



LESHAN PLATFORM LWM2M SERVER CONNECTION OPERATION GUIDE

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一、Leshan Platform Application

1.1 About Leshan Server

Leshan platform client login URL: <https://leshan.eclipseprojects.io/#/clients>

CoAP over UDP: <coap://leshan.eclipseprojects.io:5683>

CoAP over DTLS: <coaps://leshan.eclipseprojects.io:5684>

Server Information
Here some information about this server.

COAP ENDPOINT

Server URL
Available endpoints for this server:

- `coap://leshan.eclipseprojects.io:5683`: CoAP over UDP.
- `coaps://leshan.eclipseprojects.io:5684`: CoAP over DTLS.

RPK

Server Public Key
SubjectPublicKeyInfo der encoded

If you want to connect a client using DTLS with Raw Public Key(RPK) mode, your client need to trust this key to accept DTLS connection with this server.

Elliptic Curve parameters:
`secp256r1 [NIST P-256, X9.62 prime256v1]`
`(1, 2, 840, 10045, 3, 1, 7)`
Public x coord:
`4ac3e3d65e8e6176755e4ff22d71b3ce5a5072763c4d4d753a9d23ad910eaf673`
Public y coord:
`0f50310660a22219d7e7e75e8017552b31b36a92019a7e8f3d525fd2ae5a1e40`
Hex:

X509

Server Certificate
x509v3 der encoded

If you want to connect a client using DTLS with certificate(x509) mode, your client need to trust this certificate to accept DTLS connection with this server.

Hex:
`30820228308201CFA0030201020214467C08C3733498AE06D3EB4C9948F53E19509153300A06082A8648CE3D0403023069310B30090603550406130241553113301106035504080C0A536F6D652D53746174653121301F060355040A0C18496E7465726E6574205769646769747320507479204C74643122302006035504030C196C657368616E2E65636C6970736570726F6A656374732B696F3020170B3231303730393134343431345A180F32313231303631353134343431345A3069310B30090603550406130241553113301106035504080C0A536F6D652D53746174653121301F060355040A0C18496E7465726E6574205769646769747320507479204C74643122302006035504030C196C657368616E2E65636C6970736570726F6A656374732B696F3059301306072A8648CE3D020106082A8648CE3D030107034200044AC3E3D65E8C6176755A4FF22D71B3CE5A5072763C4D753A9D23AD9`

1.2 About PSK Security Mode

Notice: The Key of PSK in security mode must be a hex code string.

Security Information

Search

ADD SECURITY INFORMATION

Endpoint ↑	Security mode	Details	Actions
jessie	psk	Identity: aaabbb Key: AAABBB	add psk

Rows per page: 10 1-1 of 1

Add Security Information

Endpoint
leshanPSK [Endpoint](#)

Security Mode
psk

Identity
867997030295686 [The IMEI of the module is recommended](#)

Key
383637393937303330323935363836 [The Key must be in HEX code format](#)

ADD CANCEL

CLIENTS SERVER SECURITY ABOUT			
Security Information		Search	ADD SECURITY INFORMATION
Endpoint ↑	Security mode	Details	Actions
jessie	psk	Identity: aaabbb Key: AAABBB	
leshanPSK	psk	Identity: 867997030295686 Key: 383637393937303330323935363836	

Rows per page: 10 1-2 of 2

1.3 Connect and Register with Leshan

■ In non-security mode:

- **AT+QSClk=0** // to disable the default deepsleep function of the modem is commanded firstly
- OK
- **AT+CPIN?**
- +CPIN: READY
- OK
- **AT+CEREG?** // Ensure that the modem is successfully registered with the network
- +CEREG: 0,1
- OK
- **AT+CGPADDR** // Make sure that the PDP is activated
- +CGPADDR: 1,100.101.5.9

- OK
- **AT+QLWCONFIG=0,leshan.eclipseprojects.io,5683,"leshan99",300,3** // Register leshan server in non-security mode
- OK
- AT+QLWREG
- OK
-
- +QLWREG: 0

CLIENTS
 SERVER
 SECURITY
 ABOUT

Registered Clients

Client Endpoint	Registration ID	Registration Date ↓	Last Update	
leshan99	c9TNjMiJ5h	Nov 5, 5:34:47 PM	Nov 5, 5:34:47 PM	
urn:imei:867578050000832	Fjwp9YcKg0	Nov 5, 5:17:41 PM	Nov 5, 5:35:33 PM	
urn:imei:864200054260196	6SetE0.JyBo	Nov 5, 5:12:39 PM	Nov 5, 5:36:00 PM	
urn:dev:os:PIK-NBS180000000	RhKjvo8yUv	Nov 5, 4:48:31 PM	Nov 5, 4:48:31 PM	
urn:imei:867578050000600	3GjxacSxAb	Nov 5, 4:42:48 PM	Nov 5, 5:36:10 PM	
nrf-352656106104774	esKzBLkjbq	Nov 5, 4:04:06 PM	Nov 5, 5:32:20 PM	zz
github_com_moonglow_ulwm2m	Pu6E3NOBry	Nov 5, 3:53:49 PM	Nov 5, 5:35:50 PM	
urn:imei:864475041093120	ZjbbKIqvJX	Nov 5, 9:32:36 AM	Nov 5, 9:33:03 AM	zz
aradtec2	xkkUT52n82	Nov 5, 9:21:06 AM	Nov 5, 9:21:06 AM	zz
Michael	K1H0JRsedN	Nov 5, 8:29:15 AM	Nov 5, 5:36:25 PM	

