THE UNIVERSITY OF SOUTHERN MISSISSIPPI

NATIONAL CENTER FOR SPECTATOR SPORTS SAFETY AND SECURITY (NCS^4)

LABORATORY ASSESSMENT REPORT

LIVE EARTH

Foreword

The National Center for Spectator Sports Safety and Security (NCS[4]) at the University of Southern Mississippi has established the National Sports Security Laboratory (NSSL) to assist spectator sport venue operators with the assessment and validation of safety and security solutions.

The NSSL provides a mechanism to aggregate specific safety and security requirements for the spectator sports domain as developed by security and venue operator practitioners through participation in a National Advisory Board, which includes representatives from all professional sports leagues and select collegiate institutions. The NSSL, using industry requirements and operational needs, develops:

- Impartial, vendor agnostic, and operationally relevant assessments and validations of safety and security solutions based on community of interest (COI) requirements.

- Evaluation reports that enable venue operators and security personnel to select and procure suitable solutions and to deploy and maintain solutions effectively.

The evaluation program follows principles currently espoused by standing U.S. Department of Homeland Security (DHS) validation programs that are meant to assist end operators with objective and quantitative reviews of available commercial systems and solutions (e.g., Department of Homeland Security SAVER program)[1].

[1] System Assessment and Validation for Emergency Responders (SAVER) Program. The SAVER Program conducts assessments and validations on commercial equipment and systems, and provides those results along with other relevant equipment information to the emergency responder community.

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1. Introduction

The Introduction describes the needs analysis forming the basis for this evaluation and also provides an overview of Live Earth, the Live Earth platform, and the components of the platform.

1.1 Needs Analysis

In December 2018, the NCS[4] National Advisory Board and Technology Alliance identified the use of real-time data and mapping to enhance situational awareness and decision making as a major priority for sports safety and security. This situational awareness platform provides users the capability to instantaneously assess the states of multiple data streams (e.g., weather, transportation, parking) both individually and in combinations over a specific geographic area (e.g., around a sport venue), thus decreasing the amount of time required to evaluate situations and make decisions.

This report presents a summary of the evaluation and demonstration of the Live Earth platform. The platform was evaluated for functionality and overall performance capabilities. Evaluators also considered the role of the technology in a security operations center at a major sports and entertainment facility in the United States.

1.2 Live Earth Overview

Live Earth is an Internet of Things (IoT) data analytics and visualization platform developed using advanced GIS mapping software technology on a real-time interactive map. It is trusted by organizations and agencies around the world to bring time-sensitive information into one visualized platform, helping to drive faster response times, save costs, and better prepare the future with actionable intelligence (Figure 1).

Figure 1. Live Earth Streaming Data

1.3 Live Earth Platform Overview

The Live Earth platform is an IoT visualization, cloud-based solution, with out-of-the-box features requiring minimal set-up or implementation. The platform is purpose built for real-time visualization to display multiple existing data streams layered with the user's systems (Figure 2). The platform's live layers automatically update as new information and data becomes available. Figures 3-6 show Live Earth used at sports venues.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

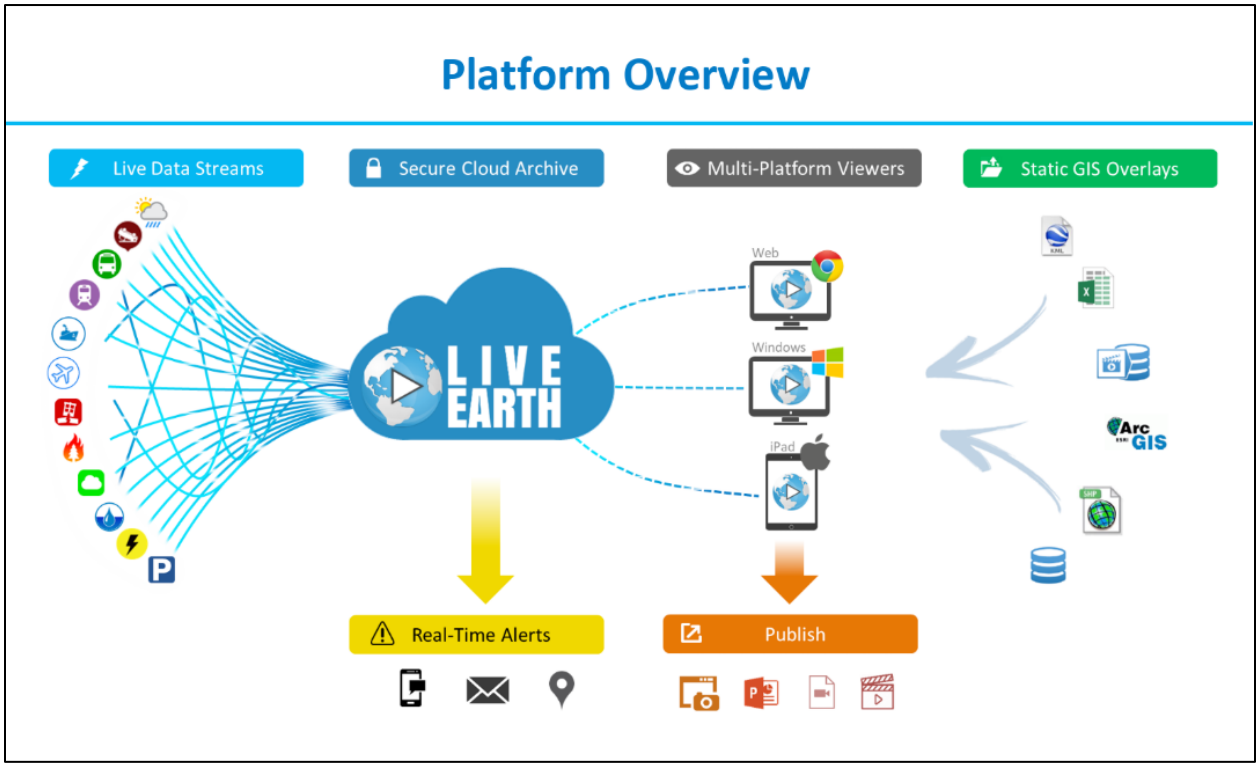

Figure 2. Overview of the Live Earth Platform

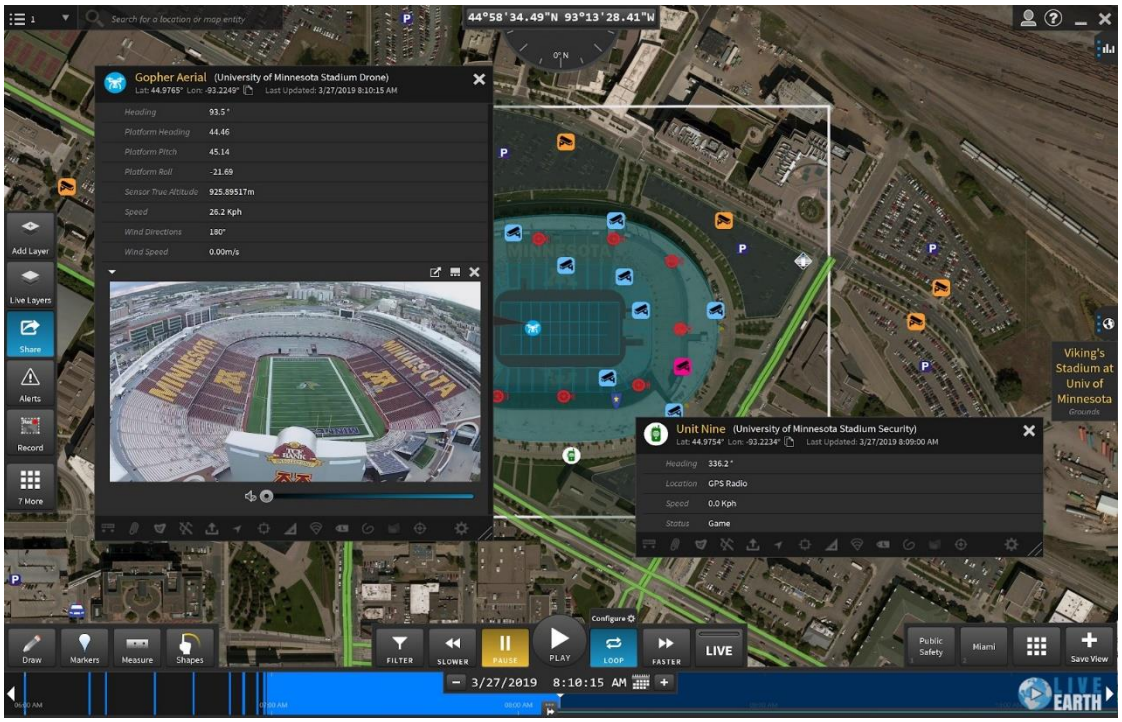

Figure 3. Live Earth at University of Minnesota's TCF Bank Stadium Using Drone and Stadium Security Feeds

