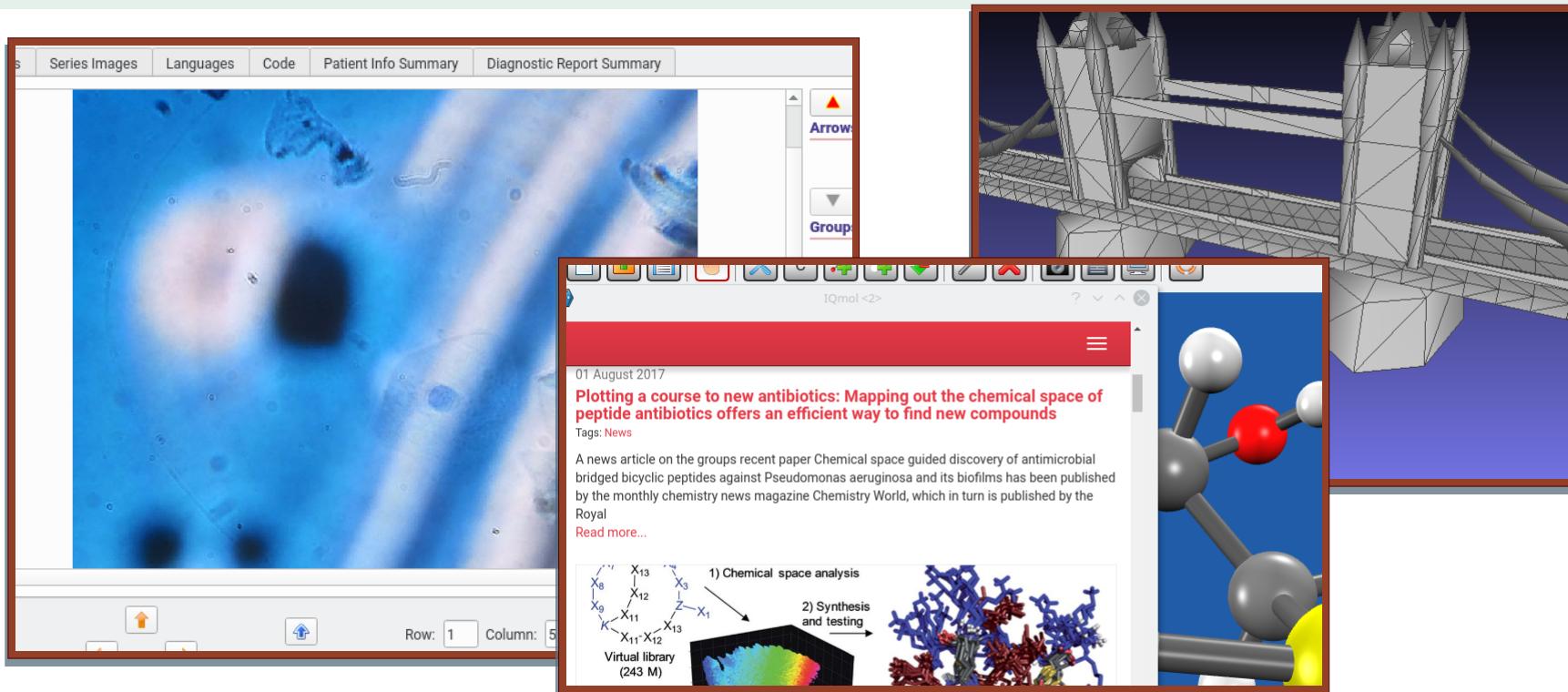


# The NCN/A3R ("NA3")

## Native Application Development Framework



Linguistic Technology Systems

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# The NCN (Native Cloud/Native) Protocol

## Cloud/Native Components as back-ends for native software

- Our “Native Cloud/Native” protocol refers to native application front-ends paired with Cloud/Native (back-end) container instances.
- Code libraries and data representation may be shared across both endpoints.
- Common representation on both server- and client-side streamlines network communications (no need to marshal data between different formats).
- The NA3 technology can be ported to other application frameworks apart from Qt (wxWidgets, XCode, MFC, etc.).
  - Note: This presentation will focus on NA3’s default Qt implementation.

## How Cloud Back-Ends Enhance Native Front Ends

- Cloud Backup
- Share Data between Users
- Collaborative Editing
- Maintain users’ application state across different computers (home/school/office)
- Upgrade running applications without needing to 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

