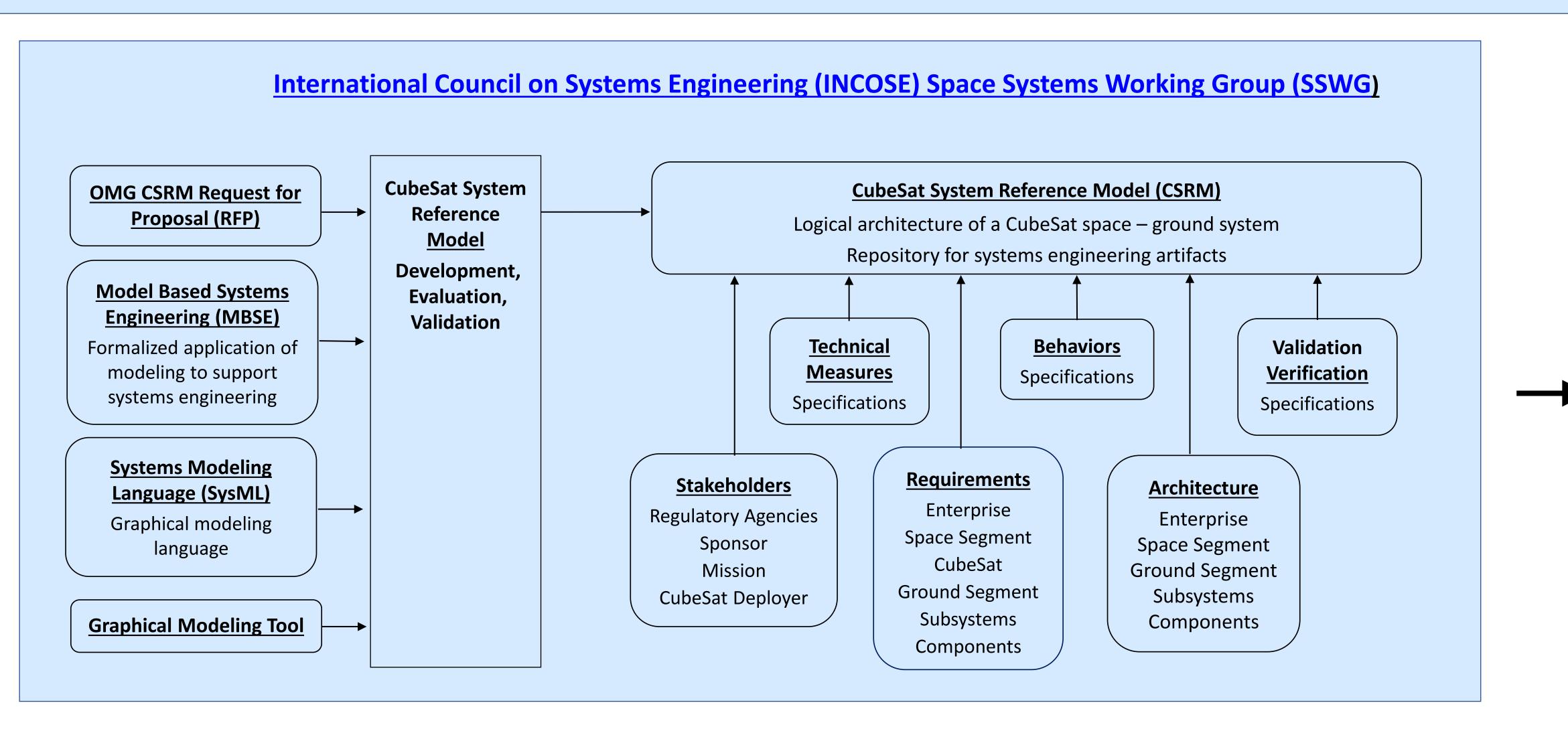
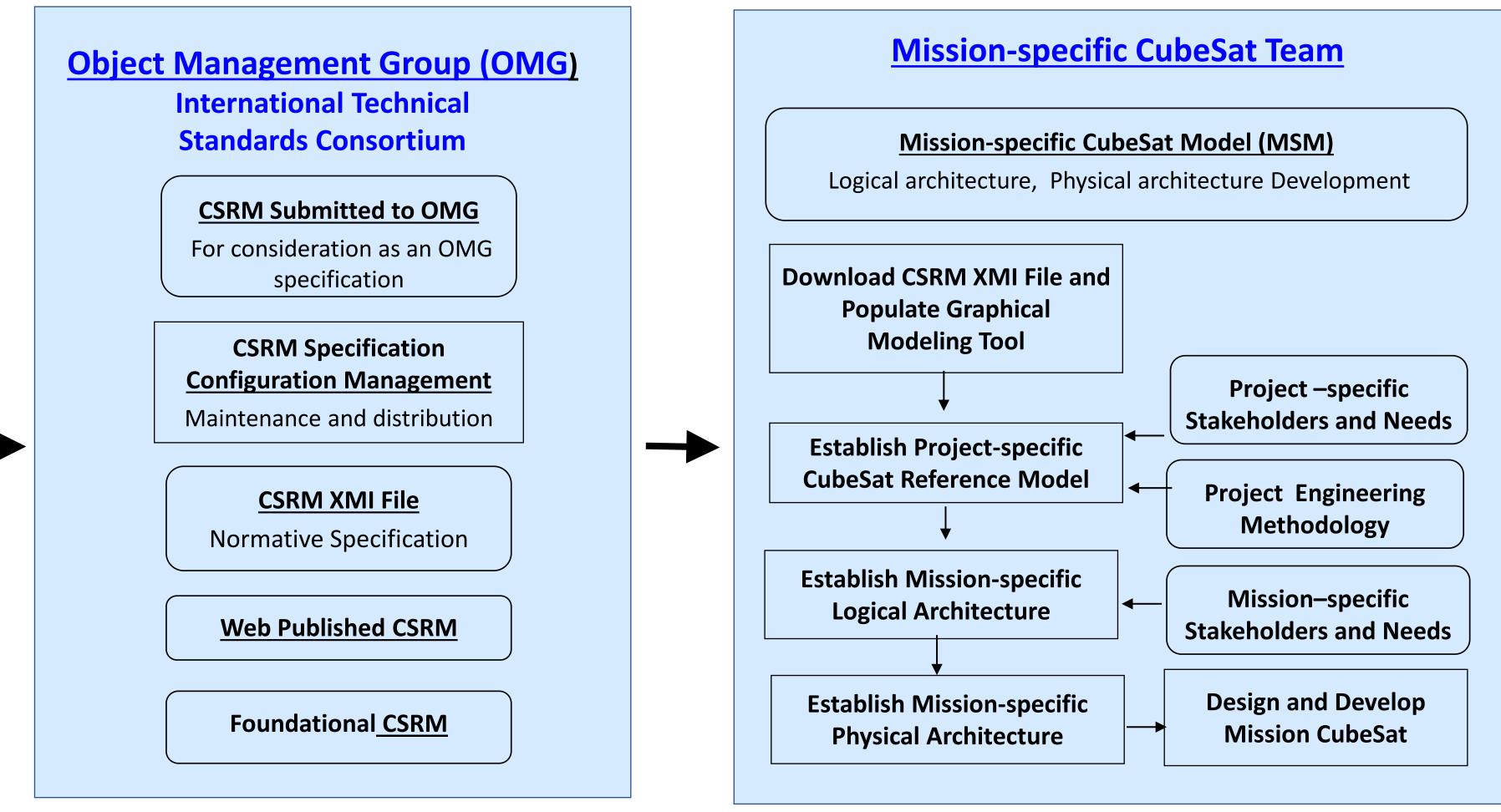
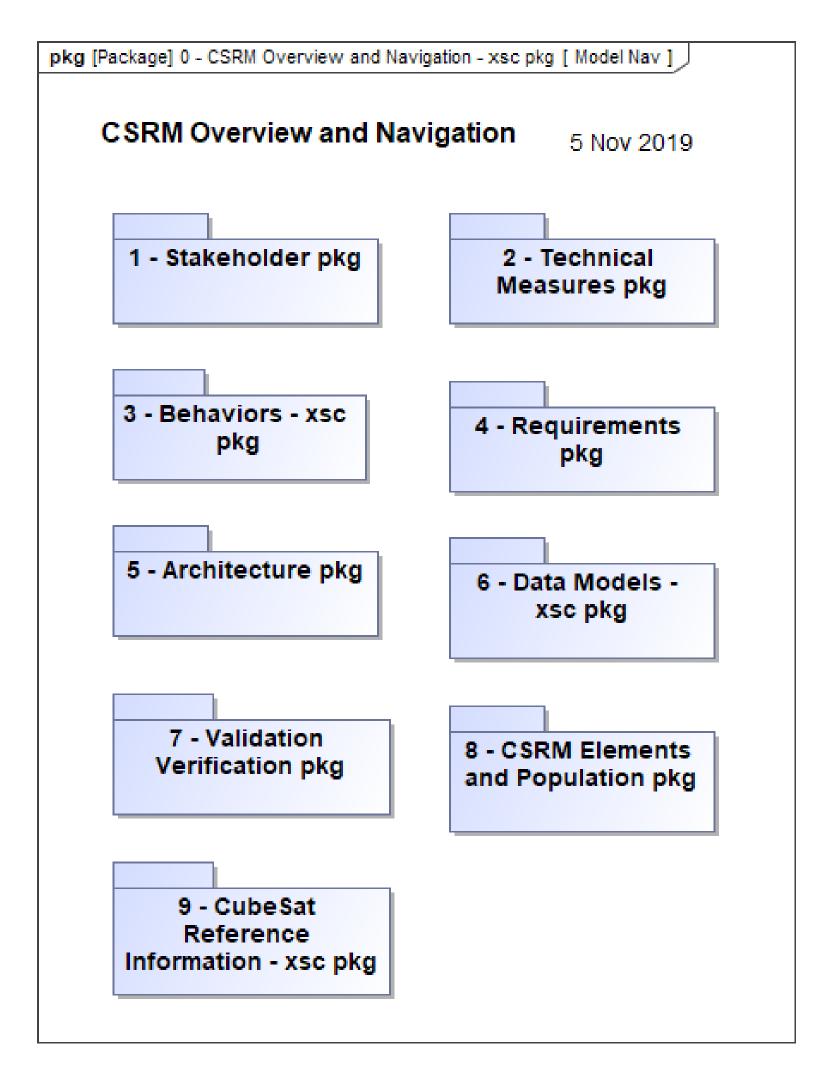
SSWG has investigating the applicability of MBSE for designing **CubeSats since 2011.**

