



Information on Time

Remote Data Ingestion and Transformation with Apache NiFi/MiNiFi and IoT

Andy LoPresto | @yolopey

Sr. Member of Technical Staff at Hortonworks, Apache NiFi PMC & Committer

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Acknowledgement of Country

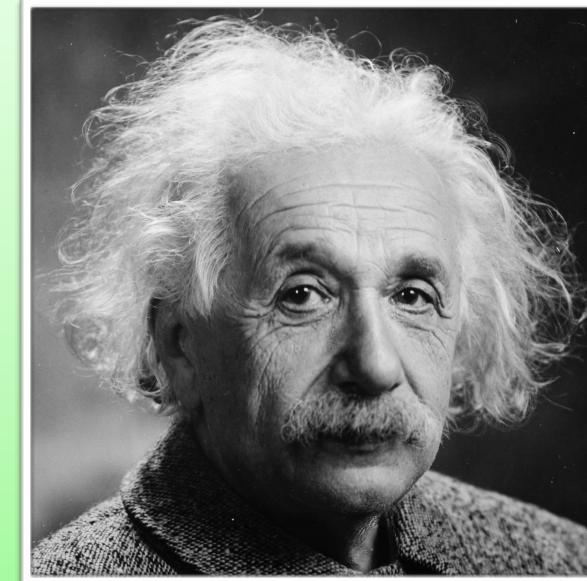
I acknowledge the Traditional Owners of the land on which we are meeting. I pay my respects to their Elders, past and present, and the Aboriginal Elders of other communities who may be here today.

Gauging Audience Familiarity With NiFi



"What's a NeeFee?"

No experience with dataflow
No experience with NiFi



"I can pick this up pretty quickly"

Some experience with dataflow
Some experience with NiFi



"I refactored the Ambari integration endpoint to allow for mutual authentication TLS during my coffee break"

Forgotten more about NiFi than most of us will ever know

Agenda

- *What is dataflow and what are the challenges?*
- Apache NiFi
- Apache MiNiFi
- Apache NiFi Registry
- IoT
- Demo
- *Roadmap*
- Q&A



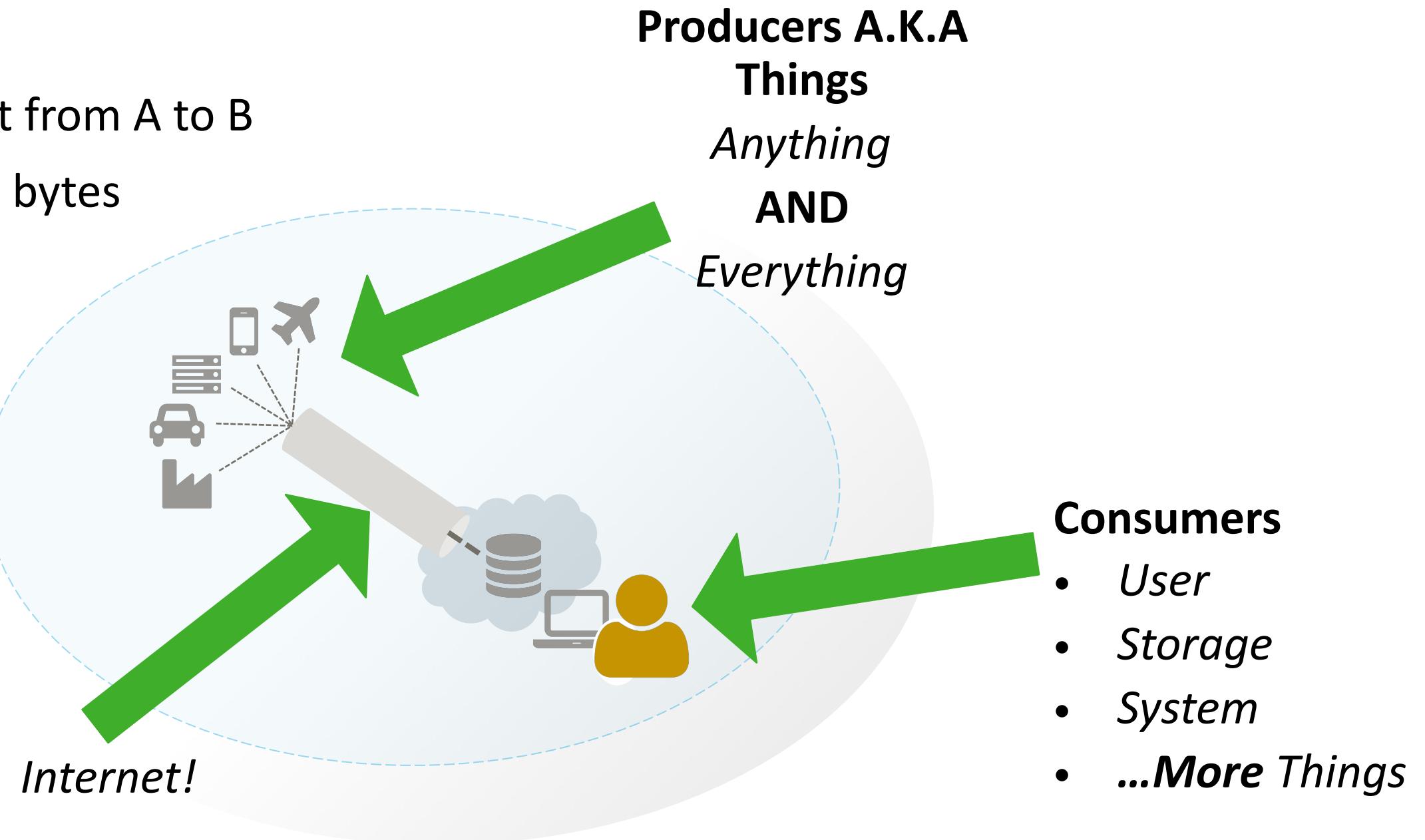
All slides provided online, no need to transcribe



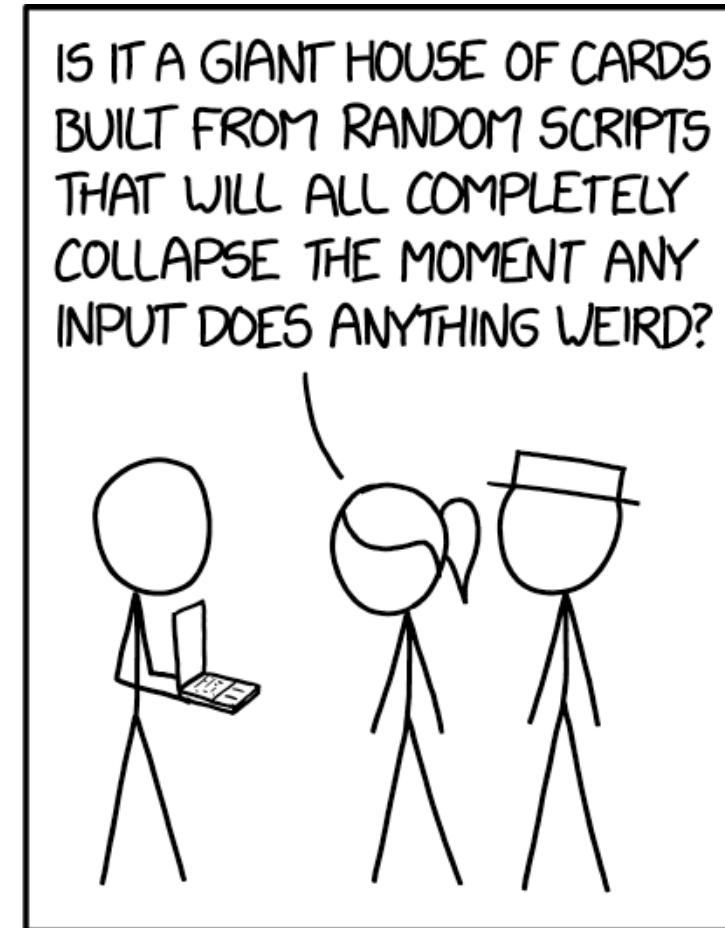
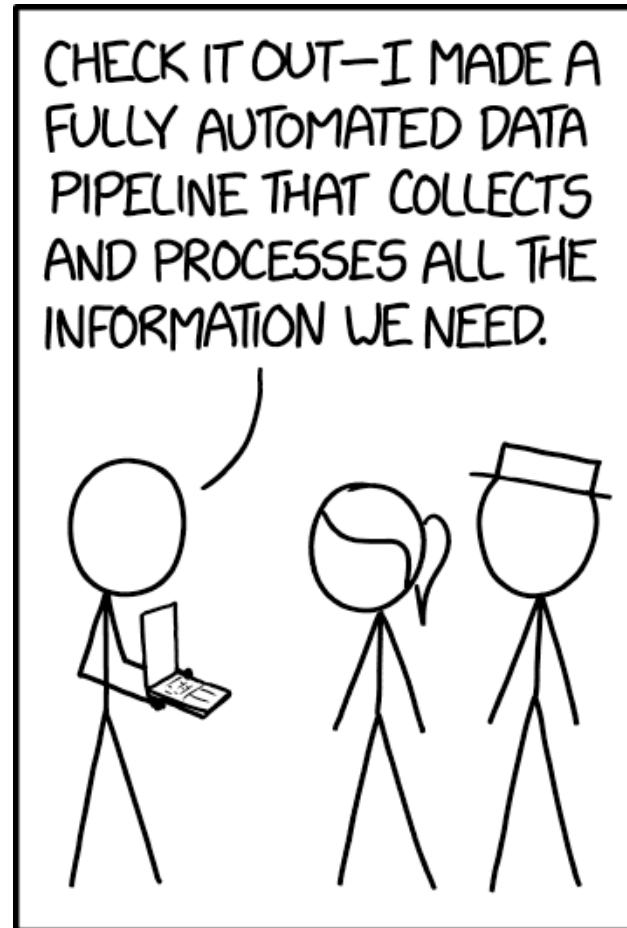
What is dataflow?

What is dataflow?

- Moving some content from A to B
- Content could be any bytes
 - Logs
 - HTTP
 - XML
 - CSV
 - Images
 - Video
 - Telemetry



Moving data *effectively* is hard



"Data Pipeline" <https://xkcd.com/2054/>

Dataflow Challenges In 3 Categories

Data

- Standards
- **Formats**
- Protocols
- Veracity
- Validity
- Schemas
- Partitioning/
Bundling

Infrastructure

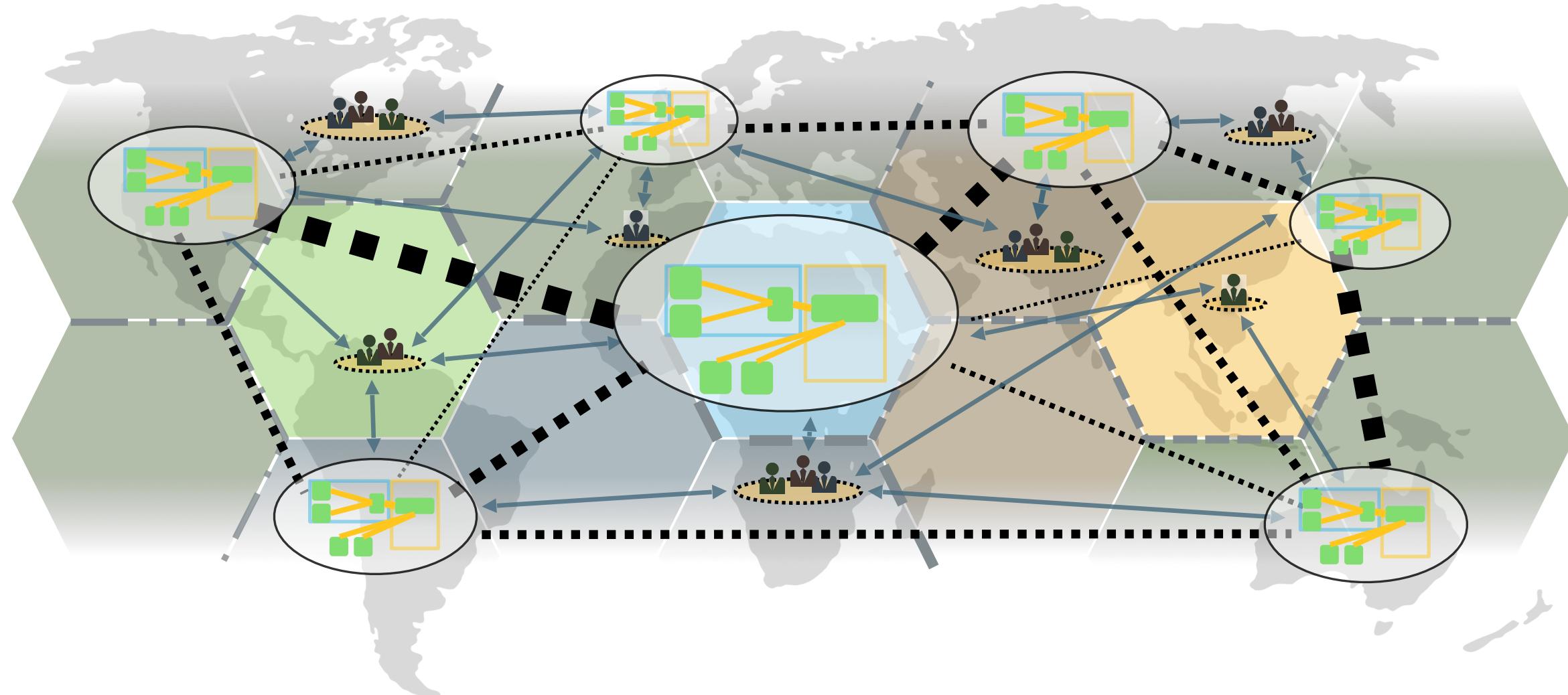
- “Exactly Once”
Delivery
- Ensuring
Security
- **Overcoming**
Security
- Credential
Management
- Network

People

- Compliance
- “**That** [person |
team | group]”
- **Consumers
Change**
- **Requirements
Change**
- “Exactly Once”
Delivery

Let's Connect Lots of As to Bs to As to Cs to Bs to Δ s to Cs to φ s

Raise your hand if you want to maintain Python scripts for the rest of your life



Apache NiFi

One Minute Intro to the NiFi Ecosystem



NiFi

- Server/DC class
- GUI & REST API
- Interacts with hundreds of services



MiNiFi (JVM/C++)

- Agent class
- Runs on minimal hardware
- Interacts with NiFi
- Simple event processing



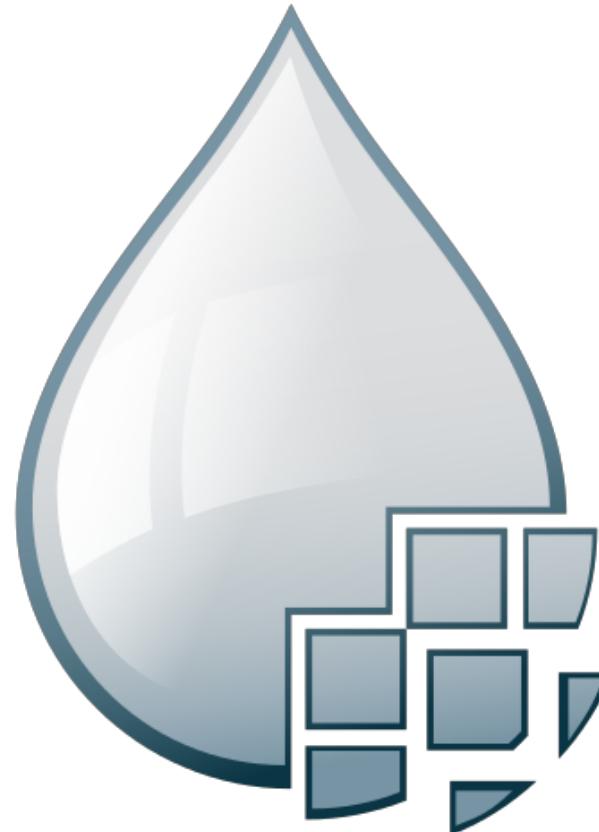
NiFi Registry

- Standalone application
- Handles asset management
- Flow versioning & deployment
- *Extension registry*



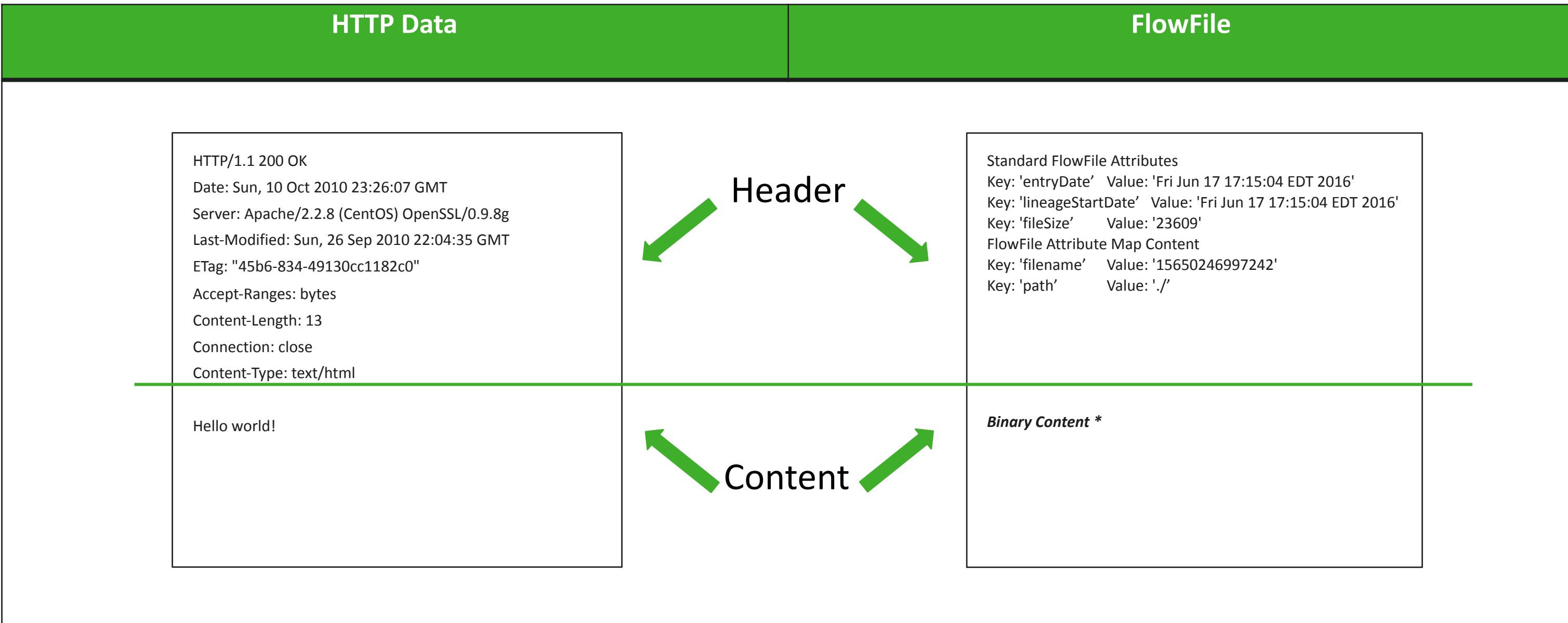
Apache NiFi

Key Features



- Guaranteed delivery
 - Data buffering
 - Backpressure
- Pressure release
- Prioritized queuing
- Flow specific QoS
 - Latency vs. throughput
 - Loss tolerance
- Data provenance
- Supports push and pull models
- Recovery/recording a rolling log of fine-grained history
- Visual command and control
- Flow templates
- Pluggable, multi-tenant security
- Designed for extension
- Clustering

