

SEEING IS BELIEVING VELOCIX CONTENT DELIVERY NETWORK

Turning service providers' broadband networks into advanced content delivery platforms

······Alcatel·Lucent 🥢

AT THE SPEED OF IDEAS™

THE RISE OF THE ON-NET CDN

Consumers want access to high-quality multimedia entertainment at their convenience on a broad range of devices, including TVs, PCs, tablets and smartphones. But factors such as surging consumer demand, proliferating video content, increasing video quality and the shift to on-demand viewing are putting pressure on current broadband network infrastructures and business models. Network service providers are searching for ways to differentiate their offers, deliver a consistently high quality of experience (QoE), control costs and generate new revenue. Many are exploring the idea of deploying their own content delivery networks (CDNs) as a means to keep up with and capitalize on continuous multimedia market evolution.



Service provider-owned CDNs open the door to a new era of rich media services. These "on-net" CDNs empower service providers to use their end-to-end networks and unique proximity to consumers to deliver content from caches distributed across the network edge. With an on-net CDN (Figure 1), a service provider can transform its broadband network into a scalable, high-performance digital media delivery platform that efficiently distributes content from multiple sources.

On-net CDNs help service providers reduce video transport costs by enabling them to ingest each content asset once and deliver it on demand to thousands of subscribers from the network edge. Delivery from inside the network also reduces the transit and peering expenses that go along with carrying over-the-top (OTT) video and distributing popular software packages.

A service provider can use an on-net CDN to deliver QoE that can't be matched by OTT providers. Unlike third-party CDN services that deliver content from off the network, an on-net CDN avoids points of congestion by delivering content from caches close to consumers. By minimizing the distance that content travels over the network, it promotes faster and more reliable streaming. This assures quality of service (QoS) and allows the service provider to manage and preserve content quality throughout delivery – a crucial requirement for monetizing content and building brand equity.

ON-NET CDN BENEFITS

Reduced video transport costs

Assured quality of service (QoS)

New monetization opportunities



Figure 1. A scalable on-net CDN architecture efficiently delivers content from multiple sources



On-net CDNs bring new opportunities to acquire, manage, publish and monetize content. Service providers can expand and diversify their content offers by capitalizing on a unified CDN infrastructure that extends across all screens. For example, a service provider can use an on-net CDN to deliver licensed content as part of a multiscreen HDTV service, or to extend an existing pay TV service to any connected device. By operating a CDN that combines greater reach with assured QoS, a service provider increases its appeal to content providers seeking to publish and offer content through their own branded portals.

TAKING CHARGE OF CONTENT DELIVERY

To take charge of content delivery and seize the opportunities presented by on-net CDNs, service providers need a partner with advanced CDN solutions, strong customer references and in-depth operational experience.

Alcatel-Lucent is the only partner that can fulfill all these needs. Its Velocix product group is a pioneer and recognized market leader in on-net CDN technologies. With the Velocix CDN, Alcatel-Lucent has equipped service providers around the world to launch multiscreen video services that generate new revenue and reduce costs while achieving outstanding delivery performance.

Alcatel-Lucent backs the Velocix CDN with years of in-house experience as a CDN provider. The Velocix team uses its unique operational expertise to offer service providers an on-net CDN solution as a managed service. This option reduces up-front investment and time to market, allowing service providers to deploy their own advanced digital delivery capabilities in a matter of weeks.

A NEW GENERATION ON-NET CDN

On-net CDNs enable service providers to cost efficiently distribute high-quality video to consumers on any connected device. Consumers have embraced the quality and flexibility these CDNs provide, but they continue to seek out richer and more customized content experiences. Service providers can delight consumers by improving performance and adding services that are tailored to their needs on each device. Providers that use the Velocix CDN can scale and fully leverage their IP networks to deliver a captivating viewing experience to every subscriber on every screen.

The Velocix Enhanced Video Experience (EVE)¹ extends the Velocix CDN technology to support the efficient delivery of *personalized* video streams to vast numbers of viewers across all connected devices. With Velocix EVE, Alcatel-Lucent introduces a foundation for delivering next-generation multiscreen video streaming services over IP-based CDNs. Shown in Figure 2, Velocix EVE is the first solution to support customized video delivery by integrating session awareness and rule-based transformation (RBT) within the same IP streaming delivery infrastructure.





