

OpenMP[®]

SC'21 Booth Talk Series

SOLLVE OpenMP Validation and Verification Effort

ECP Project WBS 2.3.1.13 STPM15

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SOLLVE OpenMP V&V: The Team

ECP Project WBS 2.3.1.13 STPM15



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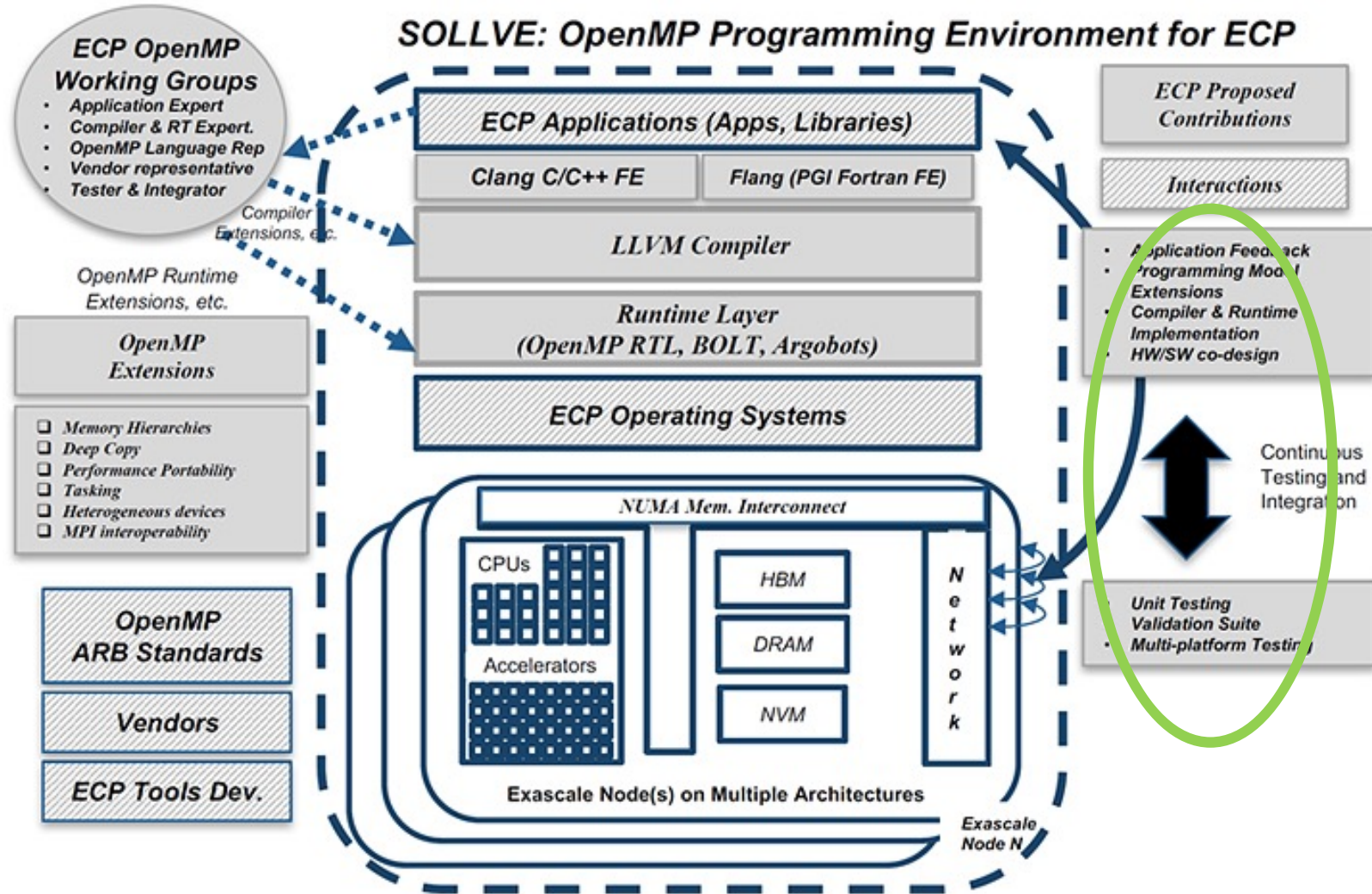
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Outline

