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[Introdução](#)

Este documento aborda os problemas comuns a serem considerados ao realizar o troubleshooting de problemas de throughput wireless. Este documento 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 (AP) 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 AP

[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 AP

[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 AP: A-

MPDU e A-MSDU.

- Tamanho Ack do bloco
- MCS e ligação do 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
802.11a802.11a Network.....
Enabled11nSupport..... **Enabled**802.11a Low
Band..... Enabled802.11a Mid Band.....
Enabled802.11a High Band..... Enabled802.11a Operational Rates802.11a
6M Rate..... Mandatory802.11a 9M
Rate..... Supported802.11a 12M Rate.....
Disabled802.11a 18M Rate..... Supported802.11a 24M
Rate..... Mandatory802.11a 36M Rate.....
Supported802.11a 48M Rate..... Supported802.11a 54M
Rate..... Supported802.11n MCS Settings:MCS
0..... SupportedMCS
1..... SupportedMCS
2..... SupportedMCS
3..... SupportedMCS
4..... SupportedMCS
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 channelAutomatic Channel AssignmentChannel Assignment
Mode..... AUTOChannel Update Interval..... 600
seconds [startup]Anchor time (Hour of the day)..... 0Channel Update
Contribution..... SNI.Channel Assignment Leader.....
00:1d:45:f0:d2:c0Last Run..... 371 seconds agoDCA
Sensitivity Level..... STARTUP (5 dB)**DCA 802.11n Channel**
Width..... 40 MHzChannel Energy
LevelsMinimum.....
unknownAverage.....
unknownMaximum..... unknownChannel Dwell
TimesMinimum.....
unknownAverage.....
unknownMaximum..... unknown802.11a 5 GHz Auto-RF Channel
ListAllowed Channel
List.....36,40,44,48,52,56,60,64,149,153,157,161Unused 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 channelAutomatic Channel AssignmentChannel Assignment
Mode..... AUTOChannel Update Interval..... 600
seconds [startup]Anchor time (Hour of the day)..... 0Channel Update
Contribution..... SNI.Channel Assignment Leader.....
00:1d:45:f0:d2:c0Last Run..... 371 seconds agoDCA
Sensitivity Level..... STARTUP (5 dB)**DCA 802.11n Channel**
Width..... 40 MHzChannel Energy

```

LevelsMinimum.....
unknownAverage.....
unknownMaximum..... unknownChannel Dwell
TimesMinimum.....
unknownAverage.....
unknownMaximum..... unknown802.11a 5 GHz Auto-RF Channel
ListAllowed Channel
List.....36,40,44,48,52,56,60,64,149,153,157,161Unused 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 802.11a802.11a Network.....
Enabled11nSupport..... Enabled802.11a Low
Band..... Enabled802.11a Mid Band.....
Enabled802.11a High Band..... Enabled802.11a Operational Rates802.11a
6M Rate..... Mandatory802.11a 9M
Rate..... Supported802.11a 12M Rate.....
Disabled802.11a 18M Rate..... Supported802.11a 24M
Rate..... Mandatory802.11a 36M Rate.....
Supported802.11a 48M Rate..... Supported802.11a 54M
Rate..... Supported802.11n MCS Settings:MCS
0..... SupportedMCS
1..... SupportedMCS
2..... SupportedMCS
3..... SupportedMCS
4..... SupportedMCS
5..... SupportedMCS
6..... SupportedMCS
7..... SupportedMCS
8..... SupportedMCS
9..... SupportedMCS
10..... SupportedMCS
11..... SupportedMCS
12..... SupportedMCS
13..... SupportedMCS
14..... SupportedMCS
15..... Supported802.11n Status:A-MPDU Tx:Priority
0..... EnabledPriority 1.....
DisabledPriority 2..... DisabledPriority
3..... DisabledPriority 4.....
DisabledPriority 5..... DisabledPriority
6..... DisabledPriority 7.....
DisabledBeacon Interval..... 100CF Pollable
mandatory..... DisabledCF Poll Request
mandatory..... Disabled--More-- or (q)uitCFP
Period..... 4CFP Maximum
Duration..... 60Default Channel.....
36Default Tx Power Level..... 1DTPC
Status..... EnabledFragmentation
Threshold..... 2346Pico-Cell Status.....
DisabledPico-Cell-V2 Status..... DisabledTI
Threshold..... -50Traffic Stream Metrics
Status..... DisabledExpedited BW Request Status.....
DisabledWorld Mode..... EnabledEDCA profile
type..... default-wmmVoice MAC optimization
status..... DisabledCall Admission Control (CAC) configurationVoice AC -
Admission control (ACM)..... EnabledVoice max RF bandwidth.....
75Voice reserved roaming bandwidth..... 6Voice load-based CAC
mode..... EnabledVoice tspec inactivity timeout.....
DisabledVideo AC - Admission control (ACM)..... DisabledVoice Stream-
Size..... 84000Voice Max-Streams.....
2Video max RF bandwidth..... InfiniteVideo reserved roaming

