

# **Software Above The Level of a Single Device: The implications**

**Tim O'Reilly  
Spark Summit  
June 15, 2015**

Hardware, Software & the Internet of Things

[solidcon.com/internet-of-things-2015](http://solidcon.com/internet-of-things-2015)

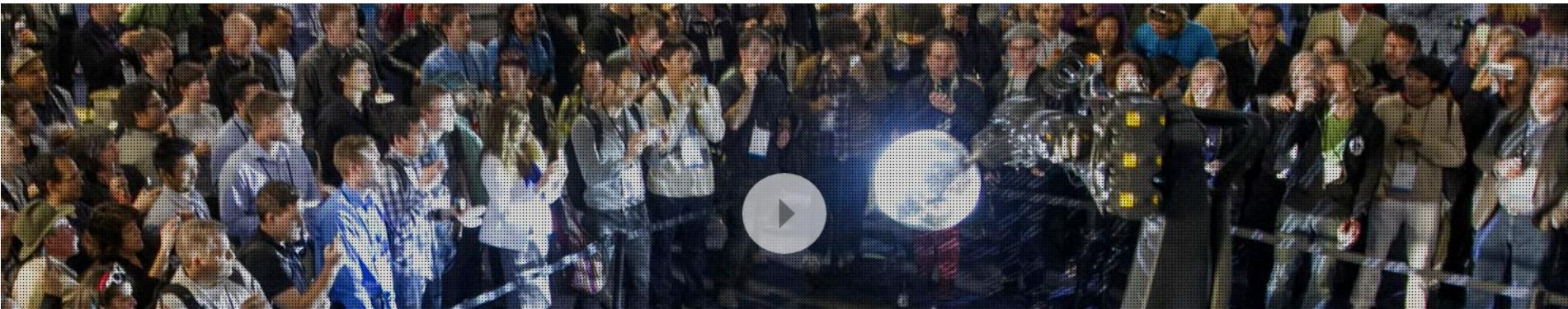
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# Solid

Hardware, Software & the Internet of Things  
June 23-25, 2015 • San Francisco, CA

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“The future has a funny way of sneaking up on you. You don’t notice it until you’re soaking in it. That was the feeling at O’Reilly’s Solid Conference.”

– Wired

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https://twitter.com/levie

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Aaron Levie @levie 23 Aug

Perspective: While Ballmer was CEO, Microsoft grew revenue by \$55B. Dell grew by \$31B, Oracle by \$27B, Intel by \$19B, IBM by \$16B.

Expand

“Uber is a [\$40] billion lesson in building for how the world \*should\* work instead of optimizing for how the world \*does\* work” - Aaron Levie of Box.net

Reply Retweet Favorite More

Aaron Levie @levie 23 Aug

It's easy to assume things can only get better at Microsoft. It's a \$78 billion revenue company. They can almost only get worse.

Expand

Aaron Levie @levie 22 Aug

Uber is a \$3.5 billion lesson in building for how the world \*should\* work instead of optimizing for how the world \*does\* work.

Expand



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## What Zipcar Got Right

- Customer self-service
- Real time availability information
- Payment via account presets
- Connected device to lock and unlock the car
- Trusting customers to refill gas and clean the car

## Where They Didn't See Far Enough

- Fixed parking locations with return to same location

https://www.car2go.com/en/washingtondc/

Business customers car2go Apps Social Media car2go Service english Washington DC

**CAR 2 GO**

Home area 397  
car2go 1  
Parkspots 0  
Reservations 0

Where am I? zoom out zoom in Maximize map

Washington

Hello Washington What is car2go? What does it cost? How does it work? Login Become a member

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**car2go gets DC going**

car2go gets DC going: Washington, DC is a city rife with energy and innovation, and here's an innovation that fits the DC lifestyle as perfectly as

