Introducing the Specifications of the MEF

MEF 23.1: Class of Service Phase 2

Implementation Agreement

Agenda

- **Approved MEF Specifications**
- **This presentation**
- **About this Specification**
- **In Scope / Out of Scope**
- **Terminology, Concepts**
- **Section Review**
  - CoS Label
  - Cos and Color Identifiers
  - Performance
  - Bandwidth Profile and Color
  - CoS Model
- **CoS Performance Objectives**
- **Summary**
- **Backup Material: Examples/Use Cases**

Approved MEF Specifications

REF	Description
MEF 2	Requirements and Framework for Ethernet Service Protection
MEF 3	Circuit Emulation Service Definitions, Framework and Requirements in Metro Ethernet Networks
MEF 4	Metro Ethernet Network Architecture Framework Part 1: Generic Framework
MEF 6.1	Metro Ethernet Services Definitions Phase 2
MEF 7.1	EMS-NMS Information Model
MEF 8	Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks
MEF 9	Abstract Test Suite for Ethernet Services at the UNI
MEF 10.2	Ethernet Services Attributes Phase 2*
MEF 11	User Network Interface (UNI) Requirements and Framework
MEF 12	Metro Ethernet Network Architecture Framework Part 2: Ethernet Services Layer
MEF 13	User Network Interface (UNI) Type 1 Implementation Agreement
MEF 14	Abstract Test Suite for Traffic Management Phase 1
MEF 15	Requirements for Management of Metro Ethernet Phase 1 Network Elements
MEF 16	Ethernet Local Management Interface

*** MEF 6.1 replaced MEF 6., MEF 7.1 replaced MEF 7, MEF 10 .2 replaced MEF 10.1.1, MEF 10.1, MEF 10 which replaced MEF 1 and MEF 5.**

Approved MEF Specifications

REF	Description
MEF 17	Service OAM Framework and Requirements
MEF 18	Abstract Test Suite for Circuit Emulation Services
MEF 19	Abstract Test Suite for UNI Type 1
MEF 20	User Network Interface (UNI) Type 2 Implementation Agreement
MEF 21	Abstract Test Suite for UNI Type 2 Part 1: Link OAM
MEF 22.1	Mobile Backhaul Implementation Agreement Phase 2
MEF 23.1	Class of Service Implementation Agreement Phase 2
MEF 24	Abstract Test Suite for UNI Type 2 Part 2: E-LMI
MEF 25	Abstract Test Suite for UNI Type 2 Part 3: Service OAM
MEF 26	External Network Network Interface (ENNI) Phase 1
MEF 27	Abstract Test Suite For UNI Type 2 Part 5: Enhanced UNI Attributes & Part 6: L2CP Handling
MEF 28	External Network Network Interface (ENNI) Support for UNI Tunnel Access and Virtual UNI
MEF 29	Ethernet Services Constructs
MEF 30	Service OAM Fault Management Implementation Agreement
MEF 31	Service OAM Fault Management Definition of Managed Objects

MEF Specifications Overview

MEF 23	Carrier Ethernet Class of Service – Phase I
Summary	Replaced by MEF 23.1.
MEF 23.1	**Carrier Ethernet Class of Service – Phase 2**
Summary	Specifies a set of 3 Class of Service Names called CoS Labels that can be used by Operators, Service Providers and their Subscribers to indicate the performance expectations to be associated with a given set of frames that comprise a CoS Frame Set. This CoS IA includes standards for CoS and Color identification as well as performance objectives and supporting requirements. The CoS Labels are envisioned as a subset of all of the Class of Service Names an Operator may provide.
Benefits	Ethernet service interoperability and consistency between Operators, a common CoS Label set for Subscribers to utilize and use of performance objectives that support key applications.
Audience	All service provider/operators interested in enabling Class of Service and associated SLAs.

This Presentation

- **Purpose:**
  - This presentation is an introduction to MEF 23.1
- **Audience**
  - Useful for Service Providers architecting their services and networks
  - Also for Equipment Manufacturers building devices that will carry Carrier Ethernet Services.
- **Other Documents**
  - Presentations of the other specifications and an overview of all specifications is available on the MEF web site
    - MEF 23.1 is particularly important to MEF 22.1 Mobile Backhaul Phase 2 IA
  - Other materials such as white papers and case studies are also available
    - Including “The Benefits of Multiple Classes of Service for Ethernet Mobile Backhaul” white paper

About the Specification

This Implementation Agreement is motivated by the need to introduce and define specific "classes" or CoS Names called CoS Labels that will deliver a commitment for a particular level of performance for a set of Service or ENNI Frames (e.g., those belonging to a particular CoS Frame Set) from the Service Provider or Operator. This is to further develop Carrier Ethernet services that are interoperable and predictably support Subscriber applications. For example, Operators and Service Providers that connect MENs will be able to do so with a set of commonly understood CoS Labels, CoS IDs and CPOs in addition to any bilateral CoS Names they want to support.

This CoS IA normative language is primarily applicable to Subscribers, Service Providers and Operators who desire CoS Name interoperability across EIs. The requirements are developed based on the needs of Subscribers and their applications. Compliance with the CoS Labels in this IA does not limit an Operator from providing additional CoS Names using CoS Identifier values (e.g., PCP) that are left unused in this IA. Examples of additional CoS Names could include Operator defined CoS Names in addition to the specific MEF CoS Labels defined in this IA. Note that the CoS Performance Objective (CPO) and Parameter values are specified in this IA as maximums or minimums and thus do not limit Operators from providing conformant values that are less than the maximums or greater than the minimums. These other values could be described as more stringent, i.e., having more rigor or severity with respect to the standard or requirement value.

