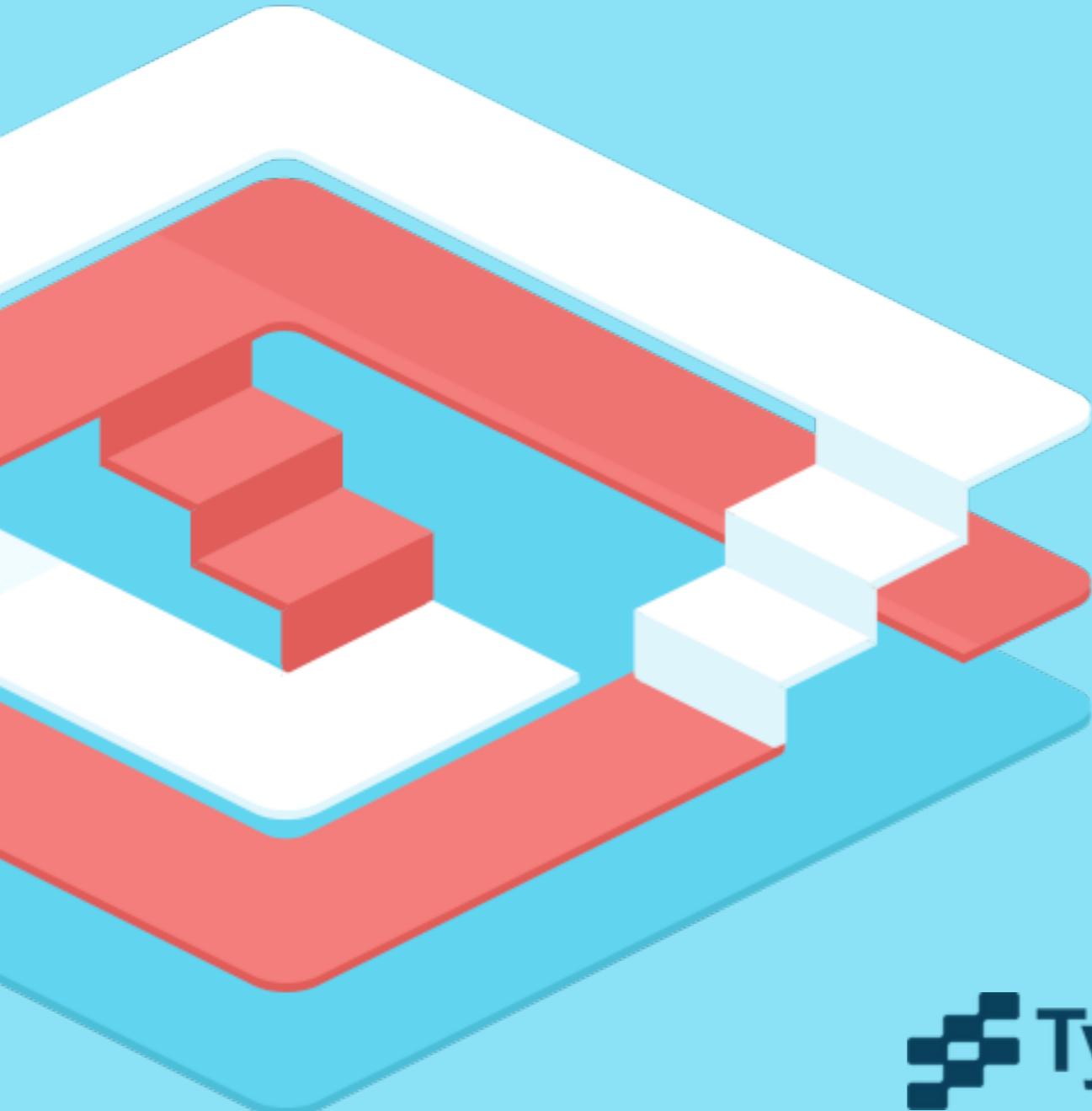


Actors Play backend role for Internet of Things



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**Early
Draft**

Scala Camp, Kraków
May 2014

Internet of Things

The Internet of Things (IoT) refers to uniquely identifiable objects and their virtual representations in an Internet-like structure.

