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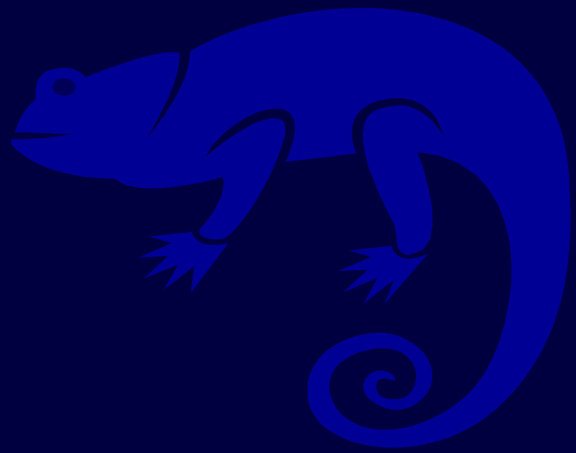

Practical digital preservation

Paul Wheatley

UK Project Manager, CAMiLEON

University of Leeds

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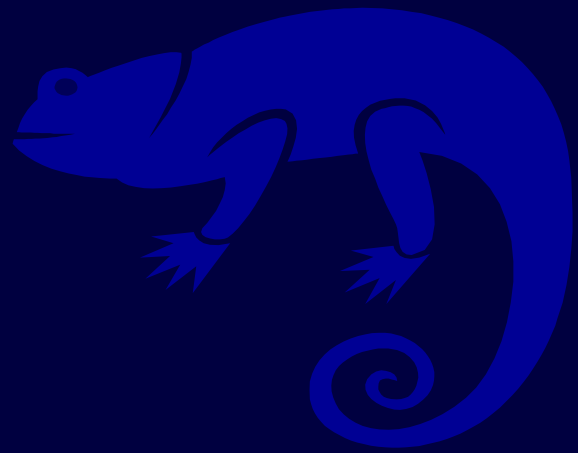

Long Term

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Considering existing strategies for preservation

- Technology preservation
- “Printing out”
- Traditional migration
- Standard formats

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Which direction to take?

- Existing strategies…
  - simple?
  - short term thinking...

- ...We need *long term* strategies

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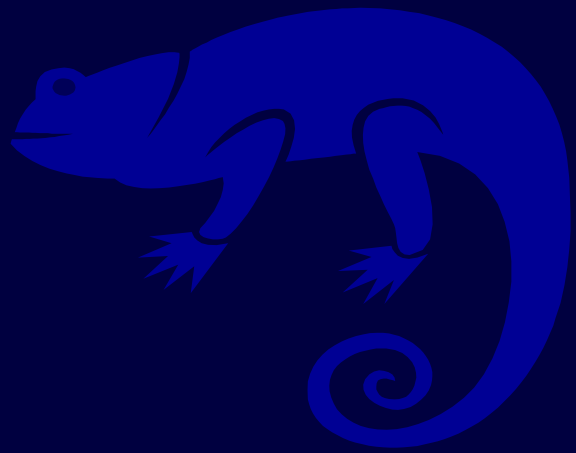
A different way forward

- Keep data in original form
- Best format in which to preserve information?
- How do we interpret the data when the original format becomes obsolete?



Rendering

- Interpreting the original digital object with:
  - an Emulator
  - a Migration tool
- How do we preserve these tools?

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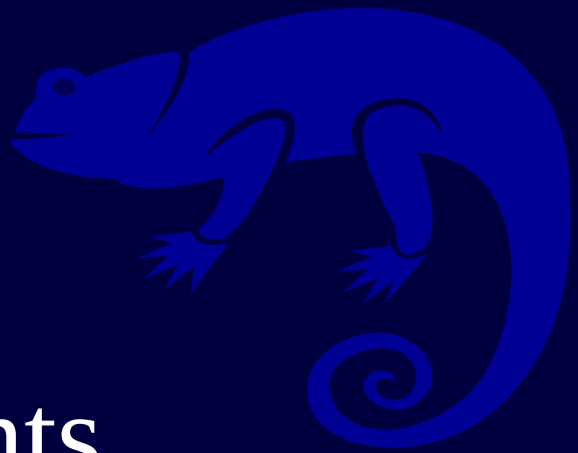
Software Longevity

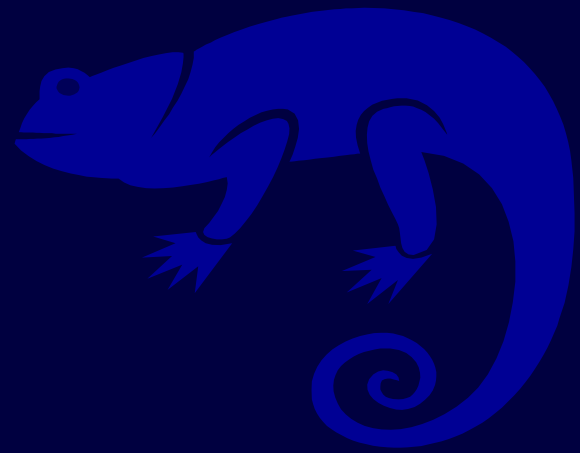
- Preserving the preservation
- Providing better preservation
- Migration path



Initial requirements

- Suitability for emulator implementation
- Stability
- Current reliance and support

…not enough of a guarantee.



The next step

- Transition to new language
- Original requirements still apply
- Migration path...

