

Отчет о тестирование WIFI7 устройств DR5018S и DR5322 про-ва Wallys

В период с 21.08.2025 по 05.09.2025 специалистами ООО «Фабмикро» и по поручению Заказчика было проведено тестирование плат маршрутизаторов DR5018S и DR5322 производства китайской компании Wallys поддерживающих стандарт WIFI7 с целью определения работоспособности данных изделий, соответствии их функций требованиям Заказчика и подготовки рабочих настроек.

Оба устройства DR5018S и DR5322 снабжены тремя независимыми радио-модулями позволяющими осуществлять связь стандарта WIFI в диапазонах 2.4ГГц, 5ГГц и 6ГГц (2x2.4Ghz, 2x5Ghz, 2x6Ghz). На устройствах установлено программное обеспечение на базе OpenWRT (дистрибутив ОС Linux) с загруженными проприетарными драйверами для беспроводных адаптеров производства Atheros (принадлежит компании Qualcomm, США).

Выявленные проблемы

В процессе настроек и проведения тестов выяснились следующие проблемные моменты:

1. На обоих устройствах имеются проблемы с Web UI. Попытка проводить настройку устройств через Web интерфейс приводит к тому, что ни один из беспроводных интерфейсов не работает. Данная проблема подтверждается специалистами техподдержки производителя. Все дальнейшие настройки проводились через командную строку путем редактирования конфигурационных файлов в /etc/config/ и активации их командой **reload_config**. Доступ к устройствам осуществлялся через последовательный порт (UART) и через SSH.
2. На устройстве DR5322 полностью неработоспособен радио-модуль для диапазона 2.4ГГц (интерфейс **ath0**). Проблема подтверждается специалистами техподдержки производителя (предлагают вернуть плату для доработки/устранения).
3. На устройстве DR5322 радио-модуль для диапазона 6 ГГц (интерфейс **ath2**) не может работать в режиме «клиент» (**option mode 'sta'**). В то же время данный радио-модуль может функционировать как «клиент» в режиме Wireless Distributed System (WDS), перевод в этот режим осуществляется опцией **option wds '1'**.
4. Радио-модули для диапазона 6 ГГц на обоих устройствах функционируют только при включенной поддержке шифрования WPA3 (**option encryption 'ccmp'**, **option sae '1'**, **option sae_pwe '1'**). При выключенной криптографии, а также в режиме WPA2 данные радио-модули не функционируют.
5. В процессе тестирования связи по WIFI7 (6ГГц) где DR5018S настроен как клиент (Client), а DR5322 — как точка доступа (AP), выяснилось, что на линке периодически с интервалом 15-20 секунд возникают задержки (флуктуации) более 100 мс. Такое поведение линка может создавать проблемы при высокой нагрузке (перегрузка очередей и потерю пакетов). Представители техподдержки производителя объясняют такое поведение устройств периодическим фоновым сканированием радио-эфира. Способов отключить данное сканирование предложено не было. Однако, выяснилось, что в если оба устройства функционируют в режиме WDS, то такой проблемы нет.

6. Устройство DR5018S не поддерживает режим Multi-Link Operation (MLO), в связи с чем данный режим работы протестирован не был.

7. Устройство DR5322 с загруженной на него «заводской» прошивкой оказалось неработоспособным. Представители техподдержки производителя прислали другую прошивку (файл **norplusnand-ipq5332s-single-20250626.img**) и инструкцию по загрузке (файл: **flash-over-tftp.txt**).

В процессе тестирования специалистам техподдержки производителя был предоставлен полный удаленный доступ к устройствам, в том числе консоль (UART), SSH и HTTP (Web), для чего был выделена отдельная машина на базе Raspberry Pi и произведены соответствующие настройки трансляции портов IP Firewall-а. Специалисты техподдержки оказывали активную помощь в разрешении различных проблем конфигурации и неоднократно подключались к устройствам. Имеется архив переписки по электронной почте со службой техподдержки производителя, который может быть предоставлен по отдельному запросу.

Процесс тестирования

Так как радио-модуль 2.4ГГц на DR5322 оказался не работоспособным, а режим MLO не поддерживается на DR5018S, то все тесты были сосредоточены на тестировании нескольких конфигураций WIFI7 — 6ГГц. В лабораторных условиях была собрана следующая установка:

RPI400 <-- 1 GbitEthernet --> DR5322 <-- WIFI7 --> DR5018S <-- 1 GbitEthernet --> Unix Host.

На машине «Unix Host» (192.168.1.1) был запущен сервер **iperf3 -s**. На машине «RPI400» (192.168.1.3) использовался клиент **iperf3 -c** с различными опциями.

Все тесты проводились в лабораторных условиях. Расстояние между антеннами двух устройств не превышает 5м. Состояние линка (Link Quality) не менее 70/94, RSSI > -70dBm. Питание устройств DR5018S и DR5322 производилось по PoE от локального Ethernet коммутатора через порты незадействованные в тестировании.

Всего было проведено 5 тестов в различных конфигурациях устройств:

Тест №1. DR5322(AP) <--> DR5018S(Client), 20 МГц.

Тест №2. DR5322(AP) <--> DR5018S(Client), 80 МГц.

Тест №3. DR5018S(AP) <--> DR5322(WDS Client), 20 МГц.

Тест №4. DR5018S(AP) <--> DR5322(WDS Client), 80 МГц.

Тест №5. DR5018S(WDS Client) <--> DR5322(AP), 80 МГц.

Результаты тестов приведены в приложениях. К данному отчету также прилагает файл-архив **Wallys-DR5018S-DR5322-test.zip** с настройками устройств в различных тестовых конфигурациях.

Генеральный директор ООО «Фабмикро»
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Тест №1. DR5322(AP) <--> DR5018S(Client), 20 МГц.

Схема соединения и настройки устройств:

RPI400 <-- 1GE --> DR5322(AP) <-- WIFI7 (6.375GHz) --> DR5018S(Client) <-- 1GE --> Unix Host.

DR5322: в режиме точка доступа (**option mode 'ap'**), протокол 802.11аха (**option hwmode '11аха'**), ширина канала 20МГц (**option htmode 'HT20'**), канал 85 (**option channel '85'**).

DR5018S: в режиме клиент (**option mode 'sta'**), протокол 802.11аха (**option hwmode '11аха'**), ширина канала 20МГц (**option htmode 'HT20'**), канал 85 (**option channel '85'**).

Состояние линка:

```
root@DR5018S-Client:~# iwconfig ath2
ath2 IEEE 802.11аха ESSID:"OpenWrt6"
Mode:Managed Frequency:6.375 GHz Access Point: C6:4B:D1:70:03:A9
Bit Rate:286.8 Mb/s Tx-Power=10 dBm
RTS thr:off Fragment thr:off
Encryption key:61A3-CF55-69E0-E255-F056-0A25-E791-FFA0 [2] Security mode:restricted
Power Management:off
Link Quality=72/94 Signal level=-70 dBm Noise level=-97 dBm (BDF averaged NF value in
dBm)
Rx invalid nwid:0 Rx invalid crypt:1 Rx invalid frag:0
Tx excessive retries:0 Invalid misc:0 Missed beacon:0
```

