A revived interest in space explorations has been initiated by major space agencies, especially in lunar explorations. In the near future, the world will witness a number of manned and robotic lunar explorations administered by different nations including the U.S, Russia, China and India [1]. At least six robotic lunar explorations are scheduled to be launched by late 2011.

One main aspect of future space explorations is being multiparty. This aspect will be apparent at two levels. Nationally, space exploration missions will be administered by multiple national parties. More specifically, multiple nations will participate in various missions’ aspects that include: planning, manufacturing and administration. Industrially, there is a strong trend towards privatizing the space organization to be no longer subsidized. This will lead to new space age, where new generation of commercial space industries will appear [2]. These industries are broken into four service groups: manufacturing, deployment, communication and operation. On the other hand, single-party exploration model combines the four industrial groups into a single national enterprise.

The multiparty explorations will have two vital advantages over the current-state sing-party ones: timeliness and cost-efficiency. Single-party explorations tend to suffer from the lack of timeliness - long deployment delays - due its responsibility of handling the manufacturing, deployment, communication and operation activities. Particularly, the manufacturing activity forms a time bottleneck because it involves a series of activities that includes designing, prototyping, testing and manufacturing of all equipments deployed in the exploration mission. On the other hand, the multiparty explorations will utilize multiple manufacturing parties to handle all related manufacturing aspects. Besides timeliness, single-party explorations also lack cost-efficiency due to the high spending budgets allocated to manufacturing, deployment and operation activities. The cost-efficiency of multiparty exploration will be evident through the existence of multiple space industries providing their services at competitive costs.

In this paper, we first present the plausible enterprise model of space exploration by juxtaposing two recently planned lunar missions namely Chandrayaan [3, 4] by India and Lunar Reconnaissance Orbiter [5] by USA. The former is presented as single-party exploration model and the other as multiparty exploration model. We envision a multiparty space enterprise model as an integration of the four industrial groups. In addition, the services supported by each group will be provided by multiple commercial industries.

Second, we describe an enterprise communication support system as a sharable and yet reusable network infrastructure. This infrastructure will integrate terrestrial networks with space networks to provide interconnectivity between the four industrial groups. The services provided by the enterprise communication system will serve three geographical zones: earth, orbiting and lunar. The earth zone represents the terrestrial network backbone that links the manufacturing, deployment and operations groups to each other. The orbiting zone will provide the satellite network that supports the near earth exploration missions. This zone will consist of various types of communication satellites including TDRSS, LEO, micro and nano satellites connecting deployment and operations groups to various near earth exploration missions. The lunar zone represents the relay satellite network backbone to provide linkage between the earth and moon orbital networks. Further, this zone also contains the colony networks to be deployed on the lunar surface. Therefore, the lunar zone will provide linkage between the operations group and the scientific equipments deployed there.
Third, we outline the specific communication demands of each industrial group at the three geographical zones. We also describe the type of data traffic exchanged between the four groups to layer the services for streamlined and secured communication. The full paper will describe the multiparty space enterprise model, describe the enterprise communication support system and finally will provide qualitative discussion for the described enterprise communication support system and how effective it would be for future space explorations.

References: