# FLINK-POWERED CUSTOMER EXPERIENCE: SCALING FROM **5 BILLION** DOWN TO **ONE**

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**Comcast Corporation**

**2 April, 2019**

**Flink Forward – San Francisco 2019**

COMCAST

A global media and technology company with several businesses, including Comcast, NBCUniversal, and Sky.

| COMCAST | NBCUniversal | | | | sky |
|---|---|---|---|---|---|
| Products & Services | Cable Networks | Broadcast | Film | Parks | Products & Services |

**COMCAST — Products & Services**

xfinity xFi  xfinity X1

xfinity mobile  xfinity home

COMCAST BUSINESS  COMCAST SPOTLIGHT

FREEWHEEL — A COMCAST COMPANY

**Comcast Spectacor**

COMCAST SPECTACOR  SPECTRA by Comcast Spectacor

WELLS FARGO CENTER  FUSION

COMCAST VENTURES

**NBCUniversal — Cable Networks**

UNIVERSO  CNBC

USA  E!  UNIVERSAL KIDS

NBCSN  OLYMPIC CHANNEL

GOLF  SYFY  MSNBC

OXYGEN  bravo

**NBCUniversal — Broadcast**

NBC  TELEMUNDO

NBCUniversal Owned Television Stations
NBC Owned Television Stations
Telemundo Station Group

NBC Sports  NBC NEWS

TeleXitos  COZI TV

NBC  NBC SPORTS REGIONAL NETWORKS

**NBCUniversal — Film**

UNIVERSAL — A COMCAST COMPANY

FOCUS FEATURES — A COMCAST COMPANY

UNIVERSAL PICTURES HOME ENTERTAINMENT

UNIVERSAL BRAND DEVELOPMENT

DREAMWORKS

ILLUMINATION ENTERTAINMENT

**NBCUniversal — Parks**

UNIVERSAL STUDIOS HOLLYWOOD

UNIVERSAL ORLANDO RESORT

UNIVERSAL STUDIOS JAPAN

UNIVERSAL STUDIOS SINGAPORE

**Digital & Other**

Snap Inc. *  MOVIES.COM  FANDANGO  VOX MEDIA *  BuzzFeed  cinepapaya

sportsengine  hulu *  GOLFNOW  bluprint  Flixster  Rotten Tomatoes

**sky — Products & Services**

sky Q  sky mobile

sky store  NOW TV

sky broadband  sky

**Channels & Content**

sky atlantic  sky one

sky sports  sky news

sky cinema  sky box sets

sky original productions

sky VR  sky KIDS

*Minority interest and/or non-controlling interest.
Slide is not comprehensive of all Comcast NBCUniversal assets
Updated: December 03, 2018

# COMCAST CUSTOMER RELATIONSHIPS

**30.3 MILLION OVERALL CUSTOMER RELATIONSHIPS AT 2018 YEAR END**

**25.1 MILLION RESIDENTIAL HIGH-SPEED INTERNET CUSTOMERS AT 2018 YEAR END**

**1.2 MILLION RESIDENTIAL HIGH-SPEED INTERNET CUSTOMER NET ADDITIONS IN 2018**

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# DELIVER THE ULTIMATE CUSTOMER EXPERIENCE

IS THE CUSTOMER HAVING A GOOD EXPERIENCE FOR HIGH SPEED DATA (HSD) SERVICE?

IF THE CUSTOMER ENGAGES US DIGITALLY, CAN WE OFFER A SELF-SERVICE SOLUTION?

IF THERE IS AN ISSUE CAN WE OFFER OUR AGENTS AND TECHNICIANS A DIAGNOSIS TO HELP SOLVE THE PROBLEM QUICKER?

REDUCE THE TIME TO RESOLVE ISSUES

REDUCE COST TO THE BUSINESS AND THE CUSTOMER

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# REDUCE COST AND TIME TO RESOLUTION

| CUSTOMER SELF-SERVICE | TALK TO AN AGENT | TECHNICIAN VISIT TO HOME |
|---|---|---|
| **COST** | **COST ORDER OF MAGNITUDE:** | **COST ORDER OF MAGNITUDE:** |
| **$ ~0** | **$ 5-10** | **$ 50-100** |
| **TIME** | **TIME:** | **TIME:** |
| **< 15 MINUTES** | **< AN HOUR** | **AT LEAST A DAY** |

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How do we personalize the conversation?

# CUSTOMER EXPERIENCE INDICATORS



*Comcast collects, stores, and uses all data in accordance with our privacy disclosures to users and applicable laws.*

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# HIGH LEVEL CONCEPT



**CUSTOMER EXPERIENCE INDICATORS**

Service Delivery Systems

Customer Experience Diagnosis Platform

CUSTOMER ENGAGEMENT PLATFORM

Predictions / Diagnosis / Treatments

*Comcast collects, stores, and uses all data in accordance with our privacy disclosures to users and applicable laws.*

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# SIMPLIFY INDICATORS

```
"packetErrors": ["327"],
"systemUptime":
        {"string": "4:26:34.27"},
"octets": ["174756692"],
"timerError": { "int": 0 },
"sysInfoHwphase2": {"int": 1}
"firmwareDlError": { int": 0 },
"sysErrorTr69NotRegistered": null,
"sysShSnmpsubagentRestartMw": null,
"wifiErrorKernelDriverNotconnected":
null,
"forcedNonDeviceRebootError":
        { "int": 0 }
```

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**GREEN**

**CUSTOMER EXPERIENCE**

**IS GOOD**

COMCAST

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**GREEN**

**CUSTOMER EXPERIENCE**

**IS GOOD**

**RED**

**POSSIBLE IMPACT TO**

**CUSTOMER EXPERIENCE**

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# What is the Digital Experience?