```

bandwidth..... 0Assegure a agregação do pacote A-MPDU. Para o melhor esforço, os níveis de QoS são permitidos através destes comandos:**a prioridade 0 do a-mpdu TX da configuração 802.11a 11nSupport permite a prioridade 0 do a-mpdu TX 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 o AES ou a criptografia aberta somente devem ser usados. Isto pode ser verificado usando-se este comando output:

```
(WiSM-slot2-2) >show wlan 1WLAN
Identifier..... 1Profile
Name..... wlab5WISMip22Network Name
(SSID).....
wlab5WISMip22Status..... EnabledMAC
Filtering..... DisabledBroadcast
SSID..... EnabledAAA Policy
Override..... DisabledNetwork Admission ControlNAC-
State..... DisabledQuarantine
VLAN..... 0Number of Active Clients.....
0Exclusionlist Timeout..... 60 secondsSession
Timeout..... 1800 secondsCHD per
WLAN..... EnabledWebauth DHCP
exclusion.....
DisabledInterface..... managementWLAN
ACL..... unconfiguredDHCP
Server..... DefaultDHCP Address Assignment
Required..... DisabledQuality of Service..... Silver
(best effort)WMM..... AllowedCCX - AironetIe
Support..... EnabledCCX - Gratuitous ProbeResponse (GPR).....
DisabledCCX - Diagnostics Channel Capability..... DisabledDot11-Phone Mode
(7920)..... DisabledWired Protocol.....
NoneIPv6 Support..... DisabledPeer-to-Peer Blocking
Action..... DisabledRadio Policy.....
AllDTIM period for 802.11a radio..... 1DTIM period for 802.11b
radio..... 1Radius ServersAuthentication.....
Global ServersAccounting..... DisabledLocal EAP
Authentication..... DisabledSecurity802.11
Authentication:..... Open SystemStatic WEP
Keys..... Disabled802.1X.....
DisabledWi-Fi Protected Access (WPA/WPA2)..... EnabledWPA (SSN
IE)..... DisabledWPA2 (RSN IE).....
EnabledTKIP Cipher..... DisabledAES
Cipher..... EnabledAuth Key
Management802.1x.....
EnabledPSK.....
DisabledCCKM.....
DisabledFT(802.11r)..... DisabledFT-
PSK(802.11r)..... DisabledFT Reassociation
Timeout..... 20FT Over-The-Air mode.....
EnabledFT Over-The-Ds mode..... EnabledCKIP
..... DisabledIP
Security..... DisabledIP Security
Passthru..... DisabledWeb Based Authentication.....
DisabledWeb-Passthrough..... DisabledConditional Web
Redirect..... DisabledSplash-Page Web Redirect.....
DisabledAuto Anchor..... DisabledH-REAP Local
Switching..... EnabledH-REAP Learn IP Address.....
EnabledInfrastructure MFP protection..... Enabled (GlobalInfrastructureMFP
Disabled)Client MFP..... OptionalTkip MIC Countermeasure
Hold-down Timer..... 60Call Snooping..... DisabledBand
Select..... EnabledLoad
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 AP 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 AP devem escolher os canais dinamicamente pelo desenvolvimento. Contudo, se executando a atribuição dinâmica do canal, assegure-se de que você não tenha dois AP 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/lperf/kperf_setup.exe.

Throughput de tráfego de medição

Execute este comando no lado de servidor:

```

(WiSM-slot2-2) >show wlan 1WLAN Identifier..... 1Profile
Name..... wlab5WISMip22Network Name
(SSID).....
wlab5WISMip22Status..... EnabledMAC
Filtering..... DisabledBroadcast
SSID..... EnabledAAA Policy Override.....
DisabledNetwork Admission ControlNAC-State.....
DisabledQuarantine VLAN..... 0Number of Active
Clients..... 0Exclusionlist Timeout..... 60
secondsSession Timeout..... 1800 secondsCHD per
WLAN..... EnabledWebauth DHCP
exclusion..... DisabledInterface.....
managementWLAN ACL..... unconfiguredDHCP
Server..... DefaultDHCP Address Assignment
Required..... DisabledQuality of Service..... Silver (best
effort)WMM..... AllowedCCX - AironetIe
Support..... EnabledCCX - Gratuitous ProbeResponse (GPR).....
DisabledCCX - Diagnostics Channel Capability..... DisabledDot11-Phone Mode
(7920)..... DisabledWired Protocol.....
NoneIPv6 Support..... DisabledPeer-to-Peer Blocking
Action..... DisabledRadio Policy..... AllDTIM
period for 802.11a radio..... 1DTIM period for 802.11b radio.....
1Radius ServersAuthentication..... Global
ServersAccounting..... DisabledLocal EAP
Authentication..... DisabledSecurity802.11
Authentication:..... Open SystemStatic WEP
Keys..... Disabled802.1X.....
DisabledWi-Fi Protected Access (WPA/WPA2)..... EnabledWPA (SSN
IE)..... DisabledWPA2 (RSN IE).....
EnabledTKIP Cipher..... DisabledAES Cipher.....
EnabledAuth Key Management802.1x.....
EnabledPSK..... DisabledCCKM.....
DisabledFT(802.11r)..... DisabledFT-
PSK(802.11r)..... DisabledFT Reassociation Timeout.....
20FT Over-The-Air mode..... EnabledFT Over-The-Ds
mode..... EnabledCKIP .....
DisabledIP Security..... DisabledIP Security
Passthru..... DisabledWeb Based Authentication.....
DisabledWeb-Passthrough..... DisabledConditional Web
Redirect..... DisabledSplash-Page Web Redirect.....
DisabledAuto Anchor..... DisabledH-REAP Local
Switching..... EnabledH-REAP Learn IP Address.....
EnabledInfrastructure MFP protection..... Enabled (GlobalInfrastructureMFP
Disabled)Client MFP..... OptionalTkip MIC Countermeasure Hold-
down Timer..... 60Call Snooping..... DisabledBand
Select..... EnabledLoad
Balancing..... Enabled

```

Execute este comando no lado do cliente:

