Sensor Resource Allocation as a Driver in System Concept Development

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Abstract

Operation of a Primary mission concurrently with an added mission like Anti Air Warfare (AAW) operations and other missions requires a balancing of competing system assets

This paper provides a methodology to assess the individual mission requirements and derive the capability assessment of multi mission scenarios

This paper also describes the drivers for such multi mission capability of the Aegis or similar naval combat systems

Overall capability to protect the ship and other protected assets as influenced by situation dependent sharing of system resources and other system constraints is discussed

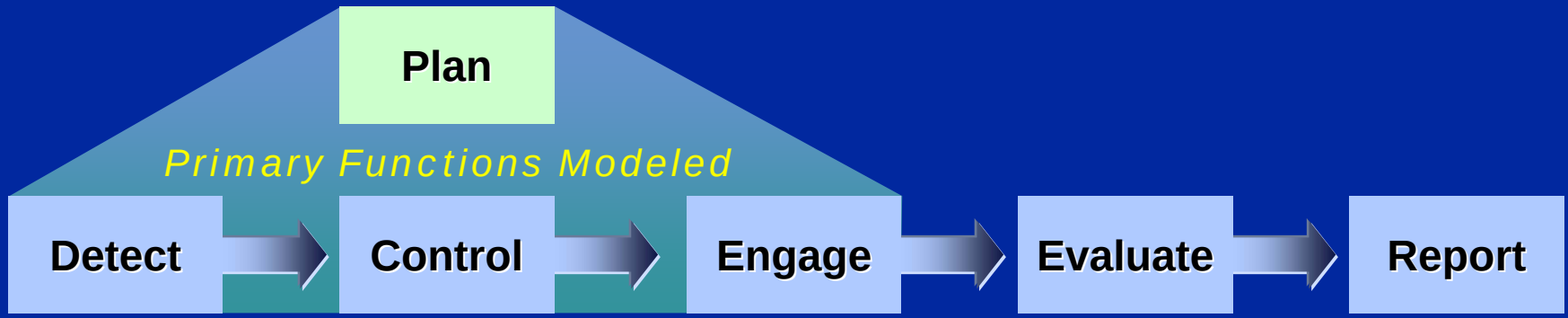
A brief description of the system level simulation model is also provided

