APPENDIX H

Data Values for TOS, DSCP, and PHB Parameters

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This appendix describes the parameters implemented in the Cisco BTS 10200 Softswitch for Type of Service (TOS), Differentiated Services Codepoint (DSCP), and Per-Hop Behavior (PHB) and provides a basic overview of industry standards for the TOS, DSCP, and PHB parameters.

Type of Service

TOS parameters are described in IETF document RFC 791, Internet Protocol.
Bits 0 - 7 are used as follows in the TOS Byte:

- Bits 0 - 2: IP Precedence
- Bit 3: Delay
- Bit 4: Throughput
- Bit 5: Reliability
- Bits 6-7: Reserved

Differentiated Services Codepoint

DSCP parameters are described in IETF document *RFC 2474, Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*. Bits 0 - 7 are used as follows in the Diffserv (Differentiated Services) Byte:

- Bits 0 - 5: DSCP Value
- Bits 6-7: Reserved

Per-Hop Behavior

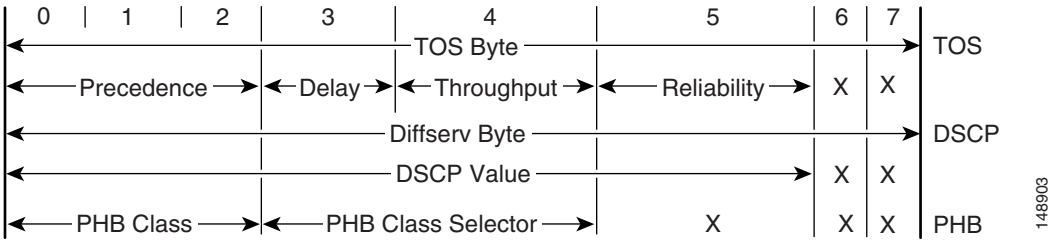
PHB is described in IETF document *RFC 2597, Assured Forwarding PHB Group*, and *RFC 3246, An Expedited Forwarding PHB (Per-Hop Behavior)*. Bits 0 - 7 are used as follows for PHB:

- Bits 0 - 2: PHB Class Value
- Bits 3 - 4: PHB Class Selector Value
- Bits 5-7: Reserved

Relationship of Type of Service, Differentiated Services Codepoint and Per-Hop Behavior Standards

Figure H-1 shows how the TOS, DSCP, and PHB standards are related.

Figure H-1 Relationship of TOS, DSCP, and PHB Standards



Provisioning Formats for TOS, DSCP, and PHB Parameters

On the Cisco BTS 10200 Softswitch, the parameters for TOS, DSCP, and PHB are provisioned differently depending on the token. There are four provisioning formats. These formats are not user-selected. Instead, the system requires the provisioning of each token using a particular format. The default values may be sufficient for your system. The default values for specific tokens are provided in the "Allowed and Default Values" section on page H-3.

Caution If you change any parameters in the ca-config table, these changes do not take effect until the Call Agent (CA) platform switches over or restarts.

TOS Precedence String Format

If the system requires parameters to be provisioned in the TOS precedence string format, provision the four tokens as follows:

- PRECEDENCE = NETCONTROL, INTERNETCONTROL, CRITICAL, FLASHOVERRIDE, FLASH, IMMEDIATE, PRIORITY, or ROUTINE
- LOWDELAY = Y or N
- THROUGHPUT = Y or N
- RELIABILITY = Y or N

Note Refer to RFC 791 for additional information on the PRECEDENCE values. The relationship between alpha values and numerical values is as follows: NETCONTROL=7, INTERNETCONTROL=6, CRITICAL=5, FLASHOVERRIDE=4, FLASH=3, IMMEDIATE=2, PRIORITY=1, ROUTINE=0.

TOS Precedence Integer Format

If the system requires parameters to be provisioned in the TOS precedence integer format, provision the four tokens as follows:

- PRECEDENCE = 0–7
- LOWDELAY = Y or N
- THROUGHPUT = Y or N
- RELIABILITY = Y or N

Note Refer to RFC 791 for additional information on the PRECEDENCE values. The relationship between alpha values and numerical values is as follows: NETCONTROL=7, INTERNETCONTROL=6, CRITICAL=5, FLASHOVERRIDE=4, FLASH=3, IMMEDIATE=2, PRIORITY=1, ROUTINE=0.