- Introduction
 - What is SOLLVE ?
 - Scope and Intent of the Validation and Verification Suite
 - OpenMP Offload (4.x+) Machine Model
 - OpenMP 5.0 New Features
 - OpenMP 5.1 New Features
- Validation and Verification Suite
 - Test design process
 - Infrastructure design
- Result Snapshot
- Success Stories
- Ways to collaborate

Introduction: The SOLLVE ECP Project

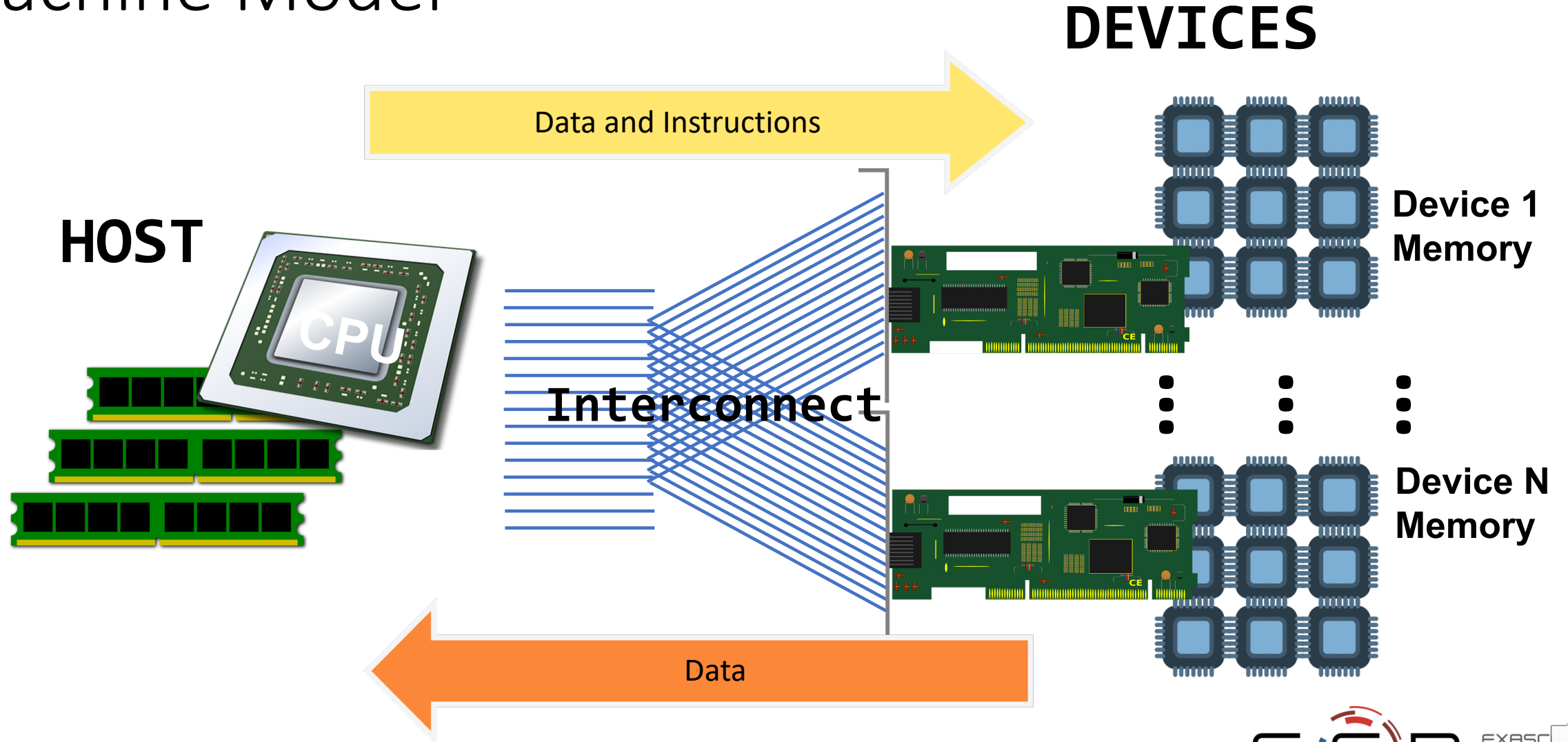


Introduction: Scope and Intent of V&V suite

- Verify the status of OpenMP implementations across ECP platforms
- Evaluation of OpenMP functionality and performance on target architectures
- Check implementations' conformance to the OpenMP standard
- Tests and kernels primarily motivated by ECP Applications
- Verify platforms are ready for OpenMP applications

