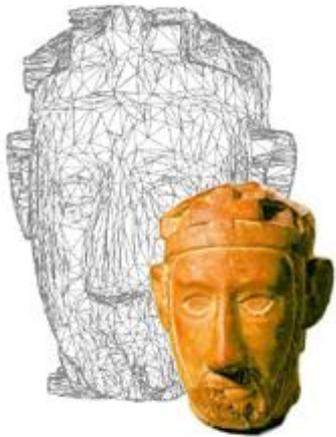


# **Publishing 3D contents on the Web: Using 3DHOP and ARIADNE Visual Media Service**



Marco Potenziani

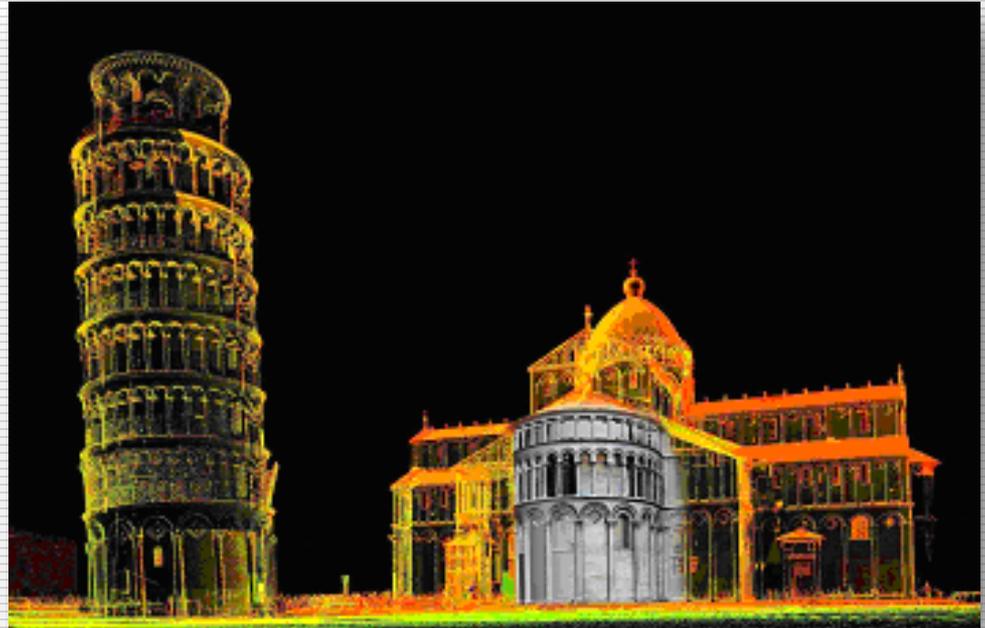
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# Overview

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- Nowadays the trend is to share all kinds of data: the reasons to publish our work and make it available to other people can be various...



- So, how to make it accessible to as many people as possible?

...of course, the Web is the answer!

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# Overview

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- ❑ In recent years all the most important Web browsers got native 3D graphics support.
  - ❑ Unluckily defining a 3D scene inside a Web page is not as easy as to design a Web page (except if you have Computer Graphics expertise).
  - ❑ Many applications have been created to fill this gap (Unity, Sketchfab, etc.), but often all these software are general purpose or designed to visualize modeled (relatively simple) geometries, so not useful to handle dense meshes (like those coming from a 3D scanner) or for specific professional aims...
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# 3DHOP

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- Summarizing, we are looking for an application:
  - Able to embed 3D contents on a Web page (like Unity or Sketchfab);
  - Easy-to-use and easy-to-learn (like HTML programming);
  - Capable to handle high resolution complex geometries (like often mandatory for visualization concerning specific professional sectors);
  
- The solution is...

...**3DHOP!**



# 3DHOP in action

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3DHOP  
3D Heritage Online Presenter

# 3DHOP, what it is

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- ❑ 3DHOP (3D Heritage Online Presenter) is an open-source software package for the creation of interactive Web presentations of high resolution 3D models.
- ❑ The 3DHOP framework provides full integration between the 3D layer and the other multimedia information contained in the Web page.



