

# OPC UA: Lowered Performance due to Encryption

The fact that communication between the OPC UA server and the OPC UA client can now be encrypted is a feature that also has disadvantages.

This affects establishing connections as well as power requirements during operation.

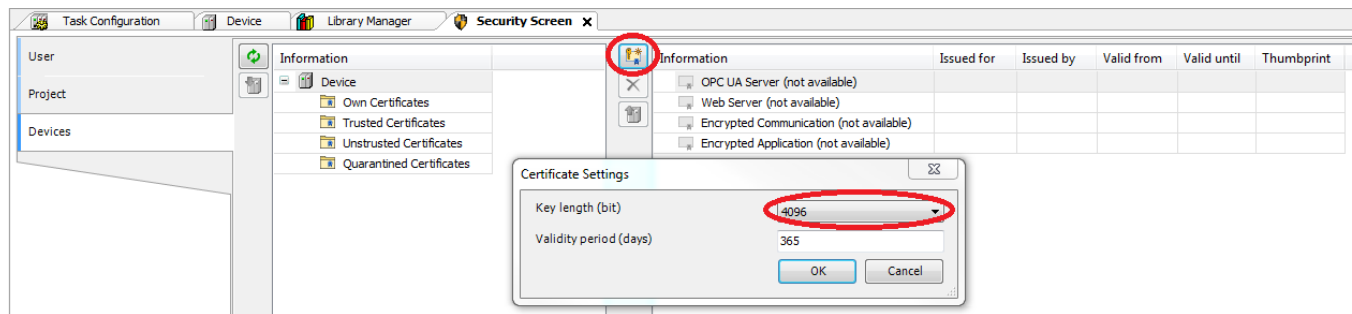
It was tested with a weaker device – the Raspberry Pi 3 – in which the results can be seen more clearly.


UaExpert was used as the OPC UA client.

The measurements were performed manually and the variables changed their value in cycles (worst case scenario).

## Establishing communication

When creating a server certificate for a CODESYS controller, you can determine the length of the encryption:



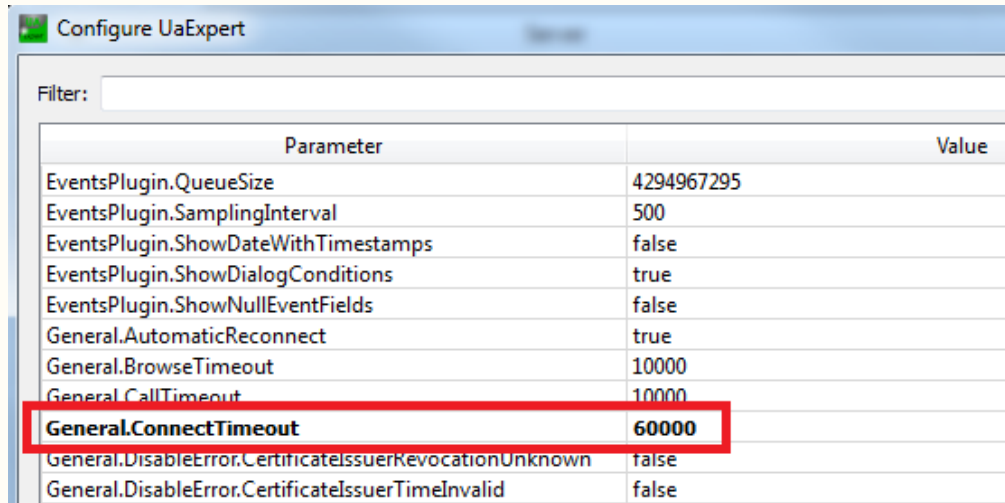
 A temporal difference can already be noticed when the certificate is created.

Depending on the length of the key, the following times may result when establishing communication:

Variable count / Key length	unencrypted	2048	3072	4096
1000 variables	~ 1 Sek.	~ 6 Sek.	~ 16 Sek.	~ 25 Sek.
2000 variables	~ 2 Sek.	~ 8 Sek.	~ 18 Sek.	~ 26 Sek.



