U.S. Local-Exchange Carrier Strategic Directions

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Summary

U.S. local-exchange carriers (LECs) are facing declines in both revenue and access lines in their core wireline services business. This paper analyses the extent and causes of these declines and suggests both business and technology initiatives for creating growth through the continuous creation (and management) of profitable new services. It concludes by identifying several attractive services and showing how they create value for both shareowners and customers.

Introduction

U.S. LECs are facing unprecedented threats to their core wireline telecommunications businesses.[1] New technology including 2.5G wireless, wireless fidelity (Wi-Fi) (802.11x), voice over Internet protocol (VoIP), and hybrid fiber coax (HFC) is being used by competitors to offer more varied, feature-rich, and personalized services than can be delivered over the LEC's traditional public switched telephone network (PSTN) infrastructure. For example, mobile phones offer a wider range of features and through their intrinsic mobility and personalization are the telephones of choice for younger consumers; enterprises increasingly are turning to IP telephony, which offers features such as Wi-Fi access, instant messaging, and e-mail/voicemail convergence that are not available from the circuit switched alternative; and cable modem deployments enjoy a 2:1 advantage over digital subscriber line (DSL) deployments. These competitive inroads are troubling especially because they are occurring in the most attractive market segments—young consumers, enterprises, and residential broadband users.

Competitors' aggressive use of modern marketing (customer management) practices and pricing strategies are putting further price and market share pressure on wireline carrier operations. Wireless operators' lifestyle market segmentation approaches, for example, are particularly effective in creating value differentiation for mobile phones over wireline phones. Similarly, cable multiple systems operators (MSOs) with extensive experience in creating service bundles have brought this practice to the U.S. telephone industry.

Out-of-date facilities and business processes, also, are contributing to slow revenue growth and a loss of customer loyalty. More than 90 percent of all business and residence customers are served by twisted-pair copper cables. Though in principle broadband services such as video, Internet access, and even metro Ethernet can be offered over twisted-pair telephone plant about 40 percent of U.S. subscriber lines cannot be upgraded to broadband because the lines are too long, served by first-generation subscriber loop carrier systems or simply not well maintained. Poor record keeping also plagues the LECs causing very high failure rates for DSL deployment. The installed base of circuit-switched end-offices together with several overlay networks employing digital cross-connect systems, synchronous optical network (SONET) transmission equipment, and asynchronous transfer mode (ATM) switches are aging, labor intensive, and poorly suited to meet emerging packet-based service requirements. In addition, many operations support systems (OSSs) employ aging mainframe-oriented architectures that are costly to maintain and lack the flexibility to accommodate the rapid changes needed to implement modern customer-management practices. Finally, wireline carriers have much larger work forces and employ out-of-date business practices as compared to wireless and cable MSO operators. Full-time salaried employees who receive generous pensions and healthcare benefits handle LEC service calls and installations, for example. Cable MSOs use contractors who are paid on a per job basis for such work.

Finally, LECs are regulated much more heavily than their competitors. Basic voice services, the most important LEC service offering, continue to be subject to pervasive regulation and subject to a number of fees, surcharges, and taxes than alternative services such as Cable TV. A number of public-service requirements such as support for the Universal Service fund and E911 also are imposed on basic voice services. In addition, the requirements and prohibitions imposed by the Telecom Act of 1996, especially the unbundled network element–platform (UNE–P) regulations, continue to overhang LEC infrastructure modernization plans, create market uncertainty for LEC, competitors, and customers and inhibit the integration of modern network services, content and infrastructure. Regulations that

require separation of network infrastructure between that made available to all carriers and that not shared are a particular barrier to LEC service innovation. For example, T1 private line and its associated physical plant are treated as part of the regulated business while IP–virtual private network (VPN) service and its associated plant is treated as part of the unregulated business. Newer services and network facilities such as IP multiprotocol label switching (MPLS) services defy such classification. These regulatory boundaries will become increasingly troublesome as LECs offer triple-play bundles in order to compete with the MSOs—content as well as all kinds of switching, transport, and information processing will be tightly linked. Comcast, for example, envisions using its IP capable HFC network linked to a new generation of intelligent set-top boxes to deliver customer specific commercials on each video program. This will provide Comcast a strategic advantage over a LEC's more restricted service offerings.

