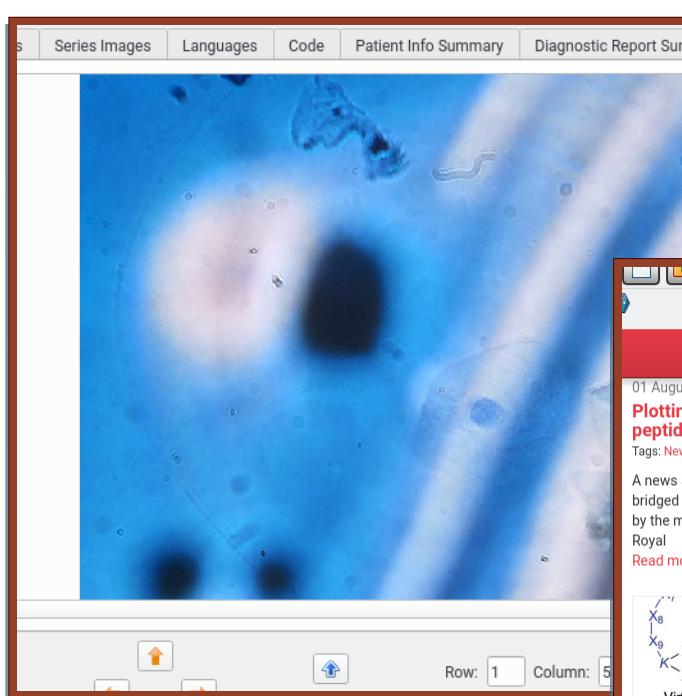


# The NCN/A3R ("NA3")

## Native Application Development Framework



A screenshot of a software interface. On the left, there is a 3D molecular model of a peptide antibiotic. On the right, a news article from Chemistry World is displayed, titled "Plotting a course to new antibiotics: Mapping out the chemical space of peptide antibiotics offers an efficient way to find new compounds". The article discusses the use of chemical space analysis and synthesis to discover new antibiotics. A small inset diagram shows a 3D plot of chemical space with axes labeled X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, and Z. The plot is labeled "Virtual library (243 M)".

Linguistic Technology Systems  
POC: Amy Neustein, Ph.D.  
Founder and CEO  
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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

