THE OPEN SOURCE VISUALIZATION ENGINE FOR BUSY HACKERS

Thibault Reuille & Andrew Hay

OpenDNS

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THIBAULT REUILLE

- Security Researcher at OpenDNS
- Former Software Engineer @ NVIDIA
- MS IT from EPITA: Ingénierie Informatique
- @ThibaultReuille

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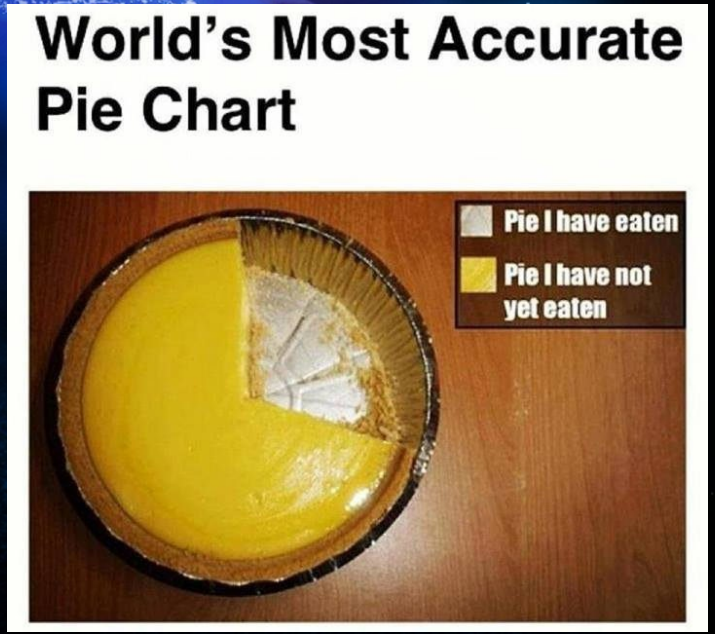
ANDREW HAY

- Sr. Security Research Lead & Evangelist
- Former research director, industry analyst, security analyst, and engineering/product/program manager
- @andrewsmhay

WHY VISUALIZE THE DATA?

Why Visualize the Data?

- Aren't pie charts enough?
- What does advanced visualization give us?
- Can't I just use R or Excel?



Because, Minority Report

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QUICK OVERVIEW OF LEARNING STYLES

Learning Styles

- Neil Fleming's VAK/VARK model

- The 4 types
  1. Visual learners
  2. Auditory learners
  3. Reading-writing preference learners
  4. Kinesthetic learners or tactile learners

Learning Styles

- Key concept of visual learning
- Graphic organizers
- Visual representations of
  - knowledge,
  - concepts,
  - thoughts, or
  - ideas

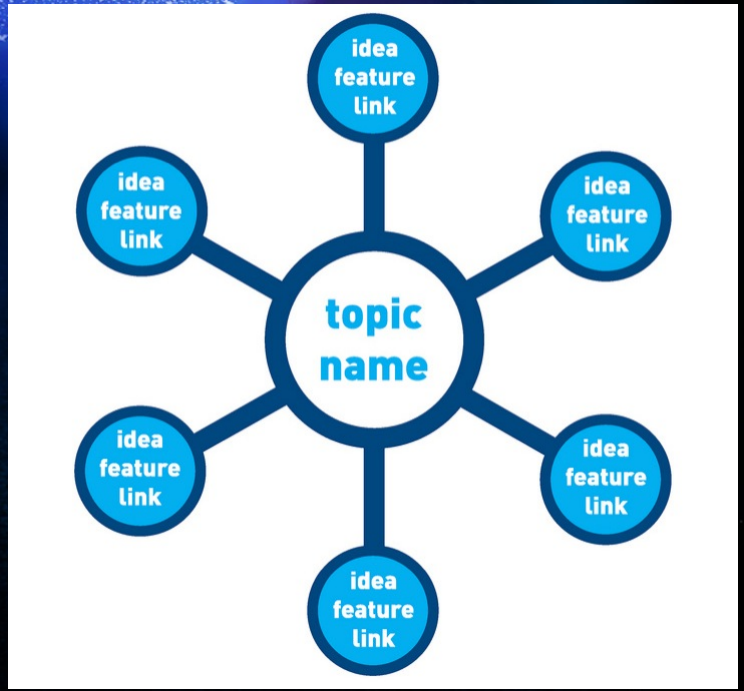
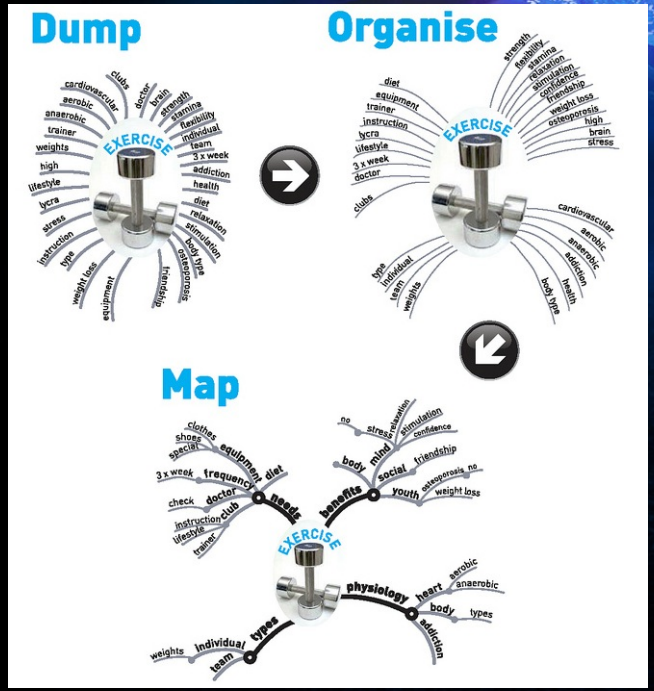


