Microsoft

Cloud-Native Geospatial
Microsoft Planetary Computer

AMS 2024

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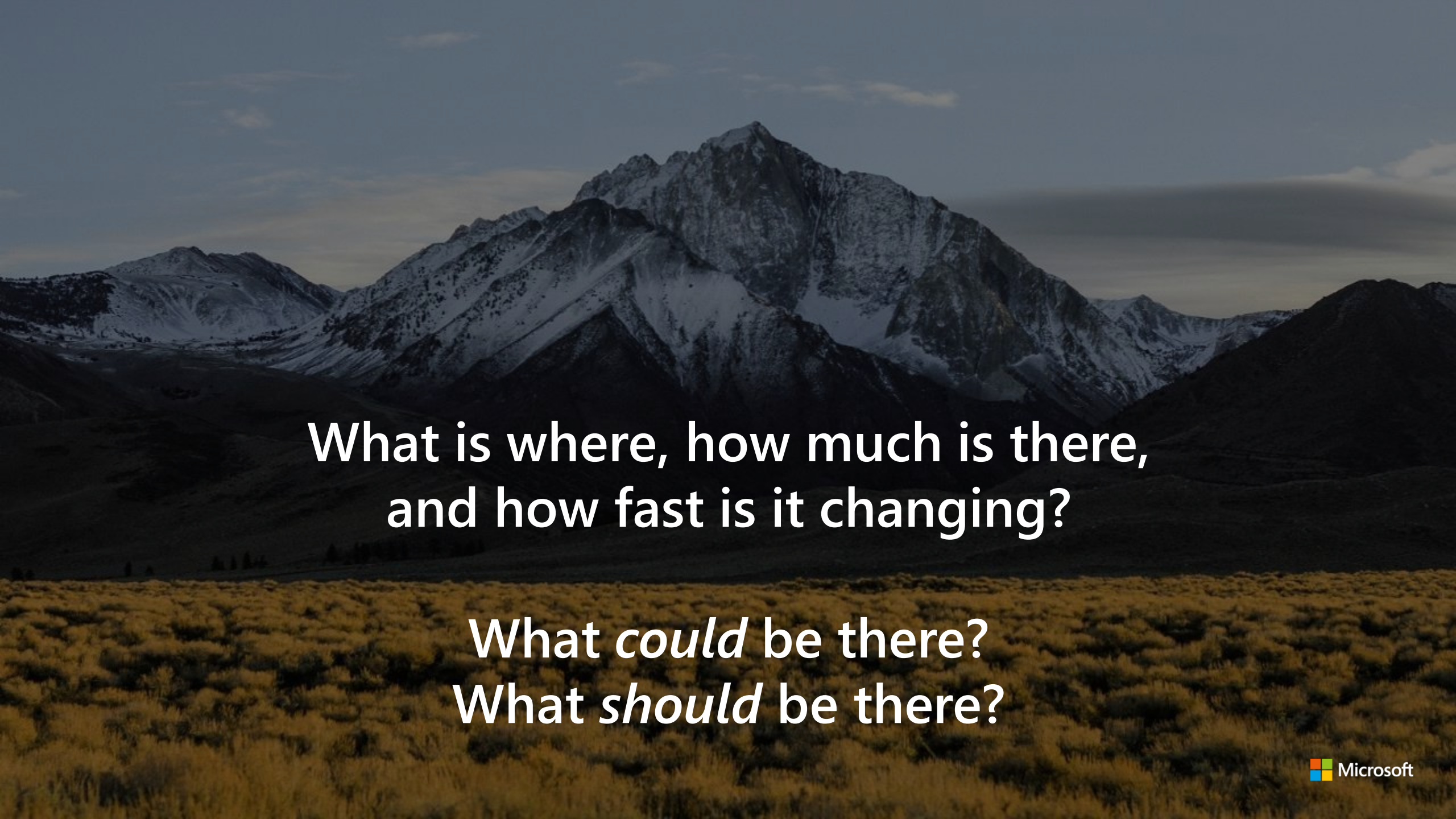
What is where, how much is there,
and how fast is it changing?
What *could* be there?
What *should* be there?
Microsoft


Food
Fiber
Minerals
Land
Wind
Biodiversity
Sun
Weather
Water
Climate
Hydrocarbons
Air
Digital transformation of Earth's natural resources
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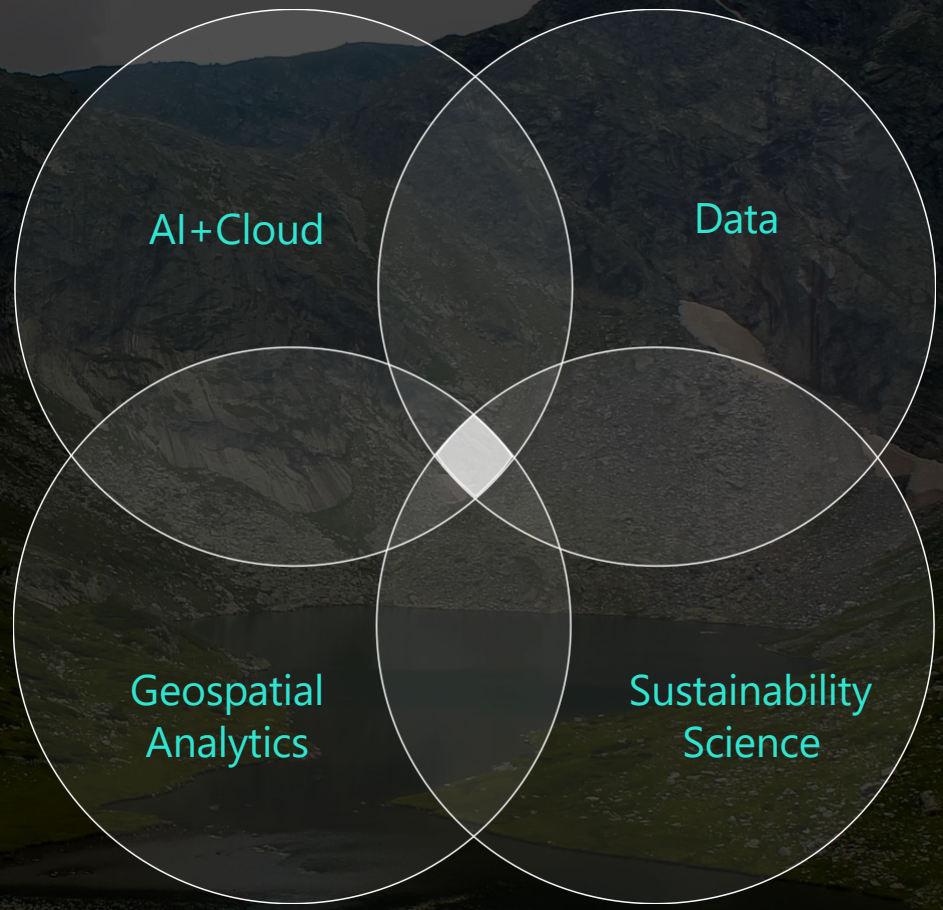
We’re experiencing an explosion of data about our planet
CO_2
Microsoft