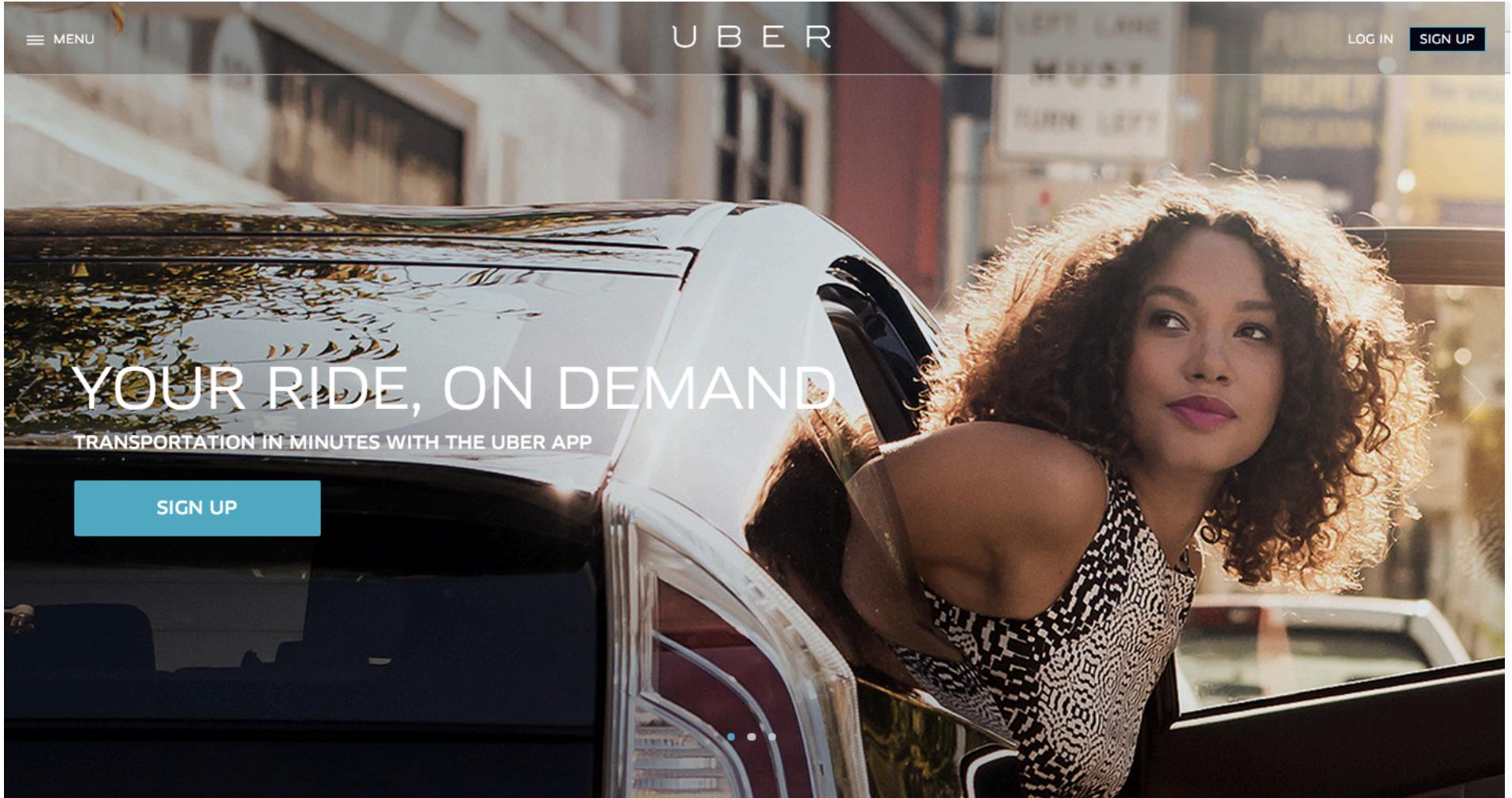
**Affordable drive**  
through the city

≡ MENU

U B E R

LOG IN

SIGN UP



YOUR RIDE, ON DEMAND

TRANSPORTATION IN MINUTES WITH THE UBER APP

SIGN UP

[CITIES](#)[DRIVE](#)[BLOG](#)[PARTNERS](#)[HELP](#)[DOWNLOAD](#)

# Rides in Minutes

[GET DOWNLOAD LINK](#)

## Take the wheel.

[DRIVE WITH LYFT](#)[Meet the new Lyft >](#)

Need a ride? Take Lyft for a welcoming, affordable, and memorable ride. Request a ride in the Lyft app, and get picked up by a reliable community driver in minutes.

# What did these services do differently?

# **“Building for the way the world should work”**

Rethinking the entire workflow and user experience

- You can hail a car from anywhere
- You can see in real time where it is en route
- You can see the name and picture of the driver and the car, and the driver can see the same for you
- No need to go through the rigamarole of payment every time
- Passenger can call or message the driver if necessary
- Manage driver quality via passenger ratings

All the data driven services we've learned to build  
on the web are now coming to the physical world

The screenshot shows a web browser window with the title 'Careers at Uber'. The URL in the address bar is <https://www.uber.com/jobs/53612>. The page header includes the Uber logo and navigation links for 'LOG IN' and 'SIGN UP'. The main content features a large, bold title: 'SOFTWARE ENGINEER - REALTIME DATA INTELLIGENCE'. Below the title is a list of bullet points describing the job requirements. At the bottom of the page, there is a section with a heading 'Responsibilities' and a list of bullet points detailing the responsibilities of the role.

- are familiar with either stats, signal processing, or machine learning algorithms.
- have deep production experience with large-scale data processing platforms, such as Hadoop or Spark.
- are familiar with interactive data visualization techniques.

- You will work with a team of talented engineers to build a highly scalable, fault tolerant, and responsive data infrastructure to meet Uber's most pressing data analytics needs. Your systems need to answer interesting questions in real time such as forecasting rider demand and traffic patterns in arbitrary geo locations.

## **But there's more than one way to do it**

Let's talk for a moment about two approaches to data and workers

# HARPER'S

M A G A Z I N E

JUNE 14, 2015: [Subways] [Mexico City] [Botany in literature] [Police brutality]

ARCHIVE / 2015 / MARCH

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REPORT — From the March 2015 issue