Тестирование пропускной способности в прямом направлении (Unix Host --> DR5018S --> DR5322 --> RPI400):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1
Connecting to host 192.168.1.1, port 5201
[ 5] local 192.168.1.2 port 59340 connected to 192.168.1.1 port 5201
[ ID] Interval      Transfer      Bitrate      Retr  Cwnd
[ 5] 0.00-1.00 sec  11.0 MBytes  92.0 Mbits/sec  0    460 KBytes
[ 5] 1.00-2.00 sec  9.66 MBytes  81.0 Mbits/sec  0    921 KBytes
[ 5] 2.00-3.00 sec  11.2 MBytes  94.4 Mbits/sec  0    1.45 MBytes
[ 5] 3.00-4.00 sec  11.2 MBytes  94.4 Mbits/sec  0    2.01 MBytes
[ 5] 4.00-5.00 sec  11.2 MBytes  94.4 Mbits/sec  0    2.57 MBytes
[ 5] 5.00-6.00 sec  11.2 MBytes  94.4 Mbits/sec  0    3.13 MBytes
[ 5] 6.00-7.00 sec  10.0 MBytes  83.9 Mbits/sec  0    3.66 MBytes
[ 5] 7.00-8.00 sec  12.5 MBytes  105 Mbits/sec  0    3.88 MBytes
[ 5] 8.00-9.00 sec  11.2 MBytes  94.4 Mbits/sec  0    3.88 MBytes
[ 5] 9.00-10.00 sec 11.2 MBytes  94.4 Mbits/sec  0    3.88 MBytes
- - - - -
[ ID] Interval      Transfer      Bitrate      Retr
[ 5] 0.00-10.00 sec  111 MBytes  92.8 Mbits/sec  0
[ 5] 0.00-10.32 sec  110 MBytes  89.8 Mbits/sec
sender
receiver

iperf Done.
```

Тестирование пропускной способности в обратном направлении (RPI400 --> DR5322 --> DR5018S --> Unix Host):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -R
Connecting to host 192.168.1.1, port 5201
Reverse mode, remote host 192.168.1.1 is sending
[ 5] local 192.168.1.2 port 52124 connected to 192.168.1.1 port 5201
[ ID] Interval      Transfer      Bitrate
[ 5] 0.00-1.00 sec  11.0 MBytes  92.1 Mbits/sec
[ 5] 1.00-2.00 sec  11.2 MBytes  94.2 Mbits/sec
[ 5] 2.00-3.00 sec  11.2 MBytes  94.1 Mbits/sec
[ 5] 3.00-4.00 sec  11.2 MBytes  94.1 Mbits/sec
[ 5] 4.00-5.00 sec  11.2 MBytes  94.1 Mbits/sec
[ 5] 5.00-6.00 sec  11.2 MBytes  94.2 Mbits/sec
[ 5] 6.00-7.00 sec  11.2 MBytes  94.1 Mbits/sec
```

```
[ 5] 7.00-8.00 sec 10.2 MBytes 85.8 Mbits/sec
[ 5] 8.00-9.00 sec 11.2 MBytes 94.2 Mbits/sec
[ 5] 9.00-10.00 sec 11.2 MBytes 94.2 Mbits/sec
- - - - -
[ ID] Interval          Transfer    Bitrate      Retr
[ 5] 0.00-10.00 sec    112 MBytes 94.2 Mbits/sec    23
[ 5] 0.00-10.00 sec    111 MBytes 93.1 Mbits/sec
sender
receiver
```

iperf Done.

Непрерывный поток пакетов (flood ping) размером 1400 байт:

```
root@rpi400:/home/rz# ping -f -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
...
--- 192.168.1.1 ping statistics ---
17199595 packets transmitted, 17197501 received, 0.0121747% packet loss, time 47896950ms
rtt min/avg/max/mdev = 1.752/2.808/109.014/2.992 ms, pipe 8, ipg/ewma 2.784/2.703 ms
```

Поток пакетов размером 1400 байт с интервалом 1 сек:

```
root@rpi400:/home/rz# ping -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
1408 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=3.32 ms
1408 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=3.05 ms
1408 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=2.88 ms
...
1408 bytes from 192.168.1.1: icmp_seq=15 ttl=64 time=2.58 ms
1408 bytes from 192.168.1.1: icmp_seq=16 ttl=64 time=2.65 ms
1408 bytes from 192.168.1.1: icmp_seq=17 ttl=64 time=2.61 ms
1408 bytes from 192.168.1.1: icmp_seq=18 ttl=64 time=2.65 ms
1408 bytes from 192.168.1.1: icmp_seq=19 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=20 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=21 ttl=64 time=2.58 ms
1408 bytes from 192.168.1.1: icmp_seq=22 ttl=64 time=2.72 ms
1408 bytes from 192.168.1.1: icmp_seq=23 ttl=64 time=2.57 ms
1408 bytes from 192.168.1.1: icmp_seq=24 ttl=64 time=2.54 ms
1408 bytes from 192.168.1.1: icmp_seq=25 ttl=64 time=2.49 ms
1408 bytes from 192.168.1.1: icmp_seq=26 ttl=64 time=103 ms
...
1408 bytes from 192.168.1.1: icmp_seq=45 ttl=64 time=2.90 ms
1408 bytes from 192.168.1.1: icmp_seq=46 ttl=64 time=3.27 ms
1408 bytes from 192.168.1.1: icmp_seq=47 ttl=64 time=2.72 ms
1408 bytes from 192.168.1.1: icmp_seq=48 ttl=64 time=3.24 ms
1408 bytes from 192.168.1.1: icmp_seq=49 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=50 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=51 ttl=64 time=2.67 ms
1408 bytes from 192.168.1.1: icmp_seq=52 ttl=64 time=3.37 ms
1408 bytes from 192.168.1.1: icmp_seq=53 ttl=64 time=2.97 ms
1408 bytes from 192.168.1.1: icmp_seq=54 ttl=64 time=3.30 ms
^C
--- 192.168.1.1 ping statistics ---
54 packets transmitted, 54 received, 0% packet loss, time 53083ms
rtt min/avg/max/mdev = 2.469/12.198/103.323/28.986 ms
```

Тест №2. DR5322(AP) <--> DR5018S(Client), 80 МГц.

Схема соединения и настройки устройств:

RPI400 <-- 1GE --> DR5322(AP) <-- WIFI7 (6.155GHz) --> DR5018S(Client) <-- 1GE --> Unix Host.

DR5322: в режиме точка доступа (**option mode 'ap'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 80МГц (**option htmode 'HT80'**), канал 85 (**option channel '41'**).

DR5018S: в режиме клиент (**option mode 'sta'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 80МГц (**option htmode 'HT80'**), канал 85 (**option channel 'auto'**).

Состояние линка:

```
root@DR5018S-Client:~# iwconfig ath2
ath2 IEEE 802.11axa ESSID:"OpenWrt6"
Mode:Managed Frequency:6.155 GHz Access Point: C6:4B:D1:70:03:A9
Bit Rate:1.201 Gb/s Tx-Power=10 dBm
RTS thr:off Fragment thr:off
Encryption key:47F4-6465-44FA-AE0E-D621-C256-6587-9F84 [2] Security mode:restricted
Power Management:off
Link Quality=92/94 Signal level=-58 dBm Noise level=-97 dBm (BDF averaged NF value in
dBm)
Rx invalid nwid:0 Rx invalid crypt:1 Rx invalid frag:0
Tx excessive retries:0 Invalid misc:0 Missed beacon:0
```

