

Configuration de la fonction de rappel MS entre un routeur et un PC Windows

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[Introduction](#)

L'implémentation Microsoft du rappel n'est pas conforme à [RFC 1570](#). Cependant, en raison de la part de marché importante du client réseau commuté Microsoft, Cisco a mis en oeuvre le protocole MSCB (Microsoft Callback) Control Protocol dans le logiciel Cisco IOS® version 11.3(2)T et ultérieure.

[Conditions préalables](#)

[Conditions requises](#)

Assurez-vous de répondre à ces exigences avant d'essayer cette configuration :

- Configurez le serveur d'accès réseau (NAS) pour accepter les appels analogiques du client. Le rappel est une fonctionnalité supplémentaire de la connexion commutée par modem. Par conséquent, vérifiez si cet aspect fonctionne correctement. Cela peut vous aider à résoudre les problèmes.
- Le circuit T1/E1 doit pouvoir être commuté. Contactez votre compagnie de téléphone (Telco)

pour vérifier cela.

Components Used

Les informations de ce document sont basées sur le logiciel Cisco IOS Version 11.3(2)T et versions ultérieures.

Ce scénario a été testé sur un PC équipé d'un réseau commuté Windows.

Les informations présentées dans ce document ont été créées à partir de périphériques dans un environnement de laboratoire spécifique. All of the devices used in this document started with a cleared (default) configuration. Si vous travaillez dans un réseau opérationnel, assurez-vous de bien comprendre l'impact potentiel de toute commande avant de l'utiliser.

Conventions

Pour plus d'informations sur les conventions des documents, référez-vous aux [Conventions utilisées pour les conseils techniques de Cisco](#).

Théorie générale

Le rappel s'exécute dans l'ordre suivant :

1. Un utilisateur PC (client) se connecte au serveur d'accès Cisco.
2. Le processus de rappel est négocié dans la phase LCP (Point-to-Point Protocol).
3. L'authentification PPP est effectuée.
4. Le logiciel Cisco IOS valide les règles de rappel pour cet utilisateur ou cette ligne et déconnecte l'appelant pour rappel.
5. Le serveur d'accès Cisco compose le numéro du client.

Il existe quatre types de MSCB :

1. Pas de rappel.
2. Numéro de rappel spécifié par l'utilisateur.
3. Numéro de rappel spécifié par le serveur (préconfiguré).
4. Liste du numéro de rappel préconfiguré.

La configuration par défaut est no callback (option 1). Les options 2 ou 3 peuvent être configurées :

- Localement (si aucun serveur AAA n'est utilisé).
- Dans le profil utilisateur TACACS+ ou RADIUS (si AAA est utilisé).

Si l'option 2 est configurée, l'utilisateur est invité à saisir son numéro de rappel. Si l'option 3 est configurée, l'invite n'offre qu'un seul choix, à savoir le numéro défini par l'administrateur.

Cisco implémente uniquement la fonctionnalité de serveur de rappel de MSCB et non la fonctionnalité de client de rappel. Cela signifie qu'un routeur Cisco peut être utilisé uniquement en tant que serveur MSCB et non en tant que client MSCB. En outre, la mise en oeuvre de MSCB par Cisco nécessite l'authentification sur le client.

Configuration

Cette section vous fournit des informations pour configurer les fonctionnalités décrites dans ce document.

Résumé de la configuration

Pour activer MSCB, vous devez activer la commande **ppp callback accept** sous l'interface de réception (par exemple, group-async). En outre, comme l'authentification est requise, vous devez activer l'authentification PAP (Password Authentication Protocol) ou CHAP (Challenge Handshake Authentication Protocol) :

```
ppp authentication chap pap
```

Deux scripts de discussion sont créés automatiquement. Voici les scripts de discussion de **décrochage** et de **rappel** :

```
chat-script offhook "" "ATH1" OK
chat-script callback ABORT ERROR ABORT BUSY ""
"ATZ" OK "ATDT \T" TIMEOUT60 CONNECT \c
```

Les scripts de discussion sont également automatiquement appliqués aux lignes utilisées :

```
line 1 24
script modem-off-hook offhook
script callback callback
```

Un utilisateur doit être **autorisé** à être rappelé. Vous pouvez le configurer localement sur NAS ou sur le serveur AAA externe (RADIUS ou TACACS+), en fonction de l'emplacement de stockage des informations de nom d'utilisateur et de mot de passe.

Il s'agit d'une configuration locale pour un utilisateur qui est rappelé au 5551212 :

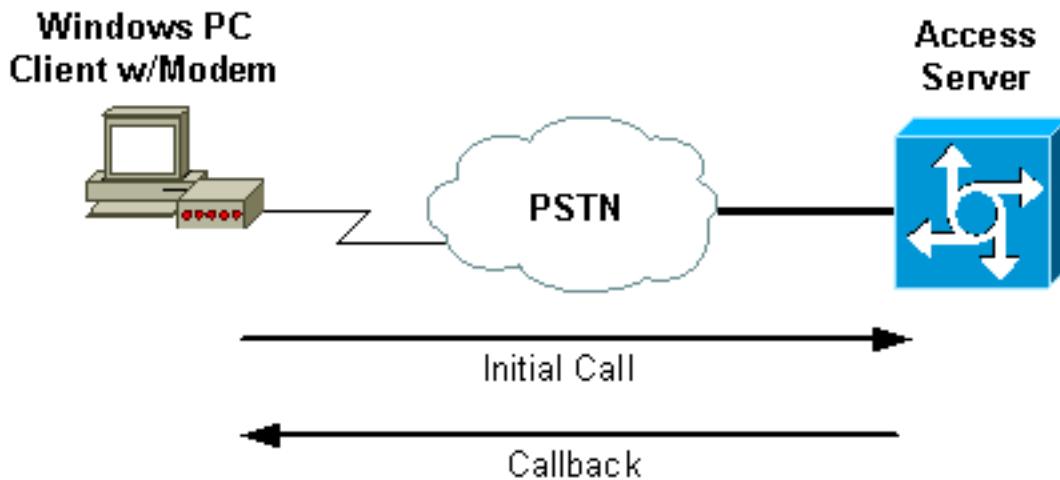
```
username callmeback callback-dialstring 5551212 password cisco
```

Cette configuration locale s'applique aux utilisateurs autorisés à spécifier leur propre numéro de rappel :

```
username callmeback callback-dialstring "" password cisco
```

Diagramme du réseau

Ce document utilise la configuration réseau suivante :



Configurations

Ce document utilise la configuration suivante :

