System Overview

FEBRUARY 2018

INATTEND

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TRADEMARKS

System Overview - InAttend
February 2018

CONTENTS

1 INTRODUCTION

InAttend is a powerful, user-friendly attendant application designed for handling high volumes of internal and external calls in an efficient way. Call and activity handling, presence and availability with line status information are all integrated into one single application.

With InAttend, attendants have access to activity and availability information for all employees and can easily search for any directory information.

When InAttend is integrated with CMG - BluStar Web, the attendant has control over the activities and forwarding for everyone registered in the CMG Server directory. This information is gathered from a groupware system (e.g. Microsoft Exchange, Lotus Domino, Novell GroupWise) or a presence system (e.g. Microsoft Lync, call manager or mobile operator). With direct access to the user's calendar, the attendant has all information about the user's activities.

Note! The Lotus Domino and Novell GroupWise groupware systems are only available when using InAttend with CMG - BluStar Web.

InAttend provides the following key features:

- Powerful Attendant queue and call handling
- Presence information from BluStar Server (BSS) - Presence Server
- Microsoft Lync integration
- Calendar information (Microsoft Exchange, Lotus Domino, Novell GroupWise)
- Call control with all functions for call handling
- Queue panel with all queues handled by the attendant (including an overview display and a detailed view of all calls in the queues)
- An A/B party panel with up to two calls
- Search panel with advanced search options and option to search on "last name", "first name" and "extensions" search. In addition, up to five more search options can be defined by the administrator
- Search results with directory information and extensive presence information
- Information panel with additional information for a selected entry in a search result list
- Busy Lamp Fields can easily be added by the attendant, including line status information from call managers and mobile operators as well as user presence information
- Web panel that can display any web page
- Message panel with SMTP message support to send messages to end users
- Instant messaging between attendants

1.1 DIRECTORY INTEGRATIONS

InAttend can be installed as a stand-alone solution or combined with CMG - BluStar Web:

- **InAttend stand-alone -** In this scenario any LDAP directory can be used for directory information. BluStar Server (BSS) can consolidate multiple LDAP directories, such as Active Directory or CRM systems.
- **InAttend with CMG Server -** With CMG Server, integration with communication servers makes it possible to divert CMG - BluStar Web users' extensions according to the different activities that have been set for a user.

  The CMG Server also contains a database with directory information and other user data, public and private – the latter can be viewed by the attendant.

2 OVERVIEW

InAttend includes the following components:

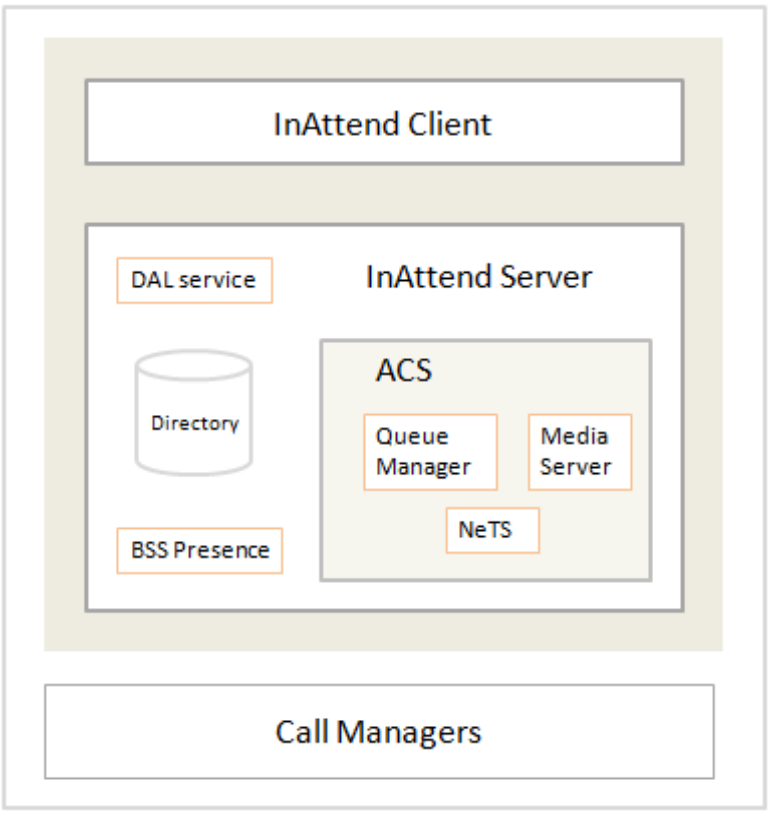
- **InAttend Client -** A Windows-based attendant client designed for efficient handling high volumes of internal and external calls, described in section 3.1.
- **InAttend Server -** The server software required for InAttend, described in section 3.2.
    - ACS - Attendant Connectivity Server
    - AnA Web Service
    - TCA - Telephony Configuration Application
    - TCS - Telephony Configuration Service
    - NeTS - Network Telephony Services
    - Queue Manager
    - Media Server
    - Line State Server
    - BluStar Server (BSS)
    - InAttend History Service
    - InAttend Server Standalone components – Additional components required if InAttend is installed as a stand-alone server (without CMG Server):
        - BluStar License Manager
        - BluStar Web Service
    - InAttend Server (CMG) components - Additional components required if InAttend is combined with CMG Server:
        - Mitel LDAP Server
- **Enterprise License Manager (ELM)** - Used to manage the licenses, see section 3.3.
- **Optional Server Software** - The optional server software that can be installed, described in chapter 4.
    - Quality Manager Server
    - Microsoft Lync Presence Information
    - Mobile Line State Server
    - SIP Line State Server

The user documentation for InAttend is published on Mitel web page (Knowledge Base) and also bundled with the software package.

3 INATTEND SOLUTION

The InAttend solution is built on open standards and offers advanced collaboration features and integration with a variety of platforms.

The figure below illustrates the main components in the InAttend solution:



InAttend works in combination with the Attendant Connectivity Server (ACS) to provide an advanced attendant solution for supported SIP-enabled call managers. See *InAttend Compatibility Matrix* for a list of supported call managers.

InAttend has full access to activity-based call routing services for all users registered in the corporate directory. The directory used can be from CMG Server, BluStar Server, or any other LDAP directory. The DAL service is the main interface for the InAttend client to connect to the directory.

The BluStar Server Presence Server provides rich presence information, including presence status, calendar and line state information for users registered in the corporate directory. The presence information is provided as part of the directory search results.

