# GBDX. The new paradigm of geospatial industry

**Alberto López | Business Development Director at DigitalGlobe, USA**
**Idan Wolfson | VP Business Development & Marketing at Video Inform, Israel**

See a better world.®

# A Mission Built and Industry Driven ecosystem

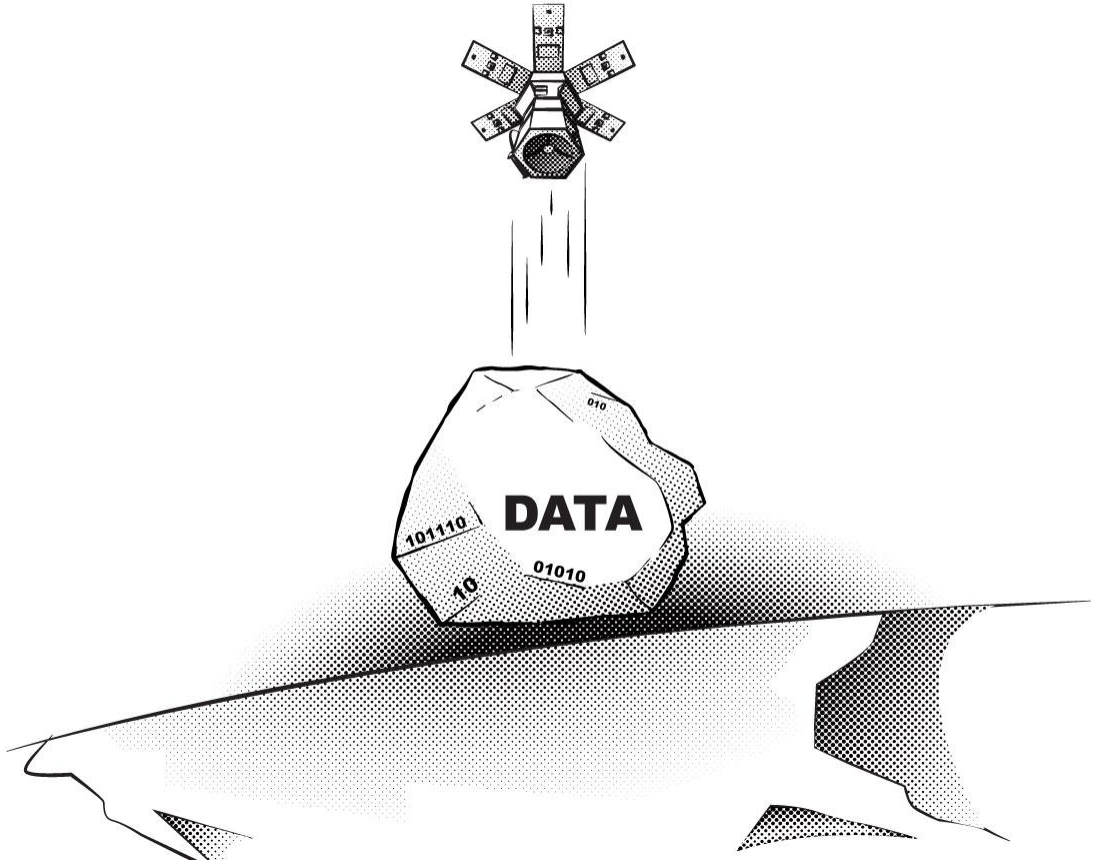
Copyright © 2017 DigitalGlobe. All rights reserved.

# DigitalGlobe at Maxar Technologies

Copyright © 2017 DigitalGlobe. All rights reserved.

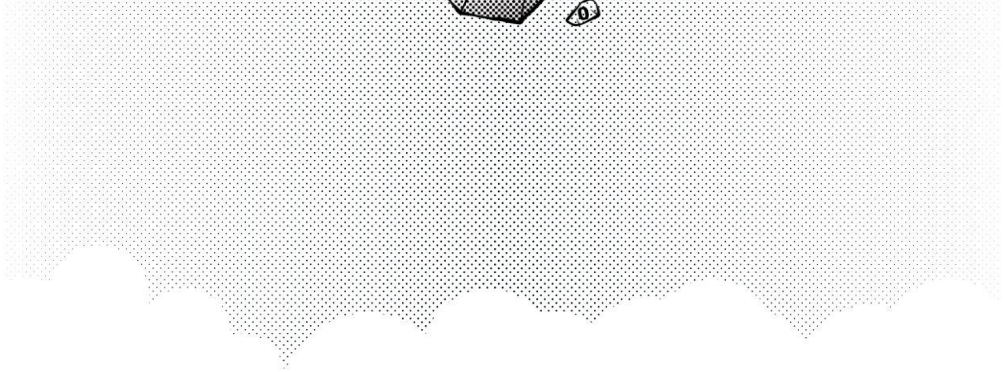
# Earth a BIG planet

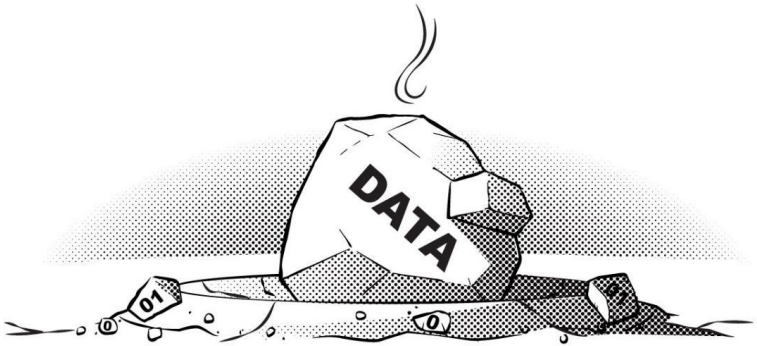
Copyright © 2017 DigitalGlobe. All rights reserved.





Copyright © 2017 DigitalGlobe. All rights reserved.







Copyright © 2017 DigitalGlobe. All rights reserved.

# We captured these data boulders …

Copyright © 2017 DigitalGlobe. All rights reserved.

# Trends have enabled large scale analytics

## 1. Elastic cloud computing

Copyright © 2017 DigitalGlobe. All rights reserved.

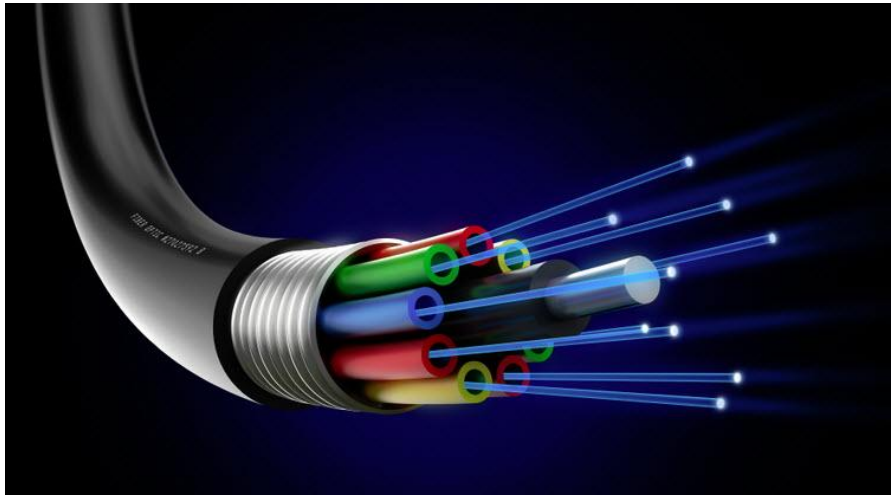
# The data management challenge

Copyright © 2017 DigitalGlobe. All rights reserved.

# The data management challenge

Copyright © 2017 DigitalGlobe. All rights reserved.

# How do we get +100 PB into the cloud?



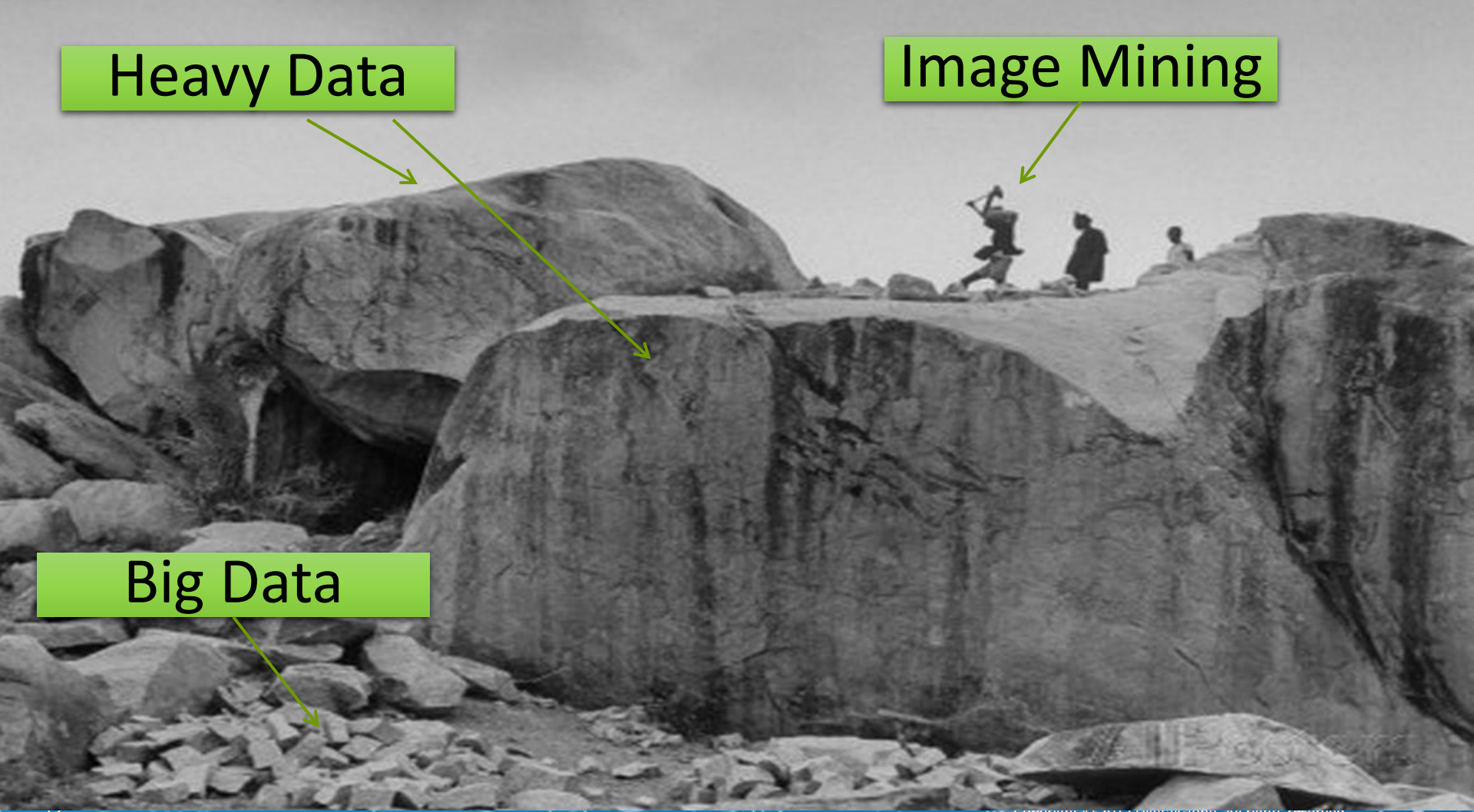
**Home broadband: 300 years** **X 1,400**

**DirectConnect: 6-18 months ($$$)**


Copyright © 2017 DigitalGlobe. All rights reserved.

