

Annalist

“Data management for the little guys”

Graham Klyne



Drosophila testes gene expression (Fly-TED)



- ★ [Browse by Gene Name](#)

Browse it

- ★ [Browse by CG Number](#)

Browse it

- ★ [Browse by Strain](#)

Browse it

- ★ [Browse by Expression Location](#)

Browse it

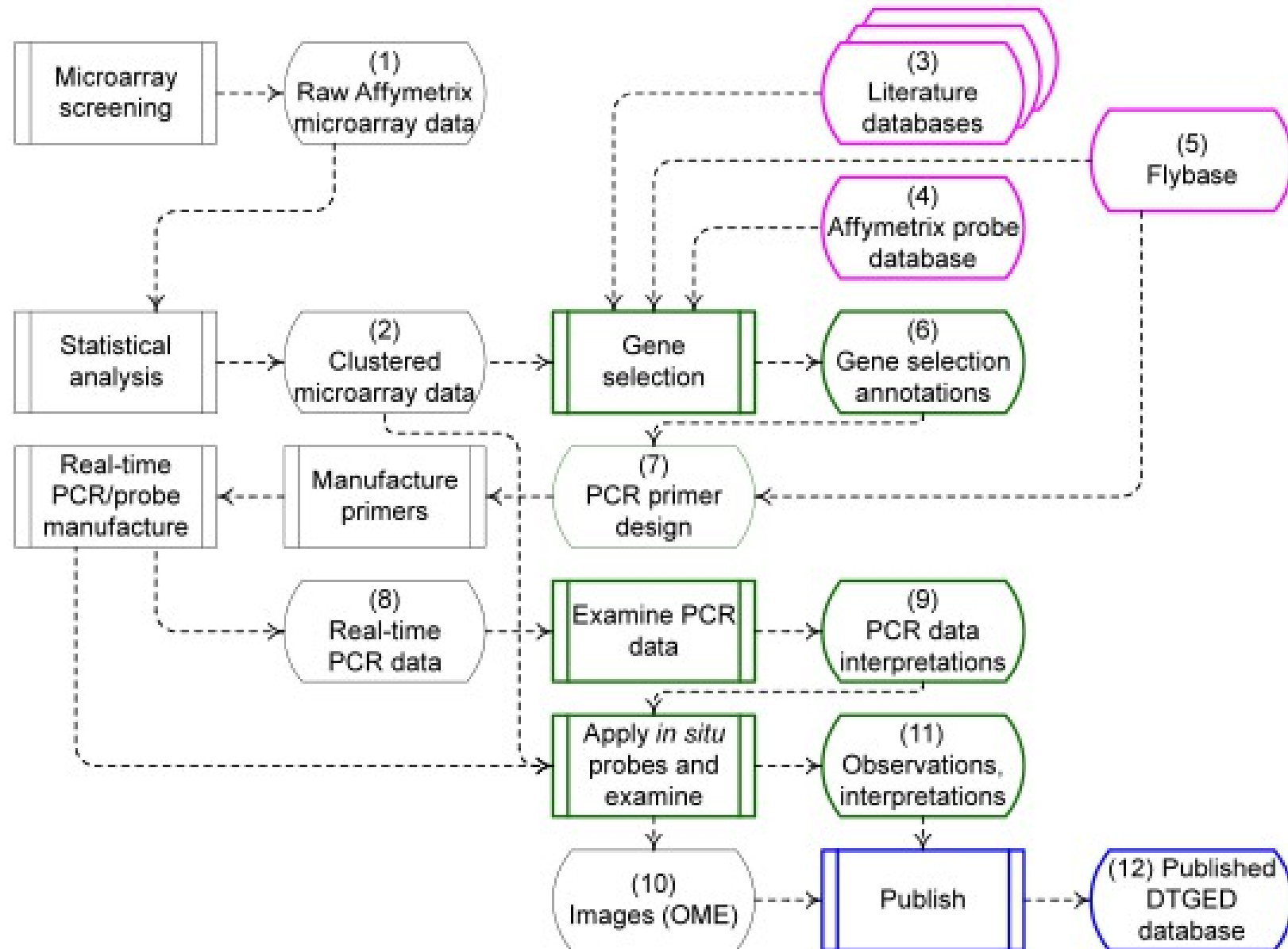
<http://flyted.zoo.ox.ac.uk/>

Excerpts from Fly-TED web site by Jun Zhao



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Fly-TED data flows



