# Jack-Daniyel Strong

Jack is the President of J-D Strong Consulting, Inc. and Strong Solutions.  As a member of the Apple Consultants Network, grew from a one-man consultancy into an Apple Authorized Reseller and Service Provider for the Eastern Washington and Northern Idaho area.




Strong Solutions' sole focus is on MacOS and iOS solutions for Small and Medium Business.

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# Networking: Discover, Map and Reporting Essentials

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Networks

Map

Detect

Report



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# snmp

# Simple Network Management Protocol

# SNMP
# Yeah, you know me

- Protocol to transmit device data
  - Performance
  - Health Status
  - Event Notification
- Supported by 99% of devices
- Mostly implemented in Data Centers
- Device Independent

# SNMP
# Yeah, you know me

- SNMPv1
- SNMPv2c
- SNMPv3



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# SNMP
# Yeah, you know me

- SNMP Manager
- Devices
- SNMP Agents
- Management Information Bases (MIBs)

# SNMP Manager

- Queries agents
- Gets responses from agents
- Sets variables in agents
- Acknowledges asynchronous events from agents

# Managed Devices

- Routers
- Switches
- Servers
- Workstations
- Printers
- UPSs
- etc…

# SNMP Agent

- Collects management information about its local environment
- Stores and retrieves management information as defined in the MIB.
- Signals an event to the manager.
- Acts as a proxy for some non–SNMP manageable network node.

# MIB



# MIB

- Dictionary for managing network element
- Each defines a unique Object Identifier (OID)
- OIDs can be Scalar or Tabular
- Every OID is organized hierarchically in MIB

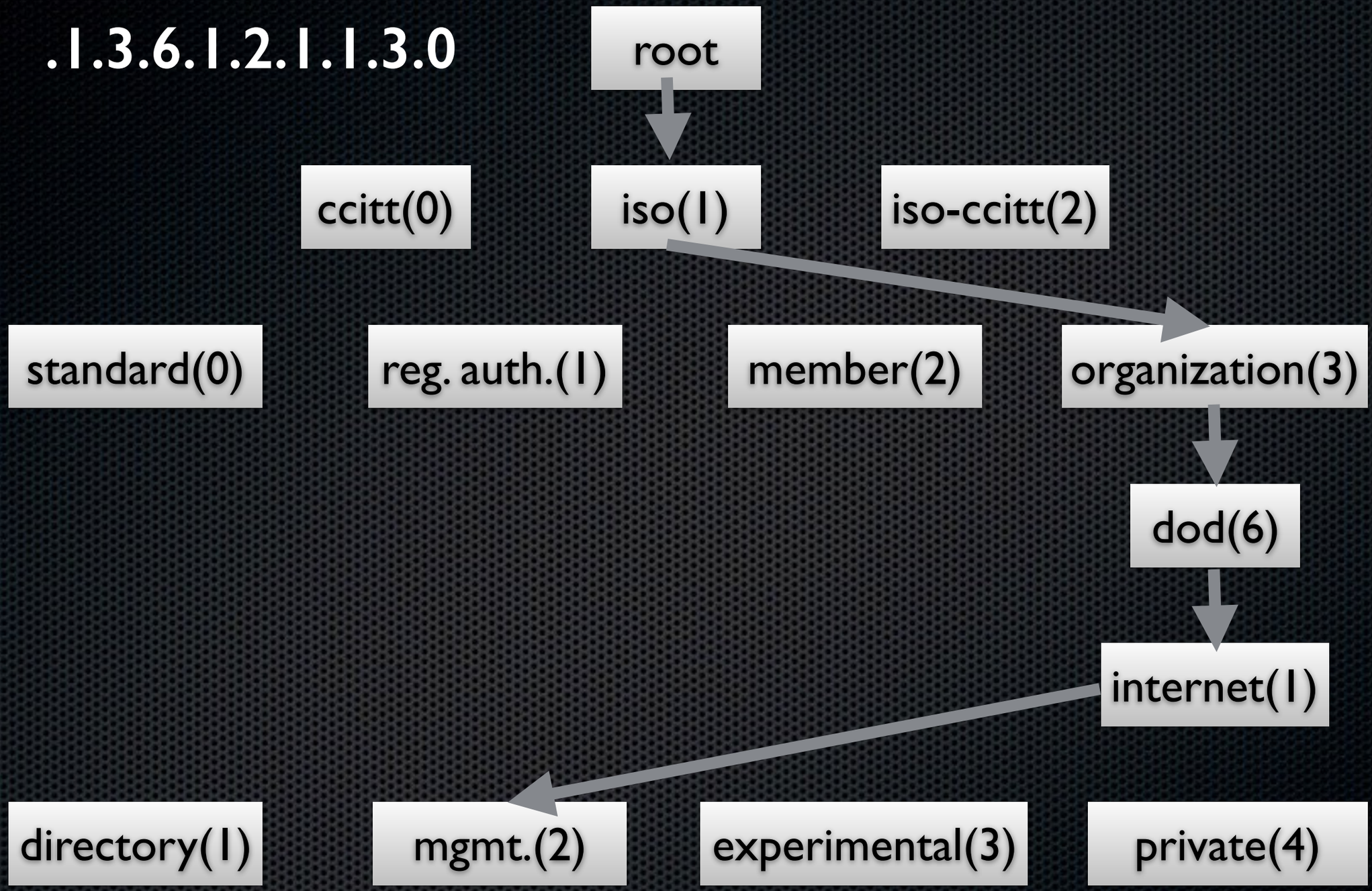
# sysUpTime

- OID for the object sysUpTime is .1.3.6.1.2.1.1.3.0
- textual description of sysUpTime OID is iso.org.dod.internet.mgmt.mib-2.system.sysUpTime.



