



DART

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DART: A STRUCTURED WEB PROGRAMMING LANGUAGE

- *New programming language*
- *New programming tools*
- *New open source project*

WARNING: THIS IS ONLY A TECHNOLOGY PREVIEW



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MY PROJECTS

- **CLDC HI** - *fast Java virtual machine for cell phones*
- **OOVM** - *embedded yet serviceable Smalltalk*
- **V8** - *high-performance JavaScript virtual machine*
- **Dart** - *structured programming for the web*



AGENDA

- *Why did we design a new language?*
- *How does it look and feel?*
- *What is this thing about isolates?*
- *Open-source project*



CURRENT WEB: THE GOOD PARTS

- *JavaScript is flexible and supports incremental development*
- *Developing and deploying small applications is easy*
 - *Platform independent execution - code runs everywhere*
 - *No installation of applications*



CURRENT WEB: THE BAD PARTS

- *Writing large well-performing applications is hard*
 - *Hard to reason about the program structure*
 - *Startup performance is often really bad*
- *Difficult to document intent and interfaces (lack of types)*
- *No support for modules, packages, or libraries*
- *Comparatively weak tool support*



INNOVATION IS ESSENTIAL

- *The Web platform must keep moving fast and innovate*
- *There is a clear need for supporting programming in the large*
- *JavaScript is a powerful tool but it has many pitfalls*



HISTORY BEHIND DART

I'm Lars

- *Last year, Lars Bak and I experimented with Spot*
- *A new simple programming language for the web*
- *Based on the experiences from JavaScript*
- *Spot was the prelude for the Dart project*



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SO WHAT IS DART?

- *Unsurprising object-oriented programming language*
- *Class-based single inheritance with interfaces*
- *Optional static types*
- *Proper lexical scoping*
- *Single-threaded*
- *Familiar syntax*



LET'S TRY SOME DART CODE

- *Fun with classes, closures, and optional types*
- *Easy to experiment with at try.dartlang.org*



A DIFFERENT TYPE-CHECKER

- *A conventional type-checker*
 - ... tries to prove that your program obeys the type system
 - ... considers it a fatal error if it cannot construct a proof
- *In Dart, you're **innocent until proven guilty***



OPTIONAL STATIC TYPES

- *Static types convey the intent of the programmer*
- *Checkable documentation for code and interfaces*
- *Avoids awkward variable naming schemes*
- *Type annotations have no effect on the runtime semantics...*



