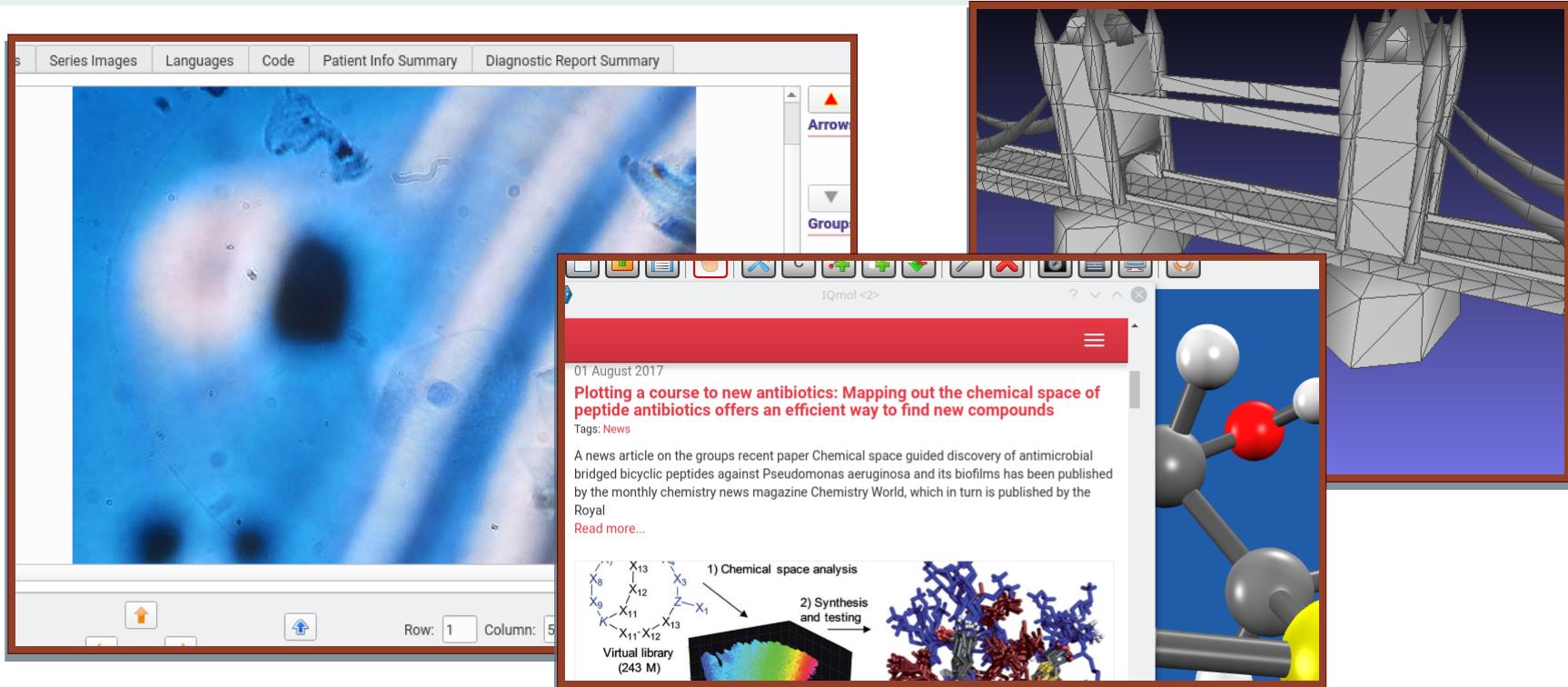


# The NCN/A3R ("NA3")

## Native Application Development Framework



Linguistic Technology Systems  
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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).

# The Qt Ecosystem

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).

