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1 Overview

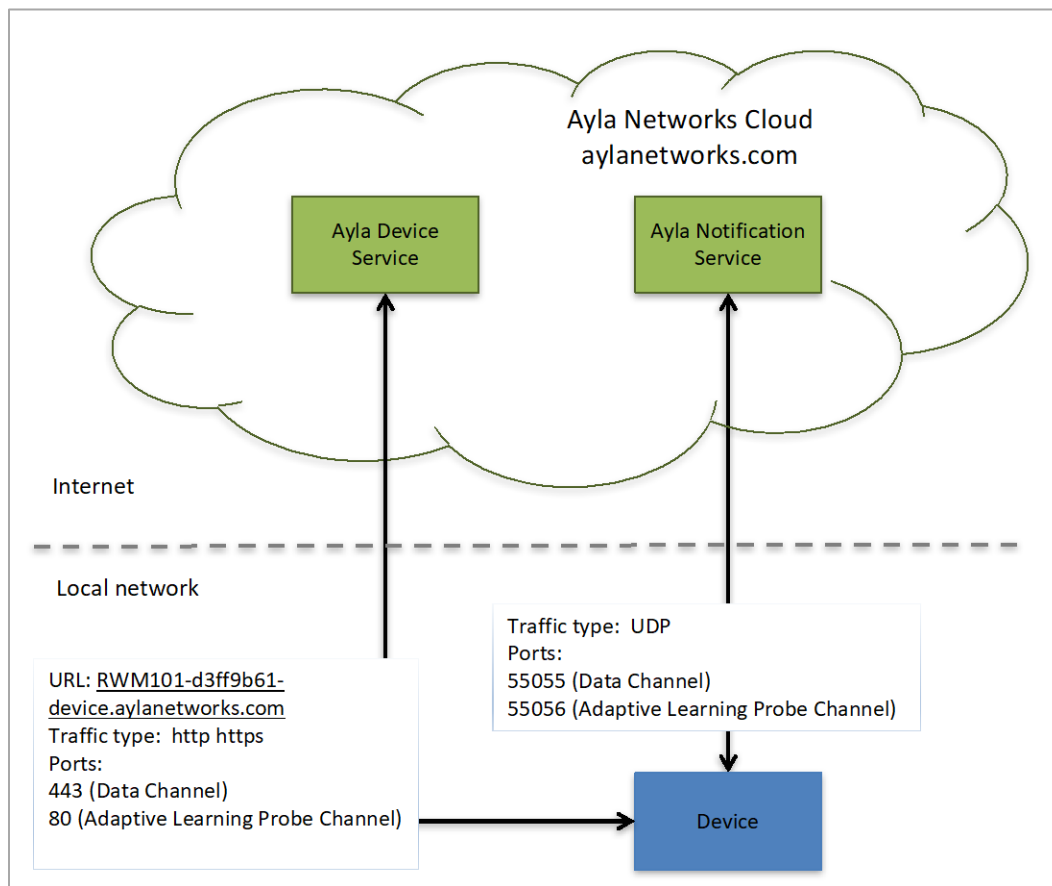
Ayla devices communicate with two services in the Ayla Cloud:

- Ayla Notification Service (ANS)
- Ayla Device Service (ADS)

Devices use UDP keep-alive packets to communicate with ANS - which maintains the device online/offline state. ANS communicates these states with ADS.

ANS notifies the device of any pending data or commands for the device. The device communicates with HTTPS to ADS to send property updates or receive property updates and commands.

Figure 1 - Architectural Overview



Device connectivity states are:

- **Online**

ANS notifies ADS the device is online. Keep alive packet exchanges are successful.

- **Offline**

ANS notifies ADS the device is offline. Two consecutive keep-alive packets are not acknowledged.

- **Initializing**

After the network was down, when device connects to the Cloud and can make the initial API call to ADS, the device state is marked as Initializing.

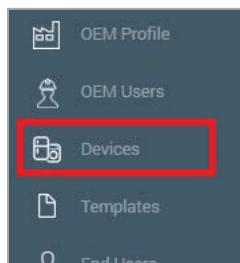
- **Polling Online**

If the device cannot communicate with ANS, ADS is pinged. If the device can communicate with ADS, ADS is polled every 5 minutes for any pending property updates or commands. This is the Polling Online state. The device can have latencies up to 5 minutes to react to Ayla Cloud changes.

1.1 Navigate to Connection History (OEM Dashboard)

The device connection status can be seen in the OEM Dashboard. To see the connection status page:

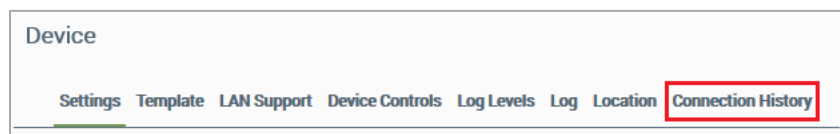
1. On the Navigation Menu (left side, click Devices.



2. In the Devices table, select the appropriate device.

<input type="checkbox"/>	Connection Status	ID	DSN	Product Name
<input type="checkbox"/>	●	11664	UVDTESTDEVICE	prodUVDTESTDEV
<input type="checkbox"/>	●	7351	COMMANDTEST2	prodCOMMANDSTE

3. On the Device details, click on the Connection History tab.



- For the selected device, the Connection History tab provides all of connection states of the device with date/time.