Overview of MEF 23.1

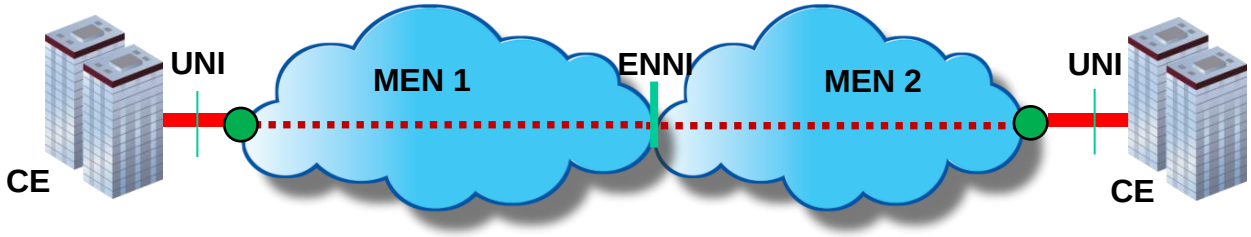
Overview of MEF 23.1

- Specifies a 3 CoS Model that includes 3 CoS Labels (H, M, L) and allows for subsets and extensions
  - An Operator may implement any number (e.g., 3, 2, or 1) of the MEF CoS Labels across a given EI
- Is applicable at External Interfaces (EIs) which can be either UNI or ENNI
- CoS ID and Color ID including support for MEF 26.0.3, 28, 10.2/10.2.1 variants
  - PCP/DSCP values, when part of the CoS ID and/or Color ID, are recommended for the UNI
  - PCP values, as part of the CoS ID and/or Color ID are mandatory at the ENNI to facilitate interconnection.
  - PCP/DSCP values specified for MEF CoS Labels are a subset of the set of values available for all CoS Names that may be supported
  - Guidance and requirements on Bandwidth Profile constraints
- CoS Performance Objectives (CPOs) and Parameter values specified for Frame Delay, Mean Frame Delay, Inter-Frame Delay Variation, Frame Delay Range and Frame Loss Ratio
  - Specified in 4 sets called Performance Tiers for each CoS Label

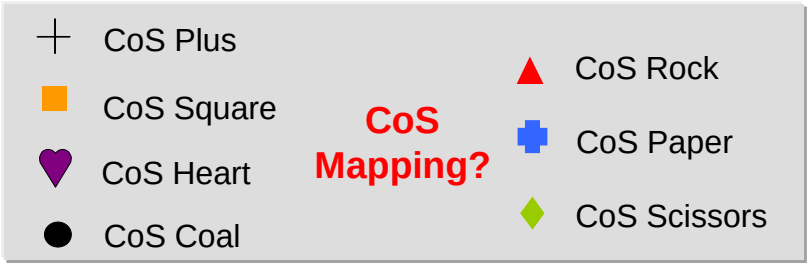
Mapping the CoS Model at an ENNI

Common CoS lexicon between the Operators on either side of the standardized Ethernet interconnect (ENNI) between MENs facilitates CoS alignment:

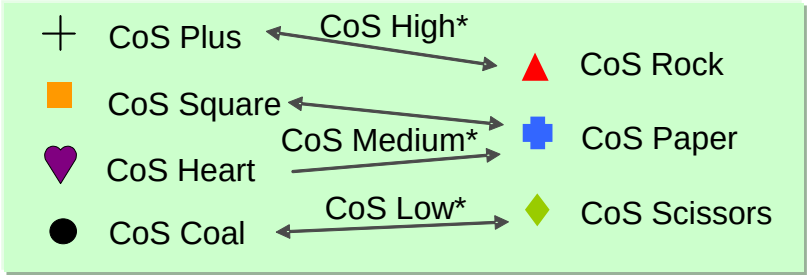
- MEF 23.1 specifies interoperability between MENs using up to 3 MEF CoS Labels
- Operators are still free to implement a subset or superset of the MEF CoS Labels



Without MEF CoS IA: Mapping at ENNI requires bilateral agreements at each ENNI. Customers may not get consistent performance



With MEF CoS IA: Operators remark frames on egress of an ENNI to align with the MEF CoS Labels.



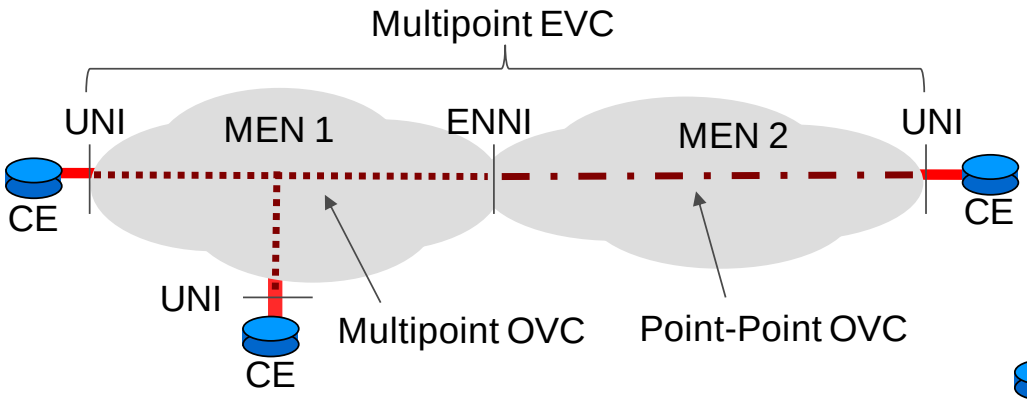
Other mappings are possible; e.g., CoS "Heart" mapping option to a MEF CoS Label, or to a MEN specific CoS Name based on bilateral agreement.