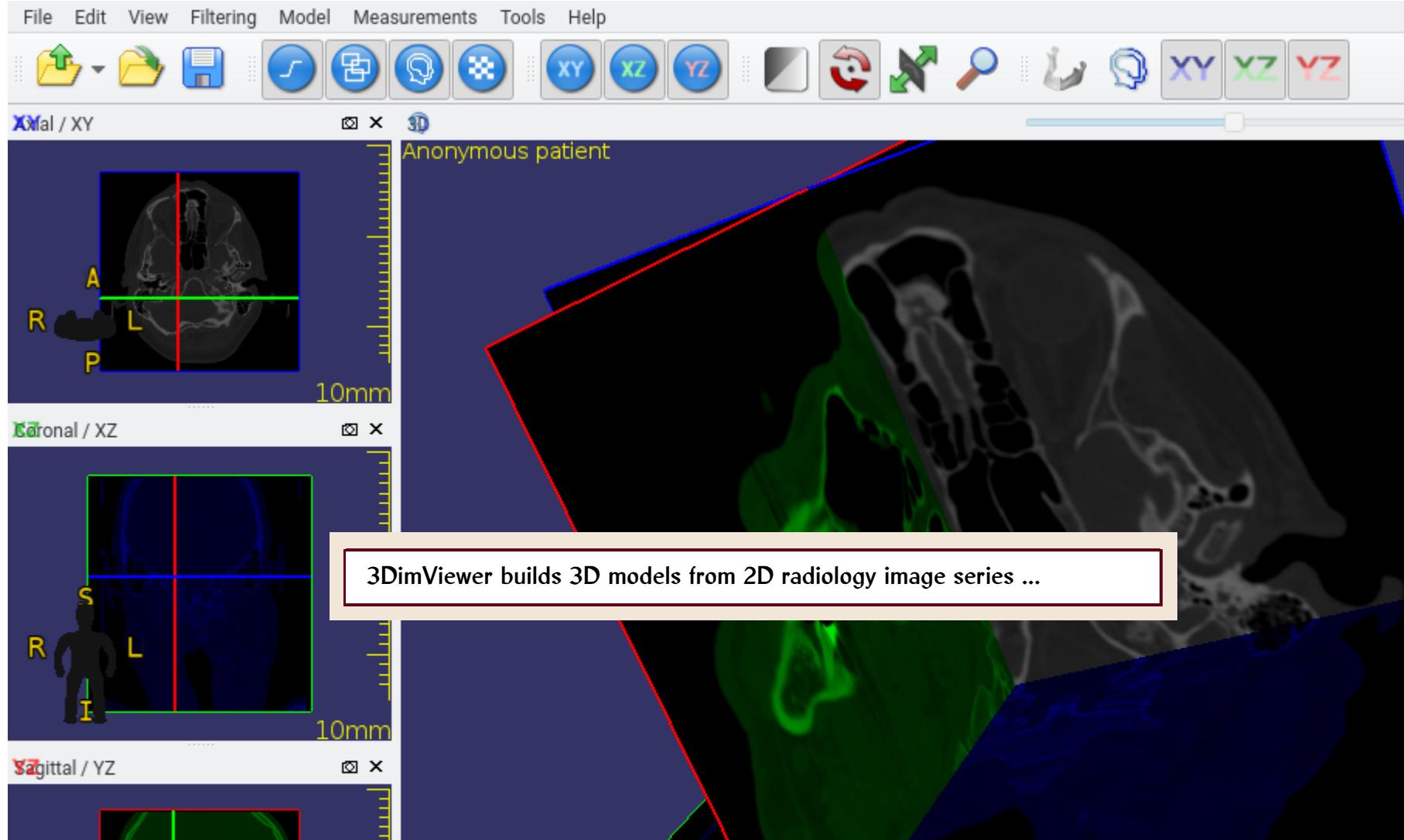
## Responsive, desktop-style applications for enhanced UX

*Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, and so on:*

- Compelling front-ends for e-commerce, Real Estate, VR, etc. (slides 11-17).
- For scientists and researchers, build innovative data-collection instruments as well as interactive Research Object applications (slides 8-10).