Fly-TED data management

- Microarray screening and selection of genes

- data collected in spreadsheets
- annotation with literature references

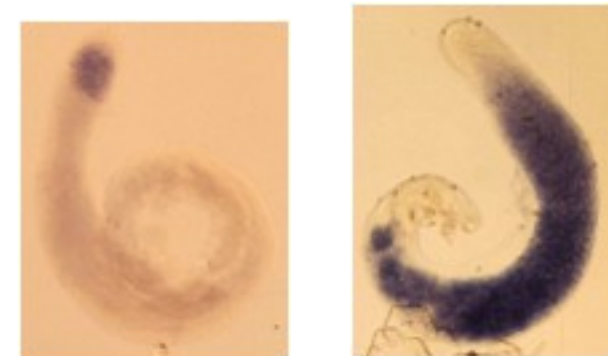
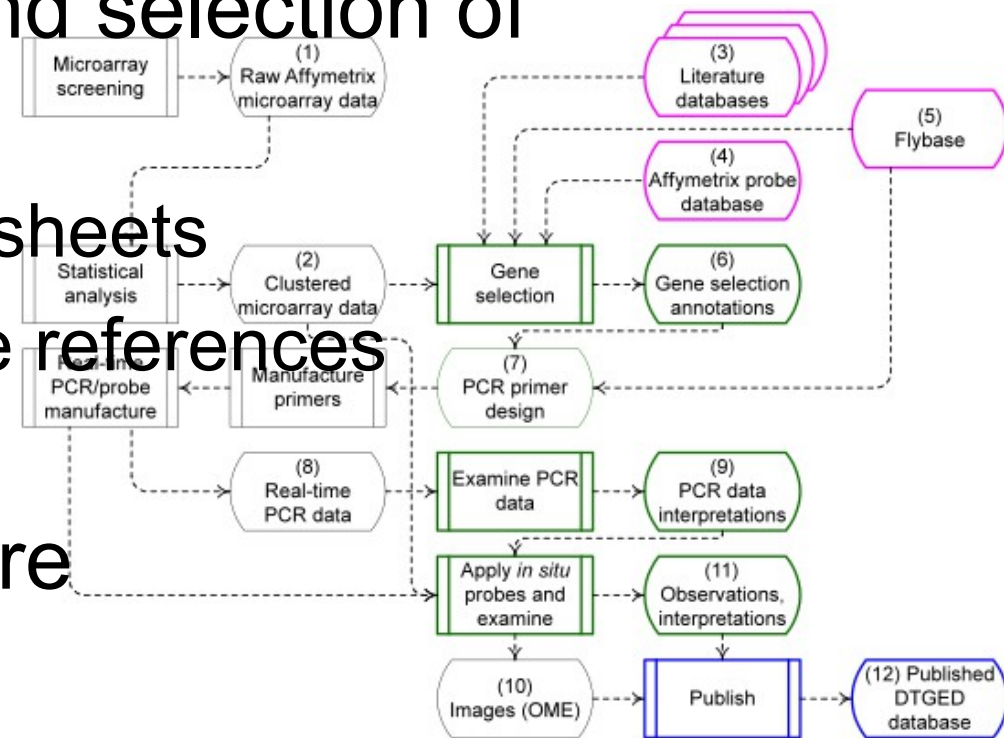
- Real-time PCR and *in situ* probe manufacture

- more spreadsheets

- In-situ imaging

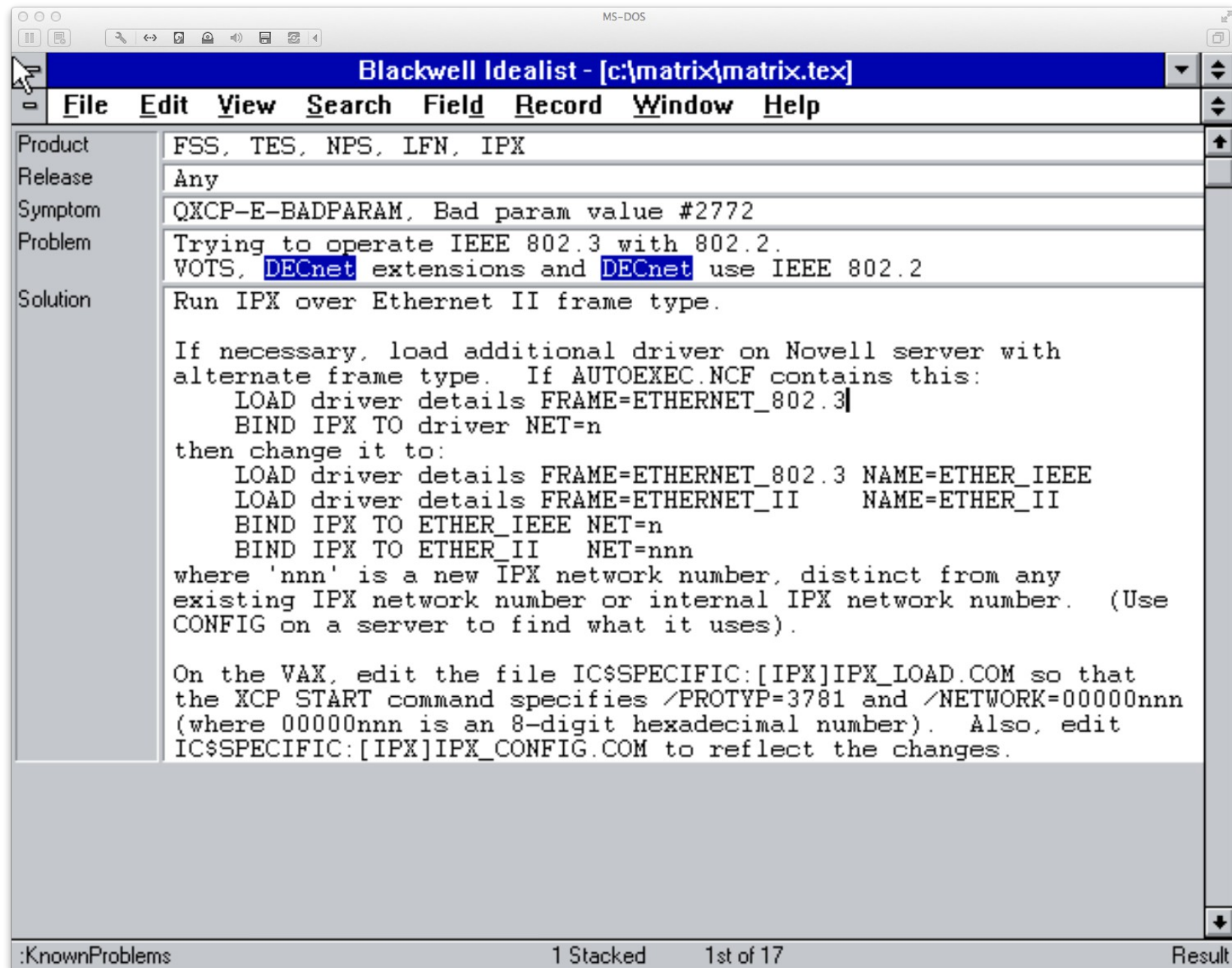
- create and examine images of in-situ hybridization

