Probleemoplossing 802.11n snelheden

Inhoud

Inleiding Voorwaarden Vereisten Gebruikte componenten Conventies Achtergrondinformatie Probleemoplossing voor de controller voor 11n snelheden Doorvoersnelheid berekenen via iPerf In wissels geadverteerde vermogens Gerelateerde informatie

Inleiding

Dit document behandelt gemeenschappelijke problemen die u kunt oplossen bij problemen met draadloze doorvoersnelheid. Dit document bevat gebruik van gereedschappen om de prestaties en doorvoersnelheid van het draadloze netwerk te meten, wat verschillende verkoper 802.11n access points (AP's) bevat in vergelijking met Cisco 1252 AP onder soortgelijke testomstandigheden.

Voorwaarden

Vereisten

Cisco raadt u aan deze vereisten te hebben:

- Tools zoals iPerf en netwerkanalyzers zoals OmniPeek en Cisco spectrumanalyse
- 802.11n ondersteund 1140, 1250, 3500 en 1260 Series AP's

Gebruikte componenten

De informatie in dit document is gebaseerd op de volgende software- en hardware-versies:

- WS-SVC-WiSM Controller software versie 6.0.18.2
- LUCHTLAP1142-A-K9 AP's

Conventies

Raadpleeg <u>Cisco Technical Tips Conventions (Conventies voor technische tips van Cisco) voor</u> meer informatie over documentconventies.

Achtergrondinformatie

802.11n wordt geboren als gevolg van een aantal wijzigingen die zijn aangebracht in de Frame Aggregation van AP's: A-MPDU en A-MSDU.

- Blokgrootte
- MCS- en kanaalbundeling
- MIMO
- Gebruik van 5 GHz meer dan 2,4 GHz: Vermeld ook Wi-Fi-certificaten voor kanaalbinding op 5 GHz

Probleemoplossing voor de controller voor 11n snelheden

Voer de volgende stappen uit:

1. Controleer of ondersteuning op 802.11n ingeschakeld is op de controller.

(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. De N-tarieven worden op twee manieren bereikt. Snelheden tot het moduleringscoderingsschema (MCS) 7 kunnen worden bereikt zonder gebruik te maken van kanaalbonding. Voor MCS-tarieven boven 7 en tot 15 moet kanaalbinding worden ingeschakeld. U kunt controleren of kanaalbonding is ingeschakeld met behulp van deze opdracht voor **show** op de controller:

(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 ur	ıknown
Average ur	nknown

 Maximum......unknown

 Channel Dwell Times

 Minimum.....unknown

 Average....unknown

 Maximum....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. U kunt ook de kanaalbreedte per AP configureren met behulp van deze opdrachten: (WiSM-slot2-2) >config 802.11a disable AP0022.9090.8e97 (WiSM-slot2-2) >config 802.11a chan_width AP0022.9090.8e97 40 Set 802.11a channel width to 40 on AP AP0022.9090.8e97
- 4. De Guard-interval en de corresponderende MCS-tarieven helpen de gegevenssnelheden te bepalen die op de 802.11n-klanten worden waargenomen. Dit zijn de opdrachten om deze configuratie te controleren:

(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

Verzeker een A-MPDU pakketaggregatie. Voor een optimale inspanning, worden de niveaus QoS geactiveerd via deze opdrachten:**configuratie 802.11a 11nOndersteuning voor a-mpduprioriteit 0 maakt het mogelijkconfiguratie 802.11b 11nOndersteuning voor a-mpdu-prioriteit 0 maakt het mogelijk**

- 5. Alle drie antennes op de A-radio moeten worden gebruikt. Zorg ervoor dat de antennes hetzelfde model hebben.
- 6. Op het WLAN-netwerk dat voor clientconnectiviteit is ingesteld, dient WMA toegestaan of vereist te zijn, en moet AES of open encryptie alleen worden gebruikt. Dit kan worden geverifieerd met behulp van deze opdrachtoutput:

(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	
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 effe	ort)
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. Antenna diversiteit: indien u om welke reden dan ook slechts twee antennes gebruikt, dient u antenne A en B te gebruiken voor zendpoorten/ontvangerpoorten.

