NRCan's Internet GPS Data Relay (iGPSDR)

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Canada's Natural Resources

30 April, 2002

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Overview

- **NRCan's Real-Time Network**
- **iGPSDR Design and Features**
- **Specifications**
- **Availability**
- **Applications**
- **Performance**
- **Summary**

NRCan's Real-Time Network

- **We have been collecting real-time data since 1996. (Currently 14 real-time stations)**

- **Private managed Frame Relay network**

- **Existing system is very reliable but costly, looking to reduce costs.**

- **We need to be able to distribute/collect data outside the frame relay network.**

- **Open Internet has improved in recent years and used successfully by others for real-time data collection(JPL)**

NRCan's Real-Time Network
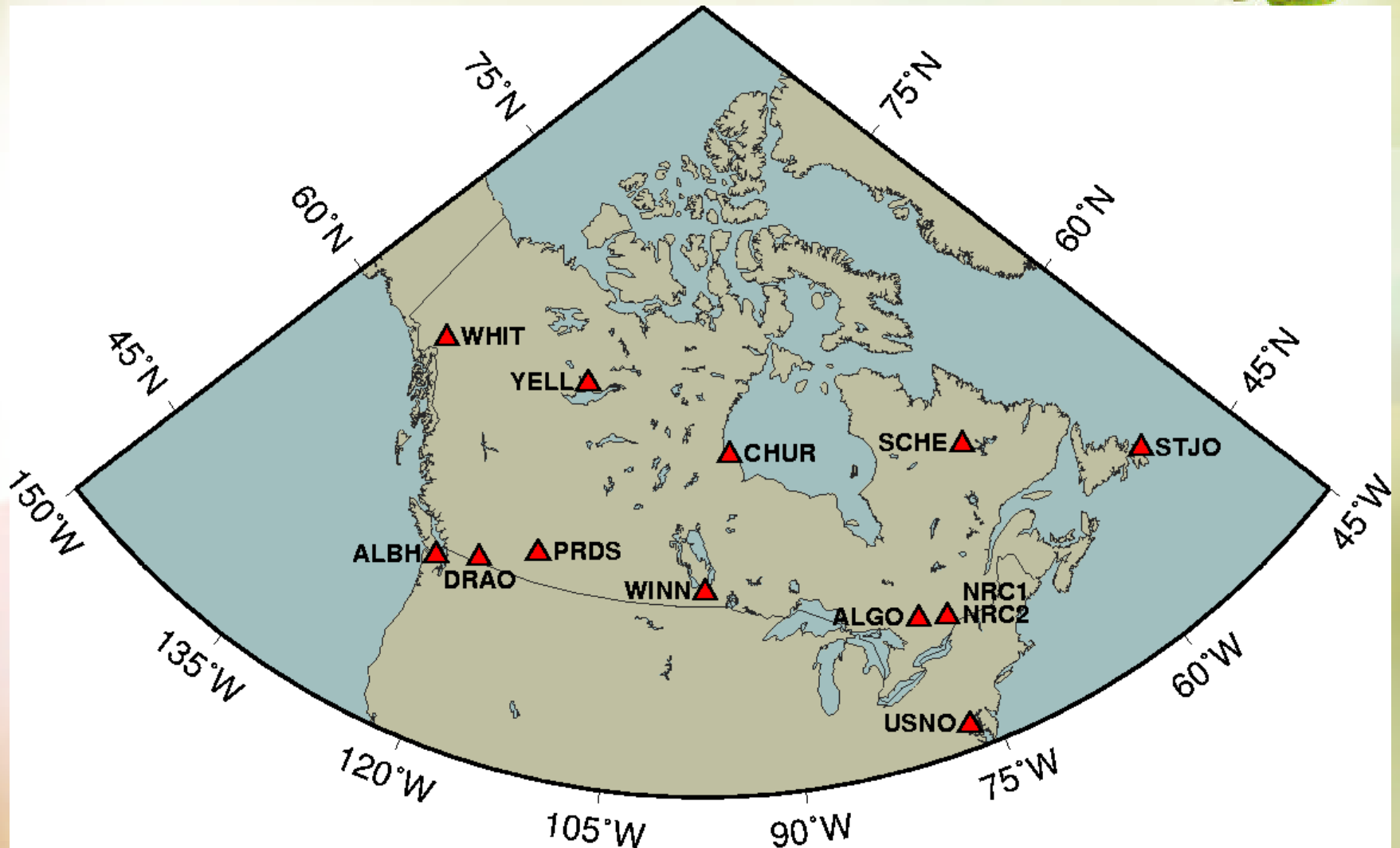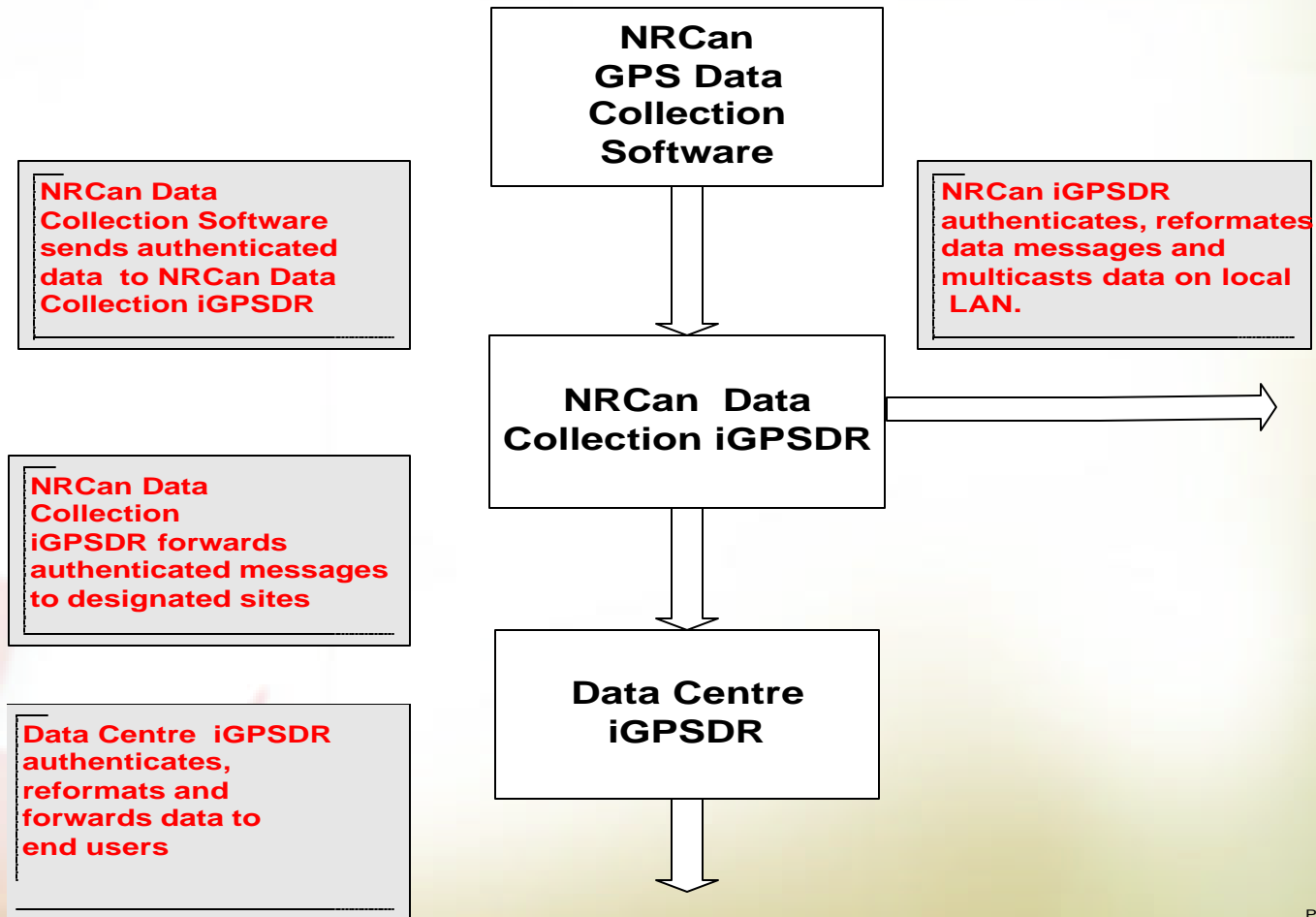
iGPSDR Design Concepts/Goals

- **The iGPSDR is an application, software that performs the functions of a hardware router**

- **The purpose of the iGPSDR is to move/relay data over the open Internet from source to relay to relay to destination**

- **Fast, efficient, cost effective data delivery**

- **Message integrity and security important**

- **Flexible administration and configuration**

Design Concepts Continued

iGPSDR Conceptual Design

NRCan GPS Data Collection Software

NRCan Data Collection Software sends authenticated data to NRCan Data Collection iGPSDR

NRCan iGPSDR authenticates, reformates data messages and multicasts data on local LAN.

