

Integrating Communications Compliance into the Next Generation 4G LTE Network



All telecommunication providers that currently or plan to provide 4G LTE service to their customers must consider significant changes and enhancements to their communications compliance (CC) capabilities. Such changes are necessary to remain compliant with legally mandated monitoring and intercept responsibilities. This whitepaper provides detailed insights into how to maintain CC compliance using the SS8 Xcipro mediation platform.

Four significant changes arise as a result of the 4G LTE migration that must be considered when evaluating CC requirements.

4G LTE represents an enormous leap in possible data transfer speeds and average throughput.

- Legacy CC solutions are not capable of the bandwidth per subscriber speeds of a 4G LTE network

The changing face of Internet access as a result of 4G LTE speeds.

- Greater number of applications and services once relegated to DSL and cable now transmitted on 4G LTE networks

New breed of communication applications and devices.

- With new applications and services comes a need to understand and identify these services in order to comply with regulations

Integration of 4G LTE with legacy networks.

- CC solutions must have a history of integrating with multiple vendors and across different technologies

LTE represents an enormous leap in possible data transfer speeds and average throughput.

The potential data generated by a single LTE user can exceed the capacity of existing 2G and 3G CC systems handling millions of subscribers. These legacy CC systems designed for older networks simply will not be able to scale for the throughput for monitoring required to scale up to LTE network speeds. More importantly, CC solutions must be able to scale going forward as the subscriber base grows and new applications and devices are added.

The changing face of Internet access as a result of LTE speeds. For many wireless subscribers, their primary connection to the Internet is now their mobile device. As users are able to accomplish more and more on their mobile devices, a dedicated home Internet connection will become less necessary. This shift will cause data that was once relegated to DSL or cable services to be transmitted on the LTE network. CC solutions must not only be able to scale to the usage of today, but the changing face of Internet access in the future.

New breed of communication applications and devices. From chat and email to video conferencing and VoIP, consumers are using the Internet as a way to keep in touch with friends and to conduct business. With the increased bandwidth of LTE and more and more traffic exclusively traversing the LTE network, new applications network devices will be created to service the communications needs of subscribers. With potentially more communications channels to monitor, CC solutions must be able to efficiently and intelligently identify the channels required for compliance with regulations.

Integration of LTE with legacy networks. While integration among LTE network components is based on open standards, integration for CC purposes is largely based on vendor proprietary specifications. In addition, most carriers are looking to integrate their 2 and 3G networks with their LTE network. This multiple proprietary vendor specification environment combined with a need to support multiple generations of the network presents significant challenges. Communications compliance solutions must have a deep and wide exposure to these elements and a long history of integrating with multiple vendors and across different technologies.

This whitepaper provides a general overview of LTE as it relates to best practices for CC and offers specific details and technical insights into SS8's Xcipio LTE-ready CC technology platform. Xcipio's latest iteration was designed specifically with these four problems resulting from LTE deployments in mind and it addresses these issues comprehensively, as this paper details.

THE LANDSCAPE OF FUTURE NETWORK COMMUNICATIONS AND THE LTE ADVANTAGE

From movies streamed over the Internet, to photo sharing, video conferencing, and social networking, real-time Internet communications are an integral part of our lives. Increasingly, consumers have come to expect the same user experience when connecting to the Internet via a high-speed wireless connection as a wired connection.

The 3rd Generation Partnership Project (3GPP), in conjunction with the International Telecommunications Union (ITU), have developed a new set of mobile network standards, 4G LTE, in order to meet this fast-growing demand for advanced services. Aside from better accommodating mobile video, Web 2.0 personalization, and streaming applications, mobile network operators view 4G LTE as a way to compete on an equal footing with cable and landline telecommunications providers for broadband data users. With potential download speeds of hundreds of megabits per second, 4G LTE is offering wireless subscribers a true broadband experience. Telecommunication operators that provide voice and/or data services (such as 4G LTE) to their customers are required to assist law enforcement in

conducting investigations. One form of assistance that may be required is communications compliance. The significant changes that come with 4G LTE have implications on existing LI systems and should also be considered when purchasing a new LI system for a 4G LTE network.

