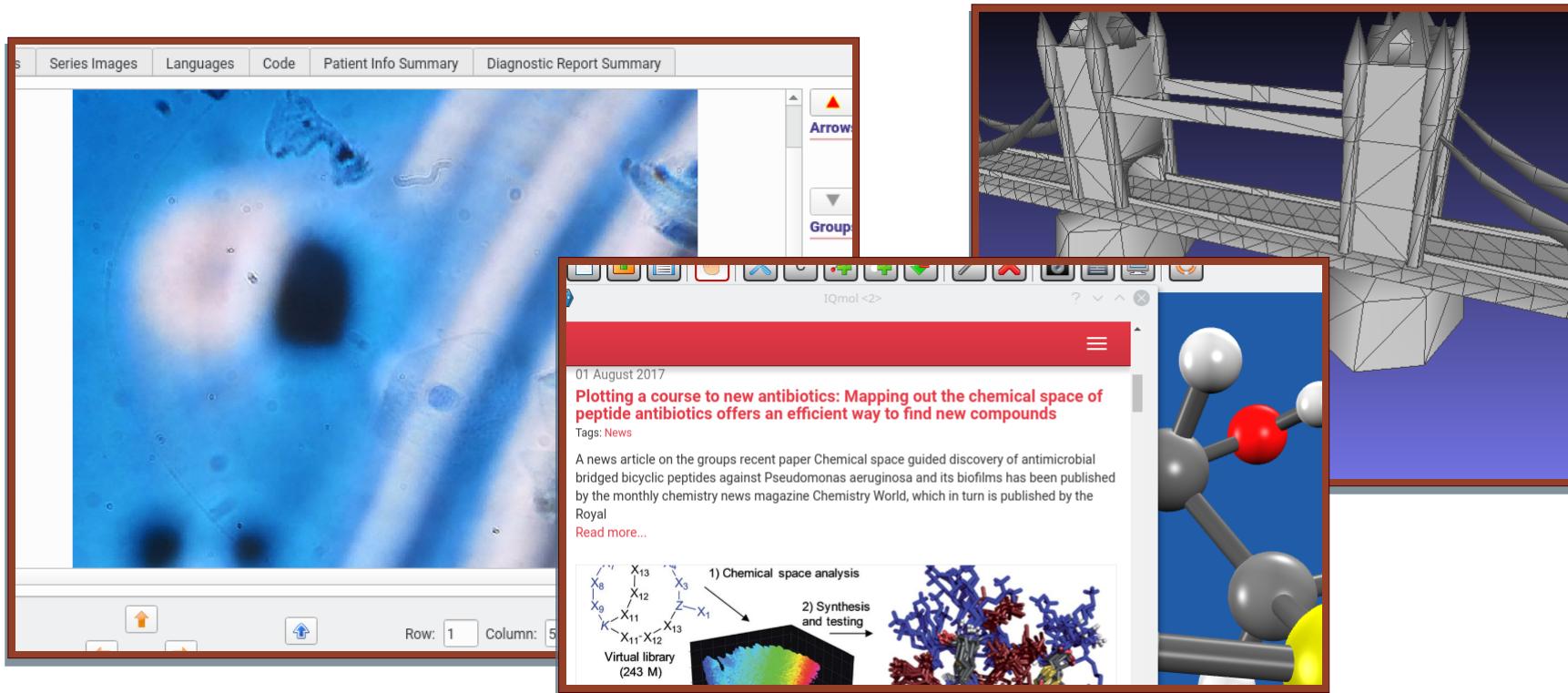


The NCN/A3R ("NA3")

Native Application Development Framework



Linguistic Technology Systems
POC: Amy Neustein, Ph.D.
Founder and CEO
amy.neustein@verizon.net
201-224-5096

The NCN (Native Cloud/Native) Protocol

Cloud/Native Components as back-ends for native software

- “Native Cloud/Native” refers to native application front-ends paired with Cloud/Native container instances.
- Share code libraries and data representation across both endpoints.
- Common representation on both server- and client-side streamlines network communications (no need to marshal data between different formats).
- This presentation will focus on NA3’s default Qt implementation, though the technology can be ported to other application frameworks (wxWidgets, XCode, MFC, etc.).

How Cloud Back-Ends Enhance Native Front Ends

- Cloud Backup; Share data between users; Collaborative Editing
- Persist users’ application state across different computers (home/school/office)
- Upgrade running applications without re-compile

Application-As-A-Resource (A3R)

The A3R Application Model

- A3R Applications are self-contained, citable resources which can conform to modern resource documentation standards, such as the Research Object protocol.
- A3R Applications can use Hypergraph-structured metadata to describe data types, procedures, User Interface features, and inter-type relationships (for instance, the relation between data types and the types of GUI components which visualize them).

A3R Developer Tools

- Hypergraph-based data modeling and serialization.
- Framework for building custom scripting, parsing, and data persistence engines.
- Enhanced support for applications specifically designed to access research data sets.
- Convenient framework for sharing data among applications (to establish inter-application workflows) or between applications and cloud or web services (including leveraging NCN services).

Qt is the most popular native, cross-platform application-development framework.

- ◆ ~1 million active developers
- ◆ Over 5,000 client companies
- ◆ Worldwide “Qt Partners” Ecosystem
- ◆ ~US \$250 million overall market

However ... Limited Qt Cloud Integration Support

- “Qt Cloud Services” Discontinued in 2016.
- Currently there is no standard model for accessing Cloud services from Qt applications.
- Nor is there a standard Qt-based Cloud Native container architecture.

