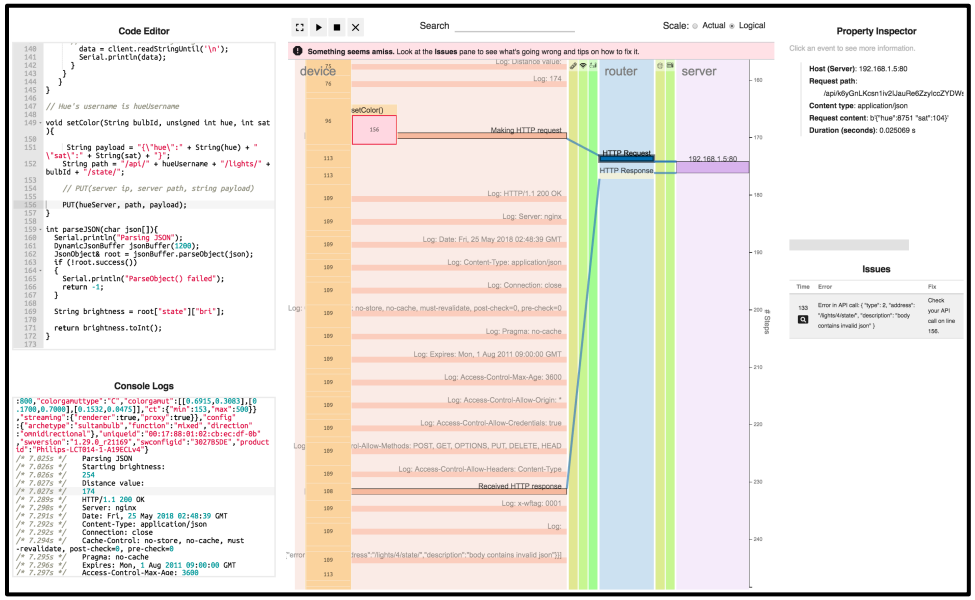
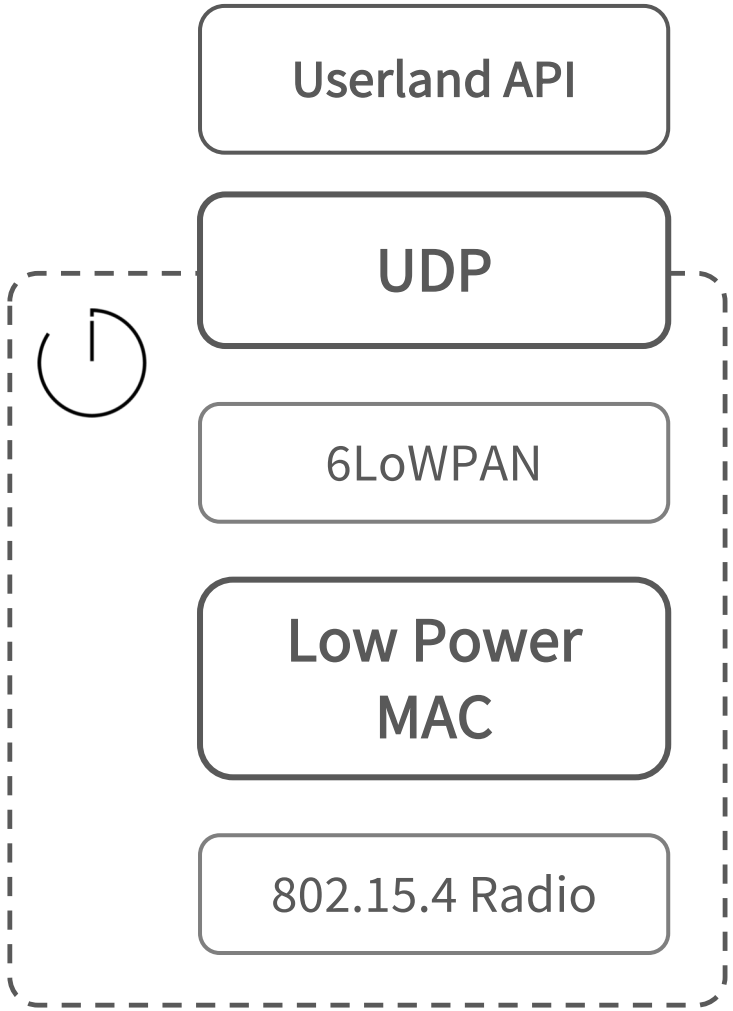
WiFröst – IoT Debugging IDE

