# Sara Cole

### **Testing Method:**

**Provider Determined From 3 Categories** 

1. MBA testing (AKA Sam Knows)

2. Existing network management systems & tools

3. Provider Developed self-testing configurations

### **Testing Route:**

**Customer Premise to Internet Exchange Point (IXP)** 

- For both speed & latency
- From the customer premise of an active subscriber to a remote test server located at or reached by passing through an FCC-designated IXP



### **Testing Interval:**

**One Week per Quarter** 

- Testing week determined by provider
- Between 6:00 pm to 12:00 am including weekends
- Testing for all locations in a single speed tier in a single state in a given week
- Speed: minimum of one test per hour in each direction
- Latency: minimum of one test per minute per hour



# Sample:

Turns on Subscribership

Number of Subscribers at CAF-Supported Locations per State and Service Tier Combination	Number of Test Locations
50 or fewer	5
51-500	10% of total subscribers
Over 500	50

170

## Additional Problematic Testing Requirements

- Churn
- Customers purchasing service below network capability
- The 150% 'rule'
- Unknown process to exclude false lows due to testing infrastructure issues



## **Compliance Framework**

### Standard/Target

- For <u>latency</u>, 95% of testing at or below 100 ms
- For <u>speed</u>, require 80% of download and upload measurements be at or above 80% of the CAF-required speed tier (i.e., an 80/80 standard)

### Must Report All

- Providers may not discard lost-packet tests from their test results; these tests count as discrete tests not meeting the latency standard.
- If you test either both latency and/or speed more than required, must submit all tests

### Compliance Levels and Support Reductions

	Qualifying	Required	Monthly
	Compliance	Quarterly	Support
	Percentage x	Reporting	Withheld
Full Compliance	x ≥ 100%	No	N/A
Level 1	$85\% \le x < 100\%$	Yes	5%*
Level 2	$70\% \le x < 85\%$	Yes	10%*
Level 3	$55\% \le x < 70\%$	Yes	15%*
Level 4	x < 55%	Yes	25%

X = carrier's compliance percentage

\* some refund possible

### **Reporting & Audit:**

- When?
- We expect USAC to create a method to report results.
- We expect USAC to audit those reports.

### Jimmy Todd CEO/General Manager, Nex-Tech

### **Nex-Tech**

- » Established as Rural Telephone Service Company, Inc. in 1951
  - » A Cooperative Telephone Company in northwest and north central Kansas
  - Wholly-Owned Subsidiary Nex-Tech
  - » Our facilities-based service area covers 9,300 square miles (17 counties)
    - Serving 32,000 customers with Voice, Video, Data and a host of other communications services, 20 store locations
  - » 307 Employees





### **Nex-Tech Services**

Voice Internet Video Wireless Security

#### **Business Technology Solutions**

- Business Telephone Systems
- Video Surveillance
- Security Systems
- Network Infrastructure and Monitoring
- Cable/Wireless Networks
- Data Security Services
- Online Data Back-up
- Cloud Services

Carrier Services

NOC
CALEA

#### **Advertising Solutions**



### **Internet Packages by Technology**

#### <u>Fiber</u>

 $\rangle$ 

- 10 / 3 mbps and 10 / 10 mbps
- 15 / 15 mbps
- 20 / 6 mbps and 20 / 20 mbps
- 30 / 6 mbps
- 50 / 10 mbps and 50 / 50 mbps
- 75 / 10 mbps
- 500 / 500 mbps
- 100 / 10 mbps and 100 / 100 mbps
- 1 gbps / 10 mbps and 1 / 1 gbps

#### <u>Copper</u>

- 1 mbps / 512kbps and 1 / 1 mbps
- 1.5 mbps / 512 kbps and 1.5 / 1.5 mbps
- 3 mbps / 768 kbps and 3 / 3 mbps
- 6 / 1 mbps

#### **Fixed Wireless**

- 512 / 256 kbps
- 1.5 mbps / 512 kbps
- 3 mbps / 512 kbps and 3 mbps / 768 kbps
- 6 mbps / 768 kbps and 6 / 1 mbps and
  - 6 / 3 mbps
- 10 / 3 mbps



# **Performance Testing**

Pro's & Con's (from my perspective)

#### PRO's

- Source of the second second
- Having uniformity in how testing is done should help mitigate some of the gamesmanship by bad actors.
- I'm willing to prove that we have done what we are supposed to do with support funding.
- In some way, testing could lead to improved mapping (maybe a stretch).