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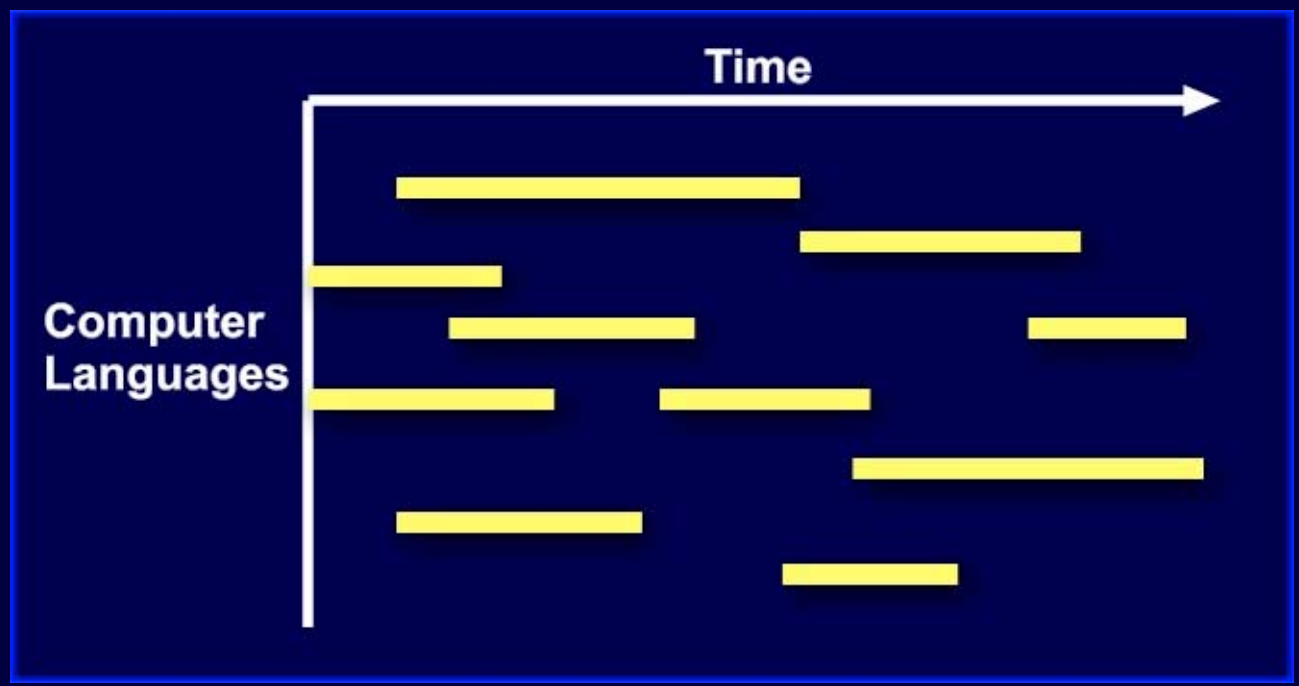
Useful lifetime of computer languages



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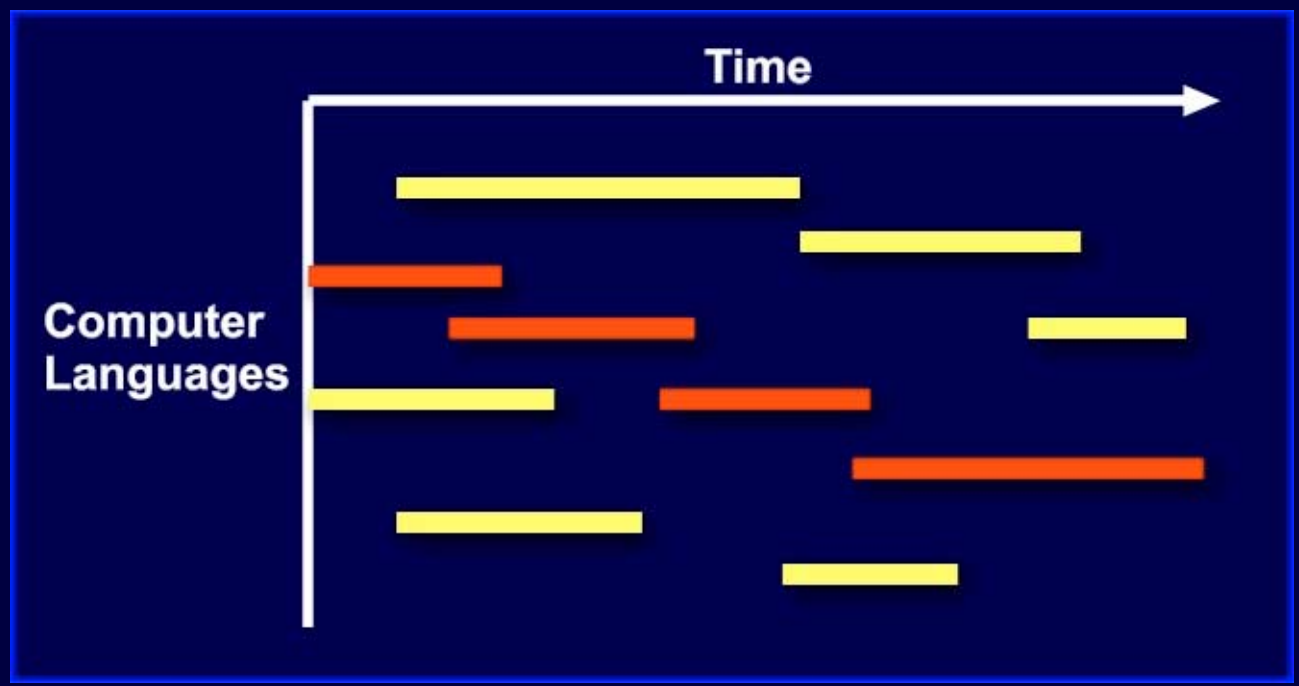
Useful lifetime of computer languages



