Writing

Analyzing

Testing

Maintaining

Configurable Software

What is Configurable Software?

- Software that can be configured to “run differently.”
- Across different environments:
  - Operating systems (Windows vs. OS X)
  - Hardware (X86 vs. SPARC)
  - User interfaces (KDE vs. Gnome)
- Enabling additional functionality:
  - Via command-line flags or config files

Examples

```
...
#ifdef BIG_ENDIAN
    P1
#else
    P2
#endif
...
```

Examples

```
...
win = open_window();
...
```

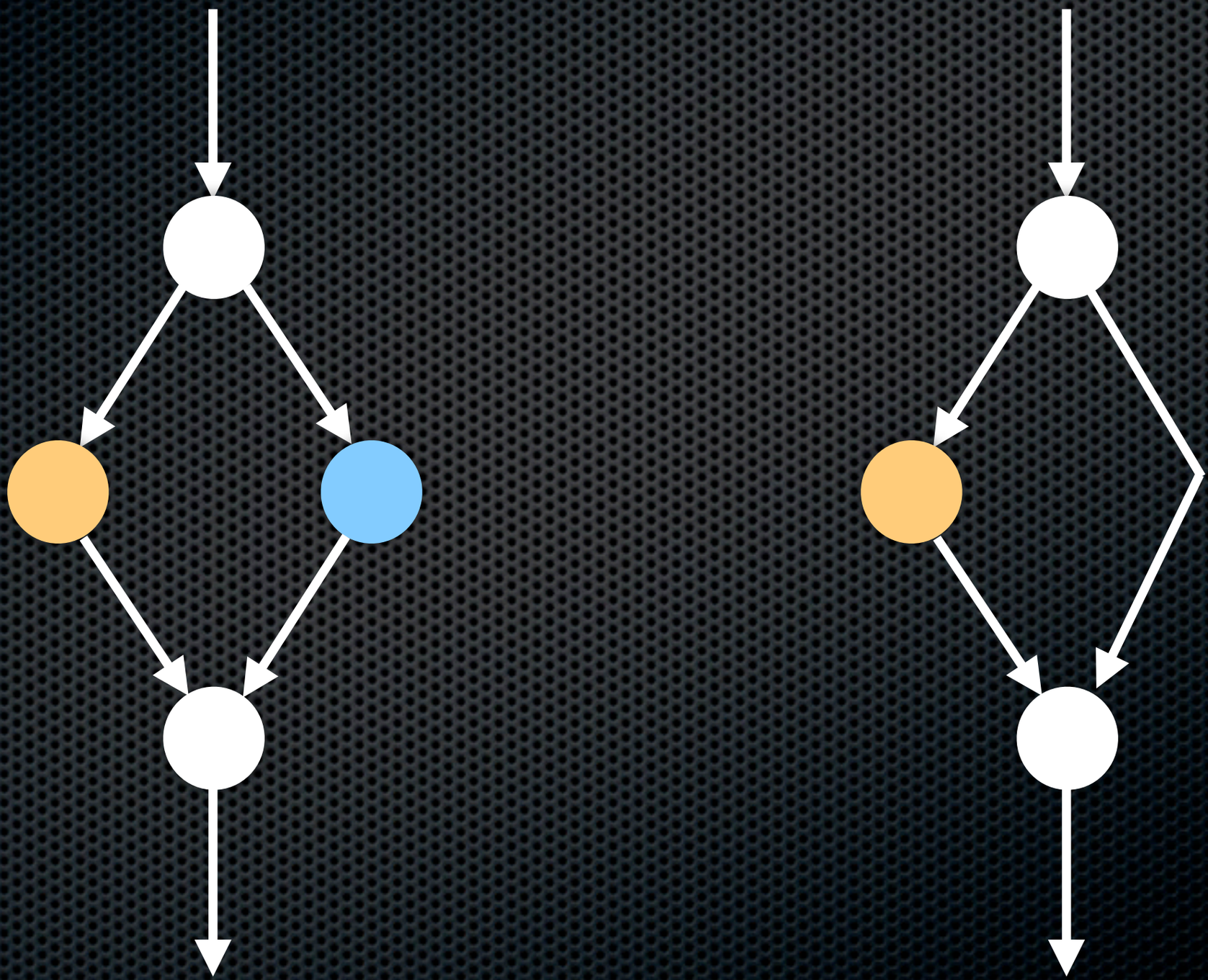
```
Win *open_window() {
    Win *w = malloc(...);
#ifdef KDE
    w.window = kOpenWindow();
#elsif GNOME
    w.window = g_open_window();
#endif
    return w;
}
```

```
struct Win {
    ...
#ifdef KDE
    KWindow *window;
#elsif GNOME
    GWin *window;
#endif
    ...
};
```

