TESTBED-15

Federated Cloud Analytics

Identity Management & Access Control

Processing

Data Center & Discovery

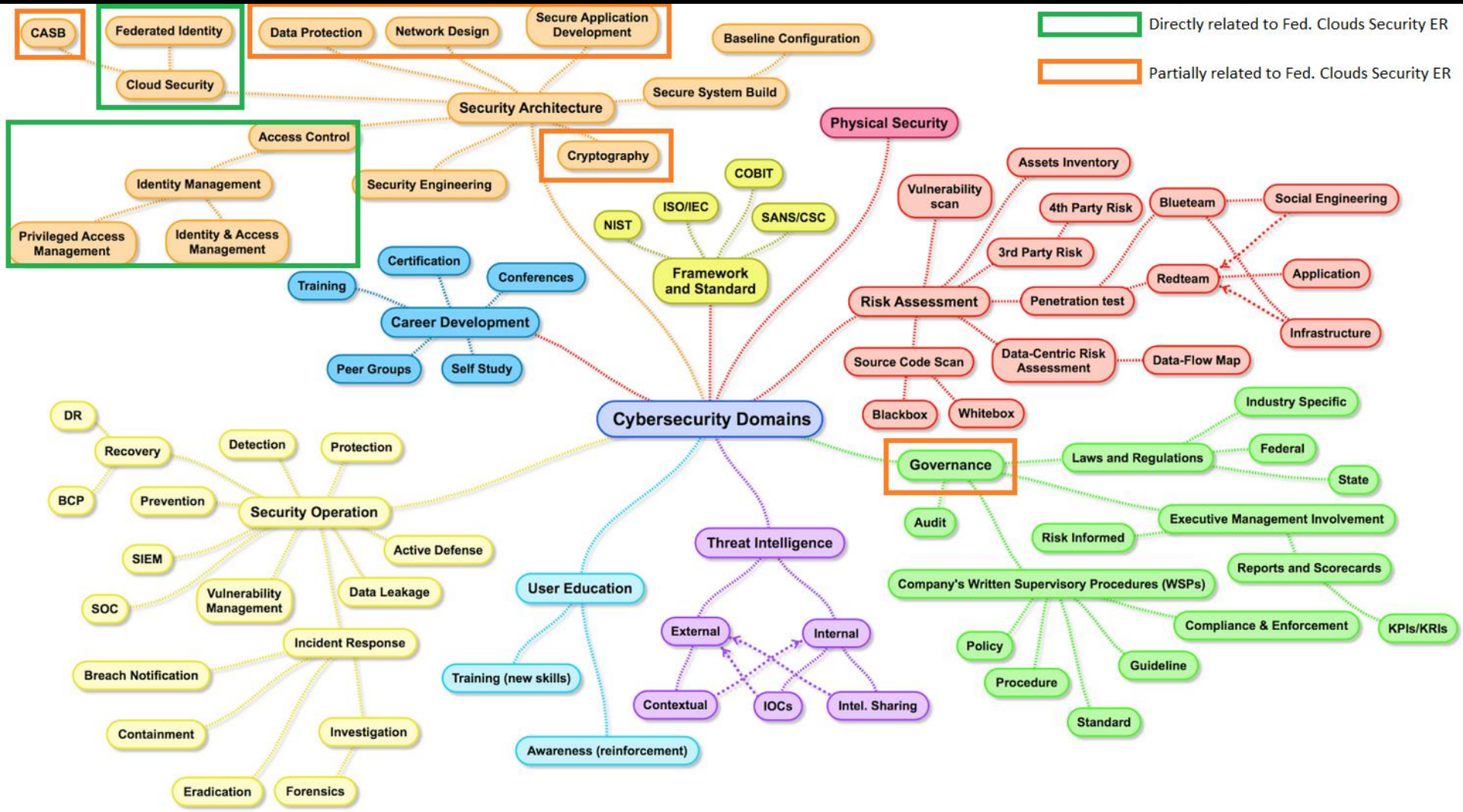
FCA in 3 Parts

- Federated Cloud Analytics
  - Introduction to the concepts of Federation and Federated Clouds; what is a Federation Manager, along with the different deployment models, and their impact in governance models.
  - Federation Manager functionality, such as:
    - Security
    - Membership Management;
    - Policy Management;
    - Portability and Interoperability.

