Wi-Fi Direct to Hell

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Whoami

Interests and expertise include network security, reverse engineering, and privacy. I enjoy playing with IEEE 802.11 security.

What?

Wi-Fi Direct specification defines the architecture and protocols to facilitate device-to-device connectivity based on the IEEE 802.11 infrastructure mode.

- Wi-Fi Direct can be use by an attacker to access a device.
- Devices supporting the protocol extends the IEEE 802.11 attack surface.

Why?

- There are several vendors that have implemented the protocol in an insecure way.

Wi-Fi Alliance

- WPS (Wi-Fi Protected Setup)
- Wi-Fi Display
- Wi-Fi Direct
- Hotspot 2.0

Wi-Fi Direct

2010 2011 2012 2013 2014 2015 2016 2017

First public release of the technical specification

https://www.wi-fi.org/discover-wi-fi/wi-fi-direct

Wi-Fi Direct

2010 2011 2012 2013 2014 2015 2016 2017

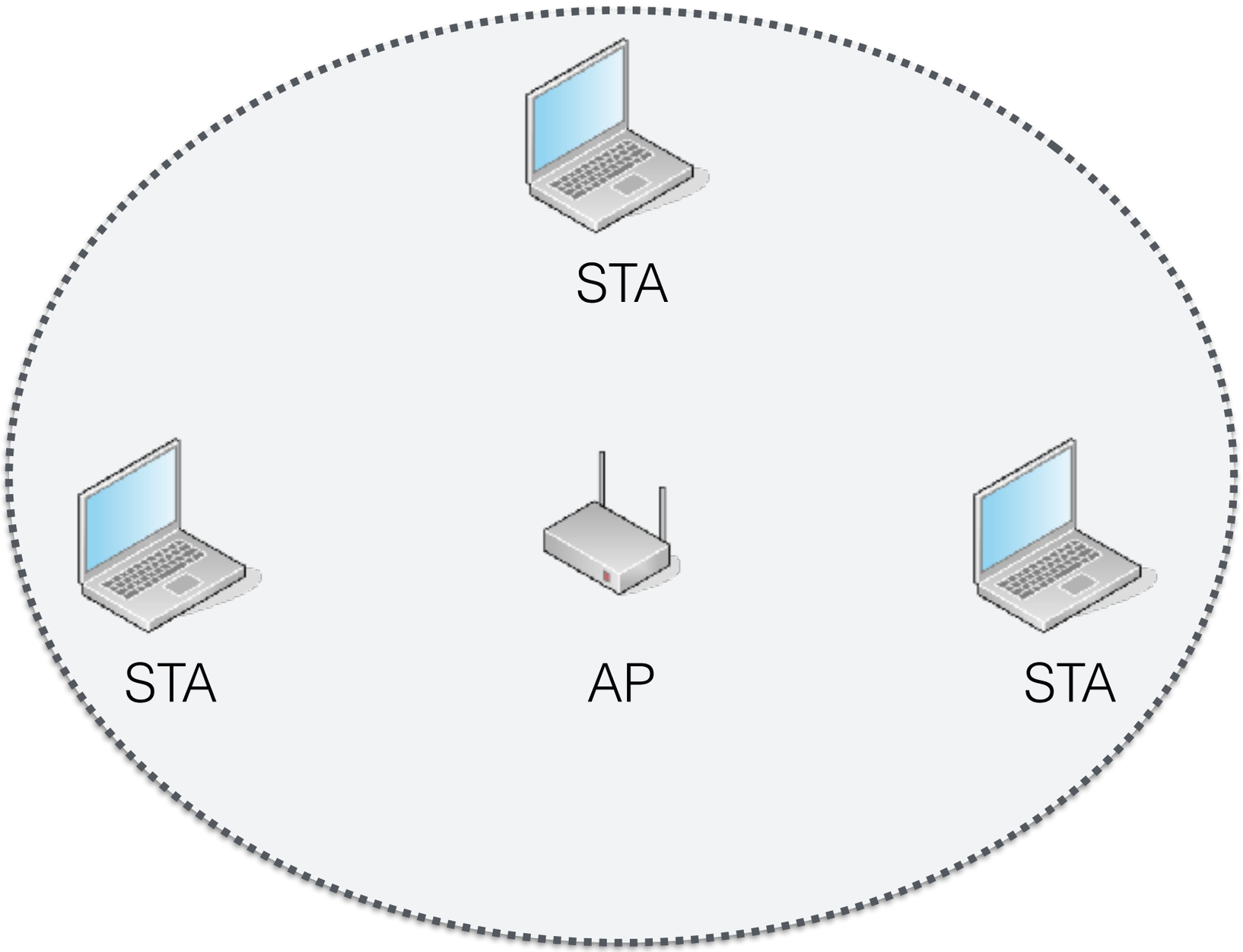
13280 Wi-Fi Direct certified products

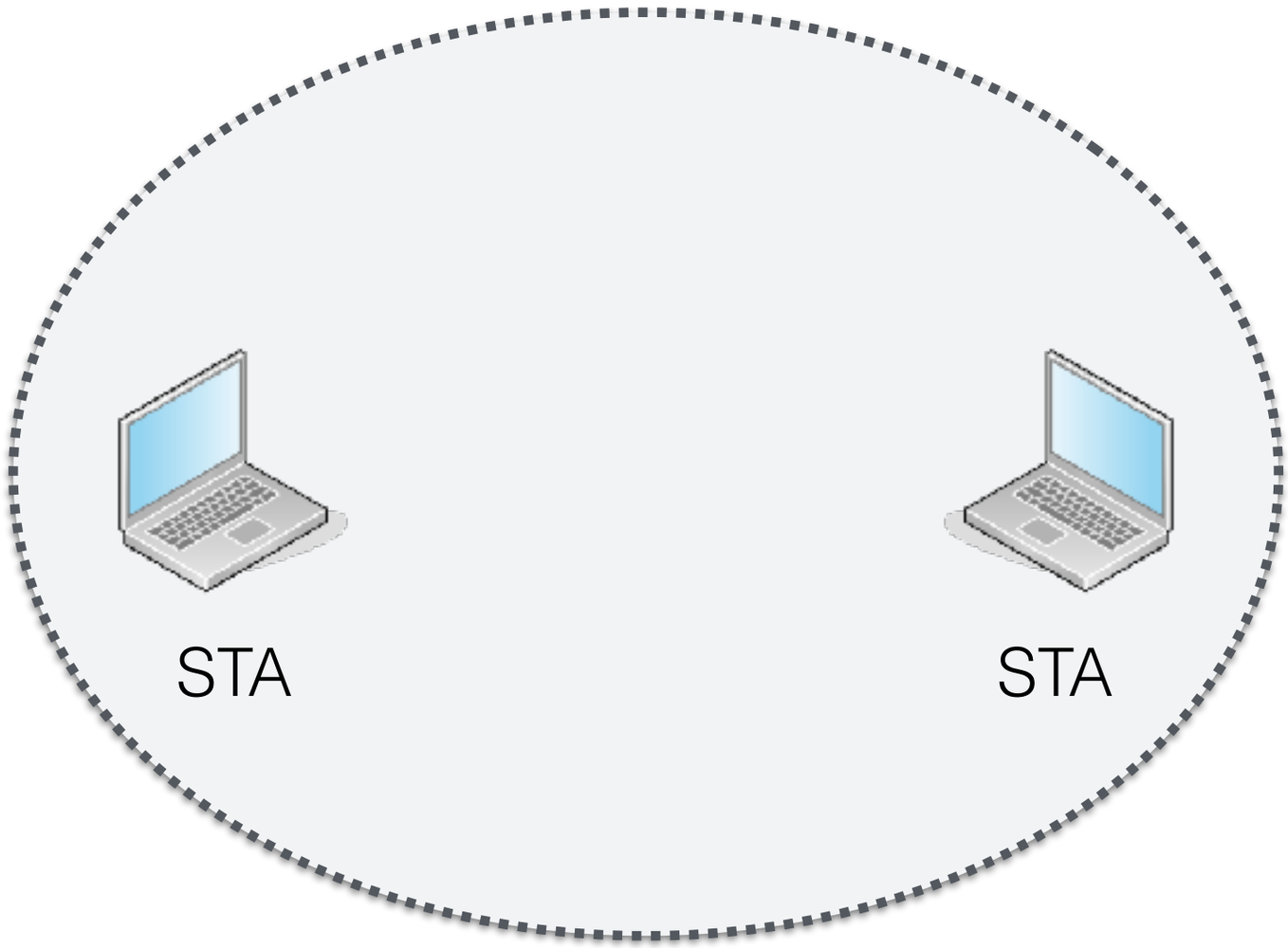
https://www.wi-fi.org/discover-wi-fi/wi-fi-direct

