

Signal Delay with Lua

For delaying the response of command execution, Lua runner could be used as one of the solutions. In this example IEC104 and Modbus TCP are used. IEC104 protocol sends the command to Modbus and Lua signals and the results are represented as two separate signals. To create Excel configuration for WCC Lite in this case device sheet should look like this:

| name | device_alias | enable | protocol | execution_type | error_limit | ip | id | mode | scan_rate_ms | retry_count | timeout_ms | bind_address | host | port | asdu_size | cot_size | ioa_size | rwt | swt | t1 | t2 | t3 | time_sync | message_size | cache_size |
|---------------------|--------------|--------|-----------------------|----------------|-------------|----|----|------|--------------|-------------|------------|--------------|------|------|-----------|----------|----------|-----|-----|----|----|----|-----------|--------------|------------|
| Modbus TCP device | Modbus_TCP | 1 | Modbus TCP | | | | 1 | tcp | 300 | 3 | 10000 | 0.0.0.0 | | 502 | | | | | | | | | | | |
| IEC104 SCADA system | IEC104_SCADA | 1 | IEC 60870-5-104 slave | | | | | | | | | 0.0.0.0 | | 2404 | 2 | 2 | 3 | 8 | 12 | 15 | 10 | 20 | 1 | 249 | 100 |
| LUA device | LUA | 1 | Lua runner | signal | 0 | | | | | | | | | | | | | | | | | | | | |

In the fields marked red, for Modbus TCP enter IP address of Wi-Fi connected to computer and for IEC104 enter IP address of WCC Lite. Map the signals as shown below:

| signal_name | device_alias | signal_alias | source_device_alias | source_signal_alias | execute | enable | gi | log | number_type | job_todo | tag_job_todo | common_address | info_address | data_type |
|----------------|--------------|--------------|---------------------|---------------------|---------|--------|----|-----|-------------|----------|--------------|----------------|--------------|-----------|
| Result_modbus | Modbus_TCP | result | LUA | result | | 1 | | 1 | SIGNED16 | 3;0;1 | 3;0;1 | | | |
| command LUA | LUA | command | IEC104_SCADA | Command | 1 | | | 1 | | | | | | |
| result LUA | LUA | result | | | | | | 1 | | | | | | |
| Command IEC104 | IEC104_SCADA | Command | LUA | command | | 1 | 1 | 1 | | | | 1 | 1 | 50 |

IEC104 SCADA will send command which will then go to Lua signal. Lua signal will send the response back to IEC104 SCADA and to Modbus TCP result signal.

For delaying signal response, Lua script could be written in many ways, however the most simple and effective one is to determine a wait time before publishing signal values to result signals. So in this case Lua script will look like this:

```

local saved = get(signals.result)--getting result signal which is equated to new variable 'saved'
local command = get(signals.command) --getting command signal which is equated to new variable 'command'

if not command then
    if saved then
        publish(signals.result, saved.value)--this value is published to result signals and saved value
    end
    return 0
end

if string.find(command.attributes, "nt") or string.find(command.attributes, "iv") or
string.find(command.attributes, "ov") then
    --searching if signal has negative attributes
    if command then
        command.attributes = "cot=7,cotn"--equates negative cot values to response signal attributes
        publish(signals.command, command)-- and publishes value to command signals and value
        if saved then
            publish(signals.result, saved.value)--restores saved value to result signals
        end
        return 0
    end
else
    if command then
        command.attributes = "cot=7"
        publish(signals.command, command)--in this cycle command value is being returned as well as
        --cot7 and cot10 values in case given signal is command type and has no negative attributes
        command.attributes = "cot=10"
        publish(signals.command, command) --publishes response to the command
        save(signals.result, command.value)--command value is being saved to result signal
    end
    local sleepTime = 30
    sleep(sleepTime) --before publishing values to result signals script waits 30s
    publish(signals.result, command.value)--in this row values are being published to result signals

```

end



After entering values to empty Excel configuration fields, upload the configuration to WCC Lite (it should upload without any errors):

| | | | | | |
|---------------|------------------|-----------|----------------------|---------------|-------|
| PROTOCOL HUB | STATUS | SYSTEM | SERVICES | NETWORK | USERS |
| CONFIGURATION | IMPORTED SIGNALS | EVENT LOG | PROTOCOL CONNECTIONS | SCRIPT-RUNNER | |

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file: 1  No file chosen 2 

PLC (IEC-61499) Boot file: No file chosen


IEC61850 Client model file: No file chosen

IEC61850 Server model file: No file chosen

Upload Lua script to script runner and press start. After this, **Status** should show *Running* and script process number will appear.