Environmental Sustainability is increasingly complicated

More data, more complex

More tools, more complex

More questions, more complex

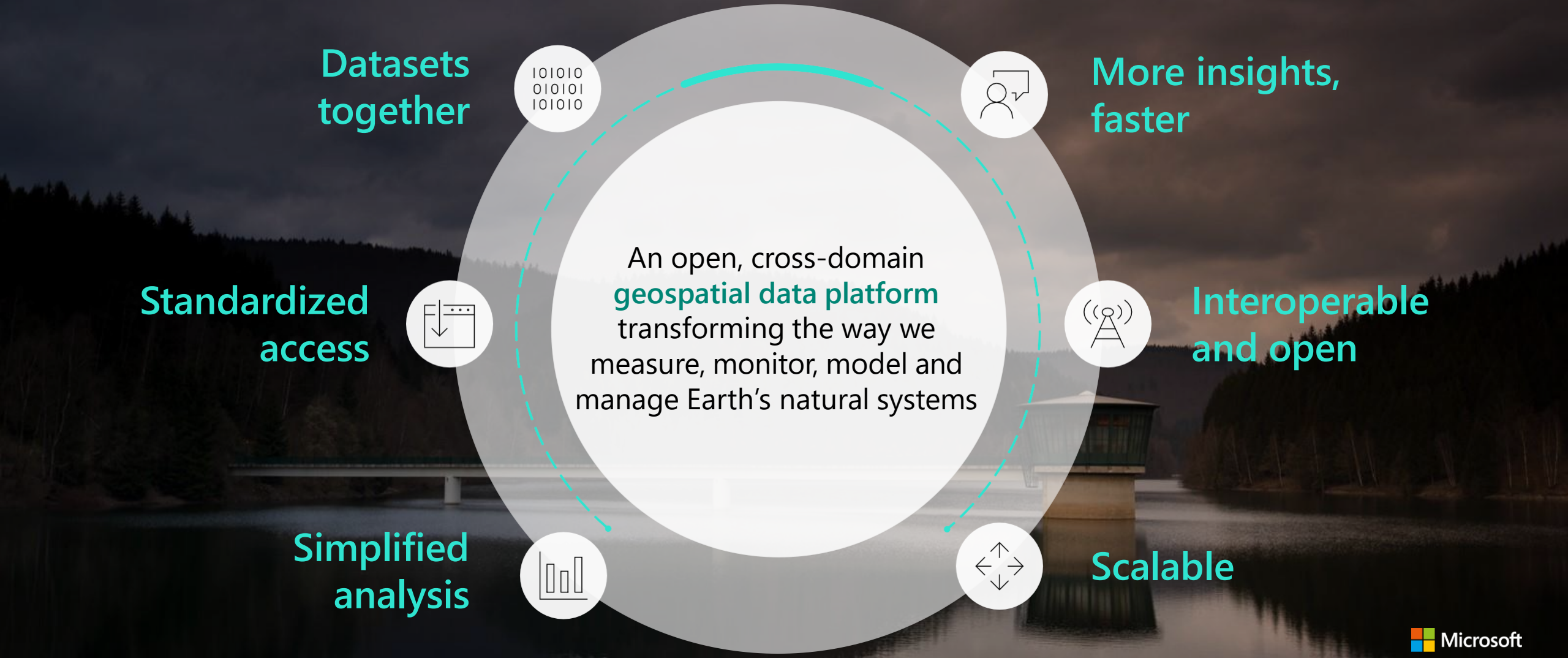


Each domain has seen a revolution in capabilities

Cross-domain areas remain behind

Microsoft

The Planetary Computer: Definition and benefits



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The Planetary Computer: Core Features

Data Catalog

The Planetary Computer includes petabytes of environmental monitoring data, in consistent, analysis-ready formats, accessible through our APIs as well as directly available via Azure Storage.

API

The Planetary Computer API makes it easy for users to find exactly the data they need, simplifying search and discovery across our Data Catalog.

Hub

The Planetary Computer Hub is a development environment that makes our data and APIs accessible through familiar, open-source tools, and allows users to easily scale their analyses.

Applications

Partners all over the world are building on top of the Planetary Computer platform, providing the actionable information that is critical to sustainability practitioners.

