Review of DRAFT "GENI Control Framework Requirements" Document (v01.3)

Contents

1. Introduction

Harry Mussman - GPO hmussman@bbn.com

An effort is underway to define and document a first view of the GENI Control Framework (CF) Requirements.

A first DRAFT (v01.3) has been completed, and can be found at http://groups.geni.net/geni/wiki/GeniControlFrameworkRequirements

The abstract is:
GENI Control Framework Requirements
GENI-SE-CH-RQ-01.3
This document defines the GENI control framework subsystem, and then specifies its requirements. It is a DRAFT, to be used for discussion in the GENI Facility Control Framework working group. Once approved, it can be used as a guide to judge the completeness of prototype control framework designs, and as a guide to their continued evolution.

To begin the review process, this DRAFT was sent out to the GENI community, and comments and changes were requested. Several were received by February 25, 2009, and were merged into the document; see Section 2.

Also, a conference call was held on February 25, 2009 with members of the GENI Control Framework Working Group to review the comments that had been received to date, and to discuss the document and the process to define control framework requirements. On this call there was a lively discussion of the document, the process towards defining the GENI control framework requirements, and on the GENI control framework. A summary is presented in Section 3.

Topics for further discussion and next steps in the process to define CF requirements are presented in Sections 4 and 5, respectively.

2. Comments on and Changes for DRAFT Document

Comments on and changes for the DRAFT document were received from the following individuals by February 25, 2009:

Hongwei Zhang – Wayne State   hzhang@cs.wayne.edu
Justin Cappos – University of Washington   justinc@cs.washington.edu
Larry Lannom – CNRI llannom@cnri.reston.va.us
Jeff Chase – Duke University chase@cs.duke.edu
Ted Faber - ISI/USC faber@ISI.EDU
Aaron Falk – GPO falk@bbn.com

These comments and changes have been merged into the DRAFT (v01.3) document, that can be found at
http://groups.geni.net/geni/attachment/wiki/GeniControlFrameworkRequiremen
ts/010909comments1%20%20GENI-SE-CH-RQ-01.3.pdf

In his comments, Justin identified a good topic for discussion (that was not discussed in the conference call):

Discussion Topic 1
Should opt-in users have the ability to control how their resources are allocated in the GENI suite?
How can this be done?

3. Summary of February 25 Conference Call on DRAFT Document

Attendees

The following members of the GENI control framework working group participated in a conference call on February 25, 2009, to review and discuss the current DRAFT GENI Control Framework Requirements document:

Harry Mussman – GPO   hmussman@bbn.com (host for the call)
Steve Schwab – SPARTA   Stephen.Schwab@sparta.com
Alefiya Hussain – SPARTA Alefiya.Hussain@sparta.com
Robert Ricci - Univ of Utah ricci@cs.utah.edu
Ted Faber - ISI/USC faber@ISI.EDU
John Wroclawski – ISI/USC jtw@isi.edu
Larry Lannom – CNRI llannom@cnri.reston.va.us
Giridhar Manepalli – CNRI gmanepalli@cnri.reston.va.us
Christophe Blanchi – CNRI cblanchi@cnri.reston.va.us
Dave Irwin – UMass Amherst irwin@cs.umass.edu

Outline of CF Requirements Document

Harry briefly reviewed outline of current DRAFT document, including: CF definition; CF structure of principals, aggregates and components; list of required functions; required federation; and required functional characteristics.

Ted, reflecting his earlier comments on the document, indicated that he thought that the document should focus more on required functions, and less on a specific implementation. Right now, he feels it is too detailed.

Purpose of Defining CF Requirements

It was noted that the abstract states that the CF requirements, once defined: "can be used as a guide to judge the completeness of prototype control framework designs, and as a guide to their continued evolution".

John disagreed with this purpose. He feels that the current document represents a homogeneous view, and that it is more likely that multiple options will be present, and that they will choose to interoperate.

