



**The Internet of Things
As a Central Nervous System
for Homes, Communities, & Cities.**

**FIG
LEAF**

**CHAD CURRY,
CENTER FOR REALTOR
TECHNOLOGY**

CENTER FOR
REALTOR[®]
TECHNOLOGY

@crtlabs

@crtweet

crt.blogs.realtor.org

crtlabs.org



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Working with your organization just got easier

New customizable member privileges, fine-grained team permissions, and improved security

Take the tour



National Association of REALTORS®

The National Association of REALTORS® is the USA's largest trade association with 1 million members involved in all aspects of real estate.

Chicago, IL and Washing... <http://realtor.org/> ccote@realtors.org

Repositories

People 9

Teams 8

Settings

Filters

Find a repository...

+ New repository

AnimatedHeatmap

Updated 8 days ago

JavaScript ★ 0 1

ChicagoHacksBig

hack.summit() 2016 data visualization

Updated 17 days ago

HTML ★ 1 0

TimespanEmitter

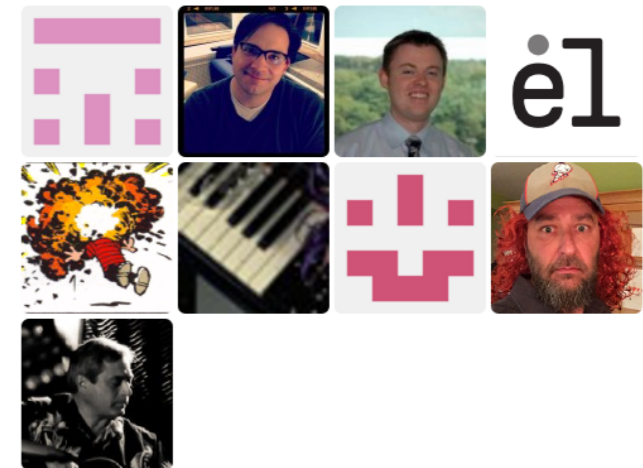
Emit events for a given timespan at a variable playback rate

Updated 18 days ago

JavaScript ★ 0 0

People

9 >



Invite someone



**Why is the
National Association
of REALTORS®
here?**



Code of Ethics and Standards of Practice

NATIONAL ASSOCIATION OF REALTORS®

Effective January 1, 2015

Under all is the land. Upon its wise utilization and widely allocated ownership depend the survival and growth of free institutions and of our civilization. REALTORS® should recognize that the interests of the nation and its citizens require the highest and best use of the land and the widest distribution of land ownership. They require the creation of adequate housing, the building of functioning cities, the development of productive industries and farms, and the preservation of a healthful environment. Such interests impose obligations beyond those of ordinary commerce. They impose grave social responsibility and a patriotic duty to which REALTORS® should dedicate themselves, and for which they should be diligent in preparing themselves. REALTORS®, therefore, are zealous to maintain and improve the standards of their calling and share with their fellow REALTORS® a common responsibility for its integrity and honor. In recognition and appreciation of their obligations to clients, customers, the public, and each other, REALTORS® continuously strive to become and remain informed on issues affecting real estate and, as knowledgeable professionals, they willingly share the fruit of their experience and study with others. They identify and take steps, through enforcement of this Code of Ethics and by assisting appropriate regulatory bodies, to eliminate practices which may damage the public or which might discredit or bring dishonor to the real estate profession. REALTORS® having direct personal knowledge of conduct that may violate the Code of Ethics involving misappropriation of client or customer funds or property, willful discrimination, or fraud resulting in substantial economic harm, bring such matters to the attention of the appropriate Board or Association of REALTORS®. Realizing that cooperation with other real estate professionals promotes the best interests of those who utilize their services, REALTORS® urge exclusive representation of clients; do not attempt to gain any unfair advantage over their competitors; and they refrain from making unsolicited comments about other practitioners. In instances where their opinion is sought, or where REALTORS® believe that comment is necessary, their opinion is offered in an objective, professional manner, uninfluenced by any personal motivation or potential advantage or gain. The term REALTOR® has come to connote competency, fairness, and high integrity resulting from adherence to a lofty ideal of moral conduct in business relations. No inducement of profit and no instruction from clients ever can justify departure from this ideal. In the interpretation of this obligation, REALTORS® can take no safer guide than that which has been handed down through the centuries, embodied in the Golden Rule, “Whatsoever ye would that others should do to you, do ye even so to them.” Accepting this standard as their own, REALTORS® pledge to observe its spirit in all of their activities whether conducted personally, through associates or others, or via technological means, and to conduct their business in accordance with the tenets set forth below.



**1.1 Million
Members**



~ 5 million

transactions a year



Residential & Commercial



Global



Chicago



Washington, DC



What is CRT?

CENTER FOR **R**EALTOR[®] **T**ECHNOLOGY

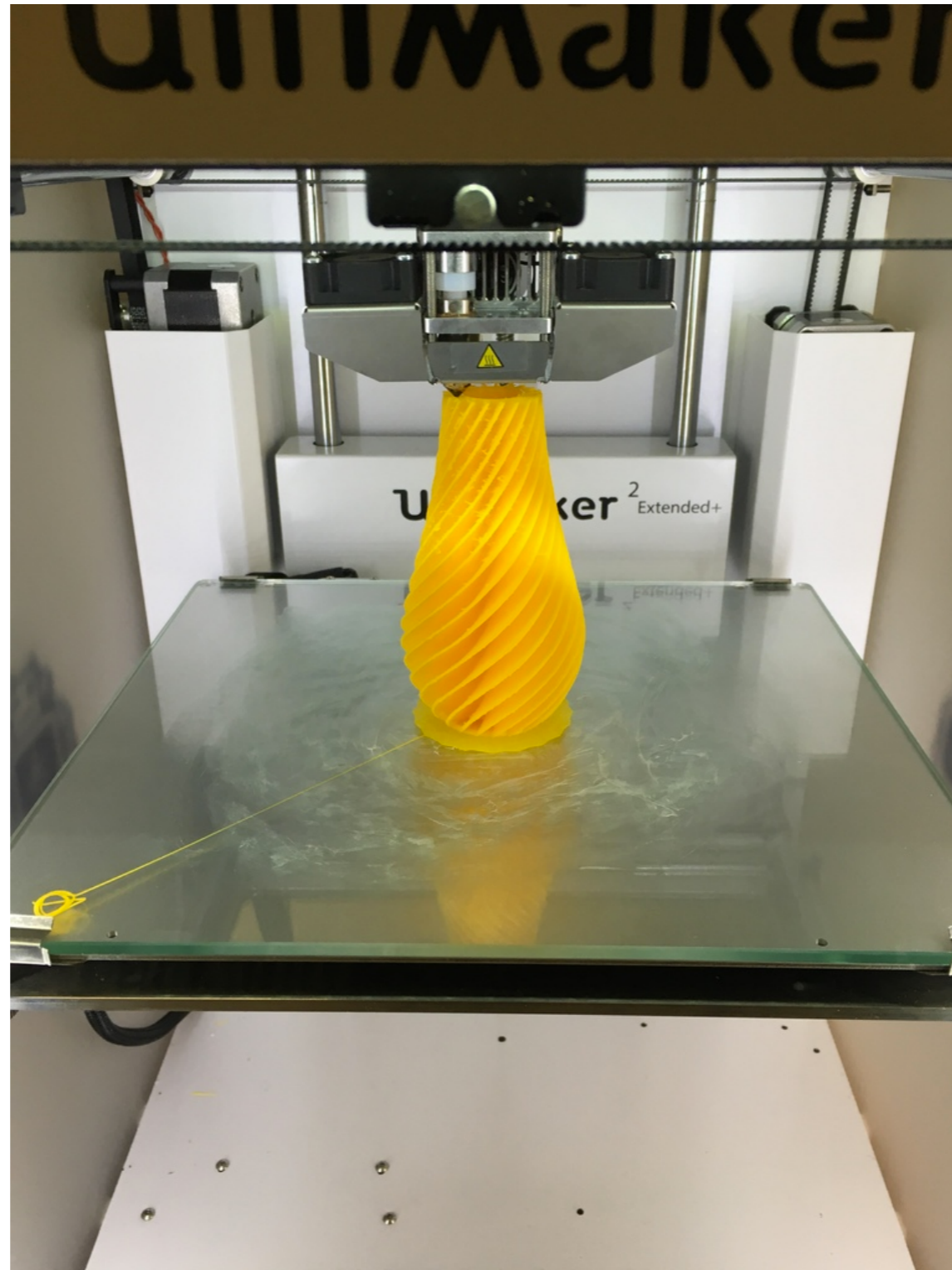
A multi-disciplinary technology research group focused on where technology is going & what it means for real estate.

CENTER FOR
REALTOR[®]
TECHNOLOGY

CRT LABS



Workbench



3D Printer



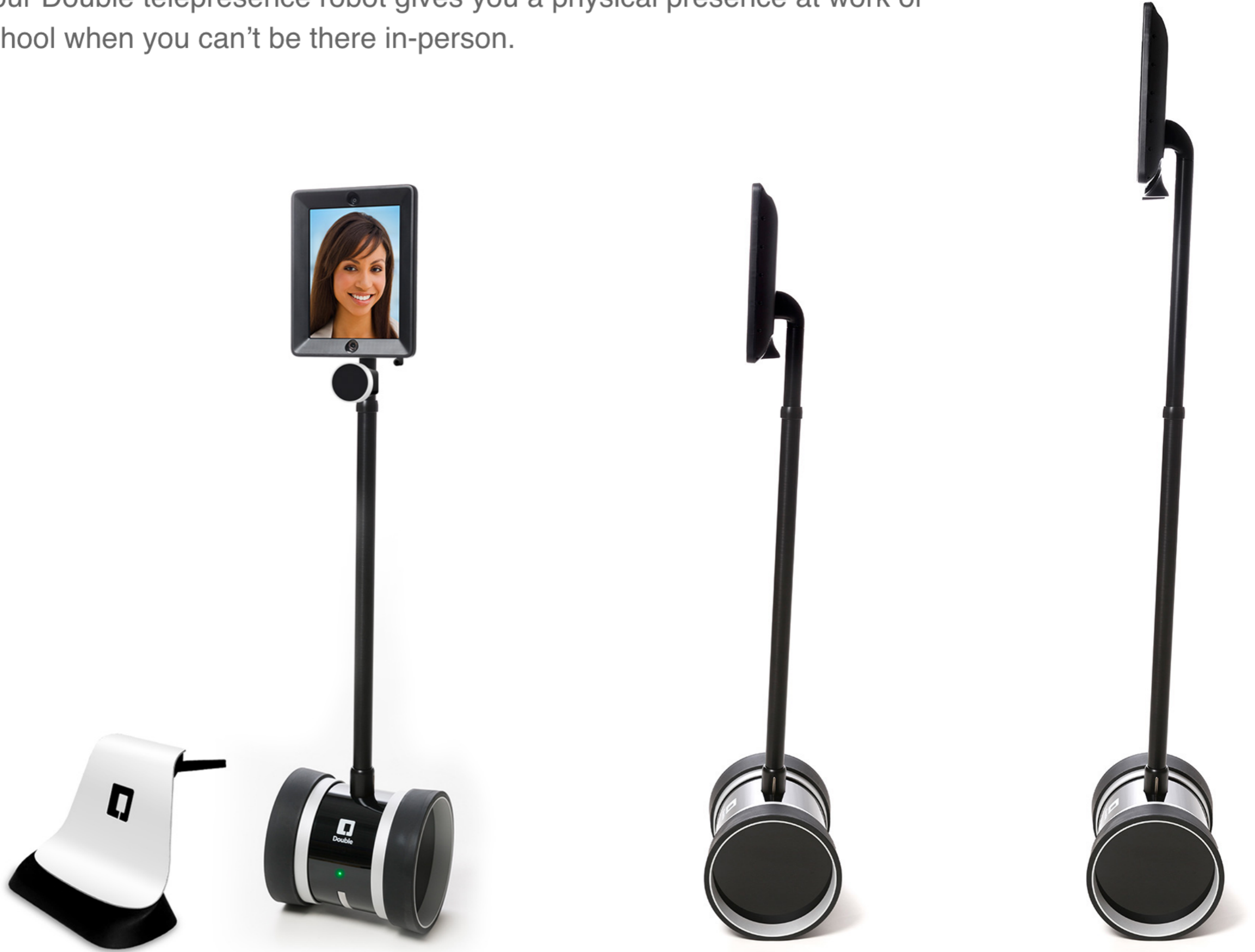
Meeting Area



Work desks

Double[®] Work from anywhere.

Your Double telepresence robot gives you a physical presence at work or school when you can't be there in-person.