## The Spy Who Fired Me

*The human costs of workplace monitoring*

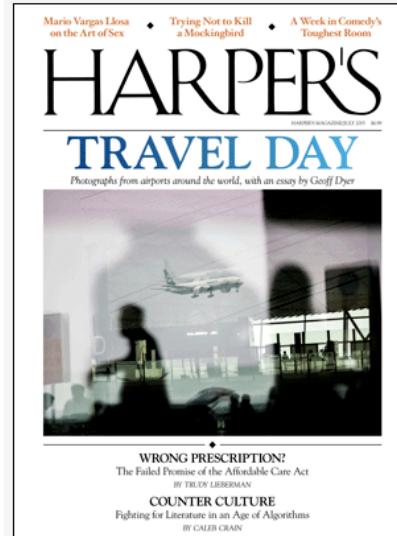
By Esther Kaplan

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Microfiche

Last March, Jim Cramer, the host of CNBC's *Mad Money*, devoted part of his show to a company called Cornerstone OnDemand. Cornerstone, Cramer shouted at the camera, is "a cloud-based-software-as-a-service play" in the "talent-management" field. Companies that use its platform can quickly assess an employee's performance by analyzing his or her online interactions, including emails, instant messages, and Web use. "We've been managing people exactly the same way for the last hundred and fifty years," Cornerstone's CEO, Adam Miller, told Cramer. With the rise of the global workforce, the remote workforce, the smartphone and the tablet, it's time to "manage people differently." Clients include Virgin Media, Barclays, and Starwood Hotels.

### THE CURRENT ISSUE



JULY 2015

## Dressed to Kill\*

By John Crowley

# Surge Pricing

Photo: Evelyn Hockstein/For the Washington Post



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These are systems made up of  
computers and humans working together

# Use technology for human augmentation

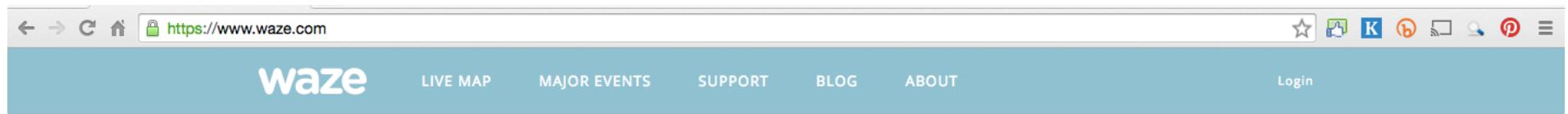
# Use humans for technology augmentation

https://www.waze.com

waze

LIVE MAP MAJOR EVENTS SUPPORT BLOG ABOUT

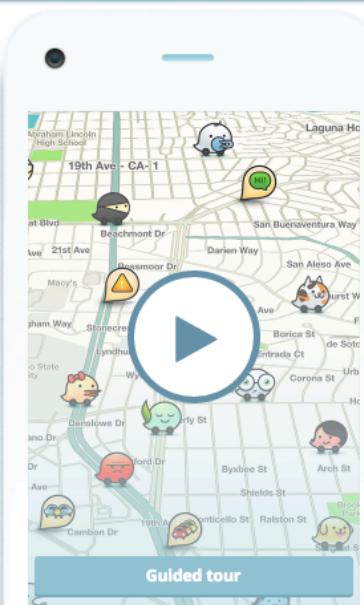
Login



## Get the best route, every day, with real-time help from other drivers.

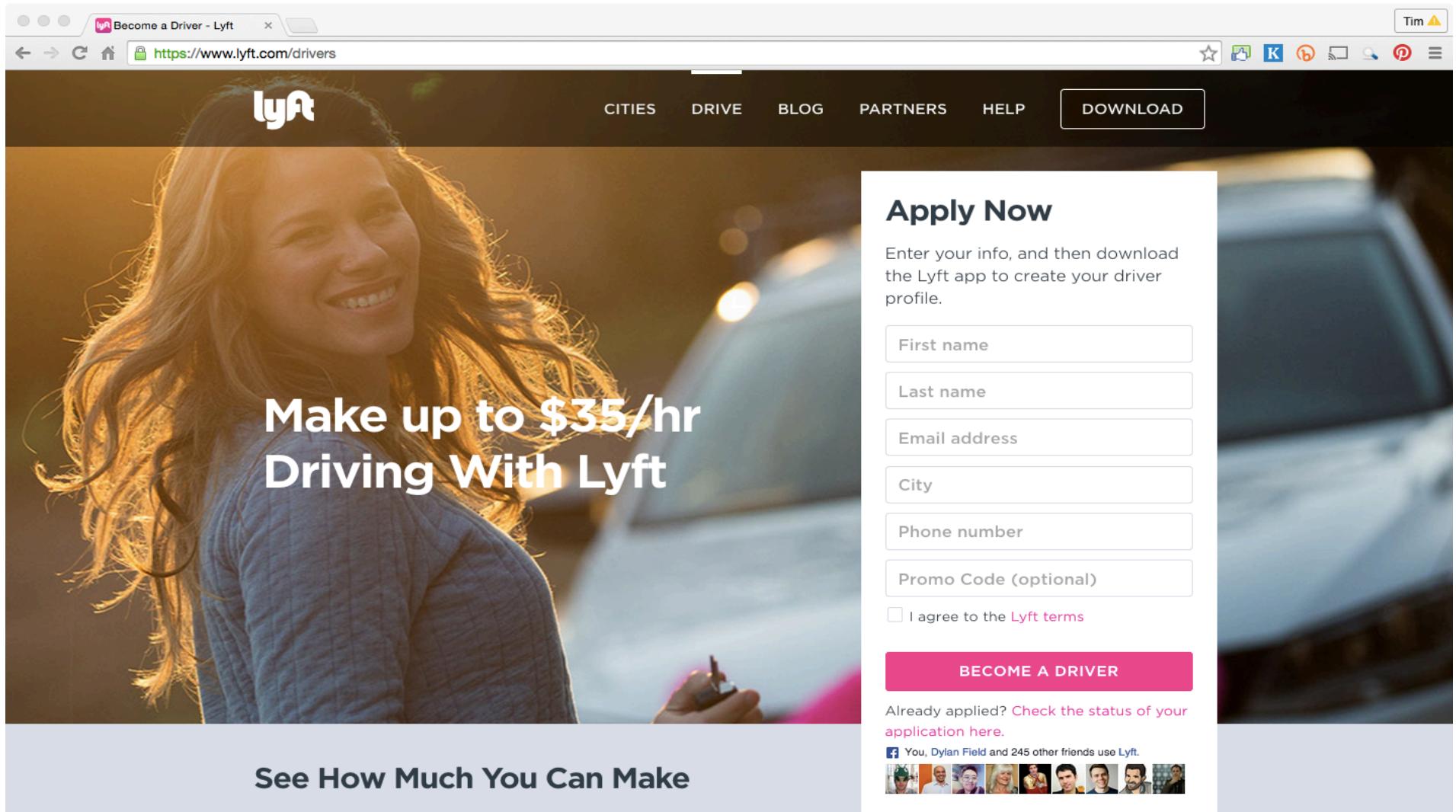
Waze is the world's largest community-based traffic and navigation app. Join other drivers in your area who share real-time traffic and road info, saving everyone time and gas money on their daily commute.

