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Green Vegetation Fraction (GVF)

Test Readiness Review

January 30, 2013

Prepared By:

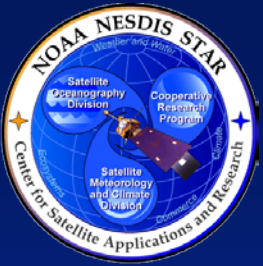
Marco Vargas (STAR)

Ken Jensen

Junchang Ju (AER)

Zhangyan Jiang (AER)

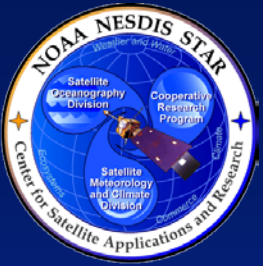
Rory Moore (Raytheon)



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GVF TRR Agenda

Project Plan	1:00 – 1:15	Rory Moore
CDR Report	1:15 – 1:30	Rory Moore
Unit Test Plan	1:30 – 2:15	Rory Moore
TGM Unit Test Readiness	2:15 – 2:25	Junchang Ju
GRD Unit Test Readiness	2:25 – 2:35	Junchang Ju
SRC Unit Test Readiness	2:35 – 2:45	Junchang Ju
Break	2:45 – 2:55	
CVI Unit Test Readiness	2:55 – 3:05	Junchang Ju
SVI Unit Test Readiness	3:05 – 3:15	Junchang Ju
GCL Unit Test Readiness	3:15 – 3:25	Junchang Ju
GAG Unit Test Readiness	3:25 - 3:35	Junchang Ju
Risks and Actions	3:35 - 2:55	Rory Moore
Summary and Conclusions	3:55 - 4:00	Marco Vargas



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- 1) **PROJECT PLAN**
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 1 – Project Plan

Presented by

Rory Moore (Raytheon)
STAR Process Lead / GVF QA



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GVF Product Team

- Development Lead: Marco Vargas
- Product Area Lead: Hanjun Ding
- Development Scientist: Marco Vargas, Ivan Csiszar, Zhangyan Jiang, **Junchang Ju**, Kevin Gallo
- Development Programmer: **Junchang Ju**, Zhangyan Jiang
- Development Tester: Zhangyan Jiang, **Junchang Ju**
- Configuration Management: **Junchang Ju**, Zhangyan Jiang
- QA/Process Lead: Rory Moore, **Ken Jensen**



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Development Project Plan

- The Development Project Plan (DPP) is a standard artifact of the STAR EPL process.
 - » The DPP identifies project objectives, stakeholder roles and tasks, resources, milestones, schedule, and budget
 - » DPP version 3.0 is an artifact for the TRR. TRR reviewers can access this document at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php
- The DPP was presented in detail at the Gate 3 Review. Here, we focus on changes to the plan since the last review (Delta CDR).



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GVF Project Plan - Changes Since Delta CDR

- Stakeholder changes
 - » Ken Jensen added to TRR Reviewers
 - » Ken Jensen added to STAR Quality Assurance
 - » Junchang Ju's last day on the program will be Jan 31, 2013
 - » Zhanyang Jiang to replace Junchang after TRR
- Project timeline extended to due to change in sub contractor status
- List of risks was updated (see Section 11 for a discussion of the risks)



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GVF Stakeholders - Suppliers

- Hardware

- » STAR (IBM servers for development)
- » NDE (SADIE for development/testing)

- Personnel

- » **AER** (2.2 FTE) Work covered by **SciTech2** contract

- Data

- » GRAVITE – provisional VIIRS granule files, GIMGO - geolocation of imagery resolution bands
- » NDE – Calibrated VIIRS granule files



GVF Stakeholders - Developers



- Lead: Marco Vargas (STAR)
- Scientists: Marco Vargas, Ivan Csiszar (STAR), Kevin Gallo (STAR), Zhangyan Jiang (AER), Felix Cogan (STAR)
- Programmers: Junchang Ju (AER), Zhangyan Jiang (AER)
- V&V: Kevin Gallo, Junchang Ju, Zhangyan Jiang
- Documentation: Marco Vargas, Kevin Gallo, Hanjun Ding, Rory Moore, Ken Jensen, Zhangyan Jiang, Junchang Ju

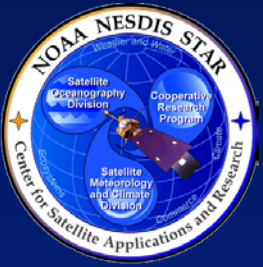


GVF Stakeholders - Operators



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- Product Area Lead: Hanjun Ding (OSPO)
- Installation and Acceptance: Geof Goodrum (NDE), Dylan Powell (ESPDS-DEV)
- Operations: NDE, ESPDS
- Science Maintenance: Marco Vargas
- Reactive Maintenance: NDE / OSPO
- Documentation: NDE / OSPO



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GVF Stakeholders - Users

- NCEP EMC Land Group: Contact (Mike Ek, Yihua Wu)
 - » Update product requirement, evaluation of product quality, and at least one of the product development reviews (e.g., CDR).
- CLASS: Contact (Phil Jones, NCDC)
 - » Work with NDE to finalize NOAA-CLASS ICD
 - » Work with OSPO on a Submission Agreement for the GVF NUP



GVF Stakeholders – Reviewers (1)



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- Gate 3 Review Lead: Hanjun Ding (OSPO)
- Gate 3 Review Team:
 - » Ken Jensen (Raytheon)
 - » Jim Silva (NDE, consultant)
 - » Tom Schott (OSD, consultant)
 - » Mitch Goldberg (STAR, consultant)
- PRR Review Lead: Ivan Csiszar (STAR)
- PRR Review Team:
 - » Zhaohui Cheng (OSPO QA)
 - » Tom Schott (NDE)
 - » Hanjun Ding
 - » Ken Jensen
 - » Kathryn Shontz (STAR, consultant)
 - » Vince Wong (NCEP, consultant)



GVF Stakeholders – Reviewers (2)



- CDR Review Lead: Ivan Csiszar (STAR)
- CDR Review Team:
 - » Zhaohui Cheng (OSPO QA)
 - » Felix Kogan (STAR)
 - » Hanjun Ding (OSPO)
 - » Ken Jensen (Raytheon)
 - » Geof Goodrum (NDE, consultant)
 - » Vince Wong (NCEP, consultant)
 - » Dylan Powell (ESPDS-DEV, consultant)
 - » Jim Silva (NDE, consultant)
 - » Tom Schott (OSD, consultant)
 - » Fuzhong Weng (STAR, consultant)



GVF Stakeholders – Reviewers (3)



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- Delta CDR Review Lead: Ivan Csiszar (STAR)
- Delta CDR Review Team:
 - » Zhaohui Cheng (OSPO QA)
 - » Felix Kogan (STAR)
 - » Hanjun Ding (OSPO)
 - » Rory Moore (Raytheon)
 - » Geof Goodrum (NDE, consultant)
 - » Vince Wong (NCEP, consultant)
 - » Dylan Powell (ESPDS-DEV, consultant)
 - » Jim Silva (NDE, consultant)
 - » Tom Schott (OSD, consultant)
 - » Fuzhong Weng (STAR, consultant)

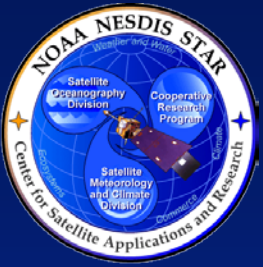


GVF Stakeholders – Reviewers (4)



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- TRR Review Lead: Zhaohui Cheng (OSPO QA)
- TRR Review Team:
 - » George Lawless (OSPO Security)
 - » Wei Guo (IMSG)
 - » Kathy Moore (Vangent)
 - » Dylan Powell
 - » Rory Moore
 - » Ken Jensen
- CTR Review Lead and Team: TBD
- SRR Review Lead: Geof Goodrum (NDE)
- SRR Review Team: TBD



GVF Stakeholders – Management and Support



- Project Management:
 - » STAR Division Chief: Fuzhong Weng
 - » STAR Branch Chief: Ivan Csiszar
 - » OSPO Branch Chief: Ricky Irving
 - » NDE Program Manager: Jim Silva
 - » STAR/NDE Liaison: Priyanka Roy
 - » OSD: Tom Schott
- CM/DM: Zhangyan Jiang, Junchang Ju
- STAR Quality Assurance: Rory Moore, Ken Jensen
- OSPO Quality Assurance: Zhaohui Cheng

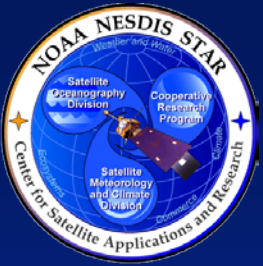


GVF IMP – Project Milestones



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- Gate 3 Review – Oct 7, 2010
- NPP Launch – Oct 28, 2011
- Project Requirements Review – Dec 7, 2011
- Critical Design Review – Apr 3, 2012
- Delta Critical Design Review – Jul 19, 2012
- **Test Readiness Review – Jan 2013**
- Code Test Review – Apr 2013
- System Readiness Review – Jun 2013
- Commencement of Operations – Jul 2013



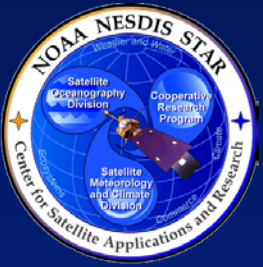
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GVF Timeline – DESIGN Phase Is Complete

CMMI Development to Transition to Operations



- Jun 14, 2010: Began deployment of CMMI practices during step 5 of STAR EPL product life cycle
- Jun-Sep 2010: CMMI-compliant GVF Development Project Plan (DPP)
- Oct 7, 2010: Gate 3 Management Review. GVF project successfully completes PLAN Phase.
- Dec 7, 2011: Project Requirements Review (PRR).
- Jul 19, 2012: Delta CDR. Conclusion of DESIGN Phase.
- **Jan 2013: Test Readiness Review (TRR). WE ARE HERE.**
- Mar 2013: Unit testing in SADIE
- Apr 2013: Code Test Review (CTR)
- May 2013: System integration and testing in NDE System Test Environment
- Jun 2013: System Readiness Review (SRR). Conclusion of BUILD Phase.
- Jun 2013: Final DAP delivery
- Jul 2013: SPSRB Operational Decision, followed by commencement of operations.



TRR Guidelines and Check List



- Guidelines for the TRR reviewers are in STAR EPL process asset PRG-9.1
- Reviewers can access this document at http://www.star.nesdis.noaa.gov/star/EPL_index.php
- The TRR Review Check List is in the Development Project Plan (DPP) Appendix C
 - » Reviewers can access this document at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NP/P/GVFdoc_TRR.php



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TRR Report

- The TRR Report (TRRR) is a standard artifact of the STAR EPL process.
 - » The TRR reviewers should produce this report after conducting the TRR.
 - » The report will be an artifact for the System Readiness Review.
- Guidelines for the TRRR are found in STAR EPL process asset DG-9.3
 - » TRR reviewers can access this document at http://www.star.nesdis.noaa.gov/star/EPL_index.php



GVF TRR – Review Objectives (1)



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- Review changes to the project plan since Delta CDR
- Review the Delta CDR Report
- Review the software architecture
 - » External interfaces (changes since Delta CDR)
 - » Software units (changes since Delta CDR)
 - » Context-Layer, System-Layer, Unit-Layer, and Sub-Unit-Layer data flows (changes since Delta CDR)
- Review changes to the detailed design since Delta CDR
- Review changes to the verification and validation plan since the Delta

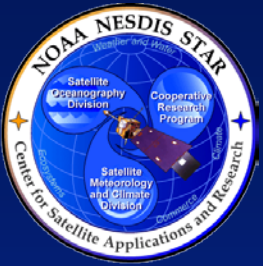


GVF TRR – Review Objectives (2)



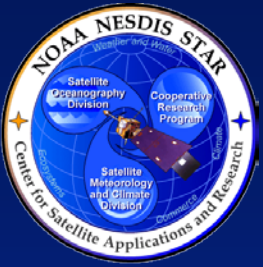
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- Demonstrate the test readiness of each unit in the software architecture.
- Provide all applicable technical data to support unit testing, including:
 - » Pre-operational code and test data
 - » Unit test plan
- Identify and update project risks. Make recommendations for risk mitigation plans and actions.
- Document the closing of all action items since the CDR. Make recommendations for open actions and new actions.



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Section 2 – CDR Report

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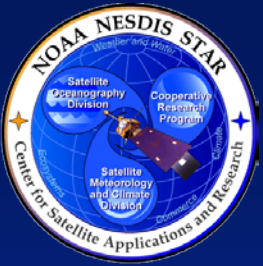
Rory Moore (Raytheon)
GVF QA



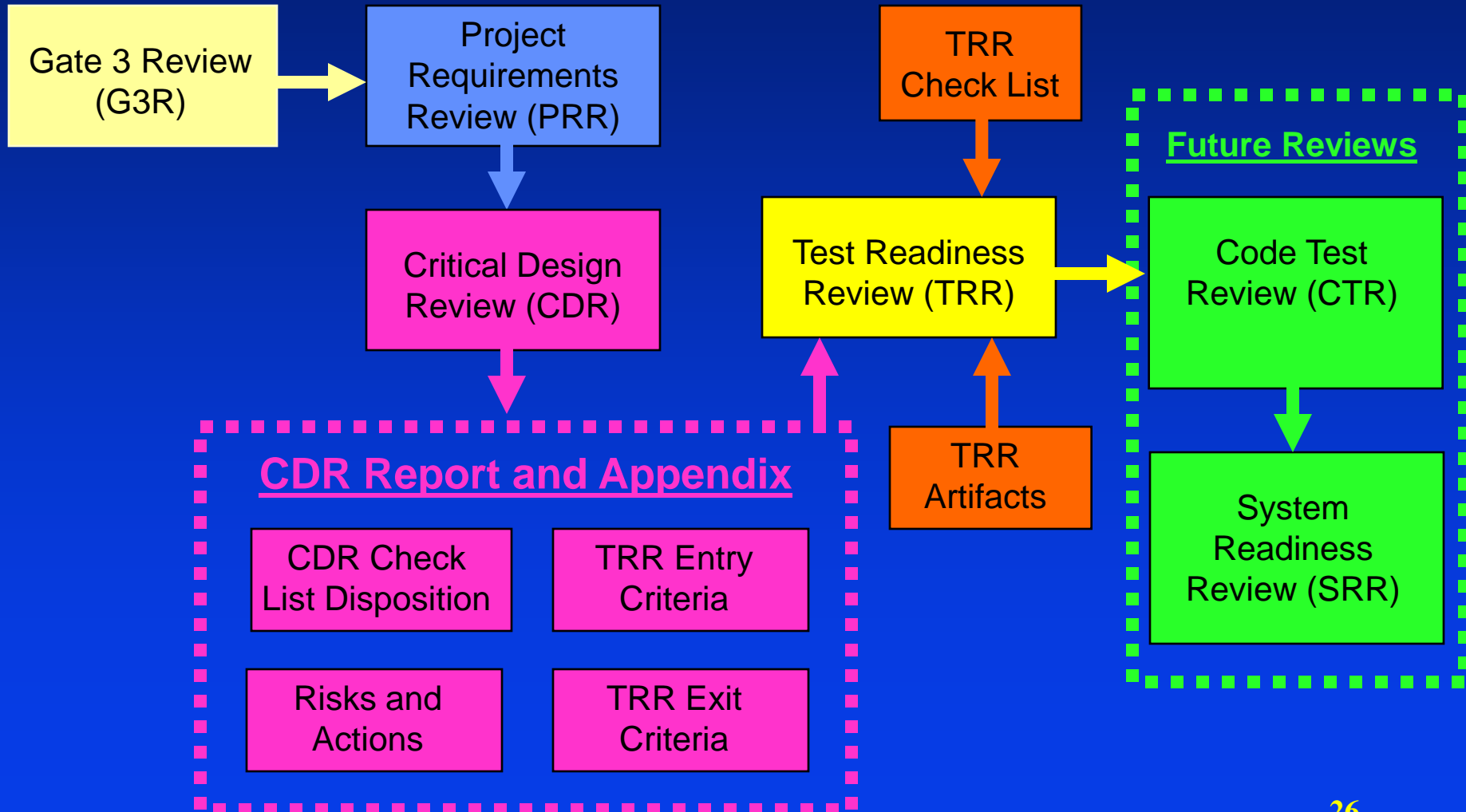
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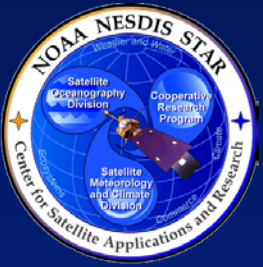
CDR Report

- The CDR Report (CDRR) is the approved report of the CDR reviewers and delta CDR Reviewers:
 - » Ivan Csiszar (STAR, Review Lead)
 - » Felix Kogan (STAR)
 - » Hanjun Ding (OSPO)
 - » Ken Jensen (Raytheon)
 - » Rory Moore (Raytheon)
 - » Zhaohui Cheng (OSPO QA)
- The CDRR reports the status of the CDR entry criteria and exit criteria
- The CDRR includes an assessment of risk items, with recommendations for risk mitigation
 - » Status of the risk items will be addressed later in this TRR
- The CDRR has established the entry criteria and exit criteria for the GVF TRR
- The CDRR can be accessed at
https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php



The CDR Report Closes the CDR and Sets Up the TRR





GVF CDR - Entry Criteria (1)



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- **Entry # 1** - A Project Requirements Review Report (PRRR) has been written. The CDR reviewers have access to the review version of the PRRR. STATUS: PASS
- **Entry # 2** - A Development Project Plan (DPP) has been written. The CDR reviewers have access to the review version of the DPP. STATUS: PASS
- **Entry # 3** - An Operations Concept Document (OCD) has been written. The CDR reviewers have access to the review version of the OCD. STATUS: PASS
- **Entry # 4** - A Requirements Allocation Document (RAD) has been written. The CDR reviewers have access to the review version of the RAD. STATUS: PASS



GVF CDR - Entry Criteria (2)



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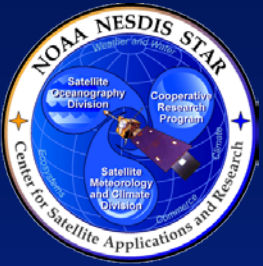
- **Entry # 5** - A Requirements/Needs Matrix (RNM) has been written. The CDR reviewers have access to the review version of the RNM. STATUS: PASS
- **Entry # 6** - A Requirements Allocation Sheet (RAS) has been written. The CDR reviewers have access to the review version of the RAS. STATUS: PASS
- **Entry # 7** - An Algorithm Theoretical Basis Document (ATBD) has been written. The CDR reviewers have access to the review version of the ATBD. STATUS: PASS
- **Entry # 8** - A Software Architecture Document (SWA) has been written. The CDR reviewers have access to the review version of the SWA. STATUS: PASS



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GVF CDR - Entry Criteria (3)

- **Entry # 9** - A Detailed Design Document (DDD) has been written. The CDR reviewers have access to the review version of the DDD.
STATUS: PASS
- **Entry # 10** - A Verification and Validation Plan (VVP) has been written. The CDR reviewers have access to the review version of the VVP.
STATUS: PASS
- **Entry # 11** - A Project Status Report (PSR) has been written. The CDR reviewers have access to the review version of the PSR.
STATUS: PASS
- **Entry # 12** - A Critical Design Document (CDD) has been written. The CDR reviewers have access to the review version of the CDD.
STATUS: PASS
- **Entry # 13** - A Project Baseline Report (PBR) has been written. The CDR reviewers have access to the review version of the PBR.
STATUS: PASS

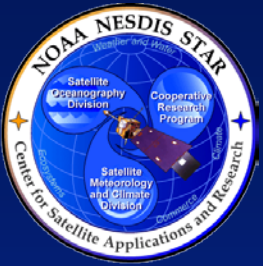


GVF CDR - Project Risks



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- 31 project risks were presented for evaluation at the delta CDR
- 26 of these risks were established by the CDRR as remaining open risks
 - » Each risk includes a Risk Assessment, Risk Mitigation Plan, and a list of actions to implement the mitigation plan (“associated” actions)
- 110 associated actions for the open risks are identified in the CDRR
 - » 29 of these are closed or withdrawn by the CDRR
 - » 81 actions remain open
- The status of the 26 open risks and 81 open actions from delta CDR will be addressed in Section 11



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GVF CDR – Exit Criteria

- **Exit # 1** – PRR “Conditional Pass” items have been satisfactorily disposed of
- **Exit # 2** – PRR “Defer” items have been satisfactorily disposed of
- **Exit # 3** – Operations concept and OCD are satisfactory
- **Exit # 4** - Requirements are satisfactory. Requirements changes since PRR are approved.
- **Exit # 5** – Algorithm theoretical basis and ATBD are satisfactory
- **Exit # 6** – Software architecture and SWA are satisfactory
- **Exit # 7** – External interfaces are satisfactory
- **Exit # 8** – Software detailed design and DDD are satisfactory
- **Exit # 9** – Verification and validation plan and VVP are satisfactory
- **Exit # 10** – Requirements allocation and RAS are satisfactory
- **Exit # 11** – Project baseline and PBR are satisfactory
- **Exit # 12** – Project risks and actions are acceptable
- **Exit # 13** – Project plan and DPP are satisfactory
- **Exit # 14** – Project status and PSR are satisfactory
- **Exit # 15** – Project is ready for the Build phase
- All 15 exit criteria have a status of **PASS**.
- Delta CDR was closed, with 81 actions deferred to the Build phase. These will be discussed in Section 11.



GVF TRR - Entry Criteria # 1 - 5



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- **Entry # 1** - A Critical Design Review Report (CDRR) has been written. The TRR reviewers have access to the review version of the CDRR.
- **Entry # 2** - A Development Project Plan (DPP) has been written. The TRR reviewers have access to the review version of the DPP.
- **Entry # 3** - A Requirements Allocation Document revision (RAD) has been written. The TRR reviewers have access to the review version of the RAD.
- **Entry # 4** - A Software Architecture Document (SWA) has been written. The TRR reviewers have access to the review version of the SWA.
- **Entry # 5** - A Detailed Design Document (DDD) has been written. The TRR reviewers have access to the review version of the DDD.



GVF TRR - Entry Criteria # 6 - 11



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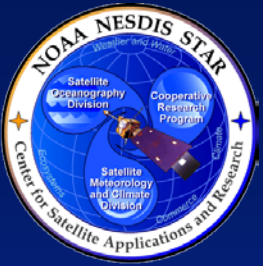
- **Entry # 6** - A Verification and Validation Plan (VVP) has been written. The TRR reviewers have access to the review version of the VVP.
- **Entry # 7** - A Unit Test Plan (UTP) has been written. The TRR reviewers have access to the review version of the UTP.
- **Entry # 8** - Pre-operational code to implement the detailed design is accessible to the TRR reviewers.
- **Entry # 9** - The unit test data are accessible to the TRR reviewers.
- **Entry # 10** - A Project Baseline Report (PBR) has been written. The TRR reviewers have access to the review version of the PBR.
- **Entry # 11** - A Test Readiness Document (TRD) has been written. The TRR reviewers have access to the review version of the TRD.



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GVF TRR – Tailored / Waived Entry Criteria

- There are no tailored entry criteria
- There are no waived entry criteria



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GVF TRR – Exit Criteria # 1 - 5

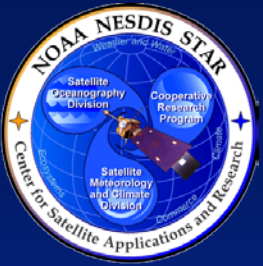
- **Exit # 1** – CDR "Conditional Pass" items have been satisfactorily disposed of
- **Exit # 2** - CDR "Defer" items have been satisfactorily disposed of
- **Exit # 3** – Changes to the project plan since delta CDR are approved.
- **Exit # 4** – Requirements allocation changes since delta CDR are approved.
- **Exit # 5** – Changes to external interfaces since delta CDR are approved



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GVF TRR – Exit Criteria # 6 - 9

- **Exit # 6** – Changes to the software architecture since delta CDR are approved
- **Exit # 7** – Changes to the detailed design since delta CDR are approved
- **Exit # 8** – Changes to the Verification and validation plan since delta CDR are approved
- **Exit # 9** - The unit test plan and UTP are satisfactory
- **Exit # 10** – Pre-operational code to implement the detailed design has been written according to standards and has been built into executable units.



GVF TRR – Exit Criteria # 11 - 15

- **Exit # 11** – Unit test data are satisfactory
- **Exit # 12** – Project baseline and PBR are satisfactory
- **Exit # 13** – The TRRR documents the current status of project risks, actions and TRR exit criteria.
- **Exit # 14** – The project artifacts document all approved changes to requirements, requirements allocation, external interfaces, software architecture, detailed design, and verification and validation plan since the delta CDR.
- **Exit # 15** – Project risks and actions are acceptable. Project is ready for unit testing.



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GVF TRR – Tailored / Waived Exit Criteria

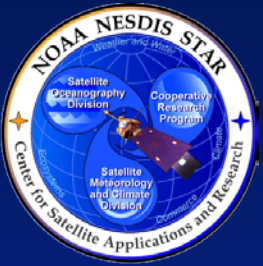
- There are no tailored exit criteria
- There are no waived exit criteria



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CDR Report Appendix – CDR Check List Disposition

- The CDRR Appendix includes the disposition status for each of 151 CDR check list items (CLI)
 - » 142 of the CLI received a “Pass” or “N/A” disposition with no identified risk. These include the CDR entry criteria and exit criteria.
 - » 9 of the CLI received a “Defer” disposition with associated risks and actions, to be discussed in Section 11



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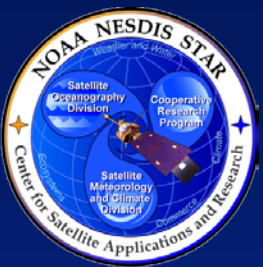


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Section 3 – Unit Test Plan

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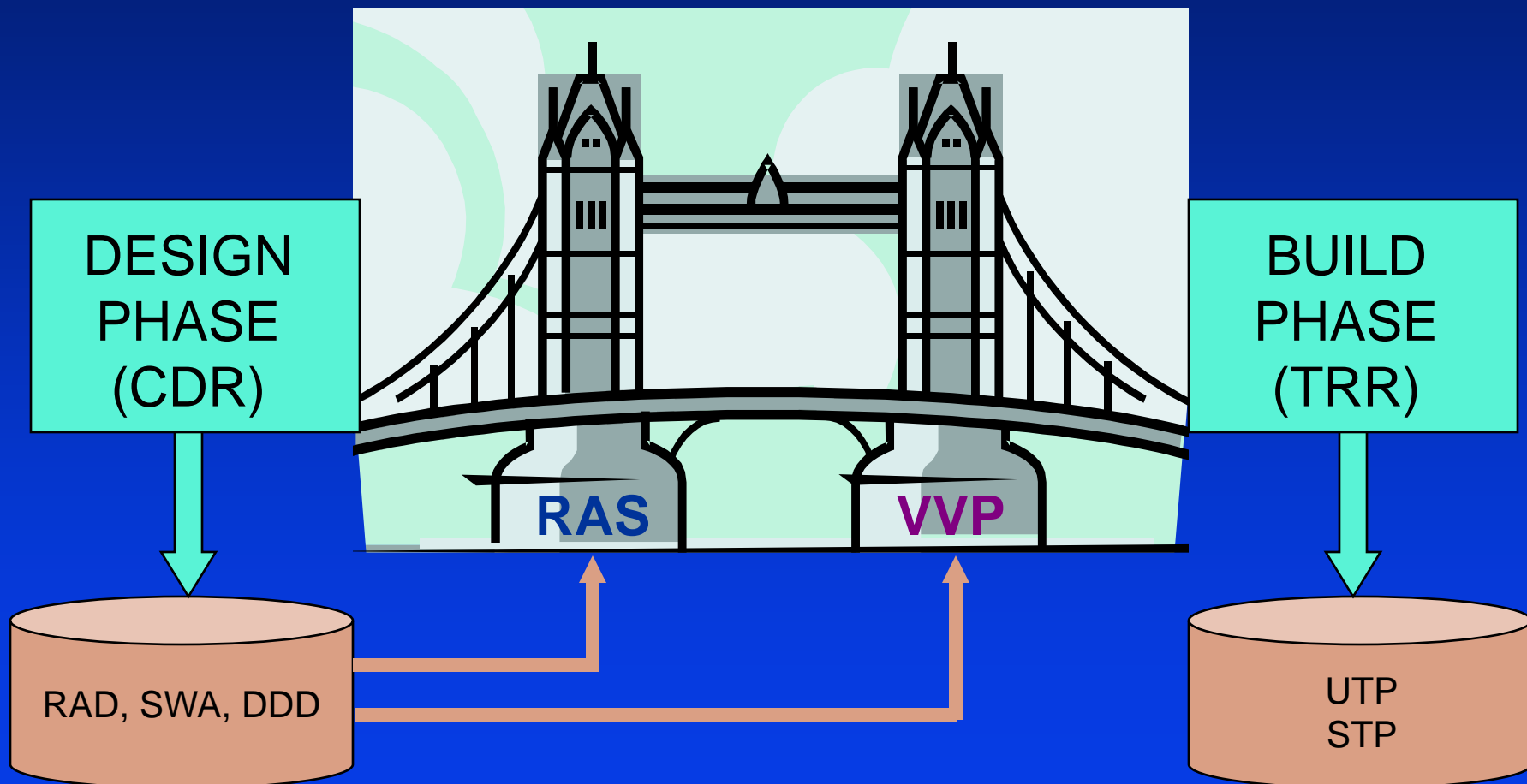
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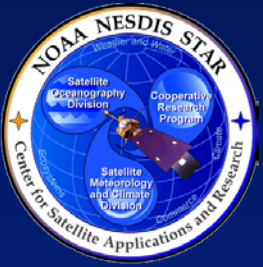


The RAS and VVP Provide the Bridge from the Design to the Test Plans



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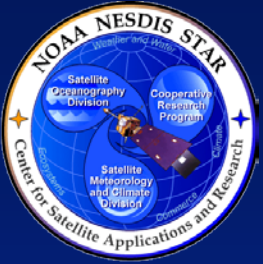




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Unit Testing

- Unit testing is performed to confirm that the software functions as designed and produces the expected outputs
- It is the first instance of formal verification and validation, which is intrinsic to the Build Phase

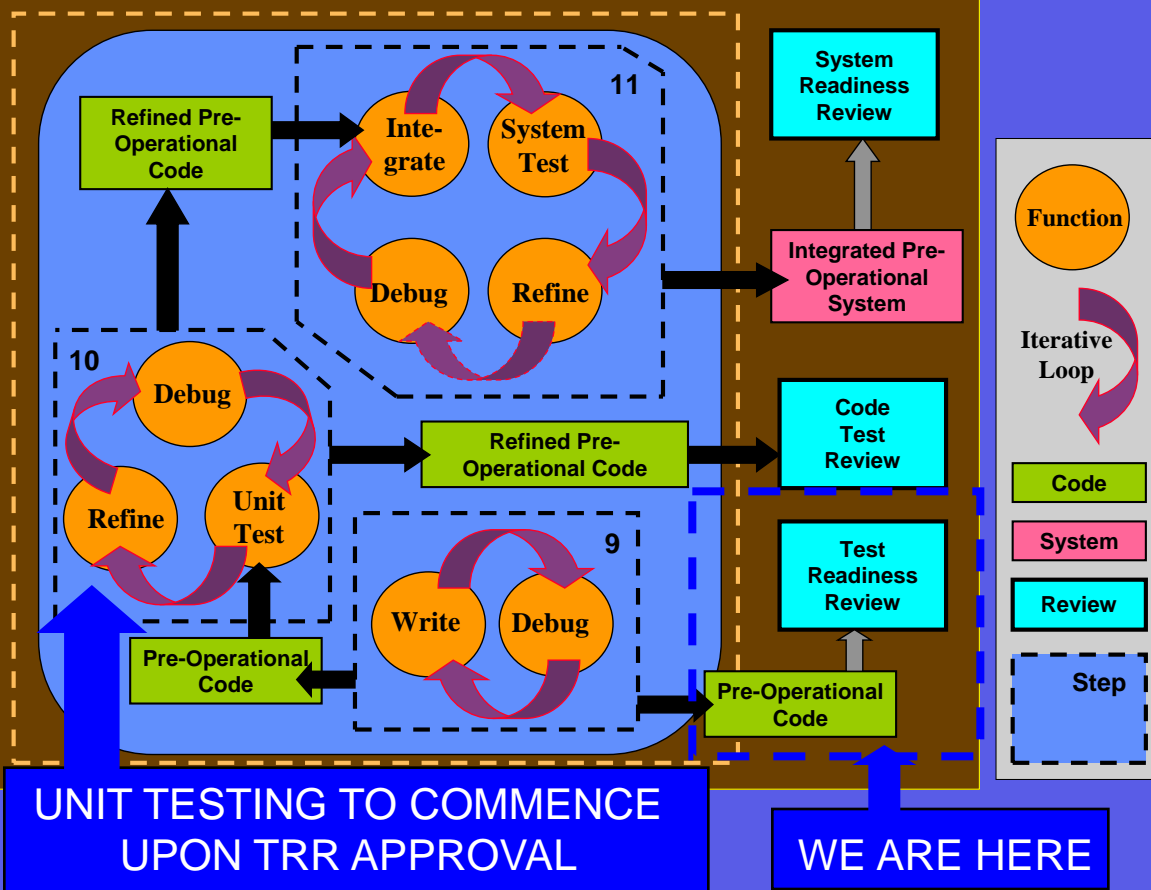


Unit Testing Within the Build Phase



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Build Phase of the STAR EPL (Three turns of the spiral = Steps 9, 10, 11)



