Tucson Fire Department

2007 ER-Link Tucson

This is one of many sections that contain information, documents, letters, newspaper articles, pictures, etc. They have been collected and arranged in chronological order or by a subject. These items were collected, organized and entered into a computerized database by Dave Ridings Assistant Chief Tucson Fire Department, Al Ring friend of the department, Greater Tucson Fire Foundation and with the help of many friends and fellow firefighters.

All graphics have been improved to make the resolution as good as possible, but the reader should remember that many came from copies of old newspaper articles. This also applies to other items such as documents, letters, etc.

Credit to the source of the documents, photos, etc. is provided whenever it was available. We realize that many items are not identified and regret that we weren’t able to provide this information. As far as the newspaper articles that are not identified, 99% of them would have to be from one of three possible sources. The Arizona Daily Star, The Tucson Citizen and the Tucson Daily Citizen, for which we want to give a special thanks.

Please use this information as a reference tool only. If the reader uses any of the information for any purpose other than a reference tool, they should get permission from the source.

Should the reader have additional information on the above subject we would appreciate you sharing it with us—Assistant Chief Dave Ridings Dave.Ridings@tucsonaz.gov or Al Ring ringal@comcast.net
Name.
AC for TFD over Emergency Preparedness Division
30 years with Department.
Emphasis EMS, Support Services, Fleet and Resource Management.

With me is Richard Nassi, Transportation Administrator and Engineer for COT and Chief Architect of the ER-Link project.
Unique Public Works project intended for the advancement of Emergency Medical Services for the City of Tucson.

Direct beneficiaries of the project include the Tucson Fire Department, University of Arizona Regional Trauma Center, University of Arizona Telemedicine Department.

Most of all the citizens of the community to whom we have the opportunity to provide better patient care.
The objective of ER-Link is to provide a wireless link from a moving ambulance to a base hospital.

The link is intended to support a high resolution live video feed, two way voice communication, and the transmission of medical data.

The system was designed to take advantage of Tucson’s traffic signal assets.

A wireless network was constructed using the City’s traffic signals and connected to the City fiber optic network. This fiber connection was then extended to the University of Arizona Regional Trauma Center.
Film clip from local public access channel.
Outlines the project.
Public Works project comprised of a **four-sided partnership**. Two Municipal, one State, and one Private agency.

**Includes: Public Works, Public Safety, Hospital, and Physician groups**

**Joined together to share the benefits of a relatively new technology.**

**CITY**
Transportation Engineering, Streets, Communications Dispatch, I.T specialists., City Attorney’s office.

**UMC**
University of Arizona, University Hospital, University Physicians, UofA Telemedicine Department.

**FIRE - EMS** - Tucson Fire Department.
The City’s TRANSPORTATION Department saw the potential usefulness of a broadband connection to all traffic signals. Currently leased phone lines are used to bring back basic data from the signals. Once the new system is rolled out, a full set of data will be available from each intersection, as well as video detection.

FIRE should be able to improve its EMS service to the public by bringing a virtual physician to the scene when necessary. The potential for expanded use of wireless technology also makes this project extremely attractive from a user standpoint.

University of Arizona Medical Center will be better able to allocate its scarce human and physical resources prior to arrival. Data, voice, and video will feed through the same pipeline and be received at the same console, streamlining patient records and tracking. Future potential of the system is of paramount consideration. Physician-directed treat and release situations should increase, saving time and expense for both the hospital and Fire EMS. Conversely, documentation of patient refusals should help to reduce legal exposure. Many other applications should also be made possible.
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The project was made possible by a Federal Highway Administration/DOT Intelligent Transportation System (ITS) grant. The partnership between Public Works and Tucson Fire/EMS was a key factor in securing the grant. The City’s portion is a dollar for dollar in-kind match. Money arrived from the grant in 3 parts over a 3-year period.

Additional funding is being sought for a second phase of the project, through an ITS grant applied for in 2007.

For TFD, once the initial implementation is completed and effects of the system are measured more accurately, we should be able to direct energy toward the most useful applications.
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A glimpse of the process that Tucson went through to bring the project to completion. The effort was arduous, but the payoff will hopefully be significant.

Credit for this effort goes almost entirely to Richard Nassi, the City’s Traffic Engineering Administrator.