# XFINITY ASSISTANT EXPERIENCE

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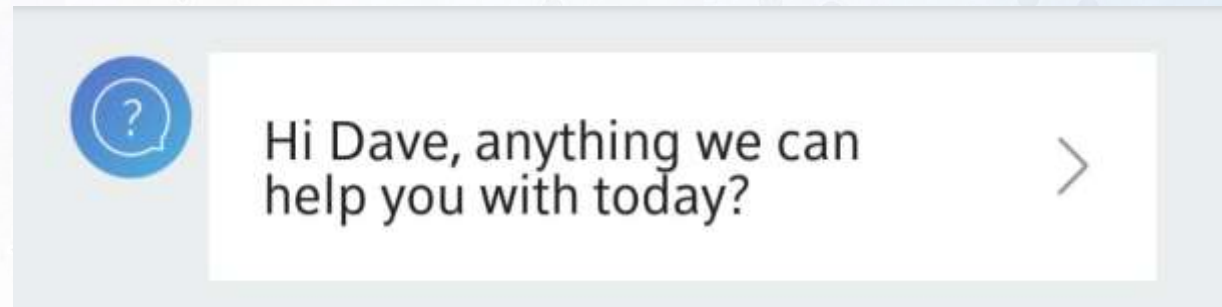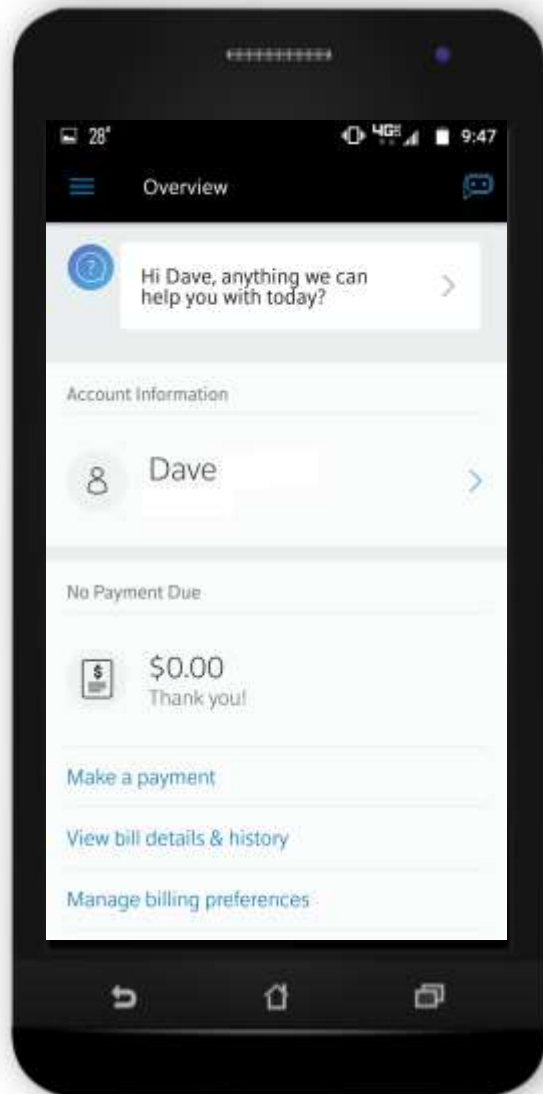
# XFINITY ASSISTANT EXPERIENCE
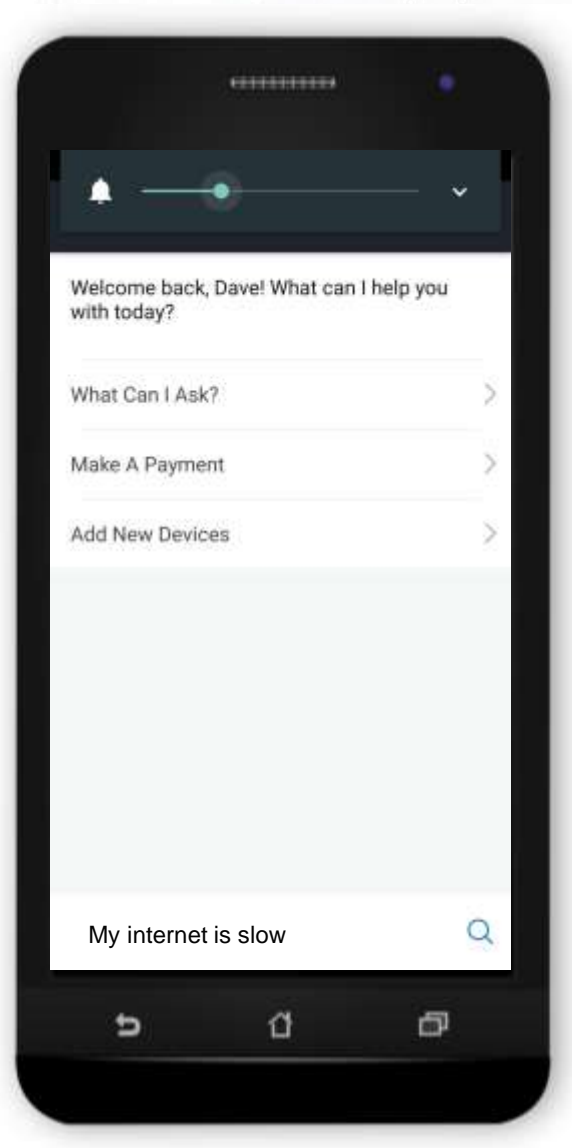


My internet is slow

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# XFINITY ASSISTANT EXPERIENCE

# FLINK POWER!

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# XFINITY ASSISTANT EXPERIENCE