NRCan Data Collection iGPSDR

NRCan Data Collection iGPSDR forwards authenticated messages to designated sites

Data Centre iGPSDR

Data Centre iGPSDR authenticates, reformats and forwards data to end users

iGPSDR Features

- **Flexible real-time Internet data exchange**
- **Supports both User Datagram Protocol (UDP) and IP multicast**
- **Automatic message authentication using public key methodology (message authentication code MAC)**
- **Open source model: code, formats and standards**
- **Supports various message formats until a standard is established (reformat data in and out)**

Features Continued

- **Real-time relay administration/configuration via XML messages**

- **Relay can be configured by either a configuration file or in real-time by sending UDP messages to iGPSDR administration Port.**

- **Connection heart beat monitored to ensure quality of service and efficient network resource management**

- **Can be used to makes efficient use of available Internet bandwidth through a hierarchical network design.**

Features Continued

- **Redundancy/Fail over features designed, but not implemented**

- **Acknowledgment and resend features**

- **Stores ephemeris so that applications can request data at startup**

- **Real-time performance statistics**

- **Log file of all administration/configuration requests and exceptions**

Specifications

- **UDP used for message transport**
- **C/C++ open source code model**
- **Supported on Red Hat Linux 7.2 and HPUX 11.0**
- **Designed to allow porting to Windows**

Availability

- **Functional version 0.5 available now**
- **Version 1.0 should be available by the end of June 2002**
- **Sample MAC implementation code is available**
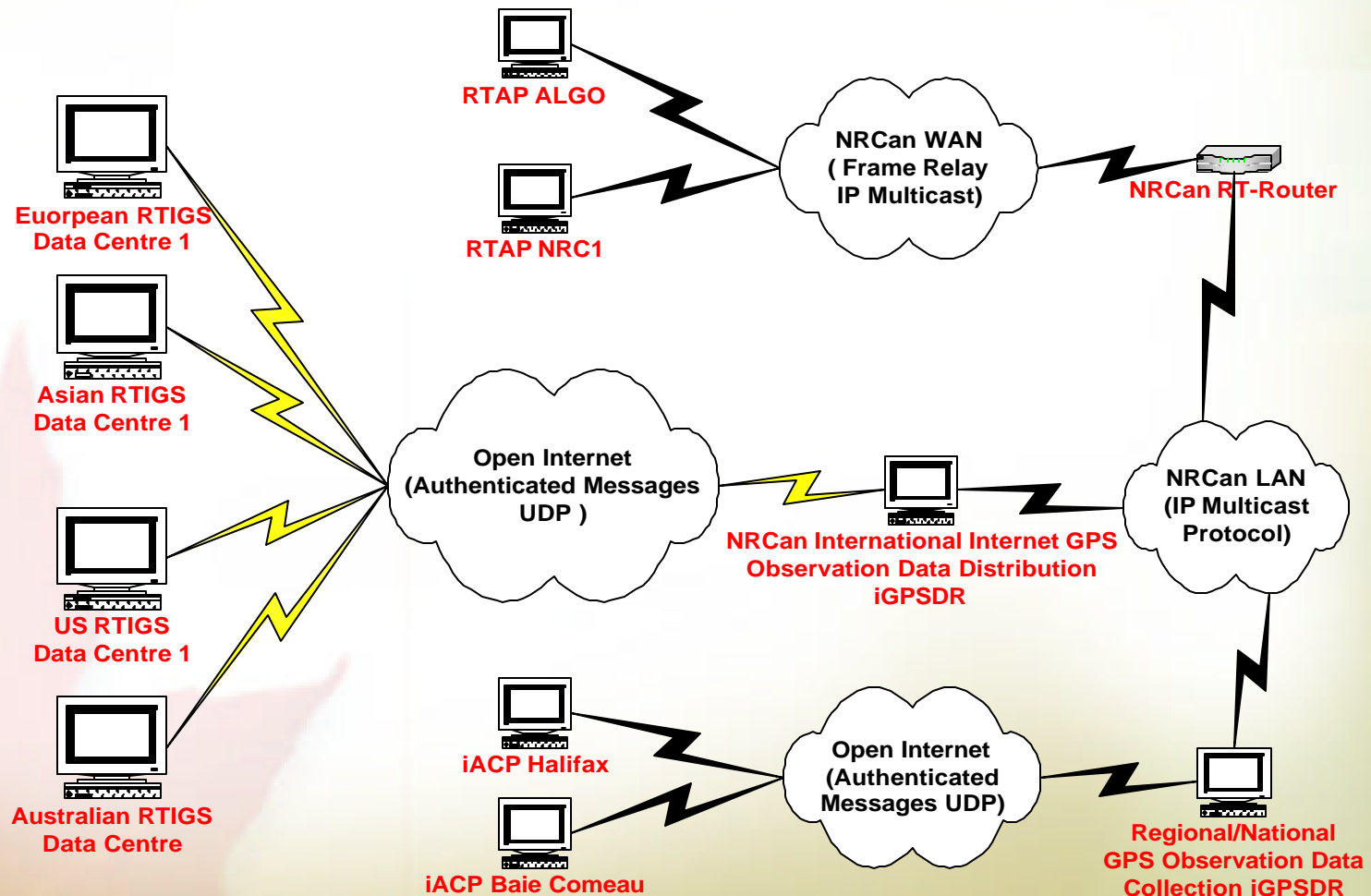- **Looking for testing and development partners.**