Instruments device code, network calls, and a local router to capture network communications and program activity

Provides a time-linked data visualization and automatic checks to highlight potential programming errors and failure states



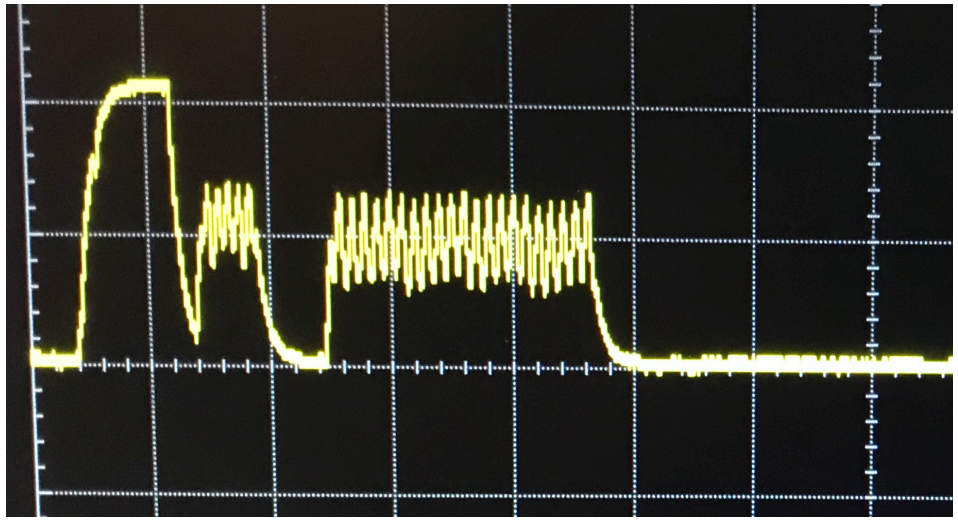
Low Power Networking in Tock




```
#include <udp.h>

int main(void) {

  sock_handle_t handle;
  sock_addr_t addr = { ifaces[0], 15123 };
  udp_socket(&handle, &addr);

  sock_addr_t destination = { ifaces[1], 16123 };
  ssize_t bytes_sent = udp_send_to(&handle, packet, len, &dest
  printf("sent!\n");
```

Making socket-like interface available to untrusted C processes.

Swappable MAC interface and a Rust X-MAC implementation.