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Planetary Computer Data

Over 120 datasets and 50PB

Remote sensing data

Weather/climate data

Land cover data

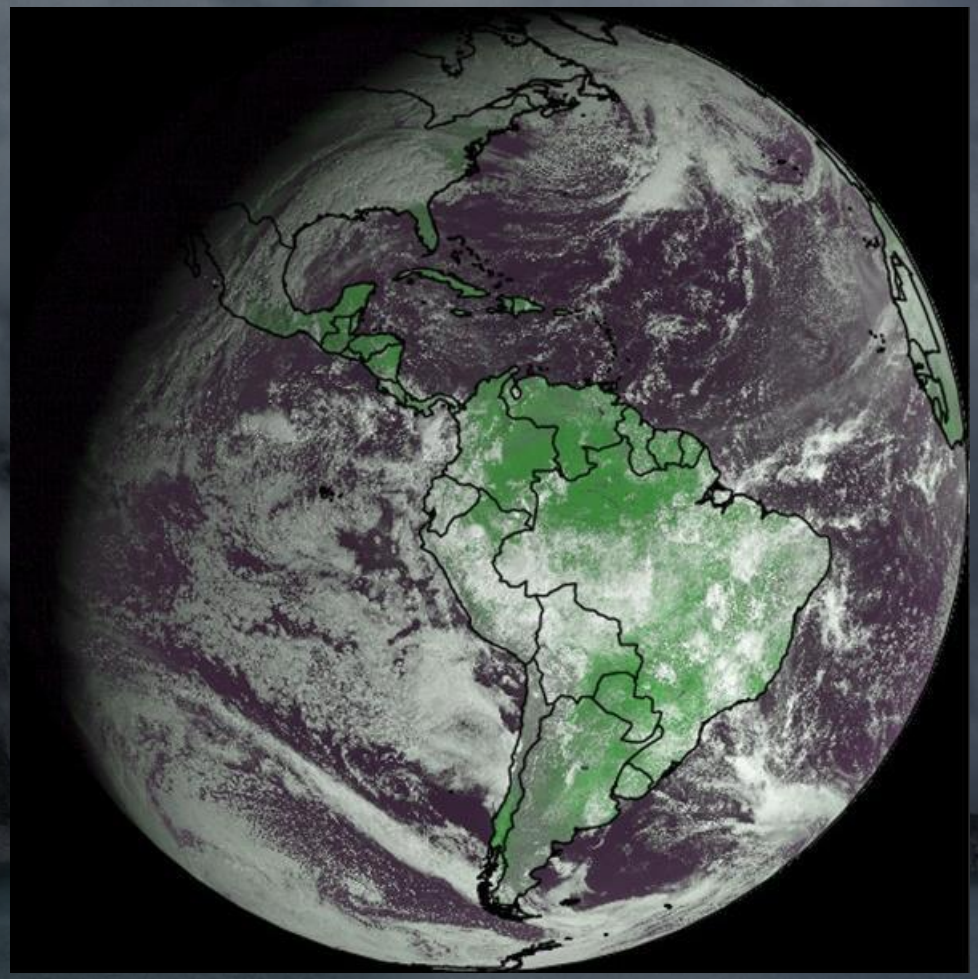
Biodiversity data

NOAA Open Data Dissemination

28 NOAA datasets and growing:

CFS, GEFS, NWM, HRRR, GOES-R, SST

...and many more



planetarycomputer.microsoft.com/catalog

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Planetary Computer APIs

Enabling fast and efficient access

Metadata API

Query by space, time and indexed properties

Implements STAC – fast becoming an industry standard

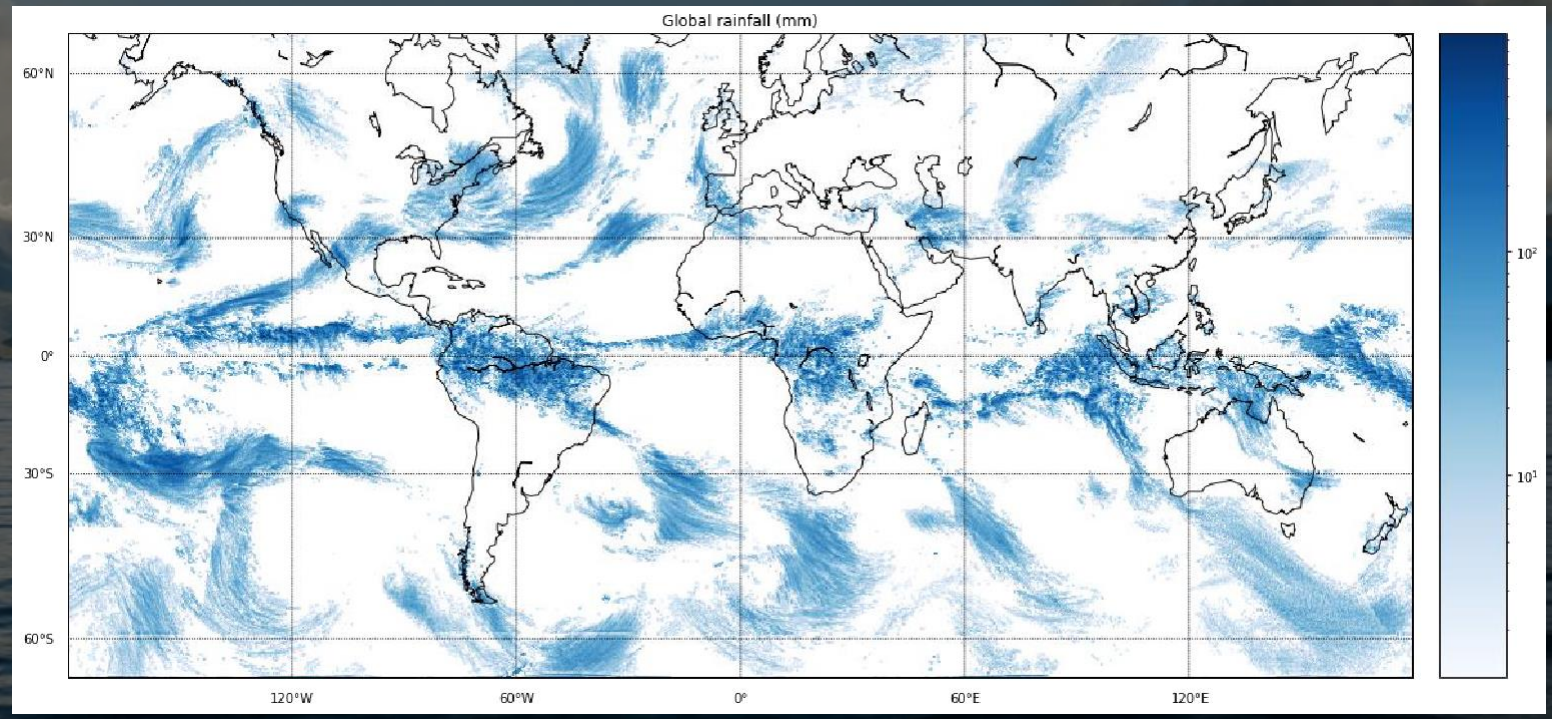
Differentiated from other cloud offerings

