

Telecommunications Standards Advisory Council of Canada

TSACC

Working Group on Information Highway

WGIH

**Standards Based Interconnection Framework
for the Canadian Information Highway**

Standards Roadmap

Version 1.0

Prepared by:

Keith G Knightson

Chairman of TSACC WGIH

Preface

As chairman of Telecommunications Standards Advisory Council of Canada (TSACC) Working Group on the Information Highway (WGIH), I am pleased to endorse the initial version of the Standards Roadmap.

This document presents a series of standards-based network interconnection scenarios, for use in the development and deployment of the Canadian Information Infrastructure or Canadian Information Highway.

It is an important first step towards the culmination of the “joint government-industry effort to develop a standards roadmap for Canada’s Information Highway” as announced in the Government publication, “Building the Information Society - Moving Canada into the 21st Century. Additionally, this work is consistent with the recommendations of the Information Highway Advisory Council who stated in their report that “TSACC is an appropriate government-industry model to establish commonality of standards”.

The primary objective of the document is to promote and encourage the use of standards-based solutions by those involved in supplying Information Infrastructure services and products in Canada.

As chairman of the TSACC WGIH I would like to express my thanks to all the TSACC members who helped to create this initial version, and invite all recipients to contribute towards its further development. We are operating in a rapidly changing environment and we know that many new areas will need to be added to keep the document market relevant. The document has an open-ended design which will permit accommodation of evolutionary trends.

In closing, I would like to acknowledge William McCrum, Director of Standards and Interconnection at Industry Canada, and members of his staff Dave Clemis, Andy Kwan and Jean-Yves Fortin, for their support to the TSACC WGIH program.

For further information or feedback, please feel free to contact me at any time using the information below.

Yours Sincerely,

Keith G Knightson
TSACC WGIH Chairman

KGK Enterprises, 6 Beaufort Drive, Kanata, ON, K2L 1Z4, Canada
Telephone: +1 613 592 7646, Fax: :613 592 6261, e-mail: kgk@igs.net

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Executive Summary

This document contains a set of scenarios showing the interconnection of various networks and technologies in a variety of configurations, involved in the delivery of a specific service or a set of services. The set of scenarios in this document provide a standards-based “Roadmap” for provision of the Canadian Information Highway¹.

Rather than simply list all known standards as a linear “laundry” list, this Roadmap provides a pictorial representation of the standards that are applicable to practical interconnection cases. In other words, it provides a context for the application of specific standards.

The document is formatted into a number of free-standing sections to facilitate ease of refinement and addition. The first section provides a general overview to the concepts and principles of scenarios, as well as other information related to network interconnection in a multi-carrier environment. This is followed by individual sections on specific types of interconnection, such as ISDN (both Narrowband and Broadband), X.25, Frame Relay, Cellular Services, etc.

This document will continue to be developed, as a result of further input from industry and evolution of the Canadian Information Infrastructure. The Roadmap will, ultimately, provide a comprehensive reference guide, and tool, for illustrating the utility of standards in various interconnection situations and, thus, the potential use of standards in Canada.

It is recognized that non-standard legacy implementations may continue to exist, arising from historical situations. However, in accordance with the views of Canadian industry, the Roadmap document is focused, primarily, on the use of international standards in a Canadian context. In this regard, the Roadmap may be regarded as a “forward-looking” document providing the target solutions.

¹ Synonymously known as the Canadian Information Infrastructure

Section I - Roadmap Overview

1 Introduction

This document, termed a “Roadmap” provides a catalog of standards-based solutions for delivery of a number of information services over the Canadian Information Infrastructure or Canadian Information Highway.

Note: The terms “Information Infrastructure” and ‘Information Highway” are used synonymously in this document. Additionally, the prefix Global or Canadian may also be applied according to the context, e.g. CII, GII.

This document contains a set of scenarios showing the interconnection of various networks and technologies in a variety of configurations, involved in the delivery of a specific service or a set of services. This set of scenarios constitutes what has been termed “The Roadmap”.

The Roadmap is intended to be a “living” document, to take account of the changing and evolving nature of services and delivery technologies.

The Roadmap, in itself, is not neither prescriptive nor proscriptive.

1.1 Purpose

The primary purpose of the Roadmap is to document a set of standards-based solutions that are both applicable and available to meet a variety of Information Highway requirements for the provision of voice, data, image and video services.

1.2 Objective

The primary objective of the document is to encourage the use of standards-based solutions by those involved in supplying Information Infrastructure services and products in Canada.

1.3 Usage

It is expected that this document will be of use to those involved in supplying services and products. It is expected that it will also be of interest to bodies overseeing the implementation and/or deployment of the Canadian Information Highway.

1.4 Evolution to a Comprehensive Guide

A number of key players in Canada, from the service provider and product supplier sectors, have contributed to the formulation of the Roadmap.

It is expected that these key players will continue to contribute to this document such that it will continue to evolve as a comprehensive reference guide and tool related to the use of standards in Canada.

