Ouverture

The children's game universe "Crimeville" from the game developers *Art of Crime* challenges the players to solve detective riddles cooperatively. In the on-line version of the game this means that the players in each session of the game can chat with each other.

To help the children write better – and to limit them being naughty – the chat is going through a language server[1].

[1] Written in Ada

Ada in the on-line multi-user game “Crimeville”

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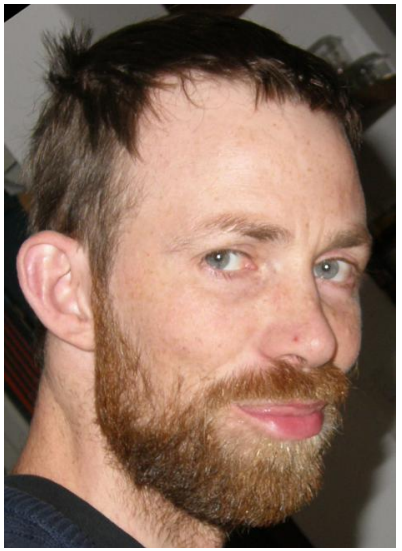

Currently:

- Independent consultant.
- Co-founder of AdaHeads K/S.
- Programs embedded devices for Koparo.

Background:

- PhD in experimental physics.
- BSc in mathematics.
- Has taught mathematics, physics and software engineering.
- Worked with bioinformatics, biotechnology and modelling of investments in the financial market.

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The context – “Crimeville”

Crimeville . . .

- is an on-line free to play[2] MMO by the Danish game producer *Art of Crime*.
- mixes a cocktail of heartfelt wacky story and character driven crime fiction, interaction and gaming for tweens.
- is both an on-line game, trading cards, and a face-to-face game.

You can play the game at `http://www.crimeville.com/`.

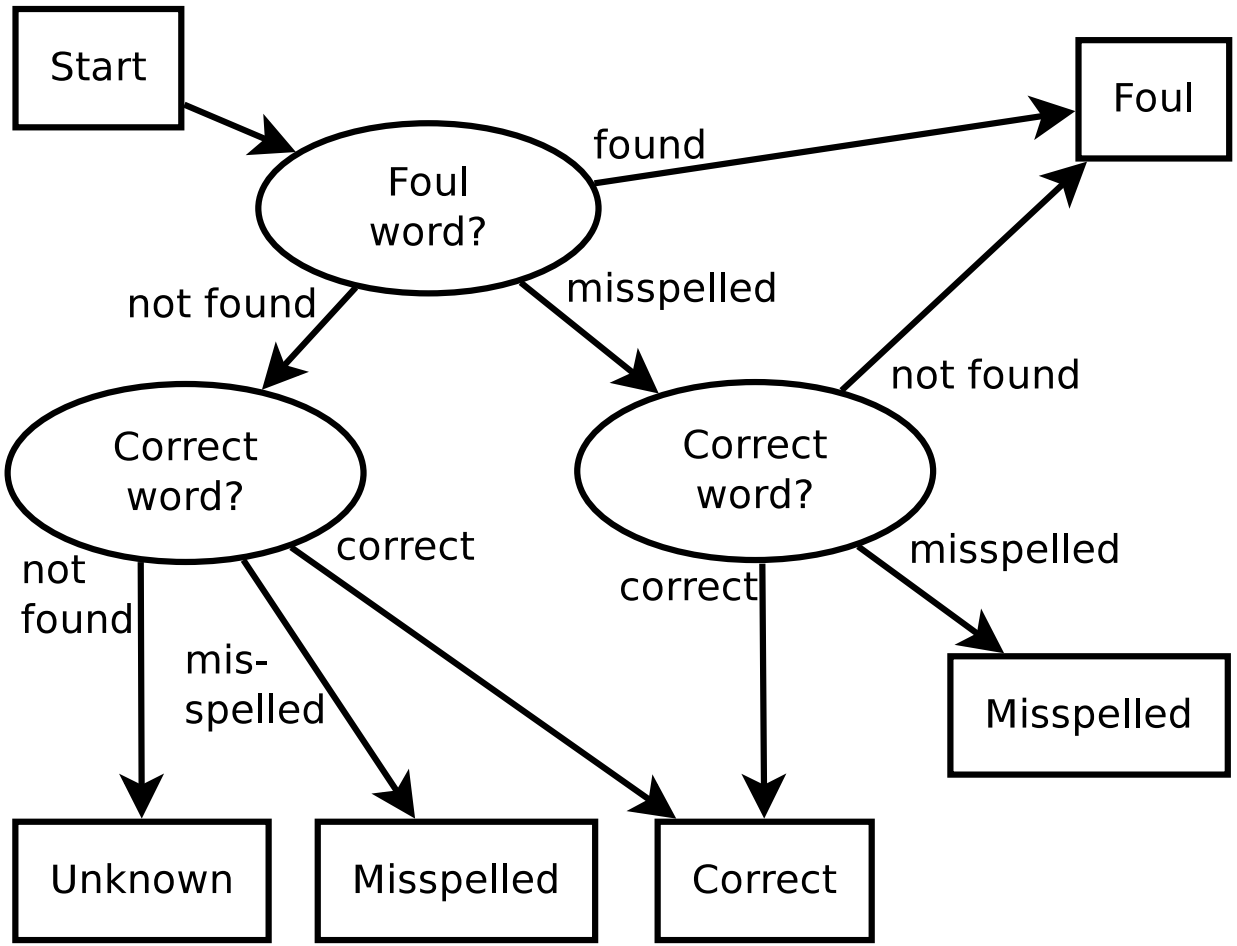
[2] But not Open Source.

