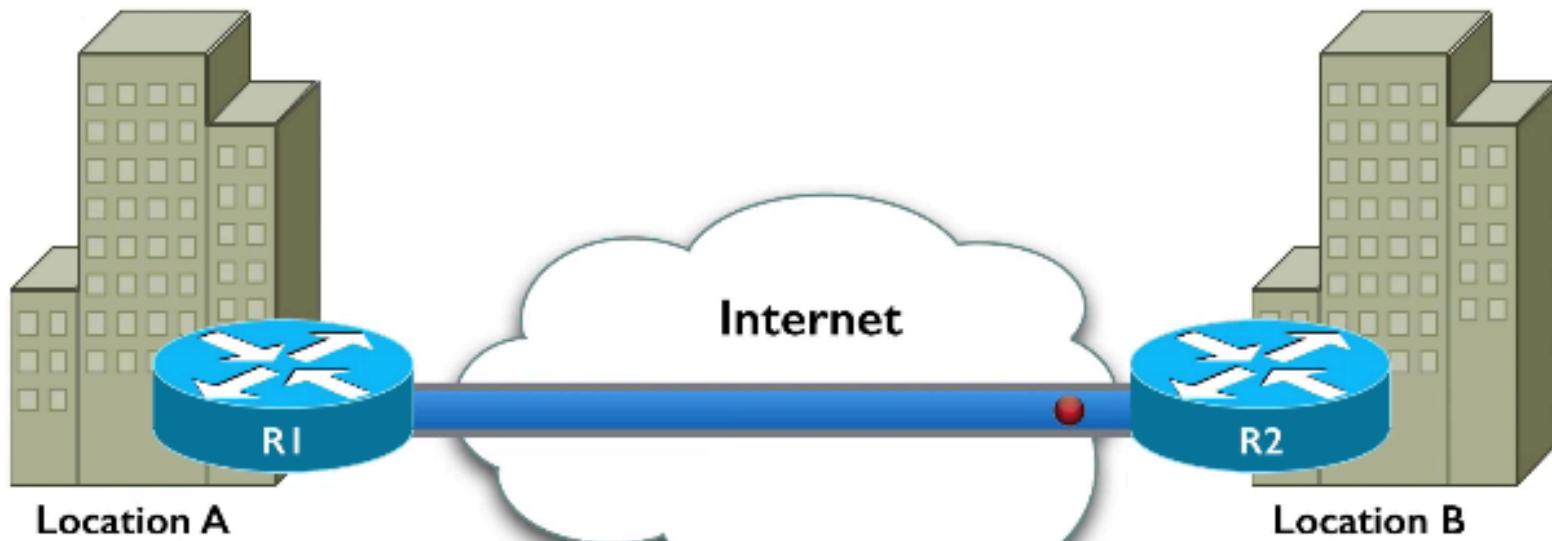


Module 4: Network Services

Virtual Private Networks

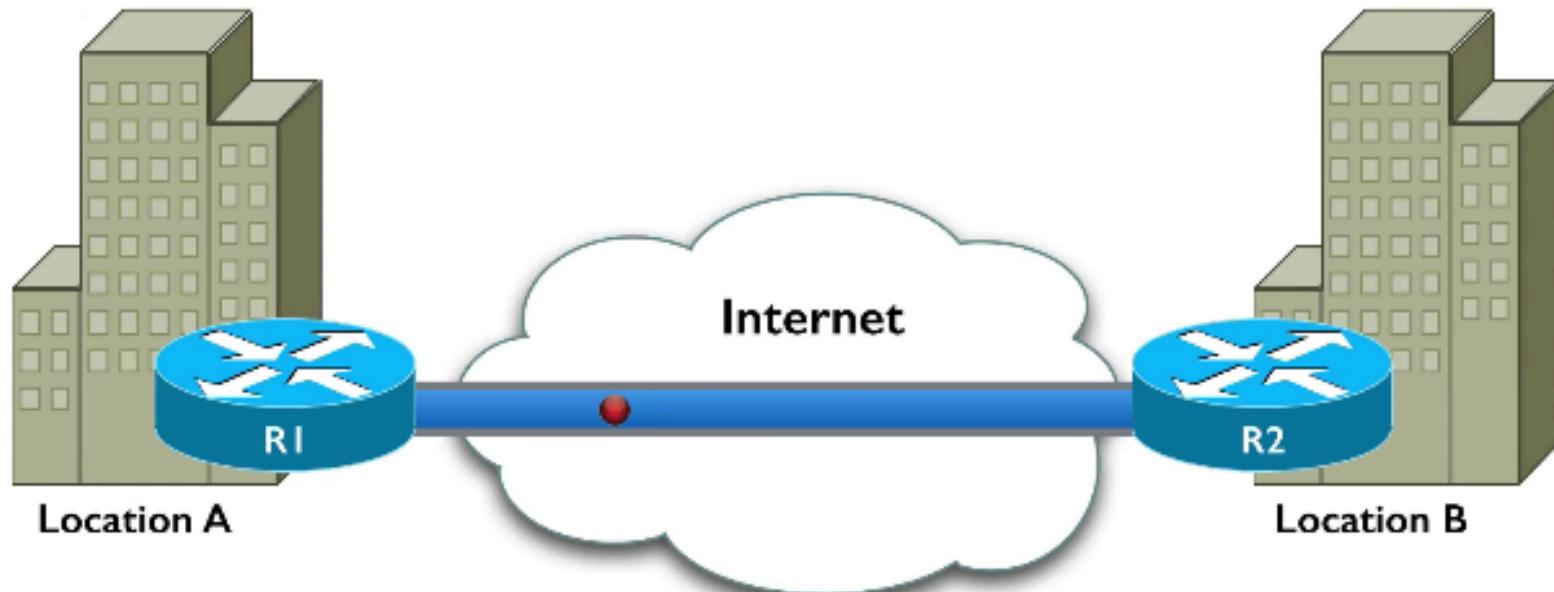
VPN



Virtual Private Network (VPN)

A logically defined network where data flows through a tunnel between two sites and where data might be encrypted, allowing the data to be securely sent across an untrusted network (e.g. the Internet).

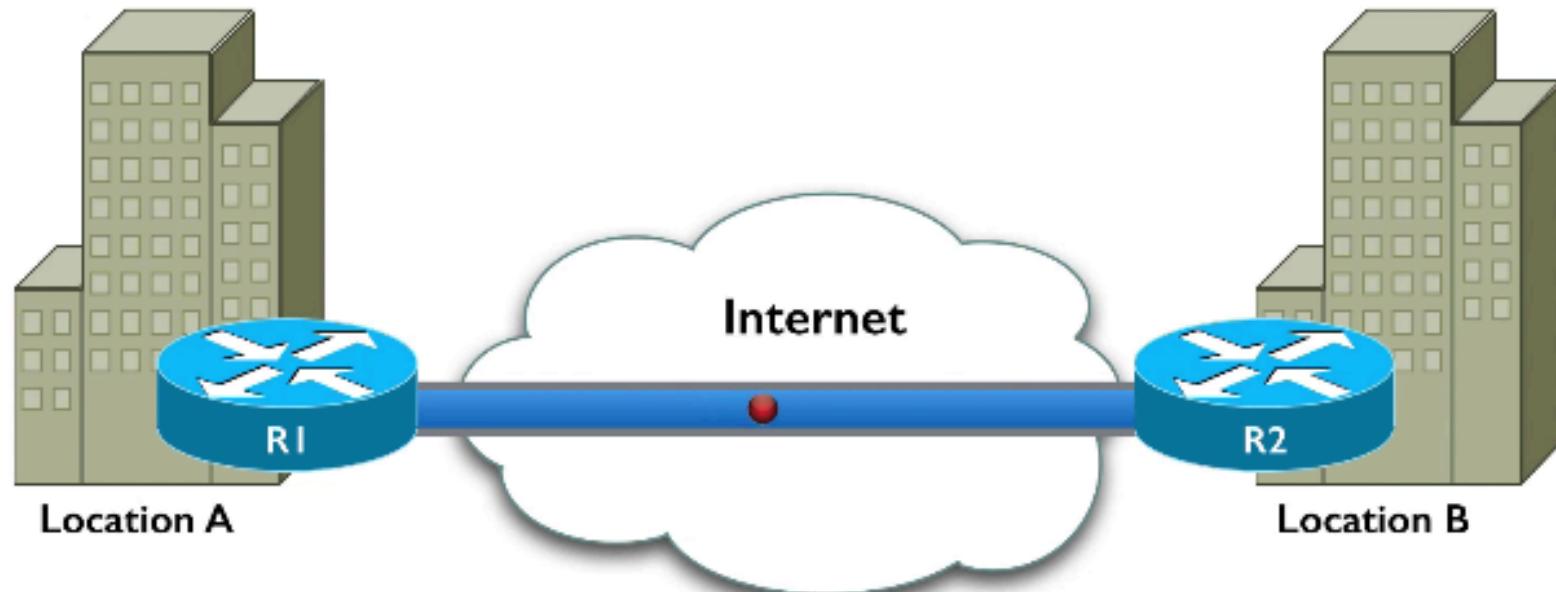
VPN



Benefits

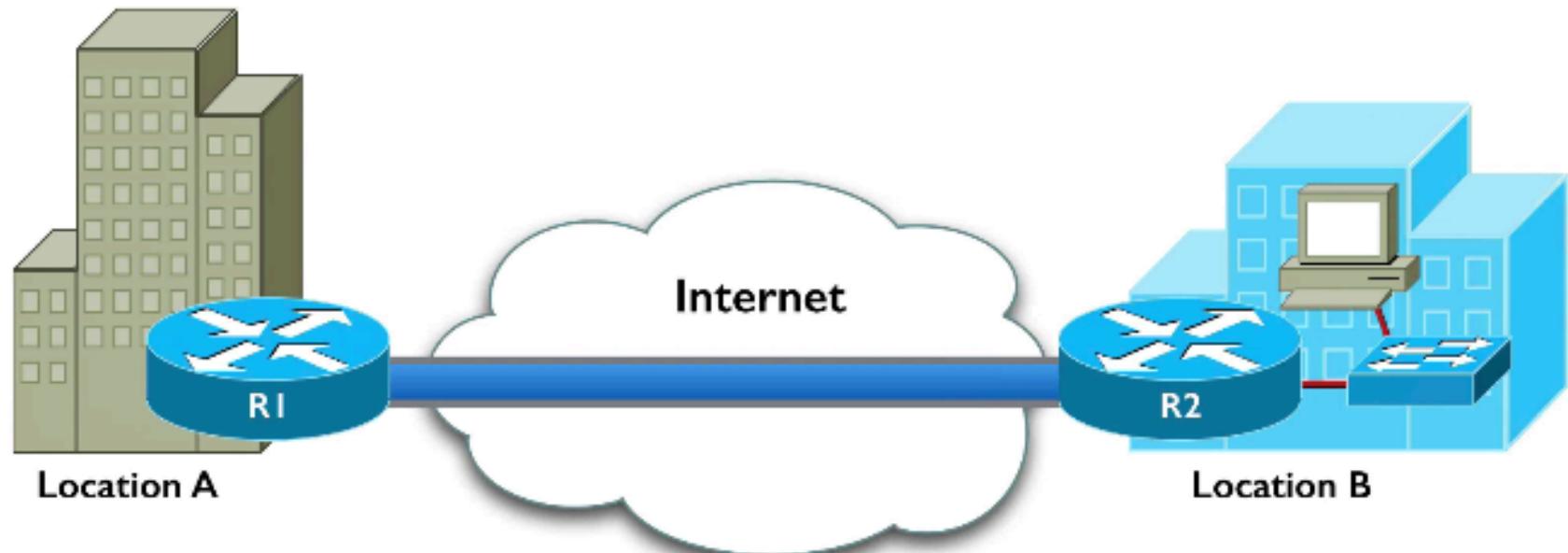
1. Can use common broadband technologies (e.g. DSL and cable)
2. Can scale to many connections (i.e. new connections just need Internet access)
3. Can securely transmit data over an untrusted network (e.g. the Internet)

VPN



Site-to-Site VPN

VPN



Remote-Access VPN



IPsec

A type of VPN that can provide confidentiality, data integrity, authentication, and anti-replay protection

