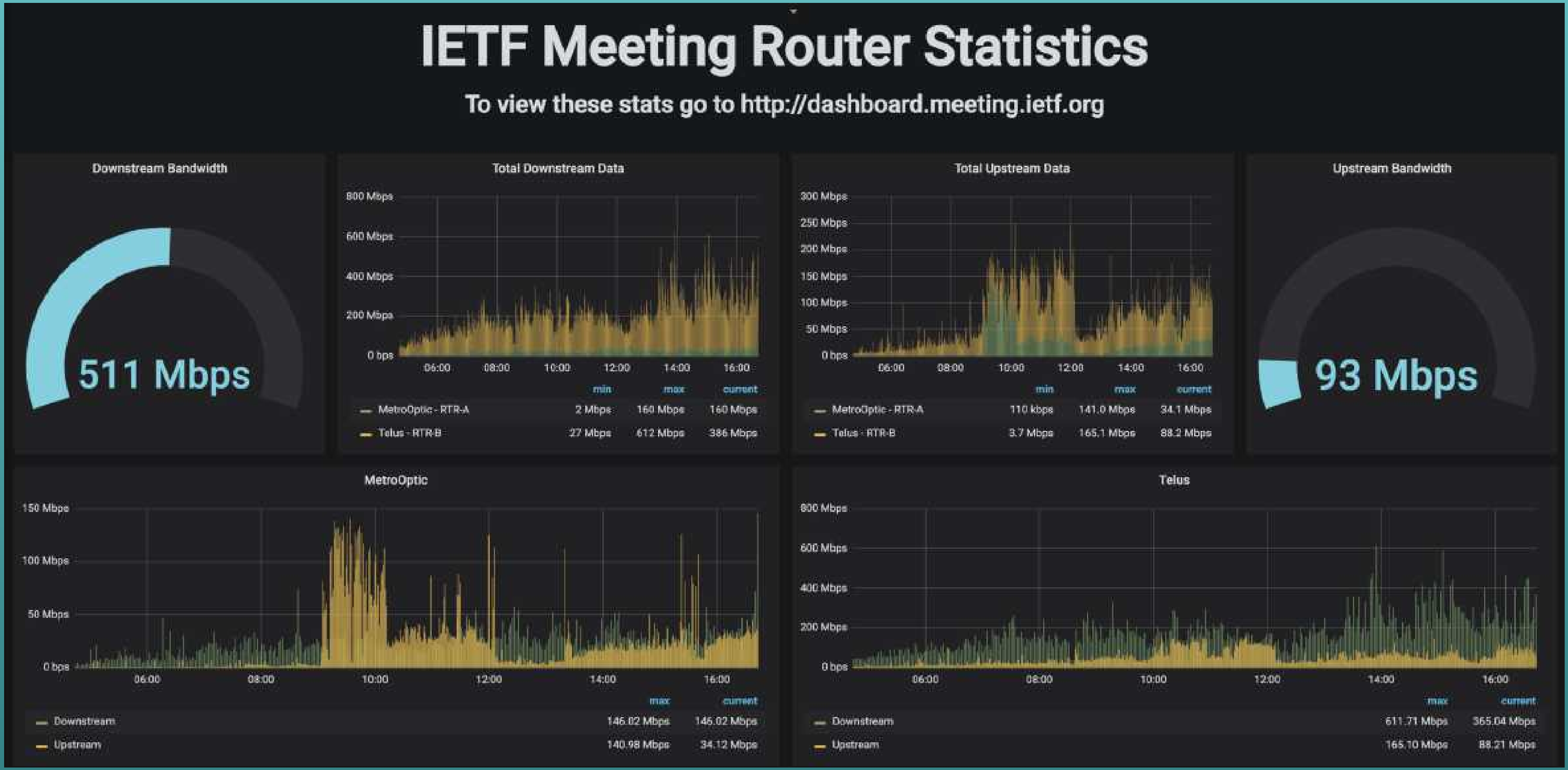
The IETF Network

... an overview

2019-07 - Montreal .CA
V0.04

I'm going on an adventure!



IETF Meeting Router Statistics

To view these stats go to http://dashboard.meeting.ietf.org

Downstream Bandwidth

511 Mbps

Total Downstream Data

	min	max	current
MetroOptic - RTR-A	2 Mbps	160 Mbps	160 Mbps
Telus - RTR-B	27 Mbps	612 Mbps	386 Mbps

Total Upstream Data

	min	max	current
MetroOptic - RTR-A	110 kbps	141.0 Mbps	34.1 Mbps
Telus - RTR-B	3.7 Mbps	165.1 Mbps	88.2 Mbps

Upstream Bandwidth

93 Mbps

MetroOptic

	max	current
Downstream	146.02 Mbps	146.02 Mbps
Upstream	140.98 Mbps	34.12 Mbps

Telus

	max	current
Downstream	611.71 Mbps	365.04 Mbps
Upstream	165.10 Mbps	88.21 Mbps

The Scout™

- A Ubiquiti router
- Shipped to site / installed during site visit
- Starts announcing our address space
  - Allows testing of the circuits
  - Validation of the BGP peering, etc.
  - Provides an anchor for geo-location data
  - Gets the **ietf-hotel** SSID up for NOC

