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Protocol Implementation Conformance Statement for the Assured Forwarding Per-Hop Behavior

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Status of this Memo

This document is an output of the EURESCOM project P1006: "Differentiated Services - Network Configuration and Management" (http://www.eurescom.de/Public/Projects/P1000-series/P1006/P1006.htm)

Abstract

This document provides the Protocol Implementation Conformance Statement (PICS) form for the Assured Forwarding (AF) Per Hop Behaviour (PHB) as defined in RFC 2597. Additional requirements posed by RFC 2475, RFC 2697 and RFC 2698 are taken into account where applicable. The purpose of this PICS is to provide a mechanism whereby a supplier of an implementation of the requirements defined in the RFCs indicated above may provide information about the implementation in a unified manner.

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1. Introduction

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented for a given specification. Such a statement is called Implementation Conformance Statement (ICS). An ICS for an implementation or system claimed to conform to a given protocol specification is called Protocol ICS (PICS).

This document provides the PICS form for the AF PHB. It describes the requirements that SHALL be satisfied by any conformant implementation of the AF PHB. The requirements listed in this document are defined by RFC 2597 [RFC2597]; additional requirements defined by RFC 2475 [RFC2475], RFC 2697 [RFC2697] and RFC 2698 [RFC2698] are also taken into account where applicable.

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 RFC 2119.

A version of this form in the Portable Document Format (PDF) is available at
http://www.eurescom.de/public/projectresults/p1000-series/1006ts1.htm

2.0 Implementation Conformance Statements

The PICS form contained in this document is comprised of information in a tabular form. The meaning of the different columns is the following:

- Description column: it provides a short text description of the item (requirement) to be evaluated. It implicitly means "is the <description> supported by the implementation?"

- Reference column: it gives reference to the Section of RFC 2597, RFC 2475, RFC2697 or RFC 2698 in which the item is defined.

- Status column: it provides the quality of the item according to the referenced RFCs. The status of the item may assume one out of the following values:
  - Mandatory (RFC says MUST): the capability is REQUIRED to be supported.
  - Optional (RFC says SHOULD or MAY): the capability SHOULD/MAY be supported or not.
  - Conditional: the capability is applicable only if one or more earlier optional or conditional capabilities are implemented. If applicable, a conditional item can be either mandatory or optional (see notes on conditional items below).

- Yes/No column: this column SHALL be filled with "yes" if the capability is supported by the implementation, it SHALL be filled with "no" if the capability is not supported by the implementation.

Notes on Conditional items:
(1): If (14=Yes) or (15=Yes) or (16=Yes) or (17=Yes) or (18=Yes) then Optional else N/A
(2): If (31=Yes) then Mandatory else N/A
(3): If (40=Yes) then Optional else N/A
(4): If (40=Yes) then Mandatory else N/A
(5): If (46=Yes) then Optional else N/A
(6): If (46=Yes) then Mandatory else N/A

Information about the implementation provider:

Form filled in by (Company/Institution)	
Responsible person (First name, surname)	
Company address (Name, street, town, country)	
Phone	
Fax	
E-mail	
The information can be made public (including other manufactures/vendors): (yes/no)	

2.1 Traffic Classification and Conditioning

2.1.1 Classification

Description	Reference	Status	Yes/No
Behavior Aggregate			
1. Does your system classify incoming IP traffic according to the DS Codepoints:	RFC 2475 Sec 2.3.1, RFC 2597 Sec 2. and Sec 6.	Option.	
2. Class 1, Low Dropping Precedence 001010		Option.	
3. Class 1, Medium Dropping Precedence 001100		Option.	
4. Class 1, High Dropping Precedence 001110		Option.	

5. Class 2, Low Dropping Precedence	010010		Option.	
6. Class 2, Medium Dropping Precedence	010100		Option.	
7. Class 2, High Dropping Precedence	010110		Option.	
8. Class 3, Low Dropping Precedence	011010		Option.	
9. Class 3, Medium Dropping Precedence	011100		Option.	
10. Class 3, High Dropping Precedence	011110		Option.	
11. Class 4, Low Dropping Precedence	100010		Option.	
12. Class 4, Medium Dropping Precedence	100100		Option.	
13. Class 4, High Dropping Precedence	100110		Option.	
Multiple Field				
14. Does your system classify incoming IP traffic according to the destination address?		RFC 2475 Sec 2.3.1.	Option.	
15. Does your system classify incoming IP traffic according to the source address?		RFC 2475 Sec 2.3.1.	Option.	
16. Does your system classify incoming IP traffic according to the protocol ID?		RFC 2475 Sec 2.3.1.	Option.	
17. Does your system classify incoming IP traffic according to the source port?		RFC 2475 Sec 2.3.1.	Option.	

