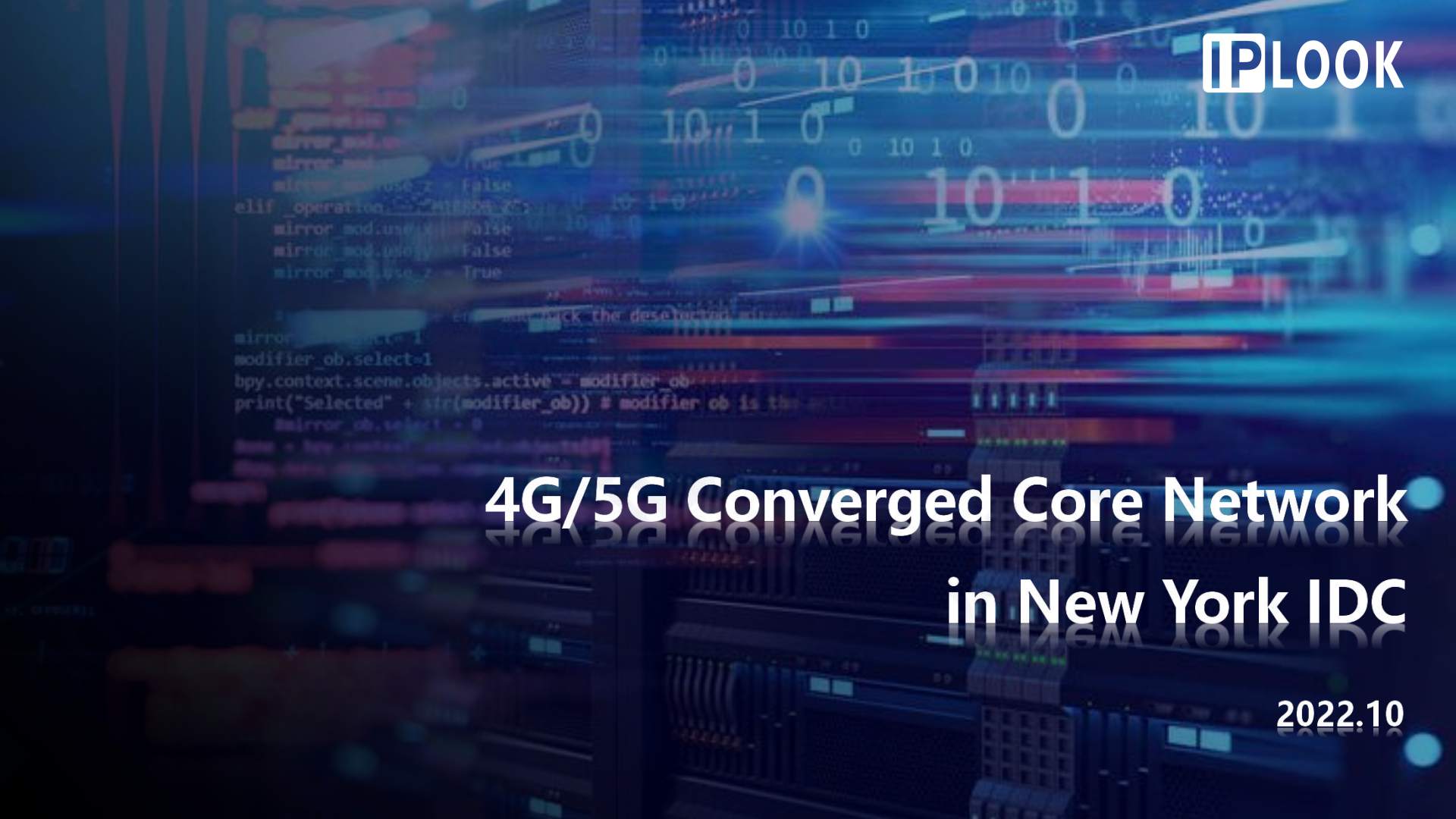

IPLOOK

4G/5G Converged Core Network in New York IDC

2022.10

01 Test Environment

02 Application

03 Precondition

04 Test Guidance

05 Expected Results

01

Test Environment

Test Environment

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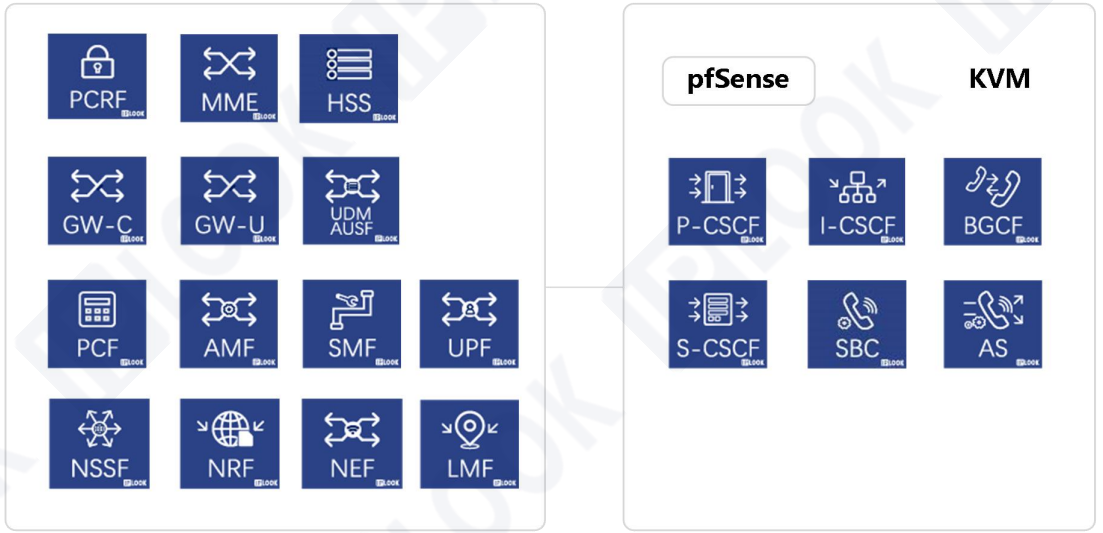
IPLOOK's 4G/5G converged core network has been deployed on the server in New York IDC, and successfully connected with eNodeB/gNodeB based at IPLOOK R&D center, via IPSec tunnel.

Currently, the test environment has been operated stably for over two months, achieving smooth and stable 4G/5G data services and VoNR/VoLTE call.



