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**Internet SARPs modifications related to the
implementation of the Echo Response function**

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SUMMARY

The ATN ICS SARPs mandate the support of the Echo Response function. However, there is a lack of detail in the specification of the setting of the optional parameters in the Echo Response PDU. In particular, the setting of the priority and security options in the Echo Response PDU is left as a local matter.

It was observed that certain ATN SARPs compliant implementations respond to an Echo Request, with an Echo Response that does not contain any security and priority parameter. The consequence is that ERP PDUs may not succeed in finding a permissible backward path to the originator of the Echo Request PDU.

This Working Paper proposes to modify Sub-volume V so that the setting of the optional parameters within Echo Response PDUs be standardized.

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1 Introduction

The Echo Response is a function performed by the network entity of ATN End Systems and Intermediate Systems when it has received an Echo Request (ERQ) PDU, that has reached its destination. When invoked, the echo response functions causes an Echo Response (ERP) PDU to be created, and passed to the CLNP route and forward PDU functions so that the ERP PDU is sent to the originator of the ERQ PDU.

Together with the Echo Request function, the Echo Response function provides two particularly useful system management functions: the basic well known “ping” and “trace route” functions. These functions allows a network manager to know whether a remote system is reachable, what is the path to this remote system, and the transit delay of this path.

The ATN ICS SARPs mandate the support of the Echo Response function. However, there is a lack of detail in the specification of the setting of the optional parameters in the Echo Response PDU. In particular, the setting of the priority and security options in the Echo Response PDU is left as a local matter.

It was observed that certain ATN SARPs compliant implementations respond to an Echo Request, with an Echo Response that does not contain any security and priority parameter. The consequence is that ERP PDUs may not succeed in finding a permissible backward path to the originator of the Echo Request PDU.

This Working Paper proposes to modify Sub-volume V so that the setting of the optional parameters within Echo Response PDUs be standardized.

2 Current specifications

The ATN SARPs do not include any specific section addressing the creation and encoding of the Echo Response PDU. The Echo Response function is just mentioned in the CLNP APRLs (section 5.6.4) as a mandatory ISO/IEC 8473-1 function of ATN ESS and ISs.

In the ISO/IEC 8473-1 standard, the Echo response function is specified as follows:

6.20 Echo response function

This function is performed by a Network entity when it has received an ERQ PDU that has reached its destination, as determined by the header format analysis function – that is, an ERQ PDU that contains, in its destination address field, a Network entity title or NSAP address that identifies the Network entity or any of its NSAPs.

When invoked, the echo response function causes an Echo Response (ERP) PDU to be created. The ERP PDU shall be constructed and processed by Network entities in end systems and in intermediate systems that support the echo response function in exactly the same way as the DT PDU, with the following exceptions:

- a) Since the echo response function is not invoked by a N-UNITDATA request, the information available to the PDU composition function consists of current state, local information, and information contained in the corresponding ERQ PDU; the reference in 6.1 to information obtained from parameters of the N-UNITDATA request do not apply to the composition of an ERP PDU
- b) The source address field of the ERP PDU shall contain the value of the destination address field of the corresponding ERQ PDU. The destination address field of the ERP PDU shall contain the value of the source address field of the corresponding ERQ PDU.
- c) The ERQ PDU, in its entirety, shall be placed into the data part of the ERP PDU. The data part of the ERP PDU shall contain *only* the corresponding ERQ PDU.
- d) If the data part of the ERQ PDU contains an ERP PDU header (see 6.19 (e)), the PDU composition function may, but is not required to, use some or all of the information contained therein to select

values for the fields of the ERP PDU header. In this case, however, the value of the lifetime field contained in the ERP PDU header in the ERQ PDU data part shall be used as the value of the lifetime field in the ERP PDU. The values of the segment length and checksum fields shall be computed by the Network entity regardless of the contents of those fields in the ERP PDU header in the data part of the ERQ PDU.

- e) The options part of the ERP PDU may contain any (or none) of the options described in 7.5. The values for these options, if present, are determined by the Network entity as a local matter. They may be, but are not required to be either identical to or derived from the corresponding options in the ERQ PDU and/or the ERP PDU header contained in the data part of the ERQ PDU (if present). The source routing option in the ERP PDU shall not be identical to (copied from) the source routing option in the ERQ PDU header. If the recording of route option in the ERP PDU is identical (copied from) the recording of route option in the ERQ PDU header, the second octet of the parameter value field shall be set to the value 3.

