

Open Data Integration (ODIN):

A Concurrent, Distributed
Message-Based Architecture
and Framework for Disaster
Response.

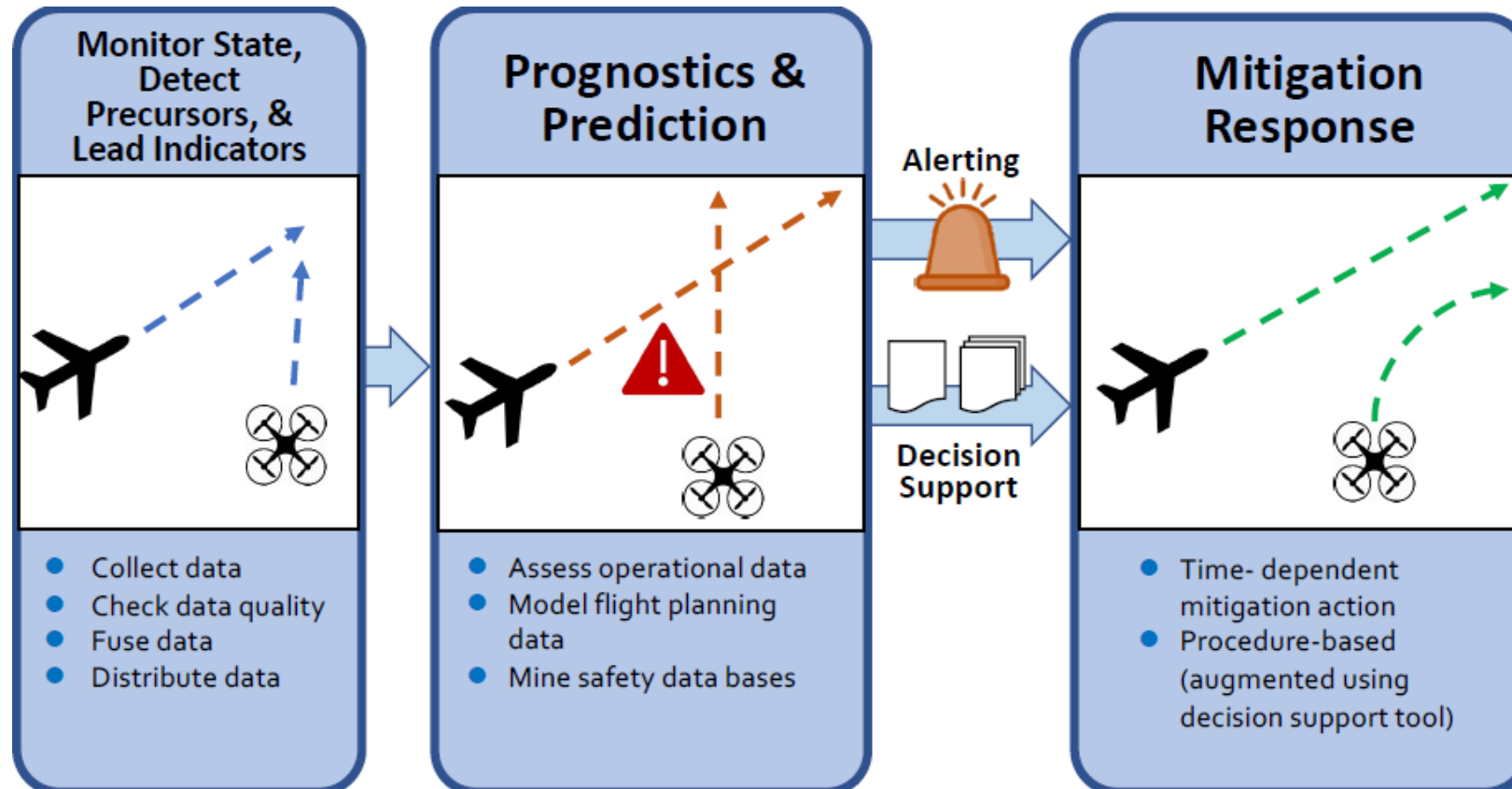
NASA Ames Research Center (ARC)
Intelligent Systems Division
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System-Wide Safety

Dr. Guillaume.P.Brat@nasa.gov, NASA/ARC
Peter.C.Mehlitz@nasa.gov, NASA/ARC
Sequoia.R.Andrade@nasa.gov NASA/ARC
Dr. Hannah Walsh@nasa.gov NAS/ARC
Carlos.V.Paradis@nasa.gov NASA/ARC
Dr. Joseph.C.Coughlan@nasa.gov NASA/ARC

