

# TR398 Compliance and Beyond

Ramakrishna Chikkala  
Product Director  
Alethea Communications Technologies

Alethea Communications Technologies  
info@aletheatech.com

# TR-398 - What is it ?

- Technical report that details Performance tests for Residential and SOHO Routers/APs
- [https://www.broadband-forum.org/technical/download/TR-398\\_Issue-2.pdf](https://www.broadband-forum.org/technical/download/TR-398_Issue-2.pdf)
- Broadband Forum - <https://www.broadband-forum.org/about-bbf>



# TR-398 - Why ? History

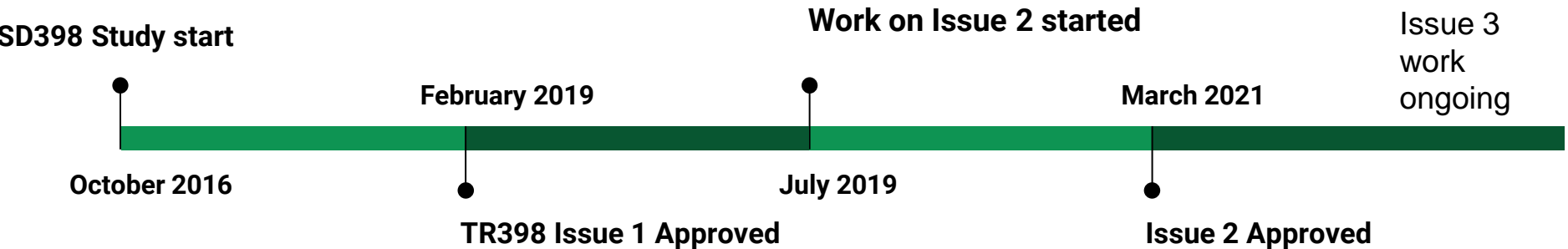
- IEEE 802.11 provides specifications
- WiFi Alliance (WFA) is focused on Interoperability tests based on 802.11 standards and new requirements from WFA itself
- Home Gateway Initiative (HGI) started in 2006 for standardising for Residential gateways but closed.
- CTIA with WFA has done some tests for RF capabilities (no metrics though)
- There are no real specifications or standards for measuring performance of Residential/SOHO Routers



# TR-398

## Why? In BBFs own words

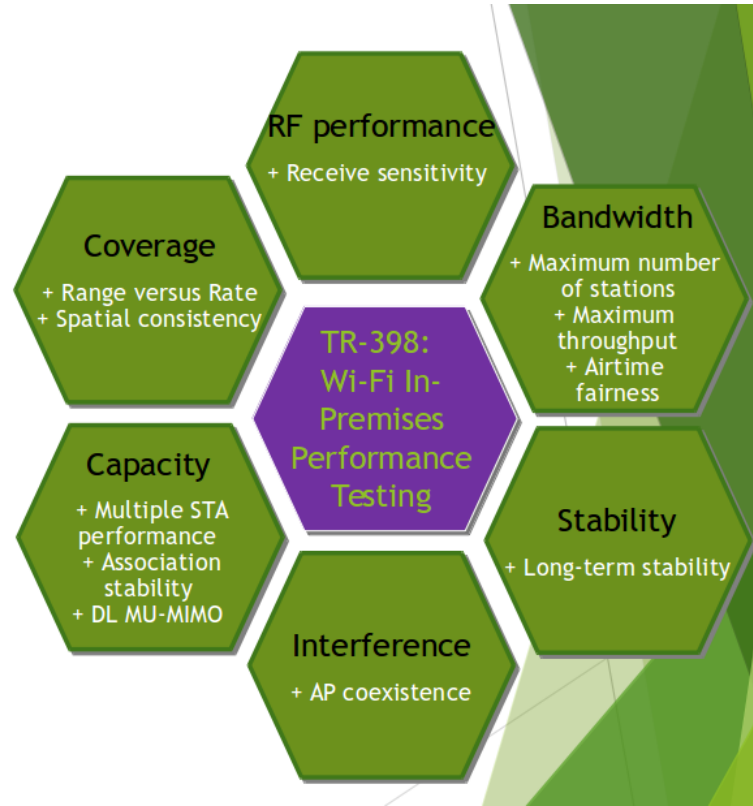
- Focused on operator requirements for “Carrier Grade” Wi-Fi
- Testing coverage is for AP devices
- Pragmatic approach to testing, with emphasis on what is or will be deployed
- Technologies: 802.11n & 802.11ac (2 spatial streams) & 802.11ax (as part of Issue 2)
- First industry agreed absolute performance requirements
- Pass / Fail decision points