TYPES ON THE DARTBOARD

- *Let's explore a few illustrative examples*

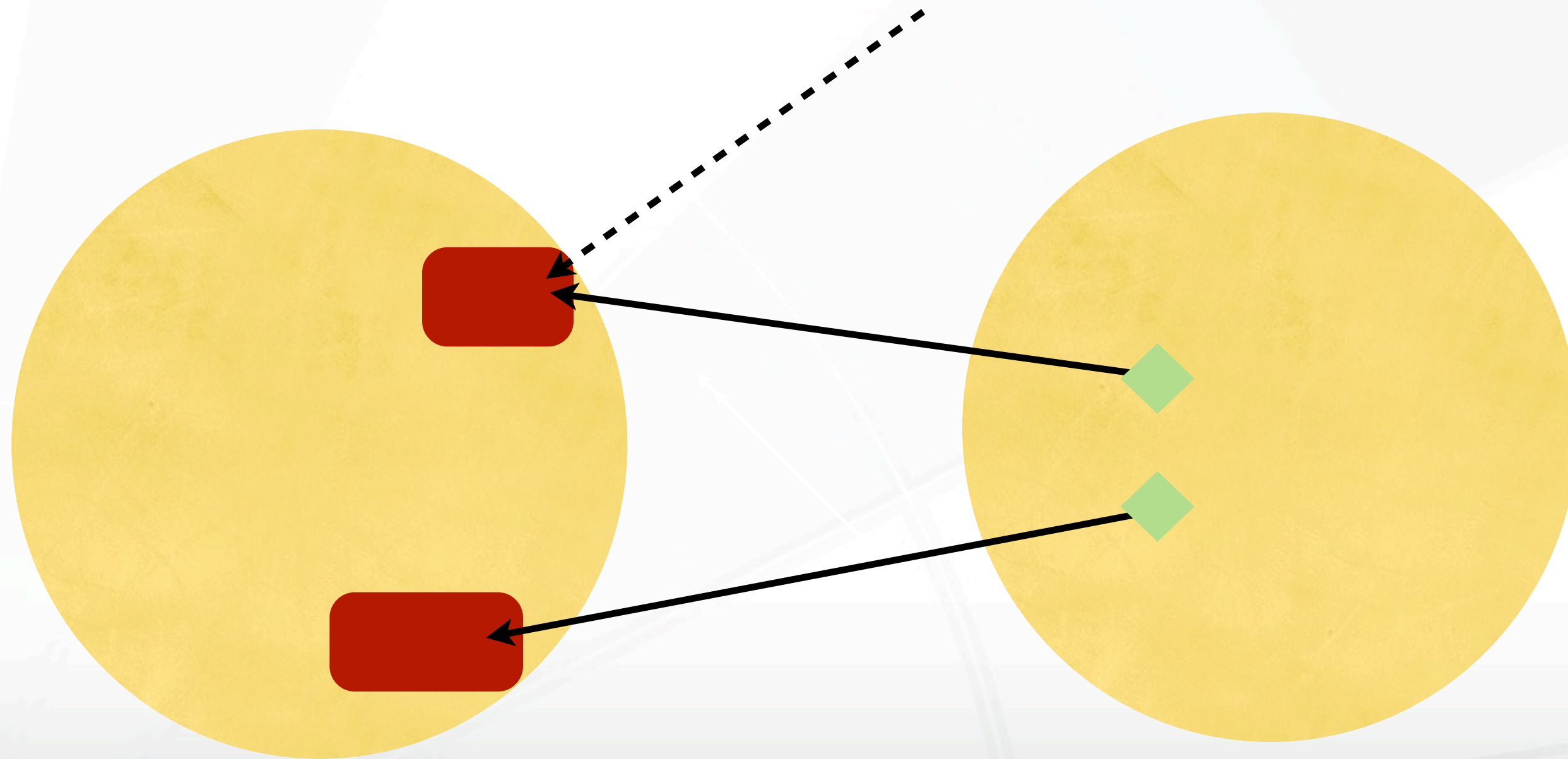


ISOLATES

- *Lightweight units of execution*
 - *Runs in their own address space like processes*
 - *Nothing is shared - nothing needs synchronization*
 - *All communication takes place via message passing*
- *Supports concurrent execution*



SENDING AND RECEIVING MESSAGES



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PORTS

- *Receive ports accept and enqueue incoming messages*
 - *Live inside a specific isolate*
 - *Can be created on demand*
- *A send port allows sending to a certain receive port*
 - *It is an unforgeable, transferrable capability*