Flowfiles Are Like HTTP Data



User Interface

Less of this..... more of this

```
1. scratch/release_verification (bash)

scratch/release_verifi... %1  vagrant/entropy (bas... %2  release_verification/... %3
scratch/release_verification (bash)
hw12203:/Users/alopresto/Workspace/scratch/release_verification (master) alopresto
└─ 3s @ 17:25:51 $ t
^C
hw12203:/Users/alopresto/Workspace/scratch/release_verification (master) alopresto  NiFi (n.n.a.o)  My NiFi Issues  NiFi
└─ 8s @ 17:26:00 $ hunt .users.xml
./nifi-1.1.0-RC1-failed/nifi-1.1.0/nifi-assembly/target/nifi-1.1.0-bin/nifi-1.1.0/conf/users.xml
hw12203:/Users/alopresto/Workspace/scratch/release_verification (master) alopresto
└─ 20s @ 17:26:21 $ ll nifi-1.1.0-RC1-failed/nifi-1.1.0/nifi-assembly/target/nifi-1.1.0-bin/nifi-1.1.0/conf/
total 144
drwxr-xr-x 16 alopresto staff 544B Nov 24 19:20 ..
drwxr-xr-x 17 alopresto staff 578B Nov 24 14:25 ..
drwxr-xr-x 38 alopresto staff 1.3K Nov 24 14:33 archive/
-rw-r--r-- 1 alopresto staff 2.5K Nov 24 19:20 authorizations.xml
-rw-r--r-- 1 alopresto staff 3.7K Nov 24 19:19 authorizers.xml
-rw-r--r-- 1 alopresto staff 2.1K Nov 23 23:36 bootstrap-notification-services.xml
-rw-r--r-- 1 alopresto staff 3.1K Nov 24 19:29 bootstrap.conf
-rw-r--r-- 1 alopresto staff 2.5K Nov 24 14:33 flow.xml.gz
-rw-r--r-- 1 alopresto staff 3.0K Nov 24 19:16 keystore.jks
-rw-r--r-- 1 alopresto staff 8.0K Nov 23 23:36 logback.xml
-rw-r--r-- 1 alopresto staff 6.2K Nov 23 23:36 login-identity-providers.xml
-rw-r--r-- 1 alopresto staff 9.0K Nov 24 19:17 nifi.properties
-rw-r--r-- 1 alopresto staff 911B Nov 24 19:16 truststore.jks
-rw-r--r-- 1 alopresto staff 226B Nov 24 19:20 users.xml
-rw-r--r-- 1 alopresto staff 1.4K Nov 23 23:36 zookeeper.properties
Tasks/Time 0 / 00:00:00.0000
Andy LoPresto  GenerateSpeaker  0 (0 bytes)  5 min
hw12203:/Users/alopresto/Workspace/scratch/release_verification (master) alopresto
└─ 21s @ 17:26:43 $ more nifi-1.1.0-RC1-failed/nifi-1.1.0/nifi-assembly/target/nifi-1.1.0-bin/nifi-1.1.0/conf/authorizations.xml
<xml version="1.0" encoding="UTF-8" standalone="yes"?>
<authorizations>
  <policies>
    <policy identifier="b2c0320b-0384-38d2-8ff7-58a26dde3897" resource="/flow" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="7e67308c-a837-3ba1-b837-4a40ff8d43fe" resource="/data/process-groups/9871f1da-0158-1000-c0b2-42aaca57d800" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="b762618f-3636-3b45-943e-6d38605e276e" resource="/data/process-groups/9871f1da-0158-1000-c0b2-42aaca57d800" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="61dfe35b-837f-37f4-9b36-b2e7bc4989c3" resource="/process-groups/9871f1da-0158-1000-c0b2-42aaca57d800" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="ff9f93ce-1fda-3b08-9309-088ba6ab5ca9" resource="/process-groups/9871f1da-0158-1000-c0b2-42aaca57d800" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="bc5512df-2a78-33ba-950e-3bc1ba5f781d" resource="/restricted-components" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="70197fb3-afda-3938-b346-498db26032fa" resource="/tenants" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="30f46aab-baa8-3b50-8b9d-d768a83e719f" resource="/tenants" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="6c25353b-fca4-3813-baa8-f879d9853e7e" resource="/policies" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="3906378a-8f9b-3a71-aa0b-44325b1723cf" resource="/policies" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="26c66358-8548-31c8-a38c-e0eb4bc3ddb4" resource="/controller" action="R">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
    <policy identifier="4470abb6-3b1e-31cd-9daa-598ea5c59ef" resource="/controller" action="W">
      <user identifier="9860132a-283e-370b-ba63-b023393be562"/>
    </policy>
  </policies>
</authorizations>
└─ 1. scratch/release_verification (bash)
hw12203:/Users/alopresto/Workspace/scratch/release_verification (master) alopresto
└─ 9s @ 17:26:53 $ 

nifi.flowfile.repository.always.sync=false
nifi.swap.manager.implementation=org.apache.nifi.controller.FileSystemSwapManager
nifi.queue.swap.threshold=20000
nifi.swap.in.period=5 sec
nifi.swap.in.threads=1
nifi.swap.out.period=5 sec
nifi.swap.out.threads=4

# Content Repository
nifi.content.repository.implementation=org.apache.nifi.controller.repository.FileSystemRepository
hw12203:.../space/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (NIFI-3313) alopresto
└─ 157s @ 17:40:39 $ nfkl

Java home: /Users/alopresto/.jenv/versions/1.8
NiFi home: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT

Bootstrap Config File: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT/conf/bootstrap.conf
GainSkills
2017-01-30 17:40:43,812 INFO [main] org.apache.nifi.bootstrap.Command Apache NiFi has accepted the Shutdown Command and is shutting down now
Name.success
2017-01-30 17:40:43,854 INFO [main] org.apache.nifi.bootstrap.Command Waiting for Apache NiFi to finish shutting down...
2017-01-30 17:40:45,867 INFO [main] org.apache.nifi.bootstrap.Command NiFi has finished shutting down.

hw12203:.../space/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (NIFI-3313) alopresto
└─ 9s @ 17:40:49 $ subl conf/nifi.properties
hw12203:.../space/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (NIFI-3313) alopresto
└─ 5s @ 17:40:55 $ nfgo

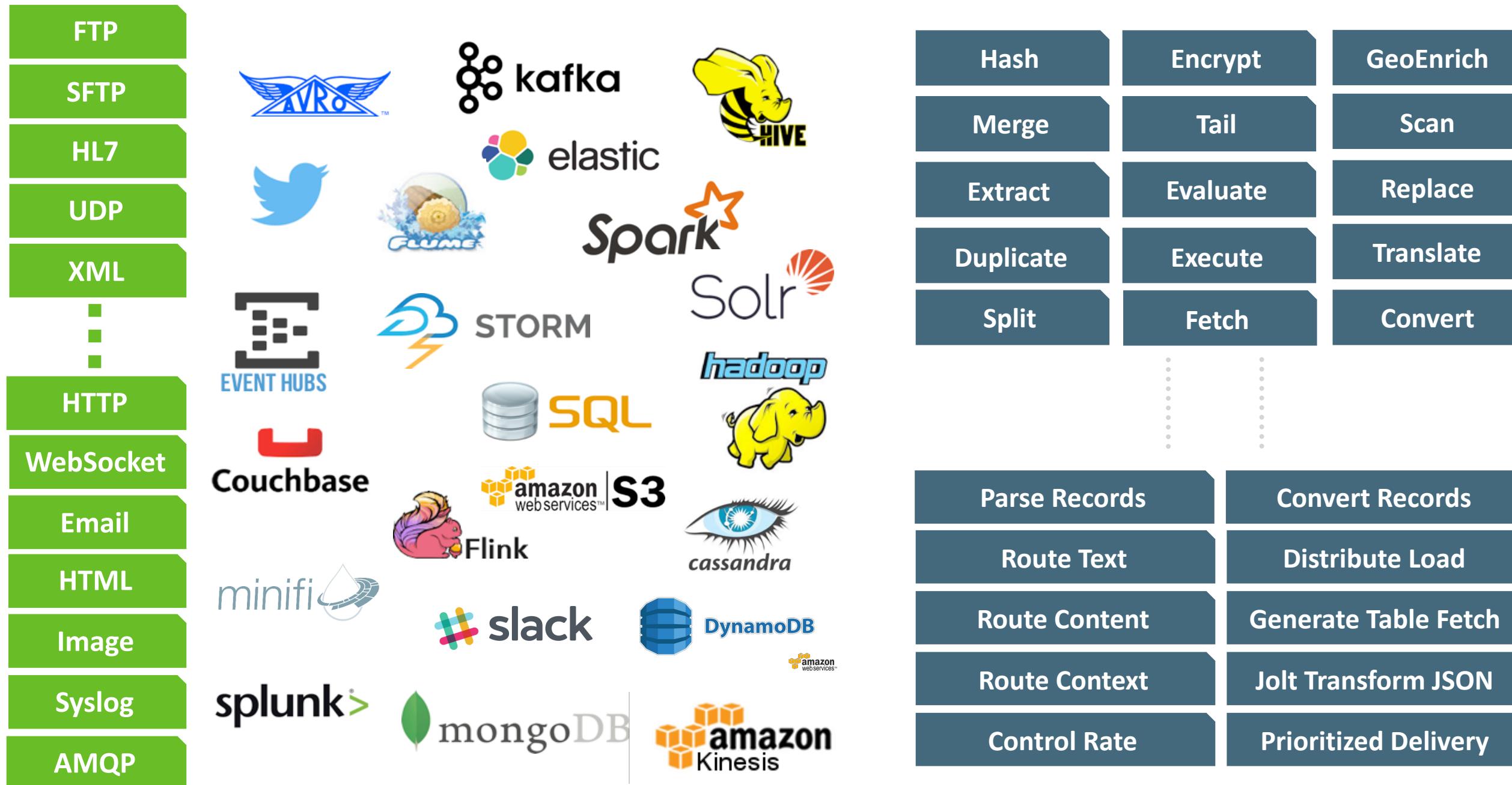
Java home: /Users/alopresto/.jenv/versions/1.8
NiFi home: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT
Bootstrap Config File: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT/conf/bootstrap.conf
GainSkills
2017-01-30 17:41:13,874 INFO [main] org.apache.nifi.bootstrap.Command Starting Apache NiFi...
2017-01-30 17:41:13,874 INFO [main] org.apache.nifi.bootstrap.Command Working Directory: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT
2017-01-30 17:41:13,874 INFO [main] org.apache.nifi.bootstrap.Command: /Users/alopresto/.jenv/versions/1.8/bin/java -classpath /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/conf:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT
2017-01-30 17:41:13,874 INFO [main] org.apache.nifi.bootstrap.Command: /Users/alopresto/.jenv/versions/1.8/bin/java -classpath /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/jcl-over-slf4j-1.7.12.jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/log4j-over-slf4j-1.7.12.jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/logback-classic-1.1.3.jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-api-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-documentation-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-framework-api-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-nar-utils-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-properties-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-runtime-1.2.0-SNAPSHOT:/jar:/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT:/lib/nifi-sl4j-api-1.7.12.jar:/jar:/Dong.apache.jasper.compiler.disablejsr199=true -Xms512m -Xmx512m -Dsun.net.http.allowRestrictedHeaders=true -Djava.net.preferIPv4Stack=true -Djava.awt.headless=true -XX:+UseG1GC -Djava.protocol.handler.pkgs=sun.net.www.protocol -Dnifi.properties.bootstrap.path=/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi.properties -Dnifi.bootstrap.listen.port=59772 -Dapp=Nifi -Dong.apache.nifi.bootstrap.config.log.dir=/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT/logs org.apache.nifi.NiFi
GainSkills
hw12203:.../space/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (NIFI-3313) alopresto
└─ 21s @ 17:41:17 $ nfkl

Java home: /Users/alopresto/.jenv/versions/1.8
NiFi home: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT
Bootstrap Config File: /Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT/conf/bootstrap.conf
GainSkills
2017-01-30 20:54:26,971 INFO [main] org.apache.nifi.bootstrap.Command Apache NiFi has accepted the Shutdown Command and is shutting down now
2017-01-30 20:54:27,075 INFO [main] org.apache.nifi.bootstrap.Command Waiting for Apache NiFi to finish shutting down...
2017-01-30 20:54:29,085 INFO [main] org.apache.nifi.bootstrap.Command NiFi has finished shutting down.

hw12203:.../space/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (NIFI-3313) alopresto
└─ 11595s @ 20:54:33 $ 
```



Deeper Ecosystem Integration: 286+ Processors, 61 Controller Services

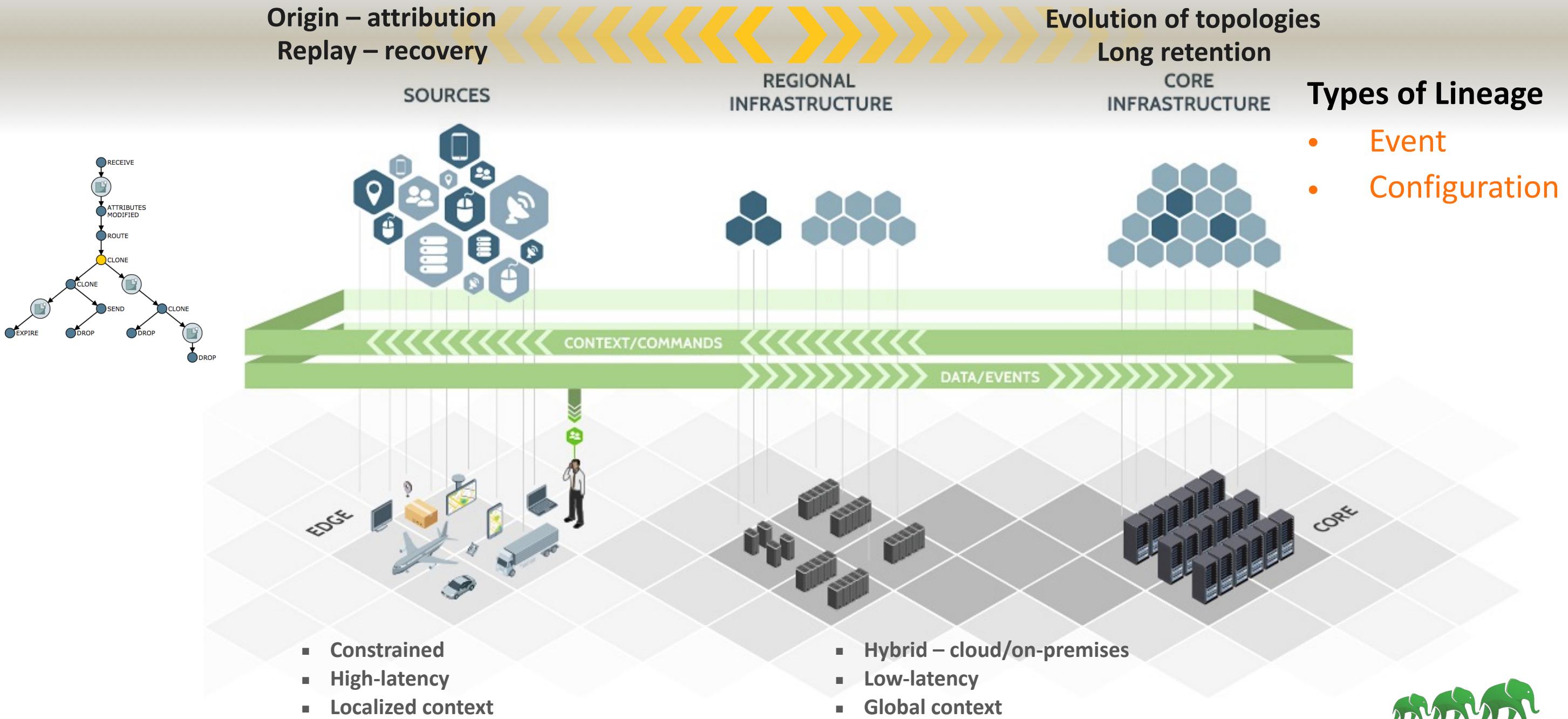


People want to know about their data



[Colin the Chicken | Portlandia | IFC](#)

Data Provenance



Apache MiNiFi

Apache NiFi Subproject: MiNiFi

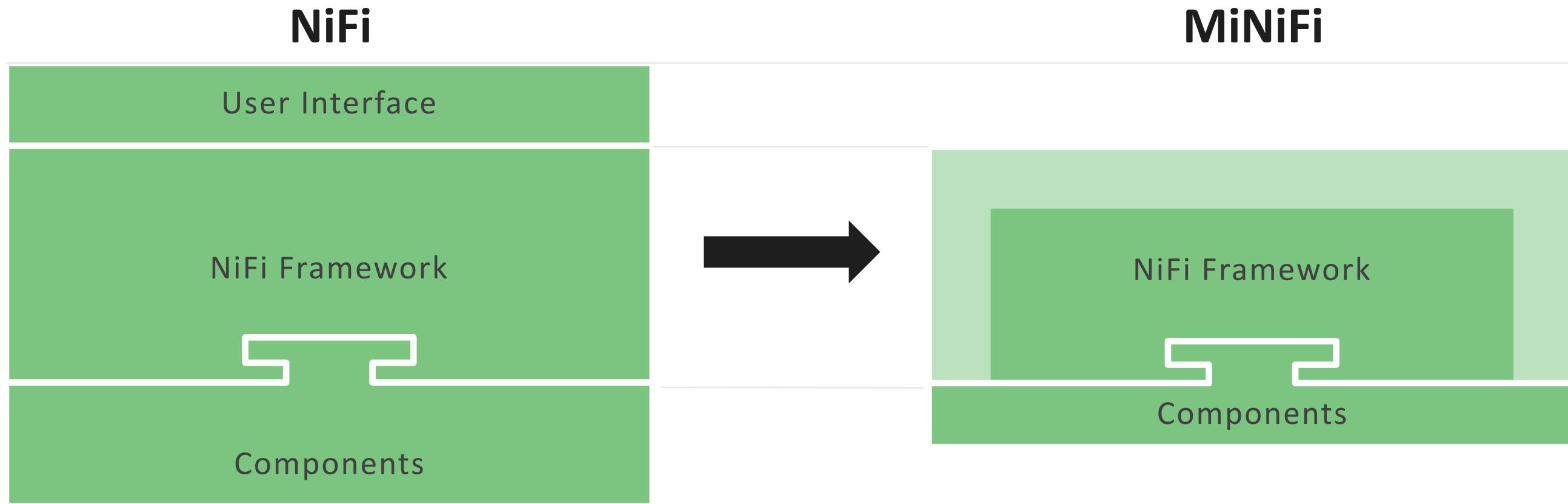
- Get the key parts of NiFi close to where data begins and provide bidirectional communication
- NiFi lives in the data center — give it an enterprise server or a cluster of them
- MiNiFi lives as close to where data is born and is a guest on that device or system
 - IoT
 - Connected car
 - Legacy hardware



Why build MiNiFi?

