

Square Pegs/Round Holes: Toolset Strengths and Weaknesses

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- Each and every tool has its use
- Some problems are better suited to specific tools
- A screwdriver can substitute for a small pry bar
- But a screwdriver is a poor hammer

Some tools have evolved for certain needs

- Torx was developed for a need
- That need was different than slotted or Phillips
- In particular, assembly line power tools

Computing is more flexible

- This does not make the problem easier
- Flexibility obscures suitability
- Suitability is often subtle
- Partisanship confuses the question
 - Is C the “Best” language?
 - Which is the “Best” editor?
 - Which is the “Best” representation?

A simple example:

$$\begin{array}{r} 40,000,000 \\ + \quad \quad \quad 0.01 \\ \hline ? \end{array}$$

The answer varies –

- a) 40,000,000. [32-bit float]
- b) 40,000,000.01 [64-bit float]
- c) ? [integer]

It is not merely a case of aesthetics

- different representations lead to differing code
- some representations are more vulnerable
- some representations are very powerful

Linked Lists vs. Trees and Hashes

- Neither is best
- Cost of search vs. cost of maintaining
- Need to maintain
- Usage pattern

An example of a paradigmatic hazard – Buffer Overflow

- C-type null terminated string
- Stack adjacent below/adjacent to program code
- ability to overwrite program
- OpenVMS pre-existing solution:
 - stack ABOVE code
 - bounded stack
 - mark stack NOEXE

Example: Synchronous vs. Asynchronous IO

- synchronous IO – FORTRAN, C, COBOL, U*IX
- asynchronous IO – RSX-11, OpenVMS (nee VAX/VMS)
- synchronous IO and parallelism:
 - practically requires threading
 - thread model more complex to manage than events
 - threading harder to do correctly

Many other examples:

- representations directly effect complexity
- complexity relates to difficulty
- difficulty corresponds to COST
- more difficult == less CORRECT

Toolset selection:

- Is not problem agnostic
- Should be reviewed with care
- “As simple as can be; but no simpler”
– Einstein
- Risk does not disappear

Questions?

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Session Notes & Materials:

<http://www.rlgsc.com/trentoncomputerfestival/2010/index.html>