- isdn2-2 (routeur AS5200)

isdn2-2 (routeur AS5200)

```
Current configuration:
!
version 11.3
service timestamps debug datetime msec
service password-encryption
no service udp-small-servers
no service tcp-small-servers
!
hostname isdn2-2
!
aaa new-model
aaa authentication login default none
aaa authentication login use-local local
aaa authentication ppp default local
aaa authorization network local
!--- Runs authorization for network-related service
requests (Example: PPP). !--- For an AAA server
implementation, replace "local" with TACACS+ or RADIUS
in !--- these statements. enable secret 5 <deleted> !
username callmeback callback-dialstring "" password 7
<deleted> !--- This is for mobile users. The client
specifies the callback number. !--- If a RADIUS server
is used, this information can be offloaded to the
server. ip domain-name cisco.com isdn switch-type
primary-5ess chat-script offhook "" "ATH1" OK chat-
script callback ABORT ERROR ABORT BUSY "" "ATZ" OK "ATDT
\T" TIMEOUT 60 CONNECT \c !--- The chat script
"callback" is used for the callback connection. clock
timezone PST -8 clock summer-time PDT recurring ! !
controller T1 0 !--- Active T1 Primary Rate Interface
(PRI). framing esf clock source line secondary linecode
b8zs pri-group timeslots 1-24 ! controller T1 1 shutdown
! interface Ethernet0 ip address 172.16.25.52
255.255.255.240 ! interface Serial0 no ip address
shutdown ! interface Serial1 no ip address shutdown !
```

```

interface Serial0:23 !--- D-channel for T1 0. ip
unnumbered Ethernet0 encapsulation ppp dialer-group 1
isdn incoming-voice modem !--- Allows incoming ISDN
voice calls to be switched to the onboard modems. peer
default ip address pool default ! interface Group-Async1
ip unnumbered Ethernet0 ip tcp header-compression
passive encapsulation ppp async mode interactive peer
default ip address pool default no cdp enable ppp max-
bad-auth 3 ppp callback accept !--- Allows the group-
async to accept a callback request to a remote host. ppp
authentication chap !--- CHAP, PAP, or both must be
enabled for callback. group-range 1 12 ! router eigrp
202 network 172.16.0.0 distance 90 172.16.25.49 0.0.0.0
no auto-summary ! ip local pool default 172.16.25.59
172.16.25.62 !--- Default IP address pool for dial-in
clients. ip default-gateway 172.16.25.49 ip classless
dialer-list 1 protocol ip permit ! line con 0 line 1 6
autoselect during-login autoselect ppp script modem-off-
hook offhook script callback callback !--- Specifies a
chat script to issue AT commands to the modem during a
callback attempt. !--- The chat-scripts "offhook" and
"callback" were configured earlier. login authentication
use-local modem InOut transport input all line 7 12 !---
These modems are busied out and not used. autoselect
during-login autoselect ppp login authentication use-
local modem InOut modem busyout transport input all line
aux 0 exec-timeout 0 0 line vty 0 4 password 7 <deleted>
! end

```

Configuration du client Windows

Configuration du client Windows 95 et 98

Pour les PC Windows 95 et 98, il n'existe aucune configuration client spéciale pour le rappel. Le serveur d'accès gère les fonctions de rappel de la connexion. Le PC Windows 95 ou 98 affiche un message « En attente de rappel » pour indiquer qu'un rappel est en cours.

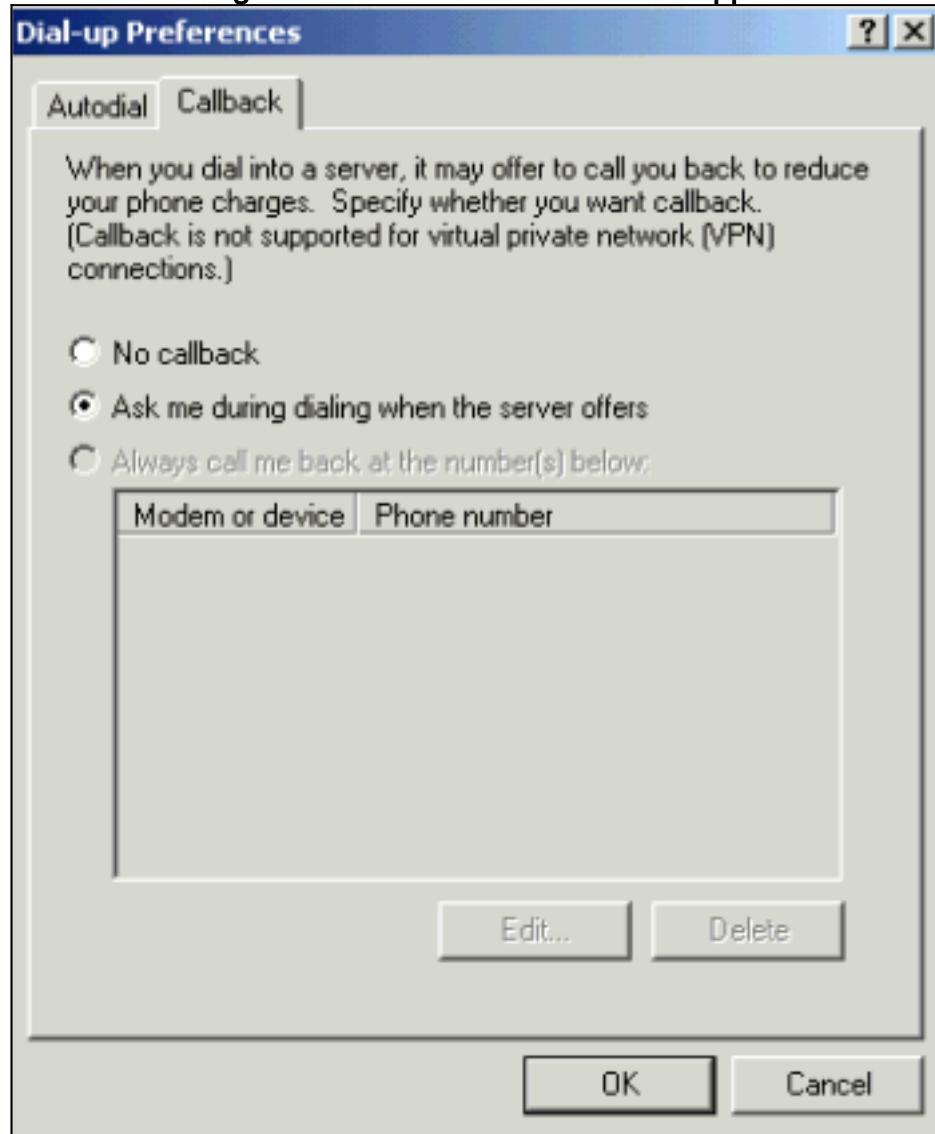
Configuration du client Windows NT et 2000