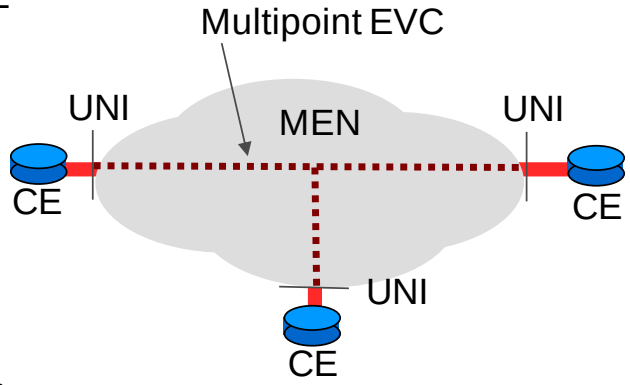
* Each CoS Label associated with particular CPO

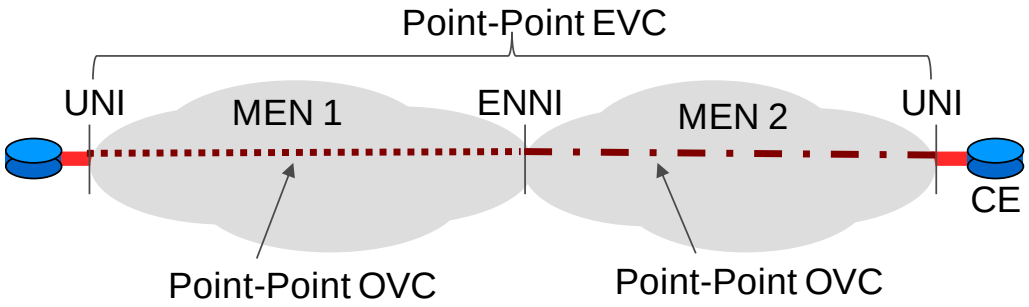
Scope & Applicability

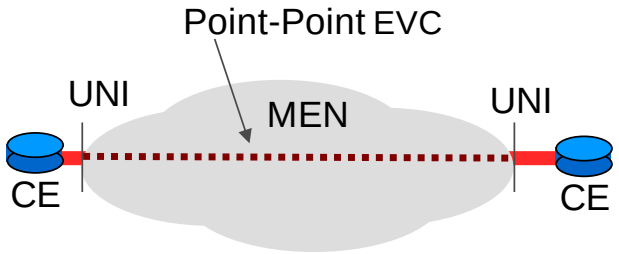
Scope and applicability of the Class of Service Implementation Agreement (MEF 23.1):

- both UNI and ENNI,
- both Multipoint and Point-Point and
- both single and multiple MENs









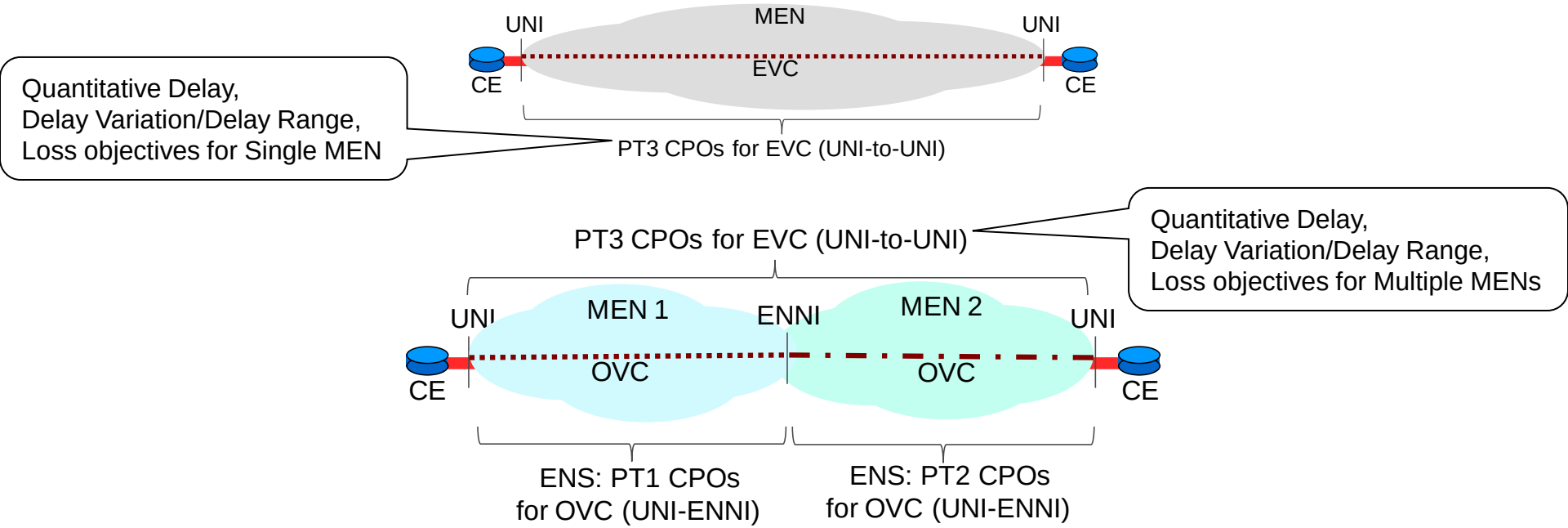
Examples of CoS IA applicability. Multipoint includes Multipoint-Multipoint and Rooted Multipoint.

Out of Scope for MEF 23.1

- Specification of all possible or likely CoS Names
- Internal mechanisms for implementing the CoS Labels and CPOs
- Operator specific CoS Names
- CPOs for Availability, High Loss Interval, Consecutive High Loss Interval (for future phase)
- CPOs for multipoint EVCs and OVCs (for future phase)
- Internal MEN CoS-related control/signaling, operations and security aspects.

