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[Introduction](#)

Remarque: Les informations dans ce document sont basées sur des versions de logiciel 11.2 et ultérieures de Cisco IOS®.

Ce document examine des problèmes communs d'élimination des imperfections pour TACACS+ quand le Password Authentication Protocol (PAP) ou le protocole d'authentification CHAP (Challenge Handshake Authentication Protocol) sont utilisés. Les configurations communes PC pour le Microsoft Windows 95, le Windows NT, le Windows 98, et le Windows 2000 est fourni, aussi bien que les exemples des configurations et les exemples de bon et de mauvais met au point.

[Conditions préalables](#)

[Conditions requises](#)

Aucune spécification déterminée n'est requise pour ce document.

[Composants utilisés](#)

Ce document n'est pas limité à des versions de matériel et de logiciel spécifiques.

Les informations contenues dans ce document ont été créées à partir des périphériques d'un environnement de laboratoire spécifique. Tous les périphériques utilisés dans ce document ont

démarré avec une configuration effacée (par défaut). Si votre réseau est opérationnel, assurez-vous que vous comprenez l'effet potentiel de toute commande.

Conventions

Pour plus d'informations sur les conventions utilisées dans ce document, reportez-vous à [Conventions relatives aux conseils techniques Cisco](#).

Configurations communes PC

Windows 95

Procédez comme suit :

1. Dans la fenêtre d'accès réseau à distance, choisissez le nom de la connexion, puis le **fichier > le Properties**.
2. Sur l'onglet Type de serveur, voyez si la case de **Require Encrypted Password** sous le type de serveur commuté est cochée. Si cette case est cochée, le PC reçoit seulement l'authentification CHAP. Si cette case n'est pas cochée, le PC reçoit le PAP ou l'authentification CHAP.

Windows NT

Procédez comme suit :

1. Dans la fenêtre commutée de réseau, choisissez le nom de la connexion, et puis choisissez le **fichier > le Properties**.
2. Vérifiez les configurations sur l'onglet Sécurité : Si le **recevoir n'importe quelle authentification comprenant la zone de texte claire** est coché, le PC reçoit le PAP ou le CHAP. Si la case **chiffrée d'authentification de recevoir seulement** est cochée, le PC reçoit seulement l'authentification CHAP.

Windows 98

Procédez comme suit :

1. Dans la fenêtre commutée de réseau, choisissez le nom de la connexion, et puis choisissez Properties.
2. Sur les types de serveur tabulez, vérifiez les configurations dans la région avancée d'options : Si la case de **mot de passe chiffré d'exigence** n'est pas cochée, le PC reçoit le PAP ou l'authentification CHAP. Si la case de **mot de passe chiffré d'exigence** est cochée, le PC reçoit seulement l'authentification CHAP.

Windows 2000

Procédez comme suit :

1. Dans des connexions de réseau et de connexion à distance, choisissez le nom de la connexion, et puis choisissez Properties.
2. Sur l'onglet Sécurité, dans l'avancé > les configurations > permettent à ceux-ci la zone de protocoles :Si la case du mot de passe non chiffré (PAP) est cochée, le PC reçoit le PAP.Si la case de protocole d'authentification CHAP (Challenge Handshake Authentication Protocol) est cochée, le PC reçoit le CHAP par RFC 1994.Si la case du CHAP de Microsoft (MS-CHAP) est cochée, le PC reçoit la version 1 MS-CHAP et ne reçoit pas le CHAP par RFC 1994.

Configurations et exemples de debug

Configuration - TACACS+ et PAP

```

Current configuration: !version 11.2
service timestamps
debug uptime
service timestamps log uptime
no service
password-encryption
service udp-small-servers
service tcp-small-servers
hostname rtpkrb
!aaa
new-model
!!-- The following four lines of the !!-- configuration are specific to !!-- Cisco IOS 11.2 and later, until 11.3.3.T. !!-- See below this configuration !!-- for commands for other Cisco IOS releases.
!aaa
authentication login default tacacs+ localaaa
authentication ppp default if-needed tacacs+ localaaa
authorization exec tacacs+ if-authenticatedaaa
authorization network tacacs+ if-authenticated
enable
secret 5 $1$pkX.$JdAySRE1SbdbDe7bj0wyt0
enable
password
ww!
username john password 0 doe
username cse password 0 csecseip
host rtpkrb 10.31.1.5
ip domain-name RTP.CISCO.COM
ip name-server 171.68.118.103
!interface Loopback0
ip address 1.1.1.1 255.255.255.0
!interface Ethernet0
ip address 10.31.1.5 255.255.0.0
no mop enabled
!interface Serial0
no ip address
no ip mroute-cache
shutdown
!interface Serial1
no ip address
shutdown
!interface Async1
ip unnumbered
Ethernet0
encapsulation ppp
async mode dedicated
peer default ip address pool async
no cdp enable
ppp authentication pap
!ip local pool async 15.15.15.15
ip classless
ip route 0.0.0.0 0.0.0.0 10.31.1.1
!tacacs-server host 171.68.118.101
tacacs-server key cisco
snmp-server community public RW
snmp-server host 171.68.118.100 traps public
!line con 0
line 1
session-timeout 20
exec-timeout 20 0
password ww
autoselect
during-login
autoselect
ppp modem InOut
transport input all
stopbits 1
speed 38400
flowcontrol hardware
line 2
modem InOut
speed 38400
flowcontrol hardware
line 3
16
line aux 0
line vty 0 4
password ww
!end

```

Commandes pour d'autres versions de Cisco IOS

Remarque: Afin d'utiliser ces commandes, enlevez les commandes en gras de la configuration et la pâte dans ces commandes dedans, comme dicté par votre Cisco IOS libérez.