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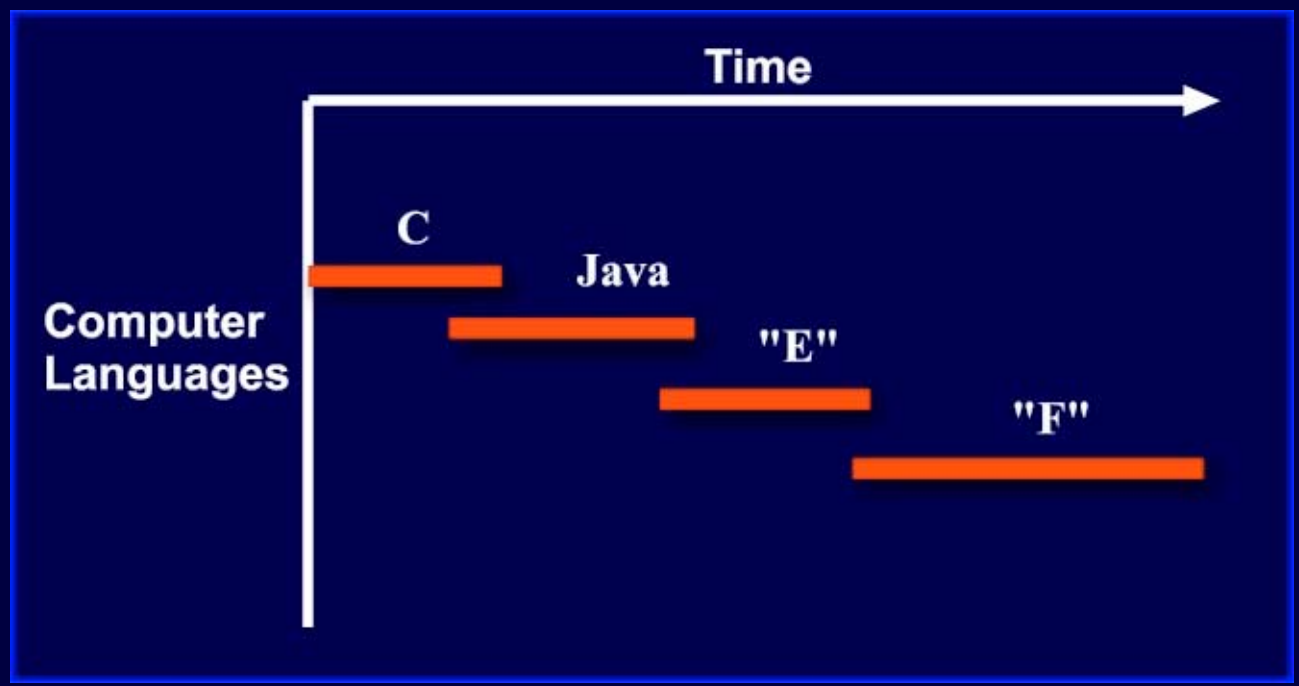
Useful lifetime of computer languages



Optimising the migration process

- Simplify process in order to:
  - Reduce cost
  - Improve accuracy
  - Perform process automatically...?

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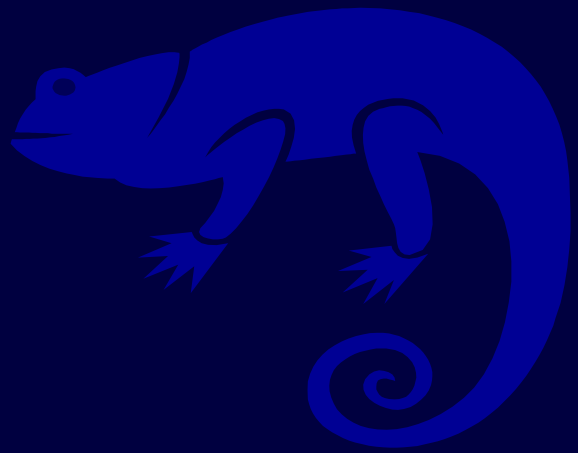

A subset of C

Features for omission from C – –

#if

The C macro preprocessor is widely regarded as a route to confusing code, although it originally allowed efficient implementation of multiple variants from a single source code. It is now regarded that normal if-tests using values known at compile time enable modern optimising compilers to achieve the same level of efficiency — which in any case, is not our main concern.

Macros as functions

Other use of the C macro preprocessor is discouraged, except #define

Unions

The particular style of the C union does not survive to other languages, although Pascal and Ada both have (different) equivalent facilities. Object orientation techniques rather render the idea obsolete. In any case the nature of the code of an emulator is such that the concept is likely to be of little value. In some respects unions have their origin in FORTRAN's EQUIVALENCE statement, that was a notorious cause of portability problems in the past.

Address arithmetic

Many typical C programs are filled with address arithmetic. In part this is historic, because the array facilities of C were not there in the earliest versions of the language. Also, address arithmetic code often compiles to faster code than the equivalent algorithm written using array subscripting. C – –. should force the use of array subscripting (as does Java).

ll be omitted. allowed as part of C – –. Please avoid

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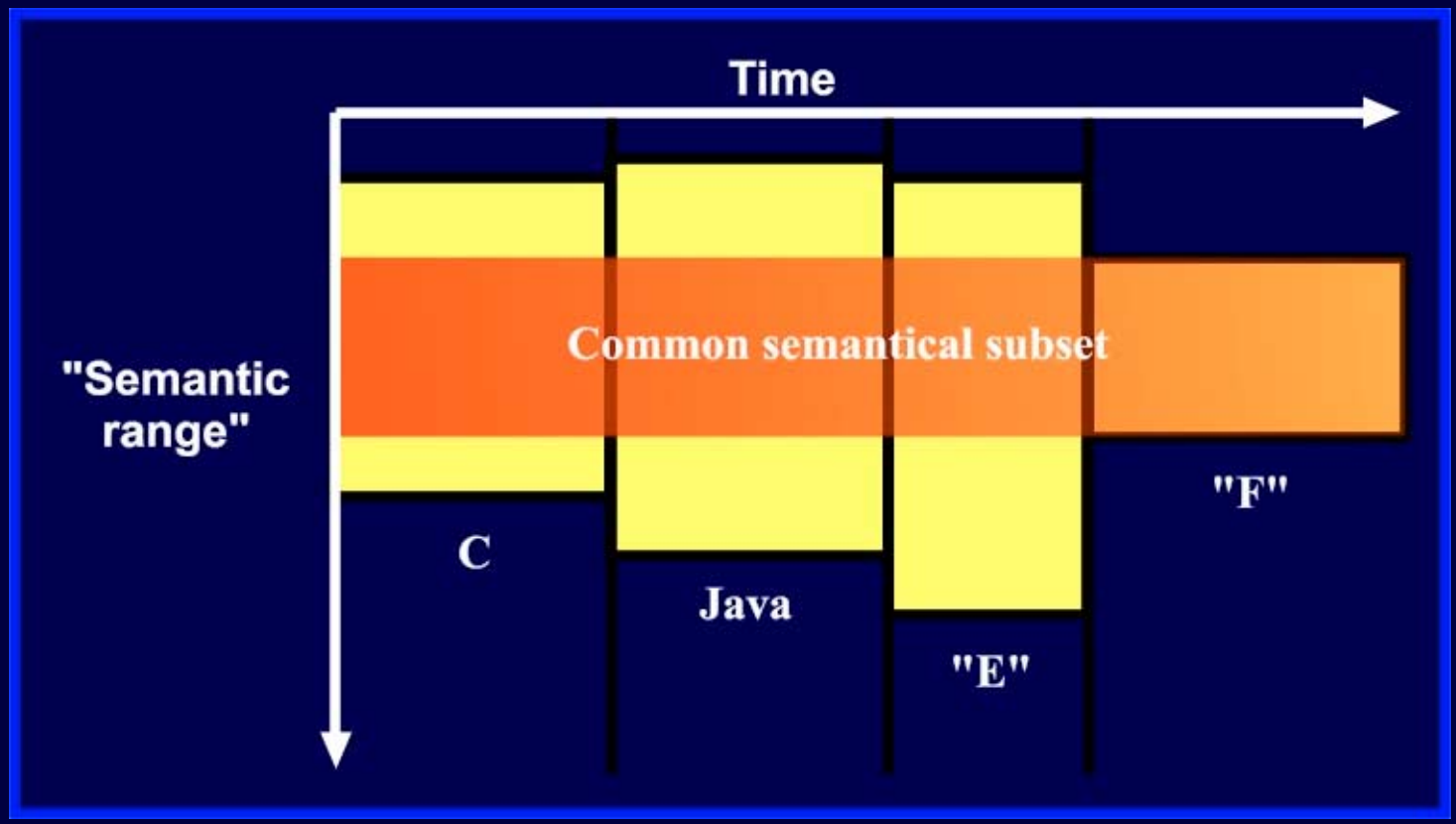
Migration over time



