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ONAP Architecture Update

Security, Logging and Others

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ARCCOM, SECCOM, OOM

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Security & Logging Mission Statements

Security

- Achieves simpler, uniform and open-source-based security and secure communications
- Handles security at the platform level, not at the application level
- Allows 3rd Party applications to participate by leveraging the platform-level security

Logging

- Supports open-source- and standard-based logging
- Separates log generation from log collection/aggregation/persistence/visualization
  - Handles collection/aggregation/persistence/visualization at the platform level
- Allows logging component stack to be realized by choices of vendors

Why Migrates from AAF to Service Mesh

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AAF had served its functions with rich features, but…

AAF Shortcomings

- Is a custom solution for ONAP (or pre-ONAP) specific
  - Limited Open-Source community support
  - Complicated user store management
  - Provides language-specific plugin (CADDI)
  - Could be a showstopper for commercial use
- Handles security at the application level
  - Burdens to application development by managing certificates, AuthN/AuthZ by each application
  - No uniform-way of security handling across ONAP
- Experiences security compatibility issues with 3rd Party applications
  - Requires 3rd Party app code modifications to work with AAF
  - Difficult to integrate/federate with operators' security ecosystems
  - Not integrated with Kubernetes
- Is an unmaintained project in ONAP; does not keep up with the latest security evolution
  - Questionable SSO and Multi-factor authentication support
- More details, see AAF and Service Mesh Risk analysis

We want to achieve simpler, uniform, open-source and standard-based Security

- Handling security at the platform level
- Enabling uniform security across applications
- Minimizing app code changes and increasing integrity, extensibility and customization
- Facilitating 3rd Party application secure communication with configurable AuthN/AuthZ
- Allowing Service Providers/vendors secure integration between ONAP and others
  - e.g., Vendor VNFM/CNFM, NF integration, External Apps
- Service Mesh-pattern Security fulfills ONAP Security requirements

Benefits to ONAP, ORAN and other External communities

- Uniform, open-source- and standard-based security is a foundation for secure integration between ONAP, ORAN and other external communities
- Keeping product impacts for security minimum
- Enabling Applications to focus on their own functionalities, not handling security directly
- Allowing 3rd Party Microservices to participate in ONAP security by configuration

ONAP Security Architecture

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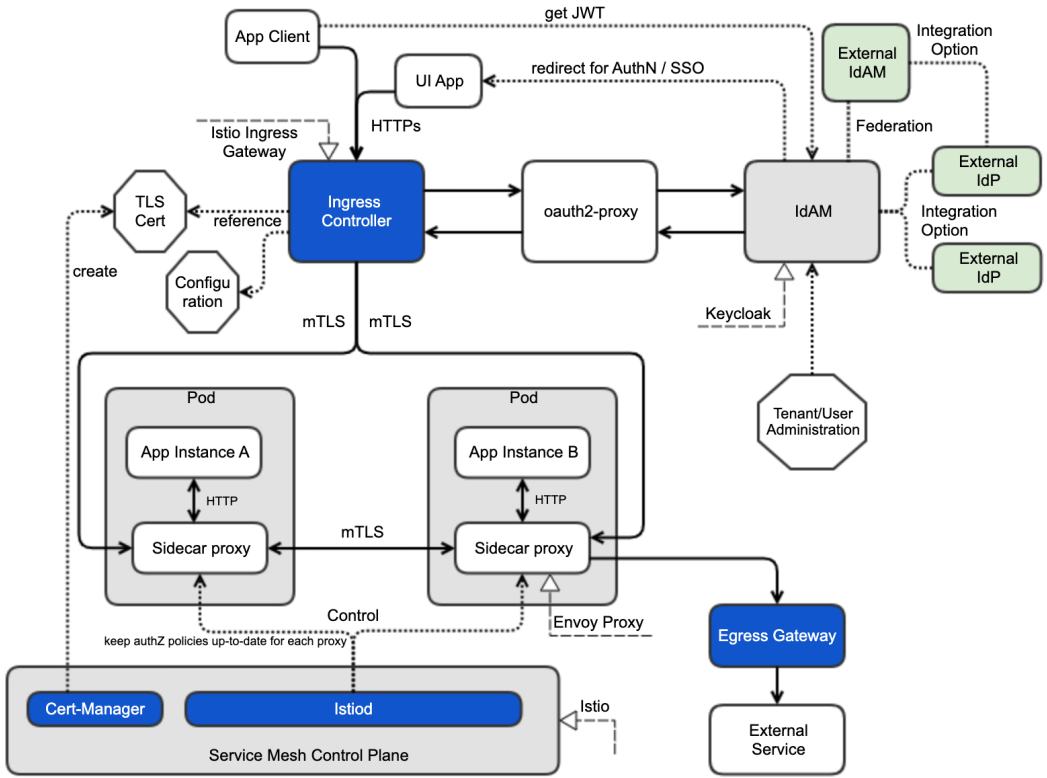