Cisco IOS 11.3.3.T jusqu'à 12.0.5.T

```

Current configuration: !version 11.2
service timestamps
debug uptime
service timestamps log
uptime
no service
password-encryption
service udp-small-servers
service tcp-small-servers
hostname

```

```

rtpkrb!aaa new-model!-- The following four lines of the !--- configuration are specific to !--
- Cisco IOS 11.2 and later, until 11.3.3.T. !--- See below this configuration !--- for commands
for other Cisco IOS releases.!aaa authentication login default tacacs+ localaaa authentication
ppp default if-needed tacacs+ localaaa authorization exec tacacs+ if-authenticatedaaa
authorization network tacacs+ if-authenticatedenable secret 5
$1$pkX.$JdAysRE1SbdbDe7bj0wyt0enable password ww!username john password 0 doeusername cse
password 0 csecseip host rtpkrb 10.31.1.5ip domain-name RTP.CISCO.COMip name-server
171.68.118.103!interface Loopback0ip address 1.1.1.1 255.255.255.0!interface Ethernet0ip address
10.31.1.5 255.255.0.0no mop enabled!interface Serial0no ip addressno ip mroute-
cacheshutdown!interface Serial1no ip addressshutdown!interface Async1ip unnumbered
Ethernet0encapsulation pppasync mode dedicatedpeer default ip address pool asyncno cdp enableppp
authentication pap!ip local pool async 15.15.15.15ip classlessip route 0.0.0.0 0.0.0.0
10.31.1.1!tacacs-server host 171.68.118.101tacacs-server key ciscosnmp-server community public
Rwsnmp-server host 171.68.118.100 traps public!line con 0line lsession-timeout 20 exec-timeout
20 0password wwautoselect during-loginautoselect pppmodem InOuttransport input allstopbits
1speed 38400flowcontrol hardwareline 2modem InOutspeed 38400flowcontrol hardwareline 3 16line
aux 0line vty 0 4password ww!end

```

[Cisco IOS 12.0.5.T et plus tard](#)

```

Current configuration:!version 11.2service timestamps debug uptime!service timestamps log
uptime!no service password-encryption!service udp-small-servers!service tcp-small-servers!hostname
rtpkrb!aaa new-model!-- The following four lines of the !--- configuration are specific to !--
- Cisco IOS 11.2 and later, until 11.3.3.T. !--- See below this configuration !--- for commands
for other Cisco IOS releases.!aaa authentication login default tacacs+ localaaa authentication
ppp default if-needed tacacs+ localaaa authorization exec tacacs+ if-authenticatedaaa
authorization network tacacs+ if-authenticatedenable secret 5
$1$pkX.$JdAysRE1SbdbDe7bj0wyt0enable password ww!username john password 0 doeusername cse
password 0 csecseip host rtpkrb 10.31.1.5ip domain-name RTP.CISCO.COMip name-server
171.68.118.103!interface Loopback0ip address 1.1.1.1 255.255.255.0!interface Ethernet0ip address
10.31.1.5 255.255.0.0no mop enabled!interface Serial0no ip addressno ip mroute-
cacheshutdown!interface Serial1no ip addressshutdown!interface Async1ip unnumbered
Ethernet0encapsulation pppasync mode dedicatedpeer default ip address pool asyncno cdp enableppp
authentication pap!ip local pool async 15.15.15.15ip classlessip route 0.0.0.0 0.0.0.0
10.31.1.1!tacacs-server host 171.68.118.101tacacs-server key ciscosnmp-server community public
Rwsnmp-server host 171.68.118.100 traps public!line con 0line lsession-timeout 20 exec-timeout
20 0password wwautoselect during-loginautoselect pppmodem InOuttransport input allstopbits
1speed 38400flowcontrol hardwareline 2modem InOutspeed 38400flowcontrol hardwareline 3 16line
aux 0line vty 0 4password ww!end

```

[Debugs d'échantillon - TACACS+ et PAP](#)

Remarque: Dans la sortie de débogage, le texte en gras met en valeur des problèmes dans le débogage. Le texte brut indique qu'un bon met au point.

```

rtpkrb#show debugGeneral OS:TACACS access control debugging is onAAA Authentication debugging is
onAAA Authorization debugging is onPPP:PPP authentication debugging is onPPP protocol
negotiation debugging is onrtpkrb#3d22h: %LINK-3-UPDOWN: Interface Async1, changed state to
up3d22h: As1 PPP: Treating connection as a dedicated line3d22h: As1 PPP: Phase is ESTABLISHING,
Active Open3d22h: As1 LCP: O CONFREQ [Closed] id 14 len 243d22h: As1 LCP: ACCM 0x000A0000
(0x0206000A0000)3d22h: As1 LCP: AuthProto PAP (0x0304C023)3d22h: As1 LCP: MagicNumber 0xF45FB7A7
(0x0506F45FB7A7)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)!-- PC insists on
doing CHAP !--- ("accept encrypted authentication only"), !--- but router is set up for PAP.As1
LCP: I CONFNAK [REQsent] id 27 len 12As1 LCP: AuthProto 0xC123 (0x0308C12301000001)As1 PPP:
Closing connection because remote won't authenticate3d22h: As1 LCP: Interface transitioned,
discarding packet3d22h: As1 LCP: I CONFACK [REQsent] id 14 len 243d22h: As1 LCP: ACCM 0x000A0000
(0x0206000A0000)3d22h: As1 LCP: AuthProto PAP (0x0304C023)3d22h: As1 LCP: MagicNumber 0xF45FB7A7
(0x0506F45FB7A7)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP:
TIMEout: Time 0x14417CC4 State ACKRcvd3d22h: As1 LCP: O CONFREQ [ACKrcvd] id 15 len 243d22h: As1
LCP: ACCM 0x000A0000 (0x0206000A0000)3d22h: As1 LCP: AuthProto PAP (0x0304C023)3d22h: As1 LCP:
MagicNumber 0xF45FB7A7 (0x0506F45FB7A7)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC
(0x0802)3d22h: As1 LCP: I CONFACK [REQsent] id 15 len 243d22h: As1 LCP: ACCM 0x000A0000
(0x0206000A0000)3d22h: As1 LCP: AuthProto PAP (0x0304C023)3d22h: As1 LCP: MagicNumber 0xF45FB7A7