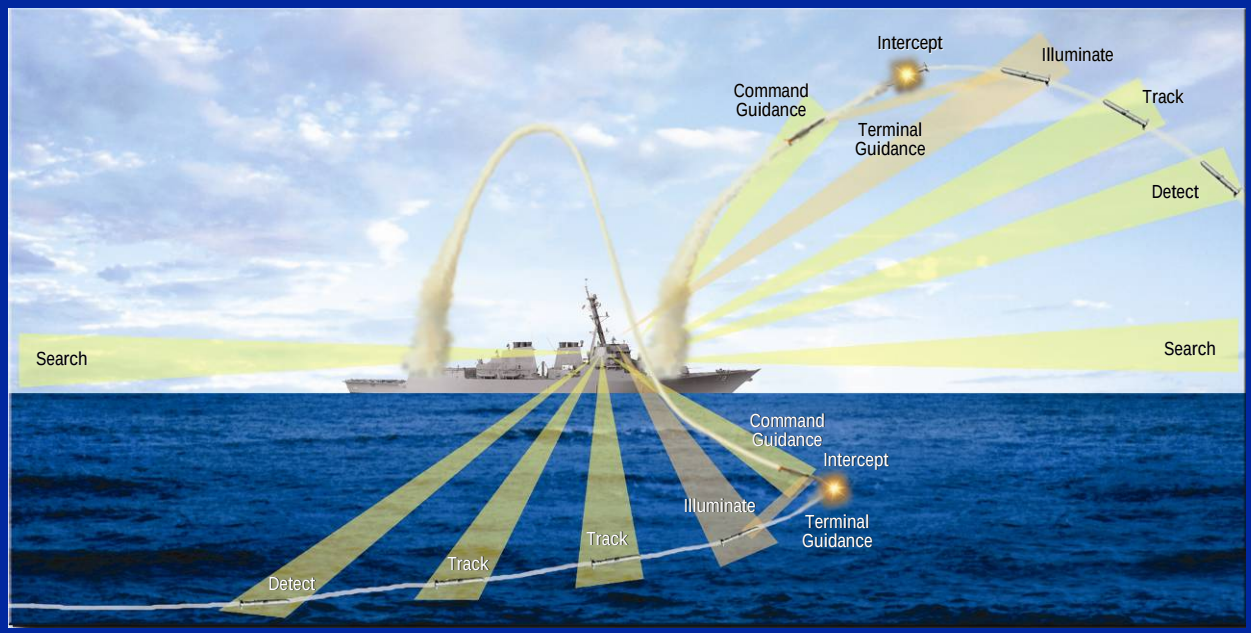
Definitions

- ***AAW – Anti Air Warfare***
- ***Sensors – Scanning and Tracking Radars***
- ***Autonomous – Organic***
- ***Multi Mission – Combined Missions requiring Simultaneous Tracking and engagements***
- ***Radar Resource Usage – Radar Time required to schedule the beams for search and track***

Scenarios and Mission

AAW Engagement General Timeline Model





Multi Mission scenario

- *A ship tasked with the primary mission may need almost all of its radar resources dedicated to that single mission*
- *To engage in an AAW mission, it would be necessary to commit another ship from the fleet operations*
- *Multiple ships will be required to perform multiple missions*
  - *Therefore it is necessary to consider reallocating the radar resources to support the AAW mission*

Multi Mission Scenario

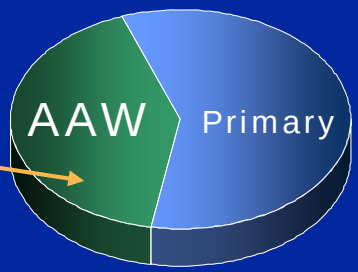
- ***Capability analysis was performed of the extent to which various levels of radar availability can be effectively utilized to defend against a breadth of AAW threat scenarios***
- ***The corollary to this is the effect on the primary mission performance of concurrent AAW missions***

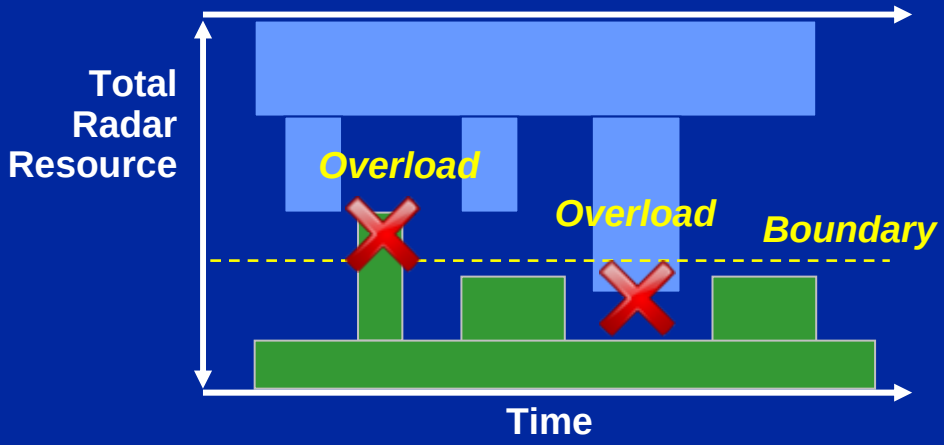
System Resource Management (1 of 2)

- ***Continuously monitor Multi Mission Sensor Resource usage***
- ***Dynamically re-allocate Multi Mission resources by predetermined mission priority***

