Towards Small Portable VMs

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Smalltalks nov 2010
Multiple devices => Multiple VMs

- Image
  - VM 1
    - OS 1
  - VM 2
    - OS 2
  - VM 3
    - OS 3
Porting the Squeak VM

Image
- Library A
- Library B
- Library Z

VM
- Plugin1
- Plugin2
- Plugin x

OS
- API α
- API β
- API ψ
Porting the Squeak VM

Image
- Library A
- Library B
- Library Z

VM
- Plugin1
- Plugin2
- Plugin x

Other OS
- API α
- API β
- API ψ
Porting the Squeak VM

- Image
  - Library A
  - Library B
  - Library Z

- VM
  - Plugin1
  - Plugin2
  - Plugin x

- Other OS
  - API α
  - API β
  - API ψ
Port a VM

Smalltalk Image

- Slang Code
- VMMaker

Code generation

- Generated C Source files .h / .c
- Compilation and linkage
- Squeak/Pharo VM

Modify plugins code

- Handwritten C Source files .h / .c
Steps to Port a VM

- Smalltalk Image
  - Slang Code VMMaker
  - Code generation
  - Generated C Source files .h / .c
  - Compilation and linkage
  - Squeak/Pharo VM
  - Low Level
  - Handwritten C Source files .h / .c
  - Poor IDE
Currently

Image

VM

OS
Specific
Slang/C
Code
Currently

- Image
- OS Specific Smalltalk Code
- Low Level
- Poor IDE

Proposal

- OOP
- Smalltalk IDE
- VM

- OS Specific Smalltalk Code
Currently

Hard to Port

Image

Low Level

OS Specific Slang/C Code

Poor IDE

Smalltalk IDE

Proposal

Easier to Port

Image

OOP

VM

OS Specific Smalltalk Code
Proposal: a Smaller VM

Image

Library A
Library B
Library Z

VM

FFI

OS

API α
API β
API ψ
Porting a Smaller VM

Image
- Library A
- Library B
- Library Z

VM
- FFI

Other OS
- API α
- API β
- API ψ
Porting a Smaller VM

Image
- Library A
- Library B
- Library Z

VM
- FFI

Other OS
- API $\alpha$
- API $\beta$
- API $\psi$
Port Smaller VM

Image

Library A
Library B
Library Z

VM

OOP

Smalltalk
IDE

Other OS

API α
API β
API ψ
Experiment:
FFI-based Network Library

OCEAN
Current network library

Image

VM

OS

Network

Socket Plugin

Network API

Hard to port
Current network library

TCP+ UDP+...
IPv4 +IPv6
Socket
HTTPSocket
SocksSocket
ByteArray
SocketAdress

0% tested
Dirty!
Overview of OCEAN

Image

VM

Wrap POSIX Lib.

OS

OCEAN

Alien Library

Alien plugin

POSIX <sys/socket.h>
OCEAN Library

Socket
  networkLibrary
  socketID

TcpSocket

UdpSocket

NetworkLibraryProxyFactory
  WindowsLibrary
  MacOSLibrary
  LinuxLibrary
  PosixLibrary

OOP
Almost 100% tested
Hard time writing tests!

- Socket connected?
- Data sent?
- Socket closed?
- Data received?

Concurrency!!!
OSProcess for tests

- Image
  - OSPProcess Library
  - OCEAN
  - Alien Library

- VM
  - OSPProcess plugin
  - Alien plugin

- OS
  - OS API
  - POSIX <sys/socket.h>
OCEAN first evaluation

Receive 10MB
Send 10MB
Summary

Smaller VM

Ease porting

Image

VM

OS

FFI

OOP

Smalltalk

IDE
Experiment

OCEAN

Alien-based Networking Library

- Portable
- OOP
- Promising first Bench
- 100% tested
Future Work

☐ Finish the OCEAN experiment

☐ Remove other VM plugins

☐ Identify the Minimal VM
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