Computer Telephony Integration (CTI)
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1 Introduction

Computer Telephony Integration (CTI) is the exchange of commands and messages between computers and telephone equipment. In simplest terms, CTI is the technique of coordinating the actions of telephone and computer systems. The ultimate goal of CTI is more efficient handling of incoming and outgoing telephone calls. CTI bridges the telecommunications industry with the computer industry, and introduces new, integrated applications such as:

- Automated call management and routing
- Unified messaging
- Database interaction
- Videoconferencing

CTI gives companies the ability to turn a desktop computer into a powerful communications tool that can combine sight, sound, text, animation, video, graphics and other sophisticated telecommunication functions.

Computer-Telephony Integration has been around since the late eighties. However, it is only after more than a decade that it was widely adapted by the business world. Until recently, CTI was mostly confined to contact centers where the complex integration processes can provide sufficient benefits to justify the high costs involved. CTI has come of age with affordable, feature-rich solutions for improving customer service and employee productivity. The dissemination of voice messaging, followed by ACD and IVR, were major milestones in the commercialization of CTI applications. Now, the next phase of CTI deployment, Desktop CTI, has arrived, and the days of expensive customized applications driven by proprietary links between the telephone system and the computer are history.

As customer relationship management and co-creation models evolve, and with newer sales channels gaining prominence the world over, CTI functionality has become relevant to enterprises across various sectors. However, rather than being used a standalone technology, CTI will evolve to be a building block in the overall IT and network architecture of the organization.
2 History

CTI involves a connection between a computer (single workstation or a file server on a local area network [LAN]) and a telephone switch. In a CTI environment, the computer controls the movement of calls by issuing commands to the switch. CTI adds computer intelligence to the call management process – making, receiving and routing calls. Traditionally, CTI was used in contact centers, where call volumes easily justified the cost of complex custom-built systems. Due to a number of factors that significantly simplified computer telephone systems, CTI rapidly expanded to organizations of all types.

First generation CTI applications focused mostly on offering 'screen pops', bringing up CRM data based on the number from which the call originated. While screen pops still remain the most pervasive use of CTI technology, they are no longer the most important when it comes to enhancing agent productivity or improving customer service levels.

Second generation CTI applications focus on the following areas:

- Improving call routing
- Enriching the interactions between ACDs and voice response system-based scripting languages
- Changing the way customer data is used and accessed by client applications
- Creating better ways to collect, store and interpret caller data

These applications are investment intensive, but have profoundly changed the way a call center operates.
3 Technology

When a call center receives a call, it carries some form of identification – either ANI (automatic number identification) or CLID (calling line ID). The switch would interpret this data and send it to a computer that would look up the information in a database and provide instructions to the switch as to where the call should be routed. Simultaneously, the customer's database record is transferred to the agent's desktop to which the call is being routed. Routing can be either skills-based (where the agent most equipped to handle the customer or the agent who had handled the customer the previous time gets the call), or productivity-based (where the agent who has been most idle gets the call). This is done through an automatic call distribution (ACD) system. ANI provides for the transmission through the originating (calling) party's billing number (BN) network. Current networks send this information through the digital Signaling System 7 (SS7) network, although the presence of SS7 is not required for ANI operations. The calling party cannot block the information. As the call progresses, the BN is presented to the ACD, and the ACD runs a query in the database, extracting the profile of the caller. The agent answering the call receives a 'screen pop' with the caller's profile.

To gain access to ANI data from the central office, there needs to be a trunk side connection (toward the central office) that supports this functionality.

The delivery of CLID information assumes the following:

- The entire network of switches must be supported by SS7.
- The calling party must originate the call from a single-channel line.
- The originating line/caller must not block the transmission of information.

The proprietary nature of the early applications served as a significant deterrent to faster implementation of CTI. In 1995, a set of industry standards were established (TAPI and TSAPI) and proprietary links gave way to open protocols, a critical milestone for desktop CTI's wide-scale development. With the explosion of Microsoft's Windows 95/98 and Windows NT, all of which include TAPI for no additional charge, TAPI was well on its way to becoming the de facto CTI standard.