Diffserv Byte Format

If the system requires parameters to be provisioned in the Diffserv byte format, provision a single token as an integer between 0 and 255. The Diffserv byte is based on 8 bits, which is 2 more bits than the DSCP value (see Figure H-1). Therefore, a value 4 times the value of the desired DSCP value must be provisioned. For example, if you want a DSCP value of 24 for a particular token, provision that token with a value of 96.

PHB Format

If the system requires parameters to be provisioned in the PHB format, provision a single token as one of the following values: CS1, CS2, CS3, CS4, CS5, CS6, CS7, AF11, AF12, AF13, AF21, AF22, AF23, AF31, AF32, AF33, EF, NONE (Release 4.4.x only), DEFAULT (Release 4.5 only).

Allowed and Default Values

This section lists the provisionable TOS, DSCP, and PHB tokens applicable to each protocol, and the allowed and default values.

Caution For all of the tokens in this section, Cisco does not recommend using any value other than the specified default. Changing these values from their defaults can significantly impact network performance. Contact Cisco TAC for further information.

Caution If you change any parameters in the ca-config table, these changes do not take effect until the CA platform switches over or restarts.

Note Refer to RFC 791 for additional information on the PRECEDENCE values. Numerical equivalents are as follows: NETCONTROL=7, INTERNETCONTROL=6, CRITICAL=5, FLASHOVERRIDE=4, FLASH=3, IMMEDIATE=2, PRIORITY=1, ROUTINE=0.

MGCP Signaling

The following values from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) are applicable to this type of signaling:

- MGCP-SIG-TOS-PRECEDENCE
- MGCP-SIG-TOS-LOWDELAY
- MGCP-SIG-TOS-THROUGHPUT
- MGCP-SIG-TOS-RELIABILITY

Table H-1 lists the allowed types and default value for each of these types.

Table H-1 MGCP-SIG-TOS Values (from CA-CONFIG Table)

Value	Allowed Values	Default Value
MGCP-SIG-TOS-PRECEDENCE	0–7	3
MGCP-SIG-TOS-LOWDELAY	Y/N	Y
MGCP-SIG-TOS-THROUGHPUT	Y/N	N
MGCP-SIG-TOS-RELIABILITY	Y/N	N

DQoS Signaling

This section lists the tokens used in provisioning DQoS signaling from the Media Gateway Profile and the Quality of Service tables. DQoS signaling uses the Common Open Policy Service (COPS) protocol.

The *Media Gateway Profile table* contains the following token:

- IPTOS-RTP-SUPP—Allowed values are Y/N; default is N.

The *Quality of Service table* contains the following tokens:

- IPTOS-RTP-PRECEDENCE
- IPTOS-RTP-LOWDELAY
- IPTOS-RTP-THROUGHPUT
- IPTOS-RTP-RELIABILITY

Table H-2 lists the allowed values and default value for each of these tokens.

Table H-2 IPTOS-RTP Values (from QoS Table)

Token	Allowed Values	Default Value
IPTOS-RTP-PRECEDENCE	NETCONTROL INTERNETCONTROL CRITICAL FLASHOVERRIDE FLASH IMMEDIATE PRIORITY ROUTINE	CRITICAL
IPTOS-RTP-LOWDELAY	Y/N	N
IPTOS-RTP-THROUGHPUT	Y/N	N
IPTOS-RTP-RELIABILITY	Y/N	N

COPS and RADIUS Signaling

This section lists the tokens used in provisioning COPS and RADIUS signaling from the Quality of Service and the Call Agent Configuration tables.

Tip The tokens in this section are provisioned using values between 0 and 255. For an explanation of how to calculate these values, see the "Diffserv Byte Format" section on page H-3.

The *Quality of Service table* contains the following token (applicable to voice traffic):

- DQOS-CMTS-DSCP-TOS—This value is used for the packets about to enter a provider backbone from the CMTS.
- DQOS-DSCP-TOS-BITMASK (Release 4.5 and later)—This token specifies particular bits within the IPv4 DSCP/TOS byte.
- DOCSIS-DSCP-TOS (Release 4.5 and later)—Identifies the DSCP/TOS value that must be matched for packets to be classified onto the IP flow.
- DOCSIS-DSCP-TOS-BITMASK (Release 4.5 and later)—This token determines what bits in the DSCP/TOS byte are to be used as filters in classifying packets.

Table H-3 lists the allowed values and default value for each of these tokens.