```

(0x0506F45FB7A7)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: I
CONFREQ [ACKrcvd] id 0 len 203d22h: As1 LCP: ACCM 0x00000000 (0x020600000000)3d22h: As1 LCP:
MagicNumber 0x000030A3 (0x0506000030A3)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC
(0x0802)3d22h: As1 LCP: O CONFACK [ACKrcvd] id 0 len 203d22h: As1 LCP: ACCM 0x00000000
(0x020600000000)3d22h: As1 LCP: MagicNumber 0x000030A3 (0x0506000030A3)3d22h: As1 LCP: PFC
(0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: State is Open3d22h: As1 PPP: Phase is
AUTHENTICATING, by this end3d22h: As1 PAP: I AUTH-REQ id 4 len 20 from "papuser"3d22h: As1 PAP:
Authenticating peer papuser3d22h: AAA/AUTHEN: create_user (0x16DAC0) user='papuser' ruser=''
port='Async1' rem_addr='async' authen_type=PAP service=PPP priv=13d22h: AAA/AUTHEN/START
(1190231344): port='Async1' list='' action=LOGIN service=PPP3d22h: AAA/AUTHEN/START
(1190231344): using "default" list3d22h: AAA/AUTHEN (1190231344): status = UNKNOWN3d22h:
AAA/AUTHEN/START (1190231344): Method=TACACS+3d22h: TAC+: send AUTHEN/START packet ver=193
id=11902313443d22h: TAC+: Using default tacacs server list.3d22h: TAC+: Opening TCP/IP to
171.68.118.101/49 timeout=5!--- *The TAC+ server is down, producing an error. !--- Since the user
is not in the local database, !--- the failover to local fails.*TAC+: TCP/IP open to
171.68.118.101/49 failed -- Connection refused by remote hostAAA/AUTHEN (866823886): status =
ERRORAAA/AUTHEN/START (866823886): Method=LOCALAAA/AUTHEN (866823886): status = FAIL3d22h: TAC+:
Opened TCP/IP handle 0x16C1F8 to 171.68.118.101/493d22h: TAC+: 171.68.118.101 (1190231344)
AUTHEN/START/LOGIN/PAP queued3d22h: TAC+: (1190231344) AUTHEN/START/LOGIN/PAP processed!--- *The
key in the router does not match that of the server.*TAC+: received bad AUTHEN packet: length =
68, expected 67857TAC+: Invalid AUTHEN/START packet (check keys)AAA/AUTHEN (1771887965): status
= **ERROR** 3d22h: TAC+: ver=192 id=1190231344 received AUTHEN status = GETPASS3d22h: TAC+: Closing
TCP/IP 0x16C1F8 connection to 171.68.118.101/493d22h: TAC+: Opening TCP/IP to 171.68.118.101/49
timeout=53d22h: TAC+: Opened TCP/IP handle 0x16EF4C to 171.68.118.101/493d22h: TAC+: Opened
171.68.118.101 index=13d22h: AAA/AUTHEN: create_user (0x16C5EC) user='papuser' ruser=''
port='Async1' rem_addr='async' authen_type=PAP service=PPP priv=13d22h: TAC+: rev0 inbound pap
login for id=1190231344 using id=31128966693d22h: TAC+: 171.68.118.101 (3112896669)
AUTHEN/START/LOGIN/PAP queued3d22h: TAC+: (3112896669) AUTHEN/START/LOGIN/PAP processed3d22h:
TAC+: ver=192 id=3112896669 received AUTHEN status = GETPASS3d22h: TAC+: send AUTHEN/CONT
packet3d22h: TAC+: 171.68.118.101 (3112896669) AUTHEN/CONT queued3d22h: TAC+: (3112896669)
AUTHEN/CONT processed!--- *The NT client sends the "DOMAIN\user" !--- and the TAC+ server expects
"user".*TAC+: ver=192 id=260507389 received AUTHEN status = FAILTAC+: rev0 inbound pap completed
for 1139034411 status=FAILAAA/AUTHEN: free_user (0x16CDD4) user='CISCO\papuser' ruser=''
port='Async1' rem_addr='async' authen_type=PAP service=PPP priv=1!--- *The TAC+ server refuses
the user !--- because the user is set up for PAP. !--- The user enters a bad password, !--- or
both the username and password are bad.*TAC+: ver=192 id=691012958 received AUTHEN status =
FAILTAC+: rev0 inbound pap completed for 3917384959 status=FAILAAA/AUTHEN: free_user (0x15AD58)
user='idochap' ruser='' port='Async1' rem_addr='async' authen_type=PAP service=PPP priv=13d22h:
TAC+: ver=192 id=3112896669 received AUTHEN status = PASS3d22h: TAC+: rev0 inbound pap completed
for 1190231344 status=PASS3d22h: AAA/AUTHEN: free_user (0x16C5EC) user='papuser' ruser=''
port='Async1' rem_addr='async' authen_type=PAP service=PPP priv=13d22h: TAC+: Closing TCP/IP
0x16EF4C connection to 171.68.118.101/493d22h: AAA/AUTHEN (1190231344): status = PASS3d22h:
AAA/AUTHOR/LCP As1: Authorize LCP3d22h: AAA/AUTHOR/LCP: Async1: (1061976769):
user='papuser'3d22h: AAA/AUTHOR/LCP: Async1: (1061976769): send AV service=ppp3d22h:
AAA/AUTHOR/LCP: Async1: (1061976769): send AV protocol=lcp3d22h: AAA/AUTHOR/LCP: Async1:
(1061976769): Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (1061976769): user=papuser3d22h:
AAA/AUTHOR/TAC+: (1061976769): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (1061976769): send AV
protocol=lcp3d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: TAC+: Opened TCP/IP
handle 0x16C9E0 to 171.68.118.101/493d22h: TAC+: Opened 171.68.118.101 index=13d22h: TAC+:
171.68.118.101 (1061976769) AUTHOR/START queued3d22h: TAC+: (1061976769) AUTHOR/START
processed!--- *The user passes authentication !--- (the username/password is good) !--- but fails
authorization !--- (the profile is not set up to authorize PPP).*TAC+: (1793875816): received
author response status = FAILTAC+: Closing TCP/IP 0x17054C connection to
171.68.118.101/49AAA/AUTHOR (1793875816): Post authorization status = FAILAAA/AUTHOR/LCP As1:
Denied3d22h: TAC+: (1061976769): received author response status = PASS_ADD3d22h: TAC+: Closing
