DOCSIS® Guidelines

Operational Guidelines for Energy Management 1x1 Feature

CM-GL-EM1x1-V01-130329

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1 SCOPE

1.1 Introduction and Overview

Most cable modems in active service experience a diurnal variation in data forwarding activity that is driven in large part by user behavior. For cable modems in residential service, many will experience a peak of activity in the morning, as users prepare for the day by performing tasks such as checking weather forecasts, calendars, email, news, etc., and then a longer and more pronounced peak of activity in the late afternoon and evening that is typically dominated by more bandwidth intensive applications such as streaming video services, online gaming, etc. During other times of the day and night, a typical cable modem in residential service continues to actively forward data to and from autonomous devices in the home network, but this traffic is sporadic and at a relatively low data rate.

Cable modems provisioned for small business service may have an entirely different activity pattern, but nonetheless also generally experience a wide variation in activity level over the course of the day.

A cable modem embedded in a set-top box will experience a different pattern of activity. These modems will generally forward system and conditional access related messaging as well as guide data at a fairly continuous low rate during all hours, and will see spikes of activity while performing video on demand functions and software updates. New generation set-top boxes that support a cloud-based navigation guide will additionally produce a peak in activity while the user is browsing the guide. Future systems may deliver video programming over IP, and thus will create significant network activity during viewing.

A DOCSIS 3.0 cable modem generally has a certain quiescent (or idle) power consumption level, and then consumes additional power that is more-or-less proportional to the data-forwarding rate. The quiescent power consumption depends on a number of factors, including the RF configuration. For a DOCSIS 3.0 modem to be prepared to deliver the burst data rate that it is configured to offer, it must be operating on a set of channels that in aggregate have sufficient bandwidth to achieve that rate. More precisely, due to the shared nature of the DOCSIS channels, the cable modem needs to be operating on a set of channels that are expected to have sufficient free capacity to achieve the configured data rate. In many cases, this means that the cable modem is configured to operate on a set of channels that have an aggregate capacity that is significantly greater than the configured data rate. This configuration provides a sufficient level of assurance that the customer can achieve their configured data rate, but also results in higher quiescent power consumption than would be the case if the modem were configured to use fewer channels.

The DOCSIS 3.0 Energy Management 1x1 Feature was added to the DOCSIS 3.0 specification in 2012 in order to reduce energy consumption by cable modems during periods of low throughput. This feature automatically and dynamically configures the modem to use a single upstream and a single downstream channel (1x1 mode) during periods of low activity, and to use a larger channel set (NxM mode) during periods of moderate to high activity.

This feature capitalizes on the presumption that there are significant periods of the day (such as during the night, and, for a residential cable modem, during the mid-day when no one is home) when a user's bandwidth needs are low enough that there is a high likelihood of them being met by the available capacity on a single upstream and single downstream channel, and thus during those times the user would not perceive a degradation to their service if the modem were operating in a 1x1 mode. Ideally, a cable modem would be in 1x1 mode at all times in which the user would not perceive a degradation of service by being in that mode, and be in NxM mode otherwise. Some anecdotal studies have indicated that residential cable modems could spend approximately 80% of the time in 1x1 Mode without impact to service.

While most cable modems experience these fluctuations in activity, and many of them follow similar diurnal patterns, they are not entirely predictable, and as a result, scheduled transitions between 1x1 mode and NxM mode would be impractical. Instead, the Energy Management 1x1 Feature utilizes activity detection to trigger the modem to enter "Energy Management 1x1 Mode" when the recent history of activity suggests that the user's bandwidth needs are likely to be met by a single channel in each direction, and to exit Energy Management 1x1 Mode when the activity level rises above a level that suggests more channel capacity will be needed.

The Energy Management 1x1 Feature is described in detail in section 11.7 of [MULPI].

1.2 Purpose of document

The purpose of this document is to present guidelines for operational and engineering staff in the configuration and operation of the Energy Management 1x1 Feature.

2 REFERENCES

2.1 Informative References

[CCAP-OSSI] Converged Cable Access Platform Operations Support System Interface Specification, CM-SP-CCAP-OSSI-I03-120809, August 9, 2012, Cable Television Laboratories, Inc.