Wi-Fi Direct

- P2P Discovery
- P2P Group Operations
- P2P Legacy Support

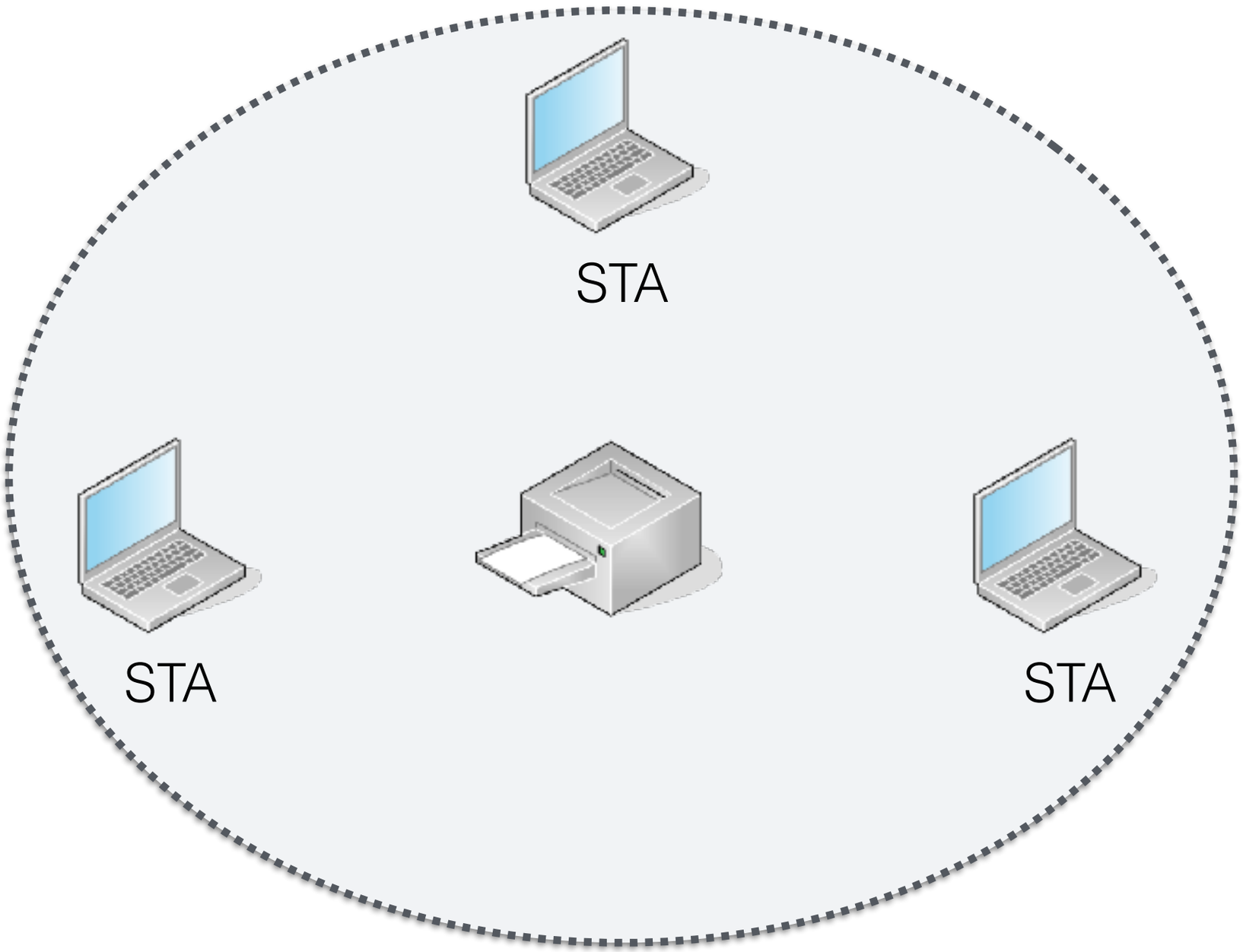
Infrastructure Mode



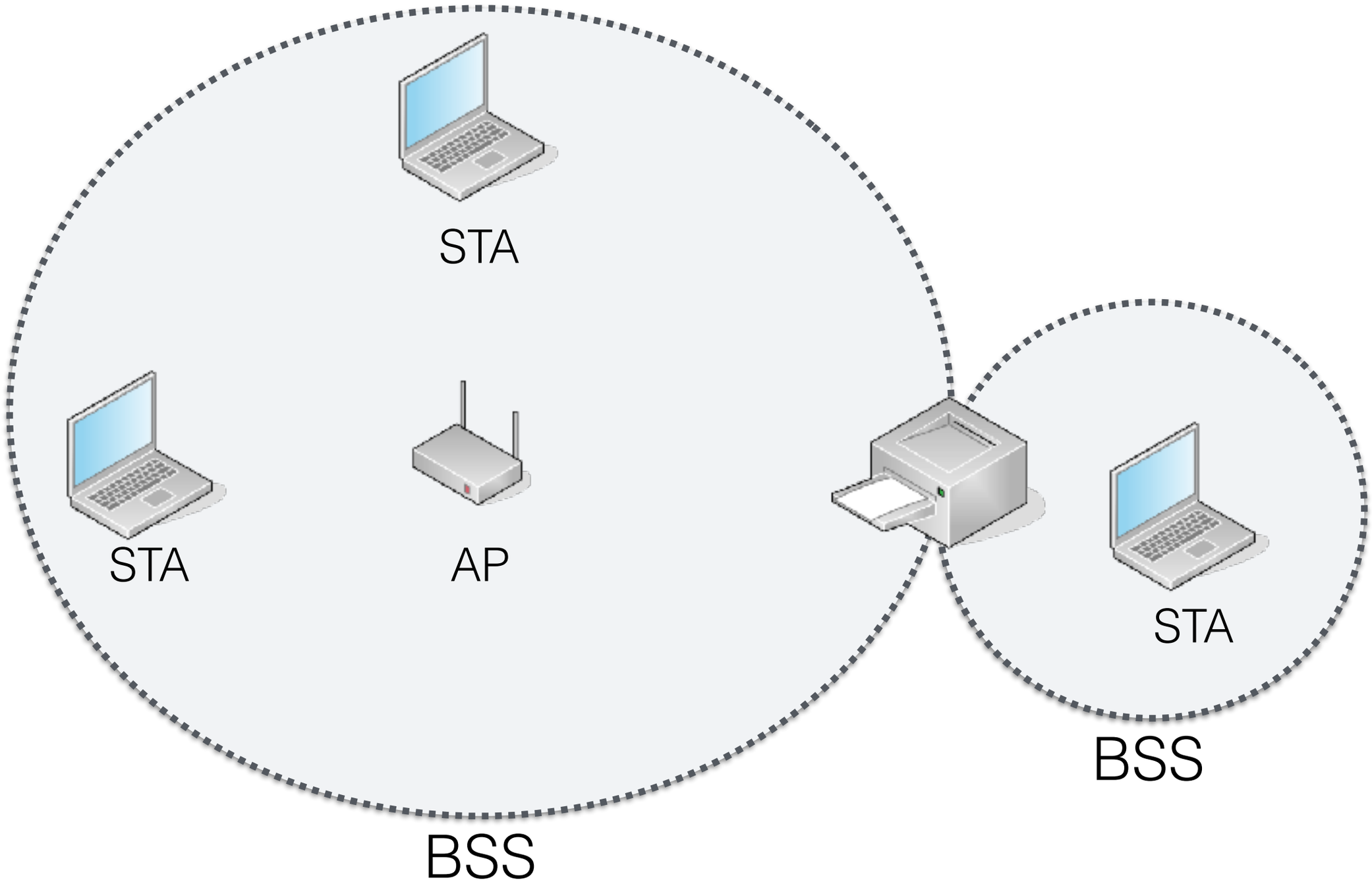


Ad Hoc Mode

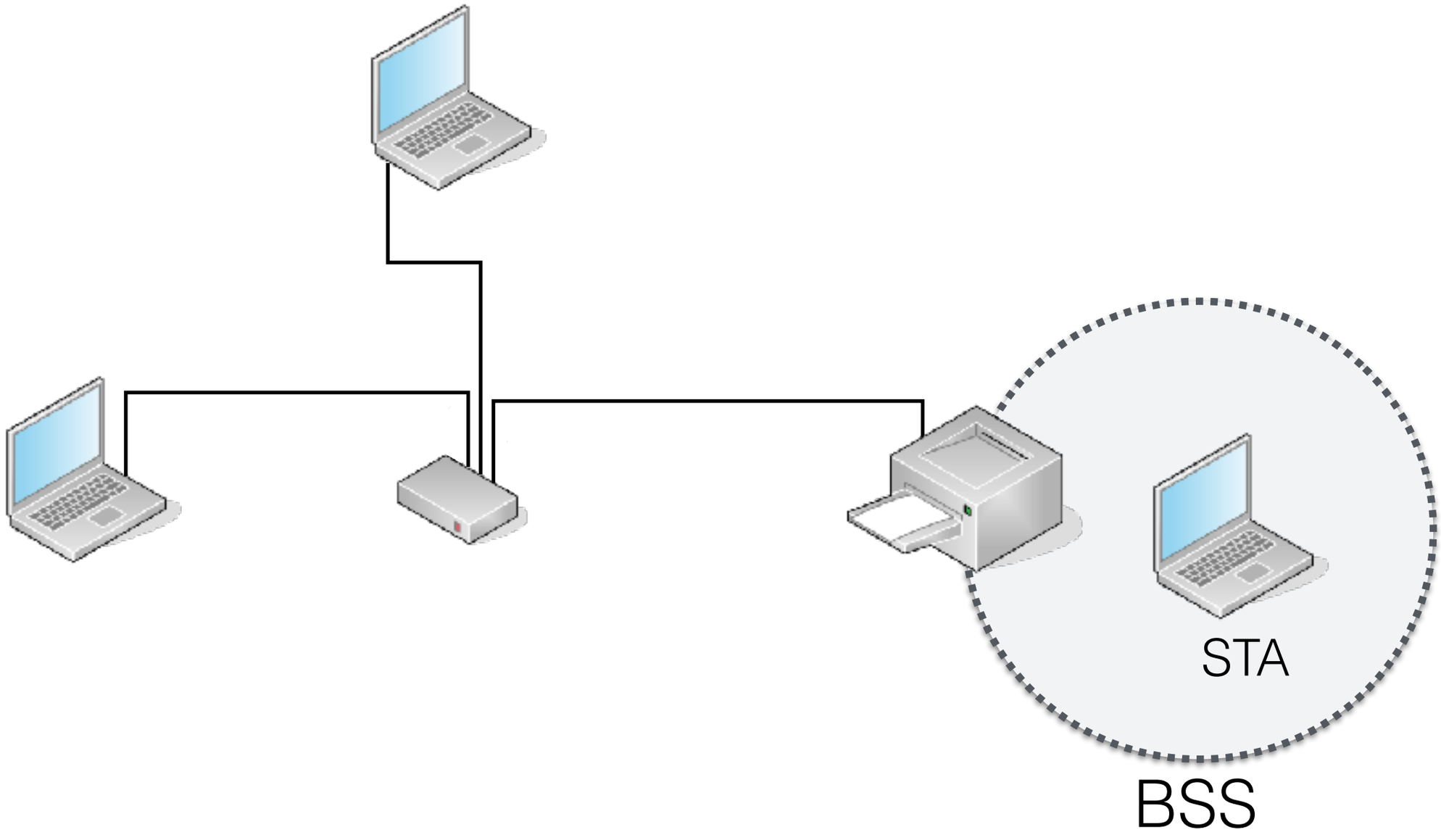
Wi-Fi Direct



Wi-Fi Direct



Wi-Fi Direct

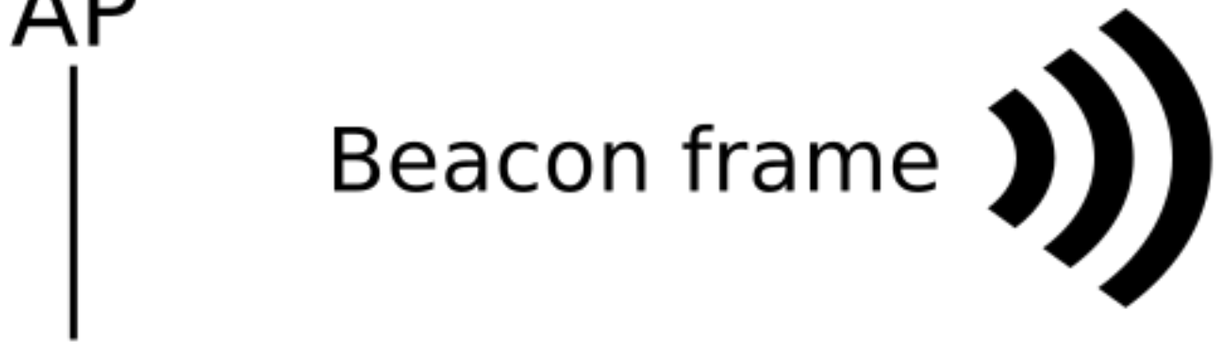


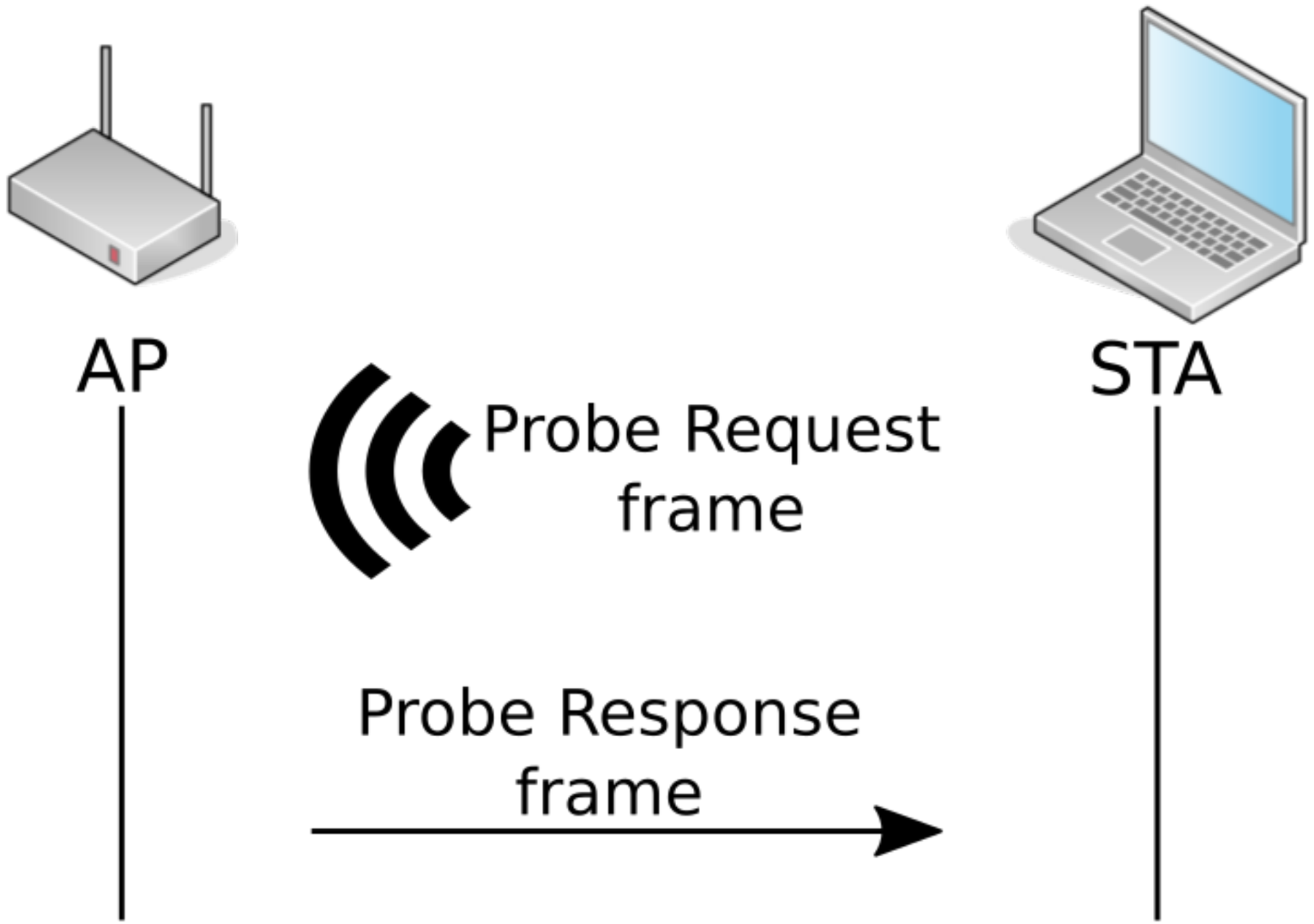
802.11 Discovery

AP

STA

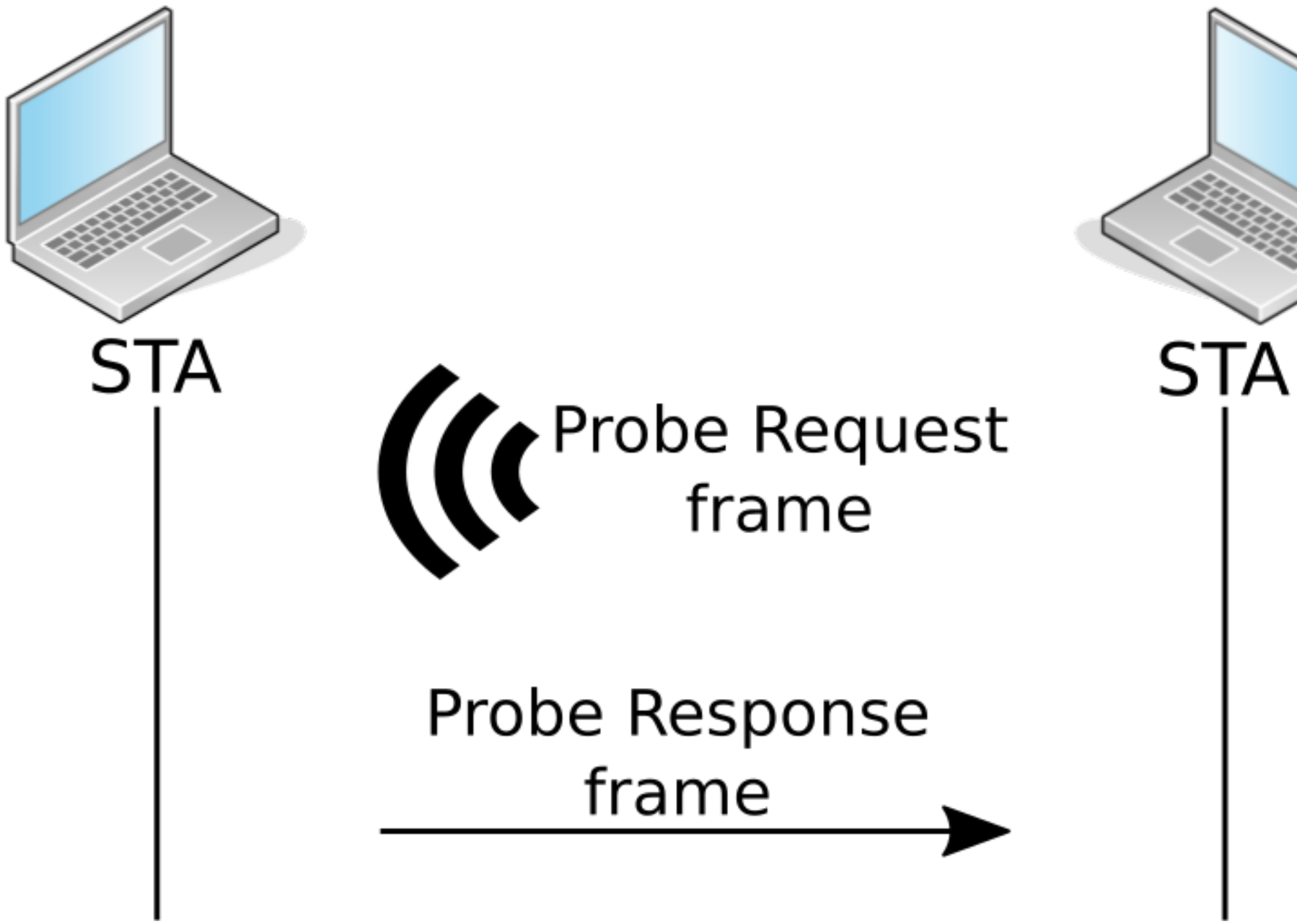
Beacon frame





802.11 Discovery

P2P Discovery



```
▶ Radiotap Header v0, Length 36
▶ 802.11 radio information
▼ IEEE 802.11 Probe Request, Flags: ........C
    Type/Subtype: Probe Request (0x0004)
  ▶ Frame Control Field: 0x4000
    .000 0000 0000 0000 = Duration: 0 microseconds
    Receiver address: ff:ff:ff:ff:ff:ff
    Destination address: ff:ff:ff:ff:ff:ff
    Transmitter address: 8a:28:
    Source address: 8a:28:
    BSS Id: ff:ff:ff:ff:ff:ff
    .... .... .... 0000 = Fragment number: 0
