

- PPTP-
- L2TP over IPsec
- OpenVPN-
- PPPoE
- PPTP
- L2TP

## PPTP-

PPTP (. Point-to-Point Tunneling Protocol) – , . PPTP () PPP IP- IP-, . PPTP . TCP- .

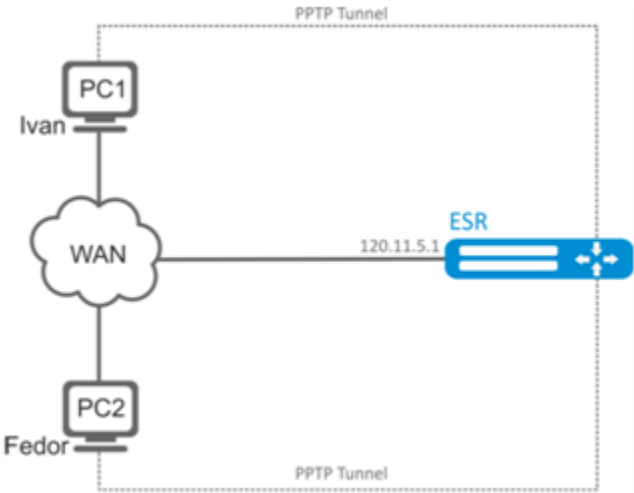
1	PPTP-.	<b>esr(config)# remote-access pptp &lt;NAME&gt;</b>	<NAME> – PPTP-, 31 .
2	( ).	<b>esr(config-pptp-server)# description &lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – PPTP-, 255 .
3	IP-, PPTP-.	<b>esr(config-pptp-server)# outside-address</b> { object-group <OBJ-GROUP-NETWORK-NAME>   ip-address <ADDR>   interface { <IF>   <TUN> } }	<OBJ-GROUP-NETWORK-NAME> – IP-, PPTP-, 31 ; <ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255]; <IF> – ; <TUN> – .
4	IP- .	<b>esr(config-pptp-server)# local-address</b> { object-group <OBJ-GROUP-NETWORK-NAME >   ip-address <ADDR> }	<OBJ-GROUP-NETWORK-NAME> – IP-, IP- , 31 ; <ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255].
5	IP-, PPTP IP- .	<b>esr(config-pptp-server)# remote-address</b> { object-group <OBJ-GROUP-NETWORK-NAME >   address-range <FROM-ADDR>-<TO-ADDR> }	<OBJ-GROUP-NETWORK-NAME> – IP-, IP- , 31 ; <FROM-ADDR> – IP-, AAA.BBB.CCC.DDD, [0.. 255]; <TO-ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255].
6	PPTP-.	<b>esr(config-pptp-server)# authentication mode</b> { local   radius }	<ul style="list-style-type: none"> <li>• local – .</li> <li>• radius – RADIUS-. RADIUS- . AAA RADIUS</li> </ul>
7		<b>esr(config-pptp-server)# authentication method</b> <METHOD>	<METHOD> - , [chap, mschap, mschap-v2, eap, pap]. chap
8	( ).	<b>esr(config-pptp-server) username &lt; NAME &gt;</b>	<NAME> – , 12 .
9	( ).	<b>esr(config-pptp-user) password ascii-text</b> { <PASSWORD>   encrypted <PASSWORD> }	<PASSWORD> – , 32 .
10	( ).	<b>esr(config-pptp-user) enable</b>	
11	PPTP- firewall ( . Firewall).	<b>esr(config-pptp-server)# security-zone &lt;NAME&gt;</b>	<NAME> – , 31 .
12	.	<b>esr(config-pptp-server)# enable</b>	
13	DSCP- ( ).	<b>esr(config-pptp-server)# dscp &lt;DSCP&gt;</b>	<DSCP>– dscp [0..63].
14	MPPE PPTP- ( ).	<b>esr(config-pptp-server)# encryption mppe</b>	

15	MTU (MaximumTransmissionUnit) ( ). MTU 1500 "system jumbo-frames"	<b>esr(config-pptp-server) mtu &lt;MTU&gt;</b>	<MTU> – MTU, [1280..1500]. : 1500.
16	DNS-, ( ).	<b>esr(config-pptp-server)# dns-servers object-group &lt;OBJ-GROUP-NETWORK -NAME &gt;</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, , DNS-, 31 .
17	WINS-, ( ).	<b>esr(config-pptp-server)# wins-servers object-group &lt;OBJ-GROUP-NETWORK-NAME &gt;</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, WINS-, 31 .

