

An Emerging Protocol for Research-to-Operations (R2O) at CPC

E. O'Lenic¹, H. Hartmann², M. Ou¹, K. Pelman¹, S. Handel¹

¹Climate Prediction Center, NOAA/NWS/NCEP, Camp Springs, MD

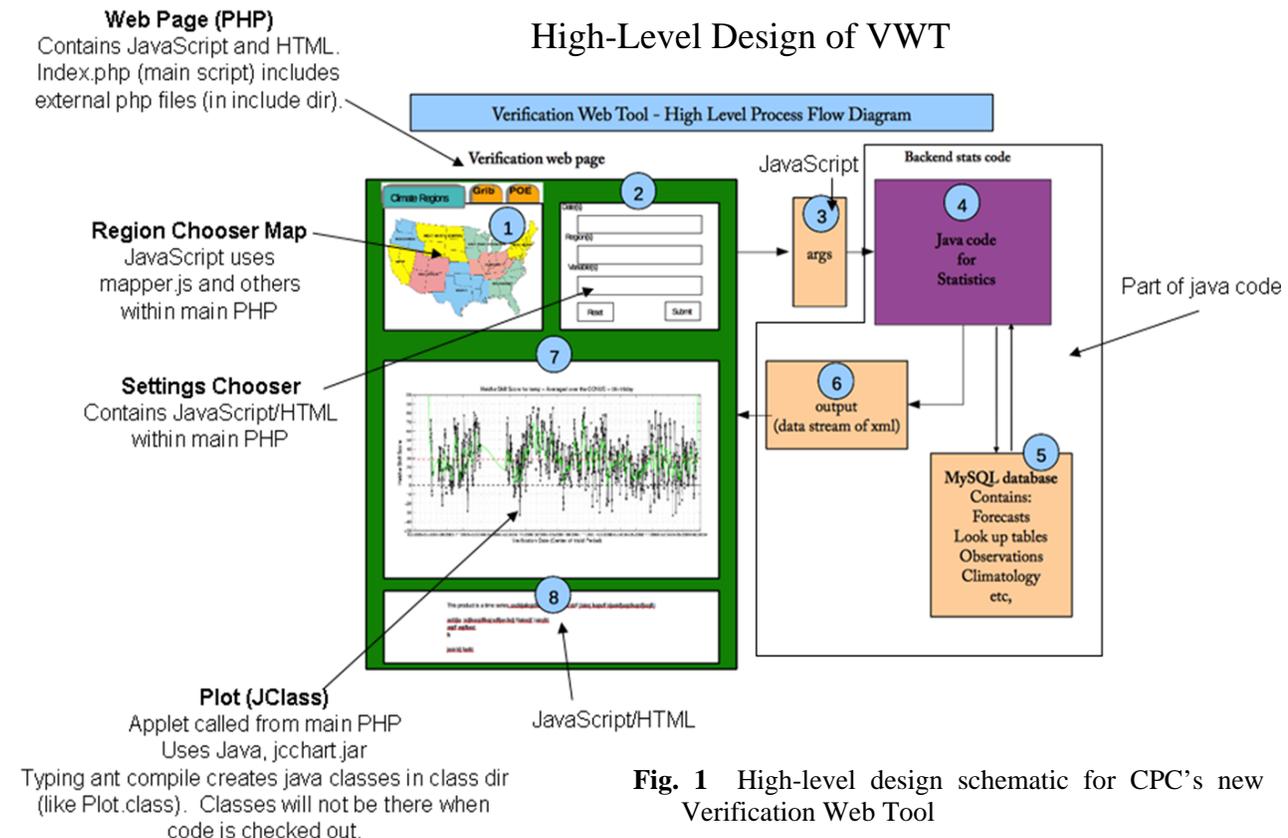
²Climate Assessment for the Southwest, The University of Arizona, Tucson, AZ

1. Introduction

Over the last several years CPC has created products and adopted protocols, which are new to the organization. The net result is an emerging R2O protocol, which promises to radically improve our capability to implement new products, while continuing to maintain our existing ones.

We identify 5 critical elements: (1) Project Planning, (2) Software Version Control, (3) Issue-Tracking, (4) Wiki usage, and (5) Collaborative Software Development; and provide 2 example projects: (1) a Verification web tool (VWT), and (2) a Dynamic Probability of Exceedance web tool (dPOE), both of which are nearing completion.

Section 2 gives a comparison of research ("R") and operations ("O"). Section 3 describes the 5 elements of a new R2O. Section 4 describes how CPC's interactions with CLIMAS inspired development of two web-based tools to allow users to interact with databases of forecasts and observations. The Verification Web Tool and the Dynamic POE Web Tool are also described. Section 5 gives Lessons Learned.



