# OnEarth: An Open Source Solution for Efficiently Serving High-Resolution Mapped Image Products

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# Outline

- Software description
- Current uses and applications
- The process to open source status

# OnEarth: the basic equation

**Specialized tiled image format**

**+**

**Support for popular image request protocols**

**=**

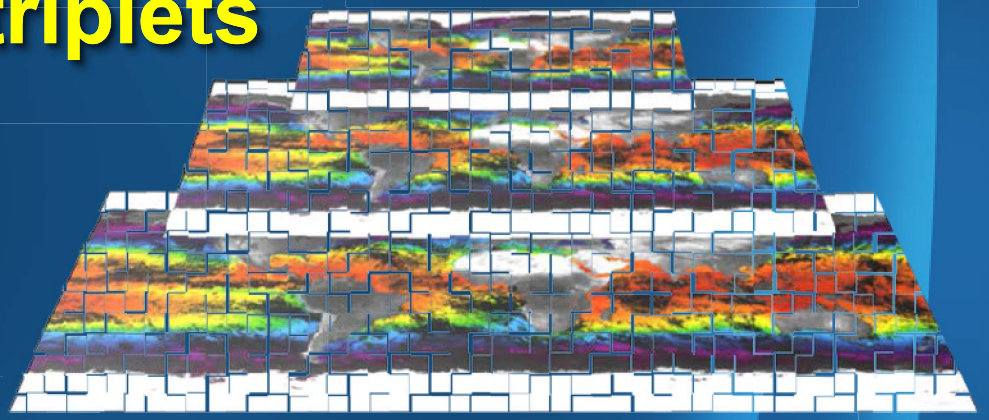
**Very responsive & efficient set of web mapping services unaffected by increased image size and/or spatial resolution**

# OnEarth elements

- **“Specialized tiled image format”**
  - Meta Raster Format (MRF)
- **“Support for popular image request protocols”**
  - Efficient set of Apache modules connecting WMTS, TWMS, and KML requests to MRF access

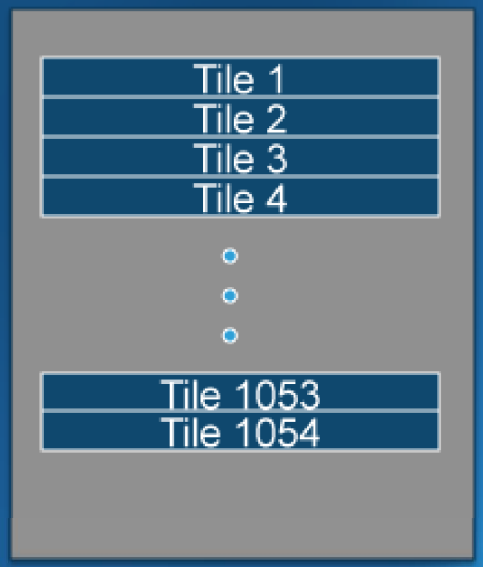
# MRF: Meta Raster Format

- Collection of interconnected indexed image tiles at multiple spatial resolutions
- Composed of file triplets
  - Data file
  - Index file
  - Metadata file
- Extension to GDAL



