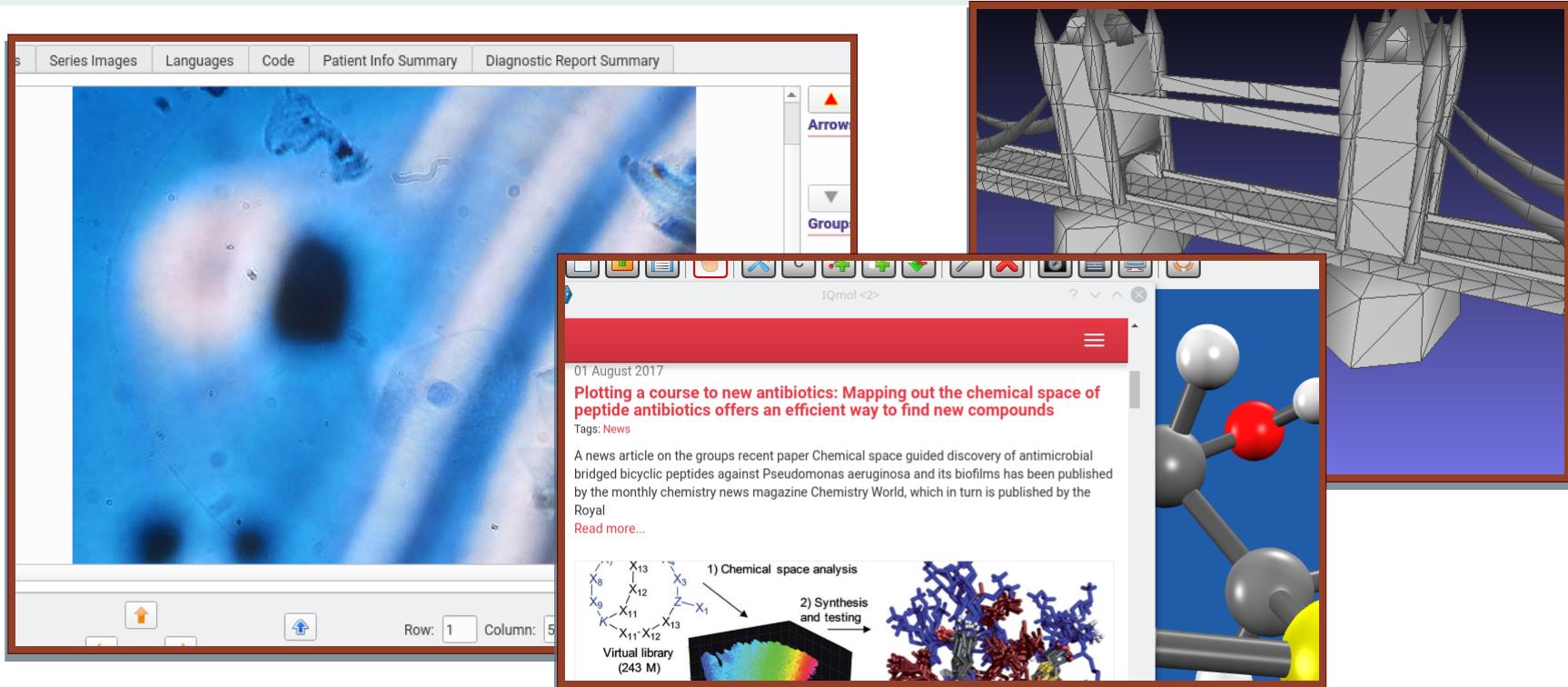


# The NCN/A3R ("NA3")

## Native Application Development Framework



Linguistic Technology Systems  
POC: Amy Neustein, Ph.D.  
Founder and CEO  
[amy.neustein@verizon.net](mailto: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).

