



## Quality of Service Definitions for REITH

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<b>Description</b>	This document is part of a complex network design for the BBC and Siemens Business Services to provide a next generation converged network for the BBC. This policy augments and amends somewhat the OSIRIS QoS policy developed by SBS, C&W and the BBC for the RAMAN next generation Wide Area Network to allow for implementation across the Wider BBC Packet Network infrastructure. This will allow for coherence across the wider networking infrastructure and consistency of QoS for all services.		
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# SBS Data Packet Quality of Service Definitions for use on the BBC Packet Network

## 1 Document Control

### 1.1 VERSION

Version:	1.4
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### 1.2 DOCUMENT AUTHORISATION

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### 1.3 QUALITY REVIEW

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### 1.4 DOCUMENT HISTORY

Version	Section	Date	Summary Of Change
Dec 2005	BBC OSIRIS Data Packet net Requirements v1_0.doc	V1.0	Stephen Hope, C&W
August 2006	SBS, REITH QoS policy	V1.0	Mark Copas – Amendment of Osiris to accommodate BBC REITH QoS requirements
September 2006	SBS, REITH QoS policy	V1.1	Amendments

September 2006	SBS, Reith QoS policy	V1.2	Revise with amendments from Naran Gorasia (BBC)
Sept 2006	SBS, Packet network QoS policy	V1.3	Revised edits from Naran Gorasia/Nigel Adams
Oct 2006	SBS, Packet network QoS policy	V1.4	Revised amendments form Nick Jupp/Stephen Hope (C&W)

## 1.5 RELATED DOCUMENTATION

## CONTENTS

<b>1</b>	<b>DOCUMENT CONTROL</b> .....	<b>2</b>
1.1	VERSION .....	2
1.2	DOCUMENT AUTHORISATION.....	2
1.3	QUALITY REVIEW .....	2
1.4	DOCUMENT HISTORY .....	2
1.5	RELATED DOCUMENTATION .....	3
<b>2</b>	<b>INTRODUCTION</b> .....	<b>5</b>
<b>3</b>	<b>QOS REQUIREMENTS</b> .....	<b>6</b>
3.1	GENERAL.....	6
3.2	DIFFSERV MARKINGS.....	7
<b>4</b>	<b>BBC CLASS OF SERVICE POLICY</b> .....	<b>9</b>

## 2 Introduction

This document is part of a complex network design for the BBC and Siemens Business Services to provide a next generation converged network for the BBC. This policy augments and amends somewhat the OSIRIS QoS policy developed by SBS, C&W and the BBC for the RAMAN next generation Wide Area Network to allow for implementation across the Wider BBC Packet Network infrastructure. This will allow for coherence across the wider networking infrastructure and consistency of QoS for all services.

This document provides a Quality of Service policy. This is not to be confused with a QoS implementation policy. It provides the guidelines and agreed principles for implementation only.

The internal BBC data network provides internal general purpose connectivity to BBC users.

The BBC Packet Network is being converged to support multiple types of traffic, including real time video, audio and voice, as well as different conventional applications. QoS is needed to provide constraints of latency and jitter to some applications, and to limit bandwidth use within a class.

Quality of Service (QoS) settings on a network are most useful when applied consistently end to end across the set of networks in use, so the document is generally applicable to other parts of the BBC Packet Network. This is why this document is a direct derivation of the RAMAN OSIRIS QoS policy document, previously agreed by SBS, The BBC and C&W.

In practice, this QoS policy will not be effective unless it is generally applied and policed to all parts of the BBC Packet Network infrastructure.

### 3 QoS Requirements

The network is designed to allow QoS to be applied across the BBC Packet Network in order to preserve the QoS policy and be fully consistent with the RAMAN infrastructure. This will provide a fully end to end consistent treatment for specific traffic types.

The end to end traffic prioritisation will be carried across the network using Diffserv DSCP markings within IP packets.

#### 3.1 GENERAL

The overall QoS schema required on the network is defined in this document.

The broad outline of QoS defined by the BBC in the “Delivering Quality” document supports four classes of service. Note that the mapping to traffic specifications was not detailed enough to allow for formal QoS testing, however it does define general types of traffic and their treatment - some traffic types such as IP Telephony real time flows will require high priority treatment to minimise latency and jitter.

The current proposal for QoS will use four specific DSCP markings on the central data (core) devices – traffic will have already been marked when it arrives at the central device from a BBC Packet Network access switch at layer 3. The central switch will enforce per QoS marking traffic limits based on link load percentage for each Ethernet link to the QoS policy specification.

Ideally traffic admission control should be implemented so that a specific traffic type volume is limited by the source bandwidth available; this takes place at the 1<sup>st</sup> network hop (i.e. at the Access Switch) at a BBC site network. Where this, however, may not always be practicable or possible due to limitations in the access layer switches, it is acceptable but not ideal that admission control should take place (for the BBC packet network at least) at the first layer 3 hop (or boundary point) on the network. This will enable the correct DSCP markings to be added or amended as required. Amended because it is possible end stations either by accident or design, could be used to set a QoS policy for a service that is out of kilter with *this* policy.

