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End-to-End Questionnaire Management for Biomedical Studies

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About Quretec

- Spin-off of EGeen
- Originally: platform development for the Estonian Genome Project
- Currently data management solutions for a variety of applications
- Focused on biomedical studies

Overview

- Motivation
- Properties
- Components
- Workflow
- Projects
- Further work

Motivation

- Turnaround time
- Why not Survey Monkey?
 - Complex data models
 - Security

Workflow

- Study environment setup
- Study object model design
- Questionnaire design and deployment
- Data collection
- Data queries
- Analysis
- Profit!

Environment Setup

Study Manager	Installation Manager
Studies	Configurations Installations Contacts Components
<h2 data-bbox="239 496 471 531">Add studies</h2> <p data-bbox="239 571 598 599">Enter study information</p> <p data-bbox="278 625 807 654">Study name <input type="text"/>*</p> <p data-bbox="278 665 795 694">Study description <input type="text"/></p> <p data-bbox="239 705 795 733">Relational Datasource <input type="text"/></p> <p data-bbox="278 745 687 773">Conflict Handling <input type="text" value="Detect and Resolve"/></p> <p data-bbox="278 785 490 811">"Write only" mode <input type="checkbox"/></p> <p data-bbox="490 822 618 842">Allow clients</p> <ul data-bbox="251 853 795 1282" style="list-style-type: none"><input type="checkbox"/> DC-007 Sample logistics php application<input type="checkbox"/> DC-400 COBRED demo installation<input type="checkbox"/> DC-401 COBRED<input type="checkbox"/> DC-402 COBRED<input type="checkbox"/> DC-403 COBRED<input type="checkbox"/> DC-404 COBRED<input type="checkbox"/> DC-405 COBRED<input type="checkbox"/> DC-406 COBRED<input type="checkbox"/> DC-407 Sample receiving in B<input type="checkbox"/> DC-408 Sample receiving in I<input type="checkbox"/> DC-409 Sample receiving in Bio<input type="checkbox"/> QT-762 Qure Designer for uploading study data (Odin)<input type="checkbox"/> QT-763 QureDesigner on Phoenix (Windows)	<h2 data-bbox="973 502 1302 536">Add Installation</h2> <p data-bbox="973 576 1290 605">General Information</p> <p data-bbox="1012 631 1846 659">Installation Code <input type="text"/></p> <p data-bbox="973 671 1866 776">Installation Description <input type="text"/></p> <p data-bbox="1070 788 1391 816">Type <input type="text" value="QureDesktop"/></p> <p data-bbox="1020 828 1476 856">Contact Person <input type="text" value="Choose contact person"/></p> <p data-bbox="1062 868 1367 896">Status <input type="text" value="active"/></p> <p data-bbox="1166 965 1244 985">Studies</p> <ul data-bbox="985 999 1418 1105" style="list-style-type: none"><input type="checkbox"/> COBRED-Breast <input type="text"/><input type="checkbox"/> COBRED-Colon <input type="text"/><input type="checkbox"/> EstonianGenomeProject <input type="text"/> <p data-bbox="981 1153 1128 1182">ok Cancel</p> <p data-bbox="981 1222 1166 1242">Certificate request</p> <p data-bbox="981 1250 1275 1270">No certificate request available</p>

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Object Model Design

Subject

- subjectId
- initials
- TumorInfo
- InclusionCriteria
- ClinicalEndpoints
- FollowUp
- Diseases
- BloodSampleCollection
- TumorSampleCollection
- MonitorVisits

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Questionnaire Design

The screenshot shows the cobredCC Editor interface. The left pane displays a hierarchical tree structure of questionnaire sections:

- [1] Subject List
 - [1] List of Subjects
 - [.1] Subject ID
 - [.2] Subject initials
 - [.3] Medical chart number
 - [.4] Protocol No
 - [.5] Set read only
 - [1] Subject #.subjectId# #.initials# Information
 - [NO CODE] GROUPING MODULE
 - [A] Personal Information
 - [.1] Sex
 - [.2] Date of birth
 - [.3] City of birth
 - [.4] Date of diagnosis
 - [.5] Age at diagnosis
 - [B] More Information
 - [D] Inclusion Criteria
 - [E] Tumor Information (1)
 - [F] Tumor Information (2)
 - [G] Treatment Information
 - [H] Follow-Up Information
 - [I] Clinical Endpoints
 - [J] Death
 - [K] Diseases
 - [L] Sample Collection and Monitoring