Data API

"Cloud Optimized" file access directly from Azure Blob Storage

APIs to visualize and mosaic data

Anonymous & authenticated access



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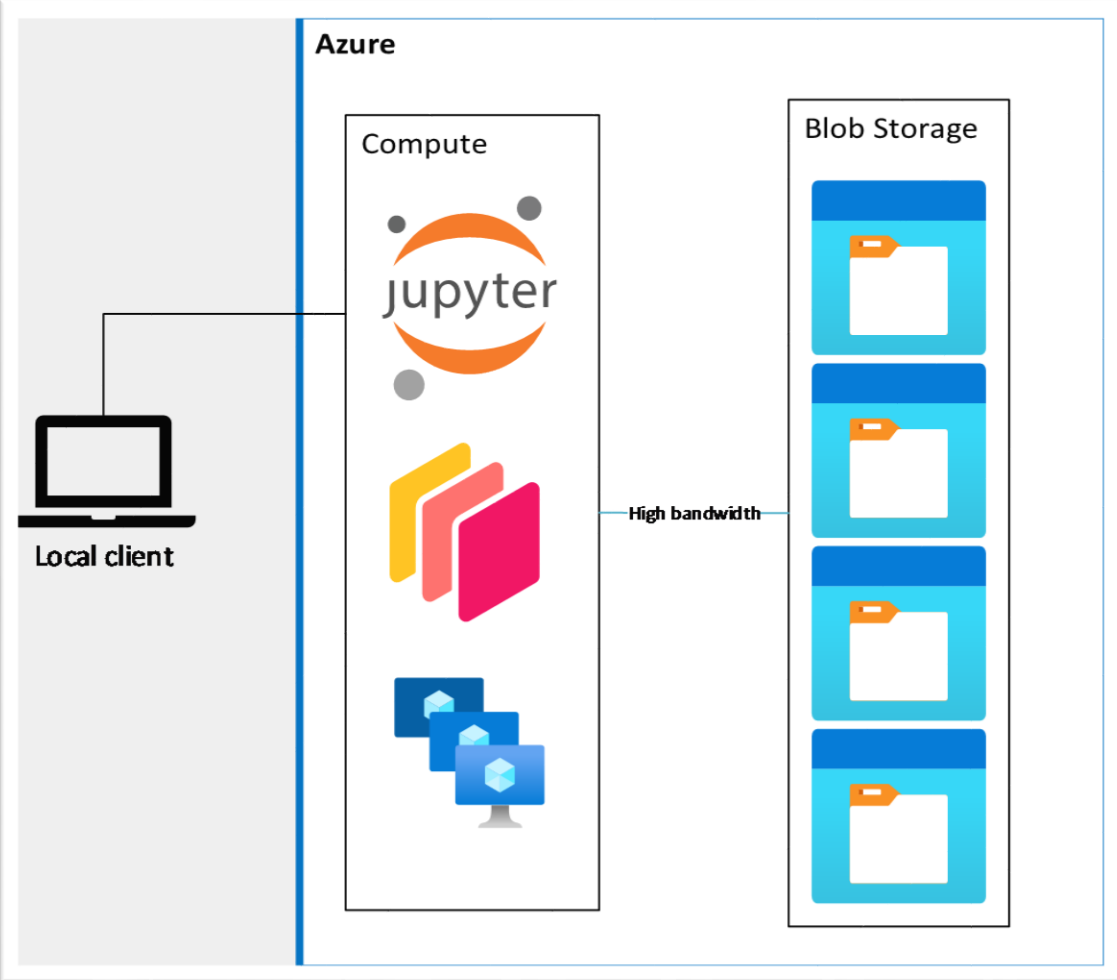
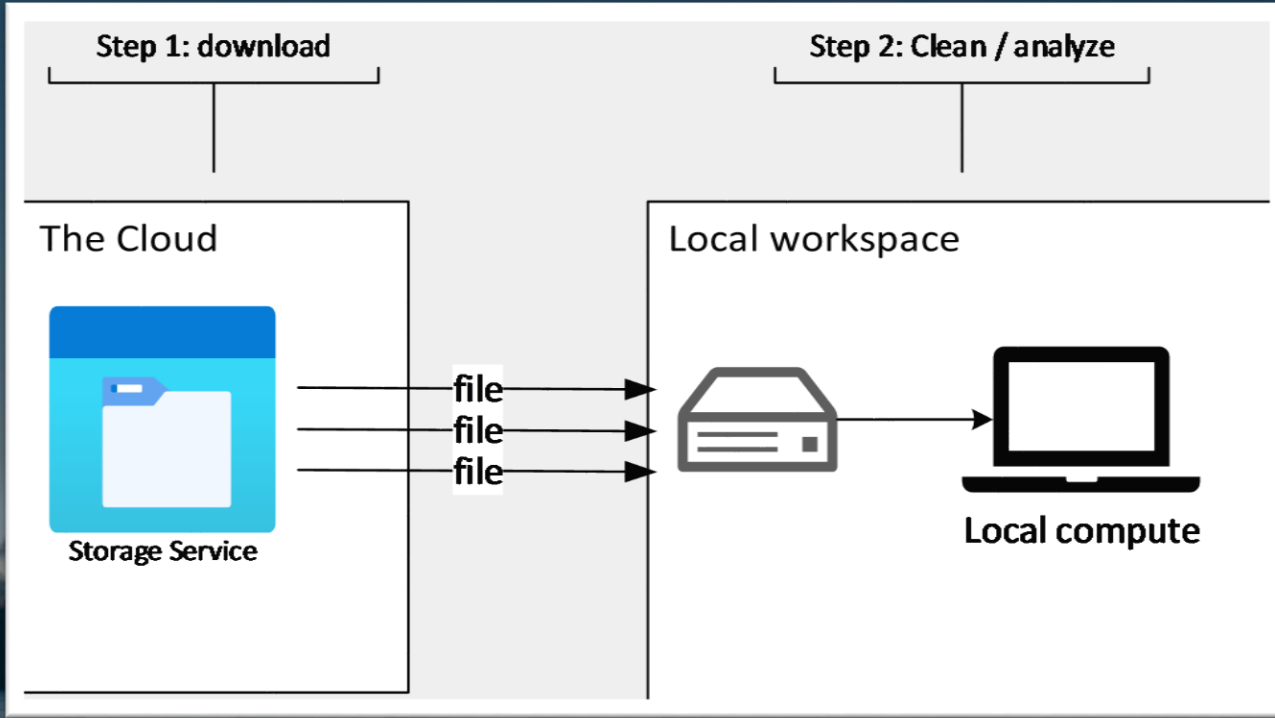
Planetary Computer APIs

Cloud Native



Data Download



planetarycomputer.microsoft.com/docs

Microsoft

Why STAC?

Files on Cloud Storage simply isn't enough!

Example:

Downloading all the Sentinel-2 images over Wyoming in 2022

Now do that for GOES-CMI, which has a completely different naming scheme

```
'https://sentinel2l2a01.blob.core.windows.net/sentinel2-l2/24/C/VV/2022/01/06/S2B_MSIL2A_20220106T110249_N0300_R065_T24CVV_20220107T061757.SAFE',
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```

Microsoft

Why STAC?

Files on Cloud Storage simply isn't enough!

Example:

Find all the Sentinel-2 images over Wyoming in 2022

STAC helps find relevant data much quicker

```
>>> import pystac_client
>>> catalog = pystac_client.Client.open(
...     "https://planetarycomputer.microsoft.com/api/stac/v1/"
... )

>>> items = catalog.search(
...     collections="sentinel-2-l2a",
...     intersects=aoi,
...     datetime="2022",
...     query={"eo:cloud_cover": {"lt": 10}}
... )
```

Microsoft

Why STAC?

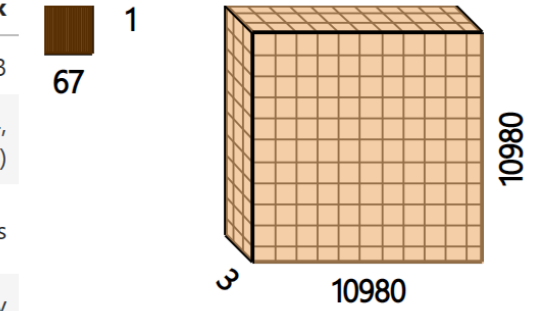
Multi-dimensional metadata

4-dimensional data cube from your scene

