# Network Computer-Telephony Integration (CTI) Delivering Intelligent Network (IN) Services

## Definition

A network computer-telephony integration (CTI) is the delivering of computer and telephone integration capabilities inside the network.

## Overview

Two major market forces and architectural frameworks are merging to create the most explosive network services opportunities of the late 1990s. Enterprise computer telephony integration (ECTI) applications and advanced intelligent network (AIN) services are being integrated to provide an array of advanced carrier delivered services. Virtual call centers, applications for effective customer interactions, productivity applications for Centrex users, blending of formal and informal call centers, and extending the resource pool of call centers to professionals working at home are but a few of the services to be delivered by the leading carriers in the near feature.

## Topics

ECTI and AIN
NCTI Opportunities
Carrier Solutions
Conclusions
Self-Test
Correct Answers
Glossary

## 1. ECTI and AIN

A short history of the evolution of AIN and ECTI underlines the symbiosis and eventual merging of these two architectural frameworks. AIN has its genesis in the local exchange carriers' (LEC) and inter exchange carriers' (IEC) desire for switch independent network architectures. Improving service velocity and gaining control of service provisioning and delivery of advanced network services were critical in a competitive and changing telecom landscape. In 1986 Ameritech proposed an architecture concept called feature node service interface(FNSI), intended to create a truly distributed network architecture. Through successive industry efforts, primarily driven by Bellcore, AIN emerged as a network standard in the early '90s. *Figure 1* shows the basic building blocks of an AIN architecture.



ECTI was the counterpart of AIN—in fact, a predecessor to AIN—proposed by the private branch exchange (PBX) manufacturers in response to the enterprise customers' desire for advanced applications, improved time-to-feature delivery, and the ability to control and customize their applications. Using an external processor, custom applications could be configured to enhance the functionality of a PBX, especially in a call-center environment. *Figure 2* highlights the basic architecture of ECTI.





Web ProForum Tutorials http://www.iec.org Copyright © The International Engineering Consortium Let's examine the architectural similarities:

- Both use an external processor to deliver advanced complementary services to the switch—a signal control point (SCP) (a highly available/hardened specialized computer) for AIN—based services and an off-the-shelf commercially available server for ECTI applications.
- The switch offers controlled call-processing access to the external processor via an open interface: signaling system 7 (SS–7)/transactional capabilities application part (TCAP)—based AIN.l access to points-in-call for AIN and applications programming interfaces (APIs) based on a variety of standards, including computer-supported telephony application (CSTA) and switch to computer applications interface (SCAI), for ECTI.
- Both provide a graphical user interface (GUI)—based service-creation environment (SCE) for rapid service and application configuration.
- Intelligent peripherals (IPs) provide additional context information for call treatment. Integrated voice response (IVR) units are the most widely deployed IPs.
- Reporting, operations, administration, and maintenance (OAM), billing interfaces, and real-time monitoring tools are available in both.

From an applications perspective, AIN.1 has primarily delivered enhanced 8XX/900 and calling-card services based on a limited set of call-control primitives. AIN.2 will provide additional services, such as voice-activated dialing, network call-back, and sequential multilocation ringing. From a call-center perspective, the 800 calls are presented to agent queues, based on a predetermined logic. The information on the real-time status of the agent does not drive the routing decision.

ECTI has permeated close to 20 percent of call centers in the U.S., providing critical productivity enhancements and customer interaction applications such as:

- **call routing**—based on business strategies and availability of agents, delivers an incoming call to the most appropriate customer-service representative; this allows for the custom treatment of every call and every customer
- **campaign management**—a composite application for running outbound sales and marketing campaigns; through call blending a call center operates most efficiently by allowing outbound campaigns to be interspersed with inbound call management

- **screen-based telephony**—uses a "SoftPhone" to reproduce an agent's phone controls on the agent's personal computer (PC)
- **call-center management**—provides a real-time pulse of the total operation of a call center, including the agent, the physical and logical queues and groups, and the level of service being provided to the customers
- **reporting applications**—tracks a call and associated transactions from cradle to grave, and produces customized reports

While this is just a sampling of applications, the key message is that, at the enterprise level and as a customer-premises equipment (CPE), ECTI delivers many sophisticated call-center services.

# 2. NCTI Opportunities

Network computer-telephony integration (NCTI), defined as the delivery of ECTI applications as a multitenant carrier network service, is currently being trialed by a number of leading carriers and large private networks.