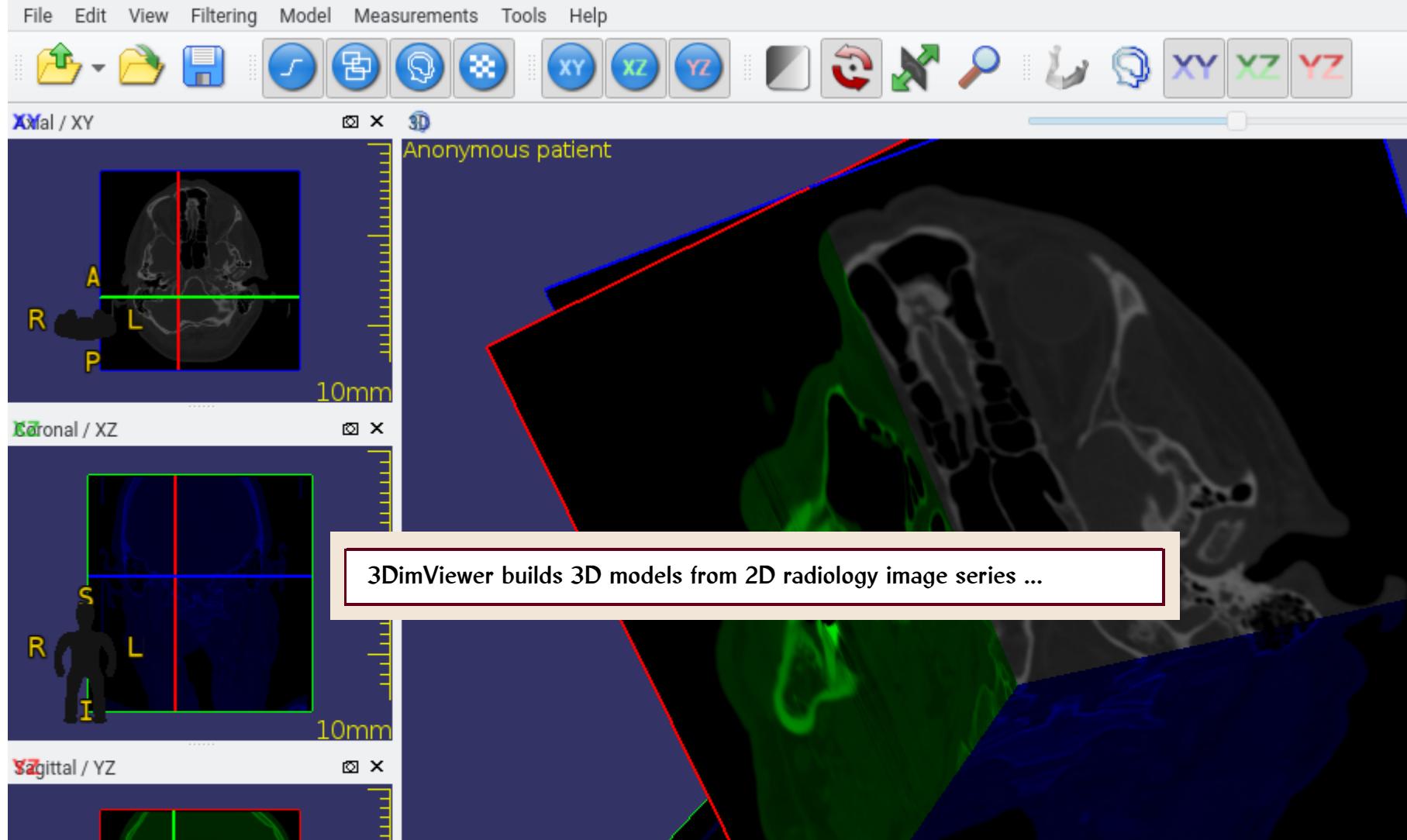
*Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, and so on:*

- 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

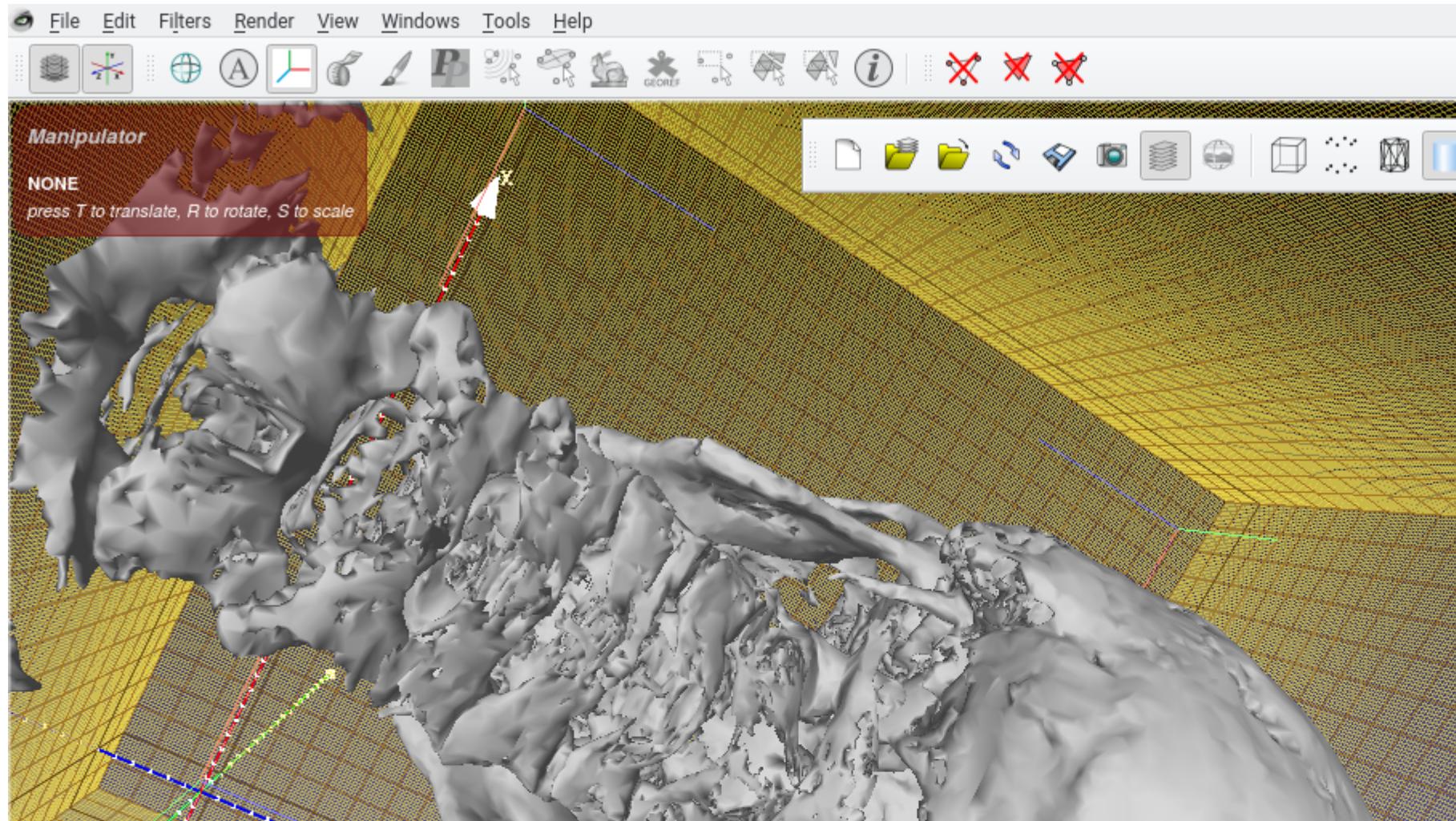
Research S  
Research Slide 2  
Research Slide 3  
Research Slide 4  
Research Slide 5

