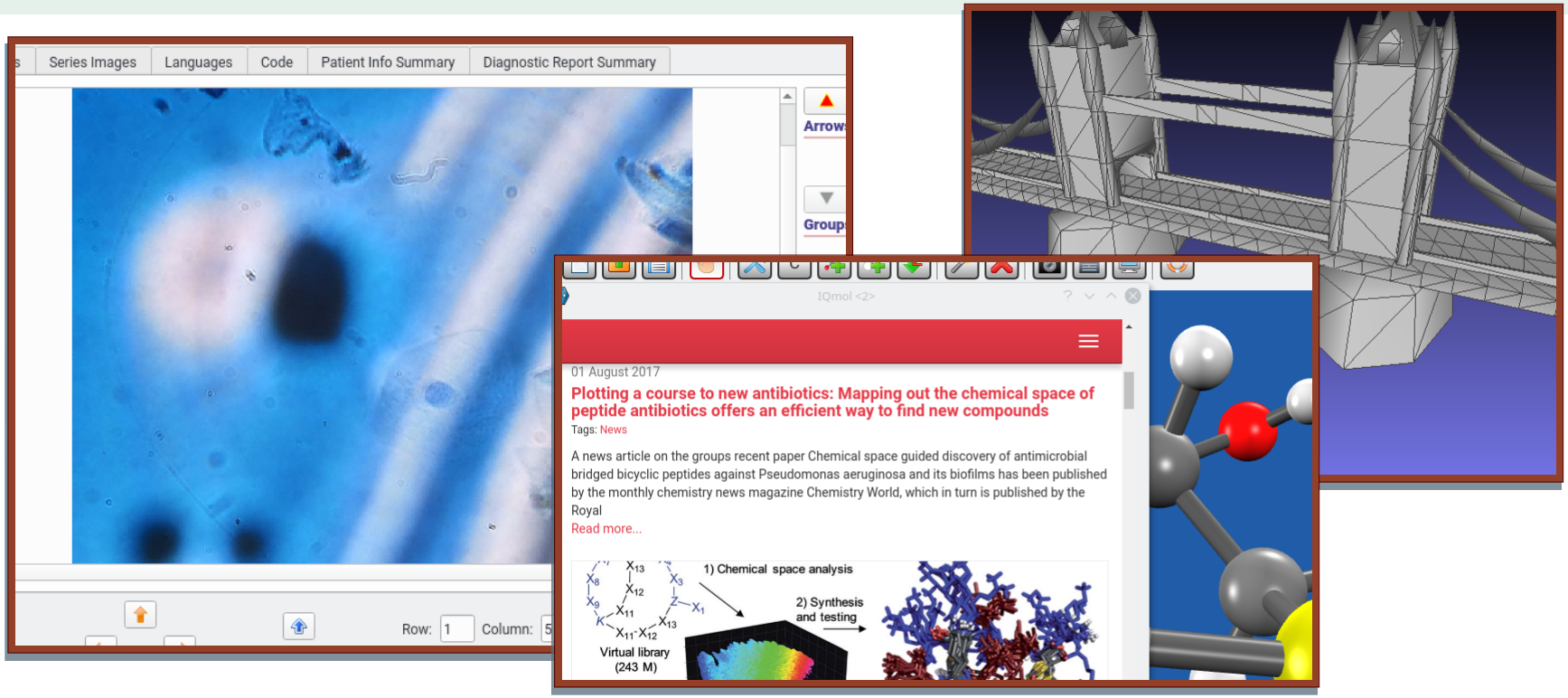
The NCN/A3R ("NA3")

Native Application Development Framework



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Team Members

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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

The Qt Ecosystem and the Limitations of Qt in the Cloud

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 $25 billion 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.

"Application-As-A-Resource" (A3R)

The A3R Application Model

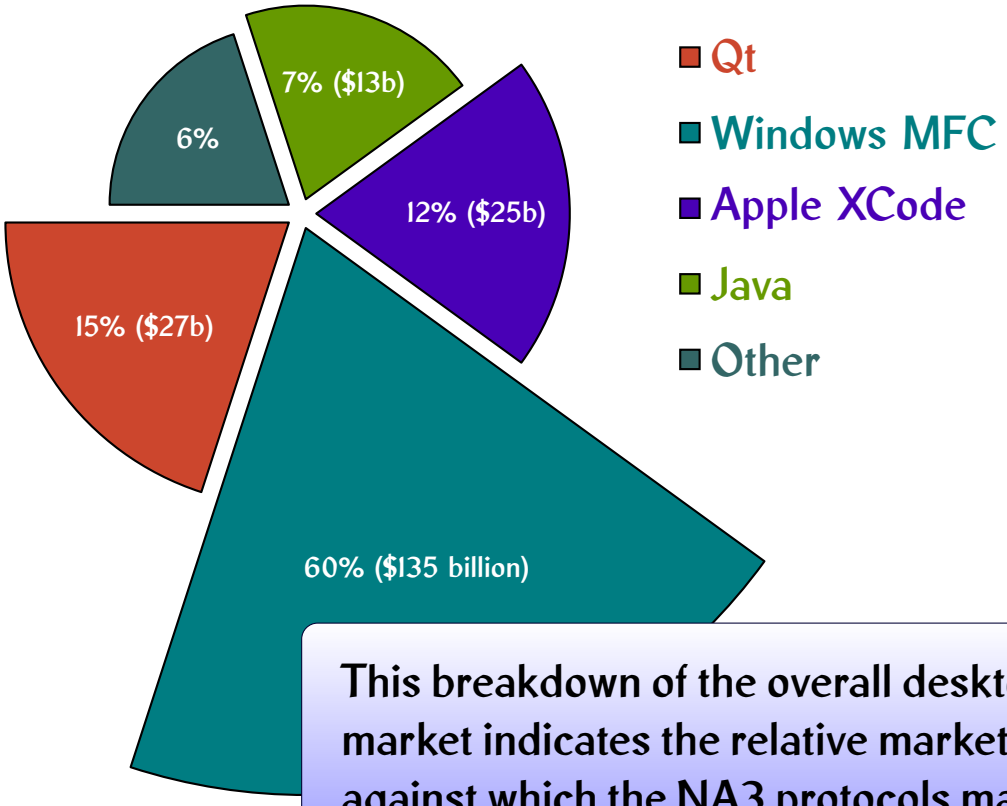
- A3R Applications are self-contained, citable resources which can conform to modern resource documentation standards, such as the Research Object protocol.
- A3R Applications can use Hypergraph-structured metadata to describe data types, procedures, User Interface features, and inter-type relationships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

Overview of the Software Development Market

This slide offers a rough breakdown of the software development market, (estimated at $350 Billion), restricted to desktop software (roughly one-half the total market), including both cross-platform and single-platform solutions.



Taking the Qt implementations of the NCN and A3R protocols as a prototype, analogous versions may be built targeting other popular software-development platforms (see next slide for a more detailed outline).

This breakdown of the overall desktop application-development market indicates the relative market share of different platforms against which the NA3 protocols may be implemented.

NA3 In Different Software Ecosystems

Potential NA3 Markets

Windows MFC ($135b market size) A3R can be implemented in C++/CLI, building off of a generic-C++ version using the C++ Standard Library in place of Qt-specific data structures.

Apple XCode ($25b market size) Apple Operating Systems are based on Linux, so a Linux-oriented A3R implementation can form the basis of an XCode version. This XCode implementation would also be built around the C++ Standard Library.

JavaFX ($12.5b market size) The Java programming language provides the most widely used cross-platform application development framework outside of Qt. It is feasible to port C++ A3R implementations to Java. The core of this re-implementation would involve designing a Java Hypergraph Library compatible with the A3R serialization and Interface Definition protocol.

Workflow Management ($10b market size) A3R plugins can be added to new or existing applications to support inter-application networking, allowing multiple applications to be unified into workflow-management systems.

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).

