Principle and Configuration of PPPoE

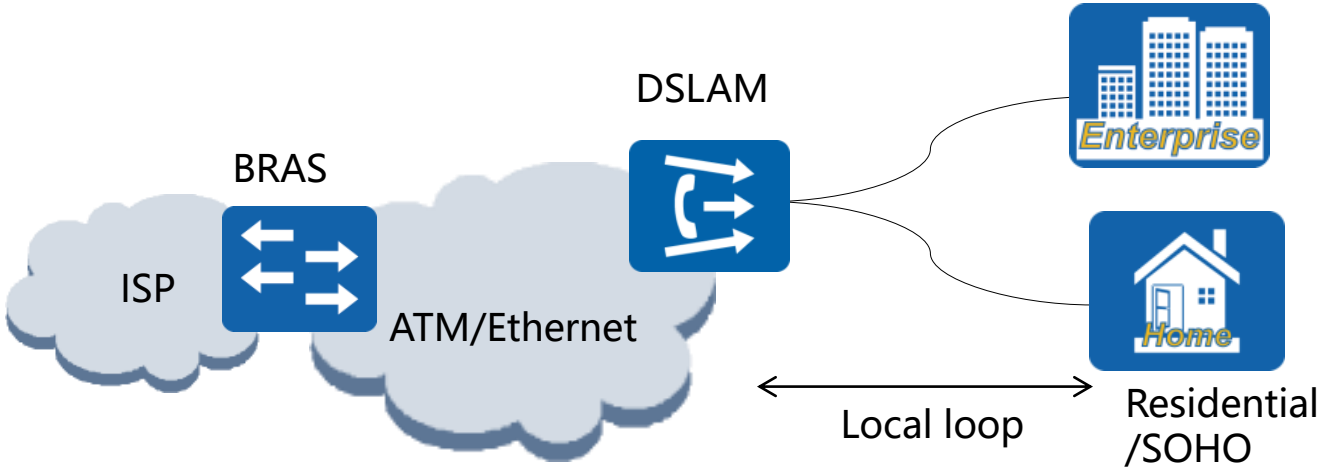
Foreword

- The application of DSL technology relies strongly on the existing telephone infrastructure that is found in almost every household and office globally. With the continued development of newer DSL standards allowing rates of up to 100Mbps, the application of DSL as a WAN technology for home and enterprise remains firmly valid. Traditional DSL connections were established over legacy ATM networks, however Ethernet has continued to emerge as the underlying technology on which many service providers establish their networks, and therefore knowledge of PPPoE technologies remains valued for establishing DSL connectivity at the enterprise edge.

Objectives

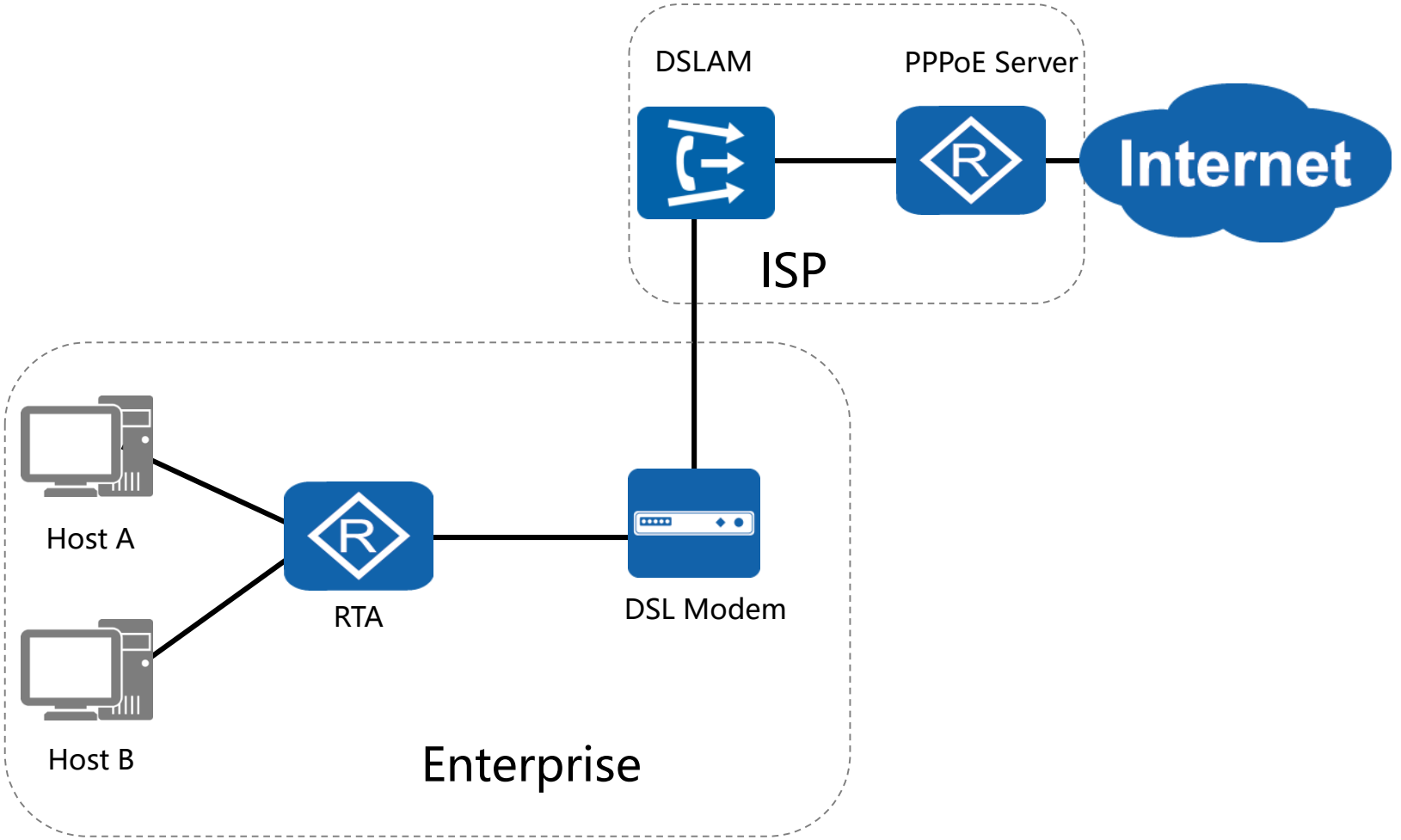
- Upon completion of this section, you will be able to:
  - Describe the PPPoE connection establishment process.
  - Configure a PPPoE session.

