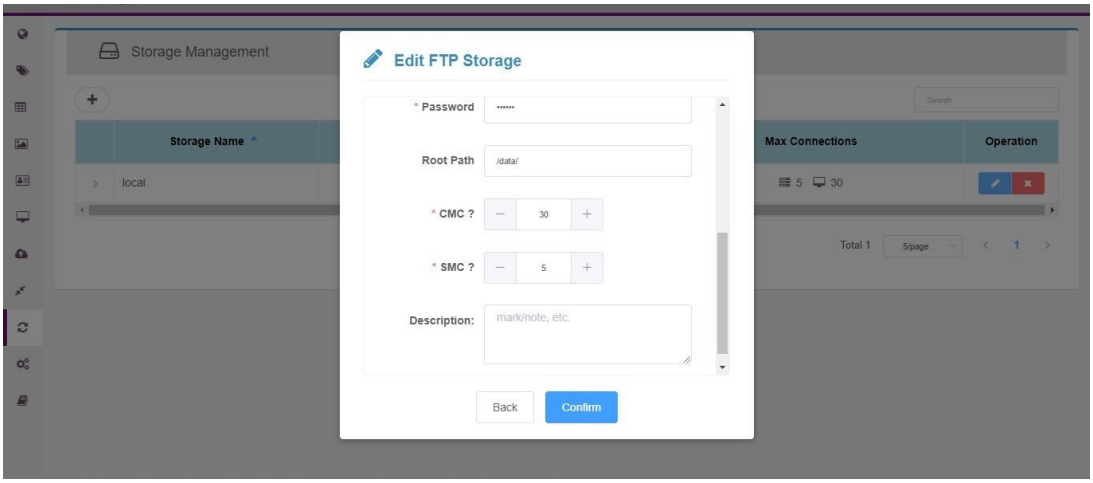
1. Click the **Storage** button item under the OTA icon.



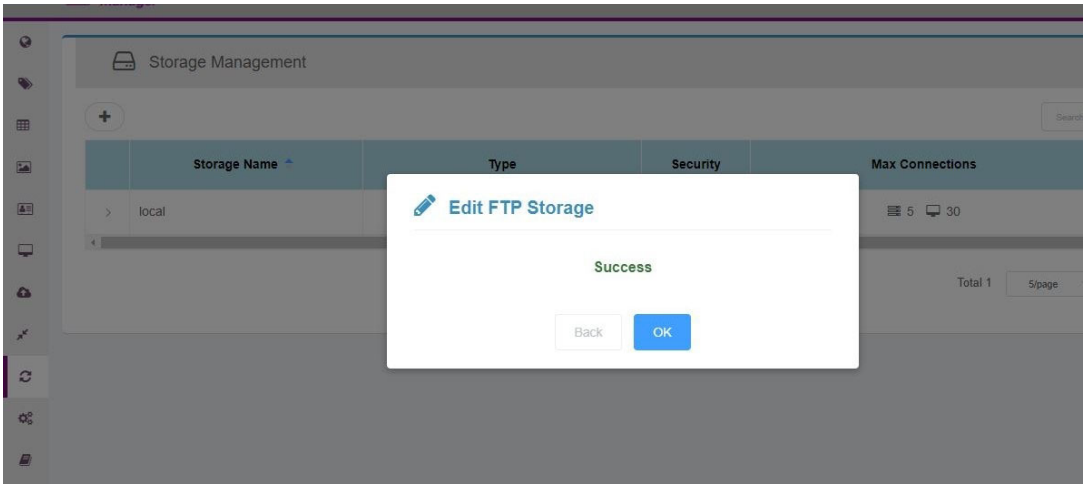
2. Click the **Edit** icon and enter information for Storage Name, Security, Domain, Port, and Account Name as shown below.
   Storage Name: local [default]
   Security: NONE
   Domain: [Your Server IP]
   Port: 21
   Account Name: user1 [default]
   Password: 123456 [default]



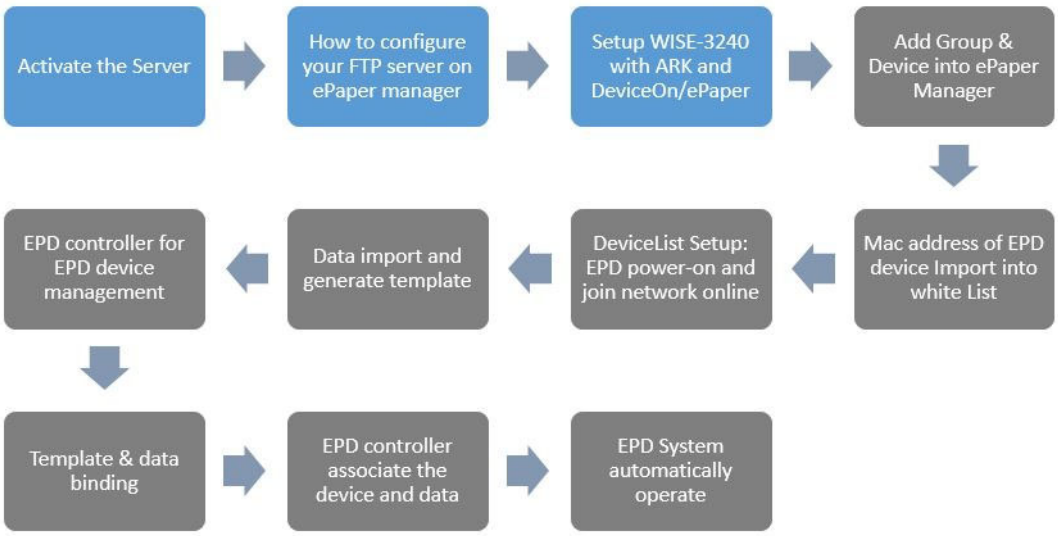
3. Scroll down to choose the values for **CMC** and **SMC** and click **Confirm.**



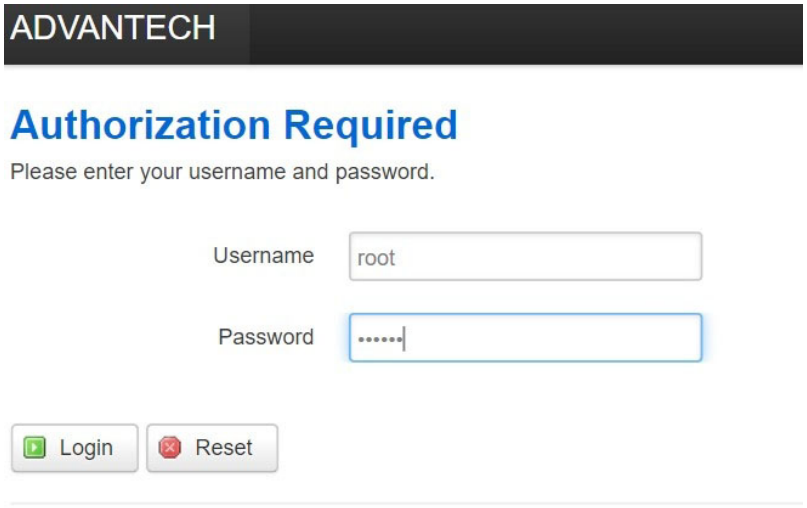
4. If successful you will see the system show the Success screen, then click **OK**.



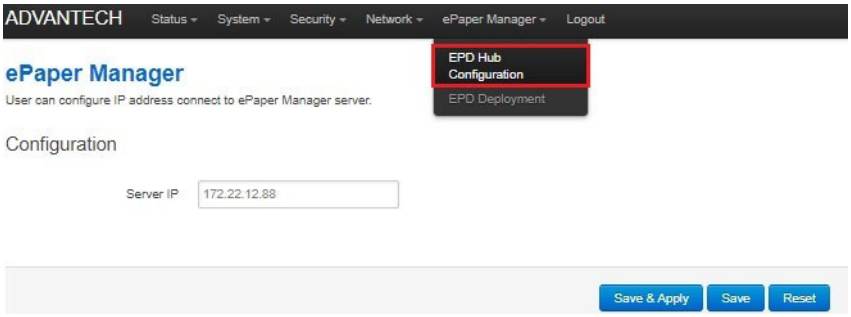
4.2.4 Setup WISE-3240 with ARK and DeviceOn/ePaper



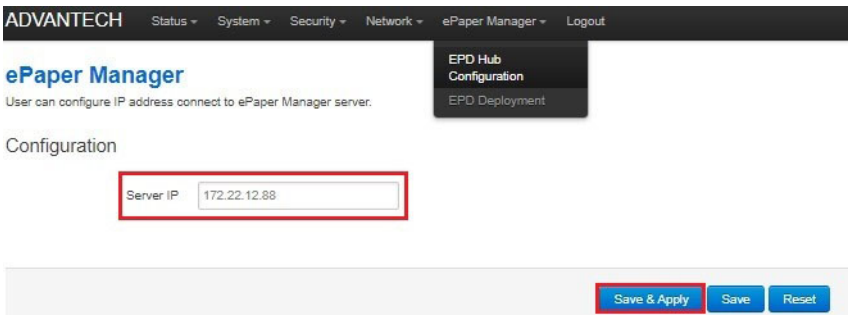
1. Power on WISE-3240 and connect with your laptop or PC.
2. Open WISE-3240 management web page: Open a web browser (Chrome is suggested) and enter the IP Address: **http://192.168.1.1**
3. Login: The default the username and password are **root** and **ePaper.** Click the Login button to open the web configuration page.



4. Click **EPD Hub Configuration.**



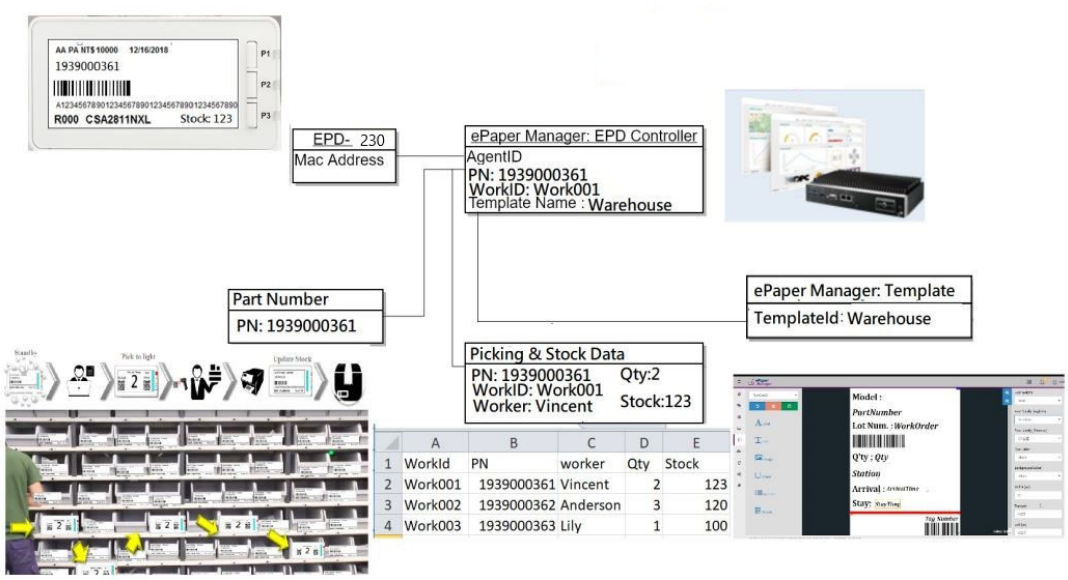
5. Enter the server IP address and click **Save & Apply.**



4.3 Hands-on EPD Device on DeviceOn/ePaper

The following figure demonstrates the usage scenario for a factory production line.

1. EPD device mac address.
2. Target Item data contains unique ID such as the key e.g. PN (part number).
3. Target Item ID is the key e.g. PN (part number).
4. EPD device screen setup is via the EPD image template.



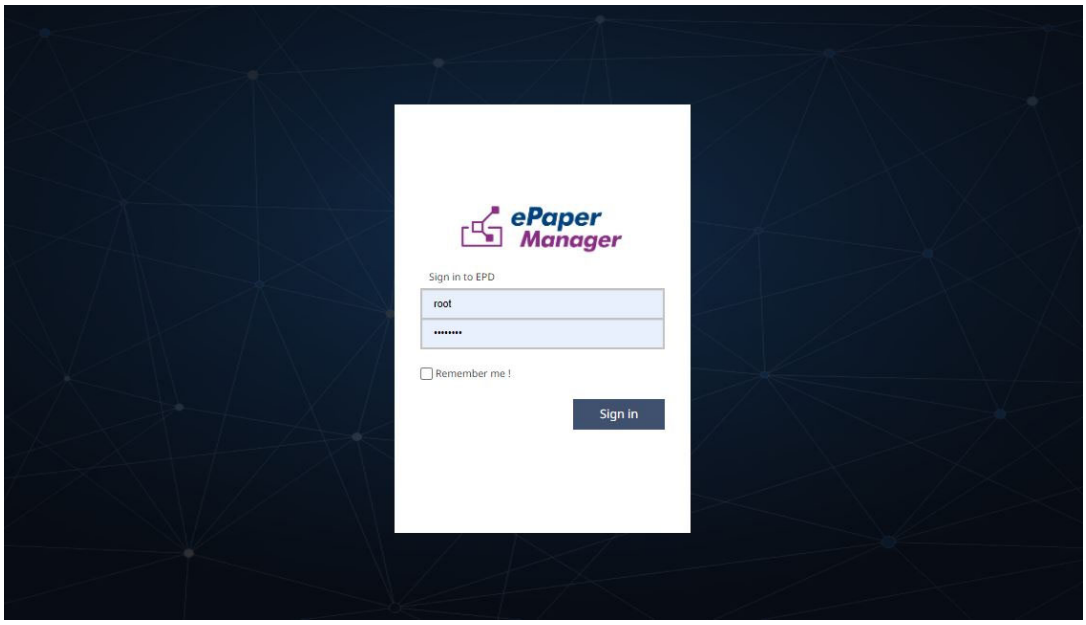
4.3.1 DeviceOn/ePaper Login

Login to your ePaper Manager by entering the IP address.

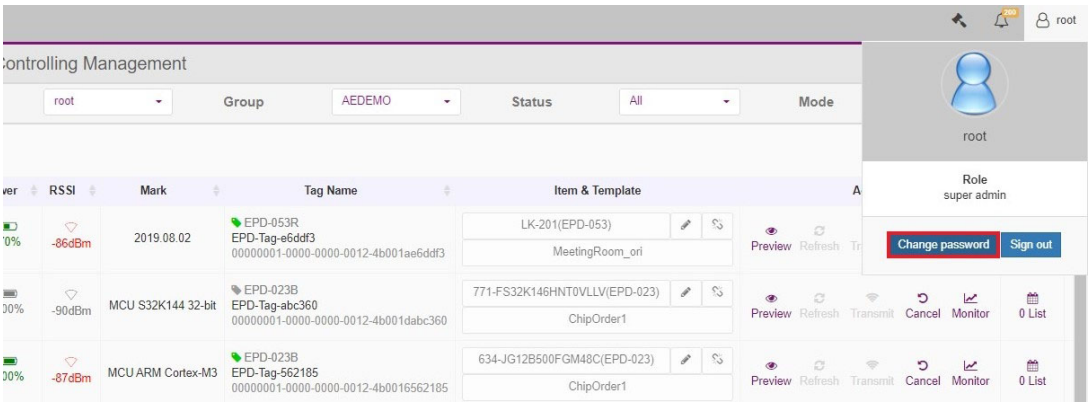
Enter the default User name and Password.

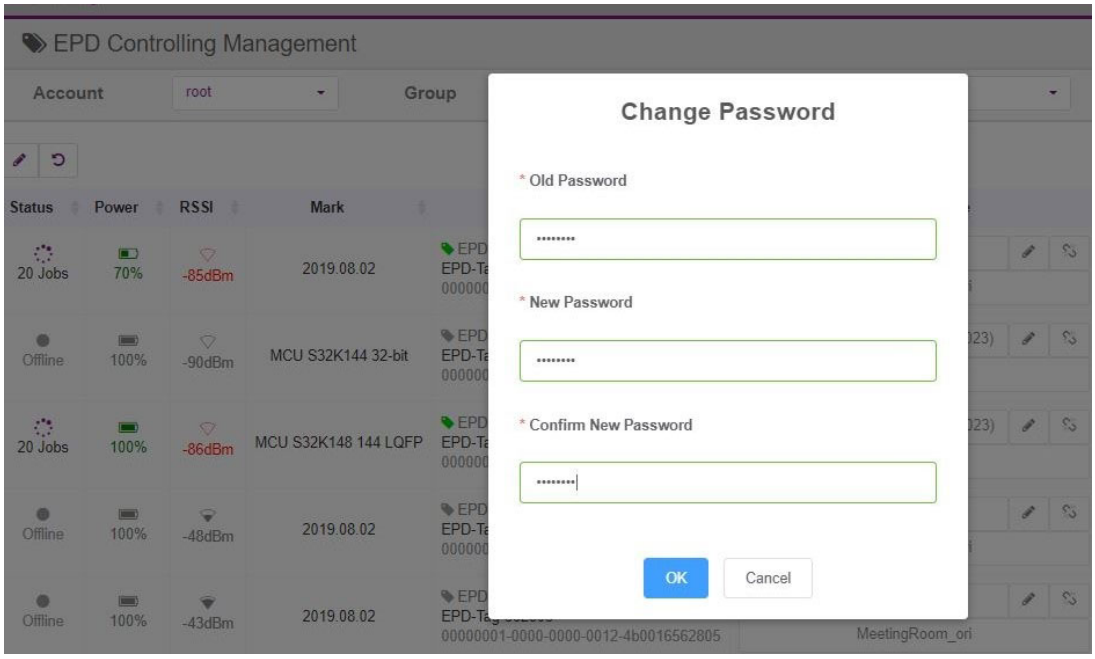
User name: **root**

Password: **P@ssw0rd**

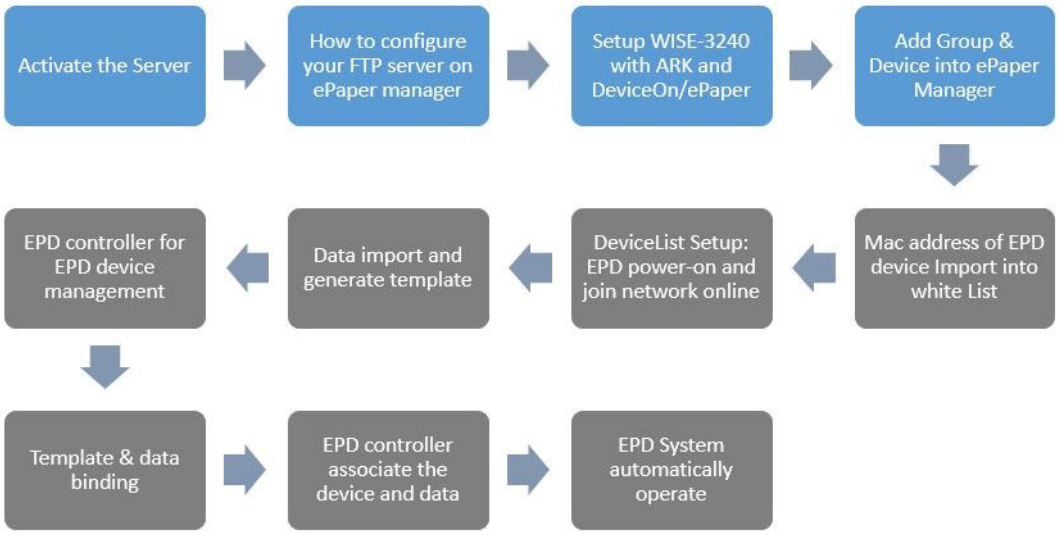


If the user wants to change the password, please click root and click change password. Then click OK.

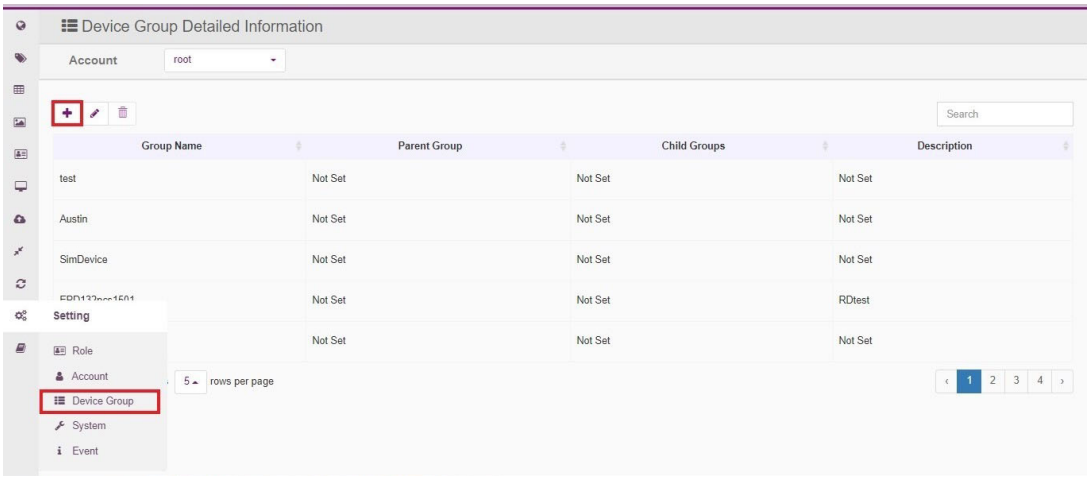




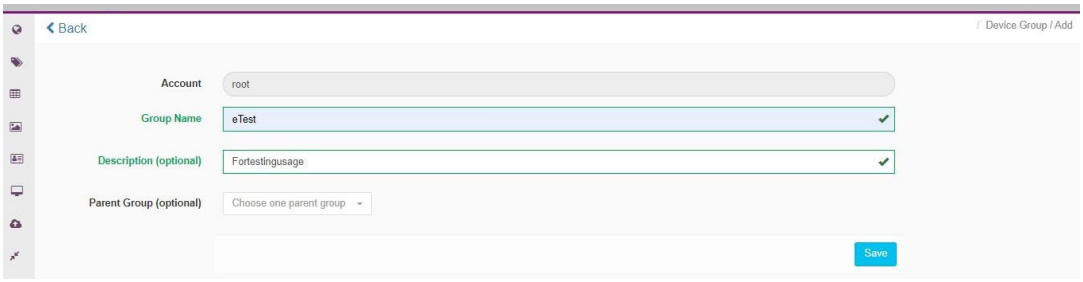
4.3.2 Add Group & Device into DeviceOn/ePaper



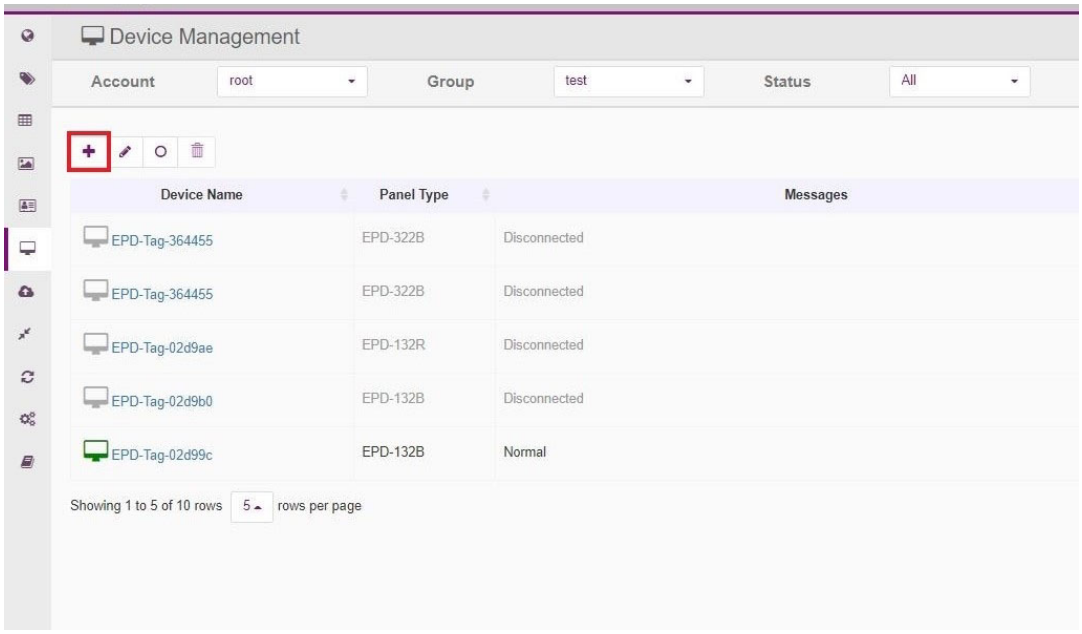
1. Add group by clicking add icon in **Device Group** in Setting.

