# INTERNATIONAL SPACE REFERENCE ARCHITECTURE ISRA

Nathaniel Dailey

## LINKING POLICY TO CAPACITY BUILDING



MITRE

# International Space Reference Architecture

- Couples the policy world (e.g. treaties, conventions and guidelines) with real capacity building mechanisms
- Digitizes Space related policy connecting it with architectural artifacts for vocabulary, standards, specifications and systems.
- Promotes cooperation among nations of the world in space innovation exploration and use by:
  - Providing low-cost, low-level-of-effort "*crowdsourcing*" Traditional Space Situational Awareness (SSA) and Space Traffic Management (STM)
  - Providing transparency, accountability and automated discovery of anomalous behavior relative to digitized "Smart-Treaties" (e.g. autonomous treaty compliance)
- Reduces uncertainty for conflict in the future use of space by mitigating misperceptions of intent.

# Agreement is necessary for cooperation

- SSA/STM efforts designed for single missions
- A distributed or "crowdsourced" SSA/STM system can better provide transparency, accountability and predictability.
- Agreements must use technical, operational, and policy language that is unambiguous, understood & agreed to among stakeholders & across disciplines.
- Multilateral cooperation is critical to establish needed vocabulary, standards, and a framework to inform and structure such global space activity.
- A structured architectural approach includes
  - agreements required for SSA and STM,
  - launch coordination,
  - operations in space,
  - re-entry, and
  - Cross-operational and disciplinary domains and sovereign boundaries.



MITRE

# From EA and RA to the socio-technological

- A shared need for a foundation of space related information and agreements supporting and enabling SSA, STM activities.
- Reference Architectures serve as tools for providing common information, guidance, and direction to guide and constrain enterprise and systems architecture and solutions.
- ISRA is a socio-technological approach to the reference architecture mechanism that creates a multidisciplinary nexus across sectors and domains.

*Enterprise Architecture*
*EA=S+B+T (Strategy plus Business plus Technology)*[1]

*Socio-technological Architecture*
*A mechanism with which to bring together Technology, Vocabulary and Policy (ISRA= T+V+P)*



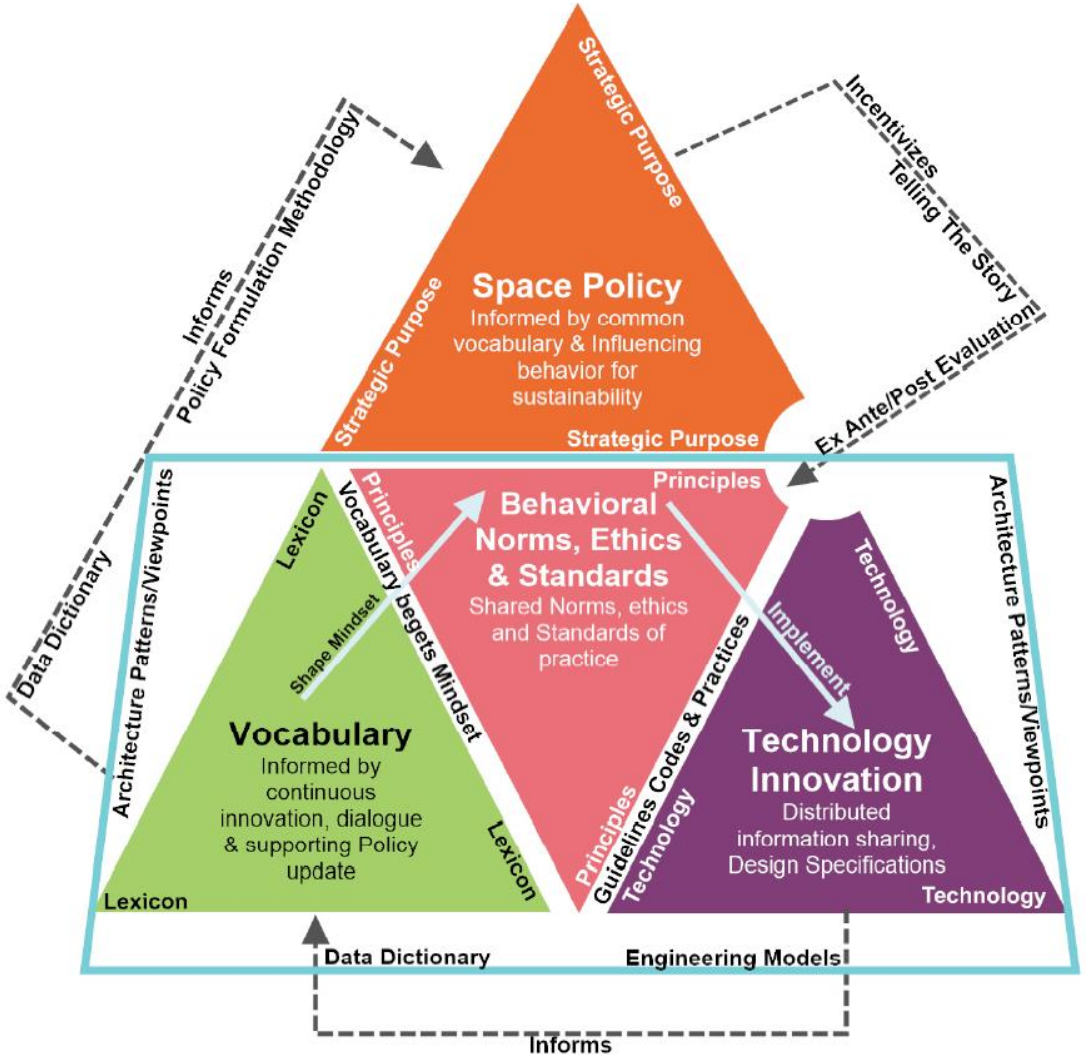
*[1] Bernard, S. (2012) EA³ An Introduction to Enterprise Architecture. AuthorHouse*

MITRE

# ISRA's Socio-Technological Model

ISRA is comprised of three fundamental components:

1. Technology innovation as a mechanisms to share common standards, best practices, tactics techniques and procedures (TTPs) in space operations to all stakeholders.
2. Shared vocabulary, continuously informing data dictionaries for continuous flow of new information; choreographing policy with definitions as they become available from civil, commercial, international sectors; coupling rapidly advancing concepts with policy updates.
3. Policy: the keystone for the principles, technical, and vocabulary-based artifacts in the ISRA framework; better informed by architecture to incentivize desired behavioral norms.






MITRE

# ISRA BESTA Link

- In the context of ISRA, Blockchain Enabled Space Traffic Awareness (BESTA) serves as a compliance mechanism for:
  - automated discovery of anomalous behavior in space relative to
  - "*smart-treaties*" as documented by ISRA and implemented in BESTA in the form of Blockchain smart contracts.
- It is intended to be a:
  - capacity building, internationally governed effort, and sets the foundation for
  - multilateral technical, operational, and policy standards and recommendations.
- Together, ISRA (as an architecture) and BESTA (as a technology) encourages sustainable ethics and practices in orbit and on the ground making the world AND SPACE, a safer place.

MITRE

MITRE's mission-driven teams are dedicated to solving problems for a safer world. Through our federally funded R&D centers and public-private partnerships, we work across government to tackle challenges to the safety, stability, and well-being of our nation.

Learn more www.mitre.org

Approved for Public Release; Distribution Unlimited. Public Release Case Number 19-3252

The author's affiliation with The MITRE Corporation is provided for identification purposes only and is not intended to convey or imply MITRE's concurrence with, or support for, the positions, opinions or viewpoints expressed by the author.