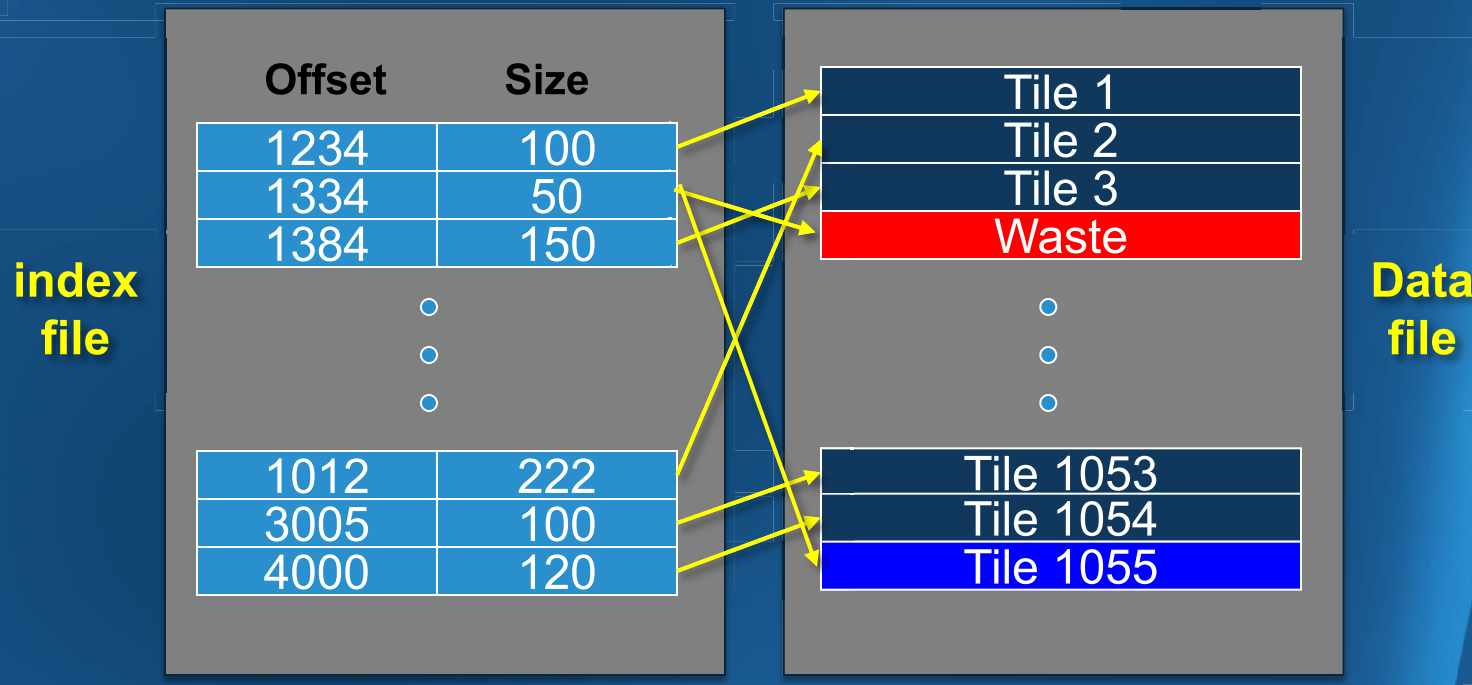
# MRF data file (.ppg/.pjp)

- Concatenated individual PNG or JPG images tiles
- RGB and indexed support
- Modifications to file are only via appends
- Suffix types
- ppg: “piles of PNGs”
- pjp: “piles of JPGs”