San Antonio - Lifelink
Las Vegas - Microwave system
Rochester, MN - Mayo Clinic RescueNet
Garland - NexGen City

STRAW POLL OF WIRELESS SYSTEM USERS?
Primary goals:

1. Build it.

2. Make the system work for the urban area.

3. Consider the possibilities beyond the immediate project before someone else does.

4. Position the department for system expansion.
• Ambulances currently use 2 x 100 amp alternators. Draw is approximately 175-185 amps at cold start. Drops the load to 135-139 amps or a reduction of 40-44 amps.

System uses 15-16 amps.

• Licensing fee language built into the contract… Based upon any new technology developed by the vendor as a result of the program.

Additional applications include:
• EPCR - Roam IT/ Rampart - January 2008 - scheduled for cellular transmission for 1st year.
• 12-lead telemetry - currently transmit via cellular provider.
  
    **Key is elimination of leased cellular line charges.**
• Fireground wireless communication
• Potential for other data transfers such as sonograms.
1. Provides an enhanced means of communication between Medics and Physicians.
2. Physicians can speak with patients and directly view responses.
3. Provides a direct view of accident scenes, mechanism, and the nature of traumatic injuries.
4. Enables earlier notification of surgical specialists, improve triage capability, reduces wasted energy preparing for trauma cases, including mass casualties.
5. Potential to address patient refusal and frequent flyer situations.
6. QA/ CQI
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RFI was created for the project. The successful bidder was what amounted to a second partnership group, brought together by the Integrator/General Contractor, Wireless Facilities Incorporated. (This company subsequently old out to SmartWA VE Technologies in 2007).

Comprised of at least 3-4 private sector companies:

**TROPOS** - provides the network radio hardware. Based upon military technology first used with the Abrams tank.

**GENERAL DEVICES** - provides the teleconference equipment including **CAREPOINT** receiving stations.

**MEDTRONIC** cardiac equipment EKG and AED. Link to 12 lead telemetry. Change to **PHILLIPS** AED in 2007.

**Local agencies** hired for Tropos traffic signal and vehicle equipment installation.

An good example of American Ingenuity at work. Taking existing technology and putting it together in a different and effective manner.
ER-LINK TUCSON
WIRELESS MESH NETWORK

- 225 Square Mile Area
- 300 Total Node and Gateway Radios
- 17 Ambulances
- 1 Hospital

• Includes video, voice, and data communication. Coverage expected to be 95% within city limits per contract stipulation.
• Network encompasses the area within the City limits - approximately 225 square miles.
• Wireless radios attached to City-owned assets - traffic signals and light poles placed at 1/2 to 1 mile intervals.
• Gateways - radios connected to City fiber.
• Nodes - relay radios providing connectivity.
• Interior cameras to all units.
• Only 1 external camera at present.
City limits showing **mesh network, node and gateway locations**. In addition to traffic signals and light poles, gateways are mounted to city-owned buildings such as fire stations, libraries, police substations, etc.

As ambulances travel along city streets, the signal is transmitted from one radio to the next. Connectivity has been excellent to date. Signals, if dropped, pick up within a matter of seconds in real time.

**SE area** of the city - large sections of vacant land without signals. Light poles will work if needed. Call volume is lower and coverage less necessary.

**Geography.** Tucson is relatively flat, with mostly scattered high rises. Also not heavily wooded.
Radio units attached to traffic signals and city buildings at **1/2 to 1 mile** intervals along **main and secondary arterials**. Designated for either **Gateway connection** or **Nodal transfer**.

Pole and building mounted **Gateways** are connected to the City’s fiber optic network, while pole mounted **Nodes** are wireless radios that only transfer signals and are not connected to fiber.

**Mbps** - Megabits per second  
**VAC** - Voltage AC power  
**Antennaes** being switched out due to leakage.
Vehicle mounted radio, identical to the Tropos 5210 unit in configuration, but with a different housing.

Frequency is 2.4 Ghz. Open channel, only mobile application at present, travels farther, goes around objects, self-adapting. Outdoor use, poles are at a reasonable height, outdoor power is greater. Have not experienced signal interference to date.

4.9Ghz Public Safety frequency - less reach, no mobility, point to point only.

VDC - Voltage DC
Tropos information on system security. Again, equipment is based upon specifications for military applications.

Tropos mesh radio to mesh radio traffic only utilizes the highest level of encryption (AES) standards.

2. **ESSID** - Enhanced Service Set Identifier. Separates traffic.


4. **MAC** - System only works with serial numbers of each individual device.

5. **HTTPS** - Config. Utility is encryption.