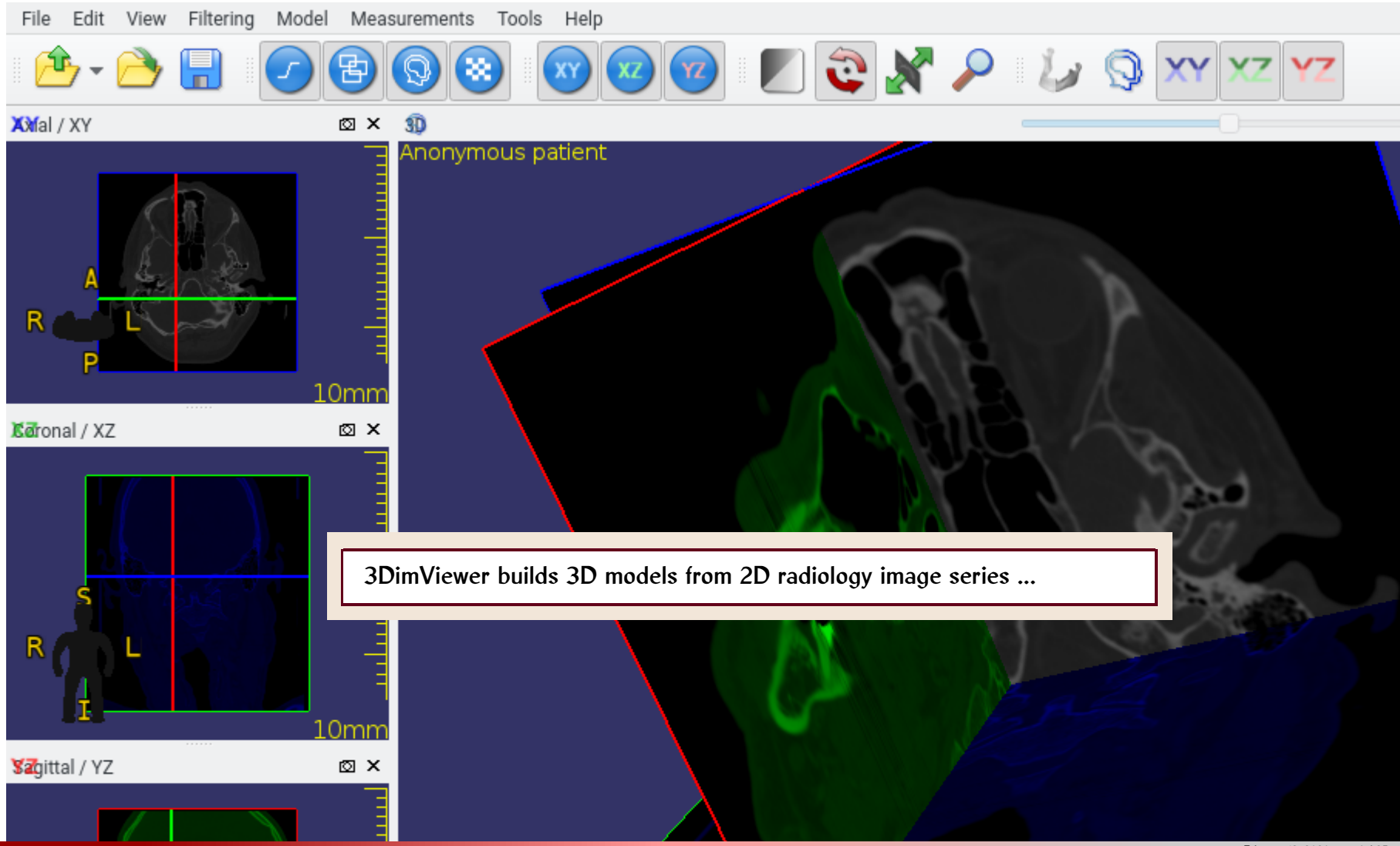
Responsive desktop-style applications for enhanced UX

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 (Note: “46% of global online retail orders happen on desktop”, source: leftronic.com), 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).

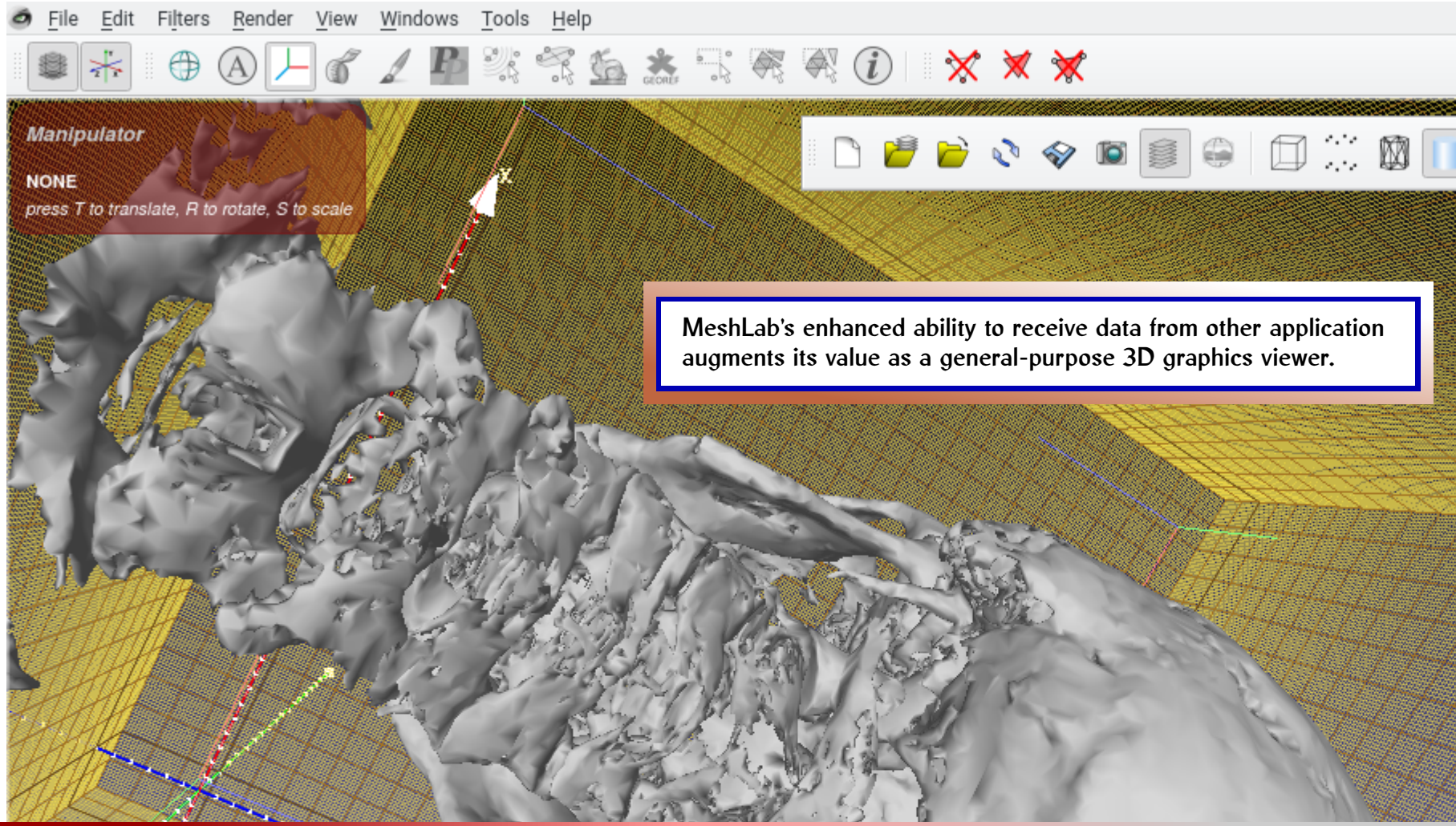
An Example of Inter-Application Networking

This slide and the next 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).