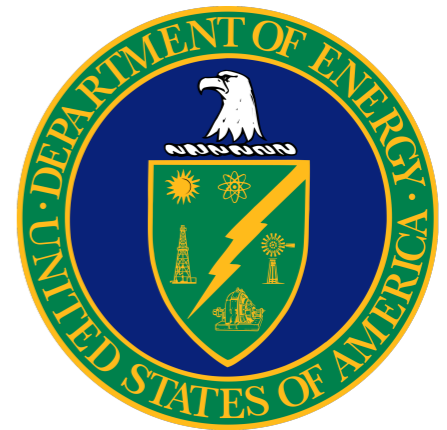


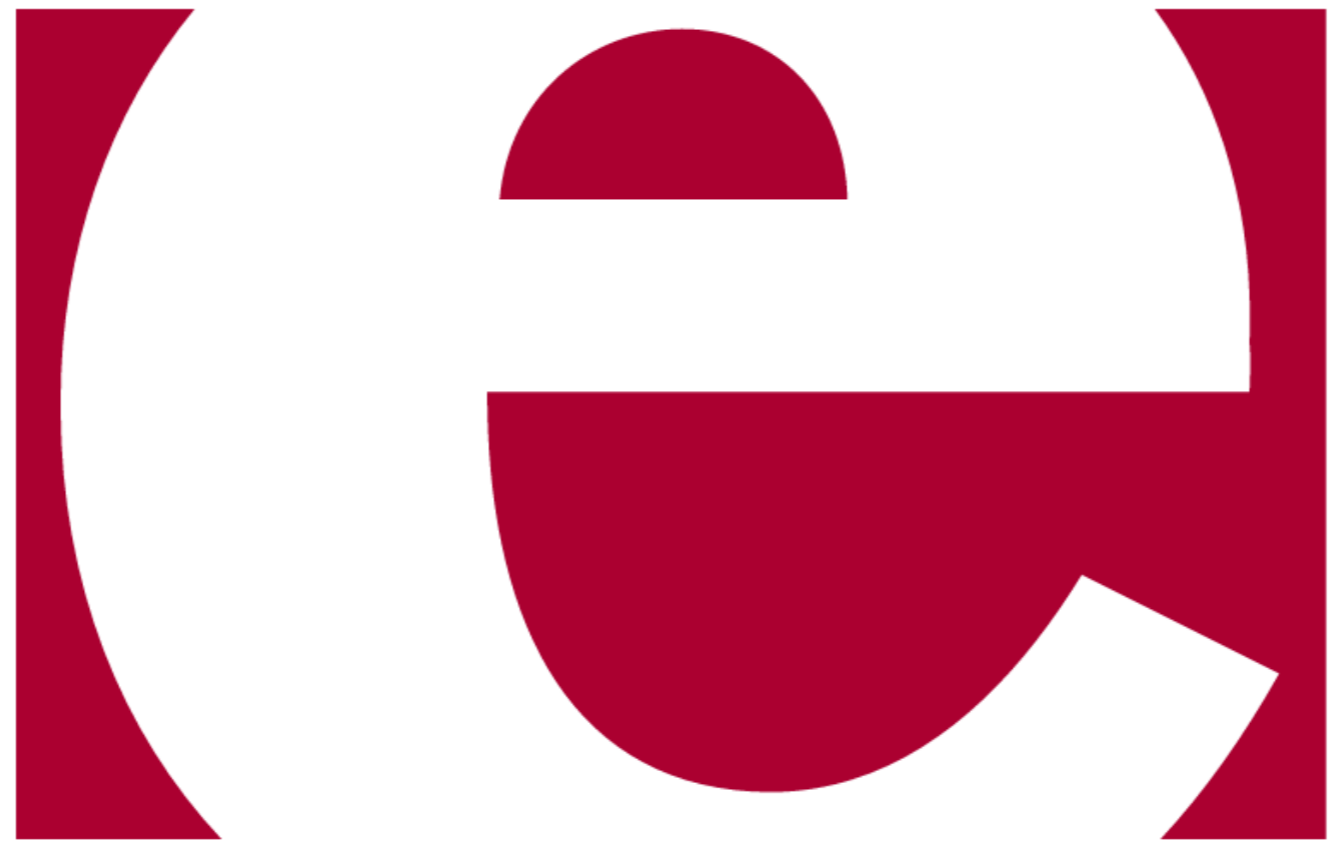
Accelerating IoT in the Midwest

ITA Internet of Things Council

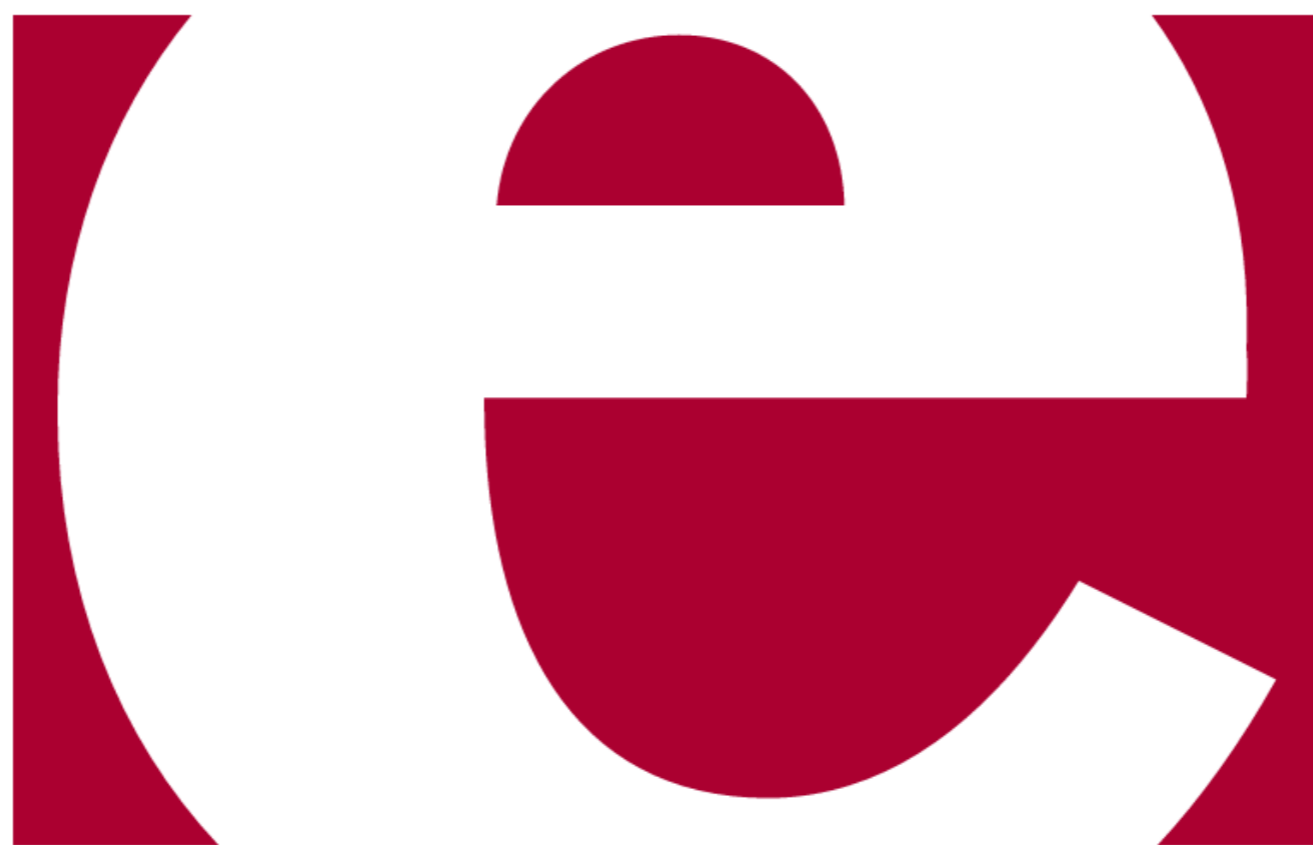


BUILDITSECURE.LY





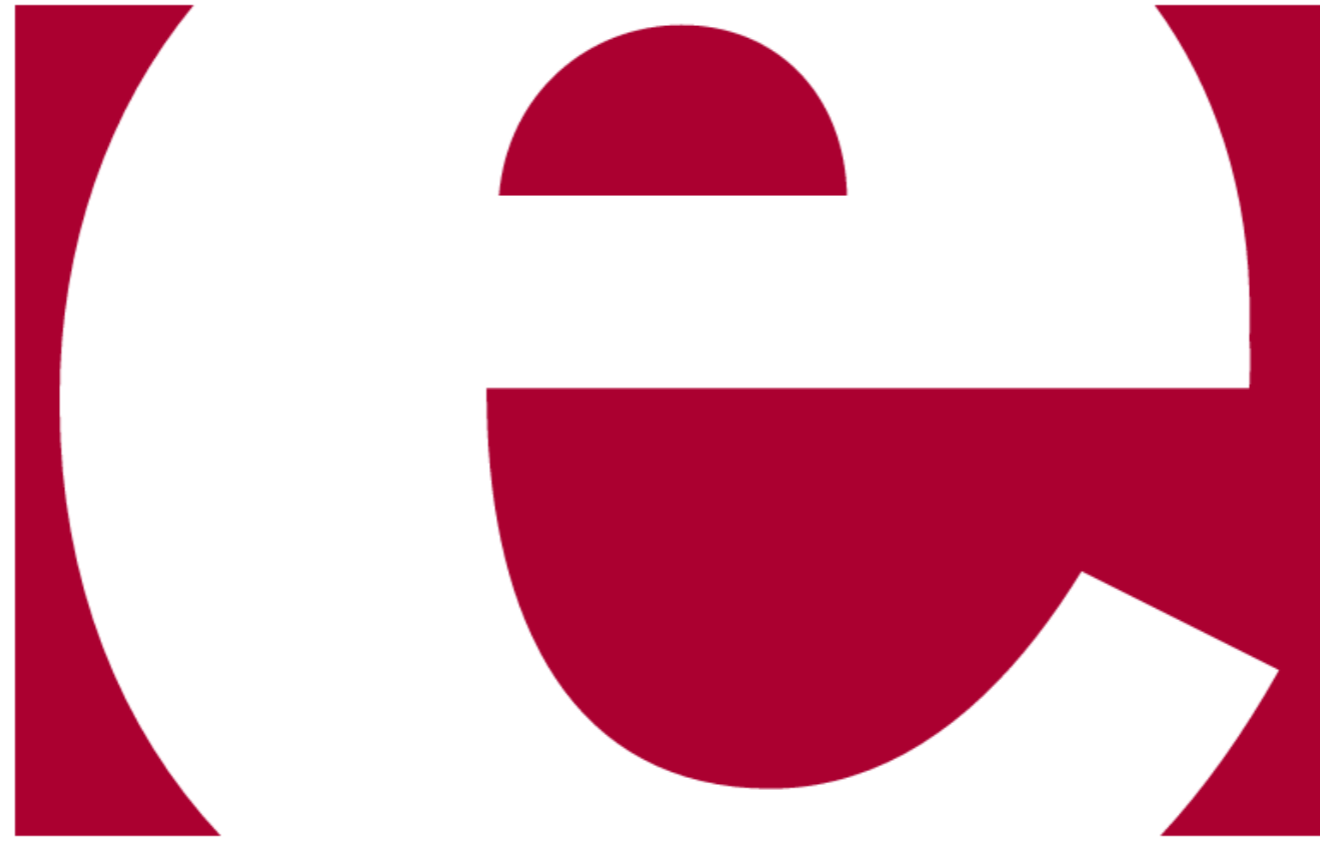
ERLANG



ERLANG



elixir



ERLANG

**WHAT IS
THE VALUE
OF A HOME?**

**IT'S MUCH
MORE THAN**

\$\$\$.

IT'S ABOUT

QUALITY OF

LIFE.

