Personal Communications: an Extension to the Mobile Satellite

Murray Epstein, François Draper
Scotgroup Enterprises Inc.
2300 Laurentien, Montreal, PQ
H4R 1K3, Canada
Phone: 514-337-7222
FAX : 514-332-5228

INTRODUCTION

A great statesman once said: "Information is power." Timely information can be even more powerful. In today's mobile society, it is increasingly more difficult to reach individuals in a timely manner. Telephone tag can be a businessman's pastime, or perhaps his nightmare.

Technologies are converging, becoming more sophisticated, and many are evolving towards personalised communications, reaching an individual by name rather than a vehicle, an office, or a terminal on a desk. Technologies have been developed such as paging, cellular telephony, cordless telephony, data terminals, personal computers (with modems) and the widespread proliferation of facsimile, similar to the PC boom several years ago, to name a few.

Today, Industry has developed tools that can reach us by telephone in our car, in our boat, on the convention centre floor. We can send weather updates, stock market quotations, and feed a message to a FAX machine that will be transmitted to someone's pocket or belt on a device that accepts 80,000 characters in its memory, no wires attached. We can monitor alarms, shop at home, move information around the world in seconds, even monitor a patient's heartbeat while he continues his normal daily chores. Our imagination is the only limit to these applications.

Telephony has been the most preferred technology to date and the most utilised. However, even in the better developed urban areas, covering less than 10% of the Canadian land mass, portable (cellular) telephones are sometimes impractical, often unaffordable to the average consumer. The problem is even more compounded when we consider the rural and underserved areas of our country, the remaining 90%. **"Mobile satellites may hold the answer."**

TERRESTRIAL SERVICES: URBAN APPLICATIONS

In this rapidly changing world, we can no longer speak of one technology - one application. Technologies such as "computers," once thought of as large mainframes, have permeated our everyday lives not only at the work level but in the home. They are qualified as "personal" and have become consumer products. They are utilised in a multiplicity of applications, new ones being continuously created.

The same phenomenon is occurring in communications; they are becoming more personalised. New applications are being developed through the combination and manipulation of two or more existing ones and the emergence of any one technology will ensure the metamorphosis of many existing ones. Such is the evolution of services today.

These developments are evident in the more urbanised, densely populated areas, covering 90% of the population and only 10% of the land mass. In these areas, due to blockage, fade margins, high interference, and low sensitivity and signal levels, satellite signals can only be captured with very large, high gain antennas, impractical for transportable and mobile applications. Hence, terrestrial systems provide the means to personalise communications to the individual. Although analog systems are making way for digital ones, such services as cellular telephony, cordless telephony, paging, data services one and two-way, facsimile, etc. will continue to be satisfied by terrestrial systems for some time to come.

MESSAGING BY SATELLITE: RURAL AND UNDERSERVED AREAS

The advent of mobile satellites will push Communications beyond the traditional urban boundaries, well into the rural roots of Canada. It will optimise the "service coverage area," extending it to all parts of the country. We have a resource based economy, yet we function in large urban locales, the population living in a 5,000 kilometer corridor, huddled near the U.S. border, occupying 10% of our land mass. We transport our goods along this corridor yet we can communicate with these various vehicles for only 20% of their journey. They are the lifelines of our Industries, our food stuffs and our economy. The question that remains unanswered is: **"Will mobile satellites be affordable?"**

The high capital investments and the heavy operating costs of these satellite systems will make the use of voice circuits difficult to afford. On the other hand, the high compression techniques and near real time needs of data circuits make them more practical and more cost-effective. Thin route, satellite to device, "Data Messaging" (paging) becomes a solution to the non-urban user needs, one-way or two-way.

INTEROPERABILITY: RURAL AND URBAN

As high as the benefits of existing systems may be, one critical element is missing: **INTEROPERABILITY** between them, that is the ability to operate devices in both rural and urban areas; thereby realising the true needs of the user, full ubiquitous services in both environments.

The marriage between these converging technologies will develop new and exciting services to better meet the user requirements. Where satellites cannot offer mobile, personal communications services to subscribers, in the 12 major Canadian corridors, covering 10% of the territory, terrestrial systems will emerge dominant. While in the remaining 90% of the land mass, where capital investments for terrestrial systems would be ludicrous, satellite services will dominate. The key, however, is found in the ability to operate the same device in both

areas, offering complimentary rather than competitive services.

Downconversion

Initially, it is envisaged that the messages will be received with a standard L-band/MSAT receiver (Mobile Earth Terminal) and antenna, and be downconverted from L-band (1.6 GHz) to an Intermediate Frequency (IF), encoded, and retransmitted at VHF (150 MHz), low band UHF (420 MHz) or high band UHF (931 MHz); the bands where pagers presently operate (Figure 1). This downconverter/repeater will be a low power, standard stability, digital only, low cost transmitter. Outputs will be in the 100mw to 1W range. The subscriber would then be able to receive the message within a radius of 1/2 mile from the downconverter, with excellent penetration.

