ODIN-fire

Open Data Integration Framework for Wildland Fire Management

website: https://nasarace.github.io/race or local
repository: https://github.com/nasarace/race

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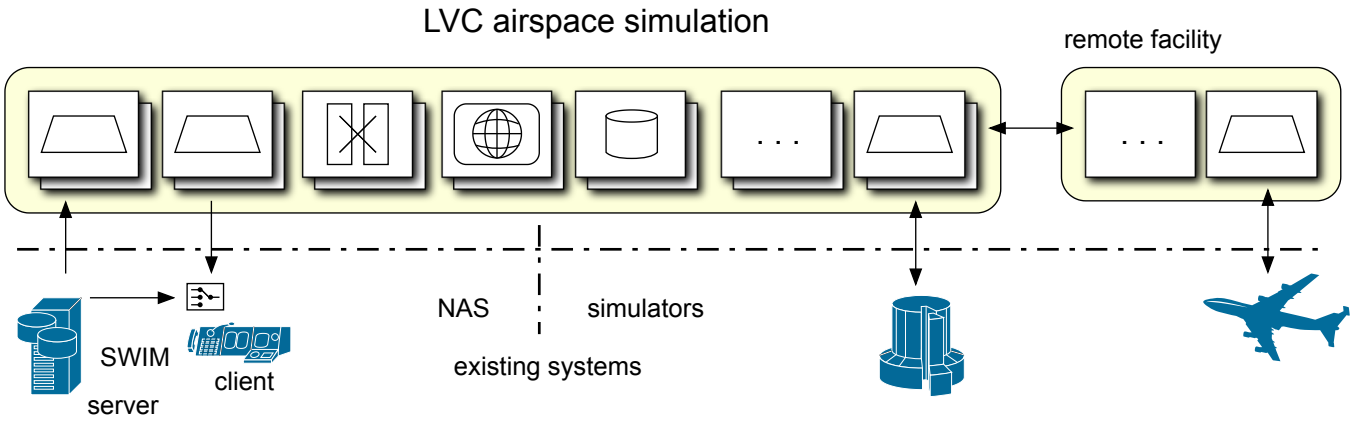
Slides

Historical Roots of ODIN?

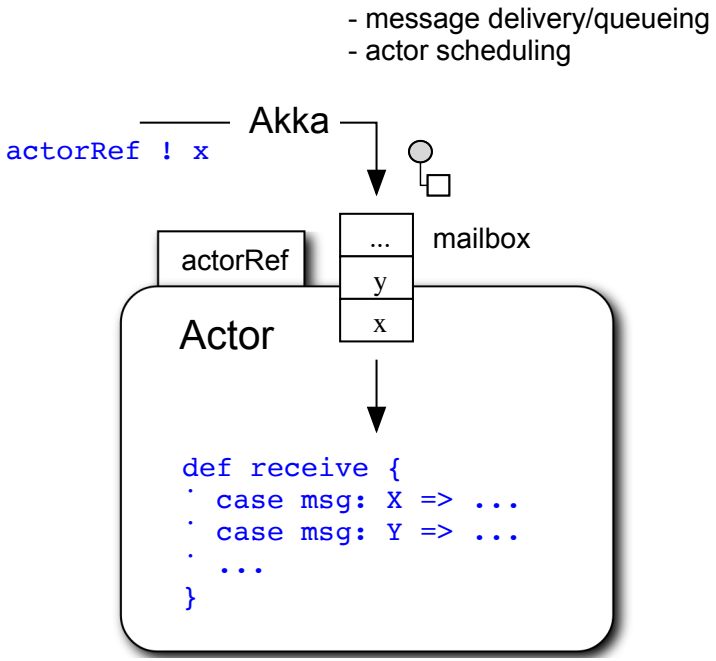
- started as a distributed LVC simulation framework in 2015



- evolved into a general framework for event driven concurrent/distributed applications:
  - can import/export from/to external systems - **connectivity**
  - can process high event rate and data volume - **scalability**
  - supports distributed and massively concurrent operation
  - has batteries included (except Java runtime, SBT build system)