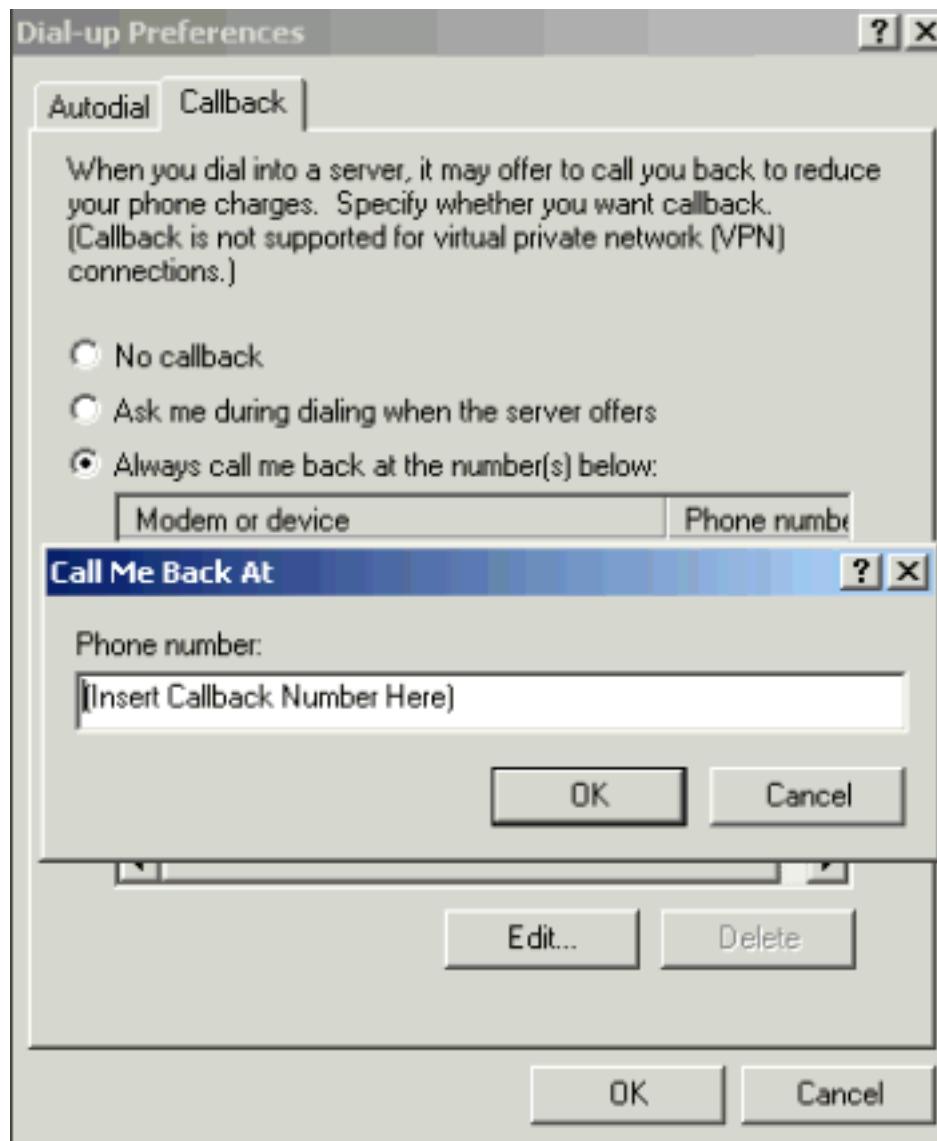
Configurez ces plates-formes pour demander un rappel. Effectuez les étapes suivantes pour les configurer :

1. Choisissez **Démarrer > Programmes > Accessoires > Communications > Connexions réseau et accès à distance**.
2. Choisissez **Advanced > Dial-up Preferences** dans le menu.
3. Cliquez sur l'onglet **Rappel** pour accéder au menu des fonctions de rappel, comme illustré à la [figure 1](#).
4. Configurez vos options de rappel si nécessaire : Afin de ne pas utiliser la fonction de rappel, cliquez sur le bouton **Pas de rappel**. Pour savoir ce qu'il faut faire lorsqu'un serveur propose un rappel, cliquez sur le bouton **Me demander lors de la numérotation lorsque le serveur offre**. Pour accepter automatiquement les offres de rappel, cliquez sur le bouton **Toujours me rappeler au(x) numéro(s) ci-dessous**, puis sélectionnez le périphérique à utiliser dans la liste. Pour modifier le numéro de téléphone de rappel, sélectionnez le périphérique et cliquez sur le bouton **Modifier**. Entrez le numéro dans le champ **Numéro de téléphone** comme illustré

à la Figure 1, puis cliquez sur OK dans la boîte de dialogue Me rappeler à.

5. Cliquez sur le champ **Numéro de téléphone**, puis saisissez le numéro dans la boîte de dialogue Rappeler à (figure 1). Cliquez sur OK quand vous avez terminé.
6. Lorsque vous avez terminé, cliquez sur OK dans la boîte de dialogue Préférences de numérotation.**Figure 1 : accès aux fonctions de rappel**





Vérification

Cette section présente des informations que vous pouvez utiliser pour vous assurer que votre configuration fonctionne correctement.

Certaines commandes **show** sont prises en charge par l'[Output Interpreter Tool](#) (clients enregistrés uniquement), qui vous permet de voir une analyse de la sortie de la commande **show**.

- **show isdn active** : affiche des informations sur les appels RNIS entrants et sortants actuels. Utilisez cette commande pour vérifier si le rappel a bien été effectué. Si le rappel réussit, **show isdn active** affiche l'appel comme sortant sur le serveur de rappel.
- **show users** : affiche des informations sur les lignes actives du routeur. Vous pouvez également utiliser la commande **show caller** si votre version du logiciel Cisco IOS le prend en charge.
- **show dialer** : affiche les informations générales de diagnostic des interfaces configurées pour le routage à établissement de connexion à la demande (DDR).

Dépannage

Cette section fournit des informations que vous pouvez utiliser pour dépanner votre configuration.

Dépannage des commandes

Note : Avant d'émettre des commandes **debug**, consultez [Informations importantes sur les commandes de débogage](#).

Pour plus d'informations sur les commandes **de débogage**, consultez la [référence des commandes de débogage de Cisco IOS version 12.0](#).

