Lessons Learned From Developing Three Generations of Remote Sensing Science Data Processing Systems

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The Biospheric Information Systems Branch at NASA's Goddard Space Flight Center has developed three generations of Science Investigator-led Processing Systems for use with various remote sensing instruments. The first system is used for data from the MODIS instruments flown on NASA's Earth Observing Systems (EOS) Terra and Aqua Spacecraft launched in 1999 and 2002 respectively. The second generation is for the Ozone Measuring Instrument flying on the EOS Aura spacecraft launched in 2004. We are now developing a third generation of the system for evaluation science data processing for the Ozone Mapping and Profiler Suite (OMPS) to be flown by the NPOESS Preparatory Project (NPP) in 2006. The initial system was based on large scale proprietary hardware, operating and database systems. The current OMI system and the OMPS system being developed are based on commodity hardware, the LINUX Operating System and on PostgreSQL, an Open Source RDBMS. The new system distributes its data archive across multiple server hosts and processes jobs on multiple processor boxes. We have created several instances of this system, including one for operational processing, one for testing and reprocessing and one for applications development and scientific analysis. Prior to receiving the first data from OMI we applied the system to reprocessing information from the Solar Backscatter Ultraviolet (SBUV) and Total Ozone Mapping Spectrometer (TOMS) instruments flown from 1978 until now. The system was able to process 25 years (108,000 orbits) of data and produce 800,000 files (400 GiB) of level 2 and level 3 products in less than a week. We will describe the lessons we have learned and tradeoffs between system design, hardware, operating systems, operational staffing, user support and operational procedures. During each generational phase, the system has become more generic and reusable. While the system is not currently "shrink wrapped" we believe it is to the point where it could be readily adopted, with substantial cost savings, for other similar tasks.