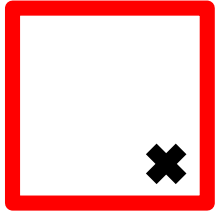


# Notworking to Networking

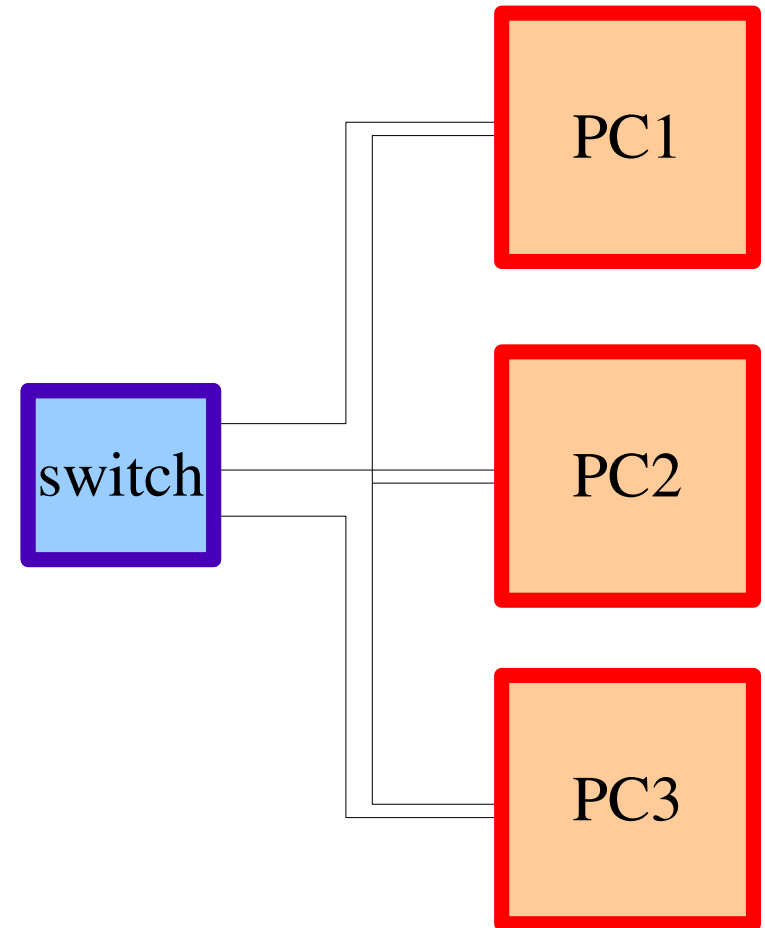
A basic guide to TCP/IP for the home network