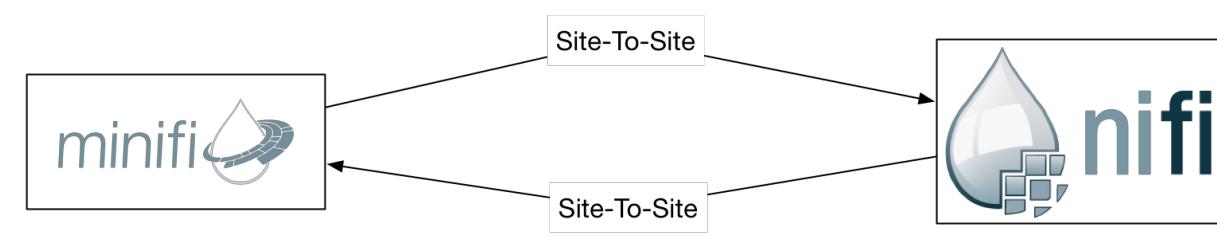
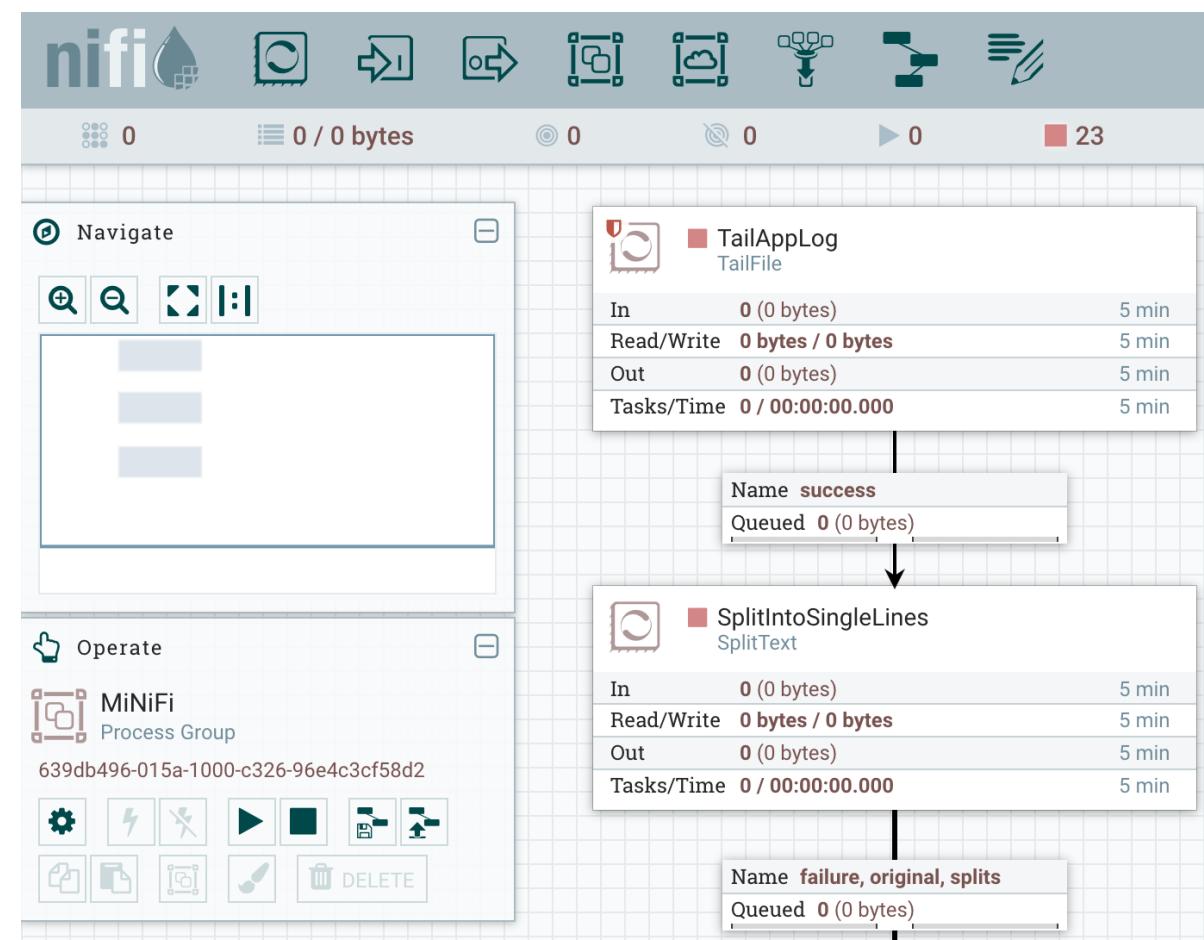
- NiFi is big
 - 1.8.0 release is 1.2 GB compressed
 - Can be modified to run in restricted environments, but requires manual surgery
 - Provides UI, provenance query, etc.
 - Runs on dedicated machines/clusters — “owns the box”
- MiNiFi lives at the edge
 - No UI
 - 0.5.0 Java release is 67 MB, C++ release is 6.1 MB (**0.2.0 fits on a floppy disk**)
 - “Good guest”

NiFi vs MiNiFi Java Processes



Flavors of MiNiFi

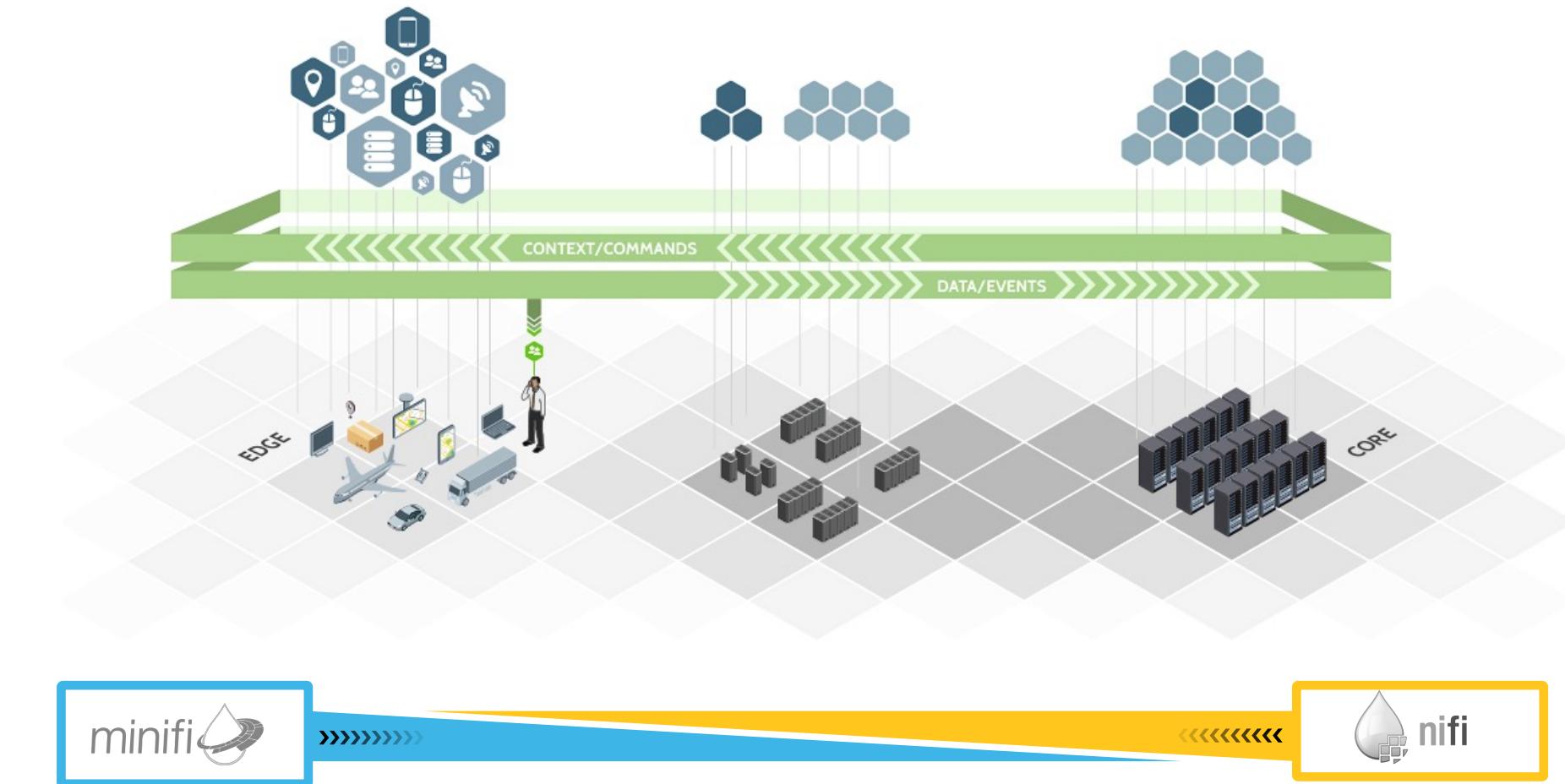
- MiNiFi Java (v0.5.0)
 - Modified version of NiFi
 - No UI
 - YAML configuration
 - Reduced processor count
 - 63+ by default, more available with additional NARs
- MiNiFi C++ (v0.5.0)
 - Written from scratch
 - 33 processors by default
 - Bi-directional site-to-site & provenance data



```
Security Properties:  
keystore: /tmp/ssl/localhost-ks.jks  
keystore type: JKS  
keystore password: localtest  
key password: localtest  
truststore: /tmp/ssl/localhost-ts.jks  
truststore type: JKS  
truststore password: localtest  
ssl protocol: TLS  
Sensitive Props:  
key:  
algorithm: PBWEWITHMD5AND256BITAES-CBC-OPENSSL  
provider: BC  
  
Processors:  
- name: TailAppLog  
  class: org.apache.nifi.processors.standard.TailFile  
  max concurrent tasks: 1  
  scheduling strategy: TIMER_DRIVEN  
  scheduling period: 10 sec  
  penalization period: 30 sec  
  yield period: 1 sec  
  run duration nanos: 0  
  auto-terminated relationships list:  
    Properties:  
      File to Tail: logs/minifi-app.log  
      Rolling Filename Pattern: minifi-app*  
      Initial Start Position: Beginning of File  
- name: SplitIntoSingleLines  
  class: org.apache.nifi.processors.standard.SplitText  
  max concurrent tasks: 1  
  scheduling strategy: TIMER_DRIVEN  
  scheduling period: 0 sec  
  penalization period: 30 sec  
  yield period: 1 sec  
  run duration nanos: 0  
  auto-terminated relationships list:  
    - failure  
    - original  
  Properties:  
    Line Split Count: 1  
    Header Line Count: 0  
    Remove Trailing Newlines: true
```

How Does MiNiFi Interact With NiFi?

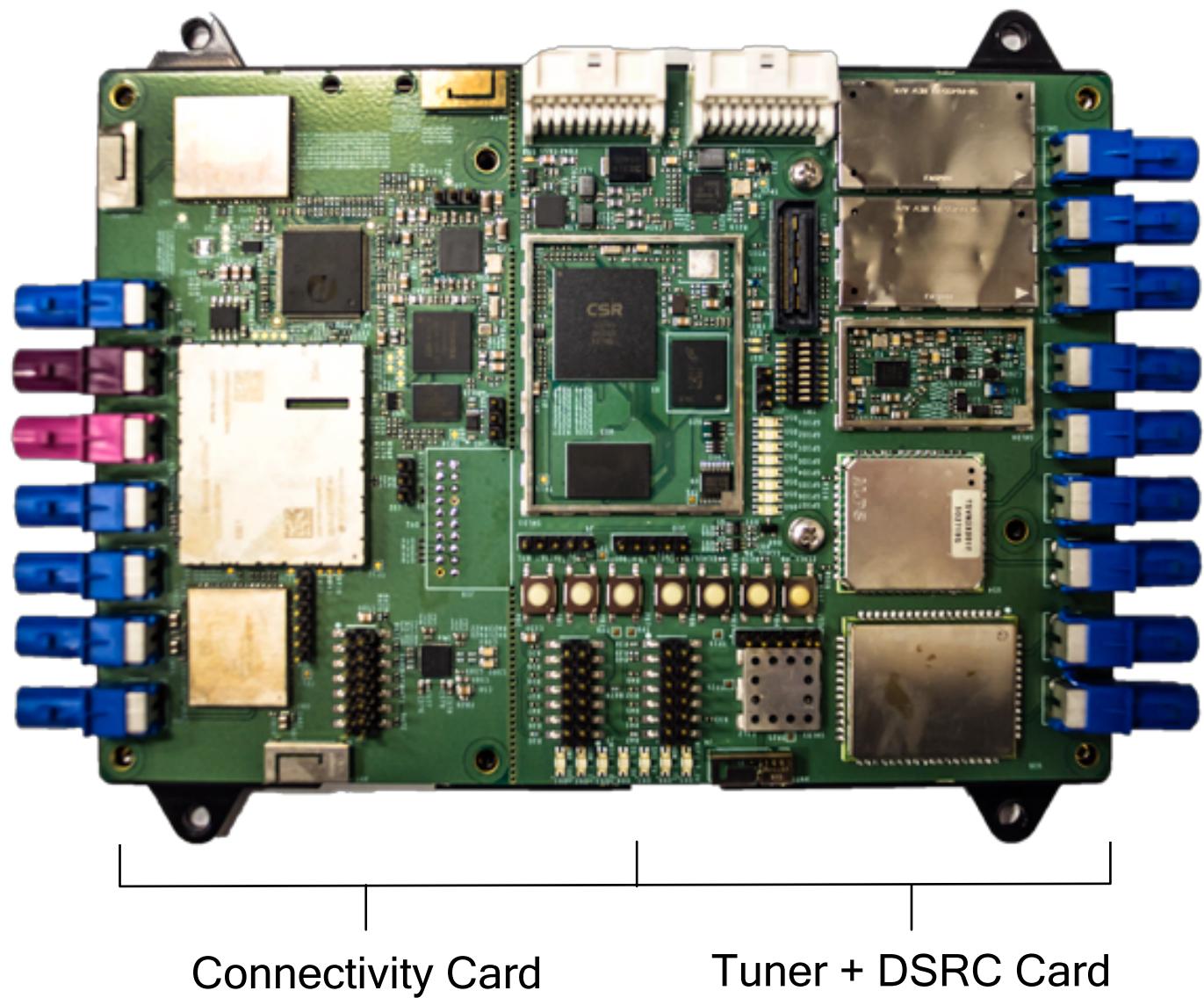
- NiFi
 - Design flows
 - Aggregate data from many sources
 - Perform routing/analysis/SEP
- MiNiFi
 - Receive flows
 - Collect data
 - Send for processing



What does MiNiFi provide?

