A PROJECT TO DEVELOP, PILOT AND EVANGELIZE A MAKER-FRIENDLY, OPEN SOURCE-BASED MODEL FOR BICYCLE SHARING
The Last Mile

Drive 29 min
18.6 mi

Transit 1 h 52 min
2 transfers

Transit 1 h 47 min
1 transfer
Lay of the land

- 3.4 mile ride
- 2.3 mile ride
- 1.9 mile ride
- 1.6 miles
- RA1
- RA3
- MAX
- MAX
- MAX
- RS5
- JF5

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Bike Share Models

"Gen 1"

"Gen 3"

"Gen 4"

• Expensive!
• Vertically integrated

“We can build that”
Employee Engagement

We believe that engaging employees is key to achieving our environmental strategies and goals.

### Intel Employee Engagement Strategy on Sustainability

<table>
<thead>
<tr>
<th>Learn</th>
<th>Action</th>
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<tbody>
<tr>
<td>Visibly integrate our commitment to sustainability into our vision,</td>
<td>Empower employees to take action by funding their environmental project</td>
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<td>strategic objectives, and compensation</td>
<td>proposals through the Sustainability in Action Grant Program</td>
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<td>Educate employees on our sustainability actions through internal</td>
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<td>into employee decision-making</td>
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**Learn**
- Visibly integrate our commitment to sustainability into our vision, strategic objectives, and compensation
- Educate employees on our sustainability actions through internal communications channels and a regular speaker series

**Act**
- Empower employees to take action by funding their environmental project proposals through the Sustainability in Action Grant Program
- Recognize employees for their actions and inspire other employees to do the same through the Intel Environmental Excellence Awards
- Create new tools that facilitate integration of sustainability factors into employee decision-making

**Share**
- Provide support for employee "green" teams that help employees collaborate and connect with each other
- Connect employees through internal social media channels and our Green Intel portal

We use a “Learn, Act, Share” model to help employees understand sustainability issues, priorities, and goals; work together to take action; and share information about our priorities with other employees and external stakeholders.

**Linking Compensation to Environmental Performance**

Since 2008, we have linked a

- Sustainability in Action Grant Program. Through this program, employees can apply for funding for innovative environmental projects. Employees are encouraged to include external stakeholders in their projects, and many focus on addressing environmental issues in their local communities. In 2012, Intel provided funding for nine employee projects—including installing bee boxes to study colony collapse disorder in California; planting a vegetable garden at a children’s home in Singapore; developing a water purification system for use in rural India; identifying energy conservation opportunities within Intel’s labs in Oregon; creating a new “Ridefinder” app to promote ride-sharing in local communities in California; organizing a sustainability speaker series for employees at our U.S. and Costa Rica sites; and piloting composting strategies for food waste in Hudson, Massachusetts. From 2006 through the end of 2012, the Sustainability in Action Grant Program provided funding for 49 projects around the world.

**Intel Environmental Excellence Awards.** Since 2000, Intel has presented these awards to employees who have helped reduce Intel’s environmental impact. In 2012, 57 teams from around the world were nominated for their work to promote recycling and waste reduction, lower the environmental impact of our products and processes, and educate others on sustainability topics. Contributors to the 12 winning projects from 15 Intel sites in five countries.
Phase 2 Project objectives

**Hardware.** Design and prototype a device that incorporates a GPS/cellular module and associated locking mechanism on to standard bicycles. Create a specification that describes how to build this device.

  – Additional materials cost goal: $200 or less

**Software.** Create software that communicates with the modules and enables the management of bikes in a bike share system.

**Pilot.** Implement the system in a pilot project at Intel; document experiences, best known methods (BKMs) for wireless services, load balancing, maintenance, etc.

**Dissemination.** Make the software freely available under open source licenses. Freely publish device specification and BKMs.
“My feeling is that this is a very big deal that could potentially shake up the entire concept of bike sharing.”

-- Jonathan Maus, editor of BikePortland

http://bikeportland.org/2013/06/18/intel-set-to-launch-open-bike-initiative-on-hillsboro-campus-88624
Phase 1

• Low-tech
• Hub-based
• *Goal: demonstrate viability of bike sharing on Intel campuses*

Phase 2

• Tech and use model still under development
• *Goal: define, demonstrate and disseminate a new model for bike sharing*
http://instagram.com/openbikeinitiative
Phase 1

Phase 1 software code and white paper available at openbikeinitiative.org
Aspirational Elements and Attributes:
• GPS
• Cellular Connectivity
• Security Cable/Electric Lock
• Local Keypad/Display
• Relatively Bike Agnostic
• Weathertight/Waterproof
• Vandal-resistant
• Minimal Complex Custom Components
Top-level Block Diagram
Back-end Software

API Backend
Central data store and business logic.