2 General Organization of Document

This document is divided into a number of sections, to satisfy the dynamic and evolving nature of the Information Infrastructure, and emerging technologies. The document is organized and designed to permit new sections to be added, or existing sections to be changed without necessarily affecting other sections of the document.

The sections in this document are organized by both numbers and letters. Material relating to general introductory, background and methodology issues are contained in the initial numbered sections. Sections which depict particular scenarios are contained in lettered sections, from "A" onwards. All sections are to be considered as integral parts of the Roadmap.

The initial section of the Roadmap, the "Roadmap Overview", contains material relating to the general and background issues, as well as the underlying basic principles and methodology being applied. This material provides the basis for understanding the remainder of the document. It may be necessary to add other numbered sections in the future.

The remaining lettered sections (Section A onwards) will be dedicated to the specific cases of network interconnection. Specific cases may be dedicated to specific services delivered over specific networks and technologies, or combinations thereof. The divisions between sections are based on convenient distinctions between specific technologies, services, or other relevant factors.

3 General Background

In order to specify particular solutions it is necessary to understand and describe the problem or set of problems to be solved. The Information Infrastructure is often described in general terms that can mean “all things to all men”. Anything related to information, its production, delivery, processing, storage, etc., can be assigned to the general category of Information Infrastructure. The general scope of the Information Infrastructure, and of this document, is illustrated in figure 1 below.

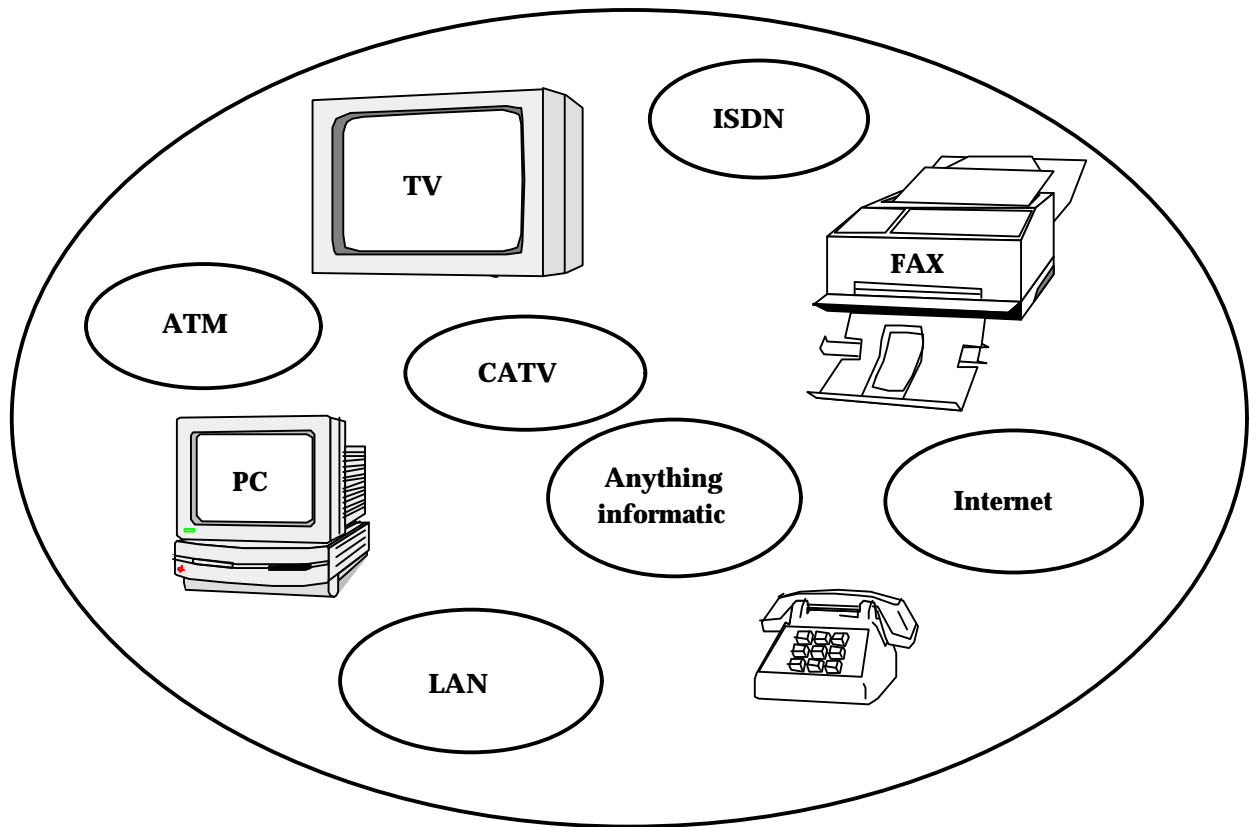


Figure 1 - General Scope of the Information Infrastructure

3.1 Problem Space

Whilst pictures such as that shown in figure 1 are very informative about the “scope” of the Information Infrastructure they provide little or no focus for application of particular standards. In order to progress further it is necessary to have an understanding of how the pieces may, could or should be fitted together and the synergy required to provide particular information services, such as voice, data, image, video, etc. This is particularly important when considering the potential for convergence between the telecommunications, information technology, and entertainment (consumer electronics) industries.

