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Title: Advanced Wireless Technologies at DARPA  
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The US Department of Defense (DoD) emphasizes reliance advanced warfighter communications and information concepts in DoD's Joint Vision 2010 and 2020 documents. The communications needs of the US Military pose many unique challenges not readily addressed by the application of commercial technologies. Paramount among them is the warfighter's need for assured communications anywhere in the world, without access to a fixed infrastructure, and with zero setup time. The challenge is increased as the military transitions to using smaller, highly mobile fighting units requiring adaptive inter- and intra-unit voice and data connectivity. Similarly, the military is pursuing the use of unattended sensors, remote ground vehicles, and unmanned aircraft requiring highly-adaptive network technologies that can support high bandwidths.

To meet the projected DoD communications technology needs, the Defense Advanced Research Projects Agency (DARPA) is pursuing the development of new technologies for future wireless communications systems in collaboration with industry, government, and academia. DARPA is developing a number of systems concepts and enabling technologies including peer-to-peer ad hoc networking, dynamic spectrum utilization, software-defined radios, advanced waveforms and coding techniques, as well as various device and antenna technologies.

The latest wireless communications technology undertaking is the neXt Generation (XG) Communications Program. The XG Program seeks to develop both the enabling technologies and system concepts to dynamically access spectrum and autonomously adjust to changes in the spectrum environment while maintaining network connectivity. The program will address changes in frequency, time, and space through adaptive waveforms, frequency agility, advanced access control schemes, and other innovative technologies. The XG program leverages the advances made in past and ongoing efforts in microelectromechanical systems (MEMS), group III-V materials, and adaptive networks. The program aims to improve spectral efficiency by a factor of 20.