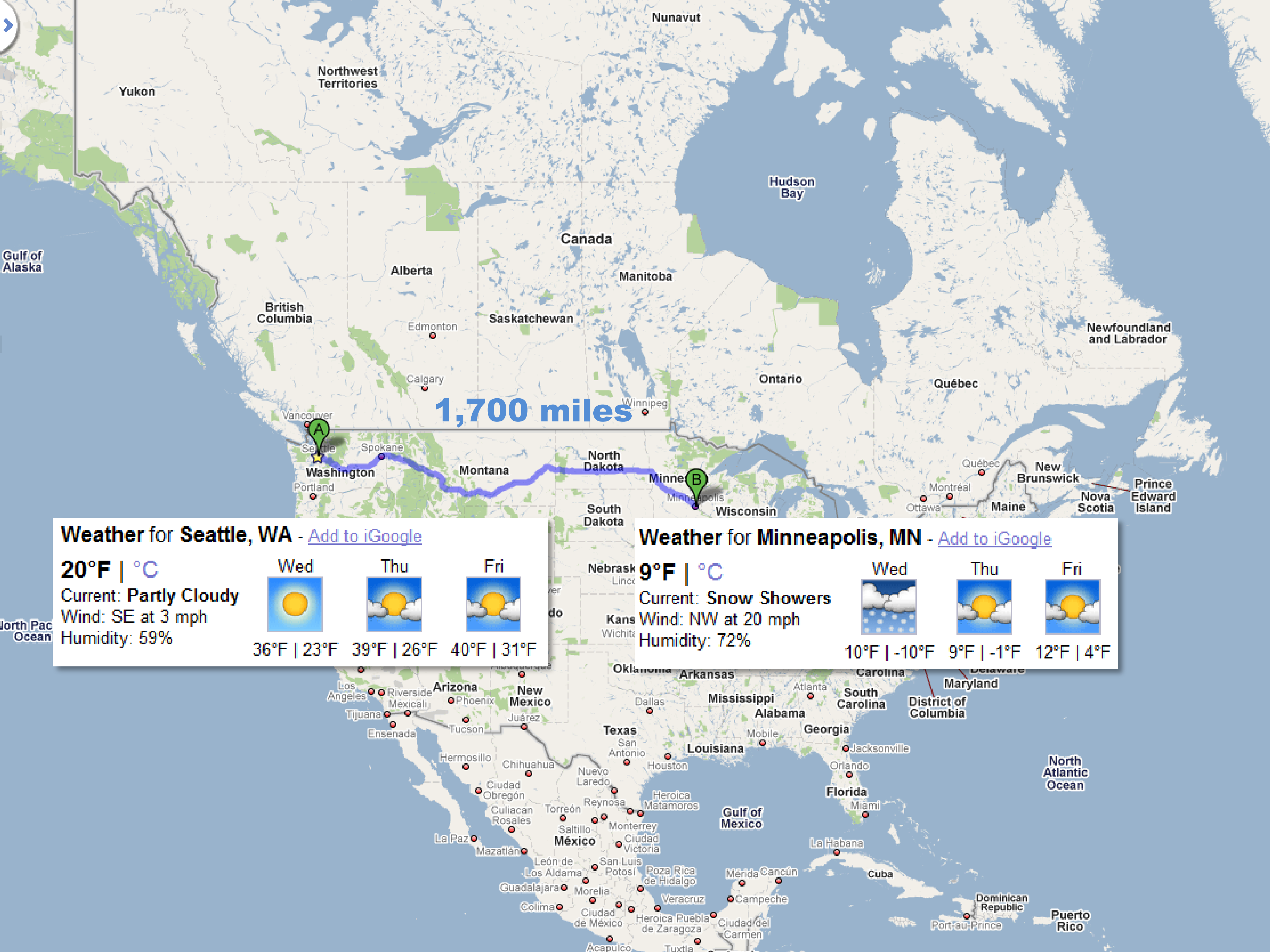
Technology as a Mirror

@jonfroehlich


1,700 miles
Weather for Seattle, WA - Add to iGoogle
20°F | °C
Current: Partly Cloudy
Wind: SE at 3 mph
Humidity: 59%
Wed
Thu
Fri
36°F | 23°F
39°F | 26°F
40°F | 31°F
Weather for Minneapolis, MN - Add to iGoogle
9°F | °C
Current: Snow Showers
Wind: NW at 20 mph
Humidity: 72%
Wed
Thu
Fri
10°F | -10°F
9°F | -1°F
12°F | 4°F
Nunavut
Northwest Territories
Yukon
Hudson Bay
Canada
Alberta
Manitoba
British Columbia
Saskatchewan
Newfoundland and Labrador
Ontario
Québec
Gulf of Alaska
Edmonton
Calgary
Vancouver
Winnipeg
Seattle
Spokane
Washington
Montana
North Dakota
Portland
South Dakota
Wisconsin
New Brunswick
Prince Edward Island
Nova Scotia
Maine
Montréal
Ottawa
Arizona
New Mexico
Texas
Louisiana
Mississippi
Alabama
Georgia
South Carolina
Maryland
District of Columbia
Florida
Gulf of Mexico
North Atlantic Ocean
Cuba
México
Dominican Republic
Puerto Rico

new reflections of self through

technology

nike+ipod

nike+ipod tracks your runs and provides low-level and high-level feedback about performance

SEARCH
SHOP
NIKEiD
TRAINING
EVENTS
NEWS
SUPPORT
VIDEO

NIKE+
Home
Runs
Goals
Challenges
Coach
Map It
Forums

andicolortoo
6

ALL RUNS WEEKLY MONTHLY YEARLY

138 WORKOUTS 71:40:08 DURATION 897.79 KM 4:47 /KM 69141 CAL

JUL 4, 2009-AUG 20, 2009

PAGE 5 OF 5

My Goals & Challenges

1 Medals 1 Trophies

My Farthest Run

My Fastest Runs

You run **4** times a week on

You run most on **Friday**. Add more

Profile
Library
Charts
Events
Friends
Neighbours
Groups
Journal
Tags

AndIColorToo

Male, United States
www.cs.washington.edu/home...
Edit »

39787 plays since 18 Jan 2006
14 Loved Tracks | 0 Posts | 1 Playlist | 3 shouts

Recently Listened Tracks

Settings | |

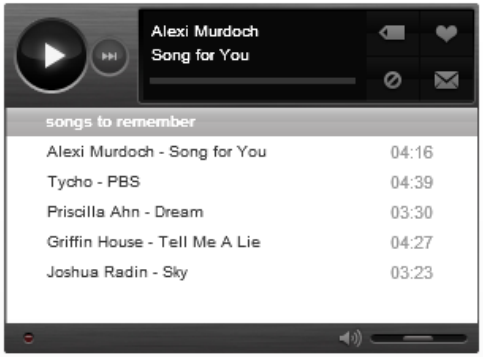
	Me First and the Gimme Gimmes – Superstar (carpenter's cover)	29 Nov 9:40am
	Black Eyed Peas – I Gotta Feeling full track	27 Nov 1:42pm
	Black Eyed Peas – I Gotta Feeling full track	27 Nov 1:42pm
	William Ackerman – Seattle full track *	27 Nov 1:32pm
	Catherine Feeny – Unsteady Ground full track	27 Nov 1:28pm
	George Winston – Sea full track	27 Nov 1:24pm
	Chicago Public Radio – #233: Starting from Scratch	27 Nov 8:07am
	The Moth – Andy Christie: It's Not The Fall That Gets You	26 Nov 2:52pm
	NPR – NPR: 11-23-2009 Fresh Air	26 Nov 2:40pm
	Greg Laswell – Not Out	26 Nov 9:31am

* NEW! Some tracks in this list have been auto-corrected. If you'd like to leave the original spelling intact, you can disable spelling correction in your settings.

See more/edit

AndIColorToo's Library

Settings



Recent Activity

- You added Joshua Radin – Sky to the playlist songs to remember. October 2009
- You added Joshua Radin – Sky to your library. October 2009
- You added Michelle Featherstone – Coffee And Cigarettes (Album Version) to your library. October 2009
- You added Michelle Featherstone – Coffee And Cigarettes (Album Version) to the playlist songs to remember. October 2009
- You added Kendall Payne – Daddy to your library. October 2009


VOX

difficulty estimating levels of personal activity

underestimate food

overestimate levels of activity

pedometer cell phone fitness study

Figure 1. a) The Omron HJ-112 pedometer, b) the pedometer in use, and c) the Nokia 6600 mobile phone running Houston.

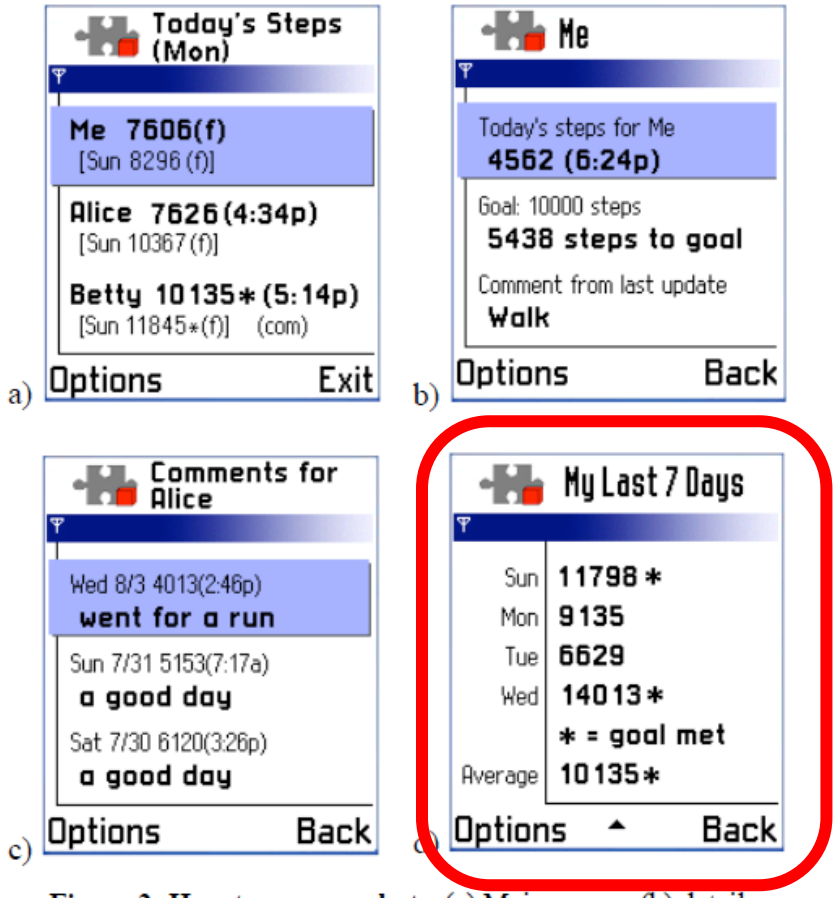


Figure 2: Houston screen shots. (a) Main screen, (b) detail screen, (c) recent comments, and (d) trending information.

