SkyServe

Leveraging Edge Computing for Earth Observation

let's talk spatial: Spatial Talks and Network #8

May 27, 2023

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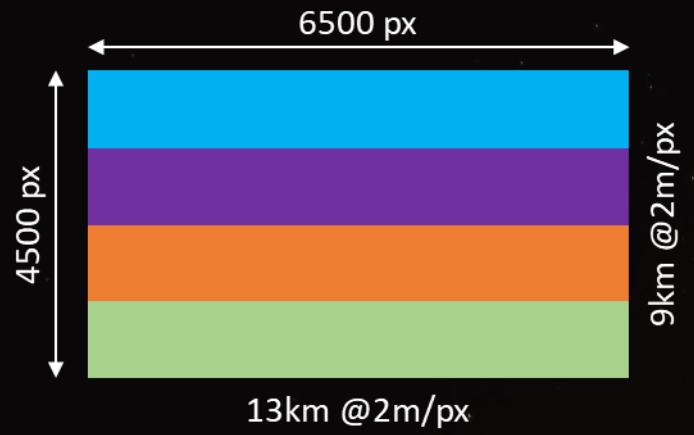
Changing Paradigm

Conventional

Edge Computing

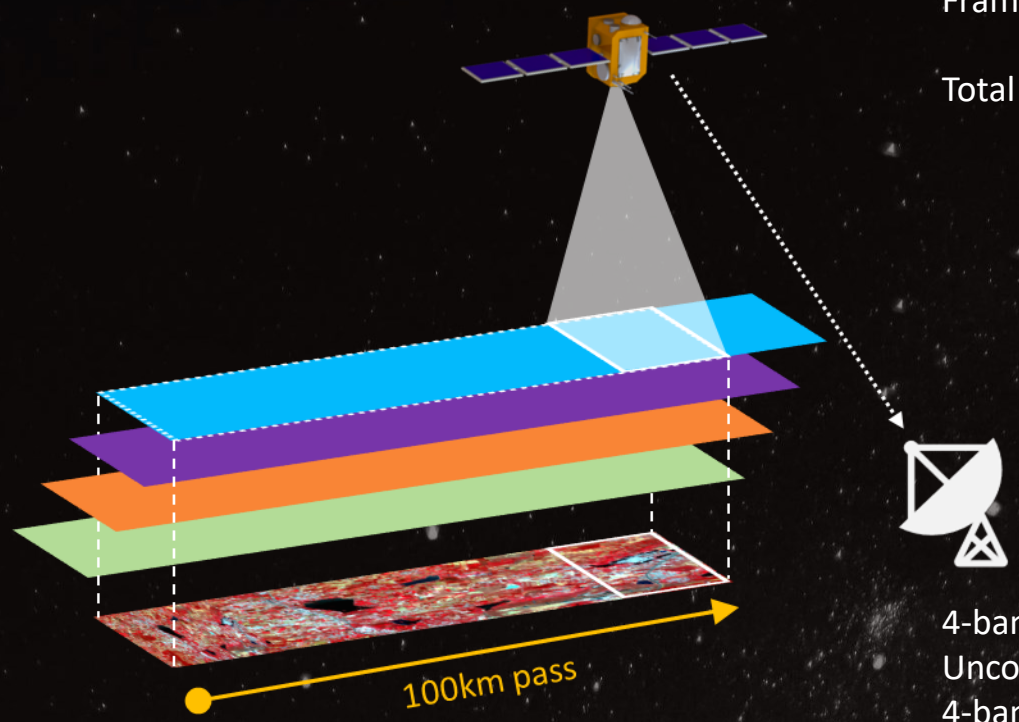
Data Size at different levels



Each band spans 1,125 rows ~ 2.25km

Raw frame
Size = 6500 x 4500 x 12bpp
= 351 Mb ~ 43.88 MB

Lossless compression
Size = 43.88 MB / 2.5 = **17.55 MB**



At ground speed of 7.85km/s,
Frames to capture for pass = at least 45, @5fps

Total compressed data size = 45 x 17.55 MB
= **789.75 MB**

4-band georeferenced scene:
Uncompressed raw size = 1.974 GB
4-band registered product = **2.6 GB**

