

Six Questions to Ask Yourself When Evaluating

# Fire Detection Systems

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The Ultimate Guidebook for Early Warning Fire Detection Systems



# A Guide for Early Warning Fire Detection Systems

## Welcome to this guide!

Fire detection is such an important subject that we decided to create this guide to educate and improve understanding of the critical considerations of early warning fire detection systems. With the development of the industrial internet of things, artificial intelligence, and infrared technology, fire detection systems are more capable than ever, with many options available for sensing, connecting, and communicating. The topic of early warning fire detection can seem a bit daunting, especially with the new technology developments.

In this guide, we break things down into the following categories:

- Sensors
- Security
- Connectivity
- Expandability and Scalability
- System Upgrades and Updates
- Integrator Expertise and Support

While we tried to make this a comprehensive guide, we understand you may still have questions. As such, we are always available by email or phone to help in any way we can. So please don't hesitate to reach out.

It is our pleasure to assist.

- The MoviTHERM Team

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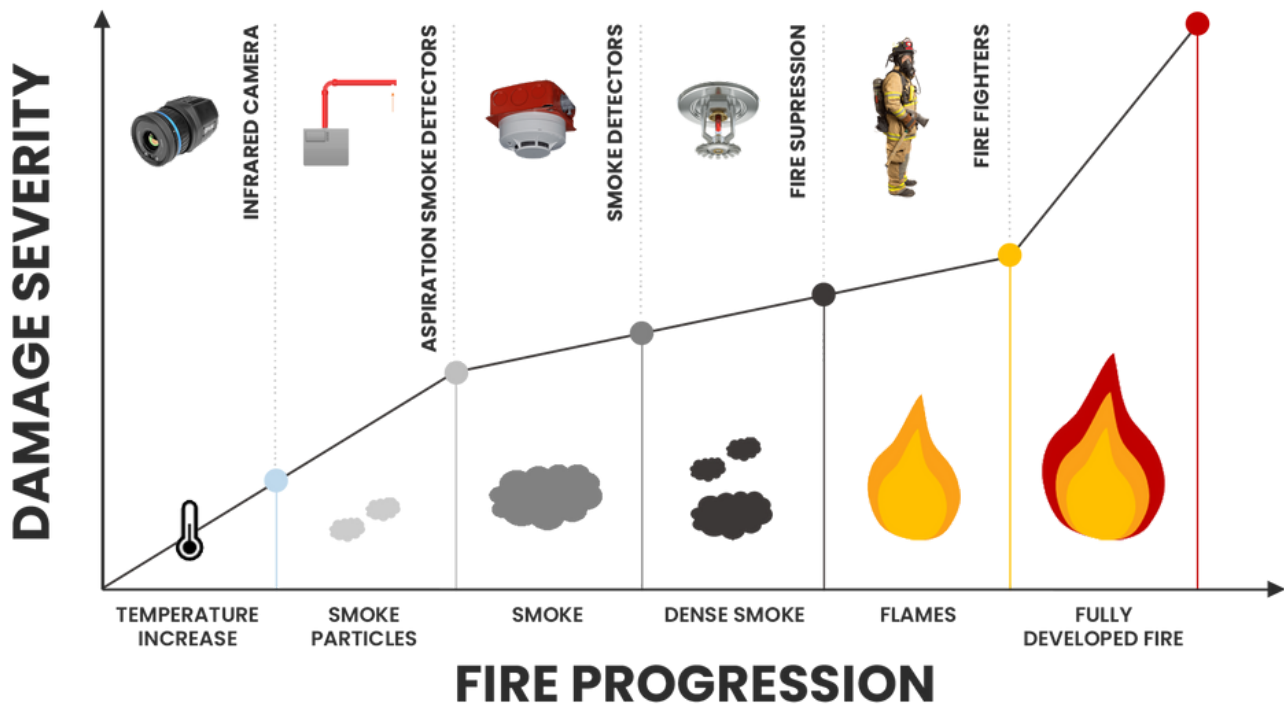
**20** **MoviTHERM's iEFD**  
*MoviTHERM's intelligent early fire detection solution.*

# Sensors

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## "What type of fire sensors are available?"