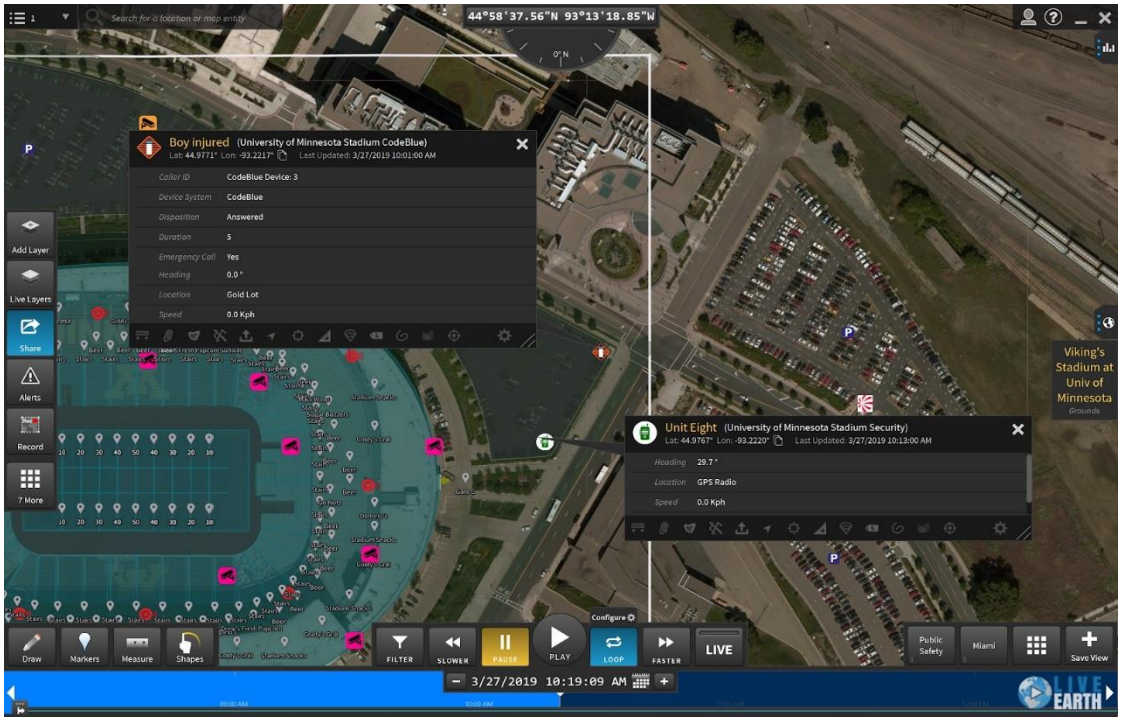

Figure 4. Live Earth at University of Minnesota's TCF Bank Stadium: Incident Alert and Emergency Response Feeds

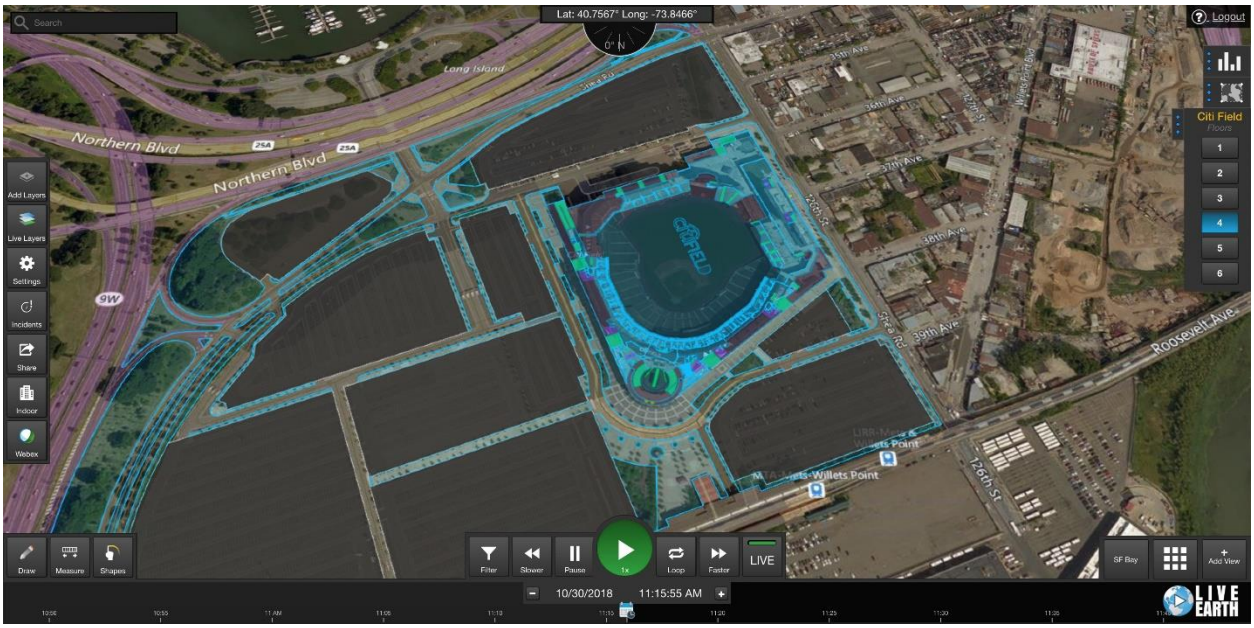

Figure 5. Live Earth at New York Mets Citi Field

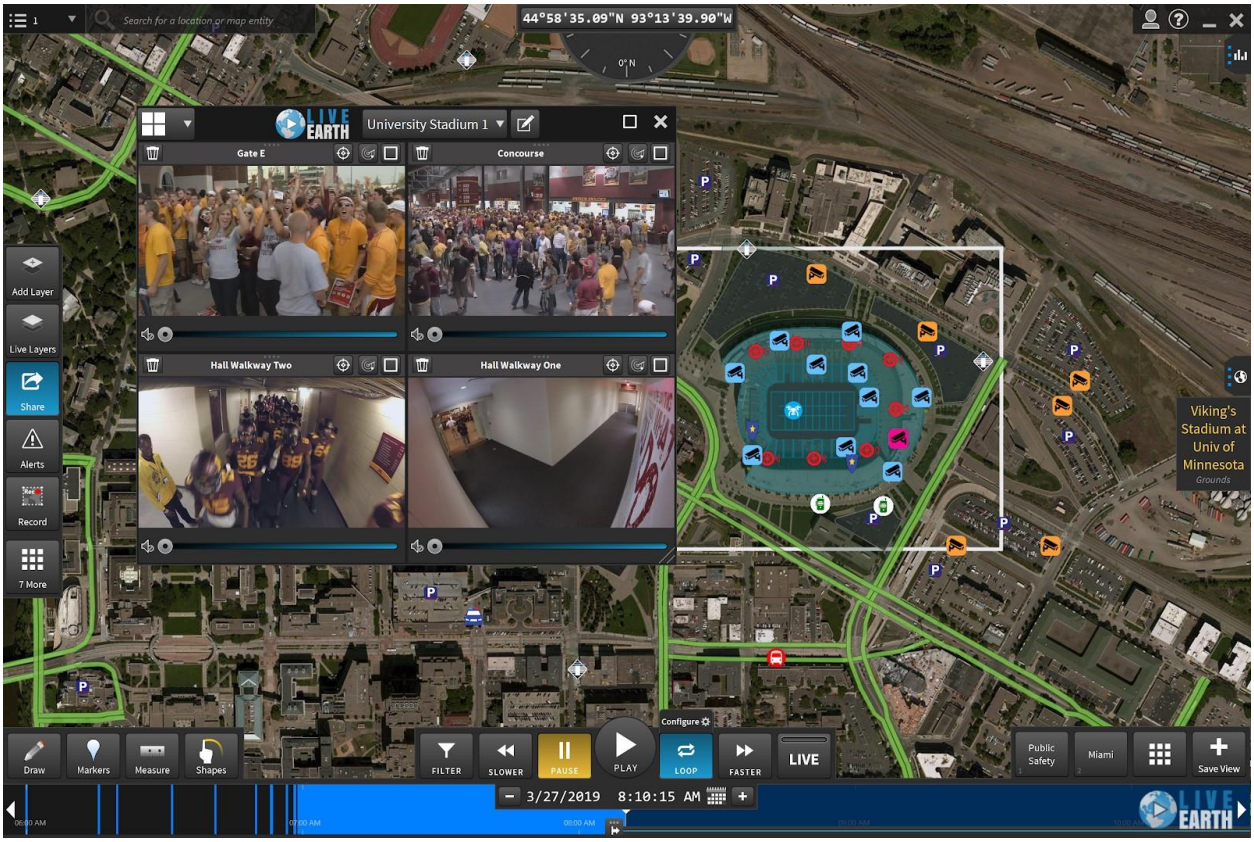

Figure 6. Live Earth at the University of Minnesota's TCF Bank Stadium: Security Camera Feeds

Real-time data feeds are everywhere – Nearly everything has sensors that can be connected, and these sensors hold raw geospatial data that the Live Earth platform helps to converge, interpret, and visualize. The faster the data can be retrieved and processed, the faster users can respond to the data collected.

NSSL Assessment: Evaluators observed how disparate data feeds from multiple sources could be quickly connected to the platform to create data rich displays and dashboards. This capability was successfully demonstrated multiple times during the evaluation.

Cloud for real-time data streams – Live Earth ingests and stores billions of events in real-time from multiple sources. With the platform, users can view real-time data or retrieve, reconstruct, and review any historical incident instantly. By seamlessly stitching together this vast amount of data on a single, interactive map, users can apply action to important scenarios quickly.

NSSL Assessment: This capability to bring in layers of data from multiple sources, view data in real-time in a single common operating picture, and review any historical incident where data was available were successfully demonstrated during the evaluation.

World's fastest map – No other platform can pull together the amount of data that Live Earth collects, and then store and render the data quickly. Once the data is processed in the cloud, Live Earth synchronizes and animates it to create visual depictions on a map. The intuitive interface makes it easy for anyone to use. The Live Earth platform is developed using concepts similar to those users are familiar with on a smartphone or tablet.

NSSL Assessment: The platform's capability to sync and animate data to create visual depictions on a map was successfully demonstrated during the evaluation. The NSSL makes no judgment regarding whether Live Earth's platform is the "world's fastest map."

Get going quickly – The platform is developed with out-of-the-box layers to be easily deployed with the added value of additional custom configurations to meet users' needs. With no advanced GIS training required, the platform is a seamless solution to input and visualize multiple data feeds and streams in real-time.

NSSL Assessment: Each evaluator was able to download the appropriate files on a variety of computers and tablets, and configure them for operational use in less than 30 minutes. Thus, this capability was successfully demonstrated during the evaluation.

1.4 Live Earth Platform Components

Live Earth has several features and tools that help users visualize and effectively pull out the information they need.

The most advantageous features of the platform are the high-speed, real-time alert capabilities (Figure 7). Customized parameters based on date, time, and location filter out unrelated data (i.e., noise) and send notifications to users via text, email, in-platform cookies, or in their preferred combination. The incidents are stored in chronological order with event details for easy access to relevant situations for historical analysis.

NSSL Assessment: These capabilities were successfully demonstrated during the evaluation.

