

AT&T Dedicated Internet
(ADI)



Class of Service Data Collection Document

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Data Collection Document

For AT&T Dedicated Internet (ADI formerly known as MIS)



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Welcome,

You are receiving this document as a subscriber to AT&T Class of Service (CoS) options for Data and IP Services. This document provides an overview of the CoS option AT&T offers as well as information to help you prepare for your technical interview. You should use this document to determine how you wish to apply CoS to meet your specific networking requirements. Additionally, your AT&T Data Network Analyst/Technical Consultant can be contacted for assistance with the CoS Profiles selection and traffic mappings. Since this document contains information how AT&T implements CoS on AT&T managed routers on the customer premises, it must not be shared with non AT&T CoS subscribers without prior written approval.

1 What is the Class of Service (CoS) Option that AT&T Offers?

AT&T's Class of Service (CoS) Option is a capability that provides improved and predictable network services. The CoS AT&T offers are based on classifying or mapping application traffic into four CoS as well as selecting the best bandwidth ratios across the four CoS to meet the application bandwidth and/or delay requirements. The CoS implementation will include the following techniques:

- I. **Traffic Classification** is used to map traffic types to different classes of service. The ingress customer premise router will classify the traffic types using IP addresses, ports, protocols, a combination of all above, or the IP Precedence/DSCP setting.
- II. **Policing and Marking** are the result of the above traffic classification when applied against an ingress CoS profile. Packets exceeding the CoS1 bandwidth allocation are strictly policed (traffic above the allocated bandwidth is discarded), while packets in any of the remaining data classes (CoS2 through CoS4) are given different markings to indicate whether they are within the bandwidth subscription per CoS (compliant) or exceeding the bandwidth subscription per CoS (noncompliant).
- III. **Scheduling and Congestion Management** are the methods used to service traffic across the Wide Area Network (WAN) connection to and from AT&T's back-bone network. An egress scheduling or queuing CoS profile is selected to allocate the bandwidth needed for each class. If there is insufficient bandwidth to fully service a class, then noncompliant packets may be discarded within the class to help relieve the congestion using the Weighted Random Early Detection (WRED) algorithm. Discarded packets allow TCP (Transmission Control Protocol) applications to throttle back by closing their TCP windows.



2 What information is required for the CoS Option?

To map your business requirements to the CoS model you need to consider and request the following information:

1. Choose one of the available CoS Classification profile for marking packets being sent into the network (ingress).
2. Choose one of the available CoS queuing profile for scheduling traffic from the network (egress).¹
3. Identify your applications and the desired classes for each. Engineers responsible to configuring the customer premise router should refer to Section 4 - How do I map my traffic to the available COS? If AT&T is to manage and provision the customer premise router, the traffic mapping requirements should be communicated to AT&T.²

3 What are the AT&T Traffic Classes?

AT&T provides four classes to classify your traffic. All four classes or a subset may be used as defined by the list of predefined CoS profiles. Table 1 below describes the different classes, the standard behaviors, and the corresponding Diffserv Code Point (DSCP) markings³ expected by AT&T. CoS1 is designed for Real-time applications whereas the other three can be used for non-Real-time applications.

¹ AT&T recommends keeping the ingress and egress CoS profiles the same. However, asymmetric pro-files are possible for customers with this requirement.

² The COS Data Collection Worksheet on the last page of this document is available to submit the traffic types and desired classes.

³ DSCP and DSCP markings are defined in RFCs 2474, 2597, and 2598. Although DSCP markings can be backwards compatible to IP Precedence, the DSCP markings are not related to the AT&T legacy IP Precedence markings and are maintained independently. New and upgraded sites with CoS are implemented with the DSCP markings.



