

White Paper

NovaTec Access Media Gateway

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This document is subject to changes.



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1 Introduction

This white paper describes the characteristics, configuration, operation and connections of NovaTec A-MGWs in a VoIP network or in interaction with e.g. the Cisco Unified Communications Manager over a SIP trunk.

The NovaTec A-MGWs provide all usual TDM based interfaces (PRI, BRI, analog, GSM, Uk0). The NovaTec Sx models can be connected e.g. as third party device to a Cisco Unified Communications Manager.

Amongst other things this document covers the general procedure for the TLS encryption, a detail description how TLS is set up, how DHCP has to be installed, a step by step guide of how the Sx has to be configured if connected over a SIP trunk, how the NovaTec Management System needs to be set up and how it works with the Sx.

2 Configuration instruction

2.1 Starting the configuration interface:

Start the configuration interface via the Windows start menu: Start menu \rightarrow Programs \rightarrow NovaTec \rightarrow NMP 6.2 \rightarrow NovaTec Configuration





2.2 Open the data base

Choose "File/open" in the menu bar. Choose the needed file in the open dialogue.

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<u>S</u> uchen in:	🔁 config 💽 🛨 🖽 😁	
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ang	Dateityp: Database (*.mdb)	brechen

2.3 Chassis configuration (S20, S6, S5+ or S3)

Click on "Novatec-System" in the left tree first and afterwards on the button "New choice" in the right window.

NovaTec	
2	If you choose a new system, all data of your current configuration will be deleted. Would you like to keep your current configuration ?
	<u>]a</u> <u>N</u> ein

Confirm the pop-up-dialogue with "No". Thereby the existing adjustments in the data base are deleted. You thereby setup a new configuration.



 Image: Second Second

Choose e.g. "System-Chassis S6" as chassis to configure a NovaTec S6.

2.4 Defining the numbering plan

Select "NovaTec-System/Numbering plan" in the left menu tree and click button "New" in the right window.

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🗉 🧰 GSM Settings	Short code-dialing 1	Short code-dialing		
E SIM Multiplexing				
🗉 🔄 Numbering plan				
E Call data profile				
Trunk group				
Master / Slave settings				
DSS1 -> 1TP6 conversion options				
Frame Relay				
🗄 🧰 Layer 3 Multiplexer				
Fixed connections				
B Channel permissions				
Protocol Settings				
Options				
Building group				
E Call take over				
🗉 🧰 Call back settings				
🕀 🦳 CLIP Masquerading				
B-channel to B-channel	New	Edit	Delete	
🗈 🧰 NIP (NovaTec Internet Pathfinder)				
Operating parameters				
Call home settings				
Advanced Least Cost Router				
SIM Server settions				
CSD general options				
Press F1 for Help.	,			



In the window "New numbering plan" you enter "0-intern" as name and choose "Dialing plan" as type. The box *"PABX-Number"* remains empty. Confirm with "Ok". Repeat the procedure and setup a second dialing plan with the name "1-SIP".Choose the same setup as before.

NovaTec-Configuration 6.2 - [1tr6 k	onverter s0 pp, pmp]			- 3 🛛
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E Chassis				
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H GSM Settings	Short code dialing 1	Short code dialing		
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😥 🧰 Call take over				
😥 🧰 Call back settings				
😟 🧰 CLIP Masquerading				
B-channel to B-channel	New	Edit	Delete	
🐑 🧰 NIP (NovaTec Internet Pathfinder)				
🗄 🧰 Operating parameters				
🕀 🦲 Call home settings				
Advanced Least Cost Router				
😟 🧰 SM5 / VSMSC - Email				
E- SIM Server settings				
CSD general options				
Press F1 for Help.	J			

2.5 Configuration of SIP Trunk group

Pick "NovaTec-System/Trunk group" in the left tree and click "Edit" in the right window. Create a trunk group with the name "1-SIP" and the calibrations/data as given below. Confirm with "Ok".

Edit trunk group	
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	C <u>S</u> equential
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2.6 Configuring modules (e.g. S6 build up)

In this example the S6 consist of the following hardware: CCU with an analog slip on board ANA4 and an ISDN to BRI board S04, ULU with 4 Uk₀ interfaces, BCU 16 with 16 VoIP canals.

Pick "NovaTec System/Chassis" in the left tree. Choose "CCU 3" for slot 1 under "Slots" in the right window. Choose "ANA04" in space 1 under "Board on slot 1" in the bottom half of the window and "S04" in space 2.

NovaTec-Configuration 6.2 - [1tr6 kg	onverter s0 pp, pmp] 📃 🗗 🔀
Eile View Configuration data Encryption Ext	ras Help
Novele-System System access control System access control System access control System Poption options System encyption options	Noval cc - Chastis Slots 1 State 2 Emply • 10 3 Emply • 11 Emply • 13 Emply • 5 Emply • 13 5 Emply • 7 Emply • 8 Emply • 17 Emply • 17 Emply • 18 Emply • 17 Emply • 17 Emply • 18 Emply • 19 Emply • 10 Emply • 10 Emply • 10 Emply • 10 Emply • 11 Emply • 12 Emply •
Press F1 for Help.	



Choose "ULU" for slot 2 and "BCU16" for slot 3. As these boards have no slip on spaces you don't have to make further adjustments for slots 2 and 3.





2.7 Defining interfaces

Pick "NovaTec System/Interfaces" in the left tree. Select the particular interface and click the button "Edit". Execute the following adjustments for the different interface types: For BRI and Uk_0 interfaces choose "Subscriber line". The position "Trunk group" remains "not assigned".

For the analog interfaces (ANA4) choose the mode *"Analog Subscriber line"*. The position "Trunk group" remains "not assigned".

For VoIP interfaces (BCU16) choose mode "SIP" and "Trunk group" "1-SIP".

NovaTec-Configuration 6.2 - [S6 SIP]				- 7 🛛
Elle View Configuration data Encryption Extr	ras <u>H</u> elp			
P NovaTec-System	NovaTec - Interfaces			
E Chassis				
Interfaces	Interface	Mode	Trunk group	
Analogue Interface-Configuration	Slot 01: CCU2 : Interface 01	Analog Subscriber Line	not pasigned	
System access control	Slot 01: CCU3: Interface 01	Analog Subscriber-Line	not assigned	
System IP options	Slot 01: CCU3: Interface 02	Analog Subscriber Line	not assigned	
System encryption options	Slot 01: CCU3: Interface 04	ánalog Subscriber Line	not assigned	
H GSM Settings	Slot 01: CCU3: Interface 05	Subscriber line	not assigned	
H SIM Multiplexing	P Slot 01: CCU3: Interface 06	Subscriber line	not assigned	
Cull data and the	Slot 01: CCU3: Interface 07	Subscriber line	not assigned	
Cali data profile	Slot 01: CCU3: Interface 08	Subscriber line	not assigned	
Trunk group	Slot 02: ULU : Interface 01	Subscriber line	not assigned	
Construction	Slot 02: ULU : Interface 02	Subscriber line	not assigned	
DSS1 > 1706 conversion options	Slot 02: ULU : Interface 03	Subscriber line	not assigned	
E Dobi -> The conversion options	Slot 02: ULU : Interface 04	Subscriber line	not assigned	
I nuer 2 Multiplever	Slot 03: BCU16 : Interface 01	SIP	1-SIP	
Evel consections	Slot 03: BCU16 : Interface 02	SIP	1-SIP	
B Channel permissions	Slot 03: BCU16 : Interface 03	SIP	1-SIP	
D Chainer permissions	Slot 03: BCU16 : Interface 04	SIP	1-SIP	
E Ontions	Slot 03: BCU16 : Interface 05	SIP	1-SIP	
P. Subcriber	Slot 03: BCU16 : Interface 06	SIP	1-SIP	
R line group	Slot 03: BCU16 : Interface 07	SIP	1-SIP	×
E Call take over				
- Call back settings				
- CLIP Masquerading	Edit	E.,	eest [
B-channel to B-channel	Lucio.		porc	
+ 📄 NIP (NovaTec Internet Pathfinder)				
+ Derating parameters				
Call home settings				
+ Advanced Least Cost Router				
+ 📄 SMS / VSMSC - Email				
SIM Server settings				
CSD general options				
Press F1 for Help.				



2.8 System IP options

Choose "*NovaTec-System/System IP options" in the left tree*. Enter the appropriate settings for your network and installations.

NovaTec-Configuration 6.2 - [S6 SIP]			_ 7 🗙
File View Configuration data Encryption Extra	as <u>H</u> elp		
Nova Tec System N	NovaTec - System IP options IP-Options Local Name Local Domain Local IP-Address Subnet mask Gateway DSCP MTU External Gateway IP-Address Public name Non masiquesaded IP addresses mask (VPN) VLAN-Tagging VLAN-Tagging On/ Off VLAN-Tagging On/ Off VLAN-ID Pitority (VLAN)	i600001 192.168.127.254 255.255.0.0 192.168.0.1 0 10	
Press H1 For Help.			

