



## Overview of DPNSS Features

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Updated 10/7/05  
Current through Release 1.1(2)

DPNSS is an industry standard interface defined between a PBX and an Access Network. DPNSS expands facilities normally only available between extensions on a single PBX to all extensions on PBXs that are connected together in a private network. DPNSS was originally derived from British Telecom's Digital Access Signaling System I (DASS I), enhanced where necessary to meet the private network requirements. DPNSS uses a 2048 kbits/s or 1544 kbits/s Digital Transmission System Interface.

For a detailed overview of DPNSS, see [Overview of DPNSS](#).

### DPNSS Features Interworking with Cisco CallManager

Cisco EGW 2200 offers the following DPNSS features:

- [Basic Call](#)
- [Call Hold](#)
- [Call Diversion](#) (also known as Call Forward)
- [Call Diversion Validation](#) (also known as Call Forward Validation)
- [Message Waiting Indicator](#)
- [Calling Name Display](#)
- [Call Transfer](#)
- [Loop Avoidance](#)
- [Call Redirection](#)
- [Night Service](#)
- [Add-on Conference](#)
- [Three Party Service](#):
  - Shuttle
  - Transfer



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- Add-on
- [Extension Status](#)
- [Call Waiting](#)
- [Call Offer](#)
- [Centralized Operator](#)
- [Route Optimization](#)
- [Call Back When Free](#)
- [Call Back When Next Used](#)



**Note**

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When DPNSS features are interworked between a legacy DPNSS PBX network and Cisco CallManager (and vice-versa), the given features mimic the implementation as the features function in a DPNSS network unless otherwise stated in the feature description.

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## Basic Call

The simple telephony call allows the user to establish a telephony connection between DPNSS and Cisco CallManager network extensions without the need for operator assistance.

## Call Hold

The Call Hold feature allows the user to place an existing call into a suspended state, with a holding indication being given to the held extension. The user may at any time reconnect to the Held Call, removing any holding indication.

## Call Diversion

Call Diversion offers users who are absent or busy the capability of having their calls forwarded to a third party.

The following variations are supported for a DPNSS extension to a Cisco CallManager (IP) extension:

- Call Diversion—No Reply (Call Forward No Answer)

**Limitation:** This feature does not work with a call from an IP Phone user to a DPNSS phone with the default Media Gateway "Trigger for SDP Transmit to H.323" setting of Address Complete.

For this feature to work, set the trigger to **Answer**.

If you set the trigger to **Answer** and you are also using either of the following methods for PSTN access to Cisco CallManager:

- a connected PBX
- the Cisco EGW 2200 (PSTN Interconnect application)

then forwarded calls to busy or unanswered PSTN numbers will get a ring tone instead of the inband busy tone or announcement.

In the first case, you can avoid the problem by setting the PBX to not allow in-band Q.931 information to pass through to the DPNSS network. If you cannot do this, change the point of PSTN access to the Cisco Call Manager. There is no workaround for the second case; we do not recommend using PSTN Interconnect if you want full CFNA interworking.

- Call Diversion—Busy
- Call Diversion—Immediate

The following variations are supported for a Cisco CallManager (IP) extension to a DPNSS extension:

- Call Diversion—No Reply
- Call Diversion—Busy
- Call Diversion—Immediate

## Call Diversion Validation

(Also known as Call Forwarding Validation) This feature ensures that when a PBX user attempts to forward a call, the PBX generates a virtual call to that phone number containing a specified string.

If Cisco EGW 2200 receives a virtual call containing this string that has the routing number and finds an available outgoing route, then Cisco EGW 2200 acknowledges the request. Otherwise, the Cisco EGW 2200 will reject the call with appropriate cause.

## Message Waiting Indicator

The Message Waiting Indicator (MWI) feature gives a TDM-based voicemail system the ability to set or clear the MWI lamp on a Cisco IP Phone. This feature allows an enterprise system to interconnect a voice mail system connected to DPNSS with Cisco CallManager. The Cisco EGW 2200 interworks the signal from DPNSS to a specific call to Cisco CallManager to set or clear the MWI lamp.