First phase developed a SysML model of a CubeSat and applied it to the Radio Aurora Explorer. The second phase included modeling behaviors and the third phase included carrying out trade studies. The current phase is the development of a **CubeSat System Reference Model (CSRM).**

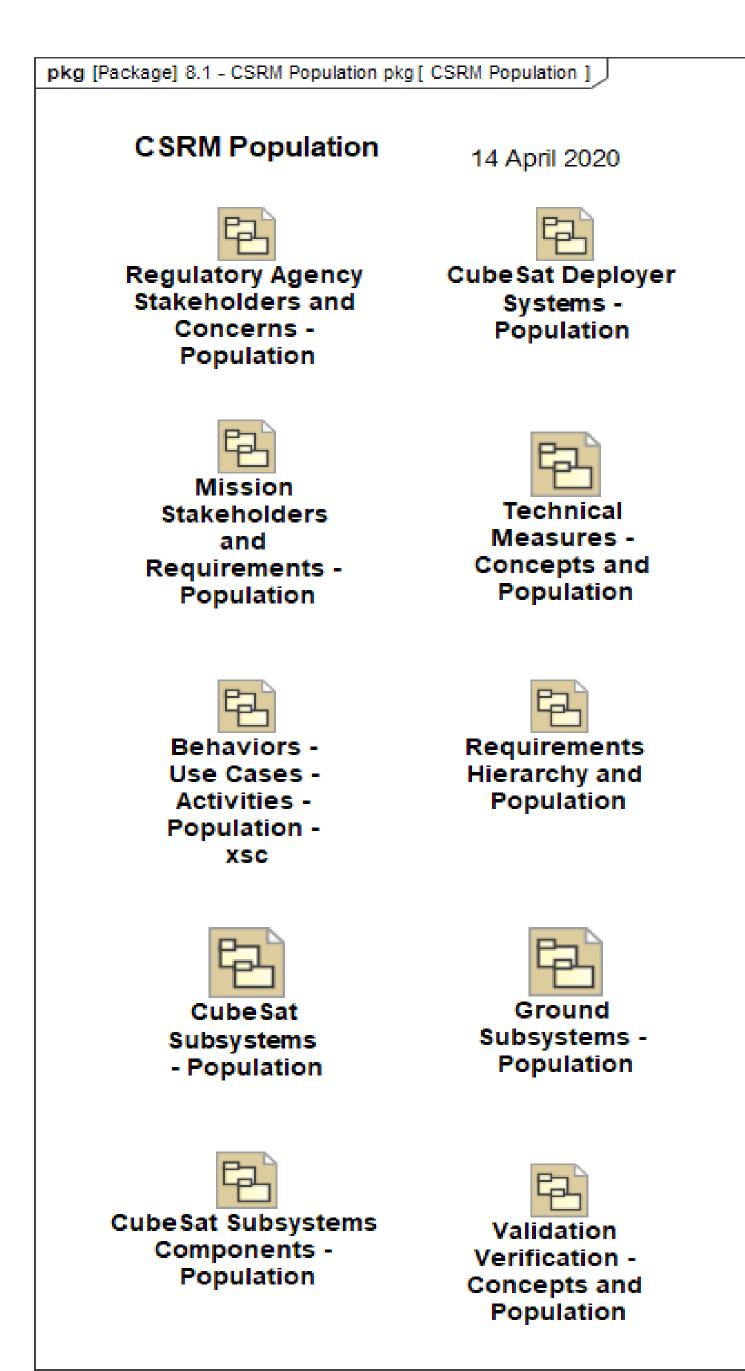
The CSRM provides the logical architecture of a CubeSat space and ground system. The CSRM logical components are reused as a staring point for a mission-specific CubeSat logical architecture followed by the development of the physical architecture during CubeSat development. The missionspecific team is free to adopt a different logical architecture and modify the CSRM to accommodate the change.