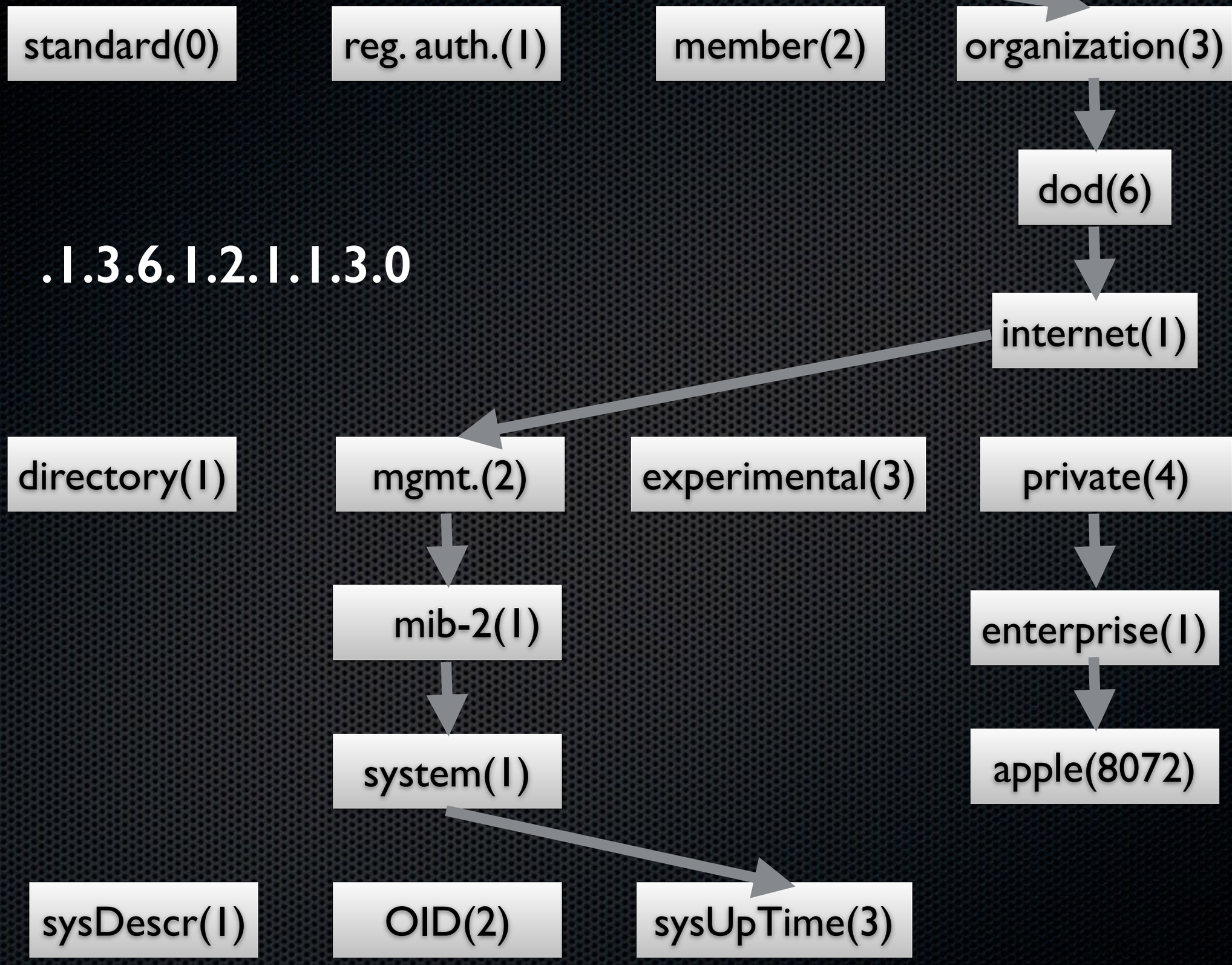
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.1.3.6.1.2.1.1.3.0





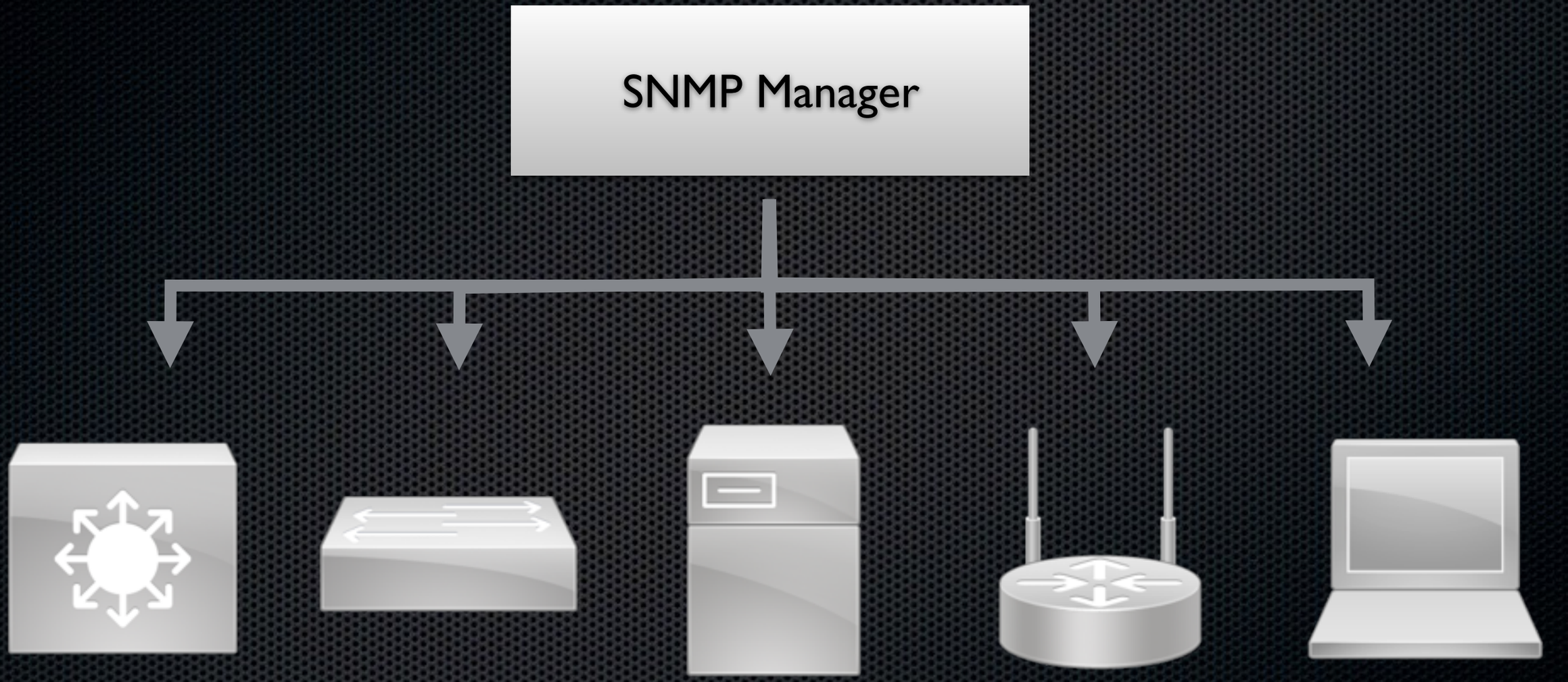

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standard(0)
reg. auth.(1)
member(2)
organization(3)
dod(6)
.1.3.6.1.2.1.1.3.0
internet(1)
directory(1)
mgmt.(2)
experimental(3)
private(4)
mib-2(1)
enterprise(1)
system(1)
apple(8072)
sysDescr(1)
OID(2)
sysUpTime(3)

