



Special Crash Course WiFi

SSID: CrashCourse

PW: DataWorks18

Apache NiFi Crash Course

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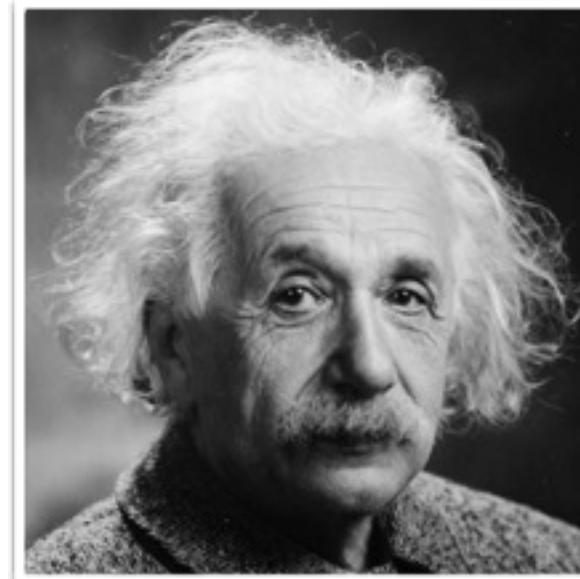
18 April 2018 Dataworks Summit Berlin

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

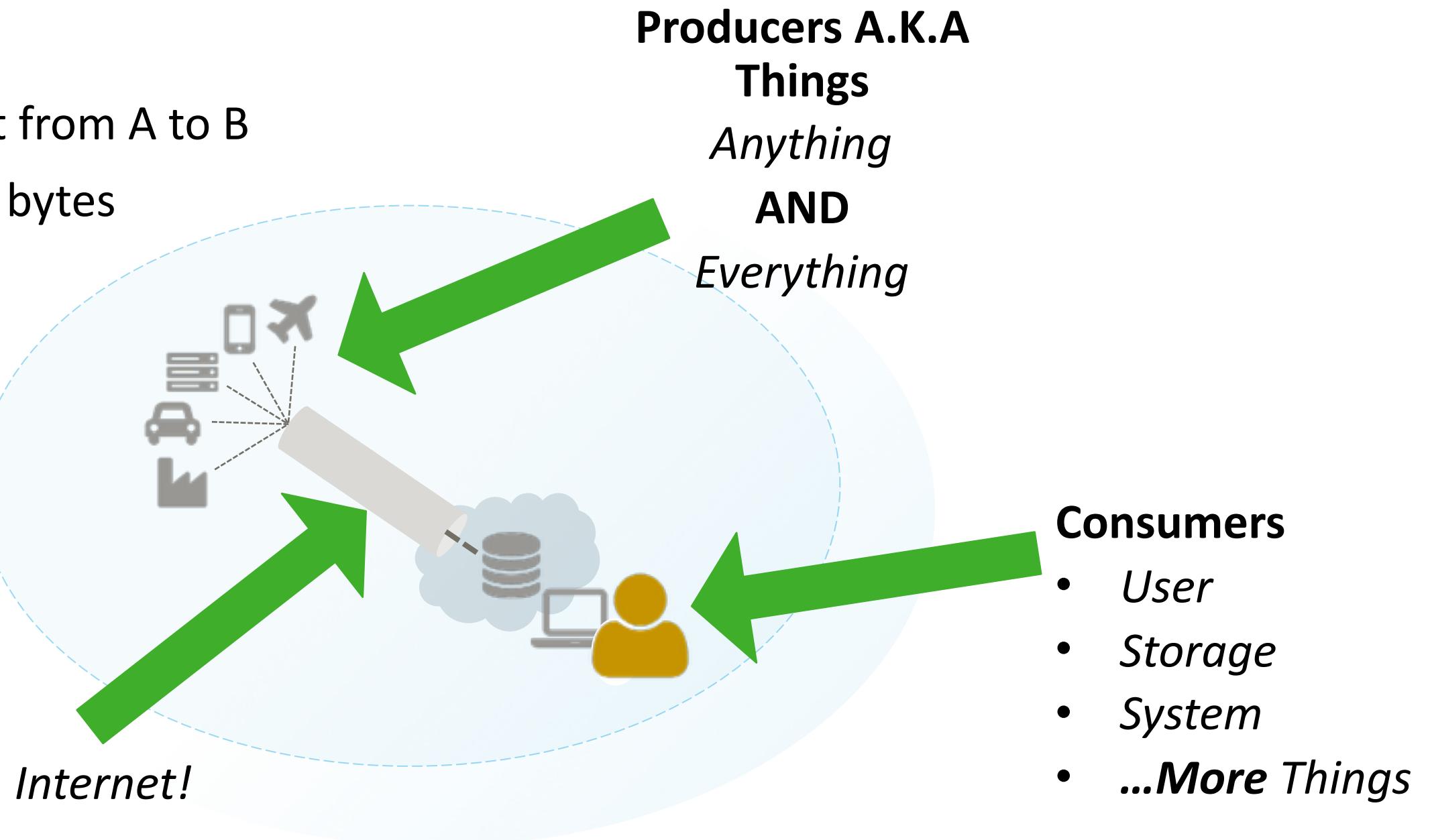
- Introduction
 - What is dataflow?
 - What is NiFi?
 - What's next?
-
- All slides provided online, so no need to transcribe



What is dataflow?

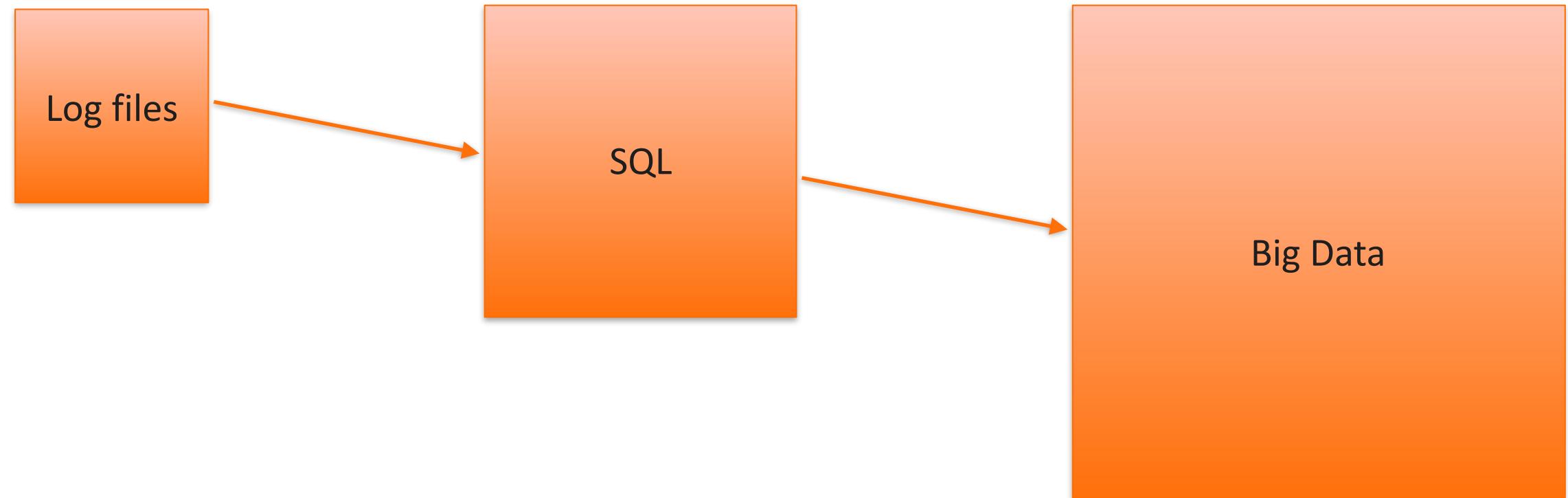
What is dataflow?