Introduction: OpenMP Offload (4.x+)

Machine Model



New Features OpenMP 5.0

- OpenMP contexts, metadirective, and declare variant
- Addition of requires directive, including support for unified shared memory
- Memory allocators and support for deep memory hierarchies
- Descriptive loop construct
- Release/acquire semantics added to memory model
- First (OMPT) and third (OMPD) party tool support
- Completed support for Fortran 2003
- Added support for Fortran 2008, C11, C++11, C++14 and C++17

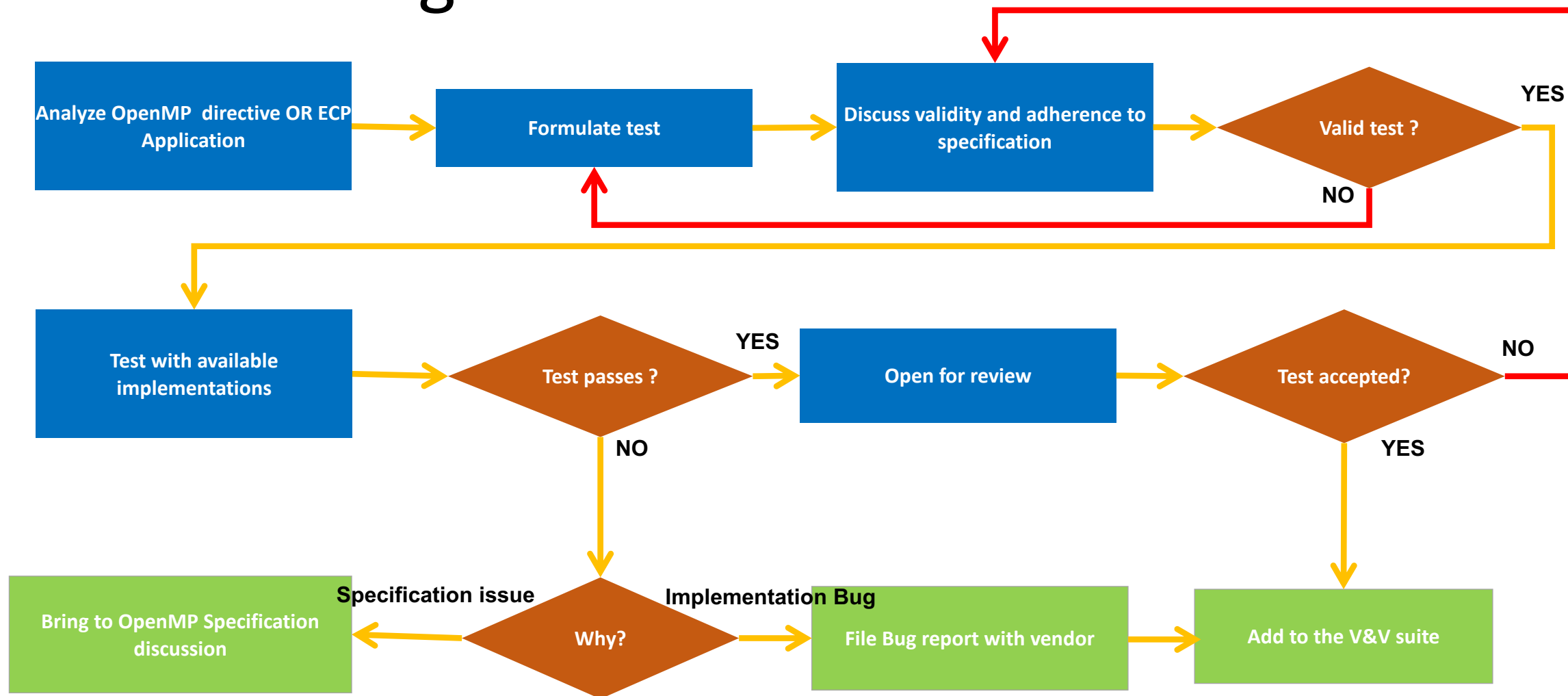
New Features in OpenMP 5.1

- Added features:
 - `omp_all_memory` reserved allocator
 - *target_device* trait
 - `target_device` selector
 - `dispatch` construct
 - `assume` directive
 - `nothing` directive
 - device-specific ICV support
 - `error` directive
 - `masked` construct
 - `scope` directive
 - Loop transformation constructs

New Features in OpenMP 5.1 (cont.)

- C++ attribute specifiers support
- Full support for Fortran 2008, C11, C++11, C++14 and C++17 and initial support for Fortran 2018