Servers in New York IDC

02

Application

Application

IPLOOK
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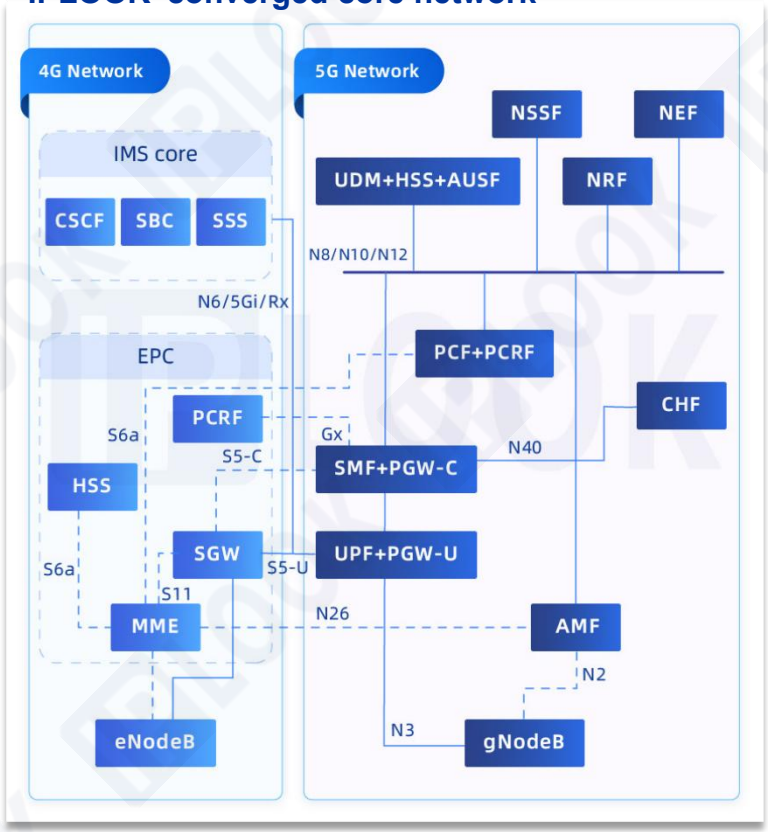
- The test environment is available for **worldwide potential customer**.
- Connect the base stations with IPLOOK's 4G/5G converged core network in New York IDC to **achieve data, VoLTE/VoNR tests**.
- **Verify the capability** of IPLOOK's mobile core network and the quality of network services.
- **Simple operation** to finish the test with IPLOOK's core network.