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A new perspective on preservation...

- Foundation of software longevity techniques
- Move the focus of preservation to the rendering tool
- Provide more accurate and more cost effective preservation

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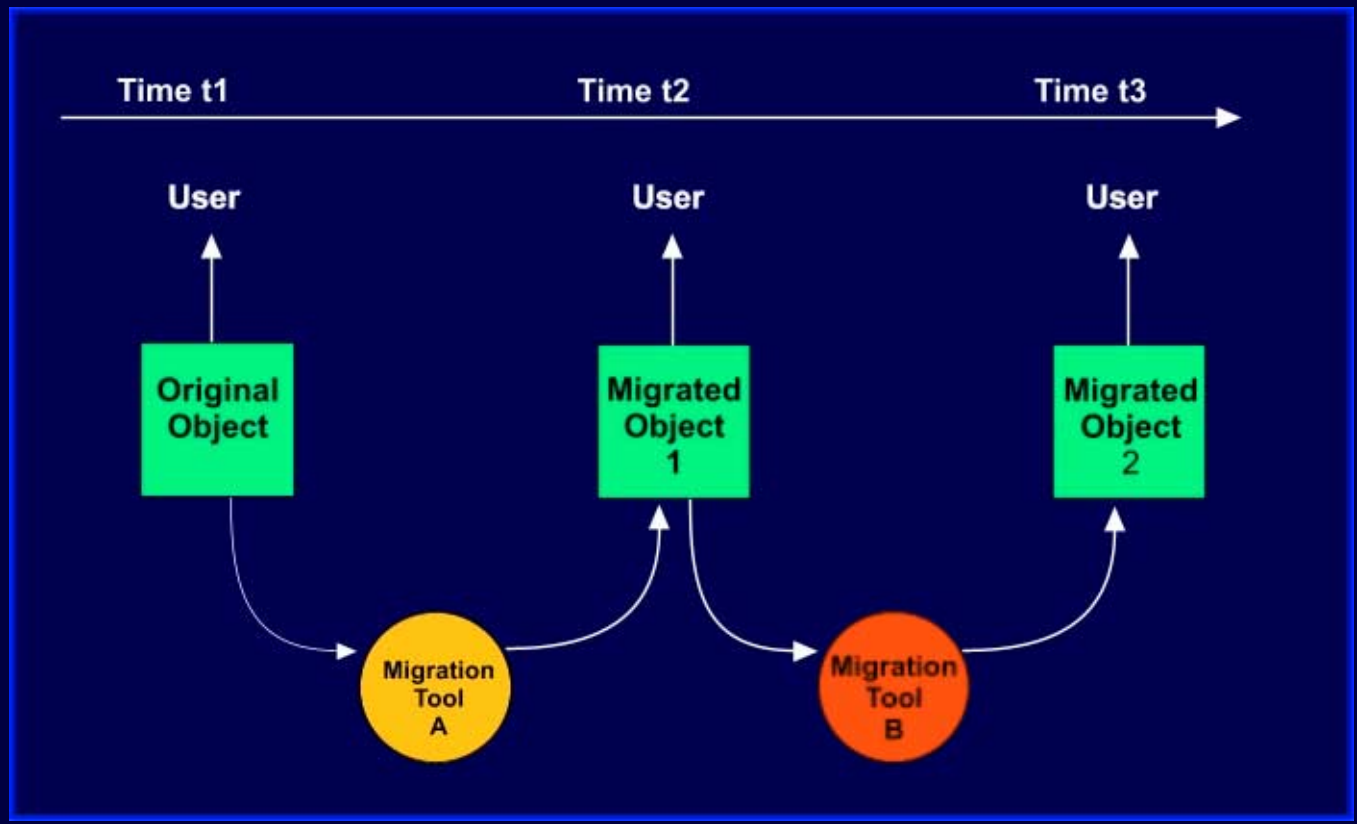
Traditional Migration



