

## Profitably Get High Speed, Reliable CE 2.0 Services Out to Small and Medium Business Using EFM over Copper

The Small and Medium Business (SMB) Ethernet services market is creating huge access, value added service, and Cloud revenue opportunities. SMBs are using the network more strategically now, and as a result many of them are demanding 10 Mbps or Nx10 Mbps of bandwidth. But getting reliable Carrier Ethernet services to SMBs is not easy given the small buildings they frequently occupy, and the distance to those buildings from the fiber network.

NxT1-based services cannot scale to meet this demand cost effectively, and reaching the vast majority of SMBs with fiber optics is simply too expensive. But waiting to offer these customers high speed Ethernet will result in customer churn and lost revenues that no incumbent or independent telco or CLEC can afford.

Actelis advanced broadband over copper transmission technology makes copper the key to profitably offering MEF CE 2.0 certified Carrier Ethernet services to SMBs. Actelis solutions enable operators to take reliable, high speed Nx10 Mbps Ethernet services and up to 100s of Mbps to SMB buildings cost effectively using copper. Actelis' hybrid copper-fiber solutions enable quick and cost effective service delivery over bonded copper today, while providing a smooth migration path to fiber backhaul where it makes sense in future.

### Actelis Networks' portfolio offers:

- **ML2300 / ML230 Aggregation Switches** – Aggregate multiple bonded G.SHDSL high speed links of from 2-32 pairs per link, or provide service over fiber. Support flexible topologies including point to multipoint (star), various ring topologies, and point to point links over bonded copper links using anywhere from 2 to 32 pairs per link, or over fiber – and the ML230 can also be used as CPE when bonding of 17-32 pairs is required. CE 2.0 certified.
- **ML600 / ML700 advanced Ethernet Switches** – Offer advanced high speed Ethernet services over a bonded link utilizing 2-16 pairs of G.SHDSL technology (ML600) or 2-8 pairs of VDSL2 (ML700). The Actelis ML640 series platforms are all CE 2.0 certified.
- **XR239 Repeaters** – Extend the reach and rate of bonded G.SHDSL links to 10 kft and beyond.
- **VBA / ABA Broadband Amplifiers** – Extend the reach and rate of bonded VDSL/ADSL links.
- **Enclosures - Flexible** options for installation on poles, a wall mount, rack or desktop

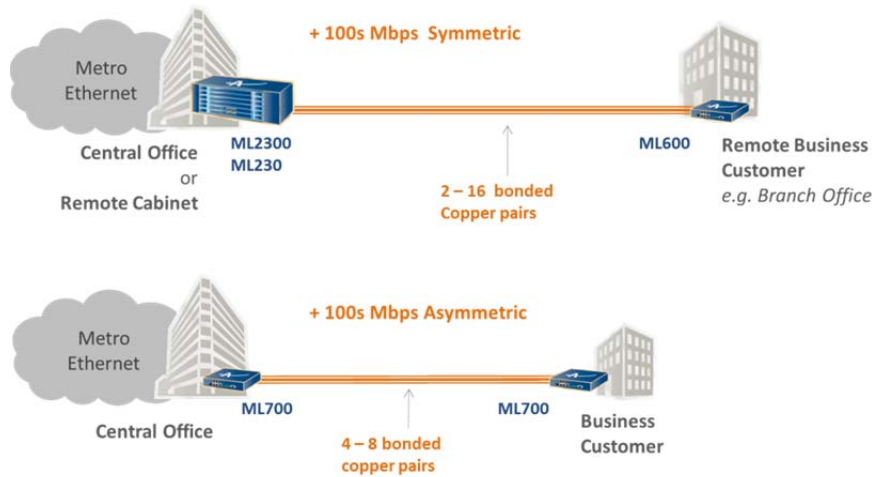
### Scenario 1: Single SMB Customer per EAD/CPE

Serving SMBs using 4, 8 or 16 pair ML640E series CPE provides enough capacity to serve many SMB bandwidth needs over great distances without repeaters. Traffic from the CPE is aggregated back into an Actelis ML230 or ML2300 aggregation device in a point-to-point or point-to-multipoint configuration.

Efficient transport with throughput of up to 15 Mbps per pair (depending on distance) is possible. Standards-based MEF CE2.0 compliant wholesale or retail services are possible with the Actelis SMB Ethernet solution, which supports offering the services they need today as well as future scalability and a smooth migration path to fiber should it be needed.