The right pane shows the configuration for the selected section, [A] Personal Information:

- .1 Sex
 - <no text>
 - item 1
 - item ...
 - item NDomain: sex
- .2 Date of birth
 - <no text>DD.MM.YYYY:
- .3 City of birth
 - <no text>:
- .4 Date of diagnosis
 - <no text>DD.MM.YYYY:
- .5 Age at diagnosis
 - full years:

Navigation buttons: Previous (F8) and Next (F9).

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Data Collection

Qure Desktop - COBRED Colon Cancer Subject Data (COBRED-Colon, cobredCC, build 164)

File Edit Action Administration Help

Show Navigation Tree Synchronize Study Content...

\ [1] Subject List \ [1] Subject <[redacted]> <[redacted]> Information \ [A] Personal Information

[1] Subject List

- [1] Subject Information
 - [A] Personal Information
 - [B] More Information
 - [D] Inclusion Criteria
 - [E] Tumor Information (1)
 - [F] Tumor Information (2)
 - [G] Treatment Information
 - [H] Follow-Up Information
 - [I] Clinical Endpoints
 - [J] Death
 - [K] Diseases
 - [L] Sample Collection and Monitoring

[A] Personal Information

A.1 Sex

Male
 Female

A.2 Date of birth
Date (DD.MM.YYYY):

A.3 City of birth

A.4 Date of diagnosis
Date (DD.MM.YYYY):

A.5 Age at diagnosis
full years:

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Data Queries

DataView

List Queries Select Main Object Type Choose Filters Choose Attributes Output options Execute Save

Query results:

Subject subjectId	Subject dateOfBirth	Subject dateOfDiagnosis	Subject cityOfBirth	Subject ageAtDiagnosis

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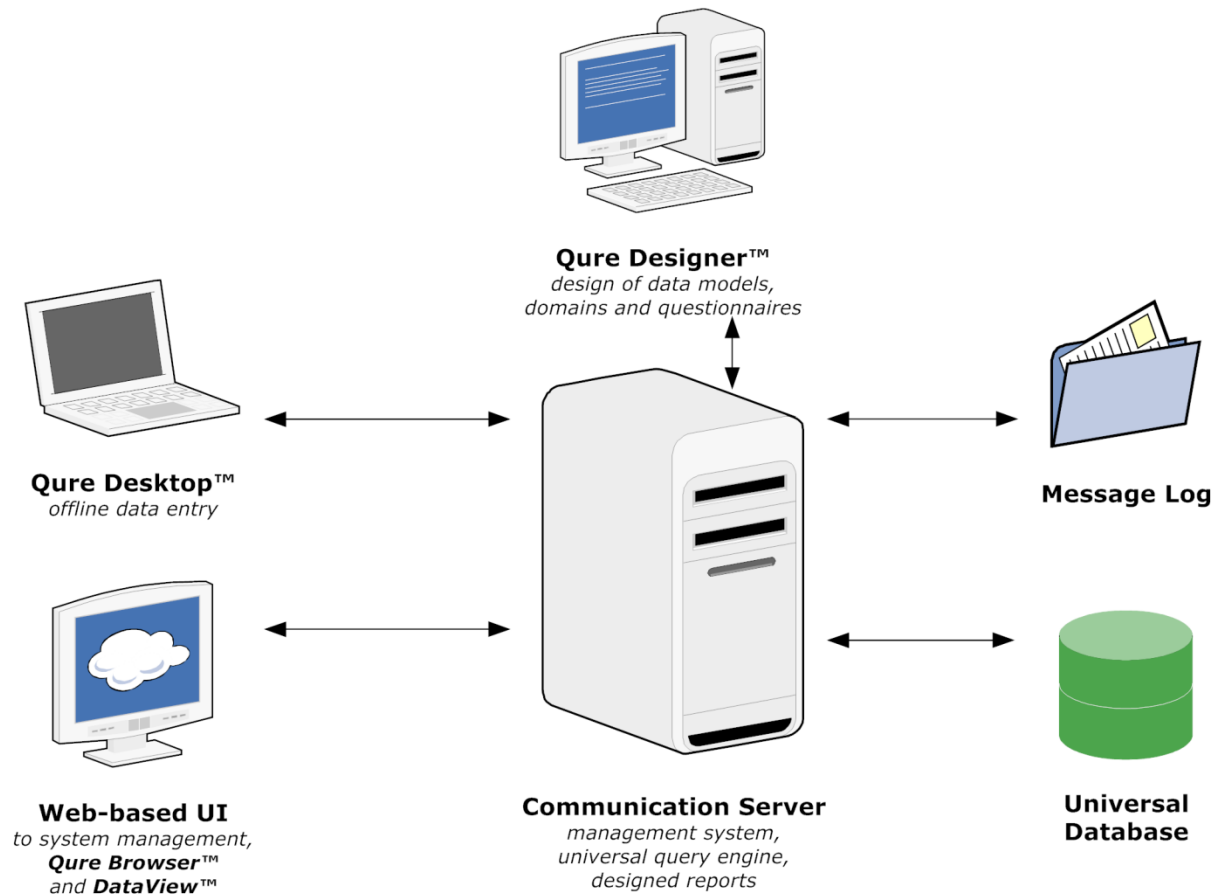
Profit!