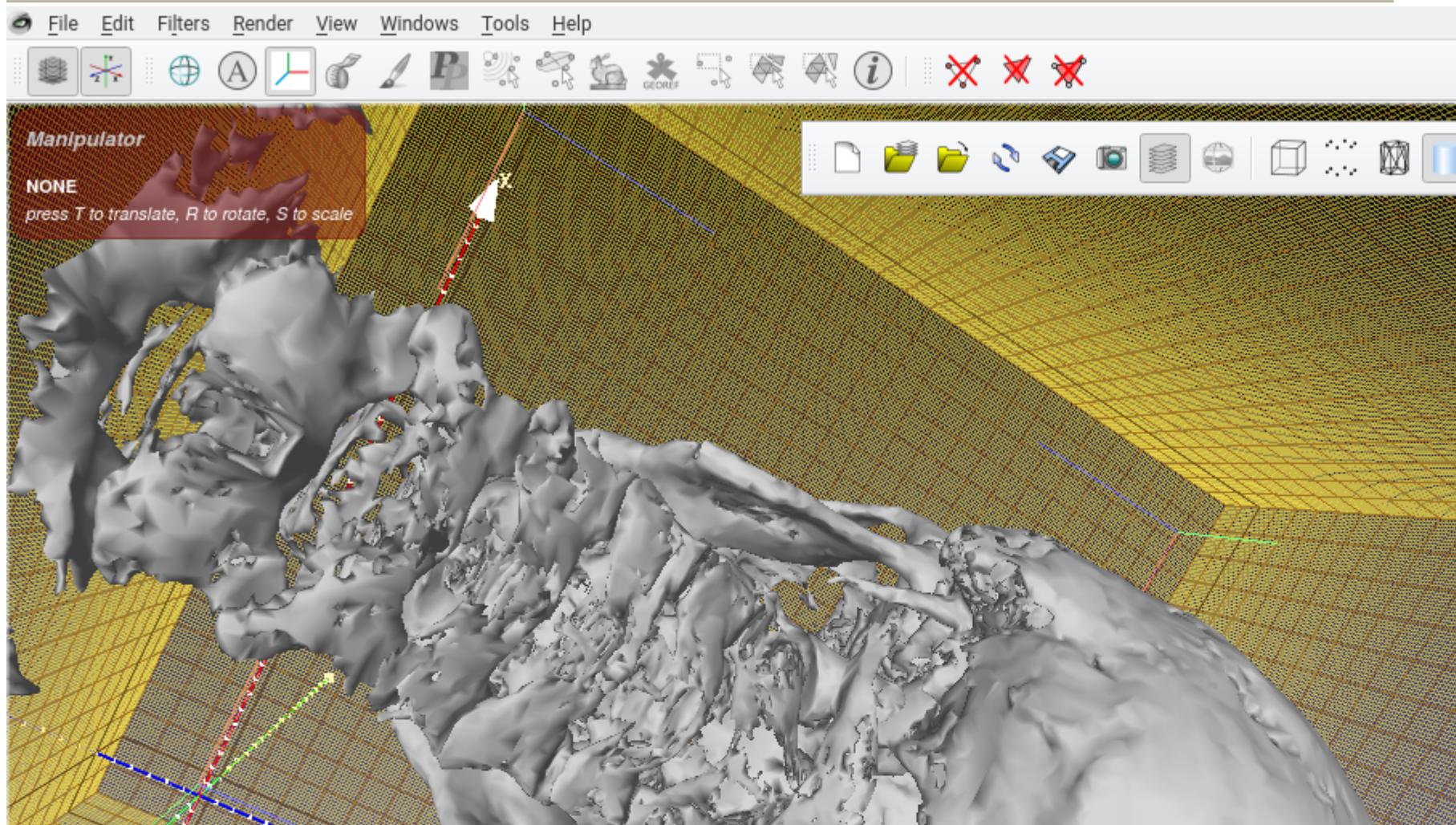
# An Example of Inter-Application Networking

This slide and the next demonstrates a case-study where inter-application data sharing enhances two applications' capabilities — 3DimViewer, a radiology tool, and MeshLab, a 3D graphics engine.



# 3D Graphics Sent to MeshLab

... Once the 3D tissue sample is constructed by 3DimViewer's algorithms, 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 < January 2018 >

Please List your Previous Stays

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

OK Print

January February March April May June July August September October

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

# Qt-Based Interactive Forms

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



# A3R Applications as Research Objects

Complementary to A3R components which facilitate *obtaining* research or experimental data, A3R “Data-Set Applications” are also powerful tools for visualizing and analyzing research findings.

Data-Set Applications are “Research Object Bundles” — combinations of code and data providing access to data sets without the need for external software.