# … or a bigger “snowball” – a Snowmobile

Copyright © 2017 DigitalGlobe. All rights reserved.





Copyright © 2017 DigitalGlobe. All rights reserved.

# Image Mining

Enrichment/Refinement

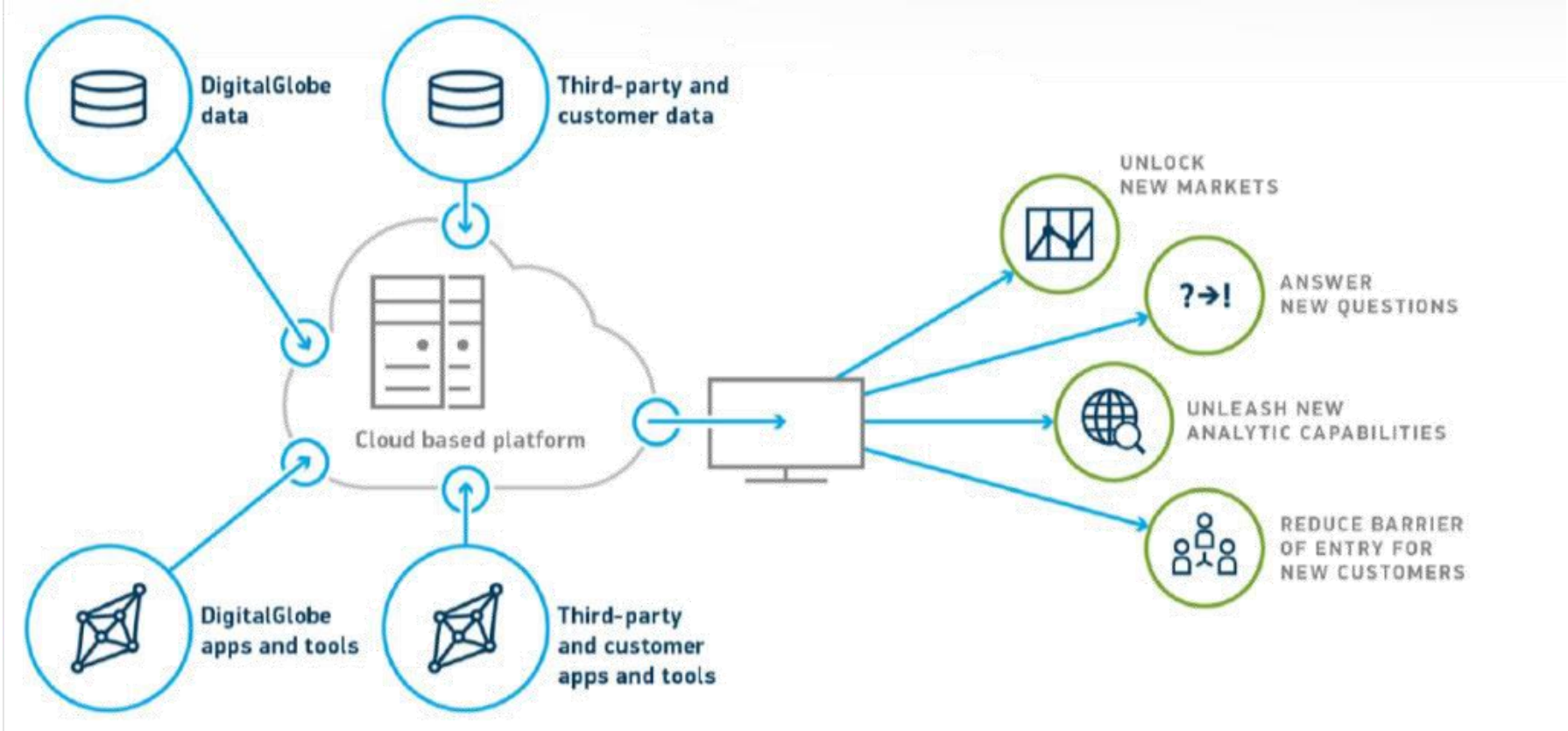
Learning/Classification

Copyright © 2017 DigitalGlobe. All rights reserved.

# From Pixels to Platforms

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# Geospatial Big Data Platform [GBDX]



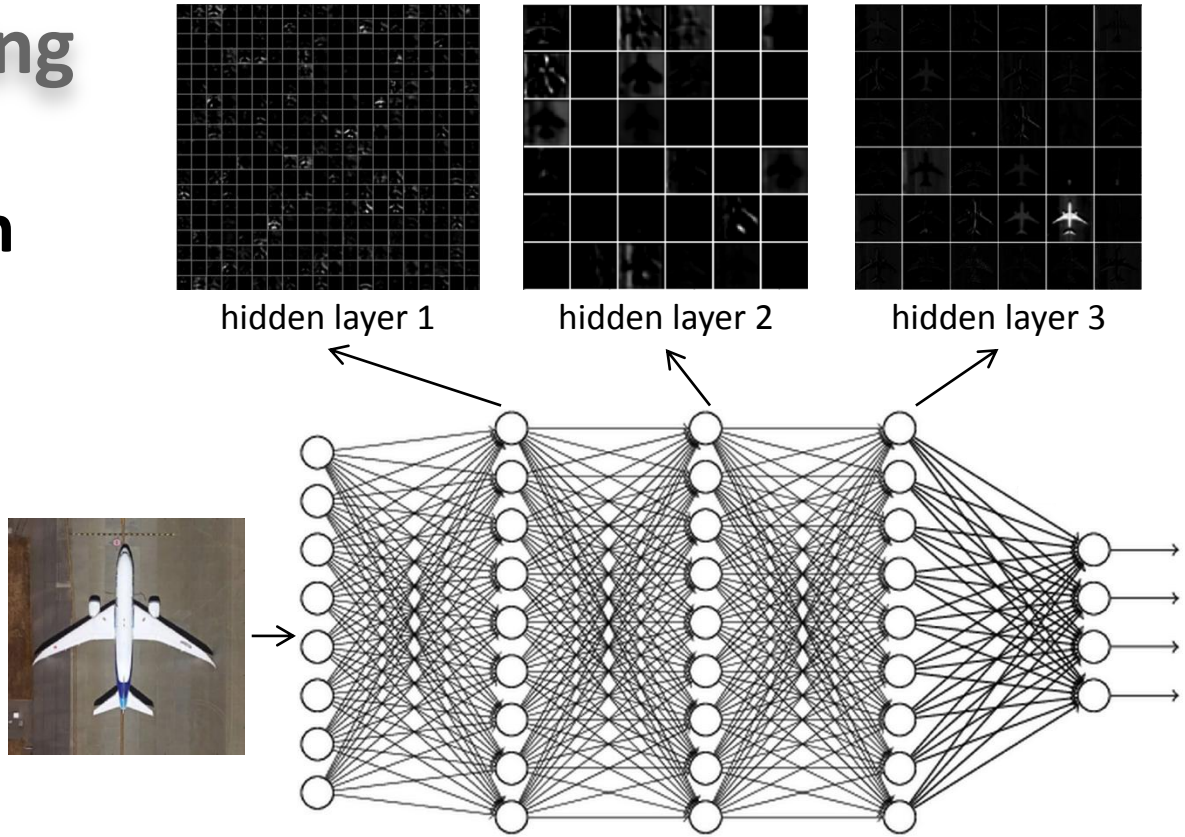


Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# Trends have enabled large scale analytics

## 2. Deep Learning

**Excels at pattern recognition**





Copyright © 2017 DigitalGlobe. All rights reserved.

RUA CECI
RUA CELINA
VIDEO inform
FOR A BRIGHT VISION

# GBDX is enabling a growing ecosystem

VRICON

ENVI

SPACE_KNOW

U.S. Government

facebook

EXOGENESIS

VIDEOinform
FOR A BRIGHT VISION

CUENDE
INFOMETRICS

Rhombus

CrowdAI

VSI
Vision Systems Inc

Orbital Insight

Grupo Revenga

PSMA
AUSTRALIA
LIMITED

Kitware

LOCKHEED MARTIN

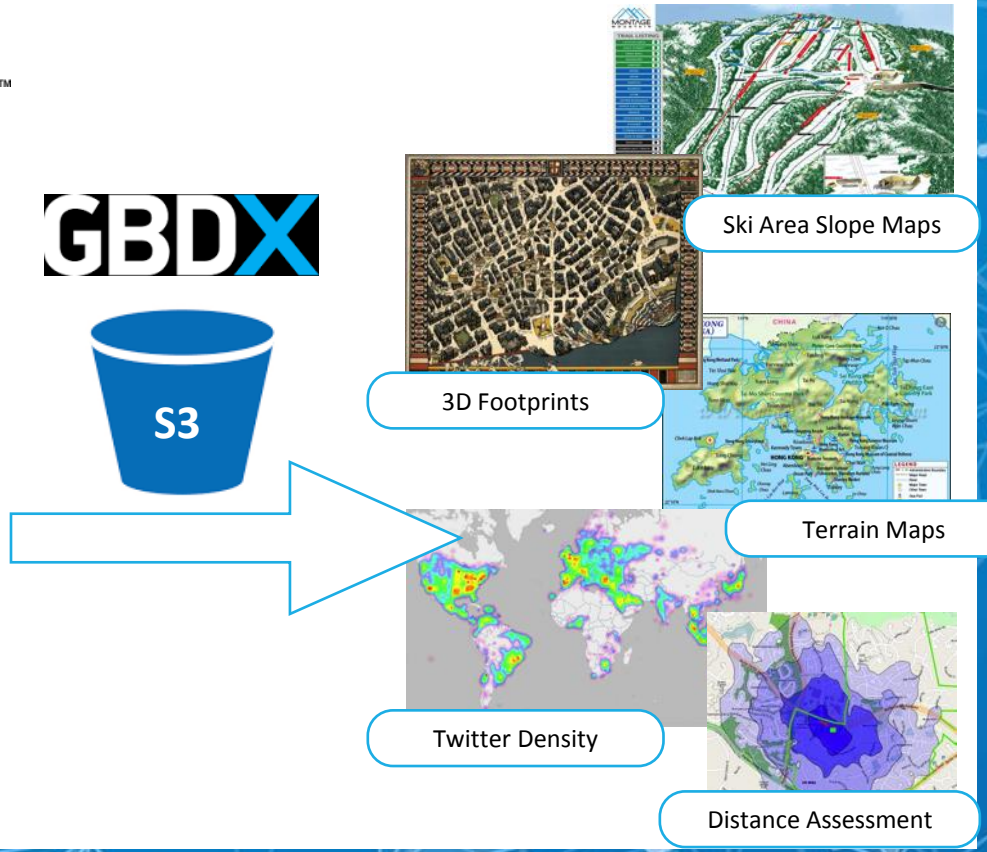
east view
geospatial

PRECISIONHAWK



Copyright © 2017 DigitalGlobe. All rights reserved.

