Internet Personal Assistant

The Brewing of an IPA

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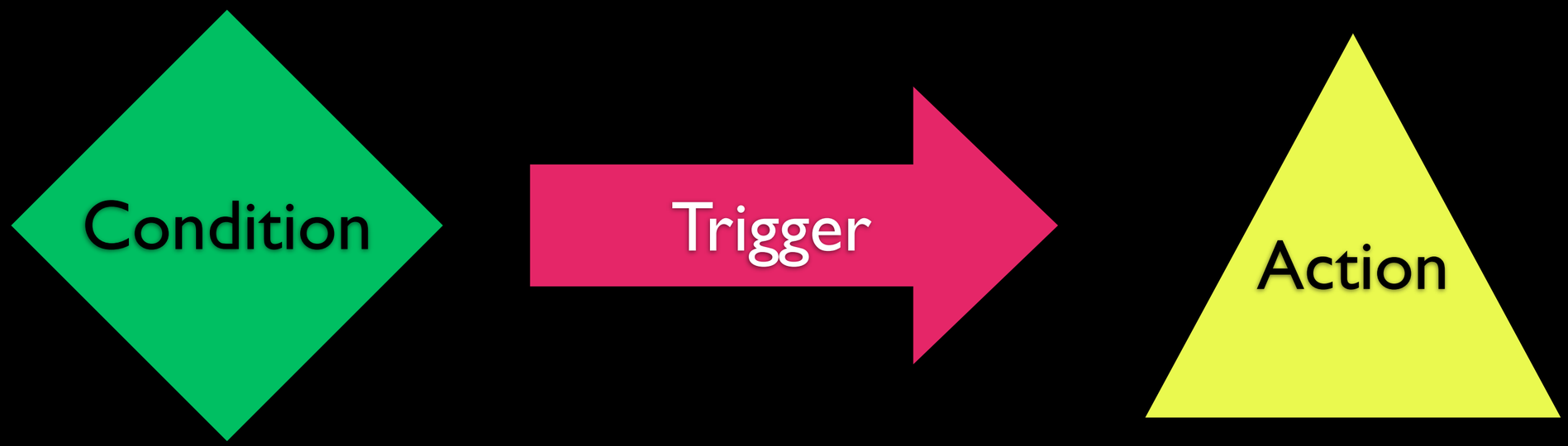
Have You Ever Wanted...

- To not worry about setting your alarm?
- To know when to go get your friends at the airport?
- To automate your home?

...to have the boring things done for you?

What does the IPA do?

- Allows users to create and manage triggers.
- Trigger: a condition-action pair
- Condition: a truth-evaluable statement
- Action: do something!



Condition

If I'm late to algorithms and the temperature in my ZIP code drops below 40 degrees

Max's Trigger

Action

Text
Me:
"It's 37 degrees out, grab your gloves... go now!"

If the cost of Apple stock drops below $400, with a P/E ratio below 15.

Michael's Trigger

Buy 3% of my savings worth of AAPL.

My friend's flight gets within 200 miles of MSP

Anya's Trigger

Text Me:
"Start driving over to the airport."

Personal Assistants Today...

- Online Calendars
- Siri
- ifttt (our competitor)

... and now IPA.

The World is Full of Events (!)

- American Airlines Flight 1344 departed Dallas for Minneapolis at 6:05 PM.
- Let's make a trigger that will let us know when it's getting close to Minneapolis.

Volunteers?

The Brewing of the IPA

- Real-time Applicability
- Reliability
- Generality
- Extensibility
- Accessibility

To Interfaces

News Agent

1. check active triggers

Trigger Manager

2. get 'unchecked' triggers

3. Triggers

4. "Check Yo'self"

Data Manager

Condition

5. Evaluate

12. True or False

Trigger

6. Evaluate

11. T/F

Operation

7. Get Attribute or Update

10. Attribute Value

Source

8. Scrape

9. Data

The Internet

13. Execute

Action

PostgreSQL

The journey continues...

- A look under the hood
- Developer Tools
- User Interface
- Demo

Under the Hood...

IPA Core

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News Agent

The Front Desk

IPA Core

News Agent

- Dispatches jobs to the rest of the core
- Manages input/output for user interfaces
- Translates between JSON and Python
- Stateless
- Asynchronous

Why...

- Stateless? - Accessibility
- Asynchronous? - Availability

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Trigger Manager

IPA Core

Trigger Manager

- Handles adding/deleting/modifying triggers
- Checks active triggers when asked by News Agent

Why...

- Outsource condition evaluating?
  - Simplicity
  - Extensibility

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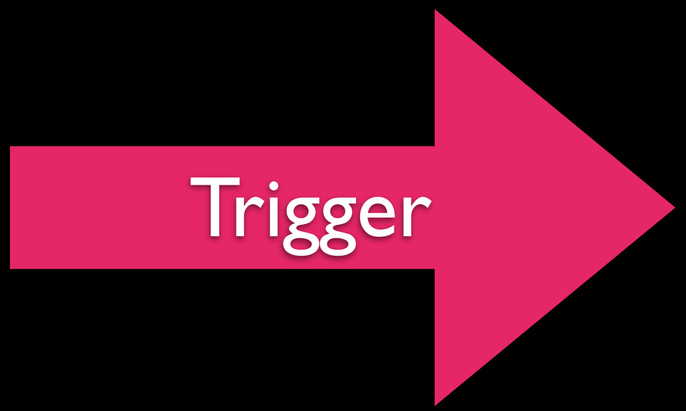
Trigger

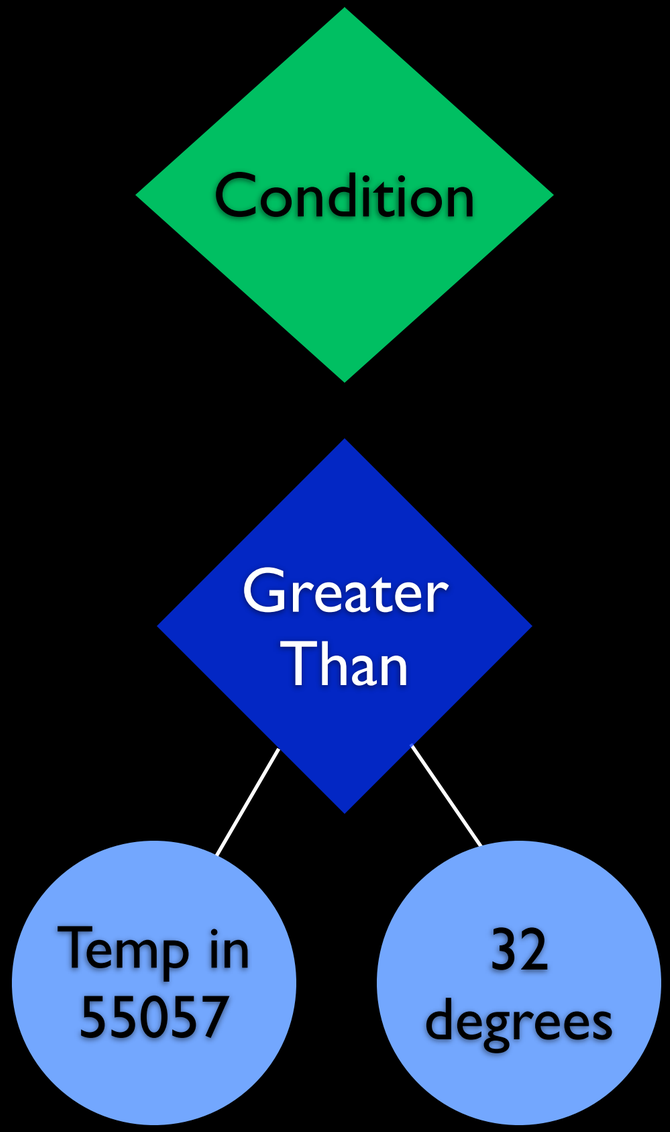
IPA Core



- Has a condition and action
- Contains timing data
- Load condition and action from DB (lazily)
- Evaluate condition and execute action

