

# Network Technologies (TCP/IP Suite)

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# Outline

▲ Virtual Private Networks (VPNs)

# Regenerating a stream with Ethereal

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Filter: (ip.addr eq 58.65.182.107 and ip.addr eq 207.142.131.205) and (tcp.port eq 80) Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
8	3.028119	58.65.182.107	207.142.131.205	TCP	1677 > http [SYN] Seq=0 Ack=0 win=16384 Len=0 MSS=1426
9	3.352705	207.142.131.205	58.65.182.107	TCP	http > 1677 [SYN, ACK] Seq=0 Ack=1 win=5840 Len=0 MSS=1460
10	3.353849	58.65.182.107	207.142.131.205	TCP	1677 > http [ACK] Seq=1 Ack=1 win=17112 Len=0
11	3.384234	58.65.182.107	207.142.131.205	HTTP	GET /wiki/GPRS_Tunnelling_Protocol HTTP/1.1
14	3.728892	207.142.131.205	58.65.182.107	TCP	http > 1677 [ACK] Seq=1 Ack=496 win=6432 Len=0
15	3.843249	207.142.131.205	58.65.182.107	HTTP	HTTP/1.0 200 OK (text/html)
16	3.897461	207.142.131.205	58.65.182.107	HTTP	Continuation or non-HTTP traffic
17	3.898688	58.65.182.107	207.142.131.205	TCP	1677 > http [ACK] Seq=496 Ack=2853 win=17112 Len=0
18	4.275724	207.142.131.205	58.65.182.107	HTTP	Continuation or non-HTTP traffic
19	4.327826	207.142.131.205	58.65.182.107	HTTP	Continuation or non-HTTP traffic
20	4.328953	58.65.182.107	207.142.131.205	TCP	1677 > http [ACK] Seq=496 Ack=5705 win=17112 Len=0
21	4.367964	207.142.131.205	58.65.182.107	HTTP	[TCP Previous segment lost] Continuation or non-HTTP traffic
22	4.369138	58.65.182.107	207.142.131.205	TCP	[TCP Dup ACK 20#1] 1677 > http [ACK] Seq=496 Ack=5705 win=17112 Len=0 SLE=7131 SRE=8190
23	4.421111	207.142.131.205	58.65.182.107	HTTP	[TCP Retransmission] Continuation or non-HTTP traffic
24	4.422278	58.65.182.107	207.142.131.205	TCP	1677 > http [ACK] Seq=496 Ack=8190 win=17112 Len=0
25	4.422924	58.65.182.107	207.142.131.205	TCP	1677 > http [FIN, ACK] Seq=496 Ack=8190 win=17112 Len=0
29	4.748144	207.142.131.205	58.65.182.107	TCP	http > 1677 [ACK] Seq=8190 Ack=497 win=6432 Len=0

**Follow TCP stream**

Stream Content

```

GET /wiki/GPRS_Tunnelling_Protocol HTTP/1.1
Host: en.wikipedia.org
User-Agent: Mozilla/5.0 (windows; U; windows NT 5.1; en-US; rv:1.8.0.3) Gecko/20060426
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.5
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Referer: http://en.wikipedia.org/wiki/Tunneling_protocol

HTTP/1.0 200 OK
Date: Tue, 30 May 2006 17:12:39 GMT
Server: Apache
X-Powered-By: PHP/5.1.2
Content-Language: en
ETag: w/"enwiki:pcache:idhash:2365049-0!1!0!0!!en!2--20060418061140"
Vary: Accept-Encoding, Cookie
Cache-Control: private, s-maxage=0, max-age=0, must-revalidate
Last-Modified: wed, 19 Apr 2006 15:15:00 GMT
Content-Encoding: gzip

```

Save As | Print | Entire conversation (8683 bytes) |  ASCII  EBCDIC  Hex Dump  C Arrays  Raw

Filter out this stream | Close

```

0000  00 13 c4 d6 06 a8 00 0e 50 a3 93 42 88 64 11 00  .....P..B.d..
0010  f3 38 00 2a 00 21 45 00 00 28 53 59 40 00 80 06  .8.*.!E. .(SY@...
0020  63 6e 3a 41 b6 6b cf 8e 83 cd 06 8d 00 50 72 8b  cn:A.k...Pr.
0030  82 aa fc 96 83 2d 50 11 42 d8 ad 1b 00 00  .....-P. B.....

```

# Self study

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Find out how point-to-point tunnelling protocol (PPTP) can be used for VPNs.