Circuits

- At least 2, but up to 5 circuits
- Almost always donated by local providers
    - Try for redundant:
        - providers
        - fiber
        - entrances
- 1Gbps -> 10Gbps
- Dual stack (IPv4 / IPv6)
- BGP

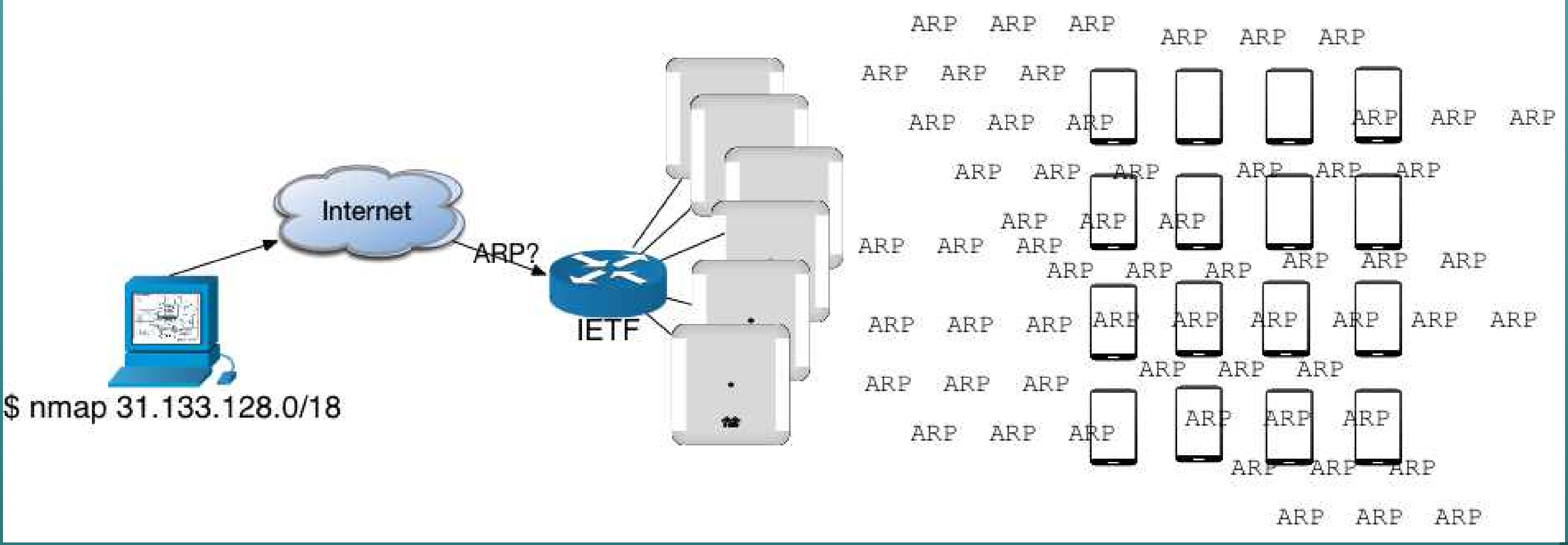
Routers

- 2 Juniper routers
    - Were MX80s, upgraded to MX204s (this meeting)
        - Convergence: ~25 minutes -> ~1.5 minutes
- Core routers for network
    - BGP (eBGP, iBGP)
        - RPKI
    - OSPF / OSPFv3
    - DHCP relay / RA
    - BCP38
    - Passive ARP learning (more if we have time...)

ARP ARP ARP… ARP ARP…

ARP ARP ARP... ARP ARP...

```
aggregate {
    inactive: route 130.129.0.0/16;
    route 31.133.128.0/18;
    route 31.130.224.0/20;
}
```



```
$ nmap 31.133.128.0/18
```

RPKI

```
routing-options {
    validation {
        group rpki-servers {
            session 31.130.229.4 {  # Dragon Research Labs RPKI Toolkit
                preference 100;
                port 323;
            }
}
policy-statement RPKI {
        term whitelist {...}
        term invalid {
            from {
                protocol bgp;
                validation-database invalid;
            }
            then {
                validation-state invalid;
                community add RPKI_Invalid;
                reject;
            }
```

```
policy-statement RPKI {
    term whitelist {
        from {
            protocol bgp;
            prefix-list RPKI_Whitelist;
        }
        then {
            validation-state valid;
            community add RPKI_Whitelist;
            next policy;
        }
    }
    term invalid {
        from {
            protocol bgp;
            validation-database invalid;
        }
        then {
            validation-state invalid;
            community add RPKI_Invalid;
            reject;
        }
    }
    term valid {
        from {
            protocol bgp;
            validation-database valid;
        }
        then {
            validation-state valid;
            community add RPKI_Valid;
            next policy;
        }
    }
```

