nuVOICE –

Next Generation VoIP Solutions

By converging voice and data traffic into a common network based on Nuera’s packet voice technology, competitive local exchange providers can reduce their cost-of-ownership and deliver high margin services.

Nuera Communications, Inc.
Draft 1.0
Wednesday, August 16, 2000
Present Situation of Local Exchange Carriers

The carrier industry has experienced double-digit growth rates during the past 4 years and the strong growth continues even today as more and more consumers subscribe telephony services. The rapidly growing subscriber base along with the dropping per-minute usage charges due to increased competition is causing concern to the service providers recently. The service operators are worried about their rising costs due to subscriber growth and shrinking margins due to new competition. These carriers need low-cost alternatives for future network evolution. The solution lies in adoption of packet telephony solutions by deploying an “All-IP Core” switching network.

Circuit vs. Packet Switching

Circuit switching formed the basis of Public Switched Telephone Network (PSTN) but now this foundation is being challenged by new packet voice technology. By now, it is a commonly accepted fact that the future belongs to packet switching, not circuit switching. Even though the transition entails major investment of effort and money, carriers are willing to undertake the change to lower costs and develop competitive advantages.

How CLECs can benefit from Packet Switching?

Basic voice service is quickly becoming a commodity. This is resulting in decreased profit margins and marginally differentiated product offerings. Packet telephony can contribute to lower operating expenses and can provide enhanced voice services.

Reduce Capital Costs

IP networks are leaner and cost less to acquire and maintain in comparison to the traditional circuit switched networks. As exemplified by the daily announcements for gigabit and terabit routers, the cost/performance curve for IP based solutions is tightly coupled to advances in high-speed silicon switching engines. This is resulting in both decreased product costs and increased switching performance. Comparing the physical size and cost of a Lucent 5ESS or Nortel DMS 500 to a state-of-the-art terabit router quickly puts this in perspective.

Additional cost savings may be realized through the consolidation of geographically dispersed offices through a common IP core. By operating a single IP core network, the carrier stands to save significantly in terms of operating expenses associated with redundant staff and equipment. Not only is the operation of multiple dedicated networks costly and complex, an IP switching core also paves the path for integration of voice and data applications into one common network. Packet switching is the only way to aggregate various types of traffic over a single core network.

Savings from Long Distance Bypass

A majority of Competitive Local Exchange Carriers does not have their own nationwide routing network for reasons of high cost and complexity. As a result, they must rely on the incumbent long distance and international carriers for completing calls between geographically dispersed locations. In that process, the CLEC incurs a steep toll fee per call levied by the international/long distance carrier. Packet telephony offers a much lower-cost and lower-complexity alternative for the local carriers to integrate voice and data communications between their remote offices (or at least between their most important locations) thereby eliminating dependence on international/long distance carriers for call completion. The long distance bypass feature of a core IP network translates into substantial savings for the local provider.
Infrastructure Extension

Packet telephony and the associated Media Gateways and Media Gateway Controllers provide a means for the CLEC to extend and expand the investment currently sunk in circuit switched equipment. Trunk group features or functions of an installed carrier class switch may be extended to any geographic location over an IP network. A specific example would be the deployment of a small gateway into a “hi-rise” environment to provide basic CLASS type Centrex services. The incremental cost at the central switching center would be small in comparison to the increased subscriber base.

Enhanced Services

The cost savings may allow an exchange carrier to stay ahead of the ever-declining price for basic voice, but not to improve its competitive positioning. Packet telephony enables a provider to stay ahead of the pack by deploying services that are difficult or impossible when voice and data travel through separate networks. The CLEC will not only offer popular services, such as voice mail, call waiting, etc., but also a new crop of innovative services stemming from the integration of voice and data into one network. The time-to-market for new applications is reduced significantly due to the tendency of IP applications to inherit from other product development efforts and also due to a strong emphasis on open interfaces and standard protocols. Traditionally, developing PSTN applications has been a slow and costly process.