# **Performance Testing**

Pro's & Con's

#### CON's

- The timeline doesn't yet make sense for the small providers that have yet been able to testing equipment to determine how it works.
- » Testing solutions by our vendor/partners has not resulted in consistent results.
- >> Third party test solution, Sam Knows, is a non-US company.
- The testing holds us responsible for consumer devices and network anomalies beyond our control.
- The number of tests and frequency for a small provider are not reasonable when compared to the requirements placed on RBOC's and Tier 2 providers.



### **Performance Testing**

### What Nex-Tech has Observed

- > Testing options are producing inconsistent results.
- We have more than 1 up-line provider to the internet. So, the routes going to the required testing point are inconsistent, and therefore result in inconsistent test results.
- Old or faulty CPE can impact the testing results.
- We were not comfortable with foreign jurisdiction of the NDA for "Sam Knows", and they were unwilling to share anything without the NDA. So, research that went nowhere.
- We are not pleased to know that we may to incent customers to be a part of the "voluntary" testing. In my service area, folks will not be happy about having us test their broadband connection to share information with the government.
- There is a very real cost for every testing option. Hardware, software, usage fees, employee time, truck roles.

# FCC Testing Overview

### Joe Reeser

ADTRAN – Business Development

**General Business** 

### **FCC Requirements Recap**

- Impacts carriers with CAF Phase II, A-CAM, rate-of-return mandatory buildout, RBE Rural Broadband Experiment, and Alaska Plan obligations
- Mandates speed and latency performance testing
- Penalizes carriers who don't comply with more stringent quarterly performance/ remediation reporting and percentage of funding withheld
- Starts performance measurements 7/1/2019 with data to be provided to and certified by USAC by July 1, 2020



DA-18-710A1 order released July 6, 2018 promoting greater accountability for recipients of high-cost universal service support <u>https://docs.fcc.gov/public/attachments/</u> <u>DA-18-710A1.pdf</u>

### **Allowed Test Frameworks**

#### Options

- Measuring Broadband America (MBA) testing
- Use existing network management systems and tools
- Provider-developed self-testing configuration using software installed on residential gateways

#### Considerations

- Subscription or SP development/ maintenance costs
- Whitebox hw costs, connect to un-managed LAN and big brother concerns
- Truckrolls



### **The ADTRAN Solution**



#### Device Manager

- Test Control
- Job Processing
- Results Storage
- Multi Function

#### Test Client

- **Test Logi**
- Traffic
   Dotocti
- Affordable
- Multi Function
- Multiple Options

#### **Test server**

- Robust
   Infrastructure
- Availability
- Meets your test schedule
- Dedicated to your testing
- Traverse your IXP

**General Business** 

### **ACS Functionality**

- SMART/RG Device Manager Workflows
  - Test Control
    - Setup
    - Execution
  - Results Management
    - Retrieval
    - Export
    - Storage
- Devices are Labeled prior to initial testing (Via GUI or API)
- Test Parameters pushed to devices in Bulk Operation (Pre Test)
- Results retrieved via Bulk Operation (Post Test)
- Export Results to CSV or JSON for reporting



TR-143 098,18 1 Control

# **ACS UI – Device Configuration**

#### CAF TESTING

CAF Settings			Voice	view Dev
Marked For Testing:	Disabled		WIFI Speedtest 2	DMZ
CAF Tier Selection:	- Low Bandwidth Settings		Reboot Device	view Down Entor
	Mid Bandwidth Settings		Replace Device	Facto
Beginning of Te	High Bandwidth Settings	1:00	RIP	Firmw
End of Tes	Time: 2019-02-11T16:	36:00	Port Forwards	Firmw Firmw
	2013-02-11110.	30.00	Local GUI Click Through v	lew Initiate
Download Setti	ngs Upload Settings	Latency Settings	Update Firmware V	lew IP Inter
	de la episite serie de		V EXPERT	LAN De
			Event Logs V	ew LAN Ho
Dov	wnload URL: ftp://172.25	.0.134/download	Analytics	LAN Sut
		/caf_test.txt		Local SL
Max I	oad (Kbos):	64	Factory Default Device vie	w Managen
	and frinkals.		Parameter Browser	Marketing
Test Du	ration (Sec):	10	Synchronization vie	W Network P
		Protocol Version:	O Type here to search	Contest Str.
		Test Jitter (Sec):		
		Test Interval (Sec):		