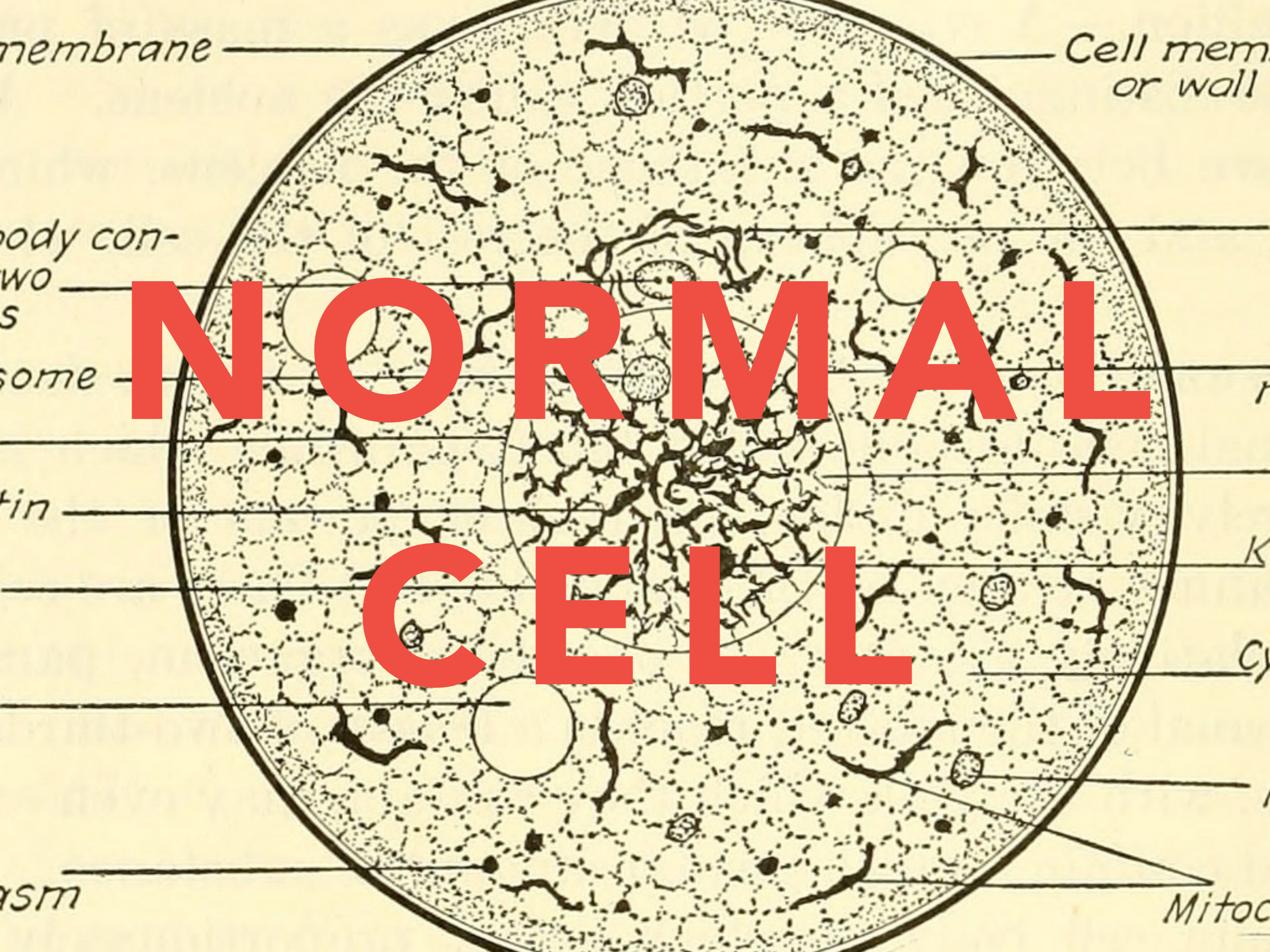
H O M E O S T A S I S

~1~

The tendency of an organism or a cell to regulate its internal conditions, usually by a system of feedback controls, so as to stabilize health and functioning, regardless of the outside changing conditions.

~2~

The ability of the body or a cell to seek and maintain a condition of equilibrium or stability within its internal environment when dealing with external changes.



membrane

Cell mem
or wall

body con-
wo
S

some

tin

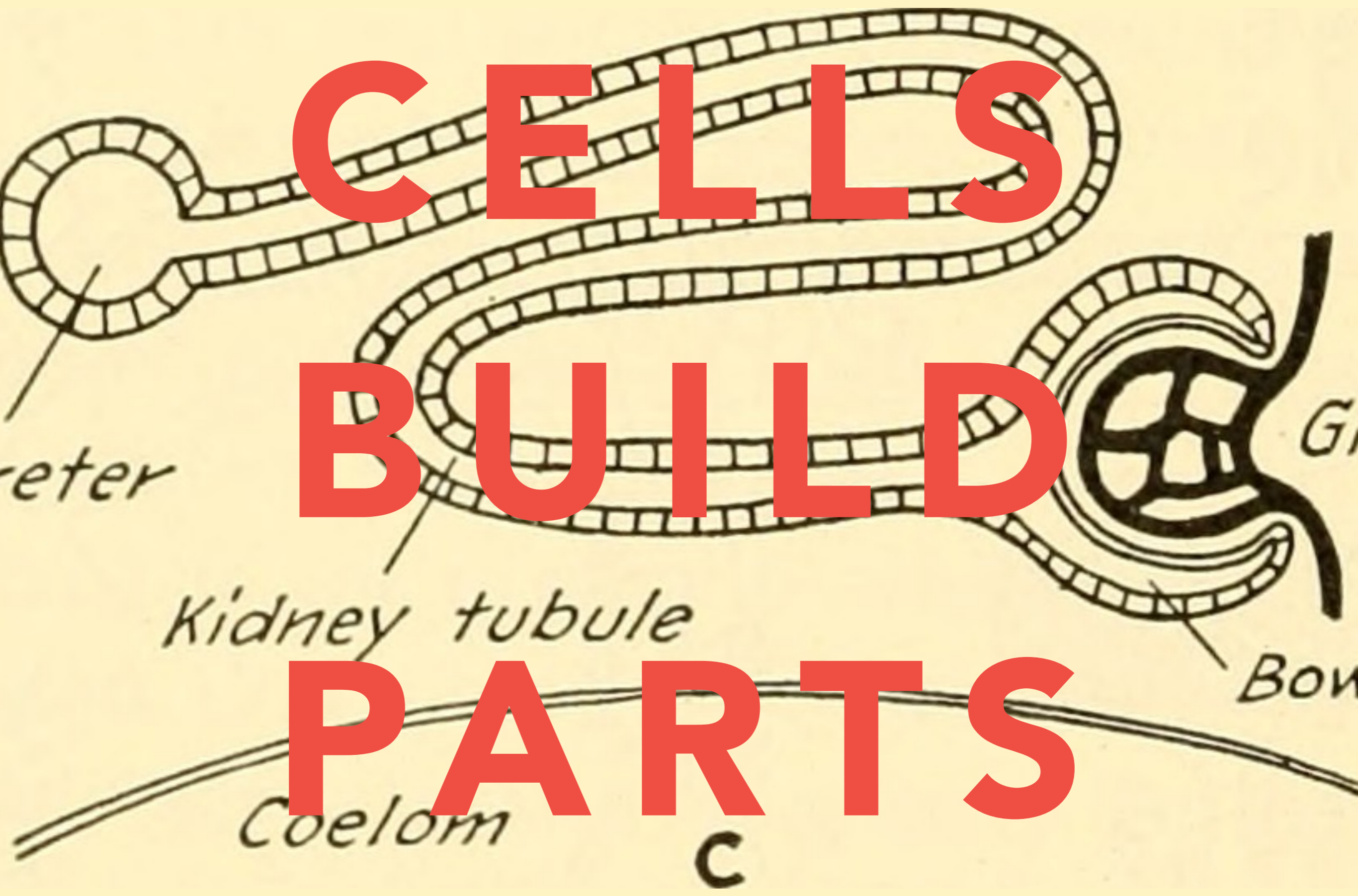
K

G

asm

Mitoc

**NORMAL
CELL**



CELLS

BUILT

PARTS

Cerebrum

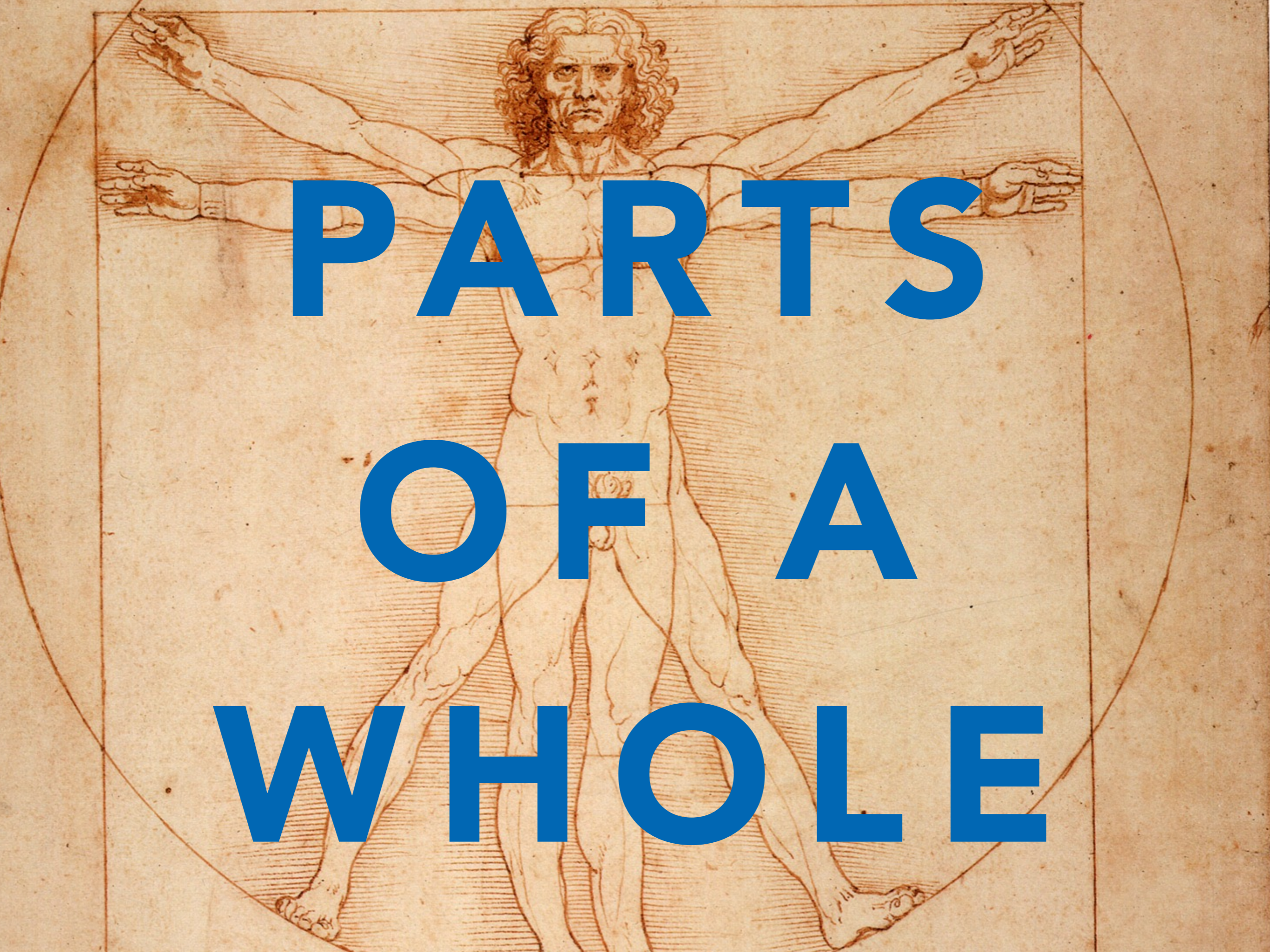
Kidney tubule

Coelom

C

Bowman's capsule

Glomerulus



**PARTS
OF A
WHOLE**

THE PULSE

OF OUR

DAILY LIVES

CONNECTED

HOME






CONNECTED
NEIGHBORHOOD



**CONNECTED
CITIES**

A night-time photograph of the Chicago skyline, featuring prominent skyscrapers like the Willis Tower and the Trump Tower, illuminated with warm lights. The city lights are reflected in the dark water of a lake in the foreground. The sky is a deep blue with scattered clouds. Overlaid on this image is white, bold, sans-serif text.

**26-250 BILLION
DEVICES
CONNECTED
BY 2020**



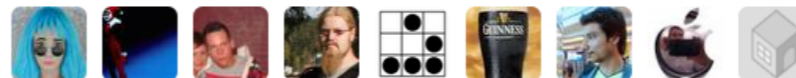
Raspberry Pi @Raspberry_Pi · 50s
A 5MB hard drive delivery in 1956.

I'm typing this on a machine that uses a 64GB SD card which cost me about £20.