Use of open APIs from third party application providers creates unlimited service possibilities, ranging from PSTN features like pre-paid calling cards to converged network features such as “click-to-talk”. The flexible nature of IP networking allow services such as:

<table>
<thead>
<tr>
<th>Segment</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate</td>
<td>IP VPN</td>
<td>Office workers use extension dialing to call one another through IP based Voice Private Network. Calls can be traditional telephones or through PC based soft-phones.</td>
</tr>
<tr>
<td>SOHO</td>
<td>Home/Office Link</td>
<td>Similar to the IP VPN, home office workers have essentially direct access into the corporate LAN and voice system over a broadband access service (DSL, cable, wireless).</td>
</tr>
<tr>
<td>Call Centers</td>
<td>Distributed Call Centers</td>
<td>Small call centers can be operated off a centralized corporate server and distributed via IP access solutions.</td>
</tr>
</tbody>
</table>

Nuera nuVOICE Solution

The local service providers expect a certain level of functionality and very high reliability from packet infrastructure solutions. The service providers wish to benefit from packet telephony by at least maintaining the current level of service expectation while simultaneously supporting high call volumes. Key requirements are:

- Network cost
- User perceived quality
- Ease of Management
- Reliability
- Availability of enhanced features
CLEC Network based on Packet Voice Technology

The present generation circuit-based switching architecture performs functions, such as mobility management, subscriber profile and services management, authentication and billing. The role of the circuit-based solution will continue to regress in favor of the statistical gains delivered by packet voice and IP-based authentication, security and mobility management. The ORCA GX-21 media gateway, Nuera Softswitch (SSC) and feature servers collectively define a distributed packet-based switching center as shown below.

The Nuera solution takes into account the existing network investments made by operators and leverages existing standards for networking and telephony communication. It supports open legacy protocols such as SS7, ISDN PRI, R2 and GR303 while maintaining compatibility with evolving Voice over Packet protocols including:

- MGCP
- NCS
- SIP
- H323

Nuera’s ORCA (Open, Reliable Communications Architecture) system relies on award-winning, high-quality low-bit-rate voice, fax, and modem technology to provide a platform that dramatically lowers the cost of deploying and operating carrier-grade telephony networks. The robust network switching and routing capability of ORCA ensures that each call is switched end-to-end through the network without the need to tandem through an intermediate Class-4 switch. This reduces network complexity, operating cost, and ensures high voice quality.
The Nuera open architecture is ideally suited to carriers that want to respond quickly to their customers' changing service needs by offering innovative and differentiated services. Open database, APIs, and support of industry standards enable carriers to quickly and seamlessly integrate this powerful IP telephony platform into existing circuit-switched networks.

**nuCO**

Part of the nuVOICE product family, nuCO provides a cost effective VolP-based broadband access platform.

nuCO provides a VoIP broadband access for office, campus and residential buildings. The ORCA Gateway (GX-21 or GX-8) or IAD consolidates TDM traffic to VoIP. The ORCA RDT-21 (Remote Digital Terminal) converts VoIP to GR303. The nuCO solution provides the same Class 5 features and same user experience as traditional architectures. Therefore, the nuVOICE architecture is transparent to the regular end-user.

Unlike other broadband access solutions, nuCO has no medium bias. nuCO can be supported by fiber (OC-N, DWDM, HFC. . .), wireless (LMDS, WLL. . .), and copper (T1, DSL, leased lines, cable). This flexibility in the network design allows for ubiquitous service offerings over any network platform.

One of the economic advantages to nuCO is the ability to merge both the data and voice networks onto a common architecture. By consolidating voice and data, complex overlay networks and their associated overhead costs are eliminated. Also, the solution replaces costly TDM equipment including DLCs.

As a packet based architecture, nuCO can take advantage of the statistical nature of voice traffic resulting in either an increased subscriber base for a given central site configuration or smaller capital requirement for a given customer base. Both scenarios translate into lower overall costs. Over subscription of at least four subscribers per CO connection would be quite conservative. In addition, since bandwidth is only utilized when a call is active there is an inherent load balancing of bandwidth resources.
nuCO Migration to Class 5 Replacement

The N Vera Softswitch Controller (SSC) allows for future migration to an all IP network and replaces costly Class 5 switches.

RDT-21s can be redeployed as GX-21s by a simple software upgrade, thereby protecting the initial equipment investment. By streamlining the network into a full VoIP network, this prepares for future migration of next-generation services. Enhanced services such as unified messaging, “follow-me”, Web-based services, calling cards, and billing are revenue-generating services carriers can offer with very low overhead and a high payback.
nuTANDEM Migration for Class 4 Tandem Replacement

The migration path to Class 4 Tandem replacement includes tandem offloading. The ORCA Gateways allow PSTN trunks to be carried over an IP network. The data and voice network is combined and offloads traffic from the Class 4 Tandem. When the Softswitch (SSC) is introduced into the network, it offloads Internet calls from the Class 4. The SSC offsets costly switch expansions with “internet redirect” and supports SS7 networking. The ORCA SSC allows all local calls to be offloaded from the Class 4 by providing all the switching capabilities that the Class 4 would have otherwise provided. Finally, at the end of this migration path is the full replacement of the Class 4 Tandem. At that point, both local and long distance traffic can be routed over the IP network by using the nuTANDEM solution.