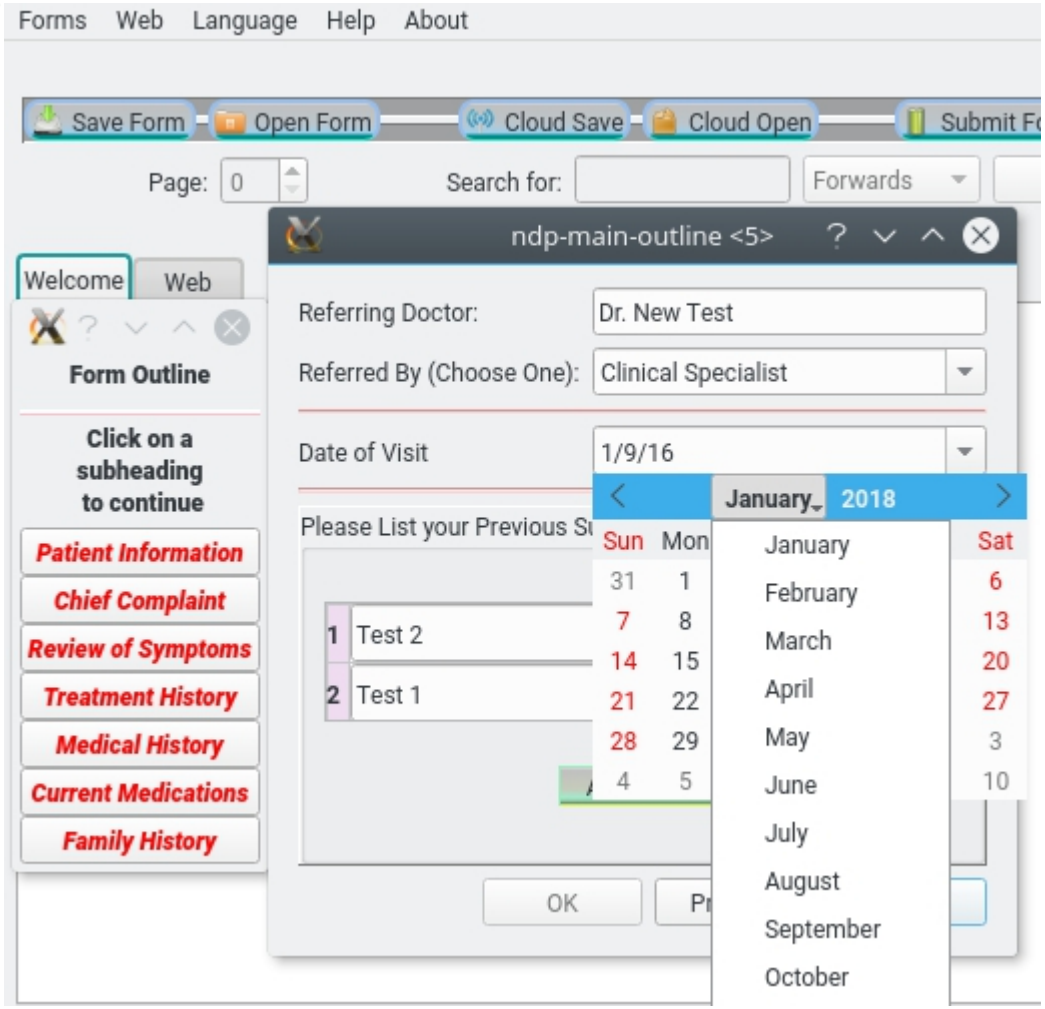
3D Graphics Sent to MeshLab

... 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.



MeshLab's enhanced ability to receive data from other application augments its value as a general-purpose 3D graphics viewer.

A3R Applications as Data Collection Instruments

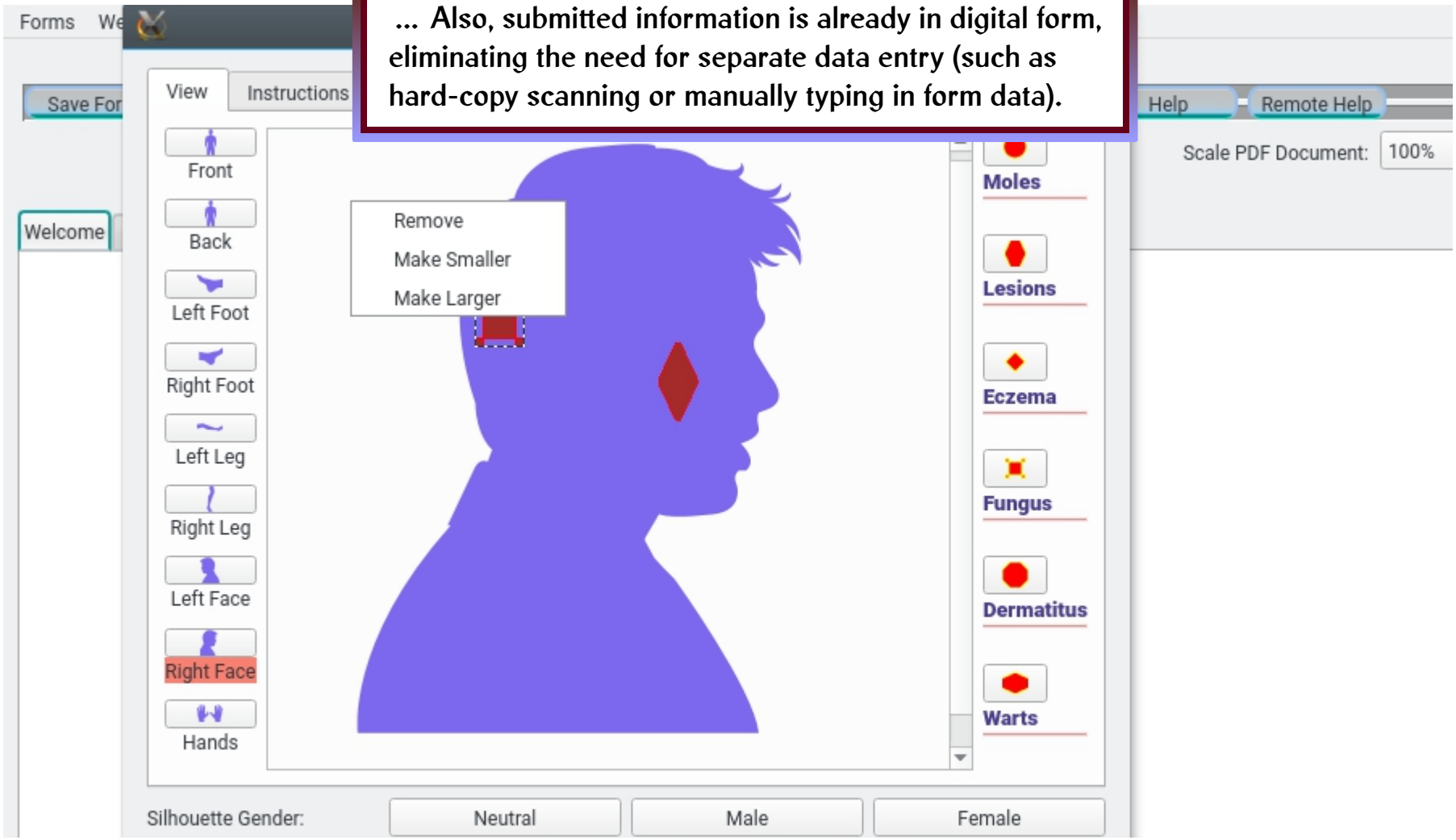


In medicine and social science, "data collection instruments" (DCIs) refer to surveys, questionnaires, and other tools to obtain human feedback.