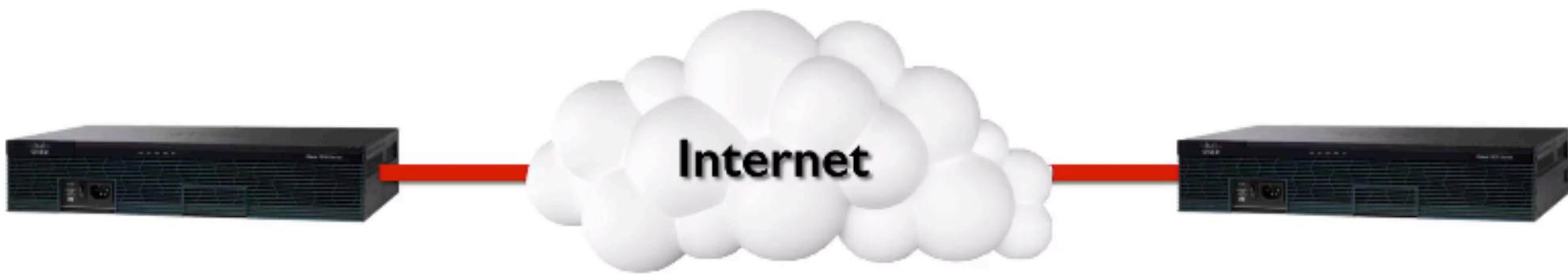


Internet Key Exchange (IKE) Phase I Tunnel

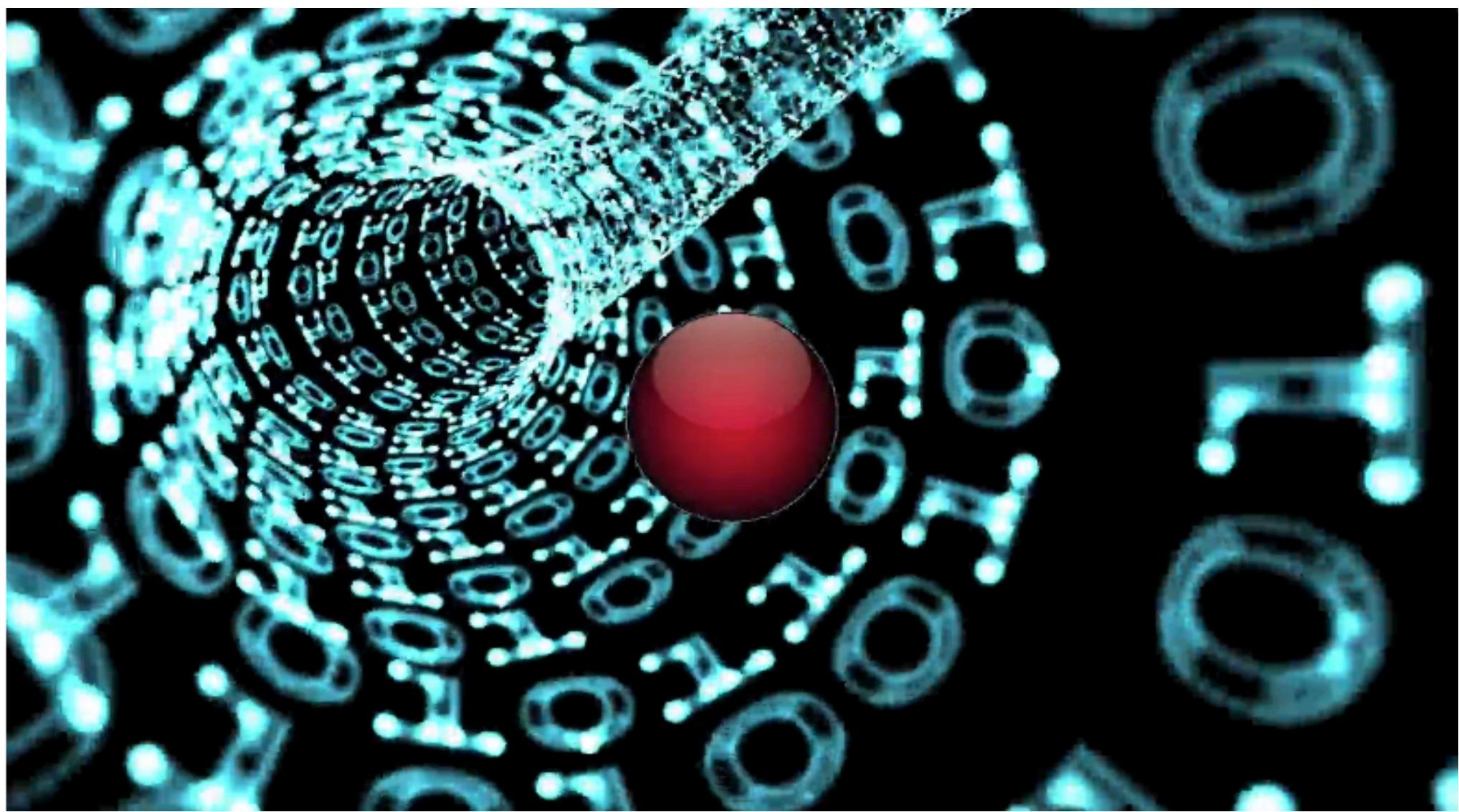
The outer tunnel in an IPsec connection (also known as an ISAKMP tunnel),
in which the security parameters for the inner tunnel are negotiated

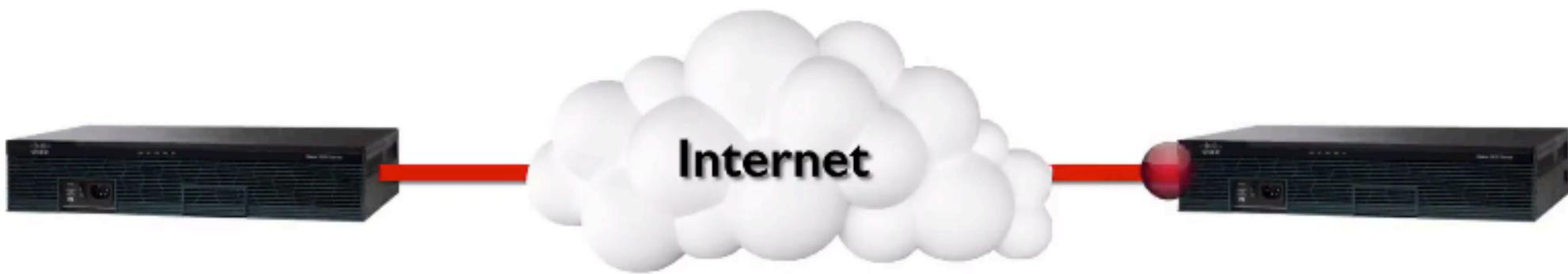


Generic Routing Encapsulation (GRE) Tunnel
A logical connection that can encapsulate a wide variety of
data types



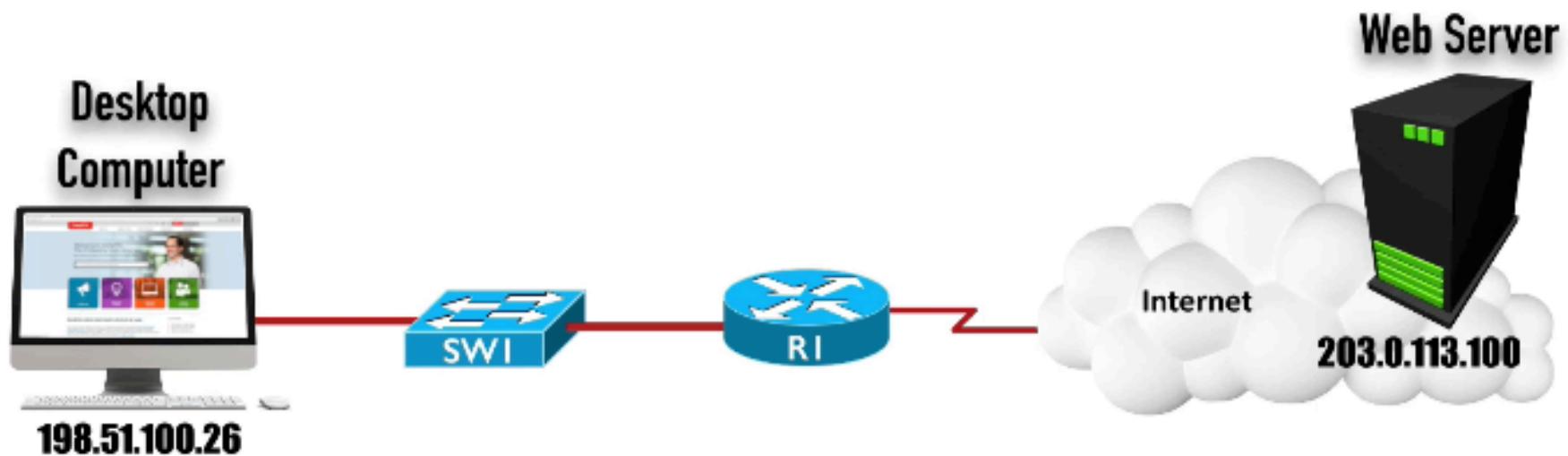






Web Services

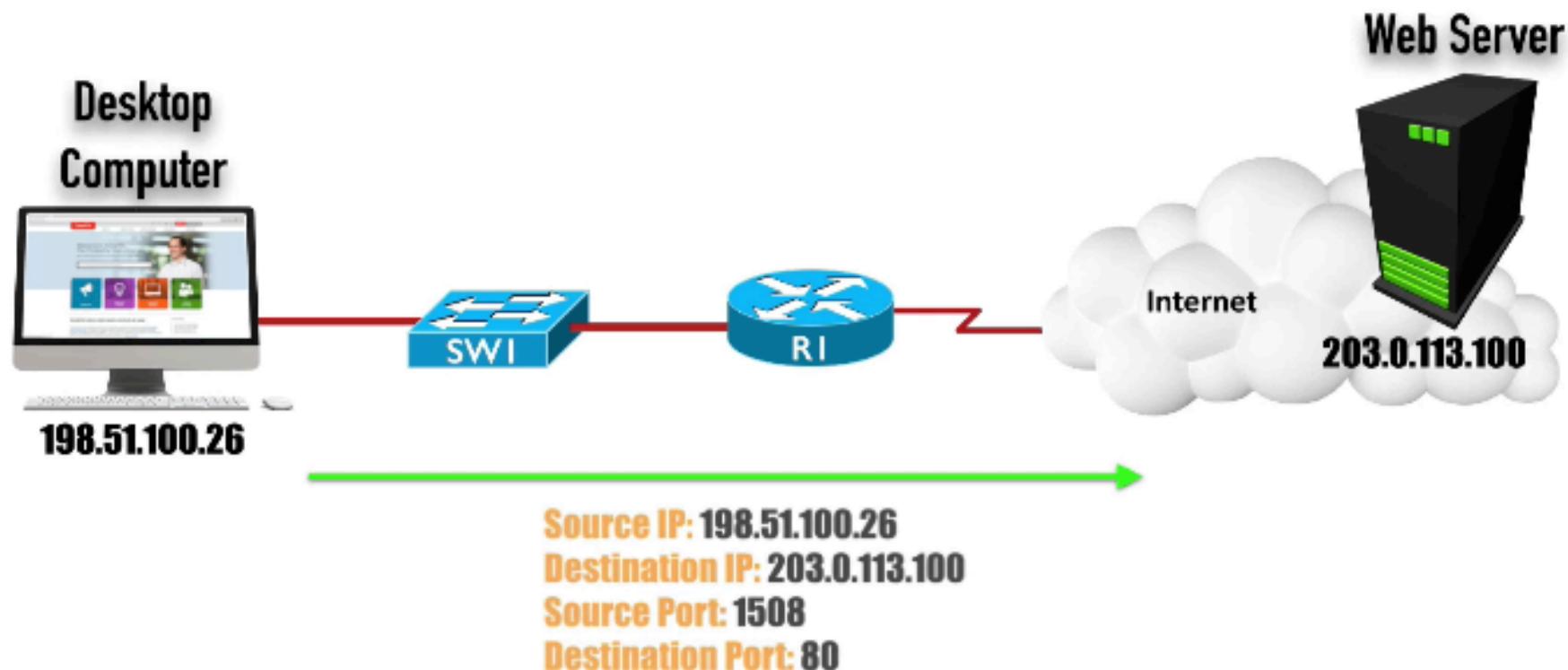
Web Services



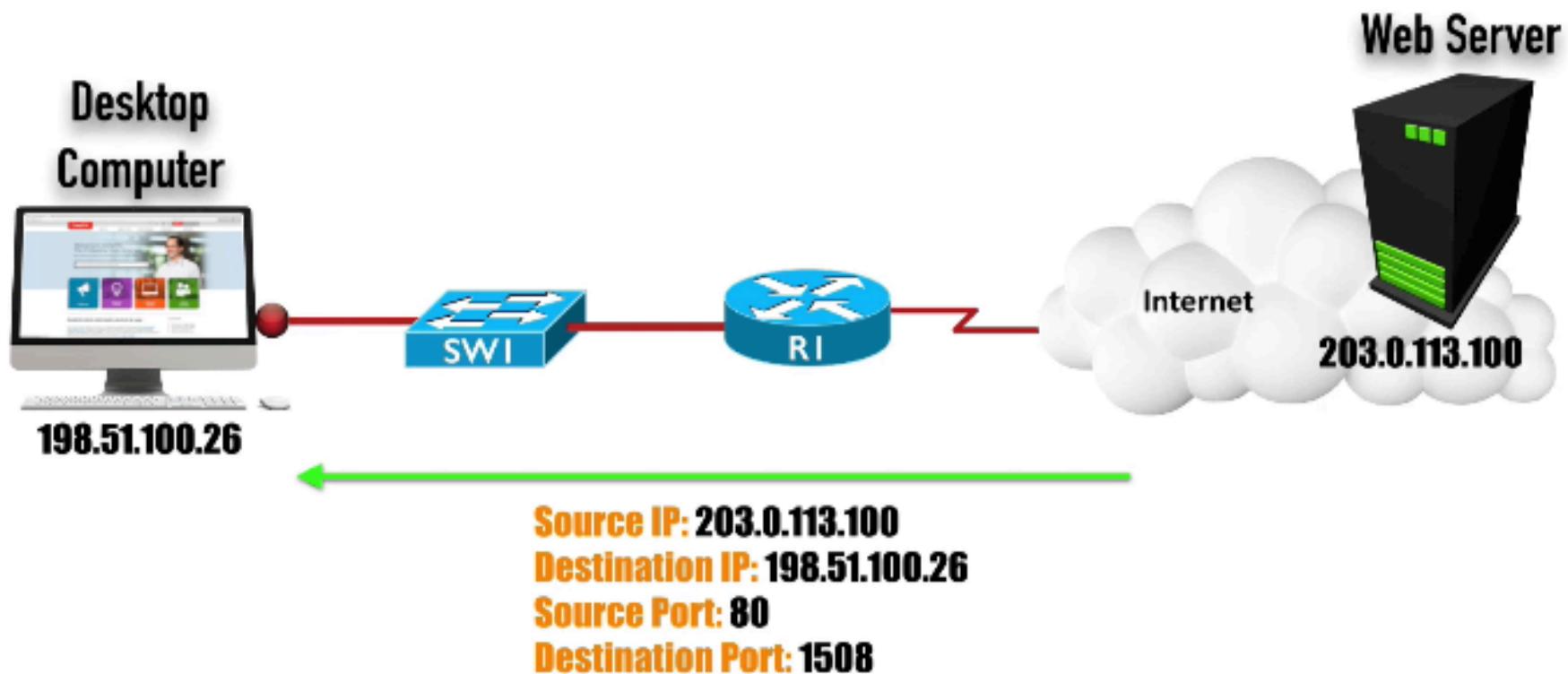
Web Service

An interaction of devices over a network.

