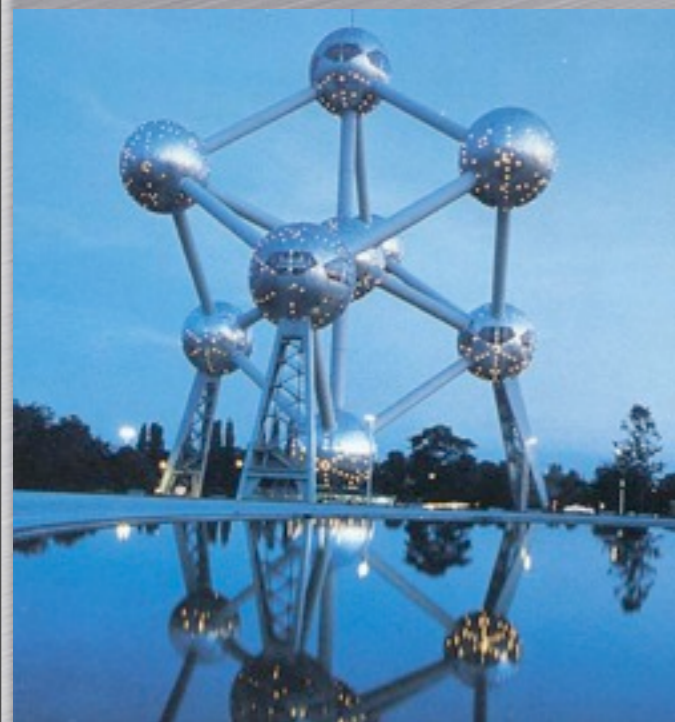


AmbientTalk

Wolfgang De Meuter - Elisa Gonzalez Boix
Software Languages Lab
Vrije Universiteit Brussel
Brussels, Belgium

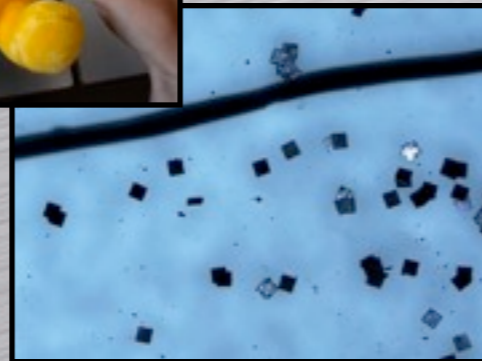
soft.vub.ac.be



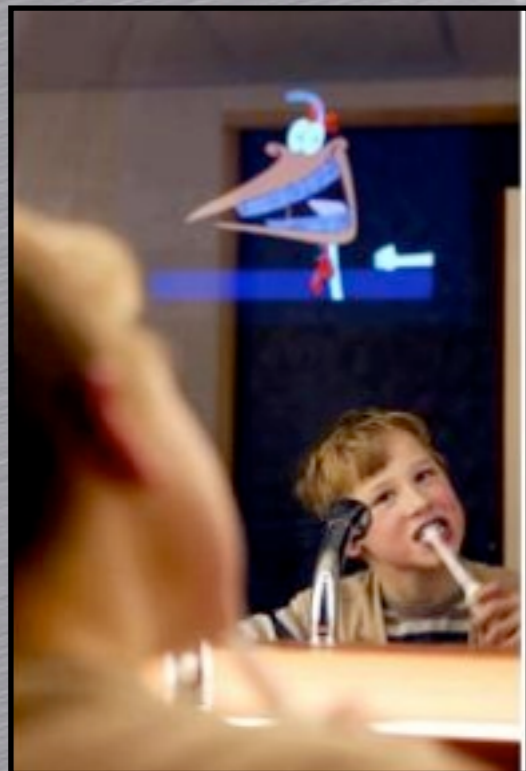
Three Phenomena

Miniaturisation

Wireless Connectivity



Spatio-Temporal Semantics



Distributed++

Why Languages?