# MRF index file (.idx)

- Pointers to individual tiles in data file
- Updated as tiles are modified

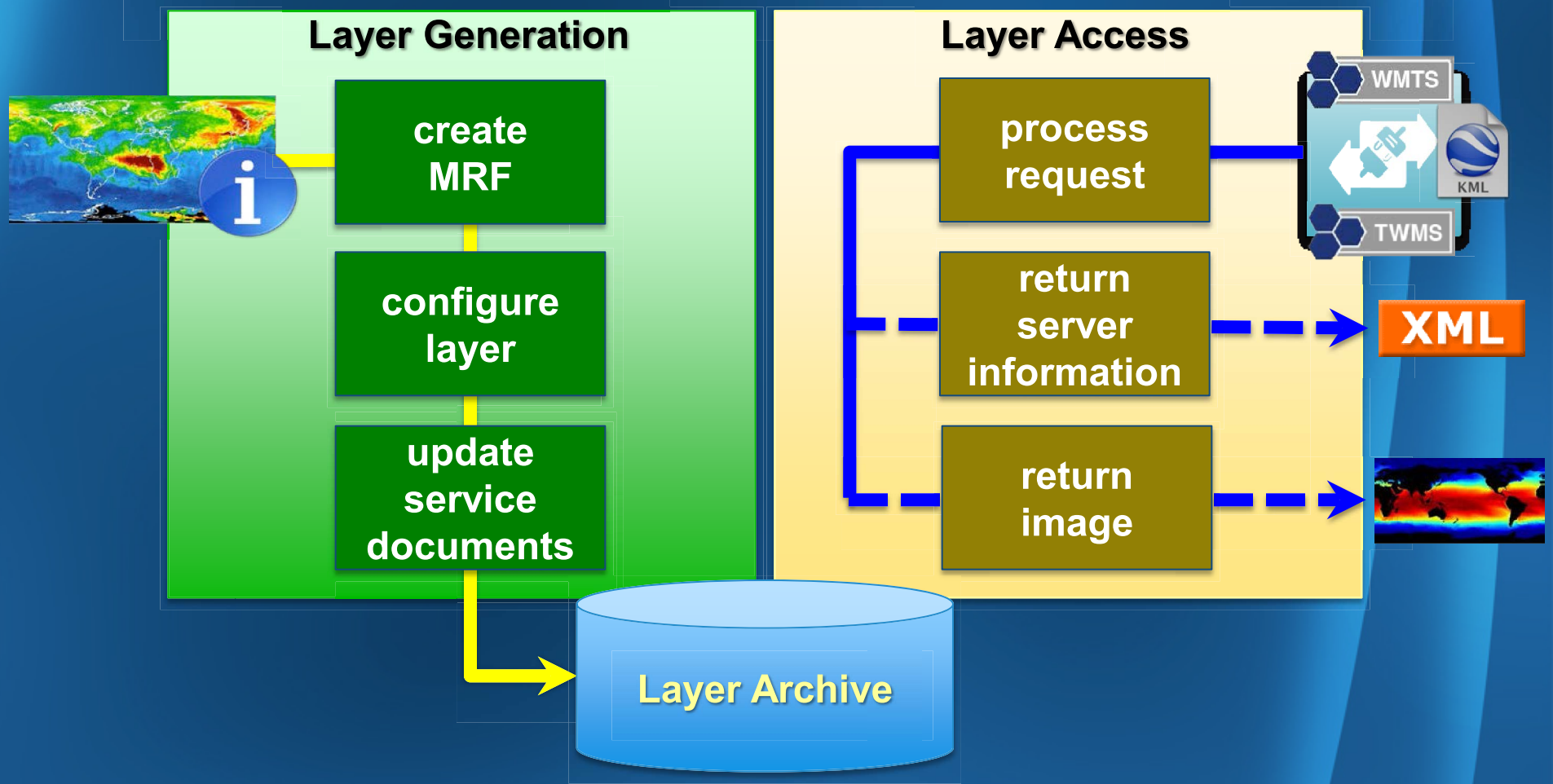


# MRF metadata file (.mrf)

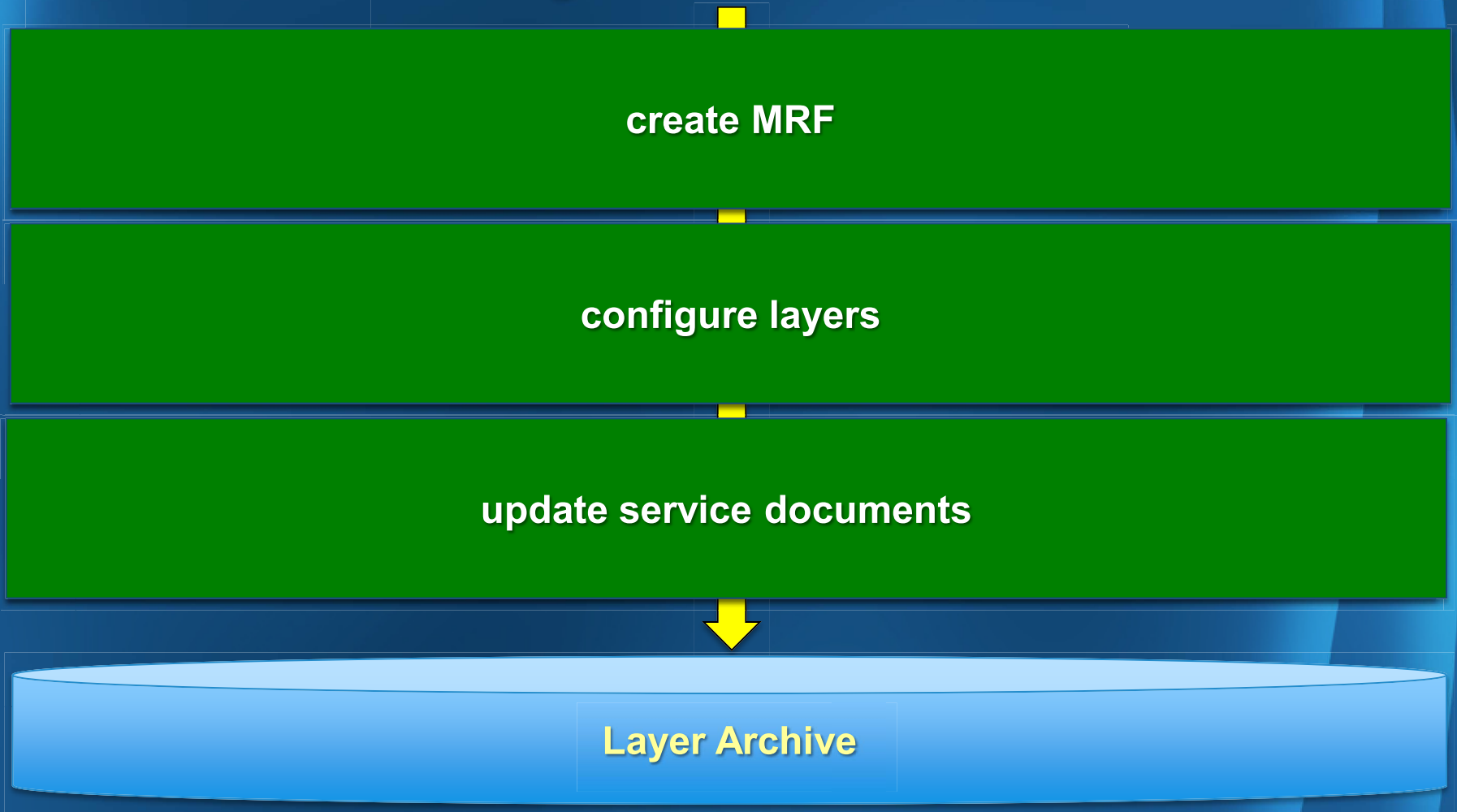
- Descriptive information about imagery
- For use with GDAL routines

```
<MRF_META>
  <Raster>
    <Size x="81920" y="40960" c="1" />
    <Compression>PPNG</Compression>
    <DataValues NoData="0" />
<Quality>85</Quality>
    <PageSize x="512" y="512" c="1" />
  </Raster>
  <Rsets model="uniform" />
  <GeoTags>
    <BoundingBox minx="-180" miny="-90" maxx="180" maxy="90" />
  </GeoTags>
</MRF_META>
```