InAttend enables quick access to the directory and presence information, which makes the attendants more effective in order to provide quick and efficient services to the end customer.

3.1 INATTEND CLIENT

The InAttend client is a Windows-based attendant console designed for handling high volumes of internal and external calls efficiently. Call and activity handling, availability and line status functions are all integrated into one single application.

The call control capabilities can be invoked using pre-defined short keys on the keyboard or by using the mouse with the call control panel. The queue area can display a variety of internal and external queues. One or several queues can be assigned to an attendant account and a priority for queue handling can be defined per attendant.

When the attendant is free, the next call in the queue is presented automatically in the A panel, so that the attendant can answer it. The attendant has the option to select another call directly from the queue for handling priority or VIP callers for example.

The A/B panels allow for toggling between callers and doing monitored or blind transfers. The search fields allow the attendant to enter a few characters (e.g., first or last name) and the progressive search capabilities begin to populate the search result list area with entries.

Besides information such as name, number and department, the search results contain rich presence information such as Line state and presence information from various sources. This means the attendant has immediate visibility to a user's availability if a user is on the phone or in a meeting. This allows the attendant to use other options, such as looking for other members in the same department by simply pressing a pre-defined key.

If a user has set an activity (meeting, lunch, out of office), the attendant sees when the person is back, even when they have back-to-back meetings scheduled. The BLF (Busy Lamp Field) area provides the attendant with a list of the most commonly-called users in direct view all the time, with status information including their activity, presence and line state.

3.1.1 ATTENDANT AVAILABILITY

When the attendant presses the Ctrl + F12 keys, the InAttend client is put in on or off duty mode. If the Attendant client is put in off duty mode, the client is relieved from the responsibility of accepting calls from any of its queues. If no client is responsible for a queue, the queue is disabled and the passive redirect configuration is triggered and calls to that queue can be routed to another queue or to an IVR.

Note! Multiple (chain) forwarding is not supported. That is, passive redirect cannot be used to make a call travel along several linked (chained) redirected queues.

3.1.2 CALL CONTROL

InAttend provides powerful attendant call control functionality. All call control functions are managed through the InAttend client. The attendant can either use the built-in soft phone for the media session or by using any standard desk phone (hard phone).

3.1.2.1 Soft phone support

InAttend is shipped with a built-in soft phone. This phone is actually not registered with the call manager (no call manager extension); instead a media session is setup between the ACS Media Server and the InAttend client. This session is then in conference with the active calling parties.

3.1.2.2 Hard phone support

The InAttend hard phone support allows the attendant to use a standard desk phone for media as an alternative to the built-in soft phone capabilities. If this option is configured, the application dials out to the designated attendant phone using the phone's normal extension number.

The phone is preferably a desk phone situated next to the InAttend client. The attendant can choose to use the handset or plug in a headset to the device (device-dependant). There are two modes of configuration for the hard phone:

- **Per session -** The designated attendant phone is dialled when the user activates the attendant console (logs in) and remains open until the user deactivates the console (logs-off). The phone should remain off hook during the entire time the attendant is logged in and is used for media. When this mode is used, the phone is dedicated to the attendant console for the duration of the session. Should the attendant hang-up the phone by accident after a call, the phone will be called up again automatically to re-establish the media session with the InAttend client.
- **Per call -** The designated attendant phone is called each time an inbound call is selected from the queues. When the call ends, the attendant media session is released and the phone returns to idle state. This mode is used primarily in low traffic situations where the phone may also be used for normal telephony traffic (non-attendant related calls). When the phone is not in an attendant call, the phone can be used as normal. When an attendant call is presented from the queue, the application calls the device to establish the media session before answering the inbound caller from the queue.

3.1.3 ATTENDANT FUNCTIONS

All call control functions, such as answering, transferring and disconnecting calls, is managed through the InAttend client (workstation). The call queuing functionality with configurable call queues also supports camp on services. Other features include automatic call distribution, which distributes the call to the attendant with the longest idle time, and direct drop to voicemail, which allows the attendant to transfer calls directly to subscribers' voicemail (SIP-enabled call managers only).

3.1.3.1 Direct drop to voicemail

With this function, the attendant can transfer a call directly to a searched subscriber's voicemail. Attendants can transfer the call to a voicemail account, regardless of the presence or state of the searched subscriber.

3.1.3.2 DTMF

The attendant can use DTMF (tone signalling) during a call where information needs to be entered, for example to a Minicall.

If using DTMF with SIP, the signalling that is sent will be tone events according to RFC2833 or SIP INFO with DTMF relay.

3.1.3.3 Incoming calls

3.1.3.3.1 Call queues

Incoming calls are routed to one of the configured queues in the system. There can be a number of different queues, for example queues for internal calls, external calls and recalls (transferred calls that return to the attendant). An attendant can choose from which queue to pick a call or Automatic Call Distribution ACD can be configured.

3.1.3.3.2 Call in queue alert

If a call has been in a queue too long, the queue turns orange and if the call is not answered after another time interval, the queue turns red. The time intervals for the alerts are configurable per queue.

3.1.3.3.3 Call list

It is possible to display a list where incoming calls appear. Calls can be answered by choosing a call from the list. The following information is displayed for each call:

- Queue name (for example internal or external)
- Caller extension (number or name)
- Called extension (number or name)
- Call status (redirect/return reason)
- Call priority
- Time in system (including park, recall and/or camp on time)

If the extension owner is found in the InAttend database (CMG database or LDAP), the name is added in the caller and called fields. The call list can be sorted by any of these criteria.

3.1.3.3.4 Automatic Call Distribution (ACD)

Active Call Distribution (ACD) is configured on operator groups. When an incoming call arrives in a queue that is monitored by an operator in an operator group with ACD enabled, the Attendant Connectivity Server delivers the call to the operator with the longest idle time. If the operator does not answer the call within a specified time, the call is directed to another operator. The operator who did not answer within the specified time interval is blacklisted until he/she manually answers a call in queue. At this point, the operator is added to the ACD group again.

If all operators are busy when a call arrives in a queue, the call is queued. The next operator who becomes idle gets the next call. Calls that have not yet been answered are visible in the queue to all other operators, and any operator can choose to answer any call in the queue (even calls dedicated to other operators). If ACD functionality is used with Auto Answer in the InAttend client, operators do not need to perform any manual operations to answer incoming calls.