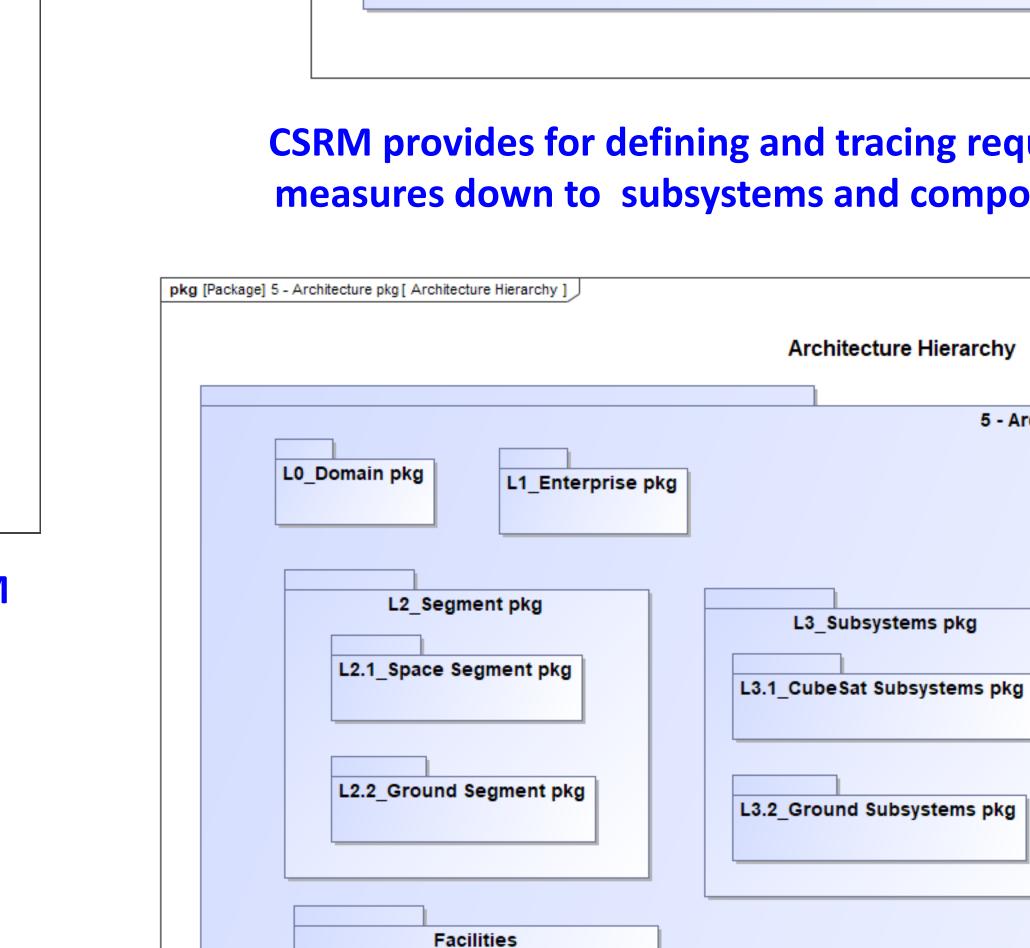




Packages for Navigation within the CSRM



Packages for Population of the CSRM



CSRM logical architecture provides the starting point for a mission-specific team establishing