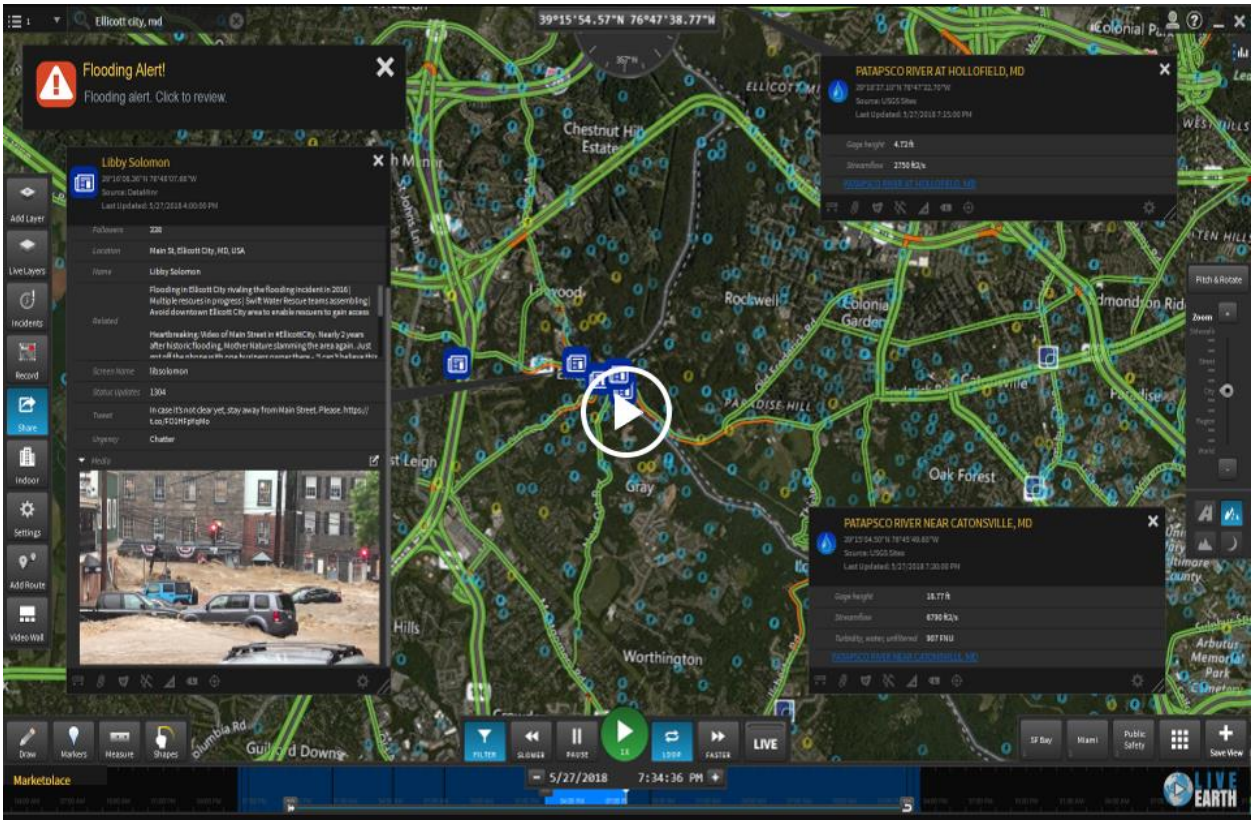

Figure 7. Live Earth's Real-Time Alert Capabilities

The next feature users benefit from is the interactive timeline (Figure 8). With access to historical data, users can instantly go back days to months in time by through the Play, Pause, and Rewind buttons. The platform can render the data immediately to easily reconstruct events. Users can pause the events and zoom in at different angles to gain a holistic view for a deeper understanding and increase their proactive planning. Users can then "loop" the data for a specific time period and return to the real-time feed by pressing the Live button.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

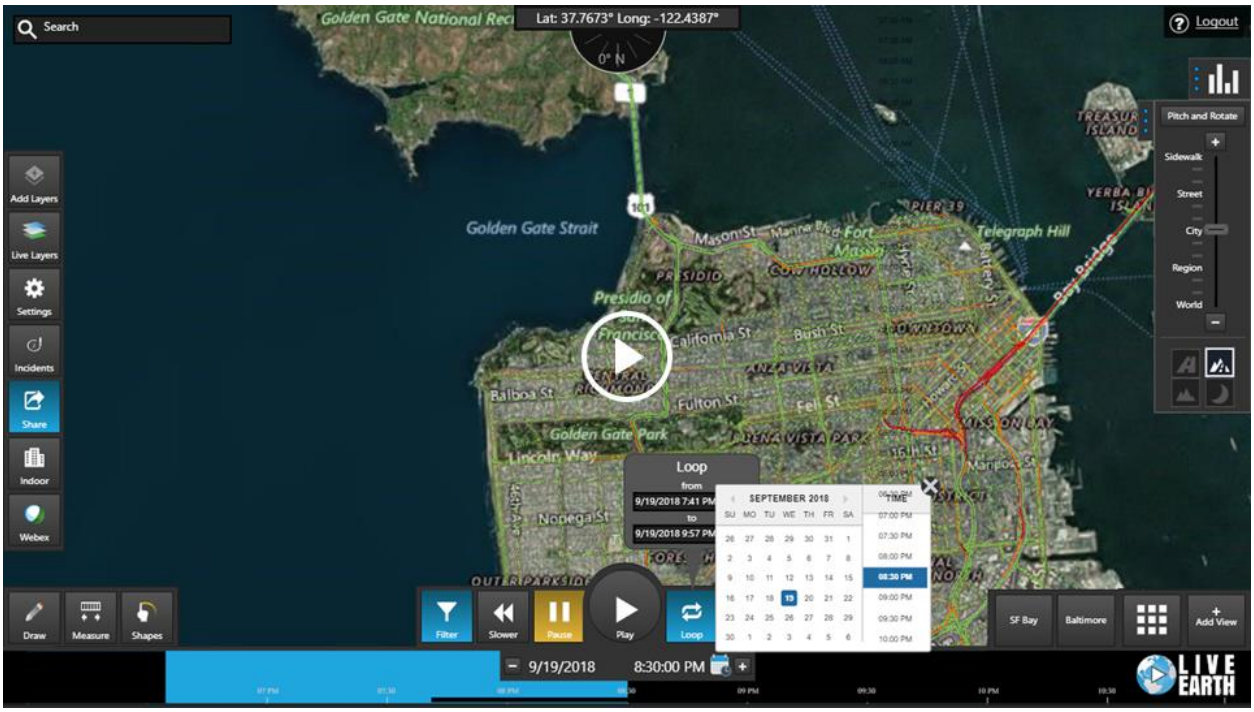

Figure 8. Live Earth's Interactive Timeline

A variety of other features are available within the Live Earth Platform:

Live Layers – Quickly and easily turn live layers on and off to focus your attention and visualize the most relevant data. Access "add layers" to include or remove integrations from the layers panel (Figure 9).

NSSL Assessment: This capability was successfully demonstrated multiple times during the evaluation.

Figure 9. Live Earth's Live Layers Feature

Shapes – Quickly and easily turn live layers on and off to focus your attention and visualize the most relevant data. Access "add layers" to include or remove integrations from the layers panel (Figure 10).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

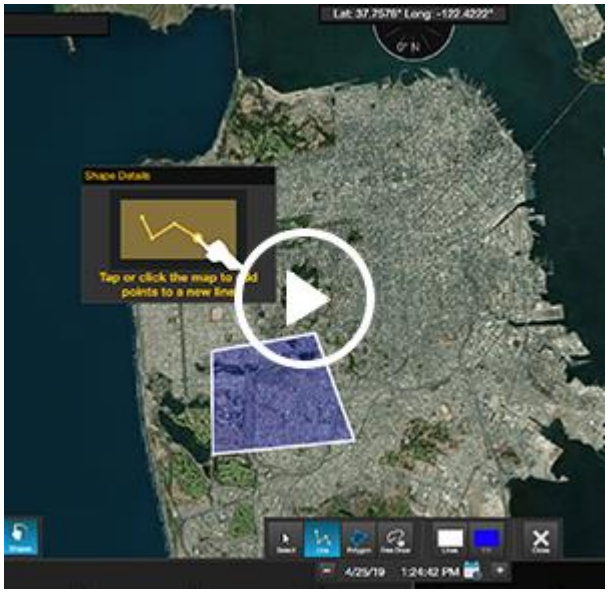

Figure 10. Live Earth's Shapes Feature

Share – The share and record features allow you to publish content out of Live Earth through screenshots, shareable links, and videos (Figure 11).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 11. Live Earth's Share Feature

Alerts - The share and record features allow you to publish content out of Live Earth through screenshots, shareable links, and videos (Figure 12).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

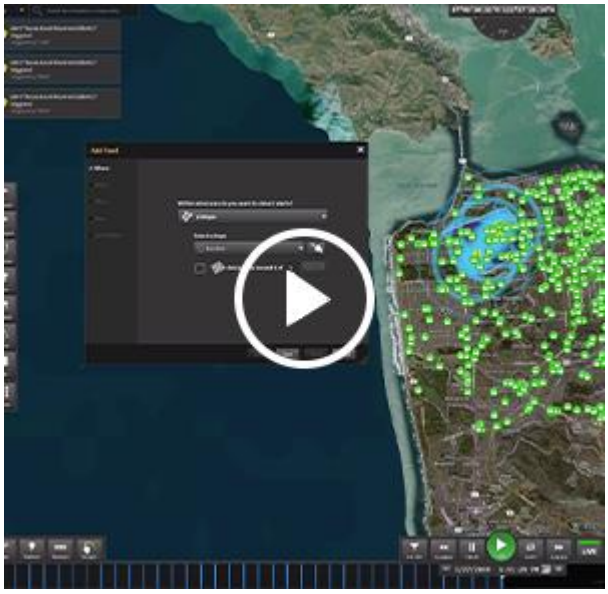

Figure 12. Live Earth's Alerts Feature

Layer Settings – Access layer settings for an independent data layer to change appearance settings or turn on additional features such as heat maps or tracks (Figure 13).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