In order to examine these issues more fully, it is necessary to have a picture of the target to be achieved. Fitting the pieces together to provide a seamless system is an important part of this exercise. It is also probable that some of the pieces may have to be re-shaped, somewhat, to achieve synergy in some cases. During the course of this exercise, gaps, conflicts and overlaps in the standards repertoire may have to be addressed.

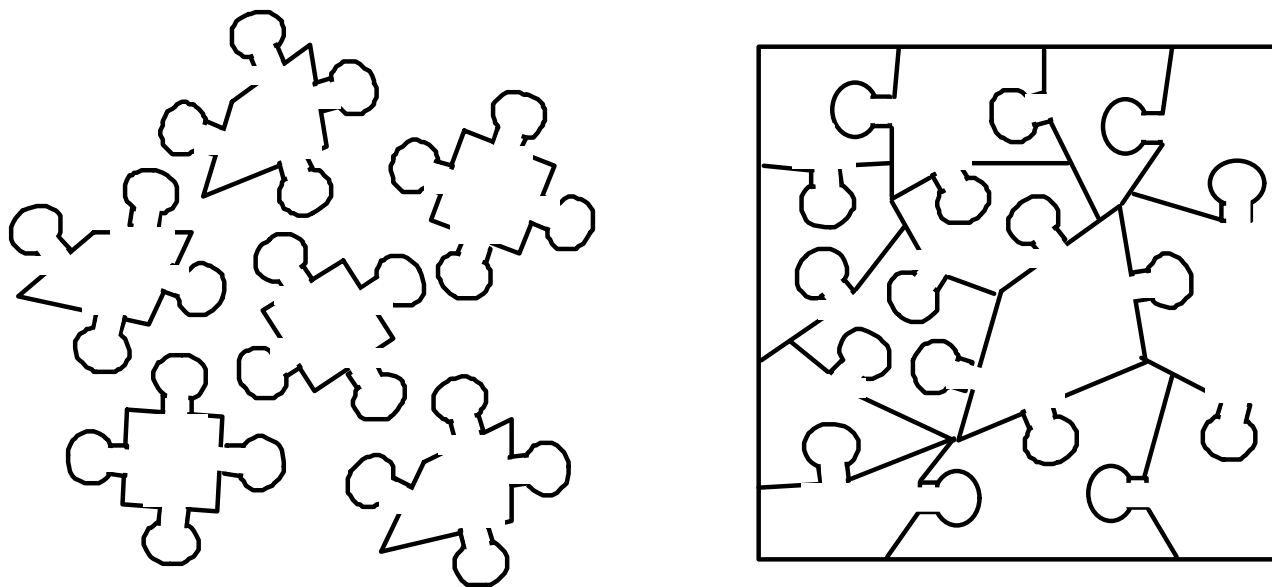


Figure 2 - Migration From Individual Pieces to a Seamless System

3.2 Network of Networks

From the networking perspective the Canadian Information Highway has been described as a “Network of Networks”, as shown in figure 3. Whilst the intent of this is clear it also suffers from the lack of precision necessary to describe or define how services are in fact delivered from provider to consumer.