Search wikipedia - PPTP

# Private networks

- ★ To be used inside the organization
- ★ Intranet
  - A private network whose access is only limited to the users inside the organization
- ★ Extranet
  - Same as the intranet, but with one addition
  - Some users outside the organization can also access (some or all) resources
    - ◆ limitations defined by the network administrator

# Addressing in private networks

- ▲ IP addresses (e.g. class A, B, C) can be used within a private network, *after* registration
  - Advantage: If we want the private network to directly access the internet, we will have no problems at all
  - Disadvantage: If there is no internet connectivity for the private network, those IP addresses will be wasted
    - ◆ unnecessary allocation

# Addressing in private networks

- ▲ IP addresses (e.g. class A, B, C) can be used within a private network, *without* registration
  - Since network is isolated, the addresses would remain unique
  - Problems when connecting to the internet



# Addressing in private networks

▲ To overcome both the previous scenarios, reservations have been made

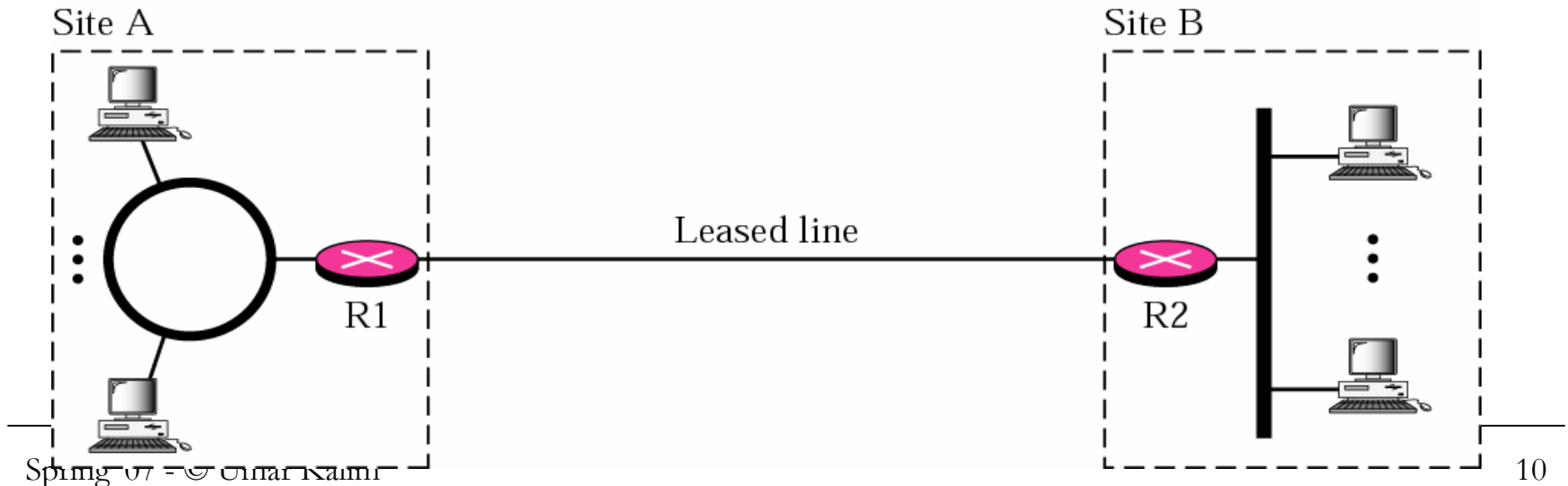
▲ These addresses are unique within an

org	<i>Range</i>	<i>Total</i>
▲ Th	10.0.0.0 to 10.255.255.255	$2^{24}$
org	172.16.0.0 to 172.31.255.255	$2^{20}$
	192.168.0.0 to 192.168.255.255	$2^{16}$

▲ Thus the routers ensure that they do not forward packets with these addresses as destination