Aan de kant van de client:

- 1. Leverancier gebruikt om de draadloze kaart te besturen, verkieslijker van de leverancier aan de draadloze kaart.
- 2. Clientbestuurders: je moet ervoor zorgen dat de laatste clientbestuurders op de draadloze kaarten actief zijn .
- 3. Neem contact op met uw verkoper van de draadloze adapter.
- 4. Zorg ervoor dat u 11n gecertificeerde adapter gebruikt om 11n gegevenssnelheden te bereiken.
- Wi-Fi gecertificeerde producten:

Prestaties verbeteren:

- Kanaalgebruik—Netwerkanalysatoren rapporteren kanaalgebruik in procenten van de tijd die besteed wordt aan het verzenden en ontvangen van frames. Dit helpt de mogelijke snelheidsvariantie te meten die te wijten is aan de afstand tot een toegangspunt. Dit zal helpen controleren en bijvoorbeeld, als een kanaal volledig bezet overbrengend op 1 Mbps onder ideale omstandigheden is zou uitvoeren bij 0,94 Mbps onder 100% gebruik.
- 2. Het fysieke medium dat gebruikt wordt in draadloze verbindingen bepaalt ook de prestaties. Het gebruik van 802.11g of 802.11a biedt meer dan 802.11b veel hogere doorvoersnelheid, vaak tot 30 mbps over 802.11b, waarbij een radiocapaciteit van 6 mpb over alle aangesloten stations wordt verdeeld.
- 3. Cell Sizes-het wordt aanbevolen om de celgrootte te verkleinen om de clients zo dichter bij de APs te laten liggen. Dit zal de gegevenssnelheden ten goede komen waarmee de klant op AP kan verbinden. Dit kan worden gedaan door de stroomniveaus op het AP te verlagen tot het laagste.
- 4. De grootte van een cel slinken vermindert ook de interferentie met meerdere kanalen. Als u RRM gebruikt, moeten APs dynamisch kanalen per de plaatsing kiezen. Als u dynamische kanaaltoewijzing toepast, zorg er dan voor dat u geen twee AP's hebt op hoog vermogensniveau op hetzelfde kanaal vlak naast elkaar.
- 5. Bescherming veroorzaakt ook een doorvoerslag.

Doorvoersnelheid berekenen via iPerf

Tips voor installatie van IPS

Voor klanten of testers die geen Chariot bezitten, kan in plaats daarvan Iperf worden gebruikt. Dit is beschikbaar op <u>http://www.macalester.edu/crash/software/pc/iperf/kperf_setup.exe</u>.

TCP-doorvoersnelheid meten

Start deze opdracht op de serverzijde:

Iperf -s -w 256k Start deze opdracht aan de clientzijde:

Iperf -c -P 6 -w 256k -r -t 60

Server li TCP windo	stening or w size: 2	n TCP port 256 KByte	5001 				
Client co ICP windo	nnecting (w size: 2	to 10.10.10 256 KByte	.10, TCP	port 5001			
[1788] lo [1820] lo [1868] lo [1836] lo	cal 10.10 cal 10.10 cal 10.10 cal 10.10	.10.20 port .10.20 port .10.20 port .10.20 port .10.20 port	1155 con 1153 con 1150 con 1152 con	nected with nected with nected with nected with	h 10.10.10.10 h 10.10.10.10 h 10.10.10.10 h 10.10.10.10 h 10.10.10.10	port port port port	5001 5001 5001 5001
[1864] 10 [1852] 10 [ID] Int [1788] 0 [1868] 0	cal 10.10 cal 10.10 erval 1.0-60.1 sc 1.0-60.1 sc	10.20 port 10.20 port Transfer ec 124 MB ec 123 MB	1154 Com 1151 con Band Sytes 17.	nected with width 3 Mbits/sec 1 Mbits/sec	h 10.10.10.10	port	5001
[1820] 0 [1804] 0 [1852] 0 [1836] 0 [SUM] 0.	1.0-60.2 so 1.0-60.1 so 1.0-60.1 so 1.0-60.2 so 0-60.2 so	ec 110 MB ec 84.6 MB ec 89.2 MB ec 86.3 MB c 617 MBy	ytes 15. ytes 11. ytes 12. ytes 12. ytes 86.0	4 Mbits/se 8 Mbits/se 4 Mbits/se 0 Mhits/se 1 Mbits/sec			
[1952] lo [1832] lo [1748] lo [1732] lo [1800] lo	cal 10.10 cal 10.10 cal 10.10 cal 10.10 cal 10.10 cal 10.10	.10.20 port .10.20 port .10.20 port .10.20 port .10.20 port .10.20 port	5001 con 5001 con 5001 con 5001 con 5001 con	nected wit nected wit nected wit nected wit nected wit	h 10.10.10.10 h 10.10.10.10 h 10.10.10.10 h 10.10.10.10 h 10.10.10.10 h 10.10.10.10	port port port port port	2663 2664 2665 2666 2667
[1812] lo [ID] Int [1800] 0 [1812] 0 [1952] 0	cal 10.10 erval 1.0-60.0 sc 1.0-60.0 sc 1.0-60.1 sc	.10.20 port Transfer ec 114 MB ec 117 MB ec 89.6 MB	5001 con Band ytes 15. ytes 16. utes 12.	nected wit width 9 Mbits/sec 3 Mbits/sec 5 Mbits/sec	h 10.10.10.10	port	2668
[1748] Ø [1732] Ø [1832] Ø [SUM] Ø.	1.0-60.1 se 1.0-60.1 se 1.0-60.1 se 0-60.1 se	ec 129 MB ec 111 MB ec 112 MB c 672 MBy	ytes 18. ytes 15. ytes 15. tes 93.8	1 Mbits/se 5 Mbits/se 6 Mbits/se Mbits/sec			