Photo Credit: modellearning

Learning Styles



- Clarify meaning through relationships
- Best example might be utilizing a mind map

Photo Credit: modellearning

Learning Styles

- Representing information spatially and with images [some*] students are able to
  - focus on meaning
  - reorganize and group similar ideas easily
  - make better use of their visual memory

Source: http://en.wikipedia.org/wiki/Visual_learning

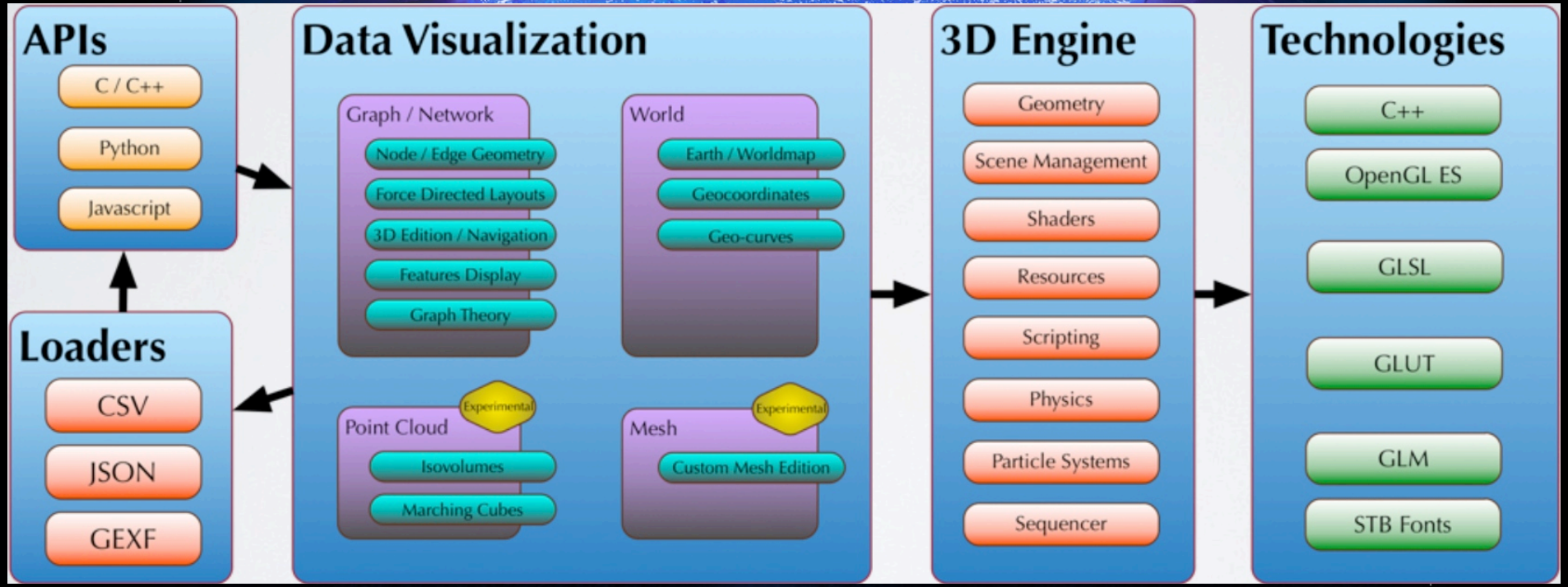
INTRODUCING OpenGraphiti

Introducing OpenGraphiti

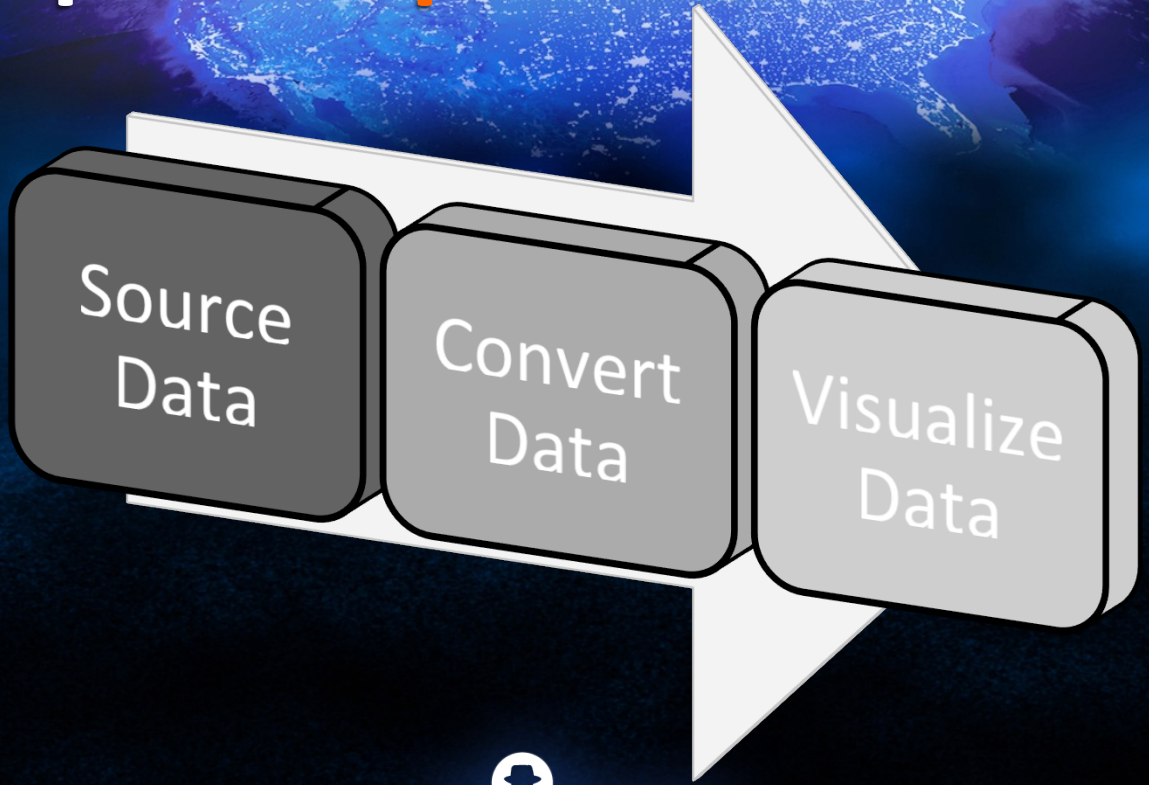
- Open Source visualization engine
- Remove the complexity of creating advanced data visualizations
- Visualize any loosely related data
  - without having to endlessly reformat that data