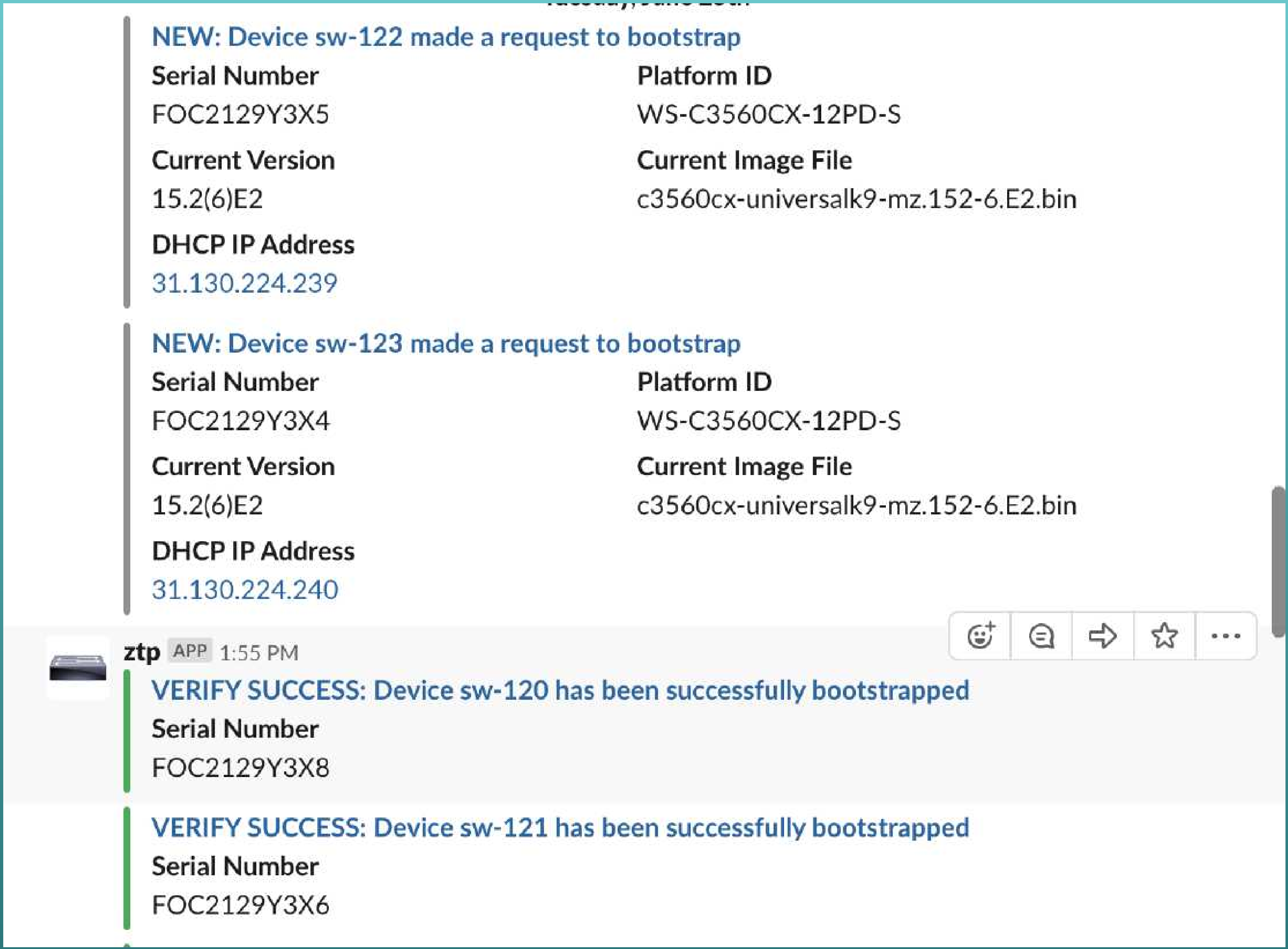
```
  term unknown {
            from {
                protocol bgp;
                validation-database unknown;
            }
            then {
                validation-state unknown;
                community add RPKI_Unknown;
                next policy;
            }
        }
        /* This should not happen -- things should be valid,
invalid or unknown */
        term failed {
            from protocol bgp;
            then {
                community add RPKI_Failure;
                next policy;
            }
        }
    }
```

Switches

- 2 x Cisco Catalyst 4500X Core stacked
- 10 x Cisco IDF switches
- 40 x Cisco 12 port switches
- "Joe's magic..."
  - Y'all keep plugging in DHCP servers :-(
  - A new switch to a fully provisioned switch in ~15 minutes (including a software upgrade).
  - Rooms are dynamic - this means we need to reconfigure things often and quickly

Switch Automation

- Feature-wise, the switch automation includes:
  - Initialize new switch with desired config and software image
  - Validation of config and image (checksum)
  - Auto-generation of SSH host key
  - Call-home for when a switch should re-ZTP
  - Auto-detection of connected device type (switch, AP, probe)
  - Port auto-config and auto-doc update
  - Detection of lost device and port description update