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# **ACS UI – Bulk Operation**

<b>Bulk Operation</b>					
Name:	CAF Test 2019-02-13				
Solicit Devices:	(contact the device instead of waiting for a periodic inform)				
Max Sessions:	10		(optional: limit the number of concurrent sessions for this bulk operation		
Action: Parameters:	CAF Start Test		8		
	Name		Value		
	End Time format Di	- ISO ate-Time	2019-02-13723-00		
	Start Tim format Da	e - ISO ate-Time	2019-02-13T18:00		
Schedule				Schedule Preview	
Run:	Now	0		Legend	
				Devices are selected on the first day of this	
				Devices are selected on the first day of this	
				Devices may be processed	
Available Columns Filter		Criteria			
Search this list! In	evice label.		Device Labels		
families Indeals			adding the CAF Loss T	MC .	

1

## **ACS UI – Test Results**

#### **Slow Download Speed**

WAN IPv4 Address	Subscriber Name	Model	Download Speed Test Throughput()
10.101.40.58	JBSR655ac	SR655ac - SR655ac	1.879724743193378, 1.880287310454
10.102.1.137		SR505N - 963168MBV_17AZZ	1.881225671224673, 1.881225671224
10.102.2.4		SR515ac - 963168_OT142C_B	1.8763563962170233
0.0.0.0, 173.78.150.211	JBSR570ac	tmp_hardware1.0 - 434RG	1.8752362948960302
10.101.40.32	JBSR570ac	SR570ac - SR570ac	1.8821649690433393
10.102.2.5		SR515ac - 963168_OT142C_B	0.012126168861263324, 0.012474199
10.102.2.5		SR555ac - 963138_T281_C	2804.4590899530253, 3348.12086716
75.164.140.221	Sam Finnigan	SR555ac - 963138_T281_C	5966.441248663545, 7921.575944178
73.240.210.33, 192.168.0.2	Sain Finnigan	SR516ac - 963167GWV_004R	31305.40225619712, 35310.77046710

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### Timeline

- February demos, March carrier lab trials,
- Q2 GA for the following Broadcom-based gateways:
  - SR320/360, SR501, SR506, SR515/516, SR555, SR570, SR616ac/ace, SR655, SR700, SR808
- Q2 carrier lab trials
- Q3 GA for the following SmartOS-based and ADTRAN gateways:
  - SR400, SR606, SR652, SR900, SR905, ADTRAN 424RG



#### SR516AC

- Residential Gateway
- Single Pair VDSL2
- 802.11AC
- Ethernet Wan Port



### SR400AC

- Residential Gateway
- 802.11AC
  - Ethernet Wan Port



### **Integrated Approach**

### Single Box

- Onboard Test Logic
- Software Upgrade for existing devices
- No Wiring Issues
  - No new wires to worry about
- Lessen Customer Complaints
- Multi-Use Solution
  - Home Router
  - WiFi Gateway
  - More than just a test box





### **Solution Benefits**

End-to-end solution including test servers as a service and optional fully managed service

Open/standards-based approach

Available across entire portfolio of gateways

Leverage existing infrastructure/ investments

No new whitebox hardware, testing on un-managed LAN, or big brother concerns

Leverage beyond CAF

## Nathan Weber

Vantage Point

### BETTI Box "BETTI" and "BETTI xt"

- » BETTI Single-ended design
  - Easy customer install
  - » Single GigE interface
  - >> Used when no crosstalk measurement required

- » BETTI xt In-line design
   » FCC crosstalk
   measurement capable
  - Three GigE interfaces with integrated switch





### **Key Attributes for BETTI Box**



**EASY TO USE** Just plug it in and walk away



**FIELD TESTED** Hundreds of thousands of tests performed



**TECHNOLOGY NEUTRAL** Vendor Agnostic and works on all networks



### INTELLIGENT

Autodetects customer information



### **RESPONSIVE** Receive alerts if a test location goes offline or if a test fails

**SECURE** Equipment and portal are secure and encrypted

### **Testing to FCC IXP Locations**

- Many small providers do not directly connect to IXP locations
- Failures may be due to network issues outside providers' control



