

# Computer Science E-1

## Understanding Computers and the Internet

### Lecture 5: The Internet, Continued

Thursday, 27 October 2005

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1

## Agenda

- Network Topologies
  - Bus
  - Ring
  - Star
- Ethernet
  - NICs
  - Cabling
    - Bandwidth
    - 10/1000/1000Base-T
    - Patch v. Crossover
  - Hubs
  - Switches
    - Collision Domains
    - Ethernet Addresses
- Wireless
  - IR
  - Bluetooth
  - 802.11
- ISPs
- Modems
  - Dialup
  - Cable
  - DSL
- The Internet
  - Backbones
  - Routers
  - TCP/IP
    - Packets
    - Ports
  - DHCP
  - DNS
- NAT

2

# Network Topologies

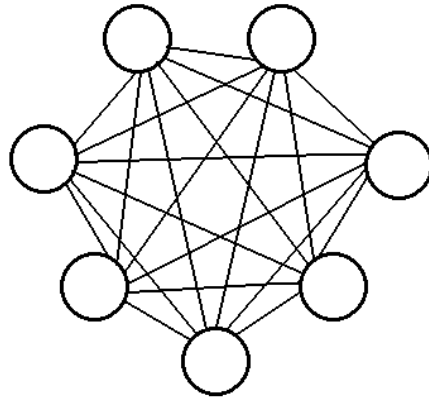


Image from <http://www.indiesoft.com/scnp/topology.html>.

3

# Network Topologies

## Bus

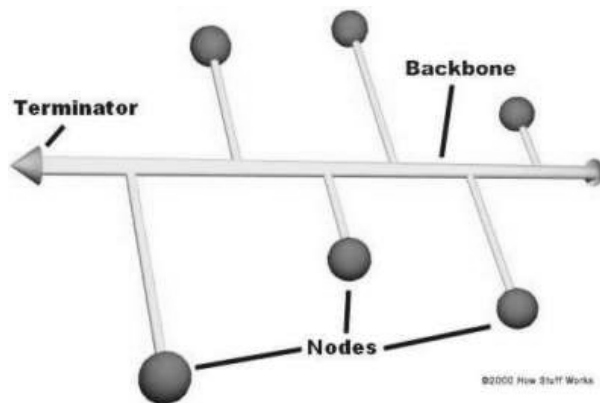


Image from <http://www.howstuffworks.com/lan-switch1.htm>.

4

# Network Topologies

## Ring

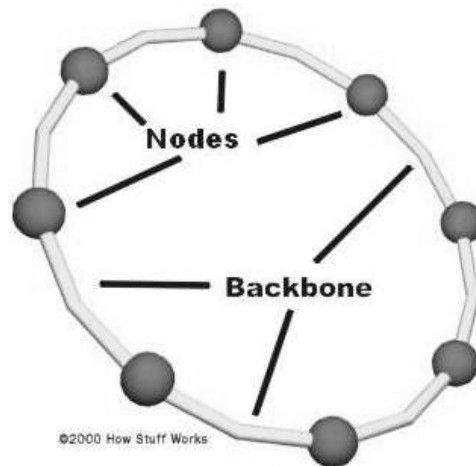


Image from <http://www.howstuffworks.com/lan-switch1.htm>.