Web Services

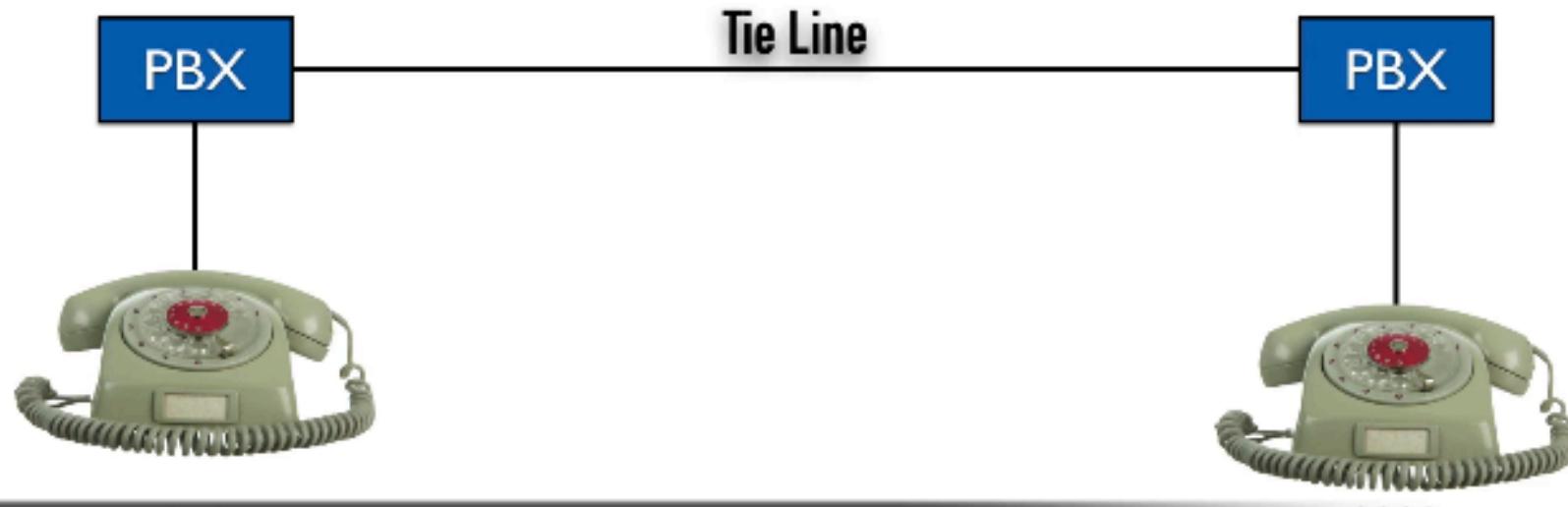


Web Services



Voice Services

Voice over IP (VoIP)

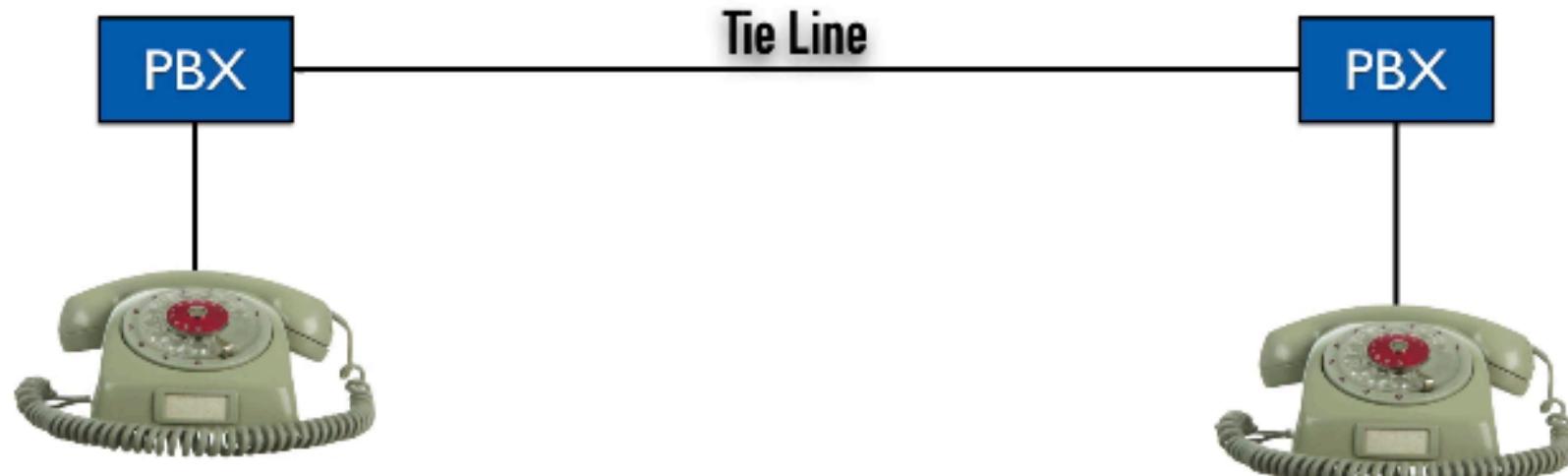


Private ^{x1050} Branch Exchange (PBX)

A privately owned telephone switch.

x2020

Voice over IP (VoIP)

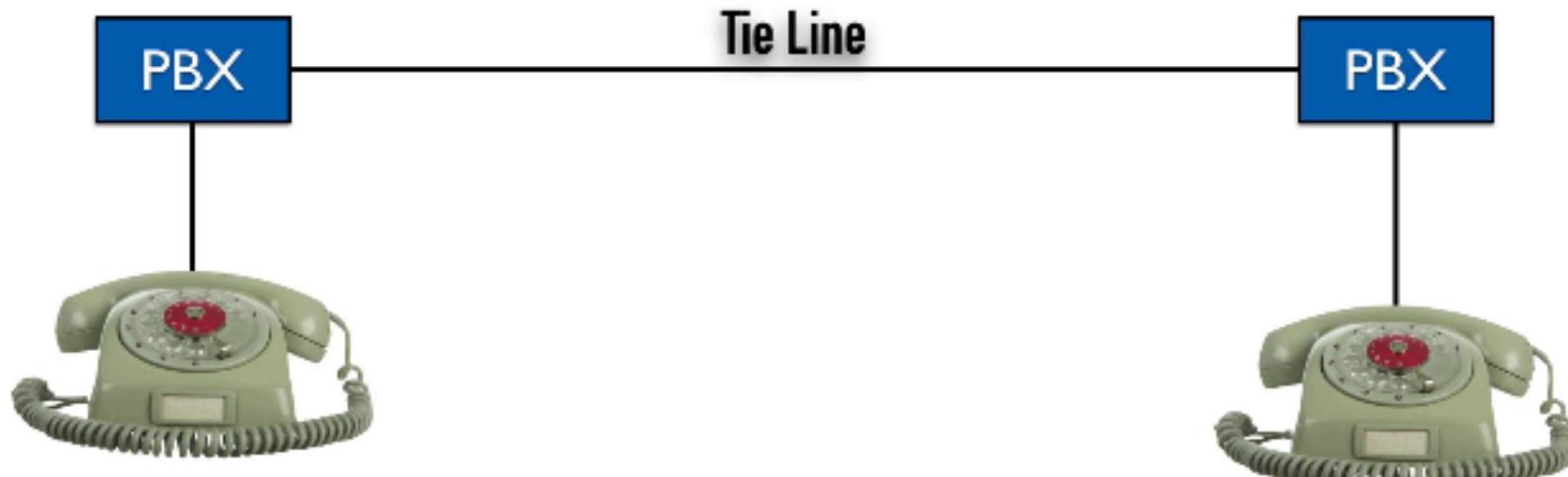


Pulse Dialing

50
The way a rotary phone indicated a dialed digit, by opening and closing the tip and ring circuit (i.e. a circuit made up of the red and green wires connecting to a phone) at specific intervals.

x2020

Voice over IP (VoIP)



Dual-Tone Multi-Frequency (DTMF) Dialing

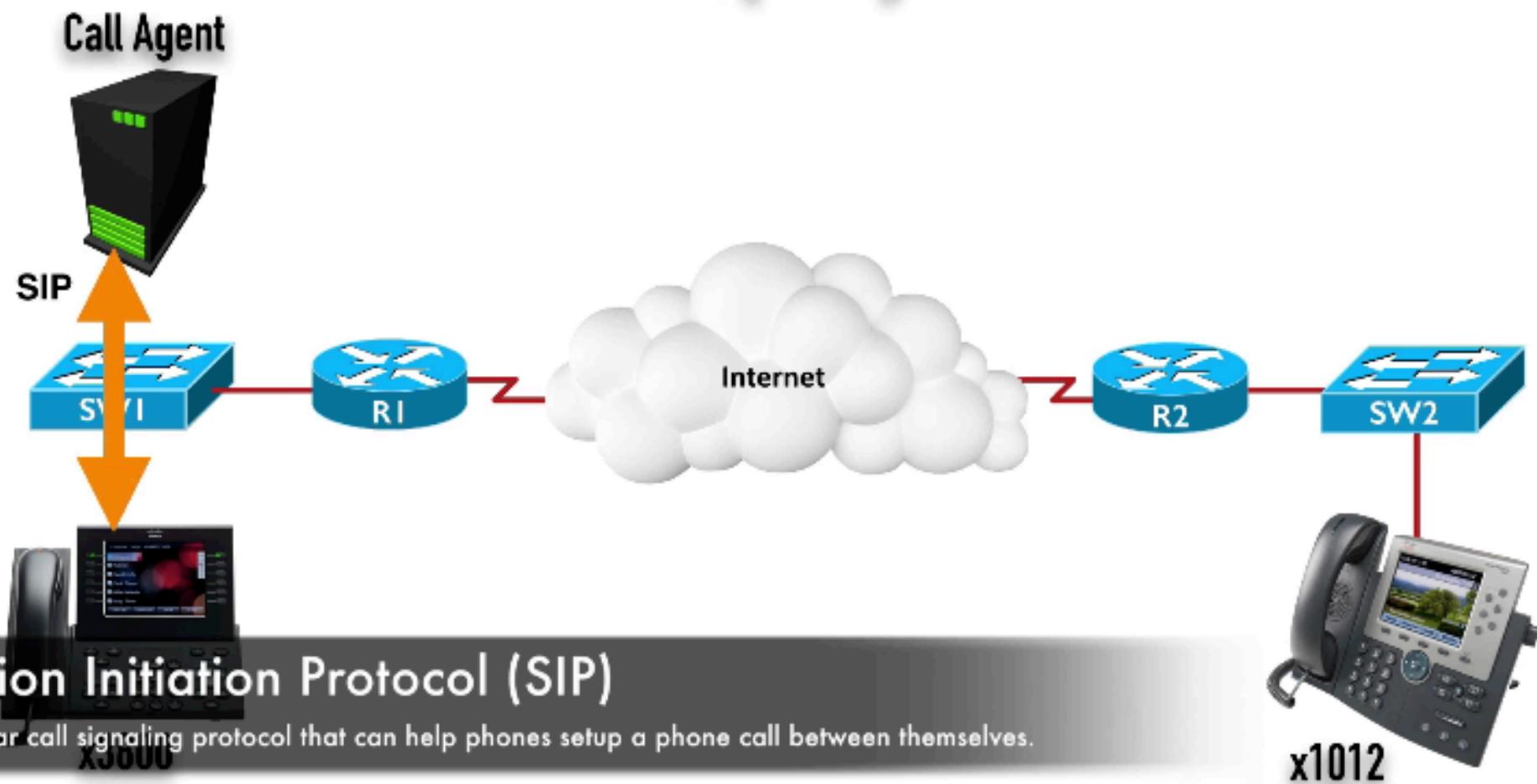
Also known as "touch tone dialing," this approach to dialing generates two simultaneous frequencies when a caller presses a button on a phone's keypad.

x2020

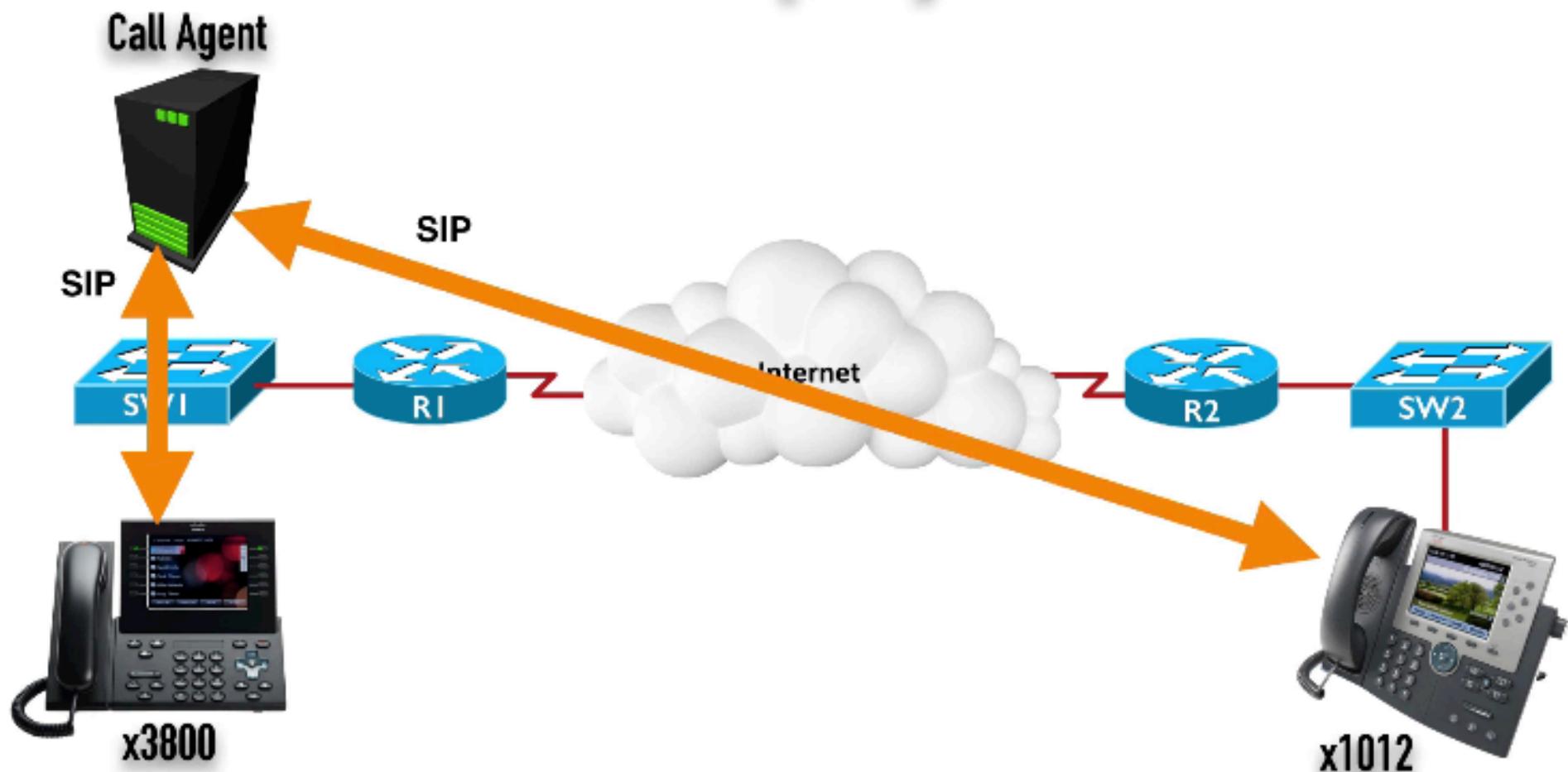
Voice over IP (VoIP)