Rows per page: 10 1-10 of 11

■ In security mode with PSK:

For details on how to create the secure mode PSK, see Section 1.2;

- **AT+QSClk=0**
- OK
- **AT+CEREG?**
- +CEREG: 0,1
-
- OK
- **AT+CGPADDR**
- +CGPADDR: 1,100.101.5.9
-
- OK
- **AT+QLWCONFIG=0,leshan.eclipseprojects.io,5684,"leshanPSK",900,0,"867997030295686","383637393937303330323935363836"**
- OK
- **AT+QLWREG**
- OK
-
- +QLWREG: 0

LESHAN				
CLIENTS		SERVER	SECURITY	ABOUT
Registered Clients				
Client Endpoint	Registration ID	Registration Date ↓	Last Update	
leshanPSK	SzVfjPxW6e	Nov 6, 9:30:11 AM	Nov 6, 9:30:11 AM	
Michael	Ui5ERyaEps	Nov 6, 8:30:36 AM	Nov 6, 9:30:25 AM	
github_com_moonglow_ulwm2m	0Avp3ALUzh	Nov 6, 7:54:05 AM	Nov 6, 9:30:06 AM	
urn:imei:351521100330596	AbZTmzMY6p	Nov 6, 4:44:56 AM	Nov 6, 4:44:56 AM	zz
urn:imei:863593050017714	Ww34hsu0GU	Nov 5, 10:33:23 PM	Nov 5, 10:33:46 PM	
urn:dev:os:PIK-NBS180000000	tBk3oy2xuZ	Nov 5, 7:58:13 PM	Nov 5, 7:58:13 PM	
aradtec2	xkKUT52n82	Nov 5, 9:21:06 AM	Nov 5, 9:21:06 AM	zz

Rows per page: 10 1-7 of 7

Notice:

If the following error occurs during modem debugging or terminal or when connecting to the registered Leshan server, it is recommended to restart the modem or terminal.

```

➤ AT+QLWCONFIG=0,leshan.eclipseprojects.io,5684,"leshanPSK",900,0,"867997030295686","383637393937303330323935363836"
➤
➤ +CMEE ERROR: 32
  
```

LESHAN				
CLIENTS		SERVER	SECURITY	ABOUT
Registered Clients				
Client Endpoint	Registration ID	Registration Date ↓	Last Update	
leshanPSK	n6dfcsD6MF	Nov 6, 9:53:10 AM	Nov 6, 9:53:10 AM	
Michael	Ui5ERyaEps	Nov 6, 8:30:36 AM	Nov 6, 9:55:48 AM	
github_com_moonglow_ulwm2m	0Avp3ALUzh	Nov 6, 7:54:05 AM	Nov 6, 9:54:07 AM	
urn:imei:351521100330596	AbZTmzMY6p	Nov 6, 4:44:56 AM	Nov 6, 4:44:56 AM	zz
urn:imei:863593050017714	Ww34hsu0GU	Nov 5, 10:33:23 PM	Nov 5, 10:33:46 PM	
urn:dev:os:PIK-NBS180000000	tBk3oy2xuZ	Nov 5, 7:58:13 PM	Nov 5, 7:58:13 PM	
aradtec2	xkKUT52n82	Nov 5, 9:21:06 AM	Nov 5, 9:21:06 AM	zz

Rows per page: 10 1-7 of 7

As can be seen from the figure below, leshan platform has defined many objects with protocol specifications for servers, devices, firmware upgrades, etc. Note that it is recommended to change the “**timeout**” in leshan platform to 15min or longer to avoid request timeout easily.

leshanPSK

Reg. ID: n6dfcsD6MF
Registered: Nov 6, 9:53:10 AM
Updated: Nov 6, 9:53:10 AM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3**
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

Device-v1.0

CREATE

This LwM2M Object provides a range of device related information which can be queried by the LwM2M Server, and a device reboot and factory reset function.

Instance 0 :		OBS	R	W	DELETE
Manufacturer	/3/0/0	OBS	R		
Model Number	/3/0/1	OBS	R		
Serial Number	/3/0/2	OBS	R		
Firmware Version	/3/0/3	OBS	R		
Reboot	/3/0/4	EXE			
Factory Reset	/3/0/5	EXE			
Available Power Sources	/3/0/6	OBS	R		
Power Source Voltage	/3/0/7	OBS	R		
Power Source Current	/3/0/8	OBS	R		
Battery Level	/3/0/9	OBS	R		

leshanPSK

Reg. ID: n6dfcsD6MF
Registered: Nov 6, 9:53:10 AM
Updated: Nov 6, 9:53:10 AM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

- LwM2M Server /1**
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

LwM2M Server-v1.0

CREATE

This LwM2M Objects provides the data related to a LwM2M Server. A Bootstrap-Server has no such an Object Instance associated to it.