One of the key technology challenges for CTI is that the underlying technologies are rapidly changing. There are different interface bridging requirements for the various new media – POP3 for email, multiple internet browsers, Java applets and servlets. This is in addition to the physical differences such as X.25 messaging and TCP/IP LAN connectivity. Thus, CTI function today needs to integrate multiple protocols with a single viewing tool.

By 2008, most PBX vendors had aligned themselves behind one or two of the TAPI, CSTA or TSAPI standards. The TSAPI advocates were Avaya, and Telrad. The CSTA advocates were Siemens (now Unify), Aastra, DeTeWe, Toshiba, and Panasonic. A few vendors also promoted proprietary standards – Mitel, Broadsoft, Digium, and most hosted platforms.
The advent of IP based telephony has opened up several possibilities such as PC softphones, remote and distributed agents, connecting over IP in a single session. There is also the possibility of cloud hosting solutions and even entire telecom networks. Regardless, CTI continues to be a compelling technology that marries voice and corresponding data, whether the contact is circuit switched or packet switched. Meanwhile, equipment vendors are offering both classic CTI as well as converged systems, allowing contact centers to customize technology to suit their specific requirements.

There are two ways to enable CTI within a CRM environment – CTI adapters and Open CTI.

1. A CTI Adapter is middleware software that runs on the agent’s desktop and acts as an intermediary between the telephone equipment and the CRM software. Whenever a call is routed to the agent’s phone, the adapter acts as the gateway to the softphone within the CRM system to alert the user and provide the correct screen pop. For outbound calls, the screen pop appears first, followed by a dial out from the softphone, which is then connected to the telephone equipment. Thus the Click-to-Call functionality in a CRM system also utilizes the CTI adapter feature.

   a. CTI adapters may be integrated with the CRM system or can be purchased independently from vendors who have created them. It is important to choose the right vendor for the CTI adapter. A safe way to do it is to get it from the vendor who has manufactured your telephone equipment – such as an Avaya CTI adapter for Avaya systems, or a Cisco adapter for Cisco networks. Free CTI adapters are also available in the market.

2. The second option is Open CTI, which is a framework introduced by Salesforce.com, a popular CRM tool. It allows “customers and partners to embed third party web apps directly into Salesforce.” This eliminates the need for an adapter running on the client’s machine and truly makes the CTI functionality a cloud sourced solution. It is a JavaScript based API that is designed to interact with web-enabled telephony systems. This means that Salesforce.com users will have a seamless user experience, allowing the agent to perform necessary work without any knowledge that a hand-off has occurred within the software/browser.
4 Cost Savings through CTI

Studies have shown that CTI can enhance productivity levels in the contact center by as much as 17%. CTI's cost savings comes from better call routing. This leads to higher FCR rates, caller specific announcements and greetings, caller specific sales and service scripts, screen pops, and pre-fetching of relevant caller data.

Not all contact centers with ACD/PBX installations have adopted CTI as it is an expensive technology that is complex and hard to integrate with legacy applications. Also, with VoIP gaining prominence, the need for CTI no longer exists. This is because all-in-one IP-based systems will offer multiple ways by which a customer can contact the enterprise. All of these contact points will be integrated, be it via IP, voice, fax or wireless. This does not mean that CTI will disappear. Rather, the technology will evolve to function as an integral part of the switching network that controls call traffic and integrates the flow of data with voice calls. The intelligence will move away from the switch to middleware, and decision making will now be done by the middleware based on data accessed from the database.

In addition, the responsibility of CTI management will move from the telecom manager to the IT manager. This will increase the need for data-related software solutions instead of hardware solutions such as the switch, which is the telecom manager's domain. The CTI middleware market is booming as the following changes are causing the technology to rapidly evolve:

- Call control and media processing moving away from the switch to the software
- Mixed media interactions that need to be integrated with backend CRM systems
- Convergence of voice and data that increases competition from a new breed of vendors

As contact centers become a strategic tool for enterprises to enhance customer loyalty and retention, it is essential that the contact center’s database and customer profiles are integrated and used effectively. While the CTI concept still matters, it will undergo drastic changes as contact centers can now accept screen pops from not only ANI and DNIS, but also from cookies and IP addresses.