Revenue Analysis

Figure 1 shows the wireline revenues of the seven[2] largest local and interexchange U.S. wireline carriers.

Wireline revenue consists of voice- and data-transport services revenue including local voice, long-distance voice, T1, frame relay, and DSL services. Long-distance service is shown net of access charges. (Access charges are shown separately since they are reported as revenue by LECs and as operating cost by interexchange carriers [IXCs].) Over the last three years local, access, and long-distance revenue have declined by 8 percent, 7 percent, and 30 percent respectively. The wireline carriers attribute 72 percent to 80 percent of this revenue to voice services. We believe that the actual share of voice service is even higher in that local T1 private line accounts for the majority of LEC data revenue and many such circuits are used to connect private branch exchanges (PBXs) to voice switches.

Long-distance revenues have fallen due to sharp price reductions caused by the following:

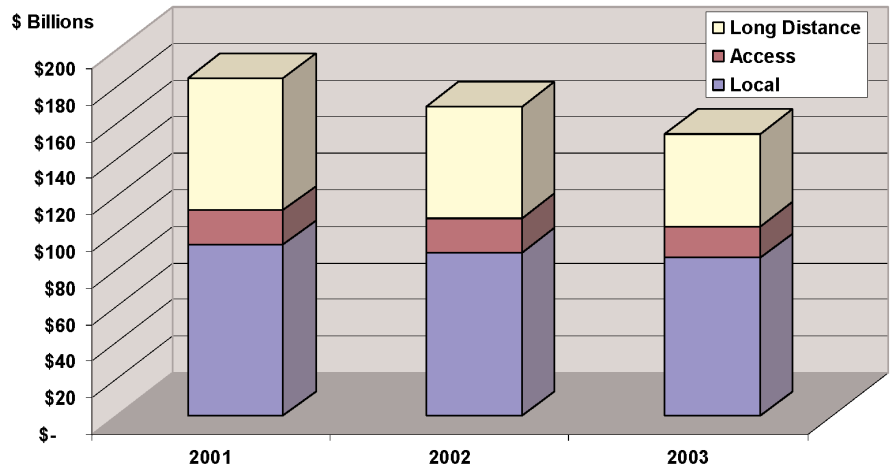
- Adoption of flat-rate billing plans like those of wireless providers
- Intense competition for enterprise voice and data service contracts
- Movement to competitive pricing of state toll (Intra–local access and transport area [LATA]) long-distance service
- Over capacity of long-haul fiber-optic cable

Despite LEC success in selling DSL service local service revenues are continuing to fall due to the following:

- Emergence of local service competition with associated downward pressure on retail prices; IXCs are successfully using the UNE–P regulation to establish a foothold; MSOs are leveraging their existing HFC infrastructure while making tentative steps to extend fiber facilities to enterprises
- Loss of access lines formerly used for fax and dial-up Internet access
- Loss of access lines to wireless services—especially large losses in the second line teenager niche and for young adults; the long-range threat is that this buying behavior may be established for life
- Loss of vertical service revenues to wireless and Internet alternatives
- Emergence of enterprise IP telephony applications

FIGURE 1

U.S. Wireline Telecommunications Revenue



- Pricing pressure on data services where T1 and DS3 prices are now at about 25 percent to 30 percent of historical levels and emerging Ethernet services deliver service at per megabit prices set at one-quarter the level of time division multiplex (TDM) alternatives

Building a Platform for Growth

The adoption of new service creation processes and extending IP technology into end offices and out into the subscriber loop plant are necessary to increasing the revenue and profitability of LEC businesses.

Service Creation as a Continuous Process

LECs traditionally were driven by technology, finance, and legal/regulatory considerations while marketing was a second priority at best. LECs are reinventing themselves as market driven companies. This primacy of marketing has taken hold first in carriers' wireless businesses and is now being extended to the more traditional wireline operations. Leading organizations in marketing and customer management such as Hertz, Home Depot, Lands End, MBNA, and Southwest Airlines have pioneered techniques to define and operationalize their customer orientation. Wireline carriers can use similar techniques. *Figure 2* illustrates the emergence of this customer orientation within the industry.