```

(WiSM-slot2-2) >show wlan 1WLAN Identifier..... 1Profile
Name..... wlab5WISMip22Network Name
(SSID).....
wlab5WISMip22Status..... EnabledMAC
Filtering..... DisabledBroadcast
SSID..... EnabledAAA Policy Override.....
DisabledNetwork Admission ControlNAC-State.....
DisabledQuarantine VLAN..... 0Number of Active
Clients..... 0Exclusionlist Timeout..... 60
secondsSession Timeout..... 1800 secondsCHD per
WLAN..... EnabledWebauth DHCP
exclusion..... DisabledInterface.....
managementWLAN ACL..... unconfiguredDHCP
Server..... DefaultDHCP Address Assignment

```

```

Required..... DisabledQuality of Service..... Silver (best
effort)WMM..... AllowedCCX - AironetIe
Support..... EnabledCCX - Gratuitous ProbeResponse (GPR).....
DisabledCCX - Diagnostics Channel Capability..... DisabledDot11-Phone Mode
(7920)..... DisabledWired Protocol.....
NoneIPv6 Support..... DisabledPeer-to-Peer Blocking
Action..... DisabledRadio Policy..... AllDTIM
period for 802.11a radio..... 1DTIM period for 802.11b radio.....
1Radius ServersAuthentication..... Global
ServersAccounting..... DisabledLocal EAP
Authentication..... DisabledSecurity802.11
Authentication:..... Open SystemStatic WEP
Keys..... Disabled802.1X.....
DisabledWi-Fi Protected Access (WPA/WPA2)..... EnabledWPA (SSN
IE)..... DisabledWPA2 (RSN IE).....
EnabledTKIP Cipher..... DisabledAES Cipher.....
EnabledAuth Key Management802.1x.....
EnabledPSK..... DisabledCCKM.....
DisabledFT(802.11r)..... DisabledFT-
PSK(802.11r)..... DisabledFT Reassociation Timeout.....
20FT Over-The-Air mode..... EnabledFT Over-The-Ds
mode..... EnabledCKIP .....
DisabledIP Security..... DisabledIP Security
Passthru..... DisabledWeb Based Authentication.....
DisabledWeb-Passthrough..... DisabledConditional Web
Redirect..... DisabledSplash-Page Web Redirect.....
DisabledAuto Anchor..... DisabledH-REAP Local
Switching..... EnabledH-REAP Learn IP Address.....
EnabledInfrastructure MFP protection..... Enabled (GlobalInfrastructureMFP
Disabled)Client MFP..... OptionalTkip MIC Countermeasure Hold-
down Timer..... 60Call Snooping..... DisabledBand
Select..... EnabledLoad
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 o throughput de upstream, 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 1WLAN Identifier..... 1Profile
Name..... wlab5WISMip22Network Name
(SSID).....
wlab5WISMip22Status..... EnabledMAC
Filtering..... DisabledBroadcast
SSID..... EnabledAAA Policy Override.....
DisabledNetwork Admission ControlNAC-State.....
DisabledQuarantine VLAN..... 0Number of Active
Clients..... 0Exclusionlist Timeout..... 60
secondsSession Timeout..... 1800 secondsCHD per
WLAN..... EnabledWebauth DHCP
exclusion..... DisabledInterface.....
managementWLAN ACL..... unconfiguredDHCP
Server..... DefaultDHCP Address Assignment
Required..... DisabledQuality of Service..... Silver (best
effort)WMM..... AllowedCCX - AironetIe
Support..... EnabledCCX - Gratuitous ProbeResponse (GPR).....
DisabledCCX - Diagnostics Channel Capability..... DisabledDot11-Phone Mode
(7920)..... DisabledWired Protocol.....
NoneIPv6 Support..... DisabledPeer-to-Peer Blocking
Action..... DisabledRadio Policy..... AllDTIM
period for 802.11a radio..... 1DTIM period for 802.11b radio.....
1Radius ServersAuthentication..... Global
ServersAccounting..... DisabledLocal EAP
Authentication..... DisabledSecurity802.11
Authentication:..... Open SystemStatic WEP
Keys..... Disabled802.1X.....
DisabledWi-Fi Protected Access (WPA/WPA2)..... EnabledWPA (SSN
IE)..... DisabledWPA2 (RSN IE).....
EnabledTKIP Cipher..... DisabledAES Cipher.....
EnabledAuth Key Management802.1x.....
EnabledPSK..... DisabledCCKM.....
DisabledFT(802.11r)..... DisabledFT-
PSK(802.11r)..... DisabledFT Reassociation Timeout.....
20FT Over-The-Air mode..... EnabledFT Over-The-Ds
mode..... EnabledCKIP .....
DisabledIP Security..... DisabledIP Security
Passthru..... DisabledWeb Based Authentication.....
DisabledWeb-Passthrough..... DisabledConditional Web
Redirect..... DisabledSplash-Page Web Redirect.....
DisabledAuto Anchor..... DisabledH-REAP Local
Switching..... EnabledH-REAP Learn IP Address.....
EnabledInfrastructure MFP protection..... Enabled (GlobalInfrastructureMFP
Disabled)Client MFP..... OptionalTkip MIC Countermeasure Hold-
down Timer..... 60Call Snooping..... DisabledBand
Select..... EnabledLoad
Balancing..... Enabled
```

Execute este comando no lado do cliente:

