OroraTech Fire Detection Updates

CEOS LSI-VC
September 16, 2026

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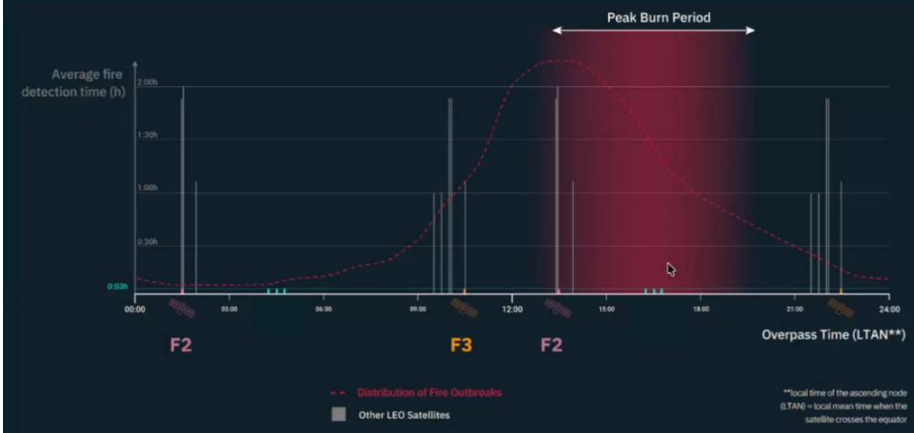
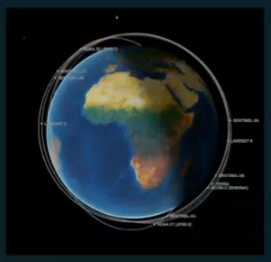
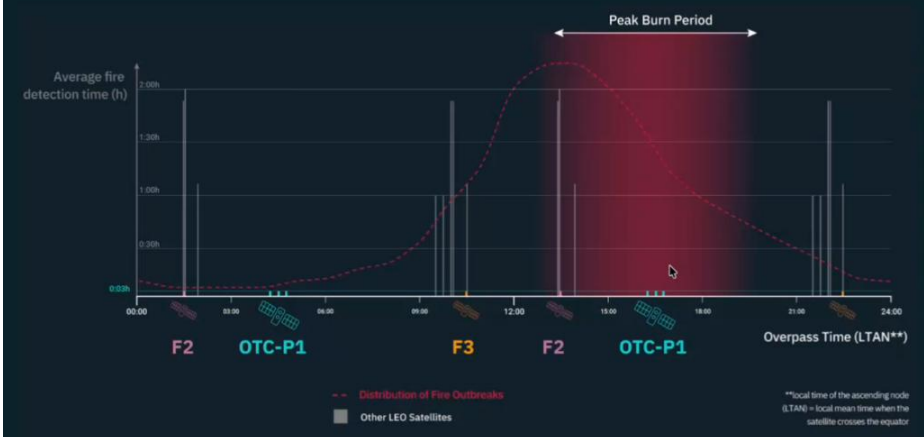
The "Afternoon Data Gap"

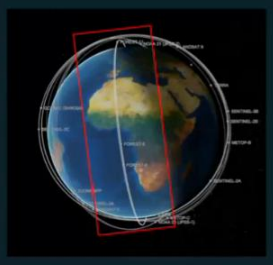




Orbits of different publics satellites. Each orbital plane is indicated in white.

The "Afternoon Data Gap"





Orbits of different satellites. Each orbital plane is indicated in white. Redbox highlights the peak burn period which OTC-P1 covers

