

# Introduction to the Atmel Cloud using 6LoWPAN SmartConnect on the SAM R21 Xplained Pro

## 1 Requirements

Before you start, be sure you have the following items.

- An active account on the Atmel Cloud.



**INFO** If you don't have an account check the instructions how to sign up to the Atmel Cloud in the Appendix section.

- Hardware
  - Two Atmel SAM R21 Xplained Pro boards
  - Ethernet1 Xplained Pro extension header
  - Two USB Micro Cables (TypeA / MicroB)
  - Ethernet Cable
- Software
  - Atmel Studio 6 (Version: 6.2.1502 or above)
  - Google Chrome (Version: 41.0.2272.118 m or above)



*Figure 1 Atmel SAM R21 Xplained Pro*

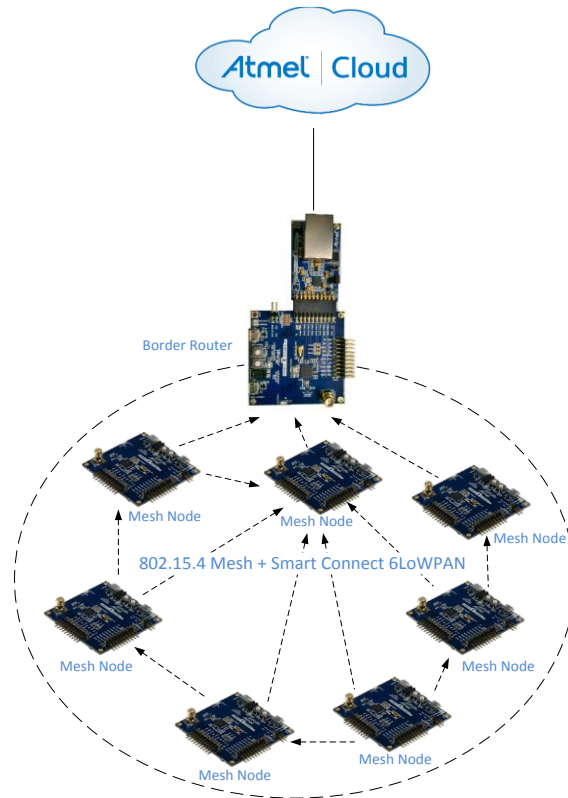


*Figure 2 Atmel Ethernet1 Xplained Pro extension header*

## 2 Introduction

This hands-on guide describes how to:

- Build a 6LoWPAN Smart Connect network Border Router based on SAM R21 Xplained Pro board.
- Register and use a SAM R21 Xplained Pro 6LoWPAN Smart Connect Node with the Atmel Cloud.



*Figure 3 6LoWPAN Smart Connect Network Setup*

The following topics are covered:

- Atmel Cloud sign-up process.
- Preparation of the 6LoWPAN Smart Connect Border Router.
- Example of an Internet of Things (IoT) application running on the 6LoWPAN Smart Connect Mesh Node
- Basics of device management in the Atmel Cloud.

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## Icon Key Identifiers



### **INFO**

Identifies contextual information about a topic.



### **TIPS**

Identifies useful tips and techniques.



### **Info:**

Identifies objectives to be completed.



### **RESULT**

Identifies the expected result of a step.



### **WARNING**

Indicates important information.



### **EXECUTE**

Identifies actions to be performed out of the target when necessary.

### 3 Atmel Cloud



#### INFO

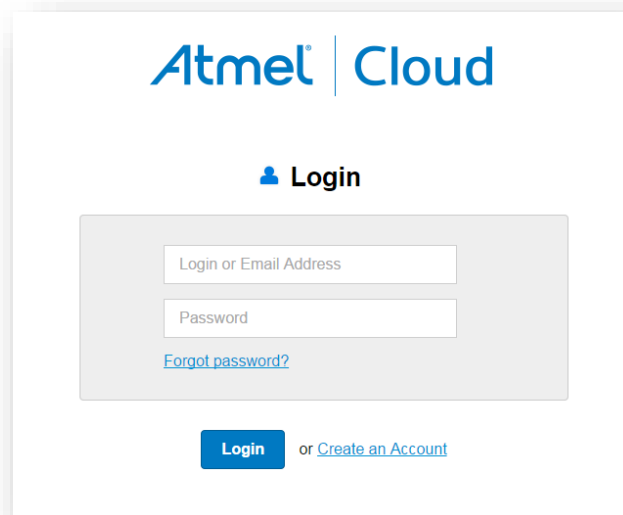
Atmel Cloud is a multi-tenant and highly scalable device management platform provided by Proximity.

Atmel Cloud is a powerful resource available to IoT solution vendors for deploying, monitoring, and testing their applications and devices.



#### Info:

To log in, go to <https://atmelcloud.proximity.com/Login>. Use your credentials to log into the Atmel Cloud and click the “Login” button.

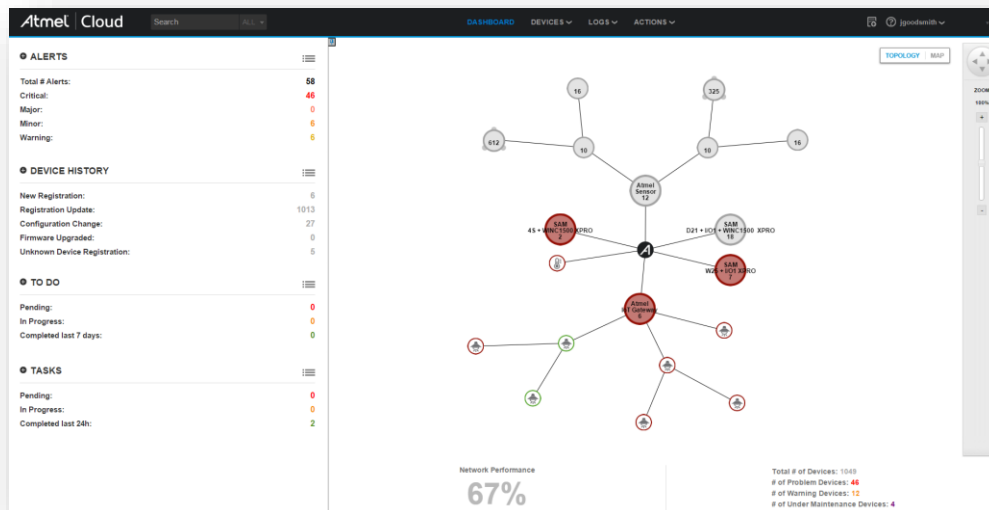


The image shows the Atmel Cloud login interface. At the top, the 'Atmel | Cloud' logo is displayed in blue. Below the logo is a 'Login' heading with a user icon. The login form is contained within a light gray box and includes two input fields: 'Login or Email Address' and 'Password'. A blue link for 'Forgot password?' is positioned below the password field. At the bottom of the form, there is a blue 'Login' button followed by the text 'or [Create an Account](#)'.



## RESULT

When logged in you should see the Atmel Cloud dashboard as depicted below. Your access rights allows you to access all devices in read-only mode, register new devices and having full access to devices you own.



## 4 Building the 6LoWPAN Smart Connect Border Router

This tutorial describes how to build a 6LoWPAN Border Router based on SAM R21 Xplained Pro, Ethernet1 Xplained Pro extension header and an example Border Router application available in the ASF version 3.26 or above. If ASF is not installed install it before proceeding.

### 4.1 Hardware Setup

To run the Border Router application, you will need:

- SAM R21 Xplained Pro host MCU board with integrated Low Power 2.4GHz Transceiver for IEEE 802.15.4 Applications
- Ethernet1 Xplained Pro extension header for IPv4 connectivity.



#### Info:

Connect the Ethernet1 Xplained Pro extension header in ETX1 of the SAM R21 Xplained Pro as shown below. Then Connect the Ethernet cable to the Ethernet1 Xplained Pro.

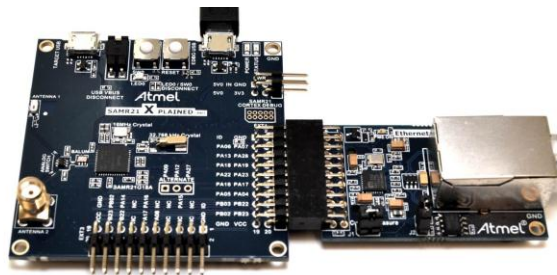


Figure 4 Border Router - Hardware Setup

## 4.2 Software Setup



**Info:** Open and compile the Border Router ASF project

- Open Atmel Studio 6.2
- Click on “File” then “New/Example Project...”
- Select the “Smart Connect 6LoWPAN - Border router SAM R21 Xplained Pro” example from the ASF

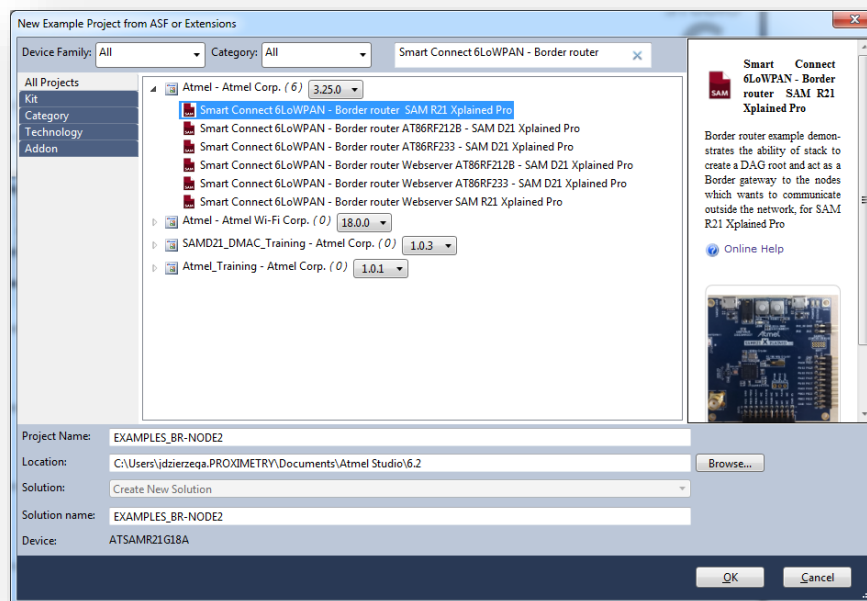


Figure 5 ASF Border Router Project Selection

- Create a new solution by pressing “OK” button and then accepting the Software License Agreement. The EXAMPLES\_BR-NODE1 solution will be created.
- Click on “Build” then “Build Solution”