This slide and the next demonstrate a case-study where inter-application data sharing enhances the capabilities of two applications: 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 applications) 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

Research S  
Research Side 2  
Research S  
Research Side 4  
Research Side 5

Forms Web Language Help About

Save Form Open Form Cloud Save Cloud Open Submit Form

Page: 0 Search for: Forwards

ndp-main-outline <5> ? ^ X

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

Referring Doctor: Dr. New Test

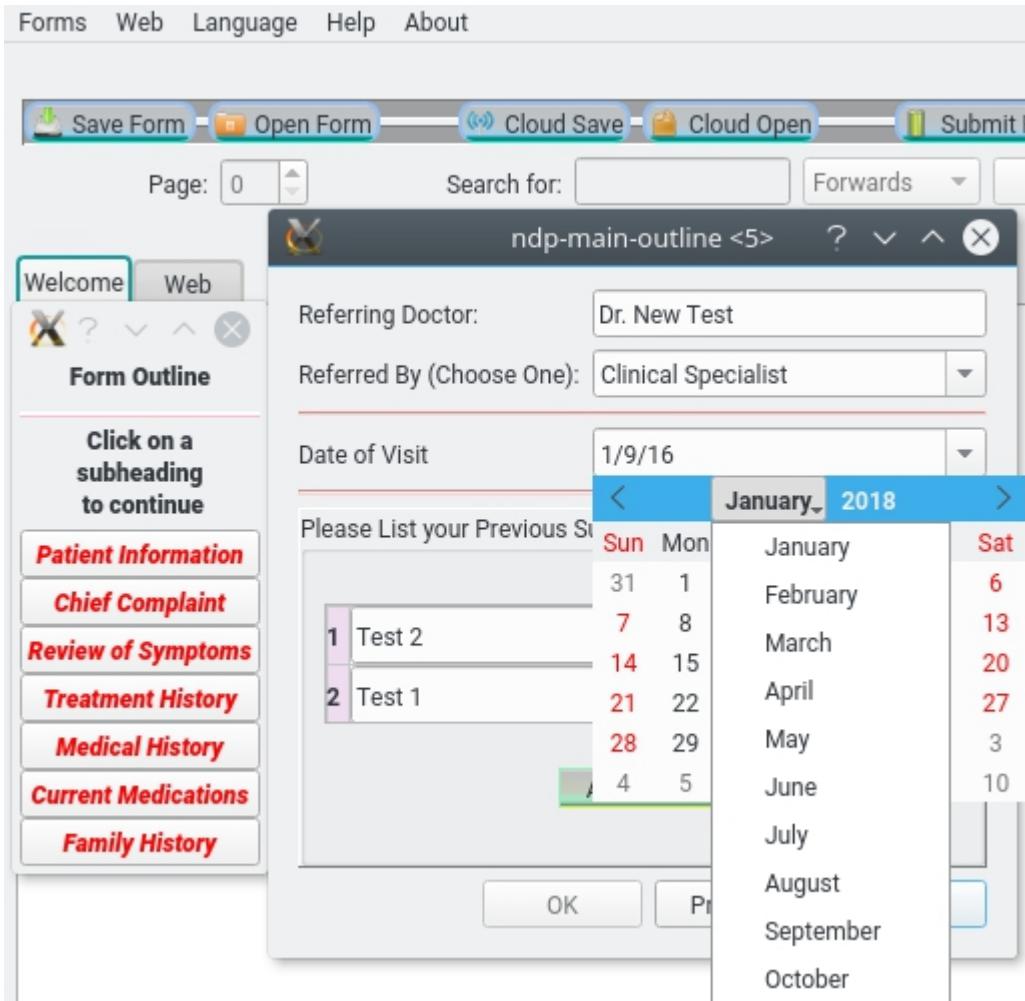
Referred By (Choose One): Clinical Specialist

