Network Address Translation

Foreword

- The continued growth of IP networks in general has resulted in an ever increasing pressure on the IPv4 address space, and the need for a way to prolong the depletion until long term solutions are founded. Network Address Translation has become well established as the existing solution and widely implemented within enterprise networks. Many variations of NAT have been developed thus conserving the public address space whilst enabling continued public network communication. This section introduces the concept of NAT along with examples of common NAT methods applied, for maintaining internetworking between the enterprise network and the public network domain.

Objectives

- Upon completion of this section, you will be able to:
  - List some of the different forms of Network Address Translation.
  - Explain the general behavior of NAT.
  - Configure NAT to suit application requirements.

NAT

Definito in RFC3022 consente ad uno o più host che non hanno un indirizzo IP valido, registrato e globalmente unico, di comunicare con altri host attraverso la rete internet.

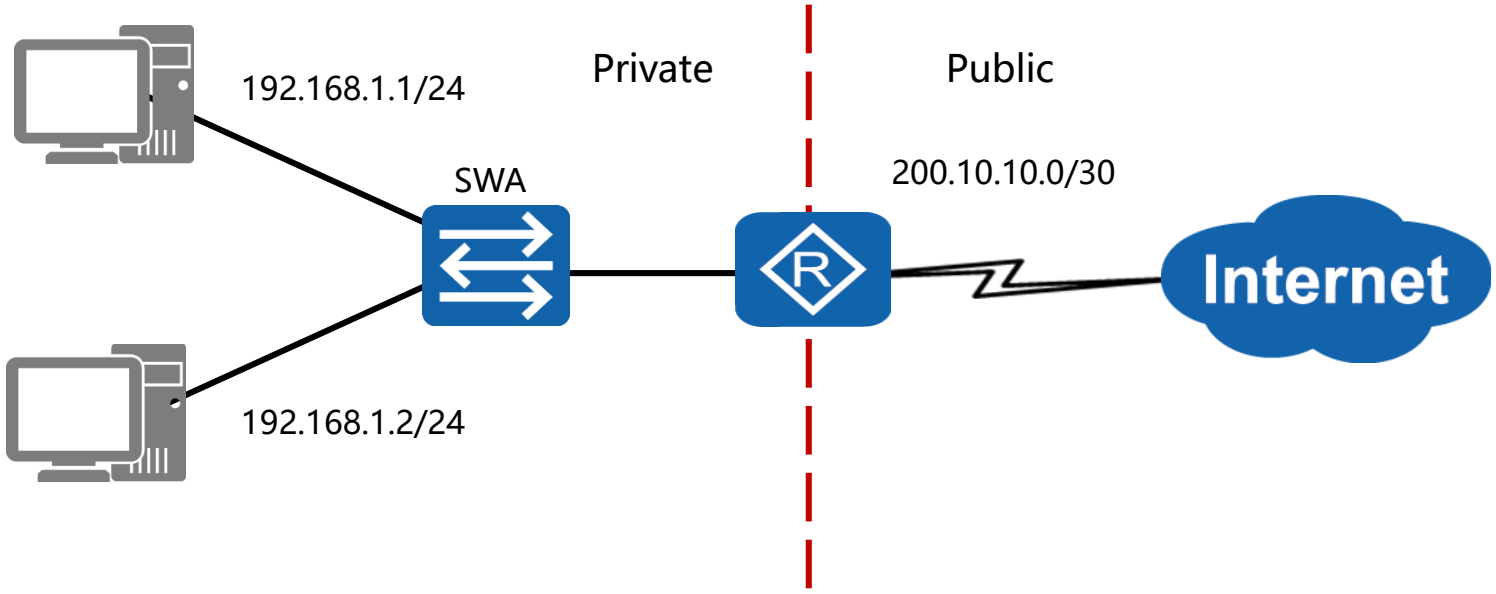
Per ottenere questo risultato, NAT utilizza uno o più indirizzo IP validi e pubblici che "rappresentano" l'indirizzo privato sulla rete pubblica.

Il dispositivo che effettua il NAT compie due operazioni:

- Modifica il contenuto del campo **ip sorgente** del pacchetto,quando questo lascia la LAN;
- Modifica il contenuto del campo **ip destinatario** del pacchetto, quando questo entra nella LAN.