Frederick Brooks

Essential Complexity
≠ Accidental Complexity

“What does a high-level language accomplish? It frees a program from much of its accidental complexity. it eliminates a whole level of complexity that was never inherent in the program at all.”

Waldo/Guerraoui-doctrine



Jim Waldo

The hard part of distributed programming is not the problem of getting things on and off the wire.

is the problem of dealing with

- differences in local and remote memory access
- partial failure
- latency
- concurrency



Rachid Guerraoui

Therefore, distribution **transparency** is a myth that is both misleading and dangerous

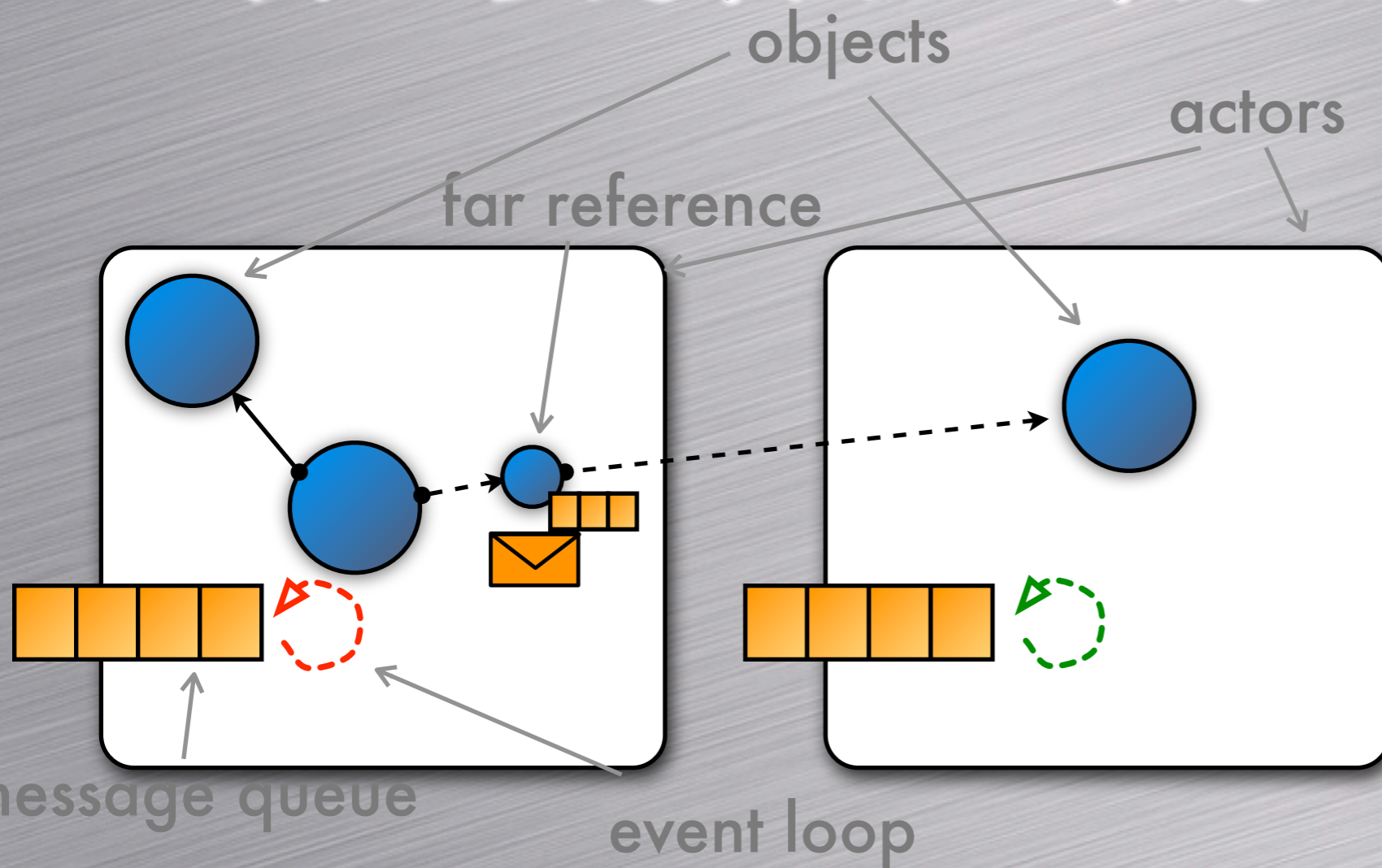
Ambient-Oriented Programming

A superset of the OO paradigm that is explicitly geared towards programming ambient applications that run on mobile ad hoc networks