Condition

IPA Core



- Represented in a tree format
- Nodes can be:
  - Variables (Stock|AAPL|Price)
  - Constants (3, “hi”, “12/26/1989 21:10”)
  - Operations (Sum, Greater Than, Distance)
  - Wolfram|Alpha (“population of China”)
- Condition ‘trees’ evaluate to true or false
- Nasty to represent in a DB!

```
{"nodeType": "operation", "arguments": [{"tableName":
"Weather", "identifier": "55057", "nodeType": "variable",
"attribute": "temperature"}, {"valueType": "Number",
"nodeType": "constant", "value": "32"}], "value": "Greater"}
```

Source and Action

IPA Core

Source

- Custom representation of data from the Internet
- Knows how to grab information from the Web
- Knows how to store and retrieve data from Data Manager

Action

- Knows how to do something
- Can use variable information from database

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Why...

IPA Core

- Conditions as trees?
  - Generality
  - Performance
- Source object separate?
  - Reliability
  - Extensibility

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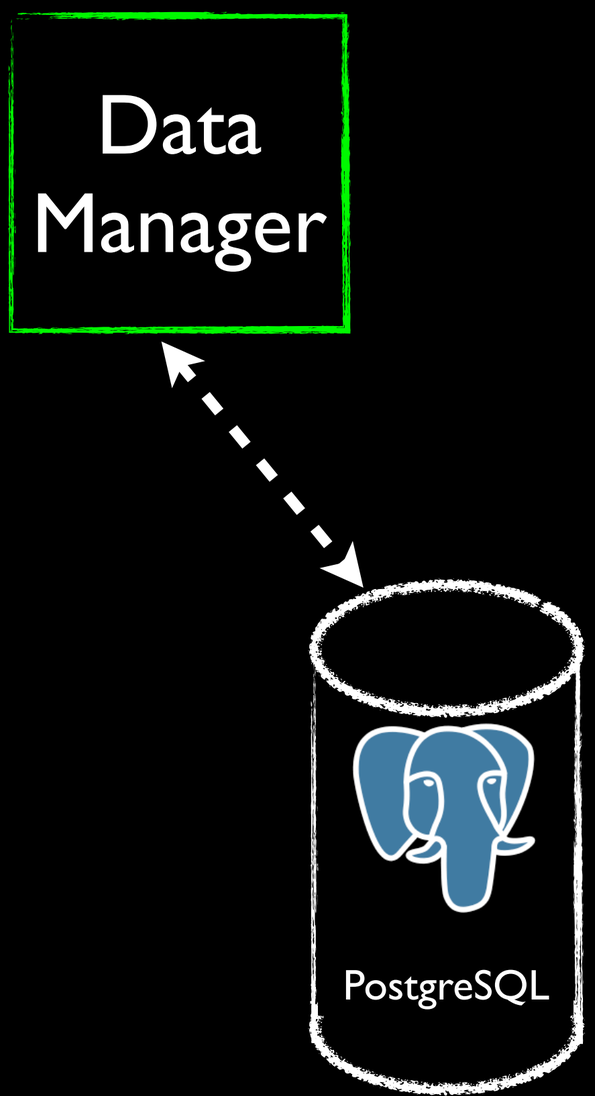
PostgreSQL

Data Manager

The Warehouse

IPA Core

Data Manager

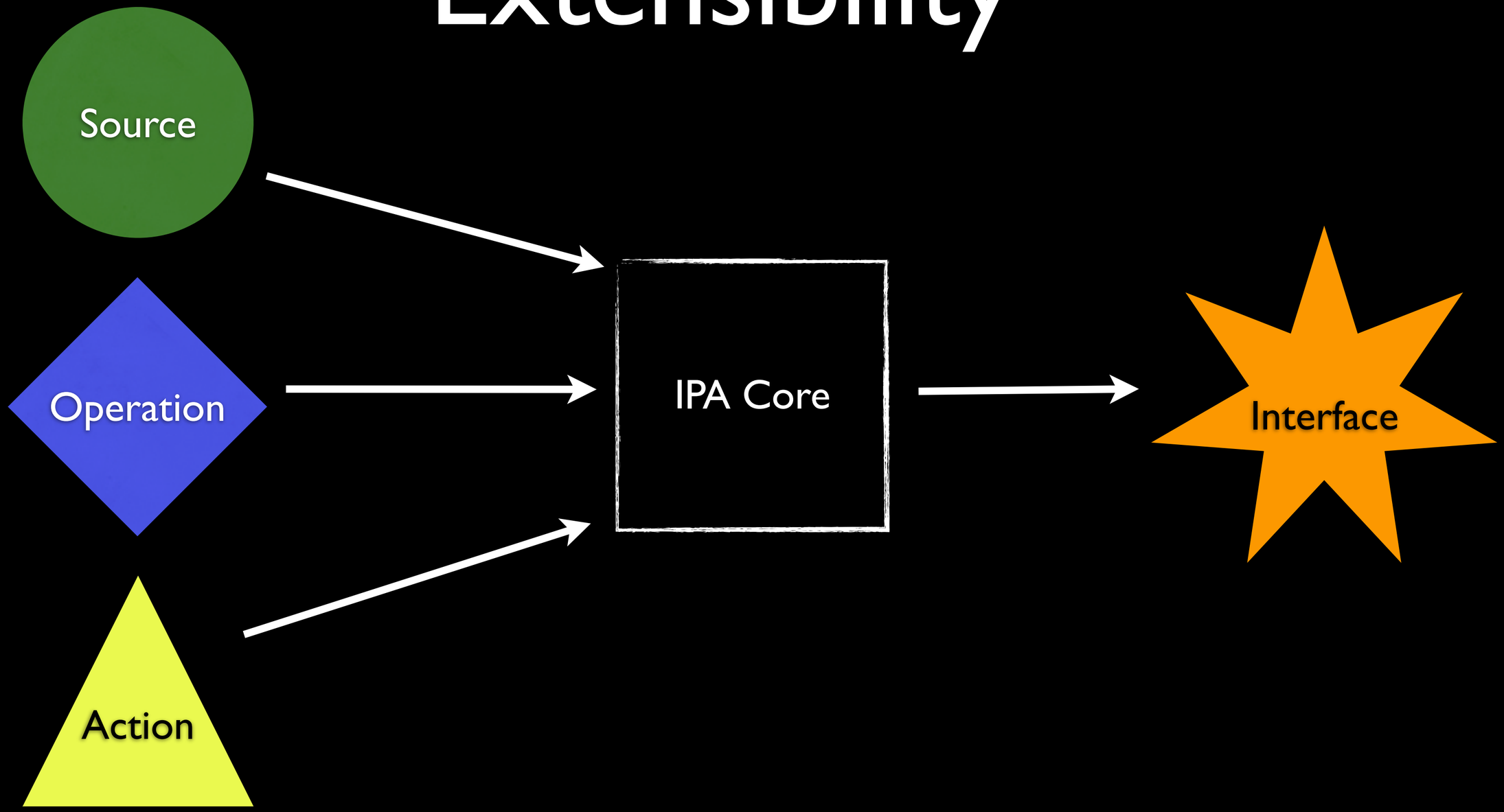


- "All roads lead to Data Manager"
- Wrapper around a PostgreSQL database
- Translates between SQL and Python

Why...