:

PPTP- .

- PPTP- – 120.11.5.1;
- – 10.10.10.1;
- IP- 10.10.10.5-10.10.10.25;
- DNS-: 8.8.8.8, 8.8.8.4;
- – fedor, ivan.



:

, , :

```
esr# configure
esr(config)# object-group network pptp_outside
esr(config-object-group-network)# ip address-range 120.11.5.1
esr(config-object-group-network)# exit
```

, :

```
esr(config)# object-group network pptp_local
esr(config-object-group-network)# ip address-range 10.10.10.1
esr(config-object-group-network)# exit
```

, :

```
esr(config)# object-group network pptp_remote
esr(config-object-group-network)# ip address-range 10.10.10.5-10.10.10.25
esr(config-object-group-network)# exit
```

PPTP- :

```
esr(config)# remote-access pptp remote-workers
esr(config-pptp)# local-address object-group pptp_local
esr(config-pptp)# remote-address object-group pptp_remote
esr(config-pptp)# outside-address object-group pptp_outside
esr(config-pptp)# dns-servers object-group pptp_dns
```

PPTP-:

```
esr(config-pptp)# authentication mode local
```

, :

```
esr(config-pptp)# security-zone VPN
```

PPTP- *Ivan Fedor* PPTP-:

```
esr(config-pptp)# username ivan
esr(config-pptp-user)# password ascii-text password1
esr(config-pptp-user)# enable
esr(config-pptp-user)# exit
esr(config-pptp)# username fedor
esr(config-pptp-user)# password ascii-text password2
esr(config-pptp-user)# enable
esr(config-pptp-user)# exit
esr(config-pptp)# exit
```

PPTP-:

```
esr(config-pptp)# enable
```

120.11.5.1:1723. PPTP- :

```
esr# show remote-access status pptp server remote-workers
```

PPTP- :

```
esr# show remote-access counters pptp server remote-workers
```

PPTP- :

```
esr# clear remote-access counters pptp server remote-workers
```

fedor PPTP- :

```
esr# clear remote-access session pptp username fedor
esr# clear remote-access session pptp server remote-workers username fedor
```

PPTP- :

```
esr# show remote-access configuration pptp remote-workers
```



PPTP- firewall TCP- 1723 GRE(47) .

## L2TP over IPsec

L2TP (. Layer 2 Tunneling Protocol – ) – , . L2TP () PPP IP- IP-, , L2TP . L2 UDP- . L2TP- IPsec, .

