

T2.2

Management Framework

Version 0.0

n4c-wp2-016-mgmt-frmwk



ABSTRACT

Starting in May 2008, N4C is a 36 month research project in the Seventh Framework Programme (www.cordis.lu/fp7). In cooperation between users in the Laponia region of the Swedish arctic and the Kočevje region in the Slovenian mountains, and partners, the project will design and experiment with an architecture, infrastructure and applications in field trials and build two test beds.

This document sets out the framework of guidelines and requirements to be used in creating the mechanisms to manage the nodes and systems used in the N4C test beds. Due to the underdeveloped state of network management in DTN networks at the start of the N4C project, N4C will be cooperating with the DTN research group network management subgroup and carrying out our own research to develop techniques and mechanisms suitable for managing DTN networks. Accordingly, this document has to be a 'living document' that will develop as the research and test deployments proceed during the project.

Due date of deliverable: day/month/year Actual submission date: date/month/year

		Document history	
Version	Status	Date	Author
0.1	After discussions with Elwyn	24/04/2009	Avri Doria
0.0	Created	22/04/2009	Avri Doria

Dissemination level		Level
PU = Public		x
PP = Restricted to other programme participants (including the Commission Services).		
RE = Restricted to a group specified by the consortium (including the Commission Services).		
CO = Confidential, only for members of the consortium (including the Commission Services).		

CONTENT

1. INTRODUCTION.....	4
2. GLOSSARY.....	4
3. PURPOSE OF THE PAPER.....	5
4. OBJECTIVES OF THE WORK.....	5
4.1 Interaction Model (IM).....	5
4.2 Management Functionality.....	6
4.3 Network Management Technology and tools.....	6
4.4 Security	6
5. REFERENCE MATERIALS.....	7

1. INTRODUCTION

Management of the overall system and the nodes in a DTN based system is a challenge that has only recently begun to be researched. DTN nodes will not be in permanent contact with a management station. Ensuring that nodes can be managed and configured without requiring a ‘return to base’ will be essential in the long run for the integrations of DTN based networks into the Internet.

It must be noted that network management is a lagging part of the research work in DTN. While some aspects of DTN are quite strong in the DTN community, such as bundle architecture, convergence layers, and specific transport protocols, network management work is just beginning. While several projects have evolved network management practices as needed, the work to try and standardize practice is just beginning. It will be an important part of the N4C effort to participate in this effort to come up with a common network management framework alongside other DTN researchers.

2. GLOSSARY

Term	Explanation
COPS	Common Open Policy Service – A set of IETF protocols for policy provisioning
DTN	[Delay, Disruption, Discontinuity] Tolerant Networking
DTNRG	The IRTF research group responsible for organizing research on the subject of DTN
ForCES	Forwarding and Control Element Separation protocol, soon to be released as a proposed standard from the IETF that allows for remote control of
IETF	Internet Engineering Task Force – Group under the umbrella of the Internet Society responsible for the stewardship for the protocols in the Internet.
IM	Interaction Model – term defined in DTNRG network management subgroup (see section 4.1)
IRTF	Internet Research Task Force – Group under the umbrella of the Internet Society charged with organizing research efforts on Internet architectures and protocols.
MIB	Management Information Base - tree structured database (schema) that defines the management objects necessary to monitor or control a managed entity.
MS	Management System - term defined in DTNRG network management subgroup (see section 4.1)
N4C	Networking for Communications Challenged Communities. – this project.