Example Use-Cases

Inter-Application Networking and Workflow Management

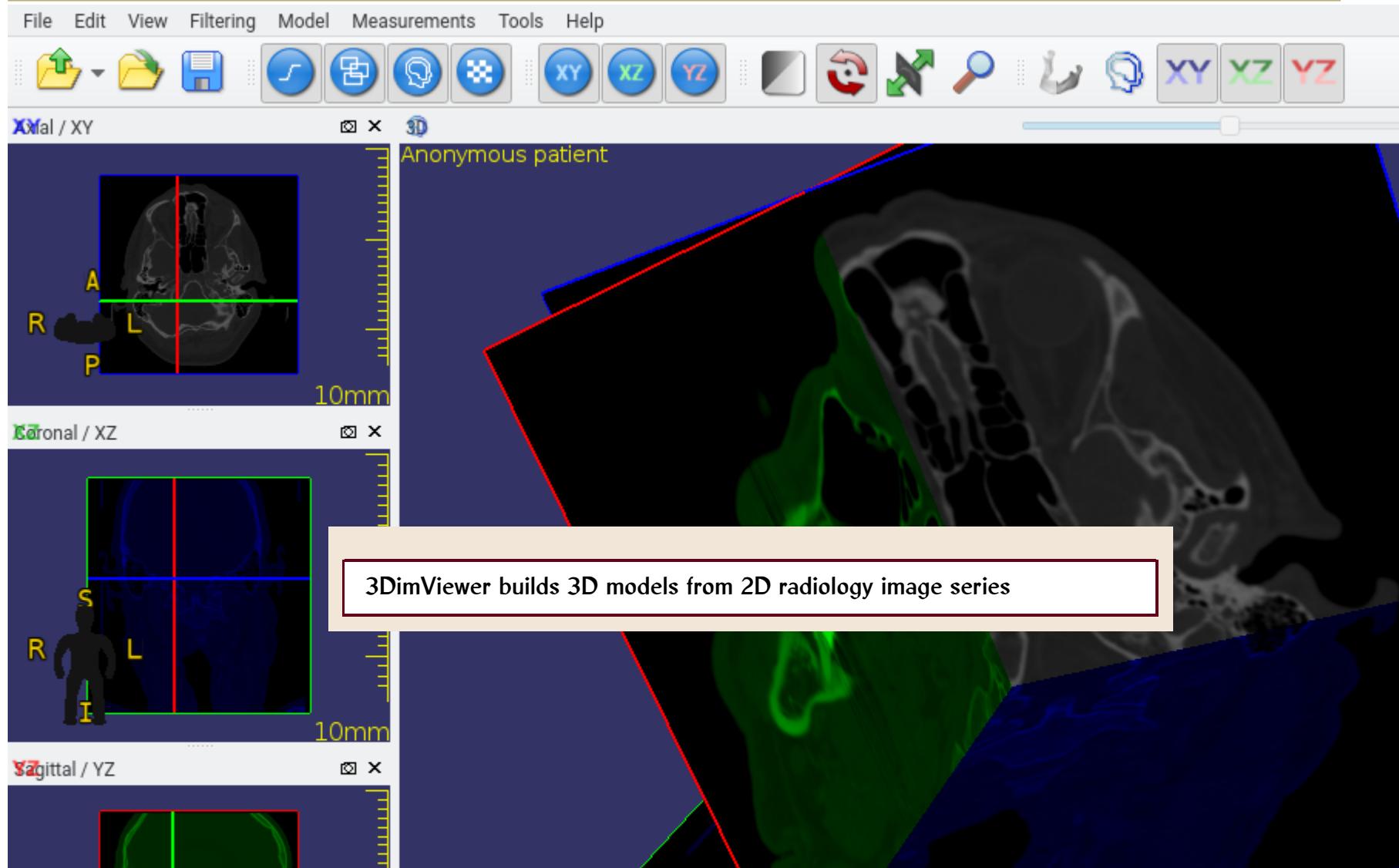
- Export data and instructions between Qt-based applications (slides 6-7).
- Embed document or multi-media viewers inside scientific or dataset applications (slides 18-21).

Responsive, desktop-style applications for enhanced UX

- Compelling front-ends for e-commerce, Real Estate, VR, etc. (slides 11-17).
- Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, etc.
- For scientists and researchers, build innovative data-collection instruments as well as interactive Research Object applications (slides 8-10).

