



**ClearMesh Metro Grid™**

*The Business Grade Service Solution  
for Service Providers*

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#### **Introduction**

Today, the telecom market is following a path driven by business and consumer applications, not by bandwidth economies or transport optimization. It's about service revenue growth and competitive positioning, not about cost. So maybe this is a good time to revisit some of the growth markets that haven't been fulfilled by the previous market cycle.

For example, what happened to the massive opportunity to bring business-grade broadband communication services to the millions of small and medium businesses – just in the U.S. alone?

Consumers are getting Cable and DSL services, with choices for 3, 8, and soon 10 Mbps available, most notably from cable companies. Incumbent local providers in the US are investing heavily to deliver on long proclaimed FTTx strategies to be able to compete in the residential multimedia market.

While many fiber service providers – and most municipalities – have buried endless miles of dark fiber in the streets of metropolitan and major urban areas, more than 90 percent of the millions of small and medium-size businesses are still forced to run their businesses on legacy copper infrastructure and services such as multiple T1s, using TDM and frame relay, or low-grade DSL.

So we have the classical opportunity of an over-supply of raw service capacity, and a long established underserved mass market need – separated by the “customer reach gap”.

While it is quickly becoming a trend among small and medium sized businesses (SMB) to move toward hosted Internet-based business applications, the very infrastructure they need is often not available to them. It is clear that in order to take full advantage of the evolving business application services market, in combination with the rich multimedia environment of the Internet, SMBs will need a significant boost to their service access facilities. SMBs are quickly outgrowing the legacy copper infrastructure.

#### **The Opportunity for Service Providers**

Today, even smaller businesses are used to paying at least \$1000 monthly for their combined telecommunication and Internet access services needs, based on multiple distinct T1 links. It is obvious that a sizeable revenue opportunity could be tapped by offering integrated, cost-effective LAN-like communication services that would replace multiple legacy T1 links with a single business grade integrated services bundle.

The majority of these customers are in dense metropolitan areas, business parks and other infrastructure-rich environments, which are often developed with core (dark) fiber infrastructure usually terminated in a local CO building or outside plant junction.

However, extending fiber facilities to reach individual commercial buildings has proven to be a daunting task, and in most cases lacks fundamental business viability.

Closing the customer reach gap, or the ability to leapfrog legacy copper and to provide business-class LAN services to millions of SMB customers in dense metropolitan areas, will open a well established mass market opportunity for service providers.

But to do so, in a commercially viable way, service providers need to take advantage of the most innovative technologies.

## **Metro Ethernet – Cost-effective, Integrated Services**

Metro LAN or Metro Ethernet services, with the promise of extending proven, low-cost LAN technology into the service provider network, have long been on the planning horizon for major service providers.

The ability to utilize standards-based LAN switching technology in the service provider Metro infrastructure (Metro LAN) promises easy integration with central office (CO) and customer premises located LAN equipment (CLE), low-cost off-the-shelf switching ports, and a low-OPEX LAN service architecture. And it matches with the needs of small and medium business customers: a simple to install, cost-effective LAN service delivery which is secure, reliable and at true LAN speeds.

The impediment for the success of Metro LAN services has always been the same for the SMB reach gap – it requires optical fiber transmission facilities to provide any given building with the necessary 10 to 100 Mbps of LAN service bandwidth.

Service providers who manage to close the customer reach gap will be able to offer cost-effective integrated business services based on the evolving Metro LAN.

## **The Customer Reach Gap or “The Pain of Lateral Fiber Extensions”**

Lateral fiber extensions are the pain point of any service provider who wants to offer high-speed services to the broader market. The cost of reaching the actual physical location of any given new customer via a lateral fiber extension presents economic challenges on several levels.

First of all, building lateral fiber extensions typically takes three to six months of planning, permitting and construction time. The up-front CAPEX ranges from \$25,000 to \$35,000 – just to get into the building.

In addition, the cost of further extending fiber to buildings (if not directly located on a fiber route) can run between \$50 and \$150 per linear foot. Depending on actual location, this can easily add up to another \$30,000 - \$100,000 per building.

The high up-front capital investment to build fiber facilities can usually not be justified for SMB customers. Therefore, it comes at no surprise that only 11.7% of commercial buildings with more than 20 employees are actually connected to fiber infrastructure (Source: *Vertical Systems Group, May 2006*).

By the same token, the building entry for a second fiber service provider is usually not justifiable at all, because the building market is already taken. When serving specific customers, service providers will need to lease fiber facilities to reach larger corporate or commercial building sites.

But leasing high-speed dark fiber access, or high-speed LAN access, will cost a retailing service provider \$2,000 - \$4,000 per month. It also requires co-located equipment in the building and central office (CO). The high recurring capital expense to lease fiber facilities can usually not be justified for SMB customers.

## **The ClearMesh Metro Grid™ Closes the “Customer Reach Gap”**

As anyone can see, the customer reach gap is more an economical than a technology gap. The traditional fiber access-based business model requires high up-front investments and drives high monthly leasing tariffs for other service providers due to individual building market monopolies.

The ClearMesh Metro Grid is an optical wireless mesh solution that transforms the legacy business model of facility-based service deployment. The solution requires minimal up-front investments and, since it is a wireless service infrastructure, it enables service providers to build out further infrastructure after customers have actually signed on to the service.

In order to further lower CAPEX and OPEX requirement, the Metro Grid is built upon a pure Metro LAN architecture – easily integrated with service provider and customer premise equipment.