    0011 0101 1011 .... = Sequence number: 859
    Frame check sequence: 0x272d3650 [correct]
    [FCS Status: Good]
▼ IEEE 802.11 wireless LAN management frame
  ▼ Tagged parameters (253 bytes)
    ▶ Tag: SSID parameter set: DIRECT-
    ▶ Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    ▶ Tag: DS Parameter set: Current Channel: 6
    ▶ Tag: HT Capabilities (802.11n D1.10)
    ▶ Tag: Extended Capabilities (8 octets)
    ▶ Tag: VHT Capabilities (IEEE Std 802.11ac/D3.1)
    ▶ Tag: Vendor Specific: 00:50:f2: WPS
    ▶ Tag: Vendor Specific: 50:6f:9a: P2P
```

P2P Discovery

```
▶ Radiotap Header v0, Length 36
▶ 802.11 radio information
▶ IEEE 802.11 Probe Response, Flags: ........C
▼ IEEE 802.11 wireless LAN management frame
  ▶ Fixed parameters (12 bytes)
  ▼ Tagged parameters (235 bytes)
    ▶ Tag: SSID parameter set: DIRECT-
    ▶ Tag: Supported Rates 6(B), 9, 12(B), 18, 24(B), 36, 48, 54, [Mbit/sec]
    ▶ Tag: DS Parameter set: Current Channel: 3