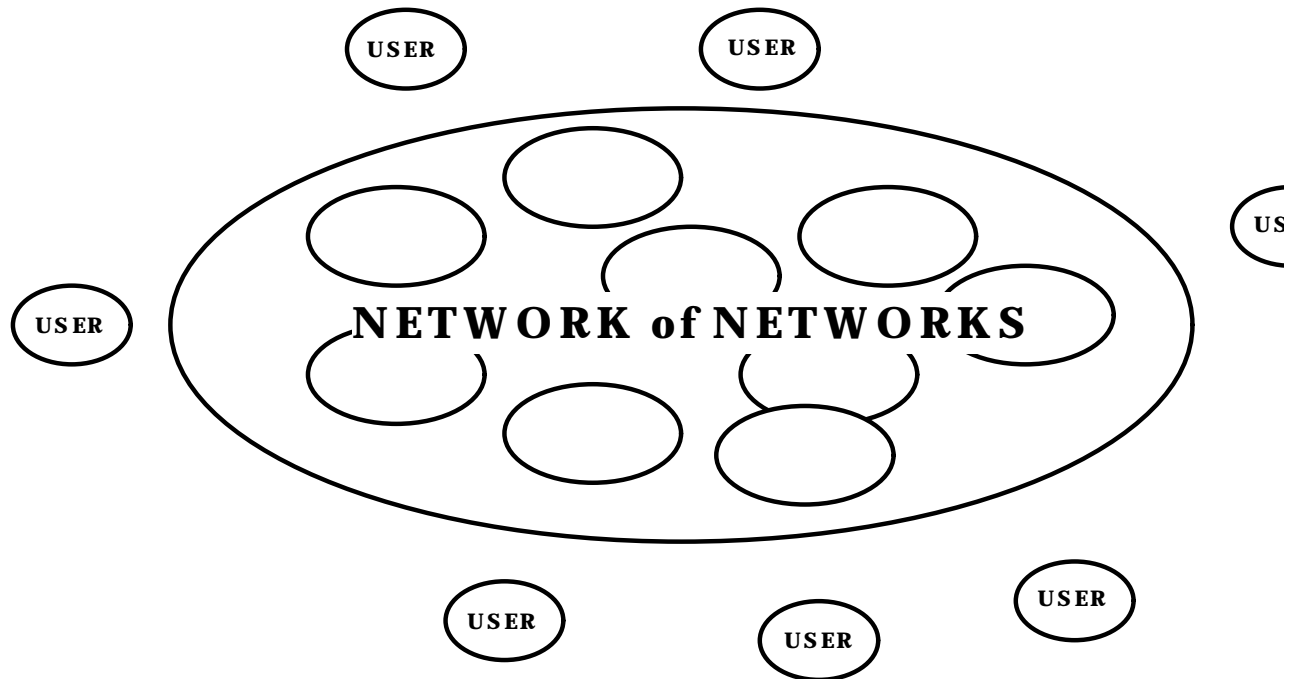


Figure 3 - The Information Infrastructure - A Network of Networks

In the context of a “Network of Networks” it is necessary to examine the interworking or interconnection amongst various networks within the infrastructure. Specific cases of interconnection will be the subject of a given scenario.

The interconnection of networks, is a highly complex subject, since it encompasses:

- a) cases where similar networks are interconnected at a peer-to-peer level;
- b) cases where dissimilar networks are interconnected at a peer-to-peer level;
- c) cases where one network is used to gain access another;

- d) cases where the protocols of one network are superimposed on top of another (by encapsulation or tunneling techniques);
- e) cases involving mixtures and combinations of some or all of the above cases.

An basic understanding of these principles is necessary, since some or all of these cases will appear in the interconnection scenarios, which will comprise the Roadmap.

4 Principles and Methodology

4.1 Interconnection of Networks

This section briefly illustrates the fundamentals of the cases enumerated above. This is not intended to be a tutorial, and only describes the underlying basis and techniques used in the Roadmap.

4.1.1 Peer-to-Peer Interworking

Figure 4 shows a case of peer-to-peer networking. Each of users, A or B, “sees” only a single network and operates with a single set of procedures irrespective of whether the destination is on his local network or the remote network.

However, the features and facilities of each network may or may not be identical. In the case where the features and facilities of each networks are not identical, some loss of functionality may be apparent to the user when accessing a user on the remote network. This may happen because of different feature/facility implementations in identical base technologies, or because of different base technologies which cannot be converted or translated.

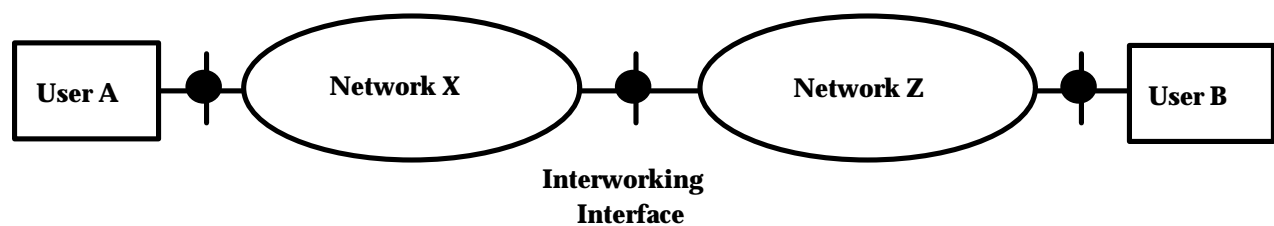


Figure 4 - Peer-to-Peer Interworking

4.1.2 Non- Peer-to-Peer Interworking

A multitude of other cases can be derived from the basic non- peer-to-peer case shown in figure 5.

In the case actually shown in figure 5, network X is used to access the other network Z. So accessing user B requires a two stage process on the part of user A. Examples of this are X.25 dial-up, access to an Internet Service Providers point of presence, etc.

Clearly, a much more complex interworking function is required in such a case.

Tunneling or encapsulation techniques also fall into this same category, where one underlying network service is used to transparently to carry another. Thus, the overlay may apply end-to-end, between intermediate points within a multiple network configuration, or between one end and some intermediate point (the actual case shown in figure 5).