I've noticed an Internet issue that should be resolved by a Gateway restart. This will take up to 10 minutes. Are you ready to start now?
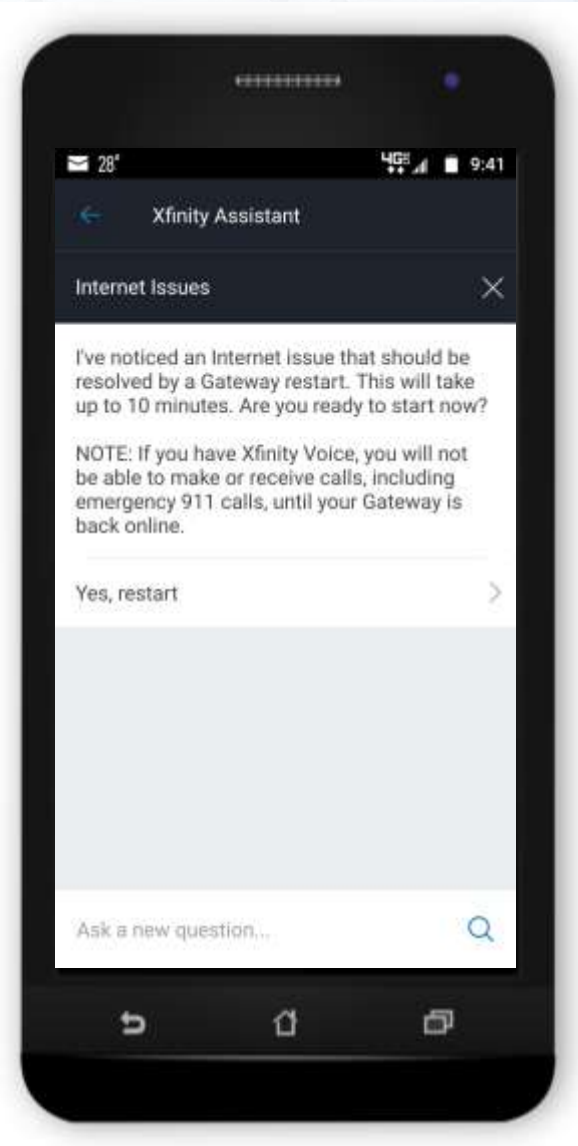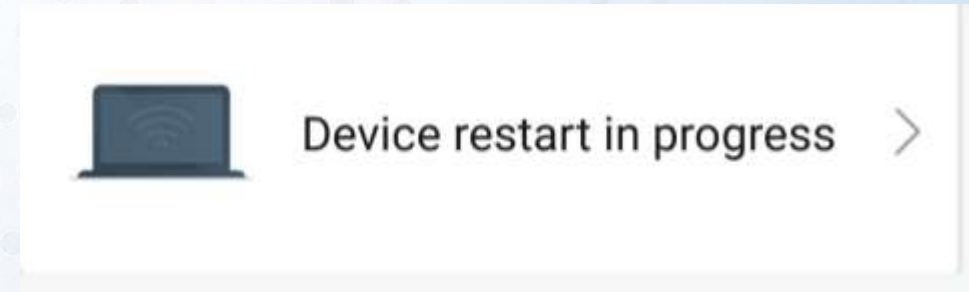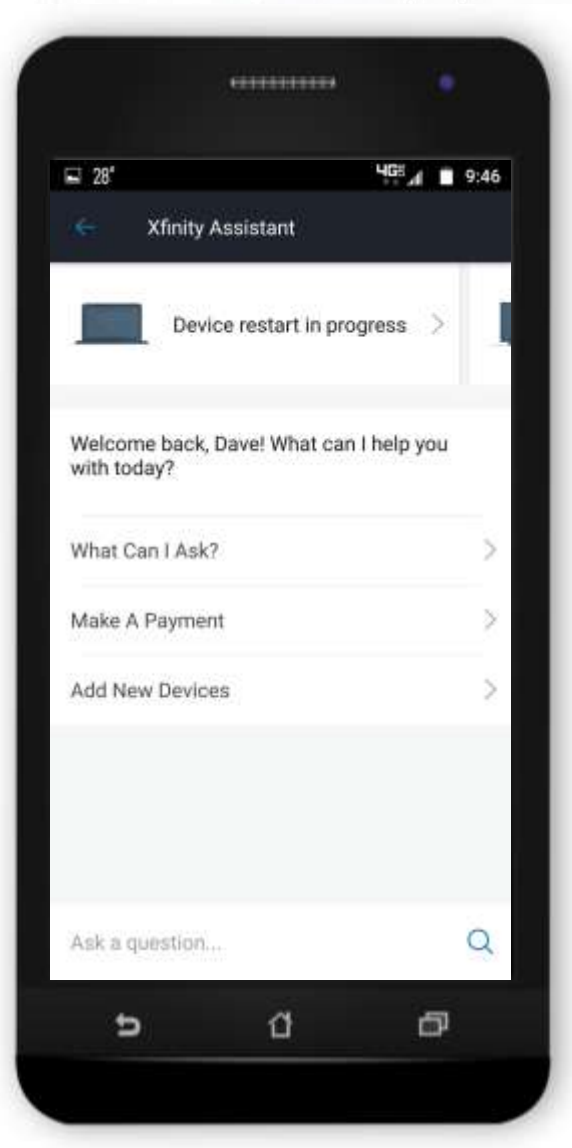
# XFINITY ASSISTANT EXPERIENCE
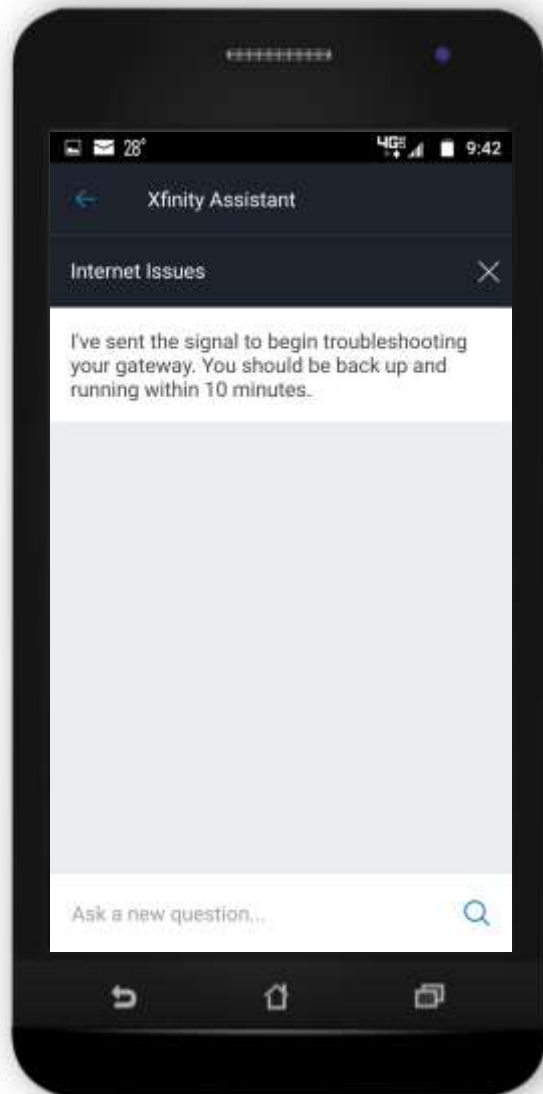


