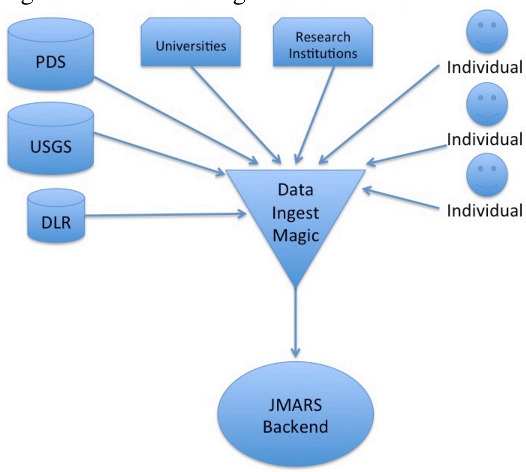
Ingesting Planetary Data into the JMARS Ecosystem

Dale Noss[1], Saadat Anwar[1], Scott Dickenshied[1], Shay Carter[1], [1]Mars Space Flight Facility, 201 E Orange Mall, Arizona State University, Tempe, AZ, 85287, USA, help@jmars.asu.edu

Introduction: JMARS was originally built primarily as a mission-planning tool to target the THEMIS instrument on the 2001 Mars Odyssey spacecraft, and to provide scientists an effective way to view the acquired THEMIS data. The number of available data products in the tool was initially limited to THEMIS and a few base maps. The benefits of having an ability to simultaneously compare data from multiple instruments in a single tool were immediately apparent. The datasets supported by JMARS grew accordingly and expanded to include more than a dozen instruments from multiple missions. Over the intervening years, the scope of the tool expanded beyond Mars to encompass additional planetary bodies and asteroids. This expansion increased complexity and added challenges to the JMARS data ingestion process.

Sources: The datasets in JMARS derive from multiple sources including the Planetary Data System (PDS), United States Geological Survey (USGS), the Deutsches Zentrum für Luft und Raumfahrt; (DLR) as well as a host of smaller institutions and individuals. The data types include map rasters, and instrument data takes such as stamps, radargrams and spectra. The data may even be as simple as text-based representations of crater, dune or boulder fields.

Fig.1 JMARS Data Ingest



Making the Sausage: JMARS users are able to view a multitude of datasets, link back to source files and view citations with only a few mouse clicks. Behind the scenes, hundreds of custom applications have been written to download, extract, and reformat meta-data before it can be loaded into database tables. Ingesting content from such a variety of inconsistent sources is often challenging. Every new dataset is a puzzle that must be decomposed into its component parts. The observation data must often be calibrated, map projected and tiled before it can be efficiently rendered in the tool. Attempts at standardization of unofficial datasets by groups such as the Mapping and Planetary Spatial Infrastructure Team[2] (MAPSIT) are welcome. Despite data type variations, there are common ingest tools: USGS/ISIS software, Davinci, GDAL, ImageMagick, PostgreSQL, PostGIS and netPBM. The Linux processing environment runs on a small yet robust cluster of 10 Xeon servers with 16 cores and 96 Gbytes of memory each.

References: [1] Christensen, P.R., et al., JMARS – A Planetary GIS, AGU 2009, Abstract IN22A-06 [2] Christensen, P. R., et al., (2001), Mars Global Survey- or Thermal Emission Spectrometer experiment: de- scription and surface science results, *Journal of Geo- physical Research*., vol. 106, (E10), 23,823-823,871, doi:10.1029/2000JE001370 [3] Kieffer, H. H. (2013), Thermal model for analysis of Mars infrared mapping, *Journal of Geophysical Research: Planets*, vol. 118, pp. 451–470, doi:10.1029/2012JE004164. [4] Forget, François, et al., (1999) “Improved General Circulation Models of the Martian Atmosphere from the Surface to above 80 Km.” *Journal of Geophysical Research: Planets*, vol. 104, pp. 24155–24175, doi:10.1029/1999je001025.

[2] MAPSIT; Skinner, J.A. Jr., Huff, A.E., Fortezzo, C.M., Gaither, T., Hare, T.M., Hunter, M.A., Buban, H., 2019, Planetary geologic mapping—program status and future needs: U.S. Geological Survey Open-File Report 2019–1012, 40 p., https://doi.org/10.3133/ofr20191012

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