Various fire detection sensors are available today that alert of fire formation at different progression times. The figure below shows the relative detectability of fire detection devices at different stages of fire development with corresponding damage levels.



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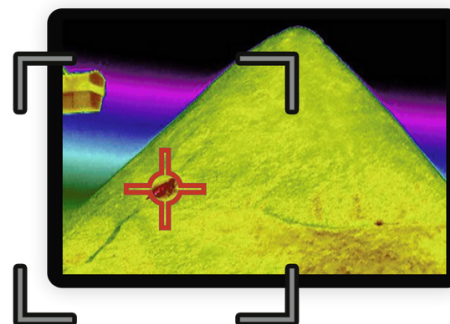
# Types of Sensors

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## Infrared (IR) Cameras

IR cameras operate on the heat transfer principle of radiation. The infrared camera has a focal plane array of detector elements that sense infrared light from object surfaces. The radiation captured by the infrared camera detector is digitized, converted to data, and displayed as a viewable image. Calibrated IR cameras can report temperature measurements from specific spots, lines, and areas on live or recorded images. IR cameras are available in different wavebands, pixel resolutions, lens configurations, and communication protocols to meet various installation requirements.

IR camera systems are the first to alert before a fire develops. They “see” a warming-up of material early in the fire development process before forming smoke particles or flames. These warming materials appear as hot spots in a thermal image and are quantified with regions of interest (ROI) that report temperature values. Applying multiple ROIs to an image and setting temperature thresholds allows monitoring and alarming multiple locations within the camera’s view. Alarms trigger alerts to the appropriate personnel when ROI threshold conditions are met.



**PROs:** Can detect and alert at the earliest stages of potential fire development. Are accurate and can precisely pinpoint the position of a hotspot.

**CONs:** Can only detect surface temperatures and require a clear line of sight to the target of interest.

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# Types of Sensors

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## Aspiration Smoke Detector (ASD) Systems

ASDs are designed to draw air samples to the detector using a sampling pipe with multiple holes. A highly sensitive laser detection unit filters and processes the air sample. If smoke particles are detected, the system's alarm is triggered. ASDs are more precise than passive smoke detectors and typically incorporate more than one alarm level. For example, an ASD can be programmed to alert at the earliest smoldering stage to prompt investigation, with other alarm levels configured to provide fire and suppression systems inputs.

**PROs:** Flexible installation due to active sampling. Detect smoke activity in large open spaces where smoke dilution can occur. Incorporates integrity monitoring and alerts when the ability to detect smoke is compromised.

**CONS:** Not suitable for dirty environments where fouling can occur.



## Ionization Smoke Detectors

In an ionization smoke detector, a small amount of radioactive material between two electrically charged plates ionizes the air, causing a current to flow between the plates. When smoke enters the chamber, it interrupts the flow of ions, reducing the current flow and triggering the alarm.

**PROs:** More responsive to the flaming stage of fires than optical detectors.

**CONS:** Susceptible to false alarms from steam or dust particles.

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# Types of Sensors

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## Photoelectric Smoke Detectors

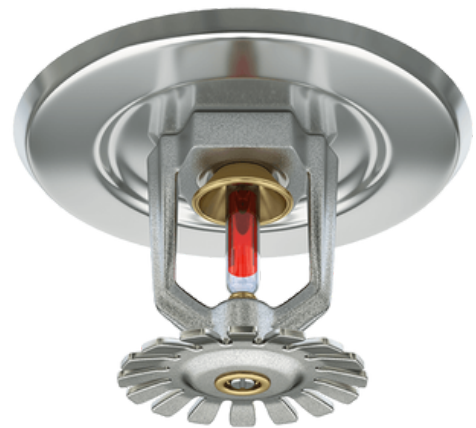
In a photoelectric smoke alarm, a light is aimed into a sensing chamber but away from the sensor itself. When smoke enters the chamber, it causes the light to be reflected onto the sensor, activating the alarm.