- Make database calls go through Data Manager?
  - Simplicity
  - Extensibility

Extensibility



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Extending IPA

- Goal: Extensibility
  - Why? Possibilities are limitless.
- Strategy: Curation
  - Why? Security and reliability.
- Developers submit code for proposed sources, conditions, actions. Curators approve and add to system.

"So easy, an intro student could do it."

Source

Data From Anywhere

Prerequisite: CS111

Source

Attributes

What information does this source provide?

Fields

Updating Behavior

How do we obtain this information?

Scrape()

Parse(scrapeResult)

Metadata

Details we need to keep things running.

Verbose Name

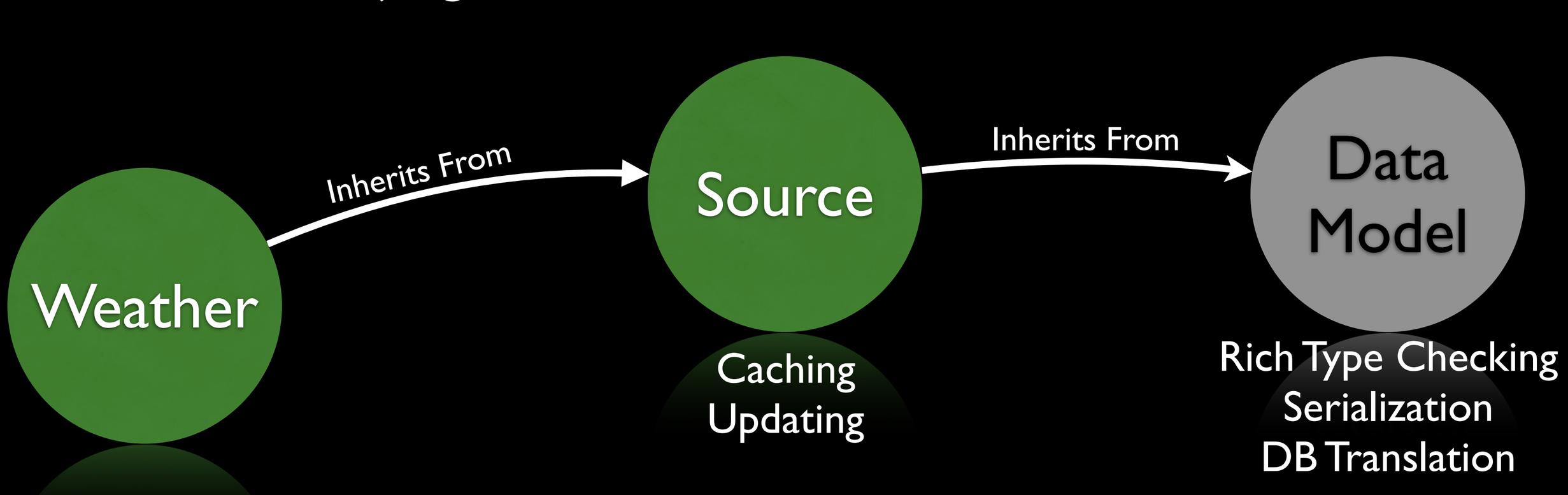
Shelf Life

Identifier

Benefits of Good Ancestry

Source

- (Rich) Type Checking
- Caching
- No Database Experience Necessary
- JSON Serialization Included
- Work like Django Models



Example: Airports

- For use with the Flight source.
  - e.g. Distance to Airport
- What information do we want?
  - Airport Name, City, Location
- How do we get the information?
  - FlightAware API. We send an XML request, FA grabs data and returns it.
  - Michael's credit card gets charged (a little).
- Necessary Data Transforms
  - Convert latitude and longitude to a single PositionField.
- Metadata
  - Data current for one year

Airport("MSP")

Code: MSP

City: Minneapolis, MN

Name: Minneapolis/St Paul Intl

Time Zone: CST6CDT

Location Coordinates: (-93.221,44.881)

Last Updated: 2012-02-20 18:07:10

```
class Airport(Source):
    # Fields
    code = StringField("Airport ICAO Code", maxLen=3)
    location = PositionField("Location Coordinates")
    city = StringField("City")
    name = StringField("Name")
    time_zone = StringField("Time Zone")

    # Metadata
    __verbosename__ = "Airport"
    __shelfLife__ = timedelta(days=365)
    __identifier__ = "code"
```

```
# Updating Behavior
def scrape(self):
    api = Client(flightapi_url,username=flightapi_username,password=flightapi_key)
    result = api.service.AirportInfo(self.code)
    return result

def parse(self,raw):
    d = dict()
    d['city'] = raw['location']
    d['name'] = raw['name']
    d['time_zone'] = raw['timezone']
    d['location'] = [Decimal(raw['longitude']),Decimal(raw['latitude'])]
    return d
```

Compare Anything

Prerequisite: CS111

Operation

Evaluation

How do we perform the operation

Evaluate(*args)

Metadata

Details we need to keep things running.