Qt-Based Interactive Forms

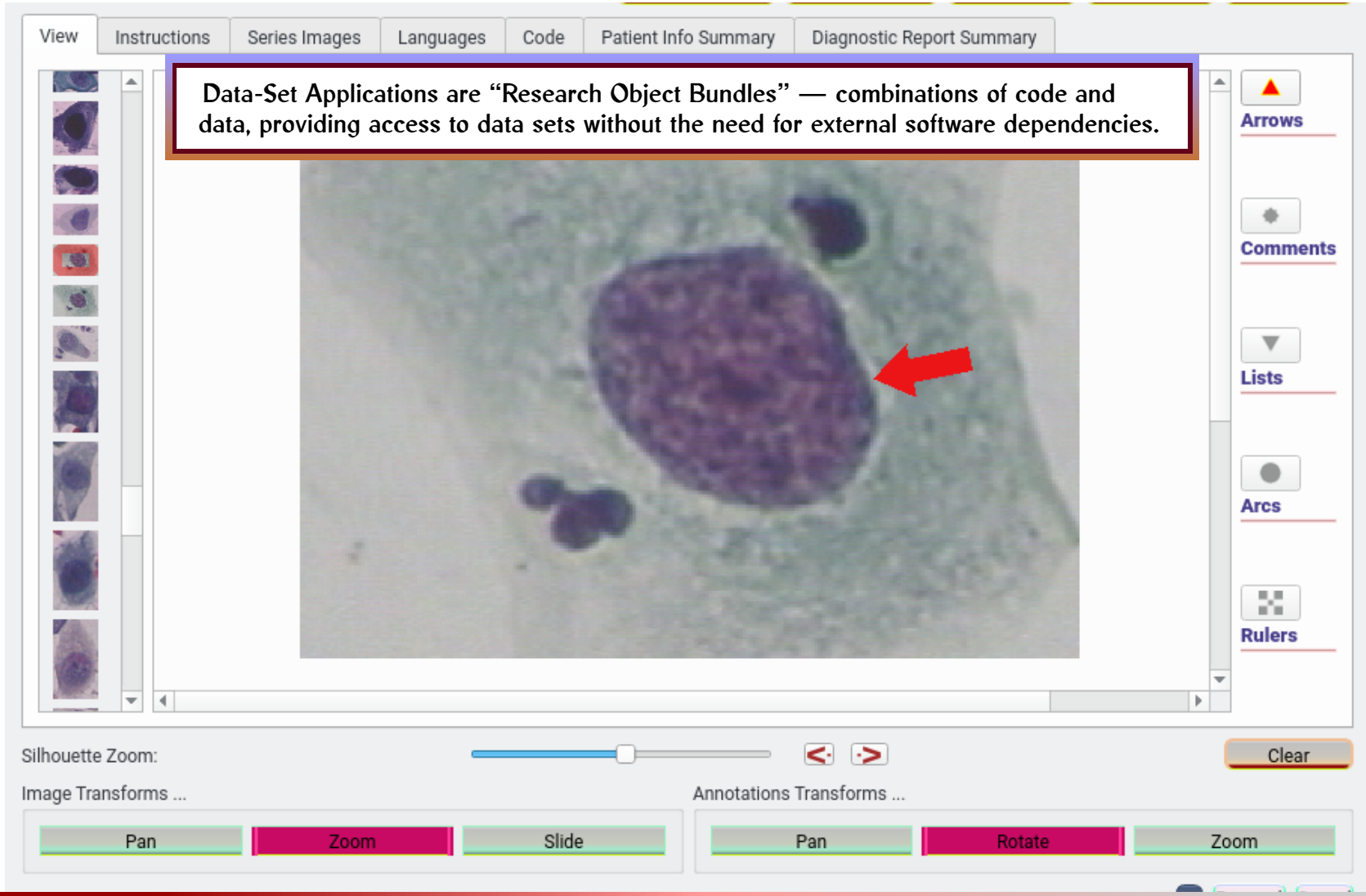
Data Collection Instruments implemented as native desktop applications can have easily navigable, interactive forms that make it simpler for people to provide information ...

... Also, submitted information is already in digital form, eliminating the need for separate data entry (such as hard-copy scanning or manually typing in form data).



A3R Applications as Research Objects

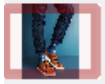
Complementary to A3R components which facilitate *obtaining* research or experimental data, A3R "Data-Set Applications" are also powerful tools for visualizing and analyzing research findings.

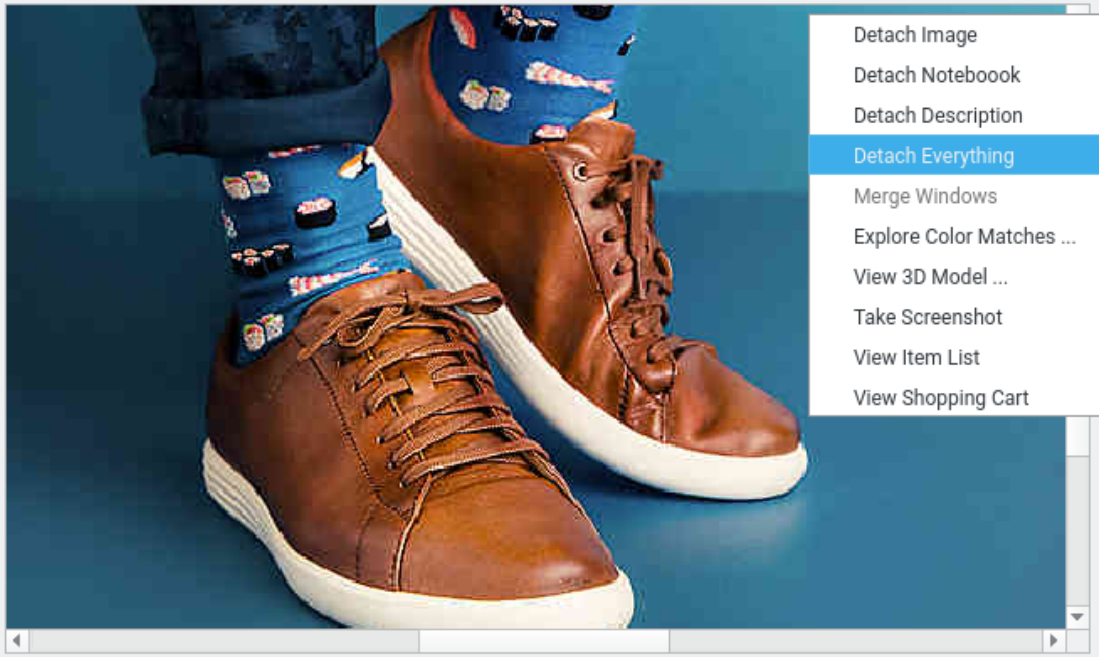


Native Applications as Interactive Catalogs

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







Item: 3 Image Zoom:

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:

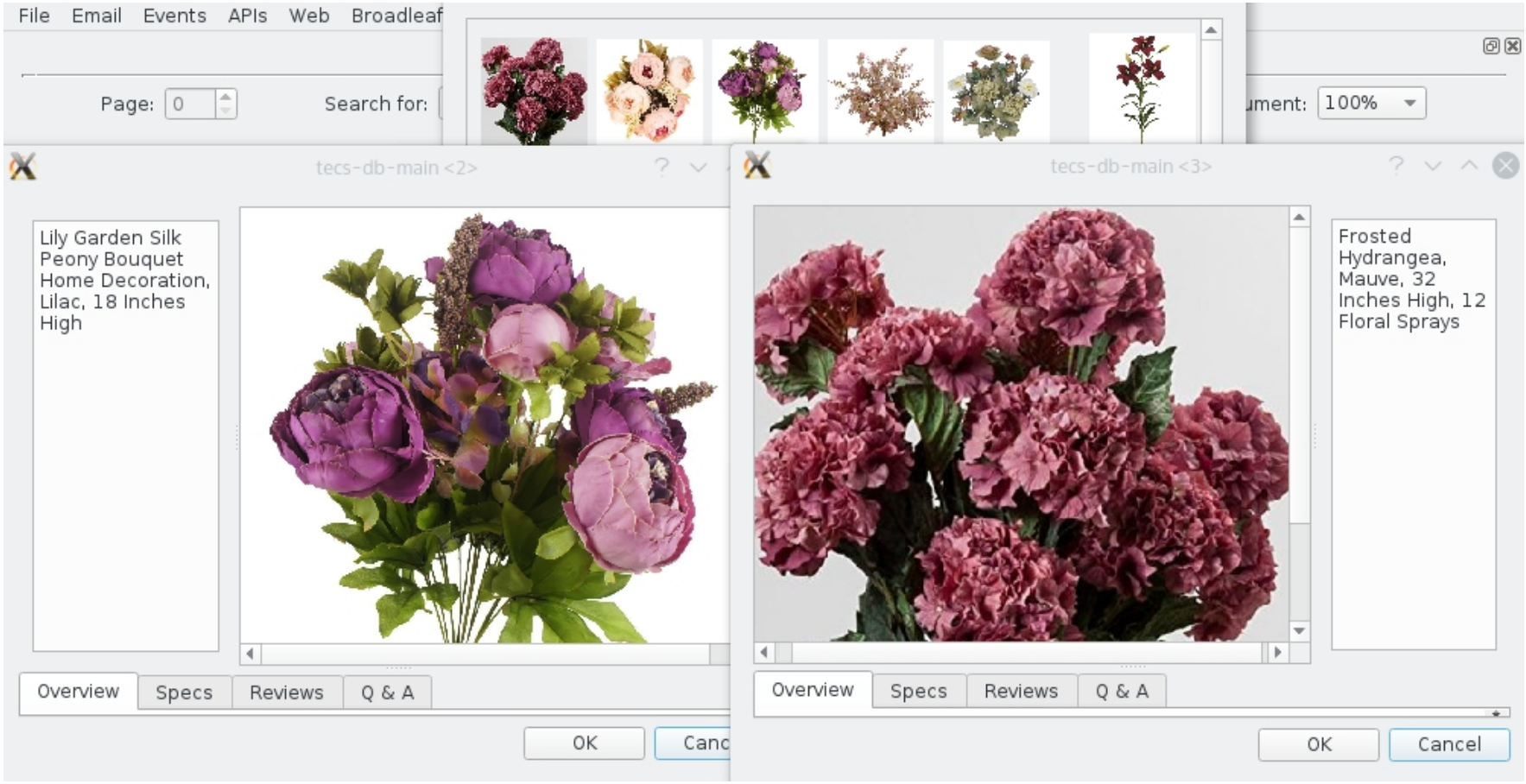
- Add to Cart
- Explore Colors


erview | Features | Specs | Reviews

- Leather upper
- Lace-up
- Round toe

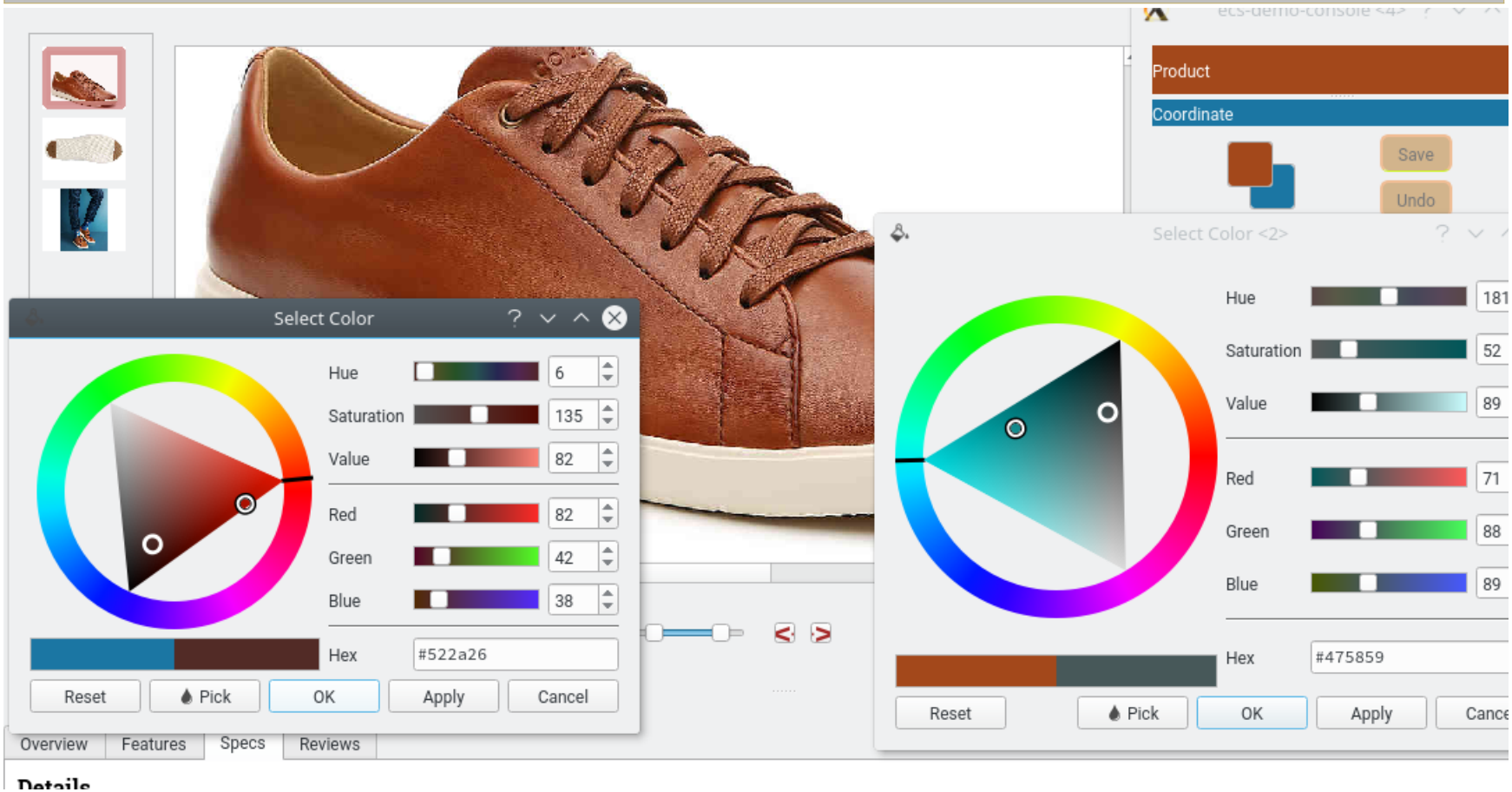
Interactive Shopping Carts

Instead of static lists, shopping carts can be made into multi-dimensional, multiple-window interactive displays.



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 can be displayed via interactive, multi-dimensionally organized, color-coded photo viewers.

