CERES Data Management Team Working Group Report

Katie Dejwakh

CERES Science Team Meeting

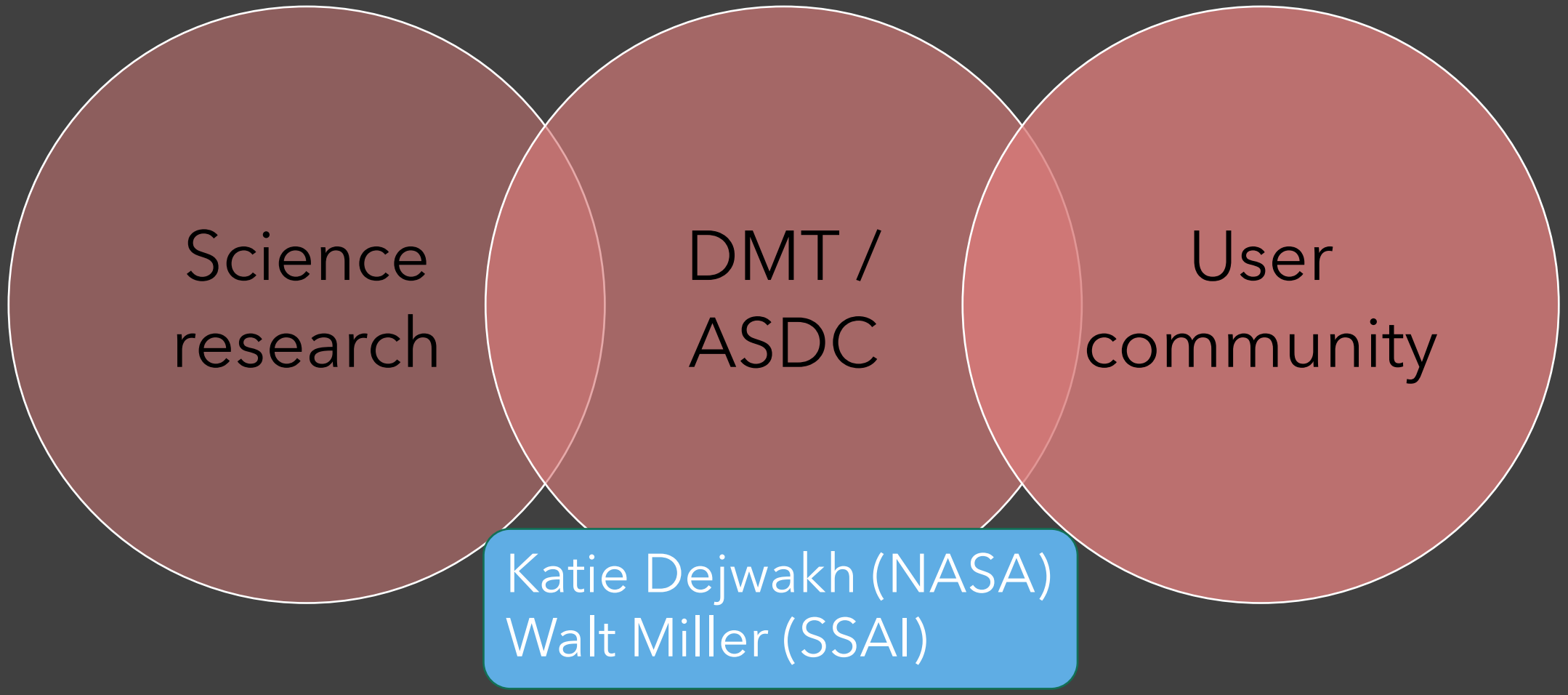
May 11, 2021

Outline

- DMT Overview
- Product Availability
- DMT Activities
- Code Re-architecture
- Systems & CM

DMT Overview

Data Management Team (DMT)



Data Management Team (DMT)

Instrument

ERBE-like

Clouds

Denise Cooper
Thomas Grepiotis
Hunter Winecoff

Inversion

SARB

TISA

Systems & CM

Data Management Team (DMT)

Instrument

ERBE-like

Clouds

Dale Walikainen
Jeremie Lande

Inversion

SARB

TISA

Systems
& CM

Data Management Team (DMT)

Instrument

ERBE-like

Clouds

Inversion

SARB

Systems & CM

Sunny Sun-Mack
Ricky Brown
Steve Kohler
Yan Chen
Liz Heckert
Rita Smith

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Inversion

SARB

TISA

Systems & CM

Victor Sothcott
Igor Antropov

Data Management Team (DMT)

Instrument

ERBE-like

Clouds

Inversion

SARB

TISA

Tom Caldwell

Systems & CM

Data Management Team (DMT)

Instrument

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Clouds

Inversion

SARB

TISA

Systems & CM

Josh Wilkins
Cathy Nguyen
Ed Kizer
Beau Branch

Data Management Team (DMT)

Instrument	ERBE-like	Clouds
Inversion	SARB	TISA
	Systems & CM	

Nelson Hillyer
Tammy Ayers
Dennis Keyes
Joanne Saunders

Data Management Team (DMT)

Instrument	ERBE-like	Clouds
Inversion	SARB	TISA
Systems & CM	PR Tool	Ordering Tool

Carla Grune
Elizabeth Heckert

Data Management Team (DMT)

