

Networking Overview

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Introduction



Introduction

- Who Says?

Introduction

- Who Says?
 - The Standards Bodies

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- Who Says?
 - The Standards Bodies
- What is a Network?

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- Who Says?
 - The Standards Bodies
- What is a Network?
 - The Hardware

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- What is a Network?
 - The Hardware
 - The Topologies

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- The OSI Model?

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- What is a Network?
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 - The Nitty Gritty Technical Details

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 - The Hardware
 - The Topologies
- The OSI Model?
 - The Nitty Gritty Technical Details
- Broadcasting, Multicasting and Gateways?

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- Who Says?
 - The Standards Bodies
- What is a Network?
 - The Hardware
 - The Topologies
- The OSI Model?
 - The Nitty Gritty Technical Details
- Broadcasting, Multicasting and Gateways?
 - The Communicating

Standards Bodies



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Alot of people have heard of these acronyms, but can't define who they are or what that do.

Standards Bodies

- IEEE ?



Standards Bodies

- IEEE ?
- IETF ?



Standards Bodies

- IEEE ?
- IETF ?
- ISO ?



Standards Bodies

- IEEE = Institute of Electrical and Electronics Engineers (www.ieee.org)
 - Pronounced “Eye-triple-E”
 - Responsible for standards related to:
“computing, sustainable energy systems, aerospace, communications, robotics, healthcare, and more.”
 - Examples include:
 - IEEE 802.3 - Ethernet
 - IEEE 802.11 - Wi-Fi
 - IEEE 1394 - Firewire

Standards Bodies

- IETF = Internet Engineering Task Force (www.ietf.org)
- Responsible for standards related to:
“making the Internet work better by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet.”
- Examples include:
 - IPv4 & IPv6
 - SMTP
 - Nearly all other Internet standards.

Standards Bodies

- ISO = International Organization for Standardization (www.iso.org)
- Responsible for standards related to:
“developing and publishing International Standards.”
- Examples include:
 - Manufacturing Certification Standards such as ISO9000
 - Film Standards
 - OSI Networking Model.

What is a Network?

- Basic Hardware Differences
- Topologies

Basic Hardware Differences

- Client
- Server
- Router
- Firewall
- Access Point
- Switch/Hub

Network Topologies



Network Topologies

- Wired

Network Topologies

- Wired
- Wireless

Network Topologies

- Wired
- Wireless
- Wired vs. Wireless

Network Topologies

- Wired
- Wireless
- Wired vs. Wireless
- Joining an Access Point

Network Topologies

- Wired - IEEE 802.3 Ethernet
 - 10/100/1000 Base
 - Cat 5, 5e, 6 Cabling
 - RJ-45

Network Topologies

- Wireless - IEEE 802.11 Wi-Fi
 - a - 54 Mbits/s on the 5 GHz
 - b - 11 Mbits/s on the 2.4 GHz
 - g - 54 Mbits/s on the 2.4 GHz
 - n - 270 Mbits/s on the 2.4/5 GHz
 - ac (DRAFT) - ~1 Gbits/s on the 5 GHz

Network Topologies

- Wired vs. Wireless
 - IPv4/IPv6
 - Difference is mostly Physical
 - Router
 - Access Point

Network Topologies

- Joining an Access Point
 - Locate access point's SSID
 - Authenticate using appropriate method
 - WEP
 - WPA/WPA Enterprise
 - WPA2/WPA2 Enterprise
 - If necessary verify MAC Address filtering or 802.1x Authentication



The OSI Model

- Describe the OSI model
- What is it?
- Why does it matter?
- How do I use it?
- Network Layers

The OSI Model

- OSI Model is:
 - Open Systems Interconnection Model
 - ISO standard
 - 7 layered model developing the framework for standardizing the functions of networking in abstract terms.
 - Evolved from ARPNET, early Internet experiences, NPLNet and others primitive networking protocols.