**PROs: More responsive to slow smoldering fires that emit larger particles. Less susceptible to false alarms.**

**CONs: Slower to respond to fast-forming fires.**

## Fire Sprinkler Systems

Fire sprinkler systems have strategically placed sprinkler heads with glass bulbs containing a glycerin-based liquid. Sprinkler systems detect a fire through rising temperatures. As the temperature at the sprinkler head increases to between 135 to 165 degrees Fahrenheit, the liquid inside the glass bulb expands and breaks the glass, thus activating the sprinkler head. Various colors of liquid in these glass components indicate a different threshold of heat required to break the glass.



**PROs: Not only detect fire but also aid to extinguish a fire. Only those sprinklers closest to the fire activate.**

**CONs: Detect late in the fire development process. Extensive installation effort.**

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# Sensors

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## "How do I know what sensor(s) I need?"

You should consider the following questions to select the best sensors for your installation. For example, understanding the airflow of your installation environment will determine if smoke detectors will be effective.

- What are you detecting?
- What is the condition of the environment? Dusty? High or low airflow? Wet?
- What are the sensor locations?
- What is the sensor distance to the monitoring target?
- How far apart should sensor spacing be?
- How do the sensors connect? Are they wired or wireless?

Correct sensor selection and placement are critical to ensure optimum detection performance. For example, IR cameras require a direct line of sight to the area of interest to provide detection. Critical areas obscured from the camera's field of view could be monitored by smoke detectors, thereby augmenting the camera's detection. For outdoor or high-airflow installations, IR sensors are best for detection as dilution effects may limit smoke detectors' performance.

How the sensor connects is also a critical selection criterion. Sensors that require wired connections for power and communications add to the infrastructure and installation costs. In contrast, wireless sensors that connect via standard protocols, like LoRa, are easy to install and configure.

Not sure where to start. No problem, give MoviTHERM a call, and we can step you through the sensor selection process.

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# Security

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## "Will a fire detection system make me vulnerable to hackers?"

We hear more and more about hacked networks and companies held hostage by hackers demanding ransom payments. As we become more connected with the proliferation of cloud-connected devices, the need for network security is ever increasing, especially for systems monitoring and controlling critical processes like early warning fire detection systems. As it applies to installing and running a connected fire detection system, adopters should consider the following key security areas.

### On Network vs. Off Network Systems

Companies today have essentially two options for a network-based fire detection system. They can choose to have the system reside on the company's network (the same network that supports its infrastructure, processes, and operations). Or they can decide to run the system separate from the company network, or in other words, "off-network." The advantage of an off-network fire detection system is that there is zero chance of hacking the company network via the detection system.



### Cloud Security

When operating a cloud-based platform, it is crucial to understand the cloud server used and the encryption provided. For example, the Amazon Web Services platform uses 2048-bit encryption to ensure system security.



