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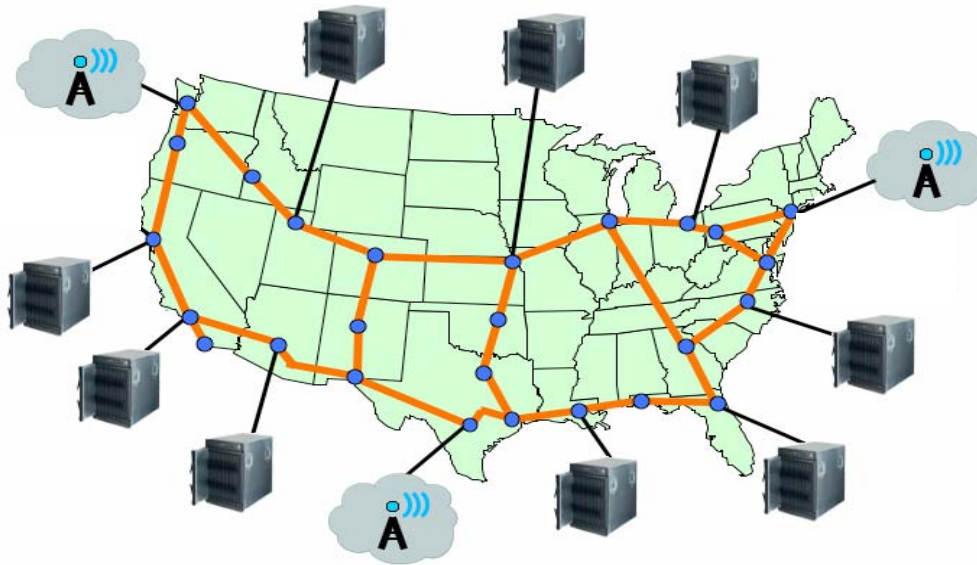
# Introducing the GENI Project Office (GPO)

Chip Elliott  
GENI Project Director



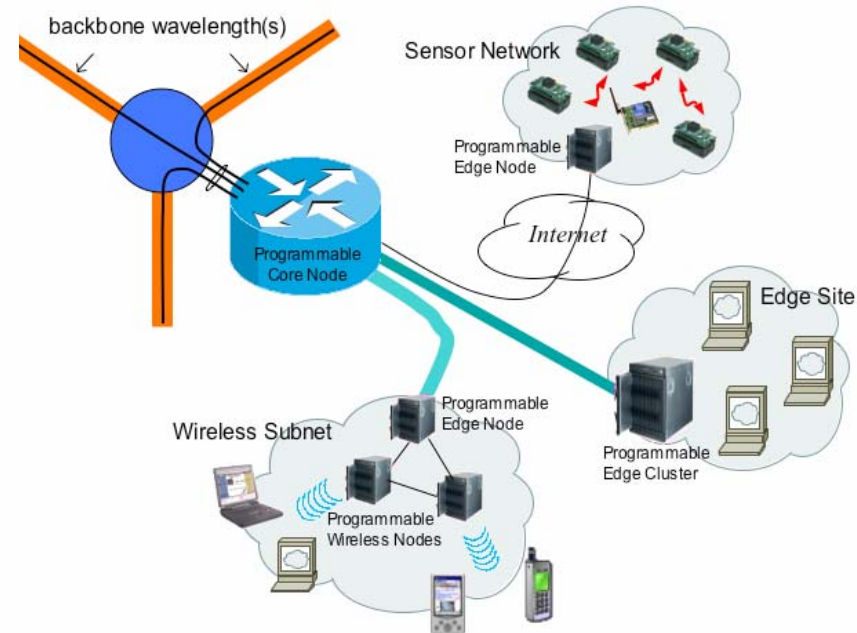
# Building GENI

The vision – a national facility to explore radical designs for a future global networking infrastructure



- Large, wide-area footprint
- High capacity backbone and programmable core nodes
- Large clusters of CPUs and storage

- A variety of edge / access technologies (e.g. sensor networks)
- Shared among researchers by virtualization & slices