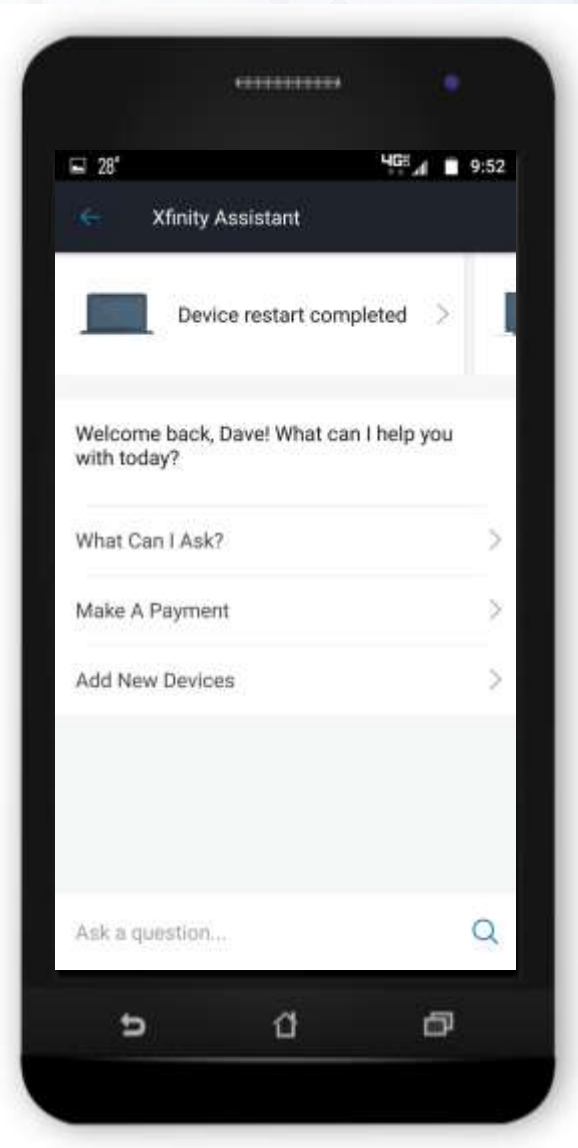I've sent the signal to begin troubleshooting your gateway. You should be back up and running within 10 minutes.
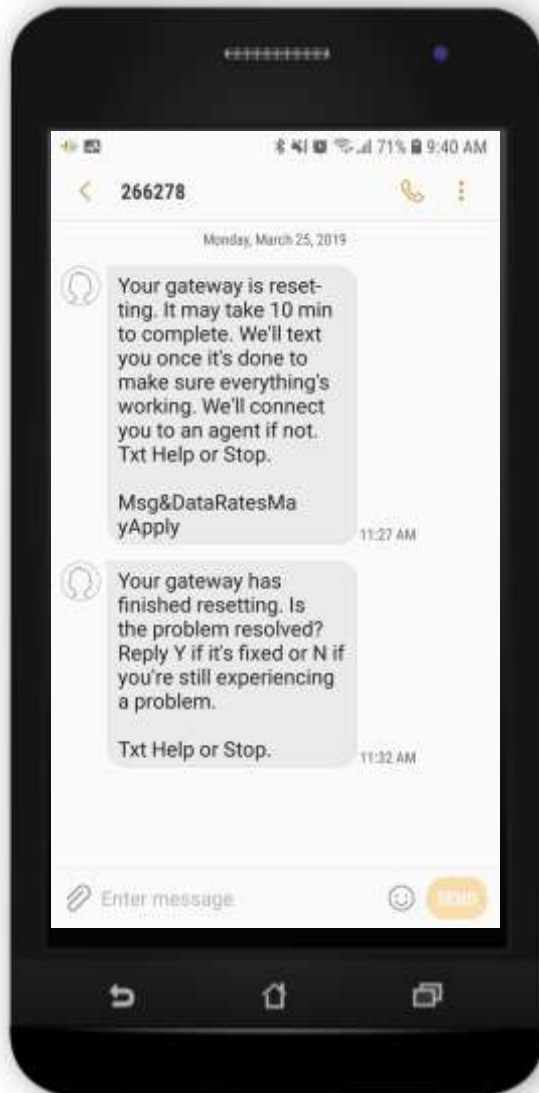
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# XFINITY ASSISTANT EXPERIENCE