— Wikipedia

Internet of Things

ABI Research: more than
30 billion devices
will be wirelessly connected to the
Internet of Things by 2020.

Internet of Things

Cisco: \$19 Trillion opportunity
with public sector cost savings
~\$4.6 Trillion.

Characteristics of Large IoT

- Large number of “nodes”.
- Potentially large number of messages to/from service providers and managers.
- Message sizes usually small.
- Message frequencies vary.
- Resilience requirements vary.

Characteristics of IoT

- Response times from:
 - Real time: μ -seconds for avionics.
 - Human time: 10s-100s of milliseconds.
 - Phoning home: no response or slow response okay.
- Connectivity: Intermittent to always on.

Examples

Med. Devices, IT Appliances



Med. Devices, IT Appliances

- Phone home with status updates.
 - Diagnose pending problems.
 - Learn client usage patterns.
- Stable internet connection?



Trucks, Farm Equipment



Trucks, Farm Equipment

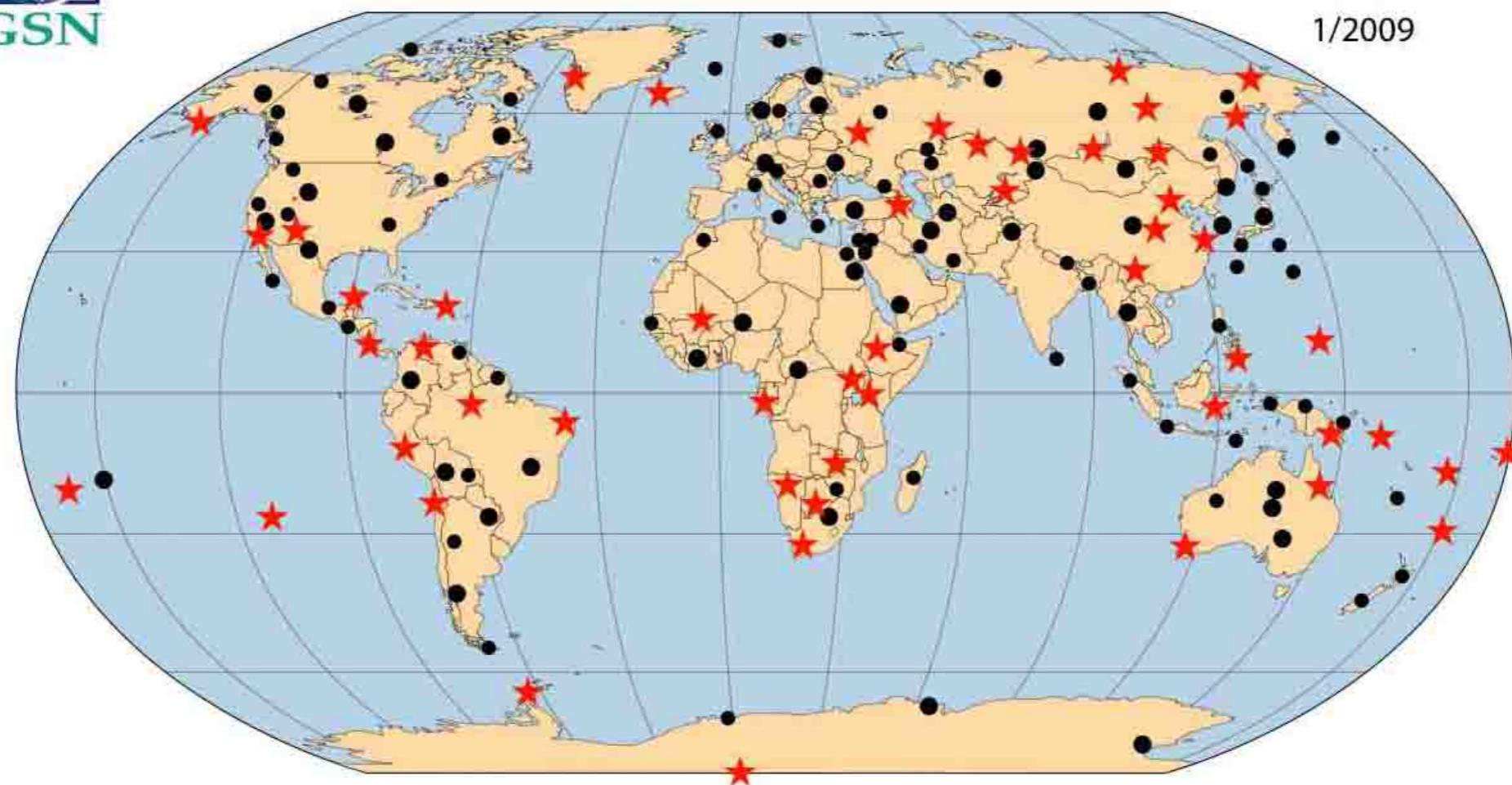
- Phone Home to report movements determined using GPS.
 - Optimize routing.
 - Spy on drivers?
- Occasional network.



