CELLULAR TELEPHONY

Approaches For Local Switched Service Recovery

By James Innes

Telecom contingency planners have become intensely aware of the local loop as the real achilles heel in their networks. This is because the local loop is by nature subject to a variety of failure modalities.

Route diversity (alternative local fiber-optic carriers) and private microwave systems are two of the contingency options available. In many cases, though, neither of these options may prove to be viable.

Alternate fiber access is far from ubiquitous. Although alternate fiber carriers operate in more than a dozen cities across the nation, many of their networks only encompass dense downtown areas. Business locations in given metropolitan areas are left with only the Bell Operating Company (BOC) as their single local access provider.

Private microwave systems are economically feasible for digital building interconnects and for alternate routing to an interexchange carrier. However, this option can only be applied in urban and campus environments where an enterprise has medium to high (multiple DS1 and/or DS3 circuits) communications requirements.

In any event, alternative fiber carriers and private microwave carriers can only provide protection against loss of private lines and special access facilities. They offer no protection against loss of local switched calling capacity. For businesses and institutions that operate within a local sphere of interest, that loss is intolerable.

There is an answer. Widely available, off-the-shelf cellular phones and services may serve as an effective short-term backup in the event of the loss of local switched voice service. The cost to install this capability is low and the technology is simple to implement, making it a ready option for businesses and institutions of any size.

The Cellular System

Cellular telephony utilizes a free space, radio frequency medium to carry phone conversations in an analog form between mobile and fixed telephones. Essential to this technology is the use of *cells* (the division of a geographic region into smaller areas). The cellular spectrum consists of two bands between 800 and 900 megahertz (MHz). These bands are assigned to each of two cellular system operators in given metropolitan or rural statistical areas.

Available Radio Frequency (RF) channels are assigned to each cell. Geographic separation of the cells permits reuse of RF channels in each band.

The cellular system itself consists of four components:

1. Mobile Telephone Switching Office (MTSO)
2. Cell site
3. System interconnect facilities
4. Mobile, portable or fixed phone unit.

The MTSO is the digital telephone exchange that controls the system, including call setup and tear down, routing between cellular phone units, the local telco, the interexchange carrier and call billing.

The cell site encompasses the cellular radios, antennas and RF transmission line, the tower, the system interconnect terminals and facilities (usually DS1 circuits carried by either the local telco or via operator-owned digital microwave facilities), an antenna supporting structure such as a steel tower or monopole, the cell site controller, which responds to instructions from the MTSO, and an environmentally controlled building or room to house the equipment. Most cellular carriers equip their cell sites with both backup batteries and generators.

Types of phone units:

- Mobiles (permanently mounted in a motor vehicle)
- Transportables (generally mounted in a vehicle but can be removed and operated for four to six hours using its own battery)
  [Both of the above use the maximum three-watt power output.]
- Portables (hand-held units approximately the size of a brick with a .5-watt output
- Microportables (approximately the size of a Walkman)
- Fixed, rack-mountable, three-watt units are also available.

Cellular Service

Cellular service is purchased through one of two carriers that operate within virtually all Metropolitan Statistical Areas (MSAs) located in the United States. The two carriers are known as the wireline and nonwireline. The wireline is owned and operated by the local BOC. The nonwireline can be locally owned and operated. However, in many cases, the nonwireline

is owned by a holding company that controls majority interest in a large number of cellular systems.

The cellular customer is charged for the monthly airtime used including both incoming and outgoing calls. In addition, there is a monthly service charge, equivalent to a local dial-tone charge. Each phone is assigned its own number, a process known as activation. This is undertaken at the time the phone is purchased.

Ideal For Disaster Recovery

This portability of cellular telephones makes the medium inherently flexible for application to disaster recovery requirements. There are a variety of ways in which a cellular-based recovery capability can be clustered together by a resourceful telecommunications staff.

At the most basic level, a small business, such as a real estate concern, can enter into an arrangement with the employees, who are equipped with cellular telephones. In this arrangement, the employees agree to make their phones available at a central location in the event of a loss of local phone service. Management agrees to bear the cost of any cellular airtime usage and, if the employees own their own phones, management should make some contribution toward their purchase or monthly airtime costs.

