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MI004390

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## Seneca Z-PC Line module: **Z-TWS5**

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# 1. Preliminary information / Informazioni preliminari

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## 2. Features

Z-TWS5 is a programmable, communication oriented PLC.

The device is based on a 32bits ARM-Cortex-A8 processor, equipped with the Windows CE operating system (WinCE 6.0).

The Z-TWS5 Codesys PLC is programmable according to the IEC61131-3 standard, by means of the Codesys development environment.

# 3. Technical specifications

COMMUNICATION PORTS			
RS 485	Maximum Baud rate 115 Kbps		
	COM 4 (screw terminals 4-5-6)		
	COM 3 (screw terminals 10-11-12)		
	COM 2 (screw terminals 1-2-3 or IDC10 connector)		
	COM 1 (removable 4 pin connector USB mini, as an alternative to RS232)		
RS 232	Maximum Baud rate 115 Kbps		
	COM 1 (removable 4 pin connector Usb mini, as an alternative to RS485)		
CAN	CAN bus port 2.0A and 2.0B (COM-0)		
	(IDC10 connector)		
Ethernet 1 and Ethernet 2	Ethernet 10/100 Mbps		
	Two RJ45 connectors on front-panel		
	Maximum connection length 100 m.		
USB #1 HOST	Plug-in: USB type A		
USB #2 On The Go	Plug-in: micro USB		
	CPU AND MEMORY		
Microprocessor	ARM Cortex A8 600Mhz		
Memories	256 Mbytes of RAM DDR2		
	128 Mbyte of FLASH		
	64 Kbytes of FeRAM		

Slot for external memory	Micro SD card: max 32 Gbytes
	POWER SUPPLY
Power supply	1040 Vdc or 1928 Vac @ 5060 Hz
Consumption	Max 6 W
	ENVIRONMENTAL CONDITIONS
Temperature	-0+55 °C
Humidity	3090 % @ 40 °C not condensing
Storage temperature	-20+85 °C
Degree protection	IP20
	CONNECTIONS
Connections	Removable 3 way screw terminals, 5.08 pitch
	Rear IDC10 connector for DIN 46277 rail
	Removable 4 pin connector, two RJ45 connectors, USB and micro USB connectors
	Plug in: micro SD card
	BOX / DIMENSIONS
Dimensions	L:100 mm; H:112 mm; W:35 mm
Case	Nylon 6 with 30% fiberglass field, self extinguishing class V0, black color

# 4. Electrical Connections

Power Supply and Modbus interface are available by using the bus for the Seneca DIN rail, by the rear IDC10 connector or by Z-PC-DINAL1-35 accessory. The following picture shows the meaning of the IDC10 connector pins. Power supply is available only from the rear connector.



If **Z-PC-DINAL1-35** accessory is used, the power supply signals and communication signals may be provided by the terminals block into the DIN rail support. In the following figure the meaning and the position of the terminal blocks are shown. The DIP-switch that sets the 120  $\Omega$  terminator is used only for CAN communication. GNDSHLD: Shield to protect the connection cables (recommended).



The Z-TWS5 has three RS 485 serial ports for Modbus communication: COM 4 , COM3 and COM 2. The RS485 connection for COM 2 can be set up by means of the corresponding screw terminals or by the IDC10 connector. To select RS 485 on IDC10 connector, put the SW1 DIP-switch on OFF position.



The Z-TWS5 has RS-485 COM3 port available at screw terminals 10-11-12.Warning!. As you can see from the next figure the signals A(+) and B(-) has the sequence inverted!



The Z-TWS5 has a USB HOST type A connector, that can be used as an external USB memory.

The Z-TWS5 has a USB On The Go connector, with micro-USB plug-in.

The Z-TWS5 has two ethernet ports with RJ45 connectors on the front panel. The two ports are internally connected in HUB/SWITCH mode. The two ports have the same MAC ID.



Through an USB special cable connector, the Z-TWS5 provides a serial RS232 port or, as an alternative, RS485 port. In order to select the RS232 port on the 4 pin removable connector, we must select by software. To select the RS485 port on the 4 pin removable connector, , we must select by software too. The cable length for the RS232 interface must be less than 3 meters.

The Z-TWS5 has a plug-in connector for micro SD card placed in the side part of the case. To insert the SD card into the connector, be sure that the SD card is oriented with metal contacts facing towards left (with reference to the figure).

The SD card can have each class.