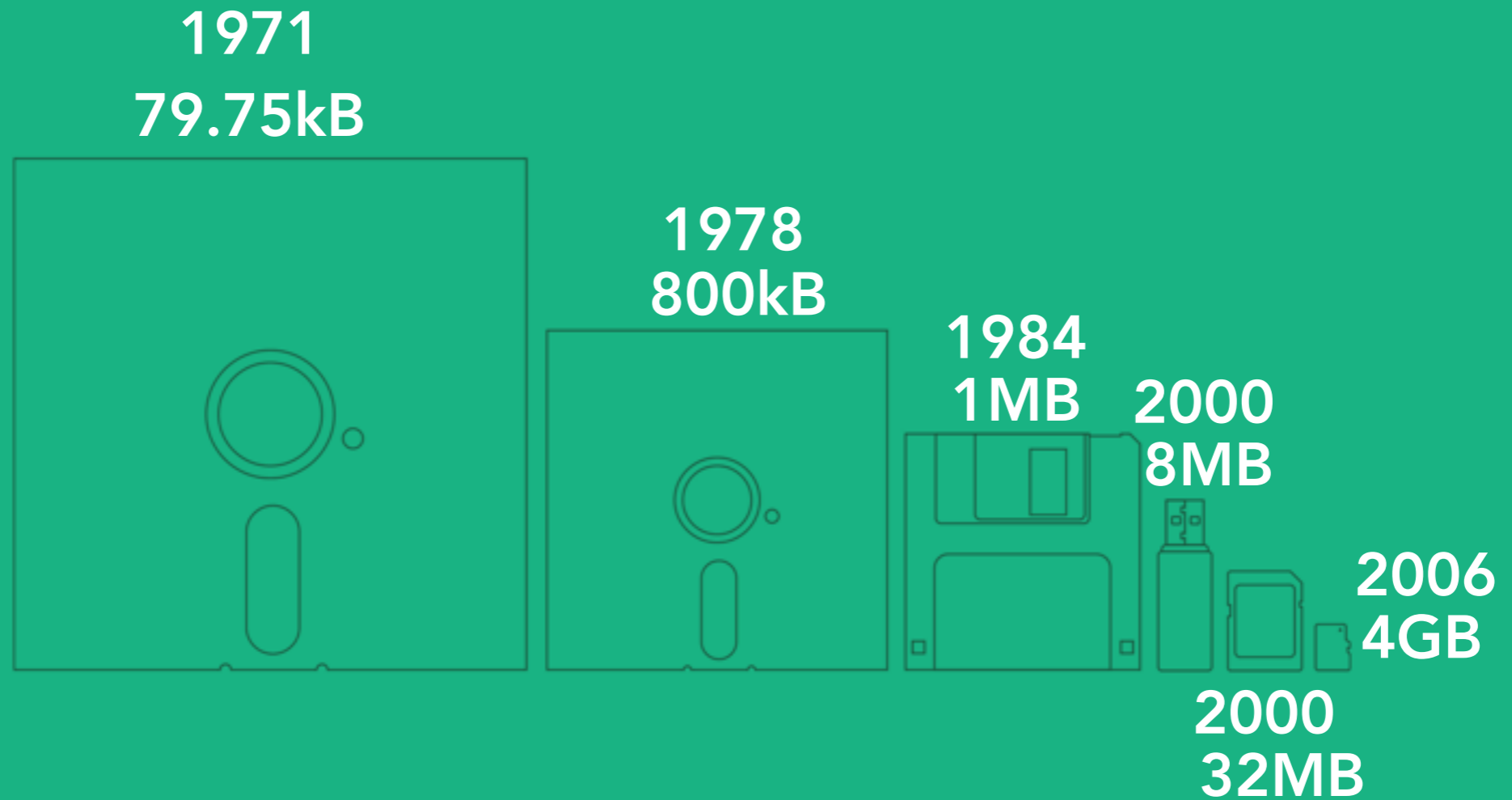


RETWEETS
16

FAVORITES
10



Smaller, Faster, Cheaper

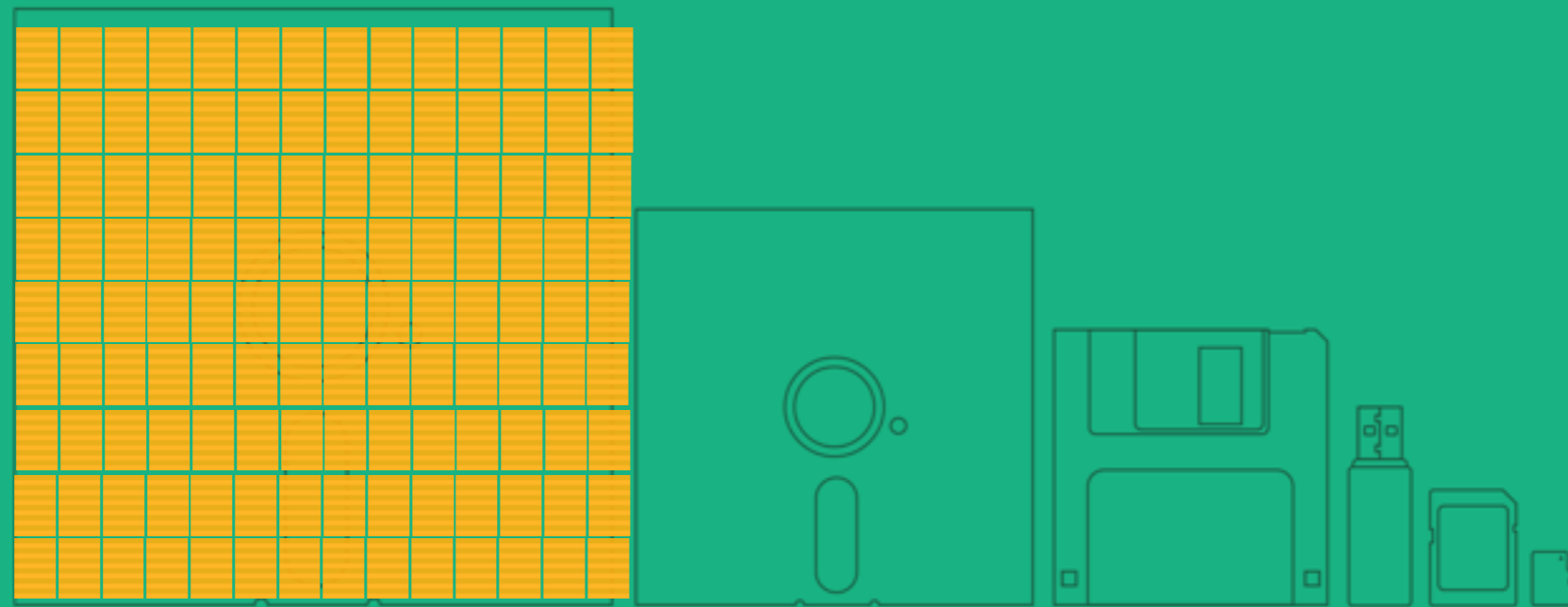


Smaller, Faster, Cheaper

2006: 126 * 4GB = 504GB

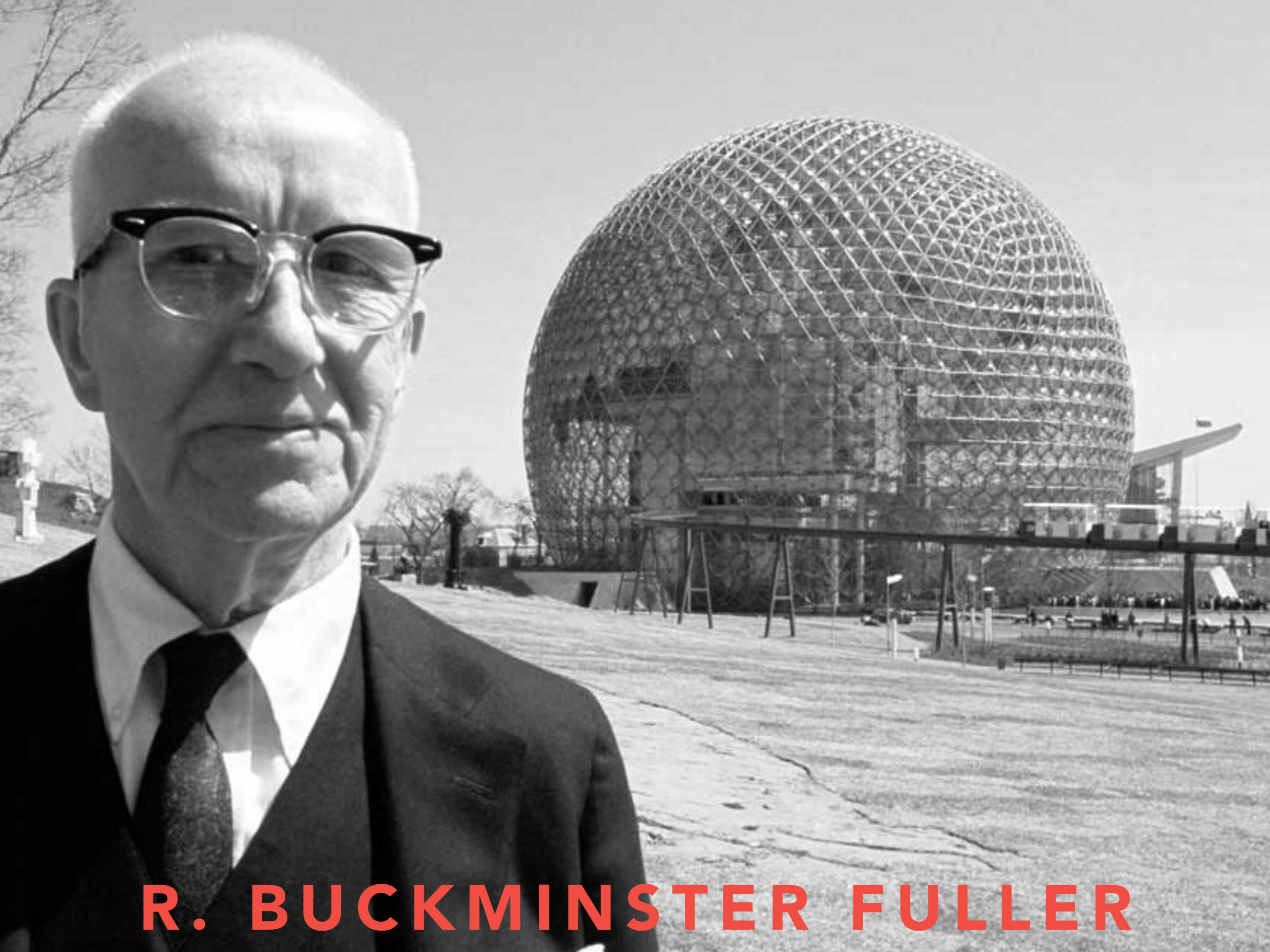
2015: 126 * 128GB = 135,291,469,824kB

10,208 8" Floppy Disks

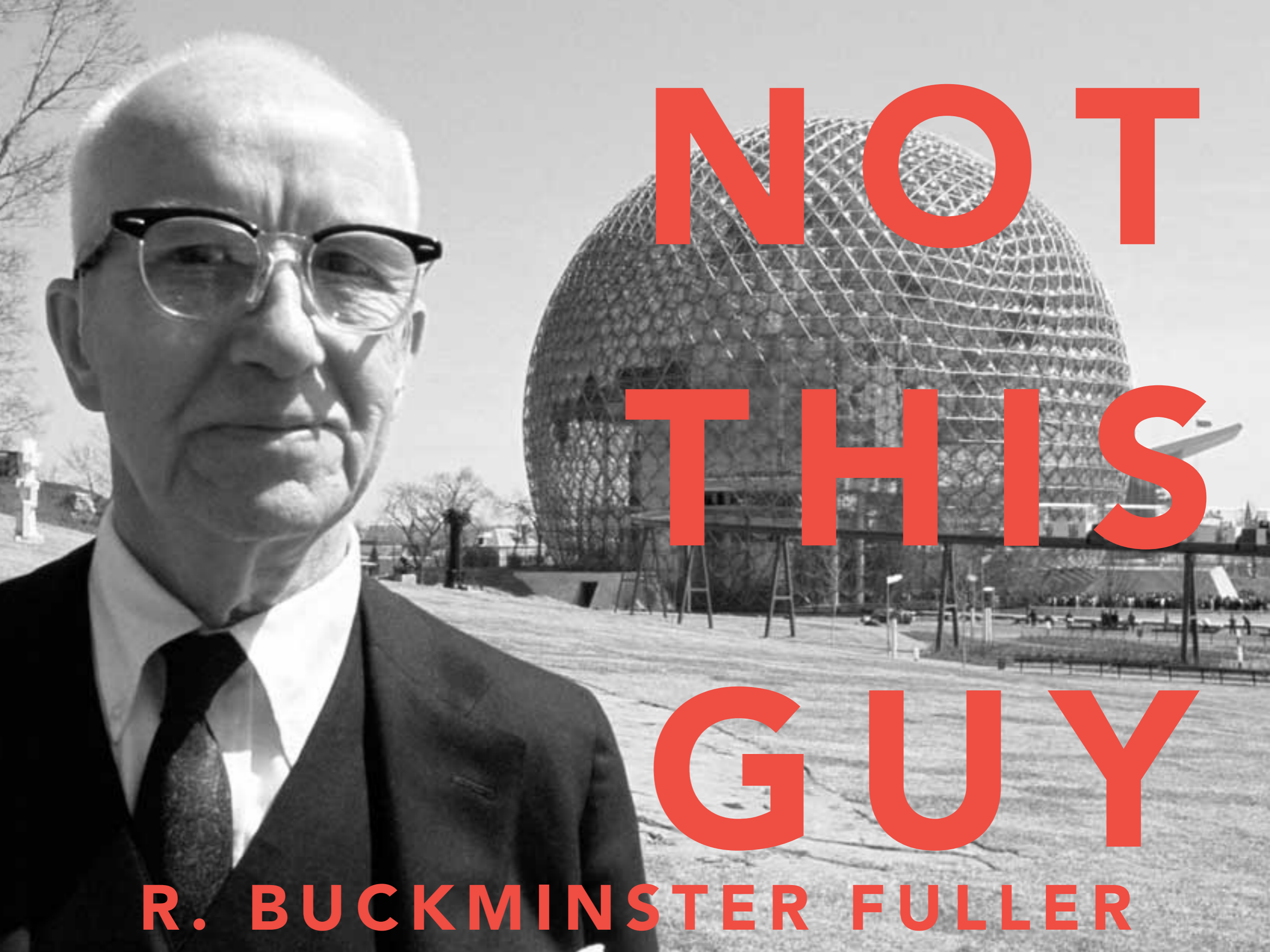


Surface area of 8"
vs. Micro SD

WHAT DOES THE
HOME OF
THE FUTURE
LOOK LIKE?



R. BUCKMINSTER FULLER



NOT


THIS

GUY

R. BUCKMINSTER FULLER



JOHN COUGAR MELLENCAMP



THIS

GUY

JOHN COUGAR MELLENCAMP



2601

2601

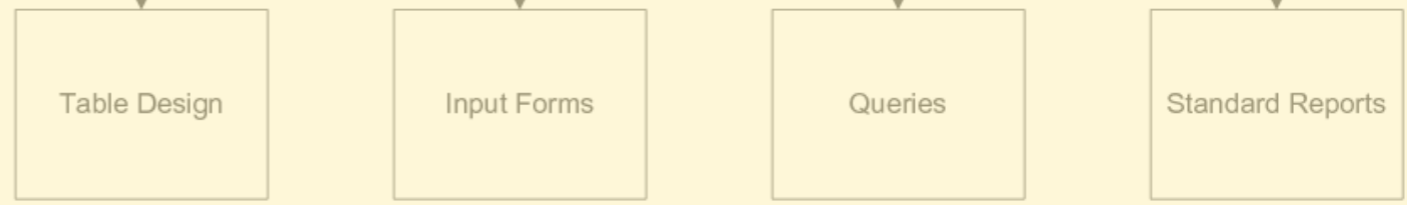
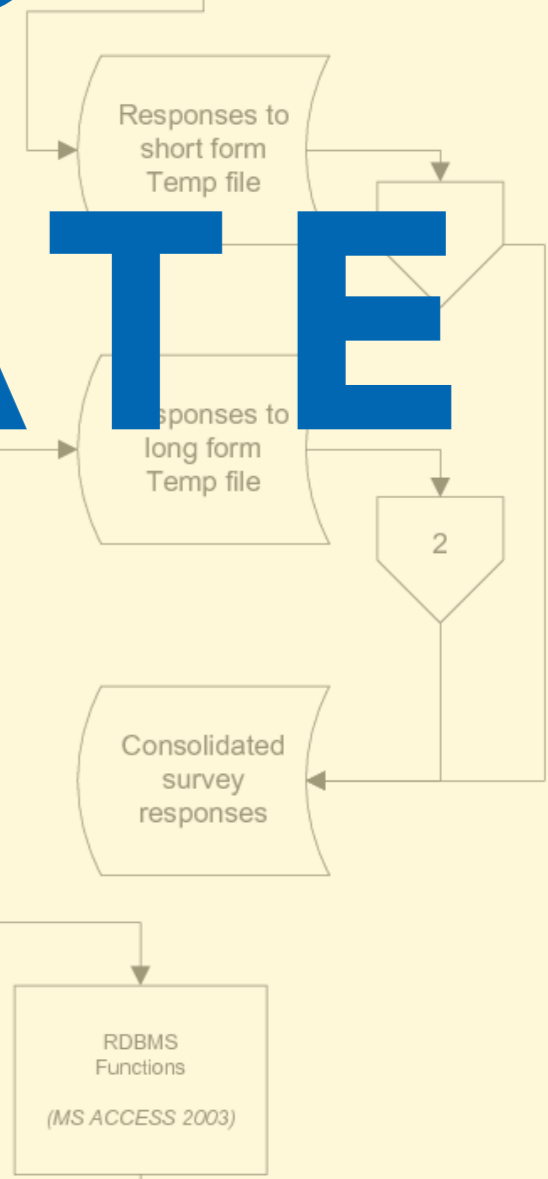
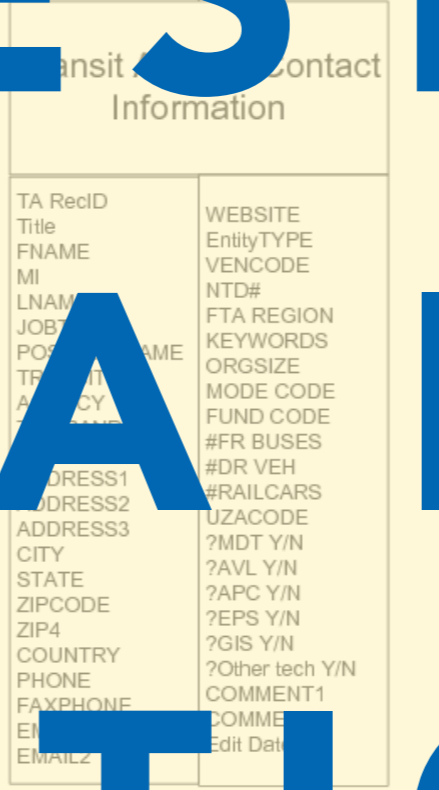
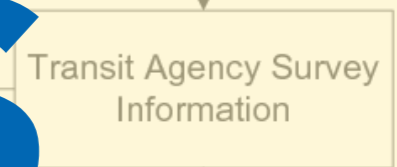
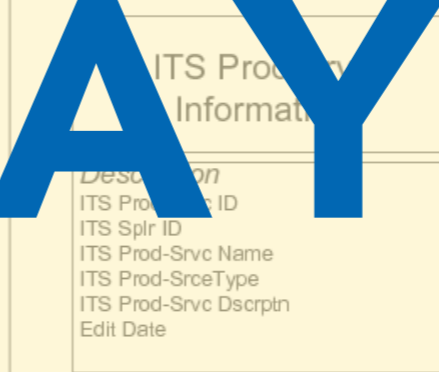
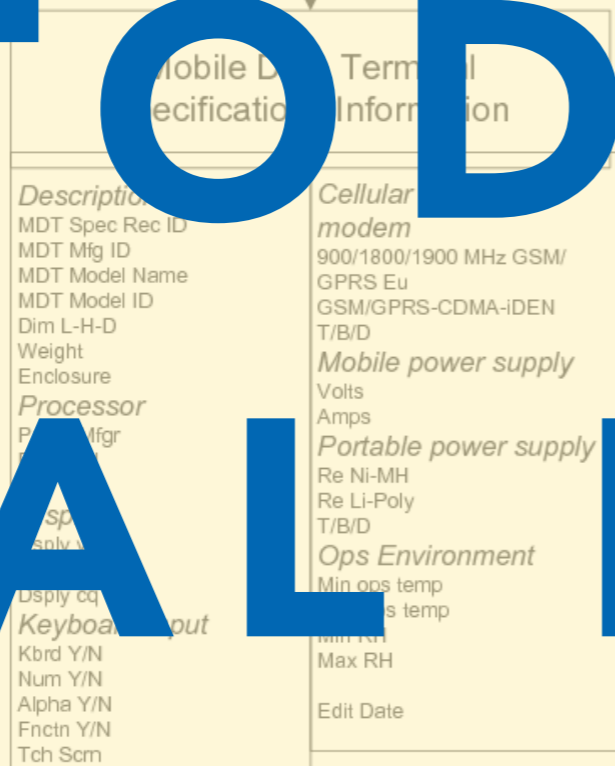
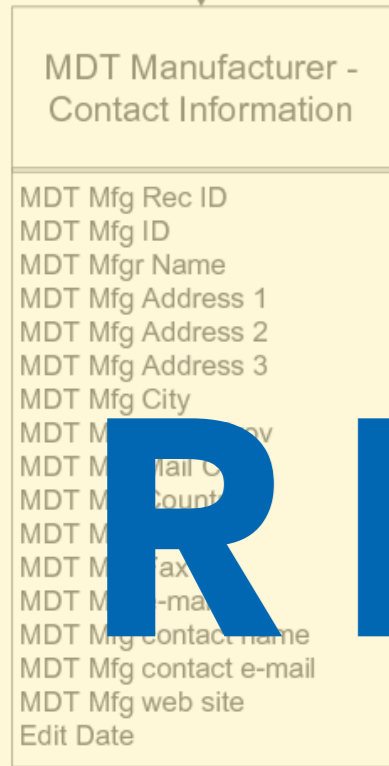
2601

A photograph of a single-story house with pink siding and a white porch. The house has a gabled roof with a dormer window. A concrete path leads from the foreground to the front steps of the house. Two large, ornate concrete planters filled with red and white flowers are positioned on either side of the path. The text "THIS IS THE HOUSE OF THE FUTURE" is overlaid in large, bold, yellow capital letters across the center of the image.

**THIS IS
THE HOUSE
OF THE
FUTURE**



Mobile Data Terminal Relational Database Structure



TODAY'S REAL STATE DATA IS STATISTIC

I O T W I L L

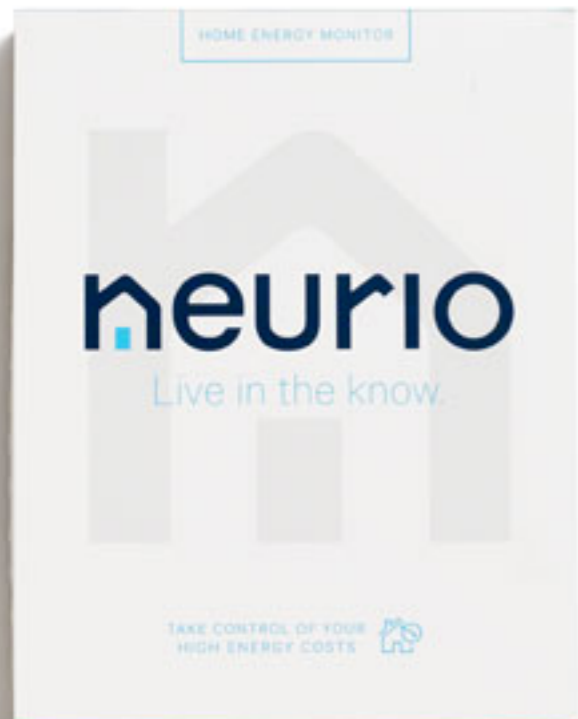