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# XFINITY ASSISTANT EXPERIENCE
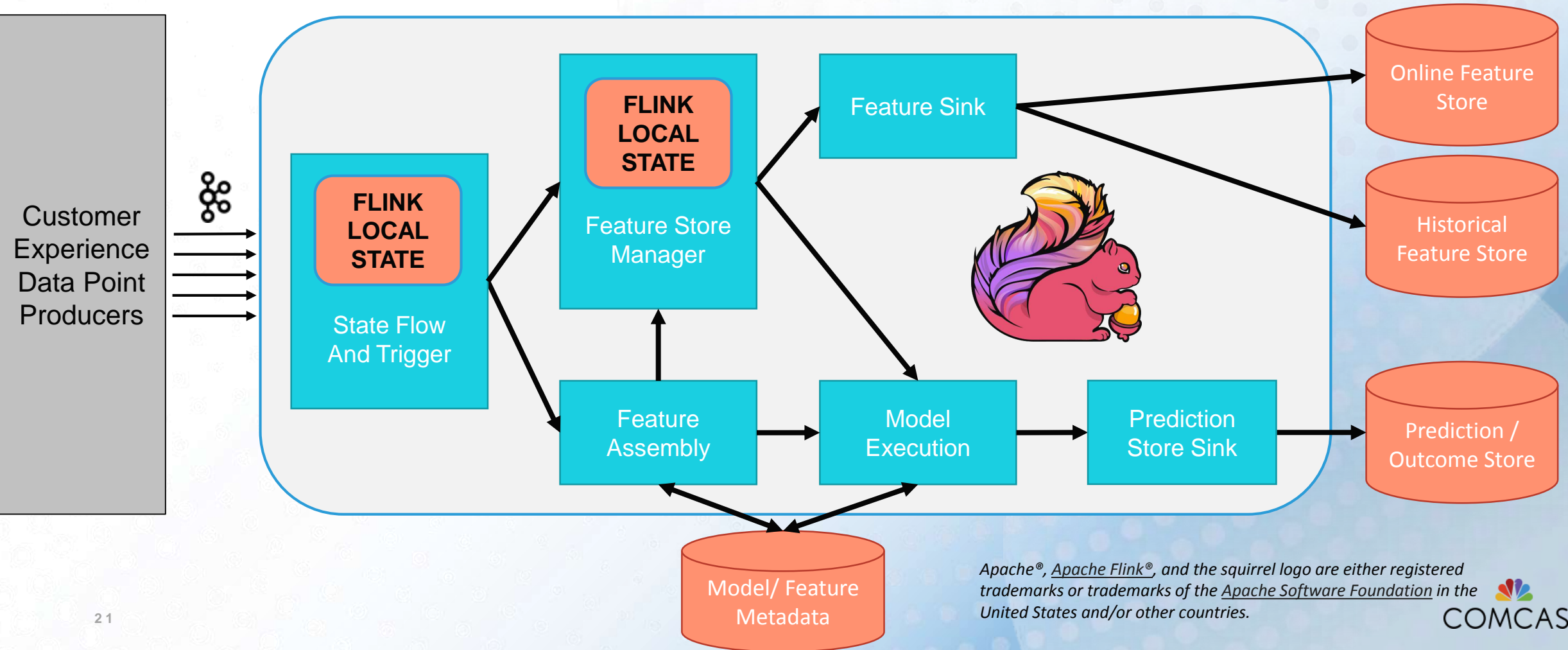
# XFINITY ASSISTANT EXPERIENCE