- record observations in

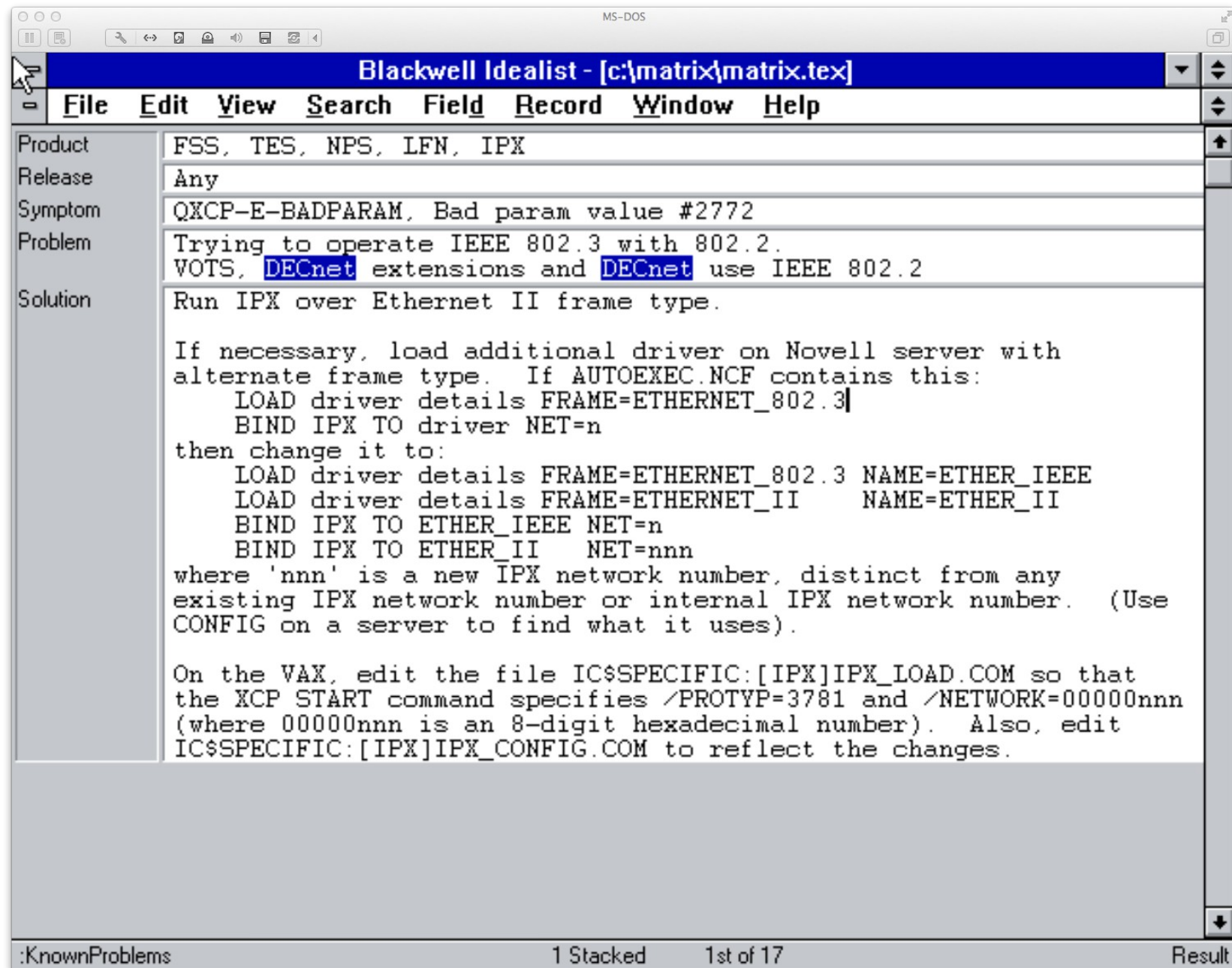


Images: Helen White-Cooper

Technical support knowledge base



Technical support knowledge base



Small business transactions

DOS622-WIN311

| | | |
|---|-------------------|---------------|
| Reference: <u>C0097</u> | Date: 23-Jul-1989 | Total: 147.74 |
| Contact: Graham Klyne | | Nett: 128.47 |
| Company: Graham Klyne (Car,office fittings) | | VAT: 19.27 |
| Address: | | |
| Town: | | |
| Item: 1 Petrol | | |
| 2 Car maintenar | | |
| 3 Office fittin | | |
| 4 Photocopying | | |

