INVENTION DISCLOSURE

1.   Invention Title.

A method for seamless Channel Change (DCC) in a plant with strong linear distortion

2.   Invention Summary.

This invention proposes a mechanism to effect a fast and optimized change to a new channel using DCC (DOCSIS 2.0 Dynamic Channel Change) in a strong micro-reflection environment. In this environment, the CM will be forced to perform initialization technique 2 that requires the CMTS to recalculate the pre-equalization coefficients after receiving the ranging request on the new channel and provide it in the ranging response. By deriving the pre-equalization coefficients for the new channel from the values used by the current channel, this proposal will eliminate the step where CM sends ranging request and CMTS communicates the pre-equalization coefficient using an unsolicited ranging response. The seamless approach defined in this disclosure will be useful in supporting business services where stringent SLA requirements are placed. In addition, it will improve reliability and service assurance of voice services by decreasing the number of dropped calls.

3.   Invention Description.

a.   Describe the invention in detail and/or attach a description, drawing(s) and/or diagram(s), if available. **Please include flow charts for descriptions of software processes, and block diagrams for descriptions of hardware systems.** Include the description/attachments in electronic form if possible.

In order to dynamically change the channel for a modem under strong liner-distortion of the plant, DOCSIS specification recommends reinitializing the MAC using initialization technique 2. This is disruptive and will increase the time for the modem to become operational.

In cases where the DCC is initiated because CMTS is unable to use pre-equalization to compensate for the micro-reflection, the CM reinitializes and sends a ranging request. The CMTS will recalculate the pre-equalization parameters for the CM corresponding to the new channel and include them in the ranging response. In the case where the micro-reflection is strong, it is possible to request a channel change with initialization technique 4 and follow this request with an unsolicited ranging response by including the pre-equalization parameters for the new channel. This avoids the modem to send a ranging request and optimizes the time for channel change thereby avoiding reinitializing the MAC layer.

There are two approaches defined to determine the pre-equalization coefficients for the new channel.

a) This approach assumes that the CMTS is capable of performing post-equalization in the upstream. This capability has been implemented by some CMTS vendors using proprietary techniques. In this scenario, the CMTS has current knowledge of the distortion compensation for the paths from all CMs. Because CMTS has this information, it can provide, through an unsolicited ranging response message, an estimate of the required distortion compensation for the new channel.

b) Another approach is for the CMTS to request the CM to reset the pre-equalization coefficients of the current channel using the load RNG-RSP message of an impulse response at its main tap during station maintenance. This erases the distortion compensation in the current channel and based on the next RNG-REQ from the CM, the CMTS will recalculate the required distortion compensation. The CMTS uses this information to estimate the required compensation for the new channel and include it in the unsolicited ranging response.

The following cases are considered irrespective of the approach used to determine the distortion compensation required for the new channel:

It is assumed that the micro-reflection is not frequency dependent in both cases below.

Case 1: The channel width of the new channel is the same as the original channel. In this case, apply the same pre-equalization parameters used for the current channel when the modem is changed to the new channel with minor adjustments as discussed in the attached paper. This approach avoids reinitializing the MAC and recalculating the parameters.

Case 2: The channel width used with the new channel is different. In this case the attached paper details the process by which the pre-equalization coefficients of the new channel are determined. The calculated values are provided with the DCC for the modem to apply without having CMTS recalculate after initializing the MAC.

In both cases, the newly calculated values are sent in an unsolicited response by the CMTS.

b. Why was the invention developed? What problem(s) does the invention solve? How is it better?

The pro-active maintenance model was developed to define a method that members can use to localize fault by using the tools in DOCSIS. During these discussions we realized that the process of performing DCC can be made optimized by applying the pre-equalization parameters.

c. Briefly outline the potential commercial value and customers of the invention.

Operators are starting to use DCC feature defined in DOCSIS for reasons such as load balancing. The current approach requires reinitializing the modem and takes time to

perform this action. In some cases, it is possible to apply the corrections used in the existing channel to the new channel and decrease the time to bring the modem operational on the new channel. The value is in removing the ranging request step and reducing the processing done at CMTS to recalculate the values.

4. HOW is your invention different from existing products, processes, systems? Please list the closest publication(s), product(s), method(s), patent(s), etc. to your invention. <u>For each item, how is your invention different?</u>

This disclosure uses the analysis defined in the previous disclosure (in 4Q 2007) and applies it to improve the time required to activate a channel change, a feature defined in DOCSIS. This is specific to DOCSIS feature and we are not aware of other patents on this topic.