Web Services that Foster Innovation in Buildings Energy Analysis Tools

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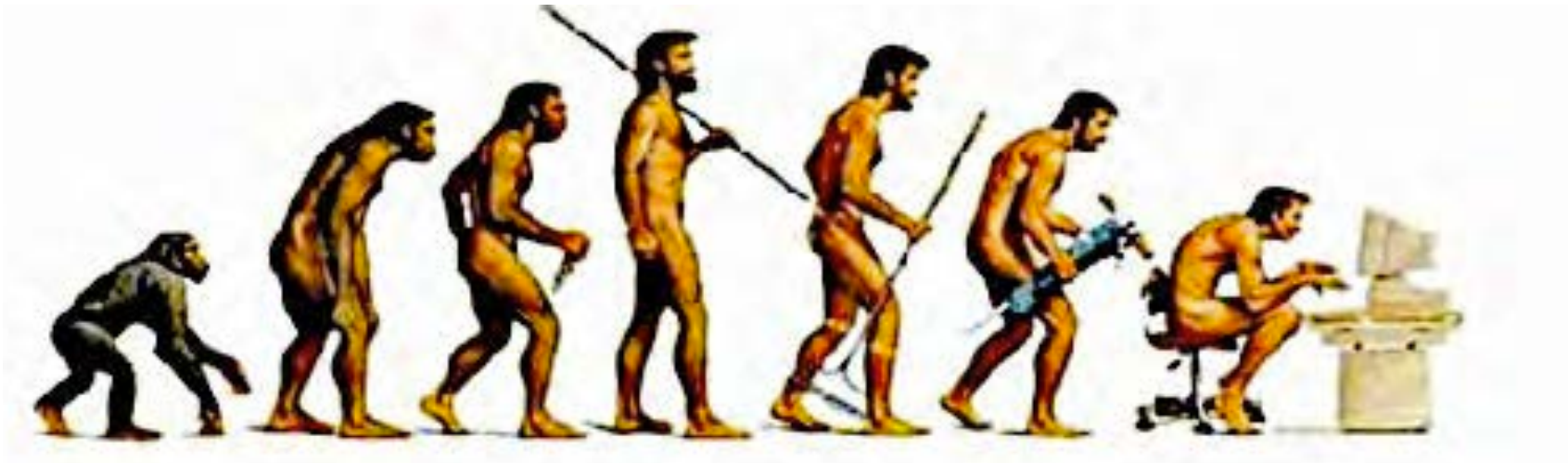
Presented at the 2012 ACEEE Summer Study on Energy Efficiency in Buildings, Asilomar, CA August 13-17

Thanks to the Home Energy Saver and EnergyIQ core teams:
Norm Bourassa, Leo Rainer, Rich Brown, Greg Homan, Danny Parker, and Andrea Mercado