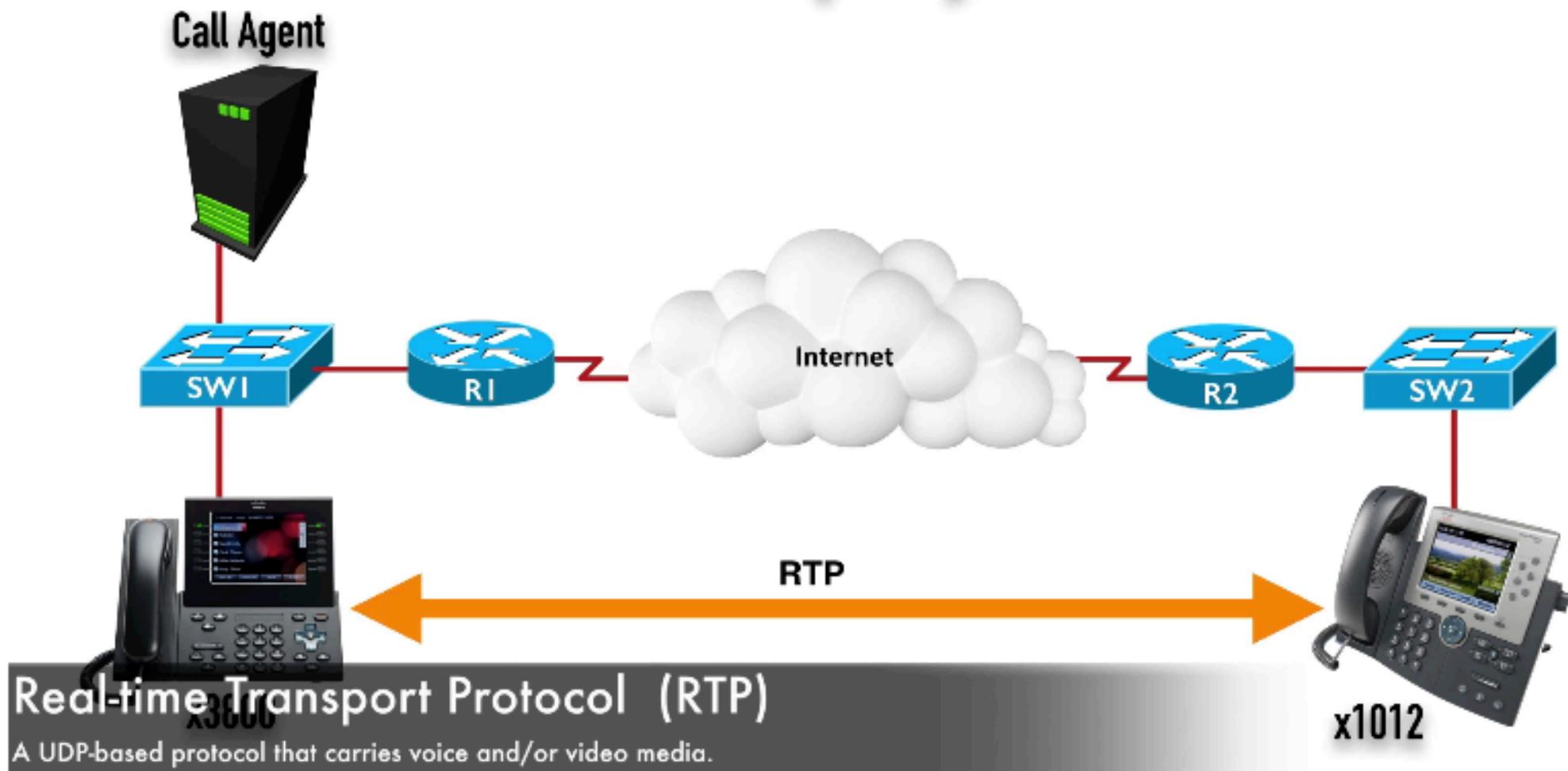
IP Telephony



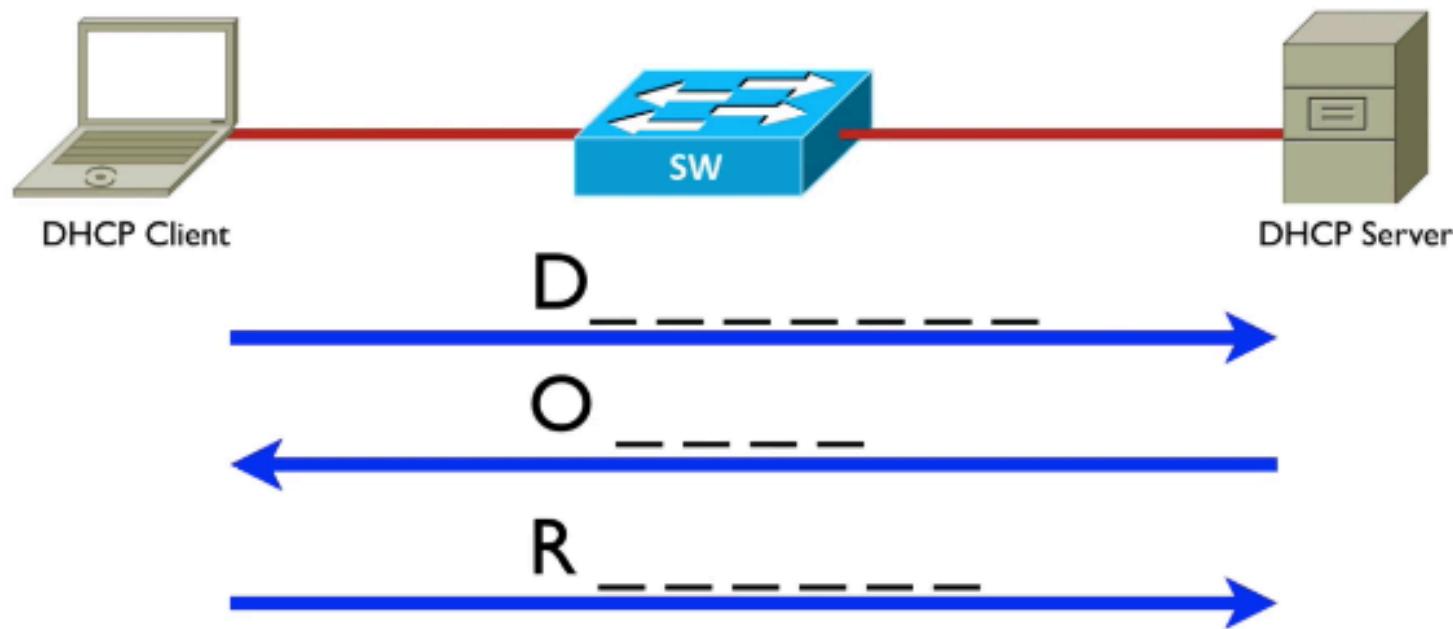
IP Telephony



IP Telephony

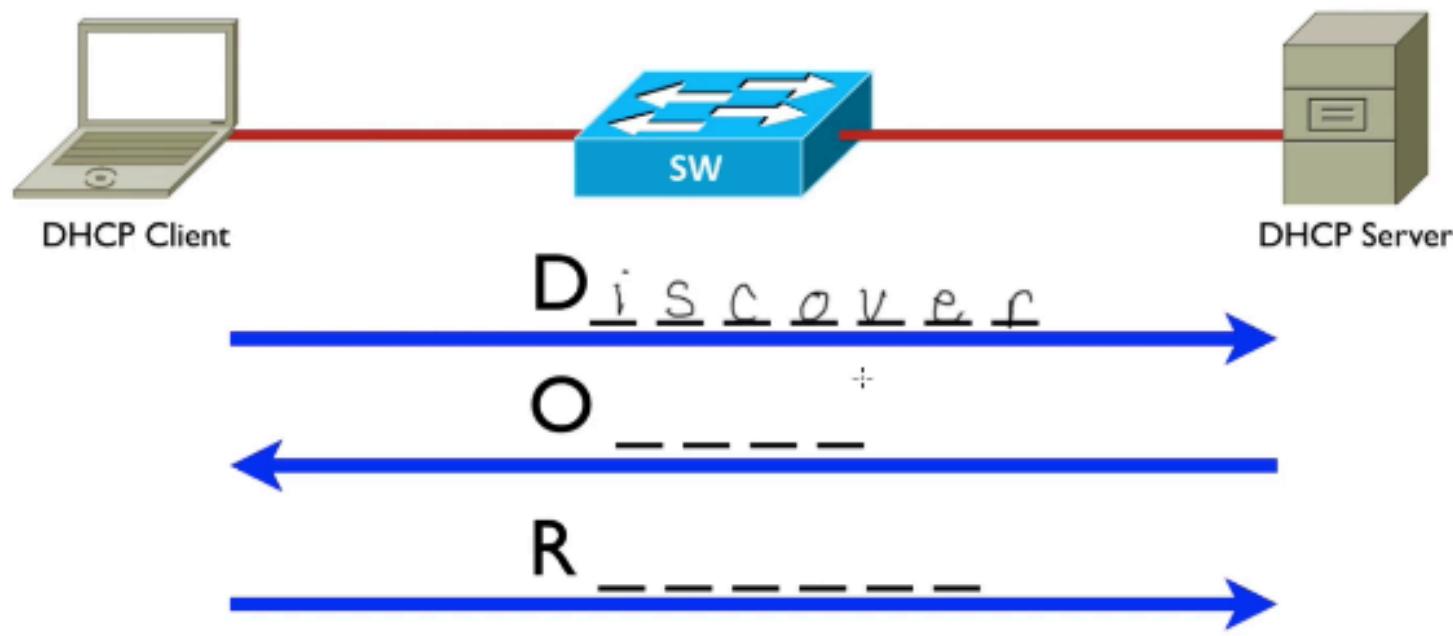


DHCP



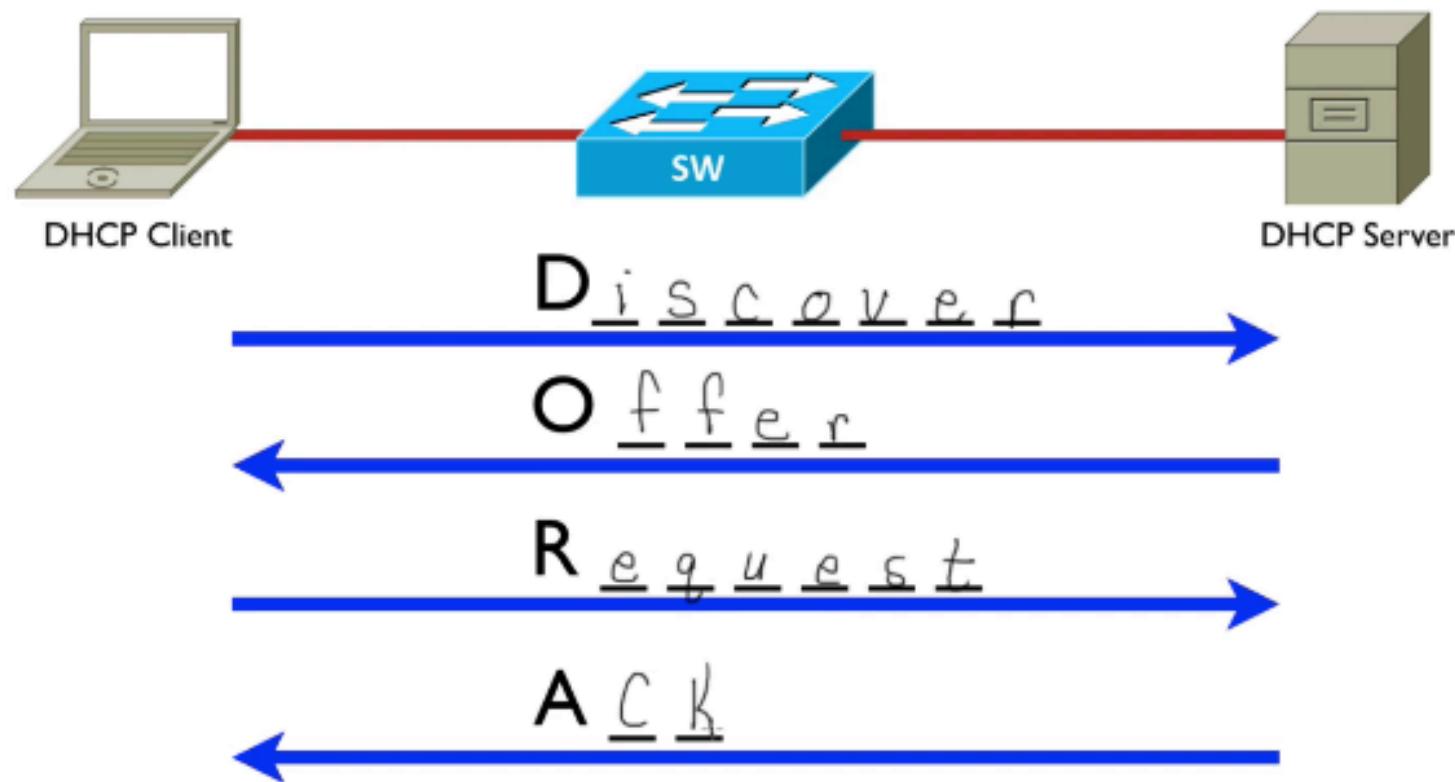
Dynamic Host Configuration Protocol (DHCP)

A network service that allows a device on a network (e.g. a PC) to dynamically obtain IP address information (as opposed to having that information manually configured).