# 3DHOP, what it is

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## □ Main features:

- Easy to use, oriented to Web designers (no particular CG knowledge required), easy to learn (pick a starting example and simply modify it!)
- Flexible and portable, it works in all the main OS (Win, Mac, Linux, Android) and in all the principal browsers (Chrome, Firefox, Edge, Opera, Safari) without use of plugins;



- Designed for Hi-Res 3D, thanks to the multi resolution approach it allows the exploration of very large models (millions of triangles/points) also in the online environment.
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# 3DHOP technology

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- ❑ The 3DHOP viewer is designed like an HTML element and created using the Web languages: JavaScript and the HTML.
- ❑ It allows the interactive visualization of 3D models in a Web page exploiting the CANVAS element provided by HTML5.
- ❑ It currently supports two model format files: .PLY for fixed resolution and .NXS for multi resolution 3D models, both with color per vertex or with multi textures.



# 3DHOP technology

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- 3D Heritage Online Presenter is based on:
    - WebGL, the core API standard for the CG on the Web (developed as the JavaScript analogous of OpenGL|ES 2.0);
    - SpiderGL, a JavaScript utility library of support to WebGL (developed by the CNR-ISTI Visual Computing Lab);
    - Nexus, the JavaScript library that support the streaming of multiresolution 3D meshes over HTTP (also developed by the CNR-ISTI Visual Computing Lab);
    - jQuery, the JavaScript utility library used to improve the user interaction experience;
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# 3DHOP target users

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- 3DHOP target audience goes from the museum curators with some IT experience to the experienced Web designers who want to embed 3D contents in their creations, from students in the CH field to small companies developing Web applications for museum and CH institutions.
  - 3DHOP wants to be a powerful resource for Web 3D development, remaining at the same time simple to use, configure and deploy.
  - NO programming necessary, NO computer graphics knowledge required, NO compilation to configure.
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# 3DHOP structure