Jean-Luc Watson, Paul Crews, Conor McAvity, Hudson Ayers

ObliDB: Oblivious Query Processing using Hardware Enclaves

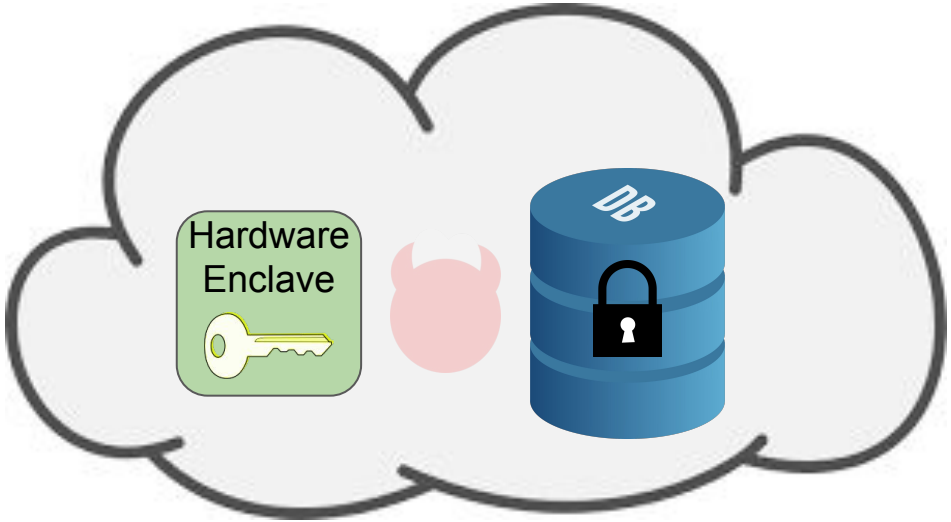
Saba Eskandarian and Matei Zaharia

Point Queries

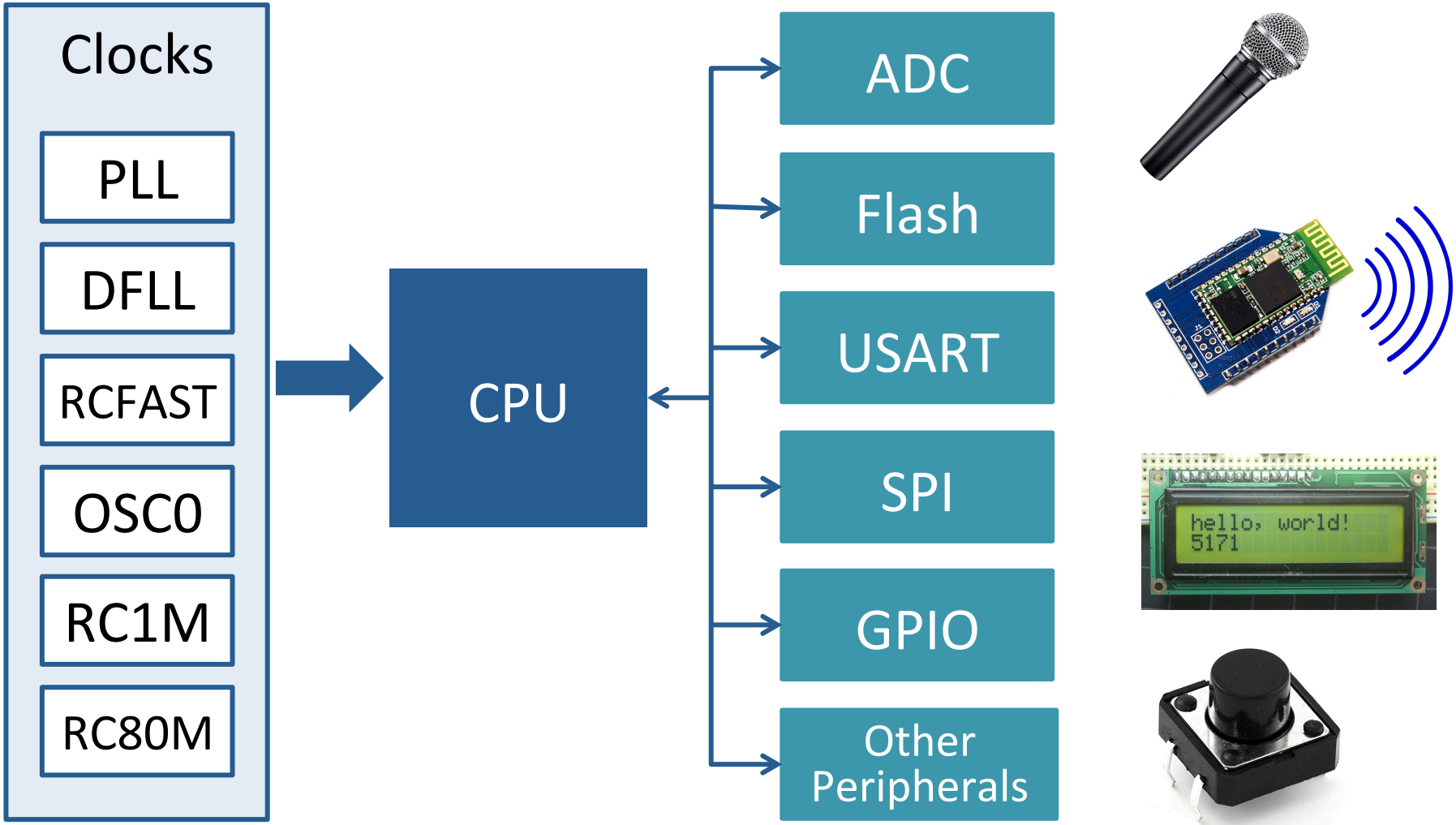
- 3-10ms point queries on 1M rows
- 7-22x faster than prior work that doesn't use enclaves