3.1.3.3.5 Call routing on return reason

When a call is returned because the extension was busy or nobody answered, the call can be returned to different queues depending on the return reason. For example, a call that has been camping on busy can be returned to the “Extension busy” queue. Configurable return reasons are:

- Internal camped on busy
- Internal no answer
- External camped on busy
- External no answer

3.1.3.4 Line A and B fields

The InAttend client uses two fields for attending calls, line A and line B. All calls are answered on line A and all transfers are handled on line B. The attendant can also use line A to initiate outgoing calls.

The following information is displayed in the line fields:

- Caller extension
- Called extension
- Queue name
- Call status or extension status symbols
- Name of caller (if in the CMG database)
- Name of the called party (if in the CMG database)

3.1.3.4.1 Preview of first call

A preview of the next expected call to be answered is shown in the line A field. Calling and called extensions are displayed. If the calling or called party is in the CMG database, their names are displayed as well.

3.1.3.4.2 Call redirect reason

When a call is redirected to the attendant because of an extension's Call Forward All, Call Forward Busy, or Call Forward No Answer settings, the redirect reason for that call is displayed.

3.1.3.5 Transfer calls

3.1.3.5.1 Queue calls on Internal or External phones (camp on)

1. When an attendant has answered a call and performs a blind transfer to an internal or external phone, the following occurs:
    a. The caller hears music, a configurable message or a ring tone (configurable).
    b. Attendant Connectivity Server (ACS) queues the caller for the external phone and starts making test calls (probing) to the external phone.
    c. If the called extension picks up within a configured time, the caller is connected.
    d. If the extension does not get through to the external phone within a configured time, the caller is returned to the attendant's recall queue.
2. When an attendant has answered a call and performs a blind transfer to a busy extension, the following occurs:
    a. The caller hears music, a configurable message or a ring tone (configurable).
    b. The ACS queues the caller for the extension.
    c. If the extension does not go idle within a configured time, the caller is returned to the attendant's recall (busy) queue.
    d. If the extension goes idle within the configured time and the queued call is first in queue for the extension, the server starts calling the extension as in the previous scenario.
3. When an attendant has answered a call and performs a blind transfer to an external phone the following occurs:
    a. The caller hears music or a ring tone (configurable).

b. The ACS queues the caller for the external phone and starts making test calls (probing) to the external phone.

c. If the called extension picks up within a configured time, the caller is connected.

d. If the extension does not get through to the external phone within a configured time, the caller is returned to the attendant's recall queue.

3.1.3.5.2 Call return reason

When a call is returned to the attendant because an extension is busy or nobody answered, the reason is displayed to the attendant. The destination extension is automatically dialled so that the attendant only needs to press the transfer button again for a new attempt to transfer the call.

3.1.3.5.3 Consult call

When an attendant has answered a call, the caller can be put on hold and a second call can be made to the required extension. The attendant can swap between the first and second call and complete the transfer at any time.

3.1.3.6 Attendant parking

When an attendant parks a call, the call ends up in a call park queue and the caller will hear music or a ring tone (configurable) until the attendant selects the call from the queue. The call can be selected by the attendant at any time. Calls in the park queue have no ring tone from the Attendant client.

Note! The parking queue is a private queue. It is not possible for other attendants to pick up the call.

3.1.3.7 Attendant handling

The attendant communicates from a hard phone or the built-in soft phone, using a headset and a sound card (SIP).

3.1.3.8 Directory searches

With the integration with the CMG or LDAP database, the attendant can perform searches for people and numbers from the InAttend client.

3.1.3.9 Line state

This is applicable for call managers supporting CSTA and SIP (RFC 3265, 3856). It is also possible to get line state on the mobile extension for selected Mobile operators.

3.1.3.9.1 Idle/busy line state

After a number is dialled (hard phone or soft phone), the idle or busy symbol appears for that extension. The symbol is updated in real time when the extension's line state changes.

3.1.3.9.2 Call forward all line state

If an extension (on a hard phone or a soft phone) is forwarded to another address the attendant will see the forward symbol and the forward address when dialling the number to that extension. The symbol will be updated in real time when the extension's forward state changes.

3.1.3.9.3 Busy/ringing status indication on extensions in contact search list

The extensions (hard phone or soft phones) that are busy will be displayed with the busy symbol in the InAttend search result list. For some call managers and mobile operators, the ringing indication is also shown. The display is updated dynamically when the extensions' line state change.

3.1.3.10 Other features

- **Breakthrough** - Attendants can transfer calls to forwarded phones. (through SIP)
- **Forward phones** - Attendants can forward a phone to an alternative number. (through SIP)
- **Message waiting** - Attendants can activate/deactivate the message waiting indication on an IP phone. (through SIP)
- **Cisco bulk handling of diversions** - The Cisco Web Service is used for setting diversion. It updates an extension by writing directly to the Cisco database. If bulk handling is enabled, the throughput is significantly improved, changing the number and forwards per second by a factor of approximately 100.

3.2 INATTEND SERVER

3.2.1 ATTENDANT CONNECTIVITY SERVER (ACS)

The Attendant Connectivity Server (ACS) is a telephony application platform that integrates with call managers using open standards. Examples of call managers are Mitel MiVoice MX-ONE, Mitel MiVoice 5000 and Cisco Unified Communication Manager (CUCM). For a complete list of call managers see *InAttend Compatibility Matrix* [9].

ACS enables advanced call and media functionality for InAttend and other applications like CMG Speech and InConference. The ACS solution allows saving and sharing resources between applications.

3.2.2 AUTHENTICATION AND AUTHORIZATION (ANA) WEB SERVICE

The Authentication and Authorization Service (AnA) Web Service is used to verify that the administrator users and InAttend attendants are authorized to use certain services when logging in to InAttend.

3.2.3 TELEPHONY CONFIGURATION APPLICATION (TCA)

ACS is configured using the Telephony Configuration Application (TCA) web application. The configuration is saved as an XML file and is deployed to all ACS components through the network with the push of a button.