- EOC, SCALE, SEED
  - The potential for the OGC Web Processing Service (WPS) Interface Standard as an API to a workflow automation service for managing job execution involving multiple containers in the Scale Data Center Environment;
  - Using WPS as a general frontend to workflow automation with containers
  - The suitability of the OGC Web Processing Service (WPS) 2.0 as an Application Programming Interface (API) for Cloud analytics;
  - Using OGC Web Services (WS) as analytics data sources and sinks;

- Federated Clouds Provenance
  - Study of application of Distributed Ledger Technologies for managing provenance information in federated clouds

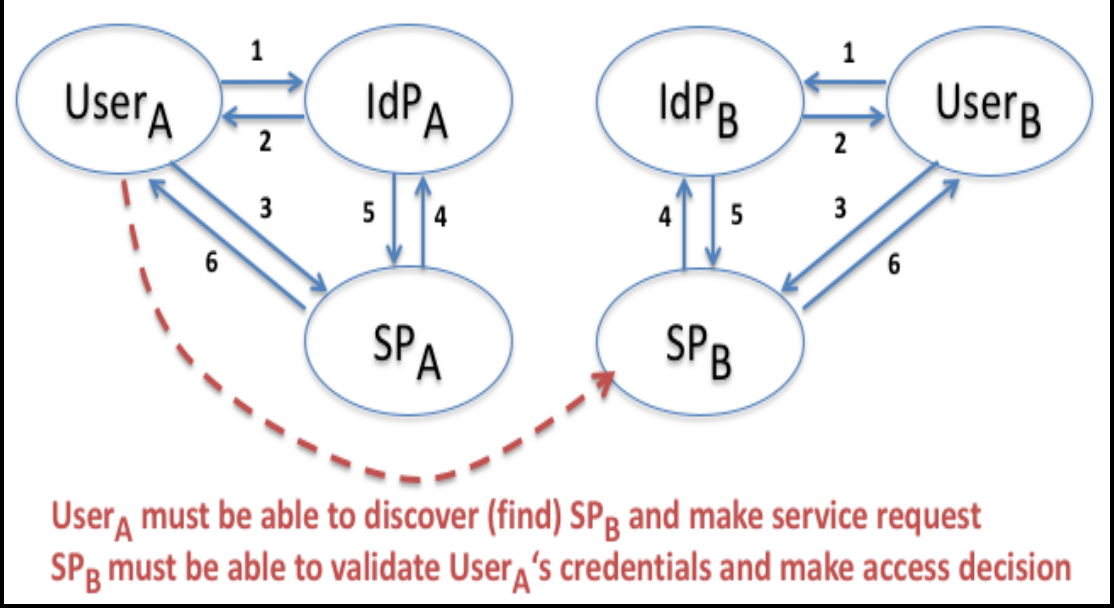
A CyberSecurity Mindmap



Sources: (1) Henry Jiang – Security Expert for Bank of America
(2) CISO 2016 Mindmap

Federation Consists of Several Fundamental Operations

- Establishing identity within a federation
  - Associating a "home" identity with a "federation" identity
- Discovering which services/data are available within a federation
- Making a "remote" service/data request
- Enabling a service/data owner to make a valid access decision based on federated identity and authorizations



Inter-Federation

- Users from both Federations should be able to interact with Service Providers that do not reside within their “home” federation

