Distributed Big Data Network Analytics
Goal: Democratize big data AI analytics framework by creating easily deployable & customizable stack
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Agenda

• Analytics introduction & Use cases
• Data analytics framework stack – Needs/requirements
• Data analytics stack - Components chosen, new enhancements
• Summary & next steps
Big Picture – Analytics

Reactive
Acted on escalation, productivity impact in hours

Pro-active
Continuous monitoring, act on alerts, little impact on end users, but may miss alerts due to volumes

Predictive
Identifies and then attempts to prevent SLA-impacting events

Need AI (ML/DL) analytics
Need Big data framework
Use cases

Traffic Prediction
(for dynamic resource allocation and power management)

Traffic Classification
(for service differentiation, security etc...)

Traffic Routing
(for selecting best path to optimize cost, maximize link utilization etc...)

Admission Control
(Allowing new requests based on available resource prediction)

Fault Prediction & Localization
(for simplifying the fault management and root cause analysis)

Network Security
(for intrusion detection)

AND Media and other Analytics
Big Data Analytics Steps

1. Collection Agents
2. Distribution
3. Data Storage (Data Lake)
4. Training
5. Store Models DB
6. Inferencing Apps
7. Corelation Apps
8. Action

Action Controllers (External controllers such as K8S, APPC, SDNC)
Stack Goals - Decentralization

Central Analytics

Central Site

Collect | Distribute | Train | Train | predict | predict | Action

Cloud Site | Cloud Site | Cloud Site

Challenges:

- Petabytes of data need to be transferred
- Need for large storage
- High compute central site requirement.
- Not edge friendly

Edge Clouds
- Predict (s)
- Action

Private Cloud
- Train

Public Cloud
- Train

Small Edge
- Collect
- Distribute

Medium Edge
- Collect
- Distribute
- Predict (s)
- Action

Large Edge
- Collect
- Distribute
- Train (s)
- Predict (s)
- Action(s)
Stack Goals – Bulk Deployment & configuration

- Edges could be in thousands
- Each edge would have its own site orchestrator (e.g. K8S)

- Need for centralized automation
  - To deploy various parts of analytics stack in multiple locations.
  - Configure them to make them work together
  - Support for dynamic edges

**Goal:** Deploy and Configure big data analytics framework in hours instead of months
Stack Goals – Use known big data frameworks

- Goal is to leverage known and open source packages
- Choose right versions
- AI (ML/DL) training and inferencing
- Make them work together
- Gaps and fixes.
Stack Goals – Follow Cloud Native and Micro-services design patterns

**Security**
- ISTIO CA, Envoy proxy for Mutual TLS among PODs.
- ISTIO ingress for communication outside of clusters.
- ISTIO RBAC
→ Security away from applications

**Operators**
- To bring up PODs.
- To configure using CRDs

**Load balancing & CI/CD**
- ISTIO Envoy with Cilium acceleration
- Visualization and monitoring
- A/B testing & Canary

**Functions**
- To enable developer functions to get executed in the pipeline
- Knative
Stack Goals – Reduce training time

- Distributed Learning with data parallelism
- Leverage hardware accelerators for performance
Stack Goals – Federated/Distributed Learning

- To honor Data sovereignty
- Data does not leave the site.
- Aggregation server based model
- Tensorflow based DL
Stack - Packages & enhancements to realize analytics stack

- An opinioned stack
- Helm Charts
- Container images
- Customized Day0 profiles
- Day2 templates for dynamic configuration
- Deployed using K8S in each site
- Monitoring
- Security via ISTIO
- Deploy with ONAP-K8S.
- Sample applications
- Code: [https://github.com/onap/demo/tree/master/vnfs/DAaaS](https://github.com/onap/demo/tree/master/vnfs/DAaaS)
Summary & Next steps

• Big data based AI analytics is a need for network and media analytics.
• We are leveraging K8S, Big data eco-system to create the stack.
• Leveraging ONAP service orchestrator to deploy various parts of stack at multiple sites
• More automation opportunities still exist – Deployment in matter of hours require enhancements at ONAP.
• Federated learning orchestration is yet to be done
• Model LCM and Model Security work is yet to be done.
• Proving with real AI application might expose few more gaps.
• Help us to improve the stack.