AMBIENTTALK

AT Distribution Model



Reconnection is as
fundamental as
connection

```
deftype InstantMessenger;  
export: (object: ...) as: InstantMessenger;
```

Actors are the unit of
distribution

```
deftype InstantMessenger;  
when: InstantMessenger discovered: {  
  |messenger|  
  when: (messenger<-getName()) becomes: {  
    |name|  
    buddyList.put(name, messenger);  
    system.println("Added buddy: " + name);  
  };  
};
```


AT Failure Model

Optimistic Model (\neq Exceptions)

```
def leaseTime := minutes(2);  
  
def leasedMsgr := renewOnCallLease: leaseTime for:  
  (object: {  
    def chat(text) {  
      ... }});  
  
when: leasedMsgr expired: {  
  // clean up the messenger's resources  
};  
  
export leasedMsgr as: InstantMessenger
```

“Failure Doesn’t Exist”

```
when: buddy<-chat(text)@Due(minutes(1)) becomes: {  
  |ack|  
  //received successfully  
}  
catch: {  
  |exc|  
  // test whether 'exc' is a TimeoutException  
}
```


AT Runtime Model

```
when: InstantMessenger discovered: {  
  |messenger|  
  ...  
  whenever: messenger disconnected: {  
    system.println("Buddy offline: " + name);  
  };  
  whenever: messenger reconnected: {  
    system.println("Buddy online: " + name);  
  };  
};};
```

Causal Connection to
Hardware Status

```
def Button := jlobby.java.awt.Button;  
def b := Button.new("Click Me");  
  
b.addActionListener(object: {  
  def actionPerformed(actionEvent) {  
    system.println("Pressed!");  
  } } )
```

Fully embedded in Java

AmbientTalk

Research Language (\neq Toy Language)

