APACHE KNOX

A3 Architecture Overview

Apache Knox A3AO Objectives

- One page architecture (external/internal views)
- Key functional requirements
- Key non-functional requirements
- Patterns/design aspects
- Technology list

Key Functional Requirements

- REST API Gateway for Hadoop Clusters
- Single AP for all REST interactions in cluster

- Authentication (LDAP / AD Provider)
- Federated SSO (HTTP header based)
- Authorization (Service Level)
- Auditing

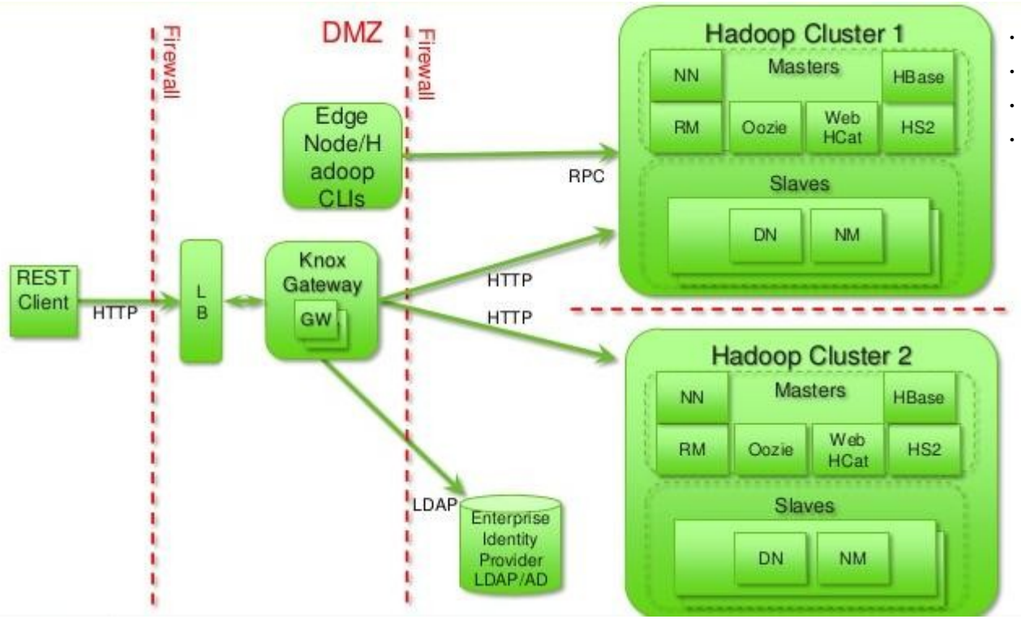
Key Non-Functional Requirements

- Extensible (through pluggability)
- Configurable
- Performance (fast responses) on request processing

Patterns / Design Aspects

- Reverse Proxy Gateway
- Servlet filter chain
- Perimeter Level Security
- Extension mechanisms
  - Service (new REST End Points)
  - Provider (new features for Services to use)
- Streaming during processing
- Deployment / Runtime phases

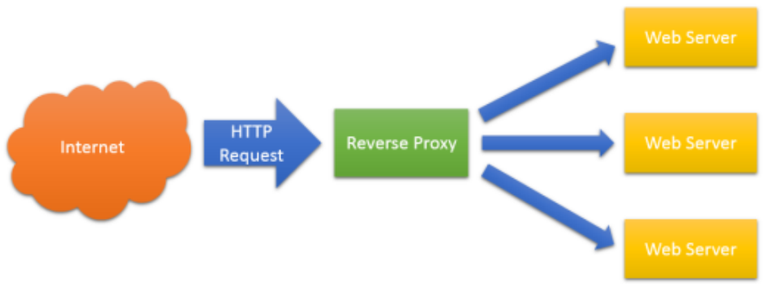
Knox Architecture From The Outside



- Clients make requests to Knox
- Knox authenticates against EidP
- Knox Processes (more later)
- Knox sends request onto Hadoop services

Patterns cont.