```
(WiSM-slot2-2) >show wlan 1WLAN Identifier..... 1Profile
```



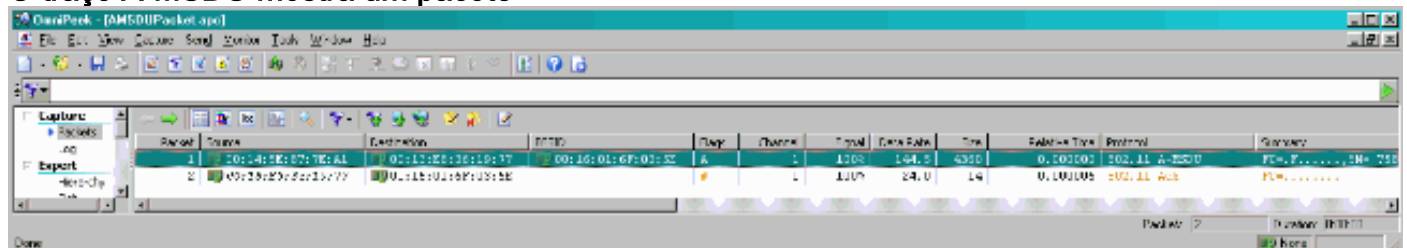
```

Name..... wlab5WISMip22Network Name
(SSID).....
wlab5WISMip22Status..... EnabledMAC
Filtering..... DisabledBroadcast
SSID..... EnabledAAA Policy Override.....
DisabledNetwork Admission ControlNAC-State.....
DisabledQuarantine VLAN..... 0Number of Active
Clients..... 0Exclusionlist Timeout..... 60
secondsSession Timeout..... 1800 secondsCHD per
WLAN..... EnabledWebauth DHCP
exclusion..... DisabledInterface.....
managementWLAN ACL..... unconfiguredDHCP
Server..... DefaultDHCP Address Assignment
Required..... DisabledQuality of Service..... Silver (best
effort)WMM..... AllowedCCX - AironetIe
Support..... EnabledCCX - Gratuitous ProbeResponse (GPR).....
DisabledCCX - Diagnostics Channel Capability..... DisabledDot11-Phone Mode
(7920)..... DisabledWired Protocol.....
NoneIPv6 Support..... DisabledPeer-to-Peer Blocking
Action..... DisabledRadio Policy..... AllDTIM
period for 802.11a radio..... 1DTIM period for 802.11b radio.....
1Radius ServersAuthentication..... Global
ServersAccounting..... DisabledLocal EAP
Authentication..... DisabledSecurity802.11
Authentication:..... Open SystemStatic WEP
Keys..... Disabled802.1X.....
DisabledWi-Fi Protected Access (WPA/WPA2)..... EnabledWPA (SSN
IE)..... DisabledWPA2 (RSN IE).....
EnabledTKIP Cipher..... DisabledAES Cipher.....
EnabledAuth Key Management802.1x.....
EnabledPSK..... DisabledCCKM.....
DisabledFT(802.11r)..... DisabledFT-