Evolution of Energy Software Tools

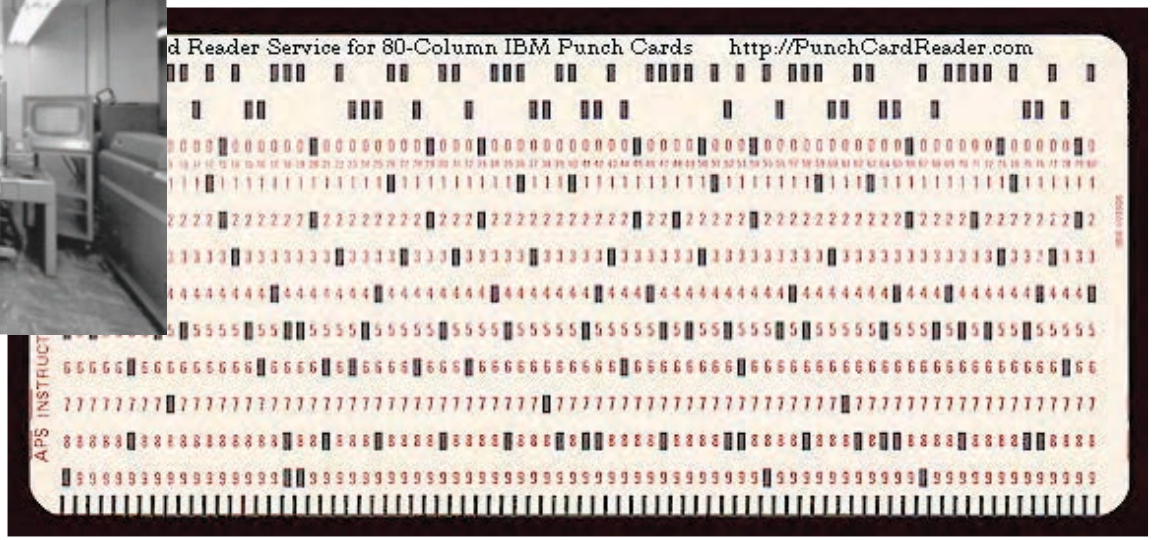


Hand Calculations

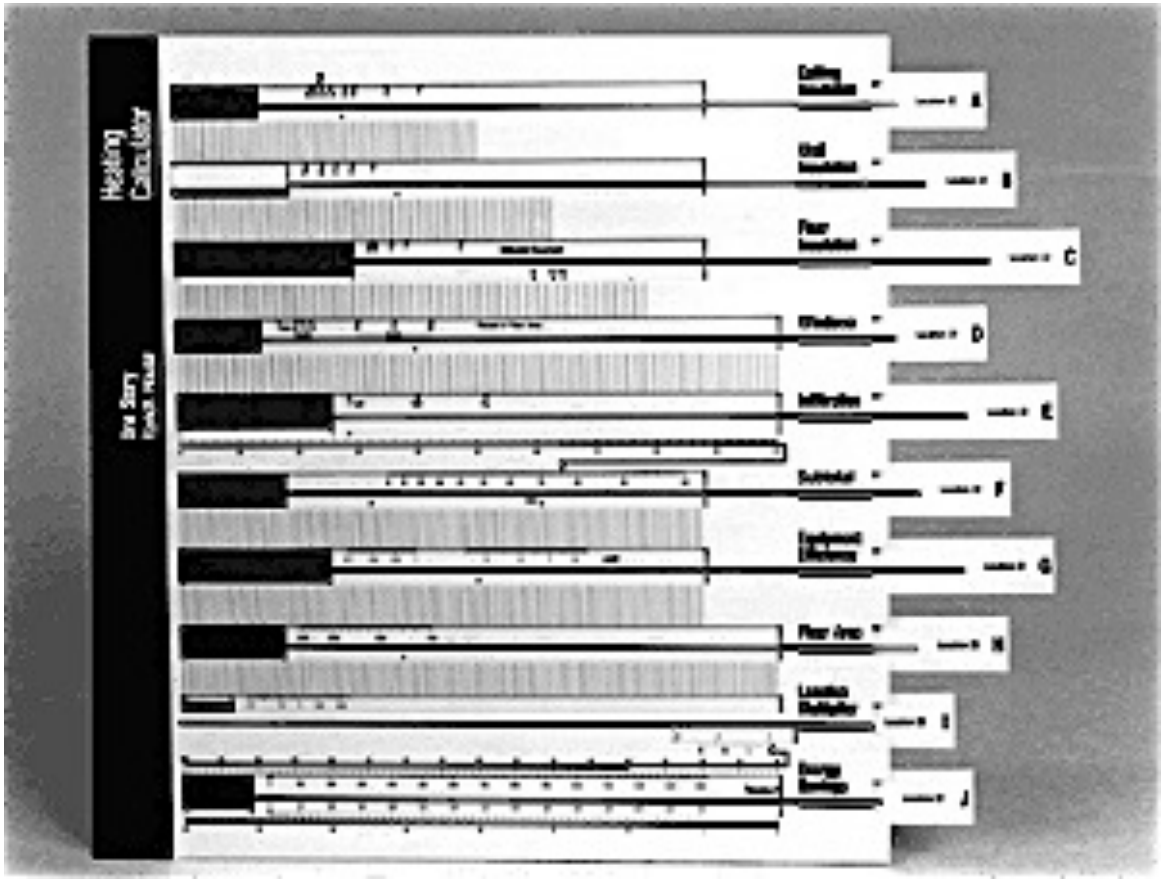
UAΔT + infiltration + solar

Mainframes

- Room-sized computers; painful input; no GUI; massive output
  - very narrow user base
  - runtime measured in <u>hours</u>