Go to "NovaTec-System/System IP options/DNS Server" in the menu tree.

Click "*New*" and enter the address of your DNS server.

NovaTec-Configuration 6.2 - [S6 SIP		_ 2 🛛
Elle View Configuration data Encryption Ex	xtras Help	
🖃 🧰 NovaTec-System	NovaTec - DNS servers	
🔳 Chassis		
Interfaces		
Analogue Interface-Configuration	DNS servers	
E i System access control	192.168.0.1	
😑 🧰 System IP options		
🖹 DNS servers		
Available IP services		
System NAT mapping		
E System encryption options		
😥 🧰 GSM Settings		
😟 🧰 SIM Multiplexing		
😥 🧰 Numbering plan		
🔳 Call data profile		
😟 🧰 Trunk group		
😥 🧰 Master / Slave settings		
Synchronisation		
DSS1 -> 1TR6 conversion options		
😟 🧰 Frame Relay		
😥 🧰 Layer 3 Multiplexer		
Fixed connections		
B Channel permissions		
Protocol Settings		
Options		
😥 🧰 Subscriber		
😟 🧰 Line group	New., Edit., Delete	
😥 🧰 Call take over		
E Call back settings		
🕀 🧰 CLIP Masquerading		
B-channel to B-channel		
🗄 🧰 NIP (NovaTec Internet Pathfinder)		
Operating parameters		
🕀 🚞 Call home settings		
🗄 🧮 Advanced Least Cost Router		
🗈 🧰 SMS / VSMSC - Email		
🗄 🧰 SIM Server settings		
CSD general options		
1		
1	I	
Press F1 for Help.		
		Annual and a second sec



Go to "NovaTec-System/System IP options/Available IP services".

Click *"New"* and process the setups as shown in the next four pictures in order to activate SIP over UDP (via IP-Port 5060).

Confirm with "OK".

Create an IP service	×
Core options General options Access opti	ions SIP specific options
Service name	SIP UDP
Core protocol	Datagram (UDP)
Service type	SIP
✓ Activate service	
Receive port	5060
Send port	5060
Destination port	5060
Bemote IP address	
C Remote name	
	,
C Client	
(• Server	
·	OK Abbrechen Übernehmen
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We change the shape of the world

Edit service properties			X
Core options General options Access options SIP speci	ic options		
Always allow Lan and subnet access			
C Activate authorization			
C life access list			
None selected			
Jaone selected			
Use user name and password			
User name			
User password			
	UK	Abbrechen	Ubernehmen
Edit service properties			×
Core options General options Access options SIP speci	ic options		1
Session owner NovaTec			
Session name NovaTed			
🔽 UAC enabled			
✓ UAS enabled			
Support V1			
Extensions 0x0000000			
_			
Proxy			
I Redirector			
I Hegistrator			
Locator			
	OK I	Abbrechen I	Ubernehmen

Click "New" anew and carry out the settings shown in the next three pictures in order to activate the service Telnet (via IP port 23).

Confirm with "OK".



We change the shape of the world

Create an IP service	<u> </u>
Core options General options Access	options
Service name	telnet
Core protocol	Stream (TCP)
Service type	TELNET
✓ Activate service	
Receive port	23
Send port	23
Destination port	23
Remote IP address	0.0.0
C Remote name	
C Lient	
·- 36/76/	
reate an IP service	
reate an IP service Core options General options Access	options
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Create an IP service Core options General options Access Timeout (in seconds) Maximal retries after timeout Retry delay (in seconds) Optional flags	options
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reate an IP	service	.1		
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- Activate				
	O Use access list			
		~		
	Use user name and password			
	User name	admin		
	User password	RECEIPTER		
		ОК	Abbrechen Obe	ernehmen

Click *"New"* again and proceed with the settings in the next pictures to activate the service http (via IP port 80).

Confirm with "OK".

Create an IP service	
Core options General options Access option	s]
Service name	http
Core protocol	Stream (TCP)
Service type	HTTP
✓ Activate service	
Becsive port	80
Send port	80
Destination port	80
Remote IP address Remote name	
	1
C Client	
(• Server	
	OK Abbrechen Obernehmen



We change the shape of the world

Create an IP service		X
Core options General options Access optio	ns l	
Timeout (in seconds)	10	
Maximal retries after timeout	5	
Retry delay (in seconds)	10	
Optional flags	0]	
	OK Abbrechen Übernehn	nen
Create an IP service		X
Create an IP service	15	X
Create an IP service Core options General options Access optio	18	
Create an IP service Core options General options Access optio Always allow Lan and subnet access	18	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Activate authorization	18	
Create an IP service Core options General options Access optio IV Always allow Lan and subnet access IV Activate authorization	15	
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list	18	
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Always allow Lan and subnet access C Use access list	22	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and passwor	18	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and passwor User name	IS	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and pessword User name User name	15	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Coupled to the service option	15	X
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Course authorization Course access list Course access list Course user name and passwor User name User password	15	×
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Course authorization Course access list Course access list Course user name and password User name User password	s	×
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and passwor User name User password	IS	×
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and passwor User name User password	12	×
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Core options C	15	
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access Court Court of Use access list Court Of Use user name and password User name User password	s	
Create an IP service Core options General options Access optio Always allow Lan and subnet access Always allow Lan and subnet access C Use access list C Use access list C Use user name and password User name User password	IS	
Create an IP service Core options General options Access optio Always allow Lan and subnet access Ketivate authorization C Use access list C Use user name and passwor User name User password	15	

If you have activated all services as given above the overview will look as shown in the picture below.



NovaTec-System	NovaTec - Available	IP services							
Chassis Interfacer									
Apalogue Interface-Configuration	Service name	Core protocol	Туре	Status	Role	Receive	Send	Destination	
System access control	SIP-UDP	Datagram	SIP	Enabled	Server	5060	5060	5060	
System IP options	telnet	Stream	TELNET	Enabled	Server	23	23	23	
DNS servers	http	Stream	HTTP	Enabled	Server	80	80	80	
Available IP services									
System encryption options									
GSM Settings									
SIM Multiplexing									
📄 Numbering plan									
Call data profile									
📄 Trunk group									
Master / Slave settings									
Synchronisation									
DSS1 -> 1TR6 conversion options									
📄 Frame Relay									
🚞 Layer 3 Multiplexer									
Fixed connections									
B Channel permissions									
Protocol Settings									
Options									
Subscriber									
Line group	New	Edit I	Delete						
Call take over									
Call back settings									
CLIP Masquerading									
B-channel to B-channel									
NIP (NovaTec Internet Pathfinder)									
Operating parameters									
Call home settings									
Advanced Least Cost Router									
5M5 / VSMSC - Email									
SIM Server settings									
CSD general options									

2.9 Configuring subscriber and permission class

Go to the left tree and choose "New" under "NovaTec-System/Subscriber".

Enter the below given data setup in order to configure a fax on the first analog interface with number "956111".

New subscriber		\mathbf{X}
Subscriber-Options		
<u>N</u> umber:	956111	-
Description:	FAX 1	
Interface:	Slot 01: CCU3 : Interface 01]
Permission class:	Permission class 1]
Call <u>t</u> ake over:	Call take over 1]
Device Type:	Facsimile]
Subaddress-IE:		1
Bearer-Capability-IE:	3.1 kHz audio]
Low-Layer-Compatibility-IE:		1
High-Layer-Compatibility-IE:	<u> </u>]
<u>0</u> K	Cancel	

Confirm with "Ok".



Click "New" again.

Enter the below given setup data in order to configure a modem on the first ISDN interface with number "956222".

Confirm with "Ok".		
Edit subscriber		×
Subscriber-Options		
<u>N</u> umber:	956222	
Description:	ISDN Modem 1	
Interface:	Slot 01: CCU3 : Interface 05	
Permission class:	Permission class 1	
Call <u>t</u> ake over:	Call take over 1	
Device Type:	Modem	
Subaddress-IE:		
Bearer-Capability-IE:	Unrestricted Digital Information (Data)	
Low-Layer-Compatibility-IE:		
High-Layer-Compatibility-IE:	User-define	
<u>D</u> K	Cancel	

Click "New" again.

Enter the below given setup data in order to configure a modem on the first $U_{\rm K0}$ interface with number "9566333".



Confirm with "Ok".

E	dit subscriber		\mathbf{X}
	Subscriber-Options		
	<u>N</u> umber:	956333	-
	Description:	ISDN Phone 1	
	Interface:	Slot 02: ULU : Interface 01	[
	Permission class:	Permission class 1	[
	Call <u>t</u> ake over:	Call take over 1	I
	Device Type:	Phone 💌	
	Subaddress-IE:		
	Bearer-Capability-IE:	Speech	1
	Low-Layer-Compatibility-IE:		
	High-Layer-Compatibility-IE:	User-define	[
	<u>0</u> K	Cancel	

Go to the tree on the left hand of the window and select "Permission class 1" under "NovaTec-System/Subscriber/Permission class". Click "Edit" after doing so.