WAZE. OUTSMARTING TRAFFIC, TOGETHER.



Nothing can beat real people working together

Imagine millions of drivers out on the roads, working together towards a common goal: to outsmart traffic and get everyone the best route to work and back, every day.



Become a Driver - Lyft

https://www.lyft.com/drivers

Tim

lyft

CITIES DRIVE BLOG PARTNERS HELP DOWNLOAD

## Make up to \$35/hr Driving With Lyft

### See How Much You Can Make

### Apply Now

Enter your info, and then download the Lyft app to create your driver profile.

First name

Last name

Email address

City

Phone number

Promo Code (optional)

I agree to the [Lyft terms](#)

**BECOME A DRIVER**

Already applied? [Check the status of your application here.](#)

 You, Dylan Field and 245 other friends use [Lyft](#).



Uber

https://www.uber.com

LOG IN

SIGN UP

≡ MENU

U B E R

DRIVE WITH UBER

YOUR CAR. YOUR SCHEDULE. YOUR MOVE.

SIGN UP

Tim

The image shows the Uber homepage. At the top, there's a navigation bar with icons for back, forward, search, and social sharing. The URL 'https://www.uber.com' is in the address bar. Below the bar, the word 'U B E R' is centered in a large, white, sans-serif font. To the left is a '≡ MENU' link, and to the right are 'LOG IN' and 'SIGN UP' buttons. The main background is a photograph of a man with dark hair and a beard, wearing sunglasses and a tan puffer vest over a red and blue plaid shirt. He is standing next to a white car. On the left side of the image, there's a teal button with the white text 'SIGN UP'. The overall layout is clean and modern, with a focus on the central promotional image and the 'SIGN UP' call-to-action.

# The Internet of Things and Humans

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@timoreilly

## Uber/Lyft are a Human-Machine Symbiosis

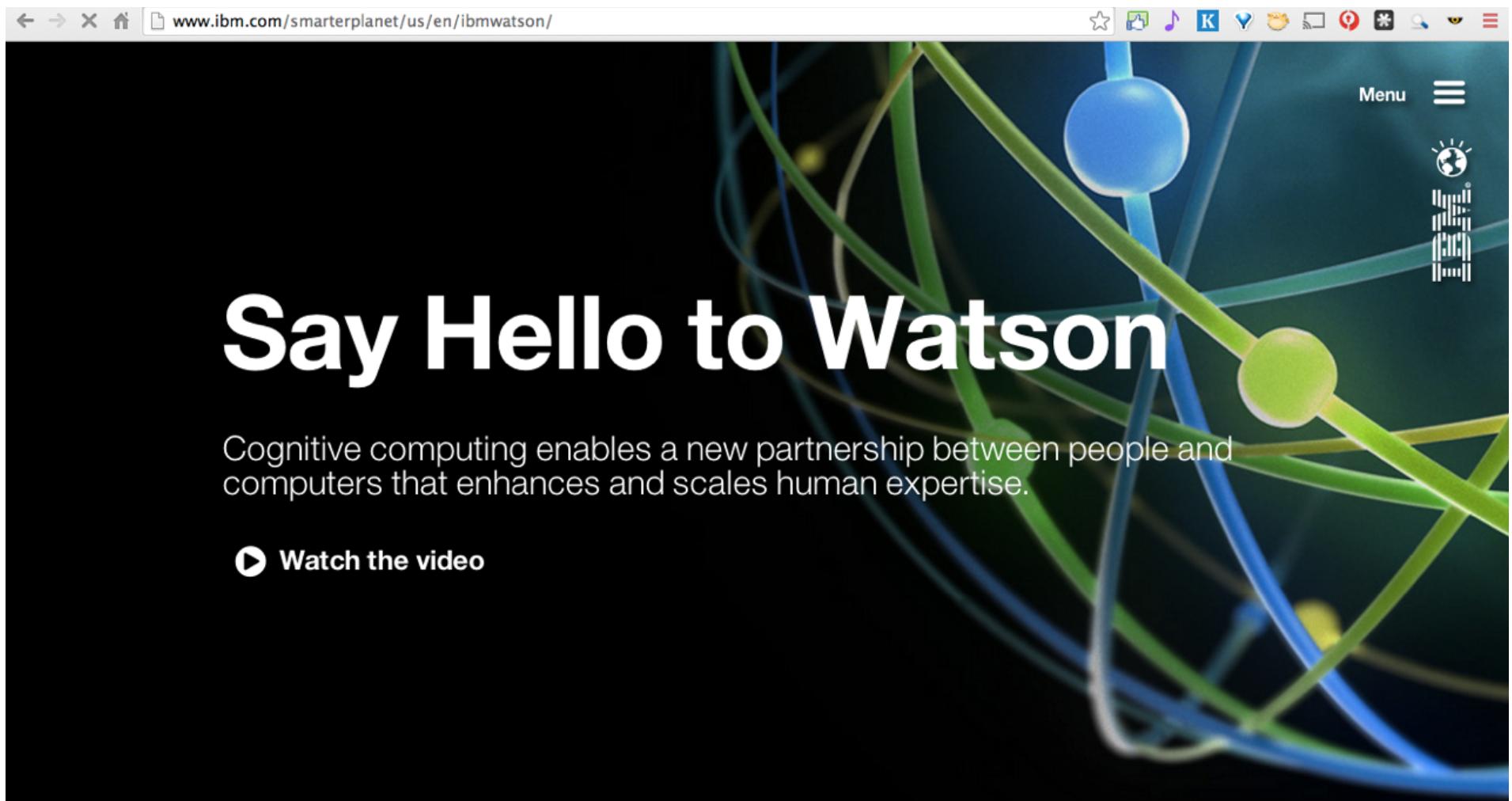
- People + new kinds of smart machines = the ability to rethink an entire industry
- We're no longer just building software, we're building new business processes and workflows in the real world