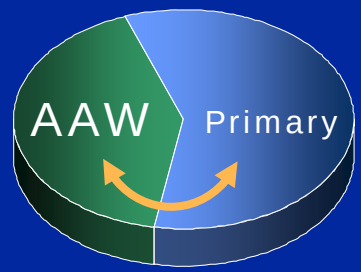
Concept 1: Fixed Mission Priority

Pre-Allocated

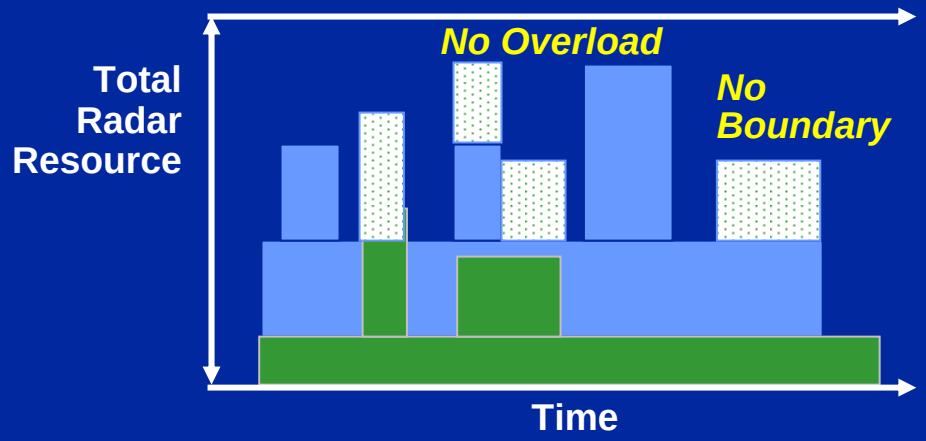




Concept 2: Dynamic Allocation

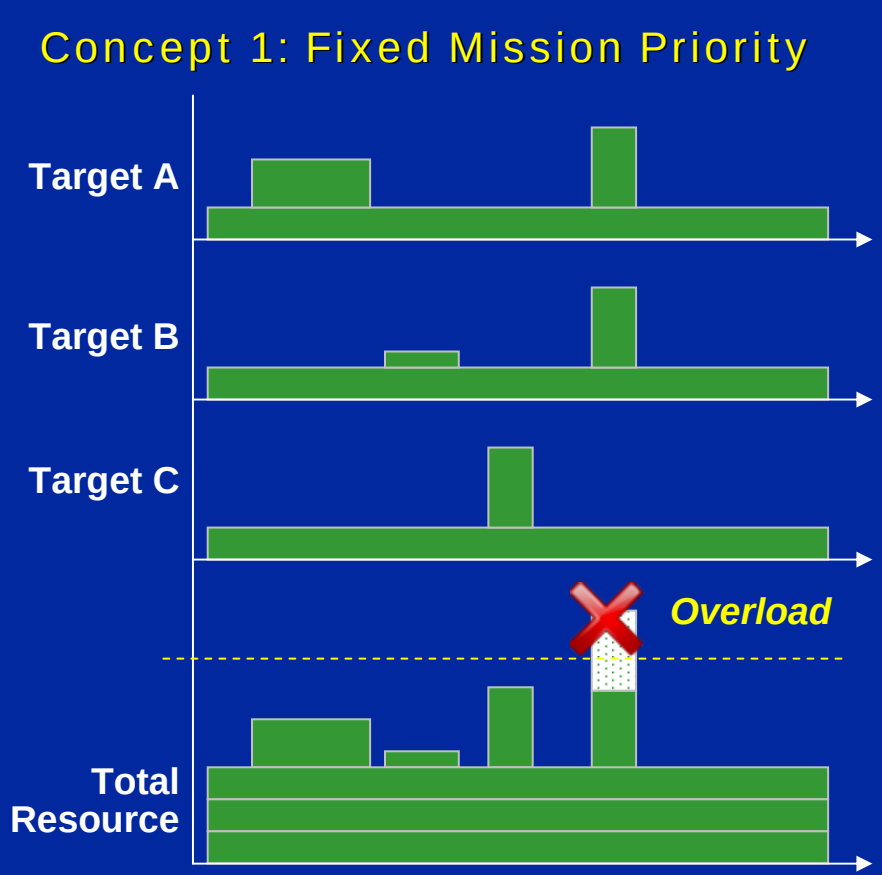