IPLOOK' converged core network

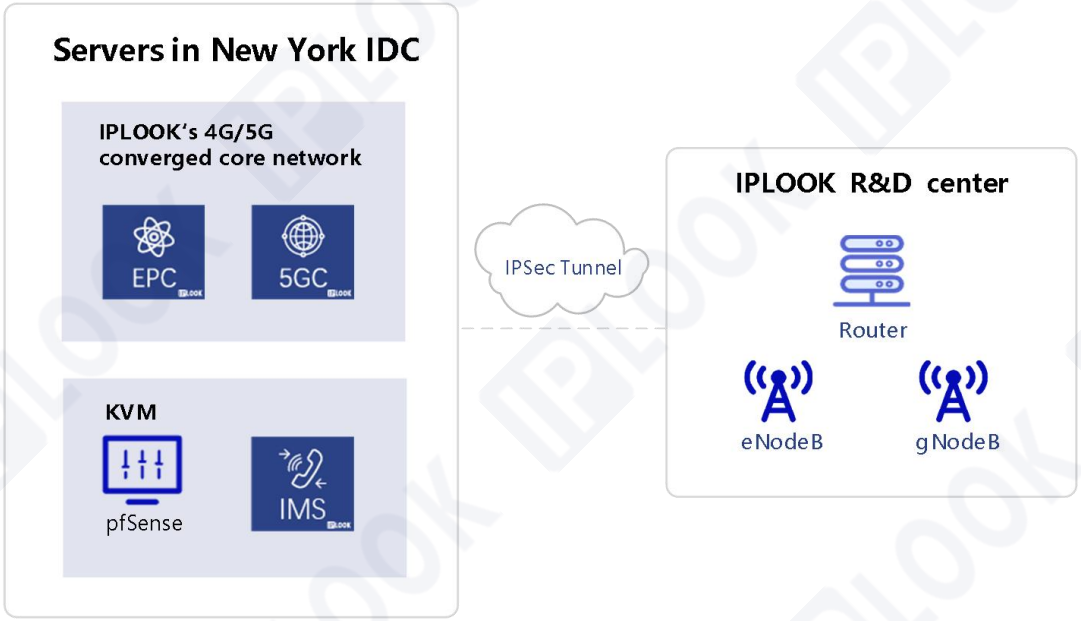


03

Precondition

Precondition

3.1 Network Topology



(For differentiation, here pfSense refers to the core network side where the IPSec tunnel is established, and the router refers to the base station side.)

Precondition

3.2 Parameters

With the set up (left side of the IPSec tunnel) of core network and pfSense server, customers need to prepare or confirm the following things for testing.

	Parameters	Note
1	IPSec-enabled router	Or install pfSense system on a server
2	eNodeB/gNodeB	
3	Public IP address	
4	Private IP address	For the IPSec tunnel of the base station side
5	Fixed IP address	On the base station side
6	SIM cards	Blank SIMs
7	Information for SIM card writing	IMSI/KI/OPC
8	PLMN	The one that the customers want to test
9	SMSC Number	For SMS service

04

Test Guidance

Test Guidance

*Note 1:

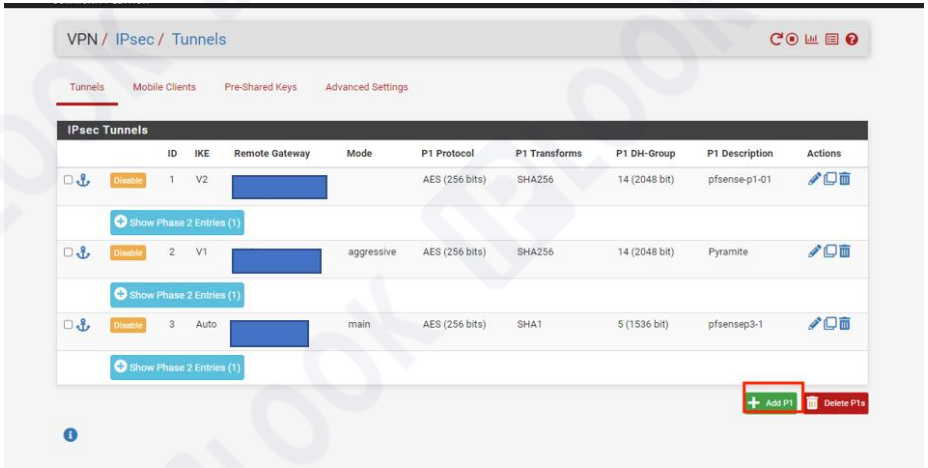
a. The following configurations are for reference only and should be configured flexibly according to the specific situation.

b. The following screenshots of the OAM interface are for reference only, as the OAM interface varies from different routers and base stations.