# Human-Computer Symbiosis

“The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today.”

-[Licklider, J.C.R.](#), "Man-Computer Symbiosis", IRE Transactions on Human Factors in Electronics, vol. HFE-1, 4-11, Mar 1960. [Eprint](#)

www.ibm.com/smarterplanet/us/en/ibmwatson/



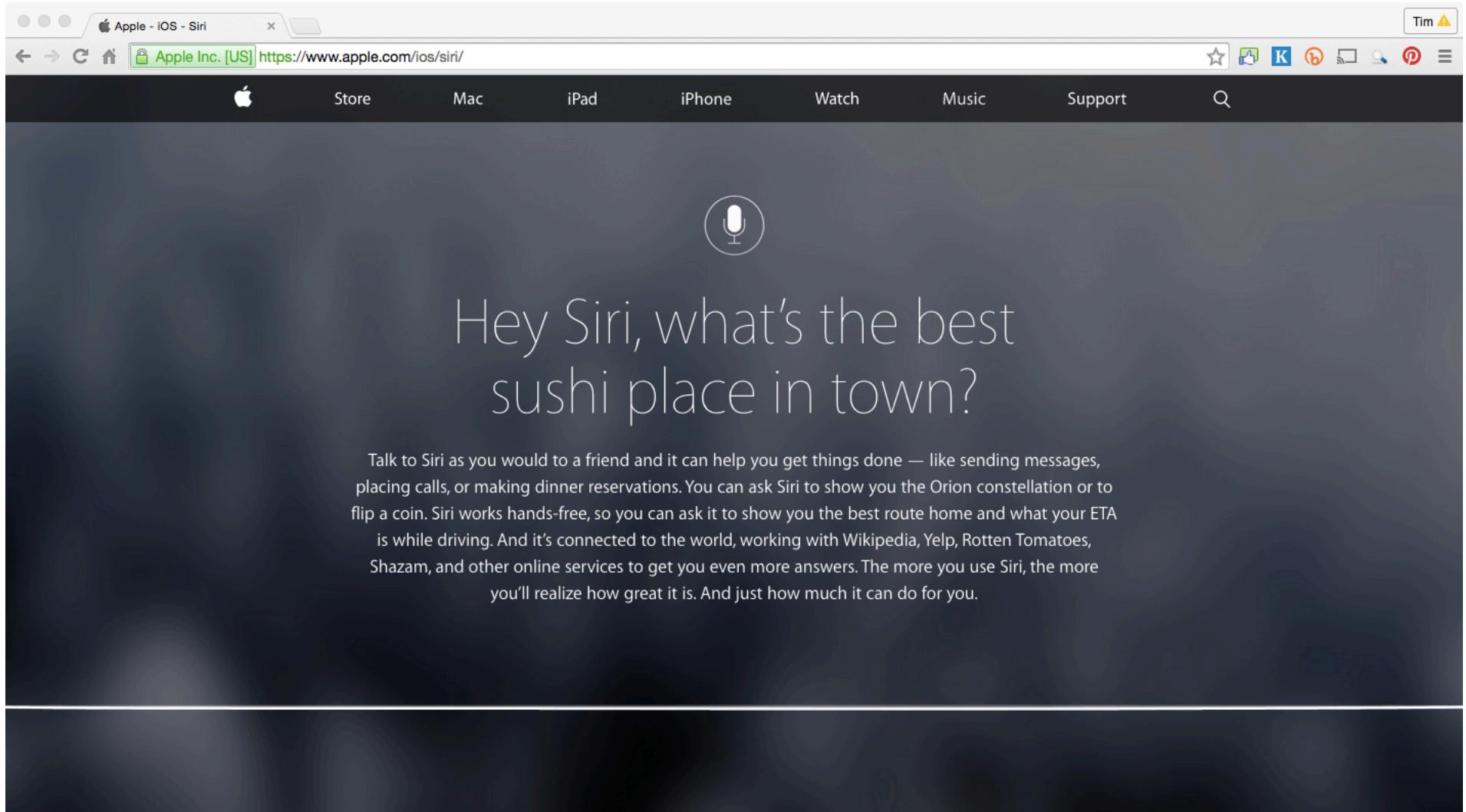
Menu

IBM

# Say Hello to Watson

Cognitive computing enables a new partnership between people and computers that enhances and scales human expertise.

