COLOURS TOOL

ATON

Open-source Web3D/WebXR framework for complex heritage data.

Web3D | WebXR Immersive Experiences | Cultural Heritage Visualization | Semantic 3D Interaction | Open Standards



Fig. 2: Example of annotation (from the Vani Virtual Experience project: vanivirtualexperience.com).

OVERVIEW

ATON is an open-source Web3D/WebXR framework developed by CNR ISPC to present and interact with complex and multi-dimensional data on the web. It allows to build interactive Web3D/WebXR applications without any installation required for final users. ATON provides a modular, cross-device platform for presenting and interacting with 3D models, scenes, and associated metadata in browsers using mobile devices, desktop workstation, museum kiosks, up to immersive VR/AR devices.

Built on modern web standards and large open ecosystems (Node.js, Three.js), ATON supports high-performance, responsive 3D visualization and collaboration. It offers a simple but extensible API for scene management, semantic annotations, measurements, advanced materials, synchronous collaboration, and spatial user interfaces for XR sessions. The framework embraces robust international formats (glTF, Cesium 3D Tiles) to ensure interoperability, streaming efficiency, and scalability for large geospatial or artifact datasets.

The framework also offers a plug&play architecture, to accelerate the creation and deployment of vertical applications (built on top of ATON features) - or extend horizontally its functionalities through plugins (“flares”) that may equip one or more web-applications.

ATON is thus a foundational framework for tools like MuLaX, traceable within COLOURS’ objectives to develop interoperable, web-based services for cultural heritage research and dissemination.

KEY FEATURES

- Adaptive 3D presentation across mobile, desktop, and XR devices
- Immersive AR/VR experiences through WebXR support
- Semantic annotations and volumetric shapes
- Multi-resolution streaming via Cesium 3D Tiles
- Support for open formats (glTF, Draco compression)
- Advanced rendering (PBR materials)
- Real-time multi-user collaboration features
- Spatial UI components for XR sessions

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IN PRACTICE: A USER STORY

Sara is a digital curator at a national archaeology museum tasked with presenting a newly scanned Roman villa for both remote audiences and on-site visitors. She needs an interactive viewer that can showcase the 3D model, allow annotations for educational content, support immersive exploration, and integrate seamlessly with existing heritage databases.

Sara logs into the main ATON instance via a web browser. Without any downloads or plugins required, she converts a painted statue's 3D model into standard Web3D formats and uploads it with associated metadata into her cloud collection. ATON's liquid presentation layer automatically adapts to her device. On her laptop, she customises the published scene by adding semantic annotations to highlight features, embedding multimedia descriptions, and setting custom viewpoints for guided tours.

Her colleague, a conservation scientist, joins remotely via link and interactively creates annotations on specific areas showing early restoration work. The real-time collaboration feature lets them discuss changes together synchronously in the same 3D scene.

Before the public launch, Sara inspects the same scene on a tablet and on a WebXR-enabled headset without any installation. In VR mode, she explores the dataset using spatial UI elements to toggle informational layers, play narrated media, and other content enriching the item.

Visitors on the museum floor can access the item directly on kiosk displays to explore different hypotheses interactively. School groups visiting the site can use mobile devices to scan QR codes to access the 3D scene without any installation.

With ATON, Sara bridges research, education, and public engagement, offering a scalable, interoperable Web3D experience that adapts to diverse audiences and devices, all grounded in open standards and cloud-ready technologies.

WHY ON THE CULTURAL HERITAGE CLOUD?

ATON provides the core Web3D/WebXR infrastructure for delivering interoperable, interactive 3D cultural heritage content, making it an ideal foundational service within the Cloud.

Cloud integration enables remote retrieval of 3D digital twins, analytical overlays, and semantic annotations, while supporting collaborative editing and version-controlled workflows. By coupling ATON's presentation layer with ECCCH's data infrastructure, institutions can deploy immersive, responsive environments directly in browsers without local resource constraints.

The plug&play architecture of the framework ensures vertical and horizontal extensibility to adapt presentation, logic and functionalities to a variety of scientific communities.

WHO CAN USE IT

ATON supports a wide range of cultural heritage communities. Heritage scientists and researchers can create interactive 3D viewers with annotations and analytical layers. Museum curators and educators can build guided virtual tours and contextual narratives. Conservation specialists can share annotated inspection results alongside 3D models.

Developers and SMEs can leverage ATON's modular API and plug&play architecture to craft custom applications tailored to projects like MuLaX or other analytical tools. Educators and students benefit from immersive AR/VR explorations of heritage sites. Within the ECCCH framework, national archives, research infrastructures, and heritage agencies can integrate ATON-based services into broader cloud-hosted ecosystems, facilitating shared access, collaborative workflows, and standardized digital asset dissemination across Europe.

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EXPECTED TIMELINE

Now Ready
Core features in production

2027 ECCCH
Cloud deployment and stable API

2028 Europe
Wider adoption and documentation

Although ATON exists as a mature open-source framework with ongoing development and adoption across projects, its integration within the COLOURS project and ECCCH infrastructure will follow incremental steps. Core features are already production-ready, with ongoing modular enhancements in 2026. Cloud-native deployment and API stabilisation for ECCCH integration are planned through 2027, with widespread European adoption and service-level documentation expected by 2028 in alignment with the project's end.

MORE IMAGES

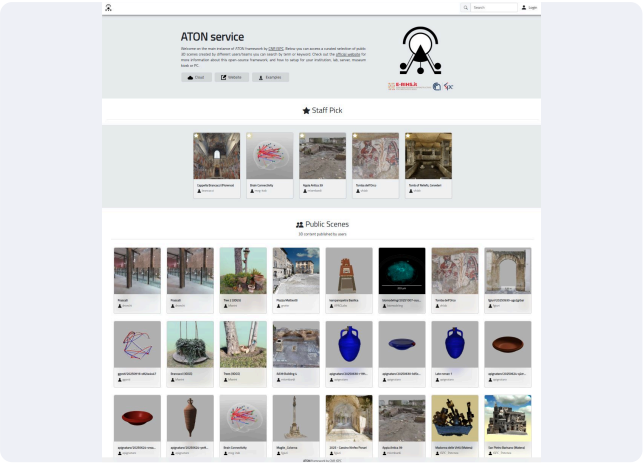


Fig. 1: Main page of the main instance of the ATON framework.

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All COLOURS tools:
colours-eccch.eu/tools

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