Тестирование пропускной способности в прямом направлении (Unix Host --> DR5018S --> DR5322 --> RPI400):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -b1000M
Connecting to host 192.168.1.1, port 5201
[ 5] local 192.168.1.2 port 43676 connected to 192.168.1.1 port 5201
[ ID] Interval      Transfer      Bitrate      Retr  Cwnd
[ 5] 0.00-1.00      sec  48.2 MBytes  405 Mbits/sec  0    2.65 MBytes
[ 5] 1.00-2.00      sec  47.5 MBytes  398 Mbits/sec  0    2.87 MBytes
[ 5] 2.00-3.00      sec  49.1 MBytes  412 Mbits/sec  0    2.87 MBytes
[ 5] 3.00-4.00      sec  48.2 MBytes  405 Mbits/sec  1    2.87 MBytes
[ 5] 4.00-5.00      sec  48.1 MBytes  404 Mbits/sec  0    2.87 MBytes
[ 5] 5.00-6.00      sec  48.6 MBytes  408 Mbits/sec  0    2.87 MBytes
[ 5] 6.00-7.00      sec  47.9 MBytes  402 Mbits/sec  0    2.87 MBytes
[ 5] 7.00-8.00      sec  47.8 MBytes  401 Mbits/sec  0    2.87 MBytes
[ 5] 8.00-9.00      sec  47.8 MBytes  401 Mbits/sec  0    2.87 MBytes
[ 5] 9.00-10.00     sec  48.4 MBytes  406 Mbits/sec  0    2.87 MBytes
- - - - -
[ ID] Interval      Transfer      Bitrate      Retr
[ 5] 0.00-10.00     sec  482 MBytes  404 Mbits/sec  1
[ 5] 0.00-10.03     sec  482 MBytes  403 Mbits/sec
sender
receiver

iperf Done.
```

Тестирование пропускной способности в обратном направлении (RPI400 --> DR5322 --> DR5018S --> Unix Host):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -b1000M -R
Connecting to host 192.168.1.1, port 5201
Reverse mode, remote host 192.168.1.1 is sending
[ 5] local 192.168.1.2 port 42530 connected to 192.168.1.1 port 5201
[ ID] Interval      Transfer      Bitrate
[ 5] 0.00-1.00      sec  79.7 MBytes  668 Mbits/sec
[ 5] 1.00-2.00      sec  93.4 MBytes  784 Mbits/sec
[ 5] 2.00-3.00      sec  93.3 MBytes  782 Mbits/sec
[ 5] 3.00-4.00      sec  93.3 MBytes  782 Mbits/sec
[ 5] 4.00-5.00      sec  92.7 MBytes  778 Mbits/sec
[ 5] 5.00-6.00      sec  85.3 MBytes  715 Mbits/sec
[ 5] 6.00-7.00      sec  84.0 MBytes  705 Mbits/sec
[ 5] 7.00-8.00      sec  85.2 MBytes  714 Mbits/sec
```

```
[ 5] 8.00-9.00 sec 85.2 MBytes 715 Mbits/sec
[ 5] 9.00-10.00 sec 84.2 MBytes 707 Mbits/sec
- - - - -
[ ID] Interval          Transfer      Bitrate      Retr
[ 5] 0.00-10.01 sec    879 MBytes   737 Mbits/sec    6
[ 5] 0.00-10.00 sec    876 MBytes   735 Mbits/sec
sender
receiver
```

iperf Done.

Непрерывный поток пакетов (flood ping) размером 1400 байт:

```
root@rpi400:/home/rz# ping -s 1400 -f 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
.....^
--- 192.168.1.1 ping statistics ---
2662102 packets transmitted, 2661920 received, 0.0068367% packet loss, time 5797664ms
rtt min/avg/max/mdev = 1.689/2.155/106.287/2.200 ms, pipe 7, ipg/ewma 2.177/2.094 ms
```

Поток пакетов размером 1400 байт с интервалом 1 сек:

```
root@rpi400:/home/rz# ping -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
1408 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=2.42 ms
1408 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=2.26 ms
1408 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=6 ttl=64 time=2.34 ms
1408 bytes from 192.168.1.1: icmp_seq=7 ttl=64 time=2.28 ms
1408 bytes from 192.168.1.1: icmp_seq=8 ttl=64 time=2.77 ms
1408 bytes from 192.168.1.1: icmp_seq=9 ttl=64 time=2.99 ms
1408 bytes from 192.168.1.1: icmp_seq=10 ttl=64 time=2.31 ms
1408 bytes from 192.168.1.1: icmp_seq=11 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=12 ttl=64 time=2.28 ms
1408 bytes from 192.168.1.1: icmp_seq=13 ttl=64 time=2.36 ms
1408 bytes from 192.168.1.1: icmp_seq=14 ttl=64 time=2.30 ms
1408 bytes from 192.168.1.1: icmp_seq=15 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=16 ttl=64 time=103 ms
...
1408 bytes from 192.168.1.1: icmp_seq=33 ttl=64 time=2.70 ms
1408 bytes from 192.168.1.1: icmp_seq=34 ttl=64 time=42.4 ms
1408 bytes from 192.168.1.1: icmp_seq=35 ttl=64 time=102 ms
...
1408 bytes from 192.168.1.1: icmp_seq=44 ttl=64 time=2.26 ms
1408 bytes from 192.168.1.1: icmp_seq=45 ttl=64 time=2.44 ms
1408 bytes from 192.168.1.1: icmp_seq=46 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=47 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=48 ttl=64 time=2.28 ms
1408 bytes from 192.168.1.1: icmp_seq=49 ttl=64 time=2.48 ms
1408 bytes from 192.168.1.1: icmp_seq=50 ttl=64 time=2.68 ms
1408 bytes from 192.168.1.1: icmp_seq=51 ttl=64 time=2.43 ms
...
1408 bytes from 192.168.1.1: icmp_seq=61 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=62 ttl=64 time=2.37 ms
1408 bytes from 192.168.1.1: icmp_seq=63 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=64 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=65 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=66 ttl=64 time=2.61 ms
1408 bytes from 192.168.1.1: icmp_seq=67 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=68 ttl=64 time=2.35 ms
1408 bytes from 192.168.1.1: icmp_seq=69 ttl=64 time=2.45 ms
1408 bytes from 192.168.1.1: icmp_seq=70 ttl=64 time=2.38 ms
1408 bytes from 192.168.1.1: icmp_seq=71 ttl=64 time=2.51 ms
1408 bytes from 192.168.1.1: icmp_seq=72 ttl=64 time=2.33 ms
1408 bytes from 192.168.1.1: icmp_seq=73 ttl=64 time=2.27 ms
1408 bytes from 192.168.1.1: icmp_seq=74 ttl=64 time=2.51 ms
1408 bytes from 192.168.1.1: icmp_seq=75 ttl=64 time=3.01 ms
1408 bytes from 192.168.1.1: icmp_seq=76 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=77 ttl=64 time=2.36 ms
1408 bytes from 192.168.1.1: icmp_seq=78 ttl=64 time=2.24 ms
1408 bytes from 192.168.1.1: icmp_seq=79 ttl=64 time=2.23 ms
```



```
1408 bytes from 192.168.1.1: icmp_seq=80 ttl=64 time=2.36 ms
1408 bytes from 192.168.1.1: icmp_seq=81 ttl=64 time=3.00 ms
...
1408 bytes from 192.168.1.1: icmp_seq=91 ttl=64 time=2.56 ms
1408 bytes from 192.168.1.1: icmp_seq=92 ttl=64 time=2.33 ms
1408 bytes from 192.168.1.1: icmp_seq=93 ttl=64 time=2.30 ms
1408 bytes from 192.168.1.1: icmp_seq=94 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=95 ttl=64 time=2.36 ms
1408 bytes from 192.168.1.1: icmp_seq=96 ttl=64 time=2.83 ms
1408 bytes from 192.168.1.1: icmp_seq=97 ttl=64 time=2.38 ms
1408 bytes from 192.168.1.1: icmp_seq=98 ttl=64 time=2.61 ms
1408 bytes from 192.168.1.1: icmp_seq=99 ttl=64 time=2.46 ms
1408 bytes from 192.168.1.1: icmp_seq=100 ttl=64 time=3.59 ms
1408 bytes from 192.168.1.1: icmp_seq=101 ttl=64 time=3.10 ms
1408 bytes from 192.168.1.1: icmp_seq=102 ttl=64 time=2.45 ms
1408 bytes from 192.168.1.1: icmp_seq=103 ttl=64 time=2.27 ms
1408 bytes from 192.168.1.1: icmp_seq=104 ttl=64 time=2.85 ms
1408 bytes from 192.168.1.1: icmp_seq=105 ttl=64 time=2.33 ms
1408 bytes from 192.168.1.1: icmp_seq=106 ttl=64 time=102 ms
1408 bytes from 192.168.1.1: icmp_seq=107 ttl=64 time=2.39 ms
...
...
1408 bytes from 192.168.1.1: icmp_seq=1566 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=1567 ttl=64 time=2.47 ms
1408 bytes from 192.168.1.1: icmp_seq=1568 ttl=64 time=2.18 ms
1408 bytes from 192.168.1.1: icmp_seq=1569 ttl=64 time=4.29 ms
1408 bytes from 192.168.1.1: icmp_seq=1570 ttl=64 time=2.94 ms
1408 bytes from 192.168.1.1: icmp_seq=1571 ttl=64 time=2.30 ms
1408 bytes from 192.168.1.1: icmp_seq=1572 ttl=64 time=2.35 ms
1408 bytes from 192.168.1.1: icmp_seq=1573 ttl=64 time=2.31 ms
1408 bytes from 192.168.1.1: icmp_seq=1574 ttl=64 time=103 ms
1408 bytes from 192.168.1.1: icmp_seq=1575 ttl=64 time=2.48 ms
1408 bytes from 192.168.1.1: icmp_seq=1576 ttl=64 time=2.34 ms
...
1408 bytes from 192.168.1.1: icmp_seq=1586 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=1587 ttl=64 time=2.41 ms
1408 bytes from 192.168.1.1: icmp_seq=1588 ttl=64 time=3.25 ms
1408 bytes from 192.168.1.1: icmp_seq=1589 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=1590 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=1591 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=1592 ttl=64 time=2.41 ms
^C
--- 192.168.1.1 ping statistics ---
1592 packets transmitted, 1592 received, 0% packet loss, time 1593395ms
rtt min/avg/max/mdev = 2.147/11.400/104.894/28.402 ms
```