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



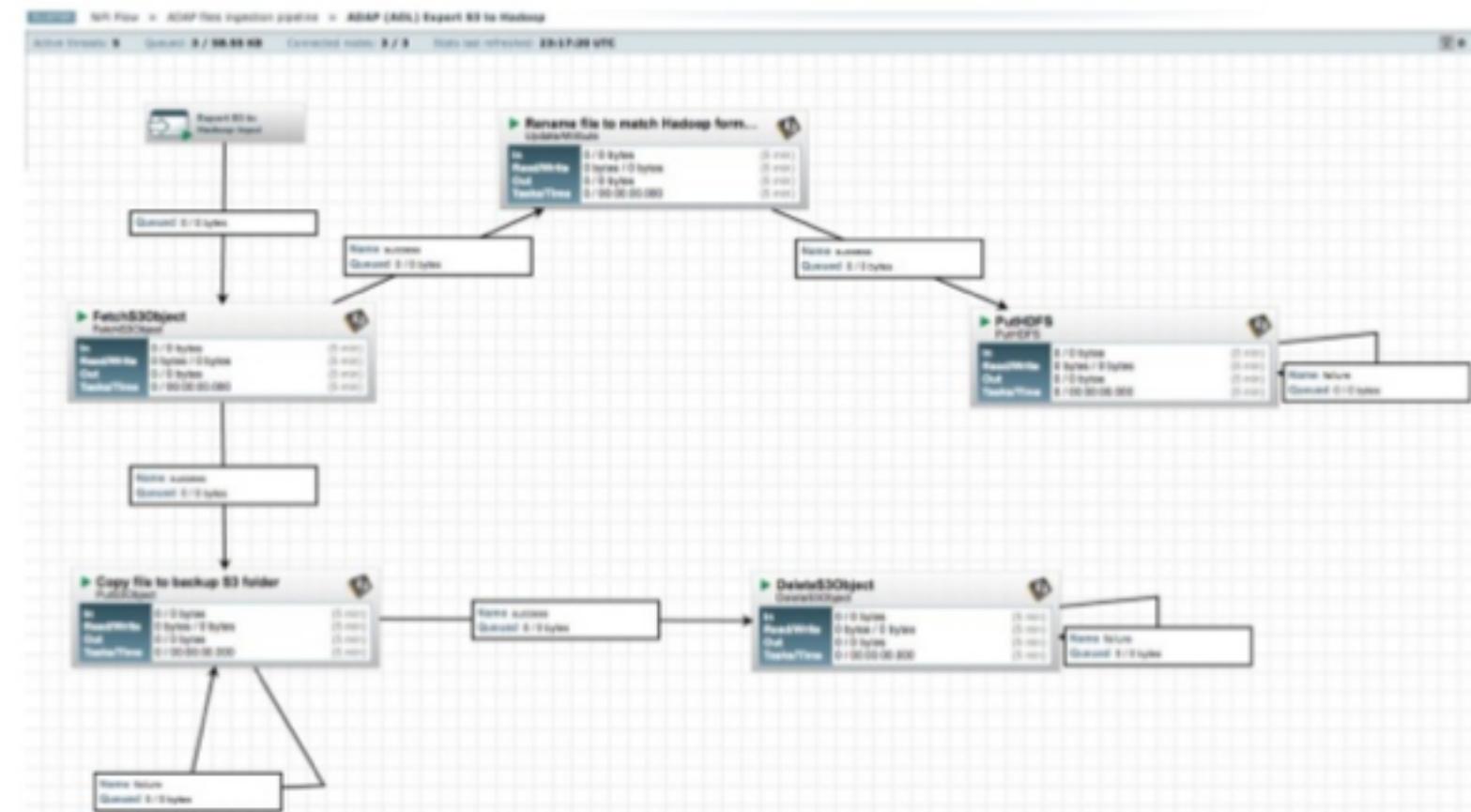
Connecting Data Points Is Easy

- Simple enough to write a process
 - Bash/Ruby/Python
 - SQL proc
 - etc.

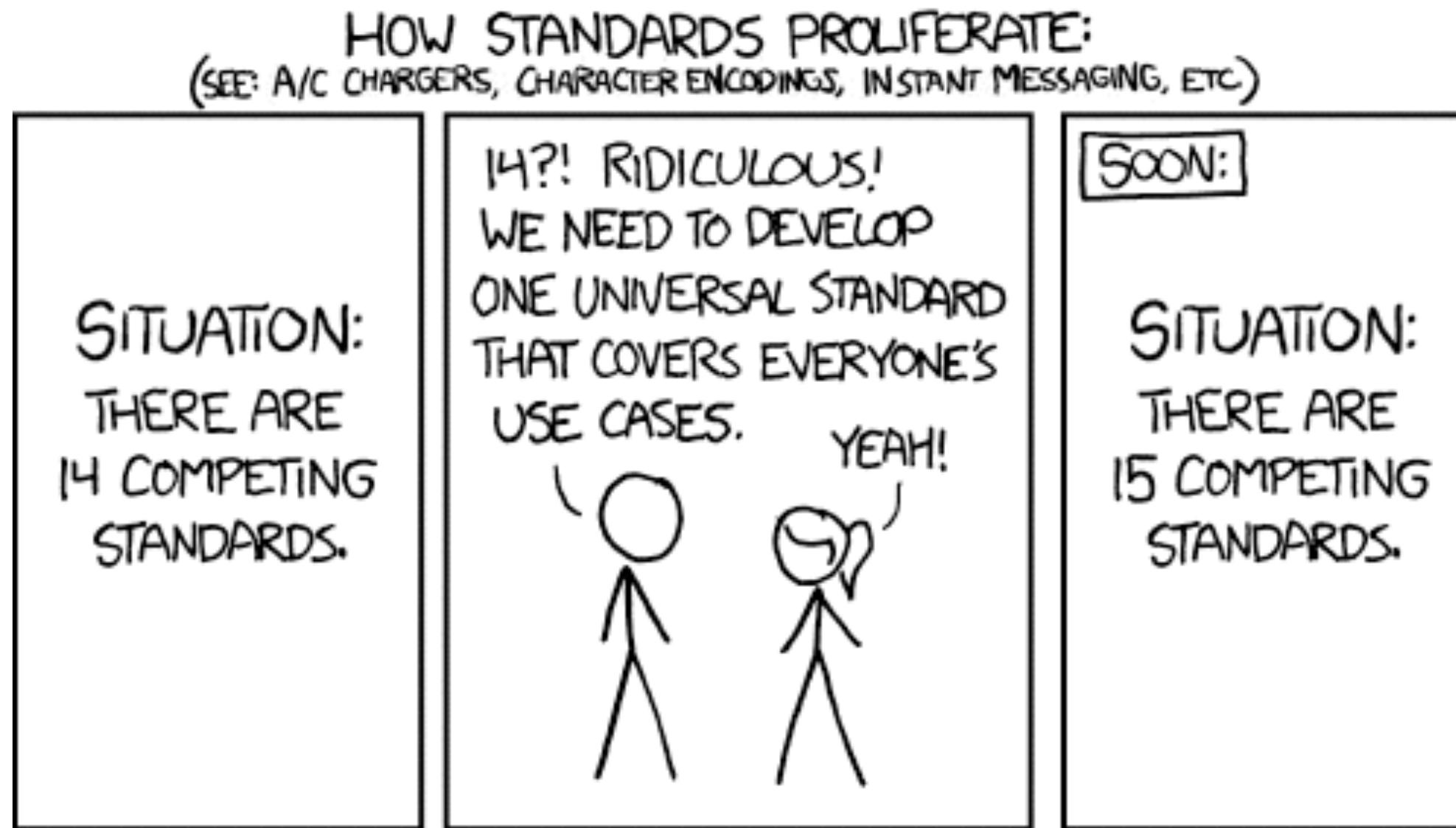


Big Data Is About Scale...

- ...and this doesn't scale
- Example use case:
 - AOL Data Processing
 - AWS -> HDFS
 - 20 TB ingested/day
 - Lev Brailovskiy, “Data Ingestion and Distribution with Apache NiFi”, Slide 27, 02/2017
 - <https://www.slideshare.net/LevBrailovskiy/data-ingestion-and-distribution-with-apache-nifi>



