

# System-of-Systems Reliability Conceptual Model

## Glossary

Element	Definition	Reference
<b>Capability</b>	The ability of a constituent system to contribute to a global mission under specified standards and conditions through combinations of means to perform a set of tasks.	Dahmann et al., 2008
<b>Constituent System</b>	Constituent systems can be part of one or more SoS. Each constituent system is a useful system by itself, having its own development, management goals and resources, but also interacts with others within a SoS to provide a unique capability of such SoS.	ISO, 2019
<b>Cooperation</b>	The ability of constituent systems to work together.	Silva et al., 2014
<b>Countermeasure</b>	Actions taken to oppose a disturbance or to prevent it.	Bourget <i>et al.</i> , 2020
<b>Constituent System Behavior</b>	The way a constituent system operates. It corresponds to a path a constituent system takes when executing from the start to the end. The behavior is greatly influenced by the runtime environment.	Lo et al., 2009 Chen et al., 2017
<b>Constituent System Disturbance</b>	Something bad that may negatively affect a constituent system's ability to deliver value. It can be classified along two axes; (1) whether the origin was internal or external to the system, or (2) whether the disturbance was natural/accidental or malevolent.	Richards, 2009 Jackson, 2010;
<b>Constituent System Evolution</b>	Continuous development that changes a constituent system's functionality or properties.	Chapin et al., 2001
<b>Emergent Behavior</b>	The cumulative actions and interactions among constituent systems give rise to the behaviors that can be attributed to a SoS as a whole.	Boardman & Sausser, 2006
<b>Interdependence</b>	A relationship among constituent systems so that the state of each system influences or is correlated to the state of another.	Rinaldi et al., 2001
<b>Individual Mission</b>	A functional goal assigned to a constituent system. Constituent systems must accomplish their own individual missions independently.	Silva et al., 2014; Silva et al., 2015
<b>Global Mission</b>	A functional goal assigned to a SoS. It must be accomplished throughout the cooperation among constituent systems of a SoS.	Silva et al., 2014; Silva et al., 2015
<b>Quality Attribute</b>	Non functional characteristic of a constituent system.	Dobrica & Niemela, 2002
<b>Severity</b>	Seriousness of the effect of a disturbance. It can be classified as <b>catastrophic</b> if a disturbance can result in the loss of personal life and/or complete system loss; <b>critical</b> if a disturbance can potentially cause serious personal injury and/or significant personal damage and loss of system functionality; <b>marginal</b> if a disturbance can result in minor injury and/or minor system damage and degradation of system functionality; and <b>minor</b> if a disturbance is not severe enough to cause any personal injury or system damage, but resulting in the requirement for some corrective maintenance.	Pecht, 2009; Zafiropoulos and Dialynas, 2004
<b>System-of-Systems Disturbance</b>	Something bad that may negatively affect a SoS ability to accomplish a global mission.	Lo et al., 2009
<b>System-of-Systems Reliability</b>	Probability of a SoS to deliver one or more functional capabilities over a global mission's duration.	Daughtrey, 2015
<b>System-of-Systems</b>	Set of systems that cooperate to provide a unique capability that no constituent system can accomplish on its own.	ISO, 2019

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