E	dit permission class	
	<u>N</u> ame	Permission class 1
	Short code-dialing	
	Call for <u>w</u> arding	
	₩ Hold	
	Explicit call transfer	
	Call take over	
	Advice o <u>f</u> charge	
	<u>D</u> ialing plan	0-intern 💌
	<u>I</u> mmediate call	
	Short code-di <u>a</u> ling	Short code-dialing 1 🗨
	Call data <u>p</u> rofile	Call data profile 1 📃 👻
	Price per <u>u</u> nit to the subscr.	0.12
	<u>O</u> K	Cancel

Adjust the setup as given below and confirm with "Ok".



Click "New" in the tree on the left hand under "NovaTec-System/Subscriber/Permission class/Assignment".

Choose the trunk group "1-SIP" as shown below and confirm with "Ok".

New assignment	×
Trunk group	
<u>0</u> K	<u>C</u> ancel

Below you can view the window shown after "1-SIP" was included in "Permission class 1".

NovaTec-Configuration 6.2 - [S6 SIP	1	- B 🛛
Elle ⊻lew ⊆onfiguration data Encryption Ex	tras Help	
NovaTec-System NovaTec-System Interfaces Interfaces System Access control System Access	NevaTec - Assignment of line bundles Permission class 1 Name D 1SIP	
Press F1 for Help.		



2.10 Configuration of dialing plans

Two dialing plans have to be configured.

The internal dialing plan (Name: "0-intern") is used by all subscribers (end devices) of the system.

Choose "NovaTec-System/Numbering plan/Dialing plans" in the left hand tree. Go to the flag "0-intern". Click "DDI Wizard". Carry out the below given adjustments and confirm with "Ok".

DDI wizard		
Destination for the rema	ining numbers	
<u>I</u> nterface		_
<u>T</u> runk group	1-SIP	•
Line group		_
Range		
Start	0	
End	9	
_		
<u>0</u> K		<u>C</u> ancel

The picture below shows the setup of the dialing plan "0-intern". All calls are routed to the trunk group "1-SIP".

The calls from the end devices are routed using the SIP call number plan.



Pick "NovaTec-Systems/Numbering plan/Dialing plans".

Go to tab "1-SIP" and click button "Subscriber". By doing so all of the configured subscribers are entered in the call number plan. (see below)

NovaTec-Configuration 6.2 - [S6 SIP]		_ 7 🛛
File View Configuration data Encryption Extra	as <u>H</u> elp	
Call back settings Call back setting	NovaTec - Assignment of dialing plans Britem TSIP Dijects Number ¹ Y Stot 01: CCU3: Interface 01 \$56111 ¹ Y Stot 02: ULU: Interface 05 \$565222 ¹ Y Stot 02: ULU: Interface 01 \$56533 Image: Stot 02: ULU: Interface 01 \$56333 Image: Stot 02: ULU: Interface 01 \$56333	
Press F1 for Help.		



2.11 Activating SIP

Open "NIP/SIP" in the tree on the left and activate the option "Activate SIP".

NovaTec-Configuration 6.2 - [S6 SIP]		- 7 🛛
Eile ⊻iew ⊆onfiguration data Encryption Ext	ras Help	
Image: State of the state	NavaTec - SIP (VoIP) activation	
Press F1 for Help.		



2.12 Defining codec priorities

Choose "NIP/Codec negotiation" in the left tree. Select a codec and use the buttons with the arrows to change the priority of the codec. The codec at the top of the list has the highest priority. The picture below shows a typical codec priority. The codec X-CCD (Cisco Clear Channel Codec) should always have the highest priority and be at the top of the list.

.: NovaTec-Configuration 6.2 - [6.3 Ref	ferenz]			- F 🛛
File View Configuration data Encryption Ext	ras <u>H</u> elp			
NovaTec-System NIP (NovaTec Internet Pathfinder)	NovaTec - Code	c negotiation /	properties	
Codec options				
Codec negotiation / properties	Name	Payload	Description	
😟 🧰 SIP (VoIP)	X-CCD	125	USCU al an Other	
Operating parameters	poma	0	aLaw 64kDit/s	
E- Call home settings	6729	18	G 7296 B 8kb/s MOS 4.0	
🗄 🚞 Advanced Least Cost Router	G728	15	G.728 16kb/s MOS 4.0	
😟 🧰 SMS / VSMSC - Email	G726-40	114	G.726 40kb/s MOS 4,0	
IF I SIM Server settings	G726-32	2	G.726 32kb/s MOS 3,7	
CSD general options	G726-24	113	G.726 32kb/s MOS 3,2	
	G726-16	112	G.726 16kb/s MOS 3,2	
	,			
	Edit			
Press E1 for Help.				



2.13 Controlling general SIP settings

Choose "NIP/SIP/SIP general settings" in the left hand tree. The setup should be shown as given below.

NovaTec-Configuration 6.2 - [S6 SIP]		- 7 🗙
Eile View Configuration data Encryption Ext	ras Help	
Der gewer Conjugation dass Entrypool ext Der gewer Conjugation dass Entrypool ext Image: Second Sec	NovaTec - SIP general settings General Local IP address 192 168 127 254 Software name NovaTec SIP 56.4 Initial sequence 0 ✓ Allow internal (routing) loops ✓ Always try to internally recolve names/IP addresses first Use local name (funchecked, use IPv4) ✓ Read internal server information every ✓ Read internal server information every ✓ Save dynamic server information every ✓ Forward numerical addresses to ISDN ✓ Activate SIP-Bridging 0 value 10 ✓ PSTN prefix PSTN prefix insett length Min. session expire 3600	4
	Session expire 2000 Anorymous name anon Optional flags 000000000031D277C UDP / RTCP options UDP packet size 1200 4 Local RTP port 30000 4 Remote RTP port 30000 4 Local RCTP port 30001 4 Remote RCTP port 30001 4 RCTP port 30001	-
Press F1 for Help.		

2.14 Assignment of DP ports

Choose "NIP/SIP/VOIP port settings/VOIP UDP port assignment" in the left hand tree and click on the button "Auto ports…". Choose the IP port to be used for RTP by entering the first IP port to be used for RTP (see below).

Automatically create BCU UDP ports						
The BCU UDP ports will be automatically assigned using the values provided below.						
30000 Start at port						
Create corresonding NAT ports in the NAT mapping list						



The configuration interface will then assign two IP ports for every VoIP interface. One for RTP and the next for RTCP.

NovaTec-Configuration 6.2 - [S6 SIP]]			
File View Configuration data Encryption Ext	ras <u>H</u> elp			
⊕ DovaTec-System	NovaTec - BCU UDP/RTCP port a	ssignment		
Image: Sector Sect				
Codec options Codec options	Interface	Port 1 Local	Port 2 Local	
Codec (regoliador) properces	Slot 03: BCU16 : Interface 01	30000	30002	
SIR codec mapping	Slot 03: BCU16 : Interface 02	30004	30006	
SIP codec mapping	Slot 03: BCU16 : Interface 03	30008	30010	
E Strigeneral sectings	Slot 03: BCU16 : Interface 04	30012	30014	
P VoIP LIDP port assignment	Slot 03: BCU16 : Interface 05	30016	30018	
+ D VoIP port profiles	Slot 03: BCU16 : Interface 06	30020	30022	
□ SIP <-> ISDN ontions	Slot 03: BCU16 : Interface 07	30024	30026	
Imenut ontions	Slot 03: BCU16 : Interface 08	30028	30030	
Session settings				
Monitoring options				
+- 📄 SIP server lists				
🕀 🦳 Mapping lists				
+ Departing parameters				
Call home settings				
Advanced Least Cost Router				
🗄 🧰 SMS / VSMSC - Email				
🗄 🧰 SIM Server settings				
CSD general options				
	E dit Auto ports			
Press E1 for Help				

2.15 SIP ISDN options

Go to "NIP/SIP/SIP <-> ISDN options" in the left hand tree and set up the following adjustments.

NovaTec-Configuration 6.2 - [S6 SIP]			- 8 🛛
File View Configuration data Encryption Ext	ras <u>H</u> elp		
MovaTcC-System NovaTcC-System NovaTcC-System Codec options Codec options Codec options StP (VeIP) SIP codec magning SIP general settings VoIP port settings VoIP port porties VoIP port porties VoIP port porties StP settings Codec options SiP server lists Code code cleast Code Router SiP System lists SiP System lists SiP System lists SiP System lists SiP Code cleast Code Router SiP System lists SiP System settings SiP System Set	NovaTec - SIP <> ISDN options Dialing plan to use for incoming SIP calls Access list to use Call data record profile to use Minimal number of digits required from ISDN Wait time between each digit (overlapped) Activate progress indication Vait for Activate "Fake" alerting after Wait for ACENT (in seconds) Wait for RELEASE (in seconds) Wait for RELEASE COMPLETE (in seconds) C Activate early media for VDICE calls Activate early media for DATA calls	1.5 P None Call data profile 1 21 1	
Press F1 for Help.			