M A K E I T

D Y N A M I C

ROSETTA HOME

ENVIRONMENT

ENERGY



Locations



7467 Sheridan **\$765,000.00**

Enormous, 4,100 sq ft., solid brick mini-mansion on 50x175' lot awaits new owner. Grand entry & staircase, double parlor. DR w/ cross beamed ceilings opens to enclosed greenhouse. Grand, open kitchen. Oak floors & trim throughout. Big BR's, vintage tile in



1761 MORSE **\$267,000.00**

Stunning! Extra large 1500sf newer all brick/limestone construction, with PRIVATE GARAGE included! Lush gardens welcome you to this intimate 8 unit bldg. Situated on the south side of the building, this unit is LOADED with SUNLIGHT! Open Living/Dining/Kitchen



7625 Eastlake **\$215,000.00**

Highly Sought after Boutique elevator Building on Eastlake Terrace, Sunny & Bright Corner unit, Huge private Deck with a Beautiful Lake View, secure indoor heated Garage parking, features open floor plan, 2 bedrooms/2bath, Gas fireplace, newly



1737 Division **\$299,900.00**

Spectacular location for a 2 bedroom 2 bath unit. Unit offers an efficient layout with kitchen and eating area, living room, 2 bedrooms and 2 bathrooms. Quality finishes throughout - hardwood floors, granite counters and contemporary cabinetry. Washer dryer



1833 73rd **\$279,000.00**

GREAT CURB APPEAL! MANY UPDATES! ADORABLE GEORGIAN HAS LIV RM, FORMAL DIN RM, 1ST FL FAM RM W/ YARD VIEW. ALL HDWD FLRS EXCEPT FAM RM. NWR KIT W/CORIAN CNTRS SS STL APPL. NEW 1ST FL POWDER RM.