4G LTE OVERVIEW

The LTE standard was designed from the ground up to serve as the sole channel for all data, voice, and text communication on a mobile network. LTE was not only designed to deliver orders of magnitude improvements in performance but also to deliver this capability at a constantly increasing scale as data consumption continues to grow and network throughput continues to rise. With a modular architecture at its core, LTE more flexibly accommodates multi-vendor environments. With LTE, mixing and matching of disparate brands of equipment will not require extensive integration or customization to maintain network throughput and efficiencies.

The System Architecture Evolution (SAE) is the core network architecture of the LTE wireless communication standard. Key defining characteristics of SAE are a flat, all-IP architecture for both data and voice that dramatically simplifies the network architecture. SAE also allows for integration with not only legacy GSM networks but also with non-GSM networks like WiMAX and CDMA2000, among others. Central to the SAE is the all-IP network architecture, the Evolved Packet Core (EPC). Also known as the SAE core, the EPC is made up of several sub-components including, the MME, SGW, PGW and HSS, as shown in Figure 1.

Mobility Management Entity (MME)

This component serves as the primary control-node for the LTE access-network. It handles User Equipment tracking and paging, handoffs between 2G/3G and 4G LTE networks, bearer activation and deactivation processes and the initial selection of the Serving Gateway (SGW) for a user. The MME also authenticates users, enforces roaming restrictions and handles security key management while serving as an access point for communications compliance.

Serving Gateway (SGW)

The MME works closely with the SGW, which routes user data and serves as a mobility anchor for the user plane (data bearer) between LTE and other 3GPP technologies. It also replicates user traffic for CC.

PDN Gateway (PGW)

Managed by the MME, the PGW connects the hand set to the external data networks and is the point of entry and exit for traffic. The PGW also drives policy enforcement as well as packet filtering and screening for communications compliance.

Home Subscriber Server (HSS)

The HSS authenticates subscribers, provides mobility management, and provides call and session establishment support.

4G LTE NETWORK COMMUNICATIONS COMPLIANCE

To comply with communications compliance requirements, an LI solution must provide both the intercept related information (IRI) and communications content (cc) for a subject’s communications stream. The IRI and cc on an LTE network are delivered collectively to the CC solution by the MME, HSS, SGW and PGW. Figure 2 depicts SS8’s Xcipio

platform within an LTE network.

Intercept Related Information

The MME is an ideal IAP (intercept access point) for intercept-related information because of its presence in the signaling path for subscriber mobility and bearer information. SS8’s CC product, Xcipio has been integrated with leading vendors of MME and HSS.

