

Technology to Support Contact Center Agents Working Remotely

Increasing mobility and the co-existence of TDM and VOIP installations require that CTI functions for contact centers be extended to support PSTN and SIP-based remote agents not directly connected to the CTI environment.

Computer telephony integration (CTI) for contact centers was originally developed for office PBX environments, that is, non-remote. However, advanced telephony services and mobility have been incorporated into new telephony protocols and technologies such as VOIP and SIP. As a result, mixed situations, where legacy PBX, PSTN, CTI, and VOIP co-exist, will continue well into the future and lead to scenarios where remote call center agents will need to work in mixed PSTN/VOIP environments. This paper describes the increasing importance of mobility and the implication of experts in call center operations. It covers the basic requirements to be supported and describes the technology elements for a PSTN environment, a SIP environment, and a mixed environment to satisfy those requirements.

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Introduction

A telephony abstraction layer exists today, making it possible to build end-user applications such as intelligent skill-based routing independent of the underlying hardware platform. The initial technology, developed by Genesys, consisted of an abstraction of multiple proprietary CTI interfaces. It has now been extended to provide a broad range of application layer technologies based on VOIP and SIP.

This paper will concentrate on a particular aspect of modern contact centers – mobility. It focuses on connecting remote agents to the contact center no matter what technology is used.

Remotely connected agents raise an additional challenge to application developers - determining the agent state. Specifically for remote agents connected to the PSTN, it is a challenge to know if the agent is on call or not.

Requirements

Remote agents and experts in contact centers

Modern contact centers typically involve experts and knowledge workers who work remotely - from home or from locations other than company headquarters. Several major reasons exist for this:

- organizational structure: many companies are organized across multiple locations - headquarters, branch offices, manufacturing sites, etc. Experts might be located at any of these locations.
- peak traffic management: additional reserves of experts and knowledge workers can be brought in as contact center agents in case of contact center overload at peak times.
- moves: with the dynamic nature of today's economy, it is typical for people to move from one location to another. Contact centers need to maintain access to their experts' knowledge, since new hires need to go through a lengthy training period if they are to provide the same level of service as the more experienced workers.
- mobility: today, people prefer mobility, and expert workers enjoy the freedom of selecting their physical location.

Co-existence of PSTN and VOIP

Computer telephony integration (CTI) was originally developed for office-bound PBX environments by PBX vendors and third party CTI companies. However, mobility and advanced telephony services have been incorporated in new telephony protocols and technologies, particularly SIP and VOIP. Today, mixed technology scenarios are widespread, and legacy PBX, PSTN, CTI and VOIP technologies will co-exist well into the future. Consequently, remote agents may need to work in mixed PSTN/VOIP environments. The following situations are quite possible:

Agent Mobility

There are situations where a remote agent might need to change location, yet continue to handle calls. An agent may work:

- at a regular CTI-enabled location – with a PBX phone in the contact center;
- at a non-CTI-enabled location - from a PSTN phone at home or in a hotel;
- using an SIP (VOIP) end point- a SIP phone or Windows Messenger, using a fixed broadband connection such as a DSL or cable connection at home;
- using an SIP (VOIP) end point - via a temporary wired or wireless broadband connection such as at a hotel.

Such changes of location might be typical or even frequent for some remote agents/experts. Those who travel a great deal, for example.

It is important to provide a consistent level of customer service, even when the location and access method of the agent/expert change. Presence technologies could be applied. Based on the agent's current location/access method, which are reported via a presence channel, the system can select the appropriate method of routing calls to the agent. In a case where the agent changes location and the access method from PSTN to SIP, this might involve media conversion using media gateways.