**RESULT** The project should build without errors. In the Output window you should get the following information.

```
Build succeeded.  
===== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped =====
```

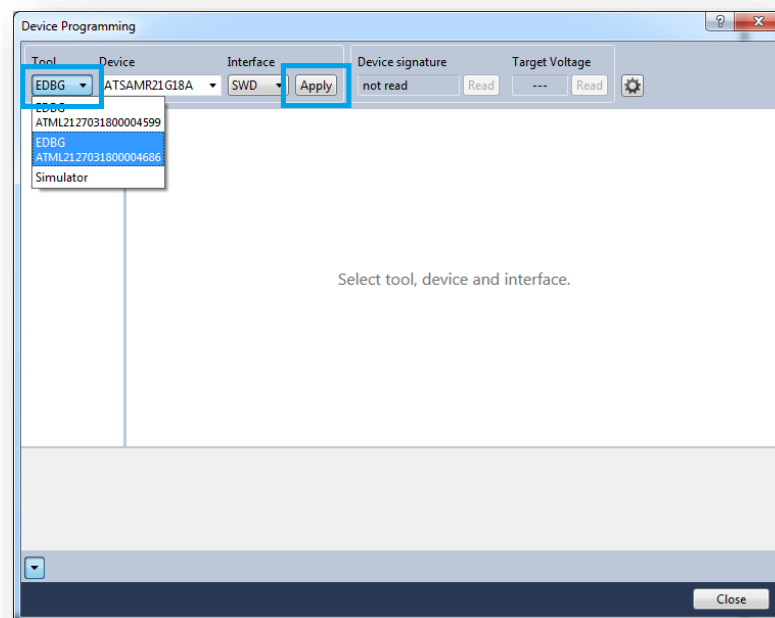


Build output files are stored in the “*Debug*” folder.

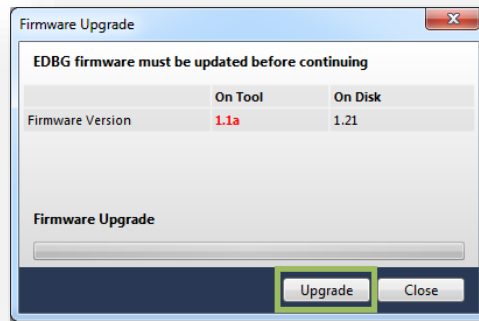


### **Info:** Program the SAM R21 Xplained Pro Border Router

- Connect the SAM R21 Xplained Pro board to your computer using a micro USB cable. Use the EDBG USB port on the SAM R21 Xplained Pro board
- In the Atmel Studio, choose "Tools->Device Programming" from the main menu
- For “Tool,” select "EDBG", choose your device from the drop down menu (if you have more than one device connected to the PC) and then click “Apply.”

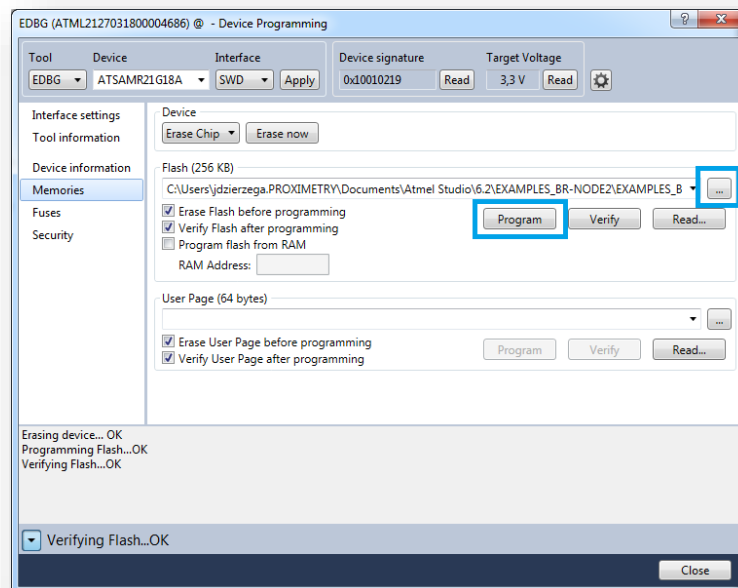


**WARNING** If prompted to upgrade your EDBG firmware, click Upgrade.



Once the upgrade EDBG firmware procedure is completed successfully close the window and proceed to the next steps.

1. From the menu on the left, choose "Memories"
2. Make sure "Erase Flash before programming" button is checked
3. Locate "Flash" edit box. Press "..." button next to it
4. Select the "EXAMPLES\_BR-NODE1.elf" file from the "Debug" folder
5. Click the "Program" button



- Close the "Device Programming" window.



## RESULT

The Border Router application is now programmed and should be running. The device automatically creates the 6LoWPAN network and starts acting as a Border Router for the Mesh Nodes. The Application uses DHCPv4 module to get an IPv4 address for the Ethernet1 Xplained Pro from the wired network. The Border Router uses IP64 module to communicate outside 6LoWPAN network. The IP64 module converts IPv6 address of a node to IPv4 address that is used to communicate with the Atmel Cloud.

## 5 Example Proximity Application for a Mesh Node

This tutorial describes how to connect and use the Atmel SAM R21 Xplained Pro Node with the Atmel Cloud.

We will guide you through the build process, installation and configuration of the Proximity example IoT application. This will allow you to manage your Atmel SAM R21 Xplained Pro using the Atmel Cloud.

The IoT application provides the following functionality:

- Automatic registration with the Atmel Cloud
- Centralized control
  - Configuration
    - LED0 Control [On, Off, Blinking]
  - Monitoring
    - Temperature [C]
    - Supply (I/O) Voltage [V]
    - Analog Input relative to Vdd [%]
    - RSSI [dBm]
    - SW0 Key State
  - Fault Management
    - Alert reported when the SW0 key is hold down
    - Alert reported when device is unreachable
- Connectivity troubleshooting using SW0 key

## 5.1 Hardware Setup

To run the application, you will need SAM R21 Xplained Pro host MCU board with integrated Low Power 2.4GHz Transceiver for IEEE 802.15.4 Applications.



Figure 6 Atmel SAM R21 Xplained Pro

## 5.2 Software Setup



**Info:** Open and Compile Proximity ASF project

- Open Atmel Studio 6.2
- Click on “File” then “New/Example Project...”
- Select the “Smart Connect 6LoWPAN – Proximity Application SAM R21 Xplained Pro” example from the ASF

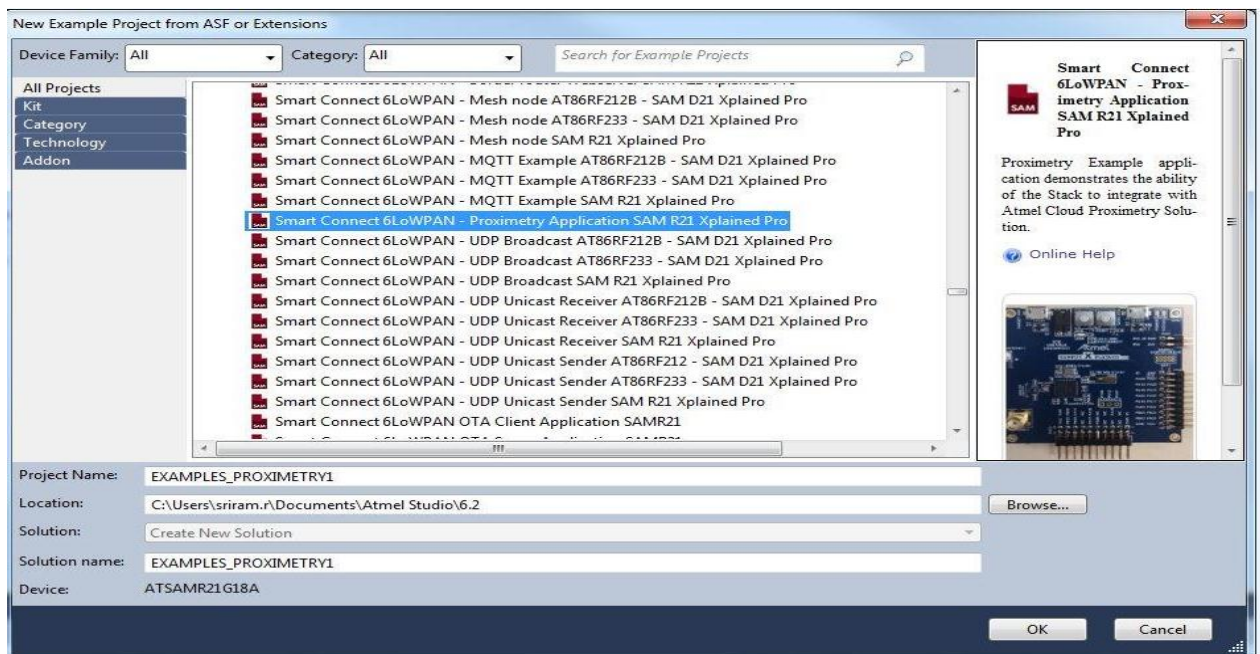



Figure 7 ASF Proximity Application Selection

- Create a new solution by pressing “OK” button and then accepting the Software License Agreement. The EXAMPLES\_PROXIMETRY solution will be created.