TOS (first 6 bits)	Standard Per Hop Behavior	AT&T Class
101 110	DSCP Expedite Forwarding (EF)	COS1
101 000 ⁴	IP Precedence 5	COS1
011 010	DSCP Assured Forwarding 31 (AF31)	COS2 compliant
011 100	DSCP Assured Forwarding 32 (AF32)	COS2 noncompliant
011 000	IP Precedence 3	COS2 compliant
010 010	DSCP Assured Forwarding 21 (AF21)	COS3 compliant
010 100	DSCP Assured Forwarding 22 (AF22)	COS3 noncompliant
010 000	IP Precedence 2	COS3 compliant
000 000	DSCP Best Effort (DEFAULT)	COS4
011 xxx ⁵	DSCP Assured Forwarding 3x (AF3x)	COS2 noncompliant
110 xxx	Reserved for control and signaling	Highest supported data class
111 xxx	Reserved for control and signaling	Highest supported data class
010 xxx	DSCP Assured Forwarding 2x (AF2x)	COS3 noncompliant
101 xxx		COS4
001 xxx	DSCP Assured Forwarding 1x (AF1x)	COS4
100 xxx	DSCP Assured Forwarding 4x (AF4x)	COS4
000 xxx		COS4

Table 1. AT&T Class Markings

Each of the three data classes (CoS2 through CoS4) has a specific amount of band-width allocation so that during congestion, all classes can transmit data. However, if any class does not use its entire bandwidth allocation, packets from other classes can share the unused bandwidth. The two primary criteria for assigning data applications to the data classes are:

- (1) Required bandwidth
- (2) Delay sensitivity

3.1 CoS1 (Real-time Applications)

The highest priority class is suitable for Real-time applications that have unique performance requirements and are sensitive to delay, packet loss and jitter (delay variation). The service is engineered such that the Real-time class has the highest priority up to its allocated bandwidth. Packets in the Real-time class are processed ahead of all other classes up to the allocated bandwidth limit. The oversubscribed packets are dropped in this class. AT&T does not recommend putting data traffic in the Real-Time class since the larger packet sizes can interfere with Voice or other Real-time traffic.

Some of the common applications that can be included in this class are:

- o Voice over IP
- o Streaming Audio Applications

⁴ IP Precedence compliant values are available for CPE devices not able to configure DSCP values.

⁵ xxx can any combination of bit pattern not explicitly predefined by AT&T.



Note: Applications that are “bursty” in nature require special attention when placed in CoS1. **Video can be placed in the Real-time class only if Voice is not present.** Because the Real-time queue is strictly limited, customer must ensure that enough bandwidth is allocated to the Real-time class to fully accommodate the bursts associated with Video. If you have a need to put Video in CoS1, please consult your Account Team and Data Network Analyst/Technical Consultant.

3.2 CoS2 (Critical Data Applications)

Since a majority of the bandwidth among data classes is allocated to this class, it is effectively the highest priority data class. Profiles with a large bandwidth allocation in this class can be used either for applications requiring a large amount of bandwidth or for applications requiring lower latency. For example, hourly downloads of accounting files may need the assurance that a specific minimum amount of bandwidth is always available. Likewise, if the mission critical data were frequent credit card transactions or character-based I/O (e.g., Telnet or TN3270), a larger bandwidth percentage would increase the service frequency and help control the perceived end-to-end delay during congestion. In both cases, any bandwidth not actually used by this class would be available to the other classes. Although the definition of Critical Data varies from customer to customer, the relevance remains the same. The common applications that maybe considered for this class are:

- Customized Corporate Applications
- ERP applications like SAP, Peoplesoft, Citrix
- Corporate database Applications
- Extranet/Intranet based critical Applications
- Video Conferencing traffic (if coexists with Voice and therefore is not put into COS1)

3.3 CoS3 (Business Data Applications)

The CoS3 data class is for applications that have a lower priority such as nor-mal/typical corporate data applications such as Human Resources related web transactions, email, inter-office file transfers, etc. The methodology for choosing the appropriate bandwidth percentage is the same as for the Critical Data class and is based on the type of traffic. Some of the common traffic that may reside in this class are:

- Essential Internet Services
- Non-critical file transfers
- Email



3.4 CoS4 (*Standard Data Applications*)

CoS4 or the default class is used for all traffic that does not map to any one of the other classes (i.e. CoS1, CoS2 or CoS3). At times when the other classes are not using their specified bandwidth allocation, the Standard Data Class still has access to their unused bandwidth. The default class may include the following traffic types:

- General Internet browsing Traffic
- Personal file transfers
- Newsgroup participation
- Non-critical corporate business
- Email