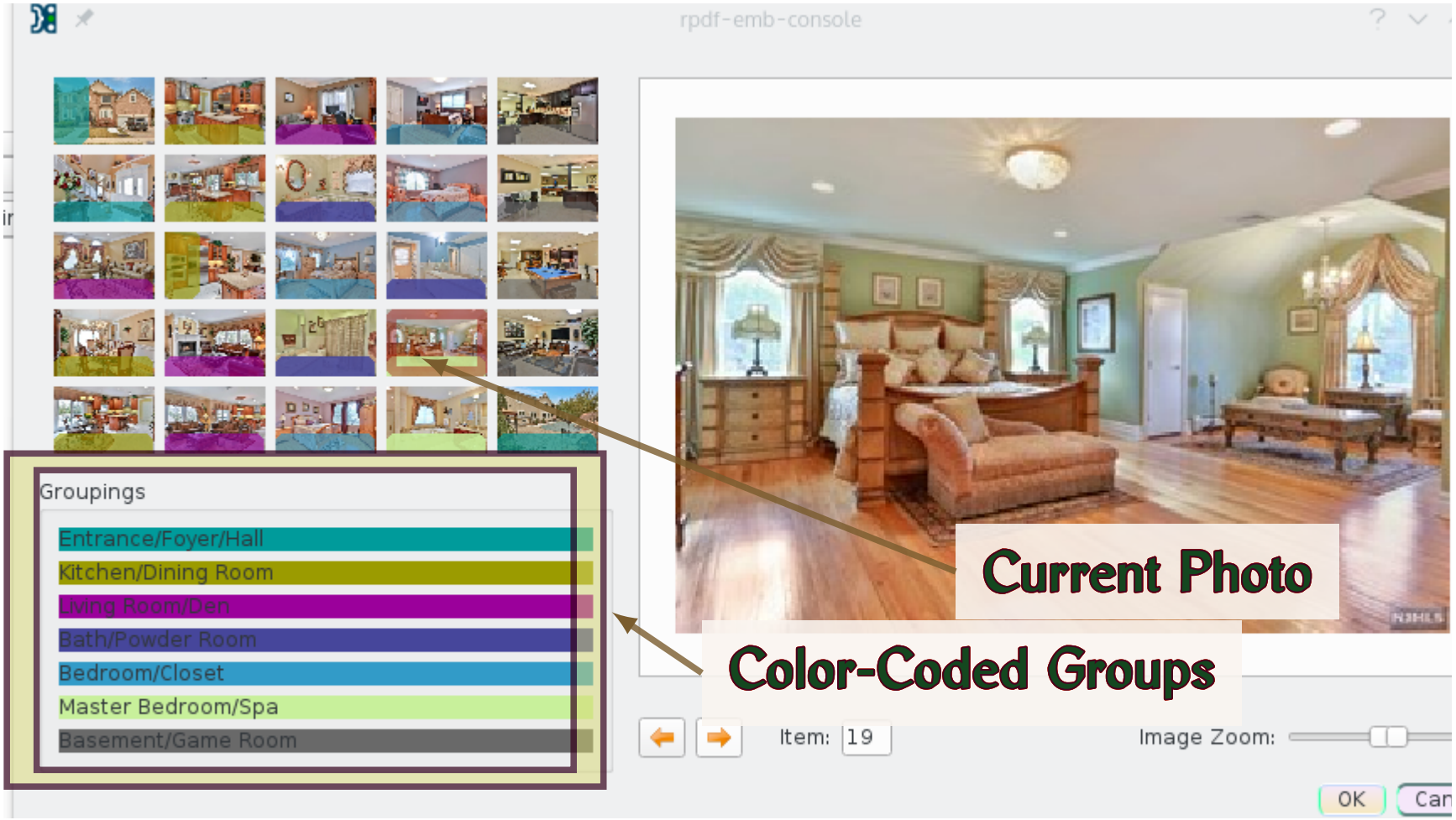
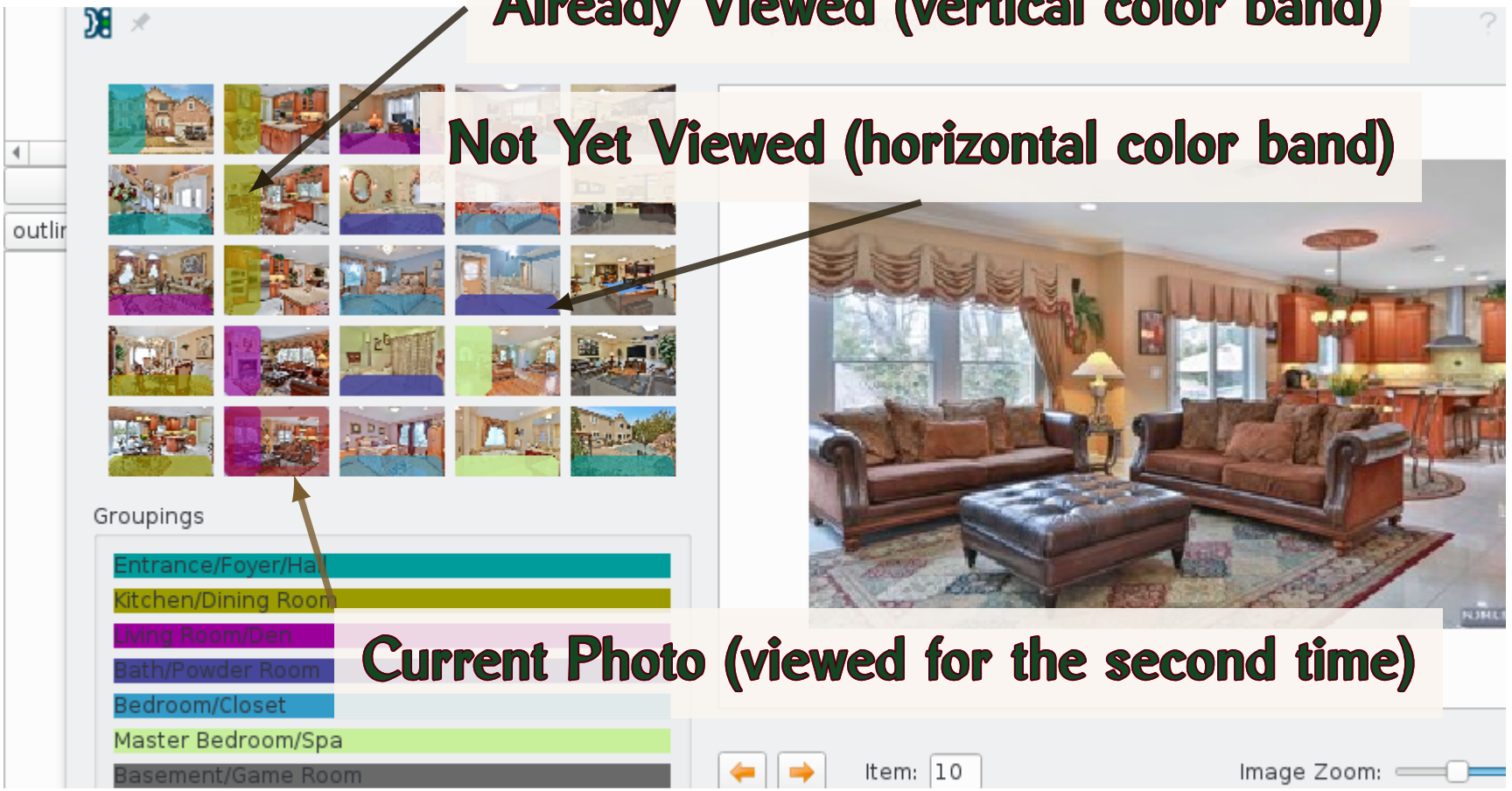


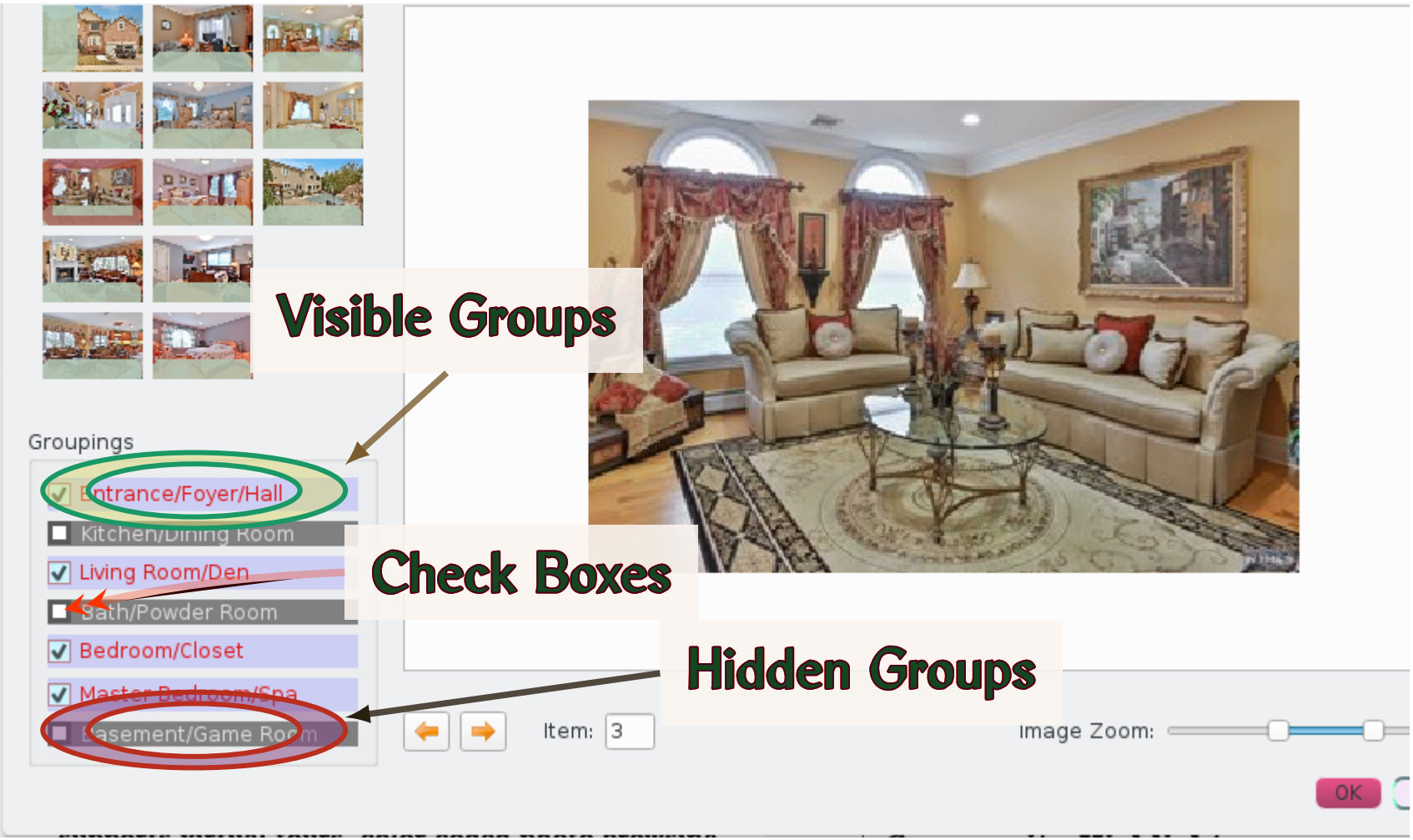
Photo Viewer Interactive Cues

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).