ONAP uses these Open-Source Security Patterns:

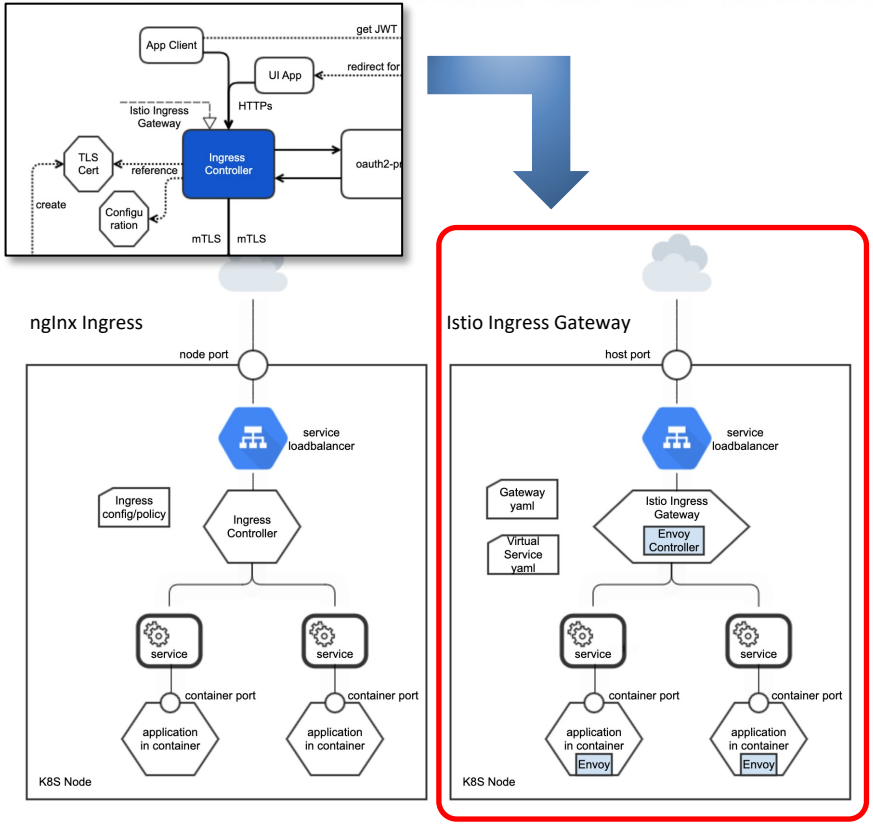
- Istio Ingress Gateway handles incoming external traffic
- oauth2-proxy redirects OAuth2-based requests to IdAM.
- Keycloak is the IdAM for AuthN/AuthZ, SSO, multi-tenancy and user management including RBAC controls
  - For UI Apps, provides redirection for SSO / AuthN / AuthZ
  - For App Clients, provides JWT and AuthN / AuthZ
- Istio acts as the Service Mesh Control Plane
  - Keep policies and authZ policies up-to-date for sidecar proxies
  - Applications are sitting behind sidecar proxies
- Policies and configurations are used for Ingress Controller and the Envoy proxies
- All the component communications are secured by mTLS.
- This Architecture allows Service Providers to integrate their own security ecosystem (external IdAM, External IdP)