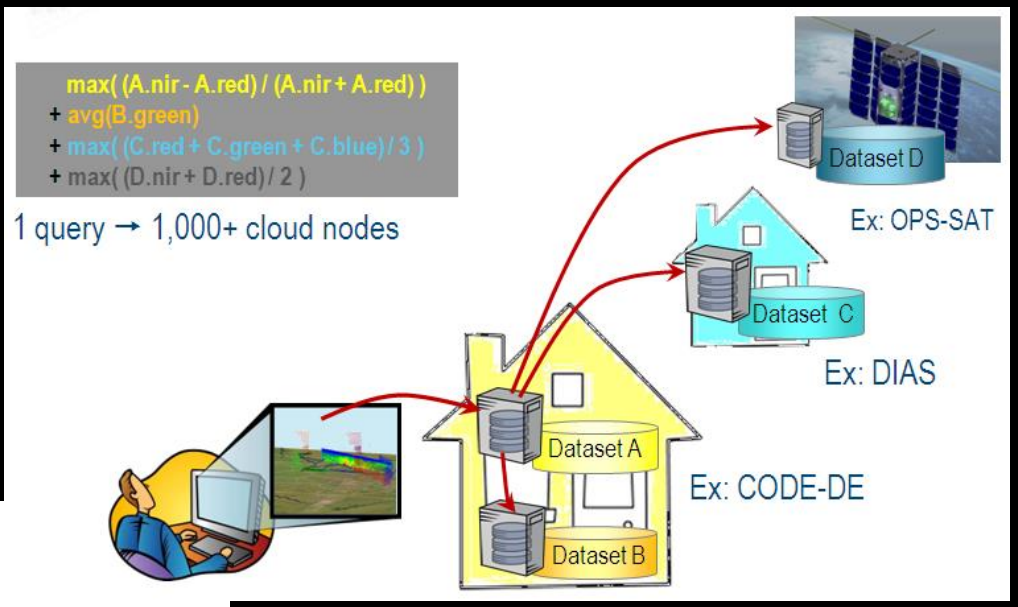
- Federation Manager #1 provides an abstraction API that FM#2 can use. FM#2 acts as a SP for FM#1 (the service would be the whole Federation)

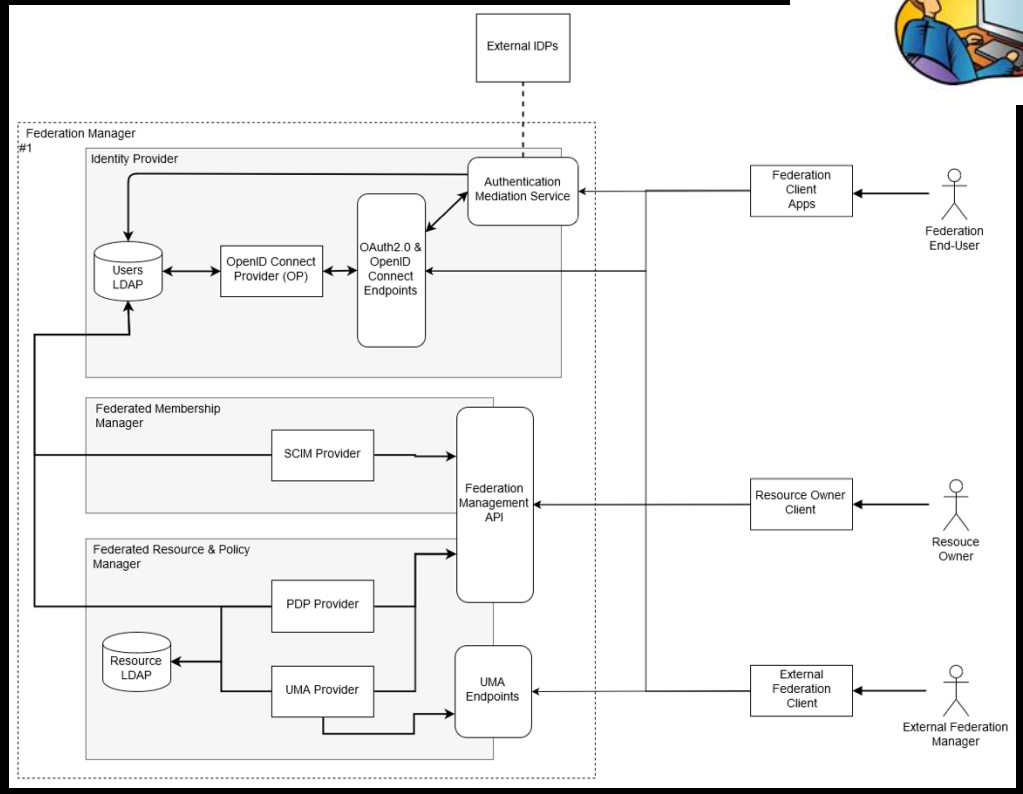
- Tested use cases:
  - Federation Manager #2 delegates authentication to FM#1 (acting as external IDP)
  - Federation Manager #1 API is used to propagate information about resources on Federation Manager #2 side