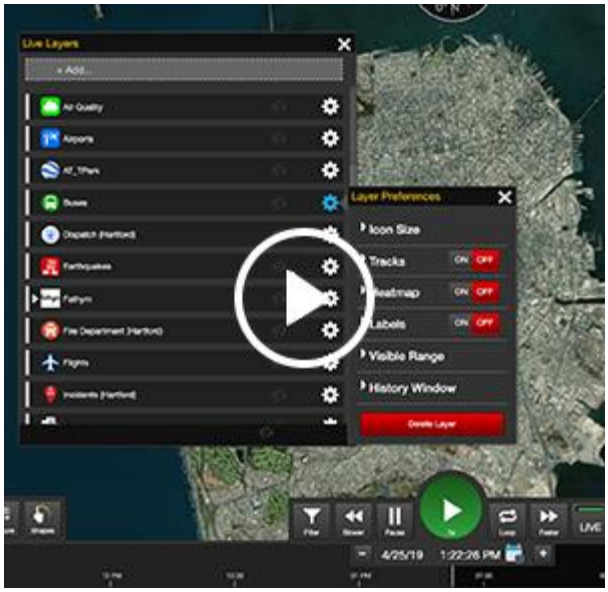

Figure 13. Live Earth's Layer Settings Feature

Charts – Build multiple charts and view them in tandem with the charting feature (Figure 14). Dynamic charts change to reflect the data represented on the screen. You can also use shapes to create boundaries for charts and get data only within the designated area.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

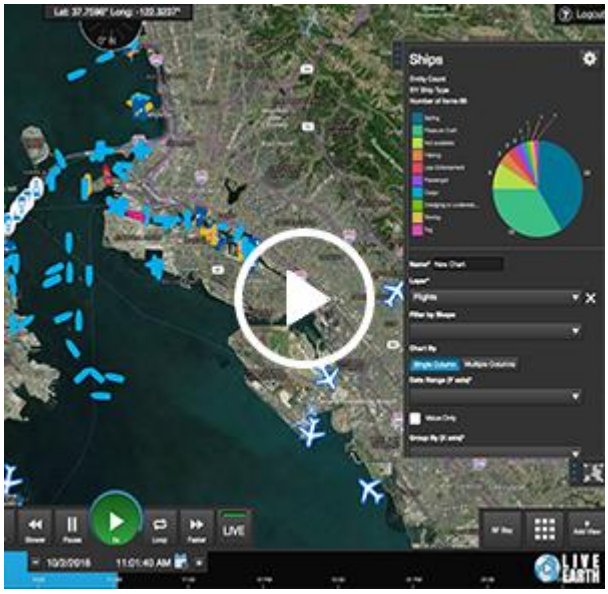

Figure 14. Live Earth's Charts Feature

3D – See 2D images on a 3D map for a combined view of assets in both spaces (Figure 15). Switch the map from "Top-Down" to "Pitch & Rotate" and visualize your buildings, assets, and more in a 3D plane.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

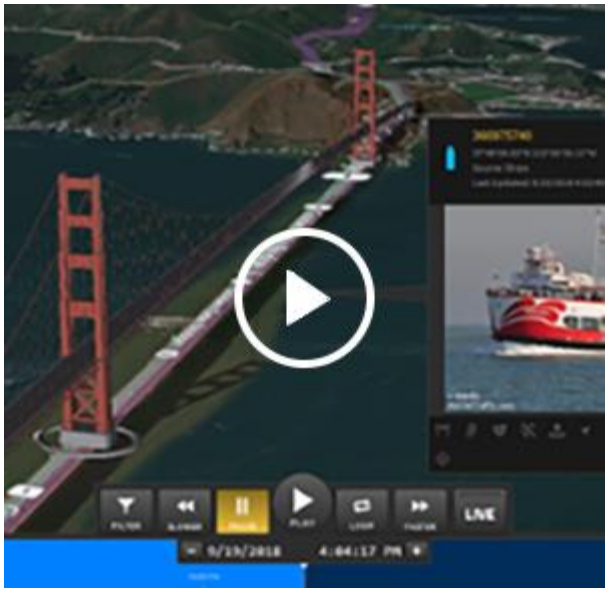

Figure 15. Live Earth's 3D Feature

Video Wall – Combine multiple video feeds into one view, allowing a group of video feeds to be reviewed in context with each other by dragging and dropping your live feeds into the video wall (Figure 16). Name and save your customized walls for organization and quick access.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 16. Live Earth's Video Wall Feature

Shortcuts – Create a shortcut of any event in time or location on the map for fast access (Figure 17). The option to save visible layers and map location makes jumping to a specific place or time easy and quick.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 17. Live Earth's Shortcuts Feature

Indoor – Integrate indoor mapping of your building and toggle easily between the different floors for a consolidated view of your infrastructure (Figure 18).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 18. Live Earth's Indoor Feature

Draw – Draw, highlight, and annotate directly on the map (Figure 19). Use Live Earth as your presentation tool. Leverage live, interactive data with drill down details when briefing decision makers.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 19. Live Earth's Draw Feature

Route Planning – Plan travel routes for vehicles and track their locations while also defining departure times and vehicle features for the fastest, safest route (Figure 20). The route weather forecast feature gives predictive route optimization based on weather related road conditions during your planned trip.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

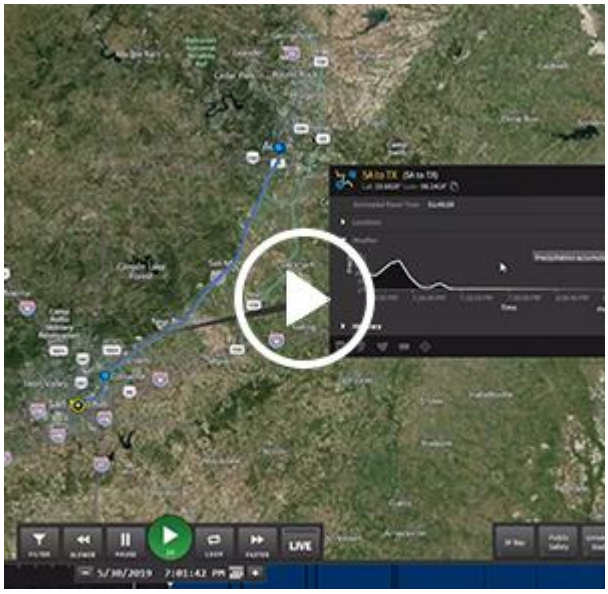

Figure 20. Live Earth's Route Planning Feature

Base Maps – There are four different base maps to choose from: Road, Hybrid, Aerial, and Night (Figure 21). Toggle easily between views by selecting your preferred base map and see it render instantly.

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

Figure 21. Live Earth's Base Maps Feature

Search – Type the desired location in the search bar on the upper left to jump to any global location immediately, with real-time data rendering almost instantly (Figure 22).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

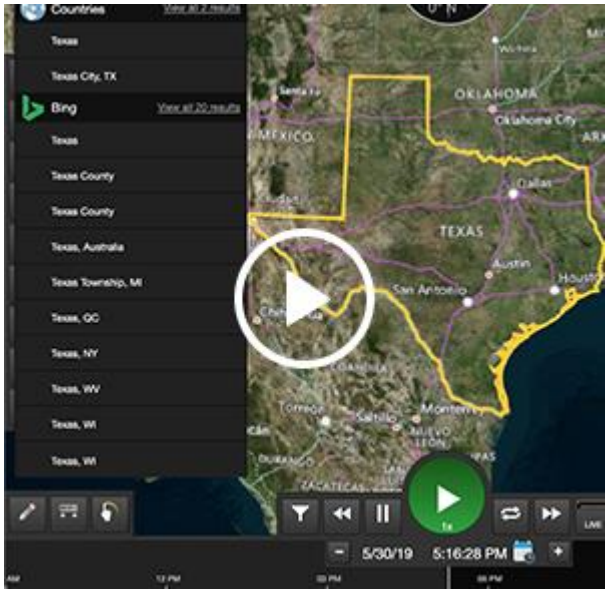

Figure 22. Live Earth's Search Feature

Measure – Measure the distance between any two data layers displayed on the map by tapping the locations on the map and see it in your preferred unit of measurement (Figure 23).

NSSL Assessment: This capability was successfully demonstrated during the evaluation.

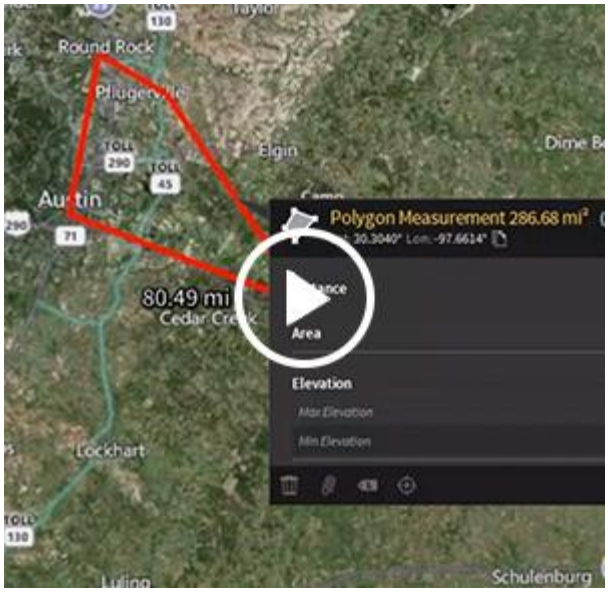

Figure 23. Live Earth's Measure Feature

Other content sources are available at:

Venues & Campus Solutions Page

https://www.liveearth.com/industry-solutions/venues-campuses/

White paper – Stadium Security and Safety in Real-Time Through Data Integration

https://info.liveearth.com/live-earth-for-stadiums

Blogs for Stadiums

https://www.liveearth.com/category/stadium/

Stadium Use Case Example

https://www.liveearth.com/use-case/real-time-common-operational-picture-offers-stadium-directors-advanced-data-insights-on-a-single-screen/

2. White Paper Objectives

The objectives of this report are as follows:

- Describe the evaluation methodology, scoring system, and the role of evaluators.
- Outline the platform's functional capabilities as identified by Live Earth.
- Publishes the evaluation scoring results, comments, and additional information provided by the evaluators and Live Earth.

The purpose of this evaluation is to validate the capabilities and functionalities of the Live Earth platform as claimed by Live Earth. This evaluation and/or report does not constitute NCS^4's endorsement of the Live Earth platform, nor is it intended to be used for comparison purposes with similar solutions.