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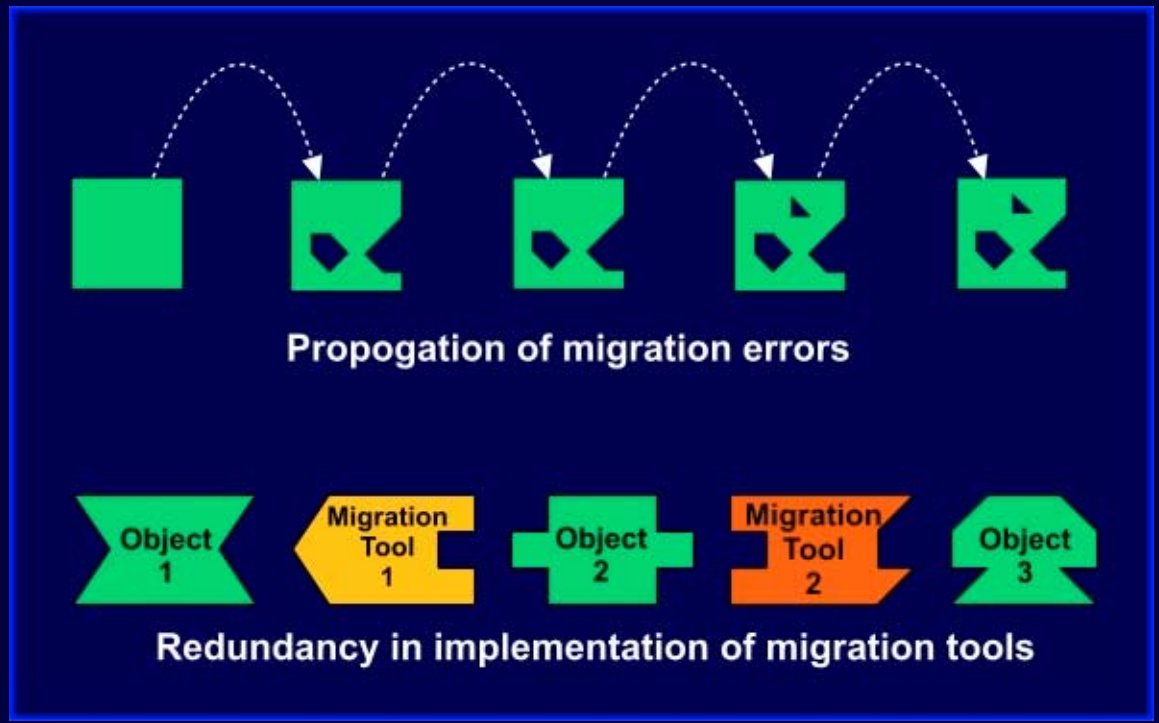
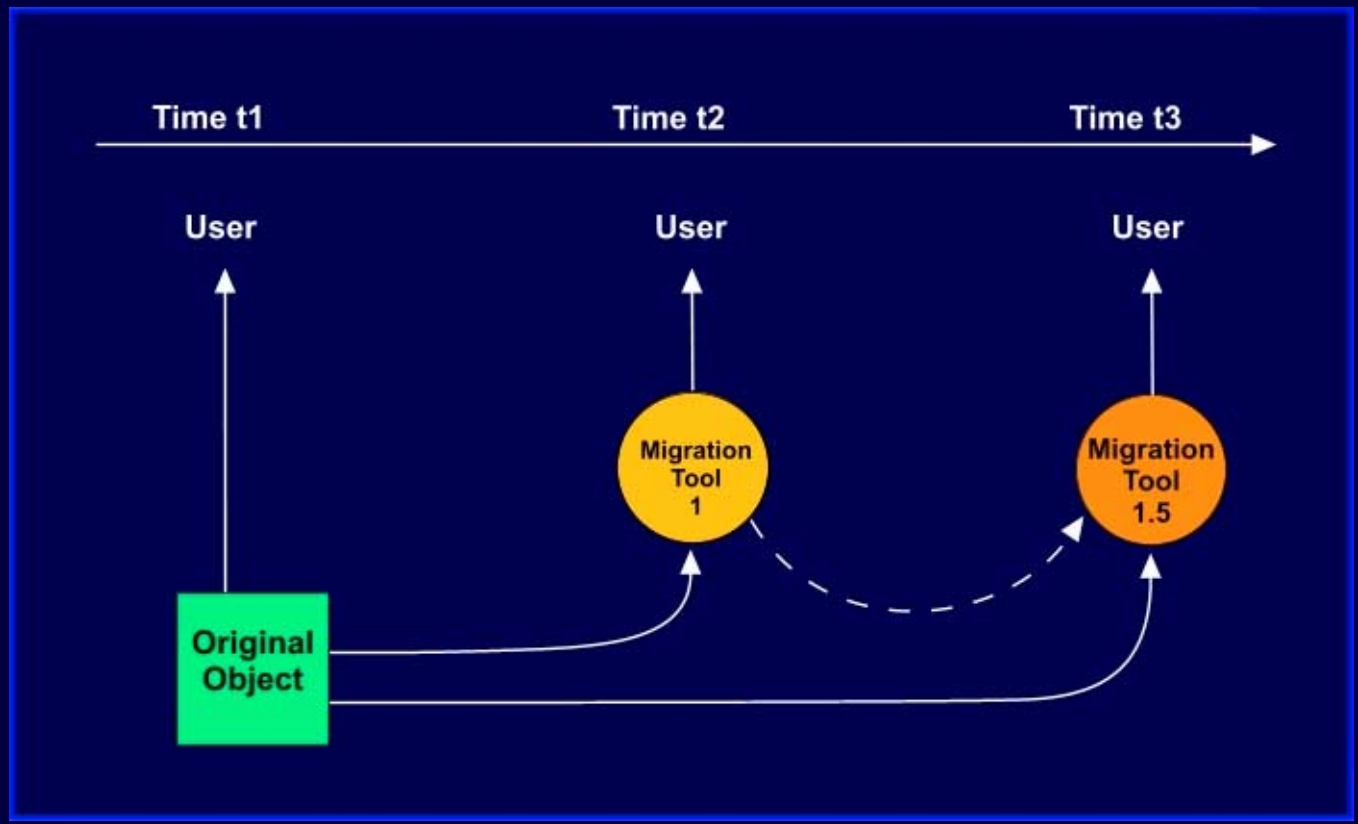
Problems with Traditional Migration