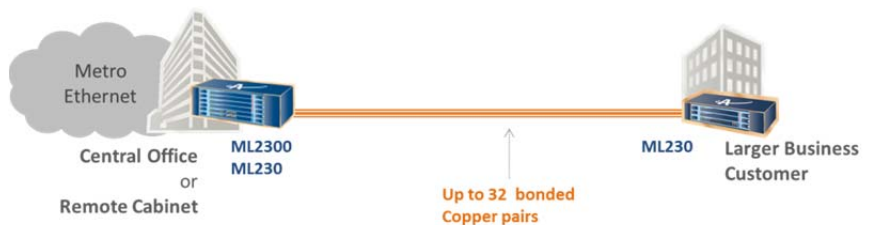
For example - A 20 Mbps service can be provided over 11 pairs to a distance of up to 10 kft (26 awg), A 50 Mbps service can be provided over 16 pairs to a distance of up to 7 kft (26 awg)

**Actelis ML2300 units and ML640/E series are CE 2.0 certified and compliant, supporting E-LAN, E-LINE as well as E-Tree services**



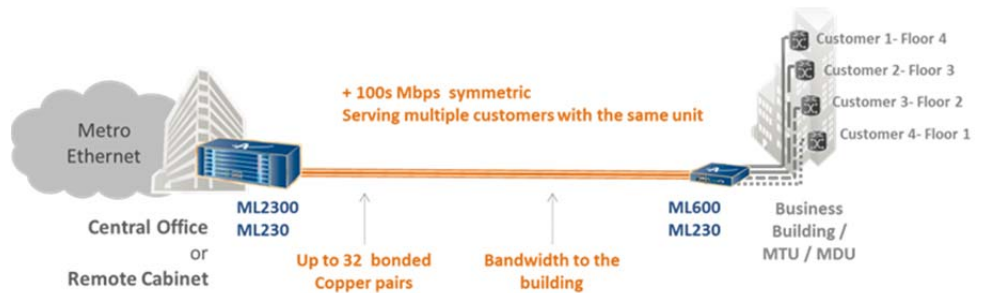
### Scenario 2: Larger SMB Customer per EAD/CPE

When higher speeds are required to serve a larger SMB customer, the Actelis ML230 units can be used to bond 17-32 pairs to achieve 10s to 100s of Mbps.



### Scenario 3: Multiple Customers per EAD/CLE<sup>1</sup> – Bandwidth to the Building/MTU/MDU

For buildings with multiple SMB customers or for larger individual SMBs, a service provider might want to use more than 16 bonded copper pairs to offer 100 Mbps or more of service cost effectively offer high speed, reliable links to enhance network efficiency and profitability.



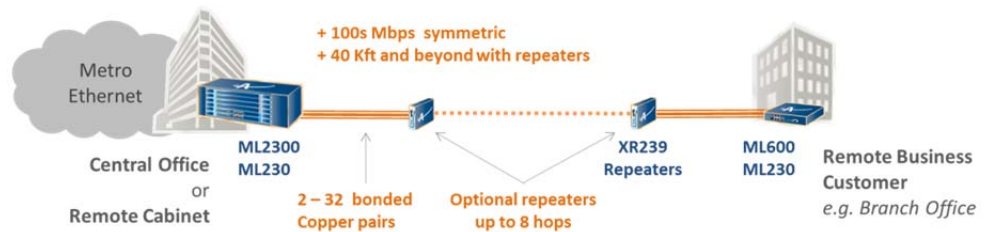
Actelis ML640E units are each equipped with 5 RJ45 interfaces and 2 SFPs that can be used for individual SMB connectivity.

The CLE would be installed in the common telco equipment closet in the basement or ground floor.