Date of Visit: 1/9/16

Please List your Previous Stays

1	Test 2	Sun	Mon	January	Sat
		31	1	February	6
		7	8	March	13
		14	15	April	20
2	Test 1	21	22	May	27
		28	29	June	3
		4	5	July	10

OK Print



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

# Qt-Based Interactive Forms

Research Side 1  
Research Side 2  
Research Side 3  
Research Side 4  
Research Side 5

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 dependencies.



The image shows a digital pathology slide of a cell with a prominent purple nucleus. A red arrow points to the right side of the nucleus. The interface includes a vertical stack of small thumbnail images on the left, a toolbar at the top with tabs for View, Instructions, Series Images, Languages, Code, Patient Info Summary, and Diagnostic Report Summary. On the right, there is a sidebar with icons for Arrows, Comments, Lists, Arcs, and Rulers, each with a corresponding color-coded preview. At the bottom, there are controls for Silhouette Zoom, Image Transforms, Annotations Transforms, and buttons for Pan, Zoom, and Slide.

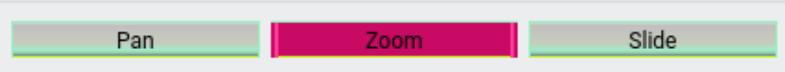
Silhouette Zoom:



Clear

Image Transforms ...

Annotations Transforms ...



# Native Applications as Interactive Catalogs

E-Commerce  
Slide 1

E-Commerce  
Slide 2

E-Commerce  
Slide 3

E-Commerce  
Slide 4

E-Commerce  
Slide 5

E-Commerce  
Slide 6

E-Commerce  
Slide 7

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

The screenshot shows a native application interface for a shoe catalog. On the left, there is a sidebar with small thumbnail images of other shoes. The main area features a large image of a brown leather lace-up sneaker with a white sole. A context menu is open over the shoe, with the 'Detach Everything' option highlighted in blue. Below the main image, there are navigation controls for item selection (Item: 3) and image zoom. At the bottom, there are tabs for 'Overview', 'Features', 'Specs', and 'Reviews', with 'Overview' currently selected. A list of product features is displayed: 'Leather upper', 'Lace-up', and 'Round toe'. To the right of the shoe image, there is a section for the 'Grand Crosscourt II Sneaker' with a description, an 'Actions' section with links to 'Add to Cart' and 'Explore Colors', and two color swatches for the shoe.

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 made into multi-dimensional, multiple-window interactive displays.

