



**Boundless Security Systems, Inc.**  
*solar- and battery-powered outdoor covert pole cameras*  
MIT-trained engineering. Patent-proven innovation.



## ***The Rabbit™* Slashes Private Investigator Labor 10X in Unmanned Video Surveillance**

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Boundless Security Systems, Inc.  
BSEE & MSEE MIT, 25 U.S. Patents  
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**Let's be honest:** With conventional video surveillance gear, no one really watches every hour of video. It's too slow and too painful. Important events get missed. And, because video review is so expensive, the number of hours monitored gets squeezed.

Boundless Security's ***The Rabbit™***: the first ***Anywhere Outdoor CAM***, changes all that. Its ***Rapid Review / Integrated Time-lapse*** enables reviewing an hour of recorded video *over the air in one minute* -- at ordinary cell network speeds -- while ***The Rabbit™*** is still live in the field. By fast-forwarding through a full day in minutes, and easily homing in on details, you can actually review it. And you can do it with dramatically less labor.

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# The Challenges

Providing unmanned video surveillance to clients across a wide geographic area using a large network of agents presents numerous challenges:

- Economically providing longer periods of video surveillance
- Providing video surveillance equipment to agents that is rugged and easily set up and used
- Minimizing skills and training required by agents while providing high quality surveillance
- Providing long run time on a small battery since AC power cannot be used in the field
- Fool-proofing the logistics of shipping surveillance equipment from one agent to another
- Ensuring proper views in the field are provided
- Periodically remotely reviewing recorded footage from each camera in the field to identify subject activity and determine patterns of presence
- Balancing the need for video retrieval with minimizing cellular data costs, especially in areas with limited or congested cellular coverage
- Reducing the cost and monotony of video review while improving accuracy and results
- Delivering frequent, timely, and well-illustrated reports to clients for actionable insights without waiting to retrieve the camera from the field

Boundless' comprehensive approach using **The Rabbit™**: the first **Anywhere Outdoor CAM**, focuses on streamlining operations, optimizing resources, and enhancing the effectiveness of large-scale unmanned video surveillance.



# Introduction

This presentation describes how the combination of Boundless Security's

- **The Rabbit™**: the first **Anywhere Outdoor CAM**, battery-operated, cellular outdoor covert PTZ camera system with four video streams optimized for PI's,
- browser-based, graphical user interface with integrated tools for rapidly reviewing captured video and obtaining snapshots for clients, while equipment is live in the field, and
- cloud-based portal that provides user interface, integrated tools and device monitoring

drastically reduces labor costs and solves data issues of large-scale, unmanned, video surveillance.



**The Rabbit**, 4" dia. x 8" high, including low profile cell antennas, is shown attached to a 3.5" diameter portable basketball pole, is usable horizontally or vertically for wide application



## **The Rabbit™ is Optimized for PI Use**

- Available to law enforcement 3 years ago, now available to PI's
- Easy to use with many labor-saving features
- Small, inconspicuous, all-in-one, just place in concealment, e.g., on its side in vehicle rear window, and connect external battery
- Rugged for frequent shipment in provided Pelican case
- Very low power consumption for long run time on an external battery (continuously run 5+ days on 12V 50AH LiFePO4 battery), with power-saving modes for even longer run time
- Video optimized for PI use
- Continuous high quality internal HD video recording
- Video streams and cellular communications optimized for use in areas with poor or congested cell service
- Optional
  - Built-in GPS and geo-tagged video recording
  - Small built-in rechargeable battery for 6+ hours run time without external battery, for tracking a tampered active unit that is not in a vehicle



## ***The Rabbit™'s* Video is Optimized for PI Use (1)**

- All camera functions can be performed over the air while ***The Rabbit™*** is live in the field, using our graphical user interface
- Four internal video streams, two *normal* and two *time-lapse*, are continuously created and recorded internally, no cellular data is required for creation, and cell network speed / congestion do not affect their internal recording
- The ***normal*** video streams are...
  - ***Situation-Assessment video***, 960x540 @ 10 frames/sec in daylight, used for live viewing, creation of internal time-lapse video, and viewing of recorded video prior to viewing selected high resolution recorded video
  - ***Evidentiary video***, 1920x1080 @ 10 frames/sec in daylight, *much* sharper than lower resolution video especially when there is motion, used by ***Image Timelines*** for snapshot selection and download



## ***The Rabbit™'s* Video is Optimized for PI Use (2)**

- The ***time-lapse*** video streams are...
  - Pedestrian-tuned, high frame rate, ***Time-lapse hour video***, optimized for capturing images of persons walking, has one frame every 3 sec and 960x540 resolution, enabling reviewing an hour's activity over the air in one minute with only 4 MB of data
  - ***Time-lapse day video***, has one frame every 5 minutes and 1920x1080 resolution, to detect when something is removed, dropped off, or changed, enabling reviewing 12 hours' activity over the air in one minute with 8 MB of data
- Time-lapse hour video should be used to quickly spot subject activity, using our patented ***Rapid Review / Integrated Time-lapse***, followed by minimal use of normal recorded video, to quickly drill down to the best snapshot of the subject, using our ***Image Timeline***, both of which are integrated into our online graphical user interface



## Integrated Tools

- Integrated into the *Main Viewing Page* of Boundless Security's online graphical user interface
  - View: live video, normal recorded video, and time-lapse recorded video
  - *Rapid Review Integrated Time-lapse* – switch back and forth between time-lapse video and normal recorded video to spot a subject
  - *Image Timeline* – get the best snapshot of a subject out of video without having to download or manipulate any video
  - Event-list creation – view time-lapse video and click each time the subject is spotted, keeping eye on the video
  - Motion graphs
  - Download video
- Save labor and reduce tedium of reviewing video



## 1-Minute Overview Image Timeline

The *Overview Image Timeline* has 60 thumbnails one second apart, of which this screenshot shows only 30. All activity during those 60 seconds can be seen in *one view*. Suppose we want a snapshot of the FedEx truck we spotted...

The screenshot displays a grid of 30 thumbnail images arranged in 5 rows and 6 columns. Each thumbnail is labeled with a number (1-30) and a timestamp. A vertical timeline on the left side of the grid indicates the time progression, with labels for 5-second intervals (5 sec, 5 sec, 5 sec). An arrow points to a specific thumbnail (number 27) showing a FedEx truck. A text label next to the arrow reads: "FedEx truck about 350 feet away".



## 5-Second Detail Image Timeline

Drilling down in time, the *Detail Image Timeline* has 50 thumbnails 1/10 second apart, of which this screenshot shows only 30. All activity during those 5 seconds can be seen in *one view*. Suppose we want the best snapshot of the FedEx truck that we spotted...



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## Snapshot Obtained from Image Timeline

Drilling further down in time, a 1920x1080 snapshot is obtained from the *Detail Image Timeline* simply by clicking on the thumbnail image that shows the subject the best. One can also easily download a short, high resolution video clip that contains this image to show, for example, a person's agility.



Raw image of FedEx truck about 325 feet away, captured by our equipment

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## Operational Cost Estimate with *The Rabbit*™ for Monitoring 60 Hours of Video (1)

- We assume
  - a job is to remotely monitor 5 days of subject activity
  - 12 hours/day of video are monitored, no motion-activated video clips
  - loaded labor cost to download and review video is \$50/hr
  - all 60 hours of video are reviewed; a job-by-job heuristic – guessing when the subject may be present -- to review less might be used as a pattern of presence emerges but at the risk of missing activity
  - cellular data costs \$3/gigabyte
- Three methods of downloading and reviewing video are presented, using different video streams, the first two methods use normal recorded video, the last method, the most efficient method, uses Boundless' high frame rate time-lapse technology
- Video is viewed online from *The Rabbit*™ using Boundless' graphical user interface and, in the most efficient method, Boundless' integrated, *Rapid Review Integrated Time-lapse*

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## Operational Cost Estimate with *The Rabbit*™ for Monitoring 60 Hours of Video (2)

Worst case costs to download and review 60 hours of video at \$50/labor-hour are about:

Type of video	Data / hr of video	Data cost / hr of video	Data cost / job	Labor hours / job	Labor cost / job	Notes
\$\$\$\$\$: Normal, high resolution (HD) video	900 MB	\$2.70	\$162	>30	>\$1,500	Viewing at > 2X speed unlikely due to cell speed limits
\$\$\$\$: Normal, lower resolution video	86 MB	\$0.26	\$15	15	\$750	Can view at 4x speed due to low data rate
\$: Time-lapse hour video	4 MB	\$0.012	\$0.72	2 (least tedious)	\$100	View at average of 30x speed

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## Roadmap

### •Today:

- The Rabbit™** has been in use by law enforcement for two years and is now available to PI firms
- Pedestrian-tuned time-lapse hour video** – continuously created in **The Rabbit™**, no cell data required to create it, optimized for spotting subjects walking, greatly reduces cellular data required to review long periods of time for subject activity, **enables viewing an hour's video over the air in one minute**, downloads faster than the time to view it, greatly reduces tedium of reviewing long periods of recorded video for subject activity
- Rapid Review Integrated Time-lapse** – enables switching back and forth between integrated, time-lapse video and normal recorded video, to quickly spot subject activity and obtain video clips of the subject
  - **Overview** and **Detail Image Timelines** to help drill further down in time and quickly obtain the best snapshots of the subject

- Future:** Cloud-based, AI-based, video analytics instead of human review of time-lapse hour video to automatically spot subject activity within a user-selected portion of the field of view, and select short video clips for user to review

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## Conclusion

Boundless Security has built a smarter way for PI firms to operate large fleets of unmanned video surveillance. Key benefits include:

- Significant Cost Savings: **Forecasted 10X reduction** in video review cost
- Enhanced Accuracy and Efficiency: Reduces the tedium and inaccuracies of reviewing video recordings for subject activity
- Increased Monitoring: minimal additional labor to extend monitoring hours
- Integrated Solution: A seamless combination of hardware and software
- Optimized logistics for shipping surveillance equipment among agents
- User-Friendly Design: Easy to use, intuitive, little training required
- Workforce Optimization: Decreases the number of agents needed, and the training required, while maintaining high surveillance performance
- Streamlined Reporting: Facilitates frequent evidence-based reporting to clients, even while surveillance equipment remains active in the field
- Scalable Operations: Removes barriers to building and managing large-scale surveillance networks effectively

**In short, Boundless Security's The Rabbit™: the first Anywhere Outdoor CAM, enables PI firms to do video surveillance more economically, more reliably, and with greater capacity to grow.**

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