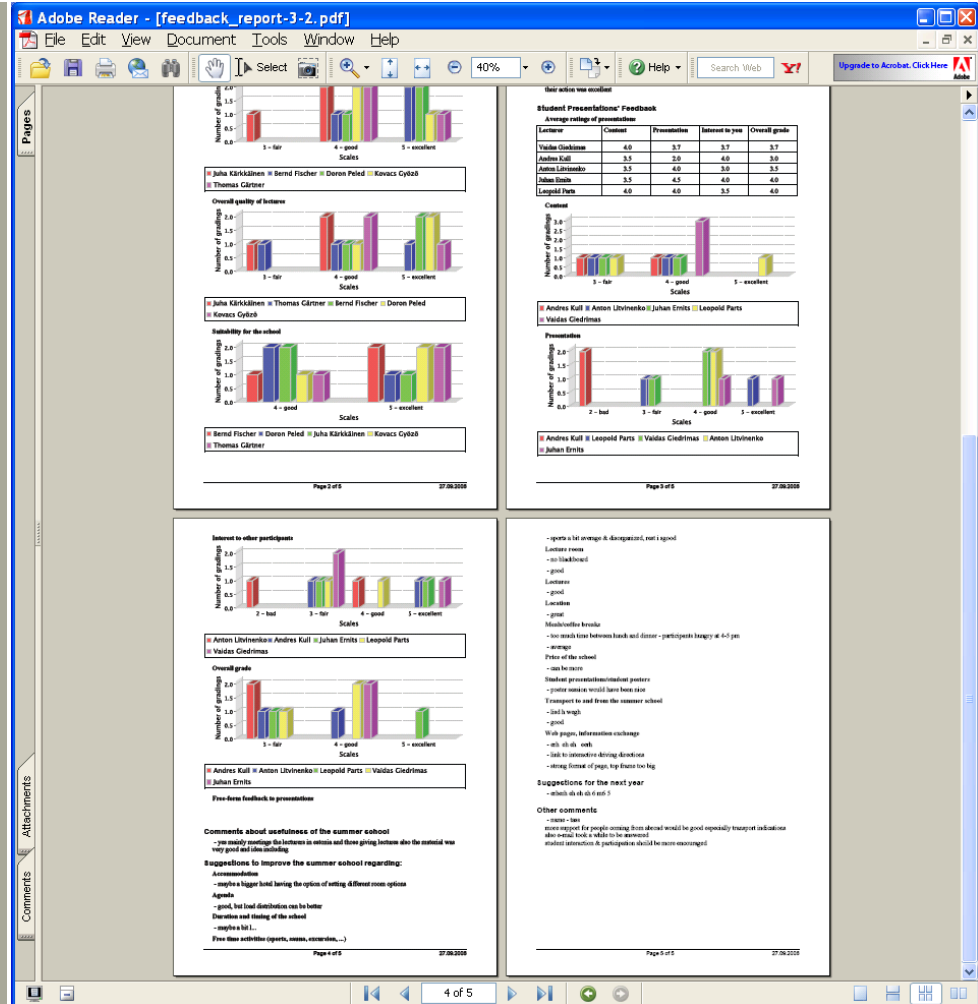
