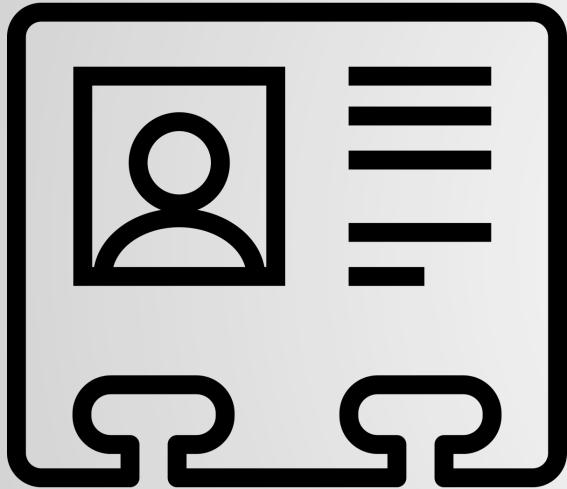




IoT REALIZED
CONNECTED CAR

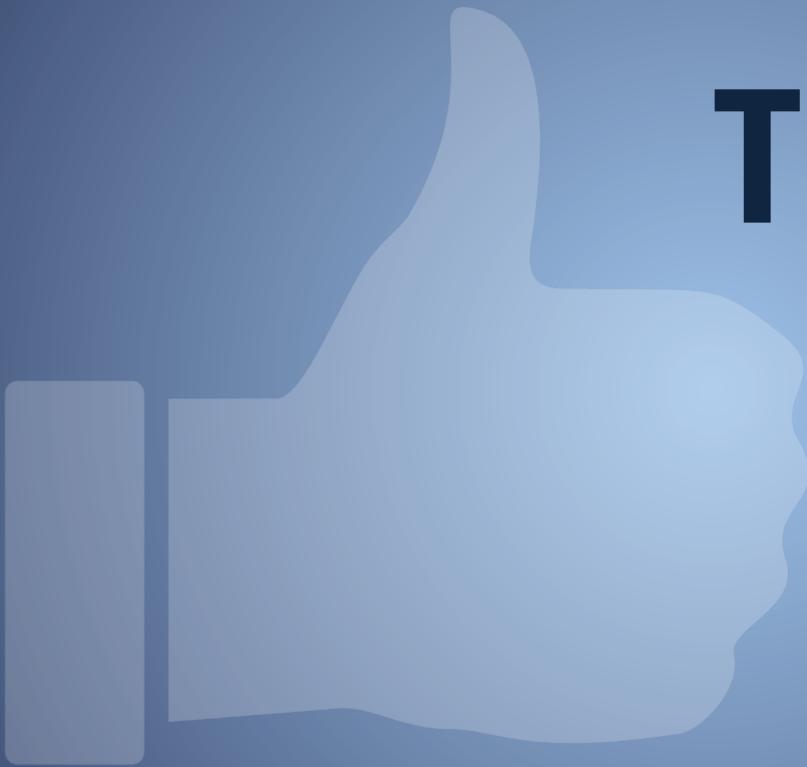
?





CONTACT INFO

EMAIL: mminella@pivotal.io
TWITTER: @michaelminella



THANKS!