# SNMP Messages

- SNMP GET
- SNMP GET-NEXT
- SNMP GET-RESPONSE
- SNMP SET
- SNMP TRAP

# SNMP Communication






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# SNMP Communication

SNMP Manager

GET / GETNEXT



Router Switch Server WAP Client



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# SNMP Communication

SNMP Manager

sysUpTime



Router Switch Server WAP Client



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# snmpwalk

uses SNMP GETNEXT requests to query a network entity for a tree of information

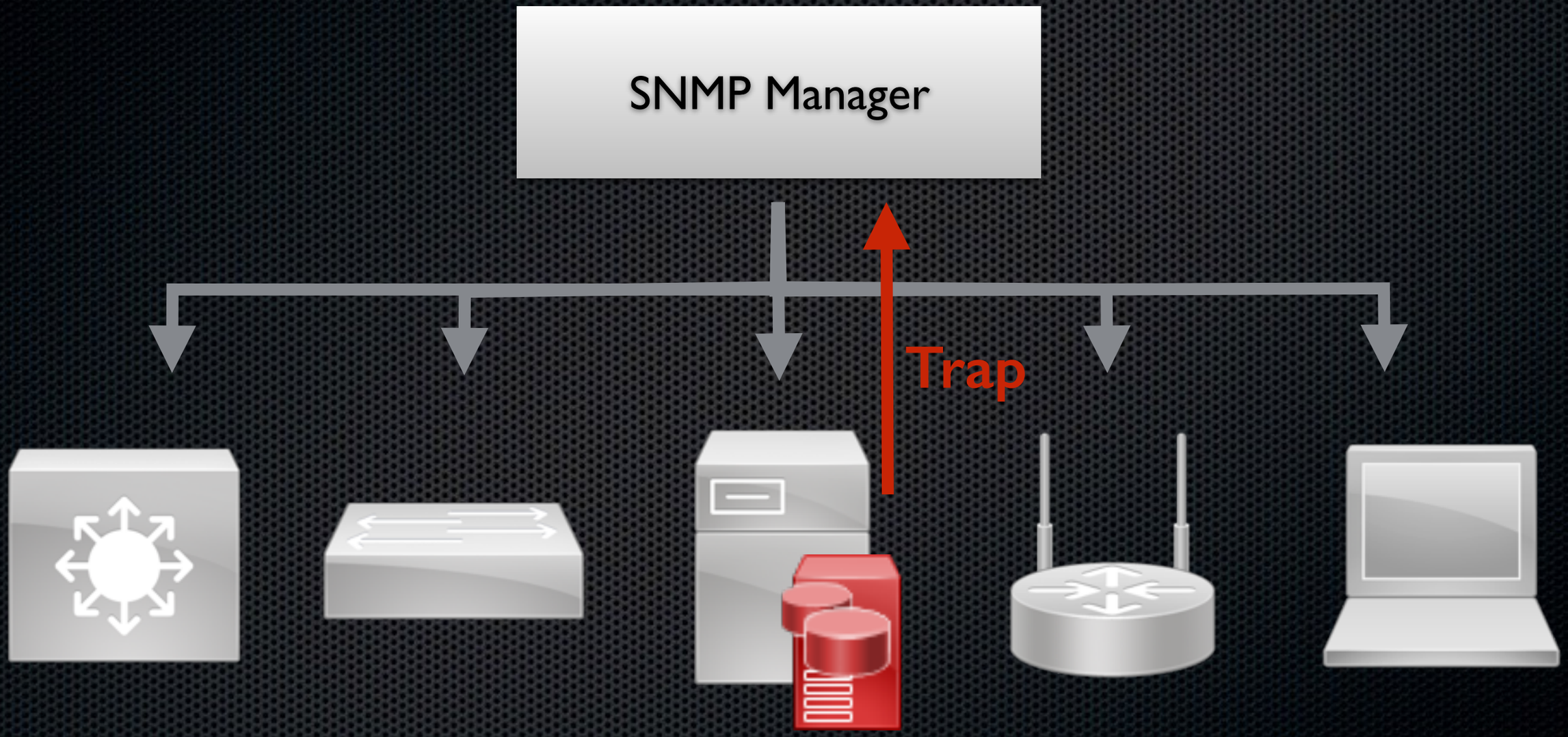
```
sudo snmpwalk -v 2c -c public -On
10.0.1.1 .1.3.6.1.2.1.1.1

.1.3.6.1.2.1.1.1.0 = STRING: Apple
AirPort – Apple Inc., 2006–2012.  All
rights Reserved.
```



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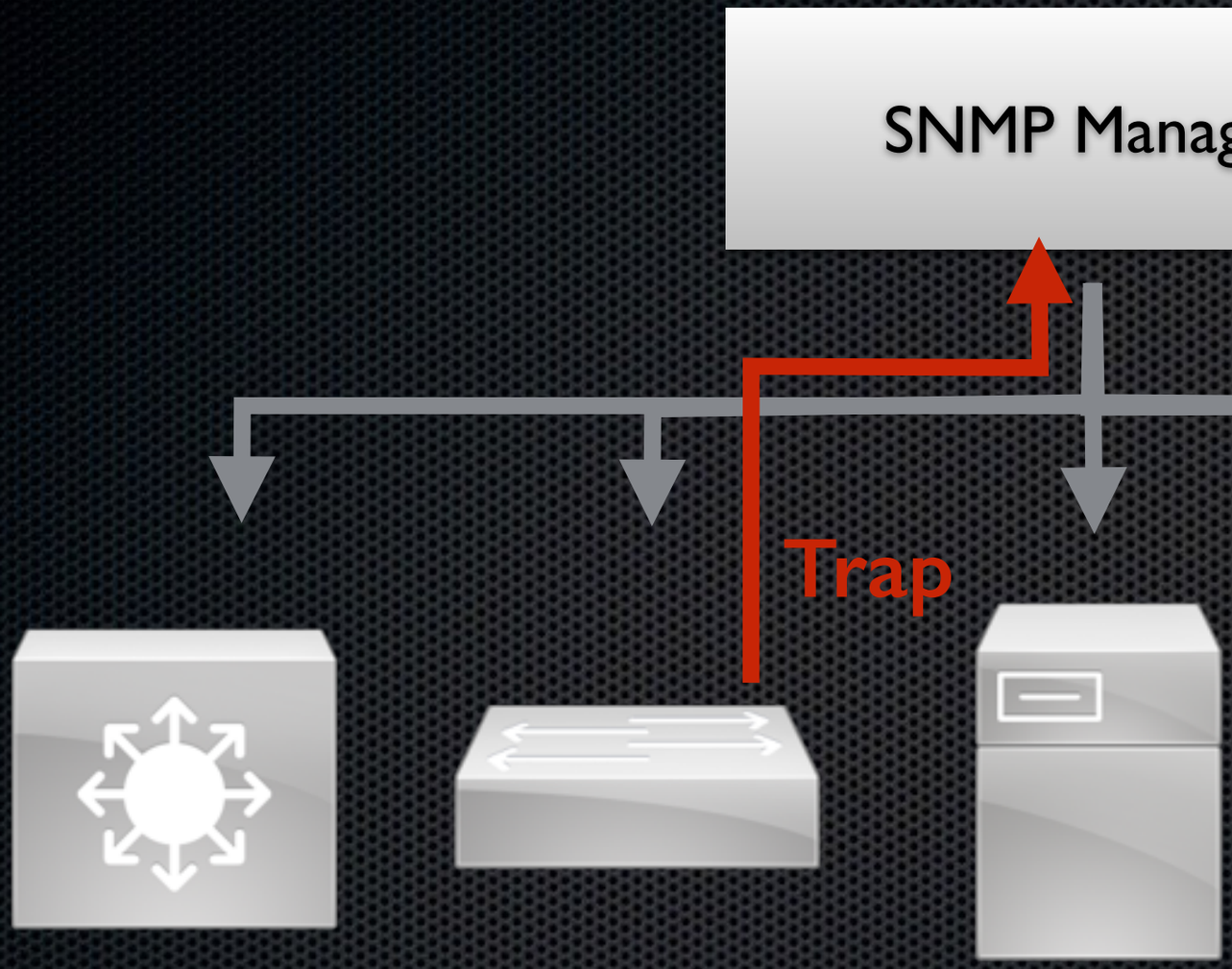
# SNMP Communication






