

# TITAN ROUTER Application Note 70

ZeroTier VPN

Easily access your Titan router configuration and connected devices via VPN.

www.webdyn.com

### 1. Scenario Details

TITAN routers have all the typical functionalities of 4G/3G/2G routers, as well as a series of added features that make them one of the most feature-packed routers on the market. One of their additional features is the ability to establish a VPN through the ZeroTier service, which allows easy access to the router and the devices connected to it regardless of whether the router connects to the internet via Wifi, Ethernet or SIM card, or whether the SIM has a private IP address or is behind conventional firewalls, etc.

#### 2. Description of the Scenario in the Example

- A Webdyn-Easy-Router device (hereinafter referred to as the Titan router) is connected to the Internet via an inexpensive SIM card that provides a private IP address of the type 10.X.X.X.

- The Titan router will have 3 devices connected. A PLC (1) will be connected via Wifi to the Titan router, as this will be configured as a Wifi Access Point. Another PLC (2) will be connected to the Titan router via an Ethernet cable. Finally, another PLC (3) will be connected to the Titan router via an RS485 serial connection.

- The Titan router's configuration menu, as well as the TCP port 81 of PLC1 and all the IP services of the PLC2 router and the RS232/RS485 serial port of PLC3, must be accessible from a remote office.



#### 3. Registration for the ZeroTier service

ZeroTier is a service that allows you to very easily implement a secure VPN connection. The registration process for the system is shown below.

To register, go to the URL https://my.zerotier.com. Once the process has been completed, the following page will be displayed:



Click on the "Create A Network" button to create a new personal network within ZeroTier. A network with a "NETWORK ID" e5cd7a9e1cd56dac will automatically be created.



## 4. Configuring the Titan router for Internet connection via SIM card

To configure the Titan router for Internet access via a SIM card, go to the menu "Mobile > Basic Settings" and fill in the necessary data (APN, Username, Password, PIN, Authentication, etc. of the SIM card). Once this is done, press the "SAVE CONFIG" button.

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🔶 Mobile	► Mobile ► Basic	Settings	
• Status • Basic Settings • Keep Online	Mobile WAN Sim Mode	Enabled (IP active)	<ul> <li>Enable Wireless WAN interface</li> <li>Sim selection</li> </ul>
<ul> <li>Ethernet</li> <li>Basic Settings</li> <li>DHCP Server</li> </ul>	SIM1 APN:	internet	SIM Card 1 APN
<ul> <li>Wifi</li> <li>Basic Settings</li> <li>DHCP Server</li> </ul>	SIM1 Username: SIM1 Password:		SIM Card 1 username SIM Card 1 password
<ul> <li>Firewall</li> <li>NAT</li> <li>Authorized IPs</li> </ul>	SIM1 Pin: SIM1 Auth:	None	SIM Card 1 PIN
• MAC Filter • Routes	SIM2 APN:		SIM Card 2 APN
<ul> <li>Serial Settings</li> <li>Serial Port1-RS232</li> <li>Serial Port2-RS485</li> </ul>	SIM2 Username: SIM2 Password:		SIM Card 2 username SIM Card 2 password

# 5. Configuring the ZeroTier service in the Titan router and registration on the ZeroTier platform.

Configuration of the ZeroTier service on the Titan router is very simple. Simply go to the menu "VPN > ZeroTier", enable the service by clicking on the "Enabled" box and enter the "NETWORK ID" obtained in point 1 of this document (in this example "e5cd7a9e1cd56dac"). Once this has been entered, the router must be rebooted via the menu "Other > Reboot".

		hdun	
VVV	vve	Service Street S	"Makes your APPLICATION happen"
Mobile	► VPN ► ZeroTier		
Status     Basic Settings     Keen Online	Enabled:		Enable ZeroTier VPN service
V Keep Online	TCP Port:	9993	TCP internal port (default 9993)
Ethernet	VPN1 Network ID:	e5cd7a9e1cd56dac	Network ID ZeroTier 1 (blank = not used)
DHCP Server	VPN2 Network ID:		Network ID ZeroTier 2 (blank = not used)
Wifi	VPN3 Network ID:		Network ID ZeroTier 3 (blank = not used)
<ul> <li>Basic Settings</li> <li>DHCP Server</li> </ul>	SAVE CONFIG		
Firewall  NAT Authorized IPs MAC Filter Routes	► VPN ► ZeroTier	► Status	
Serial Settings	Device ID:		
Serial Port1-RS232     Serial Port2-RS485	VPN1 Network name:		
<ul> <li>SSL Certificates</li> </ul>	VPN1 IP & MAC:	IP:	MAC:
External Devices	VPN1 interface:	zt0	
ModBus Devices     Generic Serial Device	VPN1 status:		
• Temperature Sensor • IEC102 Meter	VPN2 Network name:		
VPN	VPN2 IP & MAC:	IP:	MAC:
IPSec     OpenVPN Client	VPN2 interface:	zt1	
OpenVPN Server	VPN2 status:		

After restarting the Titan router, the IP obtained from the SIM can be found in the menu "Mobile > Status".