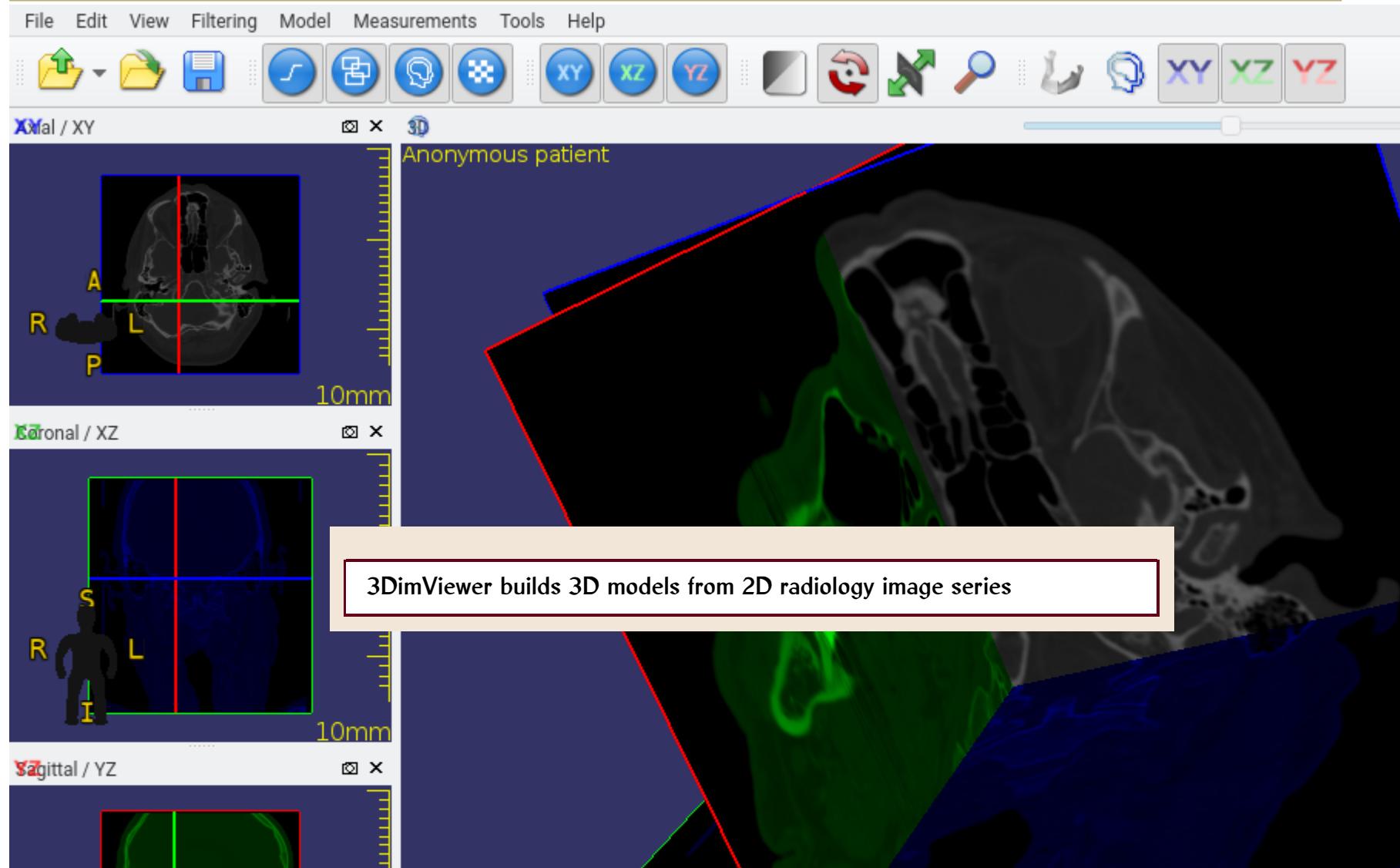
- Export data and instructions between Qt-based applications (slides e-e).
- Embed document or multi-media viewers inside scientific or dataset applications (slides e-e).

## Responsive, desktop-style applications for enhanced UX

- Compelling front-ends for e-commerce, Real Estate, VR, etc. (slides e-e).
- 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 e-e).