What's New in Class of Service Phase 2

- **Add new performance metrics for Mean Delay and Delay Range introduced in MEF 10.2**
- **Introduce four Performance Tiers (PTs)**
  - PT1 (Metro), PT2 (Regional), PT3 (Continental), PT4 (Global)
- **Specify CoS Performance Objectives and associated parameters for point-to-point EVCs and OVCs in each PT**
  - Positions for future ATS and/or certification, e.g., Access Services ATS
- **L2CP default CoS Label**
- **Clarification and restructure of "3 CoS Model Tables"**



MEF Specification Section Review

Key Terms & Definitions

- **Class of Service Frame Set (CoS FS):** A set of Service Frames or ENNI Frames that have a commitment from the Operator or Service Provider subject to a particular set of performance objectives.
- **Class of Service Name (CoS Name):** A designation given to one or more sets of performance objectives and associated parameters by the Service Provider or Operator.
- **Class of Service Label (CoS Label):** A CoS Name that is standardized in this document. Each CoS Label identifies four Performance Tiers (see Section 6.4) where each Performance Tier contains a set of performance objectives and associated parameters.
- **Class of Service Identifier (CoS ID):** The mechanism (e.g., "EVC and PCP") and/or values of the parameters in the mechanism (e.g., PCP value of 3) to be used to identify the CoS Name that applies to the frame at a given EI.
- **Color Identifier (Color ID):** The mechanism (e.g., PCP, DEI) and/or values of the parameters in the mechanism (e.g., PCP value of 3) used to identify the Color that applies to the frame at a given EI.
  - *Color (Green, Yellow or Red) is a part of the Bandwidth Profile specification*

Performance Metrics

- **PERFORMANCE -** Performance Metrics are defined such that they apply only to a Service or ENNI Frame for Qualified Frames (e.g., Color is Green)
- The following Performance Metrics, as defined in MEF 10.2.1, are included
  - ***SLS inclusion of at least one of:***
    - ***Frame Delay CPOs***
    - ***Mean Frame Delay CPOs***
  - ***SLS inclusion of at least one of:***
    - ***Inter-Frame Delay Variation CPOs***
    - ***Frame Delay Range CPOs***
  - ***SLS inclusion of:***
    - ***Frame Loss Ratio CPOs***

Performance Tiers and CoS Performance Objectives

- 4 Performance Tiers(PTs) contain sets of CoS Performance Objectives (CPOs) per CoS Label.
- A PT may be applied to an EVC or segments of an EVC, such as an OVC for point-to-point only in Phase 2
- Different PTs may provide different CPOs
- Derivation of PT CPOs based on Metro (250km), Regional (1200km), Continental (7000km), Global/Intercontinental (27500 km) distances/diameters
- **A particular PT may be selected based on criteria other than distance**

Qualified Frames

- Defined in 10.2 and 26.1
- Qualified Frames are Service or ENNI Frames that are subject to SLS (including 23.1 CoS Performance Objectives)
  - Exception is Availability metric
- Qualified Frames are characterized at a high level as follows:
  - Frames that ingress at EI (UNI or ENNI) and map to the given EVC or OVC End Point for a given Class of Service Identifier.
  - Each frame that is subject to an Ingress Bandwidth Profile must have an **Ingress Bandwidth Profile compliance of Green**, and
  - Each frame that is not subject to an ingress Bandwidth Profile must have either no Color Indicator or have a Color Indicator that indicates Green

Bandwidth Profile

This slide is cute but we also need something more detailed and accurate. See next slide for suggestion

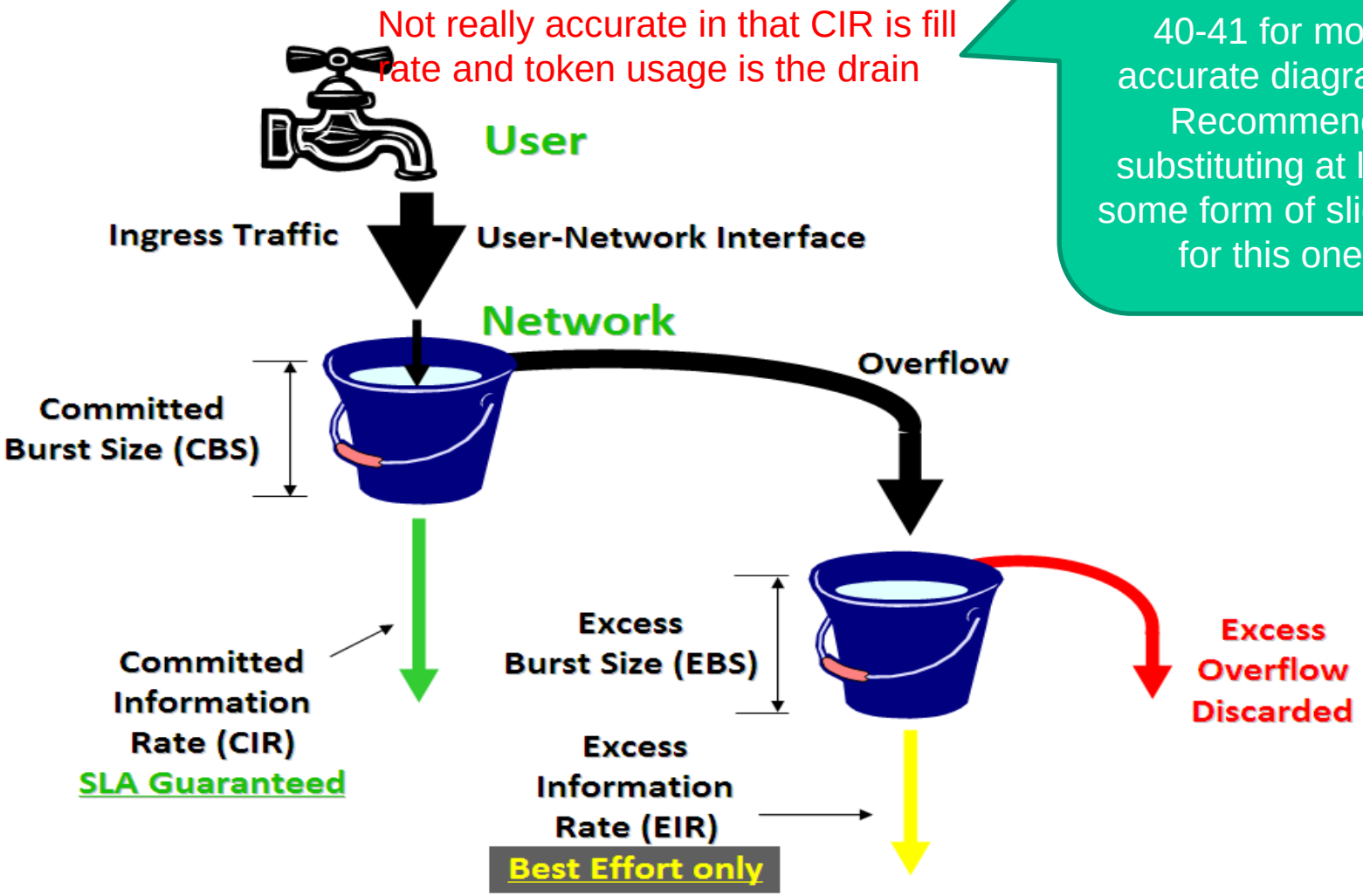
Bandwidth Profile is a characterization of Ethernet frames – e.g., frames from a customer into a UNI