For a Voice Mail system connected to a DPNSS PBX to light the MWI indicator on an IP phone connected to Cisco CallManager, the DPNSS MWI parameter is mapped to a H.323 call with the MWI flag set to MWI-ON or MWI-OFF for the appropriate extension connected to Cisco CallManager.

Cisco CallManager MWI on/off support can be found at

[http://www.cisco.com/univercd/cc/td/doc/product/voice/c\\_callmg/4\\_0/sys\\_ad/4\\_0\\_1/ccmcf/b05vmmwi.htm](http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/4_0/sys_ad/4_0_1/ccmcf/b05vmmwi.htm).

The message waiting indicator NSI string values can be configured on a per T1/E1 basis for DPNSS MWI supplementary service support.



Note

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For the MWI feature, only DPNSS TDM-based voicemail is supported.

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## Calling Name Display

This feature allows DPNSS Calling Name Display to be interworked in both directions with Cisco CallManager. When Cisco IP phone users receive a call from a user on the PBX, the name and number of the caller is displayed on the receiving phone. Also, when a user on the PBX receives a call from a user on the Cisco IP phone, the name and number of the person calling is again displayed on the receiving phone.

The calling name display can be enabled or disabled on a per T1/E1 interface basis on the Cisco EGW 2200 Administration GUI.



Note

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When the calling party invokes Number Presentation Restriction, the identity (both name and number) is restricted and not transmitted to the called party.

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## Call Transfer

This feature supports call transfers between DPNSS PBXs and the Cisco CallManager. It supports transfers between an IP Phone connected to a Cisco CallManager and a phone connected to a DPNSS PBX and vice versa.

The connected number display will be updated on the phone of the other connected parties which could be either on Cisco CallManager or the DPNSS PBX. It also supports transfer from PBX to Cisco CallManager with the final connected number display updated on the phone of the calling party which could be on either the Cisco CallManager or the DPNSS PBX.

For example, a caller A on Cisco CallManager is talking to caller B on a DPNSS PBX. When caller B transfers the original call to caller C on Cisco CallManager, the connected number display on both ends is updated to show the numbers of caller A and caller C.

## Loop Avoidance

The loop avoidance supplementary service allows a limit on the number of PBXs through which a call can pass. It allows you to limit the number of alternate routes that a call path can include. This service prevents the looping of a call ending up occupying all channels in the PBXs on its path because of any network configuration error, which can result in an extremely congested network.

DPNSS Loop Avoidance is implemented by including a loop avoidance string in the ISRM or RM message. This string has two parameters:

- The first parameter is used to count down the Transit PBXs through which the call passes.
- The second parameter is optional and if present, used to count the alternative routes the current call path has taken.

Cisco EGW 2200 supports the first parameter of the Loop Avoidance string. Upon receiving the first parameter from originating DPNSS PBX, the parameter will be decremented and passed on to the terminating side if it is a DPNSS PBX. If the originator is other than a DPNSS PBX and the terminating side is a DPNSS PBX, this string is added with the counter value configured as per the property *LoopAvoidanceCounter*.

The second parameter will be passed on to the other side “as is” if both originating and terminating sides of the call are DPNSS PBXs. Otherwise, it will be dropped.



### Note

- The loop avoidance counter values cannot be passed to Cisco CallManager
- Calls “hairpinned” through Cisco CallManager (DPNSS PBX > Cisco CallManager > DPNSS PBX) cannot be detected. Therefore, loop avoidance cannot be supported in this call scenario.
- If a call is transferred from a PBX to Cisco CallManager to a PBX, loop avoidance is not supported.
- Loop Avoidance can be enabled or disabled on a per T1/E1 basis on the Cisco EGW 2200 Administration GUI.
- The loop avoidance counter can be modified.

## Call Redirection

The Redirection Supplementary Service offers callers awaiting connection or reconnection the option of being redirected to an alternative destination after a certain time. Redirection is initiated by the waiting party's PBX if the call does not progress within a certain time. Additionally, a failed call may be redirected to an alternative destination immediately.



Note

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Only a DPNSS PBX can invoke Call Redirection. Cisco CallManager does not support Redirection.

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## Night Service

The Night Service supplementary service provides alternative answering arrangements for calls to operators at times when normal operator positions are unattended.

An operator group or specific position can be put into Night Mode when unattended. You can activate or deactivate the Night Mode in several ways. For example, each operator position may be switched into or out of Night Mode; an operator group is in Night Mode when all the positions in the group are in Night Mode. Alternatively, Night Mode may be activated and deactivated at particular times of day.



Note

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Only a DPNSS extension can serve as the night service target extension.

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## Add-on Conference

The Add-On Conference supplementary service permits the controller of a three-party service conference to extend it to four or more parties.

This supplementary service allows a three-party service conference to grow to four or more parties, depending on the capacity of the conference bridge in use at the conference PBX. The number of parties in a conference can vary.

When the conference involves three parties, both Three-Party Service and Add-On Conference services are available; but when the conference has four or more parties, only Add-On Conference Service is available. If the number of parties goes down to two, the conference reverts to a simple call.

This feature allows all the parties involved in a call to do the following:

- Place the conference on hold and make an add-on enquiry call, using Single-Channel Working as far as the conference PBX to facilitate subsequent add-on. Following establishment, shuttle between the enquiry call and the conference, and release of the enquiry call are possible. The Hold supplementary service may be used to place the conference on hold.
- Add the called party of an Add-On Enquiry Call on to the conference.
- Clear down the complete conference.
- Split a selected party away from the conference in order to talk in private to or release that party.
- Obtain details of parties currently participating in the conference.
- Clear from the conference.

## Three Party Service

This supplementary service permits a user who has placed an existing call into a suspended or on-hold state to make an enquiry call to a third party. The controlling party may then make use of any of the following service options:

- Shuttle—The connection is switched so that the controlling party is connected to the party who was on hold, and the party to whom the controlling party was connected is placed on hold. By repeated use of this option the controlling party may speak to each of the other two parties alternately. The party to whom the controlling party is currently connected is known as the connected party. Before the first Shuttle, the enquired-to party is the connected party.
- Transfer—A connection is established between the two non-controlling parties and the controlling extension is released.
- Add-On—The three parties are connected together to form a three-party conference.

## Extension Status

The Extension Status Call supplementary service offers the capability of determining, on request, the status of an extension. This service permits the establishment of a virtual call to an extension in order to determine its state that is, free, busy, out of service, diverted, etc., without calling the extension.

It might be used by an operator, before the establishment of a call on behalf of an extension, to improve the chances of the extension being free when the call is ready. It might also be used to investigate complaints.



### Note

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Extension Status is not supported from an IP operator in Cisco CallManager domain to a DPNSS extension.

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## Call Waiting

The Call Waiting supplementary service enables an extension user to request that an indication be given if there is an incoming call when the extension is busy on another call. The Call Waiting service is a called-party service.

A user on an existing call is given an indication (Call Waiting Indication) that there is another incoming call to his line, while the calling party is given an audible indication that Call Waiting Indication is being given to the called extension. The called party can choose to do one of the following:

- Terminate the existing call and be automatically re-rung.
- Hold the existing call and answer the new call.
- Reject the Call Waiting Indication.
- Ignore the Call Waiting indication.

## Call Offer

The Call Offer service enables the Calling party to indicate to the called party on an already established call that another call is being offered. The Call Offer service is a calling party service.



Note

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The Call Offer feature has the following limitation:

Cisco EGW 2200 maps call offer to call waiting. With Call Waiting, the Cisco IP phone user receives an audible inband tone and Caller ID information on the phone display. If all the lines on the Cisco IP phone are being used, the Call Offer is rejected with Busy.