Communications Content

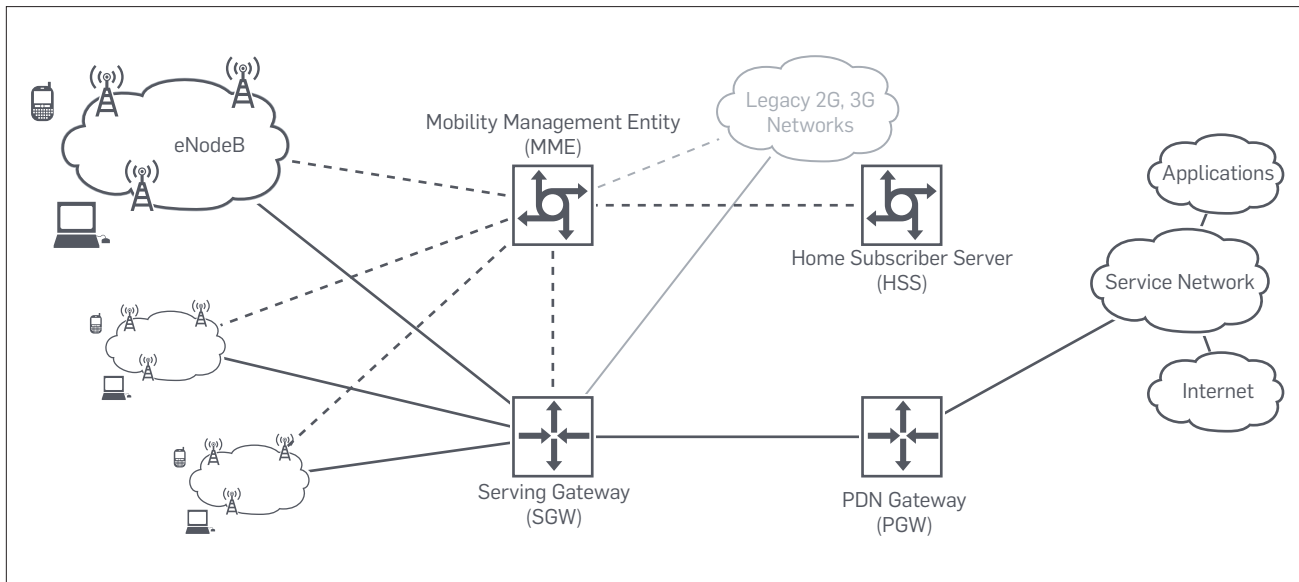
The SGW is an ideal IAP for communications content because of its role in anchoring the data bearers for the user equipment. For roaming intercept subjects, the PGW serves as an IAP. SS8’ LI product, Xcipio, has been integrated with leading vendors of PGW and SGW.

Integrating with existing 2G and 3G Networks

4G LTE networks are, in most cases, a migration from an existing 2G or 3G network and for an extended period of time, both networks will exist in parallel. A CC solution must therefore not only support both 2G, 3G and 4G LTE networks but support how these networks will inevitably interoperate.

One example of the interoperation of 2G/3G and 4G LTE networks is for voice services. In contrast to the dedicated circuit-switched voice services offered with CDMA and GSM

Figure 1: The LTE System Architecture Evolution (SAE)



networks, 4G LTE voice calls will be over the carrier's IMS (IP multimedia subsystem) network. However, in order to offer a seamless user experience, the call may transition between 2G and 3G (circuit switched) and 4G LTE (packet switched) domains.

SS8's Xcipro product provides a single platform for interoperating with multiple technologies simultaneously. The Xcipro product has been integrated with leading vendors of 2G and 3G network equipment and offers compliance with an array of international handover standards.

XCIPIO DIFFERENTIATORS FOR 4G LTE NETWORK COMMUNICATIONS COMPLIANCE DEPLOYMENTS

The migration to 4G LTE significantly increases CC technology requirements for wireless network operators. The amount of bandwidth generated by each individual intercept will increase exponentially as many new services are delivered over 4G LTE. IPv6 support is an underlying requirement for 4G LTE networks. As compared to other communications compliance technology products, SS8's Xcipro product line enjoys significant differentiators for monitoring and interception on 4G LTE networks:

- Leading Scalability and Performance
- IPv6 Ready
- Highly Available and Robust

- Wide and Deep Infrastructure Support
- Global Handover and Vendor Support

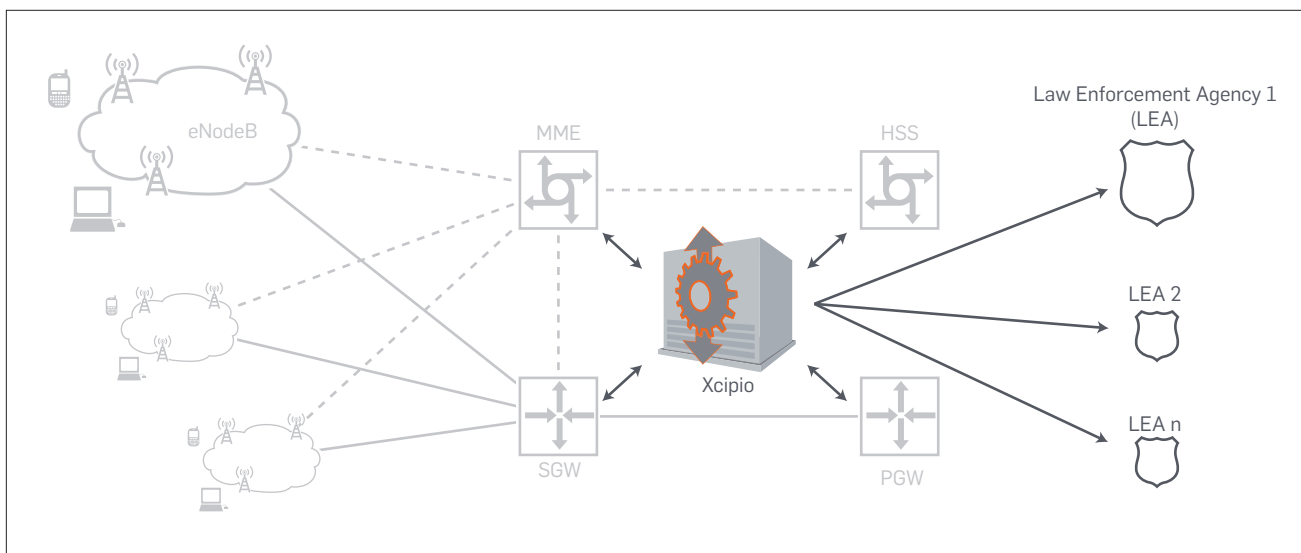
Leading Scalability and Performance

The Xcipro CC solution simplifies increasing capacity thanks to the unique relationship between processing components, which enables flexible, on-demand scaling. An Xcipro solution performs real-time optimization across multiple content processors. Xcipro does this by continually checking the load on individual components and evaluating where new filter streams should be directed. Xcipro also uses on-board intelligence to maintain awareness of the usage levels and availability of the pool of content processors. This real-time intelligence enables Xcipro to redistribute filter streams in the event of a server failure, preventing or minimizing any data loss resulting from the outage.

An Xcipro solution can scale to multi-gigabits of aggregated intercept traffic with individual intercepts supported at gigabit speeds. This built-in scalability enables a telecommunications provider to start with the capacity that is needed and easily add more CC capacity as their network bandwidth, subscribers, or number of court orders increases.

The blade server hardware architecture upon which an Xcipro solution is deployed further enhances rapid scalability. Xcipro blades can be added either to improve performance

Figure 2: SS8's Xcipro platform within an LTE network.



or, in conjunction with clustering software, to provide a high availability configuration.

IPv6 Ready

In anticipation of the global proliferation of the latest version of Internet Protocol, SS8 has included top-to-bottom IPv6 support in LTE-ready versions of the Xcipio product line. This includes: support for IPv6 in the underlying server platform, support for IPv6 in communication with content filtering elements, support for IPv6 in analyzing intercept data and support for IPv6 in delivery of intercept information to LEAs. Xcipio also supports most other possible combinations of IPv6 and IPv4 network interactions including handsets running both protocols simultaneously or in concurrent sessions; websites that use IPv6 for chat, file sharing or video chat; IPv6 proxies for hosts still serving IPv4; and, base stations carrying both IPv4 and IPv6 traffic.

Full IPv6 support up and down the network and traffic architecture is a critical capability because failure to support IPv6 in any part of the network or session could obscure traffic and interrupt intercept and monitoring of subscribers without the network operator even realizing this is happening. For this reason, SS8 has taken great pains to ensure 100% IPv6 readiness no matter where in the network or subscriber device the IPv6 activity resides. Further, comprehensive IPv6 support will become even more critical because VoLTE (Voice over LTE) networks are being served via IPv6 and not IPv4. In other words, IPv6 compatibility is mandatory for communications compliance solutions.