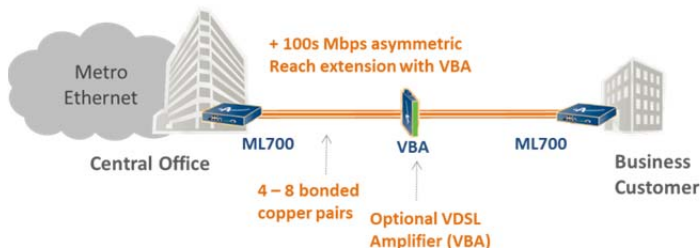
The Bandwidth to the Building with EoC is much like the strategy many service operators used when rolling out fiber to a large building, leveraging the marketability of immediately available high speed service to customers to enhance sales efforts. Once bandwidth has been taken to SMB buildings with Actelis EFM over Copper, offering customers a short ‘try and buy’ period has proven to be an extremely successful strategy. SMB customers quickly see the reliability and enjoy the benefits of reliable, dedicated, symmetrical high speed bandwidth.

### Scenario 4: Extended Reach for a Remote Customer

For service providers with their own copper, Actelis’ ability to support up to 8 repeated links extends distance out to even the most remote customer locations in the metro.



This enables providing 10 Mbps or Nx10 Mbps services out to 40 kft or more to reach remote customers and to serve all of customers’ locations.



For example: A 20 Mbps service over 11 pairs and a 50 Mbps service over 16 pairs can be extended to a distance of up to 50 kft and beyond (24 awg) with repeaters.

<sup>1</sup> CLE = Customer Located Equipment

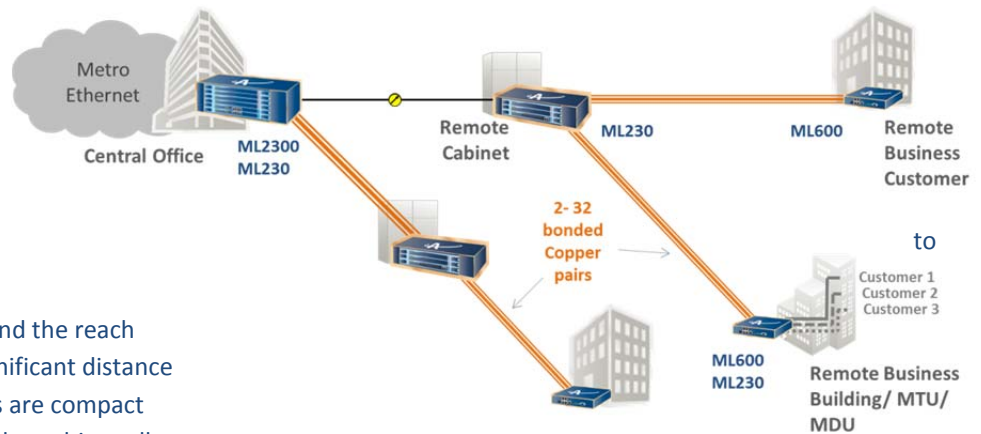
**Scenario 5:  
Distribution of Business Services from a Remote Cabinet**

SMB customers are often not in central urban areas in close proximity to a Central office.

SMBs typically choose office facilities based on cost and convenience of the location customers or employees.

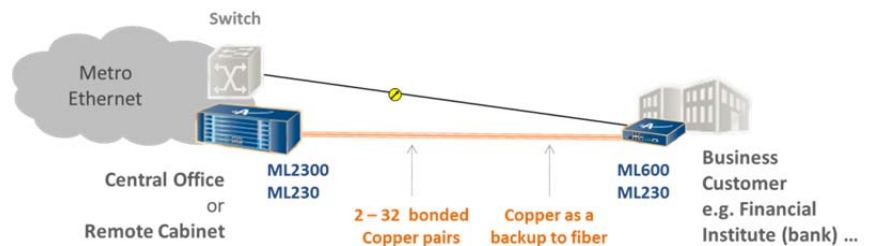
These places are likely to be beyond the reach of a fiber ring and may be at a significant distance from a major CO. Actelis solutions are compact devices that can easily fit into a telco cabinet allow service providers to effectively use copper to distribute high bandwidth services from existing telco cabinets located much closer to the SMB buildings.

**Cabinet distribution is applicable to all scenarios included in these documents.**



**Scenario 6:  
High Service Availability - Using Fiber-Copper Hybrid Connectivity**

Financial institutions are usually seeking to have very high availability. Service providers can utilize their copper to provide an alternate route to fiber to ensure enhanced availability that is offered through a completely separate technology medium and a different cable route. Actelis provides diverse media access ranging up to 100s of Mbps and beyond over copper as well as fiber.



