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JavaOneSM

Enterprise JavaTM Web Apps with Google Open Source Technology

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Software Engineer at Google

- > Co-author
 - JAX-RS: Java API for RESTful Web Services
 - JSR-303: Bean Validation
- > Core Contributor
 - Google Guice
 - MVEL
- > Represent Google on Servlet + Java EE EGs

What's on tap?

- > Google Guice
- > Google Web Toolkit
- > Web Driver

- > Google Sitebricks sneak peak!

Applications at Google scale

- > What does it mean to build a web app at Google scale?

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 - Everything x **100¹⁰⁰**

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Applications at Google scale

- > What does it mean to build a web app at Google scale?
 - Everything x 100¹⁰⁰
 - Performance (low latency)
 - Concurrency
 - Developer scalability

Google Guice

- > is the new **new**!
 - > anti-**static**
 - > enables **testing**
 - > improves **testability**
-
- > **Vitamin C** for your app



Ugh, static cling...

> Here is a traditional singleton pattern:

```
public class MyService {  
    private static MyService instance;  
  
    public static MyService get() {    //factory method  
        if (null == instance)  
            instance = new MyService();  
  
        return instance;  
    }  
}
```

Ugh, static cling...

> How would you test clients of `MyService`?

```
public class MyClient {  
    private MyService service = MyService.get();  
  
    public void doStuff() {  
        ...  
    }  
}
```

Ugh, static cling...

> How would you test clients of MyService?

```
public class MyClientTest {  
  
    @Test  
    public final void stuff() {  
        MyClient = new MyClient(); //can't mock MyService!  
        ...  
    }  
}
```

Ugh, static cling...

> You have to expose a static setter:

```
public class MyService {  
    private static MyService instance;  
  
    public static MyService get() {  
        if (null == instance)  
            instance = new MyService();  
  
        return instance;  
    }  
  
    public static void set(MyService ms) {  
        instance = ms;  
    }  
}
```

Ugh, static cling...

> Now you *can* use a mock object:

```
public class MyClientTest {  
  
    @Test  
    public final void badTest() {  
        MyService.set(new MockService());  
        MyClient = new MyClient();  
        ...  
    }  
}
```

Ugh, static cling...

> Don't forget to clean up

```
public class MyClientTest {  
  
    @Test  
    public final void betterTest() {  
        MyService prev = MyService.get();  
        MyService.set(new MockService());  
        MyClient = new MyClient();  
        ...  
  
        MyService.set(prev);  
    }  
}
```

Ugh, static cling...

> Don't forget to clean up, *properly*:

```
public class MyClientTest {  
  
    @Test  
    public final void goodTest() {  
        MyService prev = MyService.get();  
        MyService.set(new MockService());  
  
        try {  
            MyClient = new MyClient();  
            ...  
        } finally {  
            MyService.set(prev);  
        }  
    }  
}
```

Static cling is bad...

- > Still has problems:
 - Tests can't be run concurrently
 - Static cling: *poor concurrency, memory leaks, delinquent modularity*
 - Explosion of factory code
 - Annoying to test and maintain

Google Guice is the anti-**static**!

- > Responsibility for creation, scope and lifecycle is given to the injector:

@Singleton

```
public class MyService implements Service {  
    ...  
}
```

- > Frees you from infrastructure worries
- > Keeps code lean and mean!

Google Guice is the anti-static!

> Client code is now loosely coupled:

```
public class MyClient {  
    private Service service;  
  
    @Inject  
    public MyClient(Service service) {  
        this.service = service  
    }  
  
    public void doStuff() {  
        ...  
    }  
}
```

Google Guice is the anti-static!

> And very easy to test...

```
public class MyClientTest {  
  
    @Test  
    public final void stuff() {  
        MyClient = new MyClient(new MockService());  
        ...  
    }  
}
```

Google Guice is the anti-**static**!

> Testability means that tests have:

- No state-aware infrastructure code
- Strong focus on *functional unit*
- Scalability (concurrent & easy to maintain)
- Emphasis on good design

Other benefits?

- > Simple, idiomatic AOP
- > Modularity
- > Separation of concerns
- > Reduce state-aware code
- > Reduce boilerplate

Other benefits?

> Peace of mind!



Horizontal Scalability

> Important precepts:

- Type safety
- Good citizenry
- Focus on core competency
- Modularity



Modular Java with Guice

- > Modules are idiomatic, portable configuration catalogs:

```
public class MyModule extends AbstractModule {  
  
    @Override  
    protected void configure() {  
  
        bind(Towel.class)  
            .to(TurkishTowel.class);  
  
    }  
}
```

Modular Java with Guice

> Modules are intuitive and type safe:

```
public class MyModule extends AbstractModule {  
  
    @Override  
    protected void configure() {  
  
        bind(Towel.class)  
            .to(Bathrobe.class);    //compile error  
  
    }  
}
```

Modular Java with Guice

- > With Guice 2.0, even Servlets are modular:

```
public class MyModule extends ServletModule {  
  
    @Override  
    protected void configureServlets() {  
  
        serve ("/bananas")  
        .with (BananaServlet.class);    //type checked  
  
    }  
}
```

Modular Java with Guice

> And become idiomatic POJOs:

```
public class BananaServlet extends HttpServlet {  
  
    @Inject  
    BananaServlet(Soil soil, Sunlight light) {  
        ...  
    }  
  
    //lifecycle managed by Guice:  
    public void init(ServletConfig config) { .. }  
    public void destroy() { .. }  
}
```

Modular Java with Guice

> Filters are modular too, and much more...

```
public class SingleSignOnModule extends ServletModule {  
  
    @Override  
    protected void configureServlets() {  
        filter ("/*")  
            .through (SingleSignOnFilter.class);  
  
        filterRegex ("(.)*hack(.)*")  
            .through (AntiHackFilter.class);  
    }  
}
```

Modular Java with Guice

- > The canonical monkey looking for bananas application...