File Email Events APIs Web Broadleaf

Page: 0 Search for: Document: 100%

Lily Garden Silk Peony Bouquet Home Decoration, Lilac, 18 Inches High

Frosted Hydrangea, Mauve, 32 Inches High, 12 Floral Sprays

tecs-db-main <2> tecs-db-main <3>

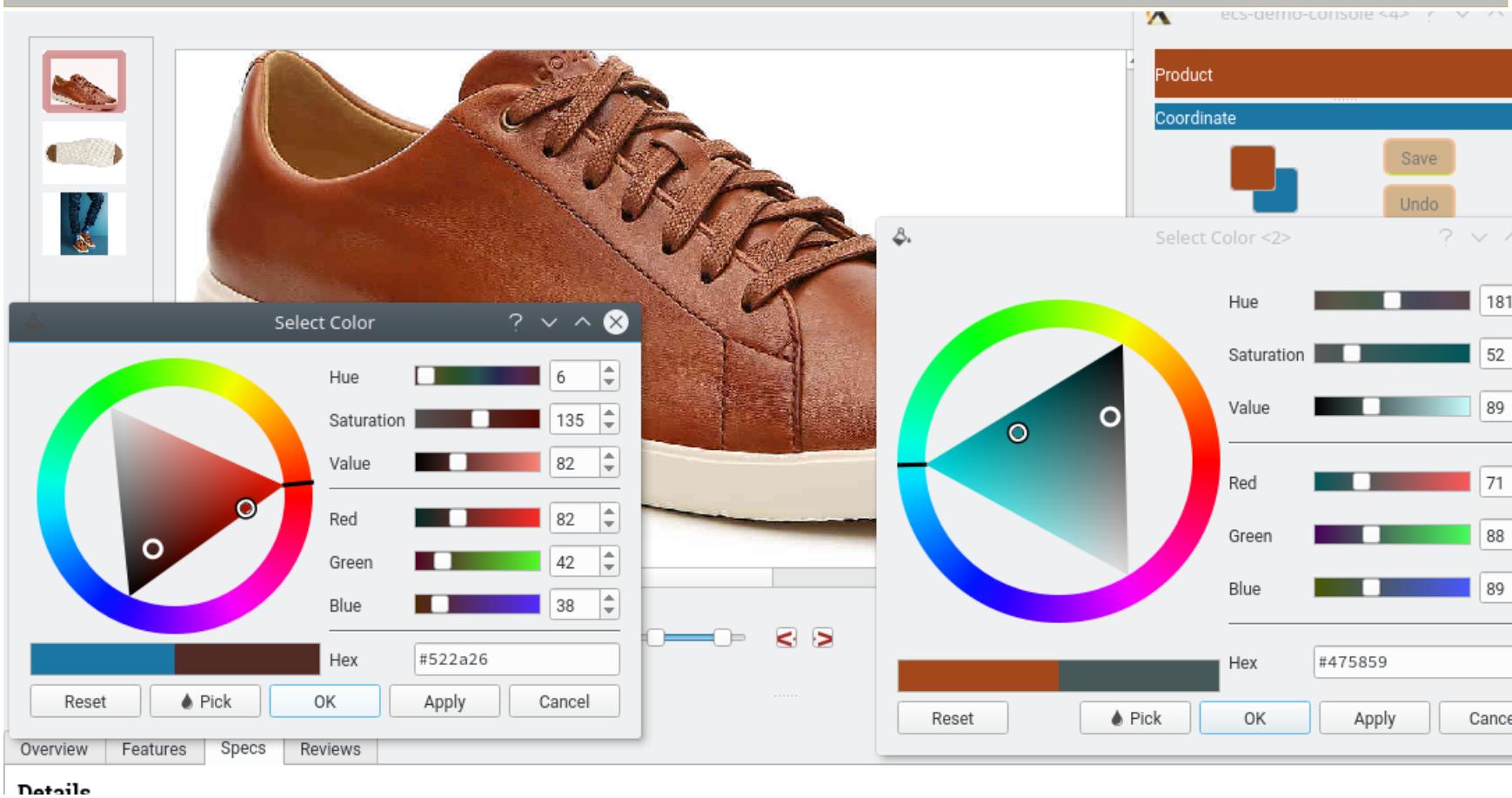
Overview Specs Reviews Q & A

OK Cancel

OK Cancel

# Explore Products with Native Software

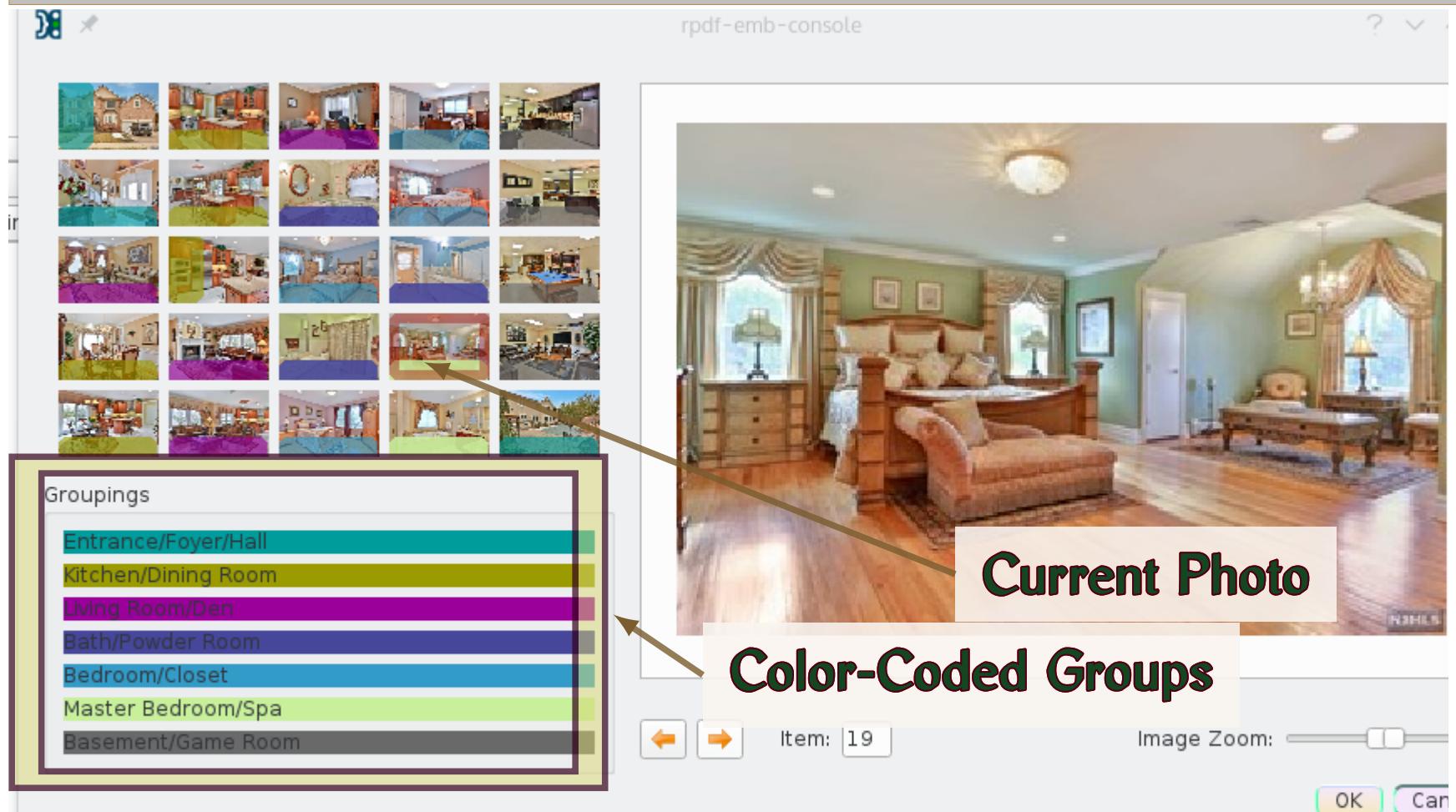
Interactive catalogs allow designers to incorporate many unique features and capabilities of desktop applications, such as using HSV color-wheel controls to explore color coordination while shopping.