# Security

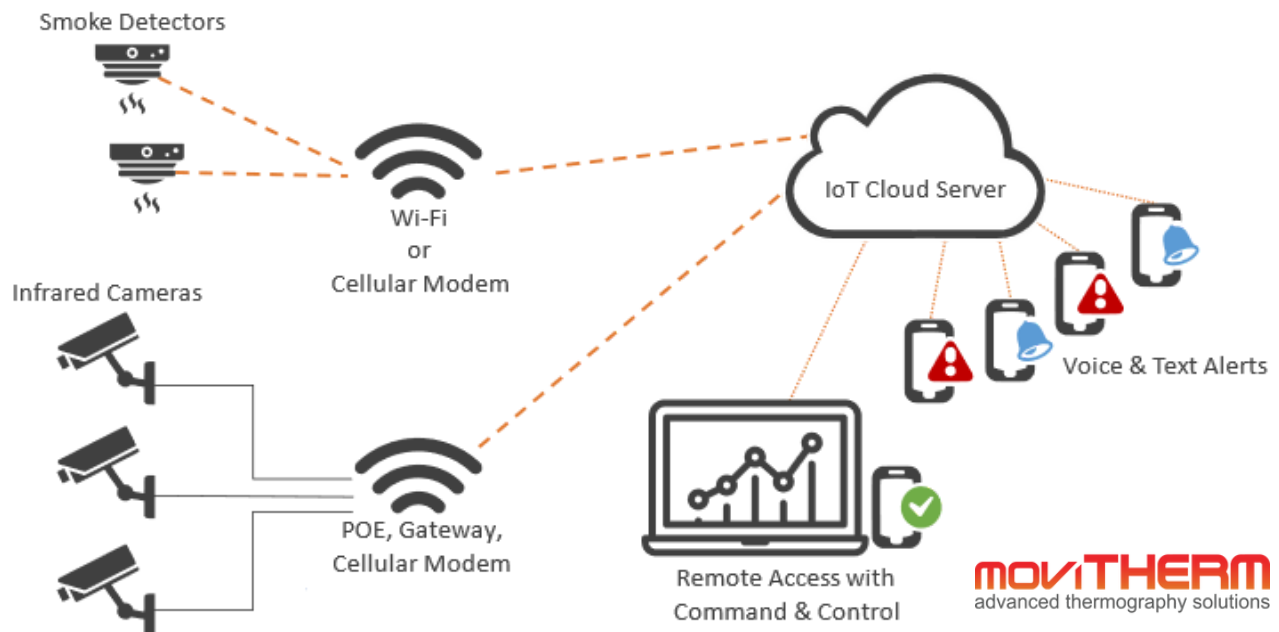
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## Cellular Connectivity

Cellular connectivity is an off-network option to connect a fire detection system to the cloud. The figure below illustrates a fire detection system that utilizes cellular for cloud connectivity.

Advantages to this approach include:

- Cloud connectivity is off-network from the company infrastructure.
- Zero company IT burden.
- Reduced cabling simplifying the installation.
- Modem firewalls and VPN cybersecurity.
- Multi-carrier options with robust fail-safe switching.
- Remote integrator support enabled.



# Connectivity

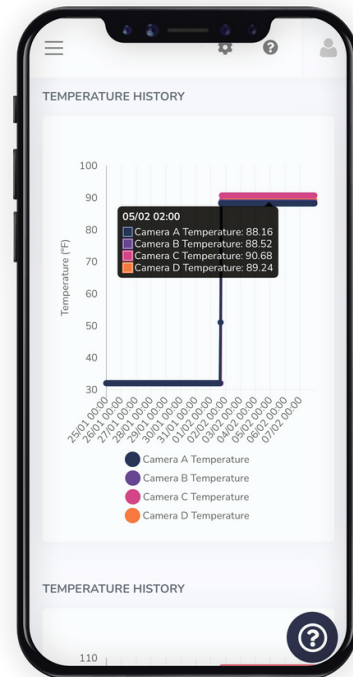
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## "How will the system alarm me?"

The next area to discuss is system connectivity. To include how you access the system and how the system accesses you. Meaning, how does the system send alerts of potential for fire? Or how does the system notify of a problem with sensor health? The detection system health is just as important as detection alarm status. Another critical aspect of connectivity is information and content presentation. Are dashboards customizable and easy to view? Can imagery from thermal and visible cameras be displayed? These topics and others are addressed in the following section.

### System Access

Having a simple and easy connection to the fire detection system while maintaining security is a critical consideration when selecting a fire detection system. Just as crucial is how the system will connect with users when there is an alarm or system health issue. Local network systems typically require the same security protocols the in-house IT organization sets. While these protocols may ensure system security, they may also add complexity to accessing the system. For example, a localized system may only allow system access with company IT-approved hardware limiting accessibility and sharing of dashboard views (more on this later).