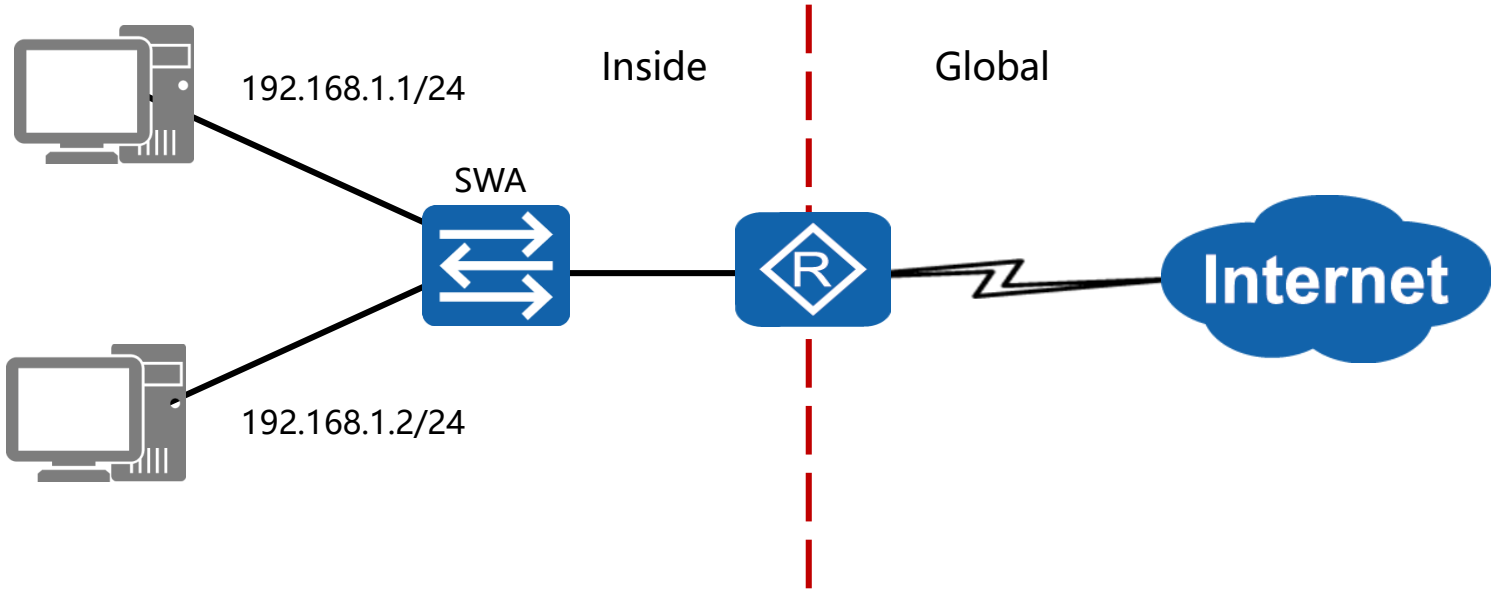
Page 3

Private & Public Networks



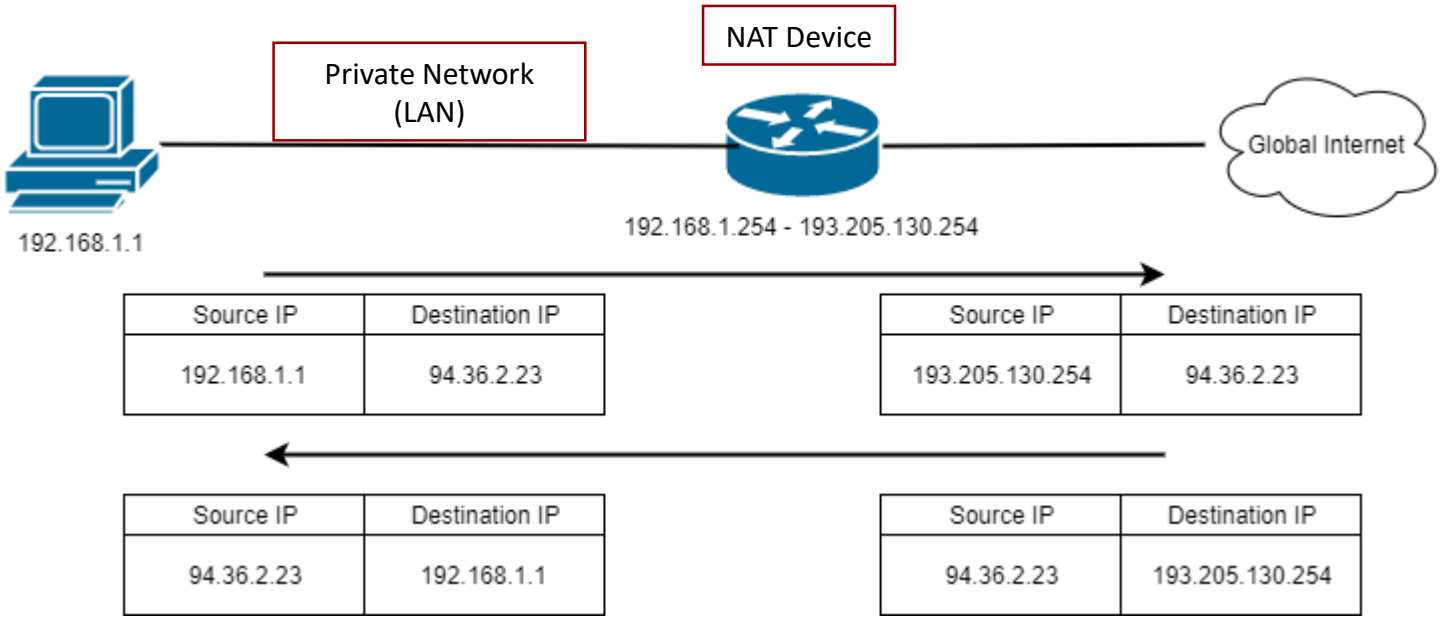
- A measure taken against rapid depletion of IP addresses.
- Gateway operates as a private/public address boundary.