Test Guidance

4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

1. Access to the pfSense management interface via the ip configured on the LAN port after the pfSense installation is completed.
2. Enter IPSec configuration tunnel under VPN option and click on Add P1.
3. The configuration can be done according to the diagram.



Test Guidance

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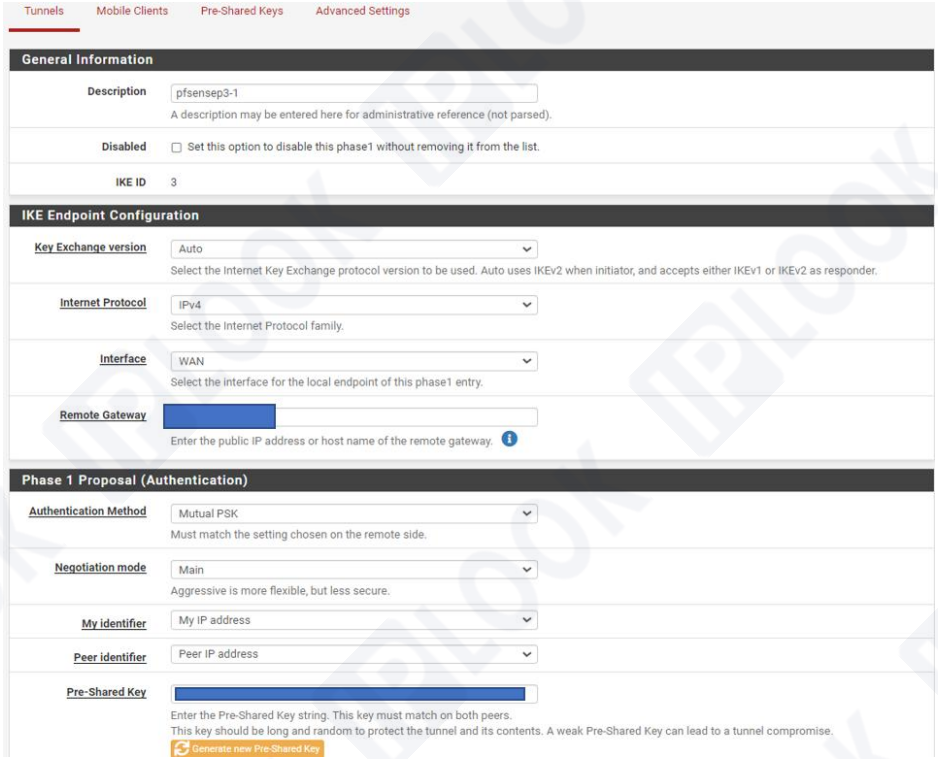
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)



*Note:

a. Remote Gateway fills in the public IP address of the WAN port on the router side.

b. The Authentication Method and Pre-Shared Key should correspond to the configuration on the router side.

Test Guidance

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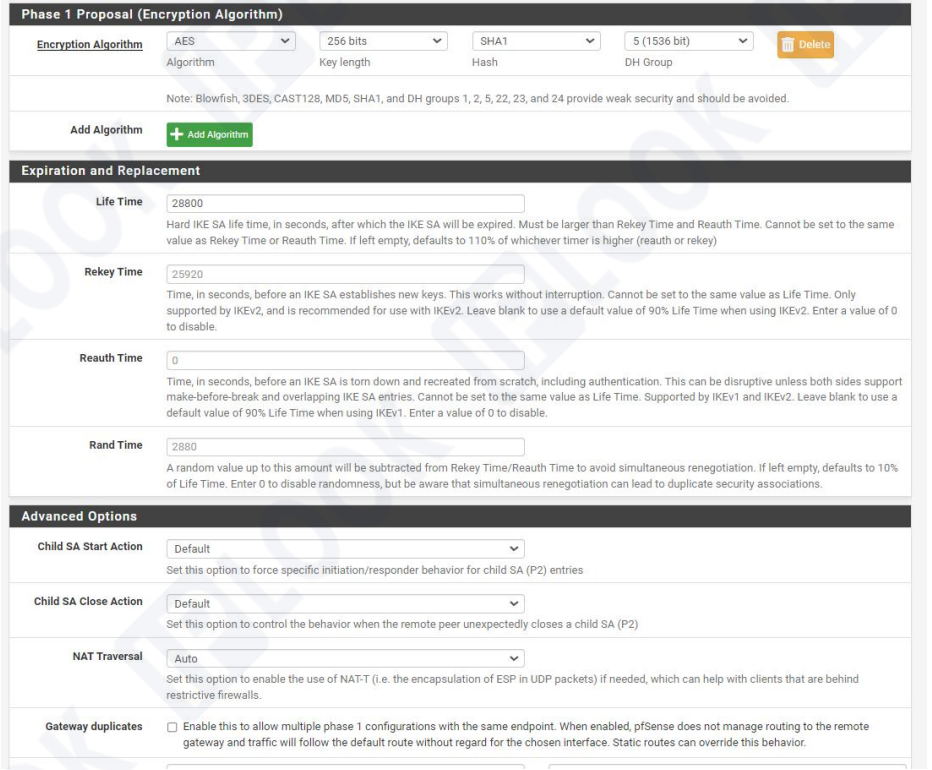
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