DOS622-WIN311

| Reference | Date | Company | Total |
|--------------|--------------------|---|---------------|
| C0090 | 02-Feb-1989 | Graham Klyne (Travel) | 40.00 |
| C0091 | 15-Feb-1989 | Graham Klyne (ACM) | 78.77 |
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| C0111 | 08-Jan-1990 | Graham Klyne (Video monitor) | 279.95 |

Tab Next Field: F2 Search:

1 Create; 2 Delete; 3 Edit; 4 Options; 5 Name Search: 3 Record 97

Some common themes

- Read/write:
 - a need for a system that handles both data access and input in the same activity; more notebook than database
- Loosely structured data
 - combining free-form description with machine-processable values and annotations
- Structure can evolve as the system is used
- Requirement to search across all fields
- Use of external systems to handle presentation or further analysis of data



Annalist: mockup demo

- In response to the common requirements of these applications (and more), a web-based system for collection of and access to semi-structured data is envisaged
- This demo is a view of what such a system might look like...
- Link to mockup:

</usr/workspace/github/gklyne/annalist/mockup/Annalist.pdf>



Annalist: Goals

- Handling semi-structured data
 - machine processable and human readable elements
- Usable “out of box”
 - no complicated setup before use ...
 - ... but also a basis for custom applications
- In-use definition and evolution of data structures
 - supporting an agile approach to data management
- Interworking with linked data and REST services



Annalist: technical features

- Fully web-integrated data management
 - internal use of REST + Linked Data mechanisms
 - linking to and using external resources (linked data)
 - seamless working across locally-stored and Web data
- No fixed schema
 - easy-to-setup; low “activation energy”
 - add structure as required
- Loosely coupled components
 - separation of storage, indexing and UI

“Source as resource”

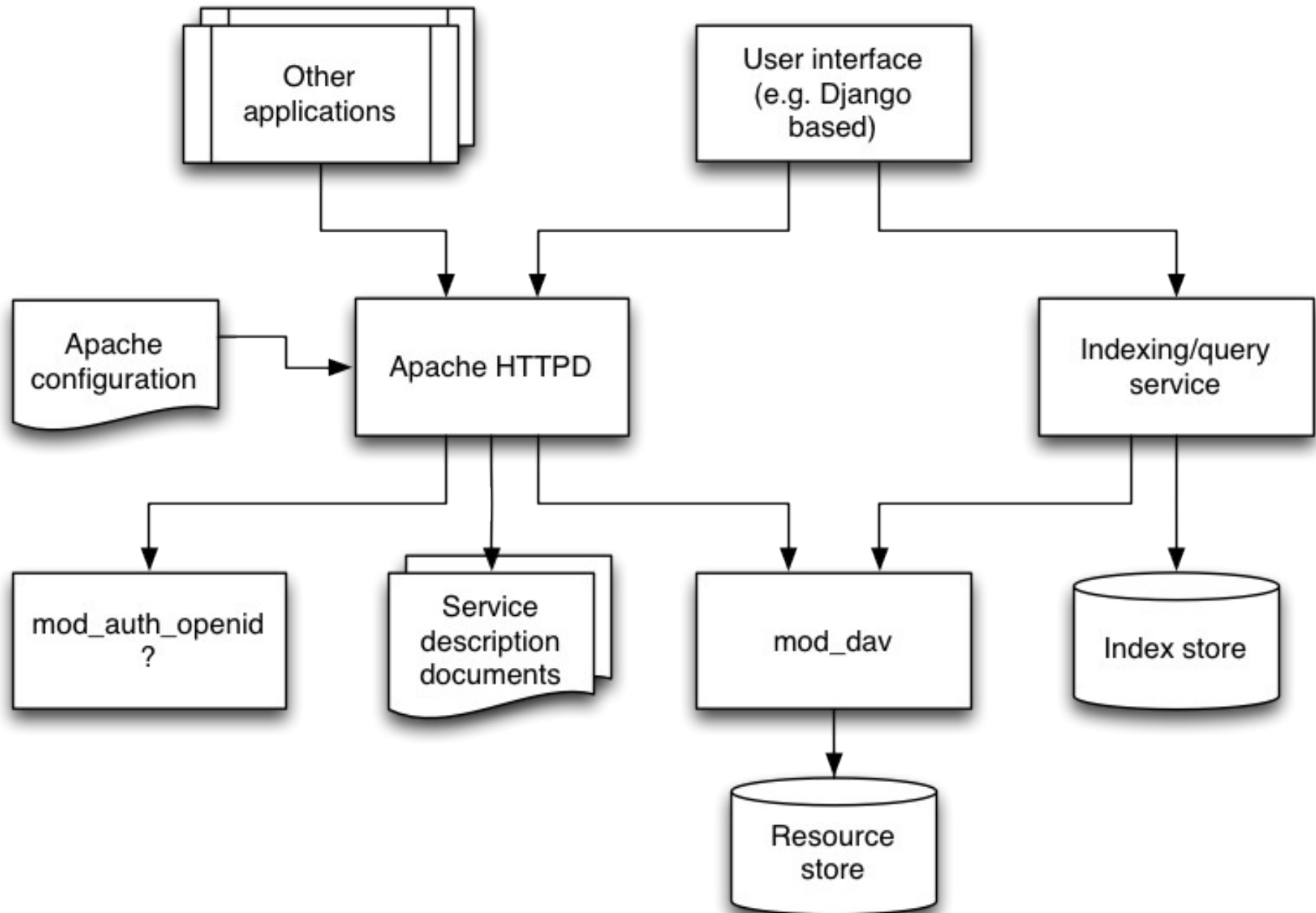
- “View source” contribution to the success of WWW
- By associating each record with human-decodable web data resource (e.g. in Turtle or JSON-LD), bring the “view source” effect to linked data
- Access to / usability of data not being tied to any specific application, supporting local *or* remote hosting of services, or both used together:
 - backup-friendly (cf. Fly-TED experience),