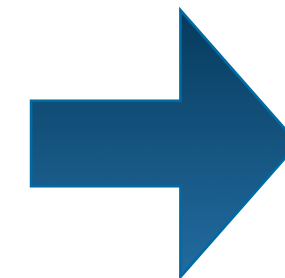
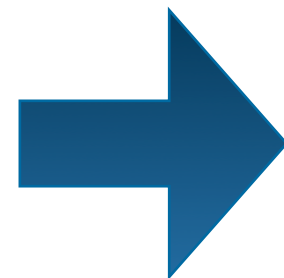
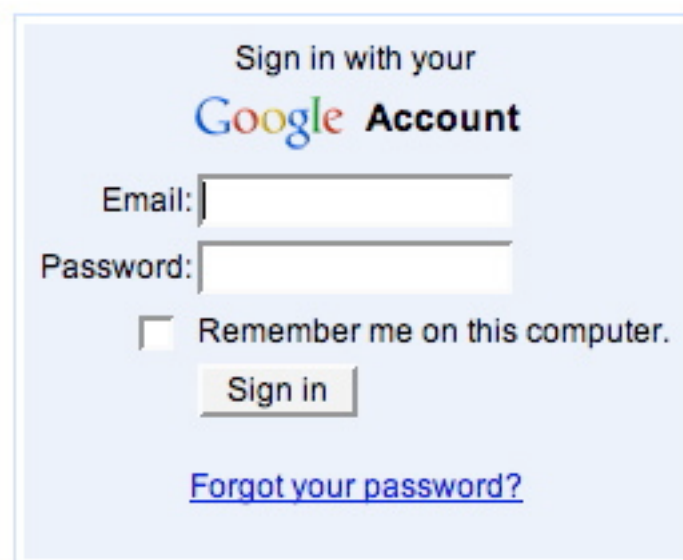
??



Modular Java with Guice

> As simple as pulling in the right modules:

```
Guice.createInjector(new SingleSignOnModule(),  
                    new GoogleMapsApiModule(),  
                    new MegaStoreModule(),  
                    new BananasModule());
```



Modular Java with Google Web Toolkit

- > Java to JavaScript compiler
- > Hosted mode
- > Core libraries emulated
- > Type safe!



iGoogle home page

[Change theme from Classic](#) | [Add stuff »](#)

NYT > Home Page

- [News Analysis: Fine Line for Obama on How to Convey Hope on Economy](#)
- [U.S. Jobless Rate Hits 8.9%, but Pace Eases](#)
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Weather

Get weather forecasts for your hometown and favorite places around the globe.

Enter your ZIP code:

Date & Time





11 12 1 2 3 4 5 6 7 8 9 10

Sat MAY 9

S	M	T	W	T	F	S
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10	11	12	13	14	15	16
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31						

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Google Calendar

« May 2009 »

S	M	T	W	T	F	S
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
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24	25	26	27	28	29	30
31	1	2	3	4	5	6