# 5. LEDs signaling

LED	STATUS	LED meaning
PWR Green	ON	The module is power on
RUN Red	Blinking	The module is ready for use
LINK1 Yellow	ON	Ethernet 1 connection detected
	OFF	Ethernet 1 connection absent
ACT1 Green	Blinking	There is data activity (Ethernet 1)
	OFF	There is no data activity (Ethernet 1)
LINK2 Yellow	ON	Ethernet 2 connection detected
	OFF	Ethernet 2 connection absent
ACT2 Green	Blinking	There is data activity (Ethernet 2)
	OFF	There is no data activity (Ethernet 2)
RX1-2-4 Red	Blinking	Data reception (COM 1-2-4)
	ON	Check the connection (COM 1-2-4)
TX1-2-4 Red	Blinking	Data transmission (COM 1-2-4)
	ON	Check the connection (COM 1-2-4)

## **6. FTP**

To easily access Z-TWS5 by means of FTP, you can use the WINSCP<sup>™</sup> program; you can free download WINSCP<sup>™</sup> from:

### http://winscp.net/eng/download.php

You must set the connection as in the following figure (the screenshot shows a connection to the 192.168.90.152 IP address):

MinSCP Login		
<ul> <li>New Site</li> <li>exor@192.168.90.150</li> <li>exor@192.168.90.152</li> <li>exor@2.192.6.126</li> </ul>	Session <u>F</u> ile protocol: FTP	Encryption: No encryption
support@ftp.seneca.it	Host name:	Po <u>r</u> t number:
user@192.168.85.68	192.168.90.152	21
-	User name:	Password:
	exor	•••••
	Edit	Advanced 💌
Tools  Manage	E Logi	in V Close Help

Note that the credentials (username and password) are the same ("exor", "exor").

After clicking the "Access" button, you will get a new window, as in the following screenshot; on the right, you can copy and delete files directly to/from the Z-TWS5.

5			log	g - user@192.1	58.85.106 - WinSCP					- 🗆 🗙
Locale Seleziona File Comandi Sessione Opzioni Remoto Aiuto										
🔹 🗏 🗊 • 🔐 📽 📀 🔤 🖉 😤 🖗		Predefinito -	- 😻							
📔 Documenti 🔹 😪 🛛 🔶 👻 🤿	- 🗈 🖾 🕼 皆				🐌 log	• 🔄   🗢 • 🔿 • 🗈 🔯	🚮 🔯 📴			
C:\Users\Spagiari\Documents					/log					
Nome Estensione	Dimensi Tipo	Modificato	Attr	^	Nome Estensione	Dimensi	Modificato	Diritti	Proprietario	
😼	Cartella superi	29/10/2014 17.43.39	r		🔒		01/01/1970 01	rwxr-xr-x	root	
l Amministrazione	Cartella di file	05/11/2014 09.14.15			퉬 conf		05/11/2014 15	<b>IWXIWXIWX</b>	root	
🐌 Bluetooth Folder	Cartella di file	15/11/2013 07.46.42			ali disk		05/11/2014 15	<b>IWXIWXIWX</b>	root	
🐌 Boards	Cartella di file	27/06/2014 13.58.25			.ash_history	672	05/11/2014 15	rw-rr	user	
🐌 Bug 1474 – Etc GMT Timezones misplaced	Cartella di file	22/11/2013 18.19.50			🔼 cron.log	45	05/11/2014 15	rw	root	
🐌 Codesys	Cartella di file	07/10/2014 10.07.56			messages	4.014	05/11/2014 15	rw-rw-rw-	root	
퉬 Copalp	Cartella di file	05/03/2014 12.14.09			💼 mmc	16	05/11/2014 15	<b>FWXFWXFWX</b>	root	
퉬 File di Outlook	Cartella di file	05/11/2014 14.28.18								
🐌 Freescale	Cartella di file	29/10/2014 17.43.51								
📔 Immagini	Cartella di file	03/12/2013 19.31.43	sh							
🐌 JMobile Suite	Cartella di file	12/09/2014 16.17.37								
🐌 Manuali	Cartella di file	17/06/2014 13.19.38								
🚺 Musica	Cartella di file	03/12/2013 19.31.43	sh							
NAT with Linux and iptables - Tutorial (Intr	Cartella di file	26/03/2014 13.41.54								
🐌 OpenEmbedded	Cartella di file	10/09/2014 11.23.41								
Progetti ZNET3	Cartella di file	07/10/2014 08.27.09								
Progetti ZNET4	Cartella di file	28/08/2014 13.13.54								
Progetti_ZNET4	Cartella di file	29/08/2014 16.04.31								
Progetti_ZNET4_2	Cartella di file	02/10/2014 08.24.04								
Progetti_ZNET4_TWS5	Cartella di file	05/11/2014 12.06.19								
퉬 Seneca	Cartella di file	26/03/2014 10.09.45								
🐌 SIMCom	Cartella di file	17/10/2014 08.32.33								
퉬 Standards	Cartella di file	21/03/2014 08.43.04								
퉬 Straton	Cartella di file	26/09/2014 13.32.03								
🍌 Tutorials	Cartella di file	22/04/2014 06.28.46								
Ju TWS3	Cartella di file	17/07/2014 14.20.45								
Ju TWS5	Cartella di file	06/06/2014 07.37.59								
J Video	Cartella di file	03/12/2013 19.31.43	sh							
퉬 Visual Studio 2008	Cartella di file	27/10/2014 14.57.02								
🖐 Visual Studio 2010	Cartella di file	27/10/2014 14.33.32		~						
0 B di 93.891 B in 0 di 40	93.891 Bin 0 di 40 0 Bid 4.747 Bin 0 di 6									
📝 🖋 F2 Rinomina 📝 F4 Modifica 📸 F5 Copia	👫 F6 Sposta 💣 F7 Crea carte	lla 🗙 F8 Elimina 💣	F9 Proprietà	👖 👖 F10 Esci						
								۵	SFTP-3	0.00.37