- Code development, testing, and integration is inherently iterative
 - Unit code is written and debugged until it can be compiled and run to produce expected outputs ✓
 - Test data are developed to test the code's functional performance and quality of outputs ✓
 - Unit tests reveal deficiencies that are corrected through code refinement
 - Refined units are integrated into an end-to-end pre-operational system that is tested and refined until all requirements are met
- The standard practices of the STAR EPL Build phase accommodate this iterative nature by including feedback loops between code and test data development, code test and refinement, and system integration and testing



Verification and Validation



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- Verification is the formal process of confirming that the requirements specified for a specific product or system are satisfied by the completed product or system.
- Validation is a process of evaluation, integration, and test activities conducted to ensure that the final developed system will satisfy the needs and expectations of customers, users, and operators
- In a well-designed system, needs and expectations are completely captured by the requirements allocation. In that case, there is no meaningful distinction between verification and validation
- The methods and planned activities for verification and validation of the project's process and products constitutes the project verification and validation plan



Project Requirements Have Been Established and Refined

- Established at Preliminary Design Review (PDR)
 - » Preliminary Design Document (PDD)
 - » Preliminary Design Review Report (PDRR)
 - » Requirements Allocation Document (RAD) v1r0
- Refined for Critical Design Review (CDR)
 - » Critical Design Document (CDD)
 - » Requirements Allocation Document (RAD) v1r1
- Modified for Test Readiness Review (TRR)
 - » Test Readiness Document (TRD – this presentation)
 - » **Requirements Allocation Document (RAD) v1r3**

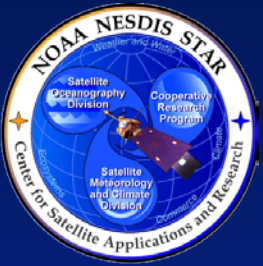


Requirements Allocation Document



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- Requirements Allocation Document (RAD)
 - » RAD v1r3, a TRR artifact, can be obtained at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TR_R.php
 - » RAD Document Guidelines in STAR EPL process asset DG-6.2 http://www.star.nesdis.noaa.gov/star/EPL_index.php
- The RAD contains the basic and derived requirements for the work products.
- RAD v1r3 includes minor modifications to the requirements, based on issues that occurred during code development (step 9)



GVF

Basic Requirements (1)

- 0) The Green Vegetation Fraction (GVF) NOAA-Unique Product development project shall adopt the standard practices of the STAR Enterprise Product Lifecycle (EPL), as established in the STAR EPL process assets v3.0
- 1) The GVF system shall generate a global gridded Weekly GVF product, called the "GVF Global Product"
- 2) The GVF system shall generate a regional gridded Weekly GVF product, called the "GVF Regional Product"
- 3) The GVF system shall have a data ingest capability
- 4) The GVF system shall implement the GVF Algorithm to generate a retrieval of GVF



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GVF

Basic Requirements (2)

- 5) The GVF system shall generate a metadata product for the NCDC CLASS archive facilities.
- 6) The GVF system shall have QC monitoring capability
- 7) The GVF developers shall produce fully functional software units in the STAR Development Environment
- 8) The GVF system shall be transitioned from the STAR Development Environment to the NDE SADIE
- 9) The GVF system shall be transitioned from the SADIE to the NDE System Test Environment

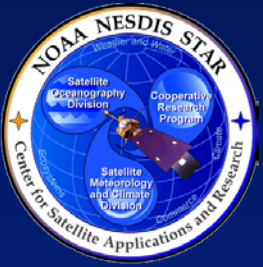


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GVF

Basic Requirements (3)

- 10) The GVF developers shall deliver to NDE a final Delivered Algorithm Package (DAP # 3)
- 11) The GVF developers shall perform validation of the Weekly GVF product
- 12) The GVF system shall comply with OSPO Code Review Security check lists
- 13) The GVF developers shall specify IT resource needs for operations



New Requirements Since Delta CDR



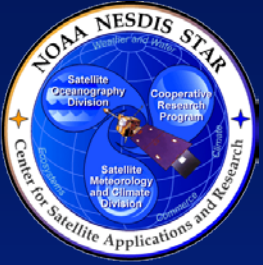
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- NONE



New Derived Requirements Since Delta CDR

- NONE



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Requirements Removed Since Delta CDR

- 4 derived requirements have been removed since the Delta CDR
 - » GVF-R 8.5.1
 - » GVF-LST-R 8.5.2
 - » GVF-LST-R 9.4.1
 - » GVF-LST-R 9.4.2



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Removed Requirements 8.5.1 and 8.5.2

- GVF-R 8.5.1: *Changes to the SADIE code baseline shall be controlled by NDE CM*
 - » **Characterization**: Derived, System, Functional
 - » **Analysis**: Removed.
- GVF-R 8.5.2: *Changes to the SADIE code baseline shall follow the NDE change control process*
 - » **Characterization**: Derived, System, Functional
 - » **Analysis**: Removed.



Removed Requirements 9.4.1 and 9.4.2

- GVF-R 9.4.1: *Changes to the NDE STE code baseline shall be controlled by NDE CM*
 - » **Characterization**: Derived, System, Functional
 - » **Analysis**: Removed.
- GVF-R 9.4.2: *Changes to the NDE STE code baseline shall follow the NDE change control process*
 - » **Characterization**: Derived, System, Functional
 - » **Analysis**: Removed.



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Requirements Changed Since Delta CDR

- 13 derived requirements have been changed since the Delta CDR
 - » GVF-R 2.1
 - » GVF-R 2.1.1
 - » GVF-R 2.1.2
 - » GVF-R 2.6
 - » GVF-R 3.1.1
 - » GVF-R 8.3.1
 - » GVF-R 8.4
 - » GVF-R 8.5
 - » GVF-R 9.0
 - » GVF-R 9.1
 - » GVF-R 9.2.1
 - » GVF-R 9.3
 - » GVF-R 9.4



Changed Requirements 2.1 and 2.1.1



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- GVF-R 2.1: *The GVF Regional product shall consist of 1 regional map*
 - » **Change Analysis:** Number of maps previously undetermined
- GVF-R 2.1.1: *Regional map 1 shall extend 130 degrees longitude eastward to 30 degrees east*
 - » **Change Analysis:** Old requirement did not specify map boundaries

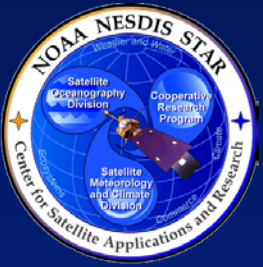


Changed Requirements 2.1.2 and 2.6



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- GVF-R 2.2: *Regional map 1 shall extend 90 degrees north latitude southward to 7.5 degrees south latitude*
 - » **Change Analysis:** Requirement was previously a placeholder
- GVF-R 2.6: *The GVF Regional Product shall have an accuracy error $\leq 10\%$*
 - » **Change Analysis:** Requirement previously read “less than” ($<$) instead of “less than or equal to” (\leq)

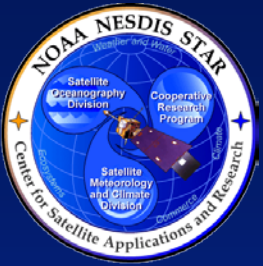


Changed Requirements 3.1 and 8.3.1



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- GVF-R 3.1.1: *The NPP VIIRS data shall be ingested from CLASS*
 - » **Change Analysis:** Ingest from CLASS has been confirmed
- GVF-R 8.3.1: *The GVF development team shall ensure that NDE has the information needed to acquire DAP # 1 from the internal FTP site.*
 - » **Change Analysis:** NDE CM changed to NDE



Changed Requirements 8.4 and 8.5



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- GVF-R 8.4: *The GVF developers shall perform unit testing in the STAR Development Environment, in accordance with the UTP*
 - » **Change Analysis:** SADIE changed to STAR Development Environment
- GVF-R 8.5: *The GVF developers shall refine the code and unit test data in the STAR Development Environment during their unit testing*
 - » **Change Analysis:** SADIE changed to STAR Development Environment



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Changed Requirements 9.0 and 9.1

- GVF-R 9.0: *GVF-R 9.0: The GVF refined pre-operational system shall be transitioned from the STAR Development Environment to the NDE SADIE*
 - » **Change Analysis:** SADIE changed to STAR Development Environment
- GVF-R 9.1: *The GVF refined pre-operational system shall be transferred to NDE as a Delivered Algorithm Package (DAP # 2)*
 - » **Change Analysis:** NDE STE changed to NDE



Changed Requirements 9.2.1 and 9.3

- GVF-R 9.2.1: *The GVF development team shall ensure that NDE has the information needed to acquire DAP # 2.*
 - » **Change Analysis:** NDE CM changed to NDE
- GVF-R 9.3: *The GVF developers shall perform system testing in the STAR Development Environment, in accordance with the STP*
 - » **Change Analysis:** NDE STE changed to STAR Development Environment

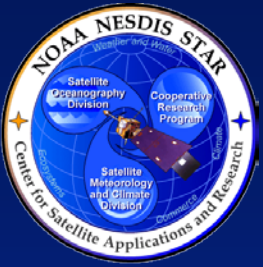


Changed Requirements 9.4



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- GVF-R 9.4: *The GVF developers shall refine the code and system test data in the STAR Development Environment during their system testing*
 - » **Change Analysis:** NDE STE changed to STAR Development Environment



Allocation of Requirements



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- To ensure that the system design will meet requirements, the requirements are allocated to components of the software system
- The software system is an integrated collection of software elements, or code, that produce well-defined output products from a well-defined set of input data, thereby implementing the algorithm that has been developed to meet product requirements and system requirements
- These software elements are identified as components of the product processing system



Software Architecture

- The software architecture organizes these components into an integrated framework that describes the structure of the system and the external and internal data flows between software elements
- The software architecture provides the framework for the detailed design
 - » The bridge between the detailed design and the requirements

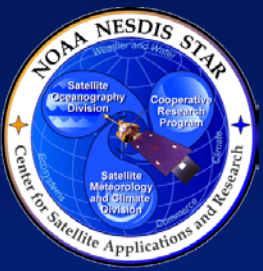


Software Architecture Documentation



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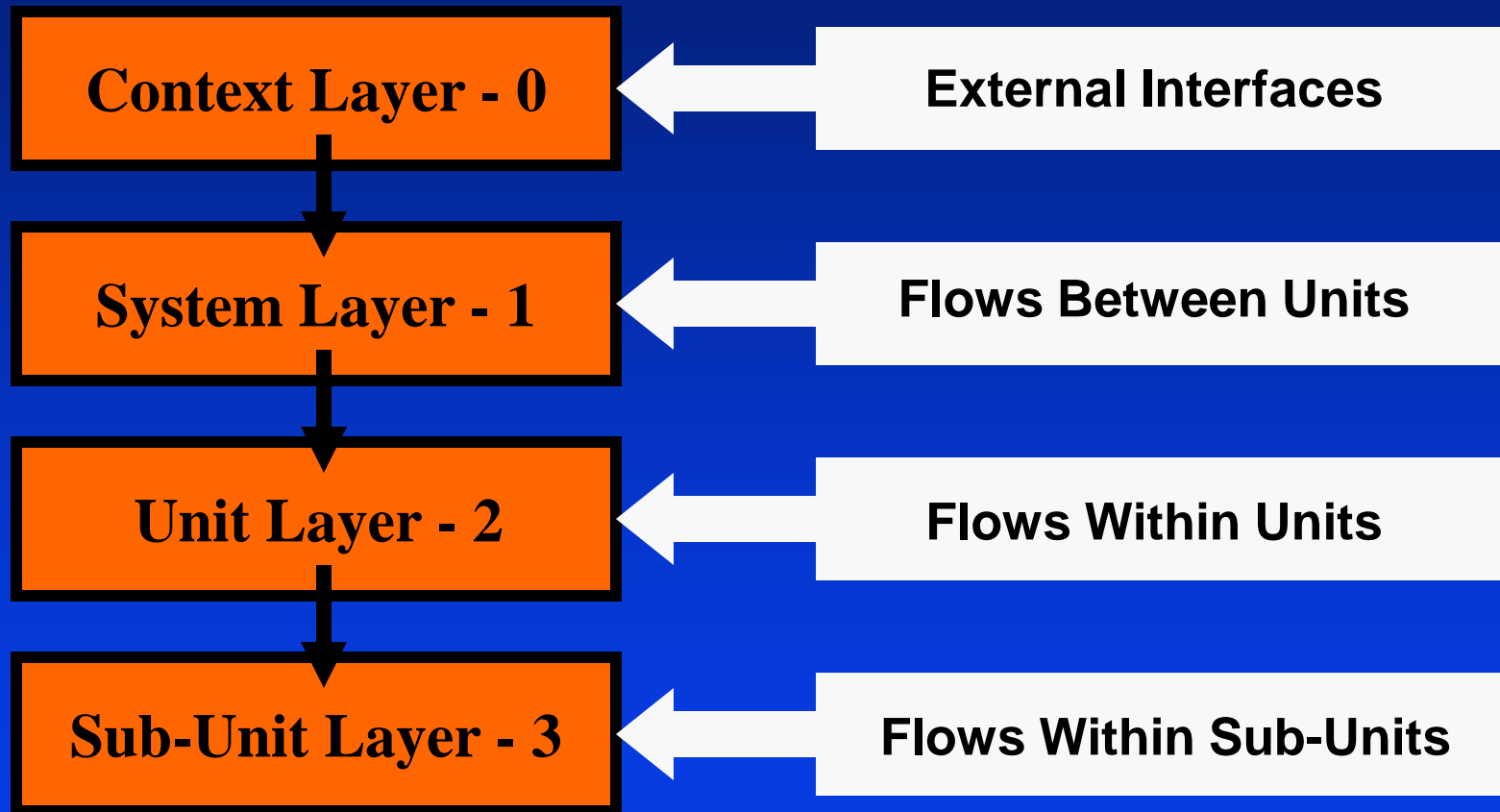
- The software architecture is described in the Software Architecture Document (SWA)
 - » SWA Guidelines in STAR EPL process asset DG-1.2
http://www.star.nesdis.noaa.gov/star/EPL_index.php
 - » SWA v1r2, a TRR artifact, is available at
https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php
 - » Purpose: Provide a description of the software components and data flows for the processing code that will implement the algorithm for the retrieval of GOES LST data products



Detailed Design Software Architecture



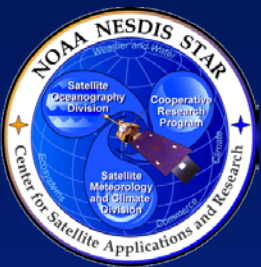
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The Context-Layer

- The Context-Layer describes the flows between the system and its external interfaces
- An external input is defined as a data source needed by the system that is produced or made available by a process external to the system
- An external output is defined as a data sink that is produced by the system for an external user



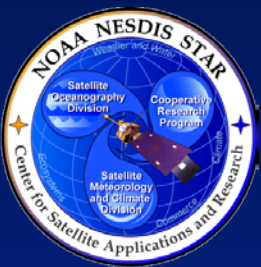
GVF

External Inputs



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Item	Type	Source	Description
Surface reflectance (IVISR)	Input	NPP/JPSS	VIIRS surface reflectance in I1, I2, and M3 bands (IVISR granule file). The QF data layers of surface reflectance include the cloud mask adapted from the official cloud mask IICMO granule.
Geolocation (GIMGO)	Input	NPP/JPSS	VIIRS geolocation and solar-view geometry for imagery resolution I1, I2 bands (GIMGO granule file). The moderate resolution geolocation granule is not explicitly needed for the moderate resolution M3 band and the cloud mask because of the nesting of imagery resolution pixels within moderate resolution pixels and the nearest-neighbor resampling used in gridding by this project.
Global Max/Min EVI	Input	GVF	The global maximum and minimum EVI values for the VIIRS instrument. Two numbers.
Water mask	Input	GVF	Derived from MODIS global water mask (MOD44W) by projecting to the internal GVF grid.
Previous Weeks Weekly EVI	Input	GVF	Weekly EVI for previous 14 weeks on 0.003° grid in HDF5. This is produced by the GVF production system as intermediate output and saved locally.



GVF

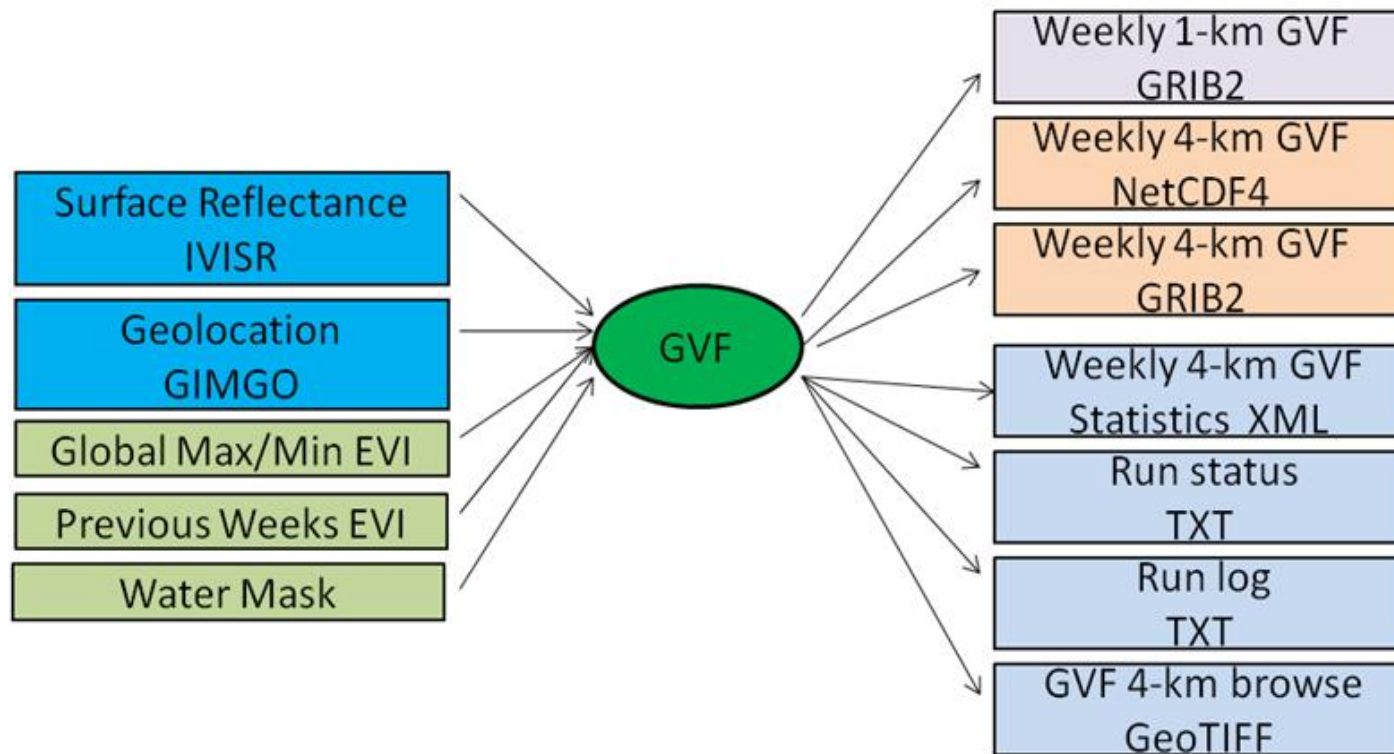
External Outputs

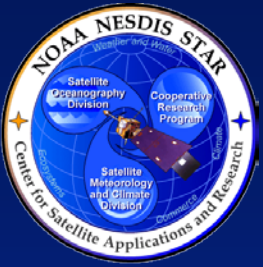


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Item	Type	Source	Description
Weekly 1-km GVF GRIB2	Output	GVF	Weekly GVF on 0.009° grid in GRIB2
Weekly 4-km GVF NetCDF4	Output	GVF	Weekly GVF on 0.036° grid in NetCDF4
Weekly 4-km GVF GRIB2	Output	GVF	Weekly GVF on 0.036° grid in GRIB2
Weekly 4-km GVF Statistics XML	Output	GVF	Statistics of 4-km GVF on 0.036° grid for selected areas and sites. Used in monitoring the production process at OSPO (not for distribution)
GVF status file	Output	GVF	The execution status report of GVF processes. Used in monitoring the production process at OSPO (not for distribution)
GVF log file	Output	GVF	The execution progress report of major GVF processes. Used in monitoring the production process at OSPO (not for distribution)
GVF browse GeoTIFF	Output	GVF	Weekly GVF browse image in GeoTIFF used in monitoring the production process at OSPO (not for distribution)

GVF Context-Layer





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The System-Layer

- The System-Layer data flow expands upon the Context-Layer data flow, showing the first layer of decomposition.
 - » In addition to the System-Layer inputs and outputs, the major processing units are shown along with their inputs and outputs.
 - » Each unit is designed as a stand-alone program for ease of testing and integration into a System-Layer scheduler.

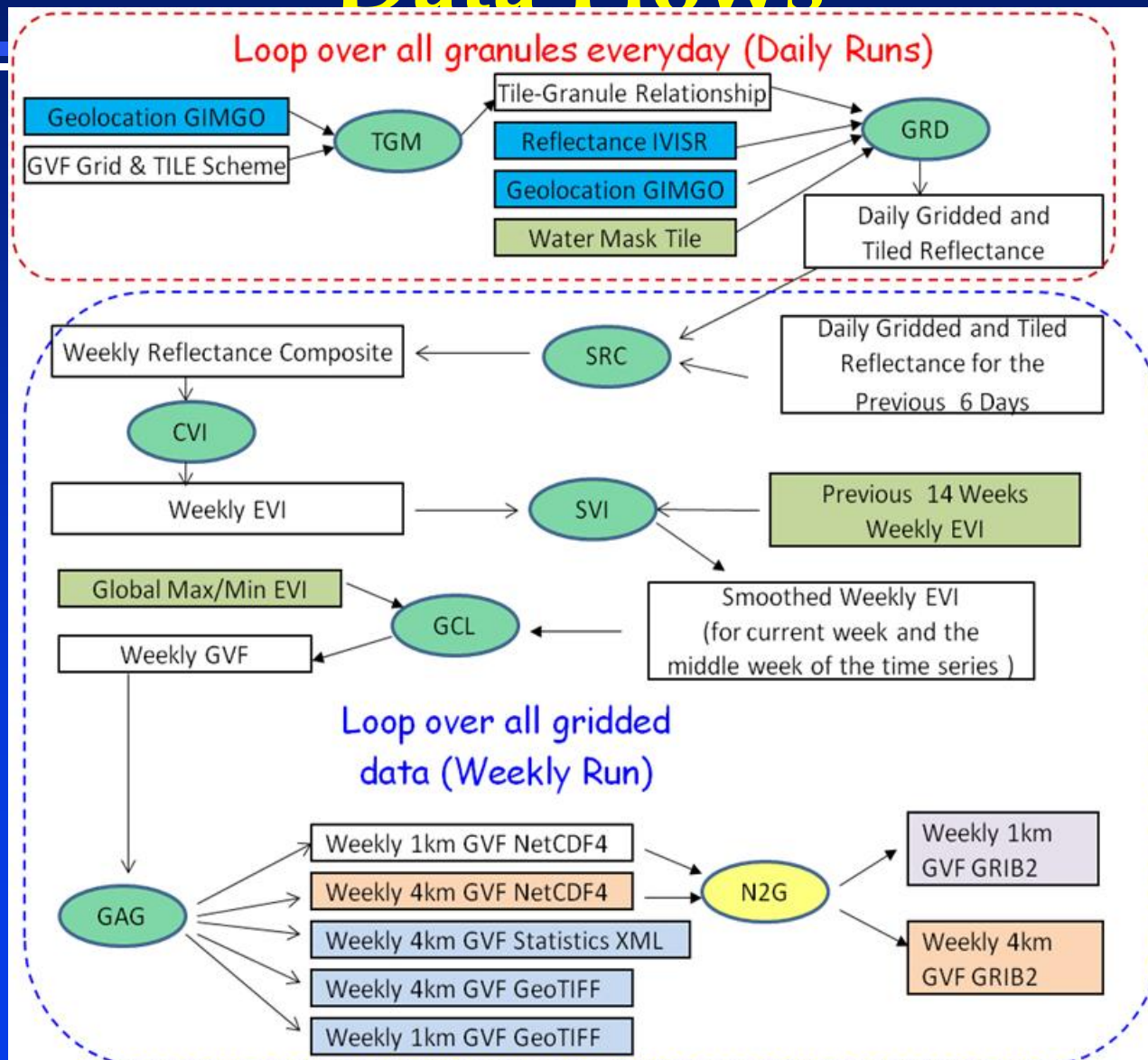


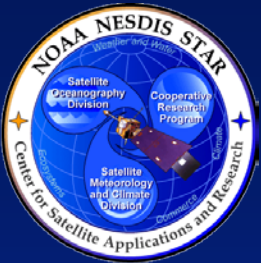
The System-Layer – Software Units



- The system layer of the GVF software consists of six processing units and their data flows:
 - » Tile-Granule Mapper (TGM)
 - » Surface Reflectance Gridder (GRD)
 - » Surface Reflectance Compositor (SRC)
 - » Smooth EVI (SVI)
 - » GVF Calculator (GCL)
 - » GVF Aggregator (GAG)
- The System layer data flows are shown in the next slide

GVF System-Layer Data Flows





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System-Layer Components – Processing Units (1)

- Tile-Granule Mapper (TGM)
 - » Derives the spatial relationship between each tile and the input granules that specifies for each tile which input granules fall on the tile.
 - » This relationship is critical for a tile-based gridding of VIIRS observations.
 - » The 0.003° GVF grid is subset into 18° x 18° tiles. Once TGM has established the spatial relationship, all subsequent processing will be tile-based.



System-Layer Components – Processing Units (2)



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- Surface reflectance gridder (GRD)
 - » For a given tile of the GVF grid system, grids I1, I2, M3 bands surface reflectance from the granules that fall on the given tile. Processes each tile in a loop over all granules falling on the given tile for the day.



System-Layer Components – Processing Units (3)



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- Surface reflectance compositor (SRC)
 - » Composites the multiple gridded surface reflectance observations of 7 days with a GVF-specific compositing rule.
 - » Compositing is needed primarily in selecting the best observation from the gridded surface reflectance data of 7 days. It may also be needed in producing the gridded daily surface reflectance data; for locations where multiple observations are available for a day, the best observation is selected using the compositing rule and written into the gridded daily data.



System-Layer Components – Processing Units (4)

- Smooth EVI (SVI)
 - » Temporally gap fills and smooths the weekly EVI using the daily rolling weekly EVI of the current week and the previous 14 weeks.
 - » Processes each tile 1 a loop.
- GVF Calculator (GCL)
 - » Calculates weekly 0.003 degree GVF after the weekly EVI has been time series gap filled and smoothed. Processes each tile in a loop.
- GVF Aggregator (GAG)
 - » Aggregates the 0.003 degree GVF multiple tiles to the 0.009° regional GVF product and 0.036° global product in NetCDF4 format. Also generates and writes statistics of 0.036° GVF for selected areas and sites in XML and generates GVF Geo-TIFF browse image. A single GVF file is created for each resolution.



System-Layer Components – Unit Data Flows (1)

- Daily Gridded Reflectance
 - » Data Flow: From GRD Unit to SRC Unit
 - » Description: Surface reflectance in I1, I2, and M3 bands mapped onto the tiles of the GVF grid (0.003 degrees), with water pixels filtered out, cloud mask information and sun-view geometry information is retained. Separate file for each tile. Due to lateral overlap of two adjacent orbital data, multiple observations of the same location are possible during a day, especially for high latitude regions, therefore the daily gridded reflectance may be the best of the gridded reflectance observations in a day, selected using a compositing rule.
- Weekly Updated Reflectance Composite
 - » Data Flow: From SRC Unit to CVI Unit
 - » Description: I1, I2, and M3 band surface reflectance composite generated from daily gridded reflectance of the last 7 days. Separate file for each tile.



System-Layer Components – Unit Data Flows (2)

- Weekly EVI
 - » Data Flow: From CVI Unit to SVI Unit
 - » Description: The unsmoothed weekly EVI for the current week derived from the weekly reflectance composite. It inherits the cloud mask in the input composite but discards the sun-view geometry information.
- Previous Weeks Weekly EVI
 - » Data Flow: From CVI Unit (for previous weeks) to SVI Unit
 - » Description: The unsmoothed weekly EVI for the previous 14 weeks. Separate files for each tile.



System-Layer Components – Unit Data Flows (3)

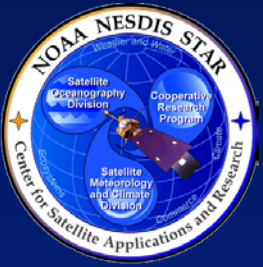
- Smoothed Weekly EVI
 - » Data Flow: From SVI Unit to GCL Unit
 - » Description: The gap filled and smoothed EVI by using a time series of weekly EVI from the current week and the past 14 weeks. Smoothed EVI is generated for current week and the middle week of the time series, and will be used to calculate GVF for respective weeks.
- Weekly GVF
 - » Data Flow: From GCL Unit to GAG Unit
 - » Description: Weekly GVF derived from the smoothed EVI on the GVF grid (0.003°), in HDF5 format. This is the intermediate product from which the final, coarser resolution GVF products will be derived. Separate file for each tile.



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The Unit Layer

- The Unit Layer Data Flow decomposes the system level software architecture to the next (unit) level.
- In this layer, the data flows within units are described.
- Typically, sub-units are identified
- The unit layer data flows for each unit will be described in the Sections to follow



The Sub-Unit Layer

- The Sub-Unit Layer software architecture provides the internal data flows for each of the Unit Layer software Sub-units.
- In this layer, the data flows within sub-units are described.
- The unit layer data flows for each unit will be described in the Sections to follow



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Detailed Design

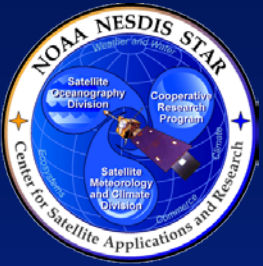
- The detailed design builds on the software architecture by providing a detailed description of each system element that is defined in the software architecture
 - » Its purpose is to describe the product design at a level of detail that is sufficient for development programmers to write fully functional pre-operational code



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Software Detailed Design

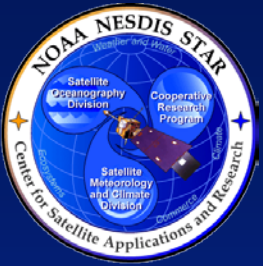
- The software detailed design describes the project system's software functionality and design characteristics at a level of detail that covers, for each software element:
 - » Its purpose
 - » External interfaces
 - » Decomposition into sub-elements
 - » Functional sequence
 - » Design Language
 - » Input and Output File Descriptions



Software Detailed Design Documentation



- The detailed design of each software unit is described in a Detailed Design Document (DDD)
 - » DDD Guidelines in STAR EPL process asset DG-8.1 at http://www.star.nesdis.noaa.gov/star/EPL_index.php
 - » DDD v1r2, a TRR artifact, is available at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php
- The content of the DDD overlaps to some extent with the content of the System Maintenance Manual (SMM) Appendix.
 - » The DDD differs from the SMM in its detailed focus on code component design and design language. Its target audience is code development programmers.
 - » The SMM is targeted at operations and maintenance personnel and focuses on providing the information needed to locate all input, intermediate and output data sets of the operational product processing system, ensure their availability, and identify and correct processing errors.
 - » The SMM will be produced during the Build phase

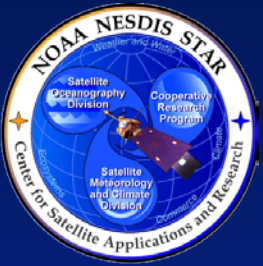


Grids and Tiles



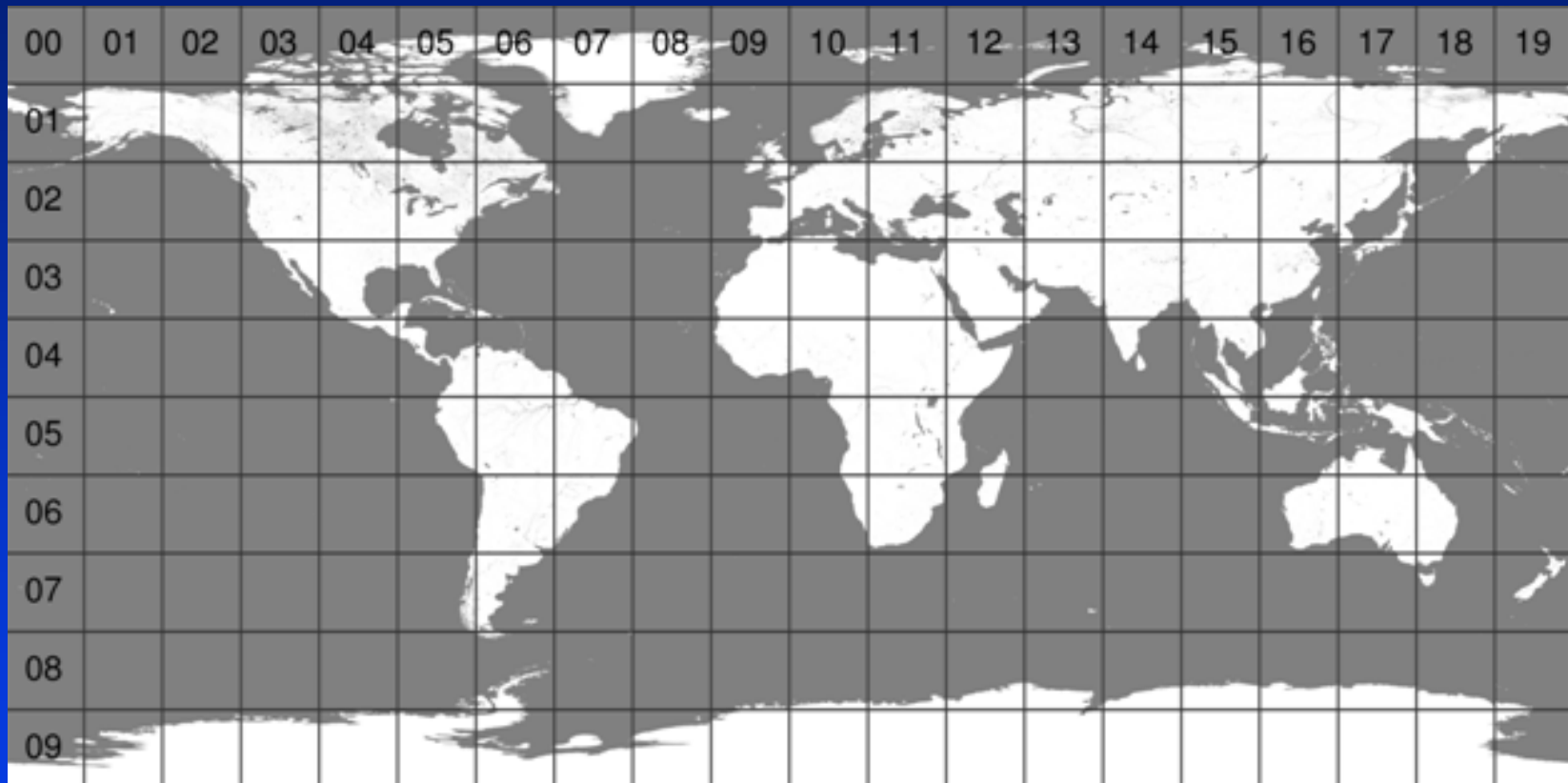
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- The GVF grid system is defined in a latitude/longitude projection at a 0.003° spatial resolution, approximately 333 meters near the equator. This resolution is a compromise of the VIIRS imagery **resolution** band nadir resolution in the along-track and across-track directions.
- Due to the huge data volume globally at 0.003° , the GVF grid is subset into square tiles, 20 tiles horizontally and 10 tiles vertically. As a result, each tile is $18^\circ \times 18^\circ$, with 6000 x 6000 pixels (**see next slide**).
- After the GRD unit projects the VIIRS observations from granules into the predefined GVF grids, all subsequent processing is carried out in tiles, before GVF values are aggregated to regional and global resolutions.