    ▶ Tag: Vendor Specific: 00:50:f2: WPS
    ▶ Tag: Vendor Specific: 50:6f:9a: Wi-Fi Display
    ▼ Tag: Vendor Specific: 50:6f:9a: P2P
        Tag Number: Vendor Specific (221)
        Tag length: 47
        OUI: 50-6f-9a (Wi-FiAll)
      Vendor Specific OUI Type: 9
    ▶ P2P Capability: Device 0x25  Group 0x80
    ▼ P2P Device Info
        Attribute Type: P2P Device Info (13)
        Attribute Length: 35
```

P2P Discovery

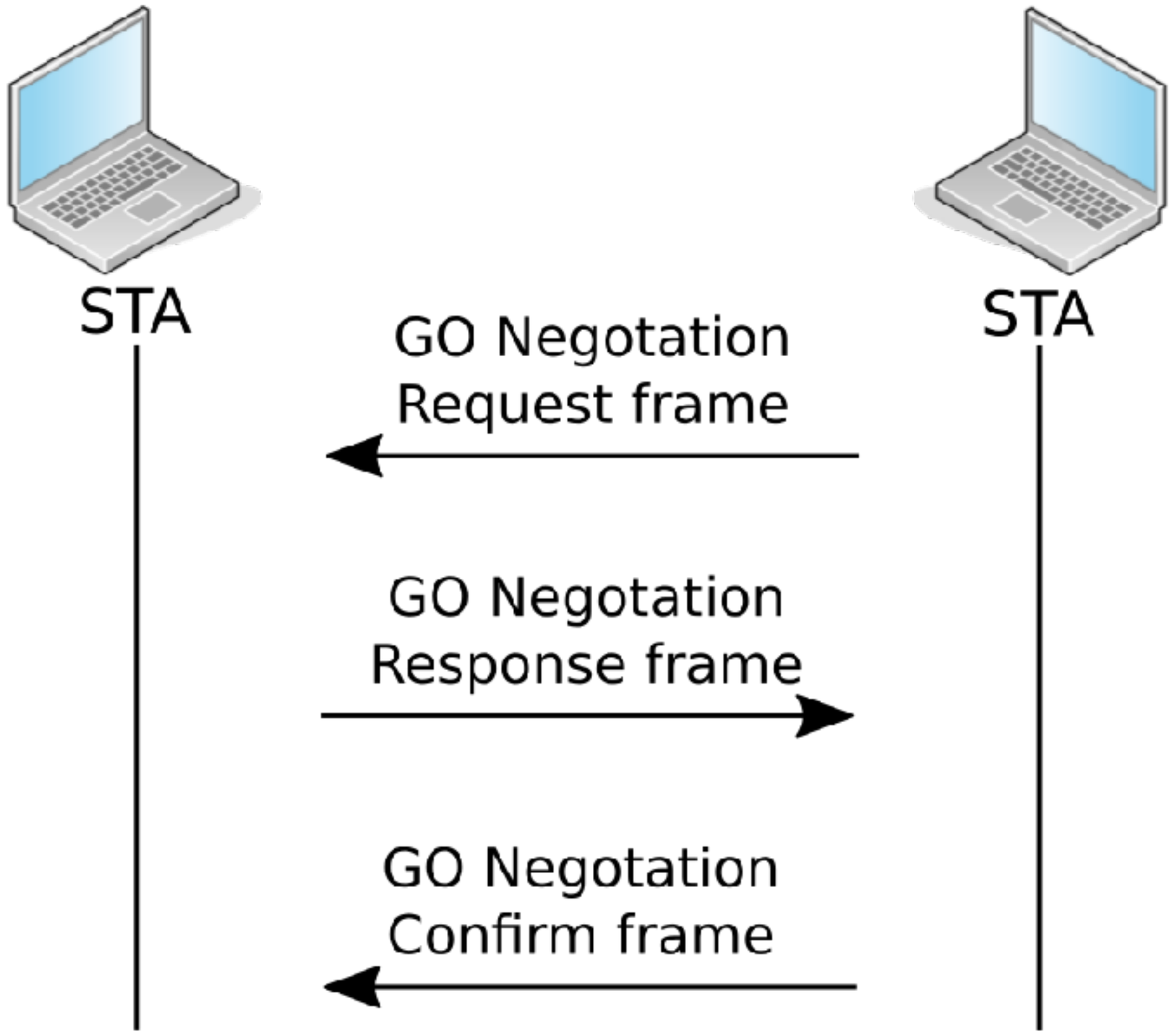
```
        Device Name attribute type: 0x1011
        Device Name attribute length: 14
        Device Name: [TV] UN32J5500
```

```
▶ Radiotap Header v0, Length 36
▶ 802.11 radio information
▶ IEEE 802.11 Action, Flags: ........C
▼ IEEE 802.11 wireless LAN management frame
  ▼ Fixed parameters
      Category code: Public Action (4)
      Public Action: GAS Initial Request (0x0a)
      Dialog token: 0x00
      Tag Number: Advertisement Protocol (108)
      Tag length: 2
```