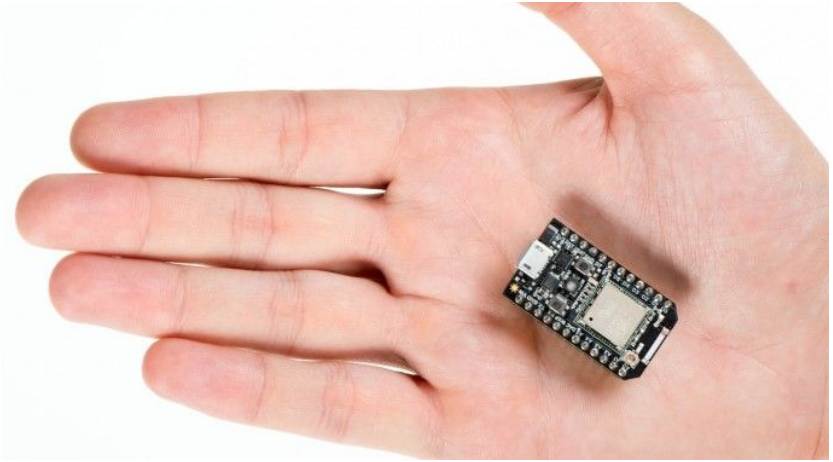
Analytics

- 20-330x improvement over Naive approach
- 1-19x improvement over Opaque



Dynamic Multi-Clock Management for Embedded Systems





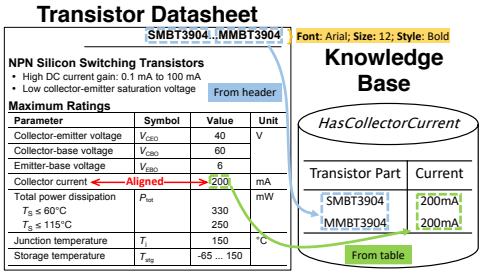
LoWPAN

Design Considerations for Low Power Internet Protocols

Hudson Ayers

Fonduer: Knowledge Base Construction from Richly Formatted Data

SIGMOD'18



Input: Richly formatted documents (PDF/HTML/XML/etc.)
Output: Structured, queryable knowledge base

Paper: `arxiv.org/abs/1703.05028`
Code: `github.com/HazyResearch/fonduer`

Challenges of Richly Formatted Data

- Prevalent document-level relations
- Multimodal information
- Data variety

Fonduer Users:

DARPA MEMEX
accenture
Alibaba Group
Macrostrat Lab
Stanford MEDICINE
District Attorney New York County
SING Stanford Information Networks Group

`fonduer` is available as a Python package today!

Sen Wu, **Luke Hsiao**, Xiao Cheng, Braden Hancock, Theodoros Rekatsinas, Philip Levis, Christopher Ré — Stanford University

Pantheon: a community evaluation platform for congestion control

Francis Yan, advised by Keith Winstein and Philip Levis https://pantheon.stanford.edu

Pantheon contains:

- a common reference set of 15+ benchmark algorithms
- a diverse testbed of network nodes in 10+ countries
- a collection of pathological and *calibrated emulators*
- a continous-testing system and a public archive of results

Pantheon use cases

- Vivace (NSDI 2018)
- Copa (NSDI 2018)
- Indigo: a machine-learned congestion control