# TR-398 Issue 1- What is in it ?

- 11 Test Cases, 6 Categories
- Framework to measure aspects of performance b/w DUT and one or more STAs
- Test setup information,
- Equipment configuration requirements,
- Test procedures, and
- Pass/Fail requirements

**Under controlled laboratory conditions**



Picture Courtesy: Broadband Forum

# TR-398 - Setup/Equipment information

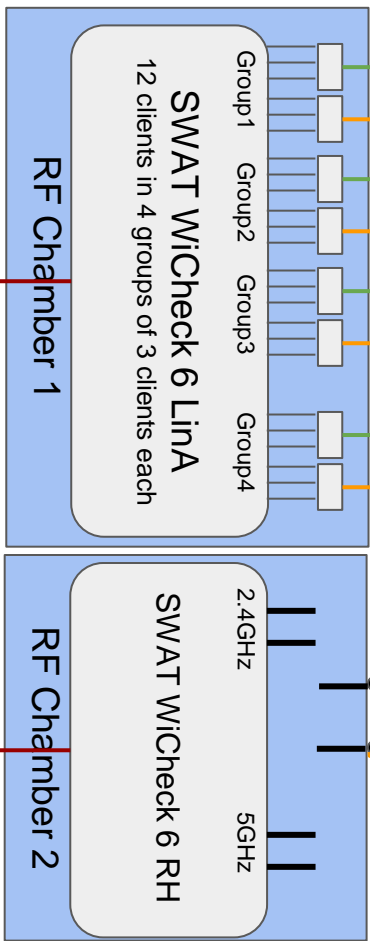
- Can use Single Chamber (big) OR multiple chambers (with attenuators)
- Allows use of real products or dedicated test equipment
- Uses External Traffic generators/Analysers
- IPERF3 is the preferred measurement tool for throughput
- Little or no special APIs needed for DUT control



# Topology

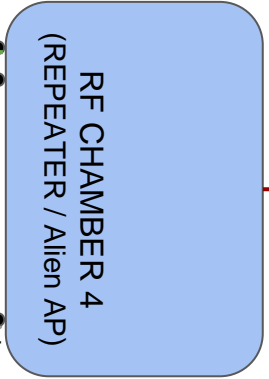
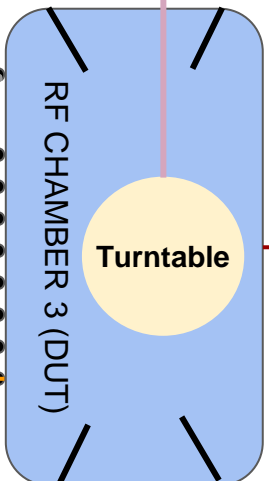


Traffic Generator  
Life









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USB Control for turntable



Fixed attenuation - 2m equivalent

Secondary connection TGL ↔ EPL

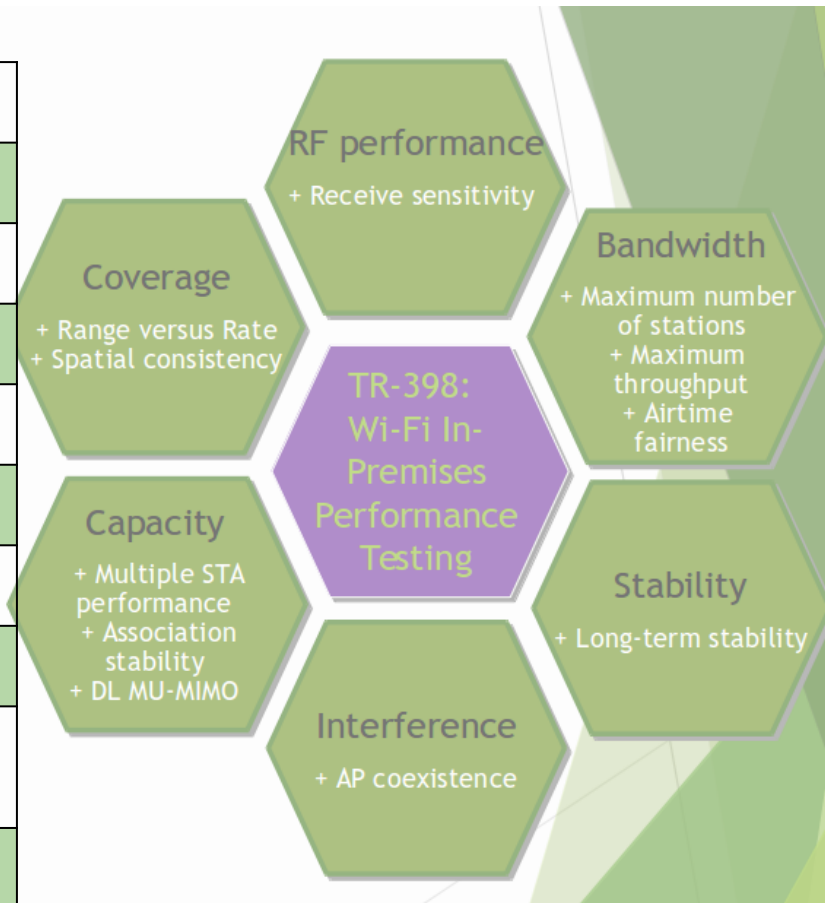
-  Combiner
-  Antenna 1 cable
-  Antenna 2 cable
-  Ethernet
-  Fixed attenuation
-  Physical Antenna