Applications

- **iGPSDR can be used to relay any data type. For example: GPS observations and corrections, meteorological and geophysical information. Options are not limited**

- **We are currently using it to relay GPS*C corrections and GPS observations to both University of Calgary (~3000 Km) and the University of New Brunswick(~1000 Km)**

- **We plan to use it for National real-time GPS data collection and distribution. Could be used for International collection/distribution as well**
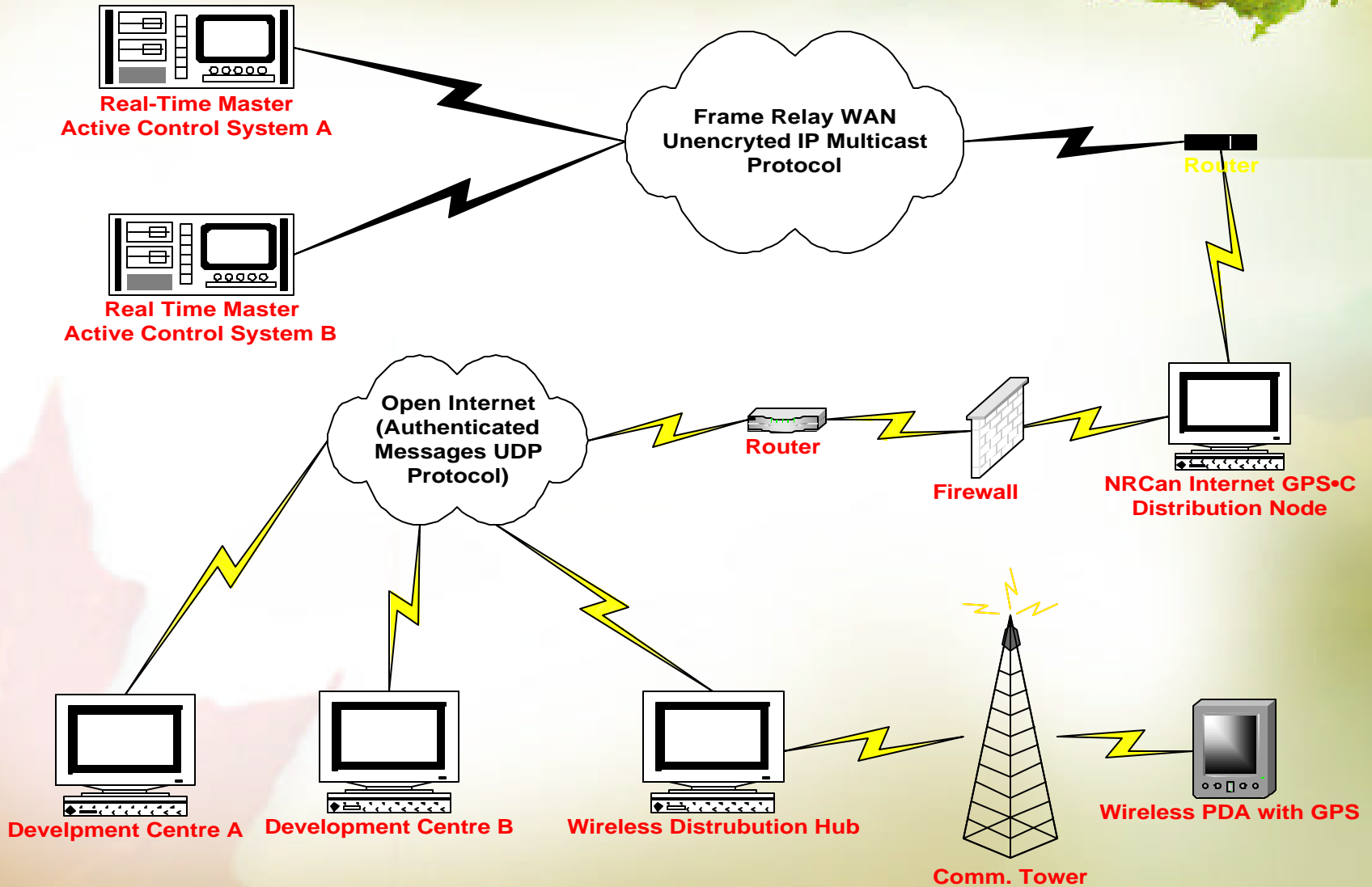
Observation Data Distribution
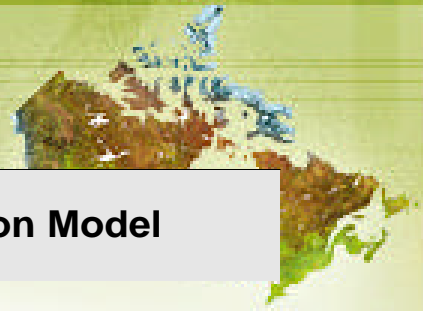
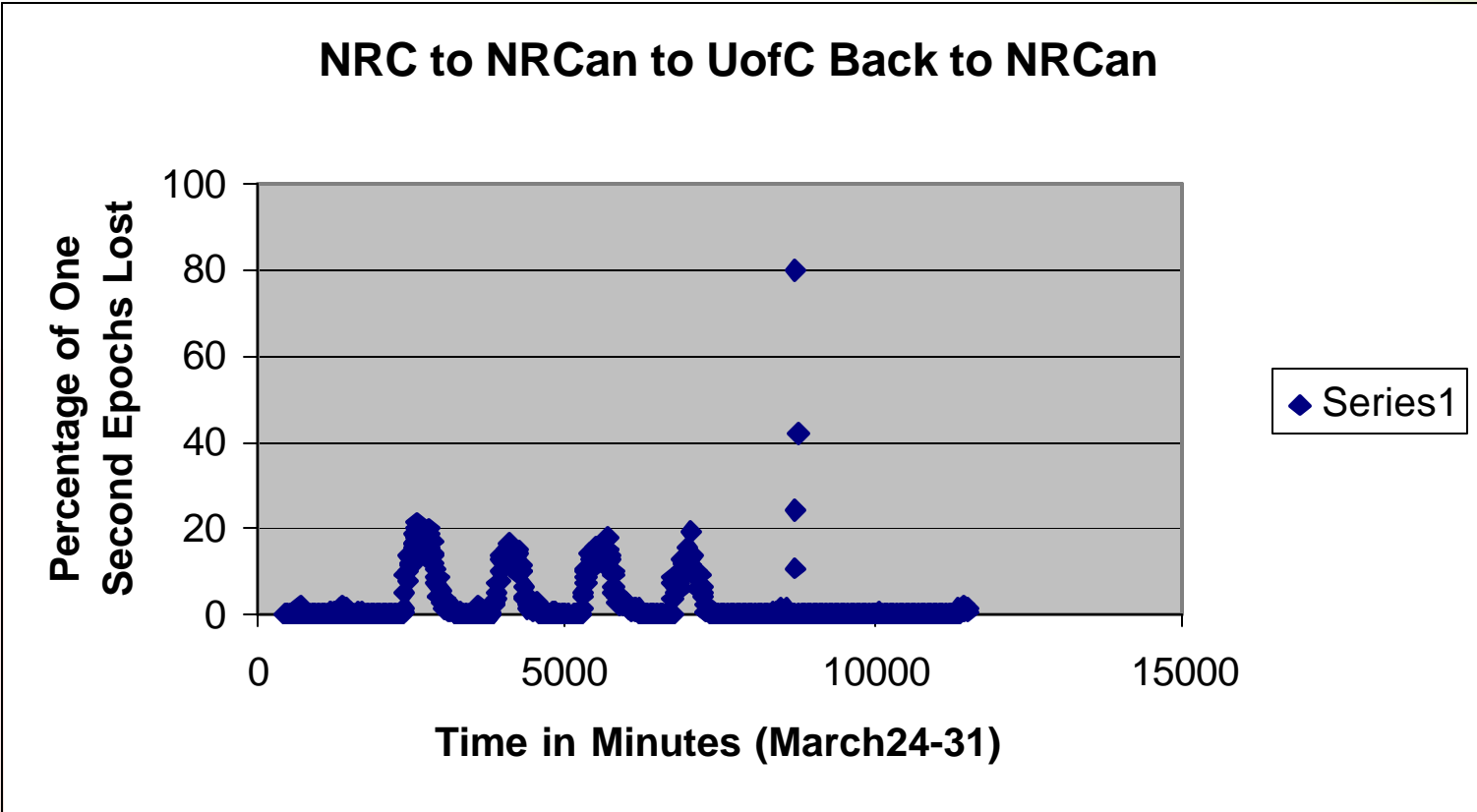NRCan International Internet GPS Observation Distribution Model