Signaling and media conversion

In a case where the expert moves from a location with a PSTN phone to one with a SIP access point, the system must be able to route calls to that agent via the new route path, including media conversion through the media gateway. A typical scenario might be:

1. The expert works at home, using a non-CTI-enabled phone.
2. The expert logs off from the home location and goes on a business trip.
3. While waiting at airport, the expert connects to the contact center via a public wireless access point, using a SIP end point.
4. When the expert logs in, the presence data contains information about the new access method (SIP) and the expert's current address.
5. Further calls are routed to the expert through the media gateway.
6. When the expert logs off, calls are routed elsewhere.

Requirements for contact center software to support remote agents

The following high-level requirements for contact center software support remote agents in mixed PSTN/SIP environments. These requirements were identified in the course of developing the Genesys Expert Contact Solution.

Screen pop-up with data transferred from the contact center

The remote agent is notified of call (screen pop-up) in the Agent Desktop Application. The notification includes data collected on the call in the contact center, for instance, IVR scripts, database look-up, etc.

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Call monitoring

The call status is constantly monitored, and notifications are sent to the remote agent. The remote agent receives the notification in the Agent Desktop Application, synchronized with the operations performed on the physical handset or in the VOIP soft phone.

Call control, such as routing back to the contact center

The remote agent has control over the call and can perform operations such as:

- re-route the call back to the contact center,
- transfer the call directly to another agent,
- add other agents to the call (conference).

Presence and availability management

The Agent Desktop Application notifies the system of the agent's current status. A high-level agent status might include:

- ready – when the agent is ready to process calls,
- not ready – when the agent cannot process calls.

In conjunction with the agent's status, the presence channel in a VOIP (SIP) environment provides the following additional information:

- the device status,
- the current location (IP address) and access method for the remote agent.

Figure 1 represents a sample of screen pop-up with customer information attached, call control buttons, call progress controls, and buttons to accept or reject the call.

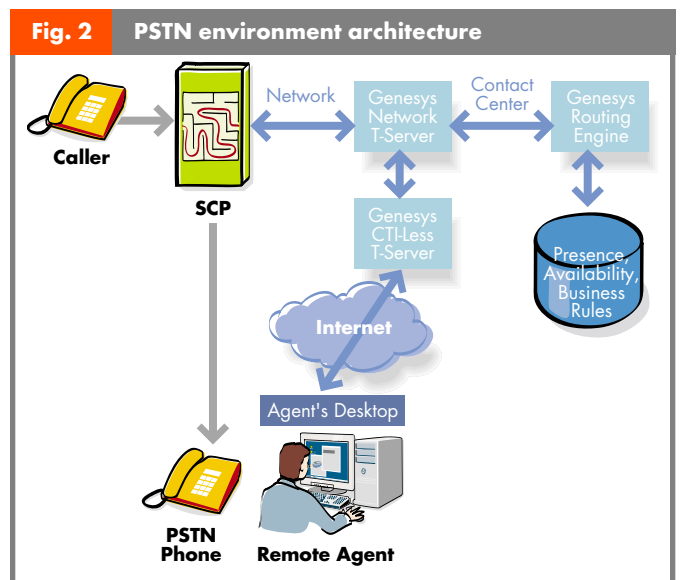
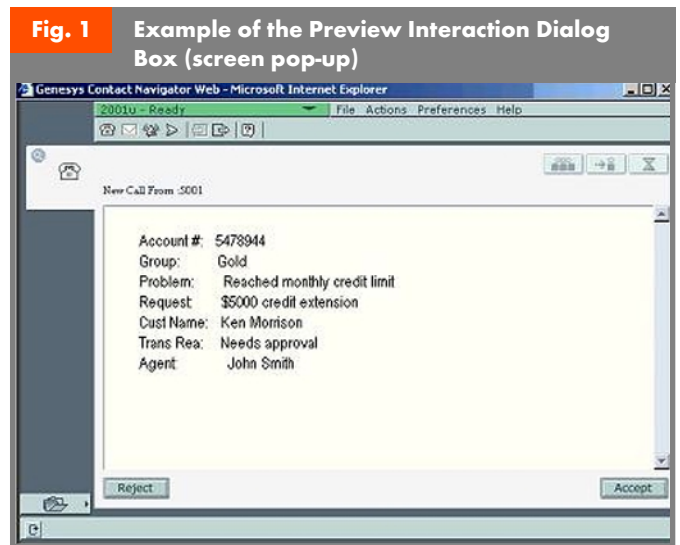
Automatic re-routing of an interaction when the call is not answered

The system must cater for a situation when the remote agent does not answer the call within a certain time interval. In this situation, the system must automatically re-route the call and suppress routing of further calls to this agent, for instance, by automatically changing the agent's status.