**MoviTHERM's iEFD Cloud**  
Early Fire Detection Application

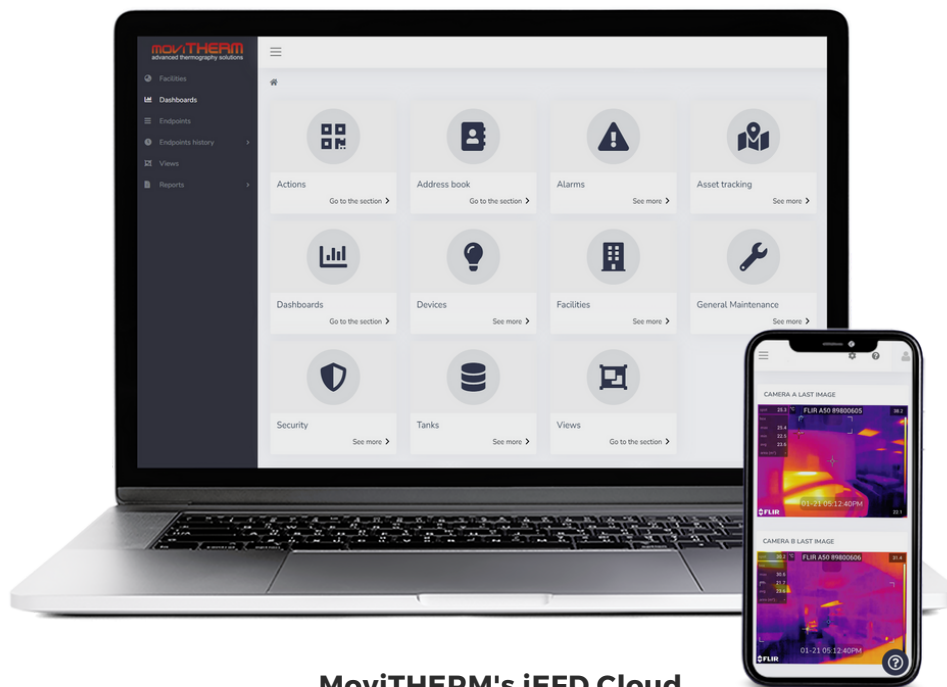
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# Connectivity

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## System Access (Cont.)

With the appropriate credentials and internet-connected devices, users can access a cloud-based off-network detection system anytime from anywhere. Additionally, users will receive alarms and notifications anytime and anywhere. And with admin credentials, administrators can edit configuration and alarm settings remotely without needing to be on-site. These are powerful features for system managers and the system integrator, who can log into the system for diagnostics, updates, and firmware upgrades.



**MoviTHERM's iEFD Cloud  
Early Fire Detection Application**

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# Connectivity

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## Configuring Alarms and Alerts

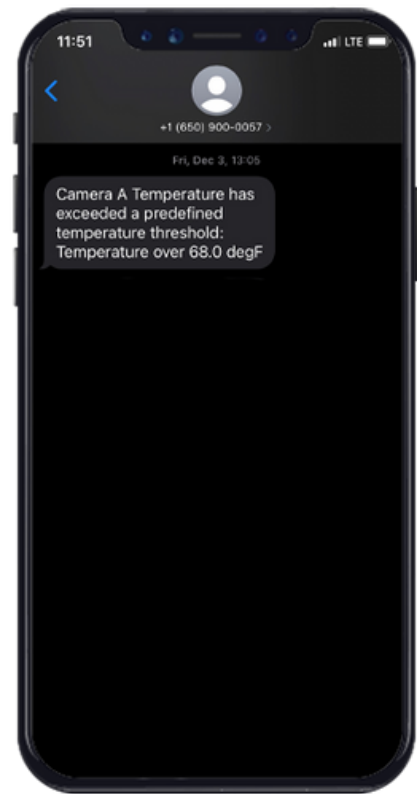
The ability to add alarms and configure alerts should not require a programmer or system integrator. Modern fire detection systems will deploy easy-to-use graphical interfaces with logical workflows to add sensors, set threshold alarms, and notification alerts. Additionally, the system should be able to select and deliver tiered notifications via text, email, or phone call.