# 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).

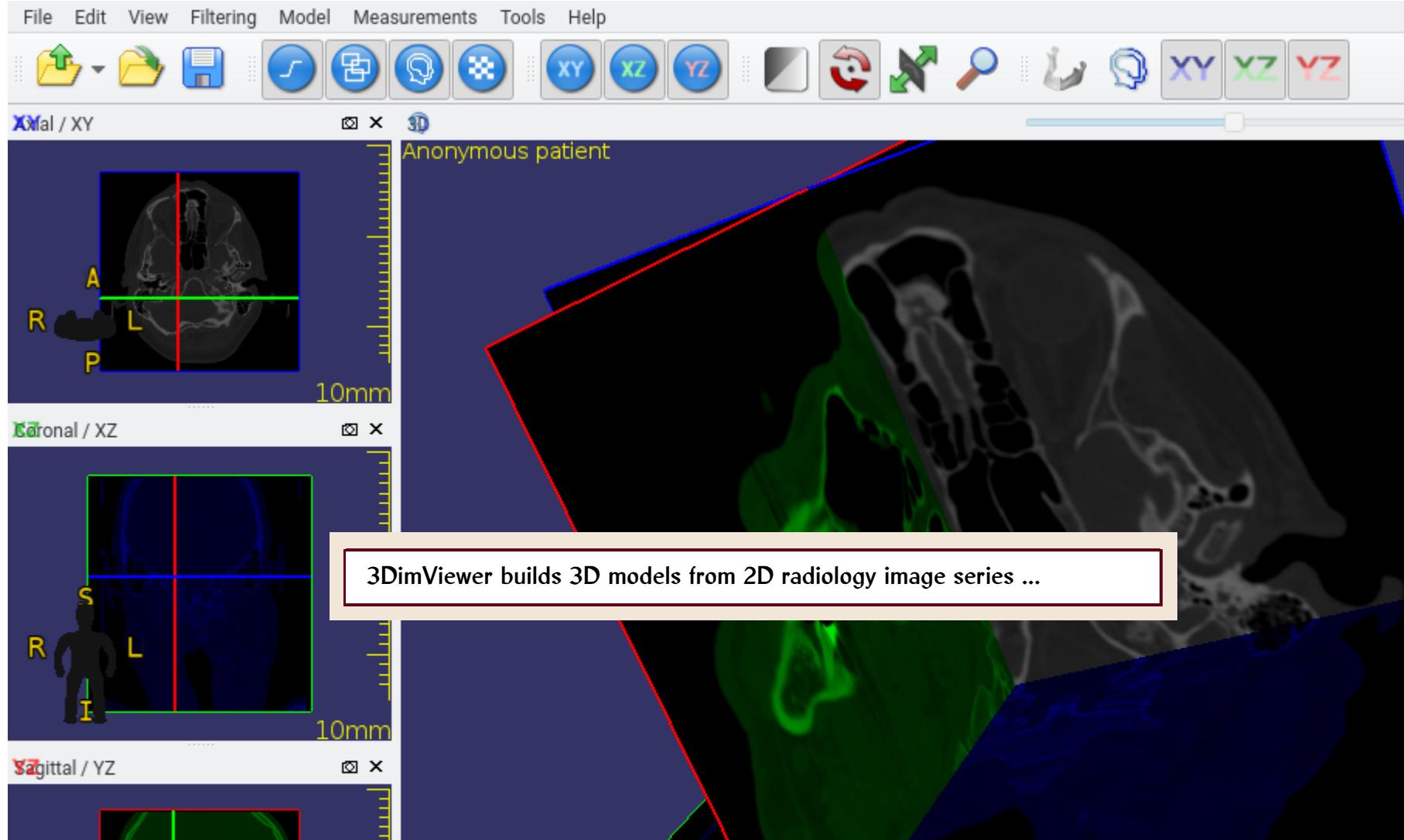
## Responsive, desktop-style applications for enhanced UX

*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).