PSK(802.11r)..... DisabledFT Reassociation Timeout.....
20FT Over-The-Air mode..... EnabledFT Over-The-Ds
mode..... EnabledCKIP .....
DisabledIP Security..... DisabledIP Security
Passthru..... DisabledWeb Based Authentication.....
DisabledWeb-Passthrough..... DisabledConditional Web
Redirect..... DisabledSplash-Page Web Redirect.....
DisabledAuto Anchor..... DisabledH-REAP Local
Switching..... EnabledH-REAP Learn IP Address.....
EnabledInfrastructure MFP protection..... Enabled (GlobalInfrastructureMFP
Disabled)Client MFP..... OptionalTkip MIC Countermeasure Hold-
down Timer..... 60Call Snooping..... DisabledBand
Select..... EnabledLoad
Balancing..... Enabled

```

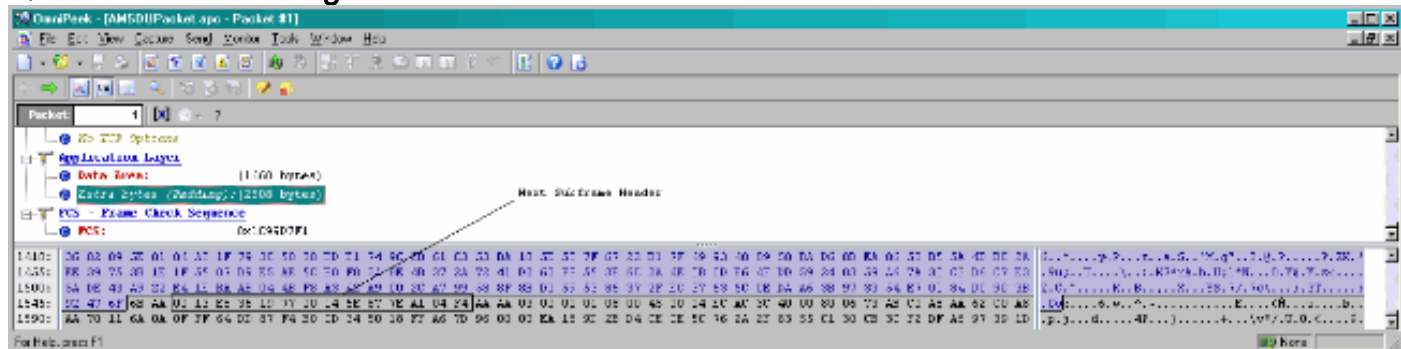
Este é um exemplo das captações de Omnipcap para analisar a unidade de dados de serviço agregada MAC:

O traço A-MSDU mostra um pacote

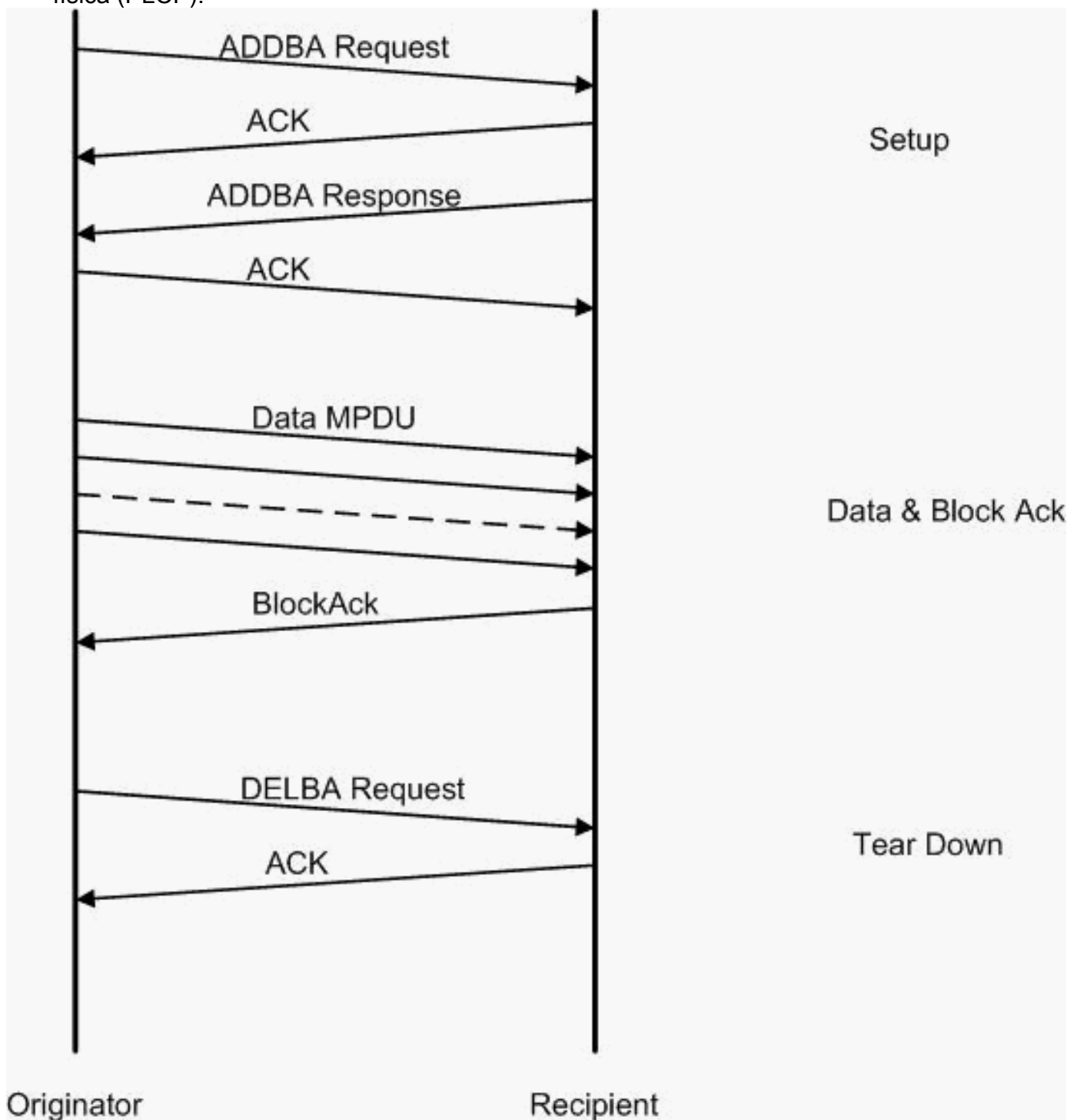


- Somente o primeiro quadro secundário é mostrado.
- Precise de inspecionar a cópia parcial da memória de HEX para ver quadros secundários adicionais.

Quadro secundário seguinte A-MSDU mostrado adicionado

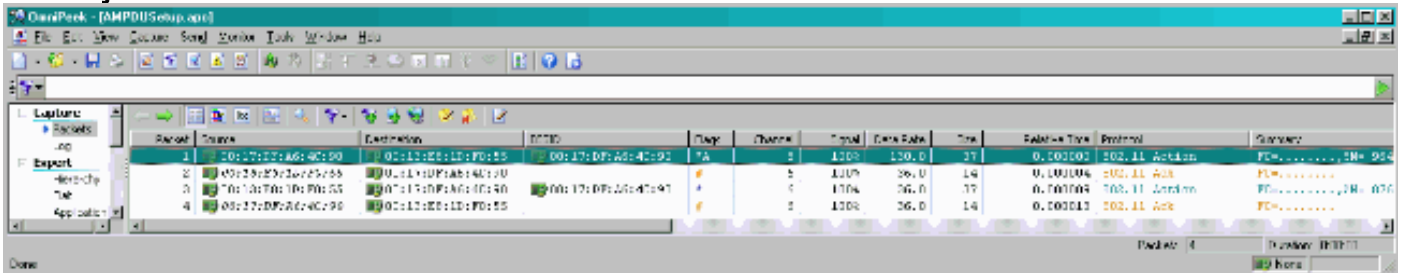


- Um A-MPDU é uma estrutura que contenha MPDUs múltiplo, transportada como um único PSDU pelo PHY.
- Indicação que o pacote é os dados A-MPDU no procedimento de convergência de camada física (PLCP).



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

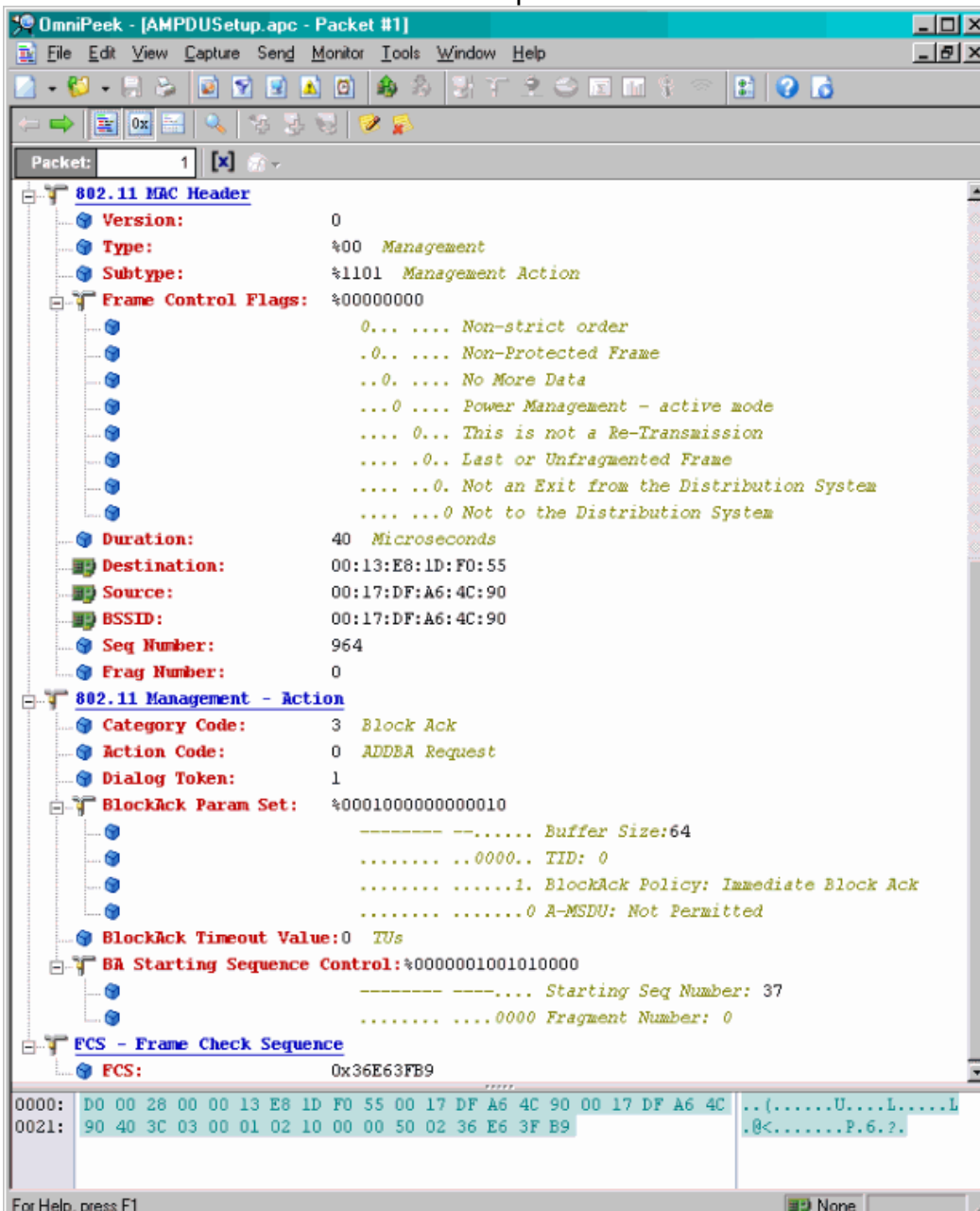
Instalação A-MPDU



- 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.



Instalação A-MPDU

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

OmniPeek - [AMPDUSetup.apc - Packet #3]

File Edit View Capture Send Monitor Tools Window Help

Packet: 3

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

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.....=...

For Help, press F1

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	Proto	Length	Info	Flags	Window	Seq	Len	Relat. to Time	Protocol
1	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000000	TCP	
2	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000005	TCP	
3	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000008	TCP	
4	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000011	TCP	
5	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000014	TCP	
6	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000017	TCP	
7	00:13:88:26:19:77	00:14:5E:97:7E:A1	00:16:01:5F:03:5E	1	100%	100%	130.0	78	0.000020	TCP	
8	00:16:01:5F:03:5E	00:13:88:26:19:77		1	100%	30.0	33	0.000023	003.11.00		

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
......ii.. 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: %0000000000000
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: %0000000000000000
XXXX .... . Reserved
.... 0... . Reverse Direction Responder: Supported
.... .0. .... +HTC Support: Supported
.... ..00 .... MCS Feedback: STA Does Not Provide MCS Feedback
.... .... XXXX 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 PPDUs 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
    Antenna Selection Capable: Not Supported