Instrument	ERBE-like	Clouds
Inversion	SARB	
Systems & CM	PR Tool	Ordering Tool

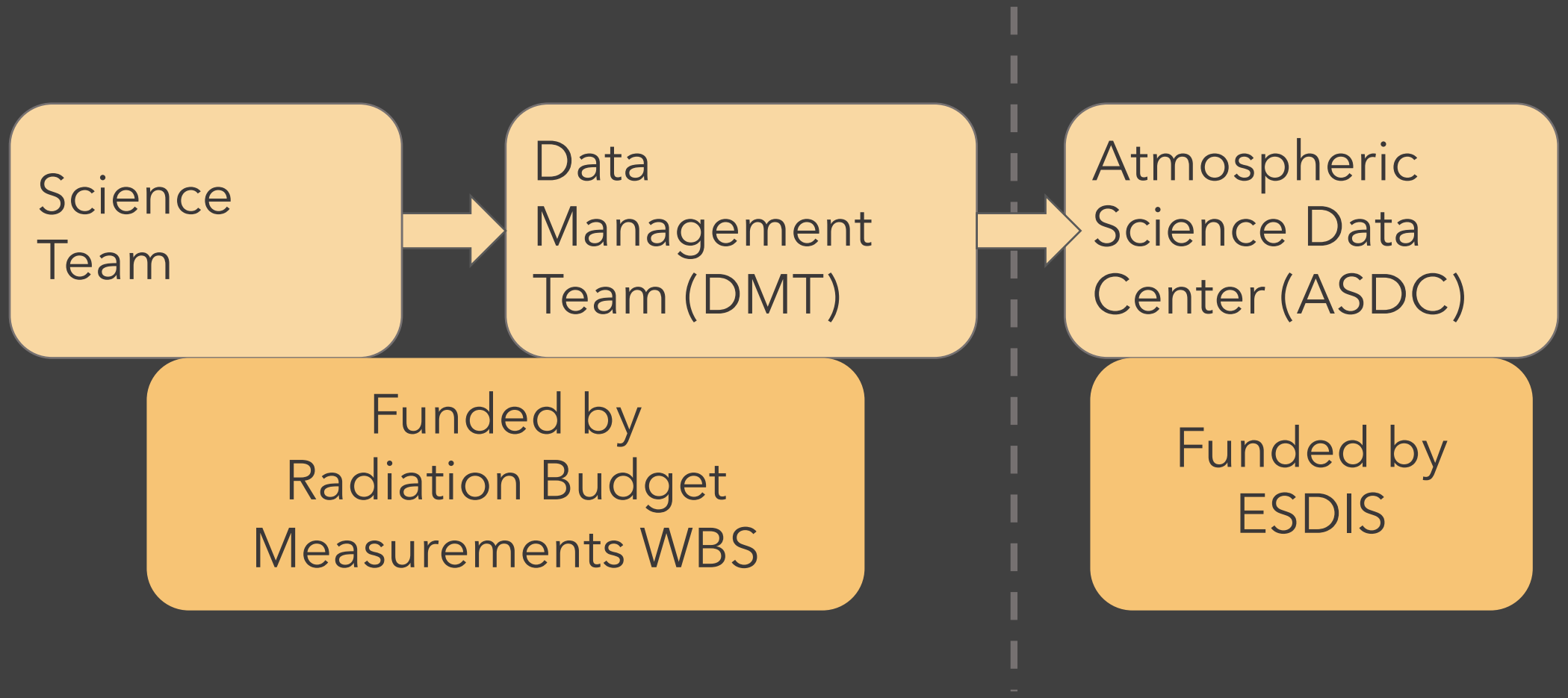
Churngwei Chu
Pamela Mlynczak
Babak Samani

Data Management Team (DMT)

Responsibilities:

- Algorithm implementation
- Software:
  - Maintenance
  - Configuration management
  - Processing
- Output validation

DMT-ASDC Interface



Product Availability

Edition 4 Terra & Aqua

Product	Platform	Processed Thru	Publicly Available?
BDS	Terra, Aqua	Feb. ‘21	Yes
SSF			
SSF1deg-Hour		Feb. ‘21	
SSF1deg-Day/-Month			
SYN1deg-Hour/3Hour/MHour	Terra+Aqua		
SYN1deg-Day/-Month			

Edition 4 Terra & Aqua

Product	Platform	Processed Thru	Publicly Available?
CldTypHist	Terra+Aqua	Dec. ’20	Yes
FluxByCldTyp		Feb. ’21	
EBAF		Nov. ’20	
EBAF ToA		Feb. ’21	

Edition 1 S-NPP

Product	Platform	Processed Thru	Publicly Available?
BDS	S-NPP	Mar. '21	Yes
SSF		Mar. '21	
SSF1deg-Hour		Sep. '19*	
SSF1deg-Day/-Month		Sep. '19*	
SYN1deg-Hour/3Hour/MHour	Terra+S-NPP	Nov. '17*	
SYN1deg-Day/-Month		Nov. '17*	

* L3 processing is paused. Instrument in RAPS mode

Forthcoming Data Product Editions

Edition 2 S-NPP

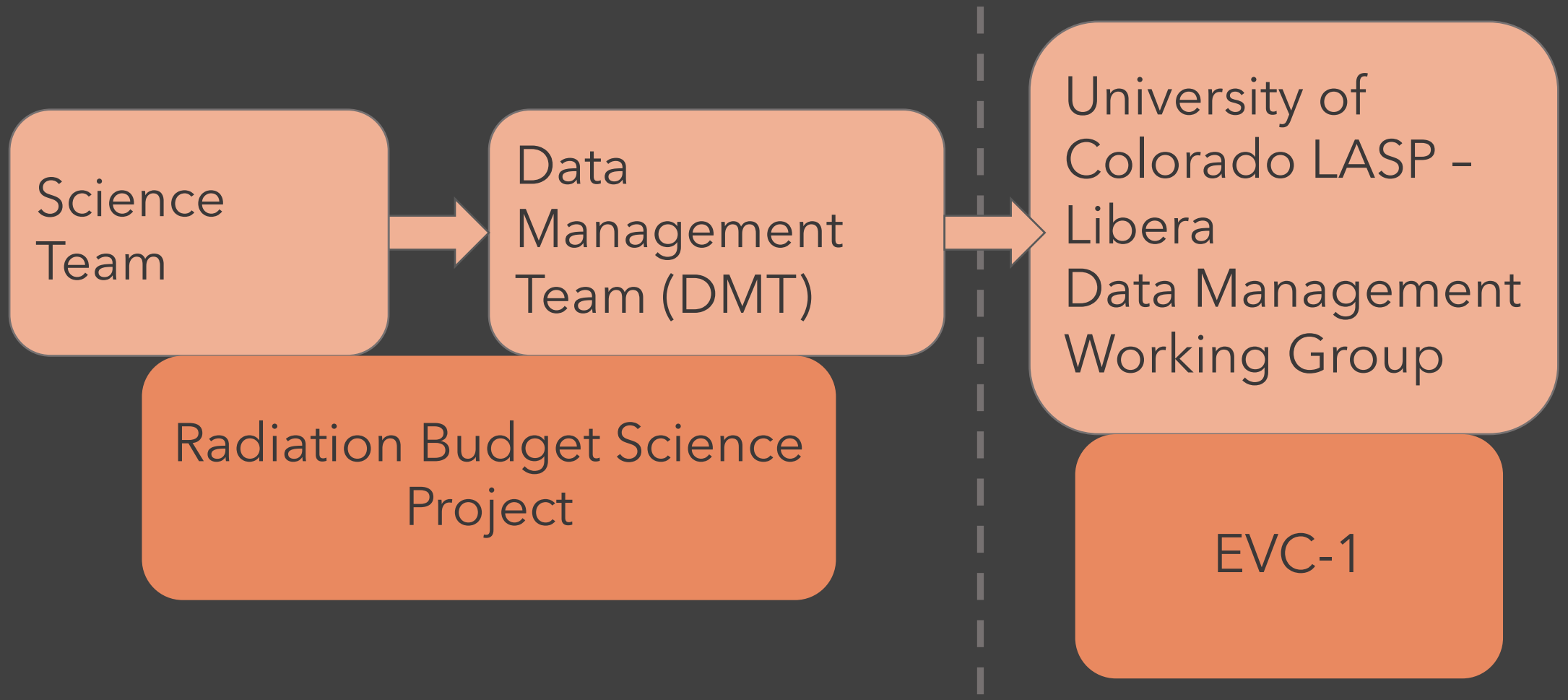
- Reprocessed first two years: 2012-2014
- Pace of C2 VIIRS data receipt driving schedule
- No L3 products from 9/2019 onward, while S-NPP in biaxial mode
- Available by Fall 2021

Edition 1 NOAA-20

- Improved Clouds!
- Will use Version 1.1 or 1.2 CrIS Fusion data for water vapor info.
- Available by Fall 2021