NEW: Device sw-122 made a request to bootstrap

Serial Number FOC2129Y3X5	**Platform ID** WS-C3560CX-12PD-S
Current Version 15.2(6)E2	**Current Image File** c3560cx-universalk9-mz.152-6.E2.bin
DHCP IP Address 31.130.224.239	

NEW: Device sw-123 made a request to bootstrap

Serial Number FOC2129Y3X4	**Platform ID** WS-C3560CX-12PD-S
Current Version 15.2(6)E2	**Current Image File** c3560cx-universalk9-mz.152-6.E2.bin
DHCP IP Address 31.130.224.240	

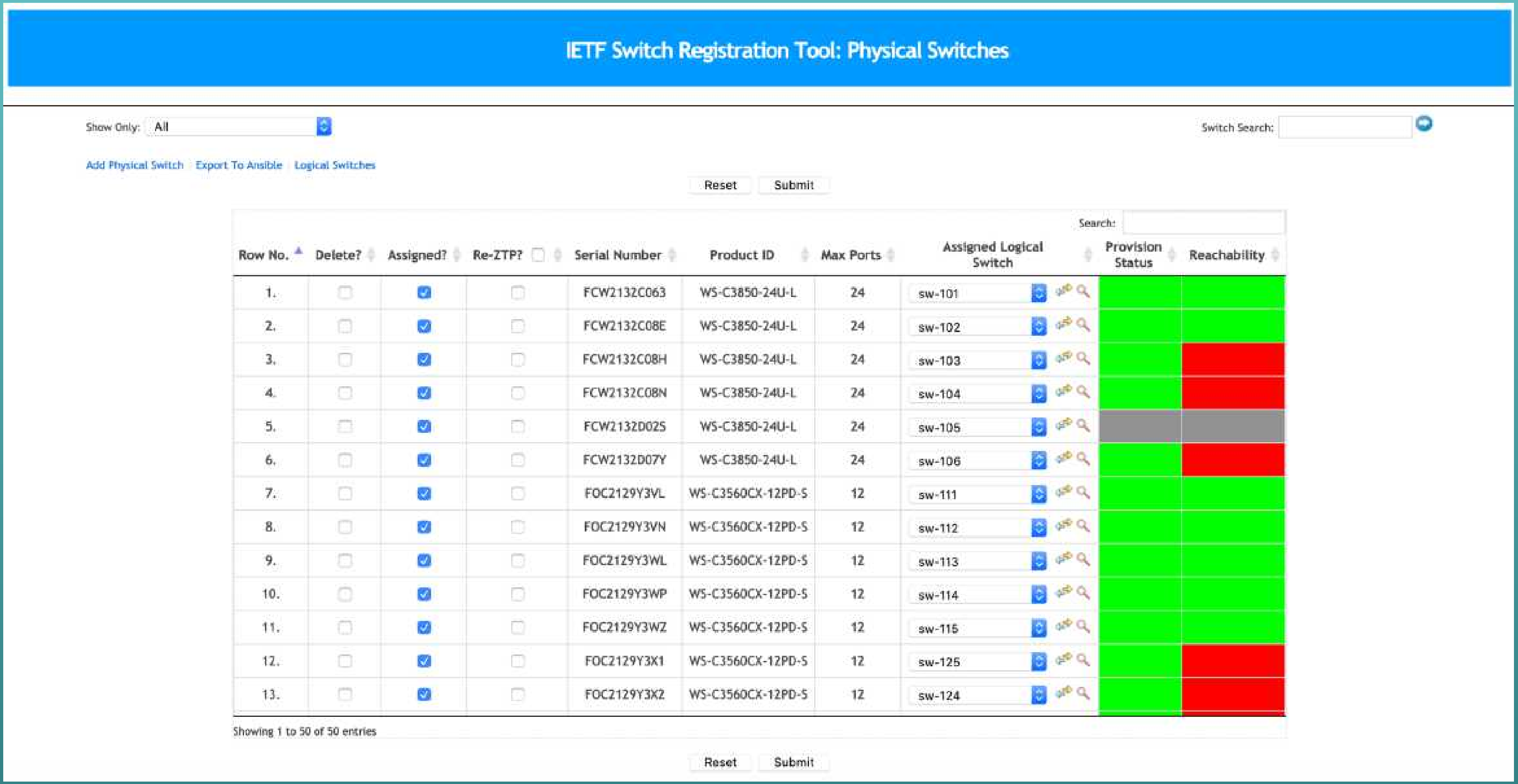
ztp APP 1:55 PM

VERIFY SUCCESS: Device sw-120 has been successfully bootstrapped

Serial Number
FOC2129Y3X8

VERIFY SUCCESS: Device sw-121 has been successfully bootstrapped

Serial Number
FOC2129Y3X6



IETF Switch Registration Tool: Physical Switches

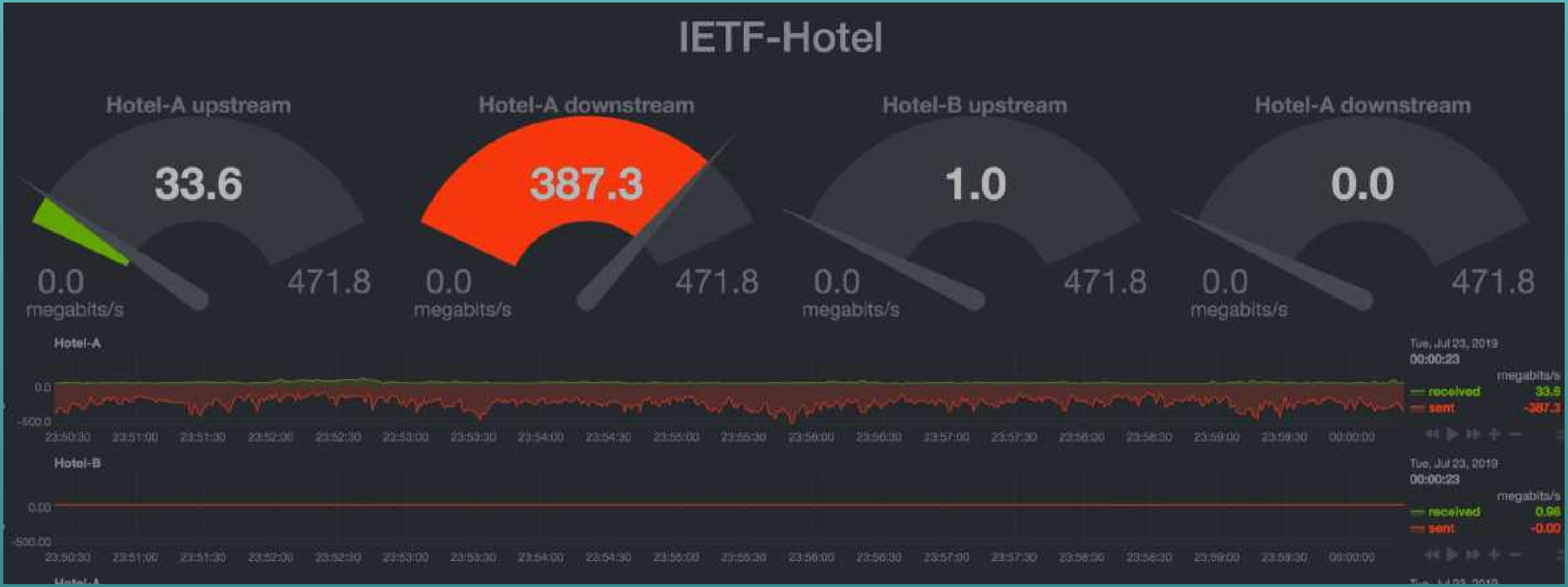
Row No.	Delete?	Assigned?	Re-ZTP? □	Serial Number	Product ID	Max Ports	Assigned Logical Switch	Provision Status	Reachability
1.	□	☑	□	FCW2132C063	WS-C3850-24U-L	24	sw-101	🟩	🟩
2.	□	☑	□	FCW2132C08E	WS-C3850-24U-L	24	sw-102	🟩	🟩