Figure 2. Velocix Enhanced Video Experience



 "Velocix Enhanced Video Experience: Accelerate the adoption and monetization of personalized streaming video services." Alcatel-Lucent white paper, 2013.



By adding Velocix EVE to the Velocix CDN, service providers can enrich their service offerings and improve the video experience. Velocix EVE combines advanced content transformation and personalization capabilities with optimization functions. This combination of capabilities and functions can help service providers boost performance and develop new use cases that target and vield benefits in key areas.

For example, Velocix EVE provides a platform for adding multiscreen support for important pay TV functions like ad insertion, blackouts and emergency alerts. It speeds up channel change times for linear TV. It adds control over video quality delivered to end users by accounting for device usage, end user profiles and network conditions. With Velocix EVE, pay TV service providers can start by delivering multiscreen services fully equal to those offered by set-top boxes. They can then quickly evolve their offers to extend personalized experiences to the main, companion and mobile screens.

In addition to improving subscriber QoE, Velocix EVE augments the performance and business benefits offered by 'traditional' on-net CDNs. Velocix EVE helps service providers create monetization opportunities, minimize storage and transport costs, and increase the security of content delivered to connected devices.

As digital media becomes the primary driver for service demand and network utilization, content delivery will become the core business for service providers. Velocix EVE enhances the pay TV delivery infrastructure by combining the best of IP streaming innovation with increased awareness of network conditions and customer context. Velocix EVE enables service providers to differentiate from competitors by offering a more compelling, consistent and personalized pay TV experience on every screen.

See how you can leverage IP Video innovations from Alcatel-Lucent



VELOCIX CDN ARCHITECTURE

The Velocix CDN uses a hierarchical architecture composed of distinct service, storage and delivery tiers (Figure 3). Deployed within these tiers, the Velocix appliances are the building blocks that shape and tailor the on-net CDN to address each service provider's needs.

Engineering requirements determine the quantity and configuration of Velocix appliances used for each deployment. For example, the Service Node is always deployed in a redundant configuration within the service tier. The Publishing Appliances, Storage Appliances and Enhanced Origin are deployed in the storage tier based on the service provider's chosen content distribution model and the size of its content catalogs. The Intermediary and Edge Delivery Appliances are deployed in the delivery tier in quantities dictated by network topology, throughput and service needs.

Figure 3. Velocix CDN architecture



SERVICE TIER

The service tier provides the management and control layer for the CDN. It consists of Velocix Service Nodes and the Session Manager.



Service Nodes

Service Nodes provide all operational services, including the management interface, the network performance and usage reporting capabilities, and the log file and audit processing functions. To support redundancy and load balancing, the Velocix CDN typically maintains at least two Service Nodes located in geographically separated locations.

The Service Nodes also provide a Web-based console interface. Teams within service provider, network operations center (NOC) and content provider organizations can use the console to interact directly with the CDN. The console offers control over a variety of key CDN functions, including network routing, geo-configuration and authentication.

Service Nodes can expose fully programmable and controllable network capabilities. Application programming interfaces (APIs) are available for control, request routing and delivery, reporting, publishing, acquisition, management and monitoring. These APIs enable service and content providers to launch services quickly, create market differentiators and simplify integration with third-party components.



Session Manager

HTTP adaptive streaming has become the standard video streaming protocol (see the **Optimized for video** section, on page 13). However, HTTP adaptive streaming uses stateless delivery, an approach that can create challenges for service providers who have little control over what is being delivered to the client. For example, it is the device that decides when to switch to a lower or higher bitrate and adapt the experience to the available bandwidth. This approach cannot be cost effectively scaled to address the needs of individual consumers or clients.

The Session Manager provides session awareness to improve overall HTTP behavior. A key component of Velocix EVE, the Session Manager can help personalize the video experience for individual consumers based on contextual factors such as network conditions, content types, consumer profiles and device characteristics. The Session Manager tracks each session and application. It interfaces with existing policy and data sources so that it can control delivery on a per-session basis without significant cost and without compromising scale and delivery efficiency.

STORAGE TIER

The storage tier combines mechanisms that ingest or register content in the CDN with unique distribution technologies that ensure high-efficiency content distribution across the network. It includes the Enhanced Origin, Publishing Appliances and Storage Appliances.