2. Research versus Operations.

Research: Untested technologies, new knowledge of uncertain or distant future application valued

1. Funding supports entirely new topics
2. Products are papers, published episodically
3. Code standards, documentation often of secondary importance
4. Driven by funding and quest for new results
5. Research personnel is largest cost
6. Narrow, highly-trained user community

Operations: Robust technologies, continuity, practicality valued

1. Funding limits ability to do new things
2. Routine/rigid delivery of products
3. Code standards, documentation essential
4. Driven by system *security considerations*
5. Software maintenance is largest cost
6. Broad user base, often untrained

Verification Web Tool

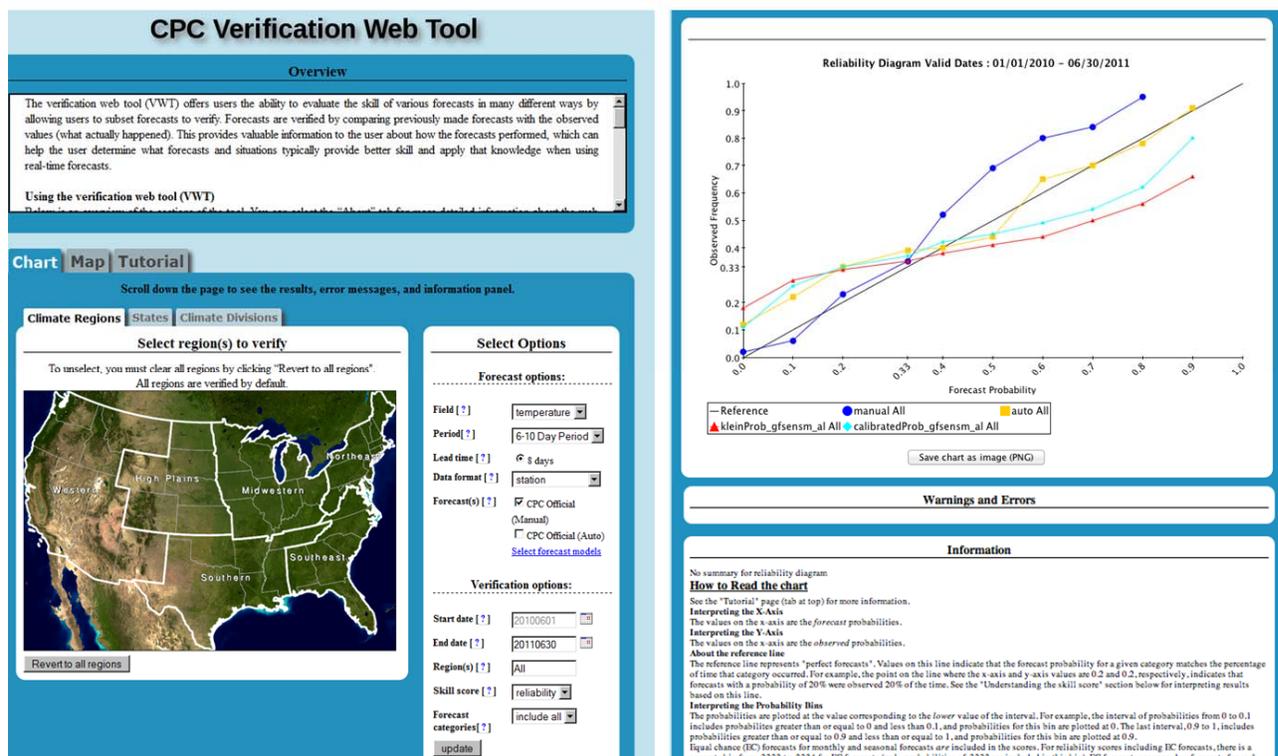


Fig. 2 The VWT is a Java-based interactive web tool which allows a user to request skill graphs or maps, for temperature and precipitation forecasts, for a variety of forecast periods, geographical regions, and historical periods.

3. The 5 essential R2O project elements

1. Collaborative Development: Leverages the talents and resources of developers inside and outside of the organization. This is facilitated by software which allows simultaneous development of code by multiple people at the same time, such as CVS or Subversion.

2. Project Planning : A formal process, starting with a Charter, which lists purpose, in and out of scope activities, costs & benefits, deliverables, resources, risks, participants.
3. Software Version Control: This software facilitates orderly code development and is essential to collaborative development. Facilitates collaborative development of code (see item 1.).
4. Issue-Tracking : Facilitates management of project through accountability. Trac issue-tracking software is used at CPC.
5. Wiki-Usage: Enables shared documentation of information.

4. How the CLIMAS-CPC collaboration led to innovation at CPC

CLIMAS introduced issue-tracking, version control, and collaborative development to CPC through a series of lectures, culminating in a project to collaboratively develop a web tool. In the process of working together, CPC and CLIMAS successfully developed and implemented web services, dynamic process initiation, and user interfaces at CPC. They also overcame security issues involving non-NWS access to NWS computers.

As a direct result of this work, CPC embarked on an effort to internally develop the Verification Web Tool. CPC and CLIMAS also continued their joint collaboration by developing the dynamic Probability of Exceedance (dPOE) web tool. These are illustrated by Figures 1-3.