Remote Sensors



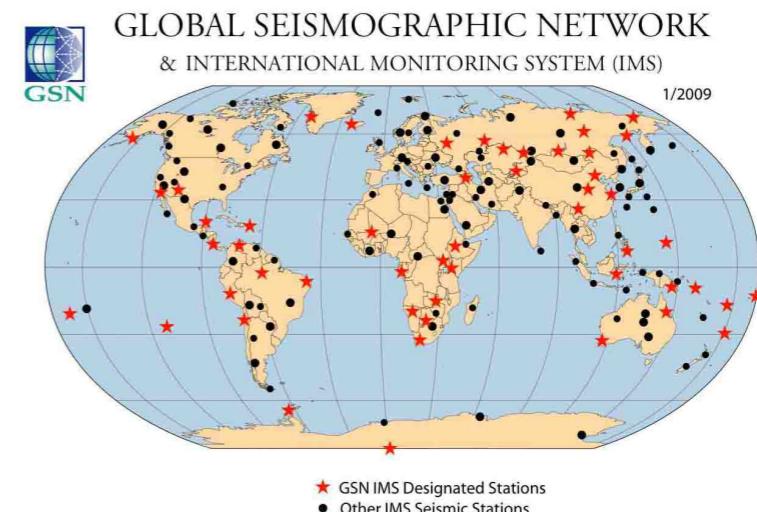
GLOBAL SEISMOGRAPHIC NETWORK
& INTERNATIONAL MONITORING SYSTEM (IMS)



- ★ GSN IMS Designated Stations
- Other IMS Seismic Stations

Remote Sensors

- Human to Real Time: trigger alert systems.
 - Earthquake warning systems.
 - Nuclear test pinpointing – test ban compliance.
- Reliable networks



Wearable Electronics



Wearable Electronics

- Phone Home to Real Time:
 - Trigger health alerts.
 - Gather activity statistics.
- Unreliable networks.



iBeacons



iBeacons

- Small wireless devices
- Low-powered
- You can stick them on the wall
- They periodically (every 200ms) broadcast signal that can be “heard” by smartphones in the range



iBeacons

- Very limited storage capacity
- Very limited computing power
- Provide effectively one-way, passive communication capability



iBeacons

- Smartphones (iOS 7 and latest Android) provide APIs for listening to events
- Getting in/out of range of iBeacon
- Changing distance to iBeacon



The Core Infrastructure

The case for a Reactive
implementation.

The Core Infrastructure

Reactive – the system responds to events quickly, rather than driving system activity

Reactive Manifesto

The Reactive Manifesto

We Are Reactive

Published on September 23 2013. (v1.1) [Table of Contents](#)