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BACK TO THE BEGINNING





REALLY COOL IoT PROJECT



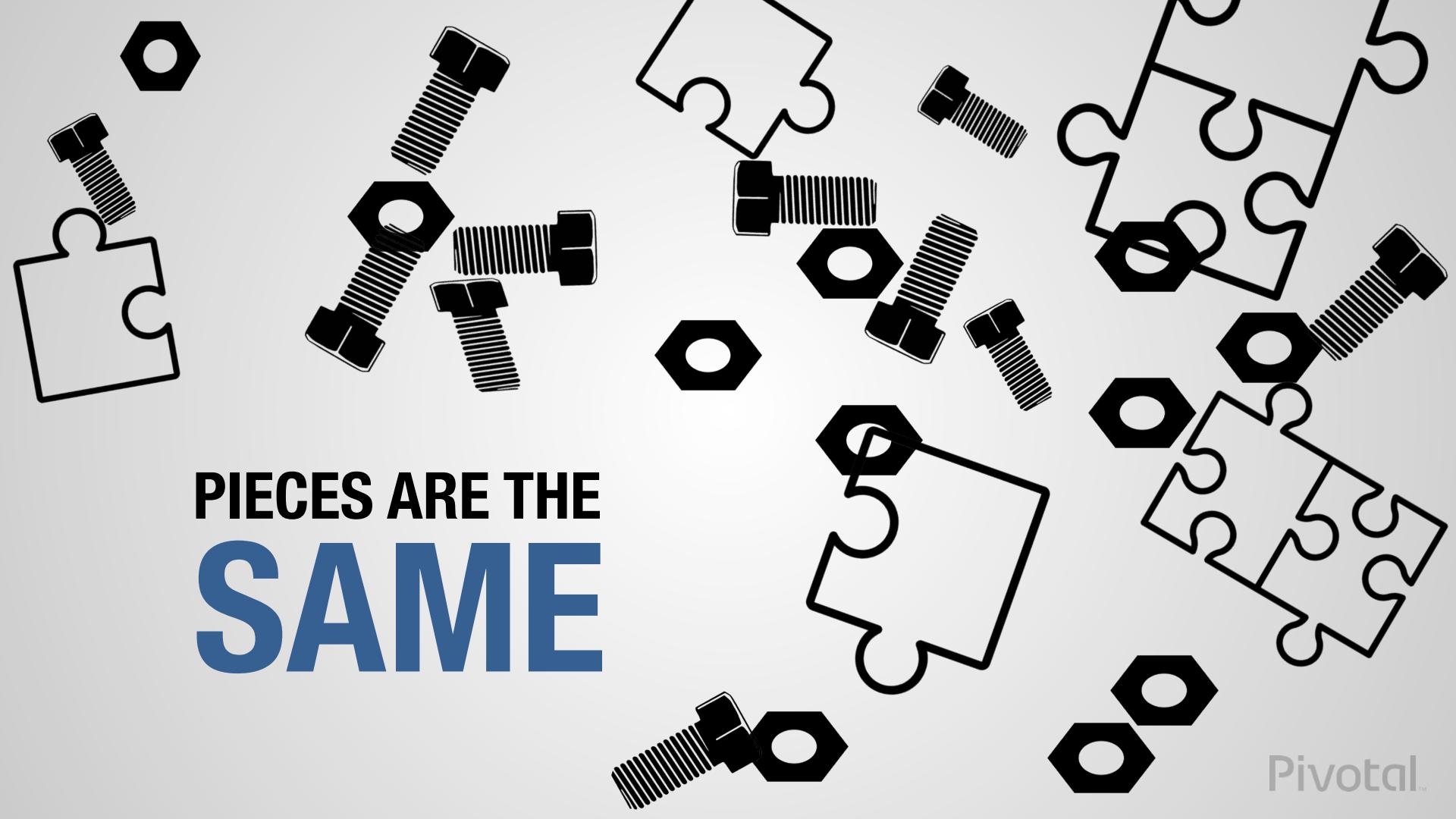
**COVERED BY AN
NDA**



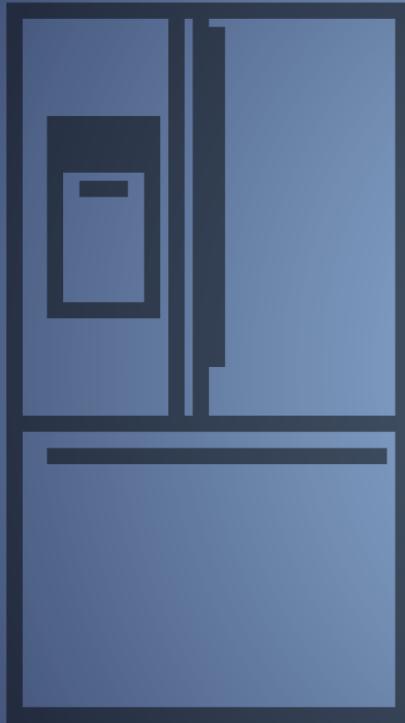
Pivotal™



CONNECTED **CAR**



PIECES ARE THE
SAME



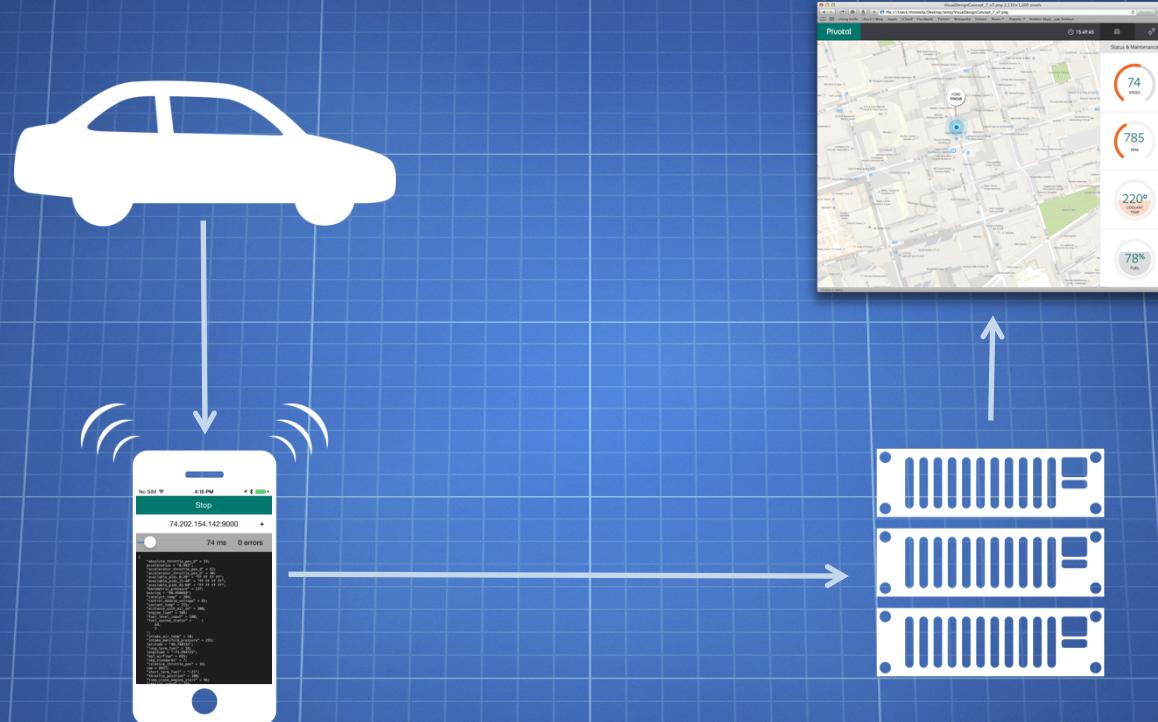
IoT IS NOT ABOUT
TWEETING APPLIANCES



1% IS A
BIG DEAL



CONNECTED **CAR**



Pivotal™



Pivotal™

HOW DOES THIS WORK?



**START IN THE
CAR**





ON BOARD DIAGNOSTICS

OBD II

01 0D

01 0D

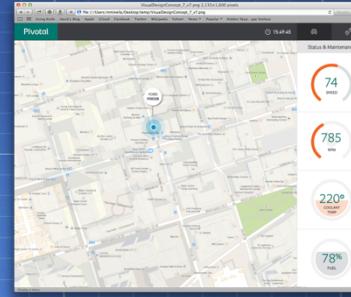
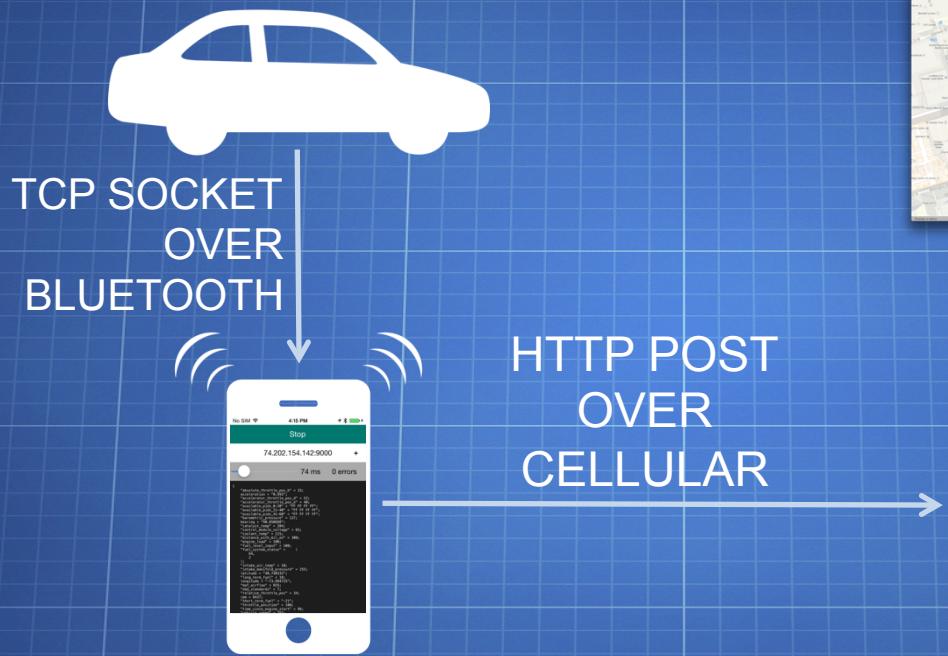
18 DA F1 11 03 41 0D 30

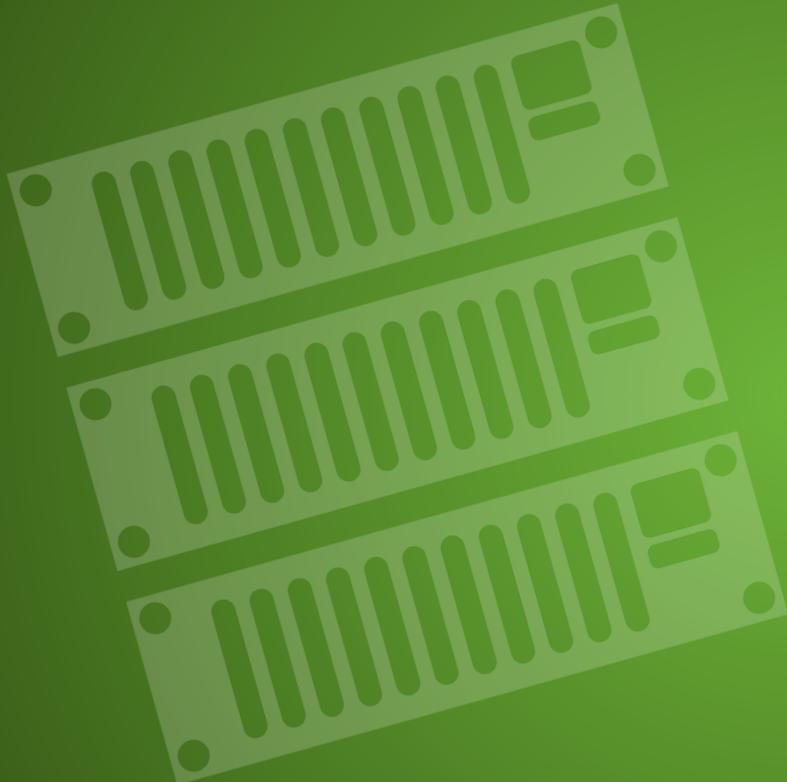
>

```
/*
 * Performs the domain transformation into an acme model.
 */
public class AcmeMotorEnrichingTransformer implements Transformer {
    @Bean
    public Message<?> transform(final Message<?> message) {
        final Object payload = message.getPayload();
        Map<String, Object> map = new HashMap<>();
        try {
            if (payload != null) {
                map = mapper.readValue(payload.toString(), Map
                    .of("timestamp", System.currentTimeMillis(),
                        "guid", UUID.randomUUID()));
            }
        } catch (IOException e) {
            log.error("Error reading payload", e);
        }
        return message.setPayload(map);
    }
}
```