Het eerste omcirkelde nummer in deze afbeelding representeert de upstream doorvoersnelheid, het tweede omcirkelde nummer de downstream-doorvoersnelheid (AP naar client).

UDP-doorvoersnelheid meten

Sluit de vorige Iperf-toepassingen aan op zowel de server als de client. Beide moeten opnieuw worden opgezet, maar dit keer voor de prestatietests van het UDP.

Start deze opdracht op de serverzijde:

Iperf -s -u -l 56k Start deze opdracht aan de clientzijde:

Iperf -c -u -b 50M -1 56k -P Dit is een voorbeeld van Omnipeek om de Aggregate MAC-service gegevenseenheid te analyseren:

A-MSDU-sporen tonen één pakje

🙀 OaniPeek - (AH5)	00Packet	apo]											
💒 Ele Est New S	japane Ser	ng ⊻onior Iook <u>W</u> indow	Help										그 원 즈
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7													>
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• escents	Renset	Source	Destination	02210	Flage	Chancel	E gruei	Deta Rate	376	Relative Time	Protocol	Success	
E Forert	1	79 10: 14: 5E: 57: 7E: AL	FP 00:12:28:36:19:37	FP 00: 16: 01: 6F: 03: 5Z	A	1	1008	144.5	4350	0.000000	102.11 A-HSDU	FT=. F	
-iero-che	2	🔲 00:28:E0:8c:15:77	10101500106F0US05E			1	1008	24.0	16	0.000005	502.11 Ack	PD=	
الأوسيسية الم	4				20.4	W. (W)	1000	100.00	1.08	A DECKER	LAND AND A		
											Packet/ 2	Divetion: J	HTTP://
Done												at None	1

- Alleen het eerste sub frame wordt getoond.
- Moet worden geïnspecteerd om extra sub-frames te zien.

A-MSDU volgend subkader getoond in bijlage

🔆 OuniPeek - [AMSDUPasket.apo - Pasket #1]	
🙍 Ele Er: Yew Cerue Send Yorke Isk Withow Hea	뮌즈
1.00.10 2.00	
· · · · · · · · · · · · · · · · · · ·	
Packet 4 [0] dr 2	
Le Xo TTP Options	-
H T and the Lager	
- Data Inves: (1.00 hytes)	
 Zatra žytas (Zatřína)/(2200 bytes) Hest Súžířnané Hender 	
B-T POS - Prane Check Sequence	
	Ξ
1410 C DE	-
LASSE WE GO TO	
15001 SA 18: 43 43 32 84 12 88 45 94 48 P8 48 28 49 10 20 47 99 33 8P 83 01 35 85 35 36 37 2P 20 17 58 50 18 1A 46 38 91 33 34 81 01 36 01 90 38 10 00 38 10 37 39 37 37 37 37 37 37 37 37 37 37 37 37 37	
1243: 10 47 67 68 44 00 12 25 35 10 17 10 14 52 57 12 41 04 24 48 57 12 41 04 24 48 50 01 01 00 05 00 45 10 14 20 47 50 40 00 80 05 17 42 01 45 44 52 01 45 44 55 10 14 10 14 10 14 10 14 10 14 14 14 14 14 14 14 14 14 14 14 14 14	
1593: AA 70 11 64 08 0F 3F 66 00 67 F4 20 10 24 20 10 24 10 96 00 00 EA 10 92 20 04 12 12 50 40 27 65 55 51 50 CB 52 27 0F AD 97 50 10 10, 0.14F)	2
For Help, press F1	- 10

- Een A-MPDU is een structuur die meerdere MPDU's bevat, die door de PHY als één PSDU worden getransporteerd.
- Indicatie dat het pakket Data A-MPDU is in Physical Layer Convergence procedure (PLCP).



