

Introduction

Canadian Technology in Rural Telecommunications Systems

Canada's 25 million people live in a few large cities and a multitude of small settlements, scattered across an immense area: 6 000 kilometres from the Atlantic to the Pacific Ocean, and nearly 5 000 kilometres from the North Pole to the United States border. With this challenge of distance on a grand scale, it was natural for Canadians to become pioneers in telecommunications. From the invention of the telephone in 1874 to the world's first domestic satellite system in 1972, Canada has been a technology leader. This heritage has led to the development and manufacture of equipment that is particularly appropriate for rural telecommunications.

As a result, today Canadians enjoy sophisticated telecommunication services. Telephone, business communications, and broadcast services are delivered by cable, microwave, fiber optics, and satellite systems. More than 160 000 route kilometres of microwave and more than 100 earth stations connect some 19 million telephones country-wide.

Domestic Experience

With Canada's small population spread over an immense area, economical telecommunication service depends on keeping the cost of transmission equipment low. In the early years, thousands of kilometres of open-wire line on wooden poles spanned the country, and extremely remote, small communities were served by HF radio.

Now a host of techniques are available to the network designer that minimize cost and maximize performance, including: VHF, UHF, and microwave radio, twisted pair, coaxial, and fiber optic cable; multiple access radio systems, and thin-route satellite service.

The advantages of digital telecommunication have long been recognized in Canada and fostered rapid development in that technology:

- In 1971 our first digital microwave transmission system was developed.
- In 1976 the first family of digital central office switching equipment was delivered.
- In 1977 the first public packet-switched network became operational.
- In 1982 a 6 000 kilometre, all-digital transcontinental multiplex transmission system went into full service.
- Time division multiplex access radio was developed in the late 1970s as a substitute for conventional outside plant.

Since these pioneer efforts, Canada has gone on to become a leader in the engineering, manufacture, and installation of such systems. The first system was installed in Newfoundland, where it replaced an outdated submarine cable and extended the province's telephone network into a number of villages.

A similar system was installed in Quebec to provide telephone service to a number of farms located on a small island. In Ontario, a precedent-setting project used this type of system to replace an obsolete central office telephone exchange. These systems are now found in virtually all areas of Canada: from the Arctic Ocean where temperatures can fall below -60°C , to arid southern regions where summer temperatures rise well above $+40^{\circ}\text{C}$.

Satellite earth stations, using single-channel-per-carrier technology, have also become a major component in Canada's rural telecommunication programs. Such stations, located in all areas of the country, are linked through one of the Anik satellites to the national telecommunication network. Their applications in voice and data services range from off-shore drilling platforms, to remote community service, to portable emergency facilities that can be quickly transported to, and set up in, disaster areas.