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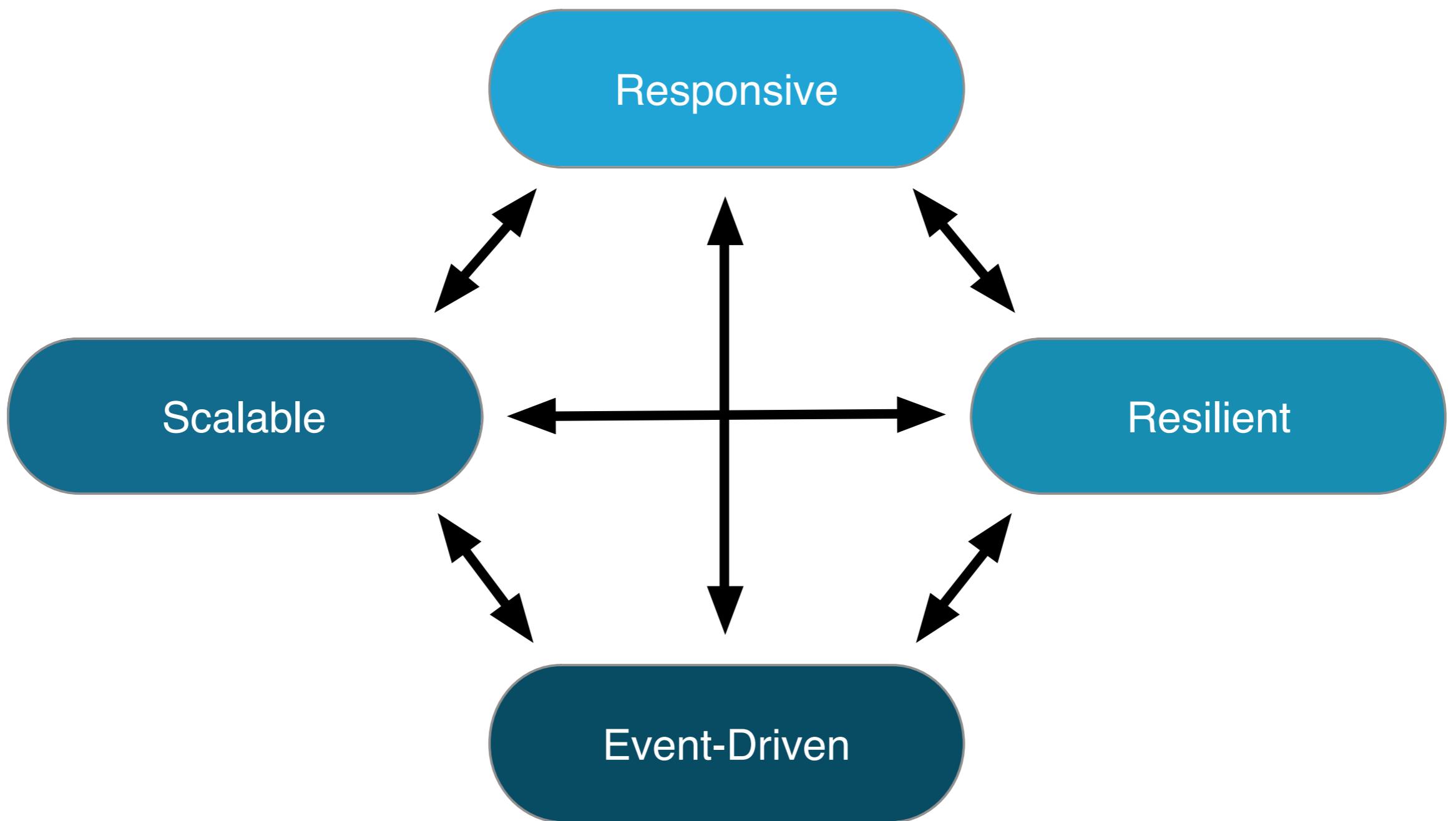
[Sign the manifesto](#)

1948 people already signed ([Full list](#))