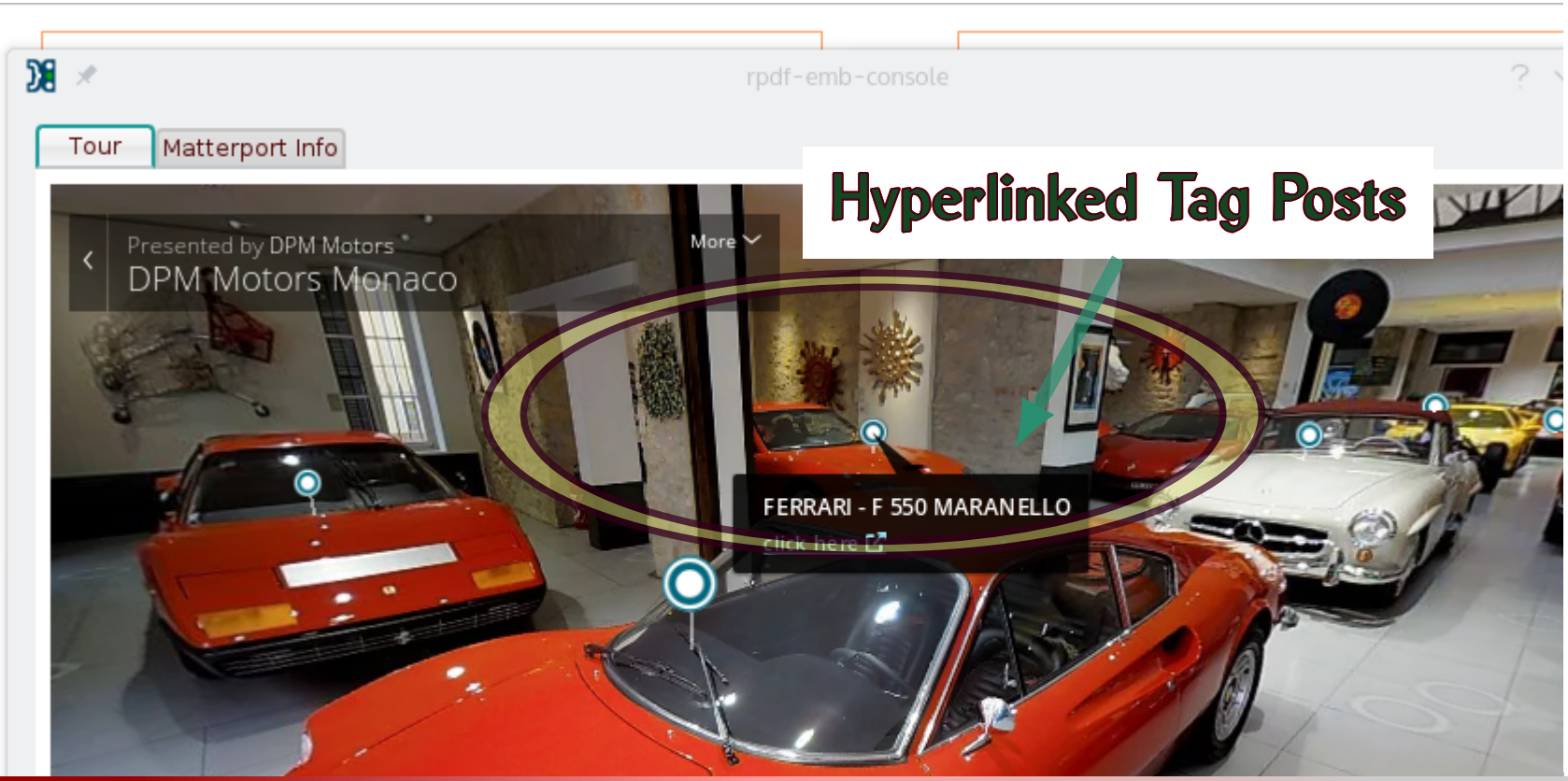
Filtering Photos

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).



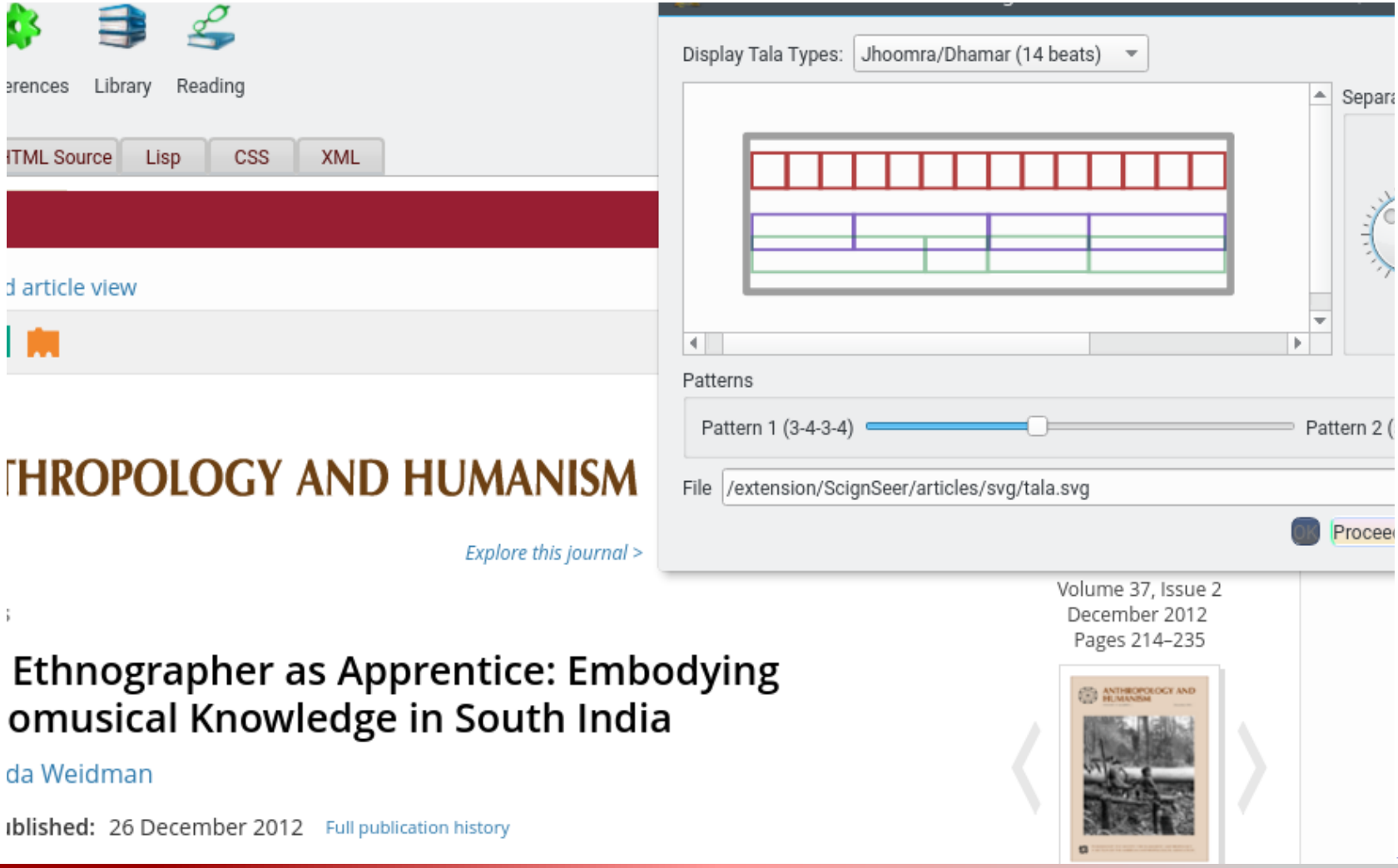
Interactive VR: Hyperlinked Tag Posts

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 sotware.