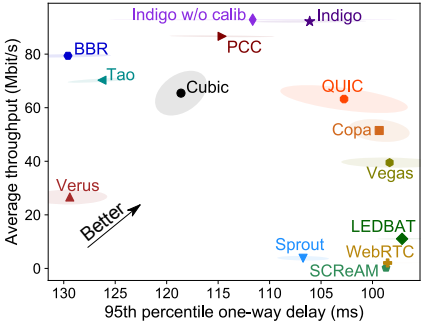
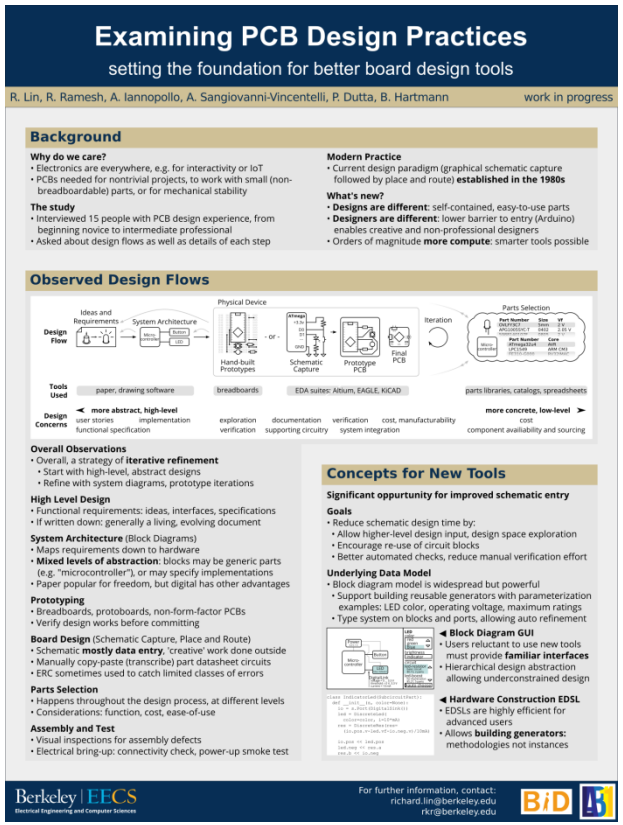


Figure: AWS Brazil to Colombia (wired, 1 flow, 10 trials, P1439: pantheon.stanford.edu/result/1439)

User-Centric PCB Tools

- SITP ’17: EDG talk
  (Embedded Design Generation)
  - Solver synthesizes circuit from spec
  - Is it sufficient for all designs?
- We interviewed PCB designers
  - Hobbyists, researchers, industry
  - Examine holistic design flows
- New design interface proposal
  - System architecture level of input

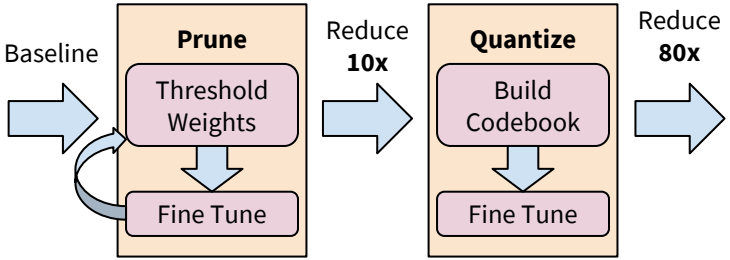


Compressing Neural Networks for Mobile

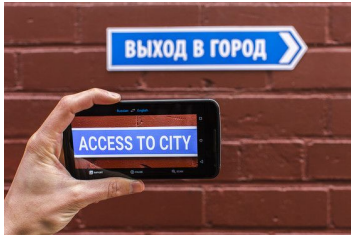
Challenge: Large Models

- Typical model >100MBs
- Large models hard to deploy
- Limited memory bandwidth on mobile

