

# Findings and Recommendations of the MAST Users Group (MUG)

The MAST Users Group (the MUG) met virtually on April 1 and 2, 2024. In attendance were Tansu Dylan (Washington University), Jeyhan Karteltepe (RIT), Britt Lundgren (UNC Asheville), Brian Nord (Fermilab/ Kavli Institute for Cosmological Physics) John O'Meara (W. M. Keck Observatory, MUG Chair), and Ian Wong (NASA GSFC). This document is intended to be brief and focus on the **findings** and **recommendations** of the MUG to help MAST leadership in decision-making. The MUG sincerely appreciates the significant work of the whole MAST team, and for the investment by STScI leadership in MAST.

**Finding:** *The state of MAST remains strong and MAST has a bright future ahead.*

The MUG received a briefing from MAST leadership, STScI leadership, and many members of the MAST team. An Agenda for the meeting can be found [here](#).

This meeting represented the first with Susan Mullally as MAST PI.

**Finding:** *The MUG welcomes with enthusiasm and confidence Dr. Susan Mullally to the position of MAST PI.*

**Finding:** *The MUG offers its sincere and deep appreciation to Dr. Josh Peek for his leadership of MAST and for placing it on a firm foundation for future success.*

After introductions, MAST presented the MUG with statistics and other measured of science reach and impact of MAST, with both showing continued growth. In addition to the science impact of MAST, some discussion was given to the strong support by MAST of FAIR (Findability, Accessibility, Interoperability, and Reuse) data management. The MUG focused on new ways MAST might engage with journals to publish code. Ideas included sharing well-maintained github repositories, leveraging/highlighting a connection with JOSS, and new methods to obtain DOIs for code.

**Finding:** *MAST has a strong engagement in the effort for FAIR data disbursement, which maximizes the equitable and reproduceable usage of astronomical data.*

**Finding:** *MAST has diligently and cleverly engaged journals to encourage the community to share data in a trackable way.*

**Recommendation:** *MAST should consider additional methods of journal engagement to encourage the publishing of reproduceable code alongside papers and data.*

The MUG heard a presentation on the future of interfaces, and the drive to consolidate interfaces and enhance sustainability. The community has accepted interface transition, as evidenced by the lack of helpdesk tickets around the transition. The MUG and MAST teams discussed the role of generative AI in future interfaces, along with the role of legacy software in newly hosted datasets (e.g. SDSS).

**Finding:** *The MUG strongly supports consolidation and migration efforts for interfaces across MAST. The acute and expert attention given to design and accessibility is paying dividends and should continue to be considered essential.*

**Finding:** *The MUG supports efforts to explore generative AI in interfaces, and would like to see future AI plans in the next MUG meeting*

**Finding:** *The MUG appreciates the need for analysis of the impacts of consolidation on what might be lost as a result.*

**Recommendation:** *The MUG recommends future-casting both in interfaces and elsewhere with regards to what happens when the current software is a “decade old”, as the age of software was given as a motivation for many of the recent changes.*

**Recommendation:** *MAST should identify what it will officially support and maintain for telescope specific backend command line catalog search tools (e.g. `jwtst_mast_query`).*

Discussion turned to the future of catalogues, including the Greenplum behind the scenes to speed delivery of results. Some discussion was had of the growing pains of the move. Additionally, a meta question arose in the MUG: ‘when is something the responsibility of MAST vs when is it of the user?’ Moving target searches were identified as a user scenario for future catalogs that warrant further community engagement.

**Finding:** *The move to Greenplum will benefit the user experience*

**Recommendation:** *MAST should assess what emergent challenges will arise for moving target queries. Topics include ephemerides services, target name crosslinking, and detectability filters.*

HLSPs and other community contributed data products were discussed next. It was agreed by the MUG that the impacts on MAST of HLSPs are increasing in terms of time. The MUG discussed the idea of a ‘parking lot’ for HLSPs that may not meet a to be determined new bar for entry onto MAST.

**Finding:** *The impacts on MAST of ingesting/maintaining HLSPs contributed by the community are rising in severity.*

**Finding:** Looking forward to *Roman*, HLSP acceptance and ingestion/serving is likely to change given the volumes of data involved.

**Recommendation:** MAST should work with the community to look at ways of raising the bar for HLSP entry into MAST, with a focus on raising the community side of the effort.

**Recommendation:** MAST should consider serving/supporting the code that generates HLSPs instead of the HLSP itself.

Discussion then moved to MAST on the Cloud. There was uniform consensus in the MUG that moving to cloud services to date has largely been invisible to the end user, since MAST focuses on user use and experience. In general, the primary concerns with expanded cloud use, notably *Roman* in the near future focused on the different needs and uses of different entities on a notional NASA SMD cloud service. For example, the MAST user experience and cloud needs are very different from the Earth Science uses of cloud. Fundamentally, the success of MAST to date has been that it understands its users and builds services around that understanding. Any transition to a larger cloud infrastructure could threaten that link. The MUG gave some consideration to *Roman* on a cloud infrastructure and wondered if future *Roman* HLSPs being only on cloud might present barriers to use. The MUG noted that a shift of *TESS* mission data to cloud was underway, and expressed concern that this shift not impact what users do. Some further discussion was given at the end of the meeting around user access to cloud and the potential for impacts of access with additional security measures.