Where CTI can offer a competitive advantage is during peak sales season, such as an online store during the holidays. While sales may be high, it is essential to ensure corresponding service levels to make sure that customers spread the good word. If done right, managing customer interactions effectively using CTI-based techniques such as screen pops and skills-based routing can go a long way towards keeping customers happy.

While traditional hardware based CTI is expensive and was limited to large contact centers, new middleware systems are far easier to integrate with legacy systems, and are available at price points that make it affordable for small and medium enterprises.

However, as long as there is a large installed base of PBXs and ACDs, traditional CTIs will continue to grow. Just two decades back, there were nearly 79,000 call centers in US and Canada. Of these, only 14,300 were CTI-enabled. This created a large market for CTI solutions. But newer implementations will no longer be a discrete CTI platform attached to existing equipment. Several vendors today offer
CTI solutions bundled with other software applications such as CRM software, web chat, email management and other collaboration capabilities. Newer contact centers that are not burdened by high-cost legacy hardware are readily opting for such solutions.

4.1 Vendor Landscape

The CTI vendor landscape is evolving in line with the underlying technology. Most small vendors have merged with larger companies, enabling faster technological growth with the availability of greater resources and a stronger market presence. For example, Genesys Laboratories, which entered the CTI market in 1989 with the T-Server, is now a division of Alcatel. T-Server has a huge installed base and is used daily the world over. It started off with a basic screen pop feature, but has since added features such as skills-based routing, configurable attributes, product portfolios, and so on.

Dialogic, another major player in the CTI space, was acquired by Intel. Dialogic supplies boards that aide in cross-communication between switches from multiple vendors. These boards can sit on a PC and talk to software, interface with the telephone network, and handle other media sources such as VoIP, fax, email and video conferencing.

As new customer service channels such as email and chat emerge, many call center skills and services are being transferred to these channels to serve customers’ web-driven requirements. As voice and data services merge with the advent of VoIP and smartphones, CTI needs to evolve into channel integrator software. Vendors that are ahead of the curve and constantly upgrade their product suites to meet the changing market requirements are the most successful. As convergence with data communications increases, there are more and more ways for desktop applications to integrate. The separate hardware approach has almost died. Today the majority of systems has changed from hardware to software, and most installations are converged systems that have multiple capabilities.

Credit card issuers are putting CTI products to work to make their customer-service and collections departments more efficient. Eventually, industry experts say, the technology will cause a dramatic shift in the way banks organize their customer-service and collections departments, and in the way they use their agents. The card issuer may also purchase automatic number identification (ANI) and dialed-number identification (DNI) services from its long-distance or regional telephone provider. ANI speeds calls up by identifying the caller immediately, while DNI allows calls to be more accurately routed. The latest twist in the collections area is the merging of inbound and outbound call operators, thanks to a product introduced by Digital Systems. VoiceLink Intelligent Call Blending automatically routes inbound calls to outbound agents when there is a surge on the inbound side.
5  Practical Applications

Computer Telephony Integration has several practical applications. The main job of a CTI system is to improve the process of handling incoming and outgoing calls in terms of both speed and efficiency. Calls can be automatically routed, recorded, and reported to further improve telephone operation and benefit the business. CTI gives agents the information they need to properly serve customers, thereby improving their productivity and job satisfaction, and making customers happy in the process.

Some of the practical applications of CTI are:

1. **Screen Pops**: also called Intelligent Answer or Call and Screen Synchronization. A screen pop refers to the change in the computer display that occurs simultaneously with the arrival of a new call. Using technologies such as ANI (Automatic Number Identification), CLID, or DNIS (Dialed Number Identification Service), the system searches the database for the caller's record and presents it to the computer display. The specific information about the caller will vary, depending upon the kind of information maintained by the company (e.g. name, address, priority level, previous purchases, etc.)

2. **Contact Management**: Many popular contact managers are TAPI enabled, meaning that dialing directly from the contact record is possible, as are screen pops of the appropriate record based on incoming CLID.

3. **Screen-Based Telephony**: Also called softphone. Screen-based telephony is the process of using the PC keyboard and mouse to answer, transfer, conference, and manage telephone calls.

