Cyber-Physical Systems Virtual Organization: Active Resources

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The central objective of the proposed research is to transform the CPS-VO from a collaboration platform and passive repository of information into an active resource that provides access to tools and methods emerging from the CPS research community.

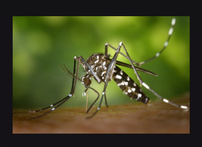
The project will make a significant contribution to education via support to student competitions that will help prepare a new generation of students who will be inspired and trained to realize the promise of CPS. We expect that the integrated suite of models, integration platforms, and intellectual frameworks to be developed and contributed by the research community will lead to a new era of low-cost, distributed and open design infrastructure.

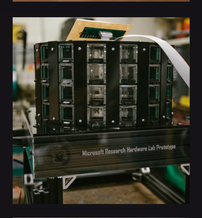
Pilot Student Challenge

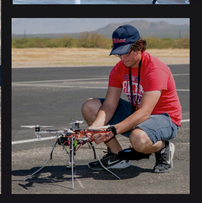
As a first step towards providing templates and infrastructure for student competitions via the CPS-VO portal, we ran a pilot with the four partner universities.

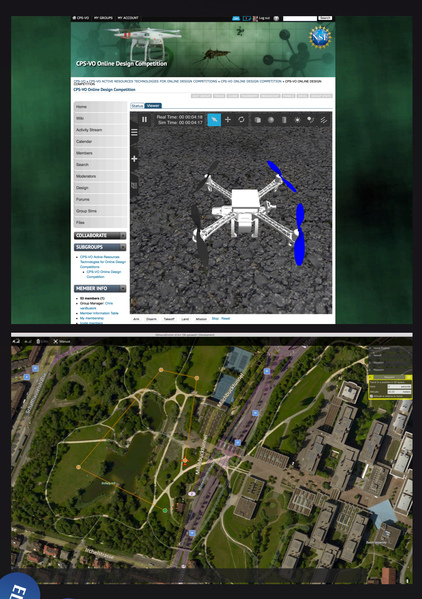
Using modeling, simulation and verification tools, teams co-designed mechanical fixtures and software controls focusing on the end-to-end design, implementation and validation of actual CPS systems.

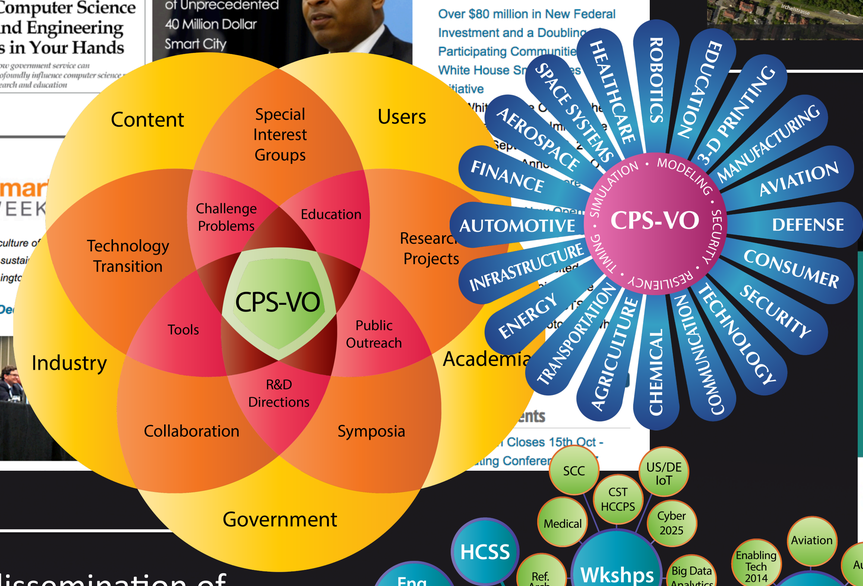
The industrial sponsor for this pilot was **Microsoft Research**, and the challenge problem was grounded in the context of their ***Project Premonition*** initiative, which seeks to track blood-borne pathogens in nature and to predict the spread of disease so that public health organizations may formulate rational, measured responses before an infectious disease reaches the epidemic stage.