```
stackstac.stack(items, assets=["B02", "B03", "B04"])
```

xarray.DataArray 'stackstac-fc76776ea959d6b0c7ef7628e81b8d2c' (**time**: 67, **band**: 3, **y**: 10980, **x**: 10980)

	Array	Chunk
Bytes	180.55 GiB	8.00 MiB
Shape	(67, 3, 10980, 10980)	(1, 1, 1024, 1024)
Dask graph	24321 chunks in 3 graph layers	
Data type	float64 numpy.ndarray	



► Coordinates: (46)

► Indexes: (4)

▼ Attributes:

spec :	RasterSpec(epsg=32613, bounds=(499980.0, 4490220.0, 609780.0, 4600020.0), resolutions_xy=(10.0, 10.0))
crs :	epsg:32613
transform :	| 10.00, 0.00, 499980.00| | 0.00,-10.00, 4600020.00| | 0.00, 0.00, 1.00|
resolution :	10.0

Microsoft

Planetary Computer Hub

Tenant-deployable Open-Source Software scalable analytics environment

Compute environment close to data

Access through:

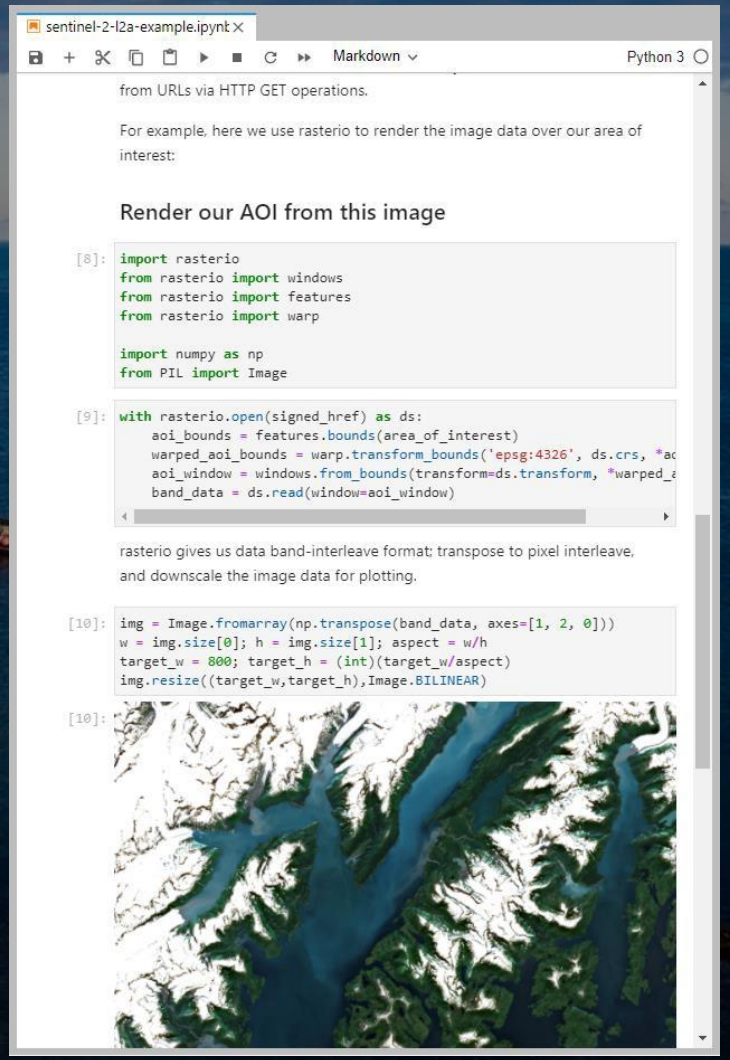
- Jupyter Notebooks
- VS Code
- GitHub Codespaces

Pre-configured with the latest in open source geospatial

&

integrated with our APIs