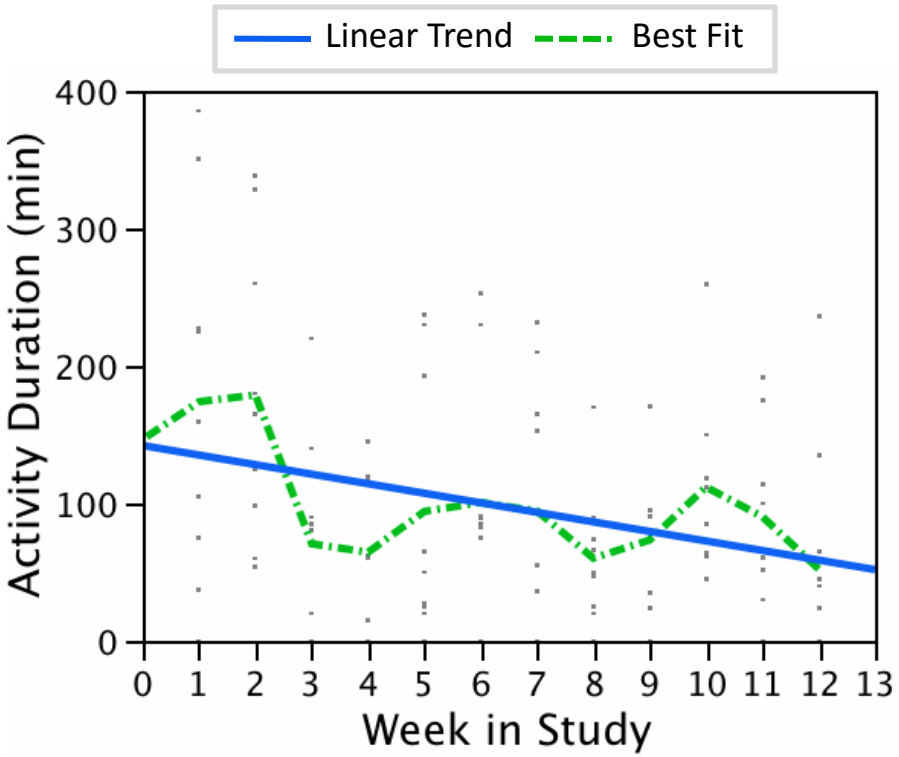
Consolvo, S., et al. Design Requirements for Technologies that Encourage Physical Activity. CHI 2006

ubifit

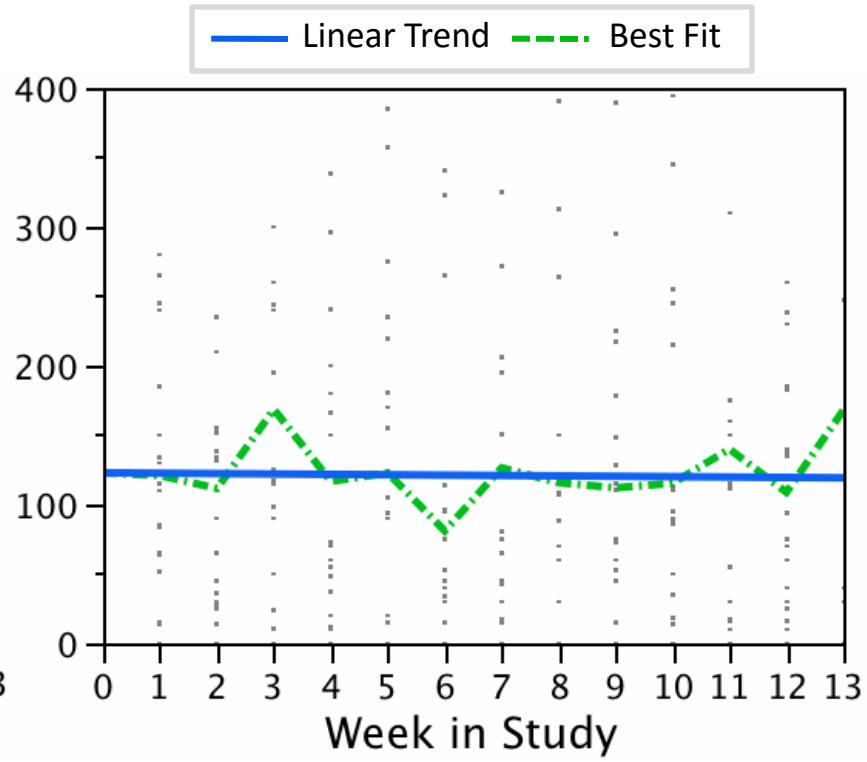
- fitness monitoring application
- automatically senses activity
- at-a-glance goal information

Consolvo, S., et al. "Flowers or a Robot Army? Encouraging Awareness & Activity with Personal, Mobile Displays" *UbiComp 2008,* COEX, Seoul, South Korea, September 21-24, 2008.

effectiveness of the ubifit glanceable display



no glanceable display



glanceable display

Study occurred over Thanksgiving, Christmas, and New Years.

sensing feedback

ubigreen

transportation display

exploring the use of mobile phones as a **persuasive eco-feedback technology** to **sense** and **feedback** information about **personal transportation**

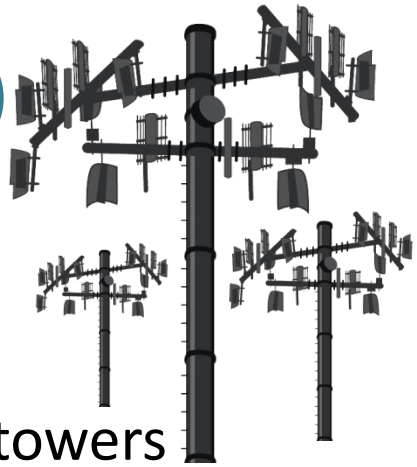
Froehlich et al., CHI2009

sensing transit

1

msp

2



cell towers

3

user

Drive Alone | Walk | Bike | Train | Carpool | Bus

minimum activity duration: 7 minutes

raw sensor data to transit activity

mean, median, range, etc.

measure of confidence for particular activities

collect raw sensor readings → calculate features → produce margins

generated at varying rates

generated at ¼ second intervals

Send margins to phone via bluetooth

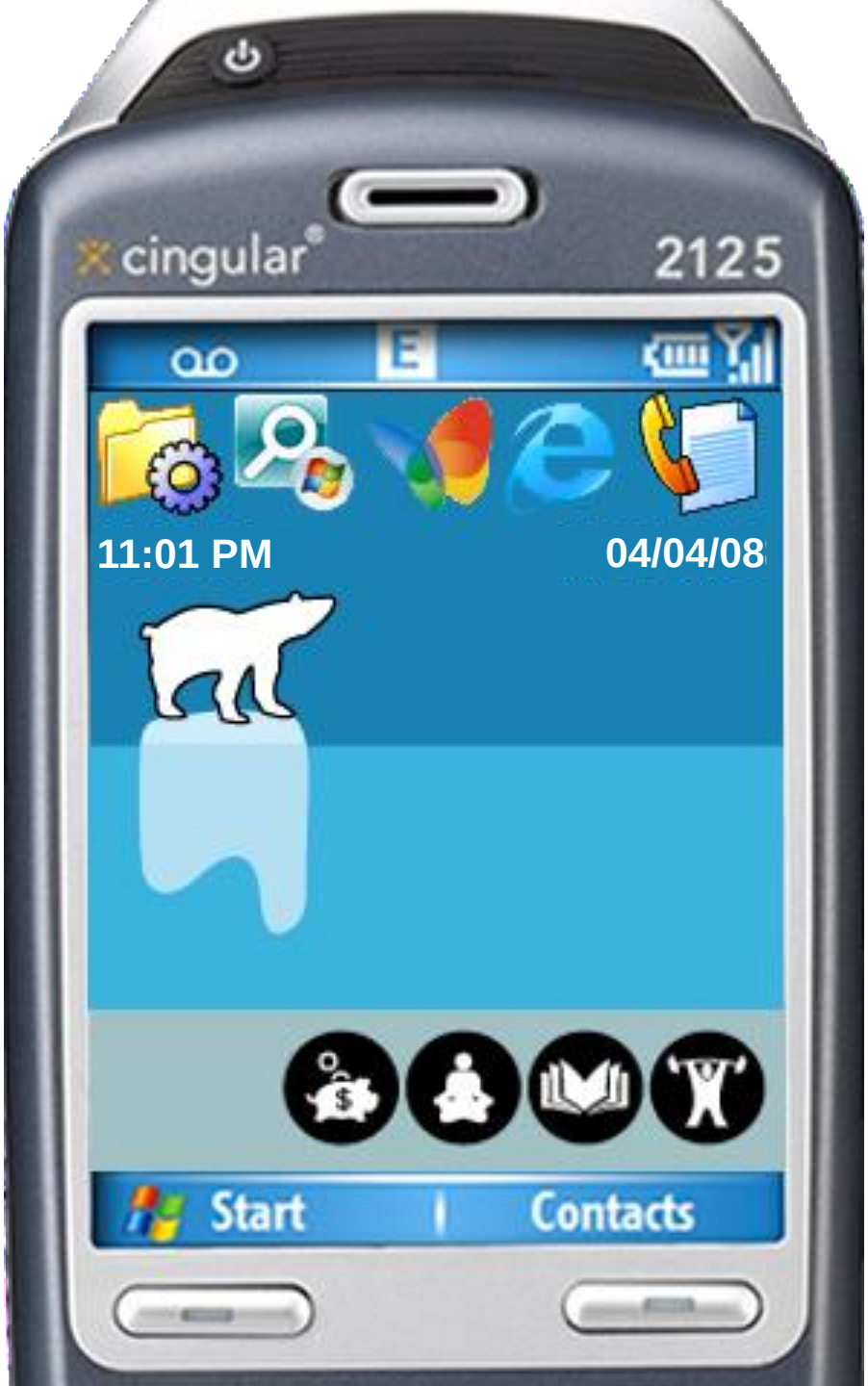
smooth margins into meaningful actions

smoothing is defined by the application, not the MSP

Saponas, T., Lester, J., Froehlich, J, Fogarty, J., Landay, J. 2008. iLearn on the iPhone: Real-Time Human Activity Classification on Commodity Mobile Phones. *University of Washington CSE Tech Report UW-CSE-08-04-02*.


current
activity
value
icon bar
phone
background
(wallpaper)
evolving
image
cingular
2125
7:27 PM
03/31/08
T-Mobile
Start
Message

everything resets on sunday


cingular
2125
11:01 PM
04/04/08
Start
Contacts

mpg?

gpm?

kwh?

why
the
dis-
connect?