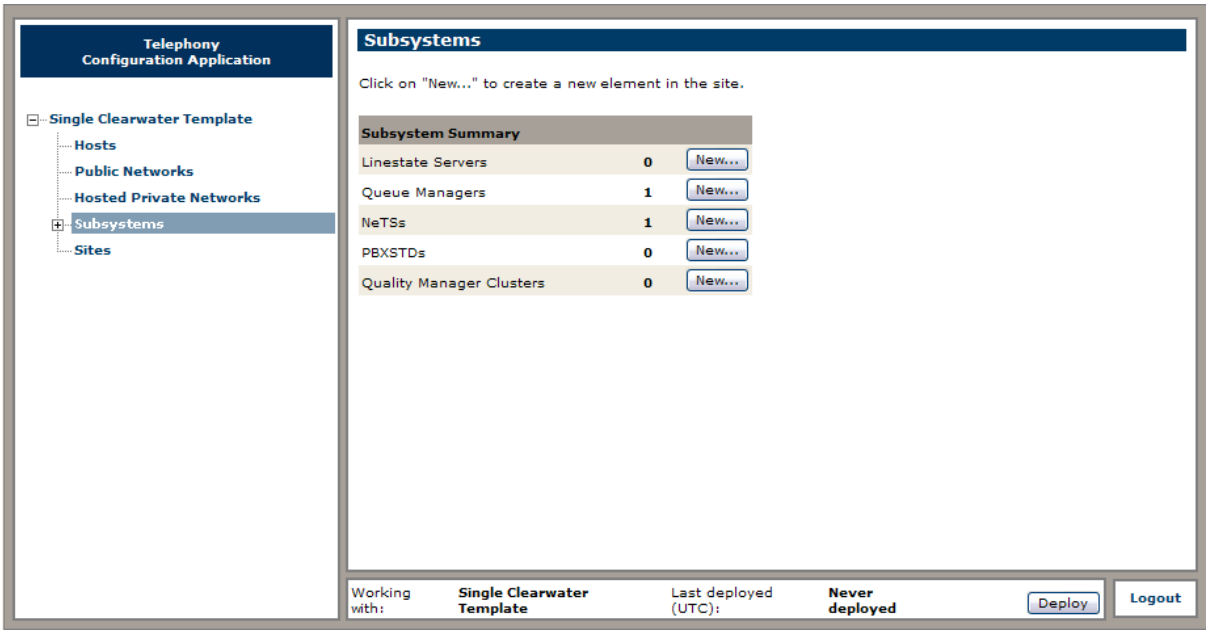


Figure 1 Screenshot of the Telephony Configuration Application

3.2.4 TELEPHONY CONFIGURATION SERVICE (TCS)

The Telephony Configuration Service (TCS) is a web service used by TCA to access and edit the XML configurations. InAttend clients also access the TCS to retrieve the configuration the logged-on attendant is entitled to work with.

3.2.5 TELEPHONY SERVICES (NETS)

The main responsibility of NeTS is call handling. Specifically, NeTS:

- communicates with the call manager through SIP
- handles incoming calls to configured queues
- handles transfer scenarios: camp on busy, consult calls, etc.
- updates queue status for Queue Manager
- negotiates media with Media Server

3.2.6 QUEUE MANAGER

Queue Manager is a key part of the InAttend solution and provides advanced attendant queue and call control handling on top of ACS. Queue Manager handles all logical inbound attendant queues as well as dynamically created outbound queues towards extensions and recall queues for calls being transferred by the attendant. Line state servers are used by the Queue Manager to determine the status of target extensions before any transfer operation.

Queue Manager also reports statistics to the Quality Manager (see section 4) for all queue and call handling, as well as statistics for currently logged on attendants.

Attendant queues can be configured and customized using the TCA application.

In addition, the Queue Manager:

- communicates with NeTS and InAttend clients
- keeps track of the queue structure
- updates queue information for all affected InAttend clients
- updates call information in all InAttend clients
- receives user commands from InAttend clients and sends instructions to NeTS
- manages dynamic queues towards extensions (blind transfer)

3.2.7 MEDIA SERVER

The Media Server handles all the media streams during a call for the time ACS is involved in a call and is responsible for:

- negotiating and set up media sessions with endpoints (SDP:s indirect through NeTS)
- mixing media streams to the attendant
- playing music on hold for waiting calls
- using the SIP protocols for media sessions

3.2.8 LINE STATE SERVER

The Line State Server (LSS) updates the Queue Manager and InAttend clients with information about line state (idle/busy). More specifically, the LSS is responsible for:

- supplying line state information
- updating InAttend clients and Queue Managers with information about extensions' call forward status
- forwarding extensions when requested by the PBXSTD on the CMG server
- turning on the message waiting indication on a CUCM phone

3.2.9 CMG SERVER - PBXSTD

The main responsibility of PBXSTD is to open and close extensions (automatically forward extensions) according to presence status in CMG Server using ACS LSS.

For Cisco; PBXSTD set forward is using ACS Cisco LSS.

For all call managers, PBXSTD also has to be configured in CMG Server.

3.2.10 BLUSTAR SERVER - PRESENCE SERVER

BluStar Server (BSS) - Presence Server provides InAttend with aggregated calendar and presence information, including real-time line state, from different presence sources. It also provides possible consolidation of directory information via LDAP from Active Directory and other systems (see Directory integrations).

The functionality for InAttend clients (profiles) and the InAttend users are configured in BSS.

Through the BSS' connections to different calendar sources, the attendant gets information about current and future appointments. The attendant can also modify calendar entries on behalf of an office user in CMG - BluStar Web.

The calendar information, together with the presence information and the line state information from call managers, provides the attendant with all the information necessary to give the best service to the customers dialling in and transfer the calls to the best available user.

The BSS Presence Server includes of the following services:

- **CTI Server** - collects telephony line state information (idle, busy and forwarded) from different call managers and mobile operators and publishes this information to connected users through the Presence Server interface.
- **Directory Server** - consists of an integrated LDAP Server, providing different options to import directory data from different databases and formats recurrently.
- **Presence Interface** - offers calendar information and call manager line state to InAttend and other clients connected to it (e.g. BluStar Web) as well as offering MS Lync users' presence states. The presence information is consolidated with other user presence information and presented in a summarized way to the end user.

BSS also offers the option to federate line state information from MiVoice MX-ONE users to MS Lync. In this way, line state information from MX-ONE is visible in the MS Lync clients.

3.3 CALL MANAGERS

The SIP-based call control interface allows full integration with call managers and third party systems.

3.4 CMG - BLUSTAR WEB COMPONENTS

CMG - BluStar Web components include BluStar Web specific database tables, BluStar Web server framework and the web site. The CMG - BluStar Web components are normally installed on the same server as CMG Server, additional web sites can be deployed (e.g. in DMZ or on the Intranet) for one system.