Lookups & Nomographs



Desktop Machines

- Disk-based
  - hundreds or thousands of users
  - runtime measured in minutes

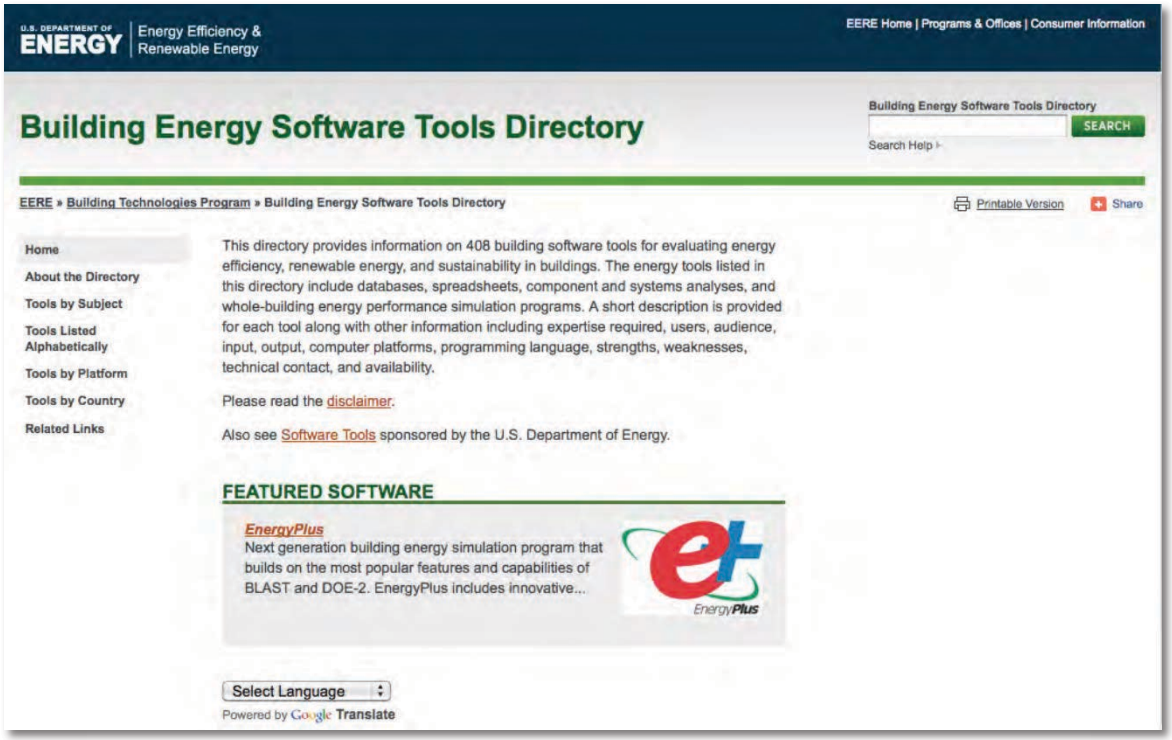
195kb capacity

Web-based

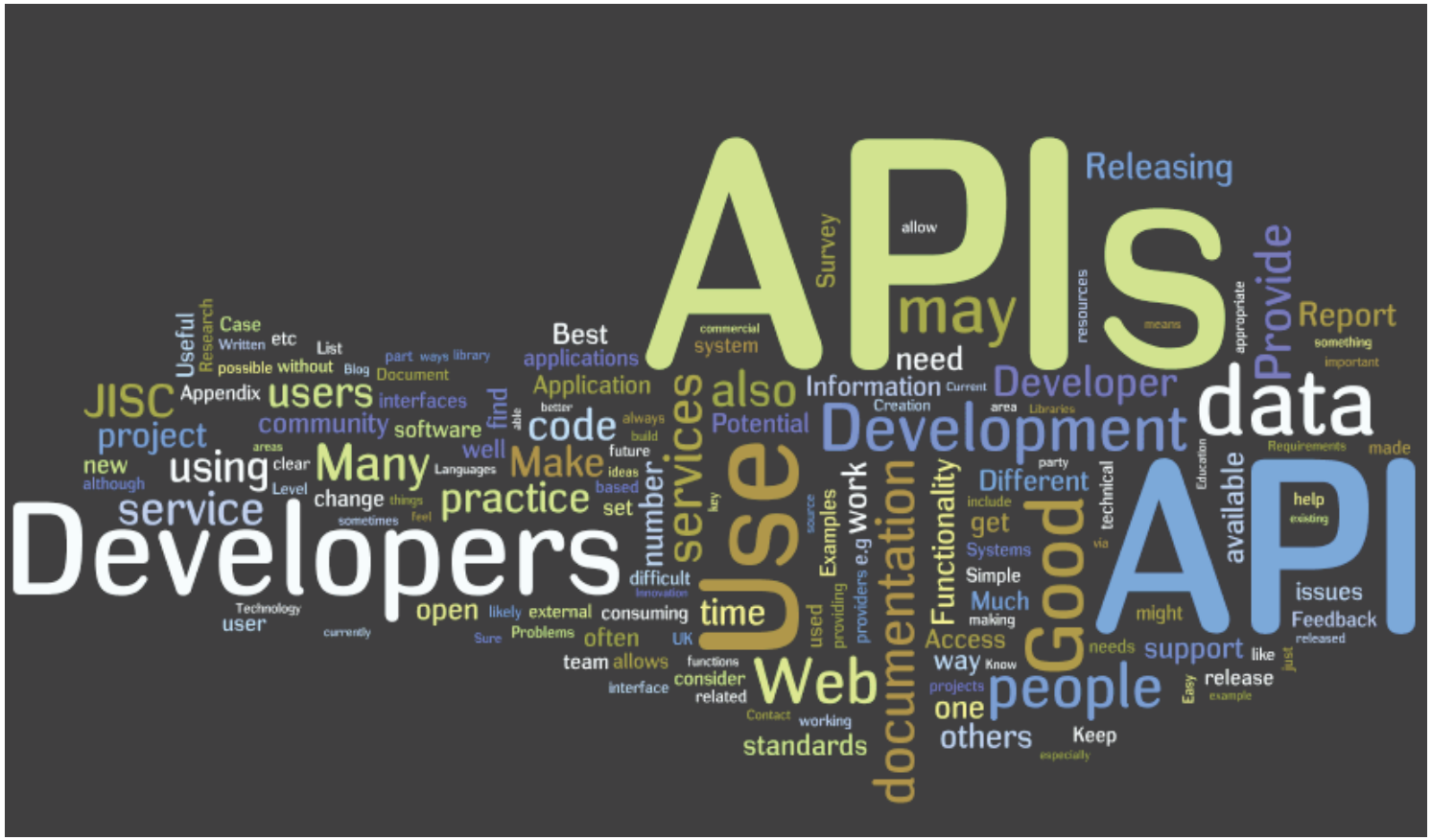
- Cloud-hosted applications with friendly GUIs
  - millions of users (including DIY)
  - runtime measured in seconds

