Modules as Objects in Newspeak

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Hardware Modules

Hardware Modules

Plug'n Play

Hardware Modules

Plug'n Play

aka: Dynamic Configuration

Hardware Modules

Plug'n Play

In to each other!

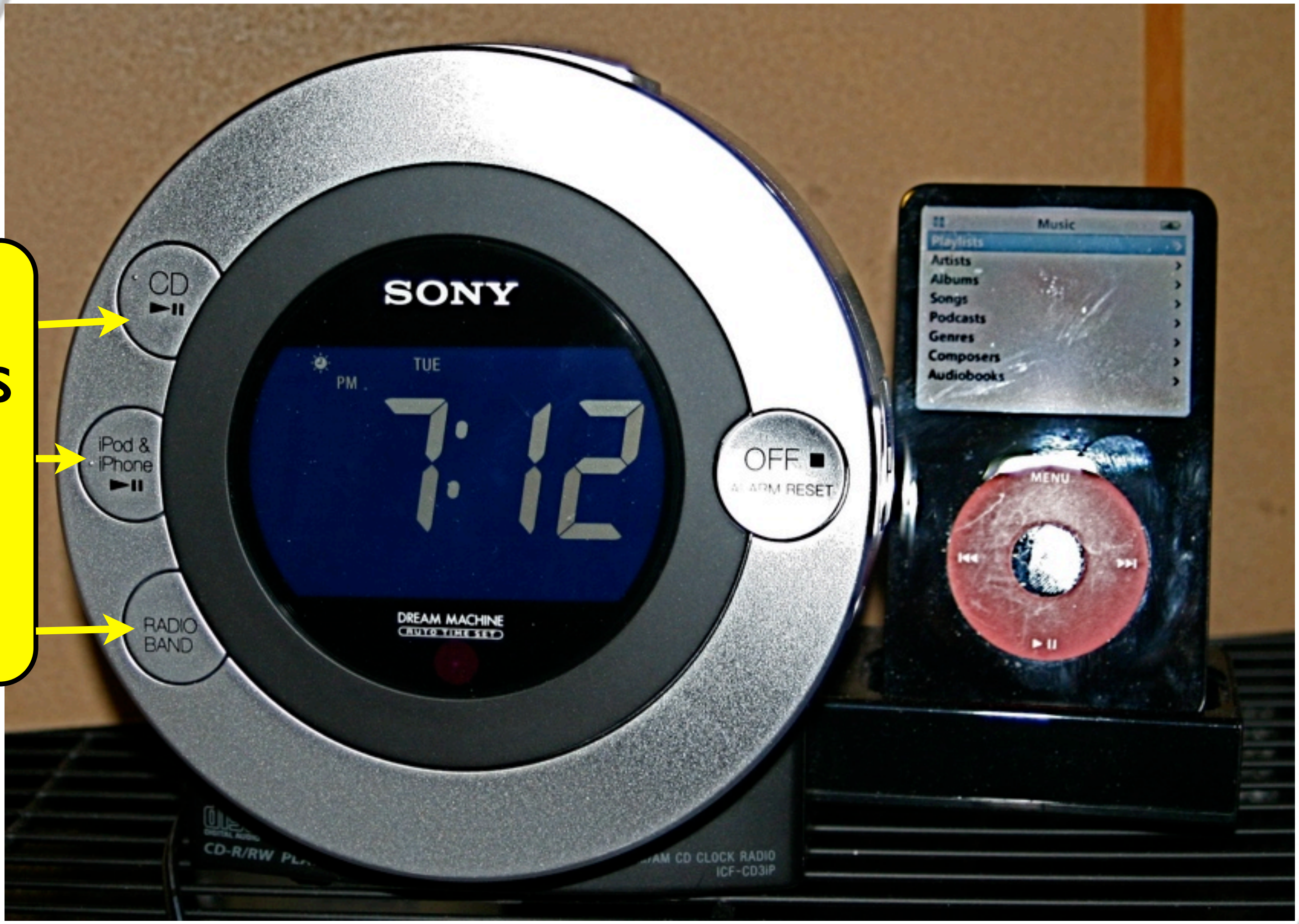
Hardware Modules

Plug'n Play

aka: Mutual Recursion

In to each other!