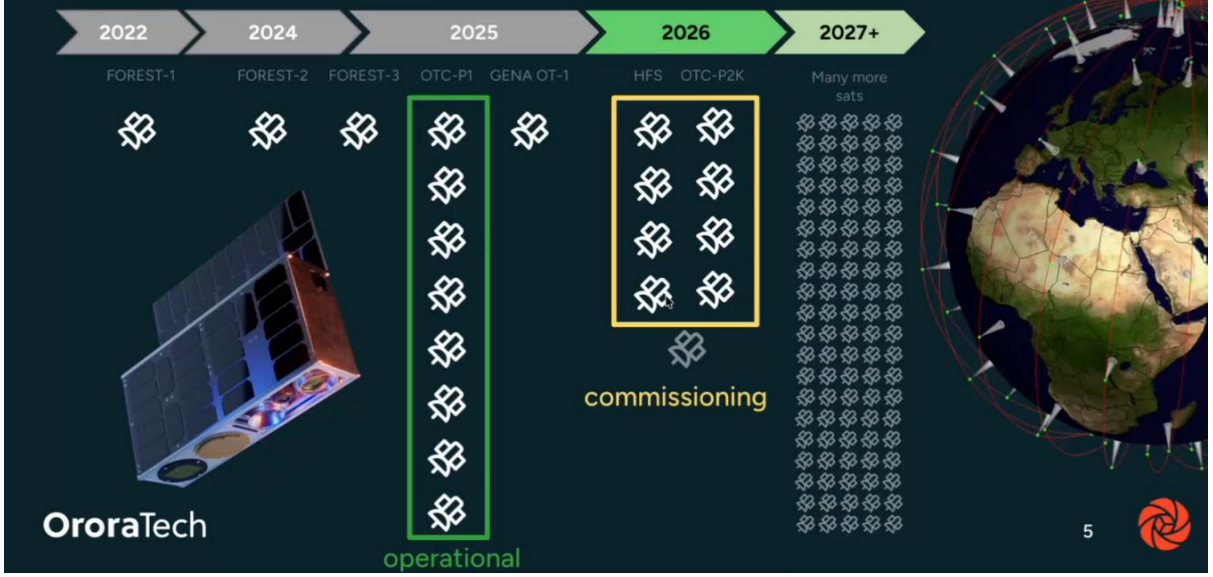
Specifications of Instrument

OroraTech Thermal Infrared Camera



Instrument name	SAFIRE
Spectral bands	M0: 3.4 – 4.2 µm
	L2: 10.4 – 12.5 µm
Product resolution	200 m
Swath (bicam)	Design: 410 km Threshold (min.): 330 km
Dynamic range	MWIR: 300 - 650 K
	LWIR: 260 - 640 K
Viewing angle	40°

Towards 15 minutes revisit - currently 19 satellites in orbit



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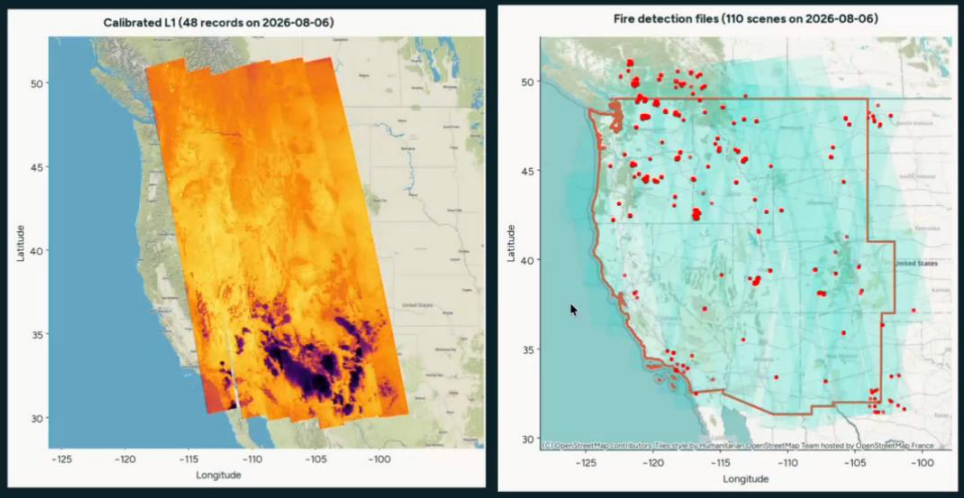
OTC-P1 Coverage



OTC-P1 data over Western US and European regions for Aug 6, 2026

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L2 OT NRT Active Fire



Step 01
Pre-processing

Step 02
Fire detection

Step 03
Downlink

Fire location downlink: KiloByte domain

Space

Earth



Step 04
Post-processing

Step 05
User notification

- Reduce latency significantly with edge processing on-orbit
- Enables continuous coverage of vast areas