Migration on Request



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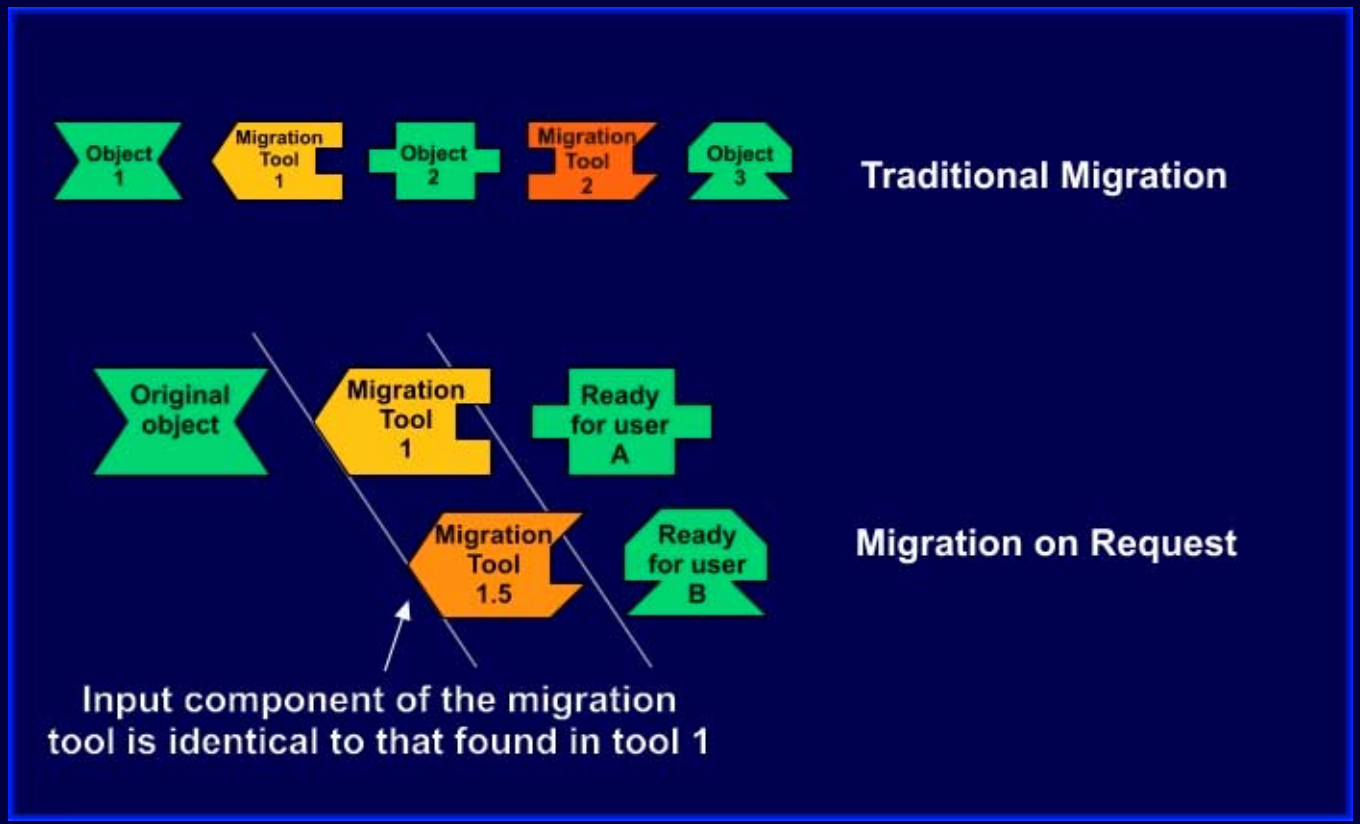
Migration comparison



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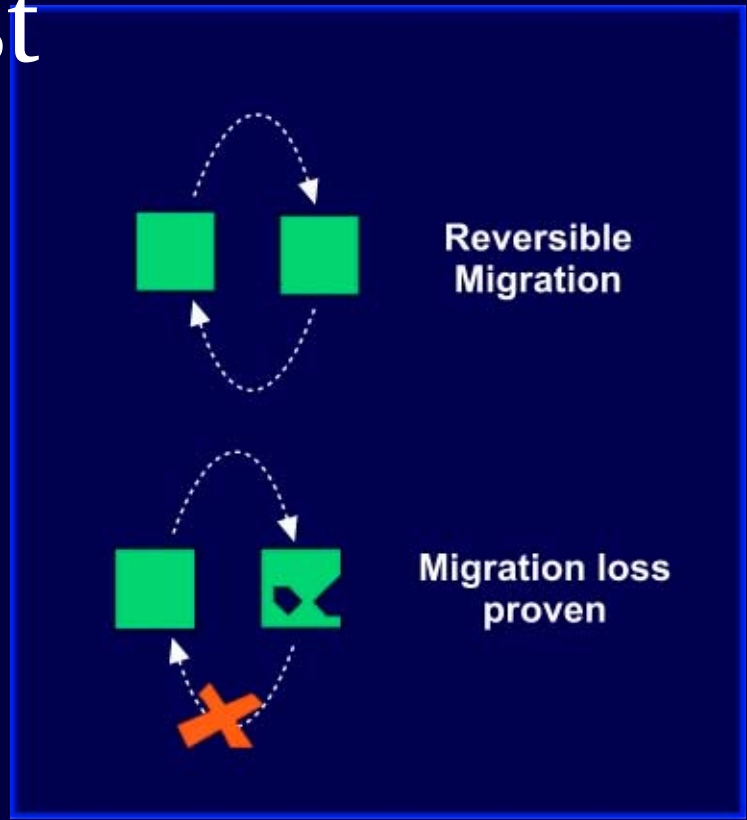
Advantages of Migration on Request