4. The overall configuration is shown in the right diagram.

*Note: Encryption Algorithm should correspond to the configuration on the router.



Test Guidance

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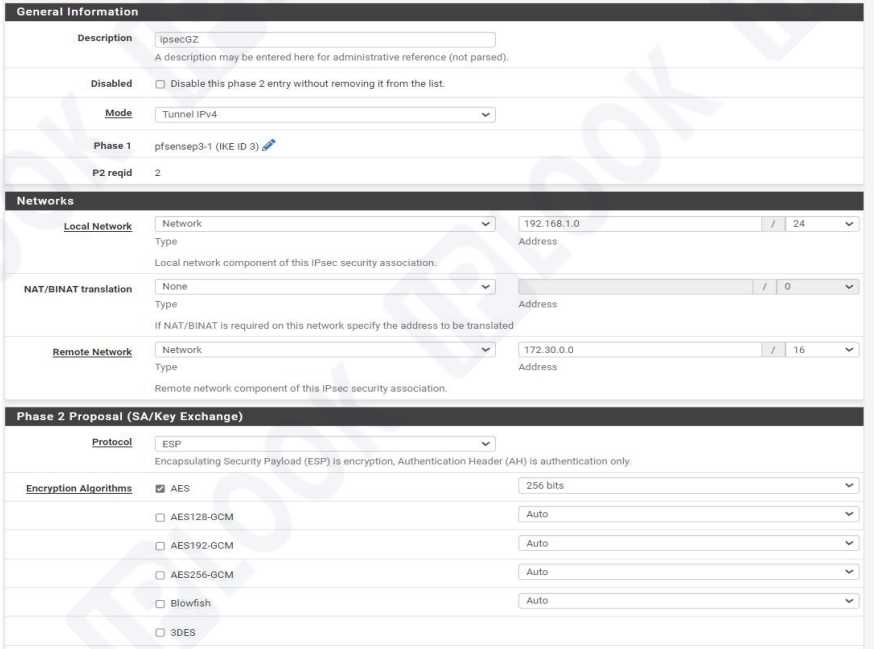
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

5. The overall configuration of Phase 2 is shown in the diagram on right.
6. Fill the subnet IP on the pfSense side in the Local Network.
7. Fill the subnet IP on the router side in the Remote Network.



Test Guidance

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4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

*Note: the configuration of Protocol, Encryption Algorithm, Hash Algorithm, and Life Time should be consistent on the both sides of IPSec .

Test Guidance

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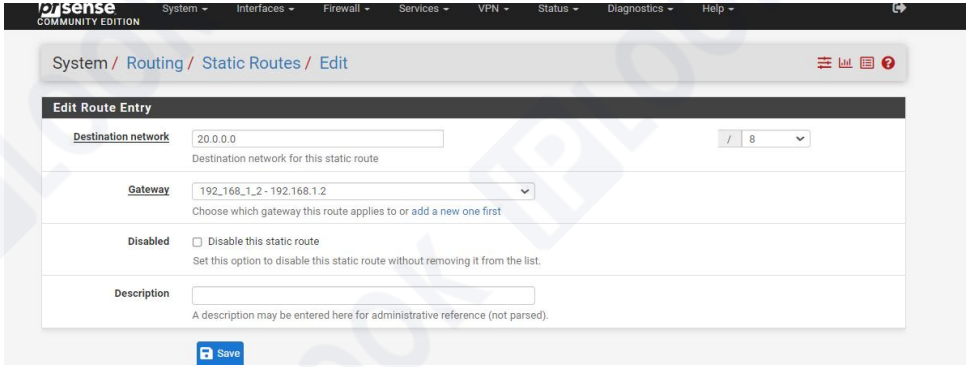
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

8. Add SGi interface of core network as a new gateway.
9. Static Routes: configure the core network address pool as the Destination Network and the S1 IP of the core network as the Gateway. (This configuration is required for internet access.)