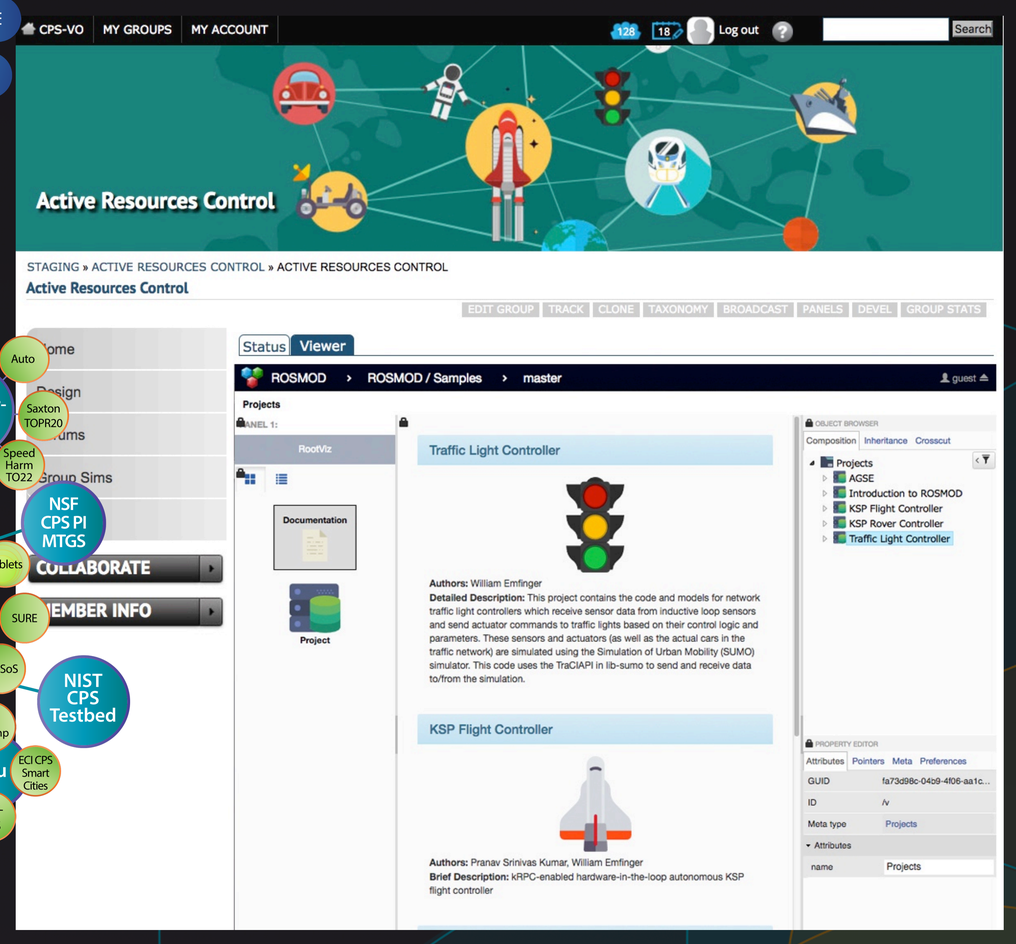




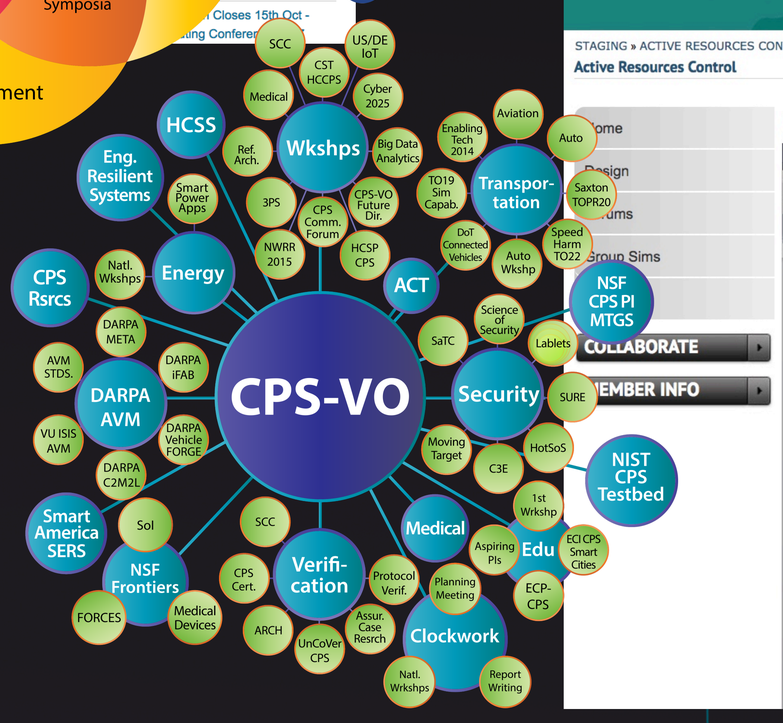




Shown here is an active resource that facilitates the use of graphical models with well defined semantics for the design and testing of CPS systems based on the ROS middleware (i.e. all code is synthesized from the formal models). The example application below is analysis of various types of cyber attacks on specific configurations of automotive traffic networks.



The development and dissemination of **open model libraries, open-source tools and integration platforms** give the proposed research significant impact. The open integration platforms will empower CPS researchers to make their work accessible and immediately usable via **design studios** built for different target domains, will enable small projects to effectively contribute to large research efforts and make a direct impact, and will help in shortening the transition path for research results.



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