Тест №3. DR5018S(AP) <--> DR5322(WDS Client), 20 МГц.

Схема соединения и настройки устройств:

RPI400 <-- 1GE --> DR5322(WDS Client) <-- WIFI7 (6.155GHz) --> DR5018S(AP) <-- 1GE --> Unix Host.

DR5322: в режиме WDS клиента (**option mode 'sta', option wds '1'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 20МГц (**option htmode 'HT20'**), канал авто (**option channel 'auto'**).

DR5018S: в режиме точки доступа (**option mode 'ap'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 20МГц (**option htmode 'HT20'**), канал 41 (**option channel '41'**).

Состояние линка:

```
root@DR5322-Client:~# iwconfig ath2
ath2      IEEE 802.11axa  ESSID:"OpenWrt6"
          Mode:Managed  Frequency:6.155 GHz  Access Point: C6:4B:D1:50:12:84
          Bit Rate:286.8 Mb/s   Tx-Power=3 dBm
          RTS thr:off   Fragment thr:off
          Encryption key:FAF0-2493-5123-40C8-A753-4D49-4944-59ED [2]   Security mode:restricted
          Power Management:off
          Link Quality=94/94  Signal level=-54 dBm  Noise level=-97 dBm (BDF averaged NF value in
dBm)
          Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
          Tx excessive retries:0  Invalid misc:0  Missed beacon:0
```

Тестирование пропускной способности в прямом направлении (Unix Host --> DR5018S --> DR5322 --> RPI400):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1
Connecting to host 192.168.1.1, port 5201
[ 5] local 192.168.1.2 port 34592 connected to 192.168.1.1 port 5201
[ ID] Interval           Transfer     Bitrate      Retr  Cwnd
[ 5]  0.00-1.00      sec    15.4 MBytes  129 Mbits/sec    0   665 KBytes
[ 5]  1.00-2.00      sec    15.0 MBytes  126 Mbits/sec    0   1.36 MBytes
[ 5]  2.00-3.00      sec    13.8 MBytes  115 Mbits/sec    0   2.06 MBytes
[ 5]  3.00-4.00      sec    13.8 MBytes  115 Mbits/sec    0   2.76 MBytes
[ 5]  4.00-5.00      sec    15.0 MBytes  126 Mbits/sec    0   3.48 MBytes
[ 5]  5.00-6.00      sec    13.8 MBytes  115 Mbits/sec    0   3.79 MBytes
[ 5]  6.00-7.00      sec    13.8 MBytes  115 Mbits/sec    0   3.79 MBytes
[ 5]  7.00-8.00      sec    13.8 MBytes  115 Mbits/sec    0   3.79 MBytes
[ 5]  8.00-9.00      sec    15.0 MBytes  126 Mbits/sec    0   3.99 MBytes
[ 5]  9.00-10.00     sec    13.8 MBytes  115 Mbits/sec    0   3.99 MBytes
-- -- --
[ ID] Interval           Transfer     Bitrate      Retr
[ 5]  0.00-10.00     sec    143 MBytes  120 Mbits/sec    0
[ 5]  0.00-10.20     sec    143 MBytes  117 Mbits/sec    0
sender
receiver

iperf Done.
```

Тестирование пропускной способности в обратном направлении (RPI400 --> DR5322 --> DR5018S --> Unix Host):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -R
Connecting to host 192.168.1.1, port 5201
Reverse mode, remote host 192.168.1.1 is sending
[ 5] local 192.168.1.2 port 45934 connected to 192.168.1.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.00      sec    23.9 MBytes  201 Mbits/sec
[ 5]  1.00-2.00      sec    26.6 MBytes  224 Mbits/sec
[ 5]  2.00-3.00      sec    26.5 MBytes  222 Mbits/sec
[ 5]  3.00-4.00      sec    27.1 MBytes  227 Mbits/sec
[ 5]  4.00-5.00      sec    27.2 MBytes  229 Mbits/sec
```


[5]	5.00-6.00	sec	27.2 MBytes	228 Mbits/sec	
[5]	6.00-7.00	sec	27.1 MBytes	227 Mbits/sec	
[5]	7.00-8.00	sec	27.3 MBytes	229 Mbits/sec	
[5]	8.00-9.00	sec	27.4 MBytes	230 Mbits/sec	
[5]	9.00-10.00	sec	27.2 MBytes	229 Mbits/sec	

[ID]	Interval		Transfer	Bitrate	Retr
[5]	0.00-10.02	sec	271 MBytes	227 Mbits/sec	0
[5]	0.00-10.00	sec	268 MBytes	225 Mbits/sec	

sender
receiver

iperf Done.

