GENI Control Framework

Corporation for National Research Initiatives
http://www.cnri.reston.va.us/

General Approach

- Leverage the handle system to:
  - Globally identify resources.
  - Standardize access to each resource's RSpec.
  - Create a standard taxonomy of resource genres.
  - Create a standard taxonomy of resource interfaces.
    - Protocols, encodings, procedures etc…
  - Create a standard taxonomy of resource combination rules.
  - Provide a generic service for resolving identifiers into associated processing services.

Control Framework Goals

- Provide a service that can automate the building a slice or sliver.
- Provide a service that can help building specific valid combinations of resources within a sliver/slice based on the resource's specific genre and other characteristics.
- Record all "valid" resource combinations.
- Record a combination's operational status.
  - Provides a combination's degree of compatibility.
  - Provides some level of a combination's performance.
- Freeze complex combinations into a new resource that can be reused in later experiments.

Resource Combination Model

- A resource combination data model needs to be developed
  - Simple sequencing: e.g. A can be sequenced with B
  - Multiplexing: e.g. A can be sequenced with B and C.
  - De-multiplexing: e.g. A and B can be sequenced with C.
  - Control: e.g. A can be sequenced with B if controlled by C.
  - Configuration: e.g. A is the software for device B.
  - Etc…
- A given resource must support a least one resource combination model.
- Each combination model is uniquely identified and described by a handle.

Resource Combination Record

- Every resource combination record is identified with a handle.
- A resource combination record contains:
  - The genre of the resources that are to be combined together.
    - Resources genre are identified by a handle (resource taxonomy).
  - The handles identifying each of the resources.
  - The combination's model's handle.
  - How the resources are combined. (e.g: A is the source, B is the target, and C is the controller)
  - Who created the resource stitching when.
  - Usage information.
  - Operational history.

RSpec

- Describes a GENI resource.
- Each RSpec is uniquely identified with a handle.
- Each RSpec handle resolves to the RSpec description.
- An RSpec includes its resource's genre identified by a handle.
- Lists all registered attributes (e.g. local, interfaces, outputs etc..)

Resource Genre

- A resource genre defines what a resource is/does.
- The resource genre expands on the existing computation, communication, measurement and storage classifications.
- A resource genre is identified by a handle.
- A resource genre may be defined in terms of other genres.
- A resource genre may hint at its usage. (e.g. interfaces)
- A resource genre may or may not have defined interfaces.
  - An interface should have be identified using a handle.

Control Framework Use Flow

- A user building a slice selects resource A and queries the control framework (CF).
- The CF maps A to its resource genre .
- Base on A's genre, the CF lists the set of available combination models for resource A.
- The user selects a particular combination model M.
- For M, the CF lists the set of resource genres that are compatible with A.
- The user selects one of more resource genres and repeats this process as needed.
- The result is a valid genre based composition.
- This can be thought of as the compilation of a slice.

Control Framework Use Flow -2

- Once a resource combination is complete, the CF can assist with the resource allocation.
- This can be thought of as the resource linking process.
- The CF searches for resources that match the various genres within the specified combinations.
  - The CF performs resource matching based on the resources' attributes.
  - The resource combination rules can include non genre specific attributes (e.g. location, versions, interface, etc).
- The CF allows for new combinations to be added.
  - Require the combination to be successfully tested first.
- The CF can mint a new GENI resource from a successful combination and add it within its registry of resources.