Verbose Name

# of Arguments

Input/Return Types

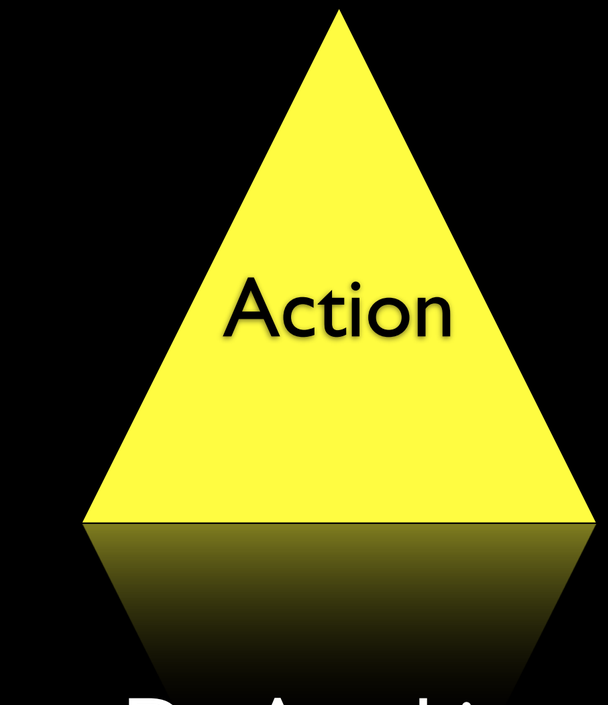
```
class Distance(Operation):
    ''' Get the distance between two lists containing lat/lon coordinates'''

    # Metadata
    __verbosename__ = "Distance"
    num_arguments = 2
    parameter_types = (list,tuple)
    return_type = (decimal.Decimal,)

    # Evaluation
    def evaluate(self,*args):
        earthRadius = 3959

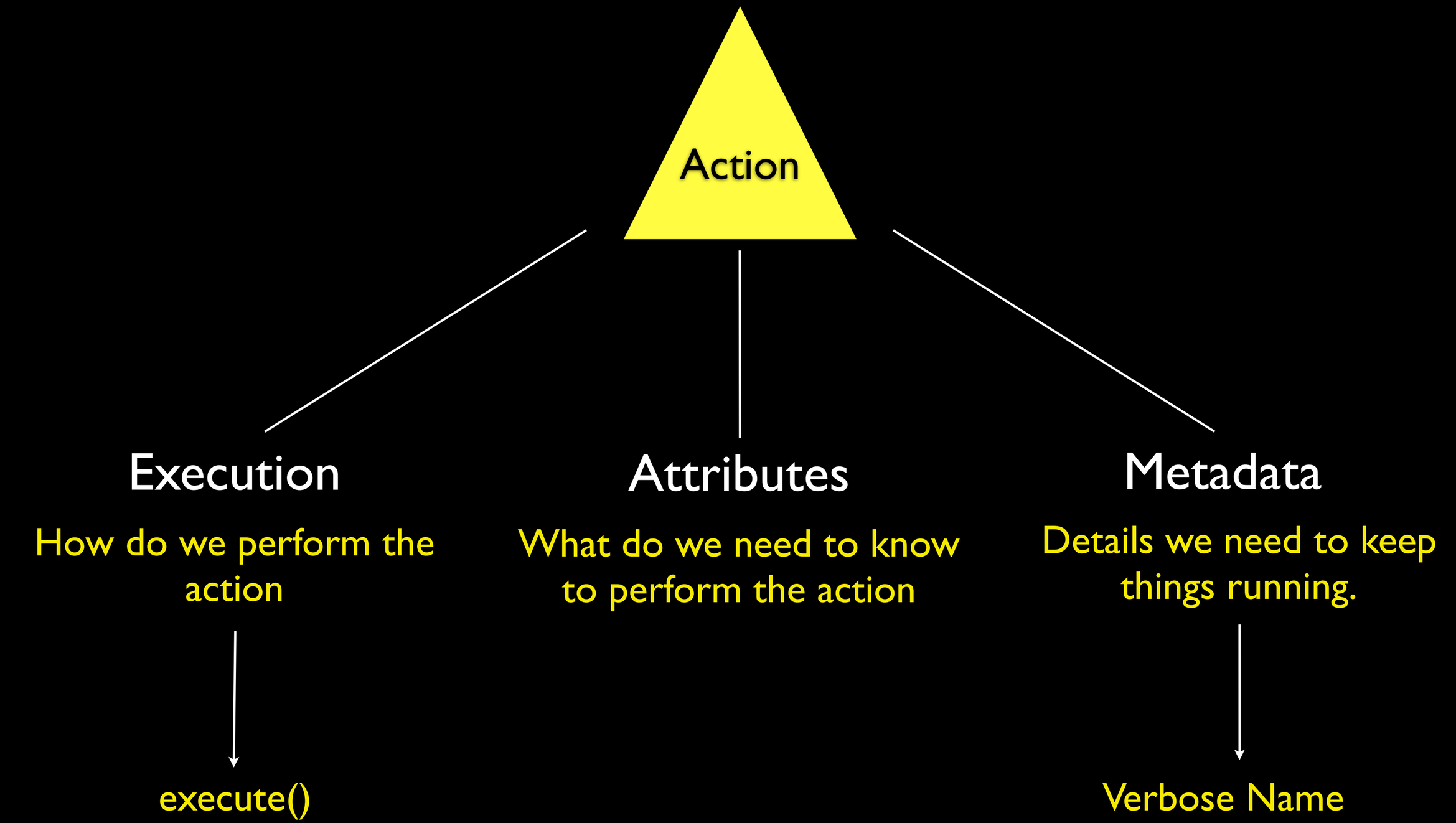
        lon1 = math.radians(args[0][0])
        lat1 = math.radians(args[0][1])
        lon2 = math.radians(args[1][0])
        lat2 = math.radians(args[1][1])

        d = math.acos(math.sin(lat1)*math.sin(lat2) + math.cos(lat1)*math.cos(lat2) * \
            math.cos(lon2-lon1)) * earthRadius
        return decimal.Decimal(d)
```



Do Anything

Prerequisite: CS111


Action
Execution
How do we perform the action
execute()
Attributes
What do we need to know to perform the action
Metadata
Details we need to keep things running.
Verbose Name

Example: SendSMS

- Send an SMS to a specified number.
- What information do we need?
  - Cell Number (and Carrier)
    - e.g. `2405069235@sms.att.net`
  - Message
- How do we do it?
  - Send an email through a carrier SMS gateway.

```
class SendSMS(ActionNode):
    # Required Information
    phoneNumber = LongField("Phone number to text", maxVal = 9999999999,\
           minVal=1000000000,required=True,default=None)
    carrier = StringField("Cellphone carrier",\
           choiceSet=['AT&T','Sprint','Verizon','T-Mobile'],required=True,default=None)
    message = StringField("Message to send",maxLen=500,required=True)

    # Metadata
    __verbosename__="Send a Text Message"

    # Execution Information
    def execute(self):
        server = smtplib.SMTP("smtp.gmail.com", 587)
        server.starttls()
        server.login(gmailAccount, gmailPassword)
        self.carrier = self.carrier.strip()
        server.sendmail(gmailAccount,
                        str(self.phoneNumber)+\
                        '@'+phoneCarriersDict[self.carrier],
                        self.message)
```