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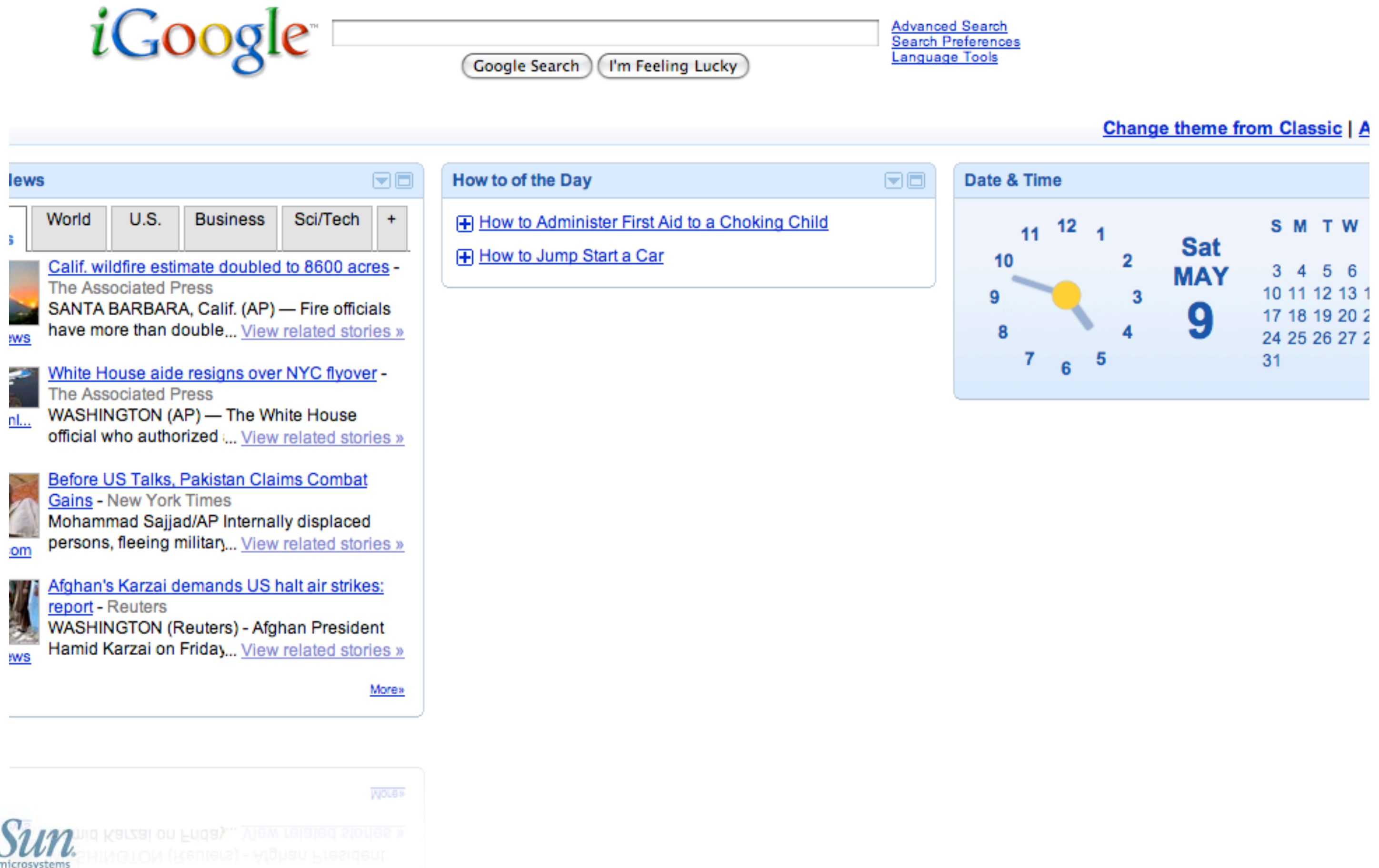
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Different iGoogle layout