3.5 ENTERPRISE LICENSE MANAGER (ELM)

Enterprise License Manager (ELM) is a client/server license-control application used by InAttend to manage licenses. In order to apply the InAttend licenses, the ELM Server must be installed on the network.

If using InAttend with CMG Server, ELM is already installed, but in case of an InAttend stand-alone system, the ELM must be installed as a part of the InAttend installation.

3.6 WINDOWS SERVICES

The following Windows services are available:

- **BluStar Web Service** - implements all functionality needed by the BluStar web site. This service is installed from Mitel Installer.
- **BSS Presence Server** - a service used to access calendar information from different mail systems like Microsoft Exchange, Lotus Domino or Novell Groupwise.

Note! The Lotus Domino and Novell GroupWise groupware systems are only available when using InAttend together with CMG - BluStar Web.

- **DAL Server** - the main interface to the database configuration. Several other servers are connected to this one and use services like querying and storing the configuration. The DAL service informs each connected server about changes in the system and also processes requests from the BluStar Server Administration application and distributes it to the appropriate server.
- **CTI Server** - provides line state information to the client.
- **InAttend History Service** - Store call history information to the database for the InAttend journal feature.
- **LDAP Administration** - controls the configuration and automatic ASCII or LDAP imports to the LDAP Server.
- **LDAP Server** - provides a directory service with a LDAP v3 interface and can be used to store up to 500 000 entries and can be filled via imports.
- **Media Server** - handles the media streams during a call.
- **NeTS** - a telephony service communicating with the call manager and handling incoming calls.
- **Queue Manager** - handles all queues towards extensions and recall queues for calls being transferred by the attendant.
- **Service Manager** – allows the administrator to control the services from the BluStar Server Administration application.

4 OPTIONAL COMPONENTS

The following optional components are available for InAttend:

- **Quality Manager** - Enables measurement of real-time and historical traffic in the system and evaluates the handling of incoming calls (i.e., call flow). Different aspects of the call flow can be visualized in reports containing a graphic view as well as in a table with the selected information. QM Wallboard provides a real time view of the traffic and the application used to generate statistical reports is a web-based application.
- **Lync Presence Information** - Integrates BluStar into Microsoft Office to provide Microsoft Lync users' presence states to InAttend and other connected clients (e.g. BluStar Web).
- **Mobile Line State Server** - Communicates line state for mobile phones from the mobile operator to the InAttend client. See Appendix I - Mobile Line State Server for more information.
- **SIP Line State Server (LSS)** - Updates the InAttend clients with information about extensions status and forwards extensions when requested by PBXSTD on the CMG server.

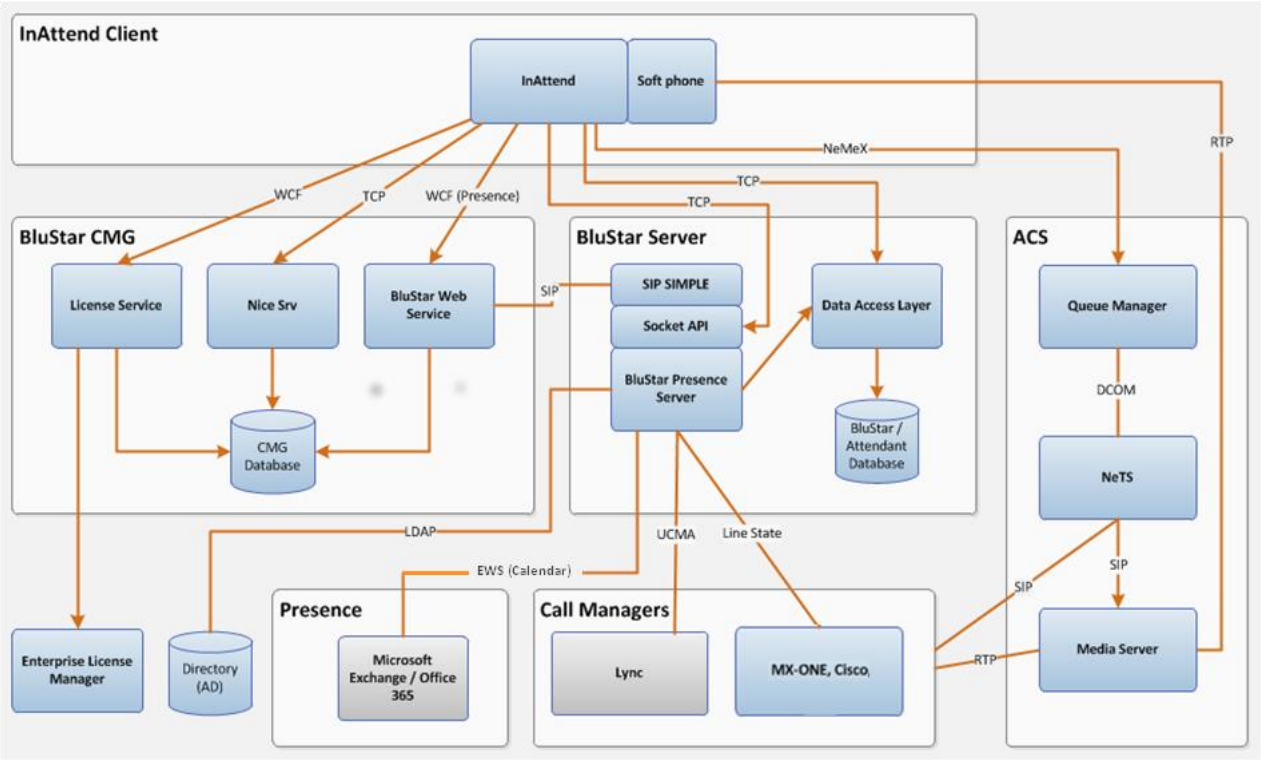
5 ARCHITECTURE

The InAttend server communicates with its client components over TCP/IP.

The InAttend Server connects to the call managers, groupware system and presence systems. At start-up, the client announces itself to the TCP/IP interface of the InAttend Server. The client receives information about the presence status of the monitored users over this connection

InAttend may be operated as a standalone system, or integrated into a CMG system. If the InAttend application is used in standalone mode, an LDAP server (preferably the Mitel LDAP Server) is used as the corporate directory, and is required prior to installing InAttend.

The InAttend Hard Phone support allows the attendant to use a standard desk phone for media as an alternative to the built-in Soft Phone capabilities.



