EPIC PROGRAM ACHIEVEMENTS

2022 EPIC Summer Workshop
Content

i. Year 1 EPIC Accomplishments (July 2021 – June 2022)

ii. Year 2 EPIC Accomplishments (July 2022 – Present)
Year 1 EPIC Accomplishments

July 2021 – June 2022
The vision of EPIC is to enable the most accurate and reliable operational numerical forecast modeling in the world.

The mission of EPIC is to become the catalyst for community research and modeling system advances that continually inform and accelerate advances in our nation’s operational forecast modeling systems.

The EPIC 5-Year Contract Strategic Plan lays out the EPIC contract roadmap for implementing the EPIC mission and achieving the EPIC vision.
EPIC Project Management Plans

The 100% completed EPIC Contract Project Management Plan (PMP) consists of the following component plans, supporting plan, and Task Order PMPs and the Project Management Plans for both Task Order 1 and Task Order 2. The following documents have been delivered as part of this completion:

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<tr>
<th>Component Plans</th>
<th>Supporting Plans</th>
<th>TO Project Management Plans</th>
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<td>Project Scope Management Plan</td>
<td>Transition-in Plan</td>
<td>TO 001 Project Management Plan</td>
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<tr>
<td>Schedule Management Plan</td>
<td>Stakeholder Involvement Plan</td>
<td>TO 002 Project Management Plan</td>
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<td>Cost Management Plan</td>
<td>Configuration Management Plan</td>
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<td>Risk and Opportunity Management Plan</td>
<td>Procurement Management Plan</td>
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<td>Release Management Plan</td>
<td>Small Business Management Plan</td>
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<td>Quality Management Plan</td>
<td>Transition-out Plan</td>
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<td>Communication Management Plan</td>
<td>Subcontracts Management Plan</td>
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<td>Staff Management Plan</td>
<td>OCI Avoidance Plan</td>
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* Component Plans are within the PMP
** Supporting Plans are external to the PMP but necessary for Project Execution
*** Task Order (TO) Plans supplement the EPIC Plan and contain TO specific information
EPIC Contract Management

- Organizational Structure consists of a Value Stream and a Functional Stream
- Value Stream is where Agile Development work is conducted. It consists of an Agile Release Train, with 4 Agile Product Teams underneath.
- Functional Stream is where Business Office work is conducted. It consists of Contracts, Finance, Supply Chain, and Quality Assurance Teams.
- 2x Weekly Program Status meetings between Raytheon and EPIC Program Team (EPT)
- Weekly Technical Exchange meetings with Raytheon and EPIC Stakeholders
- Bi-Monthly Contract meetings with Raytheon, EPT, and Acquisition and Grants Office (AGO)
- Weekly and Monthly Status Reports, along with Spend Plans, across all Task Orders
- EPT-approved deliverables are stored in Google Drive.
EPIC Risk Management

- Create a Risk template in JIRA to track all Risks across the EPIC Program, with Likelihood and Consequence rating that fully align with the NOAA Project Risk Management Reference card.
- Established monthly reviews of the EPIC Program Risk Registry, with NOAA EPT.
- Track Risks at the Agile Release Train and Agile Product Team Levels, as tickets and dashboards within JIRA Risks.
EPIC consists of an Agile Release Train, with 4 Agile Product Teams underneath.

- Conduct 3-Month Program Increments (PIs), with PI Planning week, 5 bi-weekly Sprints, and Inspect & Adapt.
- Track the Team Backlogs for each Agile Team, including assigned Features, Objectives, and Stories, weekly.
- Prioritize the Program Backlog with the EPT, Agile Team Product Owners (POs), and EPIC Stakeholders, to determine Team Backlogs for the next PI.
Management of EPIC Work Products

- JIRA is the issue tracking tool used to ensure all work conducted by Program Management and the Agile Release Train is being completed.
- Confluence is a wiki solution used for collaboration between EPIC Team members and stakeholders.
- JIRA and Confluence are hosted in the NOAA Multi-Cloud Platform.
EPIC Community Portal

- The EPIC Community Portal (ECP) is the centralized location for the Weather Enterprise to access EPIC-related content, both internally (e.g., events) and externally (e.g., code repositories)
- The ECP went live in January of 2022, and is accessible at https://epic.noaa.gov/, and is hosted in the NOAA Multi-Cloud platform.
- The ECP was enhanced with the following:
  - Dashboards – Github Metrics, AWS Costs
  - Webinar – recording of the June 2022 AMS Short Course
  - FAQ Page – program and technical questions
A Continuous Integration/Continuous Delivery (CI/CD) build pipeline was installed in the NOAA Multi-Cloud Platform, for automating the builds of UFS codebases.

Jenkins is used to automate the build pipeline through orchestration, as UFS repositories work their way toward production.