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# SNMP Communication






# nmap

# Network Mapper



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# nmap

- Free and Open Sourced
- Network Discovery
- Security Auditing
- Rapidly Scans
  - Large Network
  - Single Host
- Download from nmap.org

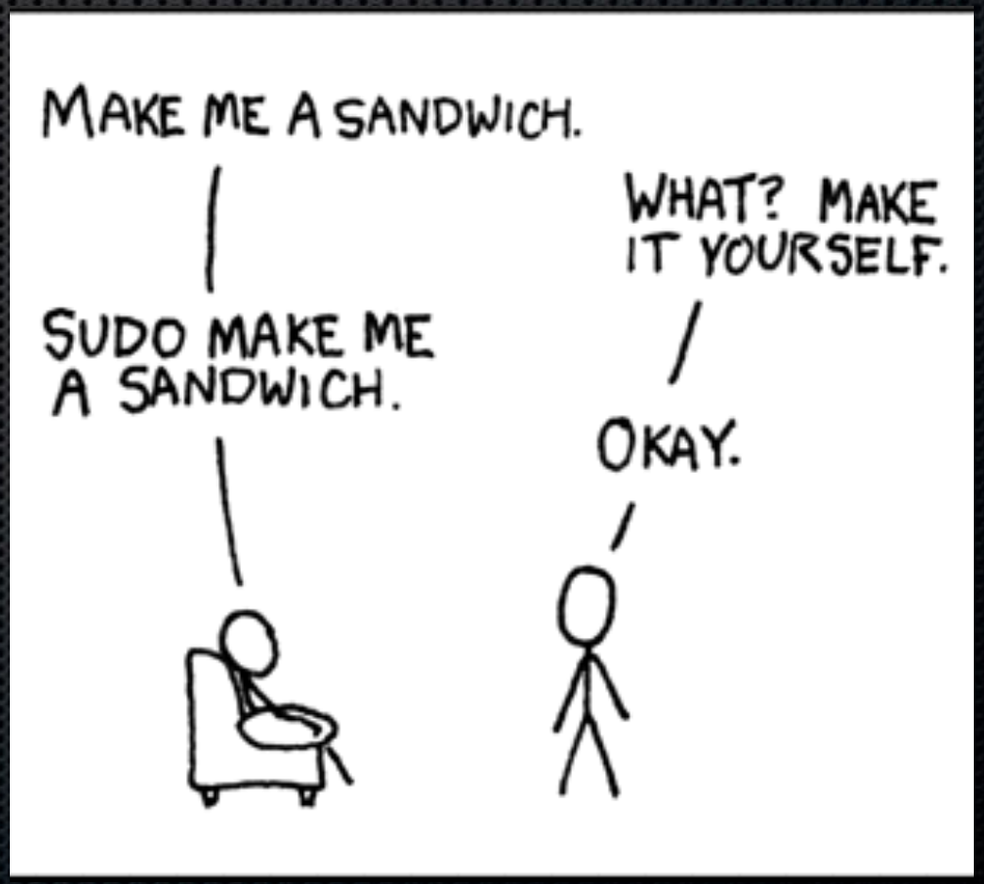
# nmap Data Collection

- Available Hosts
- Services Offered
  - Application Name
  - Version
- Operating System
- Packet Filter & Firewall Definition

# sudo nmap

Calling nmap

```
sudo nmap [commands]
```






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# nmap --iflist

Pull routing table

```
Starting Nmap 7.01 ( https://nmap.org ) at 2016-03-13 11:04 PDT
**********************INTERFACES**********************
DEV    (SHORT)   IP/MASK              TYPE        UP   MTU   MAC
lo0    (lo0)     127.0.0.1/8          loopback    up   16384
...

**************************ROUTES**************************
DST/MASK            DEV   METRIC GATEWAY
10.0.1.1/32         en1   0
162.222.40.209/32   en1   0      10.0.1.1


Similar to  ping 255.255.255.255; arp -a
```

# nmap [fqdn|ip]

Shows ports, states, services (for the ports)
and a MAC address for each IP being scanned

```
Starting Nmap 7.01 ( https://nmap.org ) at 2016-03-13 12:14 PDT
Nmap scan report for apple.com (17.172.224.47)
Host is up (0.19s latency).
Other addresses for apple.com (not scanned): 17.178.96.59
17.142.160.59
Not shown: 995 filtered ports
PORT     STATE SERVICE
21/tcp   open  ftp
80/tcp   open  http
443/tcp  open  https
554/tcp  open  rtsp
7070/tcp open  realserver

Nmap done: 1 IP address (1 host up) scanned in 28.11 seconds
```

scan a subnet

```
nmap 192.168.0.*
nmap 192.168.0.1/24
```

scan a range

```
nmap 192.168.0.1-20
```

exclude an IP

```
nmap 192.168.0.1-20 --exclude 192.168.0.10
```

a few hosts within that range

```
nmap 192.168.210.1,10,254
```

# nmap ports

- Default Scans All Ports
- Specify port(s) with -p
  - T: for only TCP
  - U: for only UDP
  - Neither for both
- Range, Individual, etc.
- `nmap -p 22-25,80,110,143,443`



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# nmap -A [fqdn]

## Operating System Detection

```
...
Warning: OSScan results may be unreliable because we could not
find at least 1 open and 1 closed port
Device type: WAP|storage-misc
Running: Apple embedded
...
```



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# nmap -v -O --osscan-guess

## True Operating System Detection

```
...
Warning: OSScan results may be unreliable because we could not
find at least 1 open and 1 closed port
Device type: WAP|storage-misc
Running: Apple embedded, Peplink embedded
...
```



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# nmap --dns-servers 8.8.8.8

## Overide System DNS

```
...
Nmap scan report for yahoo.com (206.190.36.45)
Host is up (0.073s latency).
Other addresses for yahoo.com (not scanned): 98.138.253.109
98.139.183.24 2001:4998:58:c02::a9 2001:4998:c:a06::2:4008
2001:4998:44:204::a7
rDNS record for 206.190.36.45: ir1.fp.vip.gq1.yahoo.com
Not shown: 995 filtered ports
...
```

# Firewall Detection/Evasion

- Firewalls can make mapping difficult
  - intrusion detection systems (IDS)
  - intrusion *prevention* systems (IPS)



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# nmap -sA [fqdn]

## Firewall Detection

```
Nmap scan report for www.apple.com (23.4.129.93)
Host is up (0.025s latency).
Other addresses for www.apple.com (not scanned): 2001:418:142b:
280::1aca 2001:418:142b:298::1aca
rDNS record for 23.4.129.93:
a23-4-129-93.deploy.static.akamaitechnologies.com
Not shown: 997 filtered ports
PORT     STATE      SERVICE
21/tcp   unfiltered ftp
554/tcp  unfiltered rtsp
7070/tcp unfiltered realserver
```

# nmap -PN [fqdn]

## Firewall Detection

```
Nmap scan report for www.apple.com (23.200.94.74)
Host is up (0.055s latency).
Other addresses for www.apple.com (not scanned):
2001:428:7000:49a::1aca 2001:428:7000:486::1aca
rDNS record for 23.200.94.74:
a23-200-94-74.deploy.static.akamaitechnologies.com
Not shown: 995 filtered ports
PORT     STATE SERVICE
21/tcp   open  ftp
80/tcp   open  http
443/tcp  open  https
554/tcp  open  rtsp
7070/tcp open  realserver
```

See if some devices are up even if behind a firewall

```
nmap -sP 192.168.210.10-20
```

Run a scan using SYN and ACK scans

```
nmap -PS 443 www.apple.com
nmap -PA 443 www.apple.com
```

determine port state

```
nmap -reason www.apple.com
```

Show all sent/received packets

```
nmap -packet-trace www.apple.com
```

determine version of software of remote ports from header

```
nmap -sV www.apple.com
```

# nmap Security Scanning

- Test Attacking Your Server (white hat)
- Port Scanning
  - Are Available Ports Expected?
  - Are Filters Working?
  - Survive Brute Force attack?