Instance 0 :		OBS	R	W	DELETE
Short Server ID	/1/0/0	OBS	R		
Lifetime	/1/0/1	OBS	R	W	
Default Minimum Period	/1/0/2	OBS	R	W	
Default Maximum Period	/1/0/3	OBS	R	W	
Disable	/1/0/4	EXE			
Disable Timeout	/1/0/5	OBS	R	W	
Notification Storing When Disabled or Offline	/1/0/6	OBS	R	W	
Binding	/1/0/7	OBS	R	W	
Registration Update Trigger	/1/0/8	EXE			

1.4 LwM2M update for Leshan Server

leshanPSK

Reg. ID: FdywaGbWMG
Registered: Nov 6, 10:14:01 AM
Updated: Nov 6, 10:14:01 AM

Timeout: 15min

Single Value: TEXT
Multi Value: JSON

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

LwM2M Server-v1.0 [CREATE](#)

This LwM2M Objects provides the data related to a LwM2M Server. A Bootstrap-Server has no such an Object Instance associated to it.

Instance 0: [OBS](#) [🔍](#) [R](#) [W](#) [DELETE](#)

Object ID	Object Name	Object Type	Operations	Instances	Mandatory	Type	Range or enumeration	Unit
/1/0/0	Short Server ID	OBS	🔍 R					
/1/0/1	Lifetime	OBS	🔍 R W	900				
/1/0/2	Default Minimum Period	OBS	🔍 R W					
/1/0/3	Default Maximum Period	OBS	🔍 R W					
/1/0/4	Disable	EXE	🔍					
/1/0/5	Disable Timeout	OBS	🔍 R W					
/1/0/6	Notification Storing When Disabled or Offline	OBS	🔍 R W					
/1/0/7	Binding	OBS	🔍 R W					
/1/0/8	Registration Update Trigger	EXE	🔍					

Click W to change lifetime.

leshanPSK

Reg. ID: p2w0rdGHuv
Registered: Nov 6, 10:26:27 AM
Updated: Nov 6, 10:27:24 AM

Timeout: 15min

Single Value: TEXT
Multi Value: JSON

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

LwM2M Server-v1.0 [CREATE](#)

This LwM2M Objects provides the data related to a LwM2M Server. A Bootstrap-Server has no such an Object Instance associated to it.

Instance 0: [OBS](#) [🔍](#) [R](#) [W](#) [DELETE](#)

Object ID	Object Name	Object Type	Operations	Instances	Mandatory	Type	Range or enumeration	Unit
/1/0/0	Short Server ID	OBS	🔍 R					
/1/0/1	Lifetime	OBS	🔍 R W	900				
/1/0/2	Default Minimum Period	OBS	🔍 R W					
/1/0/3	Default Maximum Period	OBS	🔍 R W					
/1/0/4	Disable	EXE	🔍					

Model:

Operations	Instances	Mandatory	Type	Range or enumeration	Unit
RW	Single	True	Integer		S

Description:
Specify the lifetime of the registration in seconds (see Section 5.3 Registration).

Write "Lifetime" Resource

Resource /1/0/1
Type : Integer
Units : s

Specify the lifetime of the registration in seconds (see Section 5.3 Registration).

integer
86400

WRITE CANCEL

[CLIENTS](#)
[SERVER](#)
[SECURITY](#)
[ABOUT](#)

leshanPSK

Reg. ID: p2w0rdGHuv
Registered: Nov 6, 10:26:27 AM
Updated: Nov 6, 10:29:06 AM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

LwM2M Server-v1.0

This LwM2M Objects provides the data related to a LwM2M Server. A Bootstrap-Server has no such an Object Instance associated to it.

Instance 0 : OBS R W DELETE

Short Server ID /1/0/0 OBS R

Lifetime /1/0/1

Model :

Operations	Instances	Mandatory	Type	Range or enumeration	Unit
RW	Single	True	Integer		S

Description :
Specify the lifetime of the registration in seconds (see Section 5.3 Registration).

OBS R W

86400

Default Minimum Period /1/0/2 OBS R W

Default Maximum Period /1/0/3 OBS R W

Disable /1/0/4 EXE

The COM port output logs are as follows;

```
➤ +QLWURC: "lifetime_changed",86400
➤
➤ +QLWUPDATE: 0,13317
```

The "Update" operation can be initiated by the LwM2M Server via an "Execute" operation on the "Registration Update Trigger" Resource of the LwM2M Server Object. The LwM2M Client can perform an "Update" operation to refresh the lifetime of its registration to the LwM2M Server.

Operations	Instances	Mandatory	Type	Range or enumeration	Units
RW	Single	True	String	The Possible Values Of Resource	

leshanPSK

Reg. ID: 4nPmzXjFXC

Registered: Nov 6, 11:03:55 AM

Updated: Nov 6, 11:05:27 AM

Timeout: 15min

Single Value: TEXT

Multi Value: JSON

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Connectivity Statistics /7

LwM2M Server-v1.0

CREATE

This LwM2M Objects provides the data related to a LwM2M Server. A Bootstrap-Server has no such an Object Instance associated to it.