The L-band receiver would be either stationary (repeater on land) serving remote communities, transportable or located in a vehicle (truck, car, ship or plane). A truck driver, for instance, could leave his vehicle when stopped, and continue to receive all his messages within a reasonable distance from that vehicle, a problem that presently exists since he is out of that vehicle longer than he is in. This service would likely utilise existing alphanumeric pagers, synonymous with one-way data devices.

When in a major corridor, the device could be disconnected from the downconverter, and simply operate through existing terrestrial systems, as they do today. The advantage of this process is that no major technological leap is required.

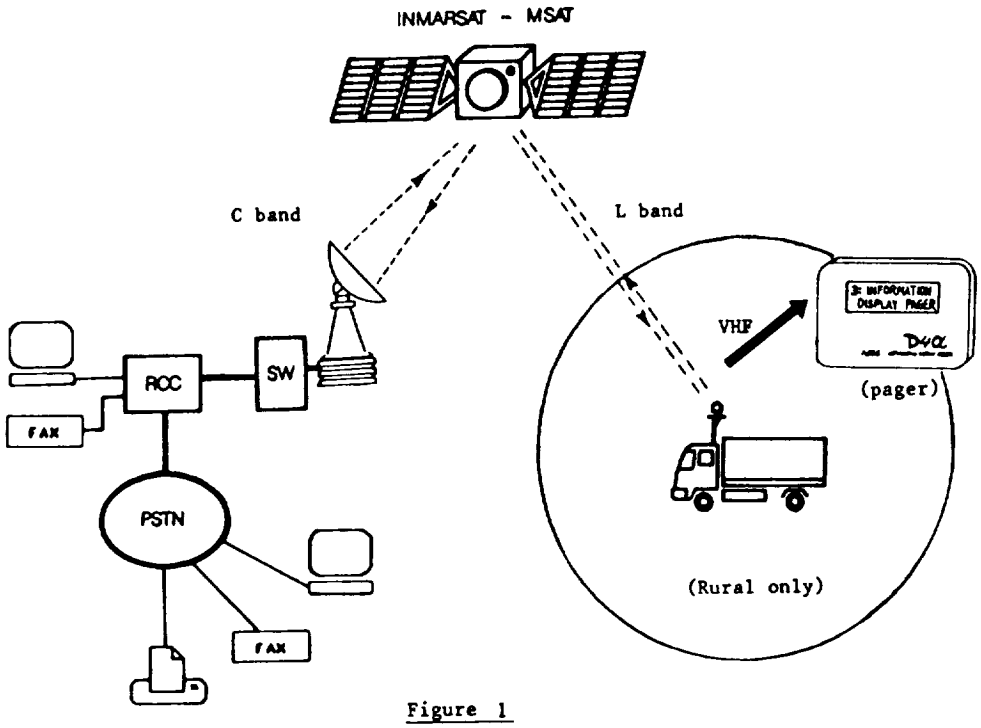

Figure 1

Dual-mode

The next development will be a dual-mode or dual-band data device, capable of transmitting/receiving L-band messages directly from the satellite while in rural areas and transmitting/receiving messages from terrestrial systems when in urban areas (Figure 2).