RPM
x1000
MPH
P R N D M
AVERAGE ECONOMY
16.3 MPG
46°F
0MPH
N


RPM
Hybrid
MPH
P R N D M
AVERAGE ECONOMY
16.3 MPG
46°F
0MPH
N

render the invisible

feedback not only draws attention but also provides a learning function

-Van Houwlingen &Van Raaij, 1989

the power-aware cord

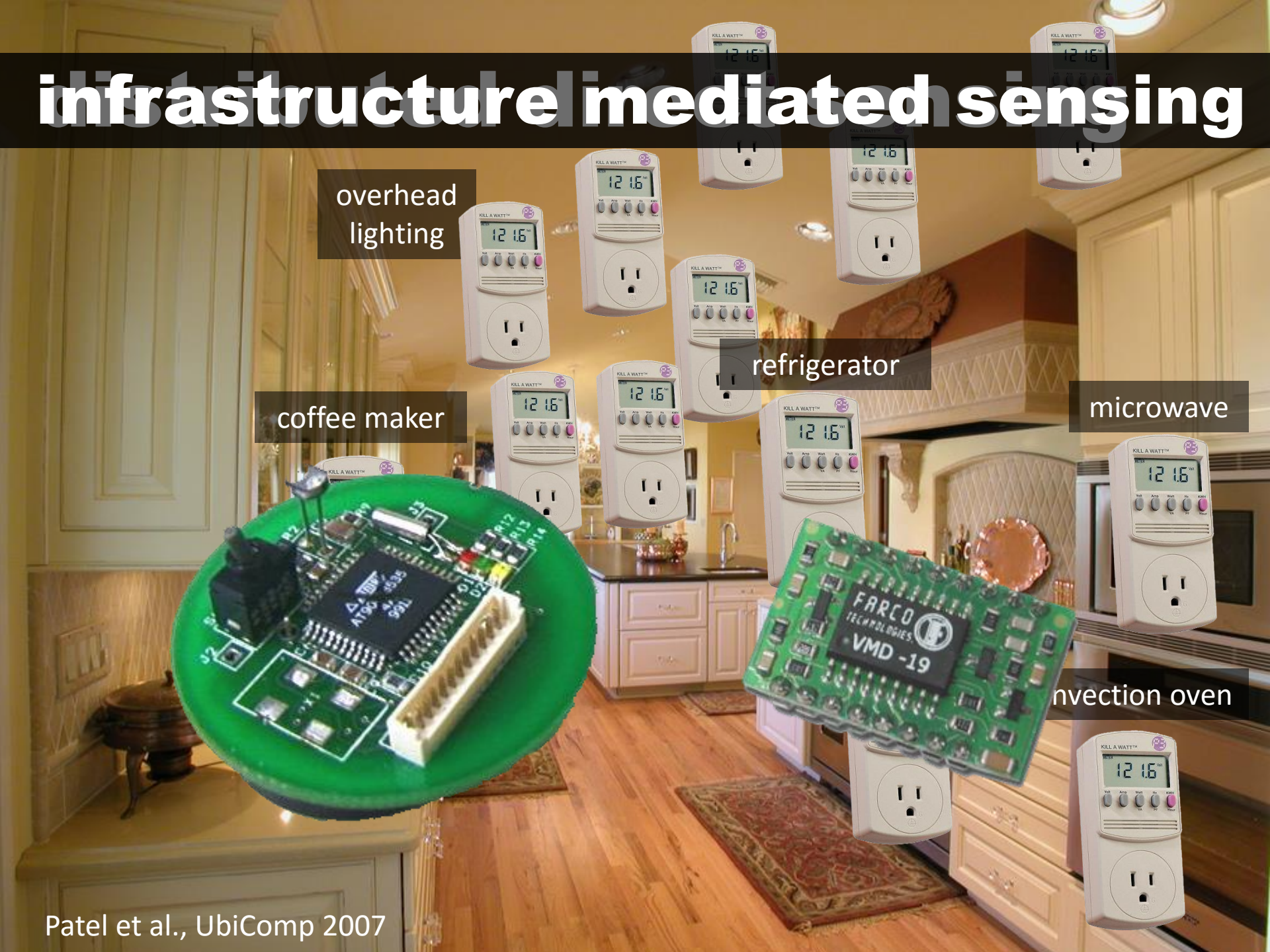
- Gustafsson & Gyllenswärd, CHI 2005

how much energy does your dryer use?

appliance + sensor = appliance-level data!

distributed direct sensing

infrastructure mediated sensing



Patel et al., UbiComp 2007

electrisense: appliance level sensing with two sensors

powerline event detection sensor

automatically detects and classifies electrical events on the home powerline

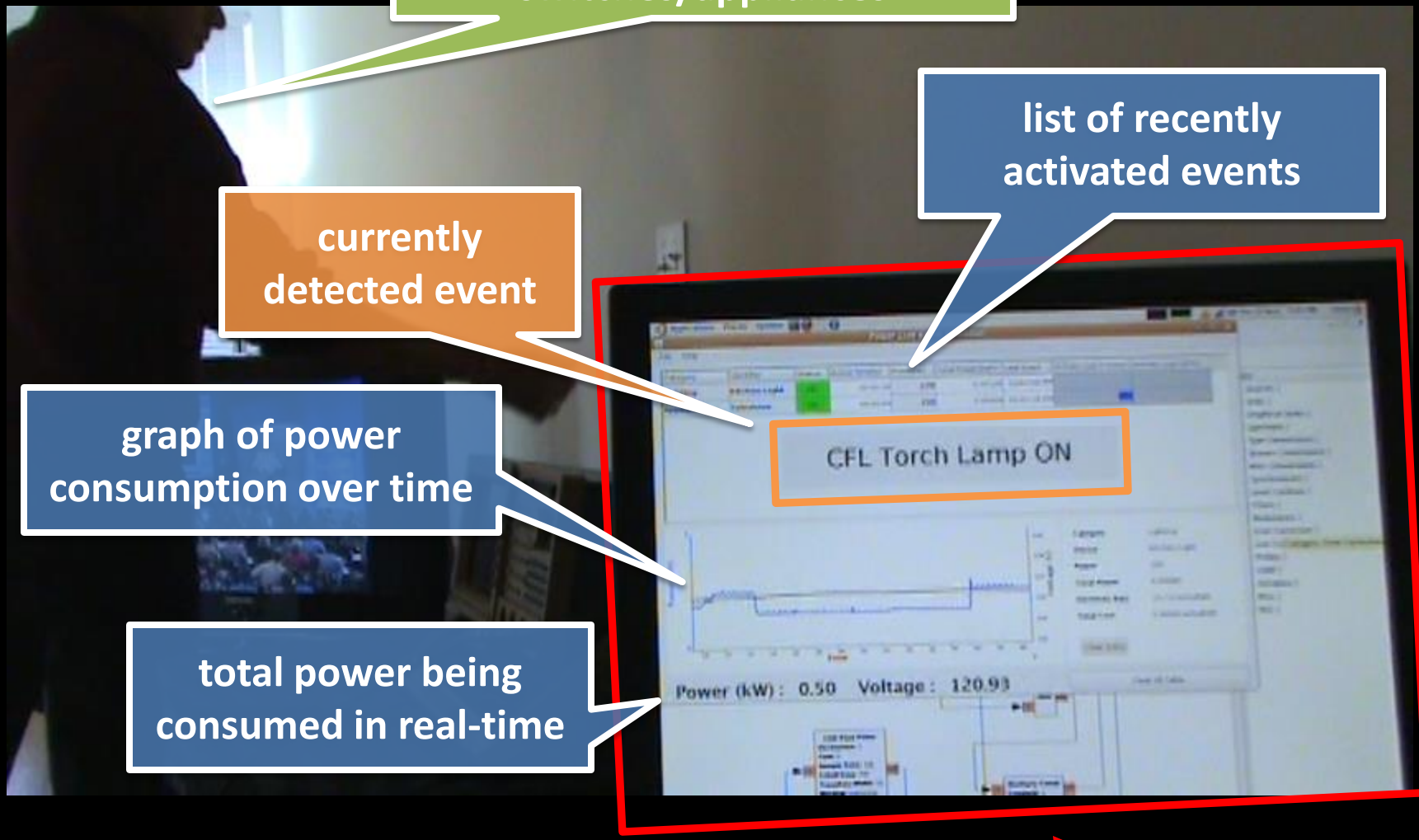
Patel et al., UbiComp 2007

contactless power consumption sensor

whole-home power consumption sensing from outside breaker panel

Patel et al., *To Appear*

demo



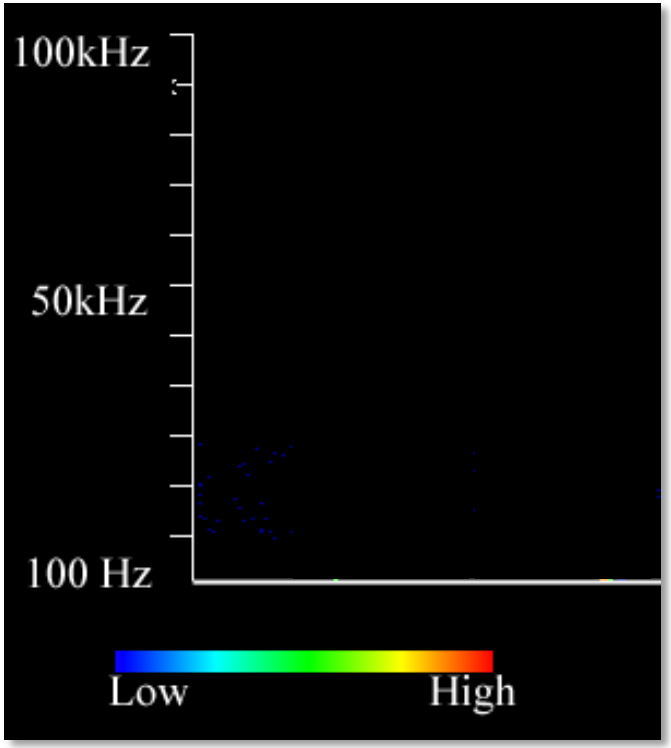
not for end users

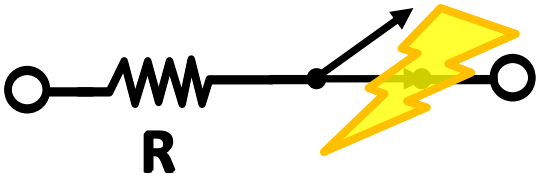
movie removed for public posting of slide deck