Enhanced Origin

Part of Velocix EVE, the Enhanced Origin records, stores and originates copies of media objects to support video content delivery by way of linear and on-demand HTTP Adaptive Streaming (HAS). It supports a variety of ingest protocols and delivery formats, including conventional HTTP, Apple® HTTP live streaming (HLS), Microsoft® Smooth Streaming, Adobe® HTTP Dynamic Streaming (HDS), MPEG Dynamic Adaptive Streaming over HTTP (DASH) and MPEG-2 TS.

The Enhanced Origin offers unique on-net video features. For example, it is a key element in the RBT solution, which efficiently spreads the content repackaging workload across the CDN. Instead of propagating all formats of a given content asset into the CDN, the Enhanced Origin sends one copy of the content to the appropriate Delivery Appliance using a common format, along with a set of rules. These rules describe how to transform the original content to produce a video stream in the desired output formats.

In addition, the Enhanced Origin hosts agents for multicast content pre-positioning, a technology that simultaneously pre-positions popular media objects on Delivery Appliances that store content locally and deliver it to requesting users. The Enhanced Origin also uses end-to-end HTTP Secure (HTTPS) to provide a secure solution for receiving, storing, replicating and distributing content. These technologies complement the publishing capabilities of the Enhanced Origin and ensure that content is acquired, processed and distributed efficiently.

Publishing and Storage Appliances

The Velocix CDN supports traditional content acquisition mechanisms that push content onto the CDN. It uses Publishing Appliances to ingest content into the network and Storage Appliances to store it. The Publishing Appliance is used to ingest non-HTTP Adaptive Streaming content into the Storage Appliance; the Storage Appliance provides large repositories for storing this content. Before it can be delivered, non-HTTP Adaptive Streaming content must either be "pulled" by reverse proxy or "pushed" by publishing and storing it in the CDN.

During the publishing process, the Publishing Appliance breaks each content asset into hundreds or thousands of pieces. It then stores the individual pieces in Storage Appliances around the CDN. These pieces can be acquired individually from multiple independent sources. The delivery tier contacts the Storage Appliance to acquire content when it is not available on the delivery tier or when cost minimization policies dictate it.

Integration with third-party CMS

The Velocix CDN is integrated with leading third-party content management systems (CMSs) using industrystandard APIs and client libraries. In-depth interoperability testing ensures that protected, pre-encoded and transcoded content can be ingested into the Velocix Platform directly from the content aggregator's CMS.

For example, the Velocix CDN is preintegrated with thePlatform as part of Alcatel-Lucent's Multiscreen Video Platform solution. Designed for telcos and cable operators, this solution leverages a strategic alliance between Alcatel-Lucent and thePlatform, the leading white label video publishing company. The Velocix CDN is also preintegrated with Microsoft Mediaroom[™] to support IPTV providers.

DELIVERY TIER

The delivery tier is made up of Velocix caching appliances. These appliances fulfill consumer requests by delivering content assets to consumer devices. They are distributed throughout the service provider's serving market so that content can be sourced close to consumers.

The caching appliances are placed and dimensioned to maximize transport savings and achieve a high cache hit rate. The hit rate potential is determined based on analysis of the catalog size and content popularity. Once their locations have been set, the caching appliances are deployed to achieve the required throughput (measured in gigabits per second) and breadth of supported services (for example, HAS, Flash[®] streaming and HTTP Web site acceleration).

The Velocix solution includes three types of caching appliances: Edge Delivery Appliances, Intermediary Delivery Appliances and Transparent Caches. All of these appliances are based on common hardware platforms.



Edge and Intermediary Delivery Appliances

Velocix Edge and Intermediary Delivery Appliances cache and deliver managed content for which a commercial agreement exists between the service provider and the content owner. Edge Delivery Appliances deliver content to users, while Intermediary Delivery Appliances deliver managed content to Edge Delivery Appliances.

The Edge and Intermediary Delivery Appliances are deployed hierarchically. They use multi-source and intercache protocols. If the content is not available in a given Edge Delivery Appliance, a request is sent to nearby Edge Delivery and Intermediary Delivery Appliances. If the content is not available in the delivery tier, it is acquired from the storage tier.