It is being implemented – See Service Mesh Update for London

For Architecture details, see [ONAP Next Generation Security & Logging Architecture]

Acronyms
- IdAM = Identity Access Management
- mTLS = mutual Transport Layer Security
- OAuth2 = Open Authorization
- HTTPs = Hypertext Transfer Protocol Secure

Ingress Controller Realization



- In ONAP, Istio Ingress Gateway is chosen for Ingress, instead of Kubernetes/NgInx Ingress
  - It is a POD with Envoy Controller that does the routing
  - It is configured by Gateway and Virtual Service metadata for intelligent routing, such as rules, load-balancing, traffic rate limiting, policy-based checking, metrics collections
- All external secure communications go thru the Istio Ingress Gateway
  - No Nodeport any longer, with the Istio Ingress Gateway option
  - Applications that are using Kubernetes/NgInx Ingress must migrate to use the Istio Ingress Gateway
- Using oauth2-Proxy, Istio Ingress Gateway interacts with KeyCloak (IdAM) for SSO / AuthN / Authorization
- Once the client request is approved, it routes the request to the Application Service(s)
- For Service Mesh with Ingress setup, see ONAP on Service setup guide

KeyCloak Functions as Reference IdAM

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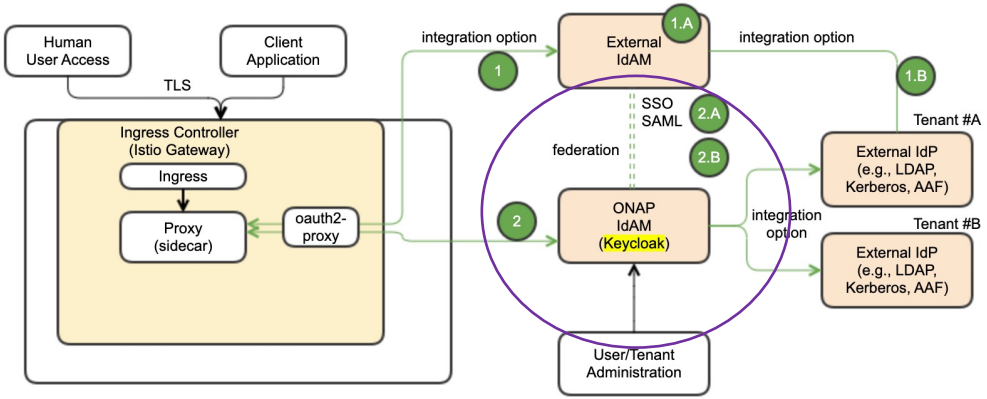
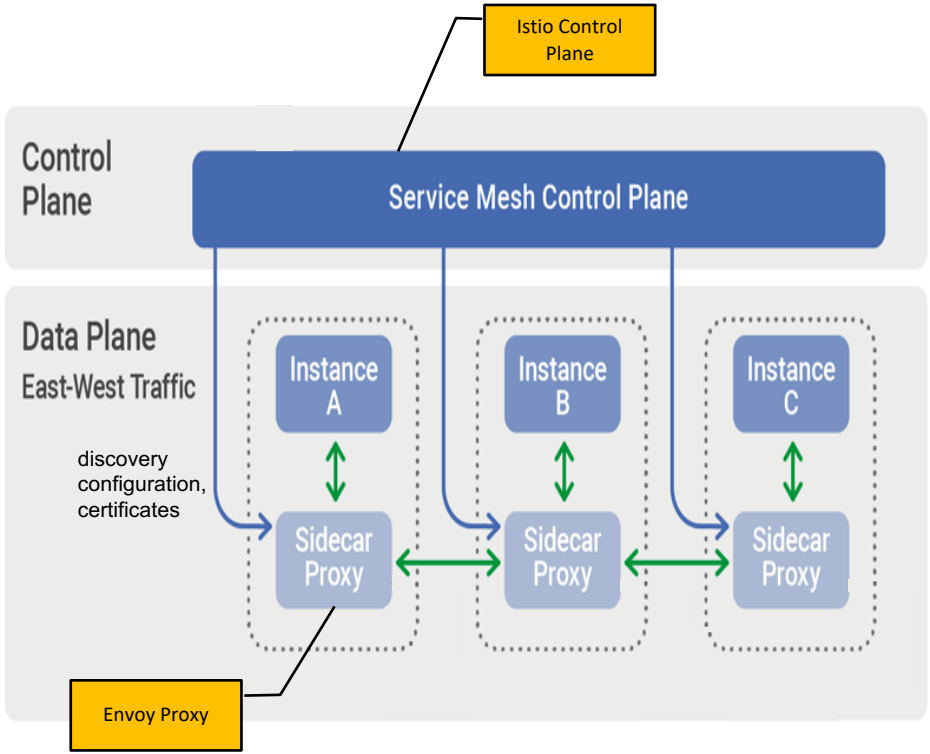