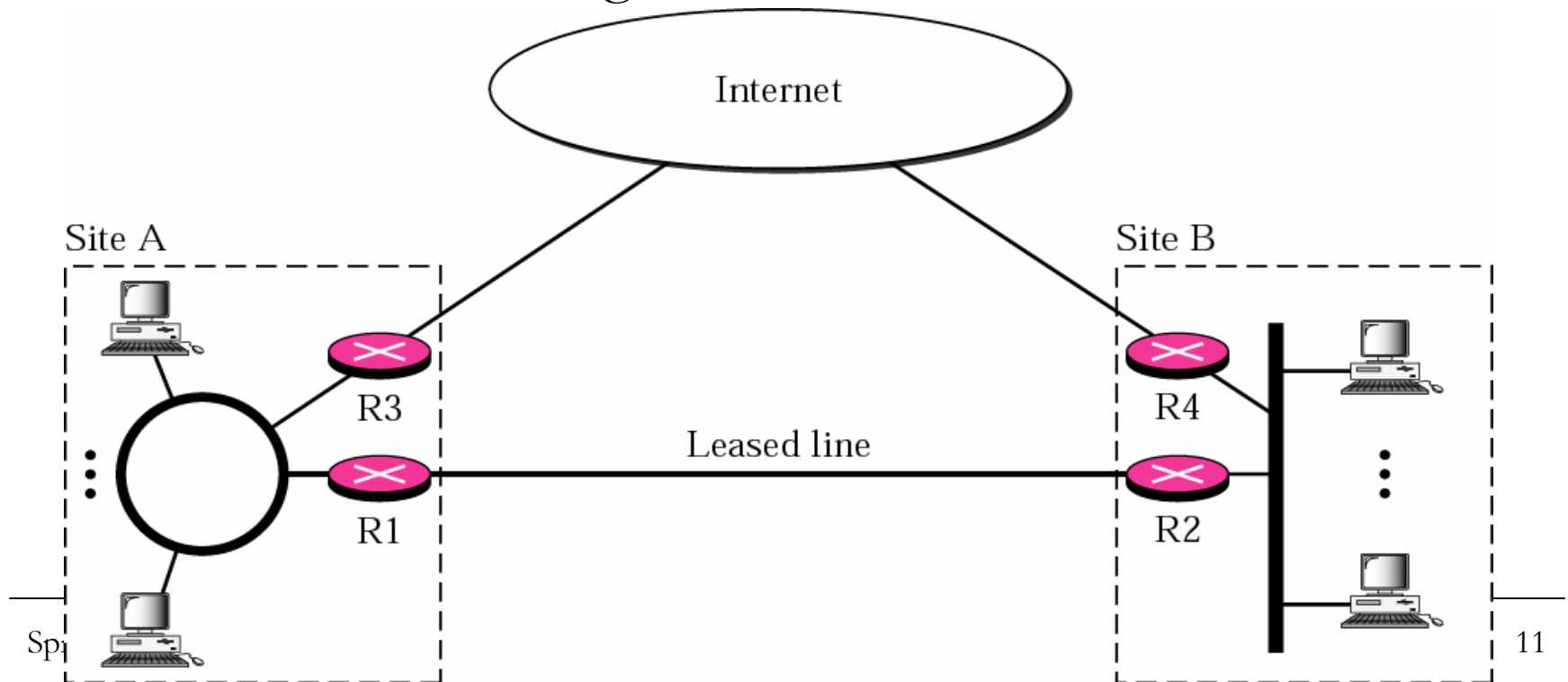
# Achieving Privacy

- ▲ A small organization can remain isolated
  - Single site
- ▲ A large organization with multiple sites can have its private internet
  - No need for address registration



# Achieving Privacy in Hybrid Networks

- Require privacy, but also need to connect to the internet
- Solution: Hybrid network
  - Problem - addressing