This hierarchical, multi-tiered approach to delivery optimizes response time and delivery speed to end users. At the same time, it makes more efficient use of the underlying network resources and reduces the load on the origin server. Each cache intelligently balances memory resources to ensure that popular content is delivered with the highest performance. The Delivery Appliances are designed for flexible, high-scale networks.

When used with Velocix EVE, the Edge and Intermediary Delivery Appliances also host agents for multicast content pre-positioning, video repackaging and RBT for video acceleration and personalization. They also ensure maximum content security by providing support for HTTPS delivery and per-session encryption, a hardware-accelerated content encryption mechanism for HAS streams. Per-session encryption is unique to the Velocix CDN.





Support for direct access to external origin servers

As traffic grows, more and more content providers are outsourcing video management and delivery functions to service providers. But some content providers still want to manage their own origin servers so that they can continue to create, market and staff their video services. Along with service providers, they continue to benefit from the ability to deliver content from caches distributed close to consumers. These caches let content providers maintain control of the acquisition and analysis of content release, promotion and usage data. This control is crucial in the emerging market for video on demand (VoD) services built on Web-based architectures.

Velocix Edge and Intermediary Delivery Appliances address the needs of content providers by offering direct access to video stored on external origin servers. Delivery Appliances use a reverse proxy to pull content directly from the origin. This proxy removes the need to ingest the content into the Velocix system first. The deployment of one or more Intermediary Delivery Appliances in the CDN increases distribution efficiency and keeps the Edge Delivery Appliances from overloading the origin server with repeated requests for the same objects.

Transparent Caches

The Velocix Transparent Cache delivers OTT video content, including content distributed by popular user-generated content and online video sites. It can also help service providers handle surges in traffic created by demand for new releases of popular software packages, such as operating system updates for PCs or smartphones, or popular applications and games. Caching is based on popularity and performed independently of any commercial agreement between the service provider and content owner.

The Velocix Transparent Cache supports flexible caching policies with configurable rules that can uniquely identify cacheable objects. It includes content filtering and parental controls that allow service providers to restrict, block or modify access to specific sites or categories of sites to avoid malware, phishing, spyware and other threats. Caching profiles for Web sites are updated online. These updates ensure that cache efficiency remains high when URL structures change or when new sites and delivery techniques emerge on the Internet.

Velocix unified caching² allows service providers to support enhanced CDN and transparent caching capabilities using a single, flexible on-net CDN deployment. Service providers can deploy and manage Edge Delivery Appliances, Intermediary Delivery Appliances and Transparent Caches within the same CDN. This helps them streamline caching processes and cost effectively deliver any content from any source with a consistent QoE. Service providers can further reduce transport costs for managed CDN content through coherent collaboration between caching nodes. For example, the Intermediary Delivery Appliance can deliver content to transparent caches located close to end users.

^{2. &}quot;Velocix unified caching: Deliver any content from any source." Alcatel-Lucent white paper, 2012.



WHY CHOOSE ALCATEL-LUCENT?

Alcatel-Lucent's Velocix team successfully operated a globe-spanning commercial CDN for many years prior to making the CDN available to service providers as an appliance-based solution. The team has acquired invaluable expertise and embedded it into a complete CDN solution that can address the technical, reporting, provisioning, billing, monitoring and business requirements of any service provider. Alcatel-Lucent is unique in building first-hand experience into its CDN products and solutions. This experience plays a vital role in helping service providers manage the complex day-to-day challenges involved in owning and operating CDNs.

The Velocix CDN puts service providers in an ideal position to capitalize on growing consumer demand for high-quality video and rich media delivered over fixed and wireless broadband connections. It gives them all the tools they need to launch premium content services that bring new revenue, lower costs and unmatched delivery performance. What's more, it equips them to offer content aggregators a truly reliable distribution and retail channel.

OPTIMIZED FOR VIDEO

The Velocix CDN is optimized for the delivery of video content and supports all industry-leading video formats across a broad range of connected devices. It empowers service providers to deliver linear TV and on-demand video services, and offers advanced recording functions that provide a foundation for building video offers around popular time-shifted TV services. The Velocix CDN also includes video-aware features that enable service providers to securely and cost effectively scale video delivery to the mass market.

To keep up with consumer demand, service providers have to manage a growing number of connected devices and an increasing diversity of multimedia delivery formats. The Velocix CDN addresses their needs by supporting a broad range of popular content delivery protocols. Figure 4 lists the protocols supported for true streaming, mobile streaming, traditional HTTP delivery and HTTP adaptive streaming.