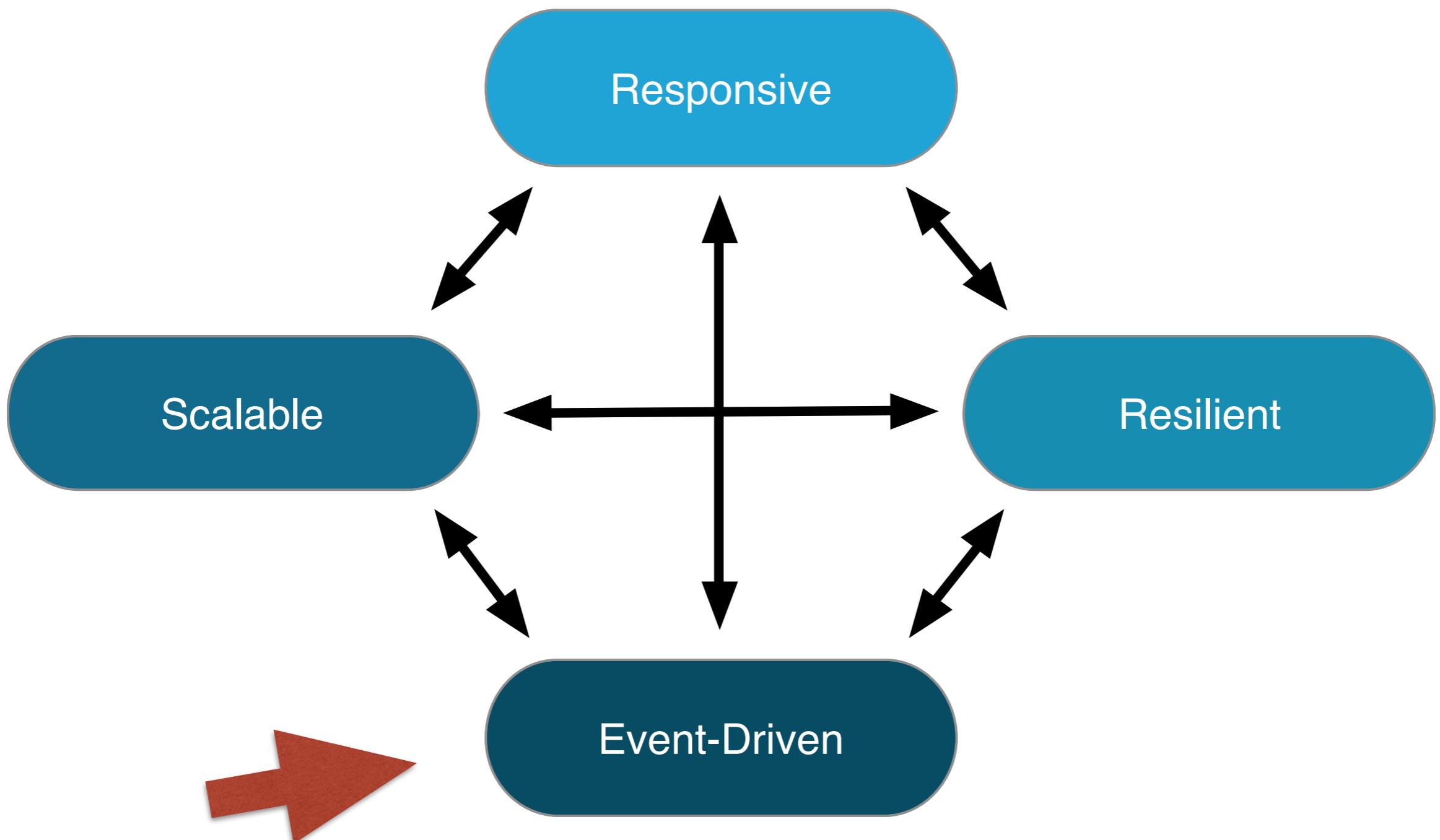


Why a Manifesto?

- **Reactive** has been trending up:
 - Growing popularity of event-driven systems like Node.js, Erlang, Akka.
 - Evangelism: Erik Meijer, Jonas Bonér, Martin Thompson...
 - Define the “buzz word” preemptively...



reactivemanifesto.org



reactivemanifesto.org

Event Driven

Reactive Applications scale up and down on demand

- Asynchronous Programming:
 - Transparently leverage all cores on each CPU.
 - Avoid resource contention; no blocking!
 - Add/remove servers dynamically.

Event Driven

Reactive Applications respond to changes
in the world around them

- Messages are passed between services and subsystems.
- Asynchronous and non-blocking throughout.
- You define the workflow; the runtime decides how to schedule those tasks.