At Least 400 Tools Now Exist

- Vibrant differentiation, but also a lot of redundancy in effort/cost (and inconsistency in results)

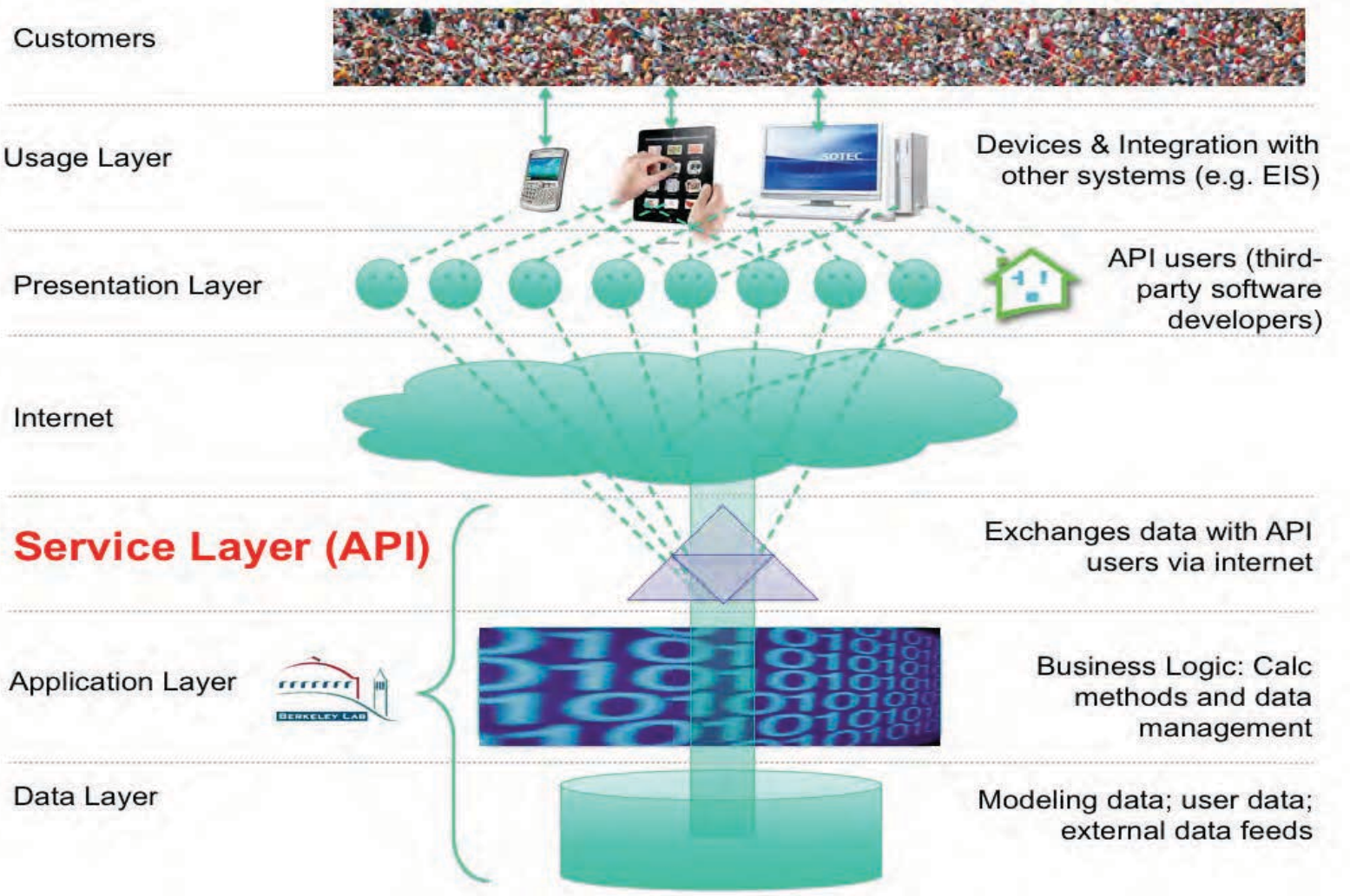


Software as a Service → APIs



What is an API, anyway?