## Actelis' Solution Advantages and Benefits

<p><b>High Speed Bandwidth Services</b> 10 Mbps, n x 10 Mbps, +100 Mbps over bonded copper</p>	<ul style="list-style-type: none"> <li>Bonding 4-32 pairs with G.SHDSL – Enabling business services of 10 Mbps n x 10 Mbps, 100 Mbps and beyond to support the escalating need for bandwidth.</li> <li>Bonding 4-8 pairs with VDSL2 - <b>Up to 260 Mbps DS</b> over 8 pairs</li> </ul>
<p><b>CE 2.0 services</b></p>	<ul style="list-style-type: none"> <li><b>Compliant and Certified CE 2.0 services</b> for e-LAN, E-Line and E-tree, and E-Access services.<sup>2</sup></li> </ul>
<p><b>Field Proven Reliability, High Availability</b></p>	<ul style="list-style-type: none"> <li>Field-proven reliability and availability with Actelis EFMplus technology.</li> <li>Bonded technology utilizing multiple pairs allows service to continue in the unlikely event of multiple pair/modem failure scenarios</li> </ul>
<p><b>Symmetrical or Asymmetric Services</b></p>	<ul style="list-style-type: none"> <li><b>Bonded G.SHDSL</b> - symmetrical transport for medium to very long reach. <b>Bonded VDSL2 (DMT)</b> - asymmetrical transport maximizing downstream bandwidth, typically used for short to medium reach.</li> </ul>
<p><b>Expanded Link Bandwidth with EFMplus</b> More Growth, More Revenues</p>	<ul style="list-style-type: none"> <li>Actelis advanced EFMplus superior performance over copper enables carriers to <b>extract more bandwidth from the same pairs</b>, offer additional bandwidth services, increase revenues and facilitate growth</li> </ul>
<p><b>Expanded Reach with EFMplus</b> More Customers, More Revenues</p>	<ul style="list-style-type: none"> <li>Actelis advanced EFMplus allows carriers to <b>expand coverage</b> reaching more customers and generating accumulating more revenues</li> </ul>
<p><b>Less Pairs per Service</b> Lower TCO, Faster Time to Revenue</p>	<ul style="list-style-type: none"> <li>Actelis advanced EFMplus enables superior copper utilization enabling service providers to <b>deliver the same service over fewer pairs</b> – improving CO density, reducing equipment per customer, significantly lowering maintenance, and leasing costs per CLEC.</li> </ul>
<p><b>Immediate and Cost Effective</b></p>	<ul style="list-style-type: none"> <li>If fiber does not exist, bonded copper based services require less capital and are much faster to deploy than fiber.</li> </ul>
<p><b>Flexible Network Topologies</b></p>	<ul style="list-style-type: none"> <li>Point-to-point, <b>Point-to-Multi-Point</b>, Ring, Drop and Continue.</li> </ul>
<p><b>Low Latency and Jitter</b></p>	<ul style="list-style-type: none"> <li>Suitable for video's latency and jitter requirements</li> </ul>
<p><b>Broad Portfolio</b></p>	<ul style="list-style-type: none"> <li>Cost optimized choices of copper and fiber solutions; ability to migrate from copper to fiber when and if needed without changing hardware</li> </ul>
<p><b>Multiple Hop Repeated Links for reaching remote customers</b></p>	<ul style="list-style-type: none"> <li>8 repeater hops per G.SHDSL bonded links – 40 Mbps / 45 kft (26 AWG)/70 Kft (22 AWG )</li> <li>VBA/ABA per VDSL2/ADSL based services link extension</li> </ul>
<p><b>Flexible and Easy Installations</b></p>	<ul style="list-style-type: none"> <li>Compact for cabinet installation; IP68 enclosures for Wall/pole mount</li> </ul>
<p><b>Remote Powering option</b></p>	<ul style="list-style-type: none"> <li>Remote express powering over copper pairs; local AC or DC powering options</li> </ul>
<p><b>Flexible Customer Interfaces</b></p>	<ul style="list-style-type: none"> <li>Optical SFP ports, 5 10/100/1000base-T interfaces (varies between models)</li> </ul>
<p><b>Comprehensive Management</b></p>	<ul style="list-style-type: none"> <li>Actelis MetaASSIST™ View and EMS management solutions</li> </ul>

<sup>2</sup> Vary per model. For certification information please refer to: <https://www.mef.net/certification/equipment-certification-registry>