Application Note

Ayla LAN Mode Mobile

Version: 2.0

Date Released: January 06, 2016

Document Number: AY006ALM3-2

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Contact Information

Ayla Networks TECHNICAL SUPPORT and SALES

Contact Technical Support: https://support.aylanetworks.com
or via email at support@aylanetworks.com

Contact Sales: https://www.aylanetworks.com/company/contact-us

Ayla Networks REGIONAL OFFICES

GREATER CHINA
Shenzhen
Room 310-311
City University of Hong Kong
Research Institute Building
No. 8 Yuexing 1st Road
High-Tech Industrial Park
Nanshan District
Shenzhen, China
Phone: 0755-86581520

HEADQUARTERS
Silicon Valley
4250 Burton Drive, Suite 100
Santa Clara, CA 95054
United States
Phone: +1 408 830 9844
Fax: +1 408 716 2621

JAPAN
Wise Next Shin
Yokohama, 2-5-14
Shnyokohama, Kohokuku
Yokohama-shi, Kanagawa-ken
Yokohoma, 222-0033 Japan

EUROPE
London
30 Great Guildford St
London SE1 0HS
United Kingdom

TAIWAN
Taipei
5F No. 250 Sec. 1
Neihu Road, Neihu District
Taipei 11493, Taiwan

For a Complete Contact List of Our Offices in the US, China, Europe, Taiwan, and Japan:
https://www.aylanetworks.com/company/contact-us

Table of Contents

1 Introduction 1
1.1 About this Document 1
1.2 Audience 1
1.3 Multi-LAN Mode Sessions 1
2 Implementations 2
3 Notify Handler 5
3.1 Example 5
3.2 (“session”) 6
3.3 (“property”) 7
3.4 (“node”) 8
4 Reachability Handler 9
4.1 Considerations 9
5 LAN Mode Specific Error Codes 10
6 Migration Steps before iOS (4.10) and Android (4.20) 12

1 Introduction

This document provides a high-level overview of how to use LAN Mode in mobile applications. Some new methods have been added into Ayla LAN Mode to handle multiple sessions. Refer the *Ayla Mobile Library for [iOS and Ayla Mobile Library | Android]* reference guides and *AppleDoc/JavaDoc* provided with the library for more details.

1.1 About this Document

LAN Mode is a key feature in the Ayla Mobile Library to support local communications between applications and devices when they are both on the same Wi-Fi network. By enabling LAN Mode support applications, you are gaining additional benefits and services including:

- Reduced latency for all LAN Mode Enabled (LME) APIs.
- Direct property/connection status updates from the device, polling for device properties is not required.
- Secure communications between applications and modules.
- Session management for applications.
- Automatically route traffic to the device or the cloud.

1.2 Audience

This document is written for engineers and Program Managers.