DMT Activities

DMT-Libera Interface

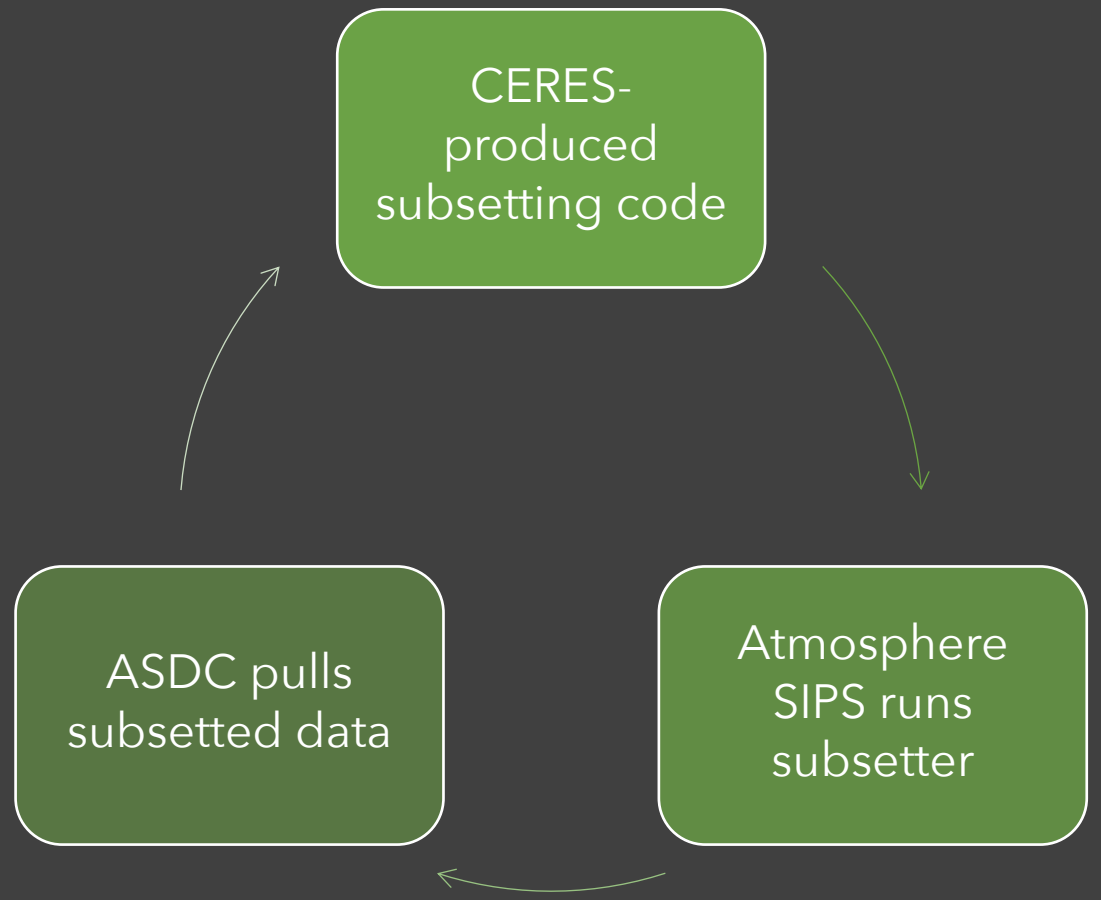


VIIRS-CrIS Fusion Data

From Atmosphere SIPS:

- "FSNRAD" product
- CO_2 channels
- Water vapor data

Recently commenced data flow



Granular Data Availability Display

- Level 3 data – days/hours of data days can be missing
- New table – displays days missing data:

  0-5% of the data are missing

  5-10% of the data are missing

  10% or more of the data are missing
- In development; prototype nearly complete

Granular Data Availability Display

Product Availability Status by Edition

SSF1deg-Month

Edition Availability Quick Links

Edition4 | Edition3 | Edition1-CV | Edition2 | Edition1 | * Internal Products

SSF1deg-Month Edition4 Product Availability

Product	Sat	Edition	2000												2001												2002												2003				
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
SSF1deg-Month	Terra	Edition4A																																									
	S-NPP	Edition1A																																									

SSF Edition4A Terra - April 2000

Day:	Hours																							
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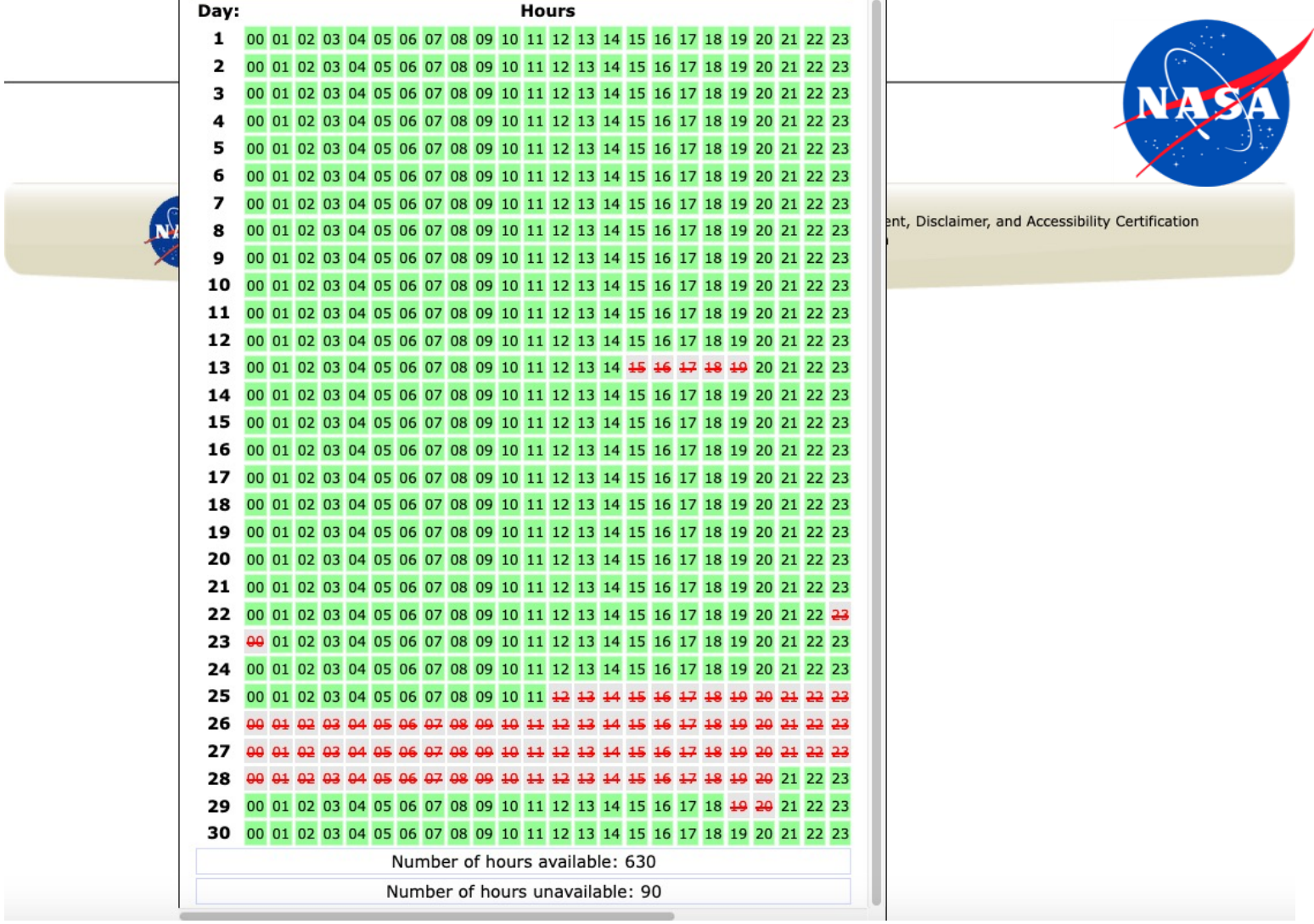
ent, Disclaimer, and Accessibility Certification