## 7. Codesys PLC

Z-TWS5 Codesys PLC version provides the full support for IEC 61131-3 PLC Standard; an Integrated Development Environment (IDE) is available for Windows<sup>™</sup> and Linux PCs.

The Codesys Integrated Development Environment includes several tools such as: a fieldbus configuration tool, an analog signal editor and editors compliant with the five languages of the IEC 61131-3 Standard: Sequential Function Chart (SFC), Function Block Diagram (FBD), Ladder Diagram (LD), Structured Text (ST), Instruction List (IL).

With Codesys IDE, it's simple to write, download and debug IEC 61131-3 code.

## 7.1. Writing, downloading and running the first program

First, we must add the Seneca Library (file *EXOR.zip*) to the IDE: Example scompact in the path: C:\Program Files\3s software\codesys v2.3\targets\

📎 CoDeSys - myFbSms.pro						
File Edit Project Insert Extras Onlin	e Window Help					
12 <b></b>	👗 🗈 🔁 🦬 🖼					
Resources     Global Variables     Global Vari	PLCPG(PRG-ST)           0001         PRCGRAM           0003         Ibrary Manager           0003         Ibrary Manager           0005         STANDARD.LIB           0006         Apri           0007         Cerca in:           0008         Nome           0010         EXOR_Modbus_RTU.lib           0010         EXOR_Modbus_RTU.lib           0010         EXOR_Modbus_RTU.lib           0011         EXOR_Modbus_RTU.lib           0012         EXOR_Modbus_RTU.lib           0013         EXOR_Modbus_RTU.lib           0014         EXOR_Modbus_RTU.lib           0015         Tpo file:           00010         Immodus           0010         Immodus           0010         EXOR_Modbus_RTU.lib           0010         EXOR_PMbus.lib           0001         Tpo file:         CoDeSys Library ("lib)           0001         Library directory:         c:\program files\3s so	FUNCTION BLOCK R TRIG ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓				

Import the Library (double click on "Library Manger" and left click on one item of library then select "Additional library..." item menu'. Choice "EXOR\_IDAL\_SYS3.lib"):

Now, we can use the library.



## 8. Seneca Function Blocks

To let the users exploit Z-TWS5 features in their IEC 61131-3 programs, Seneca has developed a set of "Function Blocks", supplied with the Seneca library for Codesys.

In this appendix, Seneca FBs are listed, providing a description of input/output parameters and some notes for each of them.

	EXOR_IDAL_CONNECT				
	connect : BOOL O_Status : CONNECT_STATUS telnum : POINTER TO STRING(80) O_PPPstatus : MODEM_ERR extras : POINTER TO STRING(80) user : POINTER TO STRING(80) password : POINTER TO STRING(80) timeout : DWORD				
_	LocalIP : POINTER TO STRING(80)				
_	primaryDNSIP : POINTER TO STRING(80) secondaryDNSIP : POINTER TO STRING(80)				

## 8.1. **PPPconnect**

The PPP CONNECT FB performs PPP connection setup or release.