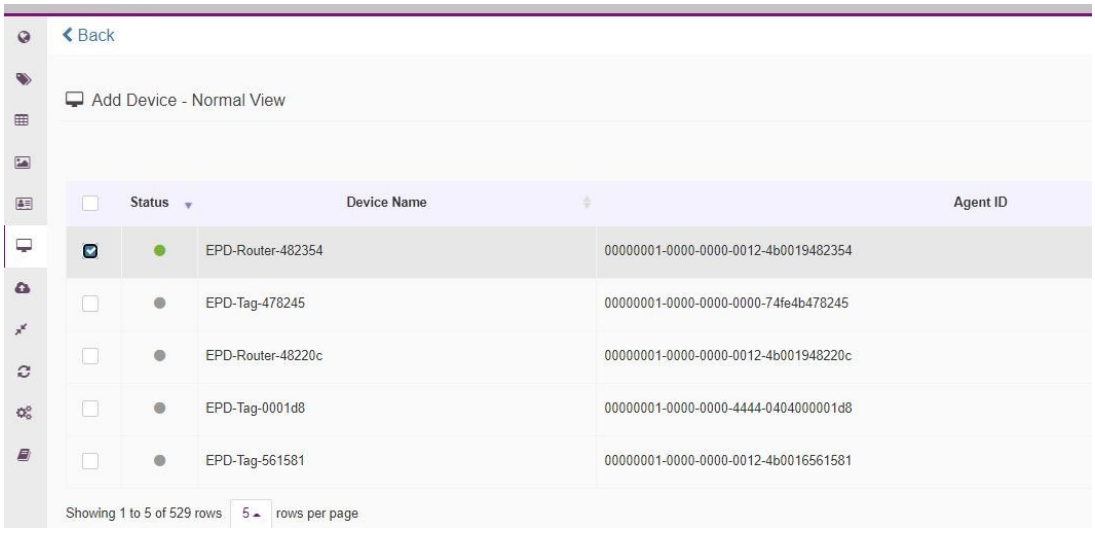


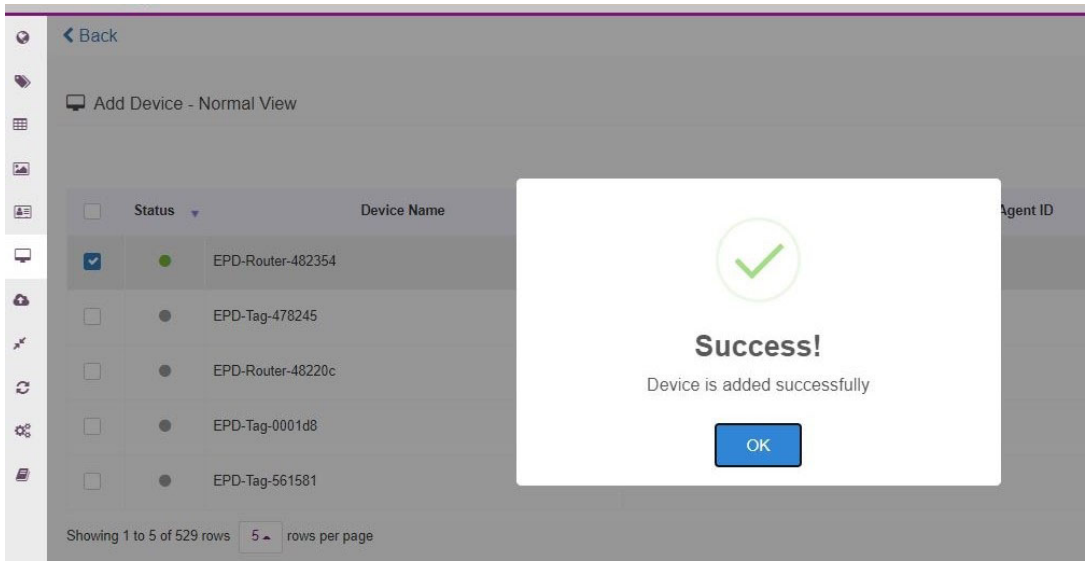
2. Add group by entering the **Group Name** and **Description (optional)**, then click Save.



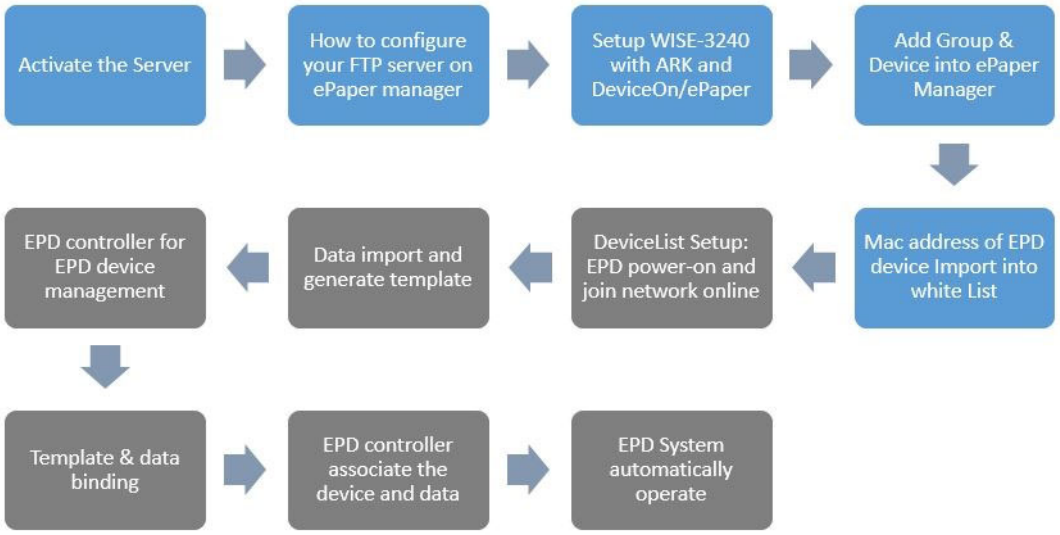
3. Add Router to Group.



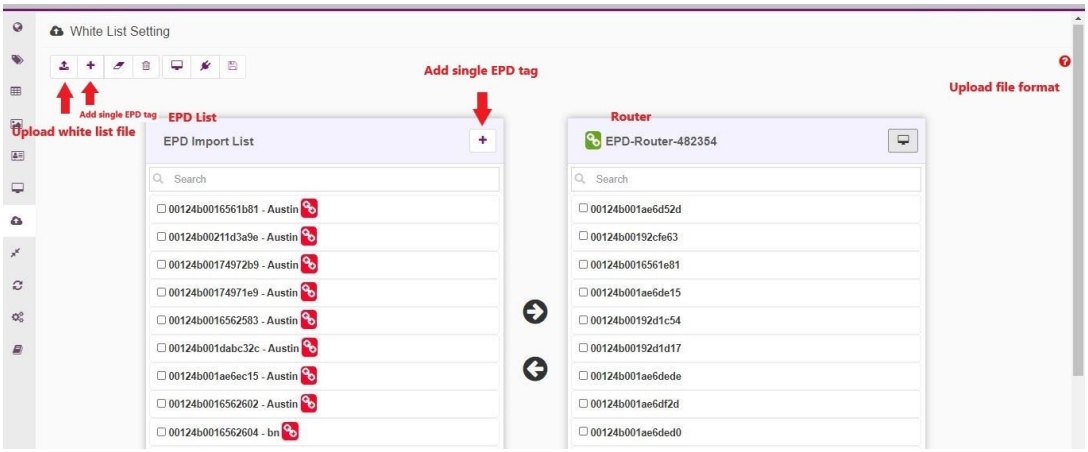


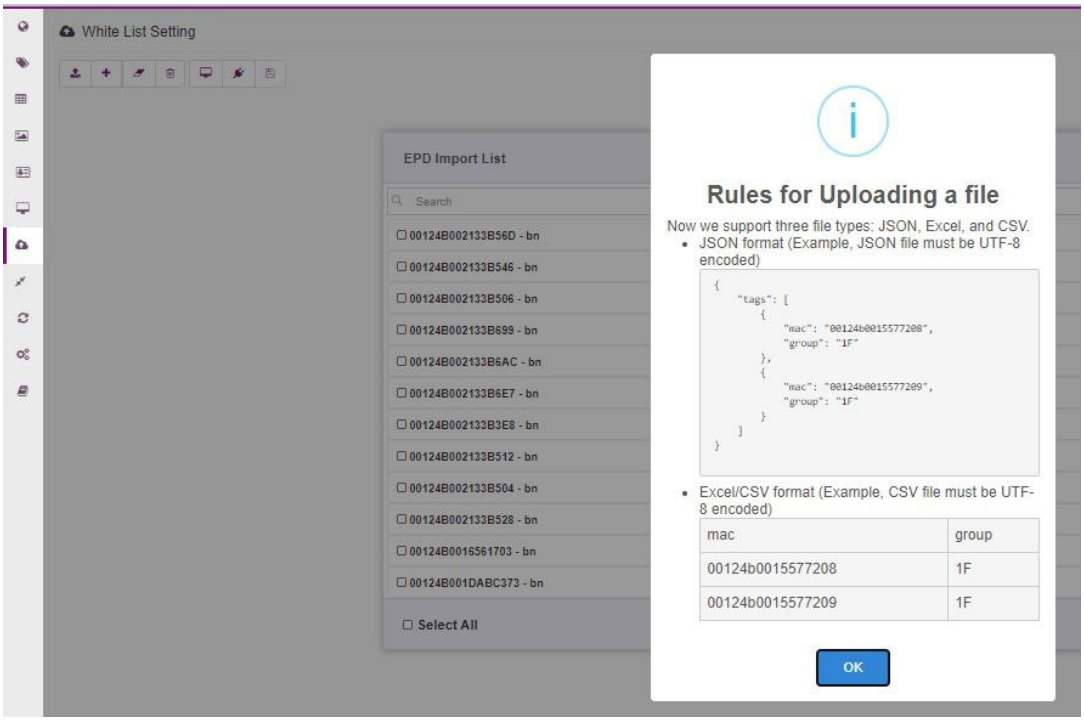


4. Legal ePaper device joins the network.



- Import the whitelist
  Import the Mac address of the EPD device list into DeviceOn/ePaper.
  Note: Users may receive the mac address file when the EPD device ships.
- Single Item Added.
  Click "+" icon to **Add single EPD tag** to your Router.
- Multiple Items Added
  Click **Upload white list file** to add multiple EPD tags to your router.

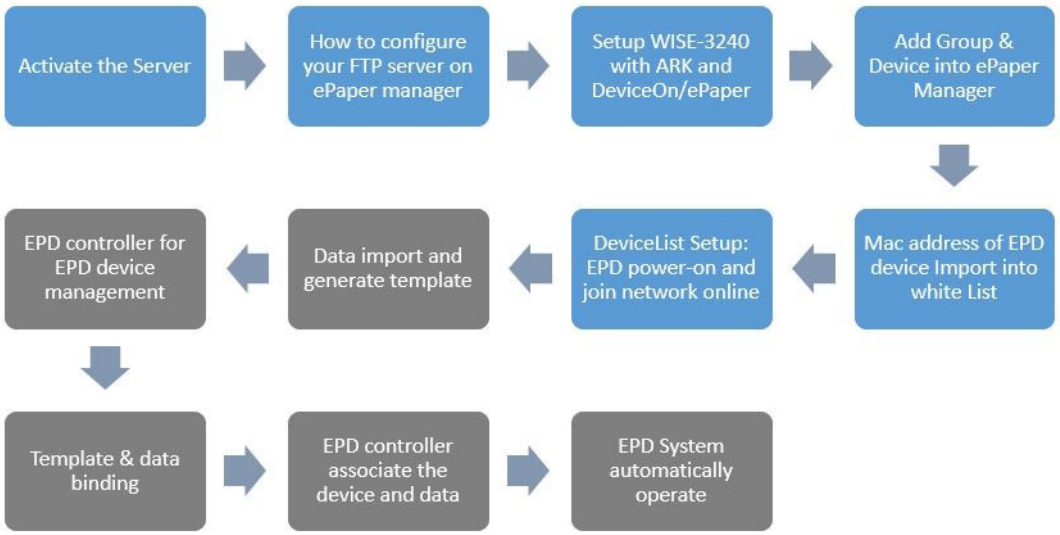




- EPD-230, 332 whitelist setting.
  The user needs to import the device list and then the device can join the network.
- Add EPD device into DeviceOn/ePaper whitelist. There is a mac address label on the EPD-230, 332 back, users may scan QR Code to map the target item.

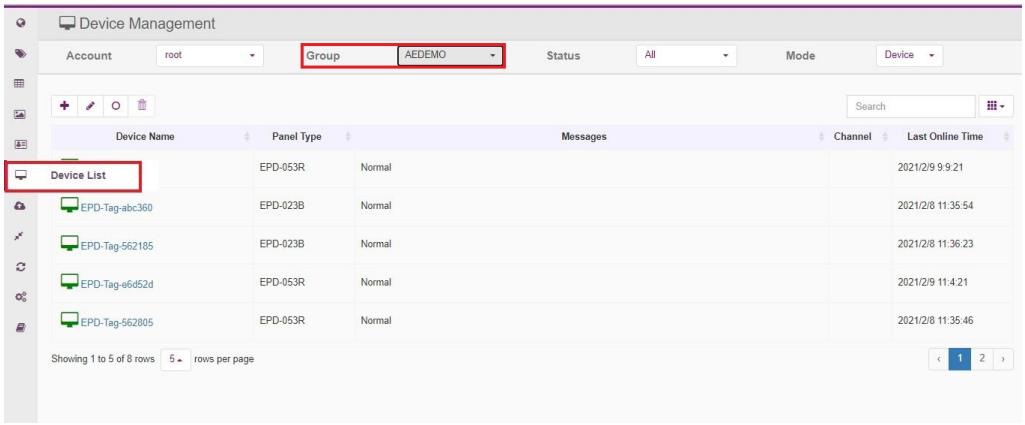
- Dispatch the EPD device to the Router
- (Option) Setup Router Channel
  - Refer to #4.3.2 item 7. Setup Router Channel.
- Wakeup EPD device from sleep mode
  - Press the button and release it.

5. Add EPD device into a Device Group

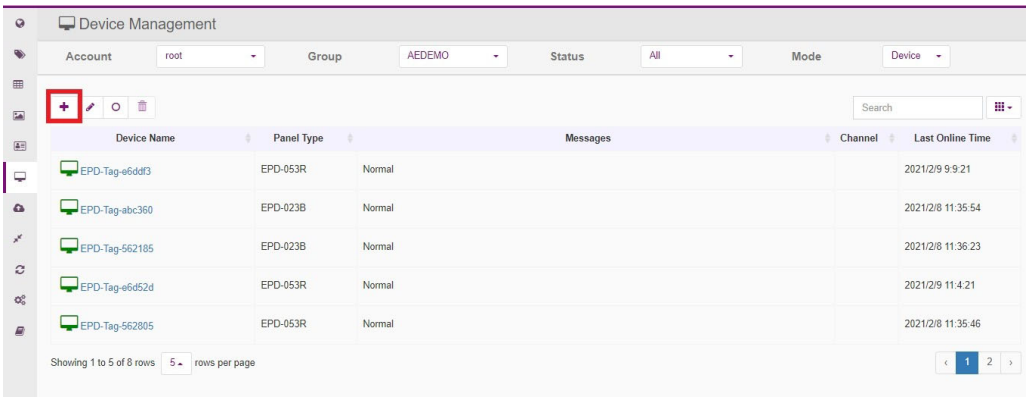


1). EPD device online. Click any button of the EPD device and you will see it on-line (30 mins for 400 pcs).

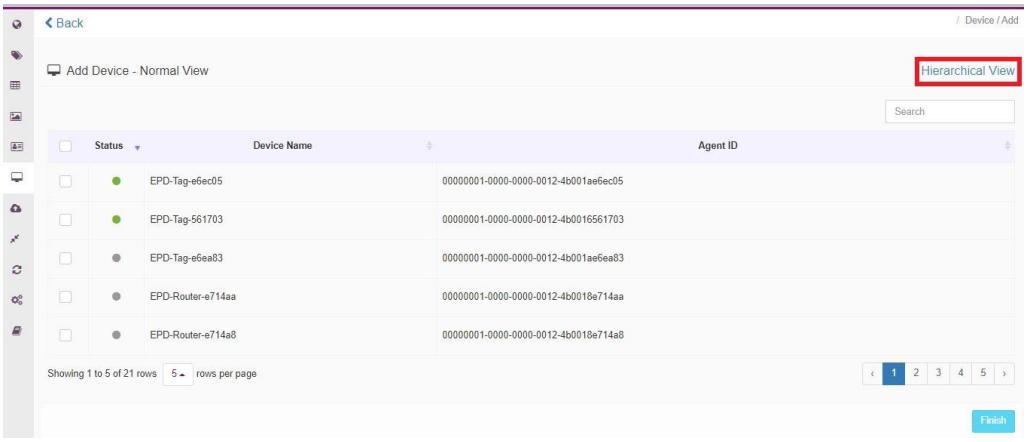
2).Click device list on the side bar menu, and select the group you want to add devices to.



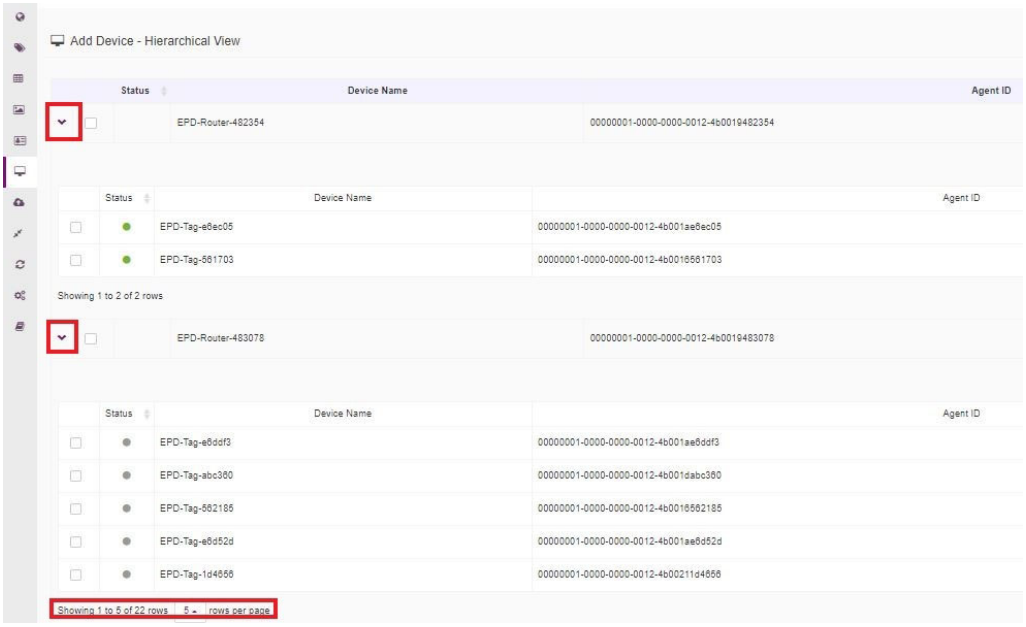
3). Click the add button on the top-left corner.



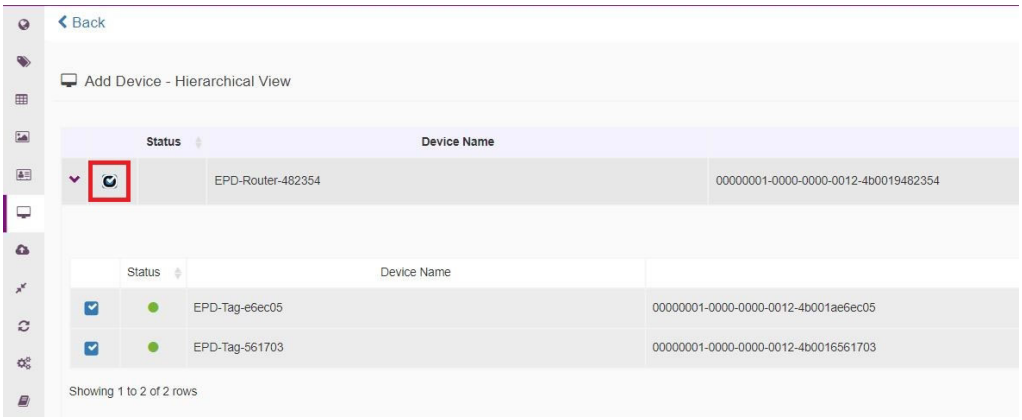
4). Choose the hierarchical view. (If you have finished the whitelist setting previously, you will see the devices grouped under a router.)



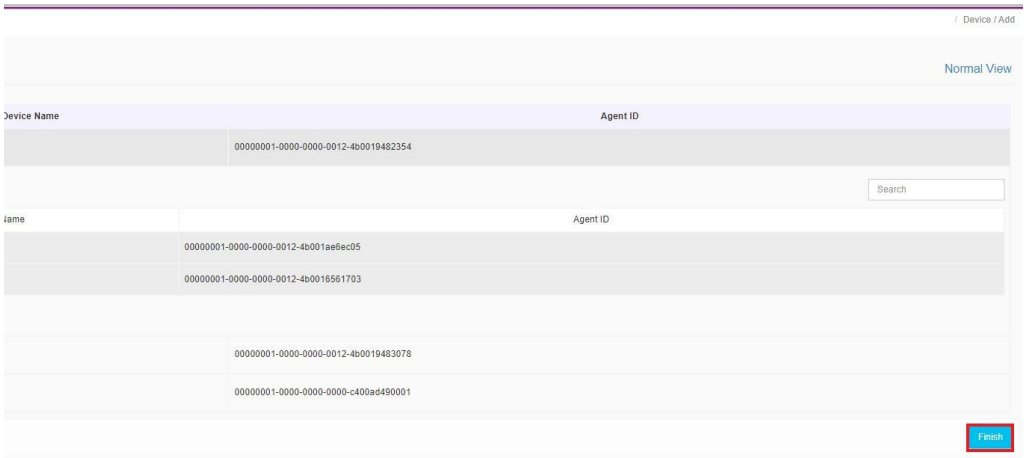
5). Open the hierarchy view until you see the device. Change the show number in order to select all devices under this router.

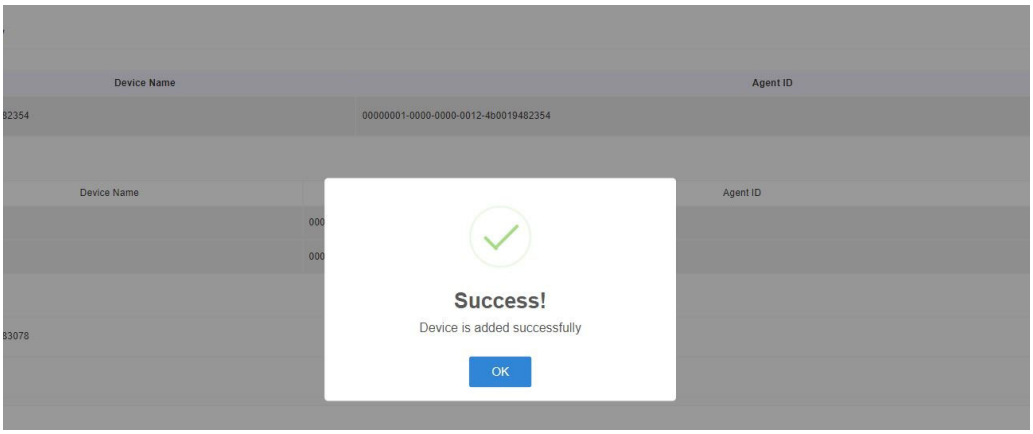


6). Select all by click the checkbox above.