Table H-3 COPS Signaling Parameters (from QoS Table)

Token	Allowed Values	Default Value
DQOS-CMTS-DSCP-TOS	0–255	160
DQOS-DSCP-TOS-BITMASK (Release 4.5 and later)	0–255	224

Table H-3 COPS Signaling Parameters (from QoS Table) (continued)

Token	Allowed Values	Default Value
DOCSIS-DSCP-TOS (Release 4.5 and later)	0–255	160
DOCSIS-DSCP-TOS-BITMASK (Release 4.5 and later)	0–255	224

The following values for the type token from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) are applicable to this type of signaling:

COPS-DSCP-TOS—This value is used for the signaling packets on COPS interfaces between the CMS and the CMTS.

RADIUS-DSCP-TOS—This value is used for the signaling packets on RADIUS interfaces between the CMS and the RKS, and the CMS and the DF server.

Table H-4 lists the allowed value and default value for each of these tokens.

Table H-4 COPS and RADIUS Signaling Parameters (from CA-CONFIG Table)

Value	Allowed Values	Default Value
COPS-DSCP-TOS	0–255	96
RADIUS-DSCP-TOS	0–255	96

Stream Control Transmission Protocol Signaling

This section lists the tokens used from the *Stream Control Transmission Protocol* (SCTP) Association table.

- DSCP (Release 4.4.x and earlier only)—The values for this token are described further in *RFC 2597, Assured Forwarding PHB Group*, and *RFC 3246, An Expedited Forwarding PHB (Per-Hop Behavior)*.
- IP-TOS-PRECEDENCE (Release 4.4.x and earlier only)

Table H-5 lists the allowed values and default value for each of these tokens.

Table H-5 SCTP Signaling Parameters (from the SCTP-Association Table)

Token	Allowed Values	Default Value
DSCP (Release 4.4.x and earlier only)	AF11, AF12, AF13, AF21, AF22, AF23, AF31, AF32 AF33, AF41, AF42, AF43, EF, NONE	NONE
IP-TOS-PRECEDENCE (Release 4.4.x and earlier only)	NETCONTROL, INTERNETCONTROL, CRITICAL, FLASHOVERRIDE, FLASH, IMMEDIATE, PRIORITY, ROUTINE	FLASH

The following value from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) is applicable to this type of signaling.

- SCTP-DSCP (Release 4.5 and later only)—The values for this token are described further in *RFC 2597, Assured Forwarding PHB Group*, and *RFC 3246, An Expedited Forwarding PHB (Per-Hop Behavior)*.

Table H-6 lists the allowed values and default value for this token.

Table H-6 SCTP-DSCP Signaling Parameters (from CA-CONFIG Table)

Token	Allowed Values	Default Value
SCTP-DSCP (Release 4.5 and later only)	DEFAULT, CS1, CS2, CS3, CS4, CS5, CS6, CS7, AF11, AF12, AF13, AF21, AF22, AF23, AF31, AF32 AF33, AF41, AF42, AF43, EF	CS3

ISDN Signaling

This section lists the tokens used from the *Backhaul Set table*.

- SIG-TOS-LOWDELAY
- SIG-TOS-PRECEDENCE
- SIG-TOS-RELIABILITY
- SIG-TOS-SUPP—Allowed values are Y/N; default is N.
- SIG-TOS-THROUGHPUT

Table H-7 lists the allowed values and default value for the -PRECEDENCE, -LOWDELAY, -THROUGHPUT, and -RELIABILITY tokens.

Table H-7 SIG-TOS Values (from BACKHAUL-SET Table)

Token	Allowed Values	Default Value
SIG-TOS-LOWDELAY	Y/N	N
SIG-TOS-PRECEDENCE	NETCONTROL INTERNETCONTROL CRITICAL FLASHOVERRIDE FLASH IMMEDIATE PRIORITY ROUTINE	CRITICAL
SIG-TOS-RELIABILITY	Y/N	N
SIG-TOS-THROUGHPUT	Y/N	N

H.323 Signaling

This section lists the tokens used from the *H.323 Gateway table*.

- IPTOS-SIG-LOWDELAY
- IPTOS-SIG-PRECEDENCE
- IPTOS-SIG-RELIABILITY
- IPTOS-SIG-THROUGHPUT

Table H-8 lists the allowed values and default value for each of these tokens.