Typical tile size: 5km x 5km
Tile file size = **50 MB**

Industrial User: Ground-based Processing

Objective: Monitor encroachment along a pipeline installation

Indicators:

- Damage to pipeline
- Vegetation overgrowth
- Encroachment (tents/building)
- Disturbed soil (impending sabotage)

Methodology:

- Acquire satellite images along pipeline once a month
- Apply sequence of change detection & object detection algorithms
- Localize and characterize incidents
- Take corrective action

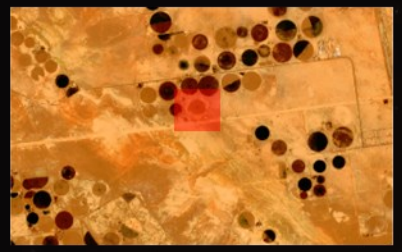
Imagery price @2m resolution = $P/km2

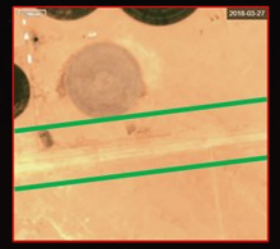
Over 100km stretch = 100 x P

Min. number of attempts to optically image the stretch = 2 (cost passed on to user because of ground-based processing)

Annual image purchase cost to user = 100 x P x 12

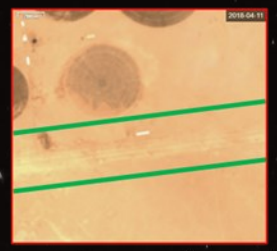
Solution using Edge Processing



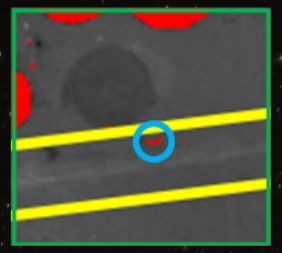


2023-05-23

500m x 500m
~375 kB



2023-05-27



```
{
 "type": "Feature",
 "geometry": {
  "type": "Point",
  "coordinates": [125.6391,
10.1037]
 },
 "properties": {
  “class": “Encroachment"
 }
}
```

113 chars = **226 Bytes**

ONLY IF A CHANGE IS DETECTED!

Edge Processing vs. Ground Processing

Info size $\sim {}^{1}/_{1,000,000}$ of 50MB tile

Considering some unit economics, info price can be at least ${}^{1}/_{100}$ of P

User spends less for the same monthly cadence

Or can increase the cadence 100x without exceeding the budget

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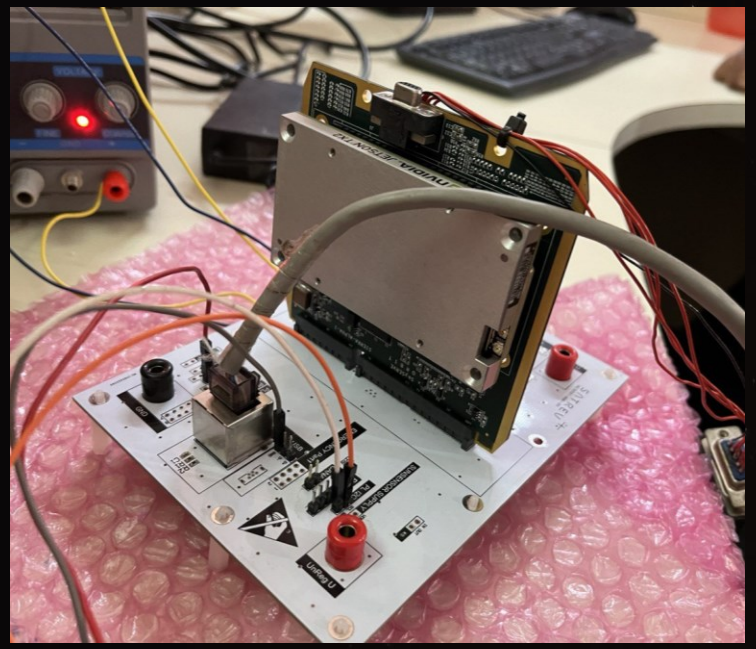
Edge Processing at SkyServe

