SUMMARY

With 4G LTE networks already in deployment and the expectation of continual growth over the next few years, LTE likely will become the standard for mobile broadband technology, offering substantial benefits to both the operator and the end user.

Alepo’s comprehensive LTE solution allows incumbent and greenfield providers to quickly and seamlessly launch LTE services through the deployment of an end-to-end EPC and OSS/BSS system.
LTE represents a powerful step forward in mobile network technology. With 4G LTE networks already in deployment and the expectation of continual growth over the next few years, LTE likely will become the standard for mobile broadband technology. Offering substantial benefits to both the operator and the end user, LTE promises to meet the unwavering, global demand for faster and more diversified mobile broadband services while reducing overhead and optimizing network resources.

Achieving the transition to LTE will vary widely among all operators, but common considerations remain. Early adopters ready and eager to roll out an LTE network require a tested, readily deployable solution that can easily integrate with their existing mobile network. For other incumbent mobile operators, a more gradual transition to LTE calls for a future-ready solution that can leverage current network elements and support new access technologies as they arise without compromising the core system. WiMAX providers, too, can take advantage of LTE to diversify their service offerings and remain at the forefront of emerging technologies. And for greenfield providers, the importance is in partnering with industry-experienced vendors to build a robust but flexible solution. In all cases, the imperative is that the transition to LTE minimizes costs and avoids the risk of exposing the existing network to disruptions in service.

With Alepo’s portfolio of flexible and standards-compliant network elements, service providers can easily and gradually upgrade to LTE at any time without costly or risky changes to the core network. And once deployed, Alepo’s catalogue of OSS/BSS functions are at the ready as providers expand and proliferate into new market segments.

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Early adopters, incumbent mobile and WiMAX providers and greenfield operators all have common considerations:

- Partnership with experienced vendors
- Seamless integration with existing core network
- Library of OSS/BSS functions to support expanding business

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SAE & the Evolved Packet Core

Built on a flat, all-IP network (AIPN) architecture, LTE’s core system focuses on simplicity by streamlining network elements while enhancing the communication between core elements as well as external elements. The architecture design eases the handover to other access technologies and supports mul-
timedia services with varying policy demands. With the ability to converge the charging and rating functions for all services, providers can achieve a more flexible network, with the agility to respond rapidly to market opportunities, all with including breakneck speeds, ample & flexible spectrum, convergence with other access technologies, and end-to-end network security.

**Alepo LTE Core Solution**

Alepo’s LTE solution provides an end-to-end backoffice solution for greenfield providers and ensures a smooth transition for providers already in the market with existing 4G technologies, such as WiMAX or 3G providers. Alepo’s solution is engineered to leverage and build upon existing network elements through integration with standards-based protocols and robust APIs, ensuring a rapid time to market and lower deployment risk. Alepo’s LTE solutions enable mobile operators to manage network traffic and deliver new value-added services while reducing backhaul and costs. Alepo’s future-ready LTE platform supports the continual evolution of mobile technologies without changes to the core system. For Greenfield Providers, Alepo can provide a complete backend solution designed to operate seamlessly within a best-of-breeds network.

**ALEPO EVOLVED PACKET CORE (EPC)**

Alepo offers a full backend solution for Greenfield LTE Providers, encompassing charging and billing functions, as well as authorization, policy, network prioritization, signaling streamlining, provisioning, and more. Incumbent providers can also deploy any of Alepo’s modules individually. Proven interoperability and deployments with leading vendors coupled with standards compliance assures providers a rapidly deployed, best-of-breeds network.

**Access and Policy Enforcement**

**POLICY CHARGING & RATING FUNCTION (PCRF)**

Alepo’s 3GPP-compliant PCRF allows for dynamic policy control, usage monitoring, and flow-based charging. A key element of the LTE EPC, the PCRF sets the quality of service (QoS) parameters for each session, as well as enforcing fair usage policies. In these capacities, the PCRF enables providers to maximize revenue and avoid bottlenecking and network strain. The PCRF communicates with external application servers such as IMS or telephony via the Rx interface, with the PCEF (PDN GW) via the Gx interface, and the OCS via Sy interface.