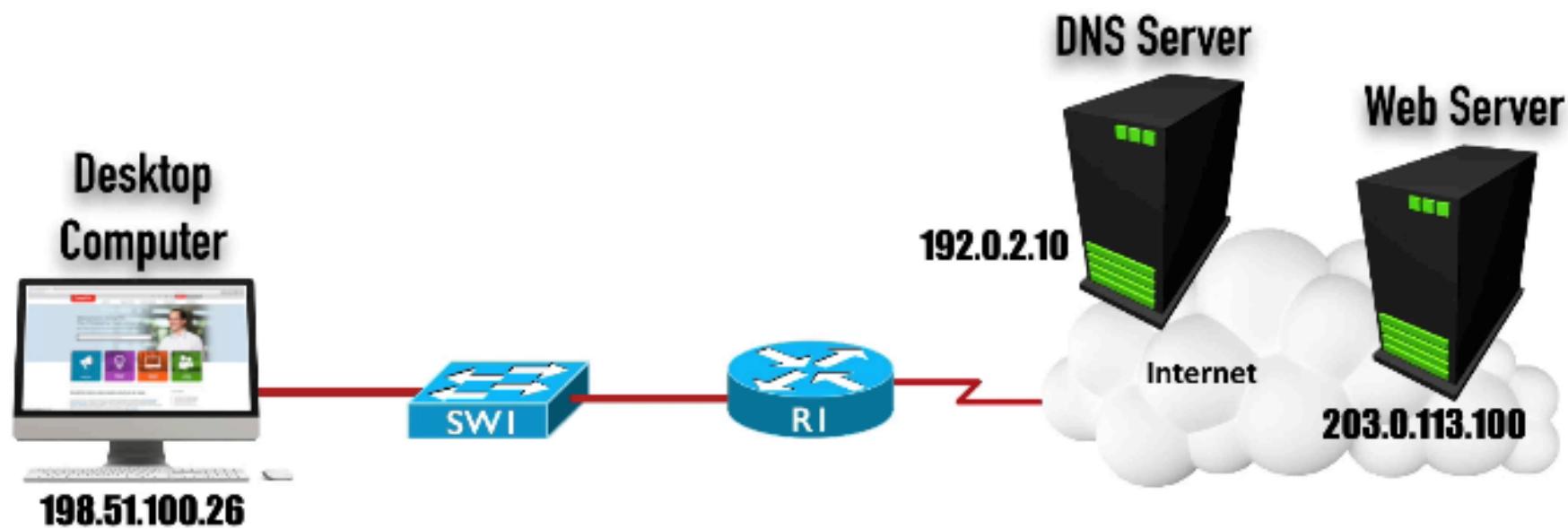
DHCP Relay Agent

A router that has been configured to forward DHCP Discover messages to a specific destination IP address or specific destination network.



DNS

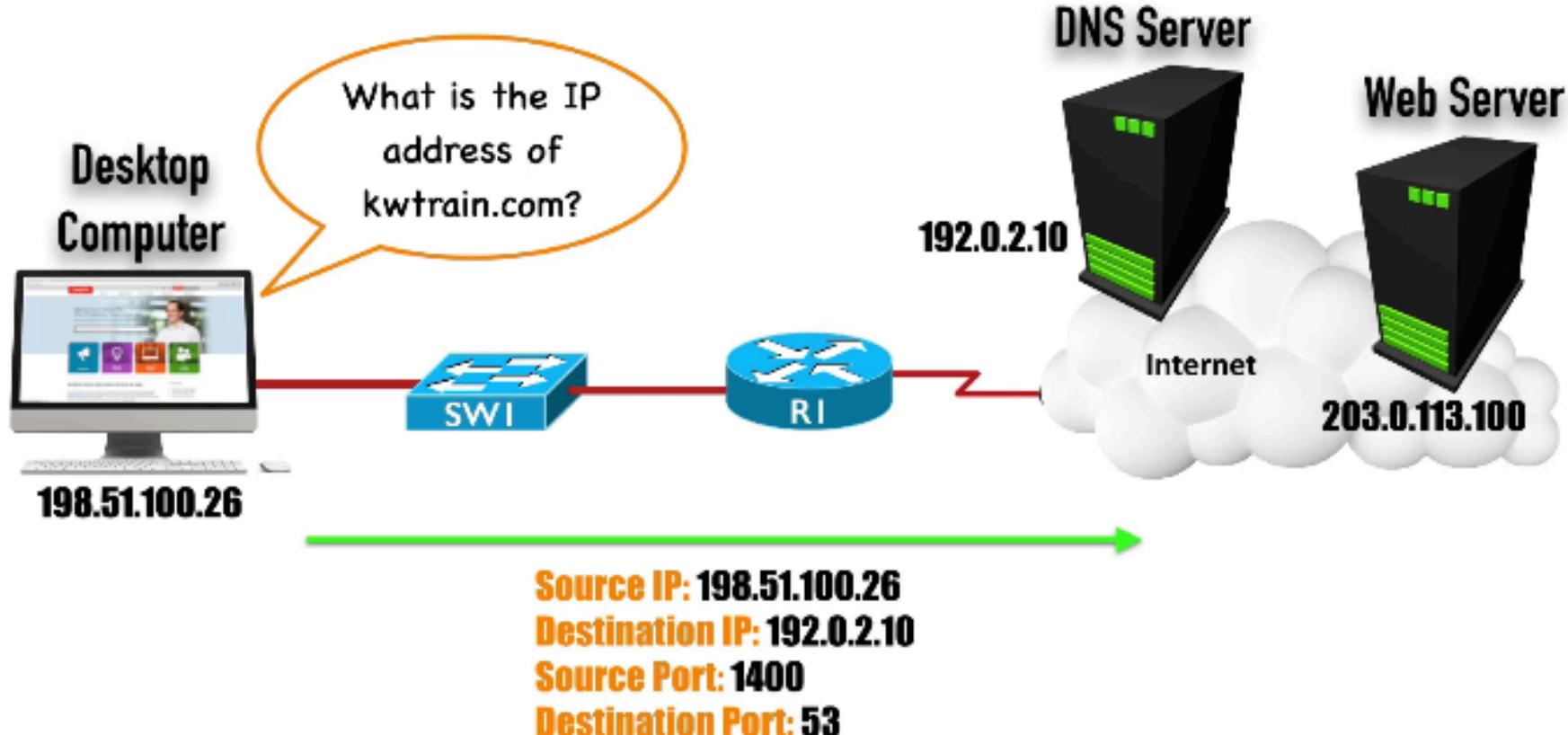
DNS Services



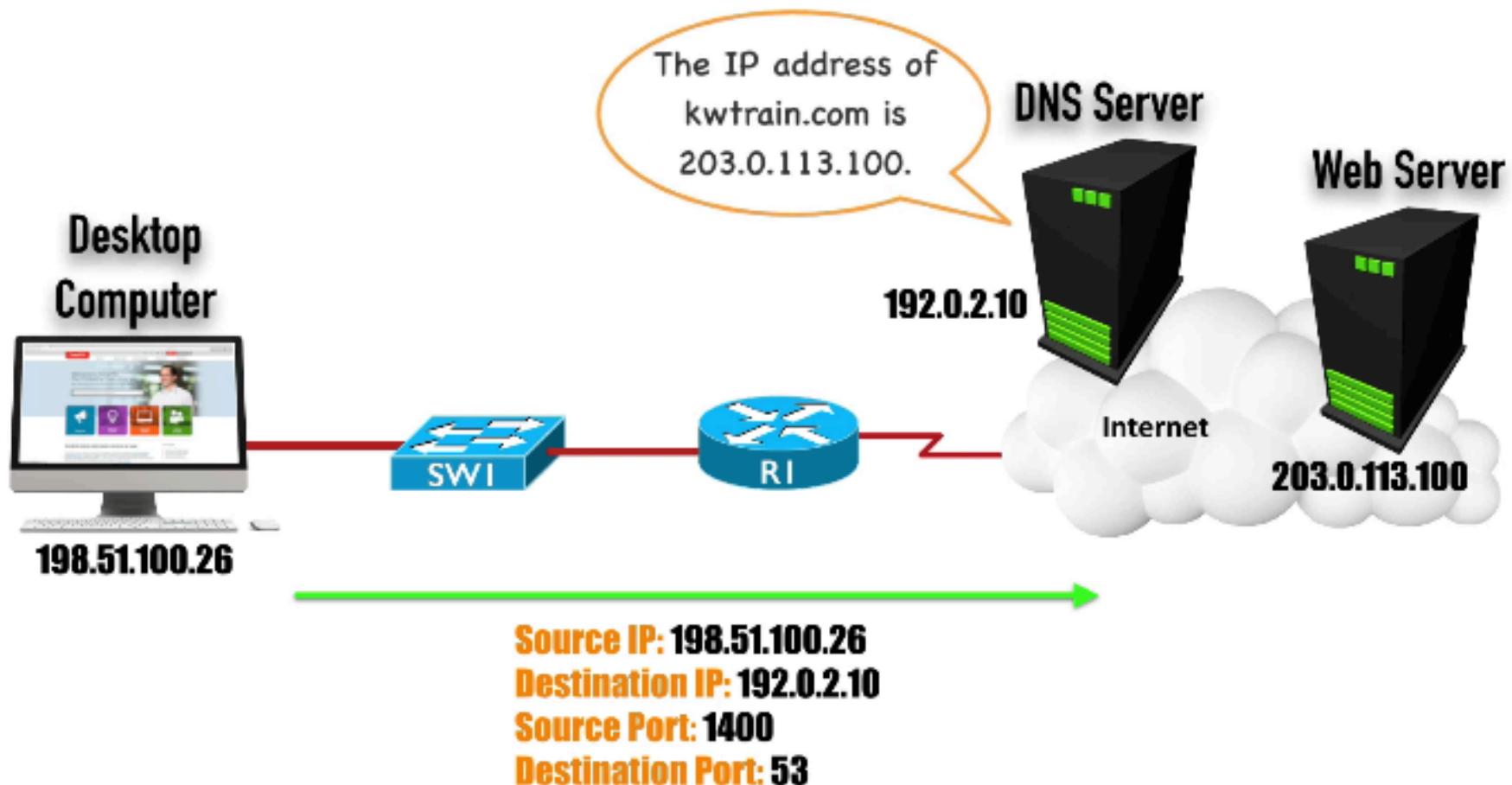
Domain Name System (DNS)

Resolves a **Fully-Qualified Domain Name (FQDN)** to an IP address.