 **Info:** Modify the default application configuration.

- In the “Solution Explorer” double click the “src\ASF\thirdparty\wireless\SmartConnect\_6LoWPAN\examples\proximity\samr21\_xpro\conf\_agent\_app.h” file.
- Modify the following fields:

- Set Device Name  
`#define DEF_DEVICE_NAME "DEVICE_NAME"`



**WARNING**

Use ASCII characters only in the device name string. The maximum length for device name is 25 characters.



**TIPS**

Use your name as a device name to easily find your device in the Atmel Cloud. E.g. “Jack’s Device”.



**INFO**

To ensure device name uniqueness system will add last three bytes from the EUI-64 of the network interface to the Device Name visible in the Atmel Cloud. E.g. “Jack’s Device\_F02080”

- Set Device Activation Code  
`#define DEF_ACTIVATION_CODE "DEFAULT_ACTIVATION_CODE"`



**INFO**

The Device Activation Code is a unique 74-character hex string assigned to your Atmel Cloud account. Device Activation Code is used to associate devices with a user account. When you log in to the Atmel Cloud, you can find your device activation code under *Devices -> Device Activation Codes*.

- Save file changes



**Info:** Build the solution.

- Click on “Build” then “Build Solution”



**RESULT** The project should build without errors. In the Output window you should get the following information.

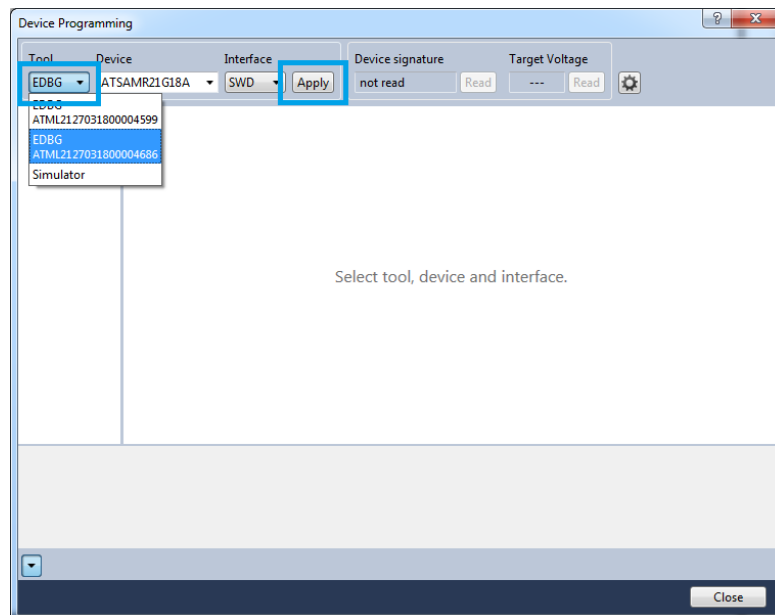
```
Build succeeded.  
===== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped =====
```

Build output files are stored in the “*Debug*” folder.

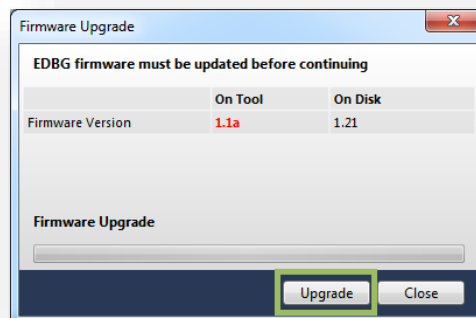


## Info: Program the SAM R21 Xplained Pro Proximity Application

- Connect the SAM R21 Xplained Pro board to your computer using a micro USB cable. Use the EDBG USB port on the SAM R21 Xplained Pro board
- In the Atmel Studio, choose "Tools->Device Programming" from the main menu
- For "Tool," select "EDBG", choose your device from the drop down menu (if you have more than one device connected to the PC) and then click "Apply."



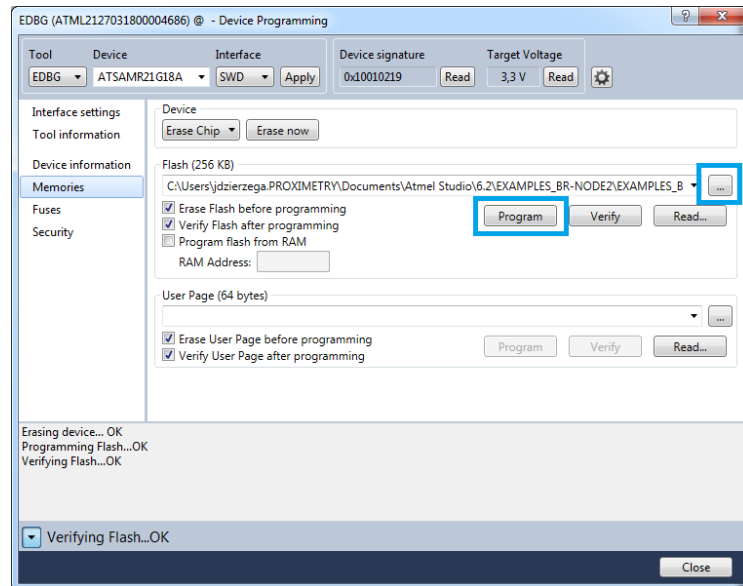
**WARNING** If prompted to upgrade your EDBG firmware, click Upgrade.



Once the upgrade EDBG firmware procedure is completed successfully close the window and proceed to the next steps.



1. From the menu on the left, choose "Memories"
2. Make sure "Erase Flash before programming" button is checked
3. Locate "Flash" edit box. Press "..." button next to it
4. Select the "EXAMPLES\_PROXIMETRY.elf" file from the "Debug" folder
5. Click the "Program" button



- Close the "Device Programming" window.



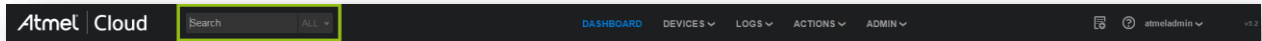
## RESULT

The Proximity IoT application is now programmed and should be running. The device connects to the 6LoWPAN network, obtains network information from DHCP, and starts the application. If everything was configured correctly, the application registers the device in the Atmel Cloud automatically. You should be able to find it from the topology view or by searching for the Device Name provided in the default configuration. If the Device Name is left blank you can find your device by searching for its EUI-64 Address. E.g. "000425191801A9A1".

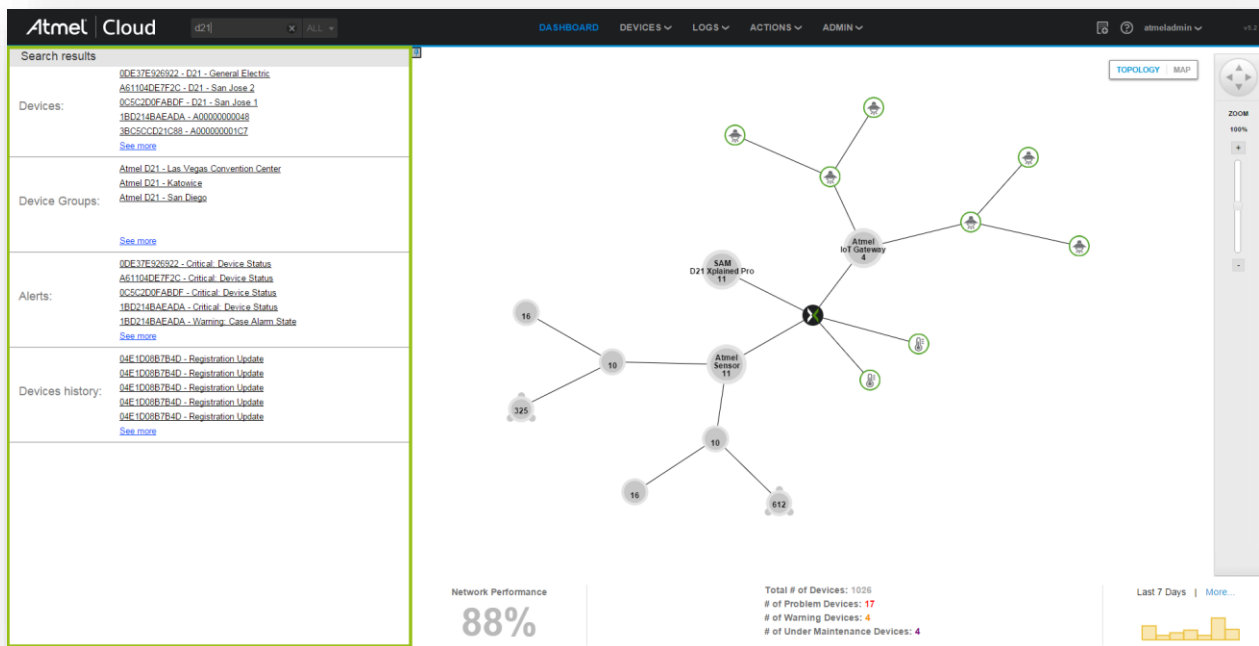


**Info:** Find your device in the Atmel Cloud.

- Open Chrome web browser and go to <https://atmelcloud.proximity.com/Login/>
- Login to Atmel Cloud.
- Put your device name or last three bytes of your EUI-64 to the quick search field