▶ Watch the video



Apple - iOS - Siri

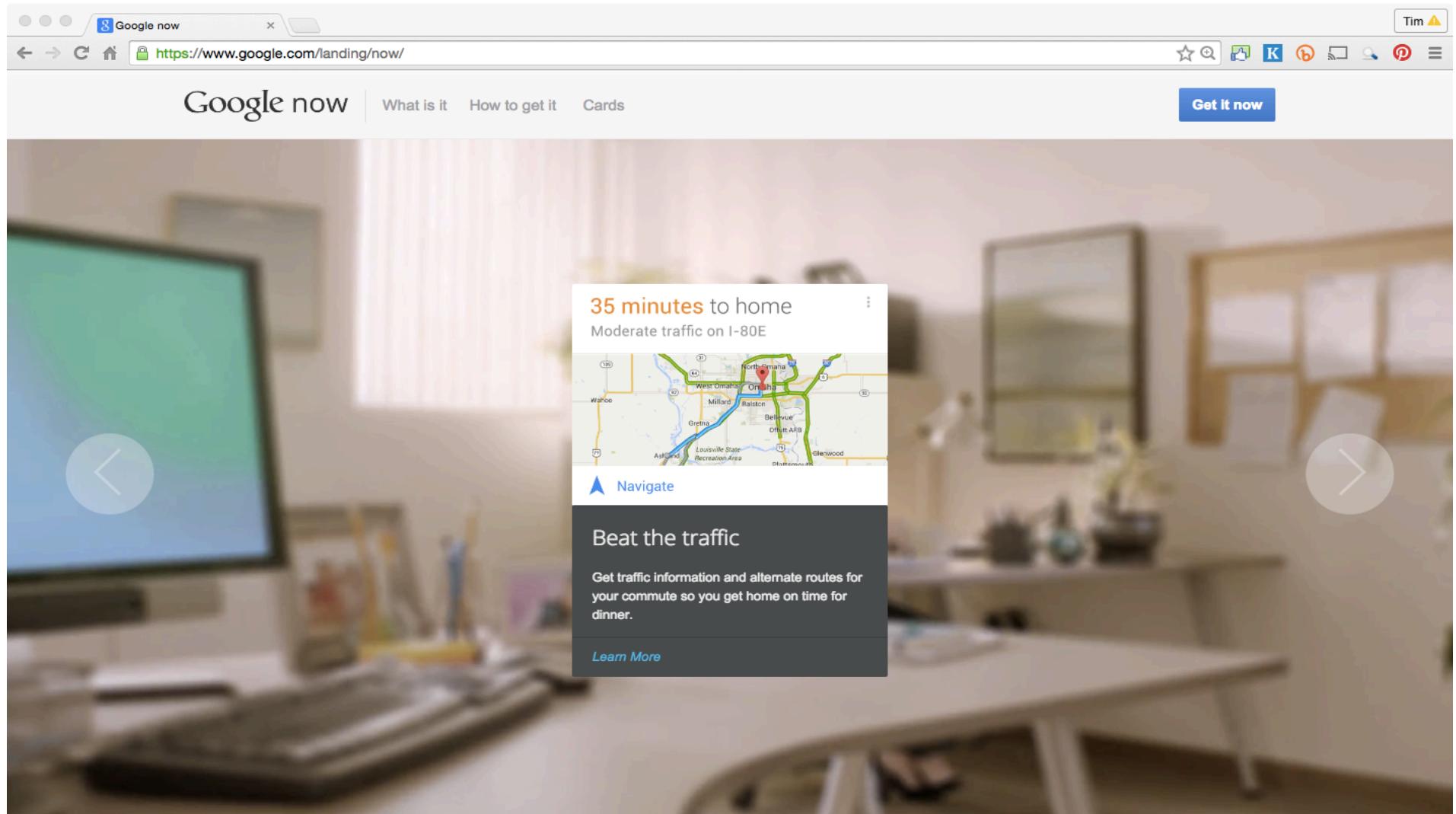
Apple Inc. [US] <https://www.apple.com/ios/siri/>