Interaction preview for the expert to be able to either reject or accept an incoming interaction, based on information attached to the call

The system must allow the remote agent to preview information about the interaction, thereby allowing him to accept or reject the call. This functionality is suitable for experts who, in contrast to contact center agents, may wish to address only a subset of interactions, selected according to certain criteria. This functionality is called "interaction preview." The following types of interaction preview are also possible:

1. Interaction preview broadcast: an interaction preview request is sent to several potential targets (remote agents) simultaneously. The first agent to accept the interaction preview request handles the interaction.



2. Multiple interaction preview: sometimes more than one interaction needs to be delivered to an expert at the same time. Interaction preview requests about all interactions are sent to all the potential targets. When an expert receives several interaction preview requests at the same time, he can choose which one to handle.
3. Background interaction preview: interaction preview requests should be sent to an expert even if this expert is already handling another interaction. The expert can then transfer/reroute/disconnect the current interaction and accept the new one. For example, an expert broker is talking on the phone with a potential client. While the conversation is in progress, a new interaction preview request arrives with an indication that the new call has higher priority than the current one. The broker transfers the current interaction to another broker and accepts the interaction preview request so as to receive the new call.

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Technology

This section looks at the architecture for a PSTN environment, a SIP environment, and a mixed environment and determines how it fulfils the requirements for remote contact center agents and experts. The major challenge here is the fact that the remote agent's phone is not connected to a PBX, so no CTI functionality is available.

Technology and architecture for a PSTN environment

Architecture

Figure 2 depicts the architecture of the PSTN environment that supports network-level routing to the remote agents.

The Genesys Network T-Server is an application communicating with a Service Control Point (SCP). A modern SCP can provide

