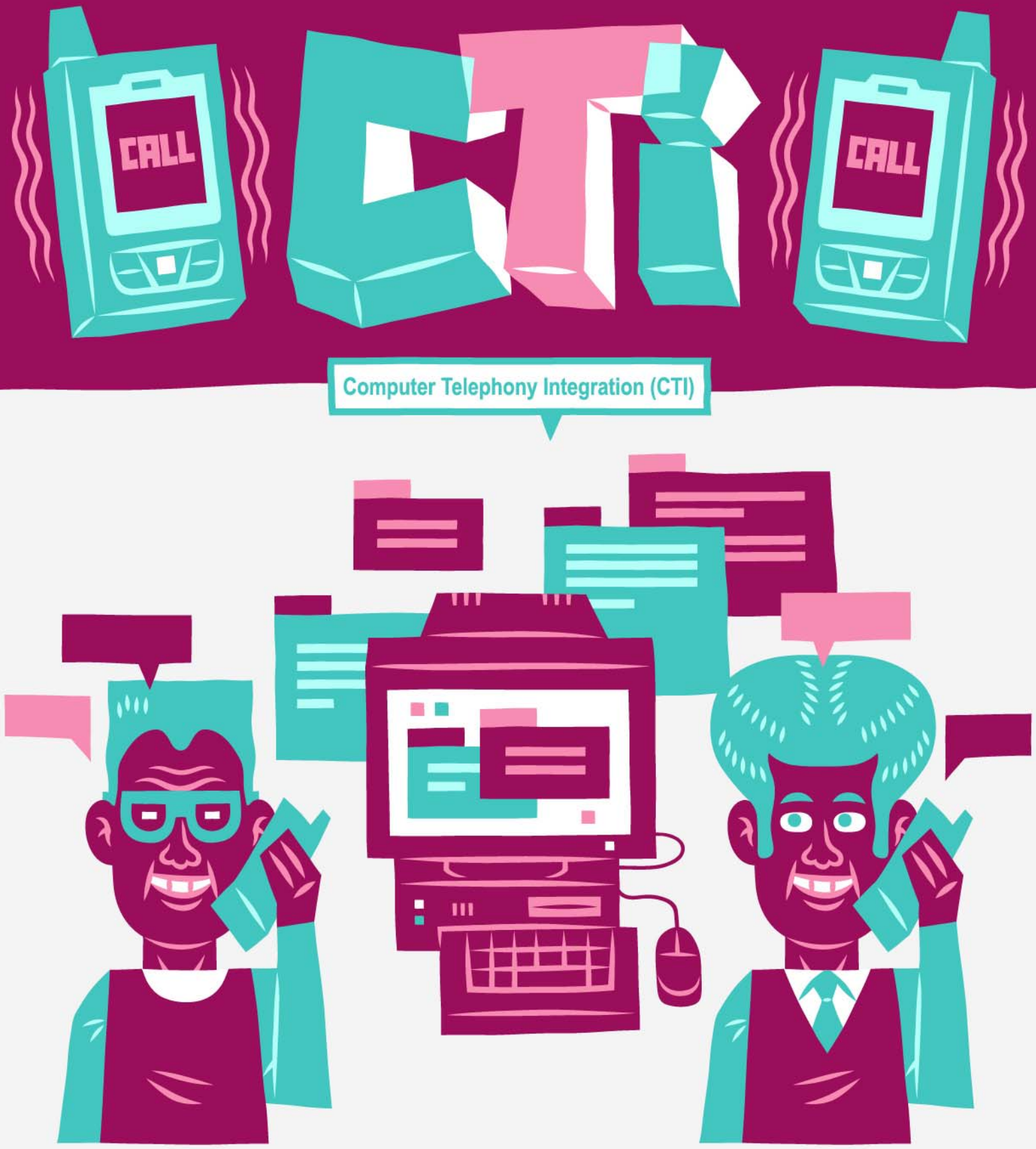

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1 Introduction

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

Computer Telephony Integration (CTI) provides companies with 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 adopted 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 now 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 channels of sales such as e-commerce gaining prominence 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 of calls. Traditionally CTI was mainly 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 pop’, bringing up CRM data based on the number from which the call originated. While screen pop still remains 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 which would look up the information in a database and provide instructions to the switch as to where the call should be routed to. Simultaneously, the customer's database record is also transferred to the agent desktop to which the call is being routed. Routing can be either skill based routing (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 routing (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 network of the billing number (BN) of the originating (calling) party. Current networks send this information through the digital Signaling System 7 (SS7) network, although the presence of SS7 throughout the entire network 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 (lookup) in the database and extracts 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 a 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 wide-scale development of desktop CTI. With the explosion of Microsoft's Windows 95/98 and Windows NT at the desktop, 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 handle multiple protocols with a single viewing tool that integrates all of this.

By 2008 most PBX vendors have aligned themselves behind one or two of the TAPI, CSTA or TSAPI standard. The TSAPI advocates were: Avaya, Telrad. The CSTA advocates were: Siemens (now Unify), Aastra, DeTeWe, Toshiba, 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 of solutions and even entire telecom networks. CTI however continues to be a compelling technology that marries voice and corresponding data, regardless of whether the contact is circuit switched or packet switched. Vendors of equipment meanwhile are offering both classic CTI as well as converged systems, thus offering 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.

A CTI Adapter is a 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 then gets connected to the telephone equipment. Thus the Click-to-Call functionality in a CRM system also utilizes the CTI adapter feature. 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 and 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. There are also free CTI adapters that are available in the market.

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 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 be able to have a seamless user experience. The agent is thus able 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%. The cost savings through CTI comes from better routing of calls leading to higher FCR rates, providing caller