Realization of this customer-oriented approach requires continuous measurement and change of service offerings, their features, and prices according to changes in each customer segment's preferences, relative profitability, and in response to competitor's initiatives. *Figure 3* illustrates this service creation life cycle.

Traditional PSTN infrastructure and its associated OSS are formidable barriers to the operation of continuous and short service-creation life cycles. They cannot accommodate frequent service modifications with fast, easy, and affordable implementations. Deployment of IP technology in end offices and throughout the subscriber loop plant breaks down these barriers to operationalizing new service-creation processes including customer specific service targeting, rapid service creation, and customer-specific pricing and measurement.

IP–Centric End Offices and Subscriber Loop Plant

Operationalizing multiple continuous service life-cycle management programs requires a radical departure from the traditional compartmentalized PSTN infrastructure. Converged service architectures extended to end offices and remote terminals provide the technical foundation for the LEC marketing and customer management process.

The converged service architecture consists of three layers:

- *Transport and access layer* – combines the line gateway, trunk gateway, digital subscriber line access multiplexer (DSLAM), short message service (SMS), and virtual private network (VPN) switch function onto a single packet transport vehicle. Legacy and packet-based interfaces including DSL, DS0, DS1, OC–3, OC–12, and Ethernet interfaces are supported along with a long list of signaling and data framing protocols including—integrated services digital network (ISDN) primary rate interface (PRI), GR–303, plain old telephone service (POTS), FXO/FXS, T1, IP, ATM and frame relay.

FIGURE 2

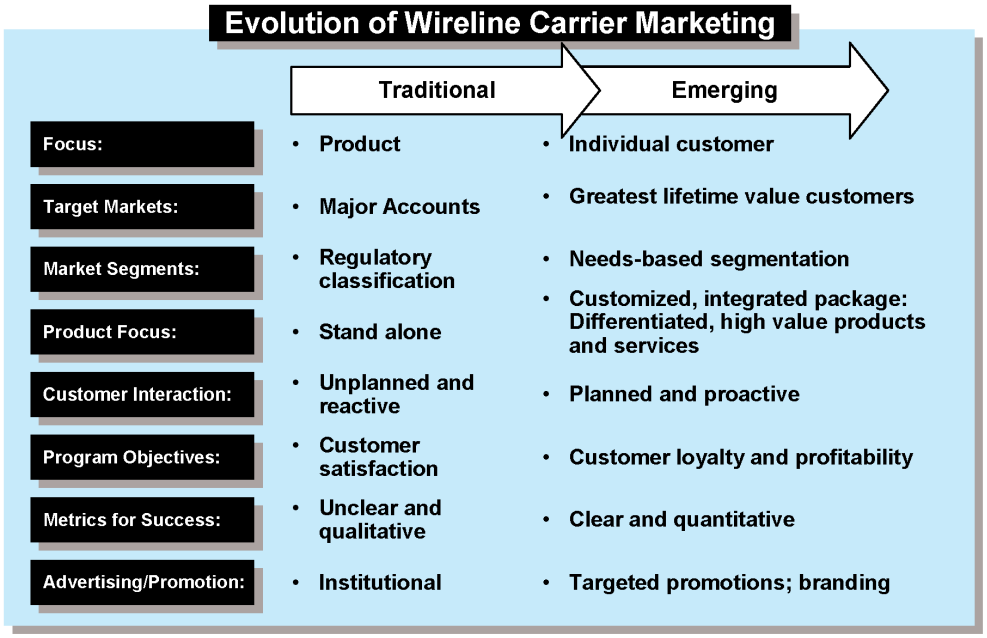
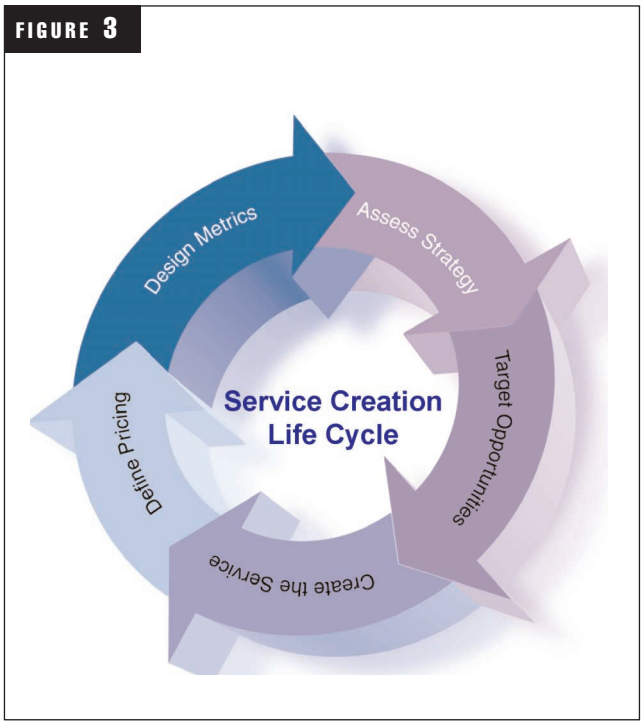