Distributed processing without the complexity of infrastructure deployment



planetarycomputer.microsoft.com/compute

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Planetary Computer Applications & Integrations

Land cover mapping

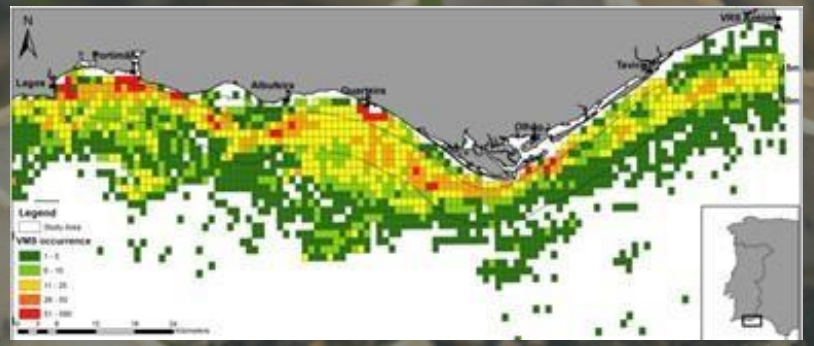
Planetary Computer enabled workflow for generating global high resolution land cover maps through Impact Observatory and Esri

Conservation spatial planning

Using global biodiversity data and remote sensing data for conservation policy, in partnership with The Nature Conservancy

Prioritizing carbon offset projects

Leveraging climate and fire risk models to inform decisions about forest protection projects, in partnership with CarbonPlan



planetarycomputer.microsoft.com/applications

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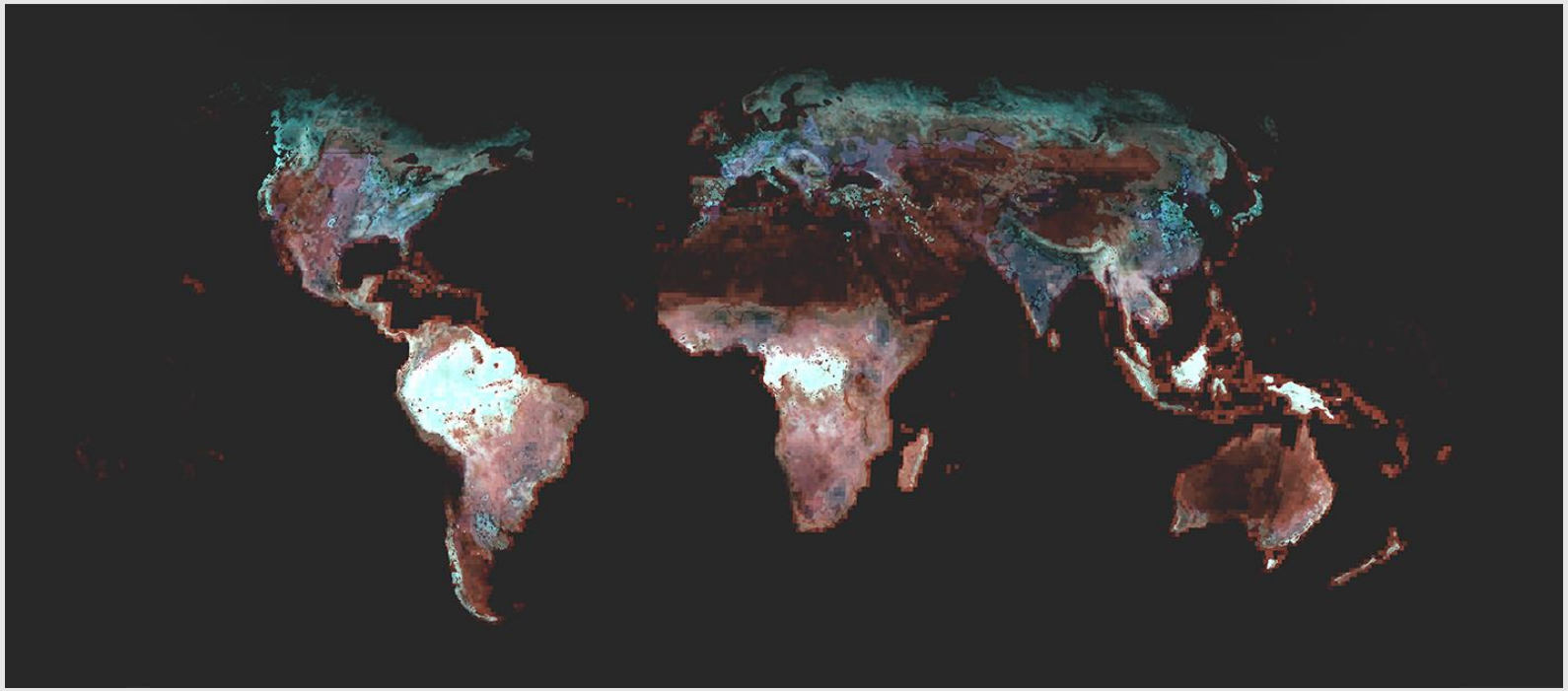
PROBLEM | Governments and enterprises face *broad, complex, and accelerating* biosecurity risks