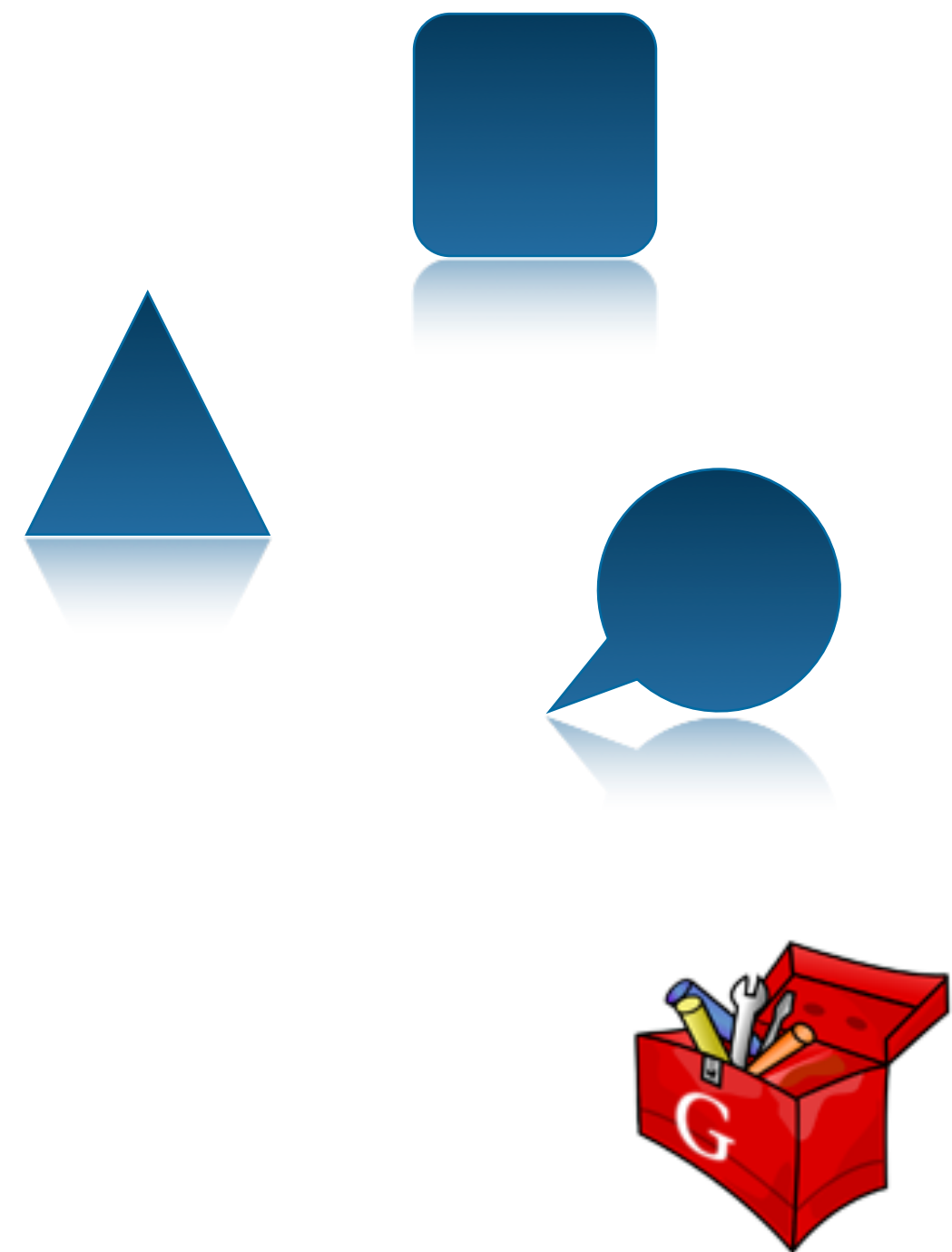


The screenshot shows the iGoogle homepage with the following components:

- Header:** The iGoogle logo is on the left. To its right is a search bar with "Google Search" and "I'm Feeling Lucky" buttons. Further right are links for "Advanced Search", "Search Preferences", and "Language Tools".
- Theme:** A link "Change theme from Classic | A" is located in the top right.
- News Section:** Titled "News", it features tabs for "World", "U.S.", "Business", and "Sci/Tech". It lists four news items with thumbnails and "View related stories" links.
 - Calif. wildfire estimate doubled to 8600 acres - The Associated Press. SANTA BARBARA, Calif. (AP) — Fire officials have more than double... [View related stories »](#)
 - White House aide resigns over NYC flyover - The Associated Press. WASHINGTON (AP) — The White House official who authorized ... [View related stories »](#)
 - Before US Talks, Pakistan Claims Combat Gains - New York Times. Mohammad Sajjad/AP Internally displaced persons, fleeing military... [View related stories »](#)
 - Afghan's Karzai demands US halt air strikes: report - Reuters. WASHINGTON (Reuters) - Afghan President Hamid Karzai on Friday... [View related stories »](#)A "More»" link is at the bottom of the list.
- How to of the Day:** A section with two links: [How to Administer First Aid to a Choking Child](#) and [How to Jump Start a Car](#).
- Date & Time:** Features a clock showing approximately 10:10, the date "Sat MAY 9", and a calendar grid for the month of May.
- Footer:** The Sun Microsystems logo is in the bottom left corner.

Modular Java with Google Web Toolkit

- > Decompose UI into modules
- > Widget or Window based UI
- > Each module is a good citizen



Modularizing iGoogle

Change theme from Classic | Add stuff »

NYT > Home Page

- [News Analysis: Fine Line for Obama on How to Convey Hope on Economy](#)
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Sat MAY 9


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« May 2009 »


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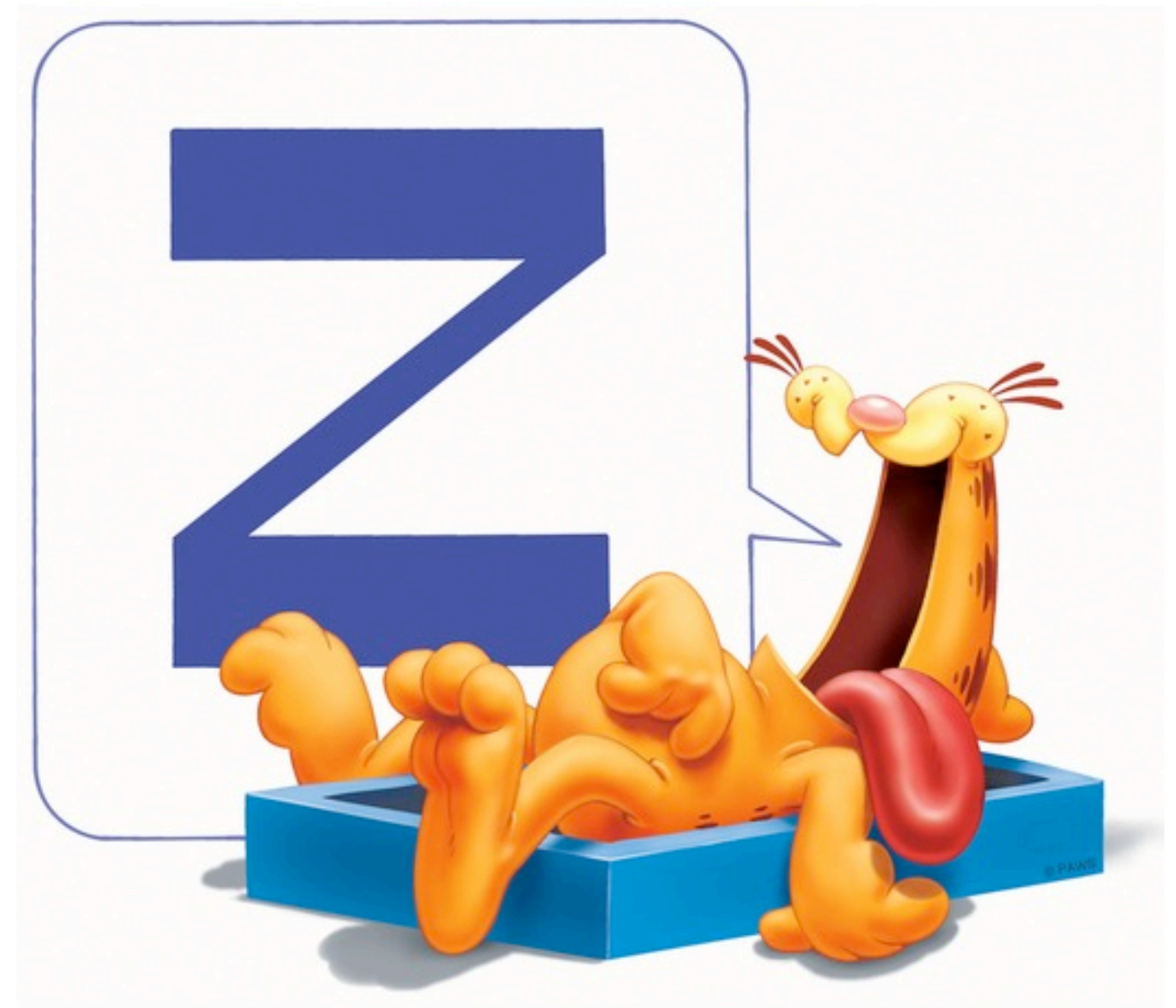
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CNN.com