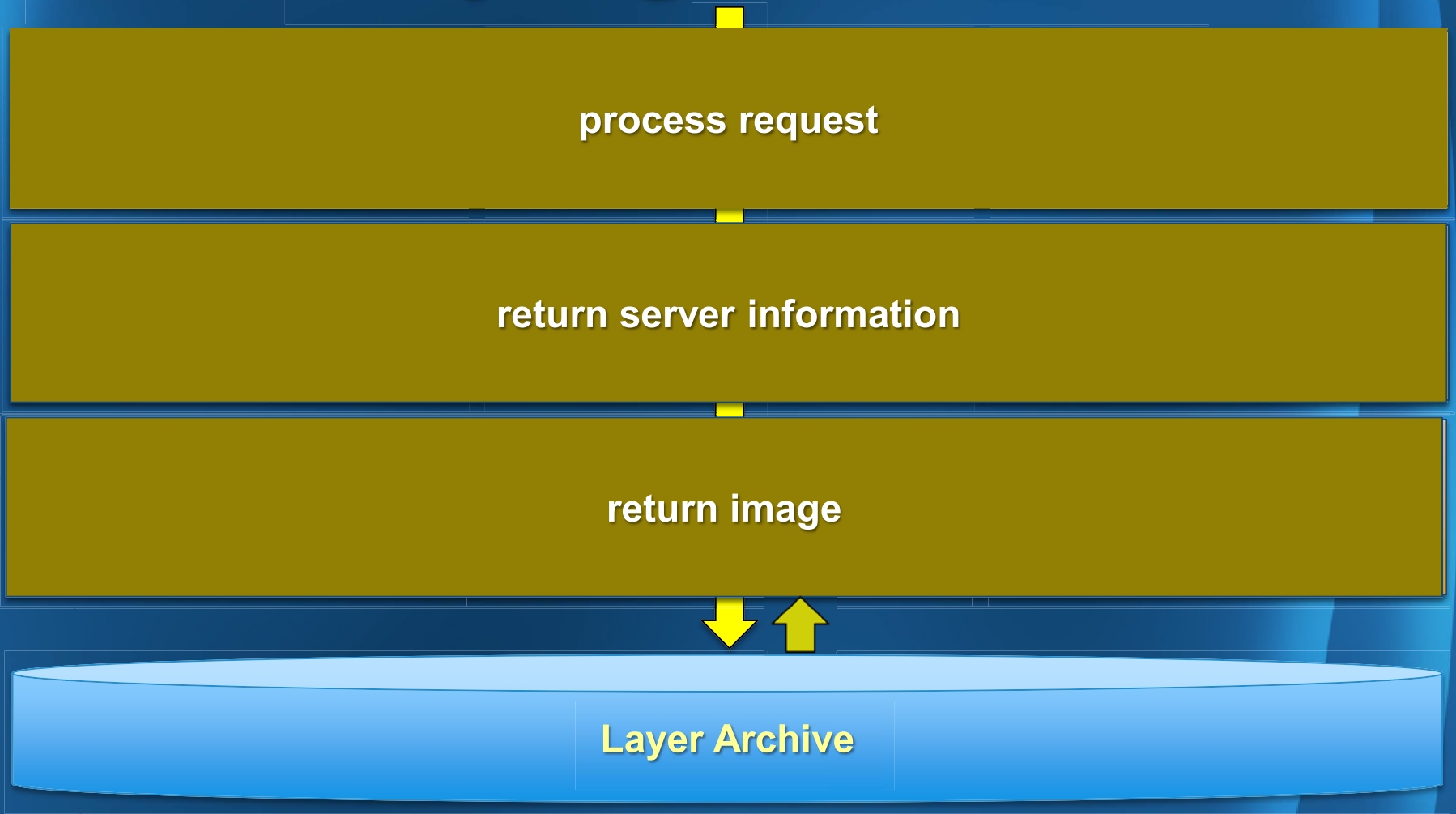
# OnEarth: primary architectural components