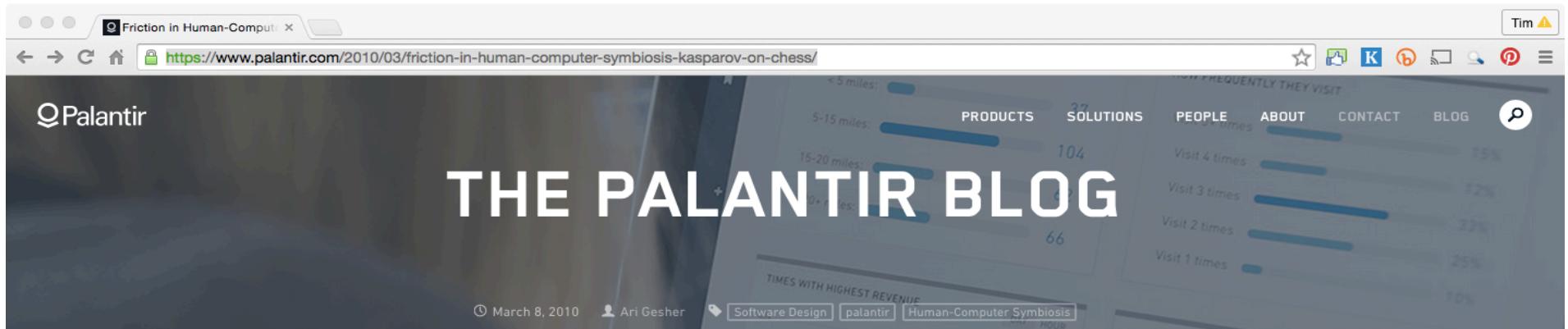
Store Mac iPad iPhone Watch Music Support

Tim

Hey Siri, what's the best sushi place in town?

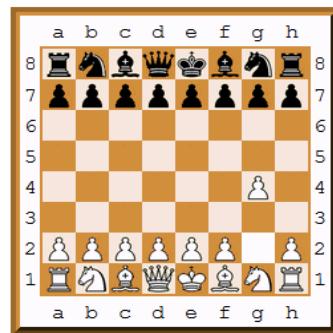
Talk to Siri as you would to a friend and it can help you get things done — like sending messages, placing calls, or making dinner reservations. You can ask Siri to show you the Orion constellation or to flip a coin. Siri works hands-free, so you can ask it to show you the best route home and what your ETA is while driving. And it's connected to the world, working with Wikipedia, Yelp, Rotten Tomatoes, Shazam, and other online services to get you even more answers. The more you use Siri, the more you'll realize how great it is. And just how much it can do for you.





The screenshot shows the Palantir blog homepage. The header features the Palantir logo and the text 'THE PALANTIR BLOG'. Below the header is a dark banner with a chart showing the frequency of visits (1-4 times) and a chessboard image. The main content area has a dark background with white text. The title of the post is 'FRICTION IN HUMAN-COMPUTER SYMBIOSIS: KASPAROV ON CHESS'. Below the title is a chessboard diagram. The post is dated March 8, 2010, and is written by Ari Gesher. It is categorized under 'Software Design', 'palantir', and 'Human-Computer Symbiosis'. The sidebar on the right lists categories: Tech, Analysis, News & Events, Philanthropy, and P/CL. There are also 'SAVE & SHARE' buttons for Facebook and Twitter, and a 'SUBSCRIBE VIA RSS' button.

## FRICTION IN HUMAN-COMPUTER SYMBIOSIS: KASPAROV ON CHESS



As we build our platforms and applications following a [human-computer symbiosis](#) approach, we keep an ear to the ground for interesting examples that illuminate new techniques or validate our approach in some empirical way.

### CATEGORIES

- T Tech
- A Analysis
- N News & Events
- ♡ Philanthropy
- P P/CL

### SAVE & SHARE

- RSS SUBSCRIBE VIA RSS
- Share 0
- Tweet 4

The screenshot shows a web browser window with the following details:

- Address Bar:** https://www.palantir.com/2010/03/friction-in-human-computer-symbiosis-kasparov-on-chess/
- Page Title:** Friction in Human-Comput
- Page Content:**
  - Header:** a( $h, c$ ) =  $hc$
  - Navigation:** PRODUCTS, SOLUTIONS, PEOPLE, ABOUT, CONTACT, BLOG
  - Social sharing:** icons for LinkedIn, Facebook, Twitter, and others
  - Text:**

ONE TERM TO DOMINATE THEM ALL: FRICTION-OF-INTERFACE

Does this simple approximation hold up? It does not. The team that won the PAL/CSS Freestyle Tournament in 2005 was composed of two amateur chess players that were able to best a computer-assisted Grandmaster.

How did they accomplish this feat? It was not through superior compute power. Instead, they did so by more effectively feeding insights to their three chess engines. They played so well that a large number of people actually assumed that it was actually Kasparov himself playing:

Many speculated that it might be Garry Kasparov, who was the initiator of this kind of computer assisted chess matches. When we asked him Kasparov confirmed that was not the case. But he reminded us that it doesn't really matter. The guiding principle of Freestyle Chess: anything is allowed. "Even if they were assisted by the devil, that would probably be covered by the rules," he joked. "Only the moves they played count."

What does this mean for our simple equation? Well, it looks it's missing a term, one we'll call  $f$ , that describes the efficiency or **friction** of the interface between human and computer.

Quoting Kasparov again:

*Weak human + machine + better process was superior to a strong computer alone and, more remarkably, superior to a strong human + machine + inferior process.*

The implication being that the equation actually looks like this:

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*Weak human + machine + better process was superior to a strong computer alone and, more remarkably, superior to a strong human + machine + inferior process.*

The implication being that the equation actually looks like this:

We are redesigning how people and computers work together!

# Measure and Respond



“What I learned from Google is to only invest in things that close the loop.”