# Interactive Real Estate

E-Commerce  
Slide 1  
E-Commerce  
Slide 2  
E-Commerce  
Slide 3  
E-Commerce  
Slide 4  
E-Commerce  
Slide 5  
E-Commerce  
Slide 6  
E-Commerce  
Slide 7

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



The screenshot shows a software interface for viewing real estate photos. On the left, a grid of thumbnail images represents different property types. On the right, a large image of a bedroom is displayed with a callout box labeled "Current Photo". Below the main image, a title "Color-Coded Groups" is shown with an arrow pointing to a sidebar. The sidebar, titled "Groupings", lists categories with corresponding color-coded bars: Entrance/Foyer/Hall (teal), Kitchen/Dining Room (olive green), Living Room/Den (purple), Bath/Powder Room (dark blue), Bedroom/Closet (blue), Master Bedroom/Spa (light green), and Basement/Game Room (grey).

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 aiding photo navigation, such as color bands (overlays) that switch from horizontal to vertical indicating which photos have been viewed so far; and the thumbnail of the current viewed photo marked with a thick colored border (surrounding the thumbnail photo and its overlays).

The screenshot shows a photo viewer interface with a grid of thumbnail images on the left and a large preview image on the right. The interface includes a toolbar, an outline panel, and a 'Groupings' section at the bottom.

- Already Viewed (vertical color band):** A callout points to a thumbnail in the grid that has a thick vertical border, indicating it has been viewed.
- Not Yet Viewed (horizontal color band):** A callout points to another thumbnail in the grid that has a thick horizontal border, indicating it has not yet been viewed.
- Current Photo (viewed for the second time):** A callout points to the large preview image on the right, which shows a living room with a sofa and a kitchen in the background. The preview image has a thick colored border, indicating it is the current photo.

**Groupings**

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

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 image shows a photo viewer interface with a sidebar of thumbnail images and a main content area displaying a living room. The sidebar includes a 'Groupings' section with a list of room categories and a 'Check Boxes' section with arrows pointing to 'Visible Groups' and 'Hidden Groups'.

**Visible Groups** (highlighted with a green oval):

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

**Check Boxes** (highlighted with a red oval):

- Basement/Game Room

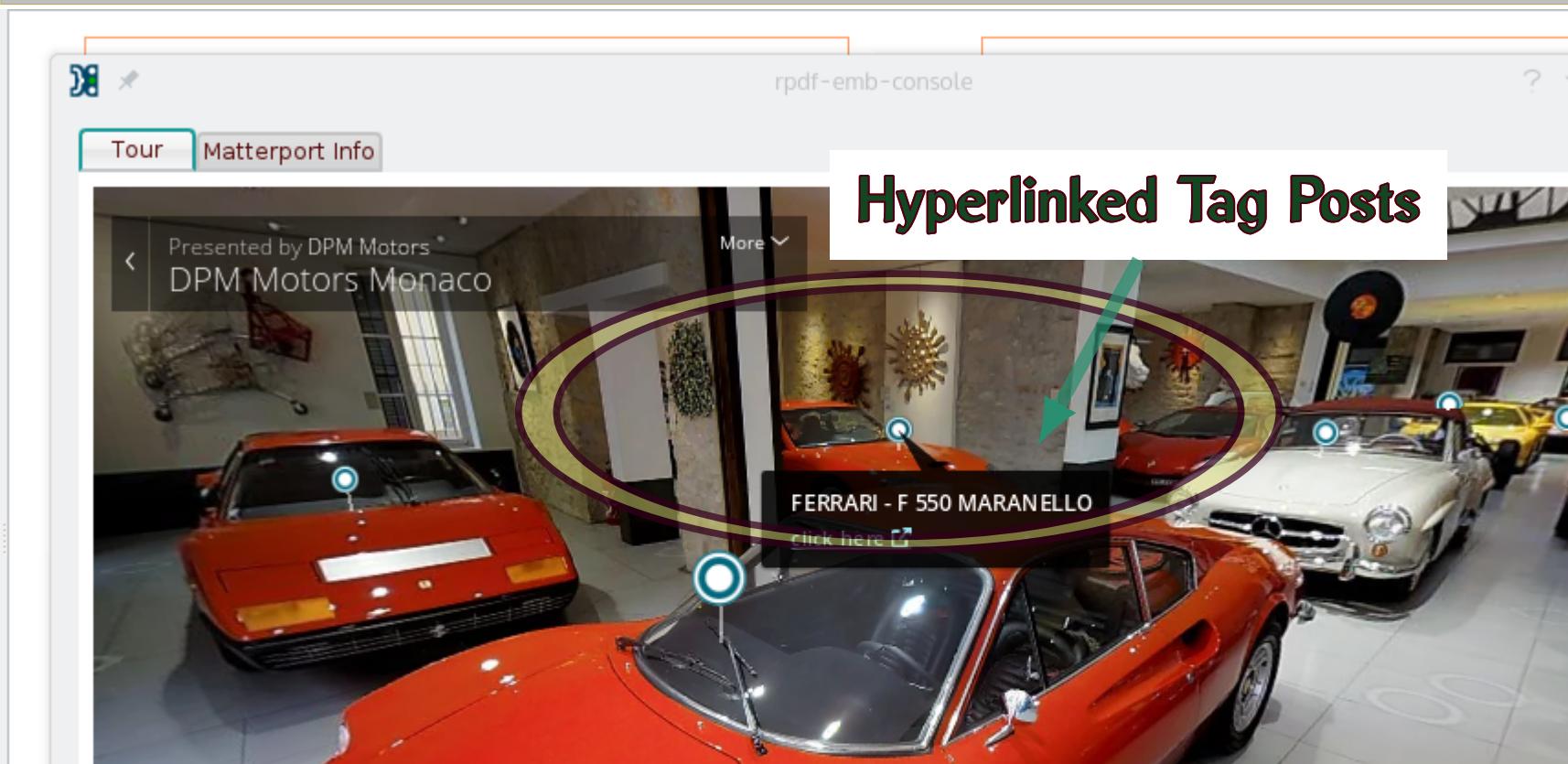
**Hidden Groups** (highlighted with a red oval):