Modules are loaded laaaazily...

- > GWT.runAsync()
- > Code downloaded on-demand
- > Contract-safe communication between modules



Modularity means speed!

- > Initial page loads much faster
- > Feature download cost is amortized
- > Teams can focus on their module



Testing with Google Web Toolkit

- > Use the Model-View-Controller (MVC) pattern
 - Isolate UI components in **View**
 - Actions/dispatch logic in **Controller**
 - **Model** used to communicate with server
- > Keep View dumb
- > Unit test Controllers like normal POJOs
- > Avoid `GWTTestCase`!

Isolating UI components with UI Binder

- > UI Binder templates are checked at compile time!

```
<gwt:FlowPanel xmlns:gwt="with:com.google.gwt...">  
    <gwt:Label gwt:field="message" />  
</gwt:FlowPanel>
```

```
public abstract class MyWidget implements Template {  
    abstract Label getMessage();    //bound by GWT  
    ...  
}
```

Unit testing with GWT

- > Put all your logic in the Controller and inject dependencies:

```
public class MyController {  
    MyController(MyView view, RemoteRpc ..) { .. }  
}
```

```
public class MyControllerTest {  
  
    @Test  
    public final void testThatRpcIsCalled() {  
        new MyController(new MockMyView(), ..);  
        //assert stuff  
    }  
}
```

Guice + GWT

- > Google Gin is Guice for GWT
 - Runs as Guice in Hosted mode (java)
 - Compiles directly to Javascript
 - No additional overhead of reflection
 - Use Guice to manage modules

Gin lets you use Guice in GWT

> Example module using Gin:

```
public class MyModule extends AbstractGinModule {  
  
    @Override  
    protected void configure() {  
        bind(MyWidgetPanel.class)  
            .in(Singleton.class);  
  
        bind(MyService.class)  
            .to(MyRemoteService.class);  
    }  
}
```

Using Gin for dependency injection

> Your code is now free of boilerplate:

```
public class MyController {  
    @Inject  
    MyController(MyView view, RemoteRpc ..) { .. }  
}
```

> Free as a bird!



Developer Scalability

- > Types are Java's natural currency
 - Guice + GWT use types to catch errors early
 - To facilitate broad refactorings
 - Prevent unsafe API usage
 - Reason better about the program

- > Essential to projects with 10+ engineers
 - Would be impossible in Javascript