Specific Office Requirements

To support this arrangement, the office manager must maintain an inventory of all of the employees' transportable phones, and, of course, have constant access to a cellular unit in order to make the initial call out in the event of a loss of local service. Each inventoried unit should be equipped with an AC power supply so that the unit can be operated in an office environment around the clock. Larger companies may also implement this approach on a departmental basis wherever it is feasible within their organizations.

Operations that require a real-time local service backup capability should consider a different approach. To fulfill this requirement, an organization should purchase an appropriate number of activated cellular phones and hold them in reserve for use only in the event of a disaster. The ideal minimum would be three, with one each for incoming and outgoing calls; and the third as a backup, although it could be used for outgoing calls. In a corporate headquarters, certain departments with operationally critical missions, such as field service, would require the greatest number of phones. Hospitals and emergency service providers are especially good candidates for this type of arrangement.

Ideally, transportable cellular phones should be purchased. These phones are small enough to be deployed quickly and they still feature a full three-watt output. Although there may be some reception difficulty when a phone is used deep within a high-rise building, there should be no problem when an outside window is nearby, assuming that there is good signal coverage outside the building. If there is a question, your cellular carrier will be happy to assist you with some informal signal penetration tests. Cellular phones are an attractive item in terms of petty thievery and the communications manager should make sure that the units are securely locked away when not in use.

Maintaining this type of arrangement is quite affordable. Both the wireline and nonwireline carriers are currently offering attractive multiphone service discounts that can bring service costs down below the $10 per unit per month and airtime charges below the 10 cents a minute for peak time usage. Transportable phones can be purchased with no minimum airtime requirement for as little as $375 per unit.

A more sophisticated approach to cellular disaster recovery utilizes fixed, rack-mounted cellular units that are interfaced directly into designated local line ports on the user's PBX. Modern digital PBXs can be programmed to automatically switch over to these cellular backup lines in the event of a local loop failure.

Telular (Wilmett, IL) is a manufacturer of fixed cellular equipment for this application. They also manufacture a system with telephone line monitoring capability that will automatically sense a line failure and switch to the available cellular port. In this way, a company employing a non-intelligent switch or a key system can have an automatic line restoral capability. This approach has also been used extensively for backup of building alarm dial-up reporting lines.

When Disaster Strikes The Carrier

It should be noted that there is one weakness in the cellular approach to disaster recovery. If your local service outage is caused by a local telco Central Office (CO) failure and that CO serves both your location and the cellular carrier's MTSO or local cell site, all service, both landline and cellular, will be affected.

If an outage is caused by widespread conditions, the cellular carriers' interconnecting lines also could be affected. However, many cellular carriers are introducing elements of diversity into their networks. Route diversity/ring protection architectures and redundant microwave backbone interconnect networks are examples. The prudent manager will consider cellular as an ideal modality for protection from localized service disruptions.

Combining Cellular, Microwave And Satellite

A team of Bell Atlantic Mobile Systems (Bedminster, NJ) and COMSAT Systems Division (Washington, DC) have introduced a new system to provide telecommunications restoral capability that integrates cellular telephony with both terrestrial microwave and satellite communications technology. While this approach is well beyond the means of most of corporate America, it provides a good illustration of how versatile cellular is as a disaster recovery modality.

Called the National Transportable Telecommunications System (NTTS), the system is a leased telecommunications service using commercial, off-the-shelf cellular and satellite equipment. The NTTS will augment federal government communications during disasters or civil emergencies when the public switched network may be disabled or nonexistent.

COMSAT will provide the satellite and microwave portion of the service, while Bell Atlantic will provide a mobile MTSO, cell sites (including collapsible towers) and cellular units. The NTTS package is designed for deployment within 24 hours by either air or ground transportation to any designated area. It is fully transportable, completely self-contained and sized to fit in a C-130 cargo aircraft.

ABOUT THE AUTHOR

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