FIGURE 3



- *Control and session layer* – consists of a serial interface protocol (SIP) proxy and a signaling system 7 (SS7) signaling gateway to provide full signaling translation between legacy and next-generation networks. This allows service providers to use existing databases with new equipment, while leveraging the SIP network for the creation of new service offerings. Traditional calling services and features of the legacy network as well as new SIP–based services hosted on feature servers in the packet network can be provided to all subscribers. This enables any standards-based SIP feature server to integrate into the SS7/C7 network.

- *Application layer* – provides fault management, configuration, provisioning, security, and billing mediation. The layer also provides terminating and originating gateway services for IP calls sent off-net to the PSTN, wholesale IP connectivity and minimizes TDM–IP interworking. In addition, the application layer acts as a bridge between the existing OSS network and next-generation OSS systems through TL1, simple network management protocol (SNMP), lightweight directory access protocol (LDAP), and CORBA interfaces.

The converged service architecture owes much to the development of 3G wireless. The architecture is embodied in the converged network solutions of the traditional circuit switch vendors, soft switches, next-generation end-offices, and next-generation digital loop carrier systems.

The converged service architecture provides very substantial total cost of ownership advantages over legacy overlay networks by consolidating network functions in fewer network elements and provides operational support savings of about 80 percent by eliminating manual handoffs of networking data and through the use of policy-based provisioning engines.

The converged service architecture enables mobile phone–like features, color ringback tones, and unified messaging. It permits delivery of alerts, and messages to essentially any access device including wireline telephone sets, PCs, PBXs or enterprise routers. SIP/SS7 interworking provides the vehicle for low-cost application development and Web portal access and control to varied combinations of Internet and telephony-based services. SIP–based services hosted on feature servers in the packet network can be provided to all subscribers. This enables any standards-based SIP feature server to integrate into the SS7/C7 network. Features consequently can be developed using industry standard Web-site development tools and the very large base of software developers trained and experienced in this environment. This increases the velocity, scope, and quality of service and feature development while the large talent pool and use of industry standard tools reduces development costs. In addition, applications developed on feature servers using standard Web-site development tools easily accommodate the large embedded base of Web portal applications and supporting software permitting rapid and inexpensive rollout of customer driven services and features.

Virtual call-center services incorporating Centrex and interactive voice response (IVR) services also can be created rapidly and at low cost using the converged service architecture. IP soft-switching capabilities cost-effectively support services such as presence, one number, IP Centrex, Internet call waiting, and unified messaging. Unlike many next-generation service-creation models, however, which dictate that these IP–enabled services be only available to IP–connected subscribers and peripherals such as SIP phones and PBXs, the converged service architecture translates between the legacy SS7/C7 network and SIP. Both SIP– and PSTN–connected customers, therefore, can enjoy the full range of both IP and traditional PSTN feature sets. For the wireline carrier both time to market and operating cost is reduced because one development effort using Web-based industry standard development tools is used to deliver the full suite of Centrex and IVR services.

The converged service architecture enables the adoption of customer-oriented marketing and customer-management business processes by providing a seamless interface between the converged network and the wireline carrier's OSS. Frequent modification and change of service offerings and features can be achieved with little disruption to the existing OSS's fault management, configuration, security, and billing mediation activities.