Introducing OpenGraphiti

Introducing OpenGraphiti



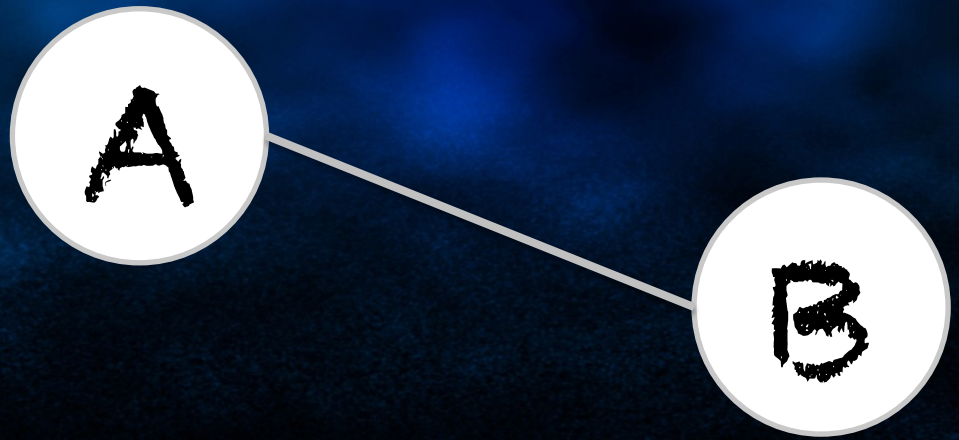
OpenGraphiti Workflow



THE MATH AND THE PHYSICS PART

The Math and Physics Part

- Graph theory 101



The Math and Physics Part

- Suppose you have a graph

$$G = (V, E)$$

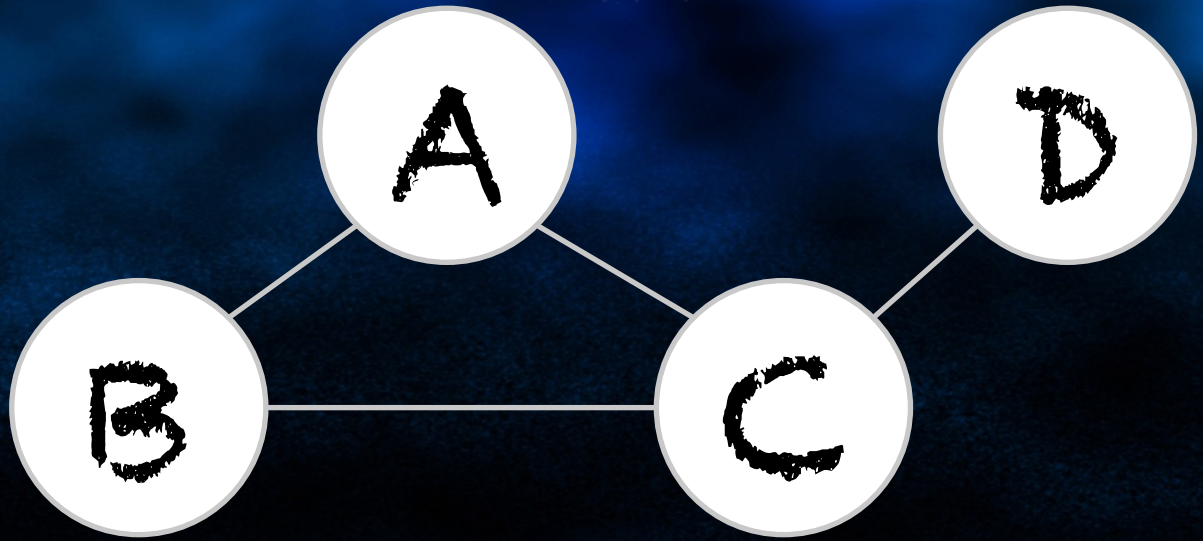
Where:

$V = \{0, 1, 2, 3\}$ and

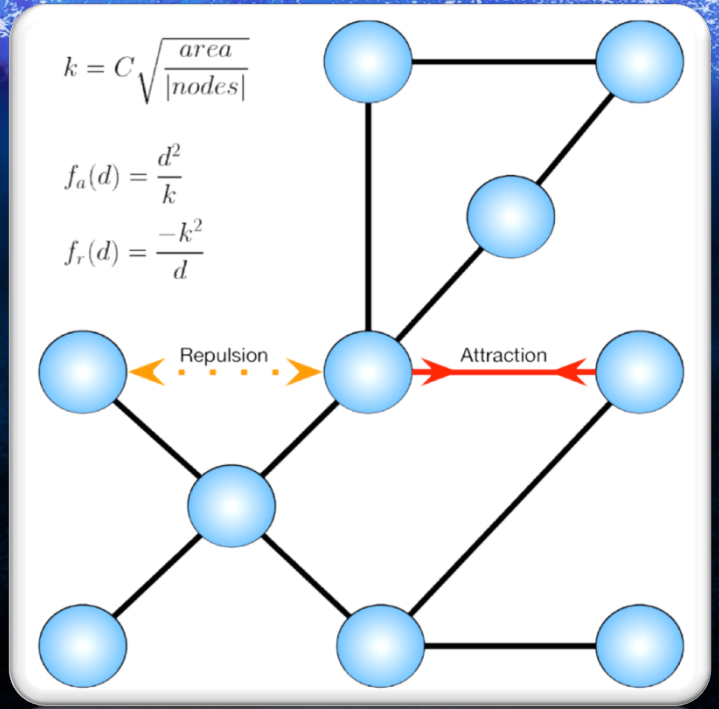
$E = \{(0, 1), (0, 2), (1, 2), (2, 3)\}$

The Math and Physics Part

- This would provide the following graph:



The Math and Physics Part



USING OpenGraphiti

Using OpenGraphiti

- Requirements
  - OS X (10.9 / Mavericks)

  - Python 2.7.x

Using OpenGraphiti

- How to build:

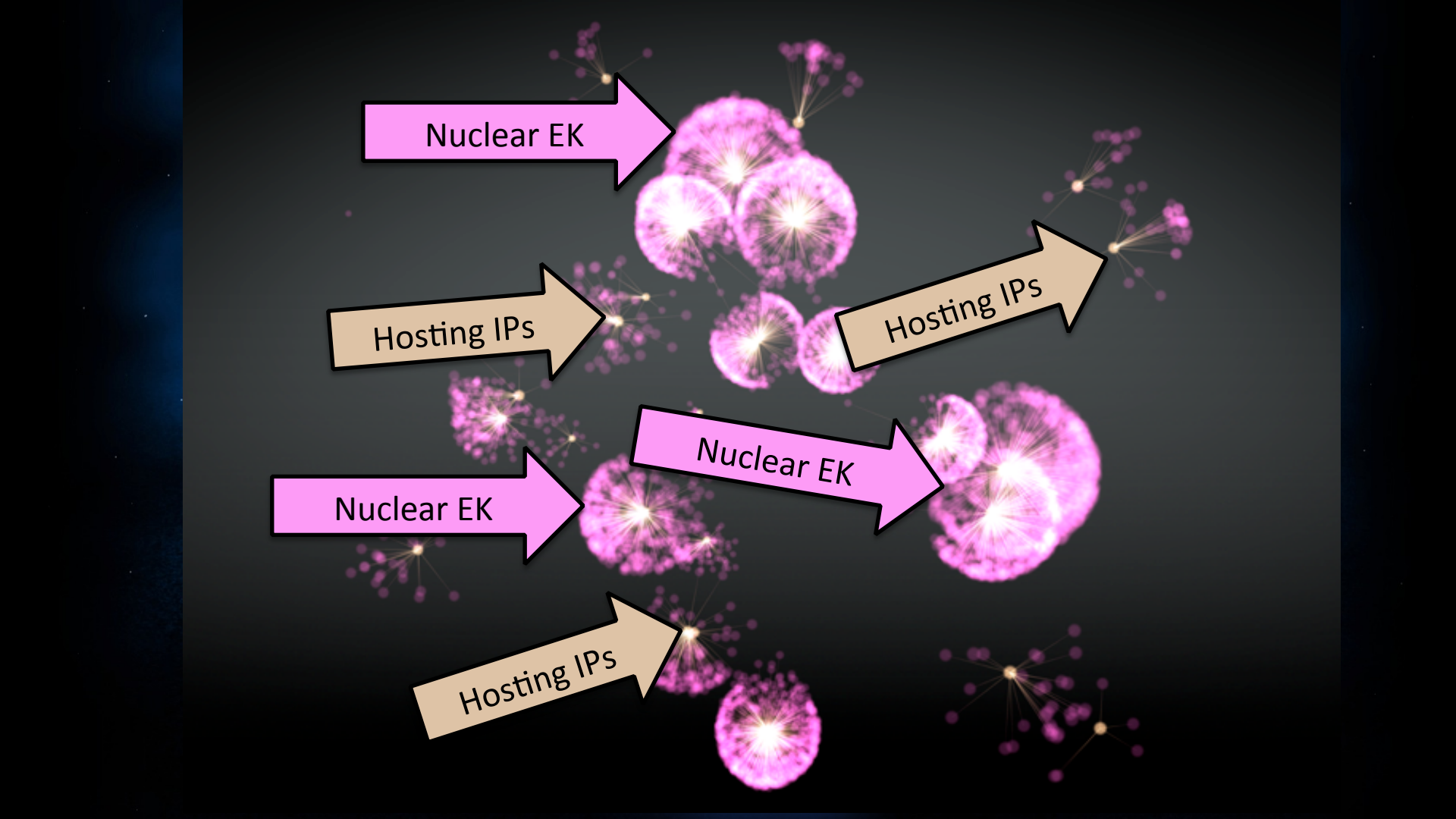
```
$ git clone <git repo>
$ pip install networkx
$ cd graphiti
$ make clean native
```

- How to run:

```
$ ./graphiti <options> output.json
```

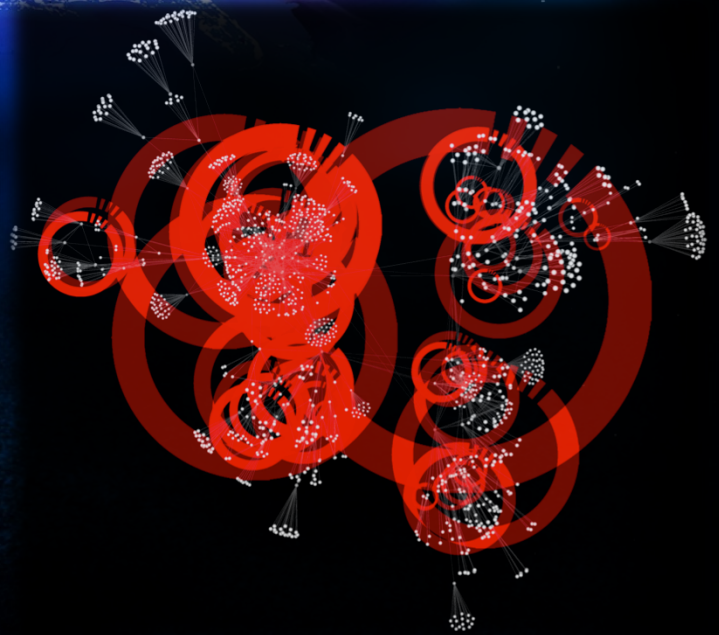
Using OpenGraphiti

- The result is something like this
- Malicious domains graph
  - Nuclear exploit kits (pink)
  - Hosting IP addresses (yellow)


Nuclear EK
Hosting IPs
Hosting IPs
Nuclear EK
Nuclear EK
Hosting IPs

Using OpenGraphiti

- OpenDNS uses OpenGraphiti and discussed methodologies
- Ongoing tracking of…
  - CryptoLocker & CryptoDefense ransomware
  - Red October malware
  - Kelihos botnet
  - and more…