The image shows a screenshot of the A3R application interface. At the top, there is a navigation bar with tabs: View, Instructions, Series Images, Languages, Code, Patient Info Summary, and Diagnostic Report Summary. Below the navigation bar is a toolbar with various icons for image processing and annotation. On the left, there is a vertical stack of small thumbnail images. The main central area displays a histology image of a cell with a prominent purple nucleus. A red arrow points to the right side of the nucleus. To the right of the image, there is a panel with several annotation tools: Arrows, Comments, Lists, Arcs, and Rulers. At the bottom, there are controls for Silhouette Zoom, Image Transforms, Annotations Transforms, and buttons for Pan, Zoom, and Slide.

# 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 window with a dark blue header bar at the top. Below the header, there is a large central image of two brown leather sneakers with white soles. A context menu is open over the right sneaker, listing options such as 'Detach Image', 'Detach Noteboook', 'Detach Description', 'Detach Everything' (which is highlighted in blue), 'Merge Windows', 'Explore Color Matches ...', 'View 3D Model ...', 'Take Screenshot', 'View Item List', and 'View Shopping Cart'. To the left of the main image, there is a vertical sidebar containing three small thumbnail images of different shoe styles. At the bottom of the screen, there is a navigation bar with tabs labeled 'Overview', 'Features', 'Specs', and 'Reviews'. The 'Overview' tab is currently selected. Below the navigation bar, there is a bulleted list of product features: 'Leather upper', 'Lace-up', and 'Round toe'. On the right side of the screen, there is a detailed product description for the 'Grand Crosscourt II Sneaker' from Cole Haan, followed by a section titled 'Actions' with links to 'Add to Cart' and 'Explore Colors', and two small color swatches for the shoes.

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 can be multi-dimensional, multiple-window interactive displays.

The screenshot illustrates a multi-dimensional shopping cart interface, likely from a software application named 'tecs-db'. The interface features a top navigation bar with links for File, Email, Events, APIs, Web, and Broadleaf. Below this is a toolbar with a 'Page' dropdown set to 0, a search bar, and a zoom level of 100%.

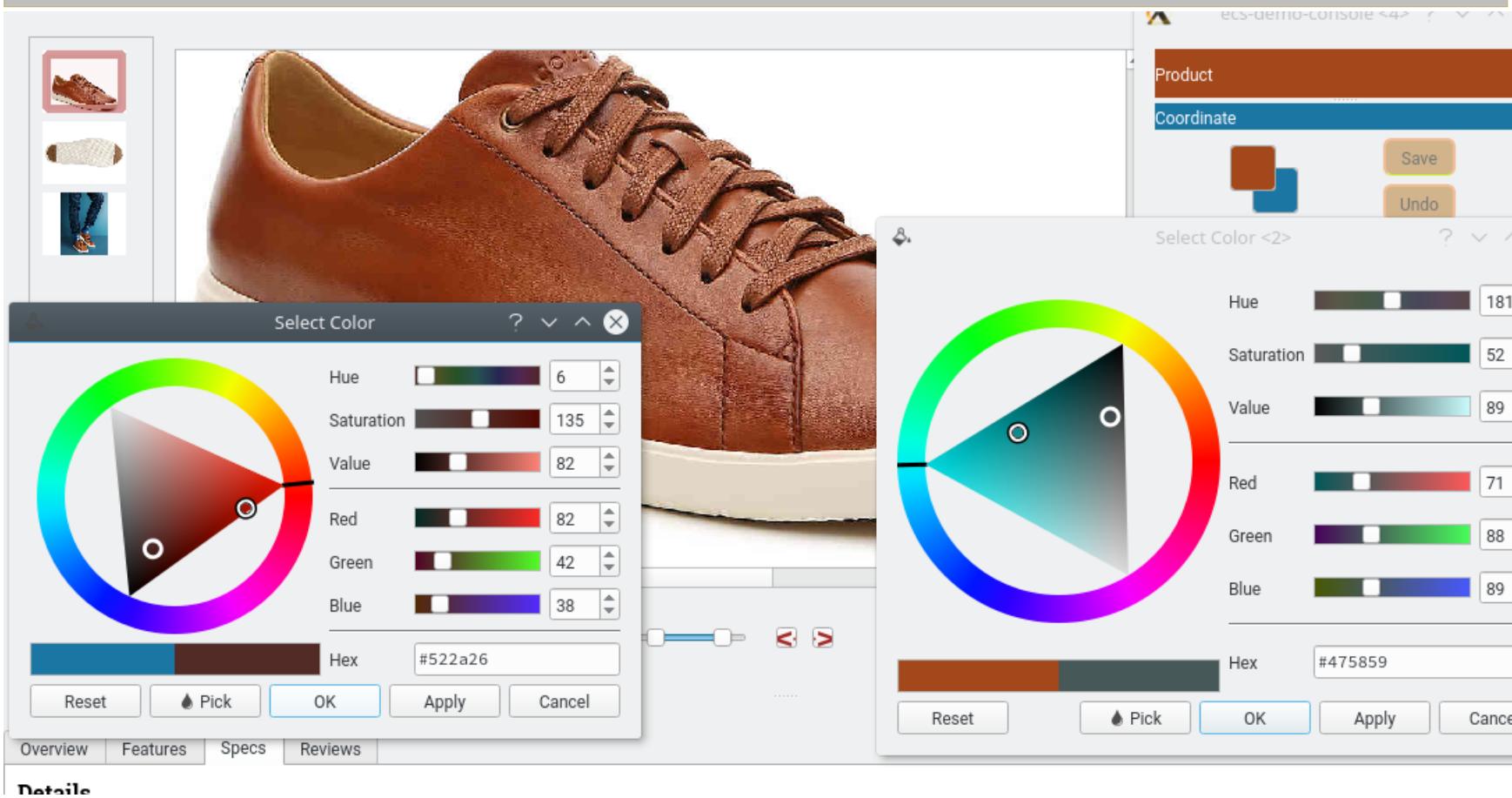
Two product windows are open:

- Window 1 (Left):** Displays a bouquet of purple peonies. The product details on the left are:
  - Lily Garden Silk Peony Bouquet
  - Home Decoration
  - Lilac, 18 Inches High
- Window 2 (Right):** Displays a large bouquet of pink hydrangeas. The product details on the right are:
  - Frosted Hydrangea, Mauve, 32 Inches High, 12 Floral Sprays

Both windows include tabs for Overview, Specs, Reviews, and Q & A, and feature 'OK' and 'Cancel' buttons at the bottom.

# 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

A3R programming can also bring enhanced UX to Real Estate presentations — instead of just groups of photos, properties may be displayed via interactive, multidimensionally-organized, color-coded photo viewers.

The screenshot shows a software interface titled "rpdf-emb-console". On the left, there is a grid of thumbnail images representing different rooms of a house. A specific thumbnail in the middle row is highlighted with a red border and has an arrow pointing to it from a callout box. This callout box contains the text "Color-Coded Groups". To the right of the grid is a large image of a master bedroom with green walls, wooden furniture, and a large bed. Overlaid on this image is another callout box containing the text "Current Photo". At the bottom of the screen, there is a navigation bar with arrows, the text "Item: 19", and a zoom slider. On the far left, a sidebar titled "Groupings" lists eight categories, each associated with a colored bar: Entrance/Foyer/Hall (teal), Kitchen/Dining Room (yellow-green), Living Room/Den (purple), Bath/Powder Room (blue-gray), Bedroom/Closet (teal), Master Bedroom/Spa (light green), and Basement/Game Room (gray).

Groupings

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

Current Photo

Color-Coded Groups

Item: 19

Image Zoom:

OK Cancel

# Photo Viewer Interactive Cues

These slides demonstrate visual cues to aid photo navigation, such as color bands (overlays) 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 (surrounding the thumbnail and any overlays).

The screenshot shows a photo viewer interface with a grid of thumbnails on the left and a large preview window on the right.

- Already Viewed (vertical color band):** A callout points to a thumbnail in the top row where a vertical purple bar overlaps it, indicating it has been viewed.
- Not Yet Viewed (horizontal color band):** A callout points to a thumbnail in the middle row where a horizontal purple bar overlaps it, indicating it has not yet been viewed.
- Current Photo (viewed for the second time):** A callout points to the thumbnail in the bottom-left corner, which is surrounded by a thick purple border, indicating it is the current photo being viewed.

**Groupings:**

- Entrance/Foyer/Hall (purple)
- Kitchen/Dining Room (green)
- Living Room/Den (blue)
- Bath/Powder Room (orange)
- Bedroom/Closet (light blue)
- Master Bedroom/Spa (yellow-green)
- Basement/Game Room (grey)

Item: 10    Image Zoom:

# 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 (note the check-box buttons on the group listing).

The screenshot shows a photo viewer interface with a sidebar of thumbnail images and a main viewing area.