# … fed by a growing network of geospatial sources

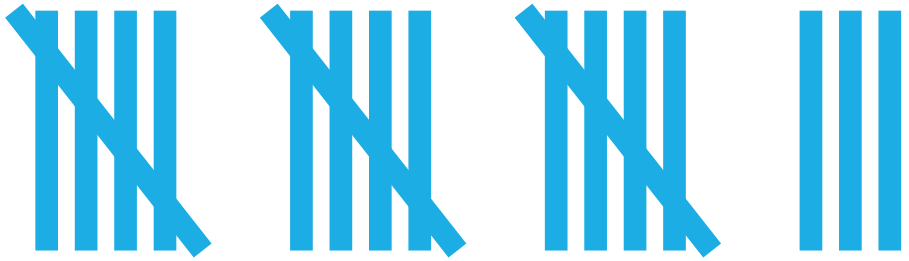


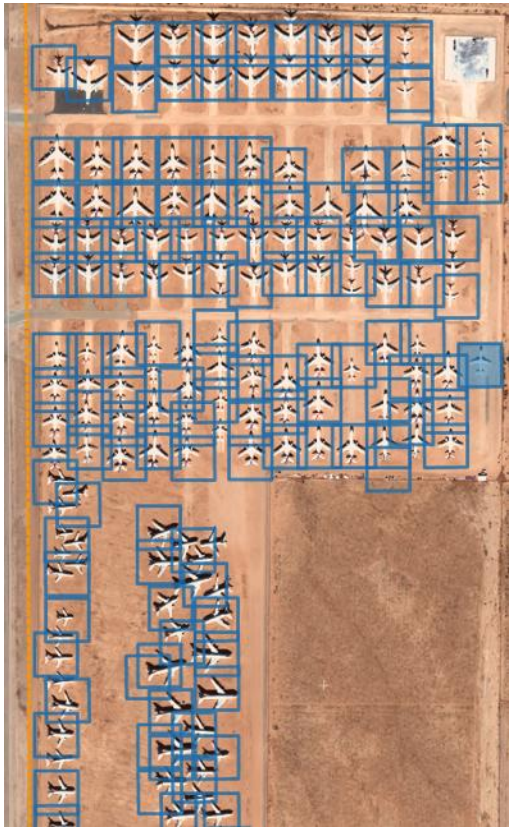

Copyright © 2017 DigitalGlobe. All rights reserved.

# … for measuring “state”

Copyright © 2017 DigitalGlobe. All rights reserved.

# … or counting “how many?”

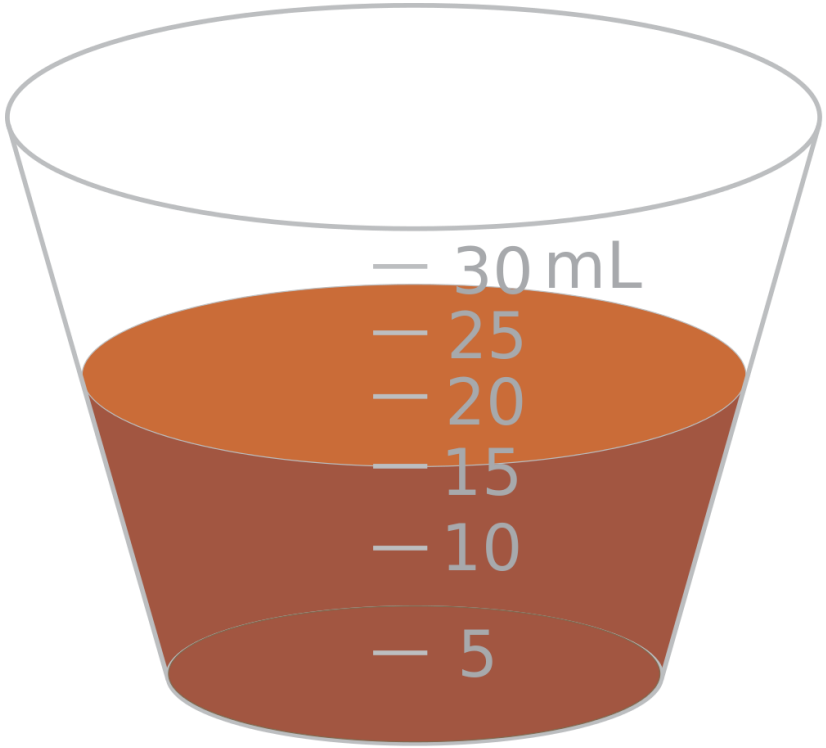






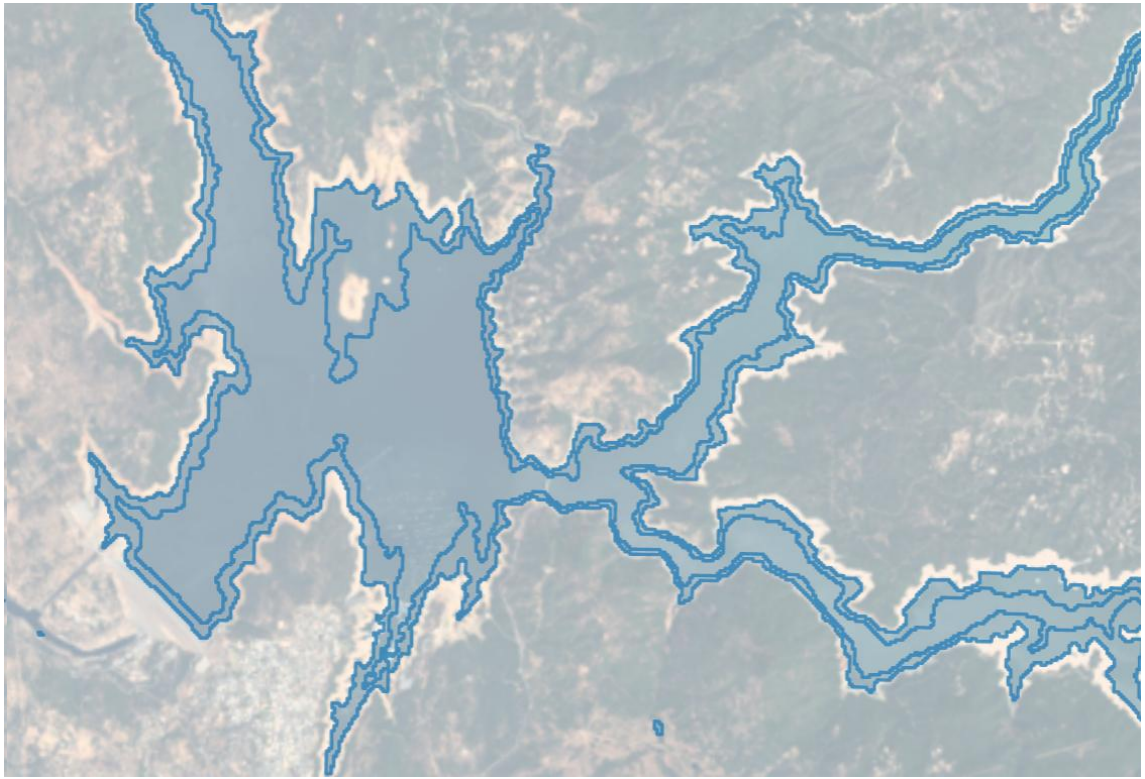
Copyright © 2017 DigitalGlobe. All rights reserved.

# … or measuring “how much?”



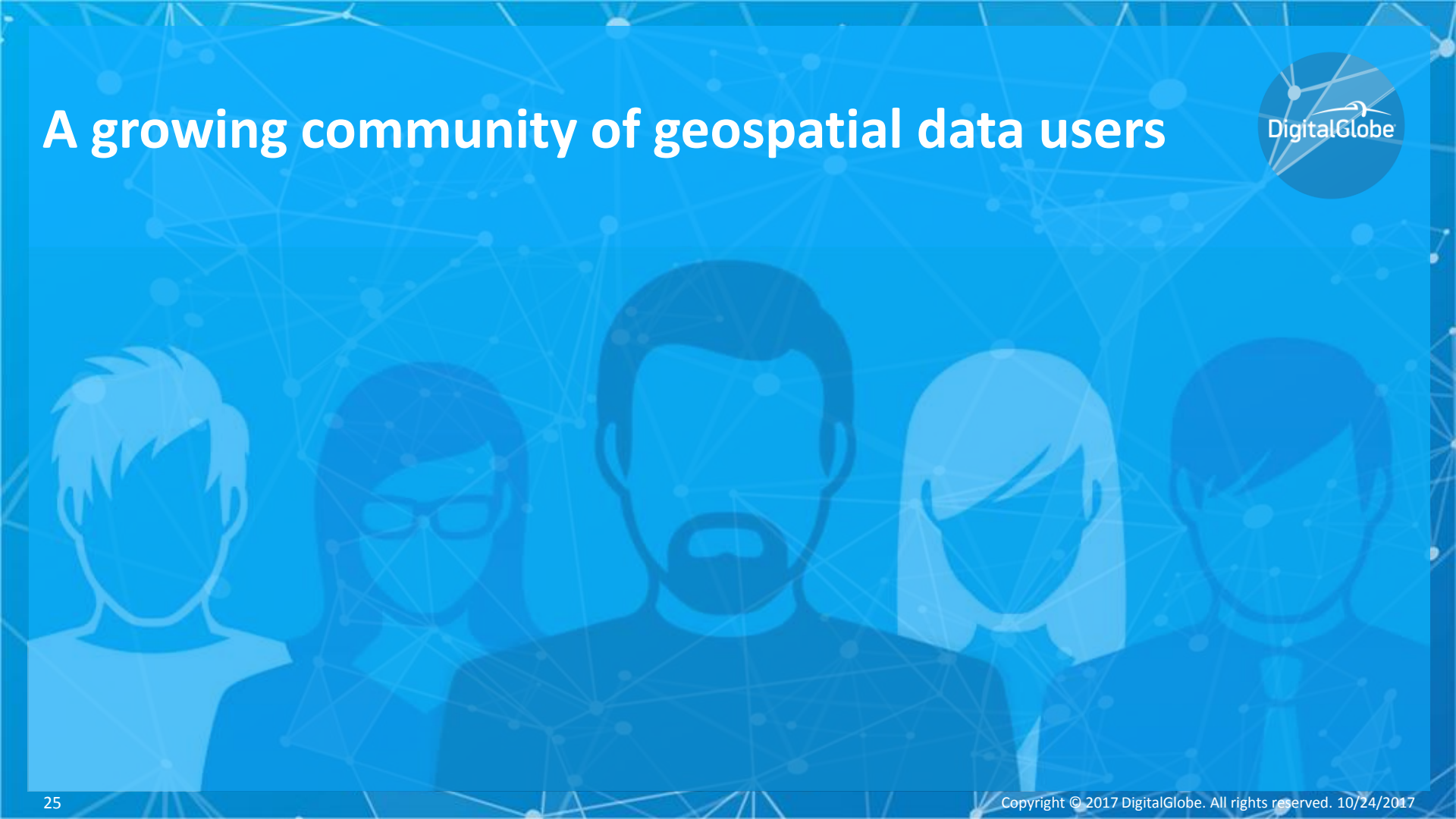
Copyright © 2017 DigitalGlobe. All rights reserved.