Risk distribution *(global and overlapping)*



Risk categories

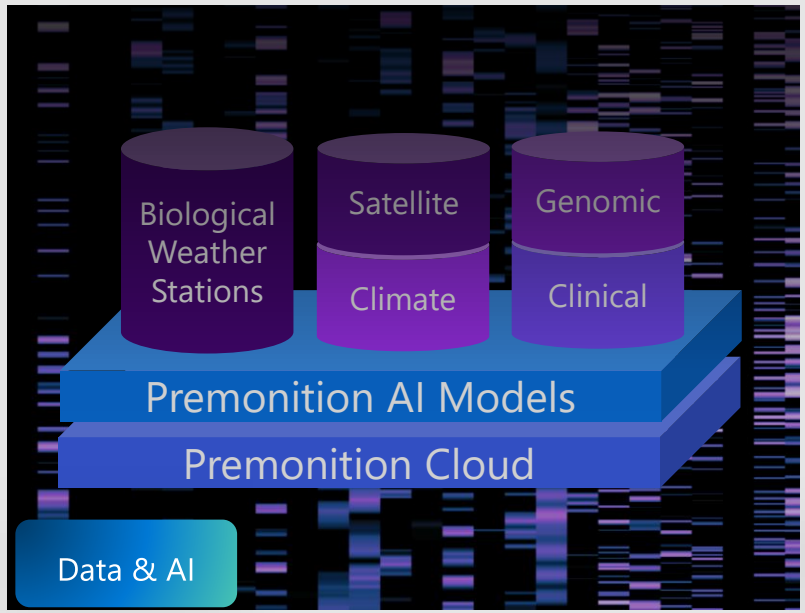
- Human pathogen risks
- Climate risks
- Food security risks
- Bioengineered agents *(Geographical risk not shown)*

Human pathogen risks	Climate risks	Food security risks
15 million deaths from covid-19 alone; 60-75% emerging diseases are zoonotic	>300 billion tons carbon sequestered at risk; >$200 billion/yr from crop pollination at risk	10-25% increase grain loss from pests; >100 million pigs killed/culled in 2019 outbreak

SOLUTION | Premonition is an end-to-end unified biosecurity platform spanning biosensing to cloud-scale AI and insights

Intelligent edge layer

Data fusion and AI layer



Actionable insights layer

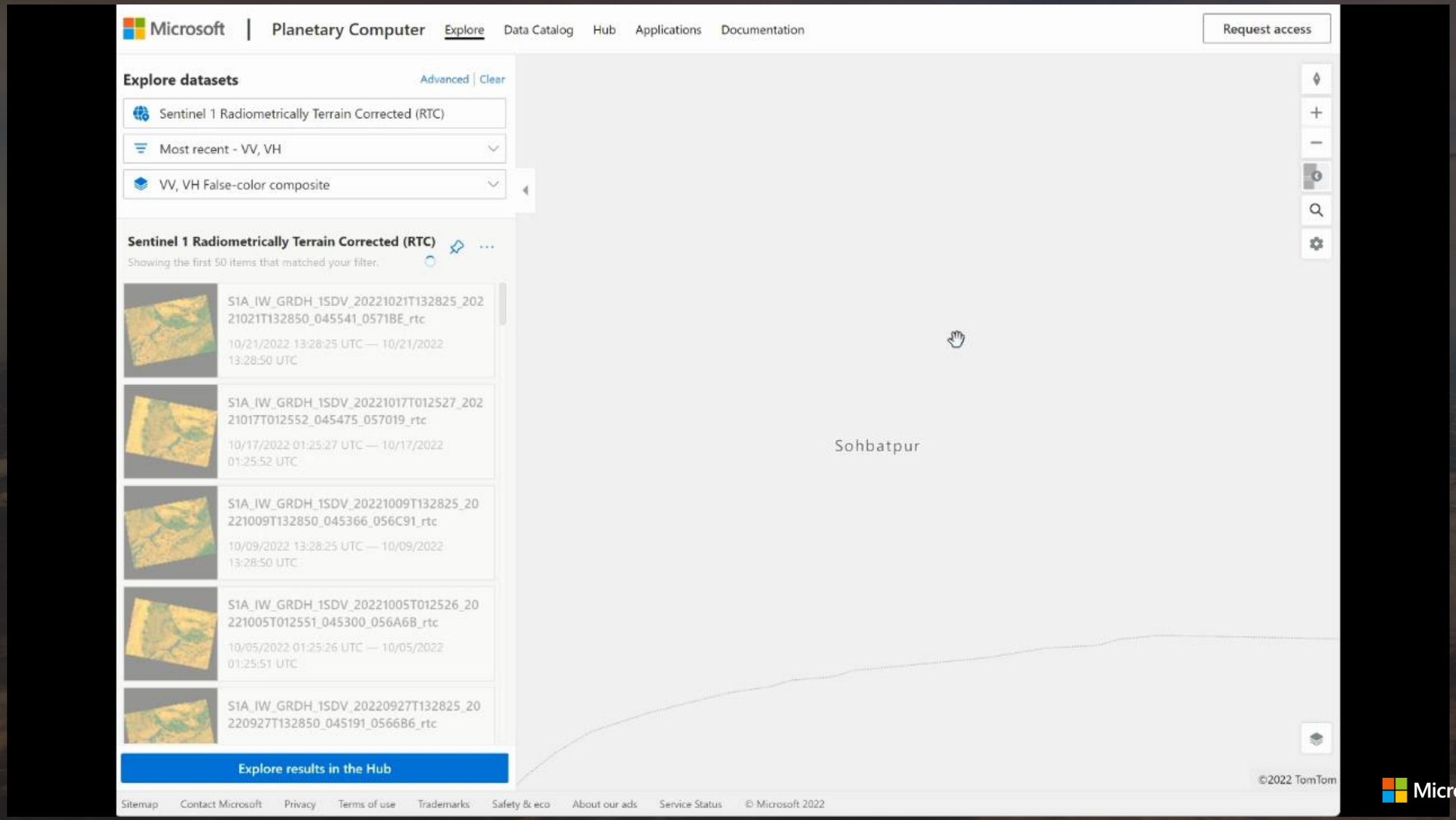
DIFFERENTIATORS

Biological Weather Stations reduce
bio-surveillance costs 95%

Premonition Cloud + AI offers
broadest detection of biothreats

Vetted App Ecosystem provides
dashboards and command-and-control

