

Dueling Architectures: Control plane vs. User-plane

Which is right for you?

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As the marketing department for a Wireless Service Provider verifies that LBS delivers a solid ROI, engineering must work to formulate a method of deploying location-based services. The two prominent avenues are control-plane and user-plane, each of which has inherent advantages and disadvantages.

Initial LBS implementations used the signaling network for deploying services. This "control-plane" approach, while highly reliable, secure, and appropriate for emergency services, is costly and in many cases, overkill for commercial location-based services. The cost is prohibitive and oftentimes kills the business case for commercial LBS. For both CDMA2000 and GPRS/UMTS networks, an IP-based approach known as "user-plane" has emerged, allowing network operators to launch LBS without costly upgrades to their existing SS7 network and mobile-switching elements.

Taking a look at the control-plane approach first, this architecture consists of a position determination entity (PDE)/Serving Mobile Location Center (SMLC), mobile positioning center (MPC)/Gateway Mobile Location Centre (GMLC), geoserver, location-based applications, and content. In this configuration, the MPC/GMLC effectively serves as the intermediary and gateway between the applications, running in the Web services space, while the PDE/SMLC runs in the signaling space. It serves as a holding agent for subscriber location

information and facilitates push and pull transactions. A "push" transaction might be an application that locates a subscriber and delivers a message, perhaps about a sale at a store nearby, while a "pull" transaction would consist of the subscriber invoking a service, such as Find my Nearest ATM machine. The service set-up and communication is performed via traditional signaling network. The MPC/GMLC also serves as a place to perform general administration functions, such as authentication/security, privacy, billing, provisioning, and so on.

A user-plane architecture is similar to control-plane but does not include the full functionality of the MPC/GMLC. Instead it allows the handset to invoke services directly with the trusted location applications, via TCP/IP, leaving out traditional SS7 messaging altogether. Typically, operators will choose to set up a scaled-down version of the MPC/GMLC to handle authentication/security for the user-plane implementation approach. This method is focused on pull transactions, where the subscriber invokes a location-sensitive service. However, push transactions are still possible and supported through the limited MPC/GMLC function.

Each of these architectures maintains its own advantages and disadvantages. The chart below discusses these as they pertain to carrier selection criteria:

Criteria (Ordered in perceived importance to carriers)	User-plane advantage	Control-plane advantage
Architecture and implementation	Fewer elements involved, resulting in less complexity, cost, and impact on the network	
Risk	Less costly to implement, offloads service development to third parties, while the operator maintains control over enabling those services with a location	Utilizes the more reliable SS7 network
Service options		More complex design lends itself to more robust service choices; in addition, voice-controlled services are also easier to implement
Management/upgrades	Fewer moving parts result in lower operating expenses; upgrades don't impact as many elements	
Control		Standards for location gateway are better defined for implementation
Extensibility (for developers)	Allows third parties to develop and host services with minimal network impact	
Service addressability		Allows operators to deploy services to subscribers with or without data connectivity

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