Dit is een voorbeeld van Omnipeek om de **geaggregeerde MAC protocol gegevenseenheid** te analyseren:

A-MPDU instellen

	-												
St OaniPeek -	OwriPeek - [AMPDUSetup and]												
🔮 Ele - Ect - M	을 Ele Est New Conne Song Monte Infe Monte Hou												
🔄 - 😂 - 🖬													
- T													
100.000		Rendet :	Source	Destination	0000	Elage	Chancel	Cignal	Deta Rate	100	Relative Time	Protocol	Success
E Barret	Ξ.	1	10:17:17:A6:4C:90	Fp 00:12:28:10:F0:55	FE 00:17:07:A6:40:91	7A	1	1005	130.0	37	0.000003	502.11 Action	PT=
dencts		z	00:28:20:28:20:28:20:08	DISLOOPSA6540590			5	100%	36.0	19	0.000004	500,11 A08	PD=
14		3	📑 10: 10: FO: 10: FO: 55	1001:13:0F:A6:40:50	📑 00: 17: DF: A6: 40: 91	*	¢ .	1004	26.0	.17	0.000003	302.11 April m	FC,28026
Application	- el .	4	B 05:17:DF:Ac:40:99	B01:12:E0:10:F0:55		1.	5	1008	36.0	14	0.00013	502.11 Ack	FC
3		4				120	120.12	1.18	1. A 1991.	100	COLUMN A	NUMBER OF STREET	
												Packetz 4	Duration: [INTER1]
Done													ally Nora

- ADDBA-Blokbevestiging toevoegen
- ADDBA-aanvraag: bevat identifier, blogbeleid, buffergrootte, enzovoort.

• ADDBA-respons kan beleid en buffergrootte wijzigen.

A-MPDU instellen

- ADDBA-aanvraag
- AP1250 gebruikt een tijd van nul om geen tijd aan te geven.



A-MPDU instellen

- ADDBA-respons
- Ontvanger moet aangeven dat de Blokkenovereenkomst is gesloten.



A-MPDU-gegevensoverdracht

- Blok Ack bevat gecomprimeerde bitmap om de ontvangen MPDU's aan te geven.
- Raadpleeg de sectie 9.10.7 van IEEE 802.11n van "HT-wet-extensies" voor informatie over het verzenden van de blokzak.

😗 OmniPesk - (AMP	0110 stsAndBlockAck.spc]											
😰 Eile Edit Mew	<u>Capture Send Monitor I</u> col	k <u>W</u> indow ∐ep									X	
■ • ♥ • ₩ > ₩ ≥ ■ ■ ■ \$\$ \$ 2 7 2 C ≥ 11 \$ < ■ \$\$ \$\$												
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Packets	Redot Source	Desk relien	82310	Place	Channel	Signal	Data Rata	State	Relative Time	Protocol		
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Hearth	2 🕎 00:13:K6:3	16:19:77 📑 00:14:5K:87:7K:A	1 100:16:01:57:03:55	*	1	100%	130.0	75	0.000003	TEP		
Bu	3 💵 00:13:E8:3	36:19:77 🛛 💵 0D:14:5E:87:7E:A	1 BD 00:16:01:6F:03:5E	à.	1	100%	130.0	78	0.000008	TCP		
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Peer Map	6 🕎 00:13:50:3	36:19:72 ∰00:14:5K:07:7E:A	1 IP 00:16:01:6F:03:55	A	1	100%	130.0	70	0.000017	TOP		
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Statistics	0 🕎 00;15;01;0	07:03:5E B 00:13:E0:36:19:7	7	1 C	1	100%	24.0	32	0.000023	002.11 04		
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	-										A. 6.	
									Packets 8	Duration	0.00.00	
Done										📑 🕽 None	10	