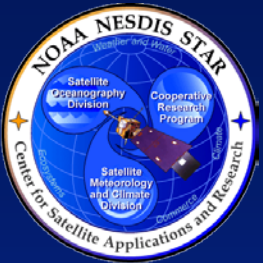


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The GVF Tile Scheme



The upper-left corner of the tile map is 180° W, 90° N. Each tile is $18^{\circ} \times 18^{\circ}$, with 6000×6000 0.003° pixels. The background of the GVF tiles is created from the MODIS water mask (MOD44W). Only tiles that contain land and are not Antarctic (termed Tiles of Interest (TOI)) are processed.



C++ Classes

- All units of the GVF Product processing system are written in C++.
- There are **nine** C++ classes used for GVF processing

Class name	Major functions	Associated data files	Used by unit
AllGranule	Manage the filenames of the reflectance, and geolocation filenames for each of the granules of a day.	List of each day's IVISR-GIMGO granule pairs	TGM, GRD,
GranuleIndex	Works in conjunction with AllGranule class in the TGM unit		TGM
SurfRefl	Read the surface reflectance in I1, I2, M3 and imbedded cloud mask for the given granule file.	IVISR in HDF5	GRD, SRC
GeoLoc	Read the lat/lon, sun/view angles for the imagery resolution bands	GIMGO in HDF5	GRD
WaterMask	Tiled water mask derived for the GVF project from MODIS water mask MOD44W	Water mask in HDF for GVF Tile Of Interest	GRD
SRTile	Manage the gridded surface reflectance that is saved in tiles.	Gridded/composited surface reflectance composite in HDF5	GRD, SRC, CVI
EVI	Manage the EVI (unsmoothed directly from reflectance composite, or smoothed from a time series of unsmoothed)	Surface reflectance composite in HDF5	CVI SVI
GVF	Manage the 0.003° GVF computed from smoothed EVI	EVI in HDF5	SVI GAG
nc4GVF	Manage the aggregated GVF	Final GVF in NetCDF5	GAG

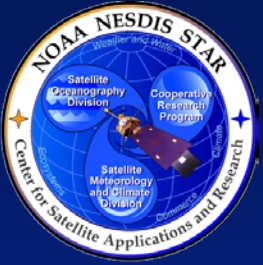


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Utility Functions

File name	Major functions
GVFUtil.cpp	<p>Check I/O exception</p> <p>File/directory operation</p> <ul style="list-style-type: none"> • Make a directory • Get directory name of a file • Check if a file exists • Get file base name • Replace extension of a file <p>Date/Time operation</p> <ul style="list-style-type: none"> • Get month and day given day_of_the_year and year • Get day_of_the_year given year, month, and day • Generate the time stamp string used in naming output files <p>Functions for observation selection in compositing</p> <ul style="list-style-type: none"> • Compute SAVI • Compute view-angle adjusted SAVI <p>Functions for time series smoothing</p> <ul style="list-style-type: none"> • Fill gaps in time series • Digital smoothing filter for removing high frequency noise

- Many of the C++ classes use functions coded in file "GVFUtil.cpp"



AllGranule Class

```
class AllGranule
{
    public:
        /* Constructor and destructor */
        AllGranule(char *listname);
        ~AllGranule();

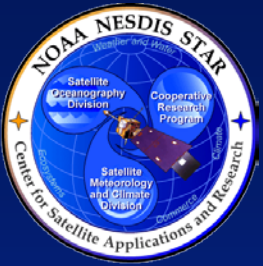
        /* Read the granule names into private arrays. */
        int readdata();

        /*Get filenames of IVISR and GIMGO granules at
        the given array index in the filename arrays.
        */
        int GranName(int igran, char *fname_ivisr, char
        *fname_gimgo);

        /* Return the number of granules */
        int ngranule();

    private:
        .
        .
};
```

- The AllGranule class is a very simple container class used to manage all the input surface reflectance IVISR and geolocation GIMGO granule filename pairs.



GranuleIndex Class

```
class GranuleIndex
{
public:
/* constructor and destructor */
GranuleIndex();
~GranuleIndex();
/* Add the index of a granule to the set if it is not yet
in the list. As many edge pixels will fall on the same
tile, it is important only to keep unique indices.
Return 0 for success and non-0 for failure.
*/
int addindex(int idx);
/* Pop out an index each time the function is called,
until the set is empty.
Return -1 if the set is empty before pop.
*/
int popindex();
/* Return the number of indices in the set */
int ngran();
private:
...
};
```

- The This is another simple class that is used by the TGM unit for each tile to save the indices of the overlapping granules in the complete granule list represented by class AllGranule.
- As the edge pixels of the imagery resolution granules are projected into the tiled GVF grid system, the unique indices of all granules overlapping with a tile are recorded by this class.
- As many edge pixels will fall on the same tile, it is important only to keep the unique indices.
- At the end the TGM unit prints a subset of the granule list for each tile based on the indices.



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WaterMask Class

```
class WaterMask
{
public:
    /* Constructor and destructor */
    WaterMask();
    WaterMask(char *fname);
    ~WaterMask();

    /* Read water mask. Return 0 on success and non-zero
on failure */
    int readdata();

    /* Public member variables */
    int nrow;
    int ncol;
    unsigned char *wm;    /* Do not read the water mask
QA */

private:
}
}
```

- The 0.003° water mask in individual $18^\circ \times 18^\circ$ tiles of the GVF grid, derived from the 250-meter MODIS water mask MOD44W. It is used in gridded to discard the water pixels.



SurfRefl Class

```
class SurfRefl
{
    public:
    SurfRefl(char *filename);
    ~SurfRefl();
    int readdata();

    int nrow_img;
    int ncol_img;
    int nrow_mod;
    int ncol_mod;

    float *i1;
    float *i2;
    float *m3;
    unsigned char *qf1;

    private:
    char fname[MAX_STR_LEN];
    bool isDataReadIn;
};
```

- The **SurfRefl class** is used for reading surface reflectance from a granule file
- Surface reflectance in I1, I2, and M3 are read



GeoLoc Class

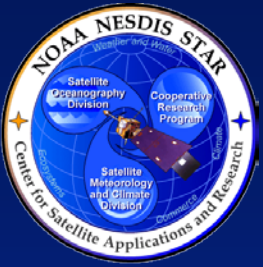
```
class GeoLoc
{
    public:
        /* Constructor and destructor */
        GeoLoc(char *filename, char *resolution_type);
        ~GeoLoc();
        bool readdata();

        int nrow;
        int ncol;
        short doy;
        float *lon;
        float *lat;
        float *sz;
        float *sa;
        float *vz;
        float *va;

        private:
        char fname[MAX_STR_LEN];

};
```

- The **GeoLoc class** is used for reading the imagery and moderate resolution geolocation from given filenames.
- Structurally the GeoLoc class is very similar to the SurfRefl class



SRTile Class

```
class SRTile
{
public:

/* Constructor and destructor */
SRTile();
SRTile(char *filename);
~SRTile();

int htile;    /* Horizontal tile ID */
int vtile;    /* Vertical tile ID */
int nrow;     /* number fo rows (6000) */
int ncol;     /* number of columns (6000) */

float *i1;
float *i2;
float *m3;
float *sz;
float *sa;
float *vz;
float *va;
unsigned char *qf1;
```

The **SRTile class** can be used to store tiled surface reflectance, which can be either the gridded reflectance before compositing or the composited surface reflectance.

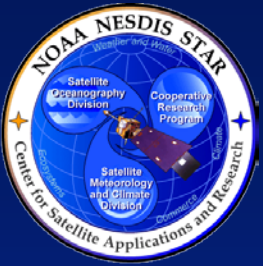
```
/* member functions */
int allocmem();
int open();

void take(obs_t obs, int k);
/*void replace(obs_t pix, int k);

/* Bowtie-effect correction. Due to the use of fine
spational resolution and the
nearest neighbor resampling, the bowtie effect is
very clear at the scan edge.
*/
int btcorrect(unsigned char
*wmask);

private:
char fname[MAX_STR_LEN];
.
.

};
```

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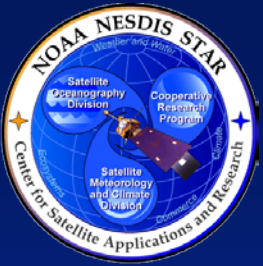
EVI Class

```
class EVI
{
public:
    EVI(char *filename, int nrow, int ncol, bool createfile);
    ~EVI();
    /* The dimension */
    int nrow;
    int ncol;
    float *evi;
    unsigned char *qf1;          /* Cloud mask */

    int open();
    int write();

private:
    ...
}
```

- The EVI Class is used to save the computed EVI
- It has only two data layers, one EVI, one cloud mask inherited from the composite.



GVF Class

The GVF Class

```
class GVF
{
public:
    /* Constructor: The flag createfile indicates
    whether a GVF is to be created
    or an existing file is to be read.
    */
    GVF(char *filename, int nrow, int ncol, bool
createfile);
    ~GVF();

    /* The dimension of the GVF tile; save as
    reflectance composite tile */
    int nrow;
    int ncol;

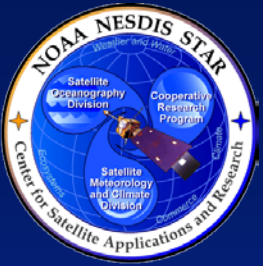
    /* Calculated gvf and the retained cloud
    mask */
    unsigned char *gvf;
    unsigned char *qf1;
```

```
    /* Create or open a GVF file.
    Return 0 on success, and non-zero on
    failure.
    */
    int open();

    /* Write the created GVF file; no need to
    call this if an existing GVF file is opened for
    read.
    Return 0 on success, and non-zero on
    failure.
    */
    int write();

    char fname[MAX_STR_LEN];

private:
}
```



nc4GVF Class

```
class nc4GVF
{
public:
    nc4GVF(char *filename, char extent, int nrow, int ncol, bool
createfile);
    ~nc4GVF();

    int nrow;
    int ncol;
    unsigned char *gvf;
    unsigned char *npix; /* Number of land pixels used in
averaging */
    int open();

    /* Set the private variable to the parameter, which is to be used
for metadata */
    void set_creation_time(char *datetime_for_metadata);

    int write();

private:
    int add_global_attributes();
    int add_statistics();
};
```

- The nc4GVF Class is used to store the aggregated GVF and write it to NetCDF4 file.
- The 3x3 average and 12x12 average GVF is computed; the number of land pixels used to derive the averages are also written to the output.



Requirements Allocation – Overview



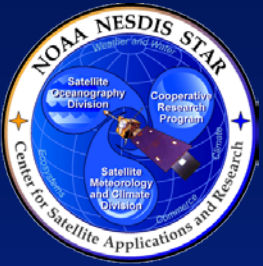
- In RAD v1r3, 159 requirements (basic and derived) are identified
- Requirements allocation associates each of these requirements with one or more system and product components of the system design.
- The detailed design includes 90 of these components.
 - » Each of these is described in the Verification and Validation Plan (VVP)
- The Detailed Design Allocation consists of the allocation of the 159 requirements to the 90 detailed design components.



Requirements Allocation Sheet (RAS)



- The allocation of requirements to components forms a matrix, called the Requirements Allocation Sheet (RAS)
- The RAS for the GVF Detailed Design Allocation will be documented as a Microsoft Excel worksheet in the file “GVF_RAS_1.2.xls”
- This file can be accessed at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php



Requirements Allocation Sheet



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A large, complex spreadsheet representing the Requirements Allocation Sheet (RAS). It features a grid with 159 rows and 90 columns. The grid is filled with various colored cells (green, yellow, blue, red) indicating different allocation states or priorities. A large brown arrow points from the text box on the right towards the spreadsheet.

- The Requirements Allocation is presented as a spreadsheet that is a matrix with 159 rows for the requirements and 90 columns for the design components
- We call this the Requirements Allocation Sheet (RAS)
- The RAS is documented as a Microsoft Excel worksheet in the file "GVF_RAS_1.2.xls". It can be found at http://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php

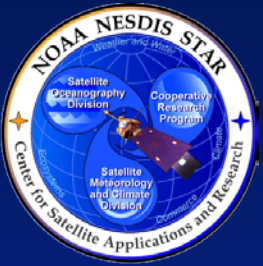


Verification and Validation Plan



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- The methods and planned activities for verification and validation of the project's process and products constitutes the project verification and validation plan, documented in the Verification and Validation Plan (VVP).
 - » VVP_1.2, a TRR artifact, can be accessed at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php
- The VVP describes the verification plan
 - » Items (work products) to be verified
 - » Verification methods and activities for each item
 - » Verification risks
- The VVP describes the validation plan
 - » Validation environments
 - » Validation of requirements
 - » Validation of operator needs
 - » Validation of user needs
 - » Validation of products



Verification Items

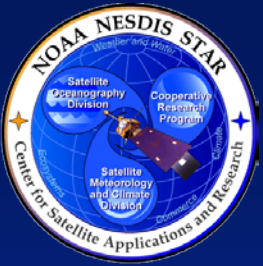
- There are **90** verification items in the detailed design. A description of each item is provided in VVP Section 2.2, along with an identification of the requirements that are allocated to the item, methods for verifying the item, and a description of activities planned to verify the item.
- These items and their associated requirements (“requirements trace”) are also identified in the Requirements Allocation Sheet (RAS) that is an Appendix to the Requirements Allocation Document (RAD).



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Verification Items 1 - 10

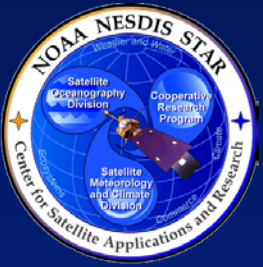
- 1) STAR EPL Process Assets v3.0
- 2) GVF Review Check Lists
- 3) GVF Artifact Repository
- 4) Subversion CM Tool
- 5) GVF Global GRIB2 File
- 6) GVF Global NetCDF4 File
- 7) GVF Global XML File
- 8) GVF Global TIFF File
- 9) GVF Regional GRIB2 Files
- 10) GVF Regional TIFF Files



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Verification Items 11 - 20

- 11) Log File
- 12) Run Status File
- 13) VIIRS Surface Reflectance File
- 14) VIIRS Cloud Mask File
- 15) VIIRS Geolocation Files
- 16) Land/Sea Mask
- 17) Global Max/Min EVI
- 18) Previous Weeks EVI
- 19) GRD Unit
- 20) RSR Sub-Unit



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Verification Items 21 - 30

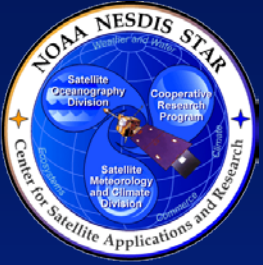
- 21) Surface Reflectance
- 22) RGE Sub-Unit
- 23) Geolocation
- 24) RWM Sub-Unit
- 25) Cloud Mask
- 26) GVD Sub-Unit
- 27) Gridded Reflectance Tile File
- 28) SRC Unit
- 29) RRC Sub-Unit
- 30) Gridded Reflectance



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Verification Items 31 - 40

- 31) MVC Sub-Unit
- 32) Weekly Reflectance Composite
- 33) WRC Sub-Unit
- 34) Reflectance Composite Files
- 35) SVI Unit
- 36) Weekly Reflectance
- 37) VIF Sub-Unit
- 38) Weekly EVI
- 39) Previous Weeks Smoothed EVI
- 40) Smoothed Weekly EVI



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Verification Items 41 - 50

- 41) WVI Sub-Unit
- 42) RVI Sub-Unit
- 43) GCL Unit
- 44) CG Sub-Unit
- 45) Non-aggregated GVF
- 46) WG Sub-Unit
- 47) Weekly GVF File
- 48) GAG Unit
- 49) RG Sub-Unit
- 50) AG Sub-Unit



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Verification Items 51 - 60

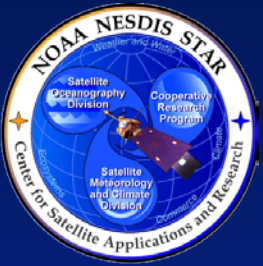
- 51) Aggregated GVF
- 52) WAG Sub-Unit
- 53) WS Sub-Unit
- 54) GBR Sub-Unit
- 55) TGM Unit
- 56) GON Sub-Unit
- 57) CVI Unit
- 58) DVI Sub-Unit
- 59) GRAVITE Interface
- 60) Unit Test Data



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Verification Items 61 - 70

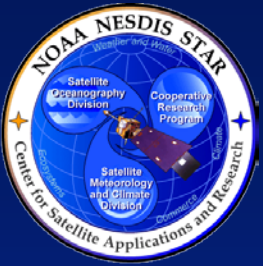
- 61) STAR/SADIE Interface
- 62) STAR/USGS Interface
- 63) System Test Data
- 64) Submission Agreement
- 65) GVF Development Server
- 66) GVF Development Project Plan (DPP)
- 67) GVF Project Baseline Report (PBR)
- 68) GVF Project Status Report (PSR)
- 69) GVF Gate 3 Document (G3D)
- 70) GVF Project Requirements Document (PRD)



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Verification Items 71 - 80

- 71) GVF Operations Concept Document (OCD)
- 72) GVF Algorithm Theoretical Basis Document (ATBD)
- 73) GVF Requirements Allocation Document (RAD)
- 74) GVF Requirements / Needs Matrix (RNM)
- 75) GVF Requirements Allocation Sheet (RAS)
- 76) GVF Software Architecture Document (SWA)
- 77) GVF Verification and Validation Plan (VVP)
- 78) GVF Detailed Design Document (DDD)
- 79) GVF Critical Design Document (CDD)
- 80) GVF Unit Test Plan (UTP)



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Verification Items 81 - 84

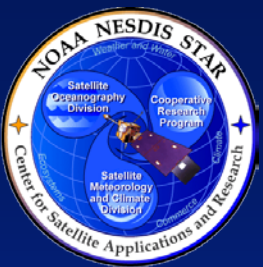
- 81) GVF Test Readiness Document (TRD)
- 82) GVF Unit Test Report (UTR)
- 83) GVF System Test Plan (STP)
- 84) GVF Code Test Document (CTD)
- 85) GVF External Users Manual (EUM)
- 86) GVF Internal Users Manual (IUM)
- 87) GVF System Maintenance Manual (SMM)
- 88) GVF Verification and Validation Report (VVR)
- 89) GVF System Readiness Document (SRD)
- 90) GVF System Readiness Review Report (SRRR)



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VVP for TRR

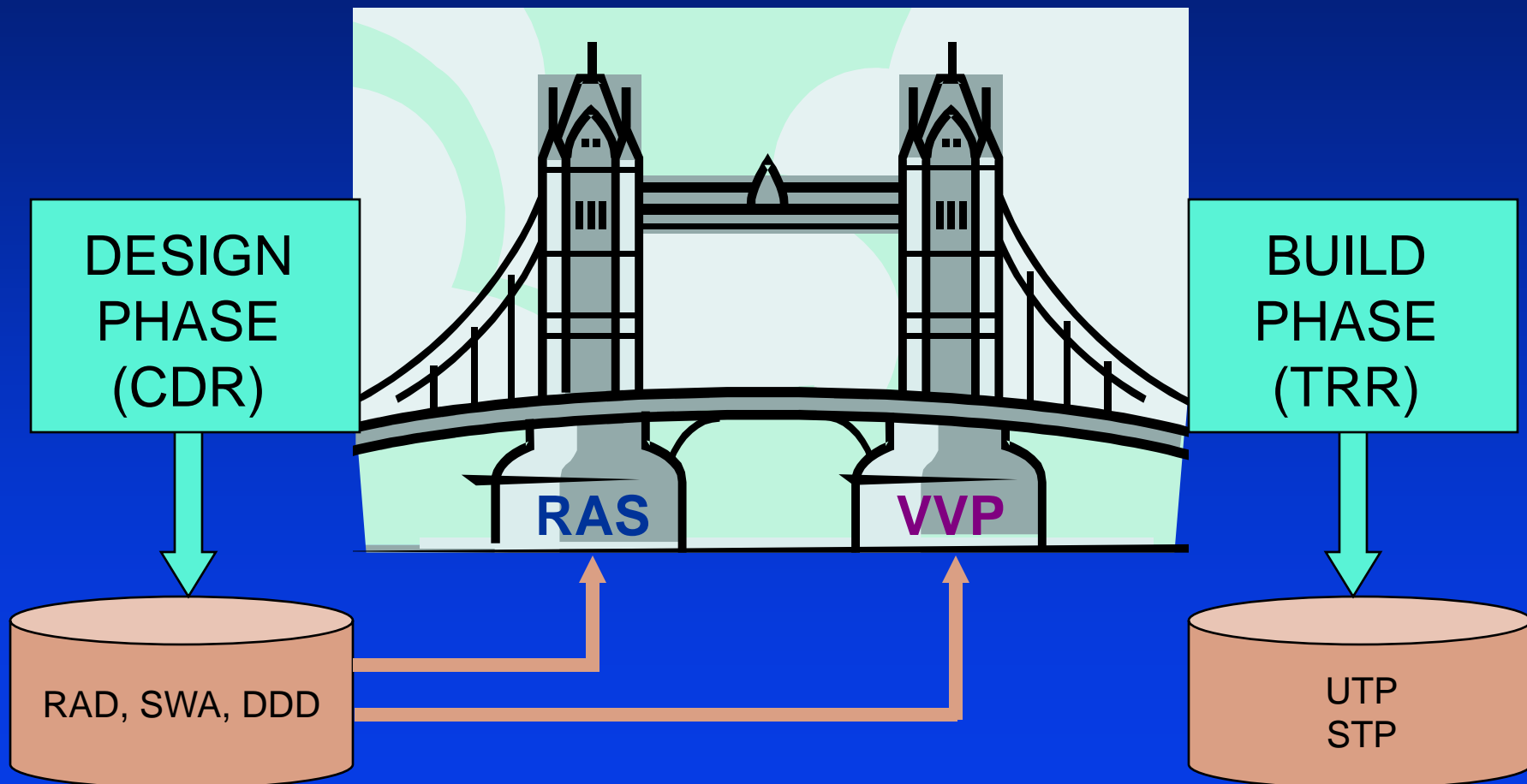
- The PDR version of the VVP addressed WHAT activities are planned for verification and validation of preliminary design components
- The version for CDR added verification of detailed design components
- The TRR version addresses HOW the planned activities will be conducted
- The TRR version is used as the reference for the development of the plans for unit testing and system testing during the Build phase

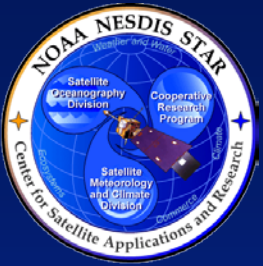


The RAS and VVP Provide the Bridge from the Design to the Test Plans



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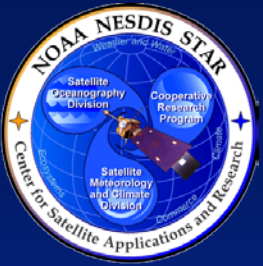




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Test Plans

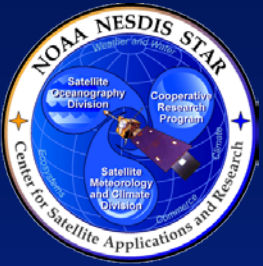
- Once the requirements have been established and allocated to components of the system design, a unit test plan (UTP) and system test plan (STP) can be developed
- The unit test plan is focused on tests to confirm that the system meets its functional requirements
- The system test plan, which is focused on tests to confirm that the system meets its operational requirements, will be developed after the completion of the unit tests



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Unit Test Plan

- Unit testing is to be performed in accordance with a unit test plan
- The unit test plan includes:
 - » A specification of the software units to be tested
 - » A description of the unit test data
 - » A description of the unit test environment
 - » A description of the unit test configuration and its build procedures
 - » A description of procedures to follow to prepare for unit testing
 - » A detailed description of the test activities and sequence of test steps for each unit in the software architecture



Unit Test Plan Documentation



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- The unit test plan document (UTP) is a Microsoft Word file “GVF_UTP_1.0.doc”
 - » The UTP describes the test setup, including test data, test environment, test configuration build, and test preparation
 - » For each unit in the software architecture, the UTP describes the unit’s purpose and function, data flows, programs, test sequence, and test risks
 - » The file can be found in the GOES LST artifact repository at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TR_R.php
- There is an Appendix to the UTP, documented as a Microsoft Excel file “GVF_UTP_Appendix_1.0.xls ”
 - » The UTP Appendix provides the detailed test activities for each unit in the software architecture
 - » This file can be found in the GVF artifact repository at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TR_R.php



Unit Test Data Description



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- Unit test data includes:
 - » Instrument data: VIIRS surface reflectance and geolocation data in granules and are dynamic
 - » Ancillary data. Relatively static although they may need to be updated over the time. Examples are Water mask, Global Max/Min EVI, and Color lookup table.
 - » Additionally, sample output for the given input is provided for comparison. All the test data are saved in a parent directory /data//data049/jju/npp_data/utp/ on the NESDIS/STAR computer network



GVF Unit Test Data



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Test data type	Location	Data volume and format	Units to be tested on
Eight days' VIIRS surface reflectance (IVISR) and imagery resolution geolocation (GIMGO) in granules.	input/20120901/IVISR input/20120901/GIMGO input/20120902/IVISR input/20120902/GIMGO input/20120908/IVISR input/20120908/GIMGO	Approximately 500 granules in HDF5 , 285 GB a day. Totally 2.3 TB for 8 days.	TGM GRD SRC CVI

Test data type	Location	Note
Water mask in GVF grid system	watermask/	Only 0.3 GB in 200 tiles of the GVF grid. Static. Used in all processing units. Saved under /data/data049/jju/npp_data/utp/
Global minimum/maximum EVI values. Filename: EVI.MinMax.txt	in the calcGVF code directory	Global minimum/maximum EVI values used in deriving GVF. More detail later.
Color lookup table. Filename:GVF_global_lut.dsr	in the bin2tiff code directory	Color lookup table used in generating GeoTIFF image of GVF. More detail later.
Areas for statistics. Filename: Areas_for_Statistics.txt	in the aggGVF code directory	Area latitude/longitude range for areas to generate the GVF statistics on. More detail later.



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Unit Test Environment

- The test will be performed on the development machine rhw 1048 in NOAA/NESDIS/STAR network.
- This is a Linux server with 32 GB of memory and 10 TB of data storage.

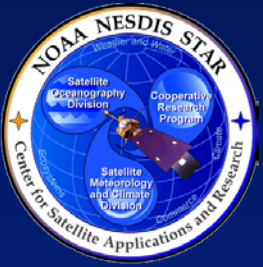


Unit Test Configuration Build



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- All unit tests will be performed from the same build.
- All codes are stored at
 - » The GVF source code and configuration script is saved in directory `/data/home001/jju/GVF/rhw1048/`. Let this directory be called Code Parent Directory. It has three sub-directories:
 - » `/data/home001/jju/GVF/rhw1048/code`
 - » `/data/home001/jju/GVF/rhw1048/compile`
 - » `/data/home001/jju/GVF/rhw1048/run`
- The code for all processing units is saved in the “code” directory. Under this directory, all the C++/C code, and shell scripts are saved into different subdirectories roughly corresponding to the GVF processing units.

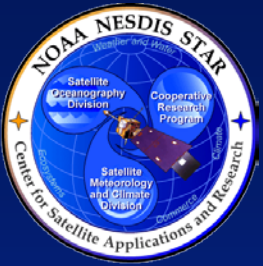


Unit Test Configuration Build Libraries



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- HDF5, NetCDF and GeoTIFF libraries are required
- For this Linux test environment, the directories of these libraries and associated header files, and the designated compilers and compiling options are specified in a file “export_linux_path.sh” in
/data/home001/jju/GVF/rhw1048/compile/.



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Error Handling

Error	Affected Unit	Expected Result
Error in writing to disk	All units	Reports the error and aborts. Probably disk full.
No input granule data	TGM	Report error and exit.
A GIMGO file is corrupted	TGM	TGM ignores this GIMGO granule and the corresponding IVISR. Continue with next granule. will be ignored when
An IVISR granule is corrupted	GRD	This granule is ignored. Continue with next granule.
Error reading a gridded reflectance tile	SRC	Reports the error and ignores this file.
Error reading a weekly composite tile	CVI	Ignore this tile and continue with next tile. (SO DEFINITELY I NEED TO CHECK THE ERROR NUMBER IN SCRIPT)
Error reading a weekly EVI file	SVI	Ignore this tile and continue with next tile.
There is no valid data for all 15 weeks of EVI	SVI	Should fill with climatology, which does not exist yet. Current ly, leave it blank.
Error reading a smoothed EVI tile	GCL	Print message, continue with next tile
Error reading a before-aggregation GVF tile	GAGG	Print error message, and abort.

- The successful completion of the system depends on the correctness of the input datasets.
- Errors may occur if the input dataset contains unexpected errors or unexpected changes of structure.
- It is necessary to check every call to open, read, manipulate or write files in the log file.

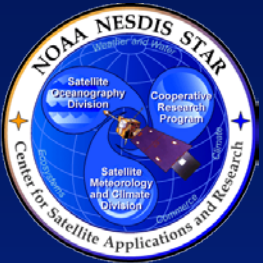


Code Review Prior To Unit Testing



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- The code has been provided to Test Readiness Reviewers for code standards checking.
- Reviewers will also check if the code complies with the OSPO data integrity check list, complies with the OSPO development security check list, and complies with the OSPO code check list.