5.1 SCALABILITY

With the Multi Node Connectivity (MNC) feature of the InAttend Server, the server can maintain several connections to different telecommunication plants at the same time or to several telecommunication plants of the same type or manufacturer. This is particularly advantageous for large telecommunication systems (several telecommunication knots, heterogeneous telecommunication landscape of different manufacturers).

To use the MNC server, install the Line State Server on a separate server and connect the primary Line State Server to the MNC server. To do this, a call manager link must be created from the Line State Server to the MNC Server.

To connect the ACS to more than one call manager for call control, a CMG system is required.

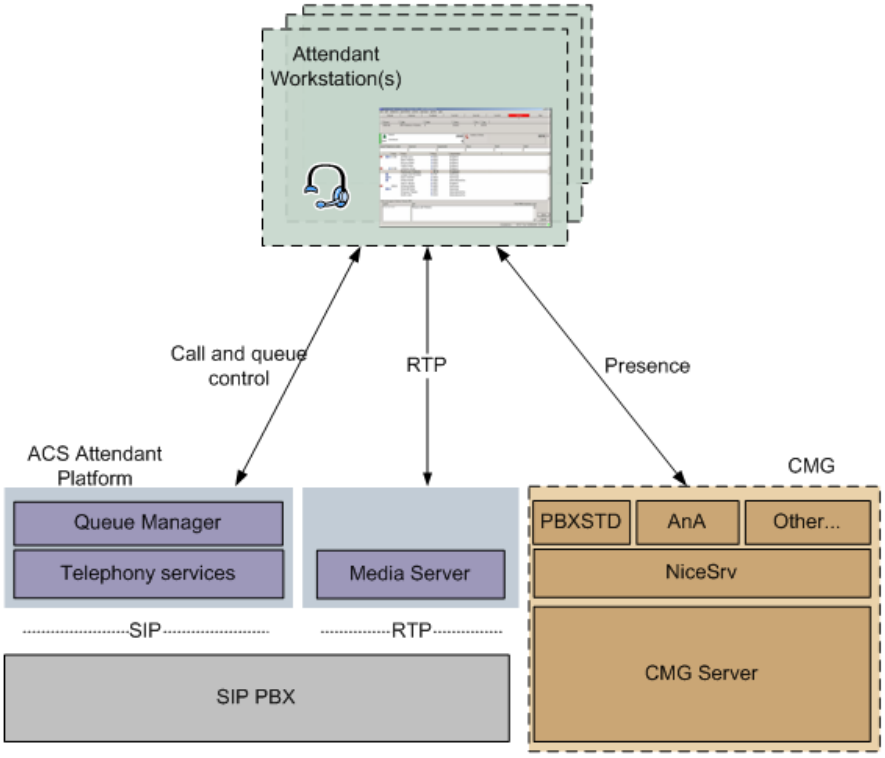
5.2 ATTENDANT CONNECTIVITY SERVER (ACS)

The InAttend call control functionality uses open SIP standards and integrates with call managers using a SIP trunk. InAttend also supports TLS, SRTP.

The ACS architecture is scalable, allowing for a practically unlimited number of users and call traffic, numerous call managers and a multitude of operator workstations. The network can be located on a single site or be distributed over several locations.

The different ACS components can be installed with the Telephony and Media Server on the same machine or with the Telephony and Media Server on separate machines. ACS can also be setup as a redundant system.

The following figure shows an example of an ACS configuration for SIP:



5.2.1 SYSTEM ENVIRONMENT

ACS can be installed in the following configurations:

- **Single Server configuration SIP**
  All ACS components are installed on the same server.
  This configuration requires **one** physical server.
- **Separate Servers configuration SIP**
  NeTS and Queue Manager are installed on one server. Media Server is installed on a separate server. This configuration requires **two** physical servers
- **Redundant System with Single Server configuration SIP**
  All ACS components are installed on two servers (primary and secondary).
  This configuration requires **two** physical servers.
- **Redundant System with Separate Servers configuration SIP**
  NeTS and Queue Manager are installed on two servers (primary and secondary).
  Media Server is installed on two separate servers.
  This configuration requires **four** physical servers.

5.2.2 CMG - BLUSTAR WEB SUBSCRIBER FUNCTIONS

This section describes how subscribers (office users) can benefit from using ACS.

5.2.2.1 Forwarding on CMG activity registration

On a CMG activity registration, the CMG subscriber's extension is forwarded to a specified destination. When an activity goes out of date, the forward is automatically removed. The CMG server uses the PBXSTD component to request the forwarding from the call manager. An activity can be forwarded using the following services:

- Office Web
- BluStar Web
- Quick application
- Mobile user client
- IP Phone Services (CUCM)
- *23 service

5.2.2.2 Activity registration using the *23 service

ACS supports activity registration directly from any hard or soft phone. CMG subscribers can dial *23*<code>*<date/time># from their own extension to register activities in the CMG database. Dialling #23# disables the activity and the forwarding is reset.

5.2.2.3 Presentation of A number for blind transfer

The A number is presented to the subscriber when the attendant has performed a blind transfer.

5.2.2.4 Line state on extension mobility

Note! Only applicable for Cisco Call Manager.

ACS supports line state on extension mobility (if a subscriber logs in on another device).

5.2.3 SERVER-SIDE FUNCTIONS

This section describes technical issues that have no visible impact on users but are of importance for technicians/system administrators.

5.2.3.1 Centralized configuration

The configuration is centralized for the telephony server, its backup servers and all InAttend clients. All ACS components are configured in the Telephony Configuration Application (TCA).

5.2.3.2 Configuration update without restart

It is possible to change queue configurations and operator groups without restarting any services after deployment.

5.2.3.3 Client queues configuration

It is possible to configure operator groups with a unique set of queues. Operator groups can share queues with one another. If a queue has reached the maximum

number of calls or if the queue is passive, calls entering that queue can be redirected to a queue in another operator group. Queues will appear in the InAttend client according to their priority configuration.

5.2.3.4 Attendant Connectivity Server domains

Attendant Connectivity Server domains can be used in hosted solutions to isolate customers from each other. Domains can also be used in non-hosted solutions for localization (e.g. when groups of extensions use different call managers to access the PSTN). Domains in Attendant Connectivity Server can be mapped to SIP domains.

5.2.3.5 Line state server

The configuration of line state servers is managed by using SIP and CSTA, which means no manual configuration when adding new phones. All line state servers have multiple call manager support.