# Layer access



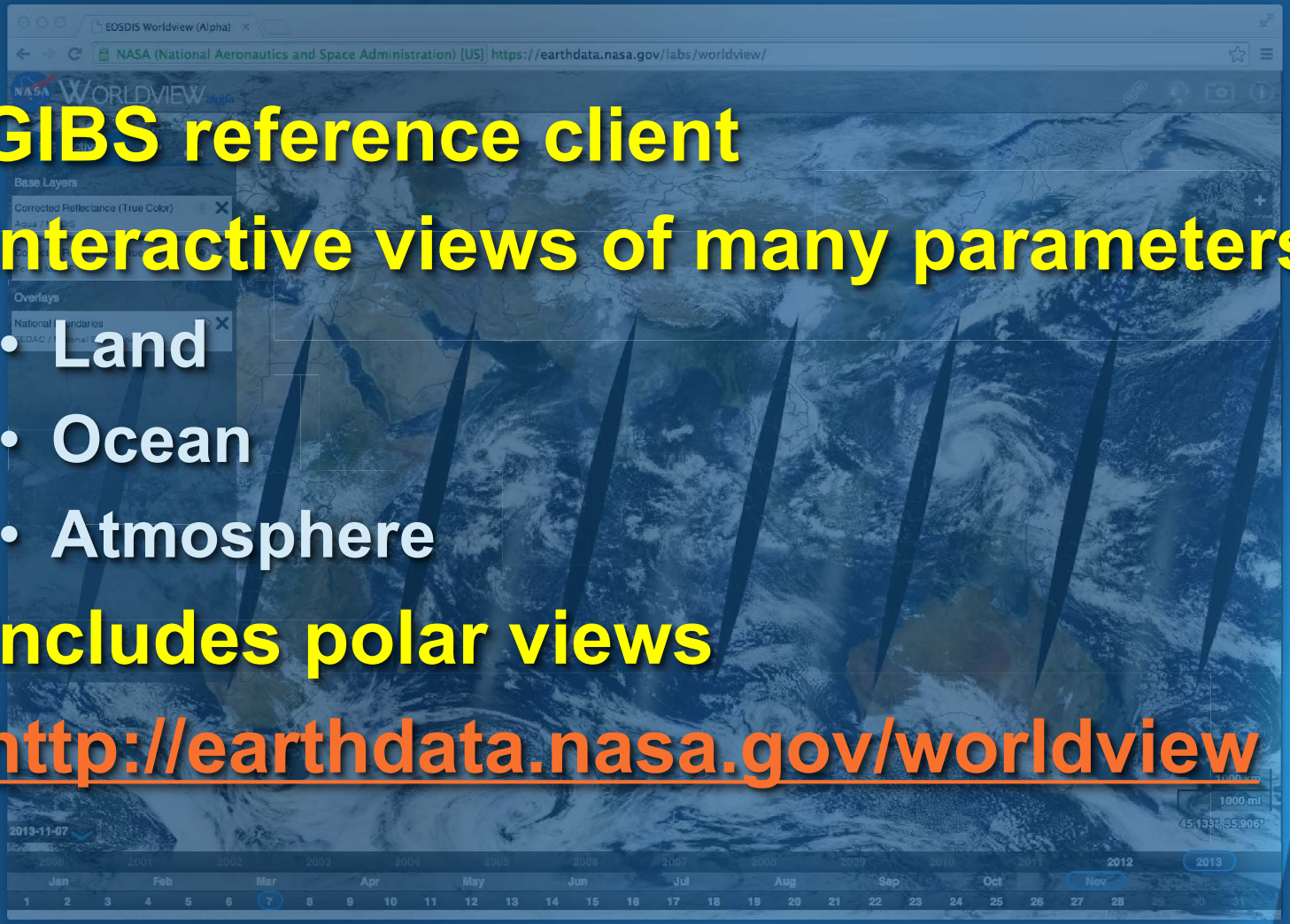
# Layer generation



# Ongoing development: GIBS

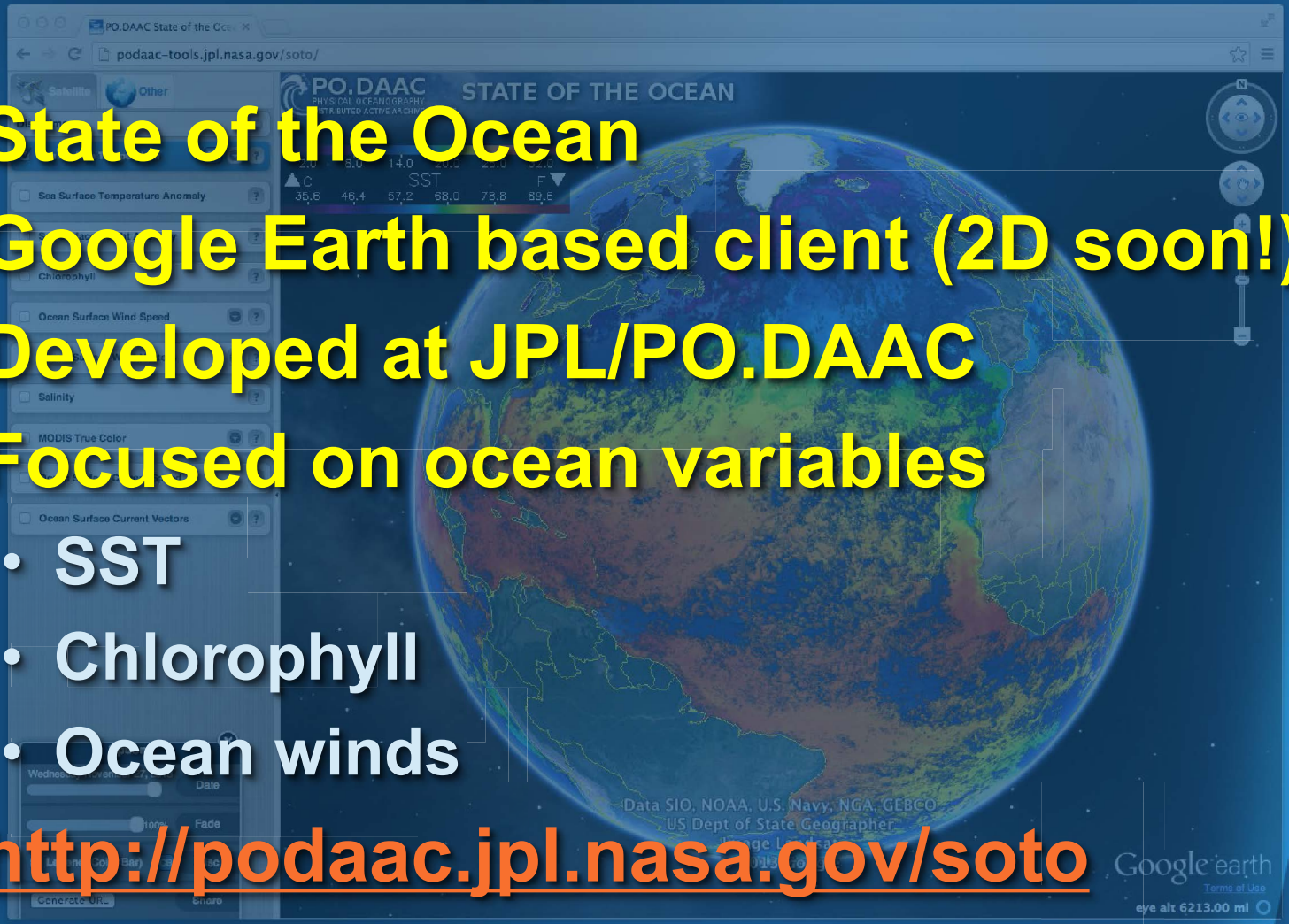
- Global Imagery Browse Services
- Value-added image archive & access web services for NASA Earth science data
- Software components
  - Processing and serving: OnEarth
  - Management/workflow: The Image Exchange (TIE)
- http://earthdata.nasa.gov
  - Search for “gibs”