Digital Subscriber Lines



- Successive broadband technology following dial-up.
- Data signals carried over copper telephone lines, or “local loop”.

PPPoE Application in DSL



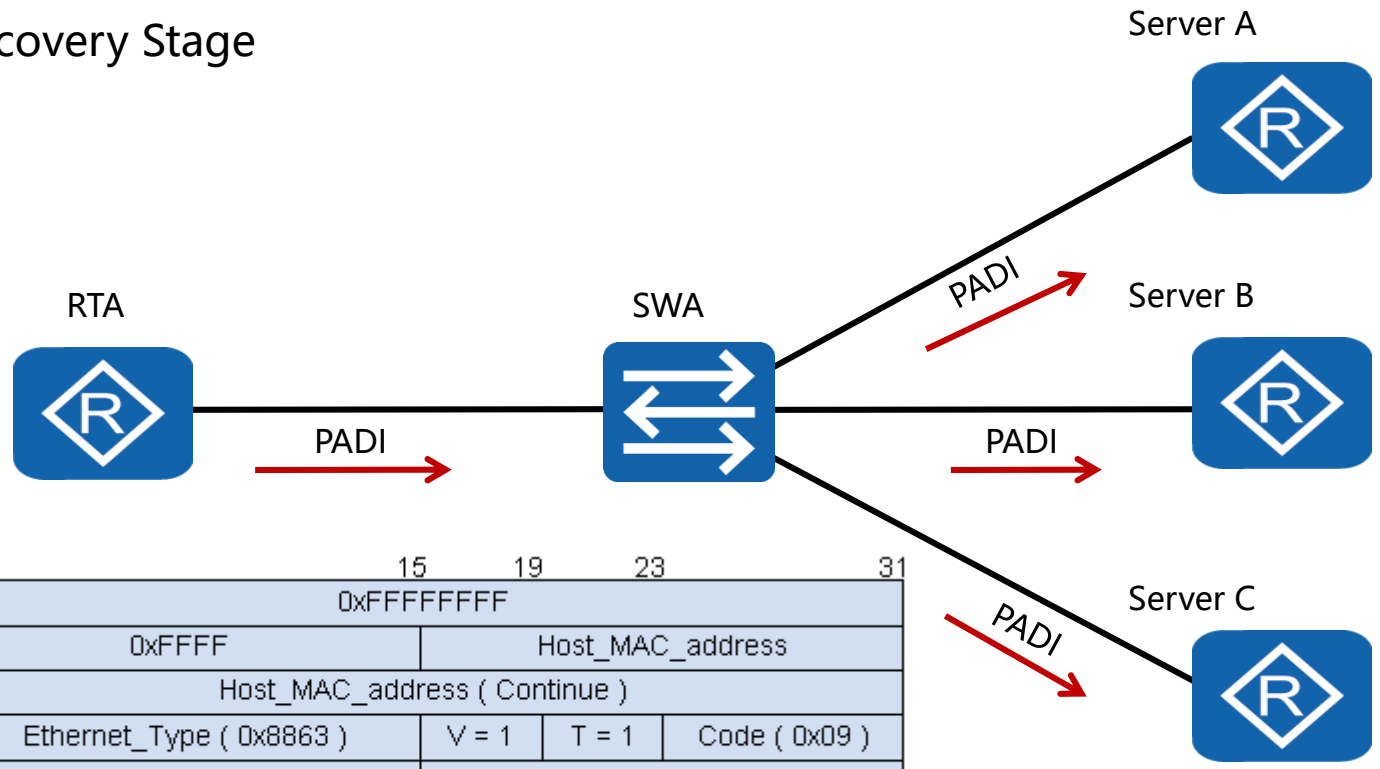
PPPoE Protocol Packets

Type	Description
PADI	PPPoE Active Discovery Initiation (PADI) packet
PADO	PPPoE Active Discovery Offer (PADO) packet
PADR	PPPoE Active Directory Request (PADR) packet
PADS	PPPoE Active Discovery Session-Confirmation (PADS) packet
PADT	PPPoE Active Discovery Terminate (PADT) packet

- Five packet types establish and terminate PPPoE sessions.