pkg [Package] 4 - Requirements pkg [Requirements Hierarchy and Population] Requirements Hierarchy and Population 20 June 2019 4 - Requirements pkg Requirement L1 Enterprise Properties -L3 Subsystem Requirements pkg Requirements pkg Illustration - xsc pkg L3.1 CubeSat L3.2 Ground Subsystems Rqts pkg Subsystems Rqts pkg L2 Segment Requirements pkg L2.1 Space Segment L2.2 Ground Segment Requirements pkg Requirements pkg L4 Component Requirements pkg L2.1.1 Cube Sat Requirements pkg L4.2 Ground L4.1 CubeSat Subsystems Subsystems Components Rqts pkg Components Rqts pkg L5 CubeSat Deployer Interface Requirements - xsc pkg

CSRM provides for defining and tracing requirements from stakeholders, behaviors, technical measures down to subsystems and components and to validation and verification activities

5 - Architecture pkg

their logical and physical architectures followed by mission-specific CubeSat development

5 November 2019

L4.1_CubeSat Subsystems

L4.1.0 Shared Components

L4.1.1 Mission Payload

L4.1.2_Command and Data

Handling Components pkg

L4_Components pkg

L4.2_Ground Subsystems

Components pkg

L4.2.1_Plan and Schedule

L4.2.2_Spacecraft Command Components pkg

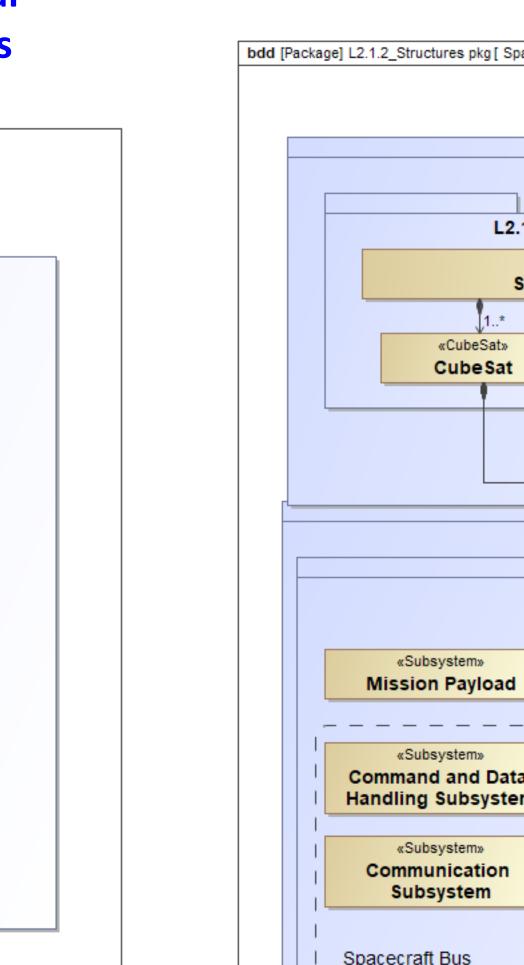
L4.2.3_Ground Equipment

Control Components pkg

Components pkg

Architecture Hierarchy

L3_Subsystems pkg



bdd [Package] L1.2 Structures pkg [CubeSat Mission Enterprise bdd]

L2.1 Space Segment pkg

L2 1.2 Structures pkg

Space Segment

CSRM provides for both space and ground capabilities and external services

L1_Enterprise pkg

Transport, Launch, and

Deploy Services

Provided to CubeSat Project

L2.2_Ground Segment pkg

L2.2.2_Structures pkg

«Segment»