Line state servers for Cisco Call Manager support the following functionality:

- Line state on Cisco device profile
- Line state on Cisco remote device profile (SIP)
- Line state on shared lines
- Set forwarding on Cisco extensions
- Set forwarding on shared lines
- Set forwarding on device profiles
- Message Waiting Indication on Cisco extensions

5.2.3.6 Queues

5.2.3.6.1 Queue entries

Each queue can have one or more Queue Entries. A Queue Entry defines an access number and a call behaviour for the caller in the queue. Multiple Queue Entries on a queue enable a single queue to behave differently towards the callers depending on which Queue Entry the caller entered through. Each queue entry can have different active hours.

5.2.3.6.2 Welcome message and music-on-hold

It is possible to play a welcome message when a caller enters a queue and then play music-on-hold and queue prompts to the caller while waiting in the queue. This is configurable for each queue entry.

5.2.3.6.3 Configurable Open and Close for each queue

Each queue entry can be configured to open and close at specified times on a daily basis. When a queue is closed, all calls to that queue can be routed to another destination (queue or address). This is configured per queue entry.

5.2.3.7 Multiple call manager and queue manager cluster support

For SIP, one Attendant Connectivity Server can be connected to call managers at multiple locations using different SIP trunks. The served call managers can be of different versions and types (hybrid solution) and work with Attendant Connectivity

Server as long as they meet the requirements. For scalability issues, the Attendant Connectivity Server can be configured to run on multiple machines in large solutions. In this case the telephony servers are isolated from each other in terms of functionality but use one single configuration and can benefit from one single Media Server.

5.2.4 TECHNICAL CONCEPTS

5.2.4.1 SIP

All connections between the InAttend client and the Queue Manager are setup as persistent sockets with configurable ports.

The RTP streaming ports range for incoming connections to the InAttend client is 40 000 - 40 004 (default). The RTP streaming ports range for incoming connections to the Media Server is 40 000 - 50 000 (default).

5.2.4.1.1 SIP trunks

ACS is setup as a SIP proxy application server. The call manager is configured so that telephone numbers that should be handled by ACS are routed to the IP address and port(s) of the ACS. The Attendant Connectivity Server supports TCP/IP and UDP on the SIP trunks.

5.2.5 CALL CASES

This section describes call cases that describe in detail how a call is handled when arriving to a queue.

5.2.5.1 Call entering queue without media termination (SIP)

This call case describes in detail how a call is handled when it arrives at an attendant queue without media termination (i.e. no messages played when queuing).

1. A call is placed to a main office number. A call is established through the call manager and routed to the SIP-trunk handled by ACS.
2. When a call arrives at the NeTS-module at the SIP port, NeTS uses the configuration information to launch the correct application (state machine) for the call based on the called number.
3. The launched NeTS application for a queue entry number adds the call to the corresponding queue and manages all the SIP call handling during the queue and attendant session.
4. When a call is answered, a media session is set up with the Media Server. All media will be mixed and streamed to and from the Media Server.
5. Changes in the queues are sent as notifications to all InAttend clients monitoring the queue.
6. When an attendant answers a call through the InAttend client, the call is still handled in NeTS and the attendant media stream (from the sound card) is relayed through the Media Server.
7. When the attendant transfers the call, another call leg is created from the NeTS-module to the destination address over the SIP-trunk. The attendant can choose to stay with the call (consultative transfer) or let ACS handle the transfer (blind transfer).

8. When the target extension answers and the transfer is complete, the media streams are connected from end point to end point and the Media Server session is released.

5.2.6 CONSIDERATIONS

This section describes scalability, recommendations, limitations, and redundancy for ACS.

5.2.6.1 Scalability

Multiple SIP-trunks can be configured to support multiple call managers. Also, ACS can be installed on several machines. Several ACSs can use the same Media Server, or multiple Media Servers can be installed in a system to support large amount of call traffic.

ACS shares the Cisco resources between queues, which reduces the usage of Cisco resources (CTI ports).

5.2.6.2 Recommendations

Forward No Answer timeout - The service parameter Forward No Answer Timeout for the call manager must be set to be greater than the No Answer Timeout configured in ACS; otherwise the recall to attendant on the No Answer feature will not work properly.

5.2.6.3 Limitations

IPv6 – Ipv6 is not supported on target machines, as the only protocol or in combination with IPv4.

Power save – Power save on the network interface is not supported on the target machine.

Telephony traffic limitations - Limitation: 5000 BHCC (Busy Hour Call Completed) must be calculated.

Overlapping number plans - All users must have their own unique extension. Calls transferred from the attendants use the same calling search space. This means that the attendants cannot transfer calls to a specified domain if the extension is not unique. Overlapping numbers on different managed call managers are supported.

Attendant work place (headset and sound card) - The attendant work place can only be configured with one unique line. (SIP)

Time zones – there is no time zone support.

5.2.6.4 Redundancy for SIP

The preferred method for achieving redundancy is to use DNS SRV records. For more information, see call manager related documentation.

6 TECHNICAL ASSISTANCE

Mitel provides *www.mitel.com* as a starting point for technical assistance regarding all products, including the CMG application suite. From here, partners can obtain online documentation, FAQs, latest software updates and request further technical assistance.

7 REFERENCES

[1] Mitel Installer Overview

[2] InAttend Installation and Configuration Guide

[3] InAttend Installation Preparation Guide

[4] BluStar Server Installation and Configuration Guide

[5] InAttend User Guide

[6] InAttend Administration and Maintenance Guide

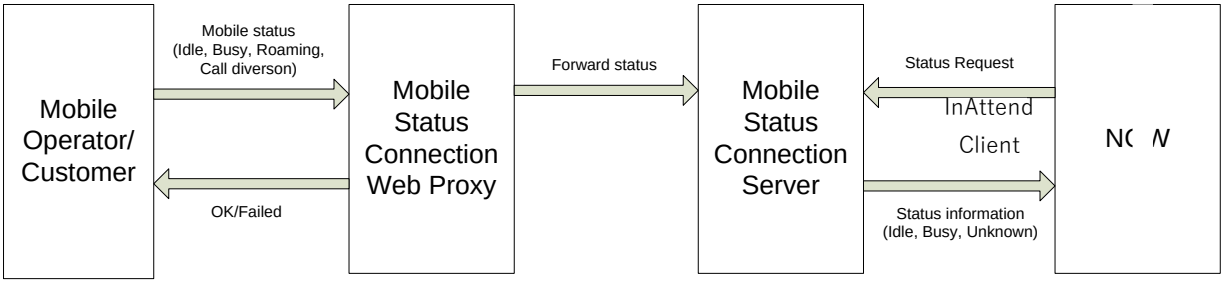
[7] Enterprise License Manager (ELM), Technical Guide

[8] Mobile Status Connection Installation and Maintenance Guide

[9] InAttend Compatibility Matrix (available on InfoChannel)

8 APPENDIX I - MOBILE LINE STATE SERVER

Mobile Status Connection (MSC) is used to communicate line state for mobile phones from the mobile operator to the InAttend client.