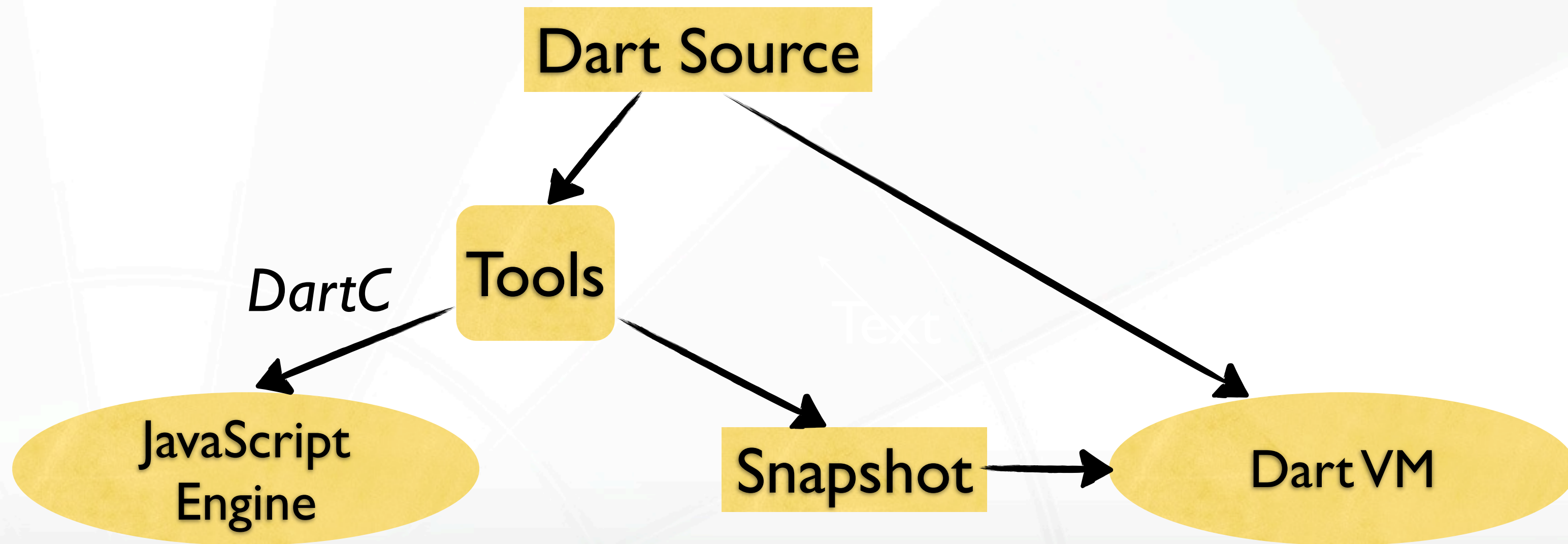


ISOLATES: LET'S SEE THE CODE

- *Dartboard supports isolates*
- *Easy to illustrate the core primitives*



DART EXECUTION



DART PERFORMANCE

Relative performance compared to JavaScript on V8

Benchmark	VM	DartC
Mandelbrot:	18.2%	88.7%
DeltaBlue:	56.6%	52.2%
Richards:	46.0%	70.9%
NBody:	35.8%	63.6%
BinaryTrees:	77.3%	104.3%
Fannkuch:	53.8%	22.3%
Meteor:	50.3%	42.1%

Details:

- V8 revision 3.5.5.
- DartC used with the `-optimize` flag



DART VM: SNAPSHOTTING

- *Process of serializing the heap after loading the application*
- *Loading 54173 lines of Dart code takes 640 ms*
- *Loading same application from a snapshot takes 60 ms*
- *Startup > 10x faster*



WEB APPLICATION IN DART

- *News reader completely written in Dart*
- *Application code: 3210 LOC*
- *UI library code: 13200 LOC*
- *Animation yields 30 fps*
- *Code is part of the open source project*



DART EDITOR

- *Editor for constructing and browsing Dart applications*
- *Lightweight editor based on Eclipse components*
- *Code is part of the open source project*



DART IS NOT DONE

- *Rest arguments and enums?*
- *Reflection support?*
- *Pattern matching for easy message decoding like in Erlang?*
- *... please give feedback by joining the discussions*



DART OPEN SOURCE PROJECT

- *The Dart web site: <http://dartlang.org>*
 - *Dart language specification*
 - *Dart language tutorial*
- *The Dart project: <http://dart.googlecode.com>*
 - *Libraries and code samples*
 - *Dart virtual machine*
 - *Dart-to-JavaScript compiler*



DART IS A TECHNOLOGY PREVIEW

- *Dart: structured programming for the web*
 - *Two execution modes: Dart VM or JavaScript engine*
 - *Compatible with the current web*
- *Please try it out and participate*





Q & A

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