Software Properties and Behaviors
Pascal Meunier, Purdue University CERIAS

Abstract
Software has moved beyond the encoding of algorithms, to enforcing moral, ethical and legal values, implementing tactics, strategies and essentially the will of designers, coders and organizational (e.g., corporate) entities, or even laws. Buyers, users and communities incur risk due to the deployment of foreign or inappropriate behaviors. Due to code complexity, obfuscation and emergent behaviors, I posit that the systematic study of software behaviors is an important and sometimes the main source of reproducible and objective information on what an artifact (including infrastructure) will and will not do. I contribute definitions of some desirable software properties useful in the context of studying the risks posed by software behaviors: software transparency, purity, obedience and loyalty.

Examples
- Unauthorized back doors obviously fail all desirable properties

- The Comcast network failed transparency by not disclosing the injection of reset packets; it failed purity because the reset packets were foreign to the stated purpose and advertised nature of the broadband internet connections; it failed obedience and loyalty because it violated the control of users' TCP connections in violation of implicit contractual agreements.

- Secret or hidden MMORPG “watch” software (e.g., “Warden” for World of Warcraft) fail at least transparency and arguably more.

- DRM software for Major League Baseball videos failed obedience and loyalty by unexpectedly preventing users from watching videos, because the DRM server was decommissioned without warning.

Loyalty
The software serves only the interests of the appropriate entities. It can't be subverted to serve the interests of third parties, or inappropriately favor some entities.

Transparency
All functions of the software are disclosed to users.

Purity
Freedom from functions that are foreign to the software's advertised nature or stated purpose.

Obedience
The functions in the software are fully under the control of the appropriate entities.