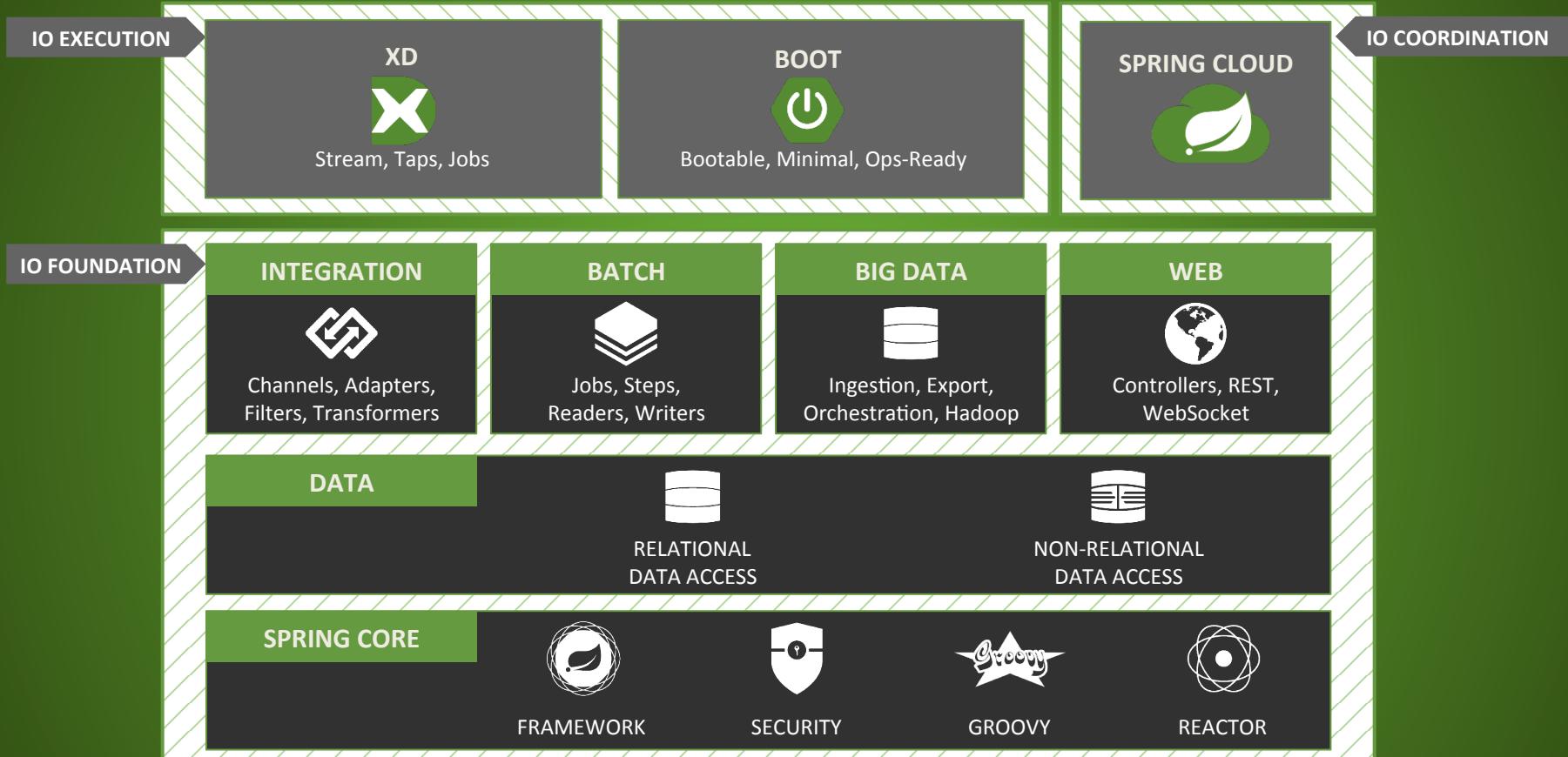


PHONE PROVIDES CONNECTIVITY



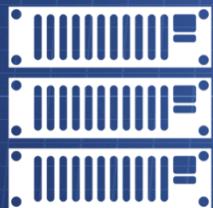


ON THE SERVER



SPRING XD EXTREME DATA





SPRING X

Ingestion
Orchestration
SPRING
Extraction
Real-time
Analytics



DISTRIBUTED RUNTIME





STREAMING BATCH &



The image shows a split-screen interface. On the left side, a terminal window titled "XD Shell 1.0.0.M7 (java)" displays the command "Michaels-MacBook-Pro-2:bin mminella\$./xd-shell" followed by a large, intricate ASCII art tree. On the right side, a web browser window titled "1. XD Shell" and "Spring XD" shows the "Executions" tab of the Spring XD interface. The interface includes a navigation bar with "STREAMS", "JOBS", and "ABOUT" tabs, and a search bar at the top. Below the navigation bar, there is a message: "This page lists all the job executions and provides the control to restart the job execution (if restartable)." A table titled "Executions" lists six entries:

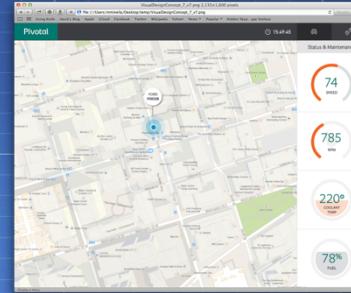
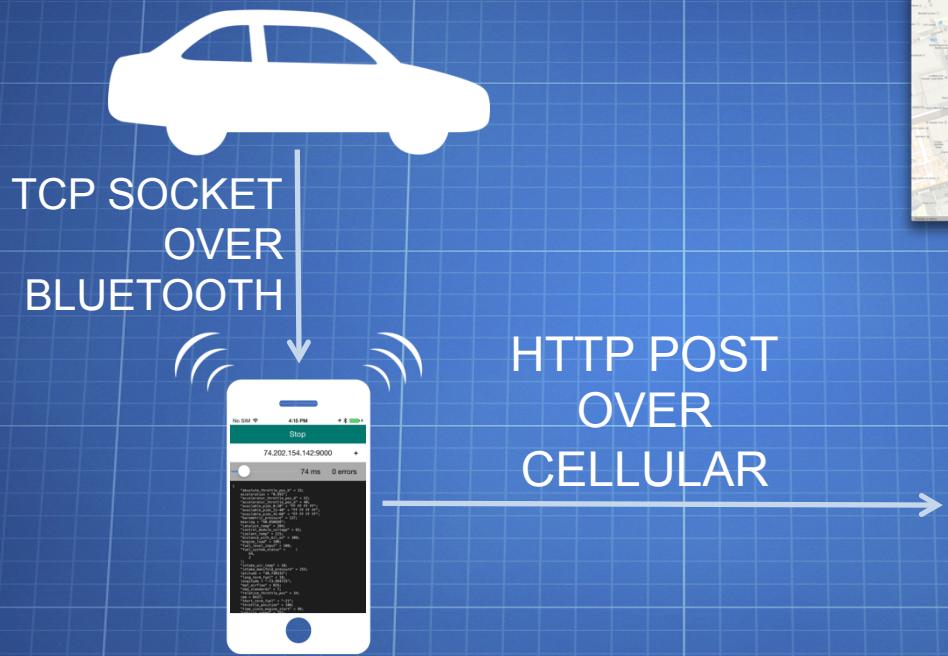
ID	Execution Id	Job Start Time	Step Executions Count	Status	Actions
7	6	2014-07-14 16:39:18	1	COMPLETED	[refresh] [stop] [log]
5	5	2014-07-14 16:38:34	1	COMPLETED	[refresh] [stop] [log]
4	4	2014-07-14 16:38:06	1	FAILED	[refresh] [stop] [log]
3	3	2014-07-14 16:37:34	1	FAILED	[refresh] [stop] [log]
Import	2	2014-07-14 16:36:06	1	COMPLETED	[refresh] [stop] [log]
Import	1	1	4	COMPLETED	[refresh] [stop] [log]