Test Guidance

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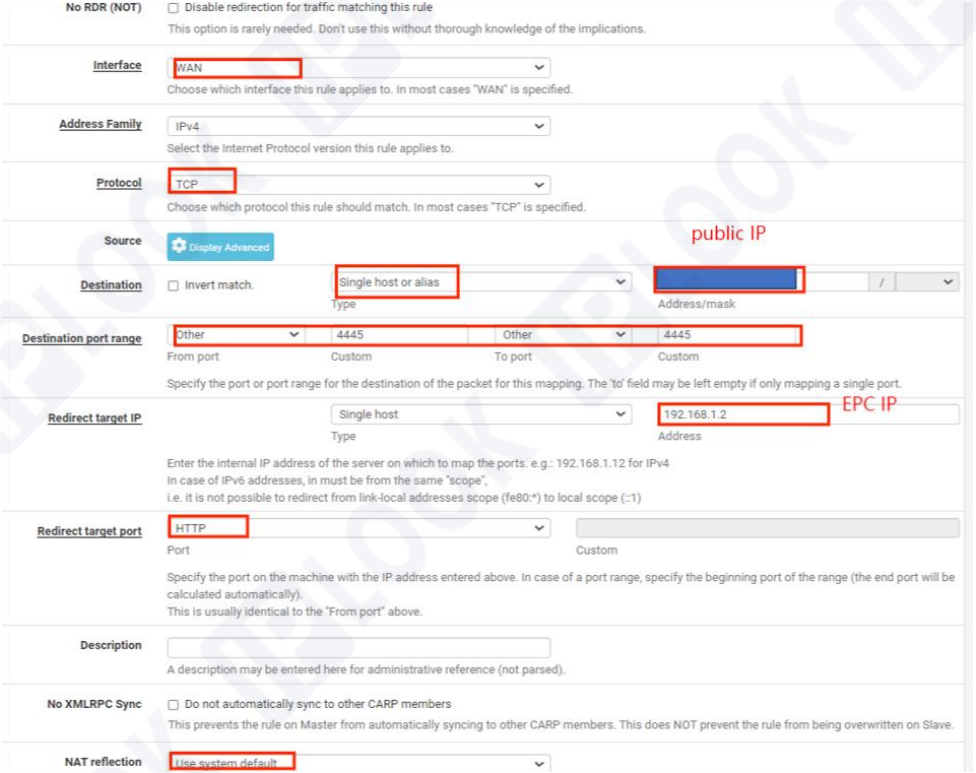
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)