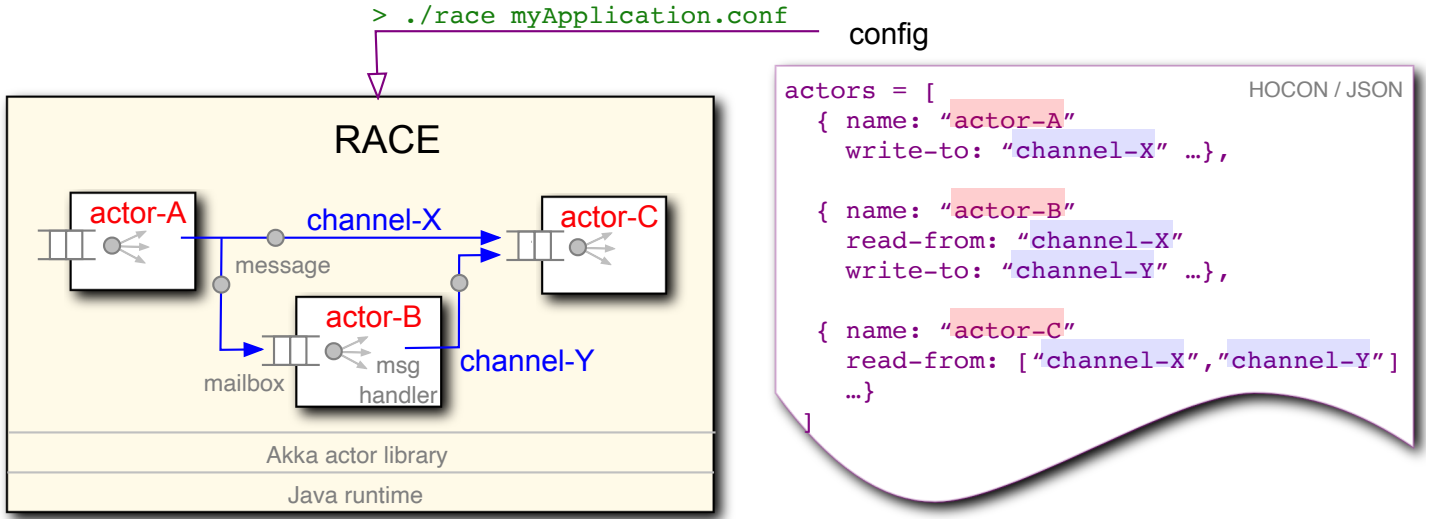
ODIN Foundation: Actor Programming Model

- well known concurrency programming model since 1973 (Hewitt et al)
- *Actors* are objects that communicate only through async messages $\Longrightarrow$ no shared state
- objects process messages one-at-a-time $\Longrightarrow$ sequential code