In wissels geadverteerde vermogens

HI 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
(3)	0 Does Not Support HT-Delayed BlockAck Operation
🗊	00 No Rx STBC Support
🕲	0 Transmitter does Not Support Tx STBC
5 (7	
🗊	
(9)	0 Device is Not Able to Receive PDDUs with GF Preamble
😭	
🞯	1. Both 20MHz and 40MHz Operation is Supported
🗑	0 LDPC coding capability: Not Supported
- T A-MPDU Parameters:	\$00011011
	xxx Reserved
🚱	110 Minimum MPDU Start Spacing: 8 usec
😭	11 Maximum Rx A-MPDU Size: 64K
Supported MCS Set	
in T One Spatial Stream	: \$1111111
MCS Index 0 Sup	ported - BPSK. Coding Rate: 1/2
	ported - QPSK. Coding Rate: 1/2
	ported - QPSK. Coding Rate: 3/4
	ported - 16 QAM. Coding Rate: 1/2
	ported - 16 QAM. Coding Rate: 3/4
😭 MCS Index 5 Sup	ported - 64 QAM. Coding Rate: 2/3
	ported - 64 QAM. Coding Rate: 3/4
🕥 MCS Index 7 Sup	ported - 64 QAM. Coding Rate: 5/6
🖃 🥤 Two Spatial Stream	s: %0111111
😭 MCS Index 8 Supp	ported - BPSK. Coding Rate: 1/2
MCS Index 9 Sup	ported - QPSK. Coding Rate: 1/2
🕥 MCS Index 10 Su	pported - QPSK. Coding Rate: 3/4
	pported - 16 QAM. Coding Rate: 1/2
🕤 MCS Index 12 Su	pported - 16 QAM. Coding Rate: 3/4
🗑 MCS Index 13 Su	pported - 64 QAM. Coding Rate: 2/3
🍘 MCS Index 14 Su	pported - 64 QRM. Coding Rate: 3/4
🕤 MCS Index 16 No	t Supported - 64 QAM. Coding Rate: 5/6
🔤 👔 Rx Bitmask b16-b23	\$0000000
🌒 Rx Bitmask b24-b31	: %0000000
🜍 Rx Bitnask b32-b39	: ≥00000000
🍘 Rx Bitmask b40-b47	: %0000000
🛶 🎯 Rx Bitmask b48-b55	: \$00000000

Beknopte vermogens in beacons:

	🕽 Rx Bitnask b64-b76:	\$00000000000
	Reserved:	\$000
	Highest Supported Rate	et0 X0xxx
	Reserved:	*00000
	Tx Supported MCS Set:	30 Not Defined
	Ty and By MCS Set:	20 Xm121
	Ty Navinum Dumber Snal	To Synap
	Tx Haxmal Kadulation	An Net Supported to F Special Solicit
	Pararand:	- 10 NOT 0000000000000000000000000000000000
-	F Futended Comphilities	
	I Extended capabilities	
		AAAA Restricted
		A With Table Supports Supported
-		NOU MAS FEEDDACKT SIA DOES NOT FLOVIDE MAS FEEDDACK
		XXXX X Keserved
1		
11	x Beam Forming Capabili	ty (TXBF): \$000000000000000000000000000000000000
		xxx Reserved
		0 0
0		
	9	
(9	
	9	CSI Number of BF Antennes: 1 TX Antenne Sounding
0	9	00 Minimal Grouping: SIA Supports Groups of 1 (No Grouping)
(Compressed BF Feedback Katrix: Not Supported
0	9	Uncompressed BF Feedback Matrix: Not Supported
(•	TxBF CSI Feedback: Not Supported
(
(9	Uncompressed BF Feedback Matrix: Not Supported
	9	Explicit CSI TxBF Capable: Not Supported
(9	Not Supported
0		Implicit TxBF Capable: Not Supported
(9	Tx NDP Capable: Not Supported
(9	0 Zx NDP Capable: Not Supported
(
(
- i (9	O Implicit TxBF Receiving Capable: Not Supported
- T	intenna Selection Capabi	lity (ASEL): \$00000000
(9	x Reserved
(9	.0 Tx Sounding PPDUs Capable: Not Supported
(9	Rx ASEL Capable: Not Supported
(9	0 Antenna Indices Feedback Capable: Not Supported
(9	0 Explicit CSI Feedback: Tx AS Capable: Not Supported
	9	0 Antenna Indices Feedback Based Tx ASEL Capable: Not Supported
(9	0. Re-Explicit CSI Feedback Tx ASEL Capable: Not Supported
1.4	•	a Button detailed decides With Commented