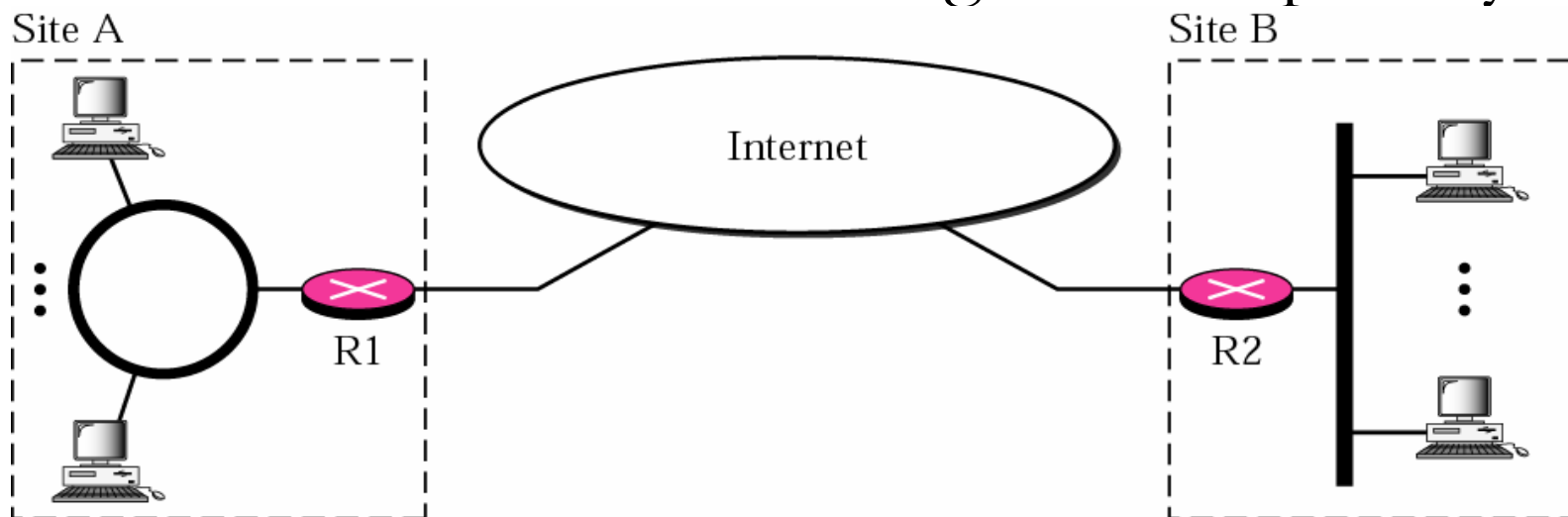


# Drawbacks of Private & Hybrid n/w

- ▲ Private & Hybrid Networks are very costly
  - Duplication of equipment
  - Leased lines for inter-site connectivity
- ▲ Difficult to administer if internet connectivity is required (as well as privacy)

# Overview: Virtual Private Networks

- ▲ Use the global internet for internet access as well as inter-site access
  - i.e. both public & private communication
- ▲ R1 & R2 use VPN-tech. to guarantee privacy