Using OpenGraphiti

- The examples in this presentation presume the following…
  1. OpenGraphiti requirements are satisfied
  2. OpenGraphiti is located in your home directory

     e.g. `/Users/ahay/graphiti/`
  3. Semantic-Net is located in your home directory

     e.g. `/Users/ahay/semanticnet/`

OPENGRAPHITI VISUALIZATION EXAMPLES

EXAMPLE 1 – VISUALIZING DIRECTORY STRUCTURE

Visualizing Directory Structure

- Easiest example
- Visualize the file and directory structure of a specified path
- Script provided to generate and convert the data

Photo Credit: ERA GRUP

Visualizing Directory Structure

- Source Data & Convert Data

```
./semanticnet/examples/fs_graph.py <directory>
```

e.g.

```
$ ./semanticnet/examples/fs_graph.py /home
```

- Visualize Data

```
$ ./graphiti demo ../semanticnet/examples/
fs.json
```

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File/Directory Structure…Visualized!
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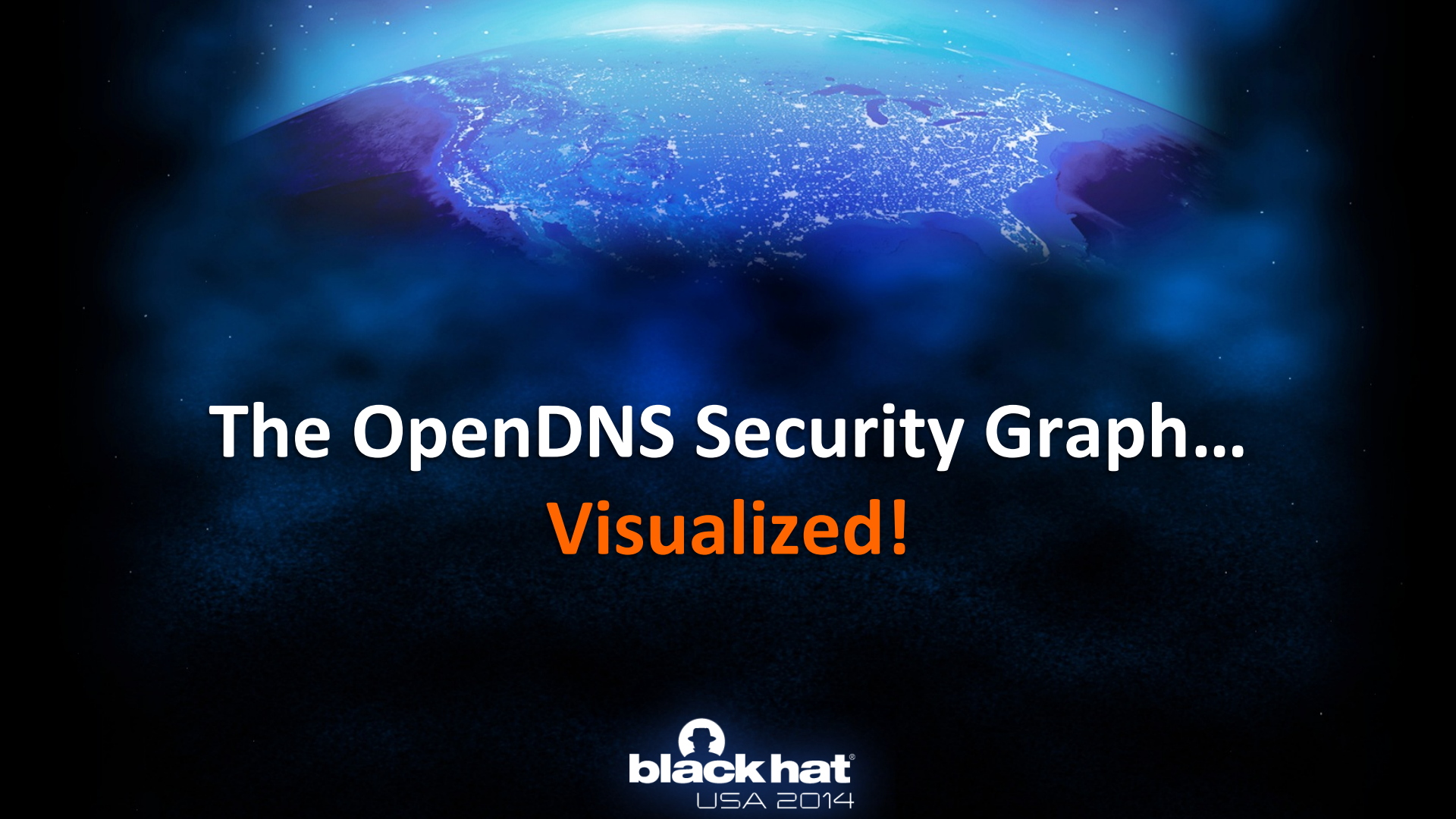
EXAMPLE 2 – VISUALIZING OPENDNS SECURITY GRAPH