5

# Network Topologies

## Star

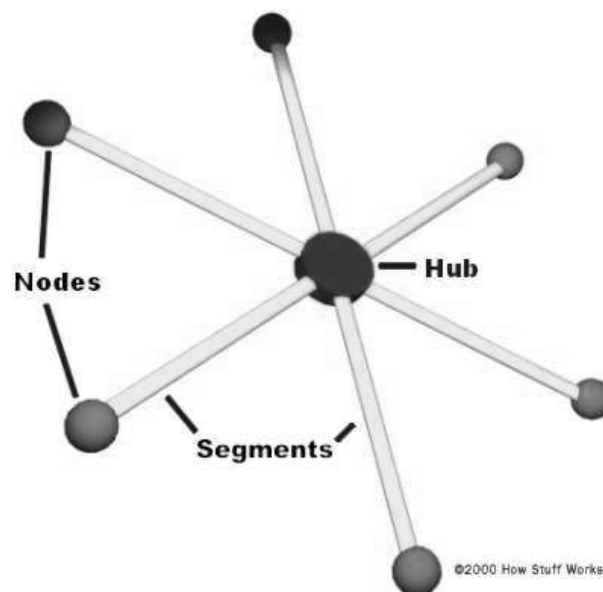
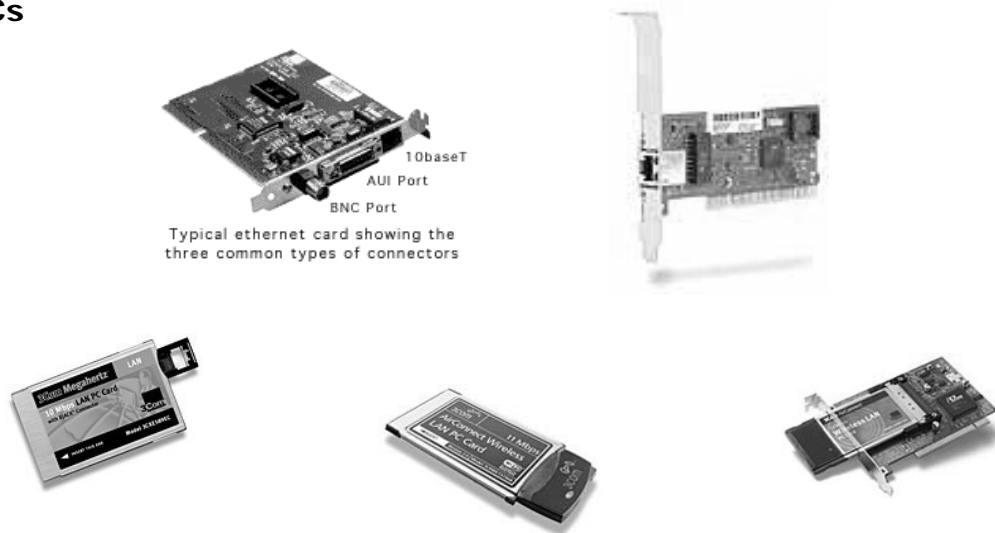


Image from <http://www.howstuffworks.com/lan-switch1.htm>.

6

# Ethernet

## NICs



Images from [http://lat.3com.com/lat/products/pc\\_cards/16bit\\_lan.html](http://lat.3com.com/lat/products/pc_cards/16bit_lan.html), [http://lat.3com.com/lat/products/wireless/11\\_mbps\\_lan.html](http://lat.3com.com/lat/products/wireless/11_mbps_lan.html), and [http://www.3com.com/products/en\\_US/detail.jsp?tab=features&pathtype=purchase&sku=3C905CX-TX-NM](http://www.3com.com/products/en_US/detail.jsp?tab=features&pathtype=purchase&sku=3C905CX-TX-NM), copyright © 3Com Corporation; and <http://www.mackido.com/Hardware/Networking102.html>, copyright © David K. Every.

7

# Ethernet

## Cabling



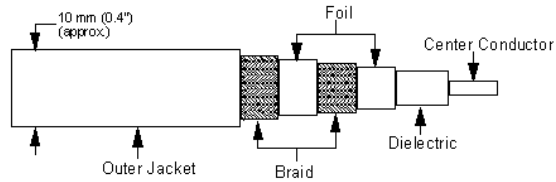
Images from <http://www.mssolutions.co.uk/cabling1.html>; <http://www.redcorp.com/products/06003129.asp>, copyright © RedCorp; and [http://www.neticamall.com/C\\_94.htm](http://www.neticamall.com/C_94.htm).