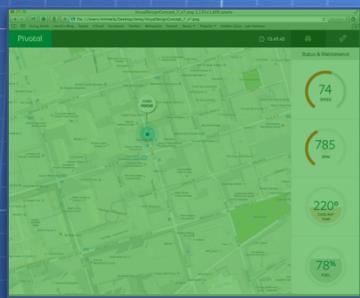
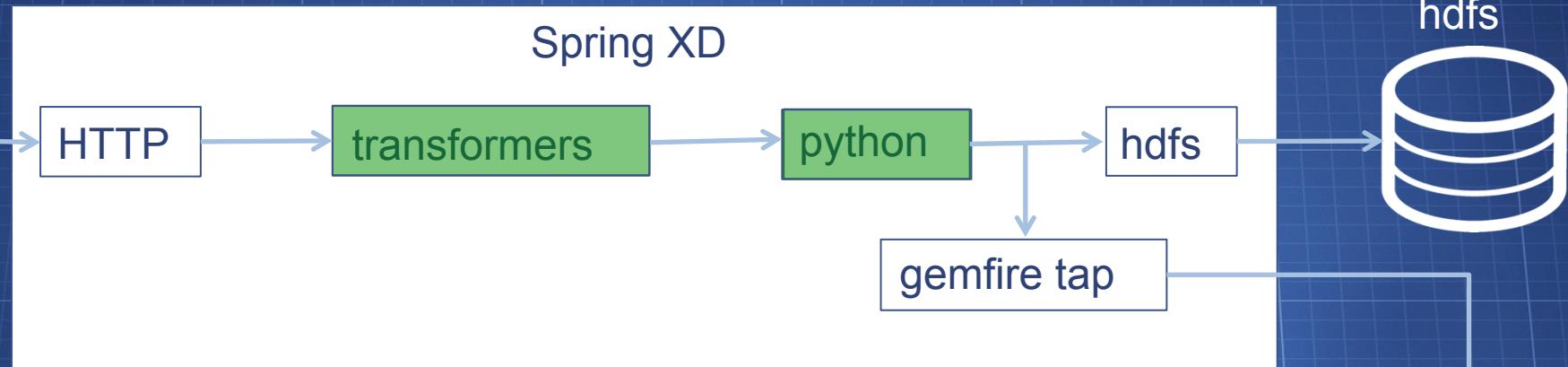
// Ingestion Stream Definitions

http | filter | acmeenrich | shell | hdfs

// Tap Definitions

IoT-HTTP.shell > typeconversiontransformer |
gemfire-server





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```
/*
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        try {
            if (payload != null) {
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                    .of("timestamp", System.currentTimeMillis(),
                        "guid", UUID.randomUUID()));
            }
        } catch (IOException e) {
            log.error("Error reading payload", e);
        }
        return message.setPayload(map);
    }
}
```



REALTIME DATA SCIENCE

1 PREDICT JOURNEY

2 PREDICT 2 RANGE

HOW DOES IT WORK?



STORE SENSOR DATA



OFFLINE BATCH TRAINING



INITIAL PREDICTION



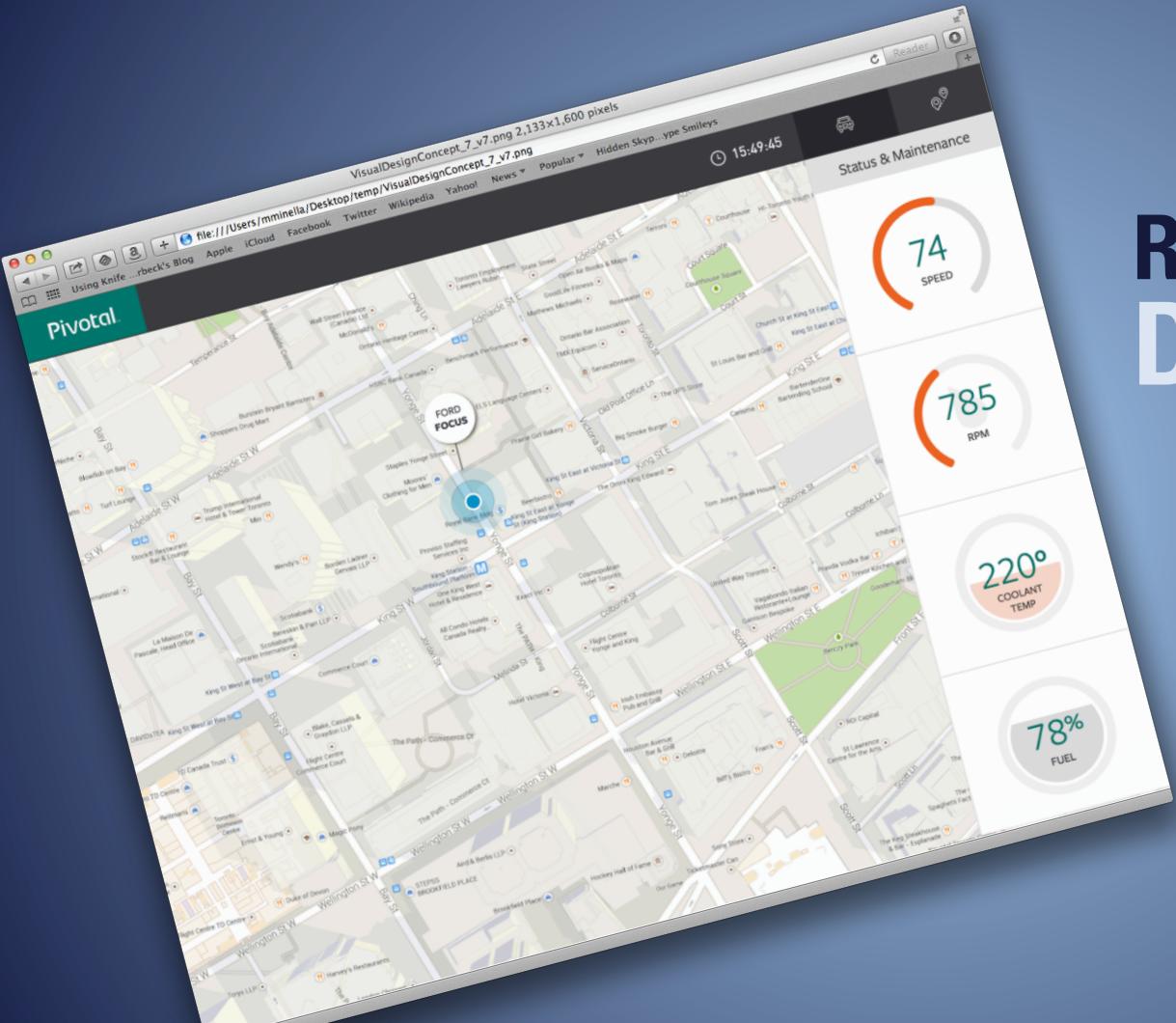


REALTIME EVALUATION

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```
...
  "Predictions": {
    "ClusterPredictions": {
      "0": {
        "EndLocation": [
          32.98525175453122,
          -96.70940837440399
        ],
        "MPG_Journey": 25.60900810315203,
        "Probability": 0.63736
      },
      ...
    }
  }
}
```

REALTIME DASHBOARD



Pivotal™

1 GEMFIRE

2 REST

3 YOEMAN

4 ANGULARJS

```
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 * Performs the domain transformation into an acme model.
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                        "guid", UUID.randomUUID()));
            }
        } catch (IOException e) {
            log.error("Error reading payload", e);
        }
        return message.setPayload(map);
    }
}
```



