

# Femtocell Communications for Transportation

The IntelliDrive<sup>SM</sup> communications architecture has centered on Dedicated Short Range Communications (DSRC), which suffers from several hurdles that limit full realization of the desired goals. The limited radio vendors and chip set suppliers, combined with slow market growth of V2V/V2I deployment, leads to expensive equipment with little realization of cost reduction due to economies of scale. Additionally, there is limited incentive for communication service providers to participate jeopardizing long term sustainability.

This white paper proposes a technology solution that leverages the economies of scale of cellular product and incorporates a long range backhaul component. The solution is composed of two new and unexpected disruptive technologies. The first is the Femtocell, a very low cost base station that is currently in deployment by service providers to provide coverage in homes to supplement coverage and to provide effective competition with WiFi. Second, a new technology that utilizes unoccupied TV spectrum (whitespace communications) provides long range high-bandwidth backhaul to overcome many of the limitations of DSRC based infrastructure.

Placement of Femtocells along the transportation infrastructure has multiple benefits for the service provider. It provides very high capacity, enabling new ITS services, and opens up new applications and markets for the service providers using a system that is fully compatible with its existing network. This provides a powerful incentive for the cellular service providers to underwrite the cost of safety applications. In exchange for selling additional services to consumers, the approach enables automobile manufacturers to reduce subscriber unit costs, realize recurring income for future upgrades, enables connectivity with existing handheld devices, and provides the U.S. DOT with a revenue stream by leasing spectrum to providers.

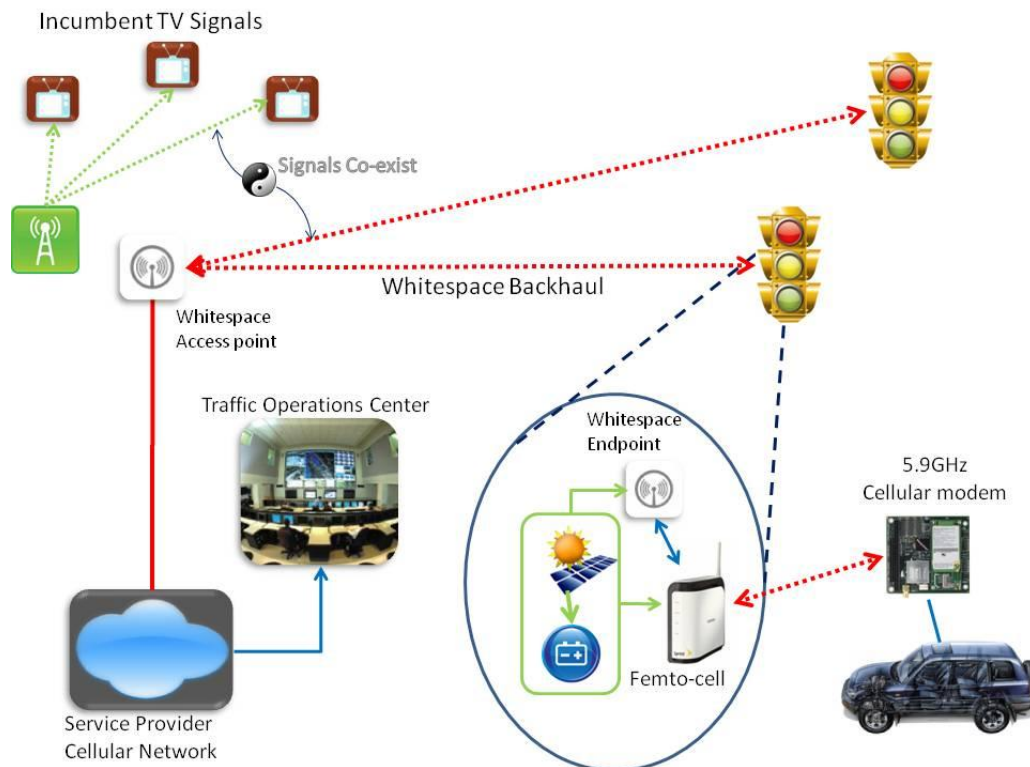


Figure 1. Architecture

Technical research issues include assessing the adaption of Femtocell technology to an outdoor vehicle based application (including latency issues), defining the network architecture, identifying requirements for configuring the technology to a 5.9GHz spectrum, investigating the scalability limitations for number of users while maintaining the required quality of service, and assessing the security and prioritization needs of IntelliDrive<sup>SM</sup> day one applications.