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## Centralized Operator

The Centralized Operator Service allows operators to assist with the connection of calls, without the need to provide and staff operator positions at every PBX in the DPNSS network.

Where operators are centralized, with operators on one PBX providing a service for a number of PBXs, the following DPNSS Supplementary Services must be supported:

- **Three Party Service**—The PBXs in the network must support Three-Party Service and use the procedures of that service when extensions or operators make enquiry calls and perform subsequent actions such as transfer.
- **Call Offer**—An operator must have the facility to offer an incoming call to a busy extension (Camp On). This is achieved by using the call offer service in conjunction with the three-party service. When the operator requests Camp On, the operator establish a call offer call to the called extension. If this is successful, the calling party "on offer" is transferred to the called extension. All PBXs for which the operator PBX provides service must be capable of accepting a Call Offer request.
- **Redirection**—All PBXs in the DPNSS network must support the Redirection Service to redirect a call back to the operator which has been transferred by an operator to an extension which has not answered and fails to answer within a certain time. This includes calls which have been transferred on offer to a busy extension and fail to progress within a certain time.
- **Night Service**—Night Service is essential where sophisticated night service arrangements are required. For example, local night-answering points. If a night service point is provided on the Operator PBX for use by all types of caller, there may not be a need for the DPNSS Night Service feature.
- **Extension Status**—The Extension Status feature allows operators the capability of determining the status of an extension without causing a ring.
- **Controlled Diversion Service**—When the Call Diversion Service is used, Controlled Diversion Service can allow operators to exercise control over any diversions encountered when establishing calls.
- **Three-Party Takeover**—The Three-Party Takeover Service allows operators to take control of a three-party situation after answering an enquiry call from an extension on another PBX (the extension that has a third party on hold)
- **Hold Service**—When Hold Service is used, the Operator PBX should reject any end-to-end message (EEM) containing HOLD-REQ from any party connected to an operator. A PBX should avoid sending an EEM containing HOLD-REQ when the distant party is an operator. Hold requests from extensions should be rejected locally. It is not necessary to use the procedures of the Hold Service when an operator places a party on hold in order to make an enquiry call. Transfer will normally occur within a few seconds and there is little point in supplying a holding indication to the held party for such a short duration. If the operator places a party on hold for another reason (e.g. to attend to another call or await a response to paging), the procedures of the Hold Service should be used.



Note

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- Cisco EGW 2200 does not support the following for DPNSS Centralized Operator:
    - Executive Intrusion

- Series Call
  - Controlled Diversion Service
  - The Centralized Operator feature is supported from DPNSS to Cisco CallManager IP, but is not supported from Cisco CallManager to DPNSS PBX.
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## Route Optimization

For various reasons, an established call through a DPNSS network may not follow the optimum route between two end PBXs. The Route Optimization feature enables end users to obtain a new connection between the two end PBXs using the preferred route.

On data calls, the use of this service may result in data loss, or corruption, at the point in time when optimization takes place. Some PBXs may, therefore, reject requests to optimize data calls, or restrict optimization to calls where it is known that sufficient error detection and recovery procedures exist to overcome the consequent disruption of the data.

An established call through a DPNSS network may follow a non-optimum route for reasons which include the following:

- The call was established by means of Transfer (Three-Party supplementary service).
- The call was established as a result of a Conference reducing to two parties (Three-Party supplementary service).
- An alternative route was used when the call was established owing to congestion on the optimum route.

Whenever there is a possibility that a call follows a non-optimum route (e.g. after a Transfer), the Originating PBX may initiate Route Optimization. An attempt is made to obtain a new path from the Terminating PBX to the Originating PBX using the optimum route. Some or the entire existing path may be used if it already follows the optimum route and the PBXs concerned support Single-Channel Working. When a new path has been obtained, the unwanted parts of the original path are released. The whole of the existing path is retained if it already follows the optimum route or if the optimum route is congested. In the latter case, the originating PBX may periodically try again.