SOLUTION AT SCALE



100,000's OF
CLIENTS



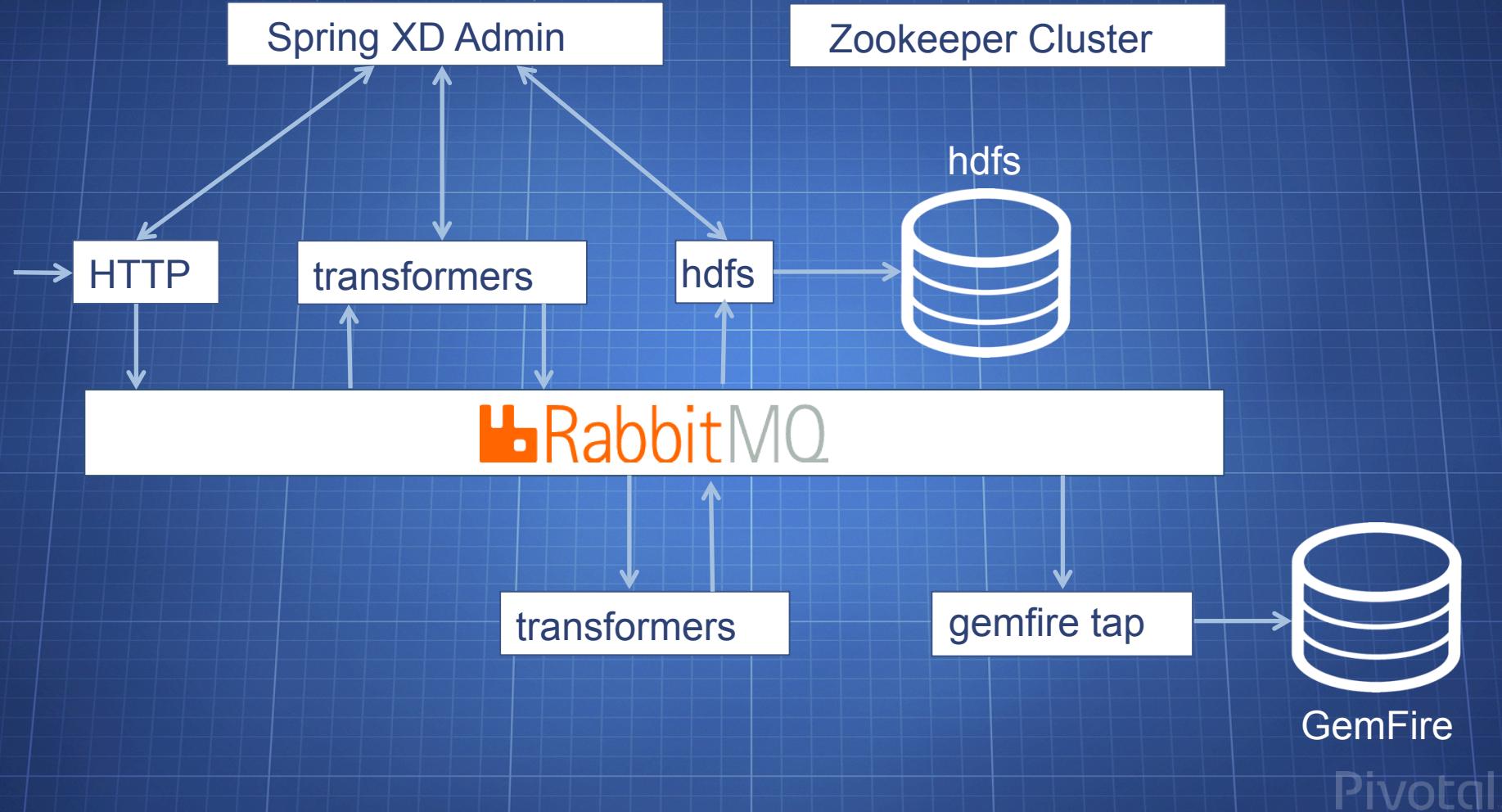
**MILLIONS OF
MESSAGES**



**PER MINUTE OVER
100 GB**

WHAT DOES THIS LOOK LIKE?





GemFire

Pivotal™



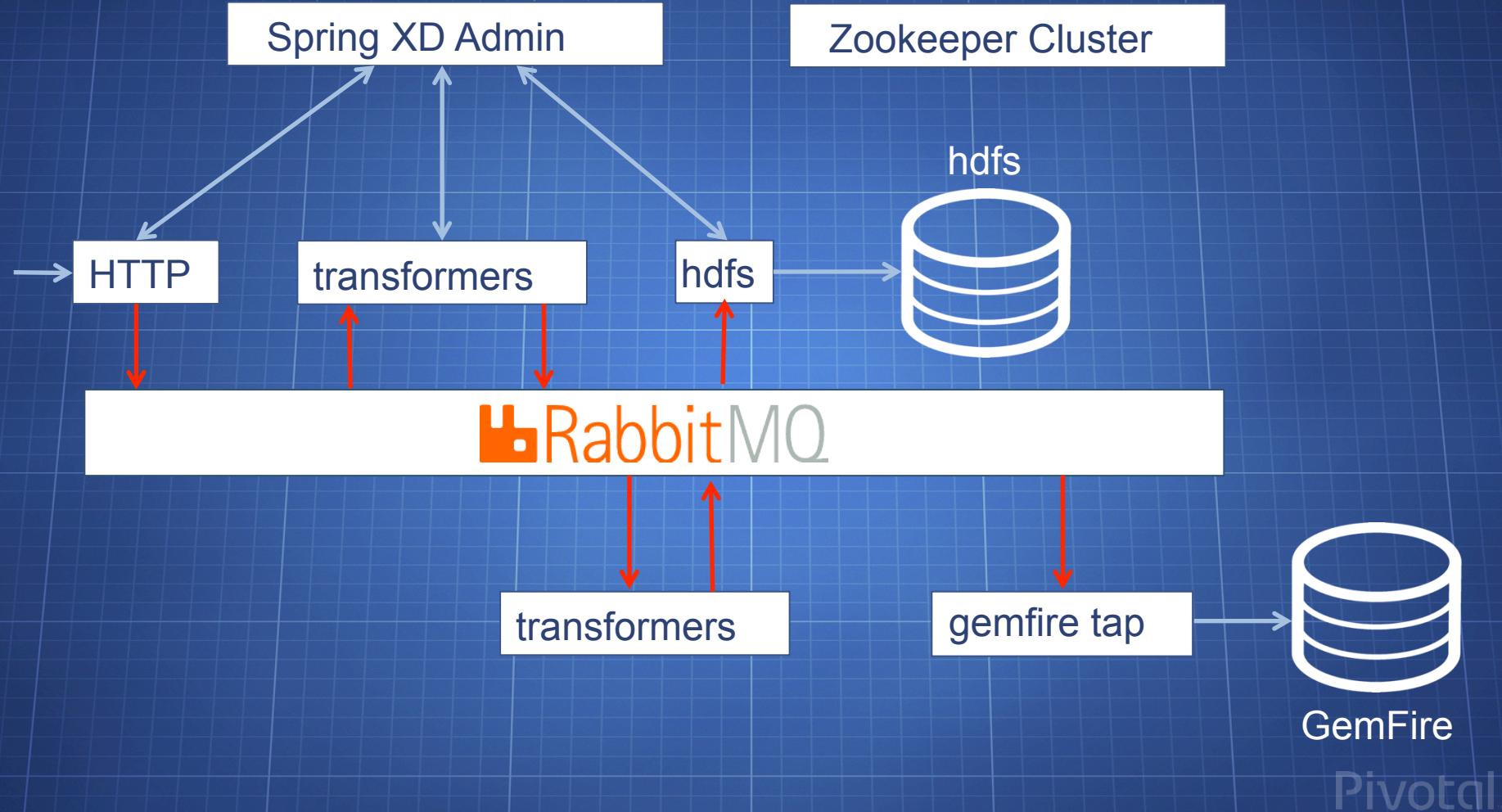
HOW DO WE MAKE IT
FASTER?

