

## How Nomad Eyes™ Is Different

compiled 23.April07, M. Dudziak

There are many companies, NTI Group and others, making big efforts these days to market and sell their products as the solution for providing faster, wider, more comprehensive notifications and alerts via mobile and internet means.

All I want to say at this point is that what we have built, called Nomad Eyes™ (and known to many of the top administrators at the Dept. of Homeland Security, Dept. of Defense, and others, including Virginia's Office of Commonwealth Preparedness), is quite different.

Nomad Eyes™ incorporates intelligence – both automated and human – in a manner that is adaptive and attuned to the kind of threats from which we all want protection.

For instance, it has in its design a feature by which your friends and family can be notified, almost simultaneously with the notifications going to you. This is just one of the differences.

Nomad Eyes™ is to our knowledge the only situation awareness, notification and response network that has fault tolerance and fail-safe mechanisms built-in and that has been designed from the perspective – from the careful, analytical and psychological study, of how terrorists and criminals think and act. We spent years analyzing how people like Kaczinski, McVeigh, Atta, and Cho think, feel, breathe, and act.

This is not in other products. They may have slick marketing and fine suits – we have a better technology and a more human-oriented solution.

### APPENDIX

A compendium of some FAQs about Nomad Eyes™ from various published and “white paper” documents:

#### **I. What Does It Do**

With NO CEBIT explosive-detecting sensor:

- 1) Police and also an automated situation-awareness responder system could have been alerted faster, and thereby:
  - 1.1) Woltinsky's car could have been tracked by police before he dropped off Saksak (referral to the Eliat, Israel incident)
  - 1.2) Saksak could have been tracked and not "lost" (because Woltinsky was unable to follow closely)
  - 1.3) Saksak could have been neutralized directly, or condoned off, or otherwise limited in his operating capacity

## How Nomad Eyes Is Different

1.4) An evacuation plan could have been initiated, instead of none at all

2) At the same time (in parallel), civilians (selected or wider audience) in the area could have received automatic alerts, and thereby:

2.1) preparation and expectation

2.2) evacuation, dispersal

2.3) closing shops, access, etc.

2.4) basic "heads up and watch your behind" initiated by the regional likely-affect populus

3) In parallel,

3.1) Advance information including potentially photos of:

3.1.1) Saksak

3.1.2) neighborhood

3.1.3) projected direction of movement

3.1.4) predictable targets

3.1.5) possible sightings of Saksak's accomplices/supporters if any were on the scene

3.2) Assistance post-event to police/security forces with Better Quality and More Specific Information for analysis and ultimately for tracking and interception of the operatives and the breaking of their operative cells

Summary:

More information, sooner, more widely dispersed, to the right people at the right time and in the right place, about the most relevant people, place, time.

With a CEBIT explosive-detecting sensor based upon precisely TODAY's current version of the chip:

1) All of the above plus:

1.1) Discriminating detection of Saksak's explosives when he got into Woltinsky's car, or even before entering the car

1.2) Confirming detection that it is an explosive while they are riding in the car together

1.3) Likely ability to discriminate from various false positives such as vegetables or fruit

1.4) Coupled with the rest of the information, this could have made it more definite and clear that Saksak was a bomber or in some fashion carrying explosive compounds, and that information could have been used to make a decision about how to intercept and neutralize Saksak with a minimization of collateral damage.

2) Deterrence

Saksak and others will be hampered by knowing that Nomad Eyes "are everywhere and nowhere" to be found - this is the basic point why Nomad Eyes is a powerful deterrent even if the explosives sensors are not so fault-less right now - Dr. Tegnalia (DTRA Director) understood this immediately this morning.

Summary:

All of the basics, plus the explosives detection and deterrence factor.

## II. What Technologies Are Needed For Its Set Up and Implementation

## How Nomad Eyes Is Different

0. The current prototype that exists (see VIII below)
1. Install the existing software onto a standard Linux server or cluster
2. Agreement with at least one cellular network provider for the uploading of simple software (like what is in used today) to cell phones
3. [Optional] Integration of the current CEBIT sensor chip set to a cell phone, or use of the current prototype Sniffex device
4. Modifications and tweaking to the existing software on both the server and the units
5. Adding operational response rules and commands - this can only be done for each specific configuration, each installation
5. Basic required technologies are completely COTS (commercial off-the-shelf) or in-house

### **III. Who Manufactures and/or Supplies the Nomad Eyes Technology**

Version 1

COTS phones, servers, everything + [optional] sensor plug-ins (TETRAD + ORNL + subcontractor)

Software, support, installation, configuration - in-house (plenty of subcontract people locally)

Version 2

More done in-house and through a large wafer fab and electronics assembler

Summary:

Get a Purchase Order for the Prototype and there will be no problem whatsoever to provide anything that needs to be mfgd or assembled

### **IV. What Are the Set Up and Maintenance Costs For a Medium High Risk Sized Facility**

N/A really for what we are talking about

I think the Nomad Eyes POPE Prototype paper goes into this

It is all about scope scope scope. The scope determines the numbers of units and work of deployment.