Moving data *effectively* is hard



Standards: <http://xkcd.com/927/>

Dataflow Challenges In 3 Categories

Data

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

Infrastructure

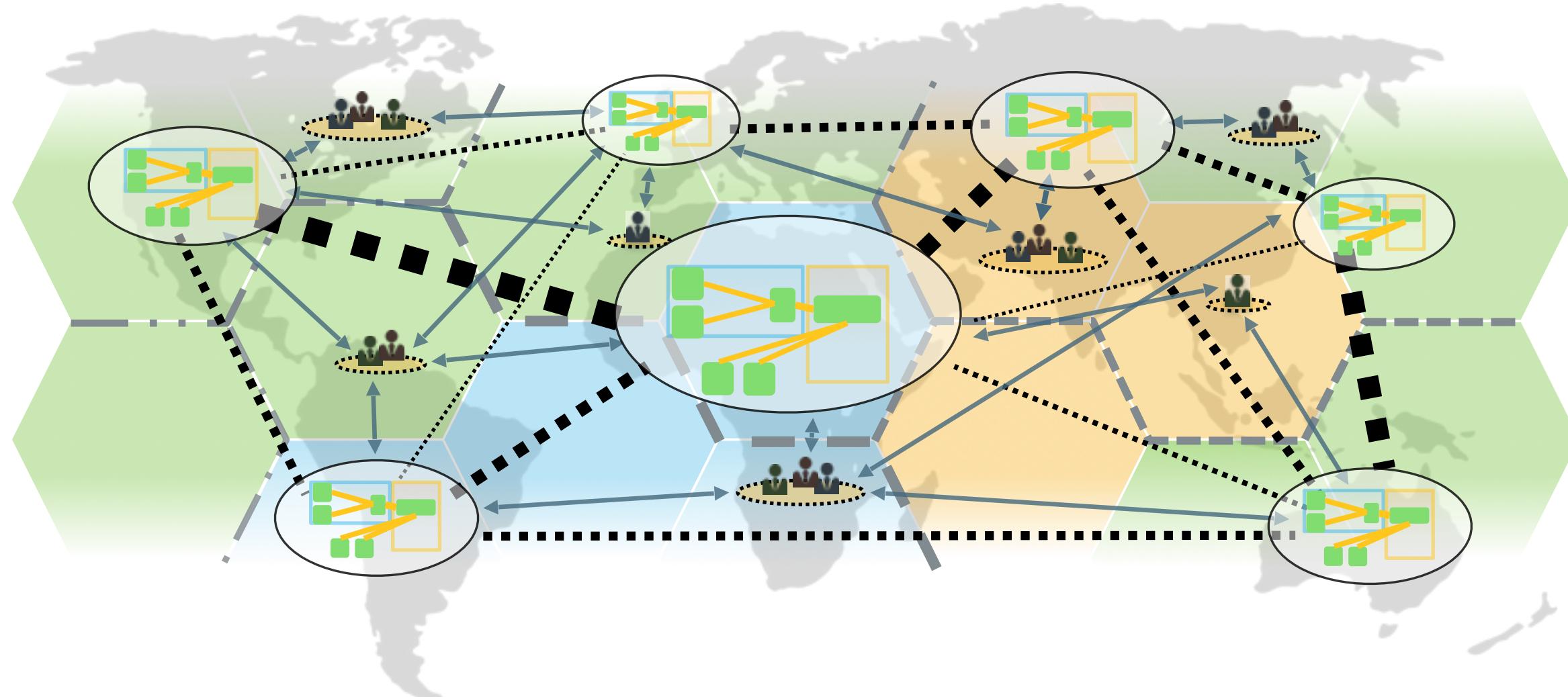
- “Exactly Once”
Delivery
- Ensuring
Security
- **Overcoming**
Security
- Credential
Management
- Network

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



What is Apache NiFi?

NiFi is based on Flow Based Programming (FBP)

FBP Term	NiFi Term	Description
Information Packet	FlowFile	Each object moving through the system.
Black Box	FlowFile Processor	Performs the work, doing some combination of data routing, transformation, or mediation between systems.
Bounded Buffer	Connection	The linkage between processors, acting as queues and allowing various processes to interact at differing rates.
Scheduler	Flow Controller	Maintains the knowledge of how processes are connected, and manages the threads and allocations thereof which all processes use.
Subnet	Process Group	A set of processes and their connections, which can receive and send data via ports. A process group allows creation of entirely new component simply by composition of its components.

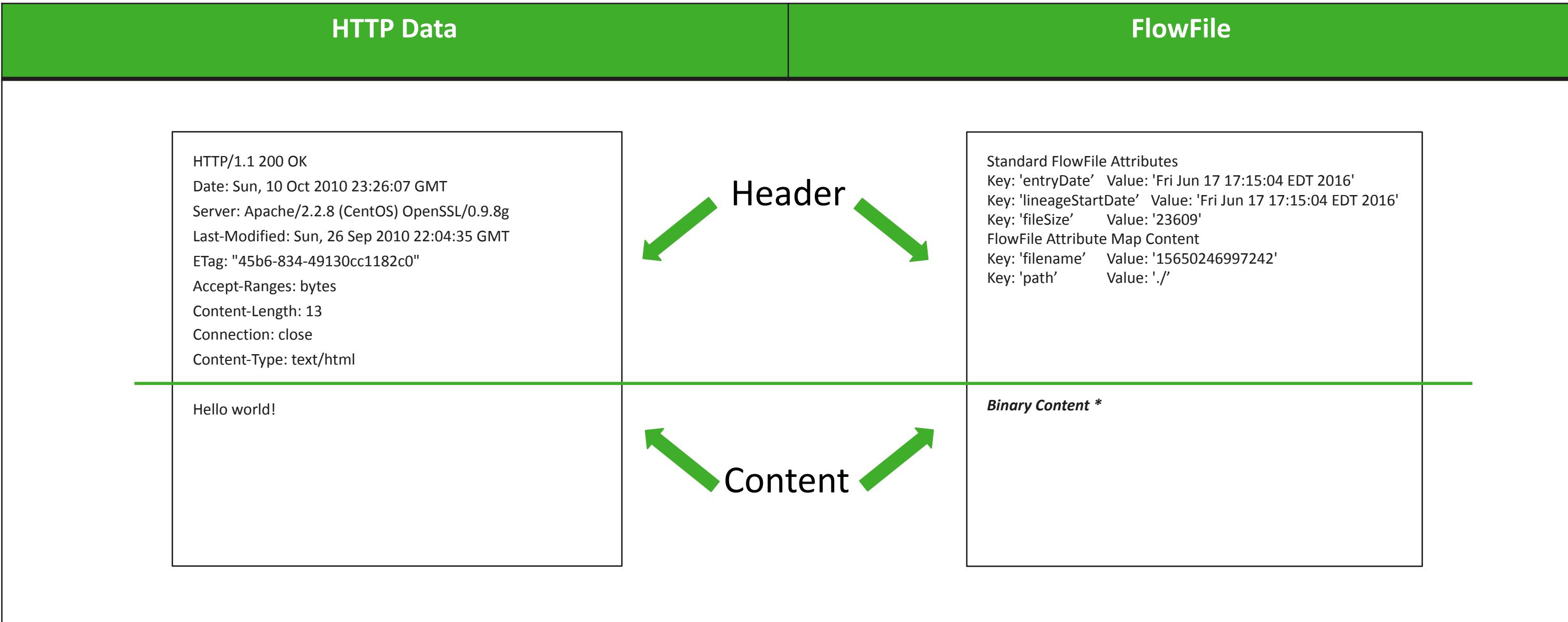
Apache NiFi

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

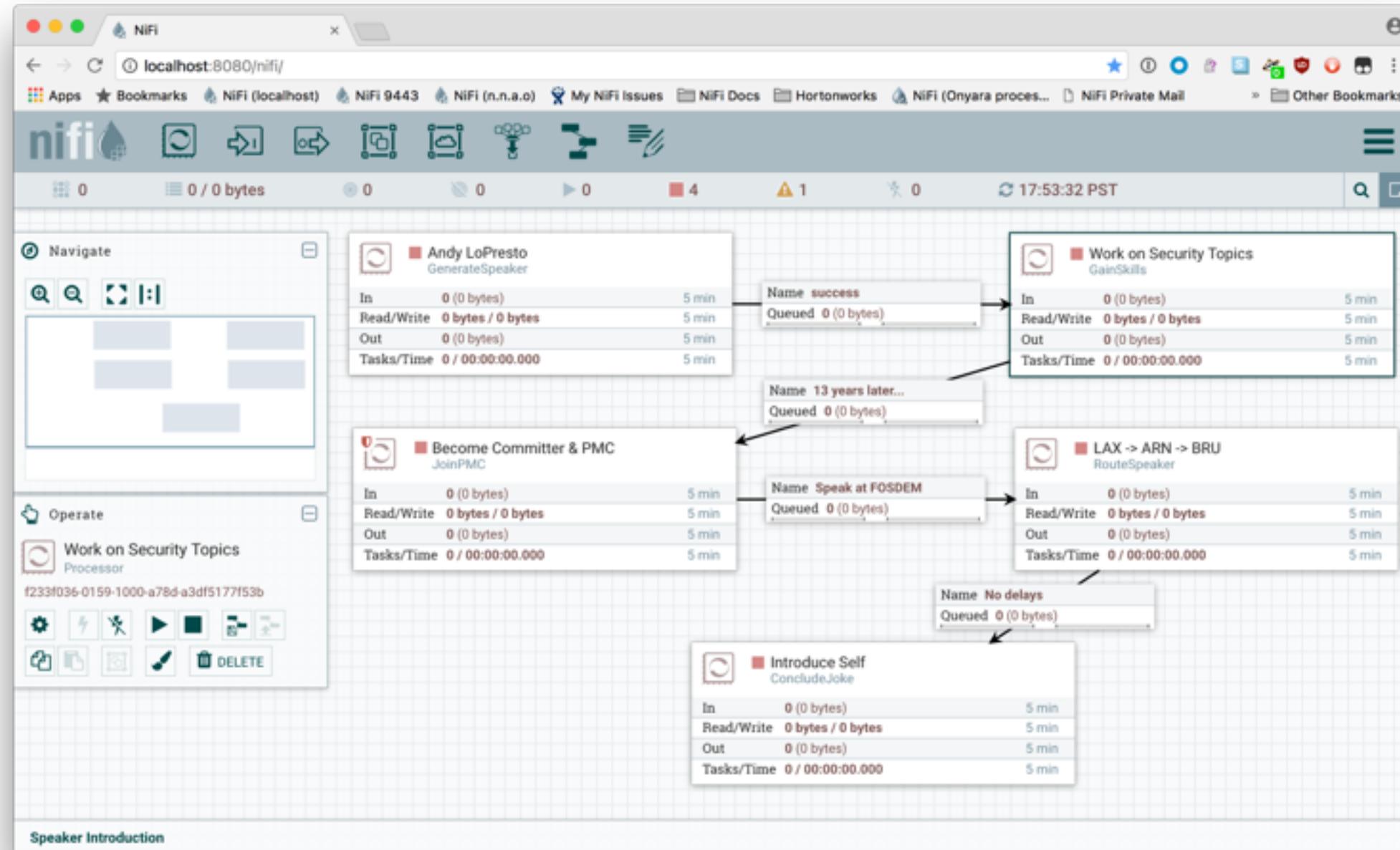
Less of this...