$\mathbf{W}$	we	bdyn Hiexitron	TITAN "Makes your APPLICATION happen"
* Mobile	Mobile > Status		
Status     Basic Settings	Firmware version:	5.3.6.25 (Webdyn EasyRou	ter)
• Keep Online	WAN Mobile IP:	10.151.85.114	WAN IP (2G/3G/4G) Network
<ul> <li>Ethernet</li> <li>Basic Settings</li> <li>DHCP Server</li> </ul>	GSM Module:	EC21 Revision: EC21EFAR06A05M	14G
🔶 Wifi	IMEI:	869101057093607	Device identification
DHCP Server	SIM:	SIM-1 (SIM READY)	Used SIM and status
🔶 Firowall	Network (2G/3G/4G):	4G (MOVISTAR)	Used network at this moment

In the menu "VPN > ZeroTier", the "Device ID" obtained by the Titan router to identify itself in the ZeroTier VPN network will be displayed (in this example "a8cf45953c"). An "ACCESS\_DENIED" message also appears on the screen. This is because the device has not yet been accepted in the ZeroTier network.

Authorized IPs	VPN > ZeroTier >	Status	
<ul> <li>MAC Filter</li> </ul>			
• Routes	Device ID:	a8cf45953c	
🌸 Serial Settings			
<ul> <li>Serial Port1-RS232</li> <li>Serial Port2-RS485</li> </ul>	VPN1 Network name:		
<ul> <li>SSL Certificates</li> </ul>	VPN1 IP & MAC:	IP:	MAC: ae:c5:1a:59:0b:46
	VDN1 interface:	7±0	
🙁 External Devices	vitvi interface.	200	
Logger configuration     ModBus Devices     Constrict Social Device	VPN1 status:	ACCESS_DENIED	
Temperature Sensor	VPN2 Network name:		
• IEC102 Meter	VPN2 IP & MAC:	IP:	MAC:
🚖 VPN	VPN2 interface:	zt1	
• IPSec			
<ul> <li>OpenVPN Client</li> </ul>	VPN2 status:		
OpenVPN Server			
• ZeroTier	VPN3 Network name:		

To accept a new device in the ZeroTier network, go back to the "my.zerotier.com" control panel. In the "Members" section of the network you will see that the new device with ID "a8cf45953c" is pending authorisation. Simply check the "Auth?" box.

				O	ne devi	e has joined thi	s netw	ork.
A ZeroTier network should have at least 2 member					devices.			
Use the ZeroTierOne app on your devices to <b>join e5c</b> o					5cd7a9			
Visit <u>the downloads page</u> to get the app.								
Search (Addres	s / Name)	Display Filter Authorized Not Authorized Bridges	Inactive Active Hidden	0 1 0	Sort By Addr Nam	ess		
Auth?	Address	Name/Description		Managed	IPs	Last Seen	Version	Physical
	a8cf45953c	(short-name) (description)		+ 10.14	7.20.x	LESS THAN A MINUTE		95.124.:

After clicking and accepting the device, if you refresh the screen of the Titan router menu "VPN > ZeroTier", the device will appear as connected and with its IP and MAC assigned by the ZeroTier network, in this case IP: 10.147.20.140.