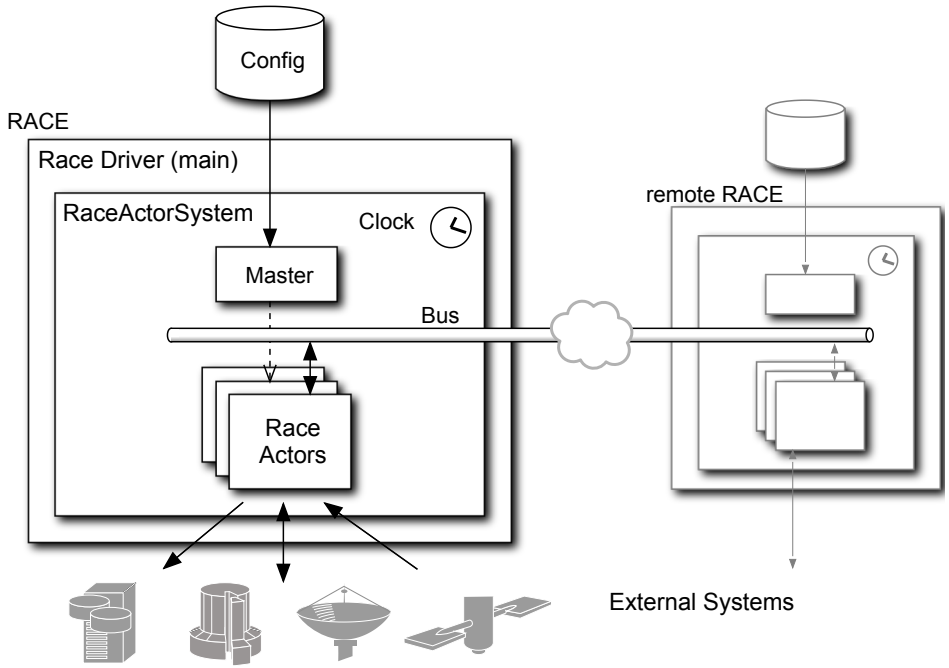
ODIN Implementation: Actor System

- runs on JVM, programmed in Scala using Akka actor library
- ODIN node = set of communicating actors
- ODIN messages are sent through (logical) publish/subscribe **channels**
- ODIN actors/channels are runtime configured (JSON), not hardwired



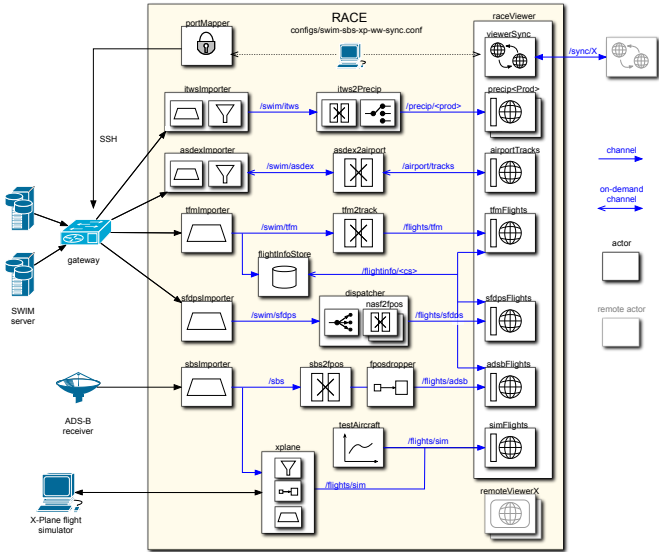
ODIN Application Design

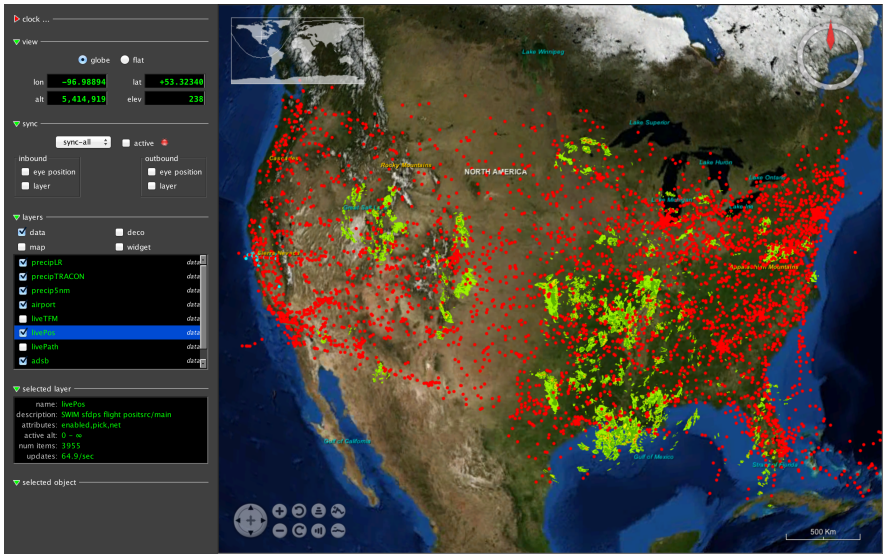
- uniform design - everything is an actor
- toplevel actors are deterministically created, initialized and terminated by *Master* actor
- actors communicate through (configured) bus channels



Example: Data Diversity and Volumne

- live NAS visualization plus local sensors
- imports SWIM messages (SFDPS,TFM-DATA,TAIS,ASDE-X,ITWS) and local ADS-B
- up to 1000 msg/sec, 4500 simultaneous flights
- RaceViewerActor uses embedded NASA WorldWind for geospatial display