Hardware Modules



Multiple Instances of the same design

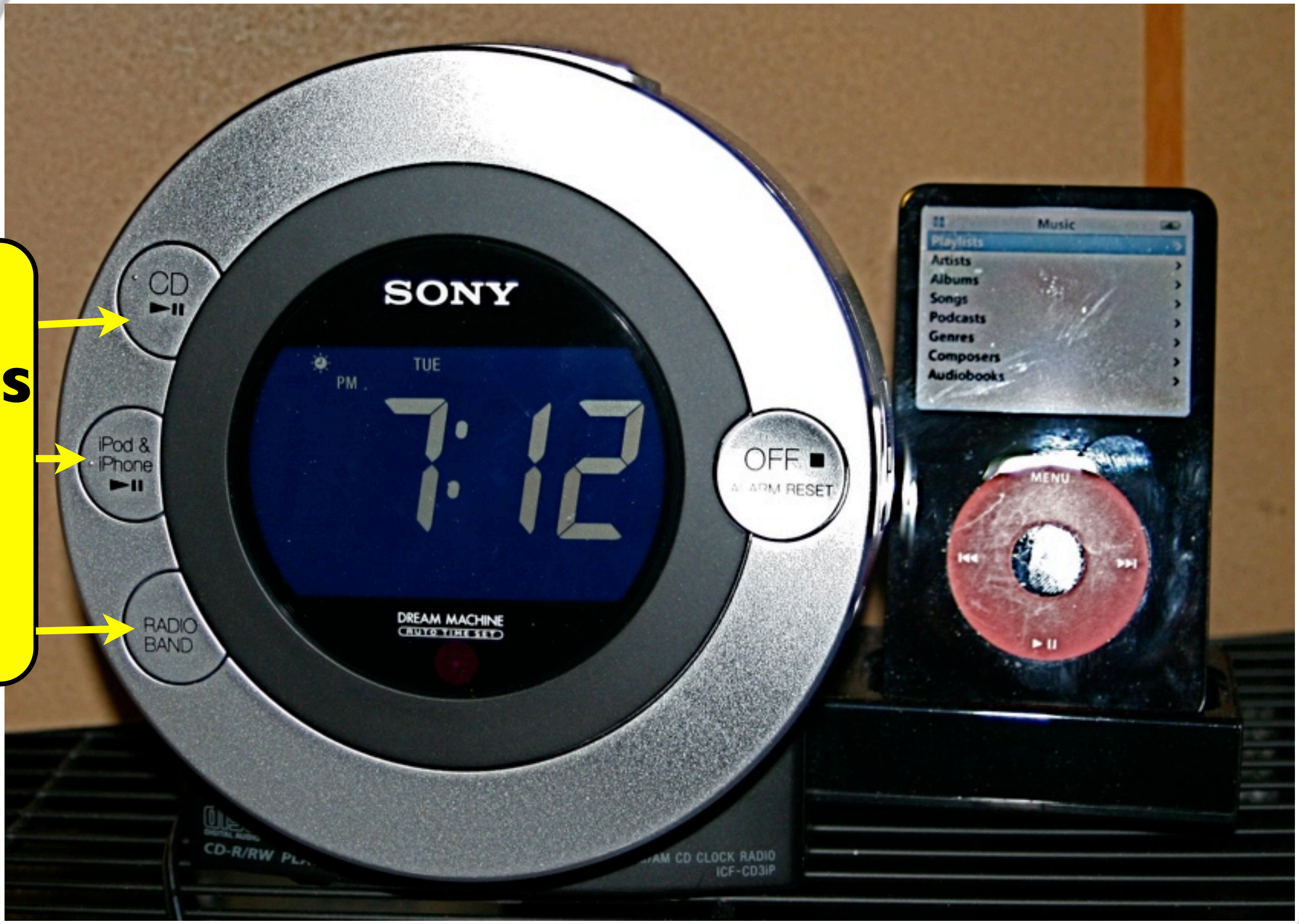
Mainstream Module Problems

- No mutual recursion
- Single instance of a design per run
- No distinction between module definition and module instances
- Awkward to define multiple configurations

Newspeak

- Newspeak is a dynamic, class based language with two defining properties:
  - All names are late bound
  - No global namespace

Hardware Modules



Multiple **Instances** of the same design

Designs are instantiated

Classes are instantiated

Use classes as unit of modular design

Classes Define Modules

Newspeak modularity is based *exclusively* on classes

- No packages, modules, bundles, templates ...