4 How do I map my traffic to the available CoS?

Your traffic should be mapped to the desired CoS through **classification** and **marking** of IP packets. Traffic types are identified using parameters within the IP packet headers such as IP addresses, port numbers, or the TOS (Type of Service) byte. The traffic can be classified with the following parameters, individually or in combination:

- Source and/or destination network/host IP Addresses
- Source and/or Destination Protocol ports (well known or port numbers for custom protocols)
- Traffic with pre-marked IP Precedence or DSCP bits

After your traffic is classified, the TOS byte must be marked with the appropriate DSCP or IP Precedence values that corresponds to the classes defined in the COS pro-file selected. Table 1 shows the lists the TOS bit settings recognized by the AT&T backbone routers.

4.1 Customer Managed Customer Premise Router

If you manage your own router, you are responsible for classifying your traffic into the correct CoS, and for marking it appropriately. All packets you send to the AT&T backbone router should be marked with either a DSCP or IP Precedence⁶ that corresponds to the CoS profile selected. Non-recognized DSCP or IP Precedence values will be accepted by the AT&T backbone router but will be processed as COS4 traffic.

⁶ IP Precedence is supported for systems that cannot support DSCP.



4.2 AT&T Managed Customer Premise Router

- If AT&T manages the customer premise router, a maximum of 50 classification entries are allowed due to router resource impacts. If you have a high number of applications to classify, you will need to lower the number of entries. If this is not possible then please discuss this limitation with your AT&T Account Team and Data Network Analyst/Technical Consultant.

4.3 Example

The CIO of SS Corp has the following CoS requirements:

- I. Voice traffic to H.323 VOIP router 12.16.1.123 to be assigned to CoS1.
- II. Corporate application traffic to server 12.16.1.25 that uses TCP port 6000 to CoS2.
- III. Hosts on the 12.16.2.0 subnet should be assigned to CoS2.
- IV. Traffic with IP precedence 3 to CoS3.
- V. All other traffic to CoS4.

Solution:

The table below is the matrix for the SS Corp CoS classification:

Source IP Address	Source Subnet Mask	Destination IP Address	Destination Network Mask	Protocol	Port Number / Range	DSCP/ IP Prec	Class
0.0.0.0 (ANY)	0.0.0.0 (ANY)	12.16.1.123	255.255.255.255 (Host)	UDP	16384 32767 (Voice)	-	CoS1
0.0.0.0 (ANY)	0.0.0.0 (ANY)	12.16.1.123	255.255.255.255 (Host)	TCP	1720 (RTP voice)	-	CoS1
0.0.0.0 (ANY)	0.0.0.0 (ANY)	12.16.1.25	255.255.255.255 (Host)	TCP	6000 (application)	-	CoS2
12.16.2.0	255.255.255.0 (subnet)	0.0.0.0 (ANY)	0.0.0.0 (ANY)	-	-	-	CoS2
0.0.0.0 (ANY)	0.0.0.0 (ANY)	0.0.0.0 (ANY)	0.0.0.0 (ANY)	-	-	3	CoS3
0.0.0.0 (ANY)	0.0.0.0 (ANY)	0.0.0.0 (ANY)	0.0.0.0 (ANY)	-	-	-	COS4 (Default)

Table 2. Traffic Classification Example



5 What Traffic Profiles are offered by AT&T?

The bandwidth allocation for each class is based on twenty-five (25) pre-defined "Traffic profiles". You will be required to select an egress queuing profile for traffic leaving the backbone network toward the customer premise router. If AT&T manages the customer premise router, the same queuing profile will be used for traffic flowing to-wards the backbone network. Additionally, you will be required to select an ingress classification profile that will be used to calculate the rates for traffic classification and policing. Real-time traffic is given strict priority over all data classes. Among the data classes, the larger bandwidth assignment means a higher probability of being serviced, whereas the bandwidth itself sets forth the maximum amount any one class can use during congestion. A small amount of bandwidth is reserved for router control and management traffic. The following traffic profiles are available for selection under each listed CoS Category:

Selectable CoS Profiles						CoS Categories				
Profile #	Profile Name	CoS1 %	CoS2 %	CoS3 %	CoS4 %	Multi-media High	Multi-media Standard	Critical Data	Business Data	Standard Data
101	90%RT, 0/0/100 Data	90	0	0	10	Yes	N/A	N/A	N/A	N/A
102	80%RT, 80/10/10 Data	80	16	2	2	Yes	N/A	N/A	N/A	N/A
103	80% RT, 60/30/10 Data	80	12	6	2	Yes	N/A	N/A	N/A	N/A
104	80% RT, 40/30/30 Data	80	8	6	6	Yes	N/A	N/A	N/A	N/A
105	60% RT, 80/10/10 Data	60	32	4	4	Yes	N/A	N/A	N/A	N/A
106	60% RT, 60/30/10 Data	60	24	12	4	Yes	N/A	N/A	N/A	N/A
107	60% RT, 40/30/30 Data	60	16	12	12	Yes	N/A	N/A	N/A	N/A
108	50% RT, 0/0/100 Data	50	0	0	50	Yes	Yes	N/A	N/A	N/A
109	40% RT, 80/10/10 Data	40	48	6	6	Yes	Yes	N/A	N/A	N/A
110	40% RT, 60/30/10 Data	40	36	18	6	Yes	Yes	N/A	N/A	N/A
111	40% RT, 40/30/30 Data	40	24	18	18	Yes	Yes	N/A	N/A	N/A
112	20% RT, 80/10/10 Data	20	64	8	8	Yes	Yes	N/A	N/A	N/A
113	20% RT, 60/30/10 Data	20	48	24	8	Yes	Yes	N/A	N/A	N/A
114	20% RT, 40/30/30 Data	20	32	24	24	Yes	Yes	N/A	N/A	N/A
115	10% RT, 80/10/10 Data	10	72	9	9	Yes	Yes	N/A	N/A	N/A
116	10% RT, 60/30/10 Data	10	54	27	9	Yes	Yes	N/A	N/A	N/A
117	10% RT, 40/30/30 Data	10	36	27	27	Yes	Yes	N/A	N/A	N/A
118	ONE CoS CoS2	0	100	0	0	Yes	Yes	Yes	N/A	N/A
119	0% RT, 80/10/10 Data	0	80	10	10	Yes	Yes	Yes	N/A	N/A



120	0% RT, 60/30/10 Data	0	60	30	10	Yes	Yes	Yes	N/A	N/A
121	0% RT, 40/30/30 Data	0	40	30	30	Yes	Yes	Yes	N/A	N/A
122	ONE CoS CoS3	0	0	100	0	Yes	Yes	Yes	Yes	N/A
123	0% RT, 0/90/10 Data	0	0	90	10	Yes	Yes	Yes	Yes	N/A
124	0% RT, 0/50/50 Data	0	0	50	50	Yes	Yes	Yes	Yes	N/A
125	NO CoS	0	0	0	100	Yes	Yes	Yes	Yes	Yes

Table 3. AT&T CoS Profiles

Note: A minimum access speed of 768Kbps is required for the Multimedia CoS categories for private leased line access. Profiles supported under the Multimedia High category (“Yes” in table 3) are only available on private leased lines access. Profiles supported under the Multimedia Standard category are available on all access types supported by the service.

Based on the traffic class requirements, AT&T CoS profiles are organized into five categories.

5.1 Multimedia High Profiles

This category allocates a major portion of the subscribed bandwidth to Real-time applications. Currently, the Multimedia profiles with Real-time bandwidth allocation are only available on private leased line access of 768K or greater. These profiles are for customers who want to make the majority of their bandwidth available for Real-time applications like Voice over IP and other delay sensitive multimedia applications with a minimal amount of data usage. If you are using Real-time applications the traffic profiles from this category will be an ideal selection.

Traffic Class	Profile# 101	Profile# 102	Profile# 103	Profile# 104	Profile# 105	Profile# 106	Profile# 107
CoS1 (Real-time)	90%	80%	80%	80%	60%	60%	60%
CoS2 (Critical Data)	0%	16%	12%	8%	32%	24%	16%
CoS3 (Business Data)	0%	2%	6%	6%	4%	12%	12%
CoS4 (Standard Data)	10%	2%	2%	6%	4%	4%	12%

Table 4. AT&T Multimedia High Profiles



5.2 Multimedia Standard Profiles

Profiles in this category are recommended for high-speed connections or if the bandwidth demands of Real-time applications is small. Currently, the Multimedia profiles with Real-time bandwidth allocation are only available on private leased line access of 768K or greater. Ideal candidates are Branch sites or Remote locations that require Real-time as well as other application access. The maximum bandwidth allocated for the Real-time class is reserved but can be shared among non Real-time traffic classes in the configured proportions.