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#### The FB has the following input parameters:

connect: BOOL;

on rising edge start a connection. On falling edge disconnect **telnum**: POINTER TO STRING;

telephone number to use in dial-up

extras: POINTER TO STRING;

extra string for modem setup

user: POINTER TO STRING;

username known by server

password: POINTER TO STRING;

password know by server for given username

timeout:DWORD;

timeout in seconds

host: POINTER TO STRING;

string where the IP number of server will be stored

LocalIP: POINTER TO STRING;

string where the local IP assigned by the Host is stored

primaryDNSIP: POINTER TO STRING;

string where the primary DNS IP assigned by the Host is stored **secondaryDNSIP:** POINTER TO STRING;

string where the secondary DNS IP assigned by the Host is stored

#### The FB has the following output parameter:

### O\_Status:

CONNECT STATUS;

### O\_PPPstatus:

MODEM\_ERR;

EXOR_IDAL_FTPGET		
EnableF : BOOL ServerAdd : POINTER TO STRING(80) UserName : POINTER TO STRING(80) Password : POINTER TO STRING(80) RemoteFileName : POINTER TO STRING(80) LocalFileName : POINTER TO STRING(80)	O_DoneF : BOOL O_Status : INT O_Result : INT O_FTP_Error : INT O_NBcount : DINT	

## 8.2. FTPget

Connects to an FTP server and retrieves a file. This FB posts a "get request" to the thread which performs the actual transfer.

#### The FB has the following input parameters:

#### EnableF:BOOL;

Rising edge starts operations.

ServerAdd: POINTER TO STRING;

Address of FTP server, for example: "192.168.10.138:21", port parameter (":21" in the example) is optional and defaults to 21.

#### UserName: POINTER TO STRING;

Username for logging into FTP Server.

Password:POINTER TO STRING;

Password for logging into FTP Server

RemoteFileName: POINTER TO STRING;

Remote File Name (name of the file on FTP Server file system).

#### LocalFileName: POINTER TO STRING;

Local File Name (name of the file on local file system)

#### Timeout: TIME;

Timeout for the operation (in millisec)

#### The FB has the following output parameter:

#### O DoneF:BOOL;

 $$\operatorname{Becomes}$  true at the completion of the operation (becomes true also in case of errors).

#### O\_Status:INT;

Thread Status (see table below).

#### O Result: INT;

Operation result (see table below).

### **O\_FTP\_Error:**INT;

FTP Error code (valid in the case "Result Output" is FTP CLIENT RESULT ERR FTP ERROR).

### O\_NBcount:DINT;

Progressive count of transferred bytes.

### EXOR\_IDAL\_FTPSEND

EnableF : BOOL
 ServerAdd : POINTER TO STRING(80)
 UserName : POINTER TO STRING(80)
 O\_Result : INT
 Password : POINTER TO STRING(80)
 O\_FTP\_Error : INT
 RemoteFileName : POINTER TO STRING(80)
 O\_NBcount : DINT
 LocalFileName : POINTER TO STRING(80)
 Timeout : TIME

## 8.3. FTPsend

Connects to an FTP server and sends a file. This FB posts a "send request" to the thread which performs the actual transfer.

### The FB has the following input parameters:

EnableF:BOOL; Rising edge starts operations. ServerAdd: POINTER TO STRING; Address of FTP server, for example: "192.168.10.138:21", port parameter (":21" in the example) is optional and defaults to 21. UserName:POINTER TO STRING; Username for logging into FTP Server. Password:POINTER TO STRING; Password for logging into FTP Server RemoteFileName: POINTER TO STRING; Remote File Name (name of the file on FTP Server file system). LocalFileName: POINTER TO STRING; Local File Name (name of the file on local file system) Timeout:TIME; Timeout for the operation (in millisec)

### The FB has the following output parameter:

O\_DoneF:BOOL; Becomes true at the completion of the operation (becomes true also in case of errors). O\_Status:INT; Thread Status (see table below). O\_Result:INT; Operation result (see table below). O\_FTP\_Error:INT; FTP\_Error code (valid in the case "Result Output" is FTP\_CLIENT\_RESULT\_ERR\_FTP\_ERROR). O\_NBcount:DINT; Progressive count of transferred bytes.

EXOR_IDAL_GETSMS			
EnableF : BOOL NextF : BOOL MsgDelF : BOOL Sender : POINTER TO STRING(80) DateTime : POINTER TO STRING(80) SMSText : POINTER TO STRING(80)	O_DoneF : BOOL O_NoMoreMsgF : BOOL O_SMSstatus : MODEM_ERR O_SMSvalid : BOOL O_SMSclass : BOOL O_SMSalphabet : USINT O_IsReport : BOOL O_referenceID : USINT		

## 8.4. <u>GETsms</u>

Get SMS from GSM/GPRS modem. Rising edge of "EnableF Input" starts operations. As soon the first SMS has been fetched, the "DoneF Ouput" becomes true and message text is available at "Text Output". At this point, a rising edge on "NextF Input" causes another SMS to be fetched. "DoneF Ouput" becomes false and is rose again as soon the second SMS has been fetched.