Unit Test Configuration – Baseline Build 3.0



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ARTIFACT	FILE	ARTIFACT TYPE
GVF Critical Design Review Report (CDRR)	GVF_CDRR_1.0.doc	MS Word
GVF CDRR Appendix (Check List)	GVF_CDRR_Appendix_1.0.xls	MS Excel
GVF Development Project Plan (DPP)	GVF_DPP_3.0.doc	MS Word
GVF FY13 SPSRB Project Plan (DPP Appendix A)	FY13_Polar_Green_Veg_Fraction_V1.ppt	MS PowerPoint
GVF Integrated Master Schedule (DPP Appendix B)	GVF_IMS_3.0.xls	MS Excel
Check List Items for each GVF review (DPP Appendix C)	GVF_Review_Check_Lists_3.0.xls	MS Excel
GVF Requirements Allocation Document (RAD)	GVF_RAD_1.2.doc	MS Word
GVF Requirements / Needs Matrix (RNM) - Appendix to RAD	GVF_RNM_1.2.xls	MS Excel
GVF Requirements Allocation Sheet (RAS) - Appendix to RAD	GVF_RAS_1.2.xls	MS Excel
GVF Software Architecture Document (SWA)	GVF_SWA_2.1.doc	MS Word
GVF Detailed Design Document (DDD)	GVF_DDD_1.1.doc	MS Word
GVF Verification and Validation Plan (VVP)	GVF_VVP_1.2.doc	MS Word
GVF VVP Appendix	GVF_VVP_Appendix_1.2.xls	MS Excel
GVF Unit Test Plan (UTP)	GVF_UTP_1.0.doc	MS Word
GVF UTP Appendix	GVF_UTP_Appendix_1.0.xls	MS Excel
GVF Integrated Pre-operational code	PCODE	Code
GVF test data	PTEST	Data
PSR Appendix - Status of GVF risks and risk mitigation actions	GVF_PSR_Appendix_3.0.doc	MS Excel
GVF Project Baseline Report	GVF_PBR_3.0.doc	MS Word
GVF Test Readiness Document (TRD) - Review slide package	GVF_TRD_1.0.ppt	MS PowerPoint

Baseline Build 3.0
consists of:

18 documents,
including 6 new
documents and 12
revised documents
from CDR

Pre-operational code

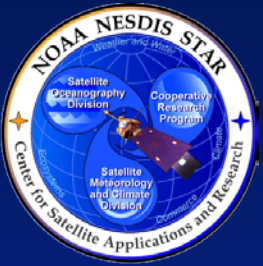
Unit test data



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Project Baseline Report

- The project's baseline and change history is maintained in a Project Baseline Report (PBR).
- The PBR includes the change history, approval status, and location of every Configuration Item in the project's baseline.
- The PBR is updated with each baseline build
- PBR_3.0, a TRR artifact, can be accessed at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) **TGM UNIT TEST READINESS**
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 4 – TGM Unit Test Readiness

Presented by

Junchang Ju
GVF Development Programmer

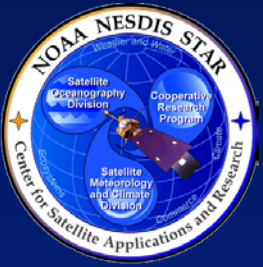


Tile-Granule Mapper (TGM) Unit (1)



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- Derives the spatial relationship between each tile and the input granules
- Reads the imagery resolution geolocation data for I1, I2 bands from the given geolocation file.
- Determines the corresponding tiles for the edge pixels of the GIMGO granules.

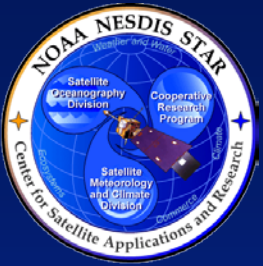


Tile-Granule Mapper (TGM) Unit (2)



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- Input:
 - » IVISR Granule file
 - » GIMGO Granule file
- Output:
 - » List, per tile, of GIMGO Granules
- Subprograms:
 - » GranuleOnTile/pairInput.sh
 - » GranuleOnTile_main



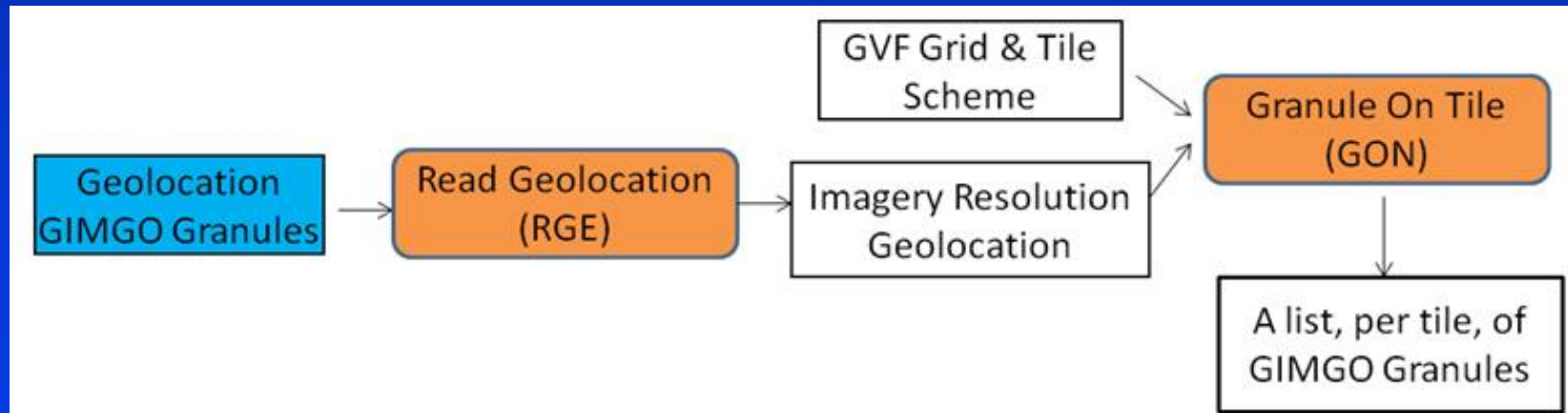
TGM Unit Flow

RGE Sub-Unit

- Read the imagery resolution geolocation data (lat/lon, solar zenith/azimuth, view zenith/azimuth) for I1, I2 bands from the given geolocation granule file..

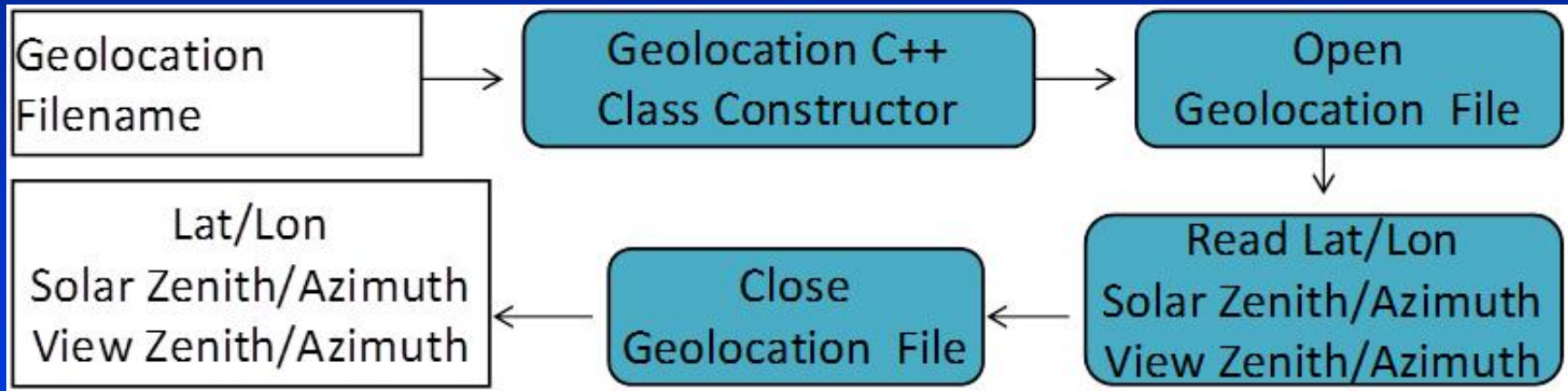
GON Sub-Unit

- Determine the corresponding tiles for the edge pixels of the GIMGO granules.
- Multiple granules may fall on the same tile, and the same granule may fall on multiple tiles.





RGE Sub-Unit Flows

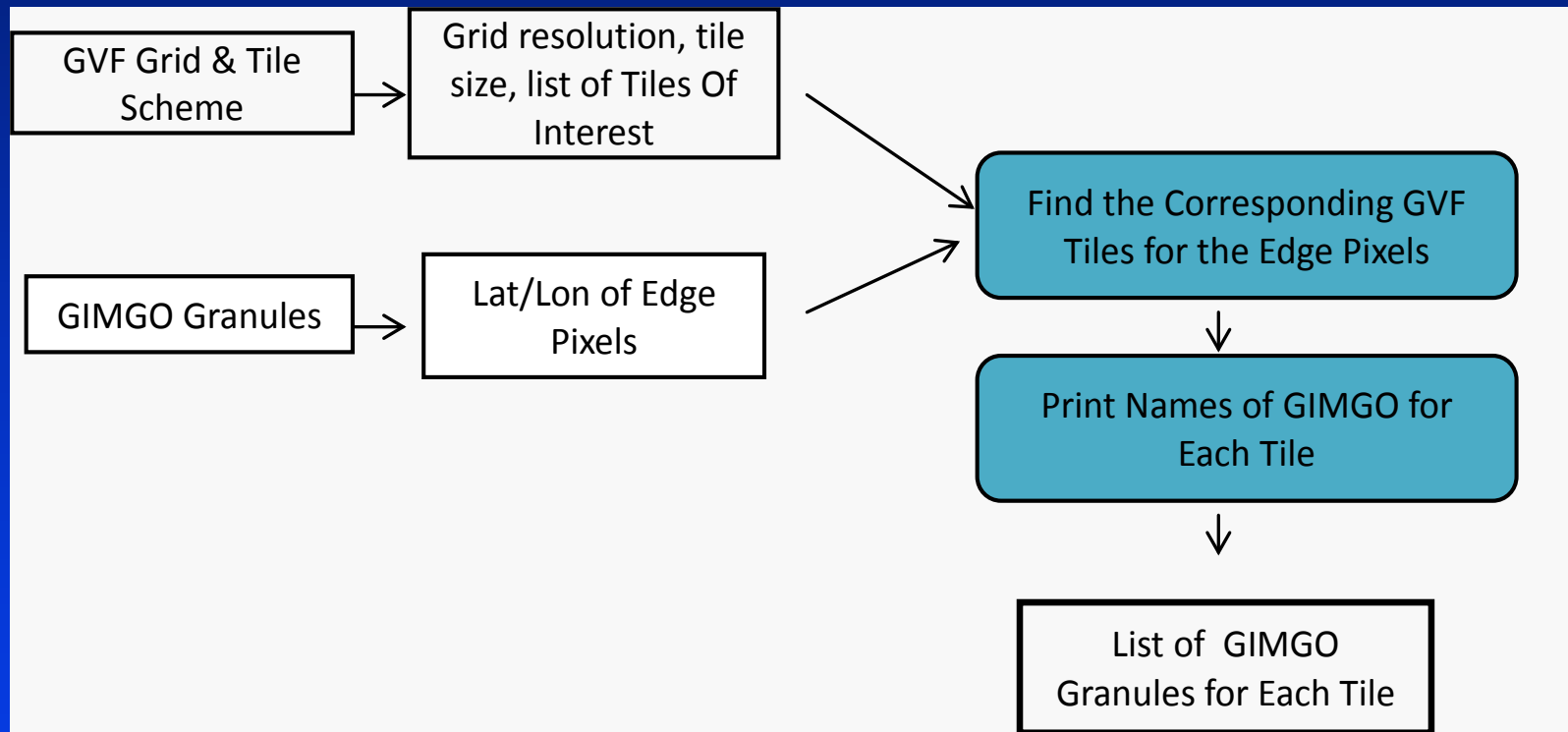




GON Sub-Unit Flow



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TGM Unit Test Activities

- There are 22 specific TGM unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "TGM" worksheet



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TGM Unit Test Activities (1)

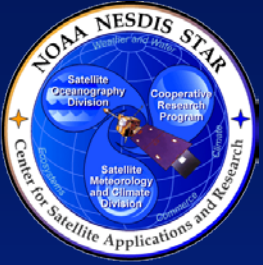
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.1	The GVF Algorithm shall read VIIRS data	RGE Sub-Unit	Confirm VIIRS data granule file are read for daily processing	
4.1	The GVF Algorithm shall read VIIRS data	TGM Unit	Confirm VIIRS data granule file are read for daily processing	
4.1	The GVF Algorithm shall read VIIRS data	GON Sub-Unit	Confirm VIIRS data granule file are read for daily processing	
4.1.1	The GVF Algorithm shall read VIIRS swath surface reflectance data in bands I1, I2, and M3 from IVISR granule files	VIIRS Surface Reflectance File	Confirm the surface reflectance files have been erad successfully	
4.1.1	The GVF Algorithm shall read VIIRS swath surface reflectance data in bands I1, I2, and M3 from IVISR granule files	Surface Relectance	Confirm the surface reflectance files have been erad successfully	
4.1.1	The GVF Algorithm shall read VIIRS swath surface reflectance data in bands I1, I2, and M3 from IVISR granule files	RGE Sub-Unit	Confirm the surface reflectance files have been erad successfully	
4.1.1	The GVF Algorithm shall read VIIRS swath surface reflectance data in bands I1, I2, and M3 from IVISR granule files	TGM Unit	Confirm the surface reflectance files have been erad successfully	
4.1.1	The GVF Algorithm shall read VIIRS swath surface reflectance data in bands I1, I2, and M3 from IVISR granule files	GON Sub-Unit	Confirm the surface reflectance files have been erad successfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMODO granule files	VIIRS Geolocation Files	Confirm the geolocation files have bee read sucessfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMODO granule files	RGE Sub-Unit	Confirm the geolocation files have bee read sucessfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMODO granule files	Geolocation	Confirm the geolocation files have bee read sucessfully	



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TGM Unit Test Activities (2)

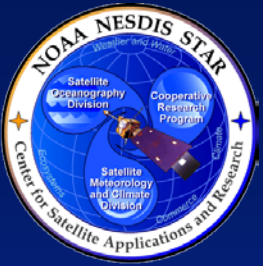
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMOD0 granule files	RGE Sub-Unit	Confirm the geolocation files have been read successfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMOD0 granule files	Geolocation	Confirm the geolocation files have been read successfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMOD0 granule files	TGM Unit	Confirm the geolocation files have been read successfully	
4.1.2	The GVF Algorithm shall read VIIRS geolocation data from GIMGO and GMOD0 granule files	GON Sub-Unit	Confirm the geolocation files have been read successfully	
4.3	The GVF Algorithm shall map VIIRS granule data to the internal GVF grid	GVD Sub-Unit	Confirm the VIIRS granule data was successfully mapped to the internal GVF grid.	
4.3	The GVF Algorithm shall map VIIRS granule data to the internal GVF grid	Gridded reflectance Tile File	Confirm the VIIRS granule data was successfully mapped to the internal GVF grid.	
4.3	The GVF Algorithm shall map VIIRS granule data to the internal GVF grid	TGM Unit	Confirm the VIIRS granule data was successfully mapped to the internal GVF grid.	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	TGM Unit	Confirm that the TGM unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	TGM Unit	Confirm that the TGM unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	TGM Unit	Confirm that the TGM unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	TGM Unit	Confirm that the TGM unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	TGM Unit	Confirm that the TGM unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	TGM Unit	DAP #1 includes code for the TGM unit programs and sub-programs	



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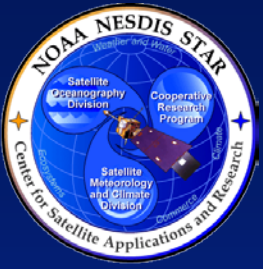
TGM Unit Test Sequence

- Run the GranuleOnTile script.
 - » Any error will be related to the setup the execution environment.
 - » Make sure the environmental variables have been setup properly in UTP Section 3.3.3.
 - » A successful run will have a return status 0.
- Compare the output files in the created temporary directory with the provided output in \$OUTPUT_SAMPLE/GranuleOnTile. The number of files in the two directories and file contents for the same tile should agree.



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) **GRD UNIT TEST READINESS**
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 5 – GRD Unit Test Readiness

Presented by

Junchang Ju
GVF Development Programmer



Surface Reflectance Gridder (GRD) Unit (1)



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- Grids I1, I2, and M3 bands surface reflectance from from the granules that fall on the tile
- Carries over the imbedded cloud mask
- Carries over the geolocation data

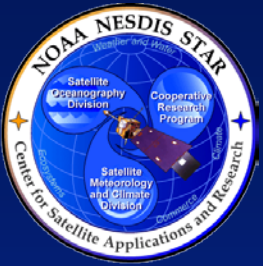


Surface Reflectance Gridder (GRD) Unit (2)



Raytheon

- Input:
 - » Surface Reflectance IVISR file
 - » Geolocation GIMGO file
 - » Water Mask Tile file
- Output:
 - » Gridded Reflectance
- Subprograms:
 - » DailyGrid_main
 - » Run.daily.alltiles.sh[YYYYMMDD]



GRD Unit Flow

RSR Sub-Unit

- Reads the I1, I2, M3 band reflectance values and QF bands from the surface reflectance granule file.

RGE Sub-Unit

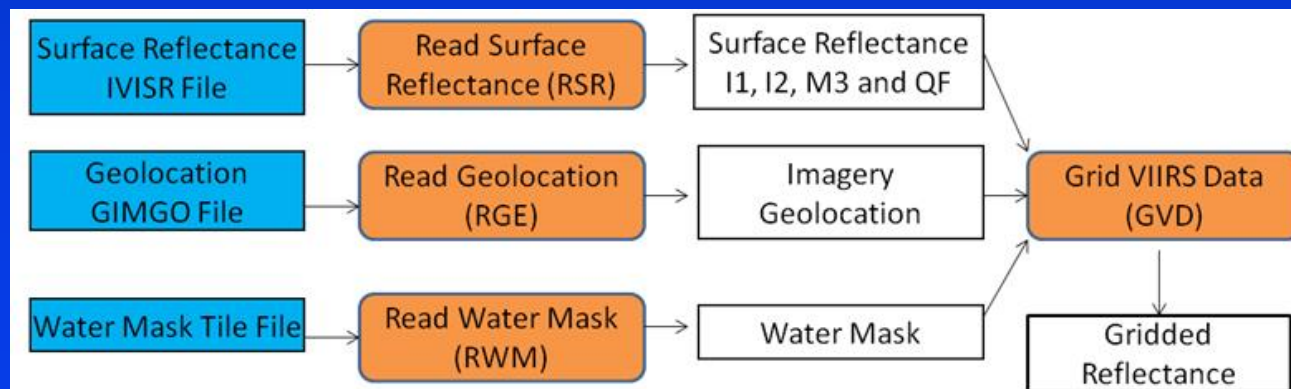
- Read the imagery resolution geolocation data for I1, I2 bands from the given geolocation granule file.

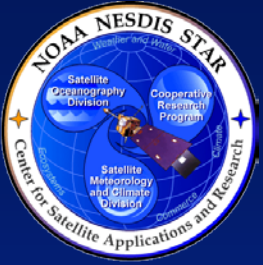
RWM Sub-Unit

- Read the water mask for the given GVF grid tile.

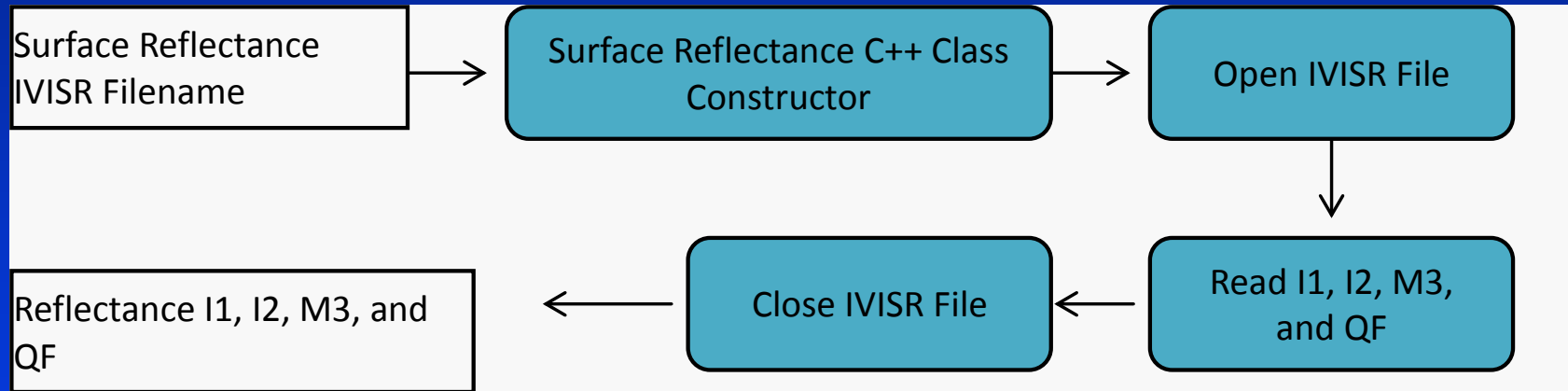
GVD Sub-Unit

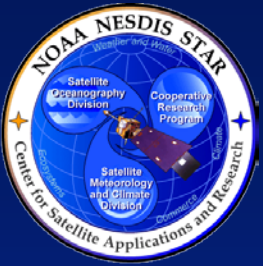
- Projects the surface reflectance and cloud mask values of the land pixels from the granules into the predefined GVF grid of 0.003-degrees Lat/Lon, using the nearest neighbor re-sampling rule.



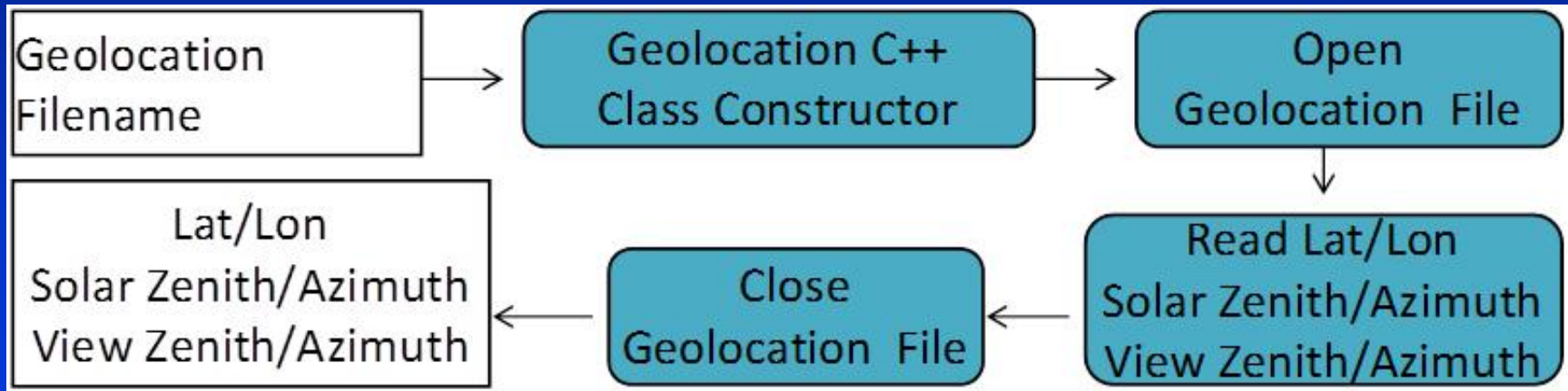


RSR Sub-Unit Flows





RGE Sub-Unit Flows

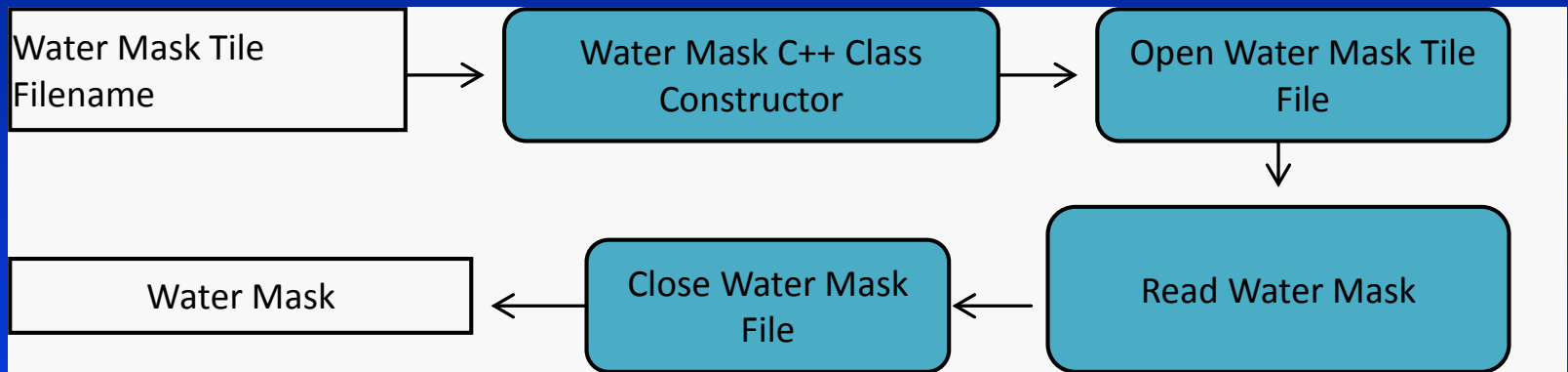


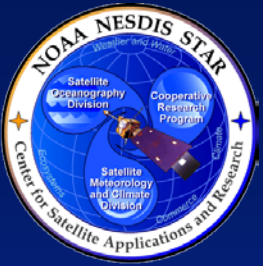


RWM Sub-Unit Flow

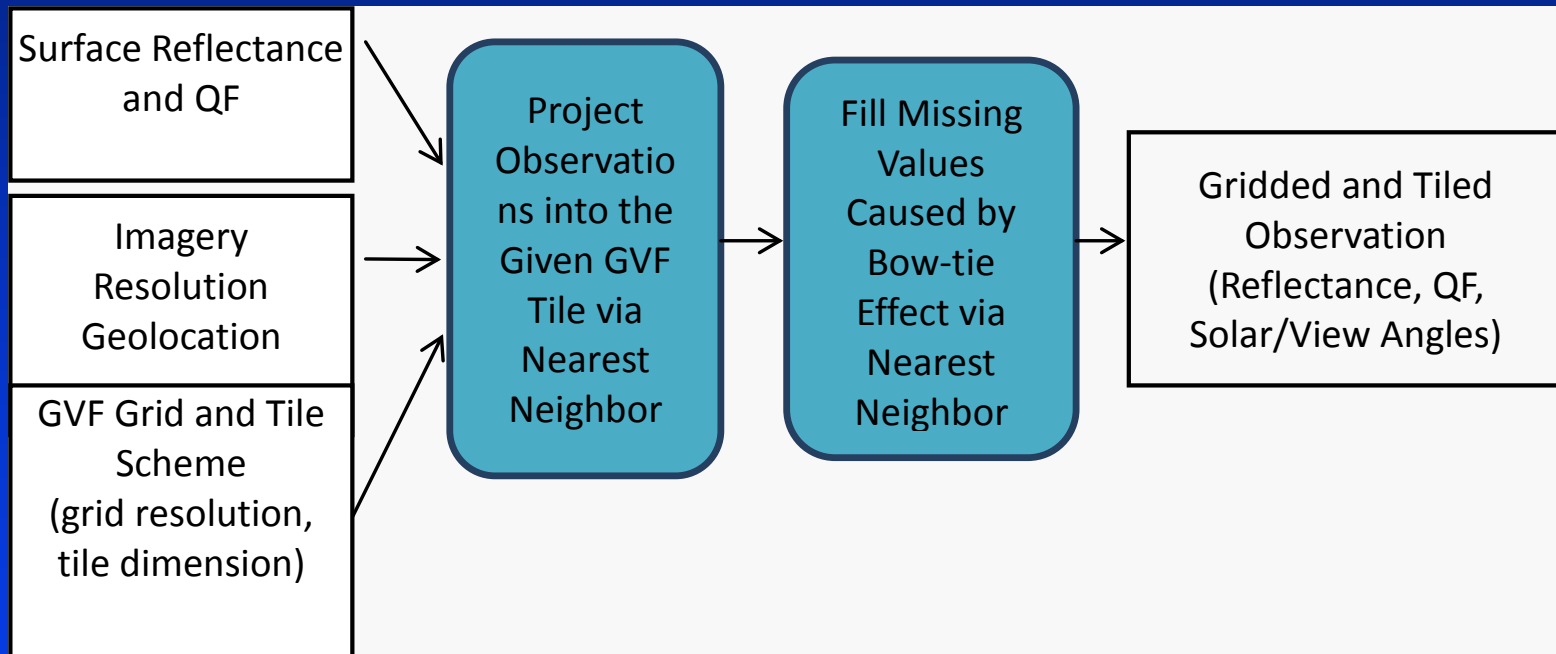


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GVD Sub-Unit Flow





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GRD Unit Test Activities

- There are 36 specific GRD unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "GRD" worksheet



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GRD Unit Test Activities (1)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
3.0	The GVF system shall have a data ingest capability	VIIRS Surface Reflectance File	Confirm that the Surface Relectance IVISR is availabe from the NPP/JPSS and can be read	
3.0	The GVF system shall have a data ingest capability	VIIRS Cloud Mask File	Confirm that the Water Mask is availabe and can be read	
3.0	The GVF system shall have a data ingest capability	VIIRS Geolocation Files	Confirm that the Geolocation Files are availabe from the NPP/JPSS and can be read	
3.1	The GVF operational system shall ingest NPP VIIRS data	VIIRS Surface Reflectance File	Confirm that the Surface Relectance IVISR is availabe from the NPP/JPSS and can be read	
3.1	The GVF operational system shall ingest NPP VIIRS data	VIIRS Cloud Mask File	Confirm that the Water Mask is availabe and can be read	
3.1	The GVF operational system shall ingest NPP VIIRS data	VIIRS Geolocation Files	Confirm that the Geolocation Files are availabe from the NPP/JPSS and can be read	
3.1.1	The NPP VIIRS data shall be ingested from CLASS	VIIRS Surface Reflectance File	Confirm that the Surface Relectance IVISR is availabe from the CLASS	
3.1.1	The NPP VIIRS data shall be ingested from CLASS	VIIRS Cloud Mask File	Confirm that the Water Mask is availabe from CLASS	
3.1.1	The NPP VIIRS data shall be ingested from CLASS	VIIRS Geolocation Files	Confirm that the Geolocation Files are availabe from CLASS	
3.1.2	The NPP VIIRS data shall include the Surface Reflectance RIP granule file (IVISR)	VIIRS Surface Reflectance File	Confirm the NPP VIIRS data (Surface Reflectance RIP granule file (IVISR)) is available from CLASS	Need to determine if CLASS RIP will meet Daily Production latency requirement.



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GRD Unit Test Activities (2)

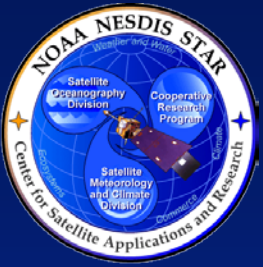
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
3.1.3	The NPP VIIRS data shall include the Cloud Mask IP granule file (IICMO)	VIIRS Cloud Mask File	Confirm that the Water Mask is available from CLASS	
3.1.4	The NPP VIIRS data shall include Geolocation granule files (GIMGO, GMOD0)	VIIRS Geolocation Files	Confirm that the Geolocation Files are available from CLASS	
3.1.5	The NPP VIIRS data shall be swath data in HDF-5 format.	VIIRS Surface Reflectance File	Confirm JPSS IDP supplied HDF-5 files	
3.1.5	The NPP VIIRS data shall be swath data in HDF-5 format.	VIIRS Cloud Mask File	Confirm JPSS IDP supplied HDF-5 files	
3.1.5	The NPP VIIRS data shall be swath data in HDF-5 format.	VIIRS Geolocation Files	Confirm JPSS IDP supplied HDF-5 files	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	VIIRS Cloud Mask File	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	GRD Unit	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	RSR Sub-Unit	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	RGE Sub-Unit	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	RVM Sub-Unit	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	



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GRD Unit Test Activities (3)

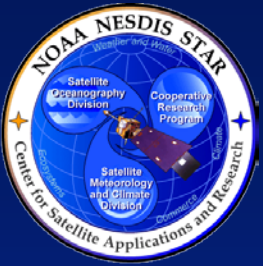
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	Water mask	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.1.3	The GVF Algorithm shall read VIIRS cloud mask data from IICMO granule files	GVD Sub-Unit	Confirm VIIRS cloud mask data from IICMO granule files was read successfully.	
4.2	The GVF Algorithm shall read ancillary data	Land / Sea Mask	Confirm ancillary data was read successfully	
4.2	The GVF Algorithm shall read ancillary data	Global Max/Min EVI	Confirm ancillary data was read successfully	
4.2	The GVF Algorithm shall read ancillary data	GRD Unit	Confirm ancillary data was read successfully	
4.2.1	The GVF Algorithm shall read land/sea mask from an internal file	Land / Sea Mask	Confirm land / sea mask files read successfully	
4.2.1	The GVF Algorithm shall read land/sea mask from an internal file	GRD Unit	Confirm land / sea mask files read successfully	
4.2.2	The GVF Algorithm shall read global minimum and maximum EVI from an internal file	Global Max/Min EVI	Confirm global max/min EVI values have been read successfully	
4.3.1	The GVF algorithm shall apply the land/sea mask to filter out water pixels.	Land / Sea Mask	Confirm the land sea mask was successfully applied.	
4.3.1	The GVF algorithm shall apply the land/sea mask to filter out water pixels.	GVD Sub-Unit	Confirm the land sea mask was successfully applied.	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	GRD Unit	Confirm that the GRD unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	GRD Unit	Confirm that the GRD unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	GRD Unit	Confirm that the GRD unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	GRD Unit	Confirm that the GRD unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	GRD Unit	Confirm that the GRD unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	GRD Unit	DAP #1 includes code for the GRD unit programs and sub-programs	



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GRD Unit Test Sequence

- Check to see output has been generated in subdirectory \$DAILY_SR_DIR/ 20120901.
- Compare the output with provided test output in \$OUTPUT_SAMPLE/daily_sr/20100901
- Do the same comparison for days from 20120902 to 20120908.



