Cascaded Bit-Interleaving Passive Optical Network
(Cascaded) Bit-Interleaving Passive Optical Network

CHALLENGE AND BREAKTHROUGHS

• Today power consumption is directly proportional to its maximum line rate and loading
• Bit-interleaving passive optical network protocol (Bi-PON) and cascaded bit-interleaving protocol (CBI-PON) organize information in a clever way
• Unwanted data can be dropped early during processing
• Protocol processing operates at the same rate as user data is consumed.

Novel Concept of “Power Consumption Follows User Traffic Load” in a Multi-Stage Network
(Cascaded) Bit-Interleaving Passive Optical Network

KEY ACCOMPLISHMENT AND RESULTS

• Developed new scheduling and transmission protocols
• Power consumption measured on a preliminary custom-built ASIC prototype

<table>
<thead>
<tr>
<th>CBI Repeater per ONU</th>
<th>Conventional aggregation switch per ONU</th>
<th>Power reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 mW</td>
<td>121 mW</td>
<td>~5 x</td>
</tr>
<tr>
<td>CBI ONU (including Lev2-Repeater and 2xLev3 devices)</td>
<td>Conventional ONU</td>
<td>~4.5 x</td>
</tr>
<tr>
<td>417 mW</td>
<td>1863 mW</td>
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~5x Reduction Of Energy Consumption Enabled by CBI-PON at Repeater Node
DEMO DESCRIPTION

- Demonstrate a single stage bit-interleaving passive optical network (Bi-PON) with live video traffic
- Real-time power consumption measurement of two Bi-PON ONT implementations, one in FPGA and one in ASIC
- Comparison to a conventional 10Gb/s NGPON ONT
- >30x dynamic power saving in protocol processing with our proof-of-concept implementation

Validates Power Follows Load with ~30x Reduction in Dynamic Power Consumption