### The FB has the following input parameters:

EnableF:BOOL; Rising edge starts get procedure. Falling edge stop operations. NextF: BOOL; Rising edge causes next message to be read MsgDelF: BOOL; If true then messagge is deleted after being read. Sender: POINTER TO STRING; string where to store Telephone number of SMS Sender. DateTime: POINTER TO STRING; string where to store SMS Date & Time in received format. SMSText: POINTER TO STRING; string where to store SMS Text.

#### The FB has the following output parameters:

O DoneF:BOOL; TRUE when next message is available O NoMoreMsgF:BOOL; TRUE when there are no more SMS to read O SMSstatus: MODEM ERR; status of modem operations (see below) O SMSvalid:BOOL; TRUE if a valid SMS was read O SMSclass:BOOL; FALSE=NO CLASS, TRUE=CLASS 0 O SMSalphabet:USINT; 0=DEFAULT, 1=8bit, 2=UCS2 O IsReport:BOOL; TRUE if SMS is a Receive Report O referenceID:USINT; reference Number of SMS if O IsReport=TRUE

## EXOR\_IDAL\_SENDEMAIL

 enable : BOOL	O_DoneF : BOOL	
 server : POINTER TO STRING(80)	O_Status : INT	
 User : POINTER TO STRING(80)	O_Error : INT-	
 Pass : POINTER TO STRING(80)	O_SSL_Error : DINT	
 From : POINTER TO STRING(80)		
 MailTo : POINTER TO STRING(80)		
 Subject : POINTER TO STRING(80)		
 Body : POINTER TO STRING(80)		
 AtcPath : POINTER TO STRING(80)		
 timeout : TIME		
 AuthEnable : BOOL		
 Becuritybel : USINI		

## 8.5. SENDmail

Send a E-Mail message.

#### The FB has the following input parameters:

```
enable:BOOL;
       start/stop the execution
server: POINTER TO STRING;
       IP address of a valid SMTP server with port in format
       xxx.xxx.xxx:yyyy.
       If not specified the default port 25 will be used
User: POINTER TO STRING;
       username in case Authentication is required
Pass: POINTER TO STRING;
       password in case Authentication is required
From: POINTER TO STRING;
       Valid mail address (name@domain) of sender
MailTo: POINTER TO STRING;
       List of mail address of recipients, comma separated
       name1@domain1 , name2@domain2
Subject: POINTER TO STRING;
       Subject of mail message
Body: POINTER TO STRING;
       Body of mail message in plain text format
AtcPath: POINTER TO STRING;
       Path of file to be attached (empty if no attachment required
       timeout:TIME; maximum time to wait (in millisec)
AuthEnable: BOOL;
       enable authentication at mail server
SecuritySel:USINT;
       security layer for authentication selector (0 = none ; 1 = use
       SSL; 2 = use TLS) (NOTE: TLS is currently **unsupported** )
```

#### The FB has the following output parameter:

O\_DoneF:BOOL; TRUE when finished O\_Status:INT; status of operation when finished see below table O\_Error:INT; SMTP error when Status > 2 O\_SSL\_Error:INT; SSL error code when Status = 5

#### EXOR\_IDAL\_SENDSMS

_	sendSMS : BOOL	O_DoneF : BOOL
_	SMSCnum : POINTER TO STRING(80)	O_count : DINT
_	telnum : POINTER TO STRING(80)	O_SMSstatus : MODEM_ERR-
_	SMSbody : POINTER TO STRING(80)	
_	SMSvalidity : USINT	
_	SMSclass : BOOL	
_	SMSalphabet : USINT	
-	askReport : BOOL	
_	referenceID : POINTER TO ARRAY [01] OF USINT	
-	LastNum : POINTER TO STRING(80)	

### 8.6. SENDsms

Sends SMS GSM/GPRS modem.

### The FB has the following input parameters:

sendSMS:BOOL; on rising edge start send procedure. On falling edge stop operations SMSCnum: POINTER TO STRING; telephone number of SMS service center, including international prefix (es. +30349.....). If NULL string, SMSC is not programmed telnum: POINTER TO STRING; telephone number od destination phone, including international prefix. Several destinations can be indicated, sepatared by commas **SMSbody:** POINTER TO STRING; message body (max. 160 chars if default alphabet, 140 if 8bit alphabet, 70 if UCS2 alphabet) SMSvalidity:USINT; validity time coded according to SMS standard (es. 169 = 3 days) SMSclass:BOOL; FALSE=NO CLASS, TRUE=CLASS 0 SMSalphabet:USINT; 0=DEFAULT, 1=8bit, 2=UCS2 askReport:BOOL; TRUE if ReceiveReport is requested referenceID:POINTER TO ARRAY[0...n-1] OF USINT; string where the reference Number of SMS, generated by modem, is stored the user must define an array with enough elements to store referenceID for each destination LastNum: POINTER TO STRING; string containing the current destination number while the operation is performed