NAT Behavior



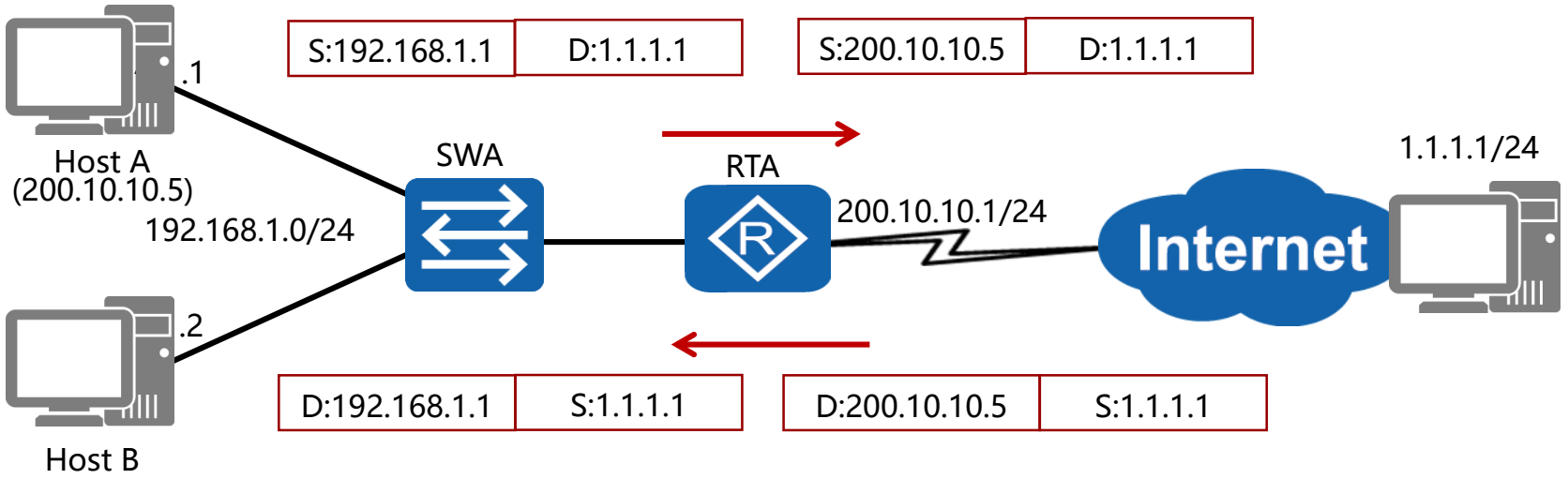
- NAT boundaries are represented as either inside or global.
- Translation of addresses is performed between boundaries.