APIs are protocols through which the a host computer and a client computer communicate and exchange data, leaving client free to decide how to gather input data from its customers and how to present them with results



APIs

Pros

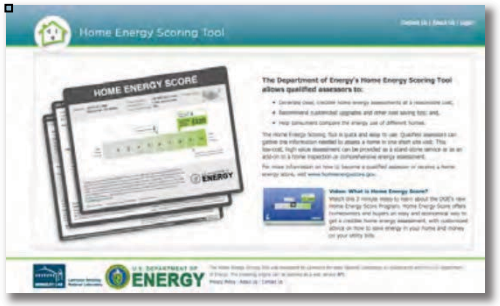
- Speeds and simplifies syndication of models and databases
- Radically lowers the cost of entry for private software developers
- Developers can focus more on front-end
- Enables more rapid innovation and differentiation of tools
- Facilitates more internal consistency in methodology and data across proliferation of tools
- Ameliorates stereotypical separation between “public” and “private” tools

Cons

- Requires web-infrastructure
- Derivative tools all depend on single API provider
- Initial development is slower; user support
- Developers need special skills and to be able to understand and adapt to outside service and support paradigm
- Requires very explicit documentation for third-party developers

LBNL APIs and Early Implementations

- **Home Energy Saver (Consumer & Pro versions)**
  - Whole-building simulation, including hourly HVAC (DOE2.1E)
  - Models/algorithms for all other end uses
  - Flexibility to model utilization and other behavioral variables
  - Defaults for every input
  - Whole building and end-use results: Energy / Costs / Emissions
  - Upgrade recommendations



- **Home Energy Scoring Tool**
  - HES Operational approach => Asset rating approach
  - Answers required (no user defaults)
  - Creates PDF label and upgrades list

- **EnergyIQ**
  - Non-residential energy benchmarking
  - 62 building types
  - 85 features/characteristics
  - 9 metrics (energy / costs/ emissions)
  - 4 chart types
  - Recommendations
  - Portfolio Manager import

API Deployment

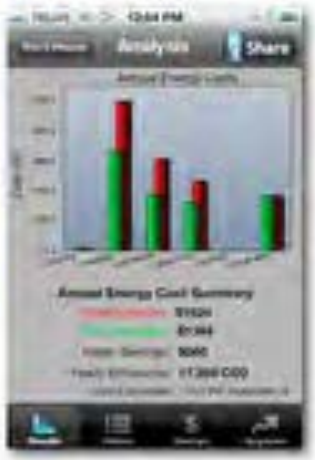
- About 300 entities have expressed interest in these APIs
- Within the first year, more than 50 entities (public and private) became users.
- Some launched products, others still working, others fell away
- More runs are generated via our APIs now than via our own GUIs

Microsoft *hohm*

- Who: Microsoft
- What: Consumer education

Mobile App: iViro

- Who: Envirolytics
- What: Consumer education & lead generator
  - Uses other apps to facilitate inputs
    - Compass for orientation
    - Camera + geometry for estimating wall heights and areas.