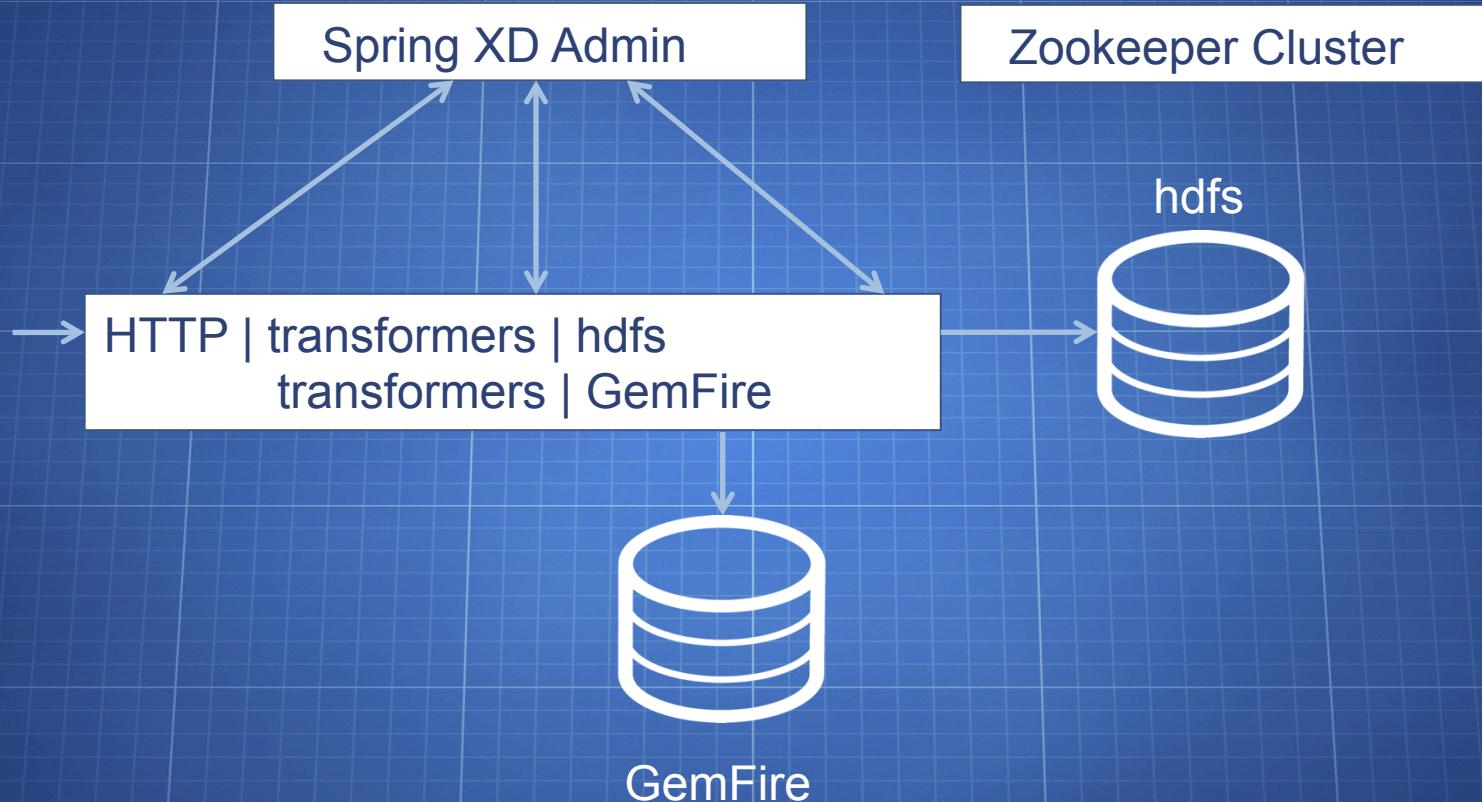


**MAKE THE PAYLOAD
SMALLER**

A large, stylized illustration of a hard drive platter dominates the left side of the slide. The platter is white with a grey center hole and two grey radial lines extending from it. A grey arrow points towards the platter from the top left. The drive is set against a light grey background with a few small white dots at the bottom right.