Annalist: intended audience

- Individuals
- Small research groups
- Small businesses (SOHO and up...)
- Clubs and non-commercial associations
- ... with unique data organization requirements, but lacking resources to create custom solutions with existing toolkits
- ... where use of data may pass to others who are familiar with different tools

Tentative architecture / overview



Application examples

- Technical support knowledge base
- Small-business book-keeping
- Personal information management
- 3D model sharing (e.g. Thingiverse)
- Recipe sharing
- Project management
- Biolmage / Fly-TED
- Workflow sharing (e.g. myExperiment)
- VIDAAS option (<http://vidaas.oucs.ox.ac.uk/>)
- CLAROS notebook (<http://www.clarosnet.org/>)
- “Research Object” construction and sharing
- Workflow annotation (e.g. of Taverna bundles)



Possibilities for near-term focus

- Small research group data management
- Dataflow/Datastage metadata capture
 - a commonly requested feature
- Databank/SWORD integration
 - building on ADMIRAL/Datastage work
- myExperiment integration
 - create ROSRS API interface

Where next?

I propose to develop and implement a prototype of this design as an independent open-source project in early 2014 (e.g. 50% time over 3-6 months for an initial prototype)

I would like to work on a consulting basis with interested university research activities to develop and refine specific requirements and features (e.g. 25% time)





Questions?

Interested?

graham.klyne@zoo.ox.ac.uk

gklyne@gmail.com

@gklyne (Twitter, Skype)

(A summary slide from 2005)

- Image Bioinformatics deploys a collection of tools for annotation and publication of multidimensional image data
 - We aim to assemble a diverse open-source toolkit, using existing components as much as possible
- Semantic rigour is needed for interoperable capture of expert observations
- Information requirements are open-ended; extensibility and evolvability are key goals
- Information design as much as software design
- We are a small, application-focused group seeking to work with appropriate technical expert collaborators



Evaluation criteria

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
- Support external applications (REST API)
- Open source, open data format



Evaluating Callimachus (5-8)

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Evaluating Semantic Wiki / Wikidata (3-8)

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- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics" (yes, but..)
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Evaluating spreadsheet (4-6)

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Evaluating Rightfield (5-6)

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Evaluating FigShare (1-7)

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Evaluating Access (1-4)

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Evaluating Idealist (5)

- Usable out-of-box for data collection
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- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
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Evaluating ResearchSpace (?)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
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Annalist

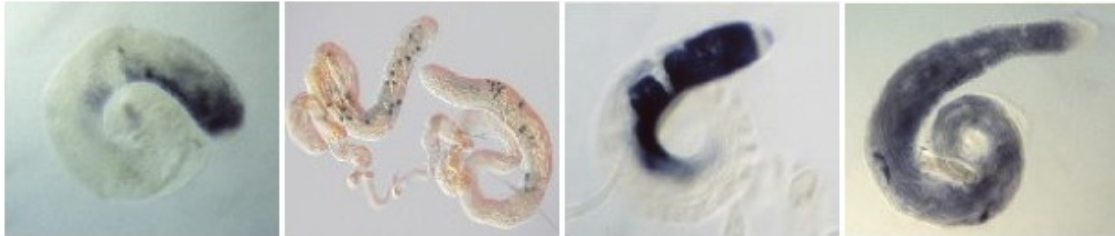
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Drosophila testes gene expression (Fly-TED)



- * [Browse by Gene Name](#) Browse it
- * [Browse by CG Number](#) Browse it
- * [Browse by Strain](#) Browse it
- * [Browse by Expression Location](#) Browse it

