CAS 706 — Programming Languages

23 September 2010

Critical Description of a Programming Language <u>Definition</u>

> This assignment may be **solved individually or in groups of 2 students**.
>
> Grading will take the number of solvers into account.

Imagine that you are working for a company that has chosen the existing programming language X for realising an important, long-term project, and for some reasons (copyright, in-house expertise, inadequate existing implementations of X) decides to produce its own implementation of X in a separate project. Your company is planning to integrate an existing code base of X **source code**, so the new implementation must adhere to the existing **definition** of X.

(a) Choose an instance X_1 among the following choices:

   Ada, Modula-3, OCaml, Python, Ruby, Objective-C

   Choose two other instances X_2 and X_3 according to your own interests.

   Perform the following steps (b) and (c) **for each of these three instances**.

(b) Produce an annotated list of **relevant** resources you will use to answer the questions in (c).

   It is important that these are complete **bibliographic citations**, and that URLs are provided for document available on the Internet.

   Your **annotations** should explain at least the following:

   – Nature of the resource: for example, legal standard, de-facto standard, textbook, reference, documentation frequently used by the X community, critical remarks, …

   – Stability of the resource, if applicable: "Does the language definition change every two weeks?"

   – Which aspects of X are covered by the resource: syntax, semantics, run-time environemnt, standard libraries, existing implementations, …

(c) Produce a **critical description of the definition** of your chosen programming language. This document should answer at least the following questions as far as applicable (not intended to enforce top-level structure of your document):

   – What is the definition of X? I.e., which documents constitute the definition of X? If

applicable, which documents constitute the definitions of the lexical syntax, the context-free syntax, scope rules, type system, execution semantics, …

If there are significant different versions of X, explain relevance of earlier versions and, if appropriate, important differences with respect to the current version.

– What is the quality of the definition of X? I.e., how precise is the definition of X, and how easy will it be to determine whether the in-house implementation is appropriate?

Which formalisms, if any, are used for different aspects of the definition? (For example, a certain kind of regular expressions for lexing, a custum variant of EBNF for context-free syntax, …) How precisely are these formalisms defined? Differentiate as applicable between the definitions of different aspects of X (syntax, type system, semantics, …)

– What is the rôle of existing implementations for the language definition? In the extreme case, is the language defined "by implementation"? Do certain existing implementations define "de-facto sublanguages"?

Deliverables:

(1) For each of your instances, you may choose to hand in (b) first to obtain some basic feedback.

(2) For each of your instances, a single, well-organised document has to be handed in **both on paper and electronically as PDF file with "clickable links"**. (Expected length (computer-formatted): about 2-4 pages for (b), and about 4-8 pages for (c).)

Document quality and readability matter!

Take care to include proper citations, and to **properly quote** material copied from sources, i.e., include such material in double quotes, followed by a reference to an entry in your bibliography, e.g.:

"*URL plus descriptive phrase.* If no facts of publication, or very few, can be determined, it is still necessary to include information beyond the URL. If only a URL is cited and that URL changes or becomes obsolete, the citation will have become just a more or less unintelligible string of characters. The URL tells *where* a source is or at least was located; a complete citation must also indicate *what* a source is." [1] section 17-235

(3) A short report about your selection process would be appreciated: Which other languages did you look into, and why did you decide not to choose them?

(4) Indicate your contributions to a group solution if applicable.

References

[1] *The Chicago Manual of Style.* The University of Chicago Press. 15th edition, 2003. ISBN 0-226-10403-6, McMaster libraries call no. Z 253.C53, Mills/Innis reference