Visualizing The OpenDNS Security Graph

- investigate.opendns.com
- Global visibility of attackers' infrastructures
  - Global network handles **two percent** of the world's Internet requests
  - Powers OpenDNS Umbrella and Investigate
  - 50b+ DNS queries per day


The OpenDNS Security Graph…
Visualized!
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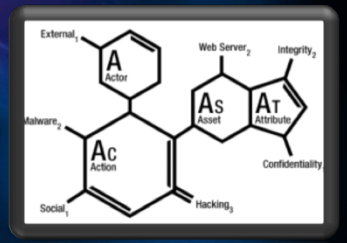
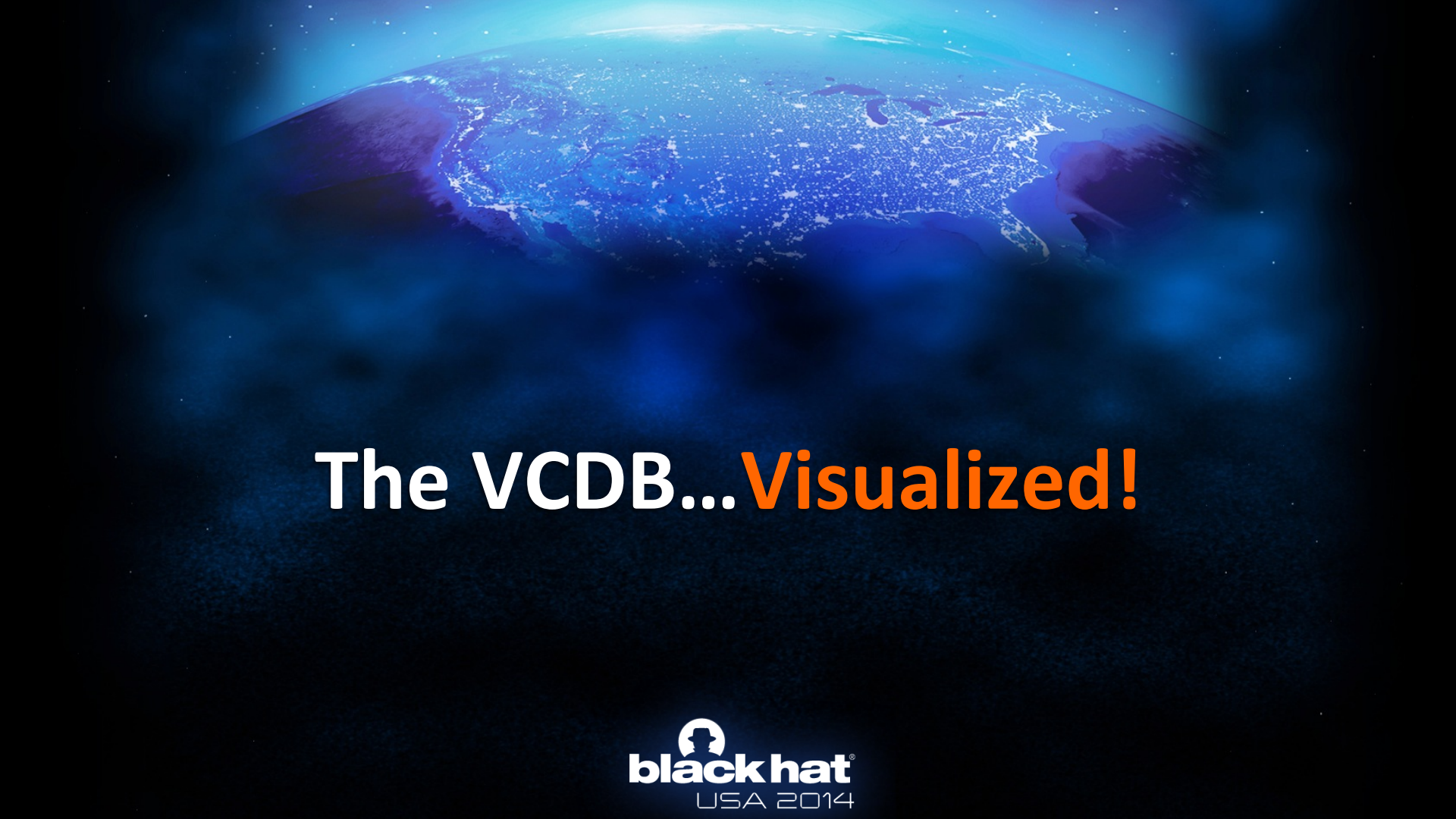
EXAMPLE 3 – VISUALIZING THE VCDB

Visualizing The VCDB

- vcdb.org
- From the Verizon Risk Team
  - Vocabulary for Event Recording and Incident Sharing (VERIS)
  - VERIS Community Database (VCDB)




