GENI Working Groups

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Abstract

This document discusses the GENI working groups, their governance, publication process, and initial charters.[1]

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1. Overview

Working groups are expected to be the locus of technical work required to develop the GENI architecture and design. They will author & review requirements and design documents and evaluate software and services contributed by Working Group (WG) members (some of which may be sponsored by the GENI Project Office). Working groups are expected to provide input to integration activities, design bake-offs, and other prototyping tasks.

Emphasis is placed on technical contribution, including expression of the research community's needs and use cases, regardless of the source of financial support. Academic, industrial, and government lab participants are encouraged.

It is important to understand that working groups exist to support GENI technical development. This development process is directed by the GENI Project Office (GPO), which is responsible for its timely completion. While working groups are expect to operate mostly autonomously, recommendations having major impact on the ability of GENI to meet its objectives, e.g., cost, schedule, or risk implications, will be reviewed by the GPO. The GPO will constantly review working group actions because the GPO is responsible for making sure GENI gets designed (and implemented).

This is a working draft process document and will be revised. Check the GENI website, http://www.geni.net/wg, for updates.

2. Governance

All working groups are led by one or two Chairs and a System Engineer. These roles are defined in Section 4, “Working Group Staff Positions”.

Decision Process. WG decisions will, in general, be made by rough consensus as judged by the WG chair. The WG System Engineer acting as the representative of the GENI Project Office will be responsible for helping the working group understand the needs and constraints of the project office and the working group is expected to be responsive to these needs and constraints in their activities. In the event the GPO modifies or rejects a WG recommendation, the rationale will be provided to the WG.

Transparency. WG operations, decisions and their rationale will be transparent, recorded in meeting minutes and open archives.

Design Teams. Experience has shown that sometimes a topic may be sufficiently rich or complicated that technical work is best performed by one or more small design teams. These teams may organize how they choose and, in particular, they may not have open participation. However, to be considered for inclusion in GENI, design teams must bring their results to a working group and publish documents through the GENI process. Design team input shall be considered with the same weight as any other working group contribution.

Oversight. WGs are overseen by the GENI Engineering Architect (GEA). Oversight includes approval of charter creation and changes, staffing decisions, breaking deadlock, defining and/or approving WG operational policies, and ensuring those policies are followed. The GEA is responsible for seeing that a comprehensive and coherent technical design is delivered to the GENI Project Director (GPD) and, thus, will direct working groups. Working group charters (and hence, working group existence) will be reviewed annually by the GEA and GPD. The GEA and GPD may also perform this review more frequently, although this is not expected to be a common occurrence.

3. Working Group Operations

Most working group discussions are expected to be performed online via email or equivalent fora. In addition, working groups will meet periodically, roughly three times per year, at GENI community meetings.

Progress Reporting. Working Groups will present progress reports at GENI community meetings (via their System Engineers), including risk assessments & mitigation suggestions, upcoming deliverables & milestones, and technical issues. The GPO will specify the format and agenda for GENI community meetings.

Decision Transparency. Working groups will explicitly identify upcoming decisions (e.g., key design choices or document reviews) and include the timeframe for closure. This is to allow working group participation by members who may have limited time (or may be more engaged with other working groups) and wish to find and engage on key issues.

A **Technical Coordination Group (TCG)** will work to ensure consistency across working groups. The TCG is chaired by the GEA and includes the Working Group Chairs, GPO System Engineers (including WG SEs), GPO Substrate Architect, and Operations & Integration Lead. The TCG coordinates schedules, documentation, logistics, publication formats, etc. It may resolve issues of overlap in working group scope. It may be a forum for communication from the GPO to the working groups. The TCG is not a decision-making or review body.

Prototyping. GENI is expected to evolve via *spiral development* with subsystems -- in particular, software subsystems -- developed in a design/build/revise structure. It is expected that the GPO will fund some prototyping to support requirements development and reduce risk to the overall design. Organizations performing prototyping are expected to participate in relevant working groups to inform the design process with their experience. Working groups should understand the results of GENI prototyping activities, including integrations and trial experiments, and use these results to inform the ongoing design process. As with other working group activities, these results will be made public through normal GENI documentation processes. Working groups will play an important role in identifying risks and design challenges for future prototyping activities. The working groups will be the community where the objectives for successive revisions are worked out.[2]

Intellectual Property. The GPO will publish and implement a consistent IPR policy for the working groups, oriented toward widely unencumbered access to the facility designs. The specifics of the IPR policy will be found in a separate GENI IPR document.