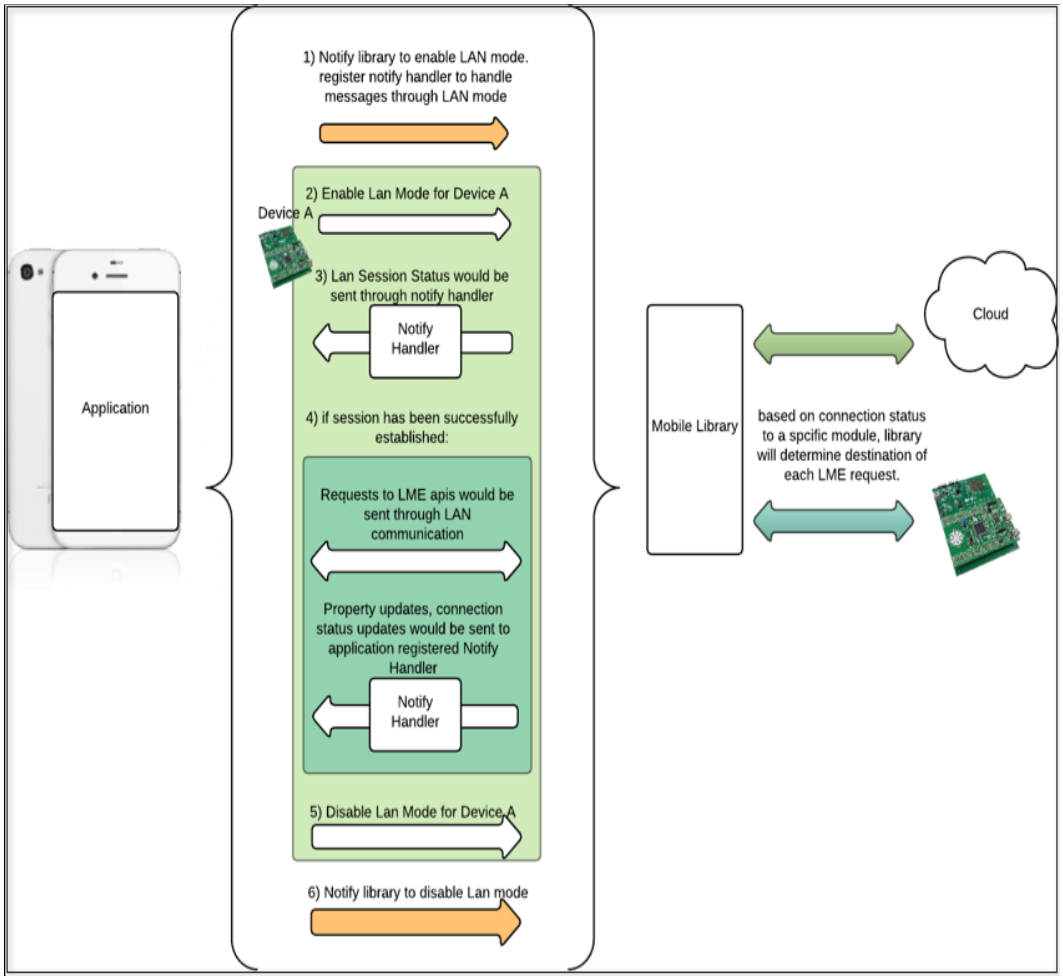
1.3 Multi-LAN Mode Sessions

Multi-LAN Mode sessions is a new enhancement introduced into mobile library in iOS version 4.10 and Android version 4.20. With this new feature, the library supports simultaneous LAN Mode sessions in the background. Applications no longer need to switch among LAN sessions because the mobile library maintains all established sessions in the background.

2 Implementations

Establishing a LAN Mode session to a module includes several steps. Figure 1 shows the basic interactions between the application and the library to initiate a new LAN connection to a device.

Figure 1. Application and Library Interactions



By default, LAN Mode is not enabled in the library. An Application needs to call a specific API to notify the library LAN Mode is supported by an application (see step 1) in Figure 1.

```
- (BOOL)application:(UIApplication *)application
didFinishLaunchingWithOptions:(NSDictionary *)launchOptions

{

//… Make sure init call to AylaNetworks has been made before enabling LAN
Mode.

 [AylaLanMode enableWithNotifyHandle:^(NSDictionary *notifyMessage) { // as
step 1

       //A block which would be called whenever a new notify message comes
in
```

```
    } ReachabilityHandle:^(NSDictionary *reachabilityMessage) {
       //A block which would be called whenever a new reachability message
comes in
    }];


or
 [AylaLanMode enable];
 [AylaLanMode registerNotifyHandle:^(NSDictionary *notifyMessage) {
     //A block which would be called whenever a new notify message comes in
  }];
 [AylaLanMode registerReachabilityHandle:^(NSDictionary
*reachabilityMessage) {
     //A block which would be called whenever a new reachability message
comes in
 }];


//...
}
```

The mobile library supports applications to provide two types of handlers:

- Notify Handler
- Reachability Handler

The **Notify Handler** is the key interface between the library and an application in LAN mode. All LAN session messages are sent through this registered handler. Set this handler in applications before enabling LAN Mode for any devices.

The **Reachability Handler** is used to notify possible reachability status updates from the library to applications. A reachability message includes two types of information:

- Device reachability
- Service reachability

AML_REACHABILITY_REACHABLE is returned if destination is treated as reachable.