The FB has the following output parameter:

O\_DoneF:BOOL; TRUE when completed O\_count:DINT; numner of SMS delivered O\_SMSstatus:MODEM\_ERR; status of modem operations (see below)

# 9. Updating the firmware by a USB pen

# **10. Open VPN Configuration**

OpenVPN is a full-featured SSL VPN which implements OSI layer 2 or 3 secure network extension using the industry standard SSL/TLS protocol, supports flexible client authentication methods based on certificates, smart cards, and/or username/password credentials, and allows user or group-specific access control policies using firewall rules applied to the VPN virtual interface.

## 10.1. OpenVPN server installation (for Windows)

OpenVPN server installer for Windows is available for download at <a href="https://openvpn.net/index.php/open-source/downloads.html">https://openvpn.net/index.php/open-source/downloads.html</a>

Follow the installation wizard



Accept License Agreement

PENVPN	License Agreement Please review the license terms before installing 2.3.4-I002.	OpenVPN	
Press Page Down to see th	e rest of the agreement.		
OpenVPN (TM) An Open	Source VPN daemon	•	
Copyright (C) 2002-2010	Copyright (C) 2002-2010 OpenVPN Technologies, Inc. <sales@openvpn.net></sales@openvpn.net>		
This distribution contains n of which fall under differer or any of the bundled com agree to be bound by the each respective componen	ultiple components, some It licenses. By using OpenVPN ponents enumerated below, you conditions of the license for It.		
OpenVPN trademark		-	
If you accept the terms of agreement to install OpenV	the agreement, click I Agree to continue. You must PN 2.3.4-I002.	t accept the	
ullsoft Install System v2,46-:	01		

Select "OpenSSL Utilities" and "OpenVPN RSA Certificate Management Scripts" from the check list (they are unchecked by default)

	<b>HOOSE Components</b> hoose which features of OpenVPN 2.3.4-I002 you want to istall.
Select the components to insta service if it is running. All DLLs	l/upgrade. Stop any OpenVPN processes or the OpenVPN are installed locally.
Select components to install:	CopenVPN File Associations     OpenSQL Utilities     OpenVPN RSA Certificate Management Scripts     OpenVPN RSA Certificate Management Scripts     OpenVPN to PATH     OpenVPN to PATH     OpenVPN to Start Menu     OpenVPN
Space required: 4.5MB	Description Position your mouse over a component to see its description.
Nullsoft Install System v2.46-101	

Choose installation folder

OpenVPN 2.3.4-1002 Setup				
Choose Install Location Choose the folder in which to install OpenVPN 2.3.4-1002.				
Setup will install OpenVPN 2.3.4-1002 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.				
Destination Folder				
Ct/program Files (x86)\OpenVPN Browse				
Space required: 4.5MB				
Space available: 56.7GB				
Nullsoft Install System v2.46-101				
< Back Install Cancel				

## Wait installation completion

OpenVPN 2.3.4-I002 Setup	
PENVPN Installing Please wait while OpenVPN 2.3.	4-I002 is being installed.
Removing any previous OpenVPN service	
Removing any previous OpenVPN service	
Nullsoft Install System v2,46-101	
< <u>B</u> ack	Next > Cancel

Installation completed



## 10.2. OpenVPN server configuration

## *10.2.1. Overview*

The first step in building an OpenVPN 2.x configuration is to establish a PKI (public key infrastructure). The PKI consists of:

- a separate certificate (also known as a public key) and private key for the server and each client, and
- a master Certificate Authority (CA) certificate and key which is used to sign each of the server and client certificates.

OpenVPN supports bidirectional authentication based on certificates, meaning that the client must authenticate the server certificate and the server must authenticate the client certificate before mutual trust is established.

Both server and client will authenticate the other by first verifying that the presented certificate was signed by the master certificate authority (CA), and then by testing information in the now-authenticated certificate header, such as the certificate common name or certificate type (client or server).

This security model has a number of desirable features from the VPN perspective:

- The server only needs its own certificate/key it doesn't need to know the individual certificates of every client which might possibly connect to it.
- The server will only accept clients whose certificates were signed by the master CA certificate (which we will generate below). And because the server can perform this signature verification without needing access to the CA private key itself, it is possible for the CA key (the most sensitive key in the entire PKI) to reside on a completely different machine, even one without a network connection.
- If a private key is compromised, it can be disabled by adding its certificate to a CRL (certificate revocation list). The CRL allows compromised certificates to be selectively rejected without requiring that the entire PKI be rebuilt.
- The server can enforce client-specific access rights based on embedded certificate fields, such as the Common Name.