NAT



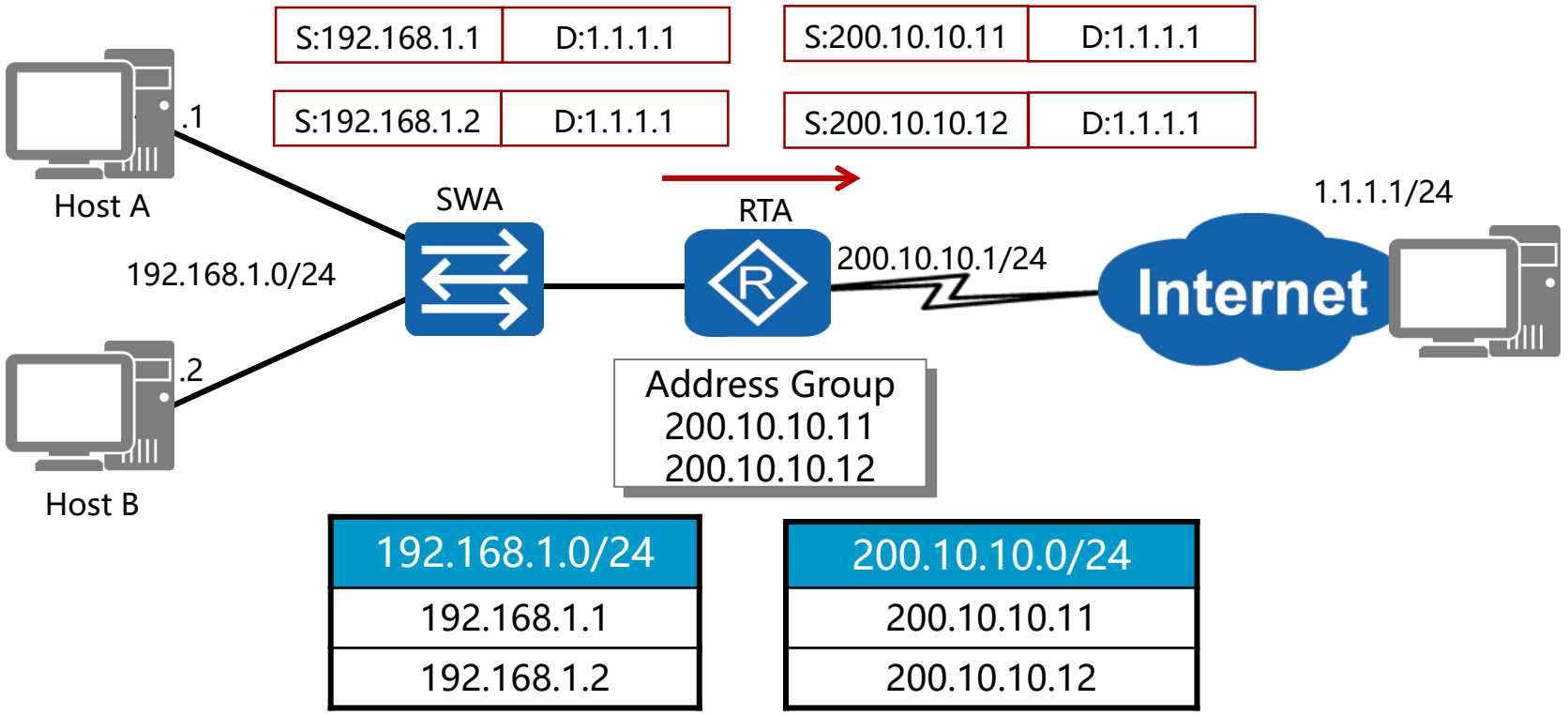
Page 6

Static NAT



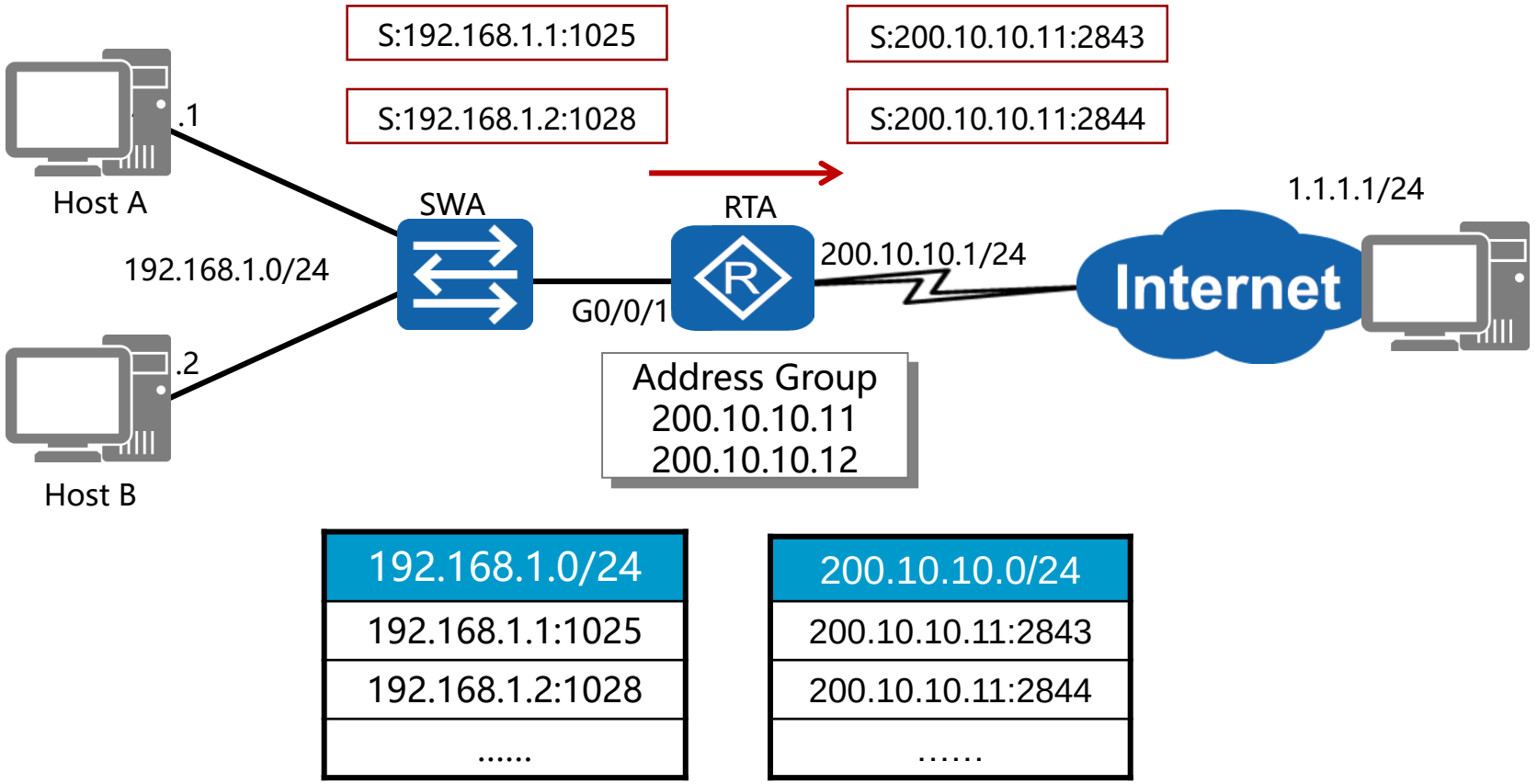
- One-to-one mapping of private to public addresses.
- Limits the need for address management with session flows.