- Data tagging/provenance
- Governance from edge (geopolitical restrictions)
- Security (encryption, certificate-based authentication)
- Low latency (immediate reactions & decision-making)

Connected Car Reference Platform Box



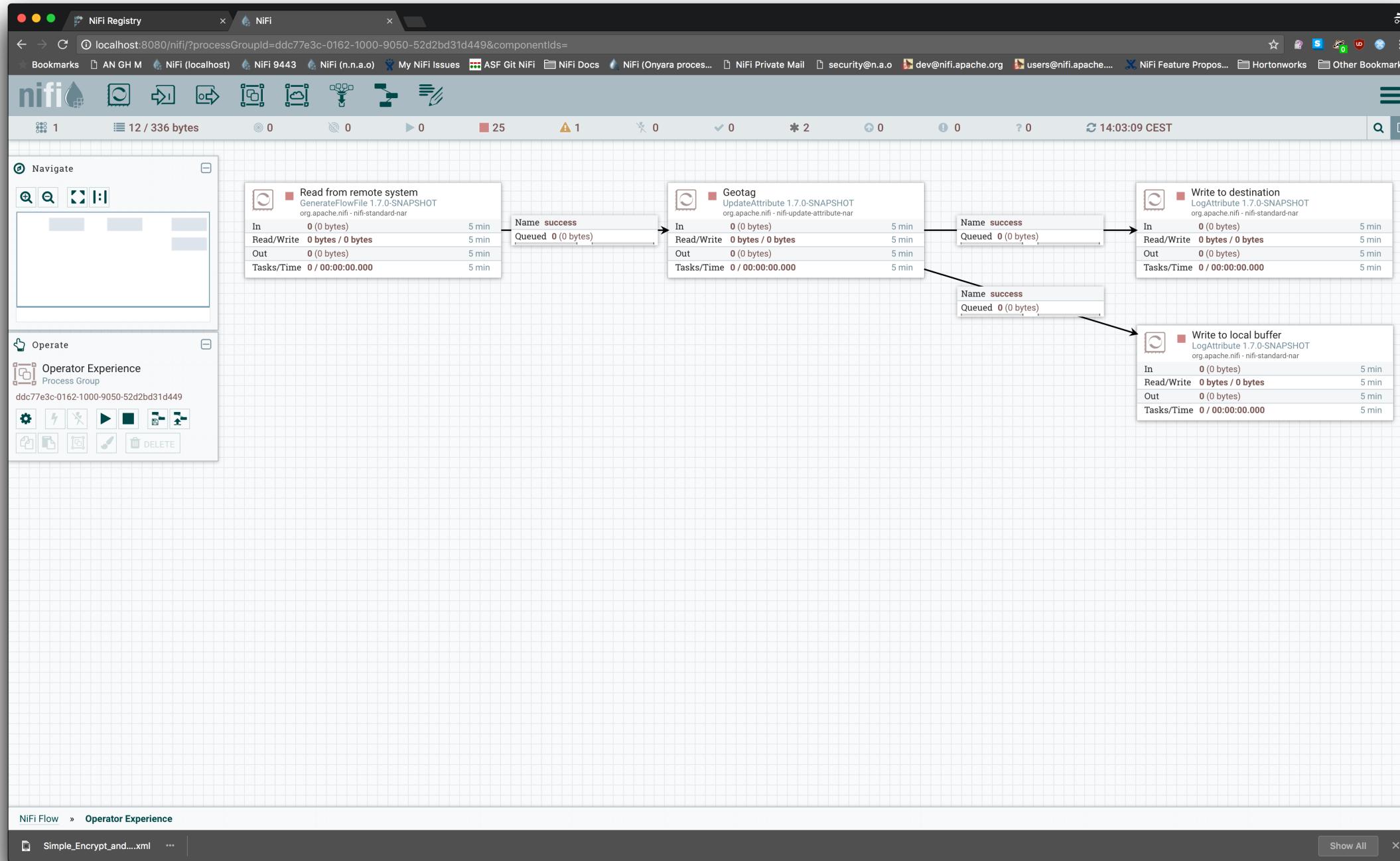
Apache NiFi Registry

Flow Development Lifecycle (FDLC)

- Origins of NiFi
- Operator Experience
 - MC data, don't drop, mitigate temporarily
- Version Control
- Environment Promotion



Operator Experience



Challenges

- Templates
 - Updates/replacement
 - Sensitive property replacement
- Flow.xml.gz migration
 - Key synchronization
- Environment promotion
 - Approval processes
 - Verifiability

Template Replacement

- Export a new version of template
- Transfer (somehow)
- Verify?
- Import onto canvas side-by-side existing flow
- Stop processors
- Empty queues
- Reconnect queues
- Start
- Pray?

```
-rw-r--r-- 1 alopresto staff 381B Apr 19 15:02 flow_20170626-171416_label_description.xml  
-rw-r--r-- 1 alopresto staff 1.4K Apr 19 15:02 flow_20170628-111620_xxe_transform_xml.xml  
-rw-r--r-- 1 alopresto staff 1.4K Apr 19 15:02 flow_20170628-155452_xxe_with_patch.xml  
-rw-r--r-- 1 alopresto staff 1.4K Apr 19 15:02 flow_20170629-103436_xxe_password_leak.xml  
-rw-r--r-- 1 alopresto staff 1.9K Apr 19 15:02 flow_20170717-192339_trusted_hostname.xml  
-rw-r--r-- 1 alopresto staff 2.7K Apr 19 15:02 flow_20170718-101751_evaluate_json_path.xml  
-rw-r--r-- 1 alopresto staff 5.2K Apr 19 15:02 flow_20170721-175745_site_to_site_secure.xml  
-rw-r--r-- 1 alopresto staff 5.2K Apr 19 15:02 flow_20170724-161539.xml  
-rw-r--r-- 1 alopresto staff 5.7K Apr 19 15:02 flow_20170724-181056_listen_http_sslv3.xml  
-rw-r--r-- 1 alopresto staff 2.3K Apr 19 15:02 flow_20170726-155905_encrypted_spk.xml  
-rw-r--r-- 1 alopresto staff 5.2K Apr 19 15:02 flow_20170802-172619_simple_gen_and_log.xml  
-rw-r--r-- 1 alopresto staff 5.2K Apr 19 15:02 flow_20170804-164011_simple_gen_and_log.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20170807-154118_groovy_json_uppercase.xml  
-rw-r--r-- 1 alopresto staff 1.8K Apr 19 15:02 flow_20170807-220536_put_mongo_record.xml  
-rw-r--r-- 1 alopresto staff 6.1K Apr 19 15:02 flow_20170809-105304_date_difference.xml  
-rw-r--r-- 1 alopresto staff 6.4K Apr 19 15:02 flow_20170809-174400_json_record_path.xml  
-rw-r--r-- 1 alopresto staff 1.3K Apr 19 15:02 flow_20170809-210516_validate_xml.xml  
-rw-r--r-- 1 alopresto staff 1.4K Apr 19 15:02 flow_20170815-102522_json_to_sql.xml  
-rw-r--r-- 1 alopresto staff 1.5K Apr 19 15:02 flow_20170822-104407_json_formatter.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20170823-123729_evaluatexpath.xml  
-rw-r--r-- 1 alopresto staff 2.5K Apr 19 15:02 flow_20170825-115758_encrypt_and_decrypt.xml  
-rw-r--r-- 1 alopresto staff 2.0K Apr 19 15:02 flow_20170825-121351_encrypt_decrypt_clean.xml  
-rw-r--r-- 1 alopresto staff 2.0K Apr 19 15:02 flow_20170825-121656_encrypt_decrypt_aligned.xml  
-rw-r--r-- 1 alopresto staff 2.3K Apr 19 15:02 flow_20170825-190225_listen_http_and_invoke_http_with_tls1_2.xml  
-rw-r--r-- 1 alopresto staff 5.0K Apr 19 15:02 flow_20170831-153220_psaltis_meetup_template_local.xml  
-rw-r--r-- 1 alopresto staff 4.0K Apr 19 15:02 flow_20170905-175343_xxe_template.xml  
-rw-r--r-- 1 alopresto staff 4.3K Apr 19 15:02 flow_20170905-185907_funnel_bus.xml  
-rw-r--r-- 1 alopresto staff 8.1K Apr 19 15:02 flow_20170906-111801_chained_get_html_element_NIFI-4356.xml  
-rw-r--r-- 1 alopresto staff 2.5K Apr 19 15:02 flow_20170909-121848_sydney_demo.xml  
-rw-r--r-- 1 alopresto staff 3.2K Apr 19 15:02 flow_20170919-202215_meetup_sydney.xml  
-rw-r--r-- 1 alopresto staff 3.8K Apr 19 15:02 flow_20170920-190328_crash_course.xml  
-rw-r--r-- 1 alopresto staff 2.9K Apr 19 15:02 flow_20170926-180548_handle_http_with_tls1_2.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20170929-172333_encrypt_decrypt_1_4_0_verification.xml  
-rw-r--r-- 1 alopresto staff 6.3K Apr 19 15:02 flow_20171003-192928_update_record_and_replace_text.xml  
-rw-r--r-- 1 alopresto staff 8.9K Apr 19 15:02 flow_20171004-180529_web_server_and_json.xml  
-rw-r--r-- 1 alopresto staff 3.8K Apr 19 15:02 flow_20171103-183334_groovy_json_to_sql_srsw.xml  
-rw-r--r-- 1 alopresto staff 1.5K Apr 19 15:02 flow_20171127-190651_local_site_to_site.xml  
-rw-r--r-- 1 alopresto staff 2.1K Apr 19 15:02 flow_20180101-145059_registry_rc_verification.xml  
-rw-r--r-- 1 alopresto staff 1.4K Apr 19 15:02 flow_20180104-104211_test_count_text.xml  
-rw-r--r-- 1 alopresto staff 2.0K Apr 19 15:02 flow_20180104-112138_test_count_text_remote.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20180202-100218_consume_jms_test.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20180202-105514.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20180202-131629_consume_jms_10_threads.xml  
-rw-r--r-- 1 alopresto staff 1.7K Apr 19 15:02 flow_20180202-160620_consume_jms_multithread.xml  
-rw-r--r-- 1 alopresto staff 1.6K Apr 19 15:02 flow_20180208-200731_simple_demo_route_on_time_parity.xml  
-rw-r--r-- 1 alopresto staff 5.2K Apr 19 15:02 flow_20180214-182110.jms_deserialization_test.xml  
-rw-r--r-- 1 alopresto staff 2.6K Apr 19 15:02 flow_20180216-205336_attribute_evaluator.xml  
-rw-r--r-- 1 alopresto staff 5.7K Apr 19 15:02 flow_20180228-130457_attribute_soq.xml  
-rw-r--r-- 1 alopresto staff 8.3K Apr 19 15:02 flow_20180307-171740_NIFI-4928.xml  
-rw-r--r-- 1 alopresto staff 1.5K Apr 19 15:02 flow_20180313-171310_python_process_attribute.xml  
-rw-r--r-- 1 alopresto staff 2.4K Apr 19 15:02 flow_20180315-113634_NIFI-4246-0Auth.xml  
-rw-r--r-- 1 alopresto staff 1.9K Apr 19 15:02 flow_20180328-115056.xml  
-rw-r--r-- 1 alopresto staff 2.5K Apr 19 15:02 flow_20180405-111419_prioritizers.xml
```

NiFi Registry for Dataflows

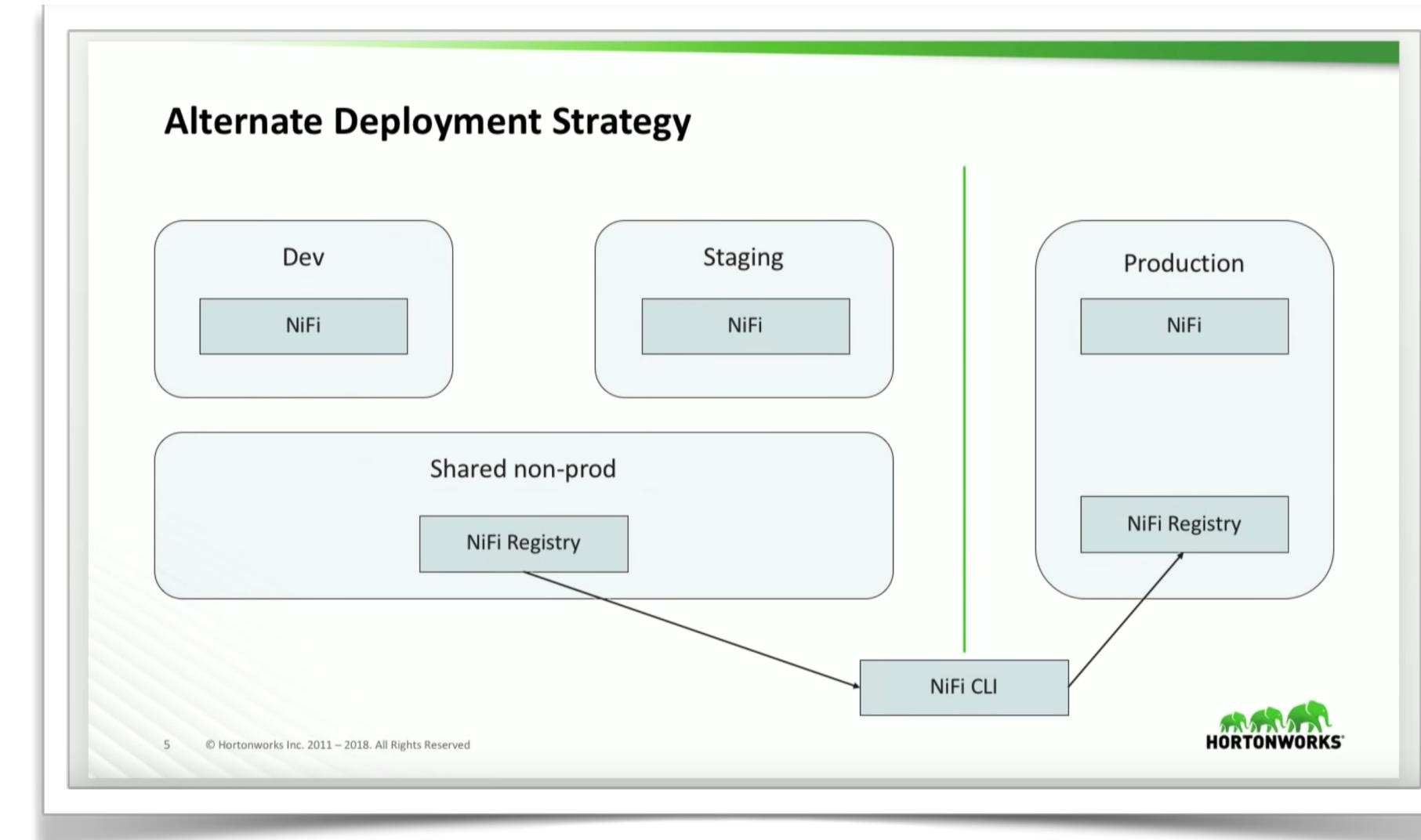
Introducing Apache NiFi Registry 0.3.0

- Previously, flows were exported via XML templates
 - Didn't contain sensitive values
 - Couldn't be updated in-place
 - No tracking system
- NiFi Registry brings asset management as first-class citizen to NiFi
- Flows can be versioned

The screenshot shows the Apache NiFi Registry interface. At the top, there's a navigation bar with the title "NiFi Registry / All" and user information "registry_user LOGOUT". Below the navigation bar, there's a search bar and a sorting dropdown set to "Sort by: Name (a - z)". The main content area displays two flows: "Flow 1 - Bucket 1" (1 version) and "Flow 2 - Bucket 2" (2 versions). For "Flow 2 - Bucket 2", the "DESCRIPTION" field contains "Description 2". The "CHANGE LOG" section shows two entries: "Version 2 - 40 minutes ago by registry_user" and "Add processors Dec-26-2017 at 11:23 PM". Another entry, "Version 1 - 41 minutes ago by registry_user", is also listed.

Flows can be promoted between environments

- Connect multiple NiFi instances to a NiFi Registry instance
- Communicate between multiple NiFi Registry instances
 - via multiple Registry Clients
 - via *NiFi CLI*



Extensibility

- Git-backed persistence
 - Share flows via GitHub, etc.
- Commit hooks
 - Register a hook & action
 - “When a new version of the flow is **committed** to QA Registry, **email** the QA team and **post** in the QA Deploy Slack channel”
- Pluggable DB implementations

Event Hooks

Event hooks are an integration point that allows for custom code to be triggered when NiFi Registry application events occur.

Event Name	Description
CREATE_BUCKET	A new registry bucket is created.
CREATE_FLOW	A new flow is created in a specified bucket. Only triggered on first time creation of a flow with a given name.
CREATE_FLOW_VERSION	A new version for a flow has been saved in the registry.
UPDATE_BUCKET	A bucket has been updated.
UPDATE_FLOW	A flow that exists in a bucket has been updated.
DELETE_BUCKET	An existing bucket in the registry is deleted.
DELETE_FLOW	An existing flow in the registry is deleted.
REGISTRY_START	Invoked once the NiFi Registry application has been successfully started. This is only invoked after a complete and successful start.

Complementary Tools

NiFi Toolkit

- TLS Toolkit
 - Generates, signs, and packages keys and certificates for NiFi services (node/cluster, clients)
- Encrypt Config
 - Protects sensitive configuration values like passwords
- CLI
 - Interacts with NiFi & NiFi Registry to operate on flows

The default output type in interactive mode is `simple`, and the default output type in standalone mode is `json`.

Example of simple output for list-buckets:

```
#> registry list-buckets -ot simple  
  
My Bucket - 3c7b7467-0012-4d8f-a918-6aa42b6b9d39
```

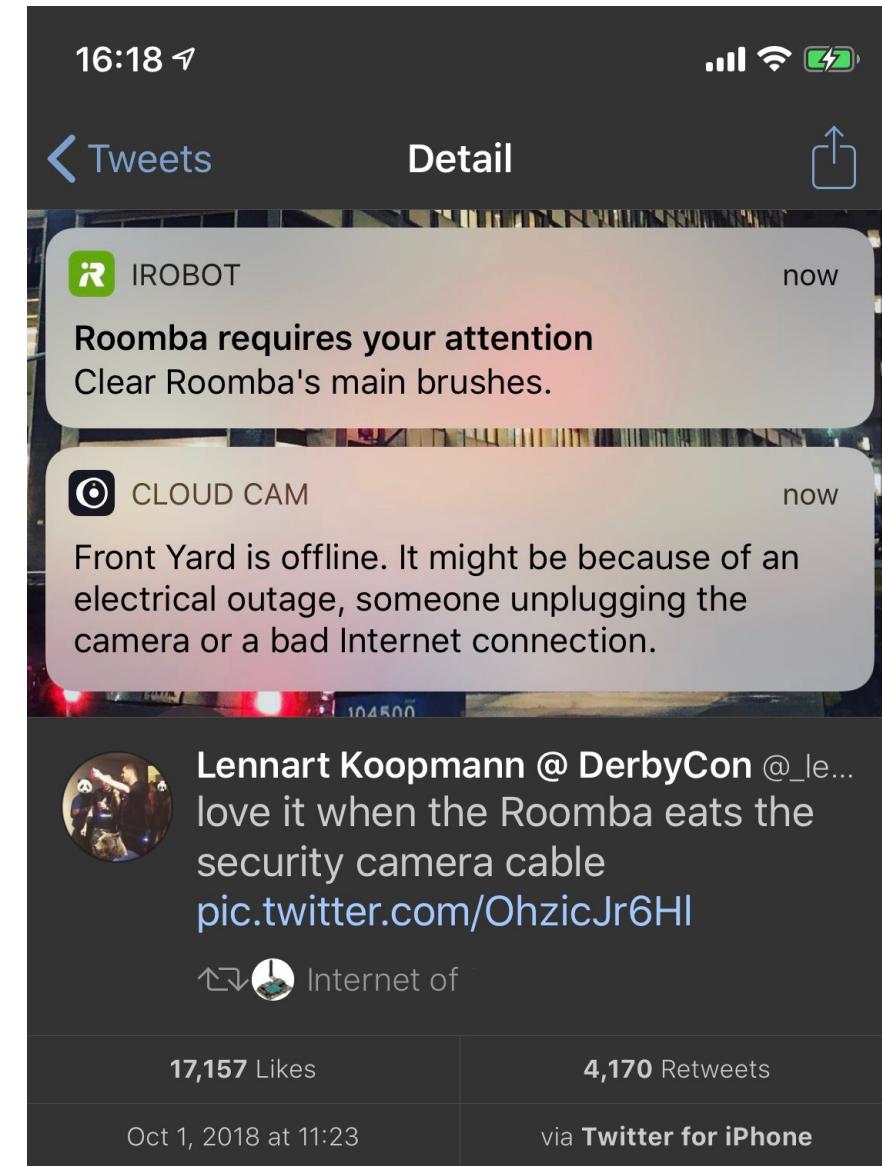
Example of json output for list-buckets:

```
#> registry list-buckets -ot json  
[ {  
  "identifier" : "3c7b7467-0012-4d8f-a918-6aa42b6b9d39",  
  "name" : "My Bucket",  
  "createdTimestamp" : 1516718733854,  
  "permissions" : {  
    "canRead" : true,  
    "canWrite" : true,  
    "canDelete" : true  
  },  
  "link" : {  
    "params" : {  
      "rel" : "self"  
    },  
    "href" : "buckets/3c7b7467-0012-4d8f-a918-6aa42b6b9d39"  
  }  
} ]
```