<http://flyted.zoo.ox.ac.uk/>

Excerpts from Fly-TED web site by Jun Zhao

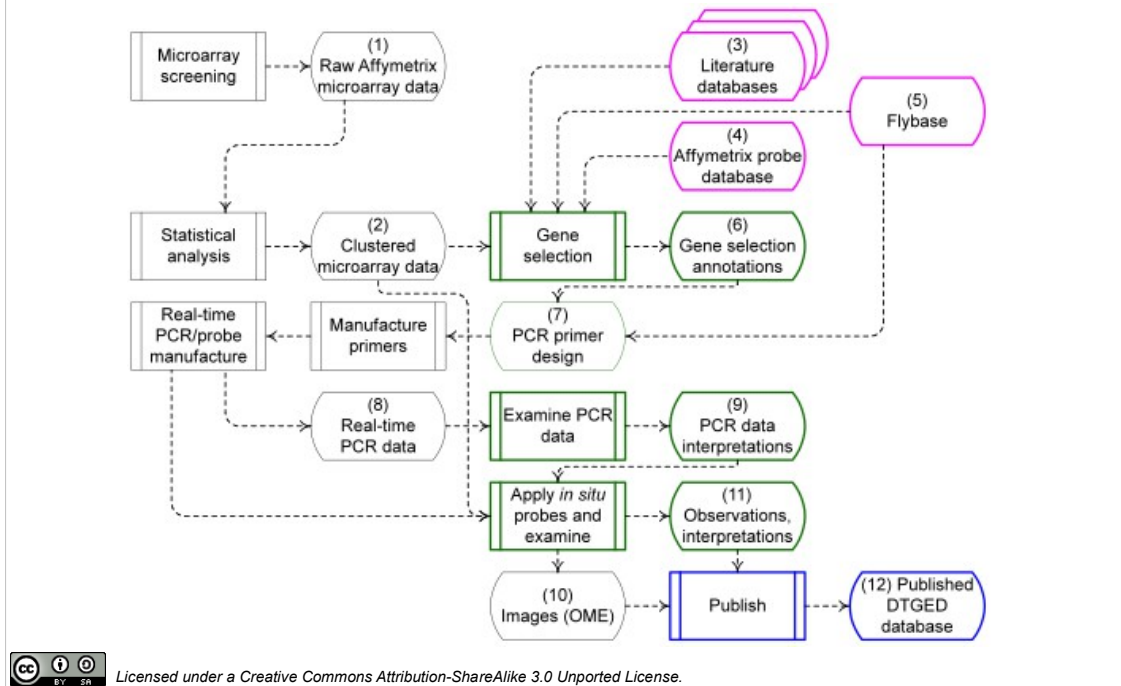


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One of the first projects I worked on after joining David Shotton's IBRG at Oxford was collection and cataloging of gene expression images of sperm development in *Drosophila Melanogaster* (a commonly studied model organism), which were collected as part of a strand of research investigating causes of male infertility in humans and other species.

The eventual result of this work was a public database and web site, through which in situ gene expression images can be viewed based on selection by gene name, *Drosophila* species, expression pattern or other criteria.

Fly-TED data flows



A substantial part of the *Drosophila* genome was screened, using microarrays, and statistically analyzed to identify genes with distinctive expression patterns in *drosophila* testes across genetic variants exhibiting male sterility, compared with expression in the normal wild-type variant (e.g. genes in sterile mutants whose expression was significantly higher or lower than in the wildtype).

This screening was used in combination with informed researcher evaluation to select a subset of about 1000 genes for in-situ gene expression imaging, a complex and labour-intensive process that results in an image showing where in the sperm development cycle the various genes are expressed.

This work required the collation and collation of diverse information about a range of *drosophila* genes associated with the microarray “probe” sequences: gene identification, species variant identification, microarray expression levels, statistical analyses, real-time PCR data, in-situ images, image annotations (including sperm development stage) based on manual through-microscope observation of the images.

Fly-TED data management

- Microarray screening and selection of genes

- data collected in spreadsheets
- annotation with literature references

- Real-time PCR and *in situ* probe manufacture

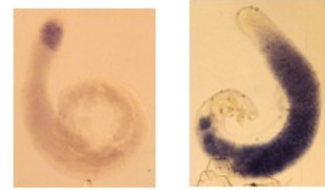
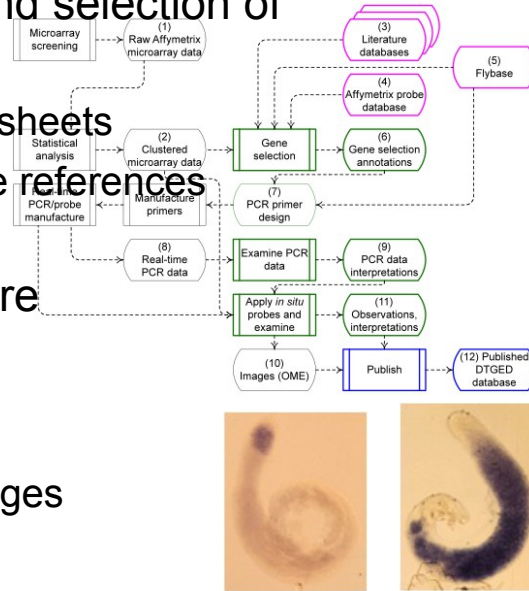
- more spreadsheets

