

Pesquisa defeitos as velocidades 802.11n

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[Introdução](#)

Este documento aborda os problemas comuns a serem considerados ao realizar o troubleshooting de problemas de throughput wireless. Este original inclui o uso das ferramentas para medir o desempenho e a taxa de transferência da rede Wireless, que inclui os Access point diferentes do vendedor 802.11n (APs) em comparação com Cisco 1252 AP sob condições de teste similares.

[Pré-requisitos](#)

[Requisitos](#)

Cisco recomenda que você tem estas exigências:

- Ferramentas tais como o iPerf, e analisadores de rede tais como o OmniPeek e a análise de espectro de Cisco
- 802.11n apoiou 1140, 1250, 3500, e o 1260 Series APs

[Componentes Utilizados](#)

As informações neste documento são baseadas nestas versões de software e hardware:

- Versão de software running 6.0.182 do controlador WS-SVC-WiSM
- AIR-LAP1142-A-K9 APs

[Convenções](#)

Consulte as [Convenções de Dicas Técnicas da Cisco](#) para obter mais informações sobre convenções de documentos.

Informações de Apoio

802.11n é nascido devido a um número de mudanças feitas na agregação do quadro APs: A-MPDU e A-MSDU.

- Tamanho Ack do bloco
- Ligação MCS e de canal
- MIMO
- Usando 5GHz sobre 2.4 gigahertz: igualmente o Wi-fi da menção certifica a ligação do canal em 5GHz

Pesquise defeitos o controlador para as velocidades 11n

Conclua estes passos:

1. Verifique que o apoio 802.11n está permitido no controlador.

```
(WiSM-slot3-2) >show 802.11a
802.11a Network..... Enabled
11nSupport..... Enabled
802.11a Low Band..... Enabled
802.11a Mid Band..... Enabled
802.11a High Band..... Enabled
802.11a Operational Rates
802.11a 6M Rate..... Mandatory
802.11a 9M Rate..... Supported
802.11a 12M Rate..... Disabled
802.11a 18M Rate..... Supported
802.11a 24M Rate..... Mandatory
802.11a 36M Rate..... Supported
802.11a 48M Rate..... Supported
802.11a 54M Rate..... Supported
802.11n MCS Settings:
MCS 0..... Supported
MCS 1..... Supported
MCS 2..... Supported
MCS 3..... Supported
MCS 4..... Supported
MCS 5..... Supported
```

2. As taxas N são alcançadas duas maneiras. Acelera ao esquema de codificação da modulação (MCS) 7 pode ser alcançado sem usar a ligação do canal. Para o MCS avalia acima de 7 e até 15, ligação do canal precisam de ser permitidos. Você pode verificar se a ligação do canal é permitida usando este **comando show** no controlador:

```
(WiSM-slot3-2) >show advanced 802.11a channel
Automatic Channel Assignment
Channel Assignment Mode..... AUTO
Channel Update Interval..... 600 seconds [startup]
Anchor time (Hour of the day)..... 0
Channel Update Contribution..... SNI.
Channel Assignment Leader..... 00:1d:45:f0:d2:c0
Last Run..... 371 seconds ago
DCA Sensitivity Level..... STARTUP (5 dB)
DCA 802.11n Channel Width..... 40 MHz
```

```

Channel Energy Levels
Minimum..... unknown
Average..... unknown
Maximum..... unknown
Channel Dwell Times
Minimum..... unknown
Average..... unknown
Maximum..... unknown
802.11a 5 GHz Auto-RF Channel List
Allowed Channel List.....
36,40,44,48,52,56,60,64,149,
153,157,161
Unused Channel List.....
100,104,108,112,116,132,136,

```

3. Você pode igualmente configurar a largura do canal pelo AP usando estes comandos:

```

(WiSM-slot3-2) >show advanced 802.11a channel
Automatic Channel Assignment
Channel Assignment Mode..... AUTO
Channel Update Interval..... 600 seconds [startup]
Anchor time (Hour of the day)..... 0
Channel Update Contribution..... SNI.
Channel Assignment Leader..... 00:1d:45:f0:d2:c0
Last Run..... 371 seconds ago
DCA Sensitivity Level..... STARTUP (5 dB)
DCA 802.11n Channel Width..... 40 MHz
Channel Energy Levels
Minimum..... unknown
Average..... unknown
Maximum..... unknown
Channel Dwell Times
Minimum..... unknown
Average..... unknown
Maximum..... unknown
802.11a 5 GHz Auto-RF Channel List
Allowed Channel List.....
36,40,44,48,52,56,60,64,149,
153,157,161
Unused Channel List.....
100,104,108,112,116,132,136,

```

4. O intervalo do protetor e as taxas correspondentes MCS ajudam a determinar as taxas de dados que são consideradas nos clientes 802.11n. Estes são os comandos verificar esta configuração:

```

(WiSM-slot3-2) >show 802.11a
802.11a Network..... Enabled
11nSupport..... Enabled
802.11a Low Band..... Enabled
802.11a Mid Band..... Enabled
802.11a High Band..... Enabled
802.11a Operational Rates
802.11a 6M Rate..... Mandatory
802.11a 9M Rate..... Supported
802.11a 12M Rate..... Disabled
802.11a 18M Rate..... Supported
802.11a 24M Rate..... Mandatory
802.11a 36M Rate..... Supported
802.11a 48M Rate..... Supported
802.11a 54M Rate..... Supported
802.11n MCS Settings:
MCS 0..... Supported
MCS 1..... Supported
MCS 2..... Supported
MCS 3..... Supported

```

```

MCS 4..... Supported
MCS 5..... Supported
MCS 6..... Supported
MCS 7..... Supported
MCS 8..... Supported
MCS 9..... Supported
MCS 10..... Supported
MCS 11..... Supported
MCS 12..... Supported
MCS 13..... Supported
MCS 14..... Supported
MCS 15..... Supported
802.11n Status:
A-MPDU Tx:
Priority 0..... Enabled
Priority 1..... Disabled
Priority 2..... Disabled
Priority 3..... Disabled
Priority 4..... Disabled
Priority 5..... Disabled
Priority 6..... Disabled
Priority 7..... Disabled
Beacon Interval..... 100
CF Pollable mandatory..... Disabled
CF Poll Request mandatory..... Disabled
--More-- or (q)uit
CFP Period..... 4
CFP Maximum Duration..... 60
Default Channel..... 36
Default Tx Power Level..... 1
DTPC Status..... Enabled
Fragmentation Threshold..... 2346
Pico-Cell Status..... Disabled
Pico-Cell-V2 Status..... Disabled
TI Threshold..... -50
Traffic Stream Metrics Status..... Disabled
Expedited BW Request Status..... Disabled
World Mode..... Enabled
EDCA profile type..... default-wmm
Voice MAC optimization status..... Disabled
Call Admission Control (CAC) configuration
Voice AC - Admission control (ACM)..... Enabled
Voice max RF bandwidth..... 75
Voice reserved roaming bandwidth..... 6
Voice load-based CAC mode..... Enabled
Voice tspec inactivity timeout..... Disabled
Video AC - Admission control (ACM)..... Disabled
Voice Stream-Size..... 84000
Voice Max-Streams..... 2
Video max RF bandwidth..... Infinite
Video reserved roaming bandwidth..... 0

```

Assegure a agregação do pacote A-MPDU. Para o melhor esforço, os níveis de QoS são permitidos através destes comandos: a prioridade 0 do tx do a-mpdu da configuração 802.11a 11nSupport permite a prioridade 0 do tx do a-mpdu da configuração 802.11b 11nSupport permite