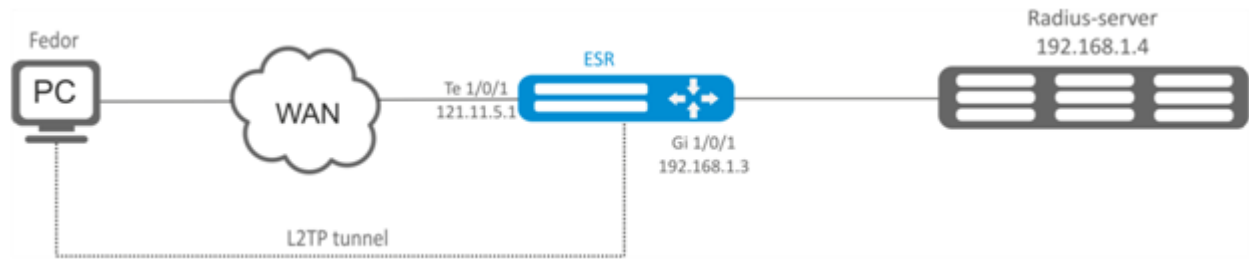
1	L2TP-.	<b>esr(config)# remote-access l2tp &lt;NAME&gt;</b>	<NAME> – L2TP-, 31 .
2	( ).	<b>esr(config-l2tp-server)# description &lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – L2TP-, 255 .
3	IP-, L2TP-.	<b>esr(config-l2tp-server)# outside-address { object-group &lt;NAME&gt;   ip-address &lt;ADDR&gt;   interface { &lt;IF&gt;   &lt;TUN&gt; } }</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, L2TP-, 31 ; <ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255]; <IF> – ; <TUN> – .
4	IP- firewall PPTP-	<b>esr(config-l2tp-server)# local-address { object-group &lt;OBJ-GROUP-NETWORK -NAME&gt;   ip-address &lt;ADDR&gt; }</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, IP-, 31 ; <ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255].
5	IP- L2TP IP- .	<b>esr(config-l2tp-server)# remote-address { object-group &lt;OBJ-GROUP-NETWORK -NAME &gt;   address-range &lt;FROM-ADDR&gt;-&lt;TO-ADDR&gt; }</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, IP-, 31 ; <FROM-ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255]; <TO-ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255].
6	L2TP-.	<b>esr(config-l2tp-server)# authentication mode { local   radius }</b>	<ul style="list-style-type: none"><li>• local – .</li><li>• radius – RADIUS-. RADIUS- . AAA RADIUS</li></ul>
7		<b>esr(config-l2tp-server)# authentication method &lt;METHOD&gt;</b>	<METHOD> - , [chap, mschap, mschap-v2, eap, pap]. chap.
8	L2TP- (. Firewall).	<b>esr(config-l2tp-server)# security-zone &lt;NAME&gt;</b>	<NAME> – , 31 .
9	( ).	<b>esr(config-l2tp-server) username &lt; NAME &gt;</b>	<NAME> – , 12 .
10	( ).	<b>esr(config-l2tp-user) password ascii-text { &lt;PASSWORD&gt;   encrypted &lt;PASSWORD&gt; }</b>	<PASSWORD> – , 32 .
11	( ).	<b>esr(config-l2tp-user) enable</b>	
12	IKE- ().	<b>esr(config-l2tp-server)# ipsec authentication method pre-shared-key</b>	
13	, , .	<b>esr(config-l2tp-server)# ipsec authentication pre-shared-key { ascii-text { &lt;TEXT&gt;   encrypted &lt;ENCRYPTED-TEXT&gt; }   hexadecimal {&lt;HEX&gt;   encrypted &lt;ENCRYPTED-HEX&gt; } }</b>	<TEXT> – [1..64] ASCII ; <HEX> – [1..32] [2..128] (0xYYYY...) (YYYY...). <ENCRYPTED-TEXT> – [1..32], [2..128] ; <ENCRYPTED-HEX> – [2..64], [2..256] .
14	.	<b>esr(config-l2tp-server)# enable</b>	
15	DSCP .	<b>esr(config-l2tp-server)# dscp &lt;DSCP&gt;</b>	<DSCP> – dscp [0..63].
16	MTU (MaximumTransmissionUnit) (). MTU 1500 "system jumbo-frames"	<b>esr(config-l2tp-server) mtu &lt;MTU&gt;</b>	<MTU> – MTU, [1280..1500]. : 1500.
17	DNS-, ().	<b>esr(config-l2tp-server)# dns-servers object-group &lt;OBJ-GROUP-NETWORK -NAME &gt;</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, , DNS-, 31 .
18	WINS-, ().	<b>esr(config-l2tp-server)# wins-servers object-group &lt;OBJ-GROUP-NETWORK -NAME &gt;</b>	<OBJ-GROUP-NETWORK-NAME> – IP-, WINS-, 31 .

:

L2TP- . RADIUS-.