P2P Discovery

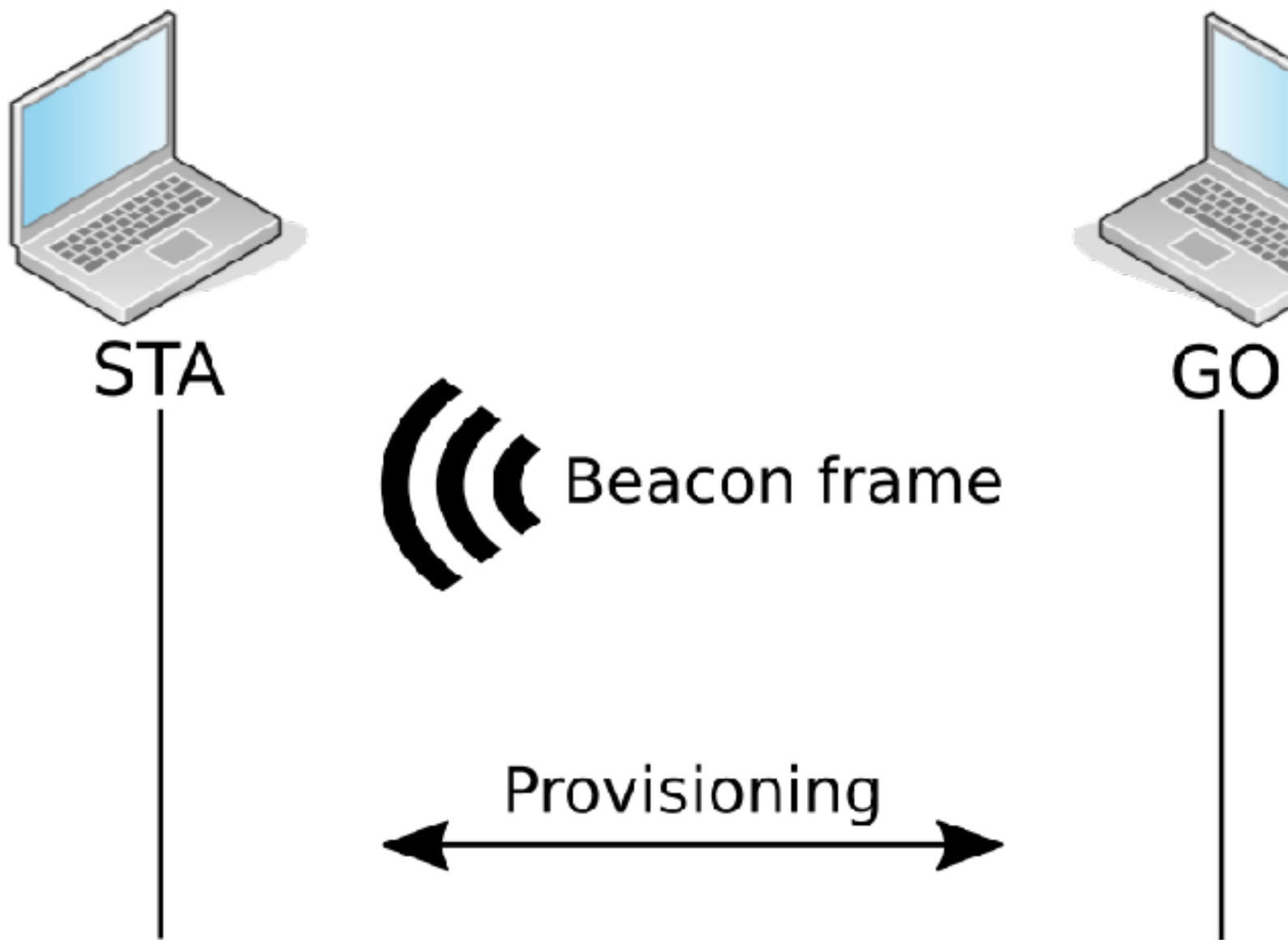
```
        OUI: 50-6f-9a (Wi-FiAll)
        ANQP WFA Subtype: P2P (9)
        Service Update Indicator: 0
      ▼ Service TLV (Transaction ID: 1  Type: UPnP)
          Length: 54
          Service Protocol Type: UPnP (2)
          Service Transaction ID: 1
          Query Data: 1075726e3a736368656d61732d75706e702d6f72673a6465...
```

```
0000  00 00 24 00 2f 40 00 a0  20 08 00 00 00 00 00 00   ..$./@.. .......
0010  8e 87 36 7c 02 00 00 00  10 0c 76 09 c0 00 ec 00   ..6|.... ..v.....
0020  00 00 ec 00 d0 00 3c 00                           ......<.
0030                                    10 c8 04 0a 00 6c   .....l
0040  02 00 00 42 00 dd dd 3e  00 50 6f 9a 09 00 00 36   ...B...> .Po....6
0050  00 02 01 10 75 72 6e 3a  73 63 68 65 6d 61 73 2d   ....urn: schemas-
0060  75 70 6e 70 2d 6f 72 67  3a 64 65 76 69 63 65 3a   upnp-org :device:
0070  49 6e 74 65 72 6e 65 74  47 61 74 65 77 61 79 44   InternetGatewayD
0080  65 76 69 63 65 3a 31 1c  f6 22 39                  evice:1. ."9
```



P2P Group Formation

P2P Group Formation



TL-WN722N

```
$ iw phy
Wiphy phy0
        max # scan SSIDs: 4
        max scan IEs length: 2257 bytes
        Retry short limit: 7
        Retry long limit: 4
        Coverage class: 0 (up to 0m)
        Device supports RSN-IBSS.
        Device supports AP-side u-APSD.
        Device supports T-DLS.
        Supported Ciphers:
                * WEP40 (00-0f-ac:1)
                * WEP104 (00-0f-ac:5)
                * TKIP (00-0f-ac:2)
```

Interface Requirements

```
                * 00-0f-ac:13
                * 00-0f-ac:11
                * 00-0f-ac:12
        Available Antennas: TX 0x1 RX 0x3
        Configured Antennas: TX 0x1 RX 0x3
        Supported interface modes:
                 * IBSS
                 * managed
                 * AP
                 * AP/VLAN
                 * WDS
                 * monitor
                 * mesh point
                 * P2P-client
                 * P2P-GO
```

```
wpa_cli v2.5
Copyright (c) 2004-2015, Jouni Malinen <j@w1.fi> and contributors

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See README for more details.


Selected interface 'wlp2s0'

Interactive mode

> p2p_find 5
OK
<3>CTRL-EVENT-SCAN-STARTED
<3>P2P-DEVICE-FOUND 70:5a:[redacted] p2p_dev_addr=72:5a:[redacted] pri_dev_type=3-0050F204-1
'DIRECT-66-HP OfficeJet Pro 8710' config_methods=0x5a88 dev_capab=0x4 group_capab=0x1 vendor_el
 new=1
<3>P2P-DEVICE-FOUND 32:cd:[redacted] p2p_dev_addr=32:cd:[redacted] pri_dev_type=3-0050F204-5
'DIRECT-KIM283x Series' config_methods=0x98 dev_capab=0x4 group_capab=0x9 vendor_elems=1 new=1
<3>P2P-DEVICE-FOUND ce:b1:[redacted] p2p_dev_addr=ce:b1:[redacted] pri_dev_type=7-0050F204-1
'[TV] UN32J5500' config_methods=0x188 dev_capab=0x25 group_capab=0x80 new=1
<3>CTRL-EVENT-SCAN-STARTED
```

wpa_cli

```
<3>CTRL-EVENT-SCAN-STARTED
<3>CTRL-EVENT-SCAN-STARTED
<3>CTRL-EVENT-SCAN-STARTED
<3>P2P-FIND-STOPPED
<3>P2P-DEVICE-LOST p2p_dev_addr=ce:b1[redacted]
<3>P2P-DEVICE-LOST p2p_dev_addr=32:cd[redacted]
<3>P2P-DEVICE-LOST p2p_dev_addr=72:5a[redacted]
```

Settings

SEARCHING... RENAME DEVICE

My Pixel

Peer devices

DIRECT-66-HP OfficeJet Pro 8710
Available

DIRECT-KIM283x Series
Available

Remembered groups

android

Kismet

110% 5900h 00m

Search:

Name	Type	Phy	Signal	Channel	Last Seen	Data	Packets
[redacted]	Wi-Fi AP	IEEE802.11	-94	11	Oct 22 2017 20:01:26	0 B	
E4:C8:[redacted]	Wi-Fi Client	IEEE802.11	-75	2.462 GHz	Oct 22 2017 20:01:20	0 B	
E0:AC:[redacted]	Wi-Fi Client	IEEE802.11	-80	2.437 GHz	Oct 22 2017 20:01:26	124 B	
DIRECT-KIM283x Series	Wi-Fi AP	IEEE802.11	-41	8	Oct 22 2017 20:01:26	0 B	
DIRECT-66-HP OfficeJet Pro 8710	Wi-Fi AP	IEEE802.11	-75	8	Oct 22 2017 20:01:26	0 B	
DC:CF:[redacted]	Wi-Fi Bridged Device	IEEE802.11	-89	2.437 GHz	Oct 22 2017 20:00:02	178 B	
D0:66:[redacted]	Wi-Fi Bridged Device	IEEE802.11	-81	2.427 GHz	Oct 22 2017 20:00:49	210 B	

kismet

Oct 22 2017 20:01:23 Detected new 802.11 Wi-Fi device 16:98:[redacted] packet 9976