5. Todas as três Antenas no rádio A devem ser usadas. Certifique-se que as Antenas são o mesmo modelo.
6. No WLAN configurado para a conectividade de cliente, WMM deve ser permitido ou exigido, e AES ou a criptografia aberta somente devem ser usados. Isto pode ser verificado usando-se este comando output:

```
(WiSM-slot2-2) >show wlan 1
```

```

WLAN Identifier..... 1
Profile Name..... wlab5WISMip22
Network Name (SSID)..... wlab5WISMip22
Status..... Enabled
MAC Filtering..... Disabled
Broadcast SSID..... Enabled
AAA Policy Override..... Disabled
Network Admission Control
NAC-State..... Disabled
Quarantine VLAN..... 0
Number of Active Clients..... 0
Exclusionlist Timeout..... 60 seconds
Session Timeout..... 1800 seconds
CHD per WLAN..... Enabled
Webauth DHCP exclusion..... Disabled
Interface..... management
WLAN ACL..... unconfigured
DHCP Server..... Default
DHCP Address Assignment Required..... Disabled
Quality of Service..... Silver (best effort)
WMM..... Allowed
CCX - AironetIe Support..... Enabled
CCX - Gratuitous ProbeResponse (GPR)..... Disabled
CCX - Diagnostics Channel Capability..... Disabled
Dot11-Phone Mode (7920)..... Disabled
Wired Protocol..... None
IPv6 Support..... Disabled
Peer-to-Peer Blocking Action..... Disabled
Radio Policy..... All
DTIM period for 802.11a radio..... 1
DTIM period for 802.11b radio..... 1
Radius Servers
Authentication..... Global Servers
Accounting..... Disabled
Local EAP Authentication..... Disabled
Security
802.11 Authentication:..... Open System
Static WEP Keys..... Disabled
802.1X..... Disabled
Wi-Fi Protected Access (WPA/WPA2)..... Enabled
WPA (SSN IE)..... Disabled
WPA2 (RSN IE)..... Enabled
TKIP Cipher..... Disabled
AES Cipher..... Enabled
Auth Key Management
802.1x..... Enabled
PSK..... Disabled
CCKM..... Disabled
FT(802.11r)..... Disabled
FT-PSK(802.11r)..... Disabled
FT Reassociation Timeout..... 20
FT Over-The-Air mode..... Enabled
FT Over-The-Ds mode..... Enabled
CKIP ..... Disabled
IP Security..... Disabled
IP Security Passthru..... Disabled
Web Based Authentication..... Disabled
Web-Passthrough..... Disabled
Conditional Web Redirect..... Disabled
Splash-Page Web Redirect..... Disabled
Auto Anchor..... Disabled
H-REAP Local Switching..... Enabled
H-REAP Learn IP Address..... Enabled
Infrastructure MFP protection..... Enabled (Global

```

```
Infrastructure
MFP Disabled)
Client MFP..... Optional
Tkip MIC Countermeasure Hold-down Timer..... 60
Call Snooping..... Disabled
Band Select..... Enabled
Load Balancing..... Enabled
```

7. Diversidade de antena: se usando somente duas Antenas por qualquer razão, você precisa de usar a antena A e B para portas do transmissor/receptor.

No lado do cliente:

1. Suplicante usado para controlar a placa Wireless, preferida combinar o vendedor do suplicante à placa Wireless.
2. Driveres de cliente: você precisa de certificar-se que os driveres de cliente os mais atrasados estão sendo executado nas placas Wireless.
3. Contacte seu vendedor do adaptador Wireless.
4. Certifique-se que você está usando 11n certificou o adaptador para conseguir as taxas de dados 11n.

Produtos certificado do Wi-fi:

http://www.wi-fi.org/certified_products.php

Como melhorar o desempenho:

1. Utilização de canal — Utilização de canal do relatório dos analisadores de rede na porcentagem de transmitir gastado tempo e de receber quadros. Isto ajuda a medir a variação potencial na velocidade devendo afastar-se de um Access point. Isto ajudará a monitorar e ver por exemplo, se um canal é inteiramente transmitir ocupado em 1Mbps sob circunstâncias ideais executaria em 0.94Mbps sob a utilização de 100%.
2. O meio físico usado no Sem fio dita também os desempenhos. Usar 802.11g ou 802.11a sobre 802.11b oferece a muito throughputs elevados, frequentemente até o 30 mbps sobre 802.11b onde uma capacidade do rádio 6mpbs é dividida entre todas as estações associadas.
3. Tamanhos de célula — Recomenda-se encolher os tamanhos de célula para ter os clientes como mais perto dos APs como possíveis. Isto beneficiará as taxas de dados em que o cliente pode conectar ao AP. Isto pode ser feito reduzindo os níveis da potência no AP ao mais baixo.
4. O tamanho de célula shrinking igualmente diminui a interferência do co-canal. Se usando RRM, os APs devem escolher os canais dinamicamente pelo desenvolvimento. Contudo, se executando a atribuição dinâmica do canal, assegure-se de que você não tenha dois APs a níveis da alta potência no mesmo direito do canal próximos um do outro.
5. A proteção igualmente faz com que a taxa de transferência bata.

[Como calcular a taxa de transferência através do iPerf](#)

[Pontas da instalação de lperf](#)

Para aqueles clientes ou verificadores que não possuem a biga, lperf pode ser usado pelo contrário. Isto está disponível em

http://www.maclester.edu/crash/software/pc/ipperf/kperf_setup.exe.

Throughput de tráfego de medição

Execute este comando no lado de servidor:

```
(WiSM-slot2-2) >show wlan 1
WLAN Identifier..... 1
Profile Name..... wlab5WISMip22
Network Name (SSID)..... wlab5WISMip22
Status..... Enabled
MAC Filtering..... Disabled
Broadcast SSID..... Enabled
AAA Policy Override..... Disabled
Network Admission Control
NAC-State..... Disabled
Quarantine VLAN..... 0
Number of Active Clients..... 0
Exclusionlist Timeout..... 60 seconds
Session Timeout..... 1800 seconds
CHD per WLAN..... Enabled
Webauth DHCP exclusion..... Disabled
Interface..... management
WLAN ACL..... unconfigured
DHCP Server..... Default
DHCP Address Assignment Required..... Disabled
Quality of Service..... Silver (best effort)
WMM..... Allowed
CCX - AironetIe Support..... Enabled
CCX - Gratuitous ProbeResponse (GPR)..... Disabled
CCX - Diagnostics Channel Capability..... Disabled
Dot11-Phone Mode (7920)..... Disabled
Wired Protocol..... None
IPv6 Support..... Disabled
Peer-to-Peer Blocking Action..... Disabled
Radio Policy..... All
DTIM period for 802.11a radio..... 1
DTIM period for 802.11b radio..... 1
Radius Servers
Authentication..... Global Servers
Accounting..... Disabled
Local EAP Authentication..... Disabled
Security
802.11 Authentication:..... Open System
Static WEP Keys..... Disabled
802.1X..... Disabled
Wi-Fi Protected Access (WPA/WPA2)..... Enabled
WPA (SSN IE)..... Disabled
WPA2 (RSN IE)..... Enabled
TKIP Cipher..... Disabled
AES Cipher..... Enabled
Auth Key Management
802.1x..... Enabled
PSK..... Disabled
CCKM..... Disabled
FT(802.11r)..... Disabled
FT-PSK(802.11r)..... Disabled
FT Reassociation Timeout..... 20
FT Over-The-Air mode..... Enabled
FT Over-The-Ds mode..... Enabled
CKIP ..... Disabled
IP Security..... Disabled
IP Security Passthru..... Disabled
```

```

Web Based Authentication..... Disabled
Web-Passthrough..... Disabled
Conditional Web Redirect..... Disabled
Splash-Page Web Redirect..... Disabled
Auto Anchor..... Disabled
H-REAP Local Switching..... Enabled
H-REAP Learn IP Address..... Enabled
Infrastructure MFP protection..... Enabled (Global
Infrastructure
MFP Disabled)
Client MFP..... Optional
Tkip MIC Countermeasure Hold-down Timer..... 60
Call Snooping..... Disabled
Band Select..... Enabled
Load Balancing..... Enabled