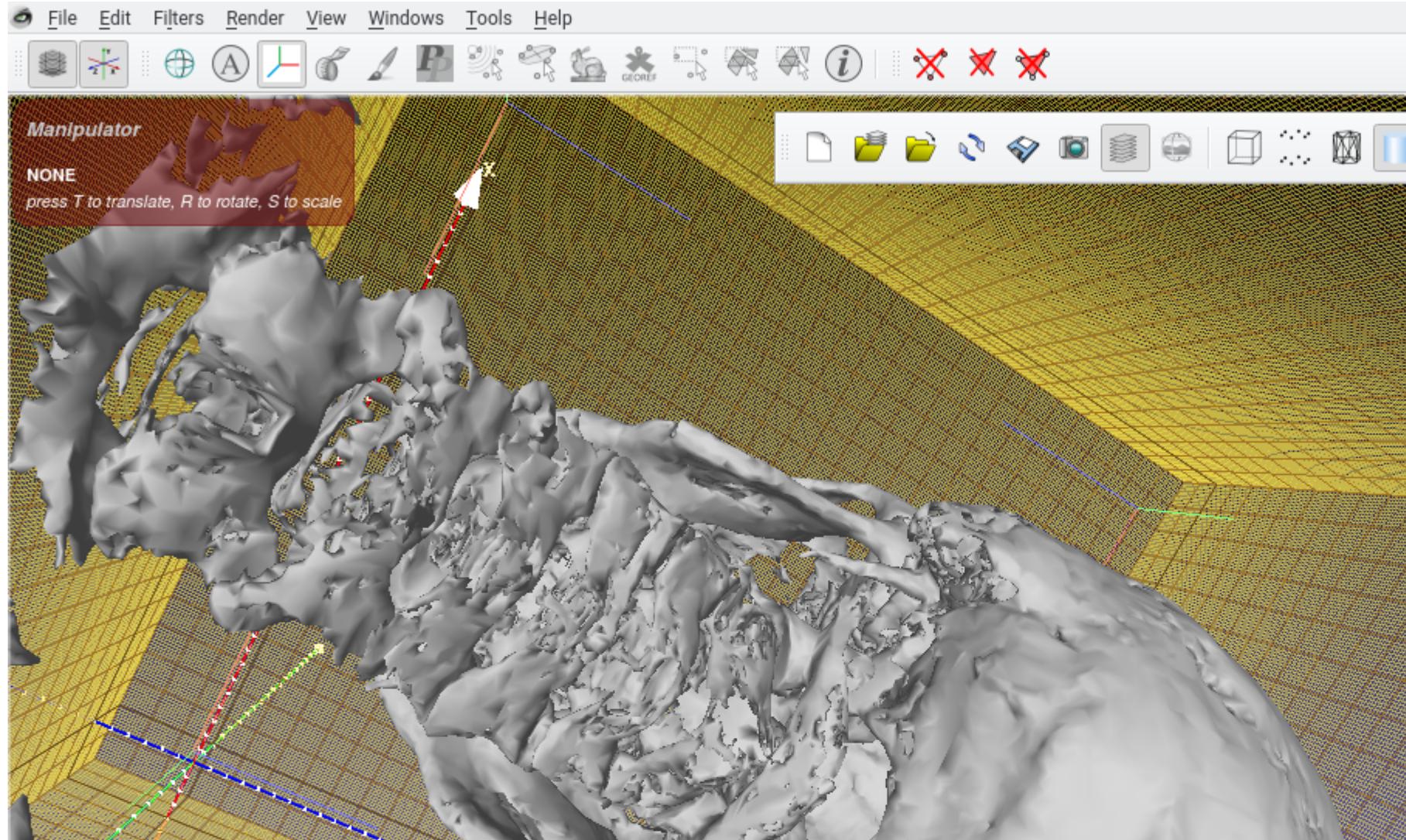
An Example of Inter-Application Networking

This slide and the next demonstrates a case-study where inter-application data sharing enhances applications' capabilities.



3D Graphics Sent to MeshLab

Once the 3D tissue sample is constructed, an A3R inter-application networking protocol (implemented as an extension to both components) allows 3DimViewer to export the model to MeshLab so that it may be studied in a more comprehensive 3D viewing environment.



A3R Applications as Data Collection Instruments

Forms Web Language Help About

Save Form Open Form Cloud Save Cloud Open Submit Form

Page: 0 Search for: Forwards

Welcome Web

X ? ^ x Form Outline

Click on a subheading to continue

Patient Information

Chief Complaint

Review of Symptoms

Treatment History

Medical History

Current Medications

Family History

ndp-main-outline <5> ? ^ x

Referring Doctor: Dr. New Test

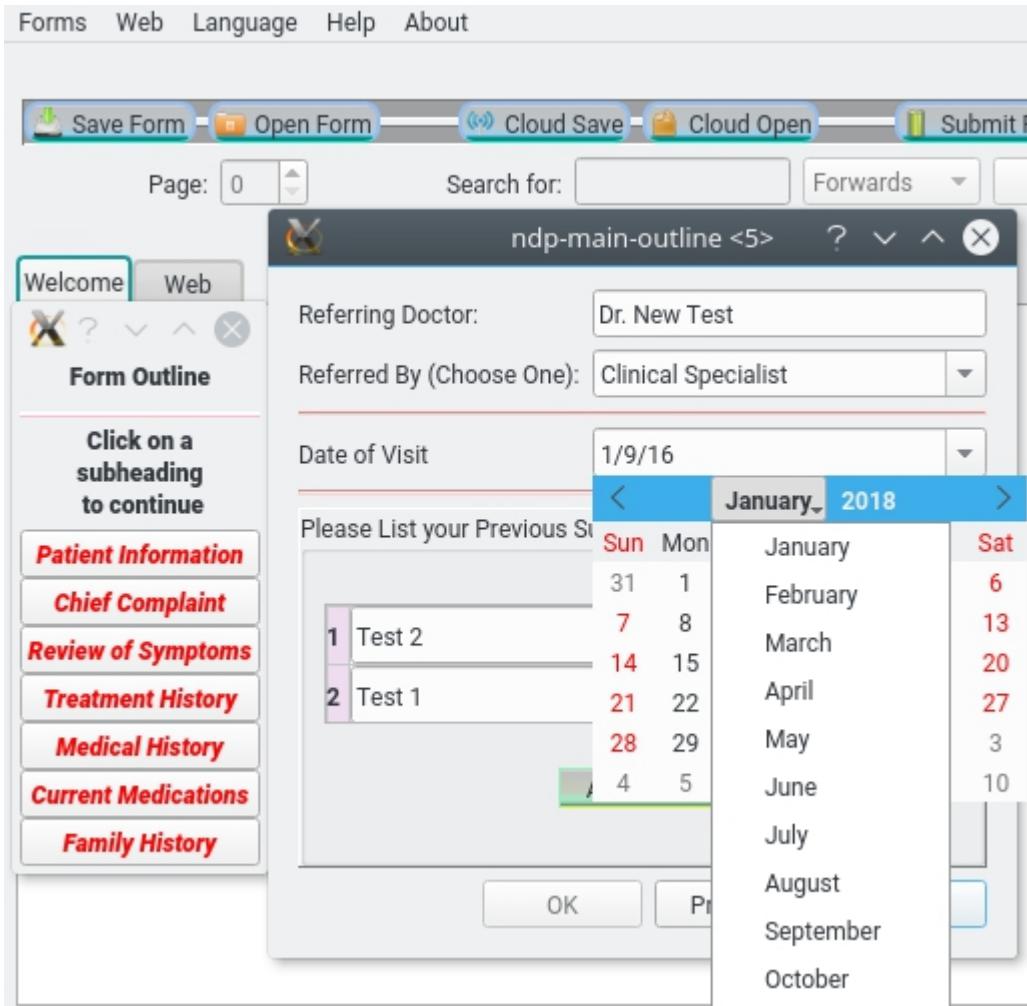
Referred By (Choose One): Clinical Specialist