### **V. What Kinds of Facilities Are Suitable For Nomad Eyes**

- 1) Cities, towns as municipal entities
- 2) Public transportation systems (e.g., London Tube, Washington Metro, Chicago Transp. Auth., Fraport)
- 3) A large corporate plant site (but better as part of (1)/(5))
- 4) A large university campus (ditto)
- 5) Civilians, the open world of people who are already in a cellular phone or wireless ISP network, the ones using the phones, PDAs, iPods.

### **VI. What Personnel Are Needed If Any To Monitor/Analyze The Information**

This can be done either of two ways:

- 1) We provide the system with the automated analysis and it ties in with existing police, hazmat, health, homeland sec, other systems and it is another major source of input (reduced from massive amounts of data to small pinpoint alerts, of course) to their existing systems

## How Nomad Eyes Is Different

2) We can also provide human monitors who are auxiliary to our automated system

### VII. How Does TETRAD know that Nomad Eyes Works

- 1) Prior simulations, both computer-based and on paper
- 2) Evidence from smaller versions of similar experiments
- 3) Experimental results with the sensors
- 4) Historical case studies of where similar types of information have been unofficially or informally collected and have demonstrated their utility
- 5) Mathematically rigorous models and plain, simple mathematics and physics, well proven in other similar models - subsurface microwave and optical sensing, submicron surface imaging, towed-array sonar, array radiotelescopy, particle beam physics - need more???
- 6) Common Sense

### VIII. Link to a Simulation Tool of Nomad Eyes

<http://nomadeyes.com/use.php>

Of course, it is better if you have a cell phone with GPS and of course a camera in it.

The present version is limited because of server limitations while we are in the process of moving our company headquarters.

## (2) Nomad Eyes and the Commonwealth Transportation Security Demonstrator Project

A Brief Description of Nomad Eyes and its Applicability to Public Transportation Settings

### Overview

A project that provides real-time usable security on a prototype basis for public transport systems and networks (trains, subway, other).

The first phase culminates in the installation and use of a prototype public-usable proof-of-concept demo for one metro underground system or comparable network in any urban or suburban region.

The functions of surveillance and monitoring are provided through both stationary and mobile-wearable sensor units spanning visual (video), audio, chemical, bio, rad.

The sensors are:

- Existing tech, COTS
- Modifications based upon COTS platforms

The system incorporates:

- hardware for detection and activation tasks
  - cameras (e.g., Axis)
  - rad sensors (stationary and cell-phone clip-on)

## How Nomad Eyes Is Different

- chem sensors (stationary and cell-phone clip-on)
- bio sensors (stationary and cell-phone clip-on)
- activation of alerts, alarms, robotic response, chemical response
- software for collection/transmission, storage, assessment/analysis, routing, notification
  - existing, COTS and ours
  - new, ours

### **The Prototype as a Project**

#### First steps

- Determine the scope of service and functionality
- Select the testing environment (e.g., Charing Cross station and several train cars)
- Determine what people and existing systems need to be linked for input to / output from ours
- Determine the integration and interface tasks (e.g. with existing information, video, etc.)

#### The implementation that will be field-tested

- One or more station areas
  - Video cams (additional to what they have)
  - Sensors attached to the video cams and in other stationary base units  
(*Nomad Eyes Sentinels*)
  - Cellphones with cams and sensors, portable non-phone units with sensors  
(*Nomad Eyes Walkers*)

- Train cars
  - Both Sentinels and Walkers deployed

#### The communications and data handling network

- Using what is in place will probably suffice, but if that is not enough, there will be an appropriate wi-fi network to handle everything
- Walkers operating on commercial cellular networks will tie in through the cellular provider gateways which exist and simply need to be interfaced through existing protocols

#### The “back end” – analytics, awareness, notification, response

This prototype will be fairly simplistic in terms of the predictive and look-ahead reasoning that is in the IRM/I<sup>3</sup>BAT model. The focus is on showing the superior utility of the sensors and the network and the basic architecture, not on the parts that only make sense if you have hundreds and thousands of sensors of different types spread across a spatio-temporally dynamic region.

Thus, we do what is needed to demonstrate, to convince, and to be useful, and do not try to do things that cannot really work anyhow unless you have an order of magnitude (or two) more devices in the field.

Notifications go to authorities and to regional user-participants, via internet and cellular transmissions. Email flashes and SMS text msgs. All of this is extraordinarily simple to implement because all of the software is done and ready and available from the different network providers and operators.

