

## Summary

# Executive summary

Mobile phones are by far the most pervasive consumer electronics devices globally. Even though the global economic slowdown led to the sharpest decline in handset sales since 2001, shipments nevertheless remained above 1.1 billion units for the third year in a row. Mobile phones with GPS receivers have been available since the late 1990s. Technical development enabling GPS integration in mass-market handsets was driven by the FCC's E911 emergency call mandates requiring all US mobile operators to provide high-accuracy location of emergency callers. CDMA and iDEN operators chose to use GPS location technology for locating emergency callers that led to rapidly increasing penetration of GPS in iDEN and CDMA handsets in North America and other parts of the world where CDMA is widely deployed. Emergency call location regulation is being introduced in other regions as well. Canada has chosen to stipulate location accuracy requirements as in the US, while no such rules are yet in place in Japan or in Europe where Cell-ID-type location accuracy so far is enough for compliance.

The number of GPS-enabled GSM/WCDMA handset models is growing fast. Disregarding handsets only available in Japan, as well as operator-specific variants of base-models, the total number of models that are available on the market has grown from 80 in 2008 to more than 180 at the end of 2009. Since 2008, all tier-1 vendors have started to ship GPS-enabled phones for markets worldwide. The attach rate for GPS is growing rapidly in GSM/WCDMA handsets, from less than 8 percent in 2008 to 15 percent in 2009.

Sales of GPS-enabled GSM/WCDMA handsets grew to an estimated 150 million units in 2009, up from 78 million devices in 2008. Berg Insight forecasts that shipments of GPS-enabled GSM/WCDMA/LTE handsets will grow to 770 million units in 2014, representing an attach rate of 55 percent. Including handsets based on other air interface standards such as CDMA and TD-SCDMA, GPS-enabled handsets sales are estimated to reach about 960 million, or 60 percent of total handset shipments in 2014.

Handset vendors are increasingly focusing on improving the user experience through software and applications. Especially smartphones are receiving more attention from handset manufacturers, mobile network operators, application developers and last but not least users. Smartphones are devices that support installation of native third party applications. In the past, smartphones have been more costly than featurephones, but chipset vendors and handset manufacturers are now developing low cost smartphones with unsubsidised retail prices below € 100 for launch in 2010. Smartphones costing about € 50 can be available on the market in 2014. Encouraged by Apple's success, major handset vendors and several leading mobile operators have now launched on-device application stores that allow users to download applications directly to their handsets. Many of these applications have some kind of support for GPS location.

GPS technology for handsets has matured, offering much better performance in terms of sensitivity, power consumption, size and price than was possible a few years ago. Support for other satellite systems such as GLONASS and Galileo will also be added over time. The first handsets with receivers for GPS and GLONASS are expected to become available in 2011 and mobile phones with Galileo compatible receivers can be expected in greater numbers in 2014 when the new system will become operational.

The OMA SUPL A-GPS standard has enabled lower cost deployment of A-GPS services that ensure a better and more consistent user experience necessary for the consumer market. SUPL allows deployment of A-GPS services that reduce the time-to-first-fix, lowers power consumption and enhances the sensitivity of GPS receivers. New business models have also become possible, ranging from hosted services for operators, to services deployed by handset vendors for end-users that cannot get similar services from their network operator. Besides adding support for other satellite systems that ensures more visible satellites and incrementally better performance in urban canyons, handset vendors are also starting to adopt hybrid location technologies to improve indoor performance. These technologies combine GPS with other wireless and sensor-based technologies, including Wi-Fi positioning, accelerometers, gyroscopes or electronic compasses to gradually improve performance in challenging environments where GPS signals are extremely weak or unavailable.