3.	□	☑	□	FCW2132C08H	WS-C3850-24U-L	24	sw-103	🟩	🟥
4.	□	☑	□	FCW2132C08N	WS-C3850-24U-L	24	sw-104	🟩	🟥
5.	□	☑	□	FCW2132D02S	WS-C3850-24U-L	24	sw-105	▨	▨
6.	□	☑	□	FCW2132D07Y	WS-C3850-24U-L	24	sw-106	🟩	🟥
7.	□	☑	□	FOC2129Y3VL	WS-C3560CX-12PD-S	12	sw-111	🟩	🟩
8.	□	☑	□	FOC2129Y3VN	WS-C3560CX-12PD-S	12	sw-112	🟩	🟩
9.	□	☑	□	FOC2129Y3WL	WS-C3560CX-12PD-S	12	sw-113	🟩	🟩
10.	□	☑	□	FOC2129Y3WP	WS-C3560CX-12PD-S	12	sw-114	🟩	🟩
11.	□	☑	□	FOC2129Y3WZ	WS-C3560CX-12PD-S	12	sw-115	🟩	🟩
12.	□	☑	□	FOC2129Y3X1	WS-C3560CX-12PD-S	12	sw-125	🟩	🟥
13.	□	☑	□	FOC2129Y3X2	WS-C3560CX-12PD-S	12	sw-124	🟩	🟥

Showing 1 to 50 of 50 entries

Wireless

- 2 x Cisco WLC 5520 in an HA pair
  - Cisco WLC 2504 for ISOC & testing
- Somewhere between 50 and 70 Access Points
  - [TODO] 55 this time
  - We do both 5Ghz and 2.4Ghz, prefer 5Ghz
- This has largely solved much of the ARP problem
  - Does your phone battery now last >3/4 day?
    - Thank Panda...!
- Multiple **encrypted** SSIDs
  - "ietf-legacy, ietf, ietf-2.4only, ietf-nat64, ietf-v6only, ietf-nat64-unencrypted, eduroam, isoc, ..."