#	Choice
1	If the vendor chooses their own IdAM (external IdAM), the AuthN/AuthZ GW should be able to use the external IdAM, instead of ONAP IdAM – full integration choice
	A. The external IdAM will handle AuthN/AuthZ for ONAP incoming traffic; session cookie handling, session handling
	B. The external IdAM will typically use their own IdP (external IdP) to verify their own user identities
2	If ONAP IdAM is used, based on business use cases, the ONAP IdAM could interface with the external IdAM, based on IdAM-to-IdAM interface configuration
	A. SSO
	B. Authentication federation (SAML) – not part of Istanbul

- Is deployed as the ONAP reference IdAM
- Creates public and private key and JWT Token in KeyCloak
- Manages tenant/realm, user, group and roles administration
- Uses its internal IdP, and it can be configured to use external IdP
- Can be replaced with an external IdAM that is compatible with OIDC/OAuth2
- Can be configured to use multiple IdPs for Multi-tenancy
- The oauth2-proxy is used to bridge between ONAP Ingress and KeyCloak for traffic redirect for SSO and AuthN/AuthZ
- For SSO, the login page is NOT part of the application and is configured at KeyCloak
- for more KeyCloak use cases, see ONAP Security & Logging Architecture

Service Mesh Realization in ONAP



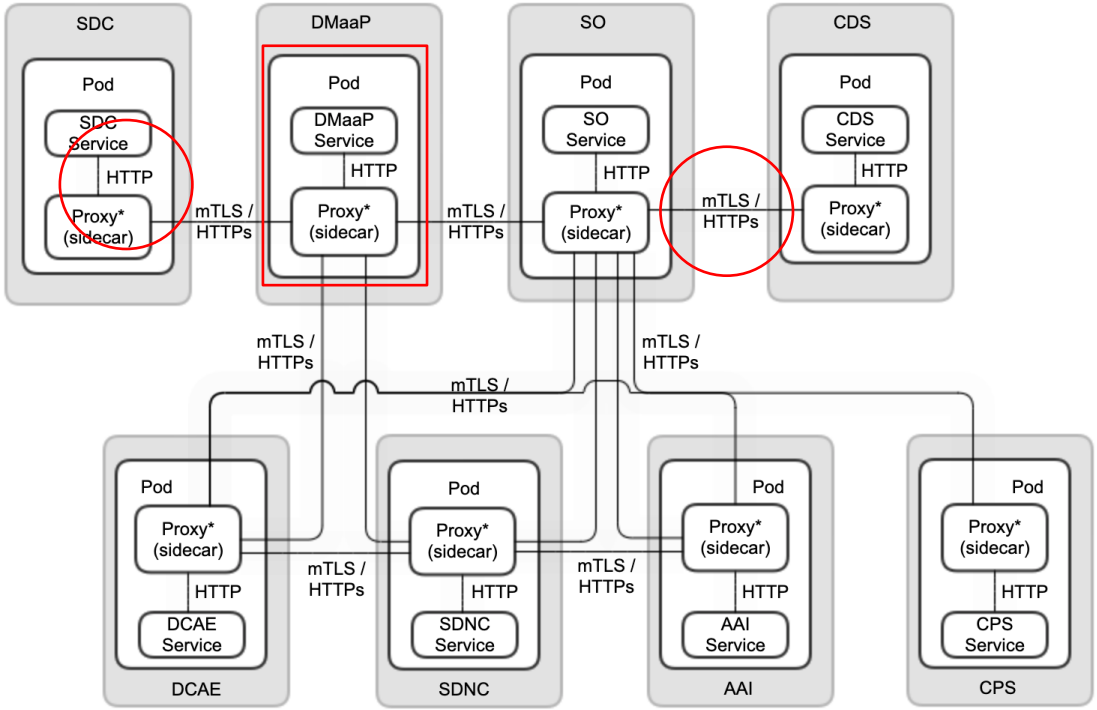
Service Mesh Pattern

