



Saving Lives and Property Through Improved Interoperability

***Greenhouse Project
Wideband Data Technology***

Whitepaper

September 2001

Motorola Corporation of Schaumburg, Illinois, has embarked upon a prototype testing and trial process of a new private radio wideband data solution. The Greenhouse Project is the first wireless wideband data system that intends to simultaneously provide wide-area mobile video, voice, and data communications with a potential data rate of up to 460 kbps. The intent of this new system is to allow users the ability to use applications upon wirelessly connected devices, which are normal found upon a desktop or a wired network computer environment.

The creation of the Greenhouse Project technology primarily occurred because of continuing concerns and problems of public safety agencies with radio and wireless data communications. Some of the issues raised by public safety are:

- Frequency Congestion – In many urban areas, allocated frequencies are severely congested
- Frequency Availability – In most large urban areas, additional frequencies are not available for expansion for voice systems or mobile data systems
- Interoperability – The advent and deployment of trunking technologies in many agencies across the nation further segregated inter-agency communications
- Advance Voice and Data Communications Features – The lack of sufficient, available, uncongested spectrum limits the ability to support new and innovative communications features.

In response to the issues raised by public safety, the Public Safety Wireless Advisory Committee (PSWAC) and the National Coordination Committee (NCC), initiated studies and made recommendations to the Federal Communications Commission (FCC) regarding allocations of existing and the new 700 MHz band of spectrum. The resulting action by the FCC provides 24 MHz of new spectrum specifically for public safety services. This allocation of spectrum represents the largest single allocation for public safety and is delineated into two sections for use for narrowband systems and wideband systems.

The Greenhouse Project technology takes advantage of the 700 MHz wideband spectrum allocation and uses a 150 kHz experimental license granted by the FCC. Motorola has developed a new over-the-air protocol called Scalable Adaptive Modulation (SAM) that is purported to achieve significantly higher over-the-air data rates. Initial information indicates that the Greenhouse technology may be up to 48 times faster than existing data communications technologies. The SAM protocol is reported to be scaleable as it may operate in a 50, 100, or 150 kHz channel. Also, the protocol is adaptive as it can adjust the throughput depending upon the distance of the wireless device from the transmitting radio base station tower site.

Motorola has purportedly submitted the SAM protocol for consideration by the Telecommunications Industry Association (TIA) as the new wideband data standard for 700 MHz as it meets the very stringent guidelines including data interoperability set out by the FCC for this area of spectrum. Other technical highlights of the protocol include:

- Internet Protocol (IP) network – allows for end-to-end IP addressing and packet based solution
- Voice over IP (VoIP) – Voice over IP is implemented with an IMBE vocoder using the H.323¹ protocol that supports full duplex operation
- Video over IP – Using the H.263² protocol the system will support two-way streaming IP-based video

In December 2000, Motorola Corporation in conjunction with Pinellas County, Florida deployed and demonstrated Greenhouse Project technology on a “proof of concept” trial basis. The Pinellas County Sheriff’s Office, Pinellas County Emergency Medical Services, and the City of Largo Fire Department are participating in this concept testing effort and have deployed this new technology and solution in seven vehicles including sheriff’s patrol vehicles, a surveillance van, ambulance, fire engine and a fire district chief’s vehicle.

Pinellas County, Florida is a peninsula located on the west side of the State of Florida bordered by the Gulf of Mexico and Tampa Bay and consists of 280 square miles. The 2000 Census estimates the permanent population of the County at 921,482 with an additional 45,000+ seasonal residents and over 4 million visitors per year. Twenty law enforcement agencies and several fire/EMS departments provide public safety services.

Pinellas County was selected to participate and collaborate with Motorola subsequent to a nationwide search for an acceptable host agency. Pinellas County is active in the Public Safety National Coordination Committee (NCC) and has been an early adopter of many innovative technology solutions for public safety including a mobile data terminal system from Kustom Electronics in 1975. The County’s testing agencies hope that Greenhouse technologies will be the foundation of their third mobile data system.

The prototype system incorporates vehicular equipment that closely resembles Motorola’s Mobile Workstation series offering. This equipment includes a color touch screen and color camera installed in the vehicle. The infrastructure is reported to be a single site private radio network operating in the 700 MHz band. It has also been reported that this prototype system only provides high-speed data coverage over an area of approximately three miles from the base station site. This appears to indicate that the system design will be similar to cellular

¹ The H.323 standard was originally developed as an adaptation of H.320, which addresses videoconferencing over ISDN and other circuit switched networks and services. Since H.320 was ratified, in 1990, corporations have increasingly implemented Local Area Networks (LANs) and LAN gateways to the Wide Area Network (WAN). H.323 has evolved beyond a logical and necessary extension of the H.320 standard to include Corporate Intranets and packet-switched networks generally. H.323 utilizes the Real-Time Protocol (RTP/RTCP) from the IETF, along with internationally standardized codecs. With the ratification of version 2, H.323 is also being used for video and other communications, over the Internet.

² H.263 is a standard video-conferencing codec. As such, it is optimized for low data rates and relatively low motion. H.263 is an advancement of the H.261 standard, mainly it was used as a starting point for the development of MPEG (which is optimized for higher data rates.)

systems which would likely have an expensive deployment cost in a wide-area system design. The applications that are supported and being further developed include:

- Distribution of still photographs of person, places or things
- Distribution of incident location specific video (surveillance video)
- Enable access to graphically based documents/information such as building plans/maps, etc.
- Transmission and receipt of fingerprint images, mugshot images, crime/fire scene images
- Transmission and receipt of live “real-time” video of ongoing pursuits or other events
- Computer-Aided Dispatch system integration and information access
- Fire/EMS and Law Enforcement Records system integration and information access
- Local, state and national criminal and information database access and inquiry including photos and signatures
- In-vehicle navigation and mapping supported with GPS/AVL systems
- Video conferencing – 2-way, 1-way, video pull and push)
- Voice Communications – Full Duplex (VoIP)
- Messaging – Local email system connections, Intranet/Internet Email and instant messaging

Pinellas County and Motorola are continuing to evaluate additional applications and opportunities that may be suited for inclusion in the final Greenhouse technology. The County public safety agencies have indicated desires to extend the technology to airborne and marine assets.

Pinellas County and Motorola are hosting tours for interested parties. The next tour date is tentatively scheduled for October 4, 2001. Additional information on tours can be obtained from Tim Goodall of Motorola at (847) 576-5186. Additional vendor information regarding the Greenhouse Project can be found at www.motorola.com/greenhouse.