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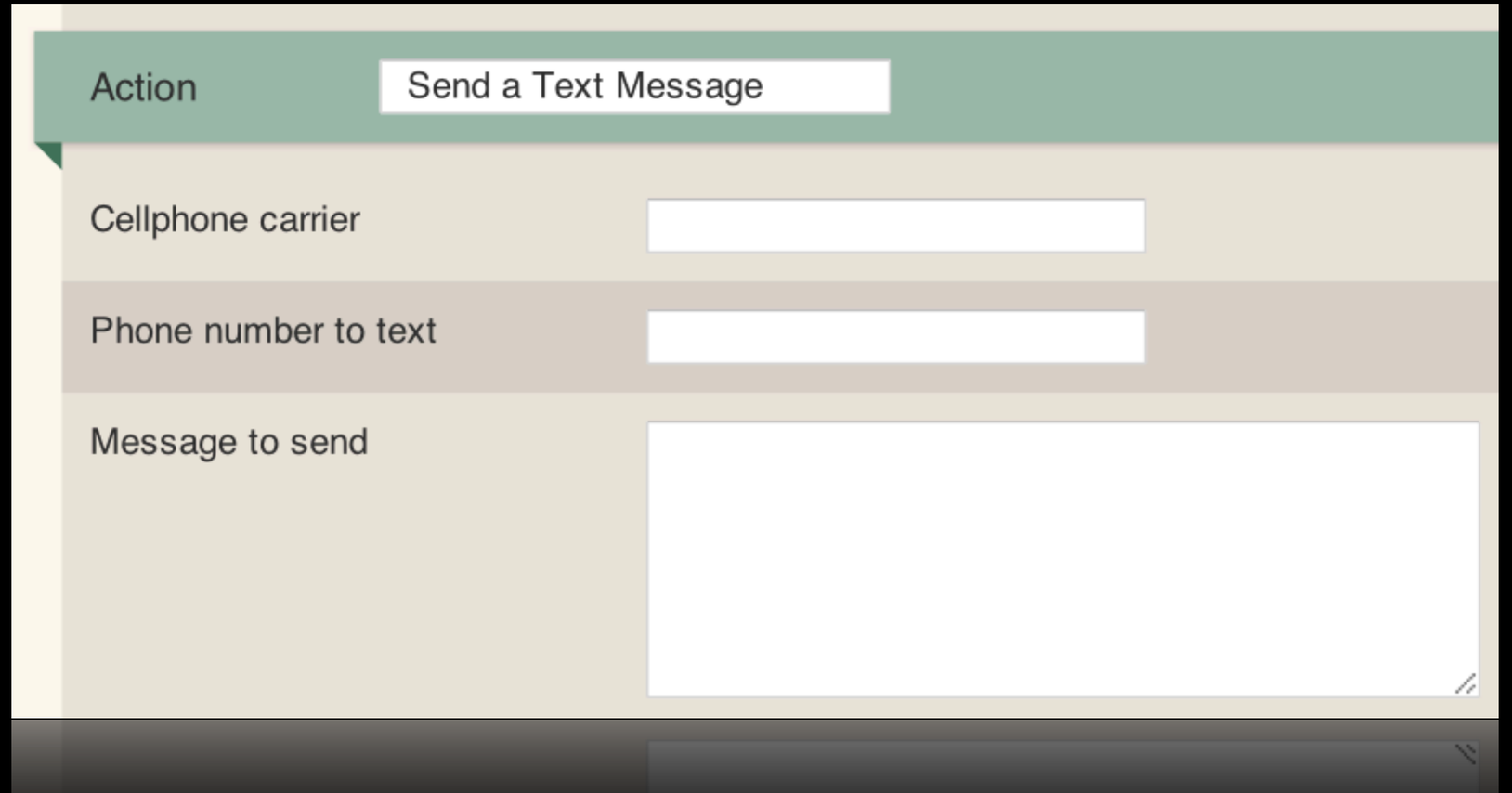
    ...
```



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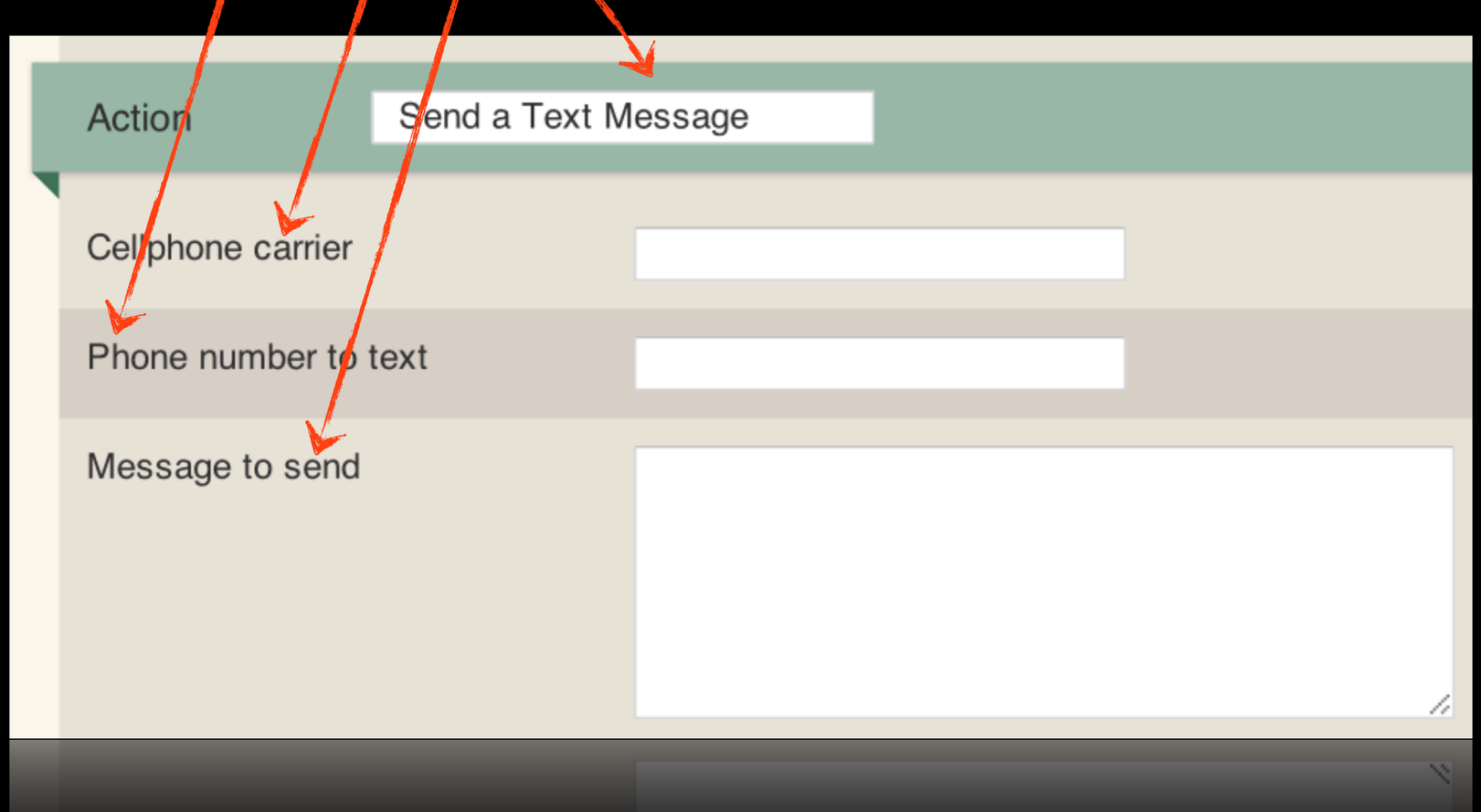

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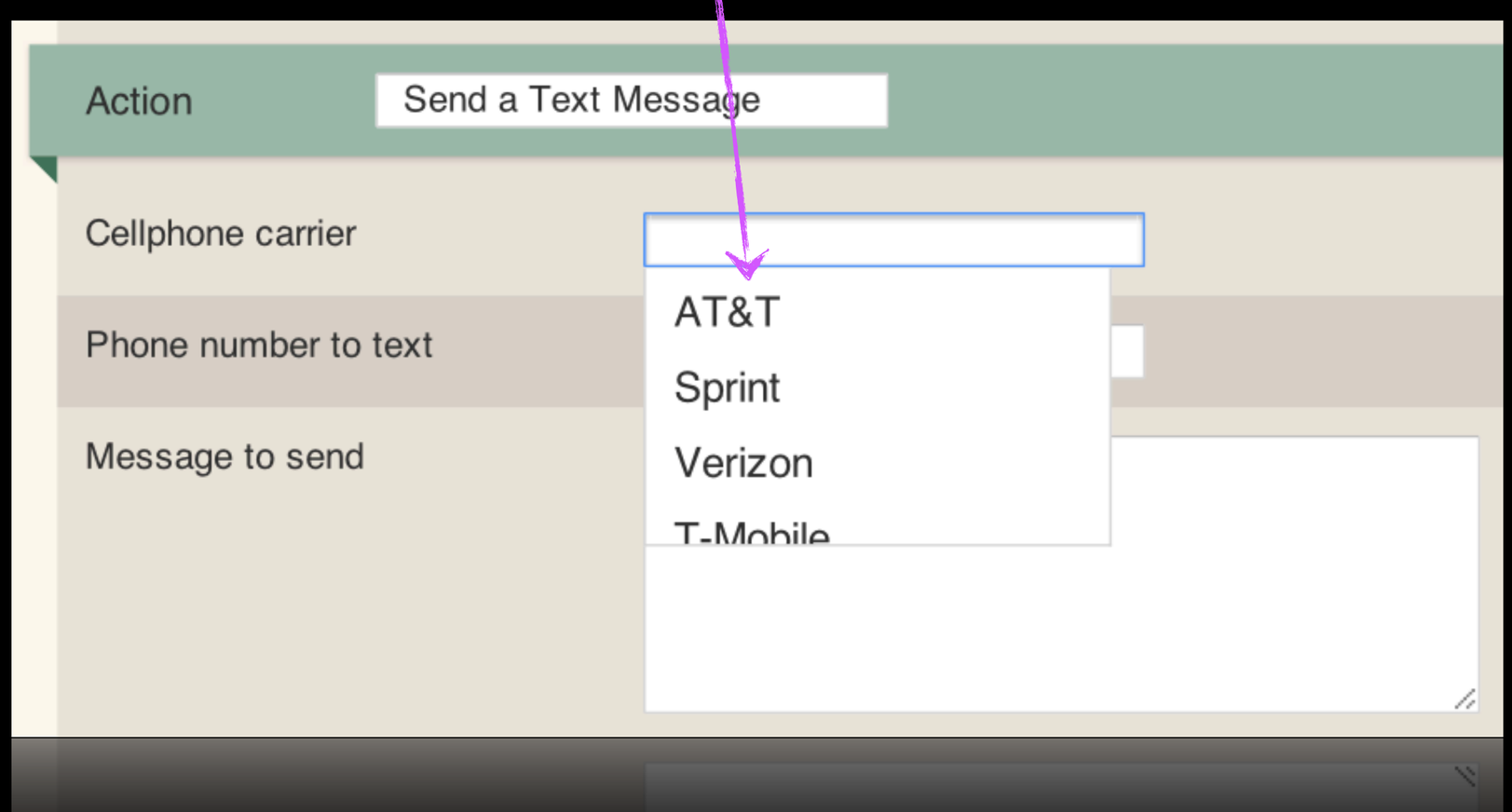
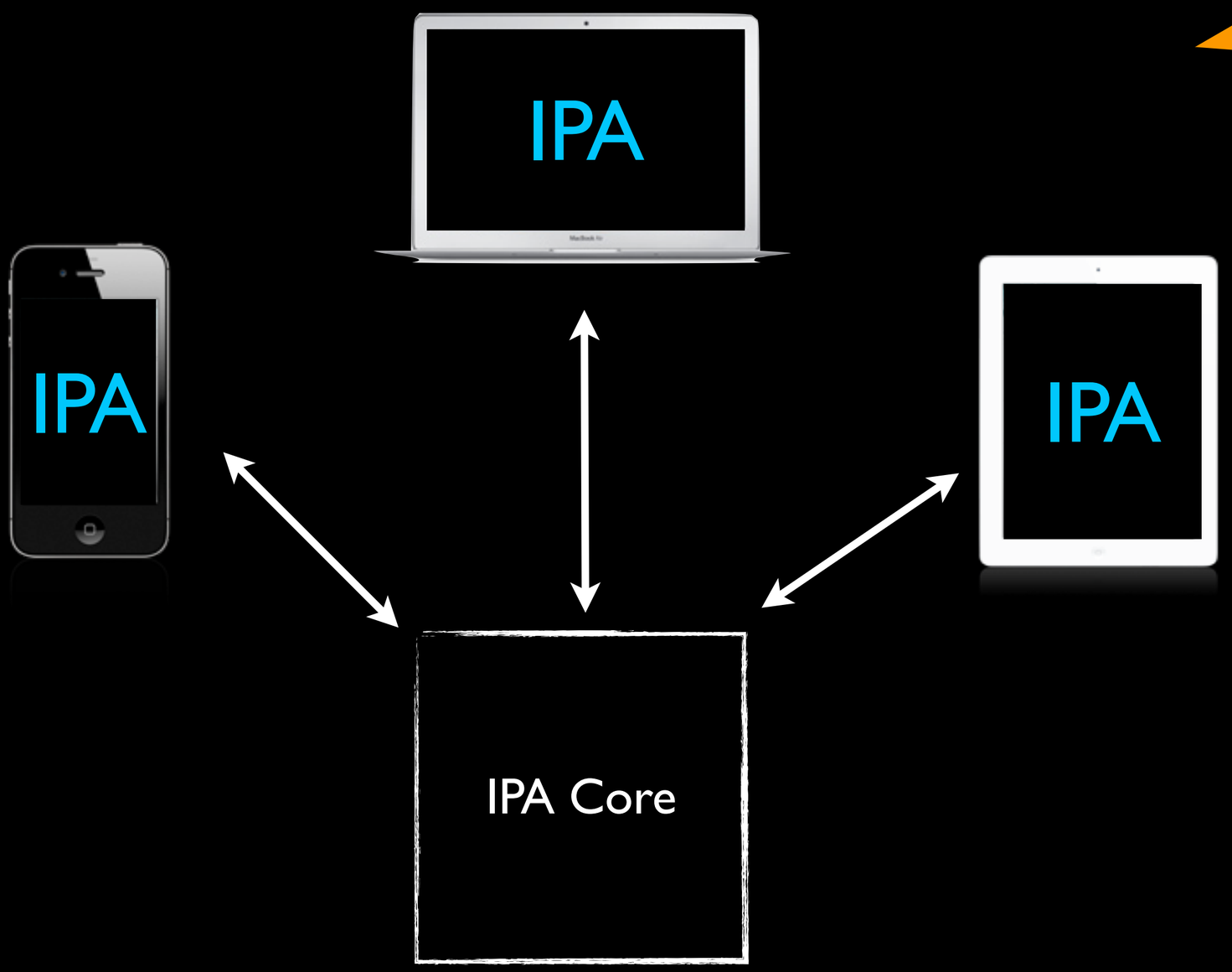


Interface...

Adrian Trunzo,
Master Interfacer

People We Don't Know

Interface

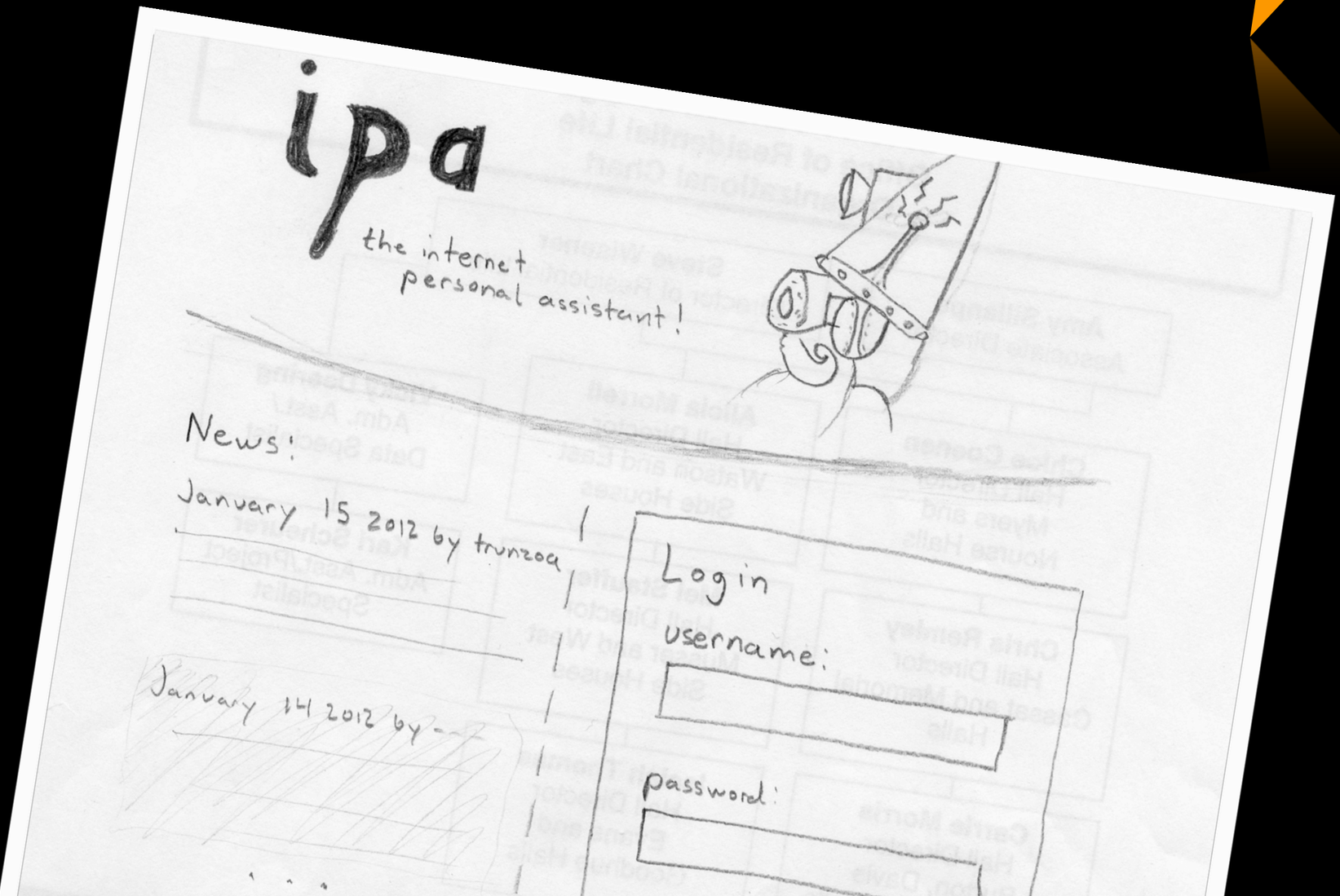


(And non-Apple products too!)

Interface