A comprehensive Subscriber Profile Repository (SPR), containing QoS-based profile information, can be either included as part of the PCRF, or separated out a distinct node for more complex networks.

Alepo’s PCRF is a high-performance and feature-rich policy control engine for Diameter-based EPC networks. Built for agility and flexibility, Alepo’s PCRF enables service providers to realize true Policy 2.0 use cases with real-time speed and efficiency. In doing so, service providers gain greater control in shaping the customer experience and network resource utilization.
HSS

A core element of LTE networks, the HSS (Home Subscriber Server) communicates with the rest of the network to provide subscriber profile and authentication information. Communicating primarily with the MME (Mobility Management Entity) via the S6a interface, the HSS is a database of subscriber information that provides authentication and device profiles, authentication credentials, and location and service information to the network via diameter protocols over S6a interface. The HSS can also serve as a dual function node to LTE and IMS networks. When deployed in IMS networks, the HSS also manages IMS subscriptions, authentication credentials and communicates with CSCF via the Cx interface. By uncoupling authentication from policy requests, the HSS helps to streamline LTE networks.

Alepo’s 3GPP-compliant PCRF allows for dynamic policy control, usage monitoring, and flow-based charging.
The HSS also implements internal EIR function where it manages mobile device status and communicates with MME via S13 interface.

Alepo’s HSS boasts both modern GUI and script-based administration, giving providers the ease of point-and-click customization alongside the power of scripting.

Convergent Charging & Billing (OFCS/OCS)

The Alepo Convergent Charging & Billing Platform encompasses real-time (online) and batch (offline) rating, performing both OFCS and OCS functions, including charging and billing, balance management, mediation, and more. The robust solution merges all next generation services and access technologies onto a single charging platform and readily bridges the prepaid / postpaid divide, allowing service providers to realize truly convergent and innovative business plans while maintaining an overall low total cost of ownership (TCO).

For OCS functions, the Platform communicates with the PCEF via the Gy interface and via the Gz interface for OFCS functions. For spending limit reporting, the Platform communicates with the PCRF via the Sy interface. And for communication with IMS application servers, the Platform communicates via the Ro and Rf interfaces for charging IMS services such as voice calling and messaging.

REAL-TIME RATING & CHARGING

The Alepo SE Convergent Charging & Billing Platform utilizes a robust, built-in rating engine to perform real-time and batch processing of all events. The flexible system can rate any aspect of the EDR as well as external parameters, giving service providers the freedom to create truly differentiated business plans that resonate strongly with customers and optimize revenues.
CONVERGENCE IN ALL DIMENSIONS

The Alepo SE Convergent Charging & Billing Platform dismantles the barriers of siloed charging systems and billing systems, allowing service providers to realize truly innovative, differentiated business plans and to bring them to market rapidly, all from a single, scalable solution. The open platform lends itself to a convergent network environment on multiple levels.

PREPAID / POSTPAID CONVERGENCE

Service providers can easily transition customers between prepaid and postpaid account types, even in the middle of a billing period. For example, postpaid subscribers who have reached a postpaid credit limit can prepay for additional overage services throughout the remainder of the billing period, helping to reduce fraud, revenue loss and bill shock.

VOUCHER MANAGEMENT

Part of the Alepo SE Convergent Charging and Billing Platform is a comprehensive voucher management system. Alepo’s system automates every step in the voucher process, from creation, to assignment to retailers and partners, activation, recall and more. And with the flexibility to make vouchers of any value or product, they may be designed to provide add-on services to current subscribers, casual access to strictly prepaid customers, additional access only to certain apps or programs, and more.