Language Laboratory

REPL-driven



Prototype-based

Distributed

Concurrent

Traits

Dynamically Typed

Reflective

First-class messages & methods

Escape-continuations

Fully embedded in Java



code.google.com/p/ambienttalk/

AMBIENTTALK

AmbientTalk

abstractions

concepts

abstractions

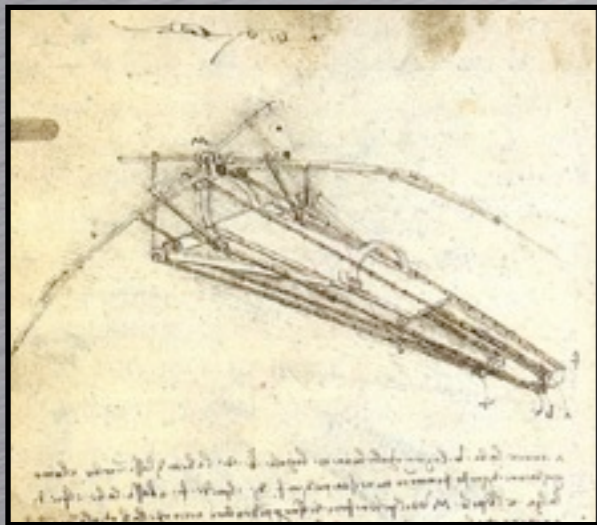
concepts

abstractions

abstractions

concepts

abstractions

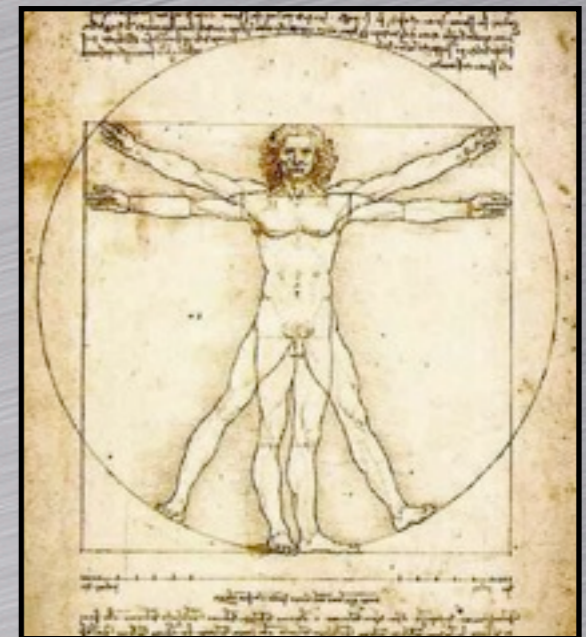


concepts

concepts

concepts

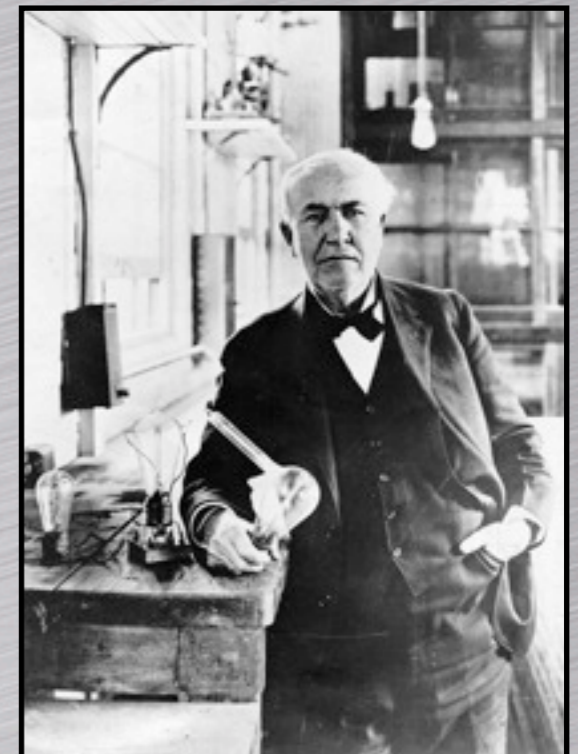
abstractions



abstractions

concepts

implemented
on real
hardware



AmbientTalk

Runs on J2ME/CDC phones

2005



2007



2009



QTek 9090

HTC Touch
Cruise

iPhone

HTC Hero

IBM J9

IBM J9

JamVM

DalvikVM

Deployment on JamVM

Christophe Scholliers & Elisa Gonzalez Boix

- Interpreter and distribution works.
- Future-type message passing.
- GUI Support.
- Performance.



```
iPod 17:38
iPod:/test root# iat
sh: iat: command not found
iPod:/test root# ./iat
Interactive AmbientTalk Shell, version 2.12
(build041108)
Wed Jan 21 17:36:51 GMT+01:00 2009 INFO at.i
nit - Added entry to object path: at=/test/a
t
Wed Jan 21 17:36:55 GMT+01:00 2009 INFO at.e
ventloops.vm - virtual machine: VM created o
n network AmbientTalk
5 >5 - 5
>>0
>7 - 5
>>2
>
```