The dominant delivery protocol is HTTP, which is widely used for adaptive video delivery. HTTP-based adaptive delivery protocols encode alternative versions of each file at different bitrates. Using these alternative versions, the client application can adapt the bitrate dynamically to ensure that it suits the device and the current network conditions.

VELOCIX CDN BENEFITS

Proven leadership with innovative technology and a global customer base

Complete solution with a wide range of APIs that support closer integration with networks and systems

Professional services that leverage Alcatel-Lucent's operational expertise with CDNs to reduce risk and accelerate time to profitability

Figure 4. Popular content delivery protocols supported by the Velocix CDN





Today many HTTP adaptive streaming protocols are competing for wider adoption. The most widely used protocols include Apple HLS, Adobe HDS, Microsoft Smooth Streaming and MPEG-DASH. The increasing diversity of available protocols creates challenges for service providers. For example, service providers have to deploy extra bandwidth and storage because they need to encapsulate, store and deliver media in several different streaming formats. This adds complexity and cost.

Rule-based transformation

Velocix EVE uses a rule-based transformation (RBT) technology to reduce the impact of video streaming format diversification. This technology improves the cost base for video delivery and reduces the time and effort required to support new adaptive streaming and video delivery protocols. When a new protocol is launched to the market, RBT can support it through a simple software update. No hardware changes are required.

RBT saves bandwidth. It creates a single copy of each content object in a common format instead of creating separate objects for each video format and adaptive protocol. As shown in Figure 5, it then uses video-aware rules to help edge delivery caches transform the content into the specific video format that each user requires.

To further optimize bandwidth usage, Velocix EVE offers multicast content prepositioning technology that combines IP multicast distribution to the edge of the CDN with HTTP adaptive streaming from the edge to the user. This technology automatically adapts to changing viewing patterns by creating multicast channels for popular live online events and linear content. It minimizes latency and start times and provides cost-efficient scaling for live online events delivered over adaptive HTTP.



Figure 5. The Velocix CDN optimizes the delivery of video content



PERSONALIZED EXPERIENCE

Velocix EVE creates a foundation for next-generation multiscreen video streaming by adding session awareness to video delivered over IP-based CDNs and embedding video processing into and across the delivery infrastructure. Service providers gain a greater awareness of individual user content requests and video streaming sessions. This awareness enables them to manipulate and personalize the flow of each video stream while accounting for multiple inputs, such as current network conditions, the subscriber's profile, the type of content being viewed and the device being used for viewing. Velocix EVE can use these inputs to manipulate content at the edge – for example, by inserting an ad, an emergency alert or alternative content for users in blackout zones.

Service providers can use Velocix EVE to control the quality delivered to end users. For example, in environments with scarce bandwidth resources – such as a home network or a mobile cell where the access technology typically limits bandwidth to a few megabits per second – service providers can define and determine exactly how bandwidth is shared among the devices. Inside a home, users can be offered higher maximum available bitrates for video streamed to connected TVs or game consoles. They can be offered lower maximum bitrates for smaller screens such as tablets or smartphones. In a mobile cell, premium subscribers can be offered higher bitrates; basic subscribers can be offered lower bitrates.





UNIFIED CACHING

The Velocix CDN can deliver all types of content from all on- and off-net sources with a superior QoE. It offers a consolidated, or unified, approach to caching that uses one CDN to support multiple business models. A service provider can use unified caching to:

- Retail its own content
- Establish a premium content delivery service that enables content providers to publish content directly to its network
- Intercept and transparently cache OTT traffic

Unified caching helps service providers take steps toward a full CDN deployment. Service providers can start by using transparent caching to reduce peering and transit costs. Next, they can use the CDN to monitor subscriber usage and identify the content that subscribers value most. With this information in hand, service providers can select content providers that will help them offer subscribers the best possible experience.



CONTENT QUICK START

The Velocix Managed Service ensures a fast time to market for service providers that are newcomers to the CDN business or that have smaller CDN deployments. This unique solution capitalizes on the expertise of the team that operated the Velocix global CDN. The Velocix team manages CDN operations remotely, allowing the service provider to quickly launch new services and concentrate on the business opportunities presented by the CDN. As the CDN grows, the service provider can add the appliances that form the management layer and take control of the entire CDN operation.