### Note

- The Cisco EGW 2200 cannot optimize call paths that are hairpinned through Cisco CallManager clusters. An example of this would be for a call originated on an extension in a Cisco CallManager cluster and terminated on a DPNSS PBX (A) extension and subsequently transferred to an extension in a Cisco CallManager cluster.
  - The interruption in the voice path upon execution of Route Optimization will be between 800 and 1200 milliseconds.
  - Route optimization from Cisco CallManager to PBX to Cisco CallManager and route optimization from PBX to Cisco CallManager to PBX is not supported. Route optimization within the DPNSS network is supported, for example, a call from DPNSS\_PBX\_A to DPNSS\_PBX\_B which is then transferred to Cisco CallManager will be optimized if DPNSS\_PBX\_A has a trunk to Cisco CallManager.
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## Call Back When Free

The Call Back When Free (CBWF) feature allows a user who receives a busy signal (i.e. extension busy or network congestion) when trying to establish a call in the Private Network to request an automatic call back. The calling party can register the feature with the originating PBX which requests the terminating PBX to monitor the called extension. When the called extension and a transmission path across the network become free, the user who invoked the feature is notified by an audible and visual alert that the called extension is available. The user has the option at that time to accept the call back and a call will be set up from the user to the extension that becomes free.

Cisco EGW 2200 supports this feature for DPNSS to Cisco CallManager calls, Cisco CallManager to DPNSS calls and calls within a Cisco CallManager cluster.

The Cisco EGW 2200 supports up to 10 Call Back When Free invocations registered against a called user and 10 Call Back When Free invocations register by a calling user. When an extension becomes available, the first user (first in) in the Call Back requesting a queue will be notified. If the user does not choose to dial the free extension after 15 seconds, the next user in the Call Back queue will be notified that the extension is free.

The CBWF feature should be invoked and supported as customary to the DPNSS end-user. The Cisco EGW 2200 interrogates, on behalf of the DPNSS PBX, the appropriate extension on Cisco CallManager and informs the DPNSS PBX when the Cisco CallManager extension returns to on-hook.

For XML-enabled IP phones connected to Cisco CallManager, the Cisco EGW 2200 provides an XML-based visual indication giving the end-user the option to invoke the CBWF feature. If invoked (via soft key), the Cisco EGW 2200 will monitor the DPNSS end-user station. Once the DPNSS end-user station is returned to on-hook, the Cisco EGW 2200 will inform the Cisco CallManager end-user via XML-based visual indication or differentiated ring pattern. The Cisco CallManager end-user will have the option to complete or cancel the call to the DPNSS end-user station.



### Note

- The Cisco EGW 2200 will reject CBWF invocations for non-XML-enabled IP phones connected to Cisco CallManager.
- The Cisco EGW 2200 will reject CBWF invocations for analog (non-IP phones) connected to Cisco CallManager
- The Cisco EGW 2200 does not have the capability of barring a user (via provisioning) from invoking the CBWF feature. But DPNSS PBX and Cisco CallManager users will be restricted from invoking CBWF to PSTN numbers.
- The Cisco EGW 2200 will not support CBWF invocations for Cisco CallManager Directory Numbers (DNs) associated with multiple or shared lines, multiple devices or multiple partitions.
- The Cisco EGW 2200 will not support CallBack to a DPNSS phone if that phone has Divert-Immediate (Call Forward Immediate) set.
- The Cisco EGW 2200 will reject CBWF invocations for IP phones that have Call Forward enabled.
- Only the English language will be supported.
- Only a single audible alert option will be provided (there are no means to configure different, customized audible alerts).

**Note**

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If a callback request is initiated on a Cisco IP phone, it can only be cancelled by calling the number first. The callback can then be cancelled while the called party phone is ringing or the caller receives a busy signal.