2.16 Mapping Lists

Go to "NIP/SIP/Mapping lists/User mapping" in the left hand tree and click "New".

Adjust set up as given below. Enter the IP address of your Cisco Unified Communications Manager under "URI / Name / IP".

Edit User mapping	
User mapping is active	v
- ISDN options	
ISDN	Wildcard 🗖 WearOut 🗖
Incoming prefix	Number length 0
Device options	
Device	Sub: LLC:
Phone	
-Facsimile over IP (T.38]
Enable T 38	T.38 Expert Settings
2110010 1.000	
SIP URI / Name / Dom	nain / IP information
URI / Name / IP	192.168.127.62
IP verfication mask	32 significant bits
Voice / Data codec	no assignment
Trusted	Accept all names Correct faulty format
Public access	User name is a prefix Can redirect in LAN
ISDN is a user name	Additional flags
Account settings	
Account	Password
Simplified digest	Basic authorisation Proxy authorisation
Reserved 1	May use alternative encryption methods
Encryption setting	Do not use Handling profile None
Additional flags	
	OK Cancel



Image: Code options Image: Code options Image: Code options SPS code: mapping Image: Code mapping SPS code: mapping Image: Code mapping SPS code: code: Code mapping Image: Code mapping SPS code: C	e ⊻iew Configuration data Encryption E>	tras <u>H</u> elp					
Worlec-System W P0 (worlec therm Relation der) Codec options Strept of the mode patients Strept of the mode patients Mapping lists Mapping lists Mapping lists Mapping lists Strept of the mode patients Advanced Lasst Code Radging Strept of the mode patients Mapping lists Mapping lists Strept of the mode patients Strept of the							
Image: Non-American Street Pathinder) Image: Codec reportions Image: Street St	NovaTec-System	NovaTec - SI	P User mapping				
Code captors IP Domain (SIP Account Voice codec Data codec Str (Var) Str (Var) IP Domain (SIP Account Voice codec Data codec Str (Var) Str (Var) Str (Var) In the strings In the strings In the strings Str (Var) Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) Str (Var) In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) Str (Var) In the strings Str (Var) Str (Var) Str (Var) In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) In the strings In the strings Str (Var) Str (Var) <td< th=""><th>NIP (NovaTec Internet Pathfinder)</th><th></th><th></th><th></th><th></th><th></th><th></th></td<>	NIP (NovaTec Internet Pathfinder)						
Image: Street	Codec options	ISDN	IP I Domain I SIP	Account	Voice codec	Data codec	
Image: Strip (viding) Image: Strip (viding) Image: Strip (viding) Image: Strip (viding) <td>Codec negotiation / properties</td> <td>• ×</td> <td>192 168 127 62</td> <td></td> <td>none assigned</td> <td>none assigned</td> <td></td>	Codec negotiation / properties	• ×	192 168 127 62		none assigned	none assigned	
ar code mapping arrow of the settings arrow of the settin	SIP (VOIP)		100.100.100.000		none accigned	Horio deligitod	
Wew Edt Delete Clear date Import Export Export Mew Edt Delete Clear date Import Export Export.	SIP codec mapping						
Image: Second patients Image: Second patien	VoIP port settings						
Tresout options Session settings Monitoring options Session settings Monitoring options Session settings Monitoring options Session settings Monitoring options Session settings Advanced Least Cost Router Sets / VSRC - Emal Session settings Coll mapping Operating parts Session settings Advanced Least Cost Router Sets / VSRC - Emal Sets / VSRC - Emal Session settings Monitoring Mon	SIP <-> ISDN ontions						
Session settings Monomoulas	Timeout options						
Monching options M Septembers Call hors settings Advanced Less SM Server settings SM Server settings SM Server settings SM Server settings SM Server settings Mew Edit Delete Clear data Import Export	Session settings						
By Server los Boom mapping Boom mapping Doer mapping Cold none settings Advanced Less Cost Router SMS /VSMC- Email SMS Server settings CSD general options	Monitoring options						
Mapping lats Mapping Continues settings Advanced Least Cost Router SMS / VSMSC - Email SMS / VSMSC - Email S	🗄 🧰 SIP server lists						
Vormoschro Hoter moschro Local mapping Coal massing Advancet Least Cost Router Sth / sympt. Sth / sympt. Coal print of the settings Sth / sympt. Sth / sympt. Edit. Delete Clear date Import Export	🖻 🚞 Mapping lists						
Index mapping Operating parameters Coll home settings Advanced Least Cost Router SMS (vsMcc - Email SM Saver settings CSD general options	🖹 User mapping						
Incelling in the settings Call horse settings Advanced Least Cost Router SMS / VSMSC - Emal SMS / VSMSC - Emal SMS / Source settings Storer settings Call provide the settings SMS / Source settings SMS / Source settings Storer settings Call provide the settings SMS / Source settings Call provide the settings SMS / Source settings Call provide the settings Storer settings Call provide the settings	🗏 Host mapping						
Operating parameters Calhone settings Advancel Least Cost Router StM Server settings CSD general options	📰 🔳 Local mapping						
Cell home settings Advanced Least Cost Router SMS (YMSC - Email SMS Serve settings CSD general options New Edit Delete Clear data Import Export	Operating parameters						
Advanced Least Cost Router Styl y SMSC - Email Styl SMSC - Email Styl SMSC - Email CSD general options CSD general options New Edit Delete Clear data Import Export	Call home settings						
SMS General options CSD general options New Edit Delete Clear data Import Export	Advanced Least Cost Router						
SIM Server settings ■ CSD general options New Edt Delete Clear data Import Export	SMS / VSMSC - Email						
CSD general options New Edit Delete Clear data Import Export	SIM Server settings						
New Edit Delete Clear data Import Export	CSD general options	1					
		New	Edit Delete	Clear data Imp	ort Expor	t.,	

After confirming with "Ok" you will find the IP address of your Cisco Unified Communications manager in the overview.

2.17 Call Home Settings

Choose "Call home settings" in the left hand tree and activate the desired call home events that are to be reported to the NovaTec network management system.

NovaTec-Configuration 6.2 - [S6 SIP]]			- 7 🛛
Ele View Configuration data Encryption Ext	tras <u>H</u> elp			
H- NovaTec-System	Call Home - Call Home Events			
Operating parameters	5.1	1	10 mi	
😑 🛅 Call home settings	Event	Intelface / Call Number	Lai Home	^
Call Home	V Client Callback failure	Domain: nmsserver.yourdomain.local:		
Advanced Least Cost Router	EWU Board removed from system	Domain: nmsserver.yourdomain.local:		
🗄 📄 SMS / VSMSC - Email	Prais short of ASH-limit	Domain: nmsserver.yourdomain.iocar		
E SIM Server settings	GSM ASH event	Domain: nmsserver.yourdomain.iocar		
CSD general options	D ISDN ASH event	Domain: nmsserver.yourdomain.tocar		
	Layer 1 or Layer 2 inactive	Domain: nmsserver.yourdomain.iocar		
	Dy Log nied	Domain: nmsserver.yourdomain.iocar		
	VILP Hunning errors	Domain: nmsserver.yourdomain.iocal		
	Disa tinang dia MIME sama	Domain: nmsserver.yourdomain.iocal		
	Comer Callback failure	Domain: hinsserver.yourdomain.tocal		
	Civic Server Calback Talule	Domain: himsserver.yourdomain.tocal		
	Similarioved for SCD	Domain: himsserver.yourdomain.tocal		=
	Sir Ash event	Domain: rimsserver.yourdomain.tocal		
	SUS Clerk unleachable	Domain: rimsserver.yourdomain.tocal		
	Curtemated default	Domain: rimsserver.yourdomain.local		
	Systemstatic deraut	Domain: rimsserver.yourdomain.tocal		
	Systemstart normal	Domain: rimsserver.yourdomain.local		
	V Time event	Domain: rimsserver.yourdomain.local	every 2 hours	
	Trace enor	Domain: rimsserver.yourdomain.tocal		
	V Trace fatal	Domain: hmsserver.yourdomain.local		
	Trace nied	Domain: hmsserver.yourdomain.local		
	Dy Trace Warning	Domain: hmsserver.yourdomain.iocal		~
	Edt.			
Press F1 for Help.				



2.18 Preparing the data base and transferring it onto the system

Press "Configuration data/Process" in your menu bar. If no major mistakes or inconsistencies are existent in the configuration setup the following window will show up:

NovaTec	-Configuration 6.2
(į)	The data has been processed succesfully and is ready to be transfered to the target system.

Confirm by pressing button "Ok". Should you receive an error report please check your setup.

Choose "Configuration data/Transmit to target system" in the menu.

Transmission options	
Update Configuration Transmit <u>n</u> ew configuration data to target system Delete <u>a</u> ll configuration data in target system Do not change <u>c</u> onfiguration data	OK Cancel
Update options Update time and date in target system <u>Reboot target system if reconfiguration is not possible</u>	

Adjust as given above and confirm with "Ok".