Bandwidth Profile attributes:

- **Frame delivery obligated by the SLA**
  - Committed Information Rate (CIR) [bits per sec]
  - Committed Burst Size (CBS) [bytes]
- **Frame delivery based on available bandwidth (not subject to SLA)**
  - Excess Information Rate (EIR) [bits per sec]
  - Excess Burst Size (EBS) [bytes]
- **Out of Profile frames policed, discarded**

Bandwidth Profile Model

This slide is not really accurate. See Slides 40-41 for more accurate diagrams. Recommend substituting at least some form of slide 40 for this one.



- **Note: frames are transmitted immediately if network is uncongested**

MEF 23.1 CoS Model Structure

MEF 23.1 IA Specifies:

- Performance Attributes,
- Applicability of Bandwidth Profile options,
- and PCP and DSCP components of the CoS Identifier

The CoS Model Tables provide normative information for each MEF CoS Label in the Three CoS Model.

Table 2 provides:

- CoS Label;
- Bandwidth Profile constraints;
- and CoS Identifier and Color Identifier using PCP and DSCP.
- Applicable to UNI and ENNI

Table 3 provides:

- CoS Label;
- CoS ID Types;
- and Color Identifiers

when CoS ID is EVC or OVC EP.

Table 4 provides:

- CoS Label;
- CoS ID Types;
- and Color Identifiers

when CoS ID type is PCP or DSCP.

CoS Labels and CoS ID Types

CoS Label	Ingress EI Bandwidth Profile Con-straints[1]	CoS ID Types			Example Applications
		EVC or OVC EP	PCP or DSCP	L2CP Related	
H	CIR>0; EIR≥0 [2]	See Table 3	See Table 4	See Section 6.5.1 & [17]	VoIP and Mobile Backhaul Control
M	CIR>0; EIR≥0	See Table 3	See Table 4	See Section 6.5.1 & [17]	Near-Real-Time or Critical Data Apps
L	CIR≥0; EIR≥0 [3]	See Table 3	See Table 4	See Section 6.5.1 & [17]	Non-critical Data Apps

[1] EBS and Color Mode Bandwidth Profile parameters are not addressed in this table.
[2] EIR is not constrained though EIR=0 assumed since this IA does not specify Color Yellow PCP and DSCP for CoS Label H. Relaxation of EIR constraint may be used in some situations for certain applications such as Mobile Backhaul.
[3] Both CIR and EIR = 0 is not allowed as this would result in no conformant Service or ENNI Frames under steady state operation.

MEF 23.1 Table 2: Color Labels and CoS ID Types in CoS IA

Color ID Values when CoS ID is EVC or OVC EP

CoS Label	CoS ID Types	Color Identifiers[1]			
		C-Tag PCP		PHB (DSCP)	
		Color Green	Color Yellow	Color Green	Color Yellow
H	EVC or OVC EP [2]	5, 3 or 1	N/S in Phase 2	EF or AF (10, 26 or 46)	N/S in Phase 2
M	EVC or OVC EP [2]	5, 3 or 1	2 or 0	EF or AF (10, 26 or 46)	AF (0, 12, 14, 28 or 30)
L	EVC or OVC EP [2]	5, 3 or 1	2 or 0	EF or AF (10, 26 or 46)	AF (0, 12, 14, 28 or 30)

[1] Specifies only the PCP or DSCP values to be used for Color ID when CoS ID is limited to EVC or OVC EP. EVC and OVC End Point indication for CoS ID is not constrained by CoS IA.
[2] EVC or OVC EP CoS ID would be different to differentiate CoS Labels H, M and L for different CoS Frame Sets on a given EI

MEF 23.1 Table 3: Color ID Values when CoS ID is Only EVC or OVC EP

CoS Identifiers and Color Identifiers

CoS Label	CoS and Color Identifiers [1]						
	C-Tag PCP		PHB (DSCP)		S-Tag PCP Without DEI Supported		S-Tag PCP With DEI Supported
	Color Green	Color Yellow	Color Green	Color Yellow	Color Green	Color Yellow	
H	5	N/S in Phase 2	EF (46)	N/S in Phase 2	5	N/S in Phase 2	5
M	3	2	AF31 (26)	AF32 (28) or AF33 (30)	3	2	3
L	1	0	AF11 (10)	AF12 (12), AF13 (14) or Default (0)	1	0	1

[1] Full CoS Identifier includes EVC or OVC End Point. Table specifies only the PCP or DSCP values to be used with EVC or OVC End Point to specify a CoS ID. EVC and OVC End Point indication is not constrained by CoS IA.