PPPoE Session Establishment Process

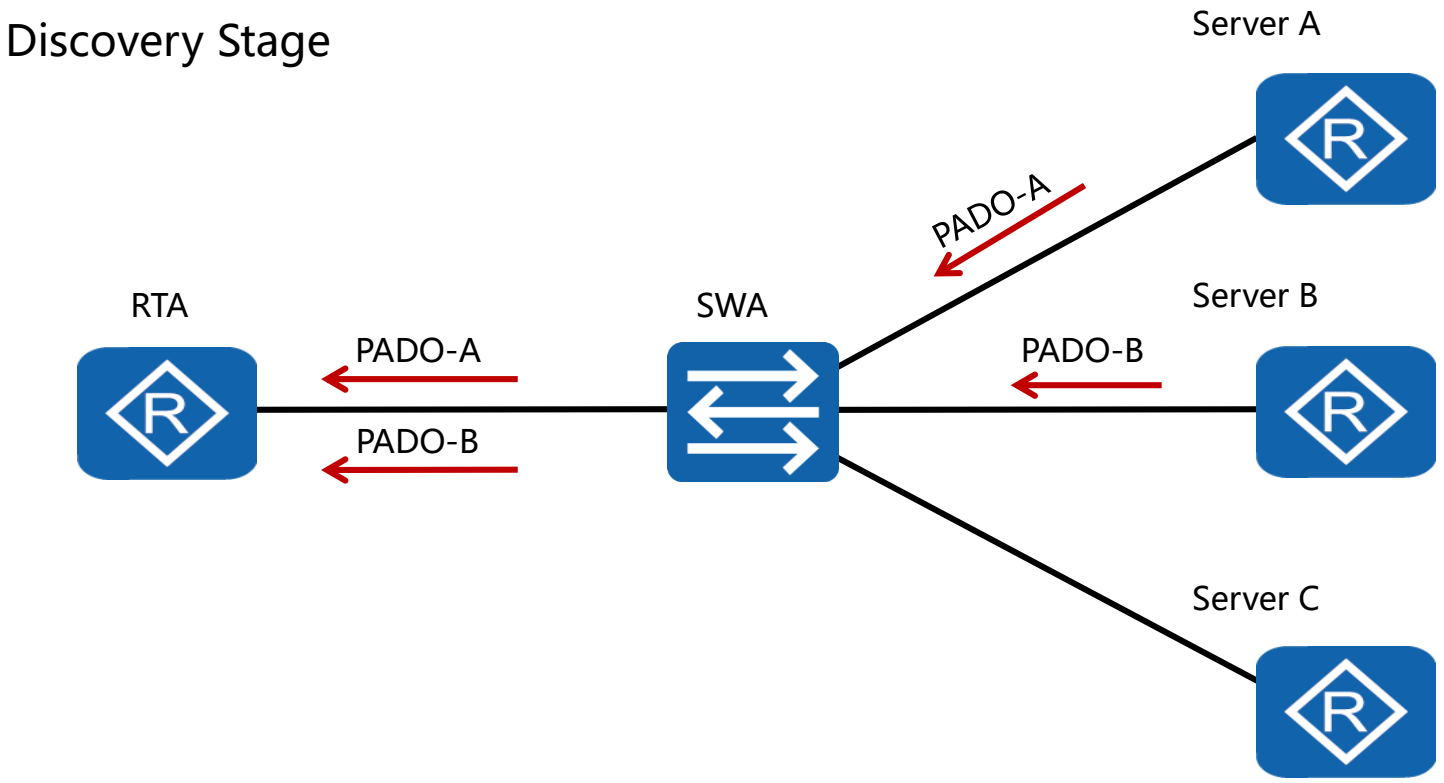
Discovery Stage



0	15	19	23	31
0xFFFFFFFF				
0xFFFF	Host_MAC_address			
Host_MAC_address (Continue)				
Ethernet_Type (0x8863)	V = 1	T = 1	Code (0x09)	
Session_ID (0x0000)	Length (0x0004)			
Tag_Type (0x0101)	Tag_Length (0x0000)			

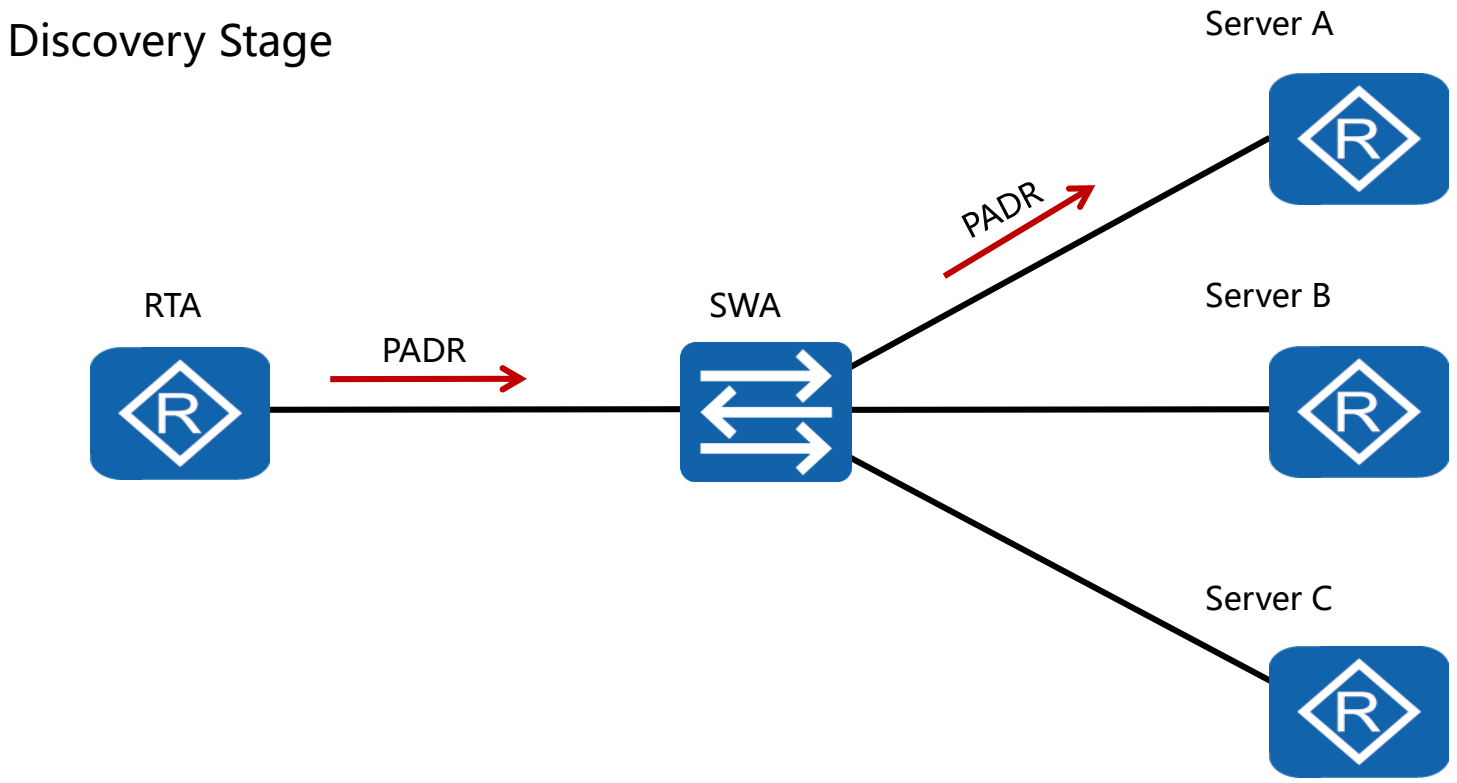
- An initiation packet is broadcast to discover access servers.

