SWMM to WEB

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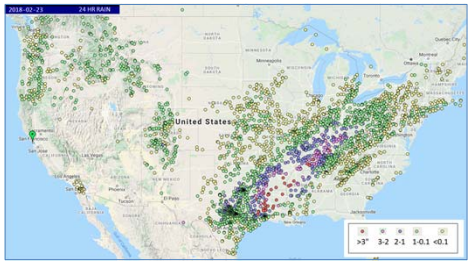
ABSTRACT

Civil engineers have continuously exploited advancement in computation technology to make design decisions economic, faster and with less manpower. Analysis of engineering systems that once needed resources only affordable by large institutions or government agencies are now routinely solved with desktop applications by a few experts. We have seen calculation tables moving to the mainframes, and then to the desktop computers. The time is here to run EPA SWMM on the world wide web. Essentially a browser can run a stormwater model. This paper demonstrates this concept using the EPA SWMM program. However, the same concept can be adapted to many open source software. By further abstracting complexity of models from end users, and presenting a simpler user interface, the involvement of stakeholders increases. In a global context, less prosperous societies can participate and take advantage of the technology within their means. Collaborations to address trans-border water and wastewater issues can be addressed transparently through hydraulic model representation of the actual system, that is available to users through the web.

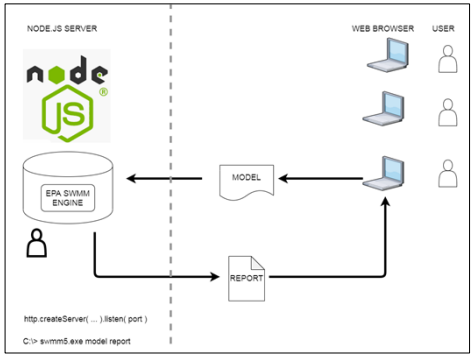
INTRODUCTION

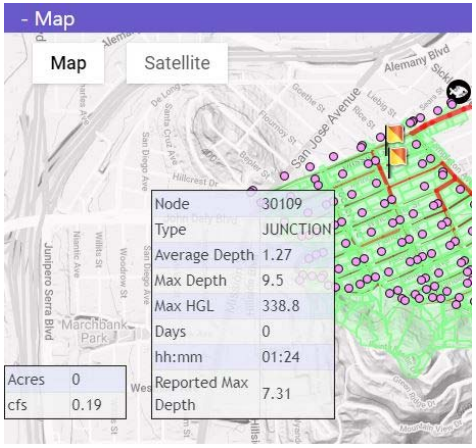
Hydrology and hydraulics systems are routinely analyzed using models on desktop software. A significant amount of expert time is spent on data collection, conversion of data to the format needed by software, and presentation of results. These activities, which can be automated, diminish the time and resource available for actual engineering analysis and design. The modeling process can be enhanced significantly by modifying pre-existing desktop software. For this minimum-viable-product demonstration, we utilized web technologies like *JavaScript*, *node.js*, and *ajax*. We embraced many *JavaScript* libraries, google map, *w2ui*, among others to run the EPA SWMM5 software on a web browser and present simulation results.



METHODOLOGY

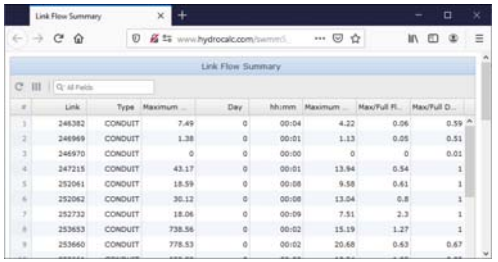
EPA SWMM5 software can be run on a command line such as DOS shell, or PowerShell. Node.js allows a desktop to be used as a web server. With the *node.js child-process*, SWMM5 engine is executed in command line. A SWMM5 input file is fed by the web browser to the node.js server. The server executes the SWMM5 engine and generates a report text file. The output report file is sent back to the web browser, which renders the results in maps and in tabular formats.





RESULTS

A single-page web application is designed to read a SWMM5 input file. It enables the user to upload a SWMM5 model to a *node.js* web server. The model run can be initiated from the browser, and the end report can be downloaded. The user can also adjust model parameters to assess various design options. The parameters can be restricted by an expert to match the familiarity of the end user.



CONCLUSION

Many of the desktop applications generated in government institutions have yet to take full advantage of the reach of the modern web. Present and future generations of engineers who are accustomed to drag-and-drop technology need a paradigm shift to leverage vast amount of computational systems that have been developed since the advent of modern computers. Software vendors and researchers in the engineering fields should boldly share and advance common technology platforms to increase efficiency and collaboration in engineering design, and to find sustainable and economic solutions to real-world problems and address the pressing needs of rapidly growing population of an ever-changing earth.

RECOMMENDATIONS

SWMM5 update should allow integration with present and future web technologies. An Application Programming Interface (API) is needed to allow data handling in *javascript object notation* (*JSON)* format. For example, river stage data from any online source can be accessed using *JSON* data format. It is unrealistic to expect uniform data format throughout all agencies and disciplines. However, with a JavaScript interface, users can write data conversion tools to adapt data on-the-fly to the format needed by SWMM5.

Engineers should embrace basic web technologies as another useful skill.

The nature of scientific data has changed considerably in the digital age. Water management software and any environmental software should be designed with the possibility of interoperability and to exchange data over the web.

Practitioners new to the field need to be presented with simplified model interface.

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