- Searching results will be displayed on the left panel

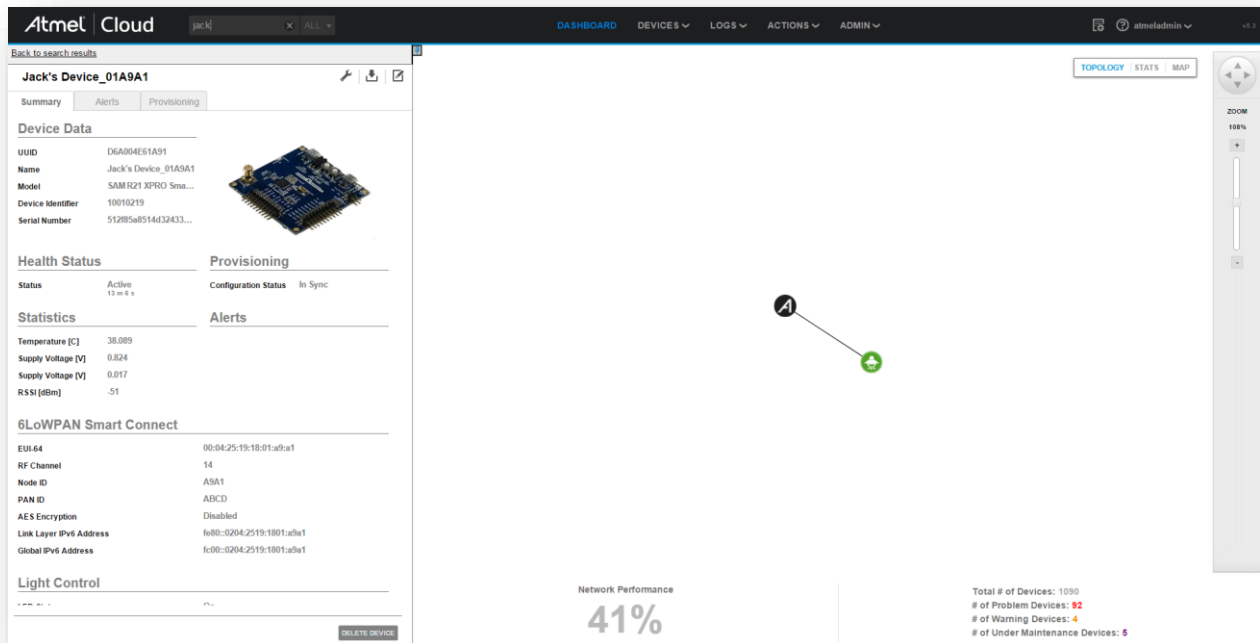


- Find your device on “Devices” section and click the hyperlink to display the device’s details.



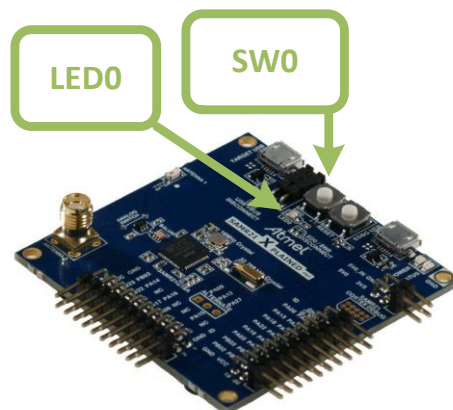
## RESULT

You should see your device details as depicted below.



## TIPS

If you cannot see your device in the Atmel Cloud, use diagnostic button (SW0) to check the connection status. When you press SW0, LED0 indicates the connection status for 5 seconds.



- LED0 is solid on
  - The Application is running normally.
  
- LED0 is blinking fast (~5Hz)
  - Error: No connection.
  - Possible problem:
    - Wrong network parameters has been provided in the *"contiki-conf.h"*.
  - Solution:
    - Make sure that you use appropriate RF\_CHANNEL. The RF\_CHANNEL must match the channel used by the Border Router. Correct the RF\_CHANNEL in the *"contiki-conf.h"*, build the solution and reprogram the SAM R21 Xplained Pro.
  
- LED0 is blinking slowly (~2Hz)
  - Error: The Application cannot communicate with the Atmel Cloud.
  - Possible problem:
    - Wrong Device Activation Code (DEF\_ACTIVATION\_CODE) has been provided in the *"conf\_agent\_app.h"*.
  - Solution:
    - Correct the Device Activation Code (DEF\_ACTIVATION\_CODE) in the *"conf\_agent\_app.h"*, build the solution and reprogram the SAM R21 Xplained Pro.
  - Possible problem:
    - Border Router does not provide Internet access.
  - Solution:
    - Connect Ethernet cable to the Border Router.
    - Contact your network administrator in case you experience connectivity issues.



**TIPS** If your device is not appearing in the Atmel Cloud, check the troubleshooting tips in the Appendix section.

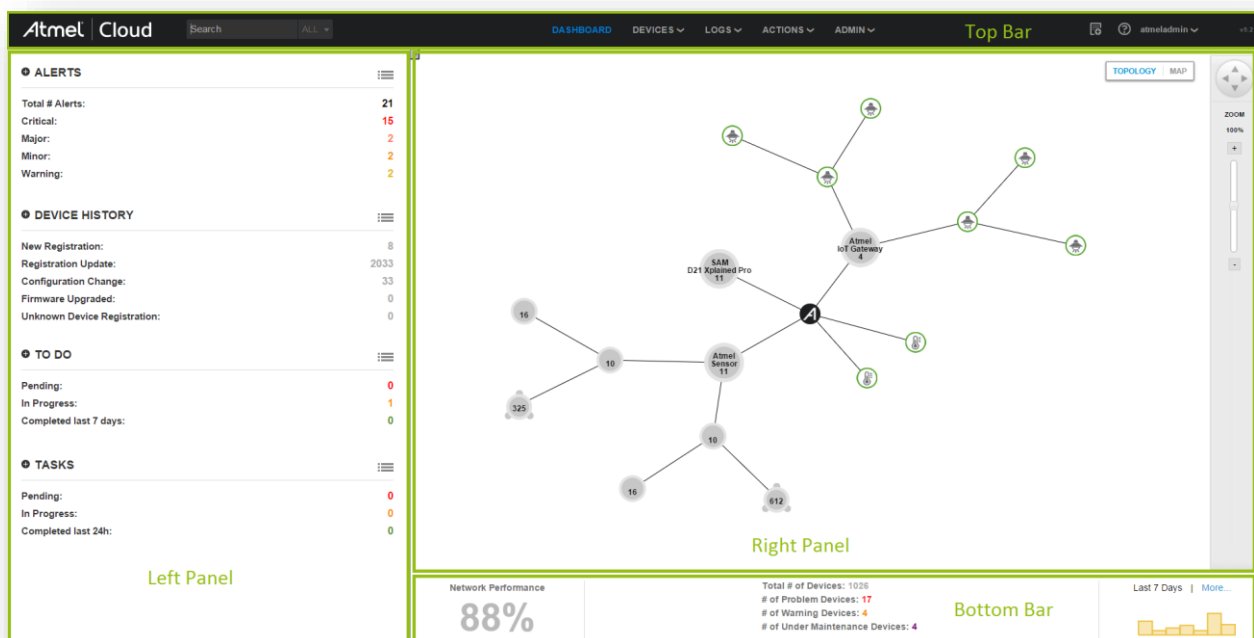
## 6 Atmel Cloud Basics

### 6.1 Dashboard Overview

The Atmel Cloud uses an exception-based management philosophy that allows operators to focus on important events in their network. By taking a quick look on the dashboard, operators obtain a clear visual indication of their network state and important events which may require immediate intervention.

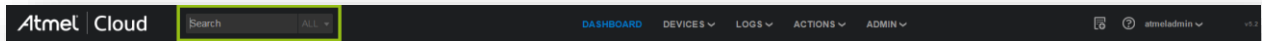
The Dashboard has the following elements:

- **Top Bar** - always visible. The Top Bar contains Quick Search, Main Menu, an option for adding new ToDo items, a link to the user documentation, and your account information.
- **Left Panel** – collapsible panel containing the most important and most recent events about your devices (Alerts and Device History), with the state of the scheduled tasks or work items assigned to you.
- **Right panel** – shows a visual representation of your network and its health. Operators can switch between logical network topology and map views.
- **Bottom bar** - shows configurable network health indicators and performance metrics.

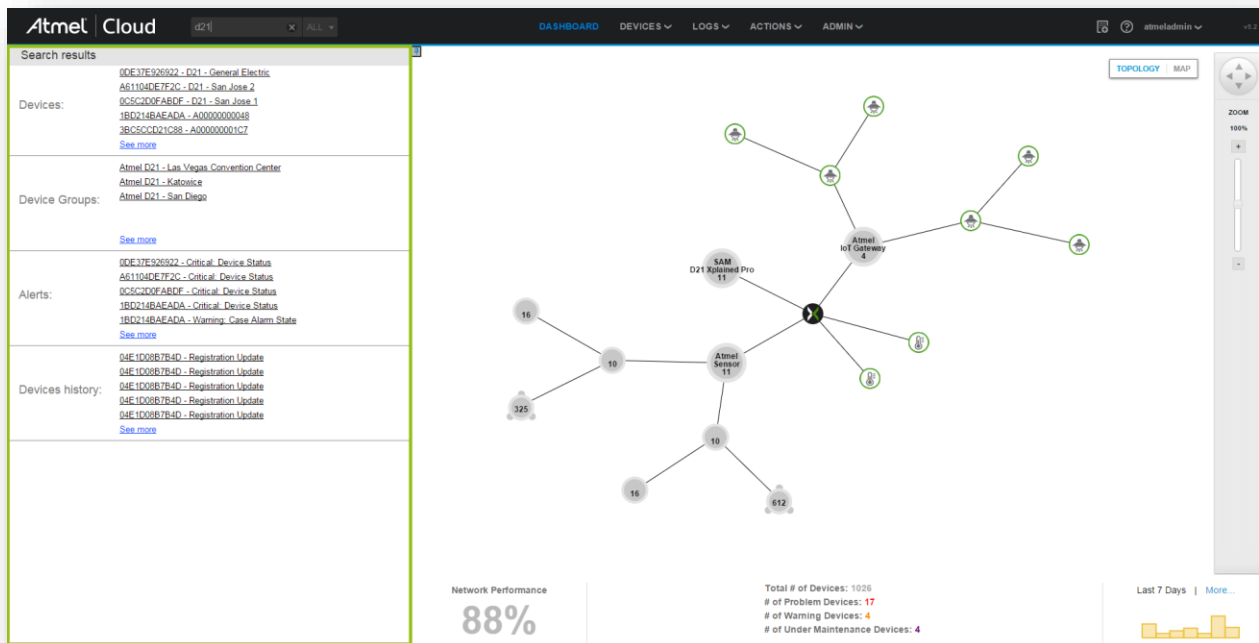


## 6.2 Find What You Need

The fastest way to find what you need is to use the quick-search option. The search field is located in the top-left corner and is available at any view.