10. Remote access to the core gateway requires to configure port forwarding.



Test Guidance

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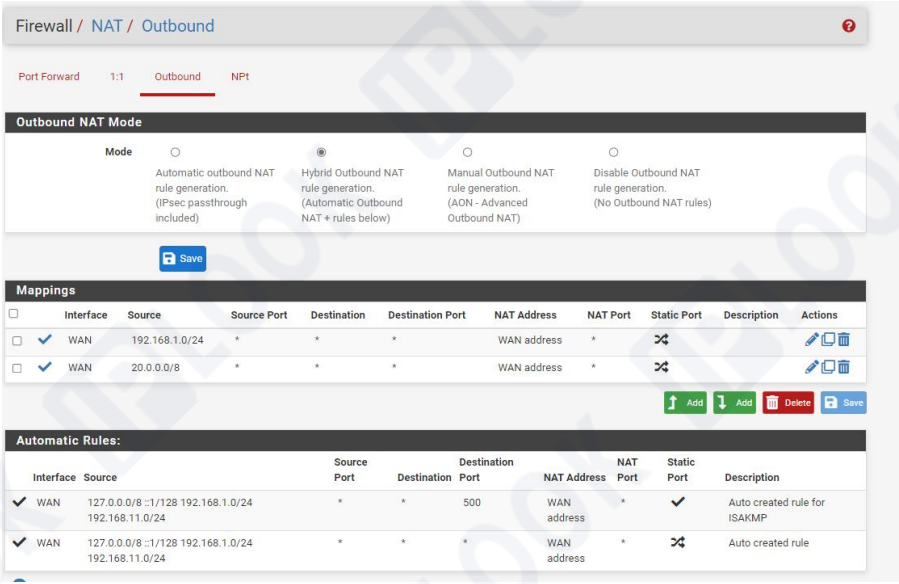
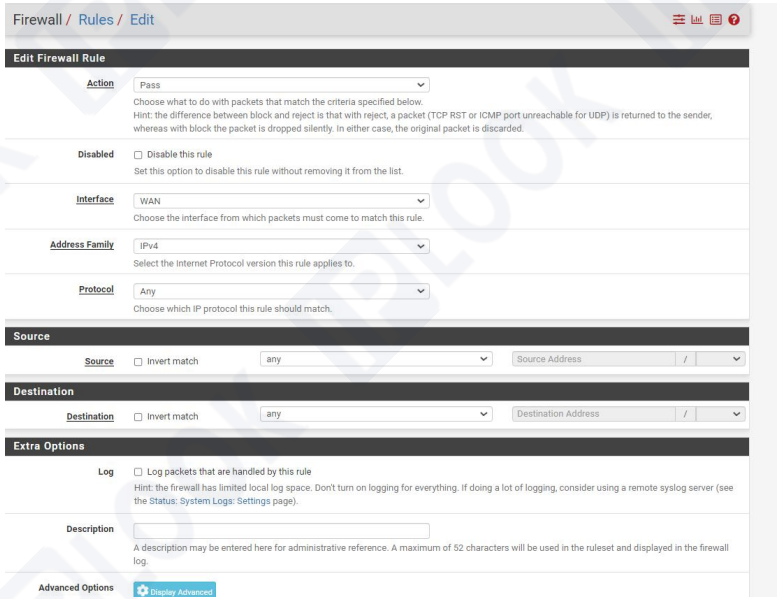
4.1 IPSec Configuration on Core Network pfSense (Configured by IPLOOK)





*Note: The outbound and interface policy rules under the firewall need to be set up for release.

Test Guidance

*Note 2:

Due to the different brands and models of routers and base stations, the configuration names may be slightly different, but the parameters to be configured are basically the same. The IPSec configuration can be flexibly changed according to the parameters supported by the router, as long as the configurations on both sides of the IPSec are consistent.

The key configurations are listed below.

Test Guidance

4.2 Router Configuration for IPSec to Interface with pfSense

- Configured Router Brand/ Model: TP-LINK/ TL-R479GP-AC
- Key Configurations on the Router:

1. Enter the router management interface, then choose the IPSec management interface under the VPN option to add an IPSec entry;
2. Fill in the public IP address of the pfSense’s WAN port in the peer gateway;
3. Bind the WAN port where the public IP address used by the router is located;
4. Fill in the subnet where the local router's LAN port is connected to the base station in the local subnet range;
5. Fill in the subnet 192.168.1.0/24 of the core network in the peer subnet;
6. The pre-shared key needs to correspond to the pre-shared key on the pfSense connected to the core network.
7. Note that the basic settings of the bound WAN port in the IPSec settings are correct.

Test Guidance

4.3 Base Station Configuration to Connect to the Router and Core Network

- Key Configurations on the Base Station:

1. Configure the subnet corresponding to the LAN port of the router in the base station;
2. The router's LAN port is the default gateway of the base station, which is in the same network segment as the base station IP.
3. Configure s1 IP of core network as service gateway, port 36412 (in 4G application scenario)
4. Configure PLMN, corresponding to the core network PLMN configuration.
5. Complete the configuration and confirm that the base station and router can ping successfully.

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4.4 4G/5G Data, VoLTE and VoNR Test on Mobile Phone/CPE