Newspeak

- Newspeak is a dynamic, class based language with two defining properties:
  - All names are late bound
  - No global namespace

No References to Variables

Representation Independence

- Always use slots via accessors

No References to Classes

- Always use accessors
- Classes are first class objects
  - Concepts are phenomena
- Classes are always virtual
- Classes are always mixins
- Class hierarchy inheritance

Newspeak

- Newspeak is a dynamic, class based language with two defining properties:
  - All names are late bound
  - No global namespace

The Insidious Import

```
module BraveNewWorldExplorer;
    import Collections.List;
```

The Insidious Import

```
module BraveNewWorldExplorer;
    import Collections.List;
```

nested within “module”

Global name!

The Insidious Import

module definition

```
module BraveNewWorldExplorer;

    import Collections.List;
```

module configuration

Module Definition

```
class BraveNewWorldExplorer usingLib: platform = (
    |
    List = platform collections List.
    ...
     |
    )( ...)
```

Module Configuration

```
main: platform args: as = (
    platform HopscotchFramework
      HopscotchWindow
          openSubject:
          ((BraveNewWorldExplorer
          usingPlatform: platform) FileSubject
          onModel: (as at: 1)
          ))
```

Module Configuration

```
main: platform args: as = (
  platform HopscotchFramework
    HopscotchWindow
        openSubject:
        ((BraveNewWorldExplorer
        usingPlatform: platform) FileSubject
        onModel: (as at: 1)
        ))
```

Module Configuration

```
class BraveNewWorldExplorerApp
    fileBrowserClass: fb <BraveNewWorldExplorer> = (
        | BraveNewWorldExplorer = fb. |
        )(
        main: platform args: as = (...)
        )
```

Module Configuration

Instantiate ***BraveNewWorldExplorerApp*** using tools (e.g., IDE).

Module Deployment

BraveNewWorldExplorerApp instance can be deployed via object serialization.

Module Loading

Serialized instance of ***BraveNewWorldExplorerApp*** can be loaded via object deserialization, followed by invocation of ***main:args:***.

Modules are Sandboxes

Factory method parameters are objects/capabilities that determine per-module sandbox