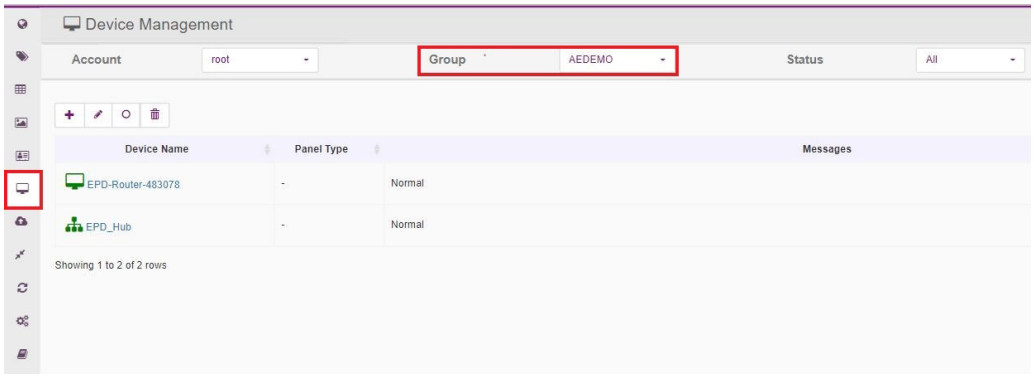


7).Click the finish button to finish the selection.
Note: It's an optional step, since the system already has encrypted keys to protect all transmission data.

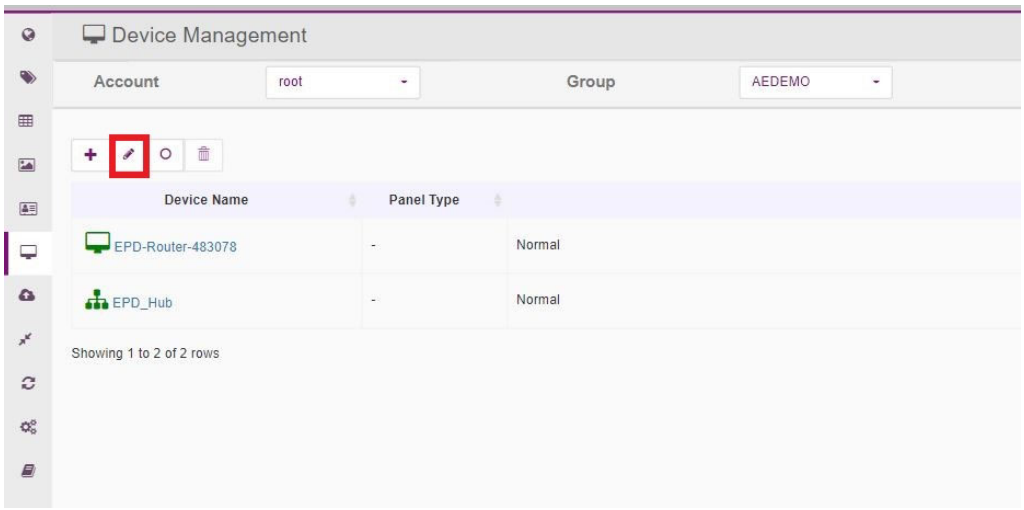




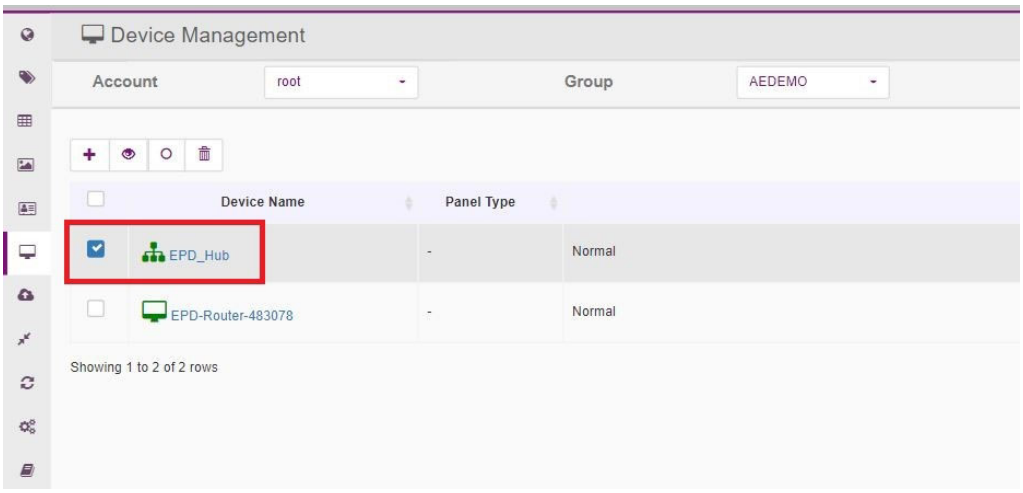
6. Set Router Encrypted Key
Note: An optional step, since the system already has an encrypted key to protect all transmission data.
1).Click Device List on the side bar menu, and select the device group for the router.



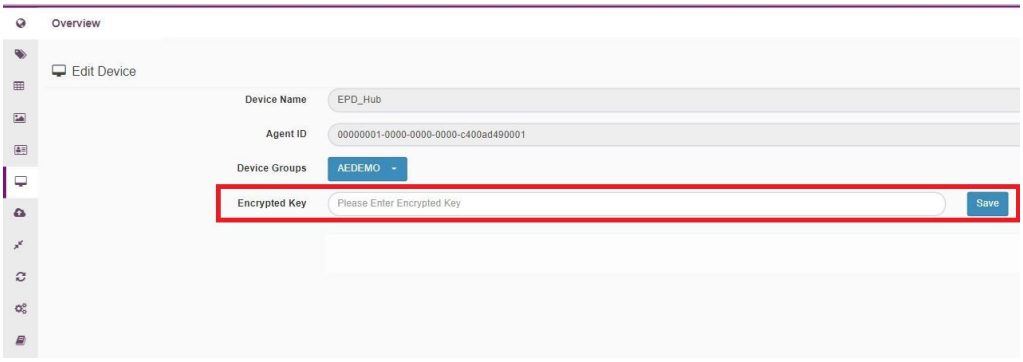
2). Find the router device, and change to edit mode by clicking the edit button.



3). Click the name of router device to enter edit mode.

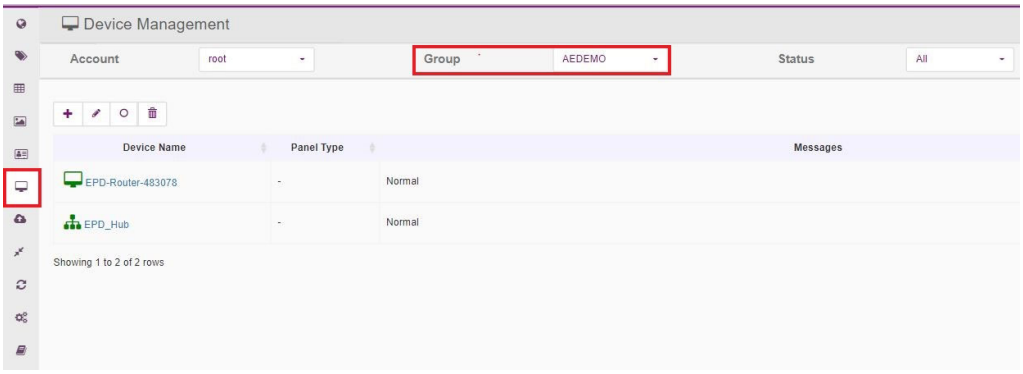


4.) Fill in the Encrypted Key field (32-characters with A-Z and 0-9), then click **Save** to finish the configuration.

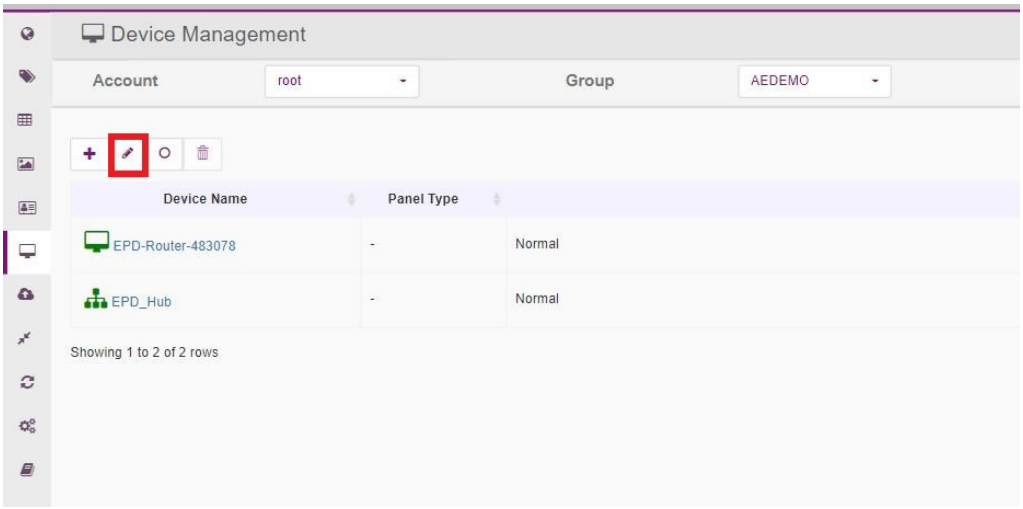


7. Setup Router Channel on WISE-3240

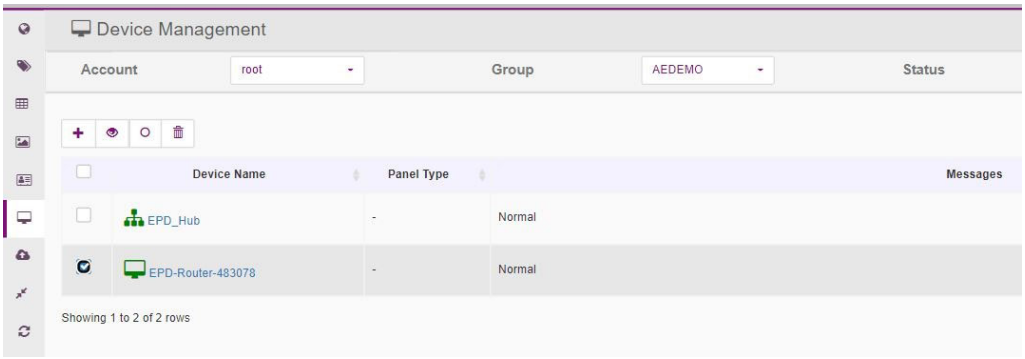
1). Click Device List on the side bar menu, and select the device group for the router.



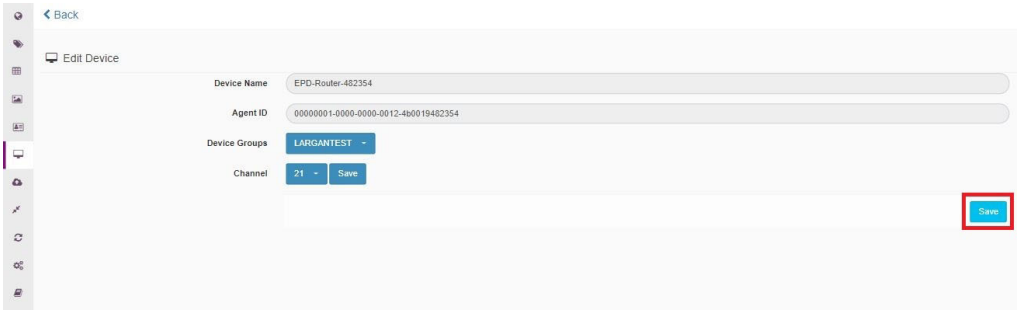
2). Find the router device, and change to edit mode by clicking the edit icon.



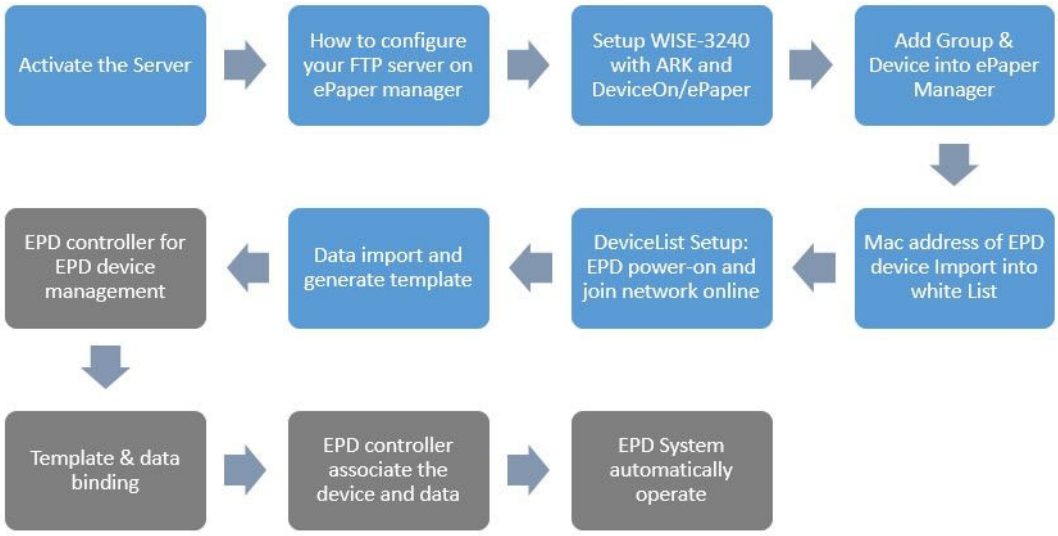
3). Click the name of router to enter edit mode.



4). Change the Channel (11,13,14,15,20,21,22,23,24,25,26 are available), and then click **Save** to finish the configuration.



4.3.3 Import Item Data to DeviceOn/ePaper



There are two ways to import data from vertical market applications to our DeviceOn/ ePaper.

1**) JSON Format: Use APIs to update data in real time.**

In order to import data to EPD, use the JSON format schema. See code below for ref.

Note: Code must be a unique ID in the JSON format.

{ "items": [{ "code": "uniqueID_user_provide_1", "name": "item_name_user_provide_1", "content": { "device Content Title 01": "device Content01", "device Content Title 02": "device Content02" } }, { "code": "uniqueID_user_provide_2", "name": "item_name_user_provide_2", "content": { "device Content Title 11": "device Content11", "device Content Title 12": "device Content12" } },] }

2) Batch data updates into DeviceOn/ePaper database using Excel or CSV format.

If you upload Excel or CSV to the system directly, the system will auto transfer the format to JSON.

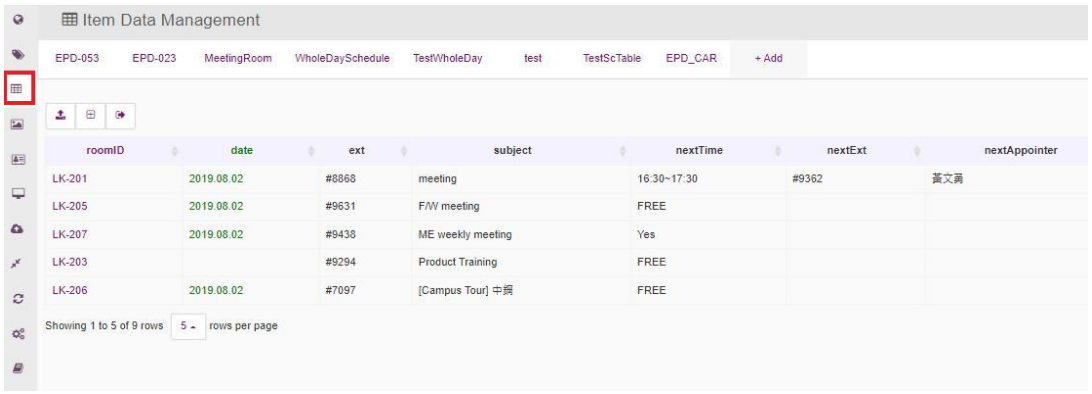
Note: The first column of data must be a unique ID in Excel or CSV format for overall item data.

Example1:

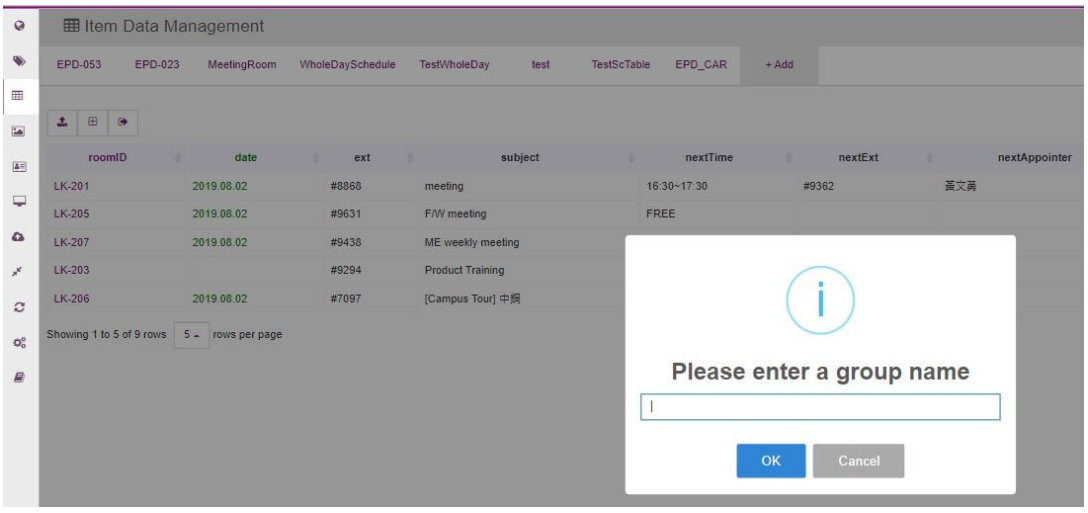
i. Vertical application scheduling sends data to the DeviceOn/ePaper server

ii. Click the **Data** icon on the left-side navigation bar and click left side button as shown below. The detail steps are demonstrated as below.

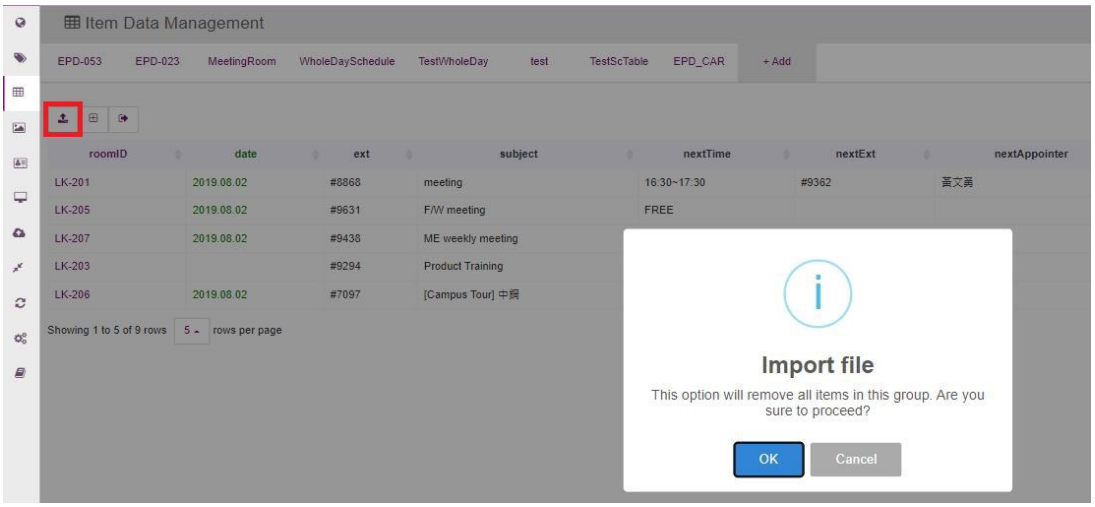
Step1. Click **Data** icon.



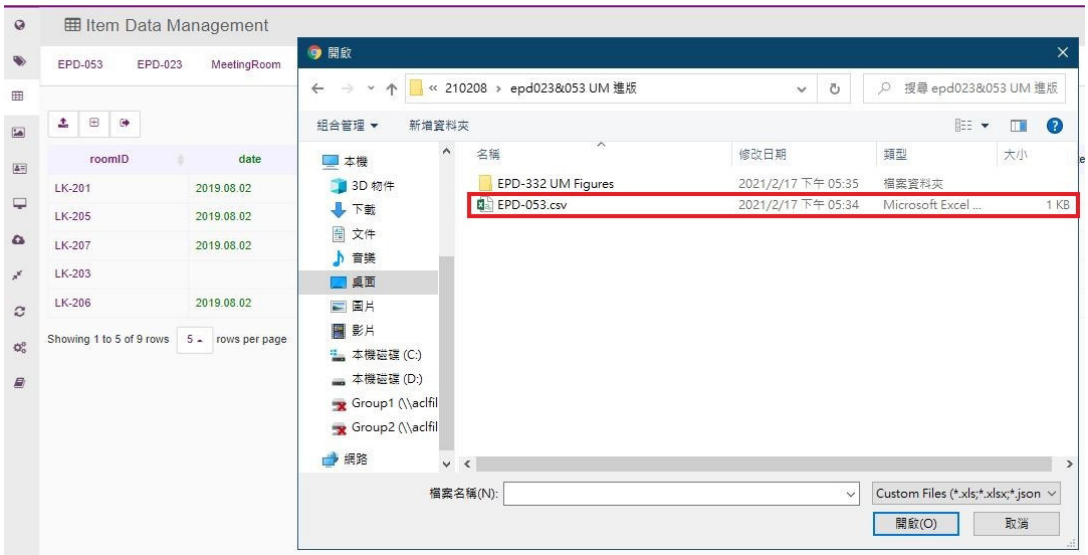
Step2. Click "+Add" and enter the group name

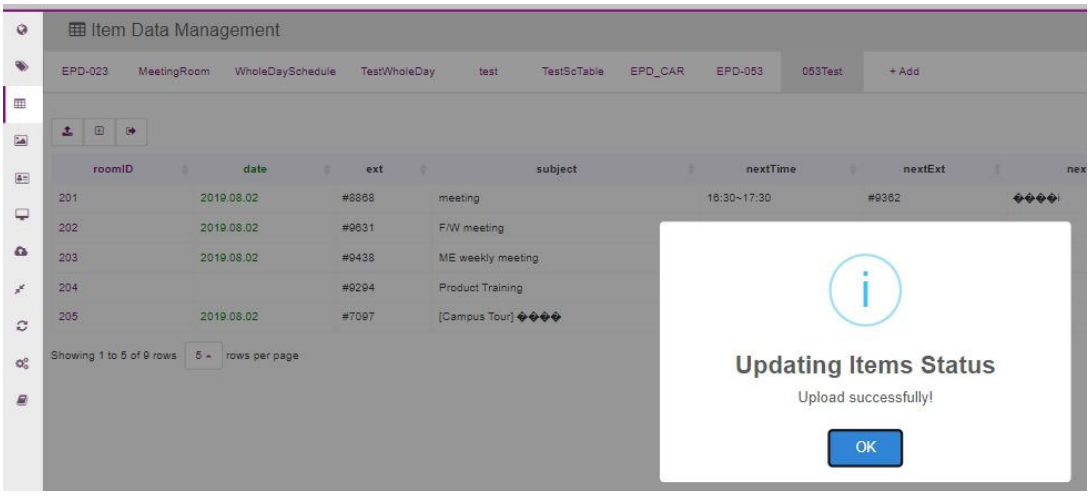


Step3. Click the **Upload new items** icon to import file

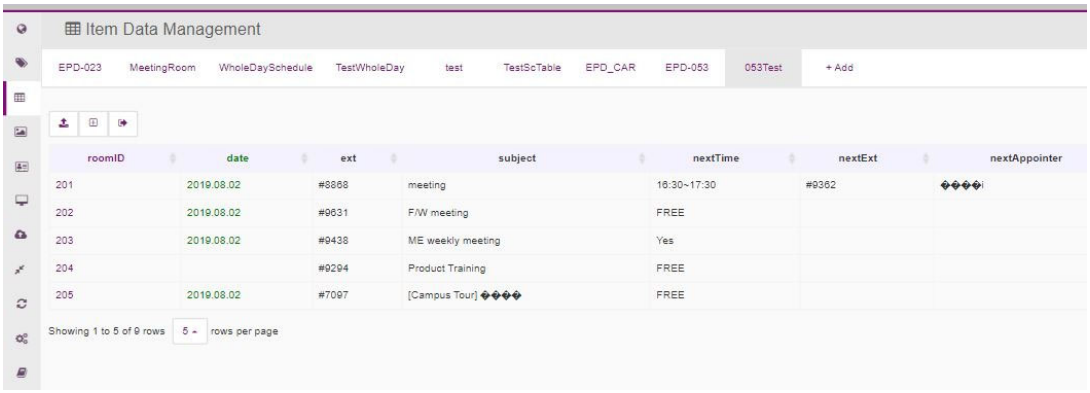


Step4. Choose the Excel file to import, and it will show **Uploaded successfully!**