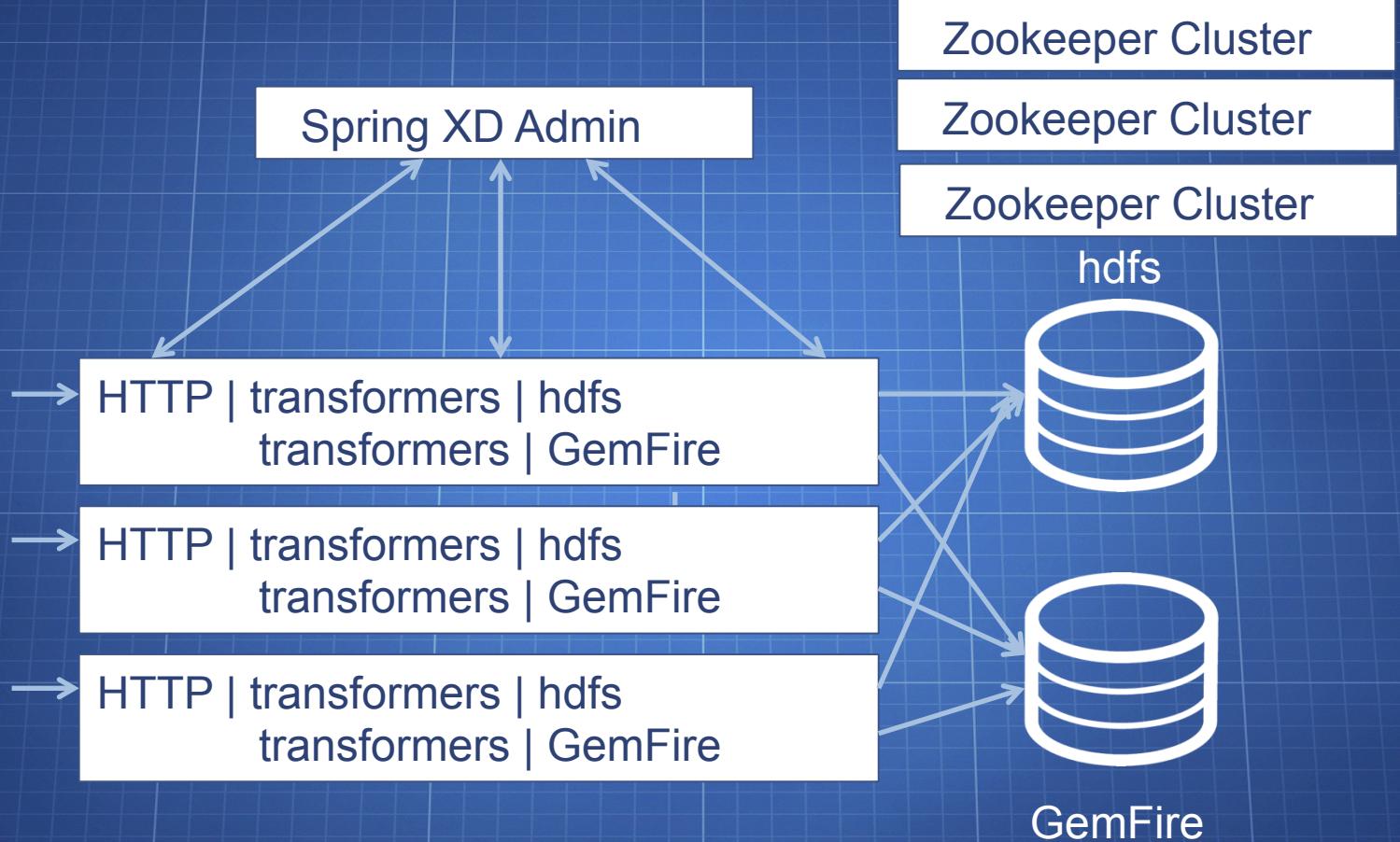
PROCESS IS **I/O BOUND**







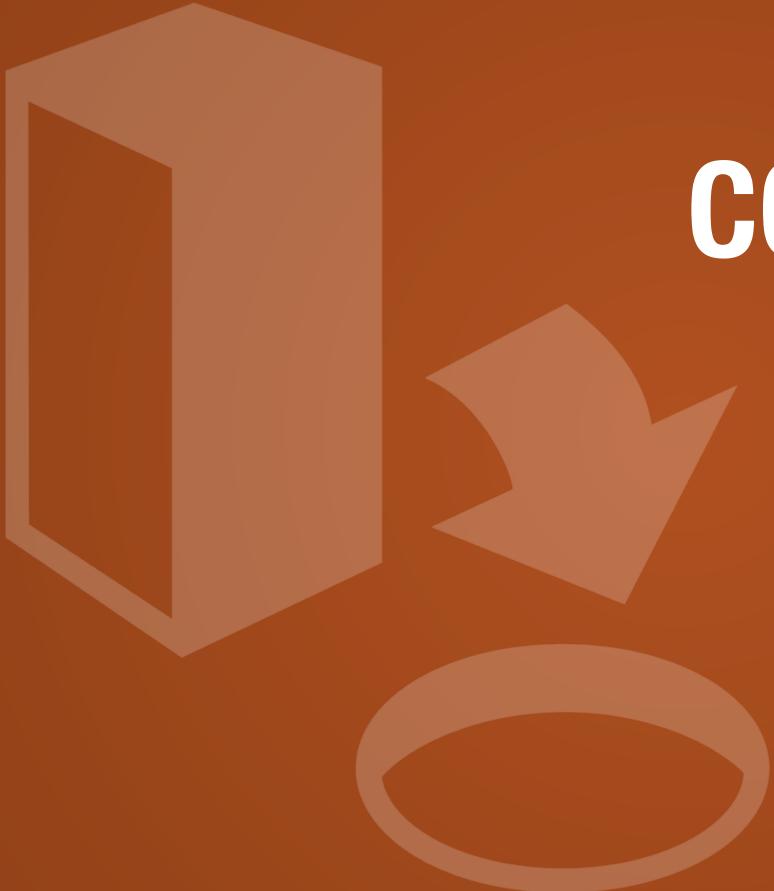
**HIGH
AVAILABILITY**





IoT ISSUES

COMPATIBILITY



CONNECTIVITY



SECURITY





LOOKING INTO THE **FUTURE**



**CLOUD
FOUNDRY™**

Pivotal™

BATCH TRAINING IN **SPRING BATCH**

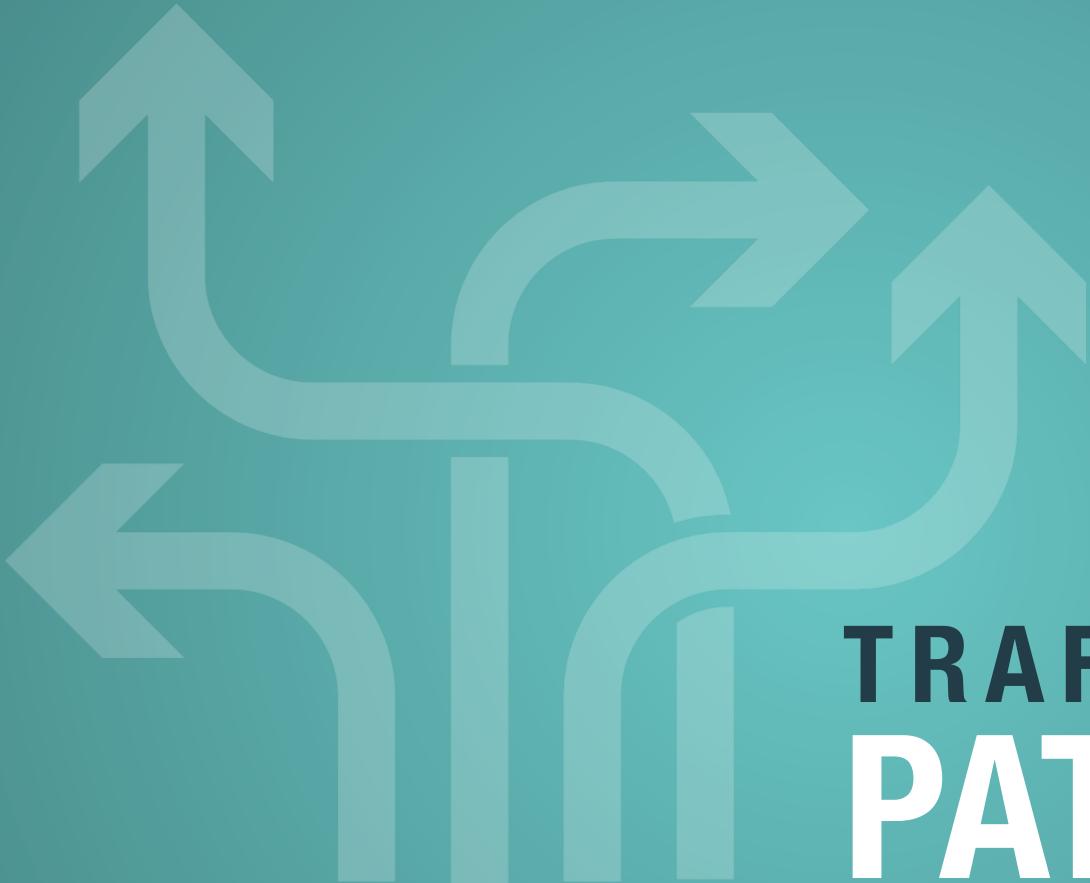




ADDITIONAL USE CASES

DRIVING EFFICIENCY





TRAFFIC PATTERNS



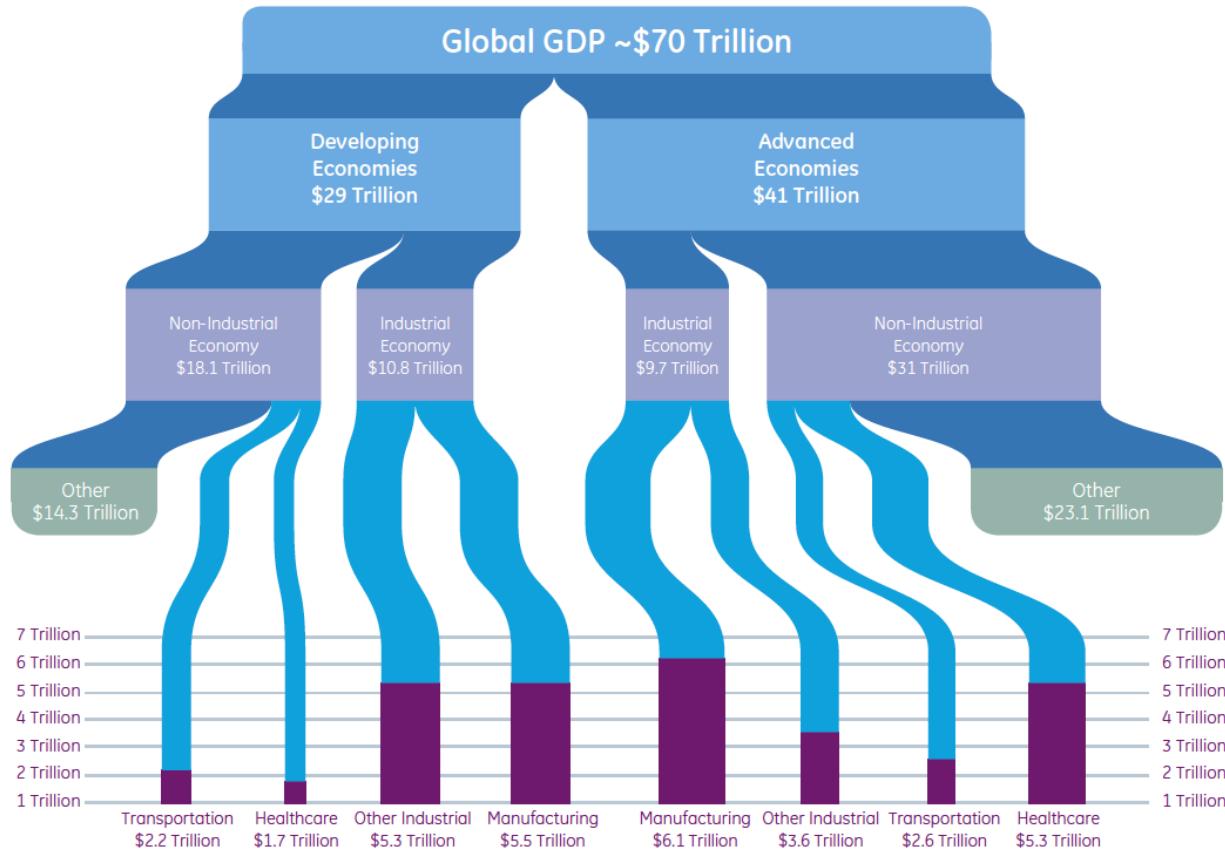
GAS PRICING

ACCIDENT ASSISTANCE



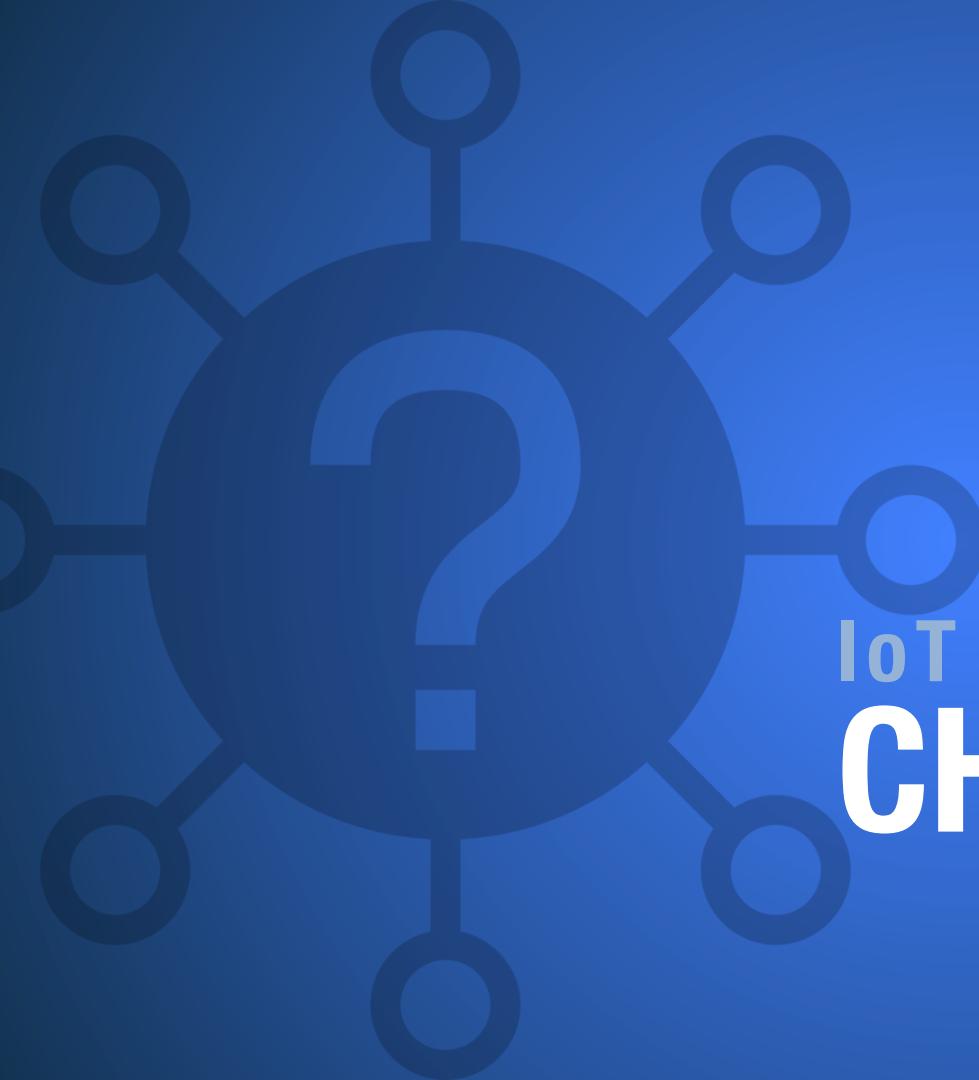


**IoT IS
EVERWHERE**



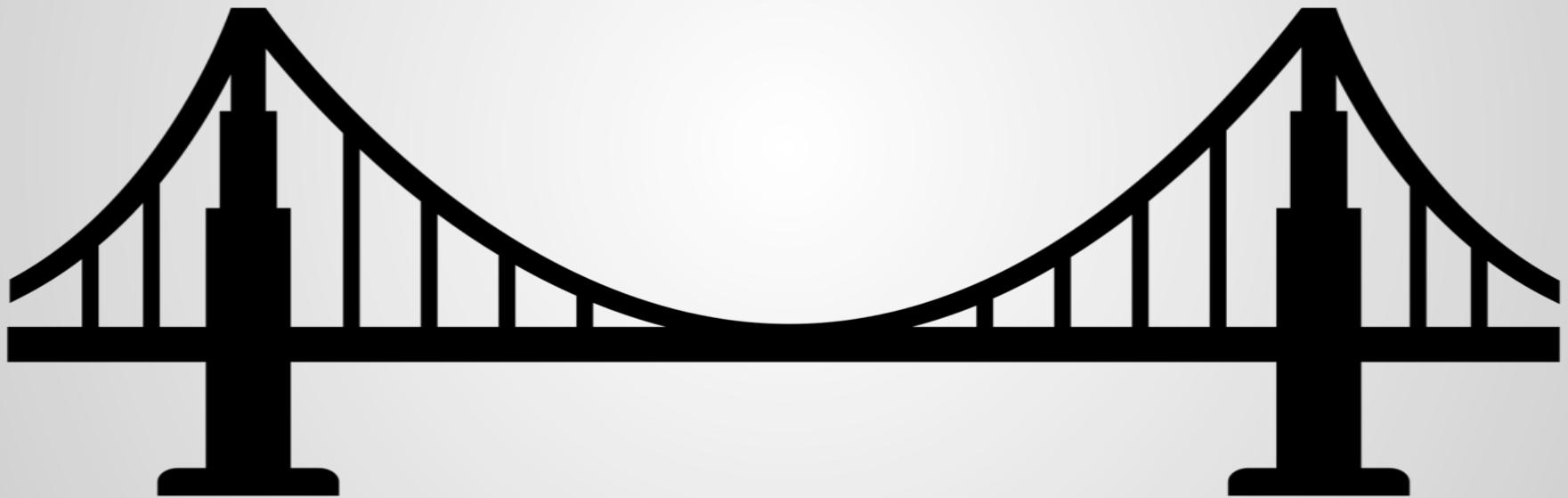
Industrial Internet opportunity (\$32.3 Trillion) 46% share of global economy today

Source: World Bank, 2011 and General Electric



IoT PRESENTS UNIQUE CHALLENGES

**IF YOU CAN
BRIDGE THE GAPS**



SPRING XD MAKES THE REST EASY





Pivotal™

Learn More. Stay Connected.



Spring Framework

Project: spring.io/spring-framework

Github: github.com/spring-projects/spring-framework

Jira: jira.spring.io/browse/SPR

Spring Boot

Project: spring.io/spring-boot

Github: github.com/spring-projects/spring-boot

Spring XD

Project: spring.io/spring-xd

Github: github.com/spring-projects/spring-xd

Jira: jira.spring.io/browse/XD

Twitter: twitter.com/springcentral

YouTube: spring.io/video

LinkedIn: spring.io/linkedin

Google Plus: spring.io/gplus



Connected Car by OliM
from The Noun Project



Scale by Edward Boatman
from The Noun Project



Question by Jessica Lock
from The Noun Project



Servers by Jaime Carrion