3. Methodology

The NSSL uses a repeatable and scalable testing methodology to guide its product evaluations. The methodology is designed to ensure that the evaluation occurs in a realistic environment so that the subject matter experts can evaluate whether the solution delivers the capabilities under the use case conditions (i.e., normal and/or emergency) within the ecosystem (i.e., sports, entertainment, and special event venue). The methodology includes: (1) a general overview of the steps used to perform an evaluation, (2) the selection and training of subject matter experts (SMEs), and (3) how the aforementioned Steps 1 and 2 were applied to the evaluation of the Live Earth platform.

3.1 Overview

A repeatable and scalable methodology was developed for use in the evaluation and assessment of numerous solutions. The evaluation results are verifiable, quantifiable, and can be used for product development and procurement decisions.

1. NCS^4 and the company seeking the evaluation discuss the capabilities and functional requirements of the company's solution and the professional backgrounds of three SMEs (e.g., law enforcement; fire/rescue emergency management; emergency medical; venue director of security, operations, or guest services) to perform in the evaluation.
2. NCS^4 ensures that the company has access to the facilities and the means to create conditions to effectively test the capabilities and functional requirements of the solution and access to SMEs with the requested experience evaluate the solution.
3. NCS^4 and the company work together to create a matrix of operational capabilities and functional requirement items that the SMEs will quantitatively rate (described below in Section 3.2).
    a. The company develops the items and NCS^4 ensures that each item addresses only one capability or functional requirement.
    b. Each item is written so that the SMEs, who may not be familiar with the solution, will understand the solution and the operational capability being evaluated in each item.
    c. NCS^4 does not tell the company what items they should include on the matrix.
4. NCS^4 and the company select a date(s), location(s), and use case(s) that will provide an appropriate ecosystem and the desired use case conditions for the product evaluation.

Testing the solution in the ecosystem under live operational conditions is ideal because the SMEs can observe the solution in realistic conditions rather than in a pure simulation. This increases the value of the evaluation; the SMEs' ratings and comments reflect the solution as it is used in practice, so the results are real rather than hypothetical.

5. NCS^4 staff, company representatives, and the SMEs meet at the date(s), location(s), and use case(s) as determined in Step 4. NCS^4 staff manages test logistics and facilitates the evaluation, ensuring that it adheres to an approved agenda. After all personnel introduce themselves, the company provides an overview of their organization and solution. Then, the SMEs either interact with the solution themselves or closely observe the company representatives interacting the solution to rate each matrix item.

Throughout the evaluation, the SMEs may ask the company representatives clarification questions about the operation and capabilities of the solution. The SMEs may provide comments and/or answer questions from the company representative (e.g., potential use cases, cost, pricing plans, future capabilities that would be beneficial to add to the solution), and make recommendations and/or suggestions based on their professional experiences. Similarly, the company representatives may ask the SMEs questions that may or may not be related to the matrix items. This open dialogue often yields valuable information beyond the matrix ratings.

3.2 Subject Matter Expert Selection and Training

To maintain the impartiality of the evaluation, the company may not request specific individuals to serve as SMEs. Per Step 1 in Section 3.1, the company may identify desired skills and experiences that evaluators should have for the solution evaluation. The company may request discrete skills or general competencies relevant to the solution under evaluation. The company may also identify the caliber of SMEs based on experience, roles, or responsibilities. Per the information provided by the company, NCS^4 canvasses its sports safety and security industry network and its SME database to identify potential SMEs with the requested professional backgrounds. NCS^4 will then invite qualified candidates to participate in the evaluation until NCS^4 has secured three SMEs with the required expertise.

As part of its due diligence, NCS^4 informs the SMEs about the company and solution under evaluation during the SME solicitation process so that potential SMEs can assess their suitability and comfort level with the solution and identify any potential conflicts of interest. In some cases, SMEs may recuse themselves because of a conflict of interest. If this occurs, NCS^4 will

invite another qualified candidate to serve. Once the SMEs are confirmed, NCS^4 notifies the company who the SMEs are for the evaluation.

Prior to the start of the evaluation, NCS^4 facilitators train the SMEs about the evaluation process and review the item rating scale (Table 1). The NCS^4 facilitators emphasize that each SME will receive his or her own copy of the matrix and must rate each item individually using this scale; the SMEs must each provide his or her own score, and may not collaborate to develop a group rating for each item or the overall evaluation. The SMEs are also encouraged to ask the company representatives questions and provide comments beyond the matrix rating feedback.

The company representatives are encouraged to ask the SMEs questions related to, or outside the scope of, the matrix items. This dialogue, coupled with the matrix item ratings, provides complete evaluation information. The matrix ratings show that the solution has been impartially evaluated by SMEs against company-defined specifications, and the conversation allows for feedback beyond the scope of the matrix (i.e., for aspects of the solution that cannot be evaluated via a matrix, such as plans for future development or how to price and market the solution).

Table 1. Item Rating Scale

Score	Description
0	Does not meet the stated requirement
1	Partially meets the stated requirement
2	Meets the stated requirement with recommendations
3	Meets the stated requirement

3.3 Live Earth Methodology

When applying the previously outlined methodology to the Live Earth platform, the subject matter experts were: (1) an Associate Athletic Director of Facilities and Operations at an NCAA Division I university in the United States, (2) a Police Special Event Coordinator at a police department in a major city in the United States, and (3) a Senior Director of Security for a professional sports organization in the United States. The evaluators will be referenced by the aforementioned numbers throughout the rest of this document.

The evaluation occurred at NCS^4's National Sport Security Laboratory (NSSL) at the Hattiesburg, MS (USA) campus of the University of Southern Mississippi on April 25, 2019 from 5-7 p.m. U.S. Central Time and April 26, 2019 from 8 a.m. to 3 p.m. U.S. Central Time. During the week prior to the evaluation, Live Earth personnel provided the SMEs and NCS^4 facilitators with user names and passwords to access the platform.

Appendix A shows the 28-item matrix that the SMEs used to evaluate the platform. Based on the scope of the matrix items, they were logically divided into four sections: (1) Application/Capability, (2) Ease of Use, (3) Mobility, and (4) Maintenance.

The average evaluator rating for each matrix item was calculated using Equation 1:

$$Equation\ 1 \quad R = (r_1 + r_2 + r_3) \div 3$$

where:

R = average evaluator rating for a given matrix item

r_1 = Evaluator 1 rating for that matrix item

r_2 = Evaluator 2 rating for that matrix item

r_3 = Evaluator 3 rating for that matrix item

Equation 1 was applied to each matrix item separately (e.g., the average evaluator rating was calculated for item 1.1.1, 1.1.2, 1.1.3, etc.).

The average evaluator score for each matrix section for each evaluator was calculated using Equation 2:

$$Equation\ 2 \quad S = \left(\sum_{i=1}^{n} r_i\right) \div n$$

where:

S = average score per evaluator for a given matrix section

n = number of items in that matrix section

r = each evaluator's rating for each matrix item in that matrix section

The average evaluator score for all of the matrix items for each evaluator was calculated using Equation 3:

$$Equation\ 3 \quad E = \left(\sum_{i=1}^{n} r_i\right) \div n$$

where:

E = average score for each evaluator for all matrix items

n = total number of items in the matrix

r = each evaluator's rating for each matrix item

The overall average matrix rating (i.e., the average of all of the item scores from all three evaluators) was calculated using Equation 4:

$$Equation\ 4 \quad A = \left[\left(\sum_{i=1}^{n_1} r_i\right) + \left(\sum_{i=1}^{n_2} r_i\right) + \left(\sum_{i=1}^{n_3} r_i\right) + \left(\sum_{i=1}^{n_4} r_i\right)\right] \div (n_1 + n_2 + n_3 + n_4)$$

where:

A = overall average matrix rating

n_1 = number of items in matrix Section 1 (i.e., Application/Capability)

n_2 = number of items in matrix Section 2 (i.e., Ease of Use)

n_3 = number of items in matrix Section 3 (i.e., Mobility)

n_4 = number of items in matrix Section 4 (i.e., Maintenance)

r = each evaluator's rating for each matrix item

4. Results and Recommendations

This section covers the following matrix-related results: (1) the average individual matrix item rating from all of the evaluators, (2) the average matrix section score for each evaluator, (3) the average overall matrix score for each evaluator, and (4) the average overall matrix rating. It also summarizes the comments from the evaluators.

4.1 Matrix Results

Table 2 shows the average evaluator rating for each matrix item. The ratings ranged from 2.33 to 3.00, with most of the ratings (i.e., 34 of 45) at 3.00. The Functional Area descriptions (Functional/Specification to Score) for each item are in the Evaluation Matrix (Appendix A). Because of the integrated design of the software, the evaluators observed the Application/Capability items multiple times. The raw scores and comments from each evaluator are in Appendices B, C, and D.

Table 2. Matrix Item Average Evaluator Rating

Item Number*	Functional Area**	Function/Specification to Score
1. Application/Capability		
1.1.1	Provides integrated information for the venue itself and provides **real-time data for the surrounding areas** co-located with the venue and in the city.	3.00
1.1.2	The **weather team**, **security team**, **operations team**, and **executives** can configure or customize a dashboard to only look at the data layers of interest for their respective positions.	3.00
1.1.3	**Converge public and private data feeds** on one visual pane (Interactive Map).	3.00
1.1.3.1	All modes of **transportation** within a city or region can be monitored and reviewed in the context of each other from one central location.	2.67

Item Number*	Functional Area**	Function/Specification to Score
1.1.3.2	Cities can **monitor and review all utilities** in relation to one another and surrounding weather, traffic, and emergency situations.	3.00
1.1.3.3	Converge **parking, traffic flow, street and city-level message boards, field personnel, and more** on a single visual pane. *NOTE: Message boards are local to the stadium and are not shown in the demonstration.*	3.00
1.2.1	**Automatically triggers internal alarms** and **prioritizes external threats**.	3.00
1.2.2	Issues **real-time alerts** via **pop-up**, **email**, and **text** for pre-defined scenarios that fall within pre-determined criteria.	3.00
1.2.3	**Predefined alerts** through the platform enable city infrastructure (e.g., street lights, cameras, road conditions, etc.) to be proactively managed from one place through GIS visualization tools.	3.00
1.2.4	Sends out **alerts for user-defined scenarios,** whether they are for historical or real-time events.	3.00
1.3.1	Provides **in-depth investigative support** for ongoing cases, including instant replays and analytics. (Note: may help prepare for future events.)	3.00
1.3.2	Ability to **export still images, video clips, and fully interactive scenes** that contain all relevant information to streamline the decision making process.	3.00
1.4	**Large number of available layers (or connectors) already created to provide a fast, out of the box, platform for immediate use.** Cameras, Door Access, Radios, Traffic, Parking, and any other data source are	2.67