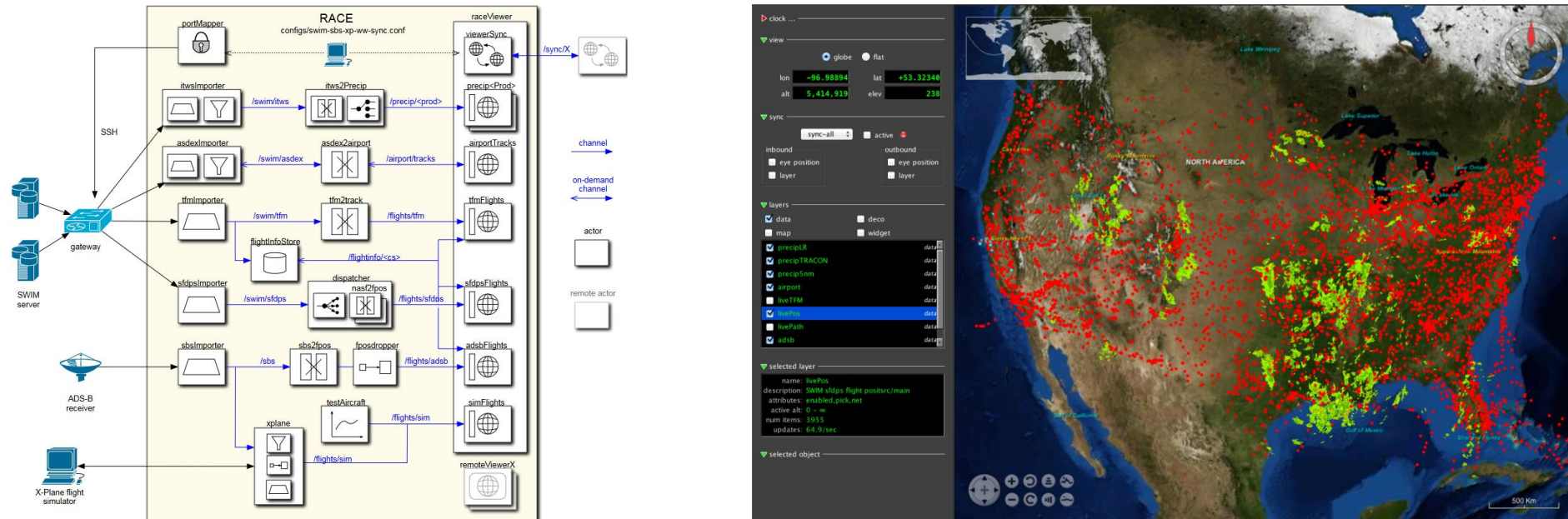
In-time Airspace Safety Management System