**Finding:** Conservation of access to data and services in the future is of key importance. The MUG recognizes the need for additional security measures in the cloud (e.g. password access), and as long as access is preserved, accepts these new measures.

**Finding:** The success of MAST derives directly from a focus on what the user needs and how the user works.

**Recommendation:** NASA SMD should work closely with MAST to maintain a user-focused delivery of data and services if a transition of MAST to a larger SMD cloud infrastructure is to be successful.

**Recommendation:** NASA SMD should assess the wide ecosystem of cloud use cases across its portfolio so that new cloud infrastructure does not create significant barrier to use of data or services currently provided by MAST.

The MUG heard a presentation on MAST Science platforms, notably TIKE. At present, there are ~40 unique users per month of TIKE. The MUG was generally quite enthusiastic about

science platforms and expressed interest in expanding TIKE to integrate with curricula, but noted that the current capacity may be somewhat limiting.

**Finding:** *The MUG is in support of the principles as shown through TIKE for future science platforms.*

**Finding:** *The current capacity for science platforms may not be consistent with the scaling needed for similar platforms in high volume cases like Roman*

**Recommendation:** *MAST should assess how TIKE is being advertised in the community, and what the user base profiles are.*

Cutout services were presented to the MUG. The MUG was very enthusiastic about these services, for example PanSTARRS cutouts. The MUG noted that the transition to cloud for cutouts, as presented in the TESSCut, was smooth from the perspective of the community, and underscores the need for user focus on any move to cloud.

**Finding:** *The transition of TESSCut to the cloud has been a success and positively represents the need for user-centric thinking in other cloud transitions.*

The MUG was given a presentation on the efforts to replace CasJobs and the HiPSCat efforts at MAST. A list of use reasons for why the community continues to use CasJobs was presented, but it was unclear to the MUG which one was the driving term.

**Finding:** *The MUG is unclear on what the driving term in CasJobs usage was from the community. Furthermore the MUG is unclear on the comparison of VO TAP to CasJobs on large table joining and complex SQL query construction.*

With regards to HiPSCat, the MUG focused on how project would sign up, since setting up infrastructure in the cloud might be more difficult, or at least different, from doing so on prem.

Following brief remarks and discussion from STScI Deputy Director Levenson, a presentation on MAST community outreach efforts, including some questions for the MUG was made: “Are there additional strategies we should explore to better reach our audience?” and “What techniques should we employ to encourage new users to take advantage of our cloud services?” The MUGs response is below

**Finding:** *There is an intentional effort at MAST to reach out to many different groups of users and potential users, including under-resources communities.*

**Recommendation:** *For new strategies, the MUG recommends that MAST: 1) attend affinity/identity-based meetings such as NSBP, NSHP. 2) Hold online webinars that are*

specific to MSIs, and 3) leverage a strong existing AAS presence to ask professors attending from MSIs if they would like to meet and discuss what MAST can offer.

**Recommendation:** MAST should consider attending science collaboration meetings (e.g. Rubin/LSST), and other venues such as AAPT.

**Recommendation:** MAST should encourage PIs who submit proposals to, where relevant, use MAST as part of their broader impact efforts by including more students in volunteer research opportunities.

**Recommendation:** MAST should consider a route for encouraging community development of notebooks (e.g. in TIKEBook) that could be vetted by MAST.

The MUG heard a brief presentation on NAVO and was supportive of the philosophy and work to date and plans. In particular, the philosophy that without participation in standards definition, we arrive at standards we cannot use.

**Finding:** The MUG supports MAST efforts within the IVOA ecosystem.

The MUG heard a presentation on quick look tools, for example with Jdaviz. A number of questions for the MUG were asked on community needs, but the MUG had no immediate answers.

**Finding:** The MUG feels Jdaviz could represent an interesting avenue for public engagement, e.g. through use in STScI press releases or Zooniverse to facilitate more citizen science interaction with MAST-served data.

**Recommendation:** As with previous efforts around UX, the MUG recommends that MAST interview the community at venues like AAS for MAST quick look tools to investigate user needs and wants.

**Recommendation:** MAST should prioritize science platform integration.

Following closed discussion, the MUG discussed a number of the above findings/recommendations. Additionally, the MUG coalesced around a top-level recommendation that helps address several of the questions MAST had for the MUG, but that the MUG felt inadequately equipped to answer.

**Recommendation:** MAST should hold a comprehensive user survey about the usage of their services, requests for new services, information to inform future decisions (including some services to discontinue), and impacts and opportunities of new and expanded cloud usage.