Непрерывный поток пакетов (flood ping) размером 1400 байт, флуктуации отсутствуют:

```
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
.^C
--- 192.168.1.1 ping statistics ---
1000499 packets transmitted, 1000498 received, 9.99501e-05% packet loss, time 2090825ms
rtt min/avg/max/mdev = 1.739/2.018/7.488/0.170 ms, ipg/ewma 2.089/1.962 ms
```

Поток пакетов размером 1400 байт с интервалом 1 сек:

```
root@rpi400:/home/rz# ping -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
1400 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=3.91 ms
1400 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=3.28 ms
1400 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=3.31 ms
1400 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=3.36 ms
1400 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=2.59 ms
1400 bytes from 192.168.1.1: icmp_seq=6 ttl=64 time=2.49 ms
1400 bytes from 192.168.1.1: icmp_seq=7 ttl=64 time=2.85 ms
1400 bytes from 192.168.1.1: icmp_seq=8 ttl=64 time=2.50 ms
1400 bytes from 192.168.1.1: icmp_seq=9 ttl=64 time=3.14 ms
1400 bytes from 192.168.1.1: icmp_seq=10 ttl=64 time=2.42 ms
1400 bytes from 192.168.1.1: icmp_seq=11 ttl=64 time=2.85 ms
1400 bytes from 192.168.1.1: icmp_seq=12 ttl=64 time=2.41 ms
1400 bytes from 192.168.1.1: icmp_seq=13 ttl=64 time=2.41 ms
1400 bytes from 192.168.1.1: icmp_seq=14 ttl=64 time=3.09 ms
1400 bytes from 192.168.1.1: icmp_seq=15 ttl=64 time=2.46 ms
1400 bytes from 192.168.1.1: icmp_seq=16 ttl=64 time=3.00 ms
1400 bytes from 192.168.1.1: icmp_seq=17 ttl=64 time=2.75 ms
1400 bytes from 192.168.1.1: icmp_seq=18 ttl=64 time=2.61 ms
1400 bytes from 192.168.1.1: icmp_seq=19 ttl=64 time=2.67 ms
1400 bytes from 192.168.1.1: icmp_seq=20 ttl=64 time=2.31 ms
1400 bytes from 192.168.1.1: icmp_seq=21 ttl=64 time=2.18 ms
1400 bytes from 192.168.1.1: icmp_seq=22 ttl=64 time=3.36 ms
1400 bytes from 192.168.1.1: icmp_seq=23 ttl=64 time=2.41 ms
1400 bytes from 192.168.1.1: icmp_seq=24 ttl=64 time=2.25 ms
1400 bytes from 192.168.1.1: icmp_seq=25 ttl=64 time=2.23 ms
1400 bytes from 192.168.1.1: icmp_seq=26 ttl=64 time=2.25 ms
1400 bytes from 192.168.1.1: icmp_seq=27 ttl=64 time=2.73 ms
1400 bytes from 192.168.1.1: icmp_seq=28 ttl=64 time=2.46 ms
1400 bytes from 192.168.1.1: icmp_seq=29 ttl=64 time=2.80 ms
1400 bytes from 192.168.1.1: icmp_seq=30 ttl=64 time=2.39 ms
1400 bytes from 192.168.1.1: icmp_seq=31 ttl=64 time=2.37 ms
1400 bytes from 192.168.1.1: icmp_seq=32 ttl=64 time=2.92 ms
1400 bytes from 192.168.1.1: icmp_seq=33 ttl=64 time=2.34 ms
1400 bytes from 192.168.1.1: icmp_seq=34 ttl=64 time=2.88 ms
1400 bytes from 192.168.1.1: icmp_seq=35 ttl=64 time=2.21 ms
1400 bytes from 192.168.1.1: icmp_seq=36 ttl=64 time=2.51 ms
1400 bytes from 192.168.1.1: icmp_seq=37 ttl=64 time=2.43 ms
1400 bytes from 192.168.1.1: icmp_seq=38 ttl=64 time=2.39 ms
1400 bytes from 192.168.1.1: icmp_seq=39 ttl=64 time=2.40 ms
1400 bytes from 192.168.1.1: icmp_seq=40 ttl=64 time=2.84 ms
1400 bytes from 192.168.1.1: icmp_seq=41 ttl=64 time=2.23 ms
1400 bytes from 192.168.1.1: icmp_seq=42 ttl=64 time=3.07 ms
1400 bytes from 192.168.1.1: icmp_seq=43 ttl=64 time=2.50 ms
1400 bytes from 192.168.1.1: icmp_seq=44 ttl=64 time=2.50 ms
1400 bytes from 192.168.1.1: icmp_seq=45 ttl=64 time=2.35 ms
1400 bytes from 192.168.1.1: icmp_seq=46 ttl=64 time=2.27 ms
1400 bytes from 192.168.1.1: icmp_seq=47 ttl=64 time=2.15 ms
1400 bytes from 192.168.1.1: icmp_seq=48 ttl=64 time=2.36 ms
1400 bytes from 192.168.1.1: icmp_seq=49 ttl=64 time=2.52 ms
```

```
1408 bytes from 192.168.1.1: icmp_seq=50 ttl=64 time=2.41 ms
1408 bytes from 192.168.1.1: icmp_seq=51 ttl=64 time=2.24 ms
1408 bytes from 192.168.1.1: icmp_seq=52 ttl=64 time=2.54 ms
1408 bytes from 192.168.1.1: icmp_seq=53 ttl=64 time=2.76 ms
1408 bytes from 192.168.1.1: icmp_seq=54 ttl=64 time=2.50 ms
1408 bytes from 192.168.1.1: icmp_seq=55 ttl=64 time=2.31 ms
1408 bytes from 192.168.1.1: icmp_seq=56 ttl=64 time=2.25 ms
1408 bytes from 192.168.1.1: icmp_seq=57 ttl=64 time=2.44 ms
1408 bytes from 192.168.1.1: icmp_seq=58 ttl=64 time=3.01 ms
1408 bytes from 192.168.1.1: icmp_seq=59 ttl=64 time=2.26 ms
1408 bytes from 192.168.1.1: icmp_seq=60 ttl=64 time=3.05 ms
1408 bytes from 192.168.1.1: icmp_seq=61 ttl=64 time=2.16 ms
1408 bytes from 192.168.1.1: icmp_seq=62 ttl=64 time=3.27 ms
1408 bytes from 192.168.1.1: icmp_seq=63 ttl=64 time=2.24 ms
1408 bytes from 192.168.1.1: icmp_seq=64 ttl=64 time=2.51 ms
1408 bytes from 192.168.1.1: icmp_seq=65 ttl=64 time=2.15 ms
1408 bytes from 192.168.1.1: icmp_seq=66 ttl=64 time=3.21 ms
1408 bytes from 192.168.1.1: icmp_seq=67 ttl=64 time=2.68 ms
1408 bytes from 192.168.1.1: icmp_seq=68 ttl=64 time=2.43 ms
1408 bytes from 192.168.1.1: icmp_seq=69 ttl=64 time=2.73 ms
1408 bytes from 192.168.1.1: icmp_seq=70 ttl=64 time=2.41 ms
1408 bytes from 192.168.1.1: icmp_seq=71 ttl=64 time=2.42 ms
1408 bytes from 192.168.1.1: icmp_seq=72 ttl=64 time=2.94 ms
1408 bytes from 192.168.1.1: icmp_seq=73 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=74 ttl=64 time=3.04 ms
1408 bytes from 192.168.1.1: icmp_seq=75 ttl=64 time=2.19 ms
1408 bytes from 192.168.1.1: icmp_seq=76 ttl=64 time=2.49 ms
1408 bytes from 192.168.1.1: icmp_seq=77 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=78 ttl=64 time=3.05 ms
1408 bytes from 192.168.1.1: icmp_seq=79 ttl=64 time=2.81 ms
1408 bytes from 192.168.1.1: icmp_seq=80 ttl=64 time=2.46 ms
1408 bytes from 192.168.1.1: icmp_seq=81 ttl=64 time=2.30 ms
1408 bytes from 192.168.1.1: icmp_seq=82 ttl=64 time=2.81 ms
1408 bytes from 192.168.1.1: icmp_seq=83 ttl=64 time=2.10 ms
1408 bytes from 192.168.1.1: icmp_seq=84 ttl=64 time=2.50 ms
1408 bytes from 192.168.1.1: icmp_seq=85 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=86 ttl=64 time=2.44 ms
1408 bytes from 192.168.1.1: icmp_seq=87 ttl=64 time=2.85 ms
1408 bytes from 192.168.1.1: icmp_seq=88 ttl=64 time=2.41 ms
1408 bytes from 192.168.1.1: icmp_seq=89 ttl=64 time=3.03 ms
1408 bytes from 192.168.1.1: icmp_seq=90 ttl=64 time=2.34 ms
1408 bytes from 192.168.1.1: icmp_seq=91 ttl=64 time=2.21 ms
1408 bytes from 192.168.1.1: icmp_seq=92 ttl=64 time=3.16 ms
1408 bytes from 192.168.1.1: icmp_seq=93 ttl=64 time=2.22 ms
1408 bytes from 192.168.1.1: icmp_seq=94 ttl=64 time=3.06 ms
1408 bytes from 192.168.1.1: icmp_seq=95 ttl=64 time=2.24 ms
1408 bytes from 192.168.1.1: icmp_seq=96 ttl=64 time=2.93 ms
1408 bytes from 192.168.1.1: icmp_seq=97 ttl=64 time=2.19 ms
1408 bytes from 192.168.1.1: icmp_seq=98 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=99 ttl=64 time=2.14 ms
1408 bytes from 192.168.1.1: icmp_seq=100 ttl=64 time=2.56 ms
1408 bytes from 192.168.1.1: icmp_seq=101 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=102 ttl=64 time=2.29 ms
1408 bytes from 192.168.1.1: icmp_seq=103 ttl=64 time=2.12 ms
1408 bytes from 192.168.1.1: icmp_seq=104 ttl=64 time=2.28 ms
1408 bytes from 192.168.1.1: icmp_seq=105 ttl=64 time=2.44 ms
1408 bytes from 192.168.1.1: icmp_seq=106 ttl=64 time=2.37 ms
1408 bytes from 192.168.1.1: icmp_seq=107 ttl=64 time=2.06 ms
1408 bytes from 192.168.1.1: icmp_seq=108 ttl=64 time=2.47 ms
1408 bytes from 192.168.1.1: icmp_seq=109 ttl=64 time=2.48 ms
1408 bytes from 192.168.1.1: icmp_seq=110 ttl=64 time=2.49 ms
1408 bytes from 192.168.1.1: icmp_seq=111 ttl=64 time=3.51 ms
^C
--- 192.168.1.1 ping statistics ---
111 packets transmitted, 111 received, 0% packet loss, time 110164ms
rtt min/avg/max/mdev = 2.062/2.570/3.908/0.359 ms
```