Acceptance testing with Web Driver

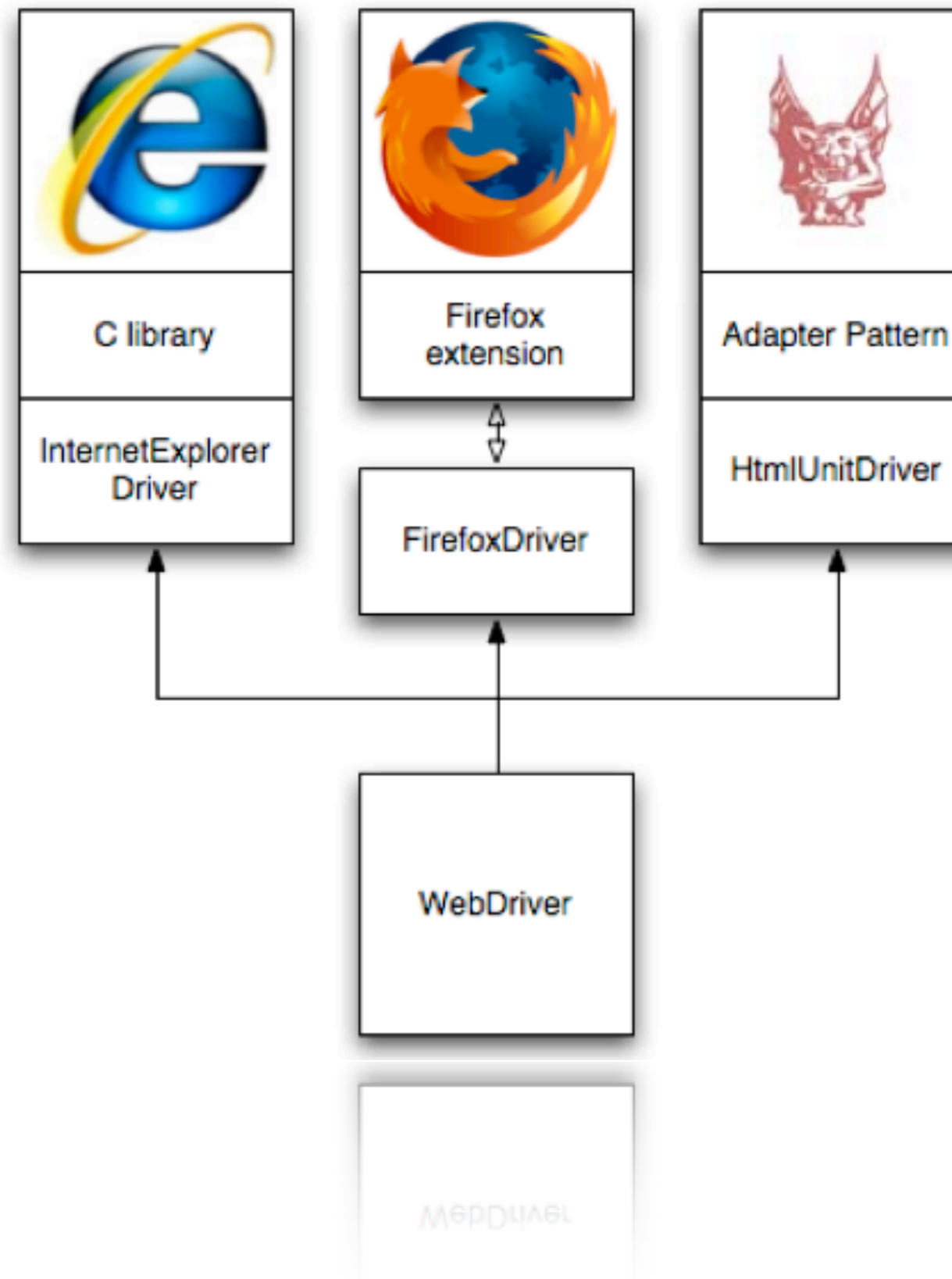


Acceptance testing with Web Driver

- > Alternative to Selenium
 - Simpler, blocking API
 - Pure Java API

- > Uses browser plugin instead of Javascript
 - Fast DOM interaction
 - Flexible API (no same origin restriction)
 - Native keyboard + mouse emulation

Web Driver architecture



Using Web Driver to test Google.com

> Example Web Driver test in Safari

```
WebDriver driver = new SafariDriver();  
  
driver.get("http://www.google.com");
```

Using Web Driver to test Google.com

> Locate the search text box:

```
WebDriver driver = new SafariDriver();  
driver.get("http://www.google.com");
```

```
WebElement e = driver.findElement(By.name("q"));
```

Using Web Driver to test Google.com

> Type in and send a query...

```
WebDriver driver = new SafariDriver();  
driver.get("http://www.google.com");
```

```
WebElement e = driver.findElement(By.name("q"));
```

```
e.sendKeys("Guice");  
e.submit();
```

Using Web Driver to test Google.com

- > Assert that the results page has our keyword:

```
WebDriver driver = new SafariDriver();  
driver.get("http://www.google.com");
```

```
WebElement e = driver.findElement(By.name("q"));  
e.sendKeys("Guice");  
e.submit();
```

```
assert driver.getTitle().contains("Guice");
```

- > Web Driver cleverly waits until the page is ready!