Check spelling and foul words

When *Art of Crime* contacted me, their problem was simply described as helping the players write correctly, and limit how much they insult each other. – Already at this stage the plan was to do this at the word level.

In short, every word written by a player should be categorised in one of four categories; correct, foul, misspelled or unknown.

How to classify words



Communications protocol

We created a simple text based protocol for the interaction between the game server and the language servers.

```
42 Fuck I'm a gud speller!
42 -Fuck +I'm +a ^gud +speller!
```

To simplify the system, we decided that each language server instance should handle a specific language[3].

[3] I.e. language is selected by IP address and port number.

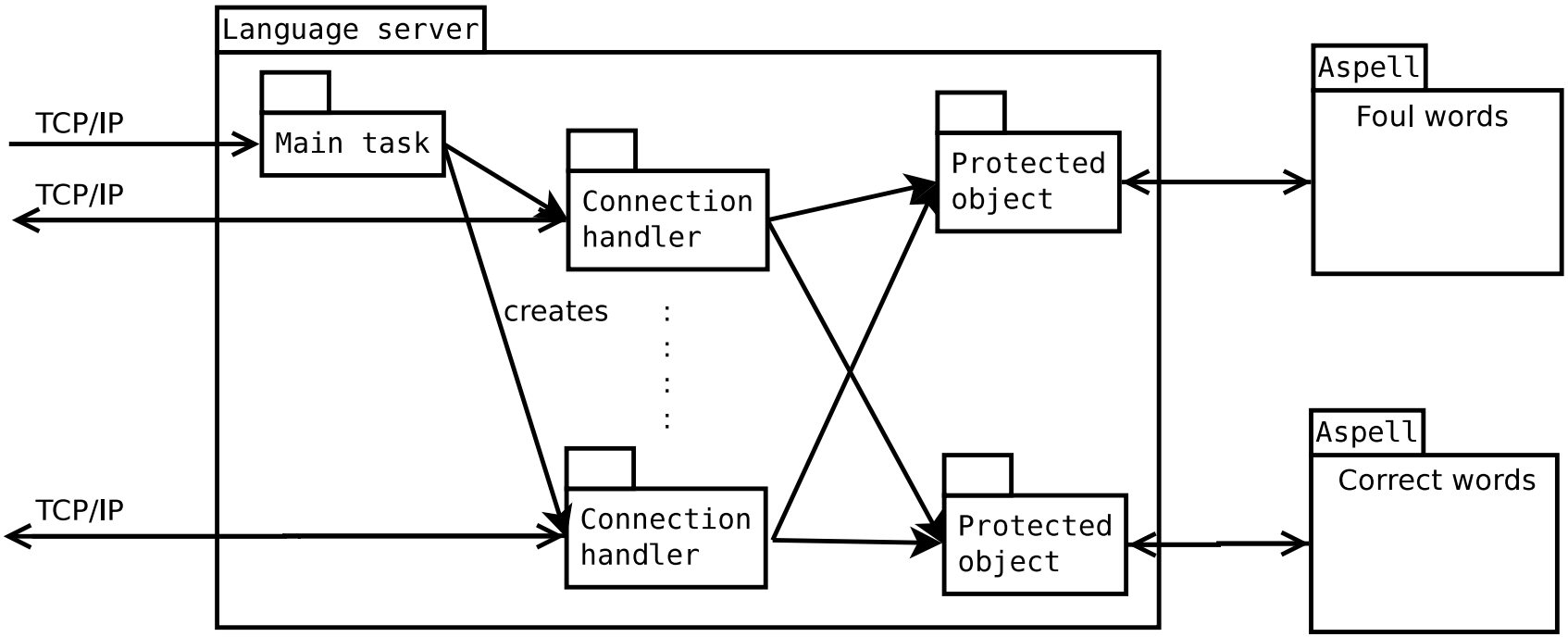
Architecture – a network server

I proposed a solution with network servers checking words using Ispell compatible Open Source spell checkers.