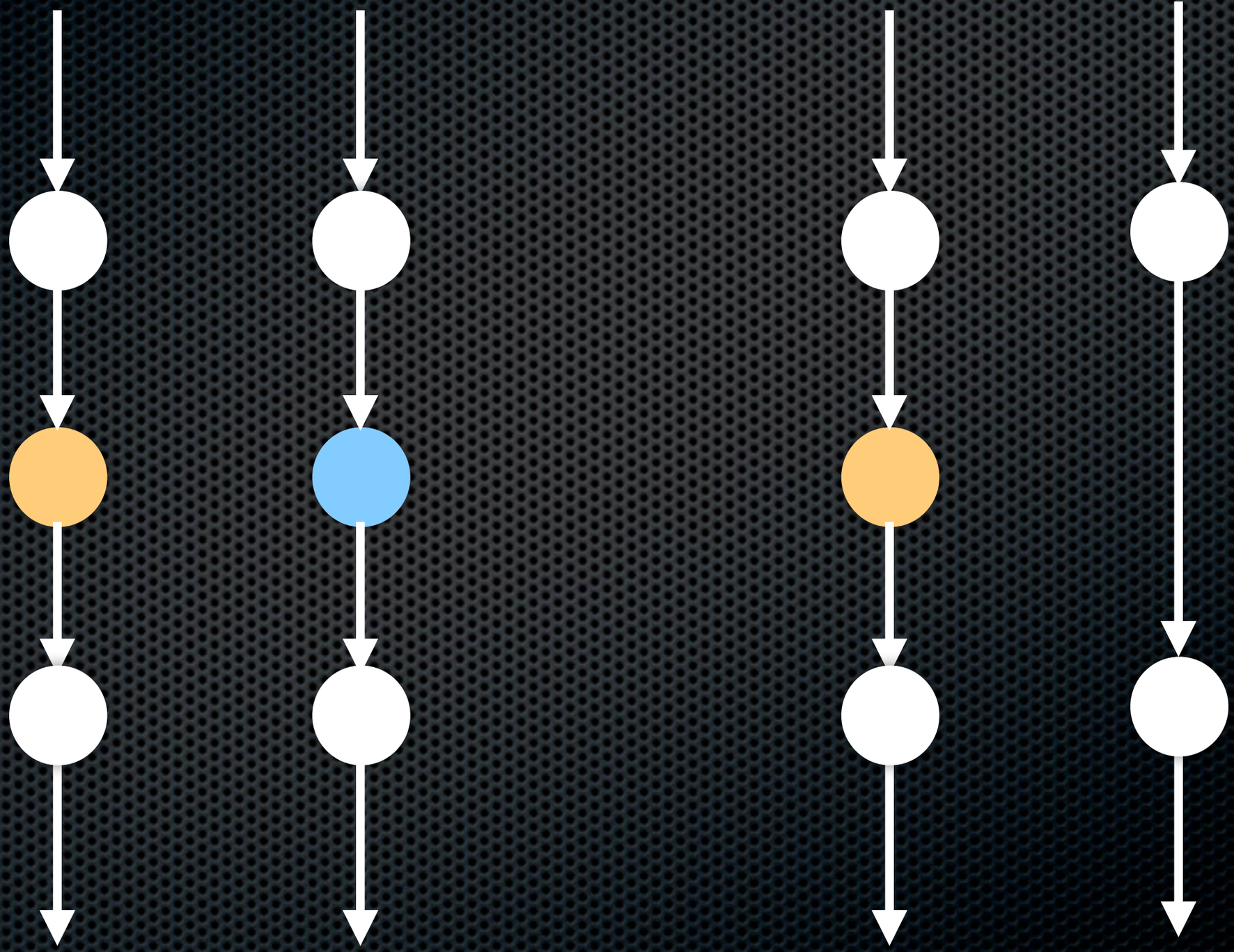
Examples

```
...
AST a = parse(lex(input));
...
if (opt_foo)
  a = foo(a);
if (opt_bar)
  a = bar(a);
...
```