The Real-time class traffic in this profile receives the highest priority over all other CoS.

Traffic Class	Profile# 108	Profile# 109	Profile# 110	Profile# 111	Profile# 112	Profile# 113	Profile# 114	Profile# 115	Profile# 116	Profile# 117
CoS1 (Real-time)	50%	40%	40%	40%	20%	20%	20%	10%	10%	10%
CoS2 (Critical Data)	0%	48%	36%	24%	64%	48%	32%	72%	54%	36%
CoS3 (Business Data)	0%	6%	18%	18%	8%	24%	24%	9%	27%	27%
CoS4 (Standard Data)	50%	6%	6%	18%	8%	8%	24%	9%	9%	27%

Table 5. AT&T Multimedia Standard Profiles

5.3 Critical Data Profiles

This category groups the profiles that do not support CoS1 (Real-time). These profiles may be appropriate for Critical Data Applications that have strict performance criteria, regardless of how much bandwidth the application would actually require. This category is idle for locations that do not use multimedia or voice applications but have business critical applications running on the network.

Applications that may not require a high bandwidth allocation, but require minimal de-lay during periods of congestion should be allocated to higher traffic classes. For example, applications such as Telnet, SNA, Citrix, DLSw or TN3270 would be the likely candidate for the Critical Data Class.

Less critical applications like HTTP and email can be used in lower traffic classes since unused bandwidth from one class is available to the other classes.



Traffic Class	Profile# 118	Profile# 119	Profile# 120	Profile# 121
CoS1 (Real-time)	0%	0%	0%	0%
CoS2 (Critical Data)	100%	80%	60%	40%
CoS3 (Business Data)	0%	10%	30%	30%
CoS4 (Standard Data)	0%	10%	10%	30%

Table 6. AT&T Critical Data Profiles

Note: If 100% of the CoS2 profile is selected, the benefit of prioritizing one type of application over other types of applications in order to better utilize the access band-width may not be realized.

5.4 Business Data Profiles

Comprised of only one or two traffic classes the profiles in this category will suit a location with minimum CoS requirements like branch or remote sites running a few business applications that require priority over routine traffic.

Traffic Class	Profile# 122	Profile# 123	Profile# 124
CoS1 (Real-time)	0%	0%	0%
CoS2 (Critical Data)	0%	0%	0%
CoS3 (Business Data)	100%	90%	50%
CoS4 (Standard Data)	0%	10%	50%

Table 7. AT&T Business Data Profiles

Note: If 100% of the CoS3 profile is selected, the benefit of prioritizing one type of application over other types of applications in order to better utilize the access band-width may not be realized.



5.5 Standard Data Profile

It is extremely important to select a profile reflecting your network needs. If a CoS Profile is somehow not selected, the Standard Data Profile is applied and all traffic is marked with the lowest marking and serviced as best effort.

6 Can I use COS for IPSec traffic?

If encrypted packets are reordered due to their CoS treatment, they may be dropped due to an anti-replay sequence number check on the receiving router. Slight congestion can cause enough reordering to provoke a large percent of anti-replay drops.

This issue with COS and IPSec can be avoided if anti-replay is disabled or the encrypted traffic is transmitted in a single class. Encrypted traffic can be placed in a single class by classifying the traffic with IP address pairs and/or port numbers. Additionally, the CoS profile selected should support the expected volume of IPSec traffic in the desired class.

7 Can I set the TOS Markings and will they be preserved?

If you are responsible to configure the customer premise router, the TOS marking will be preserved by the AT&T backbone but unrecognized DSCP values will be treated as best effort across the backbone.

If AT&T is managing the customer premise router, the TOS byte set by the applications could be altered under normal operations since the TOS bytes are modified at the originating site by the classification process. By default, AT&T will reset the non-compliant values back to the compliant values at the destination site before the packets are placed on the customer-facing LAN segment. This allows the TOS values to be preserved host-to-host if the DSCP values are aligned with the AT&T compliant values.