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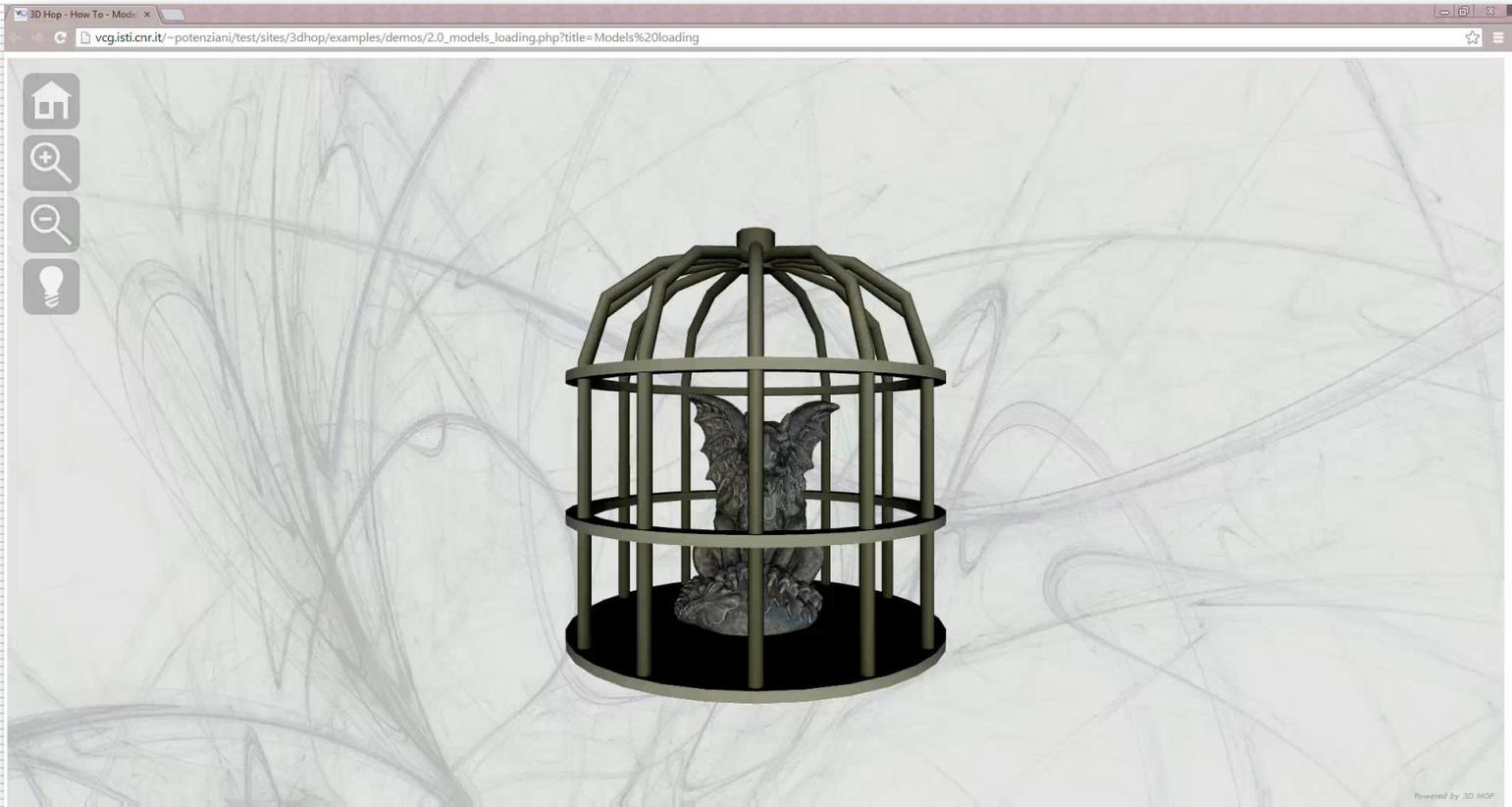
- Mandatory elements:
  - model location (URL);
  - model instances;
- Additional elements:
  - model spatial transformations;
  - trackball interface definition;
  - scene space setup;
  - animated views;
  - hotspots implementation;
  - etc...

```
function setup3dhop() {
  presenter = new Presenter("draw-canvas");

  presenter.setScene({
    meshes: {
      "Gargoyle": {
        url: "models/multires/gargo.nxs"
      }
    },
    modelInstances: {
      "Model1": {
        mesh: "Gargoyle"
      }
    },
    trackball: {
      type: TurnTableTrackball,
      trackOptions: {
        startPhi: 0.0,
        startTheta: 0.0,
        startDistance: 2.5,
        minMaxPhi: [-170, 170],
        minMaxTheta: [-10.0, 50.0],
        minMaxDist: [0.5, 3.0]
      }
    }
  });
}
```