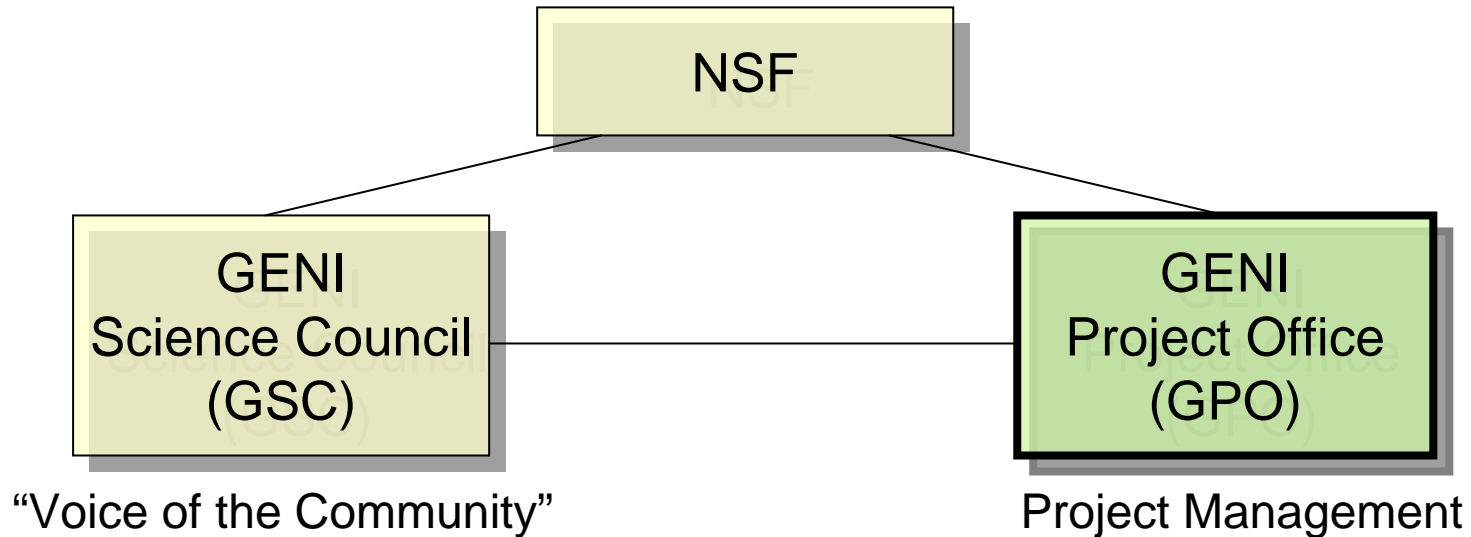
# GENI is a Huge Opportunity

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- GENI is an unbelievably exciting project for the community - a chance like this arises only once a generation and opens up major opportunities for our community to once again make history.
- We believe the whole community will pitch in and build GENI together. Our vision is for a very lean, fast-moving GPO, with substantially all design and construction work performed by academic and industry research teams.
- We'd like the community to start building prototypes immediately, within a GENI project framework that is open, transparent, and broadly inclusive.



# What is the GENI Project Office?



## Key Roles and Responsibilities

### GSC

- Definitive source of “what we need in GENI”
- Technical advisory & oversight to GPO
- Authors of GENI Science Plan

### GPO

- Project management and execution
- GENI architecture and system engineering
- Cost & schedule estimates for construction
- Authors of GENI facility construction plan
- Home for Working Groups



# GPO Leadership



Chip Elliott  
Project Director



(Community Nominee)  
Engineering Architect



Kristin Rauschenbach  
Substrate Architect



Henry Yeh  
Project Manager



Heidi Picher Dempsey  
Operations &  
Integration Director



Craig Partridge  
Outreach Director



# Key GPO Objectives

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- **Successfully complete the NSF's MREFC Planning Phase;** in particular, prepare all necessary documentation and pass PDR / FDR with flying colors. The GPO must produce a plan that provides very high assurance that GENI can be constructed on time and within budget.
- **Identify and drive down technical risk in GENI construction / operation,** primarily by means of analyses, prototypes, experiments, and trial integrations performed by the research community.
- **Use all available GPO processes to help build and strengthen the GENI research community,** greatly increase community buy-in, and perform broad outreach to academia, industry, and other important entities.



# GPO's Open, Transparent, & Fair Process

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- All prototyping and construction will be performed by the research community (academia & industry)
- Openness will be emphasized
  - Design process will be open, transparent, and broadly inclusive
  - Open-source solutions will be strongly preferred
- GPO will be fair and even-handed
  - BBN brings no technology to the table
  - BBN does not intend to write any GENI software, nor does it envision bidding on any prototyping or construction activities (but “never say never”)
  - If BBN does create any GENI technology, it will be made public at no cost



# GPO's Project Management Approach

Very Lean GPO – Leads Planning & Helps Organize Community

## GENI Project Office (GPO)

System  
Engineering

Analyses  
& Ideas

Prototypes

Integration  
Activities

Experiments  
& Trials

- GPO provides . . .
  - Organizational experience & programmatic rigor
  - Project management
  - High-level architecture, engineering, and operations planning
- Academic & industrial community provides . . .
  - Virtually all technical work
  - Detailed design for all subsystems
  - Analyses, prototypes, integration labs, experiments, . .