Granular Data Availability Display



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Number of hours available: 630

Number of hours unavailable: 90

Accelerated processing timeline

- CERES data
  - Need to process first day of next month for overlap
  - Before – 3 weeks into next data month
  - Now – No delay; use gains and sibiMap from current data month

- MATCH data
  - Before – 6 weeks after data month
  - Now – 2 weeks after data month;
    extrapolate last few hours of last day's data

Additional Key Deliveries

- CATALYST/Archiver:
  - One SSH session to expedite deliveries – 60-80% faster archiving
  - RHEL8 compatibility

- Clouds: New PGE to use VIIRS-CrIS Fusion data
  – associated PR Tool and CATALYST

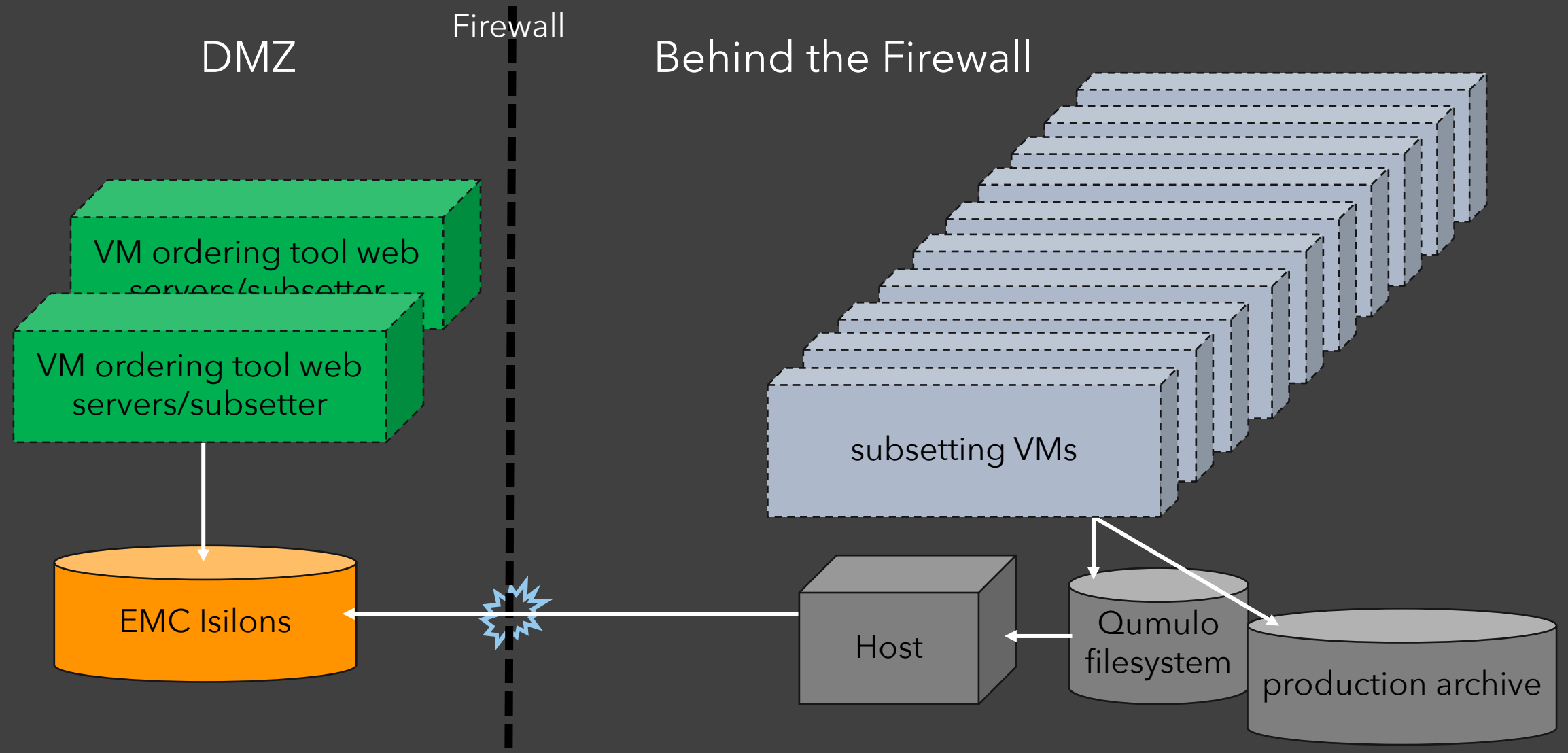
- Fill-value handling:
  - Instrument: relaxed logic; catch more valid CERES values
  - Clouds: tighten logic, skip multilayer retrieval tiles with fill values