NOTE AML_REACHABILITY_REACHABLE for a device doesn't mean LAN Mode communication can be established between the library and the module. Use session status message sent to notify handler to determine current LAN session status.

Device reachability is deprecated in iOS version 4.10 and Android version 4.20.

Once LAN Mode support has been enabled, the application starts enabling LAN communication to a device by calling:

```
[aDevice lanModeEnable];
```

The API initiates LAN Mode communication to the device. The connection attempt status/result is sent to the registered notify handler with a message type called "`session`".

Once a LAN session is established between the library and a module, all LME requests are redirected to the module. Also, after the module recognizes the current mobile application as a new connection, property updates are sent to the library through the local network. Those updates are translated by the library and forwarded to the application through the **Notify Handler**, with a message type called "`property`".

NOTE In gateway solutions, there is another type of message called "`node`", which returns node specific updates to the application.

One new LAN related method called `lanModeState` is added to Ayla Device class `aDevice` to support applications to query LAN session state for a specific device:

```
[aDevice lanModeState];
//DOWN - LAN session is down.
//LOCAL_REGISTRATION - Try to find local device.
//KEY_EXCHANGE - Trying to complete key exchange.
//UP - LAN session is on.
//ERROR - Errors found in LAN mode. LAN session aborted.
```

The library also supports disabling a LAN Mode session for a single device by calling:

```
[aDevice lanModeDisable];
```

or disabling LAN mode support entirely by calling:

```
[AylaLanMode disable];
```

NOTE Normally, an application doesn't need to call LAN Mode disable APIs to shut down LAN Mode sessions as the library manages the life cycle for each LAN session.

However, one exception is when the user logouts or when local user's information needs to be cleared, all LAN Mode sessions should be closed by an application. The library provides two calls to fulfill this task:

```
[AylaLanMode closeAllSessions];

//… Clean user's caches if necessary
[AylaLanMode resetFromCache]
```

3 Notify Handler

In LAN Mode, the application needs to set a notify handler to receive LAN Mode related messages from the library. The library retains one and only one **Notify Handler**. When a new **Notify Handler** is passed in, it replaces the last one held by the library.

3.1 Example

Here is an example on how to handle a notify message sent from the library.

```
[AylaLanMode registerNotifyHandler:^(NSDictionary *msg) {
  [self handleNotifyMessage:msg];
}];


- (void)handleNotifyMessage:(NSDictionary *)msg
{
   NSString *type = msg[@"type"]; //msg type
   NSString *DSN = msg[@"dsn"];  //device dsn


  int status =[msg[@"statusCode"] intValue]; //get status code(HTTP Status
code)


  if(!dsn) {
    // Lower level issue,
    // check type and status code and return to app
return;
  }


//GET managed device copy from library
//NOTE: this returned device should be READ-ONLY. Any change to this
returned object would cause additional issues.
   AylaDevice *readOnlyDevice = [AylaLanMode deviceWithDsn:DSN];


    //check message type
    if([type isEqualToString:@"session"]) {
      //update connection status
      if(status >= 200 && status < 300){
        //new LAN session established for device with the DSN
        //app can call getProperties to retrieve status from device in LAN
      }
```

```
    else {
      /**
       * status code is between 400 and 499, which means the LAN MODE
communication can not be established to the module.
            */
//LAN session is failed to be established for device with the DSN
NSString *code = msg [@"code"];  //error code
//Return status back to app if necessary
     }
  }
else if([type isEqualToString:@"property"]) {
  //Get names of updated properties from message
    NSArray *propertyNames = msg[@"properties"];
  if (require value of these properties)
       [readOnlyDevice getProperties:@{@"names":propertyNames} ….];
else //skip this update
  [readOnlyDevice notifyAcknowledge];
  }
  else if...// Handle other types of messages
}
```

From the library version 4.10 for iOS and 4.2 for Android forward, Multi-LAN Mode sessions are added into the library automatically if LAN Mode is enabled. When receiving a notify message, the application needs to start checking the Device Serial Number (DSN) to get the corresponding device for this message.

After receiving a property message type, the application must acknowledge receipt of the update. This is done implicitly with a `getProperties` call, or explicitly by calling `notifyAcknowledge`.