- **debug aaa authentication** - affiche des informations sur l'authentification AAA.
- **debug aaa Authorization** : affiche des informations sur l'autorisation AAA.
- **debug callback** : affiche les événements de rappel lorsque le routeur utilise un modem et un script de conversation pour rappeler sur une ligne de terminal.
- **debug modem** : vous permet d'observer l'activité de la ligne du modem sur un serveur d'accès.
- **debug ppp [paquet | négociation | erreur | authentication]**— affiche des informations sur le trafic et les échanges dans un interréseau qui implémente PPP.
packet : affiche les paquets PPP envoyés et reçus. (Cette commande affiche les vidages de paquets de bas niveau.)
negociation : affiche les paquets PPP transmis lors du démarrage du protocole PPP, lorsque les options PPP sont négociées.
error : affiche les erreurs de protocole et les statistiques d'erreur associées à la négociation et au fonctionnement de la connexion PPP.
authentication : affiche les messages de protocole d'authentification, qui incluent les échanges CHAP et PAP.
- **debug chat** : affiche la connexion qui se produit entre le serveur d'accès et son modem interne pendant que le modem est invité à composer un numéro sortant. Un script de conversation est un ensemble de paires de chaînes d'envoi d'attente qui définissent la connexion entre les équipements de terminal de données (ETTD) et les équipements de communication de données (ETCD).
- **debug isdn q931** - affiche les messages de configuration et de débogage de l'appel RNIS Q.931 (canal D) et de désactivation. Dans ce scénario, l'appel du modem est transmis en tant que service de support vocal sur le réseau téléphonique public commuté (RTPC).
- **debug modem csm** : vous permet de résoudre les problèmes CSM (Call Switching Module) sur les routeurs équipés de modems numériques internes. Avec cette commande, vous pouvez suivre la séquence complète de commutation des appels entrants et sortants.

```
isdn2-2#show debug
General OS:
Modem control/process activation debugging is on
AAA Authentication debugging is on
AAA Authorization debugging is on
PPP:
PPP protocol negotiation debugging is on
ISDN:
ISDN Q931 packets debugging is on
Chat Scripts:
Chat scripts activity debugging is on
Modem Management:
Modem Management Call Switching Module debugging is on
isdn2-2#
!--- This is the initial call from the client. *Mar 1 01:24:48.643: ISDN Se0:23: RX <- SETUP pd
= 8 callref = 0x36
*Mar 1 01:24:48.647: Bearer Capability i = 0x9090A2
*Mar 1 01:24:48.651: Channel ID i = 0xA98393
```

```

*Mar 1 01:24:48.651: Called Party Number i = 0xC1, '4084327528'
*Mar 1 01:24:48.663: ISDN Se0:23: Incoming call id = 0xA
*Mar 1 01:24:48.671: EVENT_FROM_ISDN::dchan_idb=0x7F8EE0, call_id=0xA, ces=0x1
bchan=0x12, event=0x1, cause=0x0
*Mar 1 01:24:48.671: VDEV_ALLOCATE: slot 0 and port 3 is allocated.
*Mar 1 01:24:48.675: EVENT_FROM_ISDN:(000A): DEV_INCALL at slot 0 and port 3
*Mar 1 01:24:48.675: CSM_PROC_IDLE: CSM_EVENT_ISDN_CALL at slot 0, port 3
*Mar 1 01:24:48.679: Fast Ringing On at modem slot 0, port 3
*Mar 1 01:24:48.699: ISDN Se0:23: TX -> CALL_PROC pd = 8 callref = 0x8036
*Mar 1 01:24:48.703: Channel ID i = 0xA98393
*Mar 1 01:24:48.735: ISDN Se0:23: TX -> ALERTING pd = 8 callref = 0x8036
*Mar 1 01:24:49.699: Fast Ringing Off at modem slot 0, port 3
*Mar 1 01:24:49.699: CSM_PROC_IC1_RING: CSM_EVENT_MODEM_OFFHOOK at slot 0,
port 3
*Mar 1 01:24:49.711: ISDN Se0:23: TX -> CONNECT pd = 8 callref = 0x8036
*Mar 1 01:24:49.783: ISDN Se0:23: RX <- CONNECT_ACK pd = 8 callref = 0x36
*Mar 1 01:24:49.799: EVENT_FROM_ISDN::dchan_idb=0x7F8EE0, call_id=0xA, ces=0x1
bchan=0x12, event=0x4, cause=0x0
*Mar 1 01:24:49.799: EVENT_FROM_ISDN:(000A): DEV_CONNECTED at slot 0 and
port 3
*Mar 1 01:24:49.803: CSM_PROC_IC4_WAIT_FOR_CARRIER:CSM_EVENT_ISDN_CONNECTED at
slot 0, port 3
!--- Modem has established carrier. *Mar 1 01:25:11.123: TTY4: DSR came up
*Mar 1 01:25:11.127: tty4: Modem: IDLE->READY
*Mar 1 01:25:11.131: TTY4: EXEC creation
*Mar 1 01:25:11.135: AAA/AUTHEN: create_user (0x7B009C) user='' ruser=''
port='tty4' rem_addr='async/4084327528' authen_type=ASCII service=LOGIN priv=1
*Mar 1 01:25:11.139: AAA/AUTHEN/START (3134998138): port='tty4'
list='use-local' action=LOGIN service=LOGIN
*Mar 1 01:25:11.143: AAA/AUTHEN/START (3134998138): found list use-local
*Mar 1 01:25:11.143: AAA/AUTHEN/START (3134998138): Method=LOCAL
!--- Local AAA. *Mar 1 01:25:11.147: AAA/AUTHEN (3134998138): status = GETUSER *Mar 1
01:25:13.951: TTY4: Autoselect(2) sample 7E *Mar 1 01:25:13.955: TTY4: Autoselect(2) sample 7EFF
*Mar 1 01:25:13.959: TTY4: Autoselect(2) sample 7EFF7D *Mar 1 01:25:13.959: TTY4: Autoselect(2)
sample 7EFF7D23 *Mar 1 01:25:13.963: TTY4 Autoselect cmd: ppp negotiate
*Mar 1 01:25:13.967: AAA/AUTHEN/ABORT: (3134998138) because Autoselected.
*Mar 1 01:25:13.967: AAA/AUTHEN: free_user (0x7B009C) user='' ruser=''
port='tty4' rem_addr='async/4084327528' authen_type=ASCII service=LOGIN priv=1
*Mar 1 01:25:13.975: TTY4: EXEC creation
!--- PPP has been autoselected and begins negotiation. %LINK-3-UPDOWN: Interface Async4, changed
state to up *Mar 1 01:25:16.611: As4 PPP: Treating connection as a dedicated line *Mar 1
01:25:16.611: As4 PPP: Phase is ESTABLISHING, Active Open
!--- LCP negotiation begins. *Mar 1 01:25:16.615: As4 LCP: O CONFREQ [Closed] id 3 len 25 *Mar 1
01:25:16.619: As4 LCP: ACCM 0x000A0000 (0x0206000A0000) *Mar 1 01:25:16.623: As4 LCP: AuthProto
CHAP (0x0305C22305) *Mar 1 01:25:16.623: As4 LCP: MagicNumber 0x608D04A3 (0x0506608D04A3) *Mar 1
01:25:16.627: As4 LCP: PFC (0x0702) *Mar 1 01:25:16.627: As4 LCP: ACFC (0x0802) *Mar 1
01:25:16.751: As4 LCP: I CONFACK [REQsent] id 3 len 25 *Mar 1 01:25:16.755: As4 LCP: ACCM
0x000A0000 (0x0206000A0000) *Mar 1 01:25:16.755: As4 LCP: AuthProto CHAP (0x0305C22305) *Mar 1
01:25:16.759: As4 LCP: MagicNumber 0x608D04A3 (0x0506608D04A3) *Mar 1 01:25:16.763: As4 LCP: PFC
(0x0702) *Mar 1 01:25:16.763: As4 LCP: ACFC (0x0802) *Mar 1 01:25:17.003: As4 LCP: I CONFREQ
[ACKrcvd] id 3 len 23
!--- Incoming CONFREQ. *Mar 1 01:25:17.003: As4 LCP: ACCM 0x000A0000 (0x0206000A0000) *Mar 1
01:25:17.007: As4 LCP: MagicNumber 0x004A4A09 (0x0506004A4A09) *Mar 1 01:25:17.007: As4 LCP: PFC
(0x0702) *Mar 1 01:25:17.011: As4 LCP: ACFC (0x0802) *Mar 1 01:25:17.011: As4 LCP: Callback 6
(0x0D0306)
!--- Peer requests MS Callback (Option 6). !--- A PPP callback request uses Option 0. *Mar 1
01:25:17.015: As4 LCP: O CONFACK [ACKrcvd] id 3 len 23
*Mar 1 01:25:17.015: As4 LCP: ACCM 0x000A0000 (0x0206000A0000)
*Mar 1 01:25:17.019: As4 LCP: MagicNumber 0x004A4A09 (0x0506004A4A09)
*Mar 1 01:25:17.023: As4 LCP: PFC (0x0702)
*Mar 1 01:25:17.023: As4 LCP: ACFC (0x0802)
*Mar 1 01:25:17.023: As4 LCP: Callback 6 (0x0D0306)
!--- NAS CONFACKS all LCP parameters. !--- If the NAS refuses Callback (completely or just MS
callback), LCP may fail. *Mar 1 01:25:17.027: As4 LCP: State is Open !--- Authentication begins.

