# Planetary Data System (PDS) Migration of PDS3 Products to PDS4 in Support of its Data Services Initiative

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## Introduction

Following the findings of the Planetary Data System's (PDS) 2017 Roadmap Study and reiterated again in the 2021 Planetary Data Ecosystem report the PDS is now engaged in a major Data Services effort aimed at improving the usability and discoverability of its planetary data archives. An overarching requirement of that effort is the completed migration of PDS archives from the legacy PDS3 archive standard to the new state of the art PDS4 format, by which the data services infrastructure is being planned and built.

The goals of the Data Services effort are to enhance the PDS archives by implementing an infrastructure to:

**Improve Metadata**: Capturing and curating archival data and metadata to enable both discovery and use by the community.
**Scalable Architecture**: Providing a worldwide planetary science data portal as a gateway to PDS archives and services, as well as the broad planetary community.
**Common API's**: Consistent APIs to share share data and services across PDS, planetary archives, and the planetary science community.
**Federated search**: Cross-node, cross-agency search that enables a diverse user community to use the archives.
**Improved Data Services**: Enable the exploration and integration of modern tools and access methods to enable data discovery and analysis from visualization to mining of archival data.
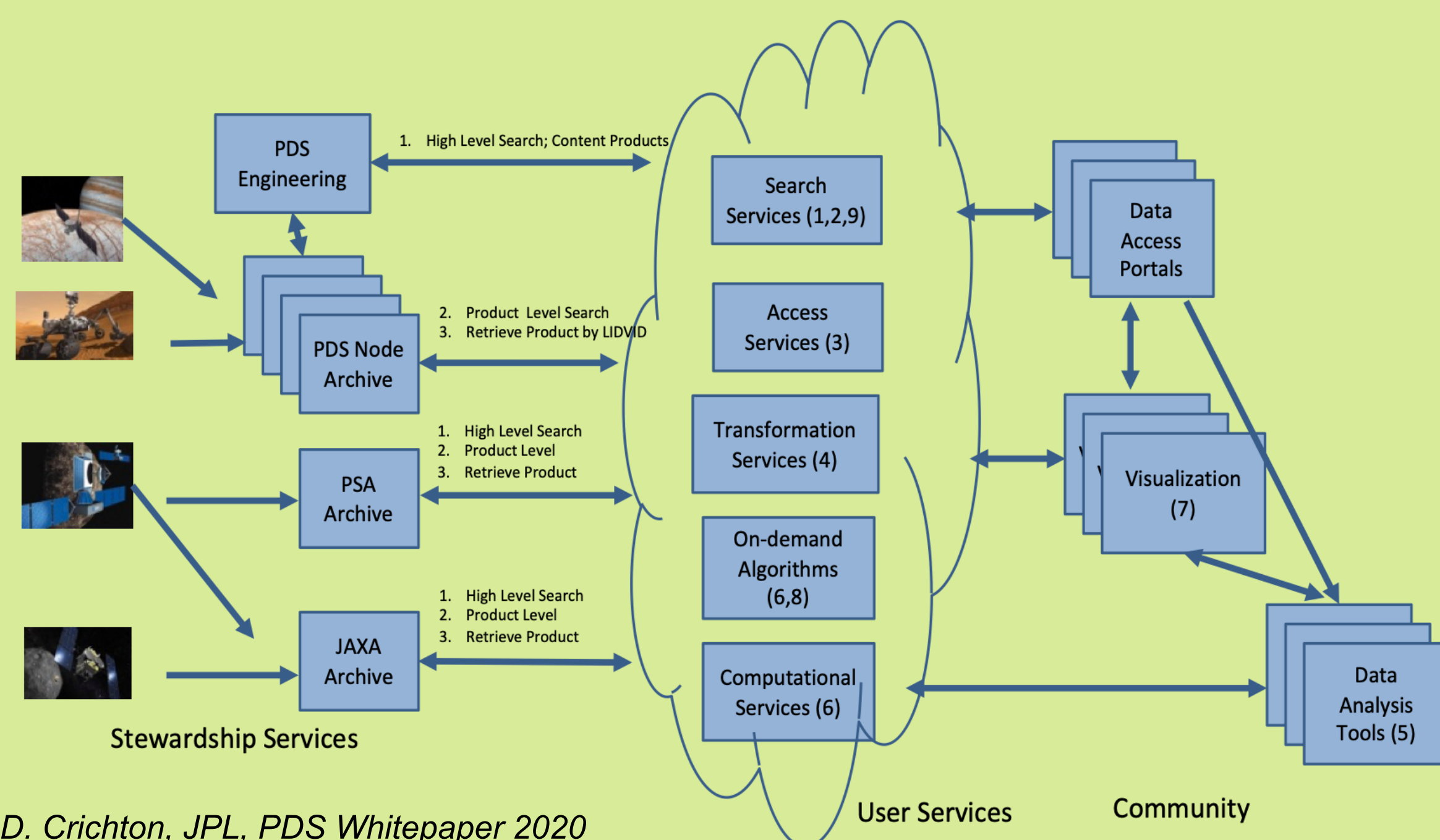