Instance 0

OBS

R

W

DELETE

Short Server ID	/1/0/0	OBS	R		
Lifetime	/1/0/1	OBS	R	W	
Default Minimum Period	/1/0/2	OBS	R	W	
Default Maximum Period	/1/0/3	OBS	R	W	600
Disable	/1/0/4	EXE			
Disable Timeout	/1/0/5	OBS	R	W	
Notification Storing When Disabled or Offline	/1/0/6	OBS	R	W	
Binding	/1/0/7	OBS	R	W	

Model:

Operations	Instances	Mandatory	Type	Range or enumeration	Units
RW	Single	True	String	The Possible Values Of Resource Are Listed	

U

Click W. and Currently, only character "U" is supported

Binding mode operation and the COM port output logs are as follows;

➤ +QLWUPDATE: 1,35458

// Binding mode read request via Leshan

➤ +QLWREG: 0

➤ AT+QLWUPDATE=1,0

//Update binding mode to UDP mode

➤ +QLWUPDATE: 60879

➤ OK

➤ +QLWUPDATE: 0,60879

// Binding mode writes updates via Leshan

➤ +QLWURC: "binding_changed",U

二、LwM2M Objects Related operations

2.1 Add Objects and Object/instances for Leshan Server

IPSO Object	ObjectID	ResourceName	ResourceID	AccessType	The Sample Data
Temperature	3303	SensorValue	5700	R	28.3
		Units	5701	R	Cel
		MinRangeValue	5603	R	-55
		MaxRangeValue	5604	R	120
Humidity	3304	SensorValue	5700	R	41
		Units	5701	R	%rh
		MinRangeValue	5603	R	0
		MaxRangeValue	5604	R	100
Actuation	3306	On/Off	5850	R,W	ON

		Dimmer	5851	R,W	87
		ApplicationType	5750	R,W	AirPressure

■ Add Object and Resource:

- AT+QLWCONFIG=0,leshan.eclipseprojects.io,5684,"leshanPSK",900,0,"867997030295686","383637393937303330323935363836"
- OK
- AT+QLWREG
- OK
-
- +QLWREG: 0
- AT+QLWADDOBJ=3304,0,4,5700,5701,5603,5604
- OK
-
- +QLWADDOBJ: 0
-
- +QLWURC: "ping",0
- AT+QLWADDOBJ=3306,0,3,5850,5851,5750
- OK
-
- +QLWADDOBJ: 0
-
- +QLWURC: "ping",0
- AT+QLWADDOBJ=3303,0,4,5700,5701,5603,5604
- OK
-
- +QLWADDOBJ: 0
-
- +QLWURC: "ping",0

 LwM2M Server /1	Firmware Version	/3/0/3	OBS		R		▼
 LwM2M Access Control /2	Reboot	/3/0/4	EXE				▼
 Device /3	Factory Reset	/3/0/5	EXE				▼
 Connectivity Monitoring /4	Available Power Sources	/3/0/6	OBS		R		▼
 Firmware Update /5	Power Source Voltage	/3/0/7	OBS		R		▼
 Location /6	Power Source Current	/3/0/8	OBS		R		▼
 Connectivity Statistics /7	Battery Level	/3/0/9	OBS		R		▼
 Temperature /3303	Memory Free	/3/0/10	OBS		R		▼
 Humidity /3304	Error Code	/3/0/11	OBS		R		▼
 LWM2M Cellular Connecti... /10	Reset Error Code	/3/0/12	EXE				▼
 Actuation /3306	Current Time	/3/0/13	OBS		R	W	▼
 LWM2M APN Connection ... /11	UTC Offset	/3/0/14	OBS		R	W	▼
 LWM2M Bearer Selection	Timezone	/3/0/15	OBS		R	W	▼
	Supported Binding and Modes	/3/0/16	OBS		R		▼
	Device Type	/3/0/17	OBS		R		▼
	Hardware Version	/3/0/18	OBS		R		▼

2.2 Observe Operation

LESHAN

CLIENTS
SERVER
SECURITY
ABOUT

leshanPSK

Reg. ID: dLsORbJTdz
Registered: Nov 6, 12:49:15 PM
Updated: Nov 6, 12:50:05 PM
Timeout: 15min
Single Value: TEXT
Multi Value: JSON

LwM2M Server /1
LwM2M Access Control /2
Device /3
Connectivity Monitoring /4
Firmware Update /5
Location /6

Temperature-v1.0
CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0:
OBS
R
W
DELETE

Min Measured Value	/3303/0/5601	OBS	R
Max Measured Value	/3303/0/5602	OBS	R
Min Range Value	/3303/0/5603	OBS	R
Max Range Value	/3303/0/5604	OBS	R
Reset Min and Max Measured Values	/3303/0/5605	EXE	
Sensor Value	/3303/0/5700	OBS	R
Sensor Units	/3303/0/5701	OBS	R

Updated: Nov 6, 3:41:22 PM
Timeout: 15min
Single Value: TEXT
Multi Value: JSON

LwM2M Server /1
LwM2M Access Control /2
Device /3
Connectivity Monitoring /4
Firmware Update /5
Location /6
Connectivity Statistics /7
Temperature /3303
Humidity /3304

Instance 0:
OBS
R
W
DELETE

Min Measured Value	/3303/0/5601	OBS	R
Max Measured Value	/3303/0/5602	OBS	R
Min Range Value	/3303/0/5603	OBS	R
Max Range Value	/3303/0/5604	OBS	R
Reset Min and Max Measured Values	/3303/0/5605	EXE	
Sensor Value	/3303/0/5700	OBS	R

Model:

Operations	Instances	Mandatory	Type	Range or enumeration	Units
R	Single	True	Float		

Description:
Last or Current Measured Value from the Sensor.