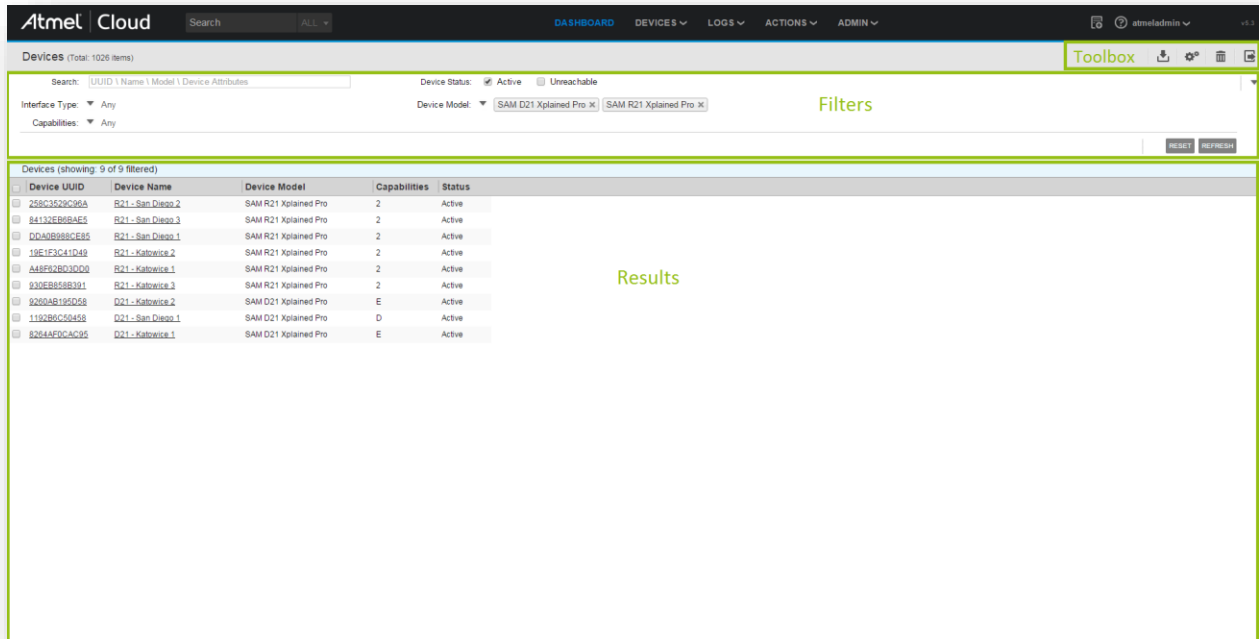
You do not need to provide the exact string to find your device. The search results are refined as you add characters. Search results are organized into the categories shown below.



If you need more sophisticated filtering options, click “[See more](#)” or select a list view from the main menu to use advanced filtering options.

### 6.3 Advanced filtering and group operations

To manage multiple devices at the same time, use the device list view. Select *Devices* -> *Device List* from the main menu.



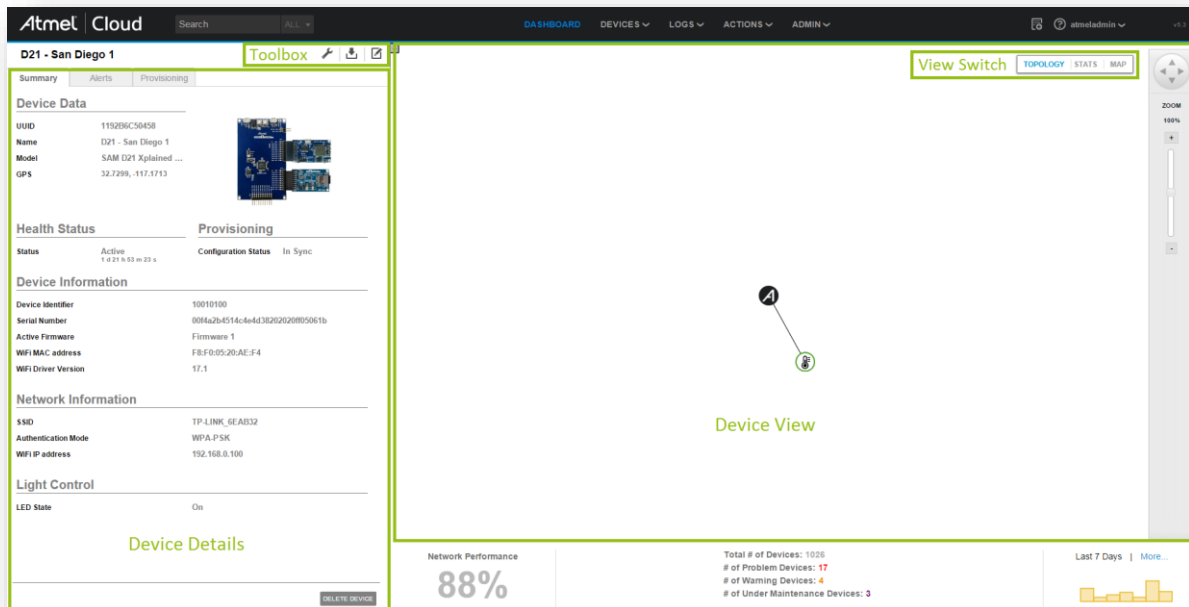
All list views are organized in the same way. Each list view contains:

- **Filters** used to refine the list.
- **Results** list of all the objects that meet the defined filtering criteria.
- **Toolbox** used to perform operations specific for selected objects. An example operation can be device configuration or firmware upgrade.

To filter the list, define your filtering criteria and click the “Refresh” button. To perform a group operation, select devices using the check boxes on the left and select the desired operation from the toolbox.

## 6.4 Monitor your devices

The statistics viewer can be launched by clicking the *STATS* option placed at the top-right corner of the device view.



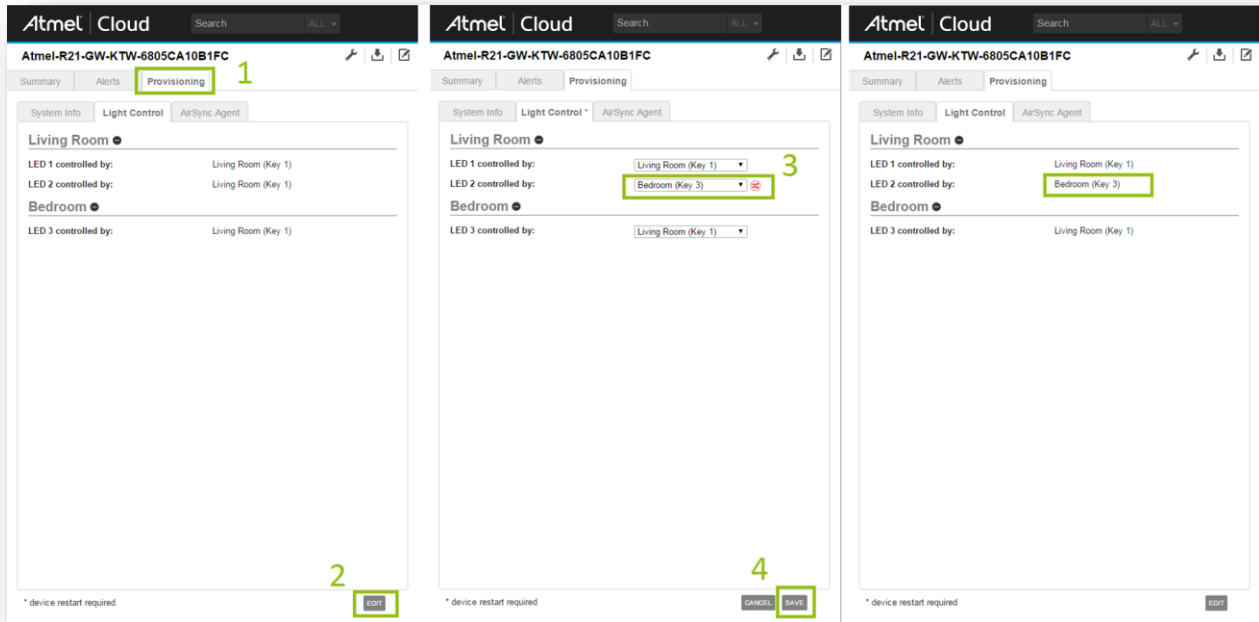
To display a given statistic plot, drag and drop the plot onto the chart area. You can define the observed data range using the bottom navigation bar.





## 6.5 Configure

Devices can be configured individually or in groups. To change a device configuration, go to the device *Provisioning* tab (1), click the *Edit* button (2), change the configuration (3), and click the *Save* button (4).



For group configurations, go to the device list (*Devices -> Device List* in the main menu), select the devices you want to modify, click the group configuration option, change the configuration, and click the *Save* button.

## 6.6 Audit

All events in the system are logged for further auditing. The logs are organized into three categories:

- User History
- Device History
- Alerts History

All categories can be found under *Logs* in the main menu. You can browse and filter the logs based on time range, device model, or event type.