Тест №4. DR5018S(AP) <--> DR5322(WDS Client), 80 МГц.

Схема соединения и настройки устройств:

RPI400 <-- 1GE --> DR5322(WDS Client) <-- WIFI7 (6.155GHz) --> DR5018S(AP) <-- 1GE --> Unix Host.

DR5322: в режиме WDS клиента (**option mode 'sta'**, **option wds '1'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 80МГц (**option htmode 'HT80'**), канал авто (**option channel 'auto'**).

DR5018S: в режиме точки доступа (**option mode 'ap'**), протокол 802.11axa (**option hwmode '11axa'**), ширина канала 80МГц (**option htmode 'HT80'**), канал 41 (**option channel '41'**).

Состояние линка:

```
root@DR5322-Client:~# iwconfig ath2
ath2 IEEE 802.11axa ESSID:"OpenWrt6"
Mode:Managed Frequency:6.155 GHz Access Point: C6:4B:D1:50:12:84
Bit Rate:1.201 Gb/s Tx-Power=3 dBm
RTS thr:off Fragment thr:off
Encryption key:FAF0-2493-5123-40C8-A753-4D49-4944-59ED [2] Security mode:restricted
Power Management:off
Link Quality=94/94 Signal level=-53 dBm Noise level=-97 dBm (BDF averaged NF value in
dBm)
Rx invalid nwid:0 Rx invalid crypt:0 Rx invalid frag:0
Tx excessive retries:0 Invalid misc:0 Missed beacon:0
```

Тестирование пропускной способности в прямом направлении (Unix Host --> DR5018S --> DR5322 --> RPI400):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1
Connecting to host 192.168.1.1, port 5201
[ 5] local 192.168.1.2 port 43706 connected to 192.168.1.1 port 5201
[ ID] Interval Transfer Bitrate Retr Cwnd
[ 5] 0.00-1.00 sec 44.6 MBytes 374 Mbits/sec 0 2.06 MBytes
[ 5] 1.00-2.00 sec 50.0 MBytes 419 Mbits/sec 0 4.00 MBytes
[ 5] 2.00-3.00 sec 56.2 MBytes 472 Mbits/sec 0 4.00 MBytes
[ 5] 3.00-4.00 sec 53.8 MBytes 451 Mbits/sec 0 4.00 MBytes
[ 5] 4.00-5.00 sec 51.2 MBytes 429 Mbits/sec 0 4.00 MBytes
[ 5] 5.00-6.00 sec 55.0 MBytes 462 Mbits/sec 0 4.00 MBytes
[ 5] 6.00-7.00 sec 53.8 MBytes 451 Mbits/sec 0 4.00 MBytes
[ 5] 7.00-8.00 sec 53.8 MBytes 451 Mbits/sec 0 4.00 MBytes
[ 5] 8.00-9.00 sec 52.5 MBytes 440 Mbits/sec 0 4.00 MBytes
[ 5] 9.00-10.00 sec 53.8 MBytes 451 Mbits/sec 0 4.00 MBytes
-- -- -- -- --
[ ID] Interval Transfer Bitrate Retr sender
[ 5] 0.00-10.00 sec 525 MBytes 440 Mbits/sec 0 receiver
[ 5] 0.00-10.02 sec 525 MBytes 439 Mbits/sec

iperf Done.
```

Тестирование пропускной способности в обратном направлении (RPI400 --> DR5322 --> DR5018S --> Unix Host):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -R
Connecting to host 192.168.1.1, port 5201
Reverse mode, remote host 192.168.1.1 is sending
[ 5] local 192.168.1.2 port 44520 connected to 192.168.1.1 port 5201
[ ID] Interval Transfer Bitrate
[ 5] 0.00-1.00 sec 73.0 MBytes 612 Mbits/sec
[ 5] 1.00-2.00 sec 84.3 MBytes 707 Mbits/sec
[ 5] 2.00-3.00 sec 85.0 MBytes 713 Mbits/sec
[ 5] 3.00-4.00 sec 85.7 MBytes 719 Mbits/sec
[ 5] 4.00-5.00 sec 85.2 MBytes 715 Mbits/sec
```

[5]	5.00-6.00	sec	85.9 MBytes	721 Mbits/sec		
[5]	6.00-7.00	sec	87.5 MBytes	734 Mbits/sec		
[5]	7.00-8.00	sec	86.1 MBytes	722 Mbits/sec		
[5]	8.00-9.00	sec	86.6 MBytes	726 Mbits/sec		
[5]	9.00-10.00	sec	85.8 MBytes	720 Mbits/sec		

[ID]	Interval		Transfer	Bitrate	Retr	
[5]	0.00-10.01	sec	849 MBytes	711 Mbits/sec	0	sender
[5]	0.00-10.00	sec	845 MBytes	709 Mbits/sec		receiver

iperf Done.

