

A Lunar Shipyard Architecture Anchors Development of a CisLunar Economy

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The objective of the Lunar Shipyard Architecture (LSA) is to enable an aggressive exploration of the Solar System out to the region of Jupiter by the end of the twenty-first century, and to do so by creating a significant infrastructure and economy in CisLunar Space¹ – above Earth’s gravity well. In a manner similar to an actual economy, the LSA is an assembly of simultaneous components supporting a comparison of features, costs, efficiencies, energy demands, flightworthiness, and more of myriad technologies, transportation modes, mining, beneficiation, processing, manufacturing methods, and business models – imagined, proposed, or developed for application in space.

The implementation of the Lunar Shipyard is essentially a very large, federated construction with a large number of technologies, some that are complementary, competitive, dependent, or enabling of other technologies. Elements of the model will be free to self-organize as technologies within enterprise sectors, as resources generate feedstocks, feedstocks connect to layer upon layer of manufacturing, and transport, conduits, cables, rockets and electric launchrail connects producers to consumers, and so on. The interconnect of the model may resemble a neural network within a few iterations. In that respect, the model will imitate the reality of an economy, where all elements are free to coexist, and compete electronically for relative parametric scoring, where efficiencies are normalized, where some bright economist may propose test cases where hypothetical Space Dollars are available as a basis for relative value, a hypothetical that may be a unit of value pegged to a kilogram of Platinum in Geosynchronous Orbit, or other figure of merit yet to be devised.

Competitive scenarios will be available where specific segments, or individual technologies are inhibited from participating in the model for the duration of the scenario’s operation. Other modes allow a specific end-to-end model to be tested that allows the determination of completeness of a series of technologies, or identification of the diverging cone of customers that are sustained, or merely enabled by the presence of a given technology (goods) or facility (services). The existing implementation vehicle is a UML/SysML software platform that uses a template that supports logistics and missions, and is consonant with commercial efforts in space. Discrete domains may be investigated, along with the integrated infrastructures represented by services, systems, and operations. The primary model depends upon SysML, and a backing repository. User interfaces are facilitated through services, systems, and operations templates that are flexibly provided through Wikis, and other tools, such as mind-mapping (collaborative, creative) software interfaces that can productively frame model domains. XML is expected to be the interchange glue that enables for the interoperation of other models, and modeling tools with the LSA.

The Lunar Shipyard Architecture is intended to provide the long-term vision for ISRU that has been difficult to frame, with technology roadmaps, commercial points of

entry, and government relaxation of centralized control. The LSA will reside within an existing non-profit, non-government foundation that features a few specialized portals managed by other foundations or industry groups that have compelling interest in space exploration and development. These groups will provide specialized support to their sectors of interest in space, and through a considerable amount of collaboration an enduring, and persistent vision may fuel widespread wealth creation and enhanced standards of living on Earth, at the heart of CisLunar Space. Notional objective horizons for the LSA are posited that include support of a series of flotillas to Mars on a sustained basis, a similar flotilla to Jupiter space, establishing beachheads on Phobos, Mars, and (subsurface) Europa, along with Cyclor Orbiters.

Keywords:

1 A volume swept by a sphere whose radius is from Earth's core to LaGrangian Point Nr. 2, which is opposite the Earth, past the farside of the Moon.