ODIN Aviation Data Diversity, Volume, & Latency



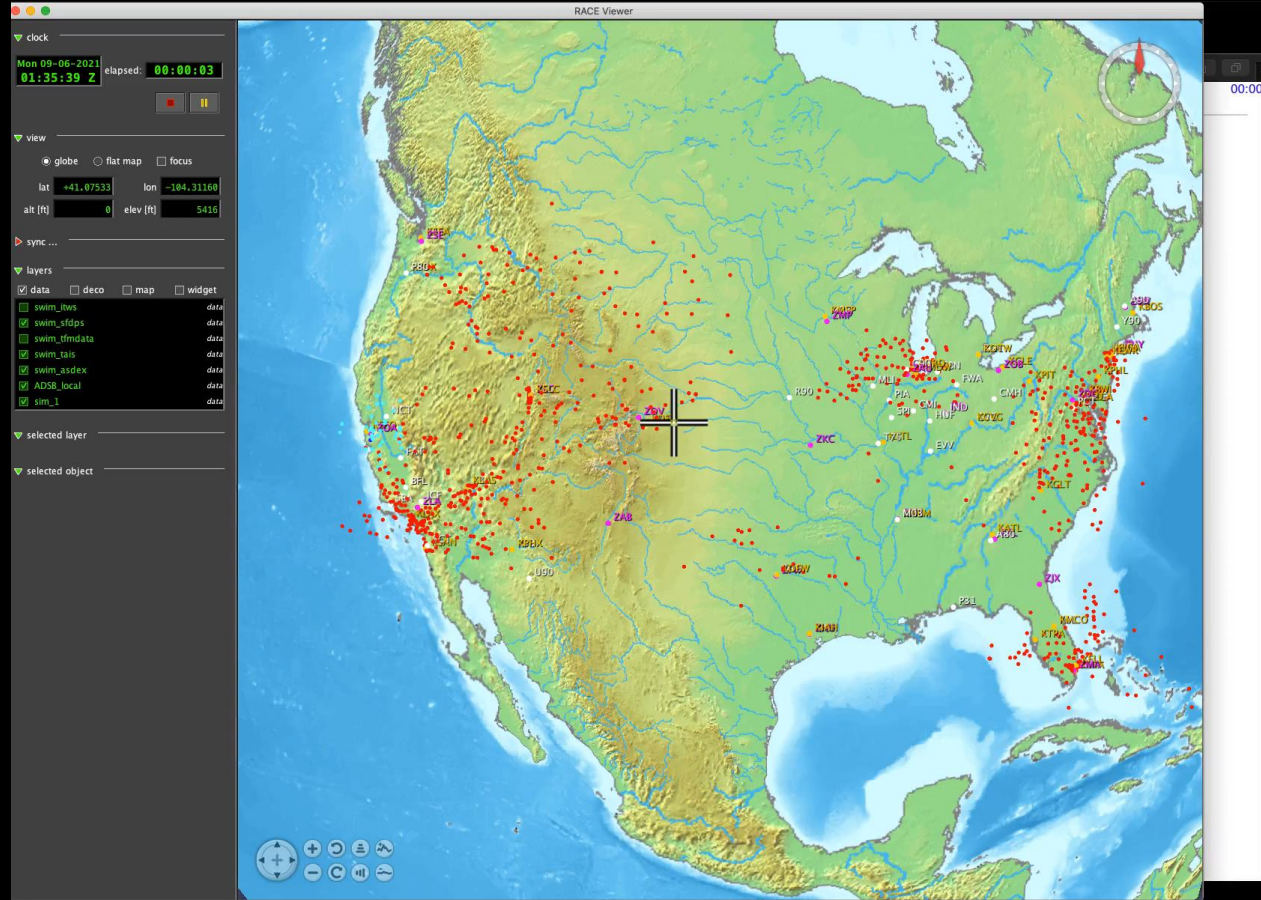
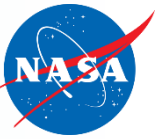
- **Live National Air Space monitoring and visualization of aircraft position and direction**
- Imports FAA's System Wide Information Management messages (**SFDPS, TFM-DATA, TAIS, ASDE-X, ITWS**) and local Automatic Dependent Surveillance-Broadcast (**ADS-B**)
- Volumes up to **1000 messages/sec, for 4500 simultaneous flights in real-time**
- Uses embedded **NASA WorldWind** for geospatial display
- Low latency essential for airspace monitoring, risk detection and risk mitigation



```
1: ./race --vault ../conf config/air/swim-all-sbs-ww.conf
1: ./race -Darchive=../data/all-080717-1744 config/air/swim-all-sbs-replay-ww.conf
```



Airspace





Scheduled Progression

SD-1 (FY 25)



SD-2 (FY 27)



SD-3 (FY 28)



SD-4 (FY 30)

Wildland Firefighting

Hurricane Relief and Recovery

Emergency Medical

Urban Disaster Relief

! HIGH Risk Tolerance
Rural and partially evacuated area

! MED Risk Tolerance
Partially evacuated area

! LOW Risk Tolerance
Urban area

! LOW Risk Tolerance
Urban area

⚙️ LOW-MODERATE
Intensive HMI and lack of commercial flights

⚙️ MODERATE
Numerous agencies coordinating multiple relief efforts

⚙️ MODERATE
Regularly scheduled commercial flights

⚙️ HIGH

? LOW-MODERATE
Unknown location of fire; poor visibility

? MODERATE-HIGH
Unknown state of terrain; poor infrastructure

? MODERATE
All weather operations

? HIGH

Environment:
Low Visibility, Smoke...

Environment:
Low Visibility, RF/EMF Hazards, Poor Weather...

Environment:
Urban Airspace, RF/EMF Hazards...

Environment:
Degraded Infrastructure, RF/EMF Hazards...

Vehicle & Mission:
sUAS, mid-size UAS/
Short Range

Vehicle & Mission:
sUAS, mid-size UAS, large UAS/
Multiple Days

Vehicle & Mission:
sUAS, mid-size UAS, large UAS/
Long Range

Vehicle & Mission:
sUAS, mid-size UAS, large UAS/
Multiple Days

Human Role:
High

Human Role:
Medium

Human Role:
Low

Human Role:
Multiple Simultaneous
HMI paradigms

NASA System-Wide Safety (SWS) Wildland Firefighting Operations Virtual Workshop



Wildland Firefighting Ecosystem Stakeholder Workshop

- Identify and prioritize top safety-oriented risks, gaps, and technologies to enhance wildland firefighting in near- and far-term
- Engage stakeholder community with guidance for increasingly complex wildland firefighting operations in information-rich, but uncertain environments
- 17 breakout sessions and 4 panels across the 3-day event
- Over 460 attendees from USFS, NASA SMD/STMD, federal, state, and tribal governments, industry and academia