your noise is our signal

how ped works

mechanical switches

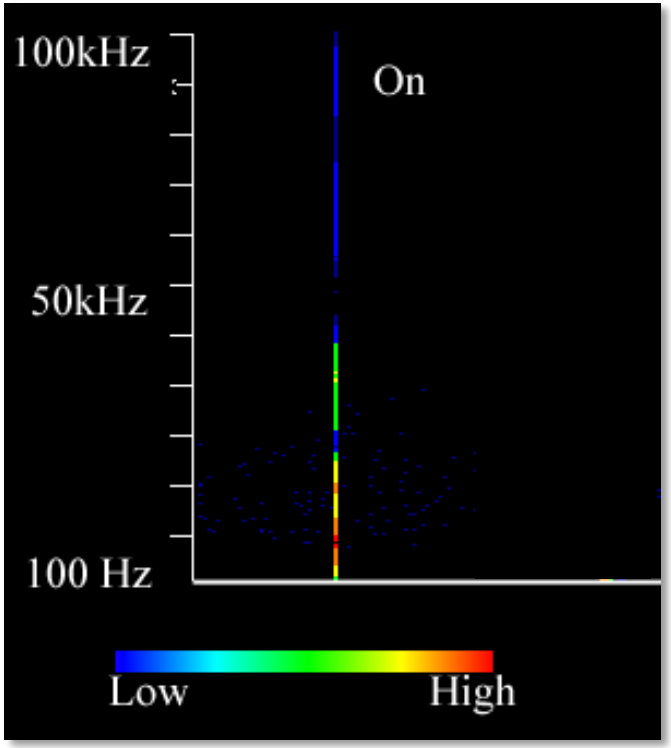


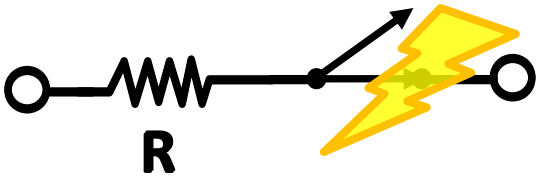


electrical noise transient

how ped works

mechanical switches



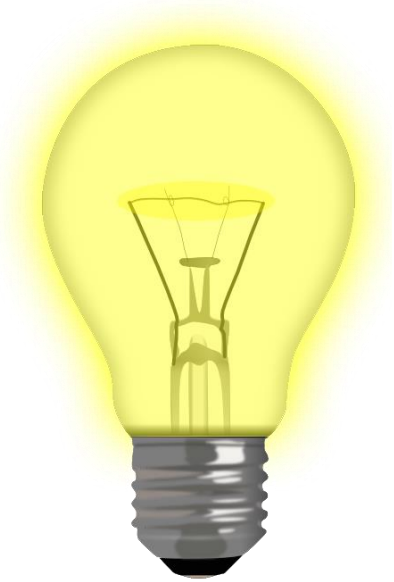


electrical noise transient

movie removed for public posting of slide deck

how ped works

three classes of noise



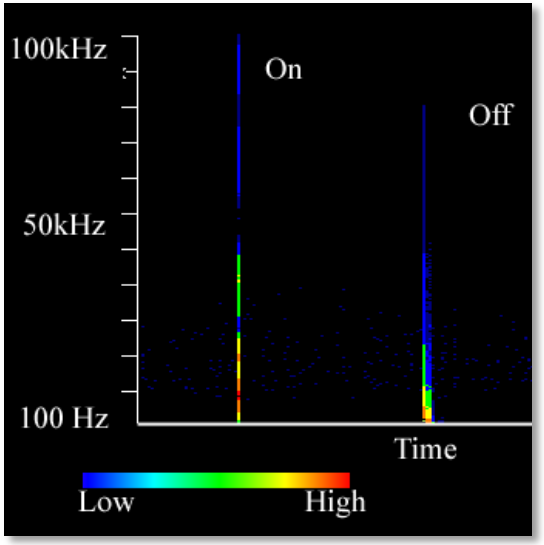
resistive

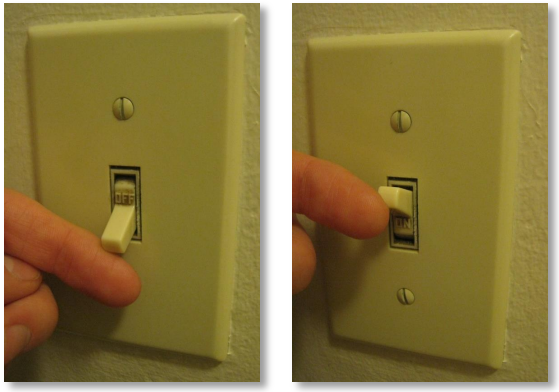
generates continuous noise

inductive loads
(e.g., from motors)

loads with solid state switching
(e.g., tvs, cfls, computers)

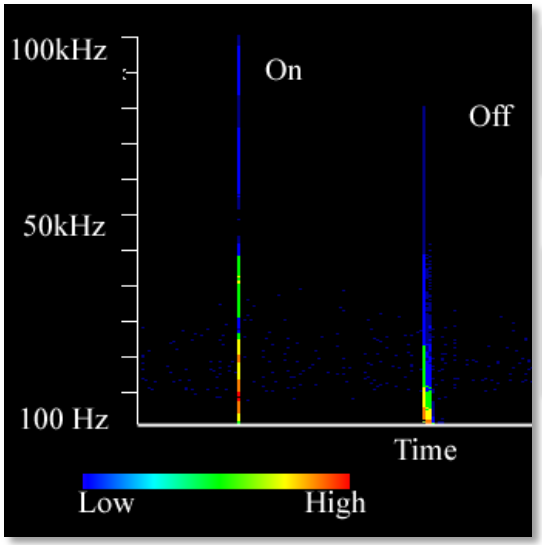
transients





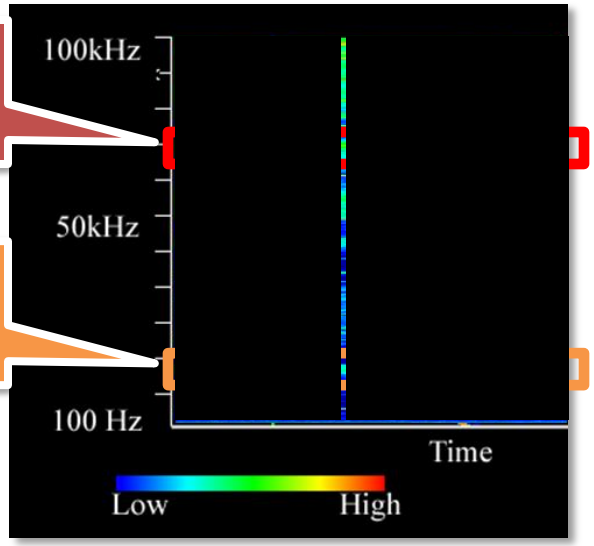
transients

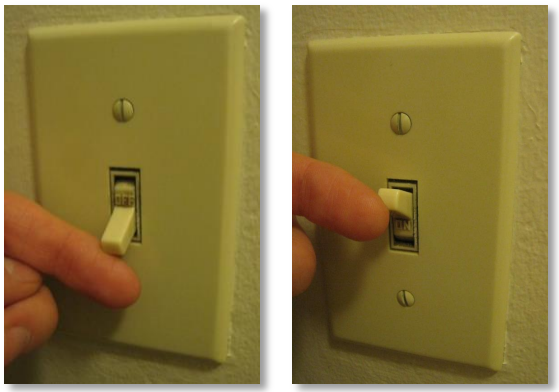
continuous noise

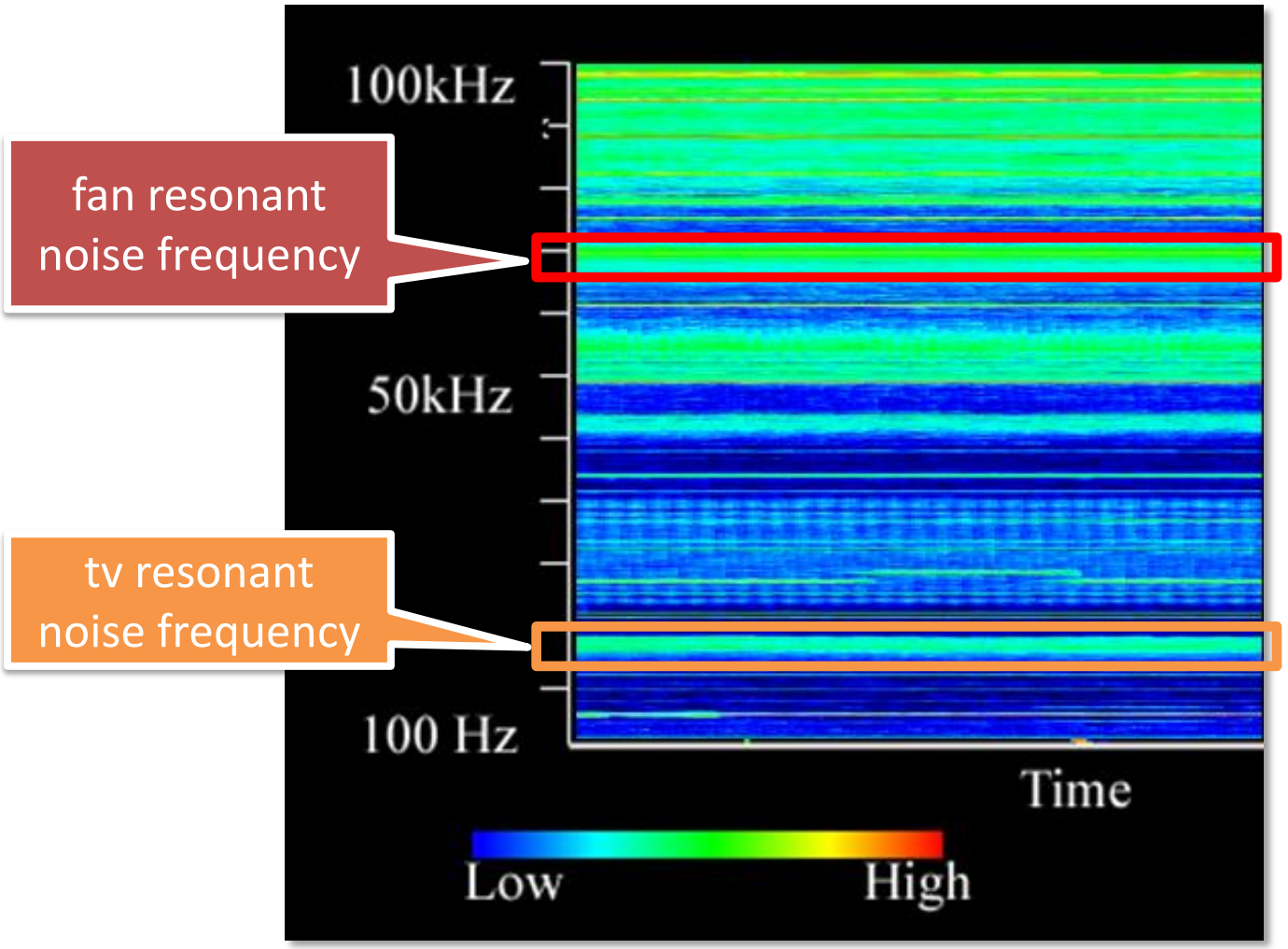


fan resonant noise frequency

tv resonant noise frequency






fan resonant noise frequency
tv resonant noise frequency
100kHz
50kHz
100 Hz
Time
Low
High

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how much water do you use when you shower?

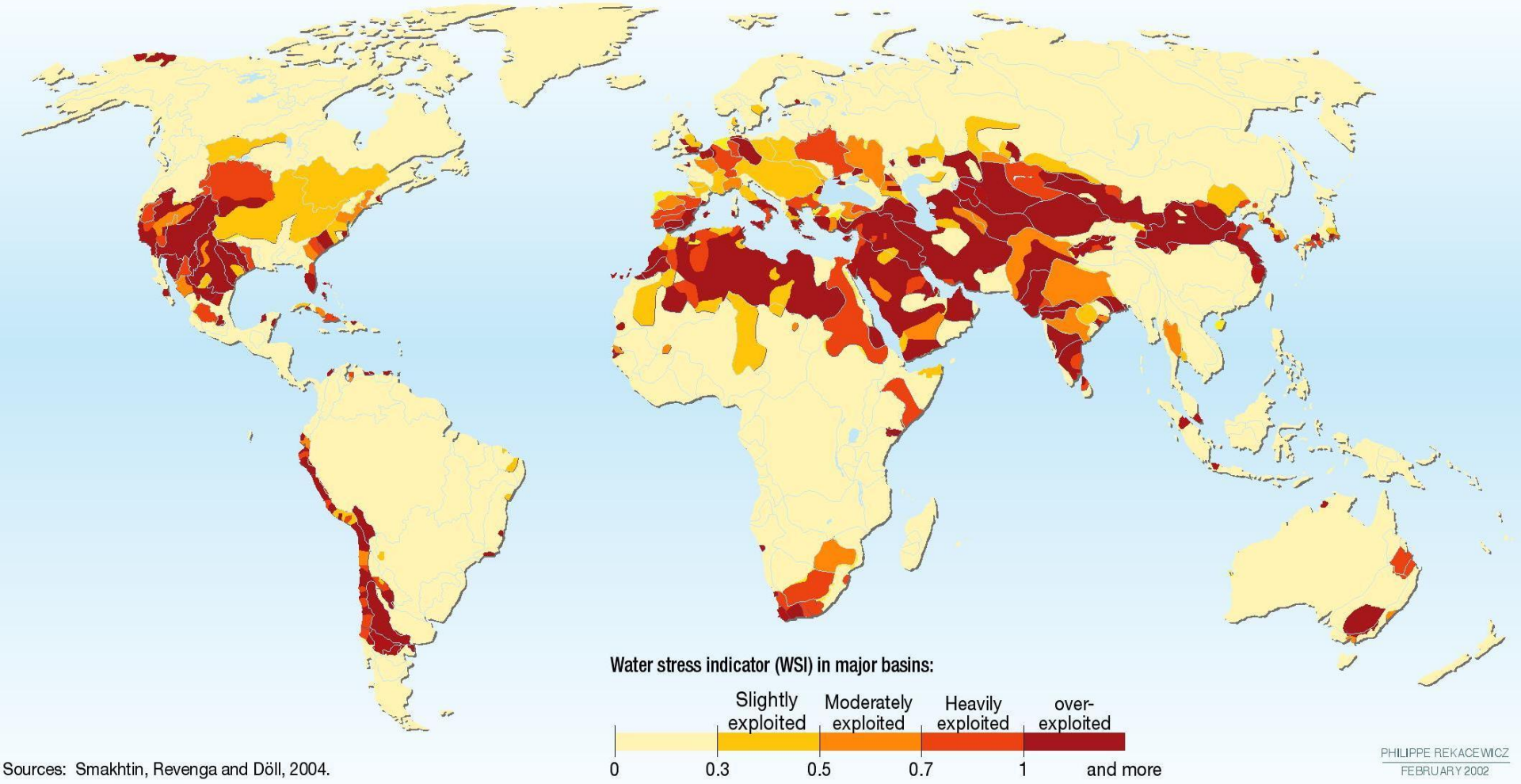
HYDROSENSE

Infrastructure-Mediated Single-Point Sensing of Whole-Home Water Activity

Jon Froehlich[1], Eric Larson[2], Tim Campbell[3], Conor Haggerty[4], James Fogarty[1], Shwetak N. Patel[1,2]

[1]Computer Science & Engineering, [2]Electrical Engineering,
[3]Mechanical Engineering, [4]Community, Environment, and Planning

water scarcity



Sources: Smakhtin, Revenga and Döll, 2004.