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Dataset

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On-Orbit Fire Detection

Dataset

Three labeled classes

01 Fires
Wildfires, bushfires, controlled burns etc

02 Heat Emitting Industrial Sites
Steel mills, cement plants, gas flares etc

03 Sun Glint
Highly reflective surfaces including solar panels, clouds, open water bodies, agriculture foils etc

Two-Fold quality control

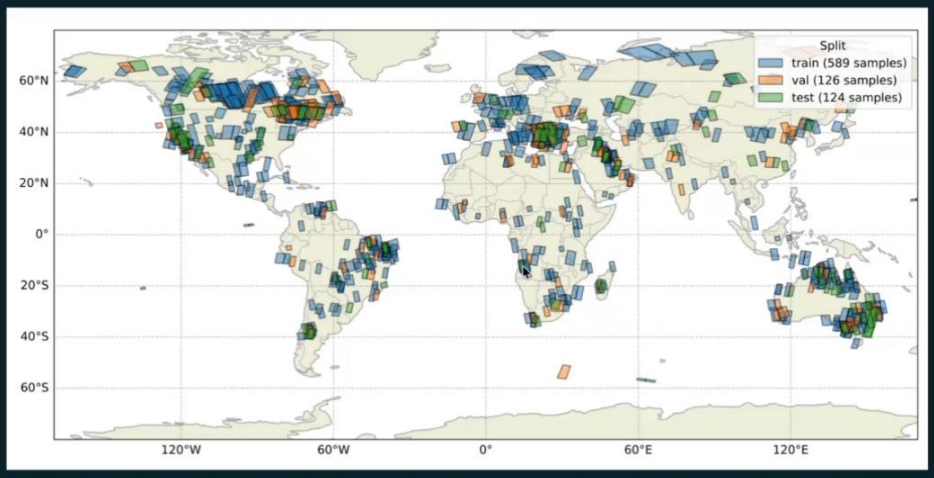
1. External Partner QC
Initial validation performed directly by the external annotation agency upon completing labeling according to our annotation guidelines.

2. Internal OroraTech QC
Secondary QC executed by our internal OT Active Fire team to reduce overall label noise to absolute minimum.



On-Orbit Fire Detection

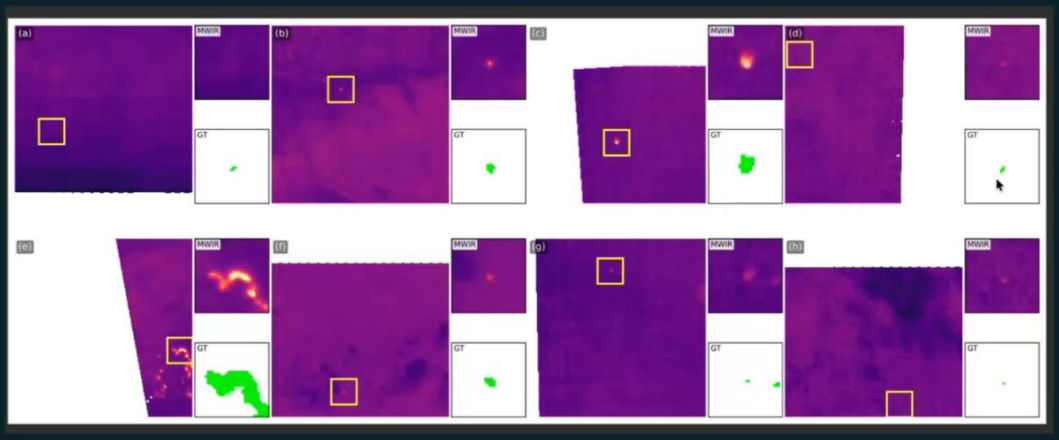
Spatial Distribution of the Dataset





On-Orbit Fire Detection

Dataset Samples



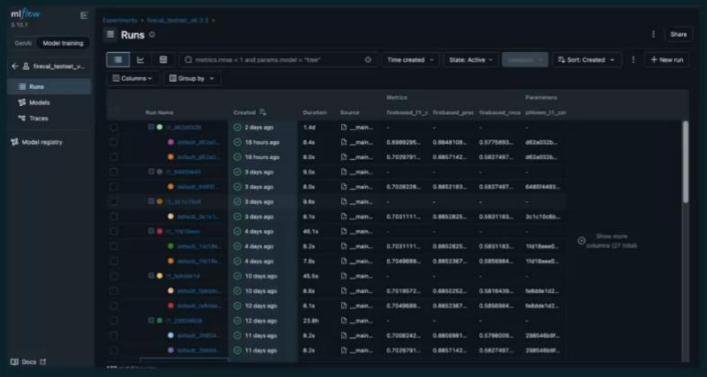


On-Orbit Fire Detection

Development Zoo

An MLops framework where we train different models on a given dataset version and a calibration version

Models are optimized on fire-based precision / recall

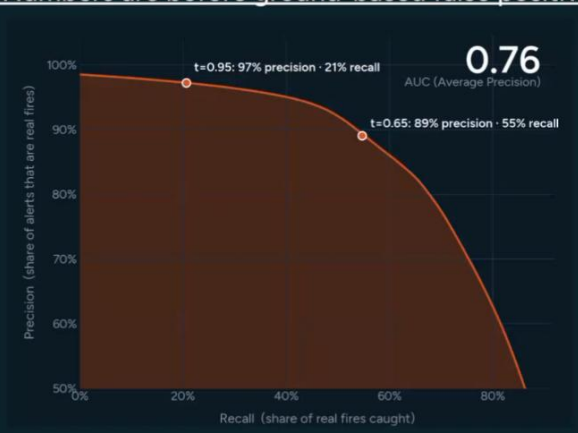




On-Orbit Fire Detection

Sneak peek of our current on-board fire detection model

! Numbers are before ground-based false positive rejection !



Architecture
Pytorch lightning development
Efficient UNet++ variant capable of high-res segmentation

TensorRT compile
Dynamic-shapes
Engine memory footprint: 2.4 Mb

Deployed on-orbit
Jetson Xavier NX @ 10 W
<300 ms

Model Validation

On-Orbit Fire Detection
Automated Validation Framework

On-Orbit Emulation

- Runs full onboard **Level-1 processing** in the ground segment.
- Executes ML model on Level-1 data
- This enables seamless validation of **different L1 calibrations** and **model** baselines.

Evaluation & Metrics

- Derives precision, recall, and F1 scores to identify performance shifts.
- **Safety Guardrail**: Prevents processor updates to satellites



On-Orbit Fire Detection
Model Porting

Before a model goes on-orbit, we validate two things the ground segment never has to worry about

Runtime Performance

- Benchmark inference latency on flight hardware
- Assess against the power budget and duty cycle
- Confirms the model fits inside the overpass-to-alert timeline

Model Size

- Uplink is the bottleneck: ~5 MB/day
- Size drives deployment schedule, not just memory
- Final pre-flight check: measured upload time for the actual engine

80 days	8 days	< 1 day
400 MB model	40 MB model	our 2.4 MB engine

On ground, model is easily scaled. On-Orbit, it is the deployment schedule.



On-Orbit Fire Detection: First Results (1)

Bald Mountain Fire - Oregon July 23, 2026



9 hours → | 2.5 hours → | 2 weeks →

FOREST-11P	GOES-18	MetOp-B	Final fire perimeter
2026-07-23 16:39 (PDT)	2026-07-24 01:25 (PDT)	2026-07-24 03:41 (PDT)	2026-08-07 12:15 (PDT)
First OroraTech observation	First GEO satellite observation	First LEO observation	

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On-Orbit Fire Detection: First Results (2)

Rock Fire - California April 12, 2026



10 hours → | 12 hours → | 6 days →

FOREST-5P	SUOMI-NPP (VIIRS)	GOES-18	Final fire perimeter
2026-04-12 16:20:54 (PDT)	2026-04-13 02:08:00 (PDT)	2026-04-13 14:15:05 (PDT)	2026-04-19 16:31:39 (PDT)
First OroraTech observation	First public satellite observation	First GEO observation	