OBS
R

Click "OBS" to observe request

```

➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 2262
➤ OK
➤ +QLWUPDATE: 0,2262
➤ +QLWURC: "observe",47702,0,3303,0,5700 //The Server initiates an observation request for resource (3303/0/5700) changes
➤ AT+QLWOBRSRSP=47702,1,3303,0,5700,4,4,"28.3",0 // In response to observe
➤ OK
➤ +QLWOBRSRSP: 0 //Observed successfully

```

leshanPSK

Reg. ID: c7ZPhGfuAR

Registered: Nov 6, 3:47:29 PM

Updated: Nov 6, 3:49:05 PM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

Temperature-v1.0 CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0 : OBS R W DELETE

Min Measured Value	/3303/0/5601	OBS R
Max Measured Value	/3303/0/5602	OBS R
Min Range Value	/3303/0/5603	OBS R
Max Range Value	/3303/0/5604	OBS R
Reset Min and Max Measured Values	/3303/0/5605	EXE

Sensor Value /3303/0/5700

Model :

Operations	Instances	Mandatory	Type	Range or enumeration	Units
R	Single	True	Float		

Description :

Last or Current Measured Value from the Sensor.

OBS

R

28.3

modem report value succeeded

2.3 Read Operation

Updated: Nov 6, 3:49:05 PM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Connectivity Statistics /7

Temperature /3303

Humidity /3304

Instance 0 : OBS R W DELETE

Min Measured Value	/3303/0/5601	OBS		R	
Max Measured Value	/3303/0/5602	OBS		R	
Min Range Value	/3303/0/5603	OBS		R	
Max Range Value	/3303/0/5604	OBS		R	
Reset Min and Max Measured Values	/3303/0/5605	EXE			
Sensor Value	/3303/0/5700	OBS		R	

Model :

Operations	Instances	Mandatory	Type	Range or enumeration	Units
R	Single	True	Float		

Description :

Last or Current Measured Value from the Sensor.

Sensor Units

/3303/0/5701

OBS

R

28.3

Click "R" to read request

- ```
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 1784
➤
➤ OK
➤
➤ +QLWURC: "read",51998,3303,0,5700 //The LwM2M Client has registered to Leshan Server successfully
and a read request related to 3303/0/5700 has been issued from the LwM2M Server.
➤
➤ +QLWUPDATE: 0,1784
➤ AT+QLWRDRSP=51998,1,3303,0,5700,4,4,"27.2",0 // The response to read
➤ OK
➤
➤ +QLWRDRSP: 0
```

Updated: Nov 6, 4:02:40 PM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Connectivity Statistics /7

Temperature /3303

Humidity /3304

Instance 0 : OBS R W DELETE

Min Measured Value /3303/0/5601

Max Measured Value /3303/0/5602

Min Range Value /3303/0/5603

Max Range Value /3303/0/5604

Reset Min and Max Measured Values /3303/0/5605

Sensor Value /3303/0/5700

Model :

| Operations | Instances | Mandatory | Type  | Range or enumeration | Units |
|------------|-----------|-----------|-------|----------------------|-------|
| R          | Single    | True      | Float |                      |       |

Description :

Last or Current Measured Value from the Sensor.

Sensor Units /3303/0/5701

27.1999999

## 2.4 Write Operation

leshanPSK

Reg. ID: 09r7oWwu27

Registered: Nov 6, 4:00:16 PM

Updated: Nov 6, 4:02:40 PM

Timeout : 15min

Single Value : TEXT

Multi Value : JSON

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Connectivity Statistics /7

Actuation-v1.0 CREATE

This IPSO object is dedicated to remote actuation such as ON/OFF action or dimming. A multi-state output can also be described as a string. This is useful to send pilot wire orders for instance. It also provides a resource to reflect the time that the device has been switched on.

Instance 0 : OBS R W DELETE

Application Type /3306/0/5750

Model :

| Operations | Instances | Mandatory | Type   | Range or enumeration | Units |
|------------|-----------|-----------|--------|----------------------|-------|
| RW         | Single    | False     | String |                      |       |

Description :

The application type of the sensor or actuator as a string depending on the use case.

Click W, write the value and COM print the value

On/Off /3306/0/5850

Dimmer /3306/0/5851

On time /3306/0/5852

Muti-state Output /3306/0/5853

Write "Application Type" Resource

Resource /3306/0/5750

Type : String

The application type of the sensor or actuator as a string depending on the use case.

string

AirPressure

WRITE CANCEL

➤ AT+QLWUPDATE=1,0

➤ +QLWUPDATE: 33163

➤

➤ OK

➤

➤ +QLWUPDATE: 0,33163

➤

➤ +QLWURC: "write",14822,3306,0,5750,1,11,"AirPressure",0 // Returns the result of the write operation

## 2.5 Notify Operation

### Crucial Note:

The Lwm2m Client has registered to Leshan Server successfully, And the leshan's OBS is triggered manually and the modem responds to Observe, or "AUTO\_ACK" automatically responds to observe, make sure that objects has been observed successfully by the server.

### ■ OBS trigger manually method:

Refer to Section 2.2 for manually triggering OBS of Leshan's Object and responding to Observe via modem. The modem will remember and save the Observe and then send data through notify.