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) **SRC UNIT TEST READINESS**
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS

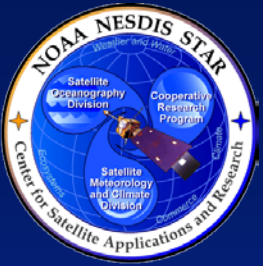


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Section 6 – SRC Unit Test Readiness

Presented by

Junchang Ju
GVF Development Programmer



Surface Reflectance Compositor (SRC) Unit (1)

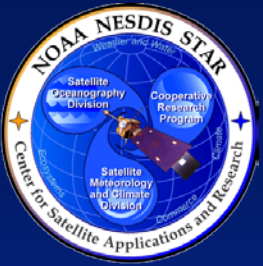
- Makes the view-angle-adjusted SAVI (VA-SAVI) maximum value composite (MVC) from the daily gridded surface reflectance of the compositing period
- Reads the reflectance values and the associated solar-view geometry and cloud mask values from the daily gridded reflectance
- Compares the observations within the compositing period using the view-angle-adjusted Soil-Adjusted-Vegetation-Index (VA-SAVI) value rule and selects one of them
- Writes the reflectance composite and the associated solar-view geometry and cloud mask values to the weekly reflectance composite tile files



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Surface Reflectance Compositor (SRC) Unit (2)

- Input:
 - » Gridded Reflectance files of 7 days
- Output:
 - » Reflectance Composite File
- Subprograms:
 - » WeeklyComposite_main
 - » Run.weekly.alltiles.sh



SRC Unit Flow

RRC Sub-Unit

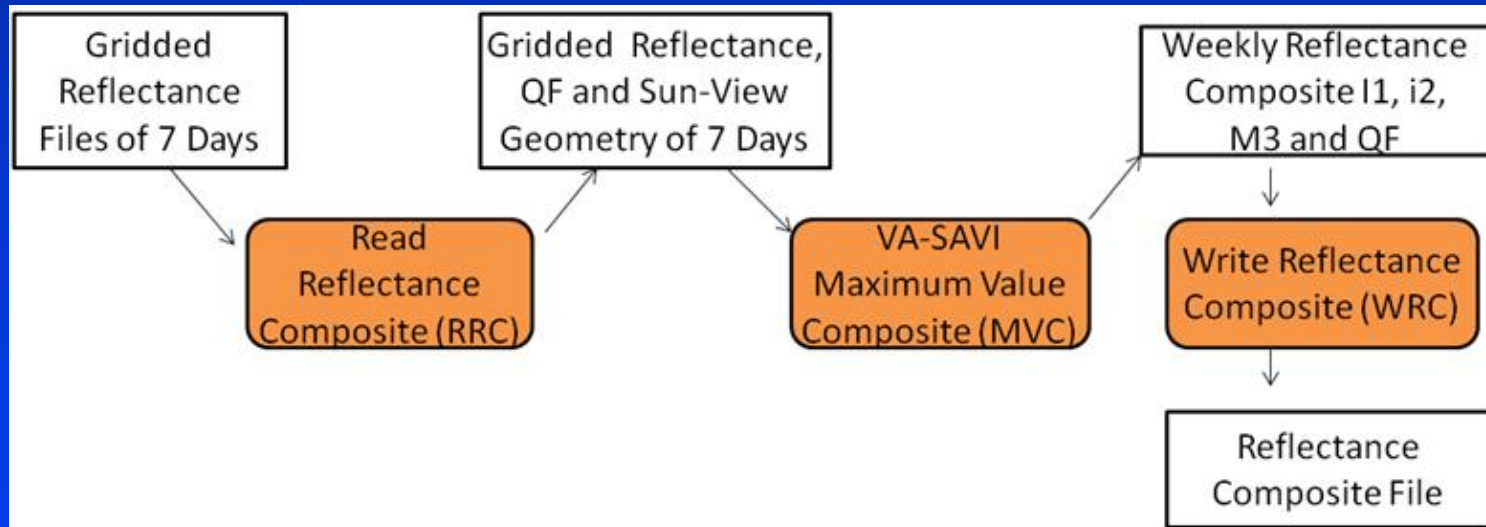
- Reads the reflectance values and the associated solar-view geometry and cloud mask values from the daily gridded reflectance.

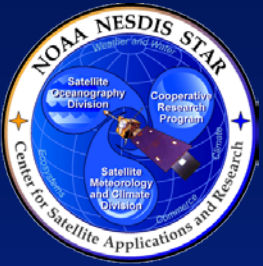
MVC Sub-Unit

- Compares the observations within the compositing period using the view-angle-adjusted Soil-Adjusted-Vegetation-Index (VA-SAVI) value rule and selects one of them.

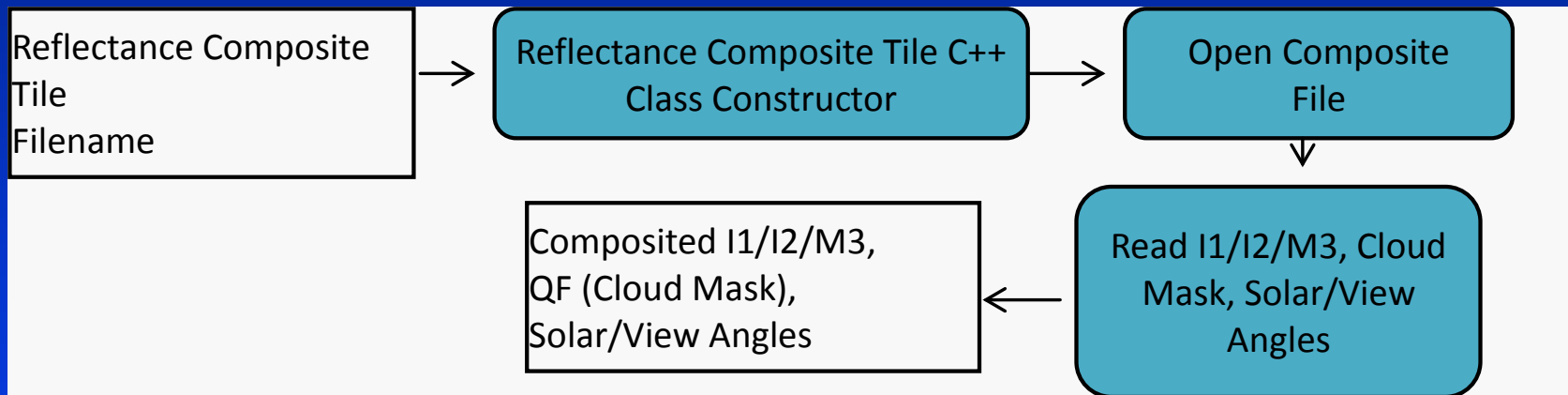
WRC Sub-Unit

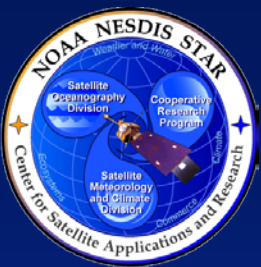
- Writes the reflectance composite and the associated solar-view geometry and cloud mask values to the weekly reflectance composite tile files.



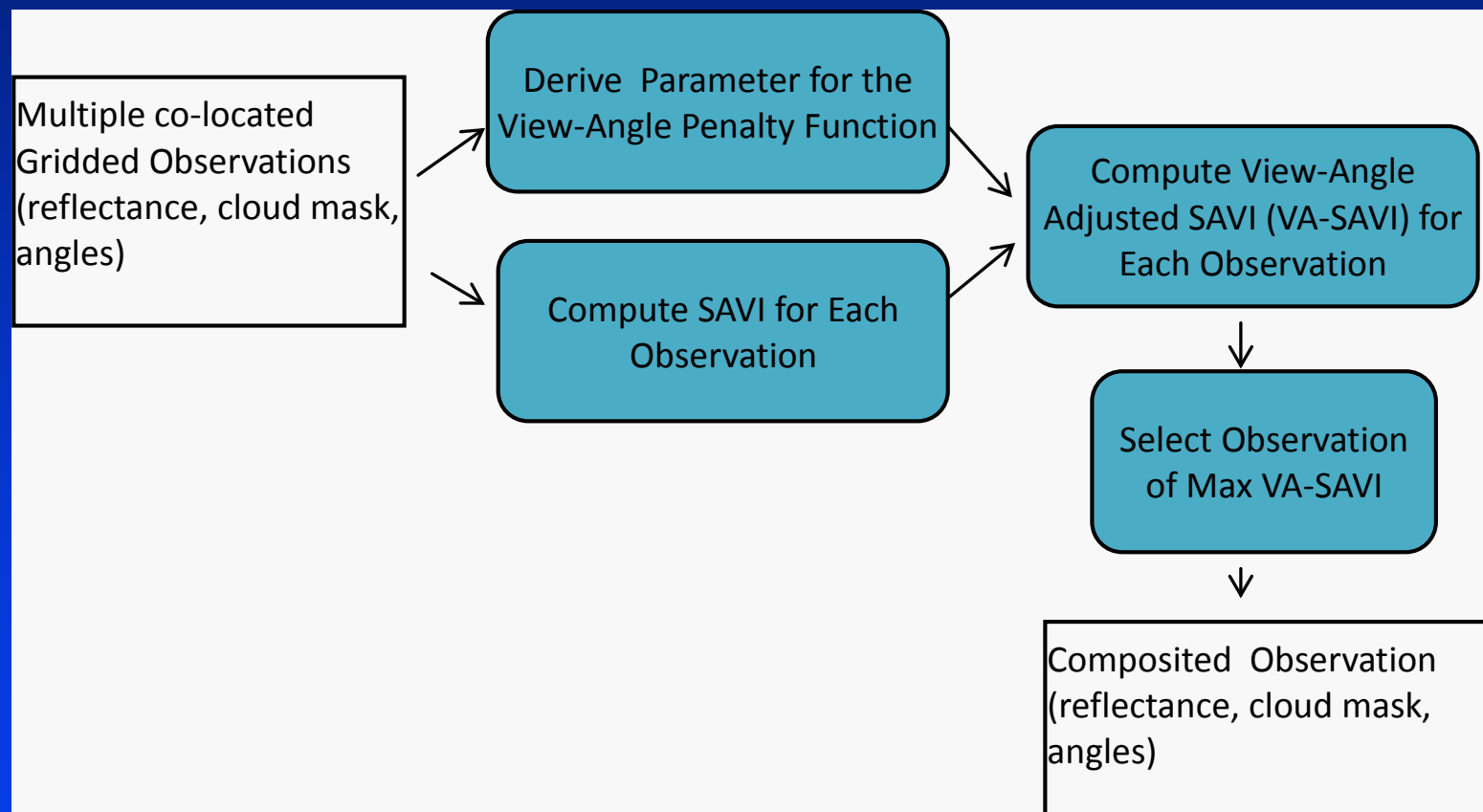


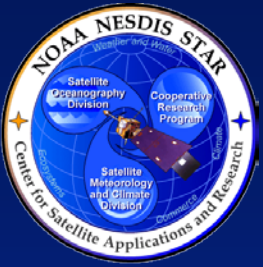
RRC Sub-Unit Flows





MVC Sub-Unit Flows

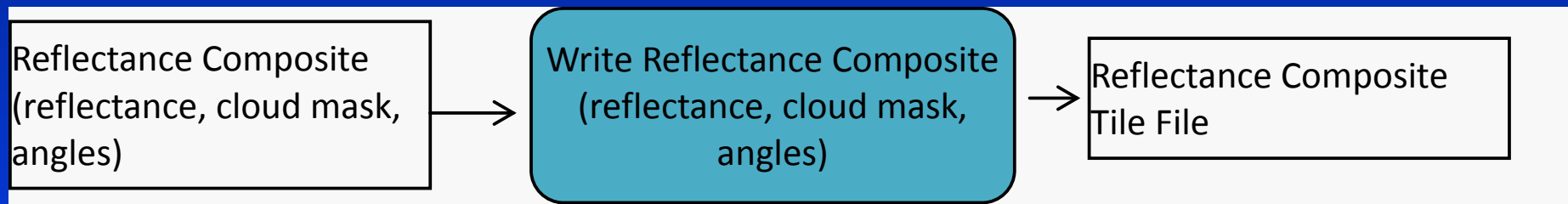




WRC Sub-Unit Flow



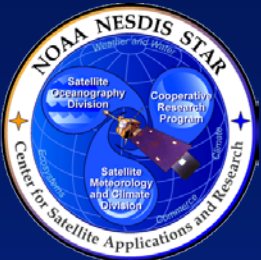
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SRC Unit Test Activities

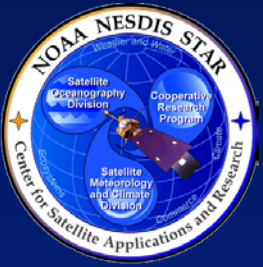
- There are 15 specific SRC unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "SRC" worksheet



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SRC Unit Test Activities

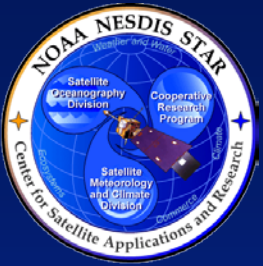
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.4	The GVF Algorithm shall generate a Daily Reflectance Composite map for each of the I1, I2, and M3 bands	SRC Unit	Confirm the Daily Reflectance Composite map for each of the I1, I2, and M3 bands was generated	
4.4	The GVF Algorithm shall generate a Daily Reflectance Composite map for each of the I1, I2, and M3 bands	RRC Sub-Unit	Confirm the Daily Reflectance Composite map for each of the I1, I2, and M3 bands was generated	
4.4	The GVF Algorithm shall generate a Daily Reflectance Composite map for each of the I1, I2, and M3 bands	Gridded Reflectance	Confirm the Daily Reflectance Composite map for each of the I1, I2, and M3 bands was generated	
4.4	The GVF Algorithm shall generate a Daily Reflectance Composite map for each of the I1, I2, and M3 bands	MVC Sub-Unit	Confirm the Daily Reflectance Composite map for each of the I1, I2, and M3 bands was generated	
4.4.1	The GVF Algorithm shall update the Daily Reflectance Composite	SRC Unit	Confirm the Daily Reflectance Composite was successfully updated	
4.4.1	The GVF Algorithm shall update the Daily Reflectance Composite	MVC Sub-Unit	Confirm the Daily Reflectance Composite was successfully updated	
4.4.1	The GVF Algorithm shall update the Daily Reflectance Composite	Weekl Reflectance Composite	Confirm the Daily Reflectance Composite was successfully updated	
4.4.1	The GVF Algorithm shall update the Daily Reflectance Composite	WRC Sub-Unit	Confirm the Daily Reflectance Composite was successfully updated	
4.4.1	The GVF Algorithm shall update the Daily Reflectance Composite	Reflectance Composite Files	Confirm the Daily Reflectance Composite was successfully updated	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	SRC Unit	Confirm that the SRC unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	SRC Unit	Confirm that the SRC unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	SRC Unit	Confirm that the SRC unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	SRC Unit	Confirm that the SRC unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	SRC Unit	Confirm that the SRC unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	SRC Unit	DAP #1 includes code for the SRC unit programs and sub-programs	



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SRC Unit Test Sequence

- To test the weekly compositing code for the week with day 7 being 20120907. That is the dates of the weeks are from 20120901 to 20120907.
 - » `$ sh CODE_PAR_DIR/WeeklyComposite/run.weekly.alltiles.sh 20120907`
 - » The output is created in a subdirectory named "20120901-20120907" in a parent directory referred to by the environmental variable WEEKLY_SR_DIR (Section 3.3.5).
- To illustrate the daily rolling weekly scheme, we can run the script with parameter 20120908. The run will use gridded surface reflectance for days from 20120902 to 20120908.
 - » `$ sh CODE_PAR_DIR/WeeklyComposite/run.weekly.alltiles.sh 20120908`



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) **CVI UNIT TEST READINESS**
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 7 – CVI Unit Test Readiness

Presented by

Junchang Ju
GVF Development Programmer



Raytheon

Calculate EVI (CVI) Unit (1)

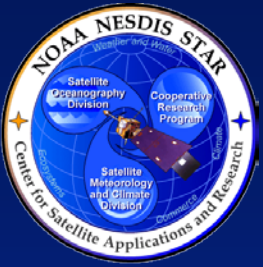
- Calculates weekly EVI from weekly surface reflectance composite
- Saves the EVI and cloud mask accompanying reflectance data
- Reads the reflectance values and the associated solar-view geometry and cloud mask values from the daily gridded reflectance
- Derives EVI using I1, I2, and I3 bands
- Writes EVI and cloud mask to tile file



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Calculate EVI (CVI) Unit (2)

- Input:
 - » Reflectance Composite File
- Output:
 - » EVI and Cloud Mask Tile File
- Subprograms:
 - » calcEVI_main
 - » run.calcEVI.sh



CVI Unit Flow

RRC Sub-Unit

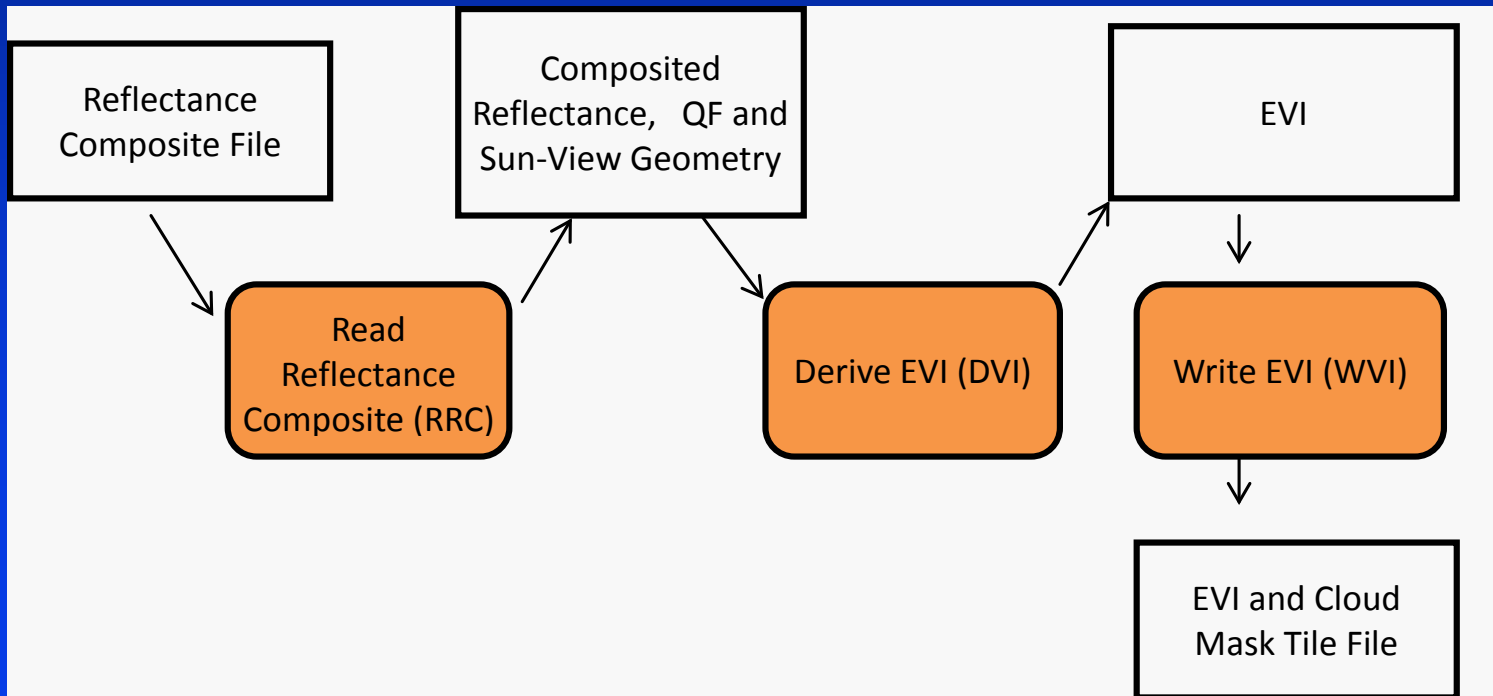
- Reads the reflectance values and the associated solar-view geometry and cloud mask values from the daily gridded reflectance.

DVI Sub-Unit

- Derive EVI using I1, I2, and I3 bands.

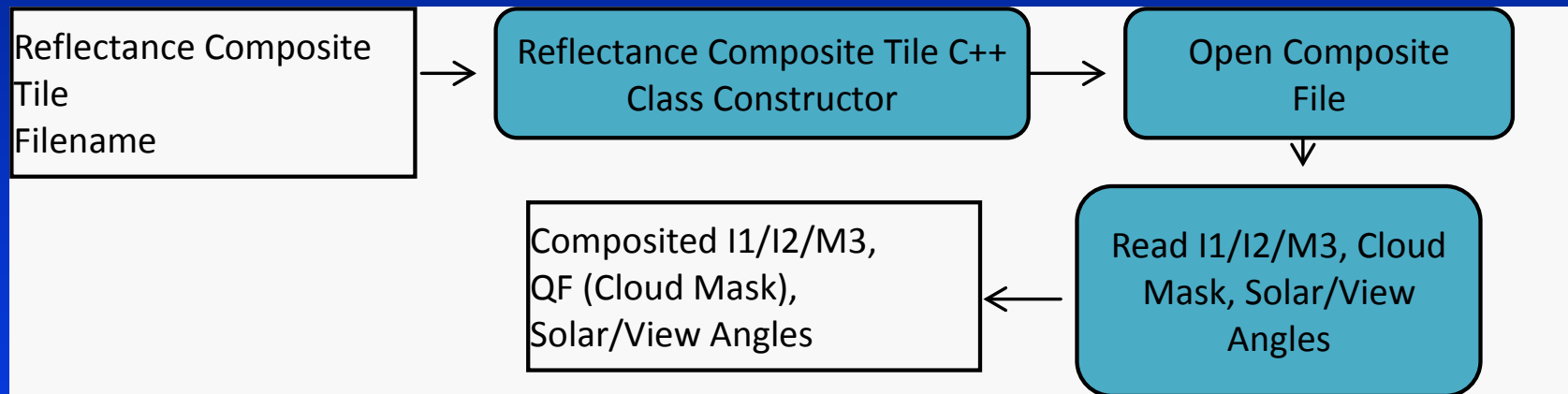
WVI Sub-Unit

- Write EVI and Cloud Mask to Tile File.





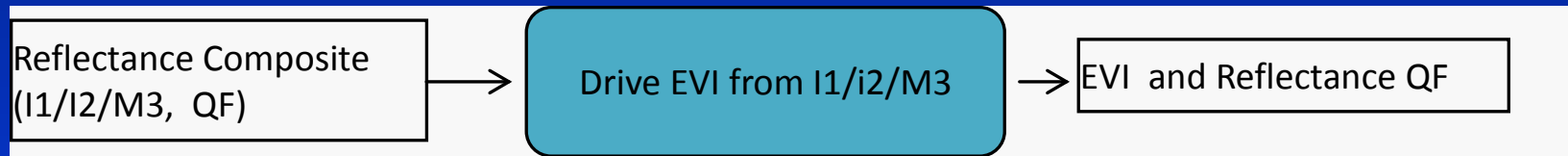
RRC Sub-Unit Flows

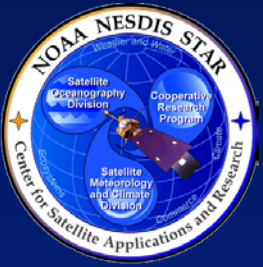




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DVI Sub-Unit Flows

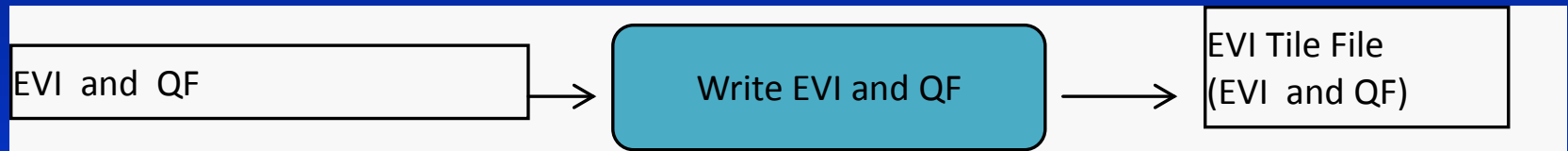




WVI Sub-Unit Flow



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CVI Unit Test Activities

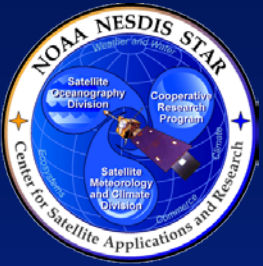
- There are 6 specific CVI unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "CVI" worksheet



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CVI Unit Test Activities

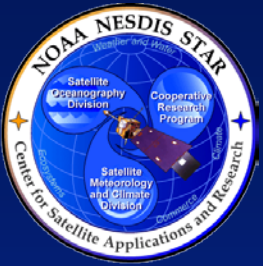
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.9	The GVF Algorithm shall be implemented by processing code written in C++	CVI Unit	Confirm that the CVI unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	CVI Unit	Confirm that the CVI unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	CVI Unit	Confirm that the CVI unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	CVI Unit	Confirm that the CVI unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	CVI Unit	Confirm that the CVI unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	CVI Unit	DAP #1 includes code for the CVI unit programs and sub-programs	



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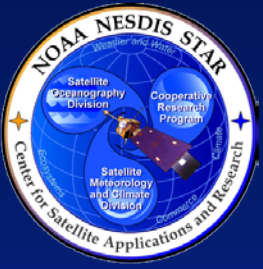
CVI Unit Test Sequence

- Run the script for the week with day 7 being 20120907:
sh CODE_PAR_DIR/calcEVI/ run.calcEVI.sh 20120907.
 - » Weekly EVI will be created in a subdirectory named "20120901-20120907" in the parent directory referred to by the environmental variable WEEKLY_BSEVI_DIR
- Compare the files in directory
\$WEEKLY_BSEVI_DIR/20120901-20120907 with the
provided output in
\$OUTPUT_SAMPLE/weekly_bsevi/20120901-20120907.



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) **SVI UNIT TEST READINESS**
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 8 – SVI Unit Test Readiness

Presented by

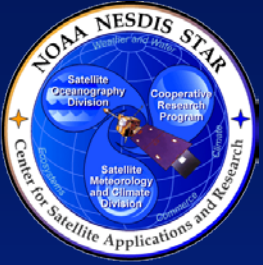
Junchang Ju
GVF Development Programmer



Raytheon

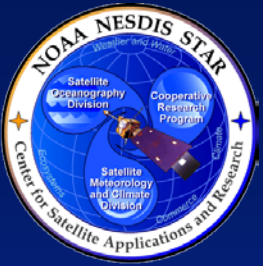
Smooth EVI (SVI) Unit (1)

- Temporally gap fills and smoothes the weekly EVI using the daily rolling weekly EVI of the current week and of the previous 14 weeks
- Reads the weekly EVI
- Compute Smoothed EVI for the current week and re-estimate the smoothed EVI for the week 7 weeks prior
- Writes EVI and cloud mask to tile file



Smooth EVI (SVI) Unit (2)

- Input:
 - » EVI Tile File of Current Week
 - » EVI Tile File of Previous 14 Weeks
- Output:
 - » Smoothed Weekly EVI Tile File for Current Week
 - » Re-estimated Smoothed Weekly EVI Tile File for 7 Weeks earlier
- Subprograms:
 - » TSsmooth_main
 - » run.TSsmooth.sh



SVI Unit Flow

RVI Sub-Unit

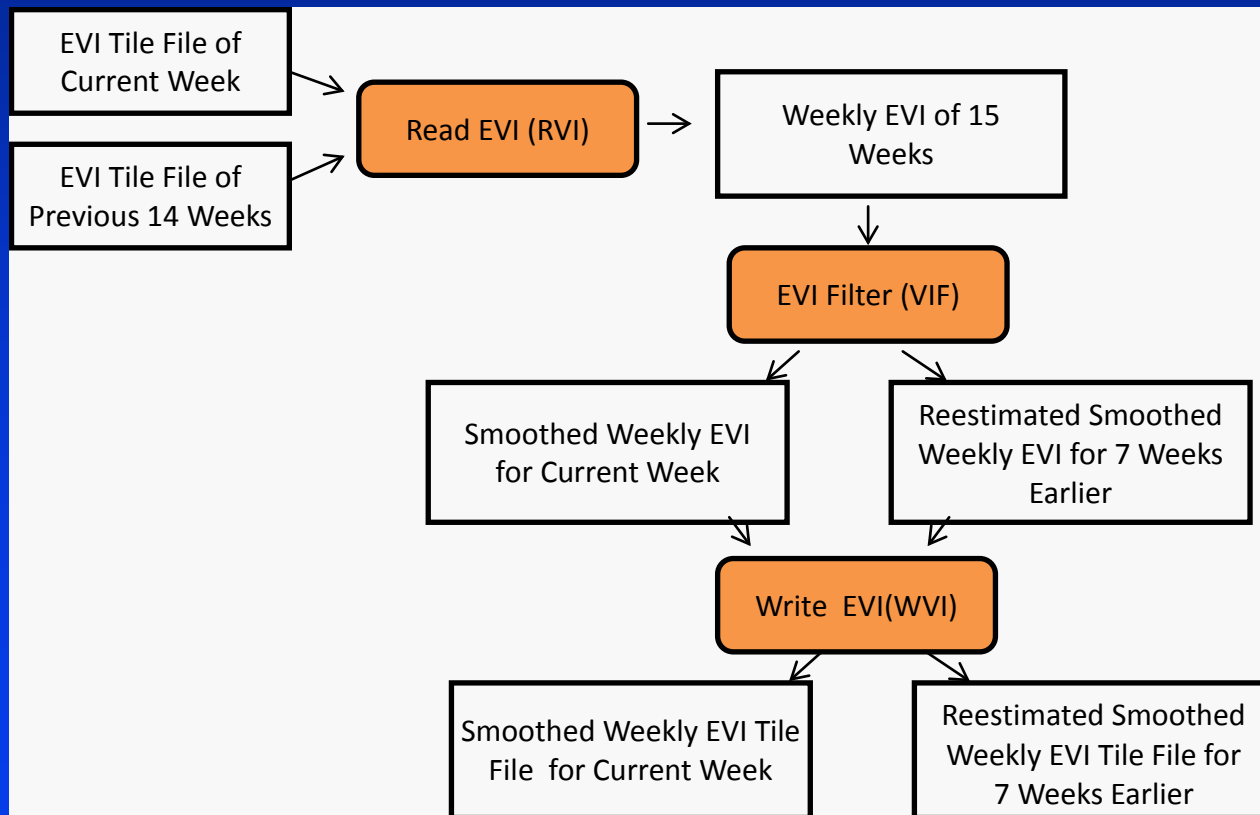
- Reads the weekly EVI.

VIF Sub-Unit

- Compute Smoothed EVI for the current week and re-estimate the smoothed EVI for the week 7 weeks prior

WVI Sub-Unit

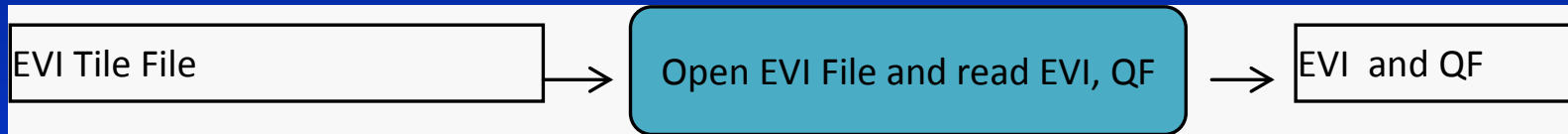
- Write EVI and Cloud Mask to Tile File.