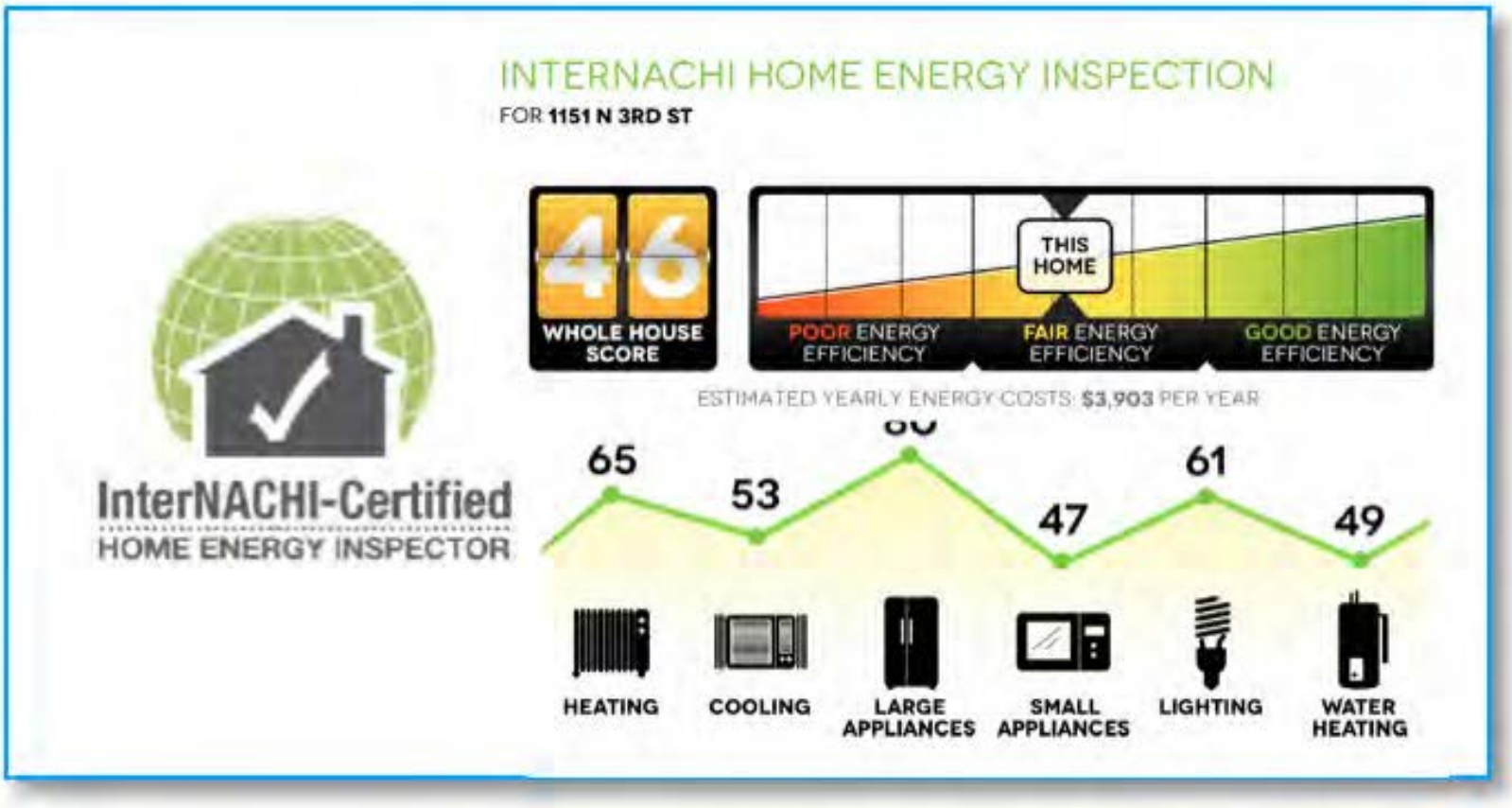


Consumer Tool

- Who: WattzOn
- What: Consumer education & lead generator

Home Inspector Tool

- Who: InterNACHI
- What: Home rating and tool for members

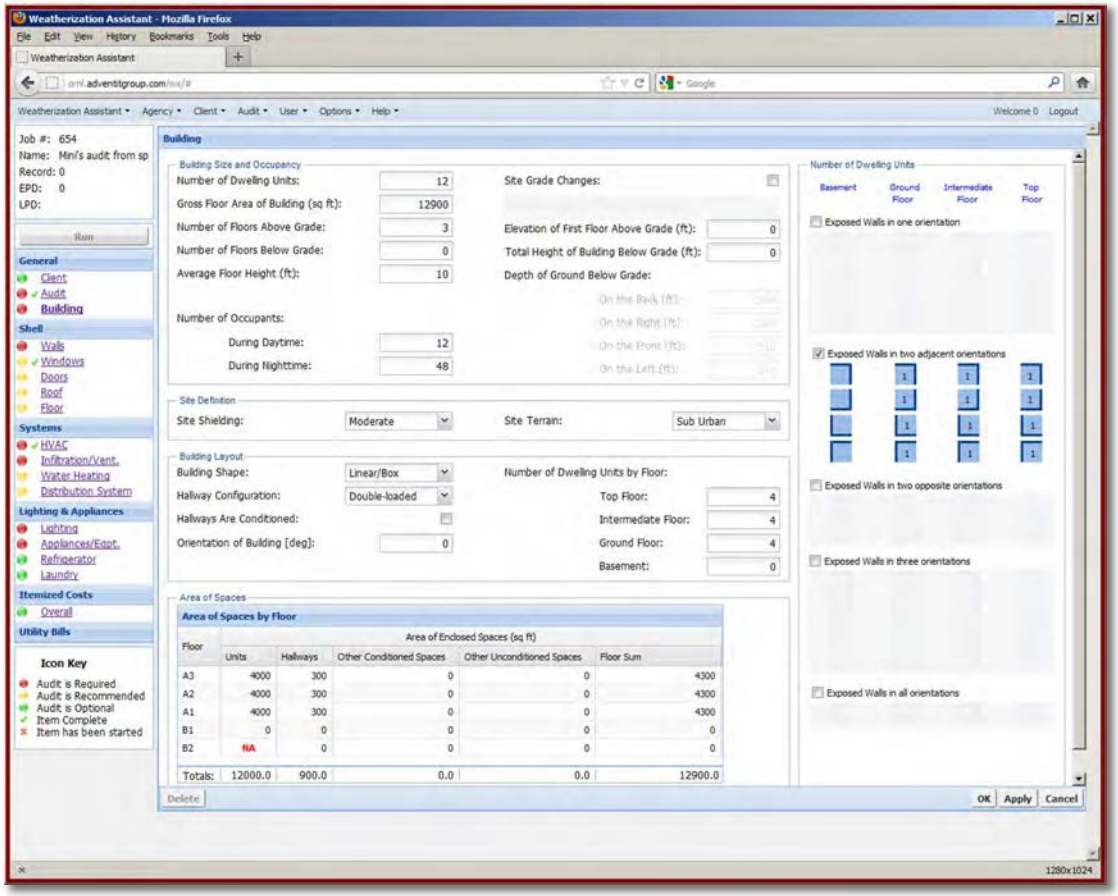


Home Energy Scoring Tool:
iOS (iPhone, iPad) Android (Phone, Galaxy Tab)