Table H-8 IPTOS-SIG Values (from H323-GATEWAY Table)

Token	Allowed Values	Default Value
IPTOS-SIG-LOWDELAY	Y/N	Y
IPTOS-SIG-PRECEDENCE	NETCONTROL INTERNETCONTROL CRITICAL FLASHOVERRIDE FLASH IMMEDIATE PRIORITY ROUTINE	FLASH
IPTOS-SIG-RELIABILITY	Y/N	N
IPTOS-SIG-THROUGHPUT	Y/N	N

Session Initiation Protocol Signaling

This section lists the tokens used from the *Softswitch Trunk Group Profile table* that affect Session Initiation Protocol (SIP) trunks.

- SIP-SIG-LOWDELAY
- SIP-SIG-PRECEDENCE
- SIP-SIG-RELIABILITY
- SIP-SIG-THROUGHPUT

Table H-9 lists the allowed values and default value for each of these tokens.

Table H-9 SIP-SIG Values (from SOFTSW-TG-PROFILE Table)

Token	Allowed Values	Default Value
SIP-SIG-LOWDELAY	Y/N	Y

Table H-9 SIP-SIG Values (from SOFTSW-TG-PROFILE Table) (continued)

Token	Allowed Values	Default Value
SIP-SIG-PRECEDENCE	NETCONTROL INTERNETCONTROL CRITICAL FLASHOVERRIDE FLASH IMMEDIATE PRIORITY ROUTINE	FLASH
SIP-SIG-RELIABILITY	Y/N	N
SIP-SIG-THROUGHPUT	Y/N	N

System-Level Signaling TOS for SIP Calls

The following values from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) are applicable to this type of signaling. These values define the system-level TOS for SIP calls. The system-level TOS is used for all calls to SIP subscribers. For trunks, the sia-trunk-grp-level-sig-tos value indicates whether the system-level (ca-config) TOS to use for SIP calls is trunk-group specific.

- SIA-TRUNK-GRP-LEVEL-SIG-TOS—Allowed values are Y/N; default is N.
- SIA-SIG-TOS-LOWDELAY
- SIA-SIG-TOS-PRECEDENCE
- SIA-SIG-TOS-RELIABILITY
- SIA-SIG-TOS-THROUGHPUT

Table H-10 lists the allowed values and default value for the -PRECEDENCE, -LOWDELAY, -THROUGHPUT, and -RELIABILITY tokens.

Table H-10 SIA-SIG-TOS Values (from CA-CONFIG Table)

Token	Allowed Values	Default Value
SIA-SIG-TOS-LOWDELAY	Y/N	Y
SIA-SIG-TOS-PRECEDENCE	0–7	3
SIA-SIG-TOS-RELIABILITY	Y/N	N
SIA-SIG-TOS-THROUGHPUT	Y/N	N

Caution If you change any parameters in the ca-config table, these changes do not take effect until the CA platform switches over or restarts.

Internal Call Agent to Feature Server Signaling

The following values from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) are applicable to this type of signaling. These values are used for internal Call Agent (CA) to Feature Server (FS) signaling.

- SIM-SIG-TOS-LOWDELAY
- SIM-SIG-TOS-PRECEDENCE
- SIM-SIG-TOS-RELIABILITY
- SIM-SIG-TOS-THROUGHPUT

Table H-11 lists the allowed values and default value for each of these tokens.

Table H-11 SIA-SIG-TOS Values (from CA-CONFIG Table)

Token	Allowed Values	Default Value
SIM-SIG-TOS-LOWDELAY	Y/N	Y
SIM-SIG-TOS-PRECEDENCE	0–7	3
SIM-SIG-TOS-RELIABILITY	Y/N	N
SIM-SIG-TOS-THROUGHPUT	Y/N	N

Internal Feature Server to Call Agent Signaling

The following values from Appendix A, "Configurable Parameters and Values" (Call Agent Configuration table) are applicable to this type of signaling (Release 4.5 and later). These values are used for internal signaling from the Feature Servers to the Call Agent.