8

# Ethernet

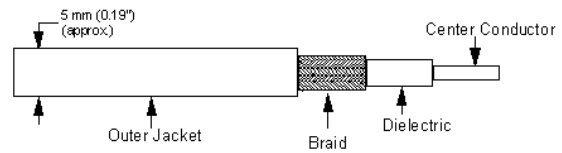
## Cabling

### Thicknet Coaxial Cable



Copyright 1999 TechFest.com All rights reserved.

### Thinnet Coaxial Cable



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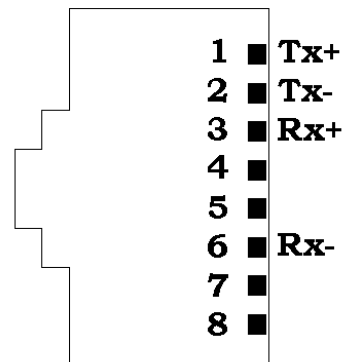
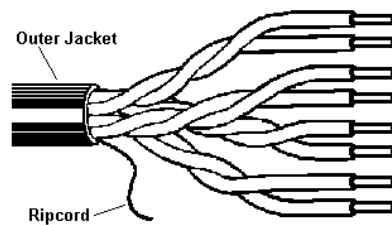
Images from <http://www.techfest.com/networking/lan/ethernet5.htm>, copyright © TechFest.com.

9

# Ethernet

## Cabling

### UTP Cable (4-pair)

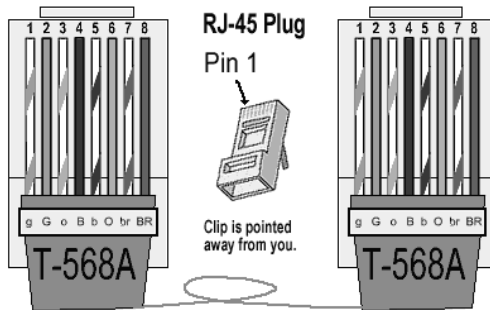


Images from <http://www.techfest.com/networking/lan/ethernet5.htm>, copyright © TechFest.com;  
and [http://www.it-cabling-solutions.co.uk/html/structured\\_cabling/systems/ethernet/ethernet.htm](http://www.it-cabling-solutions.co.uk/html/structured_cabling/systems/ethernet/ethernet.htm).

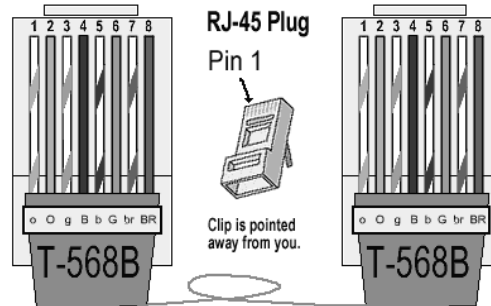
10

# Ethernet

## Cabling



Straight-Through "Patch" Cables

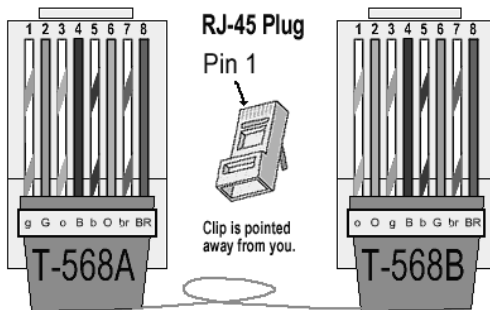


Images from <http://www.incentre.net/incentre/frame/ethernet.html>, copyright © The Internet Centre.

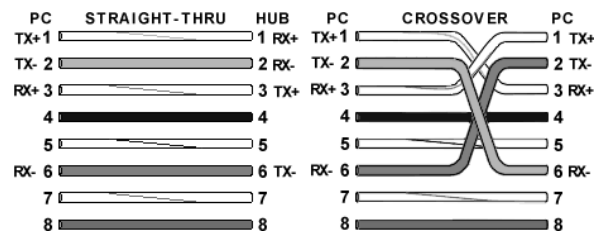
11

# Ethernet

## Cabling



Crossover Cables



Images from <http://www.incentre.net/incentre/frame/ethernet.html>, copyright © The Internet Centre.