Some of the benefits:

- This makes the language server independent of the actual game server.
- This allows *Art of Crime* to reuse existing language data (dictionaries, etc.)
- *Art of Crime* can switch between different spell checkers with only a small modification of the system.
- I could choose whatever implementation language suited me for the task.

Architecture – inside the language server



Application logic

```
Foul_Words.Check (Word  => Word,
                  Class => Class);

case Class is
   when Aspell.Found =>
      return Game_Communication.Foul_Word;
   when Aspell.Misspelled =>
      Dictionary.Check (Word  => Word,
                        Class => Class);

      case Class is
         when Aspell.Found =>
            return Game_Communication.Correct_Word;
         when Aspell.Misspelled =>
            return Game_Communication.Misspelled_Word;
         when Aspell.Not_Found | Aspell.Timeout | Aspell.Error =>
            return Game_Communication.Foul_Word;
      end case;
   when Aspell.Not_Found | Aspell.Timeout | Aspell.Error =>
      Dictionary.Check (Word  => Word,
                        Class => Class);

      case Class is
         when Aspell.Found =>
            return Game_Communication.Correct_Word;
         when Aspell.Misspelled =>
            return Game_Communication.Misspelled_Word;
         when Aspell.Not_Found | Aspell.Timeout | Aspell.Error =>
            return Game_Communication.Unknown_Word;
      end case;
end case;
```

Launching a spell checker

```
POSIX.IO.Create_Pipe (Write_End => To_Child,
                      Read_End  => From_Parent);
POSIX.IO.Create_Pipe (Write_End => To_Parent,
                      Read_End  => From_Child);
POSIX.IO.Create_Pipe (Write_End => Errors_To_Parent,
                      Read_End  => Errors_From_Child);

case Fork is
   when Parent =>
      POSIX.IO.Close (From_Parent);
      POSIX.IO.Close (To_Parent);
      POSIX.IO.Close (Errors_To_Parent);
   when Child =>
      POSIX.IO.Close (To_Child);
      POSIX.IO.Close (From_Child);
      POSIX.IO.Close (Errors_From_Child);

      Move (From => From_Parent,
            To   => POSIX.IO.Standard_Input);
      Move (From => To_Parent,
            To   => POSIX.IO.Standard_Output);
      Move (From => Errors_To_Parent,
            To   => POSIX.IO.Standard_Error);

      POSIX.Unsafe_Process_Primitives.Exec_Search (Program_Name,
                                                   Arguments);
end case;
```

Levels of source code reuse

Unit	Compilation units	Subroutines	Lines
Standardised	18	26	6297
Vendor-provided	2	9	3480
Reused	5	5	111
Reusable	7	20	344
Project-only	6	13	485
Total	38	73	10717

Supporting packages (pre-existing)

Standardised:

- `POSIX.IO`: For communication with clients and spell checkers.
- `POSIX.Unsafe_Process_Primitives`: To launch spell checkers.

Vendor-provided:

- `GNAT.Sockets`: To set up network connections.

Home-grown:

- `GNAT.Sockets.Compatibility`: To make GNAT sockets visible as POSIX file descriptors.
- `EUP.Sockets`: Short-cuts for some common patterns when using TCP/IP sockets.

Supporting packages (new, likely to be reused)

- `Buffered_IO`: Adds a minimal `Ada.Text_IO`-like interface on top of `POSIX.IO`.
- `Daemon`: Imports the C function `daemon`, which is used to disconnect a process from its terminal and parent process.
- `Logging`: Simple logging package. Encapsulates an `Ada.Text_IO` file in a protected object, which only allows writing whole lines.
- `Pipe_Fork_Exec_Search`: Launches an external program with POSIX pipes to its standard input, output and error files.

Supporting packages (application specific)

- `Aspell`: Encapsulates a spell checker instance in a protected object.
- `Game_Communication`: Encapsulates the communication with a client (game server).
- `Logs`: Declares the log files used by the server.

Conclusions

- Solving the task as a stand-alone TCP/IP server allowed
  - me to use the best programming language for the task, independently of what was used for other parts of the complete system.
  - me to make an easily reusable system
  - us to have a well-defined boundary between my responsibilities and those of my customer
- Using existing Open Source spell-checkers allows us to reuse existing language data such as dictionaries and phonetic rules.
- Using the Ispell pipe protocol to communicate with the spell-checker allows us to switch between different spell checkers with only a small modification of the system.

Contact

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Crimeville

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Complete source code at

http://www.jacob-sparre.dk/spelling/crimeville.zip