



Sun Labs Lively Kernel

Rethinking Web Programming

The Lively Kernel Team
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**2008
Sun Labs
Open House**



The Lively Kernel Team

- Core project team:
 - > Dan Ingalls, co-PI
 - > Tommi Mikkonen
 - > Krzysztof Palacz
 - > Antero Taivalsaari, co-PI
- Special thanks to:
 - > Stephen Uhler
 - > and so many others who have helped us during the project

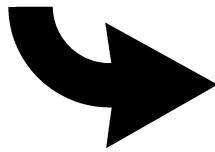
Background

- The widespread adoption of the World Wide Web is reshaping our world in various ways.
- Documents, photos, music, videos, news and various other artifacts and services have already started migrating to the Web.
- Many industries (e.g., publishing and entertainment) are currently undergoing dramatic transformations.
- The software industry is on the brink of a similar transformation, or a paradigm shift.

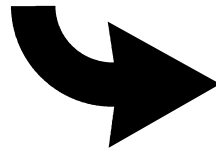
Evolution of the Web



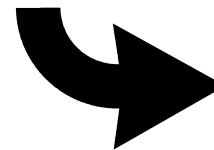
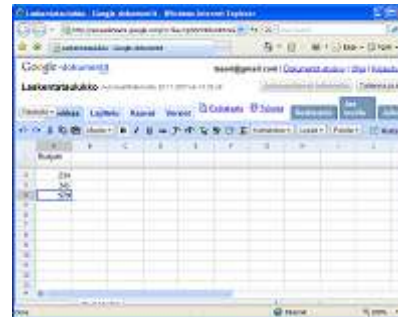
1) Simple pages with text and static images only
(e.g., <http://www.google.com>)



2) Animated pages with plug-ins
(e.g., <http://www.cadillac.com>)



3) Rich Internet Applications
(e.g., docs.google.com)



What's Next?

Implications

- Web-based software could dramatically change the way people develop, deploy and use software.
- No more installations!
 - > Applications will simply run off the Web.
- No more upgrades!
 - > Always run the latest application version.
- Instant worldwide deployment!
 - > No middlemen or distributors needed.
- No CPU dependencies, OS dependencies, ...
 - > The Web is the Platform.

Unfortunately...

- The web browser was not designed for running real applications.
 - > It was designed in the early 1990s for viewing documents, forms and other page-structured artifacts – *not* applications.
 - > Programming capabilities on the web were an afterthought, not something inherent in the design of the browser.
- Various problems and challenges remain.
 - > For details, read our technical report “*Web Browser as an Application Platform – the Lively Kernel Experience*” (SMLI TR-2008-175)

The Sun Labs Lively Kernel Project

Three Hypotheses

- The Web is *the* Application Platform
- The Web Browser is the Operating System (at least for end user applications)
- JavaScript is the *de facto* Programming Language of the Web

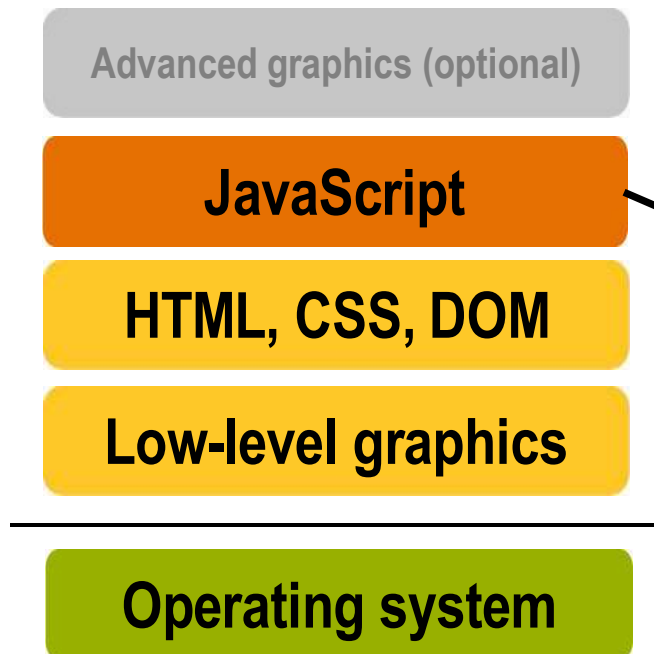
Sun Labs Lively Kernel

- The Lively Kernel is a web application development environment written entirely in JavaScript.
- Runs in a regular web browser with no installation or plug-ins whatsoever.
- Supports real applications on the Web, with rich user interface features and direct manipulation capabilities.
- Enables application development and deployment without installation or upgrades.
- Allows application development within the web browser.