Dynamic NAT



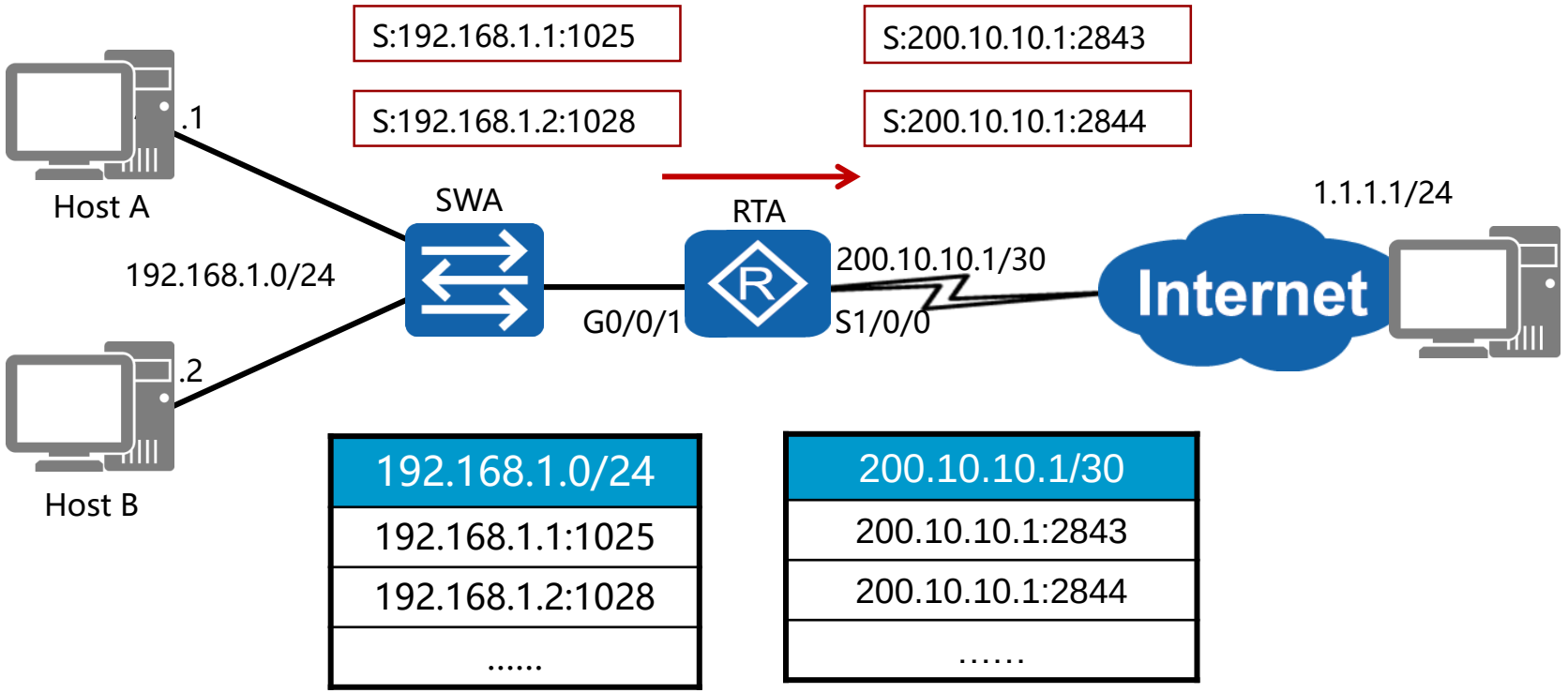
- Private address mapping based on an address resource pool.
- Allows users to utilize public addresses based on need.

Network Address Port Translation



- Port numbers distinguish mapping of the same public address.

Easy IP



- The WAN interface address used as a single public address for all internal users, with port numbers used to distinguish sessions.

NAT Tipologie

NAT STATICO

- Corrispondenza 1 ad 1 tra ip privati e pubblici;
- Non consente di risparmiare IP pubblici;
- Utilizzato su reti piccole.
- One-to-one.

NAT DINAMICO

- Definizione di un pool di indirizzi pubblici dai quali “attingere”;
- Se gli IP pubblici sono pochi, alcuni host della rete privata potrebbero non riuscire ad essere serviti.
- Many-to-many.

Page 11

NAT Tipologie

NAPT – Port Address Translation

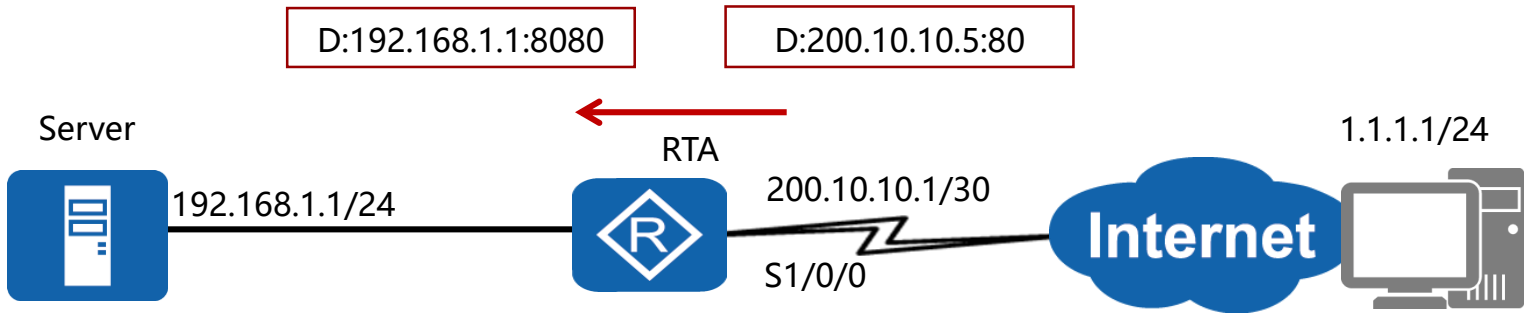
- Tanti host interni vengono mappati sullo stesso indirizzo pubblico;
- Gli host interni sono distinti attraverso il numero di porta utilizzato;
- Many-to-one;

EasyIP

- Caso particolare del NAPT;
- Utilizza l'indirizzo ip di una interfaccia di rete;
- Many-to-one;