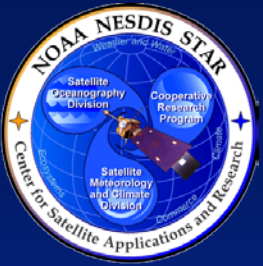




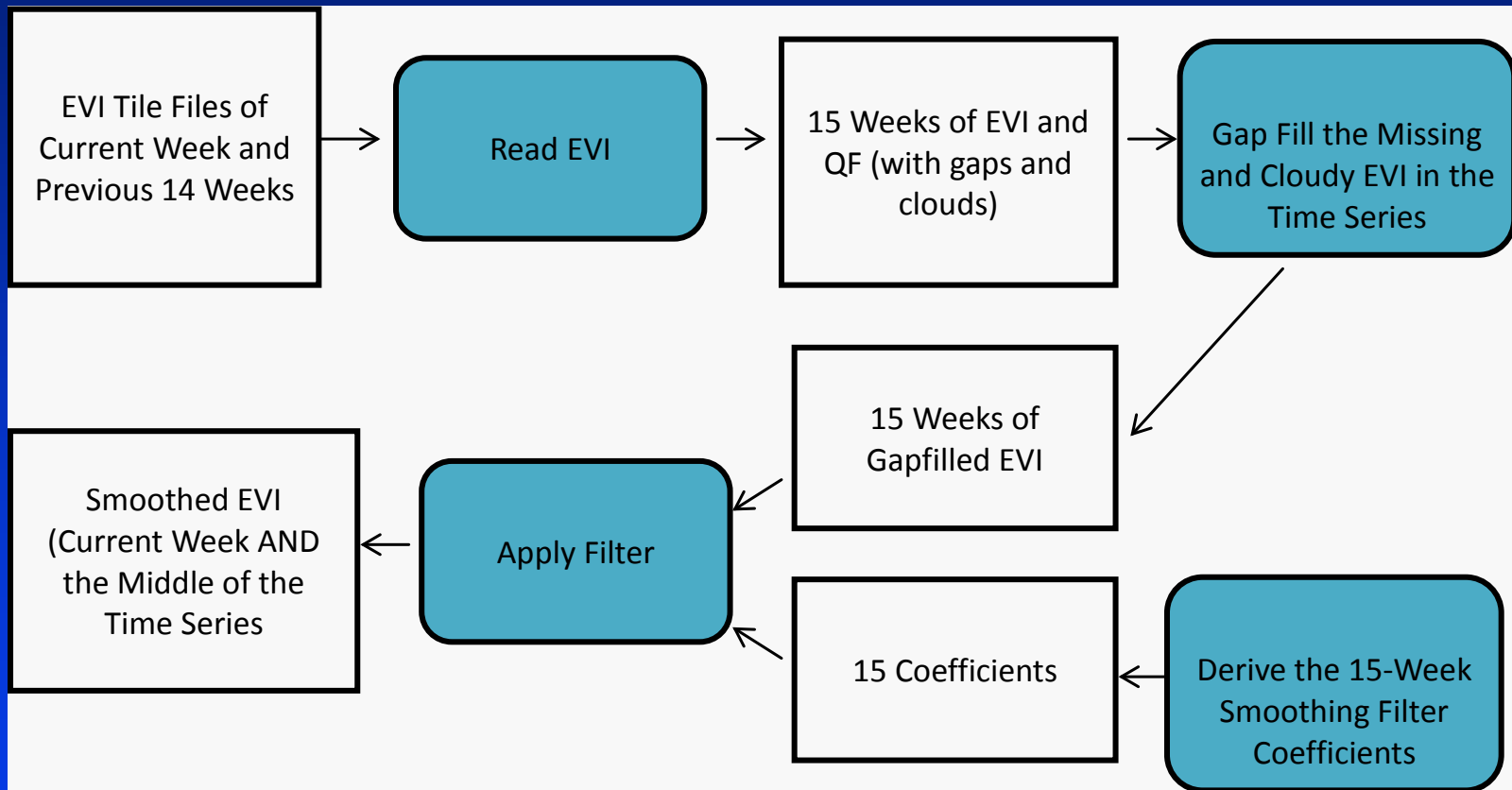
Raytheon

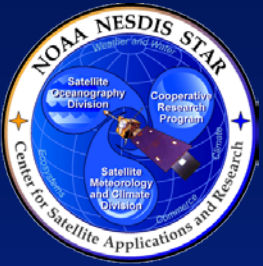
RVI Sub-Unit Flows





VIF Sub-Unit Flows

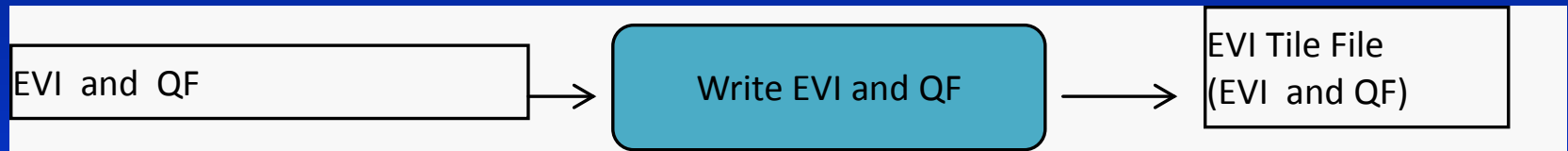




WVI Sub-Unit Flow



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SVI Unit Test Activities

- There are 18 specific SVI unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "SVI" worksheet



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SVI Unit Test Activities (1)

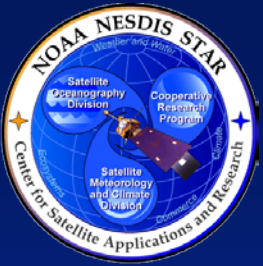
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.5	The GVF Algorithm shall calculate Weekly Enhanced Vegetation Index (EVI) from the final Reflectance Composites	SVI Unit	Confirm the Weekly EVI was calculated correctly	
4.5	The GVF Algorithm shall calculate Weekly Enhanced Vegetation Index (EVI) from the final Reflectance Composites	Weekl Reflectance	Confirm the Weekly EVI was calculated correctly	
4.5	The GVF Algorithm shall calculate Weekly Enhanced Vegetation Index (EVI) from the final Reflectance Composites	VIF Sub-Unit	Confirm the Weekly EVI was calculated correctly	
4.5	The GVF Algorithm shall calculate Weekly Enhanced Vegetation Index (EVI) from the final Reflectance Composites	Weekly EVI	Confirm the Weekly EVI was calculated correctly	
4.5	The GVF Algorithm shall calculate Weekly Enhanced Vegetation Index (EVI) from the final Reflectance Composites	WVI Sub-Unit	Confirm the Weekly EVI was calculated correctly	
4.5.1	The GVF Algorithm shall write a Weekly EVI map to a file in NetCDF4 format	SVI Unit	Confirm the Weekly EVI file was written to a file in NetCDF4 format	
4.5.1	The GVF Algorithm shall write a Weekly EVI map to a file in NetCDF4 format	VIF Sub-Unit	Confirm the Weekly EVI file was written to a file in NetCDF4 format	
4.5.1	The GVF Algorithm shall write a Weekly EVI map to a file in NetCDF4 format	WVI Sub-Unit	Confirm the Weekly EVI file was written to a file in NetCDF4 format	
4.6	The GVF Algorithm shall calculate Smoothed EVI	SVI Unit	Confirm that the Smoothed EVI was created	



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SVI Unit Test Activities (2)

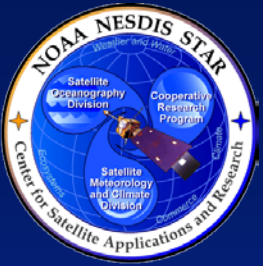
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.6	The GVF Algorithm shall calculate Smoothed EVI	VIF Sub-Unit	Confirm that the Smoothed EVI was created	
4.6	The GVF Algorithm shall calculate Smoothed EVI	Smoothed Weekly EVI	Confirm that the Smoothed EVI was created	
4.6	The GVF Algorithm shall calculate Smoothed EVI	WVI Sub-Unit	Confirm that the Smoothed EVI was created	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	SVI Unit	Confirm that the SVI unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	SVI Unit	Confirm that the SVI unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	SVI Unit	Confirm that the SVI unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	SVI Unit	Confirm that the SVI unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	SVI Unit	Confirm that the SVI unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	SVI Unit	DAP #1 includes code for the SVI unit programs and sub-programs	



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SVI Unit Test Sequence

- First copy the sample before-smoothing of 15 weeks in \$OUTPUT_SAMPLE/weekly_bsevi into \$WEEKLY_BSEVI_DIR.
- Run the script:
 - » sh CODE_PAR_DIR/TSsmooth/run.TSsmooth.sh (for the most recent week)
 - » For the current week (most recent week), compare the after-smoothing EVI files with the provided after-smoothing EVI file (in \$OUTPUT_SAMPLE/weekly_asevi/realtime/20121107-20121113) with respect to the number of files, contents of files. They should agree with each other
- Compare for the updated EVI of 7 weeks ago. They should agree with the provided files (in \$OUTPUT_SAMPLE/weekly_asevi/update/20120919-20120925).



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- 1) PROJECT PLAN
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- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) **GCL UNIT TEST READINESS**
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS



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Section 9 – GCL Unit Test Readiness

Presented by

Junchang Ju
GVF Development Programmer



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GVF Calculator (GCL) Unit (1)

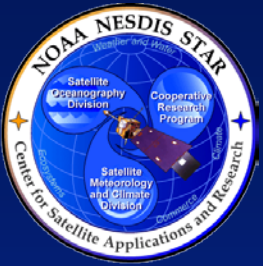
- Calculates the GVF at the GVF grid resolution from the smoothed weekly surface reflectance composite
- Calculates GVF from smoothed EVI and global Max/Min EVI for the current week and the middle week of the time series
- Writes Weekly non-aggregated GVF HDF5 tile files (GVF on the GVF grid).



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GVF Calculator (GVL) Unit (2)

- Input:
 - » Smoothed Weekly EVI (Current Week OR 7 Weeks Prior)
 - » Global Max/Min EVI
- Output:
 - » Weekly GVF HDF5 File (Current Week OR 7 Weeks Prior)
- Subprograms:
 - » calcGVF_main
 - » run.calcGVF.sh



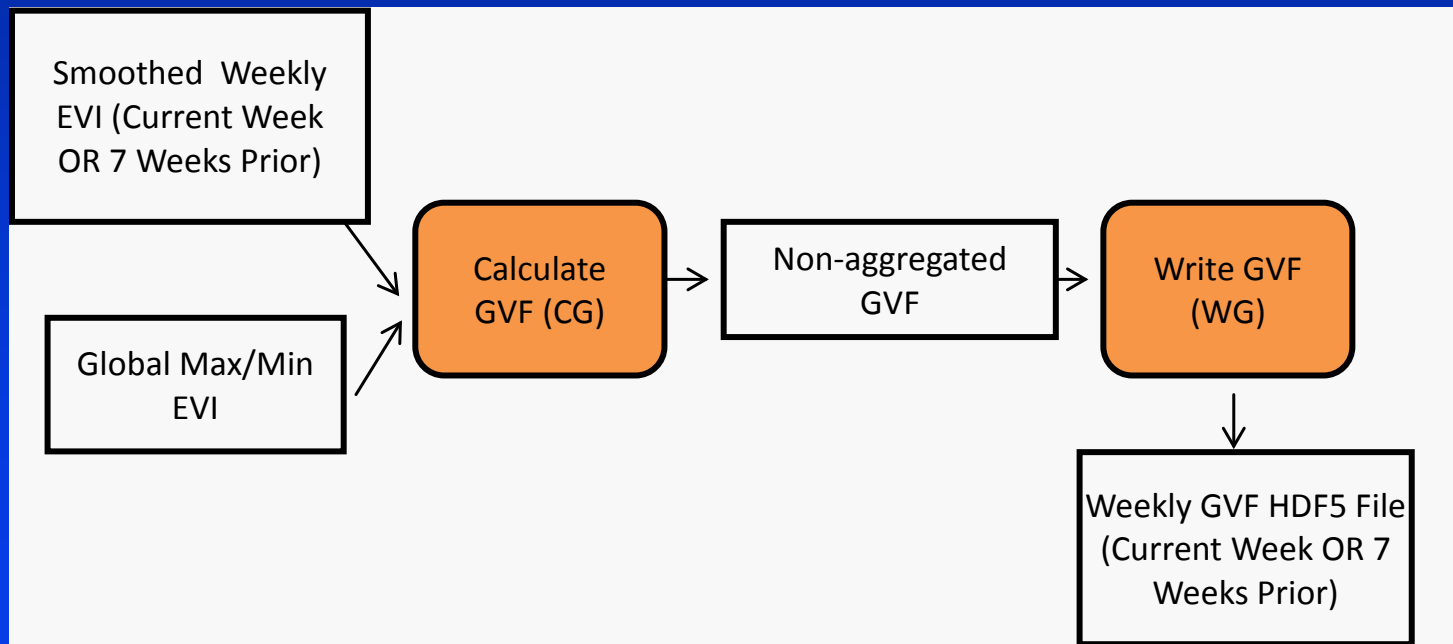
GCL Unit Flow

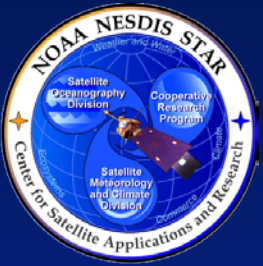
CG Sub-Unit

- Calculates GVF from smoothed EVI and global Max/Min EVI for the current week and the middle week of the time series

WG Sub-Unit

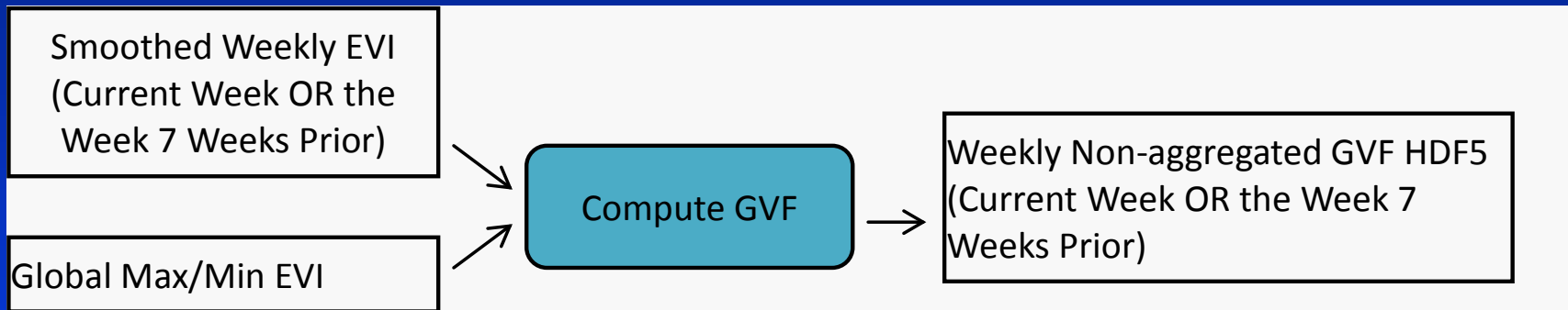
- Writes Weekly non-aggregated GVF HDF5 file files

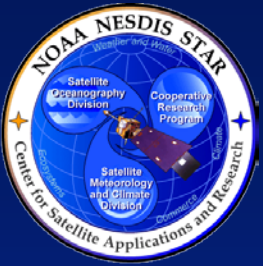




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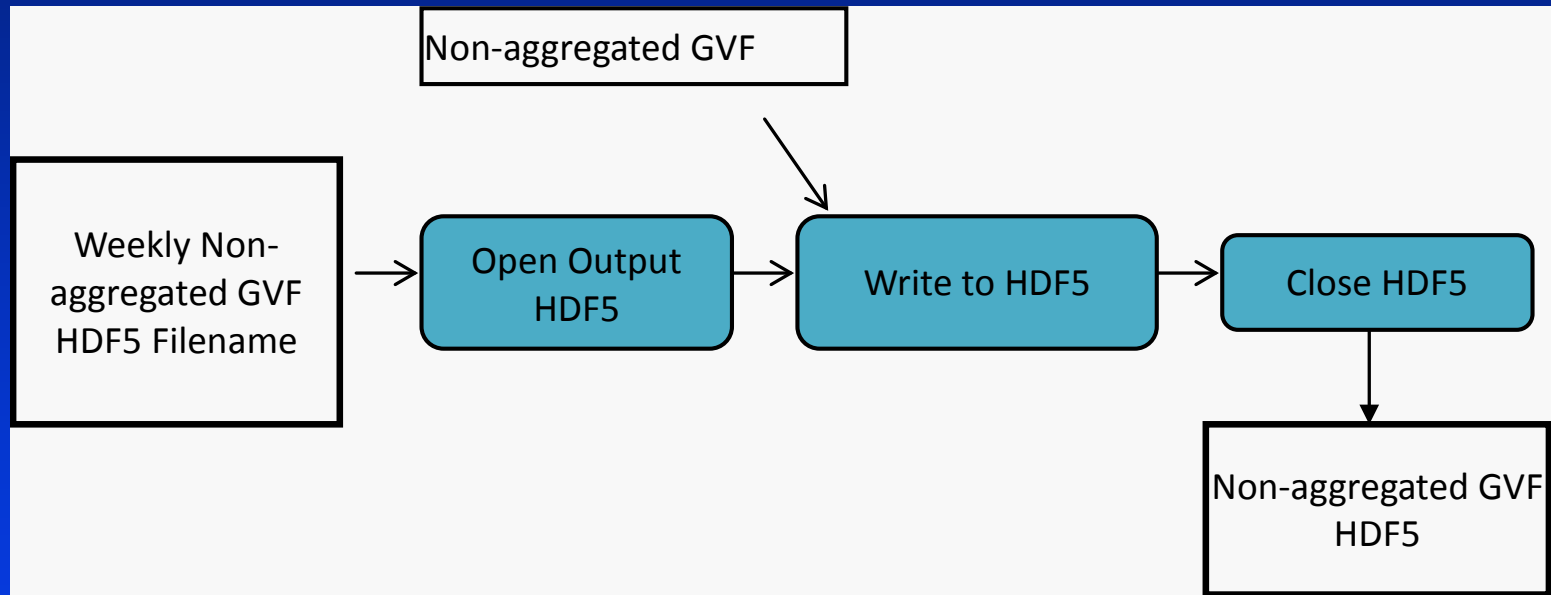
CG Sub-Unit Flows





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WG Sub-Unit Flows





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GCL Unit Test Activities

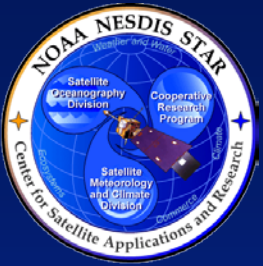
- There are 15 specific GCL unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "GCL" worksheet



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GCL Unit Test Activities

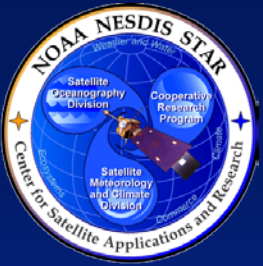
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.2.2	The GVF Algorithm shall read global minimum and maximum EVI from an internal file	WVI Sub-Unit	Confirm global max/min EVI values have been read successfully	
4.2.2	The GVF Algorithm shall read global minimum and maximum EVI from an internal file	GCL Unit	Confirm global max/min EVI values have been read successfully	
4.2.2	The GVF Algorithm shall read global minimum and maximum EVI from an internal file	CG Sub-Unit	Confirm global max/min EVI values have been read successfully	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	Global Max/Min EVI	Confirm the Green Vegetation Fraction was successfully calculated	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	WVI Sub-Unit	Confirm the Green Vegetation Fraction was successfully calculated	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	GCL Unit	Confirm the Green Vegetation Fraction was successfully calculated	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	CG Sub-Unit	Confirm the Green Vegetation Fraction was successfully calculated	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	Non-Aggregated GVF	Confirm the Green Vegetation Fraction was successfully calculated	
4.7	The GVF Algorithm shall calculate Green Vegetation Fraction (GVF)	GAG Unit	Confirm the Green Vegetation Fraction was successfully calculated	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	GCL Unit	Confirm that the GCL unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	GCL Unit	Confirm that the GCL unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	GCL Unit	Confirm that the GCL unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	GCL Unit	Confirm that the GCL unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	GCL Unit	Confirm that the GCL unit programs and sub-programs are run in Production Environment	
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	GCL Unit	DAP #1 includes code for the GCL unit programs and sub-programs	



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GCL Unit Test Sequence

- Run the script:
 - » `sh run.calcGVF.sh 2012113`
 - » If an updated, smoothed EVI has been generated in the previous unit SVI for 7 weeks earlier (i.e. 20120919-20120925), the updated GVF will also be calculated for the week
- Compare the real-time output for the current week in a subdirectory (see UTP)
- Compare the updated output for 7 weeks earlier in a subdirectory (see UTP)



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS**
- 11) RISKS AND ACTIONS
- 12) SUMMARY AND CONCLUSIONS

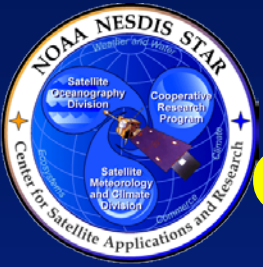


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Section 10 – GAG Unit Test Readiness

Presented by

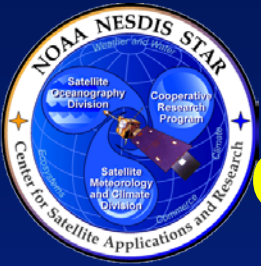
Junchang Ju
GVF Development Programmer



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GVF Aggregator (GAG) Unit (1)

- Reads the GVF in HDF5 at the GVF grid resolution
- Aggregates it to the regional 1-km (0.009°) and global 4-km (0.036°) GVF products in NetCDF4 format
- Generates and writes statistics of the 4-km GVF for selected areas and sites to XML
- Generates 1-km and 4-km GVF browse image in GeoTIFF
- Reads GVF values and QF from Weekly non-aggregated GVF NetCDF4 tile files
- Writes regional and global GVF to NetCDF4 files



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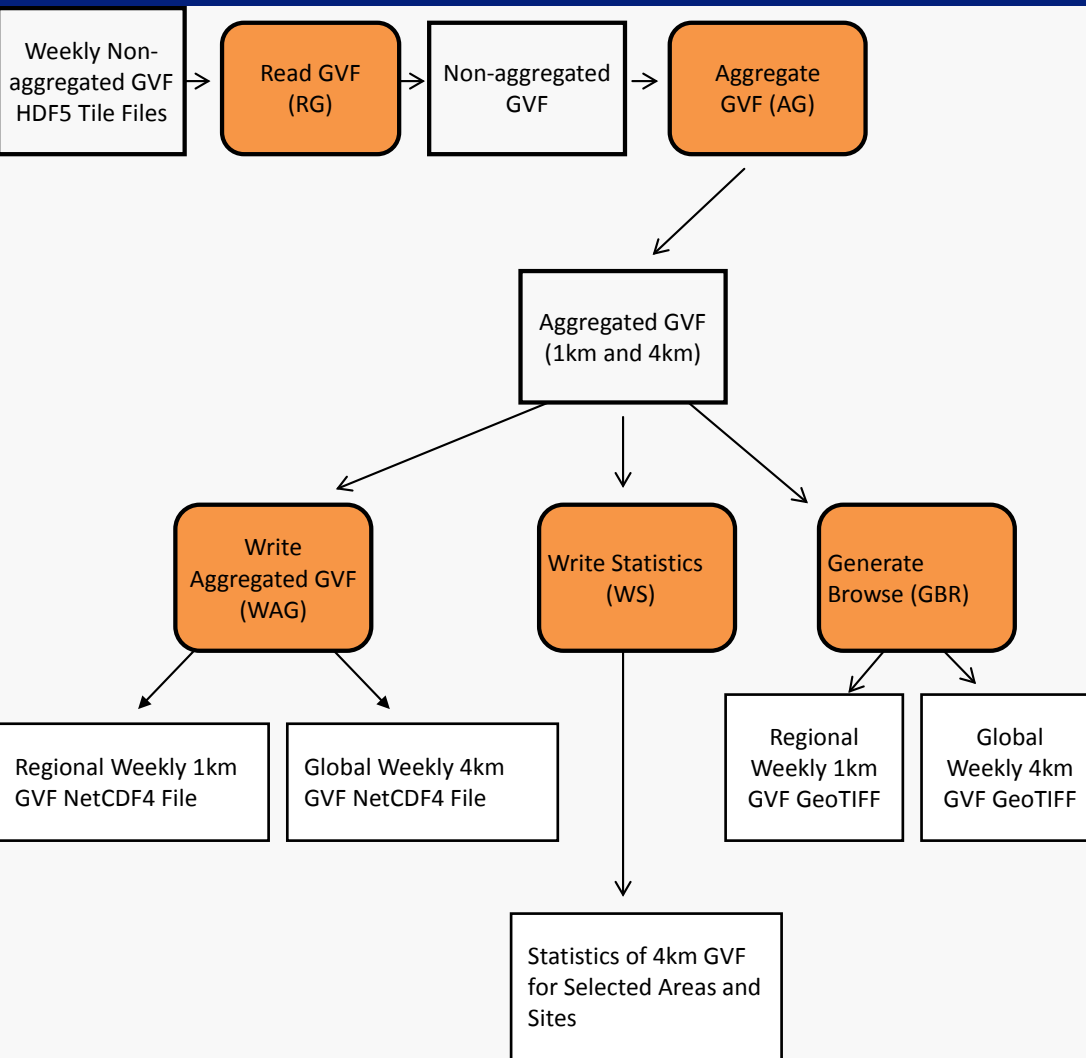
GVF Aggregator (GAG) Unit (2)

- Input:
 - » Weekly Non-aggregated GVF HDF5 Tile Files
- Output:
 - » Regional Weekly 1km GVF NetCDF4 File
 - » Global Weekly 4km GVF NetCDF4 File
 - » Statistics of 4km GVF for Selected Areas and Sites
 - » Regional Weekly 1km GVF GeoTIFF
 - » Global Weekly 4km GVF GeoTIFF
- Subprograms:
 - » aggGVF_main
 - » GV Ftiff_main
 - » run.aggGVF.sh



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GAG Unit Flow



RG Sub-Unit

- Reads GVF values and QF from Weekly non-aggregated GVF NetCDF4 tile files

AG Sub-Unit

- Aggregates 0.003° GVF to 0.009° GVF for the specified region and to 0.036° GVF globally

WAG Sub-Unit

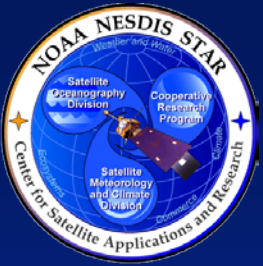
- Writes regional and global GVF to NetCDF4 files

WS Sub-Unit

- Generates and writes statistics of 4-km GVF for selected areas and sites in a text file

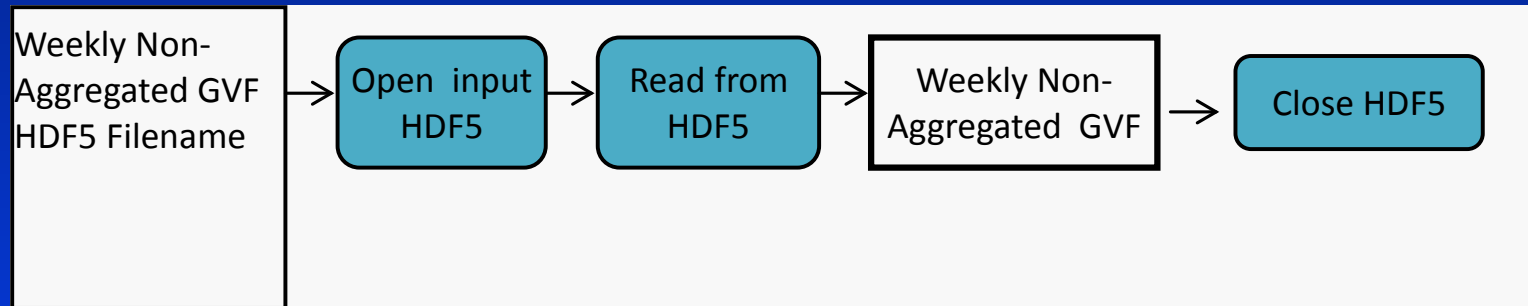
GBR Sub-Unit

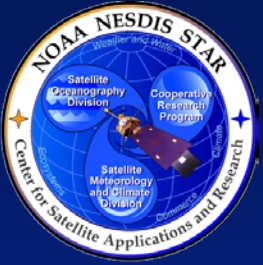
- Creates regional and global GVF GeoTIFF browse images



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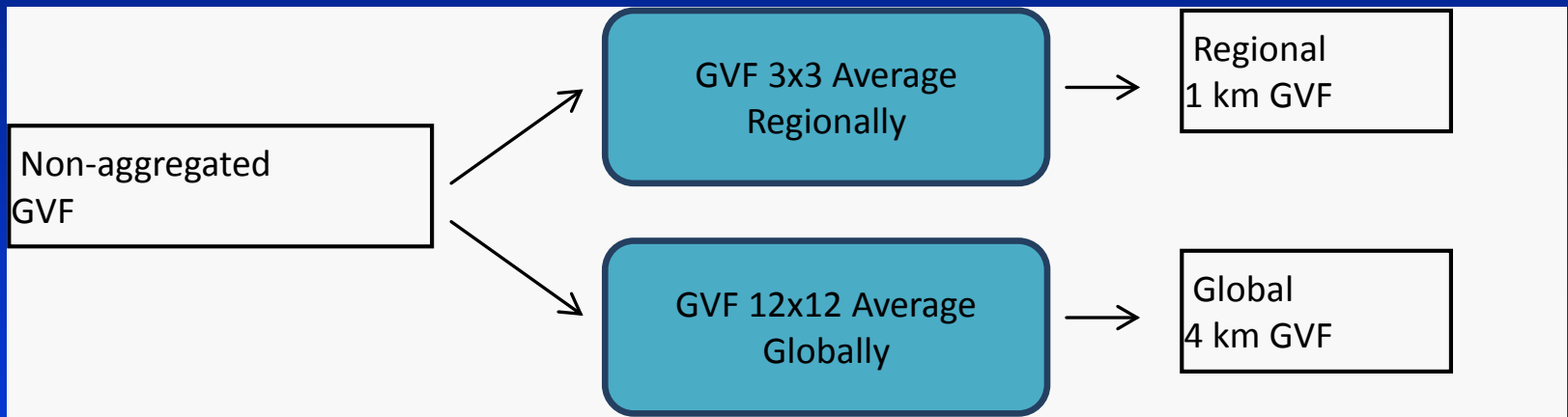
RG Sub-Unit Flows