Later, Giridhar asked if the goal was a spec that different organizations would implement, or if the goal were to have different organizations agree on a common spec.

Discussion Topic 2
The CF requirements, once defined: "can be used as a guide to judge the completeness of prototype control framework designs, and as a guide to their continued evolution".
Can we affirm this?

Structure and Interoperability

In his earlier comments on the document, Larry said that he wasn't sure if there was one GENI suite, or multiple interoperable suites. And was GENI also the name of an interoperability spec? After some discussion, a tentative consensus was reached:

Discussion Topic 3
This document should clearly reflect that there are several GENI suites, with interfaces that allow them to interoperate.
There is not "one big suite".
This should be reflected in the System Overview, and not just mentioned in the later Federation section.
Can we affirm this?

There was more discussion on the nature of the interfaces that permit interoperability.

John and Ted feel there will be many options, and multiple ways to interoperate. We should not restrict this or else we will prevent innovation.

Both Robert and Dave argued for a tighter interoperability specification, so that interoperability can be made to work. Robert felt that if too little were specified, we will never be able to integrate two suites, Dave stated that we need to do what is required to avoid having islands.

Larry commented that interoperability should be defined first for a minimal level of functionality, and then extended to higher levels of functionality. You want to define the minimal interfaces and functions that permit interoperability, such that anything less would break it.
John used the Internet as an example of a small, tightly focused spec.

Discussion Topic 4
Should we define an interoperability spec between GENI suites?
What are the minimal interfaces and functions required to permit interoperability between GENI suites?

Transactions

Harry indicated that the basic transaction that the CF needs to support is that researchers can obtain resources, and then control them to execute experiments.

Dave indicated that ORCA is based on two tenets: resources are shared, but not forever.

The group then discussed the nature of transactions.

Discussion Topic 5
The group felt that the CF needs to support a range of transactions:
   Resources that range from: valuable to not valuable.
   Scope of resources from: wide (many) to narrow (few).
   Resource control depth from: superficial to deep (detailed).
   Researchers that range from: well known insiders to possibly anonymous outsiders.
   Access control that ranges from: rigorous to loose.
   Quality of service that ranges from: reliable to casual.
   Behavior of researcher that ranges from: proper to disruptive.
It was felt that this indicates that multiple mechanisms and functions would be appropriate, not just one (perhaps rigorous) mechanism.
Can we affirm this?

Dave indicted that ORCA is based on a shared broker, which can provide rigorous access control. He does not yet know how to provide for "loose" access control, but he believes that the pieces of ORCA are highly adaptable.

Trust

The issue of trust was then discussed.

When there is only one framework (suite), it is relatively easy to define trust, and allow appropriate transactions.

When there are multiple frameworks (suites) how can trust be transferred between the suites? Rob asked what would happen if there were different trust models in different frameworks (suites)?

One example that could be studied is Shibboleth.

Discussion Topic 6
How will trust be defined in one GENI suite?
How can trust be transferred between multiple GENI suites?

Vocabulary

Larry made the point that a system like GENI needs a precise vocabulary or ontology, that is shared by all suites. This will apply to principals, aggregates and slices.

Discussion Topic 7
What will be the vocabulary or ontology that GENI suites must share for principals?
aggregates and components?
slices?
other items?

Key Elements

The key elements in a GENI suite were discussed, including the "triangle" of Researcher, Aggregate (with Components) and Clearinghouse.

In his detailed comments for the document, Jeff suggested that a "Slice Controller" should become a first-class entity (element), associated with the researcher. Harry noted that this is in keeping with the current PlanetLab, the ProtoGENI and ORCA prototypes.

Discussion Topic 8
Should there be a defined Slice Controller (Manager) in the GENI suite?
What are its characteristics?
What are its interfaces?

Essential Functions

The CF Requirements document presents a set of required functions, but we discussed that we should consider carefully which functions are "essential" and which are "extended".