Item Number*	Functional Area**	Function/Specification to Score
	all integrated together in one common view (Interactive Map).	
1.5	**Rewind, pause, and review events** with Live Earth's interactive timeline.	3.00
1.6	Provides **location intelligence** and insight into the condition of transportation assets at all times.	3.00
1.6.1	Manage transportation and logistics assets to **avoid adverse weather** and traffic conditions to minimize downtime and service disruptions.	3.00
1.6.2	**Define optimal routing predictions** based on their operational valuables and predictive alerts on external conditions from Live Earth's platform.	3.00
1.6.3	**Predictive weather software** from Live Earth integrates seamlessly with advanced routing software that captures details on truck, trailer, and cargo specifications.	3.00
1.6.4	Data can be displayed on **real-time maps**, showing route forecasts, along with the hyper-local point forecasts along a route.	3.00
1.6.5	Each **point on the route can be further analyzed** with **plot graphs** showing road state, road temperature, air temperature, wind speed, wind direction, precipitation and more.	3.00
1.6.6	Able to **monitor all security systems** at distribution centers in relation to fleet locations, configurations, and conditions on a single panel.	3.00
1.7	API documentation and methodology allows customers to **"push" any geolocation data (that contains a time and date) to the platform**. This allows users to integrate proprietary systems without external support.	3.00
2. Ease of Use		

Item Number*	Functional Area**	Function/Specification to Score
2.1	Download the application on a **Windows 10 machine.** Will be up and running in less than one hour.	2.67
2.2	Users with **minimal training** can operate the system.	3.00
3. Mobility		
3.1	Able to log in using web client on an iPad.	3.00
3.2	Able to access all functions in Section 1 of the matrix.	3.00
3.3	Able to access all function in Section 1 of the matrix.	3.00
4. Maintenance		
4.1	Automatic system updates for security patches and programming updates.	3.00

*The Item Number column in this table matches the Function # column in Appendix A.

**The Functional Area column in this table matches the Function/ Specification to Score column in Appendix A.

Table 3 and Figure 24 show the average evaluator score for each matrix section (e.g., Application/Capability, Ease of Use, Mobility, and Maintenance).

Table 3. Each Evaluator's Average Matrix Section Score

Evaluator	Application/Capability Mean Score	Ease of Use	Mobility	Maintenance
Evaluator 1	2.91	2.50	3.00	3.00
Evaluator 2	3.00	3.00	3.00	3.00
Evaluator 3	3.00	3.00	3.00	3.00

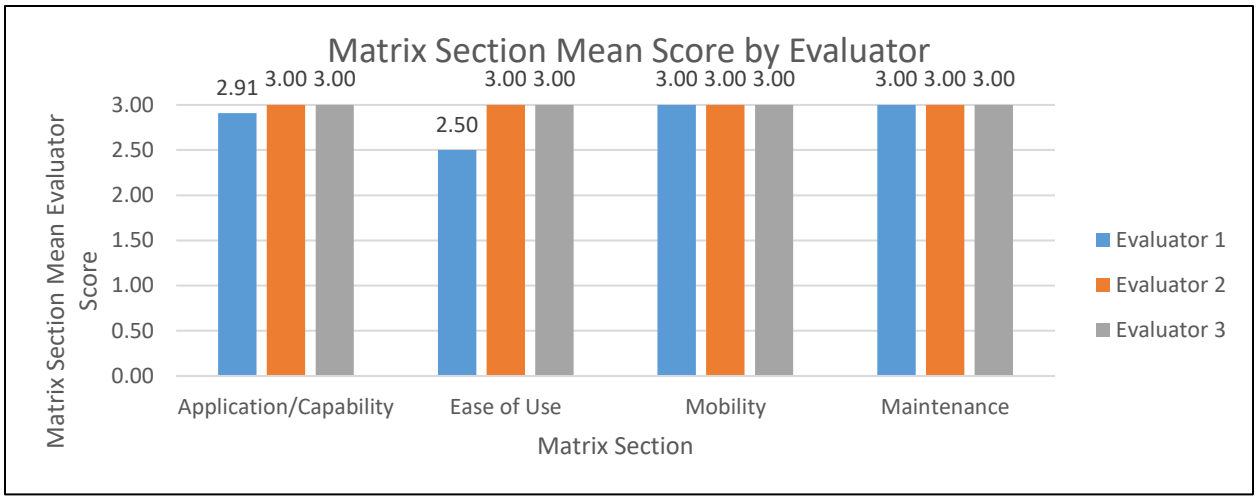

Figure 24. Matrix Section Mean Score by Evaluator

Table 4 and Figure 25 show the average evaluator score for all matrix items.

Table 4. Average Evaluator Score for All Matrix Items

Evaluator	Mean Score
Evaluator 1	2.89
Evaluator 2	3.00
Evaluator 3	3.00

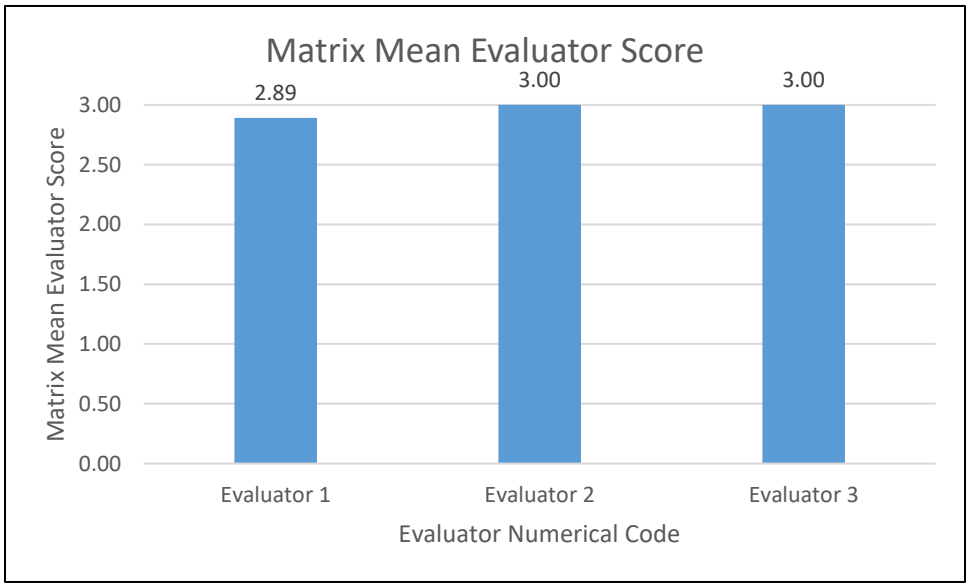

Figure 25. Average Matrix Score by Evaluator

The overall average matrix score (i.e., the average of all item scores for all evaluators) was 2.96.

4.2 Evaluator Comments and Recommendations

As noted in Sections 1.3, 1.4, and 4.1 of this document, the NSSL Assessment showed that all capabilities evaluated (Appendix A) were successfully demonstrated during the evaluation.

Comments from Evaluators 1, 2, and 3 were very favorable overall. They included specific comments on their respective matrices in Appendices B, C, and D.

Appendix A: Evaluation Matrix

LIVE EARTH
Product Evaluation
April 25-26, 2019

Evaluator

- Name: _____
- Organization/Duty Title: _____

DIRECTIONS FOR EVALUATOR

- Use this form to record observations from the Product Evaluation
- Use the Scoring System scale below to determine how well the product performs relative to its function or specification within its associated functional area.

SCORING SYSTEM

Definition	Score	Equivalent %
Does not meet the requirement	0	0%
Partially meets the requirement	1	50%
Meets the requirement, with recommendations	2	75%
Meets the requirement	3	100%

RESULTS

Function #	Functional Area	Function/ Specification to Score	Score
1. Application/Capability			
1.1	Data Visualization	Provides an **open source visualization platform** that allows **nearly unlimited numbers and types of data** feeds (**live and static**) to be displayed and reviewed in **one common operational picture.** Users can share with each other.	

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1.1.1	Data Visualization	Provides integrated information for the venue itself and provides **real-time data for the surrounding areas** co-located with the venue and in the city.	
1.1.2	Data Visualization	The **weather team, security team, operations team,** and **executives** can configure or customize a dashboard to only look at the data layers of interest for their respective positions.	
1.1.3	Data Visualization	**Converge public and private data feeds** on one visual pane (Interactive Map).	
1.1.3.1	Data Visualization (Smart City)	All modes of **transportation** within a city or region can be monitored and reviewed in the context of each other from one central location.	
1.1.3.2	Data Visualization (Smart City)	Cities can **monitor and review all utilities** in relation to one another and surrounding weather, traffic, and emergency situations.	
1.1.3.3	Data Visualization (Smart City)	Converge **parking, traffic flow, street and city-level message boards, field personnel, and more** on a single visual pane. *NOTE: Message boards are local to the stadium and are not shown in the demonstration.*	
1.2	Attribute Alerting	Allows **alerts** to be built to **notify users of events or incidents** that occur in the areas of interest. Alerts are configured to show combinations of activities from different data sources and how they interact.	
1.2.1	Real-Time Alerts	**Automatically triggers internal alarms** and **prioritizes external threats.**	
1.2.2	Real-Time Alerts	Issues **real-time alerts** via **pop-up, email,** and **text** for pre-defined scenarios that fall within pre-determined criteria.	