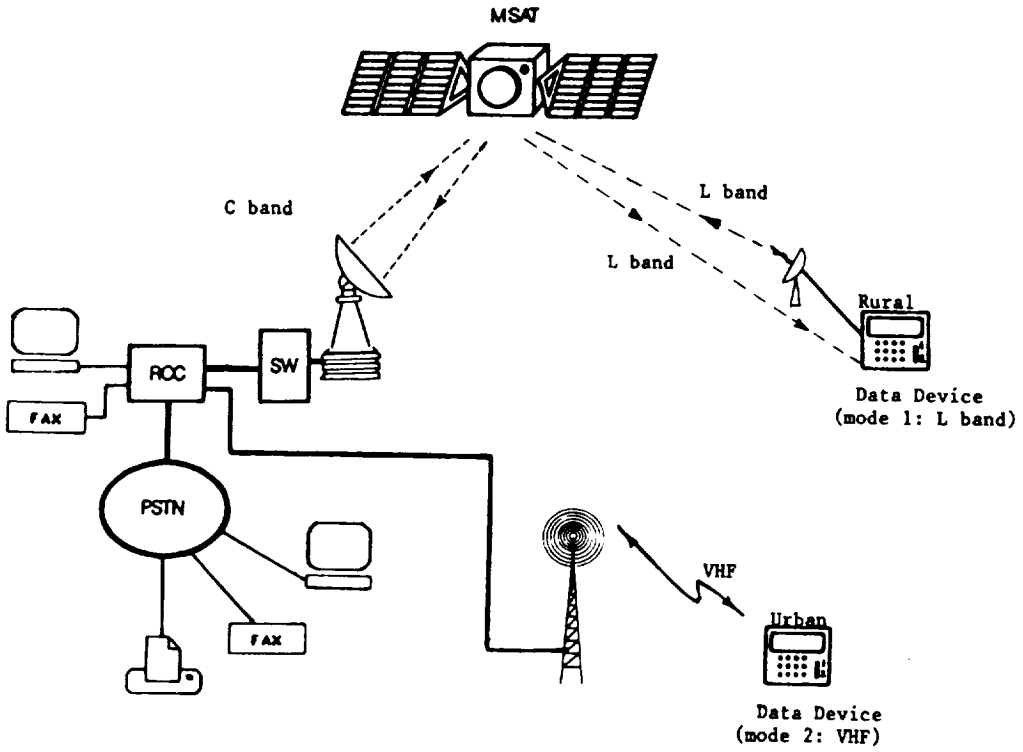

Figure 2

The downconverter, in effect, becomes part of the device. By then the satellite antenna gains will need to be greater and the device gain and sensitivity equally higher. The service will be truly portable and likely two-way. It is perceived, however, that the data device would require an external antenna (folding) in order to transmit to the satellite while in rural areas. Reception only from the satellite would not need the external antenna, nor would it be needed in urban (terrestrial) areas. Rather than paging, we might think of this service as two-way data or full messaging.

The subscriber will no longer need to carry the "Mobile Earth Terminal." This mobile data device will be dual-band scanning or perhaps manually switchable in order to conserve battery life.

Single band

Further into the future, we can conceive of a single-band data device operating at L-band only, directly with the satel-

lite, two-way and with terrestrial systems when necessary in order to reduce the cost. As in cellular telephones, the data device would identify its position, through a control channel, so that the switch could locate the subscriber and transmit messages to it by the most economical means (by satellite or terrestrially). (Figure 3)

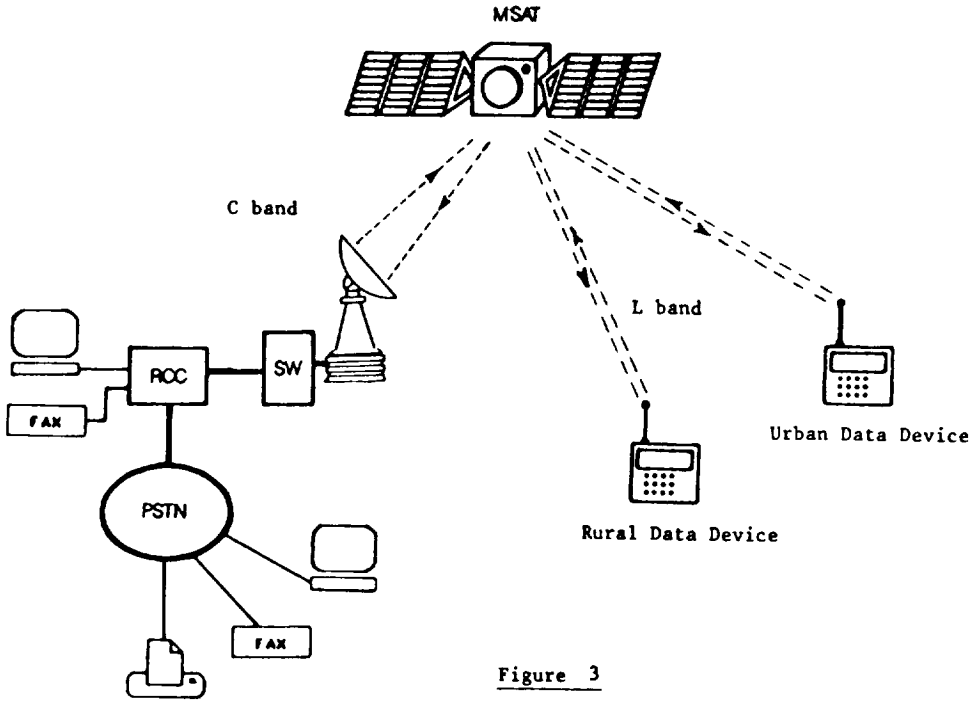

Figure 3

The subscriber now has a truly interoperable data device, including position location. It is fully two-way data and by now at relatively high speeds. The subscriber no longer carries any external antenna and the technology has evolved to provide an efficient, cost-effective, practical device. Although much more costly, the subscriber has a digitised-voice option on his device that he uses when required.

CONCLUSION

As time progresses, the customer demands are far more universal: integrated, simple to operate, cost-effective services, with technology virtually transparent to the operator.

Industry will be in a position of providing those necessary services to meet the subscriber needs. Our resource based industries, transportation and utilities in the more rural and underserved areas will require quality and affordable services that can only be supplied via satellite. Yet these same services will need to be satisfied, to the same subscribers, operating the same devices in terrestrial environments. The convergence of technologies is showing the way. One answer to those needs will be one and two-way, interoperable, **Data Messaging**.