7467 Sheridan [Edit](#)



© VHT STUDIOS

7467 Sheridan

\$765,000.00

Enormous, 4,100 sq ft., solid brick mini-mansion on 50x175' lot awaits new owner. Grand entry & staircase, double parlor. DR w/ cross beamed ceilings opens to enclosed greenhouse. Grand, open kitchen. Oak floors & trim throughout. Big BR's, vintage tile in kit and baths, 3 FP's. Tile roof, 2 car brick gar + 3 pkg spaces, 6ft. iron fence, expandable full walk-up 3rd fl., high ceiling basement, 1/2 block to Lake.

[Listing Details](#)

[Rosetta Home](#)

[True Living Cost](#)

Similar Properties



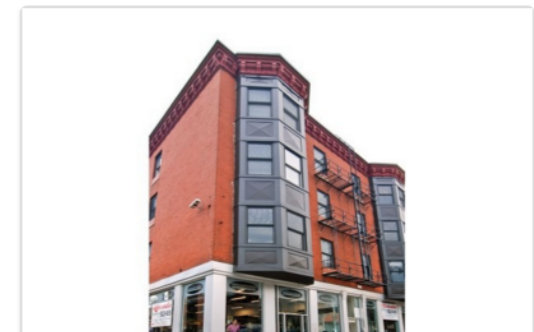
1761 MORSE

[View](#)



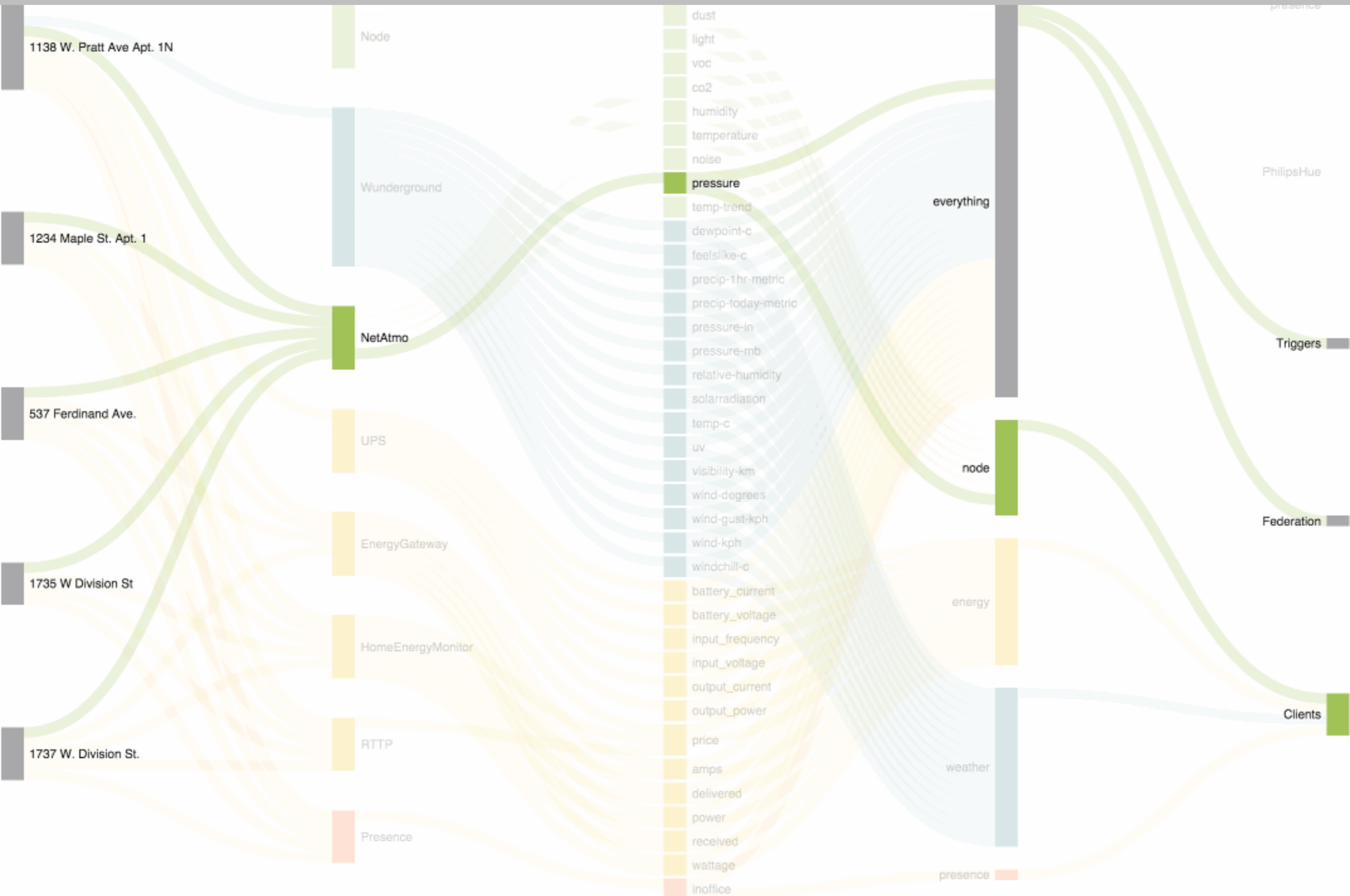
7625 Eastlake

[View](#)





ClosePrice	None
ListAgentMlsId	112446
OriginalEntryTimesta...	None
Latitude	42.018051
CloseDate	None
VOWConsumerCom...	True
OperatingExpense	None
BathroomsTotal	3.1
BathroomsFull	3
OriginalListPrice	765000
OffMarketDate	None
Green	{}
StreetDirPrefix	N
IDXAddressDisplayYN	True
PublicRemarks	Enormous, 4,100 sq ft., solid brick mini-mansion on 50x175' lot awaits new owner. Grand entry & staircase, double parlor. DR w/ cross beamed ceilings opens to enclosed greenhouse. Grand, open kitchen. Oak floors & trim throughout. Big BR's, vintage tile in kit and baths, 3 FP's. Tile roof, 2 car brick gar + 3 pkg spaces, 6ft. iron fence, expandable full walk-up 3rd fl., high ceiling basement, 1/2 block to Lake.
ContingentDate	None
ListingContractDate	2015-05-03 05:00:00
ListAgentCellPhone	None
StreetSuffix	RD
NetOperatingIncome	None
StateOrProvince	IL
PropertySubType	D
LivingArea	4100
ListOfficeName	Baird & Warner
Make	None



1138 W. Pratt Ave Apt. 1N

1234 Maple St. Apt. 1

537 Ferdinand Ave.

1735 W Division St

1737 W. Division St.

Node

Wunderground

NetAtmo

UPS

EnergyGateway

HomeEnergyMonitor

RTTP

Presence

- dust
- light
- voc
- co2
- humidity
- temperature
- noise
- pressure**
- temp-trend
- dewpoint-c
- feelslike-c
- precip-1 hr-metric
- precip-today-metric
- pressure-in
- pressure-mb
- relative-humidity
- solarradiation
- temp-c
- uv
- visibility-km
- wind-degrees
- wind-gust-kph
- wind-kph
- windchill-c
- battery_current
- battery_voltage
- input_frequency
- input_voltage
- output_current
- output_power
- price
- amps
- delivered
- power
- received
- wattage
- inoffice

everything

node

energy

weather

presence

PhilipsHue

Triggers

Federation

Clients

presence

AUTOMATION
REPLACES THE
AUTOMATON

Inman News @InmanNews · 14s

A good practice is always to know as much as you can about a property before you buy or sell. bit.ly/1F9J7dK



What's one thing that can prove a home's value an...

According to the BuildFax Index, approximately 7 million building permits for nonreplacement residential work were ...

inman.com

10:48 PM - 17 Sep 2015 · Details



[Hide summary](#)