Each interface has a common set of design principles:

- Usability
- Freedom
- Simplicity



Interface Tasks

- Create, Edit and Delete Triggers
  - Make Conditions
  - Associate Actions
  - Set timing
- Monitor status of current triggers
- Manage user profile
- Explore the current state of the system
- Discover new sources and actions

The First Interface

- A website, with four simple spaces:
  - Welcome/Login page
  - Dashboard
  - Workshop
  - Profile

- What technologies are being used?
  - HTML 5
  - CSS
  - JavaScript (jQuery)
  - Python web server (Flask)

Powered By

{ipa}

trunzoa [logout]

Updates Manage Advanced Account

Modify ⊕

~~Subscribe~~ ⊗

Step 1

Choose a Data source:

Filter:

Stocks

Step 1 > Step 2

ipa

DASHBOARD
Recent Activity

WORKSHOP
Manage Triggers

PROFILE
Your Account

Add Trigger

CONDITION
If what?

ACTION
Then what?

FINISH
Review and Submit

Create a Condition

If

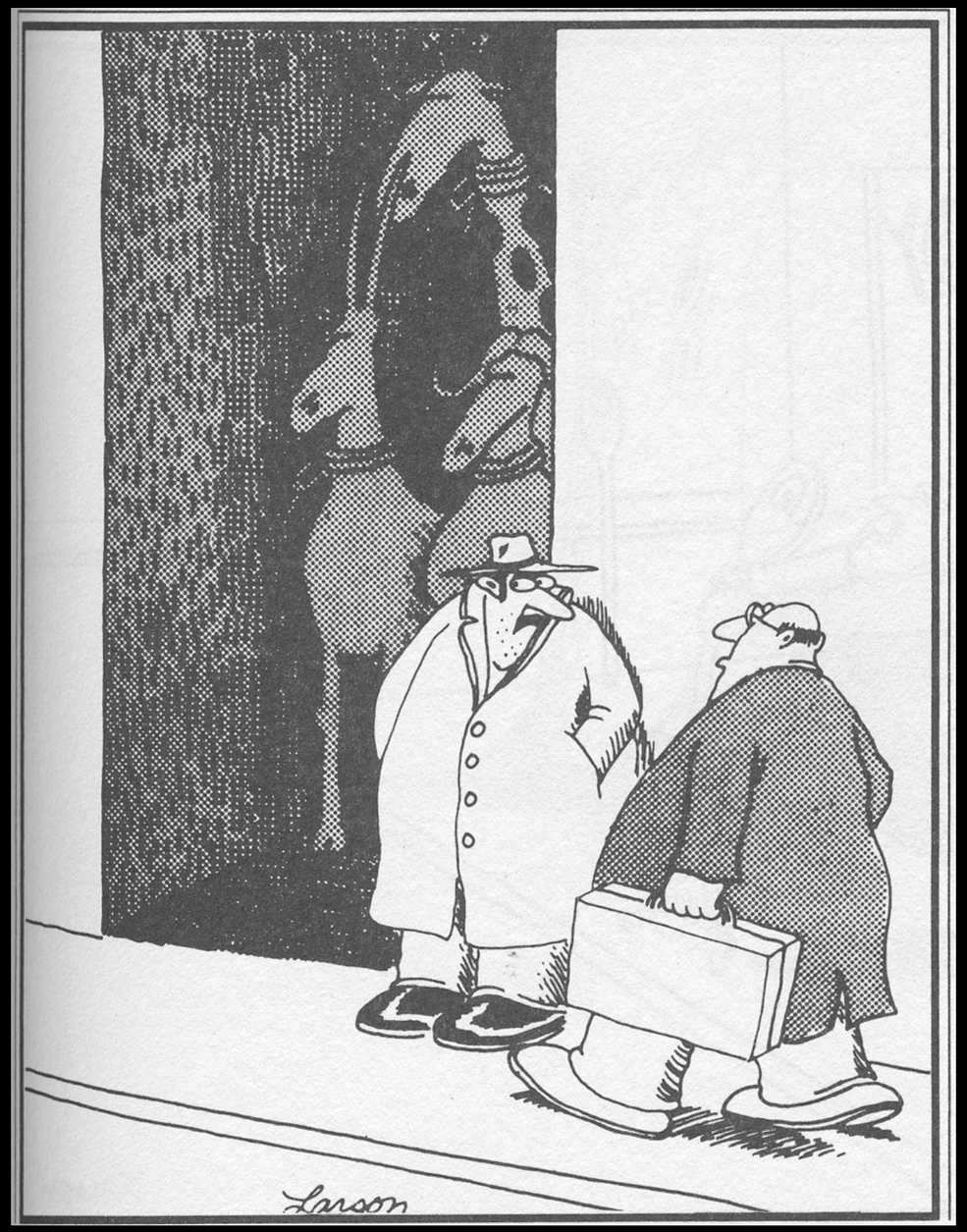
Operation

Operation >

Constant

Variable

Meanwhile on Jeff's Farm...



"Hey buddy... you wanna buy a hoofed mammal?"