```

Capacidades anunciadas nas balizas:

```

Element ID: 61 Additional HT Information
Length: 22
Primary Channel: 5
SIFS Interval: 1000
PSMP SIFS Delay: 10 Association Requests are Accepted Regardless of TXOP Capability
HTS Mode: 11 Use of RTS Forbidden
STA Channel Width: 11 Use Any Channel Width Enabled Under Supported Channel Width Set
2nd Channel Offset: 101 Above the Primary Channel
HT Info Element 1: %0000000000000000
xxxxxxxx reserved
..... 0... 0SSS Non-HT STAs: Use of Protection for Non-HT STAs Not Needed
..... ..0.. Transmit Burst Limit: No Limit
..... ..... Non-Greenfield STAs: One or more HT STAs are Not Greenfield Capable
..... ..00 Operating Mode: Full HT (No Protection) - All STAs in the BSS are 20/40 MHz HT
HT Info Element 3: %0000000000000000
xxxxx reserved
..... 0... 100 Based Switch To/Continue Use 20MHz Mode
..... 0... PCO Active: Not Active in the BSS
..... ..0. L-SIG TXOP Protection: Not Full Support
..... ..0. Secondary Beacon: Binary Beacon
..... ..0. Dual CS2 Protection: Not Required
..... ..0. Dual Beacon: No Secondary Beacon Transmitted
..... ..0... reserved
BSS MCS Set
One Spatial Stream: %00000000
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: %00000000
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 315-323: %00000000
Rx Bitmask 324-331: %00000000
Rx Bitmask 332-339: %00000000
Rx Bitmask 340-347: %00000000

```

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	WLCPP	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

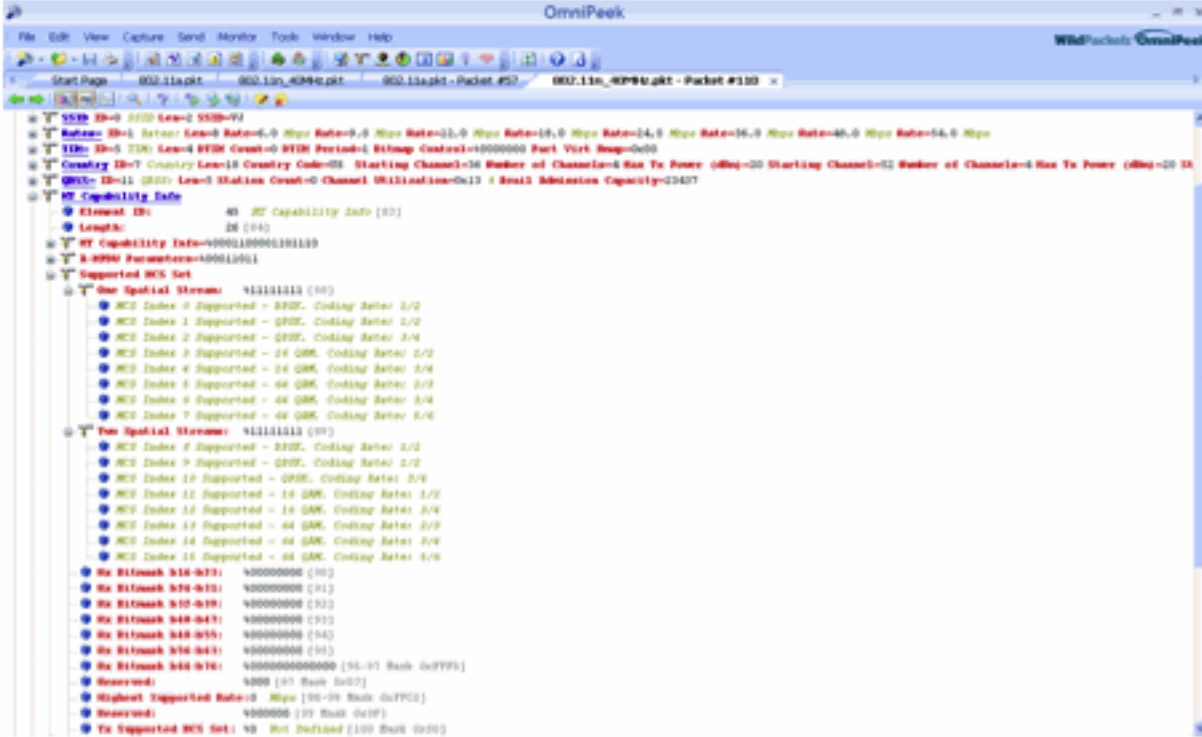
Verifying A-MPDU is enabled on the controller