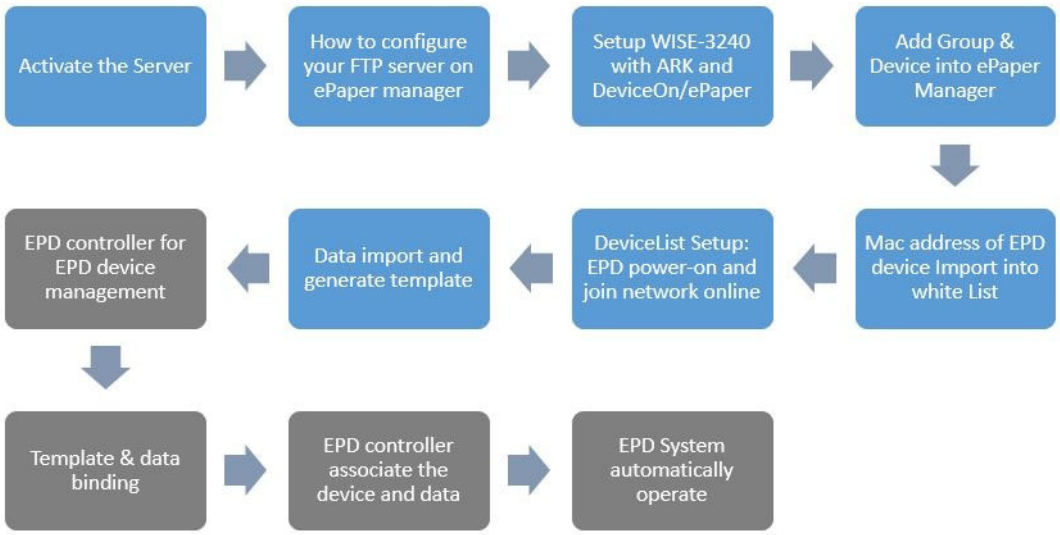




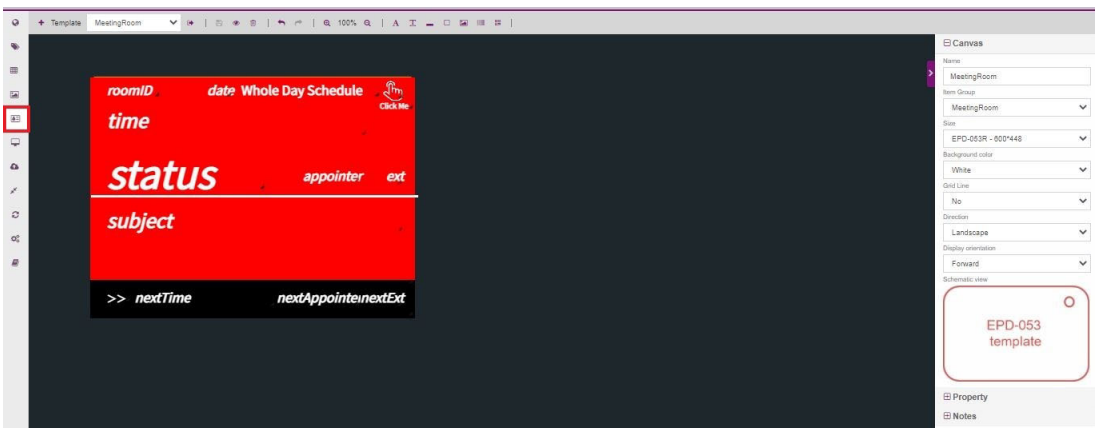
Step5. Check the uploaded file data.



4.3.4 Design Your Own Template



Before delivering data to the EPD device, the user needs to design the template for the device to show the data on the screen. We have provided you with a drag & drop user interface to help you design your templates more easily. Click the **Template** icon in the left-side navigation bar and choose various tools to design templates, such as Label, Text, Image, Shape, Barcode and QRcode.

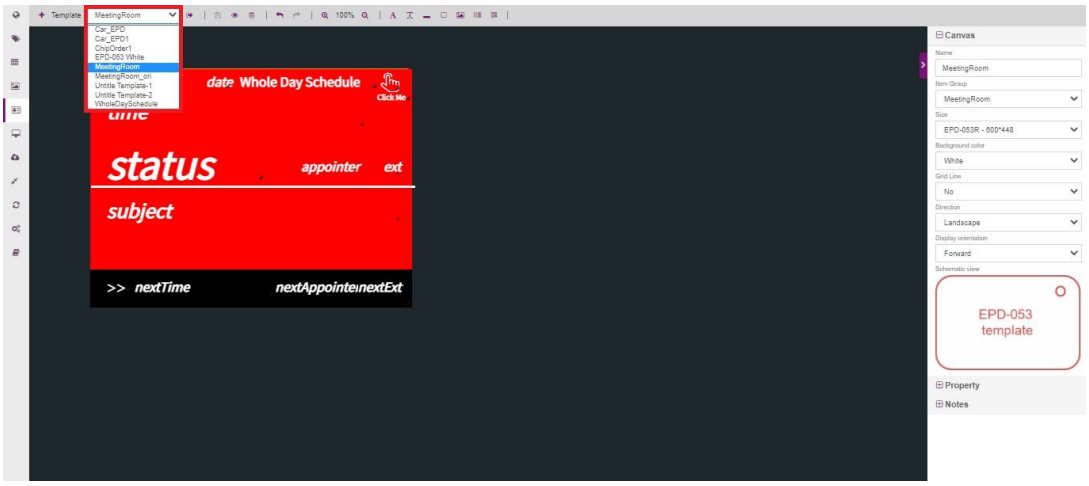


- Label
  Simply a text message
- Text
  Value comes from imported data, and you can choose what column of data needed to be shown.
- Image
  Full color images will automatically be re-sampled to red, black and white.
- Shape
  System supports rectangles, circles and triangle shapes.
- Barcode
  System supports code 39 barcodes.
- QRcode

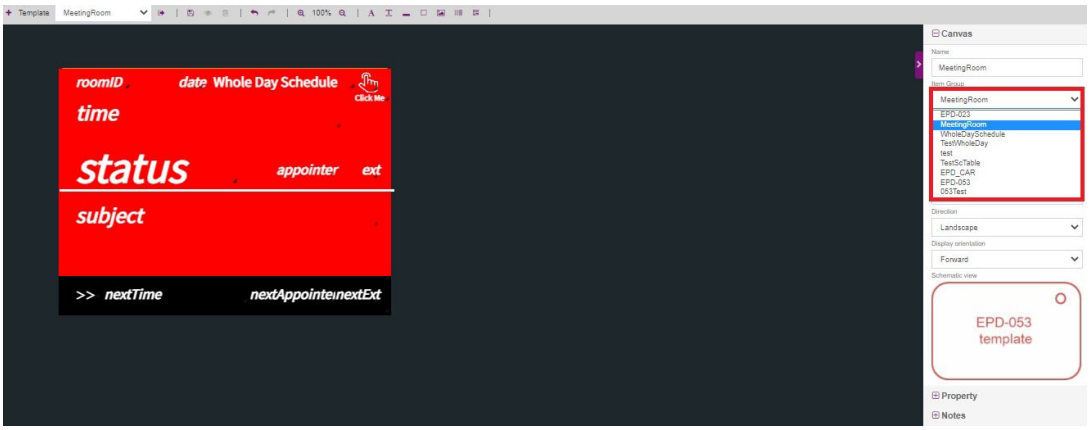
4.3.5 Combing Template and Item Data

After importing data and making the template, we can combine them for regular data auto updates.

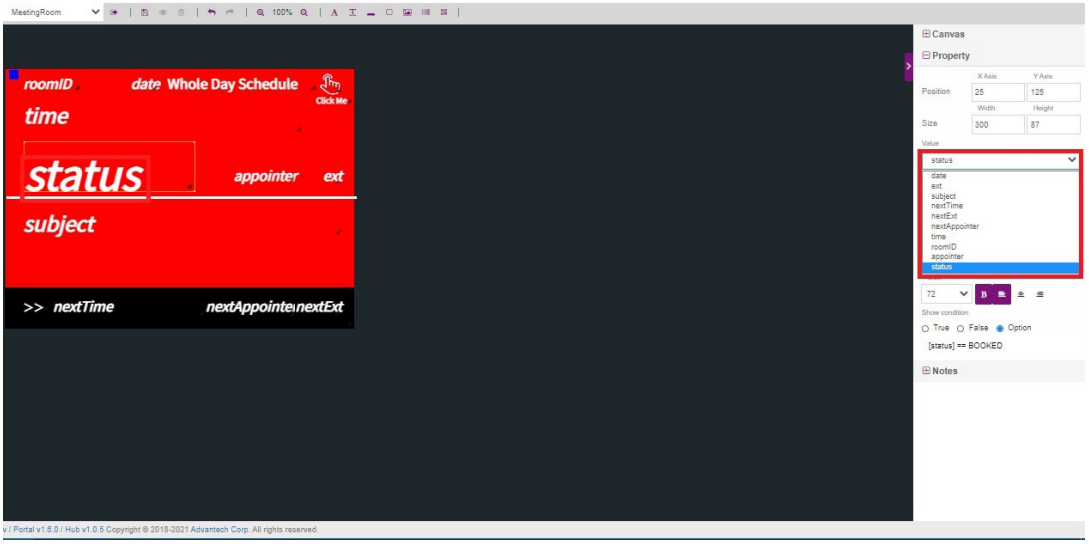
1) Select the desired Template



2) Choose the Item Group.



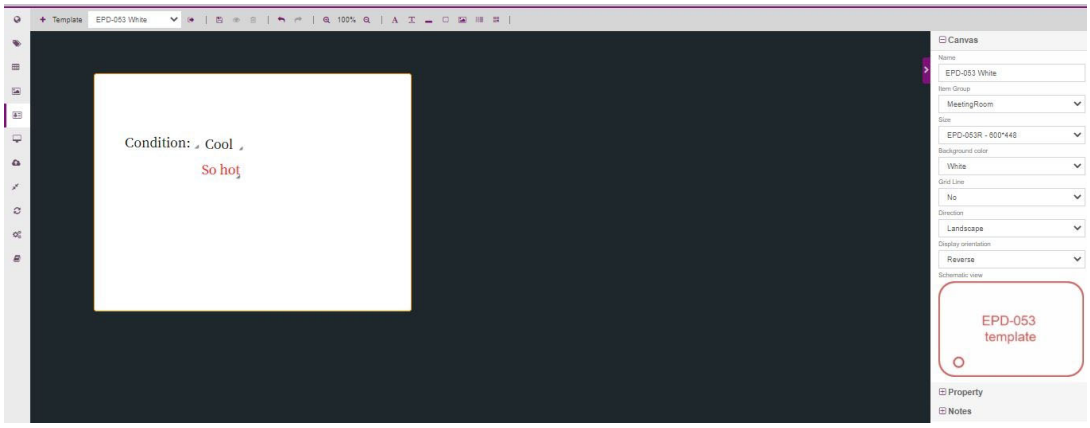
3. Click the object to edit the content by selecting the value status。



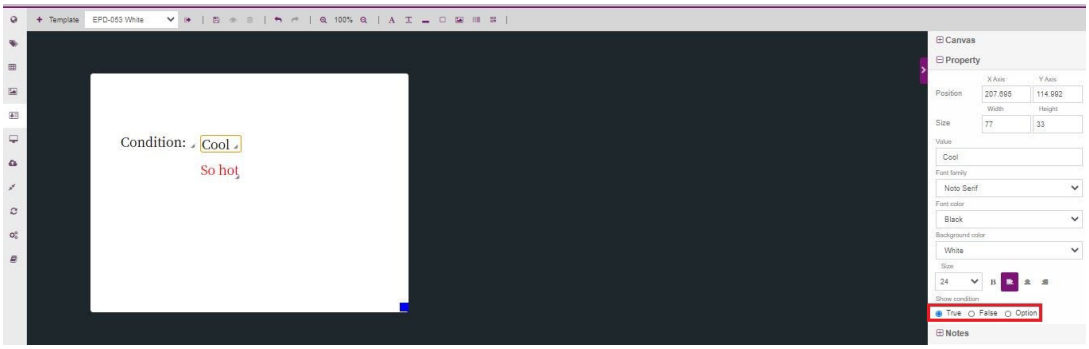
Setup dynamic template.

For another special purpose template setting, you can decide whether an object shows or not depending on the specific item values. For example, word becomes red when temperatures are over 40 degrees. The next step demonstrates how to achieve this goal.

a. Make two objects which show conditions are opposite. Click one object.

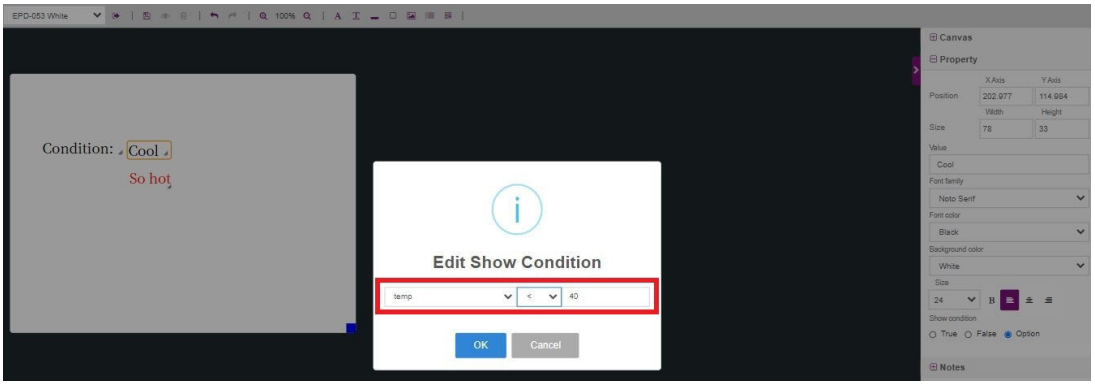


Click the radio button option in the show condition.

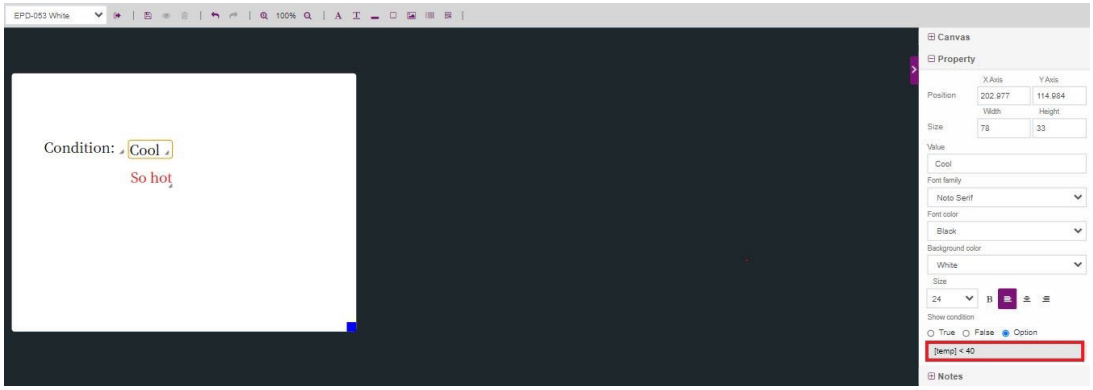


A pop up dialog will appear. Fill in the conditions to show this object.

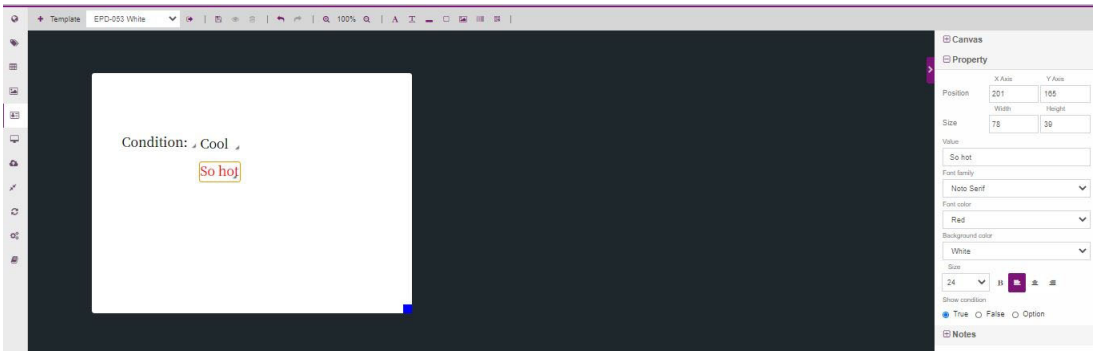
Note: if this item value is a number, you can use all operations. If this item value is a character, you only can use "==" or "!=").



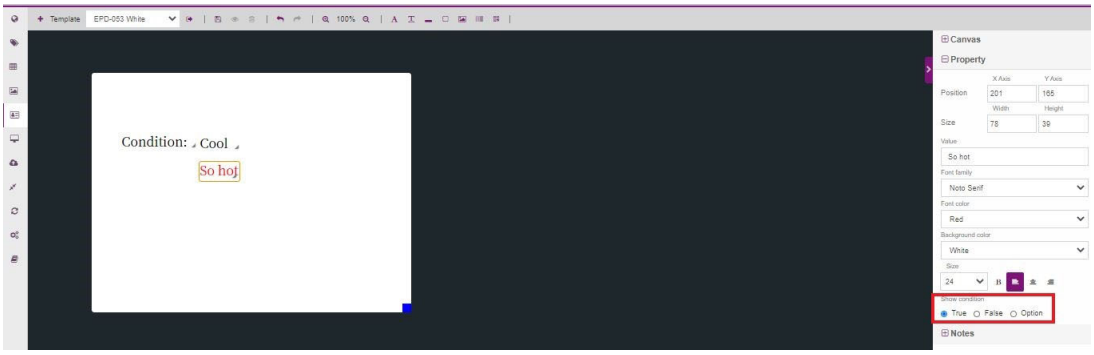
Finish the show condition setting.



Click another object.

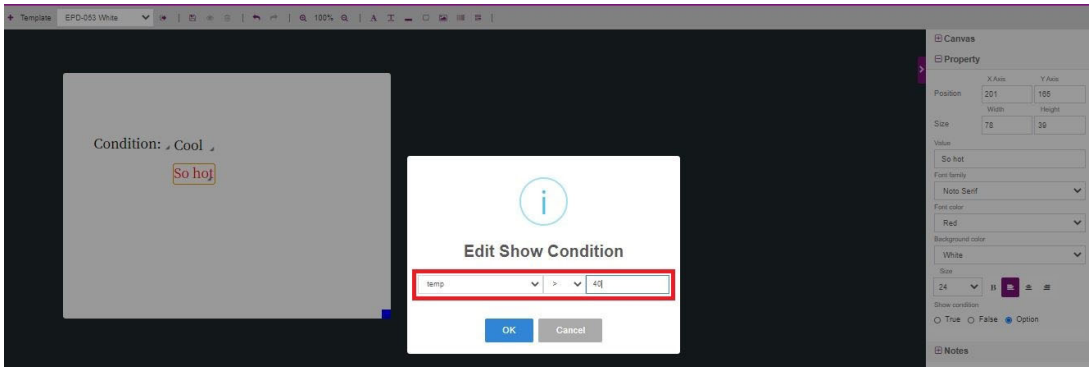


Click the radio button option in the show condition section.

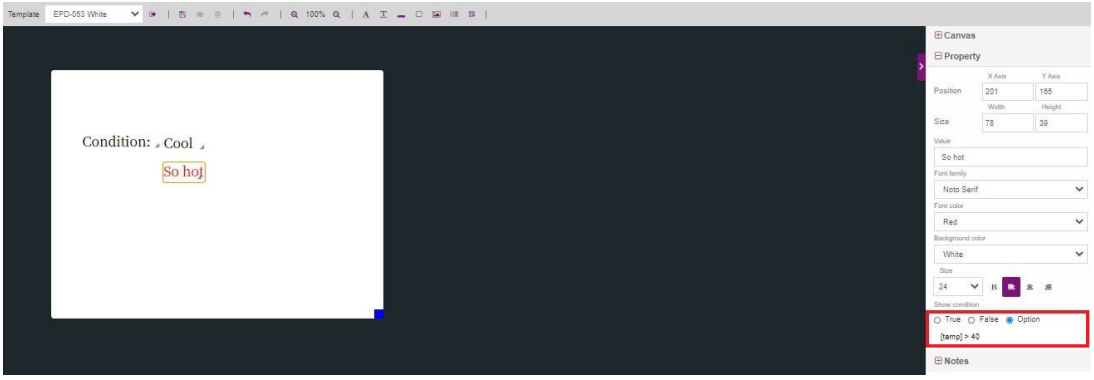


In the dialog, fill in the conditions to show this object.

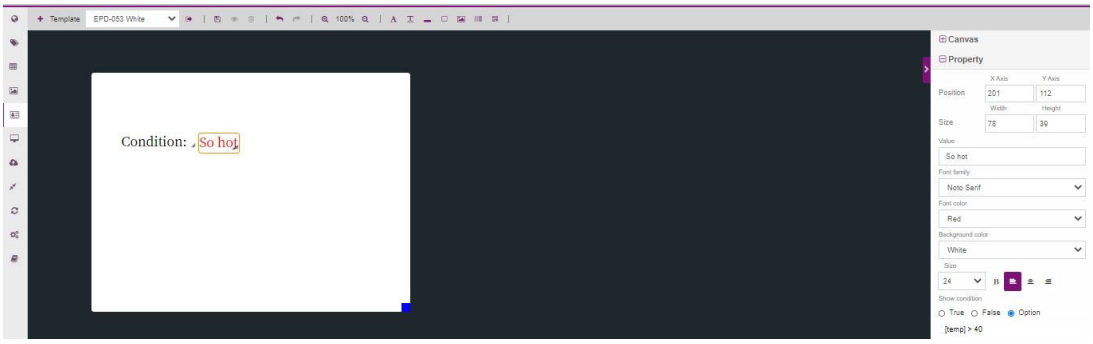
Note: If this item value is number, you can use all operations. If this item value is character, you only can use "==" or "!=").



