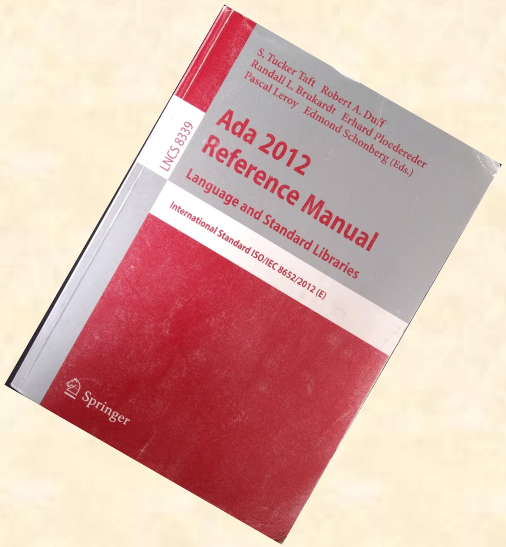
Experience in 40 Years of Teaching Ada



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The Students

- Teaching for industrials
  - All students are working in a company
  - From fresh-out-of-school to experienced
  - Mostly developers, sometimes Q/A or certification people
- No beginners
  - They know at least one other programming language
  - ... and they may have bad habits

Assume previous knowledge of programming techniques

Teaching the language

- General syntax is easy
  - Remove these damn () from the condition in **if** statements!
- But use the special features to stress safety
  - Completness of **case**, safety of **for** loop...
  - Every feature has a goal
- Show the consistency of the language
- Evolution of past experience of students changes the difficulties...
  - Exceptions are now well understood
  - Various levels of experience with concurrency
  - ... but some have difficulties understanding a variable exists even if there is no **new** !

Teaching How To Use The Language

- Don’t teach how to use Ada for programming
  - Teach how to program *in* Ada
- Stress :
  - Information hiding
  - Specifying before implementing (and checking the specs)
  - Paying attention to the choice of data structures
  - Formal "proofs"
- Tell to use the compiler often to check the code
  - Compile every 10 lines
  - The compiler is your friend !
    - Read error messages
    - Say "thank you" to error messages
    - Don’t try to remove error messages; understand how to fix your code

Examples Of Wrong Reactions

```
   D : Duration ;
begin
   D:= 1;
```

Expected type Standard.Duration,
found an integer type

```
   D : Duration ;
begin
   D:= 1.0;
```

ong !

```
if Data_Valid then ...
```

```
en ...
```

Hard Points

- Ada has a precise, but special vocabulary
  - Need to explain (especially in error messages)
    - Subtype mark, subprograms, elaboration...
- Features without equivalent in other languages
  - Discriminants
  - Rendezvous
  - Class-wide types
- Things *with* similar features in other languages
  - Hard to "unlearn"
  - People without experience understand better sometimes !

The Choice of Exercises (1)

- Avoid "Hello World" exercises
  - Not enough time...
- First exercise :
  - General features of the language
  - Write a package, stress specification vs implementation
  - Opportunity to define proper types, chase usage of Integer !
- Exercise on generics
  - Nobody really understands generics until the exercise !
- Exercise on access types
  - Implicit dereference is easily adopted
  - Oh ! you can write a linked list without any core dump !

The Choice of Exercises (2)

- OOP
  - Stress what a class is, class-wide types and class-wide operations
- Tasking with rendezvous
  - Students have difficulties understanding that **accept** is a sequential statement
- Tasking with protected types/requeue
- Distribution demo

Software Engineering ?

- Strong typing
  - If there is no point, it is an Integer, if there is a point it is a Float
- Modularity?
- 2/3 of the students have difficulties with writing a simple linked list.
- Many change the (agreed upon) specification when developing the body

There is no problem with teaching Ada as a language

Questions?