- Who: MNCEE
- What: Scores plus software for project mg't

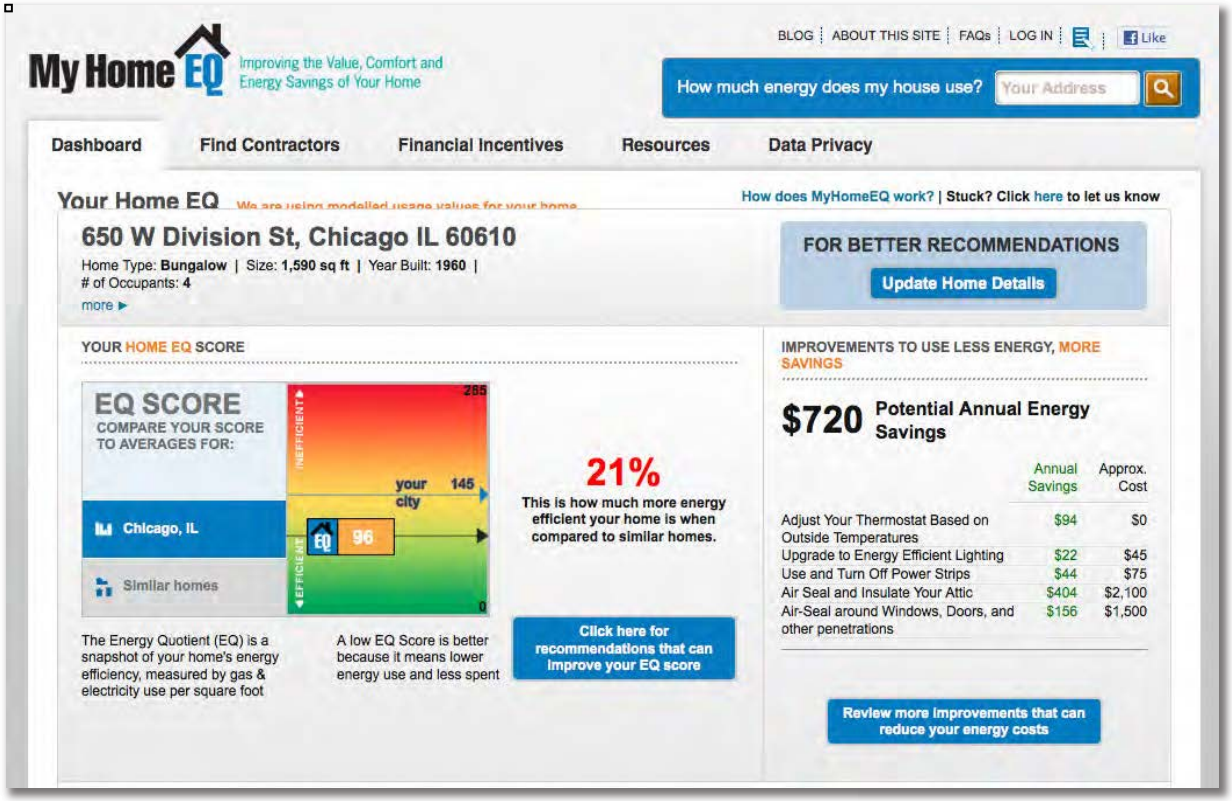
DOE WAP - MulTEA

- Who: ORNL
- What: Official tool for weatherization audits



MyHome-EQ

- Who: CNT spinoff
- What: Home rating + lead generation

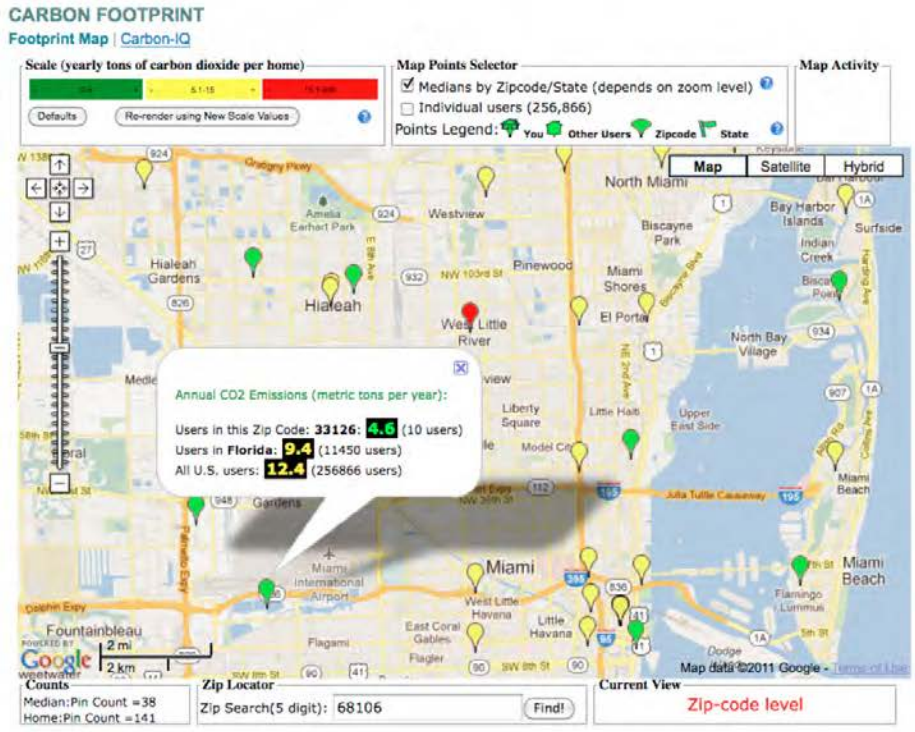


CoolCalifornia

- Who: California Air Resources Board
- What: Carbon calculators for homes and businesses