[MULPI] DOCSIS 3.0 MAC and Upper Layer Protocols Interface Specification, CM-SP-MULPIv3.0-I20-121113, November 13, 2012, Cable Television Laboratories, Inc.

[OSSI] DOCSIS 3.0 Operations Support System Interface Specification, CM-SP-OSSIv3.0-I20-121113, November 13, 2012, Cable Television Laboratories, Inc.

[PNMP] Proactive Network Maintenance Using Pre-equalization, CM-GL-PNMP-V02-110623, June 23, 2011, Cable Television Laboratories, Inc.

2.2 Reference Acquisition

CableLabs Specifications:

- Cable Television Laboratories, Inc., 858 Coal Creek Circle, Louisville, CO 80027;
  Phone 303-661-9100; Fax 303-661-9199; Internet: http://www.cablelabs.com /

3 TERMS AND DEFINITIONS

This document uses the following terms:

Energy Management 1x1 Feature	A feature introduced in the I20 release of DOCSIS 3.0 (November 2012) that enables modems to autonomously request to enter and exit a low power mode.
Energy Management 1x1 Mode	The low power mode defined by the Energy Management 1x1 Feature, in which the CM operates on a single upstream and single downstream channel.
NxM Mode	The normal operational mode of a DOCSIS 3.0 modem in which it is operating with a Receive Channel Set consisting of N downstream channels and a Transmit Channel Set consisting of M upstream channels.

4 ABBREVIATIONS AND ACRONYMS

This document uses the following abbreviations:

AD	Activity Detection
CCAP	Common Converged Access Platform
CLI	Command Line Interface
CM	Cable Modem
CMTS	Cable Modem Termination System
DBC	Dynamic Bonding Change
DBC-REQ	Dynamic Bonding Change Request
DHCP	Dynamic Host Configuration Protocol
DVD	Digital Video Disc
EM	Energy Management
EM-REQ	Energy Management Request
EM-RSP	Energy Management Response
HTTPS	HyperText Transfer Protocol - Secure
kbps	kilobits per second
MAC	Media Access Control
Mbps	Megabits per second
MMO	Massively Multiplayer Online
NOC	Network Operations Center
OSS	Operational Support System
QoS	Quality of Service
SCP	Secure Copy
SNMP	Simple Network Management Protocol
TFTP	Trivial File Transfer Protocol
TLV	Type-Length-Value
VoIP	Voice over Internet Protocol
XML	eXtensible Markup Language

5 CMTS AND CCAP CONFIGURATION

5.1 Fundamental Energy Management Mode Support at the CMTS/CCAP

From the CMTS perspective, enabling support for Energy Management is performed at the MAC Domain level through the *docsIf3MdCfgEnergyMgt1x1Enabled* (Boolean MIB object). During registration the CM advertises the Energy Management Features that are supported via the Modem Capabilities encoding. The CMTS confirms the Energy Management Features that it supports (and are enabled by the network operator) in the Modem Capabilities Encoding returned in the Registration Response message. In addition to this handshake of capabilities, a configuration file encoding is provided that allows the operator to enable/disable features on a per-modem basis. The CM enables only the energy management features that are both confirmed as supported in the CMTS response to CM Capabilities and enabled via the Energy Management Feature Control TLV in the CM's configuration file.

When the Energy Management 1x1 Feature is enabled, the CM will request to enter or exit 1x1 Mode based on its activity detection functionality, using the EM-REQ message. Entering and exiting "Energy Management 1x1 Mode" is then controlled by a single TLV communicated by the CMTS via DBC-REQ. The CM enters Energy Management 1x1 Mode upon successful completion of a DBC transaction that included the Energy Management 1x1 Mode Indicator TLV (TLV 75) with the value "Operate in Energy Management 1x1 Mode" (1). The CM exits Energy Management 1x1 Mode upon successful completion of a DBC transaction that included the Energy Management 1x1 Mode Indicator TLV (TLV 75) with the value "Do not operate in Energy Management 1x1 Mode" (0).