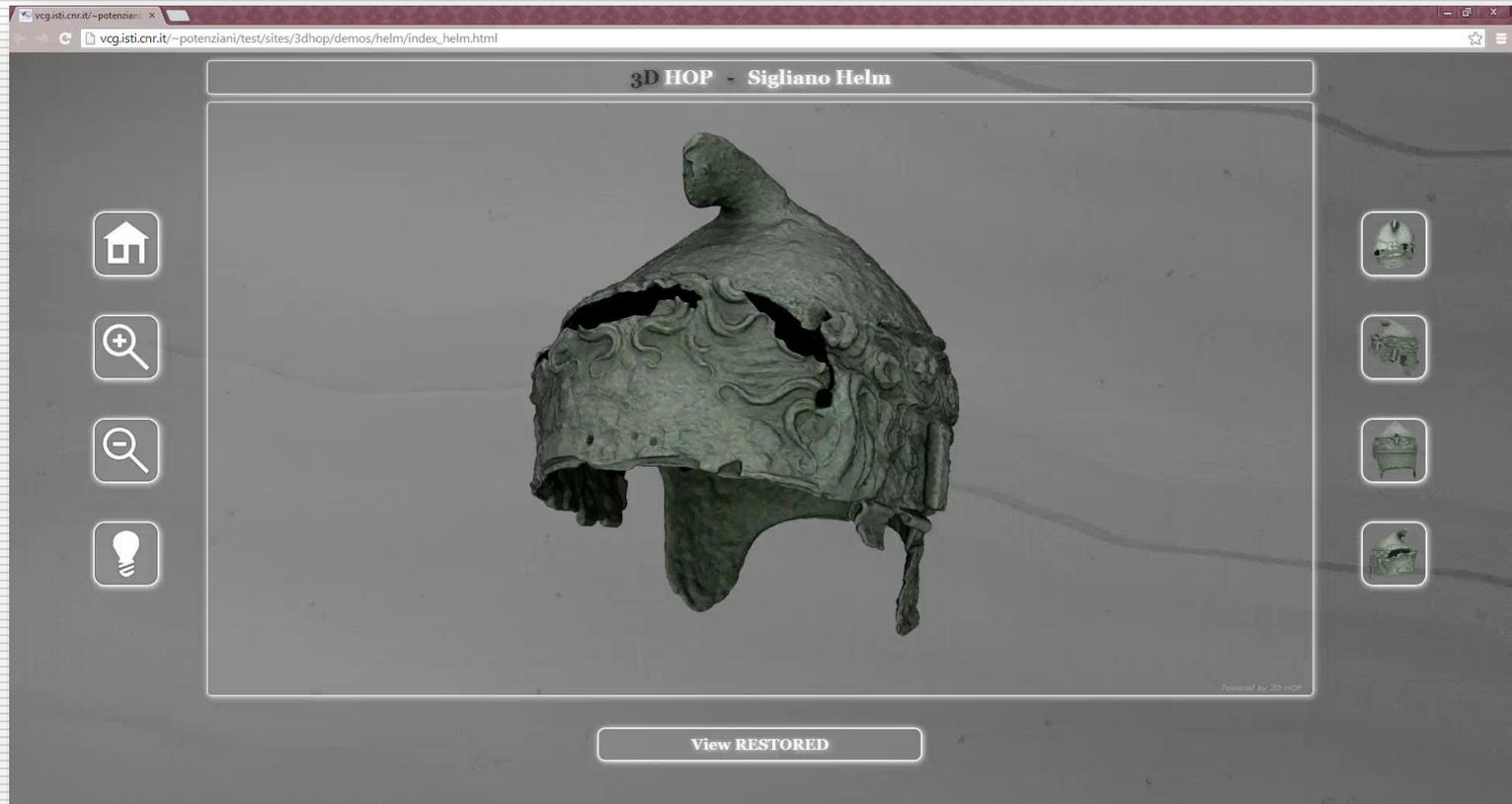
# 3DHOP example: The Cage

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# 3DHOP example: Sigliano Helm

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# 3DHOP example: Ruthwell Cross

Presenter: Ruthwell cross x

file:///C:/Users/VCLAB/Documents/Web%20Server/projects/3DHop/3dhop\_cross/index.html

## Presenter: The Ruthwell Cross



A 3D model of the Ruthwell Cross is displayed in a dark environment. To the left of the cross is a vertical toolbar with icons for: a four-way directional pad, a circular arrow icon, a home icon, a magnifying glass icon, a vertical slider, another magnifying glass icon, a lightbulb icon, and a paintbrush icon.

South Face West Face North Face East Face

### South Face

#### Top Piece 3D

"John the Evangelist." This panel depicts a man hold a bird and is commonly accepted to be John the Evangelist with his emblem, the eagle. The inscription in the border is mostly illegible due mainly to weather, although some damage may have been incurred during the reformation, when the Cross was torn down. The right corner of the panel is significantly damaged, which may have been caused by falling to the ground. However, there are traces of the Latin letters: IN [.....] UM, generally expanded to in principio erat verbum, which are the first words of the Gospel of St. John.