- L2TP- – 120.11.5.1;
- – 10.10.10.1;
- Radius- – 192.168.1.4;

IPsec : — «password».



:

:

- RADIUS-;
- te1/0/1 gi1/0/1;
- IP- te1/0/1 te1/0/1.

, :

```
esr(config)# object-group network l2tp_local
esr(config-object-group-network)# ip address-range 10.10.10.1
esr(config-object-group-network)# exit
```

, DNS-:

```
esr(config)# object-group network pptp_dns
esr(config-object-group-network)# ip address-range 8.8.8.8
esr(config-object-group-network)# ip address-range 8.8.4.4
esr(config-object-group-network)# exit
```

L2TP- :

```
esr(config)# remote-access l2tp remote-workers
esr(config-l2tp)# local-address ip-address 10.10.10.1
esr(config-l2tp)# remote-address address-range 10.10.10.5-10.10.10.15
esr(config-l2tp)# outside-address ip-address 120.11.5.1
esr(config-l2tp)# dns-server object-group l2tp_dns
```

L2TP-:

```
esr(config-l2tp)# authentication mode radius
```

, :

```
esr(config-l2tp)# security-zone VPN
```

IKE :

```
esr(config-l2tp)# ipsec authentication method psk
esr(config-l2tp)# ipsec authentication pre-shared-key ascii-text password
```

L2TP-:

```
esr(config-l2tp)# enable
```

IP- 120.11.5.1 1701. L2TP- :

```
esr# show remote-access status l2tp server remote-workers
```

L2TP- :

```
esr# show remote-access counters l2tp server remote-workers
```

L2TP- :

```
esr# clear remote-access counters l2tp server remote-workers
```

fedor L2TP- :

```
esr# clear remote-access session l2tp username fedor
esr# clear remote-access session l2tp server remote-workers username fedor
```

L2TP- :

```
esr# show remote-access configuration l2tp remote-workers
```



**L2TP- firewall UDP- 500, 1701, 4500 ESP (50) GRE (47) .**

## OpenVPN-

OpenVPN — (Virtual Private Networks, VPN), , , , SSL.

1	OpenVPN-.	<b>esr(config)# remote-access openvpn</b> <b>&lt;NAME&gt;</b>	<NAME> – OpenVPN-, 31 .
2	( ).	<b>esr(config-openvpn-server)# description</b> <b>&lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – OpenVPN-, 255 .
3	, IP- . ( tunnel ip).	<b>esr(config-openvpn-server)# network</b> <b>&lt;ADDR/LEN&gt;</b>	<ADDR/LEN> – , : AAA.BBB.CCC.DDD/EE – IP- , AAA-DDD [0..255] EE [1..32];
4	.	<b>esr(config-openvpn-server)# protocol</b> <b>&lt;PROTOCOL&gt;</b>	<PROTOCOL> – , : <ul style="list-style-type: none"><li>• TCP- TCP-;</li><li>• UDP- UDP-.</li></ul>
5	OpenVPN-.	<b>esr(config-openvpn-server)# tunnel</b> <b>&lt;TYPE&gt;</b>	<TYPE> – , : <ul style="list-style-type: none"><li>• ip – -;</li><li>• ethernet – L2 .</li></ul>
6	IP-, OpenVPN IP- L2. ( tunnel ethernet).	<b>esr(config-openvpn-server)# address-</b> <b>range &lt;FROM-ADDR&gt;-&lt;TO-ADDR&gt;</b>	<FROM-ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255]; <TO-ADDR> – IP-, AAA.BBB.CCC.DDD, [0..255].
7	OpenVPN L2 ( tunnel ethernet).	<b>esr(config-openvpn-server)# bridge-</b> <b>group &lt;BRIDGE-ID&gt;</b>	<BRIDGE-ID> – .