- TISA: Mitigation of August 2020 Aqua anomaly; substitution of NOAA-20

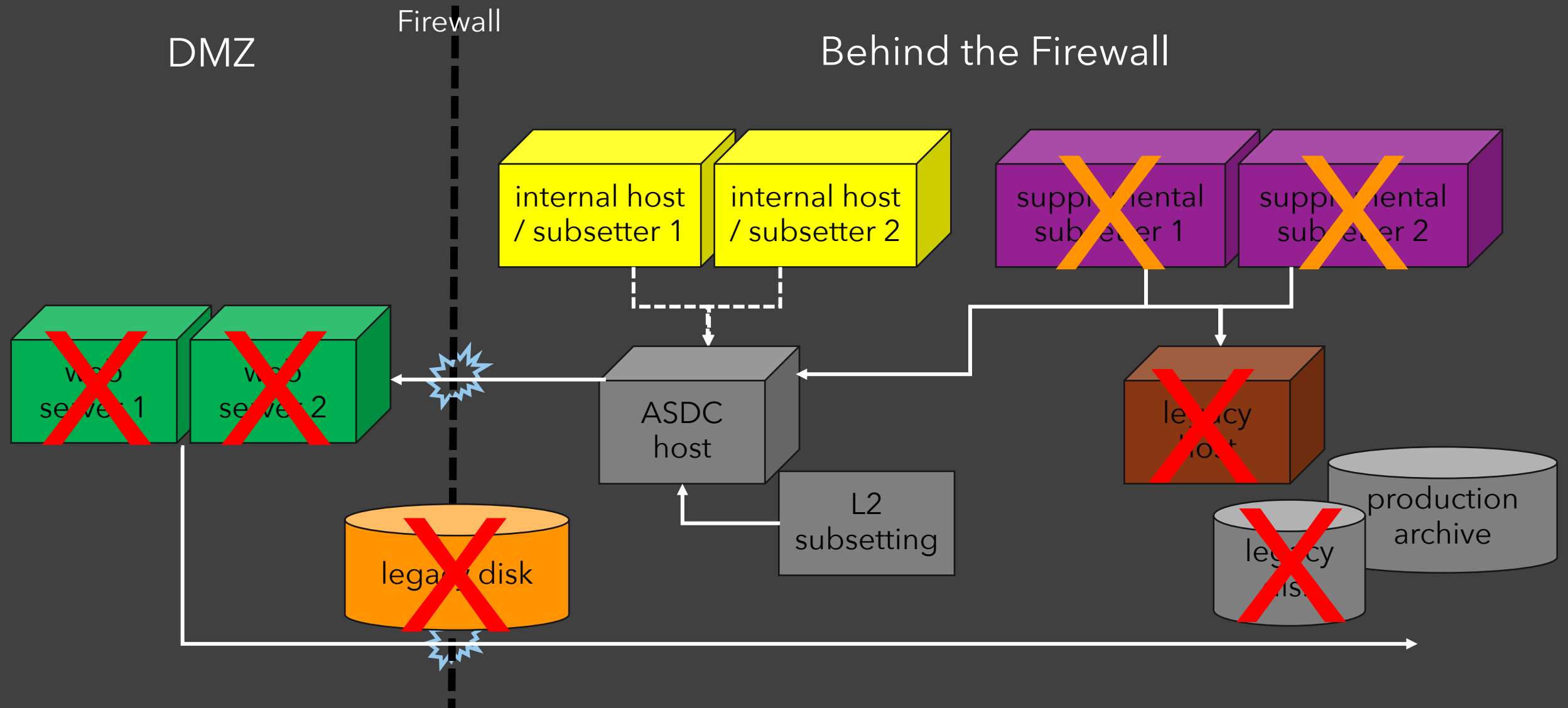
FLASHFlux

- CERES Production absorbing FLASHFlux production
- 2.5 PGEs / 8 – proof of concept runs
- No negative latency impacts
- Increased:
  - Production oversight
  - Testing
  - Scalability
- Anticipated Fall 2021 – transparent to users

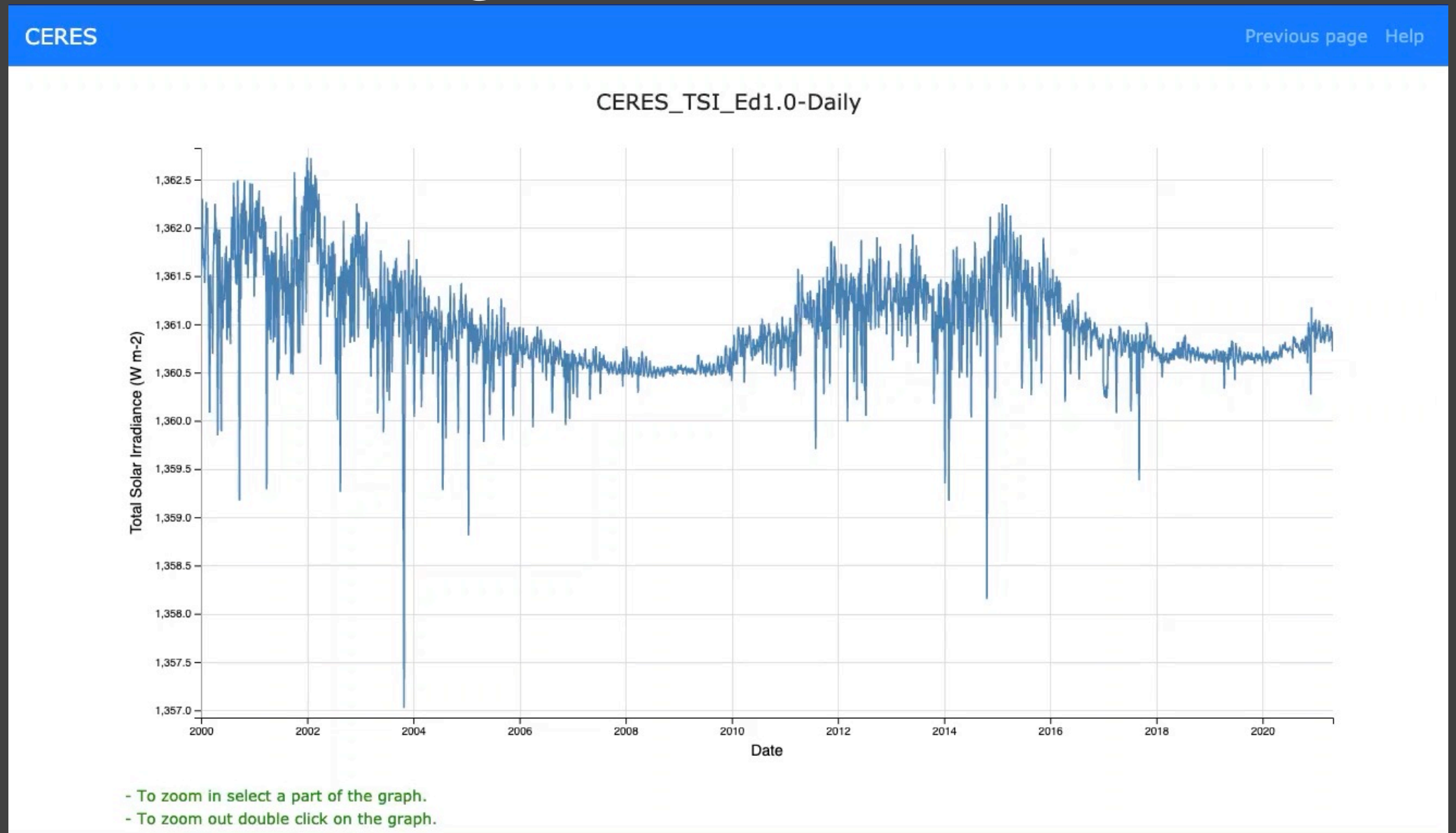
CERES Ordering Tool, Virtualized



CERES Ordering Tool, Bare Metal



CERES Ordering Tool – TSI Plotter



CERES Ordering Tool

- Upcoming:
  - Internal logging dashboard
  - Improved FluxByCldTyp visualizer
  - Virtualization of internal/pre-production version
  - Redesign

