



Next Generation of the NCEP Flexible HPC Functionally Equivalent Environment (FEE): A Bridge From Operations to Research

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The Design of NCEP FEE Standards, Based on Integration NCEP Developmental and Operational Requirements

1. Computational FEE Standards: Based on the Requirements for Operations (builds systems, builds convention, naming conventions, build structure, the OPS workflow etc.)
2. Developmental FEE Standards: Requirements for collaborative development: Coding standards, Tools and IDEs compatibility, use of the Frameworks, Versions control, CM and Collaborative development env.
3. Model Integration Standards: Based on NOAA Environmental Modeling System (NEMS) Framework Integration requirements, ESMF with NUOPC layer
4. Targeted Standard Developmental Workflow: Collaborative developmental methodology with automation of coding standards analysis and validation
5. Equivalence Evaluation Standards: Based on OPS and DEV Requirements for verification and verification methodologies consistency, including unit and regression testing requirements
6. NOAA Standards for Collaborative Development (Virtual Lab), CM, VC and CI (presented materials have been already fully deployed, or prototyped, or planned and under ongoing development as the solutions for EMC and NCO of NCEP)

1. Objective : To Link Moving FEE & Apps Revision via User Modules

Availability of the user & 3rd party libs and their Modfiles

```
> module load bacio crtm
...
LIB4=/nwprod/lib/bacio/v2.0.1/libbacio_v2.0.1_4.a
BACIO_LIB8=/nwprod/lib/bacio/v2.0.1/libbacio_v2.0.1_8.a
BACIO_SRC=/nwprod/lib/bacio/v2.0.1/src
...
NCEPLIBS DEVELOPMENT WORKFLOW
W3EMC v2.0.6
G2 v2.5.0
W3NCO lib 2.0.5
SP lib v2.0.2
NEMSIO v2.2.1
```

NEMS_v1.3.7 Modulefile (Auto-generated)

```
##%Module
## autogenerated via 'GetAppsEnv' ##
module load intel/15.1.133
module load impi/5.0.3.048
module load esmf/6.3.0rp1
module load netcdf/4.3.0
module load nemsio/v2.2.1
module load bacio/v2.0.1
module load w3nco/v2.0.6
module load w3emc/v2.0.5
module load sp/v2.0.2
module load xmlparse/v2.0.0
module load g2/v2.5.0
module load g2tmp/v1.3.0
module load Jasper/v1.900.1
module load png/v1.2.44
module load z/v1.2.6
module load sigio/v2.0.1
module load sfcio/v1.0.0
module load crtm/v2.1.3
```

Applications dependent part of the Apps Makefile

```
EXTLIBS = $(NEMSIO_LIB) $(BACIO_LIB4) $(W3NCO_LIBd) \
$(W3EMC_LIBd) $(SP_LIBd) $(NETCDF) $(ESMF)
EXTLIBS_POST = $(NEMSIO_LIB) $(POST_LIB) $(W3NCO_LIBd) \
$(W3EMC_LIBd) $(XMLPARSE_LIB) $(G2_LIB4) $(G2TMP_LIB) \
$(JASPER_LIB) $(LIB) $(Z_LIB) $(XMLPARSE_LIB) \
$(CRTM_LIB) \
$(NETCDF_LIB) $(SYS_LIB)
```

2. Auto Code EMC Standards Compliance Analysis using "Understand 4.0" of Scitools APIs

Perl API
The "Understand 4.0" of Scitools Inc. includes a full PERL/Python API which allows you to directly query the database

