Power Systems Engineering Research Center

Seamless Bulk Electric Grid Management: A Platform for Designing the Next Generation EMS

Anjan Bose
Regents Professor
College of Engineering and Architecture
Washington State University
bose@wsu.edu

PSERC Public Webinar
April 5, 2016
2:00-3:00 p.m. Eastern Time (11:00-12:00 p.m. Pacific)

Description: In designing the framework for the next generation Energy Management System (EMS) and analytics, a flexible platform is needed that can simulate the layers of high voltage hardware, the IT hardware, and the various software packages that forms the base on which the applications for operating the grid can run. The base for such a platform has to be the simulation of the power grid itself that can produce Phasor Measurement Unit (PMU) measurements with fidelity (such as the time granularity of a transient stability program). On top of this has to be the communication layer needed to move the data from where they are produced to the applications. The management of the data, both static and real-time, is another layer on which the applications layer must reside. In this project we demonstrate the feasibility of such a platform.

The power grid simulation of the platform uses the PowerWorld Dynamics Studio (DS) program to simulate the transient stability behavior of the power grid and produces the streaming output of the PMU data in standard format that would normally be measured. The same program can also accept control signals that affect the transient behavior. This work was conducted at the University of Illinois at Urbana-Champaign (UIUC). A test power system of 42 buses was used. The communication network that overlays the power grid is simulated by using NS3. Different architectures of the communication networks for the 42 bus power system are tested. This work was conducted by Washington State University (WSU). New types of EMS applications can also be tested on this platform. A decentralized control of frequency is tested by dynamically changing the power agreement between agents after a disturbance. This work was conducted by the Georgia Institute of Technology (GT).This project shows that platforms such as this one can be built to co-simulate the behavior of the power grid, the communication network, and the applications. Although more elaborate simulation platforms will be needed to test production grade designs of controller hardware and software, the models and algorithms are all shown to be feasible.

Biography: Anjan Bose is a Regents Professor and the Distinguished Professor of Electric Power Engineering at Washington State University in Pullman, Washington, where he also serves as the Site Director of PSERC. He served as the Dean of the College of Engineering & Architecture from 1998 to 2005. In 2012-13, he served the US Department of Energy as a Senior Advisor on the electric power grid in the Obama administration. He has worked in the electric power industry as well as academe for over 40 years.