8	.	<b>esr(config-openvpn-server)# certificate</b> <b>&lt;CERTIFICATE-TYPE&gt; &lt;NAME&gt;</b>	<CERTIFICATE-TYPE> – , : <ul style="list-style-type: none"><li>• ca – ;</li><li>• crl – ;</li><li>• dh – -;</li><li>• server - crt – ;</li><li>• server - key – ;</li><li>• ta – HMAC .</li></ul> <NAME> – , 31 .
9	, .	<b>esr(config-openvpn-server)# encryption</b> <b>algorithm &lt;ALGORITHM&gt;</b>	<ALGORITHM> – , : 3des,blowfish128, aes128.
10	OpenVPN- Firewall).	<b>esr(config-openvpn-server)# security-</b> <b>zone &lt;NAME&gt;</b>	<NAME> – , 31 .
11	OpenVPN- ( ).	<b>esr(config-openvpn-server)# username &lt;</b> <b>NAME &gt;</b>	<NAME> – , 31 .
12	OpenVPN-.	<b>esr(config-openvpn-user)# subnet</b> <b>&lt;ADDR/LEN&gt;</b>	<ADDR/LEN> – , : AAA.BBB.CCC.DDD/EE – IP- , AAA-DDD [0..255] EE [1..32].
13	ip- OpenVPN-	<b>esr(config-openvpn-user)# ip address</b> <b>&lt;ADDR&gt;</b>	<ADDR> – : AAA.BBB.CCC.DDD – IP- , AAA-DDD [0..255].
14	OpenVPN-.	<b>esr(config-openvpn-server)# enable</b>	
15	( ).	<b>esr(config-openvpn-server)# client-</b> <b>isolation</b>	
16	( ).	<b>esr(config-openvpn-server)# client-max</b> <b>&lt;VALUE&gt;</b>	<VALUE> – , [1..65535].
17	OpenVPN ( ).	<b>esr(config-openvpn-server)#</b> <b>compression</b>	
18	DNS-, ( ).	<b>esr(config-openvpn-server)# dns-server</b> <b>&lt;ADDR&gt;</b>	<ADDR> – IP- DNS , AAA.BBB.CCC.DDD, [0..255];
19	TCP-/UDP-, OpenVPN- ( ).	<b>esr(config-openvpn-server)# port</b> <b>&lt;PORT&gt;</b>	<PORT> – TCP/UDP , [1..65535]. : 1194
20	OpenVPN , ( ).	<b>esr(config-openvpn-server)# redirect-</b> <b>gateway</b>	
21	, IP- OpenVPN- ( ).	<b>esr(config-openvpn-server)# route</b> <b>&lt;ADDR/LEN&gt;</b>	<ADDR/LEN> – , : AAA.BBB.CCC.DDD/EE – IP- , AAA-DDD [0..255] EE [1..32];
22	, ( ).	<b>esr(config-openvpn-server)# timers</b> <b>holdtime &lt;TIME&gt;</b>	<TIME> – , [1..65535]. : 120
23	, ( ).	<b>esr(config-openvpn-server)# timers</b> <b>keepalive &lt;TIME&gt;</b>	<TIME> – , [1..65535]. : 10
24	OpenVPN- .	<b>esr(config-openvpn-server)# duplicate-</b> <b>cn</b>	
25	WINS-, ( ).	<b>esr(config-openvpn-server)# wins-server</b> <b>&lt;ADDR&gt;</b>	<ADDR> – IP- WINS , AAA.BBB.CCC.DDD, [0..255].
26	OpenVPN- ( ).	<b>esr(config-openvpn-server)#</b> <b>authentication algorithm &lt;ALGORITHM&gt;</b>	<ALGORITHM> – : <ul style="list-style-type: none"><li>• 8-128 bits key size: md4, rsa-md4, md5, rsa-md5, mdc2, rsa-mdc2</li><li>• 8-160 bits key size: sha, sha1, rsa-sha, rsa-sha1, rsa-sha1-2, dsa, dsa-sha, dsa-sha1, dsa-sha1-old, ripemd160, rsa-ripemd160, ecdsa-with-sha1</li><li>• 8-224 bits key size: sha-224, rsa-sha-224</li><li>• 8-256 bits key size: sha-256, rsa-sha-256</li><li>• 8-384 bits key size: sha-384, rsa-sha-384</li><li>• 8-512 bits key size: sha-512, rsa-sha-512, whirlpool</li></ul> : sha

:

OpenVPN- L3 .