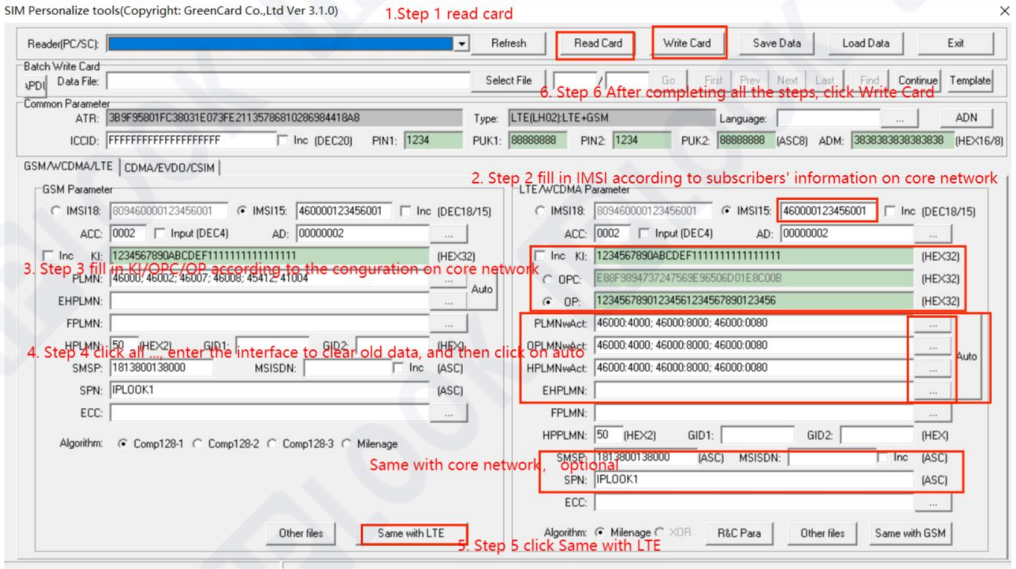
1. Write SIM cards according to the information on the core network.

*Note:

a. IMSI/KI/OPC need to be provided for core network for provisioning.

b. SMSC Number needs to be confirmed with customers for SMS service.

c. This interface will be different due to the different types of card writing tool. The above are the necessary modification items.



Test Guidance

4.4 4G/5G Data, VoLTE and VoNR Tests on Mobile Phone/CPE

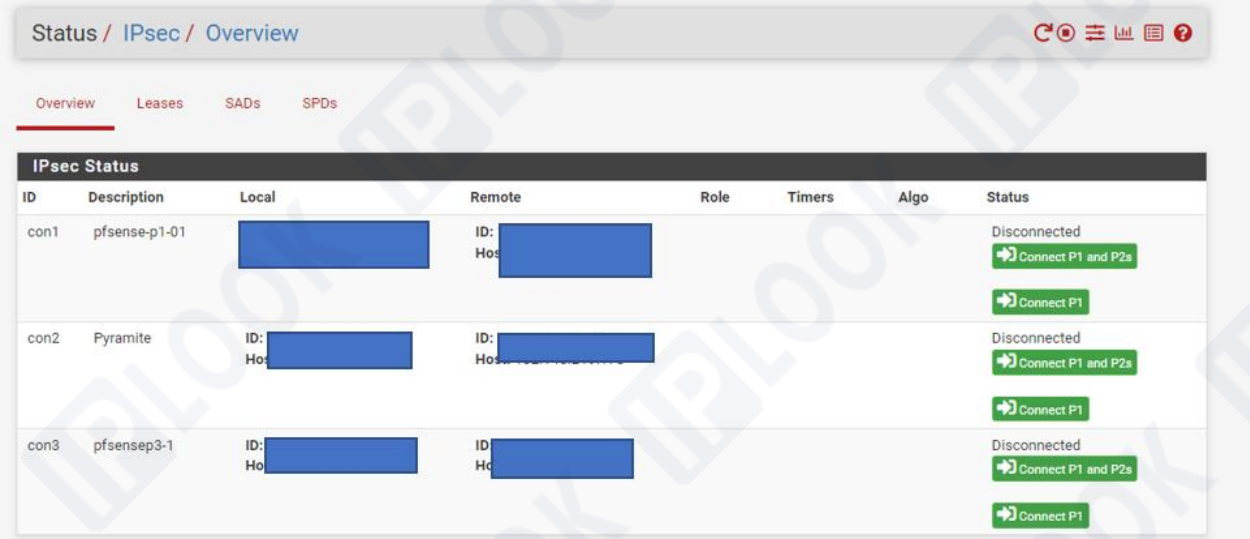
2. Insert the written SIM card into the mobile phone, and then register after opening and closing airplane mode.
3. See a signal and HD logo in the upper column of the mobile phone, which means the mobile phone is attached and registered successfully.
4. Use the number on the core network to conduct a call test between two mobile phones. After getting through, click to transfer video to conduct a video test.
5. Test the speed with a speed test app or website.

05

Expected Results

Expected Results

1. IPSec tunnels have been completed, shown as follows.



2. Customers' eNodeB/gNodeB can connect with IPLOOK's 4G/5G converged core network.
3. Mobile phone/CPE can attach and register successfully.
4. Mobile phone/CPE are able to access to the internet.
5. Mobile phone/CPE can achieve smooth VoLTE/ VoNR calls and SMS services.

THANK YOU

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