TCP/IP 0x16C9E0 connection to 171.68.118.101/493d22h: AAA/AUTHOR (1061976769): Post
authorization status = PASS_ADD3d22h: As1 PAP: O AUTH-ACK id 4 len 53d22h: As1 PPP: Phase is
UP3d22h: AAA/AUTHOR/FSM As1: (0): Can we start IPCP?3d22h: AAA/AUTHOR/FSM: Async1: (3602788894):
user='papuser'3d22h: AAA/AUTHOR/FSM: Async1: (3602788894): send AV service=ppp3d22h:
AAA/AUTHOR/FSM: Async1: (3602788894): send AV protocol=ip3d22h: AAA/AUTHOR/FSM: Async1:
(3602788894): Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (3602788894): user=papuser3d22h:
AAA/AUTHOR/TAC+: (3602788894): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (3602788894): send AV
protocol=ip3d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: %LINEPROTO-5-UPDOWN:
Line protocol on Interface Async1, changed state to up3d22h: TAC+: Opened TCP/IP handle 0x17054C

```

to 171.68.118.101/493d22h: TAC+: Opened 171.68.118.101 index=13d22h: TAC+: 171.68.118.101
(3602788894) AUTHOR/START queued3d22h: As1 IPCP: I CONFREQ [Closed] id 1 len 343d22h: As1 IPCP:
Address 0.0.0.0 (0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: As1
IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h: As1 IPCP: SecondaryDNS 0.0.0.0
(0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000)3d22h: TAC+: (3602788894)
AUTHOR/START processed3d22h: TAC+: (3602788894): received author response status =
PASS_ADD3d22h: TAC+: Closing TCP/IP 0x17054C connection to 171.68.118.101/493d22h: AAA/AUTHOR
(3602788894): Post authorization status = PASS_ADD3d22h: AAA/AUTHOR/FSM As1: We can start
IPCP3d22h: As1 IPCP: O CONFREQ [Closed] id 10 len 103d22h: As1 IPCP: Address 10.31.1.5
(0x03060A1F0105)3d22h: As1 IPCP: I CONFACK [REQsent] id 10 len 103d22h: As1 IPCP: Address
10.31.1.5 (0x03060A1F0105)3d22h: As1 IPCP: I CONFREQ [ACKrcvd] id 1 len 343d22h: As1 IPCP:
Address 0.0.0.0 (0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: As1
IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h: As1 IPCP: SecondaryDNS 0.0.0.0
(0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000)3d22h: AAA/AUTHOR/IPCP
As1: Start. Her address 0.0.0.0, we want 0.0.0.03d22h: AAA/AUTHOR/IPCP As1: Processing AV
service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV protocol=ip3d22h: AAA/AUTHOR/IPCP As1:
Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 0.0.0.0, we want
0.0.0.03d22h: As1 IPCP: Using pool 'async'3d22h: As1 IPCP: Pool returned 15.15.15.153d22h: As1
IPCP: O CONFREQ [ACKrcvd] id 1 len 223d22h: As1 IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h:
As1 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0
(0x840600000000)3d22h: As1 IPCP: I CONFREQ [ACKrcvd] id 2 len 163d22h: As1 IPCP: Address 0.0.0.0
(0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: AAA/AUTHOR/IPCP As1:
Start. Her address 0.0.0.0, we want 15.15.15.153d22h: AAA/AUTHOR/IPCP As1: Processing AV
service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV protocol=ip3d22h: AAA/AUTHOR/IPCP As1:
Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 0.0.0.0, we want
15.15.15.153d22h: As1 IPCP: O CONFNAK [ACKrcvd] id 2 len 163d22h: As1 IPCP: Address 15.15.15.15
(0x03060F0F0F0F)3d22h: As1 IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: As1 IPCP: I
CONFREQ [ACKrcvd] id 3 len 163d22h: As1 IPCP: Address 15.15.15.15 (0x03060F0F0F0F)3d22h: As1
IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: AAA/AUTHOR/IPCP As1: Start. Her address
15.15.15.15, we want 15.15.15.153d22h: AAA/AUTHOR/IPCP: Async1: (3654974050):
user='papuser'3d22h: AAA/AUTHOR/IPCP: Async1: (3654974050): send AV service=ppp3d22h:
AAA/AUTHOR/IPCP: Async1: (3654974050): send AV protocol=ip3d22h: AAA/AUTHOR/IPCP: Async1:
(3654974050): send AV addr*15.15.15.153d22h: AAA/AUTHOR/IPCP: Async1: (3654974050):
Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (3654974050): user=papuser3d22h: AAA/AUTHOR/TAC+:
(3654974050): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (3654974050): send AV protocol=ip3d22h:
AAA/AUTHOR/TAC+: (3654974050): send AV addr*15.15.15.153d22h: TAC+: Opening TCP/IP to
171.68.118.101/49 timeout=53d22h: TAC+: Opened TCP/IP handle 0x16EF4C to 171.68.118.101/493d22h:
TAC+: Opened 171.68.118.101 index=13d22h: TAC+: 171.68.118.101 (3654974050) AUTHOR/START
queued3d22h: TAC+: (3654974050) AUTHOR/START processed3d22h: TAC+: (3654974050): received author
response status = PASS_ADD3d22h: TAC+: Closing TCP/IP 0x16EF4C connection to
171.68.118.101/493d22h: AAA/AUTHOR (3654974050): Post authorization status = PASS_ADD3d22h:
AAA/AUTHOR/IPCP As1: Processing AV service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV
protocol=ip3d22h: AAA/AUTHOR/IPCP As1: Processing AV addr*15.15.15.153d22h: AAA/AUTHOR/IPCP As1:
Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 15.15.15.15, we want
15.15.15.153d22h: As1 IPCP: O CONFACK [ACKrcvd] id 3 len 163d22h: As1 IPCP: Address 15.15.15.15
(0x03060F0F0F0F)3d22h: As1 IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: As1 IPCP:
State is Open3d22h: As1 IPCP: Install route to 15.15.15.15rtpkrb#