# … and understanding change over time



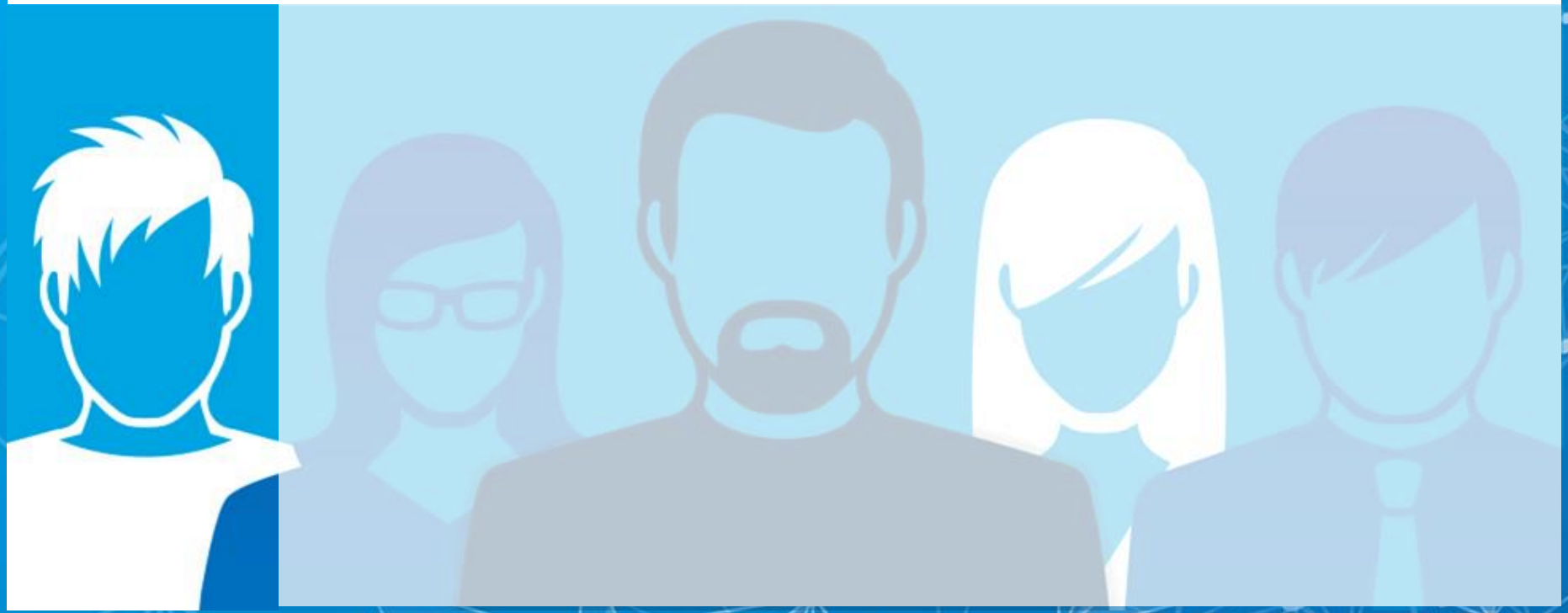

Copyright © 2017 DigitalGlobe. All rights reserved.

# A growing community of geospatial data users



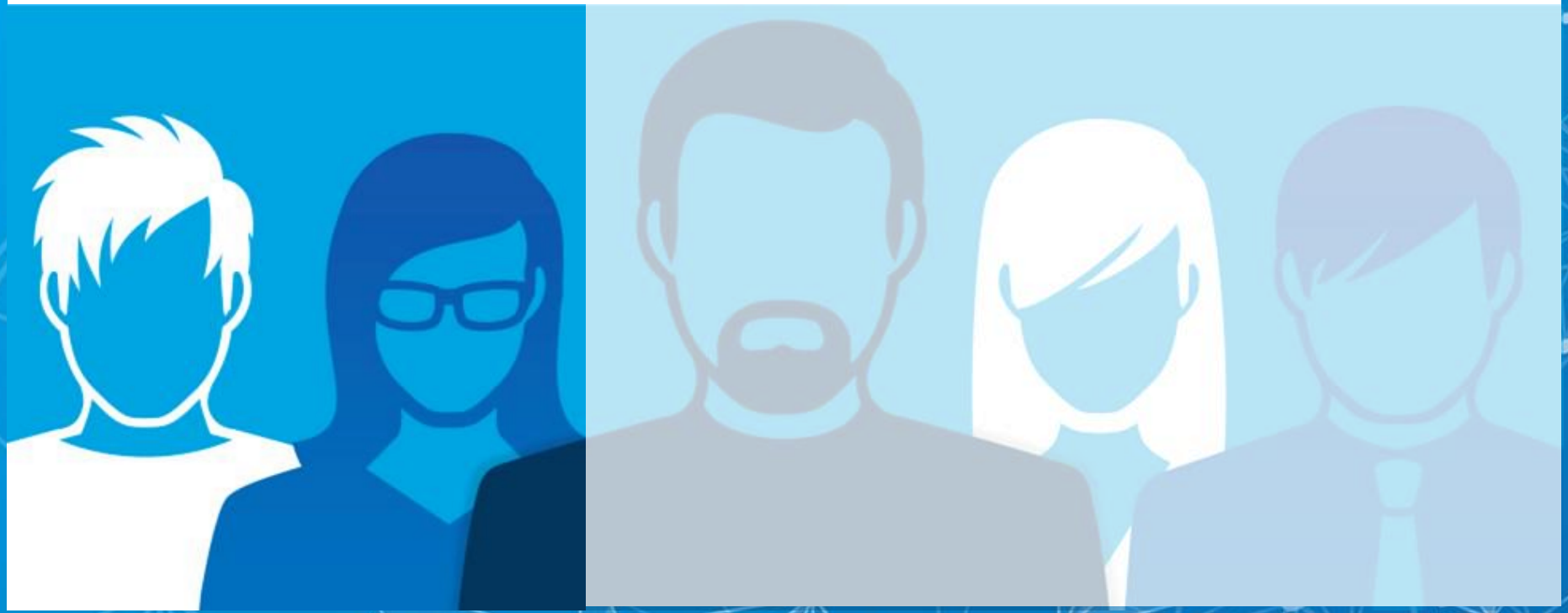

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Developer




Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The GIS Analyst




Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Imagery Analyst

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Data Scientist

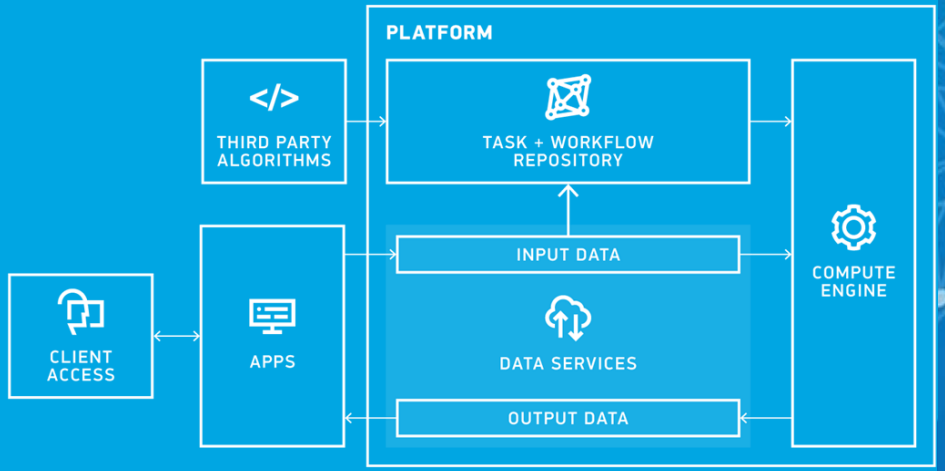
Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Consumer

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Developer

- RESTful APIs
- Python SDK
- Dockerized algorithm deployment
- Usage dashboards
- Jupyter Notebook-based web IDE (coming soon)





Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The GIS Analyst

- Esri ArcMap and QGIS Plugins to interact with vector results
- View imagery used in analysis
- Request and execute imagery analytics remotely from ArcMap GBDX Plugin

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

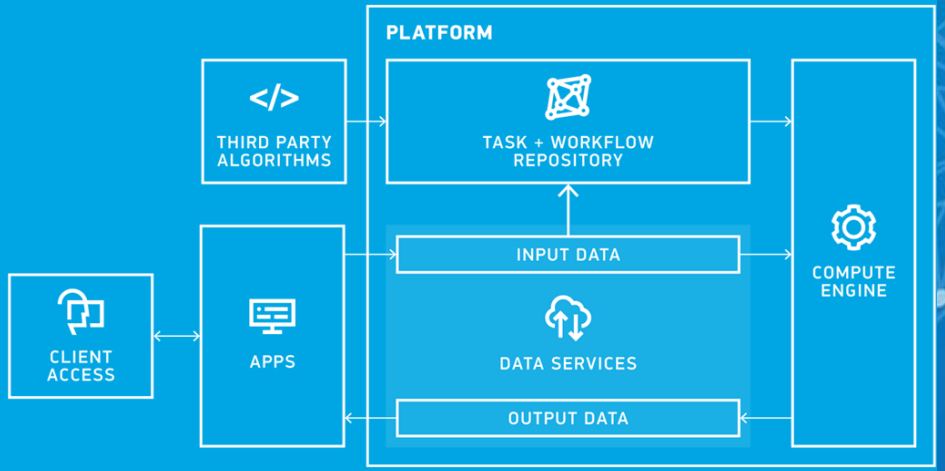
# The Imagery Analyst

- Integrated ENVI tools
- Web-based application access
- Outputs raster products
- Creates new analytic functions

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# The Data Scientist

- Jupyter Notebooks
- Abstracted from the imagery
- Simplified material selection
- Publish tasks at scale