It is a local matter whether or not the destination Network entity performs the lifetime control function on an ERQ PDU before performing the echo response function. The destination Network entity shall make the same decision in this regard that it would make, as a local matter, for a DT PDU in accordance with 6.4.

3 Discussion

The bullets d) and e) of clause 6.20 leave as a local matter the setting of the options in the ERP PDU header. The standard suggests that the options in the ERP PDU header can be identical or derived from the corresponding options in the ERQ PDU header, or in the ERP PDU header contained in the ERQ PDU data part; but this is not required and implementations may select another approach such as creating ERP PDUs without any options in the PDU header, or with options that have locally configured values.

Certain options such as the security, the priority and the QoS maintenance may have a direct effect on the routing of the ERP PDU, and/or on the delay of transit of the PDU. A possible consequence of the current specification is therefore that, depending on the implementation choice for the setting of the ERP PDU options, an ERP PDU may follow different paths, with different QoS characteristics, back to the originator of the ERQ PDU. Possibly also, and depending on the selected ERP PDU options and on the configuration of the ATN network, it may happen that an ERP PDU fails to find a permissible path back to the originator of the ERQ PDU and be discarded.

Depending on the implementation choice, a network manager using a "ping" network management function may then get different information on the transit delays in the network and on the reachability of remote systems or domains. This is believed to be particularly cumbersome for a network manager and this lessens the interest of the echo request/response functions.

Another issue is related to the use of the (partial) route recording option within Echo Request/Response PDU. The combination of the record route option with the echo function may provide the network manager with information on the roundtrip path followed by packets exchanged between 2 systems in the network. This is a well known basic network management function (referred as the "trace route" function in the Internet community), which is very useful to network managers.

However, the trace route function can only provide complete roundtrip path information, if the record route option is selected by the systems in the creation of the ERQ and ERP PDUs. With the current specification of the echo response function, the selection of the record route option in the ERP PDU is a local implementation matter. As a result, the availability of complete roundtrip path information when performing a "trace route", is conditioned by the implementation choices made in the ATN systems. This, also, is considered to be cumbersome for a network manager.

To solve these issues it is proposed to add in the ATN SARPS, new recommendations related to the setting of the optional parameters within Echo Response PDUs. More specifically, it is proposed to recommend that the setting of the security, priority, QoS maintenance, and partial route recording options in the ERP PDU be determined in function of the selection and the value of the corresponding

options in the ERP header contained in the received ERQ PDU, if present, and otherwise in function of the corresponding options in the ERQ PDU header:

The proposed changes to the SARPS are detailed in the next section.

4 Proposed Changes to the SARPs

⇒ **Add the following new section 5.6.3..4:**

5.6.3.4 Echo Response Function

5.6.3.4.1 ATN End System and Intermediate System shall support the Echo Response Function of ISO/IEC 8473.

Note.— The Echo response function is performed by a Network entity when it has received an Echo Request (ERQ) PDU that has reached its destination. When invoked, the echo response function causes an Echo Response (ERP) PDU to be created

5.6.3.4.2 The options part of the ERP PDU shall be identical to (copied from) the options part of the ERP PDU header contained in the data part of the received ERQ PDU, if present.

5.6.3.4.3 If the data part of the received ERQ PDU does not contain an ERP PDU header, the security, priority, and QoS maintenance options of the ERP PDU shall be identical to the corresponding options in the ERQ PDU.

5.6.3.4.3 If the data part of the received ERQ PDU does not contain an ERP PDU header, and if the partial record route option is present in the received ERQ PDU header, the partial record route option shall be specified in the ERP PDU, with the second octet of the parameter value field set to the value 3.

⇒ **Renumber previous section 5.6.3.4 to become 5.6.3.5**

⇒ **Add the following new entries in APRL table of section 5.6.4.2:**

ATN CLNP6	Echo Response Function	5.6.3.4.1	M
ATN CLNP7	Echo Response parameter setting	5.6.3.4.2, 5.6.3.4.3, 5.6.3.4.4	M

⇒ **Add reference to section 5.6.3.4 in subsequent APRL tables entries that relates to the Echo Response function**

⇒ **In all APRL tables entries that include a reference to the current section 5.6.3.4, replace this reference with a reference to section 5.6.3.5**

5 Recommendations

The Working Group 2 is invited to consider the above material as a new PDR on the Subvolume V of Doc 9705.