



The ADAPTIVE Project

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ADAPTIVE Overview

Atmospheric Data And mission Planning Tool in an Interactive Visualization Environment

Purpose: Create a user-friendly, interactive application driven by a data flow, node-based software architecture to tackle the organization, utilization, and visualization of the science payloads' data

1. *Support requirements development/verification, ConOps planning, Calibration/Validation planning*
2. *Produce public-ready images and movies of various aspects of the GDC mission and science data sets,*
3. *Provide a quick-look at the data over the entire constellation at any given time or location,*
4. *Extract subsets of the mission observational data and other supplemental data source for further analysis and study*
5. *Hosted on Aerospace github account during Phase A-D with long-time hosting at NASA Open-Source Software (OSS) (NASA github)*

Highlighted ADAPTIVE Features for GDC Mission

Expandability: Following created documentation, any member of the GDC team may create a specific node associated with their data.

Flexibility of data type ingestion and output: while an initial set of common input and output file format nodes will be identified and created, future format nodes can be added as needed.

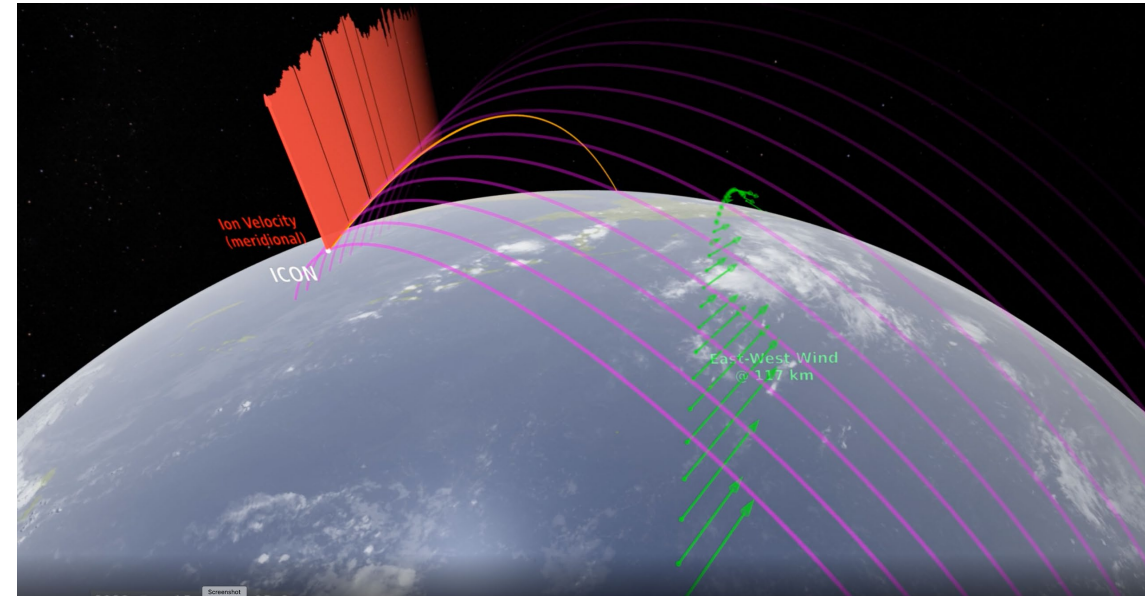
Portability: ADAPTIVE will be converted to a container form so that it can be used on a variety of platforms from a hosted server to a users' local machine.

Accessibility: Tool will be designed for use by the science community as well as the public. It will consist of a standard GUI interface with buttons and fields, a touch screen interface option (currently developed), and a node connection programming environment.

Project Overview

Mission vs. Project Tasks – Proposed

- Mission Tasks:
 - *Mission Requirements Refinement*
 - SWT development of science traceability matrix
 - *Ensure requirements are traceable, achievable, and verifiable*
 - *Mission Configuration Assessment and ConOps Planning via ADAPTIVE:*
 - 2D/3D animations using predicted ephemeris can refine assessment of mission phase evolution and sensor FOV.
 - Support campaign mode planning
 - *Sensor and Constellation Calibration, Validation, & Verification (CVV) Planning*
 - Individual satellite sensor calibration/validation and cross observatory calibration/validation planning
 - Enable ground-based sensor overflights
- Project Tasks – ADAPTIVE:
 - *Develop the ADAPTIVE Visualization Tool that will provide*
 - Animated visualizations for public use
 - Efficient and effective use of GDC data by GDC science teams and community
 - Data feature identification and extraction
 - *Science studies utilizing global GNSS tomographic data*