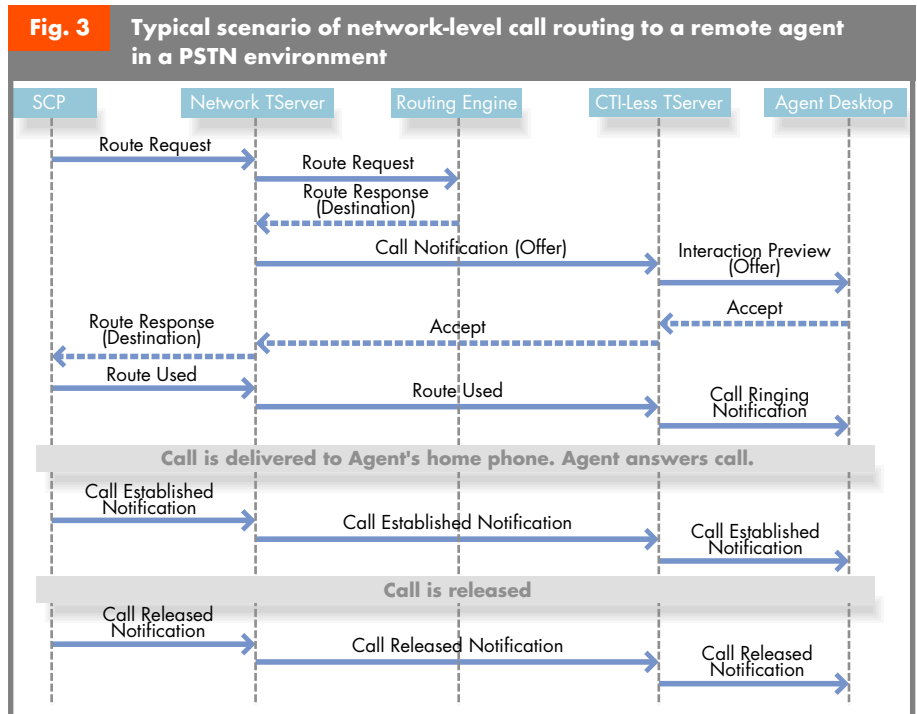
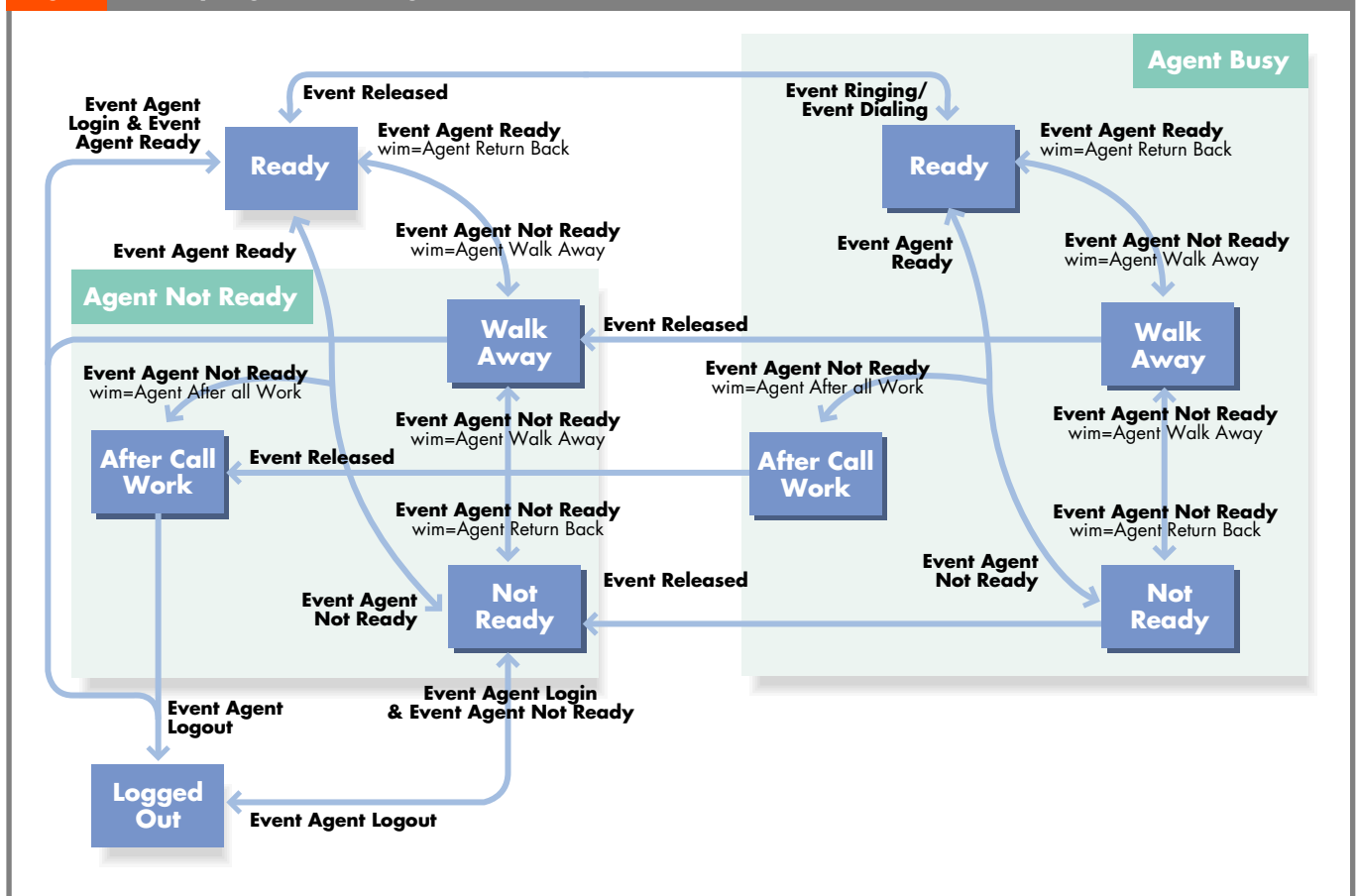


