An Empirical Characterization of IFTTT
Ecosystem, Usage, and Performance

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What is IFTTT

IFTTT

If this then that

User

Define, Run and Publish IF This Then That Workflows Called Applets

Service Provider

Configure and Publish Services Consisting of Triggers and Actions
What is IFTTT: Applets

Google Home Find My Phone
When you ask Google home to find your phone it turns the ringer to 100% and places a VOIP call through IFTT.
by ss90

Save new photos you're tagged in on Facebook to Google Photos
An easy way to download and save pictures that you’re tagged in on Facebook. Every time that you’re tagged, a copy of the photo will be saved in a Google Photos folder.
by IFTTT

When it's bedtime, turn off WeMo Switch
Select a time that you normally go to bed and your lights will let you know it's time to go to sleep.
by nickham

Tell Alexa to start the party with a Hue light color show
When you say "Alexa, trigger party time" your lights will be set to color loop.
by Philips Hue
Why IFTTT

Diverse
400+ service providers, half are IoT related

Popular
300K applets, 24-million adoptions

Emerging
How it works, How well it works
How IFTTT Works

Set up an Applet

Request Trigger Events

Return Trigger Events

Request Trigger Events

Return New Trigger Events

Send Action Request

Return Action Result

Trigger Provider

Action Provider

Sync Status

Home

Home
How IFTTT Works

**IFTTT**

RESTful Web APIs + Shared Token

**Service**

**Service**

Transparent to IFTTT and Users

**Device**

**User**

Issue and Revoke OAuth to IFTTT

**Service**
How IFTTT Evolves: Methodology

Crawl
We crawled IFTTT every week for its services and applets between Nov 2016 and May 2017

Dataset
Overall, we crawled 200G data and we have open sourced it on our project website.

Measure
Service categories and distribution, IoT usage, applet properties.
How IFTTT Evolves: Statistics

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Sep 2015</th>
<th>Apr 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>220</td>
<td>408</td>
</tr>
<tr>
<td>Triggers</td>
<td>768</td>
<td>1490</td>
</tr>
<tr>
<td>Actions</td>
<td>368</td>
<td>957</td>
</tr>
<tr>
<td>Applets</td>
<td>224K</td>
<td>320K</td>
</tr>
<tr>
<td>Applet Contributors</td>
<td>106K</td>
<td>135K</td>
</tr>
<tr>
<td>Adoptions</td>
<td>12 millions</td>
<td>24 millions</td>
</tr>
</tbody>
</table>
### How IFTTTT Performs: Applet Selection

<table>
<thead>
<tr>
<th></th>
<th>IF</th>
<th>THEN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Wemo Switch is turned on</td>
<td>Turn on</td>
<td>Hue Light</td>
</tr>
<tr>
<td>A2</td>
<td>Wemo Switch is turned on</td>
<td>Add line to</td>
<td>Google Spreadsheet</td>
</tr>
<tr>
<td>A3</td>
<td>Gmail gets a email</td>
<td>Blink</td>
<td>Google Spreadsheet</td>
</tr>
<tr>
<td>A4</td>
<td>Gmail gets new attach</td>
<td>Save to</td>
<td>Google Drive</td>
</tr>
<tr>
<td>A5</td>
<td>Amazon Alexa gets a voice CMD</td>
<td>Turn off</td>
<td>Amazon Alexa</td>
</tr>
<tr>
<td>A6</td>
<td>Amazon Alexa gets a voice CMD</td>
<td>Turn on</td>
<td>Amazon Alexa</td>
</tr>
<tr>
<td>A7</td>
<td>Amazon Alexa plays a song</td>
<td>Add line to</td>
<td>Google Spreadsheet</td>
</tr>
</tbody>
</table>
How IFTTT Performs: End2End Latency

1. Turn on Wemo

2. Sync to Server

3. Sync to IFTTT

4. Turn on Hue

5. Turn on Hue

6. Turn on Hue

7. Hue is turned on

Test Controller

Wemo Switch

Home Router

Hue Hub

Hue Official Server

IFTTT Applet Engine

Hue Light
**How IFTTTT Performs:** End2End Latency

Each applet is tested 50 times at different hours of a 3-day period.

A1-A4 show **large and highly variable** latency.  
25\(^{th}\): 58s, 50\(^{th}\): 84s, 75\(^{th}\): 122s

A5-A7 involve Amazon Alexa whose applet execution seem to be specially customized.
How IFTTT Performs: Identify Bottlenecks

1. Turn on Wemo
2. Sync to Server
3. Sync to IFTTT
4. Turn on Hue
5. Turn on Hue
6. Turn on Hue
7. Hue is turned on

Who incurs the high latency?

Home Router
Hue Hub
Wemo Switch
Test Controller

1. Turn on Wemo
2. Sync to Server
3. Sync to IFTTT
4. Turn on Hue
5. Turn on Hue
6. Turn on Hue
7. Hue is turned on

Hue Light
Hue Hub
IFTTT Applet Engine
Wemo Official Server
Hue Official Server
How It Performs: Identify Bottlenecks

1. Turn on Wemo
2. Sync to Proxy
2.1 Sync to Proxy
2.2 Sync to Server
3. Sync to IFTTT
4. Turn on Hue
5.1 Turn on Hue
5.2 Turn on Hue
6. Turn on Hue
7. Hue is turned on

E2: Replace Both Trigger and Action Services

Our Proxy
Our Action Server
Our Trigger Server
IFTTT Applet Engine
How It Performs: Identify Bottlenecks

1. Turn on Wemo
2.1 Sync to Proxy Clock: 0.04s
2.2 Sync to Server Clock: 0.16s
3. IFTTT poll events Clock: 81.1s
4. Turn on Hue Clock: 82.1s
5.1 Turn on Hue Clock: 83.0s
5.2 Turn on Hue Clock: 83.0s
6. Turn on Hue
7. Hue is turned on Clock: 83.8s

Our Action Server
Our Proxy
Our Trigger Server

Low polling frequency of IFTTT leads to high latency
Discussion: Performance

Low Polling

Low polling frequency is not suitable for time-sensitive workflows.

High Polling

High polling frequency will add untenable pressure to the server side.

Adoptions: 24 millions, Frequency: 20/min
Polls/Day: 691.2 billions
Discussion: Performance

**Push**
Intuitively works, requires various service providers to support subscription

**Edge Computing**
Deploy workflow engines in edging or local environment: security issues

We need a more Efficient and Responsive Solution
Discussion: Security

Least Privilege

Least Privilege rule is broken. IFTTT requires max privileges for each service.

Binding

Privilege authorization is not binding to specific applets and is valid even if no applets require it.

We need a more Secure Solution
Discussion: Intelligence

We need a **Smarter** Solution
Data Release

**Applets Services**
7 Snapshots, each per month across Nov 2016 to May 2017.

**Source Code**
Performance testbed, self-implemented IFTTT service, measurement scripts, data crawling scripts.

[https://www.cs.indiana.edu/~fengqian/ifttt_measurement/](https://www.cs.indiana.edu/~fengqian/ifttt_measurement/)
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