- In-situ imaging

- create and examine images of in-situ hybridization



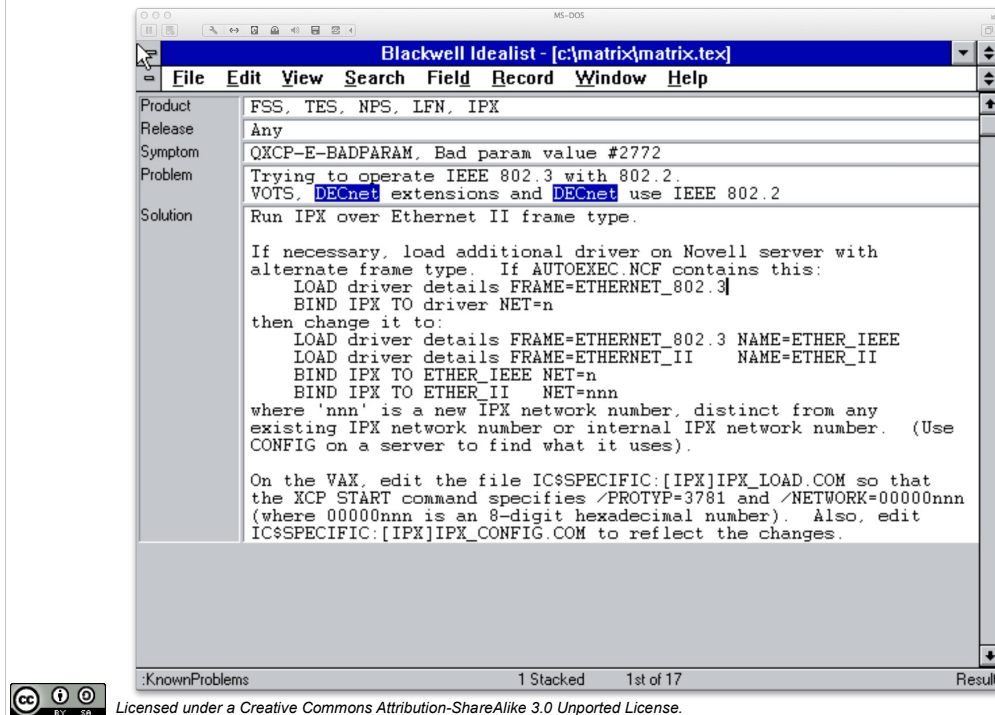
record observations in



Images: Helen White-Cooper

For this work, data on the genes selected for in-situ imaging was collected in spreadsheets with file-system references to the corresponding in-situ images. Because the spreadsheets were manually populated by a number of different people, some of the image annotations, such as those of the sperm development stages, were not consistently described and needed manual review and alignment when the data were prepared for publication

Technical support knowledge base



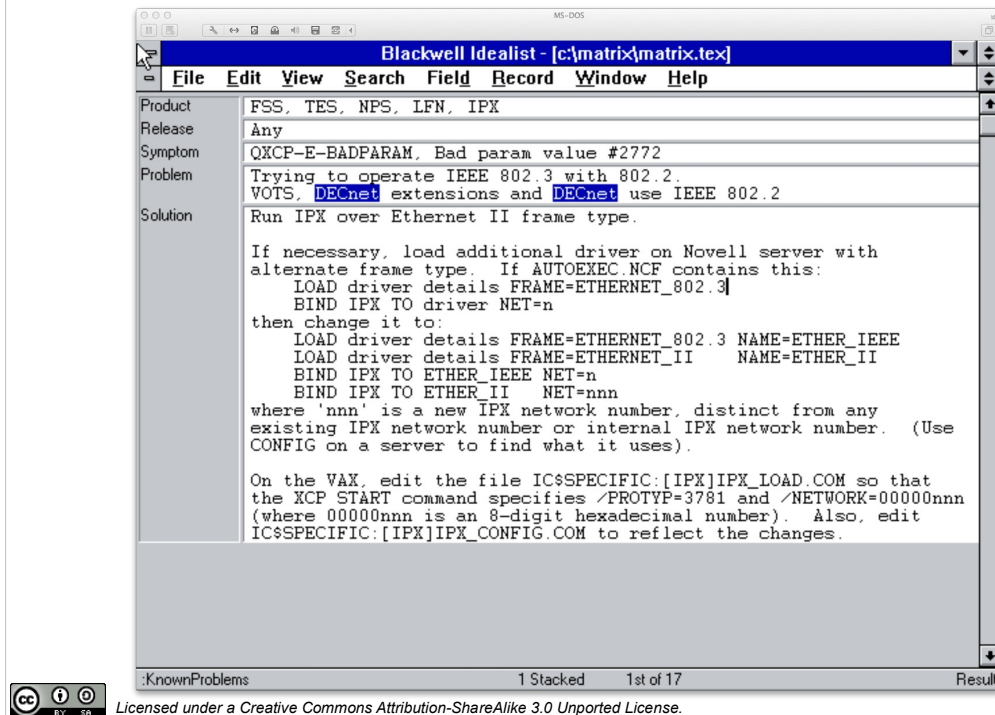
Many years ago, in the early days of personal computer adoption in corporate environments, I helped support a range of software products for connecting diverse kinds of computers, specifically between PCs and mainframe computers.

We were providing person-to-person technical and development support to high-level technical staff in large corporations (banks, telecoms, legal, multinational consumer product companies, etc.), so good access to product information, common failure modes and remediation was important. Things one might find today in a Google search returning a page on Stack Exchange, but before the Web was widely used.

I used an early PC software package called "Idealist" to create a knowledge base that could be searched online by any or all of keyword, product details, operating system version, etc. to locate possible causes and remedies for a reported problem.