# nmap -v -sT ––spoof-mac 0 fqdn

## Spoof a MAC Address

```
Spoofing MAC address 71:8A:97:9B:FA:A2 (No registered vendor)
Initiating Ping Scan at 15:14
Scanning www.apple.com (104.66.211.3) [4 ports]
Completed Ping Scan at 15:14, 3.02s elapsed (1 total hosts)
Nmap scan report for www.apple.com (104.66.211.3) [host down]
Other addresses for www.apple.com (not scanned):
2001:428:7000:486::1aca 2001:428:7000:49a::1aca
Read data files from: /usr/local/bin/../share/nmap
Note: Host seems down. If it is really up, but blocking our ping
probes, try -Pn
Nmap done: 1 IP address (0 hosts up) scanned in 3.18 seconds
           Raw packets sent: 8 (304B) | Rcvd: 0 (0B)
```



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# nmap -v -sT -Pn --spoof-mac 0 fqdn

## Spoof a MAC Address, No Ping

```
Spoofing MAC address 63:E2:89:88:1E:AB (No registered vendor)
Initiating Parallel DNS resolution of 1 host. at 15:15
Completed Parallel DNS resolution of 1 host. at 15:15, 0.03s
elapsed
Initiating Connect Scan at 15:15
Scanning www.apple.com (104.66.211.3) [1000 ports]
Discovered open port 21/tcp on 104.66.211.3
Discovered open port 554/tcp on 104.66.211.3
Discovered open port 443/tcp on 104.66.211.3
Discovered open port 80/tcp on 104.66.211.3
Discovered open port 7070/tcp on 104.66.211.3
Completed Connect Scan at 15:16, 10.47s elapsed (1000 total
ports)
Nmap scan report for www.apple.com (104.66.211.3)
```

Use decoys to avoid scan detection

```
nmap -n -D 10.0.1.10,10.0.1.54,10.0.1.210
```

SYN-Flood Attack

```
nmap -sX www.apple.com
```

Use a custom MTU (Maximum Transmission Unit)

```
nmap –mtu 64 www.apple.com
```

Use fragment packets for TCP header

```
nmap -f www.apple.com
```



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# ZenMap



- GUI for nmap
- Build nmap commands
- Topology Map
- Requires X11 (XQuartz)
- ZenMap Included with nmap installer

# ZenMap



Zenmap

Scan Tools Profile Help

Target: www.apple.com | Profile: Intense scan | Scan | Cancel

Command: nmap -T4 -A -v www.apple.com

Hosts | Services

OS | Host

10.0.1.1

www.apple.com (

Nmap Output | Ports / Hosts | Topology | Host Details | Scans

nmap -T4 -A -v www.apple.com | Details

```
Retrying OS detection (try #2) against www.apple.com (23.4.129.93)
Initiating Traceroute at 16:42
Completed Traceroute at 16:42, 0.02s elapsed
NSE: Script scanning 23.4.129.93.
Initiating NSE at 16:42
Completed NSE at 16:43, 32.00s elapsed
Initiating NSE at 16:43
Completed NSE at 16:43, 0.00s elapsed
Nmap scan report for www.apple.com (23.4.129.93)
Host is up (0.019s latency).
Other addresses for www.apple.com (not scanned): 2001:428:7000:486::1aca
2001:428:7000:49a::1aca
rDNS record for 23.4.129.93: a23-4-129-93.deploy.static.akamaitechnologies.com
Not shown: 995 filtered ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp?
| ftp-bounce: no banner
80/tcp   open  http        AkamaiGHost (Akamai's HTTP Acceleration/Mirror service)
| http-favicon: Unknown favicon MD5: 28EC4EABA5AE210B98A11257CAF5BADE
| http-methods:
|   Supported Methods: GET HEAD POST OPTIONS
| http-robots.txt: 180 disallowed entries (15 shown)
| /*/includes/* /*/retail/availability*
| /*/retail/availabilitySearch* /*/retail/pickupEligibility* /*/search/*
| /*/shop/signed_in_account* /*/shop/sign_in* /*/shop/sign_out*
| /*/shop/*WebObjects/* /*/shop/1-800-MY-APPLE/* /*/shop/answer/vote*
| /*/shop/bag* /*/shop/browse/campaigns/mobile_overlay*
| /*/shop/button_availability* /*/shop/favorites*
| http-server-header:
|   AkamaiGHost
|   Apache
| http-title: Apple
443/tcp  open  ssl/http    AkamaiGHost (Akamai's HTTP Acceleration/Mirror service)
| http-favicon: Unknown favicon MD5: 28EC4EABA5AE210B98A11257CAF5BADE
| http-methods:
|   Supported Methods: GET HEAD POST OPTIONS
```