12

# Ethernet

## Cabling

### Fiber-Optic Cables

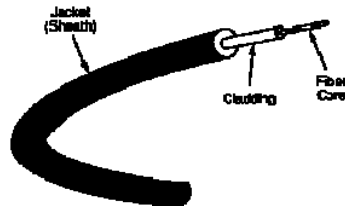
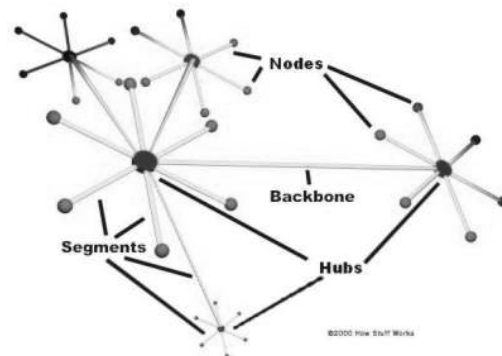
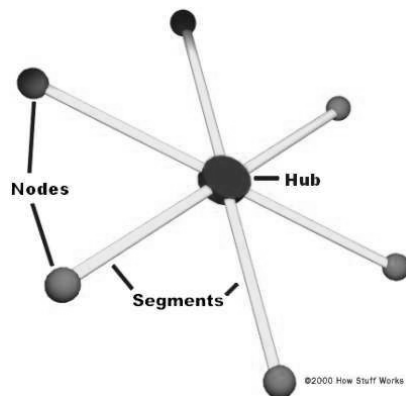


Image from <http://www.delmar.edu/Courses/ITNW2313/ethernet.htm>.

13

# Ethernet

## Hubs



Images from <http://www.howstuffworks.com/lan-switch1.htm>, copyright © How Stuff Works.

14

# Ethernet

## Hubs

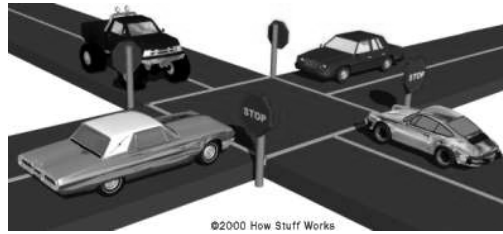


Image from <http://www.howstuffworks.com/lan-switch2.htm>; copyright © How Stuff Works.

15

# Ethernet

## Switches

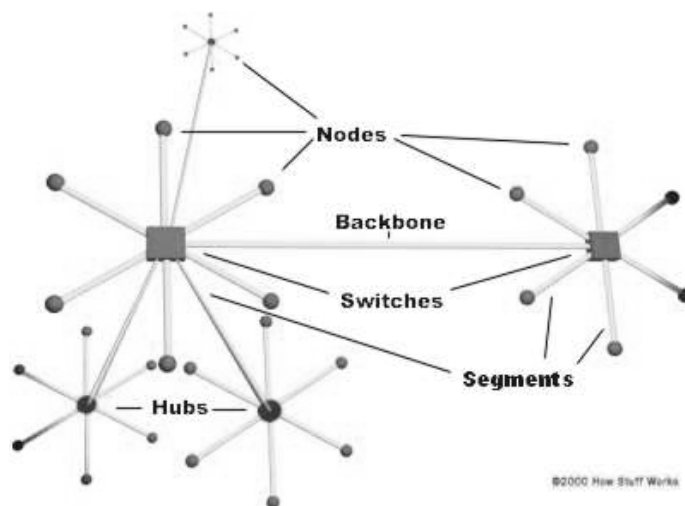


Image from <http://www.howstuffworks.com/lan-switch2.htm>; copyright © How Stuff Works.

16

# Ethernet

## Switches

Ethernet Address, Canonical Forms
??-??-??-??-??-??
?:?:?:?:?:?:?:?

where each ? denotes 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, or f

17

# Wireless

## IR



Images from <http://www.micro.rrc.ru/palmOS35.asp> and <http://www.almax.com.tw/>.