(Larson 1984)


No Gpus...
...Bad News

Demo...

Good gnus everyone!

Complex Triggers +
Automatic Checking +
Interface Independence +
3rd Party Extensibility

=

Infinite Possibilities Available

=

IPA

Thanks...

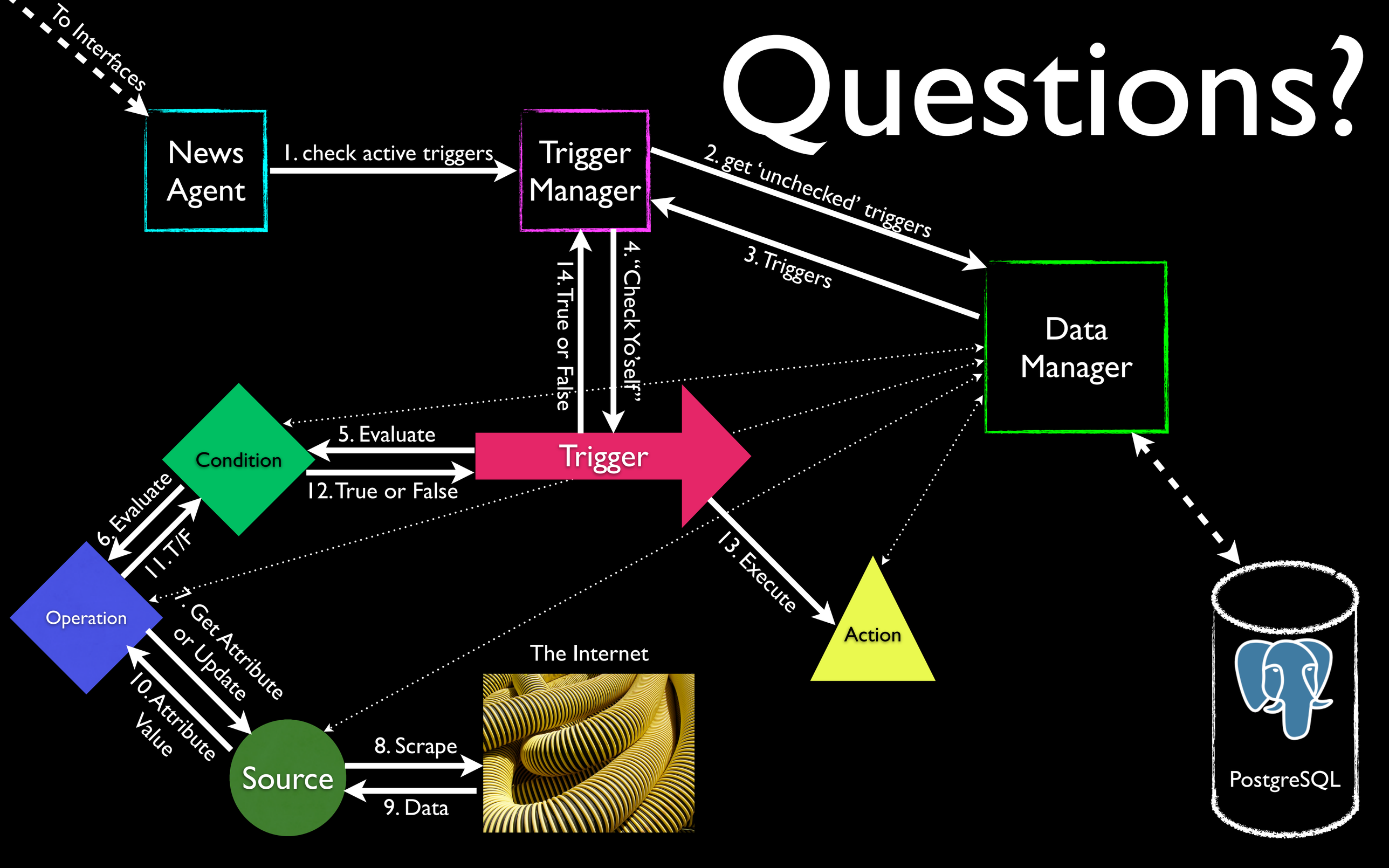
- Mike Tie
- DLN, for interrogating us
- ifttt
- The Django project
- Anya's Parents

Thanks...

Jeff Ondich

Master of the Gnus Agent

Questions?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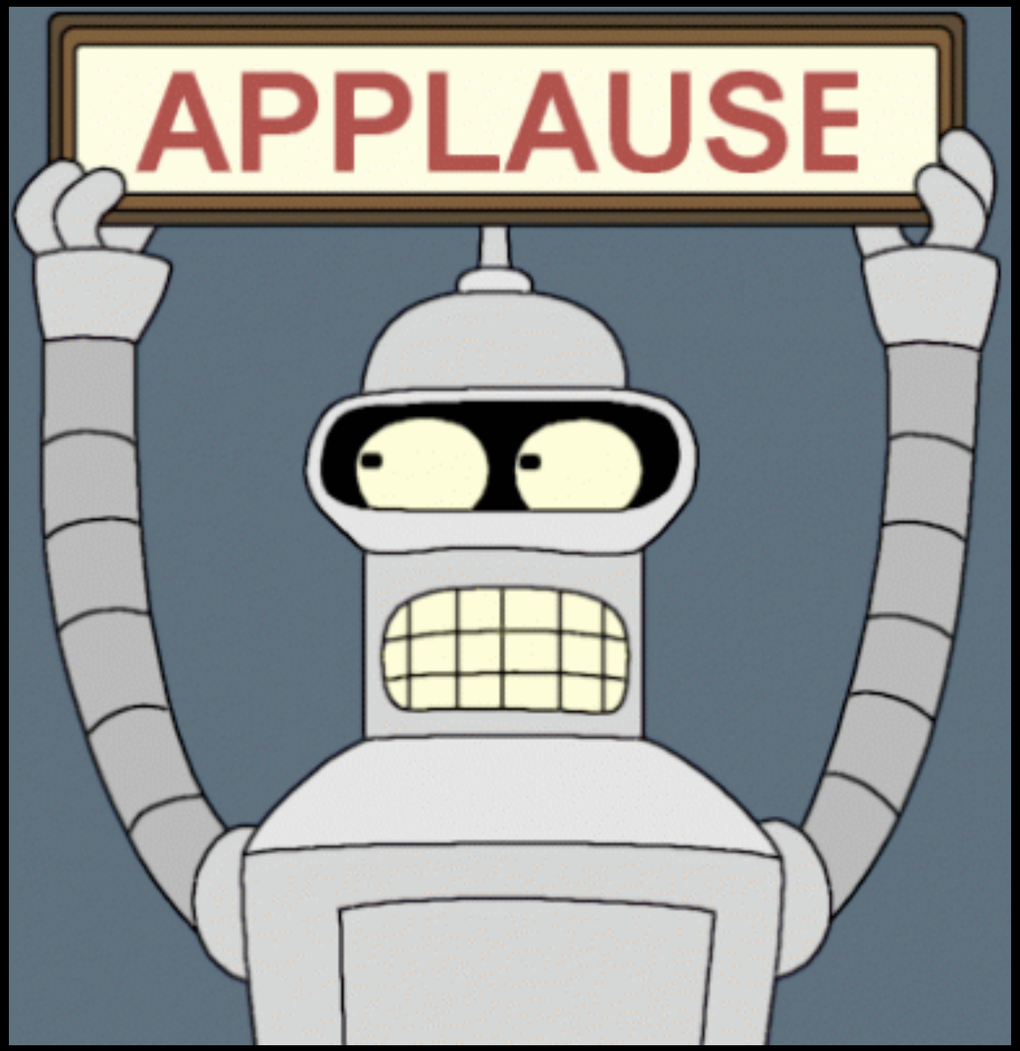
APPLAUSE