Fig. 4 Genesys Agent State Diagram



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notification on call progress via the CTI interface. It is the core technology element – the so-called network-based call monitoring – that provides the Genesys system with call progress notifications. These notifications are processed by the Network T-Server and then passed to the CTI-Less T-Server, which translates them to regular Genesys framework notifications and enables the rest of the Genesys applications to monitor the remote agent in exactly the same way as is done for PBX-connected agents.

Network-level routing in a PSTN scenario

Figure 3 illustrates a typical scenario for network-level routing of a call to the remote agent in a PSTN environment, including Network Call Monitoring and Interaction Preview. The diagram illustrates two major elements. One is the Call Notification message sent from the Network T-Server to the CTI-less T-Server. This message starts the Interaction Preview session, which may be accepted or rejected. Another important element is the Call Established Notification sent from the SCP to the Network T-Server. This notification makes it possible to represent the correct call status on the agent's desktop. It also provides other Genesys applications – first of all the routing engine – with correct availability information.

Presence is a key element in today's advanced call routing strategies, because up-to-date knowledge about the agent's current status facilitates intelligent agent and agent skill-based routing. Presence in PSTN can be implemented by installing a special Genesys desktop that monitors operator activity on a mouse and keyboard. After a configurable timeout the agent will be considered in a "not ready" state.

Figure 4 shows the agent state diagram used in Genesys solutions and, in particular, in Genesys Expert Contact.

Availability is another key factor affecting the decision-making process in an intelligent routing strategy. The Genesys T-Server can capture the current status of a PSTN-located agent and use this information in routing, particularly in skill-based routing when a remote agent is included in a skill group.

How agents connected to a PBX can exchange calls with remote PSTN agents

Previous section describes the architecture for routing a customer call directly to an expert or remote agent without the participation of a PBX-connected (CTI-enabled) agent. Another case is when the customer call is first answered by a call center agent and then transferred to an expert because, during the conversation, the call center agent recognizes that additional expertise might be needed to solve the problem. The technology challenge in this scenario is that, as soon as the call center agent hangs up, all direct call monitoring functionality is lost. Trunk monitoring of an office PBX is the key technology used to support scenarios when a customer call enters the contact center PBX and is later transferred or routed to a remote agent. It makes use of the fact that PBX trunks are still in use and the call path includes an SCP, PBX trunks, and the remote agent PSTN phone.

Fig. 5 Trunk utilization when a call is transferred from a PBX back to the PSTN.