OSI Network Layers



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- 1 - Physical Layer:
 - Defines the physical specifications and characteristics
 - Bit level transmission of data

OSI Network Layers

Media /Lower Layers



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OSI Network Layers

Media /Lower Layers

Layer 1

Physical Layer

Bits

Physical Medium,
Media Signal
& Binary Transmission

Ethernet

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1 - Physical Layer:
Defines the physical specifications and characteristics
Bit level transmission of data

OSI Network Layers

Media /Lower Layers

Layer 2	Data Link Layer	Frames	Physical Addressing (MAC Address)	Ethernet
Layer 1	Physical Layer	Bits	Physical Medium, Media Signal & Binary Transmission	Ethernet



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1 - Physical Layer:

Defines the physical specifications and characteristics
Bit level transmission of data

OSI Network Layers

Media /Lower Layers

Layer 3	Network Layer	Packets	Path Determination, Logical Addressing & Routing	IP
Layer 2	Data Link Layer	Frames	Physical Addressing (MAC Address)	Ethernet
Layer 1	Physical Layer	Bits	Physical Medium, Media Signal & Binary Transmission	Ethernet



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OSI Network Layers

Host /Upper Layers

Media /Lower Layers

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Defines the physical specifications and characteristics
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OSI Network Layers

Host /Upper Layers

Layer 4	Transport Layer	Segments	End-to-End Connections & Reliability	TCP & UDP
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Media /Lower Layers

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OSI Network Layers

Host /Upper Layers

Layer 5	Session Layer	Data	Interhost Communication	AppleTalk, NetBOIS names
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Media /Lower Layers

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OSI Network Layers

Host /Upper Layers

Layer 6	Presentation Layer	Data	Syntax Layer (encrypt and decrypt)	JPEG, GIF, MPEG, etc.
Layer 5	Session Layer	Data	Interhost Communication	AppleTalk, NetBOIS names
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Media /Lower Layers

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1 - Physical Layer:

Defines the physical specifications and characteristics
Bit level transmission of data

OSI Network Layers

Host /Upper Layers

Layer 7	Application Layer	Data	End User Layer (Application or Operating System)	HTTP, FTP, SMTP, DHCP, DNS, POP3, IMAP4, etc.
Layer 6	Presentation Layer	Data	Syntax Layer (encrypt and decrypt)	JPEG, GIF, MPEG, etc.
Layer 5	Session Layer	Data	Interhost Communication	AppleTalk, NetBOIS names
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Media /Lower Layers

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1 - Physical Layer:

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The OSI Model

- Network Layers
 - Lower Level/Media Layers
 - 1 - Physical Layer
 - 2 - Data Link Layer (IP)
 - 3 - Network Layer (TCP/UDP)
 - Upper Level/Host Layers
 - 4, 5, 6, 7 - Transport and Application Layers

OSI Network Layers

- 1 - Physical Layer
 - Defines the physical specifications and characteristics
 - Bit level transmission of data
 - Examples include:
 - Copper vs. Fiber
 - Connector pin layouts
 - Voltages
 - Hubs/Switches/network Adapters

OSI Network Layers

- 2 - Data Link Layer (IP)
 - Provides the method and means to transfer data between network nodes
 - WAN and LAN
 - MAC Addressing used at this layer
 - Organizes bits from the Physical Layer into logical units called Frames
 - Detects and corrects errors introduced in the Physical layer

OSI Network Layers

- 3 - Network Layer (TCP/UDP)
 - Provides method and means of transferring data packets from a host on one network to a host on another network.
 - Network Layer performs:
 - Network Routing
 - Packet fragmentation and reassembly
 - Routers operate at this layer.

OSI Network Layers

- 4, 5, 6, 7 - Transport and Application Layers
 - Includes data transfer and between End-user and network layers
 - The establishment, management and termination of communication between local and remote applications
 - Mapping of syntax and semantics between layers.
 - Interacts directly with software.