Future Work on Federated Clouds Security

- Inter-Federation: Definition of a reference Federation Manager API covering all identified use cases
- Policy Enforcement: Analyze the usage of Security Gateways to facilitate integration of OGC Web Services within distributed PDP/PEP authorization schemes.
- Secure Workflows: extending on Testbed-15 and Testbed-14 efforts
- Accounting and Billing capabilities in Inter-Federation scenarios

2 Totally different Approaches to Federation Management

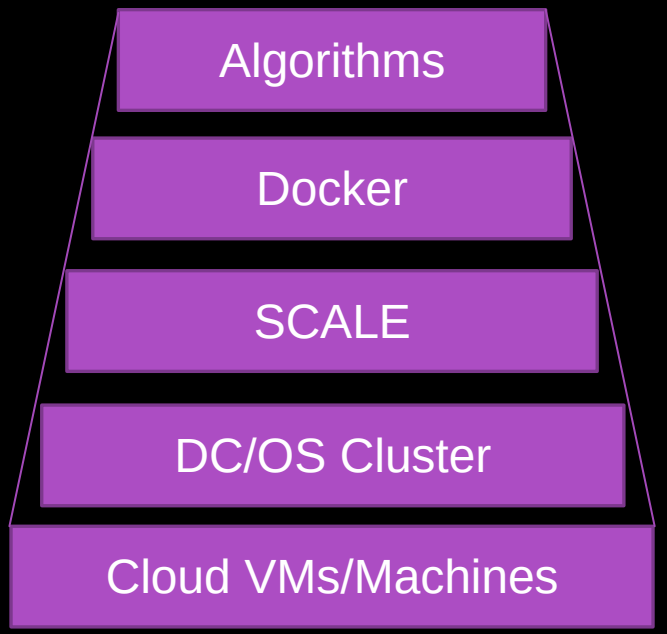




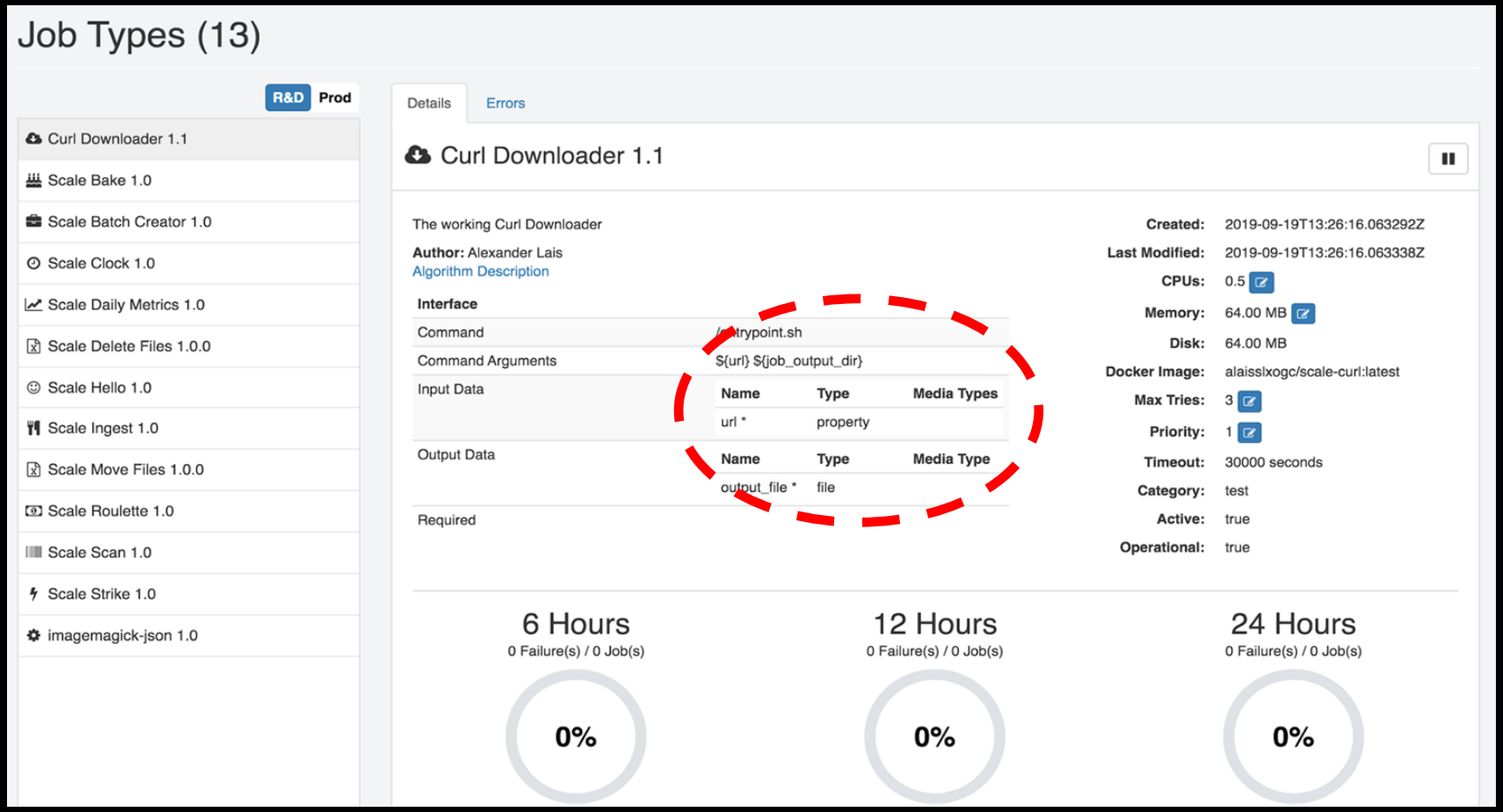
One is fully distributed the other is fully centralized

Scale Data Center Environment

- DC/OS is deployed on a private cloud cluster
- SCALE data center deployed on DC/OS
- Distributed storage by S3 or NFS
- Processing tasks (jobs) implemented as docker containers
  - SEED is a specification of a manifest format for dockerized algorithms
- Tasks are chained together into recipes
  - Allows combination of algorithms written in different languages as long as they can run in docker



Algorithm Definition in SCALE



WPS REST facade for SCALE Datacenter

- Map SCALE Jobs & Recipes to WPS processes
- Map WPS 2.0 Core Operations/REST endpoints
  - GetCapabilities
  - DescribeProcess
  - Execute
  - GetStatus
  - GetResult
- Demo SCALE Job
  - Docker image using curl to download coverage
  - Literal input: WCS url
  - Complex output: coverage file

Recommendations and Future Work

- EOC processes developed in earlier testbeds tend to be more flexible and more interoperable.
- SCALE is a powerful tool and can be used in large data center environments
- Using SEED to catalog docker images - supporting the discovery and consumption of discrete units of work contained within a Docker image
- SCALE jobs can be mapped to WPS processes enabling a standardized description and execution of SCALE jobs
- Investigate where SCALE jobs could either be combined to SCALE recipes or executed as single WPS processes