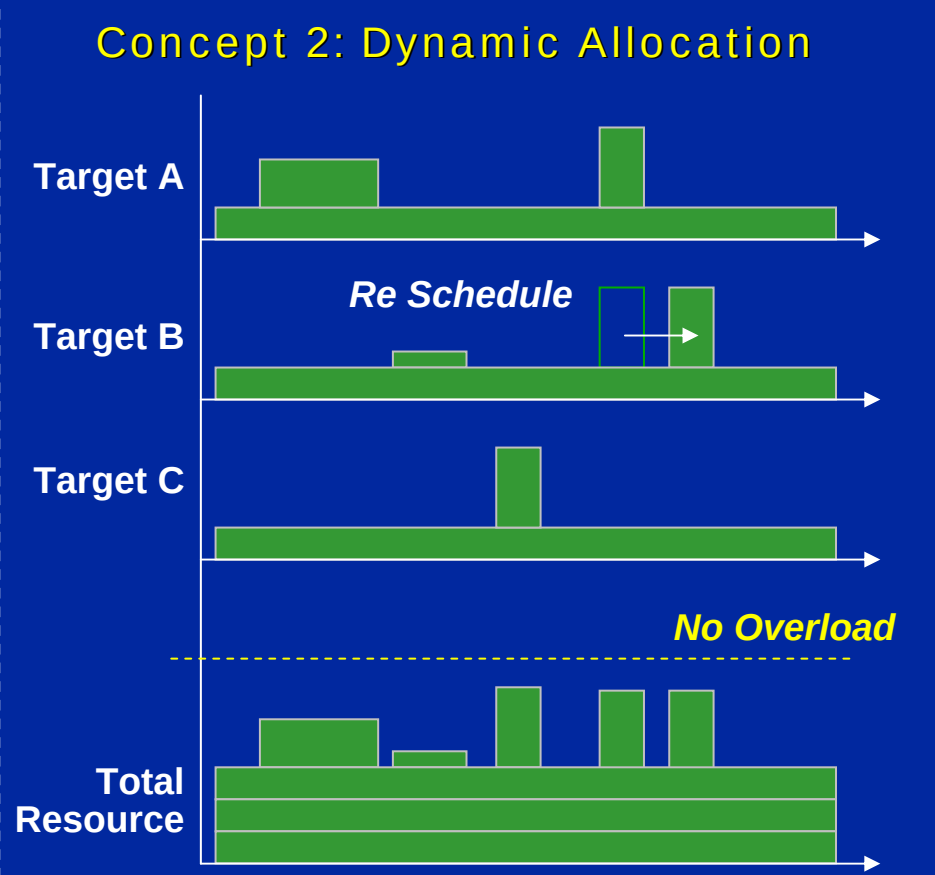
Dynamic Allocation



System Resource Management (2 of 2)

- ***Continuously monitor Multi Mission resource usage***
- ***Analyze dynamic schedule to avoid resource overload in Multi Mission Scenarios***