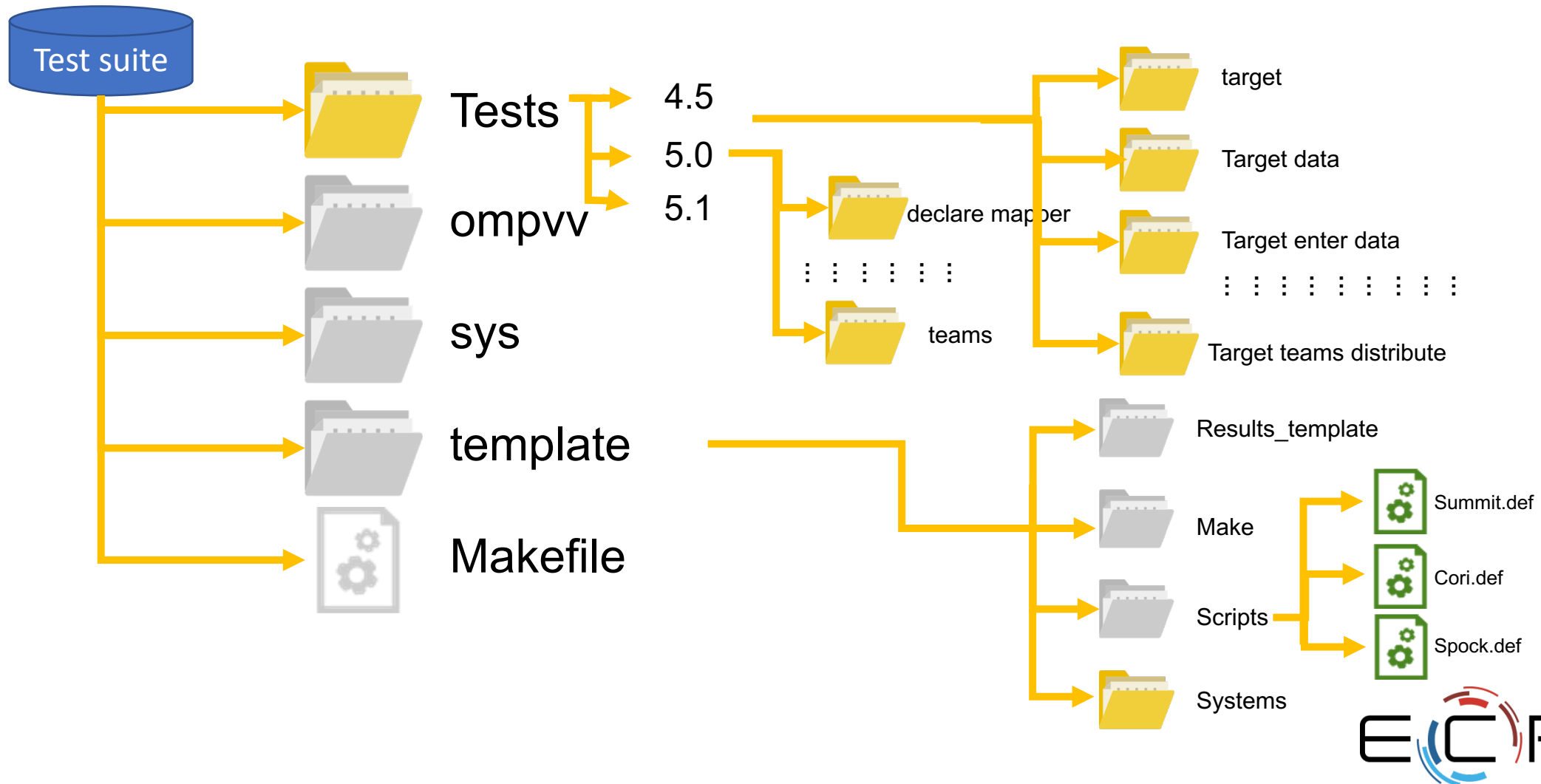
V&V: Test Design Process



V&V: Infrastructure Design

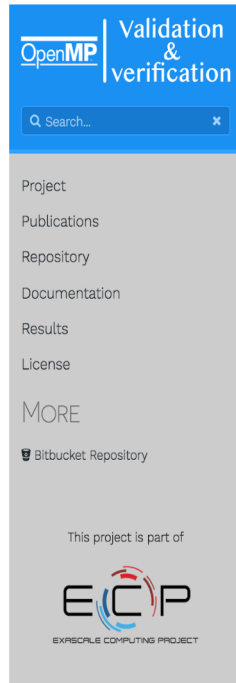
- Our infrastructure is based on a **Makefile + scripts**
- Design parameters:
 - Portability across multiple **compilers** and **systems** and easy to use
 - Support for different compiler options
 - Support for Lua-like Modules and batch schedulers
 - Fast test addition and modification
 - Divided compilation and execution phases
 - Subset of tests selection for partial execution

V&V: Infrastructure Design (cont.)



Sample Results: Current status of OMP Compilers

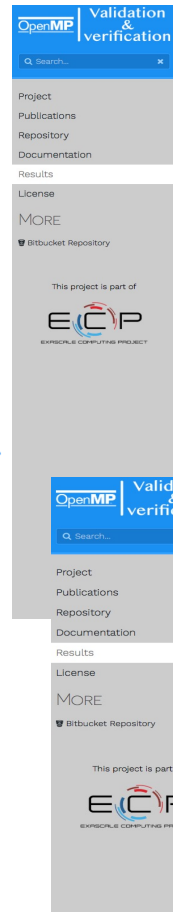
<https://crpl.cis.udel.edu/ompvvsolve/>



OPENMP VALIDATION AND VERIFICATION

This website contains all related to the OpenMP Validation and Verification suite developed as part of the [Exascale Computing Project \(ECP\)](#). In particular the Scaling OpenMP Via LLVM for Exascale Performance and Portability (SOLLVE) project.

This project is a collaboration of



391	<>	test_target_update_depend.c	summit	clang version 3.8.0 CORAL	PASS	PASS
392	<>	test_target_update_depend.c	summit	xlc 16.01.0001.0000	PASS	PASS
393	<>	test_target_update_depend.c	summitdev	clang version 3.8.0 CORAL	PASS	PASS
394	<>	test_target_update_depend.c	summitdev	gcc 7.11	PASS	PASS
395	<>	test_target_update_depend.c	summitdev	xlc 13.01.0006.0001	PASS	PASS
