The **Boundless Security System™** is an ultra low bandwidth, digital video surveillance system. It is optimized for use over public wireless wide area networks. It uniquely meets competing imaging needs for the investigation of criminals and terrorists, monitoring safety and operations, and situation assessment. It is internally IP-based for the ultimate in communications efficiency, reliability and many-stream video display. It continuously provides three to eight, different digital video streams per camera to meet the competing needs for high image quality, smooth motion, and ultra low bandwidth. All video streams are available time-shifted and recorded, and, bandwidth-permitting, live. Other systems try to handle this wide range of imaging needs with only one or two video streams per camera, compromising image quality and communications speed.
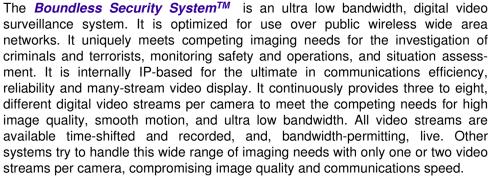
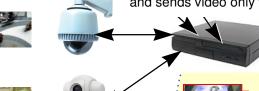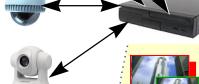Four fixed or PTZ CCTV cameras, or some IP-PTZ cameras (e.g., Sony SNC-RZ25N, RZ30N, RZ50N)

Boundless' **Multi-Stream Video Server** creates and internally records many different, digital, video streams for each of 4 cameras continuously, and sends video only when requested

Internet

Cellular Modem or 3G Mobile Router with cellular data air card

128 Kbps (typ) total to view 4 cameras live at 5 to 15 fps, 0 Kbps if none are viewed

Laptop PC with cellular air card and Boundless' **Control Panel** requests video for viewing

PDA with Windows Media Player

Investigation Stream for each camera has sharpest images with highest, full-camera resolution and fewest artifacts, low to medium frame rate, and highest internal data rate (typ. 0.5 to 2 Mbps)

Monitoring Stream for each camera has medium resolution, smoothest motion at medium to high frame rate, and medium internal data rate (typ. 64 to 512 Kbps)

Situation Assessment Stream for each camera has lowest resolution, low to high frame rate, and ultra low internal data rate (typ. 8 to 64 Kbps)

Deeper shadow indicates higher data rate

Boundless uses bandwidth-saving, video on demand with near-camera recording of many different digital video streams per camera, not bandwidth-wasting video streaming of a single digital video stream to central recording. Remotely view live, time-shifted and recorded video from dozens of cameras from dozens of **Multi-Stream Video Servers** simultaneously at multiple fps per camera on laptops with cellular communications at ultra low data rates. Multiple **Multi-Stream Video Servers** can work together as one site. Remotely perform motion searches and review recorded video rapidly, even with ultra low communications speeds. Remotely view 24 cameras live simultaneously at 10 fps per camera with only 756 Kbps total bandwidth. Live, time-shifted and recorded video are only sent over the air when requested for viewing, minimizing the communications burden on wireless wide area networks and the Internet. Optimized MPEG-4 video encoding maximizes frame rate and image quality for a given data rate. PDA requires Boundless' **Broadcast Control Panel** software on a PC. GSM networks may require Boundless' tunneling option.

Boundless Security Systems
the communications bandwidth experts

Getting Started with Ultra Low Bandwidth, Digital Video Surveillance on Cellular Data Networks

Get Boundless'
Multi-Stream Advantage™:
We put you there !

Boundless' **Multi-Stream Video Server**, a PC running Boundless' **Control Panel** viewing and searching client software, and cellular data Internet service, provide live, time-shifted and recorded digital video, with ultra low bandwidth. Boundless' system:

• makes comprehensive digital video surveillance via cellular IP-data networks practical

• uses bandwidth-saving, video on demand with near-camera recording, not streaming

• continuously records better video internally than can be sent live on wide area networks

• displays live and recorded video from dozens of cameras at once on a wireless laptop

• searches hours of video for motion in seconds with fast, remote review of activity

• has options for dynamic IP addresses and non-routable, GSM cellular networks

• used optimally, helps users avoid violating carriers' fair usage bandwidth policies

Getting Started with Ultra Low Bandwidth, Digital Video Surveillance on Cellular Data Networks

by Steve Morton, CEO, CTO, Boundless Security Systems, Inc., **www.BoundlessSecurity.com**

Cellular data networks are virtually every-where. Used wisely, they provide the wide area network, wireless communications capacity for outdoor, mobile, and temporary digital video sur-veillance that previously was not possible or re-quired dedicated point-to-point wireless networks, and often, problematic analog video transmission. Cellular networks, however, are not a direct replacement for wired networks. Care must be taken to minimize both the need for high speeds, and also the transmittal of vast amounts of data per day or per month that comes even from sus-tained video transmission at very low data rates.