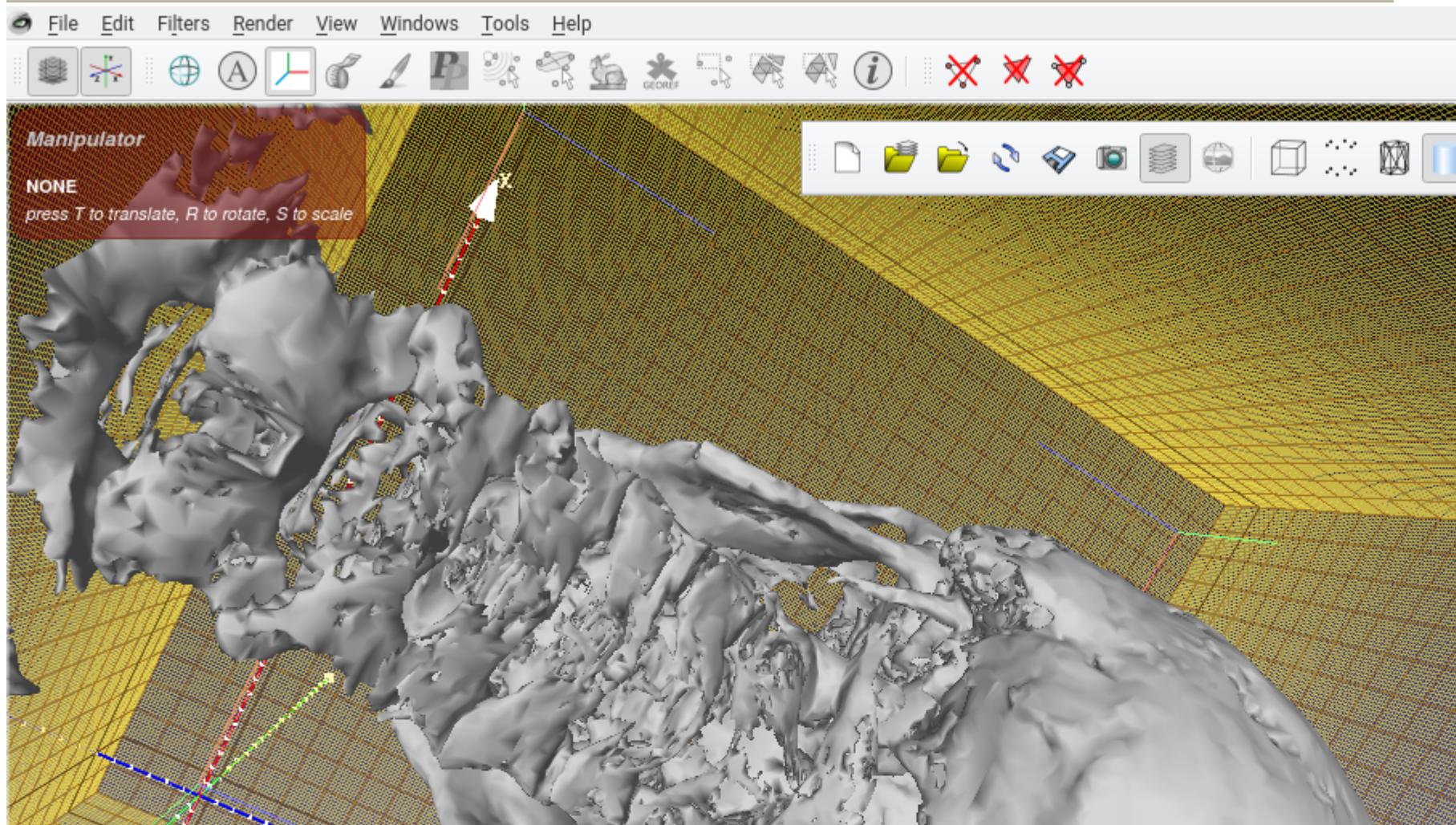
# An Example of Inter-Application Networking

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					6
7	8					13
14	15					20
21	22					27
28	29					3
4	5					10

OK Print

The screenshot shows a software interface for data collection. 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' (set to 0) and 'Search for' with a dropdown for 'Forwards'. On the left, a sidebar lists sections: 'Welcome' (highlighted in green), 'Web', 'X', '?', '^', 'X', 'Form Outline', and a note 'Click on a subheading to continue'. Below this is a vertical list of sections in red: 'Patient Information', 'Chief Complaint', 'Review of Symptoms', 'Treatment History', 'Medical History', 'Current Medications', and 'Family History'. A central 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 of Visit' field set to '1/9/16' with a calendar overlay. The calendar shows the month of January 2018, with days from 1 to 31. Two specific dates are highlighted with pink boxes: '1 Test 2' on January 1st and '2 Test 1' on January 21st. The calendar also shows the days of the week (Sun-Sat) and the months of the year (January through October).