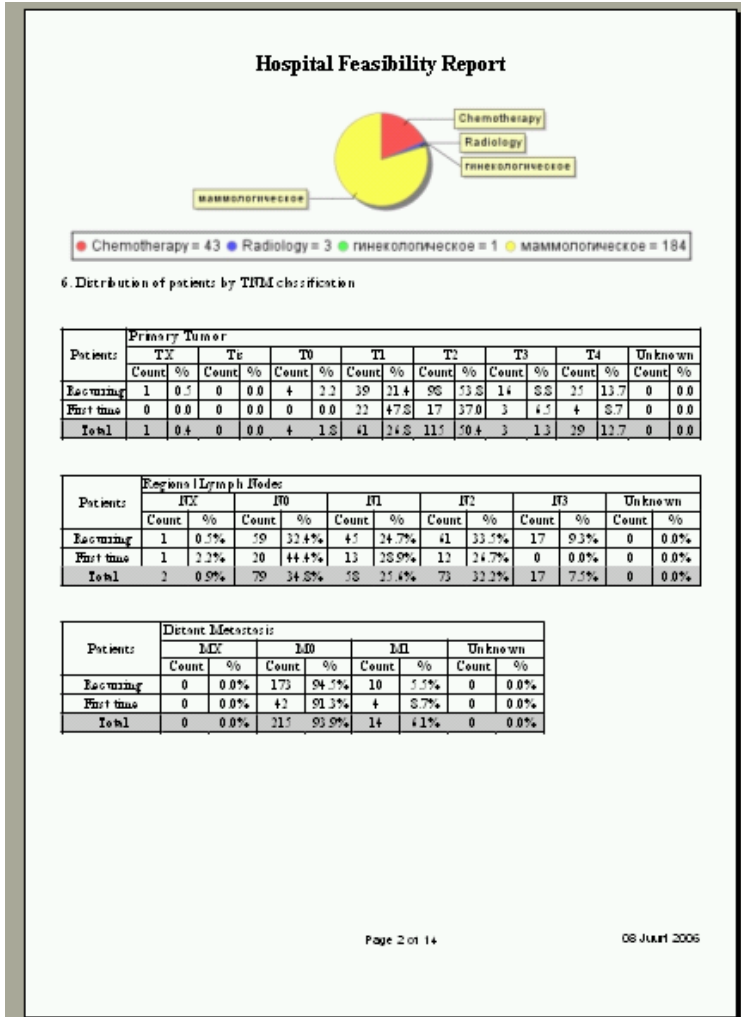
Qure Data Management Platform