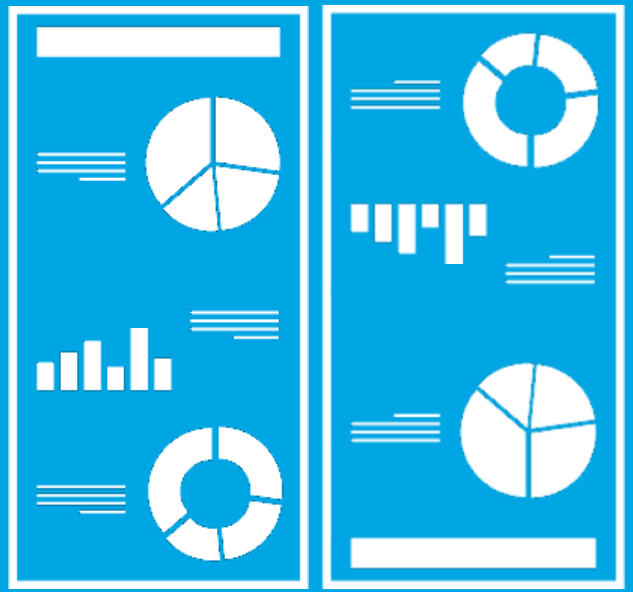




Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

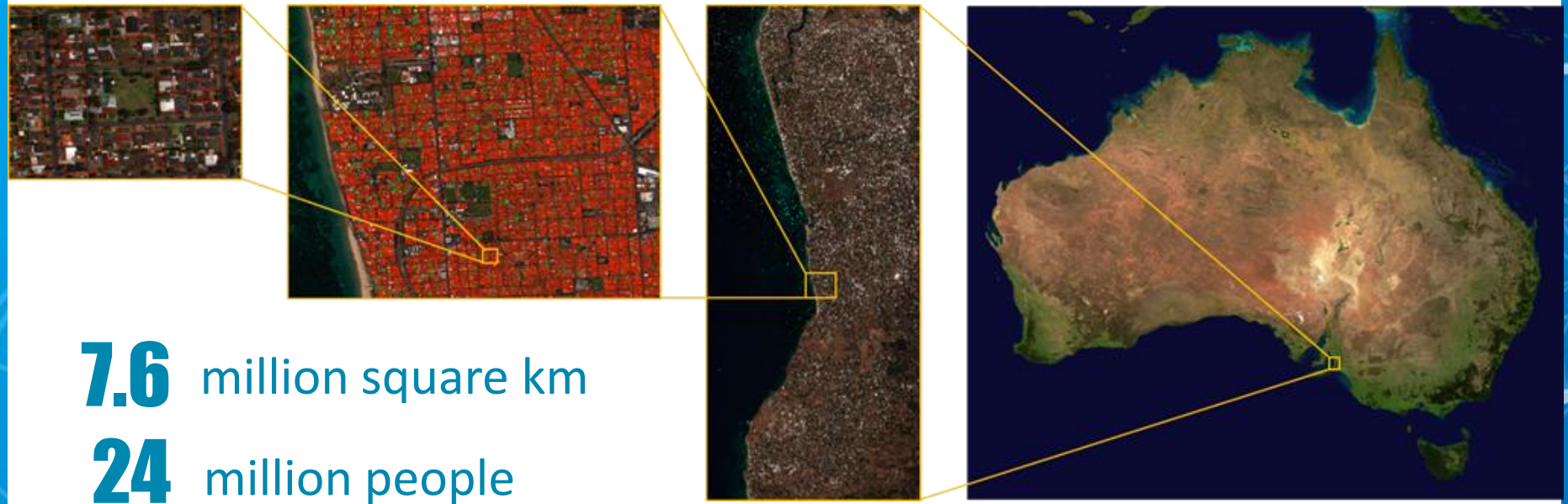
# The Consumer | The future…

- Finished data layers
- Information subscriptions
- Infographics and mashups
- Runs pre-built algorithms




Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# Geospatial Analysis at CONTINENTAL SCALE

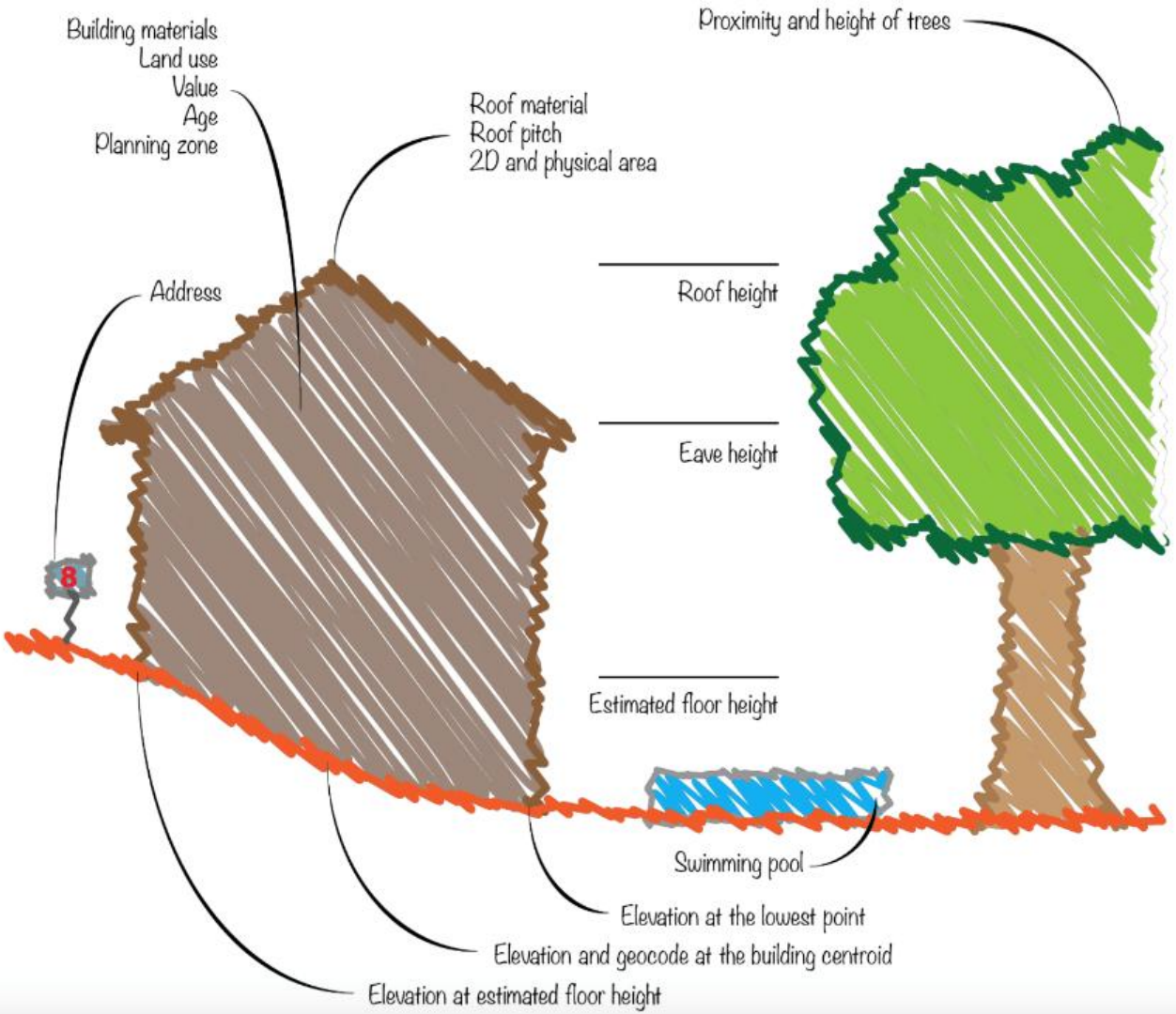


**7.6** million square km

**24** million people

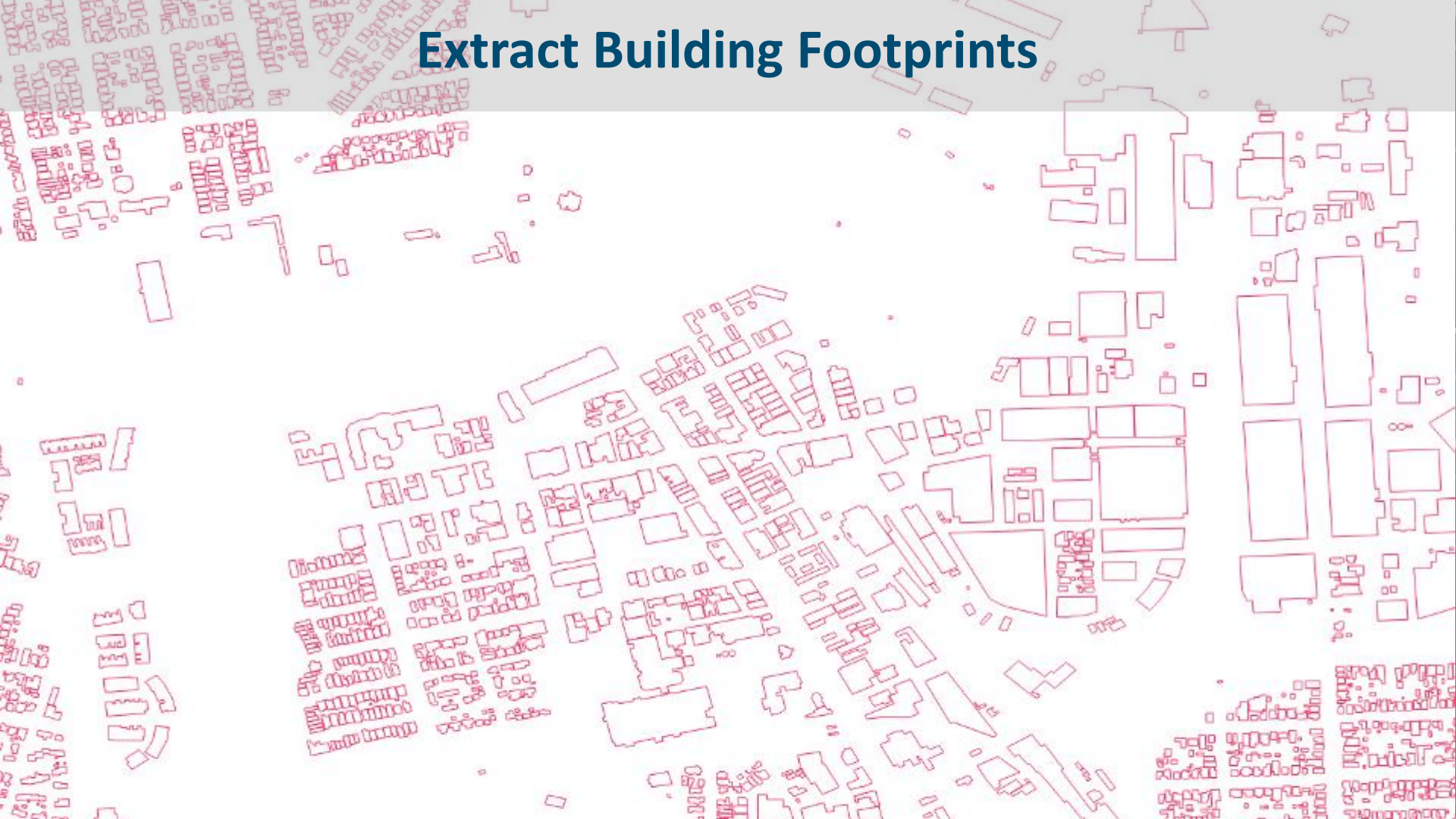
**13** million structures

Copyright © 2017 DigitalGlobe. All rights reserved.