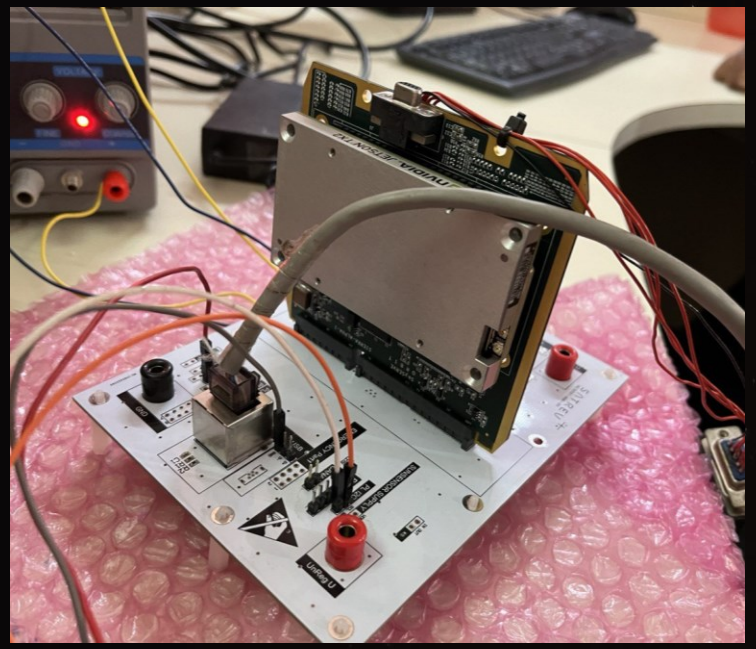


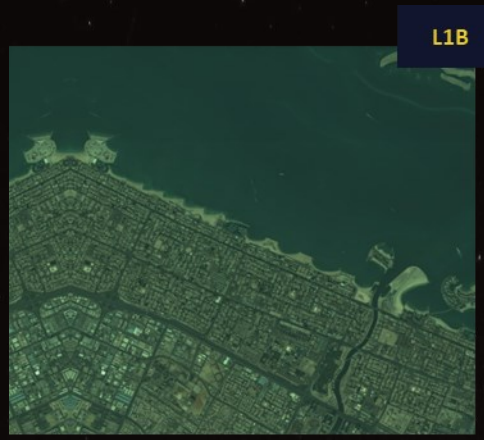
Raw Frames

Radiometrically Calibrated Frames

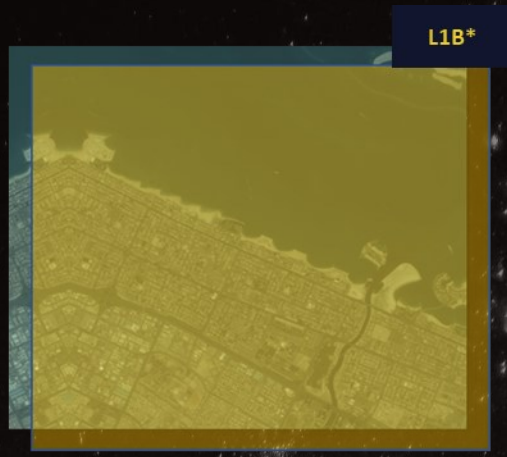
Stitched 4-band Scene

Edge Processing at SkyServe





Haze compensated scene



Scene with Cloud/shadow mask

Geo-referenced scene
(in viewer)

Leveraging this capability

- Self-serve submission of classical GIS and AI/ML models
- Automated validation of
  - Input images, metadata
  - Model framework
  - Model output
  - Edge-readiness
- In-app validation on new sensor data
- Ability to continuously improve submissions based on new sensor data, test results and evolving business needs
- Real-time tracking of progress with logging, error drill-down, chat support & resolution workflow

SkyServe

Insights-as-a-Service
from Space
for Earth

SkyServe.ai

The Sunderbans
West Bengal, INDIA
Source: ESA/Copernicus