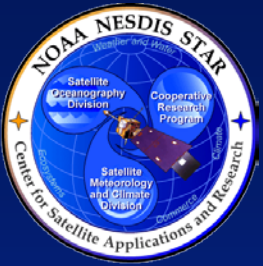




Raytheon

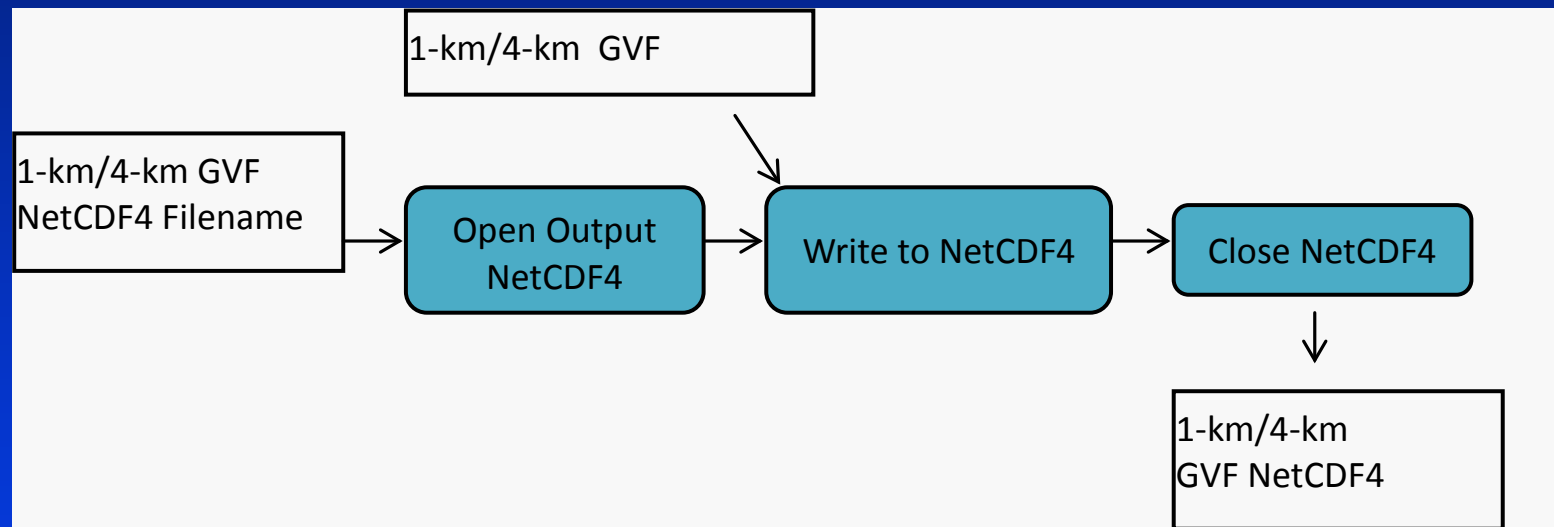
AG Sub-Unit Flows

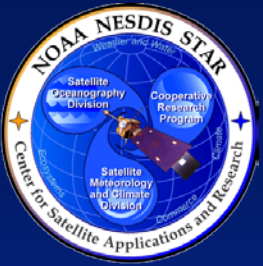




Raytheon

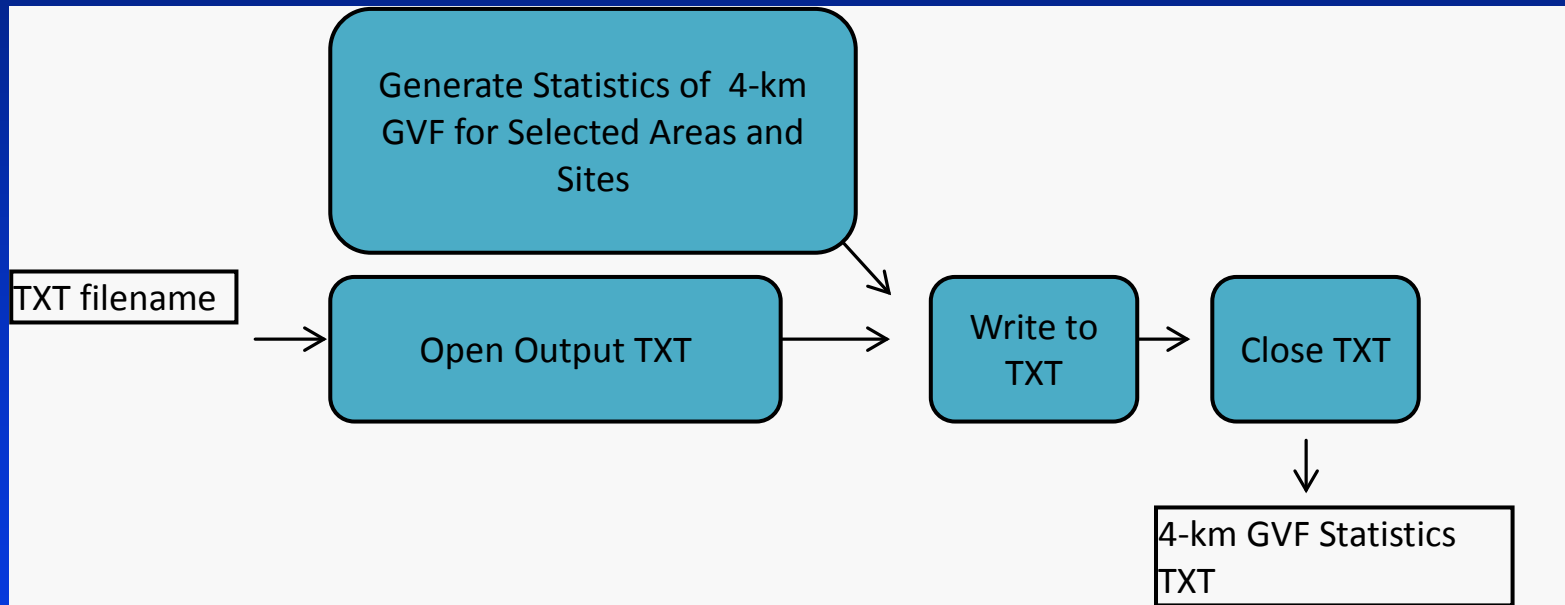
WAG Sub-Unit Flows

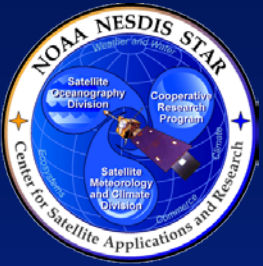




Raytheon

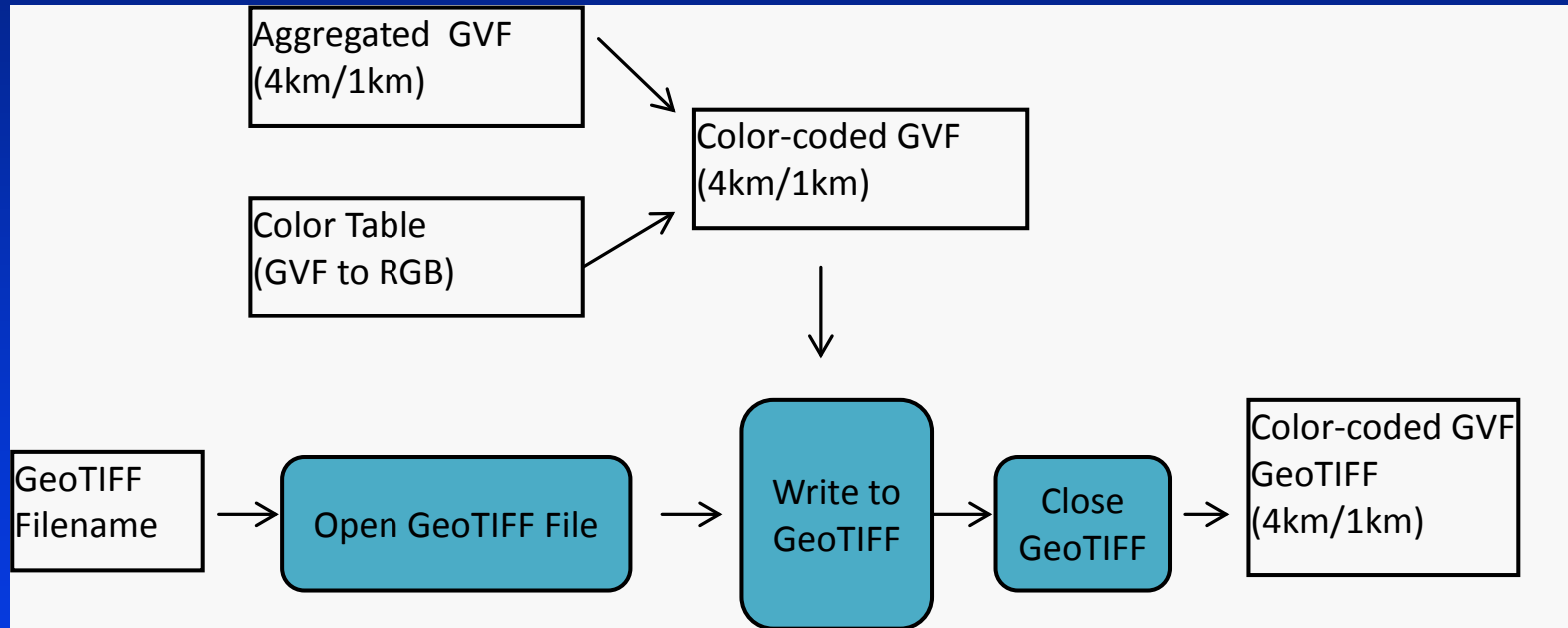
WS Sub-Unit Flows





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GBR Sub-Unit Flows





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GAG Unit Test Activities

- There are 84 specific GAG unit test activities, each traceable to a functional requirement and a system component
- These activities can be found in the UTP Appendix "GAG" worksheet



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GAG Unit Test Activities (1)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
1.0	The GVF system shall generate a global gridded Weekly GVF product, called the "GVF Global Product"	GVF Global GRIB2 File	Confirm the GVF system generated a global gridded Weekly GVF product, called the "GVF Global Product"	
1.0	The GVF system shall generate a global gridded Weekly GVF product, called the "GVF Global Product"	GVF Global NetCDF4 File	Confirm the GVF system generated a global gridded Weekly GVF product, called the "GVF Global Product"	
1.0	The GVF system shall generate a global gridded Weekly GVF product, called the "GVF Global Product"	GVF Global TIFF File	Confirm the GVF system generated a global gridded Weekly GVF product, called the "GVF Global Product"	
1.1	The GVF Global product shall represent the fractional area of a grid cell covered by live (green) vegetation	GVF Global GRIB2 File	Confirm the GVF Global product represents the fractional area of a grid cell covered by live (green) vegetation	
1.1	The GVF Global product shall represent the fractional area of a grid cell covered by live (green) vegetation	GVF Global NetCDF4 File	Confirm the GVF Global product represents the fractional area of a grid cell covered by live (green) vegetation	
1.1	The GVF Global product shall represent the fractional area of a grid cell covered by live (green) vegetation	GVF Global TIFF File	Confirm the GVF Global product represents the fractional area of a grid cell covered by live (green) vegetation	
1.2	The GVF Global product shall have a global revisit of 1 day	GVF Global GRIB2 File	Confirm the GVF Global Product has a global revisit of 1 day	
1.2	The GVF Global product shall have a global revisit of 1 day	GVF Global NetCDF4 File	Confirm the GVF Global Product has a global revisit of 1 day	
1.2	The GVF Global product shall have a global revisit of 1 day	GVF Global TIFF File	Confirm the GVF Global Product has a global revisit of 1 day	
1.3	The GVF Global product grids shall have 0.036 degree horizontal resolution	GVF Global GRIB2 File	Confirm the GVF Global Product grids have 0.036 degree horizontal resolution (4 km at equator)	
1.3	The GVF Global product grids shall have 0.036 degree horizontal resolution	GVF Global NetCDF4 File	Confirm the GVF Global Product grids have 0.036 degree horizontal resolution (4 km at equator)	
1.3	The GVF Global product grids shall have 0.036 degree horizontal resolution	GVF Global TIFF File	Confirm the GVF Global Product grids have 0.036 degree horizontal resolution (4 km at equator)	
1.3.1	The GVF Global product grids shall be in Lat/Lon projection	GVF Global GRIB2 File	Confirm the GVF Global Product grids are in Lat/Lon projection	



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GAG Unit Test Activities (2)

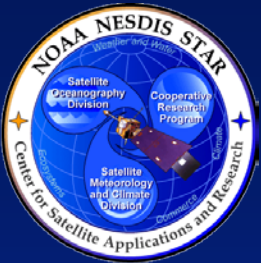
Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
1.3.1	The GVF Global product grids shall be in Lat/Lon projection	GVF Global NetCDF4 File	Confirm the GVF Global Product grids are in Lat/Lon projection	
1.3.1	The GVF Global product grids shall be in Lat/Lon projection	GVF Global TIFF File	Confirm the GVF Global Product grids are in Lat/Lon projection	
1.4	The GVF Global product shall have a measurement range from 0-100%	GVF Global GRIB2 File	Confirm the GVF Global Product has a measurement range from 0-100%	
1.4	The GVF Global product shall have a measurement range from 0-100%	GVF Global NetCDF4 File	Confirm the GVF Global Product has a measurement range from 0-100%	
1.4	The GVF Global product shall have a measurement range from 0-100%	GVF Global TIFF File	Confirm the GVF Global Product has a measurement range from 0-100%	
1.5	The GVF Global product shall have an accuracy error < 10%	GVF Global GRIB2 File	Confirm the GVF Global Product has an accuracy error <= 10%	
1.5	The GVF Global product shall have an accuracy error < 10%	GVF Global NetCDF4 File	Confirm the GVF Global Product has an accuracy error <= 10%	
1.6	The GVF Global product shall have a latency of 1 day immediately after the 7-day compositing period, updated daily	GVF Global GRIB2 File	Confirm the GVF Global product has a latency of 1 day immediately after the 7-day compositing period	
1.6	The GVF Global product shall have a latency of 1 day immediately after the 7-day compositing period, updated daily	GVF Global NetCDF4 File	Confirm the GVF Global product has a latency of 1 day immediately after the 7-day compositing period	
1.6	The GVF Global product shall have a latency of 1 day immediately after the 7-day compositing period, updated daily	GVF Global TIFF File	Confirm the GVF Global product has a latency of 1 day immediately after the 7-day compositing period	
1.7	The GVF Global product shall include quality information	GVF Global GRIB2 File	Demonstrate that the GVF unit and system test outputs contain QC flags with correct values	Quality flags are described in the GVF
1.7	The GVF Global product shall include quality information	GVF Global NetCDF4 File	Demonstrate that the GVF unit and system test outputs contain QC flags with correct values	Quality flags are described in the GVF



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GAG Unit Test Activities (3)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
1.8	The GVF Global product shall be written in multiple formats.	GVF Global GRIB2 File	Confirm output written to GRIB2 file with the correct content	
1.8	The GVF Global product shall be written in multiple formats.	GVF Global NetCDF4 File	Confirm output written to NetCDF4 file with the correct content	
1.8	The GVF Global product shall be written in multiple formats.	GVF Global TIFF File	Confirm output written to TIFF file with the correct content	
1.8.1	The GVF Global product shall be written in GRIB2 format.	GVF Global GRIB2 File	Confirm output written to GRIB2 file with the correct content	
1.8.2	The GVF Global product shall be written in netCDF4 format.	GVF Global NetCDF4 File	Confirm output written to NetCDF4 file with the correct content	
1.8.3	The GVF Global product shall be written in Geo-TIFF format.	GVF Global TIFF File	Confirm output written to TIFF file with the correct content	
2.0	The GVF system shall generate a regional gridded Weekly GVF product, called the "GVF Regional Product"	GVF Global GRIB2 File	Confirm the GVF system generated a regional gridded Weekly GVF product, called the "GVF Regional Product"	
2.0	The GVF system shall generate a regional gridded Weekly GVF product, called the "GVF Regional Product"	GVF Regional GRIB2 Files	Confirm the GVF system generated a regional gridded Weekly GVF product, called the "GVF Regional Product"	
2.0	The GVF system shall generate a regional gridded Weekly GVF product, called the "GVF Regional Product"	GVF Regional TIFF Files	Confirm the GVF system generated a regional gridded Weekly GVF product, called the "GVF Regional Product"	
2.1	The GVF Regional product shall consist of 1 regional map	GVF Regional GRIB2 Files	Confirm the GVF Regional product consists of 1 regional map	
2.1	The GVF Regional product shall consist of 1 regional map	GVF Regional TIFF Files	Confirm the GVF Regional product consists of 1 regional map	
2.1.1	Regional map 1 shall extend 130 degrees longitude eastward to 30 degrees east.	GVF Regional GRIB2 Files	Confirm that Regional map 1 extends 130 degrees longitude eastward to 30 degrees east.	



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GAG Unit Test Activities (4)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
2.1.1	Regional map 1 shall extend 130 degrees longitude eastward to 30 degrees east.	GVF Regional TIFF Files	Confirm that Regional map 1 extends 130 degrees longitude eastward to 30 degrees east.	
2.1.2	Regional map 1 shall extend 90 degrees north latitude to 7.5 degrees south latitude.	GVF Regional GRIB2 Files	Confirm that Regional map 1 extends 90 degrees north latitude to 7.5 degrees south latitude.	
2.1.2	Regional map 1 shall extend 90 degrees north latitude to 7.5 degrees south latitude.	GVF Regional TIFF Files	Confirm that Regional map 1 extends 90 degrees north latitude to 7.5 degrees south latitude.	
2.2	The GVF Regional product shall represent the fractional area of a grid cell covered by live (green) vegetation	GVF Regional GRIB2 Files	Confirm the GVF Regional product represents the fractional area of a grid cell covered by live (green) vegetation	
2.2	The GVF Regional product shall represent the fractional area of a grid cell covered by live (green) vegetation	GVF Regional TIFF Files	Confirm the GVF Regional product represents the fractional area of a grid cell covered by live (green) vegetation	
2.3	The GVF Regional product shall have a global revisit of 1 day	GVF Regional GRIB2 Files	Confirm the GVF Regional product has a global revisit of 1 day	Daily production of global Surface
2.3	The GVF Regional product shall have a global revisit of 1 day	GVF Regional TIFF Files	Confirm the GVF Regional product has a global revisit of 1 day	Daily production of global Surface
2.4	The GVF Regional product grids shall have 0.009 degree horizontal resolution	GVF Regional GRIB2 Files	Confirm the GVF Regional Product grids have 0.009 degree horizontal resolution (1 km at equator)	
2.4	The GVF Regional product grids shall have 0.009 degree horizontal resolution	GVF Regional TIFF Files	Confirm the GVF Regional Product grids have 0.009 degree horizontal resolution (1 km at equator)	
2.4.1	The GVF Regional product grids shall be in Lat/Lon projection	GVF Regional GRIB2 Files	Confirm the GVF Regional Product grids are in Lat/Lon projection	
2.4.1	The GVF Regional product grids shall be in Lat/Lon projection	GVF Regional TIFF Files	Confirm the GVF Regional Product grids are in Lat/Lon projection	
2.5	The GVF Regional product shall have a measurement range from 0-100%	GVF Regional GRIB2 Files	Confirm the GVF Regional Product has a measurement range from 0-100%	



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GAG Unit Test Activities (5)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
2.5	The GVF Regional product shall have a measurement range from 0-100%	GVF Regional TIFF Files	Confirm the GVF Regional Product has a measurement range from 0-100%	
2.6	The GVF Regional product shall have an accuracy error < 10%	GVF Regional GRIB2 Files	Confirm the GVF Regional Product has an accuracy error <= 10%	Should there be an accuracy requirement
2.7	The GVF Regional product shall have a latency of 1 day immediately after the 7-day compositing period, updated daily	GVF Regional GRIB2 Files	Confirm the GVF Regional Product has a latency of 1 day immediately after the 7-day compositing period	Latency is defined as the interval from the last observation to
2.7	The GVF Regional product shall have a latency of 1 day immediately after the 7-day compositing period, updated daily	GVF Regional TIFF Files	Confirm the GVF Regional Product has a latency of 1 day immediately after the 7-day compositing period	Latency is defined as the interval from the last observation to
2.8	The GVF Regional product shall include quality information	GVF Regional GRIB2 Files	Demonstrate that the GVF unit and system test outputs contain QC flags with correct values	
2.9	The GVF Regional product shall be written in multiple formats.	GVF Regional GRIB2 Files	Confirm output written to GRIB2 file with the correct content	
2.9	The GVF Regional product shall be written in multiple formats.	GVF Regional TIFF Files	Confirm output written to TIFF file with the correct content	
2.9.1	The GVF Regional product shall be written in GRIB2 format.	GVF Regional GRIB2 Files	Confirm output written to GRIB2 file with the correct content	
2.9.2	The GVF Regional product shall be written in Geo-TIFF format.	GVF Regional TIFF Files	Confirm output written to TIFF file with the correct content	
4.8	The GVF Algorithm shall aggregate GVF to the resolutions needed for the product files.	GAG Unit	Demonstrate that the GVF Algorithm successfully aggregated the GVF to the resolution needed for the product files	
4.8	The GVF Algorithm shall aggregate GVF to the resolutions needed for the product files.	AG Sub-Unit	Demonstrate that the GVF Algorithm successfully aggregated the GVF to the resolution needed for the product files	
4.8	The GVF Algorithm shall aggregate GVF to the resolutions needed for the product files.	Aggregated GVF	Demonstrate that the GVF Algorithm successfully aggregated the GVF to the resolution needed for the product files	



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GAG Unit Test Activities (6)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
4.8.1	The GVF Algorithm shall produce GVF on 0.009 degree regional grids.	GAG Unit	Confirm the GVF Algorithm produces a GVF on 0.009 degree regional grids.	
4.8.1	The GVF Algorithm shall produce GVF on 0.009 degree regional grids.	AG Sub-Unit	Confirm the GVF Algorithm produces a GVF on 0.009 degree regional grids.	
4.8.1	The GVF Algorithm shall produce GVF on 0.009 degree regional grids.	Aggregated GVF	Confirm the GVF Algorithm produces a GVF on 0.009 degree regional grids.	
4.8.2	The GVF Algorithm shall produce global GVF on a 0.036 degree global grid.	GAG Unit	Confirm the GVF Algorithm produces a global GVF on a 0.036 degree global grid.	
4.8.2	The GVF Algorithm shall produce global GVF on a 0.036 degree global grid.	AG Sub-Unit	Confirm the GVF Algorithm produces a global GVF on a 0.036 degree global grid.	
4.8.2	The GVF Algorithm shall produce global GVF on a 0.036 degree global grid.	Aggregated GVF	Confirm the GVF Algorithm produces a global GVF on a 0.036 degree global grid.	
4.8.3	The GVF Algorithm shall write aggregated GVF maps to output files.	WVI Sub-Unit	Confirm the GVF Algorithm writes aggregated GVF maps to output files.	
4.8.3	The GVF Algorithm shall write aggregated GVF maps to output files.	GAG Unit	Confirm the GVF Algorithm writes aggregated GVF maps to output files.	
4.8.3	The GVF Algorithm shall write aggregated GVF maps to output files.	WAG Sub-Unit	Confirm the GVF Algorithm writes aggregated GVF maps to output files.	
4.9	The GVF Algorithm shall be implemented by processing code written in C++	GAG Unit	Confirm that the GAG unit programs and sub-programs are written in C++	
4.9.1	The GVF processing code shall be able to run in the Development Environment	GAG Unit	Confirm that the GAG unit programs and sub-programs are run in the Development Environment	
4.9.2	The GVF processing code shall be able to run in the NDE SADIE	GAG Unit	Confirm that the GAG unit programs and sub-programs are run in SADIE	
4.9.3	The GVF processing code shall be able to run in the NDE System Test Environment	GAG Unit	Confirm that the GAG unit programs and sub-programs are run in NDE System Test Environment	
4.9.4	The GVF processing code shall be able to run in the Production Environment	GAG Unit	Confirm that the GAG unit programs and sub-programs are run in Production Environment	



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GAG Unit Test Activities (7)

Requirement Number	Requirement Statement	Verification Item	Verification Activities	Comments
5.0	The GVF system shall generate a metadata product for the NCDL CLASS archive facilities.	GVF Global XML File	Confirm the metadata product has been generated as outlined in the NDE-CLASS ICD	
5.0	The GVF system shall generate a metadata product for the NCDL CLASS archive facilities.	WS Sub-Unit	Confirm the metadata product has been generated as outlined in the NDE-CLASS ICD	
5.1	GVF metadata shall include collection level metadata for the GVF Global Product	GVF Global XML File	Confirm the GVF metadata includes collection level metadata as described in the NDE ADP v1.3 (Section 6).	The GVF DDD will describe the GVF collection level
5.1	GVF metadata shall include collection level metadata for the GVF Global Product	WS Sub-Unit	Confirm the GVF metadata includes collection level metadata as described in the NDE ADP v1.3 (Section 6).	The GVF DDD will describe the GVF collection level
5.2	GVF metadata shall include granule level metadata for the GVF Global Product	GVF Global XML File	Confirm the GVF metadata includes granule level metadata as described in the NDE ADP v1.3 (section 6)	The GVF DDD will describe the GVF
5.2	GVF metadata shall include granule level metadata for the GVF Global Product	WS Sub-Unit	Confirm the GVF metadata includes granule level metadata as described in the NDE ADP v1.3 (section 6)	The GVF DDD will describe the GVF
5.3	GVF metadata shall be written to a separate XML file.	GVF Global XML File	Confirm the metadata is written to a separate XML file	File contents are described in the GVF
5.3	GVF metadata shall be written to a separate XML file.	WS Sub-Unit	Confirm the metadata is written to a separate XML file	File contents are described in the GVF
8.2.1	DAP # 1 shall include C code to produce VIIRS GVF products from the identified input data, including make files and scripts, ready for configuration and unit testing in SADIE	GAG Unit	DAP #1 includes code for the GAG unit programs and sub-programs	



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GAG Unit Test Sequence

- Check if aggregated GVF at the regional scale and global scale in NetCDF4 have been created in the output directory
\$WEEKLY_AAGVF_DIR/realtime/20121107-20121113
- Compare the content of the NetCDF4 files with the provided results in
\$SAMPLE_OUTPUT/weekly_aagvf/realtime/20121107-20121113
- Do the same comparison for updated GVF of 7 weeks earlier in subdirectory update/20120919-20120925
- Check if GeoTIFF browse images have been generated in the output directory for the “realtime” and “updated” GVF, and compare with the provided output



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) **RISKS AND ACTIONS**
- 12) SUMMARY AND CONCLUSIONS



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Section 11 – Risks and Actions

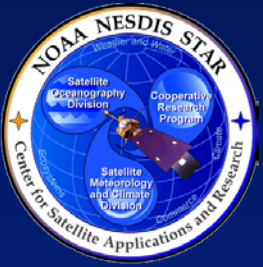
Presented by
Rory Moore (Raytheon)



Raytheon

GVF - Project Status Report Appendix

- The PSR Appendix is a Microsoft Excel file that describes the status of project risks and associated risk mitigation actions
 - » Reviewers can access PSR Appendix version 3.0 at https://www.star.nesdis.noaa.gov/smcd/emb/gvf/NPP/GVFdoc_TRR.php
- Guidelines for the PSR Appendix are found in STAR EPL process asset DG-5.2.A
 - » Reviewers can access this document at http://www.star.nesdis.noaa.gov/star/EPL_index.php



GVF – Risks at TRR



Raytheon

- There are **29** open risks to be reviewed at the **TRR**
 - » **16** of these are open risks from the PRR
 - » **3** additional Candidate Risks have been identified by the developers
- The risks will be reviewed in order from “High” to “Medium” to “Low”, as they were assessed by the PRR Reviewers or the Developers (Candidate Risks)
- The following slides contain, for each risk item:
 - » A risk statement
 - » Risk assessment (Severity and Probability)
 - » Risk mitigation recommendation
 - » Status of actions identified to mitigate the risk



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High Risks After CDR

- There were 3 High risks identified at the CDR



High Risks After CDR – Risk # 39



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- **RISK # 39** – Degradation in VIIRS I2 band results in failure to meet required GVF accuracy
- **Risk Assessment: HIGH** (Severity = 8, Probability = 5, **Score = 40**).
- **Risk Mitigation:**
 - » Work with NDE to determine when I2 band degradation has stabilized
 - » Determine and document the effect of VIIRS I2 band quality on GVF accuracy
- **New Risk Assessment: N/A** – New risk established by CDR Reviewers



Open Actions for Risk # 39



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- **ACTION CDR-18:** Work with NDE to determine when I2 band degradation has stabilized
 - » Remains open.
- **ACTION CDR-19:** Determine the effect of VIIRS I2 band quality on GVF accuracy
 - » Remains open, but progress has been made since CDR.
- **ACTION CDR-20:** Document the effect of VIIRS I2 band quality on GVF accuracy
 - » Remains open, but progress has been made since CDR.

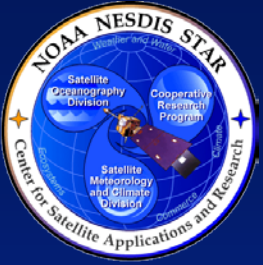


High Risks After CDR – Risk # 40



Raytheon

- **RISK # 40** – CLASS archive of GVF products is not funded
- **Risk Assessment: HIGH** (Severity = 8, Probability = 5, **Score = 40**).
- **Risk Mitigation:**
 - » None. To be addressed at the organizational level.
- **New Risk Assessment: N/A** – New risk established by CDR Reviewers



Open Actions for Risk # 40



Raytheon

- TBS



High Risks After CDR – Risk # 41



Raytheon

- **RISK # 41** – IMSG – STAR contract for scientific services has not been awarded and may cause loss of development resources
- **Risk Assessment: HIGH** (Severity = 8, Probability = 5, **Score = 40**).
- **Risk Mitigation:**
 - » Revise the IMS as needed to account for interruption of contractor services
 - » Coordinate with SPSRB to ensure availability of funds after any interruption of contractor services
- **New Risk Assessment: HIGH** (Severity = 8, Probability = 5, **Score = 40**).

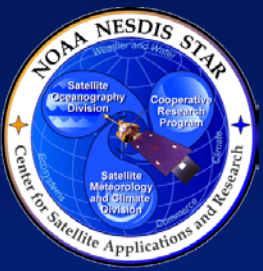


Open Actions for Risk # 41



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- **ACTION CDR-21:** Revise the IMS as needed to account for interruption of contractor services
 - » Remains open. IMS is revised as needed.
- **ACTION CDR-22:** Coordinate with SPSRB to ensure availability of funds after an interruption of contractor services
 - » Remains open.



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High Candidate Risks

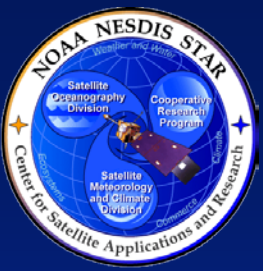


High Candidate Risks

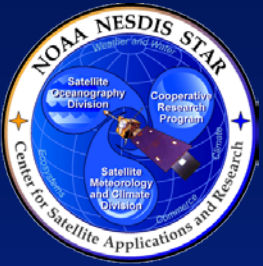


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- None



Medium Risks and Associated Actions



Medium Risks After CDR – Risk # 19



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- RISK # 19 – Operations concept is not completely developed
- Previous Risk Assessment: None (Severity = 0, Probability = 3, Score = 0).
- Risk Mitigation:
 - » Determine a time retention policy for VIIRS SDRs
 - » Submit a "Request to Archive" to NCDC
 - » Complete a DSA with NCDC
- New Risk Assessment: NONE (Severity = 5, Probability = 5, Score = 25)
 - » Submission Agreement must be between OSPO and CLASS. Risk should remain open, with actions G3R-2.2.2.2 and G3R-2.2.2.3 remaining open. Risk is re-assessed as Medium. Actions CDR-3.3.1.1, CDR-3.4.1.1, CDR-3.4.1.2, CDR-3.4.1.3, CDR-3.4.1.4, CDR-3.4.1.5, and CDR-3.4.1.6 have been added.

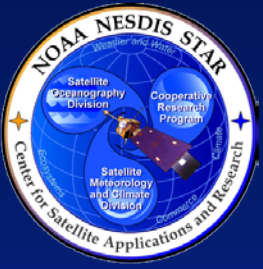


Open Actions for Risk # 19



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- **ACTION G3R-2.2.2.2:** Submit a "Request to Archive" to NCDC.
 - » Provisional request has been submitted, but may be overtaken by a revised archive process for NUP. In that case, action can be withdrawn.
- **ACTION G3R-2.2.2.3:** Complete a SA with NCDC.
 - » May be overtaken by a revised archive process for NUP. In that case, action can be withdrawn.



Open Actions for Risk # 19



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- **ACTION CDR-3.3.1.1:** Determine whether or not to write metadata to a separate XML file
- **ACTION G3R-3.4.1.1:** Confirm that a Geo-TIFF library is not needed
- **ACTION G3R-3.4.1.2:** Add retention of 14 weeks Previous Smoothed Weekly EVI files to the operations concept.
- **ACTION G3R-3.4.1.3:** Confirm system capability to retain 14 weeks Previous Smoothed Weekly EVI files.



Open Actions for Risk # 19



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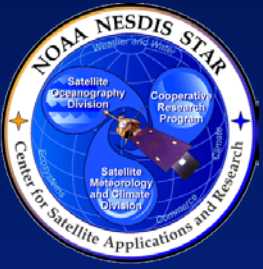
- **ACTION CDR-3.4.1.4:** Determine how to schedule GVF Daily runs for the 365th and 366th days of the year.
- **ACTION G3R-3.4.1.5:** Consider running the GVF Weekly run on multiple CPUs to reduce processing time
- **ACTION G3R-3.4.1.6:** Consider how to make the GVF daily files available to other applications
- **ACTION G3R-3.4.1.7:** Confirm with EMC that they do not need daily archiving of Weekly GVD NetCDF4 files.



Medium Risks After CDR – Risk # 29



- **RISK # 29** – Test plans are not established.
- **Previous Risk Assessment: MEDIUM** (Severity = 5, Probability = 4, Score = 20).
- **Risk Mitigation:**
 - » Describe the plan for verification and validation in the Verification and Validation Plan (VVP)
 - » Review and approve the VVP at the Critical Design Review (CDR)
 - » Produce a Unit Test Plan (UTP), based on the VVP
 - » Review and approve the UTP at the Test Readiness Review (TRR)
 - » Produce a System Test Plan (STP), based on the VVP
 - » Review and approve the STP at the Code Test Review (CTR)
- **New Risk Assessment: MEDIUM** (Severity = 5, Probability = 4, Score = 20).

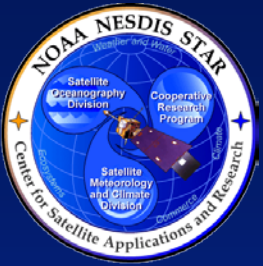


Closed Actions for Risk # 29



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- **ACTION PRR-13:** Review and approve the VVP at the CDR
- **ACTION PRR-14:** Produce a Unit Test Plan (UTP), based on the VVP



Open Actions for Risk # 29



Raytheon

- **ACTION PRR-15:** Review and approve the UTP at the TRR
- **ACTION PRR-16:** Produce a System Test Plan (STP), based on the VVP
- **ACTION PRR-17:** Review and approve the STP at the CTR
- **ACTION CDR-5:** Ensure that the unit test plan allows for sequential unit testing in the STAR and NDE environments
- **ACTION CDR-5:** Ensure that the system test plan allows for sequential system testing in the STAR and NDE environments



Medium Risks After CDR – Risk # 31



Raytheon

- **RISK # 31** – VIIRS Surface Reflectance RIP will not be available in time to meet latency requirement.
- **Previous Risk Assessment: MEDIUM** (Severity = 7, Probability = 5, Score = 35).
- **Risk Mitigation:**
 - » Determine latency of Surface Reflectance RIP from CLASS
 - » If possible, secure an alternative source of Surface Reflectance RIP
 - » Modify the production schedule and/or latency requirement to accommodate Surface Reflectance RIP latency
- **New Risk Assessment: MEDIUM** (Severity = 7, Probability = 5, Score = 35).
 - » No risk reduction has been performed since the PRR.



Closed Actions for Risk # 31



Raytheon

- **ACTION PRR-21:** Determine latency of Surface Reflectance RIP from CLASS - **CLOSED**
- **ACTION PRR-2.3.1.1:** Secure an operational source of VIIRS Surface Reflectance RIP that will meet latency requirements - **CLOSED**

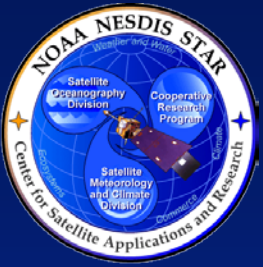


Open Action for Risk # 31



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- **ACTION PRR-22:** Modify the production schedule and/or latency requirement to accommodate Surface Reflectance RIP latency



Medium Risks After CDR – Risk # 32



Raytheon

- RISK # 32 – NCEP EMC needs for a GVF Regional Product are not completely established
- Previous Risk Assessment: MEDIUM (Severity = 5, Probability = 5, Score = 25). (was candidate risk for CDR, C25)
- Risk Mitigation:
 - » Consult with NCEP EMC to determine their needs for a GVF Regional Product
 - » Document NCEP EMC needs for a GVF Regional Product in the OCD
 - » Revise the RAD to ensure that NCEP EMC needs for a GVF Regional Product are captured
- New Risk Assessment: MEDIUM (Severity = 5, Probability = 5, Score = 25).
 - » No risk reduction has been performed since the CDR.