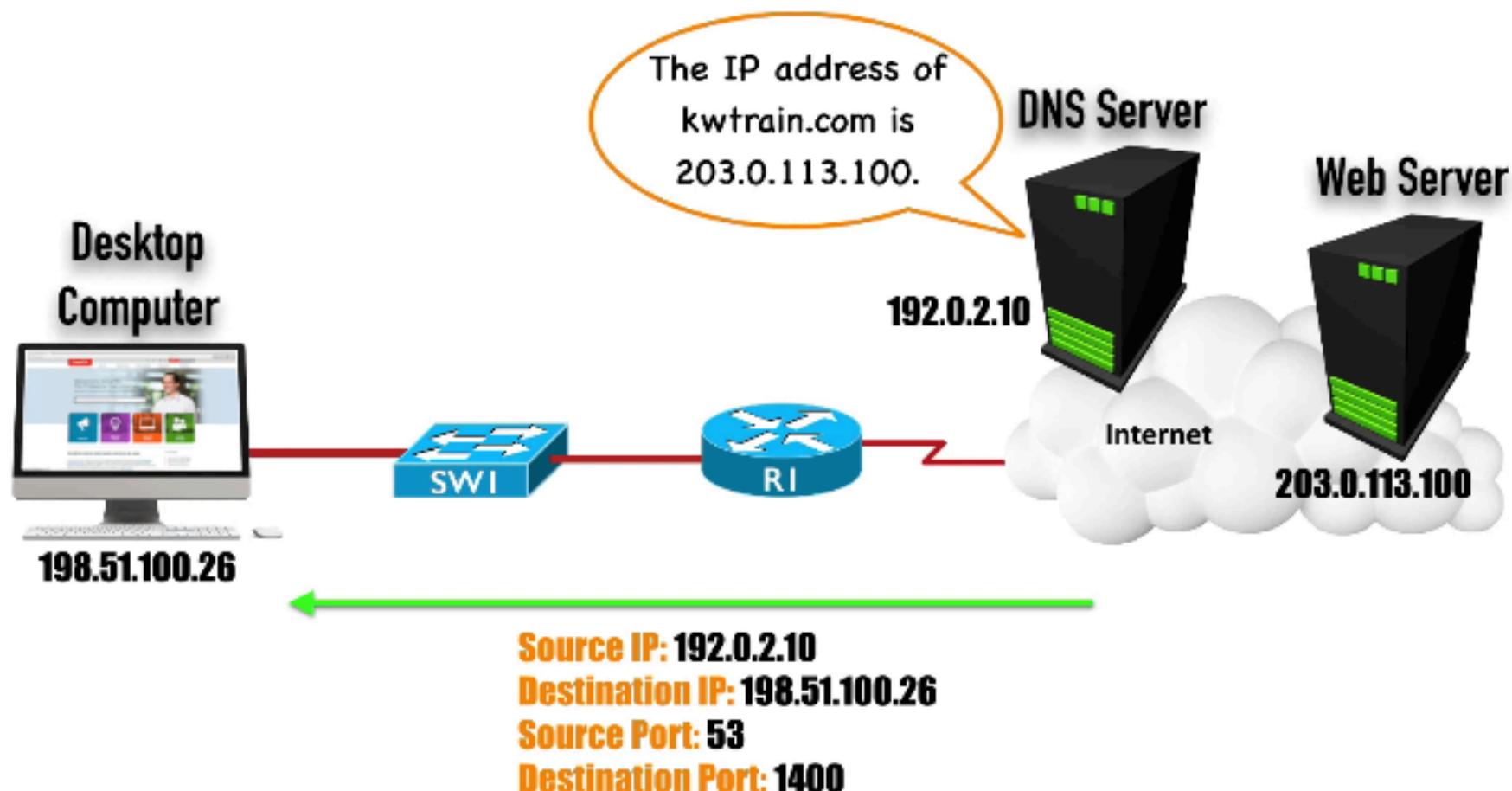
DNS Services



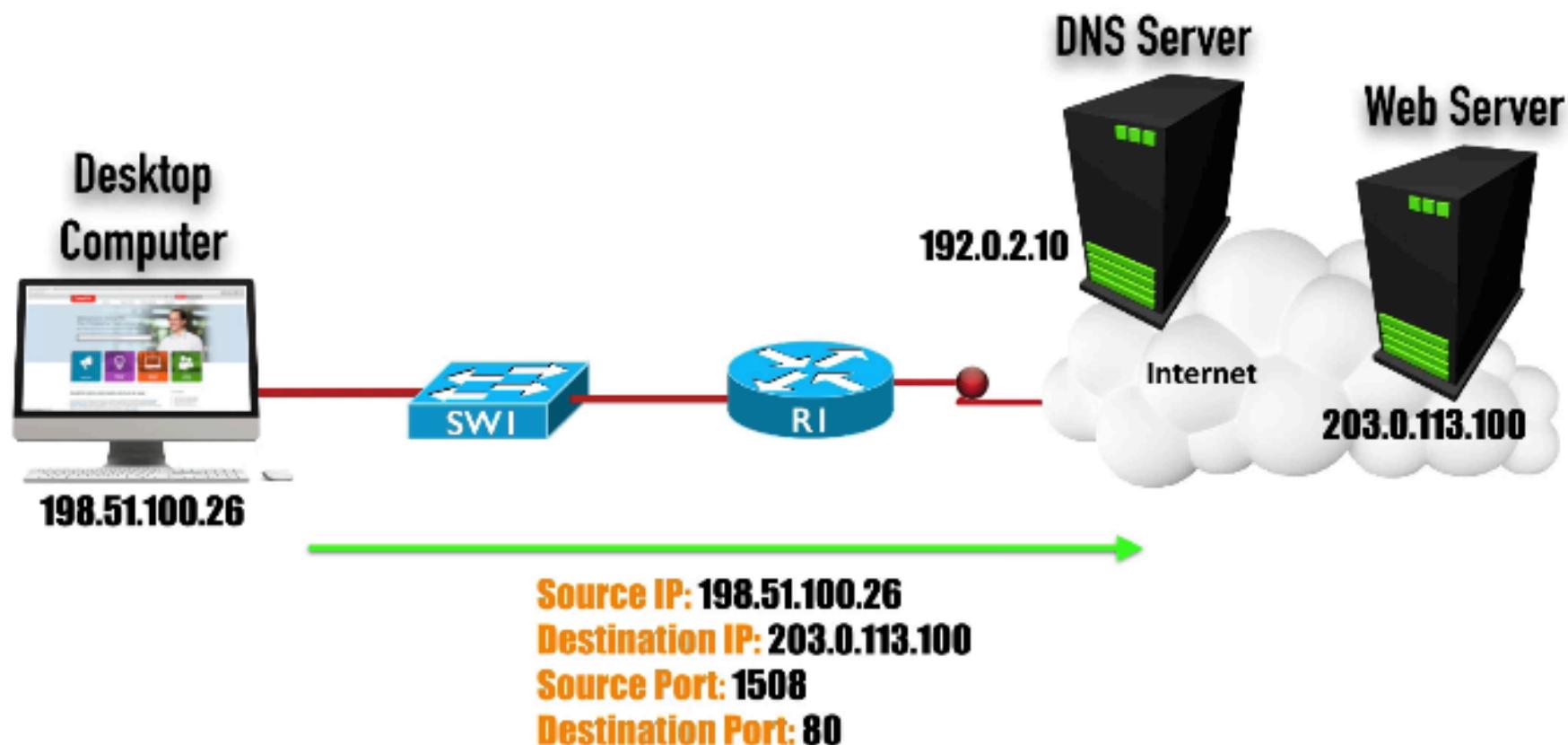
DNS Services



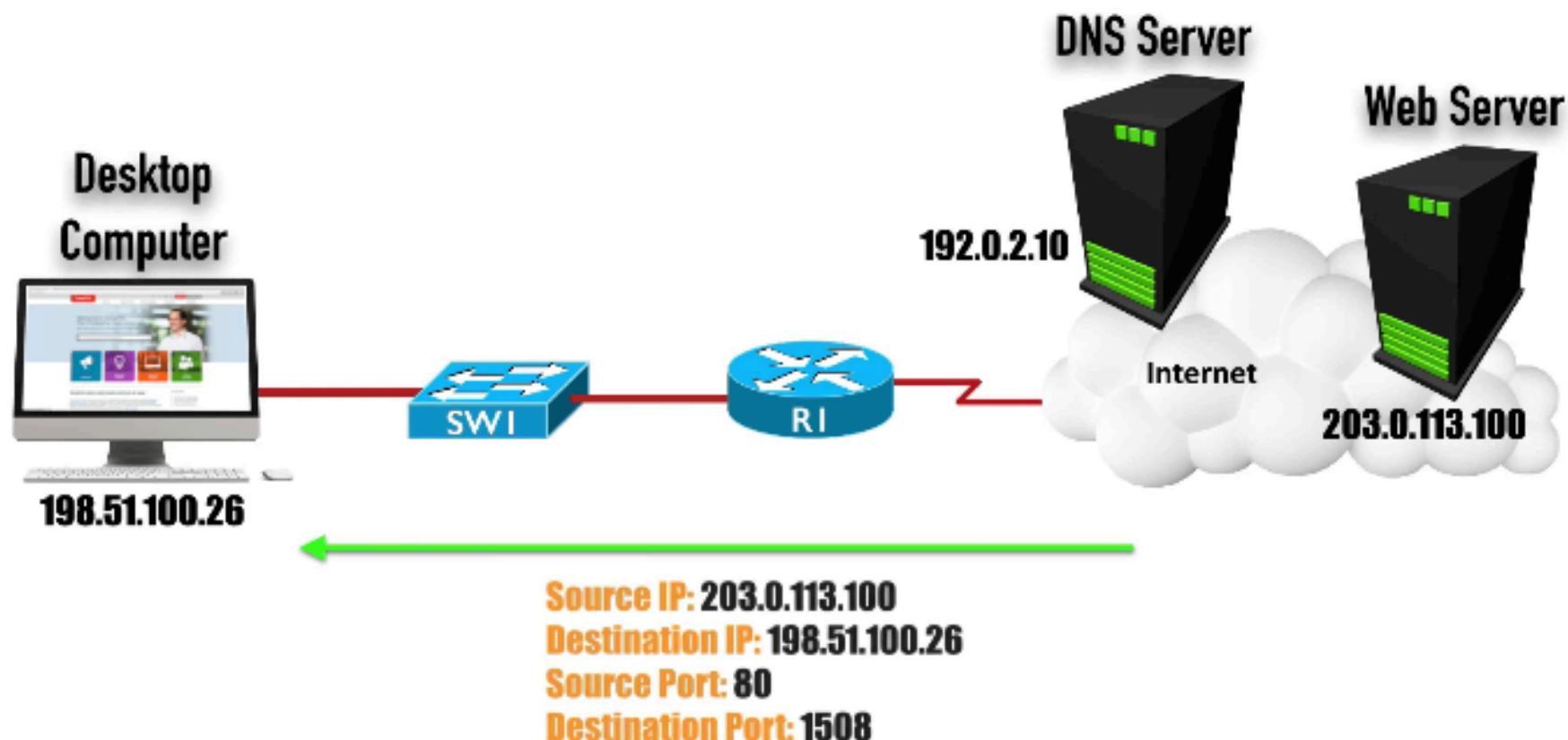
DNS Services



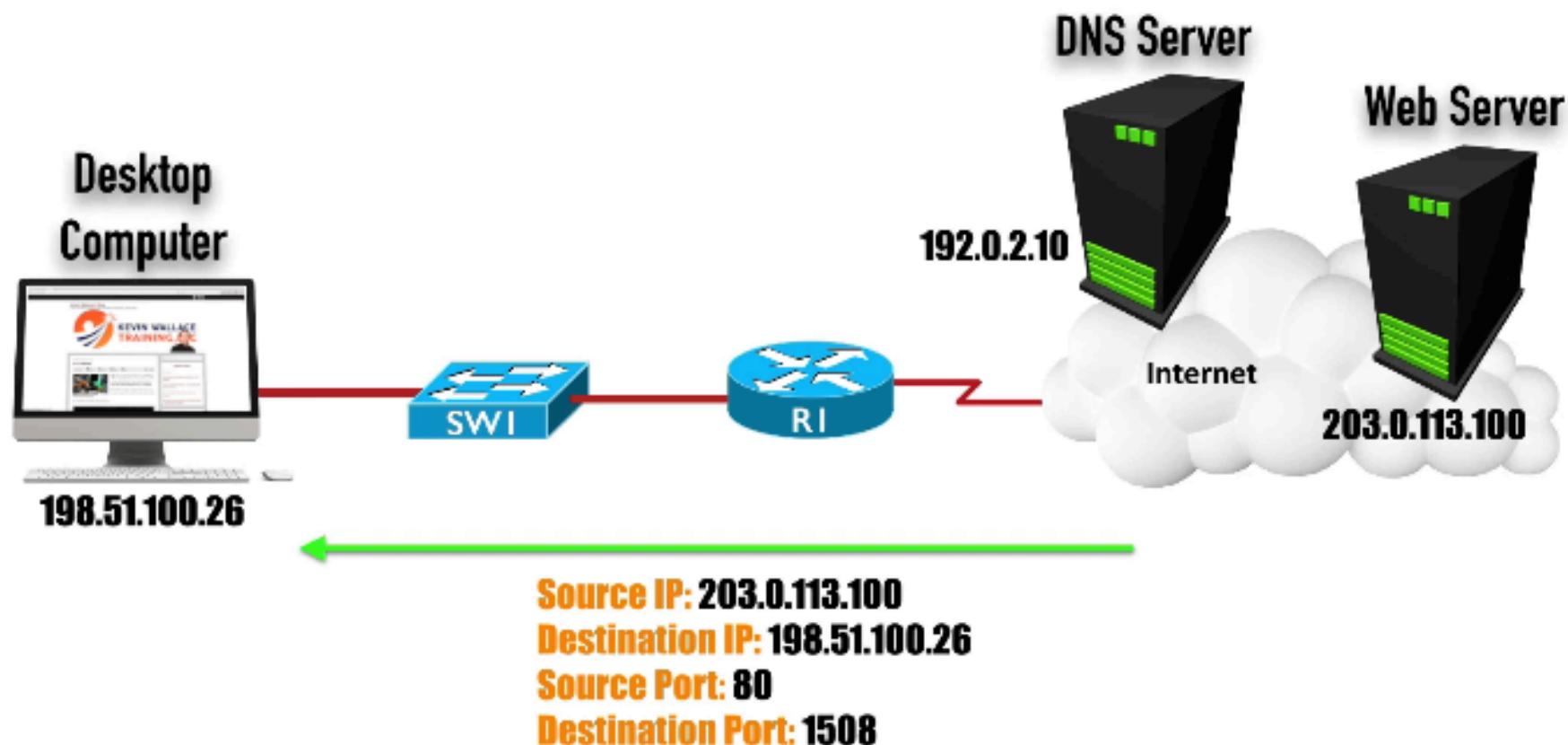
DNS Services



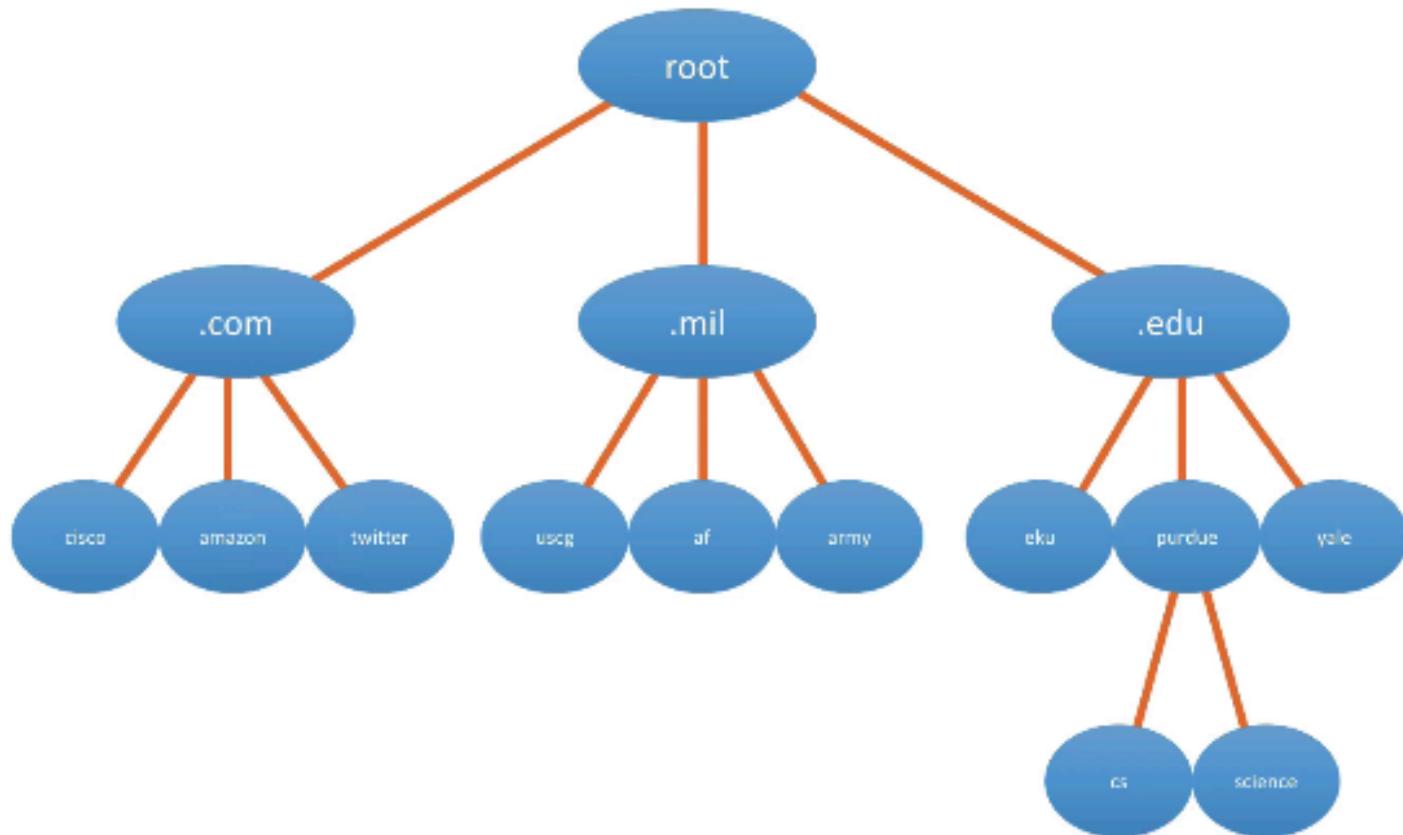
DNS Services



DNS Services



Hierarchical DNS Structure



DNS Record Types

Record Type	Description
A	An address record is used to map a hostname to an IPv4 address.
AAAA	An IPv6 address record is used to map a hostname to an IPv6 address.
CNAME	A canonical name record is an alias of an existing record, thus allowing multiple DNS records to map to the same IP address.
MX	A mail exchange record maps a domain name to an e-mail (or message transfer agent) server for that domain.
PTR	A pointer record points to a canonical name. A PTR record is commonly used when performing a reverse DNS lookup, which is a process used to determine what domain name is associated with a known IP address.
SOA	A start of authority record provides authoritative information about a DNS zone, such as: e-mail contact information for the zone's administrator, the zone's primary name server, and various refresh timers.