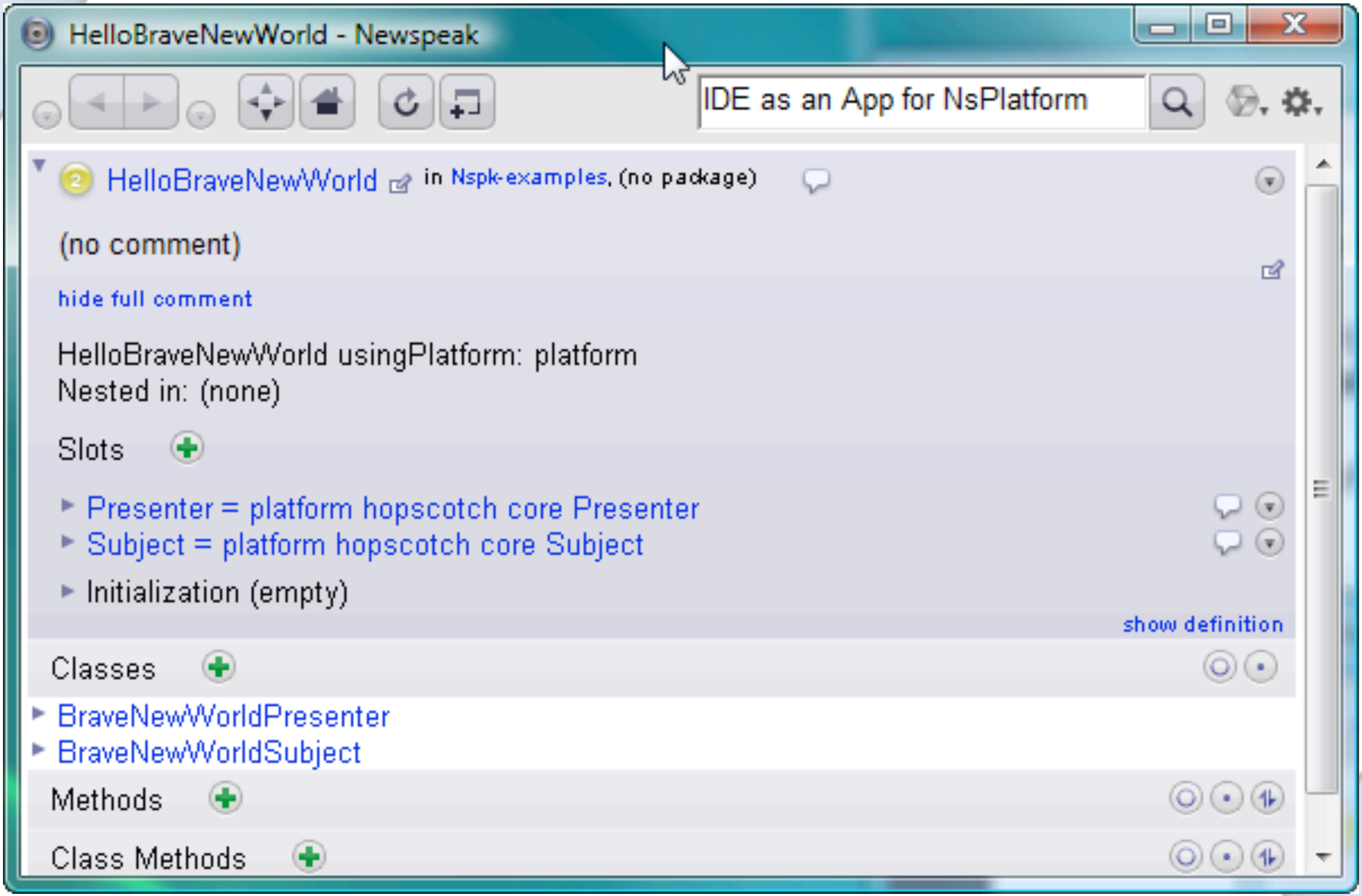
Side by Side Modules

```
platform:: Platform new.

m1:: NewspeakParsing
         using: platform
        parseLib: (CombinatorialParsing
                                usingLib: platform)

m2:: NewspeakParsing
         using: platform
        parseLib: (PackratParsing usingLib: platform)
```

Multiple Implementations

- Modules are objects, accessed via an interface
- Different implementations can co-exist

Status



HelloBraveNewWorld in Nspk-examples, (no package)

(no comment)

hide full comment

HelloBraveNewWorld usingPlatform: platform
Nested in: (none)

Slots

- Presenter = platform hopscotch core Presenter
- Subject = platform hopscotch core Subject
- Initialization (empty)

show definition

Classes

- BraveNewWorldPresenter
- BraveNewWorldSubject

Methods

Class Methods

Status

- Available at *http://newpeaklanguage.org*
  - open source under Apache 2.0 license
- Work in Progress
  - Expect some tweaks to syntax and semantics
  - Implementation still not complete - especially libraries

Related Work

- Self
- Smalltalk
- Beta, gBeta, Virtual Classes
- E
- PLT Scheme/Units
- ML
- CLU, Modula, Ada, Oberon ...
- Much more, see the paper

Conclusions

- Natural and powerful synergy between:
  - Message-based programming
  - Component style modularity
  - Virtual classes, mixins, class hierarchy inheritance
  - Object capability model and security
  - Mirror based reflection
  - Actor style concurrency
  - Pluggable types

The Newspeak eye ◉ used in the bullets, slide background etc. was designed by Victoria Bracha and is used by permission.