18. Does your system classify incoming IP traffic according to the destination port?	RFC 2475 Sec 2.3.1.	Option.	
19. If any features of 14.-18. are implemented, does your system classify incoming IP traffic according to a combination of more than one of the implemented features?	RFC 2475 Sec 2.3.1.	Cond(1)	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
Behavior Aggregate			
Multiple Field			

Comments:

2.1.2 AF PHB Group

Description	Reference	Status	Yes/No
20. Does your system implement all four general use AF classes?	RFC 2597 Sec 2.	Option.	
21. Does your system forward packets from any one AF class independent of the packets of any other AF class?	RFC 2597 Sec 2.	Mandat.	

22. Does your system allocate a minimum amount of buffer space to each implemented AF class?	RFC 2597 Sec 2.	Mandat.		
23. Does your system allocate a minimum amount of bandwidth to each implemented AF class?	RFC 2597 Sec 2.	Mandat.		
24. Is the amount of buffer space for each implemented AF class configurable by your system?	RFC 2597 Sec 2.	Mandat.		
25. Is the amount of bandwidth for each implemented AF class configurable by your system?	RFC 2597 Sec 2.	Mandat.		
26. Does your system achieve the configured rate over small time scales for each AF service class?	RFC 2597 Sec 2.	Option.		
27. Does your system achieve the configured rate over large time scales for each AF service class?	RFC 2597 Sec 2.	Option.		
28. Does your system allow excess resources to be assigned to AF classes?	RFC 2597 Sec 2.	Option.		
29. Does your system not forward an IP packet with smaller probability if it contains a drop precedence value p than if it contains a drop pre-cedence value q when p < q?	RFC 2597 Sec 2.	Mandat.		
30. Does your system accept all three drop precedence DSCP's within any AF class?	RFC 2597 Sec 2.	Mandat.		
31. Does your system yield at least two drop precedence levels per AF class?	RFC 2597 Sec 2.	Mandat.		

Description	Reference	Status	Yes/No
32. Does your system support three different drop precedence levels per AF class?	RFC 2597 Sec 2.	Option.	
33. If your system yields only two drop precedence levels per AF class, does the DSCP AFx1 yield lower loss probability than DSCP AFx2 and AFx3?	RFC 2597 Sec 2.	Cond(2)	
34. Does your system not re-order AF packets belonging to the same micro-flow regardless of their drop precedence?	RFC 2597 Sec 2.	Mandat.	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
AF PHB Group			

Comments:

2.1.3 Conditioning

Description	Reference	Status	Yes/No
35. Does your system implement traffic shaping at the edge of a domain to control the amount of AF traffic entering or exiting it?	RFC 2597 Sec 3.	Option.	

36. Does your system implement packet discarding at the edge of a domain to control the amount of AF traffic entering or exiting it?	RFC 2597 Sec 3.	Option.	
37. Does your system change the drop precedence of packets at the edge of a domain to control the amount of AF traffic entering or exiting it?	RFC 2597 Sec 3.	Option.	
38. Does your system change the AF class of packets at the edge of a domain to control the amount of AF traffic entering or exiting it?	RFC 2597 Sec 3.	Option.	
39. Do the conditioning actions of your system not cause re-ordering of packets of the same micro-flow?	RFC 2597 Sec 3.	Mandat.	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
Conditioning			

Comments:

2.2 Marking and Re-marking

Description	Reference	Status	Yes/No
40. Does your system support a "Single Rate Three Colour Marker (srTCM)"?	RFC 2697	Option.	
41. If your system supports srTCM, does it have implemented the Colour-Blind mode?	RFC 2697 Sec 3.	Cond(3)	
42. If your system supports srTCM, does it have implemented the Colour-Aware mode?	RFC 2697 Sec 3.	Cond(3)	
43. If your system supports srTCM, is the Committed Information Rate (CIR) measured in bytes of IP packets per second (without link and physical layer information)?	RFC 2697 Sec 2.	Cond(4)	
44. If your system supports srTCM, is the Committed Burst Size (CBS) measured in bytes?	RFC 2697 Sec 2.	Cond(4)	
45. If your system supports srTCM, is the Excess Burst Size (EBS) measured in bytes?	RFC 2697 Sec 2.	Cond(4)	
46. Does your system support a "Two Rate Three Colour Marker Marker (trTCM)"?	RFC 2698	Option.	
47. If your system supports trTCM, does it have implemented the Colour-Blind mode?	RFC 2698 Sec 3.	Cond(5)	

48. If your system supports trTCM, does it have implemented the Colour-Aware mode?	RFC 2698 Sec 3.	Cond(5)	
49. If your system supports trTCM, is the Peak Information Rate (PIR) measured in bytes of IP packets per second (without link and physical layer information)?	RFC 2698 Sec 2.	Cond(6)	
50. If your system supports trTCM, is the Committed Information Rate (CIR) measured in bytes of IP packets per second (without link and physical layer information)?	RFC 2698 Sec 2.	Cond(6)	
51. If your system supports trTCM, is the Peak Burst Size (PBS) measured in bytes?	RFC 2698 Sec 2.	Cond(6)	
52. If your system supports trTCM, is the Committed Burst Size (CBS) measured in bytes?	RFC 2698 Sec 2.	Cond(6)	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
Marking and Re-marking			

Comments:

2.3 Queuing and Discard Behavior

Description	Reference	Status	Yes/No
53. Does your system minimise long-term congestion within each AF class?	RFC 2597 Sec 4.	Mandat.	
54. Does your system allow short-term congestion resulting from bursts within each AF class?	RFC 2597 Sec 4.	Mandat.	
55. Does your system drop packets as a result of long term congestion within an AF class?	RFC 2597 Sec 4.	Mandat.	
56. Does your system queue packets as a result of short term congestion within an AF class?	RFC 2597 Sec 4.	Mandat.	
57. Does your system's dropping algorithm result in an equal packet discard probability for flows with different short-term burst shapes but identical longer-term packet rates, if both flows are within the same AF class?	RFC 2597 Sec 4.	Mandat.	
58. Does your system's dropping algorithm result in a discard rate of a particular micro-flow's packets within a single precedence level which is proportional to that flow's percentage of the total amount of traffic passing through that precedence level at any smoothed congestion level?	RFC 2597 Sec 4.	Mandat.	

Description	Reference	Status	Yes/No
59. Does your system's dropping algorithm respond gradually to congestion?	RFC 2597 Sec 4.	Mandat.	
60. Are the dropping algorithm control parameters of your system independently configurable for each packet drop precedence and for each AF class?	RFC 2597 Sec 4.	Mandat.	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
Queuing and Discard Behavior			

Comments:

2.4 Tunneling

Description	Reference	Status	Yes/No
61. Does your system not reduce the forwarding assurance of tunneled AF packets?	RFC 2597 Sec 5.	Mandat.	
62. Does your system not re-order packets within a tunneled AF micro-flow?	RFC 2597 Sec 5.	Mandat.	

Product Specification

	Product(Type)	Release	Technology (e.g. RED, WFQ, IPCHAIN, QDISC)
Tunneling			

Comments:

3. Security Considerations

This PICS form does not raise new network security issues because it is just a form for specifying implementation conformance of network equipment. Merely, a filled form might have to be treated as a confidential document.

4. References

[RFC2474] Nichols, K., Blake, S., Baker, F. and D. Black, "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", RFC 2474, December 1998.

[RFC2475] Black, D., Blake, S., Carlson, M., Davies, E., Wang, Z. and W. Weiss, "An Architecture for Differentiated Services", RFC 2475, December 1998.

[RFC2597] J.Heinanen, F.Baker, W.Weiss, and J.Wroclawski, "An Assured Forwarding PHB", RFC 2597, June 1999.

[RFC2697] J. Heinanen and R. Guerin, "A Single Rate Three Color Marker", RFC 2697, September 1999.

[RFC2698] J. Heinanen and R. Guerin, "A Two Rate Three Color Marker", RFC 2698, September 1999.

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