MEF 23.1 Table 4: CoS Identifiers and Color Identifiers

CoS Performance Objectives (CPOs)

CoS Performance Metric Parameters

Performance Metric	Parameter Name	Parameter Values for CoS Label H	Parameter Values for CoS Label M	Parameter Values for CoS Label L
FD	Percentile (P_d)	≥ 99.9th	≥ 99th	≥ 95th
	Time Interval (T)	≤ Month	≤ Month	≤ Month
MFD	Time Interval (T)	≤ Month	≤ Month	≤ Month
IFDV	Percentile (P_v)	≥ 99.9th	≥ 99th or N/S[1]	N/S
	Time Interval (T)	≤ Month	≤ Month or N/S[1]	N/S
	Pair Interval (Δt)	≥ 1sec	≥ 1sec or N/S[1]	N/S
FDR	Percentile (P_r)	≥ 99.9th	≥ 99th or N/S[1]	N/S
	Time Interval (T)	≤ Month	≤ Month or N/S[1]	N/S
FLR	Time Interval (T)	≤ Month	≤ Month	≤ Month
Availability	TBD	TBD	TBD	TBD
High Loss Interval	TBD	TBD	TBD	TBD
Consecutive High Loss Interval	TBD	TBD	TBD	TBD

[1] Parameters are N/S only when CPO is N/S
Note: each parameter value > 0

MEF 23.1 Table 5: CoS Performance Metric Parameters

Performance Tier 1 CPOs - Metro

Performance Metric	CoS Label H		CoS Label M		CoS Label L[1]		Applicability
	Pt-Pt	Multipt	Pt-Pt	Multipt	Pt-Pt	Multipt	
FD (ms)	≤ 10	TBD	≤ 20	TBD	≤ 37	TBD	At least one of either FD or MFD required
MFD (ms)	≤ 7	TBD	≤ 13	TBD	≤ 28	TBD	
IFDV (ms)	≤ 3	TBD	≤ 8 or N/S [2]	TBD	N/S	TBD	At least one of either FDR or IFDV required
FDR (ms)	≤ 5	TBD	≤ 10 or N/S [2]	TBD	N/S	TBD	
FLR (percent)	≤ .01% i.e. 10^{-4}	TBD	≤ .01% i.e. 10^{-4}	TBD	≤ .1% i.e. 10^{-3}	TBD	
Availability	TBD	TBD	TBD	TBD	TBD	TBD	
High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	
Consecutive High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	

[1] Ingress Bandwidth Profile parameters may be chosen such that no frames are subject to SLS.
[2] Compliant services may leave this objective not specified.

MEF 23.1 Table 6: Performance Tier 1 (Metro) CoS Performance Objectives

Performance Tier 2 CPOs - Regional

Performance Metric	CoS Label H		CoS Label M		CoS Label L[1]		Applicability
	Pt-Pt	Multipt	Pt-Pt	Multipt	Pt-Pt	Multipt	
FD (ms)	≤ 25	TBD	≤ 75	TBD	≤ 125	TBD	At least one of either FD or MFD required
MFD (ms)	≤ 18	TBD	≤ 30	TBD	≤ 50	TBD	
IFDV (ms)	≤ 8	TBD	≤ 40 or N/S [2]	TBD	N/S	TBD	At least one of either FDR or IFDV required
FDR (ms)	≤ 10	TBD	≤ 50 or N/S [2]	TBD	N/S	TBD	
FLR (percent)	≤ .01% i.e., 10^{-4}	TBD	≤ .01% i.e., 10^{-4}	TBD	≤ .1% i.e., 10^{-3}	TBD	
Availability	TBD	TBD	TBD	TBD	TBD	TBD	
High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	
Consecutive High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	

[1] Ingress Bandwidth Profile parameters may be chosen such that no frames are subject to SLS.
[2] Compliant services may leave this objective not specified.

MEF 23.1 Table 7: Performance Tier 2 (Regional) CoS Performance Objectives

Performance Tier 3 CPOs - Continental

Performance Metric	CoS Label H		CoS Label M		CoS Label L[1]		Applicability
	Pt-Pt	Multipt	Pt-Pt	Multipt	Pt-Pt	Multipt	
FD (ms)	≤ 77	TBD	≤ 115	TBD	≤ 230	TBD	At least one of either FD or MFD required
MFD (ms)	≤ 70	TBD	≤ 80	TBD	≤ 125	TBD	
IFDV (ms)	≤ 10	TBD	≤ 40 or N/S [2]	TBD	N/S	TBD	At least one of either FDR or IFDV required
FDR (ms)	≤ 12	TBD	≤ 50 or N/S [2]	TBD	N/S	TBD	
FLR (percent)	≤ .025% i.e., $2.5x10^{-4}$	TBD	≤ .025% i.e., $2.5x10^{-4}$	TBD	≤ .1% i.e., 10^{-3}	TBD	
Availability	TBD	TBD	TBD	TBD	TBD	TBD	
High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	
Consecutive High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	

[1] Ingress Bandwidth Profile parameters may be chosen such that no frames are subject to SLS.
[2] Compliant services may leave this objective not specified.

MEF 23.1 Table 8: Performance Tier 3 (Continental) CoS Performance Objectives

Performance Tier 4 CPOs - Global

Performance Metric	CoS Label H		CoS Label M		CoS Label L[1]		Applicability
	Pt-Pt	Multipt	Pt-Pt	Multipt	Pt-Pt	Multipt	
FD (ms)	≤ 230	TBD	≤ 250	TBD	≤ 390	TBD	At least one of either FD or MFD required
MFD (ms)	≤ 200	TBD	≤ 220	TBD	≤ 240	TBD	
IFDV (ms)	≤ 32	TBD	≤ 40 or N/S [2]	TBD	N/S	TBD	At least one of either FDR or IFDV required
FDR (ms)	≤ 40	TBD	≤ 50 or N/S [2]	TBD	N/S	TBD	
FLR (percent)	≤ .05% i.e., $5x10^{-4}$	TBD	≤ .05% i.e., $5x10^{-4}$	TBD	≤ .1% i.e., 10^{-3}	TBD	
Availability	TBD	TBD	TBD	TBD	TBD	TBD	
High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	
Consecutive High Loss Interval	TBD	TBD	TBD	TBD	TBD	TBD	

[1] Ingress Bandwidth Profile parameters may be chosen such that no frames are subject to SLS.
[2] Compliant services may leave this objective not specified.

