G.fast: Delivering Dynamic Gigabit Copper Symmetrical Services

Calix

TECH BRIEF

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Any information in this white paper regarding plans for future product development is based on current expectations and is inherently uncertain. Statements about future product development should not be relied upon in making purchase decisions.

Executive summary

Providing services to multi-dwelling units (MDUs) has always been a challenge for service providers using DSL technologies. Subscriber requirements have eclipsed traditional deployment models as subscribers demand greater performance. Copper DSL and DOCSIS broadband services remain asymmetric by nature, with a heavy bias to download performance in a video dominated Internet world. Speeds of hundreds of megabits per second are possible across a single copper pair. And with innovative Calix G.fast bonding, a true gigabit service is available to those MDU subscribers and multi-tenant businesses just like their fiber FTTH neighbors.

While G.fast **increases bandwidth** and bonding **expands reach** for a gigabit service, service providers should not stop there if they want to market a true fiber-like experience. A new solution is needed that can **dynamically allow increased upstream performance** to meet the more symmetrical demands of small to mid-sized enterprises (SMEs), homeworkers, and the social-media-hungry residential subscribers—a solution that enables service providers to provide the best possible advertised speeds over copper telephone wires. This solution must also address upstream demands— but not at the expense of eye catching differentiated marketed downstream speeds.

G.fast is the solution that offers breakthrough speeds for this underserved subscriber population. The Calix innovative Collective Dynamic Timing Allocation (cDTA) feature radically changes the subscriber bandwidth into a true alternative to fiber for existing MDU infrastructure.

The challenge

The goal for any service provider investing in G.fast is to establish the highest level of performance to win in the market against every competitor, whether FTTH or DOCSIS. Otherwise, why invest at all? G.fast represents the opportunity to re-invent how service providers market and sell services across copper loops in even the largest multi-dwelling unit buildings. These new service offerings enable service providers to move away from the traditional DSL "up to" speeds to offer tiered service packages similar to FTTH.

Today's subscribers depend on broadband. They work from home, engage in two-way HD video, upload video and photo content, game with peers, and back up and restore content to the cloud. Modern connected homes also **demand greater focus on upstream performance**—and traditional DSL services fail to meet these subscriber demands. The problem becomes more pronounced when multiple users in a connected home **all demand more upstream bandwidth simultaneously.**

For example, imagine an evening when your son cannot log in to his gaming console, your daughter cannot access her homework pages from school, and your spouse cannot upload their graduate papers that are due tonight. Subscribers expect downstream performance as part of the service offering, yet they depend on upstream performance when they need it.

There is also a group of higher ARPU subscribers who **demand symmetric services**. SMEs and work-from-home professionals expect the highest service levels for both downstream and upstream performance. The symmetrical challenge remains a problem for DSL and DOCSIS providers. Service providers should be able to use available bandwidth to deliver the service experience that subscribers are expecting. With cDTA, now they can.

The solution

G.fast with Collective Dynamic Timing Allocation (cDTA) enables service providers to deliver the ultimate subscriber experience over copper by delivering maximum bandwidth when it is needed. With the unparalleled ability to support high-end users, G.fast with cDTA is the first copper twisted pair solution that **enables subscriber services based on what subscribers demand rather than technology limitations.**

G.fast with cDTA provides the tools for service providers to meet or exceed subscriber performance expectations. New services can be created to offer tiered broadband packages identical to FTTH. For example, 200 Mbps standard, 500 Mbps advanced, and 1000 Mbps service tiers can be created to meet the increasing demand for the gigabit experience. These services can be offered to all MDU residents, not just the 10-20% of subscribers who live 20 meters (65 feet) from the DPU.

Now service providers can deliver the same service packages to both FTTH and G.fast subscribers. This is ideal because it:

- Reduces service provider OPEX.
- Simplifies marketing efficiency across the entire serving area.
- Increases subscriber satisfaction by delivering a unified unmatched subscriber experience.