Correction Data Distribution

NRCan GPS•C Internet Correction Distribution Model

Real-Time Master Active Control System A

Real Time Master Active Control System B

Frame Relay WAN Unencryted IP Multicast Protocol

Router

Open Internet (Authenticated Messages UDP Protocol)

Router

Firewall

NRCan Internet GPS•C Distribution Node

Development Centre A

Development Centre B

Wireless Distrubution Hub

Comm. Tower

Wireless PDA with GPS

Sample Performance

NRC to NRCan to UofC Back to NRCan

Sample Performance

NRC to NRCan to UofC back to NRCan

Sample Performance Cont.

NRC to NRCan to UNB back to NRCan

Sample Performance Cont.

Latency NRC to NRCan to UNB back to NRCan
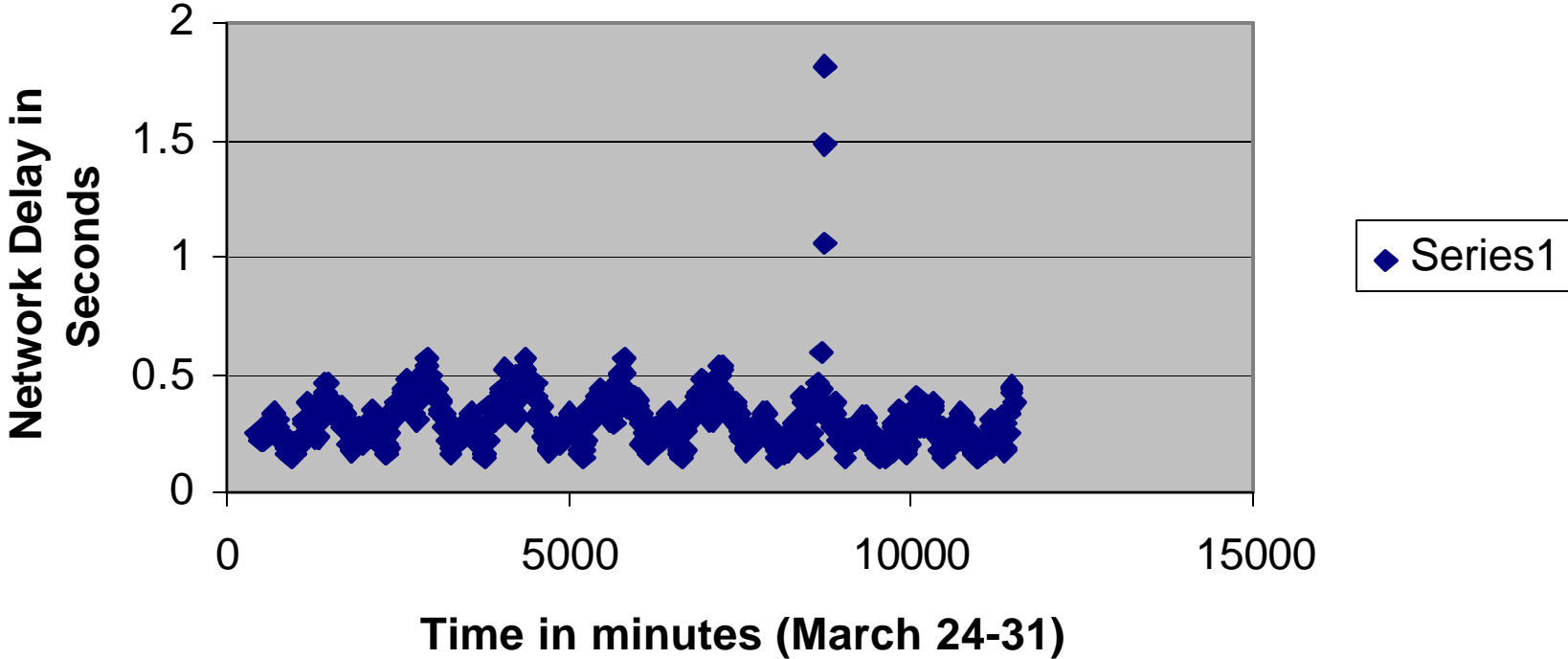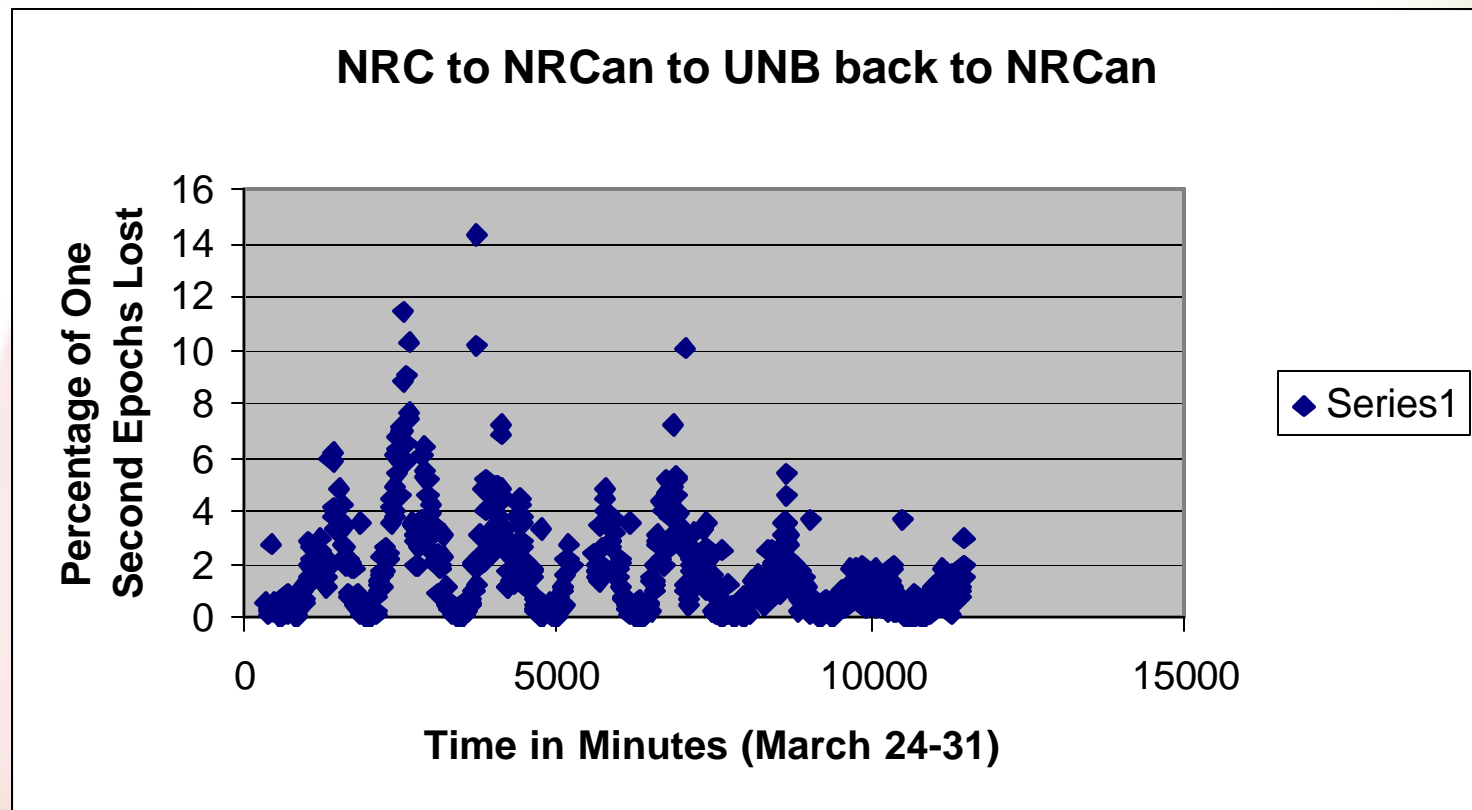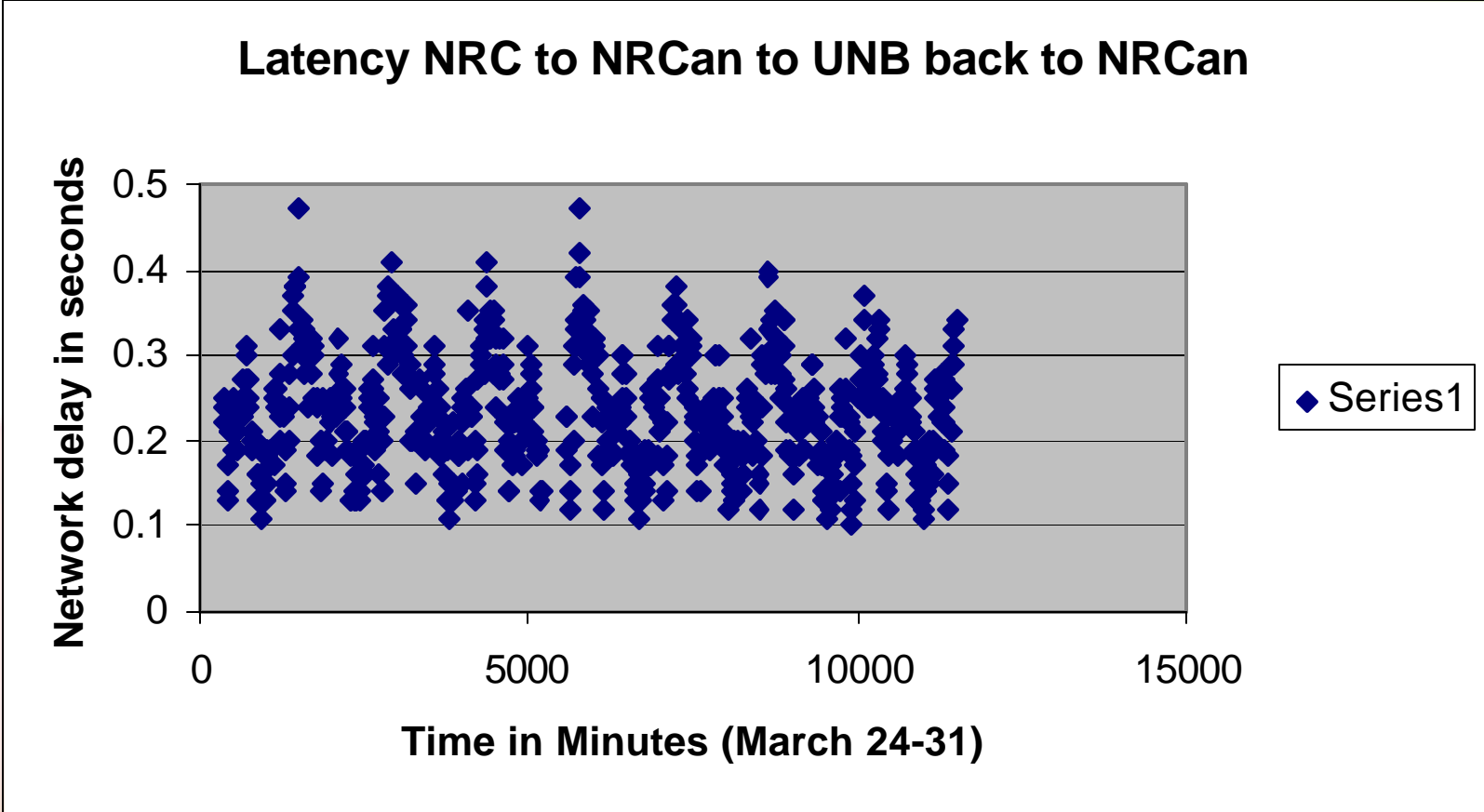
Summary

- **iGPSDR makes it easy to share real-time data.**

- **Open Internet with dedicated connection or sufficient bandwidth will provide satisfactory data delivery.**

- **Open Source policy intended to encourage adoption of the model as well as share the burden of further development and maintenance**

- **We are looking for testing and development partners.**

- **Adoption of a standard real-time GPS data format would save a significant amount of time and effort (for everyone).**

- **Demo tomorrow during the Poster Session**