MEF 23.1 Table 9: Performance Tier 4 (Global) CoS Performance Objectives

Summary

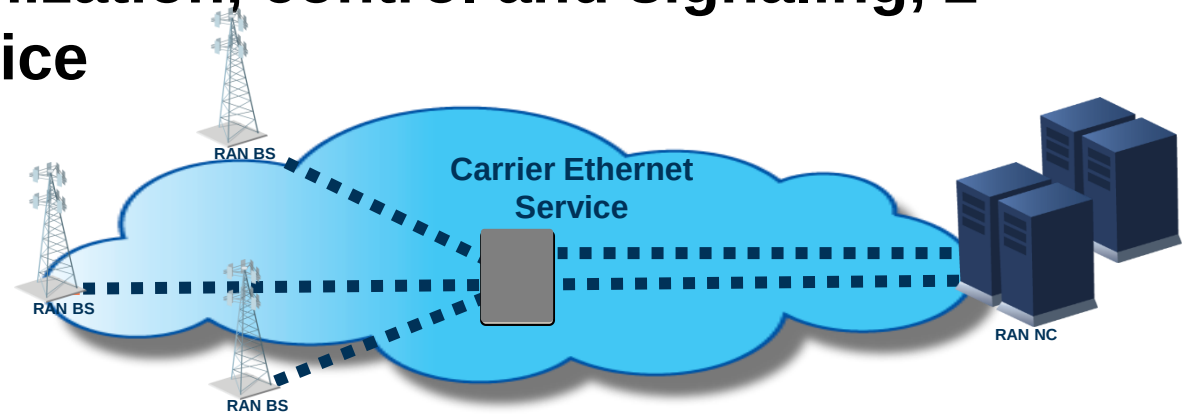
- Carrier Ethernet services that are cost effective, interoperable and predictable to support subscriber applications require CoS.
- MEF CoS IA introduces and defines specific “classes” (i.e., CoS Labels) to achieve a commitment for a particular level of performance.
- CoS IA provides a common set of CoS Labels into which Operators can map frames to facilitate interworking.
- CoS IA Phase 2 enhances Phase 1 by specifying CoS Performance Objectives and Parameter values in four Performance Tiers.
- The following topics were explicitly out of scope for Phase 2, and thus left for a future phase (although there are placeholders in the relevant tables):
  - Multipoint CoS Performance Objectives (CPOs) and parameters
  - Availability, High Loss Interval and Consecutive High Loss Interval CPOs and parameters

Backup Material

Informative Examples/Use Cases

Mapping/Grouping Service Classes

Mobile backhaul deployment requiring support for timing and synchronization, control and signaling, 2+ data classes and voice



Synchronization (Sync),
Voice,
Near Real Time (Near-RT),
Control/Signaling (C/S),
Data Class 1 (D-1),
Data Class 2 (D-2),
Background (B – e.g. – OAM bulk data, using TCP)

CoS Label H – Sync, Voice, Near-RT

CoS Label M – C/S, D-1

CoS Label L – D-2, B

An advantage of this approach is that this Implementation Agreement can be used to support the mapped classes of service, as it is defined in this Agreement.

PCP and DSCP Mapping

- **Full mapping of PCP or DSCP values at a UNI is required in 10.2 to ensure that customer frames are not inadvertently discarded and to simplify configuration of customer equipment**
  - It is allowed to define a specific class for discarding frames intentionally.
- **CoS IA provides an informative full mapping examples when only MEF CoS Labels are present**

PCP Full Mapping Example (1)

These are examples of full mapping of PCP at a UNI for multi-CoS EVCs that support all 3 MEF CoS Labels and no additional CoS.

MEF CoS Combination Supported on EVC	PCP Mapping per Class of Service - Color Blind Mode		
	H	M	L
{H + M + L}	5	2-4, 6, 7	0, 1
{H + M}	5	0-4, 6, 7	N/A
{H + L}	5	N/A	0-4, 6, 7
{M + L}	N/A	2-7	0, 1

Example PCP Mapping for Multi-CoS EVC Supporting Only Standard Classes of Service at UNI – "Router-Application-Friendly" mapping

PCP Full Mapping Example (2)

Needed if the application is not necessarily able to distinguish traffic that is carried natively in Ethernet over the local LAN from traffic that may be carried by a MEN service.

MEF CoS Combination Supported on EVC	PCP Mapping per Class of Service - Color Blind Mode		
	H	M	L
{H + M + L}	4-7	2,3	0, 1
{H + M}	4-7	0-3	N/A
{H + L}	4-7	N/A	0-3
{M + L}	N/A	2-7	0, 1

Example PCP Mapping for Multi-CoS EVC Supporting Only Standard Classes of Service at UNI – "Bridging-Application-Friendly" mapping

DSCP Full Mapping Example

Full mapping of DSCP values at a UNI for multi-CoS EVCs that support only standard MEF CoS Labels and no additional CoS

MEF CoS Combination Supported on EVC	DSCP Mapping per Class of Service – Color Blind Mode		
	H	M	L
{H + M + L}	40-47	16-39, 48-63	0-15
{H + M}	40-47	0-39, 48-63	N/A
{H + L}	40-47	N/A	0-39, 48-63
{M + L}	N/A	16-63	0-15

Example DSCP Mapping for Multi-CoS EVC Supporting Only Standard Classes of Service at UNI