Network Scalability

The voice IP core can be easily scaled from a very small to a very large network. This highly scaleable architecture is particularly interesting to competitive local service providers in situations where they want to cover a small population and purchasing a full-fledged carrier class switch is not a cost-effective method. Each softswitch controls multiple media gateways and additional gateways can be added in a single softswitch control domain in an incremental fashion as traffic needs increase. Quite similarly, if a softswitch capacity is reached, it is easy to create another softswitch domain and interconnect the two domains using Session Initiation Protocol (SIP), an industry standard protocol. The feature servers can also be replicated as needed. The distributed, database-driven nature of this architecture ensures that there is no central bottleneck in the system.
Network Management

Integration of packet voice network management into a service provider’s existing Operation Support System (OSS) environment is extremely important. The Nuera solution offers an Element Management System (EMS) that consolidates key management functions:

- Configuration Management
- Fault Management
- Performance Management
- Accounting Management

The EMS provides an easy Graphic User Interface (GUI) for network operators and APIs to tie the EMS to the service provider’s overall network management system.

Carrier Grade Packet Telephony

The ORCA GX-21 Gateway is a carrier grade packet voice gateway designed to meet the standards of a traditional central office switch. Its salient features include:

- 99.999% Availability
- Full Redundancy and Hot Swap Capability
- High Channel Density of up 68 T1s or E1s (or 2048 voice ports) per Gateway
- Lowest packet transmission delay in industry
- NEBS-3 Compliant
- Simplified operation, administration, management, and provisioning
- Subscriber Voice Interfaces
  - Signaling: MGCP, SIP, CAS, R2, FAS (SS7, CC7, and ISDN)
  - Electrical: DSX-1, T1/SF/ESF, and CCITT G.703/704

- Packet Data Interfaces
  - LAN: 100Base-T, Serial V.35, RS422, and RS232
- Vocoder Support
  - E-CELP: 4.8, 7.4, and 9.6 Kbps
  - G.711: 64 Kbps
  - G.723.1: 5.3 and 6.3 Kbps
  - G.726: 32 and 40 Kbps
  - G.729: 8 Kbps
  - G.729A: 8 Kbps
  - GSM EFR: 12.2 Kbps
  - Real-time Fax Support: 2.4, 7.2, 9.6 and 14.4 Kbps, programmable
  - Echo Cancellation: G.165 compatible, 0-49 msec adaptive delay

Enhanced Services

An ORCA gateway in combination with a centralized softswitch provides a robust, carrier-class switching platform. One or multiple softswitches provide all of the call control and signaling services to a network of ORCA gateways. Additionally, the softswitch offers a SIP-based API to third-party systems that provide custom, enhanced network services. The ORCA gateway communicates with the softswitch using the industry-standard Media Gateway Control Protocol (MGCP). As a result, third-party softswitches can be deployed to control the network of ORCA gateways.
Market Leader

Nuera has the broadest deployable product offering in this market space including the ORCA GX-21, GX-8, the ORCA RDT-21, the ORCA SSC, and the NueraView NMS. All these components translate into cost savings and network efficiency.

Nuera has the credentials to prove its quality and reputation in the industry. Nuera has been rated “Best in Test” two years in a row by Business Communications Review from test reports prepared by Mier Laboratories. Network World recently awarded the ORCA GX-8 the highest honor of the “World Class Award.” Nuera has also been the recipient of “Hot Product Awards” from Data Communications, and Editors’ Choice and Product of the Year awards from Internet Telephony and Computer Telephony magazines.

Nuera prides itself as a leader in the interoperability initiative. Many resources are dedicated full-time to promote and test interoperability with many enhanced service providers, gateway and softswitch manufacturers, billing providers, and Class 5 switch manufacturers. As a founding member of the International Softswitch Consortium and co-founder of Voice Over IP Forum, Nuera sets the standards for the industry’s adoption of MGCP and SIP.

Contact Nuera

Additional information about Nuera Communications, Inc. can be found on the Web at www.nuera.com. For more information about nuVOICE VoIP solutions, please contact:

Corporate

Nuera Communications, Inc.
10445 Pacific Center Court
San Diego, CA 92121-1761
Tel: (858) 625-2400
Tel: (858) 807-8993 (sales inquiries)
Fax: (858) 625-2422