```

Configuration - TACACS+ et CHAP

```

Current configuration: !version 11.2
service timestamps
debug uetimeservice timestamps log uptimeno service
password-encryption service udp-small-servers service tcp-
small-servers !hostname rtpkrb !aaa new-model !--- The
following four lines of the configuration !--- are
specific to Cisco IOS 11.2 and later, until 11.3.3.T. !-
-- See below this configuration !--- for commands for
other Cisco IOS releases. !aaa authentication login
default tacacs+ localaaa authentication ppp default if-
needed tacacs+ localaaa authorization exec tacacs+ if-
authenticatedaaa authorization network tacacs+ if-
authenticatedenable secret 5
$1$pkX.$JdAySRE1SbdbDe7bj0wyt0enable password
ww!username john password 0 doeusername cse password 0
csecseip host rtpkrb 10.31.1.5ip name-server

```

```

171.68.118.103!interface Loopback0ip address 1.1.1.1
255.255.255.0!interface Ethernet0ip address 10.31.1.5
255.255.0.0no mop enabled!interface Serial0no ip
addressno ip mroute-cacheshutdown!interface Seriallno ip
addressshutdown!interface Asyncclip unnumbered
Ethernet0encapsulation pppasync mode dedicatedpeer
default ip address pool asyncno cdp enableppp
authentication chap!ip local pool async 15.15.15.15ip
classlessip route 0.0.0.0 0.0.0.0 10.31.1.1!tacacs-
server host 171.68.118.101tacacs-server key ciscosnmp-
server community public Rwsnmp-server host
171.68.118.100 traps public!line con 0line lsession-
timeout 20 exec-timeout 20 0password wwautoselect
during-loginautoselect pppmodem InOuttransport input
allstopbits 1speed 38400flowcontrol hardwareline 2modem
InOutspeed 38400flowcontrol hardwareline 3 16line aux
0line vty 0 4password ww!end

```

[Commandes pour d'autres versions de Cisco IOS](#)

Remarque: Remarque: Pour utiliser ces commandes, retirez les commandes en gras de la configuration et collez ces commandes dedans, comme dicté par votre Cisco IOS libérez.

[Cisco IOS 11.3.3.T jusqu'à 12.0.5.T](#)

```

Current configuration:!version 11.2service timestamps debug uptimeservice timestamps log
uptimeno service password-encryptionservice udp-small-serversservice tcp-small-servers!hostname
rtpkrb!aaa new-model!!!--- The following four lines of the configuration !--- are specific to
Cisco IOS 11.2 and later, until 11.3.3.T. !--- See below this configuration !--- for commands
for other Cisco IOS releases.!aaa authentication login default tacacs+ localaaa authentication
ppp default if-needed tacacs+ localaaa authorization exec tacacs+ if-authenticatedaaa
authorization network tacacs+ if-authenticatedenable secret 5
$1$pkX.$JdAysRElSbdbDe7bj0wyt0enable password ww!username john password 0 doeusername cse
password 0 csecseip host rtpkrb 10.31.1.5ip name-server 171.68.118.103!interface Loopback0ip
address 1.1.1.1 255.255.255.0!interface Ethernet0ip address 10.31.1.5 255.255.0.0no mop
enabled!interface Serial0no ip addressno ip mroute-cacheshutdown!interface Seriallno ip
addressshutdown!interface Asyncclip unnumbered Ethernet0encapsulation pppasync mode dedicatedpeer
default ip address pool asyncno cdp enableppp authentication chap!ip local pool async
15.15.15.15ip classlessip route 0.0.0.0 0.0.0.0 10.31.1.1!tacacs-server host
171.68.118.101tacacs-server key ciscosnmp-server community public Rwsnmp-server host
171.68.118.100 traps public!line con 0line lsession-timeout 20 exec-timeout 20 0password
wwautoselect during-loginautoselect pppmodem InOuttransport input allstopbits 1speed
38400flowcontrol hardwareline 2modem InOutspeed 38400flowcontrol hardwareline 3 16line aux 0line
vty 0 4password ww!end