<ul><li>Authorized IPs</li><li>MAC Filter</li></ul>	VPN > ZeroTier >	Status	
• Routes	Device ID:	a8cf45953c	
<ul> <li>Serial Settings</li> <li>Serial Port1-RS232</li> <li>Serial Port2-PS485</li> </ul>	VPN1 Network name:	nostalgic_kleinschmidt	
• SSL Certificates	VPN1 IP & MAC:	IP: 10.147.20.140/24	MAC: ae:c5:1a:59:0b:46
🔶 External Devices	VPN1 interface:	zt0	
<ul> <li>Logger configuration</li> <li>ModBus Devices</li> <li>Generic Serial Device</li> </ul>	VPN1 status:	ОК	
• Temperature Sensor	VPN2 Network name:		
• IEC102 Meter	VPN2 IP & MAC:	IP:	MAC:
VPN	VPN2 interface:	zt1	
OpenVPN Client     OpenVPN Server	VPN2 status:		
• ZeroTier	VPN3 Network name:		

### 6. Configuring the ZeroTier service on a Windows PC to connect to the device.

A version for desktop PC (Windows, Linux, MAC) or mobile (Android or iOS) can be downloaded from https://www.zerotier.com/download/. Once the software is installed, simply configure the NETWORK ID of the network to connect to. In this case the NETWORK ID will be the same as the one obtained in point 2 of this document: e5cd7a9e1cd56dac. Right-click on the ZeroTier icon and click on the "Join Network" icon.



A pop-up window will appear. Enter the network ID and then click the "Join" button.

Join ZeroTier Network	_		×
Enter 16-digit Network ID to Join:			
e5cd7a9e1cd56dac			
		Cancel	Join

The new device (our PC) must be accepted in the ZeroTier control panel in the same way as you did to accept the Titan router in the network.

Search (Address /	Name)	Display Filter Carterian Authorized Carterian Not Authorized Display Bridges	Inactive     0       Active     2       Hidden     0	Sort By Address Name				
< 1-2/2 > Auth?	Address	Name/Description	Managed IPs	Last Seen	Version	Physical IP		
	eac8d53457	(description) (short-name)	+ 10.147.20.x +	1 MINUTE	1.10.1	95.124.208.169		×
- *	eac8d53457	(short-name) (description)	10.147.20.x	LESS THAN A MINUTE	-111	213.96.60.220	Î	1

... after that you will be connected to the network with your assigned IP and MAC.

			Dridges						
1-2 / 2 Auth?	2 >	Address	Name/Description	Managed IPs	Last Seen	Version	Physical IP		
	¥	a8cf45953c ae:c5:1a:59:0b:46	(short-name) (description)	10.147.20.140 + 10.147.20.x	LESS THAN A MINUTE	1.10.1	95.124.208.169	Ī	8
	×	eac8d53457 ae:87:1d:c9:aa:2d	(short-name) (description)	10.147.20.224	1 MINUTE	1.10.6	213.96.60.220	Î	8
< 1-2/2	2 >								

If a DOS console is opened, you can check the communication with a simple PING from the PC to the Titan router.



And you can also access the WEB configuration interface of the Titan router from the PC by specifying the ZeroTier IP address assigned to the Titan router by the ZeroTier network, in this example: http://10.147.20.140

S Intelligent Router X 0 ZeroTier Central	×   +	~	-	×
← → C ③ http://10.147.20.140			*	) E
we we	bdyn Hflexitron	TITAN "Makes your APPLICATION happen"		
Username: Password:				
Inte	ligent Router - Web Panel Control			

# 7. Accessing the device with RS232/RS485 serial connection (PLC3)

To access the RS232 or RS485 serial port of the PLC device, simply configure an IP-RS232 or IP-RS485 gateway on the Titan router. This can be done from the "Serial Settings > Serial Port1-RS232" or "Serial Settings > Serial Port2-RS485" section depending on whether you need to access an RS232 or RS485 port (also possible with two ports simultaneously) and by configuring the appropriate serial port parameters (which must match those of the PLC3 serial port). To do so, simply select "Function: Serial - IP Gateway (TCP Server)" and specify the TCP port to be used in the gateway, in this case TCP port 20010.