The screenshot shows a Mac OS X desktop with three windows:

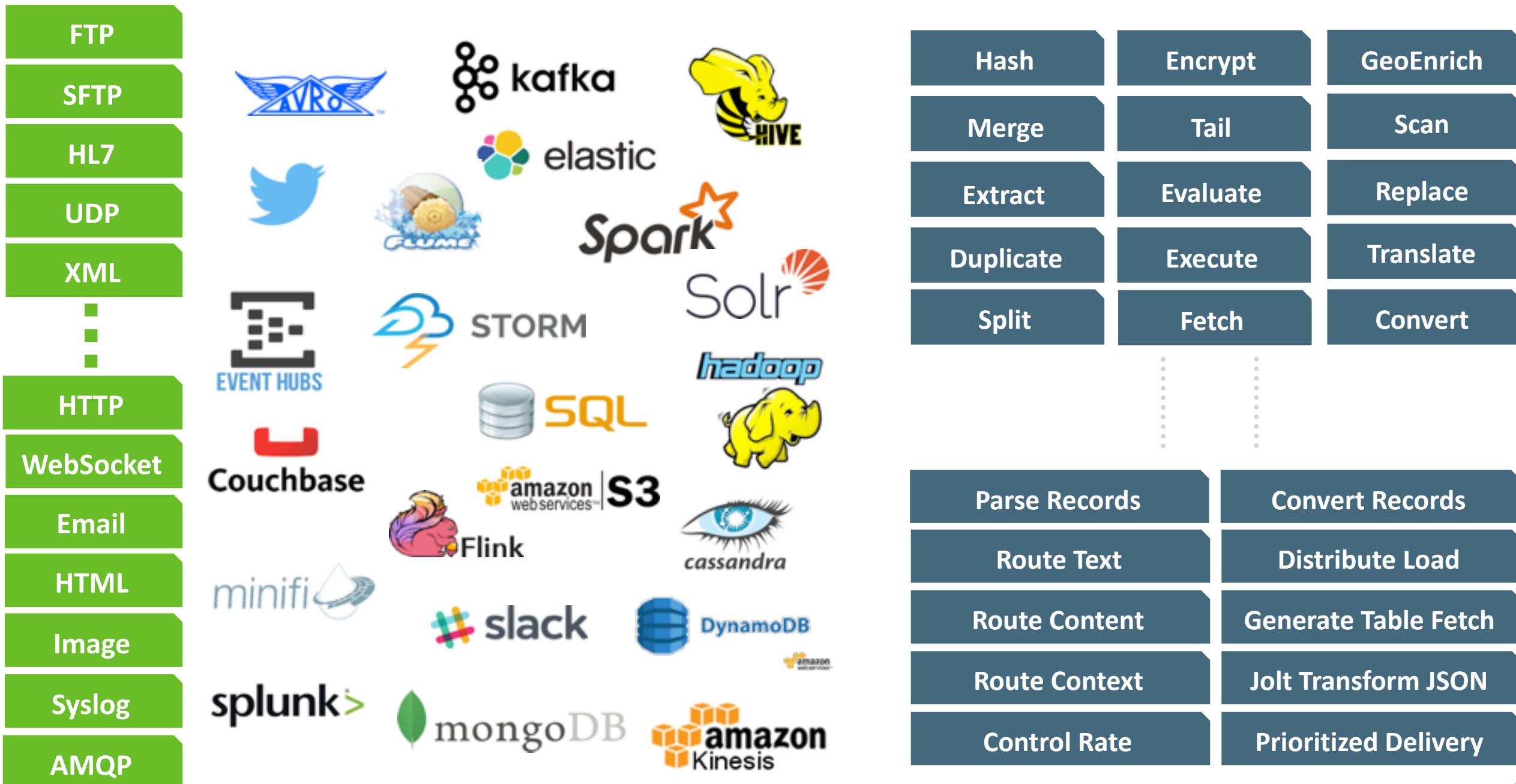
- Terminal 1 (Left):** A terminal window titled "scratch/release_verification (bash)". It displays a command-line session for a user named "alopresto" in a directory "/Users/alopresto/Workspace/scratch/release_verification". The session includes a file listing and several XML configuration files.
- Terminal 2 (Right):** A terminal window titled "nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT (bash)". It displays a command-line session for a user named "alopresto" in a directory "/Users/alopresto/Workspace/nifi/nifi-assembly/target/nifi-1.2.0-SNAPSHOT-bin/nifi-1.2.0-SNAPSHOT". The session includes logs from Apache NiFi, such as "Bootstrap Config File" and "Java home" paths.
- Web Browser:** A browser window titled "Apache NiFi - Hortonworks" showing the Hortonworks homepage.

User Interface

Less of this... ... more of this



Deeper Ecosystem Integration: 260+ Processors, 48 Controller Services



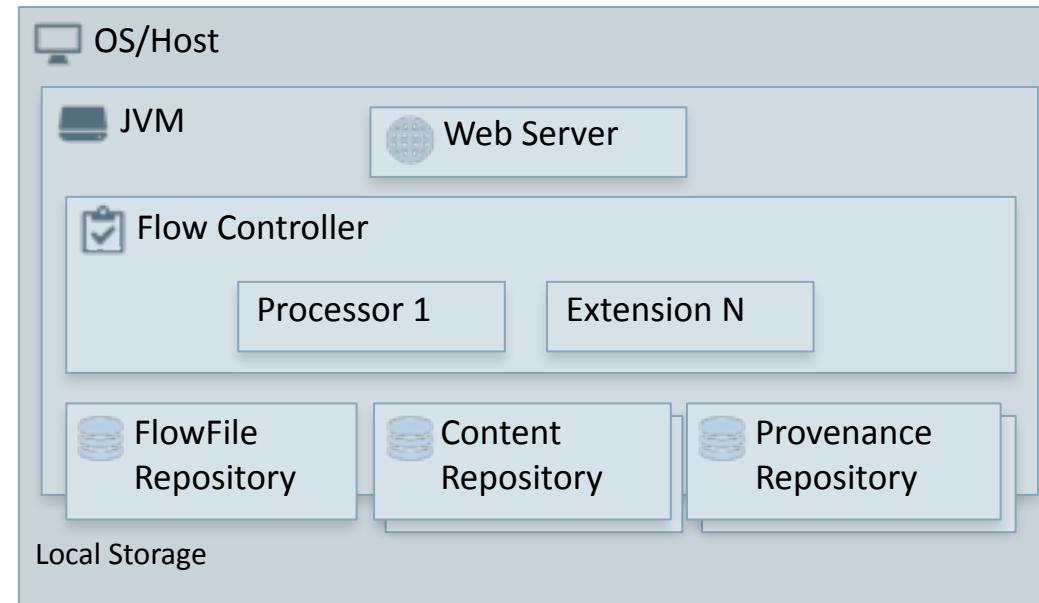
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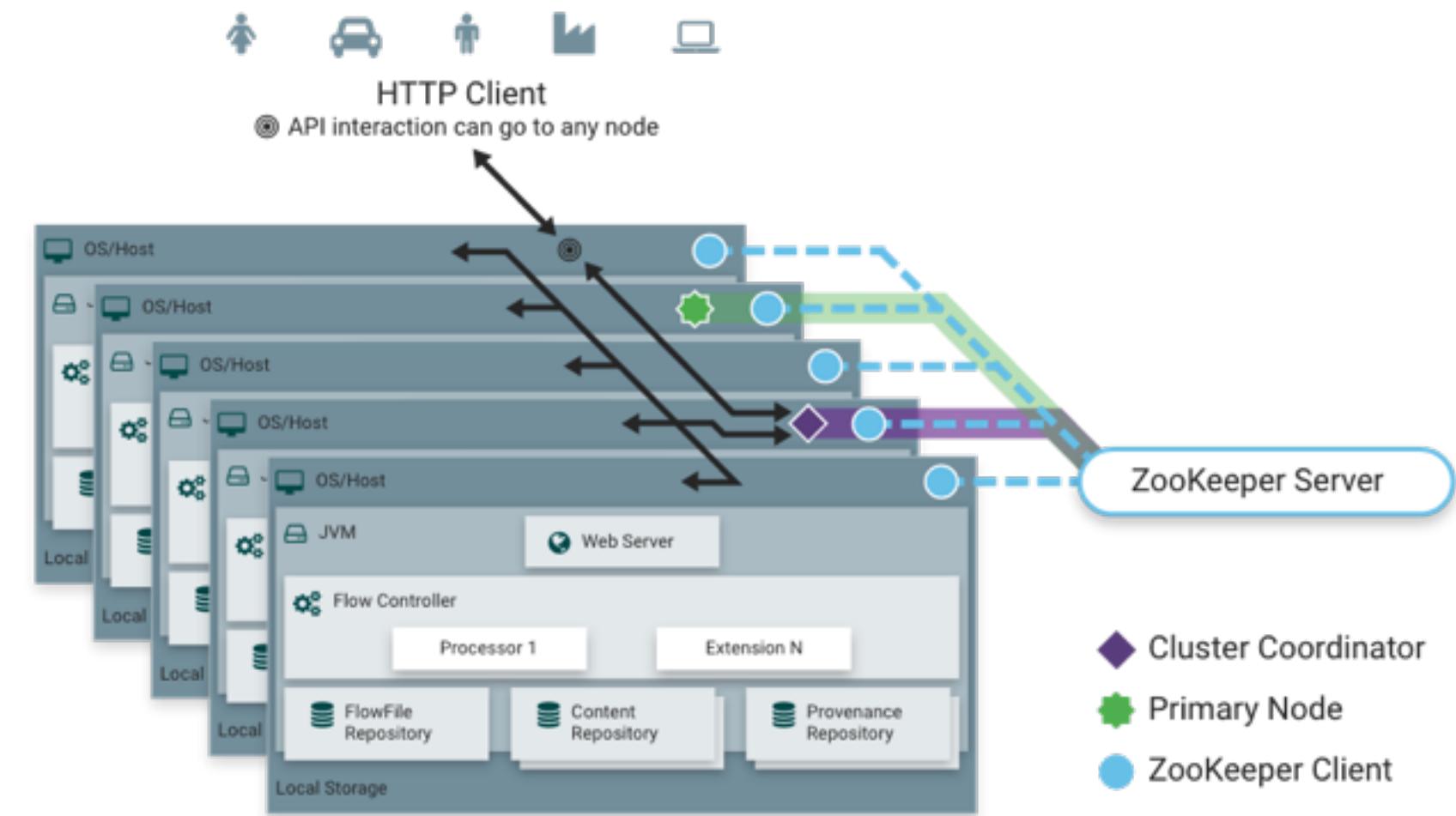
Extension / Integration Points