```

```

*Mar 1 01:25:20.095: As4 PPP: Phase is AUTHENTICATING, by this end *Mar 1 01:25:20.099: As4
CHAP: O CHALLENGE id 4 len 28 from "isdn2-2" *Mar 1 01:25:20.187: As4 CHAP: I RESPONSE id 4 len
26 from "callmeback" *Mar 1 01:25:20.191: AAA/AUTHEN: create_user (0x7ADEAC) user='callmeback'
ruser='' port='Async4' rem_addr='async/4084327528' authen_type=CHAP service=PPP priv=1 *Mar 1
01:25:20.195: AAA/AUTHEN/START (44582883): port='Async4' list='' action=LOGIN service=PPP *Mar 1
01:25:20.199: AAA/AUTHEN/START (44582883): using "default" list *Mar 1 01:25:20.199:
AAA/AUTHEN/START (44582883): Method=LOCAL !--- Authentication passes. *Mar 1 01:25:20.203:
AAA/AUTHEN (44582883): status = PASS
!--- Check authorization for LCP. !--- With local AAA, this should pass. !--- For server-based
AAA, this must be explicitly configured on the server. *Mar 1 01:25:20.207: AAA/AUTHOR/LCP As4:
Authorize LCP *Mar 1 01:25:20.207: AAA/AUTHOR/LCP: Async4: (3405067782): user='callmeback' *Mar
1 01:25:20.211: AAA/AUTHOR/LCP: Async4: (3405067782): send AV service=ppp *Mar 1 01:25:20.211:
AAA/AUTHOR/LCP: Async4: (3405067782): send AV protocol=lcp *Mar 1 01:25:20.215: AAA/AUTHOR/LCP:
Async4 (3405067782): Method=LOCAL *Mar 1 01:25:20.219: AAA/AUTHOR (3405067782): Post
authorization status = PASS_ADD *Mar 1 01:25:20.223: AAA/AUTHOR/LCP As4: Processing AV
service=ppp *Mar 1 01:25:20.223: AAA/AUTHOR/LCP As4: Processing AV protocol=lcp *Mar 1
01:25:20.227: AAA/AUTHOR/LCP As4: Processing AV service=ppp *Mar 1 01:25:20.227: AAA/AUTHOR/LCP
As4: Processing AV protocol=lcp !--- Callback-dialstring is null, so user is allowed to specify
!--- their own callback number. *Mar 1 01:25:20.227: AAA/AUTHOR/LCP As4: Processing AV callback-
dialstring=
!--- Authentication ACK is returned to client. *Mar 1 01:25:20.235: As4 CHAP: O SUCCESS id 4 len
4
!--- Callback negotiation proceeds. Because callback-dialstring !--- is null, MCB debug says
"Callback Number - Client ANY". *Mar 1 01:25:20.239: As4 MCB: User callmeback Callback Number -
Client ANY
!--- The callback number of the client is requested. Client receives a dialog !--- box that
prompts the user to type in the callback number. !--- Request is sent every two seconds. If the
user is slow to type a response, !--- the call remains in this phase for a long time. *Mar 1
01:25:20.243: Async4 PPP: O MCB Request(1) id 20 len 9 *Mar 1 01:25:20.243: Async4 MCB: O 1 14 0
9 2 5 0 1 0 *Mar 1 01:25:20.247: As4 MCB: O Request Id 20 Callback Type Client-Num delay 0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Async4, changed state to up
*Mar 1 01:25:22.459: As4 MCB: Timeout in state WAIT_RESPONSE
*Mar 1 01:25:22.463: Async4 PPP: O MCB Request(1) id 21 len 9
*Mar 1 01:25:22.463: Async4 MCB: O 1 15 0 9 2 5 0 1 0
*Mar 1 01:25:22.467: As4 MCB: O Request Id 21 Callback Type Client-Num delay 0
*Mar 1 01:25:24.499: As4 MCB: Timeout in state WAIT_RESPONSE
*Mar 1 01:25:24.503: Async4 PPP: O MCB Request(1) id 22 len 9
*Mar 1 01:25:24.503: Async4 MCB: O 1 16 0 9 2 5 0 1 0
*Mar 1 01:25:24.507: As4 MCB: O Request Id 22 Callback Type Client-Num delay 0
*Mar 1 01:25:26.543: As4 MCB: Timeout in state WAIT_RESPONSE
*Mar 1 01:25:26.547: Async4 PPP: O MCB Request(1) id 23 len 9
*Mar 1 01:25:26.547: Async4 MCB: O 1 17 0 9 2 5 0 1 0
*Mar 1 01:25:26.551: As4 MCB: O Request Id 23 Callback Type Client-Num delay 0
*Mar 1 01:25:28.583: As4 MCB: Timeout in state WAIT_RESPONSE
*Mar 1 01:25:28.587: Async4 PPP: O MCB Request(1) id 24 len 9
*Mar 1 01:25:28.587: Async4 MCB: O 1 18 0 9 2 5 0 1 0
*Mar 1 01:25:28.591: As4 MCB: O Request Id 24 Callback Type Client-Num delay 0
!--- Client returned the callback number. Notice that the response !--- is for the initial
request id 20. *Mar 1 01:25:29.763: Async4 PPP: I MCB Response(2) id 20 len 17
*Mar 1 01:25:29.767: Async4 MCB: I 2 14 0 11 2 D F 1 35 32 37 2D 39 36 35 31 0
*Mar 1 01:25:29.767: As4 MCB: Received response
!--- Response is ignored because the id is 20. There have !--- been a few timeouts and id 24
(the last one sent) is expected. *Mar 1 01:25:29.771: As4 MCB: Resp ignored. ID Expected 24, got
id 20
*Mar 1 01:25:30.623: As4 MCB: Timeout in state WAIT_RESPONSE
!--- Send out new request (id 25). *Mar 1 01:25:30.627: Async4 PPP: O MCB Request(1) id 25 len 9
*Mar 1 01:25:30.627: Async4 MCB: O 1 19 0 9 2 5 0 1 0 *Mar 1 01:25:30.631: As4 MCB: O Request Id
25 Callback Type Client-Num delay 0
!--- Client has cached user response, and so the callback number is !--- returned right away.
*Mar 1 01:25:30.715: Async4 PPP: I MCB Response(2) id 25 len 17
*Mar 1 01:25:30.719: Async4 MCB: I 2 19 0 11 2 D F 1 35 32 37
2D 39 36 35 31 0
*Mar 1 01:25:30.723: As4 MCB: Received response
!--- Received client callback number is 527-9651. *Mar 1 01:25:30.723: As4 MCB: Response CBK-

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Client-Num 2 13 15, addr
1-527-9651
!--- Callback number acknowledged. *Mar 1 01:25:30.727: Async4 PPP: O MCB Ack(3) id 26 len 17
*Mar 1 01:25:30.731: Async4 MCB: O 3 1A 0 11 2 D F 1 35 32 37
2D 39 36 35 31 0
*Mar 1 01:25:30.731: As4 MCB: O Ack Id 26 Callback Type Client-Num delay 15