**CONNECTED
HOME**



HOME

PERFORMANCE

ENERGY EFFICIENCY



LIGHT QUALITY



AMBIENT



**COMFORT &
HEALTH**

AIR QUALITY

IMPACTS HEALTH

TEMPERATURE

IMPACTS HEALTH

LIGHT QUALITY

IMPACTS HEALTH

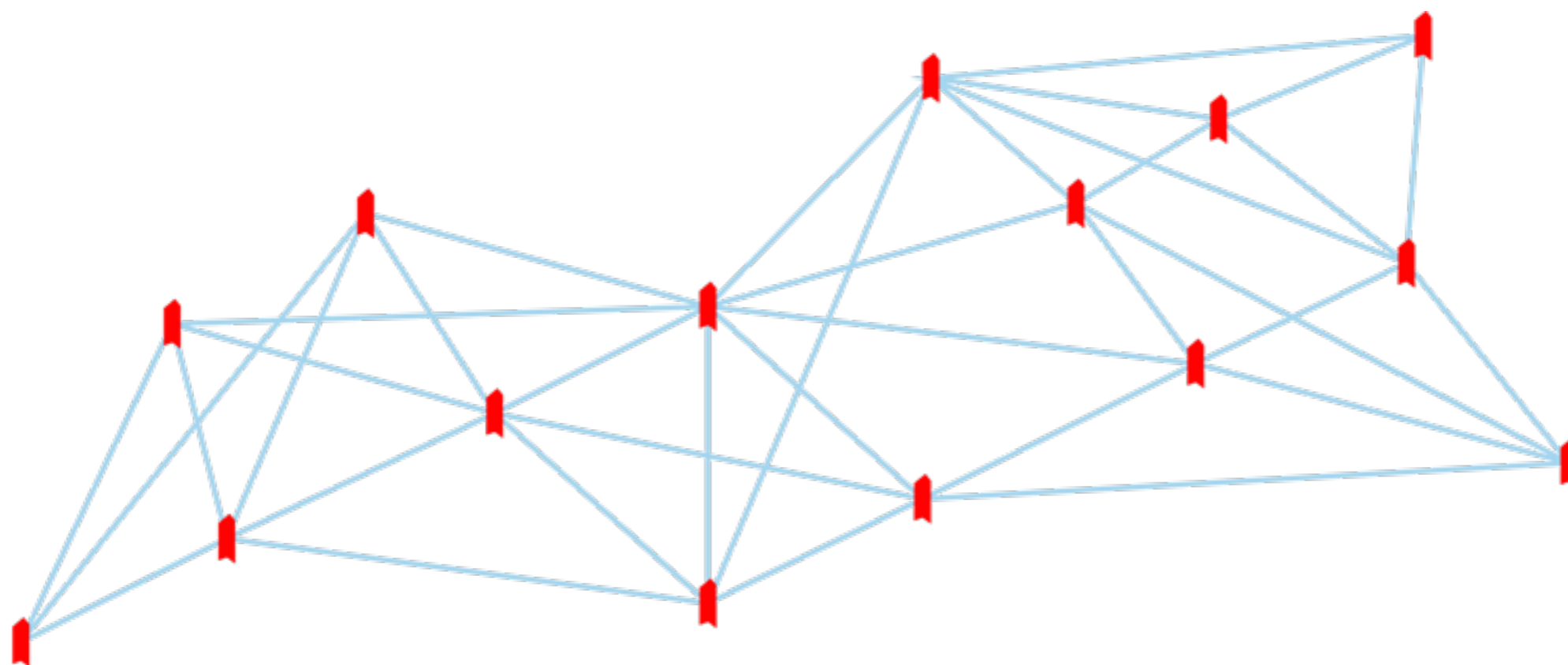
HUMIDITY

IMPACTS HEALTH

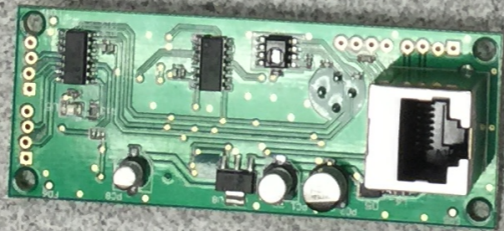
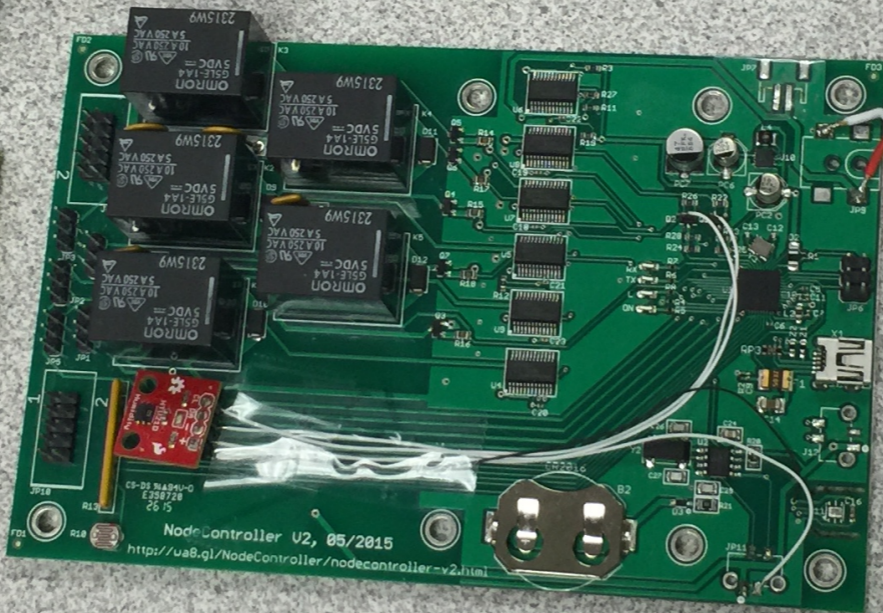
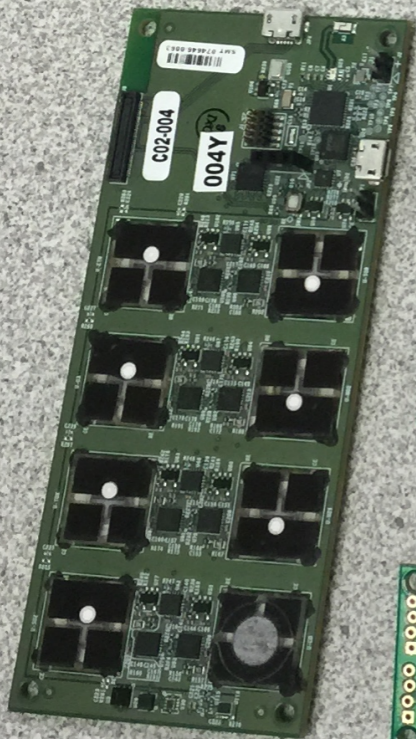
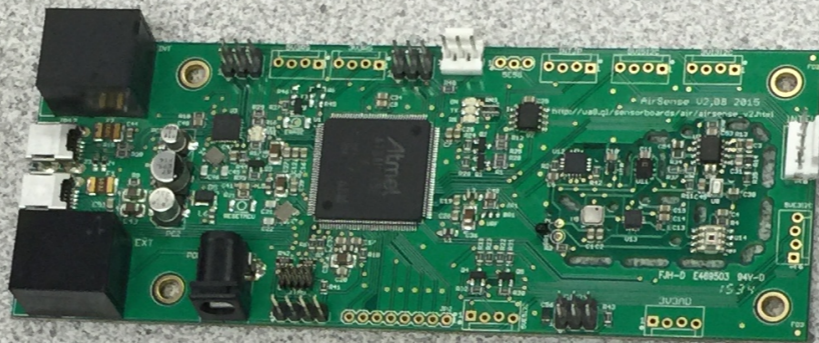




**CONNECTED
CITIES**



ARRAY  THINGS



Third Generation AoT

July 2014

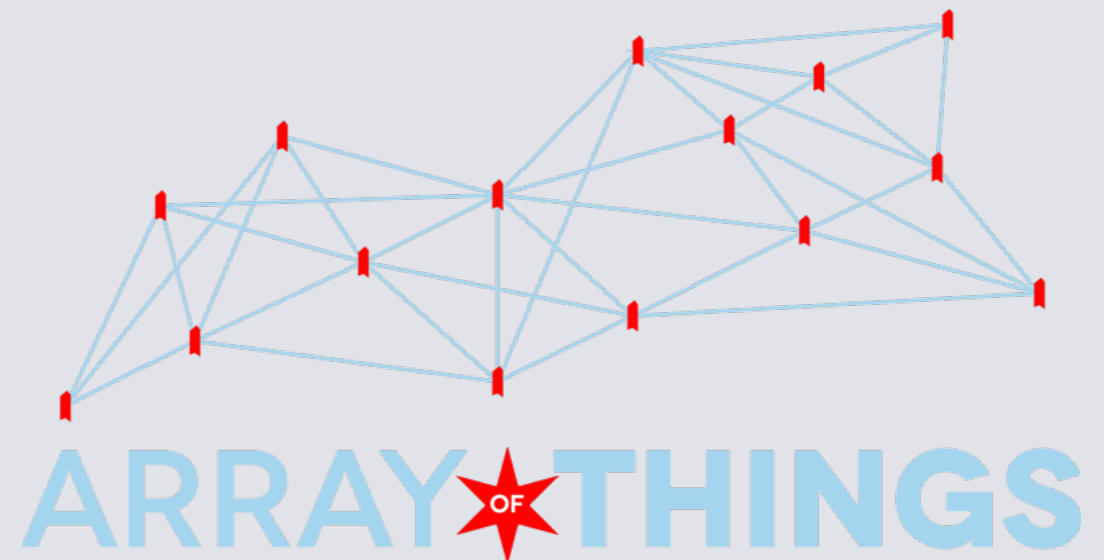
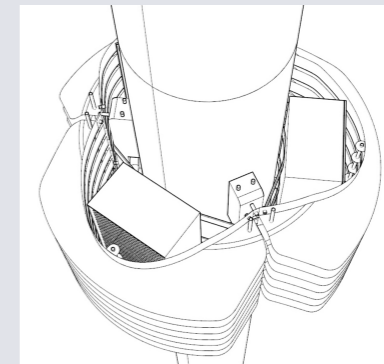