Open Actions for Risk # 32



Raytheon

- **ACTION CDR-8:** Consult with NCEP EMC to determine their needs for a GVF Regional Product
- **ACTION CDR-9:** Document NCEP EMC needs for a GVF Regional Product in the OCD
- **ACTION CDR-10:** Revise the RAD to ensure that NCEP EMC needs for a GVF Regional Product are captured

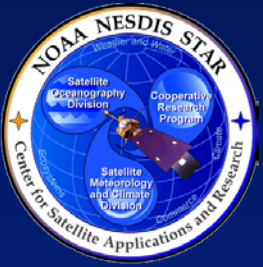


Medium Risks After CDR – Risk # 33



Raytheon

- RISK # 33 – OSPO personnel may not be ready for O&M, due to lack of access to NDE test environments
- Previous Risk Assessment: MEDIUM (Severity = 5, Probability = 5, Score = 25). (was candidate risk for CDR, C26)
- Risk Mitigation:
 - » Provide GVF operations stakeholders with access to the GVF code, test plans, test data, and test results
- New Risk Assessment: MEDIUM (Severity = 5, Probability = 3, Score = 15).
 - » Probability reduced from 5 to 3. OSPO personnel will be invited to observe NDE transition activities.



Open Action for Risk # 33



Raytheon

- **ACTION CDR-11:** Deliver pre-operational code from the Development Environment to OSPO reviewers for standards review



Raytheon

Medium Risks After CDR – Risk # 34

- RISK # 34 – Use of EVI Max/Min values derived from MODIS data during the first year of operations will introduce a bias to the calculated GVF
- Previous Risk Assessment: MEDIUM (Severity = 2, Probability = 10, Score = 20). (was candidate risk for CDR, C27)
- Risk Mitigation:
 - » When calibrated, navigated VIIRS granule files are available, develop a VIIRS-based EVI Max/Min to replace the current MODIS-based values
- New Risk Assessment: MEDIUM (Severity = 2, Probability = 10, Score = 20).



Open Actions for Risk # 34



Raytheon

- **ACTION CDR-12:** Develop a provisional VIIRS-based EVI Max/Min to replace the current MODIS-based values
- **ACTION CDR-13:** Develop an operational VIIRS-based EVI Max/Min to replace the provisional VIIRS-based values



Raytheon

Medium Risks

After CDR – Risk # 36

- RISK # 36 – Code will not run properly when Production Environment switches to a Linux environment in 2016.
- Risk Assessment: MEDIUM (Severity = 10, Probability = 3, Score = 30).
- Risk Mitigation:
 - » Write pre-operational GVF code that can be run in either IBM or Linux environment
 - » Test the code in a Linux environment
- New Risk established by CDR Reviewers

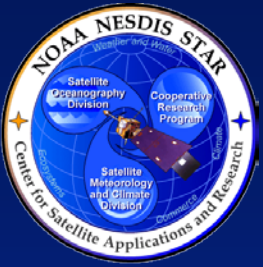


Open Action for Risk # 36



Raytheon

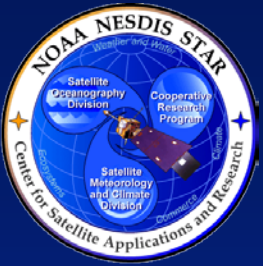
- **ACTION CDR-17:** Produce pre-operational code that can be run on a Linux server



Medium Risks

After CDR – Risk # 37

- RISK # 37 – Algorithm will not meet the GVF quality requirement
- Risk Assessment: MEDIUM (Severity = 10, Probability = 2, Score = 20)
- Risk Mitigation:
 - » Consider removing cloudy pixels from the time series smoothing by eliminating the current week EVI from the smoothing for that pixel.
 - » Re-evaluate the method for determining Global EVI Max/Min
 - » Consider making a new determination of L value in the SAVI equation, based on VIIRS data.
 - » Characterize bias in GVF due to variance in the "green-ness" of the vegetation.
 - » Consider interpolation of GVF when there are no day-time observations in winter.
- New Risk established by CDR Reviewers



Open Actions for Risk # 37



Raytheon

- **ACTION CDR-5.5.1.1:** Consider removing cloudy pixels from the time series smoothing by eliminating the current week EVI from the smoothing for that pixel.
- **ACTION CDR-5.5.1.2:** Re-evaluate the method for determining Global EVI Max/Min
- **ACTION CDR-5.5.1.3:** In the ATBD, explain why the test case analysis that used unsmoothed EVI for GVF retrieval is a reliable indicator that GVF retrieval from smoothed TOC EVI is a better approach than GVF retrieval from smoothed NDVI.

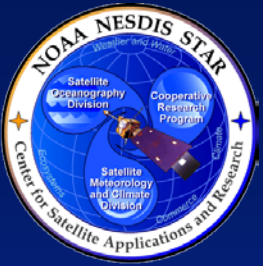


Open Actions for Risk # 37



Raytheon

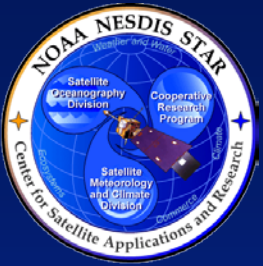
- **ACTION CDR-5.8.1.1:** Consider making a new determination of L value in the SAVI equation, based on VIIRS data.
- **ACTION CDR-5.10.4.1:** During system testing, characterize bias in GVF due to variance in the "greenness" of the vegetation.
- **ACTION CDR-5.11.1.1:** Consider interpolation of GVF when there are no day-time observations in winter.



Medium Risks

After CDR – Risk # 38

- RISK # 38 – Design is not complete at CDR
- Risk Assessment: MEDIUM (Severity = 2, Probability = 10, Score = 20)
- Risk Mitigation:
 - » Revise the SWA and DDD to show the complete and correct data flows Re-evaluate the method for determining Global EVI Max/Min
 - » Ensure that the output files from the GAG unit are compatible with the required input to the GRIB2 formatting toolkit.
 - » Ensure that the code can read the NDE Process Control File (PCF)
 - » Add DDD Section 4 (File Format Descriptions)
 - » Ensure that tiles that contain no land pixels are excluded from processing.
- New Risk established by CDR Reviewers



Open Actions for Risk # 38



Raytheon

- **ACTION CDR-6.3.2.1:** Revise the SWA to show the GRIB2 product files being output from a back-end toolkit instead of the GAG unit.
- **ACTION CDR-6.4.1.1:** Revise the GRD Unit data flow to add Land/Sea Mask input and processing
- **ACTION CDR-6.4.1.2:** Revise the SVI Unit and Sub-Unit data flows to show time series smoothing of Weeks T through T-7
- **ACTION CDR-7.5.1.1:** Ensure that the output files from the GAG unit are compatible with the required input to the GRIB2 formatting toolkit.



Open Actions for Risk # 38



Raytheon

- **ACTION CDR-7.5.1.2:** Revise the DDD to show the GRIB2 product files being output from a back-end toolkit instead of the GAG unit.
- **ACTION CDR-7.5.1.3:** Ensure that the code can read the NDE Process Control File (PCF)
- **ACTION CDR-7.5.1.4:** Add DDD Section 4 (File Format Descriptions)
- **ACTION CDR-7.5.1.5:** Ensure that tiles that contain no land pixels are excluded from processing.



Medium Risks After CDR – Risk # 42



Raytheon

- **RISK # 42** – Possible 1 month delay due to the migration of the STAR IT environment in 2012 (candidate risk for Delta CDR, C30)
- **Previous Risk Assessment:** MEDIUM (Severity = 5, Probability = 5, Score = 25)
- **Risk Mitigation:**
 - » Revise the IMS as needed to account for a 1-month delay due to the migration of the STAR IT environment
- **New Risk Assessment:** MEDIUM (Severity = 5, Probability = 5, Score = 25)

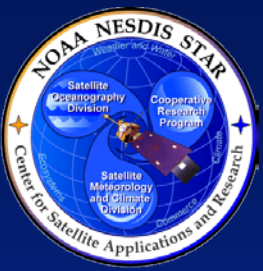


Open Action for Risk # 42



Raytheon

- **ACTION CDR-23:** Revise the IMS as needed to account for a 1-month delay due to the migration of the STAR IT environment



Raytheon

Medium Candidate Risks



Medium Candidate Risks – Risk # C31

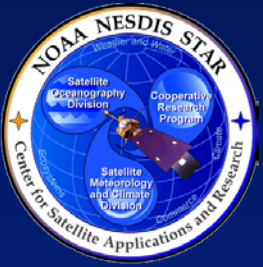


- RISK # C31 – Loss of Junchang Ju
- Risk Assessment: MEDIUM (Severity = 3, Probability = 10, Score = 30).
- Risk Mitigation:
 - » Zhangyan Jiang will assume Junchang's planned work. Planned duration of this work will be revised to reflect some learning curve for Zhangyan.
- Candidate Actions: None



Raytheon

Low Risks and Associated Actions



Low Risks After CDR – Risk # 7



Raytheon

- **RISK # 7** – User involvement is less than expected
- **Previous Risk Assessment: LOW** (Severity = 3, Probability = 2, Score = 6).
- **Risk Mitigation:**
 - » Maintain communication with all users
 - » Monitor user involvement with respect to the plan
 - » Identify and mitigate user involvement risks
- **New Risk Assessment: LOW** (Severity = 3, Probability = 2, Score = 6)
 - » Severity reduced from 5 to 3 and Probability reduced from 3 to 2 by the completion of action G3R-18 and progress on actions G3R-16 and G3R-17.

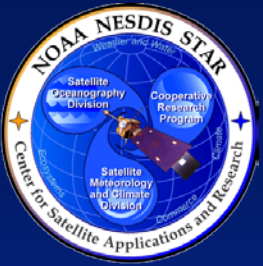


Open Actions for Risk # 7



Raytheon

- **ACTION G3R-16:** Maintain communication with all users – Remains open, but progress has been made since PRR
- **ACTION G3R-17:** Monitor user involvement with respect to the plan - Remains open, but progress has been made since PRR
- **ACTION G3R-19:** Identify and mitigate user involvement risks during the Build phase
- **ACTION G3R-2.3.1.2:** Consider adding JCSDA to the list of users



Low Risks After CDR – Risk # 10



Raytheon

- **RISK # 10** – Developers do not have access to NDE STE
- **Previous Risk Assessment: MEDIUM** (Severity = 2, Probability = 3, Score = 6).
- **Risk Mitigation:**
 - » Produce a System Test Plan (STP) that allows for system testing by STAR in SADIE, with comparable testing by NDE in the STE
 - » If necessary, perform system testing in the SADIE, comparing test results with NDE STE results
- **New Risk Assessment: LOW** (Severity = 1, Probability = 10, Score = 10)
 - » Probability increased from 3 to 10, as STAR personnel will not have access to NDE STE. Severity reduced from 2 to 1, as the operations concept has been revised to have STAR developers perform system testing in their Development Environment.



Closed Actions for Risk # 10



Raytheon

- **ACTION G3R-24:** If necessary, perform system testing in the SADIE, comparing test results with NDE STE results
- **STATUS:** This action can be withdrawn. Operations concept now has the developers performing system testing in the STAR Development Environment. **CLOSED**

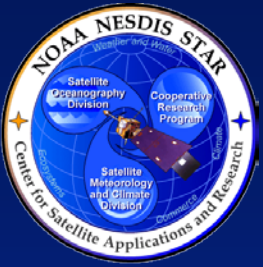


Open Actions for Risk # 10



Raytheon

- **ACTION G3R-23:** Produce a System Test Plan (STP) that allows for system testing by STAR in SADIE, with comparable testing by NDE in the STE
- **ACTION G3R-25:** Describe the system test environment in the STP and VVR



Low Risks After CDR – Risk # 11



Raytheon

- **RISK # 11** – STAR EPL process adds extra work for documentation and reviews, resulting in a schedule delay
- **Risk Assessment: MEDIUM** (Severity = 1, Probability = 3, Score = 3).
- **Risk Mitigation:**
 - » Determine tasks so that the GVF schedule risk is acceptable
 - » Assign tasks so that FTE load for each person is manageable
 - » Integrate tasks into the GVF IMP and IMS
 - » Review and approve the IMP and IMS at the Gate 3 Review
 - » Monitor project schedule periodically to identify and relieve schedule delays.
- **New Risk Assessment: LOW** (Severity = 1, Probability = 3, Score = 3)
 - » Severity reduced from 2 to 1 and Probability reduced from 4 to 3, by the completion of actions G3R-3.7.3.2 and G3R-3.7.3.3.



Open Actions for Risk # 11 (1)



Raytheon

- **ACTION G3R-2.8.2.1:** Monitor actual earned value on a monthly basis.
 - » Remains open, but progress has been made since CDR.
- **ACTION G3R-2.8.2.2:** Revise future task duration estimates, based on actual durations of previous tasks.
 - » Remains open, but progress has been made since CDR.
- **ACTION G3R-2.8.2.3:** Produce a revised IMS, based on revised task duration estimates.
 - » Remains open, but progress has been made since CDR.

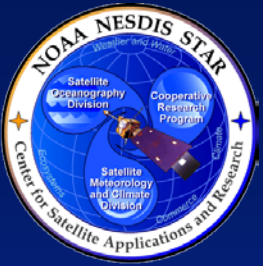


Open Actions for Risk # 11 (2)



Raytheon

- **ACTION G3R-3.7.3.2:** Produce a mitigation plan for each schedule risk identified at the CDR.
- **ACTION G3R-3.7.3.3:** Identify schedule risk mitigation actions at the CDR.
- **ACTION G3R-3.6.2.3:** Report the project's Earned Value status at the CTR.
- **ACTION G3R-3.6.2.4:** Report the project's Earned Value status at the SRR.



Low Risks After CDR – Risk # 12



Raytheon

- **RISK # 12** – Insufficient training in the STAR EPL process
- **Previous Risk Assessment: LOW** (Severity = 2, Probability = 2, **Score = 4**).
- **Risk Mitigation:**
 - » Provide process briefings to appropriate stakeholders
 - » Monitor task progress to identify and correct problems caused by insufficient training
- **New Risk Assessment: LOW** (Severity = 2, Probability = 2, **Score = 4**)
 - » No risk reduction has been performed since the PRR



Open Actions for Risk # 12



Raytheon

- **ACTION G3R-3.4.4.2:** Provide Build phase process briefings to appropriate stakeholders

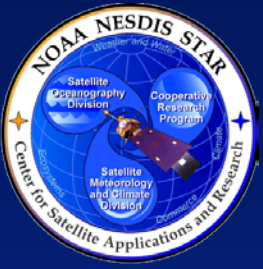


Low Risks After CDR – Risk # 13



Raytheon

- **RISK # 13** – Review teams have not been established.
- **Previous Risk Assessment: LOW** (Severity = 5, Probability = 2, Score = 10).
- **Risk Mitigation:**
 - » Select potential review team members
 - » Contact potential review team members to ensure that a review team is selected at least 2 weeks before the PRECEDING review.
 - » Document confirmed review team members in DPP updates
- **New Risk Assessment: LOW** (Severity = 5, Probability = 2, Score = 10)
 - » Severity reduced from 7 to 5 by the completion of action G3R-2.3.3.1.



Open Actions for Risk # 13



Raytheon

- **ACTION G3R-2.3.3.2:** Identify and confirm CTR reviewers.
- **ACTION G3R-2.3.3.3:** Identify and confirm SRR reviewers.

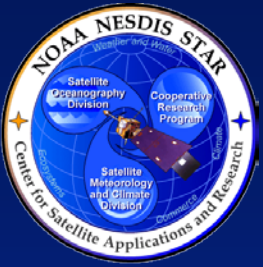


Low Risks After CDR – Risk # 15



Raytheon

- **RISK # 15** – Landsat truth data may be limited
- **Previous Risk Assessment: LOW** (Severity = 4, Probability = 2, Score = 8).
- **Risk Mitigation:**
 - » Determine whether the available Landsat truth data is sufficient to cover all biomes and seasons
 - » Arrange for backup truth data sources from comparable high resolution satellite sources (CEOS), if needed
 - » Include the use of backup truth data in the STP, if needed.
- **New Risk Assessment: LOW** (Severity = 4, Probability = 2, Score = 8)
 - » No risk reduction has been performed since the PRR.



Open Actions for Risk # 15



Raytheon

- **ACTION G3R-34:** Determine whether the available Landsat truth data is sufficient to cover all biomes and seasons
- **ACTION PRR-1:** Identify truth data for the system test, concurrent with the real VIIRS data



Low Risks After CDR – Risk # 17



Raytheon

- **RISK # 17** – ESPC SAN time retention may not be sufficient for users.
- **Previous Risk Assessment: LOW** (Severity = 3, Probability = 3, Score = 9).
- **Risk Mitigation:**
 - » Consult users to determine their time retention needs
 - » Add sufficient ESPC SAN time retention to the operations concept
 - » Document ESPC SAN time retention in the OCD.
- **New Risk Assessment: LOW** (Severity = 3, Probability = 1, Score = 3)
 - » Probability reduced from 3 to 1, as the NDE retention of 4 days should be sufficient for users, and the CLASS archive will be a source after that.

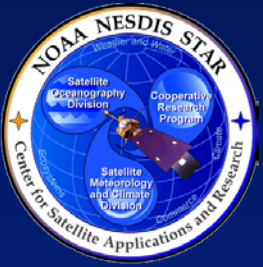


Open Actions for Risk # 17



Raytheon

- **ACTION G3R-40:** Consult users to determine their time retention needs
- **ACTION G3R-41:** Add sufficient ESPC SAN time retention to the operations concept
- **ACTION G3R-42:** Document ESPC SAN time retention in the OCD
- **ACTION G3R-43:** Include ESPC SAN retention in the system requirements

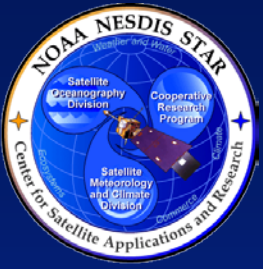


Low Risks After CDR – Risk # 21



Raytheon

- **RISK # 21** – Operator involvement is less than expected.
- **Previous Risk Assessment: LOW** (Severity = 3, Probability = 2, Score = 6).
- **Risk Mitigation:**
 - » Revise list of operations stakeholders to include Dylan Powell and Hanan Jordan
 - » Monitor operator involvement during the Design phase
 - » Monitor operator involvement during the Build phase.
- **New Risk Assessment: LOW** (Severity = 3, Probability = 2, Score = 6)
 - » Severity reduced from 5 to 3 by the completion of action G3R-47



Open Actions for Risk # 21



Raytheon

- **ACTION G3R-48:** Monitor operator involvement during the Build phase



Low Risks After CDR – Risk # 22



Raytheon

- **RISK # 22** – Product requirements are incomplete
- **Previous Risk Assessment: LOW** (Severity = 3, Probability = 2, **Score = 6**).
- **Risk Mitigation:**
 - » Specify the metadata that will be included in each DAP delivery
 - » Clarify what is meant by Accuracy of GVF
- **New Risk Assessment: LOW** (Severity = 3, Probability = 2, **Score = 6**)
 - » Severity reduced from 5 to 3 by the completion of actions PRR-4.2.3.1 and PRR-4.2.3.2.

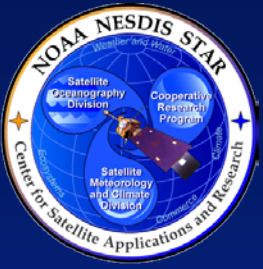


Open Actions for Risk # 22



Raytheon

- **ACTION G3R-2.4.3.1:** Specify the metadata that will be included in each DAP delivery
- **ACTION G3R-2.6.1.1:** Clarify what is meant by Accuracy of GVf
- **ACTION PRR-CDR-1:** Remove requirements 6.2, 6.3, and 6.5

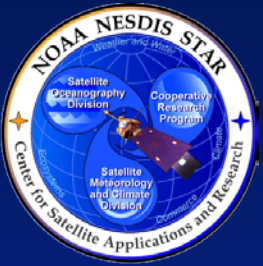


Open Actions for Risk # 22



Raytheon

- **ACTION CDR-2:** Confirm that the GVF Regional Product is part of the GVF NUP
- **ACTION PRR-4.2.3.3:** Discuss with NCEP any issues in changing from TOA NDVI-based GVF to TOC EVI-based GVF.



Low Risks After CDR – Risk # 23



Raytheon

- **RISK # 23** – Project costs exceed available funding
- **Previous Risk Assessment: LOW** (Severity = 8, Probability = 1, Score = 8).
- **Risk Mitigation:**
 - » Assess budget risks at the CDR
 - » Produce a mitigation plan for each budget risk identified at the CDR
 - » Identify budget risk mitigation actions at the CDR.
- **New Risk Assessment: LOW** (Severity = 8, Probability = 1, Score = 8)
 - » An action is needed to monitor project costs during the Build phase.

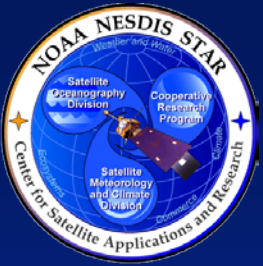


Open Actions for Risk # 23



Raytheon

- ACTION CDR-3: Monitor development costs during the build phase
- ACTION CDR-4: Report cost risks in PSR updates

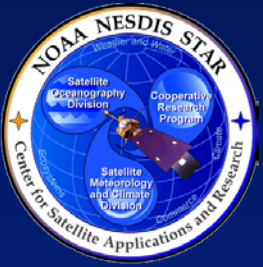


Low Risks After CDR – Risk # 26



Raytheon

- **RISK # 26 – VIIRS Cloud Mask quality may be insufficient**
- **Previous Risk Assessment: LOW** (Severity = 0, Probability = 1, Score = 0).
- **Risk Mitigation:**
 - » Consider adding a backup cloud mask algorithm to the design.
 - » Consider using the stricter clear/probably clear discrimination.
- **New Risk Assessment: LOW** (Severity = 1, Probability = 1, Score = 1)
 - » Severity is increased from 0 to 1 and the risk re-opened, as the cloud mask filter does affect the pixels selected for aggregation and therefore does affect the retrieval. Probability is reduced from 2 to 1, as the quality of the Cloud Mask IP appears to be good.



Open Actions for Risk # 26



Raytheon

- TBS



Low Risks After CDR – Risk # 28



- **RISK # 28** – Transition from NDE Operations to OSPO is affected by the non-availability of the system when OSPO training for NDE occurs.
- **Previous Risk Assessment: LOW** (Severity = 5, Probability = 3, Score = 15).
- **Risk Mitigation:**
 - » Monitor development schedule.
 - » If schedule is delayed so that system will not be in SADIE in time for training, arrange for later training..
- **New Risk Assessment: LOW** (Severity = 5, Probability = 3, Score = 15).
 - » No risk reduction has been performed since the PRR.



Open Actions for Risk # 28



Raytheon

- **ACTION PRR-11:** Monitor development schedule while DAP # 1 is being developed.
- **ACTION PRR-12:** If schedule is delayed so that system will not be in SADIE in time for training, arrange for later training.



Low Risks After CDR

– Risk # 30



- **RISK # 30** – Production of SPSRB documents will be affected because NDE personnel cannot work on them.
- **Previous Risk Assessment: LOW** (Severity = 4, Probability = 3, Score = 12).
- **Risk Mitigation:**
 - » Documents are produced by STAR and OSPO
 - » Document review at the SRR
- **New Risk Assessment: LOW** (Severity = 4, Probability = 3, Score = 12)
 - » No risk reduction has been performed since the PRR.

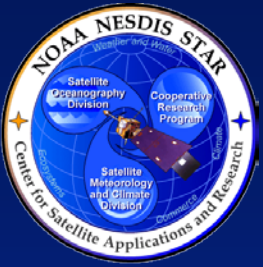


Open Actions for Risk # 30



Raytheon

- **ACTION PRR-19:** Produce SPSRB documents with STAR personnel.
- **ACTION PRR-20:** Review and approve SPSRB documents at the SRR.



Raytheon

Low Candidate Risks



Low Candidate Risks – Risk # C32



Raytheon

- RISK # C32 – Additional funds may not be available in time to prevent interruption of future work.
- Risk Assessment: MEDIUM (Severity = 5, Probability = 1, Score = 5).
- Risk Mitigation:
 - » Monitor status of additional funds and adjust the schedule if needed.
- Candidate Actions: TBS

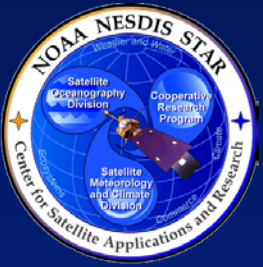


Low Candidate Risks – Risk # C33



Raytheon

- RISK # C33 – NETCDF Re-formatting toolkit may not be available.
- Risk Assessment: TBS
- Risk Mitigation:
 - » Check with toolkit developers and NDE to determine status.
Adjust the schedule as needed to wait for availability of the toolkit.
- Candidate Actions: TBS



Risk Summary - 1 Risks Can Be Closed



Raytheon

Risk # 35: Requirement to change pre-operational code in SADIE via NDE change control process will increase the time needed for code refinement during unit testing

» Close this. There is no such requirement



Risk Summary - 3 Open High Risks



Raytheon

- Risk # 39 (Score = 40)
- Risk # 40 (Score = 40)
- Risk # 41 (Score = 40)

Actions to reduce open risks are documented in the PSR



Risk Summary - 11 Open Medium Risks

- Risk # 19 (Score = 25)
- Risk # 29 (Score = 20)
- Risk # 31 (Score = 35)
- Risk # 32 (Score = 25)
- Risk # 33 (Score = 15)
- Risk # 34 (Score = 20)
- Risk # 36 (Score = 30)
- Risk # 37 (Score = 20)
- Risk # 42 (Score = 25)

Actions to reduce open risks are documented in the PSR

- Risk # C31 (Score = 30)
- Risk # 42 (Score = 25)



Risk Summary - 14 Open Low Risks



Raytheon

- Risk # 7 (Score = 6)
- Risk # 10 (Score = 10)
- Risk # 11 (Score = 3)
- Risk # 12 (Score = 4)
- Risk # 13 (Score = 10)
- Risk # 15 (Score = 8)
- Risk # 17 (Score = 3)
- Risk # 21 (Score = 6)
- Risk # 22 (Score = 6)
- Risk # 23 (Score = 8)
- Risk # 26 (Score = 1)
- Risk # 28 (Score = 15)
- Risk # 30 (Score = 12)
- Risk # C32 (Score = 5)

Actions to reduce open risks are documented in the PSR



Raytheon

Risk History (1)

Risk Number		Status After G3R	Status After PRR	Status At CDR	Status After CDR	Status At TRR
1	Real VIIRS data not available for unit testing	7	0	0	0	0
2	Real VIIRS data not available for system testing	25	0	0	0	0
3	Surface Type EDR data not available for unit testing	10	0	0	0	0
4	Surface Type EDR data not available for system testing	14	0	0	0	0
5	Vegetation Index EDR data not available for unit testing	20	0	0	0	0
6	Vegetation Index EDR data not available for system testing	21	0	0	0	0
7	User involvement is less than expected	15	15	6	6	6
8	Second development contractor has not been identified	16	0	0	0	0
9	Developers do not have access to SADIE	5	0	0	0	0
10	Developers do not have access to NDE STE	20	6	10	6	10
11	STAR EPL process adds extra work for documentation and reviews, resulting in a schedule delay.	20	20	3	3	3
12	Insufficient training in the STAR EPL process	9	4	4	4	4



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Risk History (2)

Risk Number		Status After G3R	Status After PRR	Status At CDR	Status After CDR	Status At TRR
13	Review teams have not been established.	21	14	10	10	10
14	Ivan's planned FTE load may need to be reduced because of new responsibilities	50	0	0	0	0
15	Landsat truth data may be limited	16	8	8	8	8
16	Developer ftp access to GRAVITE has not been established	10	0	0	0	0
17	ESPC SAN time retention may not be sufficient for users	9	9	3	9	3
18	Development server failure	7	0	0	0	0
19	Operations concept is not completely developed	21	9	25	25	25
20	Supplier agreements are not sufficiently established	21	0	0	0	0
21	Operator involvement is less than expected	10	10	6	6	6
22	Product requirements are incomplete	24	10	6	6	6
23	Project costs exceed available funding	16	16	8	8	8
24	PDR and CDR are combined, resulting in detailed design being performed before preliminary design is reviewed		20	0	0	0



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Risk History (3)

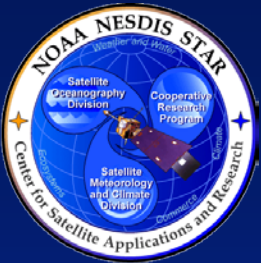
Risk Number		Status After G3R	Status After PRR	Status At CDR	Status After CDR	Status At TRR
25	CDR and Gate 4 Review are combined, necessitating a combined Technical/Management Review Team.		10	0	0	0
26	VIIRS Cloud Mask quality may be insufficient		14	1	1	1
27	Request to Archive process for NUP is not clear to OSPO		40	0	0	0
28	Transition from NDE Operations to ESPC is affected by the non-availability of the system when OSPO training for NDE occurs		15	15	15	15
29	Test plans are not established		25	20	20	20
30	Production of SPSRB documents will be affected because NDE personnel cannot work on them.		12	12	12	12
31	VIIRS Surface Reflectance RIP will not be available in time to meet latency requirement.		35	35	35	35
32	NCEP EMC needs for a GVF Regional Product are not completely established			25	25	25
33	OSPO personnel may not be ready for O&M, due to lack of access to NDE test environments			15	25	15
34	Use of EVI Max/Min values derived from MODIS data during the first year of operations will introduce a bias to the calculated GVF			20	20	20
35	Requirement to change pre-operational code in SADIE via NDE change control process will increase the time needed for code refinement during unit testing			0	25	0
36	Code will not run properly when Production Environment switches to a Linux environment in 2016.					30



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Risk History (4)

Risk Number		Status After G3R	Status After PRR	Status At CDR	Status After CDR	Status At TRR
37	Algorithm will not meet the GVF quality requirement					20
38	Design is not complete at CDR					20
39	Degradation in VIIRS I2 band results in failure to meet required GVF accuracy					40
40	CLASS archive of GVF products is not funded					40
41	IMSG – STAR contract for scientific services has not been awarded and may cause loss of development resources					40
42	Possible 1 month delay due to the migration of the STAR IT environment in 2012					25
C31	Loss of Junchang Ju					30
C32	Additional funds may not be available in time to prevent interruption of future work.					5
C33	NETCDF Re-formatting toolkit may not be available.					TBD

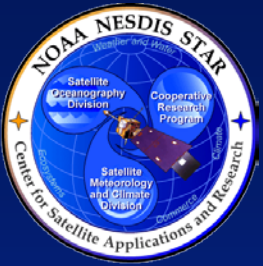


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Risk Summary - Risk Score

	Status After G3R	Status After PRR	Status At CDR	Status At TRR
Total OPEN Risks	23	19	16	29
Total HIGH Risks	0	1	0	3
Total MEDIUM Risks	10	4	3	11
Total LOW Risks	13	14	13	14
Total TBD Risks	0	0	0	1
Total CLOSED Risks	0	12	15	16
Total Established Risk Score	387	292	172	482
Total Candidate Risks			4	3
Total Candidate Risk Score			60	35

Total Risk Score at TRR is 125% of the Total Risk Score established at the G3R



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- 1) PROJECT PLAN
- 2) CDR REPORT
- 3) UNIT TEST PLAN
- 4) TGM UNIT TEST READINESS
- 5) GRD UNIT TEST READINESS
- 6) SRC UNIT TEST READINESS
- 7) CVI UNIT TEST READINESS
- 8) SVI UNIT TEST READINESS
- 9) GCL UNIT TEST READINESS
- 10) GAG UNIT TEST READINESS
- 11) RISKS AND ACTIONS
- 12) **SUMMARY AND CONCLUSIONS**



Section 12 – Summary and Conclusions

Presented by
Marco Vargas (STAR)



Review Objectives Have Been Addressed (1)



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- CDR Report has been reviewed
- Project plan changes have been reviewed
- Requirements changes have been reviewed
- Requirements allocation changes have been reviewed
- Verification and Validation plan has been reviewed

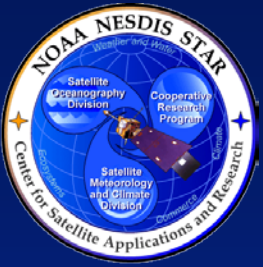


Review Objectives Have Been Addressed (2)



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- Pre-operational code has been reviewed
- Unit test plan has been reviewed
- Unit test data has been reviewed
- Unit test readiness has been reviewed
- Status of risks and actions has been reviewed



Next Steps – Code Test and Refinement



- Conduct code unit tests
- Refine code until unit tests are successful
- Produce a System Test Plan
- Develop system test data
- Assist OSPO with a code walk-through



Next Steps – System Integration and Test



- Prepare system test environment at STAR
- Conduct system test
- Refine code and system test data until system test is successful
- Produce a Verification and Validation Report
- Produce SPSRB Version 2 documents (ATBD, IUM, EUM, SMM)
- Conduct SRR
 - » Accomplish SRR objectives



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Open Discussion

- The review is now open for free discussion