Date of Visit: 1/9/16

Please List your Previous Stays

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|-----|-----|-----|-----|
| 31 | 1 | | | | | 6 |
| 7 | 8 | | | | | 13 |
| 14 | 15 | | | | | 20 |
| 21 | 22 | | | | | 27 |
| 28 | 29 | | | | | 3 |
| 4 | 5 | | | | | 10 |

OK Print



In medicine and social science, “data collection instruments” (DCIs) refers to surveys, questionnaires, and other tools to get human feedback.

Qt-Based Interactive Forms

DCIs implemented as native desktop applications can have easily navigable, interactive forms that make it simpler for people to provide information.

Also, submitted information is already in digital form, eliminating the need for separate data entry.



A3R Applications as Research Objects

Complementary to the benefits of native applications for “obtaining” data, A3R components are also powerful tools for showing and analyzing research findings.

A3R applications can be implemented as “Research Object Bundles” — combinations of code and data providing access to data sets without the need for external software.



The interface includes a toolbar with tabs: View, Instructions, Series Images, Languages, Code, Patient Info Summary, and Diagnostic Report Summary. On the right, there are tool buttons for Arrows, Comments, Lists, Arcs, and Rulers. At the bottom, there are controls for Silhouette Zoom, Image Transforms, Annotations Transforms, and a set of Pan, Zoom, and Slide buttons.

Native Applications as Interactive Catalogs

As a case-study in enhanced User Experience afforded by native applications, consider how static PDF catalogs and brochures can be turbo-charged to engaging, interactive software-based presentations.

The screenshot shows a native application interface for a shoe catalog. On the left, there is a sidebar with three small thumbnail images of shoes. The main area features a large, detailed image of a brown leather sneaker with a white sole. A context menu is open over the image, listing options: Detach Image, Detach Noteboook, Detach Description, **Detach Everything** (which is highlighted with a blue background), Merge Windows, Explore Color Matches ..., View 3D Model ..., Take Screenshot, View Item List, and View Shopping Cart. At the bottom of the main area, there are navigation icons for zooming in and out, and a text field 'Item: 3' with an 'Image Zoom:' slider. Below the main image, there are tabs for 'Overview', 'Features', 'Specs', and 'Reviews', with 'Overview' being the active tab. A list of product features is displayed: '• Leather upper', '• Lace-up', and '• Round toe'. To the right of the main image, there is a section titled 'Grand Crosscourt II Sneaker' with a description: 'Sleek and simple, the Grand Crosscourt II sneaker from Cole Haan is the perfect way to add some tailored casual style to your every day look!'. Below this, there is a section titled 'Actions:' with two items: '• [Add to Cart](#)' and '• [Explore Colors](#)'. There are also two small circular icons, one orange and one black, representing color options.

Grand Crosscourt II Sneaker

Sleek and simple, the Grand Crosscourt II sneaker from Cole Haan is the perfect way to add some tailored casual style to your every day look!

Actions:

- [Add to Cart](#)
- [Explore Colors](#)