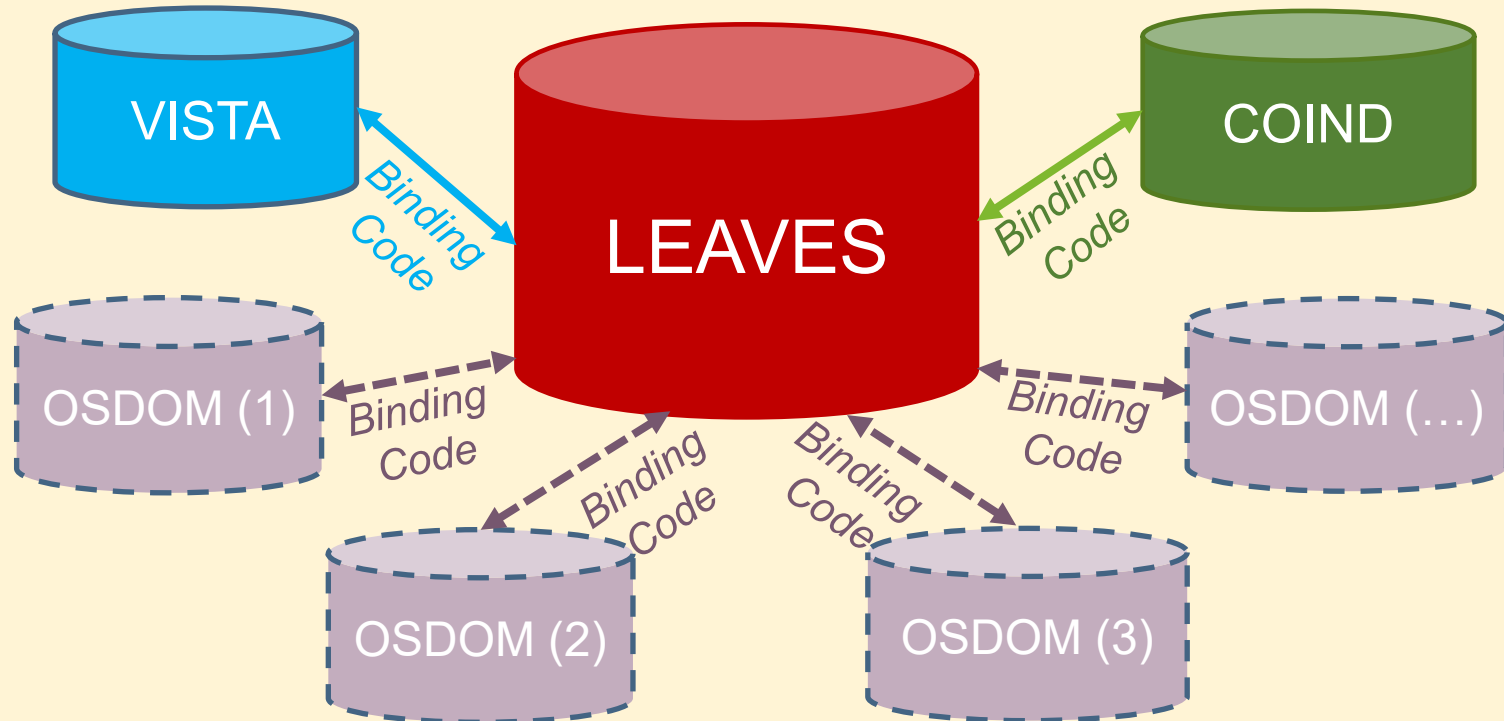


Icon visualization movie – goal for ADAPTIVE.

See <https://svs.gsfc.nasa.gov/4917>



ADAPTIVE Application

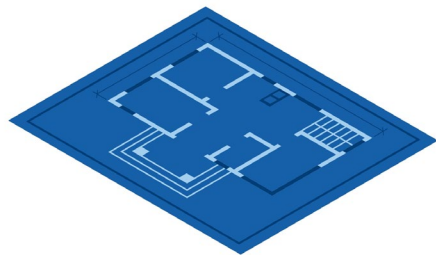


- Laboratory to Explore, Analyze, Visualize, Experiment and Simulate (LEAVES)
 - Foundational library for ADAPTIVE
- COnstellation INcoming Data overlay mapping (COIND)
 - Focusses on GDC payload data
- Visualization of Ionospheric Structures using Tomographic Analysis (VISTA)
 - Produce 3-D tomographic ionosphere images from ground and space GNSS data
- Other Science Data Overlay Mapping (OSDOM)
 - Expandable node groupings (e.g. ISR, FPI, citizen science projects, etc.)

Written in C++ with Python bindings

ADAPTIVE Progress

- Application Development Planning and Infrastructure Complete
 - *Blueprints*
- Unit Testing Software Complete
 - “*Building Inspector*”
- LEAVES in progress
 - “*Foundation*”
- First Node Completed
 - “*Brick*”