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# ZenMap



Zenmap

Scan Tools Profile Help

Target: www.apple.com Profile: Intense scan Scan Cancel

Command: nmap -T4 -A -v www.apple.com

Hosts Services

| OS | Host |
|---|---|
| | 10.0.1.1 |
| | www.apple.com ( |

Nmap Output Ports / Hosts Topology Host Details Scans

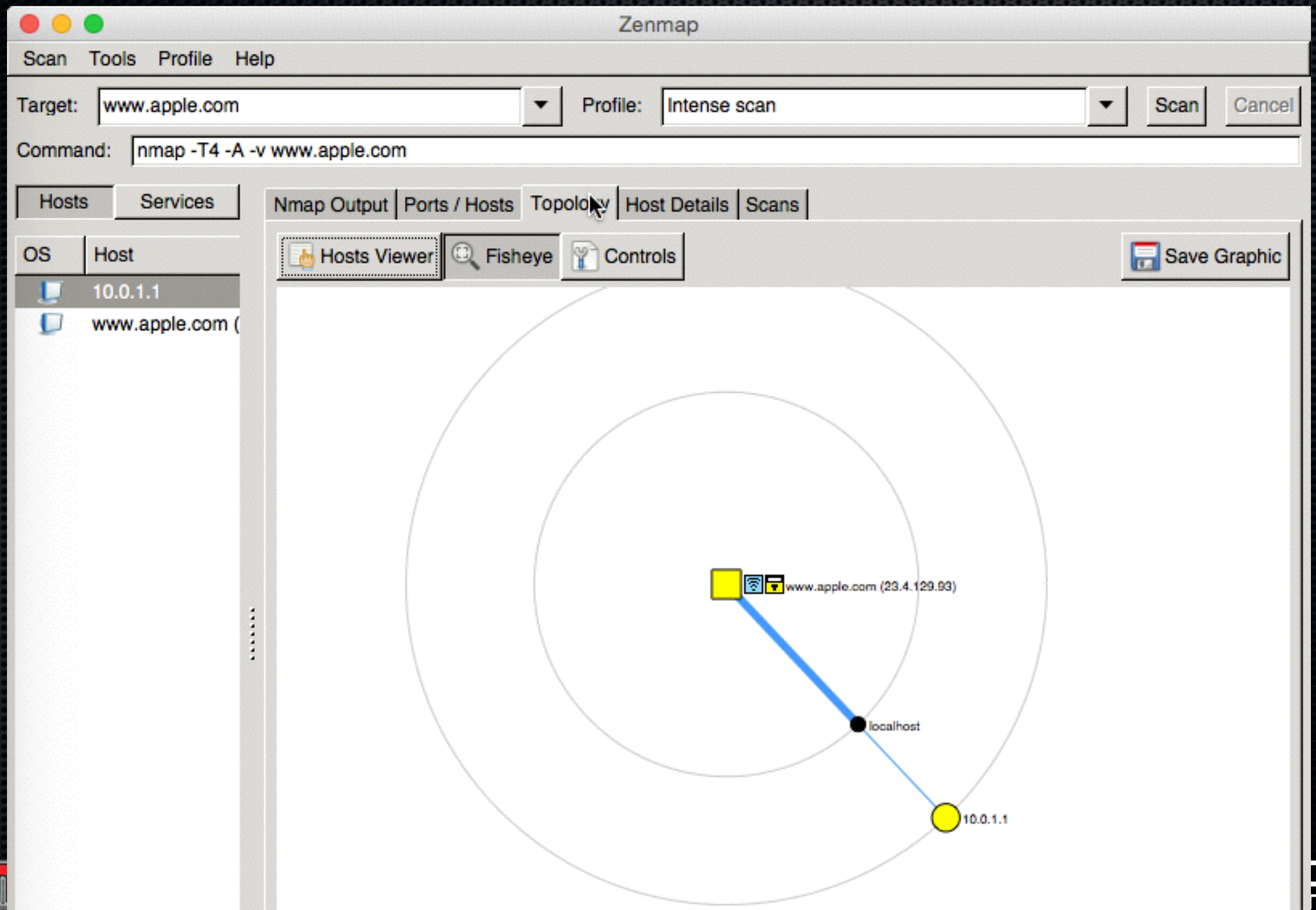
| | Port | Protocol | State | Service | Version |
|---|---|---|---|---|---|
| | 53 | tcp | open | domain | |
| | 5000 | tcp | open | rtsp | Apple AirTunes rtspd 105.1 (Apple TV) |
| | 5009 | tcp | open | airport-admin | Apple AirPort or Time Capsule admin |
| | 10000 | tcp | open | snet-sensor-mgmt | |

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# ZenMap





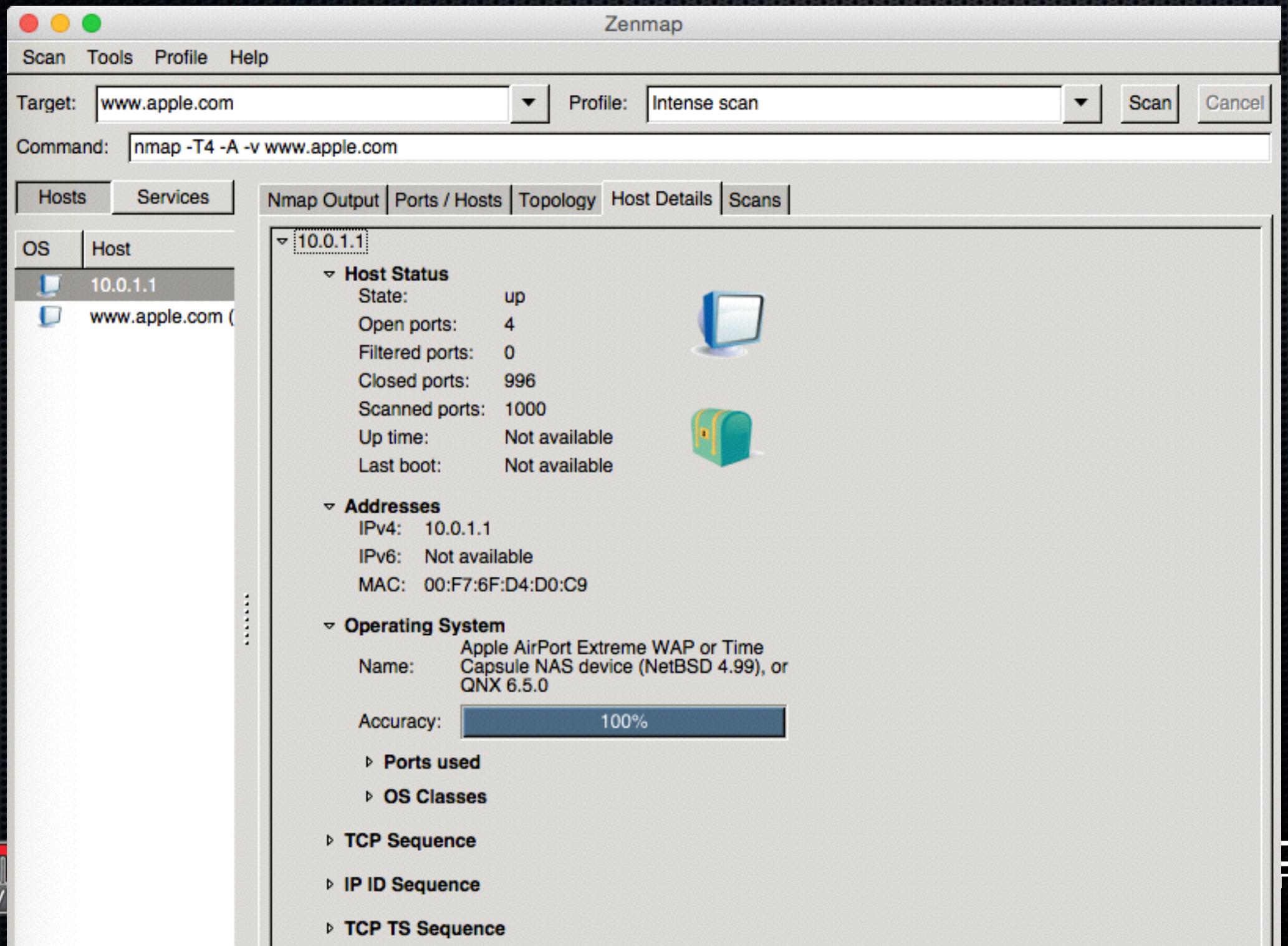


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# ZenMap







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# Fing



- (D)iscover
- (S)can
- (F)ingbox
- (P)ing
- display (I)nfos
- (Free)