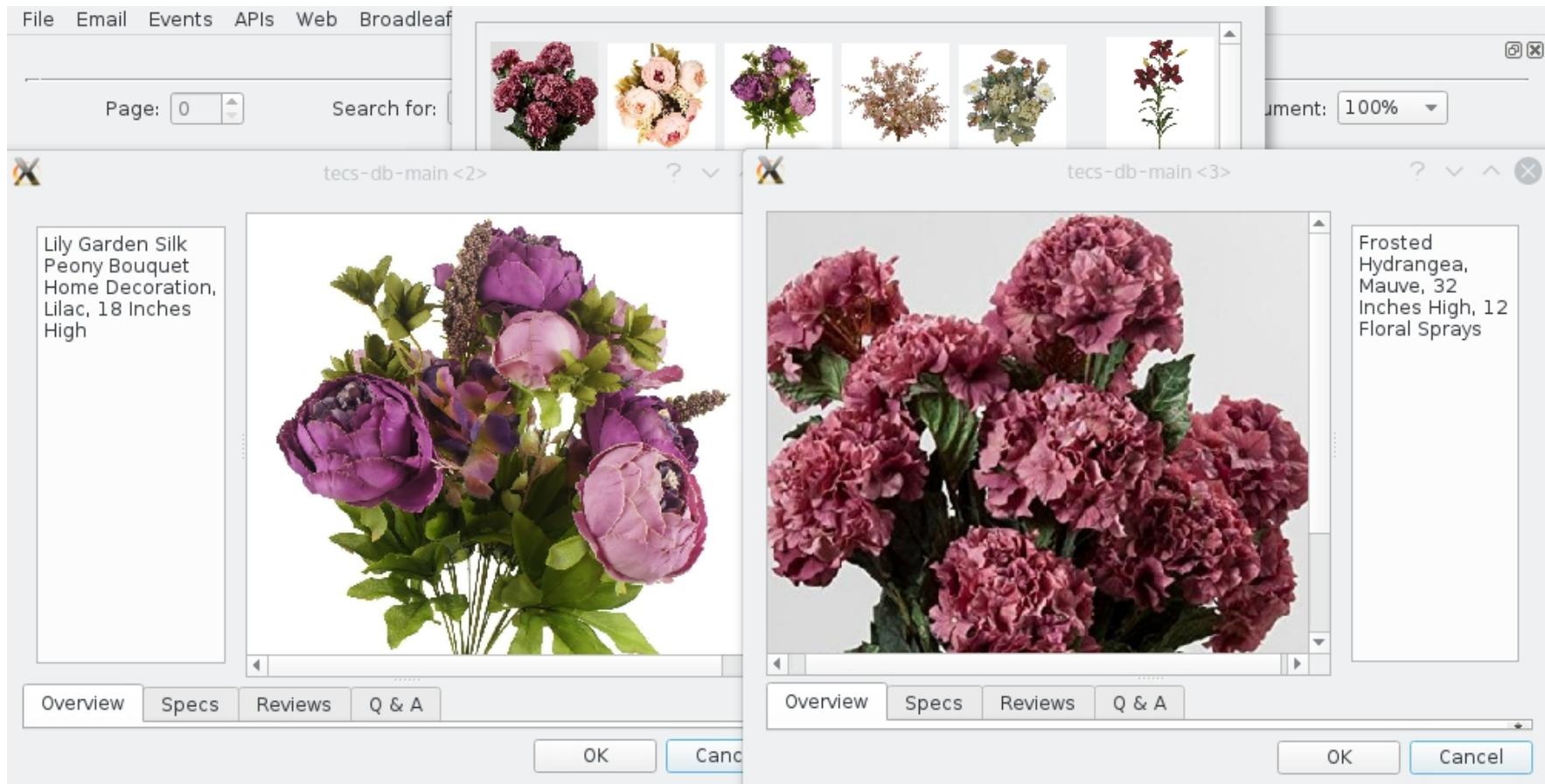
Item: 3 Image Zoom:

Overview Features Specs Reviews

- Leather upper
- Lace-up
- Round toe

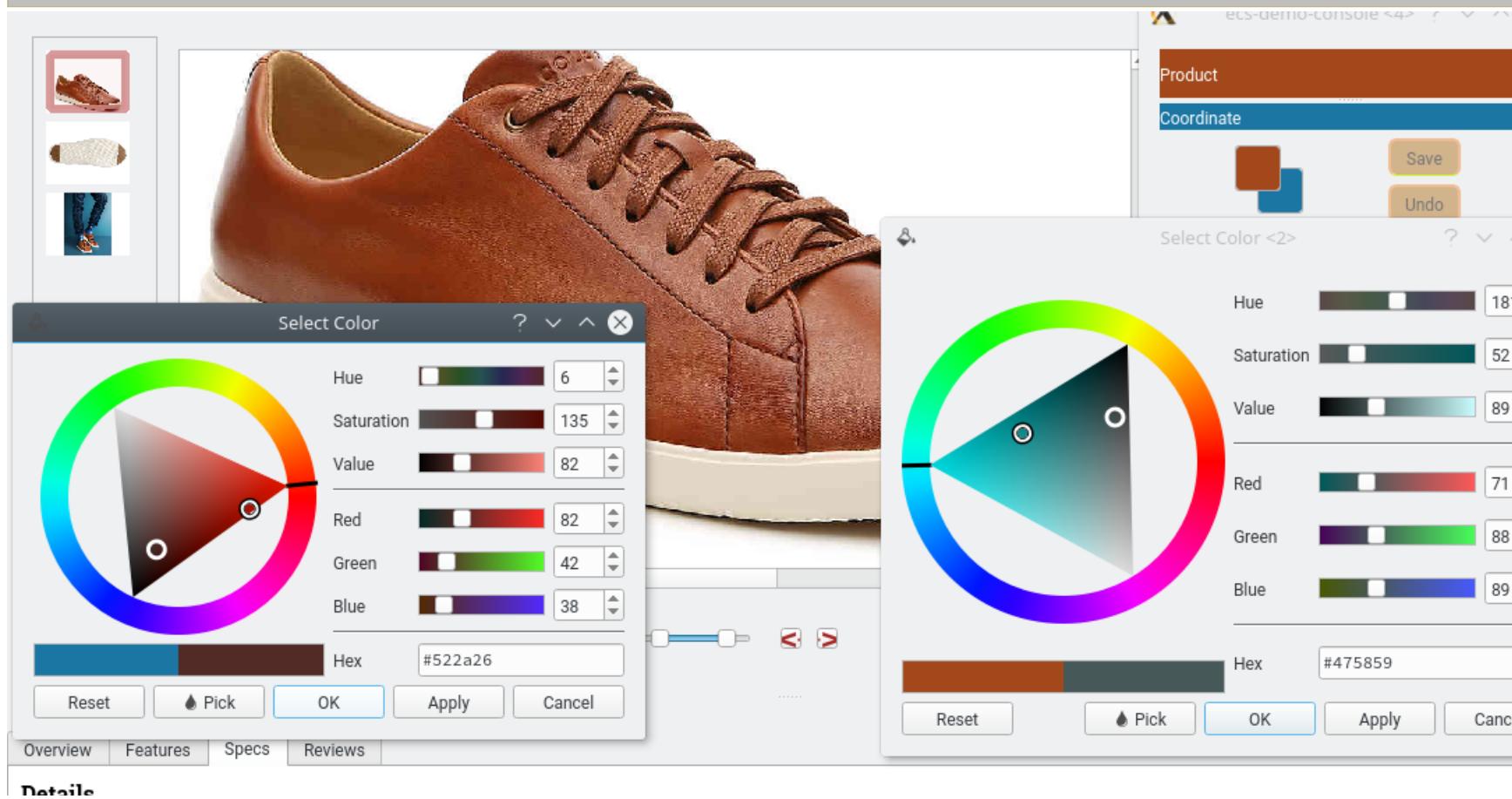
Interactive “Shopping Carts”