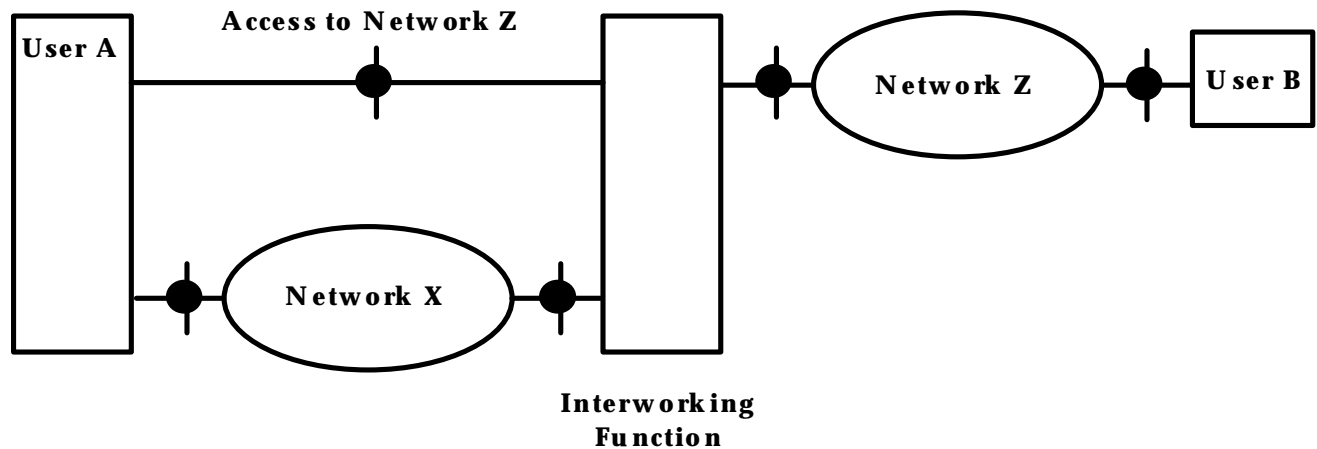


Figure 5 - Non- Peer-to-Peer Interworking

4.2 Scenarios - Descriptive Technique

This document uses the descriptive technique developed in Canada for the purposes of graphically illustrating interworking scenarios. This technique is also being adopted within ITU-T SG13 in its Global Information Infrastructure work.

The interface symbol, shown in figure 6 is used to denote an interface and/or reference point between two GII elements.



Figure 6 - Interface symbol

Individual networks shall be represented by a graphical ellipse, as shown in figure 7.

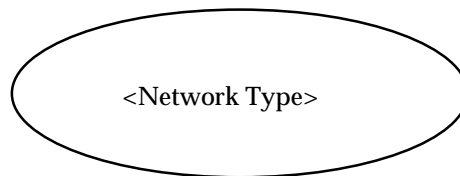


Figure 7 - Network Representation

Appliances and/or other Functional Units shall be represented by boxes, as shown in figure 8.

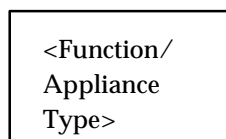


Figure 8 - Representation of Function or Appliance.

Note: In the case of an appliance suitable appliance-like icons may also be used.

Figure 9 provide two simple generic examples of use of the technique.