These leading carriers are driven by a number of business imperatives:

- The carrier services, including centrex and 800 services must be differentiated, as new entrants vie for market position.
- There are currently more than 60,000 call centers in the U.S., with a compounded annual growth rate of 18%. The smaller call-center market, below 50 agents, is growing as a percentage of the total call centers. This is a clear opportunity for carriers.
- creating virtual call centers—"taking the center out of the call center" and taking advantage of the resource pool working at home
- the slow pace of AIN-based services and the costs of wholesale infrastructure upgrades
- The leading central-office (CO) switches provide APIs for CTI applications.
- The cost and quality performance of commercial server platforms, the reach of transmission control/Internet protocol (TCP/IP) networks, and the growth of Internet and electronic based interactions and transactions.

These are but a few forces that are creating opportunities for the carriers in delivering NCTI applications.

## 3. Carrier Solutions

Three specific carrier service opportunities are discussed. For illustration purposes, current Genesys applications are referenced.

## Enterprise-Directed 800 Solution (ED800)

The ED800 application allows a routing decision to be made, at an enterprise level, based on the availability of the most appropriate agent. The 800 call is held in the carriers' network while the router makes a routing decision in less than 250 milliseconds. As depicted in *Figure 3*, this is a hybrid ECTI/NCTI application, in that the router is part of the customers' private network, but is connected to the carrier's SCP through a gateway. The call-routing application has the real-time visibility of the state of all agents at all centers (through the stat-server) and decides to which agent across all of the centers—or in the case where no appropriate agents are available, to which center—the call should be sent to be answered most quickly (dynamic load balancing).

Use of caller-entered data and database look-ups, such as automatic number identification (ANI) and dialed-number identification service (DNIS) can be used to assist in the routing decision.



Figure 3. Enterprise-Directed 800 Routing (ED800) Architecture

### **Network Call-Center Services**

This application is the true merging of AIN and NCTI. As depicted in *Figure 4*, the NCTI server acts as an SCP adjunct. For routing applications, the SCP receives its routing information from the NCTI server, which maintains a real-time view of the agents' availability through the CTI link. In the case of a remote agent, this is achieved through a telephone application-programming interface (TAPI) modem.

With NCTI as an adjunct to the SCP, new network services can be provided without the need for expensive SCP upgrades. Advanced routing schemes, including skill-based and data-driven routing, follow-me services, emergency/mass notification services are a few examples.



Figure 4. Network Call-Center Services

#### **Centrex Call-Center Services**

This virtual call-center application takes advantage of the CO switches' API link. Lucent's 5E55-Pinnacle<sup>™</sup> and Nortel's DM5 l00-CompuCall<sup>™</sup> are examples of such APIs.

As illustrated in *Figure 5*, the CO switches are NCTI–enabled, and the full suite of applications available to the CPE–based platforms are available as a telco service offering. In this virtual call-center offering, any centrex user can be viewed as an agent, and a very powerful solution for the informal call centers emerges. The telcos will be able to package and deliver this as enhanced centrex, providing vertical-market targeted applications. Examples include: point of presence "(POP)ing" a nurses' screen with the patient's information in a hospital or doctor's office as the patient calls, enabling him/her to give customized treatments to incoming calls, including unique greetings and processing and allowing him/her the freedom to work at home, having access to all services available at the office. Inbound and outbound call centers can be configured in the network, analogous to centrex service, allowing the call-center owners to focus on their customers rather than on the underlying technology and infrastructure.





## 4. Conclusions

Business is conducted using a mix of public services, private networks, the Internet, wireless networks, and specialized carriers. The carriers' vision of AIN, where they can respond to their customers' business needs in a timely fashion is becoming a reality. The use of commercially available server platforms, databases, and NCTI applications will enable the carriers to reduce the cost and the time-to-market of new services. NCTI plays a critical role in serving customer interactions in the setting of a formal call center, knowledge workers collaboration, and personal productivity applications. Using NCTI, the leading carriers will open the network, differentiate their services, and provide a host of high value network-based applications.