```

Execute este comando no lado do cliente:

```

(WiSM-slot2-2) >show wlan 1
WLAN Identifier..... 1
Profile Name..... wlab5WISMip22
Network Name (SSID)..... wlab5WISMip22
Status..... Enabled
MAC Filtering..... Disabled
Broadcast SSID..... Enabled
AAA Policy Override..... Disabled
Network Admission Control
NAC-State..... Disabled
Quarantine VLAN..... 0
Number of Active Clients..... 0
Exclusionlist Timeout..... 60 seconds
Session Timeout..... 1800 seconds
CHD per WLAN..... Enabled
Webauth DHCP exclusion..... Disabled
Interface..... management
WLAN ACL..... unconfigured
DHCP Server..... Default
DHCP Address Assignment Required..... Disabled
Quality of Service..... Silver (best effort)
WMM..... Allowed
CCX - AironetIe Support..... Enabled
CCX - Gratuitous ProbeResponse (GPR)..... Disabled
CCX - Diagnostics Channel Capability..... Disabled
Dot11-Phone Mode (7920)..... Disabled
Wired Protocol..... None
IPv6 Support..... Disabled
Peer-to-Peer Blocking Action..... Disabled
Radio Policy..... All
DTIM period for 802.11a radio..... 1
DTIM period for 802.11b radio..... 1
Radius Servers
Authentication..... Global Servers
Accounting..... Disabled
Local EAP Authentication..... Disabled
Security
802.11 Authentication:..... Open System
Static WEP Keys..... Disabled
802.1X..... Disabled
Wi-Fi Protected Access (WPA/WPA2)..... Enabled
WPA (SSN IE)..... Disabled
WPA2 (RSN IE)..... Enabled
TKIP Cipher..... Disabled
AES Cipher..... Enabled

```



```

Auth Key Management
802.1x..... Enabled
PSK..... Disabled
CCKM..... Disabled
FT(802.11r)..... Disabled
FT-PSK(802.11r)..... Disabled
FT Reassociation Timeout..... 20
FT Over-The-Air mode..... Enabled
FT Over-The-Ds mode..... Enabled
CKIP ..... Disabled
IP Security..... Disabled
IP Security Passthru..... Disabled
Web Based Authentication..... Disabled
Web-Passthrough..... Disabled
Conditional Web Redirect..... Disabled
Splash-Page Web Redirect..... Disabled
Auto Anchor..... Disabled
H-REAP Local Switching..... Enabled
H-REAP Learn IP Address..... Enabled
Infrastructure MFP protection..... Enabled (Global
Infrastructure
MFP Disabled)
Client MFP..... Optional
Tkip MIC Countermeasure Hold-down Timer..... 60
Call Snooping..... Disabled
Band Select..... Enabled
Load Balancing..... Enabled

```

```

-----
Server listening on TCP port 5001
TCP window size: 256 KByte
-----

```

```

-----
Client connecting to 10.10.10.10, TCP port 5001
TCP window size: 256 KByte
-----

```

```

[1788] local 10.10.10.20 port 1155 connected with 10.10.10.10 port 5001
[1820] local 10.10.10.20 port 1153 connected with 10.10.10.10 port 5001
[1868] local 10.10.10.20 port 1150 connected with 10.10.10.10 port 5001
[1836] local 10.10.10.20 port 1152 connected with 10.10.10.10 port 5001
[1804] local 10.10.10.20 port 1154 connected with 10.10.10.10 port 5001
[1852] local 10.10.10.20 port 1151 connected with 10.10.10.10 port 5001
[ ID] Interval      Transfer      Bandwidth
[1788] 0.0-60.1 sec    124 MBytes   17.3 Mbits/sec
[1868] 0.0-60.1 sec    123 MBytes   17.1 Mbits/sec
[1820] 0.0-60.2 sec    110 MBytes   15.4 Mbits/sec
[1804] 0.0-60.1 sec    84.6 MBytes  11.8 Mbits/sec
[1852] 0.0-60.1 sec    89.2 MBytes  12.4 Mbits/sec
[1836] 0.0-60.2 sec    86.3 MBytes  12.0 Mbits/sec
[SUM] 0.0-60.2 sec    617 MBytes   86.0 Mbits/sec
[1952] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2663
[1832] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2664
[1748] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2665
[1732] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2666
[1800] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2667
[1812] local 10.10.10.20 port 5001 connected with 10.10.10.10 port 2668
[ ID] Interval      Transfer      Bandwidth
[1800] 0.0-60.0 sec    114 MBytes   15.9 Mbits/sec
[1812] 0.0-60.0 sec    117 MBytes   16.3 Mbits/sec
[1952] 0.0-60.1 sec    89.6 MBytes  12.5 Mbits/sec
[1748] 0.0-60.1 sec    129 MBytes   18.1 Mbits/sec
[1732] 0.0-60.1 sec    111 MBytes   15.5 Mbits/sec
[1832] 0.0-60.1 sec    112 MBytes   15.6 Mbits/sec
[SUM] 0.0-60.1 sec    672 MBytes   93.8 Mbits/sec

```

O primeiro número circundado nesta imagem representa a taxa de transferência ascendente, o segundo número circundado representa (AP ao cliente) a taxa de transferência a jusante.

Taxa de transferência de medição UDP

Feche os aplicativos precedentes de Iperf em ambos o lado servidor e cliente. Ambos precisam de estabelecer-se outra vez, mas esta hora para o teste de desempenho UDP.

Execute este comando no lado de servidor:

```
(WiSM-slot2-2) >show wlan 1
WLAN Identifier..... 1
Profile Name..... wlab5WISMip22
Network Name (SSID)..... wlab5WISMip22
Status..... Enabled
MAC Filtering..... Disabled
Broadcast SSID..... Enabled
AAA Policy Override..... Disabled
Network Admission Control
NAC-State..... Disabled
Quarantine VLAN..... 0
Number of Active Clients..... 0
Exclusionlist Timeout..... 60 seconds
Session Timeout..... 1800 seconds
CHD per WLAN..... Enabled
Webauth DHCP exclusion..... Disabled
Interface..... management
WLAN ACL..... unconfigured
DHCP Server..... Default
DHCP Address Assignment Required..... Disabled
Quality of Service..... Silver (best effort)
WMM..... Allowed
CCX - AironetIe Support..... Enabled
CCX - Gratuitous ProbeResponse (GPR)..... Disabled
CCX - Diagnostics Channel Capability..... Disabled
Dot11-Phone Mode (7920)..... Disabled
Wired Protocol..... None
IPv6 Support..... Disabled
Peer-to-Peer Blocking Action..... Disabled
Radio Policy..... All
DTIM period for 802.11a radio..... 1
DTIM period for 802.11b radio..... 1
Radius Servers
Authentication..... Global Servers
Accounting..... Disabled
Local EAP Authentication..... Disabled
Security
802.11 Authentication:..... Open System
Static WEP Keys..... Disabled
802.1X..... Disabled
Wi-Fi Protected Access (WPA/WPA2)..... Enabled
WPA (SSN IE)..... Disabled
WPA2 (RSN IE)..... Enabled
TKIP Cipher..... Disabled
AES Cipher..... Enabled
Auth Key Management
802.1x..... Enabled
PSK..... Disabled
CCKM..... Disabled
FT(802.11r)..... Disabled
FT-PSK(802.11r)..... Disabled
FT Reassociation Timeout..... 20
FT Over-The-Air mode..... Enabled
FT Over-The-Ds mode..... Enabled
```

```

CKIP ..... Disabled
IP Security..... Disabled
IP Security Passthru..... Disabled
Web Based Authentication..... Disabled
Web-Passthrough..... Disabled
Conditional Web Redirect..... Disabled
Splash-Page Web Redirect..... Disabled
Auto Anchor..... Disabled
H-REAP Local Switching..... Enabled
H-REAP Learn IP Address..... Enabled
Infrastructure MFP protection..... Enabled (Global
Infrastructure
MFP Disabled)
Client MFP..... Optional
Tkip MIC Countermeasure Hold-down Timer..... 60
Call Snooping..... Disabled
Band Select..... Enabled
Load Balancing..... Enabled