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

Item: 3      Image Zoom:       OK

# Interactive VR: Hyperlinked Tag Posts

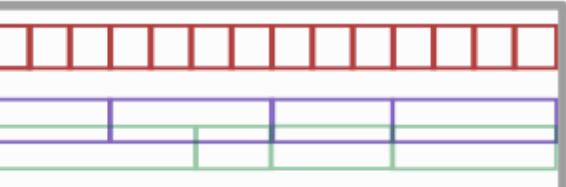
Another emerging technology, relevant to both e-Commerce and Real Estate, is the use of Panoramic Photography to create immersive Virtual Reality scenes. Panorama-Photography-based VR engines, like Matterport, allow “tag posts” with embedded hyperlinks, which in a native-application context become channels 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 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: e.g. (as in this case), a widget allowing readers to visually explore patterns in classical Indian music.

Display Tala Types: Jhoomra/Dhamar (14 beats) ▾



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

ANTHROPOLOGY AND HUMANISM

Ethnographer as Apprentice: Embodying  
omusical Knowledge in South India

da Weidman

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

# 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 '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', and 'Remove'. The 'SONIC' option is highlighted. A small window titled 'SONIC Reader' is open, displaying a search interface with 'Springer Keyword Search: Cysteine', 'Springer Web Search Home', and 'Search Saved Articles'. The main content area shows a search result for 'Cysteine Proteases of Pathogenic Organisms' by M. W. Robinson and J. P. Dalton, published in 2011. The result includes a thumbnail of the book cover, the authors' names, and a brief description: 'Cysteine proteases expressed by pathogenic organisms play key roles in virulence including host'. Below the search result is a URL: 'www.springer.com/gp/search?query=cysteine&submit=Submit'. The bottom of the interface has a navigation bar with icons for back, forward, and search.

# Document Viewers Augmented With APIs

Publishing  
1  
Publishing  
Slide  
2  
Publishing  
3  
Publishing  
Slide  
4

Another strategy for interactive publications is linking documents with APIs maintained by 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.



↑

Row: 0 Column: 0

## MEDAL

 Click the icon to save

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

Cite this object as

Medal; bronze; 1920-30

# Embedded Multimedia

Publishing  
1  
Publishing Slide  
2  
Publishing Slide  
3  
Publishing  
4

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

*Ailurus fulgens styani* (also known as *a. f. fulgens*): Only found in China (in the Hengduan

Mo  
My  
The  
ab

In this case a video player is launched in a dialog box, floating above the article text. For those reading digital books or articles, videos and other multimedia content can be presented through secondary windows launched via context menus; text and multimedia may thereby be viewed side-by-side.