Recognition. [Proposed: After key milestones (e.g., WG deliverables, design reviews) GSC members with academic stature will send letters of recognition to the academic departments of junior faculty contributors as a way of providing recognition. Possibly paired with introductory letter from NSF endorsing the importance of jr. faculty to GENI.]

4. Working Group Staff Positions

The GEA is responsible for staffing of the WG Chairs and System Engineers. The roles, responsibilities, terms, and commitment for the WG Chair and WG SE are described in the following sections.

4.1. Working Group Chairs

GENI working group chairs are responsible for:

[2]Issues surrounding GPO contracting: RFIs, RFPs, proposals, performance evaluations, etc are out of scope for WGs. However, GENI community meetings may include discussion of these matters.

- encouraging and guiding the working group's technical progress
- maintaining the working group energy level
- managing the decision making process
- ensuring transparency and fairness
- drawing out and considering minority opinions
- encouraging healthy debate and working group buy-in
- holding accountability for GPO deliverables

Term: A working group chair will nominally serve a one-year term, although it may be extended to a second year if the working group's performance is high. Performance will be judged based on the chair's ability to fulfill the responsibilities listed above. Objective measures of performance include mail list activity and timeliness of deliverables. Severely deficient progress may result in early replacement of working group chairs.

Commitment:

- active participation on mailing list
- attendance at all WG meetings

Working group chairs may receive financial support from the GENI Project Office.

4.2. Working Group System Engineer

The GPO will provide working groups with support from a staff system engineer (SE). The WG SE will share leadership of the working group with the chairs, helping to ensure the WG achieves its goals and effective communication of project office needs to the working group and working recommendations to the project office.

Responsibilities:

- communicating between GPO and working group
- collaborating with WG chair on meeting GPO programmatic needs (e.g., document reviews)
- managing the requirements allocation and traceability process
- preparing briefings for the GSC / GPO / NSF at every community meeting (every 4 months) showing - in a standard form - how readiness is progressing for that WG
- editing key WG documents (an enumerated set including documents on requirements, subsystem architecture, subsystem design, and subsystem integration & test)
- contributing to development of the GENI design
- recording working group recommendations and consensus
- generating minutes from WG meetings
- maintaining a web page for the working group

Term: as defined by GPO

Commitment:

- accountable for the schedule and work-products
- edit working group documents and maintain version control
- attendance at all working group meetings
- active participation on WG email list
- participate in change control board review
- GPO staff activities

5. Documents

Project Documents. The GENI Project Office will, from time to time, publish documents for community review. There are three types of GPO documents: *Program Documents* are deliverables for the MREFC process. Example program documents include a Project Management Plan and a Project Execution Plan. *Working Group Documents* include working drafts that will eventually become part of the GPO Program Documents and also invited contributions, e.g., white papers, analyses, or design documents intended to further the design process within the working group. *General Documents* include GPO publications of broad interest such as GPO policies, meeting agendas, or other announcements. The GPO will maintain a repository of all GPO documents and they will be indexed and labeled in a manner to make their provenence (as GPO output) clear.

Unsolicited Documents. Additionally, the GPO will accept and make available *Unsolicted Documents*. These may be contributed by working group members or other interested individuals who wish to make a document available to the GENI community. Unsolicited Documents will be maintained in a separate repository and labeled so that it is clear that these documents are not the products of GPO working groups. A working group chair and system engineer may choose to adopt an Unsolicited Document as a Working Group Document. If a working group adopts an Unsolicited Document, revision control of that document transfers to the working group system engineer.

Document Control. Working groups are expected to prepare a number of requirement and design documents. The WG system engineer retains control of key WG design and requirements documents. WG members are expected to contribute text to these documents and review works-in-progress.

Document Format. All documents must be made available in an editable format, e.g., docbook. Templates, other formatting requirements, and other aspects of the document publishing process will be defined by the GPO.

Document Publication. When documents are ready for external review, they will be assigned a fixed label and published on the GENI's website in PDF. Versions incorporated into GPO deliverables will be clearly labeled.

6. Mailing Lists & Web Pages

Working group mailing lists will be hosted by the GENI Project Office. Archives for WG mailing list archives will be public. In general, anyone may join any public mailing list. However, the GPO may limit sending privileges of list members who, in the view of the WG chair and SE, are abusing the list.

GENI working groups will maintain a web page with the names and contact information of the chair and WG SE; subscription instructions for the mailing list; charter; scope; milestones; deliverables; meeting schedules; and links to working and published documents.

7. Working Group Charters

This section discusses the initial set of GENI working groups, their leaders, and proposed activities. Once the working groups have been officially chartered by the GPO, up-to-date information about the working groups will be available through the GENI website. Working group deliverables will be updated periodically, for example, they are likely to be modified and/or refined after each GENI Engineering Conference.