Actors

- Lightweight processes with event (message) inbox
- Process incoming events asynchronously in an event loop
- Can have internal state
- Provide an excellent model for programming event-driven applications

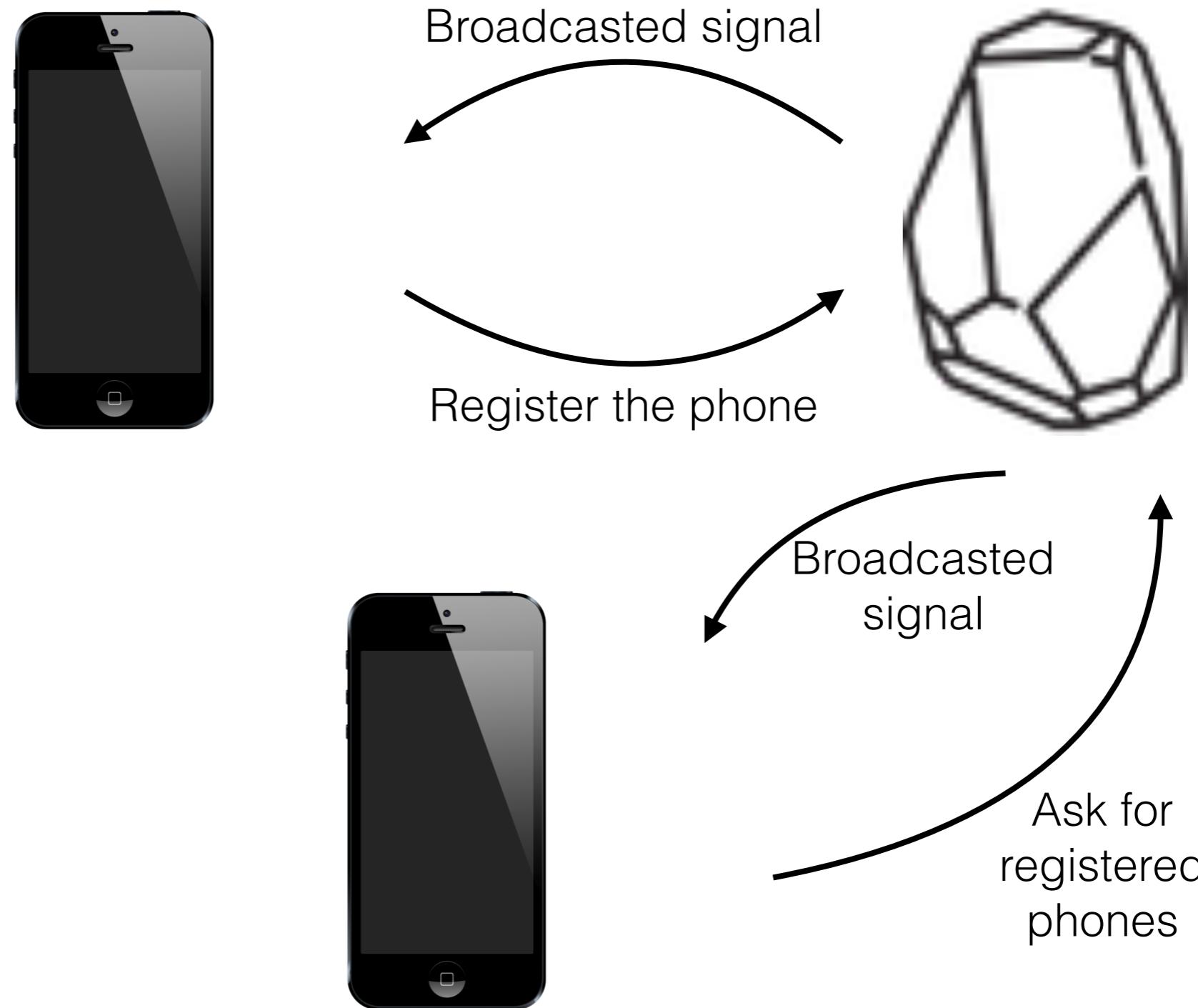
Actors and IoT

- Create virtual representation for physical devices
- Each actor represents a single device
- Virtual mirroring of devices allows one to enhance their capabilities with greater computing and communication power

Storing data in iBeacon



Storing data in iBeacon



Demo

Code at: <https://github.com/gkossakowski/vernier>

**Thanks!
Questions?**