Oct 22 2017 20:01:23 Detected new 802.11 Wi-Fi device 68:27:[redacted] packet 9957

Oct 22 2017 20:01:21 Detected new 802.11 Wi-Fi device 48:F7:[redacted] packet 9316

Oct 22 2017 20:01:17 Detected new 802.11 Wi-Fi device F8:1A:[redacted] packet 8677

Oct 22 2017 20:01:09 Detected new 802.11 Wi-Fi device 4A:F7:[redacted] packet 7532

Oct 22 2017 20:01:09 Detected new 802.11 Wi-Fi device 54:A0:[redacted] packet 7450

Oct 22 2017 20:00:59 Detected new 802.11 Wi-Fi device 90:5F:[redacted] packet 6315

Powered by many OSS components, see the **credits page**

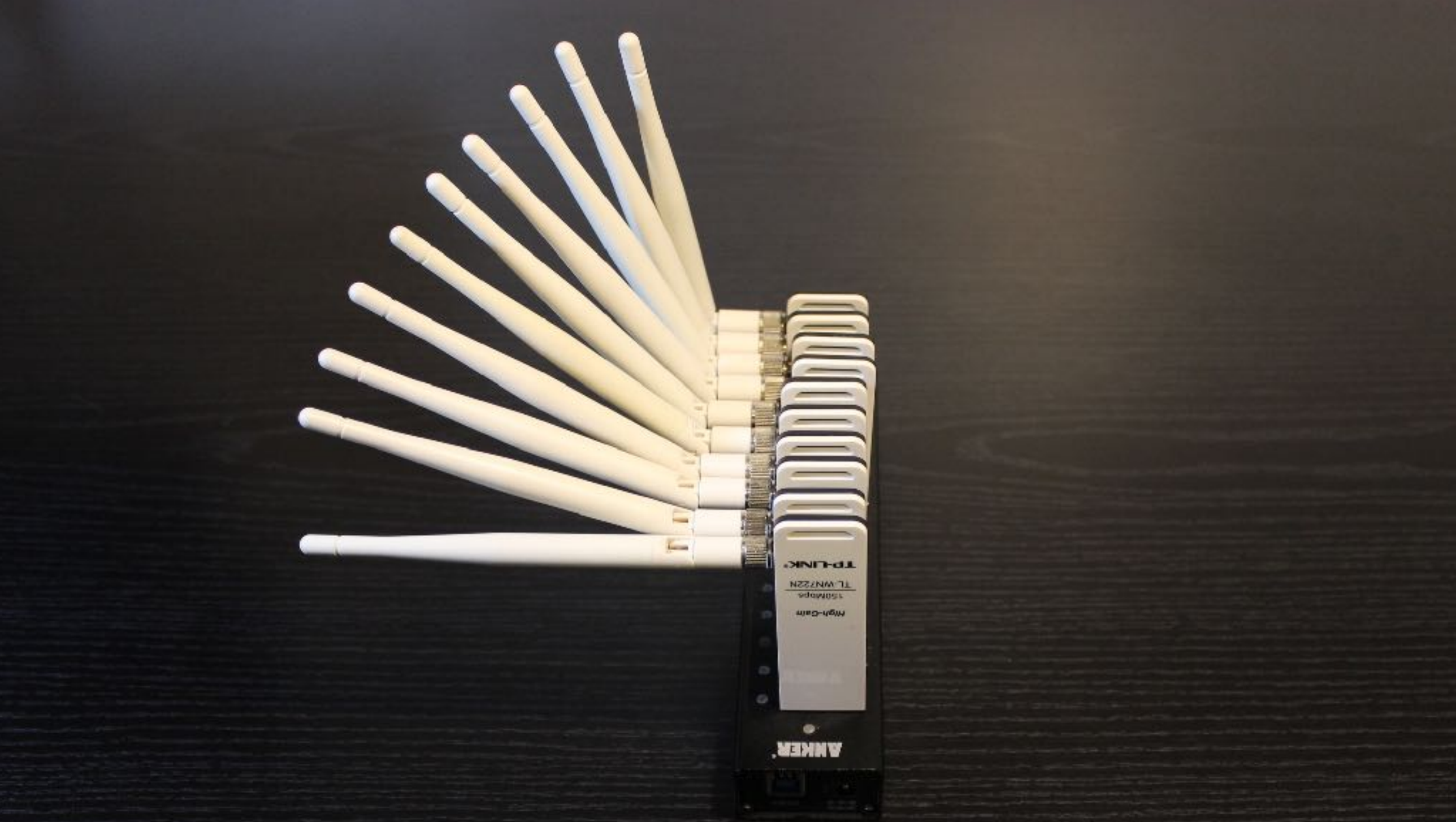
```
CH  3 ][ Elapsed: 0 s ][ 2017-10-22 19:40

BSSID              PWR  Beacons    #Data, #/s  CH  MB   ENC  CIPHER AUTH ESSID

78:45:[illegible]  -68        3        0    0   6  54e. WPA2 CCMP   PSK [illegible]
A0:E4:[illegible]  -87        2        0    0  11  54e  WPA2 CCMP   PSK [illegible]
18:1E:[illegible]  -86        2        0    0  11  54e  WPA2 CCMP   PSK [illegible]
FA:8F:[illegible]  -76        6        0    0  11  54e. OPN         [illegible]
A0:8E:[illegible]  -86        4        0    0  11  54e  WPA2 CCMP   PSK [illegible]
54:DC:[illegible]  -79        2        0    0   4  54e  WPA2 CCMP   PSK [illegible]
78:45:[illegible]  -78        3        0    0   6  54e. WPA2 CCMP   PSK [illegible]
70:5A:[illegible]  -51        6        0    0   8  54e  WPA2 CCMP   PSK  DIRECT-66-HP OfficeJet Pro
32:CD:[illegible]  -39        5        0    0   8  54e  WPA2 CCMP   PSK  DIRECT-KIM283x Series
60:14:[illegible]  -64       10        3    1  11  54e. WPA2 CCMP   PSK [illegible]
84:00:[illegible]  -63       11        0    0  11  54e  WPA2 CCMP   PSK [illegible]
84:00:[illegible]  -77        8        0    0   6  54e  WPA2 CCMP   PSK [illegible]
FA:8F:[illegible]  -83        5        0    0   6  54e. OPN         [illegible]
20:25:[illegible]  -77        2        0    0   6  54e  WPA2 CCMP   PSK [illegible]
60:14:[illegible]  -45       14        0    0   6  54e. WPA2 CCMP   PSK [illegible]
78:45:[illegible]  -25       17        0    0   8  54e. WPA2 CCMP   PSK [illegible]
60:14:[illegible]  -61       13        0    0   6  54e. WPA2 CCMP   PSK [illegible]
E0:69:[illegible]  -90        2        0    0   1  54e  WPA  TKIP   PSK [illegible]
C4:04:[illegible]  -47       22        0    0   3  54e  WPA2 CCMP   PSK [illegible]
1C:49:[illegible]  -79        6        0    0   1  54e  WPA  CCMP   PSK [illegible]

BSSID              STATION            PWR   Rate    Lost    Frames  Probe

54:DC:[illegible]  60:A4:[illegible]  -82    0 - 1      0         1
(not associated)   A4:77:[illegible]  -81    0 - 1      0         2 [illegible]
60:14:[illegible]  E4:C8:[illegible]  -82    0e- 1     34         6

# 
```

airodump-ng

```
 - Group Capabilities: ip address allocation
P2p Device Info:
```

wig

```
MAC Address: ae:37:
-----------------------------------------------------------------------
WPS Information:
---------------
Device Name: My Pixel
Primary Device Type: Telephone
Response Type: '\x00'
Model Number: Pixel
Vendor Extension: '\x007*\x00\x01 '
Serial Number: FA71S0
Version: 1.0
Model Name: Pixel
Wifi Protected Setup State: Not-Configured
Config Methods: Display, Push Button, Keypad
Uuid E: 2C48E129BEFF566FAFCAF5670562E4E6
Manufacturer: Google
-----------------------------------------------------------------------
Wi-Fi Direct Information:
------------------------
P2p Capability:
 - Device Capabilities: service discovery, concurrent operation, p2p invitation procedure
 - Group Capabilities:
P2p Device Info:
 - P2P Device address: ae:37:
 - Config Methods: Display, Push Button, Keypad
 - Primary Device Type: Telephone
 - Number of Secondary Device Types: 0
 - Device Name: My Pixel
```



Monitor P2P Devices

HP Printers

HP OfficeJet Pro 8710

Embedded Web Server

Search

Home | Scan | Fax | Web Services | Network | Tools | Settings

NETWORK

+ General

+ Wired (802.3)

+ Wireless (802.11)

– Wi-Fi Direct

Status

+ AirPrint™

Wi-Fi Direct

Status

Wi-Fi Direct Settings

Change the Wi-Fi Direct settings, and then click Apply.