2.19 Activation of SRTP

Go to "Encryption/Enter serial number..." in the left hand tree.

Encryption
Customer
Backplane ID
Serial number
OK Cancel

The encryption data is constructed by NovaTec and delivered to the customer in the following form:

User name: xxxxxxxxx (e.g. name of customer)

Backplane ID: 000006767676

Serial number:

FB11 - EF76 - CA90 - EC73 - EF00 BF12 - AE30 - CC47 - FC46 - AD47

After the encryption data was entered close the data base and reopen it.

These steps are also necessary:

Go to "NovaTec-System/System encryption options/Encryption profiles" in the left hand tree and click "New".

Pick your encryption options (see below).

Confirm with "Ok".



New Encryption profile	\mathbf{X}
Encryption profile is active	
Profile name	Encryption profile
Hash method	SHA 1
Encryption method	AES
Topology	Pre Shared Key (PSK) 📃 💌
Use ECC extensions	
Key	
Your bait of falsehood takes this ca	rp of truth
	~
ОК	Cancel

Go to *"NovaTec-System/System encryption options/Encryption handling profiles"* in the left hand tree and click *"New".*

Adjust setup as given below and confirm with "Ok".

New handling profile	
Handling profile is active	
Profile name	Handling profile
Handling method	NovaTec A 📃
Optional prameters	
OK	Cancel

Select "NovaTec-System/System encryption options/Encryption handling/profiles/Encryption - >Handling assignment" and click "New".



Choose "Encryption profile" and confirm "OK".

Encryption profiles	
Encryption profile	
ОК	Cancel

Pick "NovaTec-System/System encryption options/System module / interface settings/Module assignment" in the left hand tree and click "New".

Choose "Handling profile" and confirm "OK".

Encryption handling profiles	
Handling profile	
	Cancel

Go to "*NIP/SIP/Mapping lists/User mapping*" in the left hand tree and click "*Edit*". Choose "Try to use" for "*Encryption setting*" and "*Handling profile*" for "*Handling profile*".



We change the shape of the world

Edit User mapping	
User mapping is active	
-ISDN options	
ISDN	Wildcard 🔽 WearOut 🗆
Incoming prefix	Number length 0
Device options	
Device	Sub: LLC:
Phone	
Facsimile over IP (T.38]
Enable T 38	T 38 Expert Settings
SIP URI / Name / Dom	vain / IP information
URI / Name / IP	192.168.127.62
IP verfication mask	32 significant bits
Voice / Data codec	no assignment
Trusted	Accept all names Correct faulty format
Public access	User name is a prefix Can redirect in LAN
ISDN is a user name	Additional flags
Account settings	
Account	Password
Simplified digest	Basic authorisation Proxy authorisation
Reserved 1	May use alternative encryption methods
Encryption setting	Try to use Handling profile Handling profile
Additional flags	
	DK Cancel

Confirm "OK".

Repeat steps from 2.17. Call Home Settings.



3 Activate DCHP

By choosing "System-IP-Options" in the left part of the application window "NTConf" the following dialogue is shown on the right hand side of the window.

NovaTer-System	Nerval ac - Sectors IP actions		
ill Chanais	(ED)		
2 beterfacen	th optime		
- System access control	D#DP-Optiere	THCP of *	
E) Dhid surveys	D #OP starts optional app	18 <u>-</u>	
 III Available IP services III System NAT mapping 	Local Name	Increase and	
😑 System encryption options	Local Parale	ing rowses ap	
- GSM Settings	Land Domary	turnable, ap	
and overlapseurg	Local IP-Address	152.168.127.254	
all Call data profile	Subreat reach.	255.255.0.0	
Trutt group Marter / Save ratings	5 devay	1/2, 16 . 0 . 1	
I Synchronization	0109	D	
- 2 0521 -> 1TRE communities options	HTU	1410	
ayer 3 Multipleser	External Galaxyay IP-Addeos	0 . D . D . 0	
End conventions	Public name		
- III S Channel permensions	Non-merganished P	0.0.0.0	
E Options	anterior real (0-%)		
- Jubicober	- VLAN Teging		
Call take ever	C M 495 Textus Dol DF		
Cell back settings	- How reging on or		
I B-channel to 8-channel	VLAHD	0	
NP (NovaTec Internet Pattfinder)	Prorby (MLAN)	0	
Operating parameters			
Advanced Least Cost Router	Transpot Layer Security (TLS)	License is loaded	
SMS / VIMSC - Ernail		Enable Security	
SIM Server settings		Dude feasty	
Con Bearer checke			

Picture 1: DHCP options

DHCP options can only be defined by choosing the appropriate items in the combo boxes (choice boxes).

If DHCP is activated unnecessary entry boxes are shown grey, i.e. are deactivated.



4 General procedure TLS

The following procedure is recommended to all customers for the safe handling of encryption (TLS/SRTP) between the NovaTec-Systems resp. with the Service-PC.

4.1 Creation of a "Root Certification Authority Certificate"



Picture 1: Create Root-CA

The first step in preparation for the customer is to uniquely generate a "Root Certification Authority Certificate" (Root-CA). Should the customer already have a certificate of a certifying body this step can be left out.

The creation of a Root-CA has to be done with the NovaTec tool "Trace Info Client" (TI-CA). The application needs to be installed on an access secure Microsoft server. Access secure means the server is within a locked room without LAN access.

Via the "Graphical User Interface" of the TI-CA application an encrypted Root-CA key (cakey.pem), a root certificate (cacert.pem) and a public certificate (cacert.crt) are created.

The Root-CA key (cakey.pem) and the password to this key are the most sensitive parts of a CA infrastructure and have to be kept within the customers safe together with the root certificate.

For the transport to the safe you can declare to the TI e.g. an USB stick as data carrier for the output file and store this within the safe.

The secured Root-CA is solely conducted to the signing of other certificates (see no. 5).

The public certificate (cacert.crt) is provided to all systems within this CA infrastructure (see no. 3).



4.2 Drawing a system clearing code



Picture 2: sourcing TLS license

In step 2 the customer has to read out the MAC address of the corresponding system (S3, S5, S6 or S20) with the help of the TI application and send this to NovaTec support via mail.

NovaTec determines an individual system clearing code for this system and forwards it to the customer via mail.

4.3 Configuring encryption



Picture 3: Configuring TLS for a NovaTec system

In this step only the system with the corresponding MAC address can be configured resp. be cleared for TLS via the NovaTec configuration program.

There are three categories in the configuration interface for this: NMS, SIP and Maintenance. Maintenance includes the applications TraceInfo Client, NovaTec Configuration and Call Server.

After entering the clearing codes (step 2) the three named categories can be engaged and configured for TLS/SRTP. Depending on the security grade the modes as given in tablet 1 are possible, e.g. importing of the public certificate (cacert.crt) from step 1.

The unsecured access to the systems on site is no longer possible after TLS was activated. All accesses via V24/USB, ISDN and IP like HTTP and TELNET are not accepted.



4.4 Creating the private key within the system



- Creation of
- Encrypted private key - Request for MNT, NMS and SIP



This step is only successful if the configuration in the prior step has been effected completely and flawlessly. This step is automatically run when rebooting and takes 20-30 seconds extra to the normal reboot time.

Beginning with the transfer of the configuration data onto the hardware it checks the clearing code after the necessary reboot for validity. If the check is positive the NovaTec hardware will accept the new configuration with encryption.

Additionally the reboot process causes the following system internal actions after a successful configuration:

- Creating a hardware private key

Creation of an encrypted private RSA key which is stored in the non-volatile memory of the hardware. There is no possibility to access this storage from the outside.

The key stays within the hardware device and can neither be read nor overwritten or deleted. The password for the key is not saved but generated individually and dynamically for the hardware runtime. As such for every system a new password is created.

- Creating a hardware certificate signing request

After the creation of a private key each of the configured three categories (see no. 3) generates a corresponding certification signing request.

For Maintenance, NMS and SIP produce the files mtn_req.csr , nms_req.csr and sip_req.csr with the help of the private key and saves these in the freely accessible flash data system

Warning: The request files are automatically deleted directly after the first successful opening of the corresponding certificate.



4.5 Signing of the hardware certificate signing request



Picture 5: NovaTec system is locally signed by server



Picture 6: NovaTec system is signed by service PC

The three certification signing requests created by the hardware in step 4 have to be signed by the Root-CA (e.g. the next higher CA's, see also step 1).

During this action you receive the corresponding certificates (data sets) for the hardware: mtn_cert.crt, nms_cert.crt and sip_cert.crt.

The procedure of step 5 is again safety problematical as for this purpose the encrypted Root CA key (cakey.pem from step 1) as well as the password are needed.

The transport of the key from the safe to the secure server (step 1) can be made by USB stick. The TI-CA can import the data set (cakey.pem) directly from the USB stick.