DNS Record Types

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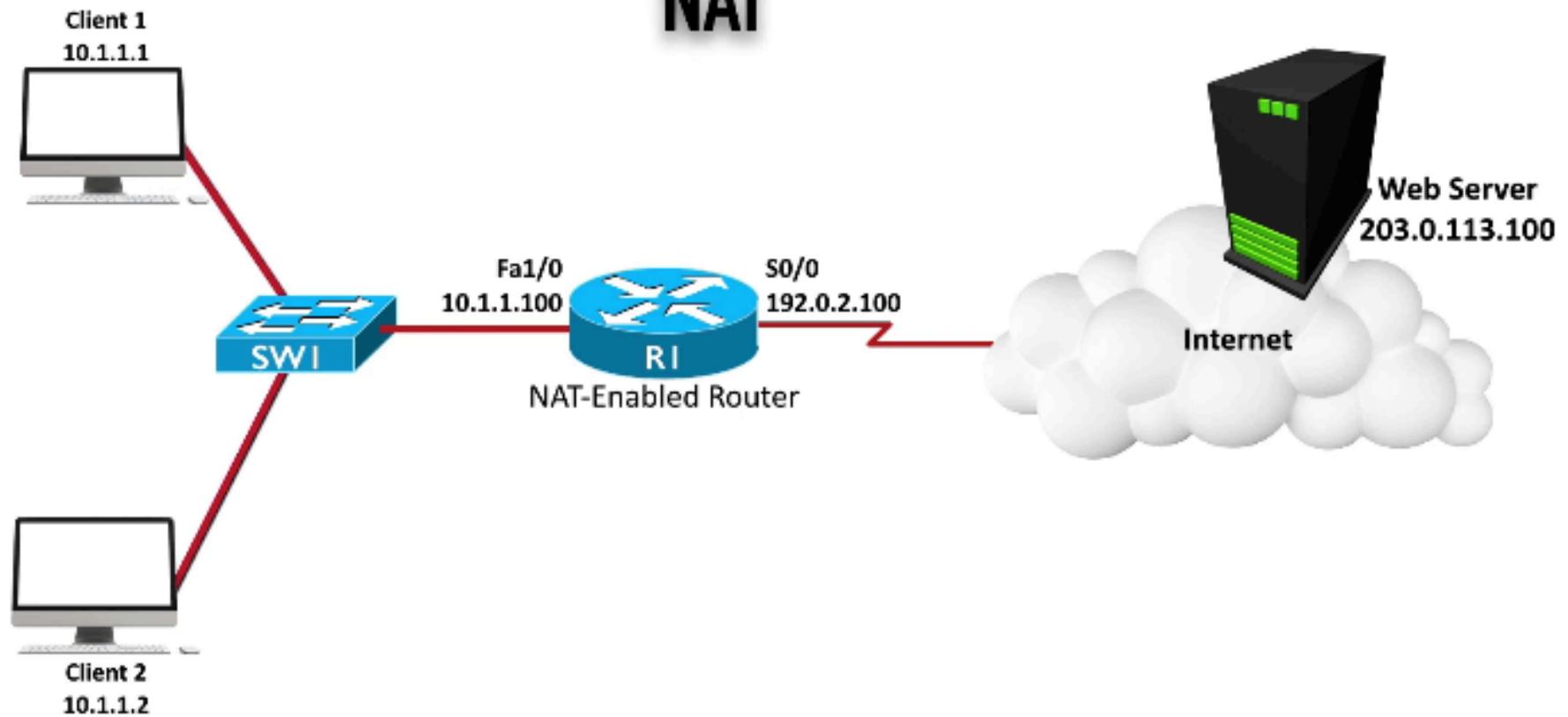
Dynamic DNS (DDNS)

A **start of authority** record provides authoritative information about a DNS zone, such as: e-mail contact information for the zone administrator, the zone's primary name server, and various refresh times for the zone.

Allows software on a network to monitor the changing IP address associated with a host and then update DNS tables to reflect the newly assigned IP address.

NAT

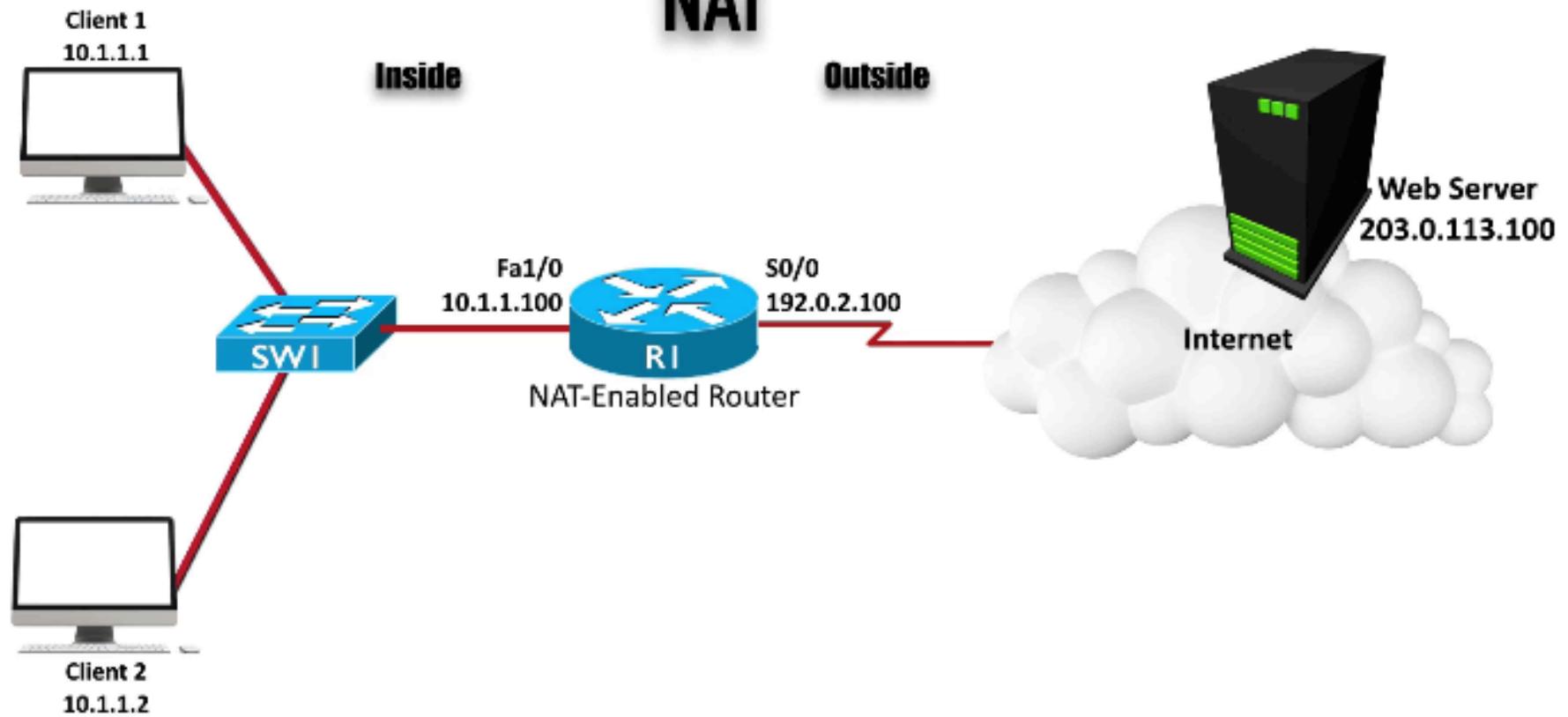
NAT



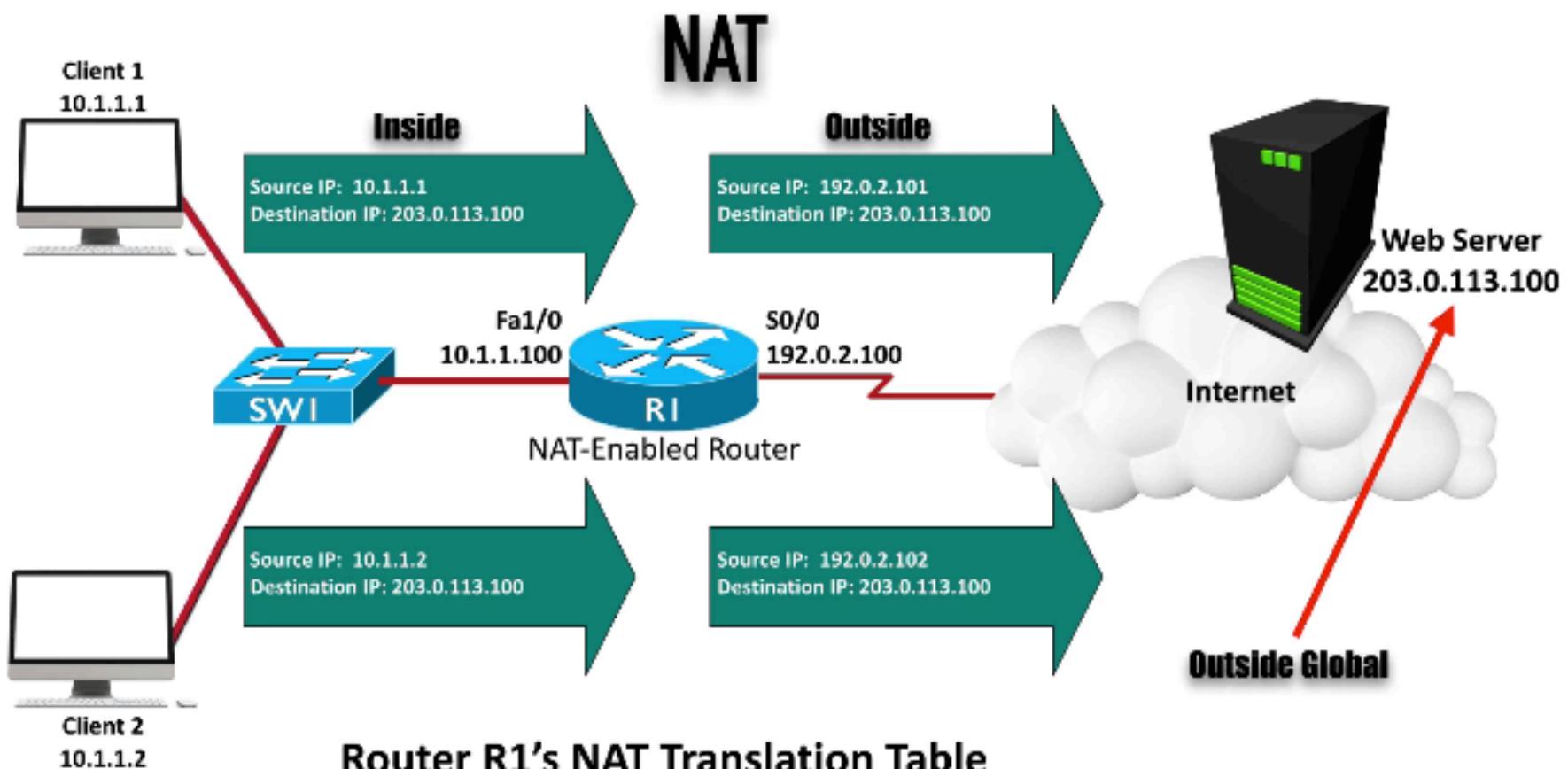
Network Address Translation (NAT)

Can map a private IP address to a publicly routable IP address, selected from a pool of publicly routable IP addresses.