AIN Feature Server

The following values are used for internal AIN Feature Server (FSAIN) to CA signaling:

- FSAIN-SIG-TOS-PRECEDENCE
- FSAIN-SIG-TOS-LOWDELAY
- FSAIN-SIG-TOS-THROUGHPUT
- FSAIN-SIG-TOS-RELIABILITY

POTS/Tandem/Centrex Feature Server

The following values are used for internal POTS/Tandem/Centrex Feature Server (FSPTC) to CA signaling:

- FSPTC-SIG-TOS-LOWDELAY
- FSPTC-SIG-TOS-PRECEDENCE
- FSPTC-SIG-TOS-RELIABILITY
- FSPTC-SIG-TOS-THROUGHPUT

Values

Table H-12 lists the allowed values and default value for each of these tokens.

Table H-12 FSAIN -SIG-TOS and FSPTC-SIG-TOS Values (from CA-CONFIG Table)

Token	Allowed Values	Default Value
FSAIN-SIG-TOS-PRECEDENCE FSPTC-SIG-TOS-PRECEDENCE	0–7	3
FSAIN-SIG-TOS-LOWDELAY FSPTC-SIG-TOS-LOWDELAY	Y/N	Y
FSAIN-SIG-TOS-THROUGHPUT FSPTC-SIG-TOS-THROUGHPUT	Y/N	N
FSAIN-SIG-TOS-RELIABILITY FSPTC-SIG-TOS-RELIABILITY	Y/N	N

Mapping of Provisionable TOS, DSCP, and PHB Values

Table H-13 shows how the provisionable values in the PHB format are mapped to the values in TOS and DSCP formats.

Caution Cisco recommends that you use the combinations of values shown in the table. The system will accept certain other combinations of values, depending on the format; however, the combinations shown in the table have been tested by Cisco for proper behavior.

Note Binary and Hex values are presented for information only, and are not used for provisioning.

Table H-13 Mapping of Provisionable Values in PHB Format to TOS and DSCP Formats [1]

Value in PHB Format	Value of TOS PRECEDENCE Bits			Other Provisionable TOS Bits			Binary	Diffserv Byte Format	Hex Value [2]
	Binary [3]	TOS String Format	TOS Integer Format	D [4]	T [4]	R [4]			
NONE (Release 4.4.x only) or **DEFAULT** (Release 4.5 only)	**000**	**ROUTINE**	**0**	**N**	**N**	**N**	**000 000 00**	**0**	**0x0**
CS1	**001**	**PRIORITY**	**1**	**N**	**N**	**N**	**001 000 00**	**32**	**0x20**
AF11				N	Y	N	001 010 00	40	0x28
AF12				Y	N	N	001 100 00	48	0x30
AF13				Y	Y	N	001 110 00	56	0x38
CS2	**010**	**IMMEDIATE**	**2**	**N**	**N**	**N**	**010 000 00**	**64**	**0x40**
AF21				N	Y	N	010 010 00	72	0x48
AF22				Y	N	N	010 100 00	80	0x50
AF23				Y	Y	N	010 110 00	88	0x58
CS3	**011**	**FLASH**	**3**	**N**	**N**	**N**	**011 000 00**	**96**	**0x60**
AF31				N	Y	N	011 010 00	104	0x68
AF32				Y	N	N	011 100 00	112	0x70
AF33				Y	Y	N	011 110 00	120	0x78
CS4	**100**	**FLASHOVERRIDE**	**4**	**N**	**N**	**N**	**100 000 00**	**128**	**0x80**
AF41				N	Y	N	100 010 00	136	0x88
AF42				Y	N	N	100 100 00	144	0x90
AF43				Y	Y	N	100 110 00	152	0x98
CS5	**101**	**CRITICAL**	**5**	**N**	**N**	**N**	**101 000 00**	**160**	**0xA0**
EF				Y	Y	N	101 110 00	184	0xB8
CS6	**110**	**INTERNETWORKCONTROL**	**6**	**N**	**N**	**N**	**110 000 00**	**192**	**0xC0**
CS7	**111**	**NETWORKCONTROL**	**7**	**N**	**N**	**N**	**111 000 00**	**224**	**0xE0**

1. Cisco recommends that you use the combinations of values shown in the table. The system will accept certain other combinations of values, depending on the format; however, the combinations shown in the table have been tested by Cisco for proper behavior.
2. Hexadecimal equivalent. This value is listed for convenience. It is not used in provisioning the Cisco BTS 10200 Softswitch.
3. Binary equivalent. This value is listed for convenience. It is not used in provisioning the Cisco BTS 10200 Softswitch.
4. D = Delay, T = Throughput, R = Reliability. To provision these tokens, enter N for 0 or Y for 1.