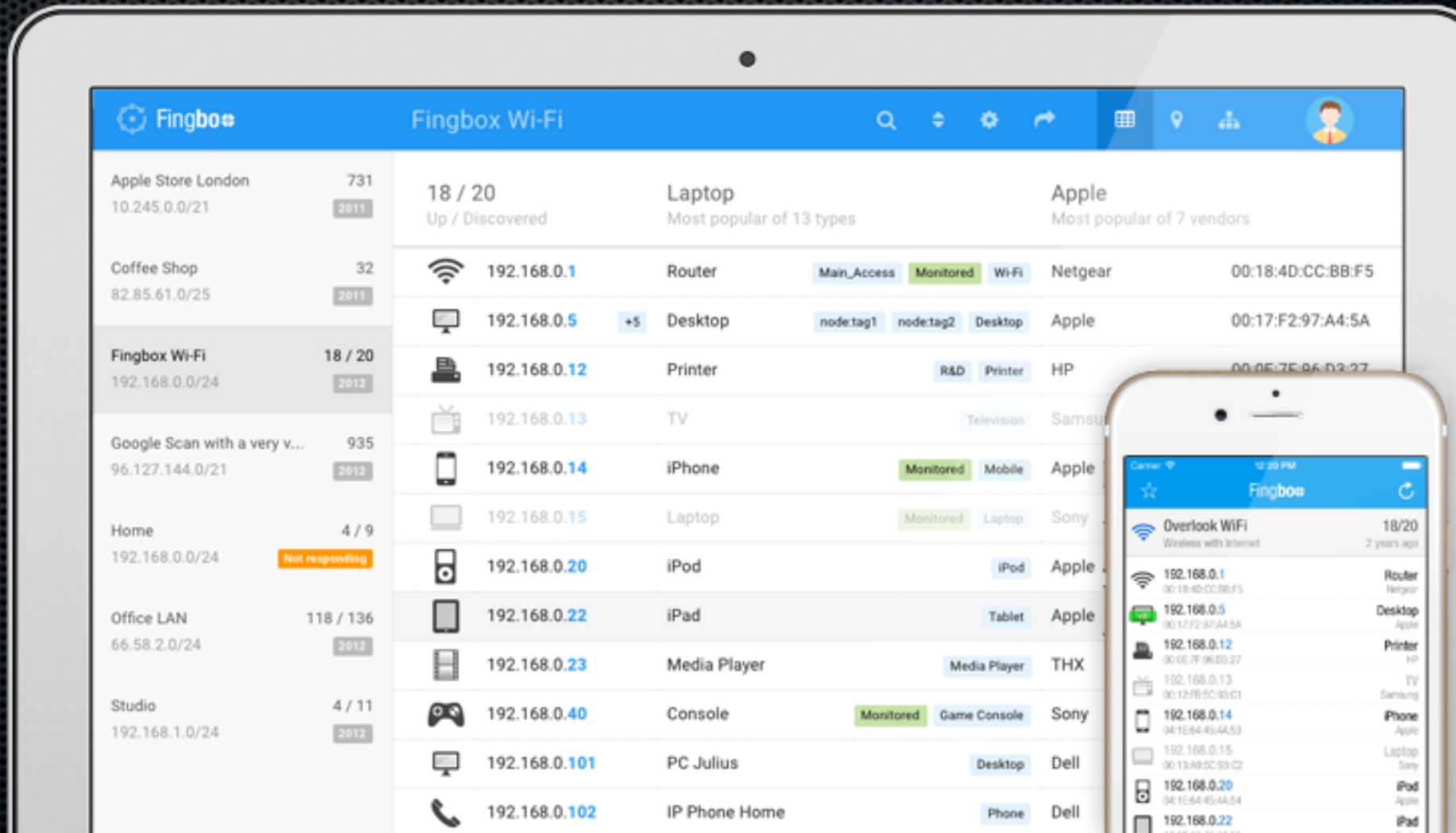
```
-------------------------------------------------------------
| 2016/03/14 22:50:19 overlook fing discovery re
|-----------------------------------------------------------
| State | Host         | MAC Address
|-----------------------------------------------------------
|  UP   | 10.0.2.1     | 50:3D:E5:83:61:3F (Cisco)
|  UP   | 10.0.2.8     | F4:CE:46:3E:BB:AB (HP)
|  UP   | 10.0.2.11    | 00:1E:8F:2E:DE:A6 (CANON)
|  UP   | 10.0.2.13    | F4:CE:46:3F:18:A6 (HP)
|  UP   | 10.0.2.16    | 00:80:87:C2:53:49 (OKI EL
-------------------------------------------------------------
| Scan result for 10.0.2.69 (00:11:32:4A:4A:DB)
|-----------------------------------------------------------
|  Port | Service           | Description
|-----------------------------------------------------------
|    80 | http              | World Wide Web HTTP
|   139 | netbios-ssn       | NETBIOS Session Serv
|   161 | snmp              |
|   445 | microsoft-ds      | SMB directly over IP
|   515 | printer           | spooler (lpd)
|   548 | afp               | AFP over TCP
```



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# FingBox

- Cloud-based GUI for fing
- Central Administration for multiple Networks




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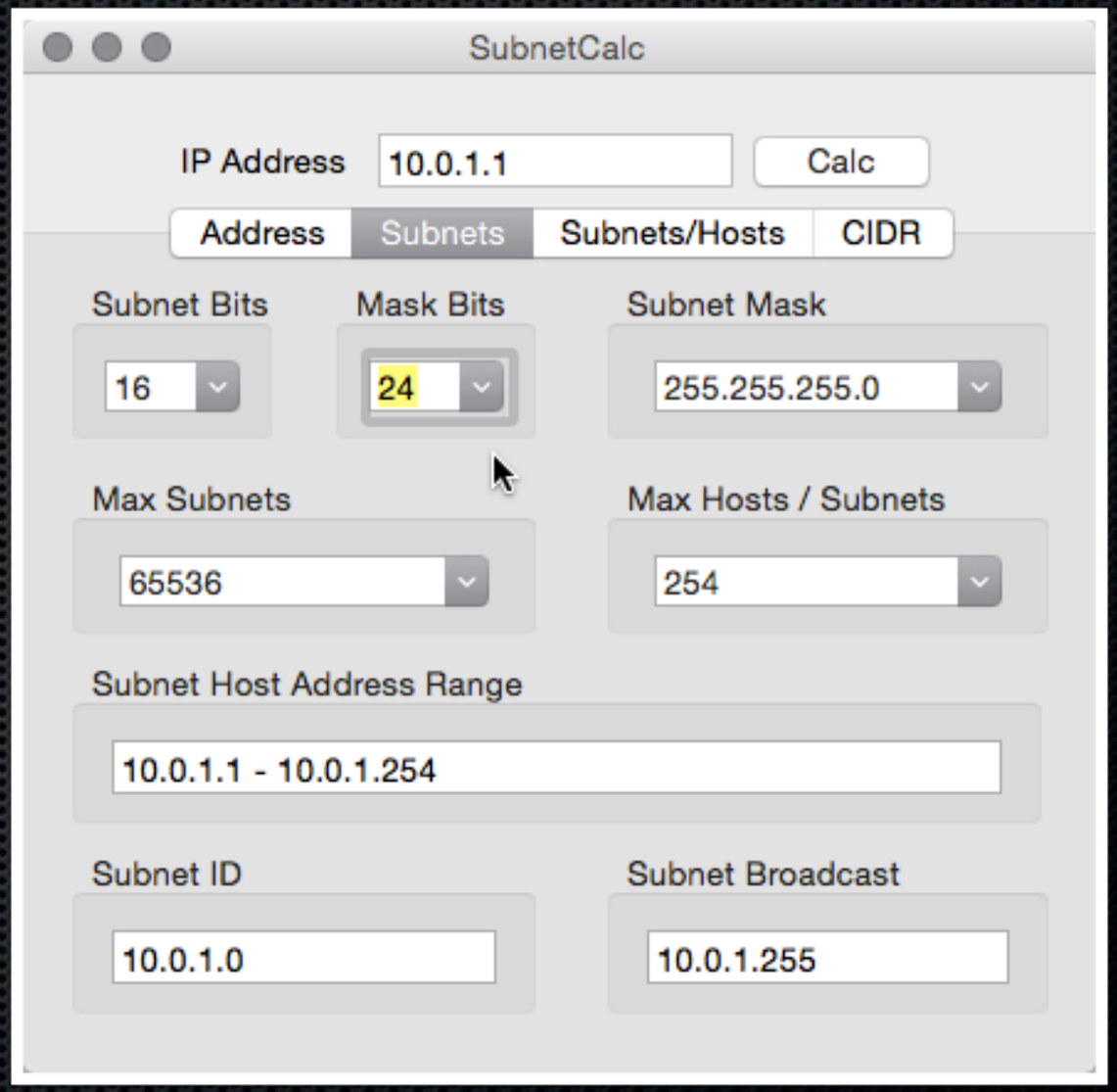
# SNMP Managers