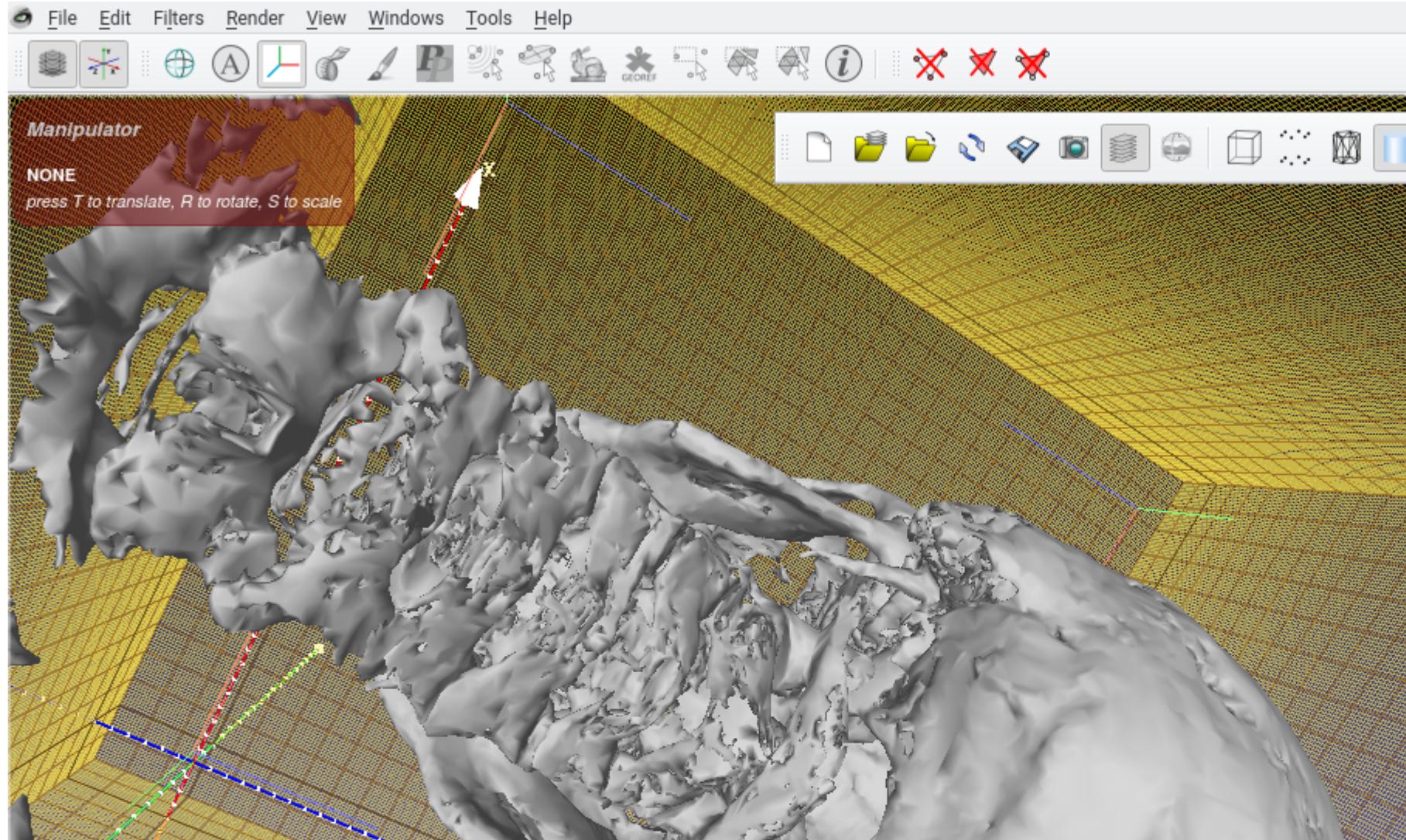
# An Example of Inter-Application Networking

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 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

The screenshot shows a medical form application interface. At the top, there's a menu bar with 'Forms', 'Web', 'Language', 'Help', and 'About'. Below the menu are several buttons: 'Save Form', 'Open Form' (which is highlighted in orange), 'Cloud Save', 'Cloud Open', and 'Submit Form'. There are also buttons for 'Page: 0', 'Search for:', and 'Forwards'. On the left, there's a sidebar with tabs: 'Welcome' (selected), 'Web', 'X', '?', '^', 'X', 'Form Outline', and a note 'Click on a subheading to continue'. Below this are several red-link buttons: 'Patient Information', 'Chief Complaint', 'Review of Symptoms', 'Treatment History', 'Medical History', 'Current Medications', and 'Family History'. A central modal window titled 'ndp-main-outline <5>' contains fields for 'Referring Doctor' (Dr. New Test) and 'Referred By (Choose One)' (Clinical Specialist). It also has a date picker set to '1/9/16' with a calendar view for January 2018. The calendar shows previous stays with entries 'Test 2' on Jan 1st and 'Test 1' on Jan 21st. Buttons at the bottom of the modal are 'OK' and '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 shows a central image of a cell with a red arrow pointing to its nucleus. To the left is a vertical stack of small thumbnail images. To the right are toolbars for Arrows, Comments, Lists, Arcs, and Rulers. At the bottom are controls for Silhouette Zoom, Image Transforms, Annotations Transforms, and various movement and rotation buttons.

Silhouette Zoom:

Image Transforms ...

Annotations Transforms ...