Internet of Things

IoT Challenges

- Limited computing capability
- Limited power/network
- **Restricted software library/platform availability**
- **No UI**
- Physically inaccessible
- Not frequently updated
- **Competing standards/protocols**
- Scalability
- **Privacy & Security**



@_lennart

Recent Examples

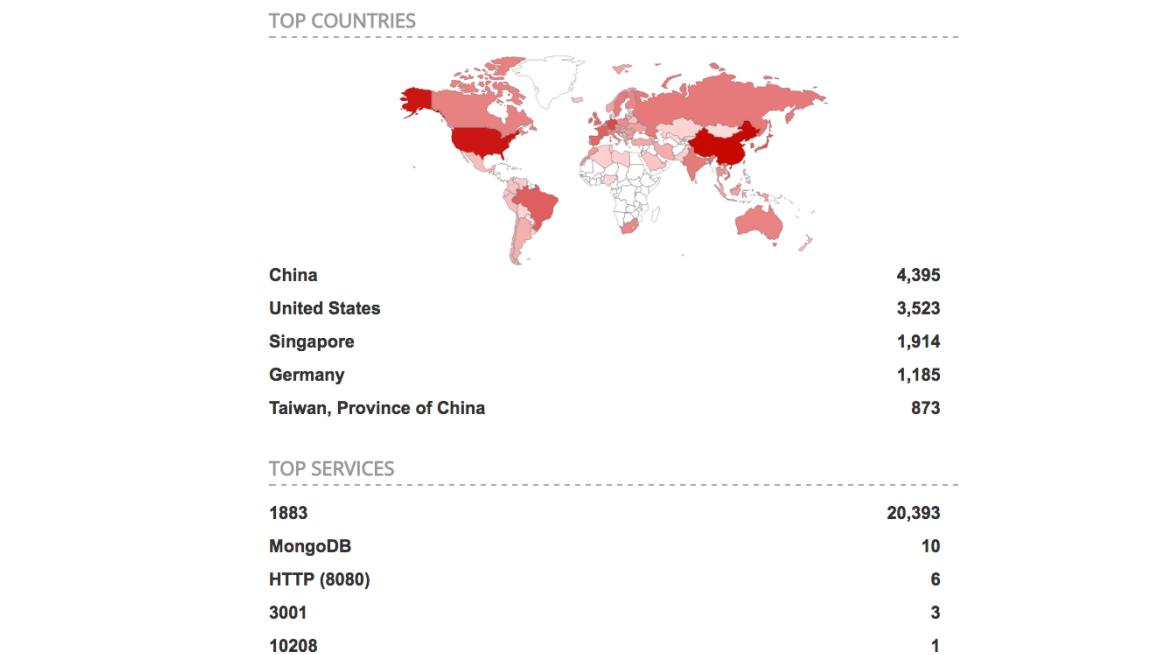
- When the Mirai attack has its own Wikipedia page, that's not good
- Hackers stole high-roller database from casino via aquarium thermometer connected to internet (04/2018)



IoTPOT: Analysing the Rise of IoT Compromises

Yin Minn Pa Pa^{†1}, Shogo Suzuki^{†1}, Katsunari Yoshioka^{†1}, Tsutomu Matsumoto^{†1},
Takahiro Kasama^{†2}, Christian Rossow^{†3}

^{†1}Graduate School of Environment and Information Sciences/Institute of Advanced Sciences
^{†1}Yokohama National University, Japan
^{†2}National Institute of Information and Communications Technology, Japan
^{†3}Institute of Advanced Sciences, Yokohama National University, Japan and
^{†3}Cluster of Excellence, MMCI, Saarland University, Germany



Google

mirai botnet

All News Videos Images Shopping More Settings Tools

About 478,000 results (0.36 seconds)

Mirai (Japanese for "the future", 未来) is malware that turns computer systems running Linux into remotely controlled "bots", that can be used as part of a **botnet** in large-scale network attacks. It primarily targets online consumer devices such as remote cameras and home routers.

Mirai (malware) - Wikipedia
[https://en.wikipedia.org/wiki/Mirai_\(malware\)](https://en.wikipedia.org/wiki/Mirai_(malware))
Block en.wikipedia.org



**“The S in IoT stands
for security”**

Oleg Šelajev, @shelajev

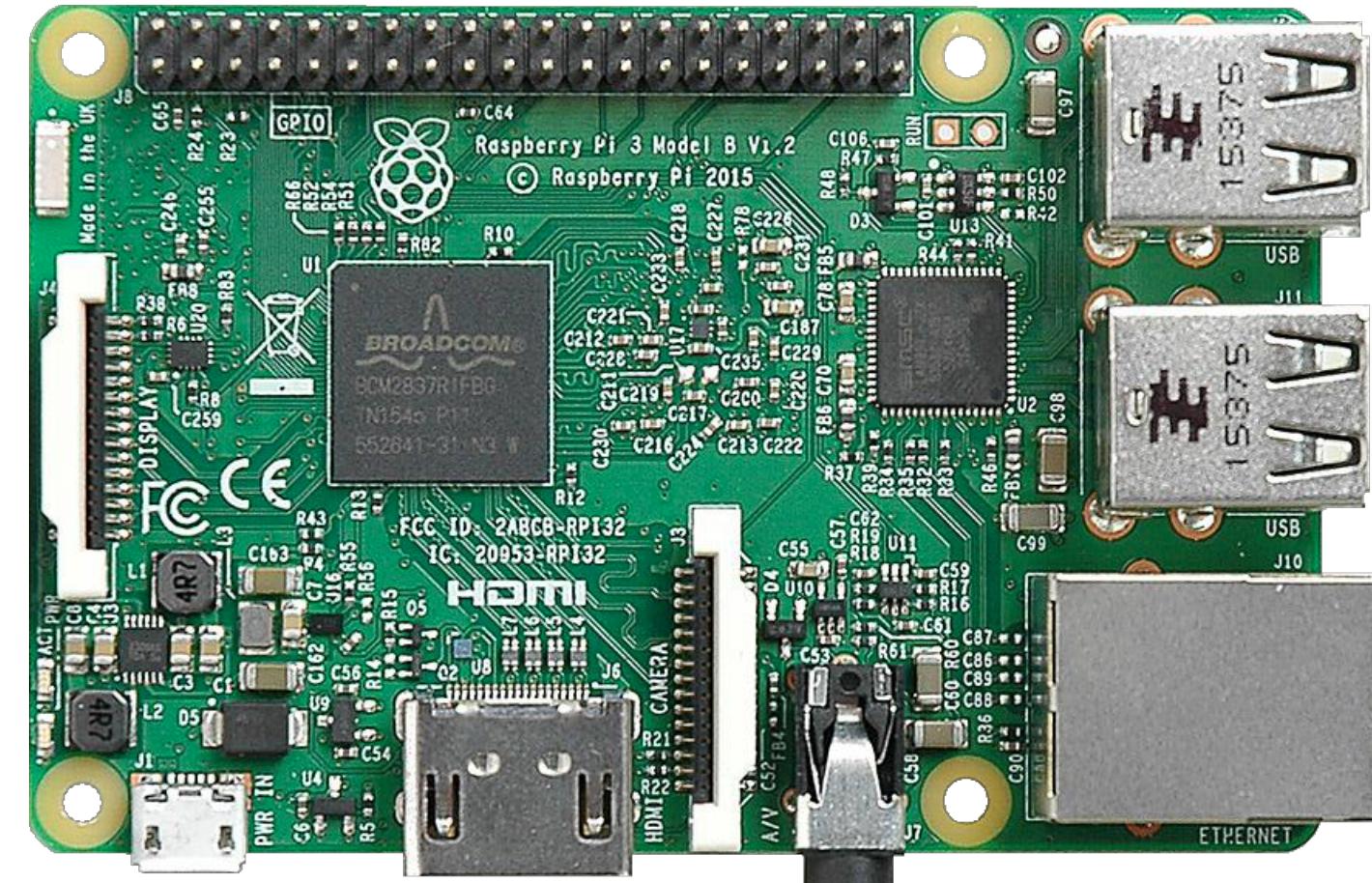
NiFi Solves Everything*

- Runs on JVM
- Provides UI for flow design & monitoring
- Security built-in
 - TLS, authentication/authorization, encrypted data
- Handles practically any format/protocol

NiFi for IoT

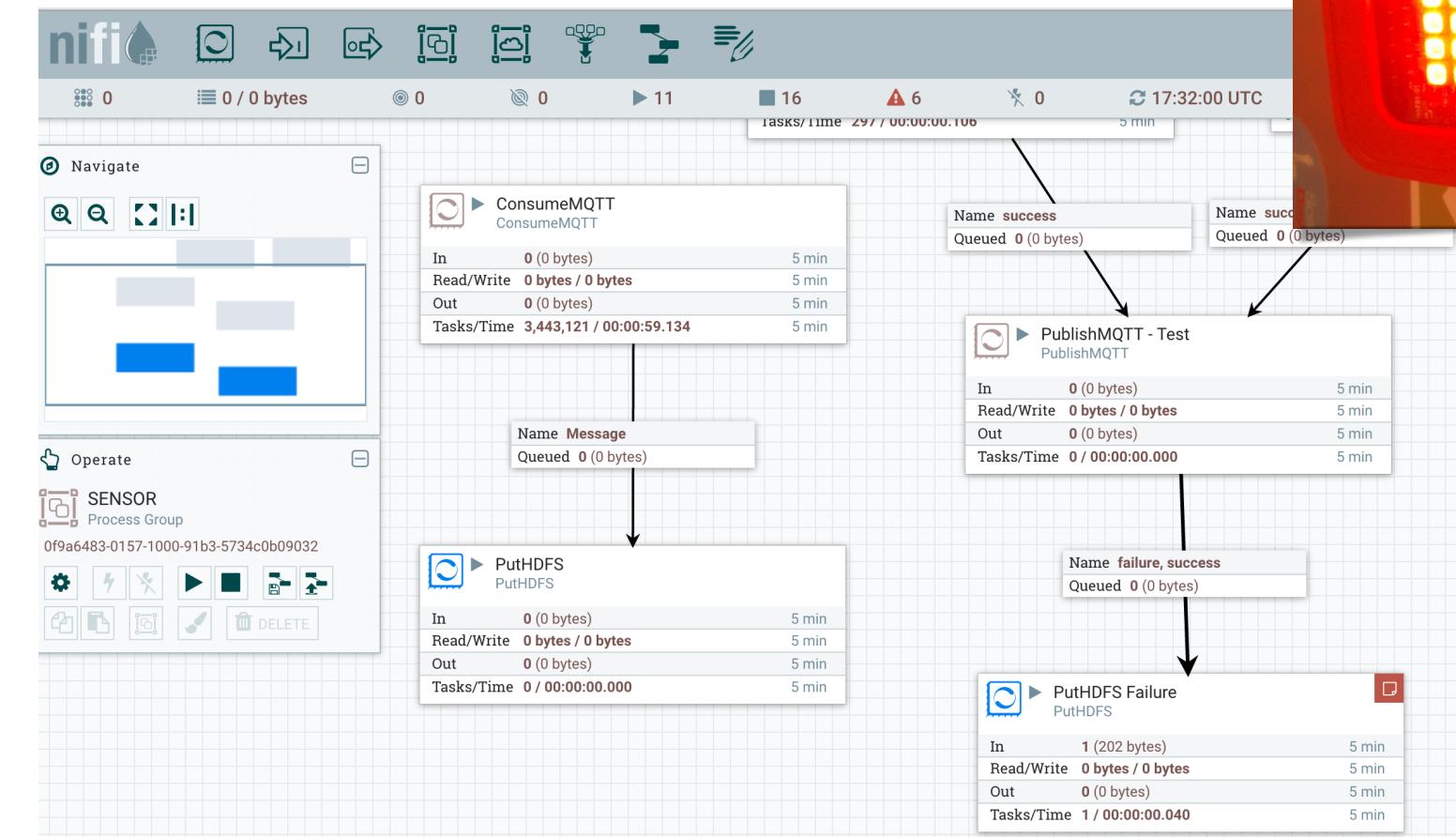
- NiFi supports AMQP, MQTT, UDP, TCP, HTTP(S), CEF, JMS, (S)FTP, *AWSIoT*
- With a little pruning, NiFi can run on a Raspberry Pi

```
bootstrap  
jcl-over-slf4j-1.7.12.jar  
jul-to-slf4j-1.7.12.jar  
log4j-over-slf4j-1.7.12.jar  
logback-classic-1.1.3.jar  
logback-core-1.1.3.jar  
nifi-api-0.6.1.jar  
nifi-documentation-0.6.1.jar  
nifi-framework-nar-0.6.1.nar  
nifi-html-nar-0.6.1.nar  
nifi-http-context-map-nar-0.6.1.nar  
nifi-jetty-bundle-0.6.1.nar  
nifi-kerberos-iaa-providers-nar-0.6.1.nar  
nifi-ldap-iaa-providers-nar-0.6.1.nar  
nifi-nar-utils-0.6.1.jar  
nifi-properties-0.6.1.jar  
nifi-provenance-repository-nar-0.6.1.nar  
nifi-runtime-0.6.1.jar  
nifi-scripting-nar-0.6.1.nar  
nifi-ssl-context-service-nar-0.6.1.nar  
nifi-standard-nar-0.6.1.nar  
nifi-standard-services-api-nar-0.6.1.nar  
nifi-update-attribute-nar-0.6.1.nar  
slf4j-api-1.7.12.jar
```



Example — Sensor Readings via RP3B

- Tim Spann
- Sense Hat sensor attachment
 - Temp, humidity, pressure
 - 8x8 LED display
- Python Flask server reading sensor and pushing to MQTT
- NiFi consuming MQTT



Building Command & Control

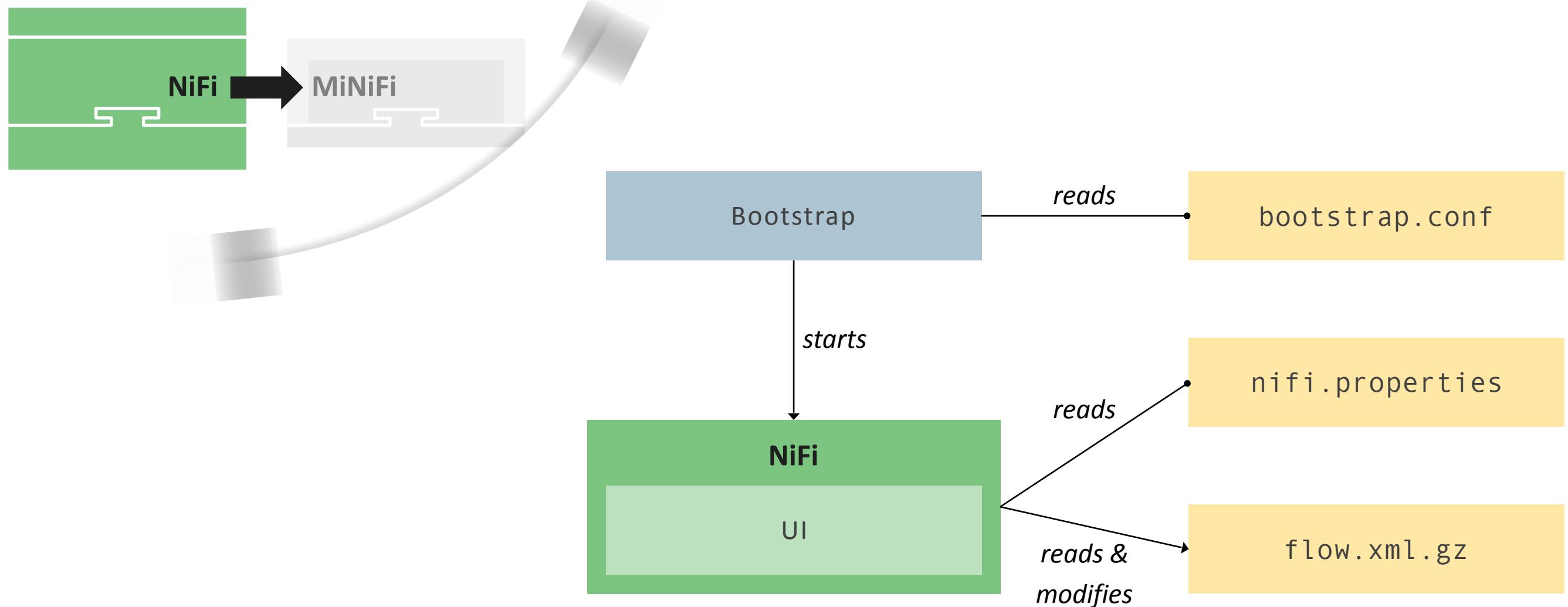
- Can expand Flask server to listen for incoming requests
- NiFi performs logic/routing/analysis
 - Can offload to Spark, Kafka, HDFS, etc.
- Decisions push new information back to Flask
- Writes to config for sensor
- Displays message/levels

So Why Do We Need A Different Solution?

