Intelligent Channel Optimizer
For E6000® CER and C4® & C4c™ CMTS

FEATURES

• Monitors upstream spectrum and analyzes upstream SC-QAM channels
• Optimize modulation profiles & upstream SC-QAM channel parameters for maximum throughput
• Works with E6000 CER Release 4.0 or higher, C4 CMTS Release 8.0 or higher and C4c CMTS Release 8.0 or higher
• Works with ARRIS E6000n RPDs provisioned by the E6000 eCore
• The ICO analysis is accomplished for a wide range of:
  • Modulation Profile Types
  • Channel Widths
  • Center Frequencies
  • Forward Error Correction (FEC) Values

PRODUCT OVERVIEW

The Intelligent Channel Optimizer (ICO) is a GUI-based tool used to maximize the throughput of RF upstream channels connected to ARRIS C4 / C4c CMTS DOCSIS® 2.0 (2Dx12U) CAMs, DOCSIS 3.0 (12U and 24U) CAMs, and E6000 CER UCAMs, UCAM-2s and ARRIS E6000n RPD.

After analyzing the noise conditions present for a particular upstream channel, the ICO employs error analysis algorithms to provide guidance on optimal modulation profile and upstream channel settings.

The operator may then choose to use the ICO to apply the recommended profile and channel settings to the selected upstream. The ICO runs on a laptop or PC and may be used remotely via Telnet, SSHv2, and SNMP.
Monitor Upstream Spectrum Remotely
ICO monitors upstream spectrum remotely for an upstream connector in the E6000 CER and E6000n RPD. Users can monitor an upstream spectrum from anywhere apart from the E6000 CER. Also ICO is very useful when installing and configuring Remote PHY nodes located in places not easily accessible.

Maximize Upstream Throughput
With the wide array of parameters that must be specified for modulation profiles and upstream channels, operators may be uncertain as to whether the parameters they have selected are maximizing upstream throughput. By looking at the actual noise conditions and employing sophisticated algorithms, ICO takes the guesswork out of selecting the best set of parameters to obtain the maximum channel throughput in the upstream at an acceptably low packet error rate.

Optimize Modulation Profile and Upstream Channel Parameters
Utilizing Fast Fourier Transform (FFT) data from the RF burst receiver, the spectrum from a specific C4/C4c CMTS or E6000 CER upstream is displayed (Power Density vs. Frequency). ICO can then measure the noise level in the upstream channel. Using the upstream noise spectrum data, the ICO calculates the effective Signal-to-Noise Ratio (SNR) and Packet Error Rate (PER) for a wide range of possible modulation profiles and upstream channel parameters. Based on the calculation results, the ICO provides guidance on the optimal modulation profile and upstream channel parameter settings. The operator can then use the ICO to apply the optimal settings to the particular CMTS upstream.

Optimize Within Operator-specified Restrictions and Limitations
As an option, the operator may use the ICO to recommend a new, optimized modulation profile without changing basic parameters such as center frequency, channel width, or channel type (TDMA, ATDMA, TDMA-ATDMA, or SCDMA). The operator can also specify limits for parameters like center frequency and cable modem power level range, and ICO will run the optimization algorithm within the specified limits.

Optimization That Accounts for Changing Noise Conditions
The ICO can be run in an iterative mode in which noise samples are taken at operator-specified time intervals. These noise samples can then be averaged to account for changing noise conditions and the averaged result is used for the optimization calculation. Alternatively, the worst of the noise samples may be used for the optimization calculation for even more robust performance in meeting levels of service committed to subscribers.

Performance Metric Calculations
Using a given modulation profile and the upstream channel noise spectrum data, the ICO calculates important performance metrics such as total available user bandwidth and expected packet error rate. Alternatively, the upstream channel noise level can be specified by the operator to perform “what-if” optimization analyses.
GENERAL SPECIFICATIONS

Minimum Requirements for Customer Supplied Hardware Platform
Laptop/PC equipped with:
- A display with the resolution of 1024 x 768 or higher
- A Network Interface with IP connectivity

Minimum Requirements for Customer Supplied Operating System
Windows 7, Windows 8.1 or Windows 10
Java 1.5 or later

Connection Protocol
C4/C4c: Telnet, SSHv2, SNMP
E6000: Telnet, SSHv2, SNMP

ICO Operation Modes

Major Operation Modes:
- FFT Capture Mode – uses time domain sampling of the specified upstream spectrum
- Optimizer Mode – uses the FFT capture data to provide guidance on parameter optimization
- Theory Mode – explores how changes in various channel characteristics and burst profile parameters might affect performance

Minor Operation Modes:
- Iterative Mode – schedules FFT data captures to be taken at specified intervals over a specified time period
- Averaging Mode – uses FFT data averaged over a specified time period to run the Optimizer Mode functions
- Worst-case Mode – takes samples at specified time intervals for a specified period; uses worst-case FFT data to run the Optimizer Mode functions

Required CMTS Hardware
- C4/C4c CMTS with DOCSIS 2.0 CAMs (2Dx12U) and DOCSIS 3.0 CAMs (12U and 24U)
- E6000 CER with UCAM, UCAM-2 or ARRIS E6000n RPD

Required CMTS Software
- C4 Release 8.0 or higher
- C4c Release 8.0 or higher
- E6000 Release 4.0 or higher
- E6000n RPD Release 1.0 or higher provisioned by the E6000

ICO Charts and Graphs
- Power density versus frequency
- Power density display at specific frequency on a graph. Up to four frequencies
- Packet error rate versus Signal-to-Noise Ratio (SNR)
- Achievable bit rate versus SNR
- Bit rate, packet rate or packet error rate versus packet size

ORDERING INFORMATION

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<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>#1001278</td>
<td>Intelligent Channel Optimizer Release 1.0.4, Per E6000 CER or C4/C4c CMTS Chassis License</td>
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CUSTOMER CARE

Contact Customer Care for product information and sales:
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- International: +1-678-473-5656

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