PPPoE Session Establishment Process



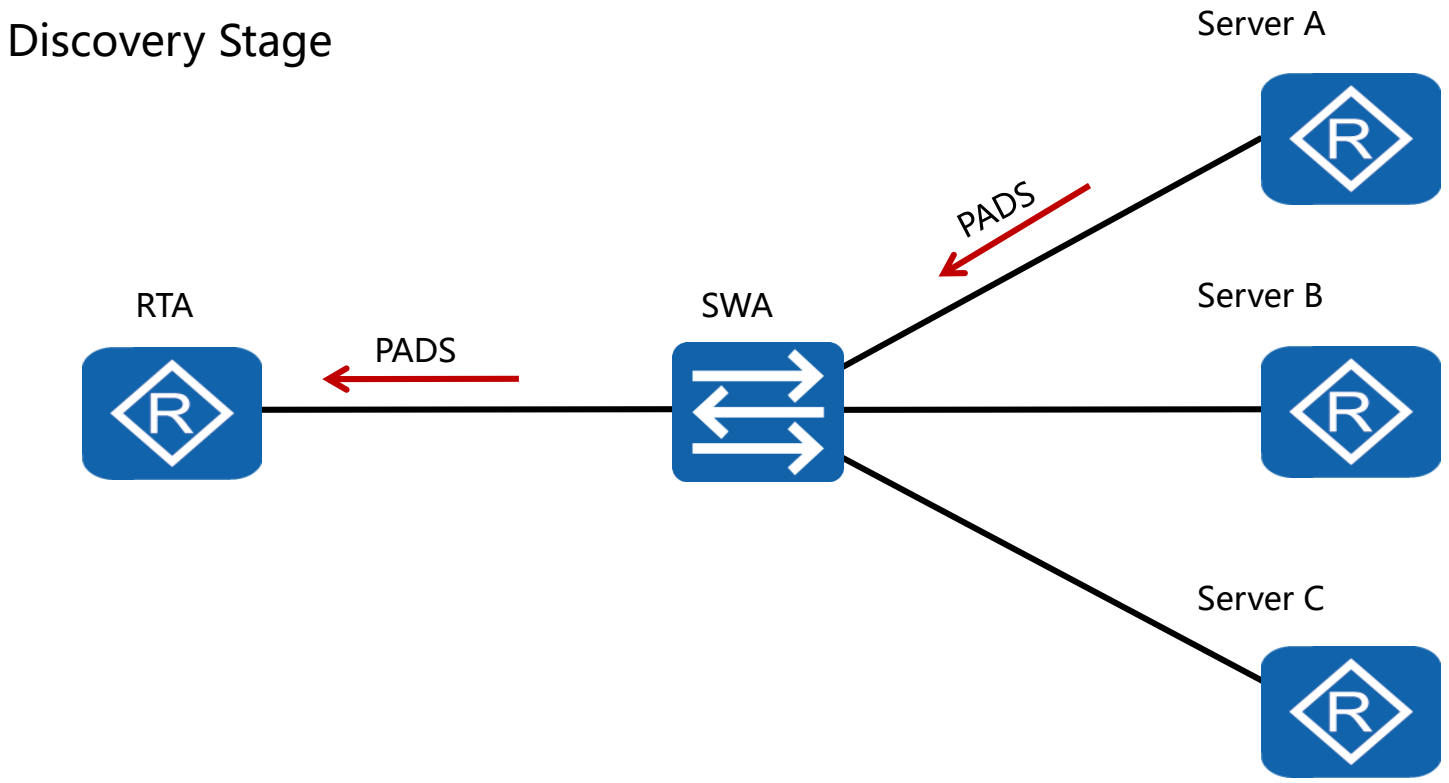
- Offers are returned to the sender by all servers that can service the received PADI packet.

PPPoE Session Establishment Process



- A client responds to a chosen server based on the name or services that are provided by that server.

PPPoE Session Establishment Process



- The chosen server generates a unique PPPoE session ID in preparation for the negotiation of the PPP session.

PPPoE Session Establishment Process

PADI (router_accesso -> broadcast
CODE: 0x09
Session_ID=0x0000
EtherType=0x8863
TAG=0x0101
Length=0x0004

PADO (router_ISP -> router_accesso)
CODE=0x07
Session_ID=0x0000
Type= UNICAST
Possono essere tanti pacchetti quanti sono i router in grado di rispondere.