End Point  
Life



# TR-398 Issue 1 - Tests

Receiver Sensitivity	Optional
Maximum Connection	Mandatory
Maximum Throughput	Mandatory
Airtime Fairness	Mandatory
Range v/s Rate	Mandatory
Spatial Consistency	Mandatory
Mutiple STAs performance	Mandatory
Multiple Association/Disassociation	Mandatory
Downlink MU MIMO Performance	Conditionally Mandatory
Long Term Stability	Mandatory
AP Co-existence	Mandatory





# TR-398 - Issue 2

- Existing tests extended to cover 802.11ax
  - Added associated metrics for 802.11ax
- New tests added
  - Dual-band Throughput
  - Bidirectional Throughput
  - Repeated Wi-Fi Performance
  - Basic Roaming Performance
  - Channel Auto-selection
  - 802.11ax Peak Performance



# TR-398 - What is good & what can improve

## The Good

- First standardized performance test pack for the WiFi industry - perfect for operators
- Simple test cases that can theoretically be done without any custom equipment
- Easy to run, replicate and compare as benchmark between various equipment
- Pass / fail criteria that are based on real world measurements and not theoretical calculations

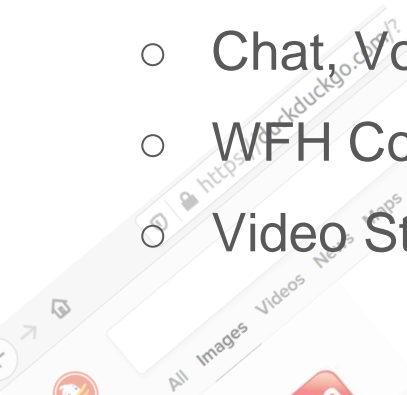
## What can improve

- Stability of the system under test under stress and soak scenarios
- Security options are not considered, especially its impact on performance
- Assumes that features such as MU-MIMO will work off-the-shelf
- Currently does not cover real-world traffic (voice, video etc.) and user behavior. Also the impact of different types of traffic running simultaneously



# Beyond T398 - Application Performance

- What are people doing with WiFi ?
  - Chat, Voice/Video Calls, Browsing
  - WFH Conference call with Screen sharing
  - Video Streaming, Games



YouTube

NETFLIX



# Beyond TR-398 - KPIs

- VoIP Call Performance (MOS, R, Latency, Jitter)
- Video Streaming (Buffering/Interruptions, Quality)
- Video Calls (MOS, Latency, Jitter)
- Browsing (Page load time)
- Gaming (Latency, Jitter, Quality)



**There is scope for collaboration to define measurable KPI with open applications for all of the above.**

# About Alethea Communications

- Alethea Communications strives to “Perfect Broadband” for Everyone Everywhere, Everytime
- Our product & services portfolio focuses on WiFi Access Point and network testing for both Residential/SOHO & Enterprise domain
- Alethea’s WiFi Multiclient Solutions allow you to perform Scale, Functional, Performance, and Stress tests with real applications (Video / VoIP Calls, Streaming, Browsing etc.) along with standard measurement tools (iperf, qperf)
- Alethea Communications is a member of Broadband Forum & Wireless Broadband Alliance

# Questions ?