18

# Wireless

## Bluetooth



Images from <http://www.cdw.com>, <http://www.usatoday.com/life/cyber/ccarch/2001-07-11-baig.htm>, and [http://darkstar-sifi.co.uk/figures\\_spawn\\_22.htm](http://darkstar-sifi.co.uk/figures_spawn_22.htm).

19

# Wireless

## 802.11

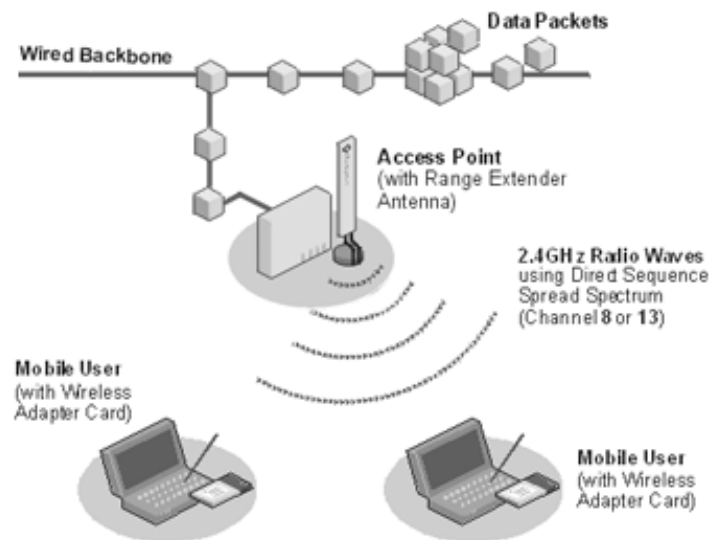
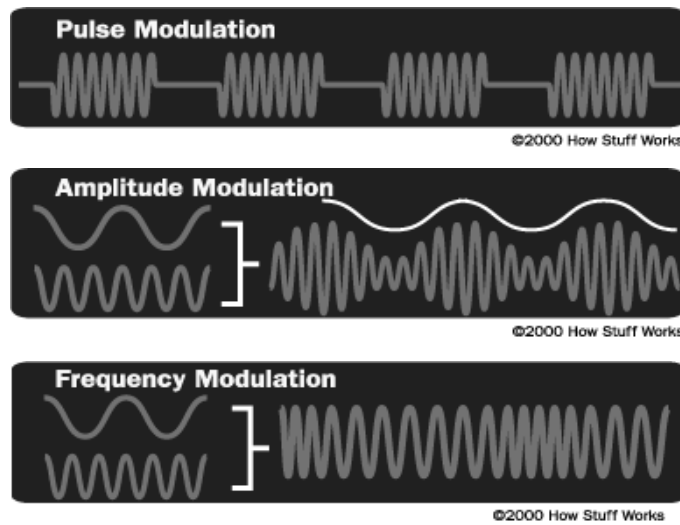


Image from <http://wirefree.ntu.edu.sg/primer/contentframe.htm>, copyright © Centre for IT Services

20

# Wireless



Images from <http://www.howstuffworks.com/radio4.htm>, copyright © How Stuff Works.

21

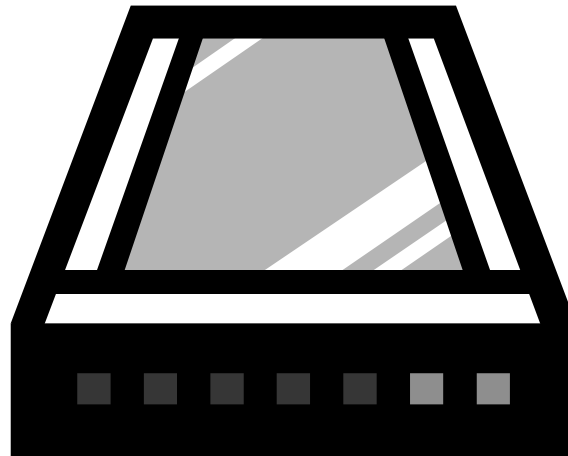
# ISPs



Image from <http://free.aol.com/tryaolfree/index.adp?143>, copyright © America Online, Inc.