Guestroom / "hotel"



Guestroom Network

IETF participants are "weird"...
... no, really weird...

- Guest networks are built for ***normal*** people
  - Captive portal
    - Intercept / rewrite DNS
    - HTTP munging...
  - NAT
  - Drop no-good, bad, dangerous ports (like 22!)
  - Assumptions:
    - Limited devices
    - Limited bandwidth
    - Limited sessions
- IPv6? Ain't nobody got time for that...

From recent stay

```
wkumari$ git push
ssh: connect to host
git.kumari.net port 22:
Connection refused
fatal: Could not read from remote
repository.

Please make sure you have the
correct access rights
and the repository exists.

wkumari$
```

~~Guestroom network~~

- Bypass guestroom gateway with Ubiquiti routers, open SSID
  - "Free Internets for all!"
- Some hotels have ~~truly bizarre~~ inventive architectures…
  - Really bad channelizing
  - Mac Mini in "Internet Sharing Mode"
  - Access Points on elevators… much hilarity…
- Too few access points in guest rooms (getting better)
- Ethernet over Coax / DOCSIS / DSL / Cat3
- Integrated PoS, TV, mini-bar, signs, thermostats, …

Servers / Services

- 3+3 Physical servers
- Ganeti, Docker

- DNS / DNSSEC, DPRIVE
- DNS64
- DHCP / DHCPv6
- NTP
- Tickets
- RPKI server
- TACACS+ / RADIUS
- ZTP server
- Etherpad
- Ansible for automation (Yay! DevOps!)
- SMTP

- Git repo
- VMs for Meetecho
- Backups
- Syslog
- Monitoring:
  - Prometheus
  - Deadman
  - Intermapper
  - Smokeping
  - Rancid
  - Netdisco
  - Observium, ...

Scrubbing PII….

Remote Participation

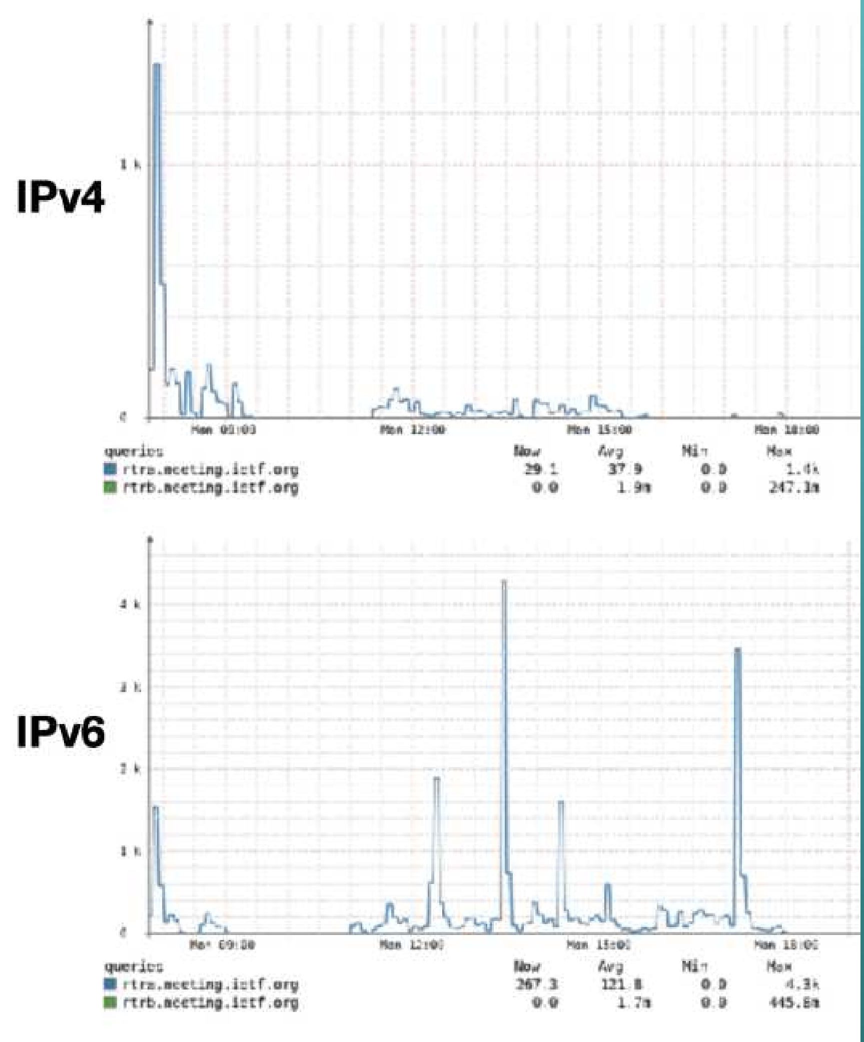
- Live streaming gets their own VLANs
- ... and VMs
- ~60 Mbps BW from VMs to Internet
- The network we build makes remote participation possible
- Meetecho / Kaskadian have done events on venue networks
    - but only streaming (not remote participants)
    - Meetecho remote participation depends on "but the limited bandwidth, NATs, firewalls, lack of IPv6, would likely prevent us from providing good remote participation."
    - Kaskadian: "Hotel network won't work!.... :-P"

You deserve a kitten now...