**FOLLOWING UP ON THE INTERACTION:**

**Is the problem resolved?**

**If so, great!**

**If not, offer to talk with an agent.**

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# CHALLENGES ALONG THE WAY

THE
**TRIGGER AND DIAGNOSIS**
PROBLEM

THE
**REST**
PROBLEM

THE
**INEFFICIENT OBJECT HANDLING**
PROBLEM

THE
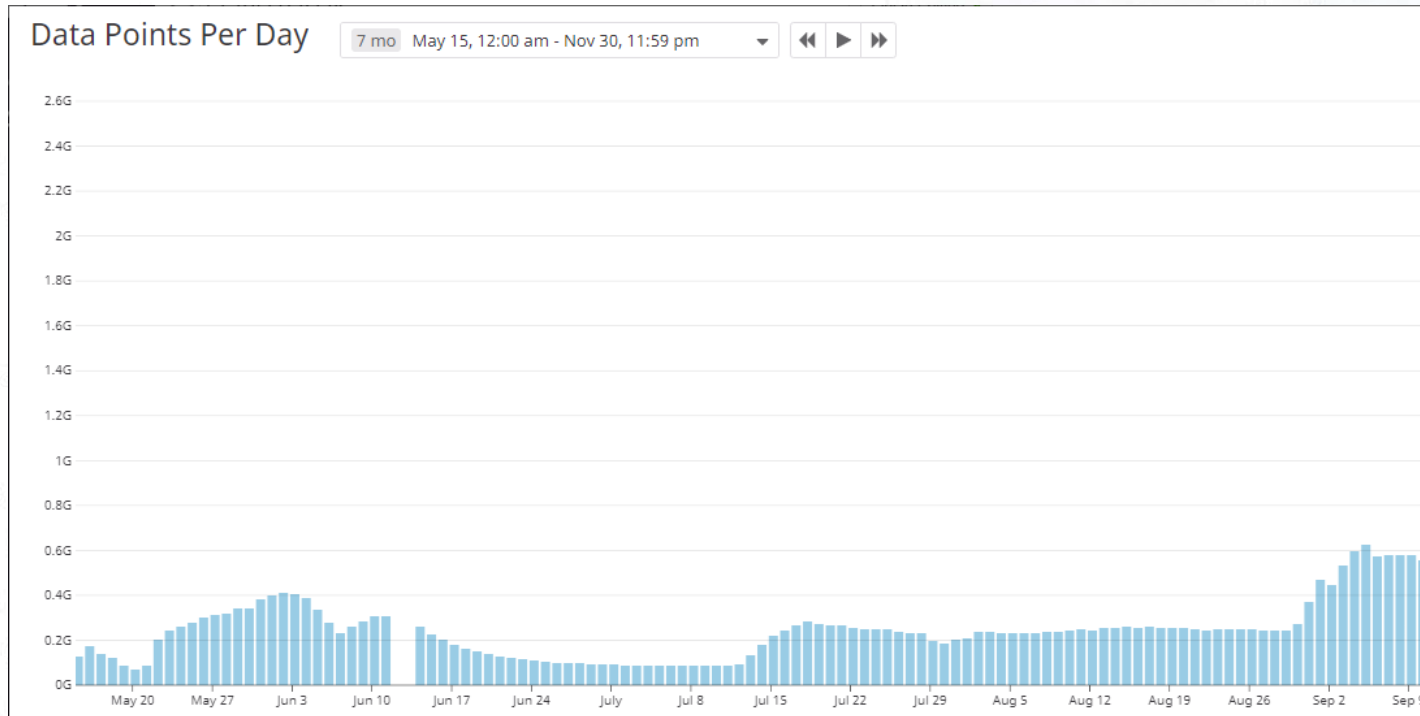**FEATURE STORE**
PROBLEM

THE
**VOLUME**
PROBLEM

THE
**CUSTOMER STATE**
PROBLEM

THE
**CHECKPOINT**
PROBLEM

THE
**TRIGGER AND DIAGNOSIS**
PROBLEM

THE
**REALLY HIGH VOLUME AND FEATURE STORE**
PROBLEM #2

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# DATA POINT VOLUME MAY–NOVEMBER 2018
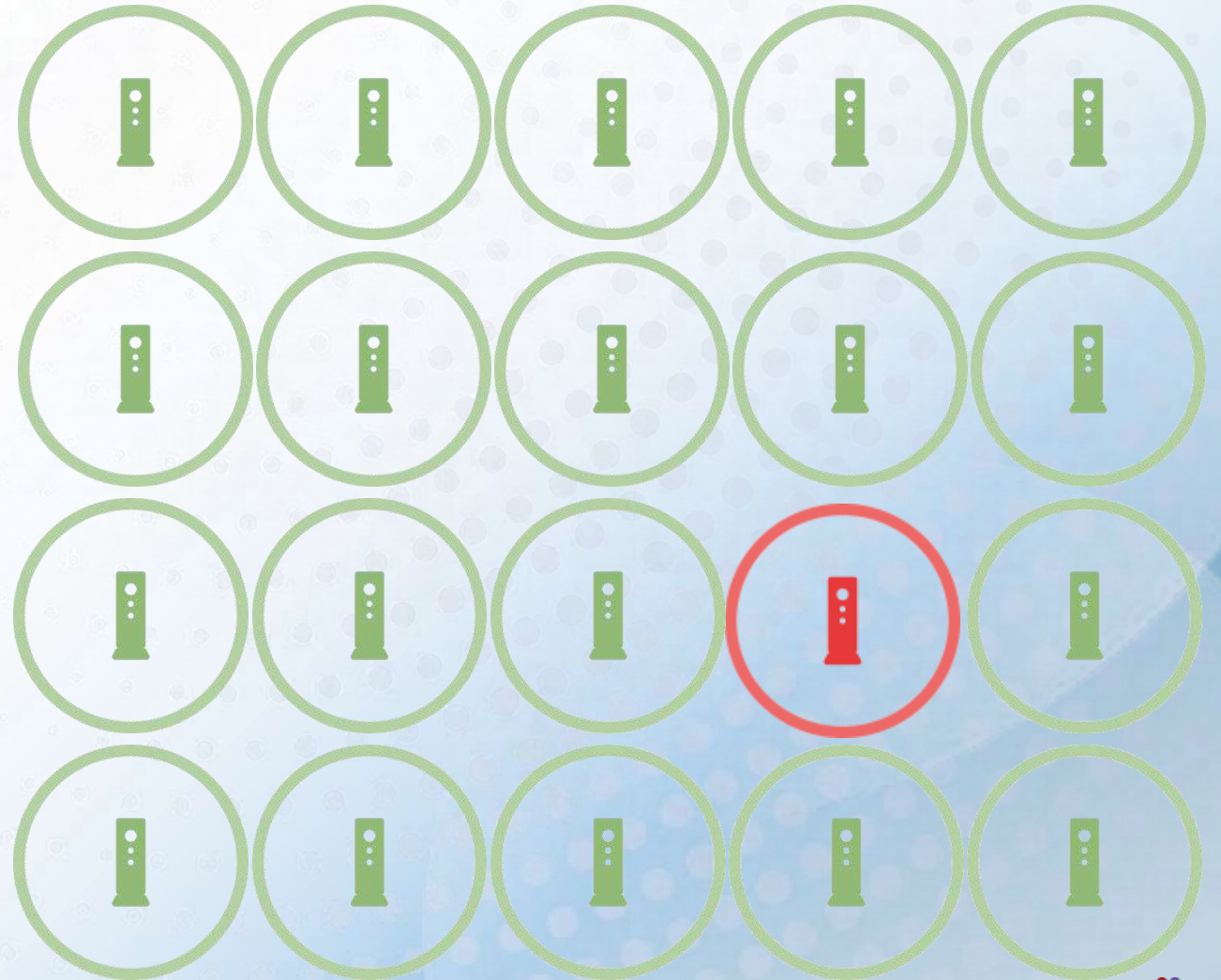
# DATA POINT VOLUME MAY–NOVEMBER 2018