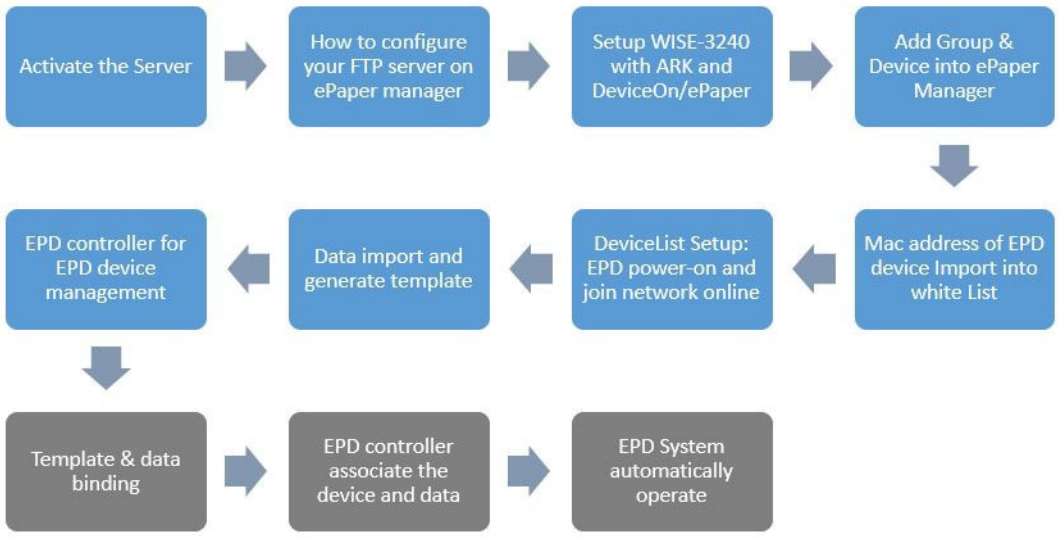
Finish the show condition setting.



b. Put these two objects in the exact same position.



c. See the results by preview in the EPD controller page.

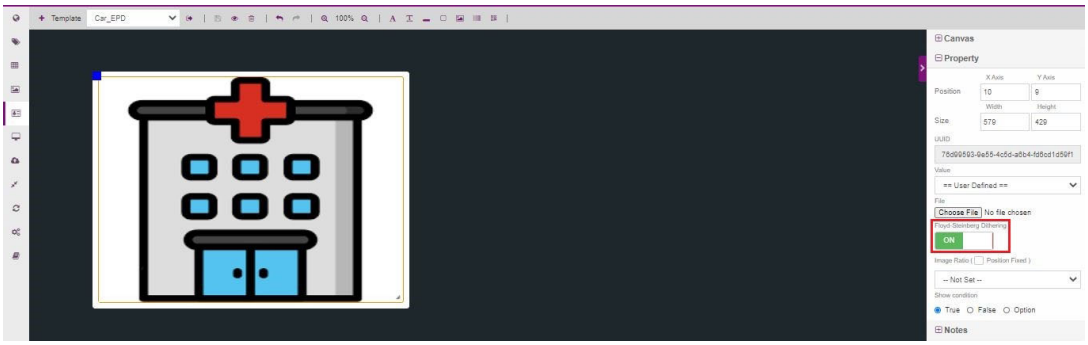


Dithering Function Introduction

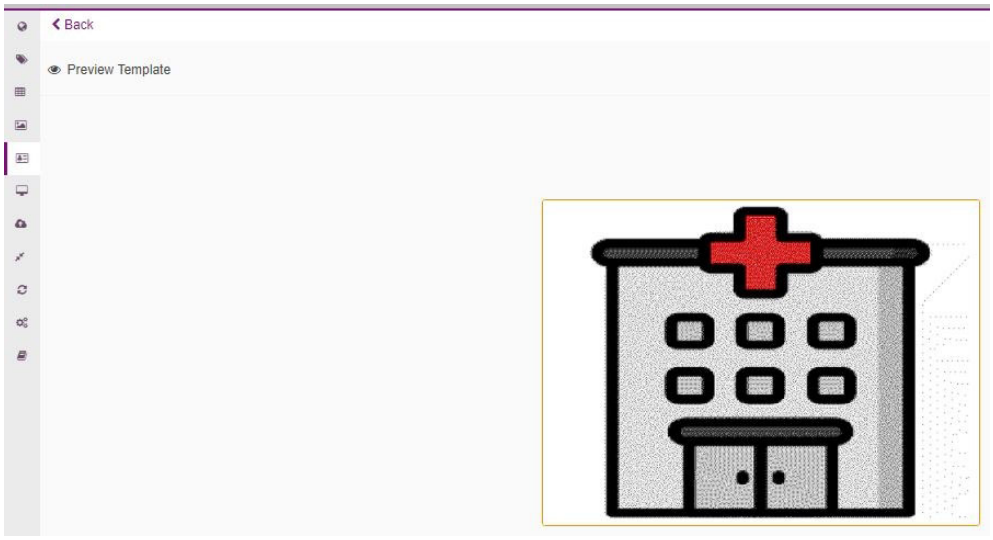
Dithering function is developed and supported with ePaper Manager for the clarity of image. Image dithering consists of mapping the original grey image into a binary image. As our eyes perform a spatial integration, it is possible to achieve reasonable results by using a mapping strategy where the gray-intensity values are converted to density of black pixels.

The following will demo how to trigger the dithering function in ePaper Manager.

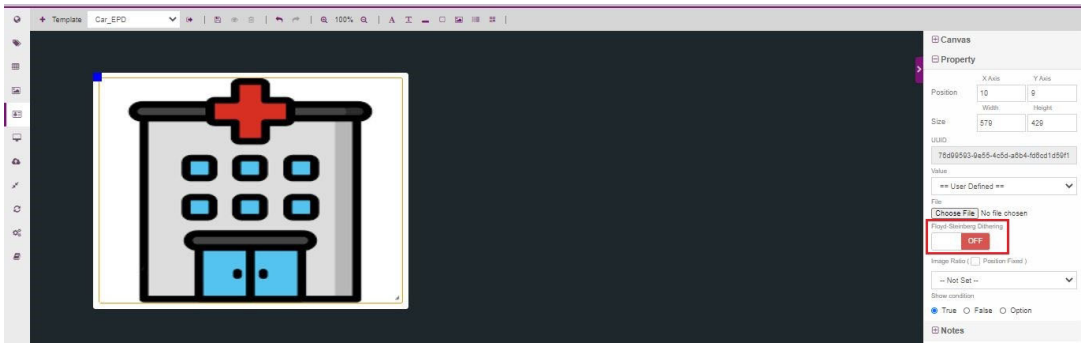
Step1. Choose an image in the template and open the dithering function.



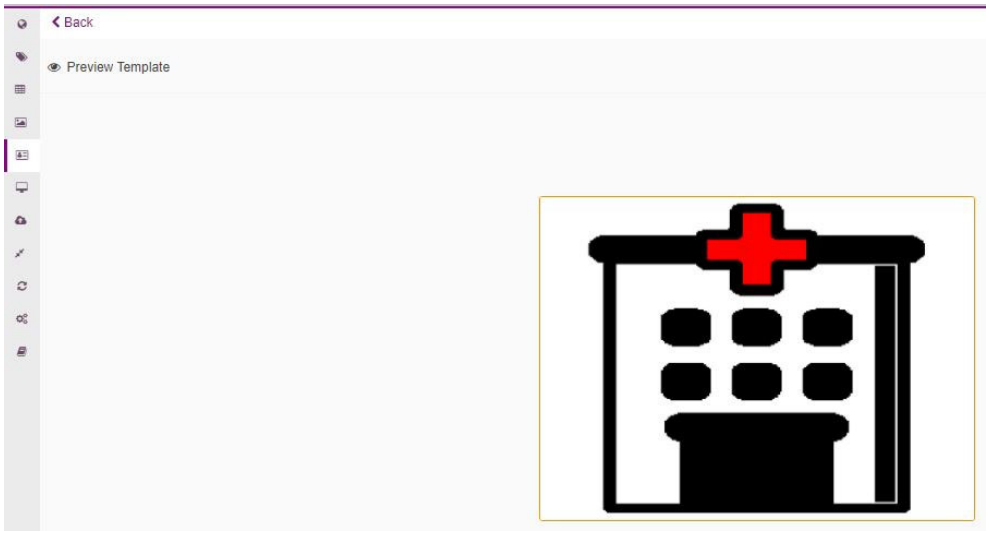
Step2. Click save and preview buttons to preview it



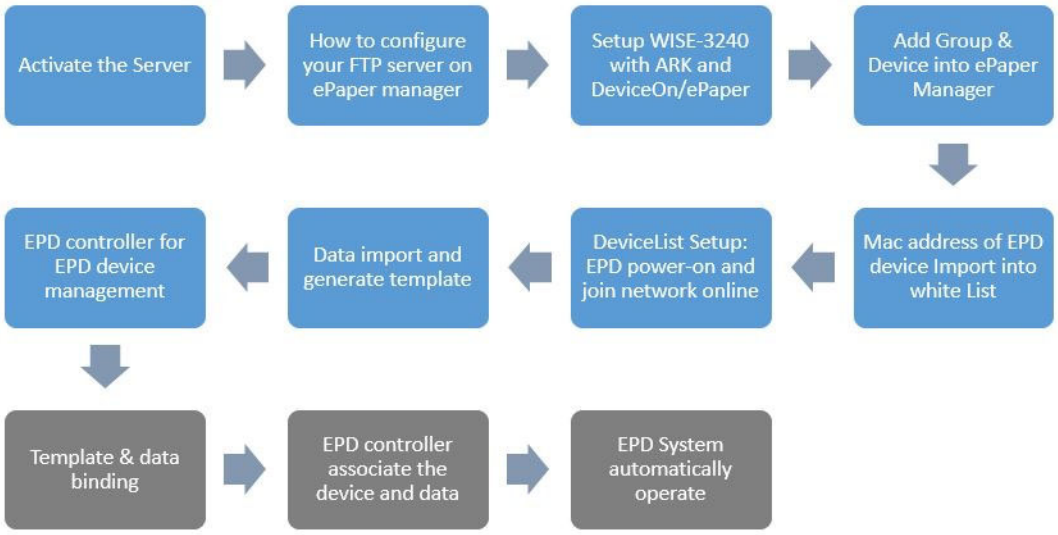
Step3. Then, users can close the dithering function to check the difference between dithering-ready and without dithering



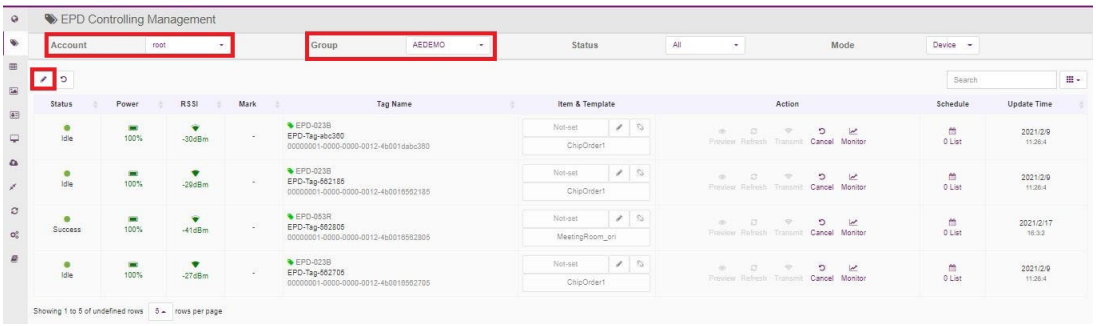
Step4. Click preview again to see the results without dithering the image



4.3.6 EPD Controller for EPD Device Management



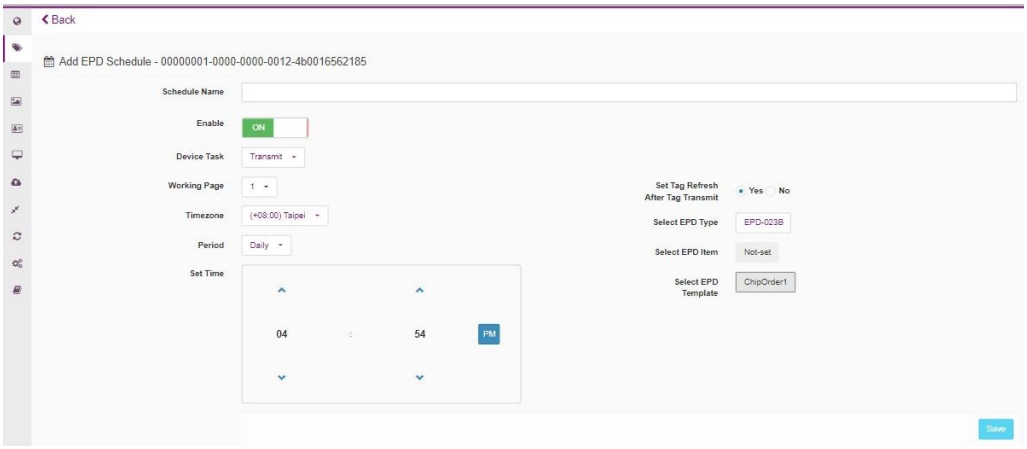
- Select correct account/group where your devices belong to
- Select Preview / Edit mode



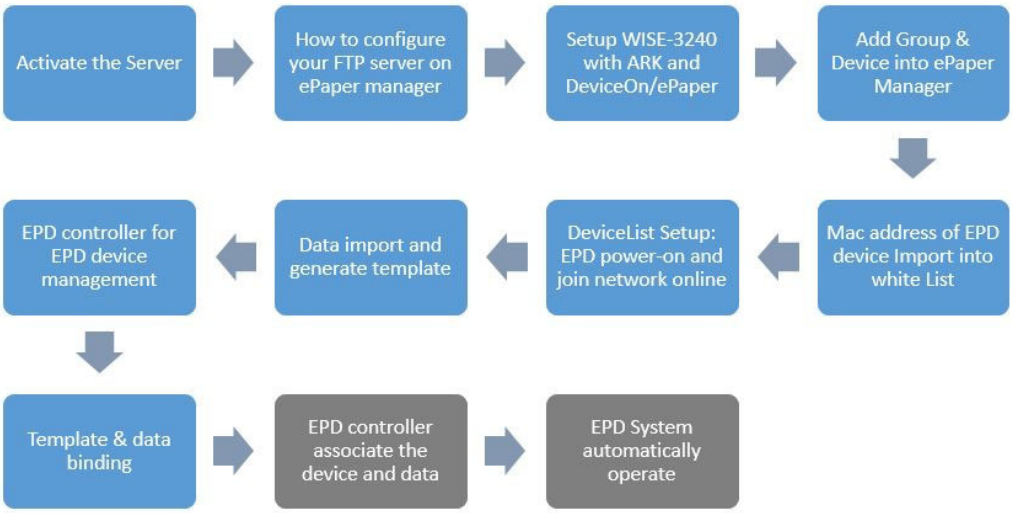
There are two parts in the management: Properties & Action:

1) Properties: Users can read EPD device status as shown below.
   - EPD Device Status
   - Power
   - RSSI
   - Device Type, Name, Mac address
   - Binding Items & Template
   - Update Time
2) Action
   - 2-1 Preview: users can preview the image on the EPD device.
   - 2-2 Refresh: users may control EPD device refresh.
   - 2-3 Transmit: users can deliver images to the EPD device.
   - 2-4 Cancel: users can cancel the transmit task.
   - 2-5 Carousel: users can setup carousel mode for the EPD device (this feature is only for EPD-662/660 model).
   - 2-6 Schedule: Users need to setup an EPD device data delivery schedule:
     Note: The timezone is determined by browser's UTC time.
     – The user needs to setup the EPD device data delivery schedule:
       Device Task: Select Transmit.

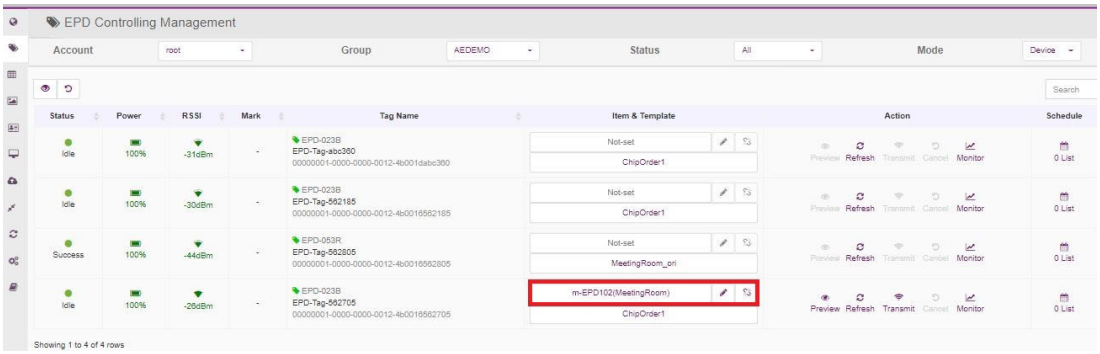
– The user needs to setup the EPD device image flash schedule
  Device Task: Select Re-fresh.



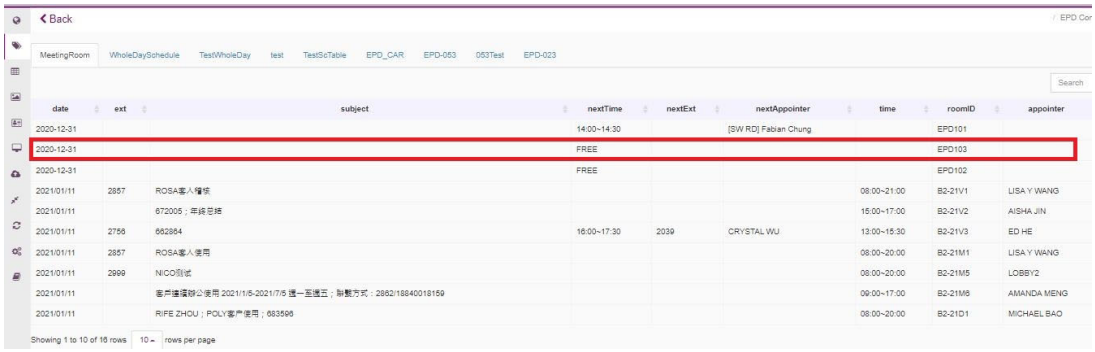
– Select EPD Item: select a device receive the schedule.
– Set EPD Template: select the EPD Template from the list which you've already designed.
– Working Page: select which page in the EPD device.
– The user may setup the schedule date and time for the system.



1. Select binding data icon.



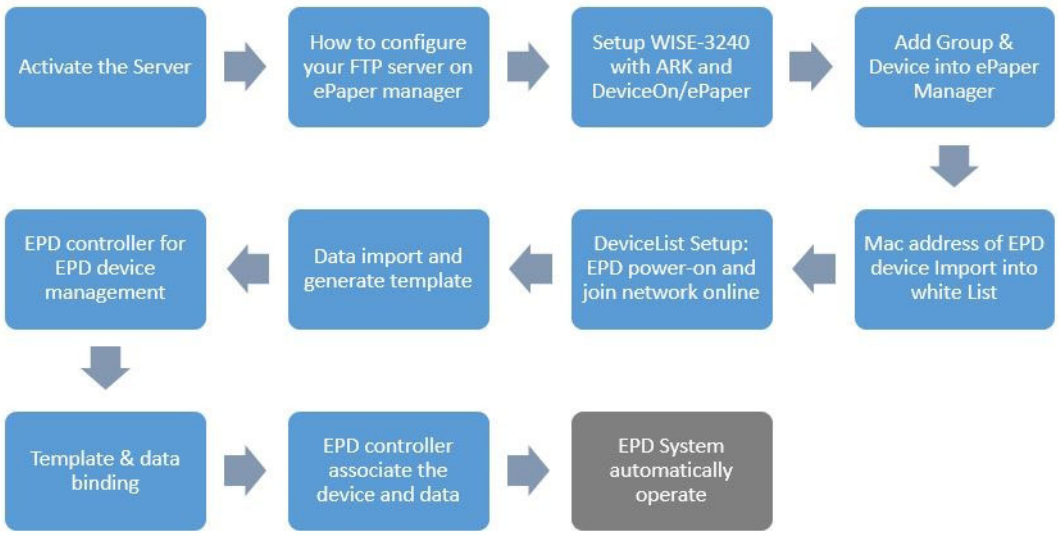
2. Select data to bind.



Note! *The user can import data and bind data to the EPD device in this web page.*

We also offer a handset APP to bind device data to the EPD.

3. Binding Product item data with the APP.



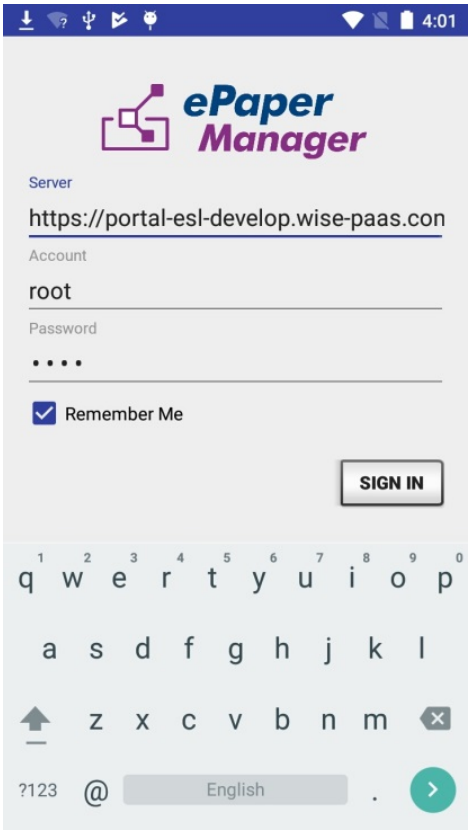
– Install on Barcode scanner handset.
– Use a barcode scanner: PWS-472 to scan the EPD device Mac address barcode and target product barcode.

DeviceOn/ePaper Associate App

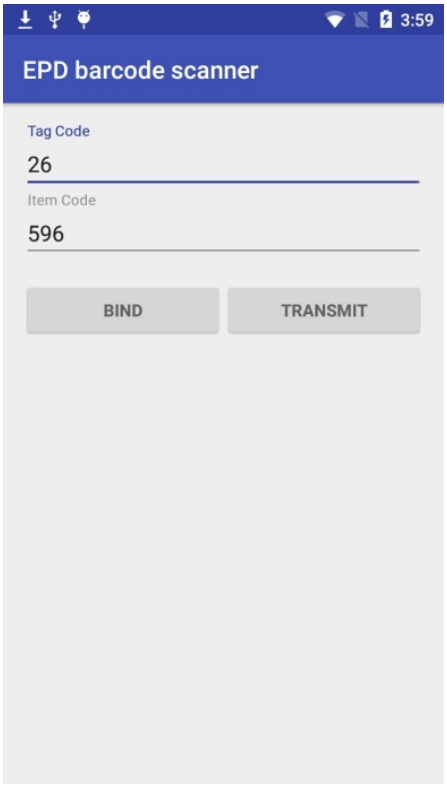
Download and install the EPM Barcode Scanner app on the PWS-472 device, a 5" Industrial-grade handheld terminal with 1D barcode scanner. You will see the icon  in your desktop.

Please check your device link. Launch the app by clicking the icon.

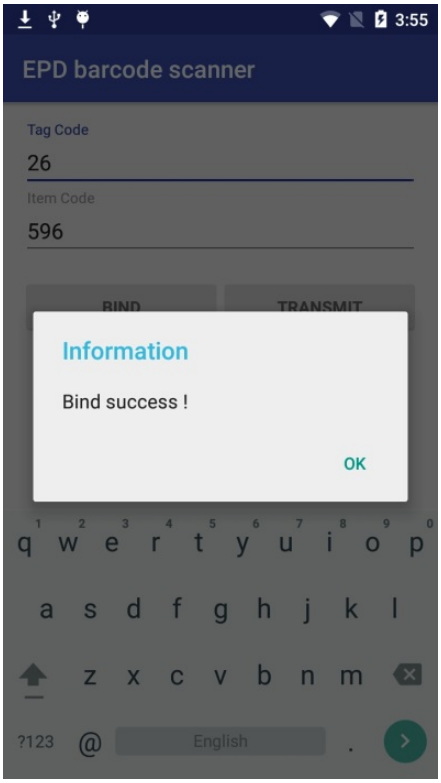
Enter the server location, account, and password to sign into e-Paper Manager.