4. **Auto Dialers**: Electronic device or software that automatically dials telephone numbers. Once the call has been answered, the auto dialer either plays a recorded message or connects the call to a live person.

5. **Simultaneous Voice-Data (SVD)**: One of the most widely used CTI applications. Sharing computer screens, Windows applications, and whiteboards while conducting a voice conversation has revolutionized CTI applications. SVD applications range from technical support and sales presentations to videoconferencing.

6. **Interactive Voice Response (IVR)**: Another common use of CTI is in IVR systems. IVR gives callers specific information based on the unique details the callers enter (usually via touch-tone dialing). A common application is banking by phone. Callers enter unique information (a personal identification number [PIN]), and retrieve specific data, such as a checking account balance. The data is returned to the customer by way of a text-to-speech application. The key to IVR is accessing unique data specific to the caller. A client/server relationship is established between the caller and the database.

5.1  Key Benefits
Organizations today face a swiftly-evolving environment fraught with challenges. As customers have more and more choices when it comes to the purchase of goods and services, it is imperative that there is adequate focus on customer service in order to retain existing customers as well as acquire new ones. A highly efficient contact center is an essential part of the customer service strategy for most organizations. For a contact center to be world class, it must have cost-effective operations; however, a challenging economic environment makes it difficult to control costs such as agent remunerations. It is here that technologies such as CTI play a crucial part, by offering the twin benefits of efficiency and cost-effectiveness. Integrating various standalone hardware and software is an important element of achieving maximum benefit from technology without negatively affecting customer service.

Today, the pace of technological changes is so rapid and wide-spread that small and medium enterprises (SMEs), often without in-house technical skills and experience, are left wondering how to get maximum benefit from their limited budgets. The prospect of establishing an entire contact center architecture in-house can be daunting. However, third party contact centers offer all the advantages of technology at a fraction of the cost. This helps SMEs focus on their core competencies while customer service is handled by trained professionals. Choosing the right contact center is key, as partnering with the wrong vendor can prove an expensive mistake for your finances and your reputation. While evaluating a potential contact center, look closely at the level to which they have invested in technologies to enhance caller experience.

The most important aspects to keep in mind when selecting a CTI system are ease of use and integration capabilities. Unless it can easily integrate with existing hardware and software applications, such as the contact center’s call routing software, CRM database, and call management software, agents may not derive its full benefit. If the contact center offers both inbound and outbound services, the CTI system should be able to integrate with both applications and provide features such as automatic dialers.

Use of CTI-based applications offers several benefits to contact centers, broadly classified as cost reduction, productivity enhancement and better customer service.

- Calls are dealt with more efficiently, leading to increased customer satisfaction.
- Agents can address callers by name and have all their details in front of them before the call is connected, thus increasing customer service levels.
- Shorter call lengths due to less time spent gathering customer information during the call leads to cost savings and enhanced agent productivity. In one combined screen, CTI allows for the integration of call logs (e.g. call history, call recordings, call transcripts, call metrics) and other relevant caller data (e.g. personal information, support tickets, cases, events, chat transcripts, emails, purchase history, order fulfillment statuses, billing, reservations, etc.). This also helps the agent offer more personalized service as the caller’s history is readily available.
• Dialing, answering, transferring and placing calls on hold can all be managed on-screen for increased productivity. If a call is transferred to another agent, the caller's details are shared with the receiving agent. For outbound calls, agents can dial directly using a softphone from the PC, thus speeding up the connection and avoiding misdials.

• Databases created for other purposes can be used as directories, allowing agents to dial numbers and send instant messages directly from their PC.

• CTI helps to authenticate the caller by comparing the phone number they called from to information in the company's database and integrated business tools. This saves a significant amount of time and eliminates one of the biggest pet peeves of customers today - having to repeat their personal information and account information over and over again so the agent can pull up their account.
6 Conclusion

As stronger technologies evolve, the future of CTI in enterprise will continue to grow. CTI will be seen as a means to facilitate customer service along with CRM and other applications, rather than as a standalone technology. CTI implementations currently in place will be enhanced through modular add-ons aimed to bridge the legacy PBX/ACD installations and the Web. Thus, CTI is here to stay, albeit in a different form.
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