specific announcements and greetings, caller specific sales and service scripts, screen pops, and prefetching of relevant caller data.

Not all contact centres with ACD/PBX installations have adopted CTI as it is an expensive technology which 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 and 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 which controls call traffic and integrates the flow of data with voice calls. The intelligence will move away from the switch to the middleware and decision making will now be done by the middleware based on data accessed from the database.

Responsibility of managing CTI shall also move to the IT manager and away from the telecom manager thus increasing the need for data related software solutions rather than hardware solutions such as the switch which is the telecom manager's domain. The CTI middleware market is booming as the technology evolves rapidly due to the following changes:

1. Call control and media processing moving away from the switch to the software
2. Mixed media interactions that need to be integrated with back end CRM systems
3. 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 database and customer profiles at the contact center are integrated and used effectively. While the CTI concept still matters, the fundamental way in which it was conceived will undergo drastic changes as contact centers can today 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 witnessing high traffic during the holiday season. While sales may be high, it is essential to ensure corresponding service levels to make sure that customers spread the good word. Managing customer interactions effectively using CTI based techniques such as screen pops, skill based routing etc if done right can go a long way towards customer delight.

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 79000 call centers in the US and Canada and of these only 14300 were CTI enabled. This offered a large market for CTI solutions since call centers need to maximize their returns from the expensive switches that they have invested on. However, newer implementations will no longer be a discrete CTI platform attached to the existing equipment. Several vendors today offer CTI solutions bundled with other software applications such as customer relationship management software. Bundled solutions that offer CRM and CTI capabilities along with web chat, email management and other

collaboration capabilities are common in the market and newer contact centers who are not burdened by legacy high cost hardware are readily opting for such solutions.

4.1 Vendor Landscape

The CTI vendor landscape is also evolving in line with the evolution in the underlying technology. Most small vendors have merged with larger companies thus enabling faster evolution of the technology due to the availability of greater resources and 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 with more than six lakh agents using it on a daily basis world over. It started off with having the most basic screen pop feature, but has since added several features such as skill based routing, configurable attributes, product portfolios and so on.