22

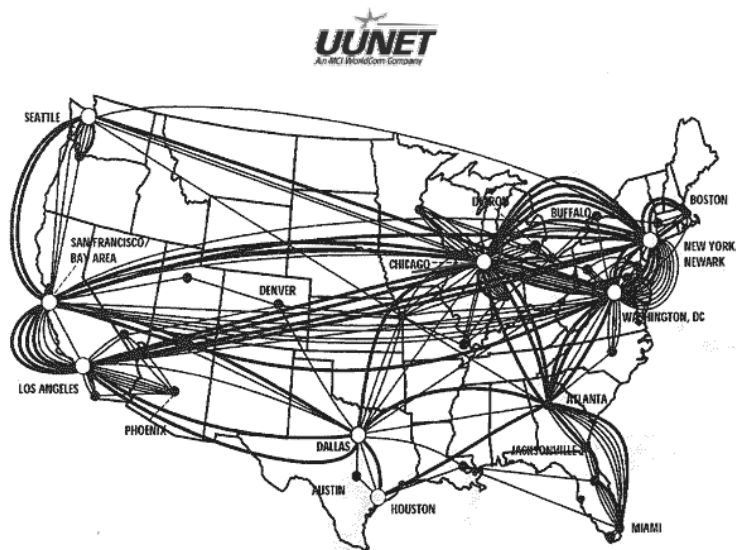
# Modems



23

# The Internet

## Backbones



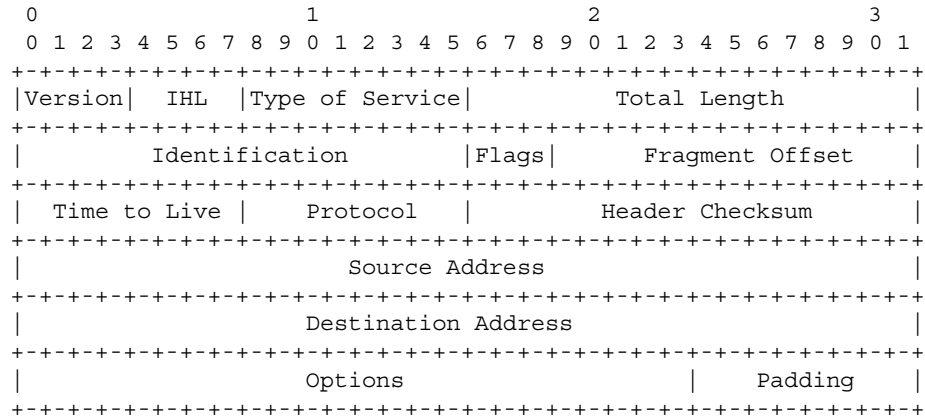
Images from <http://www.webfusion.co.uk/images/uunet-logo.gif> and <http://www.captainjack.com/uunet.html>.

24

# The Internet

## TCP/IP

### Internet Header Format



### Example Internet Datagram Header

Figure from <http://www.ietf.org/rfc/rfc0791.txt?number=791>.

25

# The Internet

## TCP/IP

IP Address, Canonical Form
#.#.#.#

where each # denotes an integer, 0 through 255, inclusive

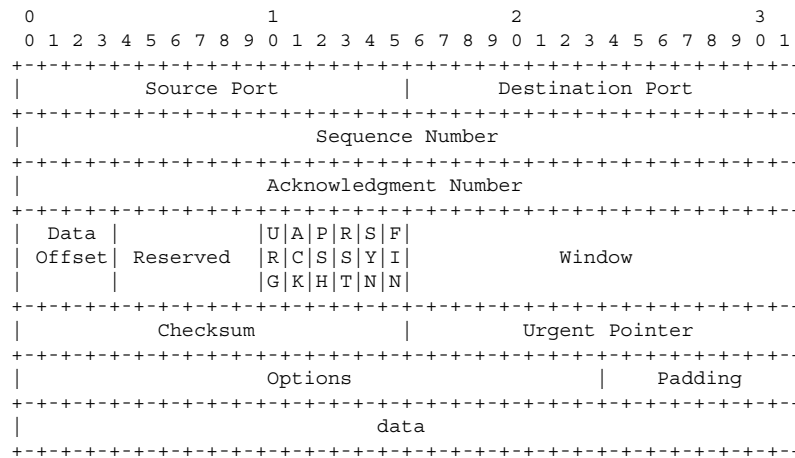
Figure from <http://www.ietf.org/rfc/rfc0791.txt?number=791>.