CLIENTS

SERVER

SECURITY

ABOUT

leshanPSK

Reg. ID: Gd0PyrSftr

Registered: Nov 8, 5:52:57 PM

Updated: Nov 8, 5:53:36 PM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Temperature-v1.0

CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0

OBS

R

W

DELETE

|                                   |              |     |   |
|-----------------------------------|--------------|-----|---|
| Min Measured Value                | /3303/0/5601 | OBS | R |
| Max Measured Value                | /3303/0/5602 | OBS | R |
| Min Range Value                   | /3303/0/5603 | OBS | R |
| Max Range Value                   | /3303/0/5604 | OBS | R |
| Reset Min and Max Measured Values | /3303/0/5605 | EXE |   |
| Sensor Value                      | /3303/0/5700 | OBS | R |
| Sensor Units                      | /3303/0/5701 |     | R |

CLIENTS

SERVER

SECURITY

ABOUT

leshanPSK

Reg. ID: Gd0PyrSftr

Registered: Nov 8, 5:52:57 PM

Updated: Nov 8, 5:53:36 PM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Temperature-v1.0

CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0

OBS

R

W

DELETE

|                                   |              |     |   |
|-----------------------------------|--------------|-----|---|
| Min Measured Value                | /3303/0/5601 | OBS | R |
| Max Measured Value                | /3303/0/5602 | OBS | R |
| Min Range Value                   | /3303/0/5603 | OBS | R |
| Max Range Value                   | /3303/0/5604 | OBS | R |
| Reset Min and Max Measured Values | /3303/0/5605 | EXE |   |
| Sensor Value                      | /3303/0/5700 | OBS | R |
| Sensor Units                      | /3303/0/5701 | OBS | R |

```

➤ AT+QLWUPDATE=1,0
➤
➤ +QLWUPDATE: 64485
➤
➤ OK
➤
➤ +QLWURC: "observe",50320,0,3303,0,5701
➤
➤ +QLWUPDATE: 0,64485
➤ AT+QLWOBSRSP=50320,1,3303,0,5701,1,6,"degree",0
➤
➤ OK
➤
➤ +QLWOBSRSP: 0
➤
➤ +QLWURC: "observe",50320,0,3303,0,5701
➤ AT+QLWNOTIFY=3303,0,5701,1,7,"Celsius",0

```

➤  
➤ OK  
➤  
➤ +QLWNOTIFY: 0

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**leshanPSK**

Reg. ID: Gd0PyrSftr  
Registered: Nov 8, 5:52:57 PM  
Updated: Nov 8, 5:53:36 PM

Timeout : 15min

Single Value : TLV

Multi Value : TLV

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

### Temperature-v1.0

CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0 : OBS R W DELETE

|                                   |              |     |   |
|-----------------------------------|--------------|-----|---|
| Min Measured Value                | /3303/0/5601 | OBS | R |
| Max Measured Value                | /3303/0/5602 | OBS | R |
| Min Range Value                   | /3303/0/5603 | OBS | R |
| Max Range Value                   | /3303/0/5604 | OBS | R |
| Reset Min and Max Measured Values | /3303/0/5605 | EXE |   |
| Sensor Value                      | /3303/0/5700 | OBS | R |
| Sensor Units                      | /3303/0/5701 | OBS | R |

Celsius

## ■ Objects automatically response observe method:

Firstly,configure AUTO\_ACK,1 with the AT Command “AT+QLWCFG”.Then,the modem automatically acquires and responds to the Observe request by triggering the OBS in object. Finally, data is sent through notify.

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**leshanPSK**

Reg. ID: G3iq0zKp0A  
Registered: Nov 8, 6:24:20 PM  
Updated: Nov 8, 6:25:21 PM

Timeout : 15min

Single Value : TLV

Multi Value : TLV

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

### Humidity-v1.0

CREATE

This IPSO object should be used with a humidity sensor to report a humidity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the humidity sensor. An example measurement unit is relative humidity as a percentage.

Instance 0 : OBS R W DELETE

|                                   |              |     |   |
|-----------------------------------|--------------|-----|---|
| Min Measured Value                | /3304/0/5601 | OBS | R |
| Max Measured Value                | /3304/0/5602 | OBS | R |
| Min Range Value                   | /3304/0/5603 | OBS | R |
| Max Range Value                   | /3304/0/5604 | OBS | R |
| Reset Min and Max Measured Values | /3304/0/5605 | EXE |   |
| Sensor Value                      | /3304/0/5700 | OBS | R |
| Sensor Units                      | /3304/0/5701 | OBS | R |

Click and trigger after configuration

➤ **AT+QLWCFG?**  
➤ +QLWCFG: "auto\_ack",0  
➤  
➤ OK  
➤ **AT+QLWCFG="auto\_ack",1**  
➤ OK  
➤ **AT+QLWCFG?**  
➤ +QLWCFG: "auto\_ack",1

```
➤ OK
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 64487
➤
➤ OK
➤
➤
➤ +QLWUPDATE: 1,64487
➤
➤
➤ +QLWREG: 0
➤
➤
➤ +QLWURC: "observe",28539,0,3304,0,5701
➤ AT+QLWNOTIFY=3304,0,5701,1,3,"%RH",0
➤ OK
➤
➤
➤ +QLWNOTIFY: 0
```

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---

**leshanPSK**

Reg. ID: IKxJJSQt2x  
Registered: Nov 8, 6:02:51 PM  
Updated: Nov 8, 6:02:51 PM  
Timeout : 15min  
Single Value : TLV  
Multi Value : TLV

- LwM2M Server /1
- LwM2M Access Control /2
- Device /3
- Connectivity Monitoring /4
- Firmware Update /5
- Location /6

### Humidity-v1.0 CREATE

This IPSO object should be used with a humidity sensor to report a humidity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the humidity sensor. An example measurement unit is relative humidity as a percentage.