NOTE `[AylaLanMode notifyAcknowledge]` is deprecated from library in version 4.10. Use `[device notifyAcknowledge]` instead.

3.2 (“session”)

A message indicating whether LAN Mode session is established for the device based on DSN. After receiving a success message of this type, an application treats LAN Mode communication to this device as enabled. LME requests are directly sent to a device.

Parameters

dsn - device DSN

statusCode - LAN Mode session status

code - on failure, this code contains detailed error information

Description – Error descriptions

Example

Success message:

```
{
    dsn = AC000W00000XXXX;
    statusCode = 200;
    type = session;
}
```

Error message:

```
{
    code = 3020;
    description = "Some information can not be found for this request.";
    dsn = AC000W00000XXXX;
    statusCode = 404;
    type = session;
}
```

3.3 (“property”)

This message contains local property update information. When receiving this message, the application must:

1) call `getProperties` for the device to retrieve the update

or

2) call `notifyAckowledge` for the device to ignore the update

Parameters

dsn - device DSN

statusCode - message status

properties - an array of updated properties

Example

```
{
    dsn = AC000W00000XXXX;
    properties =     (
        "prop1"
    );
    statusCode = 200;
```

```
    type = property;
}
```

3.4 (“node”)

A node type is only available for gateway devices. A node message contents are related to the node registered to a given gateway.

Parameters

dsn - gateway or node DSN

statusCode - LAN Mode session status

conn_status - an array of updated node connection status

Example

```
{
    "conn_status" = (
    {
      dsn = VR00ZN00000XXXX;
      status = Offline;
     }
 );
  dsn = AC000W00000XXXX;
  statusCode = 200;
  type = node;
}
```

NOTE VR00ZN prefix for nodes, AC000W prefix for gateways and devices

4 Reachability Handler

The **Reachability Handler** is set by applications for receiving reachability updates for the Ayla Cloud Service (ACS) and devices. A new reachability message is sent whenever ACS reachability is changed for the phone or tablet the application is running on.

A normal reachability message looks like this:

```
{
   connectivity = 0; // service reachability
   device = 0; // LAN device reachability, deprecated in version iOS 4.10,
Android 4.20
}
```

Similar to the **Notify Handler**, the library retains only one reachability handler.

4.1 Considerations

- Ayla library only allows applications to register one notify handler. A new pass-in handler replaces the old one.
- Most time, applications only need to notify the library, which devices need to be LAN Mode enabled. The library maintains established LAN communication.
- Ayla LAN Mode support is available for all LME APIs. The library selects the proper flow for each request; an application doesn't need to know about if this request should be sent to the cloud or a device.
- In LAN Mode communications, some property `baseTypes` are ignored, they are file stream.
- String `baseTypes` are limited to 1023 characters.
- An application must have communicated with the Ayla field service at least once.
- An application is responsible for notifying the library when the library buffered information should be cleaned up. This could always be done by calling `AylaCache.clearAll()`. When a user sign-outs: an application could pass a parameter `kAylaUserLogoutClearCache` in the API `logoutWithParams` to let the library clean all caches when a sign-out attempt succeeded.

5 LAN Mode Specific Error Codes

`AylaLanModeErrorCodeNoErr = 0`

Same as AML_ERROR_OK: no error... or success!

`AylaLanModeErrorCodeRequireCloudReachability = 3000`

A method that requires access to the cloud could not establish access. Ensure the phone/tablet is not in airplane mode. If airplane mode is off, ensure the phone/tablet is connected to a WLAN AP with internet access and or the carrier plan supports data and that it is enabled. If all of the above is correct, ensure there is sufficient signal strength to the phone/tablet to enable a reliable connection.

`AylaLanModeErrorCodeLanNotEnabled = 3001`

LAN Mode has not been enabled for this device. Call the lanModeEnable method for this device.

`AylaLanModeErrorCodeInvalidConfigFile = 3002`

For future use. Not implemented.

`AylaLanModeErrorCodeLanConfigEmptyOnCloud = 3003`

There was no LAN configuration information returned from the cloud for this device. Ensure the device has connected to the cloud at least once.

