12 From Fragmented Objects to Federated Knowledge: FAIR Digital Objects as FDOx for 3D Models and Software in the Archaeological LOD Cloud

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Archaeological digital objects – 3D models, software, datasets – are routinely produced but rarely packaged as interoperable, ontology-anchored units, limiting reuse across projects. We present the FDOx-Squirrel Implementation, a FLOSS pipeline family for generating, validating and registering FAIR Digital Objects (FDOs) from heterogeneous source material. FDOx is an independent, pragmatic implementation of the FDO concept for archaeological practice, not an official RDA/DONA Digital Object Architecture implementation.

Each FDOx packages source data with CIDOC CRM-, DCAT-, PROV-O- and GeoSPARQL-anchored metadata, a PROV-O build manifest, and SHACL-validated structure, derived deterministically from CITATION.cff/MD.cff records and registered in an open registry. The pattern applies across object classes: fdo:SoftwareFDO packages GitHub repository snapshots directly, complementing archives such as Software Heritage, which preserve code but not CIDOC CRM/DCAT-level semantic description; a forthcoming Git-based packager extends this to whole repositories, building on COMET project metadata extraction. fdo:3DDataFDO "rescues" 3D models from commercial platforms such as Sketchfab into a FAIR open-science environment.

We illustrate the pipeline with three case studies from a single heritage domain, Irish Ogham stones: a 3D FDOx for the Ogham inscription CIIC 81 (Cork Ogham Stone), rescued from its original Sketchfab upload and re-published on Zenodo; and two software FDOxs – o3d-epidoc-extractor, a LOD extractor for TEI/EpiDoc inscription data, and jupyter-nb-lod, a notebook collection querying Ogham find-spots in the NFDI4Objects Knowledge Graph. Resulting FDOxs feed that graph, moving from isolated case studies toward queryable, cross-project synthesis.

We close by reflecting on what FLOSS tooling can realistically deliver for FDO practice in archaeology, and where it still diverges from formal FDO infrastructure.