| Instance 0 :                      |              | OBS | R | W | DELETE |
|-----------------------------------|--------------|-----|---|---|--------|
| Min Measured Value                | /3304/0/5601 | OBS | R |   |        |
| Max Measured Value                | /3304/0/5602 | OBS | R |   |        |
| Min Range Value                   | /3304/0/5603 | OBS | R |   |        |
| Max Range Value                   | /3304/0/5604 | OBS | R |   |        |
| Reset Min and Max Measured Values | /3304/0/5605 | EXE |   |   |        |
| Sensor Value                      | /3304/0/5700 | OBS | R |   |        |
| Sensor Units                      | /3304/0/5701 | OBS | R |   | %RH    |

## 2.6 Excute Operation

**Notice:**

First, you need to add the corresponding executable object and resource, then enter the content and click EXE to take effect.

```
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 5722
➤
➤ OK
➤
➤ +QLWUPDATE: 0,5722
➤ AT+QLWADDOBJ=3304,0,1,5605 //Add executable object and resource
➤ OK
➤
```

```
➤ +QLWADDOBJ: 0
➤
➤ +QLWURC: "execute",37557,3304,0,5605
➤
➤ AT+QLWEXERSP=37557,2 //Step:3 Need for quick response
➤ OK
➤
➤ +QLWEXERSP: 0
```

leshanPSK

Reg. ID: tX075Wr8QO

Registered: Nov 9, 11:19:53 AM

Updated: Nov 9, 11:23:57 AM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Humidity-v1.0

CREATE

This IPSO object should be used with a humidity sensor to report a humidity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the humidity sensor. An example measurement unit is relative humidity as a percentage.

Instance 0

OBS

R

W

DELETE

|                                   |              |     |  |   |
|-----------------------------------|--------------|-----|--|---|
| Min Measured Value                | /3304/0/5601 | OBS |  | R |
| Max Measured Value                | /3304/0/5602 | OBS |  | R |
| Min Range Value                   | /3304/0/5603 | OBS |  | R |
| Max Range Value                   | /3304/0/5604 | OBS |  | R |
| Reset Min and Max Measured Values | /3304/0/5605 | EXE |  |   |
| Sensor Value                      | /3304/0/5700 | OBS |  | R |
| Sensor Units                      | /3304/0/5701 | OBS |  | R |

Enter the result of the request response

step:2

step:1

## 2.7 Up\_report Sample Data

```
//Firstly,OBS in Object3303 must be triggered
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 16919
➤
➤ OK
➤
➤ +QLWUPDATE: 0,16919
➤ AT+QLWNOTIFY=3303,0,5603,4,3,"-55",0
➤ OK
➤
➤ +QLWNOTIFY: 1 //The Observe request response timed out
```

If the above error occurs during execution, you should re-click OBS in this object.

```
//Firstly,OBS in Object3303 must be triggered
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 16919
➤
➤ OK
➤
➤ +QLWUPDATE: 0,16919
➤ AT+QLWNOTIFY=3303,0,5603,4,3,"-55",0
➤ OK
```

```
➤
➤ +QLWNOTIFY: 0
➤ AT+QLWNOTIFY=3303,0,5604,4,3,"120",0
➤ OK
➤ AT+QLWNOTIFY=3303,0,5701,1,3,"Cel",0
➤ OK
➤
➤ +QLWNOTIFY: 0
➤
➤ +QLWNOTIFY: 0
➤ AT+QLWNOTIFY=3303,0,5700,4,3,"28.3",0
➤ OK
➤
➤ +QLWNOTIFY: 0
```

leshanPSK

Reg. ID: zH4zFQ9hrs

Registered: Nov 9, 9:45:26 AM

Updated: Nov 9, 9:49:12 AM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Temperature-v1.0

CREATE

This IPSO object should be used with a temperature sensor to report a temperature measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the temperature sensor. An example measurement unit is degrees Celsius.

Instance 0

OBS

R

W

DELETE

|                                   |              |     |   |                    |
|-----------------------------------|--------------|-----|---|--------------------|
| Min Measured Value                | /3303/0/5601 | OBS | R |                    |
| Max Measured Value                | /3303/0/5602 | OBS | R |                    |
| Min Range Value                   | /3303/0/5603 | OBS | R | -55                |
| Max Range Value                   | /3303/0/5604 | OBS | R | 120                |
| Reset Min and Max Measured Values | /3303/0/5605 | EXE |   |                    |
| Sensor Value                      | /3303/0/5700 | OBS | R | 28.299999237060547 |
| Sensor Units                      | /3303/0/5701 | OBS | R | Cel                |

//Firstly,OBS in Object3304 must be triggered

```
➤ AT+QLWUPDATE=1,0
➤ +QLWUPDATE: 3914
➤
➤ OK
➤
➤ +QLWUPDATE: 0,3914
➤ AT+QLWNOTIFY=3304,0,5603,4,1,"0",0
➤ OK
➤
➤ +QLWNOTIFY: 0
➤ AT+QLWNOTIFY=3304,0,5604,4,3,"100",0
➤ OK
➤
➤ +QLWNOTIFY: 0
➤ AT+QLWNOTIFY=3304,0,5701,1,3,"%rh",0
➤ OK
➤
➤ +QLWNOTIFY: 0
```

- **AT+QLWNOTIFY=3304,0,5700,4,2,"41",0**
- OK
- 
- +QLWNOTIFY: 0

leshanPSK

Reg. ID: zH4zFQ9hrs

Registered: Nov 9, 9:45:26 AM

Updated: Nov 9, 9:46:25 AM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Humidity-v1.0

CREATE

This IPSO object should be used with a humidity sensor to report a humidity measurement. It also provides resources for minimum/maximum measured values and the minimum/maximum range that can be measured by the humidity sensor. An example measurement unit is relative humidity as a percentage.