26

# The Internet

## TCP/IP

TCP Header Format



TCP Header Format

Figure from <http://www.ietf.org/rfc/rfc0793.txt?number=793>.

27

# The Internet

## DNS

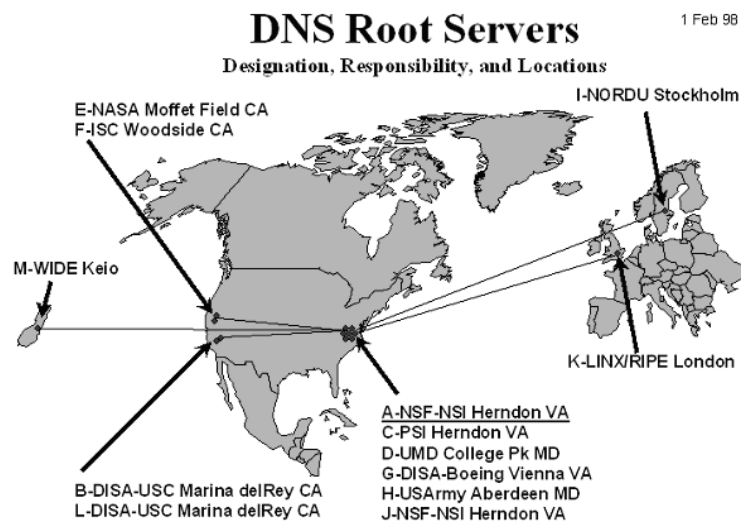


Image from <http://www.wia.org/pub/rootserv.html>.

28

# The Internet

## NAT

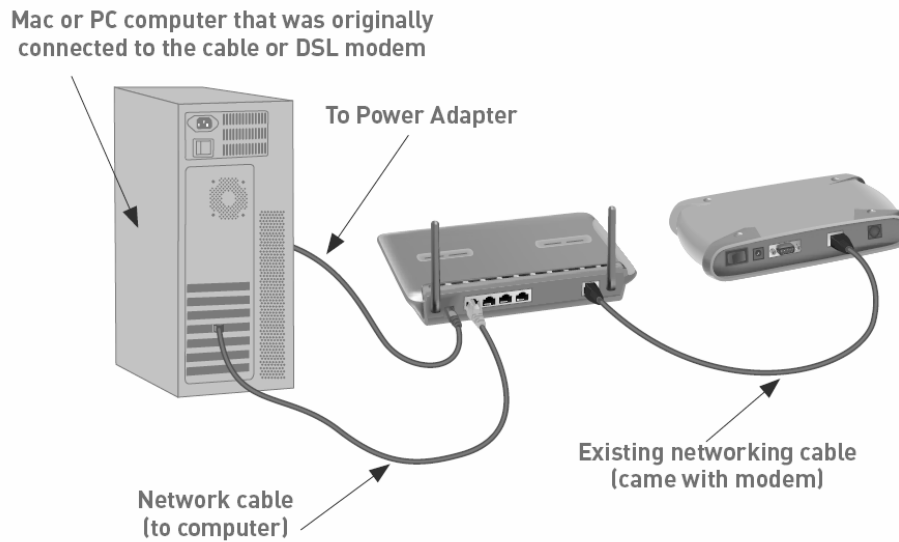


Image from <http://www.belkin.com/support/download/files/F5D7231-4.pdf>.

29

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30