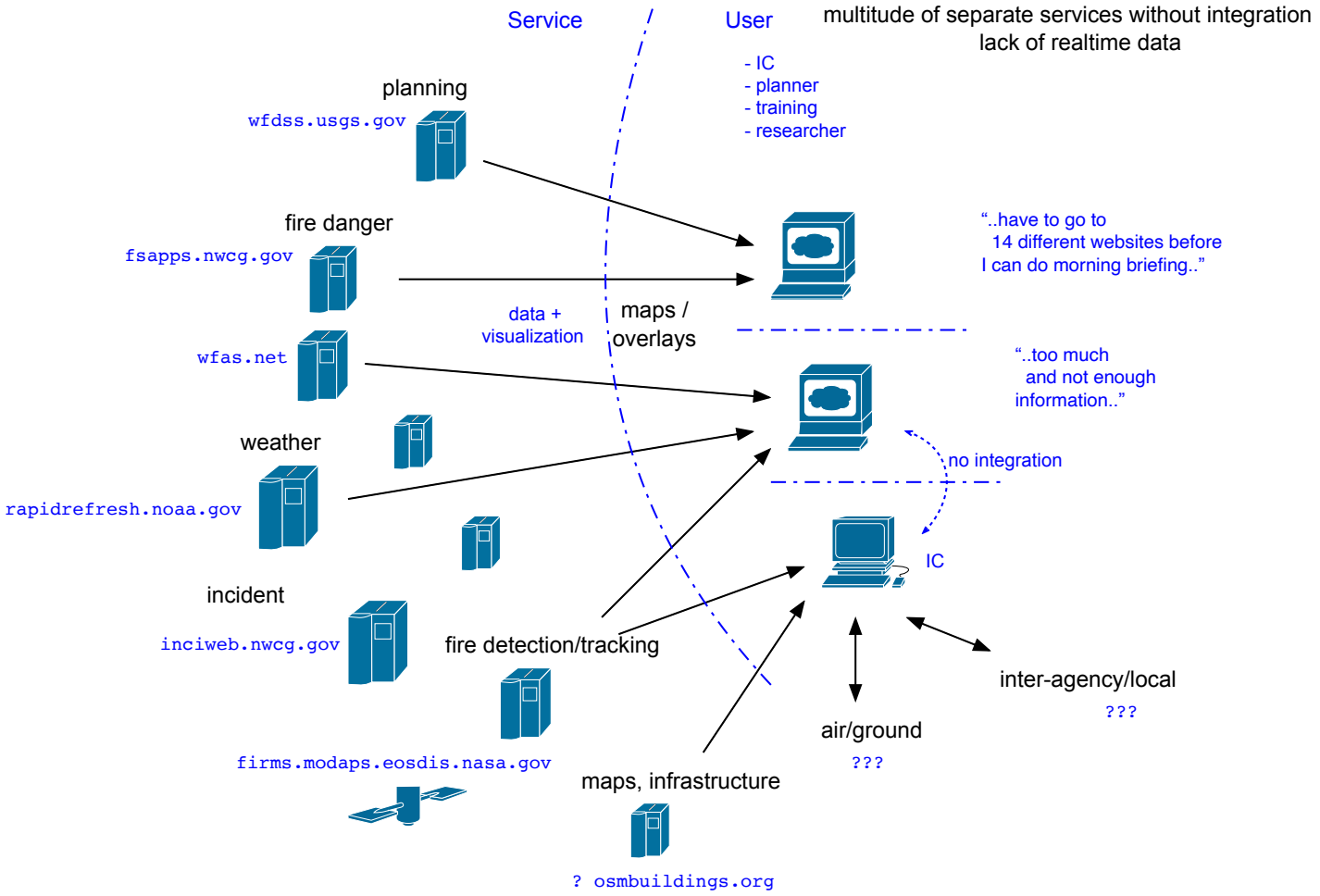





```
1: ./race --vault ../conf config/air/swim-all-sbs-ww.conf
1: ./race -Darchive=../data/all-080717-1744 config/air/swim-all-sbs-replay-ww.conf
```