Dynamic POE Web Tool

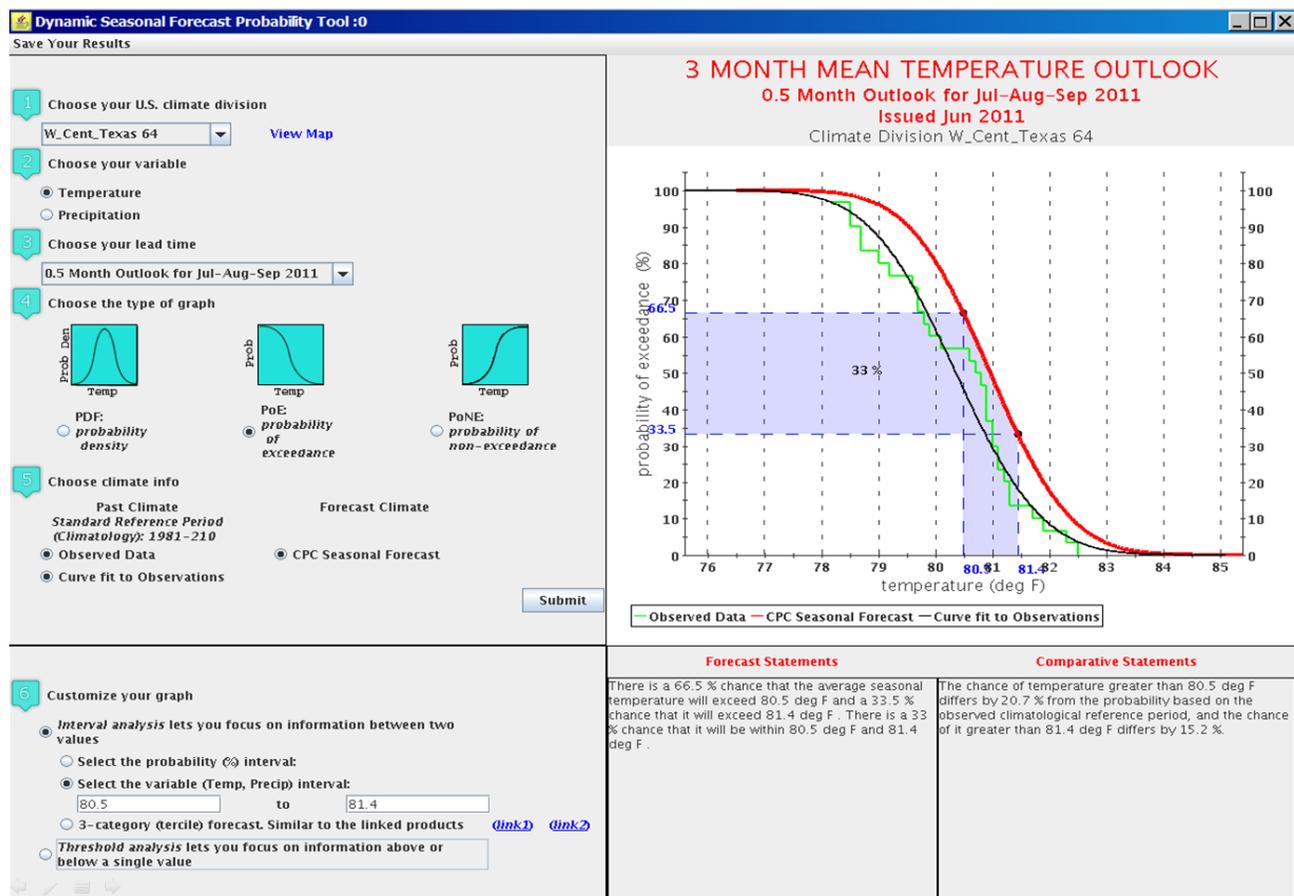


Fig. 3 The dPOE is a Java-based interactive web tool which allows a user to request graphs which place a temperature or precipitation forecast into the context of a reference distribution. These distributions may be viewed in 3 different formats controlled by the user, who may also vary the thresholds which bracket the range of possible values of a forecast.

5. Lessons learned

1. R2O is hard, partly due to natural differences in culture and communication between the research and operations side of an organization.
2. CLIMAS introduced issue-tracking, version control, and collaborative development to CPC. These powerful tools provide accountability and leverage the talents of coders inside and outside of the organization in a way never-before attempted at CPC.
3. These tools are being increasingly incorporated into CPC's Operations Branch, and have permanently changed our mode of day-to-day operations.
4. VWT and Dynamic POE were successfully developed using these, along with wiki-usage and project planning (5 elements).
5. CPC/CLIMAS Successes: web services, dynamic process initiation, user interfaces, security issues with non-NWS access to NWS computers, specific software development tools, dPOE.
6. Other parts of NCEP are adopting these software development techniques (NCO, EMC).