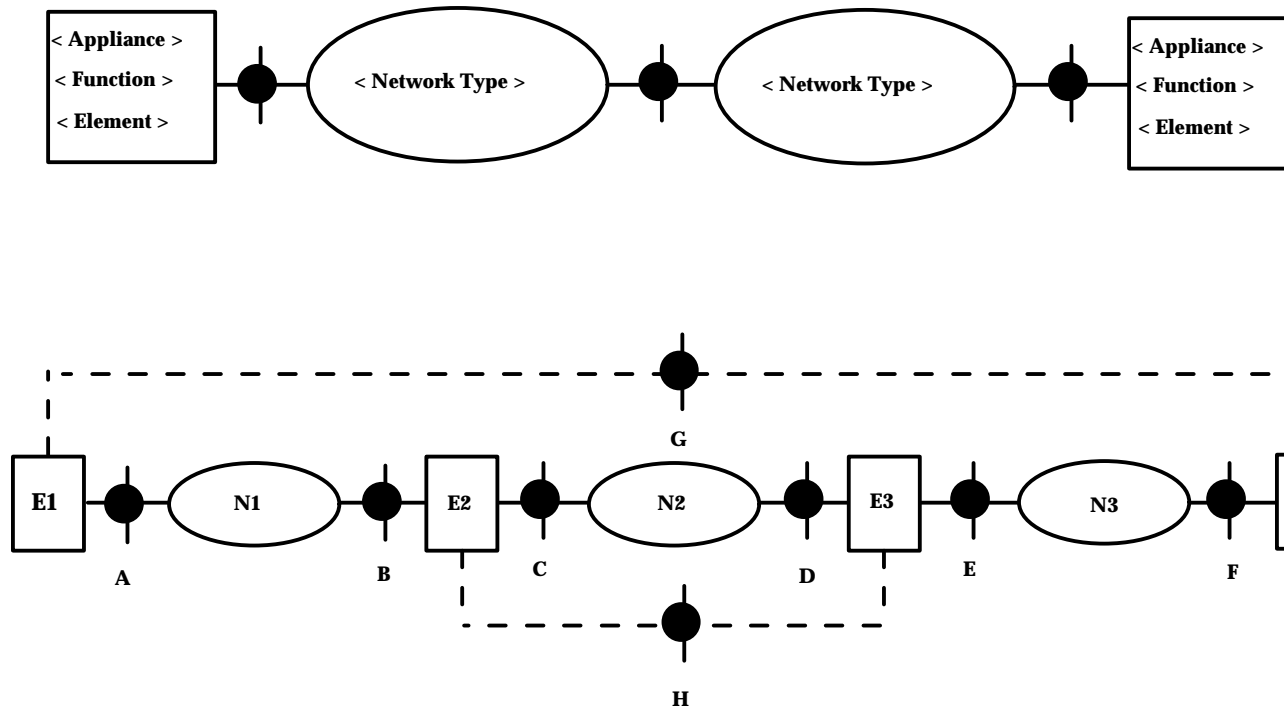


Figure 9 - Examples of Symbology used in this document

The dotted lines in the second example show how indirect interfaces between non-adjacent components, such as those used for tunneling or encapsulation can be captured if, necessary. This technique will enable non- peer-to-peer cases, such as those described earlier in section 4.1.2 to be illustrated.

At a very macro level the use of this technique enables practical scenarios such as that shown below in figure 10 below.

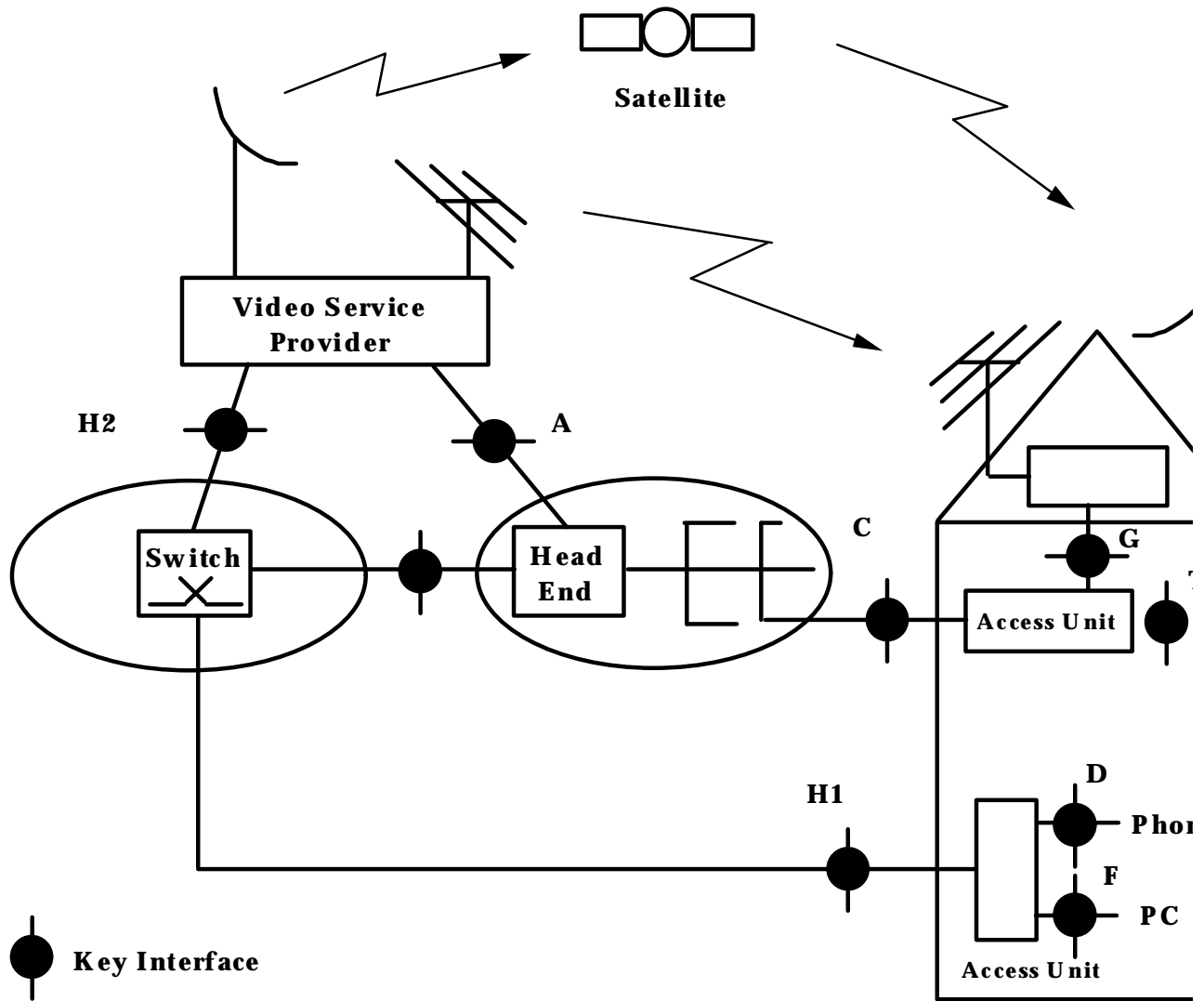


Figure 10 -High level example of a scenario

Key interfaces can be identified by allocating designations to them, such as A, B, C, etc. For each interface identified, a list of applicable standards can be drawn up.