Building materials
Land use
Value
Age
Planning zone
Roof material
Roof pitch
2D and physical area
Proximity and height of trees
Address
Roof height
Eave height
Estimated floor height
Swimming pool
Elevation at the lowest point
Elevation and geocode at the building centroid
Elevation at estimated floor height

# High Resolution Imagery

# Extract Building Footprints

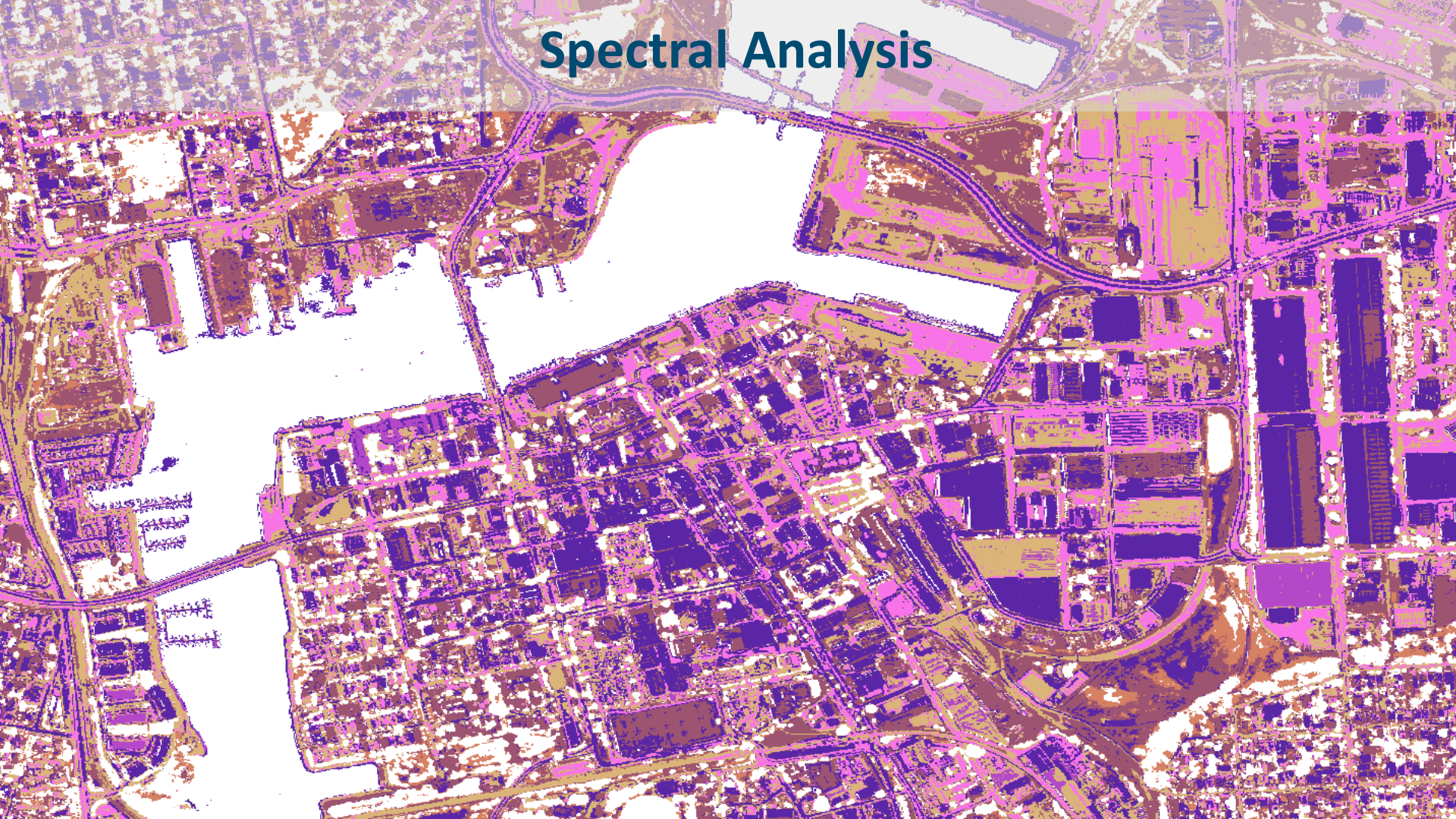


# Land Cover Map

# Elevation Map

# LULC + Elevation Map

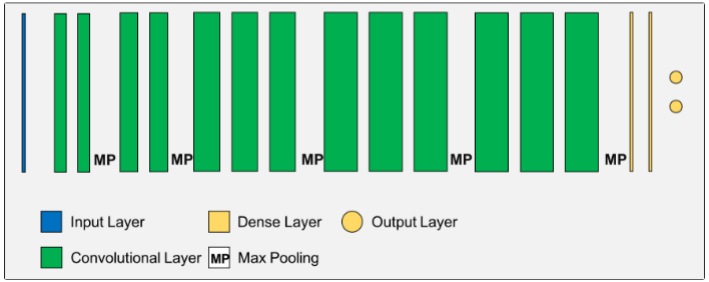
# Spectral Analysis

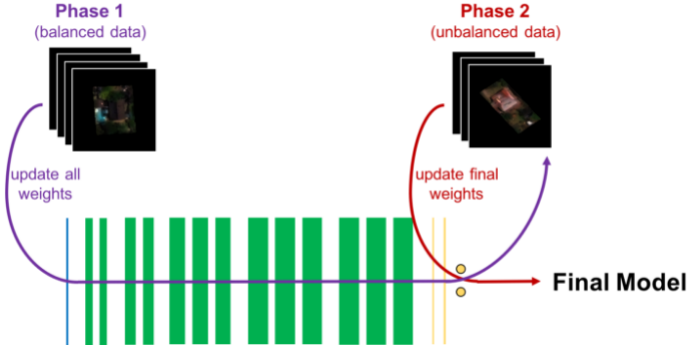


# Convolution Neural Network

## Training

We used the results of our previous approach in order to train and test a 16-layer CNN with architecture based on VGGNet, the winner of the 2014 ImageNet challenge[1]. We baptized our pool detector PoolNet.




**True Positives**

Test data labeled as 'no pool' but classified correctly by PoolNet as 'pool'.

**True Negatives**

Test data labeled as 'pool' but classified correctly by PoolNet as 'no pool'.

**Precision**: 88.1% **F1 Score**: 90.6
**Recall**: 93.3% **Accuracy**: 98.2%

| n = 1650 | Predicted: No Pool | Predicted: Pool | |
|---|---|---|---|
| Actual: No Pool | TN = 1481 | FP = 19 | 1500 |
| Actual: Pool | FN = 10 | TP = 140 | 150 |
| | 1491 | 159 | |

Copyright © 2017 DigitalGlobe. All rights reserved.

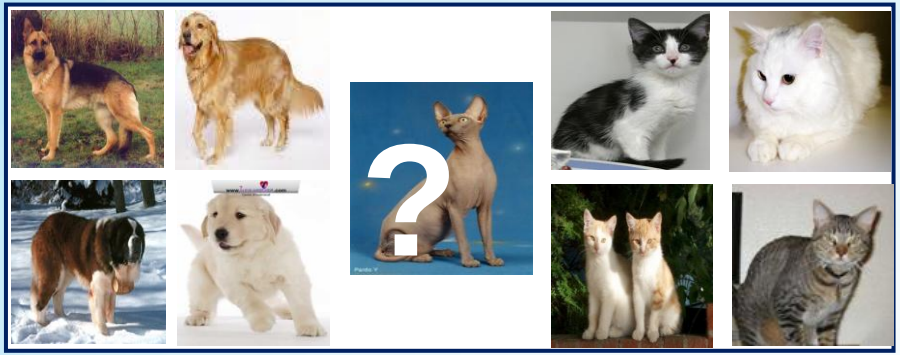
# Swimming Pools

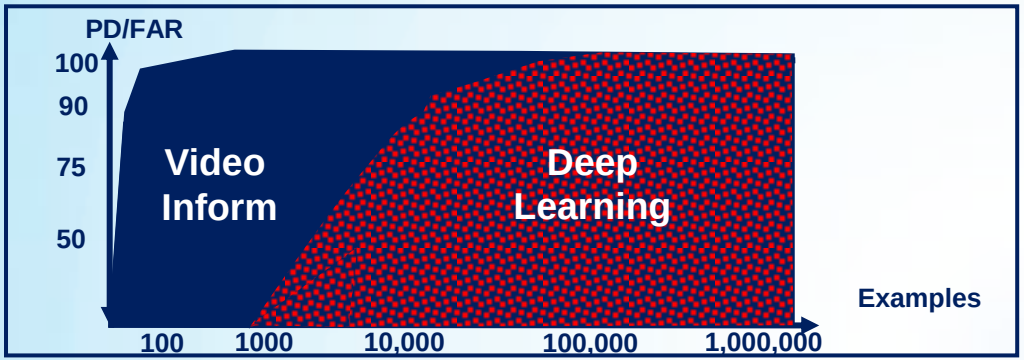
# Visual Profiler on GBDX new insight level

VIDEO Inform FOR A BRIGHT VISION

DigitalGlobe

**A novel approach of Imagery Analysis. State of the art Deep learning schemes Integrated with machine learning, trying to imitate the human object recognition and to achieve breakthrough performance**



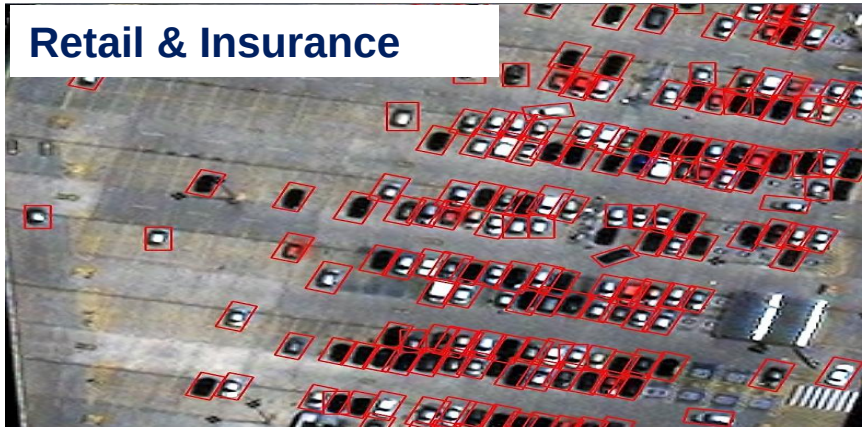


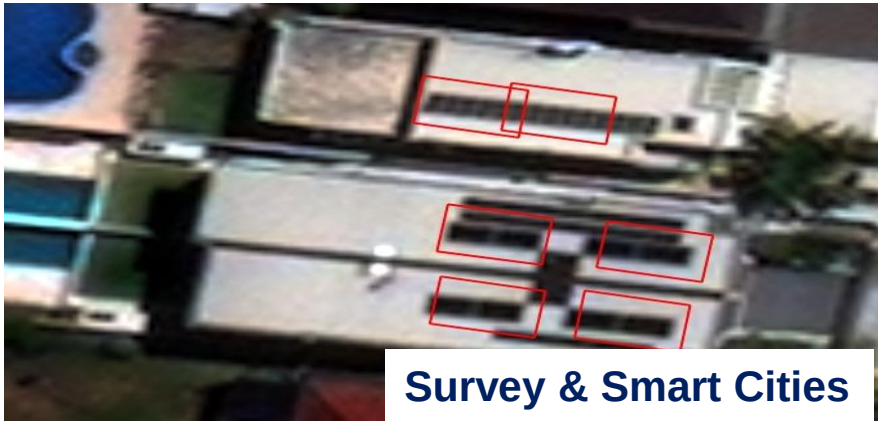

Copyright © 2017 DigitalGlobe. All rights reserved.