Непрерывный поток пакетов (flood ping) размером 1400 байт, флуктуации отсутствуют:

```
root@rpi400:/home/rz# ping -f -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
.^C
--- 192.168.1.1 ping statistics ---
279977 packets transmitted, 279976 received, 0.000357172% packet loss, time 581892ms
rtt min/avg/max/mdev = 1.733/2.008/9.942/0.240 ms, ipg/ewma 2.078/1.984 ms
```

Поток пакетов размером 1400 байт с интервалом 1 сек:

```
root@rpi400:/home/rz# ping -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
1408 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=3.19 ms
1408 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=3.28 ms
1408 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=2.87 ms
1408 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=2.55 ms
1408 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=2.34 ms
1408 bytes from 192.168.1.1: icmp_seq=6 ttl=64 time=3.75 ms
1408 bytes from 192.168.1.1: icmp_seq=7 ttl=64 time=2.13 ms
1408 bytes from 192.168.1.1: icmp_seq=8 ttl=64 time=4.19 ms
1408 bytes from 192.168.1.1: icmp_seq=9 ttl=64 time=2.40 ms
1408 bytes from 192.168.1.1: icmp_seq=10 ttl=64 time=3.12 ms
1408 bytes from 192.168.1.1: icmp_seq=11 ttl=64 time=2.34 ms
1408 bytes from 192.168.1.1: icmp_seq=12 ttl=64 time=2.50 ms
1408 bytes from 192.168.1.1: icmp_seq=13 ttl=64 time=2.86 ms
1408 bytes from 192.168.1.1: icmp_seq=14 ttl=64 time=3.01 ms
1408 bytes from 192.168.1.1: icmp_seq=15 ttl=64 time=2.14 ms
1408 bytes from 192.168.1.1: icmp_seq=16 ttl=64 time=2.51 ms
1408 bytes from 192.168.1.1: icmp_seq=17 ttl=64 time=3.10 ms
1408 bytes from 192.168.1.1: icmp_seq=18 ttl=64 time=4.09 ms
1408 bytes from 192.168.1.1: icmp_seq=19 ttl=64 time=2.98 ms
1408 bytes from 192.168.1.1: icmp_seq=20 ttl=64 time=2.82 ms
1408 bytes from 192.168.1.1: icmp_seq=21 ttl=64 time=2.86 ms
1408 bytes from 192.168.1.1: icmp_seq=22 ttl=64 time=3.03 ms
1408 bytes from 192.168.1.1: icmp_seq=23 ttl=64 time=2.49 ms
1408 bytes from 192.168.1.1: icmp_seq=24 ttl=64 time=2.34 ms
1408 bytes from 192.168.1.1: icmp_seq=25 ttl=64 time=3.04 ms
1408 bytes from 192.168.1.1: icmp_seq=26 ttl=64 time=3.04 ms
1408 bytes from 192.168.1.1: icmp_seq=27 ttl=64 time=3.00 ms
1408 bytes from 192.168.1.1: icmp_seq=28 ttl=64 time=2.94 ms
1408 bytes from 192.168.1.1: icmp_seq=29 ttl=64 time=2.58 ms
...
1408 bytes from 192.168.1.1: icmp_seq=36 ttl=64 time=2.86 ms
1408 bytes from 192.168.1.1: icmp_seq=37 ttl=64 time=2.81 ms
1408 bytes from 192.168.1.1: icmp_seq=38 ttl=64 time=3.05 ms
1408 bytes from 192.168.1.1: icmp_seq=39 ttl=64 time=2.23 ms
1408 bytes from 192.168.1.1: icmp_seq=40 ttl=64 time=2.32 ms
1408 bytes from 192.168.1.1: icmp_seq=41 ttl=64 time=2.27 ms
1408 bytes from 192.168.1.1: icmp_seq=42 ttl=64 time=4.01 ms
1408 bytes from 192.168.1.1: icmp_seq=43 ttl=64 time=2.97 ms
1408 bytes from 192.168.1.1: icmp_seq=44 ttl=64 time=2.15 ms
1408 bytes from 192.168.1.1: icmp_seq=45 ttl=64 time=2.57 ms
1408 bytes from 192.168.1.1: icmp_seq=46 ttl=64 time=3.42 ms
.^C
--- 192.168.1.1 ping statistics ---
46 packets transmitted, 46 received, 0% packet loss, time 45065ms
rtt min/avg/max/mdev = 2.125/2.851/4.194/0.516 ms
```

Тест №5. DR5018S(WDS Client) <--> DR5322(AP), 80 МГц.

Схема соединения и настройки устройств:

RPI400 <-- 1GE --> DR5322(AP) <-- WIFI7 (6.235GHz) --> DR5018S(WDS Client) <-- 1GE --> Unix Host.

DR5322: в режиме точка доступа (**option mode 'ap'**), протокол 802.11аха (**option hwmode '11аха'**), ширина канала 80МГц (**option htmode 'HT80'**), канал авто (**option channel '57'**).

DR5018S: в режиме WDS клиент (**option mode 'sta', option wds '1'**), протокол 802.11аха (**option hwmode '11аха'**), ширина канала 80МГц (**option htmode 'HT80'**), канал авто (**option channel 'auto'**).

Состояние линка:

```
root@DR5018S-Client:~# iwconfig ath2
ath2      IEEE 802.11аха  ESSID:"OpenWrt6"
          Mode:Managed  Frequency:6.235 GHz  Access Point: C6:4B:D1:70:03:A9
          Bit Rate:1.201 Gb/s   Tx-Power=10 dBm
          RTS thr:off   Fragment thr:off
          Encryption key:89E1-3BBD-7DF6-7D80-98FF-9C98-1669-9D77 [2]   Security mode:restricted
          Power Management:off
          Link Quality=89/94   Signal level=-62 dBm   Noise level=-97 dBm (BDF averaged NF value in
dBm)
          Rx invalid nwid:0   Rx invalid crypt:2   Rx invalid frag:0
          Tx excessive retries:0   Invalid misc:0   Missed beacon:0
```

Тестирование пропускной способности в прямом направлении (Unix Host --> DR5018S --> DR5322 --> RPI400) пакетами UDP с интенсивностью источника 1000МБит/сек :

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -u -b1000M
Connecting to host 192.168.1.1, port 5201
[ 5] local 192.168.1.2 port 37550 connected to 192.168.1.1 port 5201
[ ID] Interval           Transfer     Bitrate        Total Datagrams
[ 5] 0.00-1.00 sec       108 MBytes  905 Mbits/sec   78162
[ 5] 1.00-2.00 sec       114 MBytes  956 Mbits/sec   82561
[ 5] 2.00-3.00 sec       114 MBytes  956 Mbits/sec   82564
[ 5] 3.00-4.00 sec       114 MBytes  956 Mbits/sec   82560
[ 5] 4.00-5.00 sec       114 MBytes  956 Mbits/sec   82567
[ 5] 5.00-6.00 sec       114 MBytes  956 Mbits/sec   82563
[ 5] 6.00-7.00 sec       114 MBytes  956 Mbits/sec   82561
[ 5] 7.00-8.00 sec       114 MBytes  956 Mbits/sec   82567
[ 5] 8.00-9.00 sec       114 MBytes  956 Mbits/sec   82562
[ 5] 9.00-10.00 sec      114 MBytes  956 Mbits/sec   82561
- - - - -
[ ID] Interval           Transfer     Bitrate        Jitter    Lost/Total Datagrams
[ 5] 0.00-10.00 sec      1.11 GBytes  951 Mbits/sec  0.000 ms  0/821228 (0%) sender
[ 5] 0.00-10.02 sec      566 MBytes  474 Mbits/sec  0.029 ms  400189/810103 (49%) receiver

iperf Done.
```

Тестирование пропускной способности в обратном направлении (RPI400 --> DR5322 --> DR5018S --> Unix Host):

```
root@rpi400:/home/rz# iperf3 -c 192.168.1.1 -R
Connecting to host 192.168.1.1, port 5201
Reverse mode, remote host 192.168.1.1 is sending
[ 5] local 192.168.1.2 port 52022 connected to 192.168.1.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5] 0.00-1.00 sec       70.6 MBytes  592 Mbits/sec
[ 5] 1.00-2.00 sec       84.1 MBytes  705 Mbits/sec
[ 5] 2.00-3.00 sec       84.4 MBytes  708 Mbits/sec
[ 5] 3.00-4.00 sec       84.0 MBytes  705 Mbits/sec
```