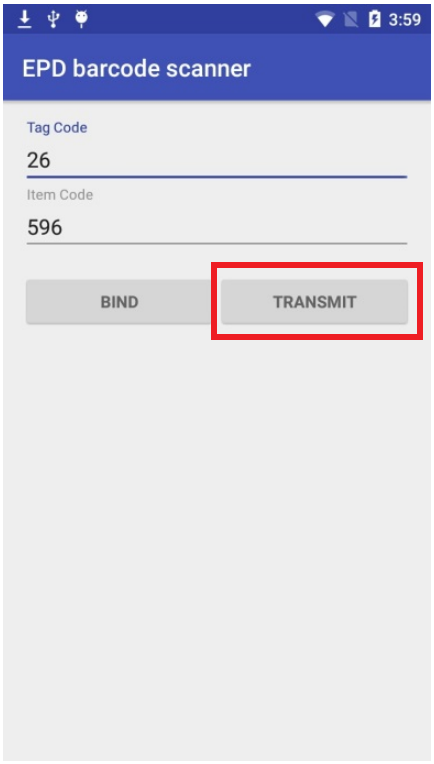
Enter your device code and Item code information to perform bind action.



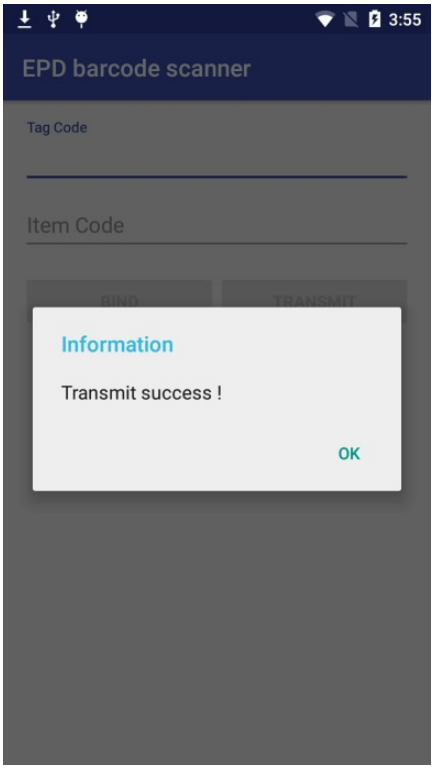
The PWS-472 device can scan a barcode quickly, which brings the device code and item code information into the fields. The **Bind success!** window will show up if successful.



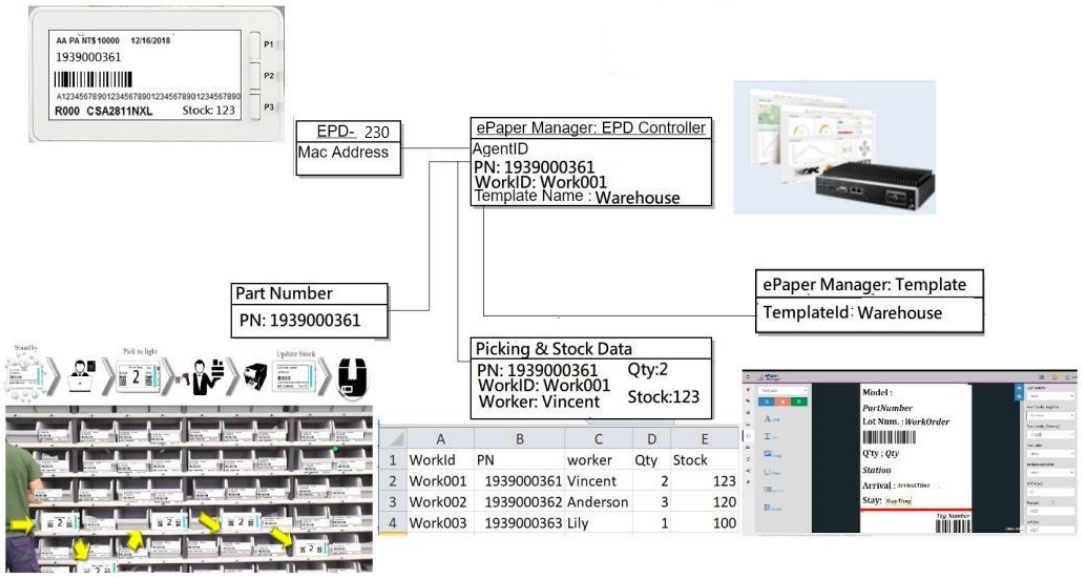
Click the **Transmit** button to transmit the image to the device.

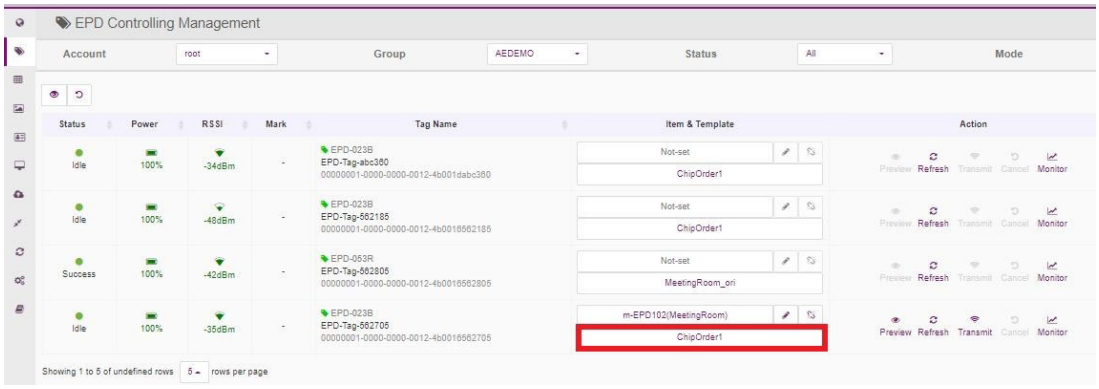


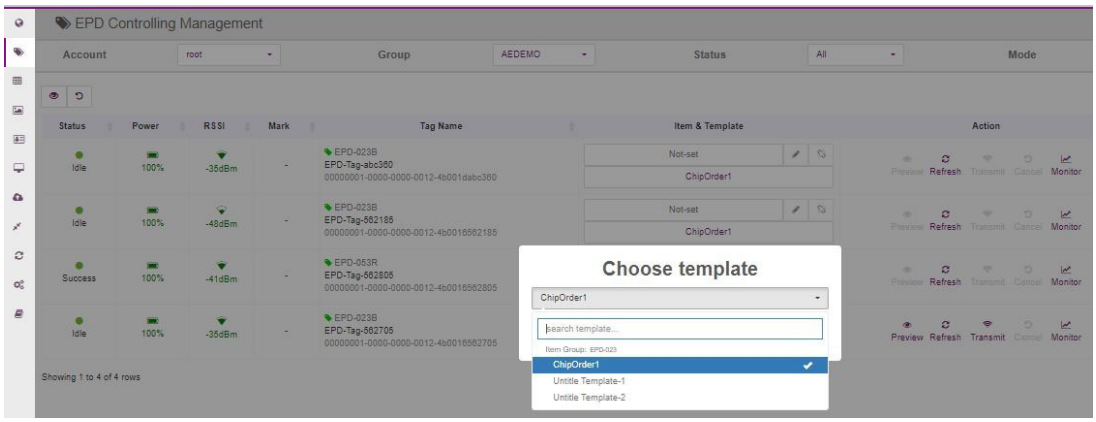
An information success window will show up.



4. Binding template:

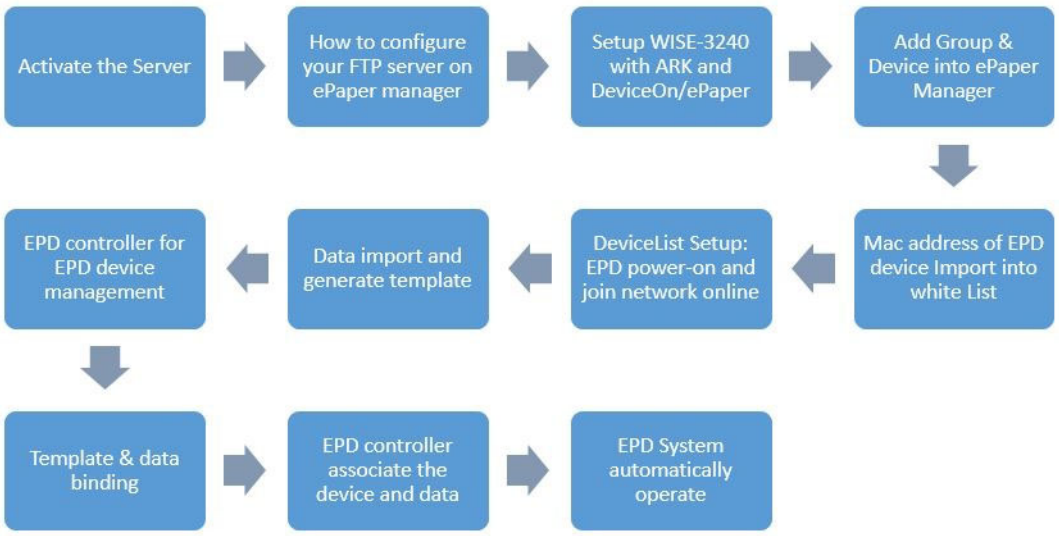


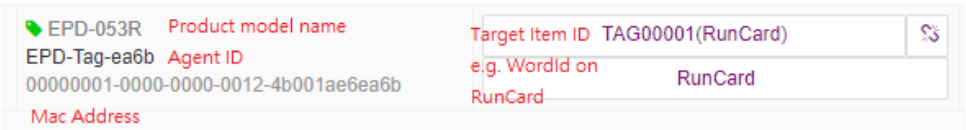




5. There are four actions for you to select.
   - Preview: Current EPD device image preview
   - Refresh: Re-fresh image
   - Transmit: Transmit image
   - Un-bind the EPD device and item

4.3.7 Final Association Between EPD Device, Target Product and Product Data



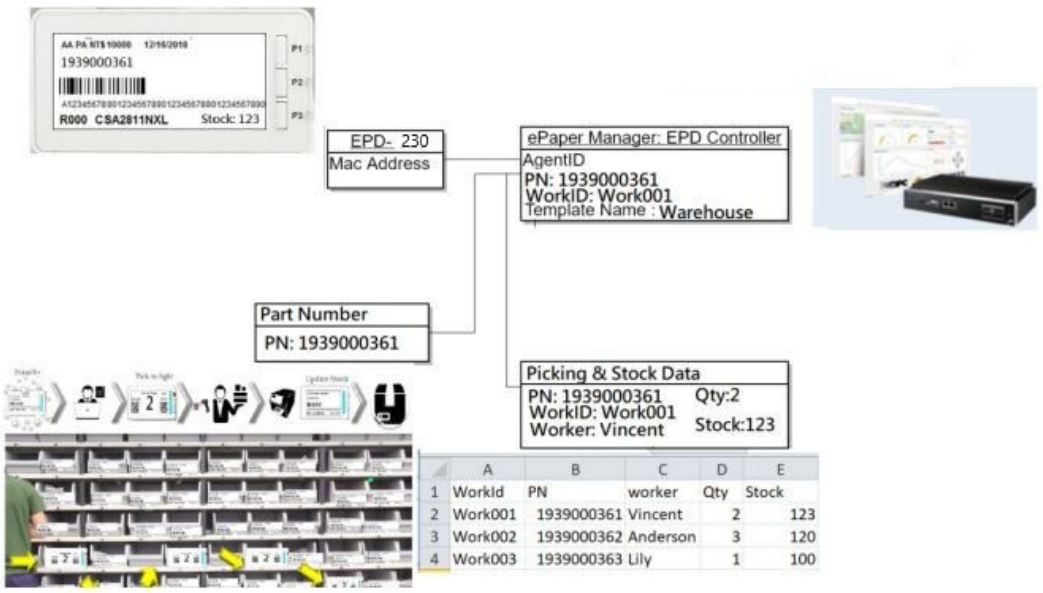


1) EPD device: Get EPD device's Mac address as an associate attribute, DeviceOn/ ePaper record and mapping to agent ID.

2) Target Item Product: Get a physical working ID Lot num as associate attribute.

3) The user needs to associate items above

4) Import RunCard Data needs to include field name: WorkID and data: Work001.



4.3.8 Smart Warehouse Pick to Light Scenario

1. EPD device in standby Mode, only shows stock status

2. When picking material request inputs, the ERP sends out an API to DeviceOn/ ePaper to trigger:
   Action 1: Change to the image as below.

   Action 2: Light up an LED to guide the picker to pick the material

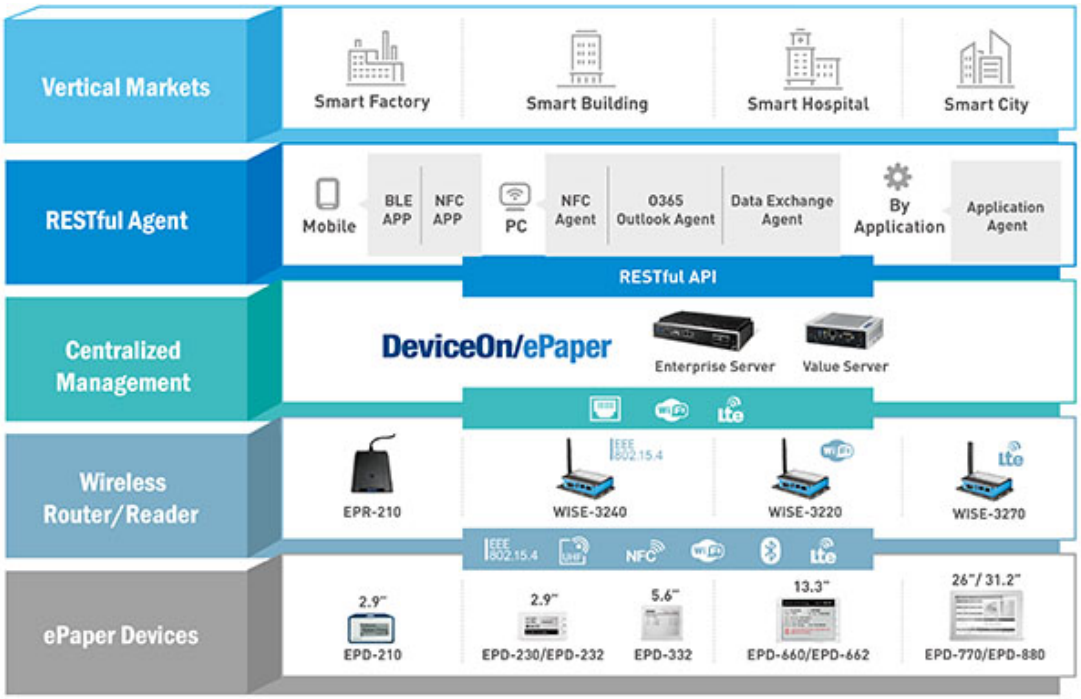
Below is the comparison between traditional card and EPD.

3. When picker see the LED indicator on the drawer.
   Action1: Picker take out the material according to the EPD's information|
   Action2: Picker uses barcode scanner to scan the QR code
   Aciton3: ERP system will update the stock status and trigger the API to request EPD to update the information

   Action4: Printer print out the label directly.

4.4 Integrate EPD APIs Into Your System

We provide easy-to-use APIs to help you integrate into your own system. Below are samples for you. They are easy to integrate into your system with our restful APIs.



Vertical applications need to send APIs to DeviceOn/ePaper. Sample code below.

1. Our API in Javascript: setItemData to update data into DeviceOn/ePaper and DeviceOn/ePaper will help forward the data to EPD.

```
// update Item Data
function setItemData(){
    var url = HOST + '/esl/v1/items';
    var type = 'PUT';
    var data = {
      "items": [ JSON.parse($('#log').val()) ]
    };
    console.log(data);

    api(url, type, data, function(res){
        if(res && res.result)
        alert("Item Successfully Updated!");
      else
        alert("Ajax request error!");
    });
}
```

2. The user also can use: setSensorData to control EPD LED

```
// set LED light
function setSensorData(){
    var agentid = $('#agentid').val();
    var plugin = $('#plugin').val();
    var sensorId = $('#sensorId').val();
    var    sensorValue    =    parseInt($('#sensor-
Value').val());

    var url = HOST + '/esl/v1/devicectrl/data';
    var type = 'POST';
    var data = {agentId: agentid, plugin: plugin,
sensorIds: [{n: sensorId, v: sensorValue}]};

    api(url, type, data, function(res){
        console.log(JSON.stringify(res));
        if(res && res.items && res.items.length > 0
&& (res.items[0].statusCode === 202 || res.items[0].statusCode
=== 200)){
        alert("Update Sensor Data Command Sended!")
      } else {
        alert("Ajax request error!");
      }
    });
}
```

4.5 Control EPD Data Through DeviceOn/ePaper API

1. Upload EPD Data

- path: /esl/v1/items
- method: POST
- header: Basic Authorization
- body paramters:
- code: string
- name (group name): string
- content: JSON string
- body(example)
  { "items": [{ "code": "X001", "name": "John", "content: "{"name": "John","age": "18"}" }] }
- response(example)
  { "result": true }

2. Upload EPD Data for a specific item group

- path: /esl/v1/items/name/{name}
- method: POST
- header: Basic Authorization

- body paramters:
  - code: string
  - name (group name): string
  - content: JSON string
- body(example)
  { "items": [{ "code": "X001", "name": "John", "content: "{"name": "John","age": "18"}" }] }
- response(example)
  { "result": true }

3. Update EPD Data

- path: /esl/v1/items
- method: PUT
- header: Basic Authorization
- body parameters:
  - code: string
  - name (group name): string
  - content: JSON string
- body(example) (Notes: you have to give all content in body even if you only need to edit partial content)
  { "items": [{ "code": "X001", "name": "John", "content": "{"name": "John","age": "20"}" }] }
- response(example)
  { "result": true }

4. Delete EPD Data

- path: /esl/v1/items
- method: DELETE
- header: Basic Authorization
- body parameters:
  - code: string
- body(example)
  { "items": [{ "code": "X001" }] }
- response(example)
  { "result": true }

5. Get EPD device AgentID

- path: /esl/v1/devices/agentid
- method: GET
- header: Basic Authorization
- url parameter: ?itemcode=[ITEM CODE]
- response(example)
  { "agentid": "00000001-0000-0000-0012-4b001557aa72" }

6. Get EPD device Status

- path: /esl/v1/devices/status
- method: GET
- header: Basic Authorization
- url parameter: ?agentid=[DEVICE AGENT ID]
- response(example) (Notes: all possible status are "sending command", "command timeout", "setting image", "set image okay", "set image error", "refreshing image", "refresh image okay", "refresh image error")
  { "status": "set image okey" }

7. Set EPD device Binding

- path: /esl/v1/devices/setBinding
- method: POST
- header: Basic Authorization
- body parameters:
  - agentid: string
  - templatename: string
  - body(example) (Notes: you must provide "agentid" or "did" in body, and for other parameters as follows, you only need to give at least one: "tid or templatename", "iid or itemcode", "mid")
    { "agentid": "00000001-0000-0000-0012-4b001557a500", "templatename": "Abnormal-English" }
- response(example)
  { "result": true }

8. Set EPD devices Binding

- path: /esl/v1/devices/setBindings
- method: POST
- header: Basic Authorization
- body parameters:
  - agentid: string
  - templatename: string
  - body(example) (Notes: you must provide "agentid" or "did" in body, and for other parameters as follows, you only need to give at least one: "tid or templatename", "iid or itemcode", "mid")
    { "bindings": [{ "did": 32, "itemcode": "Stop0002", "templatename": "Bus Stop Demo Init" }, { "agentid": "00000001-0000-0000-0012-4b001557a682", "itemcode": "Stop0002", }] }
- response(example)
  { "result": true }

9. Transmit Image

- path: /esl/v1/devices/setImage
- method: POST
- header: Basic Authorization
- body parameters:
  - agentid: string
  - refresh(optional, default: 1): number [available values: 1: Refresh after transmit, 0: Just store image to ESL device memory]
  - page(optional, default: 0): number [available values: 0 ~ maxpagesize-1]
- body(example)
  { "agentid": "00000001-0000-0000-0012-4b001557aa72", "refresh": 1, "page": 0 }
- response(example)
  { "status": "setting image" }

10. Transmit Image with Item Data

- path: /esl/v1/devices/setImageWithData
- method: POST
- header: Basic Authorization
- body parameters:
  - agentid: string
  - item: JSON

- code: string
- name (optional): string
- content (optional): JSON string
- refresh (optional, default: 1): number [available values: 1: Refresh after transmit, 0: Just store image to ESL device memory]
- page (optional, default: 0): number [available values: 0 ~ maxpagesize-1]

- body(example)
  { "agentid": "00000001-0000-0000-0012-4b001557aa72", "item": { "code": "Stop0001", "name": "Taipei 101", "content": "{\"Stop_Name\":\"Grand Hotel\", \"Route1 Name\":\"Test\"}" }, "refresh": 1, "page": 0 }
- response(example)
  { "itemStatus": "update item okay", "status": "set image okay" }

11. Refresh Image

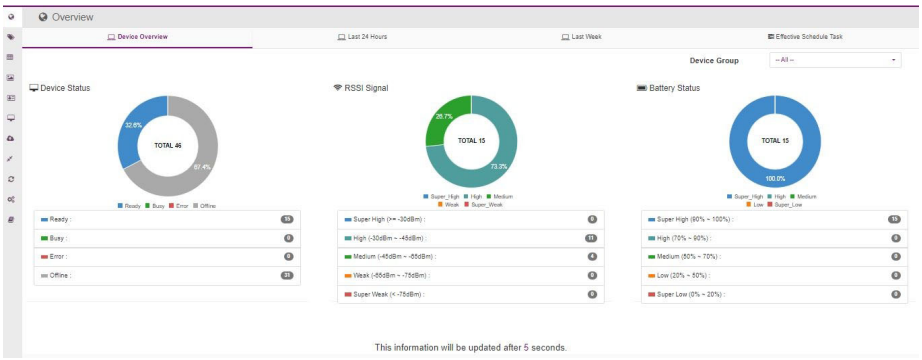
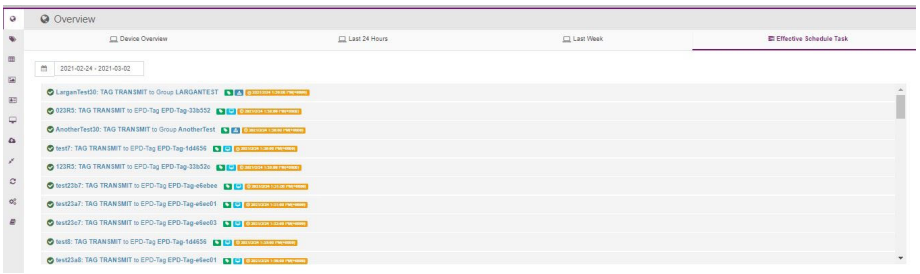
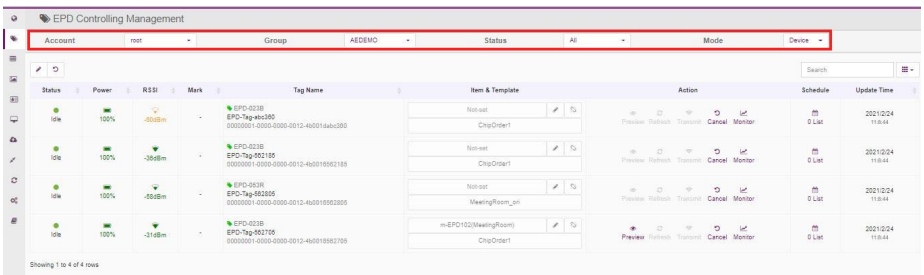
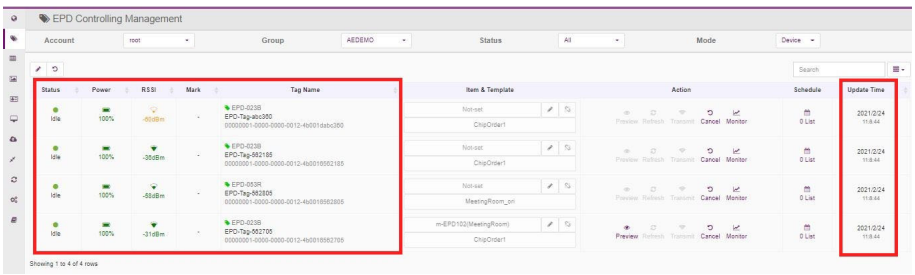
- path: /esl/v1/devices/refreshImage
- method: POST
- header: Basic Authorization
- body parameters:
  - agentid: string
  - page(optional, default: 0): number [available values: 0 ~ maxpagesize-1]
  - body(example)
    { "agentid": "00000001-0000-0000-0012-4b001557aa72", "page": 0 }
- response(example)
  "status": "refreshing image" }