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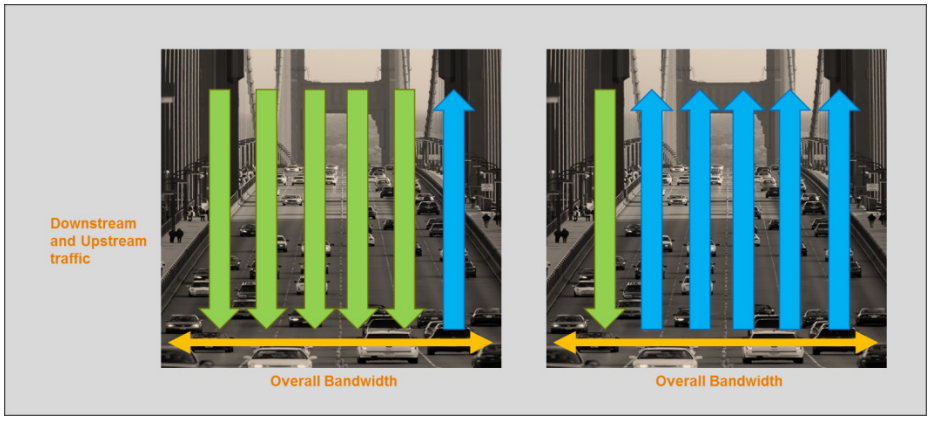
The cDTA technology is a Calix innovation that maximizes the available line bandwidth in both upstream and downstream directions to deliver an overall higher level of service. The best analogy for cDTA is to imagine the lanes of a bridge heading into a metropolitan city. During the morning commute, the bridge lanes are configured to allow the maximum number of commuters into the city. In the evening, the same bridge lanes are reconfigured to allow the maximum number of commuters to exit. The bridge represents the overall G.fast subscriber bandwidth and the traffic lanes are the traffic ratios allowing downstream and upstream traffic. With cDTA , **the traffic patterns can be updated based on subscriber bandwidth demands every 100 milliseconds.**



Calix cDTA enables service providers to dynamically shift bandwidth in upstream or downstream directions based on near real-time demand. Implementing this powerful feature is done by establishing a minimum service expectation and then applying the cDTA performance range to each G.fast subscriber's line. The G.fast line performance ratios change based on subscriber demand while protecting the minimum service expectation for downstream and upstream traffic.

As bandwidth demands fluctuate during the day, the line will respond to demand based on each subscriber's needs—while continuing to fulfill the minimum service expectation.

For example, the minimum service expectation may be set to reserve the minimum amount of performance to support video and Internet traffic that subscribers normally consume. If a service provider has a minimum service requirement of 350 Mbps (300 Mbps video service plus a 50 Mbps data service), and a G.fast line is capable of delivering 1,000 Mbps, cDTA can use the 650 Mbps that is available for upstream (US) or downstream (DS) services. In essence, the "extra" bandwidth that is available above a minimum expected level of service can be dedicated to subscriber requirements for US or DS performance. As bandwidth demands fluctuate during the day, the line will respond to demand based on each subscriber's needs—while continuing to fulfill the minimum service expectation.

Summary: Service providers and subscribers win

Calix cDTA unleashes the power of G.fast to deliver the ultimate broadband experience. Service providers using G.fast bonding and cDTA can differentiate themselves by offering the services that subscribers desire most. The cDTA technology also eliminates upstream restrictions and pain points of DSL and existing DOCSIS. By deploying cDTA, service

providers can **dramatically increase subscriber satisfaction by enabling the maximum bandwidth available in whatever direction subscribers need it dynamically.**

The market opportunity created by G.fast bonding and cDTA allows service providers to differentiate their service offering compared to any competitive MDU solution, while also selling the same services across G.fast as across FTTH. This results in a simplified market offering with identical service tiers regardless of the MDU infrastructure (fiber or copper).

G.fast bonding with cDTA is the only viable way to commercially market a true gigabit symmetrical service over copper.

Is DSL performance—both upstream and downstream—a critical issue for your subscribers? Want to learn more about the unique Calix G.fast solutions? Click here and we'll get in touch with you.

You can also learn more on the Calix website: https://www.calix.com/solutions/g-fast.html.