NiFi Term	Description
Flow File Processor	Push/Pull behavior. Custom UI
Reporting Task	Used to push data from NiFi to some external service (metrics, provenance, etc.)
Controller Service	Used to enable reusable components / shared services throughout the flow
REST API	Allows clients to connect to pull information, change behavior, etc.

Architecture



Standalone

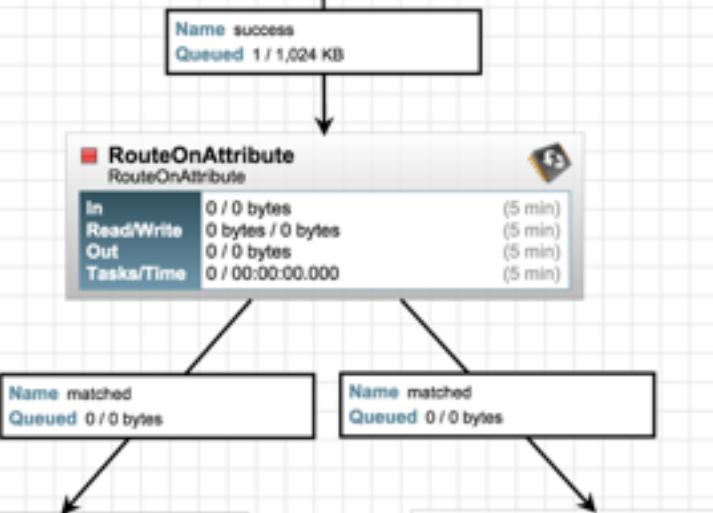


Cluster

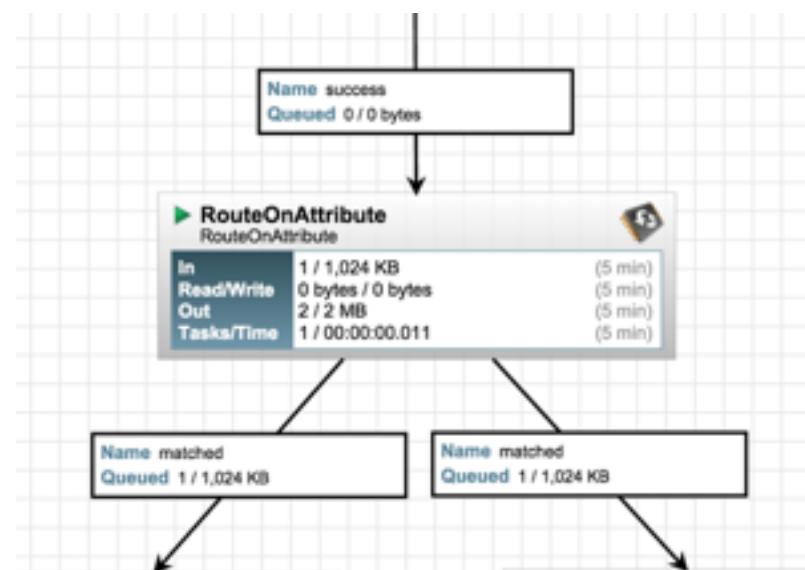
NiFi Architecture – Repositories - Pass by reference

Excerpt of demo flow...

BEFORE



AFTER



What's happening inside the repositories...

$F_1 \rightarrow C_1$

C_1

$P_1 \rightarrow F_1$

$F_1 \rightarrow C_1$

$F_2 \rightarrow C_1$

C_1

$P_1 \rightarrow F_1 - \text{Create}$

$P_2 \rightarrow F_1 - \text{Route}$

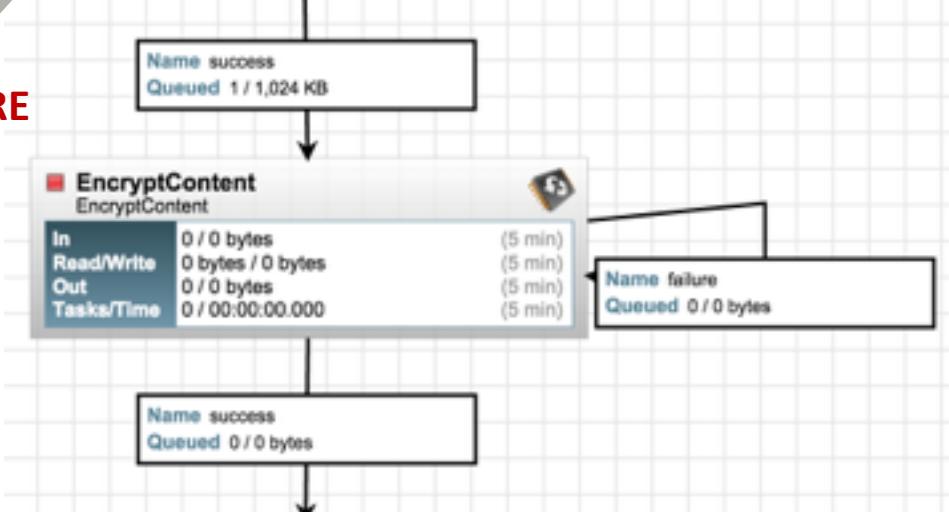
$P_3 \rightarrow F_2 - \text{Clone}(F_1)$



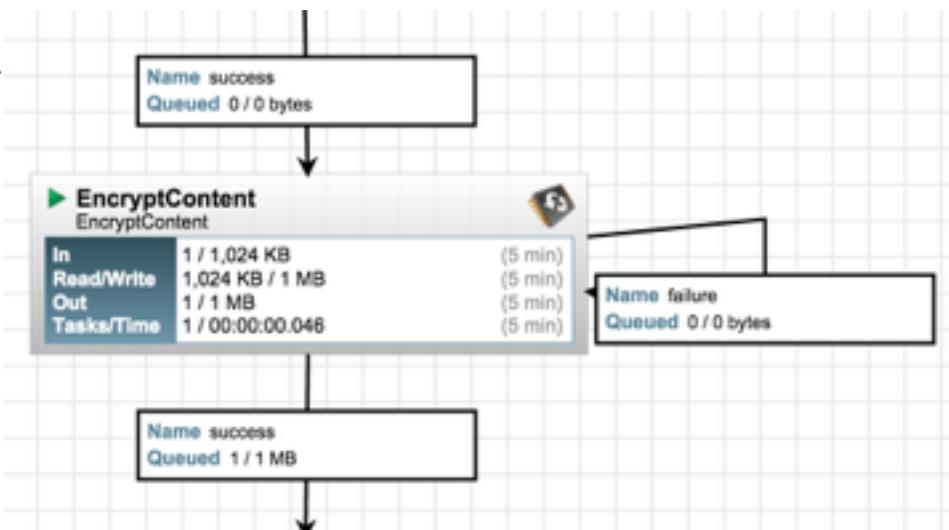
NiFi Architecture – Repositories – Copy on Write

Excerpt of demo flow...