- A Service Mesh is a pattern for controlling communications between services by configuration / policies
- It aims to achieve secure communications, authorization, service discovery, load balancing and traffic routing
- It is dedicated and configurable while running at the platform layer instead of the application layer

Istio

- Fulfills ONAP Service-to-Service Security and Communication requirements
- Makes traffic management transparent to the application
- Moves this secure communication out of the application and into the control layer
- Is lightweight and simple to configure regardless of the application size
- Istio Control Plane provides discovery, configuration, certificates and others to all the sidecar proxies.

Communication Protocol Between Service & Proxy and Between Proxies



- The communication protocol between Service and Proxy is “HTTP”
- ONAP Application does not handle security directly and it is sitting behind its own proxy (sidecar)
  - For that, Service and its Proxy will sit on the same POD to make their communications internal
- The communication protocol between Proxies (sidecars) is mTLS via “HTTPs”
- ONAP Service-to-Service communications will be handled by using Sidecar Proxies. This can make MSB use optional for those communications

ONAP Logging Framework Architecture

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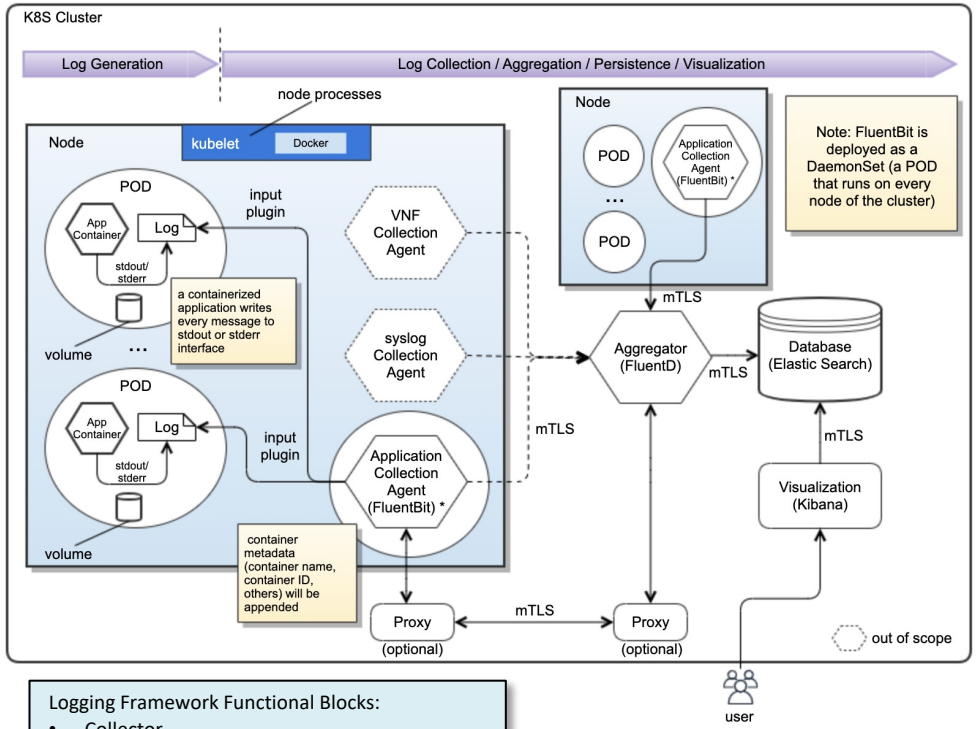