12. Get Item

- path: /esl/v1/items/itemcode/{itemcode}
- method: GET
- header: Basic Authorization
- response(example)
  { "code": "device_00001", "iid": 243, "name": "RunCard", "content": "{\"device_Number\":\"device_00001\",\"Template_ID\":\"RunCard\",\"WorkOrder\":\"YSI5001ZA\",\"PartNumber\":\"DLV8315-1J30000\",\"Qty\":\"20\",\"Station\":\"Assy\",\"NextStation\":\"BurnIn\",\"ArrivalTime\":\"5/22/18 9:11\",\"LeaveTime\":\"\",\"StayTime\":\"0\",\"Cautions\":\"\",\"Remark\":\"\"}" }

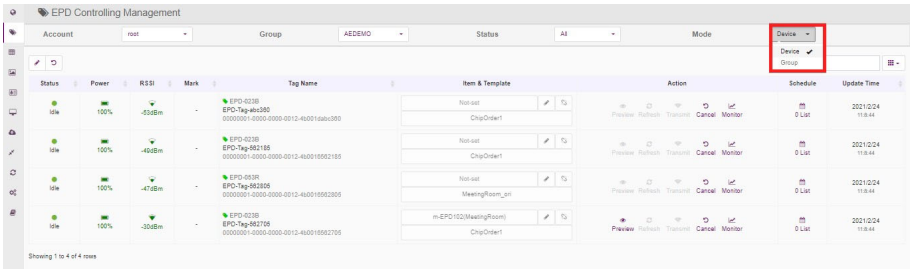
4.6 DeviceOn/ePaper Feature list

4.6.1 Component List

Dashboard	 1. Device status: Provides EPD device status in system 2. Battery status: Shows battery status on EPD device. 3. EPD Device: Shows image update status.
	 4. Schedule tasks: Users can select current schedule in the system
EPD Controller	EPD device search  Search criteria Account/ Group/Connecting Status/ EPD Device Mode
	Properties  Name / Panel type/ total page /Connecting status / Update Status

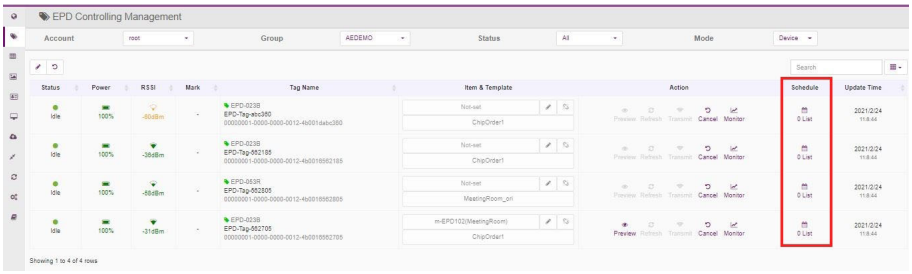
Action

Schedule

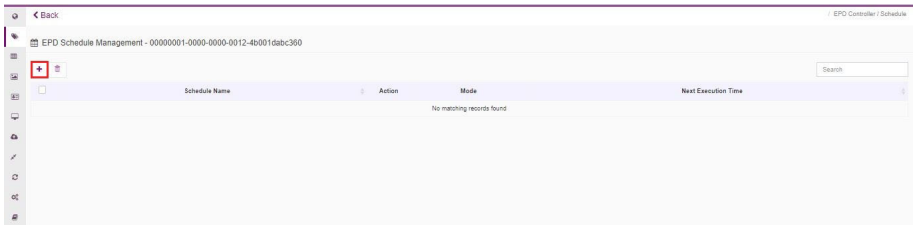


Device mode

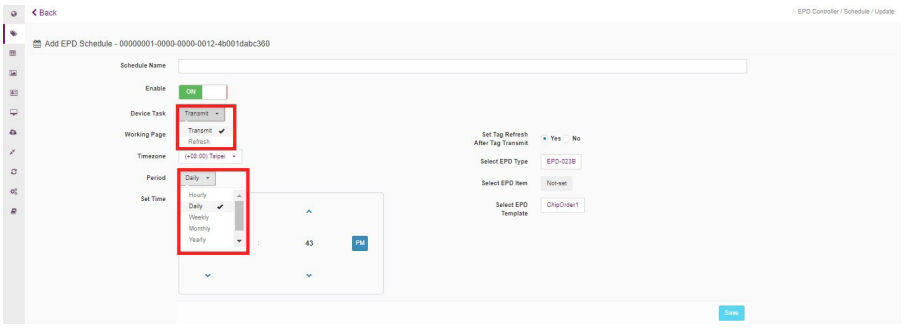
Step1: Choose the desired item to make the schedule



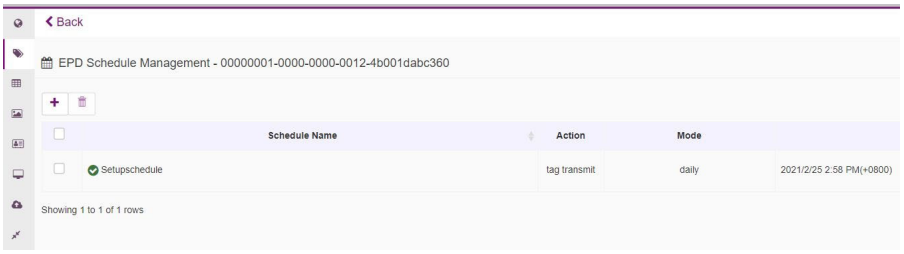
Step2: Click the “add” icon to for schedule making



Step3: The users can setup Transmit/Refresh as the scheduling task daily/ weekly/monthly/yearly, and choose EPD Type, Item and Template of schedule

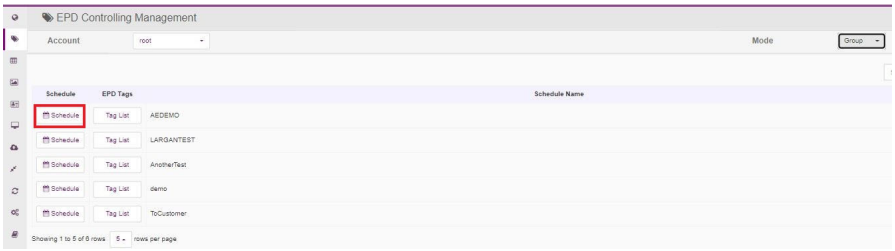


Step4: After the save is clicked, the arranged schedule will be added in the list

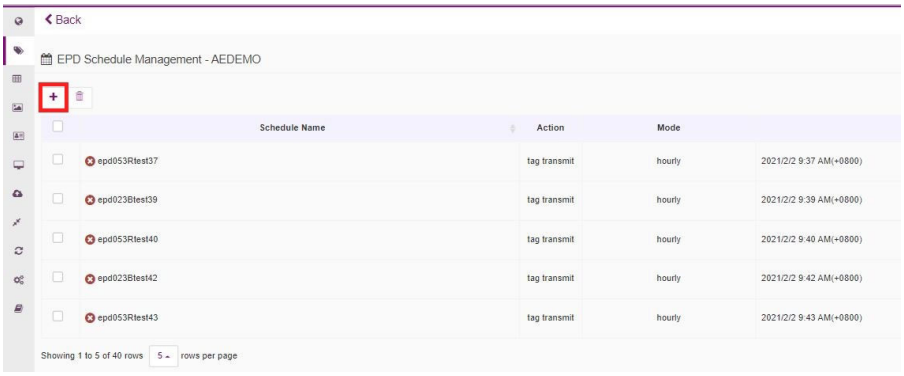


Group Mode

Step1: Choose the desired group to make the schedule

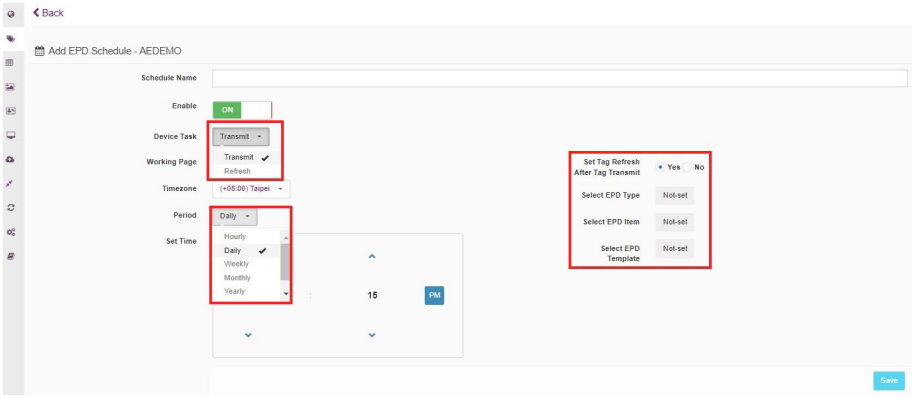


Step2: Click the “add” icon for schedule creation

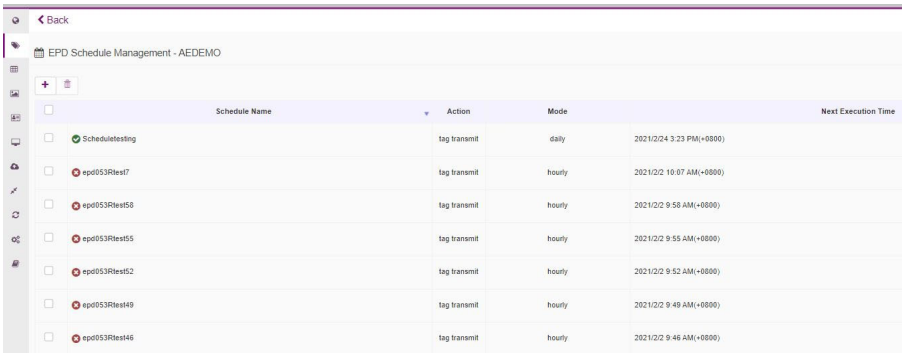


Action

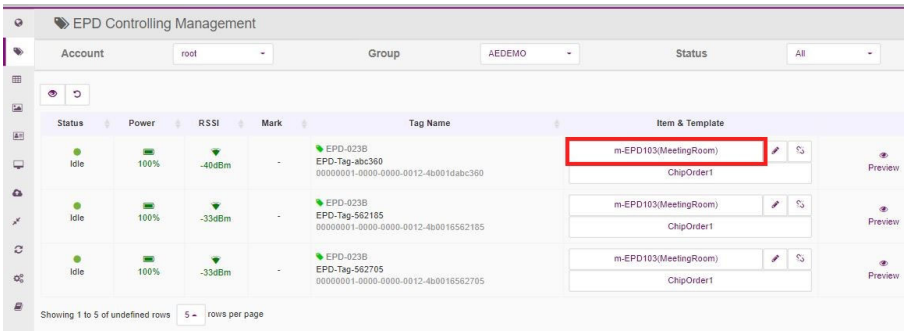
Step3: Users can setup Transmit/Refresh as the scheduling task daily/weekly/monthly/yearly, and choose EPD type, item and template of the schedule.



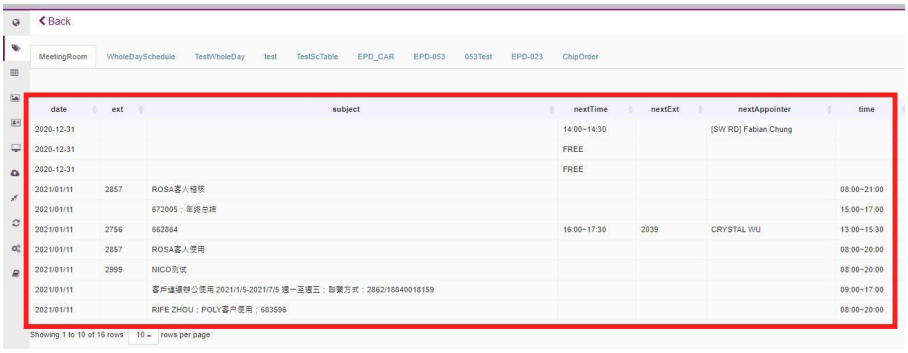
Step4: After the saving, the arranged schedule will be added in the list



Bind Item



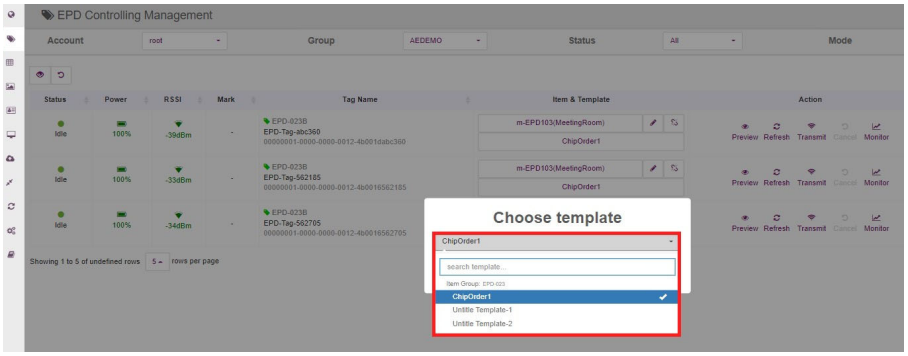
Available Target Product and Data



Action

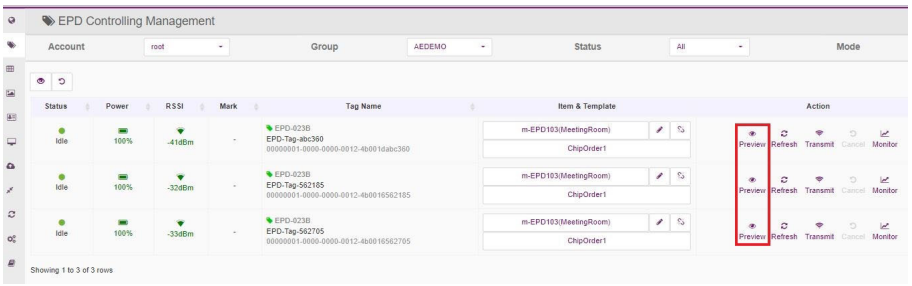
The user can manual bind/unbind ITEM DATA to the EPD device
1. Click the “pen” image icon
2. Select the bind icon
3. The system will pop-up another page for available target product and data.

Bind Template



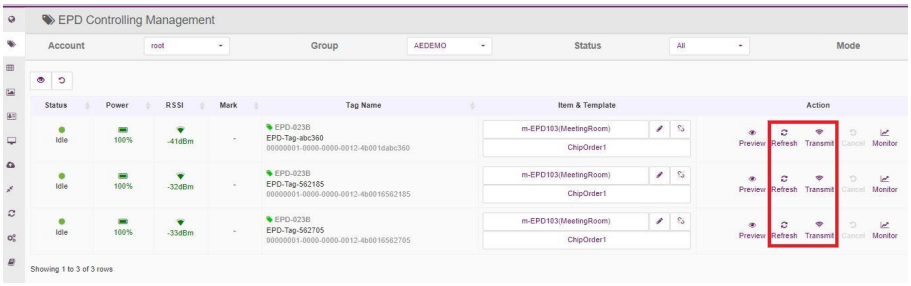
The user can manually bind TEMPLATE to EPD device

Preview



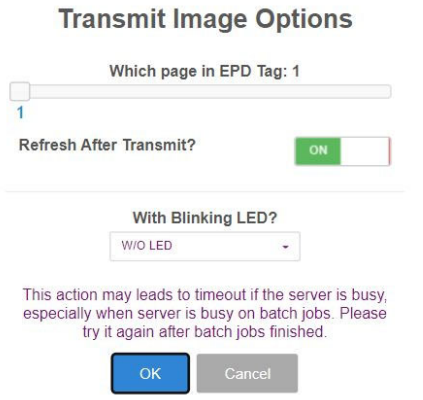
The user can preview the EPD Device image.

Transmit

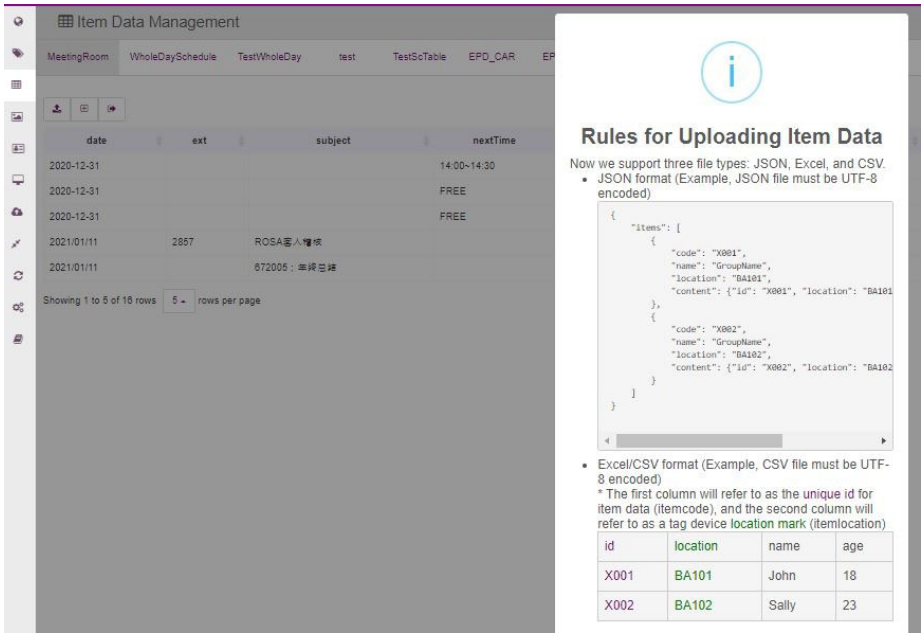


Action

1. The user can re-fresh the image on the EPD device
2. The user can transmit images to the EPD device
3. If the user clicks "transmit" or "re-fresh" for the device, then the system keeps busy, not responding from the device side. The user can click "reset" to cancel the execution.
4. LED blinking values: maximum is 86400, minimum is 0, duration cycle 1.5 secs.



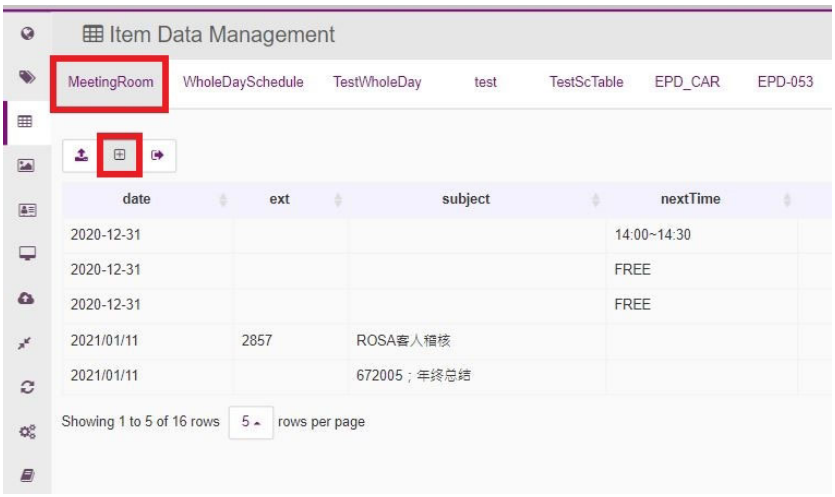
Import ITEM Data



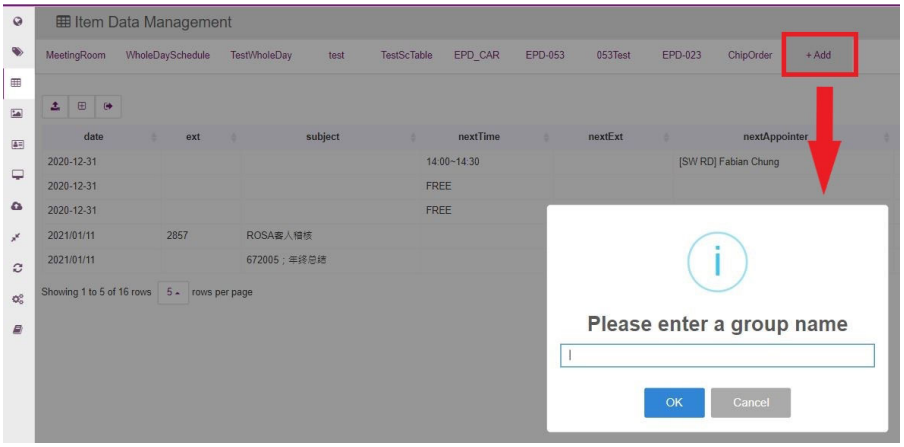
Supports CSV, EXCEL , JASON Format

Add new data into current item

Item Data

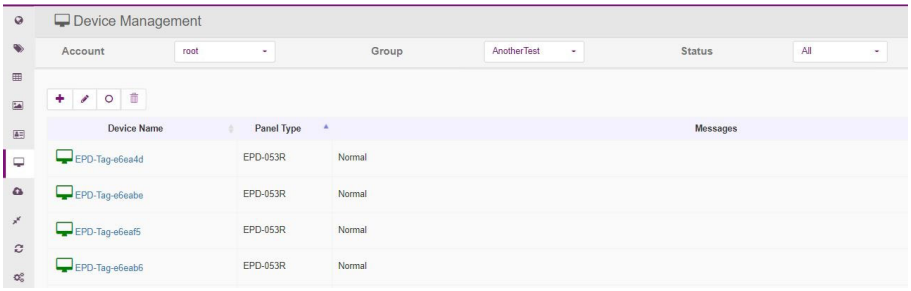


Working Group



1. The user can perform a different working group in the same system.
2. The user can add a new group by clicking the **Add** icon.

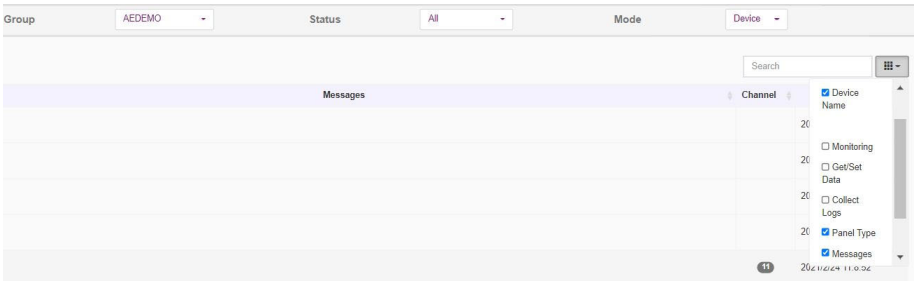
Device search including EPD device, router and hub.