The VCDB…Visualized!
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EXAMPLE 4 – VISUALIZING THE INTERNET (VIA ASN)

Visualizing The Internet

- Autonomous System Number (ASN)
- Collection of connected IP routing prefixes
- Common, clearly defined routing policy to the Internet

Source: http://en.wikipedia.org/wiki/Autonomous_System_(Internet)


The Internet…Visualized!
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EXAMPLE 5 – VISUALIZING A SHODAN QUERY

Visualizing a SHODAN Query

- www.shodanhq.com
- Lets you find specific computers (routers, servers, etc.) using a variety of filters
- Some have described it as a public port scan directory or a search engine of banners

Visualizing a SHODAN Query

- Source Data & Convert Data

```
./semanticnet/examples/shodan_graph.py -k <key> -s <string>
```

e.g.

```
$ ./semanticnet/examples/shodan_graph.py -k shokey -s aws
```

- Visualize Data

```
$ ./graphiti demo ../semanticnet/examples/shodan_aws.json
```

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A SHODAN Query…Visualized!
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Some Other Examples…Visualized!
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WHAT ELSE CAN I USE OpenGraphiti FOR?

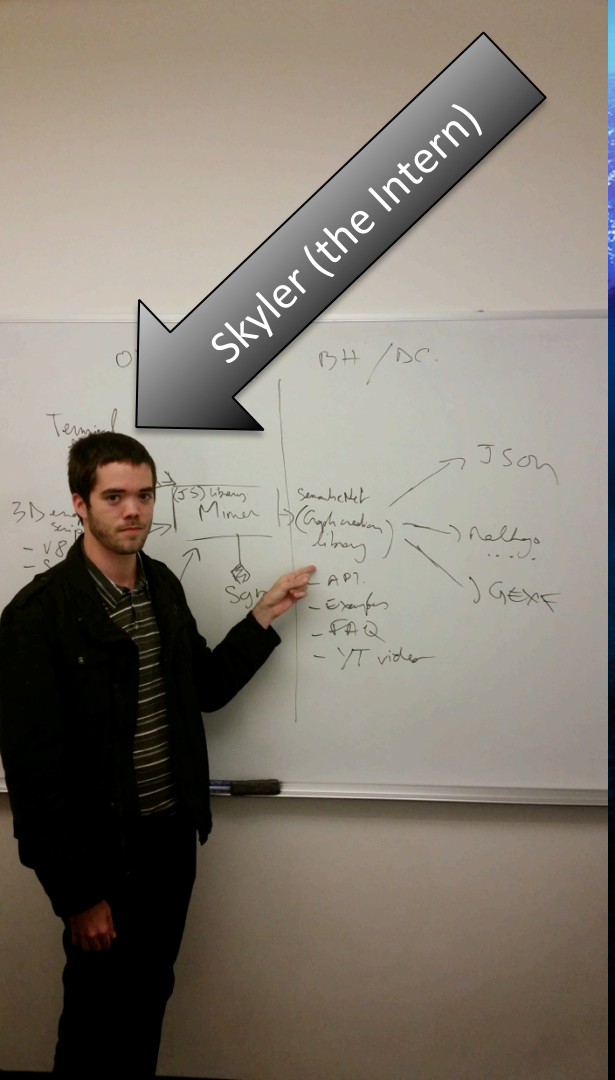
Use OpenGraphiti…

- Against **any** relational data
  - Network packet captures
  - IDS alerts
    - e.g. Snort, Bro, Suricata, etc.
  - Environmental data
    - e.g. wind, water, earthquake, temperature, tide, soil statistics
  - Odd data
    - e.g. Migratory patterns of the African and European coconut-laden swallow population

Use OpenGraphiti…

- Provided data generation scripts
  - File system (*from Example 1*)
    - `semanticnet/examples/fs_graph.py`
  - SHODAN query (*from Example 5*)
    - `semanticnet/examples/shodan_graph.py`
  - BRO IDS logs
    - `semanticnet/examples/bro_graph.py`

WHAT'S NEXT FOR OpenGraphiti?



OpenGraphiti 1.0++

- Lots of cool things coming
- Can't do it without the help of the security community
- And Skyler (the Intern)

OpenGraphiti 1.0++

- Explore enhanced human interaction
  - Oculus Rift (DK2 on order)
  - Leap Motion Controller (we have one!)
- More input/output plugins
- More of that physics and math stuff

Photo Credit: http://www.imdb.com/media/rm2660874752/ch0014870

Summary

- **OpenGraphiti** is a
  - Free, Open Source, and awesome data visualization tool…
  - Used to visualize **any** relational data as an interactive 2D or 3D model…
  - And is available at:

    http://github.com/opendns/graphiti

QUESTIONS?

Contact Us:

Thibault Reuille, thibault@opendns.com, @ThibaultReuille
Andrew Hay, ahay@opendns.com, @andrewsmhay

www.opendns.com
labs.opendns.com

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