Pan      Zoom      Slide

Pan      Rotate      Zoom

# 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's a sidebar with three small thumbnail images of shoes. The main area features a large, detailed image of a brown leather sneaker with white laces and a white sole. A context menu is open over the image, listing options like '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'. At the bottom of the main window, there are navigation controls for 'Item: 3' (with arrows), 'Image Zoom' (with a slider), and zoom-in/out icons. Below the main image, there are tabs for 'Overview', 'Features', 'Specs', and 'Reviews'. Under the 'Overview' tab, there's a bulleted list: '• Leather upper', '• Lace-up', and '• Round toe'. To the right of the main image, there's 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's a heading 'Actions:' followed by two blue links: 'Add to Cart' and 'Explore Colors'. There are also two small circular icons below the text.

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](#)

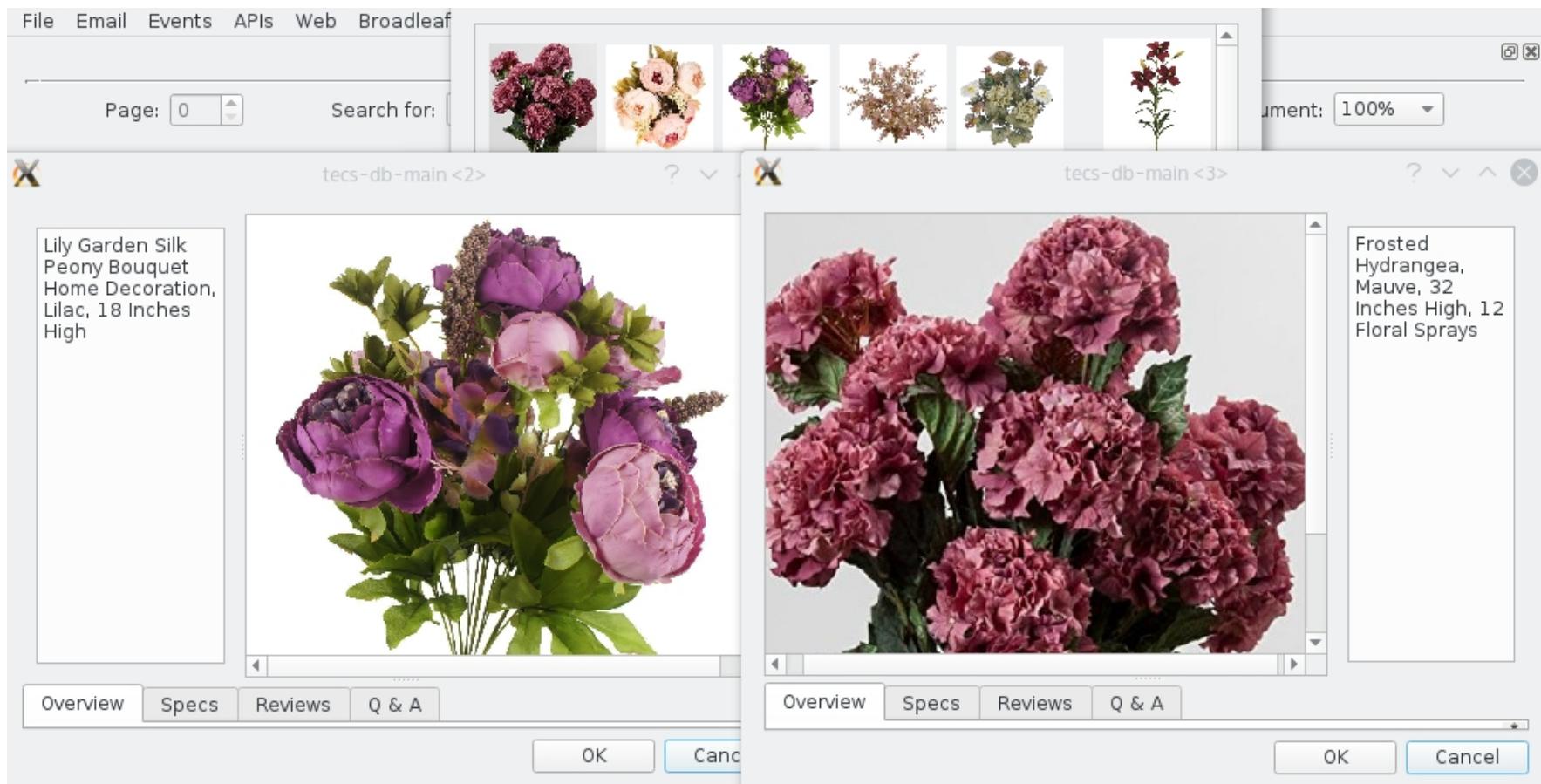
Item: 3 Image Zoom:

Overview Features Specs Reviews

- Leather upper
- Lace-up
- Round toe

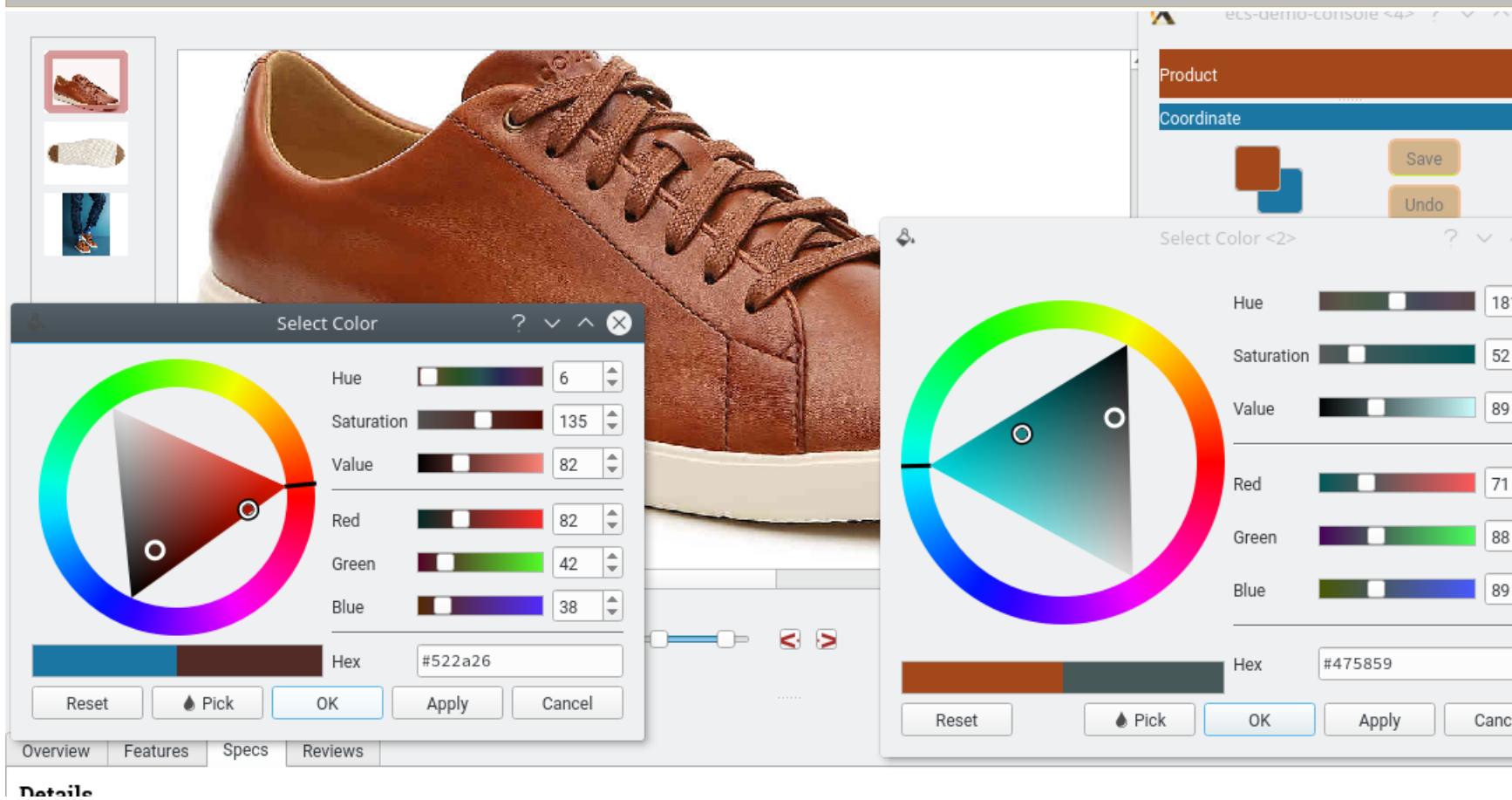
# Interactive “Shopping Carts”