The screenshot displays the 'Atmel Cloud' interface for 'Device History'. The page title is 'Device History (Total: 24138 items)'. A search bar is present with the text 'Search: UUID / Device Name'. Below the search bar, there are filters for 'Event Type' (set to 'Configuration Change X') and 'Date From' (01/02/2015 12:00:00 AM) to 'Date To' (02/02/2015 12:00:00 AM). A 'Device Type' dropdown is also visible. A green box labeled 'Filters' highlights the search and date filter area. Below the filters, a table titled 'All Device History Events (showing 152 of 152 filtered)' displays the following data:

| Event Type           | Date/Time           | Device UUID  | Device Name       | Device Model         | Capabilities |
|----------------------|---------------------|--------------|-------------------|----------------------|--------------|
| Configuration Change | 01/02/2015 09:14 PM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:14 PM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:14 PM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:14 PM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:13 PM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:13 PM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 09:13 PM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 08:52 PM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/02/2015 08:38 PM | 848449C454A3 | D21 - San Diego 2 | SAM D21 Xplained Pro | d            |
| Configuration Change | 01/02/2015 08:37 PM | 848449C454A3 | D21 - San Diego 2 | SAM D21 Xplained Pro | d            |
| Configuration Change | 01/29/2015 09:11 AM | 998CE399CA72 | Atmel R21-GW      | Atmel IoT Gateway    | 4            |
| Configuration Change | 01/29/2015 09:03 AM | 998CE399CA72 | Atmel R21-GW      | Atmel IoT Gateway    | 4            |
| Configuration Change | 01/29/2015 09:03 AM | 998CE399CA72 | Atmel R21-GW      | Atmel IoT Gateway    | 4            |
| Configuration Change | 01/29/2015 01:29 AM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:29 AM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:29 AM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:28 AM | 19E1F3C41D49 | R21 - Katowice 2  | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:25 AM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:25 AM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:25 AM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:24 AM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:12 AM | 830E8B58B391 | R21 - Katowice 3  | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:10 AM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:08 AM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:08 AM | 84132E86BAE5 | R21 - San Diego 3 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:08 AM | 258C3529C96A | R21 - San Diego 2 | SAM R21 Xplained Pro | 2            |
| Configuration Change | 01/29/2015 01:01 AM | D0A0B88CE85  | R21 - San Diego 1 | SAM R21 Xplained Pro | 2            |

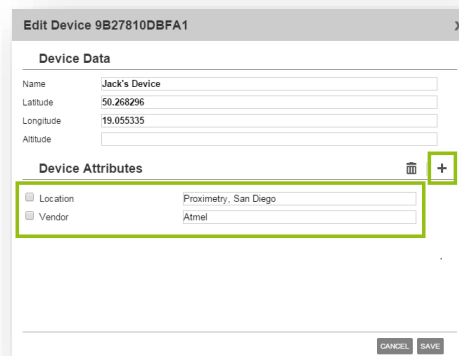
A green box labeled 'Results' highlights the table content.

## 6.7 Tips

Atmel Cloud is designed to minimize the efforts required to perform the most frequent and critical operations. Below are tips and advice for being even more efficient when working with the Atmel Cloud.

### 6.7.1 Annotate your devices

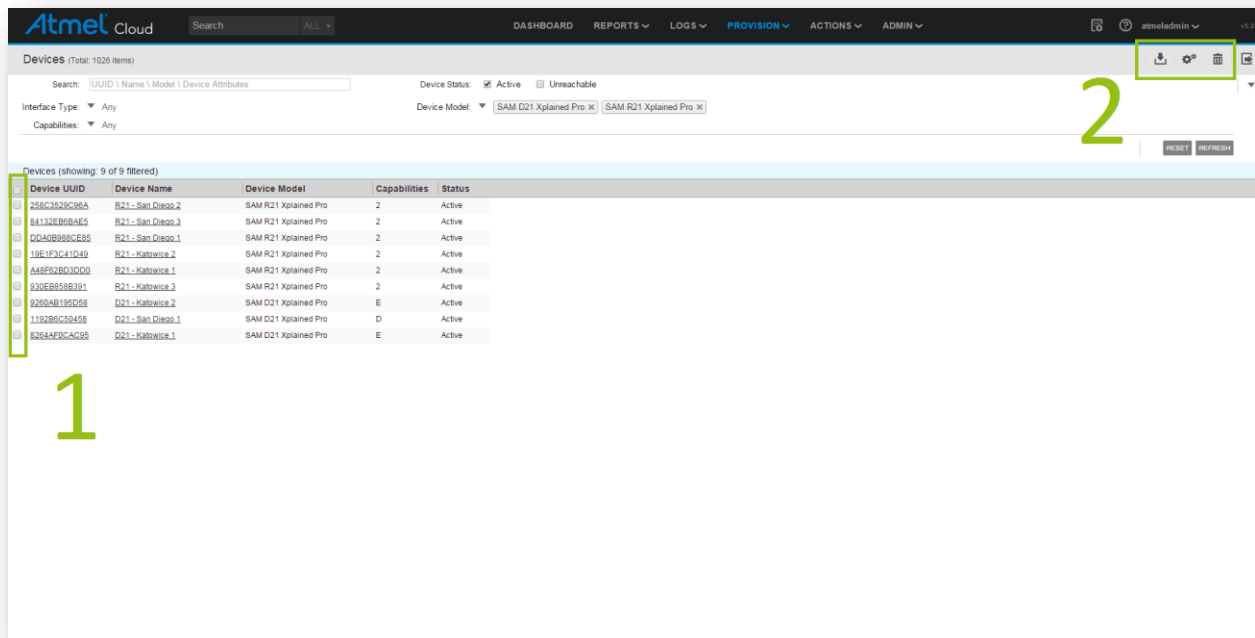
Atmel Cloud allows you to annotate your devices using *Device Attributes*. Device attributes are very useful if you want to enrich your devices with additional data, such as location, support webpage, owner, or group name. To annotate a device select “*Edit Device*” option from the device toolbox.



Atmel Cloud considers your annotations in the search results automatically, so you can find your devices easily.

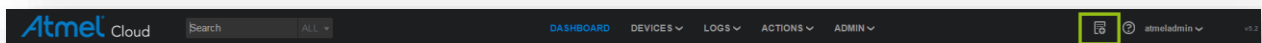
### 6.7.2 Save time by using bulk operations

Bulk operations can save significant time. The Atmel Cloud provides an option for making group configurations, upgrades or device removal. To perform these operations, select a group of devices and choose an operation from the toolbox. By single clicking, you can modify any number of devices.



### 6.7.3 Make a ToDo list

Use the ToDo list to record and keep track of your tasks. The option to add a new work item is always available for you at the top-right corner of the screen.



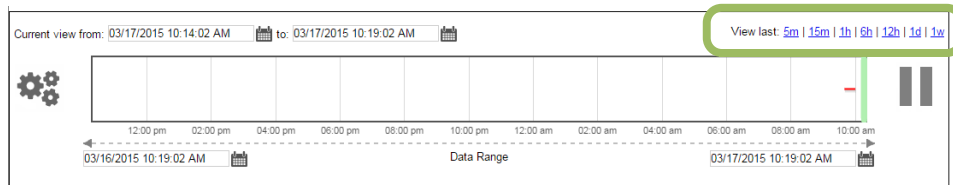
## 7 Example Demonstrations

### 7.1 Sensor Readings

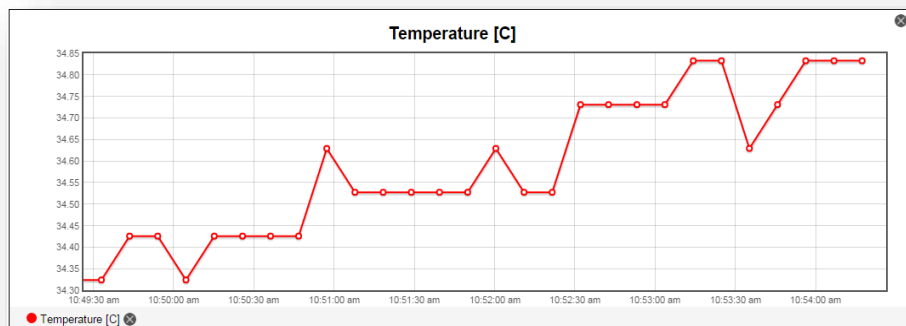
The application monitors the chip temperature, supply (I/O) voltage, analog input and RSSI. To demonstrate the sensor readings in the Atmel Cloud, click your device, switch to the “Statistics” view and then drag and drop the desired sensor readings onto the chart area.



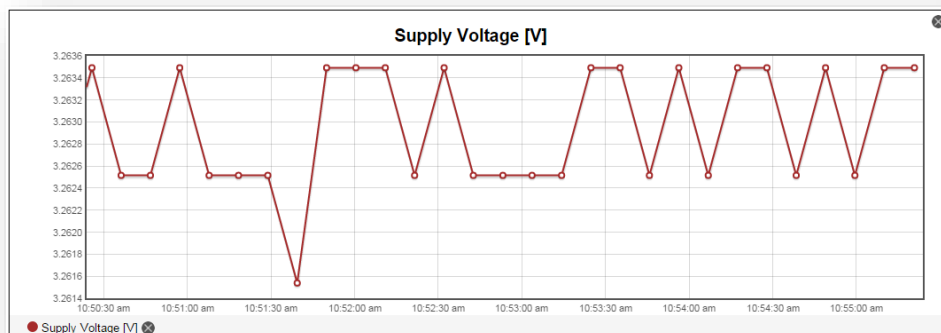
**TIPS** To get the results faster on the screen, select “View last 5m” from the statistics navigation bar