BEFORE



AFTER



What's happening inside the repositories...

$F_1 \rightarrow C_1$

C_1

$P_1 \rightarrow F_1 - \text{CREATE}$

$F_1 \rightarrow C_1$
 $F_{1.1} \rightarrow C_2$

C_1 (plaintext)
 C_2 (encrypted)

$P_1 \rightarrow F_1 - \text{CREATE}$
 $P_2 \rightarrow F_{1.1} - \text{MODIFY}$



Data Provenance

Origin – attribution
Replay – recovery

Evolution of topologies
Long retention

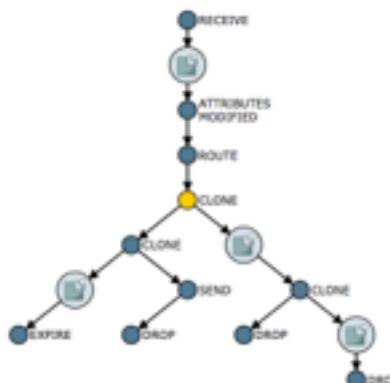
SOURCES

REGIONAL
INFRASTRUCTURE

CORE
INFRASTRUCTURE

Types of Lineage

- Event
- Configuration

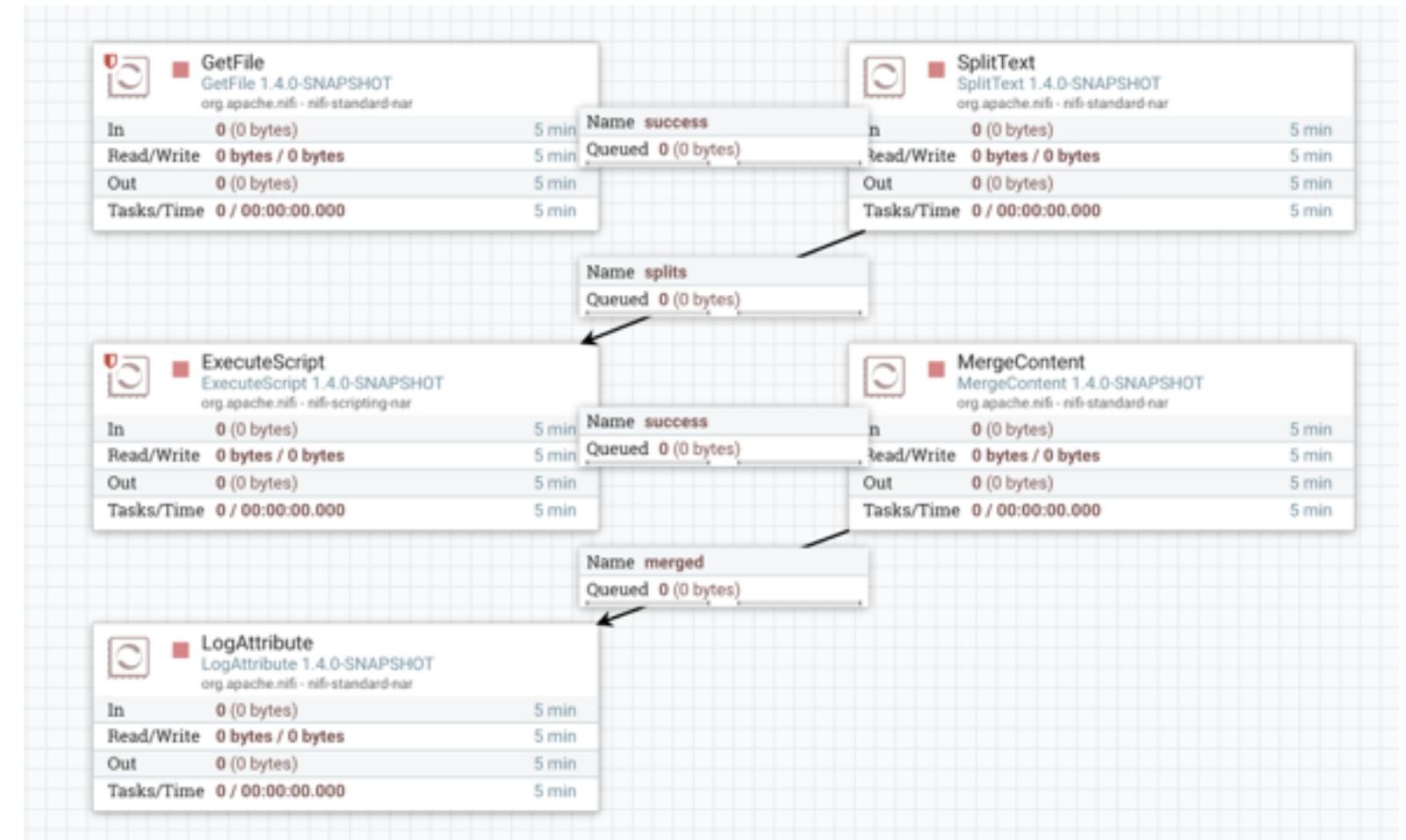


- Constrained
- High-latency
- Localized context

- Hybrid – cloud/on-premises
- Low-latency
- Global context

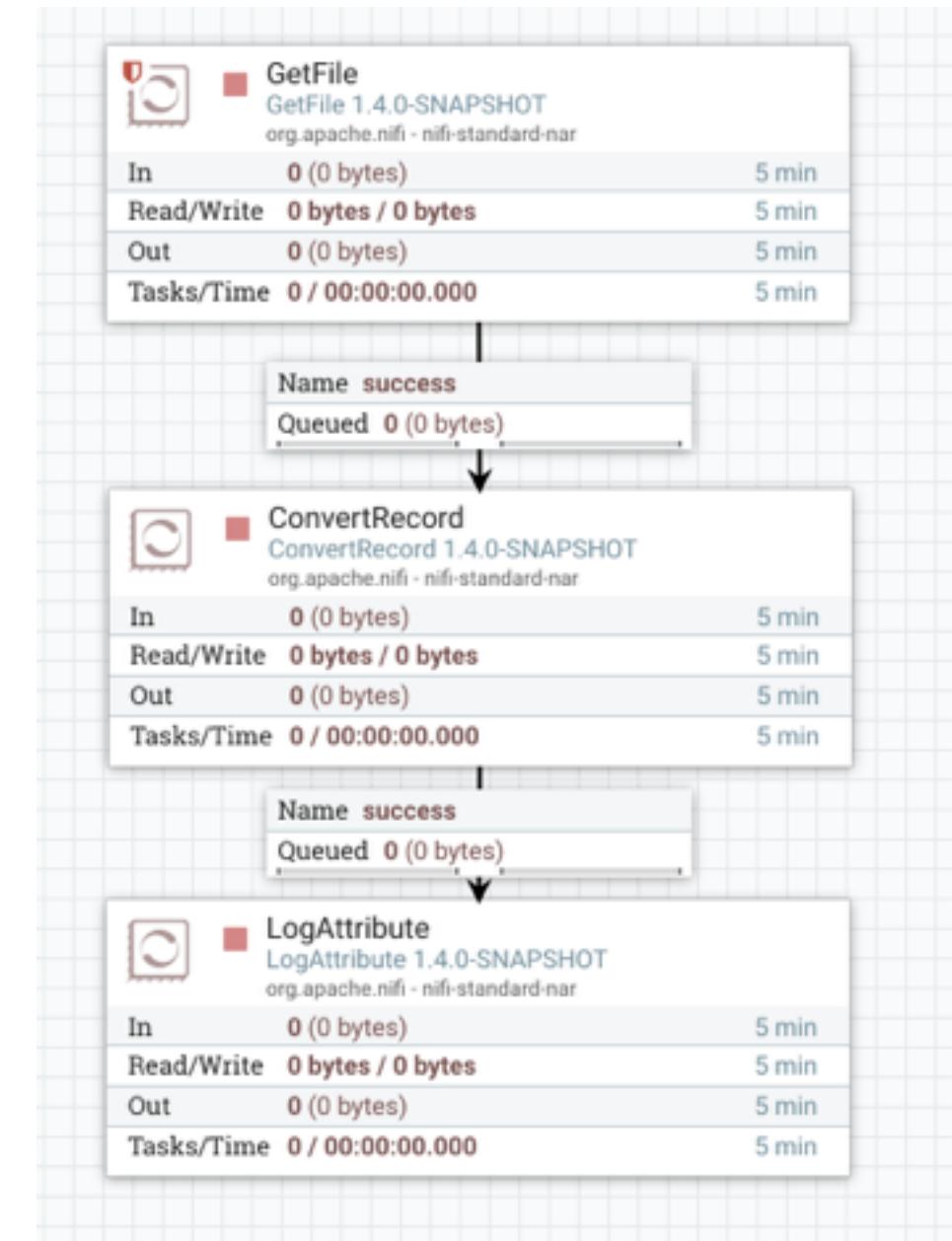
Record Parsing

- Previously, data had to be divided into individual flowfiles to perform work
- CSV output with 50k lines would need to be split, operated on, remerged
- $1 + 50k + 50k + 1$ flowfiles = 100k flowfiles