If COS is enabled for the first time it could affect legacy applications that will not function with COS. If you are uncertain if all your applications will function with COS, you should select Reset Mode (which is off by default) to have the TOS bytes reset to DSCP-0 as packets leave the AT&T Managed customer premise router and placed on the customer-facing LAN segment.



8 What is AT&T Business VoIP (BVoIP) with CoS?

The AT&T BVoIP service previously offered a VoIP and Data service where unused VoIP bandwidth would be dynamically allocate to data traffic in a lower priority data class. With COS enhancement, AT&T BVoIP customer can now select any of 17 CoS profiles with up to four classes. Multiple classes give BVoIP customers additional control for traffic separation of their data traffic. In addition, all applications including VoIP can be assured to have sufficient bandwidth by selecting a profile with the appropriate bandwidth allocation.

The purpose of this section is to capture the impact to the CPE router needed to sup-port BVoIP with CoS enhancement and to provide new guidelines on the maximum concurrent calls for each CoS profile.

8.1 Guidelines and Number of Concurrent VoIP Calls

Using the port speed and the bandwidth percentage allocation for the real-time class, the number of concurrent VoIP calls can be calculated. BVoIP customer are given the option to select the CoS profiles with real-time allocation (#102 - #117). How-ever, IOS Firewalls are not supported with these additional supported CoS profiles. The tables below capture the number of concurrent voice calls for various port speeds using the G729 codec with IP PBXs and TDM PBXs. For other codec types, please discuss with your AT&T Data Analyst/Technical Consultant or refer to the BVoIP Product Reference Guide.



8.1.1 TDM PBX with PRI

The following table captures the maximum number of concurrent voice calls for a TDM PBX using G729 codec and a Primary Rate Interface (PRI).

Profile #	Profile Name	T1	FT3 10M	FT3 15M	FT3 20M	FT3 25M	FT3 30M	FT3 35M	FT3 40M	T3
101	90% RT 0/0/100 Data	46	230	230	230	230	230	230	230	230
102	80% RT 80/10/10 Data	42	230	230	230	230	230	230	230	230
103	80% RT 60/30/10 Data	42	230	230	230	230	230	230	230	230
104	80% RT 40/30/30 Data	42	230	230	230	230	230	230	230	230
105	60% RT 80/10/10 Data	30	214	230	230	230	230	230	230	230
106	60% RT 60/30/10 Data	30	214	230	230	230	230	230	230	230
107	60% RT 40/30/30 Data	30	214	230	230	230	230	230	230	230
108	50% RT 0/0/100 Data	24	180	230	230	230	230	230	230	230
109	40% RT 80/10/10 Data	18	142	230	230	230	230	230	230	230
110	40% RT 60/30/10 Data	18	142	230	230	230	230	230	230	230
111	40% RT 40/30/30 Data	18	142	230	230	230	230	230	230	230
112	20% RT 80/10/10 Data	10	70	100	130	160	200	230	230	230
113	20% RT 60/30/10 Data	10	70	100	130	160	200	230	230	230
114	20% RT 40/30/30 Data	10	70	100	130	160	200	230	230	230
115	10% RT 80/10/10 Data	6	36	50	76	80	100	114	130	170
116	10% RT 60/30/10 Data	6	36	50	76	80	100	114	130	170
117	10% RT 40/30/30 Data	6	36	50	76	80	100	114	130	170



8.1.2 TDM PBX with CAS

The following table captures the maximum number of concurrent voice calls for a TDM PBX using G729 codec and Channel Associated Signaling (CAS).