Most of the software work is of the order and type as putting together a basic server with web host and database engines, COTS, simple, direct, almost fill-in-the-blank, no R&D required.

### **(3) The POPE Outline Document – 30.Nov.2006**

#### **A “proof of effectiveness” prototype of Nomad Eyes that can be installed and tested by security staff in multiple public transport and pedestrian settings<sup>1</sup>**

The Nomad Eyes “POPE” (proof of prototype effectiveness) will consist of a portable network of devices and software that will demonstrate the ability to:

- (1) sense one or more chemicals including biological or radioactive compounds in an area that is typically frequented by the public in transport, pedestrian or residential settings, and
- (2) notify human authorities and automated security systems with sufficient timeliness so as to circumvent an incident<sup>2</sup> that would result in injuries, deaths, or mass fear outbreaks.

This prototype – with some customization in advance of or following initial delivery to the customer – can be installed and tested in the following types of environments:

- A metro underground station (e.g., Kings Cross, etc.)
- A public mass-transit vehicle (e.g., bus, train wagon)
- A building lobby or hallway (e.g., school, hotel, theater, etc.)
- A lorry for use in clandestine neighborhood surveillance/inspection

At this point, in this description, there are no assumptions about the type of pre-existing digital networks, cameras, sensors, or any other type of security/detection equipment in such a testing environment. We are assuming only that there will be minimally:

- available sources of electric power and wireless communication for cellular or wi-fi internet connectivity requiring at most some software integration and switch-setting (e.g., with a mobile wireless provider, either commercial or governmental).

#### **Nomad Eyes POPE Features and Operation**

The prototype will consist of the following operational components:

**Explosives Alert** Two or more hand-held, battery-operated units employing a PRMC (piezoresistive microcantilever) sensor array for detection of the following explosive compounds: TNT, RDX, PETN, TATP.<sup>3</sup> Each unit, when triggered by a detection event, will transmit a digital message to a wireless-enabled device that in turn automatically transmits information about the event to a minimum of two destinations:

- (1) an input into a server-based application representative of the Nomad Eyes LUCY analytics and sensor fusion software, but also representative of any existing agency database or notification system, and
- (2) a situation awareness notification and display application for alerting a human operator such as a security or transport department staff member.

These notifications will demonstrate the following:

---

<sup>1</sup> This is not a contractual commitment to any of the terms but a reasonable statement of what we believe we can do and deliver. As for pictures and graphics, you can find illustrations in some of the documents you have, including those sent recently and go to <http://london.nomadeyes.com> and related pages in that online illustration.

<sup>2</sup> intentional (e.g., terrorist) or otherwise (e.g., accidental, naturally-caused)

<sup>3</sup> Optional sensitivity may be included for certain other compounds including that are not individually explosive but that in combination can result in volatile explosive reactions; e.g., acetone, strong acids, peroxides).

## How Nomad Eyes Is Different

- automated detection of a substance of interest (e.g., an IED)
- real-time notification of human operators and automated systems
- synchronization of multiple sensor reports for intelligent assistance in tracking the point or area of origin, vector of movement, person or object carrying the substance (e.g., bomb, explosives)
- synchronization with video surveillance cameras
- synchronization with security intervention responders (e.g., transport police, city police)
- synchronization with information required to enable human operators in decision processes regarding traffic, vehicles, trains, pedestrians, etc.

### **Video Interface**

Each Explosive Alert device will send output that can be used to automatically modify the operation or data handling for other security systems such as video cameras in public stations and vehicles. Within the POPE this will be demonstrated in the following manner, exclusive of dependence upon agency video networks but enabling the easy interface of the TETRAD prototype directly into one or more pre-existing video surveillance networks:

Two or more video cameras and two or more camera-equipped mobile phones (phonecams) will be provided as part of the prototype. These will all be operational and can be placed in a variety of locations during any field test. The alert signals from the sensor units will trigger modifications to the videocam performance such that the prototype will demonstrate two key points:

- (1) the ability to modify in real-time the performance of any servo-controlled or robotic videocams in order to align, focus, zoom or otherwise target-in on the locations of the detected substance, perpetrator and/or weapon, and
- (2) the ability to bring the most significant images or camera sequences to the foreground and attention of a human operator.

The alert signals from the sensor units can also (optionally) provide in this prototype a suitable alarm notification that can be used by human testers holding the phonecams to know that there is an alert situation. These phonecams can be used by the testers to take photos that will be automatically transmitted to the same human operators and software systems. This will demonstrate the effectiveness of employing Nomad Eyes mobile devices in the context of device-equipped transport staff or civilian volunteers - in keeping with the fundamental Nomad Eyes model - for widespread and multi-point collection of sensor data and also visual data in addition to that data collected by stationary or agency-only operated units.

