

# Kanban Scheduling System

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## System of Systems

### Health care System of Systems example



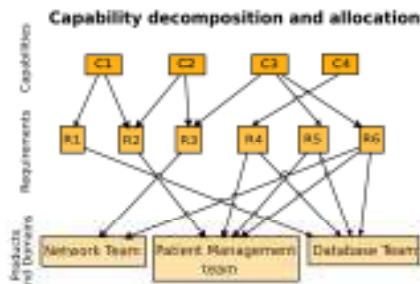
## System engineering challenges

System engineering processes in large systems have become significantly software-driven and software-intensive. Many large projects have multiple levels of abstraction where these system engineering processes take place. Multiple levels of management make it difficult to capture actual state and relative value of work in this kind of environments. Therefore, development becomes less and less deterministic and controllable. To deal with these obstacles we need to achieve:

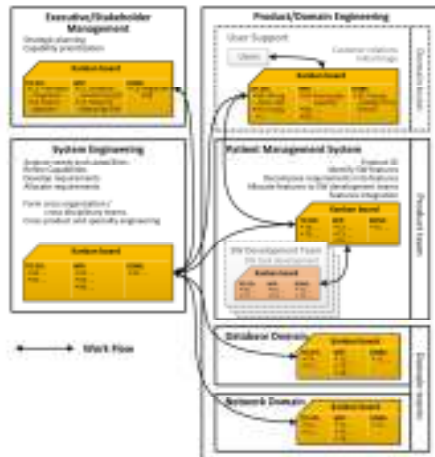
- More effective integration and use of scarce system engineering resources
- Improved visibility and coordination
- Improved flexibility without reducing predictability across systems
- Increased value delivered earlier
- Lower governance overhead

The **Kanban-based scheduling system (KSS)** applies original lean concepts to achieve these goals. The KSS provides a set of guidelines to coordinate work queues and work prioritization based on lean concepts.

## Kanban network



### SoS structure and work follow



## Process simulation

In order to analyze complex event sequences and behavior characteristics, a **discrete-event simulation** approach was used. The simulation model describes engineering processes as a discrete sequence of timeframes. All the system engineering activities in this model are represented as a set of **work items** grouped by aggregation nodes such as **requirements** and **system capabilities**. Together work items and aggregation nodes form a network, also called a **KSS network** or Kanban network. The KSS network evolves over time, and this evolution is represented by a chronological sequence of states of this network. The way the KSS network evolves is defined by an event scenario and other input parameters such as scheduling algorithm and team's resource allocation. The event scenario is a sequence of events that describes how work item properties and relationships change over the course of their execution.

### KSS Simulator



One of the main purposes of the model is to compare amount of value delivered to the stakeholders over time using various work prioritization techniques. There are two algorithms that are compared here using the KSS simulator:

- value-neutral work selection
- value-based prioritization technique known as Kanban Scheduling

### Simulation results

