The emerging fields of Time Domain Astronomy (TDA) and Multi Messenger Astronomy (MMA) require rapid dissemination of data products from ground-based facilities. In response, the Keck Observatory and its archive (KOA) are transforming their business model from one where raw data are ingested into the archive the day following the observations and where users must reduce the data, to one where data are reduced at the telescope and made accessible through the archive in near real-time. This new model involves new infrastructure that requires modern pipelines that create science-ready products; a new archive architecture that enables real-time ingestion; and data access mechanisms that permit fast discovery and access.

O'Meara et al. (2019) have argued that strategic investment in such infrastructure is necessary across US ground-based facilities. See "The need for robust data services on large, ground-based OIR facilities" (an Activity, Project, and Statement of the Profession (APC) white paper submitted to the US Decadal Survey in Astronomy).

The Observatory and archive have begun to the necessary development. The Observatory will deliver a Python framework to support deployment and execution of new Python-based data reduction pipelines (DRPs). When this development is complete, an ensemble of DRPs maintained by the Observatory will replace deprecated DRPs, usually written in IDL. Assessing the performance of the new DRPs will be a crucial part of the development effort, given that they are intended to operate in near-real time at the telescope. DRPs for KCWI and KPF (under construction) are driving the preliminary design of the framework.

The architecture for real-time data ingestion will be API-based, and will automatically transfer data that are acquired and processed at the telescope to the archive, housed at Caltech/NExScI. A consequence of real-time ingestion is that the archive will play a much more active role in Observatory operations than at present. PIs will access their data directly from the archive, and archive holdings will be available for QA, verification, trending etc.

KOA is replacing its largely web-based search engine with an API-based search engine. The API will comply with the Virtual Observatory (VO) Table Access Protocol (TAP) and will permit discovery of Keck data by VO-search engines, as well as providing a common interface to all Keck data. The TAP service is under development in collaboration with the NASA Exoplanet Archive and the new NN-explore Exoplanet Investigations with Doppler spectroscopy (NEID), expected to open for business in January 2020. It is (to our knowledge) the first pure Python implementation of a TAP server, and by design database-vendor specific calls are isolated in a single low-level module. The TAP service will accessible through an `astroquery` compliant Python interface; such clients are under active development by all NASA archives.

There is as yet no formal schedule for completion of this work, though release by the time of LSST Commissioning is highly desirable.