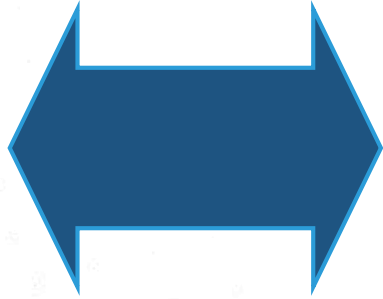# DATA POINT VOLUME MAY–NOVEMBER 2018

# LET'S ADD ANOTHER 3 BILLION!

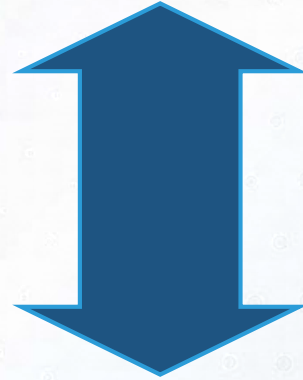**15 MILLION DEVICES**

**3 BILLION DATA POINTS**

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# MEETING THE CHALLENGE

## HORIZONTAL SCALING

TO MEET THE VOLUME

## VERTICAL SCALING
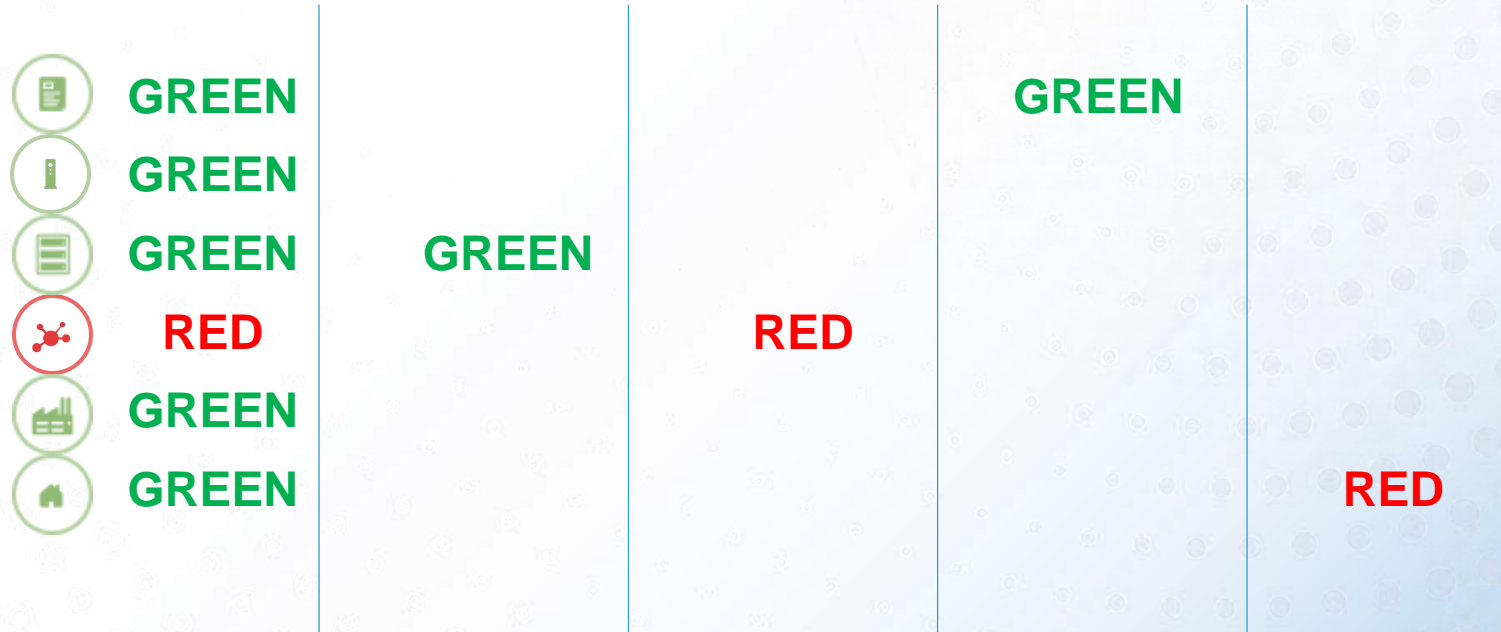
TO PROCESS HIGH-VOLUME DATA SOURCES

## FLINK FEATURES

QUERYABLE STATE
CHECKPOINTING
GLOBAL WINDOWS
CONNECTED STREAMS
STREAMING SINKS
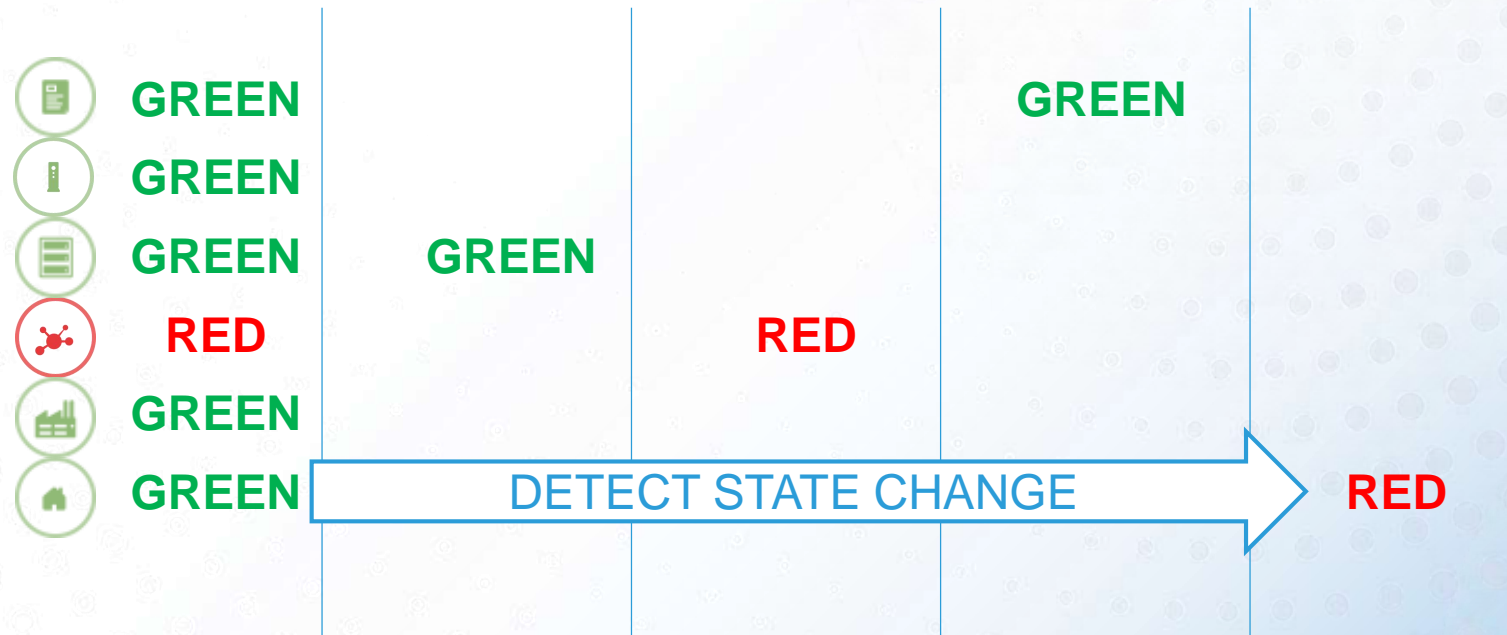
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# USING FLINK STATE TO TRIGGER DIAGNOSIS