Planetary Computer Explorer



https://ai4edatasetspublicassets.azureedge.net/assets/pc_video/docs-explorer-animation.mp4

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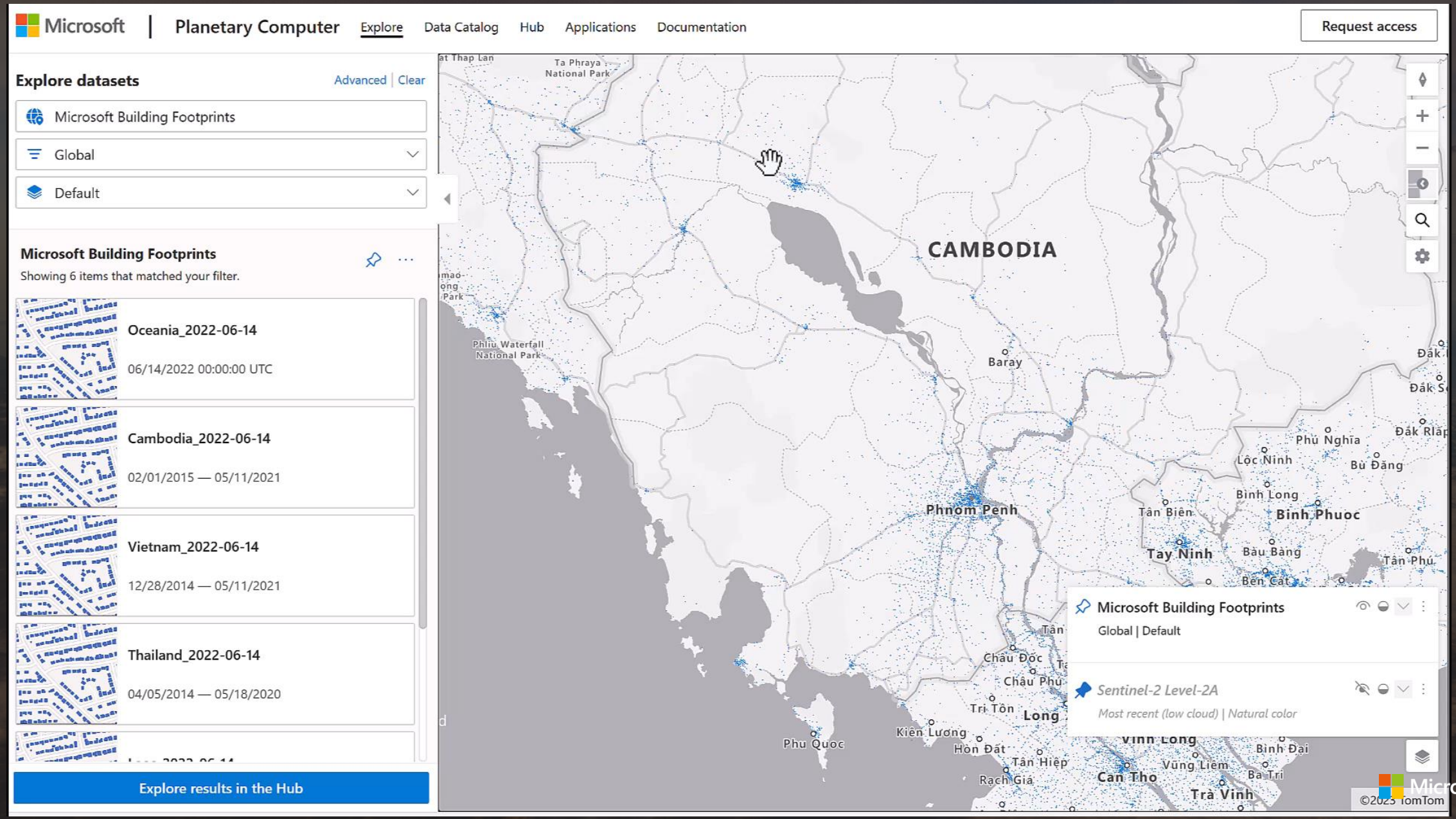
Planetary Computer Explorer



https://ai4edatasetspublicassets.azureedge.net/assets/pc_video/vector-tile-ms-buildings-feature.mp4

Data to Decisions

a simplified view

Data Capture

Storage & Access

Analytics

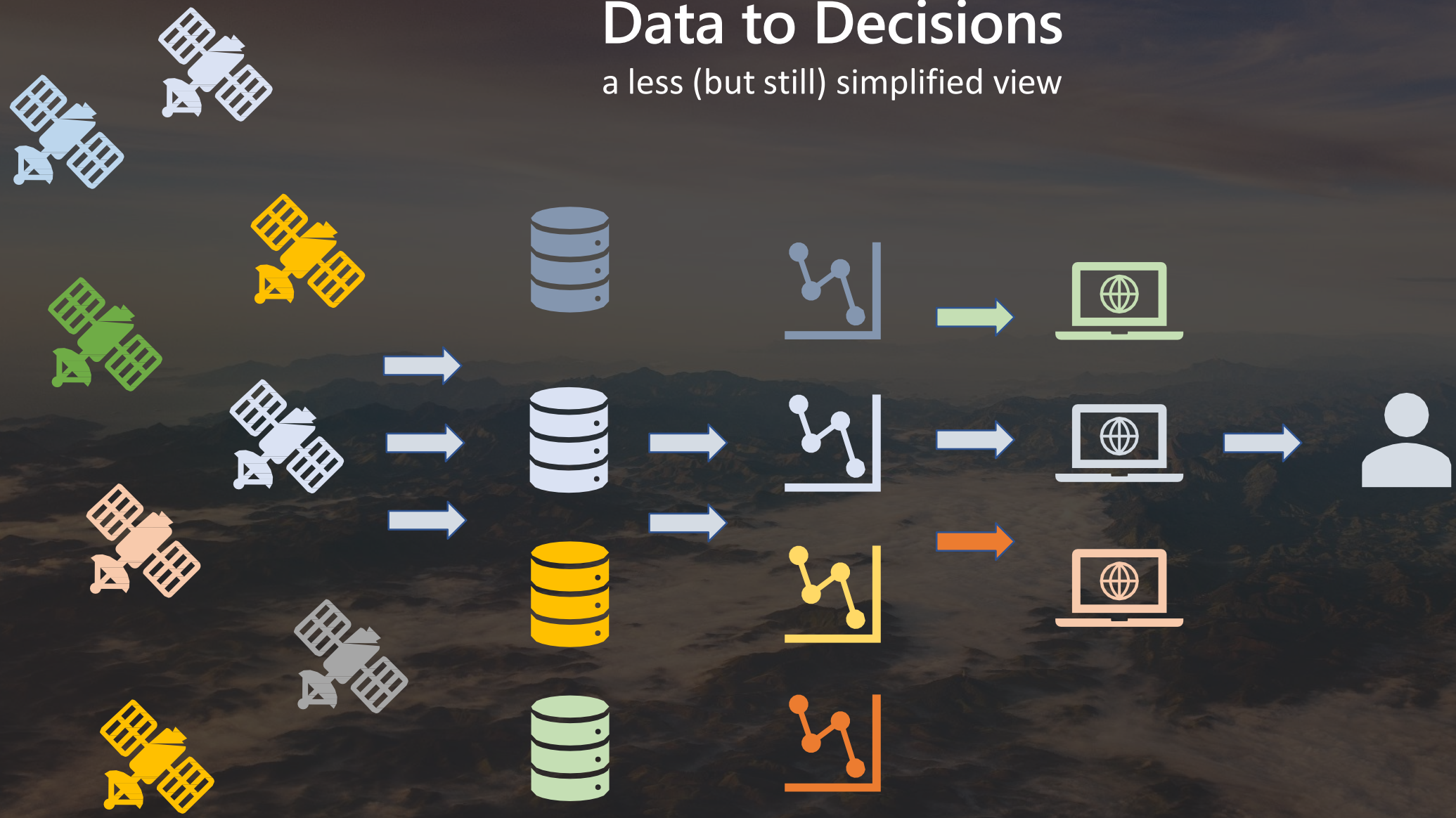
Applications

Decisions

Microsoft

Data to Decisions

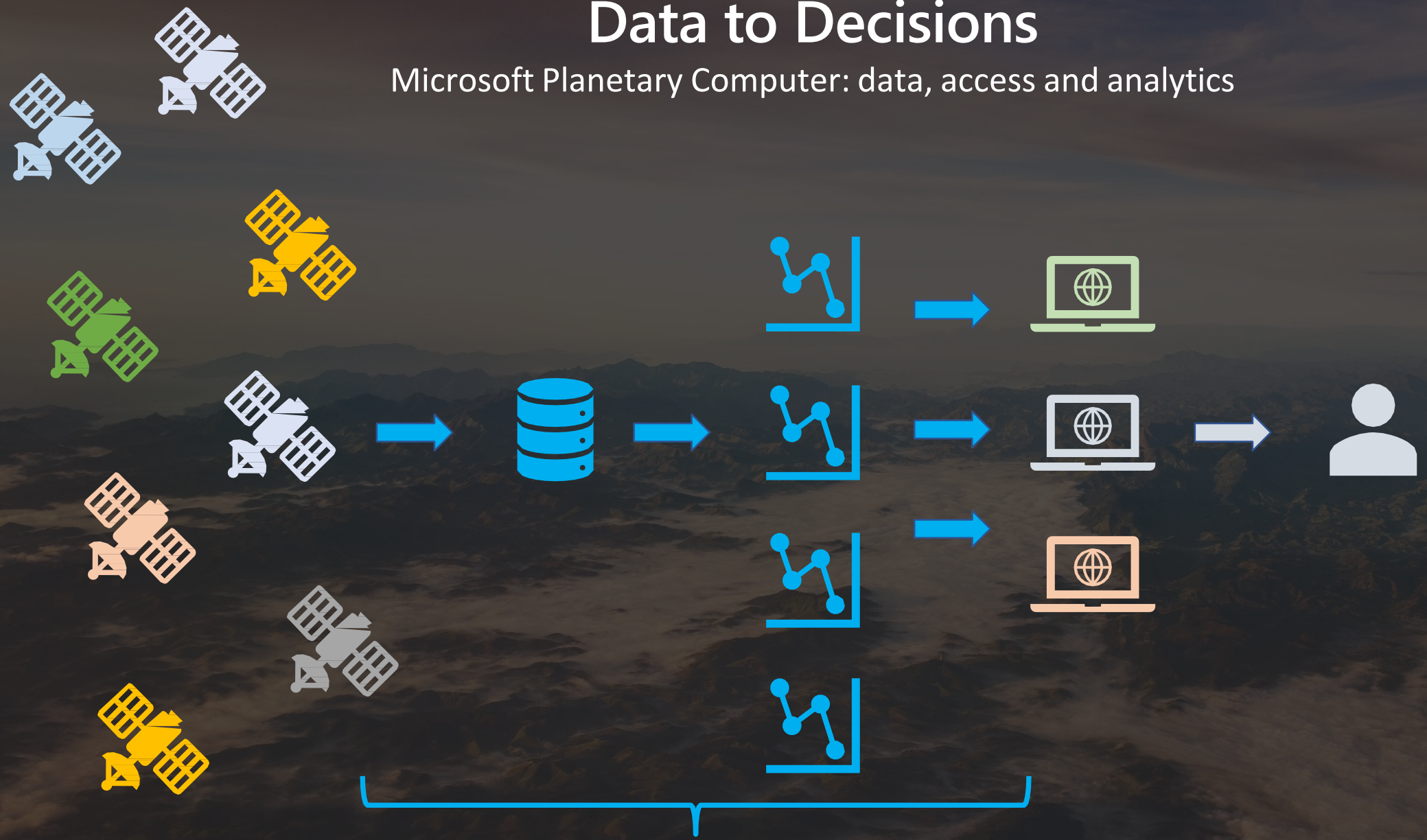
a less (but still) simplified view



Microsoft

Data to Decisions

Microsoft Planetary Computer: data, access and analytics



Microsoft Planetary Computer

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Microsoft
Workshop
https://aka.ms/pc-ams
Reference: https://github.com/TomAugspurger/pc-ams

Microsoft

Thanks!

https://planetarycomputer.microsoft.com

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