In medicine and social science, “data collection instruments” (DCIs) refers 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](#)

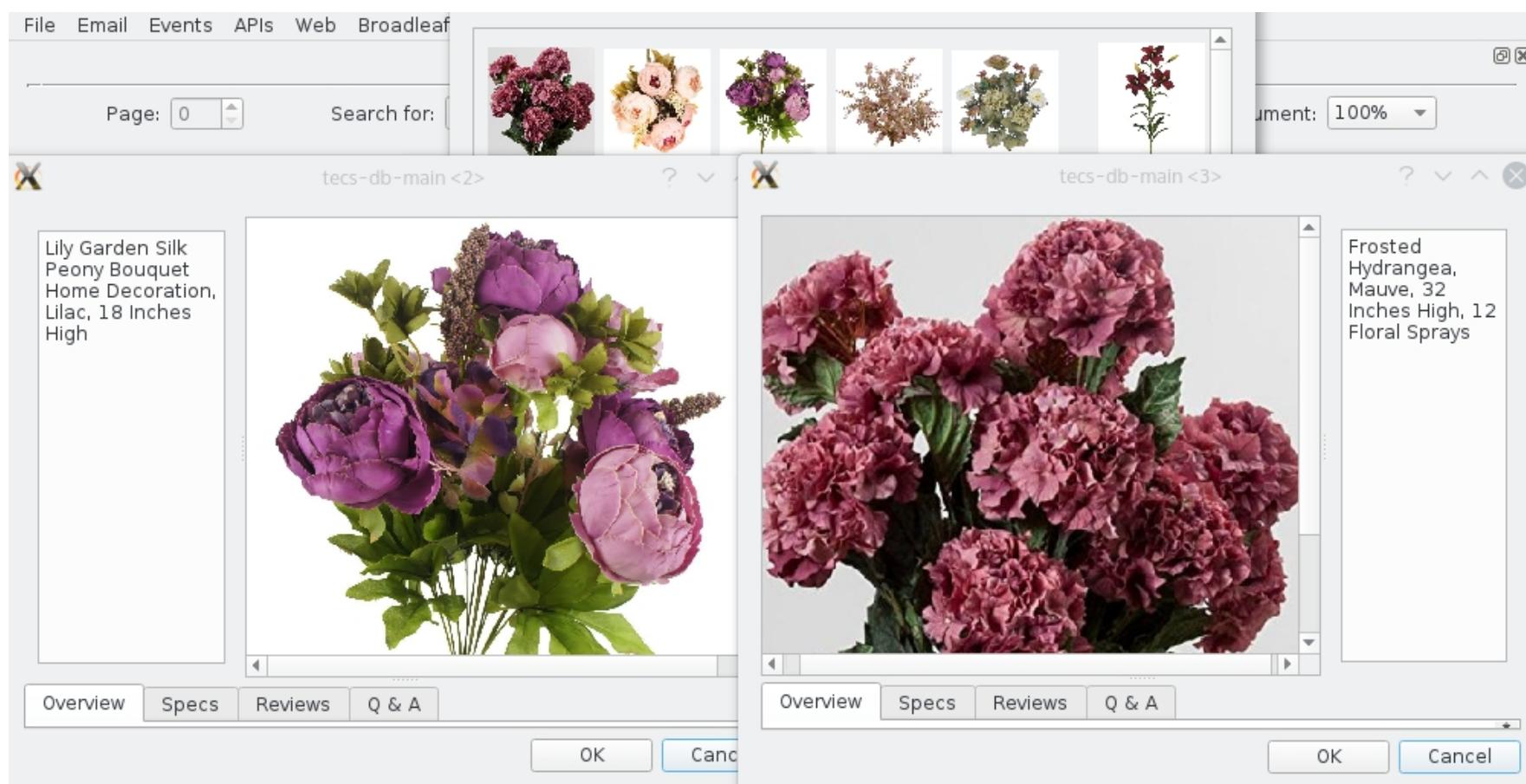
Item: 3    Image Zoom: ↔ ↔

Overview Features Specs Reviews

- Leather upper
- Lace-up
- Round toe

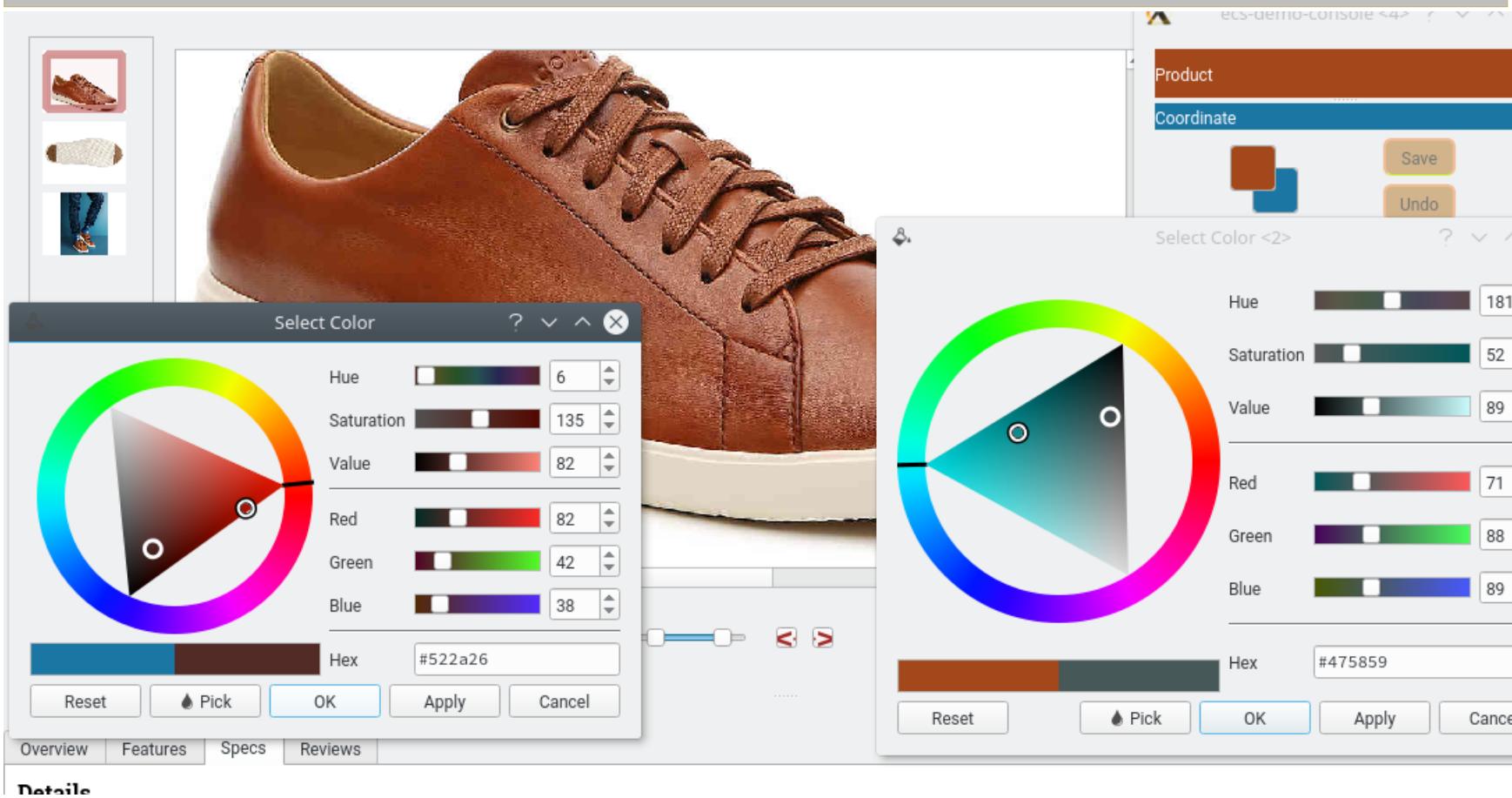
# Interactive “Shopping Carts”

Instead of static lists, shopping carts 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

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, a wooden bed, and a chaise lounge. A white overlay box on this image contains the text "Current Photo". At the bottom of the screen, there are navigation controls (left/right arrows), an item counter ("Item: 19"), an "Image Zoom" slider, and standard window control buttons ("OK", "Cancel").

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 (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 list below, which is highlighted with a green oval.

**Check Boxes:** This label points to the list of room categories on the left, each with a corresponding checkbox. Some checkboxes are checked (green), while others are unchecked (grey).

**Hidden Groups:** An arrow points from this text to the "Basement/Game Room" checkbox in the list below, which is highlighted with a red oval.