D. Crichton, JPL, PDS Whitepaper 2020

**Figure 1:** PDS data services are being augmented by developing new infrastructure that will abstract the PDS nodes ongoing data curation effort (*left*) from users. Migration of PDS3 to PDS4 products will standardize products to improve searchability and usability. PDS archives will be scalable to span new missions and products. Users experience will be improved by unifying PDS nodes websites to a single unified NASA website. Users will access both data and services (*right*) using a common application programming interface to enable enhanced browsing, visualization and analytical capabilities. Plans include migrating data to NASA sponsored cloud systems.

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## PDS3 to PDS4 Migration

PDS4 is the cornerstone of the future PDS and defines the foundation by which its coming data services effort will be realized. NASA realizes the importance of having its products in the PDS4 data formatting standard and has in recent years funded the migration of its earlier mission PDS3 products to PDS4. Earlier mission data archived in PDS3 format had less consistent formatting, labeling and metadata production rules. The rate of data migration to PDS4 migration will increase in the coming years.

PDS4 information model leverages the latest in information and database modeling research to define a consistent and strictly enforced standard by which datasets from across missions and scientific disciplines can be registered using standardized metadata that improves search, and standardized distribution and analysis. Figure 2 shows the present PDS archive breakdown as accumulated from over 50 years of NASA planetary missions including data from over 70 missions and 700 different scientific instruments.
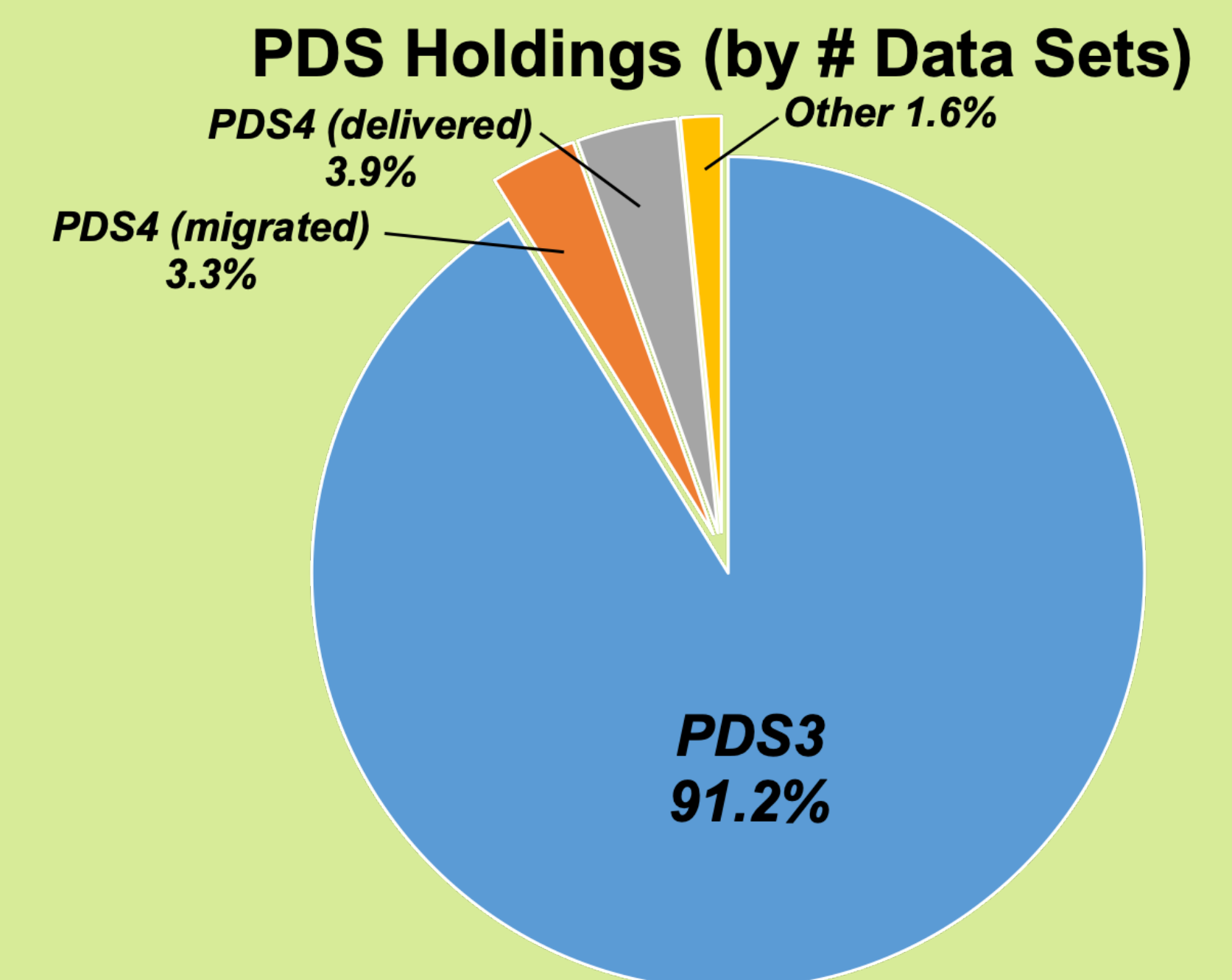
**Figure 2:** PDS data holdings as a function of PDS3 and PDS4 products. 91.2% of the existing PDS archive are in the PDS3 format and are scheduled for migration. 3.9% of the holdings, primarily from recent missions, are being delivered in the PDS4 format.