- OpenVPN- – 10.10.100.0/24;
- – L3;
- .



- :
  - :
    - ()
    - OpenVPN
    - - HMAC TLS
  - te1/0/1
  - IP- te1/0/1.

tftp :

```

esr# copy tftp://192.168.16.10:/ca.crt certificate:ca/ca.crt
esr# copy tftp://192.168.16.10:/dh.pem certificate:dh/dh.pem
esr# copy tftp://192.168.16.10:/server.key certificate:server-key/server.key
esr# copy tftp://192.168.16.10:/server.crt certificate:server-crt/server.crt
esr# copy tftp://192.168.16.10:/ta.key certificate:ta/ta.key

```

OpenVPN- , :

```

esr(config)# remote-access openvpn AP
esr(config-openvpn)# network 10.10.100.0/24

```

L3 .

```

esr(config-openvpn)# tunnel ip
esr(config-openvpn)# protocol tcp

```

OpenVPN DNS

```

esr(config-)# route 10.10.0.0/20
esr(config-openvpn)# dns-server 10.10.1.1

```

, OpenVPN-:

```

esr(config-openvpn)# certificate ca ca.crt
esr(config-openvpn)# certificate dh dh.pem
esr(config-openvpn)# certificate server-key server.key
esr(config-openvpn)# certificate server-crt server.crt
esr(config-openvpn)# certificate ta ta.key

```

, :

```

esr(config-openvpn)# security-zone VPN

```

aes128:

```

esr(config-openvpn)# encryption algorithm aes128

```

OpenVPN-:



```
esr(config-openvpn)# enable
```

1194 ( ).

OpenVPN- :

```
esr# show remote-access status openvpn server AP
```

OpenVPN- :

```
esr# show remote-access counters openvpn server AP
```

OpenVPN- :

```
esr# clear remote-access counters openvpn server AP
```

fedor OpenVPN- :

```
esr# clear remote-access session openvpn username fedor
esr# clear remote-access session openvpn server AP username fedor
```

OpenVPN- :

```
esr# show remote-access configuration openvpn AP
```



OpenVPN- firewall TCP- 1194.

## PPPoE

PPPoE — (tunneling protocol), IP PPP Ethernet PPP-, Ethernet- -, IP-, PPP. PPP- , , - (, Ethernet), -. , IP- PPPoE- , IP-.

1	PPPoE- PPPoE-.	<b>esr(config)# tunnel pppoe &lt;PPPoE&gt;</b>	<PPPoE> – 1 10.
2	( ).	<b>esr(config-pppoe)# description &lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – PPPoE-, 255 .
3	VRF, PPPoE- ( ).	<b>esr(config-pppoe)# ip vrf forwarding &lt;VRF&gt;</b>	<VRF> – VRF, 31 .
4	PPPoE .	<b>esr(config-pppoe)# interface &lt;IF&gt;</b>	<IF> – .
5	PPPoE-.	<b>esr(config-pppoe)# username &lt;NAME&gt; password ascii-text { &lt;CLEAR-TEXT&gt;   encrypted &lt;ENCRYPTED-TEXT&gt; }</b>	<NAME> – , 31 ; <CLEAR-TEXT> – , [8 .. 64] ; <ENCRYPTED-TEXT> – , [16..128] .
6	PPPoE- (. Firewall).	<b>esr(config-pppoe)# security-zone &lt;NAME&gt;</b>	<NAME> – , 31 .
7		<b>esr(config-pppoe)# enable</b>	
8	( ).	<b>esr(config-pppoe)# authentication method &lt;METHOD&gt;</b>	<METHOD> – , : chap, mschap, mschap-v2, eap, pap : chap
9	PPPoE- ( ).	<b>esr(config-pppoe)# ignore-default-route</b>	
10	, ( ).	<b>esr(config-pppoe)# load-average &lt;TIME&gt;</b>	<TIME> – 5 150 ( 5 )



```
esr# show tunnels configuration pppoe 1
```

PPPoE- :

```
esr# show tunnels counters pppoe 1
```

## PPTP

PPTP (. Point-to-Point Tunneling Protocol) – , . PPTP () PPP IP- IP-, , PPTP . TCP- .