1.2.3	Attribute Alerting (Smart City)	**Predefined alerts** through the platform enable city infrastructure (e.g., street lights, cameras, road conditions, etc.) to be proactively managed from one place through GIS visualization tools.	
1.2.4	Attribute Alerting (Public Safety Alerts)	Sends out **alerts for user-defined scenarios,** whether they are for historical or real-time events.	
1.3.	Play, Pause, Rewind (Event Review)	**Synchronizing data from multiple systems** or VMS systems to allow past events to be reviewed together. Stadiums review the previous days events to understand crowd control, security events, and all surrounding influences (e.g., traffic, weather, etc.) to plan and staff better for the day ahead. Having multiple synchronized cameras and views provides improved situational awareness.	
1.3.1	Analytics	Provides **in-depth investigative support** for ongoing cases, including instant replays and analytics. (Note: may help prepare for future events.)	
1.3.2	Decision Support	Ability to **export still images, video clips, and fully interactive scenes** that contain all relevant information to streamline the decision making process.	
1.4	Data Source Integration	**Large number of available layers (or connectors) already created to provide a fast, out of the box, platform for immediate use.** Cameras, Door Access, Radios, Traffic, Parking, and any other data source are all integrated together in one common view (Interactive Map).	
1.5	Investigative and Forensic Support	**Rewind, pause, and review events** with Live Earth's interactive timeline.	
1.6	Proactive Management of Transportation and Logistics	Provides **location intelligence** and insight into the condition of transportation assets at all times.	
1.6.1	Proactive Management of Transportation and Logistics	Manage transportation and logistics assets to **avoid adverse weather** and traffic conditions to minimize downtime and service disruptions.	

1.6.2	Proactive Management of Transportation and Logistics	**Define optimal routing predictions** based on their operational valuables and predictive alerts on external conditions from Live Earth's platform.	
1.6.3	Proactive Management of Transportation and Logistics	**Predictive weather software** from Live Earth integrates seamlessly with advanced routing software that captures details on truck, trailer, and cargo specifications.	
1.6.4	Proactive Management of Transportation and Logistics	Data can be displayed on **real-time maps**, showing route forecasts, along with the hyper-local point forecasts along a route.	
1.6.5	Proactive Management of Transportation and Logistics	Each **point on the route can be further analyzed** with **plot graphs** showing road state, road temperature, air temperature, wind speed, wind direction, precipitation and more.	
1.6.6	Proactive Management of Transportation and Logistics	Able to **monitor all security systems** at distribution centers in relation to fleet locations, configurations, and conditions on a single panel	
1.7	Open Source Integration using Application Program Interface (API)	API documentation and methodology allows customers to **"push" any geolocation data (that contains a time and date) to the platform.** This allows users to integrate proprietary systems without external support.	
2. Ease of Use			
2.1	Time required for set-up	Download the application on a **Windows 10 machine.** Will be up and running in less than one hour.	
2.2	Intuitive	Users with **minimal training** can operate the system.	
3. Mobility			
3.1	Use on an iPad	Able to log in using web client on an iPad	

3.2	Use on an iPad Pro	Able to access all functions in Section 1 of the matrix.	
	Use on Laptop, PC, Mac, tablets	Able to access all function in Section 1 of the matrix.	
4. Maintenance			
4.1	System updates	Automatic system updates for security patches and programming updates.	
		Average Score	

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

Appendix B: Evaluator 1 Matrix

LIVE EARTH
Product Evaluation
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DIRECTIONS FOR EVALUATOR

- Use this form to record observations from the Product Evaluation
- Use the Scoring System scale below to determine how well the product performs relative to its function or specification within its associated functional area.

SCORING SYSTEM

Definition	Score	Equivalent %
Does not meet the requirement	0	0%
Partially meets the requirement	1	50%
Meets the requirement, with recommendations	2	75%
Meets the requirement	3	100%

RESULTS

Function #	Functional Area	Function/ Specification to Score	Score
1. Application/Capability			
1.1	Data Visualization	Provides an **open source visualization platform** that allows **nearly unlimited numbers and types of data** feeds (**live and static**) to be displayed and reviewed in **one common operational picture**. Users can share with each other.	

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1.1.1	Data Visualization	Provides integrated information for the venue itself and provides **real-time data for the surrounding areas** co-located with the venue and in the city.	3
1.1.2	Data Visualization	The **weather team, security team, operations team,** and **executives** can configure or customize a dashboard to only look at the data layers of interest for their respective positions.	3
1.1.3	Data Visualization	**Converge public and private data feeds** on one visual pane (Interactive Map).	3
1.1.3.1	Data Visualization (Smart City)	All modes of **transportation** within a city or region can be monitored and reviewed in the context of each other from one central location.	2
1.1.3.2	Data Visualization (Smart City)	Cities can **monitor and review all utilities** in relation to one another and surrounding weather, traffic, and emergency situations.	3
1.1.3.3	Data Visualization (Smart City)	Converge **parking, traffic flow, street and city-level message boards, field personnel, and more** on a single visual pane. *NOTE: Message boards are local to the stadium and are not shown in the demonstration.*	3
1.2	Attribute Alerting	Allows **alerts** to be built to **notify users of events or incidents** that occur in the areas of interest. Alerts are configured to show combinations of activities from different data sources and how they interact.	
1.2.1	Real-Time Alerts	**Automatically triggers internal alarms** and **prioritizes external threats.**	3
1.2.2	Real-Time Alerts	Issues **real-time alerts** via **pop-up**, **email**, and **text** for pre-defined scenarios that fall within pre-determined criteria.	3

1.2.3	Attribute Alerting (Smart City)	**Predefined alerts** through the platform enable city infrastructure (e.g., street lights, cameras, road conditions, etc.) to be proactively managed from one place through GIS visualization tools.	3
1.2.4	Attribute Alerting (Public Safety Alerts)	Sends out **alerts for user-defined scenarios,** whether they are for historical or real-time events.	3
1.3.	Play, Pause, Rewind (Event Review)	**Synchronizing data from multiple systems** or VMS systems to allow past events to be reviewed together. Stadiums review the previous days events to understand crowd control, security events, and all surrounding influences (e.g., traffic, weather, etc.) to plan and staff better for the day ahead. Having multiple synchronized cameras and views provides improved situational awareness.	
1.3.1	Analytics	Provides **in-depth investigative support** for ongoing cases, including instant replays and analytics. (Note: may help prepare for future events.)	3
1.3.2	Decision Support	Ability to **export still images, video clips, and fully interactive scenes** that contain all relevant information to streamline the decision making process.	3
1.4	Data Source Integration	**Large number of available layers (or connectors) already created to provide a fast, out of the box, platform for immediate use.** Cameras, Door Access, Radios, Traffic, Parking, and any other data source are all integrated together in one common view (Interactive Map).	2
1.5	Investigative and Forensic Support	**Rewind, pause, and review events** with Live Earth's interactive timeline.	3
1.6	Proactive Management of Transportation and Logistics	Provides **location intelligence** and insight into the condition of transportation assets at all times.	3
1.6.1	Proactive Management of Transportation and Logistics	Manage transportation and logistics assets to **avoid adverse weather** and traffic conditions to minimize downtime and service disruptions.	3

1.6.2	Proactive Management of Transportation and Logistics	**Define optimal routing predictions** based on their operational valuables and predictive alerts on external conditions from Live Earth's platform.	3
1.6.3	Proactive Management of Transportation and Logistics	**Predictive weather software** from Live Earth integrates seamlessly with advanced routing software that captures details on truck, trailer, and cargo specifications.	3
1.6.4	Proactive Management of Transportation and Logistics	Data can be displayed on **real-time maps**, showing route forecasts, along with the hyper-local point forecasts along a route.	3
1.6.5	Proactive Management of Transportation and Logistics	Each **point on the route can be further analyzed** with **plot graphs** showing road state, road temperature, air temperature, wind speed, wind direction, precipitation and more.	3
1.6.6	Proactive Management of Transportation and Logistics	Able to **monitor all security systems** at distribution centers in relation to fleet locations, configurations, and conditions on a single panel	3
1.7	Open Source Integration using Application Program Interface (API)	API documentation and methodology allows customers to **"push" any geolocation data (that contains a time and date) to the platform**. This allows users to integrate proprietary systems without external support.	3
2. Ease of Use			
2.1	Time required for set-up	Download the application on a **Windows 10 machine.** Will be up and running in less than one hour.	2
2.2	Intuitive	Users with **minimal training** can operate the system.	3
3. Mobility			
3.1	Use on an iPad	Able to log in using web client on an iPad	3

3.2	Use on an iPad Pro	Able to access all functions in Section 1 of the matrix.	3
	Use on Laptop, PC, Mac, tablets	Able to access all function in Section 1 of the matrix.	3
4. Maintenance			
4.1	System updates	Automatic system updates for security patches and programming updates.	3
		Average Score	

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

1.3.1 — EXPORT VIDEO — BEYOND 30 DAYS . . . ?
VIDEO / LINK SOURCE . . .

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

Appendix C: Evaluator 2 Matrix

LIVE EARTH
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DIRECTIONS FOR EVALUATOR

- Use this form to record observations from the Product Evaluation
- Use the Scoring System scale below to determine how well the product performs relative to its function or specification within its associated functional area.

SCORING SYSTEM

Definition	Score	Equivalent %
Does not meet the requirement	0	0%
Partially meets the requirement	1	50%
Meets the requirement, with recommendations	2	75%
Meets the requirement	3	100%

RESULTS

Function #	Functional Area	Function/ Specification to Score	Score
1. Application/Capability			
1.1	Data Visualization	Provides an **open source visualization platform** that allows **nearly unlimited numbers and types of data** feeds (**live and static**) to be displayed and reviewed in **one common operational picture**. Users can share with each other.	

