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NETROM CONTROL MESSAGE PROTOCOL (NCMP)

STATUS OF THIS MEMO

This memo provides information for the Amateur Packet Radio community. It outlines a new network supervisory protocol for NET/ROM, implemented in XRouter packet radio nodes. Distribution of this memo is unlimited.

1. INTRODUCTION

NCMP is an extension to the NET/ROM protocol widely used in Amateur Packet Radio networking.

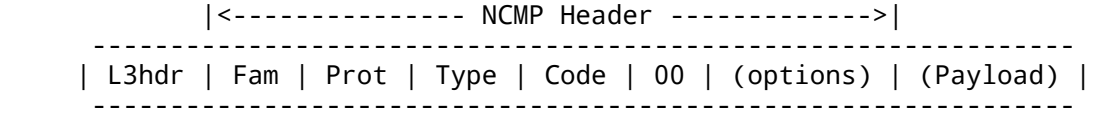
Its purpose is to provide extra tools for network administration, such as network probing and unknown route reporting.

NCMP sits above the routing sub-layer. It is intended to be transparently routable by any NET/ROM node, whether or not that node implements the protocol. To that end it uses NET/ROM "protocol extension" packets, which should be routed "as-is" by any node which doesn't understand them.

2. NCMP PACKET STRUCTURE - OVERVIEW

NCMP datagrams consist of a normal Layer 3 NET/ROM header, followed by the NCMP header, which may in some cases be followed an optional NCMP payload.

The NCMP header is of variable length, and its first 5 bytes occupy the space normally used by a NET/ROM layer 4 header, as depicted in the diagram below:



Field	Bytes	Description
L3hdr	15	NET/ROM Layer 3 Header
Fam	1	Protocol Family = NET/ROM = 0x0f
Prot	1	Protocol = NCMP = 0x00
Type	1	Type of NCMP packet (see below)
Code	1	Usage depends on "type".
Options	var	Additional fields present in some types only
Payload	var	Optional payload present in some types only

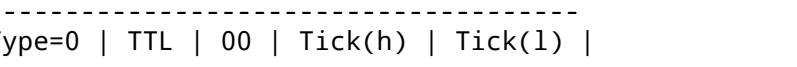
The upper 4 bits of the TYPE are reserved for future expansion, and are set to zero in this version. The lower 4 bits are the packet type as follows:

Type	Purpose
0	Probe Request
1	Probe Reply
2	Echo Request
3	Echo Reply
4	Routing Information Unicast
5	Destination Unreachable

3. NCMP PACKET TYPES

The following diagrams omit the L3 header for clarity:

Type 0: Probe Request

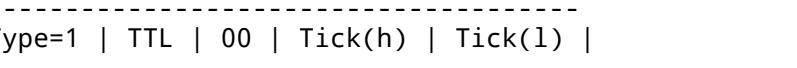


"TTL" is a Time To Live, limiting the no. of hops the probe may propagate. This value is also copied into the L3 TTL field.

"Tick" is a 16 bit tick counter, sent high octet first. This is returned unmodified by the responder, and used to calculate the Round Trip Time (RTT).

A node which responds to a probe request must return the whole datagram (including any additional fields not specified above), after changing the NCMP type from 0 to 1 and inserting the TTL from the L3 header into the NCMP TTL field.

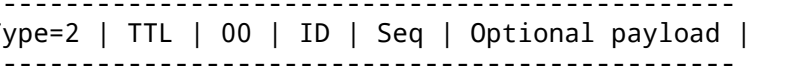
Type 1: Probe Reply



"TTL" is the TTL from the L3 header of the received probe.

"Tick" is the 16 bit tick counter from the probe datagram

Type 2: Echo Request

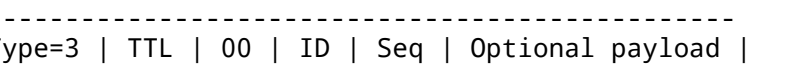


"TTL" is the initial Layer 3 TTL

"ID" is a unique 16 bit identifier, sent high octet first, allowing the originator to match responses with the requests.

"Seq" is a 16 bit sequence number, sent high octet first. Usually carries a timestamp, allowing the RTT to be computed.

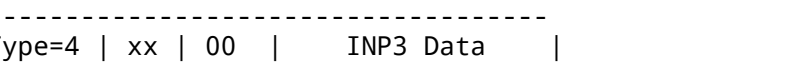
Type 3: Echo Reply



"TTL" is the TTL from the L3 header of the received request.

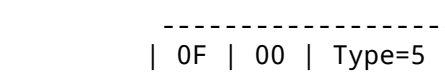
The ID, SEQ and Payload fields must be returned unmodified.

Type 4: Routing Information Unicast



"xx" = unused field

Type 5: Destination Unreachable



"Returned Data" is the first 28 octets of the unrouted datagram.

"Code" is as follows:

Code	Meaning	Explanation
0	Host Unknown	The router does not know the destination node.
1	Host Unreachable	The destination node is known, but there are no viable routes at this time, due to obsolescence or link failure.
2	Net Unreachable	The number of hops to the target system is more than the remaining Time To Live.
3	Proto Unreachable	The destination host does not know how to handle the requested protocol.
4	Service Unreach	The requested service is not implemented at the destination host.
5	TTL Exceeded	The datagram could not be routed any further because the Layer 3 Time to Live has reached zero.
6	Frag Required	The datagram is too large for the outgoing link, and the link does not support fragmentation.
7	Source Quench	The datagram could not be handled at this time due to insufficient resources. This situation is temporary. Upon receipt of this message, the sender should reduce the sending rate.

4. ADDITIONAL INFORMATION

Probe datagrams are intended for "peer discovery". In this context, PEER means another NCMP-capable node. At this time, only XRouters are NCMP-capable, but wider adoption would be desirable.

Probes are currently dispatched with an initial TTL of 6, to nodes with a quality of 20 or more and a one way trip time below 1 minute. These figures are likely to be revised down in future. If no reply is received, the probe interval increases.

Upon receipt of a probe, no matter whom it is addresed to, an NCMP peer returns it to the sender. Thus only the nearest peers are discovered.

The purpose of peer discovery is to facilitate the transfer of additional network-related information across a legacy network, most of which which doesn't, and probably never will, adopt INP3.

Such information may include a node's position, town, software type and version, contact details, Amprnet IP address, available services and so on. These things make Packet Radio more interesting.

Once a peer had been identified, The XRouters are able to exchange

INP3 data "tunneled" inside NCMP type 4 datagrams, even if the intervening nodes are not INP3-capable. A consequence of this is to allow expansion of and experimentation with INP3-like options, without breaking the existing INP3 protocol.

Echo requests are intended for testing the network, and are invoked using XRouter's NPING (Netrom Ping) and NTRACERT (Netrom Traceroute) commands.

"Destination unreachable" messages are intended to improve the user experience, by reporting problems instead of leaving the user waiting for a reply that will never come.

For instance, if the user tries to connect to a node that is in the nodes table but no longer has a viable end-to-end path, one of the intervening nodes should quickly return a "destination unreachable" message. Without this, the user could typically wait 6 minutes until a "Connect failed" response.

With the exception of echo and probe, NCMP datagrams are never sent in response to NCMP.