*Mar 1 01:25:30.735: As4 MCB: Negotiated MCB with peer
!--- Client hangs up and begins to wait for callback. !--- This is indicated by an Incoming (I) TERMREQ. *Mar 1 01:25:30.815: As4 LCP: I TERMREQ [Open] id 5 len 4
*Mar 1 01:25:30.815: As4 LCP: O TERMACK [Open] id 5 len 4
*Mar 1 01:25:30.819: As4 MCB: Peer terminating the link
*Mar 1 01:25:30.819: As4 PPP: Phase is TERMINATING
*Mar 1 01:25:30.819: As4 MCB: Link terminated by peer, Callback Needed
!--- Initiate callback to client; sleeps for ten seconds. *Mar 1 01:25:30.823: As4 MCB: Initiate Callback for callmeback at 527-9651
    using Async
    *Mar 1 01:25:30.827: As4 MCB: Async-callback in progress
!--- Drop modem and B-channel for initial call from client. *Mar 1 01:25:31.499:
CSM_PROC_IC5_OC6_CONNECTED: CSM_EVENT_MODEM_ONHOOK at slot 0, port 3 *Mar 1 01:25:31.503:
VDEV_DEALLOCATE: slot 0 and port 3 is deallocated *Mar 1 01:25:31.503: ISDN Se0:23: Event:
Hangup call to call id 0xA %ISDN-6-DISCONNECT: Interface Serial0:18 disconnected from unknown , call lasted 41 seconds
!--- Call is completely disconnected. *Mar 1 01:25:31.523: ISDN Se0:23: TX -> DISCONNECT pd = 8
callref = 0x8036 *Mar 1 01:25:31.523: Cause i = 0x8090 - Normal call clearing *Mar 1
01:25:31.583: ISDN Se0:23: RX <- RELEASE pd = 8 callref = 0x36 *Mar 1 01:25:31.655: ISDN Se0:23:
TX -> RELEASE_COMP pd = 8 callref = 0x8036 %LINEPROTO-5-UPDOWN: Line protocol on Interface
Async4, changed state to down *Mar 1 01:25:31.851: TTY4: Async Int reset: Dropping DTR *Mar 1
01:25:33.695: As4 LCP: TIMEout: Time = 0x4E521C State = TERMsent *Mar 1 01:25:33.699: As4 LCP:
State is Closed *Mar 1 01:25:33.699: As4 PPP: Phase is DOWN *Mar 1 01:25:33.703: As4 PPP: Phase
is ESTABLISHING, Passive Open *Mar 1 01:25:33.707: As4 LCP: State is Listen %LINK-5-CHANGED:
Interface Async4, changed state to reset *Mar 1 01:25:33.879: As4 LCP: State is Closed *Mar 1
01:25:33.879: As4 PPP: Phase is DOWN *Mar 1 01:25:33.883: As4 IPCP: Remove route to 172.16.25.61
%LINK-3-UPDOWN: Interface Async4, changed state to down *Mar 1 01:25:38.887: As4 LCP: State is
Closed *Mar 1 01:25:38.887: As4 PPP: Phase is DOWN !--- Cleanup from previous call is finished.
*Mar 1 01:25:40.863: CHAT4: Matched chat script offhook to string offhook
    *Mar 1 01:25:40.867: CHAT4: Asserting DTR
!--- Modem goes offhook. *Mar 1 01:25:40.867: CHAT4: Chat script offhook started *Mar 1
01:25:40.871: CHAT4: Sending string: ATH1 *Mar 1 01:25:40.871: CHAT4: Expecting string: OK *Mar
1 01:25:40.911: CSM_PROC_IDLE: CSM_EVENT_MODEM_OFFHOOK at slot 0, port 3 *Mar 1 01:25:40.963:
CHAT4: Completed match for expect: OK *Mar 1 01:25:40.967: CHAT4: Chat script offhook finished, status = Success
!--- Chat script "offhook" was successfully completed. *Mar 1 01:25:40.967: CHAT4: Matched chat script callback to string callback
!--- Chat script "callback" is initiated. *Mar 1 01:25:40.971: CHAT4: Asserting DTR *Mar 1
01:25:40.975: CHAT4: Chat script callback started !--- Reset modem to known state. *Mar 1
01:25:40.975: CHAT4: Sending string: ATZ *Mar 1 01:25:40.979: CSM_PROC_OC1_REQUEST_DIGIT:
CSM_EVENT_MODEM_ONHOOK at slot 0, port 3 *Mar 1 01:25:40.983: VDEV_DEALLOCATE: slot 0 and port 3
is deallocated *Mar 1 01:25:40.979: CHAT4: Expecting string: OK *Mar 1 01:25:42.123: CHAT4:
Completed match for expect: OK !--- Dial the callback number of the client. *Mar 1 01:25:42.127:
CHAT4: Sending string: ATDT \T<527-9651>
    *Mar 1 01:25:42.131: CHAT4: Expecting string: CONNECT
    *Mar 1 01:25:43.199: CSM_PROC_IDLE: CSM_EVENT_MODEM_OFFHOOK at slot 0, port 3
!--- Modem/ISDN needs to collect the digits from IOS before it makes the call. *Mar 1
01:25:43.327: DSX1_MAIL_FROM_NEAT: DC_READY_RSP: mid = 5, slot = 2, unit = 1 *Mar 1
01:25:43.331: CSM_PROC_OC1_REQUEST_DIGIT:
    CSM_EVENT_DIGIT_COLLECT_READY at slot 0, port 3
    *Mar 1 01:25:43.331: CSM_PROC_OC1_REQUEST_DIGIT:
    CSM_EVENT_ADDR_INFO_COLLECTED at slot 0, port 3
    *Mar 1 01:25:44.327: DSX1_MAIL_FROM_NEAT: DC_FIRST_DIGIT_RSP: mid = 5,
    slot = 2, unit = 1
    *Mar 1 01:25:44.331: CSM_PROC_OC2_COLLECT_1ST_DIGIT:
    CSM_EVENT_GET_1ST_DIGIT at slot 0, port 3
    *Mar 1 01:25:47.331: DSX1_MAIL_FROM_NEAT: DC_ALL_DIGIT_RSP: mid = 5, slot

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= 2, unit = 1
*Mar 1 01:25:47.331: CSM_PROC_OC3_COLLECT_ALL_DIGIT:
CSM_EVENT_GET_ALL_DIGITS at slot 0, port 3
*Mar 1 01:25:47.335: CSM_PROC_OC3_COLLECT_ALL_DIGIT: called party num:
(5279651) at slot 0, port 3
!--- Digits have been collected; ISDN call is made. *Mar 1 01:25:47.339: process_pri_call making
a voice_call. *Mar 1 01:25:47.351: ISDN Se0:23: TX -> SETUP pd = 8 callref = 0x0005 *Mar 1
01:25:47.355: Bearer Capability i = 0x8090A2
!--- Bearer cap indicates call is an analog call. *Mar 1 01:25:47.355: Channel ID i = 0xE1808397
*Mar 1 01:25:47.359: Called Party Number i = 0xA1, '5279651'
*Mar 1 01:25:47.431: ISDN Se0:23: RX <- CALL_PROC pd = 8 callref = 0x8005
*Mar 1 01:25:47.435: Channel ID i = 0xA98397
*Mar 1 01:25:47.451: EVENT_FROM_ISDN::dchan_idb=0x7F8EE0, call_id=0xA005,