Instance 0:

OBS

R

W

DELETE

|                                   |              |     |   |     |
|-----------------------------------|--------------|-----|---|-----|
| Min Measured Value                | /3304/0/5601 | OBS | R |     |
| Max Measured Value                | /3304/0/5602 | OBS | R |     |
| Min Range Value                   | /3304/0/5603 | OBS | R | 0   |
| Max Range Value                   | /3304/0/5604 | OBS | R | 100 |
| Reset Min and Max Measured Values | /3304/0/5605 | EXE |   |     |
| Sensor Value                      | /3304/0/5700 | OBS | R | 41  |
| Sensor Units                      | /3304/0/5701 | OBS | R | %RH |

**//Firstly,OBS in Object3304 must be triggered**

- **AT+QLWUPDATE=1,0**
- +QLWUPDATE: 3062
- 
- OK
- 
- +QLWUPDATE: 0,3062
- **AT+QLWNOTIFY=3306,0,5850,5,1,"1",0**
- OK
- 
- +QLWNOTIFY: 0
- **AT+QLWNOTIFY=3306,0,5851,3,1,"87",0**
- OK
- 
- +QLWNOTIFY: 0
- **AT+QLWNOTIFY=3306,0,5750,1,11,"AirPressure",0**
- OK
- 
- +QLWNOTIFY: 0

leshanPSK

Reg. ID: GD9dqmwyYj

Registered: Nov 9, 9:59:45 AM

Updated: Nov 9, 9:59:45 AM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

Actuation-v1.0

CREATE

This IPSO object is dedicated to remote actuation such as ON/OFF action or dimming. A multi-state output can also be described as a string. This is useful to send pilot wire orders for instance. It also provides a resource to reflect the time that the device has been switched on.

Instance 0:

OBS

R

W

DELETE

|                   |              |     |   |   |             |
|-------------------|--------------|-----|---|---|-------------|
| Application Type  | /3306/0/5750 | OBS | R | W | AirPressure |
| On/Off            | /3306/0/5850 | OBS | R | W | true        |
| Dimmer            | /3306/0/5851 | OBS | R | W | 87          |
| On time           | /3306/0/5852 | OBS | R | W |             |
| Muti-state Output | /3306/0/5853 | OBS | R | W |             |

## 2.8 Delete LwM2M Object and Deregister

```

➤ AT+QLWCONFIG=0,leshan.eclipseprojects.io,5684,"leshanPSK",900,0,"867997030295686","383637393937303330323935363836"
➤ OK
➤ AT+QLWREG // Register the Leshan server
➤ OK
➤
➤ +QLWREG: 0
➤ AT+QLWADDOBJ=3303,0,1,5701 //Add objects and resources
➤ OK
➤
➤ +QLWADDOBJ: 0
➤ AT+QLWDELOBJ=3303 // Delete the object3303
➤ OK
➤
➤ +QLWDELOBJ: 0
➤
➤ +QLWURC: "ping",0
➤ AT+QLWDEREG // Deregister the Leshan server
➤ OK
➤
➤ +QLWDEREG: 0

```

## 三、About Object 19

Leshan platform LwM2M server supports object 19, but based on testing, to create instance 1 is recommended.

leshanPSK

Reg. ID: rV9chiro16

Registered: Nov 9, 1:50:09 PM

Updated: Nov 9, 1:51:54 PM

Timeout: 15min

Single Value: TLV

Multi Value: TLV

LwM2M Server /1

LwM2M Access Control /2

Device /3

Connectivity Monitoring /4

Firmware Update /5

Location /6

BinaryAppDataContainer-v1.0

CREATE

This LwM2M Objects provides the application service data related to a LwM2M Server, eg. Water meter data.

There are several methods to create instance to indicate the message direction based on the negotiation between Application and LwM2M. The Client and Server should negotiate the instance(s) used to exchange the data. For example:

- Using a single instance for both directions communication, from Client to Server and from Server to Client.
- Using an instance for communication from Client to Server and another one for communication from Server to Client
- Using several instances

Instance 1

OBS

R

W

DELETE

|                    |         |     |  |   |   |  |
|--------------------|---------|-----|--|---|---|--|
| Data               | /19/1/0 | OBS |  | R | W |  |
| Data Priority      | /19/1/1 | OBS |  | R | W |  |
| Data Creation Time | /19/1/2 | OBS |  | R | W |  |
| Data Description   | /19/1/3 | OBS |  | R | W |  |
| Data Format        | /19/1/4 | OBS |  | R | W |  |
| App ID             | /19/1/5 | OBS |  | R | W |  |

## 四、Notes

1. To add objects and resources that comply with the IPSO standard specifications《IPSO-Smart-Objects-Starter-Pack》, It's also recommended.
2. This example was tested using Quectel's BC66, using the standard LwM2M AT Command to connect to the Leshan server.
3. If the server does not respond during the operation, it is recommended to issue the update request "AT+QLWUPDATE".
4. If there are exceptions that you cannot resolve, it is recommended that you restart the device or module, reconnect to leshan server, and test patiently.