The Velocix NOC (Figure 6) monitors the performance of managed Velocix networks 24x7. It uses automated tools that monitor the availability of individual appliances as well as the overall behavior of delivery services. These tools continually monitor all publishing and delivery methods to ensure that they remain operational. In addition, they continually monitor the overall status of key services such as publishing, distribution and the control portal. The status is reported to administrators through the Velocix console.

The Velocix NOC provides first- and second-level maintenance support and telephone assistance 24x7. Staffed with a team of trained and knowledgeable network engineers, it offers industry-leading service levels. The Velocix NOC team is equipped to resolve customer problems in a timely and efficient manner.



Figure 6. The Velocix NOC in Cambridge, UK



VELOCIX PROFESSIONAL SERVICES

There are many important factors to consider when designing, dimensioning and deploying a CDN for digital media delivery. These include traffic and service types, hit rates, deployment locations, redundancy and service availability. The Velocix team has acquired more than a decade's worth of unique expertise in building and operating a global CDN. This expertise forms the basis of the Velocix Professional Services package, which encompasses the specification, configuration and turnkey operation of the Velocix CDN within the service provider's network footprint.

Velocix Professional Services delivers a rapid deployment trajectory, an intensive knowledge transfer program, and a time to market that is measured in weeks rather than months. Custom professional services are available on a project-specific or daily-rate basis. The Velocix training curriculum is available on request. Courses can be hosted at local Alcatel-Lucent offices or at the customer's own training facilities.

MANAGEMENT SUITE

The Velocix CDN offers service providers fine-grained control over every aspect of the content delivery process. Its comprehensive suite of management tools covers reporting, billing, account management, content distribution, network monitoring, alerts and element management.

These tools allow service providers to administer and analyze delivery statistics for their digital asset libraries. Service providers can use them to set delivery options for individual assets or groups of assets. Configurable settings include delivery method, access control, delivery speed and geographic distribution restrictions.

The Velocix CDN generates detailed delivery reports and provides real-time monitoring capabilities that help service providers improve delivery performance and manage delivery costs. It streamlines accounting and billing by providing audit trail and logging information that can be easily exported for processing by external information management systems.

ABOUT VELOCIX AND ALCATEL-LUCENT

A wholly owned subsidiary of Alcatel-Lucent, Velocix was founded in 2002. The Velocix team is a leading authority and innovator in the field of Internet-based digital content delivery. It has a proven track record of delivering unique and exciting technologies that improve Internet content delivery performance, particularly for large multi-gigabyte content assets.

The combination of Velocix and Alcatel-Lucent offers the commercial and technical expertise required to supply the content delivery and IP networking marketplace with solutions that address the rapidly growing consumer demand for premium digital media. Alcatel-Lucent is advancing on-net CDN evolution with a strategic alliance program that brings together key innovators from inside and outside the media value chain. Designed to further accelerate time to market for premium media service delivery to multiple screens, this program includes pre-integrated components from leaders across the content and communications industries.

The Velocix CDN is an integral part of the Alcatel-Lucent **High Leverage Network™** (HLN), a framework for network evolution that delivers continuous scalability at the lowest cost per bit. The HLN framework unlocks new business and service value by embedding intelligence in the network and exposing it to applications.

Velocix EVE enhances and extends the delivery infrastructure by combining IP streaming innovation with increased awareness of network conditions and customer context. Deployed with the Velocix CDN, Velocix EVE leverages the service provider network to create powerful service offers that are not easily replicated by traditional CDN overlays. These offers can empower service providers to captivate connected consumers and accelerate the adoption and monetization of personalized video streaming services.

Alcatel-Lucent has deployed more than 100 multimedia solutions, 60 IPTV solutions and 200 mobile media solutions around the world. Many cable operators and Telco operators have chosen the Velocix CDN to deliver multiscreen video services to consumers. Public references include Verizon, Time Warner Cable, Oi, TalkTalk and Orcon. Many more references will be announced as service providers continue to build out their next-generation video networks.



Learn more about Velocix at www.velocix.com

See the possibilities with IP Video innovation



www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein. Copyright © 2013 Alcatel-Lucent. All rights reserved. M2012073700 (March)