**Visible Groups:** An arrow points from this text to the "Entrance/Foyer/Hall" checkbox in the "Groupings" list, which is highlighted with a green oval.

**Check Boxes:** This label points to the "Groupings" list itself, which contains the following items:

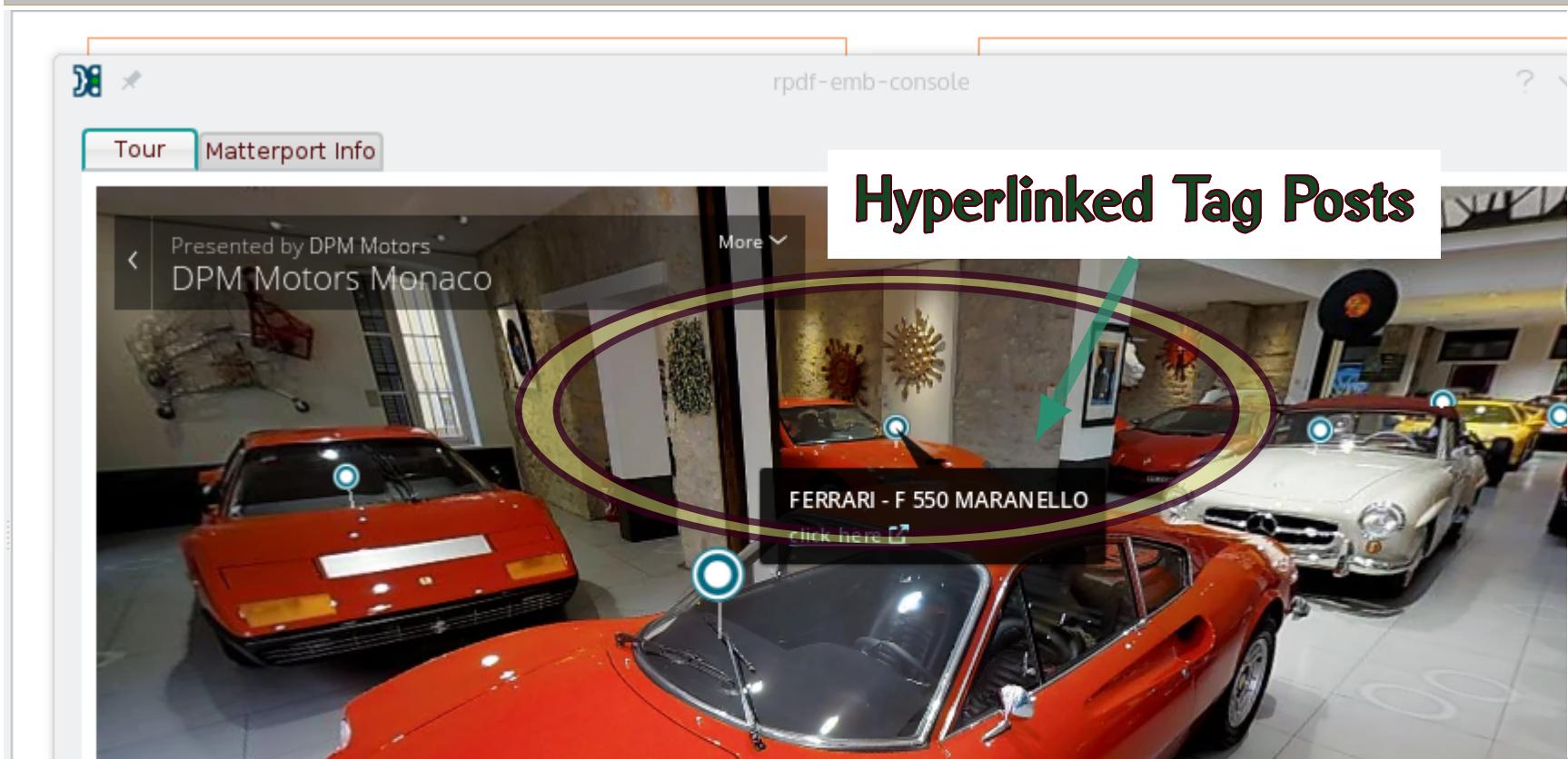
- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

**Hidden Groups:** An arrow points from this text to the "Bath/Powder Room" and "Basement/Game Room" checkboxes, which are circled in red.