More detailed and finer granularity use of the technique can be applied to achieve more further decomposition as will be necessary for the specific scenarios contained in the following sections.

4.3 Points of Interconnection

A number of assumptions are necessary about the available access points or Points of Interconnection (POI) within the totality of all networks being considered. Unlike some other countries, Canada does not have a formal Interconnection Framework, such as that shown below in figure 11. However, it is necessary to assume one in order to further evaluate possible interconnection/interworking scenarios and the use of various standards.

For the purposes of this document the interconnection framework in figure 12 is assumed to be appropriate basis for the detailed scenarios that follow in the subsequent sections of this document. In general the figures the following types of interface may arise:

Designation	Points of Interconnection
A1	User Network Interface - Raw Technology
A2	User Network Interface - Network Interface Device
B1	Access Network Distribution Point - Line Side
B2	Intermediate Distribution Point (upstream)
B3	Intermediate Distribution Point (downstream)
C	Access Network Distribution Point - Local Exchange Side
D	Local Exchange - Line Side
E1	Local Exchange - Trunk Side
E2	Local Exchange - Local Exchange
F	Transit Exchange - Local Side
G1	Transit Exchange - Trunk Side
G2	Transit Exchange - Transit Exchange
H	International Exchange - National Side
I	International Exchange - International Sid

The set of interfaces shown above is provided, primarily, for illustrative purposes. The scenarios will not use exactly the same designations. The POI in a given scenario will use an arbitrary designation scheme. Additionally, it may not be necessary to separately identify each side of a given interface.