Alepo Diameter Signaling Controller (DSC)

LTE is a Diameter-heavy architecture, and a centralized signaling node guarantees maximum network efficiency. Alepo’s DSC separates performance-related tasks from the core competencies of the network elements, ensuring a more efficient and stable network that can detect erroneous routing loops that might have otherwise caused network distress. The Alepo DSC also
serves as a network border element to facilitate roaming and interconnect scenarios between EPCs. A proven, carrier-grade solution, the Alepo DSC facilitates greater interoperability between multi-vendor elements and endpoints, enabling carrier EPC interconnect, including LTE roaming scenarios. Within the evolved packet core network, it promotes network performance, growth and scalability by reducing the provisioning and maintenance costs of new and updated nodes. The Alepo DSC implements various Diameter reference points such as Gx, Rx, S9, S6a and Gy, and it can function fully as an IETF Diameter Agent, 3GPP Diameter Routing Agent (DRA) or GSMA Diameter Edge Agent (DEA). Alepo’s DSC is extremely high-performing, with the ability to process over 15,000 Diameter messages per second on a single appliance.

Alepo OMA DM Server

For a truly ubiquitous customer experience, from start to finish, Alepo’s OMA DM Server eases and automates provisioning, bootstrapping, activation, configuration changes, diagnostics and firmware updates of devices all over the air.

ANDSF

The ANDSF communicates with the UE via the S14 interface and provides mobile providers the ability to automatically prioritize access networks. By efficiently and automatically choosing the best-suited network dynamically, the ANDSF helps to create a consistent, hands-off customer experience.

SAMPLE OSS/BSS FUNCTIONS

A comprehensive OSS/BSS system is a vital component of any LTE provider’s success. Below is a partial list of OSS/BSS functions that have particular relevance for the LTE environment, but is only a small sampling of the functionalities available from Alepo.

PARTNER AND RESELLER MANAGEMENT — allows for the cre-
ation and automation of reseller and affiliate management, including automated commission tracking, branded affiliate web portals, and assignment of vouchers to affiliates for revenue assurance and performance tracking.

**ROAMING** — (when deployed with the Alepo DSC Server or 3GPP AAA Server). With support for both Inbound and Outbound roaming, providers are assured of rapid network growth, as well as the ability to monetize visiting users from other providers. Both real-time and batch processing of roaming EDRs are supported.

**MEDIATION** — collects all the data records from third party systems and ensures usage data is validated and processed before forwarding to the Charging and Billing layer.

The Mediation function can support records in any format:

- CDR – Call Detail Record
- EDR – Event Data Record
- IPDR – Internet Protocol Data Record
- UDR – Usage Data record.

**CUSTOMER MANAGEMENT** — offers a full suite of automated and intuitive tools, empowering customer service agents and end customers to easily view account activity and make account changes with the click of a button.

Alepo’s Customer Management System empowers both customers and customer service representatives to perform comprehensive care from intuitive portals. Messages can be pre-programmed to be sent to customers to alert them of balances (to prevent bill shock), or to present targeted promotional offers without the intervention of agents.

For customer service representatives, portals grant a 360-degree view of customer accounts.
Customer information is logically organized and arranged in tabs, ensuring efficiency and ease when addressing customer concerns. Additionally, account maintenance, such as password change or account refill, is prompted via pop-up, relieving navigation confusion.

Intuitive and user-friendly interfaces are defining characteristics of Alepo’s system to enable efficiency and satisfaction for customers and employees. For customer service representatives, portals grant a 360-degree view of customer accounts.
For customers, two modes of self-care are available: the web self-care portal, and the mobile self-care app. The web self-care portal contains a wealth of information and self-care options, including password change, account top-up, trouble ticketing, and a complete plain-language history of account changes and service access. The portal is completely customizable, with built-in multi-language support.

And for customers on the go, a mobile self-care app provides a robust set of services for customers on smart phones and tablets. With an intuitive and graphic-rich interface, customers can access account history, pay and view bills, top-up their bills, and more, with a few simple clicks.

REPORTING — supports graphically-rich and easily customizable reports that allow providers to respond quickly to market changes. With the ability to compile data from the Alepo centralized database, as well as via JDBC, XML, web services, Java objects, and flat files, providers are assured of reports that give a holistic picture of their business. Though reports are easily customizable via a WYSIWYG editor, canned reports are also deployed as part of the solution and include reports such as Revenue by Products, Top 10 Customers (by Revenue), Subscription Longevity, New registrations in a period, and more. Reports are rendered in HTML and PDF, making them easy to export and share offline, or they can be configured to be sent automatically.

