Device Commissioning Workflow

> *This guide is currently a draft. It is under review and subject to changes in the future.*

> *WIP: Include more images and screens*

When using an application that deals with physical devices and their data, one of the first challenges that a user will face is how to get those devices connected to the application and properly configured.

Depending on the particular devices and the nature of your application, this process can vary significantly. This workflow describes some of the common steps and elements of connecting and configuring devices in order to create as much consistency as possible between different applications.

[TOC Component - Interactive React component]

Steps

Setting Up Devices One-by-One

Setting up devices typically involves two phases: Device Discovery and Device Configuration.

Device Discovery

The search phase generally consists of the following steps (some steps may not be required for your application):

- **Prepare the device**: provide instructional text, images, and animations to the user so they can ensure that the device is discoverable. Some example instructions might include "move within range of the device," "turn off all other devices," "press the XYZ button on the device," "scan the code on the device using your camera," etc.
- **Select the device type**: if there could be multiple discoverable devices, you may wish to allow your user to narrow down the options prior to discovery. This is also an important step if different devices have different steps and protocols for connecting and / or configuring.
- **Identify the target device**: if multiple devices are discovered, provide the user a way to choose the target device from the list. To assist with identification (particularly if devices are not readily identifiable by their name or id), you can implement an indicator light to help the user locate the target device.
- **Confirm device selection**: have the user confirm that this is the device they are looking for. On this screen, you would show device details (serial number, address, model, etc.) for the user to double-check their selection.
- **Confirm device's functionality**: to verify that the device is working correctly before entering the configuration phase, you may wish to give the user the ability to test the functionality. For example, you could give them the option to turn on or off a light bulb or allow them to press a button on the device and see some status change in the application.

Device Configuration

- **Configure network**: many devices are initially connected via Bluetooth but will ultimately be controlled over WiFi. In this step, users can configure the network connection.
- **Check firmware**: perform a device firmware version check in the background and prompt your user to upgrade the firmware if applicable.
- **Name the device**: give the device an identifiable name. You should always suggest a default name to avoid overtaxing the users during the configuration stage.
- **Configure additional device parameters**: change other device-specific parameters. In this step, a user would assign locations / groups, select an icon, assign a technician, enter device descriptions, etc. Try to keep the required configuration to a minimum — give them options to skip for now and provide ways to come back or do additional configuration later. You should communicate the setup progress to your users with a stepper to inform them where they are in this flow and how many more steps are ahead.
- **Success or failure screen**: if the configuration is completed successfully, a success screen should present users with options to add more devices or quit and view the device list / dashboard. This screen usually has a humorous and cheerful tone. If the configuration fails, you should inform the user why and what steps they need to perform to fix the error.

Setting Up Multiple Devices at Once

Configuring many devices simultaneously (batch configuration) requires advanced preparation and is usually handled by skilled personnel. Because of the advanced preparation, a batch configuration requires fewer steps and instructions within your application. The workflow would consist of the following:

- **Prepare devices and configuration file**: a screen to remind the user to prepare their devices for discovery and a button to upload the configuration file.
- **Upload the configuration file**: this is usually a CSV file with predefined parameters that describe all of the target devices.
- **Indicate current progress**: show which devices have been set up successfully and which ones are running into trouble. Show the progress and an estimate of the time remaining.
- **Success or failure screen**: similar to the individual device workflow, you should show the user what has succeeded and what has failed. You may wish to provide the option to add more devices, finalize details that the system could not interpret from the configuration file, or go back to the dashboard or the device list.

Design Variations

Multiple factors may require you to adjust or deviate from the general steps outlined above. The following are some items you may need to consider when designing the commissioning workflow for your application.

Device Type

Connection protocols can vary by device — some may use Bluetooth or WiFi while others may require being hardwired via Ethernet. Some devices might also have different access controls for different users (an admin who can write to the device versus a user who can only read from it).

Number of Devices Commissioned at Once

Will your users be unboxing and configuring many devices at once? Perhaps after 2 or 3 devices, they are comfortable with all of the steps. Your application can remember their preferences so that they don't have to perform too much repeated data entry.

Or maybe a technician is configuring an entire facility for their client, and they need to import 1000+ devices at a time? If the technician uses a batch configuration, can this

process run in the background while the technician configures something else?

Expertise of Users

The design should be tuned to fit the need of different personas. They can be non-technical users, operations / analysts, your client's engineers, your own company's engineers, or site managers. Consumer applications should contain more instructions (in texts, images, animations, or even AR) and a wider breakdown of the steps, whereas an application for technicians should emphasize more efficiency in the setup process.

Platform

If a user is commissioning devices with a mobile phone or tablet, you can take advantage of the device camera to speed up configuration by scanning QR codes. Other technologies like near-field communication (NFC) allow devices to quickly transmit a small amount of data; BlinkUp allows device sensors to receive data via a blinking pattern on the phone's screen. Mobile phones are easier to carry around and convenient if your devices are in crowded or hard-to-reach areas.

On the other hand, computers have the advantage for larger jobs. Their greater computing power and larger screens position them well for doing large batch configurations or jobs that require a lot of configuration details which would be difficult to fit on a mobile-sized screen.

Design Tricks

Do not force your users to make decisions on the first go

To minimize setup time, only require users to provide information that is essential to getting the device connected and working. For example, if the user does not specify where a device is physically located, will that prevent your dashboard from working, or is it safe

to list this device as "location unspecified" until a later time? Let users know that they can skip these settings for now and come back in the future.

The person doing configuration may not be the final user

Often, users may invite experts to come to their homes or company to set up the system for them, or devices may come preconfigured from the factory. This may require some type of credential hand-off experience at the end of your workflow.

Do not force them to create an account until needed

Accounts are often used to control the device from anywhere (web, phone, device's HMI) or manage access for different people. However, not all of these functionalities are necessary during an initial device setup. You should only prompt your users to create the account when they actually need it, rather than adding yet another step to the commissioning process.

Devices can lose connection halfway through the process

You should never assume that devices will stay connected through the entire process. If there is a network issue, how will your application recover? Will you wait and retry in the background, pause the process, or abort the entire workflow? The application shall also try to help users identify and fix the network problem so that the same situation does not recur in the future.

Processing time can be long

Data transmission between devices and applications can be slow. How do you communicate this to your users if they are expecting immediate results after clicking a button in your application?

It can take a long time to initialize a device module too. If possible, you shall make use of this waiting period and have your users work on other device configurations.

When a device is installed, its firmware might already be outdated

There is usually a time gap between when a device is manufactured and packaged in the factory and when that device gets unboxed by your user. By the time the user plugs it in, your device's firmware might need a firmware upgrade.

Tell your users how long the upgrade might take and whether this will impact the setup process. If the upgrade is non-interruptive, you can have the process running in the background while users are doing the configuration and return to it after they are finished with everything else.

Answer users' questions where they are asked

Your users might encounter different problems while using your application. The application should be able to help them troubleshoot in the moment. For example, if the application says that an indicator light should be blinking but it isn't, how can you help users proceed? Do they need to call your company right away, restart their router, or simply move the device closer to the WiFi connection? Often, this can be tackled with a simple "Having trouble?" button on the screen that can help users self-diagnose common issues.

You should also avoid using technical jargon whenever possible and provide tooltips for any terms that users may not understand. Your tooltips should not be longer than what a first-time user would need. You may include a link to external documentation if you think technical users could benefit from more detailed information.

If your configuration includes multiple steps running in the background, articulate the step names would help your users troubleshoot.