Experiments…

DPRIVE

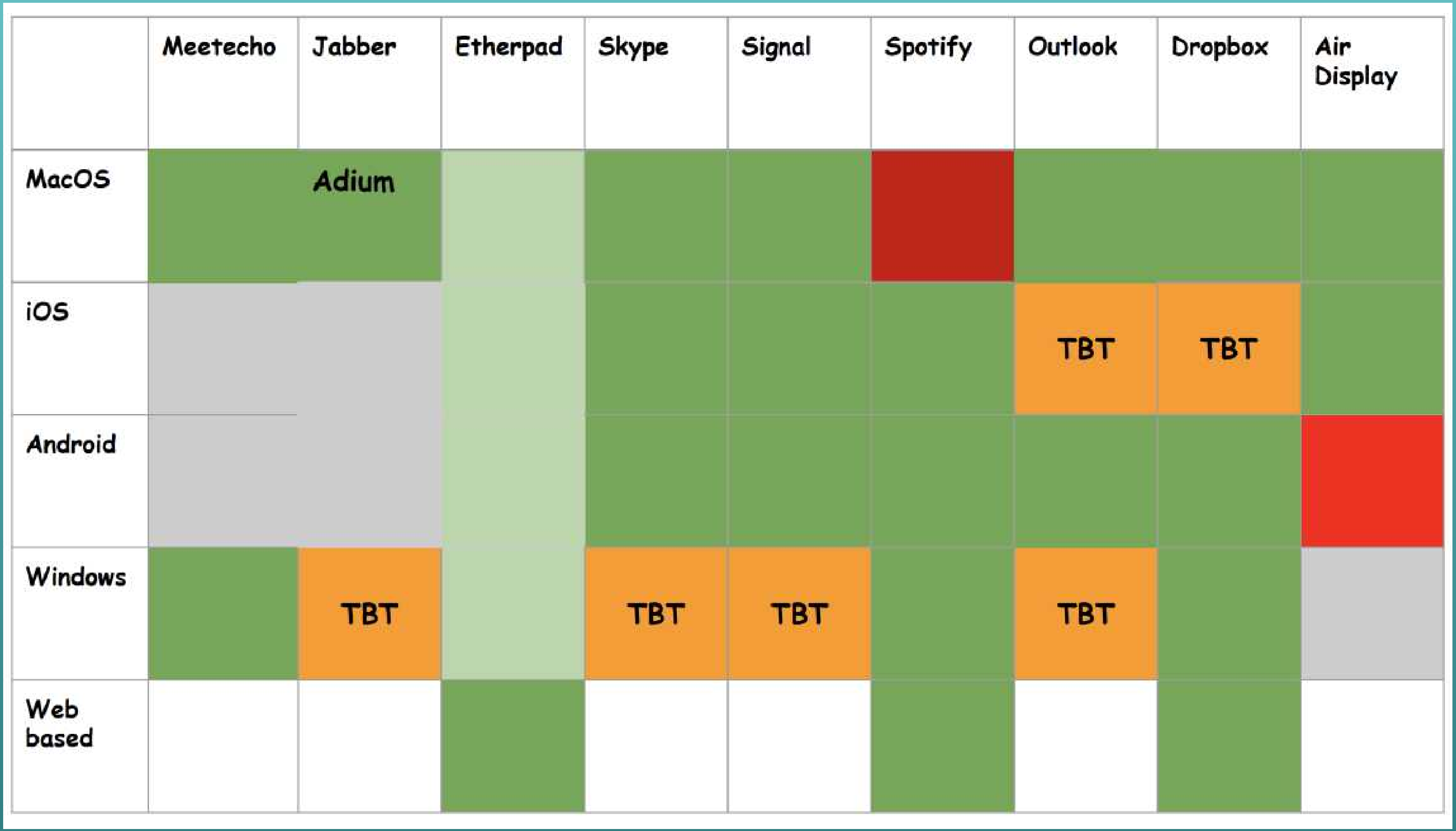
- Ran one of the early DNS-over-TLS services
- Now it is a "standard service"



V6ONLY – no, really.