Profile #	Profile Name	T1	FT3 10M	FT3 15M	FT3 20M	FT3 25M	FT3 30M	FT3 35M	FT3 40M	T3
101	90% RT 0/0/100 Data	48	240	240	240	240	240	240	240	240
102	80% RT 80/10/10 Data	44	240	240	240	240	240	240	240	240
103	80% RT 60/30/10 Data	44	240	240	240	240	240	240	240	240
104	80% RT 40/30/30 Data	44	240	240	240	240	240	240	240	240
105	60% RT 80/10/10 Data	32	214	240	240	240	240	240	240	240
106	60% RT 60/30/10 Data	32	214	240	240	240	240	240	240	240
107	60% RT 40/30/30 Data	32	214	240	240	240	240	240	240	240
108	50% RT 0/0/100 Data	26	180	240	240	240	240	240	240	240
109	40% RT 80/10/10 Data	20	142	240	240	240	240	240	240	240
110	40% RT 60/30/10 Data	20	142	240	240	240	240	240	240	240
111	40% RT 40/30/30 Data	20	142	240	240	240	240	240	240	240
112	20% RT 80/10/10 Data	12	70	100	130	160	200	240	240	240
113	20% RT 60/30/10 Data	12	70	100	130	160	200	240	240	240
114	20% RT 40/30/30 Data	12	70	100	130	160	200	240	240	240
115	10% RT 80/10/10 Data	6	36	50	76	80	100	114	130	170
116	10% RT 60/30/10 Data	6	36	50	76	80	100	114	130	170
117	10% RT 40/30/30 Data	6	36	50	76	80	100	114	130	170



8.1.3 IP PBX

The following table captures the maximum number of concurrent voice calls for an IP PBX using G729 codec on an Ethernet interface.

Profile #	Profile Name	1.5M	10M	15M	20M	25M	30M	35M	40M	45M
101	90% RT 0/0/100 Data	50	300	450	600	700	700	700	700	700
102	80% RT 80/10/10 Data	46	270	340	340	340	340	340	340	340
103	80% RT 60/30/10 Data	46	270	340	340	340	340	340	340	340
104	80% RT 40/30/30 Data	46	270	340	340	340	340	340	340	340
105	60% RT 80/10/10 Data	34	210	300	340	340	340	340	340	340
106	60% RT 60/30/10 Data	34	210	300	340	340	340	340	340	340
107	60% RT 40/30/30 Data	34	210	300	340	340	340	340	340	340
108	50% RT 0/0/100 Data	28	175	250	340	340	340	340	340	340
109	40% RT 80/10/10 Data	22	140	200	270	340	340	340	340	340
110	40% RT 60/30/10 Data	22	140	200	270	340	340	340	340	340
111	40% RT 40/30/30 Data	22	140	200	270	340	340	340	340	340
112	20% RT 80/10/10 Data	14	70	100	140	340	340	340	340	340
113	20% RT 60/30/10 Data	14	70	100	140	340	340	340	340	340
114	20% RT 40/30/30 Data	14	70	100	140	340	340	340	340	340
115	10% RT 80/10/10 Data	8	35	50	70	170	170	170	170	170
116	10% RT 60/30/10 Data	8	35	50	70	170	170	170	170	170
117	10% RT 40/30/30 Data	8	35	50	70	170	170	170	170	170



9 Special Notes:



Appendix A

PROTOCOL & PORT NUMBERS

The port numbers are divided into three ranges: the Well Known Ports, the Registered Ports, and the Dynamic and/or Private Ports.

- I. The Well Known Ports are those from 0 through 1023.
- II. The Registered Ports are those from 1024 through 49151
- III. The Dynamic and/or Private Ports are those from 49152 through 65535

WELL KNOWN PORT NUMBERS

The Well Known Ports are assigned by the IANA and on most systems can only be used by system (or root) processes or by programs executed by privileged users.

Ports are used in the TCP [RFC793] to name the ends of logical connections that carry long-term conversations. For the purpose of providing services to unknown callers, a service contact port is defined. This list specifies the port used by the server process as its contact port. The contact port is sometimes called the "well-known port". To the extent possible, these same port assignments are used with the UDP [RFC768].

The range for assigned ports managed by the IANA is 0-1023.

A complete list of port assignments is available at

<http://www.iana.org/assignments/port-numbers>



Application List

The following applications can be found in a customer environment:

Voice: the classes of service offering allow the customer to use a single network service for all his needs, including voice. The advantage is reduced cost, and a single point of contact for all his applications

Video: While video is not yet an important application for the customer, the use of collaboration tools, including voice, video and data sharing, should increase the importance of this traffic. Video training and video conferencing should also be successful in the coming years.

ERP: SAP, JD Edwards, BAAN, Oracle Java client. The Enterprise Resource Planning (ERP) applications are part of the strategic applications used in the Enterprise world. Network service must provide high packet delivery, performance predictability and availability.

