

Title: Hybrid Planning in Self-adaptive Software Systems

Abstract:

The ability to plan is one of the key requirements to build a self-adaptive software system. This ability helps the system to determine adaptation plans at run time that seek to change its behavior in response to faults, changing environments and attacks. Therefore, having an appropriate planning approach to find a plan is a critical design consideration to successful self-adaptation.

For many realistic systems, ideally one would like to have a planning approach that finds quality plans in a timely manner. However, due to the fundamental trade-off between quality and timeliness of planning, often designers have to compromise between an approach that is quick to find a plan and an approach that is slow but finds a quality plan.

To deal with this trade-off, this talk proposes a hybrid planning approach for self-adaptive systems that combines deliberative and reactive planning to find a balance between quality and timeliness. The key idea is to use reactive planning to provide a quick (but potentially a sub-optimal) response, but simultaneously invoke deliberative planning to determine quality plans. Once the deliberative plan is ready, it takes over execution from the reactive plan to provide a higher quality adaptation thereafter.

The talk discusses both the theoretical and the practical aspects of hybrid planning in self-adaptive systems. Specifically, the talk presents: (a) a formal framework defining the problem of hybrid planning, (b) a practical approach (grounded on the formal model) to apply hybrid planning to self-adaptive systems, and (c) a concrete example bridging the gap between theory and practice.