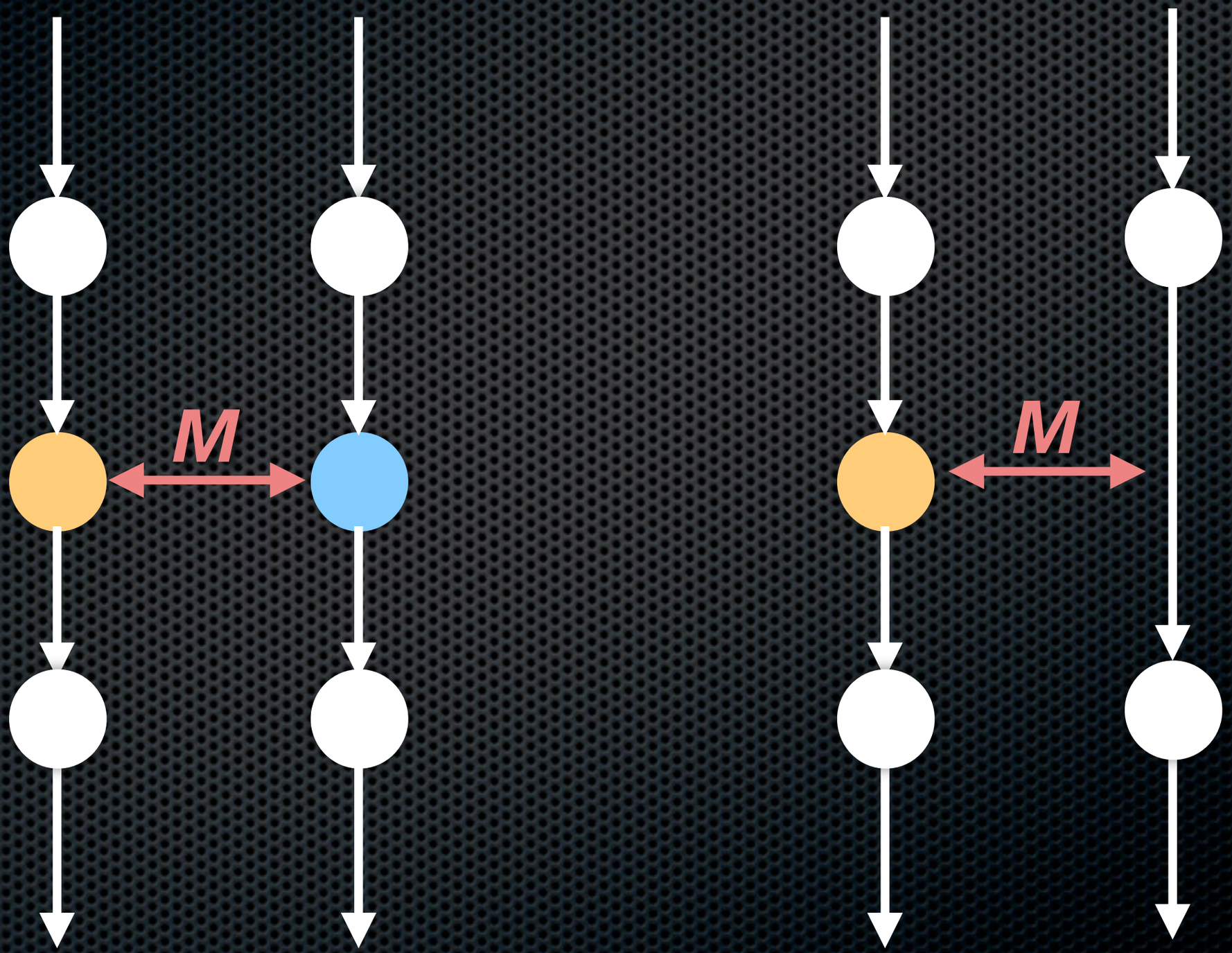
Configuration Mappings



Configuration Mappings



Configuration Mappings



Configuration Mappings

- They explain how a configuration relates to another.
- Fuzzy example:

Gnome	*KDE*
`g_open_window()`	`kOpenWindow()`
`g_close_window()`	`kCloseWindow()`
`GWin`	`KWindow`
`...`	`...`

Applications: Testing

- Write Gnome-specific test.
- Automatically generate corresponding KDE test.

Applications: Maintenance

- Modify Gnome code.
- Tool helps you identify where and how to make corresponding changes to the KDE code.

Applications: Maintenance

- Change both configurations.
- A tool helps you understand if the two configurations are in sync.

Applications: Bug Reports

- A bug database contains a Gnome-specific bug.
- A tool automatically inserts a “bug warning” into the database that corresponding code in the KDE configuration may contain an equivalent bug.

Project Ideas

- Automatically extract configuration-specific code from programs.
  - “Slice out” the configurations from a program.
- “Fairly easy” to do when configs are managed with the C preprocessor.

Project Ideas

- Study bug databases for configurable programs.
  - Bug was reported and fixed in one config.
  - Equivalent bug in the other configuration was reported and fixed at a later time.
  - A bug was reported for one config.
  - Determine if the equivalent bug exists in the corresponding configuration.

Project Ideas

- Empirical study of test harness management for configurable software.
- Does the harness structure match the program's configuration structure?
- Is there unnecessary duplication?
- Are some configurations not tested at all?
- Suggestions for improvement.