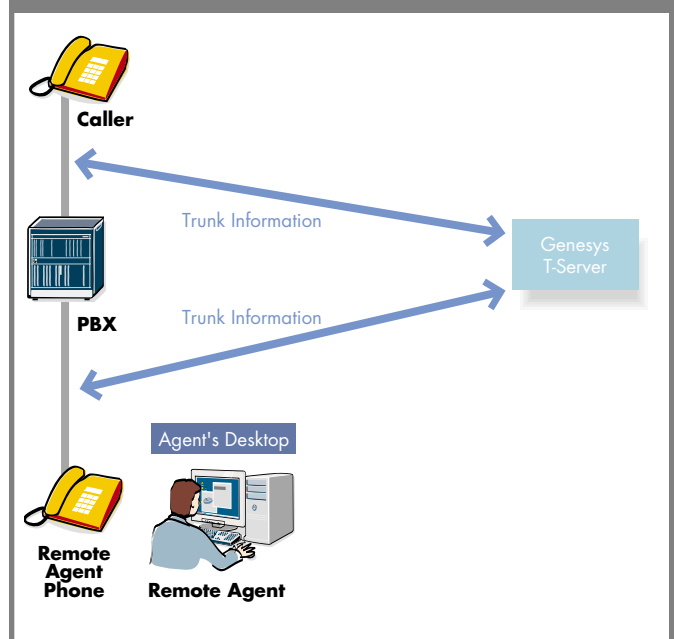
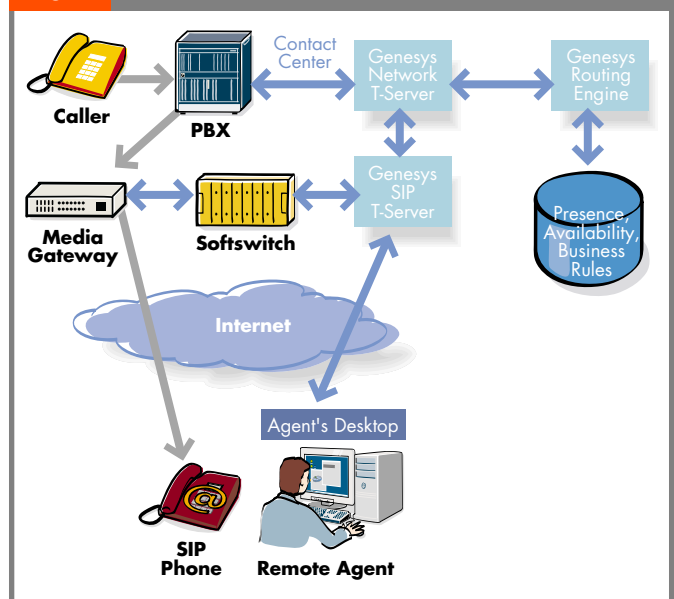


Fig. 6 Mixed PSTN/SIP environment architecture



When a call enters an office PBX and is subsequently transferred back to the PSTN, there is no specific device on the PBX participating in the call. However, trunks on the PBX are still being used, and trunk monitoring gives the major functionality needed to recognize that the PSTN agent is later ready to receive the next call.

Figure 5 illustrates trunk utilization after the call has arrived at the PBX and has been transferred to a remote PSTN agent.

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When the PSTN agent hangs up, the PBX trunk is released, and the Genesys T-Server marks the agents as available for the next call.

Architecture and technology for a mixed PSTN/SIP environment

Architecture

Figure 6 depicts the architecture of a mixed PSTN/SIP environment that supports routing to remote agents.

Technology

In this architecture, Genesys software has full control of the remote agent's phone via the Genesys SIP T-Server. The Genesys abstraction layer offers smooth migration from TDM telephony to IP and can select any vendor's soft switch, including the one provided by Genesys, which can support both SIP and H.323.

Technology and architecture for a pure SIP environment

In a pure SIP environment, the notion of remote agents disappears, making the solution robust and functionally flexible. A presence and availability capability built into SIP provides call control and monitoring functions naturally. In a pure SIP environment, the Genesys contribution ensures that the customer and agent experience remain the same as for a PSTN environment, and the application stack can be reused. Genesys provides both soft switch and stand-alone configurations. In a case where a customer is using a third party soft switch, Genesys provides a T-Server to connect to the Genesys framework (for example, a routing engine). Another possible configuration is for the Genesys SIP communication server to work as a soft switch and connect SIP phones directly.

Figure 7 represents an architecture with a soft switch installation. In this case, the soft switch performs all call control and agent availability functions. The Genesys SIP communication server is an interface to the rest of the Genesys suite (in this figure it is routing engine).

Figure 8 shows an installation where SIP phones are connected directly to the Genesys SIP communication server.