Broadcasting, Multicasting, and Gateways



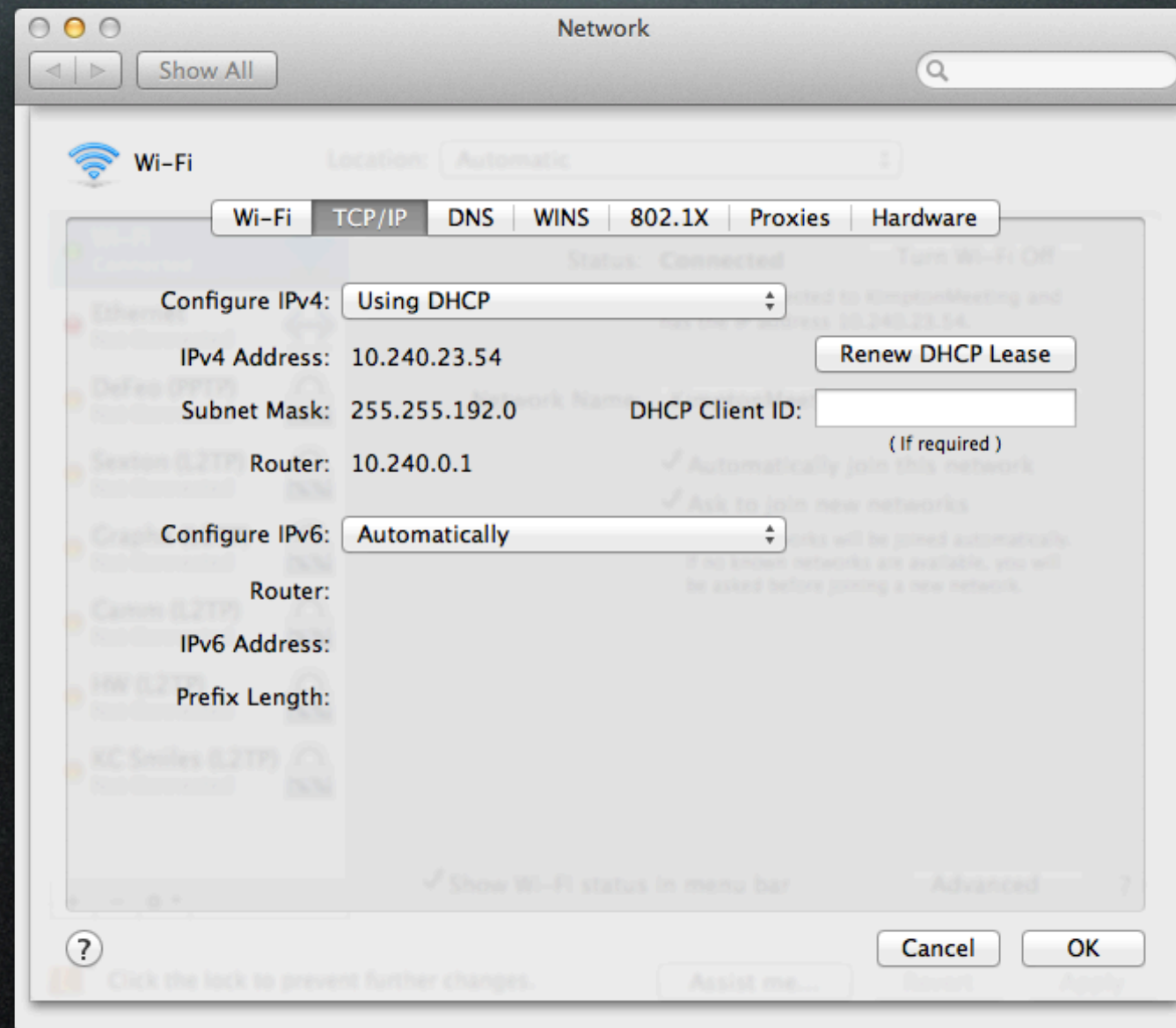
Broadcasting, Multicasting, and Gateways

- What are the Broadcast & Gateway addresses?
- Difference between Broadcast & Multicast