```

Execute este comando no lado do cliente:

```

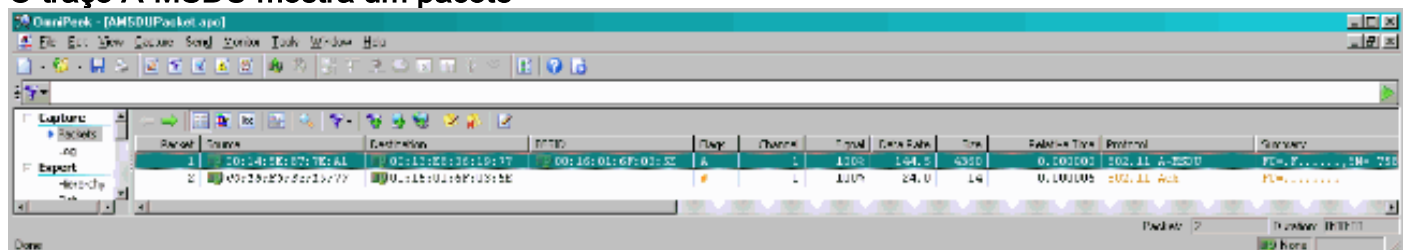
(WiSM-slot2-2) >show wlan 1
WLAN Identifier..... 1
Profile Name..... wlab5WISMip22
Network Name (SSID)..... wlab5WISMip22
Status..... Enabled
MAC Filtering..... Disabled
Broadcast SSID..... Enabled
AAA Policy Override..... Disabled
Network Admission Control
NAC-State..... Disabled
Quarantine VLAN..... 0
Number of Active Clients..... 0
Exclusionlist Timeout..... 60 seconds
Session Timeout..... 1800 seconds
CHD per WLAN..... Enabled
Webauth DHCP exclusion..... Disabled
Interface..... management
WLAN ACL..... unconfigured
DHCP Server..... Default
DHCP Address Assignment Required..... Disabled
Quality of Service..... Silver (best effort)
WMM..... Allowed
CCX - AironetIe Support..... Enabled
CCX - Gratuitous ProbeResponse (GPR)..... Disabled
CCX - Diagnostics Channel Capability..... Disabled
Dot11-Phone Mode (7920)..... Disabled
Wired Protocol..... None
IPv6 Support..... Disabled
Peer-to-Peer Blocking Action..... Disabled
Radio Policy..... All
DTIM period for 802.11a radio..... 1
DTIM period for 802.11b radio..... 1
Radius Servers
Authentication..... Global Servers
Accounting..... Disabled
Local EAP Authentication..... Disabled
Security
802.11 Authentication:..... Open System
Static WEP Keys..... Disabled
802.1X..... Disabled
Wi-Fi Protected Access (WPA/WPA2)..... Enabled
WPA (SSN IE)..... Disabled

```

```
WPA2 (RSN IE)..... Enabled
TKIP Cipher..... Disabled
AES Cipher..... Enabled
Auth Key Management
802.1x..... Enabled
PSK..... Disabled
CCKM..... Disabled
FT(802.11r)..... Disabled
FT-PSK(802.11r)..... Disabled
FT Reassociation Timeout..... 20
FT Over-The-Air mode..... Enabled
FT Over-The-Ds mode..... Enabled
CKIP ..... Disabled
IP Security..... Disabled
IP Security Passthru..... Disabled
Web Based Authentication..... Disabled
Web-Passthrough..... Disabled
Conditional Web Redirect..... Disabled
Splash-Page Web Redirect..... Disabled
Auto Anchor..... Disabled
H-REAP Local Switching..... Enabled
H-REAP Learn IP Address..... Enabled
Infrastructure MFP protection..... Enabled (Global
Infrastructure
MFP Disabled)
Client MFP..... Optional
Tkip MIC Countermeasure Hold-down Timer..... 60
Call Snooping..... Disabled
Band Select..... Enabled
Load Balancing..... Enabled
```

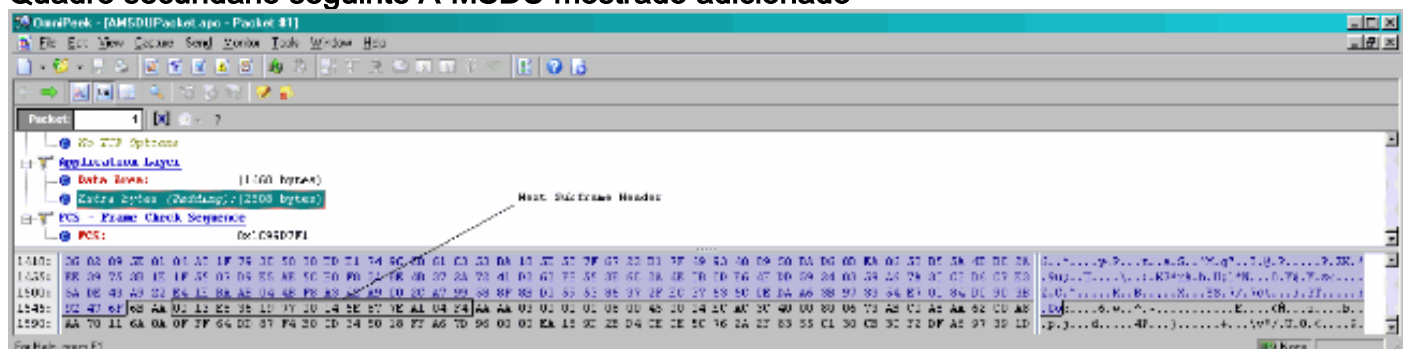
Este é um exemplo das captações de Omnipeek para analisar a unidade de dados de serviço agregada MAC:

O traço A-MSDU mostra um pacote



- Somente o primeiro quadro secundário é mostrado.
- Precise de inspecionar a cópia parcial da memória de HEX para ver quadros secundários adicionais.

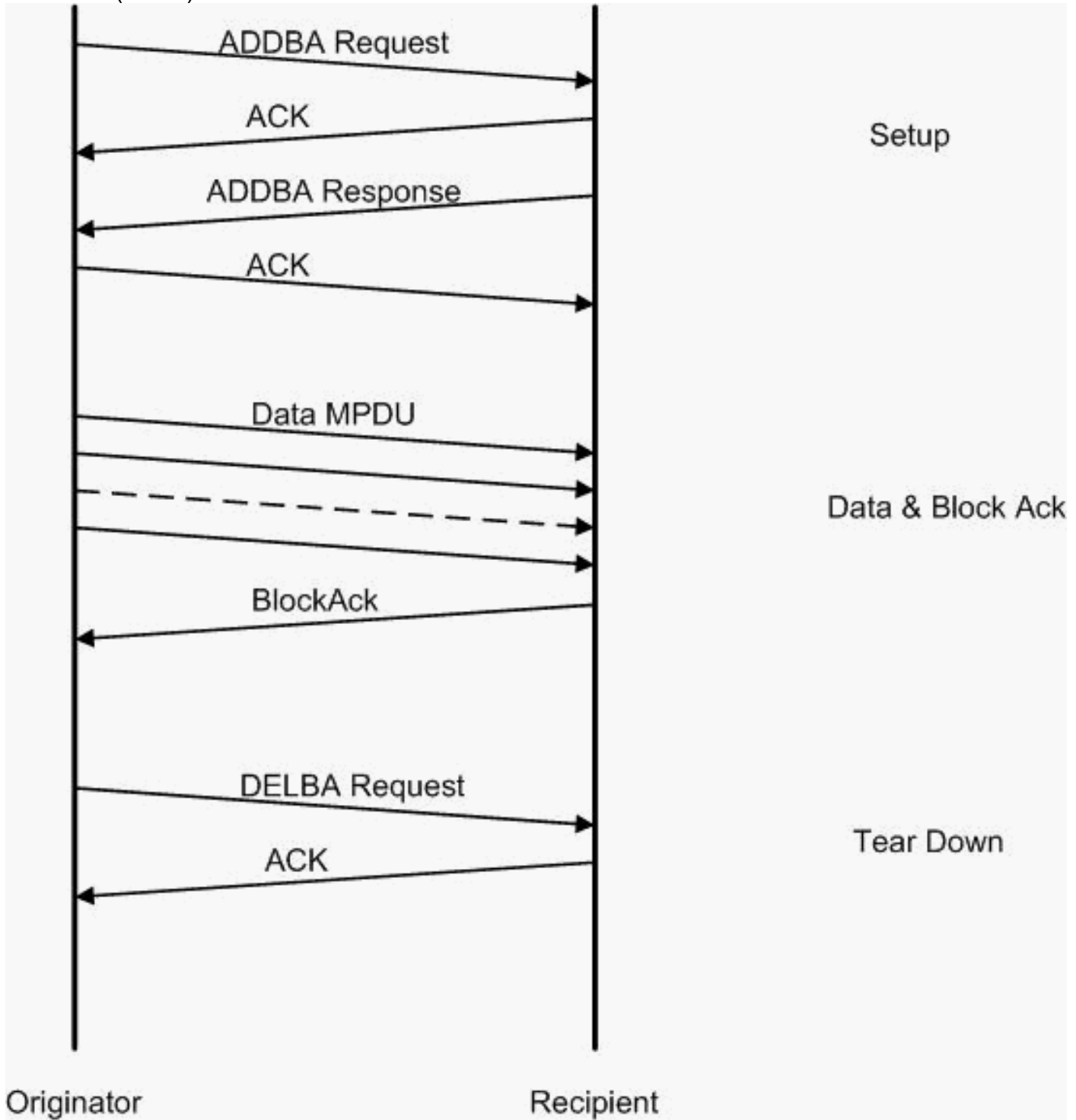
Quadro secundário seguinte A-MSDU mostrado adicionado