Proposal

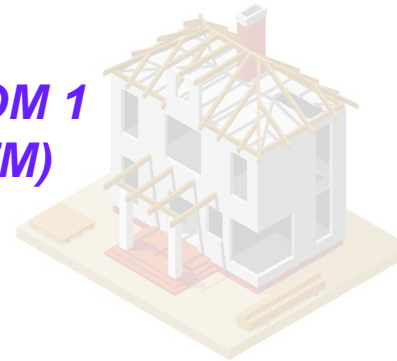


Unit Testing Interface

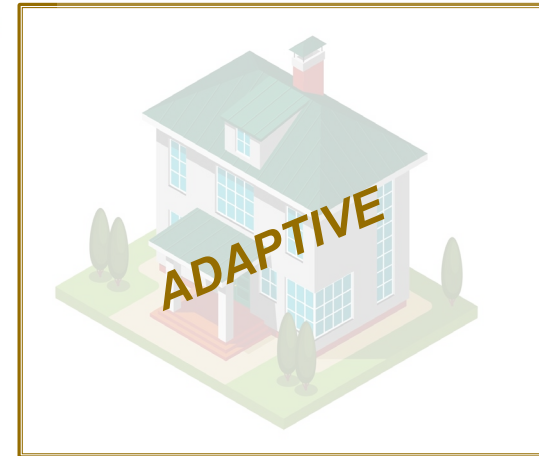
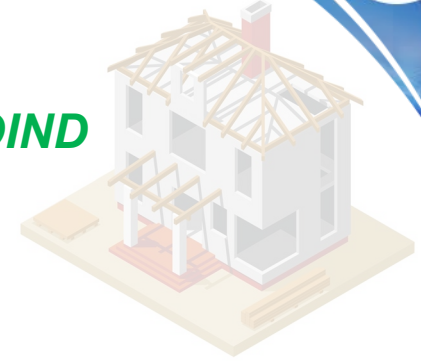
OSDOM 2



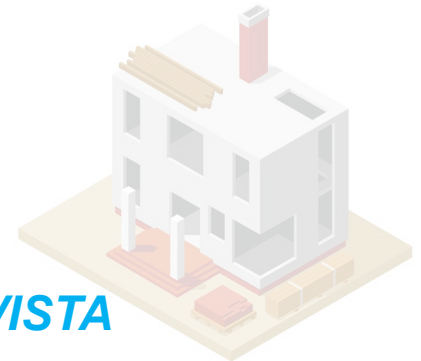
**OSDOM 1
(GITM)**



COIND



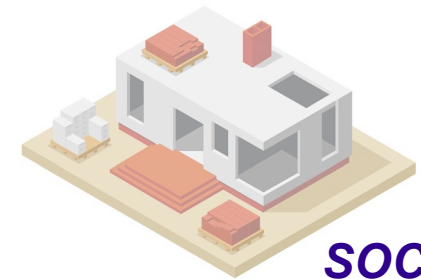
VISTA



LEAVES



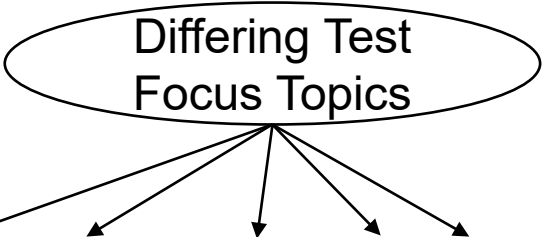
**SOC
Implementation**



Images by macrovector on Freepik

Unit Test Summary

Parameters



Debug

Error

View

20 Oct 13, 2022 @ 11:01:21. leaves::core::kernel::LcObject

Checking Debug log for VisServiceManager

20 Oct 13, 2022 @ 11:01:21. TestTouchTool

TestTouchTool::event::default: name: TouchTool1 type: 75

TestTouchTool::event::default: name: TouchTool1 type: 170

TestTouchTool::event::default: name: TouchTool1 type: 39

TestTouchTool::event::default: name: TouchTool1 type: 69

20 Oct 13, 2022 @ 11:01:21. TestTouchTool

TestTouchTool::event::default: name: TouchTool1 type: 65535

TestTouchTool::event::default: name: TouchTool1 type: 74

TestTouchTool::event::default: name: TouchTool1 type: 76

TestTouchTool::event::default: name: TouchTool1 type: 65535

80 Oct 13, 2022 @ 11:01:24. LuUiTests

Testing Console Tool logger error

60 Oct 13, 2022 @ 11:01:24. LuUiTests

Testing Console Tool logger warning

40 Oct 13, 2022 @ 11:01:24. LuUiTests

Testing Console Tool logger info

20 Oct 13, 2022 @ 11:01:24. LuUiTests

Testing Console Tool logger debug

20 Oct 13, 2022 @ 11:01:28. TestTouchTool

TestTouchTool::event::default: name: TouchTool1 type: 126

TestTouchTool::event::default: name: TouchTool1 type: 13

TestTouchTool::event::default: name: TouchTool1 type: 14

Parameters

Gestures

Task Manager

Misc

Qt3d

Parameter Editor

MyLength1

5.000

m

My First Group

My First Sub Group

MySubGroupLength1

5.000

m

MySubGroupLength2

6.200

m

MySubGroupLength3

4357.000

m

My Second Group

My Third Group

My Fourth Group

My Fifth Group

Automatic layout of Parameter controls

Parameter – Data variables associated with nodes and components (i.e., display objects)

Warning

Information