Beknopte vermogens in beacons:

```
61 Additional HT Information
 😥 Element ID:
 🗑 Length:
                     22
 Primary Channel:
                    - 6
- 🌍 Srvc Int Granularity: 4000 - 5ms
 BY SNP STAS Only: 30 Association Requests are Accepted Regardless of PSNP Capability
 🗑 RIFS Mode:
                     41 Use of RIFS Permitted
 🗑 STA Channel Width:
                     %1 Use Any Channel Width Enabled Under Supported Channel Width Set
 2nd Channel Offset: 401 Above the Primary Channel
. 🗑
                       XXXXXXXX XXX.... Reserved
   . 💮
                       .
                       .....0... Transmit Burst Limit: No Limit
  -- 🕲
                       .....1.. Non-Greenfield STAs: One or more HT STAs are Not Greenfield Capable
   . 🐨
                       HT Info Element 3:
                     $00000000000000000
   . 📦
                       xxxx.... Reserved
                       ....0.... PCO Phase: Switch To/Continue Use 20MHz Phase
  --- 🗑
                       .....0.. ....... PCO Active: Not Active in the BSS
   - 🗑
   ... 🗑
                       .....0. ...... L-SIG TXOP Protection: Not Full Support
  -- 😥
                       .....0 ...... Secondary Beacon: Primary Beacon
                       ..... 0..... Duel CTS Protection: Not Required
   . 🕤
                       0
   . 📦
                       - Basic 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: 300000000
     -- 🎯 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 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: *00000000
   📵 Rx Bitnask b24-b31:
                       $00000000
   🝘 Rx Bitnask b32-b39:
                       $00000000
   💼 Rx Bitnask b40-b47:
                       $00000000
```

Associatie vergelijkbaar met toevoeging van bloggen voor A-MPDU:

194	🕎 00:13:E8:1D:F0:55	BO:17:DF:A6:4C:90	802.11 Ack			100%	6.0	14
195	EE 00:17:DF:A6:4C:90	FgEthernet Broadcast	802.11 Beacon	m 00:17:DF:A6:4C:90	*	100%	6.0	204
196	E 00:13:28:1D:F0:55	FP Ethernet Broadcast	802.11 Probe Reg	Ethernet Broadcast	*	100%	1.0	81
197	FE 00:17:DF:A6:4C:90	P2 00:13:E8:1D:F0:55	802.11 Probe Rsp	FP 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	N: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	B) 00:17:DF:A6:4C:90	*+	100%	6.0	204
202	Image: 00:13:E8:36:19:77	00:17:DF:A6:4C:90	802.11 Ack		¥	100%	6.0	14
203	BO: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	B 00:17:DF:A6:4C:90	00:13:E8:36:19:77	802.11 Probe Rsp	B00:17:DF:A6:4C:90	*+	100%	6.0	204
206	00:13:E8:36:19:77	B) 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	B) 00:13:CE:89:DC:A2	Ethernet Broadcast	802.11 Probe Req	Ethernet Broadcast	*	100%	1.0	87
210	D0:13: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 Reg	Ethernet Broadcast	*	100%	1.0	55
215	E 00:13:E8:1D:F0:55	F 00:17:DF:A6:4C:90	802.11 Auth	FE 00:17:DF:A6:4C:90	*	100%	36.0	34
216	E2 00:17:DF:A6:4C:90	F 00:13:E8:1D:F0:55	802.11 Ack		<i>i</i> i	100%	36.0	14
217	E 00:17:DF:A6:4C:90	E 00:13:E8:1D:F0:55	802.11 Auth	E 00:17:DF:A6:4C:90	×	100%	36.0	34
218	🕎 00:13:E8:1D:F0:55	F2 00:17:DF:A6:4C:90	802.11 Ack		ÿ	100%	36.0	14
219	FE 00:13:E8:1D:F0:55	FE 00:17:DF:A6:4C:90	802.11 Assoc Req	FE 00:17:DF:A6:4C:90	*	100\$	36.0	134
220	E 00:17:DF:A6:4C:90	E 00:13:E8:1D:F0:55	802.11 Ack		ÿ	100%	36.0	14
221	FE 00:17:DF:A6:4C:90	FP 00:13:E8:1D:F0:55	802.11 Assoc Rsp	FP 00:17:DF:A6:4C:90		100%	130.0	180
222	📰 00:13:E8:1D:F0:55	B 00:17:DF:A6:4C:90	802.11 Ack		¥.	100%	36.0	14
223	3 192.168.170.89	3224.0.0.1	IGNP	B00:17: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	IGNP	B) 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		9	100%	36.0	14
227	00:17:DF:A6:4C:90	00:13:E8:1D:F0:55	WLCCP	E) 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	E 00:17:DF:A6:40:90	F 00:13:E8:1D:F0:55	802.11 Action	Percent and the second seco		100%	130.0	37
230	00:13:E8:1D:F0:55	B 00:17:DF:16:4C:90	802.11 Ack		¥	100%	36.0	14
231	EE 00:13:28:1D: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: 16:4C:90	B00:13:E8:1D:F0:55	802.11 Ack		ý.	100%	36.0	14