- Questions/comments:
  larc-CERES-Help@mail.nasa.gov

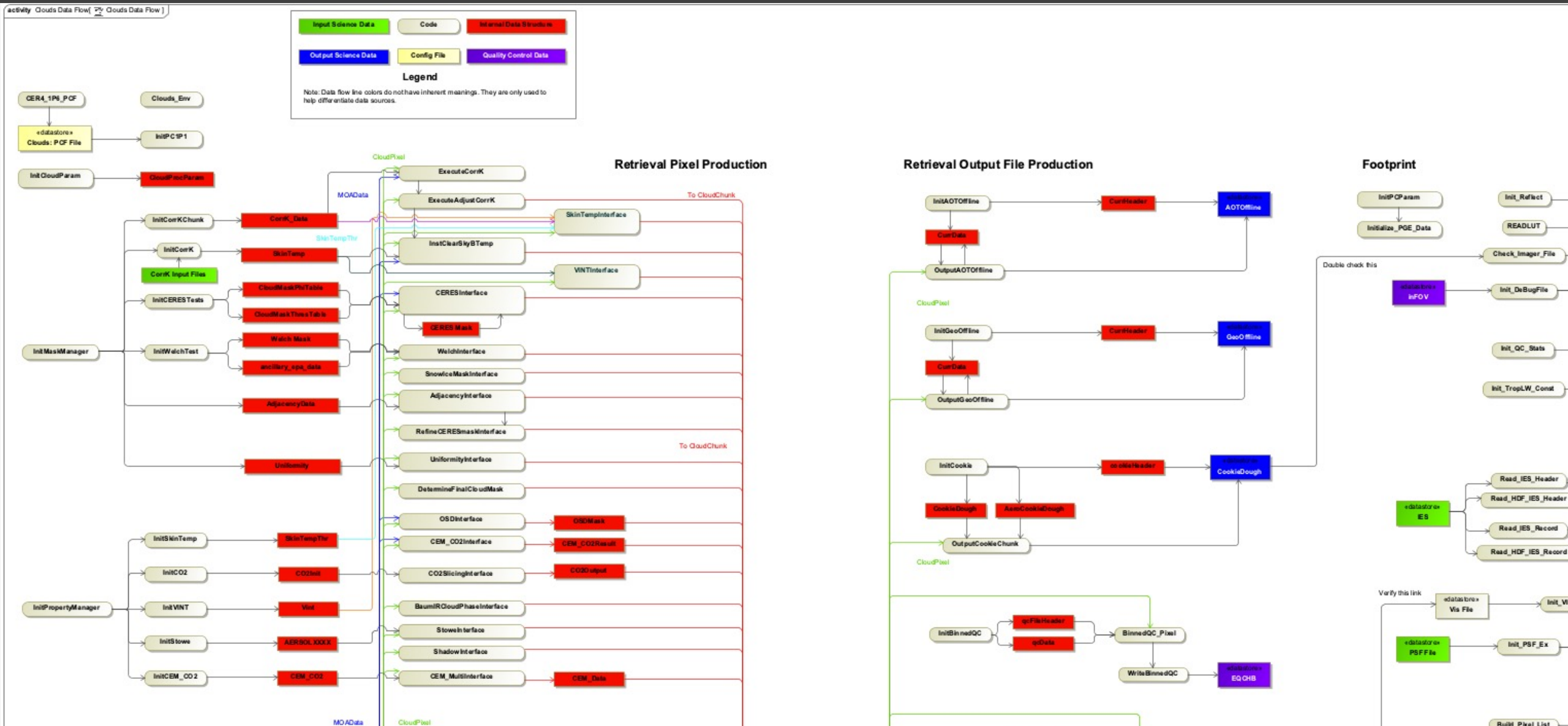
Code Re-architecture

Clouds

- Diagrammed using Magic Draw
  - Inputs
  - Retrieval
  - Footprint
  - Outputs

- Next step: outline new system flow

Clouds

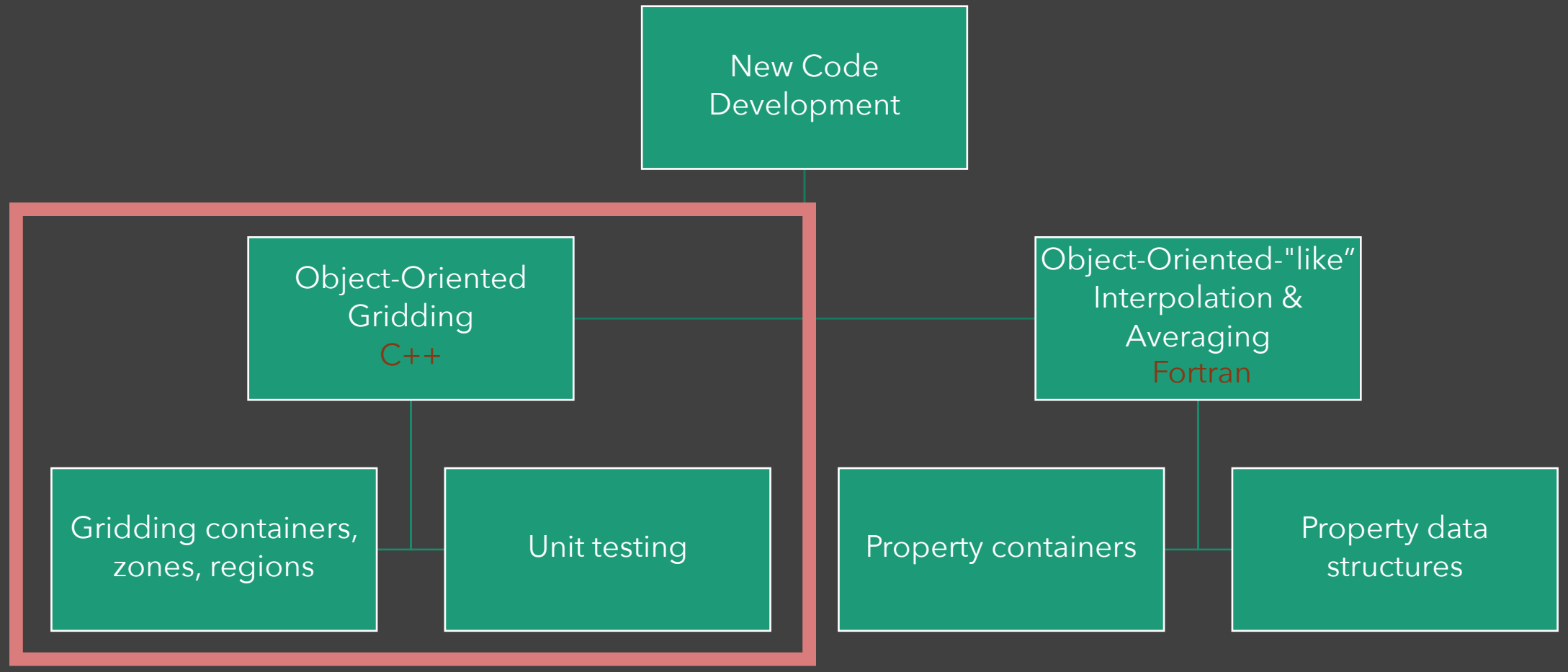

activity Clouds Data Flow [Clouds Data Flow]
Input Science Data
Code
Internal Data Structure
Output Science Data
Config File
Quality Control Data
Legend
Note: Data flow line colors do not have inherent meanings. They are only used to help differentiate data sources.
CER4_1P6_PCF
Clouds_Env
«datastore» Clouds: PCF File
InitPC1P1
InitCloudParam
CloudProcParam
InitCorrKChunk
CorrK_Data
InitCorrK
SkinTemp
CorrK Input Files
InitCERESTests
CloudMaskPhiTable
CloudMaskThresTable
InitMaskManager
InitWelchTest
Welch Mask
ancillary_eps_data
AdjacencyData
Uniformity
InitSkinTemp
SkinTempThr
InitCO2
CO2Init
InitPropertyManager
InitVINT
Vint
InitStowe
AERSOL_XXXX
InitCEM_CO2
CEM_CO2
CloudPixel
MOAData
SkinTempThr
Retrieval Pixel Production
ExecuteCorrK
ExecuteAdjustCorrK
To CloudChunk
SkinTempInterface
InstClearSkyBTemp
VINTInterface
CERESInterface
CERES Mask
WelchInterface
SnowIceMaskInterface
AdjacencyInterface
RefineCERESmaskInterface
To CloudChunk
UniformityInterface
DetermineFinalCloudMask
OSDInterface