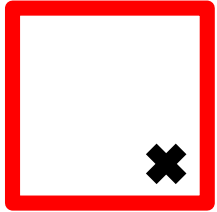
Hugo Mills



# Ethernet

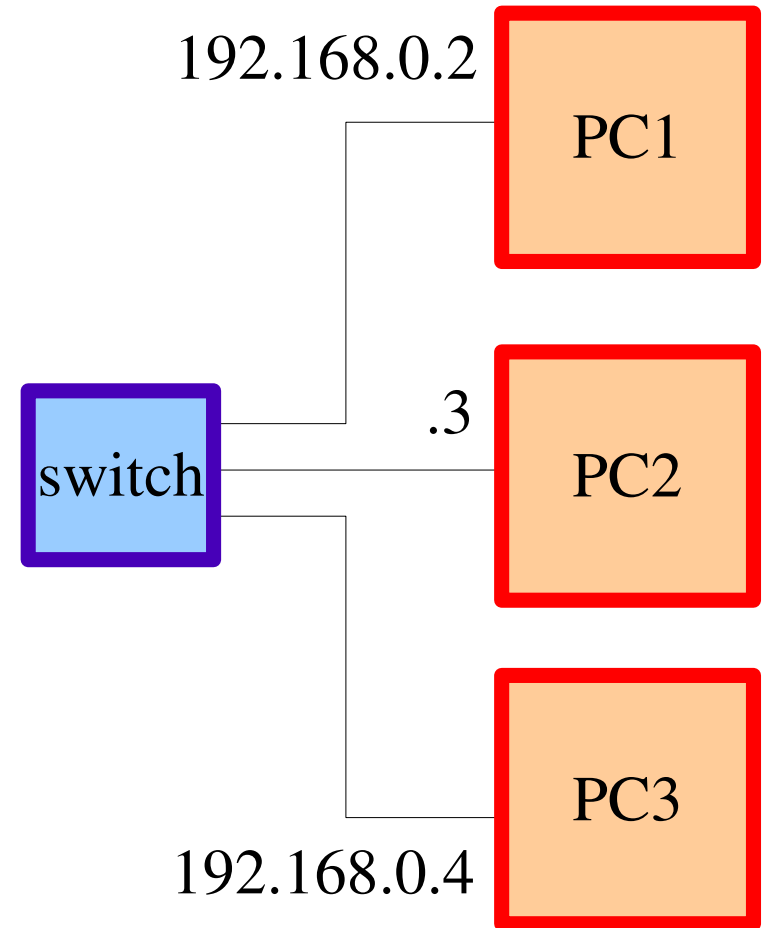
- Hubs
  - Connect multiple computers on the same Ethernet
  - All machines see all packets