1	PPTP- .	<b>esr(config)# tunnel pptp &lt;INDEX&gt;</b>	<INDEX> – : [1..10].
2	( ).	<b>esr(config-pptp)# description &lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – , 255 .
3	VRF, PPTP- ( ).	<b>esr(config-pptp)# ip vrf forwarding &lt;VRF&gt;</b>	<VRF> – VRF, 31 .
4	PPTP- firewall (. <a href="#">Firewall</a> ).	<b>esr(config-pptp)# security-zone &lt;NAME&gt;</b>	<NAME> – , 31 .
		<b>esr(config-pptp)# ip firewall disable</b>	
5	IP- .	<b>esr(config-pptp)# remote address &lt;ADDR&gt;</b>	<ADDR> – IP- , AAA.BBB.CCC.DDD, [0..255].
6	MTU (MaximumTransmissionUnit) ( )	<b>esr(config-pptp)# mtu &lt;MTU&gt;</b>	<MTU> – MTU, : <ul style="list-style-type: none"><li>• ESR-10/12V(F)/14VF – [552..9600];</li><li>• ESR-20/21 – [552..9500];</li><li>• ESR-100/200/1000/1200/1500/1511/1700 – [552..10000]</li><li>• ESR-3100 – [552..9190].</li></ul> : 1500.
7	.	<b>esr(config-pptp)# username &lt;NAME&gt; password ascii-text { &lt;WORD&gt;   encrypted &lt;HEX&gt; }</b>	<NAME> – , 31 . <WORD> – , [8..64], [0-9a-fA-F]. <HEX> – , [16..128] .
8	.	<b>esr(config-pptp)# enable</b>	
9	MSS (Maximum segment size) TCP- ( ).	<b>esr(config-pptp)# ip tcp adjust-mss &lt;MSS&gt;</b>	<MSS> – MSS, [500..1460]. : 1460
10	PPTP- ( )	<b>esr(config-pptp)# ignore-default-route</b>	
11	, ( ).	<b>esr(config-pptp)# load-average &lt;TIME&gt;</b>	<TIME> – , [5..150] : 5
12	( ).	<b>esr(config-pptp)# authentication method &lt;METHOD&gt;</b>	<METHOD> – , : chap, mschap, mschap-v2, eap, pap : chap
13	( ).	<b>esr(config-pptp)# history statistics</b>	
14	, keepalive- ( ).	<b>esr(config-pptp)# ppp timeout keepalive &lt;TIME &gt;</b>	<TIME> – , [1..32767]. : 10
15	data-link ( ).	<b>esr(config-pptp)# ppp failure-count &lt;NUM&gt;</b>	<NUM> – data-link , [1..100]. : 10

:

PPTP- :

- PPTP- 20.20.0.1;

- – : ivan, : simplepass.



PPTP:

```
esr(config)# tunnel ptp 1
```

(Ivan) :

```
esr(config-ptp)# username ivan password ascii-text simplepass
```

:

```
esr(config-ptp)# remote address 20.20.0.1
```

:

```
esr(config-ptp)# security-zone VPN
```

PPTP:

```
esr(config-ptp)# enable
```

:

```
esr# show tunnels status ptp
```

:

```
esr# show tunnels counters ptp
```

:

```
esr# show tunnels configuration ptp
```

## L2TP

L2TP (Layer 2 Tunneling Protocol – ) – , . L2TP () PPP IP- IP-, , . L2TP . L2 UDP- . L2TP- IPsec, .