```

[Cisco IOS 12.0.5.T et plus tard](#)

```

Current configuration:!version 11.2service timestamps debug uptimeservice timestamps log
uptimeno service password-encryptionservice udp-small-serversservice tcp-small-servers!hostname
rtpkrb!aaa new-model!!!--- The following four lines of the configuration !--- are specific to
Cisco IOS 11.2 and later, until 11.3.3.T. !--- See below this configuration !--- for commands
for other Cisco IOS releases.!aaa authentication login default tacacs+ localaaa authentication
ppp default if-needed tacacs+ localaaa authorization exec tacacs+ if-authenticatedaaa
authorization network tacacs+ if-authenticatedenable secret 5
$1$pkX.$JdAysRElSbdbDe7bj0wyt0enable password ww!username john password 0 doeusername cse
password 0 csecseip host rtpkrb 10.31.1.5ip name-server 171.68.118.103!interface Loopback0ip
address 1.1.1.1 255.255.255.0!interface Ethernet0ip address 10.31.1.5 255.255.0.0no mop
enabled!interface Serial0no ip addressno ip mroute-cacheshutdown!interface Seriallno ip
addressshutdown!interface Asyncclip unnumbered Ethernet0encapsulation pppasync mode dedicatedpeer
default ip address pool asyncno cdp enableppp authentication chap!ip local pool async
15.15.15.15ip classlessip route 0.0.0.0 0.0.0.0 10.31.1.1!tacacs-server host

```

```
171.68.118.101tacacs-server key ciscosnmp-server community public RWsnmp-server host
171.68.118.100 traps public!line con 0line lsession-timeout 20 exec-timeout 20 0password
wwautoselect during-loginautoselect pppmodem InOuttransport input allstopbits lspeed
38400flowcontrol hardwareline 2modem InOutspeed 38400flowcontrol hardwareline 3 16line aux 0line
vty 0 4password ww!end
```

Debugs d'échantillon - TACACS+ et CHAP

Remarque: Dans la sortie de débogage, le texte en gras met en valeur des problèmes dans le débogage. Le texte brut indique qu'un bon met au point.

```
General OS:TACACS access control debugging is onAAA Authentication debugging is onAAA
Authorization debugging is onPPP:PPP authentication debugging is onPPP protocol negotiation
debugging is onrtpkrb#3d22h: As1 LCP: I CONFREQ [Closed] id 0 len 203d22h: As1 LCP: ACCM
0x00000000 (0x020600000000)3d22h: As1 LCP: MagicNumber 0x000042C5 (0x0506000042C5)3d22h: As1
LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: Lower layer not up, discarding
packet3d22h: %LINK-3-UPDOWN: Interface Async1, changed state to up3d22h: As1 PPP: Treating
connection as a dedicated line3d22h: As1 PPP: Phase is ESTABLISHING, Active Open3d22h: As1 LCP:
O CONFREQ [Closed] id 12 len 253d22h: As1 LCP: ACCM 0x000A0000 (0x0206000A0000)3d22h: As1 LCP:
AuthProto CHAP (0x0305C22305)3d22h: As1 LCP: MagicNumber 0xF45D776F (0x0506F45D776F)3d22h: As1
LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: I CONFACK [REQsent] id 12 len
253d22h: As1 LCP: ACCM 0x000A0000 (0x0206000A0000)3d22h: As1 LCP: AuthProto CHAP
(0x0305C22305)3d22h: As1 LCP: MagicNumber 0xF45D776F (0x0506F45D776F)3d22h: As1 LCP: PFC
(0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: I CONFREQ [ACKrcvd] id 0 len 203d22h: As1
LCP: ACCM 0x00000000 (0x020600000000)3d22h: As1 LCP: MagicNumber 0x000042C5
(0x0506000042C5)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC (0x0802)3d22h: As1 LCP: O
CONFACK [ACKrcvd] id 0 len 203d22h: As1 LCP: ACCM 0x00000000 (0x020600000000)3d22h: As1 LCP:
MagicNumber 0x000042C5 (0x0506000042C5)3d22h: As1 LCP: PFC (0x0702)3d22h: As1 LCP: ACFC
(0x0802)3d22h: As1 LCP: State is Open3d22h: As1 PPP: Phase is AUTHENTICATING, by this end3d22h:
As1 CHAP: O CHALLENGE id 3 len 27 from "rtpkrb"3d22h: As1 CHAP: I RESPONSE id 3 len 29 from
"chapuser"3d22h: AAA/AUTHEN: create_user (0x15B394) user='chapuser' ruser='' port='Async1'
rem_addr='async' authen_type=CHAP service=PPP priv=13d22h: AAA/AUTHEN/START (2183639772):
port='Async1' list='' action=LOGIN service=PPP3d22h: AAA/AUTHEN/START (2183639772): using
"default" list3d22h: AAA/AUTHEN (2183639772): status = UNKNOWN3d22h: AAA/AUTHEN/START
(2183639772): Method=TACACS+3d22h: TAC+: send AUTHEN/START packet ver=193 id=21836397723d22h:
TAC+: Using default tacacs server list.3d22h: TAC+: Opening TCP/IP to 171.68.118.101/49
timeout=5!--- The TAC+ server is down, producing an error. !--- Since the user is not in the
local database, !--- the failover to local fails.TAC+: TCP/IP open to 171.68.118.101/49 failed -
- Connection refused by remote hostAAA/AUTHEN (2546660185): status = ERRORAAA/AUTHEN/START
(2546660185): Method=LOCALAAA/AUTHEN (2546660185): status = FAILAs1 CHAP: Unable to validate
Response. Username chapuser: Authentication failure3d22h: TAC+: Opened TCP/IP handle 0x17054C to
171.68.118.101/493d22h: TAC+: 171.68.118.101 (2183639772) AUTHEN/START/LOGIN/CHAP queued3d22h:
TAC+: (2183639772) AUTHEN/START/LOGIN/CHAP processed!--- The key in the router does not match
that of the server.TAC+: received bad AUTHEN packet: length = 68, expected 67857TAC+: Invalid
AUTHEN/START packet (check keys)AAA/AUTHEN (1771887965): status = ERROR3d22h: TAC+: ver=192
id=2183639772 received AUTHEN status = GETPASS3d22h: TAC+: Closing TCP/IP 0x17054C connection to
171.68.118.101/493d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: TAC+: Opened
TCP/IP handle 0x16EF4C to 171.68.118.101/493d22h: TAC+: Opened 171.68.118.101 index=13d22h:
AAA/AUTHEN: create_user (0x170940) user='chapuser' ruser='' port='Async1' rem_addr='async'
authen_type=CHAP service=PPP priv=13d22h: TAC+: rev0 inbound chap for id=2183639772 using
id=1667030293d22h: TAC+: 171.68.118.101 (166703029) AUTHEN/START/SENDPASS/CHAP queued3d22h:
TAC+: (166703029) AUTHEN/START/SENDPASS/CHAP processed!--- The NT client sends the "DOMAIN\user"
!--- and the TAC+ server expects "user".TAC+: ver=192 id=3373385106 received AUTHEN status =
FAILTAC+: rev0 inbound chap FAIL for id=2082151566AAA/AUTHEN: free_user (0x170940)
user='CISCO\chapuser' ruser='' port='Async1' rem_addr='async' authen_type=CHAP service=PPP
priv=1!--- The TAC+ server refuses the user !--- because the user is set up for PAP. !--- The
user enters a bad password, !--- or both the username and password are bad.TAC+: ver=192
id=1989464562 received AUTHEN status = PASSTAC+: rev0 inbound chap SENDPASS status=PASS for
id=3657266965TAC+: rev0 inbound chap MD5 compare FAILEDAAA/AUTHEN: free_user (0x170940)
user='chapuser' ruser='' port='Async1' rem_addr='async' authen_type=CHAP service=PPP priv=1TAC+:
Closing TCP/IP 0x16EF4C connection to 171.68.118.101/49AAA/AUTHEN (2082151566): status = FAILAs1
CHAP: Unable to validate Response. Username papuser: Authentication failure3d22h: TAC+: ver=192
id=166703029 received AUTHEN status = PASS3d22h: TAC+: rev0 inbound chap SENDPASS status=PASS
```