- Switches
  - Connect multiple computers on the same Ethernet
  - Only the destination machine(s) see the packets



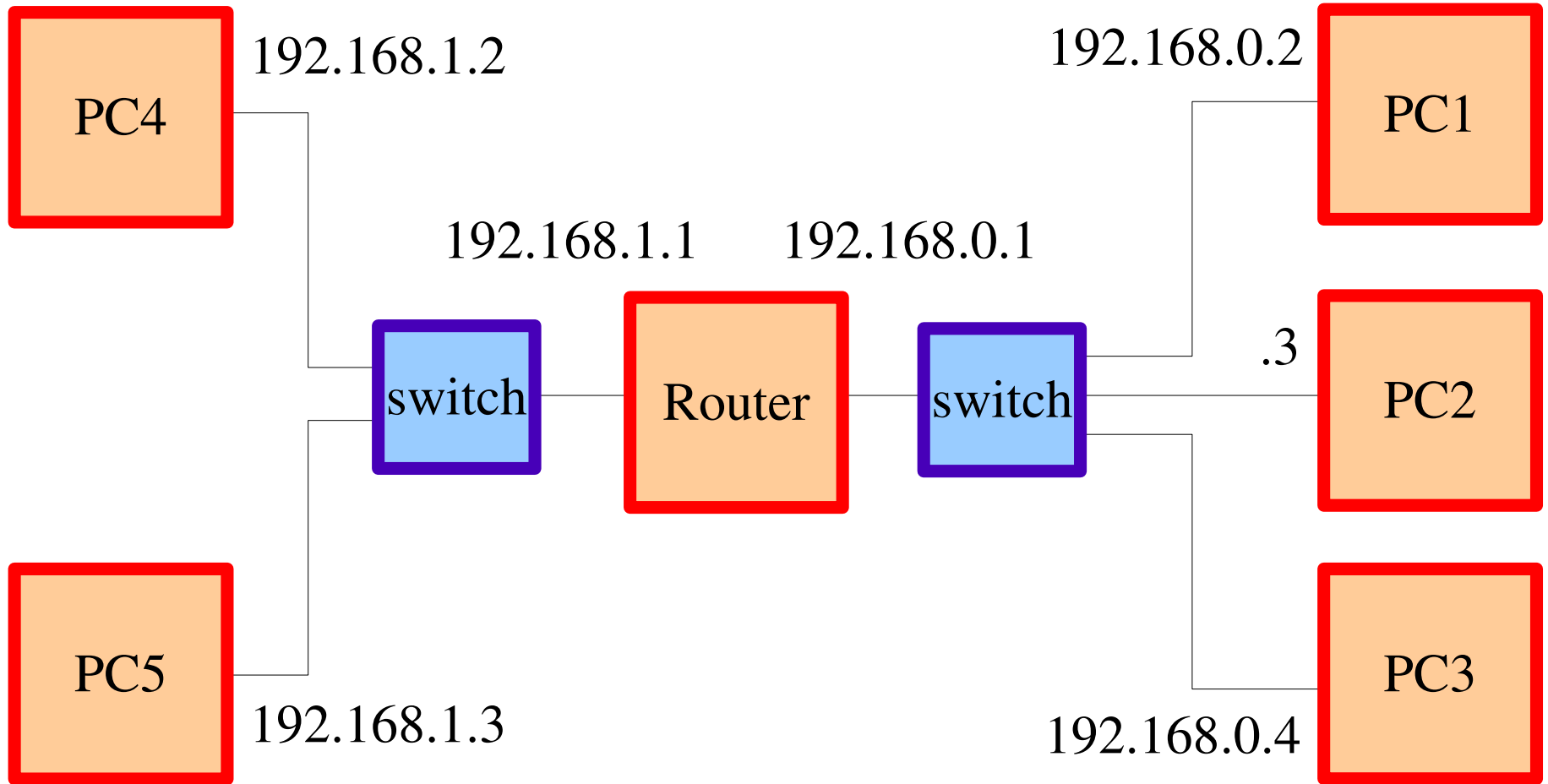
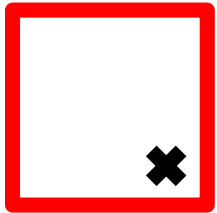