5.2 CCAP XML Configuration File Theory of Operation

To configure complex and dense CCAP devices, an XML-based configuration file is constructed, transferred to the device, and executed locally. This provides for a standard configuration data model with vendor-specific extensions for proprietary features. It is assumed that the startup configuration of a CCAP will contain only basic default settings, that the operator will complete configuration of the CCAP via serial console connection, and that basic default settings are vendor-specific. The XML-based configuration file holds the configuration details for the CCAP platform which are conformant to the XML schemas based on the CCAP configuration object model. Operators place XML configuration files in CCAP local storage via file transfer. Before executing an XML configuration file, the CCAP verifies that it has not been corrupted in the file transfer process. The XML configuration file is then validated against the configuration file schema to ensure that the configuration is valid. The CCAP parses the entire XML configuration file and processes the configuration objects represented in the file in a vendor-proprietary manner.

The idealized use case for configuring a CCAP with an XML configuration file is depicted in the figure below, as shown in the [CCAP-OSSI] specification.

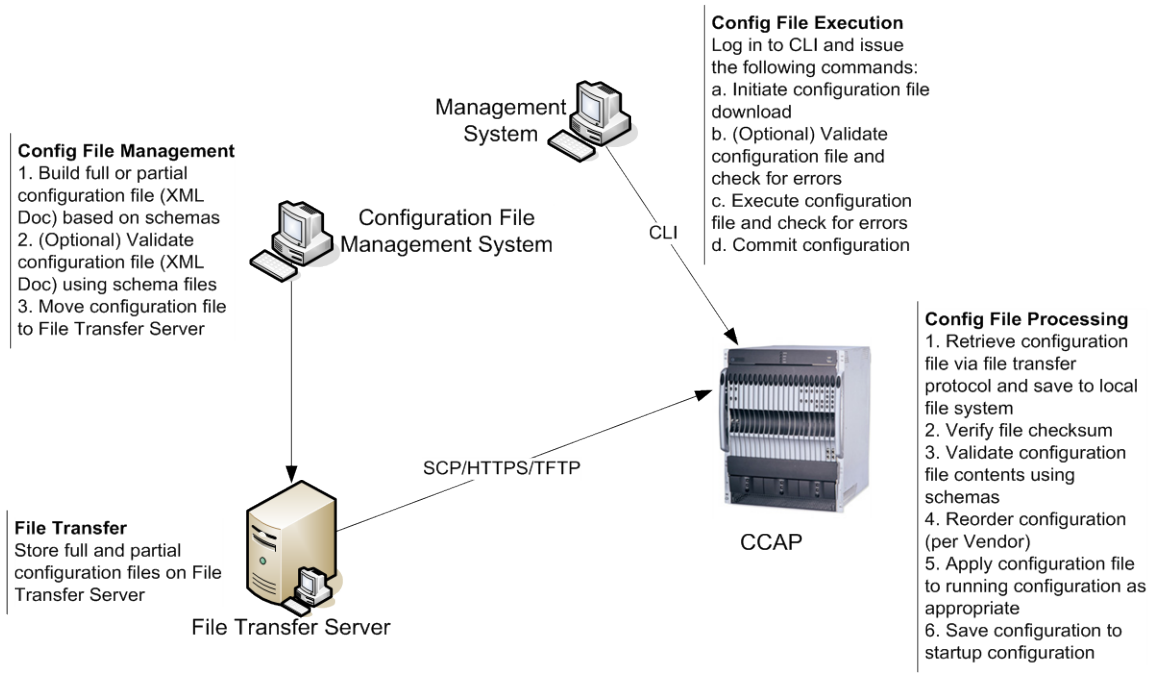

Figure 1 - CCAP XML File-based Configuration Use Case

5.3 CMTS Configuration

1. **Verify** CMTS/CCAP supports EM 1x1 Mode by consulting the vendor, the vendor's software version release notes, or via the successful execution of the following steps.