`AylaLanModeErrorCodeLanConfigNotEnabled = 3004`

There was LAN configuration returned from the cloud for this device, but LAN mode support was not enabled. Ensure the device is LAN Mode enabled on the develop site.

`AylaLanModeErrorCodeUnmatchedKeyInfo = 3005`

Could not establish a LAN mode session because the device and the phone/tablet have different LAN IP Keys. The key generated by the cloud and shared with the device and the phone/tablet.

It is used to generate a unique per session key for a LAN Mode session. If the keys do not match, try power cycling the device and restarting the app. If the problem persists, disable/re-enable LAN mode on the developer site. This should not be a common problem. If it happens with any frequency, contact Ayla support.

`AylaLanModeErrorCodeMobileSessionMsgTimeOut = 3020`

The network operation timed out. Ensure a good connection from the phone/tablet to the device. Ensure the device is responding appropriately. Depending on the device (OEM host application) retrying may or not be appropriate. Check with the device OEM host application developers for the appropriate action.

`AylaLanModeErrorCodeDeviceNotSupport = 3021`

The device was not found. The library could not discover the device on the wireless LAN the phone/tablet is connected to. This could be the expected response if the device is not on the same WLAN subnet as the phone/tablet. If this is not the expected response, check device and phone/tablet connectivity are to the same WLAN AP.

`AylaLanModeErrorCodeDeviceDifferentLan = 3022`

The device is reachable but will not establish a LAN mode session because the phone/tablet is on a different subnet. Ensure the device and the phone/tablet are on the same network subnet.

`AylaLanModeErrorCodeDeviceResponseError = 3023`

This occurs when the device returns a 412 or a 503. The 412 can occur when precondition for a LAN Mode request has prerequisite that has not been satisfied. This can occur when the device does not have the LAN IP Key.

Ensure the device is connected to the network and the Ayla cloud. See AylaLanModeErrorCodeUnmatchedKeyInfo. A 503 response can occur when the device host app is busy, has insufficient resources to satisfy a request, etc. Consult with your device host application developer for the appropriate response.

`AylaLanModeErrorCodeLibraryNilDevice = 3050`

The key for the device is missing. This can happen if you create an instance of an Ayla object and then try to change it on the cloud using update or delete methods. Use the object that was returned via the create or get (or getAll, etc). These objects contain a valid key.

`AylaLanModeErrorCodeLibraryInvalidParam = 3051`

For future use. Not implemented.

`AylaLanModeErrorCodeCloudInvalidResp = 3052`

The cloud returned a non-200 error code in response to getting the LAN Mode configuration information for the device. The error code and corresponding text will be included with the error object.

6 Migration Steps before iOS (4.10) and Android (4.20)

In iOS version 4.10 and Android version 4.20, the LAN Mode flow was refactored to have multiple LAN session support. Most of the updates were made with the library scope requiring no application changes. However, some changes are required for the application for LAN Mode to work smoothly.

- (depreciated) The `[AylaLanMode notifyAcknowledge]` has been deprecated.

  The `[aDevice notifyAcknowledge]` must be called when a property update is received by the Notify Handler if the `getProperties` method is not called. Use this method to acknowledge a receipt, and then ignore the property update.

- Use the `[AylaLanMode deviceWithDsn: <DSN>]` to query property updates received through the Notify Handler.

- (depreciated) The `[AylaLanMode resume]` and `[AylaLanMode pause]` has been deprecated from the library. The library pauses and resumes LAN sessions on the behalf of application when an application moves to the background or foreground. Hence, the application no longer requires the resume and pause method calls.

- Cancellation of outstanding LAN Mode requests is included in iOS version 4.10 and Android 4.20. By calling `-cancel` on the returned NSOperation * from LME methods, all pending LAN commands belonging to that request tagged as cancelled.

- Time-out of a LAN Mode request was introduced in iOS version 4.10 and Android version 4.20. Applications receive a timeout message in the failure block if the LAN request could not be completed within a defined time interval.

- Some new methods have been added into `AylaLanMode` to handle multiple sessions.

4250 Burton Drive, Santa Clara, CA 95054
Phone: +1 408 830 9844
Fax: +1 408 716 2621