It was agreed that the essential functions required of a CF in a GENI suite included more than just resource acquisition.

Discussion Topic 9
What are the "essential" functions of the control framework in a GENI suite?
What are the "extended" functions of the control framework in a GENI suite?

Example Systems

Harry asked which systems in use today might be useful as examples for GENI. Several were mentioned:

Shibboleth, for identity management.

Digital Object Registry, for registry functions.

Web services, for interfaces between trusted objects.

MEMS exchange, for resource assignment. Christophe forwarded more information on the MEMS exchange, including a link to http://www.mems-exchange.org/ . He explained that both the MEMS exchange and GENI will be used to assign resources, with the difference that resources in in MEMS are assigned sequentially and resources in GENI are assigned in parallel.

Discussion Topic 10
What similar systems can as examples for GENI?
Shibboleth?
Digital Object Registry?
Web services?
MEMS exchange?
Others?

4. Discussion Topics

The following discussion topics were identified by the comments and changes received from the community and by discussion during the conference call.

Discussion should continue within the community on each of these topics. Ideally, the discussion will lead to a "rough consensus" on each topic. Then, the control framework requirements document can revised to reflect the community consensus.

Discussion Topic 1
Should opt-in users have the ability to control how their resources are allocated in the GENI suite?
How can this be done?

Discussion Topic 2

The CF requirements, once defined: "can be used as a guide to judge the completeness of prototype control framework designs, and as a guide to their continued evolution".
Can we affirm this?

Discussion Topic 3

This document should clearly reflect that there are several GENI suites, with interfaces that allow them to interoperate.
There is not "one big suite".
This should be reflected in the System Overview, and not just mentioned in the later Federation section.
Can we affirm this?

Discussion Topic 4

Should we define a precise interoperability spec between GENI suites?
What are the minimal interfaces required to permit interoperability between GENI suites? Between which elements?
What are the minimal functions required to permit interoperability between GENI suites?

Discussion Topic 5

The group felt that the CF needs to support a range of transactions:
>   Resources that range from: valuable to not valuable.
>   Scope of resources from: wide (many) to narrow (few).
>   Resource control depth from: superficial to deep (detailed).
>   Researchers that range from: well known insiders to possibly anonymous outsiders.
>   Access control that ranges from: rigorous to loose.
>   Quality of service that ranges from: reliable to casual.
>   Behavior of researcher that ranges from: proper to disruptive.

It was felt that this indicates that multiple mechanisms and functions would be appropriate, not just one (perhaps rigorous) mechanism.
Can we affirm this?
Note: Perhaps we should focus two corner cases that the CF must support, e.g.: a) Valuable resources, deep control, rigorous access control, reliable service. B) Not valuable resources, superficial control, anonymous researchers, loose access control, casual service.

Discussion Topic 6

How will trust be defined in one GENI suite?
How can trust be transferred between multiple GENI suites?

Discussion Topic 7

What will be the vocabulary or ontology that GENI suites must share for principals?
aggregates and components?
slices?
other items?

Discussion Topic 8
Should there be a defined Slice Controller (Manager) in the GENI suite?
What are its characteristics?
What are its interfaces?

Discussion Topic 9
What are the "essential" functions of the control framework in a GENI suite?
What are the "extended" functions of the control framework in a GENI suite?

Discussion Topic 10
What can GENI learn from similar systems:
Shibboleth?
CoManage?
Digital Object Registry?
Web services?
MEMS exchange?
Others?

5. Next Steps

These next steps are recommended:

1. The discussion topics will be forwarded to the community via the CF WG mailing list, with discussion encouraged in the next several weeks before GEC4.
Suggested approaches and draft text will be included, where possible.
The goal is "rough consensus".

2. A report on progress towards rough consensus on each topic will be prepared for consideration and discussion during the CF WG meeting at GEC4.

3. After GEC4, the CF Requirements document will be revised to reflect the "rough consensus" affirmed at GEC4. Then a second review process will commence.