Status: On

Wi-Fi Direct Name: DIRECT-66-HP OfficeJet Pro 8710

Connection Method: Automatic

Wi-Fi Direct Password: 12345678 Generate

HP Printers

Apply Cancel

English

HP Connected | Product Support | Software | HP SureSupply | About HP

HP OfficeJet Pro 8710

Embedded Web Server

Search

Home | Scan | Fax | Web Services | Network | Tools | Settings

NETWORK

+ General

+ Wired (802.3)

+ Wireless (802.11)

– Wi-Fi Direct

Status

+ AirPrint™

Wi-Fi Direct

Status

Wi-Fi Direct Settings

Change the Wi-Fi Direct settings, and then click Apply.

Status: On

Wi-Fi Direct Name: DIRECT-66-HP OfficeJet Pro 8710

Connection Method: Manual

Wi-Fi Direct Password: 77346443 Generate

HP Printers

Apply Cancel

English

Samsung Printers

SyncThru Web Service™
Embedded Web Server

M283x Series

Eco ON | Site Map | Logout | English

Information | Settings | Security | Maintenance

Settings

- Network Settings
  - General
  - TCP/IPv4
  - TCP/IPv6
  - Raw TCP/IP, LPR, IPP
  - AirPrint
  - Samsung Cloud Print
  - Google Cloud Print
  - WSD
  - SLP
  - UPnP
  - mDNS
  - SNMP
    - SNMPv1/v2
    - SNMPv3
  - HTTP
  - Proxy
  - Wi-Fi
    - Wi-Fi
    - **Wi-Fi Direct™**
  - Restore Default

Wi-Fi Direct™

Apply | Undo

Wi-Fi Direct™

Wi-Fi Direct™:	On
Device Name:	M283x Series
IP Address:	192.168.3.1
Group Owner:	Activate
Network Key:	24767897

Hide Network Key

Wi-Fi Direct™ Status

Current Role:	Group Owner
Current SSID:	DIRECT-KIM283x Series
Current Status:	Connected (0)

Information Desk

Recent Links
- Wi-Fi Direct™
- General
- SNMPv3
- Home

SAMSUNG

Samsung Printers

Samsung Printers

Samsung Smart TV

```
▶ Radiotap Header v0, Length 36
▶ 802.11 radio information
▼ IEEE 802.11 Action, Flags: ........C
    Type/Subtype: Action (0x000d)
  ▶ Frame Control Field: 0xd000
    .000 0000 0011 1100 = Duration: 60 microseconds
    Receiver address: ae:37:
    Destination address: ae:37:
    Transmitter address: ce:b1:
    Source address: ce:b1:
    BSS Id: ae:37:
    .... .... .... 0000 = Fragment number: 0
    1000 1010 0100 .... = Sequence number: 2212
    Frame check sequence: 0x94f60964 [correct]
    [FCS Status: Good]
▼ IEEE 802.11 wireless LAN management frame
  ▼ Fixed parameters
      Category code: Public Action (4)
      Public Action: Vendor Specific (0x09)
      OUI: 50-6f-9a (Wi-FiAll)
      WFA Subtype: 9
      P2P Public Action Subtype: GO Negotiation Confirmation (2)
      P2P Public Action Dialog Token: 1
  ▶ Tagged parameters (126 bytes)
```

Samsung Smart TV

WD TV Live

```
Completed SYN Stealth Scan at 22:04, 4.61s elapsed (1000 total ports)
Initiating Service scan at 22:04
Scanning 5 services on 192.168.69.61
Completed Service scan at 22:04, 26.03s elapsed (5 services on 1 host)
Initiating OS detection (try #1) against 192.168.69.61
```

WD TV Live

```
Completed NSE at 22:05, 0.00s elapsed
Nmap scan report for 192.168.69.61
Host is up (0.0033s latency).
Not shown: 995 closed ports
PORT      STATE SERVICE     VERSION
80/tcp    open  http        Apache httpd (PHP 5.2.17)
139/tcp   open  netbios-ssn Samba smbd 3.X (workgroup: WORKGROUP)
443/tcp   open  ssl/http    Apache httpd (PHP 5.2.17)
445/tcp   open  netbios-ssn Samba smbd 3.X (workgroup: WORKGROUP)
30000/tcp open  unknown
MAC Address: 02:90:A9:67:7B:7E (Unknown)
OS fingerprint not ideal because: Didn't receive UDP response. Please try again with -
No OS matches for host
Network Distance: 1 hop

TRACEROUTE
HOP RTT     ADDRESS
1   3.34 ms 192.168.69.61

NSE: Script Post-scanning.
Initiating NSE at 22:05
Completed NSE at 22:05, 0.00s elapsed
Initiating NSE at 22:05
Completed NSE at 22:05, 0.00s elapsed
```