### Scenario Examples:

1) As a first-level alert, an infrared camera detects a warm spot in a biomass pile, measuring a slight increase in temperature; the system may send a text message to a yard worker to investigate. Upon investigation, the yard worker might take a shovel and mitigate the early potential hazard. Situation remedied. Crisis averted.

2) As a second level of alert, the infrared camera may detect a hot spot with a moderate increase in temperature; at this level, the system could call the yard crew to soak the area with a water truck.

3) Finally, as a third-tier alert, if the infrared camera detects a hot spot with a significant increase in temperature, the system could call the local fire department and alert them of the potential fire. The system could also share a URL link giving the first responders access to a live map view of the scene, allowing an assessment of the hazard before arriving onsite (more on this later).



**Text Alert Received from Early Fire Detection System**

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# Connectivity

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## Dashboards & Reports

Dashboards are a visual tool used to distill the critical detection system and sensor information into an easily consumable format.

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**Essential features to consider when evaluating a detection system display capabilities include:**

- **Customizable Layout** – Does the system support the easy creation of custom displays? Does the system include dashboard templates to work with as a starting point?
- **Facility Selector** – Does the system support sharing multiple facility systems with the ability to “drill into” a single facility view?
- **Alarm Status** – Does the dashboard have a flexible way to show alarm status? Can the sensor status be overlaid on a facility map or schematic view?
- **Sensor Trending** – Can the system show measurement trends from the various sensor types? Can sensor raw data be accessed?
- **Thermal Imagery** – Do the dashboards show infrared camera output along with the region of interest temperature measurement?
- **Visible Imagery** – Can the dashboard show visible camera imagery?



# Connectivity

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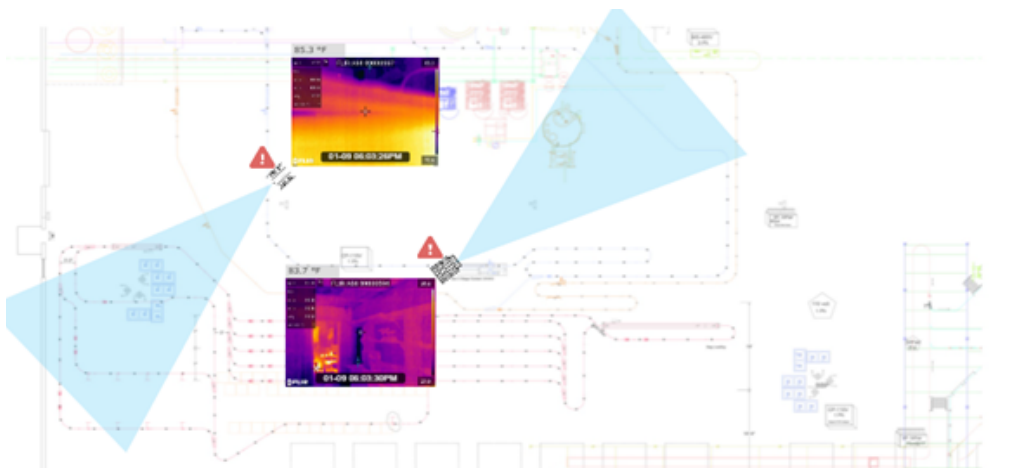
## Sharing Views

The ability to freely share dashboards and views can be valuable when working with external response teams. For example, a live map view could be shared with first responders via a URL link if an alarm threshold is met.

### The map view could include:

- Schematic of the facility showing entry and exit points.
- Detector/sensor locations with alarm status.
- Current thermal and visible camera views.

Using this map view, first responders can assess the scene before arriving on-site to safely and effectively remedy the hazard.