Note that the server and client clocks need to be roughly in sync or certificates might not work properly.

## 10.3. Generate the master Certificate Authority (CA) certificate & key

In this section we will generate a master CA certificate/key, a server certificate/key, and certificates/keys for 3 separate clients.

For PKI management, we will use easy-rsa, a set of scripts which is bundled with OpenVPN 2.2.x and earlier. If you're using OpenVPN 2.3.x, you need to download easy-rsa separately from here:

https://github.com/OpenVPN/easy-rsa

If you are using Windows the openSSL in binary format is is available for download at:

https://indy.fulgan.com/SSL/

If you are using Windows, open up a Command Prompt window and cd to \Program Files\OpenVPN\easy-rsa. Run the following batch file to copy configuration files into place (this will overwrite any preexisting vars.bat and openssl.cnf files):

init-config

Now edit the vars file (called vars.bat on Windows) and set the KEY\_COUNTRY, KEY\_PROVINCE, KEY\_CITY, KEY\_ORG, and KEY\_EMAIL parameters. Don't leave any of these parameters blank.

😭 *C:\Program Files (x86)\OpenVPN\easy-rsa\vars.bat - Notepad++					
<u>F</u> ile <u>E</u>	dit <u>S</u> earch <u>V</u> iew Encoding <u>L</u> anguage Settings Macro Run Plugins <u>W</u> indow <u>?</u>	Х			
🖹 vars.bat					
20	rem are paranoid. This will slow	-			
21	rem down TLS negotiation performance				
22	rem as well as the one-time DH parms				
23	rem generation process.				
24	set KEY_SIZE=1024				
25					
26	rem These are the default values for fields				
27	rem which will be placed in the certificate.				
28	rem Change these to reflect your site.				
29	rem Don't leave any of these parms blank.				
30					
31	set KEY COUNTRY=IT				
32	set KEY PROVINCE=PD				
33	set KEY_CIIY=Padua				
34	set KLI UKG-Seneca				
35	set KFI_CN_Space	=			
27					
20		- 11			
39	set REL_SCIINGIUE PATH=changeme				
40	set PKCS11 PTN=1234				
41					
		-			
Batch fil	e length:997 lines:41 Ln:38 Col:16 Sel:0 Dos\Windows ANSI IN	IS Ja			
		( d			

Next, initialize the PKI.with commands

vars.bat

clean-all.bat build-ca.bat

The final command (build-ca) will build the certificate authority (CA) certificate and key by invoking the interactive openssl command:

```
Generating a 1024 bit RSA private key
....+++++++
....+++++++
writing new private key to 'ca.key'
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
____
Country Name (2 letter code) [KG]:
State or Province Name (full name) [NA]:
Locality Name (eg, city) [BISHKEK]:
Organization Name (eg, company) [OpenVPN-TEST]:
Organizational Unit Name (eg, section) []:
Common Name (eg, your name or your server's hostname) []:OpenVPN-CA
Email Address [me@myhost.mydomain]:
```

Note that in the above sequence, most queried parameters were defaulted to the values set in the vars or vars.bat files. The only parameter which must be explicitly entered is the Common Name. In the example above, I used "OpenVPN-CA".

10.3.1. Generate certificate & key for the server

Next, we will generate a certificate and private key for the server. On Linux/BSD/Unix:

build-key-server server

As in the previous step, most parameters can be defaulted. When the **Common Name** is queried, enter "server". Two other queries require positive responses, "Sign the certificate? [y/n]" and "1 out of 1 certificate requests certified, commit? [y/n]".

### 10.3.2. Generate certificates & keys for N clients

Generating client certificates is very similar to the previous step. Remember that each client certificate has an expiration date which is 3650 days (10 years) after creation by default. If you would like to change the validity period you have to change "vars.bat" file. After expiration you have to generate a new certificate for that client.

```
build-key client1
build-key client2
build-key client3
.....
build-key clientN
```

Remember that for each client, make sure to type the appropriate Common Name when prompted, i.e. "client1", "client2", or "client3". Always use a unique (different) common name for each client.

### 10.3.3. Generate Diffie Hellman parameters

Diffie Hellman parameters must be generated for the OpenVPN server. On Linux/BSD/Unix:

build-dh

Output:

## **10.4.** Creating configuration files for server and clients

Server configuration is contained in file "server.ovpn" provided together with this document, copy and paste this file into your "openvpn\config" directory.

Edit "server.ovpn" and change the path to the ca, cert and key if necessary.

C:\Program Files (x86)\OpenVPN\config\server.ovpn - Notepad++						
E	ile	<u>Edit S</u> earch <u>V</u> iew Encoding Language S <del>et</del> tings Macro Run Plugins <u>W</u> indow <u>?</u>	X			
	6	· · · · · · · · · · · · · · · · · ·				
E	server.ovpn					
hΓ	67	# use the same ca file.				
	68	*				
	69	# See the "easy-rsa" directory for a series				
	70	# of scripts for generating RSA certificates				
"	71	# and private keys. Remember to use				
	72	# a unique Common Name for the server				
	73	# and each of the client certificates.	=			
	74	*				
	75	# Any X509 key management system can be used.				
	76	# OpenVPN can also use a PKCS #12 formatted key file				
	77	# (see "pkcs12" directive in man page).				
	78	ca "C:\\Program Files (x86)\\OpenVPN\\config\\ca.crt"				
	79	cert "C:\\Program Files (x86)\\OpenVPN\\config\\server.crt"				
	80	<pre>key "C:\\Program Files (x86)\\OpenVPN\\config\\server.key" # This file should be kept secret</pre>				
W.	81					
1	82	# Diffie hellman parameters.				
	83	# Generate your own with:				
	84	# openssl dhparam -out dh1024.pem 1024				
	85	# Substitute 2048 for 1024 if you are using				
	86 # 2048 bit keys.					
	87 dh "C:\\Program Files (x86)\\OpenVPN\\config\\dh1024.pem"					
	88		-			
H	0 • Configure server made and sumply a UDN subnet					
	orma	I text file length : 10/b1 lines : 300 Ln : 177 Col : 24 Sel : 0 Dos/Windows ANSI INS	at			

Network subnet that will be used for vpn communication is defined with directive

server 10.9.7.0 255.255.255.0

Remember that the server takes every time .1 as last octect for his IP address. In this example the IP subnet is 10.9.7.0 so the server IP address is 10.9.7.1.

The folder ccd provided together with this document contains the client configuration files for 5 client. Copy and paste the configuration file into your ccd directory. In this example the client IP assignment is as follows:

client1	10.9.7.13	refers to the pair [13, 14]
client2	10.9.7.17	refers to the pair [17, 18]
client3	10.9.7.21	refers to the pair [21, 22]
client4	10.9.7.25	refers to the pair [25, 26]
client5	10.9.7.29	refers to the pair [29, 30]

but you can extend yourself for a large number of clients taking the last octet of ip address for **ifconfig-push** from the pairs below, note that the maximum number of clients is 64 (for windows os):

[ 1, 2] [ 5, 6] [ 9, 10] [ 13, 14] [ 17, 18] [ 21, 22] [ 25, 26] [ 29, 30] [ 33, 34] [ 37, 38] [ 41, 42] [ 45, 46] [ 49, 50] [ 53, 54] [ 57, 58] [ 61, 62] [ 65, 66] [ 69, 70] [ 73, 74] [ 77, 78] [ 81, 82] [ 85, 86] [ 89, 90] [ 93, 94] [ 97, 98] [101,102] [105,106] [109,110] [113,114] [117,118] [121,122] [125,126] [129,130] [133,134] [137,138] [141,142] [145,146] [149,150] [153,154] [157,158] [161,162] [165,166] [169,170] [173,174] [177,178] [181,182] [185,186] [189,190] [193,194] [197,198] [201,202] [205,206] [209,210] [213,214] [217,218] [221,222] [225,226] [229,230] [233,234] [237,238] [241,242] [245,246] [249,250] [253,254]

There are 2 important things that must be respected:

- File name in ccd directory must be the same used in the common name of the client certificate and key (e.g. client1, client2, etc...)
- Each file must contain a row that define the IP address of the client (chosen from the pair list above) for example:
  - 1.

ifconfig-push 10.9.7.13 10.9.7.14

## 10.5. Starting up the VPN and testing for initial connectivity

To start OpenVPN Server opens a terminal window (cmd.exe), cd into your OpenVPN\config dir and run openvpn with your server.ovpn config as argument



While running OpenVPN Server will print on console all log informations (es. New client connected, etc...)



## 10.6. Upload client configuration files on TWS5

Open Seneca Z-NET4 and select the project that you made previusly. Select the Cpu Objects and the tabulation Configurations. Enable VPN and set the parameters:

- Server Vpn
- Port Udp
- Ca.crt
- Client.crt
- Client.key

Confirm the modifications and send the new configuration by special Button.

Reboot the apparatus to make active the new configurations