Device	
Settings Template LAN Support Device Controls Log Levels Log Location Connection History	
PREV 1 - 4 of 4 NEXT	SHOW: <input type="button" value="10"/> <input type="button" value="25"/> <input type="button" value="50"/> <input type="button" value="100"/>
Event Time (UTC)	Status
10/31/2017 at 21:32:04	Online
10/31/2017 at 21:31:36	Initializing
10/18/2017 at 0:19:13	Online
10/18/2017 at 0:19:12	Initializing

2 Connection History Log Examples

The six scenarios below show state change situations with explanations on how these occur.

2.1 Case 1: Online > Online

Figure 2 – Online > Online

10/17/2017 at 6:47:51	Online
10/17/2017 at 5:12:46	Online

Ayla has a pool of Ayla Notification Service (ANS) edge nodes. An ANS edge node is an endpoint a device keeps in contact with for near-real-time notification messaging purposes. If a particular edge node should become unavailable, the device performs a DNS lookup to get an IP address for an alternative ANS edge node and then attempts to connect to this alternative node.

When the device establishes a successful connection to the alternative ANS node then the ANS node will update the underlying database with the information that the node is online. If the node detects that the last device connection status was handled by a different ANS node then a duplicate 'Online status will be observed in the connection history log, hence the second Online entry is seen in the above Connection History events table.

2.2 Case 2: Online > Initializing > Online

Figure 3 – Online > Initializing > Online

10/17/2017 at 8:09:04	Online
10/17/2017 at 8:09:04	Initializing
10/17/2017 at 8:07:50	Online

In this situation, the node was Online. The device was rebooted or lost power. This changes the state to Initializing. On connection, the device goes to the Online state.

2.3 Case 3: Offline > Online

Figure 4 – Offline > Online

10/17/2017 at 5:12:46	Online
10/17/2017 at 5:01:14	Offline

In this case, the device was in the Online state. Then, for some reason, the device lost communication with the ANS Cloud service. Normally, the device maintains an UDP connection to ANS. Through this connection, ANS expects a Keep-Alive (heartbeat) packet from the device about every three minutes.

If ANS does not receive three packets in the time frame (approximately 10 minutes), the device state changes to Offline. The time calculations are: 3 minutes * 3 attempts + 1 min. (the Cloud systems timer uses a one-minute invocation timer).

If the device can reconnect after the offline state was recorded, the device state will change to Online (since the device reported itself as such because it was not rebooted).

2.4 Case 4: Offline > Initializing > Online

Figure 5 - Offline > Initializing > Online

10/18/2017 at 0:13:44	Online
10/18/2017 at 0:13:43	Initializing
10/17/2017 at 8:53:08	Offline

The device was Offline early on 10-17, then powered on (moved to Initializing state) on 10-18 (14 hours later). A second later, the device was reporting itself as Online.

2.5 Case 5: Initializing > Initializing > Initializing

Figure 6 – Initializing > Initializing > Initializing

10/18/2017 at 8:20:00	Initializing
10/18/2017 at 8:08:38	Initializing
10/18/2017 at 7:57:15	Initializing

The device repeatedly reports the Initializing state - and appears to never finish. It seems to reboot and start over (usually because of a watch-dog timeout or similar restart condition). The device repeatedly tries to fix the problem with a reboot.

The device may have communication problems with ANS (UDP) or ADS (TCP) – possibly from hardware related issue(s). Another possibility could be a failing or under-powered power supply (this is an often-seen problem in cases where the device uses a Power-Over-Ethernet power source with maximum cable length. 48V 802.3af standard POE can usually go about 100 meters/300 feet).

2.6 Case 6: Initializing > PollingOnline > Initializing > PollingOnline

Figure 7 - Initializing > PollingOnline > Initializing > PollingOnline

10/17/2017 at 15:02:23	PollingOnline
10/17/2017 at 14:57:20	Initializing
10/16/2017 at 14:58:59	PollingOnline
10/16/2017 at 14:53:56	Initializing

In this situation, the device starts in the Initializing state - but communication could not be established with ANS (UDP event driven communication). The device then switched to the less efficient PollingOnline backup communication. It remained in this state for approximately 24 hours before this scenario was repeated.

If the device completely losses connectivity with the Cloud, the Offline state is by default concluded at approximately a) 10 seconds-16 minutes, if the device is already in a PollingOnline state, and after b) 15-16 minutes if it was in Online state prior to the complete loss of communication.

a) The timespan minimum is (10 seconds * 3 tries). Maximum is (5 minutes * 3 tries + 1 minute), as the Cloud systems timer uses a one-minute loop timer.

b) The timespan range minimum is (approximately 30 seconds * 3 tries). Maximum is (300 seconds * 3 tries + 1 minute), as the Cloud systems timer uses a one-minute loop timer.

3 Degradation of PollingOnline Downstream Propagation

When a device uses the fallback PollingOnline notification algorithm, end-users may see a propagation degradation for a non-LAN-mode mobile or custom portal or service property update (datapoint) to reach the device.

There are no timing differences for device to cloud bound datapoints while in PollingOnline mode. This is as Datapoints are always immediately pushed by the device to the Cloud independent of the device notification protocol.

4 Responsiveness Configuration

By default, the PollingOnline downstream delay is between 0 to 5 minutes, depending on where the device is in its ADS poll loop cycle. The PollingOnline related timing is only configurable during manufacturing while the device is in Setup mode, by modifying the Client Configuration Setting 'client/poll_interval' to a none default value.

There is currently no similar OEM configurable parameter for the ANS UPD keep a-live related timing.



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