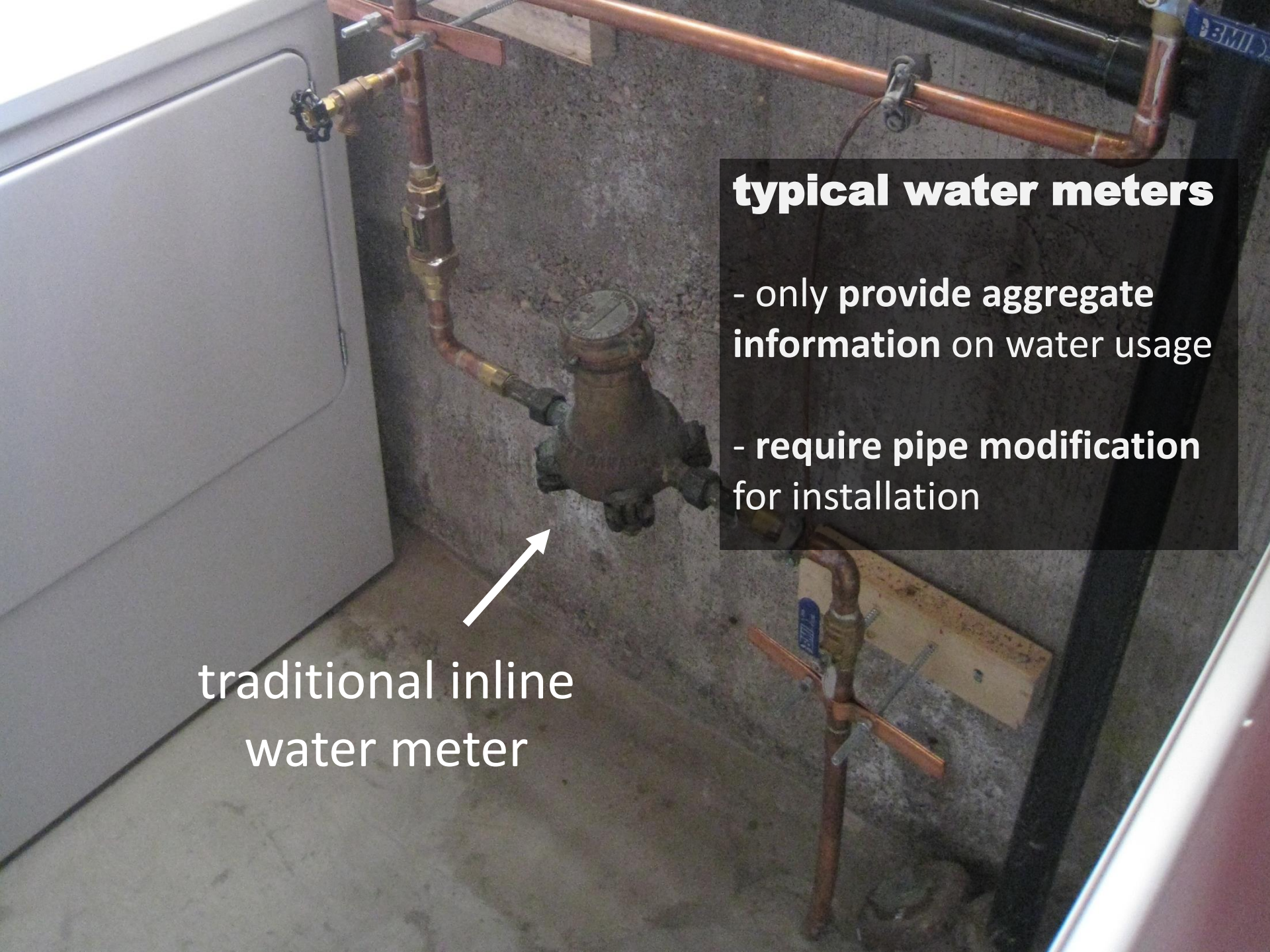
PHILIPPE REKACEWICZ
FEBRUARY 2002


barcelona, spain


lake mead, nevada

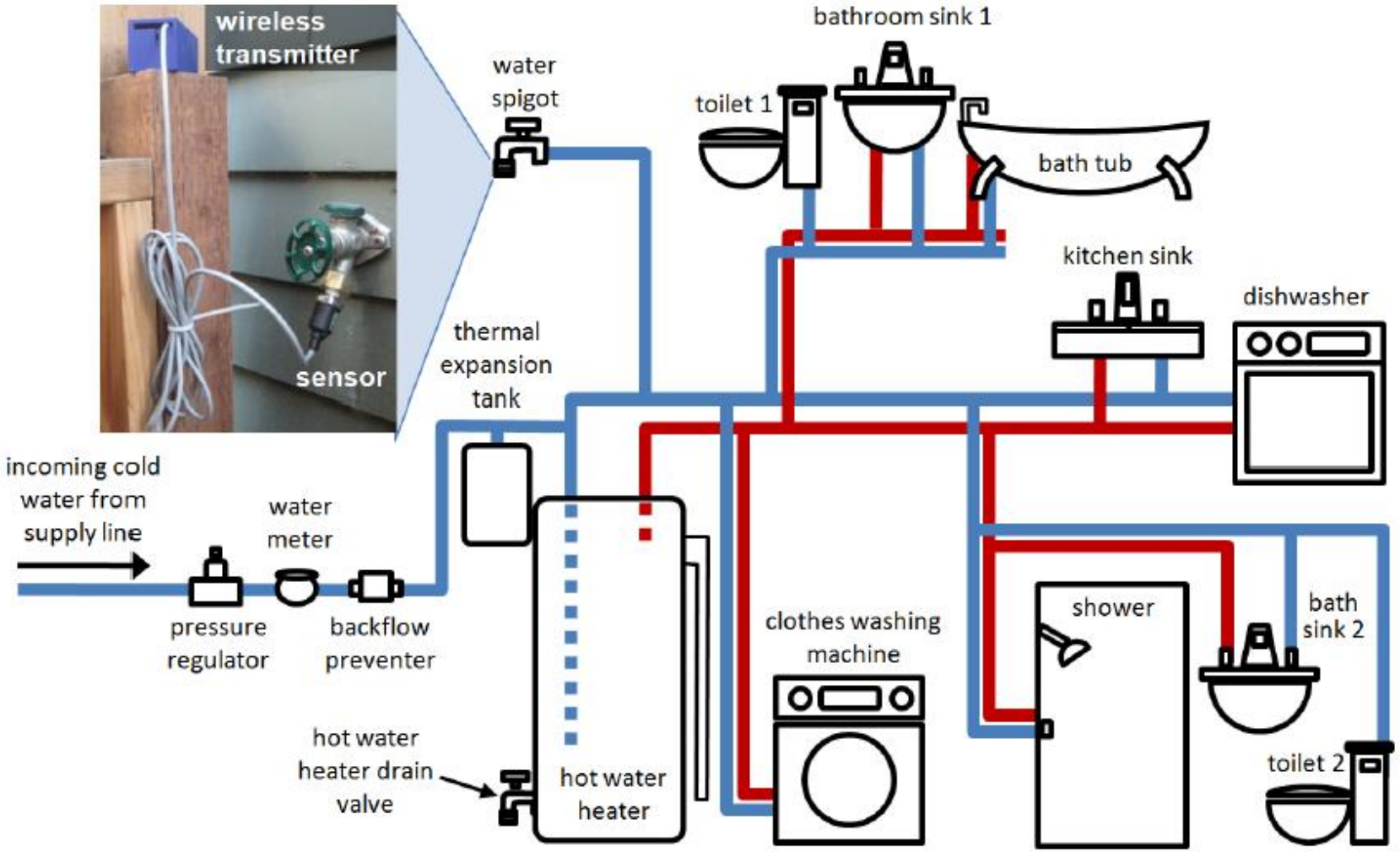
hydrosense

- **single-point** pressure-based sensor of water usage
- **identifies water usage** activity **down to its source**(e.g., toilet)
- provides **estimates of flow** at **each fixture**


typical water meters
- only **provide aggregate information** on water usage
- **require pipe modification** for installation
traditional inline water meter