396	<>	test_target_update_depend.c	titan	cc 8.7.5	PASS	PASS
397	<>	test_target_update_devices.c	summit	clang version 3.8.0 CORAL	PASS	PASS
398	<>	test_target_update_devices.c	summit	xlc 16.01.0001.0000	PASS	FAIL
399	<>	test_target_update_devices.c	summitdev	clang version 3.8.0 CORAL	PASS	PASS
400	<>	test_target_update_devices.c	summitdev	gcc 7.11	PASS	PASS
401	<>	test_target_update_devices.c	summitdev	xlc 13.01.0006.0001	PASS	FAIL
402	<>	test_target_update_devices.c	titan	cc 8.7.5	PASS	PASS
403	<>	test_target_update_from.c	summit	clang version 3.8.0 CORAL	PASS	PASS
404	<>	test_target_update_from.c	summit	xlc 16.01.0001.0000	PASS	PASS
405	<>	test_target_update_from.c	summitdev	clang version 3.8.0 CORAL	PASS	PASS
406	<>	test_target_update_from.c	summitdev	gcc 7.11	PASS	PASS
407	<>	test_target_update_from.c	summitdev	xlc 13.01.0006.0001	PASS	PASS
408	<>	test_target_update_from.c	titan	cc 8.7.5	PASS	PASS
409	<>	test_target_update_if.c	summit	clang version 3.8.0 CORAL	PASS	PASS
410	<>	test_target_update_if.c	summit	xlc 16.01.0001.0000	PASS	PASS
411	<>	test_target_update_if.c	summitdev	clang version 3.8.0 CORAL	PASS	PASS
412	<>	test_target_update_if.c	summitdev	gcc 7.11	PASS	PASS
413	<>	test_target_update_if.c	summitdev	xlc 13.01.0006.0001	PASS	PASS
414	<>	test_target_update_if.c	titan	cc 8.7.5	PASS	PASS