The MSC software consists of two parts, the MSC Web Proxy and the MSC Server, usually installed on different servers.

The customer, that is, the mobile operator, sends line state to the MSC Web Proxy interface and gets a response from the proxy. The MSC solution itself is not able to poll status information from the operator's systems due to security and network traffic load. The web proxy forwards the status to the MSC Server where it is stored in a non-permanent cache. The cache's intention is to store status information for each mobile number and provide it to the InAttend client upon request. This is due to the unidirectional way of communication that prevents polling of line states from the operator directly.

Note! If the operator fails to send updated line state at some point, the cache's content might become invalid. In addition, if the MSC Server is restarted it does not contain line state information until it is updated with new line states from the operator.

8.1.1 MODE OF OPERATION

The operator sends line states contained in messages (formatted according to the specifications in the MSC Web Proxy interface) to the proxy, and receives a response message with a format that is also defined in the interface.

The proxy works only as a generally accessible interface and does no data processing itself. The proxy forwards the provided data to the MSC Server, where it is stored in the cache.

When an InAttend client requests line state information for a specific mobile device, the stored data is mapped to the three line states the InAttend client can handle – idle, busy or unknown – and sent to the client. Any additional information (e.g., regarding roaming or call forwarding), is sent to the client as extra information, but it is not reflected in the client's user interface.

The mobile operator is responsible for:

- implementing a pull mechanism that runs on status changes of monitored mobile extensions
- translating and formatting generic status information so that it meets the requirements of the interface definition
- wrapping the status information in messages that match the interfaces' operations definitions
- processing the response messages sent back from the proxy and trigger further actions (for example re-sending messages the proxy failed to receive), if necessary

The MSC Web Proxy is responsible for:

- receiving properly formatted messages containing line state for a mobile extension
- forwarding all line state information from properly formatted messages to the MSC Server
- confirming reception and forwarding of status messages with a response message to the operator, or reporting errors in reception, forwarding or server-side processing. The response message can contain a detailed error description in the message body.

The MSC Server is responsible for:

- receiving line state information forwarded by the proxy
- updating the cache with newly provided line states
- translating cached line state data for a specific mobile number (when requested by the InAttend client), and sending the translated data to the InAttend client

8.1.2 TECHNICAL BACKGROUND

This section describes the technical details of the InAttend components.

8.1.2.1 MSC Web Proxy

The MSC Web Proxy is a web interface running on Microsoft IIS that can receive messages. It automatically connects to a running MSC Server if the configured IP address and port number match.

The format of the messages and the permitted variable types for attribute values are defined by the interface's operations. The following operations are available:

- QueueChanged*
- PhoneStateChanged
- QueueHandlerGroupChanged*
- RedirectionChanged
- RoamingStateChanged
- MobilePhoneStateChanged
- Ping*

Note! Data processing for operations marked with an * is not implemented on the server-side.

The operator is responsible for providing each message with a unique ID number (attribute <SequenceNumber>) that the response message refers to as part of its content.

The response message also contains a result string value. The string value can be “ok”, “failed”, or a detailed system error description.

For further information about the operations and the values they expect and return refer to the “Mobile Status Connection – Web Proxy Interface Description” document.

8.1.2.2 MSC Server

The MSC Server runs as a Windows service, and automatically connects to a running MSC Web Proxy if the configured port number matches.

The MSC Server consists of a non-permanent data cache that stores the line state transmitted by an operator as delivered, to ensure that a maximum of information is available for future client development. When requested by an InAttend client, the MSC Server retrieves the line state information for the specified mobile from the cache and maps it to one of the status values supported by the InAttend client – “Idle”, “Busy” or “Unknown”. If no line state could be retrieved (e.g., if the operator has not sent any line state for the mobile yet), the status is displayed as “Unknown”.

Note! In this case, the attempt to start monitoring failed. That means that the attendant sees the Unknown symbol (the question mark) in the InAttend client and the mobile device changes status for the first time since the MSC Server was started; the attendant is not updated and still sees the question mark.

The InAttend client retrieves the line state for a specified mobile by requesting a cache look-up from the server. However, if the number used in the InAttend client differs from the number sent by the operator, it is necessary to configure a prefix removal and/or pattern transformation (e.g., if the number in the InAttend client is “7005”, while the operator sends the whole number “+46 736-7005”). This way, the numbers in the cache can be transformed accordingly to match the result with the number provided by the InAttend client.

Note! Restarting the server clears the cache, and the InAttend client displays the monitored mobiles in “Unknown” state. This does not necessarily reflect their actual state. They are only updated again when the operator sends a new line state.

8.1.2.3 Mobile Operator Line State and InAttend Client Line State

The Attendant client is restricted in the number of different line states it can display, while the number of potential line states sent by the operator to the MSC system are not as limited.

The MSC Server maps operator line states to line states that the Attendant client can handle according to the table below.

OPERATION	OPERATOR LINE STATE	ATTENDANT CLIENT LINE STATE	ATTENDANT CLIENT EXTRA INFO*
PhoneStateChanged			<state>
	Idle	Idle	-
	Busy	Busy	-
	Off	Unknown	Off
	BusyQueue	Unknown	BusyQueue
RedirectionChanged	(no line state sent with this operation)	(line state not affected by this operations)	<redirectiontype> CFU CFB CFNRC CFNRY <redirectionnumber> Any expression
RoamingStateChanged	(no line state sent with this operation)	Unknown	
MobilePhoneStateChanged			<state>
	Idle	Idle	-
	Busy	Busy	-
	Off	Unknown	Off
	BusyQueue	Unknown	BusyQueue

*) The InAttend client receives extra information as an addition to the mapped Attendant client-compatible line state, but cannot process it into meaningful information for display. The extra information appears in the log.