Service Initiatives for Growth and Profitability

Once a continuous service-creation process is in place and a converged service architecture is deployed many new service initiatives can be used to create profitable growth. They include the initiatives described in the following paragraphs.

Service Bundling

Service packages can be created such as a single monthly fee for local, long distance, DSL, and value-added voice features. Buyers will buy more of each service when packaged together than they will if forced to make service-by-service purchasing decisions. Wireline carriers recognizing this behavior have offered calling feature packages for many

years. The new forms of competition require extending the concept across all forms of voice, data, and video service.

Mobile Phone-Like Features
Much of the attraction of mobile phones particularly to the attractive youth market are the messaging, game, and ringer tone features commonplace on mobile phones but rarely found on wireline telephones. They provide opportunities to build customer value and loyalty through high levels of personalization.

Triple Play
Triple play refers to voice, video, and Internet access as a single offering. Triple-play offerings will increasingly become an essential defensive offering as cable MSOs begin offering consumer telephone service bundled with TV and Internet. It also is a major offensive tool that can more than double wireline carrier profitability. *Figure 4* shows the revenue contributions for a residential triple-play deployment.

The triple-play revenue analysis shows that very little revenue is contributed by telephone service while video services account for about half of total revenue. The addition of a triple-play capability into an existing LEC network provides very substantial revenue growth.

Figure 5 shows the cash flow of a triple-play project where a "Green Field" deployment of multiservice access (DLC/DSLAM) systems is used to provide voice, data, and video services.

The project turns cash flow positive within the first year and produces an internal rate of return of 180 percent per year for the five-year study period.

Creating Profitable IP services
Innovative IP–based services encompassing voice, video, and data offerings have appeal to both enterprise and consumer subscribers. They can offer unique capabilities such as unified messaging or attractive pricing such as IP telephony for international calling.

Fiber-Based Offerings for Large Enterprises
Fiber-based metro Ethernet service offerings that provide affordable access to bandwidth ranging in speed from 3 Mbps to 1 Gbps possess the flexibility to match precisely customer perceived value with performance. Currently fiber optic–based service offerings such as SONET are available only to those large enterprises willing and able to pay for special construction projects. The emerging metro Ethernet offerings provide optical performance over shared infrastructure that unlocks a much larger revenue opportunity than special construction (ICB) projects can deliver.

DSL Build-Out
DSL remains an important foundation for LEC delivery of new services, despite DSL's second-place showing to cable modems in the consumer market and the failure of many CLEC's enterprise DSL offerings. New technology using the converged network architecture is underpinning a second generation of DSL development for enterprises and consumers. Notable developments include the emergence of the G.SHDSL standard that will enable enterprise service offerings of more than 1.5 Mbps (symmetrical) and video service delivery for consumers. Aggressive new deployment of fiber to the premise (FTTP) and digital loop carrier (DLC), also, are reducing the number of subscribers whose loop plant cannot accommodate DSL.

New Technology for TDM Service Delivery
T1 service dominates the enterprise access service market. It is used for both voice and data services and underlies frame-relay service offerings that are the dominant form of intercity enterprise data communications. T1 service delivered over traditional PSTN infrastructure, unfortunately, does not scale—the cost to deploy two T1 circuits is twice the cost of deploying one circuit. From an economics perspective this creates a bandwidth void between the 1.5