PADR (router_accesso -> router_ISP)
CODE=0x19
Session_ID=0x0000
TYPE=unicast

PADS (router_ISP -> router_accesso)
CODE=0x65
Session_ID=<ID>
EtherType=0x8864
TYPE=unicast

PADT (router_accesso -> router_ISP)
CODE=0xA7
Session_ID=<ID>
TYPE=unicast

Nota Bene:
MAX MRU=1492 byte;
Overhead: PPP=2 byte
PPPoE=6byte

Codetype: 8863 – discover
8864 - stage

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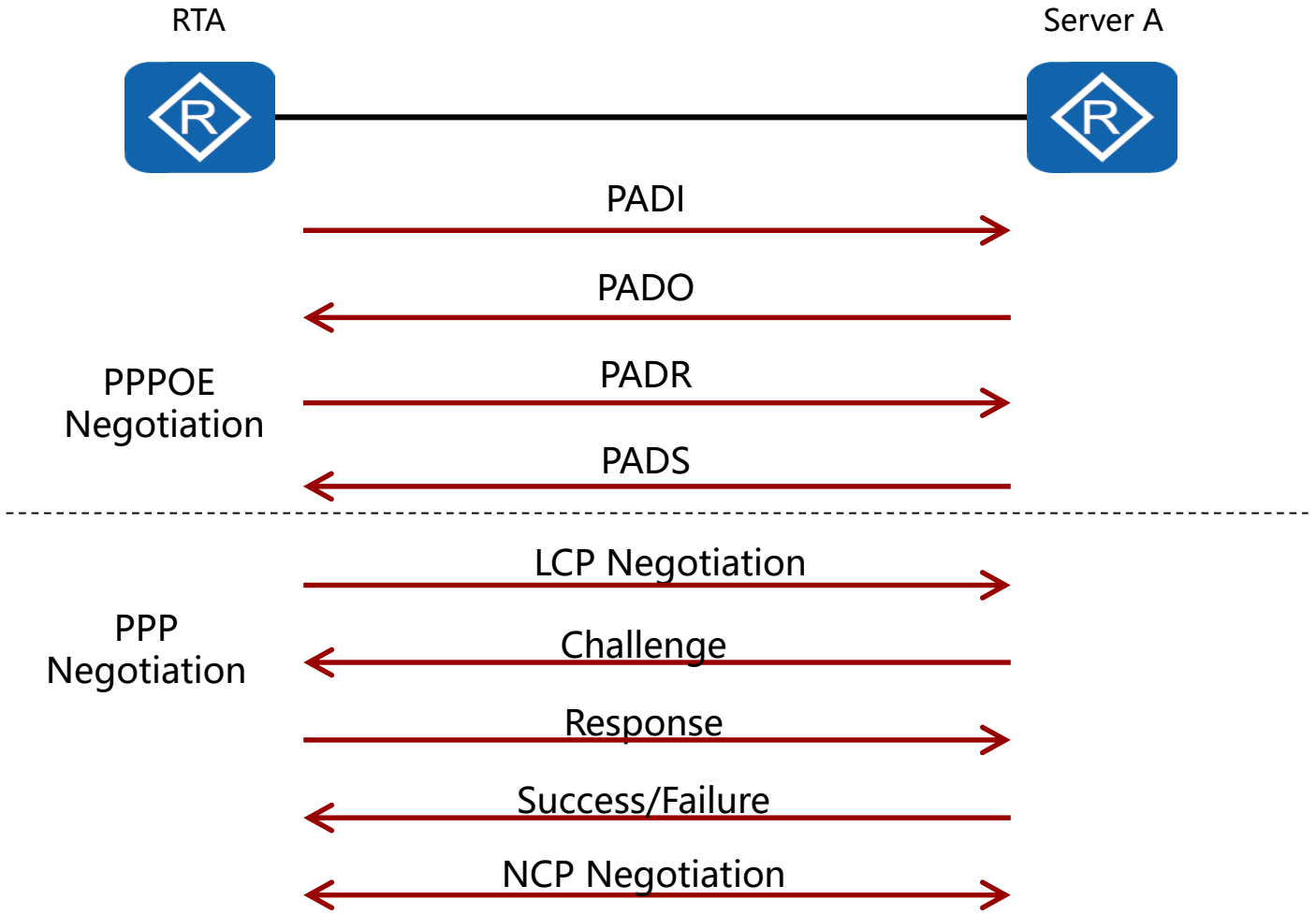
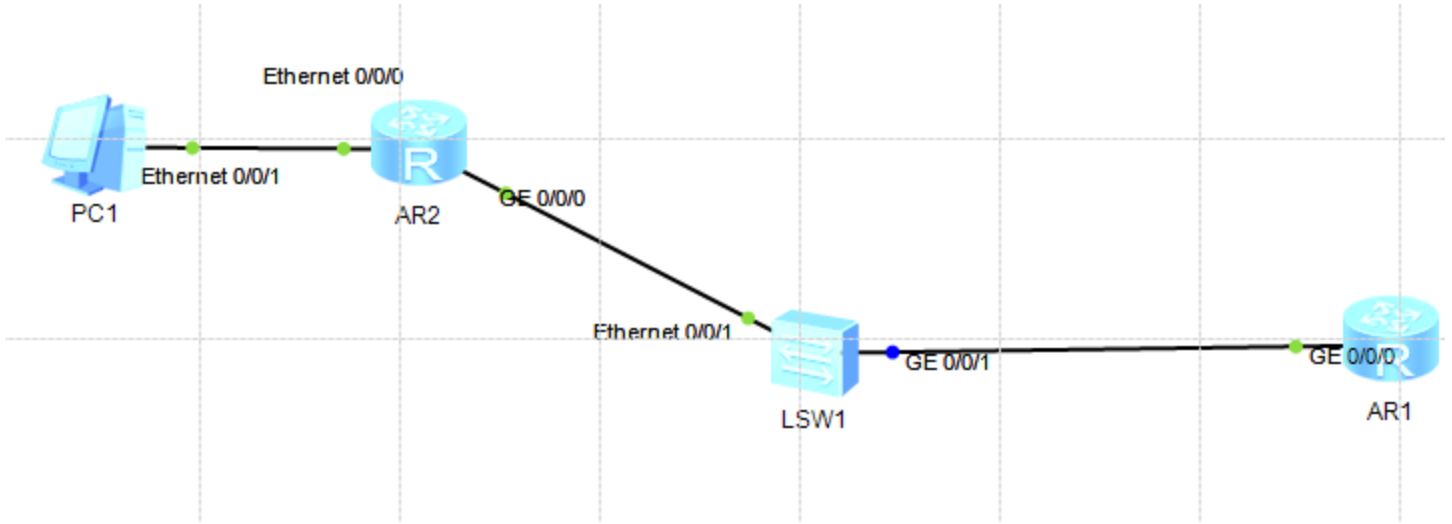
PPPoE Session Establishment Process