It is thought now, that when Rev. Henry Duncan rebuilt the Cross in 1823, that he placed this piece on backwards, that John and his eagle were meant to balance out the North side and be above Matthew and his angel. The image on the top of the South face was intended to be the solitary eagle, and take its place above the Archer, the panel below the modern transept. The panel, along with the Visitation panel, was found by Rev. Duncan buried in the ground.

#### The Archer 3D

This panel makes up the lower arm of the cross-piece. It depicts a man in profile drawing his bow, and is referred to as "the Archer." Beneath the figure's arm is a square object on a strap, and is most probably a quiver. There is some evidence that there was once an inscription bordering this panel, however, because of severe weathering, it is completely illegible. If the top piece were faced the right way around, the archer would be paired with the solitary eagle found on the North face.

#### The Visitation 3D

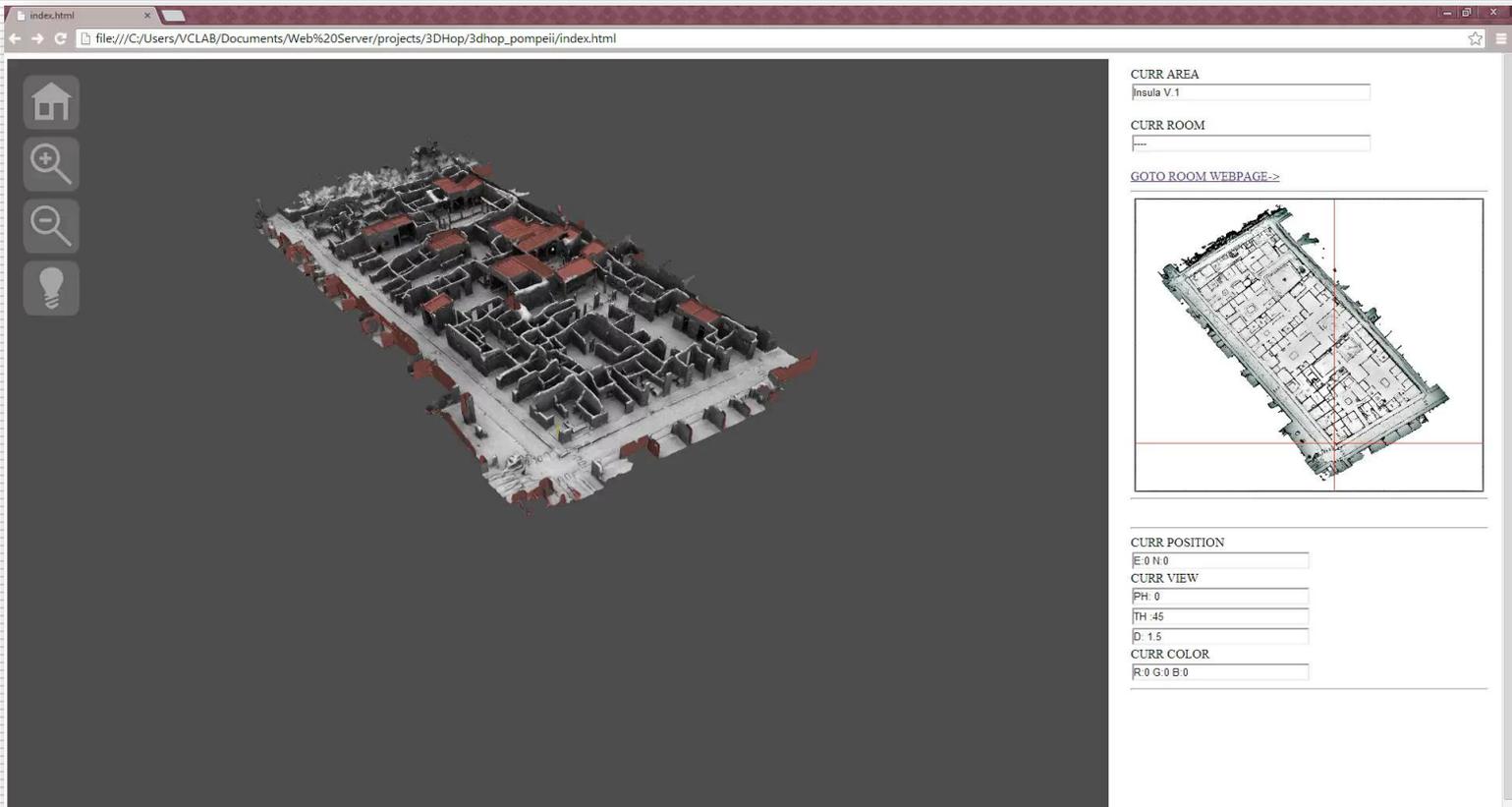
This panel was found buried in the ground by Rev. Duncan. This panel depicts two figures in profile, facing each other and in an embrace. There is some confusion as to who these two figures are (Mary and Martha or Mary and Elizabeth), which stems mainly from the translation of the inscription bordering this image, as it is extremely weathered.