Only those ‘critical’ applications or services as identified and agreed with the BBC will be allowed to be placed in the ‘Gold’ or Silver’ classes. This policy must be rigidly enforced and policed without exception; especially if traffic remarking happens on the desktop devices. In summary, ALL applications or services will be tagged for the bronze service unless specifically agreed otherwise between BBC TD and SBS.

There is a possibility that giving a high QoS marking to a service or application may, in the future, attract an extra fiscal cost.

QoS settings MUST be strictly adhered to across the complete infrastructure; it must be policed and rigidly controlled.

Although it can be difficult to enforce these parameters across low speed (i.e.2mbps) links there should be no exception to this policy. If a certain class is becoming over loaded then a link upgrade must be sought. Because of this ‘limitation’ It is recommended that a high watermark be set for each priority class of 95% this would be measured as an average across a given 90 day period. When this is breached a link upgrade must again be sought.

### 3.2 DIFFSERV MARKINGS

Class definitions

Type	Name	Overload schema	Allocation (% link)	DSCP Marking name, (value)	“In contract” Potential SLA on:	Notes
1.	Real time	Policed	30%	EF (46)	delay, jitter, loss	VoIP + real time streams – voice is premarked by SBS IP Telephony systems.
2.	Gold	Policed	20%	AF41 (34)	Bounded delay, loss?	Hi priority traffic (+ voice signalling where tagged differently to voce real time data).
3.	Silver	Shaped	40%	AF31 (26)	Bounded delay?	
3a.	Silver overflow	N/A	No limits, lowest priority	AF11 (10)	None	Only occurs on queue overflow at a remarking switch - not from end station. Depends on availability of remarking capability in switch hardware (or software on a router). If remarking to silver overflow is not supported but remarking is still feasible then the device whould remark to bronze
4.	Bronze	N/A	10% min	BE (0)	None	default queue. Any traffic not explicitly identified (or tagged at other settings) should be remarked as bronze.

Notes:

The DSCP markings chosen are backwards compatible with IP precedence values.

DSCP is a 6 bit field. The numbers given above in brackets for (value) are in decimal.

The system components can treat multiple DSCP markings as equivalent if required – this would allow easy migration to variations of the QoS model if required over time.

These markings are similar to current C&W (ex Energis) practice on the corporate MPLS based IP service (IP Select, IP Connect), so existing configurations and templates are applicable to Cisco software router requirements and should, therefore, be easily added to the Foundry hardware configurations currently used.

The number of QoS levels and chosen values are compatible with more complex models – see the ‘Cisco reference document for one possible framework, which in turn is based on IP best practice in RFC 2474 and 2597’.

Bandwidth in this document is described as a percentage of traffic at layer 1 within the interface type (all Ethernet for Raman/BBC Lans, others may be PPP, HDLC, etc)

The encapsulations mean that although such limits could be applied at a different network layer, the overhead is dependent on packet size and so limiting will need to be derated and, since ‘worst’ case limits will be needed, may reduce the high priority values

If percentages are applied at a higher network layer, then the high priority streams get higher throughput – best effort may end up with a ‘guarantee’ of 0% throughput.

## 4 BBC DQ

Excerpt from the “Delivering Quality” BBC policy document for networks – for the current version of the full document please see the link given in the references.

This reference on DQ is an early guidance policy and set the watermark the BBC must adhere to going forward; however, these values do concentrate on class of service applied to IEEE 802.1p class of service (CoS) settings in an Ethernet campus environment. Notwithstanding that the principles given can still be translated into an IP / Diffserv / DSCP QoS environment.

### 5.6 Class of Service (CoS)

Use of the available queues on the intermediate systems is limited to 4. This gives us 4 queues for Class of Service. As there are 8 defined QoS levels in 802.1p they should be divided up as follows:-

- 1 streaming real-time inc telephony.
- 2 time critical e.g. media object for transmission
- 3 business critical
- 4 the rest

All switches use the same ACLs to classify traffic into the same queues for easier management.

All priority 1 & 2 must be rate limited at ingress or by admission control in the application (for IPT) to protect 3 & 4

Priority 1 traffic is 30% max on any link before upgrade is required

Priority 2 traffic limit is be 20%

Priority 3 traffic limit is 40% max per link

Priority 4 traffic limit is 10% max per link (Note - actually minimum allocated bandwidth according to the authors).

Until such time as trials and pilots are complete, QoS and/or CoS headers should not be configured or used in any intermediate system.

## 5 Glossary

REITH – All BBC Packet LANs managed by SBS in London and Nations and regions

RAMAN – Next generation Wide area Network, managed by Cable and Wireless

## 6 References

General page for Cisco design docs:

[www.cisco.com/go/srnd](http://www.cisco.com/go/srnd)

[www.cisco.com/application/pdf/en/us/guest/netsol/ns432/c649/ccmigration\\_09186a008049b062.pdf](http://www.cisco.com/application/pdf/en/us/guest/netsol/ns432/c649/ccmigration_09186a008049b062.pdf)

[www.cisco.com/warp/public/105/dscpvalues.html](http://www.cisco.com/warp/public/105/dscpvalues.html)

[guidelines.gateway.bbc.co.uk/dq/index.shtml](http://guidelines.gateway.bbc.co.uk/dq/index.shtml)

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