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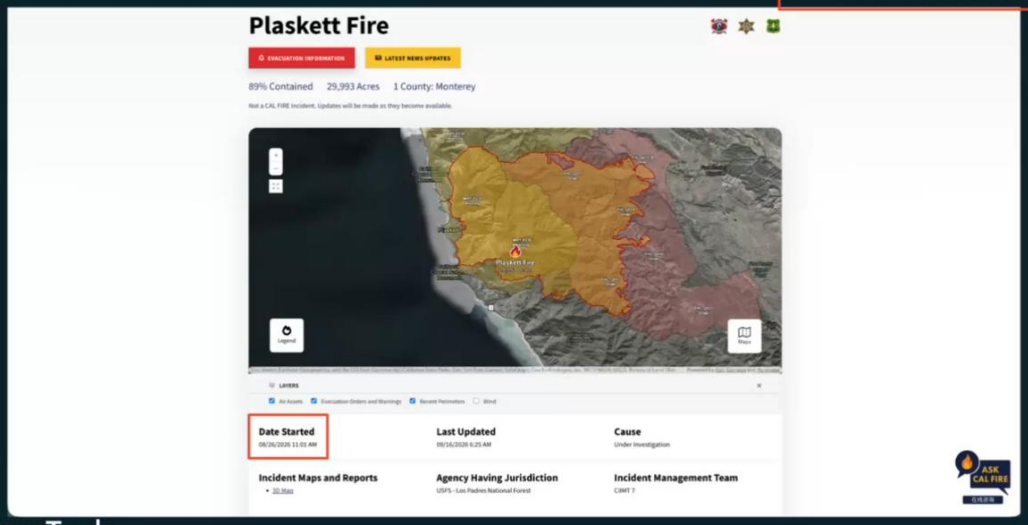
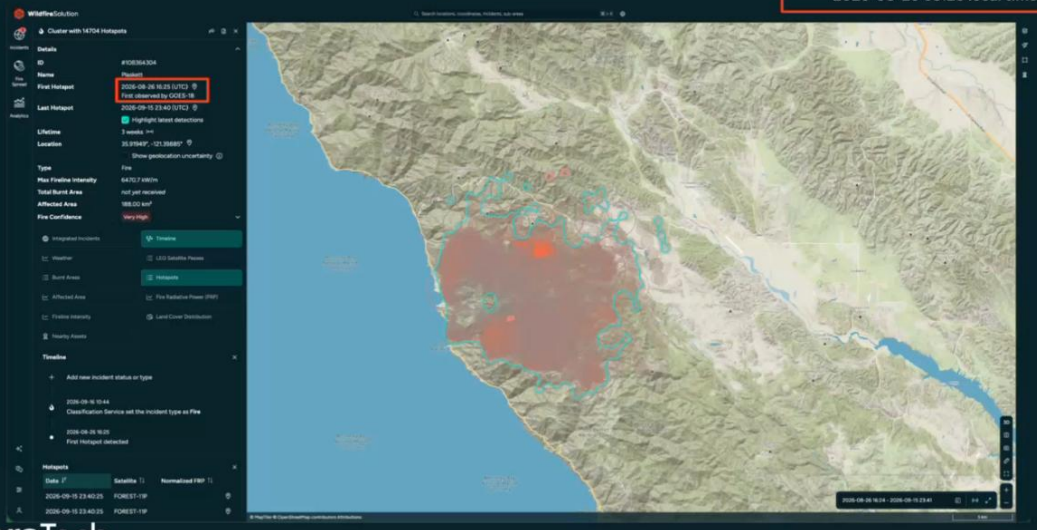
Plaskett Fire: Case Study