OSDMask
CEM_CO2Interface
CEM_CO2Result
CO2SlicingInterface
CO2Output
BaumIRCloudPhaseInterface
StoweInterface
ShadowInterface
CEM_MultiInterface
CEM_Data
MOAData
CloudPixel
Retrieval Output File Production
InitAOTOffline
CurrHeader
«datastore» AOTOffline
CurrData
OutputAOTOffline
CloudPixel
InitGeoOffline
CurrHeader
«datastore» GeoOffline
CurrData
OutputGeoOffline
InitCookie
cookieHeader
«datastore» CookieDough
CookieDough
AeroCookieDough
OutputCookieChunk
CloudPixel
InitBinnedQC
qcFileHeader
qcData
BinnedQC_Pixel
WriteBinnedQC
«datastore» EQCHB
Footprint
InitPCParam
Initialize_PGE_Data
Init_Reflect
READLUT
Check_Imager_File
Double check this
«datastore» inFOV
Init_DeBugFile
Init_QC_Stats
Init_TropLW_Const
«datastore» IES
Read_IES_Header
Read_HDF_IES_Header
Read_IES_Record
Read_HDF_IES_Record
Verify this link
«datastore» Vis File
«datastore» PSF File
Init_PSF_Ex

Clouds

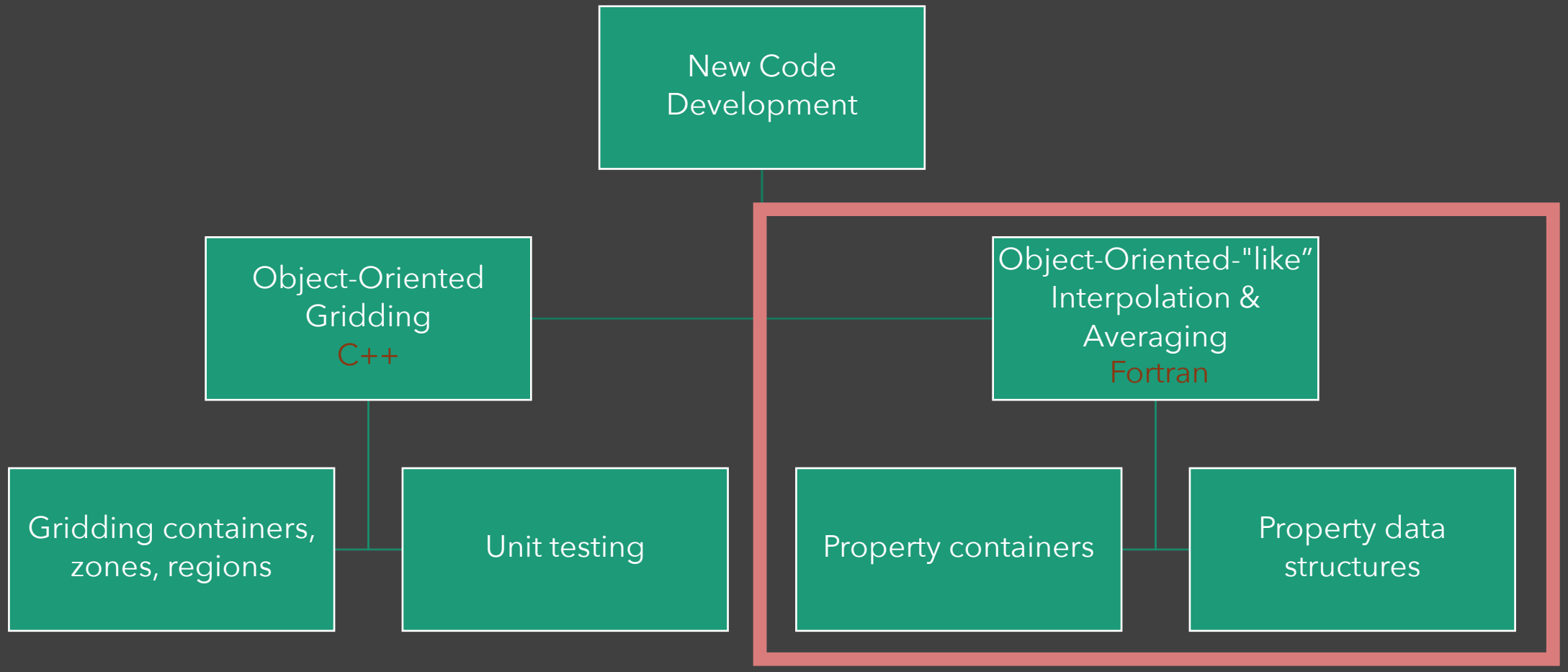
- Configured Jenkins to run Clouds on VM
  - Rapid development
  - “build-test-deploy”

- Hybrid development
  - Hook into C with C++
  - Dovetail with current codebase

TISA


New Code Development
Object-Oriented Gridding
C++
Object-Oriented-"like" Interpolation & Averaging
Fortran
Gridding containers, zones, regions
Unit testing
Property containers
Property data structures