from The Noun Project



Running by Dillon Arloff
from The Noun Project



Puzzle by Matthew Hall
from The Noun Project



Sad by Austin Condifff
from The Noun Project



Happy by Austin Condifff
from The Noun Project



Nut by Naomi Atkinson
from The Noun Project



iPhone by Oleg Frolov
from The Noun Project



Plus by P.J. Onori
from The Noun Project



Erlenmeyer Flask by Emily van den Heever
from The Noun Project



Loop by useiconic.com
from The Noun Project



Square Peg Round Hole by Brady Clark
from The Noun Project



Arrows by Juan Pablo Bravo
from The Noun Project



Flow Chart by Michael Wohlwend
from The Noun Project



Network by Mister Pixel
from The Noun Project



Car Accident by Stephanie Wauters
from The Noun Project



Contract by Dmitry Baranovskiy
from The Noun Project



World by Janique Le Bail
from The Noun Project



Stopwatch by Scott Lewis
from The Noun Project



Puzzle by Eric M. Ellis
from The Noun Project



Thinking by Jens Tärning
from The Noun Project



Clock by Nick Green
from The Noun Project



Database by Anton Outkine
from The Noun Project



Refridgerator by Rohan Gupta
from The Noun Project



Car by Laura Beggs
from The Noun Project



Car Accident by Stephanie Wauters
from The Noun Project



Error by Dmitry Baranovskiy
from The Noun Project



Blueprint by Dimitry Sokolov
from The Noun Project



Hard Drive by Mike Wirth
from The Noun Project



Fuel by Yair Cohen
from The Noun Project

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The End