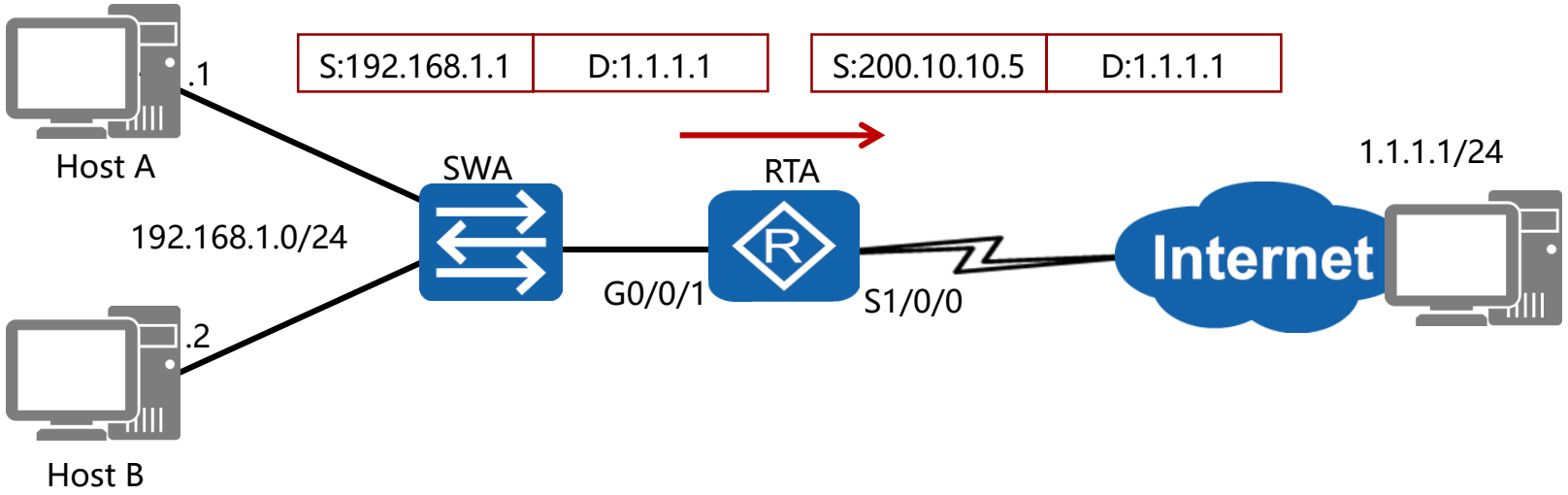
Page 12

NAT Internal Server



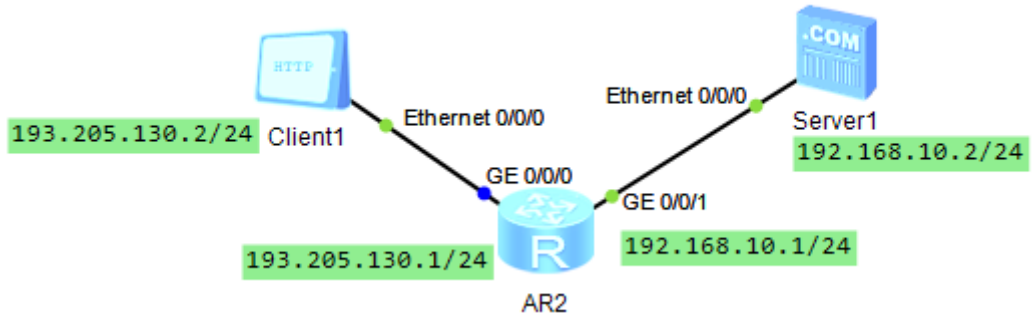
- External sources can reach internal addresses.
- Mapping of both the IP address and port number is performed.

Static NAT Configuration




```
[RTA]interface GigabitEthernet0/0/1
[RTA-GigabitEthernet0/0/1]ip address 192.168.1.254 24
[RTA]interface Serial1/0/0
[RTA-Serial1/0/0]ip address 200.10.10.1 24
[RTA-Serial1/0/0]nat static global 200.10.10.5 inside 192.168.1.1
```

Static NAT Configuration




```
[RTA]interface GigabitEthernet0/0/0
[RTA-GigabitEthernet0/0/0]ip address 192.168.1.254 24
[RTA-GigabitEthernet0/0/0] nat static protocol tcp global
193.205.130.3 90 inside 192.168.10.2 80
```

Con questa configurazione di INTERFACCIA si effettua una traslazione “bidirezionale”.

Il server interno viene mappato sull’indirizzo 193.205.130.3 porta 90.

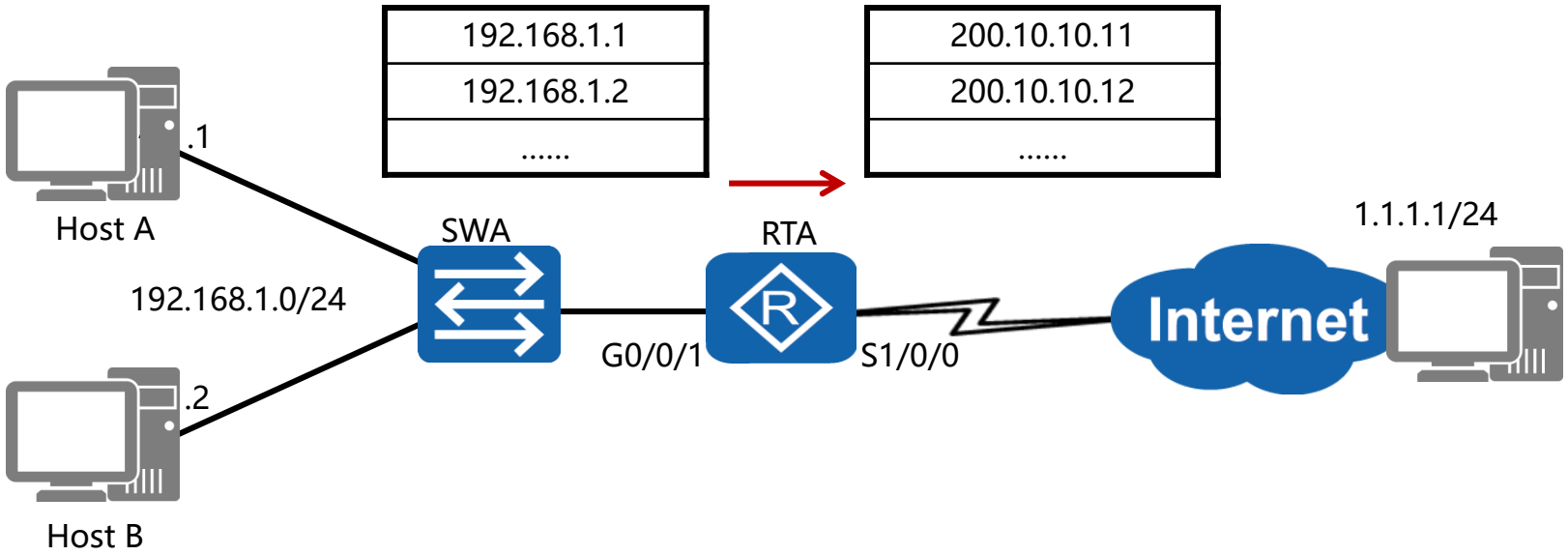
Static NAT Configuration Validation

```
[RTA]display nat static
  Static Nat Information:
  Interface  : Serial1/0/0
    Global IP/Port     : 200.10.10.5/----
    Inside IP/Port     : 192.168.1.1/----
    Protocol : ----
    VPN instance-name  : ----
    Acl number         : ----
    Netmask  : 255.255.255.255
    Description : ----

  Total :    1
```