ces=0x1 bchan=0x16, event=0x3, cause=0x0
*Mar 1 01:25:47.451: EVENT_FROM_ISDN:(A005): DEV_CALL_PROC at slot 0 and port 3
*Mar 1 01:25:47.455: CSM_PROC_OC4_DIALING:
CSM_EVENT_ISDN_BCHAN_ASSIGNED at slot 0, port 3
*Mar 1 01:25:48.147: ISDN Se0:23: RX <- ALERTING pd = 8 callref = 0x8005
*Mar 1 01:25:48.151: Progress Ind i = 0x8388 - In-band info or
appropriate now available
*Mar 1 01:25:50.835: ISDN Se0:23: RX <- CONNECT pd = 8 callref = 0x8005
*Mar 1 01:25:50.851: EVENT_FROM_ISDN::dchan_idb=0x7F8EE0, call_id=0xA005,
ces=0x1 bchan=0x16, event=0x4, cause=0x
*Mar 1 01:25:50.855: EVENT_FROM_ISDN:(A005): DEV_CONNECTED at slot 0 and port 3
*Mar 1 01:25:50.859: CSM_PROC_OC5_WAIT_FOR_CARRIER:
CSM_EVENT_ISDN_CONNECTED at slot 0, port 3
!--- ISDN call is connected. *Mar 1 01:25:50.867: ISDN Se0:23: TX -> CONNECT_ACK pd = 8
callref = 0x0005
*Mar 1 01:25:53.735: AAA/AUTHEN: free_user (0x7ADEAC) user='callmeback'
ruser='' port='Async4' rem_addr='async/4084327528' authen_type=CHAP
service=PPP priv=1
!--- Modems have established carrier. *Mar 1 01:26:13.487: CHAT4: Completed match for expect:
CONNECT *Mar 1 01:26:13.491: CHAT4: Sending string: \c *Mar 1 01:26:13.491: CHAT4: Chat script
callback finished, status = Success *Mar 1 01:26:15.415: TTY4: DSR came up
*Mar 1 01:26:15.419: tty4: Modem: IDLE->READY
*Mar 1 01:26:15.439: TTY4: EXEC creation
*Mar 1 01:26:15.443: AAA/AUTHEN: create_user (0x7ADEA4) user='' ruser=''
port='tty4' rem_addr='async/5279651' authen_type=ASCII service=LOGIN priv=1
*Mar 1 01:26:15.447: AAA/AUTHEN/START (2043462211): port='tty4'
list='use-local' action=LOGIN service=LOGIN
*Mar 1 01:26:15.451: AAA/AUTHEN/START (2043462211): found list use-local
*Mar 1 01:26:15.451: AAA/AUTHEN/START (2043462211): Method=LOCAL
*Mar 1 01:26:15.455: AAA/AUTHEN (2043462211): status = GETUSER
!--- PPP negotiation begins again. *Mar 1 01:26:16.631: TTY4: Autoselect(2) sample 7E %LINK-
3-UPDOWN: Interface Async4, changed state to up *Mar 1 01:26:18.663: As4 PPP: Treating
connection as a dedicated line *Mar 1 01:26:18.663: As4 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:26:18.667: As4 LCP: O CONFREQ [Closed] id 5 len 25 *Mar 1 01:26:18.671: As4 LCP: ACCM
0x000A0000 (0x0206000A0000) *Mar 1 01:26:18.675: As4 LCP: AuthProto CHAP (0x0305C22305) *Mar 1
01:26:18.675: As4 LCP: MagicNumber 0x608DF70C (0x0506608DF70C) *Mar 1 01:26:18.679: As4 LCP: PFC
(0x0702) *Mar 1 01:26:18.679: As4 LCP: ACFC (0x0802) *Mar 1 01:26:18.779: As4 LCP: I CONFACK
[REQsent] id 5 len 25 *Mar 1 01:26:18.783: As4 LCP: ACCM 0x000A0000 (0x0206000A0000) *Mar 1
01:26:18.787: As4 LCP: AuthProto CHAP (0x0305C22305) *Mar 1 01:26:18.787: As4 LCP: MagicNumber
0x608DF70C (0x0506608DF70C) *Mar 1 01:26:18.791: As4 LCP: PFC (0x0702) *Mar 1 01:26:18.791: As4
LCP: ACFC (0x0802) *Mar 1 01:26:19.707: As4 LCP: I CONFREQ [ACKrcvd] id 3 len 20 *Mar 1
01:26:19.711: As4 LCP: ACCM 0x000A0000 (0x0206000A0000) *Mar 1 01:26:19.711: As4 LCP:
MagicNumber 0x004B3EF5 (0x0506004B3EF5) *Mar 1 01:26:19.715: As4 LCP: PFC (0x0702) *Mar 1
01:26:19.715: As4 LCP: ACFC (0x0802) *Mar 1 01:26:19.719: As4 LCP: O CONFACK [ACKrcvd] id 3 len
20 *Mar 1 01:26:19.723: As4 LCP: ACCM 0x000A0000 (0x0206000A0000) *Mar 1 01:26:19.723: As4 LCP:
MagicNumber 0x004B3EF5 (0x0506004B3EF5) *Mar 1 01:26:19.727: As4 LCP: PFC (0x0702) *Mar 1
01:26:19.727: As4 LCP: ACFC (0x0802) *Mar 1 01:26:19.731: As4 LCP: State is Open !---
Reauthenticate the user. *Mar 1 01:26:22.779: As4 PPP: Phase is AUTHENTICATING, by this end
*Mar 1 01:26:22.783: As4 CHAP: O CHALLENGE id 6 len 28 from "isdn2-2"
*Mar 1 01:26:22.887: As4 CHAP: I RESPONSE id 6 len 26 from "callmeback"
*Mar 1 01:26:22.895: AAA/AUTHEN: create_user (0x8F1DAC) user='callmeback'

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ruser=' port='Async4' rem_addr='async/5279651' authen_type=CHAP
service=PPP priv=1
*Mar 1 01:26:22.899: AAA/AUTHEN/START (2174906802): port='Async4' list=''
action=LOGIN service=PPP
*Mar 1 01:26:22.899: AAA/AUTHEN/START (2174906802): using "default"      list
*Mar 1 01:26:22.903: AAA/AUTHEN/START (2174906802): Method=LOCAL
*Mar 1 01:26:22.903: AAA/AUTHEN (2174906802): status = PASS
*Mar 1 01:26:22.907: AAA/AUTHOR/LCP As4: Authorize LCP
*Mar 1 01:26:22.911: AAA/AUTHOR/LCP: Async4: (3262137315): user='callmeback'
*Mar 1 01:26:22.911: AAA/AUTHOR/LCP: Async4: (3262137315): send AV service=ppp
*Mar 1 01:26:22.915: AAA/AUTHOR/LCP: Async4: (3262137315): send AV
protocol=lcp
*Mar 1 01:26:22.915: AAA/AUTHOR/LCP: Async4 (3262137315): Method=LOCAL
*Mar 1 01:26:22.923: AAA/AUTHOR (3262137315):
Post authorization status =PASS_ADD
*Mar 1 01:26:22.927: AAA/AUTHOR/LCP As4: Processing AV service=ppp
*Mar 1 01:26:22.927: AAA/AUTHOR/LCP As4: Processing AV protocol=lcp
*Mar 1 01:26:22.931: AAA/AUTHOR/LCP As4: Processing AV service=ppp
*Mar 1 01:26:22.931: AAA/AUTHOR/LCP As4: Processing AV protocol=lcp
*Mar 1 01:26:22.931: AAA/AUTHOR/LCP As4: Processing AV callback-dialstring=
*Mar 1 01:26:22.939: As4 CHAP: O SUCCESS id 6 len 4
*Mar 1 01:26:22.943: As4 PPP: Phase is UP
*Mar 1 01:26:22.947: AAA/AUTHOR/FSM As4: (0): Can we start IPCP?