Warning: If the certificate is invalid the system blocks and has to be brought into default mode on site. In this mode the system cannot be used within the network and needs a corresponding configuration once again. The new configuration can be transferred onto the system with help of the NovaTec tools or you can change the IP settings of the system with help of e.g. Telnet in such way as to enable it to load the configuration from NMS.



4.6 Creation of the PC key and certificates



Picture 7: TI-CA signs the NovaTec PC tools MNT and NMS

In order to enable the service PC to communicate with the NovaTec hardware with TLS the PC applications have to be included in the CA infrastructure. TI-CA creates an encrypted private key and a certificate signed by the CA to achieve this. These data sets have to be saved on the service PC together with the public certificate of the CA and imported into TI, CI, CONF and NMS. The password of the private key also has to be imported (e.g. with an encrypted USB stick).

After this step all actions are completed and the service PC can communicate TLS encrypted with the NovaTec system.

This step is unnecessary with SIP connections in between the NovaTec systems.



4.7 Explanation of hardware TLS1.0 Modi as per RFC4346

Server modes for the applications Maintenance (TI, NtConf, Callserver) and SIP

Mode	Server key	Server-Cert	CA-Cert	Notes
0	-	-	-	Encrypted
1	mandatory	-	-	Anonymous Mode
				Is not supported
2	mandatory	mandatory	-	Optional: No client check
				safety: medium
3	mandatory	mandatory	mandatory	Full check:
				Safety high
4-8	-	-	-	not permitted with TLS

Client modes for the applications NMS and SIP

Mode	Client key	Client-Cert	CA-Cert	Notes
1	mandatory	-	-	Anonymous Mode
				Is not supported
2	mandatory	-	mandatory	Optional: No client check
				safety: medium
3	mandatory	mandatory	mandatory	Full check:
				Safety high
4-8	-	-	-	Not permitted with TLS







Comments on step 5:

The communication between TI-CA and the NovaTec system is effected manually for the time being with their own MMX protocol. If the customer has no own CA server in the second step the protocol SCEP (Simple Certificate Enrollment Protocol) can make sure of an automatically encrypted data exchange (SCEP is not part of the delivery for the time being).



5 TLS

5.1 Creating a Root-CA

DE_TICA_CREATECERT

An user can create the following with the application TI-CA:

CA private key and root certificate Certificate request for client or server

📲 TraceInfo CA 1.0	
About Connection Files	Create Key/Certificate Sign Cerificate Requests
Select cert-type	Root key(2048b)+ certificate
Enter Password	XIXXXXXXXXXXXX
Repeat Password	KINKINKIKK
Country name:	DE
State or Province:	NordRhein-Westfalen
City name:	Paderborn
Organization name:	NovaTec Kommunikationstechnik
Organization unit:	Software R & D
Common name:	www.novatec.de
Email address:	info@novatec.de
Valid days:	3650
Path for serial no.:	C:\keys\serial
Output path:	C:\keys\ca Generate key and cettificate
	Exit Help

a) Creating CA private key and root certificate:

- Select flag "Create Key/Certificate".
- A connection to the NovaTec system is not essentially necessary.
- Choose "Root key (2048b) + Certificate" in the combobox.
- Enter a CA password. The password has a minimum length of four and a maximum length of 20 figures.
- Repeat your CA password. Please keep your password in mind. If you wish to sign anything with this root certificate you will need it.
- The next steps are the entry of the CA identity such as land, province, town, organization, organization unit, common names and email address. For the Land you always need to enter two figures. The other entries may have a maximum length of 64 figures.
- Enter the validity of the root certificate in days.
- Enter an index path in which the data set serial.txt resides.⁽¹⁾
- Enter the index path in which the created CA private key and root certificate are to be saved. The created data sets are named cakey.pem and ca_cert.crt.
- If all entries are completed press button "Generate key and certificate". The application needs a few seconds to create the private key. Please confirm all notices with "Ok".

Note⁽¹⁾:

The serial number of a certificate is administered by a data set serial.txt. If this data set is not existent in the given path the application will design it anew and will assign a default start serial number.

If you want to assign the serial number yourself write a 16-digit hexadecimal number e.g. 0123456789ABCDEF into the data set serial.txt. After usage the number is incremented in serial.txt.



b) Creating certificate request for client or server:

 TraceInfo CA 1.0	
About Connection Files	Create Key/Certificate Sign Cerificate Requests
Select cert-type Enter Password	MNT-key(1024b) + cert-Reques
Repeat Password	
Country name:	DE
State or Province:	NordRhein-Westfalen
City name:	Paderborn
Organization name:	NovaTec Kommunikationstechnik
Organization unit:	Software R & D
Common name:	www.novatec.de
Email address:	info@novatec.de
Valid days:	3650
Path for serial no.:	C:\keys\serial
Output path:	C:\keys\ca Generate key and certificate
	Exit Help

- Select flag "Create Key/Certificate".
- A connection to the NovaTec system is not essentially necessary.
- Choose "MNT-key (1024b) + Cert-Request" or "NMS-key (1024b) + Cert-Request" in the combobox. You need MNT request for Maintenance and NMS request for the NMS server.
- Enter a password. The password has a minimum length of four and a maximum length of 20 figures.
- Repeat your password. Please keep your password in mind. If you wish to sign anything with this root certificate you will need it.
- The next steps are the entry of the subjects identity such as land, province, town, organization, organization unit, common names and email address. For the Land you always need to enter two figures. The other entries may have a maximum length of 64 figures.
- Enter the validity of the request in days.
- Enter the index path in which the created CA private key and root certificate are to be saved.
- If all entries are completed press button "Generate key and certificate". The application needs a few seconds to generate the private key. Please confirm the notices with "Ok".

DE_TICA_SIGNCERT

With the application TI-CA you can sign a certificate request in a certificate during which the certificate request can be situated on a PC or in a NovaTec device.



Case 1)

Sign a certificate request whilst this request is situated on a PC. The signed data set is written in a PC path. If needed the signed data set can be written in a NovaTec device.

🖬 TraceInfo CA 1.0				
About Connection Files Create Key/Certificate Sign Cerificate Requests				
Please enter issuer password reservences Please enter issuer password reservences Input Output CSR from : certificate request from PC • CA Key file: C:\cakey.pem • CA's Cert: C:\ca_cert.ort • REQ-file: C:\keys\mnt_red_csr • Sign the certificate request				
Exit Help				

- Select flag "Sign Certificate Requests".
- A connection to the NovaTec device is only necessary if you want to rewrite the signed data set onto the NovaTec device.
- Enter a CA password. This is the corresponding password to the CA private key.
- Repeat your password.
- Enter the following input feeds:
 - Select "certificate request from PC" in the combobox.
 - Enter the CA private key.
 - Enter the CA certificate.
 - Enter the certificate request to be signed.
 - Enter the following output feeds:
 - Select "signed certificate to PC" in the combobox.
 - Enter the index path where the data set serial.txt is situated.⁽¹⁾
 - Enter the validity of the certificate in days.
 - Enter the index path in which the signed certificate is to be written.
- If all entries are completed press the button "Sign the certificate request".



Case 2)

Sign certificate requests whilst the request is situated on a NovaTec device. The signed data set can be rewritten on a NovaTec device or in the PC if necessary.

📲 TraceInfo CA 1.0				
About Connection Files Create Key/Certificate Sign Certificate Requests				
Please enter issuer password Input Input Output CSR from : mnt_req.csr from target CA Key file: C:\keys\ca\ca\cakey.pem CA's Cert: C:\keys\ca\ca_cert.crt Temp path: C:\keys\temp Sign the certificate request				
Exit Help				

- Select flag "Sign Certificate Requests".
- A connection to the NovaTec gateway is necessary if you want to rewrite the signed data set into the NovaTec device.
- Enter a CA password. This is the password to the private CA key.
- Repeat your CA password.
- Enter the following input feeds:
 - Select "certificate request from target" in the combobox.
 - Enter the private CA key.
 - Enter the CA certificate.
 - Enter a temporary file path in which the certificate request should be buffered.
 - Enter the following output feeds:
 - Select "signed certificate to target" in the combobox.
 - Enter the file path in which the data set serial.txt resides.⁽¹⁾
 - Enter the validity of the certificate in days.
 - Enter a temporary file path in which the signed certificate should be buffered.
 - If all entries are completed press the button "Sign Certificate Requests".

Note⁽¹⁾:

The serial number of a certificate is administered by a data set serial.txt. If this data set is not existent in the given path the application will design it anew and will assign a default start serial number.

If you want to assign the serial number yourself write a 16-digit hexadecimal number e.g. 0123456789ABCDEF into the data set serial.txt. After usage the number is incremented in serial.txt.



5.2 Clearing NovaTec for TLS

The customer has received his license data and can now clear his systems for TLS with help of the application "NovaTec Configuration".

In order to achieve this he opens his conventional configuration with "NovaTec Configuration" and chooses "System-IP-Option" within the left hand tree.