- Static inside and global address translation can be verified.

Dynamic NAT Configuration



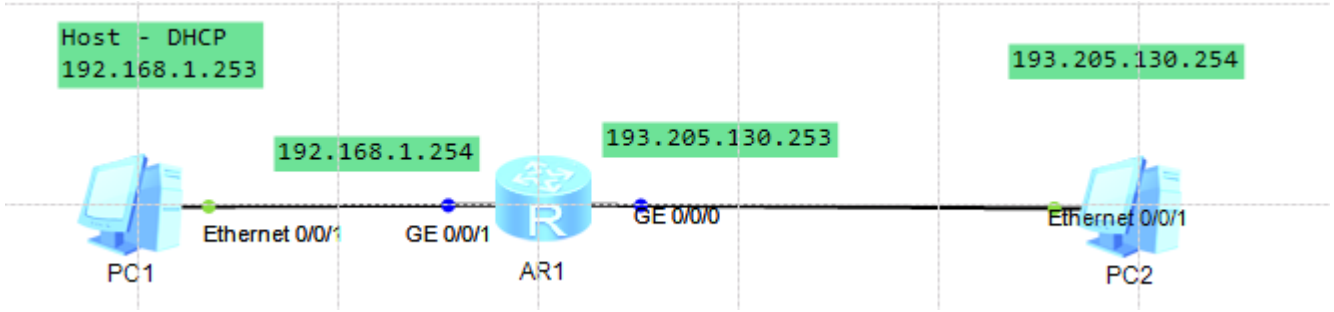

```
[RTA]nat address-group 1 200.10.10.11 200.10.10.16
[RTA]acl 2000
[RTA-acl-basic-2000]rule 5 permit source 192.168.1.0 0.0.0.255
[RTA-acl-basic-2000]quit
[RTA]interface serial1/0/0
[RTA-Serial1/0/0]nat outbound 2000 address-group 1 no-pat
```

Dynamic NAT Configuration Validation

```
[RTA]display nat address-group 1
 NAT Address-Group Information:
 --------------------------------------
 Index    Start-address       End-address
 1        200.10.10.11        200.10.10.16
[RTA]display nat outbound
 NAT Outbound Information:
 --------------------------------------------------------------------
 Interface           Acl     Address-group/IP/Interface      Type
 --------------------------------------------------------------------
 Serial1/0/0        2000                          1          no-pat
 --------------------------------------------------------------------
  Total : 1
```

- Enables group binding parameter configuration to be verified.

Dynamic NAT Configuration




```
> Frame 3: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
> Ethernet II, Src: HuaweiTe_59:6f:90 (54:89:98:59:6f:90), Dst: HuaweiTe_1b:68:1b (00:e0:fc:1b:68:1b)
> Internet Protocol Version 4, Src: 192.168.1.253, Dst: 193.205.130.254
> Internet Control Message Protocol
```