PROVISIONING — enables automatic provisioning of new devices and services when purchased from retail outlets or via web self-care. New devices can simply be activated via registration on the web registration portal and be automatically provisioned to the HSS, giving customers a hands-free and automated
PROCESS THAT ENSURES THE UTMOST EFFICIENCY.

PRODUCT CATALOG — Alepo’s system handles the full lifecycle of a provider’s Product Catalog. This includes the creation of nuanced plans in an intuitive management interface, allowing rapid time to market for plans with QoS parameters, flexible availability, bundles, discounts and promotions, product switching, and more. All Products are contained in a centralized portfolio, for ease of management. The system also supports market segmentation, enabling customers to be associated with different locations, services, account types, devices, inventory items and more, enabling extremely targeted marketing and promotional campaigns. To ease service purchase and activation, service fulfillment with Alepo is a fully automated process, from device provisioning and add-on service activation.

SOLUTION FEATURES AND HIGHLIGHTS

VENDOR NEUTRAL SOLUTION — The LTE network’s strength is in its flexibility. In order to be best poised to best succeed, in both the current and emerging market, operators must have the agility to respond to emerging technologies and opportunities with best-of-breed network elements and innovative updates. A single vendor network runs the risk of locking operators into one brand, leaving operators unable to adopt emerging technologies.

STANDARDS COMPLIANCE — Alepo’s standards compliance and participation in Industry forums ensures interoperability between all major vendors. With a rapidly expanding partner network and continued innovation, Alepo assures operators of a market-leading solution.

EXPERIENCE WITH INTEROPERABILITY — With successful deployments and IOTs with leading LTE vendors, Alepo assures providers a successful and rapid deployment. Alepo’s vast list of IOTs allows providers to create a best-of-breed network, assured that Alepo’s backoffice solution will interoperate seamlessly with vendors at the time of deployment, and progressively as the

FULL SOLUTION STANDARDS

- 3GPP and IMS (Gx, Gy, Gz, Rx, Ro, Rf, S6b, sWx, sWm, sTa, sWa, S6a, S9, Cx, S13, Sy, etc.)
- 3GPP2
- Diameter Based Protocol - RFC 3588, 4960, 793
- Diameter Commands for 3GPP - RFC 3589
- NASREQ Support for Network Access Server - RFC 4005
- EAP Support for Extensible Authentication Protocol- RFC 4072
- WiMAX Forum
business grows and market opportunities shift.

**CONVERGENT POLICY & CHARGING CONTROL** — Pre-integrated 3GPP Policy & Charging Control (PCC) allows providers to offer extremely targeted ratings plans that precisely match customer needs and keep mobile broadband profitable. In order to both preserve network strength by enforcing caps on overactive users and to monetize heavy use with top-tier plans, providers are best served by offering differentiated service tiers with various usage caps and service restrictions. And with Alepo’s intuitive interfaces, the configuration of complex, granular ratings plans is simple, and can be done from anywhere. As part of a PCC solution, providers can offer:

» **DIFFERENTIATED SERVICE TIERS** — allowing providers to charge users for the bandwidth level appropriate for their usage

» **SMART CAPS FOR OVERAGE** — preserving network integrity by downgrading over-active users

» **BANDWIDTH ON DEMAND (TURBO)** — offering temporary, increased-speed services to customers at the exact moment they need it

» **SERVICE OR APPLICATION DAY PASS** — creating nuanced market opportunities for those customers that only want access to certain sites and apps.

» **TIME & LOCATION-BASED POLICIES** — responding agilely to market demand in space and time

» **PARENTAL & CORPORATE CONTROLS** — increasing customer satisfaction and offering plans with pre-integrated usage control

With Alepo’s Policy and Charging Control Platform, service providers can offer fine-grained plans that offer stepped bandwidth, ensuring network strength and avoidance of network bottleneck.
» CONGESTION MANAGEMENT — solving “rush hour” bottleneck issues that typically happen as networks are strained by a small percentage of overactive users. With PCC, providers can downgrade overactive users while also monetizing high use.