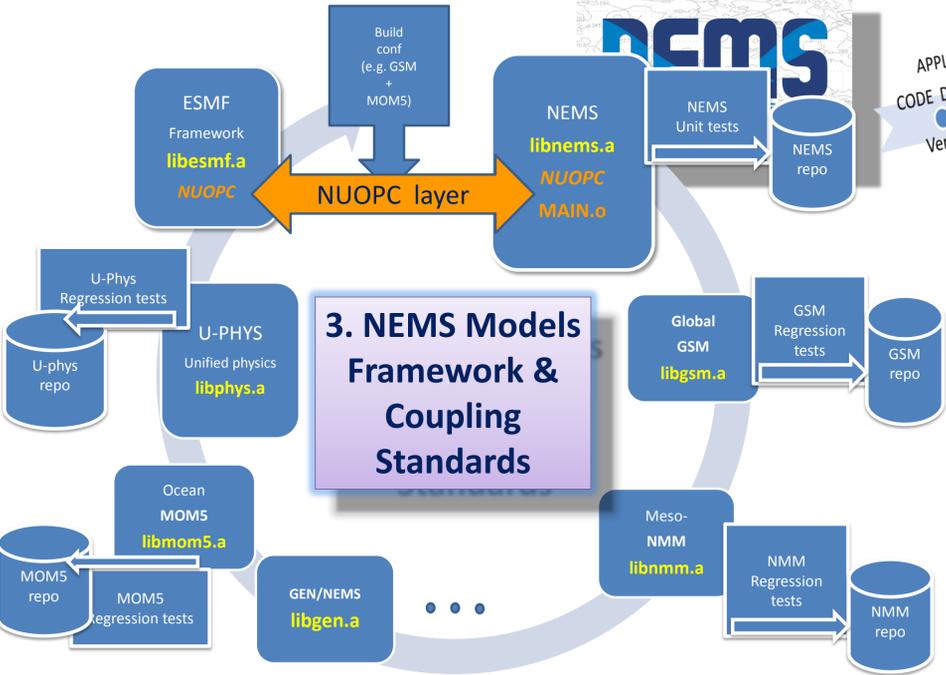
Ready to go scripts:
Code Validation for the metrics like:

- Cyclometric Complexity
- Function Length
- Nesting depth etc.