PPPoE Session Establishment Process

- Protocol Grab!

pppoe_grab.pcapng



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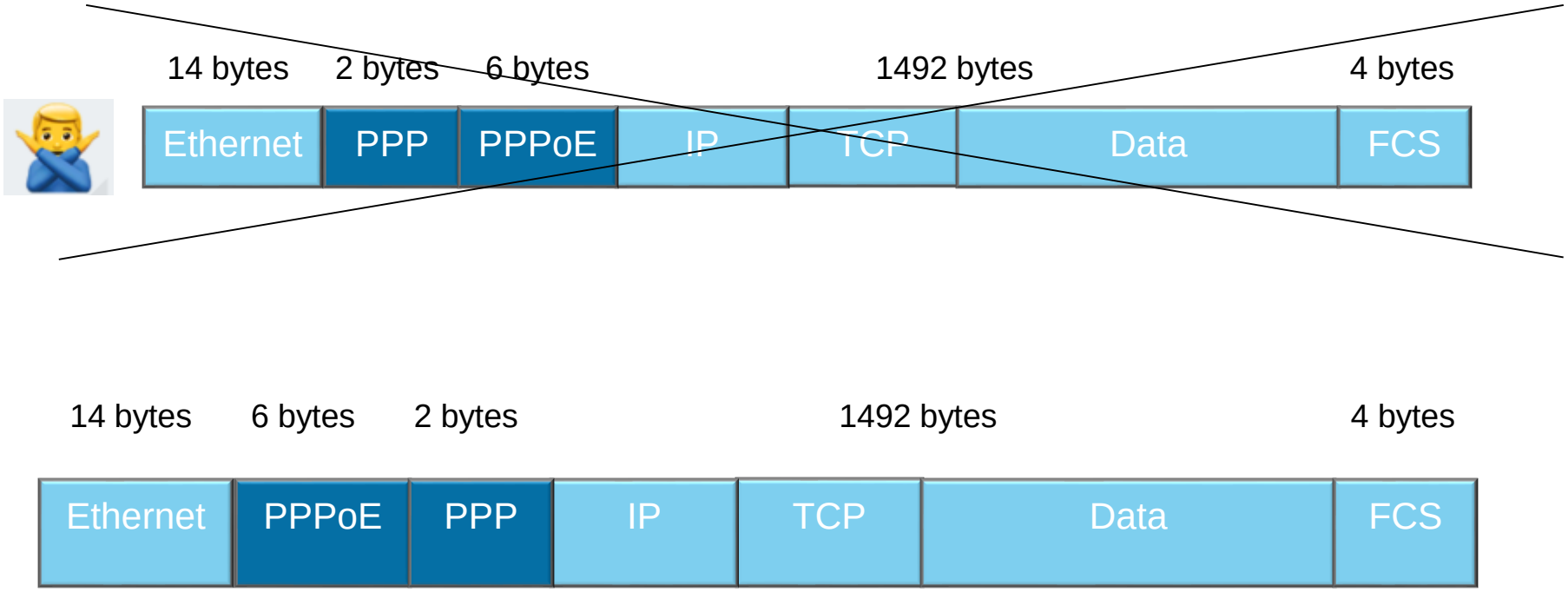
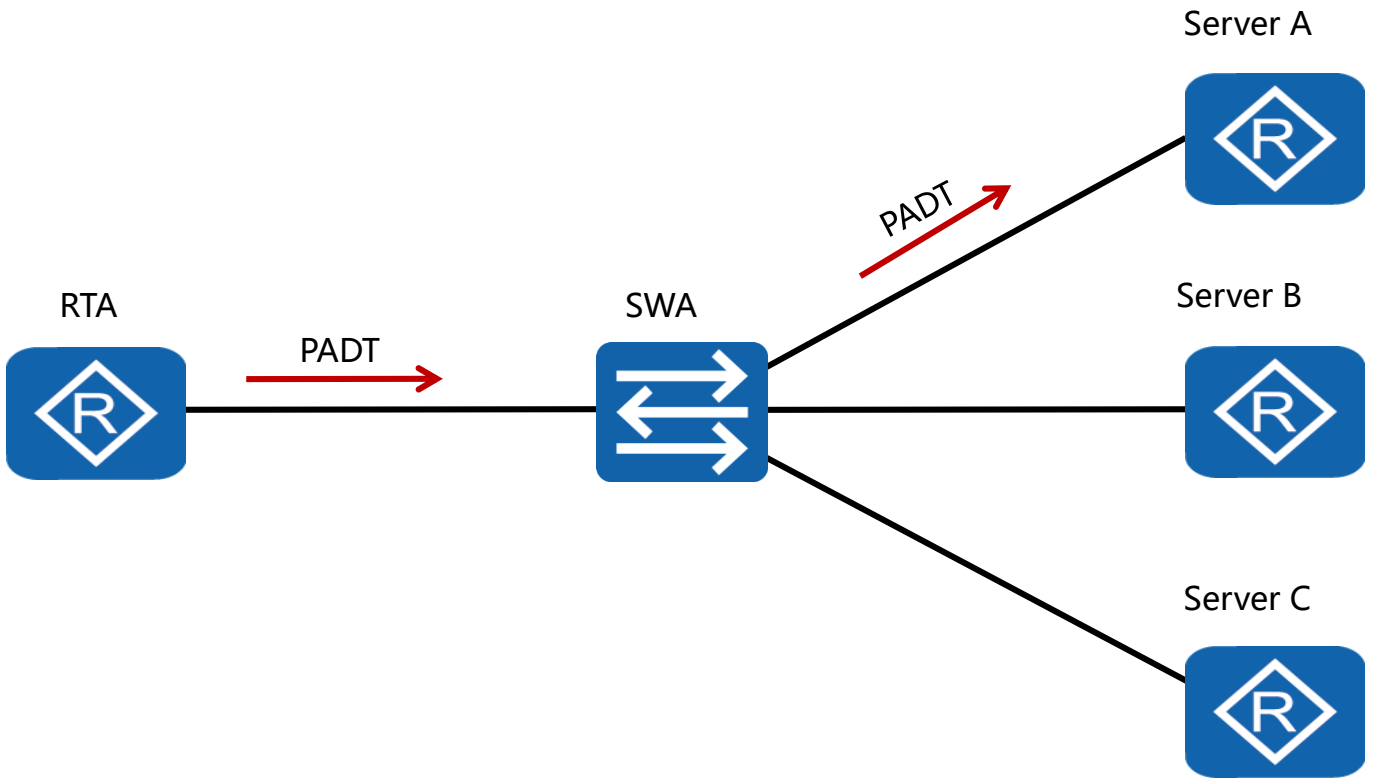
Packet Size Negotiation