MEF

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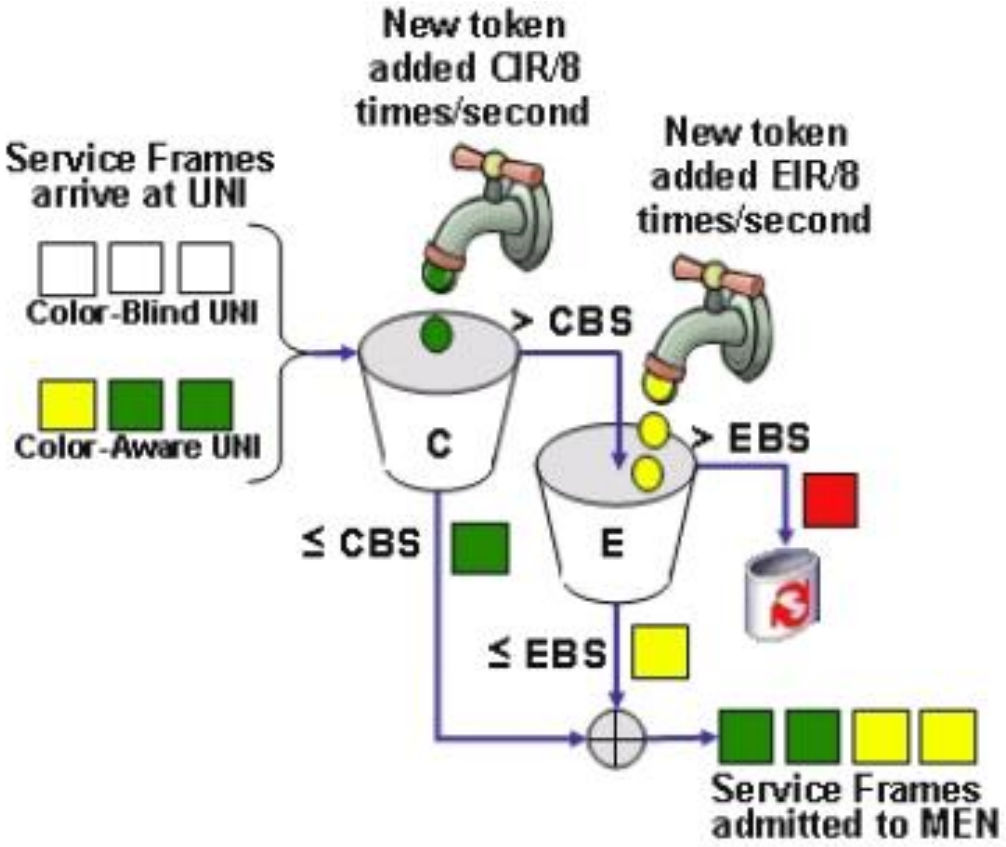
MEF BWP Algorithm Diagrams—1 of 2

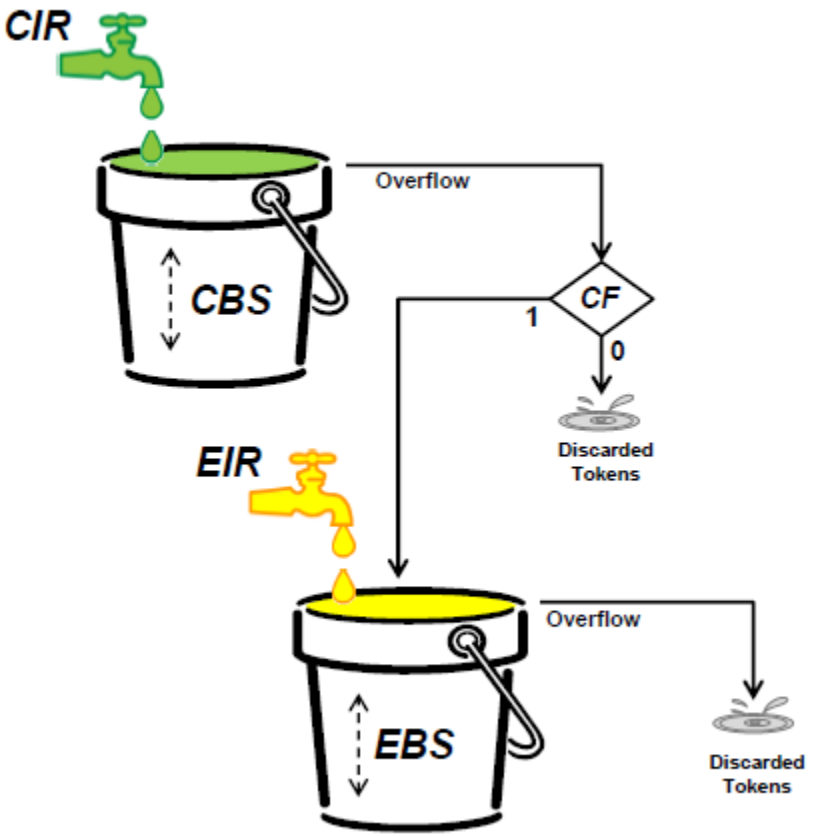
These two diagrams are from Ralph Santitoro's white paper "Bandwidth Profiles for Ethernet Services.pdf"



Conformance	Color	Service Frame Delivery
CIR Conformant		Service Frames green and delivered per the performance objectives specified in the SLA/SLS.
EIR Conformant		Service Frames are yellow and may be delivered but with no performance assurances.
None		Service Frames are red and dropped.

MEF BWP Algorithm Diagrams—2 of 2

This diagram of the existing MEF 10.1 BWP algorithm is from Norival Figueira's preso "Hierarchical BWP Algorithm Strict Priority.pdf" (BWP folder, ~9/2/2011)



- Overflow green tokens can be used as yellow tokens when *CF* = 1
- Overflow yellow tokens are discarded