Instead of static lists, shopping carts in a native context can be multi-scale, multi-window interactive displays.



Explore Products with Native Software

Interactive catalogs allow designers to incorporate many unique features and capabilities of desktop applications, such as using HSV color-wheel controls to explore color coordination while shopping.



Interactive Real Estate

Native applications can also bring enhanced UX to Real Estate presentations — instead of just groups of photos, properties may be introduced via interactive, color-coded photo viewers visually organized according to desktop-software conventions.

The screenshot shows a window titled "rpdf-emb-console" displaying a grid of 25 thumbnail images of various interior and exterior real estate scenes. A specific thumbnail in the bottom row is highlighted with a red border and an arrow points from it to a larger image of a master bedroom on the right. The master bedroom image features a large bed with a wooden headboard, a chaise lounge, and a nightstand. A text overlay "Current Photo" is placed over the bedroom image. Another arrow points from the "Groupings" list on the left to the "Color-Coded Groups" text on the right. The "Groupings" list contains eight items, each with a colored background matching the corresponding photo in the grid. The "Color-Coded Groups" text is also in a large, bold, green font.

rpdf-emb-console

Groupings

- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

Color-Coded Groups

Current Photo

Item: 19

Image Zoom:

OK Cancel

Photo Viewer Interactive Cues

These slides demonstrate visual cues to aid photo navigation, such as color bands that switch from horizontal to vertical indicating which photos have been viewed; and the thumbnail of the current viewed photo marked with a thick colored border (this border will surround the thumbnail and both horizontal and vertical overlays).

The screenshot shows a photo viewer interface with the following features and annotations:

- Already Viewed (vertical color band):** A callout points to a thumbnail in the grid that has a vertical teal border, indicating it has been viewed.
- Not Yet Viewed (horizontal color band):** A callout points to a thumbnail in the grid that has a horizontal teal border, indicating it has not yet been viewed.
- Current Photo (viewed for the second time):** A callout points to a large image of a living room with a brown leather sofa, a large ottoman, and a kitchen area in the background. The thumbnail for this image in the grid also has a thick teal border.
- Groupings:** A sidebar on the left lists photo groupings with corresponding colored horizontal bars:
 - Entrance/Foyer/Hall (teal)
 - Kitchen/Dining Room (yellow)
 - Living Room/Den (purple)
 - Bath/Powder Room (blue)
 - Bedroom/Closet (light blue)
 - Master Bedroom/Spa (light green)
 - Basement/Game Room (grey)
- Navigation:** At the bottom are standard photo viewer navigation buttons: a left arrow, a right arrow, and a zoom slider labeled "Image Zoom".
- Item Counter:** The text "Item: 10" is displayed at the bottom center.

Filtering Photos

Another feature which may be conveniently implemented in A3R-style photo viewers is a filtering option, which — given a collection of pictures classified into several groups — allows users to show or hide photos based on the group they belong to.

The image shows a photo viewer interface with a sidebar of room groupings and a main area displaying a filtered photo.

Visible Groups: The sidebar shows a list of room groupings. The first group, "Entrance/Foyer/Hall", is circled in green and has a checked checkbox. The last group, "Basement/Game Room", is circled in red and has an unchecked checkbox.