Front Page > Results
These results were last reviewed on Sunday January 13th 2019

Filter results

Search Results

Compilers

clang version 3.8.0 CORAL
xlc 16.01.0001.0000
gcc 7.11

Systems

summit
summitdev
titan

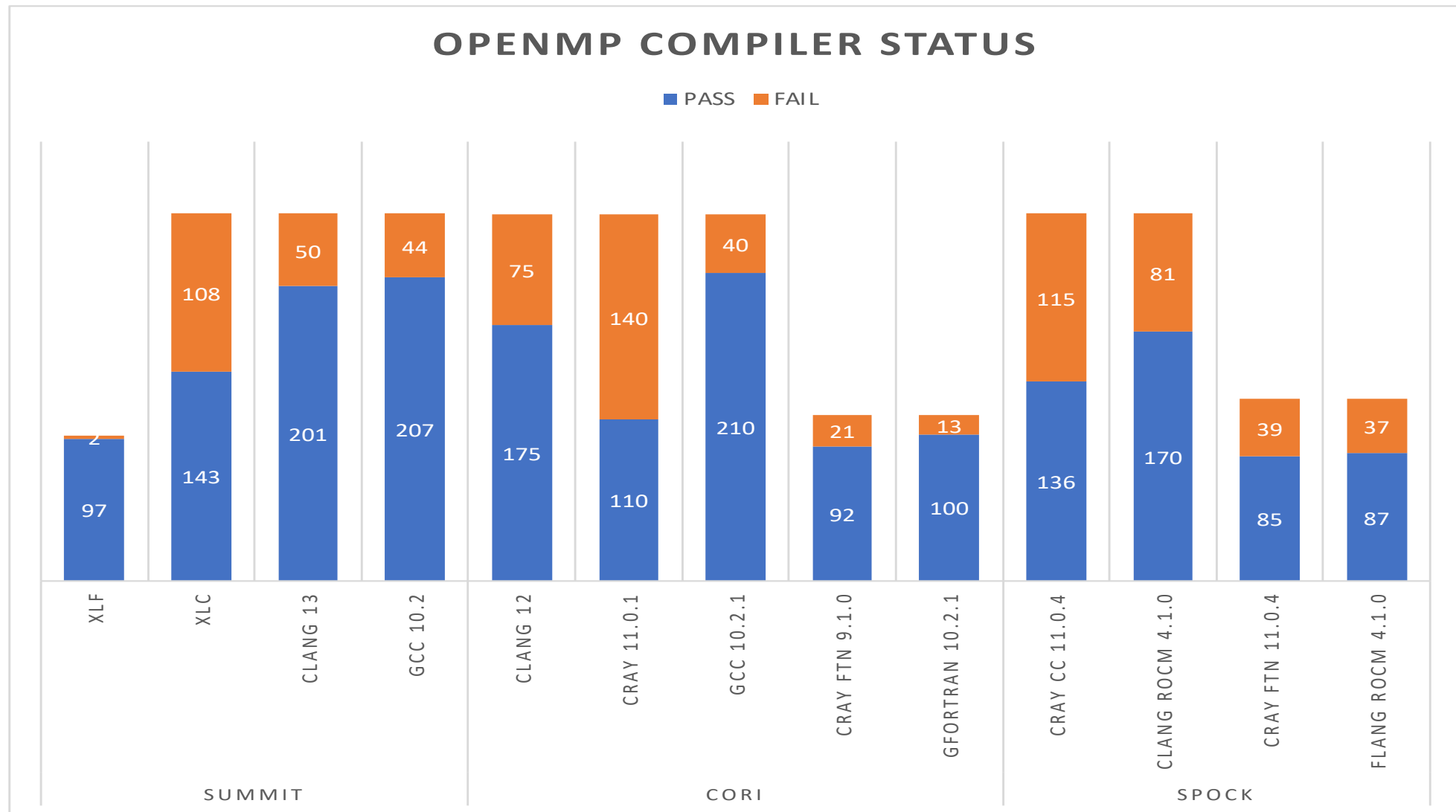
Compiler results ☒ Both ☐ FAIL ☐ PASS

Test run results ☒ Both ☐ FAIL ☐ PASS

#	Source code	Test name	Test system	Compiler name	Compiler result	Runtime res
1	<>	ompvvs_template.c	summit	clang version 3.8.0 CORAL	PASS	PASS
2	<>	linked_list.c	summit	clang version 3.8.0 CORAL	PASS	PASS
3	<>	mmm_target.c	summit	clang version 3.8.0 CORAL	PASS	PASS
4	<>	mmm target parallel for simd.c	summit	clang version 3.8.0 CORAL	PASS	PASS



Result Snapshot



Success Stories

- Cray and AMD are actively using SOLLVE V&V tests to verify correctness and coverage of new features introduced in OpenMP 4.5 and 5.0 (on-going effort).
- Vendors are actively engaging to improve coverage and bug fixes.
- Implementation bugs were identified in the GCC, IBM, and Cray implementations and have been brought to the vendor's attention.
- OLCF is using SOLLVE V&V as part of acceptance tests for exascale ECP platform Frontier.
- NERSC has integrated SOLLVE V&V for testing OpenMP implementations.

Ways to Collaborate: GitHub

https://github.com/SOLLVE/solve_vv

SOLLVE / solve_vv Sponsor Unwatch 7 Star 3 Fork 2

Code Issues 15 Pull requests 4 Wiki Security Insights Settings

OpenMP Offloading Validation & Verification Suite; Official repository. We have migrated from bitbucket!! For documentation, results, publication and presentations, please check out our website -> <https://crpl.cis.udel.edu/ompvvsolve/> Edit

openmp testing testing-framework openmp-offloading openmp-target compilers verification validation Manage topics