### **Randomize Test Hour Window**

"We note that speed testing has greater network impact than latency testing. For speed testing, we require providers to start separate download and upload speed tests at the beginning of each test hour window." (para. 28)

» Thousands of performance tests will be initiated at the same time

> Even with test weeks distributed throughout the quarter, test servers and middle mile circuits could become overloaded if every speed test is initiated at the beginning of each test hour window

» Network load could be minimized if tests were distributed throughout the test hour

### Subscriber Package < FCC Tier

- » A randomly selected subscriber location may purchase a broadband service with the downstream/upstream speed below the CAF obligated tier
- The service provider may have to increase broadband speed to that subscriber to meet the CAF obligated tier
- » For certain companies, this may require moving the customer to a different network

### **Dealing with Crosstalk**

 Customer usage at some test locations may never drop below 64 kbps downstream or 32 kbps upstream
 Cameras, OTT video, IoT, etc.

The FCC's goal is to collect six speed tests at each test location each night
 Continuously deferring tests due to customer usage contradicts that goal

There needs to be a process to deal with persistent crosstalk

- Streamlined process for selecting another test customer location
- » Ability to add crosstalk to the speed test result

### **Greg Bathrick** Calix

# CAF Performance Testing

# Pre-testing has started, How about you?



**General Business** 

# 

Implementation

Investigation 35%

Not started 29%

Reviewing the order 29%

September 2018

Calix

Implementation 5% Not started 10%

> Reviewing the order 16%

Investigation 69%

February 2019

Implementation 100%

July 2019?

Top Three Concerns

Early Feedback from early in the program

» Guarantying performance
» Finding the best "test server"

» Minimizing subscriber involvement



### **Guarantying performance**

FCC states: "We require that carriers test up to 50 locations per CAF-required service tier offering per state." possible tiers: 1G/500M, 100/20M, 25/3M, 10/1M

### **Questions/Concerns:**

- I have a mix of services in the same state (100/20M, 25/3M, 10/1M) and I am concerned with test server overload
- Full gigabit test are just around the corner



Answer: the only way to know for sure is to confirm it! **Start testing today... but what test server?** Colix

### Finding the best "test server"

FCC states: "... (Must test between) a customer premises and remote server that is located at or reached by passing through an FCC-designated (16) IXP"

### **Questions/Concerns**

- Which IXP city? I do not manage the middle mile network to the test server.
- » How much time will it take and how much will it cost?
- Will it always be available and reliable?



Answer: Proven nationwide service with a track record measuring loads similar to the FCC mandated test

### **Minimizing subscriber involvement**

FCC States: "Providers may employ any of these 3 options as long as the provider's implementation meets the .... requirements established in this Order."

### Questions/Concerns:

- Why do I need this white test box?
- » How do I receive, connect and maintain it?
- Will it accurately test my speed and latency?

Answer: Simplify... No white boxes... The FCC test framework #2 allows the RG to be the test client



# Proven... Ready... Simplify...

- The only way to know for survivor
   your network
   the confirm it
   today
   CSC
   GigaSpire,
   Ookla
   Ready
- » Ookla 🦳 Proven
  - Contraction of the second seco
- The easiest way to Simplify operations is to minimize subscriber involvement. FCC allows the RG (GigaSpire) to be the test client





### Proven... Ready... Simplify...

- The only way to know for sure your network meets FCC rules is the confirm it! Start testing today... Calix CSC and GigaSpire, and Ookla are Ready
- » Ookla is a Proven nationwide service with a track record measuring loads similar to the FCC mandated test
- The easiest way to Simplify operations is to minimize subscriber involvement. FCC allows the RG (GigaSpire) to be the test client







MAY | 2019



JUNE | 2019



# So What Happens Next?

- Don't count on a delay
- » Don't wait on the FCC for more info
- If you haven't done so, start testing
   Set up using FCC rules by extending operations
  - Activate test client on RG
  - Download test controller
  - Assign a test city
  - Collect and anlyze data
  - Make network adjustments
  - Retest...

Go operational July 1 (59 working days)

Download latest software as needed when FCC rules are clarified





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