

**TITLE: Advanced Network Engineering and Applications from Space Missions**

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**EXTENDED SUMMARY**

This presentation reflects aspects of advanced network engineering being considered in conjunction to applications derived from space missions. It derives from the initiative being taken in a multilateral cooperation work involving Brazilian and foreign institutions. These institutions are: 1) INPE-Instituto Nacional de Pesquisas Espaciais; 2) DLR-German Space Agency; 3) EPUSP-Escola Politécnica da Universidade de São Paulo and; 4) UFRPe-Universidade Federal Rural de Pernambuco. Other foreign institutions, not mentioned in this context, are also involved in this initiative.

The basic Project that motivated this initiative is the existing, on going, International Cooperation Project between INPE(Brazil) and DLR(Germany), entitled 'SLIM-Space Linked Multimedia Information Network Applied to Science, Research and Education'. This Project has different topics being explored in the context of this international, multilateral cooperation. One of these topics is committed to the development and consequent pilot operation of Application Services dedicated to near real time data transport, buffering and temporary storage, derived from satellite tracking and data acquisition operations, in the form of image and other embedded and related data contents. This text summarizes that specific topic, related to the SLIM Project.

The development of the mentioned topic and operation of the resulting pilot Application Services require the use of advanced techniques related to high speed data network engineering and servicing. Those techniques include, but are not limited to, topics related to: The Management of Information Networks; The trade-offs in Quality-of-Service, which result from Measurements derived from constraints that influence the identification and choice of compromising parameters that dictate the Performance, related but not restrict to: Alternative Routing and Temporary Data Buffering and Storage; Confrontation of Medium/High Speed versus High Volume versus (Near) Real-Time Data Transport requirements; Distributed Data Archiving and Availability to Authorized Users; Content Oriented Lossless and Lossy Data Compression Tools; Exploration of Multimedia, mainly, image and other data contents for Value Addition, in support to User Oriented Data Products; Plus other topics, not mentioned in this context. For instance, the exploration of Tele-Educational resources and collateral products derived from this initiative, are also being considered in the context of this cooperation project.

It is, therefore, of fundamental importance the efficient use of the highest possible channel bandwidth and of buffering and temporary storage capacity for each information network, in support to a Pilot Application Service identified and characterized in the realm of this Project activity. For instance, the capability of servicing the topology of an information network where the use of remote visualization, static and, possibly, animated (dynamic), is required, is desirable, in respect to data products which are expected to be accessed by authorized users.

The main nodes or backbone of the network topology which is being considered for characterizing the many information networks to be considered in the pilot realization of the Pilot Application Services being considered under this initiative, are: 1) LARC/EPUSP, in São Paulo, SP, BR; 2) DFD/DLR, the German Remote Sensing Data Center, in Oberpfaffenhofen/Wessling, in Germany; 3) INPE/MCT, in São José dos Campos, SP, BR; 4) GEOSERE/UFRPe, Recife, PE, BR. Each different combination for the utilization of those network backbone nodes and of their pertinent links result in a specific topology of information network, depending on the data products which are considered in remote processes which execute the download or upload of pertinent data products. For instance, on a regular servicing time basis, TIROSN/NOAA/AVHRR image and appended data, being tracked and acquired at UFRPe will be regularly downloaded to EPUSP for temporary storage and access by INPE authorized scientific research group users, while a concurrent process for immediate (near-real-time) upload of, possibly the same, data product to DLR Remote Sensing Data Center (DFD) will be also under execution.

Two other Pilot Application Services are being considered under this topic of International cooperation, related to other satellite missions: 1) BIRD, a German, Earth infrared mapping mission, of interest to INPE for the monitoring of land use and vegetation (forests, etc.), among other possibilities; 2) SeaWiifs, a complex Oceanography oriented satellite mission, capable of providing colored patterns of the sea, of special interest for INPE research activity in Oceanography.

In view of the cited, Pilot applications, the already cited topics, related to advanced network engineering and related application tools and methodologies will be playing a fundamental role in constantly seeking an efficient use of bandwidth, buffering and temporary storage capabilities of the existing medium high speed networks, at National and International level, where the pertinent information networks will be immersed. Therefore, this is an essential requirement for the viabilization of the pertinent Pilot Application Services. Additionally, as part of the strategy for obtaining the best possible performance of data transport under real circumstances, the exploration of diversity of end-to-end data link paths, in view of the existing backbones at National and International level, is also under consideration, to the possible, practical extent.