$\mathbf{W}$	<b>\</b> we	Selection and the second secon	TITAN "Makes your APPLICATION happen"
🔶 Mobile	Serial Gatewa	y 🕨 Com1 Settings	
<ul> <li>Status</li> <li>Basic Settings</li> </ul>	Baudrate:	9600	Baudrate of serial port
<ul> <li>Keep Online</li> </ul>	Data bits:	8	Number of data bit
Ethernet	Parity:	none	→ Parity
DHCP Server	Stop bits:	1	✓ Number of stop bits
wifi	Flow Control:	none	Flow control of serial port
<ul> <li>Basic Settings</li> <li>DHCP Server</li> </ul>	Timeout ms:	50	msec without serial data before sending
<ul> <li>Firewall</li> <li>NAT</li> <li>Authorized IPs</li> <li>MAC Filter</li> <li>Routes</li> </ul>	<ul> <li>Allow local emb</li> <li>Allow remote e</li> <li>Allow incoming</li> </ul>	edded AT commands mbedded AT commands GSM call (CSD Data Call)	Ex.: <mtxtunnel>AT</mtxtunnel> Ex.: <mtxtunnelr>AT</mtxtunnelr> Only TCP Server and TCP Client functions or Nothing. 26 (CSD) network required.
Serial Settings     Serial Port1-R5232     Serial Port2-R5485     SSL Certificates      External Devices     Logger configuration	• Function: Noth	ing or used by External Devi I - IP Gateway (TCP Server	ice or Script
ModBus Devices     Generic Serial Device	TCP Local Port:	20010	Listening TCP Port (1 65535)
Temperature Sensor	Timeout:	300	Seconds without data for closing. (07200) 0=not used.

Once the Titan router has rebooted, it is possible to access the RS232 port of the PLC3 equipment by connecting any application to TCP port 20010 from the IP address 10.147.20.140 (10.147.20.140:20010).

### 8. Accessing the device with Ethernet connection (PLC2)

The aim is to be able to access all the PLC2 services. The PLC2 has an Ethernet connection to the Titan router. Reminder of the wiring diagram:



In order to directly access the PLC2 device with its IP 192.168.1.10 from the OFFICE, a route must be created from the ZeroTier control panel, indicating that to reach the device 192.168.1.10 it must be done through the ZeroTier IP of the Titan router, namely IP address 10.147.20.140. To do this, the following route must be added "10.147.20.140 > 192.168.1.10/32" as follows:

The provided of the provided	Network	s Logout
Advanced Managed Routes 1/28- I 0.147.20.0/24 (LAN) Add Routes Destination 192.168.1.10/32 Submit		

If there were more devices to be accessed within the 192.168.1.X network (e.g. because the Titan router was connected to several Ethernet computers via a switch), the following route could be added to access that entire network:

÷	→ C So my.zerotier.com/network,	/e5cd7a9e1cd56dac				Ľ	☆ 🗯	• 🦃	:
Φ	ZEROTIER		Download	Knowledge Base	API Community	Account	Networks	Logou	it Í
	Advanced	Managed Routes 1/128- 10.147.20.0/24 = Add Routes Pestination 192.168.1.0/24 Submit	(LAN)	Via 10.147.20	0.140				

To test communication with PLC2, simply PING from the control PC to PLC2's local IP 192.168.1.10.



### 9. Accessing the device with Wifi connection (PLC3) via NAT

In this example, it is not the intention to access all PLC3 IP services, i.e. all TCP ports that PLC3 might have open. In this example, we only need to access TCP port 81 of the local IP 192.168.2.10 of PLC3 via NAT, i.e. via the ZeroTier IP of the Titan router 10.147.20.140 and TCP port 81.

To do this, simply access the Titan router via the menu "Firewall > NAT" and configure a rule as shown below, and then reboot the router.

$\mathbf{w}$	<b>N</b> We	bc بالا		noup	"Makes your A	FAN PPLICATION hap	ppen"		
Mobile	► Firewall ► NA	► Firewall ► NAT							
Status     Basic Settings	Service name	Protocol	In. Port	Out. Port	Destination IP	Interface			
• Keep Online	PLC3	tcp + udp	81	81	192.168.2.10	zt0	Delete		
Basic Settings     DHCP Server	Service name: Protocol:	PLC3	PLC3     Insert a name for the service       TCP+UDP     Select TCP/UDP protocol						
Basic Settings	Port:	81		In	put port (0 65535	5) - Router			
<ul> <li>DHCP Server</li> </ul>	Output Port:	81		0	utput port (0 6553	35) - Destinatio	on server		
e NAT	Server IP Address:	192.168	3.2.10	Se	et the IP of the desti	nation server			
<ul> <li>Authorized IPs</li> <li>MAC Filter</li> <li>Routes</li> </ul>	Interface:	Mobile - 4G/3G/2G (ppp0) Mobile - 4G/3G/2G (ppp0) WIFI (wlan0) Open/VPN (tun0)			Network interface. Normally: WAN - 4G/3G/2G (ppp0)				
Serial Settings     Serial Port1-RS232     Serial Port2-RS485	SAVE SERVICE	ZeroTie ZeroTie ZeroTie	er1 (zt0) er2 (zt1) er3 (zt2)						