IEEE 802.11 Beacon
 Element ID: 46 IEEE Capability Info (80)
 Length: 26 (84)
 IEEE Capability Info: 0000100001100110 (81-86)
 ..0..... 1-512 ESDP Protection Support: Not Supported
 ..0..... AP allow use of 40MHz Transmissions In Neighboring BSS
 ..0..... Device/BSS does Not Support use of P2P
 ..0..... BSS does Allow use of ESDP/CCX Rates (40MHz)
 ..0..... Maximal A-MPDU size: 7905 bytes
 ..0..... Does Not Support HT-Delayed BlockAck Operation
 ..00..... No Rx STBC Support
 ..0..... Transmitter does Not Support Tx STBC
 ..0..... Short GI for 40 MHz: Supported
 ..0..... Short GI for 20 MHz: Supported
 ..0..... Device is Not Able to Receive ESDPs with GI Flexible
 ..0..... Spatial Multiplexing Enabled
 ..0..... Both 20MHz and 40MHz Operation is Supported
 ..0..... 4 ESDP coding capability: Not Supported
A-MPDU Parameters: 00001011 (87)
 ..0..... Reserved (87 Sub 0x0)
 ..010.. Minimum MPDU Start Spacing: 4 used (87 Sub 0x1C)
 ..011.. Maximum Rx A-MPDU Size: 64K (87 Sub 0x03)

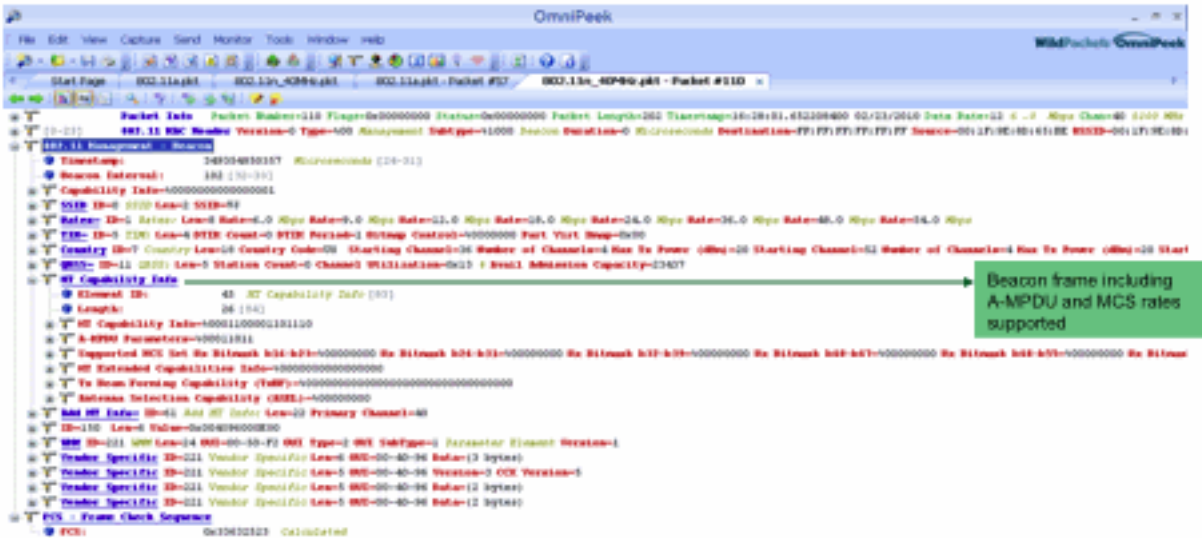
A-MPDU enabled and seen in the beacon

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

Supported MCS rates



802.11a with N rates Enabled



Informações Relacionadas

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