Solution: Network Compression



Our Work: Compressed model for Machine Translation

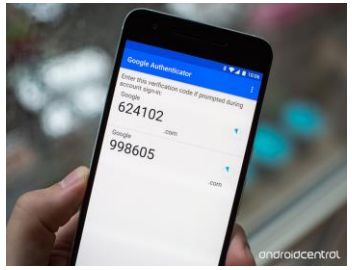


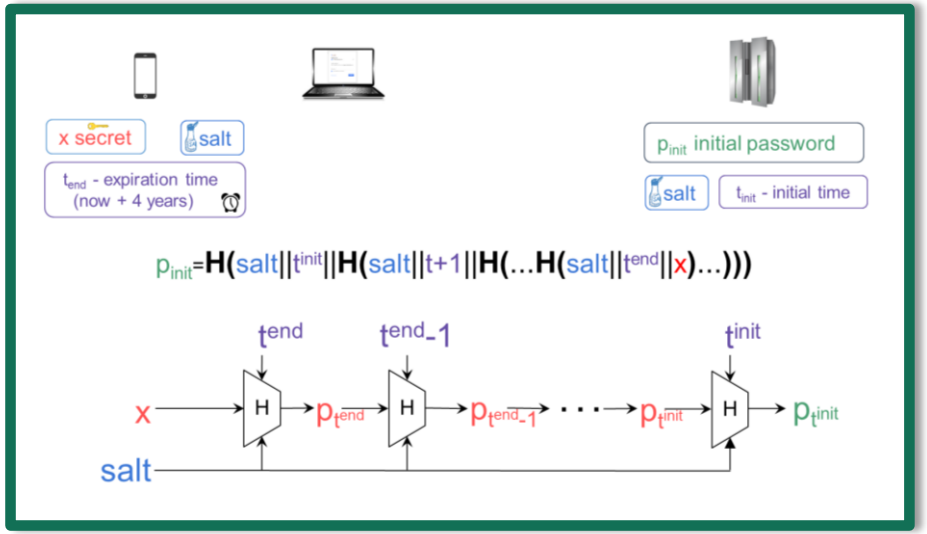
1/80 the size + State of the art accuracy

	BLEU Score		Size
	Original	Retrained	MB
Baseline	28.53	28.29	235.8
Compress	27.44	**28.27**	**3.1**

T/KEY: OFFLINE SECOND-FACTOR AUTHENTICATION WITHOUT SERVER SECRETS

Time-Based One-Time Passwords (TOTP) rely on symmetric keys and are therefore susceptible to server-side hacks





T/Key Agent is an offline second-factor authentication scheme based on hash chains:

- ✓ requires no secrets to be stored on the server
- ✓ OTPs are much shorter than in signature-based schemes

Dmitry Kogan, Nathan Manohar, Dan Boneh

Permamote:

A Long-Lifetime Sensor Platform for a Reliable Internet of Things

Neal Jackson, Joshua Adkins, and Prabal Dutta

- Based on newest, lowest power components
- Hierarchical power supply combines energy harvesting and backup battery storage
- High reliability
- Estimated >10 year lifetime
- Supports occasional long running computation
  - Firmware updates, cryptography

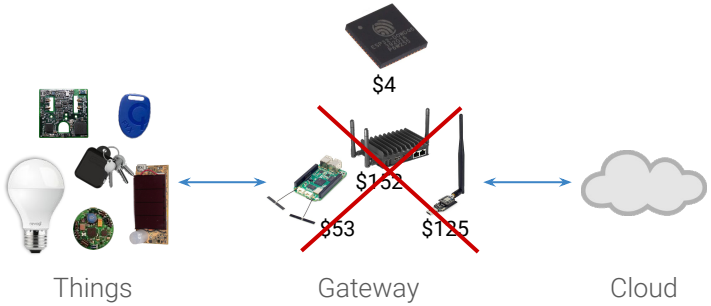
Experiences with Using Bluetooth-Based Tools for Internet Connectivity in the Web of Things

Thomas Zachariah & Prabal Dutta

SITP - June 2018

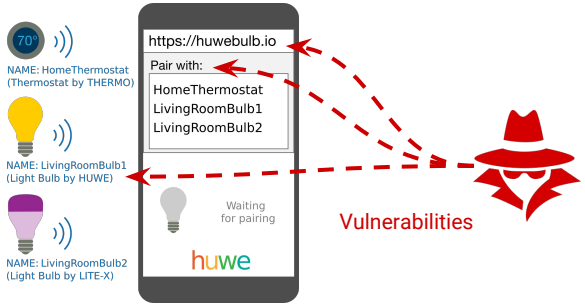
IoT Gateway on a Diet

Creating a simple, cheap gateway using
ESP32, a new SoC with integrated Bluetooth & Wi-Fi



Bluetooth as a Web Standard

Interacting with nearby devices through websites
using Web Bluetooth, a new (risky) W3 standard & JS API



Web Bluetooth Model