hydrosense: pressure-based sensor

closed pressure system



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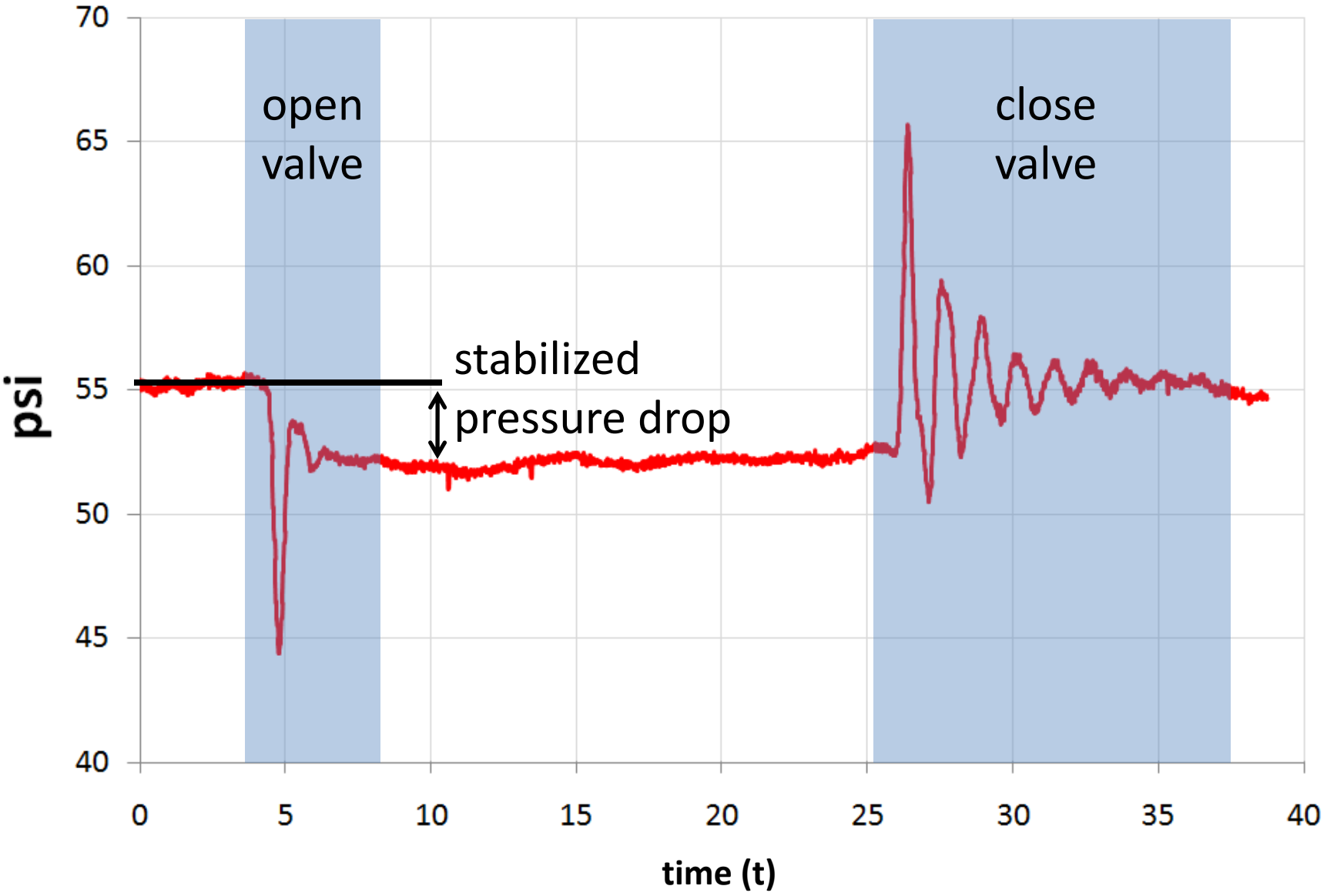
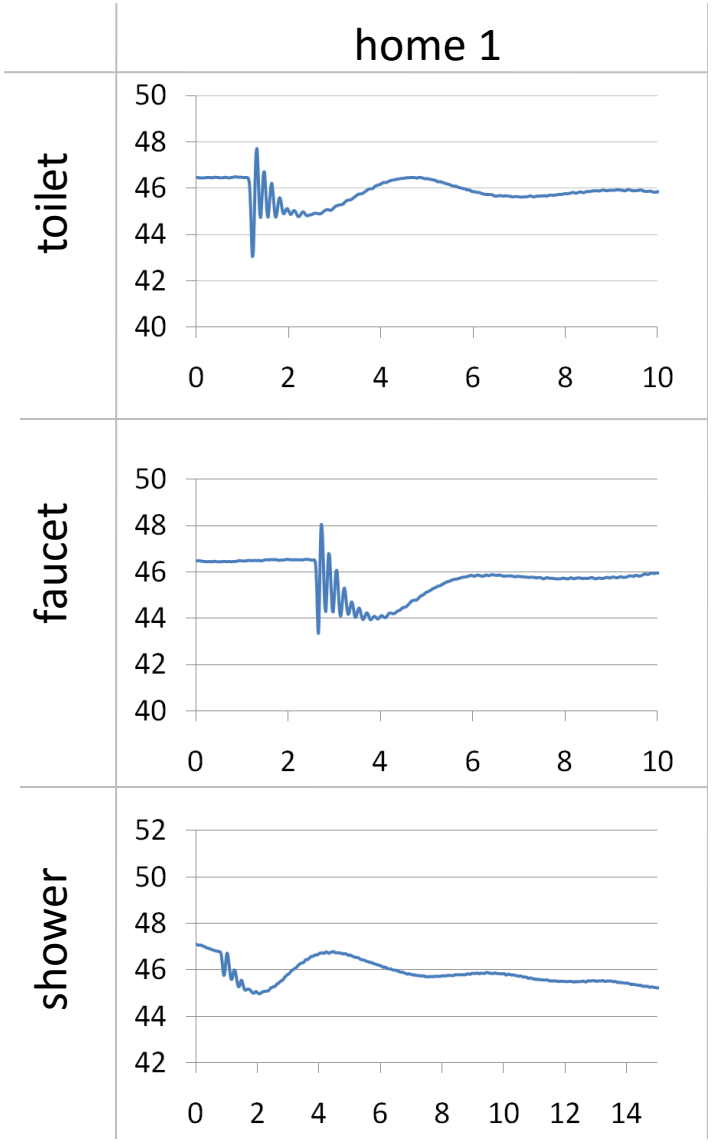
raw bathroom sink signal



example open events



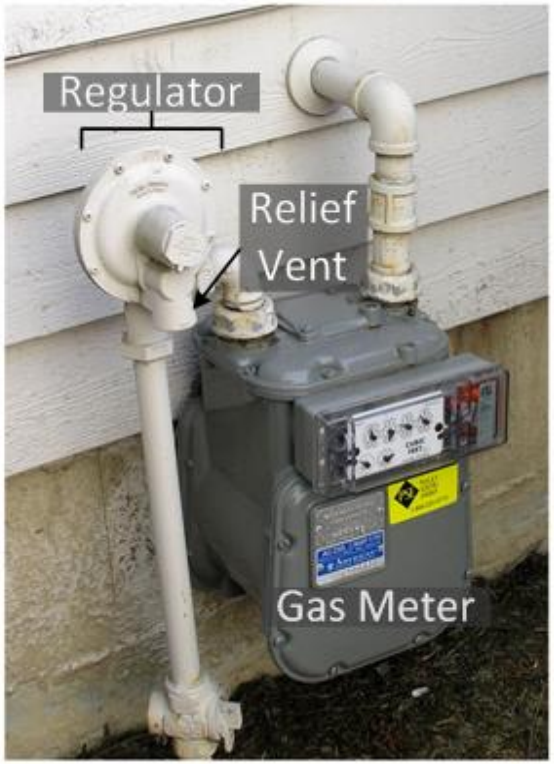
signature dependent on:

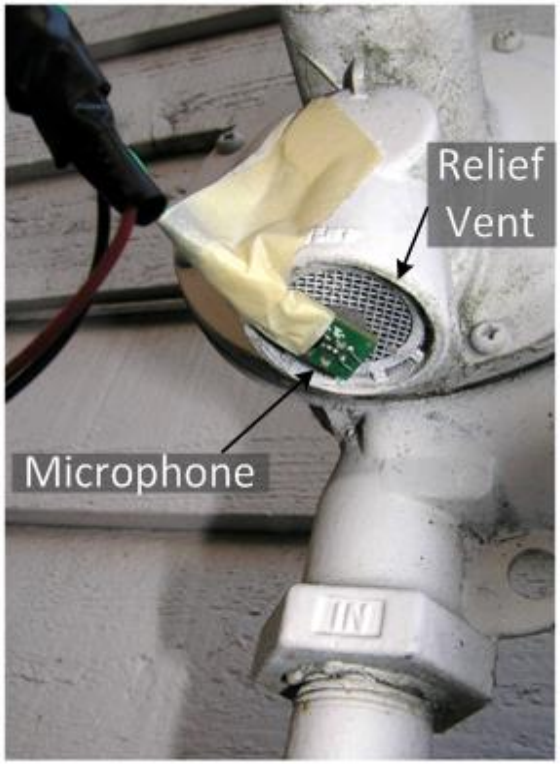
- **fixture type**
- **fixture location in home**

GasSense: Appliance-Level, Single-Point Sensing of Gas Activity in the Home

Gabe Cohn[1], Sidhant Gupta[2], Jon Froehlich[2], Eric Larson[1], Shwetak Patel[1,2]
[1]Electrical Engineering, [2]Computer Science and Engineering

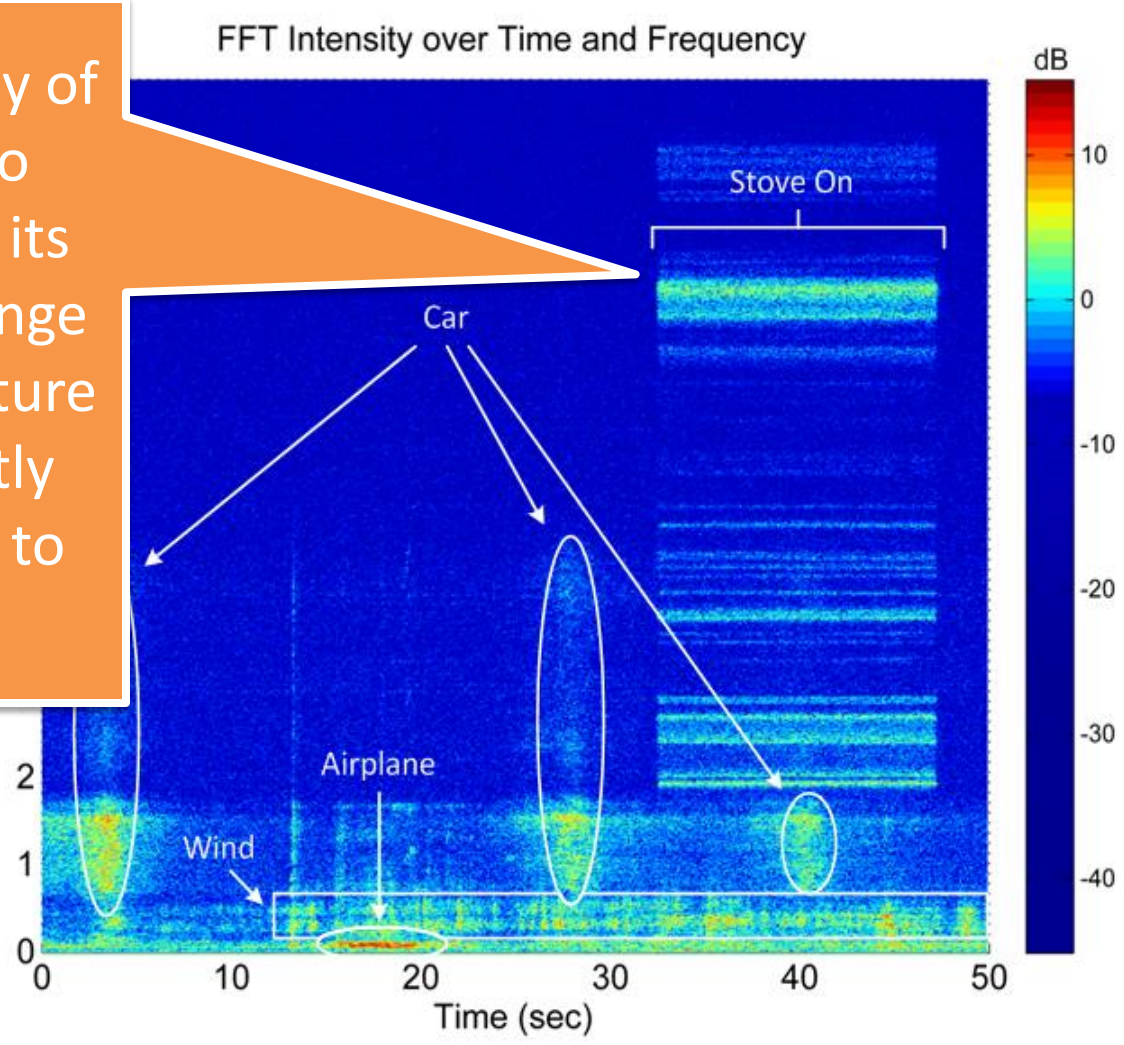
gassense installs on outside of gas regulator