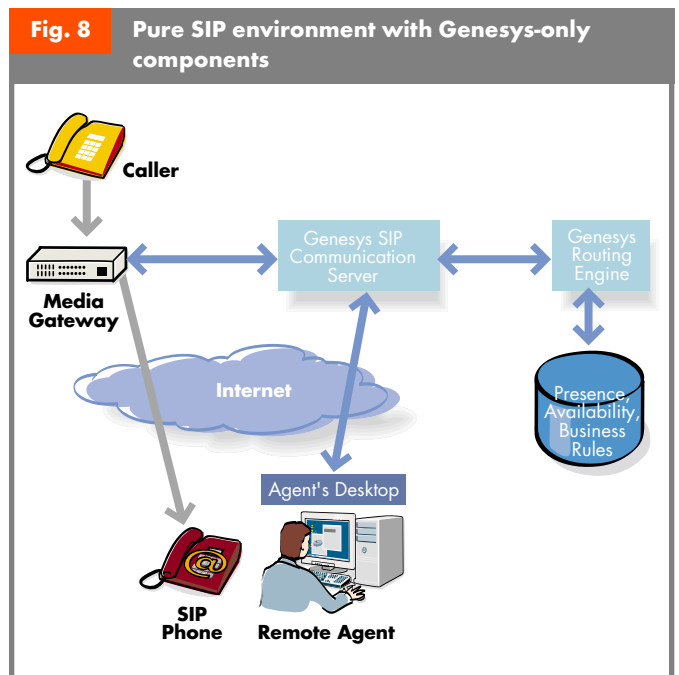
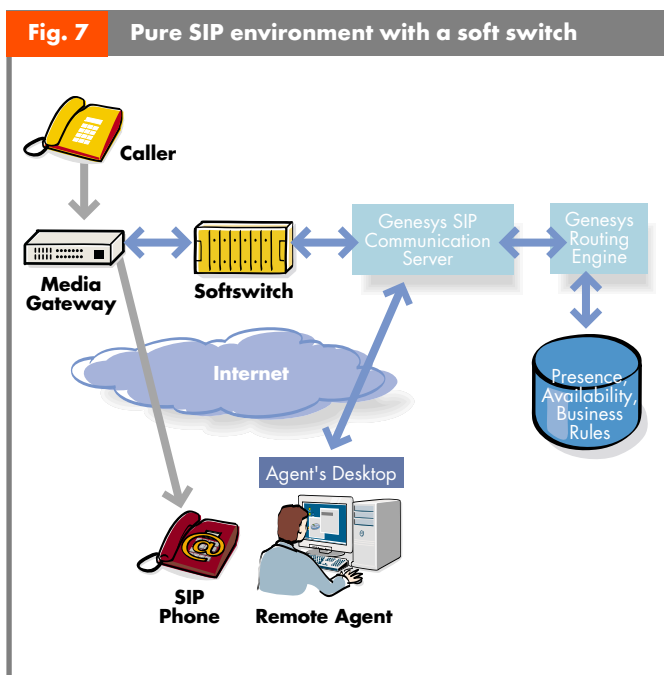
Conclusion

Genesys provides a unique solution that combines TDM and VOIP technologies to provide an independent application layer for routing and reporting. This application layer is built on top of the T-Server PBX abstraction.

Since mixed PSTN and VOIP environments will continue to exist in the near future, Genesys is concentrating on providing solutions that are also neutral to these underlying technologies.

The following are the key elements of the Genesys solution for remote agents and experts:

- agents are increasingly remote, and this leads to the need to provide a robust solution supporting mobility;
- consistent user and agent experience is key in a mixed environment;
- Genesys has a solution that uses all the latest advances in technology to resolve the issues and provide an integrated solution for both SIP and PSTN environments.



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Glossary

- T-Server** Genesys Telephony Server – an abstraction layer that provides the same interface to the application layer, such as routing and reporting.
- PBX** Private Branch Exchange – a telephone system that switches calls among enterprise users on local lines while allowing all users to share a certain number of external phone lines. The main purpose is to save the cost of requiring a line for each user.

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