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The National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS), Comprehensive Large Array-data Stewardship System (CLASS) is NOAA's premiere on-line facility for the distribution of NOAA and US Department of Defense (DoD) Polar-orbiting Operational Environmental Satellite (POES) data, NOAA's Geostationary Operational Environmental Satellite (GOES) data, and derived data. CLASS data is used by weather and climate researchers. **The CLASS data helps researchers improve forecasts that in-turn saves lives and property.** The data is also used to study long-term climate effects, and allows government officials to make informed decisions.

CLASS is designed to consolidate environmental data holdings into one very large distributed database. CLASS supports the long-term preservation and dissemination of NOAA's environmental data including: weather satellite data, ocean observation data, and earth resources data. The CLASS system provides critical support for NOAA's mission that includes weather and climate prediction. The system also provides data for the sustaining engineering for NOAA's weather satellite instruments and their data products. In order to maintain the system and accomplish the mission, it is recommended that the **NOAA / CLASS core budget for 2014 be increased to \$20M.**

For FY2012 and FY2013 the Joint Polar Satellite System (JPSS) and Geostationary Operational Environmental Satellite – R Series (GOES-R) programs provided 70% of the funding for CLASS. These programs are experiencing schedule and budget difficulties and have cut their contributions to the development of CLASS. In addition, due to funding contributions from JPSS and GOES-R the **CLASS core budget has not been increased since 2002** and this stagnation of the core budget has worsened the current situation. This has necessitated significant cuts to staff while at the same time the system is being required to ingest and disseminate more data than it is designed to handle. Further, CLASS data-holdings are expected to increase at an exponential rate due to increased data volumes from both near- and long-term NOAA weather satellite missions.

Current Status

Currently CLASS is holding 5.0 *Petabytes* growing at 2 *Petabytes* per year. After 2015, the growth will increase to 4 *Petabytes* per year.

- 1 *Petabyte* is equal to 1,000 *Terabytes*
- 1 *Terabyte* is equal to 1,000 *Gigabytes*
- 1 *Petabyte* is equivalent to 20 million four-drawer filing cabinets filled with text.

- CLASS is designed to ingest up to 5 Terabytes per day
- CLASS is also designed to disseminate and process up to 30 Terabytes per day
 - **CLASS currently disseminates 20 Terabytes per day**
 - **CLASS is expected to disseminate 30 Terabytes per day by mid-2013**
 - CLASS Data holdings are expected to increase by 1.8 Petabytes (1,800 Terabytes) more by 2013-2014
 - Primarily due to the Suomi NPP satellite mission. Suomi NPP is the first in a series of Joint Polar Satellite System (JPSS) Missions through FY 2015 and then increase more dramatically through FY 2017.
 - CLASS data holdings will increase by an additional PB per year after launches of GOES-R and JPSS 1 and the completion of data center migration
 - **By the end of FY 2016, CLASS will ingest 17 Terabytes per day and disseminating 96 Terabytes per day with more large datasets to come**

CLASS Users

CLASS data is used by weather and climate researchers through 1,755 active accounts. These accounts are responsible for all the data disseminated in the last six months. Active users also order data from CLASS and distribute it to other entities thereby increasing the total number of users by several hundred more.

- Total Registered Users: 35,000-plus
 - U.S. Government: DoD, DoJ, DoE, etc.
 - Foreign Governments: China, Russia, Europe, Asia, the Americas, etc.
 - Commercial: Insurance, legal, disaster recovery, energy, etc.
 - Academia
- Total Active U.S. Government users/volumes: 310 user accounts
 - 403 Terabytes/month; 2.4M files/year, 4.84 Petabytes/year
 - Largely consists of NOAA line offices including NWS, Los Alamos, CDC, USGS, Army, Navy, EPA, State Environmental Agencies, and Brookhaven National Laboratory
- Total Active Foreign Government users: 363 user accounts
 - 15 Terabytes/month; 83,000 files/year; .2 Petabytes/year
- Total Active Commercial users: 821 user accounts
 - 19 Terabytes/month; 106,000 files/year; 2.3 Petabytes per year
- Total Active Academic users: 261 user accounts
 - 6.3 Terabytes/month; 33,400 files/year; .08 Petabytes per year



Conclusion

The currently projected budget for CLASS in 2013 and beyond could put the system in what is being called a “doomsday” scenario where the program could fail to meet its mission objectives.

- **2013 -2018 Data Migrations to CLASS**

- Suomi NPP (2012): 5 Terabytes of data to CLASS per day or 1,800 TB (1.8 PB) per year
- GOES-R (2015) and GOES-S (2017): 4.5 Terabytes of data to CLASS per day each for GOES –R and GOES-S or 1,700 TB (1.7 PB) per year for each satellite
- JPSS-1 (2016) and JPSS-2 (2022): An additional 5 Terabytes of data to CLASS per day or 1.8 PB per year for each satellite
 - Does not include other “free flyer” and other missions that are yet to be defined or funded or increases in JPSS data products that are likely to occur
- Migration of 2,000 Terabytes (2 Petabytes) from NOAA data centers and a follow on daily rate of approximately 2 Terabytes per day to CLASS
- Additional Data
 - Data from other programs (NEXRAD Weather Radar, international satellites, etc.)
 - Archival of future Climate Model Data – To be determined and not included in forecast (Note: A single Climate Model data set can be as large as 1 Petabyte)

FY 13	FY 14	FY 15	FY 16	FY 17	FY 18
6.3 Petabytes	9.1 Petabytes	14.9 Petabytes	21.2 Petabytes	28.3 Petabytes	34.6 Petabytes

- **2010-2011 Budget:**

- \$27.2M
- Kept Staff and program stable -- no growth

- **2011-2012 Budget:**

- \$22.3M -- 12 people laid off
- Infrastructure and technical refresh of the system deferred.

- **Projected 2013 Budget:**

- \$19-20M – 12 more people have been laid off totaling 24
- Infrastructure improvements, technical refresh, critical development activities are deferred



- Infrastructure improvements and refresh to date total \$15M of deferred investments.
- **Projected 2014 Budget:**
 - Negotiations with JPSS and GOES-R underway
- ❖ If JPSS and GOES-R budgeted allotment for CLASS remains at current low levels and the FY 13 budget is not approved by congress, the 2014 projected budget of \$14M can be called a "doomsday scenario" as it would certainly devastate the program resulting in the loss of 40 more staff with the realization of a failure to meet commitments and a total loss of expertise that will take years to rebuild.