### **Notification Network**

The prototype will enable a human operator to initiate a signal that will alert persons holding suitably equipped mobile devices that there is an incident within an area where they may be in proximity to danger. This will be demonstrated by a suitable computer software interface and by the prototype system having two or more mobile phones that are addressable within the mobile network and also equipped with GPS locator technology.

### **Radiation Alert**

The prototype will include a minimum of one mobile handheld device capable of detecting quantities of gamma and alpha radiation. This device will operate in precisely the same manner as indicated for the Explosives Alert sensor units as described above. The device will demonstrable in a way proving its utility as a mobile, stationary or robotic implementation.

### **Nerve Agent Detection**

## How Nomad Eyes Is Different

The prototype will include a demonstrator unit that is designed for the detection of organophosphate chemicals and the discrimination of specific weapons-grade agents (Sarin, VX). This unit will be a prototype system that is functionally complete but not yet available in an automated handheld microchip variant. Its operation can be performed with simulated chemical agents in order to be able to perform sampling in any public location. The device has been tested with live nerve agents in a US DOD laboratory. The prototype will demonstrate how this device can be integrated into a Nomad Eyes implementation along with video and other chemical detection, analysis and response in keeping with the descriptions given above for explosives.

### **Installation, Training and Operation**

The prototype will be developed by TETRAD with informational input from the interested agency parties according to a specification that will be the result of discussions and exchanges based upon this document. The prototype may have reduced functionality or narrower scope than what has been outlined here, depending upon those discussions. However, a more extensive or full-featured system than what is indicated herein may require additional considerations of cost and time.

The prototype as envisioned will be installed by TETRAD staff and provided to a prospective customer agency with onsite training and provisions for documented and online operational assistance. Testing will be performed according to the guidelines and stated limits of the system's performance and it is envisioned that agency staff will be able to use the prototype in more than one physical setting, with different operational staff, and under a variety of testing conditions, once the basic installation has been completed.

The POPE system as described herein will be produced by TETRAD and, along with field test results, will remain the property of TETRAD.

### **Conclusion**

Based upon this material and other written and verbal information that can be made available, TETRAD is seeking to receive a formal expression of interest with some indicators of the possible scope of work, including a more detailed specification of operational constraints and a range of possible budget(s), applicable to one or more projects that could realistically follow after the production and successful field-testing of this POPE system. That formal expression of interest is important in order for TETRAD to be able to dedicate the personnel and financial resources for producing this specific prototype in the indicated timeframe and according to the outline of specifications given above. It is important for prospective customers to understand that the ability of TETRAD to produce, install and maintain the type of prototype system as described herein is directly related to the strength of interest and level of probability for achieving a suitable design and implementation contract following the successful demonstration and testing of the Nomad Eyes prototype.

### **(4) From the "Nomads Eyes Architecture Overview" piece used in the BP and for Veneto**

Nomad Eyes™ is a distributed, mobile, rapidly-deployable network of sensors and data collection units plus back-end analytics and forecasting. The product serves emergency and security planning, countermeasures and first response teams in both public and private sectors, as well as the general public. Incorporating both consumer-grade cellular phones and wi-fi platforms plus custom devices, Nomad Eyes™ gives early warning and detection plus response directives to

## How Nomad Eyes Is Different

emerging-threat events and situations including natural and intentional emergencies including accidents and CBRNE terrorist actions.

### Unique Features and Competitiveness:

NomadEyes integrates multiple types of sensors into an interoperable, plug-and-play environment that makes extensive use of ordinary, in-the-field consumer mobile phones and wi-fi. Its human-system interface is tailored to the general non-technical-specialist user. Unlike other systems, nothing beyond familiarity with a cell phone is required of the user. More sophisticated sensors can be accommodated as well. The back-end analytical engine employs several novel algorithms of recognition and learning, with a high degree of parallelism, enabling the very rapid and smooth processing of information and the issuance of alerts and notifications to users such as security and law enforcement agencies. Nomad Eyes™ provides both early warning and forecasting for “situation awareness” that can be used by public health as well as defense/intel providers. It is as applicable to “Sept. 11” and “New Orleans” situations before, during and after, aiming to minimize the human and logistic costs beforehand and quicken the responses.

### Product Viewpoint:

Nomad Eyes encompasses image and audio clip collection using standard cell phone technology plus radiation and chemical (organic and inorganic) sensing for substances that may indicate a threat to health and safety, particularly in the context of potential terrorist actions or industrial accidents. The products include a class of devices for data collection – Nomad Walkers, Sentinels and Warriors – with varying functional power, and the server-side analytic software to process and route the data. More than eight sensor modalities are in the first series.