**Groupings**

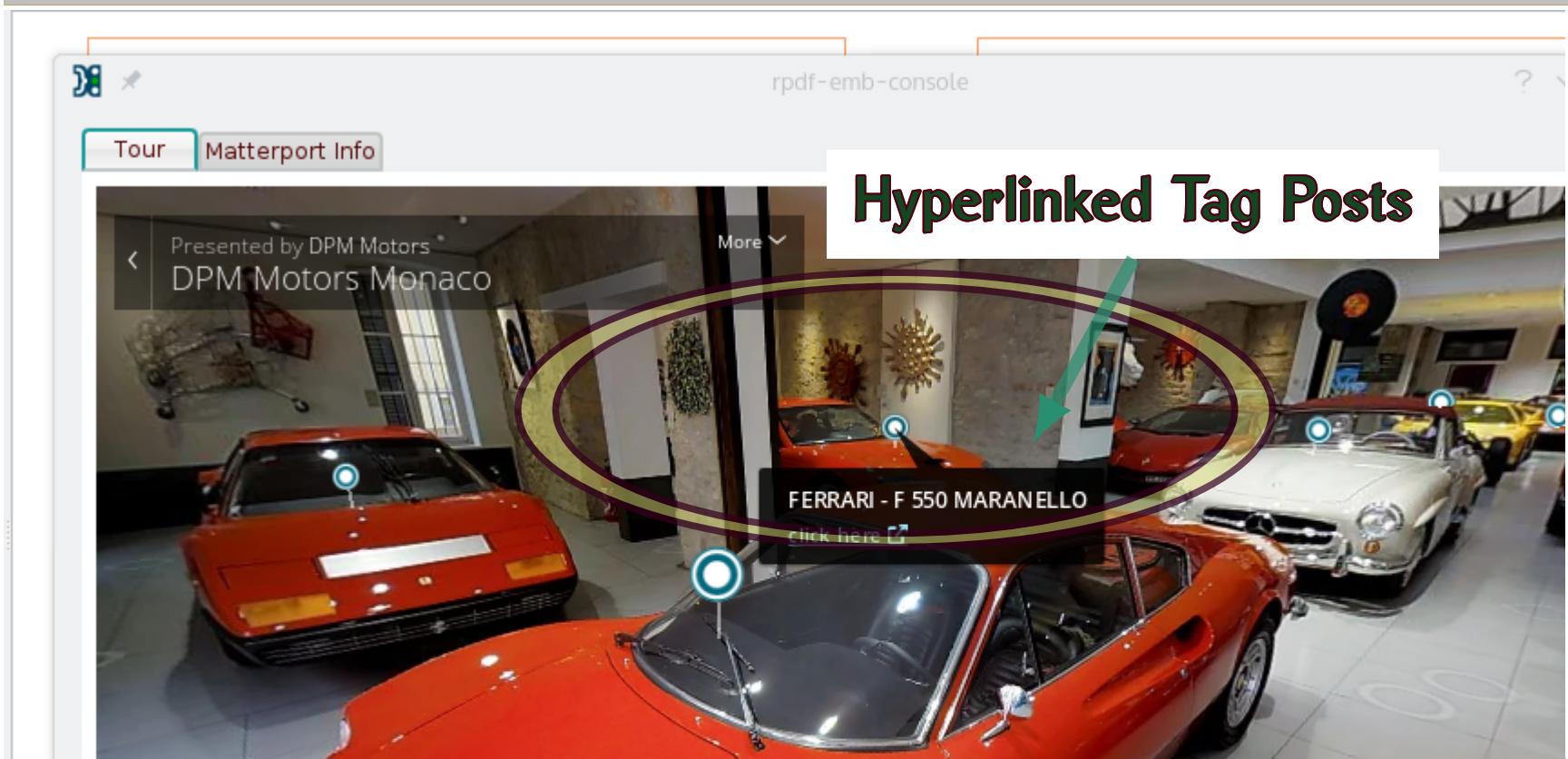
- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

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 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 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.

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 them are links for 'References', 'Library', and 'Reading'. A navigation bar includes 'HTML Source', 'Lisp', 'CSS', and 'XML'. A large red rectangular area covers the middle section. Below it, a link reads 'Read article view'. At the bottom, there's a logo consisting of a vertical bar and a stylized orange shape.

## 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 interface displays a visualization of musical patterns. At the top, a dropdown menu says 'Display Tala Types: Jhoomra/Dhamar (14 beats)'. Below it is a grid of colored rectangles (red, purple, green) representing the pattern. A horizontal slider at the bottom is labeled 'Patterns' and has markers for 'Pattern 1 (3-4-3-4)' and 'Pattern 2'. A file path 'File /extension/ScignSeer/articles/svg/tala.svg' is shown. On the right, there's a vertical sidebar with a decorative icon and a button labeled '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.