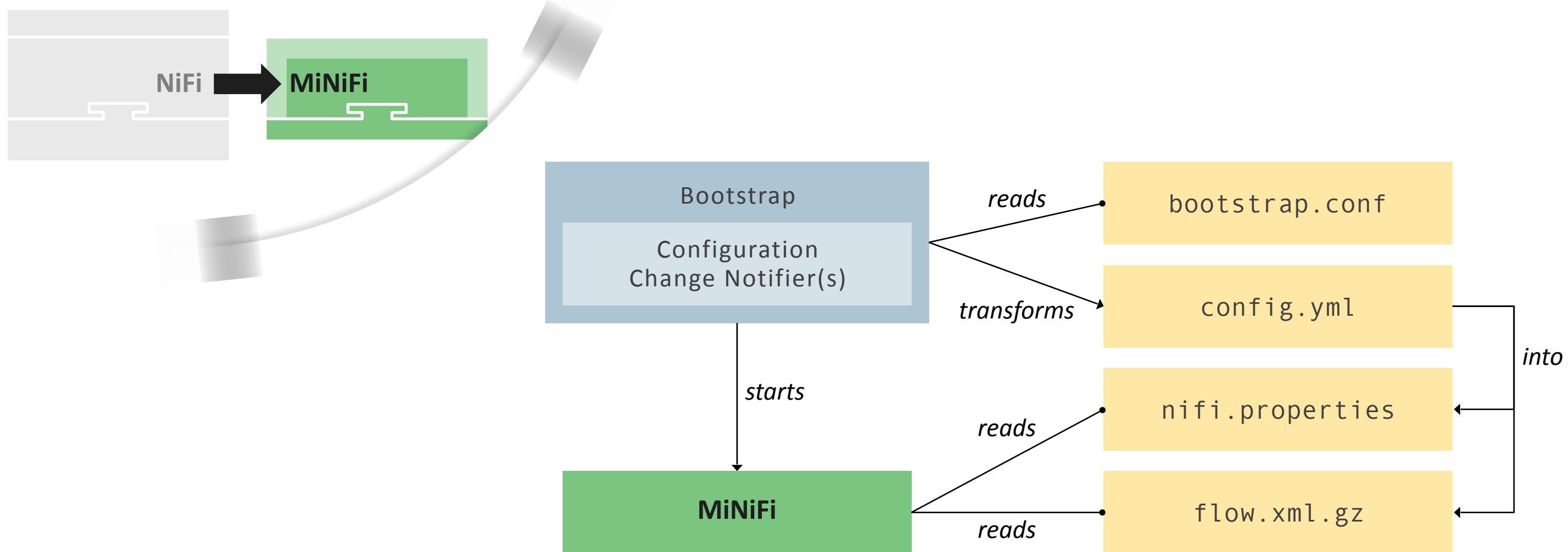
- NiFi is designed to “own the box”
- NiFi 0.7.x started up in about 10-15 minutes on RP3 (593 MB)
- NiFi 1.x started up in about 30 minutes on RP3 (760 MB)
 - 33 new processors
 - Rewrite for multi tenant authorization
 - Complete UI overhaul

```
▶hw12203:/Users/alopresto/Workspace/scratch/rp3b-demo (master) alopresto
└─ 113s @ 17:09:05 $ ssh pi@my-raspberry-pi
^C
▶hw12203:/Users/alopresto/Workspace/scratch/rp3b-demo (master) alopresto
└─ 145s @ 17:09:37 $ █
```

NiFi Java Processes



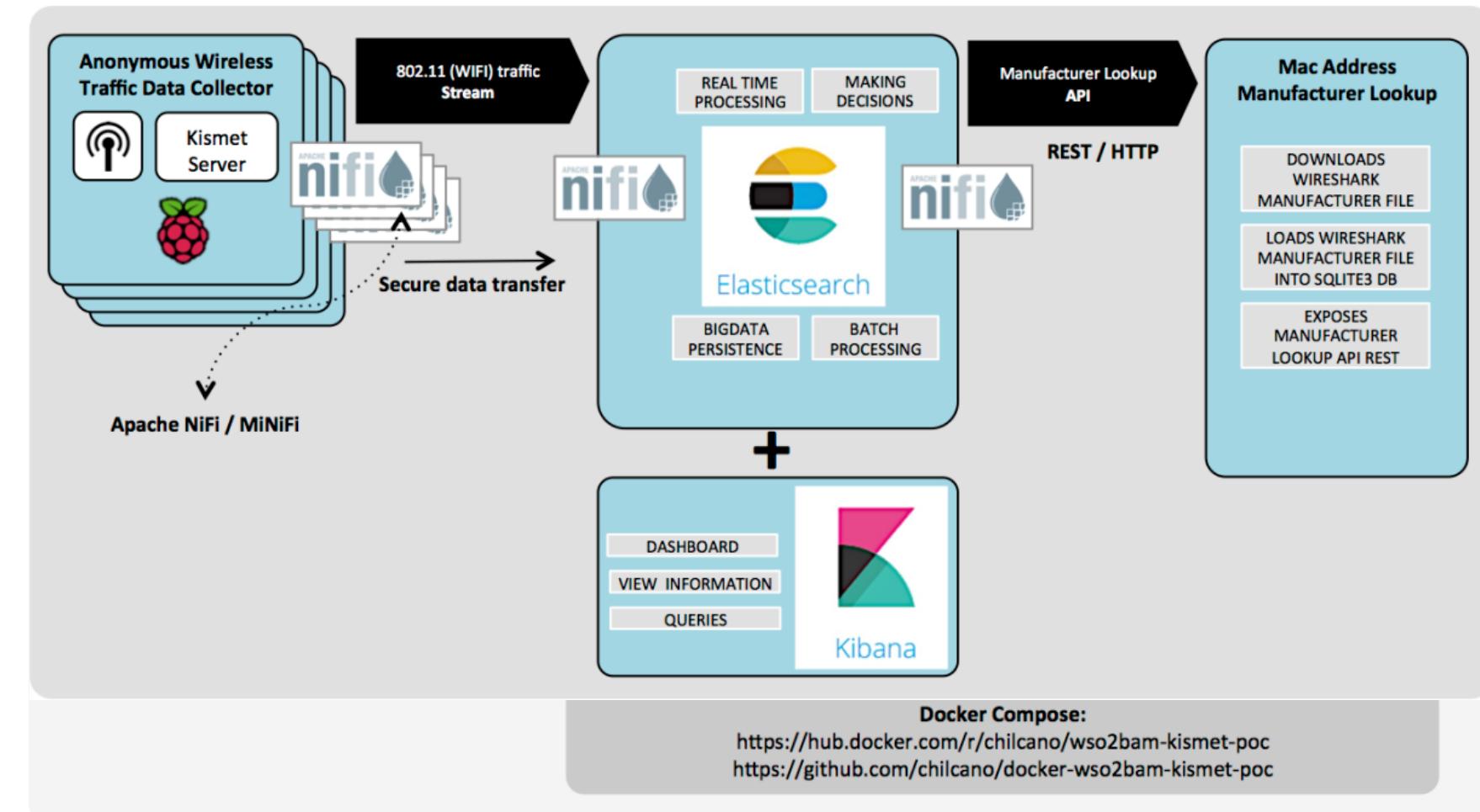
MiNiFi Java Processes



Community Example

- Roger Carhuatocto
- RP3B, Apache Thrift, Kismet, Apache Cassandra, and more

- Large scaling.
 - I would like to avoid to deploy Logstash in each Raspberry Pi just to transform in JSON the captured 802.11 (WIFI) traffic and send it to Elasticsearch. Other approach what I want to avoid is to deploy Logstash with the UDP/TCP Input Plugin in the Elasticsearch side, because both choices need parse/transform/filter the captured traffic by using [GROK](#) and Elasticsearch Index Templates for each Logstash instance deployed. What if I have 100 or more Raspberry Pi distributed in different locations?.
- Security.
 - I'm using Kismet installed in each Raspberry Pi to capture 802.11 traffic, by default Kismet sends that traffic over UDP, UDP is faster but not secure. The big problem with Logstash listening UDP traffic over a port is that Logstash is susceptible to DoS attacks and the traffic to be spoofed. I have to update UDP to the "secure UDP", UDP over SSL/TLS for example.
- Monitoring/Tracking.
 - How to monitor if Kismet is running in the Raspberry Pi?, How to know if Raspberry Pi is healthy ?.
- Administrable remotely.
 - Definitely I can't do that in a massively distributed Raspberry Pi's.



Then, what can I do ?....

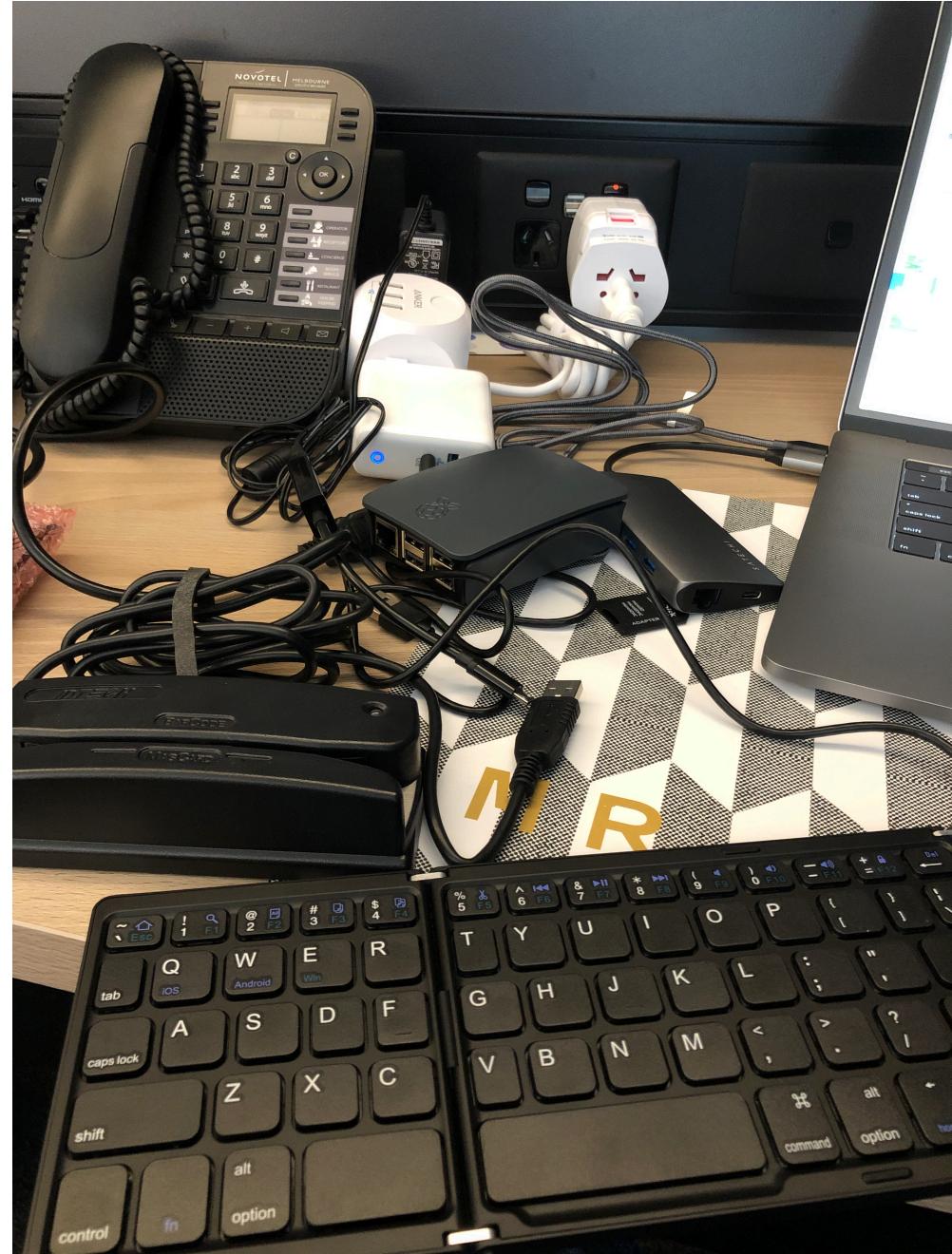
Apache NiFi to the rescue!



Demo

Collect Card Contents

- User swipes magnetic stripe card
- Raspberry Pi collects data
- Sends back to laptop



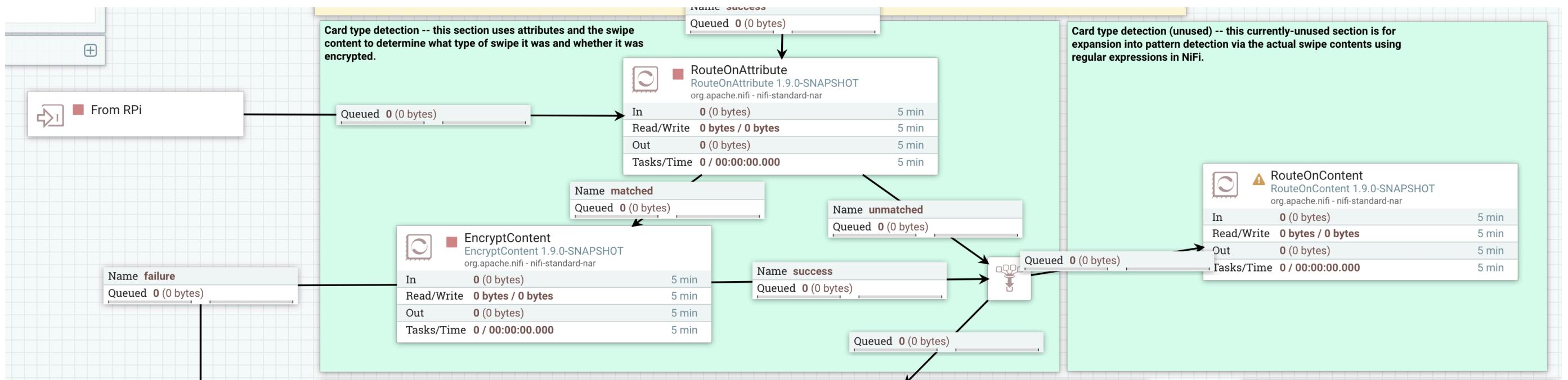
Component List

- IDTECH WCR3237-733U
- Raspberry Pi 3 B+
- Apache MiNiFi 0.6.0-SNAPSHOT
- Apache NiFi 1.9.0-SNAPSHOT
- Apache NiFi Registry 0.4.0-SNAPSHOT

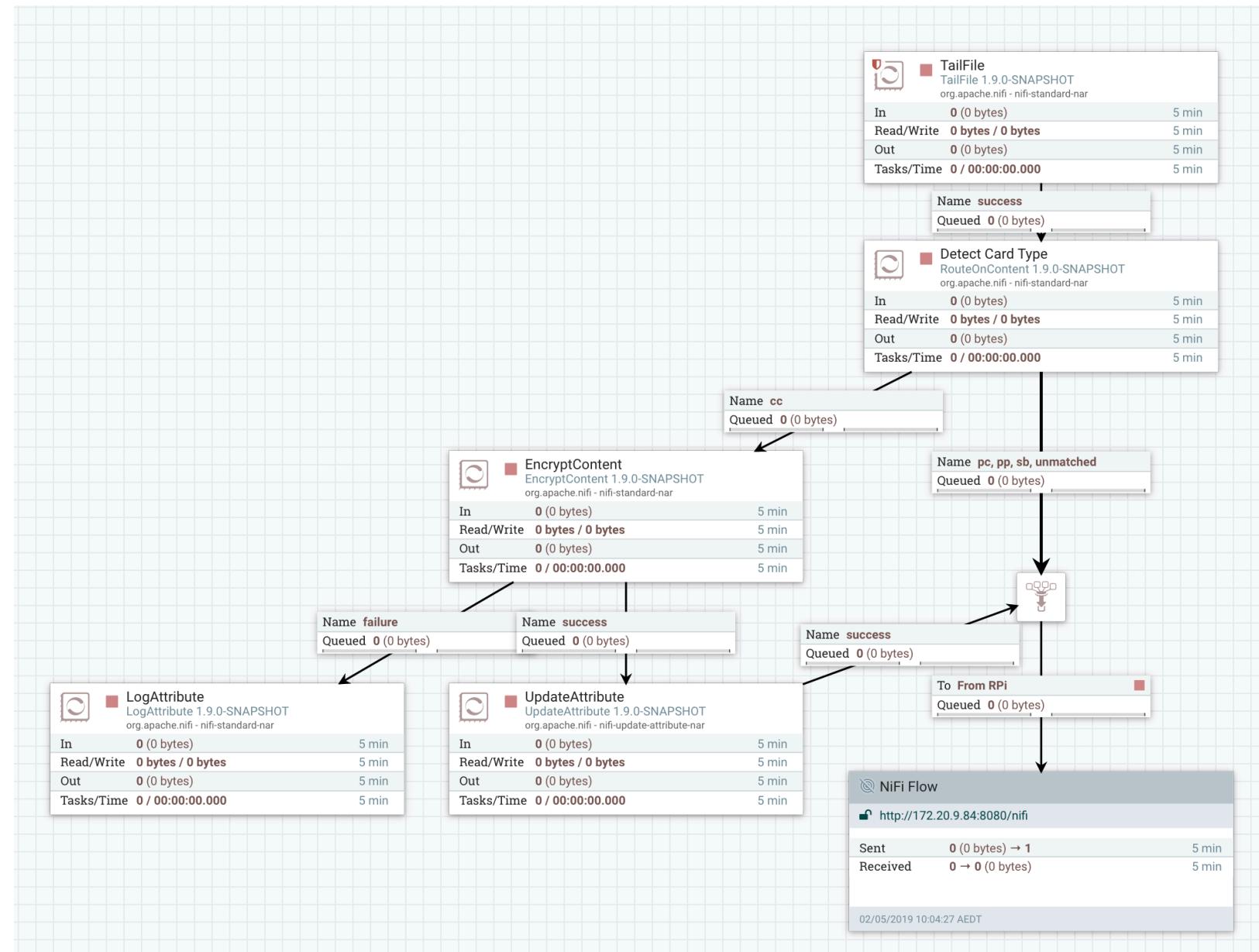
Flow Design

- NiFi Flow
 - Receive data via S2S
 - Route encrypted CC data to decrypt
 - Route all plaintext swipes through parser
 - Convert to JSON
 - Batch & write to file
- MiNiFi Flow
 - Tail file containing swipe data
 - Detect CC swipes & encrypt
 - Transmit all swipes to NiFi via S2S