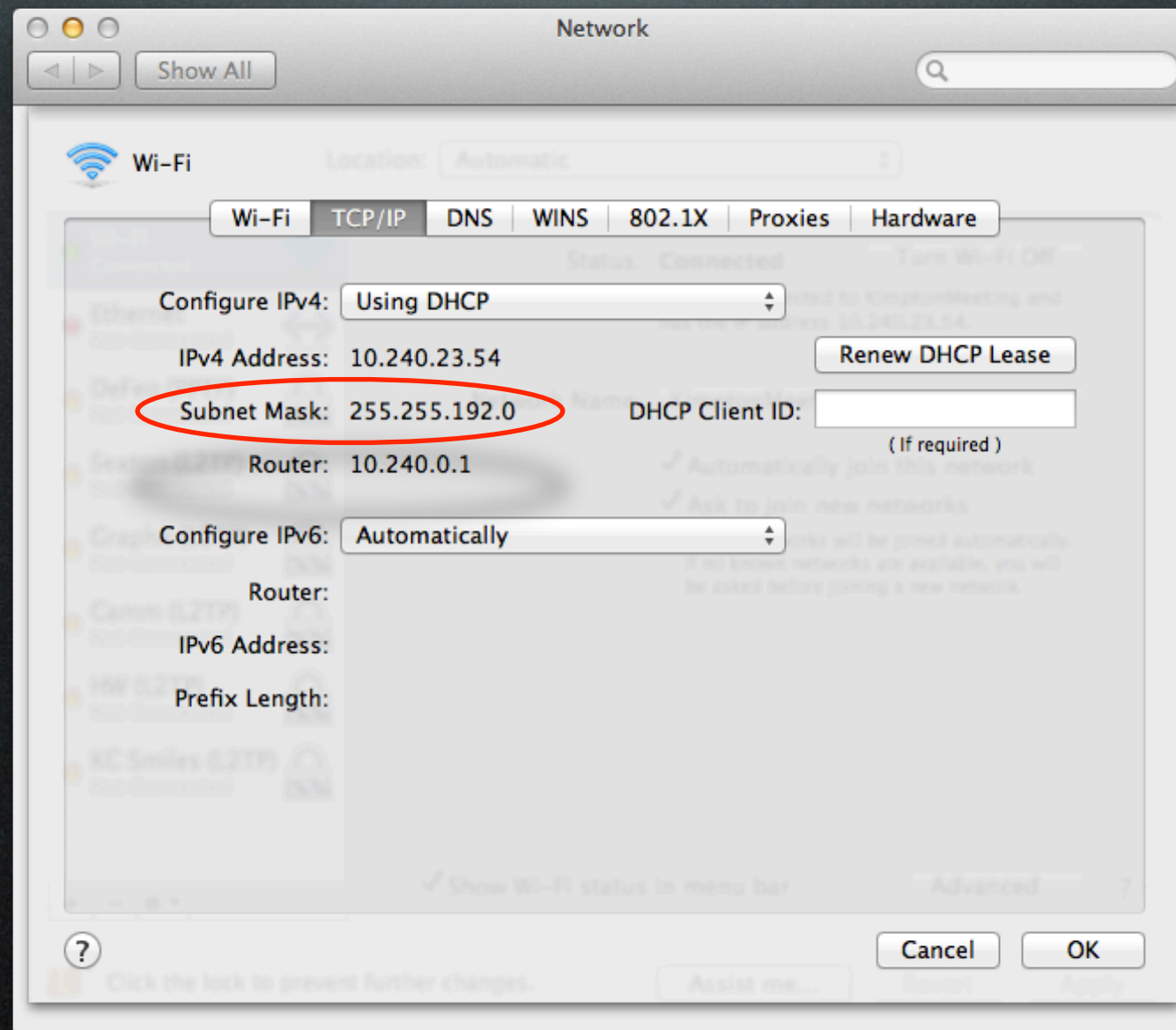
Broadcast vs. Gateway Addresses

- Broadcast Address
 - Also referred to as Subnet Mask
 - Defines the scope and range of local nodes
 - An example as seen in IPv4 would be:
255.255.255.0
- Gateway Address
 - Often referred to as the Router
 - Is the address of the node for routing the network traffic to another network or the Internet.
 - Gateway address/node must be within the Broadcast Address