3.3% of the PDS3 archives have been migrated. This fraction will increase substantially in the next few years as 60% of the PDS3 holdings are attributed to the Lunar Reconnaissance Orbiter Camera (LROC). LROC will complete its migration in FY23.



### PDS Holdings (by # Data Sets)
PDS4 (delivered) 3.9%
Other 1.6%
PDS4 (migrated) 3.3%
PDS3 91.2%

Over 50 missions and instrument archives are scheduled for PDS3 to PDS4 migration during FY22 to FY28. Figure 3 shows the expected in-guide PDS migration progress for these missions. The most scientifically relevant migrations, e.g. LROC will take place in the next two years and then transition towards older and lower priority holdings towards FY28.
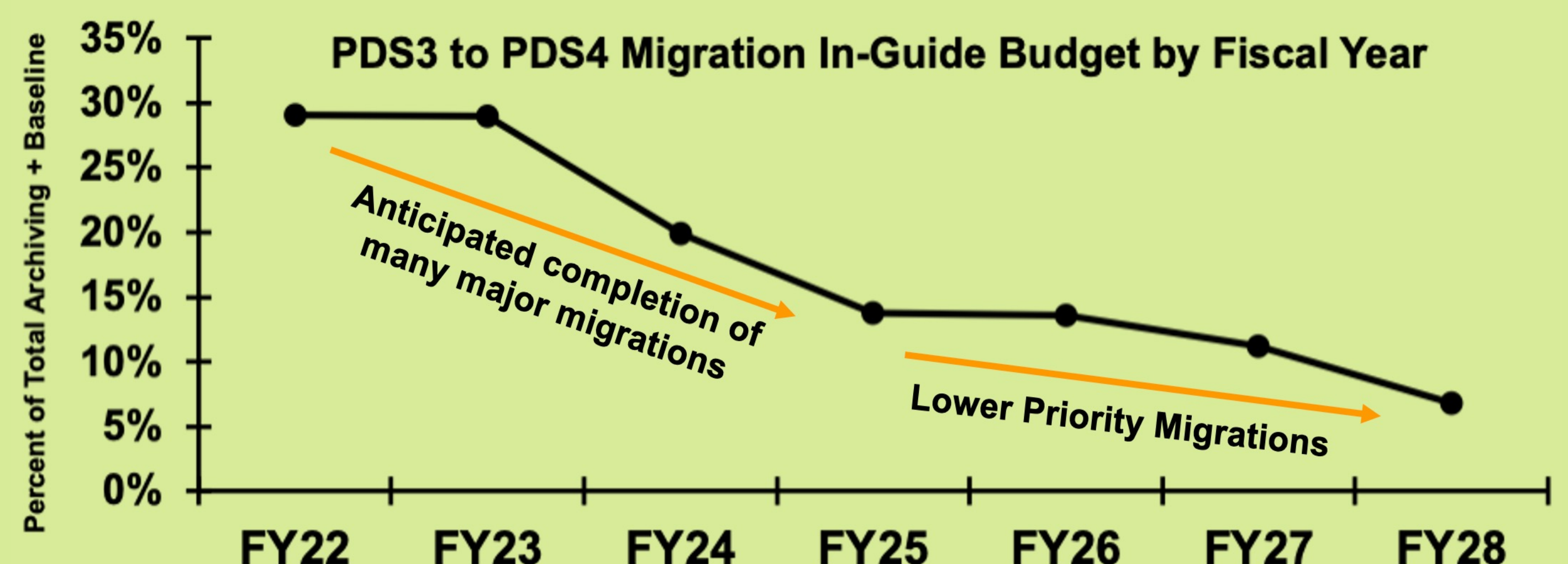


**Figure 3:** PDS3 to PDS4 data migration progress indicated by the reduction in the PDS3 to PDS4 archiving budget as represented by that fraction of expected PDS total archive budget for each fiscal year FY22 to FY28.