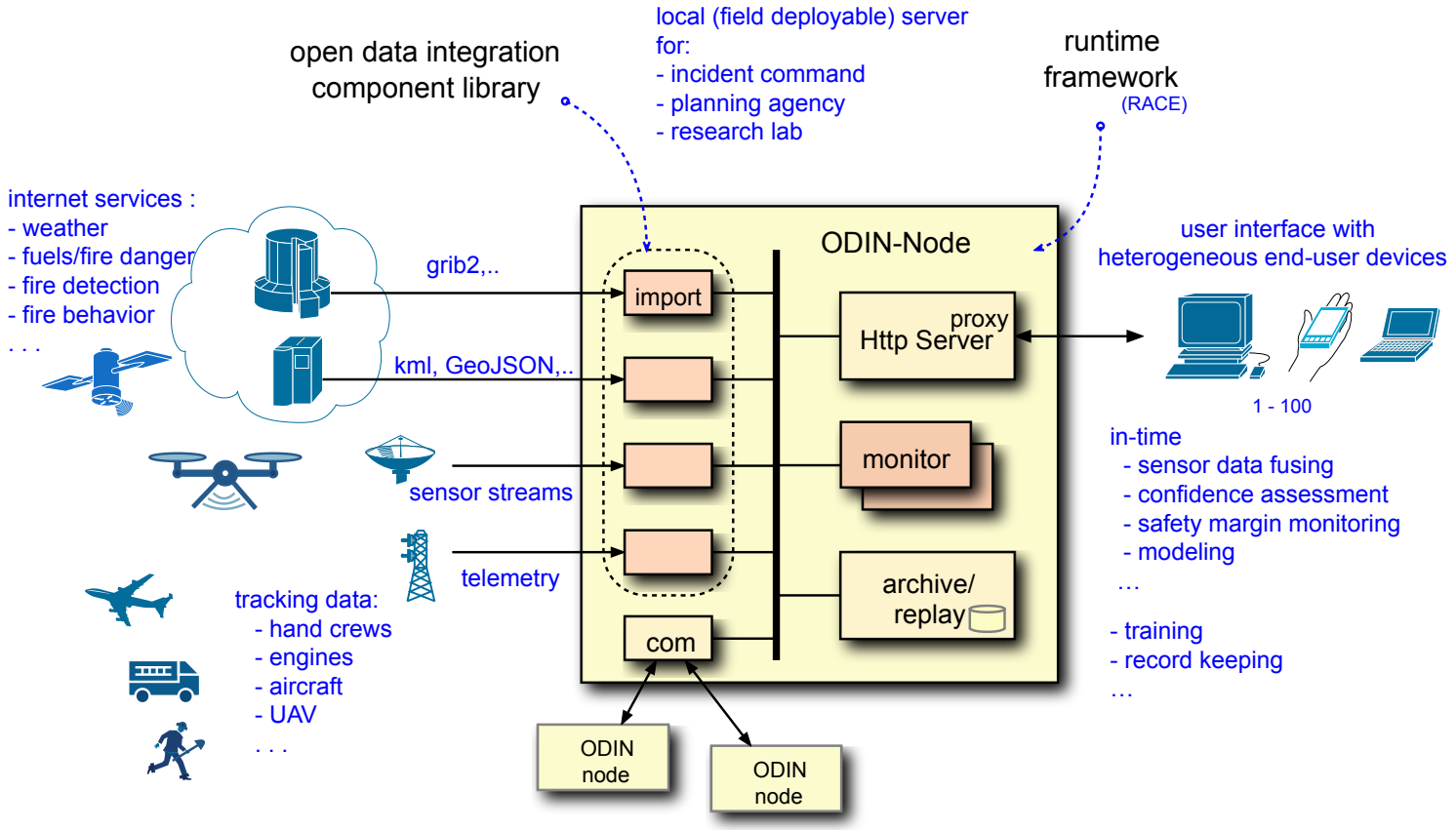
Wildland Fire Management Application - Current

- fragmented: *"..have to hop between 14 different websites to create morning briefing.."*
- no single view across stakeholder-specific external (edge) services and own tracking / sensors



Wildland Fire Management Application - Vision

- ODIN node = data integration hub as field deployable server
- provides task-specific view across various input sources (layers)