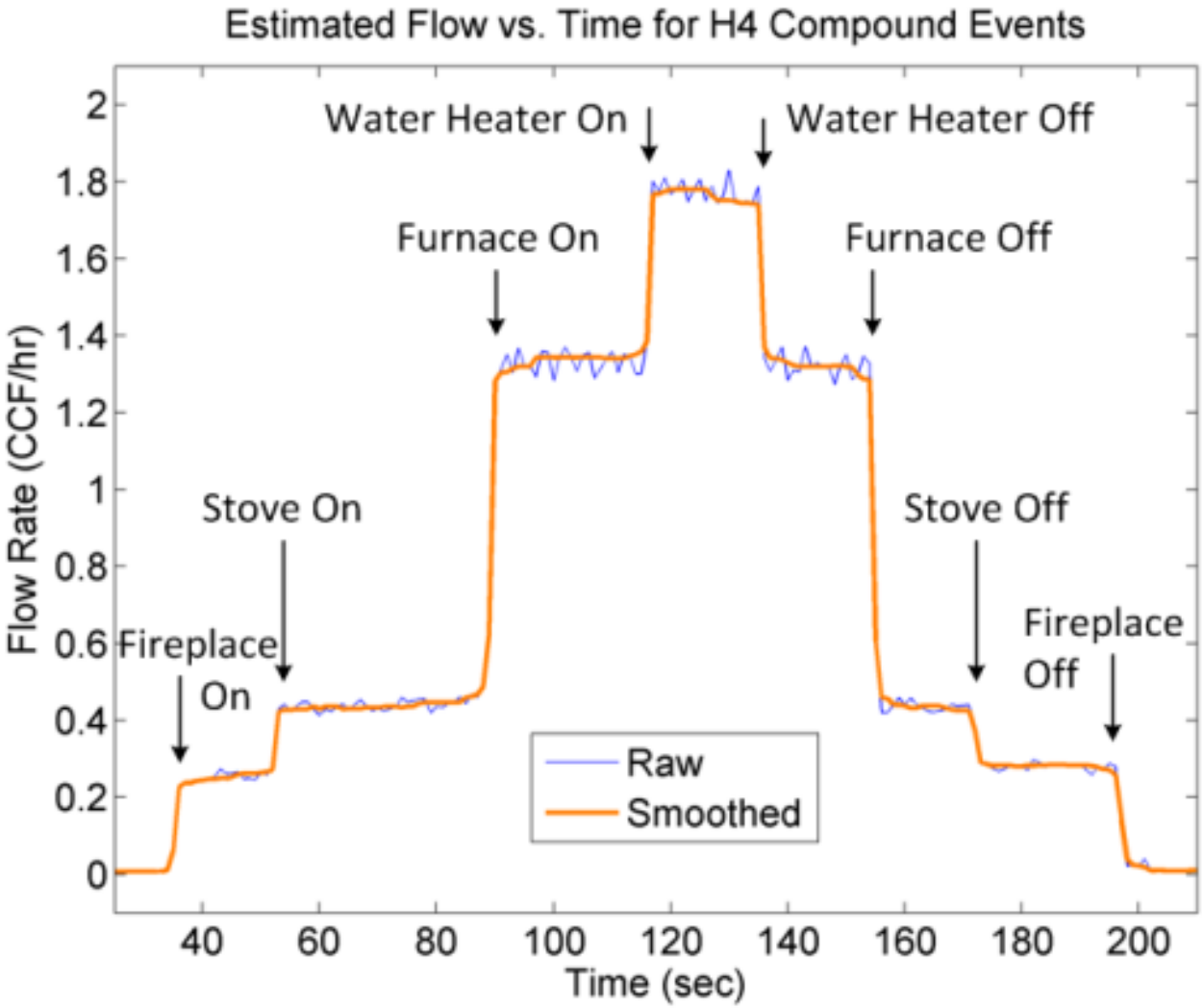


the gassense signal

the intensity of this audio signal and its rate of change indicate fixture and directly correlates to flow