Using Web Driver to test Google.com

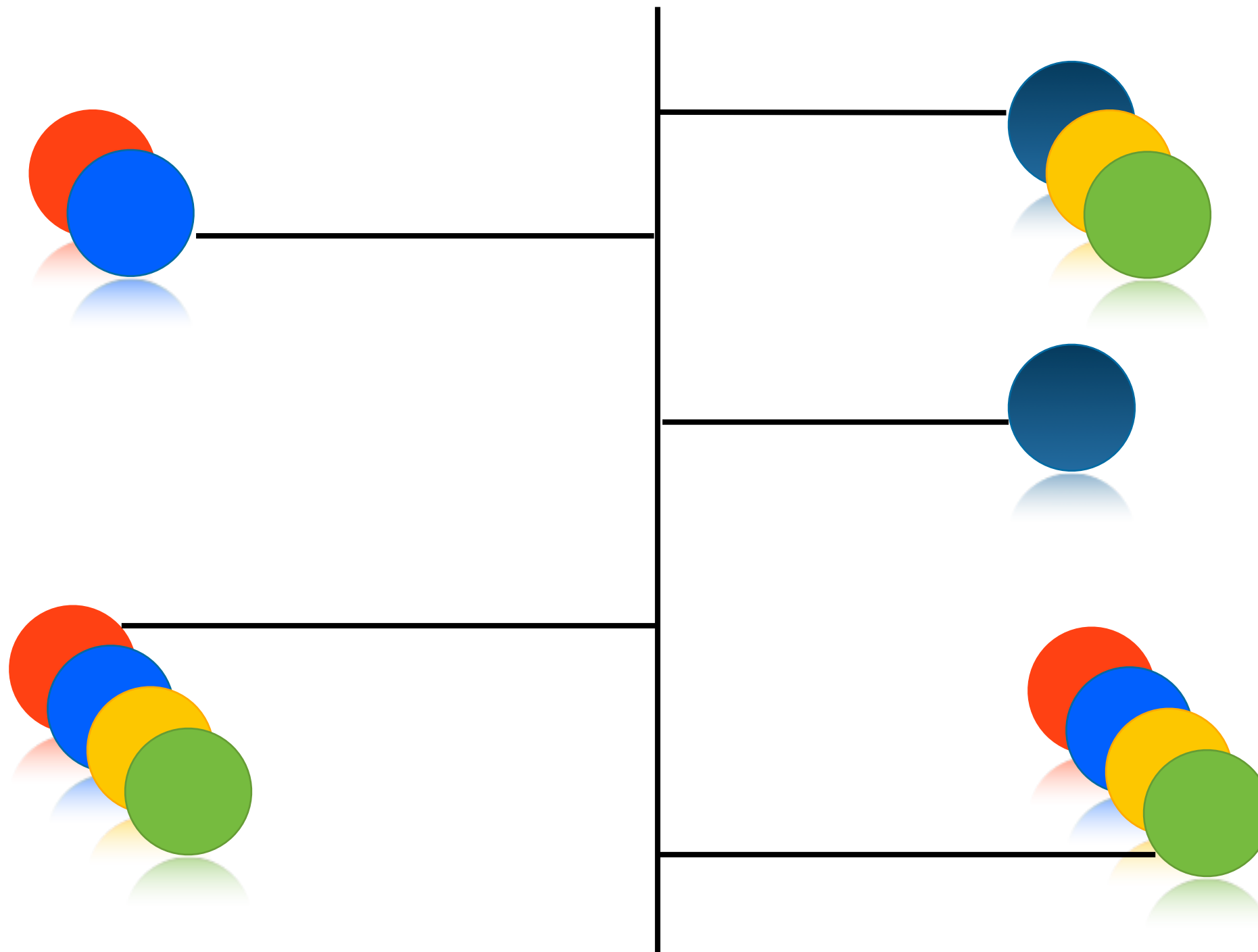
> Testing in other browsers is cake!

```
WebDriver driver = new FirefoxDriver();  
driver.get("http://www.google.com");
```

```
WebElement e = driver.findElement(By.name("q"));  
e.sendKeys("Guice");  
e.submit();
```

```
assert driver.getTitle().contains("Guice");
```

Web Driver supports clustering



Google Sitebricks sneak peak!

- > RESTful web framework for Java
 - Strong focus on HTTP
 - Lessons from JAX-RS
- > Statically typed templates
 - Rigorous error checking
 - Concise: uses type inference algorithm
- > Fast!

An example Sitebricks web page

- > Sitebricks pages are template + POJO couples:

```
<body>  
    The meaning of life is: ${meaning}  
</body>
```

```
class MyPage {  
    @Property String meaning = "17";  
}
```

Helpful error checking

- > Sitebricks templates are compiled on-load:

```
<body>  
    The meaning of life is: ${meening}  
</body>
```

```
class MyPage {  
    @Property String meaning = "17";  
}
```

- > This raises a compile error!

Helpful error checking

- > Sitebricks templates are statically type checked:

```
<body>  
    The meaning of life is: ${meaning - 3}  
</body>
```

```
class MyPage {  
    @Property String meaning = "20";  
}
```

- > This also raises a compile error!

Helpful error checking

> Sitebricks error checks complex expressions too:

```
<body>  
    The meaning of life is: ${person.life.meening}  
</body>
```

```
class MyPage {  
    @Property Person person = "20";  
}
```

An example Sitebricks web page

- > Sitebricks templates are much cleverer than that:

```
<body>  
  <a href="/nonexistenturi">Bad Link</a>  
  
  <form action="/misspelleduri">  
    ...  
</body>
```

- > If there is no target page, Sitebricks raises a compile warning!