Client/server: Sun-RPC, Fix, Corba

Thin client/server: Citrix, RDP terminal server

E-mail: MS exchange-Outlook, Notes, CCmail. All companies now use E-mail for internal and external communication. While strategic for the company, e-mail is not sensitive to network performance

Collaboration tools: NetMeeting, jabber, Instant Messaging. Some customers start to ask for specific support for collaboration tools. These tools include multiple options, such as voice, video, white board, document sharing, and could be used to replace the usual video conferencing applications in the future. In this case, real time network performances are required.

Legacy LAN, non-IP: SNA, DECnet, Appletalk, IPX, X25. This type of traffic is strategic for the enterprise, and may be delay sensitive (SNA), but the application itself is not “real time”.

Internet: Web browser, http, gopher – NNTP, UUCP. This is usually non strategic to the customer, and can suffer low network performance, and some packet loss. It represents a large amount of data, usually not controlled by the IT services. Part of it is for employee personal use. This traffic should be separated from the strategic applications in the customer's view.

Customer Intranet: Directory, utilities, sale tools, customer support. These are strategic customer applications. They are not real time in nature, and are bandwidth consuming.



DB: Oracle, IBM DB2, Sybase, and Ingres. Usually transactional, delay sensitive traffic

File server/file transfer: NFS, NetBios, Novell, Non-delay sensitive, file transfer can suffer some packet loss, with retransmission.

Print: Non real time usually

Host Access: TN3270. Telnet / TN3270 are interactive applications. They have Real Time requirements, but may be separated from other interactive applications depending on customer mix of traffic.

NM: RSVP, SMTP, and ICMP. This is not an enterprise strategic traffic, but it is high priority in order to keep the network and service alive.

Financial: ATM machines, Stock trading. Banks are very sensible to the delay induced on these applications. They usually represent a small amount of traffic, with small packets. The performance should be very good on any type of access (low speed included).

In addition to these applications, personal non-business traffic may be seen: Game, push, Yahoo messenger, Streaming media (Napster, Gnutella, Real Audio, Quick Time, and MP3)



CoS Data Collection Worksheet⁷

If AT&T is to manage the customer premise router, please complete and submit a separate CoS Data Collection Worksheet for each set of sites with the same CoS Pro-files and Traffic Classification requirements.

1. Choose a suitable CoS **Classification profile** for marking packets being sent into the network (ingress). The Profile numbers are listed in table-3.
2. Choose a suitable CoS **Queuing profile** for scheduling traffic from the network (egress). The recommendation (and default) is to make the Classification and Queuing profiles the same. The Profile numbers are listed in table-3.
3. Specify the **Site Names** for the unique combinations of CoS Profiles and Traffic Classification
4. Identify the **Traffic Types** and the corresponding **Classes** they should be carried in. Only the first three Classes need to be specified, as traffic not identified will be provisioned in CoS4 (the default catch-all class⁸). The worksheet allows 4 ways to classify traffic into classes. If you choose classification by IP address and/or ports, TCP and/or UDP port numbers should be requested independently for the source and destination addresses (separate lines) unless the requirement is to use the same port numbers for both the source and the destination addresses. Additionally, if you intend to classify both TCP and UDP traffic with the same port numbers, then please specify the "TCP and UDP" keyword.
5. Verify if the default setting of **Reset Mode=N** for CoS would be okay. If Reset Mode is requested, all packets leaving the AT&T Managed customer premise router will be reset to DSCP-0 as they are placed on the customer-facing LAN segment.
6. If you need assistance understanding or completing the *CoS Data Collection Worksheet*, please contact your AT&T Account Team and Data Analyst/Technical Consultant.
7. Click on the following link to access the *CoS Data Collection Worksheet* and select **Enable Macros**.

[CoS Data Collection Worksheet](#)

⁷ Completing the CDC Worksheet is only necessary when AT&T is responsible to manage and provision the customer premise router.

⁸ Any data class can be defined as the catch-all class by specifying the wildcard source and destination addresses pairs. Further assistance can be obtained from your AT&T Data Network Analyst/Technical Consultant.

END OF DOCUMENT