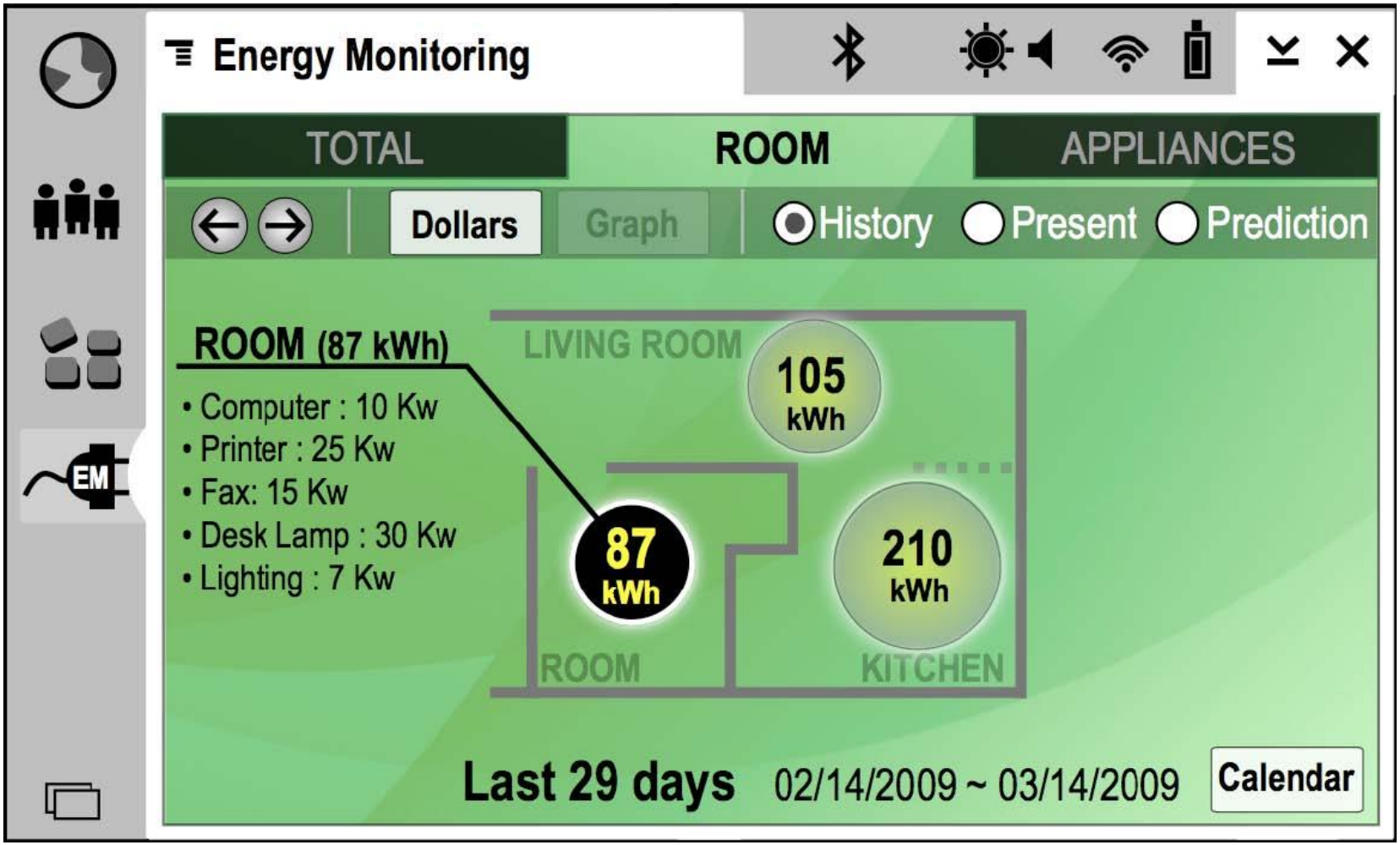


example data

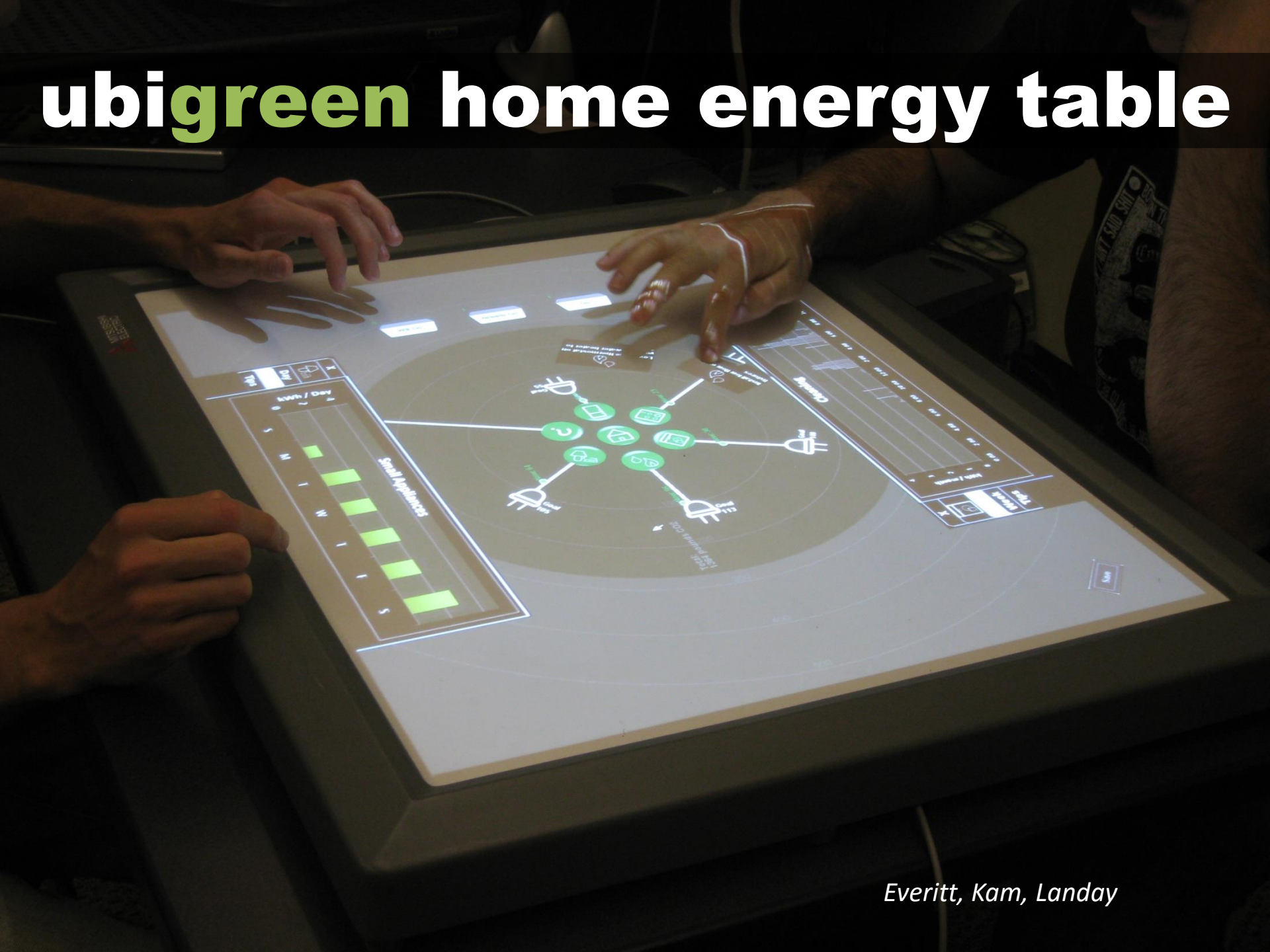


enable new mirrors reflecting our behaviors

real-time displays

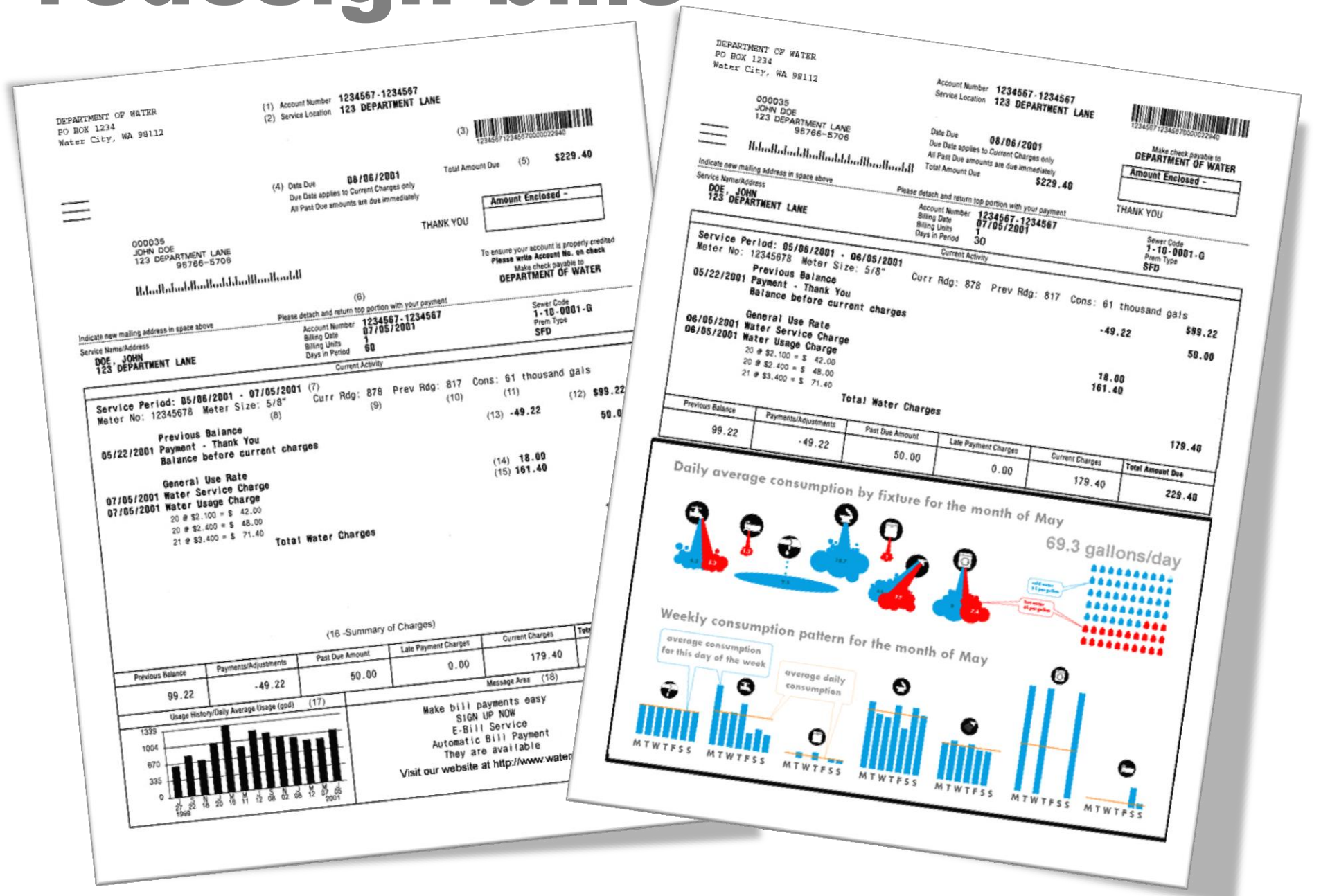


ubigreen home energy table



Everitt, Kam, Landay

redesign bills



DEPARTMENT OF WATER
PO BOX 1234
Water City, WA 98112

(1) Account Number 1234567-1234567
(2) Service Location 123 DEPARTMENT LANE

(3)

(4) Date Due 08/06/2001
Due Date applies to Current Charges only
All Past Due amounts are due immediately

Total Amount Due (5) $229.40

Amount Enclosed -

THANK YOU

000035
JOHN DOE
123 DEPARTMENT LANE
98766-5706

To ensure your account is properly credited
Please write Account No. on check
Make check payable to
DEPARTMENT OF WATER

(6)
Indicate new mailing address in space above
Please detach and return top portion with your payment

Service Name/Address
DOE, JOHN
123 DEPARTMENT LANE

Account Number 1234567-1234567
Billing Date 07/05/2001
Billing Units 1
Days in Period 60

Sewer Code 1-10-0001-G
Prem Type SFD

Current Activity

Service Period: 05/06/2001 - 07/05/2001 (7)
Meter No: 12345678 Meter Size: 5/8" (8) Curr Rdg: 878 (9) Prev Rdg: 817 (10) Cons: 61 thousand gals (11) (12) $99.22

Previous Balance (13) -49.22 50.0
05/22/2001 Payment - Thank You
Balance before current charges (14) 18.00
(15) 161.40

General Use Rate
07/05/2001 Water Service Charge
07/05/2001 Water Usage Charge
20 @ $2.100 = $ 42.00
20 @ $2.400 = $ 48.00
21 @ $3.400 = $ 71.40
Total Water Charges

(16 -Summary of Charges)

Previous Balance	Payments/Adjustments	Past Due Amount	Late Payment Charges	Current Charges	Tot
99.22	-49.22	50.00	0.00	179.40	

Usage History/Daily Average Usage (gpd) (17)

Message Area (18)

Make bill payments easy
SIGN UP NOW
E-Bill Service
Automatic Bill Payment
They are available
Visit our website at http://www.water

DEPARTMENT OF WATER
PO BOX 1234
Water City, WA 98112

Account Number 1234567-1234567
Service Location 123 DEPARTMENT LANE

000035
JOHN DOE
123 DEPARTMENT LANE
98766-5706

Date Due 08/06/2001
Due Date applies to Current Charges only
All Past Due amounts are due immediately
Total Amount Due $229.40

Make check payable to
DEPARTMENT OF WATER

Amount Enclosed -

THANK YOU

Indicate new mailing address in space above
Please detach and return top portion with your payment

Service Name/Address
DOE, JOHN
123 DEPARTMENT LANE

Account Number 1234567-1234567
Billing Date 07/05/2001
Billing Units 1
Days in Period 30

Sewer Code 1-10-0001-G
Prem Type SFD

Current Activity

Service Period: 05/06/2001 - 06/05/2001
Meter No: 12345678 Meter Size: 5/8" Curr Rdg: 878 Prev Rdg: 817 Cons: 61 thousand gals

Previous Balance -49.22 $99.22
05/22/2001 Payment - Thank You
Balance before current charges 50.00

General Use Rate
06/05/2001 Water Service Charge 18.00
06/05/2001 Water Usage Charge 161.40
20 @ $2.100 = $ 42.00
20 @ $2.400 = $ 48.00
21 @ $3.400 = $ 71.40
Total Water Charges 179.40

Previous Balance	Payments/Adjustments	Past Due Amount	Late Payment Charges	Current Charges	Total Amount Due
99.22	-49.22	50.00	0.00	179.40	229.40

Daily average consumption by fixture for the month of May

69.3 gallons/day

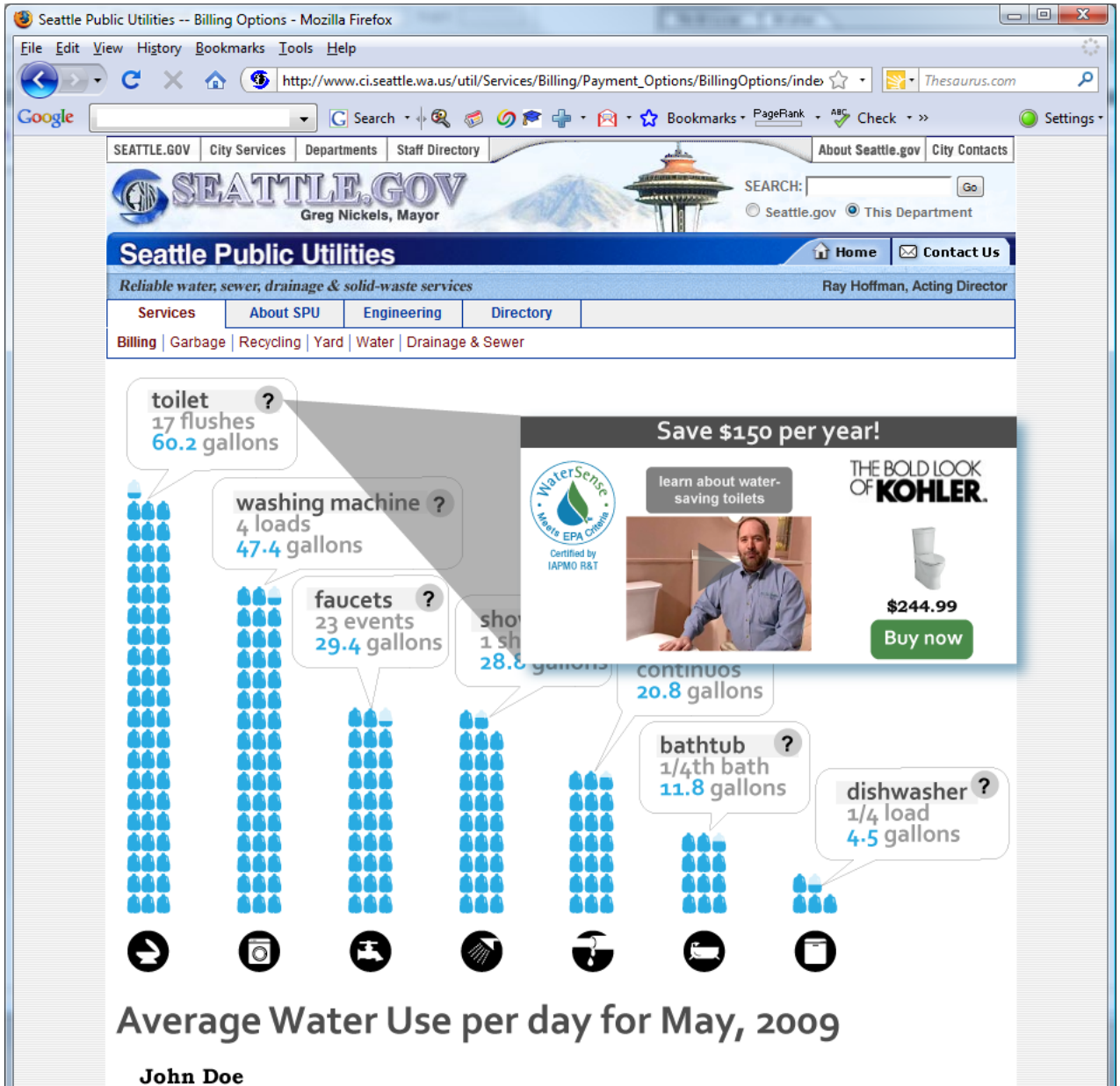
Weekly consumption pattern for the month of May

average consumption for this day of the week

average daily consumption

M T W T F S S

redesigned websites



Thank You!

jonfroehlich@gmail.com
twitter @jonfroehlich

http://ubicomplab.cs.washington.edu
http://dub.washington.edu/

students


Jon Froehlich


Gabe Cohn


Sidhant Gupta


Eric Larson


Tim Campbell


Kate Everitt

faculty


Marilyn Ostergren


Shwetak Patel


James Fogarty


James Landay

dub
design:
use:
build:
university of washington

ubicomp lab
university of washington

sustain
sustainability research