Results

- Initial Stakeholder Engagement and ConOps Development
 - <https://ntrs.nasa.gov/citations/20220014721>

Impact

- Identified gaps that the overall community and stakeholders want addressed, such as timely access to information, tailorable standards, and situational awareness.
- Supports partnership strategy and SD-1 objectives



Evan Dill moderating the Organizational Safety and Safety Roles Panel



Natasha Neogi leading the wildland firefighting workshop

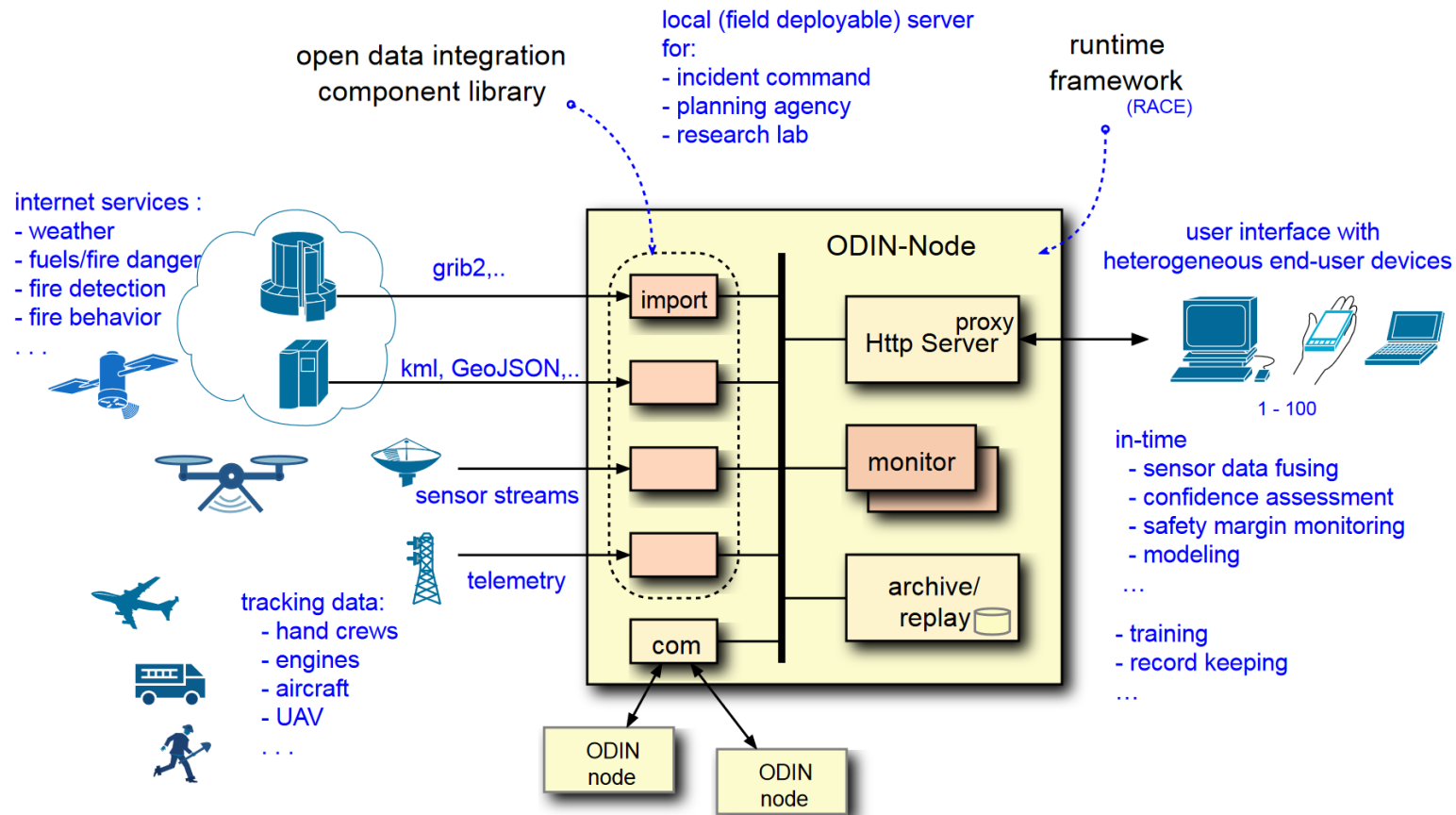


Wildland Fire Management Application Vision



ODIN

- Operates as a data integration hub and field deployable server
- Provides task-specific view across various input sources (layers)



Smart Alerts with Actionable Sensor Data





View

fullscreen pointer camera

Home lat 40.07778
Down lon -126.58827
alt 779589

Save Peninsula
Back CZU
Holy City
space

view parameters ...