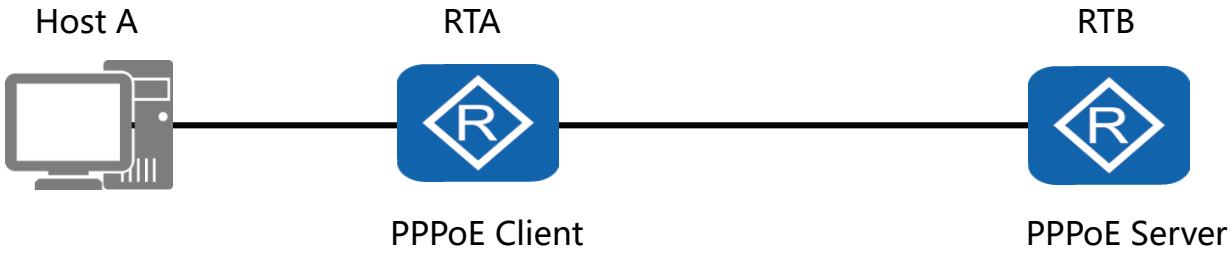
- An additional six bytes PPPoE header is carried in the frame.
- The MTU/MRU must support a lower value to prevent frame loss.

PPPoE Session Termination



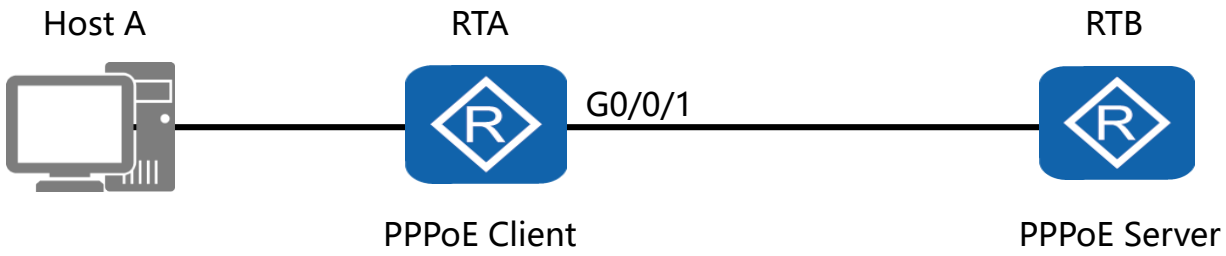
- Used to notify of the termination of a PPPoE session.

Configuring a PPP Dialer Interface




```
[RTA]dialer-rule
[RTA-dialer-rule]dialer-rule 1 ip permit
[RTA-dialer-rule]quit
[RTA]interface dialer 1
[RTA-Dialer1] link-protocol ppp
[RTA-Dialer1]dialer user enterprise
[RTA-Dialer1]dialer-group 1
[RTA-Dialer1]dialer bundle 1
[RTA-Dialer1] ppp chap user enterprise@huawei
[RTA-Dialer1] ppp chap password cipher huawei123
[RTA-Dialer1]ip address ppp-negotiate
```

PPPoE Session Binding




```
[RTA]interface GigabitEthernet 0/0/1
[RTA-GigabitEthernet0/0/1]pppoe-client dial-bundle-number 1 on-demand
[RTA-GigabitEthernet0/0/1]quit
[RTA]ip route-static 0.0.0.0 0 dialer 1
```

- A binding is performed of the PPPoE session with the dialer bundle, and associated with the PPPoE WAN interface.