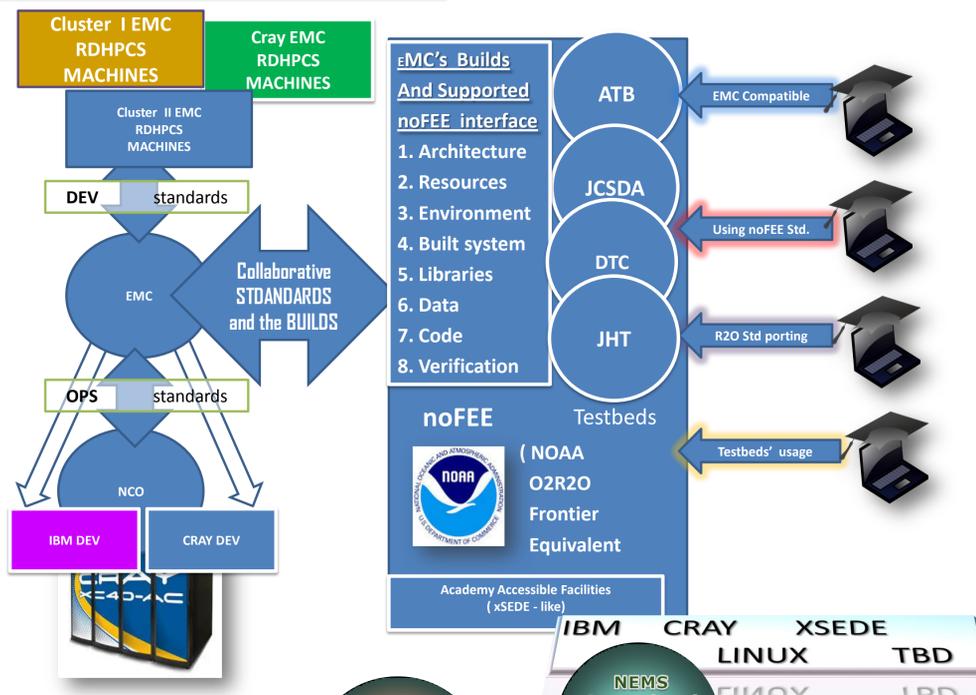
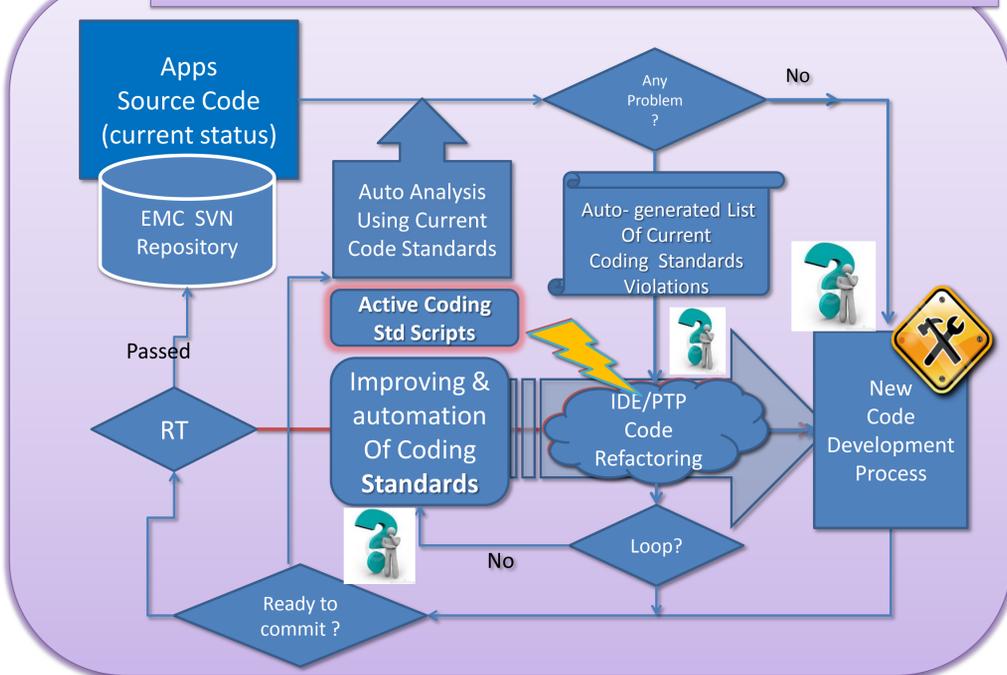
Source Code Cyclomatic Complexity

Source Code Corp Std violation tree

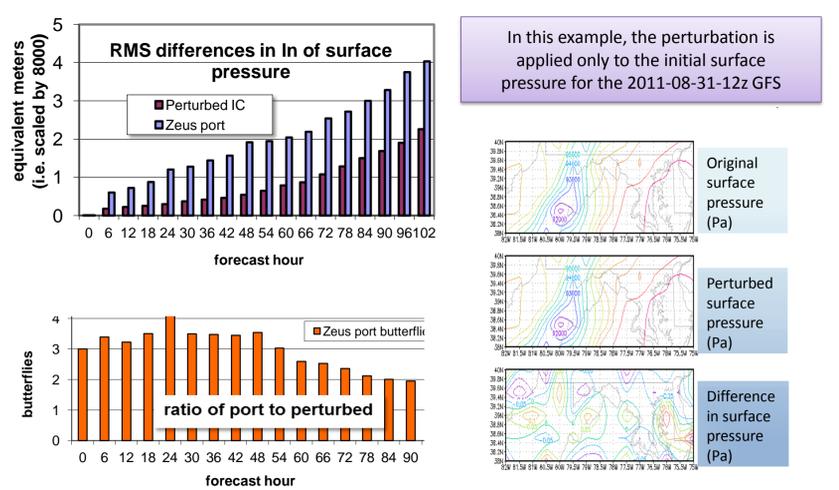
Std Metric Violations Report



4. Targeted Standard Developmental Workflow



5. The Butterfly Std. Tests of the Functional Equivalence



6. NOAA Standards for Collaborative Development, CM, VC and CI