2. Enable CMTS Energy Management 1x1 Mode support using SNMP, a CMTS Configuration file, or equivalent CLI commands, by setting for the applicable MAC Domain(s): .iso.org.dod.internet.private.enterprises.cableLabs.clabProject.clabProjDocsis *docsIf3Mib.docsIf3MibObjects.docsIf3MdCfgTable.docsIf3MdCfgEntry.docsIf3MdCfgEnergyMgt1x1Enabled* (Boolean) to **True.** When True, this attribute indicates the CMTS is configured for 1x1 Energy Management Mode of operation on a per MAC Domain basis; its default value is False.

5.4 CCAP Configuration

1. **Verify** CMTS/CCAP supports EM 1x1 Mode by consulting the vendor, the vendor's software version release notes, or via the successful execution of the following steps.

2. Assuming an XML schema exists that supports energy management modes, an existing, correct CCAP XML configuration file is modified by adding the following energy management line in the XML node corresponding to the applicable Mac Domain(s):

```
<ccap>
  <docsis>
    <docs-mac-domain>
      <mac-domain>
        <mac-domain-name>MacDomain1</mac-domain-name>
        <energy-mgt-1x1-enabled>true</energy-mgt-1x1-enabled>
      </mac-domain>
    </docs-mac-domain>
  </docsis>
</ccap>
```

The XML configuration file must be named with a .xml suffix.

3. Transfer the XML configuration file to the CCAP via a secure file transfer protocol.
4. Move the XML configuration file to the directory specified by the vendor.
5. Using vendor-specific CLI commands, check the XML configuration file for checksum integrity.
6. Using vendor-specific CLI commands, validate the XML configuration file for XML schema compliance.

   Note: When an XML configuration file fails validation, an error message is sent to the user interface in use. In addition, a log of the error is created in the validation output log file stored on the local file system.

7. Once an error-free validation is completed, use vendor-specific CLI command(s) to parse and execute the configuration file.

   Note: The CCAP will re-validate the configuration file as an initial step of the execute command before any changes are applied to the configuration store.

8. Verify successful execution of the configuration file by perusing the execution output log file stored on the local file system and ensure there are no error messages.

6 CM CONFIGURATION

1. Verify that the CM supports EM 1x1 Mode by consulting the manufacturer, or via the following steps.
2. Generate a CM configuration file using a configuration tool that includes the new TLVs required for Energy Management; see Annex C.1.1.30 Energy Management Parameter Encoding in the MAC and Upper Layer Protocols Interface Specification [MULPI] for details on TLV 74.

   The following shows an example TLV 74 and sub TLVs, using the recommended values discussed in the next section.

   Sub-TLV 74.1 is required in order to enable the EM 1x1 Feature. The remaining sub-TLVs are optional, and if not provided in the config file, will take on default values. The default value for sub-TLV 74.3 is 15 minutes, whereas the default values for the 74.2 encodings are vendor-specific.

   74. Energy Management Parameter Encoding
   - 74.1 Energy Management Feature Control = 0x00000001
   - 74.2 1x1 Mode Encodings
     - 74.2.1 Downstream Activity Detection Parameters
       - 74.2.1.1 Downstream Entry Bitrate Threshold = 1,500,000
       - 74.2.1.2 Downstream Entry Time Threshold = 300
       - 74.2.1.3 Downstream Exit Bitrate Threshold = 2,000,000
       - 74.2.1.4 Downstream Exit Time Threshold = 2
     - 74.2.2 Upstream Activity Detection Parameters
       - 74.2.2.1 Upstream Entry Bitrate Threshold = 500,000
       - 74.2.2.2 Upstream Entry Time Threshold = 300
       - 74.2.2.3 Upstream Exit Bitrate Threshold = 1,000,000
       - 74.2.2.4 Upstream Exit Time Threshold = 2
   - 74.3 Energy Management Cycle Period = 900

3. Verify that the CMTS is configured to support the Energy Management feature using the steps detailed in Section 5, CMTS and CCAP Configuration.
4. Upload the new CM configuration file to the TFTP server being used by the CMTS/CM during registration and ensure the DHCP server will inform the CM of the new configuration file if the name has changed.
5. Reboot the CM so the new configuration file will be used.
6. If the CMTS has CLI support for reporting EM 1x1 status, use the relevant commands to check that the CM has the feature enabled.
7. If the CMTS does not support the ability to check the CM capabilities, the following SNMP object can be read via a Network Management System (NMS) to determine if energy management is active on the CM. Read the docsIf3CmEnergyMgtCfgFeatureEnabled object and check that bit 0 is set to 1 (i.e., the value 0x01) indicating that the modem has the feature enabled.