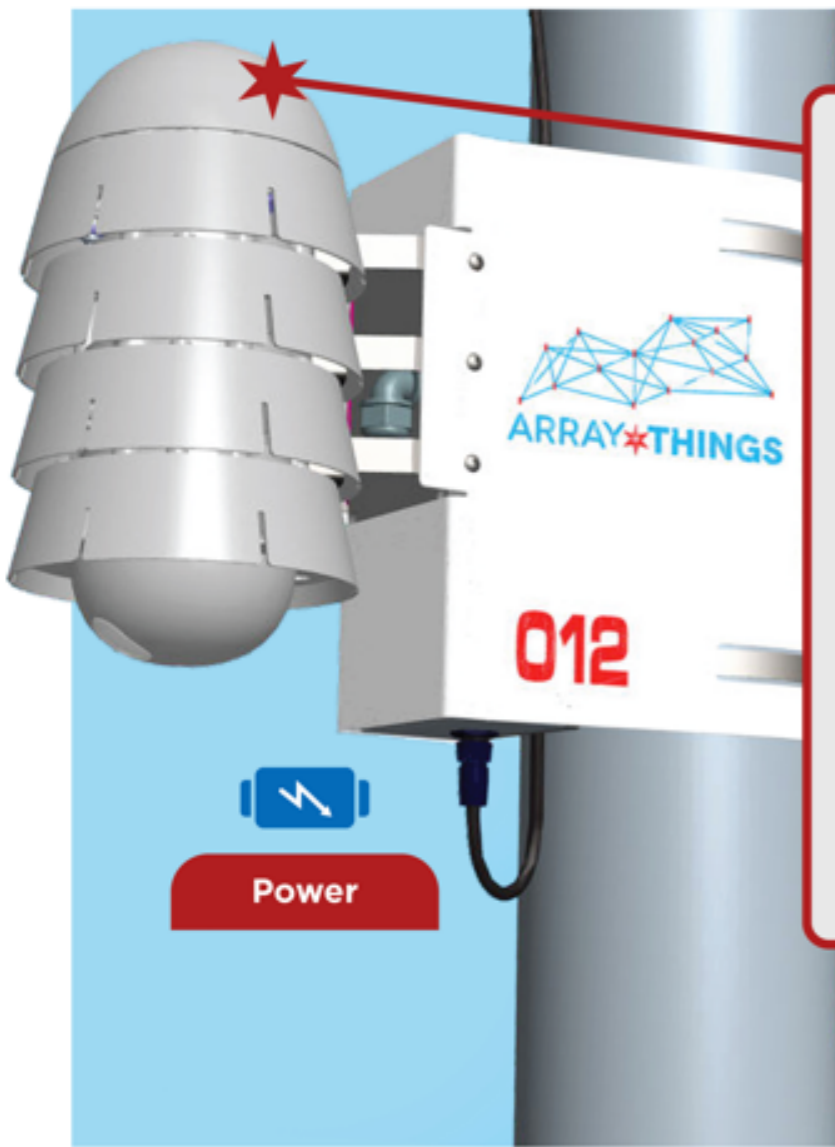
May 2015



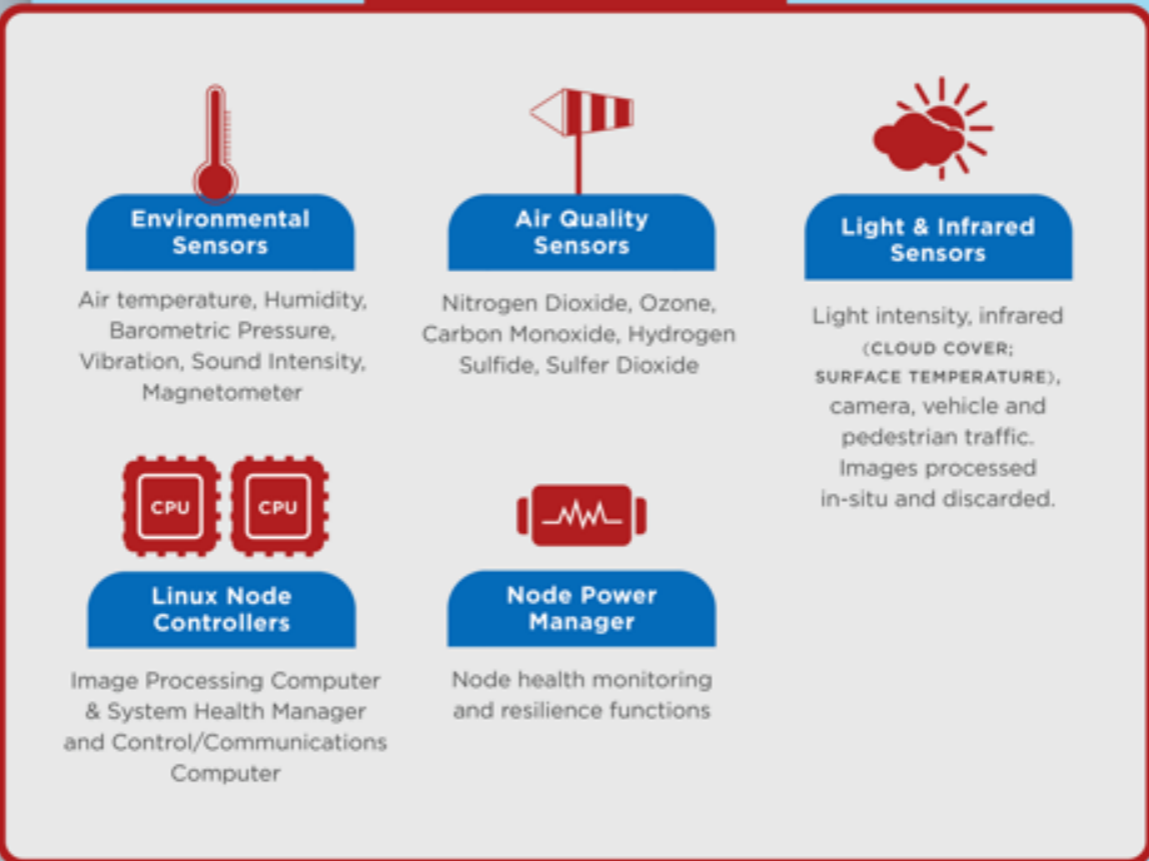
Fall 2015

Street Light Pole Units





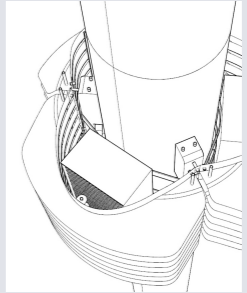
Node Components



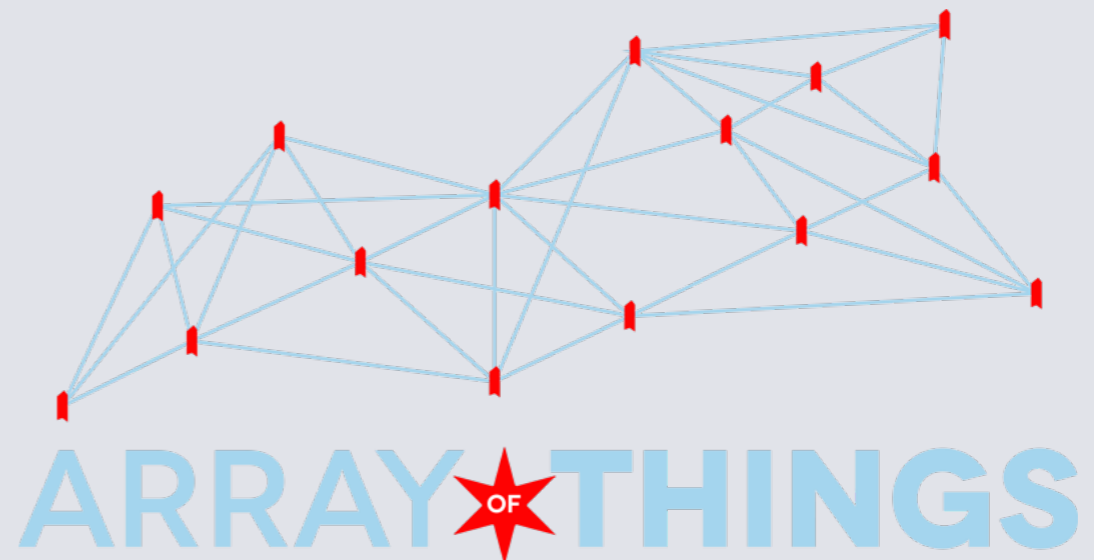
Argonne Server

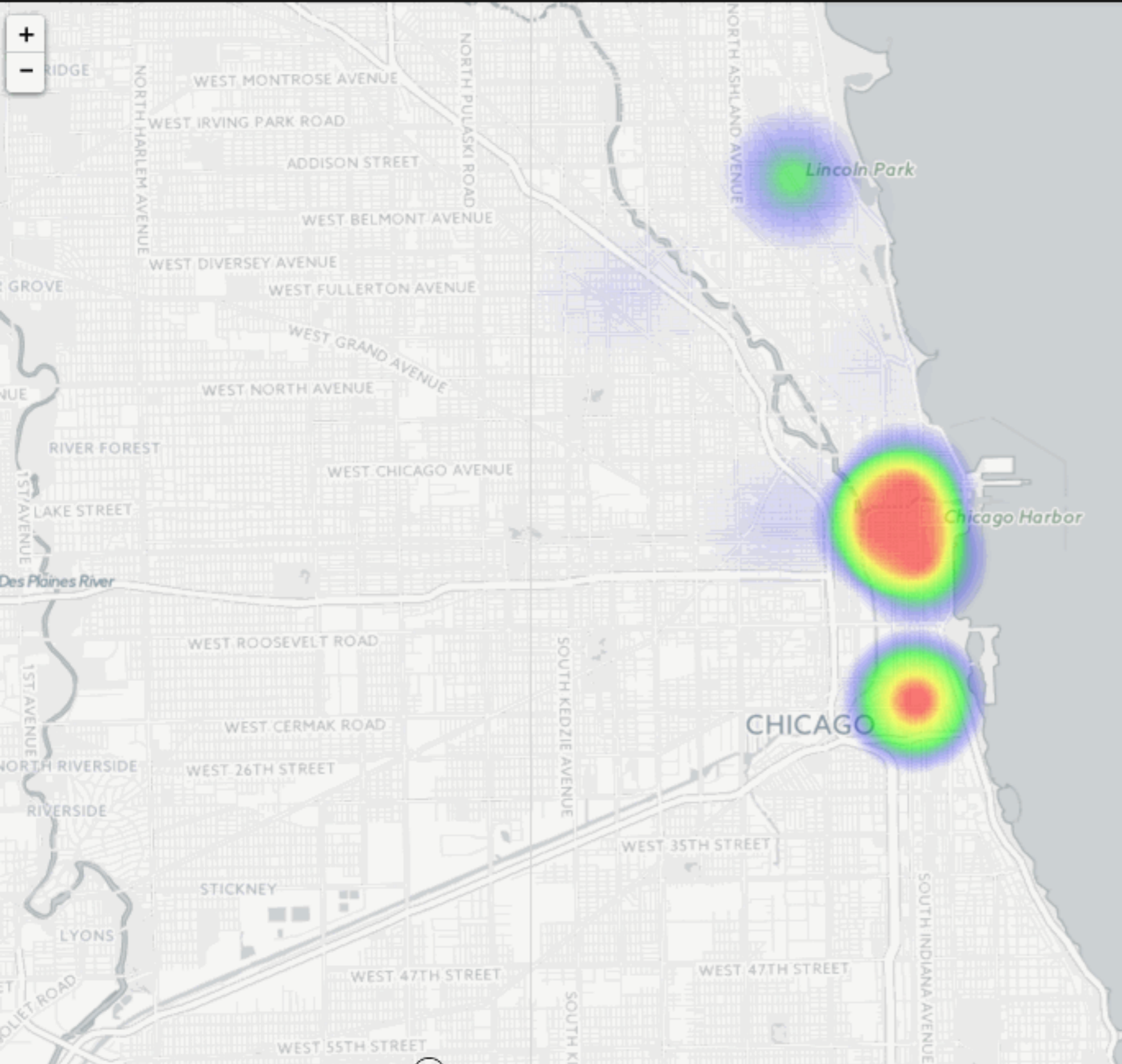


Plenario, Open Data Portals, Dashboards, and Apps



By late 2015 we expect to have the capability to produce hundreds of nodes, given increasing interest from cities worldwide.





Graph It!

Stream Graph



[< Previous Article](#)

[Next Article >](#)

National Science Foundation Awards \$3.1 Million to Chicago's Array of Things Project

NSF Grant will fund development and installation of 500 nodes in Chicago

Released: 14-Sep-2015 12:05 PM EDT

Source Newsroom: [Computation Institute](#)

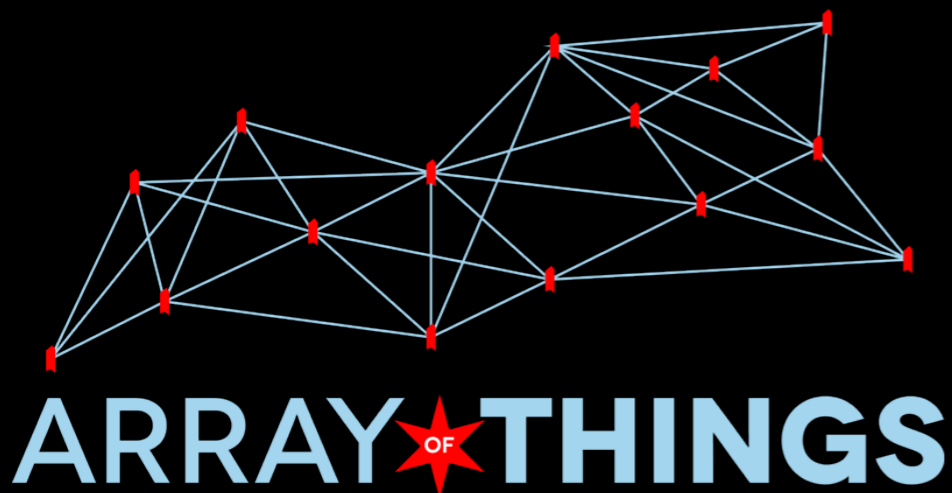
[more news from this source](#)

★ [Add to Favorites](#)

Contact Information

Available for logged-in reporters only

Newswise — CHICAGO—The University of Chicago (UChicago) announced today that the National Science Foundation has awarded a \$3.1 million grant to support the development of Array of Things, an urban sensing instrument that will serve as a fitness tracker for the city. Starting next year, 500 [Array of Things](#) (AoT) nodes will measure data on Chicago's environment, infrastructure and activity to scientifically investigate solutions to urban

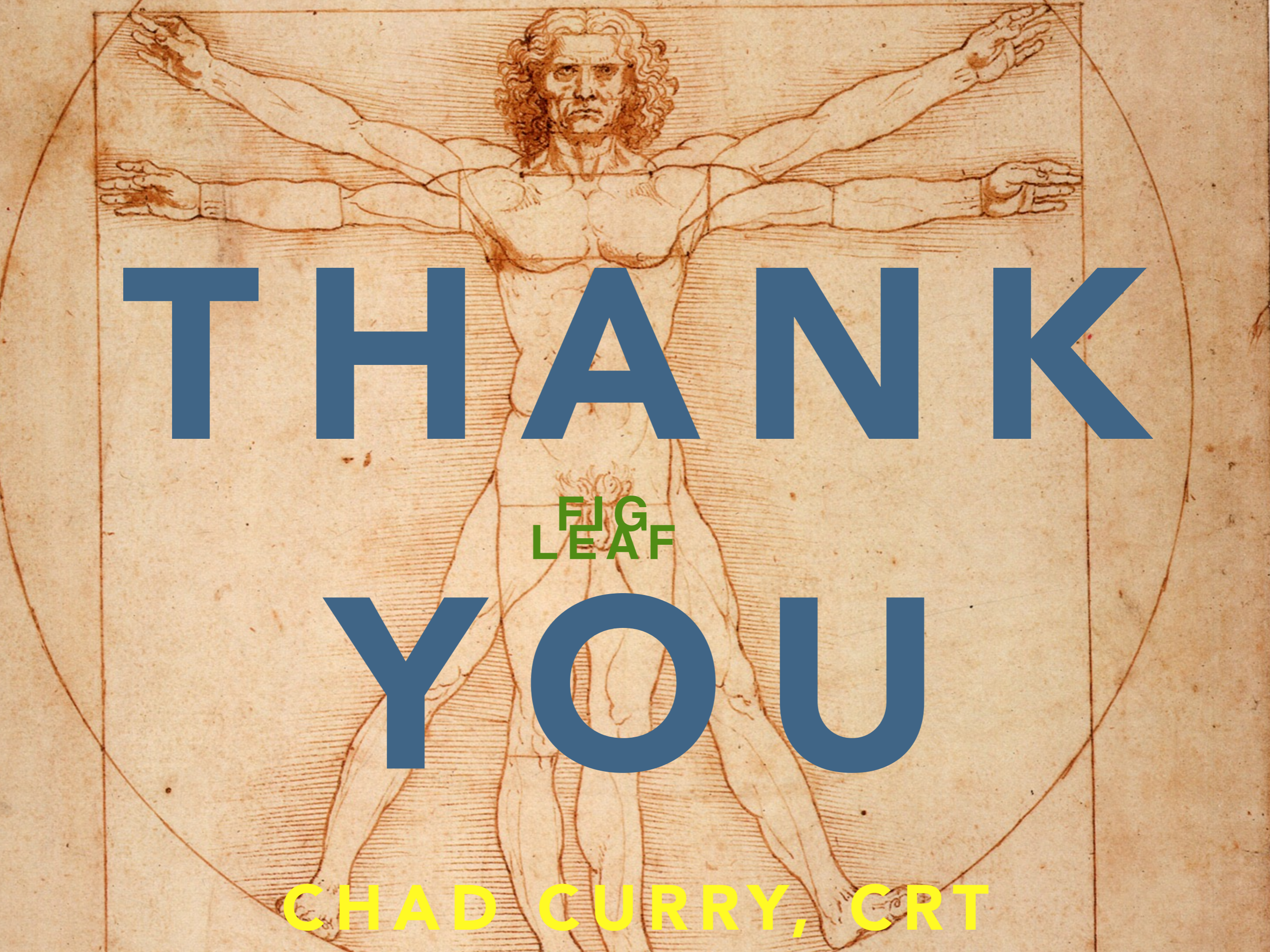




A SYSTEM

OF

SYSTEMS



THANK

**FIG
LEAF**

YOU

CHAD CURRY, CRT

CENTER FOR
REALTOR[®]
TECHNOLOGY

@crtlabs

@crtweet

crt.blogs.realtor.org

crtlabs.org