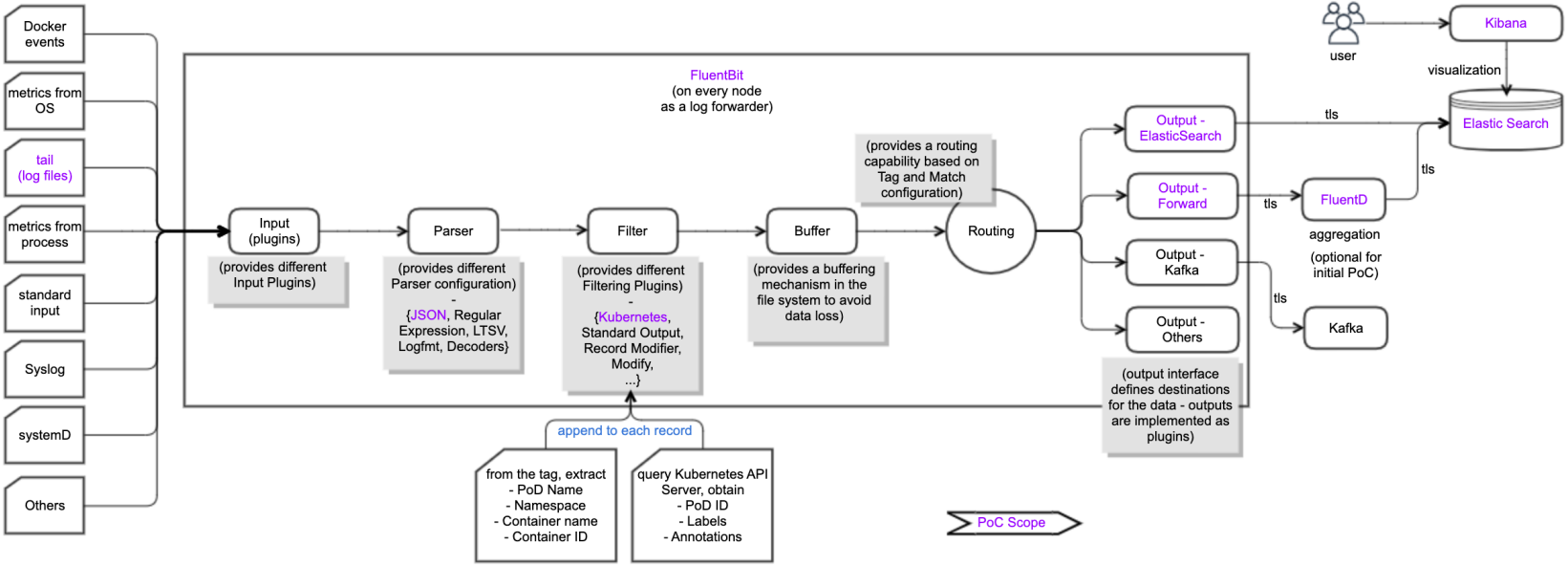
Logging Framework Functional Blocks:

- Collector
- Aggregator
- Database
- Visualization

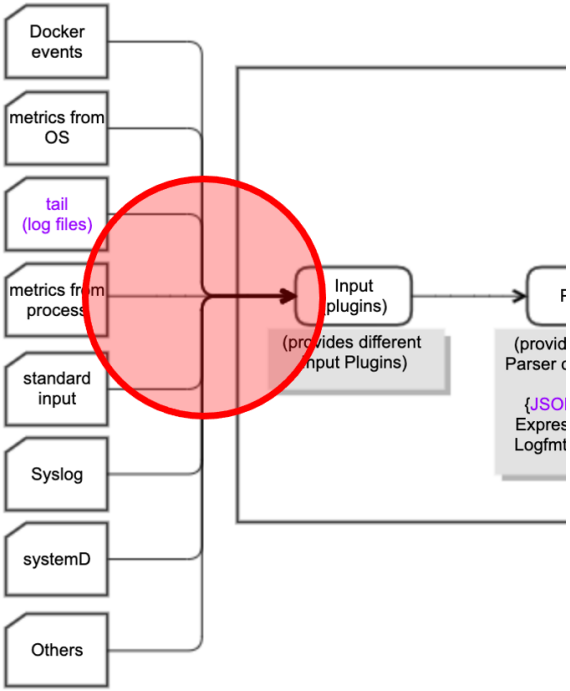
- Supports open-source- and standard-based logging
- Separates log generation from log collection/aggregate/persistence/visualization/analysis
  - ONAP Applications handle log generation only
  - Logging Framework Stack will handle the rest
- Assumes all the ONAP applications push their logs into STDOUT/STDERR
- Provides reference implementation and can be realized by choices of vendors
- Deploys the Log Collector to every node and the Collector pushes log data to the Aggregator/Database
- Conforms to SECCOM Global Requirements for the standardized log format
- Communications between Logging functional blocks will be secure

FluentBit Internal Pipeline for Logging

- For ONAP Logging reference implementation, FluentBit is used as the log collector.
- FluentBit will be deployed to every node to collect log data from each application POD
- Fluentbit will append container metadata to conform to Log Global Requirement
- In ONAP, FluentBit is configured to receive ONAP App log data thru the “tail” FluentBit input plugin



Logging Framework PoC Update



PoC Status:

- Deployed FluentBit as a Daemonset to deploy it to every node in ONAP
- Configured FluentBit to receive ONAP App log data thru the “tail” FluentBit input plugin
- Used FluentBit Kubernetes Filter to add container metadata
- Pushed normalized log output to ElasticSearch thru the FluentBit Output-ElasticSearch plugin
- Visualized log data thru Kibana

Security Issues:

- FluentBit Daemonset with root-access is used to access log files in ONAP App PODs
- In ONAP, root-access users are not allowed for security reasons
- Without root-access, deployed FluentBit cannot access log files in ONAP App PODs
- There was an attempt to use Daemonset SecurityContext, dropping all the capabilities except file access, but this is not a clean solution.

Suggested Solutions:

- Reroute log files to where FluentBit can access
- The rerouting mechanism is under investigation

ONAP Mainstream Architecture Study

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ONAP Mainstream Architecture aims to facilitate ONAP adaptation and extensibility for Service Providers / DevOps. The following would be study areas:

- More component/sub-component modularity and independence
- Component interface and behavior normalization / standardization
- Extensible, customizable and substitutional component functions and mechanisms
- Well-balanced common/platform services vs. autonomous services
- Pick & choose and Aggregation of functions
- Unified and Platform-level security and logging across ONAP and SP OAM & Network Resource domains
- ONAP Mainstream Architecture skeleton outline

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