- Um A-MPDU é uma estrutura que contenha MPDUs múltiplo, transportada como um único

PSDU pelo PHY.

- Indicação que o pacote é os dados A-MPDU no procedimento de convergência de camada física (PLCP).



Este é um exemplo das captações de Omnipcap para analisar a **unidade de dados agregada do protocolo MAC**:

Instalação A-MPDU

No.	Time	Source	Destination	Length	Info	Type	Length	Data Size	Time	Relative Time	Protocol	Summary
1	0.000000	10.0.2.15	10.0.2.15	1200	...	RA	1200	150.0	0.000000	0.000000	10.0.2.15	...
2	0.000000	10.0.2.15	10.0.2.15	1009	...	ACK	1009	36.0	0.000000	0.000000	10.0.2.15	...
3	0.000000	10.0.2.15	10.0.2.15	1704	...	ACK	1704	36.0	0.000000	0.000000	10.0.2.15	...
4	0.000000	10.0.2.15	10.0.2.15	1208	...	ACK	1208	36.0	0.000000	0.000000	10.0.2.15	...

- ADDBA — Adicionar o reconhecimento do bloco
- Pedido ADDBA — Contém o identificador, a política Ack do bloco, o tamanho de buffer, etc.
- Resposta ADDBA — Pode mudar a política e o tamanho de buffer.

Instalação A-MPDU

- Pedido ADDBA
- AP1250 usa um intervalo de zero para não indicar nenhum intervalo.

The screenshot shows the OmniPeek interface for a packet capture. The main window displays the details of a selected packet (Packet #1). The packet structure is as follows:

- 802.11 MAC Header**
 - Version: 0
 - Type: %00 Management
 - Subtype: %1101 Management Action
 - Frame Control Flags: %00000000
 - 0... .. Non-strict order
 - .0.. .. Non-Protected Frame
 - ..0. .. No More Data
 - ...0 Power Management - active mode
 - 0... This is not a Re-Transmission
 -0.. Last or Unfragmented Frame
 -0. Not an Exit from the Distribution System
 -0 Not to the Distribution System
 - Duration: 40 Microseconds
 - Destination: 00:13:E8:1D:F0:55
 - Source: 00:17:DF:A6:4C:90
 - BSSID: 00:17:DF:A6:4C:90
 - Seq Number: 964
 - Frag Number: 0
- 802.11 Management - Action**
 - Category Code: 3 Block Ack
 - Action Code: 0 ADDBA Request
 - Dialog Token: 1
 - BlockAck Param Set: %0001000000000010
 - ..0000.. TID: 0
 -1. BlockAck Policy: Immediate Block Ack
 -0 A-MSDU: Not Permitted
 - BlockAck Timeout Value: 0 TUs
 - BA Starting Sequence Control: %0000001001010000
 - ..0000 Starting Seq Number: 37
 -0000 Fragment Number: 0
- FCS - Frame Check Sequence**
 - FCS: 0x36E63FB9

At the bottom, a hex dump shows the raw bytes of the packet:

```

0000: D0 00 28 00 00 13 E8 1D F0 55 00 17 DF A6 4C 90 00 17 DF A6 4C ..{.....U...L....L
0021: 90 40 3C 03 00 01 02 10 00 00 50 02 36 E6 3F B9 .@<.....P.6.?.

```

Instalação A-MPDU

- Resposta ADDBA
- O receptor precisa de indicar que acordo Ack do bloco esteve estabelecido com sucesso.

The screenshot shows the OmniPeek interface for packet #3. The main pane displays the following details:

- 802.11 MAC Header**
 - Version: 0
 - Type: %00 Management
 - Subtype: %1101 Management Action
 - Frame Control Flags: %00000000
 - 0... .. Non-strict order
 - .0.. .. Non-Protected Frame
 - ..0. .. No More Data
 - ...0 Power Management - active mode
 - 0... This is not a Re-Transmission
 -0.. Last or Unfragmented Frame
 -0. Not an Exit from the Distribution System
 -0 Not to the Distribution System
 - Duration: 40 Microseconds
 - Destination: 00:17:DF:A6:4C:90
 - Source: 00:13:E8:1D:F0:55
 - BSSID: 00:17:DF:A6:4C:90
 - Seq Number: 876
 - Frag Number: 0
- 802.11 Management - Action**
 - Category Code: 3 Block Ack
 - Action Code: 1 ADDBA Response
 - Dialog Token: 1
 - Status Code: 0 Successful
 - BlockAck Param Set: %0001000000000010
 - --..... Buffer Size:64
 -0000.. TID: 0
 -1. BlockAck Policy: Immediate Block Ack
 -0 A-MSDU: Not Permitted
 - BlockAck Timeout Value: 5000 TUs
- FCS - Frame Check Sequence**
 - FCS: 0x3DD891AF

At the bottom, a hex dump shows the raw bytes of the packet:

```

0000: D0 00 28 00 00 17 DF A6 4C 90 00 13 E8 1D F0 55 00 17 DF A6 4C ..{.....L.....U....L
0021: 90 C0 36 03 01 01 00 00 02 10 88 13 3D D8 91 AF ..6.....=...

```

Transferência de dados A-MPDU

- O bloco Ack contém bitmap comprimido para indicar que MPDUs recebeu.
- Refira a seção 9.10.7" da IEEE 802.11n "Ramais HT-imediatos Ack do bloco" para obter informações sobre de enviar o bloco Ack.