```
[ 5] 4.00-5.00 sec 83.2 MBytes 698 Mbits/sec
[ 5] 5.00-6.00 sec 85.9 MBytes 720 Mbits/sec
[ 5] 6.00-7.00 sec 85.2 MBytes 715 Mbits/sec
[ 5] 7.00-8.00 sec 84.4 MBytes 708 Mbits/sec
[ 5] 8.00-9.00 sec 84.9 MBytes 713 Mbits/sec
[ 5] 9.00-10.00 sec 86.0 MBytes 721 Mbits/sec
- - - - -
[ ID] Interval          Transfer      Bitrate      Retr
[ 5] 0.00-10.01 sec      836 MBytes    701 Mbits/sec 0
[ 5] 0.00-10.00 sec      833 MBytes    699 Mbits/sec
sender
receiver
```

iperf Done.

Непрерывный поток пакетов (flood ping) размером 1400 байт, флуктуации отсутствуют:

```
root@rpi400:/home/rz# ping -s 1400 -f 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
.^C
--- 192.168.1.1 ping statistics ---
266343 packets transmitted, 266342 received, 0.000375456% packet loss, time 589668ms
rtt min/avg/max/mdev = 1.730/2.143/6.992/0.245 ms, ipg/ewma 2.213/2.088 ms
```

Поток пакетов размером 1400 байт с интервалом 1 сек:

```
root@rpi400:/home/rz# ping -s 1400 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 1400(1428) bytes of data.
1400 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=9.56 ms
1400 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=3.07 ms
1400 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=2.39 ms
1400 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=2.34 ms
1400 bytes from 192.168.1.1: icmp_seq=5 ttl=64 time=2.46 ms
1400 bytes from 192.168.1.1: icmp_seq=6 ttl=64 time=2.36 ms
1400 bytes from 192.168.1.1: icmp_seq=7 ttl=64 time=2.91 ms
1400 bytes from 192.168.1.1: icmp_seq=8 ttl=64 time=2.35 ms
1400 bytes from 192.168.1.1: icmp_seq=9 ttl=64 time=2.73 ms
1400 bytes from 192.168.1.1: icmp_seq=10 ttl=64 time=2.38 ms
1400 bytes from 192.168.1.1: icmp_seq=11 ttl=64 time=2.43 ms
1400 bytes from 192.168.1.1: icmp_seq=12 ttl=64 time=2.37 ms
1400 bytes from 192.168.1.1: icmp_seq=13 ttl=64 time=3.07 ms
1400 bytes from 192.168.1.1: icmp_seq=14 ttl=64 time=2.53 ms
1400 bytes from 192.168.1.1: icmp_seq=15 ttl=64 time=2.39 ms
1400 bytes from 192.168.1.1: icmp_seq=16 ttl=64 time=3.32 ms
1400 bytes from 192.168.1.1: icmp_seq=17 ttl=64 time=2.63 ms
1400 bytes from 192.168.1.1: icmp_seq=18 ttl=64 time=2.44 ms
1400 bytes from 192.168.1.1: icmp_seq=19 ttl=64 time=2.82 ms
1400 bytes from 192.168.1.1: icmp_seq=20 ttl=64 time=3.16 ms
1400 bytes from 192.168.1.1: icmp_seq=21 ttl=64 time=2.30 ms
1400 bytes from 192.168.1.1: icmp_seq=22 ttl=64 time=2.38 ms
1400 bytes from 192.168.1.1: icmp_seq=23 ttl=64 time=5.36 ms
1400 bytes from 192.168.1.1: icmp_seq=24 ttl=64 time=2.89 ms
1400 bytes from 192.168.1.1: icmp_seq=25 ttl=64 time=3.18 ms
1400 bytes from 192.168.1.1: icmp_seq=26 ttl=64 time=2.49 ms
1400 bytes from 192.168.1.1: icmp_seq=27 ttl=64 time=2.76 ms
1400 bytes from 192.168.1.1: icmp_seq=28 ttl=64 time=2.37 ms
1400 bytes from 192.168.1.1: icmp_seq=29 ttl=64 time=3.61 ms
1400 bytes from 192.168.1.1: icmp_seq=30 ttl=64 time=2.47 ms
1400 bytes from 192.168.1.1: icmp_seq=31 ttl=64 time=2.41 ms
1400 bytes from 192.168.1.1: icmp_seq=32 ttl=64 time=2.93 ms
1400 bytes from 192.168.1.1: icmp_seq=33 ttl=64 time=3.04 ms
1400 bytes from 192.168.1.1: icmp_seq=34 ttl=64 time=2.37 ms
1400 bytes from 192.168.1.1: icmp_seq=35 ttl=64 time=2.46 ms
1400 bytes from 192.168.1.1: icmp_seq=36 ttl=64 time=3.15 ms
1400 bytes from 192.168.1.1: icmp_seq=37 ttl=64 time=2.84 ms
1400 bytes from 192.168.1.1: icmp_seq=38 ttl=64 time=2.35 ms
1400 bytes from 192.168.1.1: icmp_seq=39 ttl=64 time=2.35 ms
1400 bytes from 192.168.1.1: icmp_seq=40 ttl=64 time=3.67 ms
1400 bytes from 192.168.1.1: icmp_seq=41 ttl=64 time=3.07 ms
1400 bytes from 192.168.1.1: icmp_seq=42 ttl=64 time=2.30 ms
1400 bytes from 192.168.1.1: icmp_seq=43 ttl=64 time=2.54 ms
1400 bytes from 192.168.1.1: icmp_seq=44 ttl=64 time=2.41 ms
1400 bytes from 192.168.1.1: icmp_seq=45 ttl=64 time=2.36 ms
1400 bytes from 192.168.1.1: icmp_seq=46 ttl=64 time=2.45 ms
1400 bytes from 192.168.1.1: icmp_seq=47 ttl=64 time=3.07 ms
```



```
1408 bytes from 192.168.1.1: icmp_seq=48 ttl=64 time=3.00 ms
1408 bytes from 192.168.1.1: icmp_seq=49 ttl=64 time=3.26 ms
1408 bytes from 192.168.1.1: icmp_seq=50 ttl=64 time=2.47 ms
1408 bytes from 192.168.1.1: icmp_seq=51 ttl=64 time=3.12 ms
1408 bytes from 192.168.1.1: icmp_seq=52 ttl=64 time=2.47 ms
1408 bytes from 192.168.1.1: icmp_seq=53 ttl=64 time=2.89 ms
1408 bytes from 192.168.1.1: icmp_seq=54 ttl=64 time=2.56 ms
1408 bytes from 192.168.1.1: icmp_seq=55 ttl=64 time=3.59 ms
1408 bytes from 192.168.1.1: icmp_seq=56 ttl=64 time=2.42 ms
1408 bytes from 192.168.1.1: icmp_seq=57 ttl=64 time=2.37 ms
1408 bytes from 192.168.1.1: icmp_seq=58 ttl=64 time=2.95 ms
1408 bytes from 192.168.1.1: icmp_seq=59 ttl=64 time=3.12 ms
1408 bytes from 192.168.1.1: icmp_seq=60 ttl=64 time=3.14 ms
1408 bytes from 192.168.1.1: icmp_seq=61 ttl=64 time=2.35 ms
```

^C

--- 192.168.1.1 ping statistics ---

61 packets transmitted, 61 received, 0% packet loss, time 60093ms
rtt min/avg/max/mdev = 2.295/2.868/9.558/0.997 ms