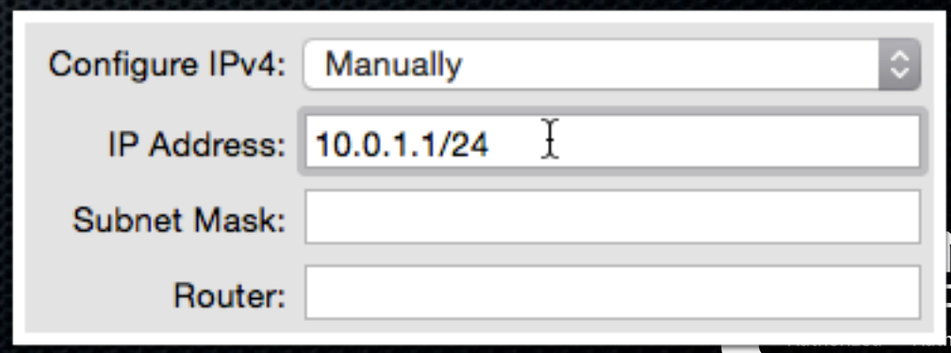
- Cacti
- OiDVIEW
- Manage Engine
- Nagios
- Zenoss
- InterMapper
- OpenNMS
- Observium
- MRTG - Multi Router Traffic Grapher

# Tools - Subnet Calclulator

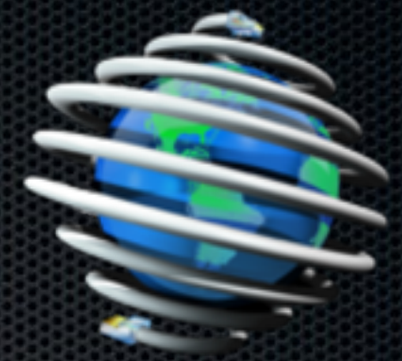



- SubnetCalc or SubnetMask.info
  - Endless Mask Calculations
  - See ranges, see broadcast.

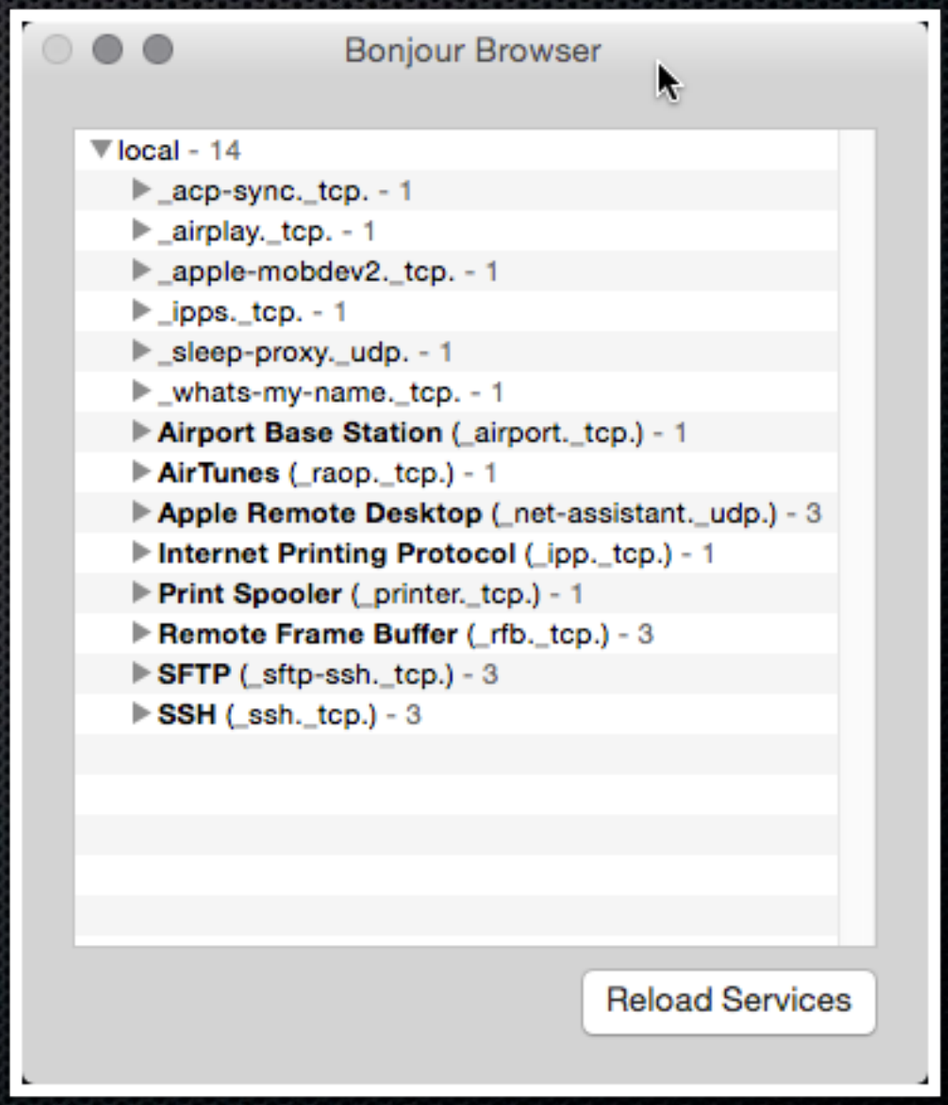


# Bonjour Browser



- Effortlessly discovers Macs and recent printers on your LAN.
- Displays great information for locating devices.
- Bring your copy & paste!



# Resources

- CMAP - construct, navigate, share concept maps
- WiFi Explorer
- AngryIP Scanner



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# More Resources

- Enabling SNMPv3 on OS X Server
- krypted: Configure SNMP
- Monitoring OS X Servers with Observium
- SNMP Test Utility
- NetUse Traffic Monitor
- PeakHour

# Questions?



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