TISA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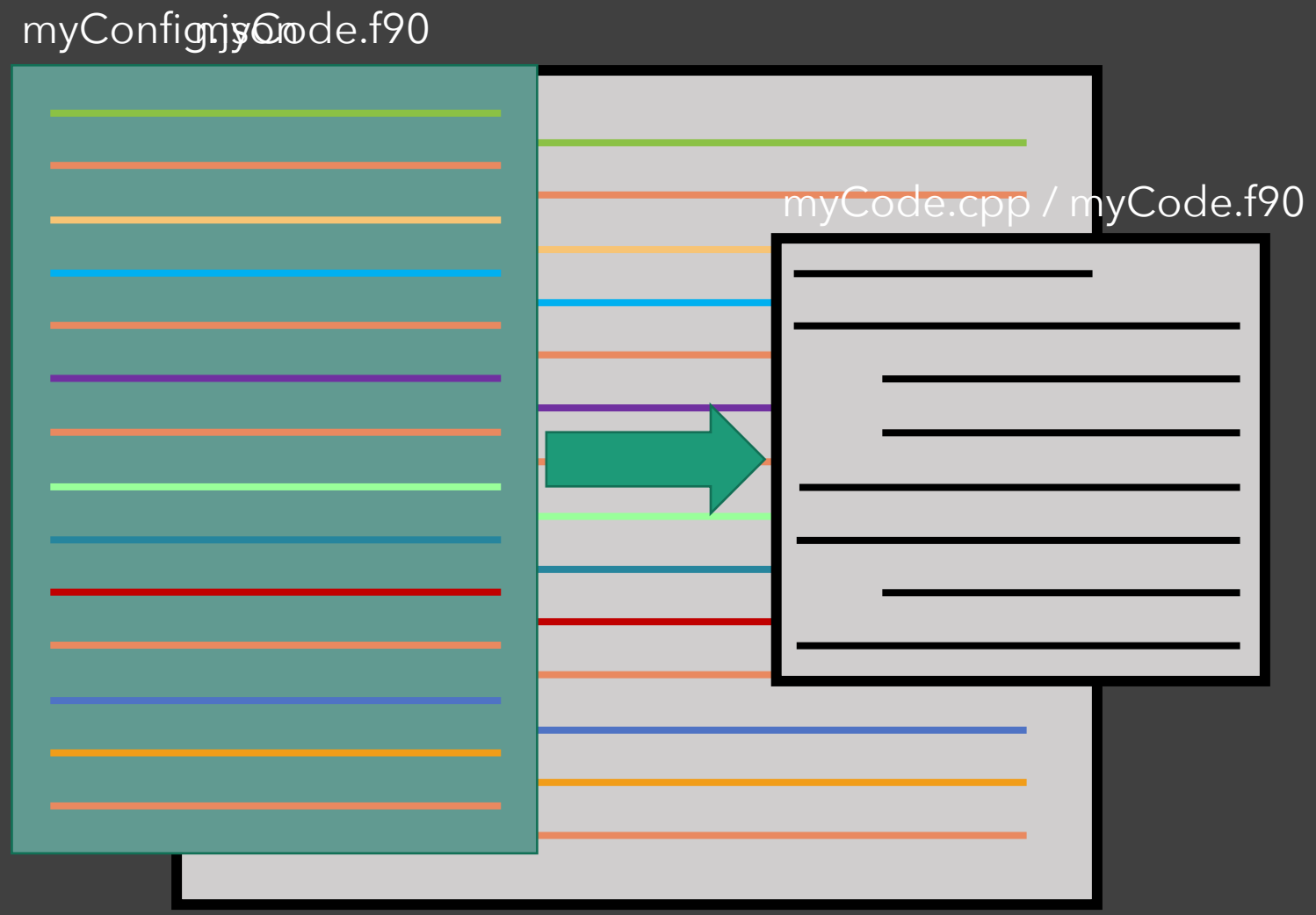


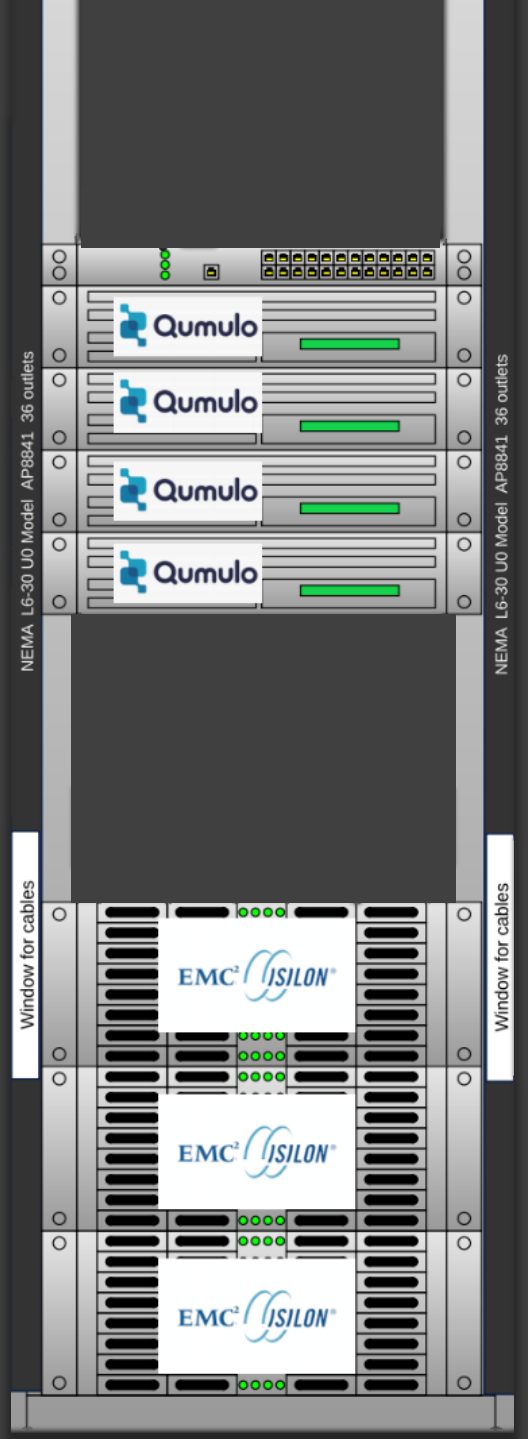
TISA

- Flexible:
  - Spatial resolution
  - Platform (satellite) combinations
  - Temporal
    - Format
    - Interpolation
- Unit testing
- Property introspection library
- Reduced remaining averaging code by another 30%

Systems & CM

Systems

- ANGe configuration for CrIS Fusion
- OS Upgrades:
  - RHEL7 – ANGe (Ingest system at ASDC)
  - RHEL8 – AMI-P (CERES production system)
- "Offline" Storage:
  - Science work storage – aged, insecure posture
  - Refreshed with HPE Scale-Out NAS storage w/ Qumulo



Documentation

- Data Quality Summaries: consistency/terminology

- All documentation on website:
  - PDF only
  - Current editions first
  - Historical editions second

- New site continuously evolving & improving

CERESlib

- Internal code library – I/O, Toolkit routines, etc.
- Needed a refresh
- Pared down by ~5%
- Evaluating other functionality for inclusion, like:
  - Constants
    - Thermodynamic
    - Solar
  - Digital elevation map API
  - Physical equations
  - Ephemeris data
  - and more!

CERESlib

- Continuing to test PGE compilation and running
- Tentative subsystem test-by date: May 31, 2021
- Tentative release date: July 31, 2021
- Up next: enhancement with additional, useful routines

Summary

- Anticipated new releases
- Emphasis on user experience
- Cloud storage and processing on horizon
- Coordination with Libera team – seamless continuity