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 software interface titled "rpdf-emb-console". On the left, there is a grid of thumbnail images representing different rooms of a house. On the right, a larger image of a master bedroom is displayed. A callout box labeled "Current Photo" points to the large image. Below the large image, there are navigation arrows, an item counter (Item: 19), and zoom controls. To the left of the main content area, a sidebar titled "Groupings" lists categories for the photo grid, each associated with a colored bar: Entrance/Foyer/Hall (teal), Kitchen/Dining Room (yellow-green), Living Room/Den (purple), Bath/Powder Room (blue), Bedroom/Closet (dark blue), Master Bedroom/Spa (light green), and Basement/Game Room (grey).

rpdf-emb-console

Groupings

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

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:

- Thumbnail Grid:** A grid of 40 small thumbnail images representing different rooms.
- Groupings:** A sidebar on the left lists room categories with corresponding colored horizontal bars:
  - Entrance/Foyer/Hall (teal)
  - Kitchen/Dining Room (yellow-green)
  - Living Room/Den (purple)
  - Bath/Powder Room (dark blue)
  - Bedroom/Closet (light blue)
  - Master Bedroom/Spa (light green)
  - Basement/Game Room (grey)
- Current Photo:** A large image of a living room with two brown leather sofas, a large ottoman, and a kitchen area in the background. The image has a thick yellow border.
- Navigation:** Buttons for previous and next photos, and a zoom control.
- Item Counter:** Shows "Item: 10".
- Image Zoom:** A slider for adjusting the image size.

Annotations with arrows point to specific elements:

- An arrow points from the text "Already Viewed (vertical color band)" to the teal bar under "Entrance/Foyer/Hall".
- An arrow points from the text "Not Yet Viewed (horizontal color band)" to the yellow-green bar under "Kitchen/Dining Room".
- An arrow points from the text "Current Photo (viewed for the second time)" to the thick yellow border around the current photo thumbnail.

# 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 screenshot shows a photo viewer interface with a sidebar of thumbnails on the left and a large preview area on the right. The sidebar includes a 'Groupings' section with checkboxes for various room categories. Two categories are highlighted: 'Entrance/Foyer/Hall' (circled in green) and 'Basement/Game Room' (circled in red). Arrows point from these circled items to labels 'Visible Groups' and 'Hidden Groups' respectively. The preview area shows a living room with a sofa, coffee table, and large windows. At the bottom, there are navigation buttons, an item counter (Item: 3), an image zoom slider, and an 'OK' button.