Incident reported start time:
2026-08-26 09:25 local time



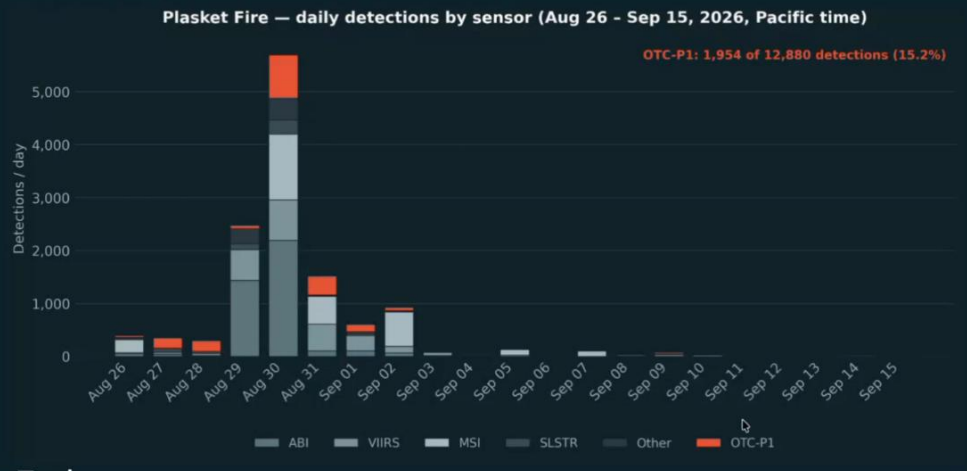
Plaskett Fire: Case Study

First Detection in WFS (GOES-18):
2026-08-26 09:25 local time



Plaskett Fire: Case Study

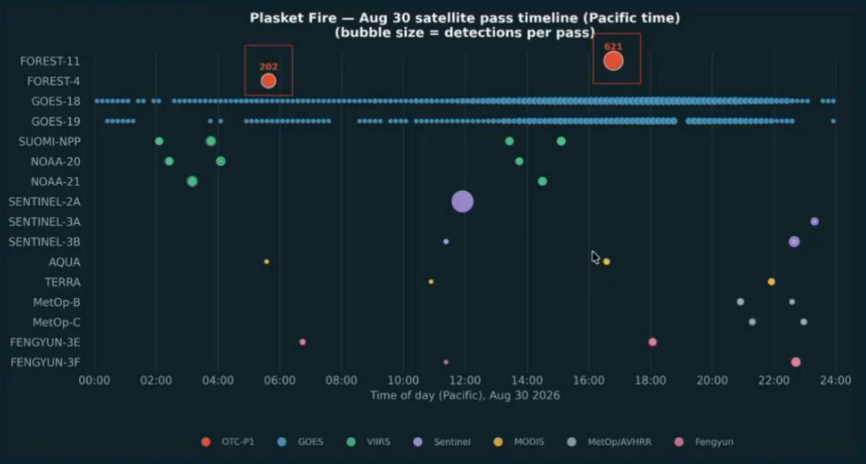
Detections distribution across time and sensors





Plaskett Fire: Case Study

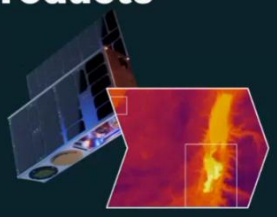
Focus during peak burn time





Our Data Products

FOREST Clean Data
Level 2



Smart Data & Analytics
Level 3 & Level 4



Tasking — Preview
On-Demand L1+ Data

Scan — Beta
Systematic L1+ Data

OT Level-1 TOA — Beta
Brightness Temperature & Radiance

OT NRT Active Fire — Live
Near Real Time Fire Detection

OT LST — Preview
Land Surface Temperature

OT FRP — 2026/27
Fire Radiative Power

OT Continuous Active Fire — Live
Wildfire Detection and Monitoring

OT Fire Spread — Live
Fire Spread Prediction

OT Burnt Area — Live
Burnt Area Mapping

OT Fire Hazard — Preview
Short Term Fire Hazard Prediction

WFS & API
Tasking, Dissemination, Analysis

STAC

REST API

Resources and Data



On-Orbit Real-Time Wildfire Detection Under On-Board Constraints

Matthias Rötzer[1], Veronika Pörtge[1], Martin Ickerott[1], Jayendra Praveen Kumar Chorapalli[1], Dimitri Scheftelowitsch[1], Max Bereczky[1], Dmitry Rashkovetsky[1], Sai Manoj Appalla[1], and Julia Gottfriedsen[1,2]

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Our paper discussing fire detection model has been accepted at ECCV 2026 and is now available open access. Check it out!

Thermal data, shared with the research community

Our data is available for researchers through partnerships with different organizations. Request our data if you are working on research projects

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I look forward to further discussions!



Jayendra Chorapalli
Applied Research Engineer
Near Real Time Active Fire

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