## Self-Test

1. ECTI has its genesis in the LEC's and IEC's desire for switch-independent network architectures.

a. true

b. false

Web ProForum Tutorials http://www.iec.org 2. Both AIN and CTI provide a GUI–based SCE for rapid service and application configuration.

a. true

b. false

3. IVR units are the most widely deployed IPs.

a. true

b. false

4. ECTI has permeated close to 80 percent of the call centers in the United States, providing productivity enhancements and customer-interaction applications.

a. true

b. false

5. With NCTI as an adjunct to the SCP, new network services cannot be provided without SCP upgrades.

a. true

b. false

- 6. \_\_\_\_\_ can all be used to assist in the call-routing decision in a hybrid ECTI/NCTI application.
  - a. use of caller-entered data, database look-ups, ANI, and DNIS
  - b. use of preentered host data, database look-ups, and DNIS
  - c. use of caller-entered data, host-entered data, and database look-ups
- 7. In the case of a remote agent, routing information is received from
  - a. the NCTI server
  - b. the CTI link
  - c. TAPI modem

- 8. A few of the services soon to be available by the leading carriers are:
  - a. virtual call centers, distinct formal and informal call centers, and an extended resource pool of call centers for professionals working at home.
  - b. productivity applications for customer use, formal and distinct informal call centers for professionals working at home, and virtual call centers.
  - c. virtual call centers, productivity applications for centrex users, and blending of formal and informal call centers.
- 9. EDTI provides critical productivity enhancements and customer-interaction applications such as:
  - a. call regulation, screen-based telephony, and the ability to track a call from cradle to grave.
  - b. campaign management, call-center management, and call routing
  - c. campaign routing, regulated call management, and reporting applications.
- 10. The number of call centers in the United States, which is currently 60,000, grows by \_\_\_\_\_ annually.
  - a. 3 percent
  - b. 18 percent
  - c. 42 percent

### **Correct Answers**

1. ECTI has its genesis in the LEC's and IEC's desire for switch-independent network architectures.

a. true

#### b. false

See Topic 1.

- 2. Both AIN and CTI provide a GUI–based SCE for rapid service and application configuration.
  - a. true

Web ProForum Tutorials http://www.iec.org b. false

See Topic 1.

3. IVR units are the most widely deployed IPs.

a. true

b. false

See Topic 1.

4. ECTI has permeated close to 80 percent of the call centers in the United States, providing productivity enhancements and customer-interaction applications.

a. true

#### b. false

See Topic 2.

5. With NCTI as an adjunct to the SCP, new network services cannot be provided without SCP upgrades.

a. true

b. false

See Topic 3.

6.  $\_\_$  can all be used to assist in the call-routing decision in a hybrid ECTI/NCTI application.

#### a. use of caller-entered data, database look-ups, ANI, and DNIS

- b. use of preentered host data, database look-ups, and DNIS
- c. use of caller-entered data, host-entered data, and database look-ups

See Topic 3.

- 7. In the case of a remote agent, routing information is received from
  - a. the NCTI server
  - b. the CTI link

#### c. TAPI modem

See Topic 3.

- 8. A few of the services soon to be available by the leading carriers are:
  - a. virtual call centers, distinct formal and informal call centers, and an extended resource pool of call centers for professionals working at home.
  - b. productivity applications for customer use, formal and distinct informal call centers for professionals working at home, and virtual call centers.

# c. virtual call centers, productivity applications for centrex users, and blending of formal and informal call centers.

See Topic 1.

- 9. EDTI provides critical productivity enhancements and customer-interaction applications such as:
  - a. call regulation, screen-based telephony, and the ability to track a call from cradle to grave.

# b. campaign management, call-center management, and call routing

c. campaign routing, regulated call management, and reporting applications.

See Topic 1.

- 10. The number of call centers in the United States, which is currently 60,000, grows by \_\_\_\_\_ annually.
  - a. 3 percent

#### b. 18 percent

c. 42 percent

See Topic 2.

## Glossary

# **AIN** advanced intelligent network

**ANI** automatic number identification

**API** applications programming interfaces

**CO** central office

**CPE** customer premises equipment

**CSTA** computer-supported telephony application

**CTI** computer-telephony integration

**DNIS** dialed-number identification service

**ECTI** enterprise computer telephony integration

**FNSI** feature node service interface

**GUI** graphical user interface

**IEC** interexchange carrier

**IP** intelligent peripherals

**IVR** integrated voice response

**LEC** local exchange carrier

**NCTI** network computer telephony integration

#### OAM

operations, administration, and maintenance

Web ProForum Tutorials http://www.iec.org **PBX** private branch exchange

**PC** personal computer

**POP** point of presence

**SCAI** switch to computer applications interface

**SCE** service creation environment

**SCP** signal control point

**SS7** signaling system 7

**TAPI** telephone application-programming interface

**TCAP** transactional capabilities application part

#### **TCP/IP** transmission control/Internet protocol