WD TV® Live

WD TV Live

Login

Password

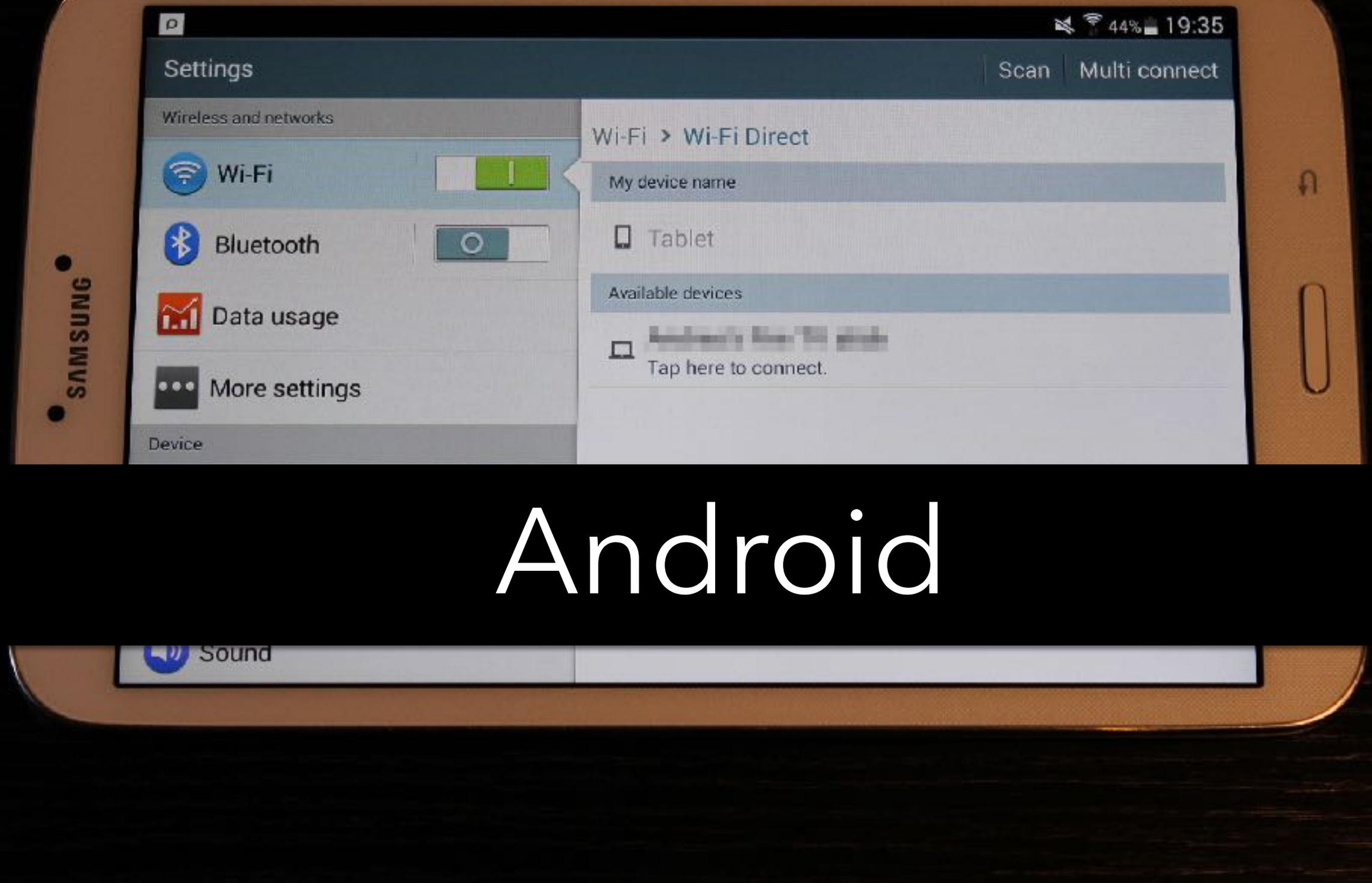
Language

English

I accept END USER LICENSE AGREEMENT

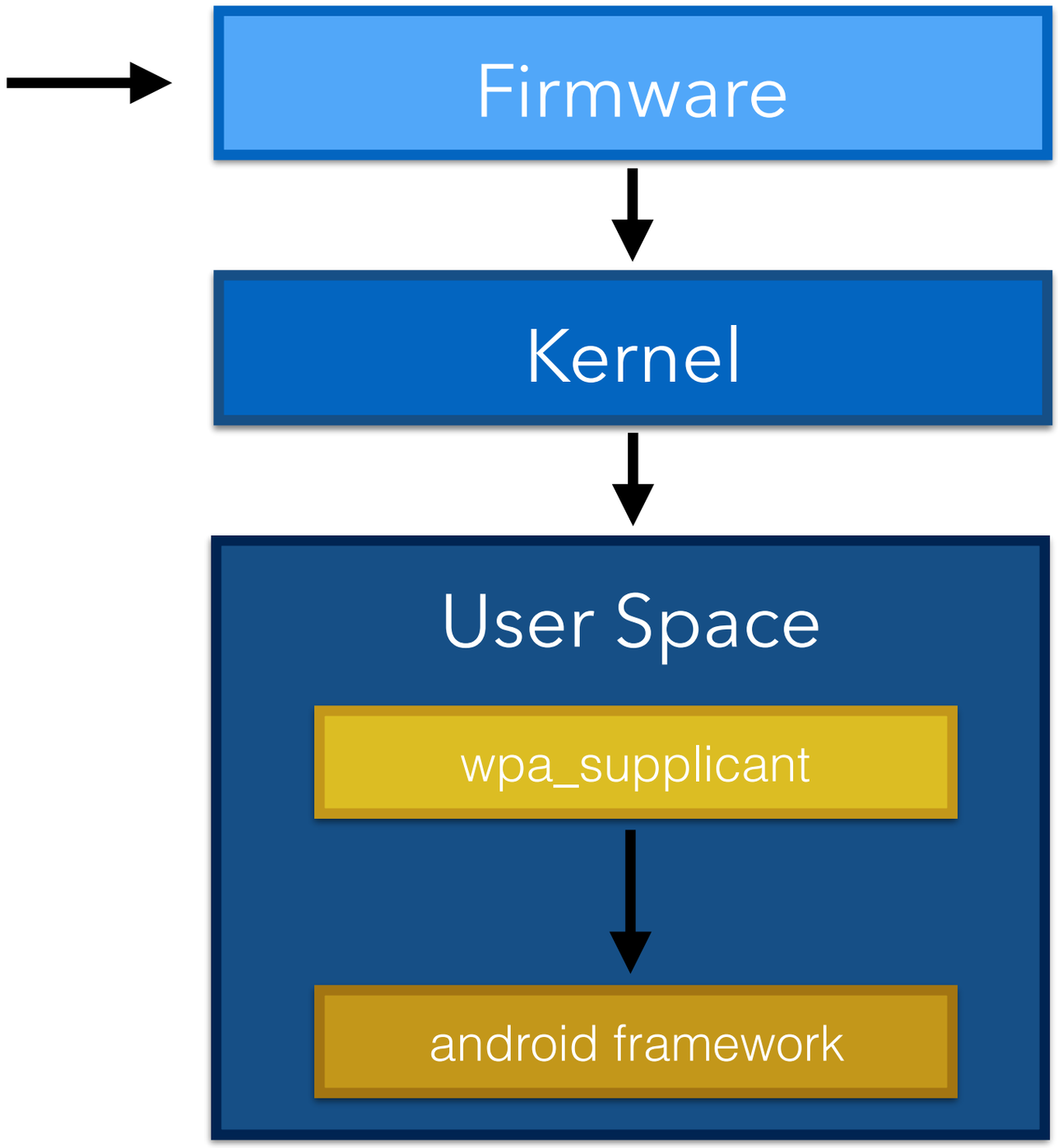
Keep me signed in

Login


44% 19:35
Settings
Scan
Multi connect
Wireless and networks
Wi-Fi
Bluetooth
Data usage
More settings
Device
Sound
Wi-Fi > Wi-Fi Direct
My device name
Tablet
Available devices
Tap here to connect.
SAMSUNG

Android

Android


Firmware
Kernel
User Space
wpa_supplicant
android framework

```
private static final Pattern detailedDevicePattern = Pattern.compile(
    "((?:[0-9a-f]{2}:){5}[0-9a-f]{2}) " +
    "(\\d+ )?" +
    "p2p_dev_addr=((?:[0-9a-f]{2}:){5}[0-9a-f]{2}) " +
    "pri_dev_type=(\\d+-[0-9a-fA-F]+-\\d+) " +
    "name='(.*)' " +
    "config_methods=(0x[0-9a-fA-F]+) " +
    "dev_capab=(0x[0-9a-fA-F]+) " +
    "group_capab=(0x[0-9a-fA-F]+)" +
    "( wfd_dev_info=0x000006([0-9a-fA-F]{12}))?"
);
```

Android

```
/**
 * @param string formats supported include
 *  P2P-DEVICE-FOUND fa:7b:7a:42:02:13 p2p_dev_addr=fa:7b:7a:42:02:13
 *  pri_dev_type=1-0050F204-1 name='p2p-TEST1' config_methods=0x188 dev_capab=0x27
 *  group_capab=0x0 wfd_dev_info=000006015d022a0032
 *
 *  P2P-DEVICE-LOST p2p_dev_addr=fa:7b:7a:42:02:13
 *
 *  AP-STA-CONNECTED 42:fc:89:a8:96:09 [p2p_dev_addr=02:90:4c:a0:92:54]
 *
 *  AP-STA-DISCONNECTED 42:fc:89:a8:96:09 [p2p_dev_addr=02:90:4c:a0:92:54]
 *
 *  fa:7b:7a:42:02:13
 *
 *  Note: The events formats can be looked up in the wpa_supplicant code
 * @hide
 */
public WifiP2pDevice(String string) throws IllegalArgumentException {
    String[] tokens = string.split("[ \n]");
    Matcher match;

    if (tokens.length < 1) {
        throw new IllegalArgumentException("Malformed supplicant event");
    }
```

```
D/TCMD    (  519): Listening for incoming client connection request
I/wpa_supplicant( 3482): P2P-DEVICE-FOUND 70:5a:0f:16:ed:54 p2p_dev_addr=72:5a:0f:16:b4:66 pri_dev
 name='DIRECT-66-HP OfficeJet Pro 8710' config_methods=0x5a88 dev_capab=0x4 group_capab=0x1 level=
I/wpa_supplicant( 3482): P2P-DEVICE-FOUND 00:de:ad:fa:fa:fa p2p_dev_addr=00:de:ad:fa:fa:fa pri_dev
5 name='fafa<FA><FA>' config_methods=0x188 dev_capab=0x21 group_capab=0x0 level=-27
D/MDMCTBK (  267): reply_len: 40 reply is = <3>P2P-DEVICE-FOUND 70:5a:0f:16:ed:54 p2
D/MDMCTBK (  267): Event received = P2P-DEVICE-FOUND 70:5a:0f:16:ed:54 p2
D/MDMCTBK (  267): reply_len: 40 reply is = <3>P2P-DEVICE-FOUND 00:de:ad:fa:fa:fa p2
D/MDMCTBK (  267): Event received = P2P-DEVICE-FOUND 00:de:ad:fa:fa:fa p2
D/WifiP2pService( 1024): InactiveState{ when=-1ms what=147477 obj=Device: DIRECT-66-HP OfficeJet P
D/WifiP2pService( 1024):  deviceAddress: 72:5a:0f:16:b4:66
D/WifiP2pService( 1024):  primary type: 3-0050F204-1
```

Android

```
D/WifiP2pService( 1024):  level: -49 target=com.android.internal.util.StateMachine$SmHandler }
D/WifiP2pService( 1024): P2pEnabledState{ when=-1ms what=147477 obj=Device: DIRECT-66-HP OfficeJet
D/WifiP2pService( 1024):  deviceAddress: 72:5a:0f:16:b4:66
D/WifiP2pService( 1024):  primary type: 3-0050F204-1
D/WifiP2pService( 1024):  secondary type: null
D/WifiP2pService( 1024):  wps: 23176
D/WifiP2pService( 1024):  grpcapab: 1
D/WifiP2pService( 1024):  devcapab: 4
D/WifiP2pService( 1024):  status: 3
D/WifiP2pService( 1024):  wfdInfo: null
D/WifiP2pService( 1024):  level: -49 target=com.android.internal.util.StateMachine$SmHandler }
W/dalvikvm( 1024): threadid=71: thread exiting with uncaught exception (group=0x4171bd40)
E/AndroidRuntime( 1024): *** FATAL EXCEPTION IN SYSTEM PROCESS: WifiMonitor
E/AndroidRuntime( 1024): java.lang.IllegalArgumentException: Malformed supplicant event
E/AndroidRuntime( 1024):        at android.net.wifi.p2p.WifiP2pDevice.<init>(WifiP2pDevice.java:21
E/AndroidRuntime( 1024):        at android.net.wifi.WifiMonitor$MonitorThread.handleP2pEvents(Wifi
E/AndroidRuntime( 1024):        at android.net.wifi.WifiMonitor$MonitorThread.dispatchEvent(WifiMo
E/AndroidRuntime( 1024):        at android.net.wifi.WifiMonitor$MonitorThread.run(WifiMonitor.java
I/Process ( 1024): Sending signal. PID: 1024 SIG: 9
I/ServiceManager(  255): service 'package' died
I/ServiceManager(  255): service 'sensorservice' died
```

Availability

https://www.flickr.com/photos/ell-r-brown/

Confusion

https://www.flickr.com/photos/wwward0/

Weakest Link

https://www.flickr.com/photos/smithser/

Bridge

https://www.flickr.com/photos/lennykphotography/

Attack Surface

https://www.flickr.com/photos/fearless_fred/

Questions

https://github.com/6e726d/BHEU17

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