**Example of a facility's layout viewed from the iEFD dashboard.**

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# Connectivity

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## Reporting

Another connectivity area for consideration is the system's ability to automatically generate and distribute status reports. Tracking the facility's status through reporting can be a valuable tool for communicating facility safety status to owners, regulatory agencies, and insurance providers.

### Scheduled report

📎 1 ✓



Movitherm alerts

To:



Mon 4/18/2022 12:00 AM



You are receiving this e-mail because report "**Alarms History**" is scheduled to be issued and delivered to you. This report was created from favorite "**Alarm History for Facility A**".



If you no longer wish to receive these emails, [unsubscribe here](#).

**Example of a schedule email report sent from  
MovITHERM's iEFD Application**



# Expandability & Scalability

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## "Will the system be able to adapt to the growth of my business?"

Expandability is the ability to add sensors, features, and users, while scalability is the ability to add additional sites/facilities to the detection system. The ability to do both with low effort and cost is an essential aspect of an early fire warning system.

### Expandability

Cloud-based early fire warning systems are the easiest to expand and grow. Once the application foundation is in place, additional sensors and cameras can be added and configured with just a few clicks. The initial investment is small compared to traditional fire detection systems, with a new installation consisting of as little as a single camera or sensor.



Another aspect of expandability is the ability to add automation.

### For example:

Can the system trigger and control an extinguishing system when a certain alarm threshold is met?

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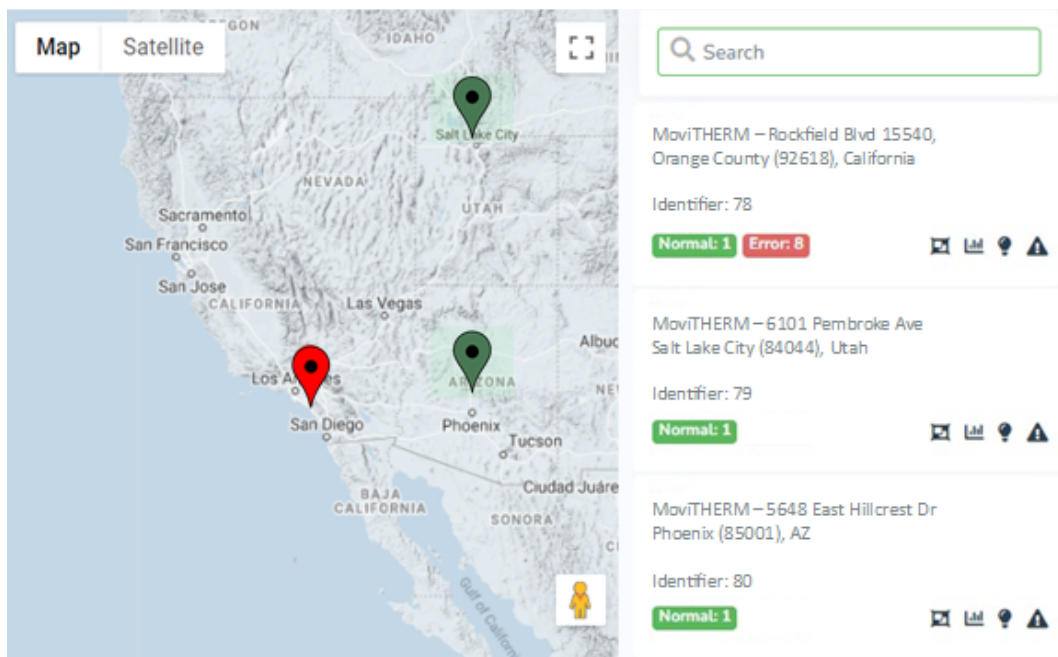
# Expandability & Scalability

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## Scalability

Scalability is another area where cloud-based detection systems shine. Adding sites and facilities to global dashboards take just a few clicks in the application software. Once added, managers can readily see all facilities' health and safety status.

These managers have access to all the connectivity functionality available at the local level, including dashboard views, alarm and health notifications, and automated reporting. Connection only requires an internet-connected device with the appropriate credentials.