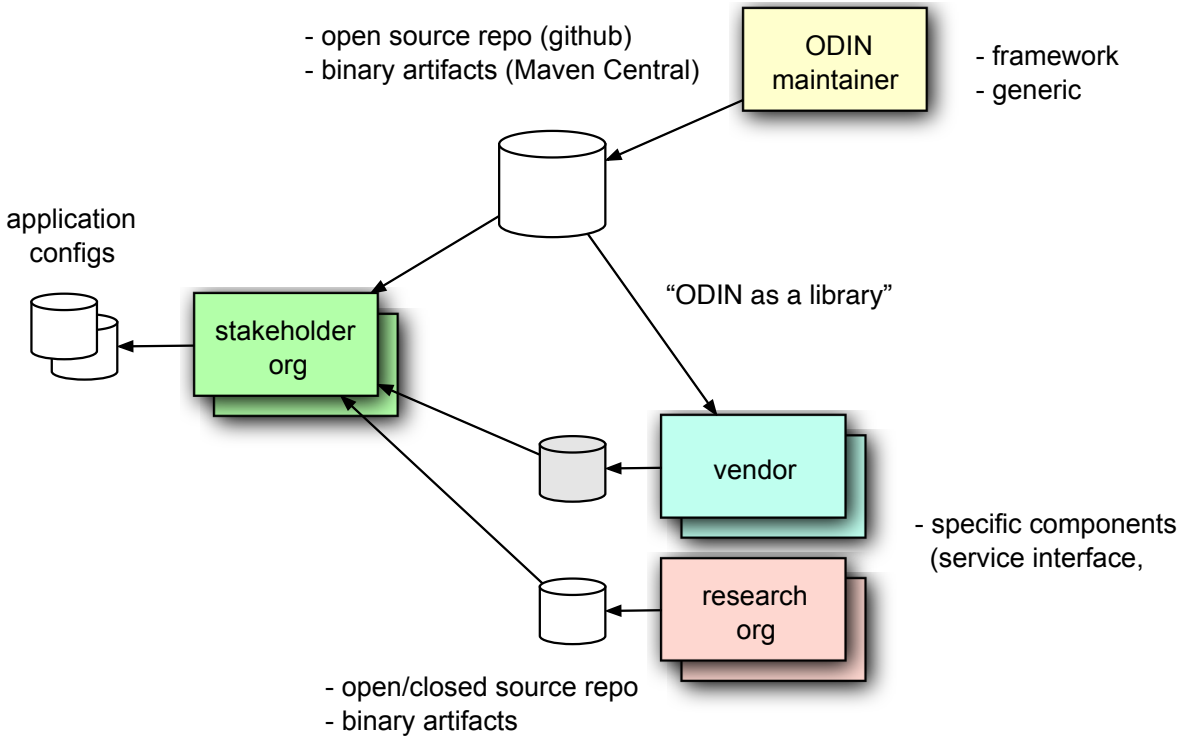



```
1: ./race --vault ../conf config/cesium/cesium-app.conf
```

http://localhost:9000/app

Why Open Source?