7 CONFIGURE APPROPRIATE ACTIVITY DETECTION (AD) THRESHOLDS

In order to take advantage of 1x1 Mode operation during periods of low activity, appropriate thresholds need to be defined that will allow the device to enter and remain in 1x1 Mode while simply servicing background tasks (i.e., periodic polling of email clients or other social networking functions) and then return to normal operations when higher bandwidth needs are required (i.e., delivery of high definition video services, video conferencing or online gaming).

In order to accomplish this goal without impacting the user experience, we need to understand the bandwidth demands for these different services. The usage, expectations and goals for 1x1 mode should be based on the following criteria:

1) What percentage of modems on a given downstream/upstream channel would be in a 1x1 mode of operation? This allows for a better determination of the throughput needs that can be maintained for a device in 1x1 mode, and ensures that the exit thresholds are reasonable. If you cannot achieve the exit thresholds required to transition out of 1x1 mode due to the number of devices on the channel, then that presents a major problem.

2) What percentage of time are devices expected to be in 1x1 mode? Knowing this allows for tracking metrics to determine if you are achieving this goal. A typical U.S. household sees an increase in user traffic for a short time in the morning, between 6am and 8am, and also a large spike in traffic throughputs between the hours of 4pm and 10pm on a weekday. Weekends obviously yield wider variability in throughputs vs. time of day. Even during periods of user activity, the bandwidth required may be provided sufficiently in a 1x1 mode of operation. Given this fact, a good target for a percentage of time in 1x1 mode for a typical residential customer would be approximately 80% of the time over the course of a week.

This activity detection functionality uses configurable bit-rate and time thresholds that give quite a bit of flexibility to the operator in controlling the transitions into and out of Energy Management 1x1 Mode. Due to the fact that this functionality uses recent history of activity as a predictor of future bandwidth needs, it is understood that it will not be a perfect predictor. As a result, the expectation is that many operators will choose (at least initially) to be conservative in their choice of thresholds, such that the potential for negative impact to user experience is minimized. One way to accomplish this is to set the thresholds for entering 1x1 Mode to have long time values such that the operator has a good deal of confidence that the user is truly absent, and to set the thresholds for exiting 1x1 Mode to have short time values, such that once activity resumes, the cable modem exits 1x1 Mode almost immediately.

7.1 Determination of Entry Thresholds

Low (or no) user activity can be discerned if throughput rates are lower than 1.5 Mbps in the downstream direction, and 500 kbps in the upstream direction. If these low throughputs are sustained for at least 5 minutes (300 seconds), it would be sufficient to transition to the 1x1 mode of operation. These thresholds should allow for background tasks running over the network; email polling, etc., as well as sustain periods of light activity from users; i.e., sending emails, VoIP calls, etc., without a return to normal operations.

Table 1 - Recommended Entry Thresholds

Type	Parameter	Value
74.2.1.1	Downstream Entry Bitrate Threshold	1,500,000 bps
74.2.1.2	Downstream Entry Time Threshold	300 seconds
74.2.2.1	Upstream Entry Bitrate Threshold	500,000 bps
74.2.2.2	Upstream Entry Time Threshold	300 seconds

Note: These values are intended as initial recommendations. Operators are encouraged to utilize the tools and techniques described in Section 7.3 to evaluate their performance.

7.2 Determination of Exit Thresholds

Typical activities that may require higher throughputs and QoS include video streaming services, video conferencing services, and even online gaming (MMOs, multiplayer, etc.). Video streaming services require throughput rates of at least 1.5Mbps, and at least 3 Mbps for DVD quality. High-definition video conferencing can require throughputs of over 1.2 Mbps in the downstream and upstream directions. Therefore, the recommendation for exit thresholds should be 2Mbps downstream and 1 Mbps upstream. It is important to minimize or eliminate entirely any discernible impacts to the end user when having to make this transition; if these throughputs are exceeded for even 2 seconds, then the device should transition back to normal operations.