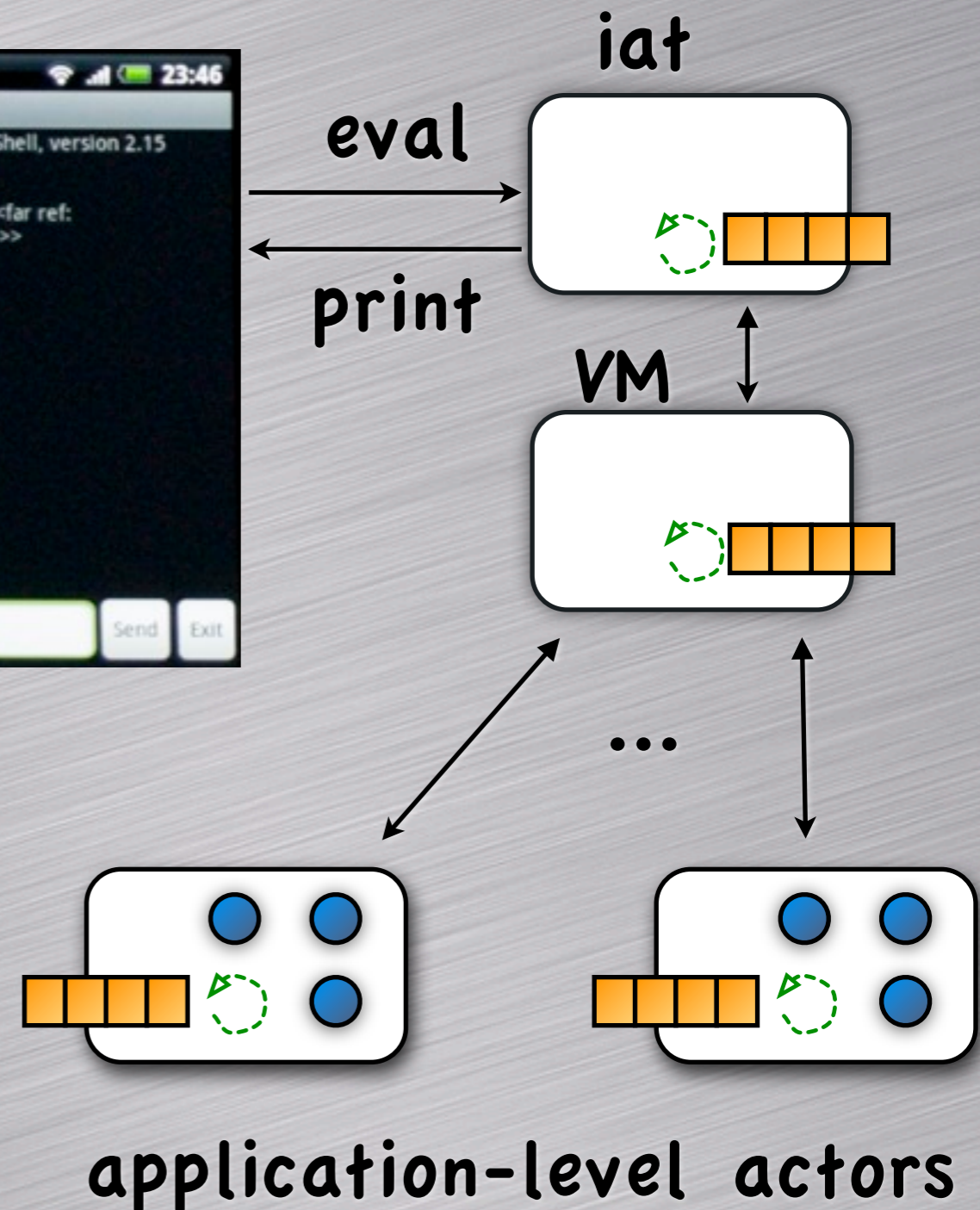

Deployment on Android

Lode Hoste, Elisa Gonzalez Boix & Dries Harnie

Android application that launches the interpreter



Disabling jline for compatibility.



Deployment on Android

Platform Issues:

Emulator does not support multicast.

Stack overflow.

Heap usage.

```
5554:my_test_2
8:11 PM
ATAndroid
Interactive AmbientTalk Shell, version 2.15
(development)
>><obj:1136800136{makeFuture,makeFuture:=,...
}>
>Added buddy: bob
>>nil
```

```
5556:my_test_1
8:50 PM
ATAndroid
Interactive AmbientTalk Shell, version 2.15
(development)
>><obj:1136412896{makeFuture,makeFuture:=,...
}>
>Added buddy: alice
alice: hi, bob
```


Deployment on Android

Platform Issues:

Emulator does not support multicast.
Patch on its way.