- Reverse Proxy Pattern
  - Knox is the Reverse Proxy Gateway
- Provides access to multiple, known, services
- Any client can access Hadoop services via Knox
- Side benefits
  - Single server/port for all services
  - Single point for authentication
  - Single point to secure against external threats
  - Single SSL certificate



Technology List

- Shiro authentication provider (LDAP/AD/BASIC)
- Pac4J (authentication / authorization mechanisms)
- ACL based authorization
- Log4j (auditing)
- Embedded Jetty JEE server
- Maven multi-module build
- Topology descriptors
- Kerberos

Version Information

Title	Apache Knox A3AO
Author	John McParland
Version	0.1
Date	M 24 Oct 2016
Audience	ODSC Knox Team; CySAFA Representative

CGI

Deployment

- Convert topology to WARs
- Based on Contributors
  - Pluggable components
- Basic WAR created
- Visitor pattern
  - Contributors modify WAR
  - Adding Services/Providers to WAR
- Service Deployment
  - Svcs created for roles in descriptor
  - Deployment framework adds filters to it
- Provider Deployment
  - Prvdrs created for roles in descriptor
  - Will add runtime deployment descriptors
  - Adds Servlet Filters to gateway runtime

Runtime

- Filter chains managed by GatewayServlet
  - Allows more powerful URL matching
- Main filter – GatewayFilter
  - Allows dynamic deployment of modified topologies

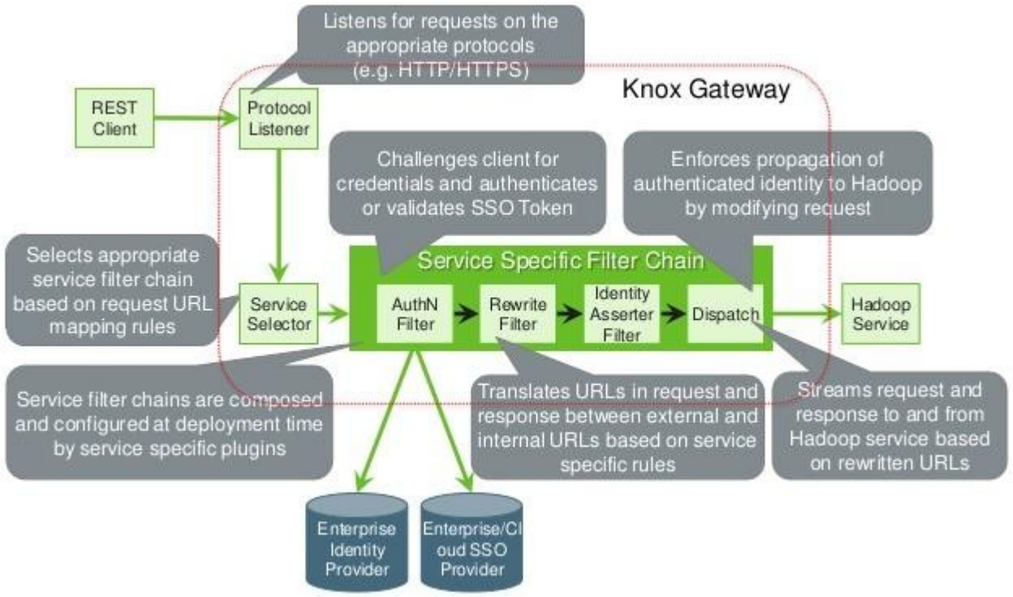
Services

- Convert topology file to runtime descriptors
- Modify gateway or other runtime descriptors
- ServiceDeploymentContributor is interface
- Loaded via ServiceLoader mechanism
  - String lookup from topology file
- Add via service.xml and rewrite.xml
- services/service name/version/<files>
- In gateway-service-definitions module

Providers

- Implement ProviderDeploymentContributor

Knox Architecture From The Inside



- Come in through protocol handler
- Select appropriate service
- Service Specific Filter Chain
  - Authentication
  - Rewriting
  - Identity
  - Dispatch
- Stream in/out of Hadoop service

Extending

- Extensions discovered via ServiceLoader (Java)
- Classpath (no recompile)
- Maven modules (add to gateway-release)
- Services (see other panel)

Service Contribution Behaviour

- gateway.xml
  - Controls behaviour of GatewayFilter
  - Mapping of URL patterns and filter chains
- rewrite.xml
  - Rules to control URL re-writing
  - Svc Contrbtr need to provide this