- Turned off IPv4 on all radios near V6OPS, 6MAN
  - Hilarity ensues... :-P

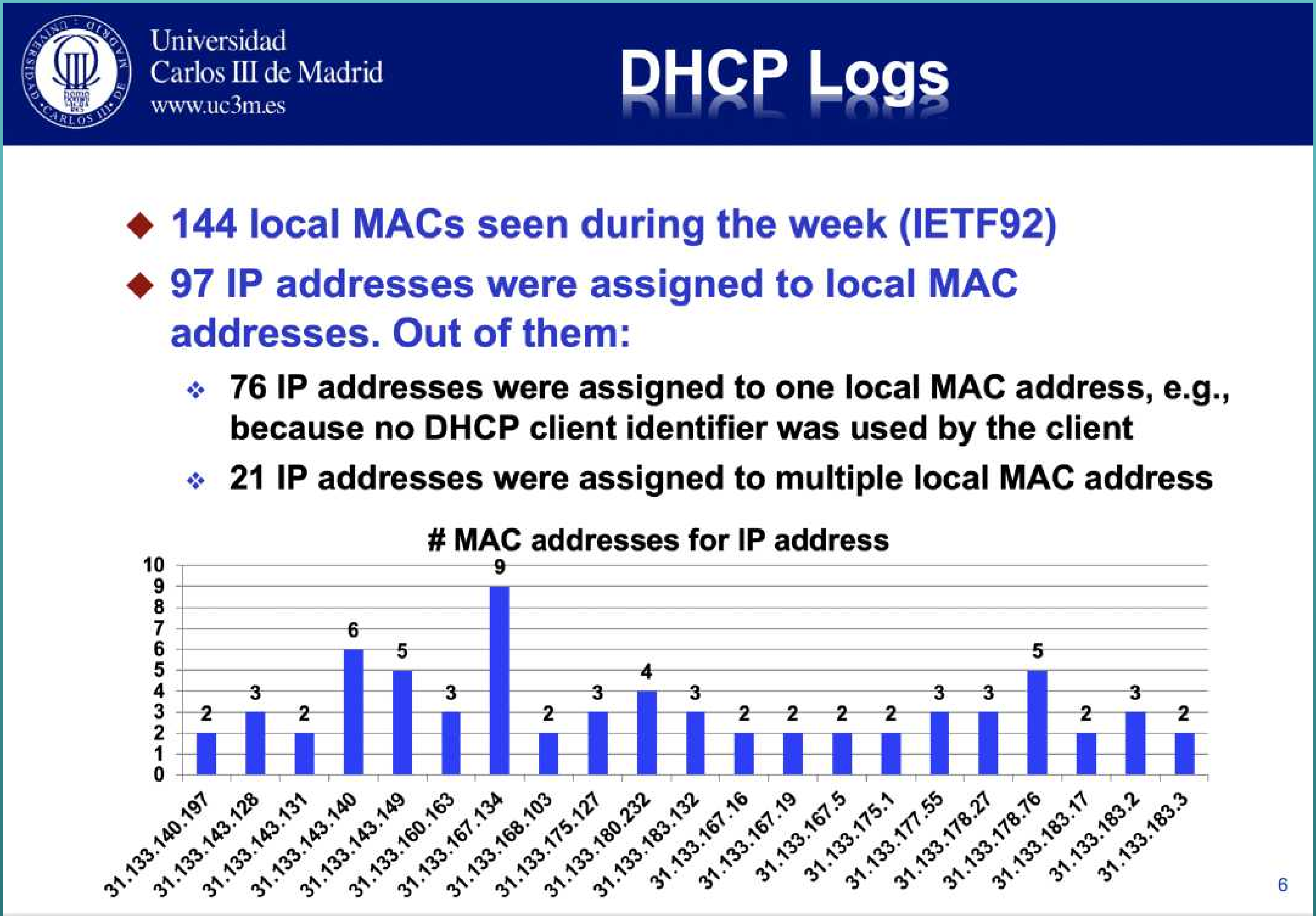
NAT64 Testing



	Meetecho	Jabber	Etherpad	Skype	Signal	Spotify	Outlook	Dropbox	Air Display
MacOS	🟩	🟩 Adium	▨	🟩	🟩	🟥	🟩	🟩	🟩
iOS	⬜	⬜	▨	🟩	🟩	🟩	🟧 TBT	🟧 TBT	🟩
Android	⬜	⬜	▨	🟩	🟩	🟩	🟩	🟩	🟥
Windows	🟩	🟧 TBT	▨	🟧 TBT	🟧 TBT	🟩	🟧 TBT	🟩	⬜
Web based			🟩			🟩		🟩	

Ref: https://datatracker.ietf.org/meeting/100/materials/slides-100-v6ops-sessa-readout-from-ietf100-hackathon-01

MAC Randomization



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DHCP Logs

- 144 local MACs seen during the week (IETF92)
- 97 IP addresses were assigned to local MAC addresses. Out of them:
  - 76 IP addresses were assigned to one local MAC address, e.g., because no DHCP client identifier was used by the client
  - 21 IP addresses were assigned to multiple local MAC address

MAC addresses for IP address

Questions?