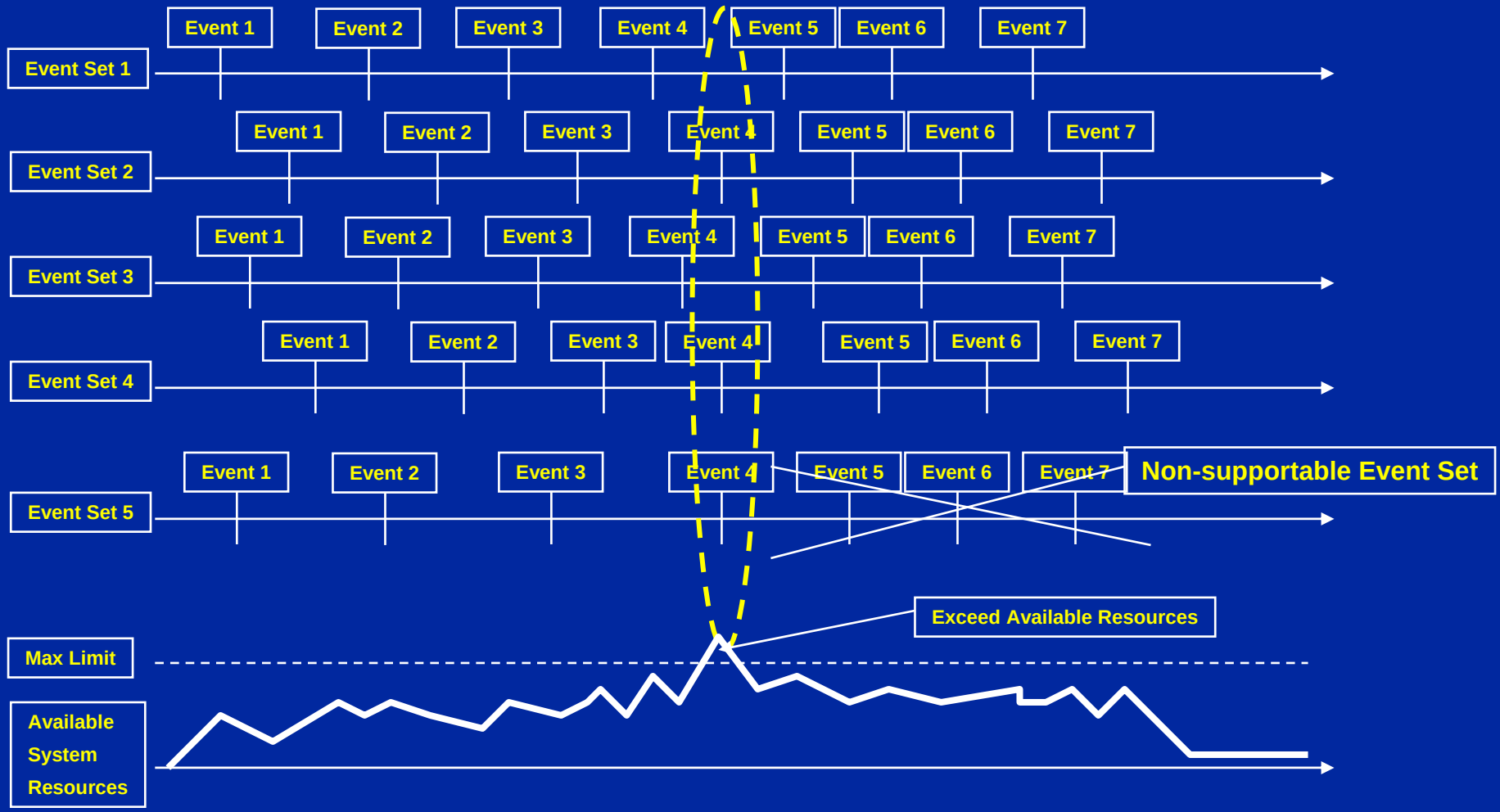




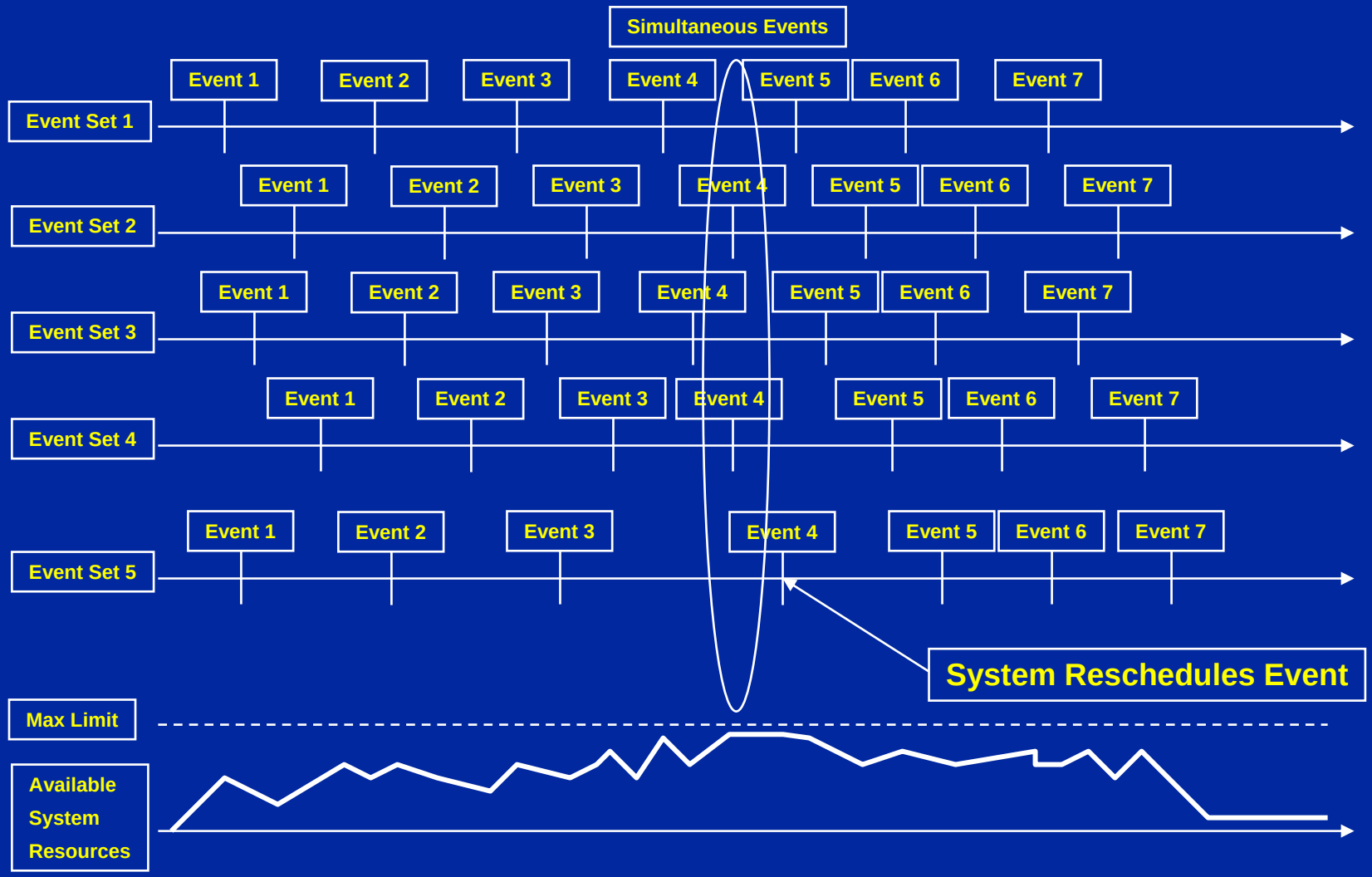
Sensor Resource Management

- *Continuously monitor sensor resources i.e. sensor usage*
- *Dynamically schedule Multi Mission resource between AAW and Primary mission by designated mission priority*
- *Dynamically re-schedule system activity to avoid Multi Mission resource overload*
- *No fixed capability boundary for target tracking and engagement*
- *Preserve Multi Mission system resources for committed weapon system actions*

Event Timeline
(Concept 1: Fixed Mission Priority)



Event Time Line (*Concept 2: Dynamic Allocation*)



System Concept Development

- ***In a Multi Mission environment engagement completion is based on sensor resource scheduling priority***
- ***Event times are delayed to allocate needed resources required to complete the event timeline***
- ***Missions do not always get 100% allocation of resources***

About the Authors

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