Community continues to act as the source of GENI planning and technological innovation, but within framework of GPO-run processes.



# What about Today's GENI Working Groups?

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- Working Groups continue to create design
  - GPO may redefine the set of working groups to better match design/construction problems
  - GPO will specify clear governance rules (open membership, rotating chairs, etc.)
  - Each group will be augmented by a System Engineer who draws up detailed engineering and budget plans
  - Progress checked often by GPO & GSC
- Today's plans form the starting point for GENI going forward



# GENI Needs Rapid Prototypes

Work should begin immediately by multiple teams

GENI's envisioned technology *TODAY*

## TRL NASA Definition, adapted to GENI Context

- |   |  |
|---|--|
| 1 | Basic principles observed and reported.  |
| 2 | Technology concept and/or application formulated.  |
| 3 | Analytical and experimental critical function and/or characteristic proof-of-concept achieved in a laboratory environment. |
| 4 | Component and/or breadboard validated in a laboratory environment.   |
| 5 | Component and/or breadboard validated in a relevant environment.   |
| 6 | System/subsystem model or prototype demonstration in a relevant lab environment.   |
| 7 | System prototype demonstrated in an end-to-end "GENI-like" environment.  |
| 8 | Actual system completed and demonstrated in the end-to-end GENI environment.   |
| 9 | Actual system "flight proven" through successful end-to-end GENI experiments.  |

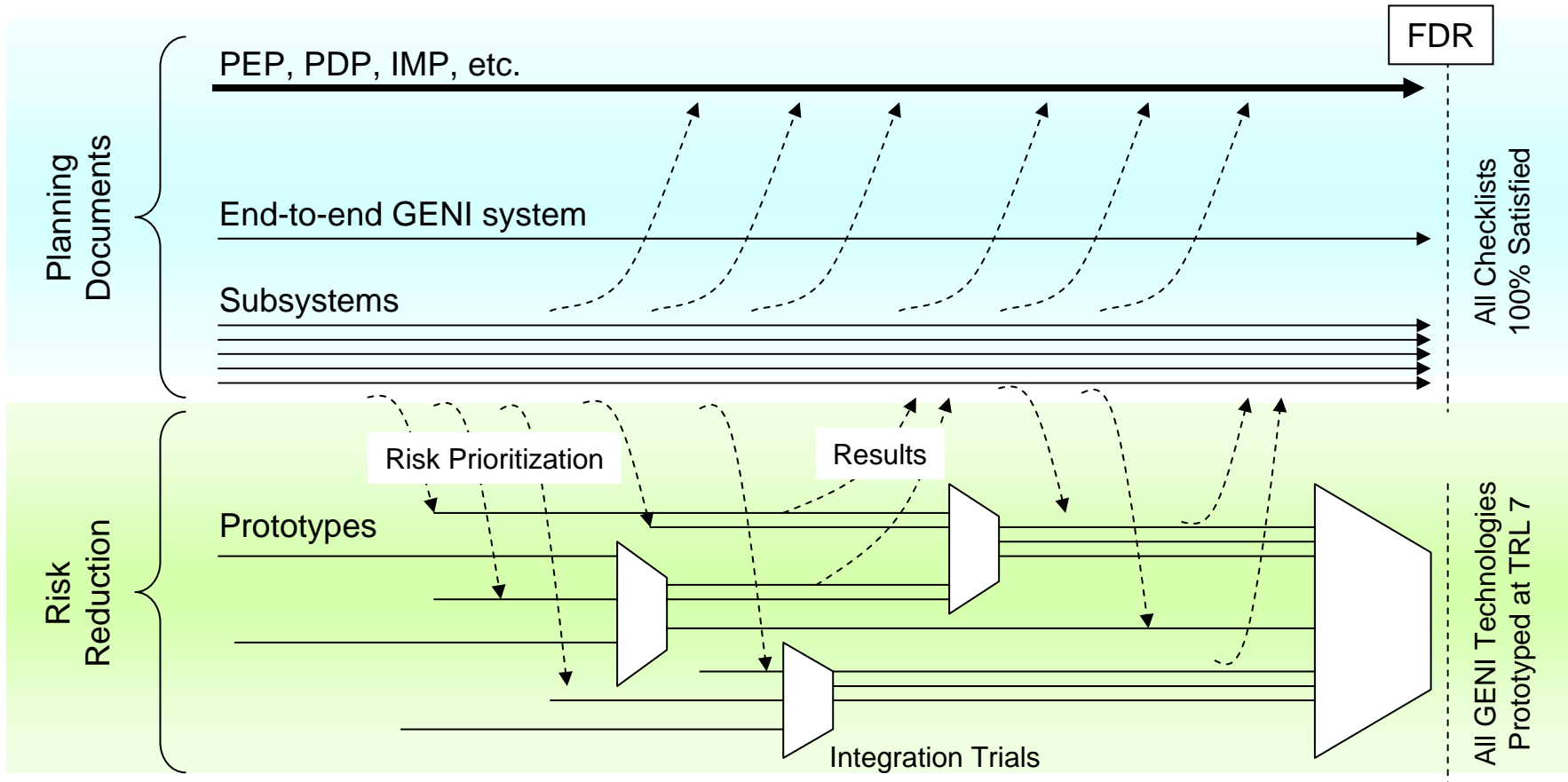
GENI needs to be *here* @ Final Design Review