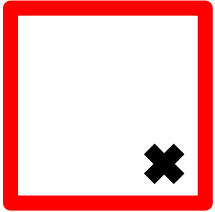
# IP on Ethernet

- IP address
  - Each **interface** gets one
  - Packets have source and destination addresses
  - Packets are read only by destination machine (or by a machine in *promiscuous mode*)



# Internetworking





# Subnet Masks

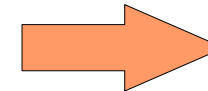
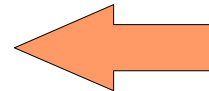
IP address

192 . 168 . 0 . 3  
11000000 . 10101000 . 00000000 | 00000001

Netmask

255 . 255 . 255 . 0  
11111111 . 11111111 . 11111111 | 00000000

Network

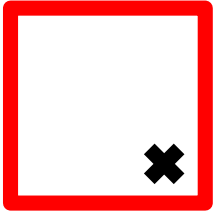


Machine

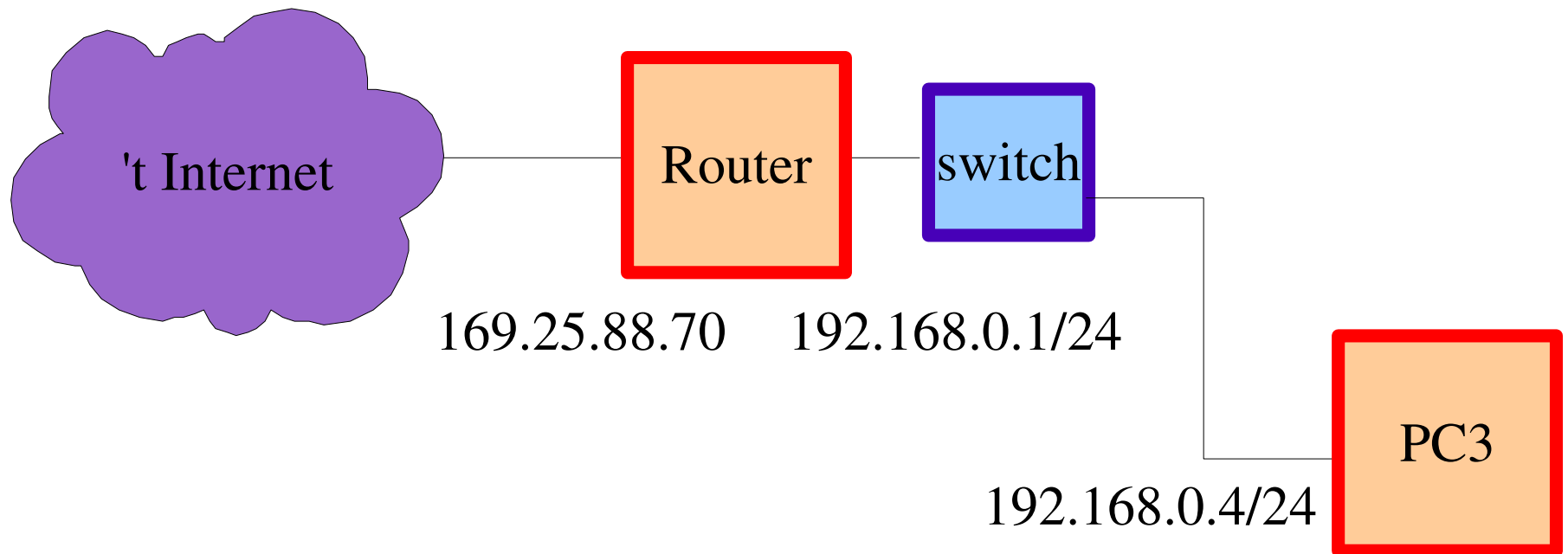
Network address

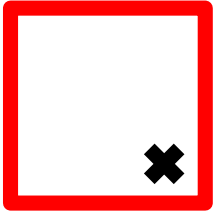
192 . 168 . 0 . 0

Also written 192.168.0.3/24



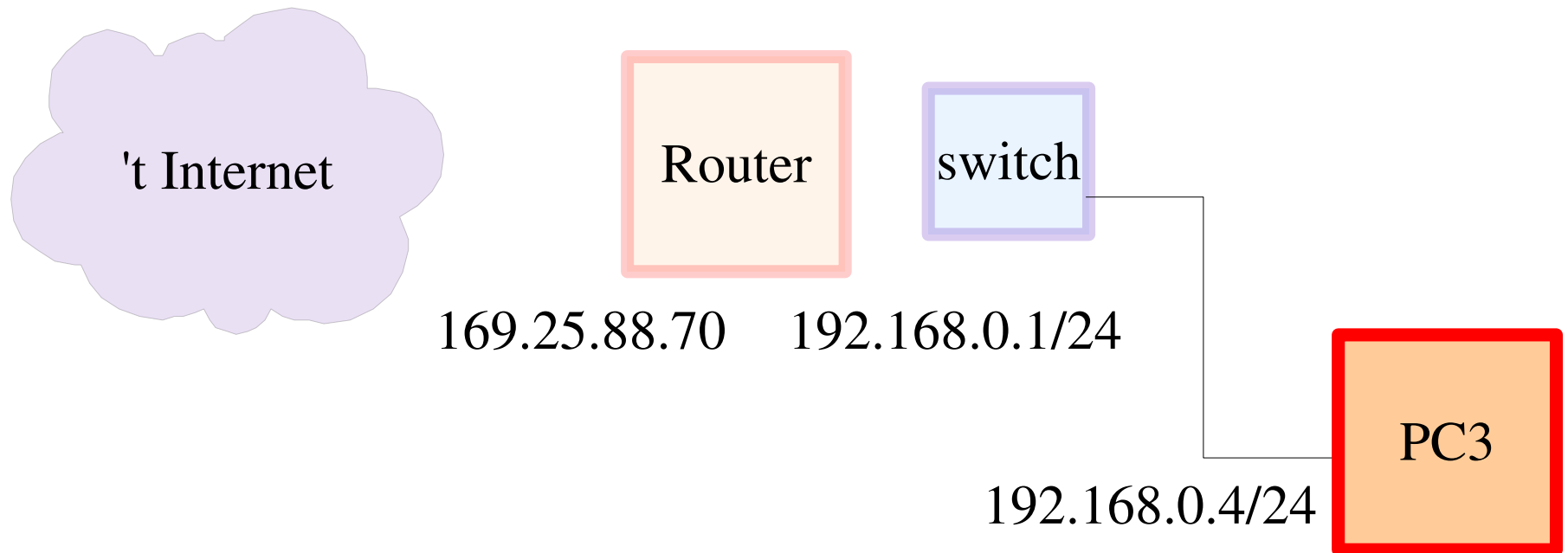
# Routing

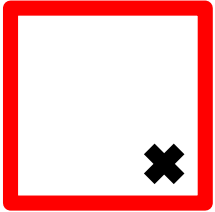




# Routing

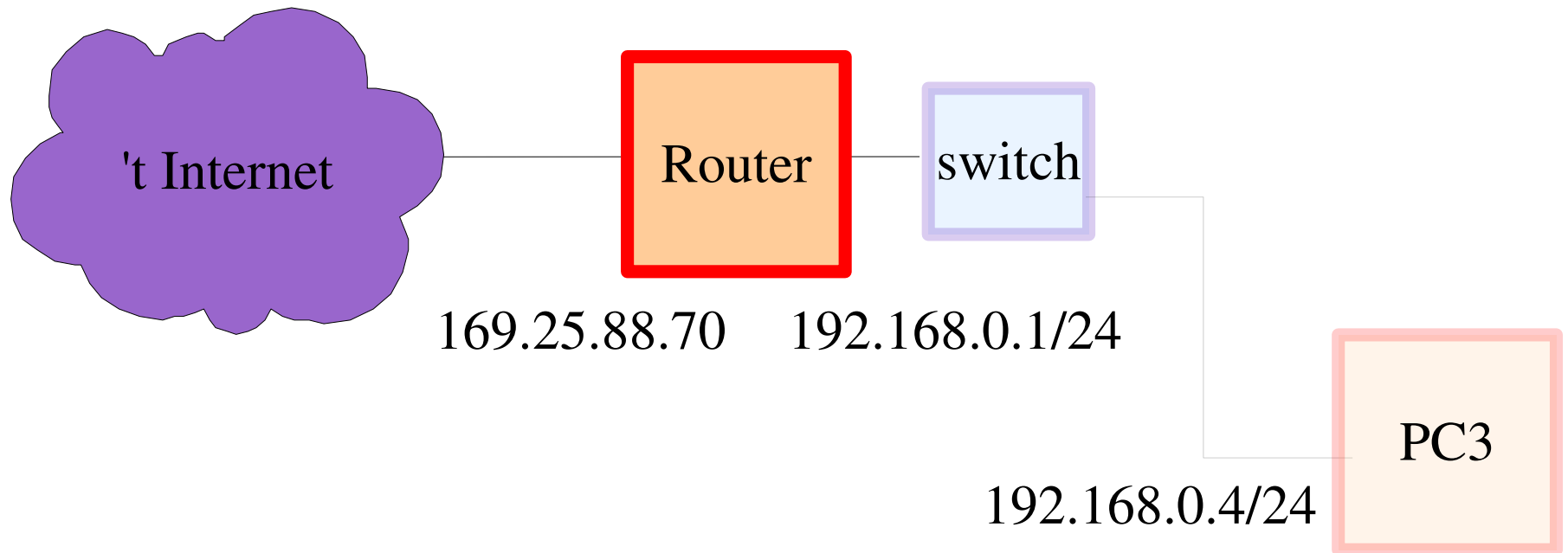
Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.0.0	0.0.0.0	255.255.255.0	U	0	0	0	eth0
0.0.0.0	192.168.0.1	0.0.0.0	U	0	0	0	eth0