The principal form of deliverable for a working group is its set of documents which will support the NSF MREFC design process as described in [1]. The planning process for GENI requires creation of the documents found in the table below. This list is oriented towards subsystems of the GENI facility and, in many cases, the subsystems don't cleanly map to the initial set of working groups. Nevertheless,

each working group will contribute to the documentation required for of all related subsystems. These documents will be authored by Working Group System Engineers based on contributions and/or review from the working group membership.

Table 1. GENI Project Deliverables

Requirements	Explicit formal requirements for subsystem elements, including quantities, reliability, timing, and cost; requirements analysis with traceability to higher-level GENI requirements and ultimately the GENI Research and Education Plan.
Architecture	Authoritative definitions of all subsystem elements, internal and external interfaces (via Interface Control Documents), and their evolution over time. Worked end-to-end examples of experiment setup, operation, and shutdown, within an end-to-end context. Worked examples of how the subsystem is operated and maintained.
System Engineering	Detailed descriptions of all subsystem elements, based on architecture. Explicit definition of all hardware and software required with estimated development timelines, and discussions of possible obsolescence issues during construction phase, etc. Detailed description of each system interface. Explicit definition of all inherited software & the required modifications (if any).
Development, Integration, and Test Plan	Gantt and task flow charts for development, integration and test activities during the construction phase, both for the subsystem itself and for integration into the end-to-end facility. High-level test plans for the types of testing required, facility requirements, etc.
WBS with Cost & Schedule Estimates	Work Breakdown Structure (WBS) with dictionary, providing a highly detailed, credible plan of all tasks necessary for constructing, integrating, shaking down, and “turning on” the subsystem, together with its evolutionary development during the construction phase. Detailed cost and schedule estimates that show how tasks fit together, including highly credible plans for risk mitigation (cost & schedule).
Current Readiness	Current readiness of the subsystem engineering documents, including both the most recent Readiness Review findings and the working group’s estimate of subsequent changes. (A short document that indicates “maturity” or “readiness at a glance.”)
Risk Register	A list of all risks identified for this subsystem, organized into three sections: newly identified risks, risks already prioritized by a Readiness Review, and retired risks. These registers feed into the GPO’s GENI-wide Risk Register.
Capabiliities	Highlight critical, required, and optional capabilities. List critical capabilities that if not fully met would be considered as a "show-stopper".

7.1. Substrate Working Group (substrate-wg)

Chair(s):

SE:

Scope: What technologies should be in GENI? How will they be used? What is the framework for evolution of substrate technologies?

Initial Deliverables:

- Description of what can/should be implemented by Oct 2008: one brief (20pp) overview and one brief (20pp) document for each substrate type. Documentation should include high level functional architectures, initial capabilities definitions, projected development schedules with dependencies and identified risks, Technology Readiness Levels [3], and best-effort cost estimates

Later Deliverables:

- **Substrate Framework**: e.g., generic substrate requirements; appropriate abstractions for specific technologies; evolution strategies
- **Technology Identification:** e.g., technology survey; technology tradeoffs including justification in GENI's scientific context; identification of candidate substrate technologies plus characterization of additional development to meet GENI requirements
- **Requirements Definition & Design:** significant contributions to the documents described in Table 1, “GENI Project Deliverables”. In particular, the WG will contribute to the *Technical Requirements Document* to cover the substrate portion of an eventual construction RFP. The chapters in this document will span generic requirements applicable to all substrate technologies as well as requirements specific to each substrate technology. The WG will populate the specifics of this document based on the outcomes of trade studies, risk-reduction prototyping and analysis, e.g., Internet interconnect tradeoffs & recommendations or recommendations on incorporation of "disadvantaged" GENI nodes with various examples (sensors, cell phones, etc.).
- **Risk Register:** performance, cost, and schedule risks.

7.2. Narrow Waist Working Group (narrow-waist-wg)

Chair(s):

SE:

Scope: *What is universal across GENI components? How will evolution be accommodated with or without a full transition of all GENI nodes at once?*

Initial Deliverables:

- A 20pp description of what can/should be implemented by Oct 2008 (including dependencies); system diagram with major entities and system interfaces; worked example showing how an experiment is instantiated and runs end-to-end across a system where GENI has federated with other facilities (i.e., interconnected with autonomously-administered facilities).

Later Deliverables:

- **Implementation Plan:** schedule of functional milestones (with initial emphasis on period leading up to October 2008); analysis of gaps in current technology and previous design work; strategy for evolving functionality

- **Definition of Architectural Components:** policy-agnostic resource framework; resource specification, discovery, & protection; addressing architecture; federation mechanisms; naming; authentication, & authorization; universal operations interface
- **API Definitions:** specify resource allocation & control interfaces
- **Architectural Risks:** if the choices are wrong, how might the system be limited?
- Other contributions required for the project documents listed in Table 1, “GENI Project Deliverables”.