New Net Sectors Chanse Chans	Monvall etc System IP options - IP Optoro D # DP-Optiers D # DP-Optiers	THCP of	
Consist Standards Consist Standards Consist Consister Consiter Consister Consit	DHOP-Optione DHOP-Optione DHOP starts optional app	THCP of	
2014 Annual Contraction 2014 Statement Access controls 2014 Statement Access controls 2014 Statement 2014 Statement 2014 Statement NetT mapping 2014 Statement Statement	DHDP-Options DHDP starts optional app	1HCP d1 *	
a → Tytherm access a common → System R system → Available IP services → Available IP services → System NAT mapping → Tytherm services	D # CP-Options D # CP-starts optional app	DHCP of	
Distances Available IP services Available IP services System NAT mapping System surphises	0 HCP starts optional app		
Available IP services System NAT mapping Souther energy from options		18 -	
 System NAT mapping System encryption options 			
2 🚍 System encryption options	LocalHase	the counter sit	
	Liversaic	They revised by	
a- 🛄 GSM Settings	Local Domain	rorate: ip	
e 🛄 SBM Multiplexing	Local IP-Address	152.168.127.254	
2 🚘 Northaring plan		ME ME A A	
- W Cell deta profile	Submet reach.	255.255.0.0	
g 🚍 Trunk group	5 steway	172.16.0.1	
2 - Meeter / Slave settings	24178		
- I Synchronaution	010		
Contract of a line content of a phone	MTU	1410	
2	External Galeway IP-Address	0.0.0.0	
2 - Fund corrections	Bally server		
- II 8 Channel permissions	PADE NEW		
+ 🤄 Protocol Settings	Non-mecqueraded IP	0.0.0.0	
- B Options	addenous reach (VPB)		
- 🛄 Subscriber			
8- 🛄 Line group	VLWI Teaping		
2 🚘 Call take ever	C MAR-Texting Dod DF		
- 🔛 Cell beck settings	to an eaging on on		
2 - CLP Marquerading	VLAHD	0	
1 8-channel to 8-channel	The A CHAIN	0	
INP (NovaFec Internet Pattfinder)	- KARY (ADAN)	P	
Colliners of free			
Advanced Least Cost Brater	- Transpot Layer Security (TLS)	Licerse is loaded	
SML/VIMSC - Ireal		Enable Security	
SIM Server settings			
E CSD peneral options		Chiebe techny	

Picture 1: System-IP-Options

After doing so he presses the button "Enable Security..." in the window on the right.



Picture 2: Activating TLS



A dialogue opens asking the customer to localize the received license within the data system.

Choose license	and on house the	×		
😋 🕞 🗕 🕌 « SYSTEM	(C:) ► TEMP ► 19145 🔹 🔹	Suchen 🔎		
🐚 Organisieren 🔻 🎬 Ansichten 👻 📑 Neuer Ordner 🔹 🕐				
Linkfavoriten	Name Änderungs Typ	Größe		
🔢 Zuletzt besuchte Orte	Licence.tis			
Marktop				
🛒 Computer				
Dokumente				
Bilder				
Musik				
Zuletzt geändert				
Suchvorgänge				
Öffentlich				
Ordner 🔺				
Dateiname	: licence tis	TLS-NovaTec (".tis)		
		Officer T		
		Sinnen IV Abbrechen		

Picture 3: Import of a TLS license

The successful import of the license is shown to the user by an activated check box "License is loaded" in the right part window.

 Transport Layer Security (TLS) 		License is loaded 🔽
	Enable Security	
	Disable Security	
		-

Picture 4: Successful import of a TLS license

Also within the tree in the left hand window a special node "TLS-Security" shows up.

🖻 🧰 NovaTec-System
🗐 Chassis
🗐 Interfaces
🗄 🧰 System access control
System IP options
🗐 DNS servers
Available IP services
System NAT mapping
TLS Security
🕀 🧰 System encryption options

Picture 5: node "TLS-Security"



After picking this node three flags will appear in the right hand window: Maintenance, SIP and CallHome.

aintenance STP CallHo	ment		
- General TLS Settings for t Security Hethod Server Authentication	Maintenance SSLv3	Cpher Options	
Client-Authentication:			
Import DArite	. No CA certificate loaded		
	Default		

Picture 6: Security Management

If you want to import a CA certificate you can initiate this by pressing the button "Import CA-file…". A new dialogue shows up in order to localize the CA certificate within the data system.

Choose CA certificate	Secular Revised	1.54	×
😋 🌍 🗕 🕌 « Worky 🕨	cert ► JP145 ► mnt	▼ 4 9 S	Suchen 🔎
🎝 Organisieren 👻 🎬 Ar	isichten 🔹 📑 Neuer O	rdner	0
Linkfavoriten	Name Änderungs	Тур	Größe
💁 Zuletzt besuchte Orte	MNT_CERT.CRT		
Desktop			•
Dokumente			
E Bilder			
Musik Zuletzt geändert			
Suchvorgänge			
Offentlich			
0.1			
Ordner			
Dateiname	MNT_CERT.CRT	•	TLS-Application (*.cit) -
			Offnen 🔻 Abbrechen

Picture 7: Import of CA certificate



The successful import is shown in the right hand window.

Jur Com	ame
- General TLS Settings for	Maintenance
Security Kethod	TLSv1 Cpher Options
Server Authentication	
Client-Authentication	v
(Import CA-file.	C \WorkyAcetNP146Vm/\WNT_CERT.CHT

Picture 8: Successful import of a CA certificate

If you want to restrict TLS e.g. to specific algorithms – this is if you want to define the cipher list – you can initialize this by pressing the button "Cipher Options....".

A dialogue shows up allowing the customer to restrict the given ciphers further.

Selected ophers	
AES256 SHA AES128-SHA RCHMDS	
Select Deselect	
Service 1	
Priority -	
	Selected ophers AES 256 5H4 AES 128-FH RC+HOS Select Deselect Phonty + Priority -

Picture 9: Cipher options

In the left part window the available ciphers are shown and the user defined cipher list in the right part window.

Ciphers from the left part window can be transferred into the right part window either by double clicking them or by pressing the button "Select". Equally ciphers are returned to the left part window and so deleted from the user specific list by double clicking or by pressing the button "Deselect".



The priority of the cipher is very important - it can be changed with the buttons "Priority+" and "Priority-".

Is the TLS configuration constructed it can be transferred to the target system with the help of NovaTec Configuration.

If TLS is activated in the target system the configuration has to be transferred in TLS mode. This is achieved by selecting "Network Options" under the menu topic "Extras".



Picture 10: Menu item "Network Options"

After the choice of this menu item a dialogue shows up allowing the definition of a connection partner.

Network options			
Address for N	NovaTec Network Serv	vices	
Hostname	172.16.1.1	•	
Port	800	 Enable TLS TLS-Settings 	
ОК	Help	Cancel	

Picture 11: Network options

By activating the hooklet "Enable TLS" the button "TLS-Settings" just below it is engaged and operated.



Security Method: Server-Authentication:	TLSv1	•	Cipher Uptions
Client-Authentication:	v		
Certificate/Key - Manager	nent		
Import Private I	<еу	C:\Worky\cert\pk_soft10.pe	m
Import Private Cer	tificate	C:\Worky\cert\cert_soft10.cr	ıt
Import CA-file	9	C:\Worky\cert\cacert.crt	

Picture 12: Security options

After the above given options have already been chosen supplementary to the import of the CA certificate you can also import the private key and private certificate of the user within this dialogue.

Now you can transfer the configuration onto the target system. Whilst the connection to the target system is established the passphrase of the private key is required from the user. This is necessary to enable the system to open the private key.

Enter your private	e passphrase
Passphrase:	*****
	Show asterisk 🔽
	Cancel OK

Picture 13: Enter "passphrase"



6 The Network Management System

6.1 Installation of NMS

The following software packages have to be installed on a server running the NovaTec Network Management System to enable the operation of NMS and to make direct access to an A-MGW possible:

- NovaTec Network Management System
- NovaTec Maintenance Package

The server has to be incorporated in a LAN network. The IP ports 800 and 802 have to be cleared in the firewall to enable access in both directions.





The following system precondition should be fulfilled by the server in minimum to ensure a fast handling of a target system:

Windows XP 2 GB RAM 1 GHz CPU

6.2 Functionality of the NMS 6.x

The following applications are running on the server:

Maintenance Package:

Hereby the direct access onto the target system is effected. The package includes the necessary applications to enable you to access an A-MGW manually e.g. to read out the CDRs, update the firmware, read out traces and log files or query the status.

Job Management:

The Job Management application is part of the NovaTec NMS Package and controls which target systems are allowed to access NMS resp. which target systems are accepted by NMS and which jobs are to be carried out if a target system comes forward. All jobs can be controlled specifically per target system.