6. **AES** - Tropos to Tropos. 128 bit.

7. No network identifier. Mobile network not stated.

Also includes: VPN filtering (not used) - rejects non-VPN traffic. Packet filtering (not used) - limits file sharing, etc.

Engineers say the weak link is the City’s network, not the wireless system.
• **Uses Pan-Tilt-Zoom camera.** Both the ER physician and Paramedic have control.

• **22x optical zoom.** Provides the physician with excellent resolution of injuries or patient condition.

• **Resolution 352 x 288 at 30 FPS.** Unit can only be turned on by the ambulance crew.

• Two Carepoint stations will be located in the hospital; one in the Telemetry Room and one in the Telemedicine department office on the 5th floor, some distance from the ED.

• **Rosetta/ Carepoint** system includes a specialized PC running WinXP embedded with restricted access users.

• **Cost** for the Rosetta VC equipment is approximately $30,000, not including the driver compartment monitor and external camera.

• External camera cost is $5000.
View of the **data transfer path**. Lifepak 12 to Rosetta VC to Tropos radio to fiber optic to Carepoint (ED) through Lifenet RS to Cardiac Data research office (Per Medtronic stipulation).

Transfer of 12-lead data permitted under a special agreement between Medtronic and General Devices.

System is **HIPAA compliant**.
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Conducted in October 2006

The Development Phase was a sort of “proof of concept”. Previous to this, a four mile test was conducted to confirm that WiFi technology would work on a moving vehicle.

A 1-square mile grid was tested in April 2007 utilizing 9 nodes and gateways. Signal penetration through the neighborhood was almost 100% for all locations within the boundaries.
Quality Assurance will be developed over time. Program is not intended to spy on paramedics.

Anecdotes

“FLIP OFF”
FREQUENT FLYER ALCOHOLIC
• Initial use will be limited to Trauma cases per the Dept.’s Medical Director.

• Video will not be recorded or made part of the patient report at the outset.

• Eventually will be, we assume. Lawyers and physicians say no to start.

• Want to obtain maximum participation and buy-in from the Medics at the outset.

• SOPs will be clarified as we get used to the system. Important to allow as much Medic control as possible.
• Expand system infrastructure for department - build-out of external cameras, driver display, participation of all hospitals. 911 dispatch center would only be provided with a view from the external camera.

• Use of video to either encourage or discourage transport.

• Increase level of trust between hospital and pre-hospital workers. Should be a relationship builder, and not result in a Big Brother scenario.

• Medical-legal - May become used to reinforce and verify proper Medic actions at a scene. Potential to reduce exposure and liability.
• Eliminate reliance on and cost of leased cellular transmissions.
• EPCR - Joining statewide consortium using a common report. - January 2008
• Improve efficiency for Medics and billing staff. Increase in collection percentage?
• Local Mass Casualty Incidents (MCIs)
• Regional Metropolitan Medical Response System MMRS response that requires multiple agency participation at the regional and state level.

• Homeland security - video link from mobile to mobile application. 
  **Eventually hope to link to regional and statewide communication system**

• Fireground - Communication with firefighters inside structures. Wireless video Thermal Imaging, etc.
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After Phase 1 of ER-Link is finished, the City of Tucson Transportation Dept. will begin a project to connect all traffic signal devices within the city to the wireless network.
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Intersection video access. Richard should talk about.

FIRE DISPATCH will have access to intersection video and be able to provide relevant information to responding vehicles.
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- To insure first rights to the system, a City Ordinance was developed to restrict access to all other agencies except Public Safety and Public Works. A class 6 misdemeanor was also established for hacking into the system. Has not been signed as of yet.

- Wireless initiative for citizen use is on a separate track.

- $2.6 million for TFD expansion. Includes driver displays, external cameras, all community hospitals, and adjacent fire departments - NWFD.
PHASE 2 - METRO
PLANNED IMPLEMENTATION

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For TFD and all participants, it comes down to judging the risk v. reward for the new system.

**Risks** include:

- Expansion of patient record - liability concerns
- Hacking - HIPPAA violations
- Big Brother syndrome.

**Rewards:**

- Enhanced patient care.
- More efficient use of resources.
- Development of new Fire/EMS technology.
- Expanded applications beyond simple video link.

**Importantly** - partnering with other municipal, government, and private agencies to increase creativity and research, utilize other avenues of funding, consider new products, and open new markets to Fire/EMS.