- Chris Sacca

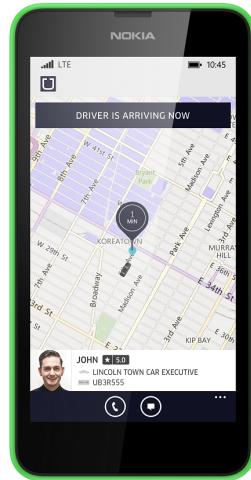
Software “above the level of a  
single device”



“Why be distracted into looking backwards by the commodity cloners of open source?...There is a new frontier, where software "collectives" are being built with ad hoc protocols and with clustered devices. Robotics and automation of all sorts is exposing a demand for sophisticated new ways of thinking....Useful software written above the level of the single device will command high margins for a long time to come.”

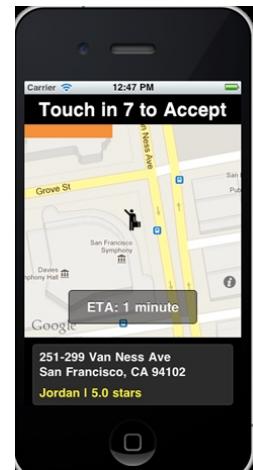
- Dave Stutz, On Leaving Microsoft, February 2003  
<http://www.synthesist.net/writing/onleavingms.html>

# Data Above the Level of a Single Device



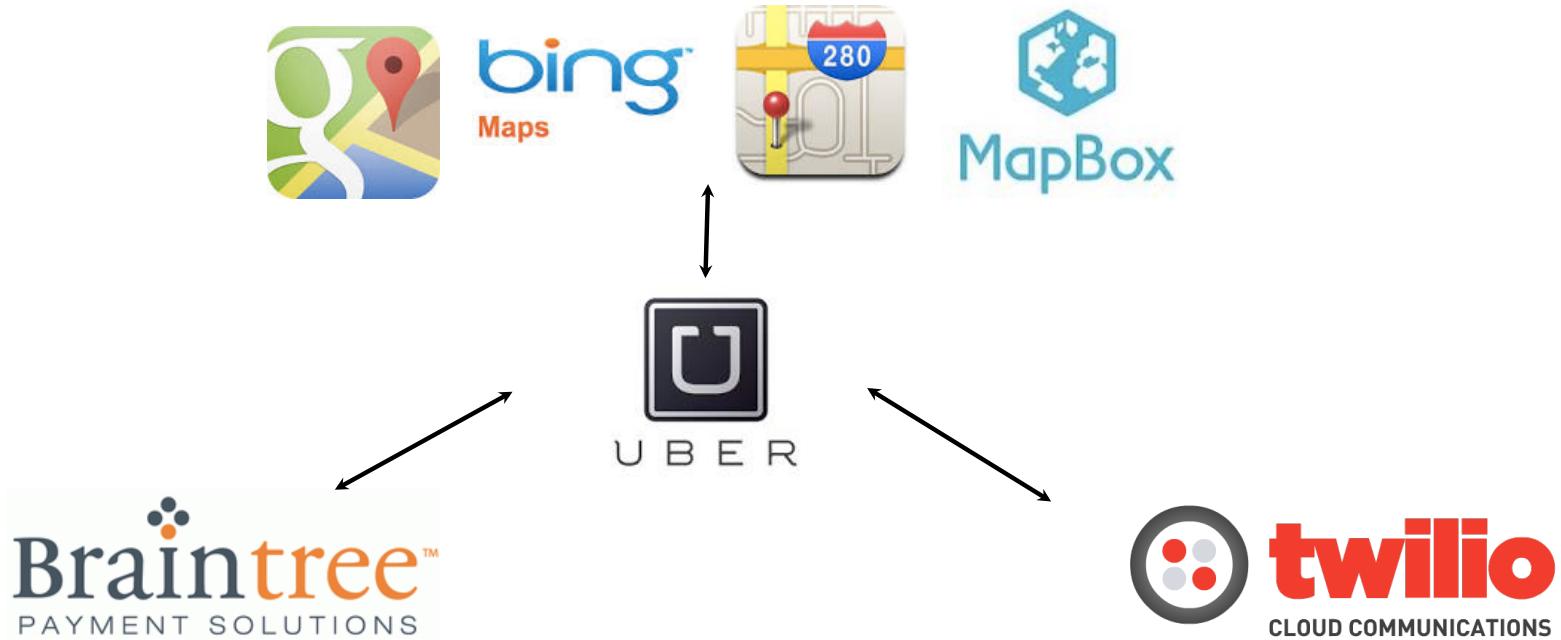
Passenger

- Real-time location tracking
- Dispatch
- Trip tracking
- Names and faces
- Payment
- Dynamic Pricing
- Reputation



Driver

**Many of these data services are not run by Uber**



Microsoft Project Oxford  Tim

www.projectoxford.ai

Microsoft Project Oxford

Services Demo Documentation SDKs Blog Community



Computer Vision APIs enable you to build the most compelling app experience to present the media in its best form

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...



Face APIs  
BETA

See your users with Face Detection and Recognition



Speech APIs  
BETA

Communicate with your users with speech recognition and synthesis powered by Bing



Computer Vision APIs  
BETA

Understand images and generate thumbnails



Language Understanding Intelligent Service (LUIS)  
Invite only

Understand natural language commands tailored to your application

**What kind of data infrastructure  
will that require?**

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# Solving new kinds of problems

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**Work on stuff that matters**

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