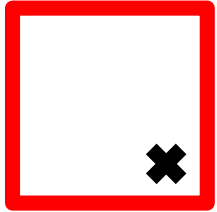




# Routing

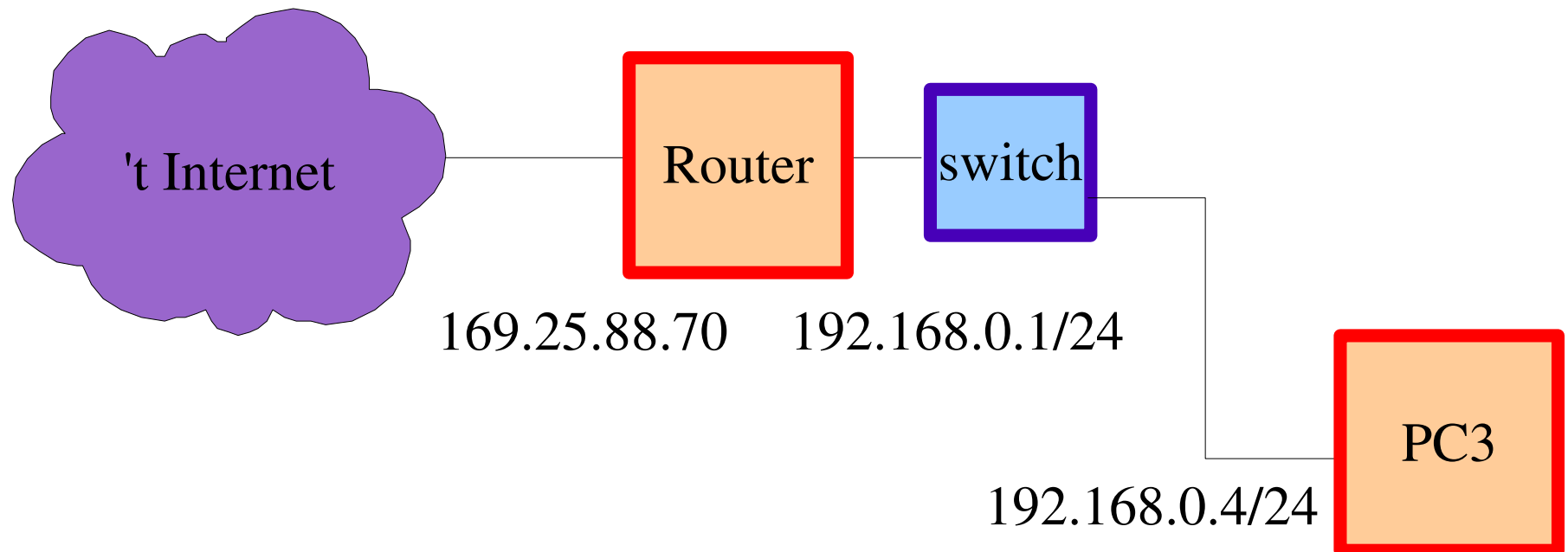
Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
192.168.0.0	0.0.0.0	255.255.255.0	U	0	0	0	eth0
0.0.0.0	169.25.88.1	0.0.0.0	U	0	0	0	eth0

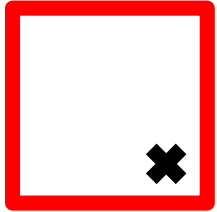




# Private networks and NAT

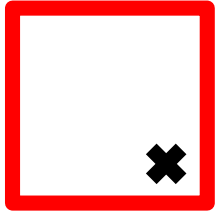
- IP addresses are scarce
- Private address ranges: **No internet routing**
- NAT translates (private) subnets to single address





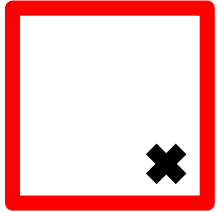
# Private network ranges

- 192.168.0.0/16
- 172.16.0.0/12
- 10.0.0.0/8
- Can be split up any way you like.
  - e.g. 10.0.1.0/24 for main subnet
  - 10.0.2.0/24 for wireless
  - 10.0.3.0/24 for DMZ
- 192.168 range typically used as /24s



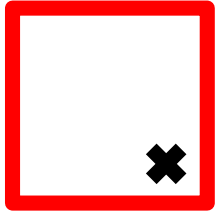
# DHCP and DNS

- DHCP automatically configures network devices
  - IP address and netmask
  - Routing
  - DNS servers (overwrites `/etc/resolv.conf`)
  - DNS search path
- DNS does name-to-IP lookups



# Troubleshooting

- Ping 127.0.0.1 (loopback)
  - Check basic networking
- Ping own IP address
  - Check configuration with `ifconfig`
- Ping something on same subnet by IP
  - Check configuration both ends with `ifconfig`
  - Check firewalls
  - Check hardware (`mii-tool` or `ethtool`)



# Troubleshooting

- Ping router by IP
  - Check router is up
- Ping an internet host by IP
  - Check router config
  - Check routing tables with `route -n`
  - Check firewalling on router
- Ping an internet host by name
  - Check DNS settings in `/etc/resolv.conf`