1	L2TP- .	esr(config)# tunnel l2tp <INDEX>	<INDEX> – : [1..10].
2	VRF, L2TP- (.).	esr(config-l2tp)# ip vrf forwarding <VRF>	<VRF> – VRF, 31 .

3	( ).	<b>esr(config-l2tp)# description &lt;DESCRIPTION&gt;</b>	<DESCRIPTION> – , 255 .
4	L2TP- firewall ( . Firewall).	<b>esr(config-l2tp)# security-zone &lt;NAME&gt;</b> <b>esr(config-l2tp)# ip firewall disable</b>	<NAME> – , 31 .
5	IP- .	<b>esr(config-l2tp)# remote address &lt;ADDR&gt;</b>	<ADDR> – IP- , AAA.BBB.CCC.DDD, [0..255].
6	.	<b>esr(config-l2tp)# username &lt;NAME&gt; password ascii-text { &lt;WORD&gt;   encrypted &lt;HEX&gt; }</b>	<NAME> – , 31 . <WORD> – , [8..64] , [0-9a-fA-F]. <HEX> – , [16..128] .
7	IKE-.	<b>esr(config-l2tp)# ipsec authentication method pre-shared-key</b>	
8	, , .	<b>esr(config-l2tp)# ipsec authentication pre-shared-key { ascii-text { &lt;TEXT&gt;   encrypted &lt;ENCRYPTED-TEXT&gt; }   hexadecimal {&lt;HEX&gt;   encrypted &lt;ENCRYPTED-HEX&gt; } }</b>	<TEXT> – [1..64] ASCII ; <HEX> – [1..32] [2..128] (0xYYYY...) (YYYY...); <ENCRYPTED-TEXT> – [1..32] , [2..128] ; <ENCRYPTED-HEX> – [2..64] , [2..256] .
9		<b>esr(config-l2tp)# enable</b>	
10	MTU (MaximumTransmissionUnit) ( ).	<b>esr(config-l2tp)# mtu &lt;MTU&gt;</b>	<MTU> – MTU, : <ul style="list-style-type: none"> <li>• ESR-10/12V(F)/14VF – [552..9600];</li> <li>• ESR-20/21 – [552..9500];</li> <li>• ESR-100/200/1000/1200/1500/1511/1700 – [552..10000]</li> <li>• ESR-3100 – [552..9190].</li> </ul> : 1500.
11	L2TP- ( )	<b>esr(config-l2tp)# ignore-default-route</b>	
12	( ).	<b>esr(config-l2tp)# authentication method &lt;METHOD&gt;</b>	<METHOD> – , : chap, mschap, mschap-v2, eap, pap : chap
13	, ( ).	<b>esr(config-l2tp)# load-average &lt;TIME&gt;</b>	<TIME> – , [5..150] : 5
14	, keepalive- ( ).	<b>esr(config-l2tp)# ppp timeout keepalive &lt;TIME &gt;</b>	<TIME> – , [1..32767]. : 10
15	data-link ( ).	<b>esr(config-l2tp)# ppp failure-count &lt;NUM&gt;</b>	<NUM> – data-link , [1..100]. : 10
PPPoE- QoS ( . QoS).			

:

PPTP- :

- PPTP 20.20.0.1;
- – : ivan, : simplepass



:

L2TP:

```
esr(config)# tunnel l2tp 1
```

(Ivan) :

```
esr(config-l2tp)# username ivan password ascii-text simplepass
```

:

```
esr(config-l2tp)# remote address 20.20.0.1
```

:

```
esr(config-l2tp)# security-zone VPN
```

IPsec:

```
esr(config-l2tp)# ipsec authentication method pre-shared-key
```

IPsec:

```
esr(config-l2tp)# ipsec authentication pre-shared-key ascii-text password
```

L2TP:

```
esr(config-l2tp)# enable
```

:

```
esr# show tunnels status l2tp
```

:

```
esr# show tunnels counters l2tp
```

:

```
esr# show tunnels configuration l2tp
```