- Reversible migration



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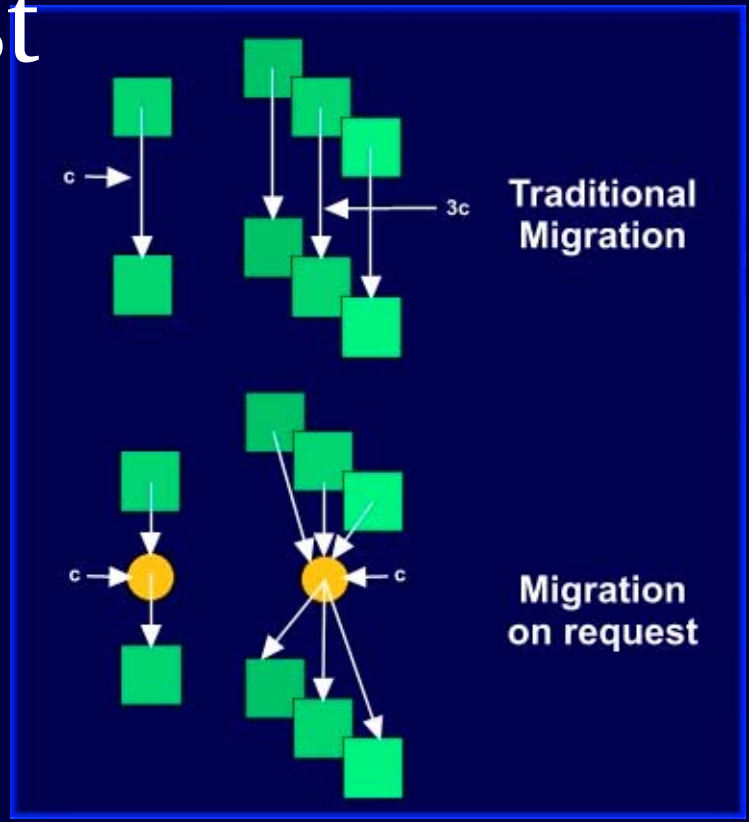
Advantages of Migration on Request

- Reversible migration
- Economy of scale



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Advantages of Migration on Request

- Reversible migration
- Economy of scale
- Simplified authenticity

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Advantages of Migration on Request

- Reversible migration
- Economy of scale
- Simplified authenticity
- Keeps options open

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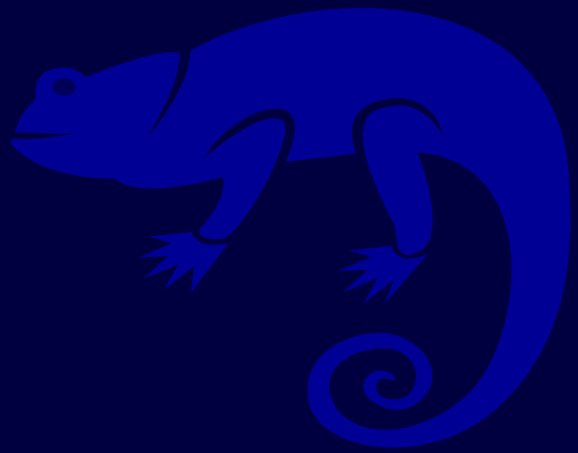
Advantages of Migration on Request

- Reversible migration
- Economy of scale
- Simplified authenticity
- Keeps options open
- Can emulate



Emulation

- Foundation of software longevity and computer science
- Emulation works… now.
- Existing emulation:
  - commercial emulators
  - freeware emulators

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Requirements for a “preservation quality emulator”

- Accurate recreation of original environment
- Economical maintenance over time
- Supporting metadata

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A Combined Strategy for Preservation

- Common elements between Migration on Request and Emulation
- Can these strategies work practically together?
- Issues of cost?

Implementation effort

- Specific costing… well, it depends.
- Practical implementation to provide costed examples.
- Further estimates based on our real life examples

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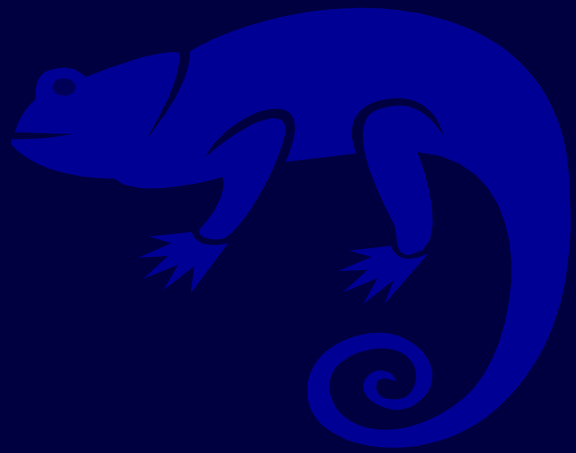

Disclaimer...

- These are not final figures
- Work is incomplete
- More accurate numbers available at project end
- Based on software engineer supported by a technical team

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Migration on request - vector graphics

- Implementation 30 days
- Addition of new format 8 days
- Preservation of tool cheap?

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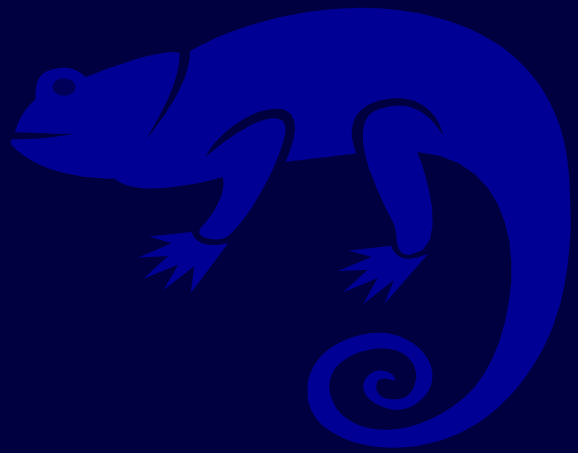
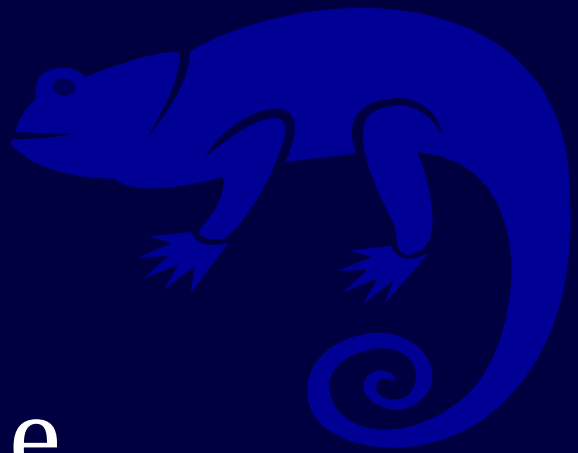
BBC Micro emulator

- BBC B emulator 6 months
- Additional Domesday emulation 4 months
- Enhance to “preservation quality emulator” standard 2 months
- Preservation of emulator reasonable?



