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IPv6 IPID Needed
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Abstract

The IPv4 main header contained a 16-bit IP Identification (IPID) field used for fragmentation and reassembly. In practice, this field was commonly used by network diagnosticians for tracking packets. In IPv6, the IPID has been moved to the Fragment header, and would only be used when fragmentation is required. Thus, the IPID field in IPv6, is no longer able to be utilized in the valuable role it played in IPv4, relative to diagnostics and problem resolution. This causes great concern in particular for end users and large enterprises, for whom Network/Application availability and performance can directly and profoundly affect bottom line financials. Several viable solutions to this situation exist. One potential solution is included in later sections of this RFC, but the primary intention of this RFC is to initiate action by the IETF on this issue, perhaps in the form of a Working Group Subcommittee.

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[1.](#) Introduction

In IPv4, the 16 bit IP Identification (IPID) field is located at an offset of 4 bytes into the IPv4 header and is described in [RFC791](#) [[RFC791](#)]. In IPv6, the IPID field is a 32 bit field contained in the Fragment Header defined by [section 4.5 of RFC2460](#) [[RFC2460](#)].

Unfortunately, unless fragmentation is being done by the source node, the packet will not contain this Fragment Header, and therefore will have no Identification field.

The intended purpose of the IPID field is to enable fragmentation and reassembly, and as currently specified is required to be unique within the maximum segment lifetime (MSL) on all datagrams. The MSL is often [2](#) minutes.

In practice, the IPID field is used for more than fragmentation. During network diagnostics, packet traces may be taken at multiple places along the path, or at the source and destination. Then, packets can be matched by looking at the IPID.

Obviously, the time at each device will differ according to the clock on that device; so another metric is required. This method of taking multiple traces along the path is of special use on large multi-tier networks to see where the packet loss or packet corruption is happening. Multi-tier networks are those which have multiple routers or switches on the path between the sender and the receiver.

The inclusion of the IPID makes it easier for a device(s) in the middle of the network, or on the receiving end of the network, to identify flows belonging to a single node, even if that node might have a different IP address. For example, if the sending node is a mobile laptop with a wireless connection to the Internet.

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For its de-facto diagnostic mode usage, the IPID field needs to be available whether or not fragmentation occurs. It also needs to be unique in the context of the entire session, and across all the connections controlled by the stack.

This document will present information that demonstrates how valuable and useful the IPID field has been (in IPv4) for diagnostics and problem resolution, and how not having it available (in IPv6), could be a major detriment to new IPv6 deployments and contribute to protracted downtimes in existing IPv6 operations. A possible solution to this situation will be suggested, but the primary intention of this document is to highlight the existence of this issue and to ask that the IETF research and recommend an optimal solution, perhaps by the formation of a Working Group Subcommittee. End users and Large Enterprises involved in this initiative to date seem to agree on the need to retain this valuable diagnostic facility, as well as the preference that it be able turned on and off as needed, if it cannot be statically included in the base header, as it is in

IPv4.

[2.](#) Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119](#) [[RFC2119](#)].

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[3.](#) Applicability

The base IPv6 standard, [RFC2460](#), [[RFC2460](#)] allows the use of extension headers, such as the Destination Options Header, in order to encode optional destination information in an IPv6 packet. Extended diagnostic information such as this MUST be sent by implementations upon request. The example solution is an implementation of the Destination Options Header. Once again, this approach assumes the IPID field cannot be included in the base header, as it is in IPv4.

BASIC RATIONALE FOR RETENTION OF THE IPID FIELD

[1.](#) The ability to utilize the IPID has enhanced problem diagnosis efforts and significantly reduced problem resolution time.

[2.](#) Several actual use case examples are shown below. These demonstrate how use of the IPID has reduced problem resolution time in very valuable production networks of Large Enterprises/End Users. In general, if a problem or performance issue with an application or network component can be fixed in minutes, as opposed to hours, this can mean significant dollar savings to large enterprises. The IPID can be used extensively when debugging involves traces or packet captures. Its absence in IPv6 may lead to protracted problem diagnosis and extended problem resolution time.

[3.](#) This value/perspective may be unique to tech support organizations of large enterprises. Other functional areas may not share this concern/perspective, as packets could continue to flow, but service levels may not be acceptable to end users during the extended problem resolution time.

[4.](#) Although very situation dependent, the use cases below clearly illustrate the value of network availability, and the need to keep problem resolution time to an absolute minimum.

[5.](#) Another benefit of using the IPID to expedite problem resolution is reducing the cost of associated resources being consumed during

extended problem resolution, such as storage, CPU and staff time.

6. Will IPID be critical in most problem resolutions? NO! But if it even helps in a few per year, significant money and/or lost business could be saved.

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7. A facility such as IPID, that has proven field value, should not be eliminated as an effective diagnosis tool!

USE CASE EXAMPLES.

USE CASE #1 --- Large Insurance Company

- (estimated time saved by use of IPID: 7 hours)

PERFORMANCE TOOL PRODUCES EXTRANEIOUS PACKETS?

- Issue was whether a performance tool was accurately replicating session flow during performance testing?
- Trace IPIDs showed more unique packets within same flow from performance tool compared to IE Browser.
- Having the clear IPID sequence numbers also showed where and why the extra packets were being generated.
- Solution: Problem rectified in subsequent version of performance tool.
- Without IPID, it was not clear if there was an issue at all.

USE CASE #2 --- Large Bank

- (estimated time saved by use of IPID: 4 hours)

BATCH TRANSFER DURATION INCREASES 12X

- A 30 minute data transfer started taking 6-8 hours to complete.
- Possible packet loss? All vendors said no.
- Other Apps were working OK.
- 4 trace points used, and then IPIDs compared.
- Showed 7% packet loss.
- Solution: WAN hardware was replaced and problem fixed.
- Without IPID, no one would agree a problem existed

USE CASE #3 --- Large Bank

- (estimated time saved by use of IPID: 6 hours)

VERY SLOW INTERACTIVE PERFORMANCE.

- All network links looked good.
- Traces showed duplicated small packets (which can be OK).
- Saw that IPID was equal but TTL was always + 1.
- Network device was "Splitting" small packets only.(2 interfaces).
- The small packets were control info, telling other side to slow down.

- Erroneously looked like network congestion.
- Solution: Network Device replaced and good interactive performance restored.
- Without IPID, flows would have appeared OK.

USE CASE #4 --- Large Government Agency

- (estimated time saved by use of IPID: 9 hours)

VPN DROPS

- Cell phone connection to law enforcement were being dropped. Going through a VPN.
- All parties (both sides of VPN connection, application, etc.) said it was not their problem. Problem went on for weeks.
- Finally, when we were called in as consultants, we took a trace which showed packet with IPID and TTL that did not match others in the flow AT ALL was coming from router nearest application server end of VPN.
- Solution: Provider for VPN for application server changed. Problem resolved.
- Without IPID, much harder to diagnose problem.
- (Same case also happened with large corporation. Again, all parties saying not their fault until proven via packet trace.)

[6. Security Considerations](#)

There are no security considerations.

[7. IANA Considerations](#)

There are no IANA considerations.

[10. References](#)

[10.1. Normative References](#)

[RFC791] Postel, J., "Internet Protocol", [RFC 791](#) / STD 5, September 1981.

[RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), December 1998.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[11](#). Acknowledgments

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