FIGURE 4
Triple Play Revenue Analysis

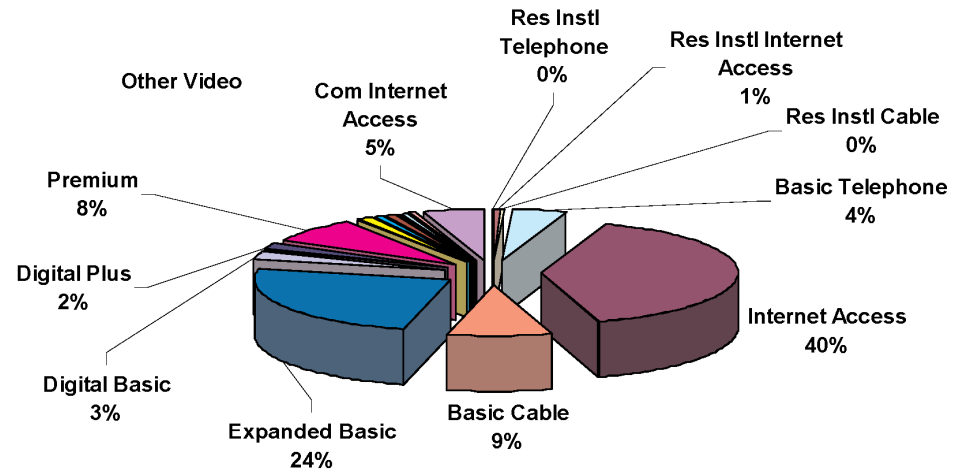
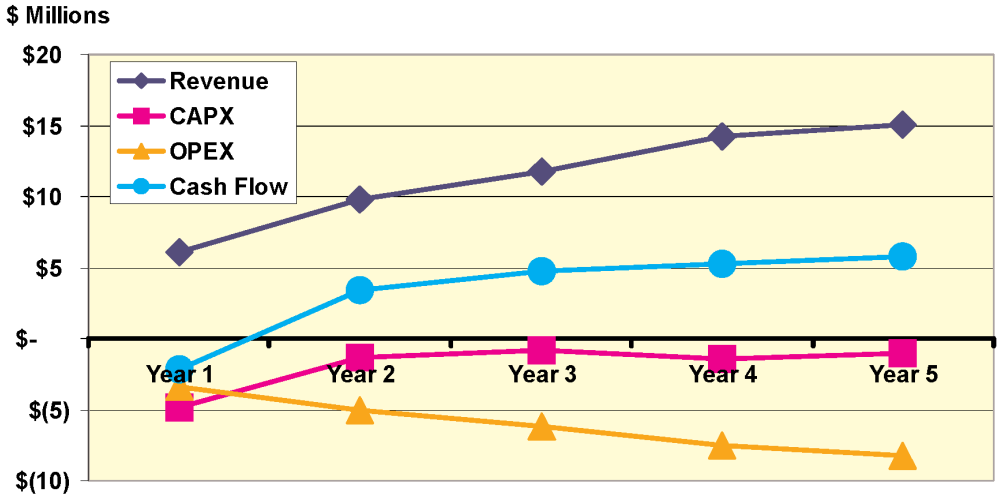


FIGURE 5

Triple Play Cash Flow



Mbps to 45 Mbps data rates. The converged network architecture supports cost effective provisioning of N X T1 service, thus, providing incumbent LECs a means of protecting their embedded base of enterprise customers and delivering affordable bandwidth upgrades.

IP–VPN Migration from Frame Relay

LECs can use IP–VPN service to build enterprise market share. The IXCs—AT&T, MCI, and Sprint—dominate the frame-relay market. IP–VPN, however, offers better price/performance and flexibility than frame relay. Wireline carriers can achieve major market share gains in the enterprise by using the converged network architecture to deploy IP–VPN services.

Conclusion

LECs face unprecedented competition from wireless operators, the Internet, and cable MSOs. Their challenge is to create high-growth profitable new service offerings. This can be achieved by building a continuous service-creation process that incorporates proactive life-cycle management of a multitude of customer-tailored service offerings. Deployment of a converged network architecture also is needed. Creation and delivery of services and features built and delivered through packet network based servers to all customers whether located on an IP network or the PSTN provides the market coverage and versatility to satisfy a very wide range of consumer and enterprise customer requirements. At the same time development of services and feature sets using industry standard Web development tools and development personnel permits achievement of time-to-market and cost points essential to customer management processes built upon proactive life-cycle management.

Notes

1. BellSouth, Qwest, SBC and Verizon account for more than 90 percent of U.S. local-exchange revenue, while these companies also account for a large share of U.S. wireless and Internet service revenue this report focuses on the wireline voice and data transport service market segment.
2. The largest LECs—BellSouth, Qwest, SBC, and Verizon—and the three largest IXCs—AT&T, MCI, and Sprint.