# CS z/OS Integrated IP Security

## Additional IPSec VPN concepts

# A few additional IPSec VPN concepts - NAT traversal and Sysplex-wide SAs

# IPSec VPN concepts - no NAT devices between security endpoints

- Tunnel mode with AH and/or ESP

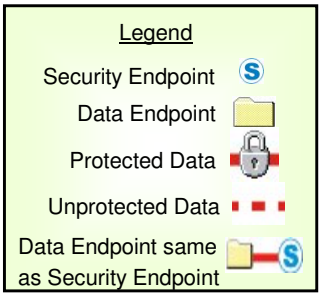
Gateway to Gateway


Gateway to Host


Host to Gateway


- Tunnel or transport mode with AH and/or ESP

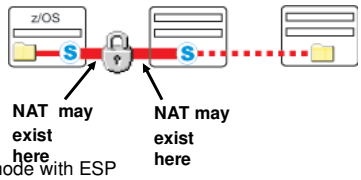
Host to Host

# IPSec VPN concepts - NAT devices between security endpoints

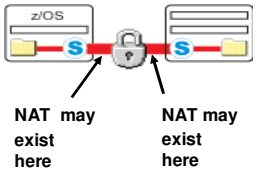
- **If the responder of an SA negotiation is behind a NAT firewall, a static NAT mapping should be used**
- **If z/OS is restricted to responder only, then the data flows must be initiated by the peer as well**
- Tunnel mode with ESP (Responder only)

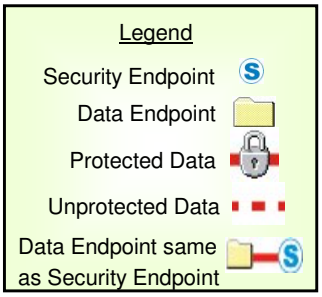
Host to Gateway




- Tunnel or transport mode with ESP

Host to Host



# IPSec VPN concepts - general NAT/NAPT restrictions

- **Only ESP is supported (AH is not allowed by RFC 3947/3948 restriction)**
- **z/OS is optimized for host configuration (does not support acting as a security gateway for SAs that traverse a NAT)**
- **z/OS only supports SAs that traverse a NAT, not SAs that traverse an NAPT**
  - NAPT is a NAT that maps many private addresses to 1 public address by performing port translation (also known as Port Address Translation (PAT)

- Tunnel mode with ESP (Responder only)

Host to Gateway


- Tunnel or transport mode with ESP
  - Potential issues when interoperating with non-z/OS platforms
    - When z/OS initiates an SA for specific ports or protocol
    - When z/OS initiates data on a tunnel mode SA for all ports and protocols

Host to Host


Legend

Security Endpoint

Data Endpoint

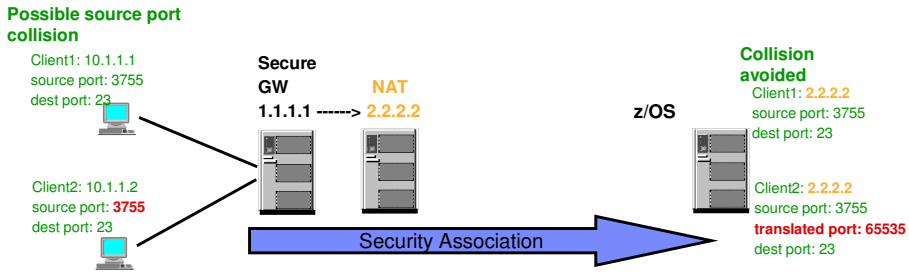
Protected Data

Unprotected Data

Data Endpoint same as Security Endpoint

# IPSec VPN concepts - source port translation for NAT traversal

- **Done when the remote security endpoint is a security gateway behind a NAT**
  - Only done for TCP and UDP packets
  - Since only the public (NAT'ed) address of the security gateway is known to z/OS:
    - Clients that reside behind a security gateway might choose identical source ports
    - z/OS translates source ports to distinguish connections that have a duplicate source port
- **Connection information displayed on z/OS:**
  - Netstat shows translated port
  - ipsec command can be used to show the port mapping (ipsec -o)
  - System logs show when a port translation was performed



# IPSec VPN concepts - NAT keepalive messages

NOTES

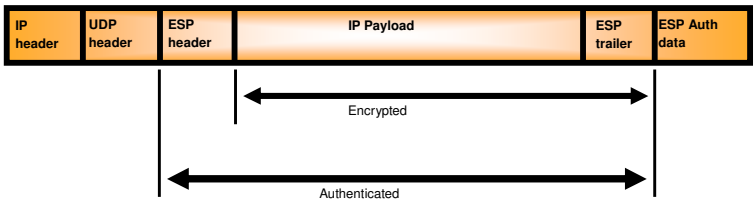
- Intended to prevent NAT mappings from expiring
  - Only required when z/OS is behind a NAT that dynamically assigns IP addresses
- Generated by the stack
  - Only issued when a valid IKE SA exists and IKE is behind a NAT
  - Frequency at which NAT keepalive messages are generated is configurable
    - Defined in the IPSec configuration file
      - Part of Key Exchange Policy
    - Can be turned off
      - Should be turned off if z/OS is behind a static NAT

# IPSec VPN concepts - UDP encapsulation (NAT traversal)

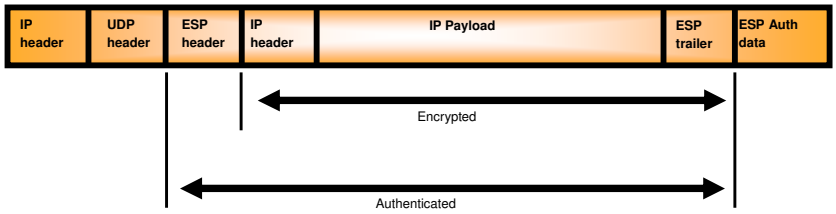
- **Additional encapsulation modes used when a NAT is traversed**
  - UDP-encapsulated transport
  - UDP-encapsulated tunnel
- **Only valid with ESP packets**
  - Normal transport/tunnel mode encapsulation performed
  - Inserts an additional UDP header in front of the ESP header
- **Allows ESP packets to traverse a NAT**
- **On z/OS the decision to use UDP-encapsulation is made by the IKE daemon if a NAT is detected**
- **NAT traversal support can be enabled or disabled in IP security policy**

# IPSec VPN concepts - UDP-encapsulated packets

- **Below shows the format of a UDP-encapsulated transport mode packet**




- **Below shows the format of a UDP-encapsulated tunnel mode packet**



# IPSec VPN concepts - Sysplex Wide Security Association (SWSA) considerations

- **A dynamic VIPA may be the endpoint of an SA - IPSec SAs will be distributed to target stacks of distributed dynamic VIPAs**
  - Used to distribute IPSec-protected workload
  - Used for VIPA takeover
- **Requires the DVIPSEC keyword on the IPSEC statement in the TCPIP profile**
- **Compatibility with z/OS Firewall Technologies IPSec**
  - A FIREWALL stack can be the target of an IPSECURITY stack
  - An IPSECURITY stack can be the target of a FIREWALL stack
  - A FIREWALL stack can be a backup for an IPSECURITY stack
  - An IPSECURITY stack can be a backup for a FIREWALL stack
- **Policies must be consistent on distributing and target stacks**
- **Requires the use of the Coupling Facility EZBDVIPA structure**
- **NAT traversal restrictions - SAs that traverse a NAT:**
  - Cannot be taken over if the remote host is a security gateway
  - Are not supported by z/OS Firewall Technologies IPSec (distributor, target, nor backup)

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