Boundless' ultra low bandwidth, *advanced* IP-based (not conventional IP-based), digital video surveillance system takes advantage of cellular and other wireless, wide area IP-data networks for outdoor, mobile and temporary digital video surveillance via the Internet. Boundless provides live, time-shifted, and continuously recorded digital video from multiple clusters of cameras with better recorded video than can be sent live, and, when used optimally, help users avoid vio-lating wireless Internet Service Providers' fair usage bandwidth policies.

Broadband wireless wide area networks -- most commonly 3G cellular IP-data networks -- simply were not built for continuous transmission, either to or from the Internet, of even low data rate video. The networks were built for browsing the web and sending e-mail, which only require occasional short bursts of data, and enable shared access by many such users simultaneously.

Many carriers protect their quality of service with fair usage bandwidth policies that prohibit exces-sive data transfers. A continuous data stream at only 16 Kbps, a mere 0.26% of the data rate of a DVD movie, moves 5 GB per month, the maxi-mum amount of traffic allowed by Verizon-Wireless, and nearly twice Orange's 3 GB limit.

It is becoming popular to connect a digital, IP-camera to a cellular network and continuously stream the best live video possible to a distant, central monitoring and recording location. Many assume that broadband, wireless wide area cell-ular data networks are replacements for wired local area networks, where high sustained traffic from even multiple IP-cameras can be supported.

However, the raw data rate of a standard defini-tion video camera is 200 Mbps. With high, 50-fold compression, one has a "low" data rate of "only" 4 Mbps -- 25+ times the usable uplink speed of many cellular networks, and 1,350 GB per month. Users of IP-cameras must reduce video quality drastically to move it over wide area net-works, and they should only send it occasionally.

In contrast, Boundless uses bandwidth-saving, video-on-demand with many different video streams per camera and continuously records much better images internally than can be sent live. A block diagram is shown on the cover.

To get started, one needs only:

1) a Boundless' *Multi-Stream Video Server* for indoor and mobile applications. Each one has a unique, meaningful name for ease of reference.

2) one to four cameras, each with an analog composite video output. PTZ cameras with the Pelco-D protocol, and IP-PTZ cameras such as the Sony SNC-RZ30N that have an analog composite video output, can also be used.

3) a 3G modem, or 3G mobile router and cellular data card, with an ethernet port, and data service from one of the cellular companies, to provide an always-on connection of the *Multi-Stream Video Server* to the Internet. No SIM card is required, but modems and data cards are not universal and can only be used with particular carriers.

Alternatively, Boundless' turn-key pole camera system, the *Nail-and-Go™*, can be used. It com-bines 1, 2 and 3 into one. Data service is required.

4) a PC with a wired or wireless Internet con-nection, and Boundless' *Control Panel*, live, time-shifted and recorded video, and motion searching, client software. A site file gives the server names and IP addresses of the *Multi-Stream Video Servers* that can be viewed. Video streams are dragged and dropped into the screen and saved as reusable sessions. Users see *Multi-Stream Video Servers'* meaningful, custom-assigned server names, not IP addresses.

If the cellular carrier, like most, provides public dynamic IP addresses, Boundless' dynamic name service can be used. If the cellular network is GSM, which is often not routable from the Inter-net, Boundless' tunneling option and *Tunneling Broadcast Server* provide comprehensive digital video surveillance where others can't.

Conclusion

Boundless Security Systems, Inc., makes the use of cellular data networks for outdoor, mobile and temporary digital video surveillance via the Internet quick, easy and powerful, and has ultra low bandwidth that doesn't flood the network.