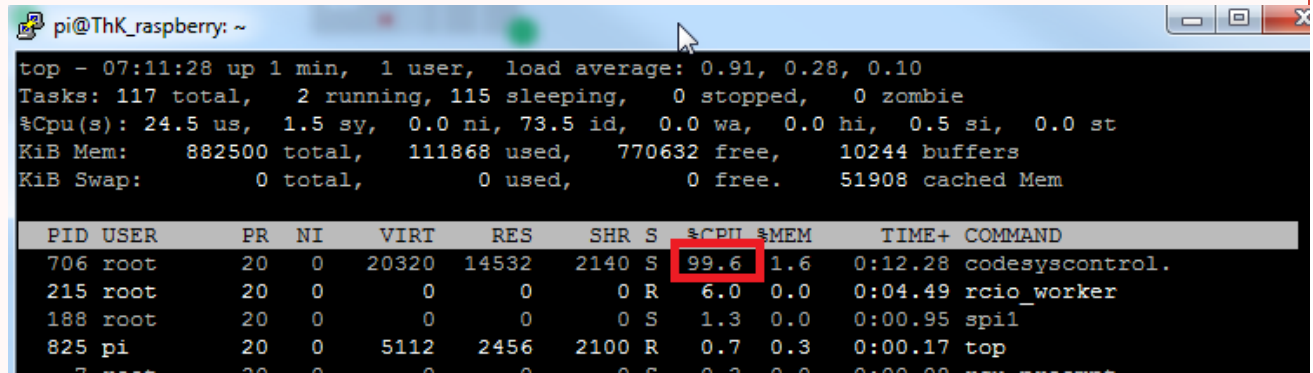
Depending on the client, it may not be possible to establish a connection to the controller.  
The "ConnectionTimeout" in UaExpert has to be edited (default setting: 10 seconds):



Parameter	Value
EventsPlugin.QueueSize	4294967295
EventsPlugin.SamplingInterval	500
EventsPlugin.ShowDateWithTimestamps	false
EventsPlugin.ShowDialogConditions	true
EventsPlugin.ShowNullEventFields	false
General.AutomaticReconnect	true
General.BrowseTimeout	10000
General.CallTimeout	10000
<b>General.ConnectTimeout</b>	<b>60000</b>
General.DisableError.CertificateIssuerRevocationUnknown	false
General.DisableError.CertificateIssuerTimeInvalid	false



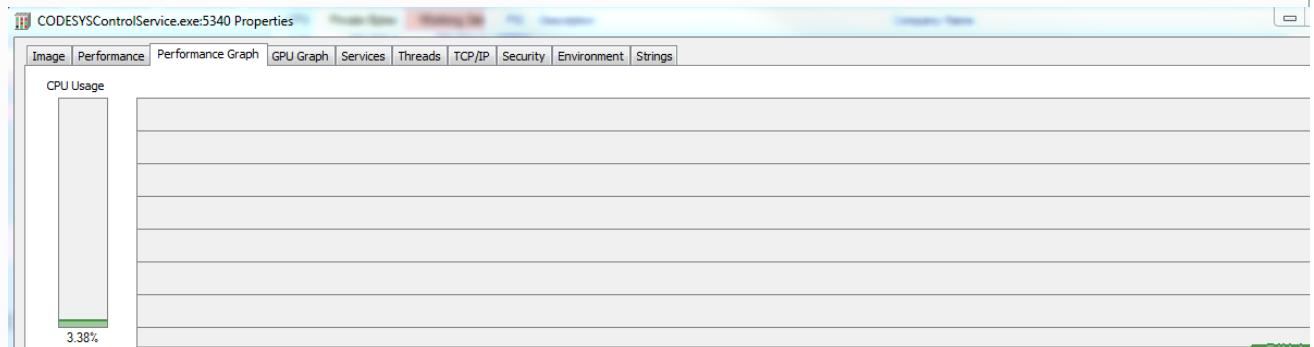
The device is running at full capacity when the connection is established. => CPU load: ~ 100%



```
pi@ThK_raspberry: ~  
top - 07:11:28 up 1 min, 1 user, load average: 0.91, 0.28, 0.10  
Tasks: 117 total, 2 running, 115 sleeping, 0 stopped, 0 zombie  
%Cpu(s): 24.5 us, 1.5 sy, 0.0 ni, 73.5 id, 0.0 wa, 0.0 hi, 0.5 si, 0.0 st  
KiB Mem: 882500 total, 111868 used, 770632 free, 10244 buffers  
KiB Swap: 0 total, 0 used, 0 free. 51908 cached Mem  
  
  PID USER      PR  NI   VIRT   RES   SHR S %CPU %MEM    TIME+  COMMAND  
  706 root        20   0  20320  14532  2140 S   99.6   1.6   0:12.28 codesyscontrol.  
  215 root        20   0     0     0     0 R    6.0   0.0   0:04.49 rcio_worker  
  188 root        20   0     0     0     0 S    1.3   0.0   0:00.95 spi1  
  825 pi          20   0   5112   2456  2100 R    0.7   0.3   0:00.17 top
```



To illustrate how strongly the influence depends on the device, here is a connection from an OPC UA client to a CODESYS Control Win V3.  
With 1000 variables and a key length of 3072 bits, this takes approximately 1 second:



Normal operation

Even during normal operation, the encryption requires a little more computing power, as the following table shows:

Variable count / Key length	unencrypted	2048	3072	4096
1000 variables	~ 23 %	~25 %	~ 25 %	~ 25 %
2000 variables	~ 35 %	~ 39 %	~ 40 %	~ 40 %