7.3. Experiment Workflow & Services Working Group (services-wg)

Chair(s):

SE:

Scope: *What do experimenter-users need from GENI? Consider planning, scheduling, running, debugging, analyzing experiments; long running experiments & how they grow; archiving data.*

Initial Deliverables

- 20pp single experiment workflow from planning through publication of results (similar to that developed for the ORION project [4]).

Later Deliverables:

- Catalog of use cases for using GENI
- Experiment instantiation mechanisms
- Support-services GENI should provide to experimenters
- Address management mechanisms
- Measurement requirements
- Measurement infrastructure design
- Incentive structure for contributing resources
- Technology surveys
- Other contributions required for the project documents listed in Table 1, “GENI Project Deliverables”.

7.4. End-user Opt-in Working Group (opt-in-wg)

Chair(s):

SE:

Scope: *How do end-users (including Internet users) participate in GENI experiments? What are the various aspects including user interfaces, scheduling, debugging, measurement, archiving data, sandboxes, etc? What are the privacy and legal issues involved in user opt-in?*

Initial Deliverables:

- 20pp action plan for facilitating and encouraging Internet users to access GENI (outreach, tools, stakeholders, roadblocks, incentives, economics, workshop proposal?)
- list of issues (e.g., privacy, legal, review) with brief discussion and plan for how each issue will be tackled by WG

Later Deliverables:

- Ways in which to encourage and support real users "opting in" to long-running GENI experiments.
- technology survey
- Other contributions required for the project documents listed in Table 1, “GENI Project Deliverables”.

7.5. Operations, Management, Integration, & Security Working Group (omis-wg)

Chair(s):

SE:

Scope: *What are the requirements for operating GENI and managing its services? What are GENI's security requirements, both from a researcher's viewpoint and from that of its operators?*

Initial Deliverables

- **Operations Framework:** A document (20pp) that describes the high-level functions required for running the near-term GENI facility 24x7x365 with appropriate security and management safeguards for a research infrastructure. This document will pay particular attention to the minimal set of operations, management, and security functions needed for the narrow waist.

Later Deliverables:

- **Technology Survey:** A document that reports on available commercial and open-source tools and systems that are appropriate for operations in a large-scale research environment, explaining how such tools might be adapted for GENI requirements. The report will identify areas where GENI system requirements and new technology may drive new development.
- **Security Policy Recommendations:** A document that identifies GENI assets, data, and processes for which there are security requirements, provides a framework for comparing the degree of protection required for various GENI elements, and recommends suitable procedures, tools, and technologies for adequately protecting those elements. The document will pay special attention to security needs related to federation and the requirements for interconnections between GENI elements and those of other organizations.
- **Long-Term Operations Framework:** A document that describes the expected operations functions of the GENI facility that will come into being during and after the MREFC construction phase. This document will follow the initial Operations Framework document. It will be based on the fully-developed GENI system requirements that evolve from the GENI Research and Education Plan.
- **Concept of Operations Documents:** Documents that describe the concept of operations, including worked-through examples, for operations, management, integration and security processes in GENI. The working group will assess the areas in which Concept of Operations documents are needed, based on the GENI system requirements derived from the Research and Education Plan. The working group may release Concept of Operations documents in phases that coordinate with the spiral development process. The working group will produce separate Concept of Operations documents for at least the following areas:
  - experiment support, monitoring, and data storage
  - security monitoring and incident response (including incidents unrelated to security)
  - federation management and monitoring
  - hardware release, maintenance and integration
  - software release, maintenance and integration
  - operations metric collection and analysis
- **Facility Management Interface Requirements:** Document requirments for desired interfaces between the GENI operations, facility management, and security infrastructures and the rest of the GENI elements. Initial versions will describe functional interfaces (for example between a GENI node

and the operations function that provides current status on that node). Later versions will define the interfaces in more detail, possibly to the level of a GENI API for a particular interface.

8. Timeline

The initial deliverables are expected to be reviewed by the first GENI community meeting scheduled for October 9-11 in Minneapolis, Minnesota. The emphasis of the initial deliverables are to inform the initial set of risk reduction design and prototyping activities. I.e., what should we build in the next year? Prototyping solicitations are expected to be available mid-Fall 2007.

Once the solicitation for prototyping is underway, the emphasis will move to preparing for the GENI Conceptual Design Review (CDR) currently planned for Spring 2008.

Bibliography

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