202 commits 34 branches 0 releases 7 contributors View license

Branch: master New pull request Create new file Upload files Find file Clone or download

jhDavis8 Merge pull request #29 from SOLLVE/fix_test/test_target_teams_distrib... Latest commit d212f60 7 days ago

.github	Update issue templates	19 days ago
ompvv	Fixing problem with string for when it is defined in constant memory ...	20 days ago
sys	removing -std=c99 from clang	2 months ago
template	Merging changes made to the infrastructure on the development branch....	last year
tests/4.5	Merge pull request #29 from SOLLVE/fix_test/test_target_teams_distrib...	7 days ago
.gitignore	Merging changes made to the infrastructure on the development branch....	last year
LICENSE	adding multiple files from the development branch. LICENSE, Makefile ...	2 years ago
Makefile	Adding OMPVV_SYSTEM as an option for system. To be used as an env var...	10 days ago
README.md	Updated README.md	25 days ago

README.md

NEWS!

We have recently moved from Bitbucket into Github. The old Bitbucket repository is now a mirror of Github, it has been set up to read only and it will not be maintained any further. Any communication please use our [Github Repo](#)

Ways to Collaborate: GitHub

- Need to check the behavior of YOUR OpenMP application ?
 - Create an application kernel
 - SUBMIT an Issue OR CREATE a PR on https://github.com/SOLLVE/solve_vv
- Found something we missed ?
 - SUBMIT an Issue OR CREATE a PR on https://github.com/SOLLVE/solve_vv

Ways to Collaborate: Contact information



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For the OpenMP specification, tutorials, forum, reference guides, and links to other resources, visit **www.openmp.org**