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# System Upgrades & Updates

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## "How often will I need to worry about system maintenance?"

Cloud-based early warning detection systems are less expensive than traditional detection systems. Because the detection system software resides in the cloud, there is no need to maintain a dedicated facility computer server and be concerned with software updates. Also, as system access only requires an internet connection, any potential operating system software conflicts are eliminated. When application updates and new features are released, they are readily available to system users without the hassle of installing updates.

In addition to software updates, firmware updates to cameras and sensors are done automatically and remotely via cloud connectivity, another critical advantage of cloud-based systems over traditional localized detection systems.



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# Integrator Expertise & Support

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## "Who should I consider installing my fire detection system?"

Not to be overlooked is the reputation of the system integration and the support you will receive, not only during the installation but during the system's operation. You will want to be sure the integrator has experience with successful installations. Additionally, suppose your system is going to incorporate thermal imaging technology. In that case, you will want to ensure the integrator understands the physics of infrared imaging and has access to reliable and proven IR camera technology.



### Who is MoviTHERM?

MoviTHERM has over 20 years of experience engineering solutions that leverage the sensing advantages of thermal imaging. Our strategic partnerships with key suppliers provide access to the latest and greatest sensing technology. Our experience combined with the newest tech produces “a generation ahead” smart IR solutions for early fire detection, condition monitoring, automated quality inspection, and infrared non-destructive testing.

Our vision is to make hindsight irrelevant for our customers by eliminating surprises and guesswork. Our solutions provide the foresight needed to take best-informed actions before failures occur. We turn efforts from reactive to proactive, thus avoiding the pain of making mistakes.

# MoviTHERM's iEFD

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## What is MoviTHERM iEFD?

MoviTHERM iEFD is an intelligent fire detection solution that uses thermal imaging and other sensing technology to detect fire formation at the earliest stage. By leveraging the industrial internet of things (IIoT) connectivity with cloud computing, iEFD more efficiently detects and alerts potential hazards with much lower installation and maintenance costs than traditional systems. MoviTHERM iEFD can quickly scale to connect and monitor multiple sites from a central location anywhere in the world.

MoviTHERM iEFD is used in industrial laundry, coal mining, metal recycling, biomass utility, battery charging, and other installations.

Learn more about MoviTHERM iEFD at <https://movitherm.com/solutions/movitherm-iefd-early-fire-detection/>

Or contact one of our application specialists at +1 (949) 699-6600





# iEFD vs Traditional Systems

## iEFD System

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- ✓ **IR Cameras**
  - Receive expert guidance from our team of engineers on what camera best fits your needs.
- ✓ **Mass Alerting**
  - Customize and set alerts to be sent via voice call, text, or email, depending on the severity of the alarm.
- ✓ **Easily Scalable**
- ✓ **Personalized Dashboard**
  - Access to all connected sensors.
  - Access your facility's layout.
  - Access alarm history reports.
- ✓ **URL MapVIEWS**
  - Updates in real-time to keep all first responders aware of the quickly evolving situation.
- ✓ **Automated Reporting**
  - Schedule history reports to be delivered to your inbox.
- ✓ **Upgrades & Updates**
  - The application resides in the cloud, which means automatic software & firmware installs.

## Traditional Systems

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- ✓ **IR Cameras**
  - Receive suggestions on what type of camera will fit your needs.
- ✓ **Mass Alerting**
  - Alerts will typically require an autodialer and are not customizable.
- ✗ **Easily Scalable**
  - Expandability is possible, but not achieved easily on systems that do not reside in the cloud.
- ✗ **Personalized Dashboard**
  - Traditional systems don't come with a user-friendly application.
- ✗ **URL MapVIEWS**
  - MapVIEWS are not available in traditional systems.
- ✗ **Automated Reporting**
  - Automated reporting can only be achieved on cloud-based systems.
- ✗ **Upgrades & Updates**
  - Traditional systems require manual upgrades, plus PC and hardware maintenance and/or replacement.