for id=21836397723d22h: TAC+: rev0 inbound chap MD5 compare OK3d22h: AAA/AUTHEN: free_user (0x170940) user='chapuser' ruser='' port='Async1' rem_addr='async' authen_type=CHAP service=PPP priv=13d22h: TAC+: Closing TCP/IP 0x16EF4C connection to 171.68.118.101/493d22h: AAA/AUTHEN (2183639772): status = PASS3d22h: AAA/AUTHOR/LCP As1: Authorize LCP3d22h: AAA/AUTHOR/LCP: Async1: (683360936): user='chapuser'3d22h: AAA/AUTHOR/LCP: Async1: (683360936): send AV service=ppp3d22h: AAA/AUTHOR/LCP: Async1: (683360936): send AV protocol=lcp3d22h: AAA/AUTHOR/LCP: Async1: (683360936): Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (683360936): user=chapuser3d22h: AAA/AUTHOR/TAC+: (683360936): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (683360936): send AV protocol=lcp3d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: TAC+: Opened TCP/IP handle 0x16C1F8 to 171.68.118.101/493d22h: TAC+: Opened 171.68.118.101 index=13d22h: TAC+: 171.68.118.101 (683360936) AUTHOR/START queued3d22h: TAC+: (683360936) AUTHOR/START processed!--- The user passes authentication !--- (the username/password is good) !--- but fails authorization !--- (the profile is not set up to authorize PPP).TAC+: (3803447096): received author response status = FAILTAC+: Closing TCP/IP 0x16C2A4 connection to 171.68.118.101/49AAA/AUTHOR (3803447096): Post authorization status = FAILAAA/AUTHOR/LCP As1: DeniedAAA/AUTHEN: free_user (0x15B2E8) user='noauth' ruser='' port='Async1' rem_addr='async' authen_type=CHAP service=PPP priv=1As1 CHAP: O FAILURE id 9 len 24 msg is "Authorization failed"3d22h: TAC+: (683360936): received author response status = PASS_ADD3d22h: TAC+: Closing TCP/IP 0x16C1F8 connection to 171.68.118.101/493d22h: AAA/AUTHOR (683360936): Post authorization status = PASS_ADD3d22h: As1 CHAP: O SUCCESS id 3 len 43d22h: As1 PPP: Phase is UP3d22h: AAA/AUTHOR/FSM As1: (0): Can we start IPCP?3d22h: AAA/AUTHOR/FSM: Async1: (977509495): user='chapuser'3d22h: AAA/AUTHOR/FSM: Async1: (977509495): send AV service=ppp3d22h: AAA/AUTHOR/FSM: Async1: (977509495): send AV protocol=ip3d22h: AAA/AUTHOR/FSM: Async1: (977509495): Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (977509495): user=chapuser3d22h: AAA/AUTHOR/TAC+: (977509495): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (977509495): send AV protocol=ip3d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: TAC+: Opened TCP/IP handle 0x16EF4C to 171.68.118.101/493d22h: TAC+: Opened 171.68.118.101 index=13d22h: TAC+: 171.68.118.101 (977509495) AUTHOR/START queued3d22h: As1 IPCP: I CONFREQ [Closed] id 1 len 343d22h: As1 IPCP: Address 0.0.0.0 (0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: As1 IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h: As1 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000)3d22h: TAC+: (977509495) AUTHOR/START processed3d22h: TAC+: (977509495): received author response status = PASS_ADD3d22h: TAC+: Closing TCP/IP 0x16EF4C connection to 171.68.118.101/493d22h: AAA/AUTHOR (977509495): Post authorization status = PASS_ADD3d22h: AAA/AUTHOR/FSM As1: We can start IPCP3d22h: As1 IPCP: O CONFREQ [Closed] id 8 len 103d22h: As1 IPCP: Address 10.31.1.5 (0x03060A1F0105)3d22h: As1 IPCP: I CONFACK [REQsent] id 8 len 103d22h: As1 IPCP: Address 10.31.1.5 (0x03060A1F0105)3d22h: %LINEPROTO-5-UPDOWN: Line protocol on Interface Async1, changed state to up3d22h: As1 IPCP: I CONFREQ [ACKrcvd] id 1 len 343d22h: As1 IPCP: Address 0.0.0.0 (0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: As1 IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h: As1 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000)3d22h: AAA/AUTHOR/IPCP As1: Start. Her address 0.0.0.0, we want 0.0.0.03d22h: AAA/AUTHOR/IPCP As1: Processing AV