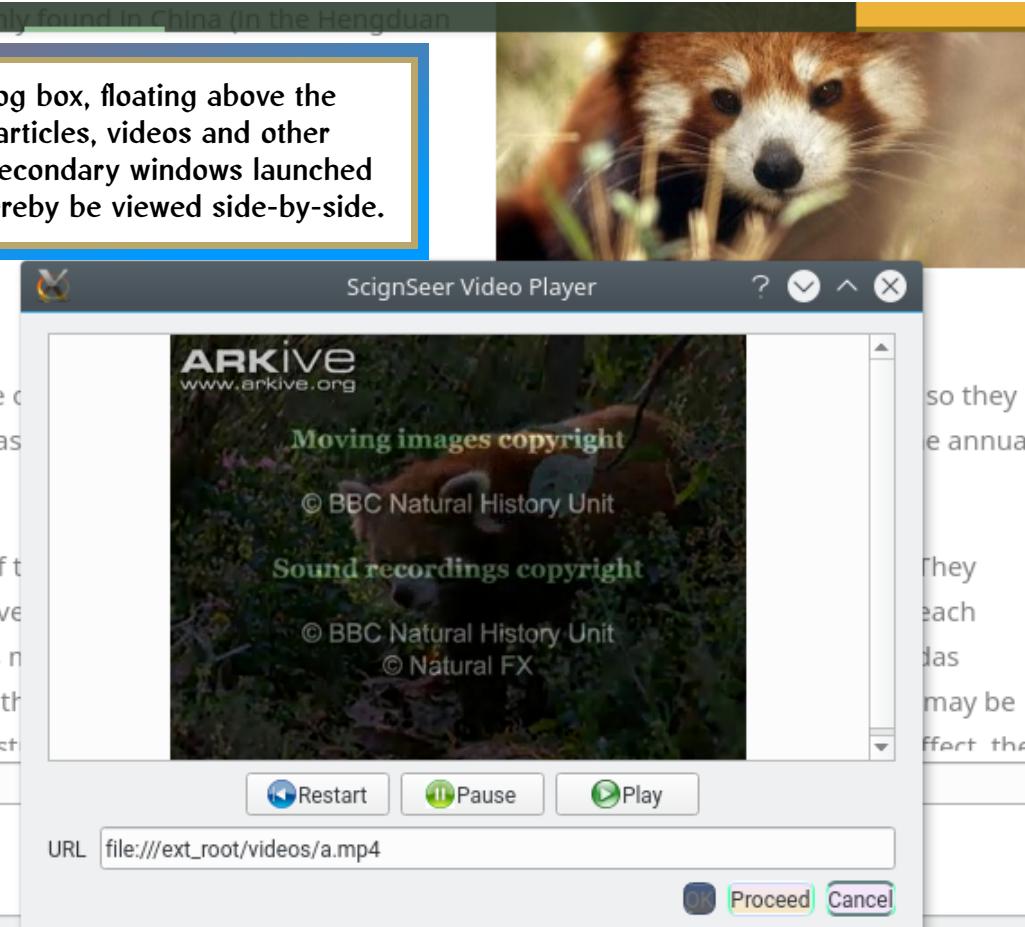
## Behavior

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.



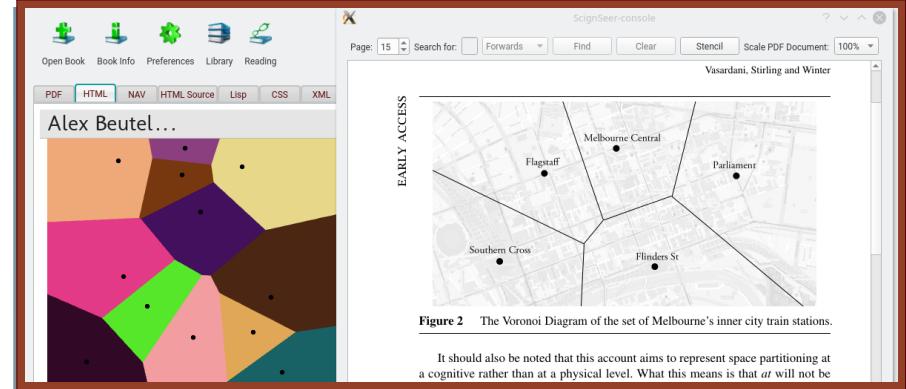
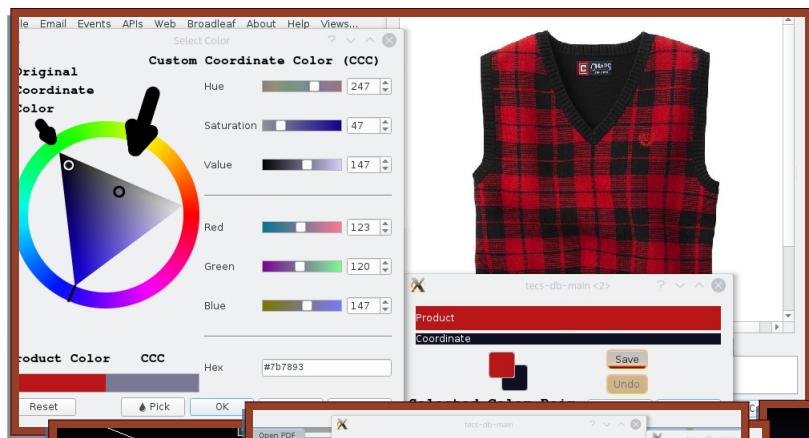
[ark.org/red\\_panda/about-the-red-panda/](http://ark.org/red_panda/about-the-red-panda/)

In terms of their social behavior, red pandas tend to have a very limited interaction with other. This is particularly true during the breeding season, when they may be patchily distributed across their range.



# Thank You!

Please contact Linguistic Technology Systems for more information about NA3 and/or other Software Development and Software Language Engineering Solutions: (917) 817-2184.



**Figure 2** The Voronoi Diagram of the set of Melbourne's inner city train stations.

It should also be noted that this account aims to represent space partitioning at a cognitive rather than at a physical level. What this means is that *at will* not be