RESTful (pretty) URL mapping

> Pages can map to dynamic RESTful URLs:

```
@At("/artists/:name")
class MyPage {

    @Get
    void get(@Named("name") String name) { .. }
}
```

> The URL is stripped and injected:

- localhost/artists/Nirvana => get("Nirvana")
- localhost/artists/Pearl%20Jam => get("Pearl Jam")

Simple, idiomatic templating system

> Sitebricks widgets are like Java annotations:

```
<body>
    The meaning of life is:
```

```
    @ShowIf (should)
```

```
    <span>${meaning}</span>
```

```
</body>
```

```
class MyPage {
    boolean getShould() {
        return name.equals("Zaphod Beeblebrox");
    }
    ...
}
```

Simple, idiomatic templating system

> Convert any HTML/Javascript page into a widget:

```
<head>
    @Require
    <script src="gwt_suggest.js"></script>
    ...
<body>
    <input type="textbox" name="suggest"/>
</body>
```

```
@EmbedAs ("Suggest")
class SuggestBoxWidget {
    ...
}
```

Simple, idiomatic templating system

> And reuse it anywhere with a simple annotation:

```
<body>
```

```
    Tell me something I don't know:
```

```
    @Suggest
```

```
    <span>Suggest widget gets embedded here</span>
```

```
</body>
```

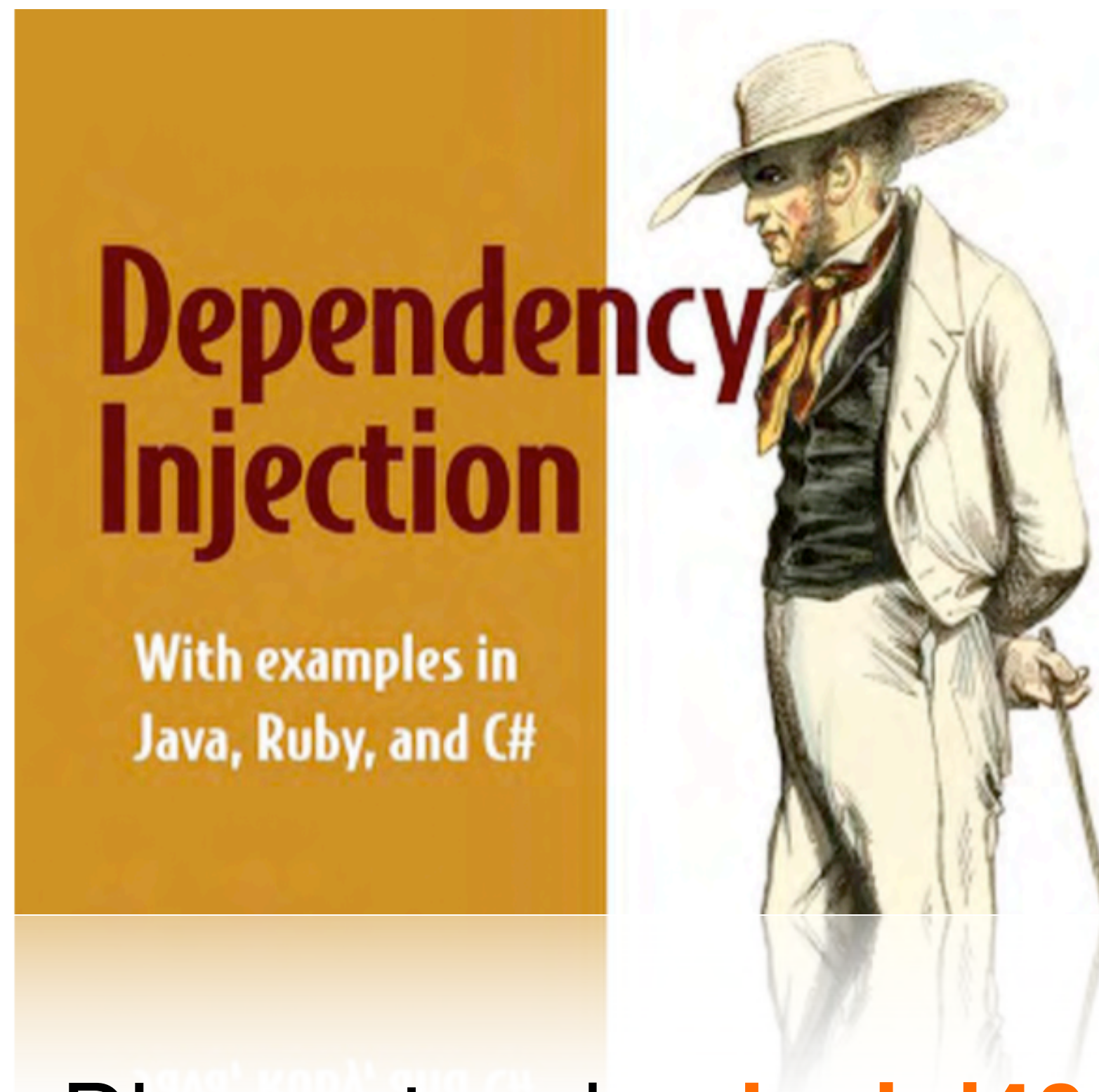
Google Sitebricks ftw!

- > Everything is type checked at compile time
- > Sitebricks modules are Guice Servlet modules
 - Ship any module as a widget library
 - Any page is injectable
 - Web scopes + Conversation scope
- > Planned Comet (reverse AJAX) support
- > Look out for a preview release soon on the Google Code Blog!

Shout outs

- > Bob Lee, Google
- > Jesse Wilson, Google
- > Simon Stewart, Google
- > Mike Brock, Red Hat

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Thank You



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