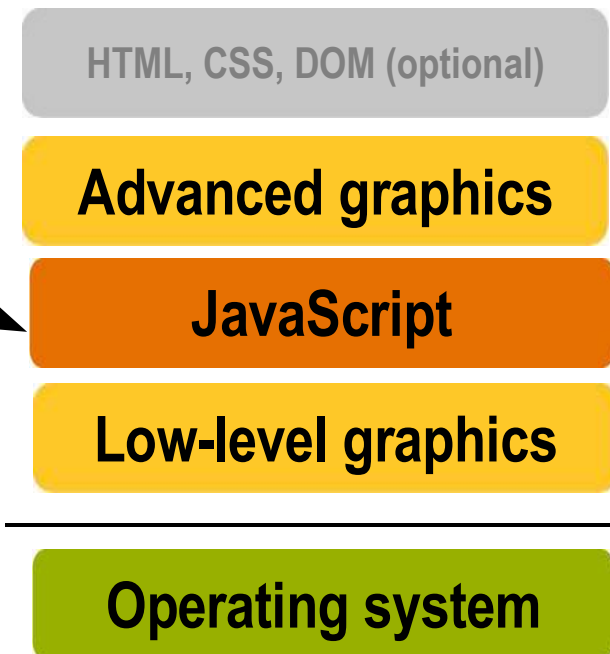
Turning Things “Upside Down”

- The original idea: Start with JavaScript and a desktop-style graphics architecture.
- De-emphasize the current document-oriented approach.

Conventional Web Client Stack



Lively Kernel Stack



The Lively Kernel In a Nutshell

Key components:

- JavaScript programming language
 - Asynchronous networking support (async HTTP)
 - Desktop-style graphics architecture with zooming
 - Morphic application framework and widgets
-
- Built entirely on existing technologies!

Demos!

The screenshot shows the Sun Labs Lively Kernel browser interface. The address bar displays `http://research.sun.com/projects/lively/index.xhtml`. The browser title is "Sun Labs Lively Kernel".

Key components visible include:

- JavaScript Code Browser:** A list of widget classes on the left, with `ClockMorph` selected. The code editor on the right shows the `setHands` method implementation:


```

      initialize
      makeNewFace
      reshape
      startSteppingScripts
      setHands
      
```
- Widgets:**
 - A Lively Engine:** A central window with a mechanical gear-like interface.
 - Sun 3D Logo:** A yellow window displaying a 3D logo.
 - Weather Widget:** A tilted window showing weather data for San Francisco, California:
 - San Francisco, California
 - Tampere, Finland
 - London, United Kingdom
 - Clear
 - Temperature: 9°C (48°F)
 - Wind Speed: 6 mph
 - Wind Direction: NW
 - Pressure: 1014mB, Rising
 - Relative Humidity: 68%
 - Visibility: Good
 - BBC WEATHER
 - Stock Widget:** A window displaying market data from BigCharts:
 - DJIA:** 13,727.03 (+101.45, +0.74%)
 - NASDAQ:** 2,718.95 (+12.79, +0.47%)
 - Includes line charts for both indices.
 - Score: 0:** A small window showing a score of 0.
 - High: 0:** A window showing a high score of 0.
- Navigation:** Buttons for "More complex sample widgets" and "Development Tools" are visible at the bottom left.
- Footer:** Sun Microsystems logo and text at the bottom left.

Where Are We Headed?

- The Lively Kernel was released to the public as an Open Source project in October 2007.
- Available under GPL license.
- Current research directions:
 - > better end-user programming / IDE capabilities
 - > running the system on mobile devices
 - > building more complete applications
 - > support for on-the-fly creation of dynamic web sites

Related Systems

- There are many other web application development (a.k.a. Rich Internet Application, RIA) systems.
- The following systems are best known:
 - > Ajax
 - > Adobe AIR
 - > Google Web Toolkit & Google Gears
 - > Java FX
 - > Microsoft Silverlight
 - > Ruby on Rails

How is the Lively Kernel Different?

- No plug-ins! All you need is the browser.
- No installation!
- No binaries!
- Everything written in JavaScript using a uniform set of APIs.
- Built-in IDE capabilities – applications can be developed using the Lively Kernel itself using nothing more than a web browser.

Summary

- The Lively Kernel is a new web application development system built at Sun Labs.
- The Lively Kernel is the first truly “zero-installation” web application environment that even includes built-in development tools for on-the-fly use.
- Available as an Open Source project at:
> <http://research.sun.com/projects/lively>
- Come to meet us & see our demos in Room 1860 (The Old Mint)



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