- Study designer tool - QureDesigner
- Desktop application - QureDesktop
- Data and update server - QureServer
 - Web-based data entry - QureBrowser
 - Data querying - DataView
- Specific web applications with less security - Qure WebCollector
- Study specific reports

Platform Architecture



Study Specific Reports



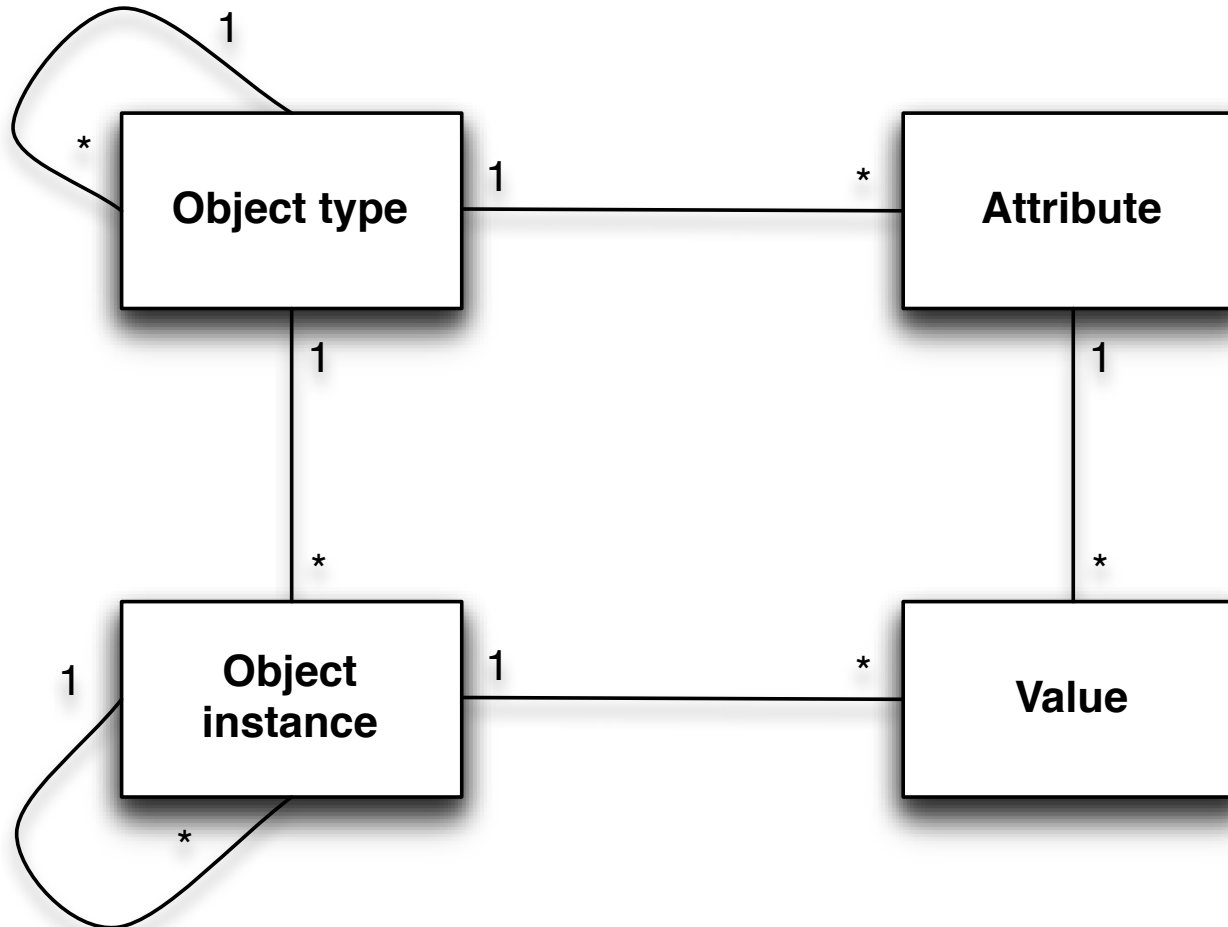
Properties (1)

- Quick study environment setup
- User management and access control
- Application management

Properties (2)

- Quick study model design
- Different views for different users
- Relatively intuitive user interface
- Software updates
- Universal database
- Relational mapping

Our EAV/CR Implementation



Security

- Public Key Infrastructure
- Authentication of the desktop application in the server
- Certificates used for identification
- Encryption of sent and stored data

Limitations

- Speed vs. data quantity
- Predetermined modules
- Strict rules for changing studies after data collection has begun
- Too much security

Some Current Projects

- Estonian Genome Project
- COBRED project
- Dysmorphology study
- Also applications in other areas
 - Herbarium
 - Endangered species database ("Red Book")
 - Different feedback forms

Further Development

- Data queries from relational database
- Machine learning aspect
- National Census, Statistics Estonia

Thank You!