NiFi Flow



MiNiFi Flow



Custom MSR Parsing Logic

```
1 import groovy.json.JsonBuilder
2 import groovy.json.JsonOutput
3 import groovy.json.JsonSlurper
4 import org.apache.commons.io.IOUtils
5 import org.apache.nifi.processor.io.StreamCallback
6
7 import java.nio.charset.StandardCharsets
8
9 def flowFile = session.get()
10 if (flowFile == null) {
11     return
12 }
13
14 final String CC_PATTERN = /%B\d{16}\^A-Za-z+/
15 final String PC_PATTERN = /%1w+/
16 final String PP_PATTERN = /%PP\//\w+/
17 final String SBUX_PATTERN = /%B601.*SERVICERECOVERY/
18
19 String determinedType = "unknown"
20
21 flowFile = session.write(flowFile, { inputStream, outputStream ->
22     def content = IOUtils.toString(inputStream, StandardCharsets.UTF_8)
23     Map parsedObject
24
25     // Logic to do various parsing
26     if (content =~ CC_PATTERN) {
27         log.info("Detected CC format")
28         parsedObject = parse(content, detectedType: "CC")
29     } else if (content =~ PP_PATTERN) {
30         log.info("Detected Priority Pass format")
31         parsedObject = parse(content, detectedType: "PP")
32     } else if (content =~ PC_PATTERN) {
33         log.info("Detected Players Club format")
34         parsedObject = parse(content, detectedType: "PC")
35     } else if (content =~ SBUX_PATTERN) {
36         log.info("Detected Starbucks Gift Card format")
37         parsedObject = parse(content, detectedType: "SB")
38     } else {
39         log.info("Could not determine MSR type; using generic parsing heuristics")
40         parsedObject = parse(content, detectedType: "generic")
41     }
42
43     // Write the determined type to an attribute
44     determinedType = parsedObject["type"]
45
46     // Write the timing info to the parsed object
47     parsedObject["time_parsed"] = new Date().format(format: 'YYYY-MM-dd_HH-mm-ss.SSS Z')
48     parsedObject["id"] = flowFile.uuid
49     parsedObject["source"] = flowFile.filename
50
51     // Convert the object into JSON
52     def jsonString = JsonOutput.toJson(parsedObject)
53     log.info("Formed JSON: ${jsonString}")
54
55     outputStream.write(jsonString.getBytes(StandardCharsets.UTF_8))
56
57 } as StreamCallback)
58 flowFile.determinedType = determinedType
```

```
59
60 private Map parse(String content, String detectedType) {
61     Map parsedObject = [:]
62     parsedObject["type"] = detectedType
63
64     def tracks = content.split( regex: /\?\n/ )
65     log.info("Tracks ${tracks.size()}: ${tracks.collect { "\n\t${it}" }}")
66
67     // Put the track 1 data directly
68     parsedObject["track1"] = tracks[0]
69
70     def track1Elements = tracks[0].split( regex: /\^/ )
71     log.info("Track 1 Elements ${track1Elements.size()}: ${track1Elements.collect { "\n\t${it}" }}")
72
73     // The PAN and Name are common elements
74     parsedObject["pan"] = track1Elements[0][2..-1] // Skip the start sentinel and format code (%B)
75     if (track1Elements.size() > 1) {
76         parsedObject["name"] = track1Elements[1].trim()
77     }
78     if (track1Elements.size() > 2) {
79         // Put the remaining track 1 data in a generic field
80         parsedObject["additionalTrack1"] = track1Elements[2..-1].join("^")
81     }
82
83     // Put track 2 data directly
84     parsedObject["track2"] = tracks[1]
85
86     // Return the parsed object
87     parsedObject
88
89
90     session.transfer(flowFile, REL_SUCCESS)
```

Running on Raspberry Pi

LXTerminal

File Edit Tabs Help

```
pi@gobias:/opt/iot$ ./prompt.sh
Swipe your card : : pi@gobias:/opt/iot$ more swipes.txt
%PP//ANDREW/D/LOPRESTO?\n;7357450001927901=102018?
pi@gobias:/opt/iot$
```

0 items

LXTerminal

File Edit Tabs Help

```
459-510.txt,size=51]
-----[Transmitting data]-----
Standard FlowFile Attributes
Key: 'entryDate'
    Value: 'Tue Feb 05 14:43:32 AEDT 2019'
Key: 'lineageStartDate'
    Value: 'Tue Feb 05 14:43:32 AEDT 2019'
Key: 'fileSize'
    Value: '51'
FlowFile Attribute Map Content
Key: 'RouteOnContent.Route'
    Value: 'pp'
Key: 'filename'
    Value: 'swipes.459-510.txt'
Key: 'mime.type'
    Value: 'text/plain'
Key: 'path'
    Value: './'
Key: 'tailfile.original.path'
    Value: '/opt/iot/swipes.txt'
Key: 'uuid'
    Value: '3dc63eb3-a3fd-4e47-bfce-46dc7792d4a3'
-----[Transmitting data]-----
%PP//ANDREW/D/LOPRESTO?\n;7357450001927901=102018?
```