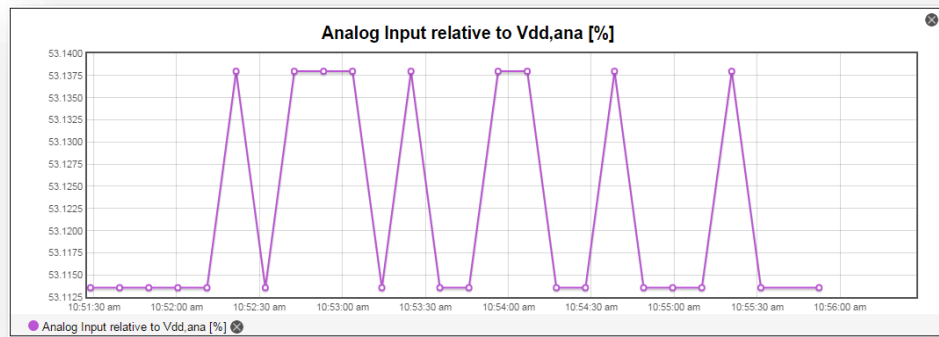
- Temperature Sensor



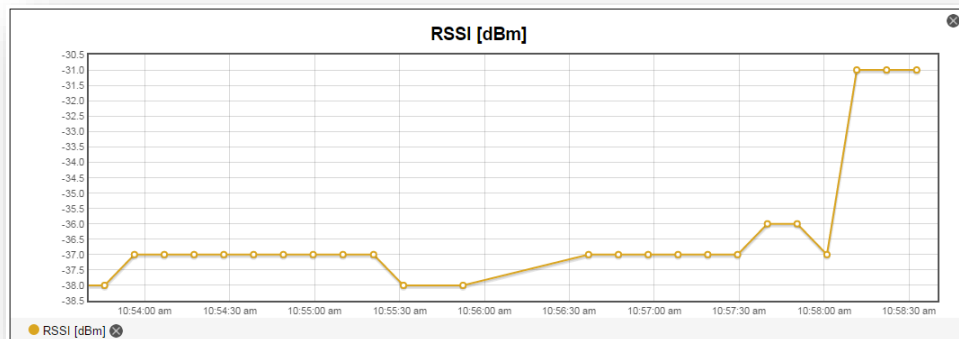
- Supply Voltage Sensor



- Analog Input Sensor



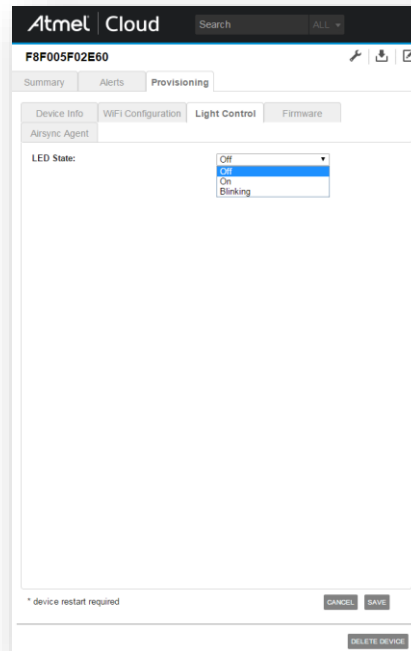
- Received Signal Strength Indicator (RSSI)



## 7.2 Remote Control

The application supports centralized remote control of the SAM R21 device. This function includes LED0 state control.

To present the LED0 remote control from the Atmel Cloud, click your device; click the *Provisioning* tab; click the *Light Control* tab; click the Edit button; change the *LED State* parameter to On, Off or Blinking; and click the *Save* Button. The desired state is propagated to the device.



## 8 Appendix - Creating an Account on the Atmel Cloud



**Info:** To sign up to the Atmel Cloud, open Chrome web browser and complete the form at:  
<https://atmelcloud.proximetry.com/Login/Register>

The image shows a screenshot of the Atmel Cloud 'Sign Up' registration form. The form is titled 'Atmel | Cloud' and 'Sign Up'. It contains several input fields: 'First Name\*', 'Last Name\*', 'Email Address\*', 'Organization', 'Phone Number', 'Address', 'City', 'State/Province/Region', 'ZIP Code/Postal Code', and a 'Country' dropdown menu. At the bottom of the form is a blue 'Sign Up' button. Below the button, there is a small text link: 'By signing up you agree to the [Terms of Use](#) and [Privacy Policy](#)'.

Asterisks identify required fields. After completing the form, click the “Sign Up” button to send an activation email to the email address you specified.



**WARNING** To avoid authorization issues, enter your Atmel email account in the registration form.

Check your inbox for the activation email, and then use the account-activation link in the email to activate your account and set your password.



**WARNING** In some cases, an additional authorization is required to create an account. In such case, you will receive an email about pending account authorization. Account authorization should not take more than 24 hours.



**RESULT** When your account is activated successfully, you can use your credentials to log in to the Atmel Cloud.



## 9 Appendix - Troubleshooting

For more troubleshooting information, use the EDBG DEBUG USB serial COM port.

- Open the EDBG DEBUG USB serial COM port with the following settings: 115200 bauds, 8-bit data, no parity, one stop bit, and no flow control



**TIPS** Use “Putty” or “Tera Term” terminal emulator

- Press the “Reset” button.

### 9.1 Diagnostic Button

Press the Diagnostic Button (SW0) to get information about the connection status.

- The following diagnostic information is printed when a device is not connected to the 6LoWPAN network.

```
DIAGNOSTIC BUTTON: end node disconnected from BR.=====
```

If you see such message make sure the RF\_CHANNEL number provided in the “*contiki-conf.h*” matches the RF\_CHANNEL used by the Border Router.

- The following diagnostic information is printed when a device is successfully connected to the 6LoWPAN network but there is no communication with the Atmel Cloud.

```
DIAGNOSTIC BUTTON: end node connected with BR only. =====
```

If you see such message the check the following:

1. You have provided a valid Device Activation Code in the “*conf\_agent\_app.h*”.
2. The Ethernet cable is connected to the Border Router Ethernet1 Xplained Pro.
3. Your Ethernet network provides connectivity to the Atmel Cloud. Ask your IT department if your network is allowed to communicate with IPv4 address *54.191.88.84* on UDP port *5050*.

- The following diagnostic information is printed when a device is successfully connected to the Atmel Cloud.

```
DIAGNOSTIC BUTTON: end node agent connected to Cloud Server. =====
```

## 9.2 Invalid Device Activation Code

- An example below presents information printed by the application when an invalid Activation Code is provided in the “*conf\_agent\_app.h*”

```
Starting the SmartConnect-6LoWPAN
Platform : Atmel IoT device
Last reset cause: External Reset
Link layer addr 0:4:37:25:24:1:169:161, 00:04:25:19:18:01:a9:a1r

Configured RF channel: 14
Node id not set.
nullrdc 128 14
IPv6 Address: fe80:0000:0000:0000:0204:2519:1801:a9a1
Tentative global IPv6 address fc00:0000:0000:0000:0204:2519:1801:a9a1
Starting End_Node led

Warning: AES encryption is disabled
Using NodeId: A9A1

Connecting to a Wireless Network...
INFO: Loading default settings

Settings:
  server_ip:      54.191.88.84
  server_port:    5050
  led0:          2
  activation_code: DEFAULT_ACTIVATION_CODE
  sync_msg_interval: 10
  device name:    DEVICE NAME
Invalid activation code
ERROR: settings are invalid - program stopped
```

- An example debug information below shows unsuccessful connection to the Atmel Cloud. If you see such an error check the Device Activation Code provided in the “*conf\_agent\_app.h*”.

```
<I> [amp.c,L171] Sending Perform Device Announcement Response
buffer [0x20004d30]:
[0000] 90 08 00 00 00 00 00 00 00 50 81 09 30 4b 4a 30 | ..... .P..0KJ0 |
[0016] 30 30 30 30 30 30 33 38 64 33 32 32 35 34 38 36 | 00000038 d3225486 |
[0032] 34 35 64 35 64 37 39 34 39 65 36 35 38 30 30 39 | 45d5d794 9e658009 |
[0048] 61 39 64 66 39 39 33 34 37 66 39 36 64 32 36 37 | a9df9934 7f96d267 |
[0064] 66 30 33 36 35 63 38 39 31 36 30 63 61 62 34 32 | f0365c89 160cab42 |
[0080] 62 64 35 30 30 63 63 38 32 31 3a 20 35 31 32 66 | bd500cc8 21:.512f |
[0096] 38 35 61 38 35 31 34 64 33 32 34 33 33 32 32 30 | 85a8514d 32433220 |
[0112] 32 30 32 30 30 62 30 63 31 38 30 36 12 44 45 56 | 20200b0c 1806.DEV |
[0128] 49 43 45 5f 4e 41 4d 45 5f 30 31 41 39 41 31 00 | ICE_NAME _01A9A1. |
[0144] 08 01 46 00 02 | ..F.. |
<I> [amp.c,L404] Received AMP message, buffer:[0x20000f74] length:[25]
buffer [0x20000f74]:
[0000] 88 08 00 00 00 00 00 00 00 11 07 0d 05 00 00 00 | ..... |
[0016] ff 00 00 00 00 00 00 00 00 | ..... |
<I> [amp.c,L450] Main TLV type:[0x11], length:[7]
<I> [amp.c,L223] Sending Finish Device Announcement Response
buffer [0x20004d30]:
[0000] 90 08 00 00 00 00 00 00 00 51 00 | ..... .Q. |
<E> [amp.c,L494] Error 255 in Finish Device Announcement Req: rejected by the server
```

### 9.3 Normal Operation

An example below presents information printed by the application during normal operation.

The following important information is printed:

- 1 - Configured RF channel along with 802.15.4/6LoWPAN network information
- 2 - Atmel Cloud settings and initial values of the LED0 state (led0) and the periodic message interval (sync\_msg\_interval). The Atmel Cloud settings includes server IP address (sever\_ip), server port number (server\_port), activation code (activation\_code) and the initial device name (device\_name).
- 3 - Data used during device registration to the Cloud. Here you can find a device name that will be displayed in the Cloud (e.g. *"Jack's Device3\_01A9A1"*).
- 4 - Configuration parameters retrieved from the device.
- 5 - Messages exchanged with the Atmel Cloud to perform device registration.
- 6 - Messages exchanged with the Atmel Cloud to synchronize the configuration parameters.
- 7 - Periodic messages with statistics values reported to the Atmel Cloud.

```

Starting the SmartConnect-6LoWPAN
Platform : Atmel IoT device
Last reset cause: External Reset
Link layer addr 0:4:37:25:24:1:169:161, 00:04:25:19:18:01:a9:a1r

Configured RF channel: 14
Node id not set.
nullrdc 128 14
IPv6 Address: fe80:0000:0000:0000:0204:2519:1801:a9a1
Tentative global IPv6 address fc00:0000:0000:0000:0204:2519:1801:a9a1
Starting End_Node led

Warning: AES encryption is disabled
Using NodeId: A9A1

Connecting to a Wireless Network...
INFO: Loading default settings

Settings:
server_ip:          54.191.88.84
server_port:        5050
led0:               2
activation_code:    00000003bb3d3987a9b5bd47bbe877328ccf75d28285e0a312e8a1159f144f234cf78bb5de
sync_msg_interval: 10
device_name:        Jack's Device3

Connected to Wireless network
agent_start
Device ID: [10010219]
Device Serial NO: [512f85a8514d3243322020200b0c1806]
Device name: "Jack's Device3_01A9A1" is set
<I> [amp_agent.c,L106] Initialising AMP Agent Library
<D> [amp_agent.c,L109] === sys info ===
<D> [amp_agent.c,L111] device id: 512f85a8514d3243322020200b0c1806
<D> [amp_agent.c,L112] model id: 80146
<D> [amp_agent.c,L113] software ver: 2
<D> [amp_agent.c,L114] sync msg interval: 10
<D> [amp_agent.c,L115] sync msg backoff: -1
<D> [amp_agent.c,L116] activation code:
00000003bb3d3987a9b5bd47bbe877328ccf75d28285e0a312e8a1159f144f234cf78bb5de
<D> [amp_agent.c,L118] === sys data ===
<D> [amp_agent.c,L120] params: 12 at 0x2000001c
<D> [amp_agent.c,L121] stats: 5 at 0x200000ac
<D> [amp_agent.c,L122] alarms: 1 at 0x20000018
<D> [amp_agent.c,L124] === library version ===
<D> [amp_agent.c,L125] 1.7.0
<I> [amp.c,L316] Initialising AMP submodule
<D> [amp.c,L343] sync msg TLV length: [43b]
<D> [amp.c,L344] stats TLV length: [34b]
<D> [amp.c,L345] alarms TLV length: [2b]
--- Agent params values ---
id:1031 agent version: 0.0.1
id:1001 device_id: 10010219
id:1002 serial_no: 512f85a8514d3243322020200b0c1806
id:1030 sync interval: 10
id:1020 led state: 2
id:1011 802154 eui64: 00:04:25:19:18:01:a9:a1
id:1012 802154 rf_channel: 14
id:1013 802154 node_id: A9A1
id:1014 802154 pan_id: ABCD
id:1015 802154 aes_enc: disable
id:1016 6LoWPan ll_ipv6: fe80::0204:2519:1801:a9a1
id:1017 6LoWPan glb_ipv6: fc00::0204:2519:1801:a9a1
--- Agent system info ---
Device id: 512f85a8514d3243322020200b0c1806
Device name: Jack's Device3_01A9A1
Model id: 0x80146
Software ver: 0x2
Sync.msg.interval 10
Activation code: 00000003bb3d3987a9b5bd47bbe877328ccf75d28285e0a312e8a1159f144f234cf78bb5de

```



```

Using Proximity Server: 54.191.88.84:5050
...
<I> [amp.c,L171] Sending Perform Device Announcement Response
buffer [0x20004d30]:
[0000] 90 08 00 00 00 00 00 00 00 50 81 0c 30 4b 4a 30 | ..... .P..OKJ0 |
[0016] 30 30 30 30 30 30 33 62 62 33 64 33 39 38 37 61 | 0000003b b3d3987a |
[0032] 39 62 35 62 64 34 37 62 62 65 38 37 37 33 32 38 | 9b5bd47b be877328 |
[0048] 63 63 66 37 35 64 32 38 32 38 35 65 30 61 33 31 | ccf75d28 285e0a31 |
[0064] 32 65 38 61 31 31 35 39 66 31 34 34 66 32 33 34 | 2e8a1159 f144f234 |
[0080] 63 66 37 38 62 62 35 64 65 31 3d 20 35 31 32 66 | cf78bb5d e1=.512f |
[0096] 38 35 61 38 35 31 34 64 33 32 34 33 33 32 32 30 | 85a8514d 32433220 |
[0112] 32 30 32 30 30 62 30 63 31 38 30 36 15 4a 61 63 | 20200b0c 1806Jac |
[0128] 6b 27 73 20 44 65 76 69 63 65 33 5f 30 31 41 39 | k's.Devi ce3_01A9 |
[0144] 41 31 00 08 01 46 00 02 | Al...F.. |
<I> [amp.c,L404] Received AMP message, buffer:[0x20000f74] length:[73]
buffer [0x20000f74]:
[0000] 88 08 00 00 00 00 00 00 00 11 37 0d 05 00 00 00 | ..... .7..... |
[0016] 00 00 32 2e 20 35 31 32 66 38 35 61 38 35 31 34 | ..2..512 f85a8514 |
[0032] 64 33 32 34 33 33 32 32 30 32 30 32 30 30 62 30 | d3243322 020200b0 |
[0048] 63 31 38 30 36 0c 35 46 39 39 35 39 35 31 32 34 | c1806.5F 99595124 |
[0064] 38 31 00 00 00 00 00 00 00 | 81..... |
<I> [amp.c,L450] Main TLV type:[0x11], length:[55]
<I> [amp.c,L223] Sending Finish Device Announcement Response
buffer [0x20004d30]:
[0000] 90 08 00 00 00 00 00 00 00 51 00 | ..... .Q. |
<I> [amp.c,L404] Received AMP message, buffer:[0x20000f74] length:[25]
buffer [0x20000f74]:
[0000] 8c a8 00 5f 99 59 51 24 81 00 00 00 00 00 00 00 | ..._.YQ$ ..... |
[0016] 00 00 00 00 00 00 00 00 00 | ..... |
<I> [amp.c,L450] Main TLV type:[0x00], length:[0]
<I> [amp.c,L141] Sending Registration Response
buffer [0x20004d30]:
[0000] 94 a8 00 5f 99 59 51 24 81 40 17 03 15 5f 99 59 | ..._.YQ$ .@..._.Y |
[0016] 51 24 81 00 08 01 46 00 02 08 30 30 30 30 30 30 | Q$....F. ..000000 |
[0032] 30 31 | 01 |
<I> [amp.c,L404] Received AMP message, buffer:[0x20000f74] length:[25]
buffer [0x20000f74]:
[0000] 8c b8 00 5f 99 59 51 24 81 03 03 0a 01 80 00 00 | ..._.YQ$ ..... |
[0016] 00 00 00 00 00 00 00 00 00 | ..... |
<I> [amp.c,L450] Main TLV type:[0x03], length:[3]
<I> [amp.c,L248] Sending Configuration Response
buffer [0x20004d30]:
[0000] 94 b8 00 5f 99 59 51 24 81 43 81 42 0c 81 3f 00 | ..._.YQ$ .C.B.?. |
[0016] 00 03 fc 02 00 00 03 e9 08 31 30 30 31 30 32 31 | ..... .1001021 |
[0032] 39 00 00 03 ea 20 35 31 32 66 38 35 61 38 35 31 | 9.....51 2f85a851 |
[0048] 34 64 33 32 34 33 33 32 32 30 32 30 32 30 30 62 | 4d324332 2020200b |
[0064] 30 63 31 38 30 36 00 00 04 06 00 00 00 0a 00 00 | 0c1806.. ..... |
[0080] 04 07 05 30 2e 30 2e 31 00 00 03 f3 17 30 30 3a | ...0.0.1 .....00: |
[0096] 30 34 3a 32 35 3a 31 39 3a 31 38 3a 30 31 3a 61 | 04:25:19 :18:01:a |
[0112] 39 3a 61 31 00 00 03 f4 02 31 34 00 00 03 f5 04 | 9:a1.... .14.... |
[0128] 41 39 41 31 00 00 03 f6 04 41 42 43 44 00 00 03 | A9A1.... .ABCD... |
[0144] f7 00 00 00 03 f8 19 66 65 38 30 3a 3a 30 32 30 | .....f e80::020 |
[0160] 34 3a 32 35 31 39 3a 31 38 30 31 3a 61 39 61 31 | 4:2519:1 801:a9a1 |
[0176] 00 00 03 f9 19 66 63 30 30 3a 3a 30 32 30 34 3a | .....fc0 0::0204: |
[0192] 32 35 31 39 3a 31 38 30 31 3a 61 39 61 31 | 2519:180 1:a9a1 |
<I> [amp_agent.c,L178] Sync Msg overdue: 0ms
PROX_AGENT_STAT_ID_TEMPERATURE: 0xb16
PROX_AGENT_STAT_ID_SUPPLY_VOL: 0xd23
PROX_AGENT_STAT_ID_ANALOG_INP: 0x18
PROX_AGENT_STAT_ID_KEYSTATE: 0
PROX_AGENT_STAT_ID_RSSI: -40
<I> [amp.c,L354] Sending Sync Message
buffer [0x20004e74]:
[0000] 85 c8 00 5f 99 59 51 24 81 80 2d 00 01 00 01 02 | ..._.YQ$ ..-..... |
[0016] 01 00 02 22 00 00 00 c9 42 0f 66 89 00 00 00 ca | ..."..... B.f..... |
[0032] 40 52 3d 24 00 00 00 cb 3f 16 09 61 00 00 00 cc | @R=$.... ?.a.... |
[0048] 00 00 00 00 cd d8 20 00 | ..... |
<I> [amp_agent.c,L178] Sync Msg overdue: 0ms
PROX_AGENT_STAT_ID_TEMPERATURE: 0xb17
PROX_AGENT_STAT_ID_SUPPLY_VOL: 0xd24
PROX_AGENT_STAT_ID_ANALOG_INP: 0x18
PROX_AGENT_STAT_ID_KEYSTATE: 0
PROX_AGENT_STAT_ID_RSSI: -40
<I> [amp.c,L354] Sending Sync Message
buffer [0x20004e74]:
[0000] 85 d8 00 5f 99 59 51 24 81 80 2d 00 01 00 01 02 | ..._.YQ$ ..-..... |
[0016] 01 00 02 22 00 00 00 c9 42 0f ce ba 00 00 00 ca | ..."..... B..... |
[0032] 40 52 4d 25 00 00 00 cb 3f 16 09 61 00 00 00 cc | @RM%.... ?.a.... |
[0048] 00 00 00 00 cd d8 20 00 | ..... |

```

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