# Visual Profiler on GBDX - Applications

VIDEO inform
FOR A BRIGHT VISION

DigitalGlobe

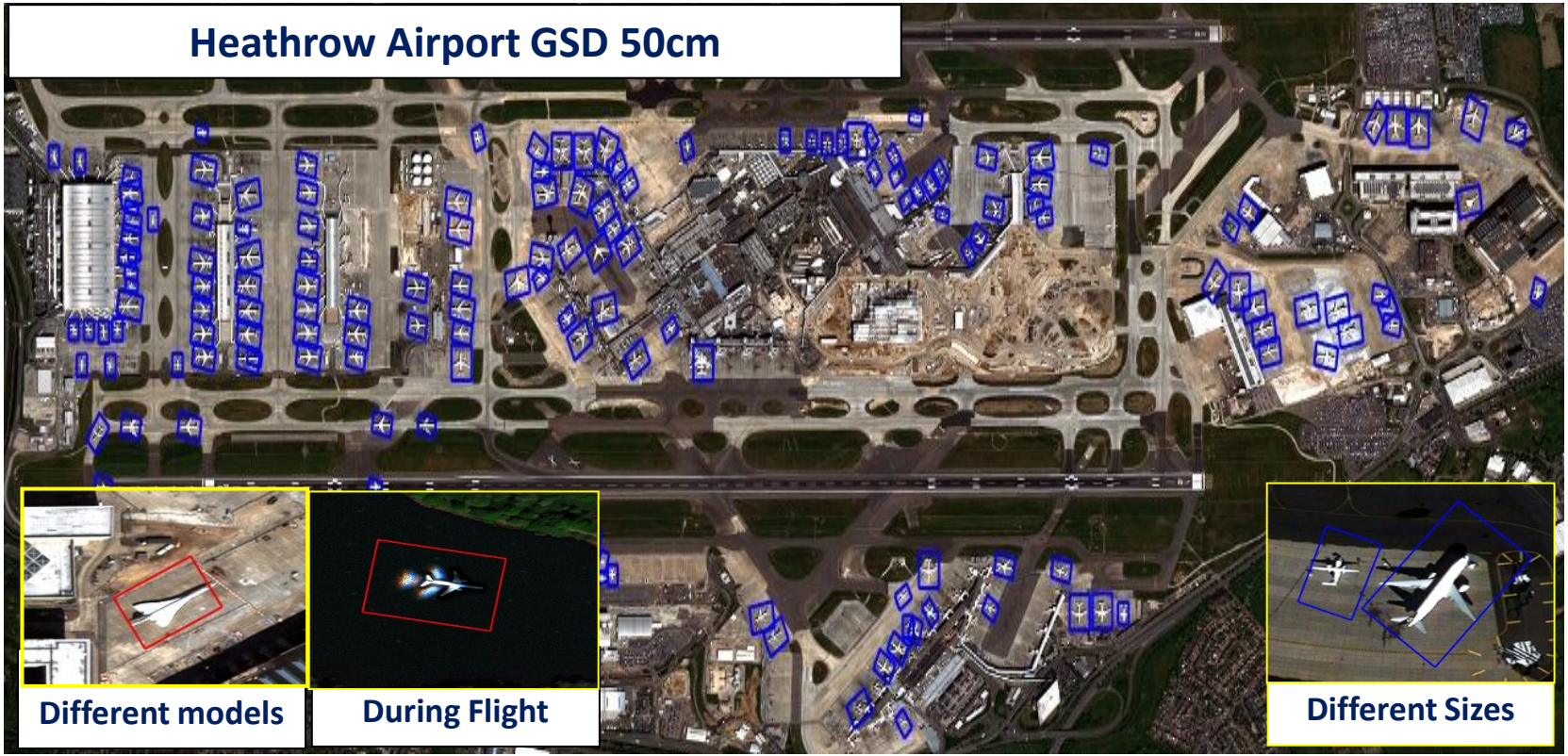





Copyright © 2017 DigitalGlobe. All rights reserved.

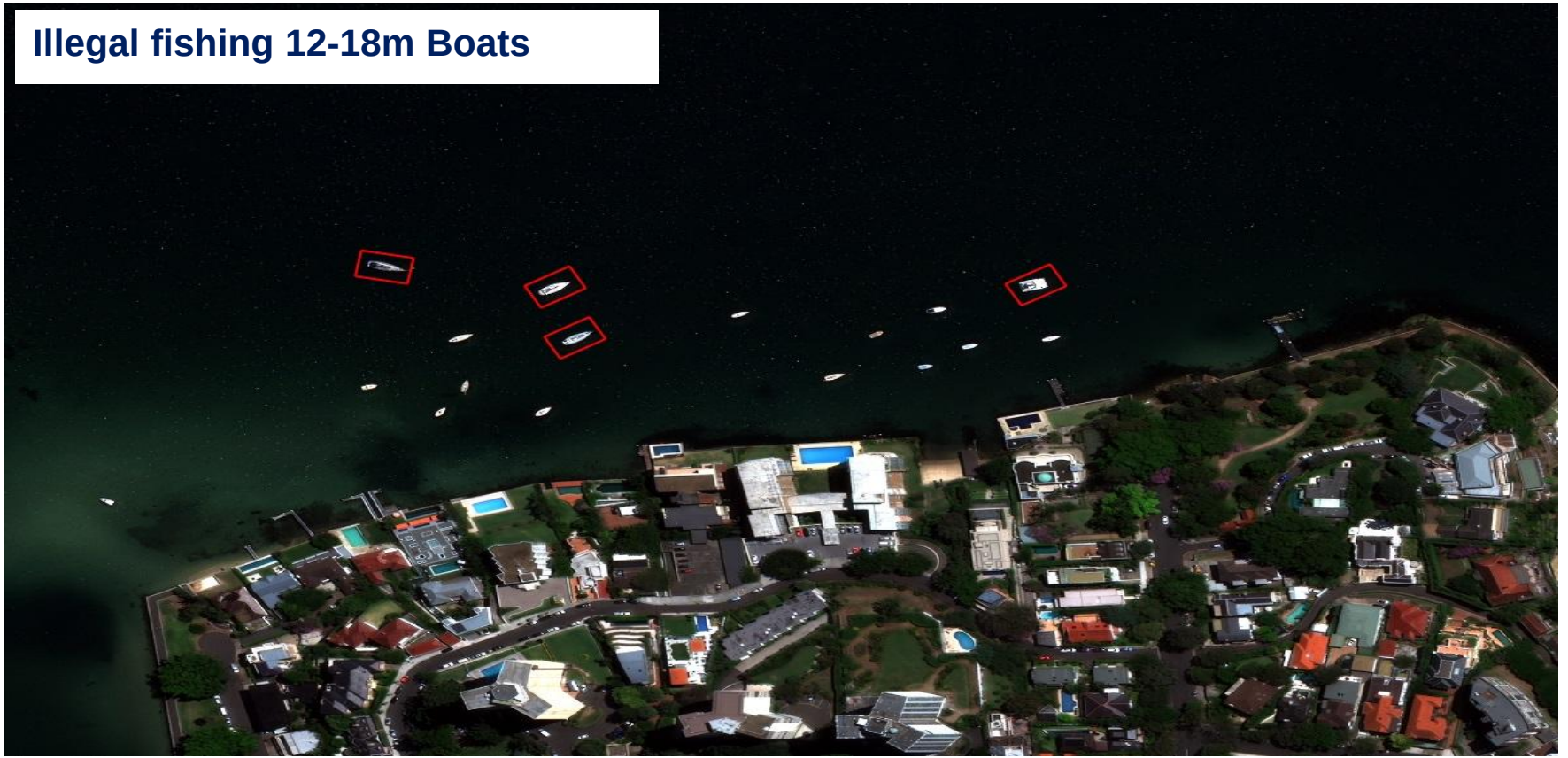
# Counting Commercial aircrafts

VIDEO inform
FOR A BRIGHT VISION
DigitalGlobe




Copyright © 2017 DigitalGlobe. All rights reserved.

# Detecting boats – GSD 30cm




Copyright © 2017 DigitalGlobe. All rights reserved.

# Counting cars - Parking lots GSD 30-40cm

VIDEO inform
FOR A BRIGHT VISION

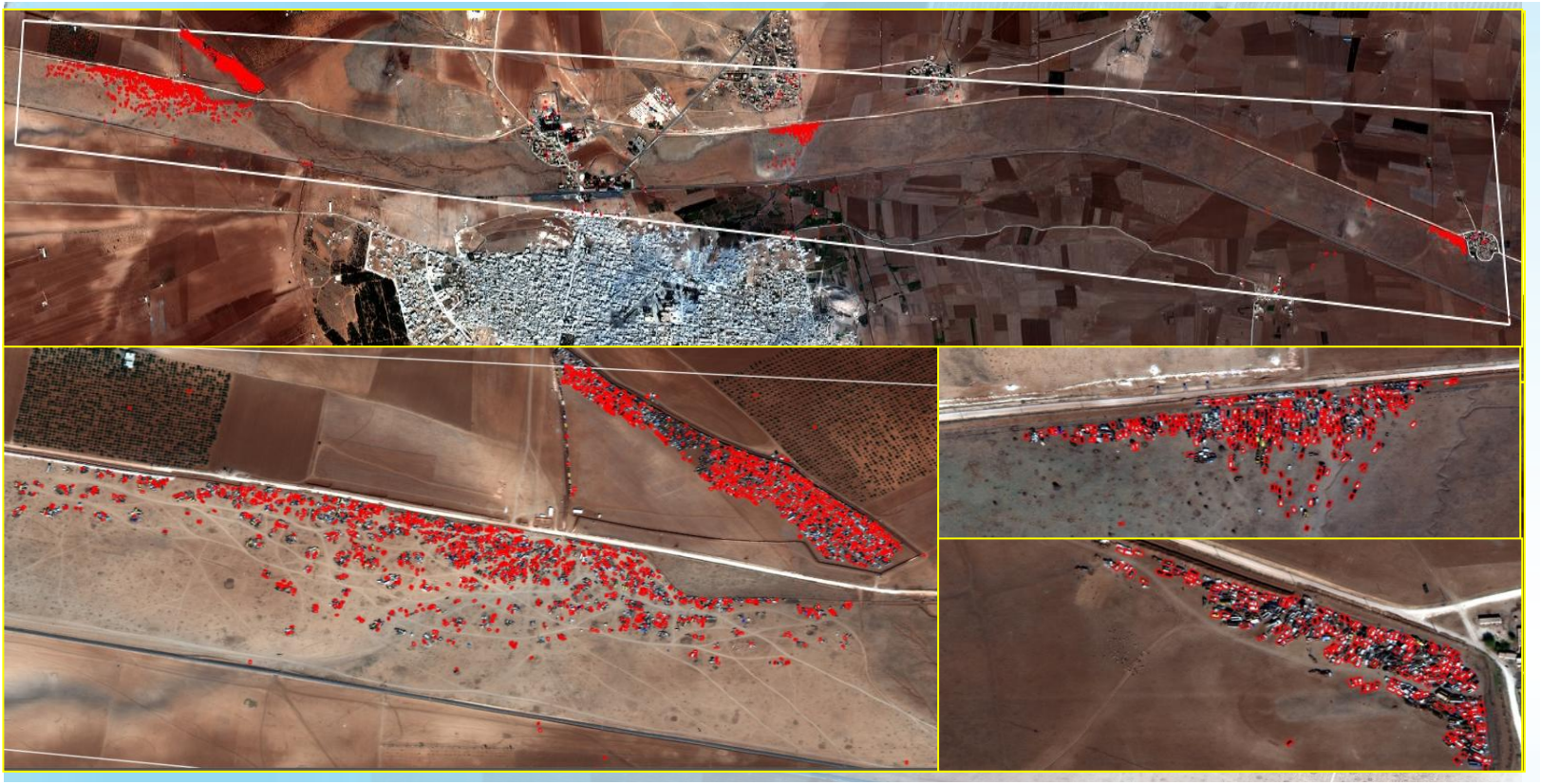
DigitalGlobe

Copyright © 2017 DigitalGlobe. All rights reserved.

# Counting cars – Urban env. GSD 30-40cm

Copyright © 2017 DigitalGlobe. All rights reserved.

# Change Detection – Cars



Copyright © 2017 DigitalGlobe. All rights reserved.