Free spa

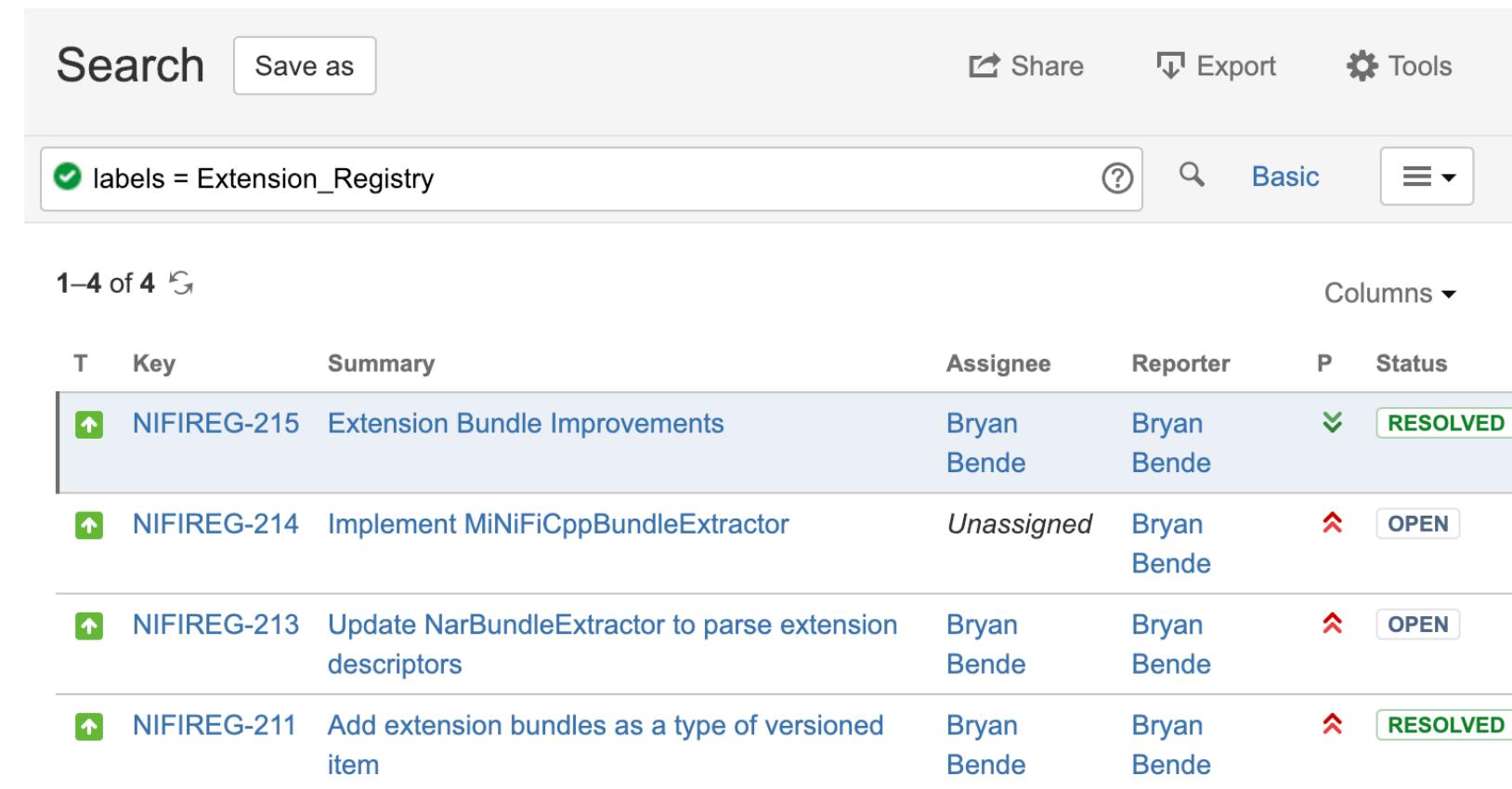
Running on MacBook Pro

```
× 2 scratch/iot_msр (more)
drwxr-xr-x 8 alopresto staff 256B Feb 5 14:47 .
drwxr-xr-x 180 alopresto staff 5.6K Feb 3 14:17 ..
-rw-r--r-- 1 alopresto staff 2.9K Feb 3 14:19 2019-02-03_14-19-24_824_+1100.json
-rw-r--r-- 1 alopresto staff 2.9K Feb 3 14:19 2019-02-03_14-19-29_828_+1100.json
-rw-r--r-- 1 alopresto staff 3.5K Feb 3 14:19 2019-02-03_14-19-34_836_+1100.json
-rw-r--r-- 1 alopresto staff 3.4K Feb 3 14:19 2019-02-03_14-19-40_837_+1100.json
-rw-r--r-- 1 alopresto staff 3.7K Feb 3 14:19 2019-02-03_14-19-46_849_+1100.json
-rw-r--r-- 1 alopresto staff 3.4K Feb 3 14:19 2019-02-03_14-19-52_853_+1100.json
> . . . sers/alopresto/Workspace/scratch/iot_msр (master) 😊
└─ 0s @ 14:49:01 $ more 2019-02-03_14-19-52_853_+1100.json
{"type": "PC", "track1": "%1AANDREW. 01037983102300", "pan": "AANDREW. 0103798310230000?", "time_parsed": "2019-02-03_14-19-46.884 +1100", "id": "47fc007e-aa24-47b5-94aa-7793acb8cbe4", "source": "564a9f2f-74b8-4a47-9cad-df8742e4a02a"}  
{"type": "PP", "track1": "%PP//ANDREW/D/LOPREST0", "pan": "P//ANDREW/D/LOPREST0", "track2": "7357450001927901=102018?", "time_parsed": "2019-02-03_14-19-47.862 +1100", "id": "ffea2add-03e6-49d8-b0ea-570ff7485d0c", "source": "739599e1-2286-440a-8635-623206f589cf"}  
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Roadmap

Roadmap

- Command & Control Architecture
- Extension Registry



The screenshot shows a Jira search results page with the following details:

Search: labels = Extension_Registry

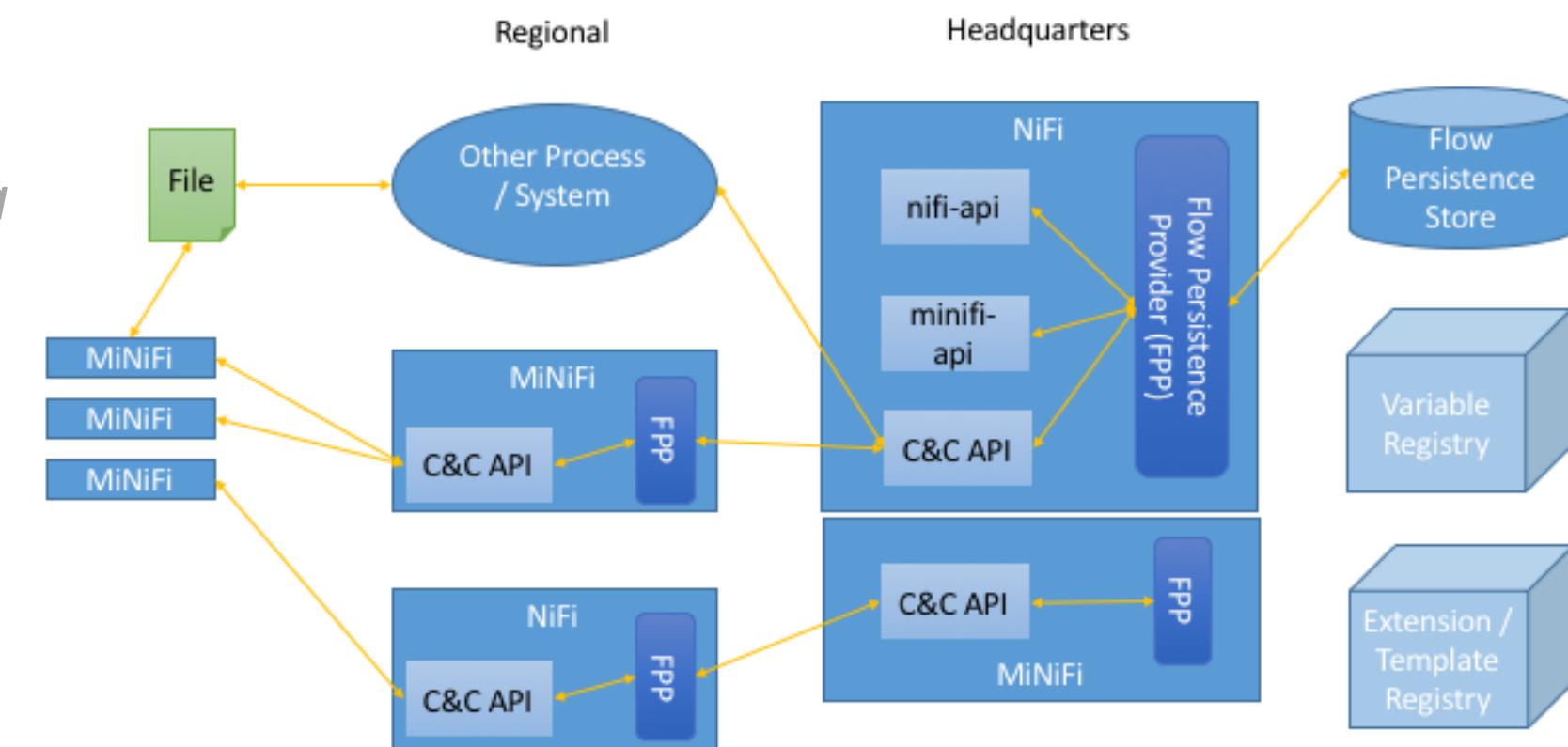
Results: 1–4 of 4

Columns: T, Key, Summary, Assignee, Reporter, P, Status

T	Key	Summary	Assignee	Reporter	P	Status
↑	NIFIREG-215	Extension Bundle Improvements	Bryan Bende	Bryan Bende	✓	RESOLVED
↑	NIFIREG-214	Implement MiNiFiCppBundleExtractor	Unassigned	Bryan Bende	✗	OPEN
↑	NIFIREG-213	Update NarBundleExtractor to parse extension descriptors	Bryan Bende	Bryan Bende	✗	OPEN
↑	NIFIREG-211	Add extension bundles as a type of versioned item	Bryan Bende	Bryan Bende	✗	RESOLVED

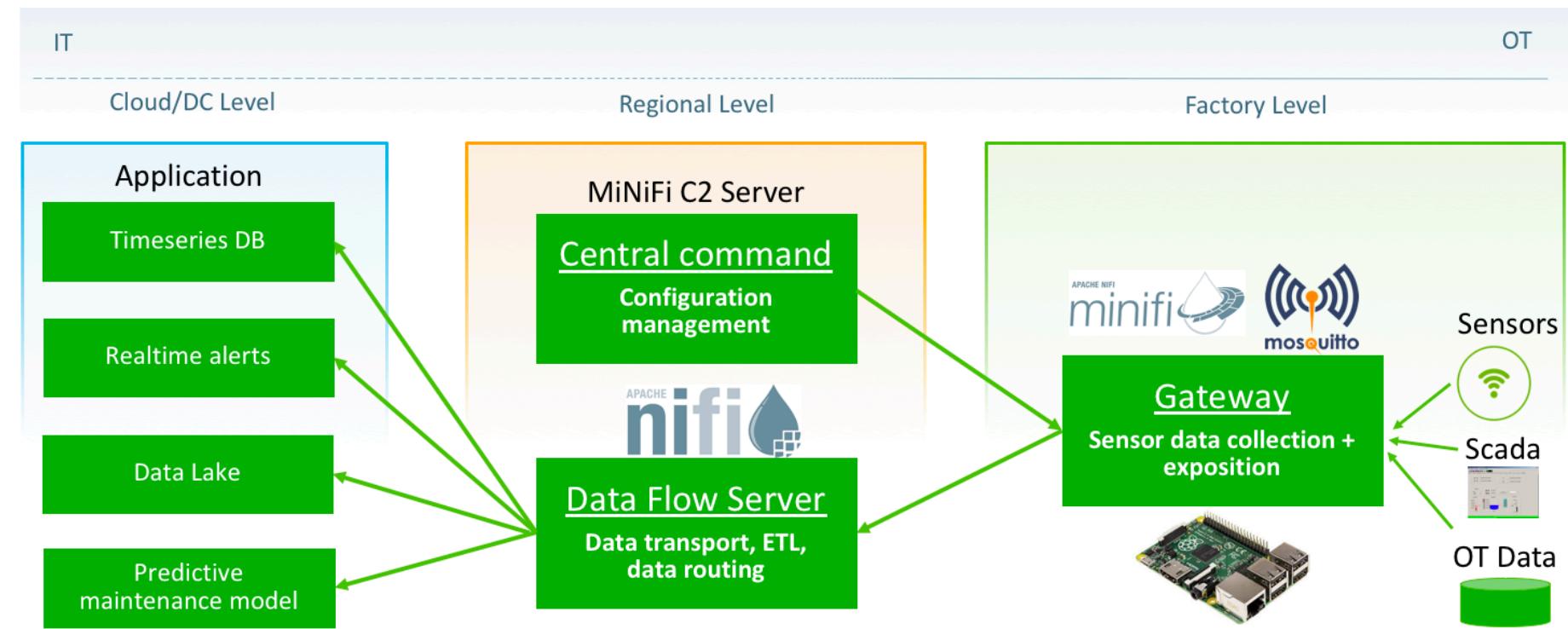
MiNiFi Command & Control Architecture

- Flow Versioning
 - Develop flows for class of MiNiFi instances
- Command & Control (C2) API (*in Java master*)
 - FileChangeIngestor
 - RestAPIIngestor
 - PullHTTPIngestor



MiNiFi C2 + Raspberry Pi

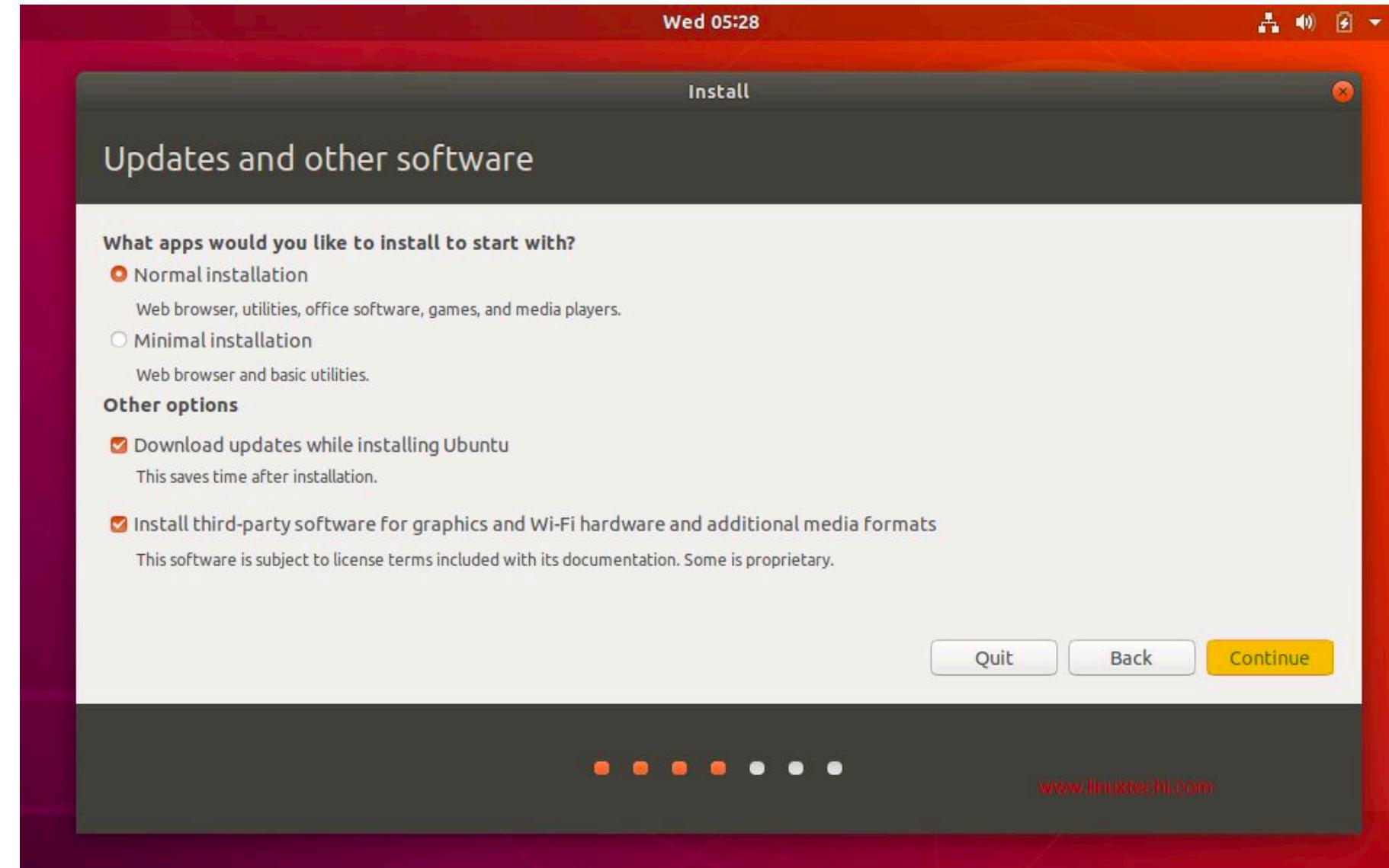
- Abdelkrim Hadidj
- Step-by-step walkthrough
 - deploying services
 - configuring endpoints
 - developing flows



[How to build an IIoT system using Apache NiFi,
MiNiFi, C2 Server, MQTT and Raspberry Pi](#)

Extension Registry

- Uses NiFi Registry to manage extensions (“narballs”)
- Allows faster download, build, and deployment
 - *Think Ubuntu Server vs. Desktop*
- Create, upload, and download functional bundles



LinuxTechi.com

- [NiFi Wiki - Extension Registry Feature Proposal](#)
- [NiFi Dev Mailing List - Discussion of implementation](#)

Community

New Announcements

- NiFi 1.8.0 — 26 Oct 2018 (212+ Jiras)
 - Jetty, DB improvements
 - Auto load-balancing queues
 - TLS Toolkit w/ external CA
 - Record processor improvements
- MiNiFi C++ 0.5.0 — 6 June 2018
- MiNiFi Java 0.5.0 — 7 July 2018
- NiFi Registry 0.3.0 — 25 Sept 2018



Community Health

apache / nifi

Unwatch ▾ 154 Unstar 1,103 Fork 1,041

Code Pull requests 145 Projects 0 Insights

Mirror of Apache NiFi

4,720 commits

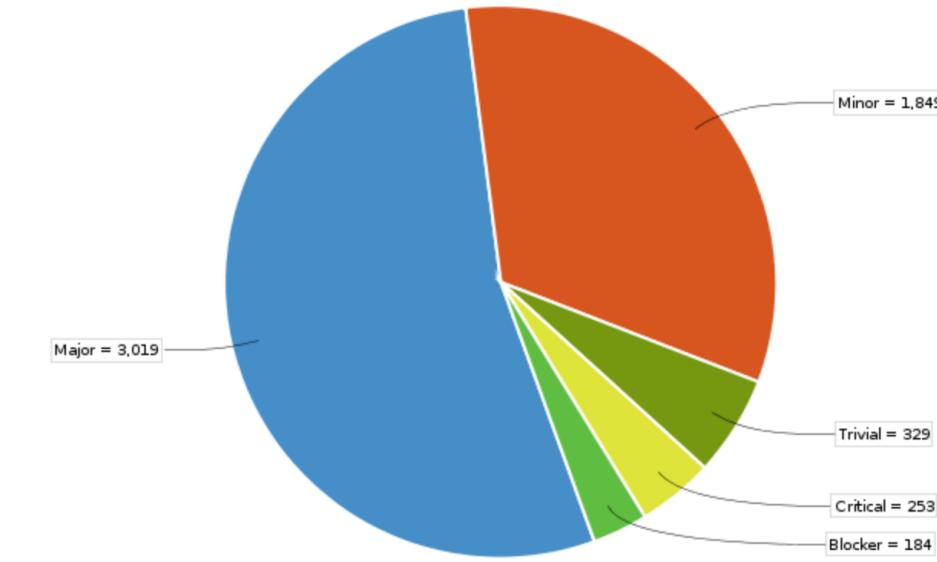
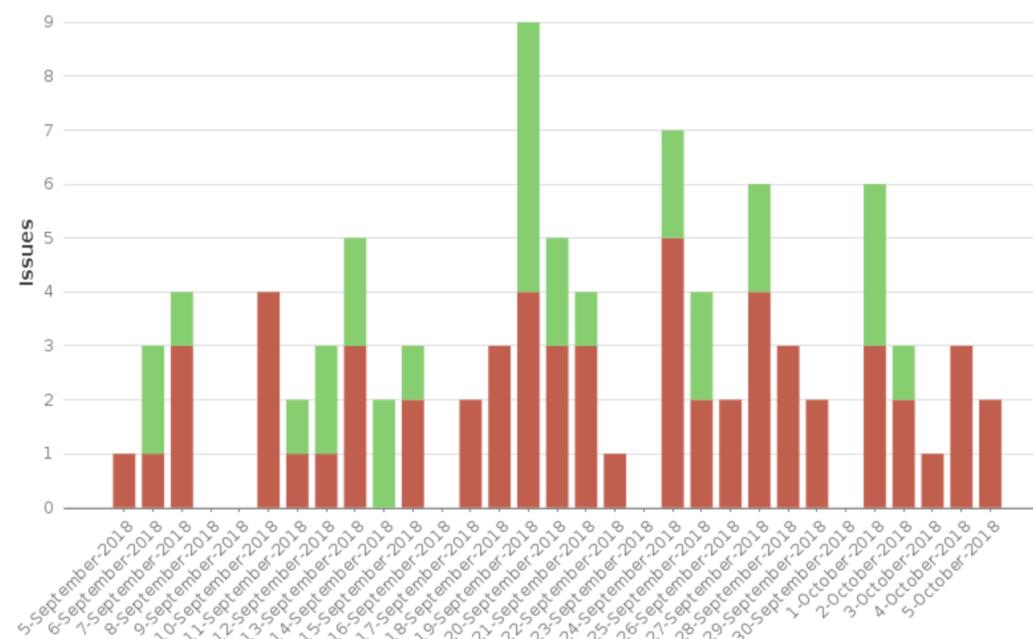
52 branches

63 releases

200 contributors

Apache-2.0

This chart shows the issues created in the last 30 days



Learn more and join us

Apache NiFi site

<https://nifi.apache.org>

Subproject MiNiFi site

<https://nifi.apache.org/minifi/>

Subscribe to and collaborate at

dev@nifi.apache.org

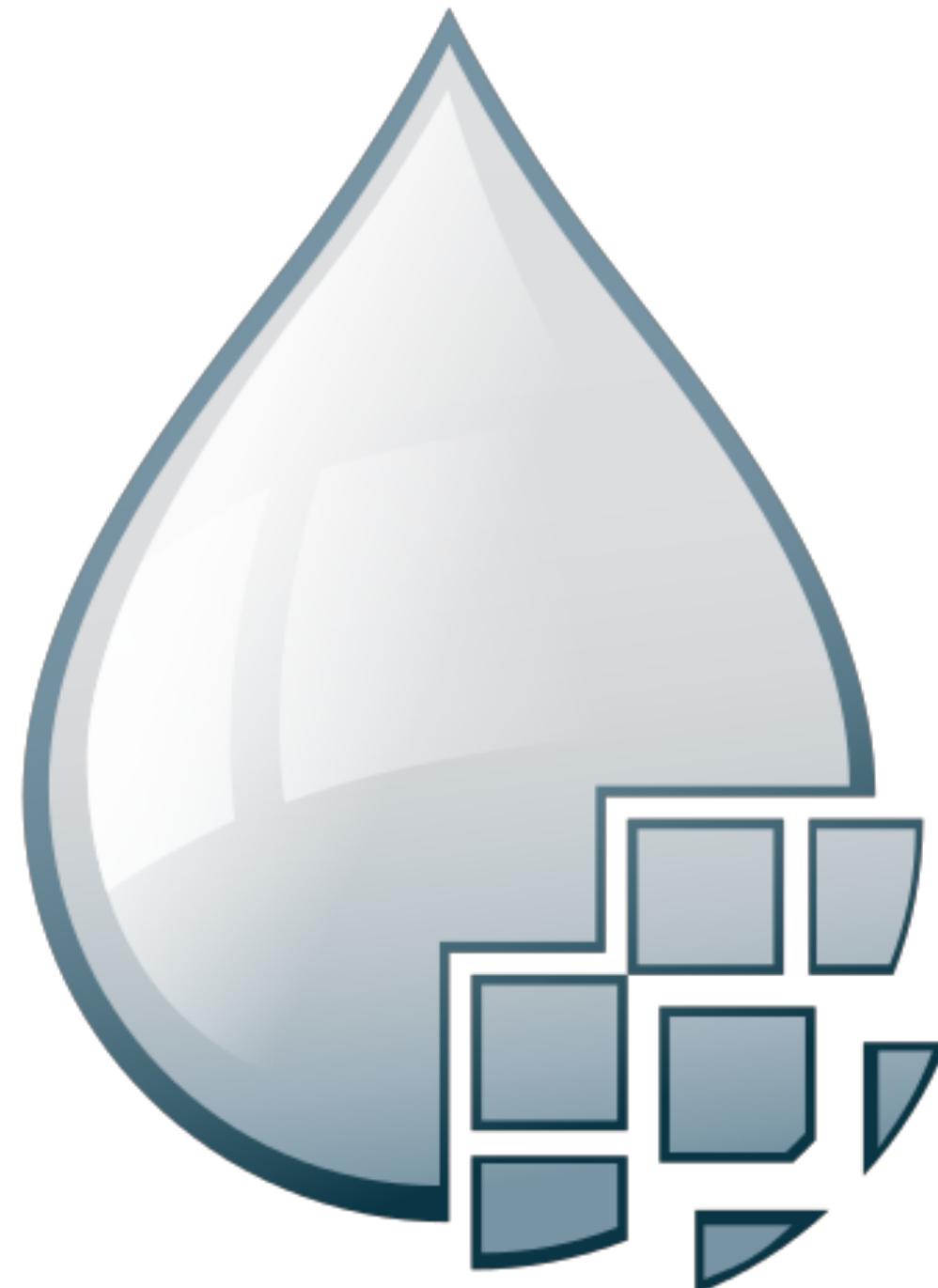
users@nifi.apache.org

Submit Ideas or Issues

<https://issues.apache.org/jira/browse/NIFI>

Follow us on Twitter

[@apachenifi](https://twitter.com/apachenifi)



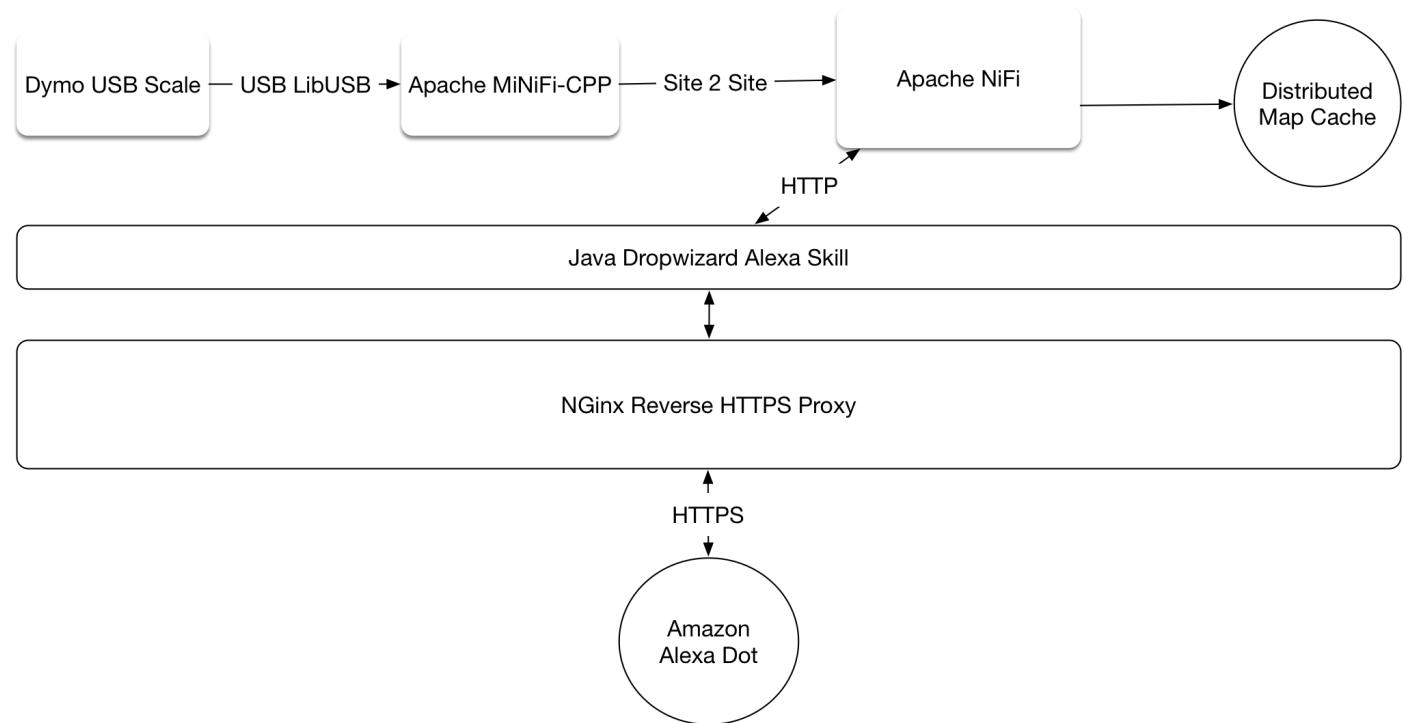
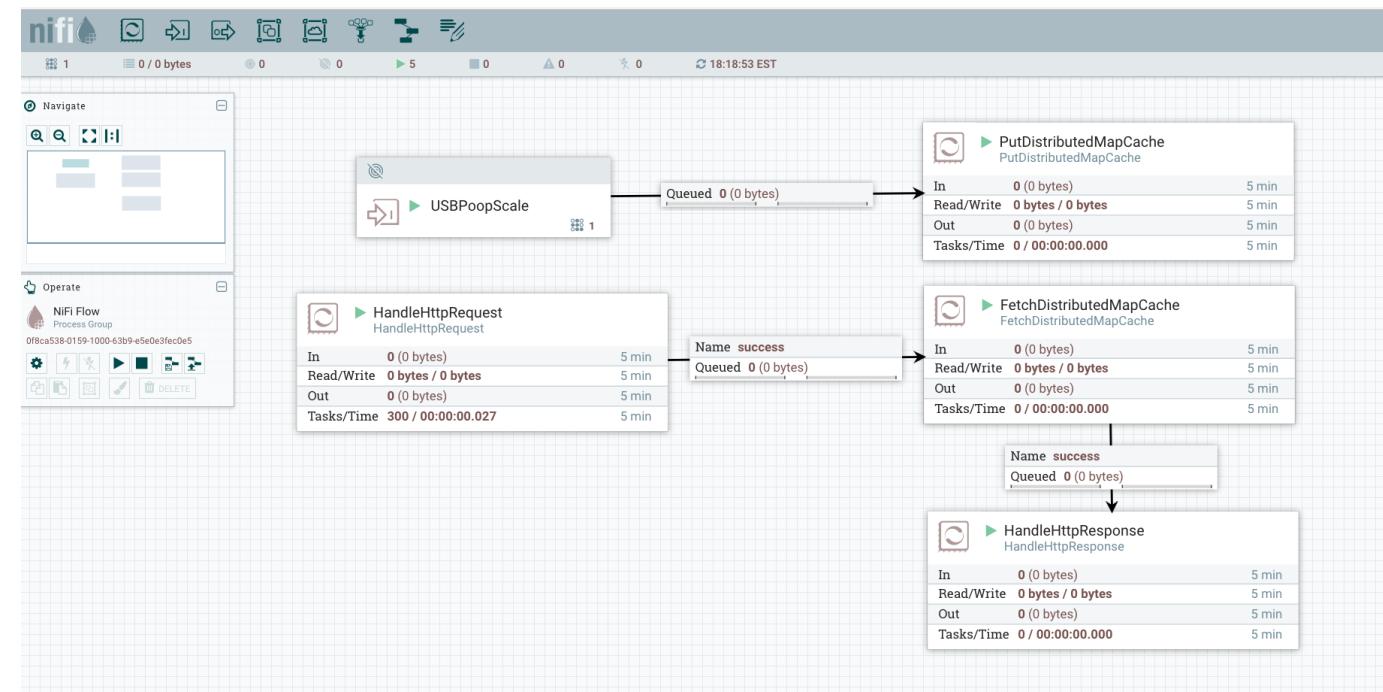
Dataworks Summit Melbourne Tomorrow

Title	Time	Room
The First Mile – Edge and IoT Data Collection with Apache NiFi and MiNiFi	1100 - 1140	Room 103
Apache NiFi Crash Course	1400 - 1600	Room 109
Dataflow Management From Edge to Core with Apache NiFi	1650 - 1730	Room 112
Using Spark Streaming and NiFi for the Next Generation of ETL in the Enterprise	1650 - 1730	Room 103



Community Example

- Jeremy Dyer
- Alexa + MiNiFi + Dyer 2.0





Thank you

alopresto@hortonworks.com | alopresto@apache.org | [@yolopey](https://twitter.com/yolopey)
github.com/alopresto/slides