Analysis

- Implementation is not as expensive as we thought
- Extension is economical
- In the long term, Migration on request and Emulation can be very cost effective



Economy of scale

- Each tool provides the preservation of many objects and many different kinds of objects
- Develop once, use by many

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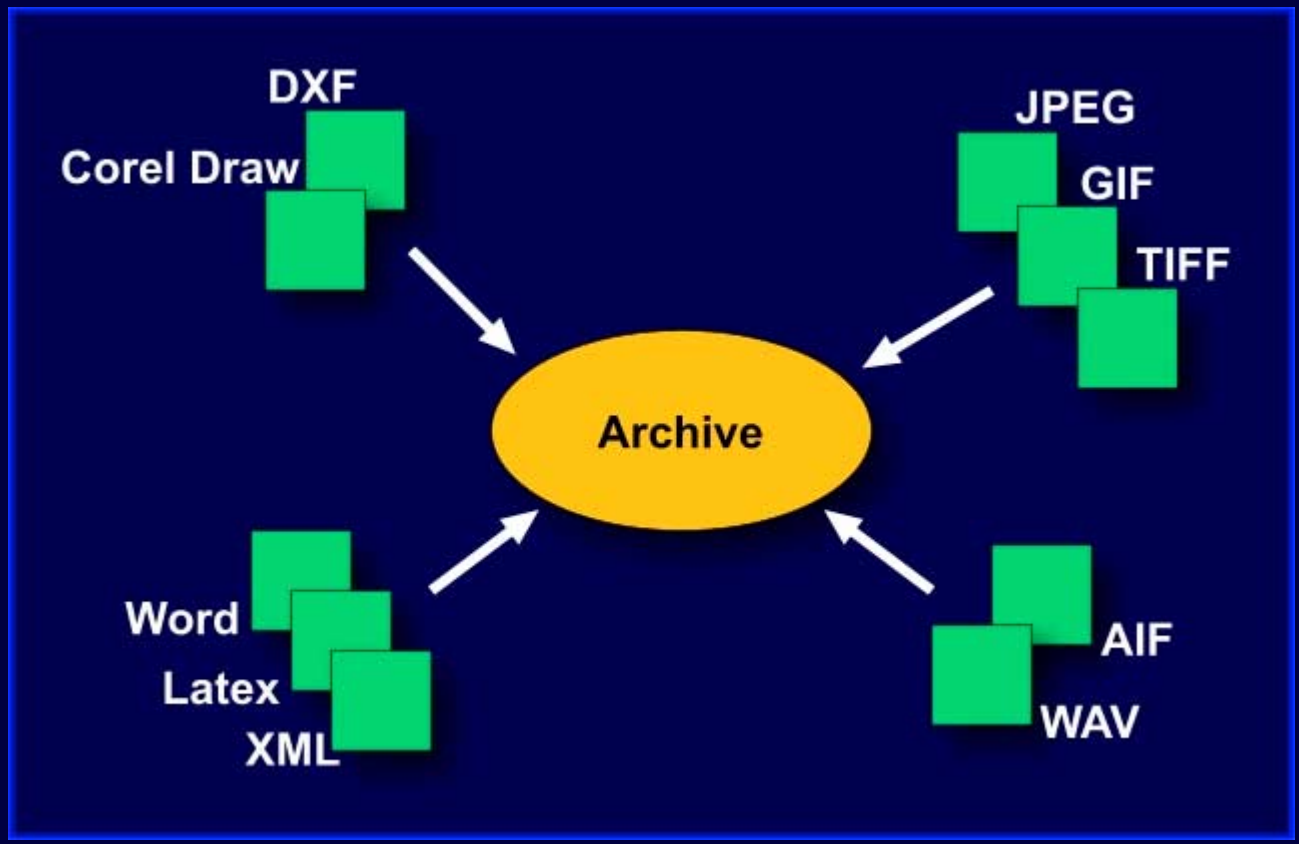
Preservation example



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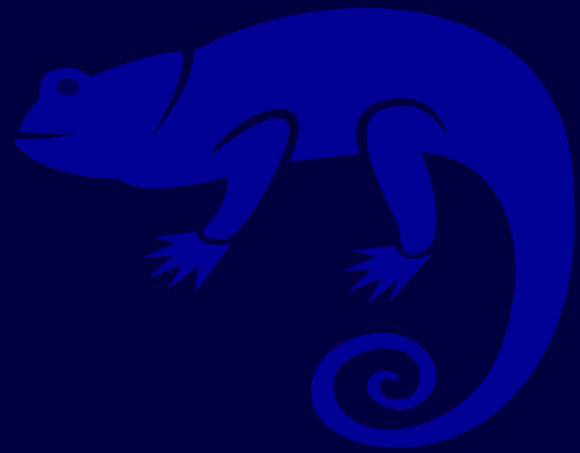

Requirements...

- Investment
- Metadata
- Monitoring and maintenance

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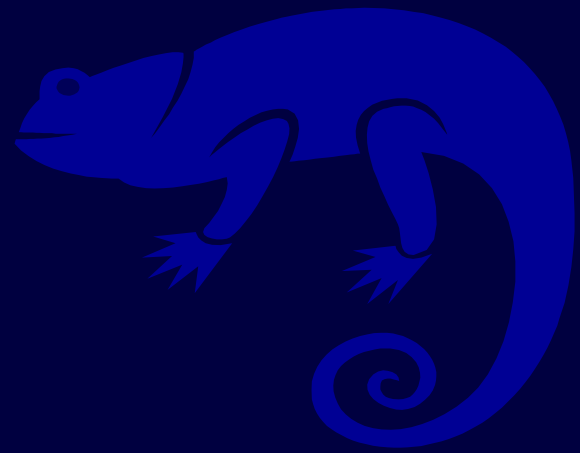

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p.r.wheatley@leeds.ac.uk

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UK Project Manager, CAMiLEON

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