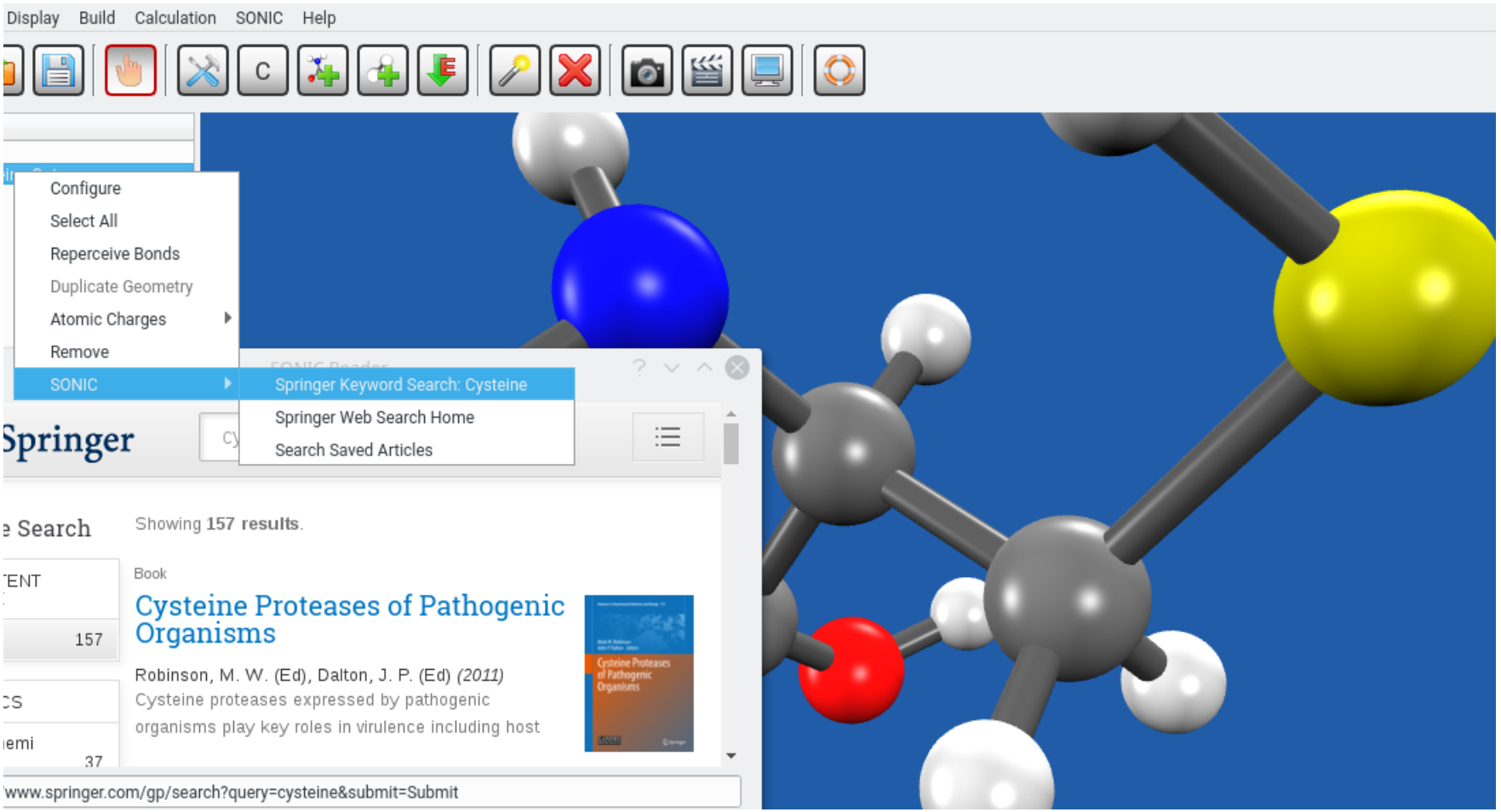
A3R Document Viewers

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.



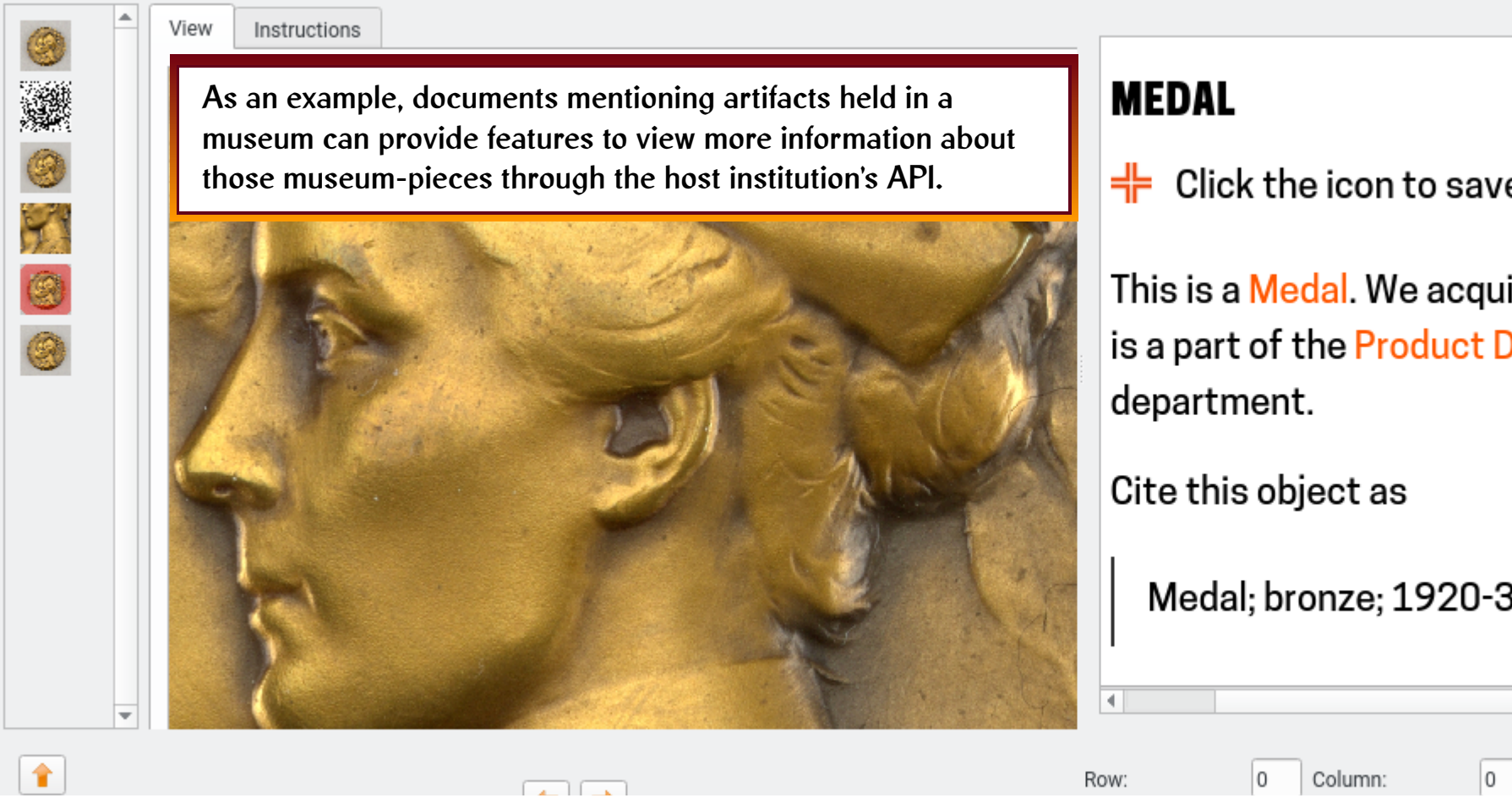
A3R Document Viewers as Embedded Components

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.



Document Viewers Augmented With APIs

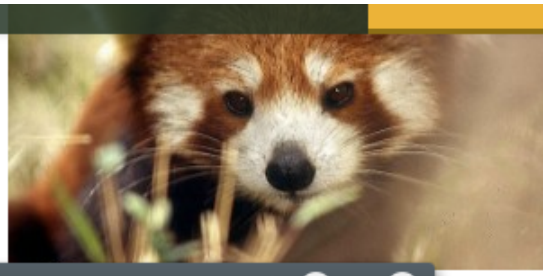
Another strategy for interactive publications is linking documents with APIs maintained by publishers, or by cultural or educational institutions.



Embedded Multimedia

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.

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
develop extended associations with their mothers that las
breeding season.

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

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.