Network Management System:

The Network Management System is the application which receives inbound calls from target systems/A-MGWs and executes the necessary jobs in accordance with the specifications from the job management. Hence for the operation of NMS a job database has to exist in any case. If NMS is to update the configuration or firmware of a target system the according configuration (configuration database) and firmware have to be deposited for NMS. The data sets can reside locally on a server or on a file server. NMS needs the necessary access rights to these data sets. In order to save call data an existing (empty in the beginning) CDR database is needed. Traces and log files of the target system / A-MGW and the log file of NMS itself are created anew and not saved in a database.

The NMS hat no direct access to the target systems but waits until these come forward per call home. A target system carries out a call home as soon as an according event occurs and call home is configured for this event. If desired the target system can be configured in such way as that variable servers are called depending on the event.

On demand NMS sends an email to inform about the occurred event. The target systems are related to the customer. An email address can be configured for every customer.

The following picture shows how the access to the A-MGW takes place and which data sets are processed by NMS:







The following events are supported at the time being:

- Budget Limit reached
- The configured budget limit has been reached.
- Call data filled
- The CDR storage is full (resp. half full).
- Client Callback failure
- During a call back process an error on client side has occurred.
- Server Callback failure
 During a call back process an error has occurred on server side.
- EWU Board removed from System
- An EWU board has been removed from the target system.
- SIM removed from SCU A SIM card has been removed from a SCU board.
- Falls short of ASR limit The configured ASR threshold has been underrun.
- GSM ASR event
- The configured ASR threshold for the GSM network has been underrun.
- ISDN ASR event
 - The configured ASR threshold for ISDN has been underrun.
- SIP ASR event
- The configured ASR threshold for the SIP network has been underrun.
- Layer 1 or Layer 2 inactive
- The layer 1 or layer 2 connection has broken down at a point to point interface.
- Log filled
 - The log file is full.
- Trace filled
- The trace data storage is full.
- Ping timeout to TIME server
- The connection to the TIME server is broken down.
- SOS client unreachable
- The connection to the SOS client is broken down.
- SOS SIM error
- During the access to a SIM an error has occurred.
- Systemstart default
- The target system has carried out a reset and runs in default configuration.
- Systemstart normal
 - The target system has carried out a restart and runs with the last transferred configuration.
- Time event

The target system comes forward after a configurable time slot. No unexpected events have occurred.

- TIP Running errors
- An error has occurred in TIP operation.
- TIP Startup errors
 - During startup of the TIP interfaces an error has occurred.
- Trace warning
 - A warning was created in the target system.
- Trace error

An error has occurred in the target system.

The events in **grey** are irrelevant for the planned application area of the A-MGW. They have been listed for reasons of completeness and to show that the different events can be implemented.



7 NovaTec Sync. Admin

The NovaTec Sync. Admin consists of several NovaTec hardware and software components which together provide for clock synchronization of all NovaTec components in a TDM, IP or mixed network. The components are:

- 1- The RTP Master Clock Source (RMCS)
- 2- The Sync. Manager tasks in the A-MGWs
- 3- The configuration tool

During synchronization with RMCS a SIP connection to a RMCS server is established before the actual SIP call is made. The synchronization results from the RTP stream received by the RMCS server. A RMCS server always has an external clock source (PRI/BRI or GPS). A system with a high-precision silica can be used as alternative.





We change the shape of the world

The following directives were transposed:

- A RMCS call is only established for data calls.
- In case a RMCS server is unavailable it is attempted to get through to the next configured RMCS server.
- If the RMCS connection breaks down during a SIP call the next RMCS server is contacted immediately.
- \circ $\,$ If no canal is free for the RMCS call the data call is rejected.
- \circ $\:$ If no RMCS server is available the data call is rejected.
- For the RMCS call any free VoIP channel can be used. Alternatively it is also possible to assign a channel on the A-MGW for the RMCS server to ensure that there is always a channel available for the synchronization connection.
- The choice of a RMCS is possible with the methods sequential or Round-Robin.

7.1 Configuration of the RMCS clients

When connecting the systems via a soft switch like Cisco CUCM extra adjustments have to be made:

7.1.1 RTP Sync. settings

:: NovaTec-Configuration 6.7.0.0 - [Kopie von Grundkonfig	uration S6]		_ 7 🗙
Eile View Configuration data Encryption Extras Licensing Help			
Image: System Image: System Image: System	Idvalue - RTP Synchronisation Settings RTP Stream of SIP Caller Priority of synchronization with RTP-Stream of SIP Caller Priority of synchronization with device using external clock: Priority of synchronization with device using external clock: RMCS Parameters Act as a Client or a Server RMCS Mode: Priority of this synchronization: number@IP-address of RMCS servers 338989@192.188.2.71 38888@132.188.2.71 Edt	Sequential	
Press F1 for Help.			NUM



The following adjustments have to be made:

Box "Act as a Client or a Server":

Tells whether the system is run as client or server. Please choose "Client".

Box "RMCS Mode":

Tells whether the RMCS servers have been chosen with the method sequential or Round-Robin by the client. Both settings are possible. With method sequential the 1rst server is always called and the next server is only contacted if the call to the 1rst server cannot be established. With method Round-Robin the next server is chosen always. If the end of the list is reached it is restarted with the 1rst server.

Box "Priority of this synchronization":

Tells which synchronization priority the RTP stream of the RMCS server is given by the client. The entered value is also shown under "interface Sync Priority" together with all other priorities.

List "number@IP-address of RMCS servers":

All RMCS servers to which the client is supposed to have access are listed here. Only the number is essential. The IP address is only informative at this point. The number is transformed into a SIP address in the SIP user mapping. If the CUCM is not listed as SIP receiver for all call numbers nothing has to be changed in the SIP user mappings.

7.2 Configuration of the RMCS server

The following adjustments are to be made on the server side:

7.2.1 RTP-Sync settings

NovaTec-Configuration 6.7.0.0 - [Kopie von Grundkonfi	guration S6]		
Elle View Configuration data Encryption Extras Licensing Help			
WovaTec-System WovaTec-System WovaTec-System WovaTec-System WovaTec-System WovaTec-System WovaTec-System System Proptons System Proptons System Proptons WovaTec-System WovaT	NovaTec - RTP Synchronization Settings RTP Stream Enable synchronization with RTP-Stream of SIP Called Priority of synchronization with device using external clock: RMCS Parameters Act as a Client or a Server RMCS Mode: Priority of this synchronization: numberGIP-address of RMCS servers NewEdx_	Sever Sequential Social	NUM
			proved [

Box "Act as a Client or a Server": Choose server.

All other boxes are irrelevant.



7.3 User Mapping

NovaTec-Configuration 6.7.0.0 - [Kopie von Grundkonfi	uration S6]					
File View Configuration data Encryption Extras Licensing Help						
NovaTec-System NiP (NovaTec Internet Pathfinder)	NovaTec - SIP User mapping					
Codec options	Linni		[
Codec negotiation / properties	ISUN	IP Doman ISIP	Account	Voice codec	Data codec	
BIP (VoIP)		192.168.2.71		auto-negotiation	auto-negotiation	
SIP codec mapping SIP general settings						
VoIP port settings						
ISIP <-> ISDN options						
Timeout options						
Session settings						
SIP server lists						
🗄 💼 Mapping lists						
🖹 User mapping						
E Host mapping						
Operating parameters						
Call home settings						
🗄 🧰 Advanced Least Cost Router						
SMS / VSMSC - Email SMS / VSMSC - Email						
SD general ontions						
	New	Edit Delete	Clear data Impo	rt Export		
Press F1 for Help.						NUM

All RMCS Server systems need an entry under "User Mappings". The next screenshot shows which adjustments have to be made:

Jser mapping is active		
ISDN options		
ISDN	Wildea	ard 🔽 WearOut 🗔
Incoming prefix	Numbe	er length 0
Device options		
Device	Sub: LLC:	
Phone		
		<u>•</u>
Facsimile over IP (T.3	8) RMCS Synchronisation setting	gs
Enable T.38	T.38 Expert Settings Has external clock source	Is a RMCS system 🔽
SIP URI / Name / Do	main / IP information	
URI / Name / IP	192.168.2.71 CUCM	trunk
IP verfication mask	32 significant bits	
Voice / Data codec	auto-negotiation 💌	
Trusted	Accept all names	Correct faulty format 🛛 🗌
Public access	User name is a prefix	Can redirect in LAN 🛛 🗖
ISDN is a user name	Additional flags	
Account settings		
Account	Password	
Simplified digest	Basic authorisation Proxy authorisation	on 🗖
Reserved 1	May use alternative encryption method	ls 🗖
	Do not use Handling profile None	V
Encryption setting		



We change the shape of the world

It is important that the hooklet "Is a RMCS system" is activated to ensure that the RMCS server accepts the synchronization call. Otherwise all adjustments are to be made like the normal "User Mapping". Any number can be entered in the box "ISDN" as the RMCS server is only called and does not build up calls itself.

The RMCS server is connected to CUCM with a SIP trunk like all other NovaTec systems.

With usage of TLS the appropriate adjustments are to be made like in other NovaTec systems.