| | | | | | | |
|---------------|------------------|-----------|----------------------|---------------|-------|---------------|
| PROTOCOL HUB | STATUS | SYSTEM | SERVICES | NETWORK | USERS | LOGOUT (ROOT) |
| CONFIGURATION | IMPORTED SIGNALS | EVENT LOG | PROTOCOL CONNECTIONS | SCRIPT-RUNNER | | |


Script-Runner

| LUA SCRIPT INSTANCE CONTROL | | | |
|-----------------------------|----------------|---------|--|
| Script Configuration | Script process | Status | Script File |
| control1 | - | Stopped | No Script provided 1  |
| | | | <input type="button" value="Upload Script"/> <input type="button" value="Waiting for script"/> |

SAVED VALUE CLEARING

| | | | | | | |
|---------------|------------------|-----------|----------------------|---------------|-------|---------------|
| PROTOCOL HUB | STATUS | SYSTEM | SERVICES | NETWORK | USERS | LOGOUT (ROOT) |
| CONFIGURATION | IMPORTED SIGNALS | EVENT LOG | PROTOCOL CONNECTIONS | SCRIPT-RUNNER | | |

Script-Runner

| LUA SCRIPT INSTANCE CONTROL | | | |
|-----------------------------|----------------|---------|---|
| Script Configuration | Script process | Status | Script File |
| LUA | - | Stopped | LUA.lua |
| | | | <input type="button" value="Upload Script"/> <input type="button" value="Start"/> 2  |

SAVED VALUE CLEARING

Open Vinci as IEC104 master, enter IP address of WCC Lite and start communication. Then open another Vinci window and connect Modbus TCP master – select Modbus TCP slave in Vinci and enter the same IP address as set in Excel configuration for Modbus device. With both communications running check **Protocol connections** on WCC Lite web interface, it should show *connected*. From IEC104 Vinci window go to *System* tab. Select command determined in the Excel configuration (50), IOA (1) and value (eg. 2).

Tags

System

Channel

ASDU: 1

Originator: 1

Test

P/N

General interrogation

Send

QOI: 20

Counter interrogation

Send

FRZ: 0

RQT: 0

Commands

Read

Test

Clock synchronization

Send

IV

SM

SB

PC time

2023-08-10 11:10:44

Custom Command

Type: C_SE_NC_1(50)

IOA: 1

Value: 2

QU/QL: 0

Cause: Activation

SBO delay: 0

Select

Execute

Execute the command and check *Imported signals*:

| IMPORTED SIGNALS | | | | | | |
|---------------------|----------------|-------|-------|-------|---|------------------------|
| Device | Signal | Value | Units | State | Attributes | Time |
| | | | | | | |
| Modbus TCP device | Result_modbus | 0 | | | | 2023-08-10 11:10:03.32 |
| IEC104 SCADA system | Command IEC104 | 2 | | cmd | asdu=1,cot=6,ioa=1,org=1,ql=0,ty=pe=float | 2023-08-10 11:35:40.18 |
| LUA device | command LUA | 2 | | cmd | asdu=1,cot=6,ioa=1,org=1,ql=0,ty=pe=float | 2023-08-10 11:35:40.18 |
| LUA device | result LUA | 3 | | | | 2023-08-10 10:04:14.94 |

After 30s result signals will now have the same value:

| IMPORTED SIGNALS | | | | | | |
|---------------------|----------------|-------|-------|-------|---|------------------------|
| Device | Signal | Value | Units | State | Attributes | Time |
| | | | | | | |
| Modbus TCP device | Result_modbus | 2 | | | | 2023-08-10 11:36:10.52 |
| IEC104 SCADA system | Command IEC104 | 2 | | cmd | asdu=1,cot=6,ioa=1,org=1,ql=0,ty=pe=float | 2023-08-10 11:35:40.18 |
| LUA device | command LUA | 2 | | cmd | asdu=1,cot=6,ioa=1,org=1,ql=0,ty=pe=float | 2023-08-10 11:35:40.18 |
| LUA device | result LUA | 2 | | | | 2023-08-10 11:36:10.20 |

Signal delay could be used as a tool to synchronize signals so all the values are received at the same time. It can also be used to schedule commands or tasks when delay is required. Since Lua is one of the faster programming languages, it is the most effective instrument to be used in such matters.

[Configuration --> Download](#)

[Lua script --> Download](#)

🔄Revision #9

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