Verifying A-MPDU is enabled on the controller

A MARK CONTRACTOR OF A		
a distributing two	All all an original had been	
Element ID	45 BT Capability Date [01]	
- Unigth:	26 [04]	
T HT Capability Info:	<pre>w0001100001101110 (05-06)</pre>	
- •	0 E-SIG TADP Protection Support: Not Supported	
	.0 30 allows use of 4000s Transmissions In Meighboring Blds	
-•	Derice/BSS does Not Support use of 2592	
	0 Transmitter does Not Support Ty STBC	
	A 150° online cambilities for formertad	
The second burners and	And the second s	 A-MPDU enabled and seen in the
a a ware reservers	November (07)	+ baacon
	ART Medarver [17] Hart Child	Deacon
T Supported BCS Set		

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

- interface Dot11Radio1
- Radio AIR-RM1252A, Base Address 00119ea6.8520, BBlock version 0.00, Software version 2.10.20
- Serial number: FOC1212405A
- Number of supported simultaneous BSSID on Dot11Radio1: 16
- Carrier Set: Americas (OFDM) (US) (-A)
- Uniform Spreading Required: Yes
- Configured Frequency: 5180 MHz Channel 36 40MHz, extended above
- Compared Prequency: 5159 MHz Channel 36 40MHz, extended above Allowed Frequencies: 5180(36) 5200(40) 5220(44) 5240(48) *5260(52) *5280(56) *5300(60) *5320(64) *5500(100) *5520(104) *5540(108) *5560(112) *5590(116) *5660(132) *5680(136) *5700(140) 5745(148) 5765(153) 5785(157) 5805(161) 5825(165) * = May only be selected by Dynamic Frequency Selection (DFS) Listen Frequencies: 5180(36) 5200(40) 5220(44) 5240(48) 5260(52) 5280(56) 5300(60) 5320(64) 5500(100) 5520(104) 5540(108) 5560 (112) 5580(116) 5660(132) 5680(136) 5700(140) 5745(149) 5765(153) 5785(157) 5805(161) 5825(165) Beacon Flags: 0, Interface Flags 20105; Beacons are enabled; Probes are enabled Compared Brance Methods Methods and the second Brance Methods and Brance Methods Methods

- Configured Power: 14 dBm (level 1)
- Active power levels by rate
- 6.0 to 54.0 , 14 dBm
- 6.0-bf to 54.0-b, 8 dBm, changed due to regulatory maximum m0. to m15.-4, 11 dBm, changed due to regulatory maximum
- OffChnl Power: 14, Rate 6.0
- Allowed Power Levels: -1 2 5 8 11 14 --More--
- --More--Allowed Client Power Levels: 2 5 8 11 14
- Receive Antennas : right-a left-b middle-c
- Transmit Antennas : right-a left-b, ofdm single
- Antenna: external, Gain: Allowed 11, Reported 0, Configured 0, In Use 11
- Active Rates: basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0
- Current Rates: basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0
- Allowed Rates: 6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0
- All Rates: 6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 m0. m1. m2. m3. m4. m5. m6. m7. m8. m9. m10. m11. m12. m13. m14. m15.
- Default Rates: basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0 m0. m1. m2. m3. m4. m5. m6. m7. m8. m9. m10. m11. m12. m13. m14. m15.
- Best Range Rates: basic-6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 m0. m1. m2. m3. m4. m5. m6. m7. m8. m9. m10. m11. m12. m13. m14. m15.
- Best Throughput Rates: basic-6.0 basic-9.0 basic-12.0 basic-18.0 basic-24.0 basic-36.0 basic-48.0 basic-54.0 m0. m1. m2. m3. m4. m5. m6. m7. m8. m9. m10. m11. m12. m13. m14. m15.