Packet	Source	Destination	BSSID	Frame	Channel	Signal	Data Rate	Size	Rate vs Time	Protocol
1	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00020	TCP
2	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00065	TCP
3	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00098	TCP
4	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00011	TCP
5	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00014	TCP
6	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00017	TCP
7	00:13:8E:26:19:77	00:14:5E:97:7E:A2	00:16:01:0F:03:5E	A	1	100%	130.0	78	0.00020	TCP
8	00:16:01:0F:03:5E	00:13:8E:26:19:77		A	1	100%	35.0	33	0.00073	003.11 BA

Capacidades anunciadas nas balizas

```

HT Capability Info
  Element ID: 45 HT Capability Info
  Length: 26
  HT Capability Info: %0001100001101110
    0..... L-SIG TXOP Protection Support: Not Supported
    .0..... AP allows use of 40MHz Transmissions In Neighboring BSSs
    ..0..... Device/BSS does Not Support use of PSMP
    ...1..... BSS does Allow use of DSSS/CCK Rates @40MHz
    ....1..... Maximal A-MSDU size: 7935 bytes
    .....0.. Does Not Support HT-Delayed BlockAck Operation
    .....00..... No Rx STBC Support
    .....0..... Transmitter does Not Support Tx STBC
    .....1..... Short GI for 40 MHz: Supported
    .....1..... Short GI for 20 MHz: Supported
    .....0.... Device is Not Able to Receive PPDU with GF Preamble
    .....11... Spatial Multiplexing Enabled
    .....1. Both 20MHz and 40MHz Operation is Supported
    .....0 LDPC coding capability: Not Supported

A-MPDU Parameters: %00011011
  xxx..... Reserved
  ...110.. Minimum MPDU Start Spacing: 8 usec
  .....11 Maximum Rx A-MPDU Size: 64K

Supported MCS Set
  One Spatial Stream: %11111111
    MCS Index 0 Supported - BPSK. Coding Rate: 1/2
    MCS Index 1 Supported - QPSK. Coding Rate: 1/2
    MCS Index 2 Supported - QPSK. Coding Rate: 3/4
    MCS Index 3 Supported - 16 QAM. Coding Rate: 1/2
    MCS Index 4 Supported - 16 QAM. Coding Rate: 3/4
    MCS Index 5 Supported - 64 QAM. Coding Rate: 2/3
    MCS Index 6 Supported - 64 QAM. Coding Rate: 3/4
    MCS Index 7 Supported - 64 QAM. Coding Rate: 5/6

  Two Spatial Streams: %01111111
    MCS Index 8 Supported - BPSK. Coding Rate: 1/2
    MCS Index 9 Supported - QPSK. Coding Rate: 1/2
    MCS Index 10 Supported - QPSK. Coding Rate: 3/4
    MCS Index 11 Supported - 16 QAM. Coding Rate: 1/2
    MCS Index 12 Supported - 16 QAM. Coding Rate: 3/4
    MCS Index 13 Supported - 64 QAM. Coding Rate: 2/3
    MCS Index 14 Supported - 64 QAM. Coding Rate: 3/4
    MCS Index 15 Not Supported - 64 QAM. Coding Rate: 5/6

  Rx Bitmask b16-b23: %00000000
  Rx Bitmask b24-b31: %00000000
  Rx Bitmask b32-b39: %00000000
  Rx Bitmask b40-b47: %00000000
  Rx Bitmask b48-b55: %00000000
  
```

Capacidades anunciadas nas balizas:

```

Rx Bitmask b64-b76: %0000000000000000
Reserved: %000
Highest Supported Rate:0 Mbps
Reserved: %0000000
Tx Supported MCS Set: %0 Not Defined
Tx and Rx MCS Set: %0 Equal
Tx Maximum Number Spatial Streams Supported:%00 1 Spatial Stream
Tx Unequal Modulation:%0 Not Supported
Reserved: %00000000000000000000000000000000 b101-b127
HT Extended Capabilities Info:%000000000000000000
xxxx .... .. Reserved
.... 0... .. Reverse Direction Responder: Supported
.... .0.. .. +HTC Support: Supported
.... ..00 .. MCS Feedback: STA Does Not Provide MCS Feedback
.... ..xxx x... .. Reserved
.... ..00. .. Transition Time: No Transition
.... ..0 .. Transmitter Supports PCO: Supported
Tx Beam Forming Capability (TxBF):%00000000000000000000000000000000
xxx. .... .. Reserved
...0 0... .. Channel Estimation Capability: 1 Space Time Stream
.... .00. .... CSI Max Number of Rows: 1 Row of CSI
.... ..0 0... .. Compressed BF Feedback Matrix: 1 TX Antenna Sounding
.... ..00. .... Uncompressed BF Feedback Matrix: 1 TX Antenna Sounding
.... ..0 0... .. CSI Number of BF Antennas: 1 TX Antenna Sounding
.... ..00. .... Minimal Grouping: STA Supports Groups of 1 (No Grouping)
.... ..0 0... .. Compressed BF Feedback Matrix: Not Supported
.... ..00. .... Uncompressed BF Feedback Matrix: Not Supported
.... ..0 0... .. TxBF CSI Feedback: Not Supported
.... ..0.. .... Compressed BF Feedback Matrix Capable: Not Supported
.... ..0. .... Uncompressed BF Feedback Matrix: Not Supported
.... ..0 .... Explicit CSI TxBF Capable: Not Supported
.... ..00.. .. Calibration: Not Supported
.... ..0. .... Implicit TxBF Capable: Not Supported
.... ..0 .... Tx NDP Capable: Not Supported
.... ..0... .. Rx NDP Capable: Not Supported
.... ..0.. .. Tx Staggered Sounding Capable: Not Supported
.... ..0. .... Rx Staggered Sounding Capable: Not Supported
.... ..0 .. Implicit TxBF Receiving Capable: Not Supported
Antenna Selection Capability (ASEL):%00000000
x... .. Reserved
..0.. .... Tx Sounding PPDU's Capable: Not Supported
..0. .... Rx ASEL Capable: Not Supported
...0 .... Antenna Indices Feedback Capable: Not Supported
.... 0... .. Explicit CSI Feedback: Tx AS Capable: Not Supported
.... .0.. .. Antenna Indices Feedback Based Tx ASEL Capable: Not Supported
.... ..0. .. Re-Explicit CSI Feedback Tx ASEL Capable: Not Supported
.... ..0 .. Antenna Selection Capable: Not Supported

```

Capacidades anunciadas nas balizas:

```

Element ID: 61 Additional HT Information
Length: 22
Primary Channel: 6
Srvc Int Granularity: 4000 5ms
PSMP STAs Only: 40 Association Requests are Accepted Regardless of PSMP Capability
RIFS Mode: 41 Use of RIFS Permitted
STA Channel Width: 41 Use Any Channel Width Enabled Under Supported Channel Width Set
2nd Channel Offset: 401 Above the Primary Channel
HT Info Element 2: 40000000000000100
XXXXXXXX XXX..... Reserved
..... 0.... OBSS Non-HT STAs: Use of Protection for Non-HT STAs Not Needed
..... 0.... Transmit Burst Limit: No Limit
..... 1.. Non-Greenfield STAs: One or more HT STAs are Not Greenfield Capable
..... 00 Operating Mode: Pure HT (No Protection) - All STAs in the BSS are 20/40 MHz HT
HT Info Element 3: 40000000000000000
XXXX..... Reserved
..... 0.... PCO Phase: Switch To/Continue Use 20MHz Phase
..... 0.. PCO Active: Not Active in the BSS
..... 0. L-SIG TNDP Protection: Not Full Support
..... 0 Secondary Beacon: Primary Beacon
..... 0..... Dual CTS Protection: Not Required
..... 0..... Dual Beacon: No Secondary Beacon Transmitted
..... .XXXXX Reserved
Basic MCS Set
One Spatial Stream: 400000000
MCS Index 0 Not Supported - BPSK, Coding Rate: 1/2
MCS Index 1 Not Supported - QPSK, Coding Rate: 1/2
MCS Index 2 Not Supported - QPSK, Coding Rate: 3/4
MCS Index 3 Not Supported - 16 QAM, Coding Rate: 1/2
MCS Index 4 Not Supported - 16 QAM, Coding Rate: 3/4
MCS Index 5 Not Supported - 64 QAM, Coding Rate: 2/3
MCS Index 6 Not Supported - 64 QAM, Coding Rate: 3/4
MCS Index 7 Not Supported - 64 QAM, Coding Rate: 5/6
Two Spatial Streams: 400000000
MCS Index 8 Not Supported - BPSK, Coding Rate: 1/2
MCS Index 9 Not Supported - QPSK, Coding Rate: 1/2
MCS Index 10 Not Supported - QPSK, Coding Rate: 3/4
MCS Index 11 Not Supported - 16 QAM, Coding Rate: 1/2
MCS Index 12 Not Supported - 16 QAM, Coding Rate: 3/4
MCS Index 13 Not Supported - 64 QAM, Coding Rate: 2/3
MCS Index 14 Not Supported - 64 QAM, Coding Rate: 3/4
MCS Index 15 Not Supported - 64 QAM, Coding Rate: 5/6
Rx Bitmask b16-b23: 400000000
Rx Bitmask b24-b31: 400000000
Rx Bitmask b32-b39: 400000000
Rx Bitmask b40-b47: 400000000