Ground Segment

GNSS

L1.2_Structures pkg

CubeSat Mission Enterprise

Ground Statio

Services

20 September 2019

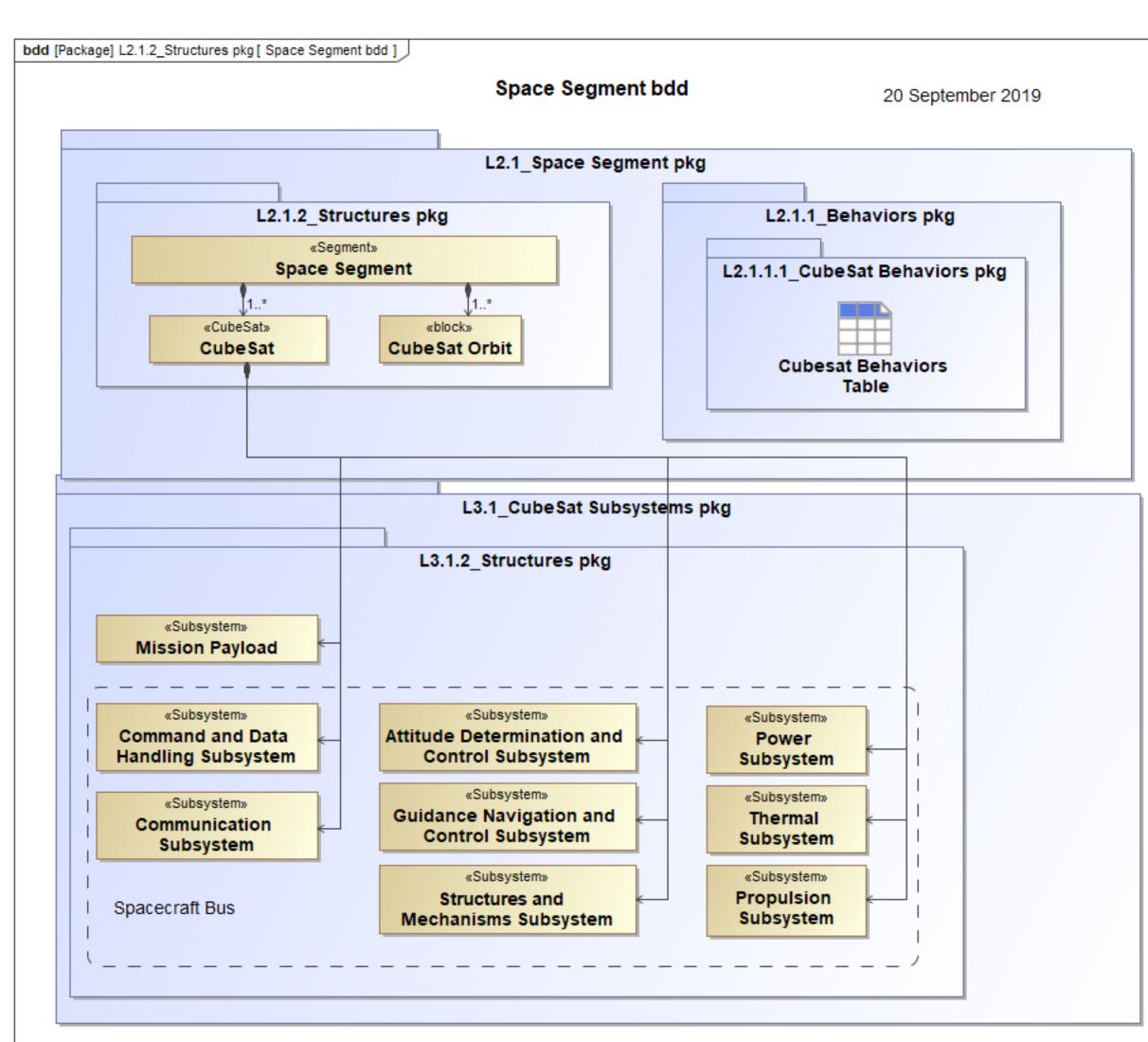
L1.1_Behaviors pkg

L1.1.1_Enterprise

Behaviors pkg

Enterprise

Behaviors Table



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2020 IEEE Aerospace Conf Development and Application of the CubeSat Systems Reference Model

2018 AIAA Space Forum - Developing a CubeSat MBSE Reference Model - Interim Status #4

2017 CSER - Validation and Verification of MBSE-compliant CubeSat Reference Model

Behaviors of CubeSats

2019 Small Satellite Conf - Developing a CubeSat System MBSE Reference Model – Interim Status #5

2018 IEEE Aerospace Conf - MBSE Approach for Technical Measurement with Application to a CubeSat

2017 IEEE Aerospace Conf - A Model-Based Systems Engineering (MBSE) Approach for Defining the