Below the list are navigation arrows, an "Item: 3" indicator, an "Image Zoom:" slider, and "OK" and "Cancel" buttons.

# 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 Matterport, 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 fully realized via Virtual Reality engines (such as WebGL) 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.

The screenshot shows a digital journal interface. At the top, there are three icons: a gear, a stack of books, and a book with glasses. Below the icons are links for 'References', 'Library', and 'Reading'. A navigation bar below these links includes tabs for 'HTML Source', 'Lisp', 'CSS', and 'XML'. The main content area features a large red rectangular placeholder. Below this placeholder, the text 'Read article view' is visible. At the bottom of the page, there is a navigation bar with a left arrow, a right arrow, and a central search or filter icon.

## ANTHROPOLOGY AND HUMANISM

[Explore this journal >](#)

### Ethnographer as Apprentice: Embodying omusical Knowledge in South India

da Weidman

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

The screenshot shows a digital journal interface with a sidebar on the left. The sidebar includes a 'Display Tala Types' dropdown set to 'Jhoomra/Dhamar (14 beats)', a 'Patterns' section with a slider between 'Pattern 1 (3-4-3-4)' and 'Pattern 2 ()', a 'File' input field containing the path '/extension/ScignSeer/articles/svg/tala.svg', and a 'Proceed' button. The main content area displays a visual representation of musical patterns. It consists of two horizontal rows of colored boxes. The top row has 14 red boxes. The bottom row has 14 boxes, with colors alternating between purple, green, and light blue. The entire visualization is contained within a scrollable window with a vertical scrollbar on the right.

Volume 37, Issue 2  
December 2012  
Pages 214-235



# 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 program for molecular visualization and physical/chemical analysis) via an A3R document-viewer plugin.

The screenshot shows a chemistry application interface. At the top is a menu bar with options: Display, Build, Calculation, SONIC, and Help. Below the menu is a toolbar with various icons. On the left, there's a vertical sidebar with a "Springer" logo and some search results. A context menu is open over a 3D ball-and-stick model of a molecule, showing options like "Configure", "Select All", "Reperceive Bonds", "Duplicate Geometry", "Atomic Charges", and "Remove". A sub-menu for "SONIC" is also open, listing "Springer Keyword Search: Cysteine", "Springer Web Search Home", and "Search Saved Articles". The main area displays a 3D molecular model of cysteine (a thiol). In the bottom right corner, there's a small search results window titled "SONIC Results" showing 157 results for "Cysteine Proteases of Pathogenic Organisms". The results list includes the book title, authors (Robinson, M. W. (Ed), Dalton, J. P. (Ed)), and a brief description: "Cysteine proteases expressed by pathogenic organisms play key roles in virulence including host". At the very bottom, there's a URL: [www.springer.com/gp/search?query=cysteine&submit=Submit](http://www.springer.com/gp/search?query=cysteine&submit=Submit).

# 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

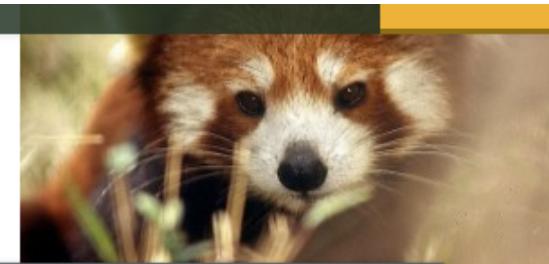
Row: 0 Column: 0

# 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 styani* (also known as *a. f. refulgens*). 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 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 different areas, which may be patchily distributed.

[ark.org/red\\_panda/about-the-red-panda/](http://ark.org/red_panda/about-the-red-panda/)

so they  
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ARKIVE  
www.arkive.org

Moving images copyright  
© BBC Natural History Unit

Sound recordings copyright  
© BBC Natural History Unit  
© Natural FX

Restart Pause Play

URL file:///ext\_root/videos/a.mp4

OK Proceed Cancel

February 3, 2020 21 / 22

# Thank You!

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