The ClearMesh Metro Grid delivers a true “pay-as-you-grow” business model:

- Minimal up-front CAPEX, typically ~ \$10,000 (< 6 mo. ROI<sup>\*</sup>)
- Modest per-customer CAPEX, typically ~ \$7,000 (< 1 year ROI<sup>\*</sup>)
- Low OPEX, based on Metro LAN architecture

<sup>\*</sup> ROI estimates based on \$600 average monthly revenue per building

The most important business aspect of the Metro Grid is that it shatters the cost barrier to deploy high-speed broadband business services across an entire metro area or entire business parks. And by doing so, it enables service providers to offer business LAN services to the broader SMB mass market.

Service providers are now able to distribute business-grade LAN services to SMBs without utilizing costly fiber facilities with highly profitable business class service bundles.

### **The ClearMesh Metro Grid Next-Generation Technology Delivers the SMB Opportunity**

The wireless ClearMesh Metro Grid™ integrates the core characteristics of several key technology components: wireless deployment, optical transmission and integrated mesh networking.

Deployment of wireless network infrastructure brings a variety of inherent advantages:

- Low-cost facilities with no need for trenching or other fiber or cable deployment
- Fast installation times, typically within days
- Cash-flow optimized with very little up-front investment
- Pay-as-you-grow because infrastructure equipment is installed after customers sign up

The ClearMesh nodes utilize several optical wireless transmission links to provide fiber-grade service capacity distribution. The inherent advantages of utilizing optical wireless technology are:

- License-free so there is no up-front capital investments, even for large deployments
- No interference which provides guaranteed service quality, even in very dense deployments
- High capacity transmission, currently full-duplex 100 Mbps per wireless optical link
- Fine grained class of service (CoS) support provides
  - Negligible transmission loop delay – micro seconds (just like fiber)
  - Low jitter which enabling digital voice and video quality (just like fiber)
- Low cost, because it utilizes off-the-shelf, high-powered LEDs

The ClearMesh technology retains the flexibility and cost-efficiency of license-free wireless deployment while maintaining the high service capacity and the fiber-grade service quality of optical transmission.

A ClearMesh Metro Grid consists of up to 256 ClearMesh 300 (CM 300) nodes, forming an open mesh topology, and is managed from a central NOC “over-the-air”, with the carrier-class ClearMesh Management System (CMS).

There are several inherent advantages of the managed open mesh based network architecture:

- On-demand extension of the mesh infrastructure as customers sign up to create a pay-as-you-grow business paradigm
- Flexible end-to-end path selection provides high service resiliency which is extensible across external LAN switching elements (Metro LAN)
- Seamless integration with service provider networks and end-to-end services with support for certified Metro Ethernet Forum (MEF) services
- Centralized, end-to-end mesh visibility via open SNMP-based CMS management system

The ClearMesh Metro Grid is the only solution on the market that integrates standards-based LAN switching technology with wireless optical transmission and is capable of distributing gigabits of business grade LAN service capacity across metropolitan areas.

Optical wireless transmission does have a dependency on weather conditions, as dense fog scenarios can limit the reach of light transmission paths. Proper network design is required in order to maximize link availability in adverse weather conditions.

That's why the ClearMesh Metro Grid is purpose-built to work in dense urban or metro areas, and business parks where license-free RF technology fails to deliver.

Typical distances between buildings in these areas range between 100 and 300 feet, with an entire street block usually running at 500 feet – all well below the 800 feet link length supported by ClearMesh.

To further enhance the reliability of the network, the ClearMesh Metro Grid provides a resilient mesh topology with many alternate paths across an established optical wireless mesh.

Thus, the service availability across the Metro Grid is higher than the availability of any individual link.

### **Privacy and Data Security – A Key Service Element**

Wireless technology has adopted many open standards over the past few years, providing nomadic and mobile wireless network infrastructure with security capabilities that actually exceed the security levels commonly derived from any wired LAN infrastructure.

The wireless Metro Grid makes no exception here, the provision of in-line scrambling, and optional encryption and key management extensions provides service providers with a range of security tiers, essentially delivering on a completely secure and confidential network and service distribution infrastructure.

### **Unmatched Service Reliability**

The ability to offer reliable services, even to the smallest business customers is essential. However, this can also create additional service tiers and revenue opportunities for service providers.

The Wireless Optical Mesh has an inherent “multi-path” capability, which allows buildings or customers to reach multiple independent physical wireless paths simultaneously. This provides the highest level of service availability to customers and the ClearMesh managed open mesh architecture makes it easy for service providers to operate these resiliency options. Unlike RF based wireless solutions, the denser the Wireless Optical Metro Grid is deployed, the more reliable and robust it becomes. Additional reliability options such as node diversity and redundancy options can be applied cost-effectively.

An operator can also offer point-to-multipoint RF services as an integrated overlay of the Metro Grid. Specific service classes or specific customer sites can then be backed up in the unlikely event of a complete mesh or node failure. This solution has the additional benefit of providing full physical path end equipment diversity, creating unmatched service reliability similar to dual-path fiber service protection.

## Conclusion

The Metro Grid scales to enable service providers to target the SMB population in dense urban and metropolitan areas with high-capacity, business-class service distribution networks that enable providers to offer their customers fiber-grade LAN services at prices comparable to traditional T1 tariffs.

Capable of providing hundreds of buildings, housing thousands of tenants, with carrier-grade digital voice quality, high-speed Internet, digital video and rich multimedia content services, service providers can now light up the endless miles of “dark fiber” already deployed – without prohibitive investments in costly lateral fiber extensions.

For more information, please visit [www.clearmesh.com](http://www.clearmesh.com), email us at [info@clearmesh.com](mailto:info@clearmesh.com) or call us at (626) 535-2800.