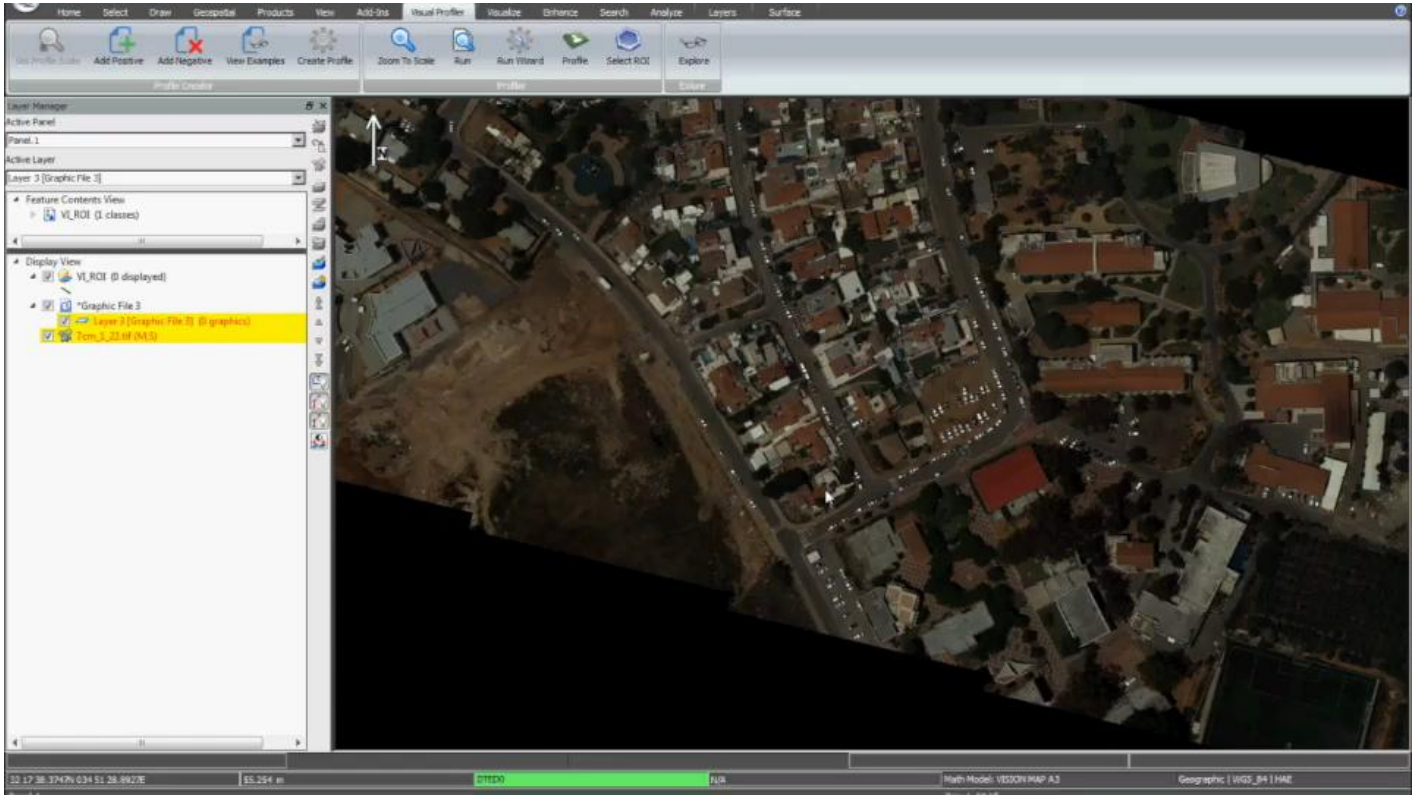
# Segmentation and Classification

Copyright © 2017 DigitalGlobe. All rights reserved.

# Infrastructures Detection

Copyright © 2017 DigitalGlobe. All rights reserved.

# Training Visual Profiler…






Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

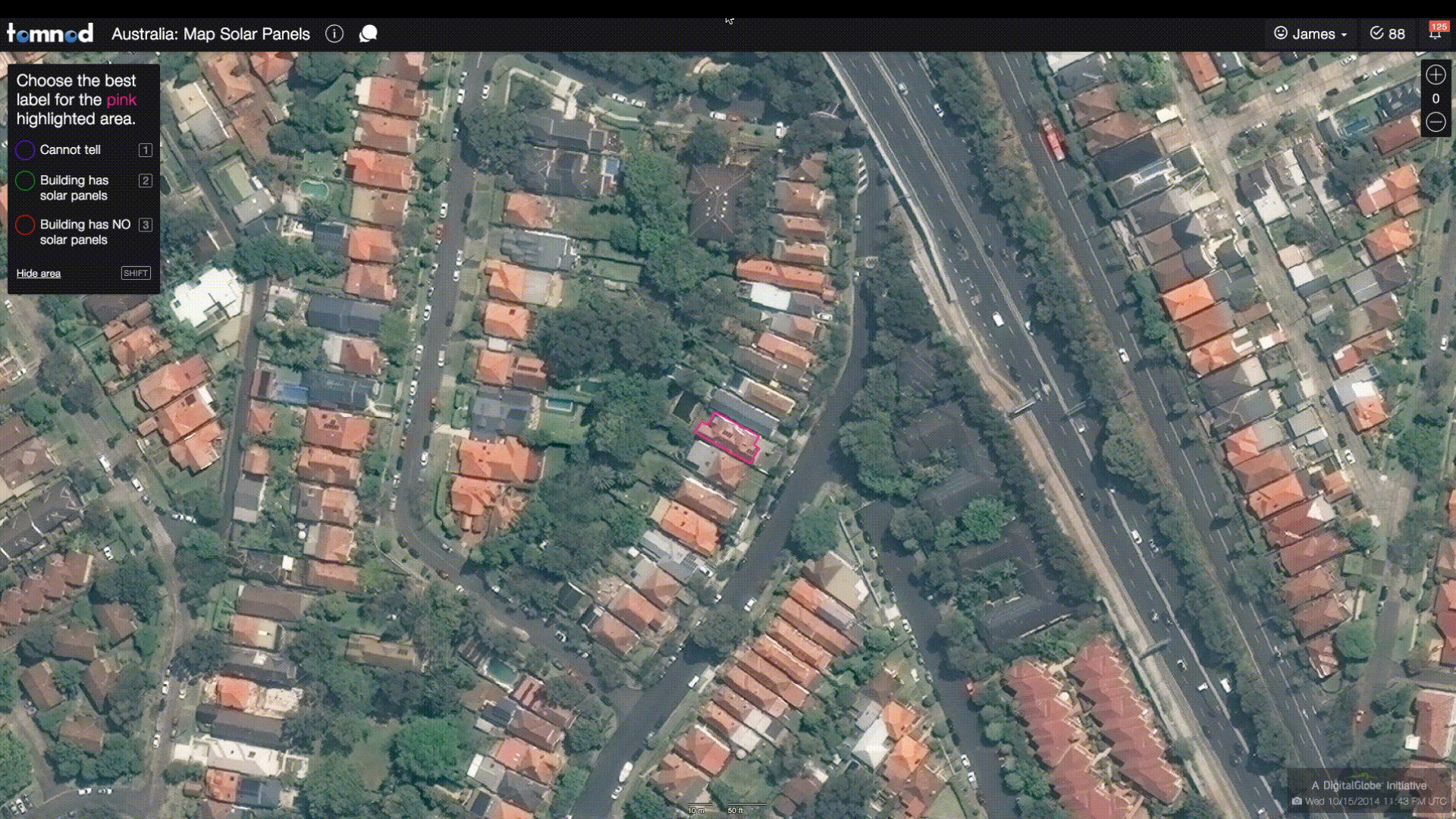
# Infrastructures Detection

VIDEO inform
FOR A BRIGHT VISION
DigitalGlobe

## Solar Panels – 30cm GSD

Copyright © 2017 DigitalGlobe. All rights reserved.

# Solar Panels

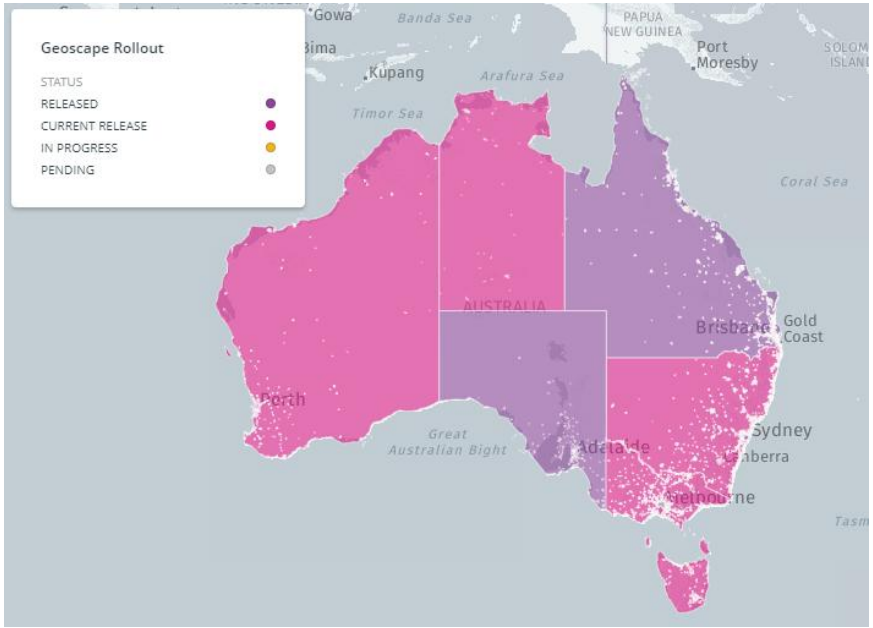

tomnod
Australia: Map Solar Panels
James
88
125
Choose the best label for the pink highlighted area.
Cannot tell 1
Building has solar panels 2
Building has NO solar panels 3
Hide area SHIFT
0
A DigitalGlobe Initiative
Wed 10/15/2014 11:43 PM UTC
10 m
50 ft

# Visual Profiler in Summary…

- High detection rates
- Unlimited object definition and profiling flexibility
- Rapid count of objects of interest
- The ability to scan large scale areas within a short period of time
- Resiliency and robustness to unforeseen changes such as lighting and seasonal affects


Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# Project Rollout




| RELEASE SCHEDULE | LOCATIONS | STATUS |
|---|---|---|
| Release 1 (December 2016) | Adelaide | Released |
| | Canberra | Released |
| | SA rural* | Released |
| Release 2 (April 2017) | Sydney | Released |
| | QLD rural* | Released |
| | SA urban areas | Released |
| | Griffith & NSW urban areas | Released |
| Release 3 (July 2017) | NSW rural* | Current Release |
| | VIC rural* | Current Release |
| | WA rural* | Current Release |
| | TAS rural* | Current Release |
| | NT rural* | Current Release |
| | Perth | Current Release |
| | Cairns | Current Release |
| | TAS urban areas | Current Release |
| | Launceston | Current Release |
| Late 2017 | Mackay | In Progress |
| | Sunshine Coast | In Progress |
| | Hobart | In Progress |
| | Brisbane | In Progress |
| | Townsville | In Progress |
| | Wollongong | In Progress |
| | Rockhampton | Pending |
| | Geelong | Pending |
| | Newcastle | Pending |
| | Melbourne | Pending |
| | Toowoomba | Pending |
| | Darwin | Pending |
| | Ballarat | Pending |
| | Bendigo | Pending |
| | Albury/Wodonga | Pending |
| | Bunbury | Pending |
| | Remaining Locations | Pending |


Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

# Project so far

DigitalGlobe

**75 TB**

**14 M**

**95%**

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017

Copyright © 2017 DigitalGlobe. All rights reserved. 10/24/2017