Table 2 - Recommended Exit Thresholds

Type	Parameter	Value
74.2.1.3	Downstream Exit Bitrate Threshold	2,000,000 bps
74.2.1.4	Downstream Exit Time Threshold	2 seconds
74.2.2.3	Upstream Exit Bitrate Threshold	1,000,000 bps
74.2.2.4	Upstream Exit Time Threshold	2 seconds

Note: These values are intended as initial recommendations. Operators are encouraged to utilize the tools and techniques described in Section 7.3 to evaluate their performance.

7.3 1x1 Mode Performance and Expectations

The following metrics are available for tracking the performance and expectations of devices in 1x1 mode: *docsIf3CmEm1x1StatsTotalDuration* - This metric can be used in conjunction with the sysUpTime to determine the percentage of time that the device has been in 1x1 mode.

docsIf3CmEm1x1StatsTotalDurationBelowUsThrshlds and *docsIf3CmEm1x1StatsTotalDurationBelowDsThrshlds* - These two parameters can be used to gauge which of the entry thresholds (upstream or downstream) is limiting entry into 1x1 Mode. For example, if the CM is not spending sufficient time in 1x1 mode, and *TotalDurationBelowUsThrshlds* is substantially lower than the *TotalDurationBelowDsThrshlds*, then it's a strong indicator that the Upstream Entry value is set too low, preventing entry into 1x1 Mode.

docsIf3CmEm1x1StatsNumberTimesCrossedBelowUsEntryThrshlds and *docsIf3CmEm1x1StatsNumberTimesCrossedBelowDsEntryThrshlds* - These two parameters can be used to determine if the thresholds are not set appropriately. For example, if the CM shows a high value for *TotalDurationBelowUsThrshlds* (relative to sysUpTime), but shows a low value for *NumberTimesCrossedBelowUsEntryThrshlds*, it indicates that the CM is crossing below the upstream entry threshold and remaining below threshold for significant periods of time. This may be an indication that the upstream thresholds are set too high. On the other hand, if *NumberTimesCrossedBelowUsEntryThrshlds* shows an excessively high value, it indicates that the upstream entry bitrate threshold is more of a hair trigger that could result in the CM not spending much time in 1x1 Mode.

Event Log messages have been added to report when the device has entered/exited 1x1 mode, as well as messages to indicate when a device requested 1x1 mode, but was rejected for various reasons. These messages can be monitored to see if the device is transitioning into and out of 1x1 mode too often, which could also be used to determine if the exit thresholds are set too low as well.

7.4 Dynamic Configuration of Activity Detection Thresholds

In addition to the Configuration File TLVs for setting the Activity Detection thresholds at registration time, the CM supports MIB objects (*CmEnergyMgt1x1CfgEntryBitrateThrshld*, *CmEnergyMgt1x1CfgEntryTimeThrshld*, *CmEnergyMgt1x1CfgExitBitrateThrshld*, *CmEnergyMgt1x1CfgExitTimeThrshld*) that can be used to dynamically change the threshold values. While it is expected that static configuration is sufficient for most applications, this option could be used as part of the threshold tuning process to quickly set the activity detection thresholds while monitoring their effect. Additionally, this option could be used to implement a time-of-day based threshold change for certain customers.

8 RUNNING STATUS OSS TOOLS

The tools available on the CM and CMTS allow the operator to audit the network and understand the usage of the EM 1x1 feature. The CM reports information relating to the AD thresholds:

- Current settings for the EM 1x1 Mode activity detection thresholds and cycle period
- Number of times since registration the cable modem crossed below threshold in the upstream and/or downstream direction
- Amount of time since registration the cable modem was below threshold from the upstream and/or downstream perspective

As was discussed in the previous section, this information can be used to tune the thresholds on a modem-by-modem basis. It could also be used in aggregate to adjust thresholds system-wide or for certain service tiers.