Stack overflow.

Heap usage.

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Deployment on Android

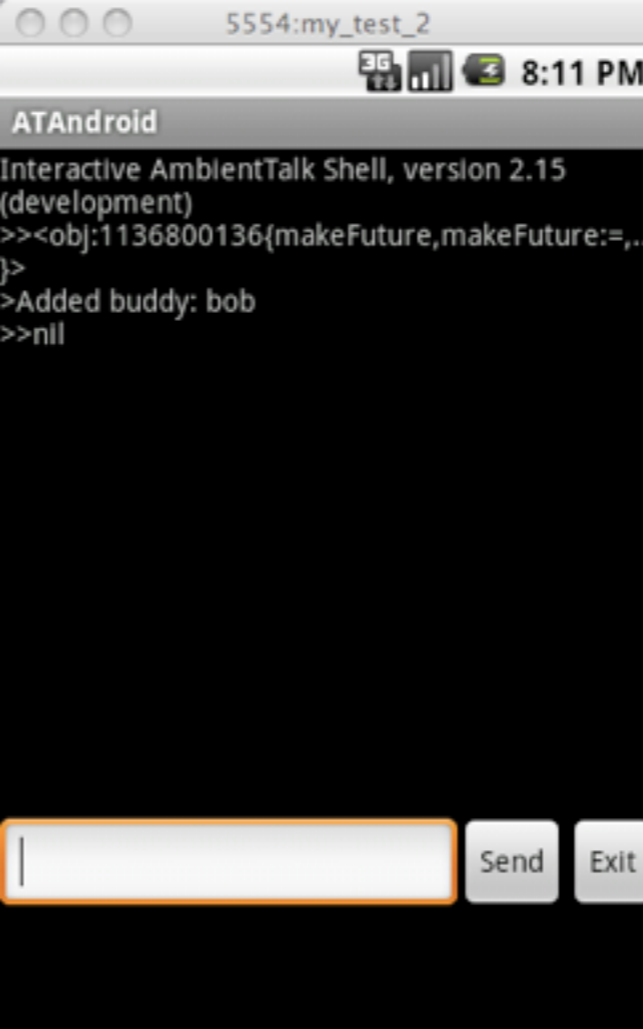
Platform Issues:

Emulator does not support multicast.
Patch on its way.

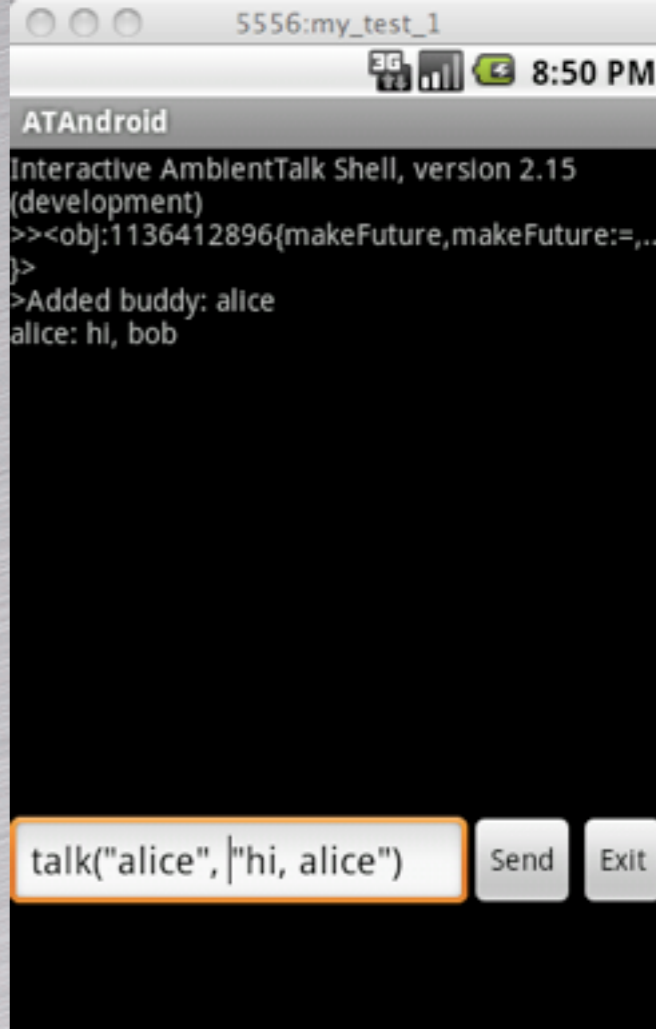
Stack overflow.