Term	Explanation
NetConf	Network Configuration - Framework and protocols defined in the IETF to install, manipulate and delete the configurations of network entities.
NSIM	Not so Instant Messaging – tool developed in SNC project originally for remote debugging.
SNC	Sámi Network Connectivity - one of the ancestor projects to N4C
SNMP	Simple Network Management Protocol – A system of protocols, schemas, information bases and identifiers used mostly to monitor Internet device though sometimes also employed for other management tasks.
W3C	World Wide Web Consortium – International Standard Organization responsible for stewardship of the WWW.
XML	Extensible Markup Language recommended by the W3C
XSD	XML Schema Language defined by the W3C

3. PURPOSE OF THE PAPER

This paper is intended as a rolling document on the framework for network management to be used in the N4C project. Its nature as a rolling document is forced by two circumstances:

- The entire sub-field of network management in a DTN environment is still new and it will be at least until the end of the 2009 before the first version of the IRTF DTN Research Group's network management framework will be ready for publication. N4C is participating in this effort and it is important to commit ourselves to working with the methods and tools to be used in the general effort.
- Network management that is responsive to the delay, disruptions and discontinuity that is the norm in a DTN network is still very much a research theme. The process of creating network management will be a spiral process with tools developed, tried and superseded by new tools and methods. While this spiral process is mandated elsewhere in the N4C project as a policy, within network management, there is no other alternative.

Early versions of this document will focus more on requirements than on solutions, though some solutions will be outlined. Later versions of the document should have a richer discussion of solutions, both those that have been tried and those that should be developed.

4. OBJECTIVES OF THE WORK

The primary object of this effort is to begin to understand how management can be applied to the N4C test networks. One of the goals is to understand what kind of management is needed for a DTN living test bed. It is understood that this test bed will be interconnected with the Internet and that it should be possible to manage both the DTN network and experiments in the DTN test environment from remote settings. This scenario has yet to be defined in a detailed way. Once the scenario is clearly defined it needs to be compared with other DTN network management scenarios, especially those being defined in the IRTF's DTNRG Network Management subgroup.

4.1 INTERACTION MODEL (IM)

In order to understand the requirements, it will be necessary to define the interaction model between management stations (MS) and the remote managed networks and devices over a DTN interconnect. This model will rely on the management scenario, though in defining this model, it is important to make sure that it fits in with other scenarios being designed by other international DTN projects.

4.2 MANAGEMENT FUNCTIONALITY

After having defined the the IM, it will be necessary to fit the management functions within the model. While of course any management needs to take into account the FCAPS (Fault, Configuration, Accounting, Performance, and Security) model, in this project the accounting aspects of management will not be an issue for study. The general management functions that will be the focus of the project will be:

- Monitoring state of remote nodes and networks
- Bi-directional alert notification
- Performance monitoring
- Configuration management including:
 - commit policies and mechanisms
 - methods for incremental change
 - rollback strategies
- Logging
- Fault Isolation and remote debugging

4.3 NETWORK MANAGEMENT TECHNOLOGY AND TOOLS

One of the decision that will need to be made on a case by case basis will be the choice of technology used to instantiate the IM. Among the non goals of the project is to create any new management tools, especially when an existing tool will work. That is the decisions will involve choosing between the use of software tools such as SNMP and Netconf (and possibly even COPS or ForCES). While there is an expectation that new data models will need to be implemented and thus some work on MIBs or XSDs will need to occur, it is a goal to minimize even this work using existing data models where they are available.

Some of the trade-offs that need to be decided when looking at tools include:

- when to push and when to pull methods when transferring information
- to managed nodes
- Benefits of making of allowing policy decisions locally
- The interface between the various management protocols and bundles

Some of the tools that will be used include:

- (DTN) Ping
- Traceroute
- Not so Instant Messaging (NSIM) - chats
- Heartbeat
- Email, especially for logs but perhaps for configuration changes

4.4 SECURITY

There are two sense in which Security needs to considered in a management framework

- Management of the security relationships including key management.

As the methods for providing security within DTN are still very much the subject of research, it is unknown at this time what measures may be needed. This subject will be revisited later in the project.

- Security of the management information.

This is especially important if management methods are being used for remote configuration, though it can be important in protect confidential information that may contained in logs and other. Considering how the management information is secured should be considered alongside and discussion of the management methods. And should be integrated with the methods.

5. REFERENCE MATERIALS

tbd

MORE TO COME