The text is a mixture of Latin and Runic text. The Latin can roughly be read as Mf.JR[.JA. Mf. ...]ER.

**Lecture: The Cross and the Gospels**

Start...

# 3DHOP example: Pompeii Insula



# ARIADNE Visual Media Service

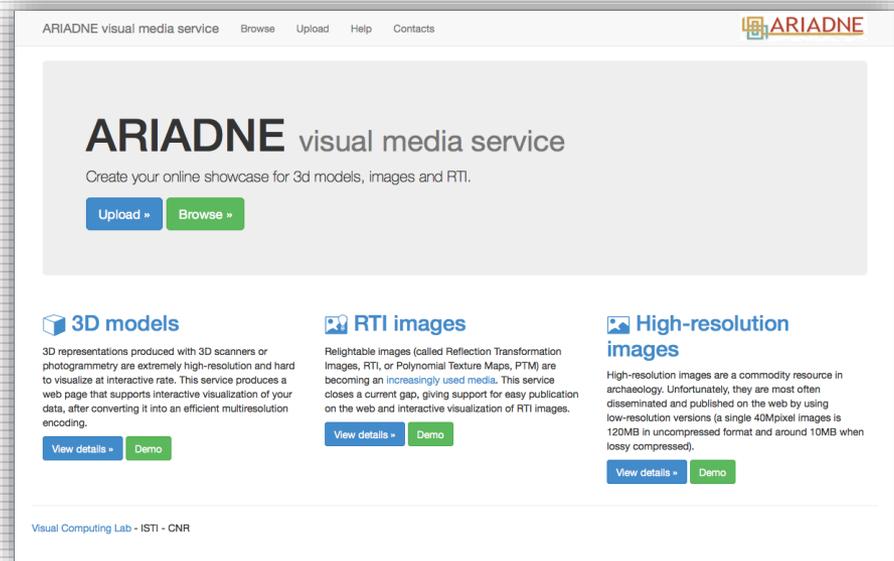
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- All the proposed examples, from the simplest to the more specialized, have in common the ability to improve the effectiveness of the 3D data presentation at the final user level... but also that all the implementation work has been performed handmade by the developer.
  - So, how to improve the effectiveness of the publishing also at content creator level?
  - The assisted publishing (via Web Service) could be the answer. It is the easiest procedure to adopt for anyone who wishes to create Web contents starting from selected data.
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# ARIADNE, what it is

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- The ARIADNE Visual Media Service provides easy publication and presentation on the Web of complex visual media assets.