service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV protocol=ip3d22h: AAA/AUTHOR/IPCP As1: Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 0.0.0.0, we want 0.0.0.03d22h: As1 IPCP: Using pool 'async'3d22h: As1 IPCP: Pool returned 15.15.15.153d22h: As1 IPCP: O CONFREQ [ACKrcvd] id 1 len 223d22h: As1 IPCP: PrimaryWINS 0.0.0.0 (0x820600000000)3d22h: As1 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000)3d22h: As1 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000)3d22h: As1 IPCP: I CONFREQ [ACKrcvd] id 2 len 163d22h: As1 IPCP: Address 0.0.0.0 (0x030600000000)3d22h: As1 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000)3d22h: AAA/AUTHOR/IPCP As1: Start. Her address 0.0.0.0, we want 15.15.15.153d22h: AAA/AUTHOR/IPCP As1: Processing AV service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV protocol=ip3d22h: AAA/AUTHOR/IPCP As1: Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 0.0.0.0, we want 15.15.15.153d22h: As1 IPCP: O CONFNAK [ACKrcvd] id 2 len 163d22h: As1 IPCP: Address 15.15.15.15 (0x03060F0F0F0F)3d22h: As1 IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: As1 IPCP: I CONFREQ [ACKrcvd] id 3 len 163d22h: As1 IPCP: Address 15.15.15.15 (0x03060F0F0F0F)3d22h: As1 IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: AAA/AUTHOR/IPCP As1: Start. Her address 15.15.15.15, we want 15.15.15.153d22h: AAA/AUTHOR/IPCP: Async1: (3918374858): user='chapuser'3d22h: AAA/AUTHOR/IPCP: Async1: (3918374858): send AV service=ppp3d22h: AAA/AUTHOR/IPCP: Async1: (3918374858): send AV protocol=ip3d22h: AAA/AUTHOR/IPCP: Async1: (3918374858): send AV addr*15.15.15.153d22h: AAA/AUTHOR/IPCP: Async1: (3918374858): Method=TACACS+3d22h: AAA/AUTHOR/TAC+: (3918374858): user=chapuser3d22h: AAA/AUTHOR/TAC+: (3918374858): send AV service=ppp3d22h: AAA/AUTHOR/TAC+: (3918374858): send AV protocol=ip3d22h: AAA/AUTHOR/TAC+: (3918374858): send AV addr*15.15.15.153d22h: TAC+: Opening TCP/IP to 171.68.118.101/49 timeout=53d22h: TAC+: Opened TCP/IP handle 0x16C9E0 to 171.68.118.101/493d22h:

```
TAC+: Opened 171.68.118.101 index=13d22h: TAC+: 171.68.118.101 (3918374858) AUTHOR/START
queued3d22h: TAC+: (3918374858) AUTHOR/START processed3d22h: TAC+: (3918374858): received author
response status = PASS_ADD3d22h: TAC+: Closing TCP/IP 0x16C9E0 connection to
171.68.118.101/493d22h: AAA/AUTHOR (3918374858): Post authorization status = PASS_ADD3d22h:
AAA/AUTHOR/IPCP As1: Processing AV service=ppp3d22h: AAA/AUTHOR/IPCP As1: Processing AV
protocol=ip3d22h: AAA/AUTHOR/IPCP As1: Processing AV addr*15.15.15.153d22h: AAA/AUTHOR/IPCP As1:
Authorization succeeded3d22h: AAA/AUTHOR/IPCP As1: Done. Her address 15.15.15.15, we want
15.15.15.153d22h: As1 IPCP: O CONFACK [ACKrcvd] id 3 len 163d22h: As1 IPCP: Address 15.15.15.15
(0x03060F0F0F0F)3d22h: As1 IPCP: PrimaryDNS 171.68.118.103 (0x8106AB447667)3d22h: As1 IPCP:
State is Open3d22h: As1 IPCP: Install route to 15.15.15.15rtpkrb#
```

commandes de débogage

Ces commandes de débogage ont été utilisées de produire l'exemple de sortie de débogage dans ce document.

Remarque: Avant d'émettre des commandes **debug**, reportez-vous aux [Informations importantes sur les commandes de débogage](#).

- **debug aaa authentication** ? Affiche des informations sur l'authentification d'AAA.
- **autorisation de debug aaa** ? Affiche des informations sur l'autorisation d'AAA.
- **mettez au point tacacs+** ? Affiche les informations de débogage détaillées associées avec TACACS+.
- **debug ppp negotiation** ? Paquets PPP d'affichages transmis pendant le startup de PPP, où des options PPP sont négociées.

Informations connexes

- [TACACS+ dans la documentation d'IOS](#)
- [Page d'assistance TACACS+](#)
- [Support et documentation techniques - Cisco Systems](#)