Dialogic, another major player in the CTI space was acquired by Intel. They supply boards that aide in cross-communication between switches from multiple vendors. They can also sit on a PC and talk to software as well as interface with the telephone network. It can also 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 web-driven requirements of the customers. As voice and data services merge with the advent of VoIP and smartphones, CTI needs to evolve into a channel integrator software. Vendors who are ahead of the curve and constantly upgrades their product suites to meet the changing market requirements are the ones who are successful in the CTI space. As convergence with data communications increase, there are more and more ways for desktop applications to integrate. The separate hardware approach has almost died and today the majority of systems have changed their form factor from hardware to software and most installations are converged systems that has multiple capabilities.

5 Practical Applications

Computer Telephony Integration has several practical applications. The main job of a CTI system is to improve the process of handling both incoming and outgoing calls – both in terms of speed and efficiency. Calls can be automatically routed, recorded, and reported to further improve the telephone operational aspects as well as accrue underlying business benefits. By using CTI, customers can be serviced faster, and agent satisfaction can also be improved by providing them with the information they need to properly serve the customers.

Some of the practical applications of CTI are discussed below:

Screen Pop: 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 (Calling Line ID), 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.)

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.

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.

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.

Simultaneous voice-data (SVD) is 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 video conferencing.

Another common usage of CTI is in Interactive voice response (IVR) systems. IVR gives callers specific information based on the unique information 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 information, such as a checking account balance. Information 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 telephone caller and the customer database.

5.1 Key Benefits

Organizations today face a fast evolving environment fraught with many challenges. As customers have more and more choices when it comes to 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 of most organizations. However, for a contact center to be a world class, it is necessary to have cost effective operations and 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. The effective use of technology investments by integrating the various stand alone pieces of hardware and software is an important element of achieving maximum benefits from technology without affecting customer service.

Today, the pace of technological changes are so rapid and wide-spread and that small and medium enterprises (SMEs) often without in-house technical skills and experience not to mention large technological budgets are left wondering how to get the maximum benefits from the limited budgets that they have. The prospect of establishing an entire contact center architecture in-house can be daunting for such businesses. However, third party contact centers offer all the advantages of technology at a fraction of the cost required to set up the entire network in-house. This helps SMEs to focus on their core competencies while customer service gets handled by professionals trained for it. However, choosing the right contact center partner is important as partnering with the wrong vendor can prove to be an expensive mistake not just financially but also for the reputation. An important element while evaluating

a potential contact center vendor is the level to which they have invested in technologies such as CTI to enhance caller experience.

One of the key aspects to keep in mind while selecting a CTI system is the ease of use and integration capabilities. Unless it is easy to integrate with existing hardware and software applications, agents may not derive full benefits from the system. It should integrate with call routing software, CRM database and even call management software in the contact center. If the contact center offers both inbound and outbound call services, the CTI system should be able to integrate with both sets of applications and offer features such as automatic dialers.

Use of CTI based applications offer the following benefits to contact centers. The business benefits of CTI can be 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 lesser time spent gathering customer information during the call leading to cost savings and enhanced agent productivity. CTI allows for the integration of call logs (i.e., call history, call recording, call transcripts, call metrics) and other relevant caller data (i.e., personal information, support tickets, cases, events, chat transcripts, emails, purchase history, order fulfillment statuses, billing, reservations, etc.) from integrated business tools in one combined screen. This also helps the agent to offer more personalized service to the caller as the caller's history is readily available with the agent. By opening the applications on the right screen, agents can enter information about the call right away, without losing time searching for the correct screen to input data to.
- Dialling, answering, transferring and placing calls on hold can all be managed on-screen for increased productivity. If a call is transferred to another agent all the caller details are shared with the next agent who is handling the call. For outbound calls, agents can dial directly using a softphone from the PC application, thus speeding up the connection and avoiding mis-dials.
- 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

In short the future of CTI in enterprise is set to explode with time as stronger technologies with additional functionalities evolve. CTI will also be seen as a means to facilitate customer service along with CRM and other applications rather than as a stand-alone technology. CTI implementations currently in place will get

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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