In addition to the information relating to AD thresholds themselves, the CM reports:

- Total duration since registration the cable modem was operating in EM 1x1 mode

This statistic can be compared to the total uptime of the CM to understand what percentage of time the CM spent in EM 1x1 Mode. This can also be compared with the *TotalDurationBelowUsDsThresholds* parameter. If the *TotalDurationBelowUsDsThresholds* is greater than the actual time spent in EM 1x1 mode, this could be due to one of several causes:

- EM-RSP reject-temporary from the CMTS, indicating that the CMTS is likely overloaded and can't process the EM-REQ
- Delay in the CMTS issuing the DBC-REQ to place the CM into EM 1x1 Mode
- EM CyclePeriod is causing CM to delay requesting EM 1x1 Mode. This could be an indication that the activity detection thresholds are not set appropriately.

From the CMTS, the operator can derive the following statistics:

- number of cable modems that support the Energy Management 1x1 feature
- number of modems with the Energy Management 1x1 feature enabled
- number of modems currently in Energy Management 1x1 mode

Furthermore, the CMTS can report events corresponding to CMs entering and exiting EM 1x1 Mode. When enabled, these events could be used to develop a more detailed understanding of the EM behavior of the modem population. For example, the logs could be post-processed to extract information such as:

- How frequently do modems (individually or in aggregate) change modes over a certain time period?
- What are the statistics on time spent in EM 1x1 mode for each instance of operating in that mode?
- What percentage of CMs are in EM 1x1 mode on average, and by time of day?

Additionally, the operator can monitor the distribution of modems in EM 1x1 Mode across the available channels in the service group to determine whether they are being appropriately balanced across those channels.

9 DISABLING 1X1 OPERATION

There may be instances in which the operator would like to temporarily disable 1x1 Mode operation on a modem or a set of modems. For example, during times (e.g., during the work day for a business customer) when it would result in an unacceptable risk of impact to service level, or for troubleshooting or network monitoring functions (see Section 10).

There are several ways to accomplish this.

1. Change CM configuration file(s) to indicate 1x1 Mode Disabled, and reboot the CM(s) via *docsDevResetNow* or another method.
2. Configure 1x1 Mode Disabled on the CMTS MAC Domain.

   Note: This will affect all of the CMs in the MAC Domain. This will result in the CMTS immediately ceasing to allow CMs to enter 1x1 Mode, and should trigger the CMTS to start migrating CMs out of 1x1 Mode.
3. Use the CM MIB objects described in Section 7.4 to set the Activity Detection thresholds such that they effectively disable 1x1 Mode. Setting the bitrate thresholds to low values (e.g., 1 bps), the entry time thresholds to high values, and the exit time thresholds to low values would accomplish this.

10 UPDATES NEEDED FOR BACK-OFFICE (OSS) SYSTEMS

10.1 Proactive Network Maintenance / Plant Monitoring

Proactive Network Maintenance [PNMP] utilizes pre-equalization data from cable modems in order to detect and characterize plant maintenance issues before they cause a significant degradation of service. One key piece of information used for this function is the set of pre-equalizer coefficients reported by the modem for each upstream channel on which the CM is actively ranged. CMs in 1x1 mode won't report equalization coefficients for upstream channels that aren't active. So, if a large percentage of the CMs are in 1x1 mode at any point in time, it could be more difficult to poll the device pool and get enough information to feed the decision-making process. Assuming that there are a sufficient number of modems, and if the modems are properly balanced among the upstream channels, the operator may get the data they need anyway, but with less precision. If more precision or more data is needed on an *ad hoc* or scheduled basis, EM 1x1 Mode could be disabled temporarily to take plant measurements, and then re-enabled once complete.

10.2 Other network management systems

If any Network Operations Center (NOC) dashboards report network health based on assumptions about channel bonding for D3.0 modems, those systems may need to be updated so that CMs in EM 1x1 Mode don't get represented as being in a "degraded" mode of operation.

For other validations (such as "is upstream bonding working"), this is done on a more *ad hoc* basis and could be done via temporarily disabling EM 1x1 Mode.

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