```

Associação similar com a adição do bloco Ack setup para A-MPDU:

194	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	6.0	14
195	00:17:DF:A6:4C:90	Ethernet Broadcast	802.11 Beacon	00:17:DF:A6:4C:90	*	100%	6.0	204
196	00:13:E8:1D:F0:55	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	81
197	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Probe Rsp	00:17:DF:A6:4C:90	*+	100%	6.0	204
198	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	6.0	14
199	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	87
200	00:13:E8:36:19:77	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	81
201	00:17:DF:A6:4C:90	00:13:E8:36:19:77	802.11 Probe Rsp	00:17:DF:A6:4C:90	*+	100%	6.0	204
202	00:13:E8:36:19:77	00:17:DF:A6:4C:90	802.11 Ack		#	100%	6.0	14
203	00:13:E8:36:19:77	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	74
204	00:13:E8:36:19:77	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	81
205	00:17:DF:A6:4C:90	00:13:E8:36:19:77	802.11 Probe Rsp	00:17:DF:A6:4C:90	*+	100%	6.0	204
206	00:13:E8:36:19:77	00:17:DF:A6:4C:90	802.11 Ack		#	100%	6.0	14
207	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	52%	1.0	55
208	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	97%	1.0	55
209	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	87
210	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	55
211	00:17:DF:A6:4C:90	Ethernet Broadcast	802.11 Beacon	00:17:DF:A6:4C:90	*	100%	6.0	204
212	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	95%	1.0	55
213	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	87
214	00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	55
215	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Auth	00:17:DF:A6:4C:90	*	100%	36.0	34
216	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Ack		#	100%	36.0	14
217	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Auth	00:17:DF:A6:4C:90	*	100%	36.0	34
218	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
219	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Assoc Req	00:17:DF:A6:4C:90	*	100%	36.0	134
220	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Ack		#	100%	36.0	14
221	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Assoc Rsp	00:17:DF:A6:4C:90	*	100%	130.0	180
222	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
223	192.168.170.89	224.0.0.1	IGMP	00:17:DF:A6:4C:90		100%	130.0	84
224	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
225	192.168.170.89	224.0.0.1	IGMP	00:17:DF:A6:4C:90	+	100%	130.0	84
226	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
227	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	WLCCP	00:17:DF:A6:4C:90		100%	130.0	92
228	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
229	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Action	00:17:DF:A6:4C:90	*	100%	130.0	37
230	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Ack		#	100%	36.0	14
231	00:13:E8:1D:F0:55	00:17:DF:A6:4C:90	802.11 Action	00:17:DF:A6:4C:90	*	100%	36.0	37
232	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	802.11 Ack		#	100%	36.0	14

Verifying A-MPDU is enabled on the controller

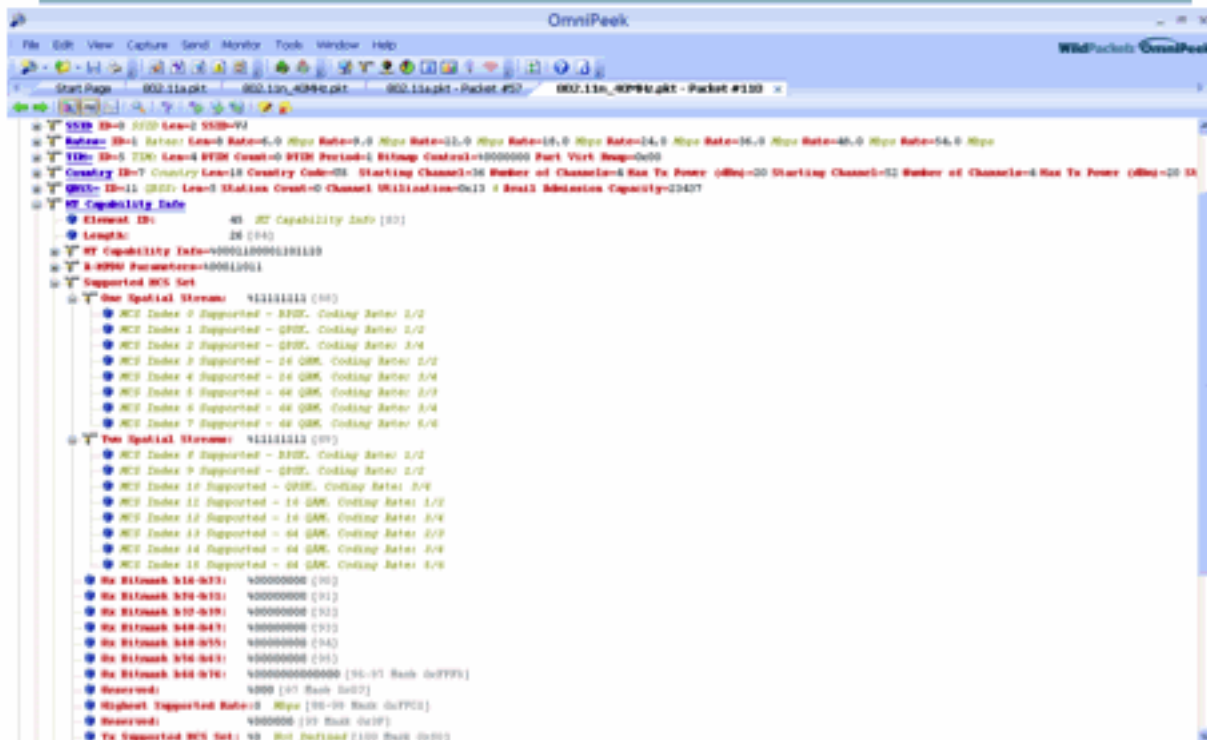
The image shows a Wireshark packet capture of an 802.11 Beacon frame. The 'HT Capability Info' section is expanded, showing the following details:

- Element ID: 45 HT Capability Info [63]
- Length: 26 [64]
- HT Capability Info: 0000100001101110 [65-96]
 - 0..... 1-STS TXOP Protection Support: Not Supported
 - ..0..... AP allows use of 40MHz Transmissions In Neighboring BSSs
 - ...0..... Device/BSS does Not Support use of TXOP
 -2..... BSS does Allow use of 20MHz/40MHz
 -1..... Maximal A-MPDU size: 7935 bytes
 -0..... Does Not Support HT-Delayed BlockAck Operation
 -0..... No Rx STBC Support
 -0..... Transmitter does Not Support Tx STBC
 -1..... Short GI for 40 MHz: Supported
 -1..... Short GI for 20 MHz: Supported
 -0..... Device is Not Able to Receive 220MHz with GF Freeable
 -11... Spatial Multiplexing Enabled
 -1..... Both 20MHz and 40MHz Operation is Supported
 -0..... LDPC coding capability: Not Supported
- A-MPDU Parameters: 00001011 [97]
 - ...0..... Reserved [87 Back 0x00]
 - ...110... Minimum MPDU Start Spacing: 2 used [87 Back 0x1C]
 -11 Maximum Rx A-MPDU Size: 64K [87 Back 0x03]
- Supported MCS Set

An arrow points from the 'A-MPDU Parameters' section to the text 'A-MPDU enabled and seen in the beacon'.

