spack-stack: A reproducible, many-platform software stack for operational weather applications

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4) Science and Technology Corporation
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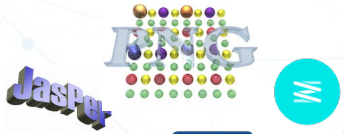
Overview

- Motivation for *spack-stack*
- Introduction to *Spack*
- *spack-stack* and its benefits
- *spack-stack* on HPC, cloud, and container platforms
- Challenges and future efforts of *spack-stack*

Motivation: *spack-stack* reflects the growing need for well organized software library installations

- Large modern weather applications may have **dozens of dependencies**
- These dependencies include libraries for file I/O, physics routines, etc.
- Manual software management and "one-off" installations are **expensive and risky**


Spack is a package manager for scientific HPC workflows

- Core developers at LLNL
- Has recipes for **~7,000 packages**, including most and soon all of those needed for *UFS*, *JEDI*
- Handles dependencies, conflicts, compiler & build system logic, etc.
- *Spack* is **highly extensible and customizable**

spack-stack is a set of *Spack* configurations and extensions

- *spack-stack* is developed and maintained by **NOAA EMC, JCSDA, and EPIC**
- It provides **site-specific configurations** and **templates** for our libraries
- Built-in caching and parallel features **reduce build times**

spack-stack is installed as a unified environment on these HPC platforms:

- Gaea, Hera, Jet (NOAA RDHPCS)
- Acorn (NOAA WCOSS2 TDS)
- Orion, Hercules (MSU)
- Discover (NASA)
- Narwhal, Nautilus (US Navy)
- Casper, Cheyenne, Derecho (NCAR)
- S4 (U Wisconsin)

spack-stack is installed as a unified environment on these cloud platforms:

- NOAA ParallelWorks (AWS, Azure, GCP)
- AWS ParallelCluster
- AWS EC2 AMIs (Ubuntu, RedHat)

...and is available through container images deployed by EPIC and JCSDA:

https://hub.docker.com/u/noaaepic/ *(Docker)*
https://hub.docker.com/u/jcsda/ *(Docker)*
https://cloud.sylabs.io/library/jcsda *(Singularity)*

spack-stack allows developers to move to the cloud **faster** and **more consistently**

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Challenges and future efforts

- Maintaining a unified environment requires ongoing engagement with application developers; versioned *spack-stack* releases ensure **stability**
- NOAA EMC applications are currently moving over to *spack-stack*, and **all future *UFS* application releases** will use it
- Regression testing and deployment of *spack-stack* across NOAA tier-1 platforms will be automated via **Jenkins**
- In addition to JCSDA's container releases, EPIC will release *spack-stack* and *spack-stack*-based *UFS* app **Docker images** to support public users

For code, documentation, and support, visit
github.com/JCSDA/spack-stack