# GENI's Planning Phase

## Prototyping while refining design & budget

“Paper” Design Documents, Schedule, Budget, etc.



Academic / Industrial Prototyping, Integration, Experiments



# How the GPO Will Fund Rapid Prototyping and Experiments

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- Needs are driven by “long poles” in GENI construction – the high risk technology
  - High risks are identified at 4-month intervals by the GSC / GPO review panel
  - GPO issues RFPs multiple times per year
  - Proposals are merit-reviewed by NSF-style panels
  - GPO continuously monitors contracts for performance
  - Quick decisions and quick funding are essential
- Goal is to have multiple research teams up to speed in each area before construction begins, who can then bid on the big construction contracts



# What the GPO Needs from You

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- GENI Science Council (GSC)
  - A compelling Research Plan that drives system requirements
  - Mutually agreed GSC / GPO roles & responsibilities
  - Quick agreement on a Planning Phase schedule
- Universities
  - Active engagement in GENI definition & planning
  - Proposals for analysis, system prototypes, & experiments that aggressively drive down GENI construction risk
- Industry
  - Active engagement in GENI definition & planning
  - Active collaboration with University research teams
  - Technology and labor donations
- NSF
  - Immediate funding for community prototyping & experiments



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Questions ? Concerns ?  
Suggestions for Improvement ?

Thank You



# Backup Slides

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# GENI will be Planned and Built Within the NSF's MREFC Process . . .

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- NSF's *Guidelines for Planning and Managing the Major Research Equipment and Facilities Construction (MREFC) Account*, November 22, 2005, defines MREFC stages and requirements.
- Relatively traditional “plan, build, operate” model for large-scale facility construction, e.g., radio telescope or particle accelerator.
- Intended to provide very high assurance that resultant project will be built on time, on budget, and provide the desired functionality.
- Since this level of assurance is absolutely essential for overall project success, the GPO takes the MREFC process and its requirements very seriously.



## . . . and GENI will be Planned and Built Within Computer Science “Systems Culture”

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- Computer Science researchers have been extraordinarily successful with a rapid-paced, “eat what you cook” approach to creating highly innovative new technology and systems.
- With care, this development style meshes smoothly with the more traditional approach prescribed by NSF’s MREFC process.
- To this end, GPO will fund large-scale prototyping and experimentation during the GENI Planning Phase to engage the CS community on its own terms, and to reduce facility construction risk, and will act as a buffer between styles.



# Critical Path in GENI Planning Phase

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- Near-term
  - Derive requirements from GENI Research Plan
  - Establish agreed end-to-end architecture and phased construction framework
  - Determine current readiness
- After these tasks are in hand
  - Critical path almost surely dominated by technology risk reduction timelines
- Tension between careful risk management and natural urge to begin construction quickly
  - NSF, community, GPO must work together to find right balance



# Many Types of Risk Reduction

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- **Analyses & Ideas** – Many types of technical risk can be addressed quickly and cheaply via analysis or “idea papers.” We expect to issue many such subcontracts, primarily to academia. The GPO will fund these tasks via a streamlined process that does not require peer review.
- **Prototypes** – Some forms of substantial technical risk are best addressed by building prototypes and demonstrating basic functionality. We expect to issue a variety of such subcontracts, primarily to academia. Awards will be made via a merit review process similar to that used by NSF.
- **Integration Labs** – Multiple integration facilities will be created in academia or industry labs, in which end-to-end GENI trials can be performed. These trials will incorporate a representative sample of the full GENI facility, populated with prototypes built during the planning phase. These facilities will likely be staffed by industrial researchers, and will be procured by the same process as for prototypes.
- **Experiments & Trials** – Independent evaluation of prototypes and end-to-end facilities will also be subcontracted, primarily to academia. These will allow a wide variety of research teams to become familiar with GENI technology and to provide input on its evolution.