Idealist was unusual in that it was one of the first PC software packages to provide free-text keyword searching in semi-structured data. When a new problem was encountered, a description and summary would be entered into the knowledge base by a technical support person so that information about it would be available should it occur for any other customer reporting the same problem. Idealist was probably ahead of its time, as it did not survive as a commercial product, and as far as I'm aware there is still not a ready-to-go product that provides the same level of lightly structured data entry and structured search. (There are plenty of developer tools that might be used to create such a product, but not one I'm aware of that just works out of the box.)

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Small business transactions

The screenshot shows a DOS-based accounting application window titled 'DOS622-WIN311'. It displays a transaction summary for Reference C0097, dated 23-Jul-1989, with a total of 147.74. The contact is Graham Klyne, and the company is Graham Klyne (Car, office fittings). The address is also shown. Below this, a list of transactions is displayed, including items like Petrol, Car maintenance, Office fittings, and Photocopying, with their respective dates, descriptions, and totals. The application is licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported License.

| Reference | Date | Company | Total |
|-----------|-------------|--|--------|
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1 Create; 2 Delete; 3 Edit; 4 Options; 5 Name Search: 3 Record 97

For many years, I ran a small self-employed consulting business, starting in the early days of availability of personal computers at a price that individuals and small businesses could afford. I had a need to raise invoices, handle purchase orders, etc.

Not wishing to pay for a fully-fledged accounting software package, I used a combination of WordPerfect and an associated utility called Notebook to create a kind of computerized card index, with a "card" for each invoice, purchase order, etc. The Notebook utility maintained its data in a simple text document format that was compatible with WordPerfect's mail-merge capabilities, so could easily be formatted as a document for submission to a customer, supplier or just filed.

The simple, out-of-box working of Notebook, and its integration with other WordPerfect office suite programs, made it very easy for me to set up a system that maintained records and generated appropriate presentations, which I used for many years. (I now use a descendant of that system based on MS Access, which was much harder to set up and is, in many ways, less satisfactory in use.)

Some common themes

- Read/write:
 - a need for a system that handles both data access and input in the same activity; more notebook than database
- Loosely structured data
 - combining free-form description with machine-processable values and annotations
- Structure can evolve as the system is used
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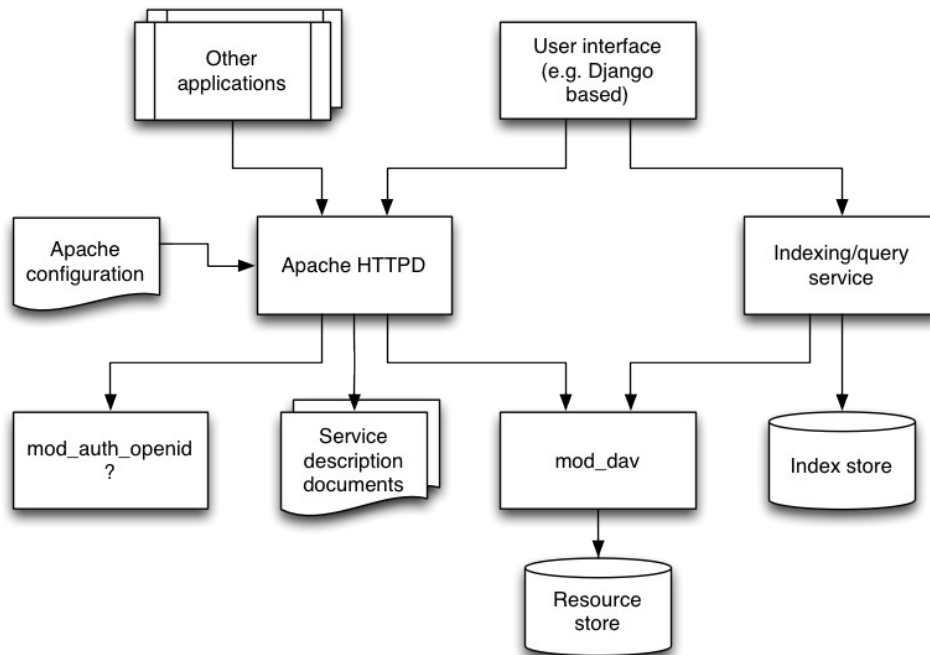
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Tentative architecture / overview



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Application examples

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graham.klyne@zoo.ox.ac.uk

gklyne@gmail.com

@gklyne (Twitter, Skype)

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Evaluating Callimachus (5-8)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
- Support external applications (REST API)
- Open source, open data format



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Evaluating Semantic Wiki / Wikidata (3-8)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics" (yes, but..)
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
- Support external applications (REST API)
- Open source, open data format



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Evaluating spreadsheet (4-6)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
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- Open source, open data format



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Evaluating Rightfield (5-6)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
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Evaluating FigShare (1-7)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
- Support external applications (REST API)
- Open source, open data format



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Evaluating Access (1-4)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
- Support external applications (REST API)
- Open source, open data format



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Evaluating Idealist (5)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
- Desktop or web hosting; work with separately hosted data
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- Open source, open data format



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Evaluating ResearchSpace (?)

- Usable out-of-box for data collection
- Setup/configuration by end user
- Incremental definition of structures
- Mixed data - free text and structured "semantics"
- VCS-friendly; Dropbox-friendly; etc.
- Mobile-friendly
- Content accessible as linked data; links to/from public data
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