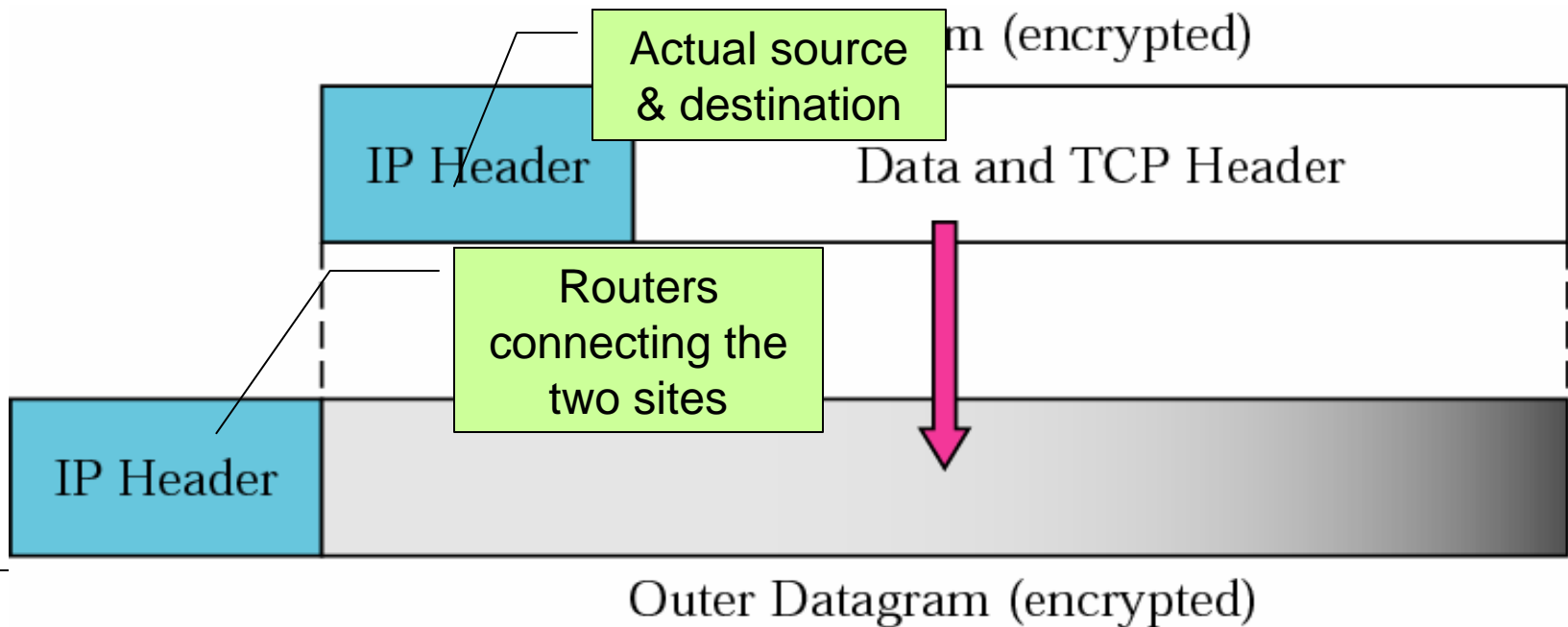


# What is a VPN?

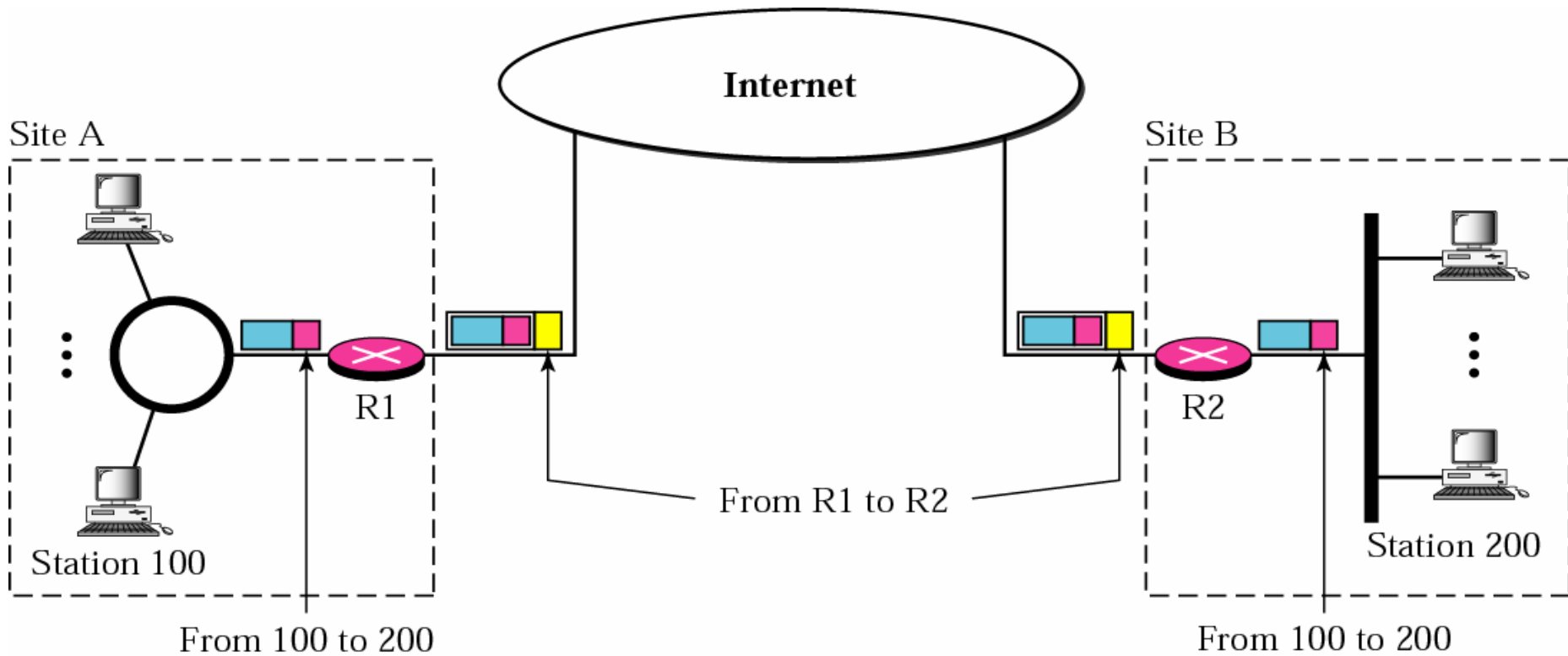
- ▲ A technology based on two techniques which guarantee privacy
  - Tunnelling
    - ◆ Simple
    - ◆ TLS/SSL
  - IPSec
    - ◆ Authentication Header (AH)
    - ◆ Encrypted Security Payload (ESP)

# Tunnelling

- ▲ VPN specifies that each IP datagram destined for a private use in the organization must be encapsulated inside another datagram



# Addressing in VPN





# What is a VPN?

- ▲ A technology based on two techniques which guarantee privacy
  - Tunnelling
    - ◆ Simple
    - ◆ TLS/SSL
  - IPSec
    - ◆ Authentication Header (AH)
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# Questions?

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That's all for today!