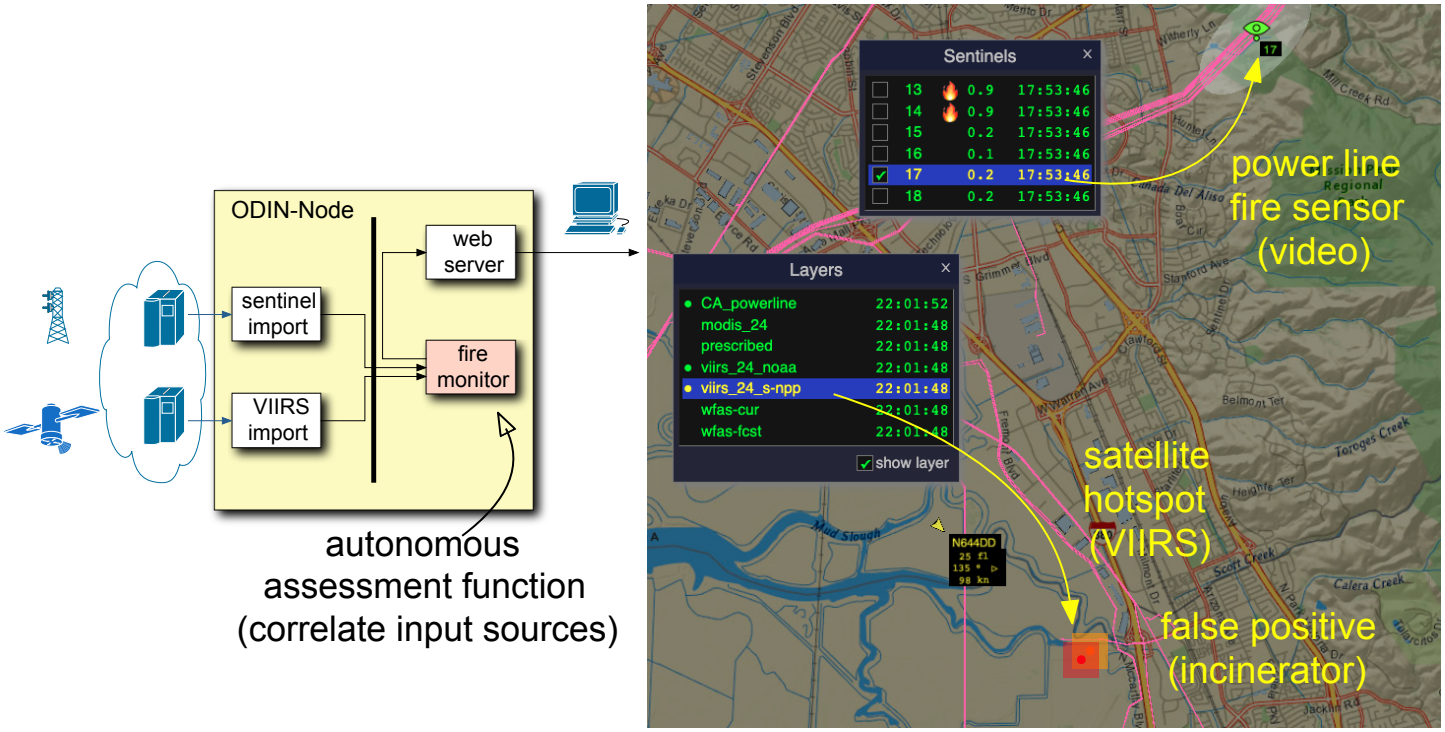
- *community* is larger than fire agencies (>600)
- provide common ground with low barrier of entry for stakeholders, vendors and research orgs