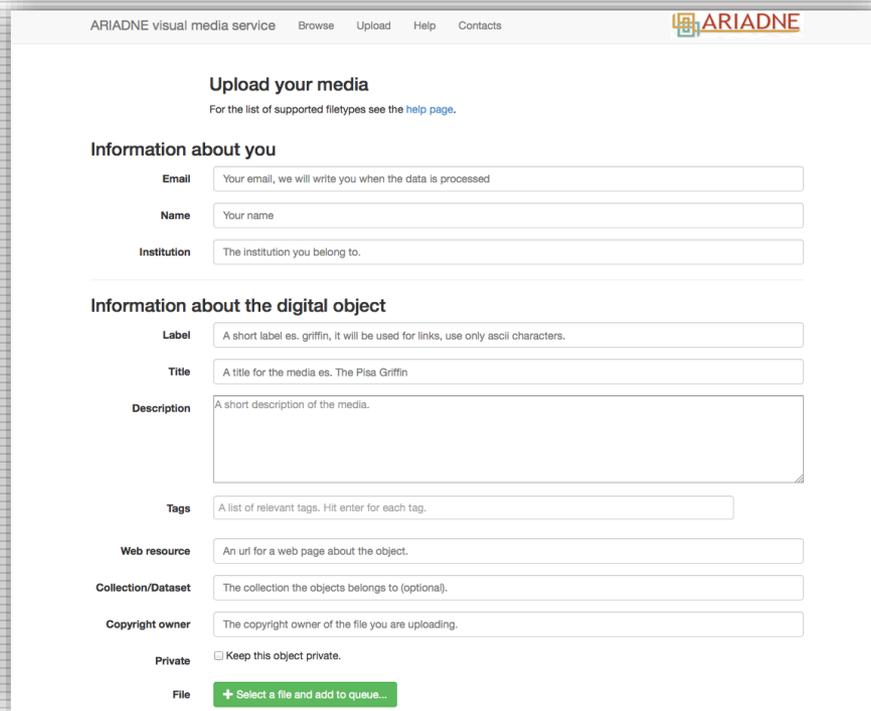


- It is an automatic service that allows to upload visual media files on a server, transforming them into an efficient Web format and making them ready for Web-based visualization.
  - It is able to create your online showcase for 3D models, high resolution images and RTI.
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# ARIADNE, the Web Service

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- The designed Web Service is able to build, using a simple layout, presentation Web pages with visual media content embedded.



The screenshot shows the 'Upload your media' page of the ARIADNE visual media service. The page has a navigation bar with links for 'Browse', 'Upload', 'Help', and 'Contacts'. The main heading is 'Upload your media' with a link to a 'help page' for supported filetypes. The form is divided into two sections: 'Information about you' and 'Information about the digital object'. The 'Information about you' section includes fields for 'Email', 'Name', and 'Institution'. The 'Information about the digital object' section includes fields for 'Label', 'Title', 'Description', 'Tags', 'Web resource', 'Collection/Dataset', and 'Copyright owner'. There is also a 'Private' checkbox and a 'File' button labeled '+ Select a file and add to queue...'

- The ARIADNE Web Service accepts the upload of the selected media plus some basic metadata provided using a simple Web form.

# ARIADNE using 3D models

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- Uploading a 3D geometries, the model is converted (with an unattended routine) from a fixed resolution to multi resolution format.
- After the model processing is complete, the system returns to the user the viewer as:
  - HTML frame to embed;
  - URL to a ready to use visualization Web page;
  - download package, allowing the developers to use the resulting Web page on their own server.
- The returned viewer can be easily personalized adding toolbar buttons, 3D scene analytical tools, etc.



# ARIADNE using 3D models

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- ARIADNE Visual Media Service is aimed to drive, assist and speed up the publishing of 3D data in a Web page. This service exploits the 3DHOP framework adaptability to interactively handle the uploaded data.
  - With this setup even naive users can display complex 3D content easily creating an efficient Web page or just integrating the obtained visualizations inside existing Web sites.
  - For more experienced users these basic Web pages may be the starting point for more complex visualizations, taking advantage of the features provided by the 3DHOP platform.
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# Thank you! Questions?

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## □ References:

- 3DHOP – 3D Heritage Online Presenter:
  - Web: [www.3dhop.net](http://www.3dhop.net)
  - Email: [info@3dhop.net](mailto:info@3dhop.net)
- ARIADNE Visual Media Service:
  - Web: <http://visual.ariadne-infrastructure.eu>