Future Directions

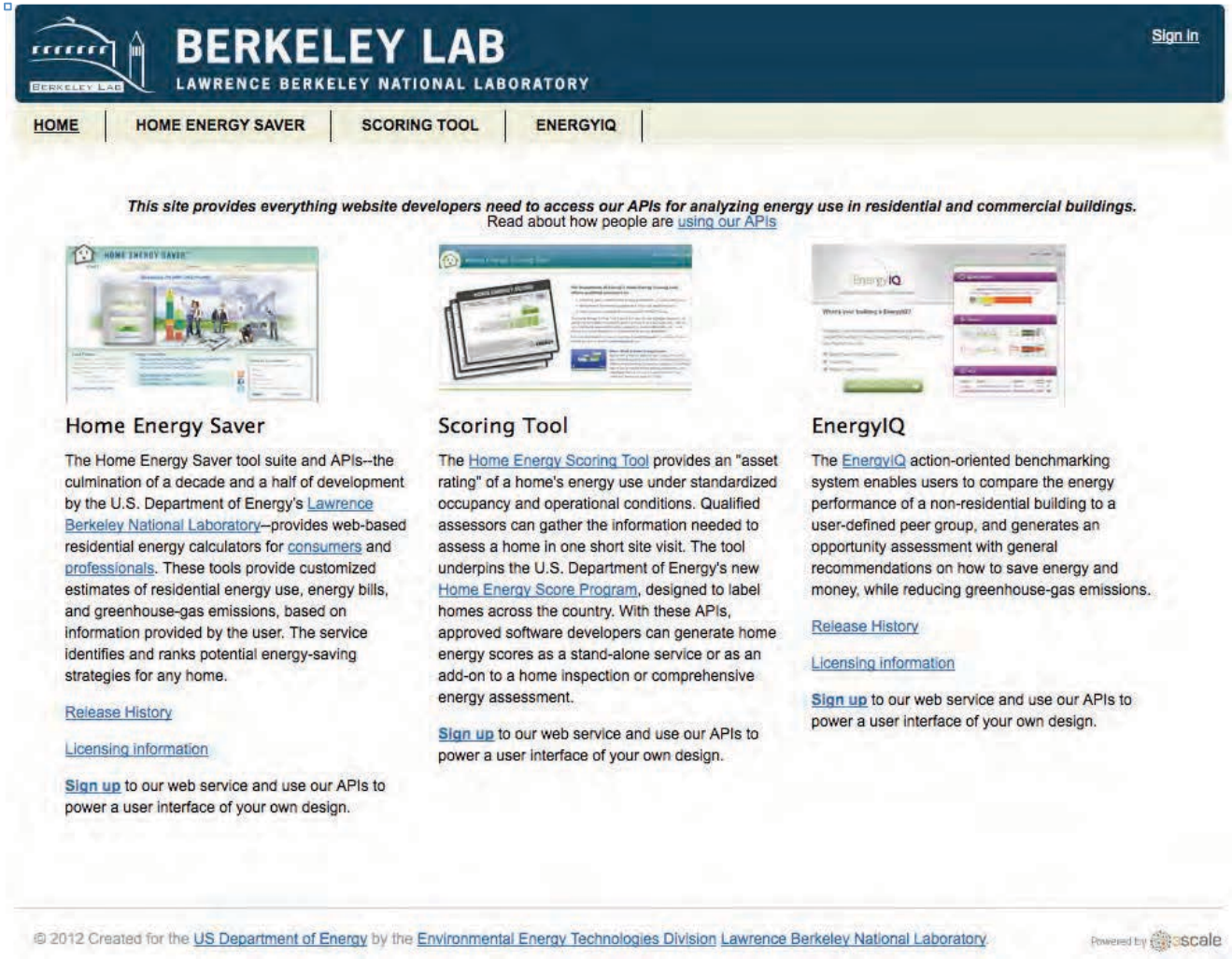
- Embedded *inside* devices (e.g. TSTATS)
- EMS integration
- Mash
- Etc…



Take-aways

- APIs are powerful new technologies for energy modeling
- Public R&D investment is enabling private-sector innovation in user-interfaces and delivery, eliminating bottlenecks, and (potentially) supporting back-end standardization
- The public sector is a good place for developing APIs
  - There's no money in it
  - Innovative mode of technology transfer
  - Non-proprietary (no particular product or fuel orientation)
  - Staying power
- Not for the faint of heart
  - Development is grueling
  - Users are demanding
  - Stakes are high (others depend on your service)
- Users are (understandably) fickle

https://developers.buildingsapi.lbl.gov/



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