Open Source Utilization

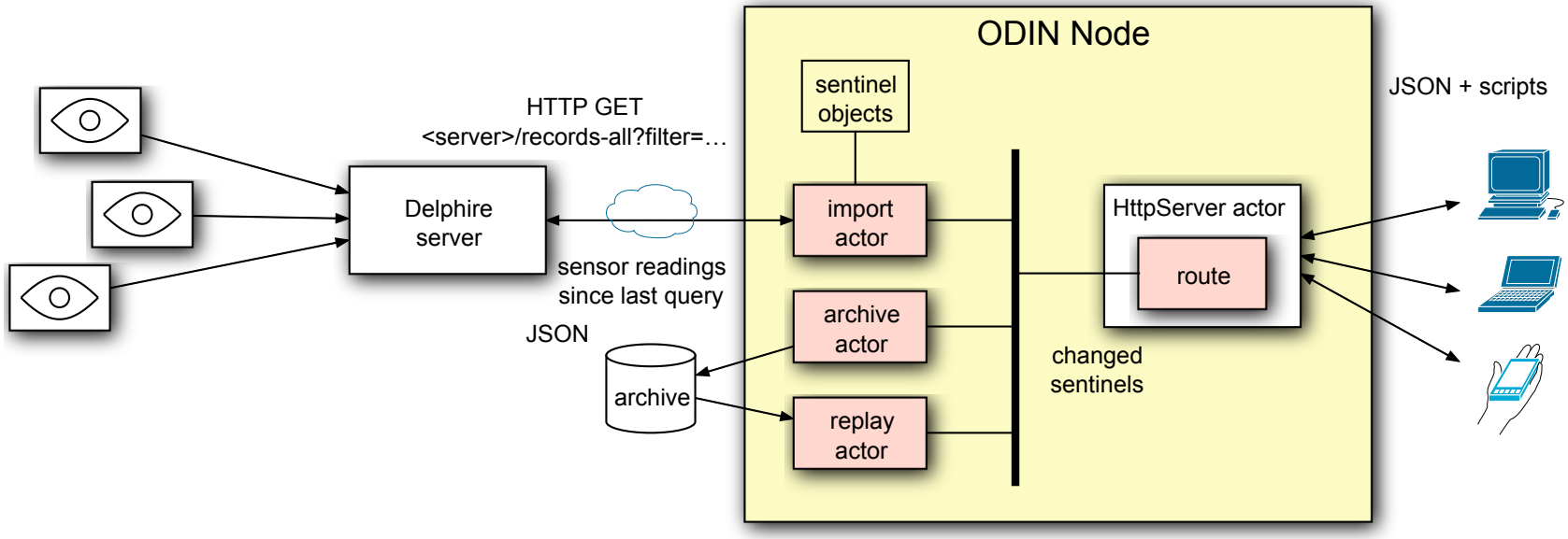
Example - Multi-Sensor Data Integration

- collaboration with Delphire to integrate their Sentinel fire sensors
- provides visual, infrared and gas sensor readings along power lines
- good to correlate with other inputs such as satellite based IR (VIIRS)

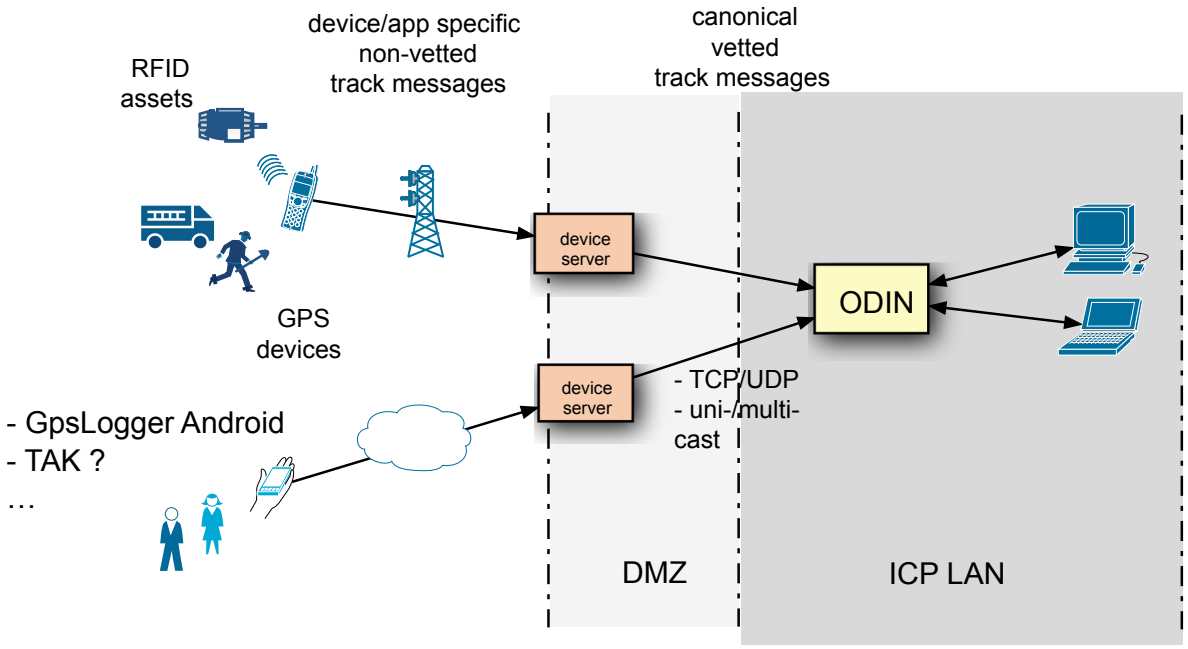


Sentinel Sensor

- import of Sentinel Sensor Records (JSON) from Delphire's edge server
- archive/replay with standard RACE infrastructure
- visualization through SentinelRoute (HttpServer actor)



Tracking



GPS Tracking Dataflow