Roadmap

Looking toward the XNAT future
Presenter: Kate Alpert, Flywheel

- Sr Director of XNAT Product and Engineering at Flywheel
- Has worked with XNAT since 2008, first at Northwestern University - customizing for targeted data science workflows; later with Radiologics, Inc. and Flywheel on core application
- Bummed that London precip is not currently in her preferred frozen form 🎿
Agenda
What will we cover in this talk?

- Review the XNAT roadmap
  - Near-term focus
    - Features
    - NFRs
  - Over the next 4 years of the R01
    - Architecture
    - Integrations
    - Apps

- Hear from you!
  - Interactive discussion
  - Feedback form
Near-term focus

Features aimed at extensibility for the end-user

- Developer-facing extensibility
- User-facing extensibility

...and NFRs to ensure quality
XNAT & eXtensibility
A bit of history

XNAT: eXtensible [Neuro]imaging Archive Toolkit

- Through v1.6,
  - Customizations required developers to fork XNAT core and/or the pipeline engine and struggle through a potentially complex, manual merge process to upgrade
  - User-facing customizations available around naming, default searches, custom variables, permissions, etc.

- As of v1.7,
  - Spring integration supports plugin injection, allowing developers to maintain isolated repositories for their customizations thereby reducing burden of updating core (but plugins are not aware of one another)
  - Container service offers end-users the ability to dynamically configure processing launch UI from json configuration and leverage any published container image for processing

- As of v1.8,
  - Event service facilitates user-configured actions in response to application events (e.g., creating a project, archiving a session, etc.)
Features

⚠ Day 3 emerging feature
demo teasers ahead!
Coming soon!
Custom forms MVP

- WYSIWYG form builder from form.io
  - (json also supported)
- Dynamically-typed data collection
  - No more xml modifications or clunky custom variables
  - Still must “hang” on an existing data type
    - Fully dynamic data type management is in the works
- Federation-ready
Coming soon!

Jupyter notebook integration MVP (IC3R @ WUSTL with support from Flywheel)

- Launch and manage notebooks straight from XNAT, stage data, do science!
  - xnatpy (Erasmus MC)
- Leverage notebooks to quickly prototype custom UI
Coming soon!

Viewer enhancements (ICR/NCITA team with support from Flywheel)

- Measurement service
- MONAI Label integration
- Metadata crawler performance optimizations
Coming soon(ish)!

Viewer enhancements cont’d (ICR/NCITA team with support from Flywheel)

- More activities in 3D
- In-viewer forms
- Microscopy support
Coming soon!

...and more

- Unified OpenID plugin
  - Integrating AIS core, PKCE support, and streamlined UI customization
- MONAI template container for use with XNAT-ML *(IC3R @ WUSTL)*
  - “Pick your framework”
- Additional k8s feature support in CS
  - PVC, images labels -> node constraints, in-app management
- Anonymization profiles in DicomEdit
  - Imports, conditional blocks, federation-ready
Nonfunctional Requirements

YOU ONLY WORK ON FEATURES?

I TOO LIKE TO LIVE DANGEROUSLY
Coming soon(ish)!

Nonfunctional requirements

- **Tackle some tech debt**
  - Enhanced horizontal scalability
  - Dependency updates (Spring, etc)
  - Performance optimizations

- **Enhance our automated test suites**
  - Performance tests
  - REST tests
  - Selenium tests

- **Streamline deployment**
  - K8s helm chart *(AIS)*
  - Dev and prod
Coming soon(ish)!

Nonfunctional requirements, cont’d

- Improve instrumentation & metrics collection
- Optimize the SDLC (FWE)
  - Monorepo
    - Robust CI
  - TBD branching model, moving toward CD
  - Increase release cadence
    - MVP
    - Feature flags
  - Path for community contributions
Thank you! 🙏

These near-term advancements are made possible by numerous valuable collaborations and contributions.

In particular, we would like to acknowledge work from the IC3R @ WUSTL, ICR/NCITA, AIS, and Erasmus Medical Center, as well as funding and support from Flywheel’s commercial clients, and efforts from the entire Flywheel team.

We are thrilled to have such a vibrant community!
The Future
What are our longer term goals?

- **Modernize** the XNAT platform architecture
  - Simplify the XNAT codebase
  - Enable faster development cycles
  - Improve maintainability, security, scalability, and performance
- **Expand** XNAT core capabilities
  - Focus on integrations
- **Develop** new XNAT capabilities
  - Leverage integrations
- **Support and grow** the XNAT community
Modernize the XNAT platform architecture

- **UI overhaul**
- **New archive management service**
  - Abstract storage (file, object, perhaps more!)
  - Direct database tracking, no more catalog files
    - Improved versioning
    - Billing
  - Native zip support
- **New database management service**
  - Replace XFT with a standard ORM (e.g., Hibernate)
  - Explore database technologies (horizontally scalable relational database, noSQL, graph, etc.)
- **Multiprovider compute**
  - Container execution across multiple providers and platforms (swarm, k8s, HPC, etc.)
  - Access controls (and billing) by project, user, and container requirements
  - Federation-ready
- **Monolith → microservices**
  - Scalable, reliable (isolated), flexible (independent services), maintainable, CD
Expand XNAT core capabilities

Facilitate integrations via flexible tooling

- Consistent, well-documented RESTful APIs
  - DICOMweb
- Robust SDKs
  - xnatpy! Erasmus MC
- Webhooks
Develop new XNAT capabilities

- User-facing worklists to streamline manual, task-oriented activities
  - E.g., rapid reader with hanging protocols
- Portable user workspaces for cohort building, exploration, and processing
  - Filter and snapshot
  - Lessons learned in XNAT-ML dataset builder
- Orchestration/workflow engine supporting complex, multistage pipelines including human-in-the-loop tasks
- Productivity applications that bring it all together for a streamlined, targeted UX
  - E.g., ML Studio
Support and grow the XNAT community

- **Outreach**
  - Hosting workshops and hackathons
  - Conferences
  - Social media

- **Documentation and support**
  - Updated website & documentation
  - Moderating discussion group

- **XNAT Academy**
  - “Virtual Lab” courses

- **Promote and integrate code and documentation contributions**
Discussion & Feedback

LEARN FROM FEEDBACK
ONE MUST
What should be easier to do in XNAT?
What should be easier to do in XNAT?
What is missing in XNAT?
What is missing in XNAT?
Why do you use XNAT instead of another tool or platform?
Why do you use XNAT instead of another tool or platform?

Start presenting to display the poll results on this slide.
What is your favorite thing about XNAT?
Roadmap feedback
We would love to hear from you!