Record Parsing

- Now flowfile content can contain many “record” elements
- Read and write with **Reader* and **Writer* Controller Services
- Perform lookups, routing, conversion, SQL queries, validation, and more...
- $1 + 1$ flowfiles = 2 flowfiles



Encrypted Provenance Repository

- Every provenance event record is encrypted with AES G/CM before being persisted to disk
- Decrypted on deserialization for retrieval/query
- Random access via offset seek
- Handles key migration & rotation

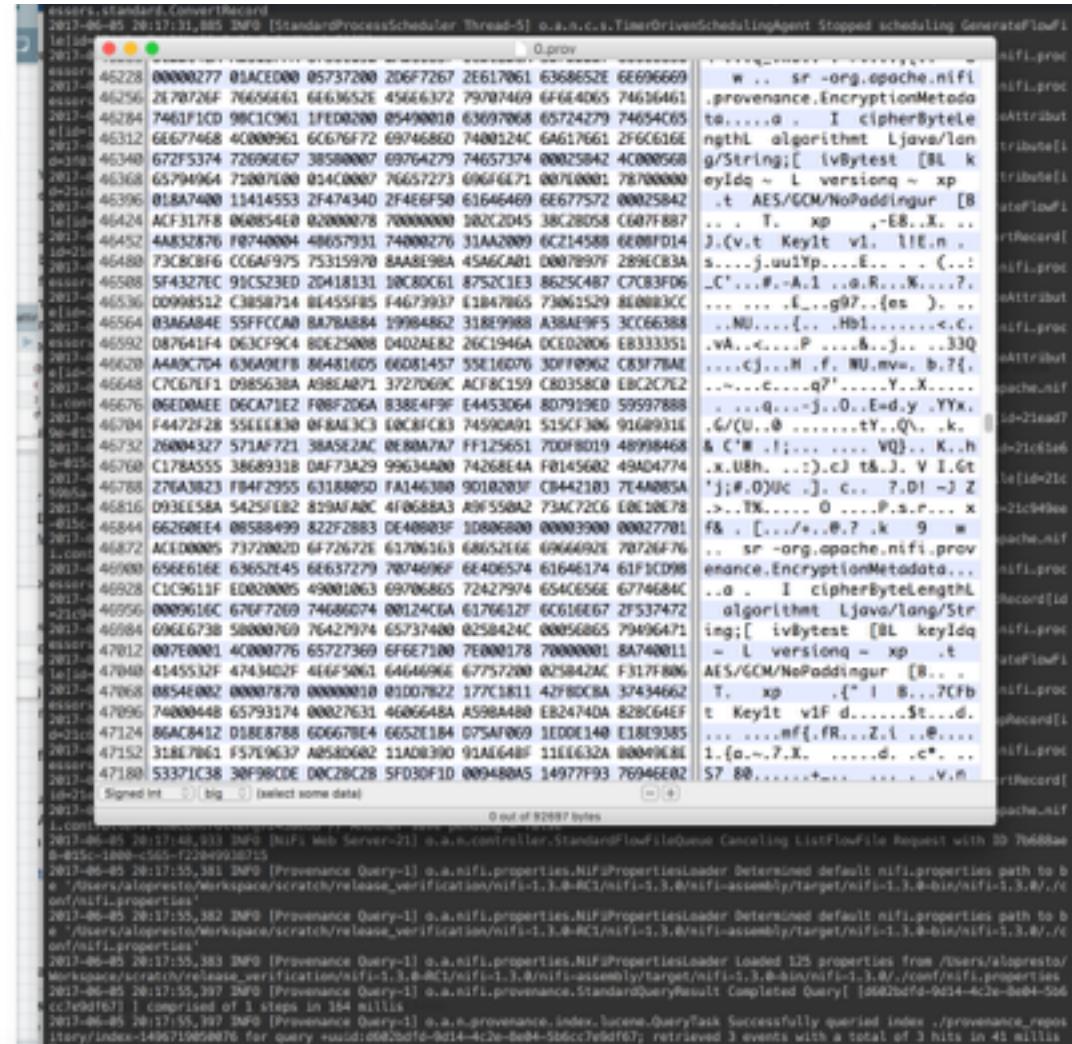
NiFi Data Provenance

Displaying 3 of 3
Oldest event available: 06/05/2017 20:17:30 PDT

Showing the events that match the specified query. Clear search

Date/Time	Type	Flowfile UUID	Size	Component Name	Component Type
06/05/2017 20:17:4...	CONTENT_MODIFIED	d902bd0-9d14-4c0e...	77 bytes	ConvertRecord	ConvertRecord
06/05/2017 20:17:4...	ROUTE	d902bd0-9d14-4c0e...	46 bytes	LookupRecord	LookupRecord
06/05/2017 20:17:4...	FORK	f540ffcf1ea1-4cbf...	40 bytes	LookupRecord	LookupRecord