Dialer Interface Configuration Validation

```
<Huawei>display interface Dialer 1
Dialer1 current state: UP
Line protocol current state: UP (spoofing)
Description: HUAWEI, AR Series, Dialer1 Interface
Route Port, The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is negotiated, 192.168.10.254/32
Link layer protocol is PPP
LCP initial
Physical is Dialer
Bound to Dialer1:0:
Dialer1:0 current state : UP
Line protocol current state : UP

Link layer protocol is PPP
LCP opened, IPCP opened
```

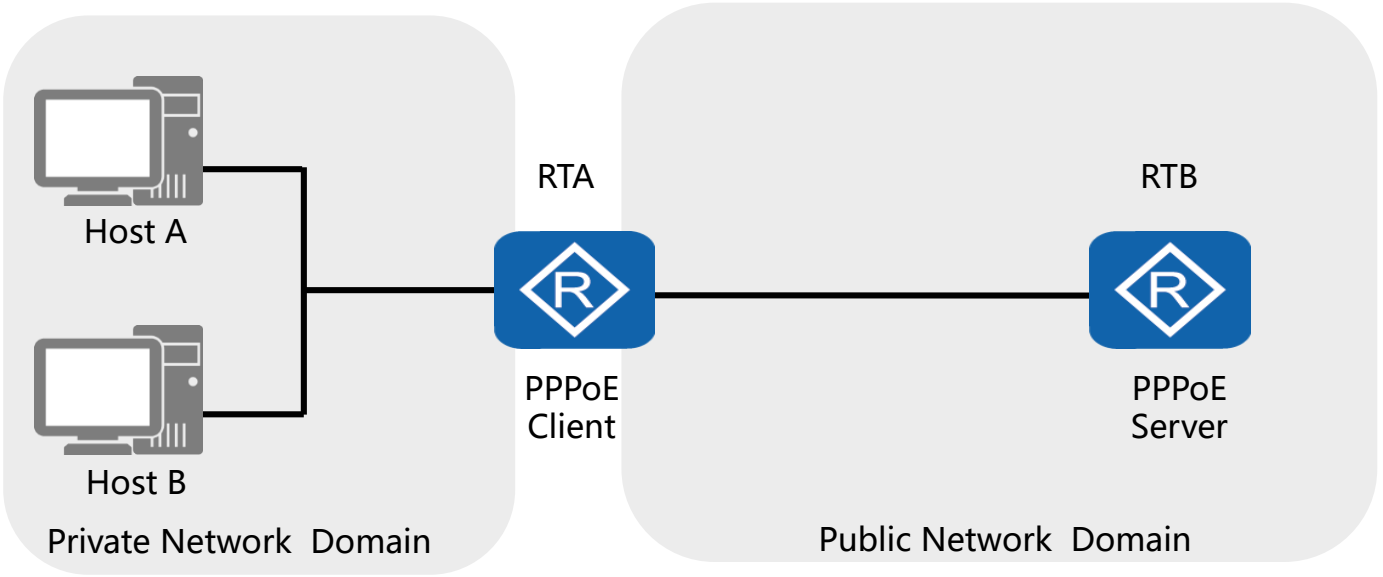
PPPoE Session Validation

```
[RTA] display pppoe-client session summary
PPPoE Client Session:
ID    Bundle   Dialer   Intf          Client-MAC     Server-MAC     State
0     1        1        GE0/0/1       54899876830c   000000000000   IDLE
```

```
[RTA] display pppoe-client session summary
PPPoE Client Session:
ID    Bundle   Dialer   Intf          Client-MAC     Server-MAC     State
1     1        1        GE0/0/1       00e0fc0308f6   00e0fc036781   UP
```

- The PPPoE client session status can be determined as either IDLE, in the discovery stage (PADI/PADR), or UP.

PPPoE Application in Enterprise Networks



- Privately addressed hosts cannot exist in the public domain.
- Address translation along with PPPoE necessary.

PPPoE sul simulatore!

Come configurare un **PPPoE server**:

Creazione del pool IP:

```
ip pool <nome_pool>
network <address> mask <maschera>
gateway-list <gateway_ip>
```

Creazione del template:

```
interface virtual-template 1
    ppp authentication-mode chap
    ip address <gateway_ip>
    remote address pool <nome_pool>
```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PPPoE sul simulatore!

Come configurare un **PPPoE server**:

Binding con interfaccia:

interface <type> <number>

pppoe-server bind virtual-template 1

Creazione degli utenti su aaa

aaa local-user <nome_utente> password cipher <pass>

aaa local-user <nome_utente> service-type ppp

Esempio PPPoE_Server

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A casa come funziona?

Consideriamo una configurazione “legacy” ma utile ai fini del corso

Per configurare una connessione sempre attiva da parte del modem/router, i **parametri** necessari sono i seguenti:

- USERNAME: **timadsl**
- PASSWORD: **timadsl**
- PROTOCOLLO: **PPPoE Routed** (definito come RFC2516)
- INCAPSULAMENTO: **ATM LLC**
- NAT: **attivo**
- VPI: 8
- VCI: 35

La maggiore parte dei provider usa PPPoA e non PPPoE

DSL Internet access architecture

Router		DSL modem	DSLAM		Remote access server		(ISP)
(IP)							(IP)
Ethernet	PPP				PPP	PPP	PPP
	PPPoE	**PPPoE**	**PPPoA**		**PPPoA**	backbone	backbone
	Ethernet	Ethernet	AAL5	AAL5 backbone	backbone	IP	IP
			ATM	ATM			
			DSL	DSL			

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A casa come funziona?

VCI/VPI : Virtual Circuit Identifier – Virtual Path Identifier

Consentono di identificare la destinazione di una cella che attraversa una serie di switch ATM

NB: il concetto di VCI è molto simile al concetto di DLCI incontrato in Frame Relay

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Summary

- Why is it necessary to reduce the MTU/MRU size of PPPoE packets?
- What is the purpose of the dialer bundle command when establishing the PPPoE connection?


Thank You
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