**Visible Groups**

**Hidden Groups**

Groupings

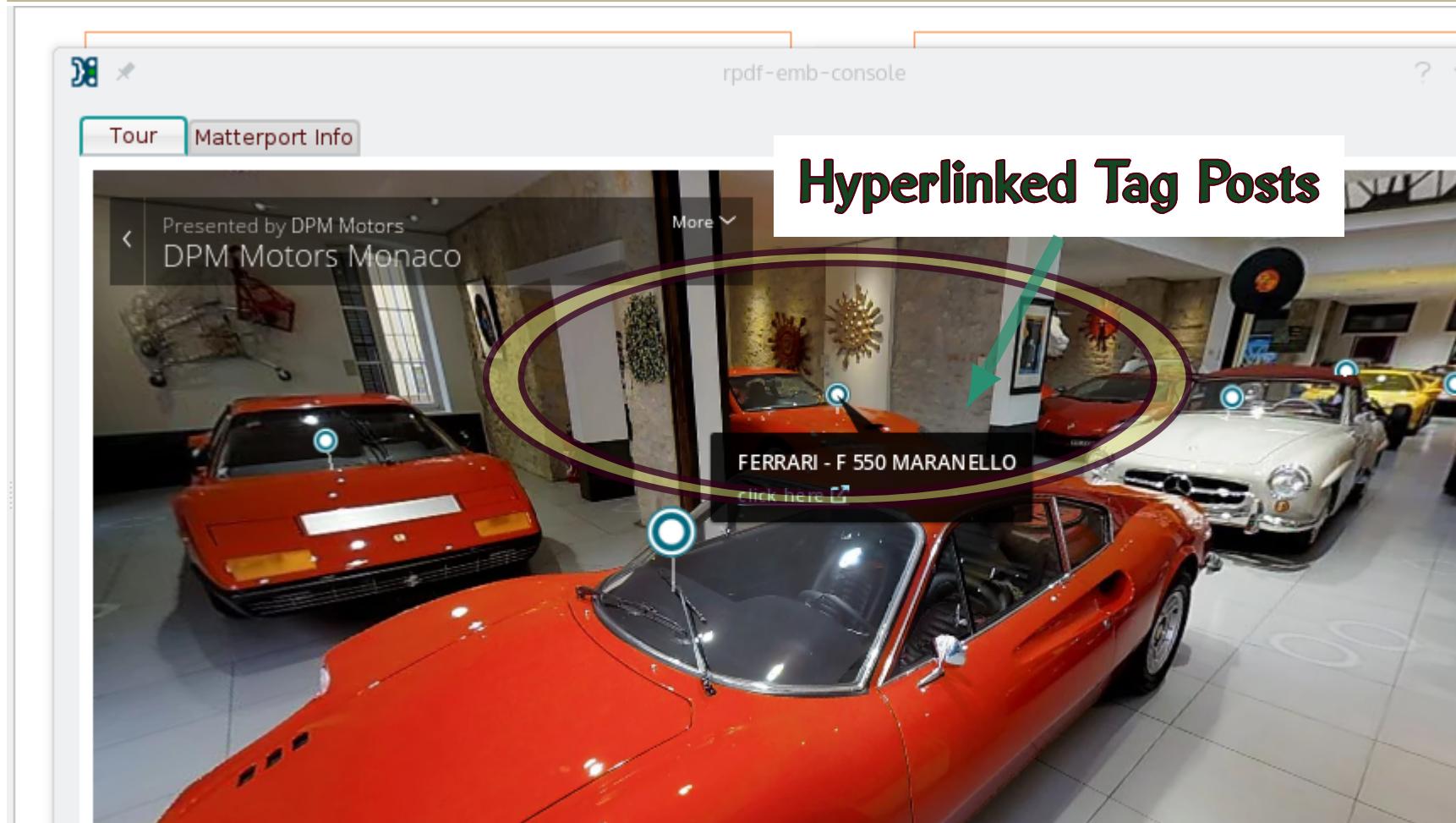
- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

Item: 3      Image Zoom:

OK

# 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.

Preferences Library Reading

HTML Source Lisp CSS XML

Red rectangular placeholder area

## ANTHROPOLOGY AND HUMANISM

[Explore this journal >](#)

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

da Weidman

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

0.1111/j.1548-1409.2012.01131.x [View/save citation](#)

Display Tala Types: Jhoomra/Dhamar (14 beats)