Highly Available and Robust

SS8 designed Xcipio to fulfill the highest standards of availability, as required by mission critical applications such as CC. The entire Xcipio stack is integrated with clustering capabilities which allows the system to continue to operate in cases of catastrophic failure. Most Xcipio operators choose to run redundant instances of all Xcipio elements in order to minimize or eliminate any chance of data loss due to system failure. The high availability design also allows for the addition of new hardware when rapid capacity increases are required.

An Xcipio solution has components designed for load distribution for the most efficient utilization of processing.

In real-time, triage is performed, the result of which is intelligent assignment of intercepts to content processing components. Using this framework, the system redistributes intercepts from a failed component to working ones. The state of the system, including availability, is reported via a dashboard. The real time state of the system coupled with alarms and key performance indicators can provide early-warning for failures.

Xcipio components run on carrier-grade hardware with redundant and hot-swappable power supplies and fans. And, in order to meet the tough safety, spatial and environmental requirements for telecommunications equipment, Xcipio servers are NEBS Level 3 certified. Leveraging the IP Multi-Path (IPMP) capability of the Solaris Operating System, an Xcipio solution offers fault-tolerance and load spreading for physical server network interfaces.

Wide and Deep Infrastructure Support

As a recognized leader in the global communication and cyber intelligence market, SS8 embraces interoperability as a core element of integrated innovation. SS8 has performed extensive integration and tested interoperability and compatibility with a variety of partners all over the world. This enables SS8 to provide additional, complementary technologies and services to create a complete end-to-end communications compliance solution for customers within any network infrastructure.

Xcipio supports all of the leading vendors of network infrastructure from voice to data and from wireless to wireline. For wireless operators, this breadth of support covers manufacturers of 2G, 3G and 4G networks. Equally as impressive as the wide support for leading vendors is the depth of support for network elements offered by these vendors. Specifically for 4G LTE networks, Xcipio has integrated with leading vendors of PGW, SGW, MGW, HSS and MME. The strong relationships with these technology partners results in proactive development, technology and roadmap alignment, and interoperability testing to simplify the integration of Xcipio into any LTE environment.

In addition to directly connecting to network infrastructure, Xcipio supports interfacing with legacy communications compliance solutions. Xcipio's amalgamated approach

provides a single point for management, operation and administration. This single point results in more efficient CC operations and lowers costs by leaving legacy systems in place.

Global Support

SS8 is globally recognized as a leader in the communication interception and forensics market. Xcipro offers operators the ability to comply with national and international standards for delivery of intercepted information to law enforcement. This support includes standards from ETSI, ANSI, 3GPP and other recognized organizations. SS8's extensive experience around the world provides operators field-proven compliance coupled with a perspective on regulatory requirements around the world.

XCIPIO 4G LTE DEPLOYMENT ARCHITECTURE

Xcipro's deployment architecture consists of 4 elements. How they are used in a 4G LTE deployment scenario follows, as shown in Figure 3.

Xcipro Control Plane (XCP)

An XCP provides the command and control infrastructure for all LI activity on the Xcipro platform including the following:

- Provisioning of filters on network elements
- Audit, verification and correction

- Alignment, correlation and aggregation
- Formatting into industry standard handover
- Logging of activities of end users