SonarQube is the static code analysis solution used for evaluating the codebases to make sure they are up to quality, security, and coding standards, before being pushed to production.
EPIC Cloud Sandbox

- The EPIC Cloud Sandbox is an AWS environment that is accessible by non-NOAA users, for EPIC-related purposes.
- It has been used by attendees of June 2022 AMS Short Course, along with the initial Code Sprint and Hackathon, to configure, run and evaluate the SRW Container that was developed on the EPIC Program.
- A scaled version of the CI/CD pipeline is currently being worked, to be installed in the EPIC Cloud Sandbox.
UFS Performance Benchmarks

- The Figure shows UFS weather model (WM) performance in Orion and Amazon Web Services (AWS, based on # of CPU cores used to execute each job, vs. the time to complete each job. This was conduc

- Expectations were that model performance (time to complete a given job) improves as more computational resources are added, but large jobs are generally more parallelizable than smaller jobs.

- Benchmarks results show that smaller jobs reach parallelization limits faster than larger jobs. With larger jobs, there is a clear limit where additional CPUs don’t add appreciable performance gains.
## UFS SRW Container Release

- The SRW Application was containerized in November of 2021, which is run using Singularity.
- The Figure shows the highest repository structure levels of the SRW Container version 2.0, which includes the gnu/ openmpi-based container.
- This SRW version was released in June of 2022.
- The SRW Container doesn’t run through the Rocoto workflow due to complications from interacting with the batch scheduler (slurm/pbs/lsf).

<table>
<thead>
<tr>
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<th>Current release branch name</th>
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## EPIC Data Management in the Cloud

### Completed EPIC Data Initiatives for Contract Year 1

| **Cloud Data Storage** | Cloud Data Storages Established for UFS Weather Model (UFS-WM) Regression Test (RT) datasets, SRW Application & Medium-Range Weather (MRW) Application datasets  
- Established requirements & setup for SRW & MRW cloud data storage  
- Acquired Identity Access & Management (IAM) credentials from BDP  
- SRW cloud data storage contains data supporting cases unique to SRW 2.0 Release |
| **Cloud Data Transferring** | Utilization of Multi-Thread Uploader program to continue transfer of UFS-WM RT data to cloud  
- Partitioned large files into chunks to assist in improving upload performance to cloud storage.  
- Successfully transferred UFS-WM RT datasets to cloud storage |
| **Data Management Support** | Creation of Multi-Thread Uploader program to transfer SRW data to cloud  
- Partitioned large files into chunks to assist in improving upload performance to cloud storage.  
- Successfully transferred SRW datasets to cloud storage & up-to-date |
| **Data Log Visuals** | Utilization of Data Tracker Bot program to continue UFS-WM data management support.  
- Detects & records timestamp datasets being pushed to the developing UFS-WM repository  
- Ensures UFS-WM cloud data storage is up-to-date |
|  | Creation of UFS-WM RT Log Extraction application which extracts, parses, & converts UFS-WM logs into visuals.  
- Application parses, extracts, summarizes, & displays metrics from UFS-WM RT logs into plot figures. |
### Cloud Data Storage Information: UFS-WM RT Datasets

<table>
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<th>Description</th>
<th>Resource Type</th>
<th>Resource Name (ARN)</th>
<th>AWS Region</th>
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### Cloud Data Storage Information: SRW Datasets

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### Cloud Data Storage Information: MRW Datasets

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Data Analytics Tool

Tool Capabilities:

• Observe Data Storage Distribution Across Timestamps
• Observe Data Storage Distribution Across UFS Components
• Obtain Size of Datasets, Individual Files
• Observe Majority of Data Files Node (Depth) Location
• Detect Duplications
• Filter & Sort Data Filenames By Feature (e.g. UFS component, File Type, Resolution, Compiler, etc)
• Transfer Datasets & Details to a Format of Interest (e.g. .csv, dataframe)
Year 2 EPIC Accomplishments

July 2022 – Present
Scalable UFS SRW Containers

- A new approach was recently discovered for running the SRW workflow using Rocoto inside the container on the host system, as if they are just a plain file on the host system.
- This approach eliminated host system complexities that had previously limited the use of Rocoto, which resulting in the SRW Container being able to only run on a single node at a time.
- With the new approach, the SRW Containers is now able to scale across multiple HPC nodes, which significantly improves runtime performance.
Automated Analysis of FORTRAN Code

• SonarQube doesn’t support the ability to read FORTRAN code out of the box.
• An open source plugin is available for SonarQube, that allows it to interpret FORTRAN 77 and 90.
• UFS-WM repositories have been forked and scanned with this upgraded SonarQube solution.
• There are 10,213 vulnerability findings in the UFS-WM repositories alone!
• An environment was recently setup where individuals can branch scan their own projects in the EPIC Cloud Sandbox before checking in that code.