**GREEN**

**GREEN**

**GREEN**

**RED**

**GREEN**

**GREEN**

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# USING FLINK STATE TO TRIGGER DIAGNOSIS

GREEN

GREEN

GREEN     GREEN          GREEN

RED                RED

GREEN

GREEN                                       RED

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# USING FLINK STATE TO TRIGGER DIAGNOSIS

GREEN                           GREEN

GREEN

GREEN          GREEN

RED              RED

GREEN

GREEN    DETECT STATE CHANGE →    RED
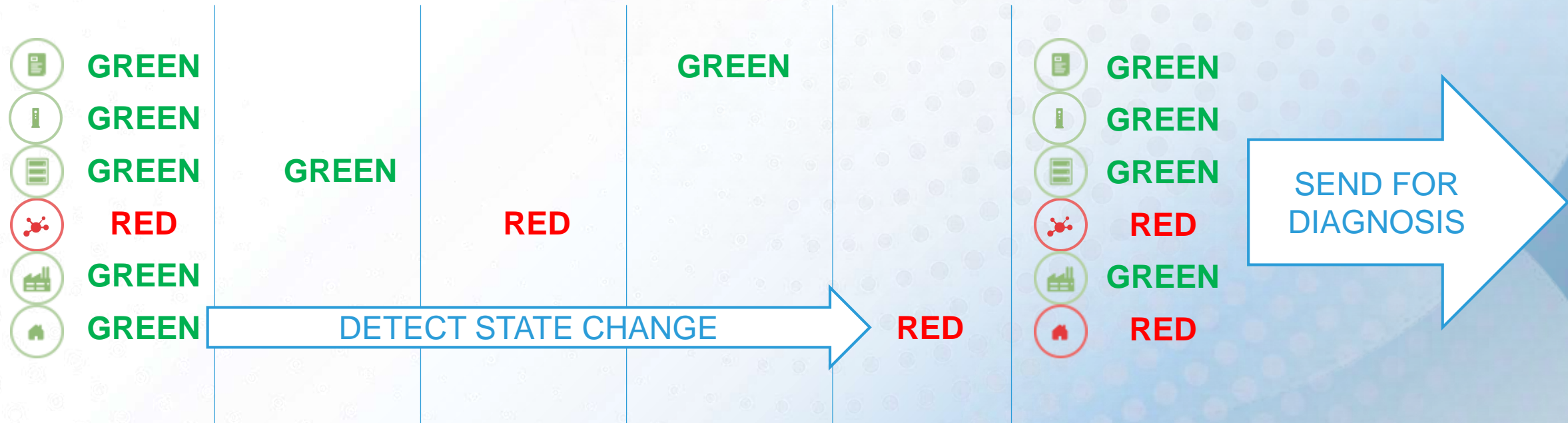
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# USING FLINK STATE TO TRIGGER DIAGNOSIS
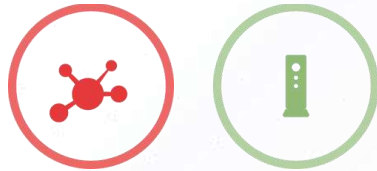
# KEEPING TRACK OF DATA POINT STATE

**25+ MILLION HIGH SPEED INTERNET CUSTOMERS**

**10+ DATA POINT TYPES**

**TWO FLINK STATES TO MANAGE:**

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**RED / GREEN "TRIGGER"**

**[ENTITY ID]**
**(DATA POINT TYPE, STATE)**

**~1 GB TOTAL**

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**QUERYABLE STATE FEATURE STORE**

**UP TO 15KB JSON PER DATA POINT**

**~ 1 TB TOTAL**

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# WHERE ARE WE TODAY

**INDICATORS**

**HIGH-VOLUME INDICATORS**

**TOTAL**

**725+ MILLION DATA POINTS PER DAY**

**6 BILLION PER DAY**

**~7 BILLION DATA POINTS PER DAY**

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# WHERE ARE WE TODAY – FLINK CLUSTERS

**CLUSTERS**

# 14

**VCPU**

# 1100

**INSTANCES**

# 150

**RAM**

# 5.8 TB

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# RESULTS

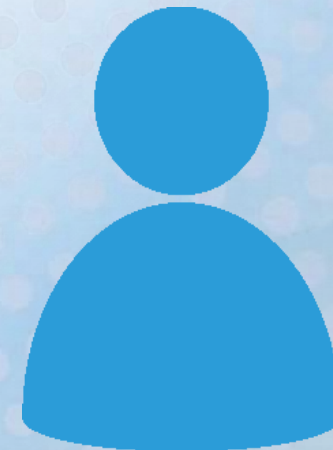## MILLIONS
**OF UNIQUE USERS REACHED**

## MILLIONS
**OF OPERATIONAL DOLLARS SAVED**

## INCREASED
**CUSTOMER SATISFACTION WITH DIGITAL INTERACTION**

## REDUCED
**TIME TO RESOLVE COMMON ISSUES THROUGH SELF-SERVICE**

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# RESULTS

## MILLIONS
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SCALING THE EXPERIENCE TO ONE

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