

# CSEP 2.0 : System and Software Considerations

Philip J. Maechling, Fabio Silva, John Yu, Max Werner, and Thomas J. Jordan



## ***CSEP Nightly Processing Status***

**SCEC CSEP Operational Testing Center performs daily processing for earthquake forecasts for California and Global Regions:**

- **SCECNaturalLab (California)**
- **Global**
- **GlobalPDE**
- **SWPacific**
- **NWPacific**
- **OceanicTransformFaults**

**SCEC CSEP operational testing system runs all forecasts and evaluation on single server hosted by SCEC on campus at University of Southern California.**

**SCEC CSEP Testing Center must complete daily forecast processing within 24 hours. Reprocessing must occur on single server when not in use.**

**Starting in last CSEP release November 2016, we have incomplete forecast archives for 4 of 19 forecast groups. We can re-process the incomplete forecasts, but running both daily processing, and needed reprocessing, it will take months to catch up.**

# *CSEP Forecast Group Processing Status*

## *November 2016 – Sept 2017*

- (1) one-day forecasts (dispatcher\_ANSS1985\_forecasts.tcsh)
- (2) five-year models (dispatcher\_ANSS1985.tcsh)
- (3) **one-day models 1985 (dispatcher\_ANSS1985\_one\_day.tcsh) - Fail**
- (4) 3-month and 5-year models 1932 (dispatcher\_ANSS1932.tcsh)
- (5) 1-day 3-month alarm models 1932 (dispatcher\_ANSS1932\_notFiltered.tcsh)
- (6) **30-minute models 1985 (batch\_ANSS1985\_30min.tcsh) - Fail**
- (7) 30-minute models 1985 T/W tests (batch\_ANSS1985\_30min\_TWTests.tcsh)
- (8) **one-day models synthetic catalogs 1985 Md2.95 (dispatcher\_ANSS1985\_M2\_95.tcsh) - Fail**
- (9) **one-day models not filtered 1932 using Md2 (dispatcher\_ANSS1932\_notFiltered\_Md2\_one\_day.tcsh)-Fail**
- (10) California models (not filtered) 1932 using Md2 (dispatcher\_ANSS1932\_notFiltered\_Md2.tcsh)
- (11) NW Pacific 1-year (dispatcher\_one\_year.tcsh)
- (12) NW Pacific 1-day (dispatcher\_daily.tcsh)
- (13) SW Pacific 1-year (dispatcher\_one\_year.tcsh)
- (14) SW Pacific 1-day (dispatcher\_daily.tcsh)
- (15) Global 1-year (dispatcher\_one\_year.tcsh)
- (16) Global 0.1-degree 1-year (dispatcher\_one\_year\_V12.1.tcsh)
- (17) Global 0.1Degree 1-year (dispatcher\_one\_year\_V14.1.tcsh)
- (18) Global 0.1Degree 1-day (dispatcher\_one\_year\_0.1degree\_V14.4.tcsh)
- (19) Oceanic Transform Fault 1-day (dispatcher\_daily.tcsh)

# *Increasing Scale of CSEP Processing*

**After 10 years, the SCEC CSEP operational testing center is reaching its computational and file management limits.**

**Required Testing Center Framework improvements include:**

- **Distribute operational CSEP processing onto multiple servers.**
- **Maintain a current list of all earthquake catalogs, earthquake forecasts, and forecast results produced by the system.**
- **Run prospective and retrospective earthquake forecasts.**
- **Improve automated processing error detection, retry, and recovery.**

**Forecasts, Catalogs, Evaluations:**

2.5	/home/csep/operations/SCEC-natural-laboratory
0.576	/home/csep/operations/testing-regions/Global
0.0001	/home/csep/operations/testing-regions/GlobalPDE
0.112	/home/csep/operations/testing-regions/SWPacific
0.091	/home/csep/operations/testing-regions/NWPacific
0.003	/home/csep/operations/testing-regions/OceanicTransformFaults
2.7	/home/csep/operations/testing-regions-2/Global
1.7	/home/csep/operations/testing-regions-2/one-day-model-archives
-----	
7.68T	Forecast Archive Storage Total

**Runtime Logs:**

0.442	/home/csep/operations/dispatcher/runs/csep
0.062	/home/csep/operations/dispatcher/runs/Global/csep
0.105	/home/csep/operations/dispatcher/runs/NWPacific/csep
0.013	/home/csep/operations/dispatcher/runs/OceanicTransformFaults/csep
0.106	/home/csep/operations/dispatcher/runs/SWPacific/csep
1.5	/home/csep/operations/testing-regions2/dispatcher

**Saved Catalogs:**

0.0033	/home/csep/operations/catalogs/ANSS
0.000075	/home/csep/operations/catalogs/CMT

**Source / Buildlogs / Binaries v16.10**

0.020	/usr/local/csep-16.10.0
0.043	/home/csep/buildCSEP
0.029	northridge:/work/source/svn/csep

-----  
2.32T + (7.68T) = 10.00T

**Complete CSEP data archives should be preserved as a provisional, and curated as an approved research dataset.**

**Curated datasets will include clearly identified, retrospectively updated, earthquake forecasts and evaluation results.**

# *Proposed CSEP Phased Development*

**Phase 1: Single Server Phase (Sept 2007 – Sept 2017) - Current operational version of CSEP v16.10 will complete the Phase 1 processing. We can assume all Phase 1 processing was done in a consistent way with a consistent codebase:**

- **Preserve source code repo:**
- **Preserve Complete Preliminary Data Set for CSEP Phase 1**
- **Create inventory of expected and current results**
- **Curate Preliminary Data Set by Reprocessing**

**Phase 2: Multi-Server Phase (Sept 2017 – Sept 2018) - Next CSEP Release will start the CSEP Multi-server Phase:**

- **Will maintain the goals of transparency, controlled environment, reproducibility.**
- **Give up single server controlled environment. Create a common computing environment using identical server images, to ensure multiple computers are running the same software and producing equivalent results.**
- **Release new CSEP version that runs independent forecasts on multiple functionally equivalent computer servers.**
- **Multi-processor system will do separate computing but transfer results to single testing center prospective archives.**
- **Will introduce any fixes we have for current CSEP operational system in this new release.**

**Phase 3: Multi-Server Workflow Phase (Sept 2018 – Sept 2022) - Future workflow system will:**

- **Increase automatic error retry**
- **Minimize observational data accesses**
- **Improve scheduling**
- **Improve data transfer between testing center and results viewer storage system**
- **Support prospective and retrospective testing**
- **Create catalog of forecasts groups, forecasts, evaluations, and catalogs produced by the system**

***SC/EC***

AN NSF+USGS CENTER

***Southern California  
Earthquake Center***

[www.SCEC.org](http://www.SCEC.org)