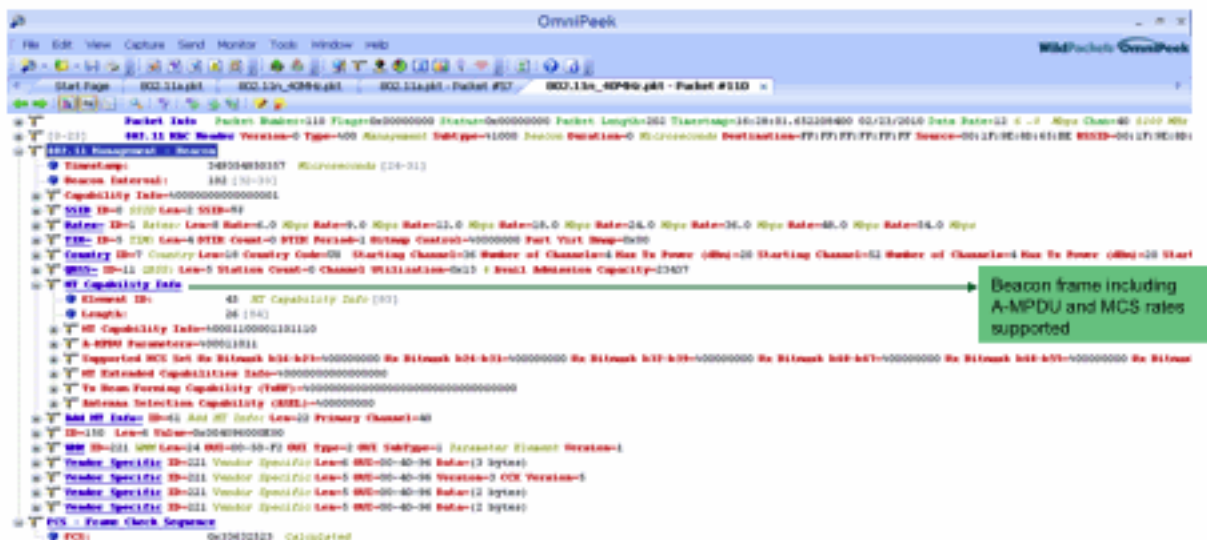
Above is a beacon frame from an SSID enabled for n rates

Supported MCS rates



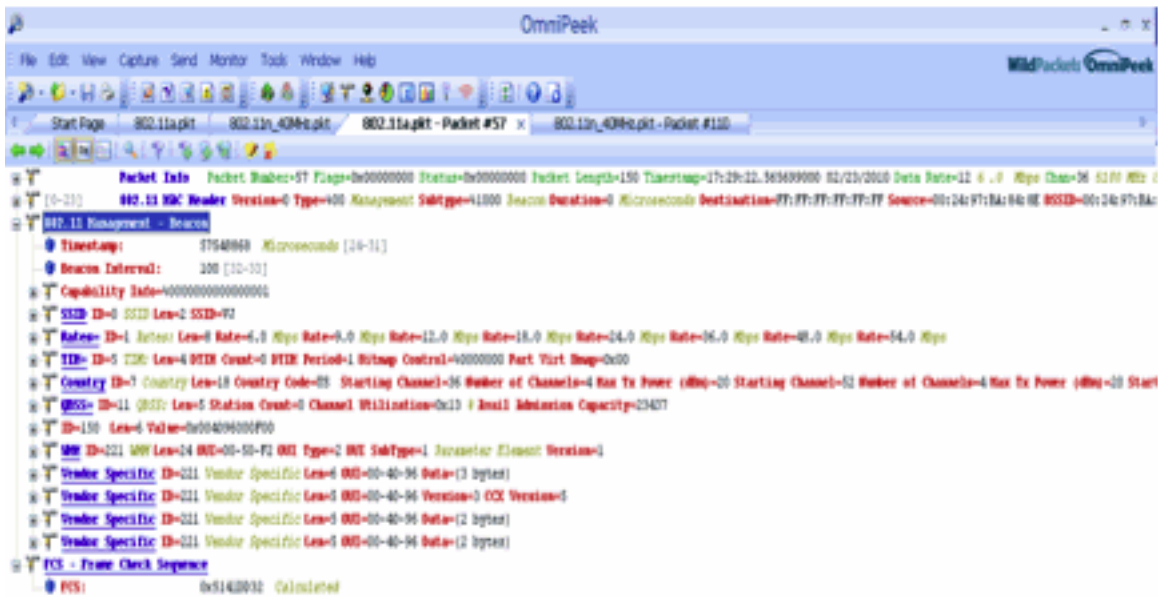
The screenshot displays the 'Supported MCS Set' section of a packet capture analysis. It lists two spatial streams, 'One Spatial Stream' and 'Two Spatial Stream', each with a list of supported MCS indexes and their corresponding coding rates. Below these lists, it specifies the bitstream lengths (e.g., 48, 96, 144, 192, 240, 288, 336, 384, 432, 480, 528, 576, 624, 672, 720, 768, 816, 864, 912, 960, 1008, 1056, 1104, 1152, 1200, 1248, 1296, 1344, 1392, 1440, 1488, 1536, 1584, 1632, 1680, 1728, 1776, 1824, 1872, 1920) and the highest supported rate, which is 48 Mbps for a 66 MHz channel.

802.11a with N rates Enabled



The screenshot shows the 'Supported MCS Set' section for a packet capture analysis. It lists supported MCS indexes and their coding rates for two spatial streams. A green callout box with an arrow points to the 'Supported MCS Set' section, containing the text: 'Beacon frame including A-MPDU and MCS rates supported'. The supported MCS set includes MCS indexes 0 through 12, with coding rates ranging from 1/2 to 3/4. The bitstream lengths are listed as 48, 96, 144, 192, 240, 288, 336, 384, 432, 480, 528, 576, 624, 672, 720, 768, 816, 864, 912, 960, 1008, 1056, 1104, 1152, 1200, 1248, 1296, 1344, 1392, 1440, 1488, 1536, 1584, 1632, 1680, 1728, 1776, 1824, 1872, 1920. The highest supported rate is 48 Mbps for a 22 MHz channel.

802.11A Beacon frame



```
Packet Info Packet Number: 57 Flags: 0x00000000 Status: 0x00000000 Packet Length: 150 Timestamp: 17:29:12.36369900 01/23/2010 Data Rate: 12.0 Mbps Chan: 36 52.0 MHz
[0-23] 802.11 Beacon Header Version: 0 Type: 00 Management SubType: 41000 Beacon Duration: 0 Microseconds Destination: FF:FF:FF:FF:FF:FF Source: 00:14:97:8A:84:0E BSSID: 00:14:97:8A:84:0E
802.11 Management - Beacon
Timestamp: 37048868 Microseconds [10-11]
Beacon Interval: 300 [12-13]
Capability Info: 0000000000000000
SSID ID: 0 SSID Len: 2 SSID: F2
Rates ID: 1 Rates Len: 0 Rate: 0.0 Mbps Rate: 0.0 Mbps Rate: 12.0 Mbps Rate: 18.0 Mbps Rate: 24.0 Mbps Rate: 36.0 Mbps Rate: 48.0 Mbps Rate: 54.0 Mbps
TIM ID: 5 TIM Len: 4 TIM Count: 0 TIM Period: 1 Bitmap Control: 00000000 Part Virt. Smp: 0x00
Country ID: 7 Country Len: 19 Country Code: 00 Starting Channel: 36 Number of Channels: 4 Max Tx Power (dBm): 20 Starting Channel: 32 Number of Channels: 4 Max Tx Power (dBm): 20 Start
QoS ID: 11 QoS Len: 5 Station Count: 0 Channel Utilization: 0x13 / Avail. Admission Capacity: 23407
ID: 150 Len: 6 Value: 0x00409600P00
MIME ID: 221 MIME Len: 24 MIME ID: 00-50-F2 MIME Type: 2 MIME SubType: 1 Parameter Element Version: 1
Vendor Specific ID: 221 Vendor Specific Len: 4 OUI: 00-40-94 Data: (3 bytes)
Vendor Specific ID: 221 Vendor Specific Len: 4 OUI: 00-40-94 Version: 0 CCX Version: 1
Vendor Specific ID: 221 Vendor Specific Len: 4 OUI: 00-40-94 Data: (2 bytes)
Vendor Specific ID: 221 Vendor Specific Len: 4 OUI: 00-40-94 Data: (2 bytes)
FCS - Frame Check Sequence
FCS: 0x51420932 Calculated
```

Informações Relacionadas

- [Suporte Técnico e Documentação - Cisco Systems](#)