The screenshot shows the IQmol molecular visualization program. In the center is a 3D ball-and-stick model of the amino acid cysteine, featuring a blue nitrogen atom, a yellow sulfur atom, and several grey carbon and white hydrogen atoms. The background is a solid blue. At the top, there is a menu bar with options: Display, Build, Calculation, SONIC, and Help. Below the menu is a toolbar with various icons. On the left side, there is a sidebar with a 'Springer' logo and some search results. A context menu is open over the molecule, 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, containing 'Springer Keyword Search: Cysteine', 'Springer Web Search Home', and 'Search Saved Articles'. The main search results area shows 'Showing 157 results.' for a search term. One result is highlighted: 'Cysteine Proteases of Pathogenic Organisms' by M. W. Robinson and J. P. Dalton (Eds.) from 2011. The result card includes the book cover, the authors' names, the publication year, and a brief description: 'Cysteine proteases expressed by pathogenic organisms play key roles in virulence including host'. At the bottom of the search results, there is a URL: [www.springer.com/gp/search?query=cysteine&submit=Submit](http://www.springer.com/gp/search?query=cysteine&submit=Submit). The bottom right corner of the image shows standard Qt-style window control buttons (minimize, maximize, close).

# 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

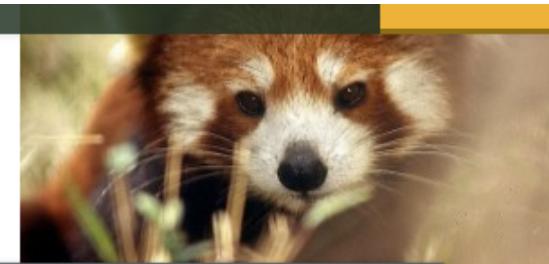
Row: 0 Column: 0

# 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  
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Sound recordings copyright  
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© Natural FX

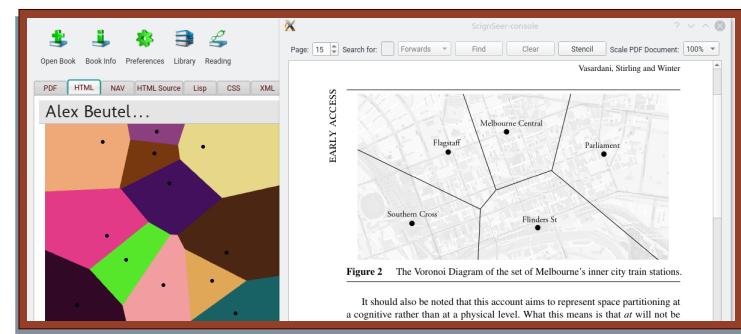
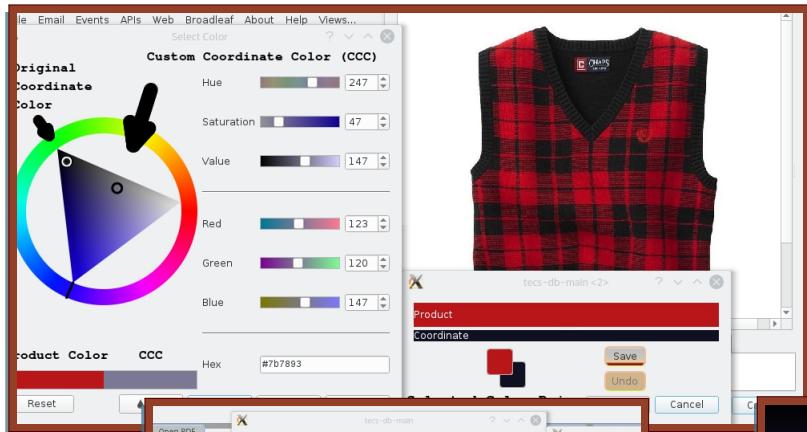
Restart Pause Play

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.



This screenshot shows a software application window titled "tec3-db-main". It features a sidebar with categories: "Clothing" (Women, Men, Children, Boy, Maternity) and "Electronic" (Appliances, Video Games). The main area displays a product card for a "Sweater Vest (Cashmere)" with a price of \$175, on sale for \$69, and sizes S - XXL. Below the card is a "Product Coordinate" dialog box with a "Save" and "Cancel" button. Another smaller window titled "Casual Wear Possibilities" is also visible.