*Mar 1 01:26:22.947: AAA/AUTHOR/FSM: Async4: (345798021): user='callmeback'
*Mar 1 01:26:22.951: AAA/AUTHOR/FSM: Async4: (345798021): send AV service=ppp
*Mar 1 01:26:22.951: AAA/AUTHOR/FSM: Async4: (345798021): send AV protocol=ip
*Mar 1 01:26:22.955: AAA/AUTHOR/FSM: Async4 (345798021): Method=LOCAL
*Mar 1 01:26:22.955: AAA/AUTHOR (345798021):
Post authorization status = PASS_REPL
!---- Negotiate IPCP. *Mar 1 01:26:22.959: AAA/AUTHOR/FSM As4: We can start IPCP *Mar 1
01:26:22.963: As4 IPCP: O CONFREQ [Closed] id 1 len 16 *Mar 1 01:26:22.967: As4 IPCP:
CompressType VJ 15 slots (0x0206002D0F00) *Mar 1 01:26:22.967: As4 IPCP: Address 172.16.25.52
(0x0306AC101934) *Mar 1 01:26:23.019: As4 IPCP: I CONFREQ [REQsent] id 1 len 40 *Mar 1
01:26:23.023: As4 IPCP: CompressType VJ 15 slots CompressSlotID (0x0206002D0F01) *Mar 1
01:26:23.027: As4 IPCP: Address 0.0.0.0 (0x030600000000) *Mar 1 01:26:23.027: As4 IPCP:
PrimaryDNS 0.0.0.0 (0x810600000000) *Mar 1 01:26:23.031: As4 IPCP: PrimaryWINS 0.0.0.0
(0x820600000000) *Mar 1 01:26:23.035: As4 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000) *Mar 1
01:26:23.035: As4 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000) *Mar 1 01:26:23.039:
AAA/AUTHOR/IPCP As4: Start. Her address 0.0.0.0, we want 0.0.0.0 *Mar 1 01:26:23.039:
AAA/AUTHOR/IPCP As4: Processing AV service=ppp *Mar 1 01:26:23.043: AAA/AUTHOR/IPCP As4:
Processing AV protocol=ip *Mar 1 01:26:23.043: AAA/AUTHOR/IPCP As4: Authorization succeeded *Mar
1 01:26:23.047: AAA/AUTHOR/IPCP As4: Done. Her address 0.0.0.0, we want 0.0.0.0 *Mar 1
01:26:23.047: As4 IPCP: Using pool 'default' *Mar 1 01:26:23.051: As4 IPCP: Pool returned
172.16.25.60 *Mar 1 01:26:23.051: As4 IPCP: O CONFREJ [REQsent] id 1 len 28 *Mar 1 01:26:23.055:
As4 IPCP: PrimaryDNS 0.0.0.0 (0x810600000000) *Mar 1 01:26:23.059: As4 IPCP: PrimaryWINS 0.0.0.0
(0x820600000000) *Mar 1 01:26:23.059: As4 IPCP: SecondaryDNS 0.0.0.0 (0x830600000000) *Mar 1
01:26:23.063: As4 IPCP: SecondaryWINS 0.0.0.0 (0x840600000000) *Mar 1 01:26:23.067: As4 IPCP: I
CONFACK [REQsent] id 1 len 16 *Mar 1 01:26:23.067: As4 IPCP: CompressType VJ 15 slots
(0x0206002D0F00) *Mar 1 01:26:23.071: As4 IPCP: Address 172.16.25.52 (0x0306AC101934) *Mar 1
01:26:23.139: As4 IPCP: I CONFREQ [ACKrcvd] id 2 len 16 *Mar 1 01:26:23.139: As4 IPCP:
CompressType VJ 15 slots CompressSlotID (0x0206002D0F01) *Mar 1 01:26:23.143: As4 IPCP: Address
0.0.0.0 (0x030600000000) *Mar 1 01:26:23.147: AAA/AUTHOR/IPCP As4: Start. Her address 0.0.0.0,
we want 172.16.25.60 *Mar 1 01:26:23.147: AAA/AUTHOR/IPCP As4: Processing AV service=ppp *Mar 1
01:26:23.151: AAA/AUTHOR/IPCP As4: Processing AV protocol=ip *Mar 1 01:26:23.151:
AAA/AUTHOR/IPCP As4: Authorization succeeded *Mar 1 01:26:23.151: AAA/AUTHOR/IPCP As4: Done. Her
address 0.0.0.0, we want 172.16.25.60 *Mar 1 01:26:23.155: As4 IPCP: O CONFNAK [ACKrcvd] id 2
len 10 *Mar 1 01:26:23.159: As4 IPCP: Address 172.16.25.60 (0x0306AC10193C) *Mar 1 01:26:23.255:
As4 IPCP: I CONFREQ [ACKrcvd] id 3 len 16 *Mar 1 01:26:23.259: As4 IPCP: CompressType VJ 15
slots CompressSlotID (0x0206002D0F01) *Mar 1 01:26:23.263: As4 IPCP: Address 172.16.25.60
(0x0306AC10193C) *Mar 1 01:26:23.263: AAA/AUTHOR/IPCP As4: Start. Her address 172.16.25.60, we
want 172.16.25.60 *Mar 1 01:26:23.267: AAA/AUTHOR/IPCP: Async4: (3819567164): user='callmeback'
*Mar 1 01:26:23.271: AAA/AUTHOR/IPCP: Async4: (3819567164): send AV service=ppp *Mar 1
01:26:23.271: AAA/AUTHOR/IPCP: Async4: (3819567164): send AV protocol=ip *Mar 1 01:26:23.275:
AAA/AUTHOR/IPCP: Async4: (3819567164): send AV addr*172.16.25.60 *Mar 1 01:26:23.275:

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AAA/AUTHOR/IPCP: Async4 (3819567164): Method=LOCAL *Mar 1 01:26:23.279: AAA/AUTHOR (3819567164):  
Post authorization status = PASS_REPL *Mar 1 01:26:23.283: AAA/AUTHOR/IPCP As4: Reject  
172.16.25.60, using 172.16.25.60 *Mar 1 01:26:23.287: AAA/AUTHOR/IPCP As4: Processing AV  
service=ppp *Mar 1 01:26:23.291: AAA/AUTHOR/IPCP As4: Processing AV protocol=ip *Mar 1  
01:26:23.295: AAA/AUTHOR/IPCP As4: Authorization succeeded *Mar 1 01:26:23.295: AAA/AUTHOR/IPCP As4: Done. Her  
address 172.16.25.60, we want 172.16.25.60 *Mar 1 01:26:23.299: As4 IPCP: O CONFACK [ACKrcvd] id  
3 len 16 *Mar 1 01:26:23.303: As4 IPCP: CompressType VJ 15 slots CompressSlotID (0x0206002D0F01)  
*Mar 1 01:26:23.303: As4 IPCP: Address 172.16.25.60 (0x0306AC10193C) *Mar 1 01:26:23.307: As4  
IPCP: State is Open *Mar 1 01:26:23.323: As4 IPCP: Install route to 172.16.25.60      %LINEPROTO-  
5-UPDOWN: Line protocol on Interface Async4, changed state to up  
!---- Client is connected.
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Informations connexes

- [Configuration du rappel asynchrone](#)
- [Rappel PPP sur RNIS](#)
- [Configuration du rappel PPP pour DDR](#)
- [Configuration de la fonction PPP Callback avec TACACS+](#)
- [Configuration de la fonction PPP Callback avec RADIUS](#)
- [Pages d'assistance sur les produits d'accès](#)
- [Pages d'assistance sur la technologie de numérotation](#)
- [Support technique - Cisco Systems](#)