FUTURE-READY — Alepo’s solution is built to be endlessly scalable. By simply adding more servers, Alepo assures operators of a solution that supports rapid growth. And in a rapidly evolving marketplace, operators have the imperative to partner with a company that has not only incredible depth of experience in the marketplace, but continued deployments in emerging markets. With this breadth of experience and continued innovation, operators will benefit from a market-leading roadmap of cutting edge features.

FLEXIBLE & CONVERGENT — Offering vendor-neutral and standards-compliant solutions with a modular system ensures providers of a tailor made solution from a provider poised to enable growth. As customer needs evolve, Alepo’s vast set of OSS/BSS functions and network nodes are at the ready to aid in network expansion. This exact fit deployment method also rapidly increases time-to-market, and with automation and advanced configuration via administration portals in their control, providers are less dependent on Alepo for common network changes.

INTUITIVE PORTALS FOR EMPLOYEES AND CUSTOMERS—All of Alepo’s interfaces, from registration to customer self-care, employee access, partner self-management, and administrator access are built with leading Java-based technologies to create the most flexible and user-friendly interfaces available. Intuitive and user-friendly interfaces are the defining characteristics of Alepo’s products, designed to enable efficiency and satisfaction for customers and employees.

Core Alepo Design Principles:

• Endless Scalability
• Flexibility
• Convergence
• Automation
• Intuitive Interfaces
• Seamless Integration
Alepo utilizes the following web portals:

- **ALEPO ENTERPRISE PORTAL** — A centralized dashboard for all service provider system users, including comprehensive operations, admin & maintenance (OAM) as well as 360° customer view for point of sales (PoS) & contact center agents.

- **ALEPO SUBSCRIBER PORTAL** — Simple, convenient end-user registration (Web Registration Center) & independent account management (Web Self Care).

- **ALEPO NOTIFICATION PORTAL** — A redirect portal used to communicate with customers facing account issues.

With out-of-the-box multi-language support and HTML customization, providers can easily create branded portals. Built to be the core interface for the system, providers can merge multiple systems’ UI’s onto one centralized dashboard. And all of Alepo’s portals are built with utmost security in mind. The portals implement top industry standard encryption technologies and support CAPTCHA, account lockout, minimum password strength, customizable Single Sign on, and LDAP Authentication.

**PROFESSIONAL SERVICES** — An expert, extremely responsive deployment and support team are key to Alepo’s success. With a team of engineers with years of successful deployments across all business types and customer needs, Alepo assures providers a rapid time to market and responsive support team for any future issues. Often cited as a major factor in providers’ satisfaction, Alepo’s professional services and timely, expert support team are dedicated to leveraging almost a decade of industry experience to ensure our customers’ success.
About Alepo

Founded in 2004, Alepo is a leading provider of enabling infrastructure for telecommunications service providers worldwide. Alepo provides both Business Support Systems (such as billing and customer management) and Operational Support Systems (such as service creation, activation, provisioning...) to telecommunications companies, enabling them to compete efficiently and realize next generation services’ opportunities. With core values of constant innovation, customer satisfaction, and recognizing and rewarding merit, Alepo strives to stay at the forefront of telecommunications technologies. Alepo is proud to support innovative market leaders as they evolve in the telecommunications marketplace.

With a focus on revenue and subscriber management, packet core evolution, carrier Wi-Fi, mobile data offload, fixed mobile convergence, and more, Alepo’s solutions are deployed in six continents, span mobile (2G, 2.5G, 3G, LTE, VAS, SMS, MMS) and broadband (ADSL, Wi-Fi, WiMAX, VoIP, FTTx...), and unify mobile and broadband through convergent architectures for enhanced marketing and active retention of the customer base.

Maturity, stability, and innovation make Alepo a market-leading vendor of solutions for both greenfield and established service providers.