MCS Rates on 802.11n beacon

In a state for each other and the state of t
a T Capacitod MIX Set.
(a) T the Spectral Property Sections (10)
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Wit index a furgerand - as just coming factor dive
- But Dates i Dagestied - of UBR, Colling Relet 2/7
. · With Dasher & Degenerated - of GBK, Conting Rates 2.14
BCS (balas 7 Suggesting - of UBM, Colour Balas 1/4
The lastic Barrier Allinger Allinger
- Bill Bader & Segmented - 2018. Contag Bater 2/0
- WH Dates > Departed - QUIL, Colling Beter 2/0
. S With Dasher 24 Regenerations - GARL Continue Refers Arts
- The second sec
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Self Dates 10 Supervised - 68 100. College Select 1/6
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• The Bit Reads \$200 to 12: 400000000 [11]
Be Bulland Std of 1 Stormond (11)
Be Bullegash 242-675- 400000000 [14]
- * He Street 255-621: 10000000 [11]
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Supported MCS rates

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	T Supported MIS Set	
	G The Spatial Stream + 1111111 (***)	
	We cannot a supported - state. Contry where 1/2	
	Ref Dates 2 Supporter - 0027, Colling Barty 3/4	
	Will Index 3 Supported - 16 GMM, Coding Rate: 1/1	
	- Will Index 4 Supported - 14 GMK, Coding Reter 1/4	
	- 🗣 MCF Index 6 Supported - 66 QBM. Coding Ante: 2/9	
	- • MCF Index 6 Supported - 46 QMK, Coding Actor 3/4	
	La ACE Jonda 7 Supported - 42 QMA, Coding Arter 5/4	
	We special intervent transmission (17)	
	REL Dates 9 Supported - OVE, Collar Late L/I	
	WET Index 10 Supported - OFER, Colling Rate: 3/4	
	- 🖉 MCF Index 12 Supported - 14 GAM. Collar Aste: 1/2	
	With Index 12 Supported - 14 GAM. Coding Bates 3/4	
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	Bit Bitmark bit should be separate to be a second bit	۳
	- R Bitmack b19-0101 V00000000 [01]	
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	- • • • • • • • • • • • • • • • • • • •	
	• Nuclear Transition Robert Rose (201701)	
	9 Reserved) 940000 (17 Ball 0217)	
	The Supported MCS Set: VB. Dot Decision 2100 Basis (2001)	*

802.11a with N rates Enabled

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F His Edit. View Cupture Send Monitor Tools Hindow Help	WildPachels OmniPeek
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a T the B-3 DM Loss-4 BTH Forst-0 BTH Forst-0 Bitter Control - Control For York Rep-Child South Control - Control	and these lines in the second s
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T Version Investigation In-Cold Version States (199-10-40-10 Version-1 OX Version-1	
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w W wenter spectate ID-011 Ventor System (D-00-40-66 Deta-(1 bytes)	
T FIS - Frame Check Segment	
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802.11A Beacon frame

β	OmniPeek _ o x
i No - E	10. Vew Capture Sand Monitor Tools Window Help Wild/Paciets OmniPeek
2-6	
17-1	Start Page 802 111apht 802 111apht 902 111apht - Padent #57 x 802 111apht+Padent #110
44	A A A A A A A A A A A A A A A A A A A
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	Timestampi ST540960 Microsowada [24-11]
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1.1	SSD Del SIII Land SSD-WI
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87	100- D-5 T20: Len-6 MIN Count-0 MIN Period-1 Bitmap Control-40000000 Part Virt Baug-0c00
*T	Country ID-3 Country Lea-18 Country Code-08 Starting Channel-36 Munice of Channels-4 Ray To Power (MIN)-20 Starting Channel-58 Munice-4 Ray To Power (MIN)-20 S
11	With Deal (1957: Leve Station Created Channel Williamine-Scil) # Jenil Medianics Capacity-29407
114	Brill State References and an entropy of the second state and the second
1.1	Product Specific De211 Vender Specific Level 00-40-40-40 (bitset)
187	Vester Specific D-011 Vester Specific Lead 001-00-00-00 Version-0 022 Version-0
87	Vender Specific ID-211 Vender Specific Lane d 000-00-40-06 Owta-(2 hytes)
87	Whate Specific ID=011 Vende Specific Least 000-00-00-00 beta=(2 bytes)
θΨ.Ř	3 France Clarck Separace
	LERI DOTATIANE CYTOTRAGE

Gerelateerde informatie

• Technische ondersteuning en documentatie – Cisco Systems