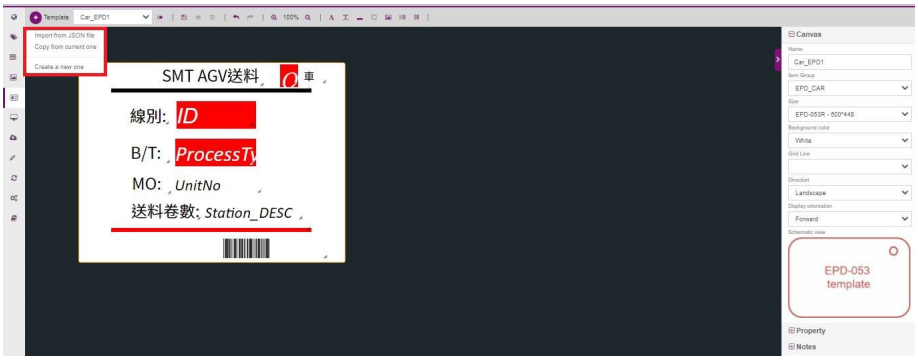
Search criteria
Account/ Group/Connecting Status/ EPD Device Mode

Device List

Action

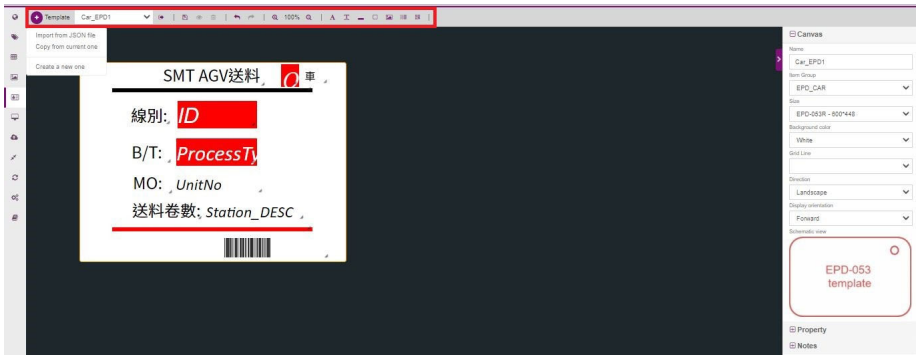


Remote control device:
1. Default column is Name and status message.
2. The user can click the icon at the right to select more fields: monitoring, Get/ Set Data, and more.



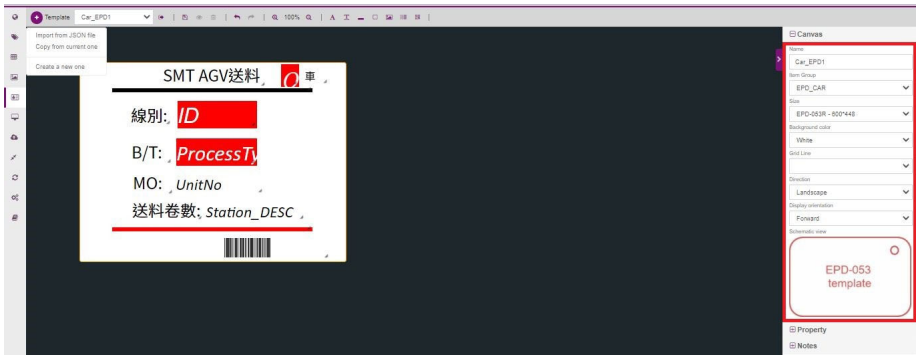
The user can create a new template, import from JSON file, or copy from current one

Template



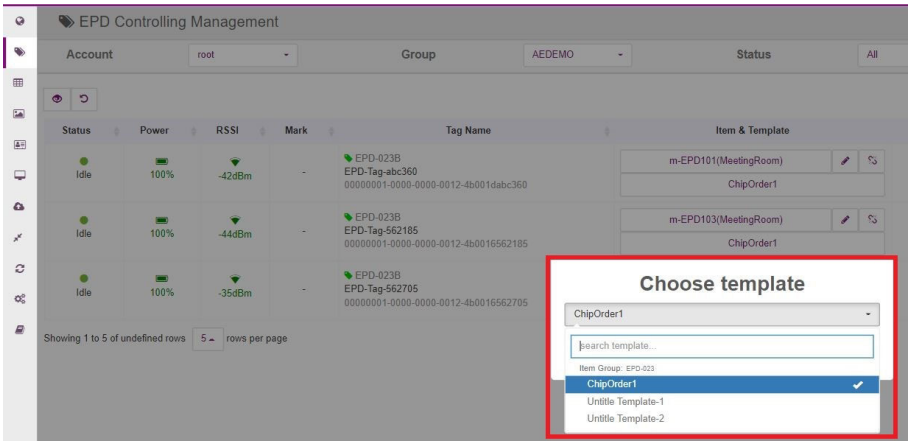
Provides image tool
Save / Preview / Delete / Previous Movement or Next Movement / Zoomin or Zoomout / Dynamic or Static Text / Shape / Image / Barcode / QRcode

The user may save the template and then go to EPD controller to bind the template with the EPD device.

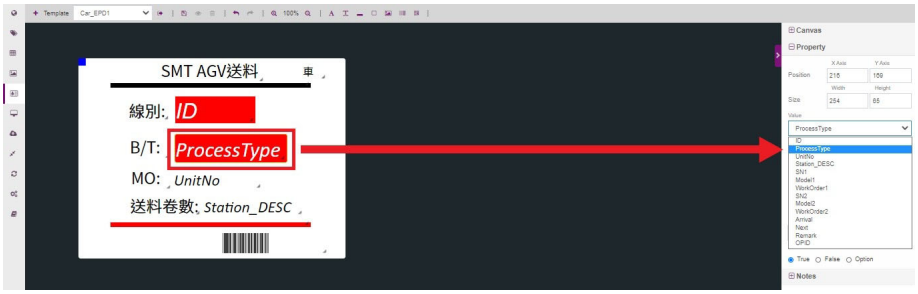


Template name: users can enter the template name here
Item group: users can select the created Item Group
EPD size: users can choose 2.9", 5.6", 13.2", or 32"
Background color: White/Black/Red
Grid line: No/Yes
Direction: Portrait/Landscape
Display orientation: Forward/Reverse
Schematic view

Template



1.EPD controller should setup the binding template.



1. Select on component
2. Right side shows the component properties.
3. Select the field “Value” and drop down menu shows data field from item data.

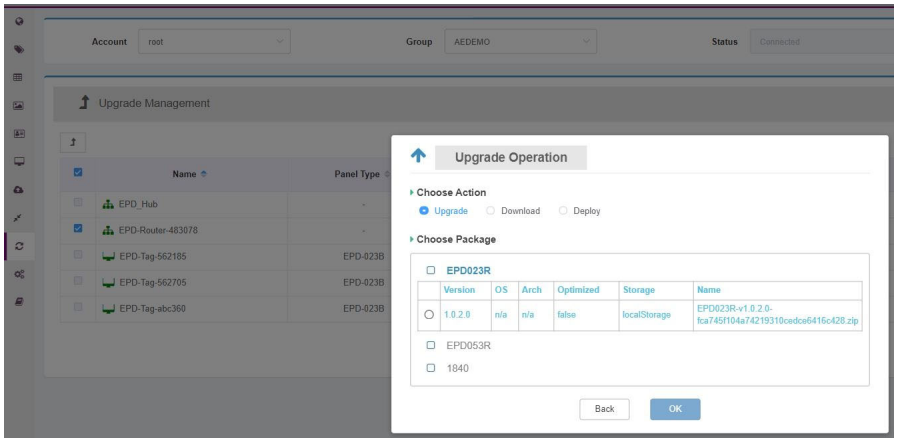
Note:
The upgrade action currently is valid for Router 3220, 3240, 3270 only and cannot upgrade single device individually.

Upgrade: This step will proceed Download and Deploy, which describe the following:

Download: This step will download the specific version of package file from FTP server. Before proceeding this step, you need to upload the package file in the upload page.

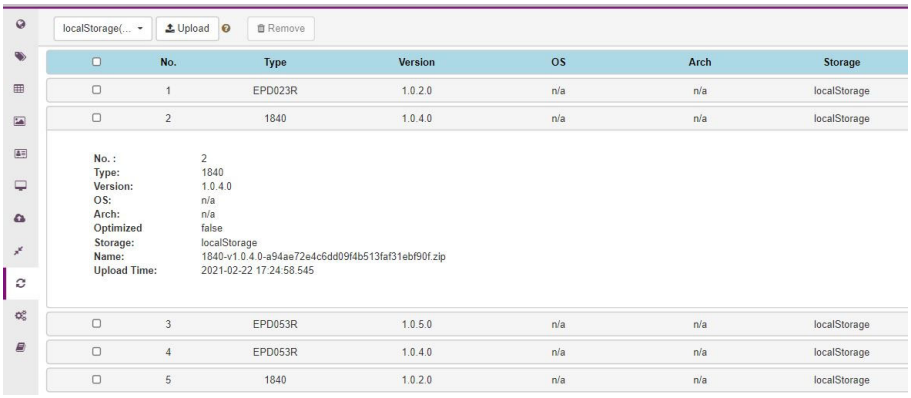
Deploy: This step will deploy the file and upgrade the EPD devices firmware to the specific version.

OTA



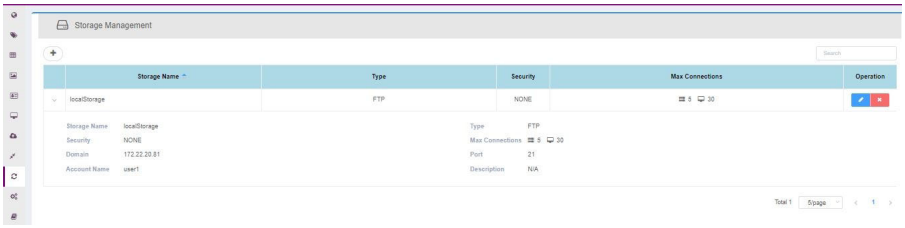
Select upgrade device

Package

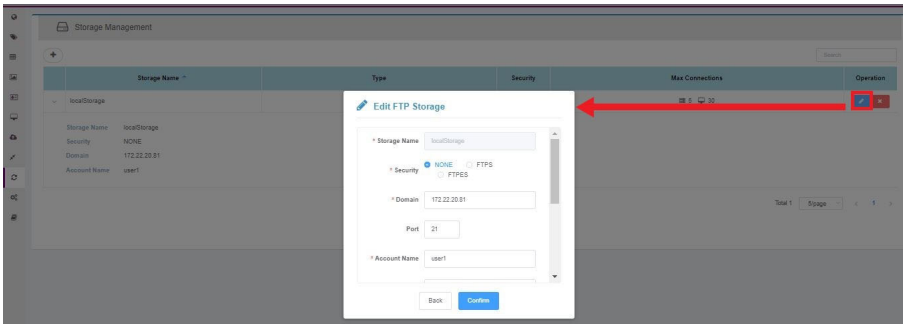


File preparation for the upgrade

Storage

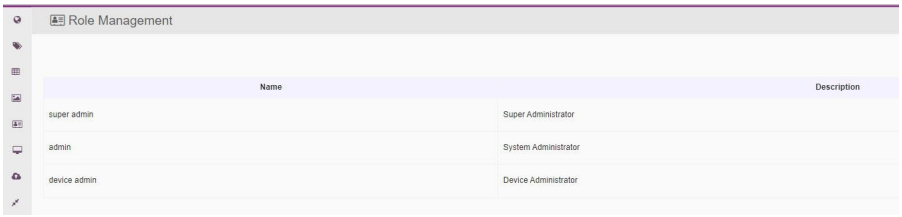


OTA



FTP & File path setting

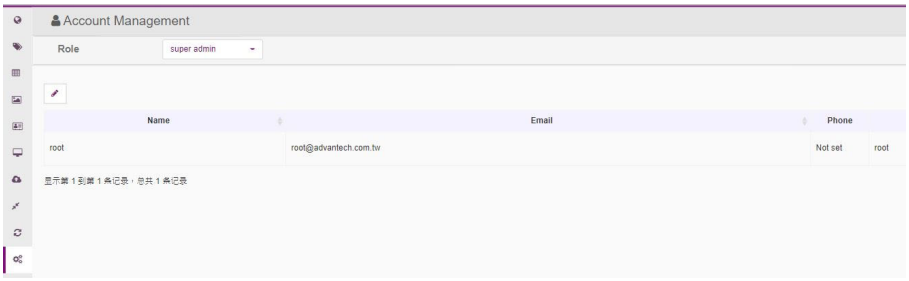
Role

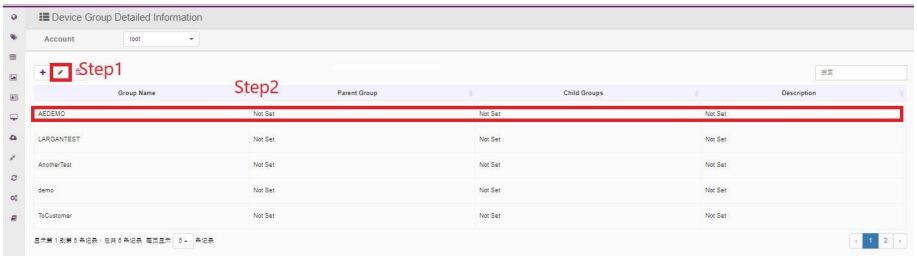


Definition as below
Super Admin: Super Administrator
Admin: System Administrator
Device Admin: Device Administrator

Account & Group

Setting



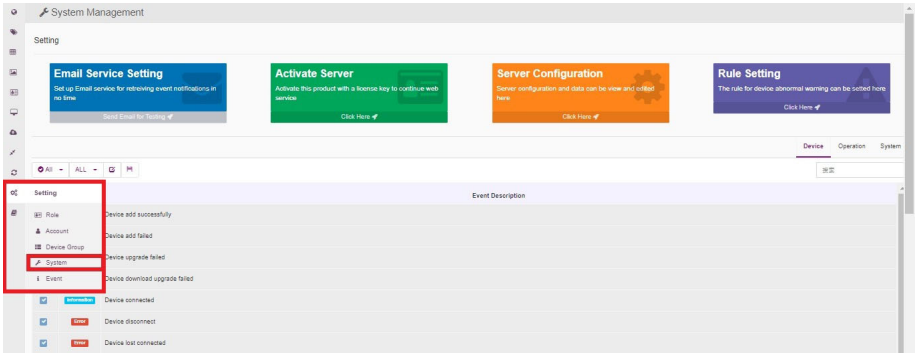


Sets the device into group.

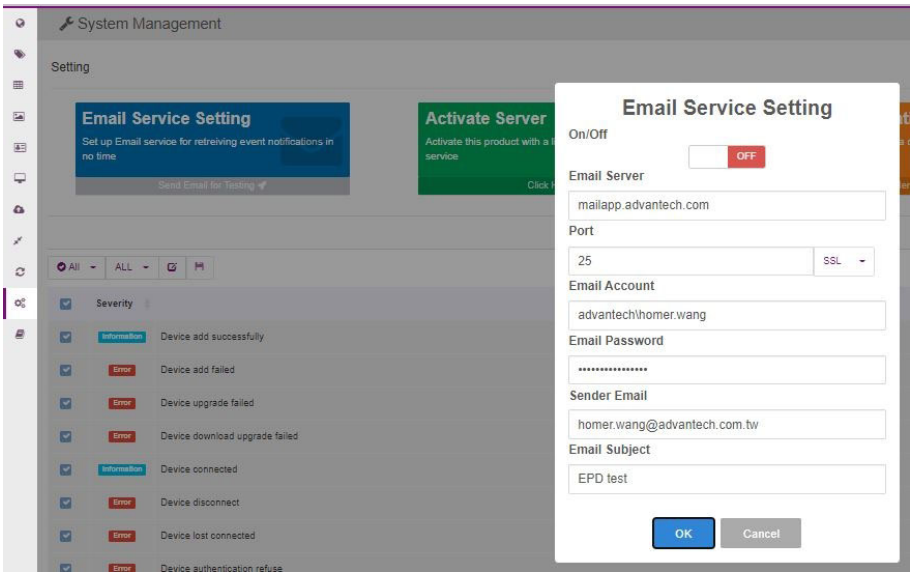
Email Service

Setting

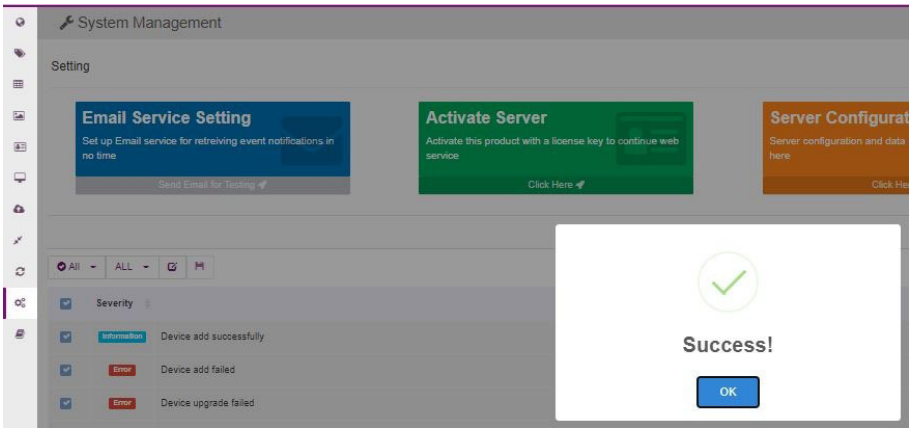
1.Click **System** button under the setting list



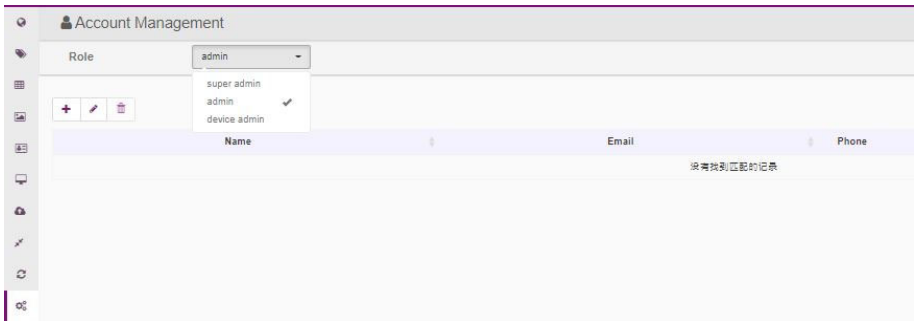
2.Click Email Service Setting, and fill in the following form.



3.Success.

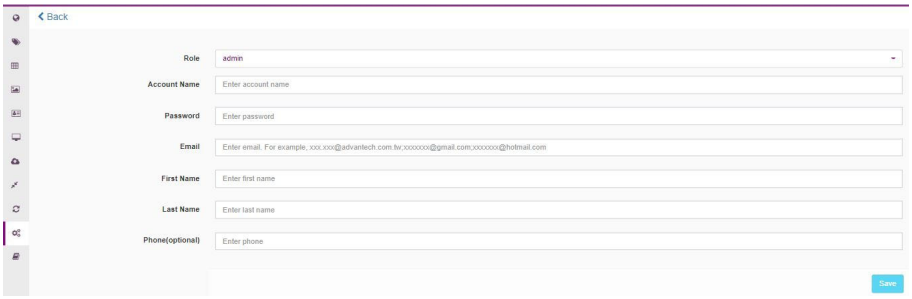


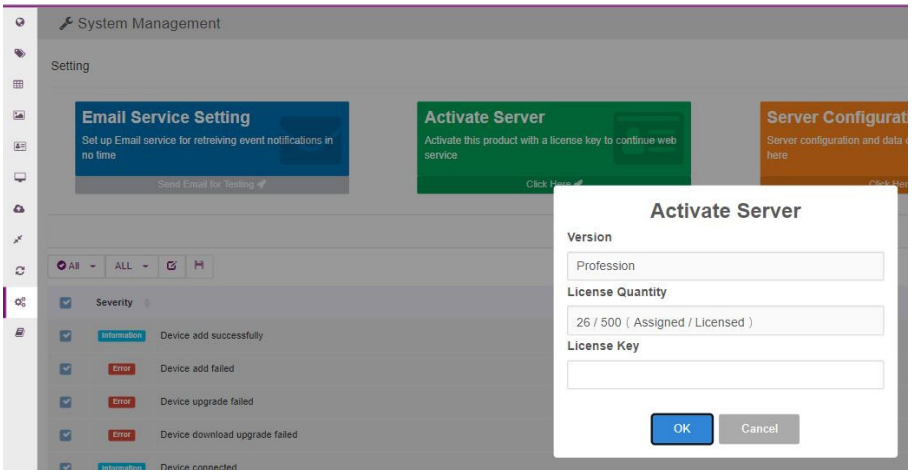
4.Add email account list for this service. Click Account button under the Setting List.



5.Add an admin account. Click Save button. An email will be sent to this local user when an event occurs.

Setting

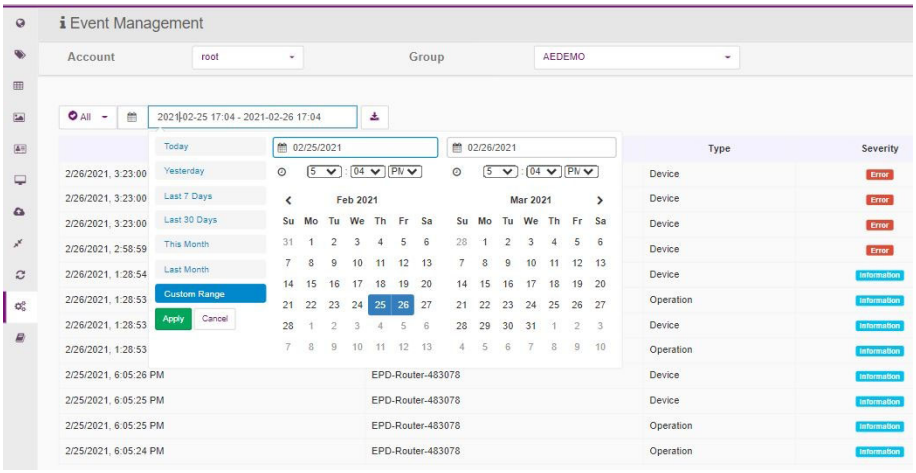




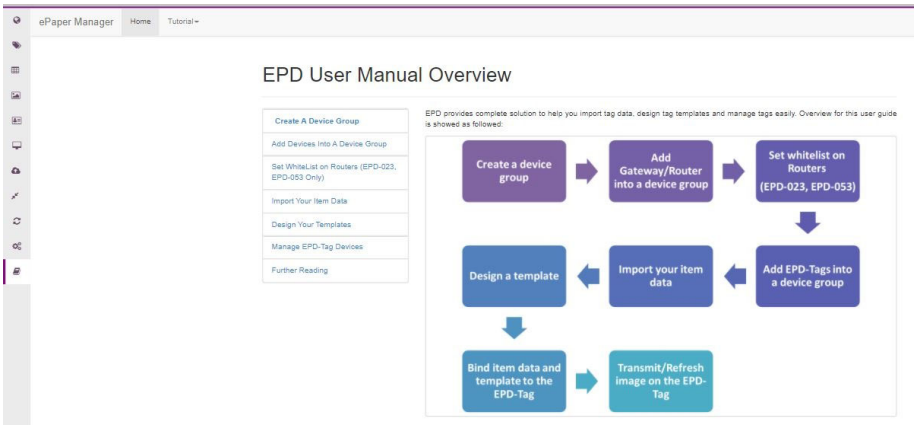
Add EPD connection number license.

Event

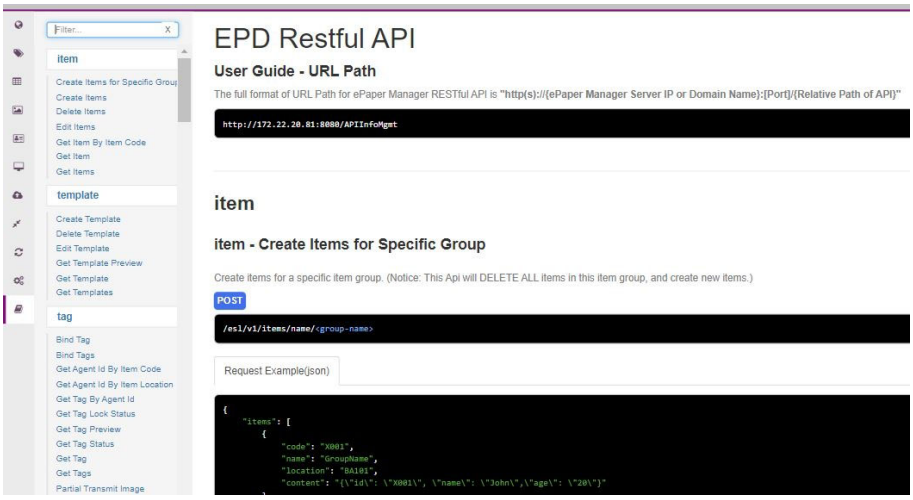
Setting



The user can query the event by clicking the calendar.



Document



Document: User Manual - RESTful API

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