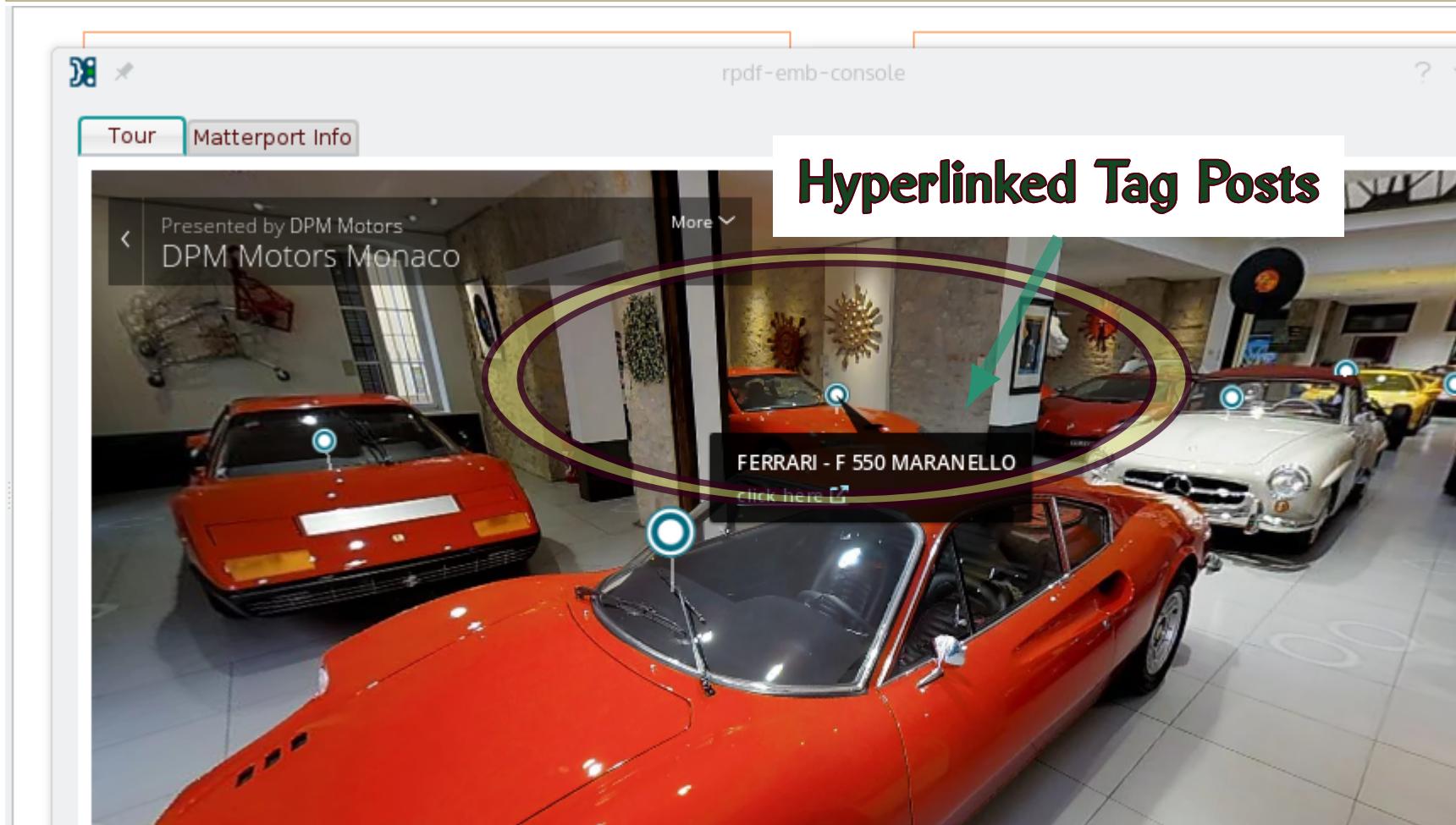
Hidden Groups: The main area displays a large photo of a living room with a sofa, a coffee table, and a painting on the wall. Below the photo, the text "Hidden Groups" is displayed.

UI Elements: The sidebar includes a "Groupings" label, a list of room categories with checkboxes, a "Groupings" button, and a "Groupings" dropdown menu. The main area includes a "Image Zoom" slider, a "OK" button, and a "Cancel" button.

| Grouping | Status |
|---------------------|--------------------|
| Entrance/Foyer/Hall | Visible (checked) |
| Kitchen/Dining Room | Hidden (unchecked) |
| Living Room/Den | Visible (checked) |
| Bath/Powder Room | Hidden (unchecked) |
| Bedroom/Closet | Visible (checked) |
| Master Bedroom/Spa | Visible (checked) |
| Basement/Game Room | Hidden (unchecked) |

Interactive VR: Hyperlinked Tag Posts

Another emerging technology, relevant to both e-Commerce and Real Estate, is the use of Panoramic Photography to create immersive Virtual Reality scenes. Panorama-Photography-based VR engines, like Materport, allow “tag posts” with embedded hyperlinks, which in a native-application context become channels of communication between the VR renderer and the host application. The full capabilities of this interactive modality — combining VR with clickable links and text “bubbles” — can only be feasibly realized with VR embedded in native software.



A3R Document Viewers

A3R applications may embed viewers for document formats such as e-Pub, HTML, and PDF; then supplement conventional publications with special components customized for individual manuscripts — here, a widget allowing readers to visually explore patterns in classical Indian music.

ANTHROPOLOGY AND HUMANISM

[Explore this journal >](#)

Ethnographer as Apprentice: Embodying musical Knowledge in South India

Linda Weidman

Published: 26 December 2012 [Full publication history](#)

doi:10.1111/j.1548-1409.2012.01131.x [View/save citation](#)