Last updated: 20:17:55 PDT



```
0.prov
[{"id": "45228", "flowfile_id": "01ACED00_05737200_206F7267_26617061_6368652E_66696669", "component_type": "ConvertRecord", "component_name": "ConvertRecord", "key": "45228", "size": 77, "type": "CONTENT_MODIFIED", "timestamp": "2017-06-05 20:17:31,000", "version": 1, "version_hex": "00000277", "version_size": 4}, {"id": "46256", "flowfile_id": "2E70726F_76656E61_6663652E_45666372_7907469_6F64065_74616461", "component_type": "ConvertRecord", "component_name": "ConvertRecord", "key": "46256", "size": 46, "type": "ROUTE", "timestamp": "2017-06-05 20:17:31,000", "version": 1, "version_hex": "00000278", "version_size": 4}, {"id": "46284", "flowfile_id": "7461F1CD_98C1C961_1FED0000_05490010_63697068_65724279_74654C65", "component_type": "ConvertRecord", "component_name": "ConvertRecord", "key": "46284", "size": 46, "type": "ROUTE", "timestamp": "2017-06-05 20:17:31,000", "version": 1, "version_hex": "00000279", "version_size": 4}, {"id": "46312", "flowfile_id": 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```

A photograph of a modern airport terminal. The ceiling is a large, curved glass roof supported by a steel framework. People are walking on a moving walkway. A sign above the walkway provides directions to Terminal 3 and the Airport Express Train.

What's Next?

New Announcements

Introducing Apache NiFi Registry

- NiFi 1.6.0 — 08 April 2018
 - MongoDB, InfluxDB, Druid, HBase components
 - Granular @Restricted components
- MiNiFi C++ 0.4.0 — 27 January 2018
- MiNiFi Java 0.4.0 — 22 January 2018
- NiFi Registry 0.1.0 — 1 January 2018



NiFi Registry for Dataflows

Introducing Apache NiFi Registry 0.1.0

- 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
- Flows can be promoted between environments

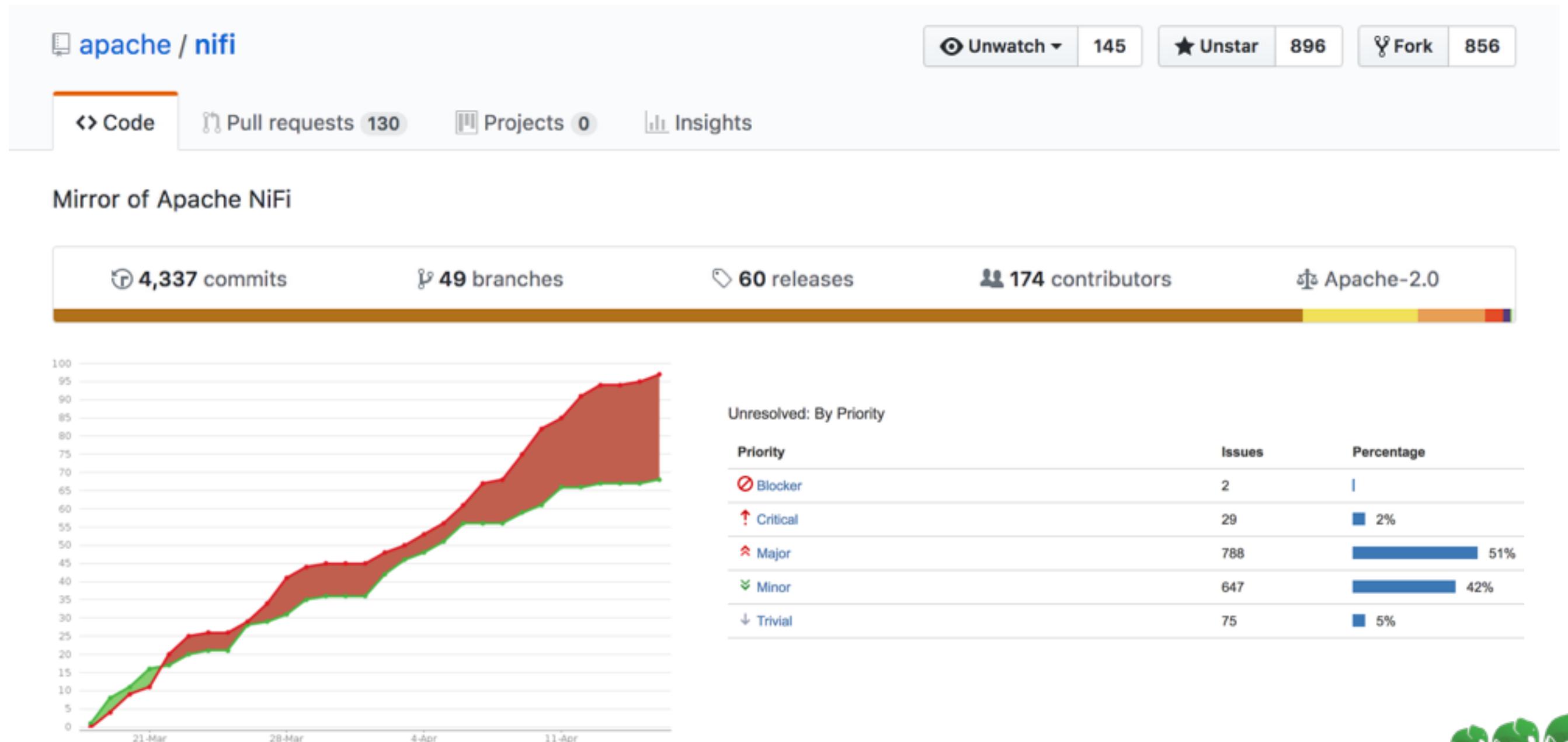
The screenshot shows the Apache NiFi Registry interface. At the top, there's a navigation bar with a logo, the text "NiFi Registry / All", and user information ("registry_user LOGOUT"). Below the header, there's a search bar and sorting options ("Sort by: Name (a-z)"). The main area displays two flows: "Flow 1 - Bucket 1" (1 version) and "Flow 2 - Bucket 2" (2 versions). Clicking on "Flow 2 - Bucket 2" opens a detailed view. This view includes a "DESCRIPTION" section with "Description 2" and a "CHANGE LOG" section. The change log shows three entries:

- Version 2 - 40 minutes ago by registry_user: Add processors (Dec-26-2017 at 11:23 PM)
- Version 1 - 41 minutes ago by registry_user: (no details shown)

A "DESCRIPTION" section is also present in the detailed view.

Learn more at [Forget Duplicating Local Changes: Apache NiFi and the Flow Development Lifecycle \(FDLC\)](#)
Thursday 19/4 @ 1600, Room II

Community Health



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

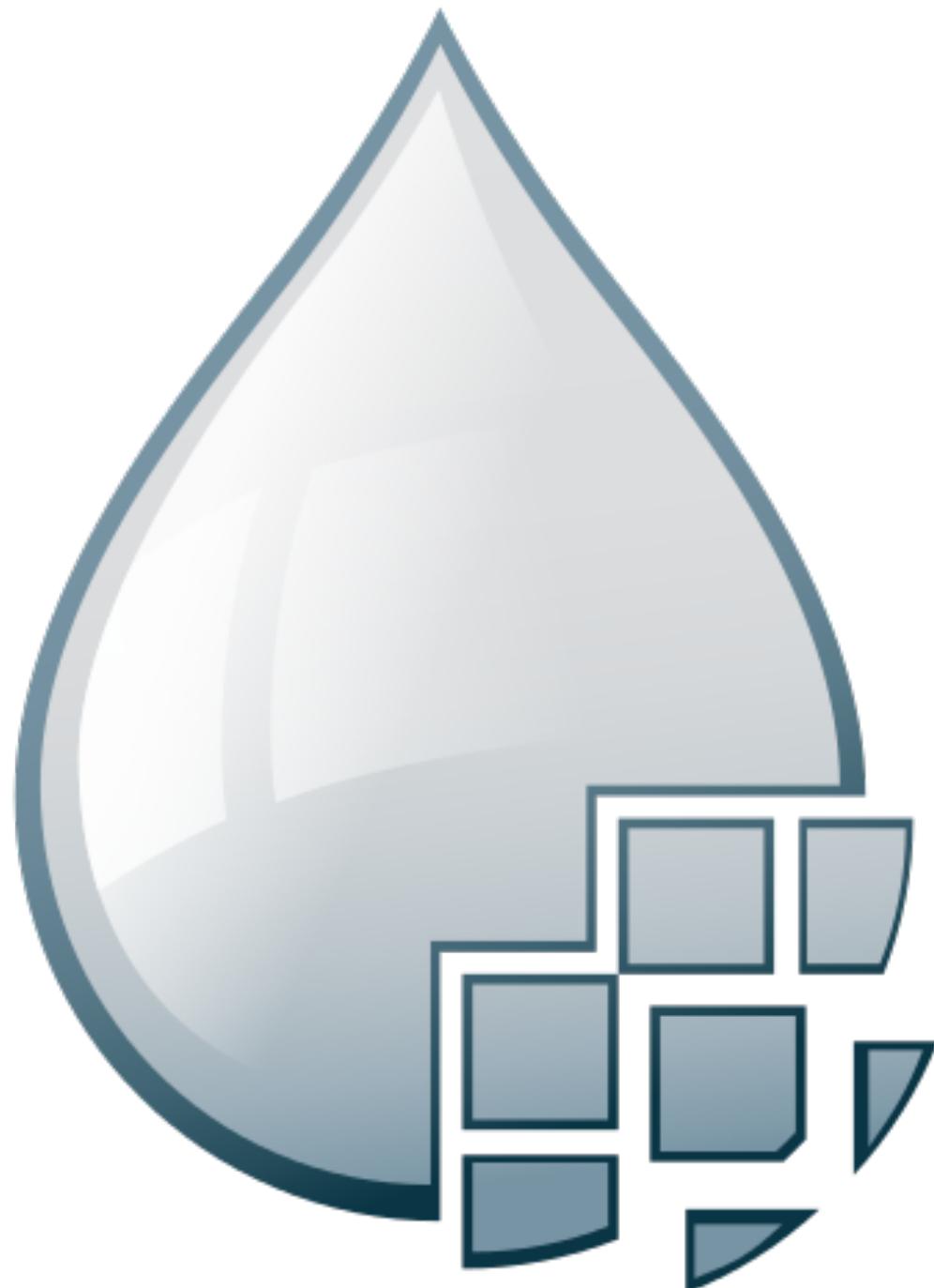
users@nifi.apache.org

Submit Ideas or Issues

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

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More NiFi This Week...

Title	Room	Time	Speaker(s)
Apache NiFi Crash Course	Hall I - D	1115 - 1345	Andy LoPresto, Tim Spann
IoT with Apache MXNet and Apache NiFi and MiNiFi	Hall I - C	1150 - 1230	Tim Spann
Best practices and lessons learnt from Running Apache NiFi at Renault	Europe	1650 - 1730	Adel Gacem, Abdelkrim Hadjidj
From an experiment to a real production environment	Room V	1650 - 1730	Jeroen Wolffensperger, Martijn Groen
IoT, Streaming, and Dataflow Birds of a Feather	Room I	1740 - 1855	George Vetticaden, Davor Bonaci, Andy LoPresto, Stephan Ewen
Intelligently Collecting Data at the Edge — Intro to Apache MiNiFi	Room II	1100 - 1140	Andy LoPresto
The Power of Intelligent Flows: Realtime IoT Botnet Classification with Apache NiFi	Hall I - C	1400 - 1440	Andy LoPresto
Forget Duplicating Local Changes: Apache NiFi and the Flow Development Lifecycle (FDLC)	Room II	1600 - 1640	Andy LoPresto



[https://hortonworks.com/tutorial/
analyze-transit-patterns-with-apache-nifi/](https://hortonworks.com/tutorial/analyze-transit-patterns-with-apache-nifi/)



Thank you

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github.com/alopresto/slides