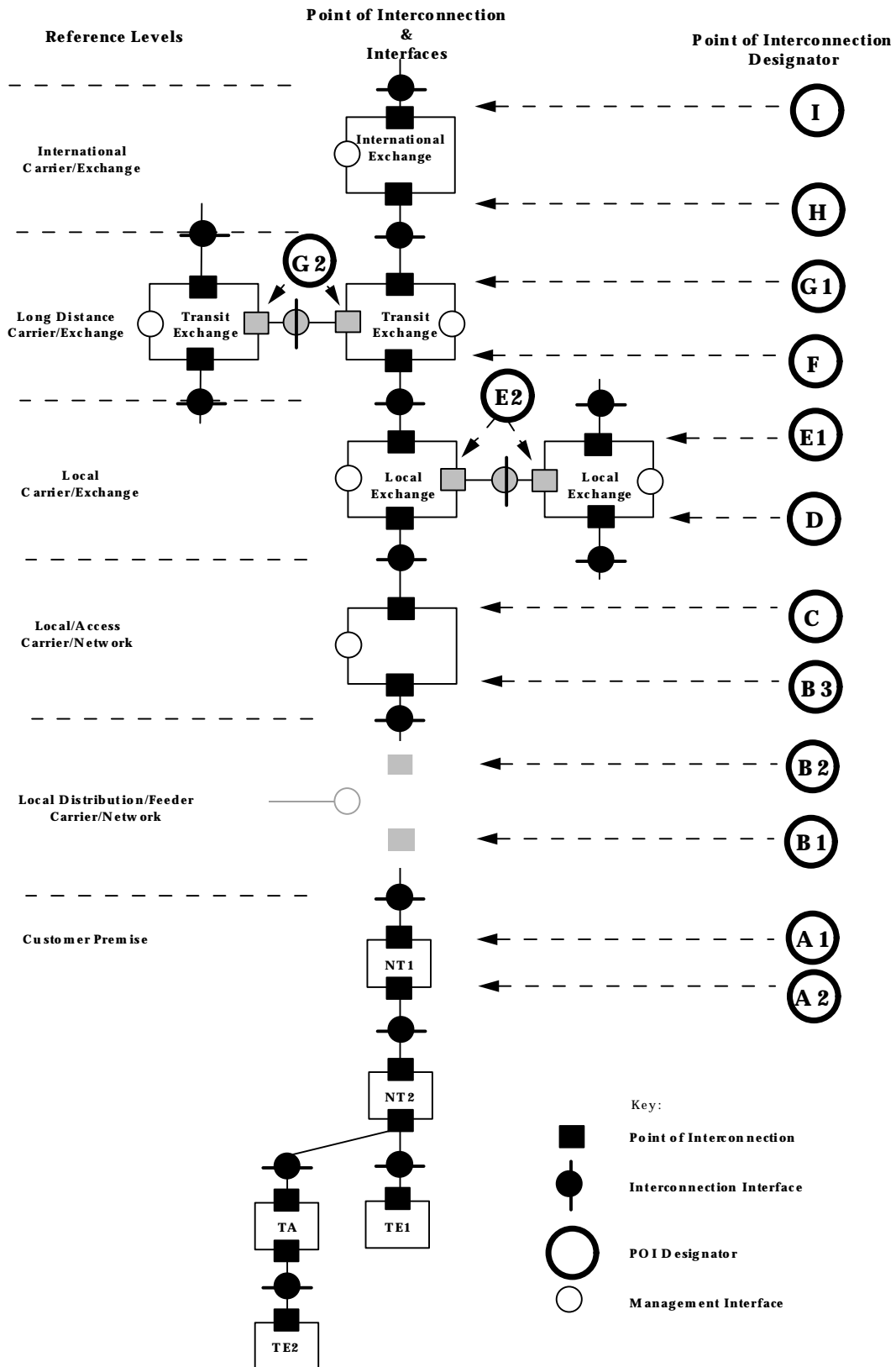


Figure 11 - Assumed interconnection Framework

4.4 Infrastructural Roles

The model given in figure 11, above, allows the potential infrastructural roles of individual companies or organizations to be illustrated. An example showing various infrastructural roles of a number of organizations is given in figure 12 below.

Figure 12 shows a single company in operating in a number of infrastructural roles as well as a number of other companies operating in single specific infrastructural role. The interfaces defined in figure 11 are then applied to the inter-company interconnections. The same interfaces may also be applied within the single organization, as intra-company interfaces, although there is no necessity for this since exclusive internal arrangements may apply.

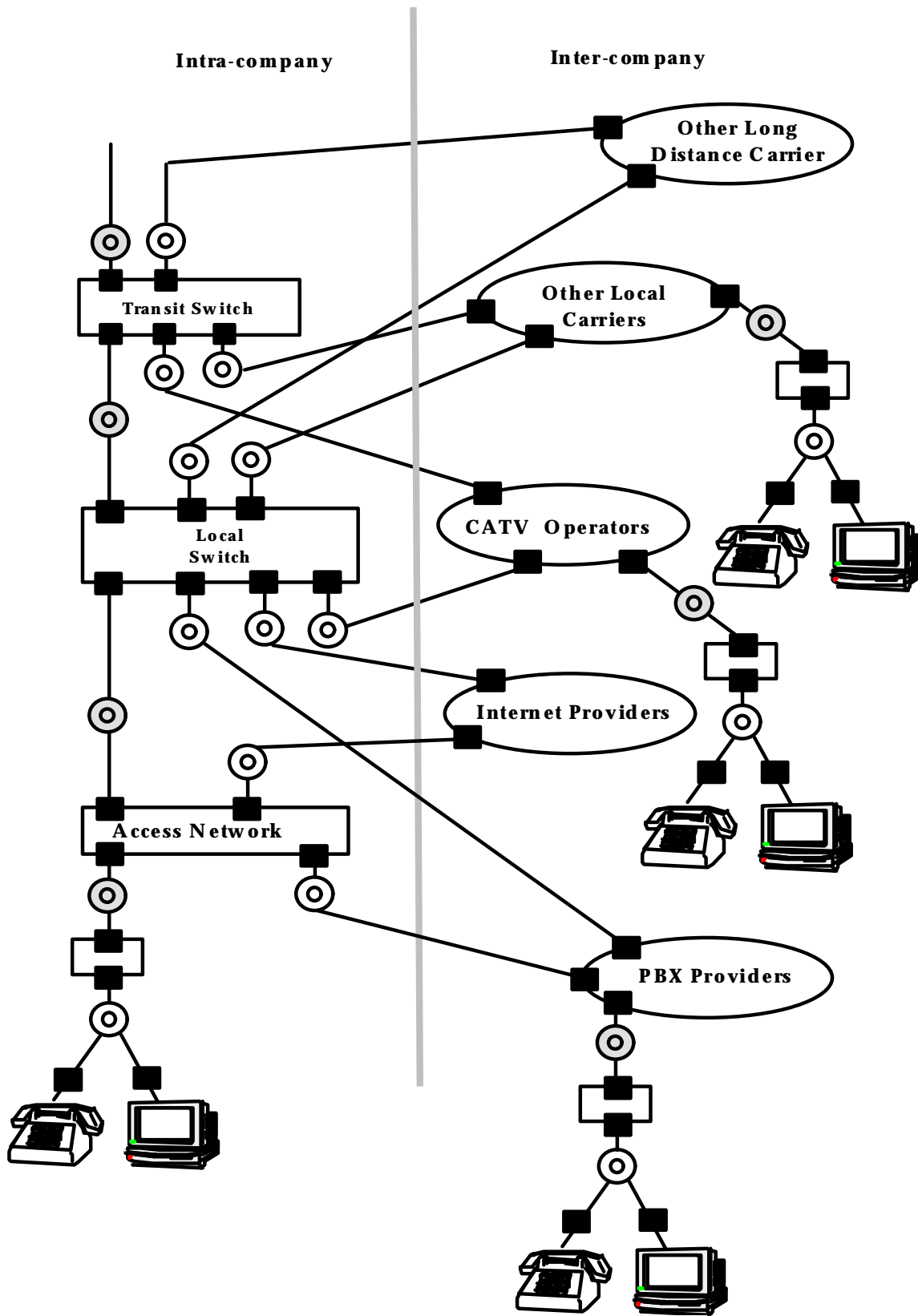


Figure 12 - Examples of Infrastructural Roles