Instrumentation of the interpreter.

Heap usage.



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```


Deployment on Android

Platform Issues:

Emulator does not support multicast.

Patch on its way.

Stack overflow.

Instrumentation of the interpreter.

Heap usage.

Change VM configuration on emulator by means of adb.

```
5554:my_test_2
8:11 PM
ATAndroid
Interactive AmbientTalk Shell, version 2.15
(development)
>><obj:1136800136{makeFuture,makeFuture:=,...}
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>><obj:1136412896{makeFuture,makeFuture:=,...}
>
>Added buddy: alice
alice: hi, bob
```


Deployment on Android

- Interpreter and distribution works.
- Future-type message passing.
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- Performance.

Deployment on Android

Interpreter and distribution works.

Future-type message passing. Works on emulators.

GUI Support.

Performance.

Deployment on Android

Interpreter and distribution works.

Future-type message passing. Works on emulators.

GUI Support.

Anh Le Tuan

Performance.

Deployment on Android

Interpreter and distribution works.

Future-type message passing. Works on emulators.

GUI Support.

Anh Le Tuan

Performance.

Dries Harnie

AmbientTalk project

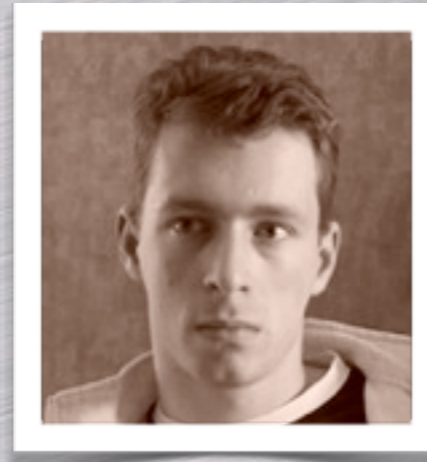
soft.vub.ac.be/amop



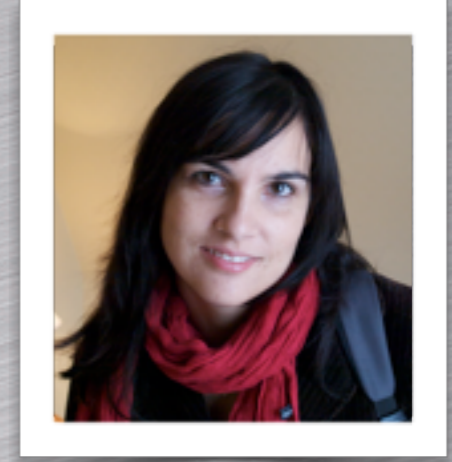
Wolfgang De Meuter



Tom Van Cutsem



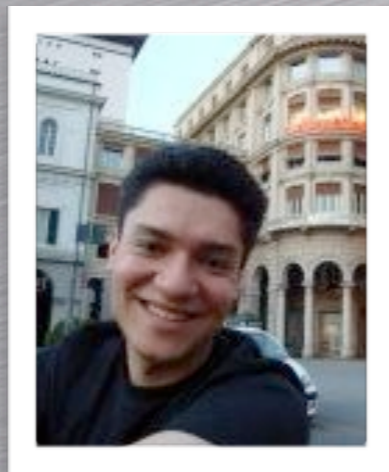
Stijn Mostinckx



Elisa Gonzalez Boix



Andoni Lombide



Christophe Scholliers



Eline Phillips



Kevin Pinte



Dries Harnie

code.google.com/p/ambienttalk/