# OnEarth applications: Worldview




- GIBS reference client
- Interactive views of many parameters
  - Land
  - Ocean
  - Atmosphere
- Includes polar views
- http://earthdata.nasa.gov/worldview

# OnEarth applications: SOTO




- State of the Ocean
- Google Earth based client (2D soon!)
- Developed at JPL/PO.DAAC
- Focused on ocean variables
  - SST
  - Chlorophyll
  - Ocean winds
- http://podaac.jpl.nasa.gov/soto

# Clarification

- **In this presentation..**
  - OnEarth refers to open source software, NOT onearth.jpl.nasa.gov
  - An earlier version of the OnEarth software (aka Tiled WMS) powers the OnEarth website
  - The OnEarth website is to eventually be replaced by GIBS

# So…
# why the push for open source?

- **Share JPL-authored code with GIBS collaborators**
  - GIBS physical location at Goddard
  - Not a requirement between NASA centers
- **Increasing support at JPL**
  - Evolving process for open source designation
- **Change in personnel**
  - OnEarth creator left JPL in 2012
  - Still active with development

# Step 1: Navigating the evolving institutional process

- File a New Technology Report (NTR)
- Gather a stack of management signatures
- Submit paperwork to cognizant individual
- Receive approval e-mail

# Primary Issues Encountered: Lag Time and Tracking

- NTR process not instantaneous
- Signature acquisition on single paper form passed from manager to manager
- Form submission problematic
- Total approval time required months
- Word on the street: process has since been streamlined
  - 2 week turnaround
  - Online submission in the works

# Step 2: Pushing to code to the outside world

- Select appropriate software license
- Select hosting service
- Upload source to repository

# A whole set of considerations to mull over!

- **Licensing**
  - Code contributions as employee of private company versus own time?
- **Current installations**
  - Are there individuals who have the source and want to contribute?
- **GDAL extensions**
  - How should MRF reader/writer be licensed given GDAL is open source?
- **Institutional restrictions**
  - Are there certain open source models that NASA imposes?
- **Downstream development**
  - Allow proprietary extensions?
- **Integration approach**
  - “Review then commit" or "commit then review”?
- **Future change of course**
  - Possible to update open source components (licensing, repository)?

# So, where are we?

- Hosting service: Github
- Licensing: Apache
- Repository: nasa-gibs
- Initial fork: nasa-jpl
  - nod to origins
- Hope to work out remaining important details by end of year

# A wish for the future…

- **An interface that holds your hand**

# Related oral and poster presentations

- **Monday**
  - IN14A-04. Expanding Access and Usage of NASA Near Real-Time Imagery and Data
- **Wednesday**
  - IN31C-1512. See It First: Interactively and Visually Discovering Interesting Satellite Data with NASA Worldview
- **Thursday**
  - IN41C-1623. NASA Polar Imagery: Have It Your Way or Have It Our Way
  - IN43C-05. The Imagery Exchange (TIE): Open Source Imagery Management System
- **Friday**
  - IN51A-1535. Rapid Global Imagery Management and Generation In Action

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  - George Chang
  - Ryan A. Boller
  - Shriram Ilavajhala
  - Kevin J. Murphy
  - Andrew W. Bingham
- Chris Mattmann
- Brian Morrison

# Thank You!

https://github.com/nasa-gibs/onearth