Separate

Patterns

Pattern 1 (3-4-3-4) ————— Pattern 2 (

File /extension/ScignSeer/articles/svg/tala.svg

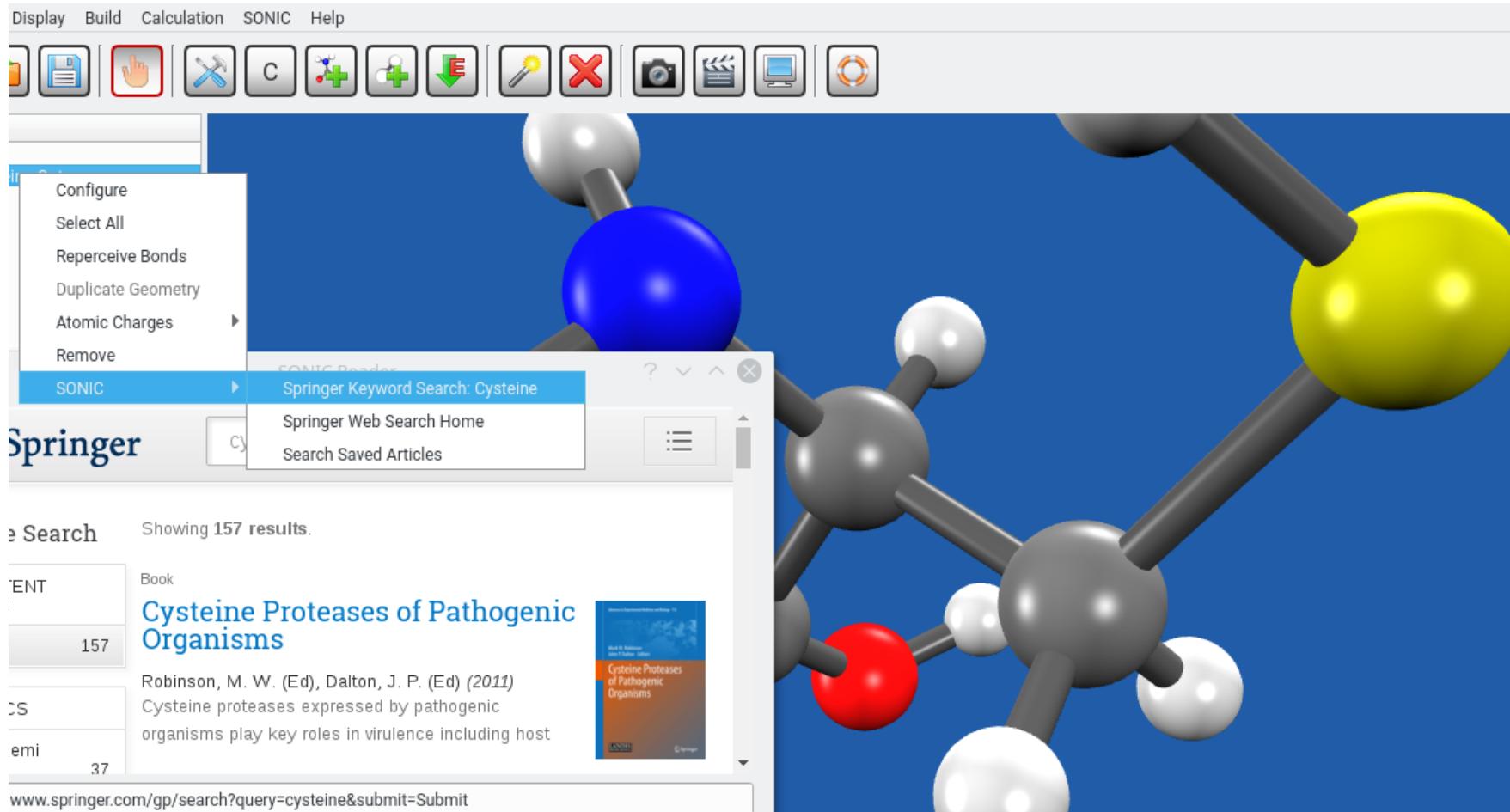
Proceed

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 molecular visualization program) via an A3R document-viewer plugin.



# 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  
is a part of the **Product D**  
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 syriani* (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 their search for the best food sources, which are patchily distributed across their habitat.

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

ScignSeer Video Player

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

# Thank You!

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