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1.1.1	Data Visualization	Provides integrated information for the venue itself and provides **real-time data for the surrounding areas** co-located with the venue and in the city.	3
1.1.2	Data Visualization	The **weather team, security team, operations team,** and **executives** can configure or customize a dashboard to only look at the data layers of interest for their respective positions.	3
1.1.3	Data Visualization	**Converge public and private data feeds** on one visual pane (Interactive Map).	3
1.1.3.1	Data Visualization (Smart City)	All modes of **transportation** within a city or region can be monitored and reviewed in the context of each other from one central location.	3
1.1.3.2	Data Visualization (Smart City)	Cities can **monitor and review all utilities** in relation to one another and surrounding weather, traffic, and emergency situations.	3
1.1.3.3	Data Visualization (Smart City)	Converge **parking, traffic flow, street and city-level message boards, field personnel, and more** on a single visual pane. *NOTE: Message boards are local to the stadium and are not shown in the demonstration.*	3
1.2	Attribute Alerting	Allows **alerts** to be built to **notify users of events or incidents** that occur in the areas of interest. Alerts are configured to show combinations of activities from different data sources and how they interact.	
1.2.1	Real-Time Alerts	**Automatically triggers internal alarms** and **prioritizes external threats**.	3
1.2.2	Real-Time Alerts	Issues **real-time alerts** via **pop-up, email**, and **text** for pre-defined scenarios that fall within pre-determined criteria.	3

1.2.3	Attribute Alerting (Smart City)	**Predefined alerts** through the platform enable city infrastructure (e.g., street lights, cameras, road conditions, etc.) to be proactively managed from one place through GIS visualization tools.	3
1.2.4	Attribute Alerting (Public Safety Alerts)	Sends out **alerts for user-defined scenarios,** whether they are for historical or real-time events.	3
1.3.	Play, Pause, Rewind (Event Review)	**Synchronizing data from multiple systems** or VMS systems to allow past events to be reviewed together. Stadiums review the previous days events to understand crowd control, security events, and all surrounding influences (e.g., traffic, weather, etc.) to plan and staff better for the day ahead. Having multiple synchronized cameras and views provides improved situational awareness.	
1.3.1	Analytics	Provides **in-depth investigative support** for ongoing cases, including instant replays and analytics. (Note: may help prepare for future events.)	3
1.3.2	Decision Support	Ability to **export still images, video clips, and fully interactive scenes** that contain all relevant information to streamline the decision making process.	3
1.4	Data Source Integration	**Large number of available layers (or connectors) already created to provide a fast, out of the box, platform for immediate use.** Cameras, Door Access, Radios, Traffic, Parking, and any other data source are all integrated together in one common view (Interactive Map).	3
1.5	Investigative and Forensic Support	**Rewind, pause, and review events** with Live Earth's interactive timeline.	3
1.6	Proactive Management of Transportation and Logistics	Provides **location intelligence** and insight into the condition of transportation assets at all times.	3
1.6.1	Proactive Management of Transportation and Logistics	Manage transportation and logistics assets to **avoid adverse weather** and traffic conditions to minimize downtime and service disruptions.	3

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1.6.2	Proactive Management of Transportation and Logistics	**Define optimal routing predictions** based on their operational valuables and predictive alerts on external conditions from Live Earth's platform.	3
1.6.3	Proactive Management of Transportation and Logistics	**Predictive weather software** from Live Earth integrates seamlessly with advanced routing software that captures details on truck, trailer, and cargo specifications.	3
1.6.4	Proactive Management of Transportation and Logistics	Data can be displayed on **real-time maps**, showing route forecasts, along with the hyper-local point forecasts along a route.	3
1.6.5	Proactive Management of Transportation and Logistics	Each **point on the route can be further analyzed** with **plot graphs** showing road state, road temperature, air temperature, wind speed, wind direction, precipitation and more.	3
1.6.6	Proactive Management of Transportation and Logistics	Able to **monitor all security systems** at distribution centers in relation to fleet locations, configurations, and conditions on a single panel	3
1.7	Open Source Integration using Application Program Interface (API)	API documentation and methodology allows customers to **"push" any geolocation data (that contains a time and date) to the platform**. This allows users to integrate proprietary systems without external support.	3
2. Ease of Use			
2.1	Time required for set-up	Download the application on a **Windows 10 machine.** Will be up and running in less than one hour.	3
2.2	Intuitive	Users with **minimal training** can operate the system.	3
3. Mobility			
3.1	Use on an iPad	Able to log in using web client on an iPad	3

3.2	Use on an iPad Pro	Able to access all functions in Section 1 of the matrix.	3
	Use on Laptop, PC, Mac, tablets	Able to access all function in Section 1 of the matrix.	3
4. Maintenance			
4.1	System updates	Automatic system updates for security patches and programming updates.	3
		Average Score	3

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

- SPECIAL EVENT INCIDENT COMMANDER - MIDSIZE POLICE DEPARTMENT

- ESSENTIAL TECH AS IT RELATES TO EVENT PLANNING + INCIDENTS ARISING ~~FROM~~ WITHIN EVENTS.

- MUNICIPALITIES SHARING THIS TECH IS PREFERRED. O.E.M. MIGHT BE BEST WAY INTO L.E. IN MY REGION - NORTH

- BODY WORN CAMERA (AXON) PARTNERSHIP WILL ADD THE LAYER A CRIME CENTERED CITY WILL WANT TO MAKE THIS TECH EASIER TO FUND + SUPPORT.

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EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

Appendix D: Evaluator 3 Matrix

LIVE EARTH
Product Evaluation
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DIRECTIONS FOR EVALUATOR

- Use this form to record observations from the Product Evaluation
- Use the Scoring System scale below to determine how well the product performs relative to its function or specification within its associated functional area.

SCORING SYSTEM

Definition	Score	Equivalent %
Does not meet the requirement	0	0%
Partially meets the requirement	1	50%
Meets the requirement, with recommendations	2	75%
Meets the requirement	3	100%

RESULTS

Function #	Functional Area	Function/ Specification to Score	Score
1. Application/Capability			
1.1	Data Visualization	Provides an **open source visualization platform** that allows **nearly unlimited numbers and types of data** feeds (**live and static**) to be displayed and reviewed in **one common operational picture**. Users can share with each other.	

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1.1.1	Data Visualization	Provides integrated information for the venue itself and provides **real-time data for the surrounding areas** co-located with the venue and in the city. Great for real time mapping	3
1.1.2	Data Visualization	The **weather team, security team, operations team,** and **executives** can configure or customize a dashboard to only look at the data layers of interest for their respective positions.	3
1.1.3	Data Visualization	**Converge public and private data feeds** on one visual pane (Interactive Map). Important tool to use for planning	3
1.1.3.1	Data Visualization (Smart City)	All modes of **transportation** within a city or region can be monitored and reviewed in the context of each other from one central location. Public modes of Transportation only	3
1.1.3.2	Data Visualization (Smart City)	Cities can **monitor and review all utilities** in relation to one another and surrounding weather, traffic, and emergency situations.	3
1.1.3.3	Data Visualization (Smart City)	Converge **parking, traffic flow, street and city-level message boards, field personnel, and more** on a single visual pane. *NOTE: Message boards are local to the stadium and are not shown in the demonstration.* Can show at this time	3
1.2	Attribute Alerting	Allows **alerts** to be built to **notify users of events or incidents** that occur in the areas of interest. Alerts are configured to show combinations of activities from different data sources and how they interact.	
1.2.1	Real-Time Alerts	**Automatically triggers internal alarms** and **prioritizes external threats.** Great tool to use for event time, Good Tracking program	3
1.2.2	Real-Time Alerts	Issues **real-time alerts** via **pop-up, email,** and **text** for pre-defined scenarios that fall within pre-determined criteria. works very good	3

1.2.3	Attribute Alerting (Smart City)	**Predefined alerts** through the platform enable city infrastructure (e.g., street lights, cameras, road conditions, etc.) to be proactively managed from one place through GIS visualization tools.	3
1.2.4	Attribute Alerting (Public Safety Alerts)	Sends out **alerts for user-defined scenarios,** whether they are for historical or real-time events. No Public alerts	3
1.3.	Play, Pause, Rewind (Event Review)	**Synchronizing data from multiple systems** or VMS systems to allow past events to be reviewed together. Stadiums review the previous days events to understand crowd control, security events, and all surrounding influences (e.g., traffic, weather, etc.) to plan and staff better for the day ahead. Having multiple synchronized cameras and views provides improved situational awareness.	
1.3.1	Analytics	Provides **in-depth investigative support** for ongoing cases, including instant replays and analytics. (Note: may help prepare for future events.) Great tool for Pre Planning future events.	3
1.3.2	Decision Support	Ability to **export still images, video clips, and fully interactive scenes** that contain all relevant information to streamline the decision making process. Very useful in decision process	3
1.4	Data Source Integration	**Large number of available layers (or connectors) already created to provide a fast, out of the box, platform for immediate use.** Cameras, Door Access, Radios, Traffic, Parking, and any other data source are all integrated together in one common view (Interactive Map). Good features!!	3
1.5	Investigative and Forensic Support	**Rewind, pause, and review events** with Live Earth's interactive timeline.	3
1.6	Proactive Management of Transportation and Logistics	Provides **location intelligence** and insight into the condition of transportation assets at all times. Good tool for planning purposes	3
1.6.1	Proactive Management of Transportation and Logistics	Manage transportation and logistics assets to **avoid adverse weather** and traffic conditions to minimize downtime and service disruptions. Good tool for planning purposes	3

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1.6.2	Proactive Management of Transportation and Logistics	**Define optimal routing predictions** based on their operational valuables and predictive alerts on external conditions from Live Earth's platform.	3
1.6.3	Proactive Management of Transportation and Logistics	**Predictive weather software** from Live Earth integrates seamlessly with advanced routing software that captures details on truck, trailer, and cargo specifications.	3
1.6.4	Proactive Management of Transportation and Logistics	Data can be displayed on **real-time maps**, showing route forecasts, along with the hyper-local point forecasts along a route.	3
1.6.5	Proactive Management of Transportation and Logistics	Each **point on the route can be further analyzed** with **plot graphs** showing road state, road temperature, air temperature, wind speed, wind direction, precipitation and more.	3
1.6.6	Proactive Management of Transportation and Logistics	Able to **monitor all security systems** at distribution centers in relation to fleet locations, configurations, and conditions on a single panel	3
1.7	Open Source Integration using Application Program Interface (API)	API documentation and methodology allows customers to **"push" any geolocation data (that contains a time and date) to the platform**. This allows users to integrate proprietary systems without external support.	3
2. Ease of Use			
2.1	Time required for set-up	Download the application on a **Windows 10 machine.** Will be up and running in less than one hour. Took less than one hour	3
2.2	Intuitive	Users with **minimal training** can operate the system. very easy to operate	3
3. Mobility			
3.1	Use on an iPad	Able to log in using web client on an iPad	3

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3.2	Use on an iPad Pro	Able to access all functions in Section 1 of the matrix.	3
	Use on Laptop, PC, Mac, tablets	Able to access all function in Section 1 of the matrix.	3
4. Maintenance			
4.1	System updates	Automatic system updates for security patches and programming updates. update on a regular basis	3
		Average Score	

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.

NOTES written above.

one of the best platforms for information systems I have seen. Brought information together in a very easy platform.

I can see the application being used for many different types of events, and event planning. Product has proven Real world applications.

EVALUATOR FEEDBACK

NOTE: Comments are incorporated into the White Paper.