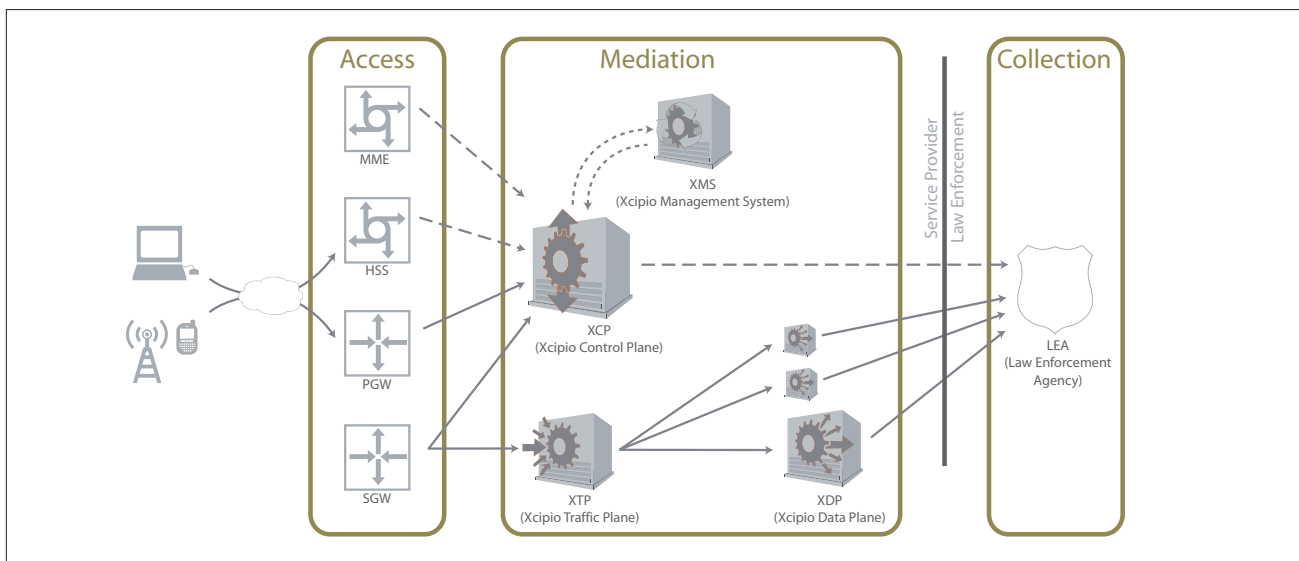
Xcipro Data Plane (XDP)

The XDP provides the primary content processing engine for an Xcipro solution. Most Xcipro solutions have at least two XDPs in order to assure the highest level of availability and to eliminate a single point-of-failure. Typically network operators will add additional XDPs following an N+1 redundancy structure when they need additional processing capacity to handle higher bandwidth coverage or additional subscriber coverage.

Xcipro Traffic Plane (XTP)

The XTP functions as a highly intelligent load distribution point and availability assurance element for filtered communications. It aggregates filtered traffic and distributes it to the appropriate XDPs. It also performs bandwidth accounting and throttling to optimize system performance. Correspondingly, this capability provides excellent redundancy and high availability by enabling an Xcipro solution to quickly shift traffic from one XDP to another (or multiple XDPs) with minimal monitoring and intercept interruptions.

Figure 3: Xcipro 4G LTE deployment architecture.



Xcipio Management System (XMS)

The XMS provides a simplified GUI management tool for provisioning and administering an Xcipio solution. With an XMS, a user may: quickly create, modify and delete XCP, XDP and XTP components; configure and manage court orders and filtering hierarchies; create modify and delete users and perform audits of user actions; and, monitor system status and track key performance indicators through dashboards and automatically generated reports.

CONCLUSION

The transition to 4G LTE networks by wireless providers will radically increase technology demands on communications compliance tools. LTE networks will not only exponentially increase bandwidth per subscriber but also dramatically increase the types and numbers of services regularly accessed via a wireless data connection. SS8 has demonstrated its leadership in the space by continually enhancing Xcipio to be ready for the challenges that our customers face. Xcipio provides wireless network operators the most comprehensive, efficient, and technologically advanced solution to the new monitoring and intercept demands of 4G LTE networks.

ABOUT SS8

SS8 is a leading worldwide provider of innovative regulatory compliant, communications compliance and high capacity end-to-end communications and cyber intelligence solutions. From access to mediation and monitoring to next generation criminal and national security intelligence analysis, SS8 can meet the data discovery and analysis needs for today's fast and complex networks. SS8's solutions enable telecommunications providers, law enforcement agencies ("LEAs") and national governments communications compliance and cyber monitoring of both current- and next-generation voice and ip data communications in accordance with local laws and standards.

For more information about SS8 and SS8 solutions, please visit us on the web at <http://www.ss8.com> and follow us on Twitter at [@SS8_Inc](https://twitter.com/SS8_Inc).



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