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## Call Back When Next Used

The Call Back When Next Used (CBWNU) feature allows a user who receives no reply when trying to establish a call in the Private Network to request an automatic call back. The calling party can clear the call and invoke CBWNU. When the called extension becomes free after having been used, the user that invoked the feature is notified by an audible and visual alert. The user has an option at that time to accept the call back and a call will be set up from the user to the extension that becomes free.

Cisco EGW 2200 will support this feature for DPNSS to Cisco CallManager calls, Cisco CallManager to DPNSS calls and calls within a Cisco CallManager cluster.

DPNSS PBX to Cisco CallManager: The Cisco EGW 2200 interrogates, on behalf of the DPNSS PBX, the appropriate extension on Cisco CallManager and informs the DPNSS PBX when the Cisco CallManager extension returns to on-hook after the next use.

Cisco CallManager to DPNSS PBX: The Cisco EGW 2200 interrogates, on behalf of Cisco CallManager, the appropriate extension on the DPNSS PBX and informs Cisco CallManager when the DPNSS PBX extension returns to on-hook after the next use.

**Note**

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- CBWF and CBWNU features will not be supported under the following conditions:
    - For non XML-enabled IP phones connected to Cisco CallManager
    - For analog (non-IP phones) connected to Cisco CallManager
    - For Directory Numbers (DN) with multiple or shared lines
    - For the same DN occurrence across multiple devices
    - For partitions on Cisco CallManager
    - For calls from DPNSS PBX phone to Cisco CallManager IP phone and being forwarded to DPNSS phones
    - For CallBack to a DPNSS phone if that phone has Divert-Immediate (Call Forward Immediate) set.
  - If more than one CBWNU request has been registered against the called extension, the requests will be converted to CBWF requests when the extension is next used; the Free Notifications shall be queued and handled serially, as for the CBWF service
  - The Cisco EGW 2200 supports up to ten booked CBWNU requests (calls queued) on and against a subscriber line.
  - The end user has the ability to cancel any CBWNU booked requests on their extension.
  - The end users have the ability to scroll through CBWNU requests booked on their extension.
  - The CBWNU feature times out after 180 minutes if the booked CBWNU feature is not invoked.
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Cisco EGW 2200 provides an XML-enabled, XML-based visual indication giving the end-user the option to invoke the CBWNU feature. If invoked (via soft key), the Cisco EGW 2200 monitors the DPNSS end-user station. Once the DPNSS end-user station is returned to on-hook after the next use, the

Cisco EGW 2200 informs the Cisco CallManager end-user via XML-based visual indication or differentiated ring pattern. The Cisco CallManager end-user has the option to complete or cancel the call to the DPNSS end-user station.



**Note**

If a callback request is initiated on a Cisco IP phone, it can only be cancelled by calling the number first. The callback can then be cancelled while the called party phone is ringing or the caller receives a busy signal.

## DPNSS Features Interworking with Cisco Unity

Cisco EGW 2200 supports the following DPNSS features for interworking with Cisco Unity:

- [Basic Call](#)
- [Call Hold](#)
- [Message Waiting Indicator](#)
- [Auto Attendant](#)

### Basic Call

The simple telephony call allows outbound calls from Cisco Unity to a station or trunk on the PBX. The outbound calls are used for Pager support and Telephone Record and Playback (TRaP).

### Call Hold

The call hold feature is used for call transfers and call screening, with a holding indication being given to the held extension.

### Message Waiting Indicator

This supplementary service enables a Cisco Unity voicemail to light or clear the MWI indicator on phones on a DPNSS PBX connected to the Cisco EGW 2200.



**Note**

The MWI On/Off strings for the DPNSS PBX must be set per T1/E1 interface on the Cisco EGW 2200 Administration GUI.

### Auto Attendant

Cisco Unity provides support for Auto Attendant. Cisco EGW 2200 provides the ability to interwork Auto Attendant Release Transfers to phones connected to a DPNSS PBX, allowing the Auto Attendant function to transfer an incoming call to a specified extension.



**Note**

Cisco EGW 2200 does not support Supervised Transfer.