NAT



Pool of Addresses:
192.0.2.101-192.0.2.199

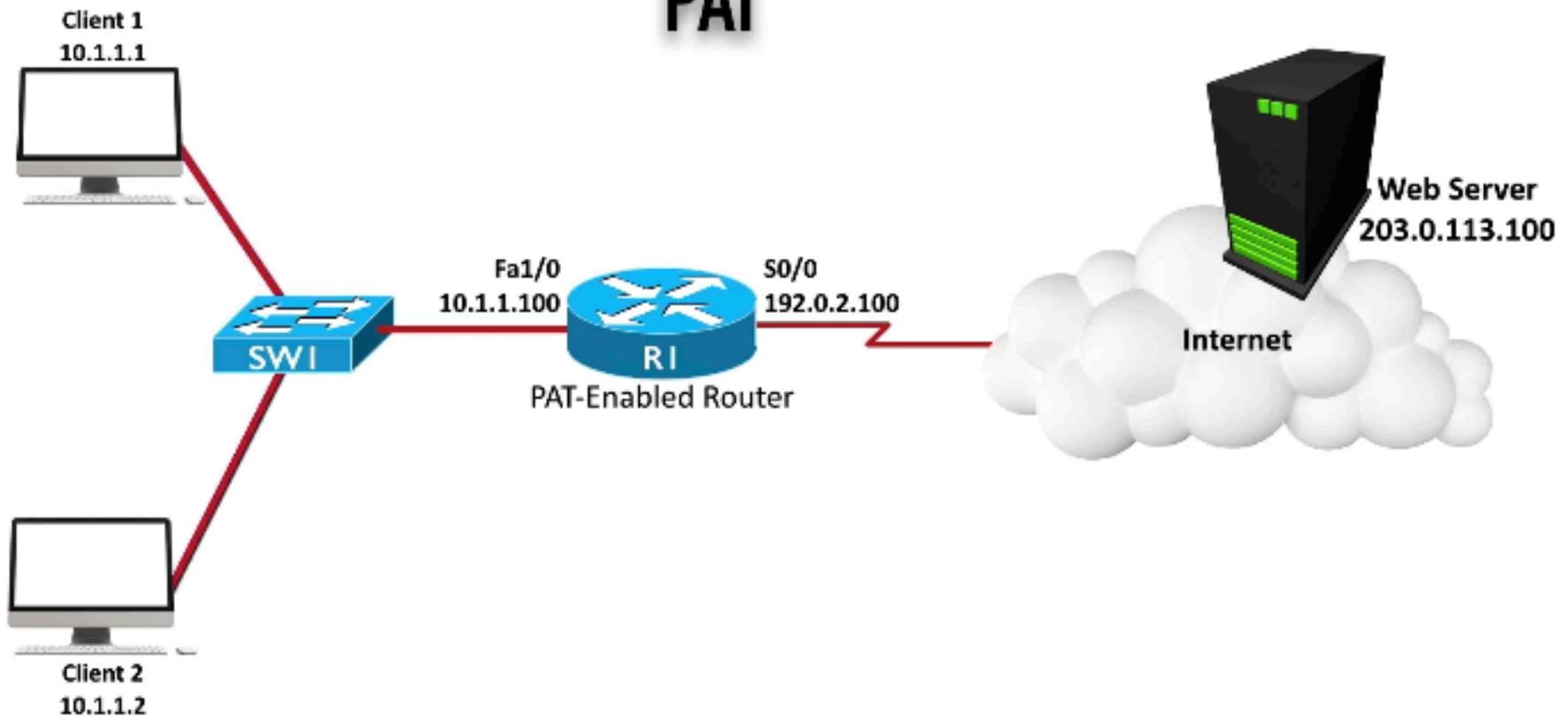


Router R1's NAT Translation Table

Inside Local	Inside Global
10.1.1.1	192.0.2.101
10.1.1.2	192.0.2.102

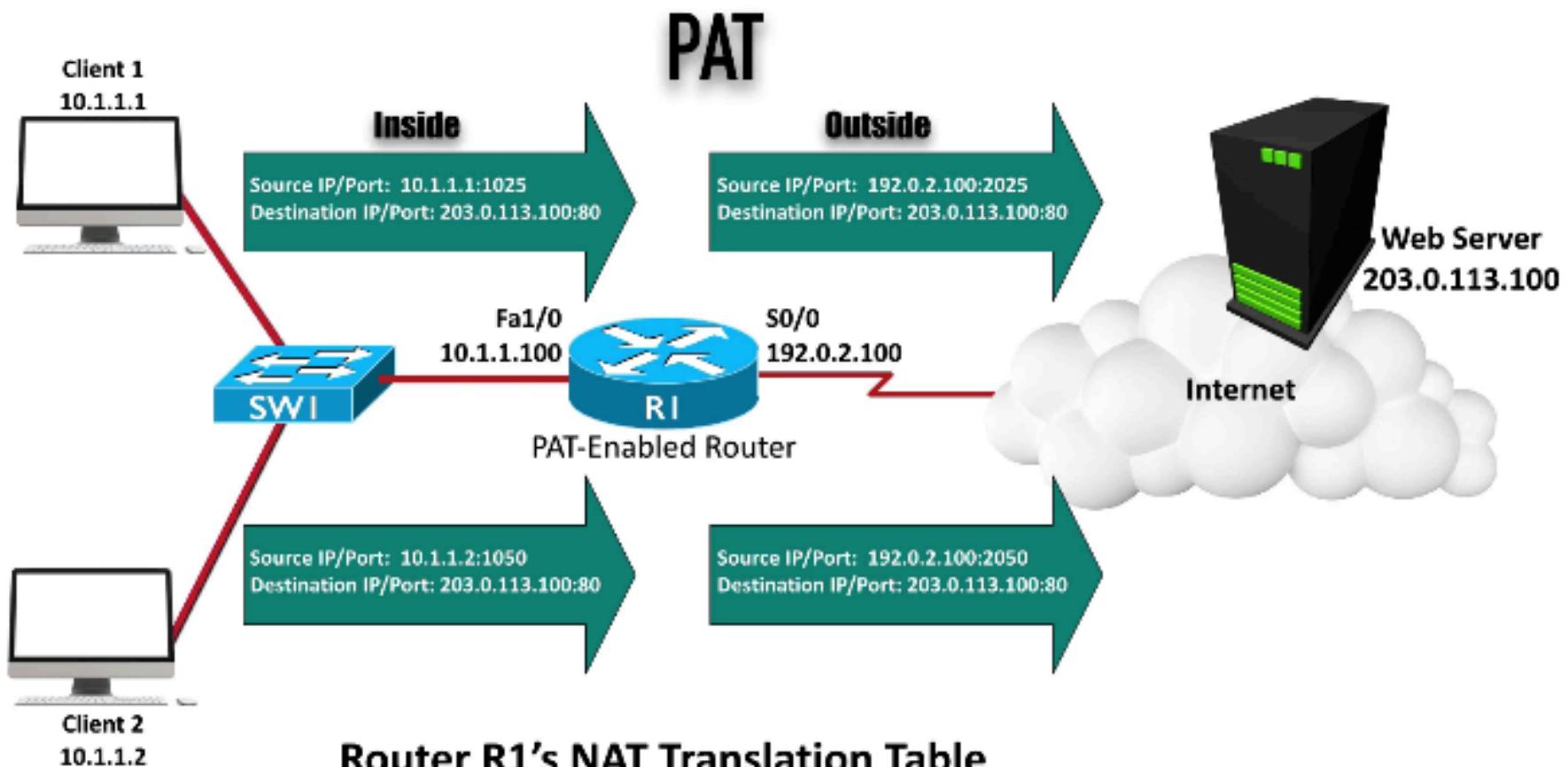
Pool of Addresses:
192.0.2.101-192.0.2.199

PAT



Port Address Translation (PAT)

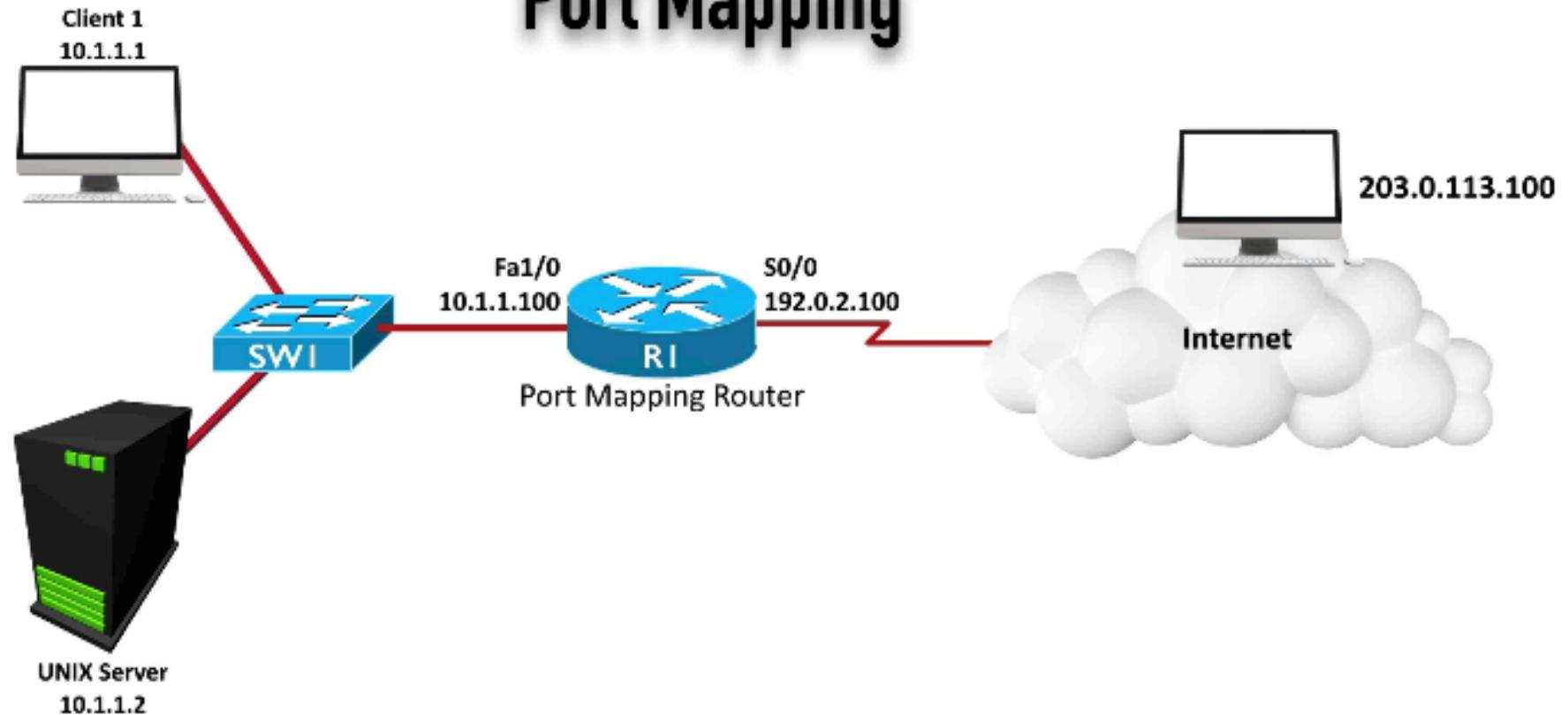
A feature that lets multiple private IP addresses inside a network share a single publicly routable IP address assigned by an Internet Service Provider (ISP).



Router R1's NAT Translation Table

Inside Local	Inside Global Address
10.1.1.1:1025	192.0.2.100:2025
10.1.1.2:1050	192.0.2.100:2050

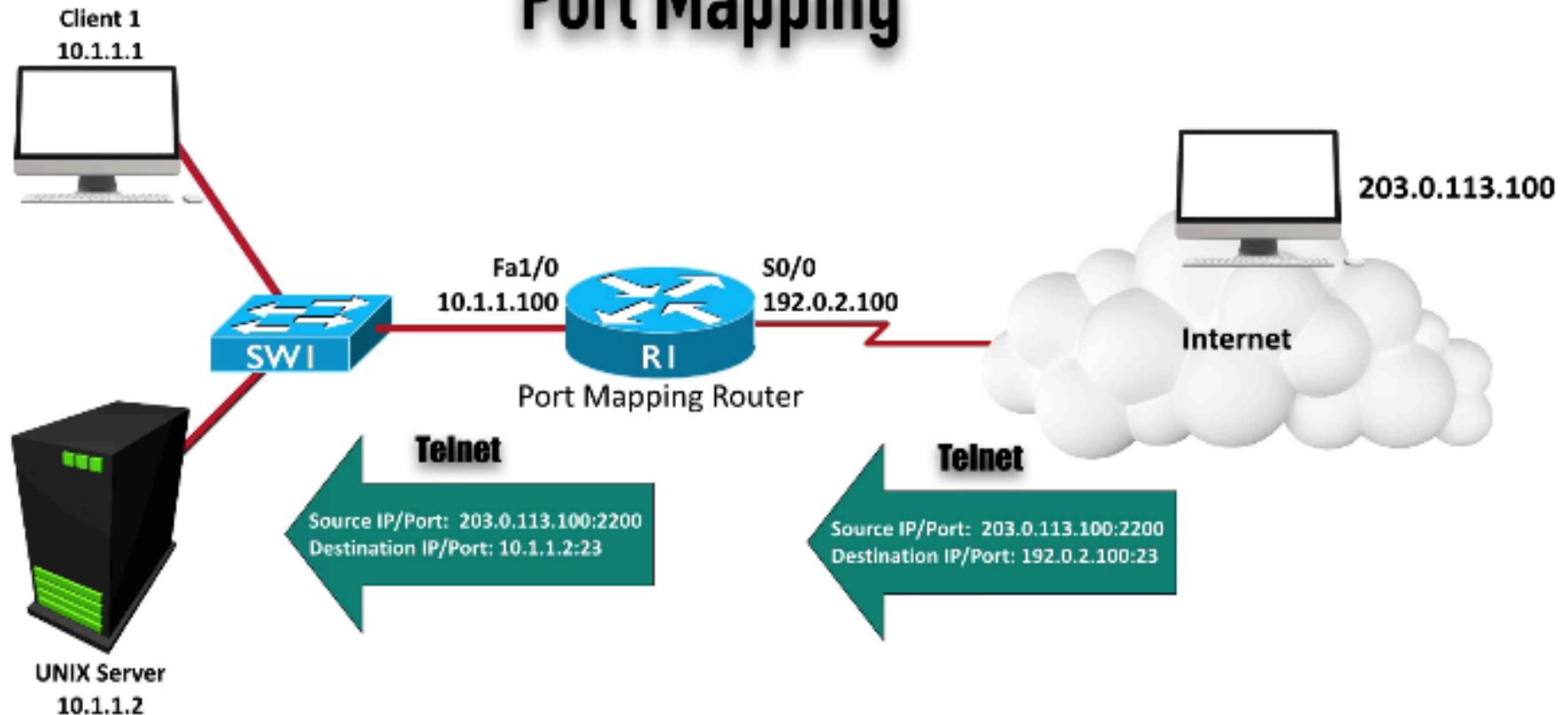
Port Mapping



Port Mapping

Allows a router to forward incoming traffic to a specific inside host, based on the destination port number of the incoming packet.

Port Mapping



Module 4: Review