Broadcast vs. Gateway Addresses



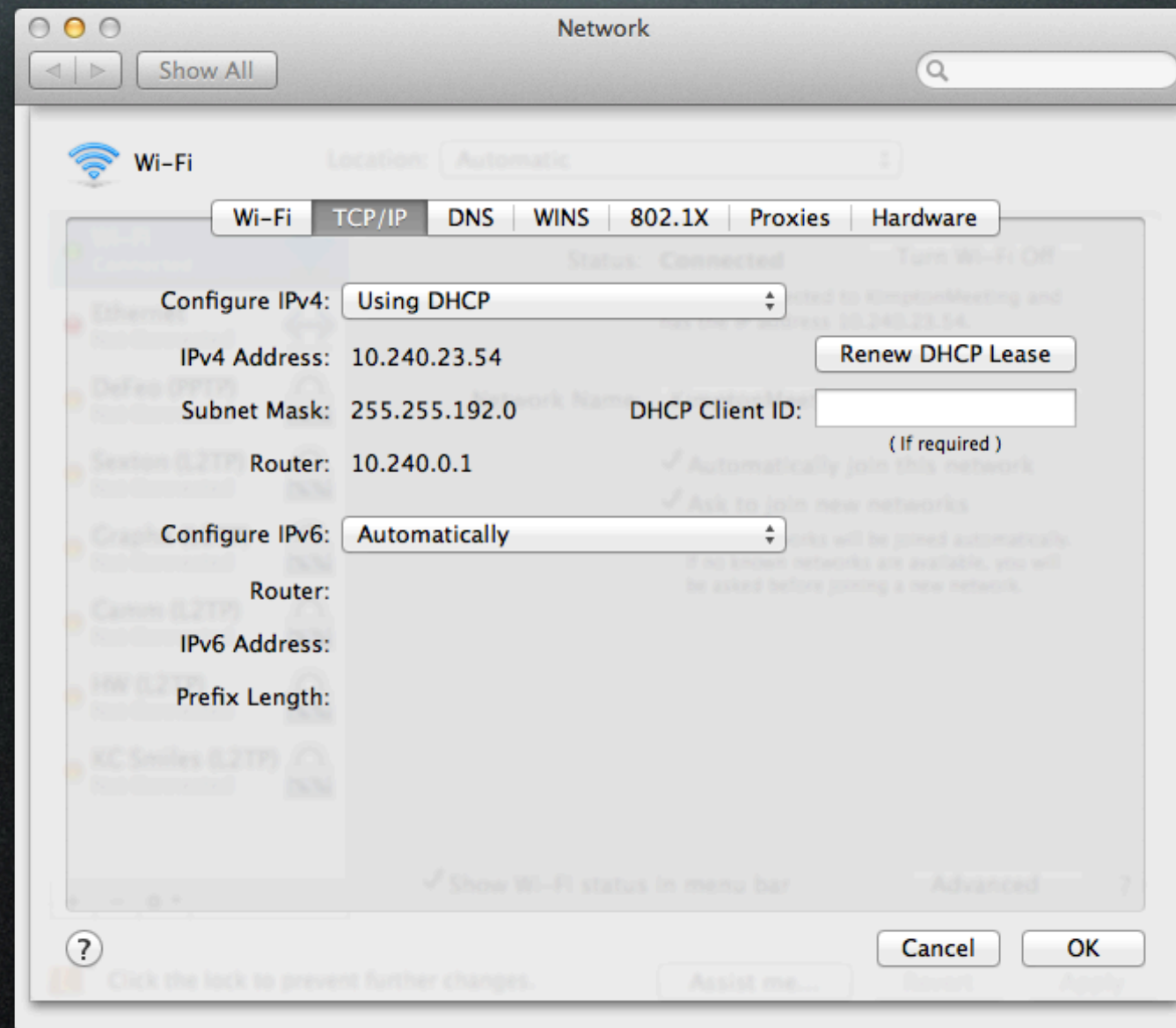
Broadcast vs. Gateway Addresses



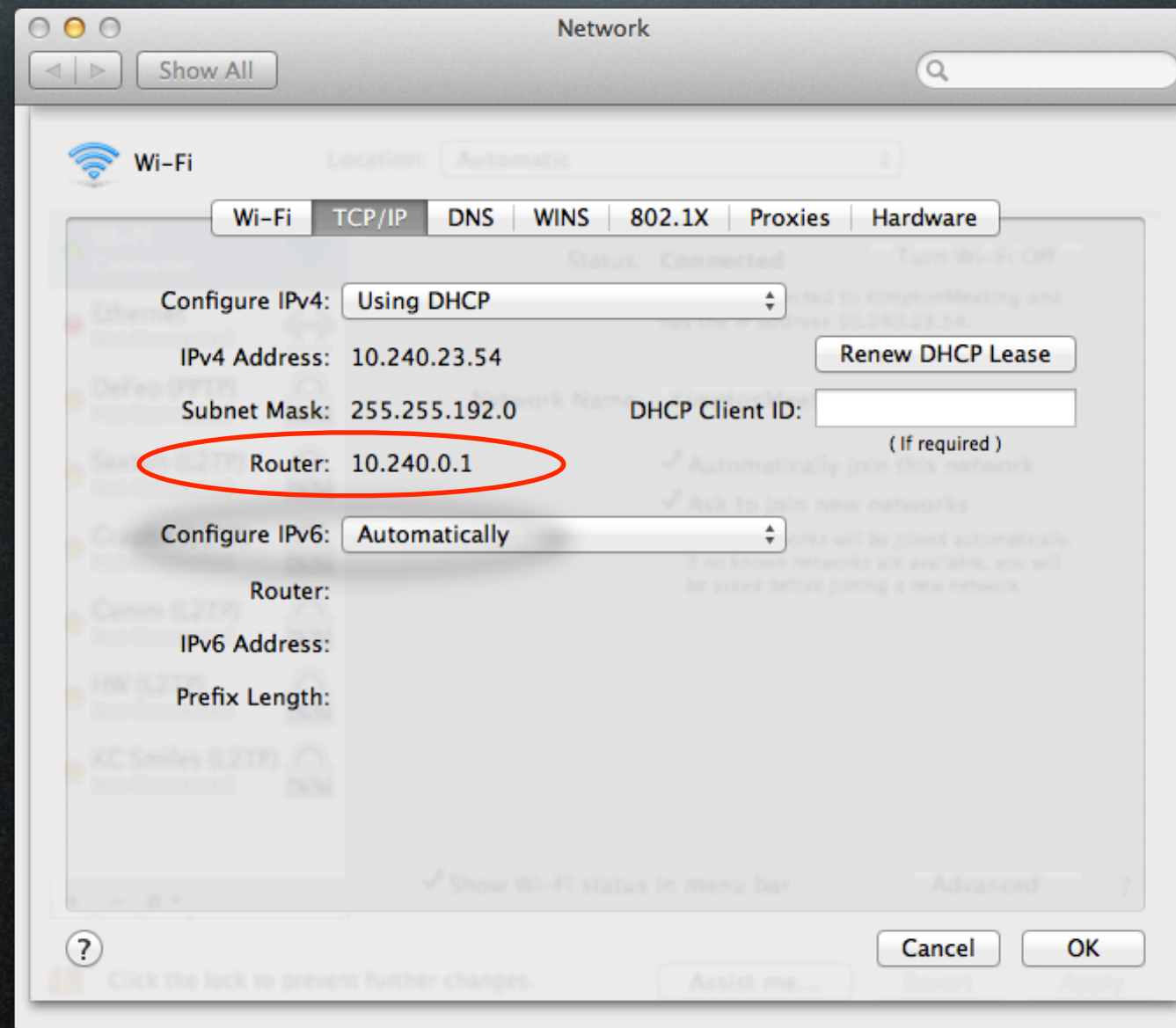
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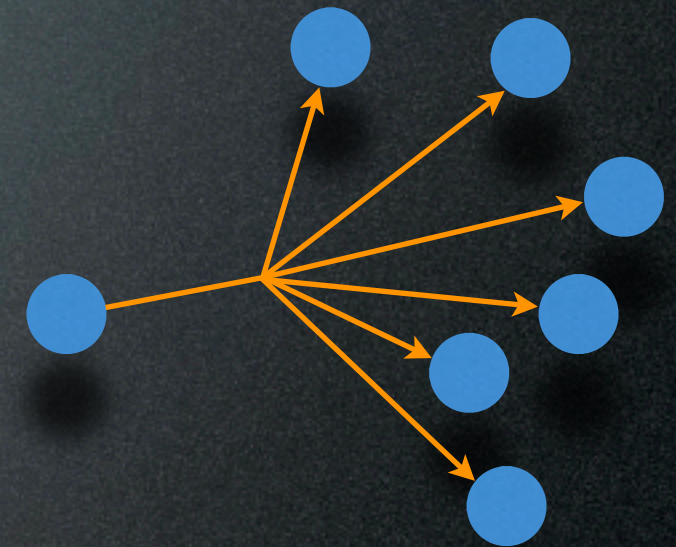
Broadcast vs. Gateway Addresses



Broadcast vs. Multicast

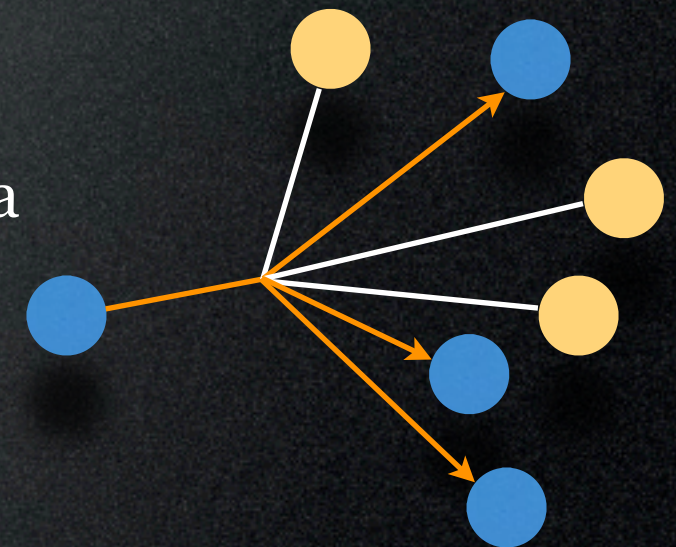
- Broadcast

- One-to-All - A method of transferring a message or packets to all recipients simultaneously in a single transmission
- “All” recipients is defined by Broadcast Address



- Multicast

- One-to-Multiple - A method of transferring a message or packets to a group of recipients simultaneously in a single transmission.
- Common use of multicast is streaming media, conferencing.



Networking Overview

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