Example:

GET /bikes?near=100.00,40.00&state=available

```
{
  "url": "/bikes/41", "state": "available", "location": [-103.34, 41.22], "timestamp": 1374423023 },
  "url": "/bikes/42", "state": "available", "location": [-102.54, 40.35], "timestamp": 1374423160 },
  "url": "/bikes/43", "state": "available", "location": [-102.12, 42.92], "timestamp": 1374423240 },
  "url": "/bikes/24", "state": "available", "location": [-104.56, 41.68], "timestamp": 1374424967 },
...```

Bike Controller
Offloaded central bike intelligence.

Example:

```
< @STATION: 101
  -> @NODE: 16a123b52a34e63
  @BKE: 51a66d87679c45a
  @GRPC: 060420.000,4530.7227N,12247.6251W,1.0,103.6,3,106.69,0.07,0.03,110320.07
  @BKEAT: available
  -> @BKEFAV: reserved
  -> @BKECODE: 634182
  @BKE: reserved
...```
Bike Status

This bike has already been reserved.
Bike Reservation

This bike is available to be reserved.

[Buttons: Cancel, Reserve Now]
HF MAX Rack Status

Capacity: 20
Available: 12
Data!

http://bikes.oobrien.com/london/

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Next steps

1. Finalize technology and implement Phase 2 (before 9/30)
2. Document and publish (by 12/31):
   a. Mechanical design and electronics
   b. Firmware, backend and UI software (open source)
   c. BKMs for wireless services, operations, etc.
   → “Playbook” for implementation

Then:
   – Declare victory and walk away?
   – Drive further evolution of project?
Transform a (small) vertical, proprietary market to a (larger) horizontal, open, standards-based market

1. Better for society (more bike sharing)
2. Better market for buyers
3. Better market for (most) sellers

(Multiple vendors in each market segment)
Option: Standards Body

Open Bike Initiative

- 501(c)(6) non-profit
- Analogous to USB-IF, WiFi Alliance, Open Data Center Alliance, Open Compute Foundation, Linux Foundation...

Host device reference designs
Define standard interface between devices & backend
Manage open source backend and UI code base
Document and share best practices
Promote adoption of ‘open’ bike share model
Test & certify compliant devices

Or: some of the above, via multi-party collaboration agreement
Option: 'Arduino' Model

WIRED MAGAZINE: 16.11

TECH BIZ : START-UPS

Build It. Share It. Profit. Can Open Source Hardware Work?

By Clive Thompson  10.20.08

specialized market. What's really remarkable, though, is Arduino's business model: The team has created a company based on giving everything away. On its Web site, it posts all its trade secrets for anyone to take—all the schematics, design files, and software for the Arduino board. Download them and you can manufacture an Arduino yourself; there are no patents. You can send the plans off to a Chinese factory, mass-produce the circuit boards, and sell them yourself — pocketing the profit without paying Banzi a penny in royalties. He won't sue you. Actually, he's sort of hoping you'll do it.

Open Bike Initiative

Benefit Company Bill Signed Into Law

Published on June 18, 2013 in Corporation, Press Releases. Secretary Brown and Uncategorized. 0 Comments

Tags: 2013, employment, secretary of state kate brown

House Bill 2296 allows companies to incorporate social causes into their by-laws
Option: Pass the Ball

Open Bike Initiative → OTREC → BTA → Community Cycling Center
Portland, OR (of all places) should not be U.S. city number 43 doing traditional Generation 3 bike share. Portland should be U.S. city number one implementing innovative, radically open Generation 4 bike share.

(disclaimer: like all of this talk, just Brad & Kevin’s opinion)
Credits

Intel Corp:
Hardware
  Kevin Bross
  Cailan Collet
  Mustafa Haswarey
  Carter Anderson
  Brian Jensen
Firmware
  Chris Crase
  Jeff Murry
Software
  Joel Morrissette
  Greg Perry
  Matt Groener
Project management & operations
  Brad Biddle
  Leonard Cano
  Courtney Martin
  Giedre Novikaite
  Robinson Eaton
  Meera Gajjar
Key supporters
  Anne Marie McSwiggan
  Ann Armstrong
  Michael Jacobson

Bicycle Transportation Alliance
  Rob Sadowsky
  Stephanie Noll

Community Cycling Center
  Jonnie Ling
  James Keating

Nike
  Caitlin Williams

Portland State University/OTREC
  Hau Hagedorn
  John MacArthur
  Bianca Viggiano

Westside Transportation Alliance
  [Heather McCarey]
  Mike Armstrong
  Jenny Cadigan

Others
  John Benner
  Mordechai Sadowsky
  Bill MacCracken

Plus:  thanks to Urban Racks, Eagle Precision, CCM
and Advanced Sports (Breezer)
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