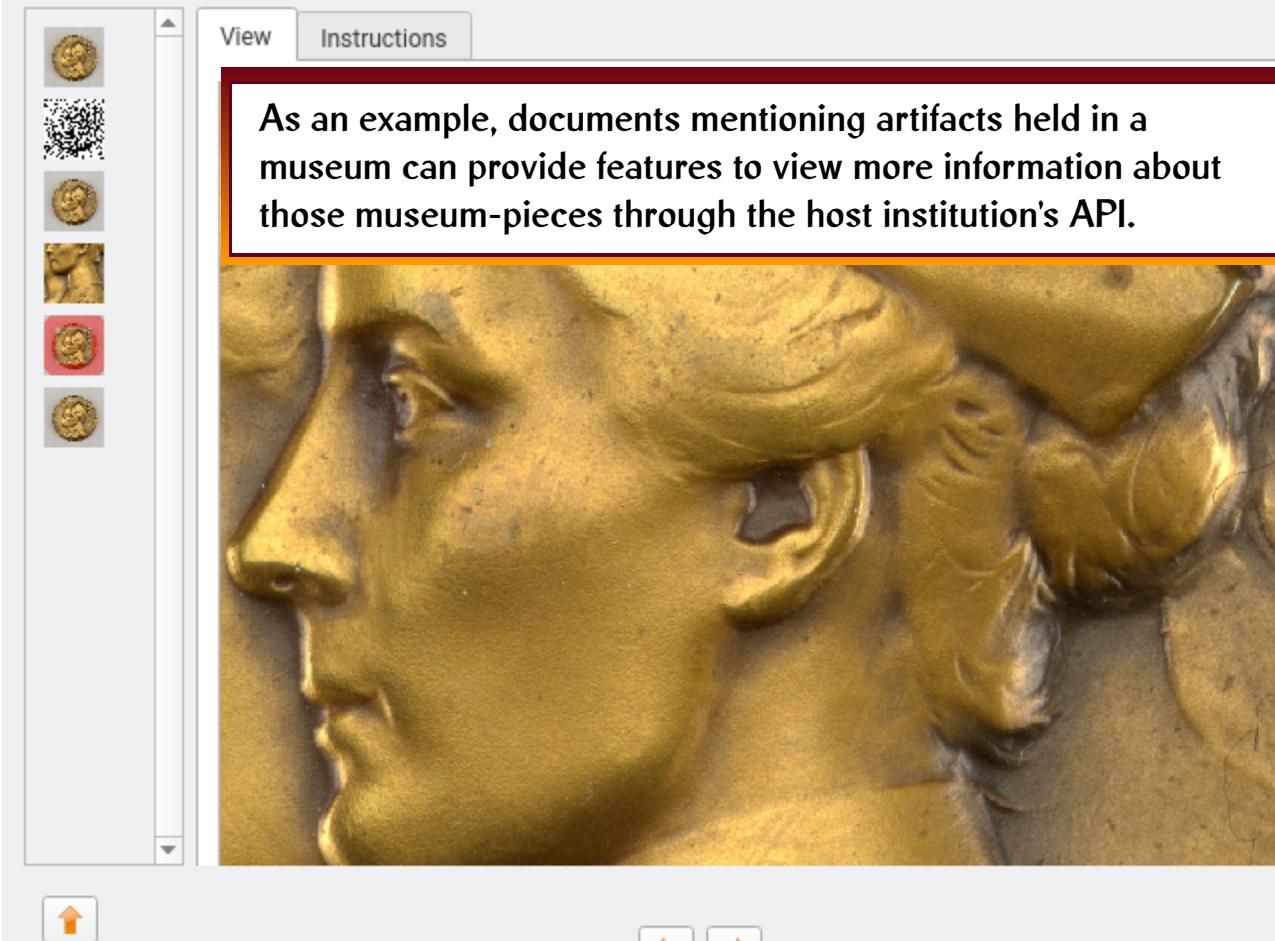
A3R Document Viewers as Embedded Components

Document Viewers may also be embedded in host applications which provide domain-specific visualization capabilities. For example, chemistry papers might be viewed within IQmol (a Qt-based molecular visualization program) via an A3R document-viewer plugin.

The screenshot shows the IQmol interface. At the top is a menu bar with 'Display', 'Build', 'Calculation', 'SONIC', and 'Help'. Below the menu is a toolbar with various icons. A context menu is open over a 3D molecular model, showing options like 'Configure', 'Select All', 'Reperceive Bonds', 'Duplicate Geometry', 'Atomic Charges', 'Remove', and 'SONIC'. The 'SONIC' option is highlighted. A sub-menu for 'SONIC' is open, showing 'Springer Keyword Search: Cysteine', 'Springer Web Search Home', and 'Search Saved Articles'. The main window displays a 3D ball-and-stick model of a cysteine molecule, with a red oxygen atom, a yellow sulfur atom, and several grey carbon and white hydrogen atoms. In the bottom left, there is a search interface for Springer, showing a search for 'Cysteine Proteases of Pathogenic Organisms' by M. W. Robinson and J. P. Dalton from 2011. The search results page shows 157 results. The URL 'www.springer.com/gp/search?query=cysteine&submit=Submit' is visible at the bottom of the search interface.

Document Viewers Augmented With APIs

Another strategy for interactive publications is linking documents with APIs maintained publishers, or by cultural or educational institutions.



View Instructions

As an example, documents mentioning artifacts held in a museum can provide features to view more information about those museum-pieces through the host institution's API.

MEDAL

 Click the icon to save

This is a **Medal**. We acquired it in 1920. It is a part of the **Product Design** department.

Cite this object as

Medal; bronze; 1920-3

Embedded Multimedia

Custom-built A3R document viewers can provide convenient access to multimedia content embedded in or linked to documents — including audio files, videos, and 3D graphics scenes or models.

Ailurus fulgens syriani (also known as *a. f. fulgens*). Only found in China (in the Hengduan Mountains in Sichuan and the East Nujiang River of Yunnan Province) and northern Myanmar.

The head and body length of red pandas averages 56 to 63 cm (22 to 25 in), and their tails about 37 to 47 cm (15 to 19 in).



Behavior

Red pandas are generally solitary, but there are a couple of cases where they develop extended associations with their mothers that last through the breeding season.



In terms of territoriality, red pandas tend to have overlapping ranges with other. This may be due to the fact that they search for their food in the same areas, which may be patchily distributed.

ark.org/red_panda/about-the-red-panda/

ARKIVE
www.arkive.org

Moving images copyright
© BBC Natural History Unit

Sound recordings copyright
© BBC Natural History Unit
© Natural FX

ScignSeer Video Player

Restart | Pause | Play

URL: file:///ext_root/videos/a.mp4

OK | Proceed | Cancel

Thank You!

Please contact Linguistic Technology Systems for more information about NA3 or other Software Development and Software Language Engineering solutions.