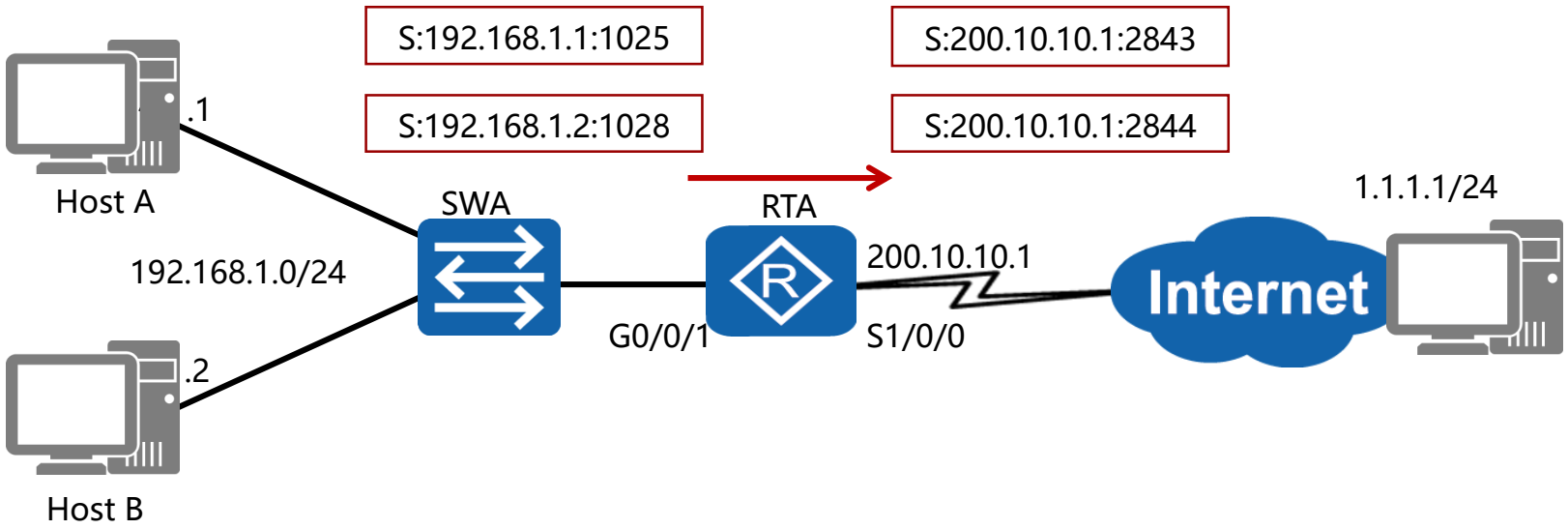
```
> Frame 3: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
> Ethernet II, Src: HuaweiTe_1b:68:1a (00:e0:fc:1b:68:1a), Dst: HuaweiTe_58:01:52 (54:89:98:58:01:52)
> Internet Protocol Version 4, Src: 193.205.130.2, Dst: 193.205.130.254
> Internet Control Message Protocol
```

```
> Frame 4: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
> Ethernet II, Src: HuaweiTe_58:01:52 (54:89:98:58:01:52), Dst: HuaweiTe_1b:68:1a (00:e0:fc:1b:68:1a)
> Internet Protocol Version 4, Src: 193.205.130.254, Dst: 193.205.130.2
> Internet Control Message Protocol
```

```
> Frame 4: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
> Ethernet II, Src: HuaweiTe_59:6f:90 (54:89:98:59:6f:90), Dst: HuaweiTe_1b:68:1b (00:e0:fc:1b:68:1b)
> Internet Protocol Version 4, Src: 192.168.1.253, Dst: 193.205.130.254
> Internet Control Message Protocol
```


Page 19

Easy IP Configuration



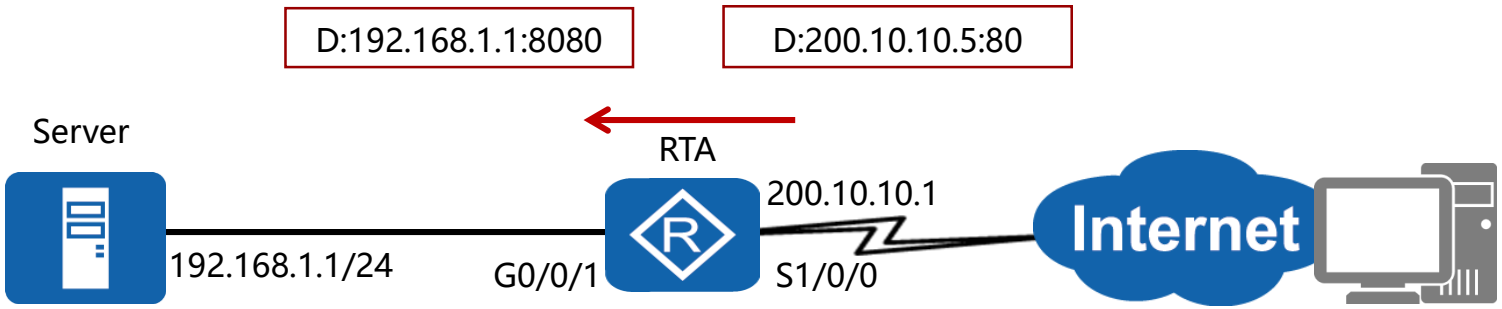

```
[RTA]acl 2000
[RTA-acl-basic-2000]rule 5 permit source 192.168.1.0 0.0.0.255
[RTA-acl-basic-2000]quit
[RTA]interface serial1/0/0
[RTA-Serial1/0/0]nat outbound 2000
```

Easy IP Configuration Validation

```
[RTA] display nat outbound
 NAT Outbound Information:
 --------------------------------------------------------------------------
 Interface         Acl     Address-group/IP/Interface      Type
 --------------------------------------------------------------------------
 Serial1/0/0       2000      200.10.10.1                   easyip
 --------------------------------------------------------------------------
  Total : 1
```

- Associated outbound interface parameters are displayed.
- The type field verifies the successful configuration of Easy IP.

NAT Internal Server Configuration




```
[RTA]interface GigabitEthernet0/0/1
[RTA-GigabitEthernet0/0/1]ip address 192.168.1.254 24
[RTA]interface Serial1/0/0
[RTA-Serial1/0/0]ip address 200.10.10.1 24
[RTA]nat server protocol tcp global 200.10.10.5 www inside
192.168.1.1 8080
```

NAT Internal Server Configuration Validation

```
[RTA]display nat server
  Nat Server Information:
  Interface  : Serial1/0/0
    Global IP/Port     : 200.10.10.5/80(www)
    Inside IP/Port     : 192.168.1.1/8080
    Protocol : 6(tcp)
    VPN instance-name  : ----
    Acl number         : ----
    Description : ----

  Total :    1
```

- Successful translation of the IP address and port is achieved.

Summary

- Which form of translation will allow a server in a DMZ to be accessed from both an external and an internal network?
- What is the function of the PAT feature?


Thank You
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