



GENI

Global Environment for Network Innovations

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www.geni.net

Clearing house for all GENI news and documents



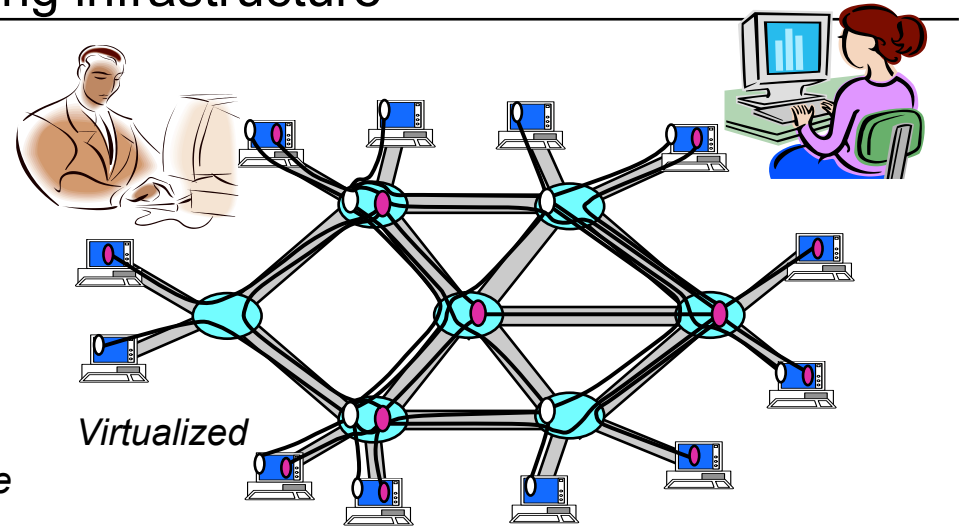
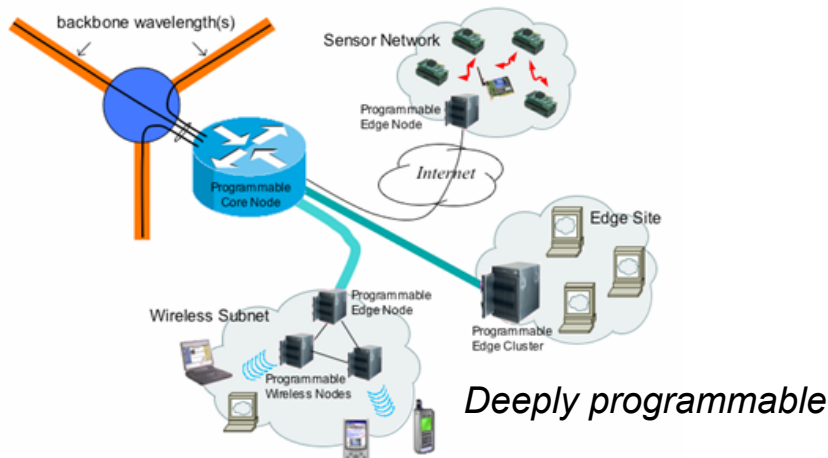
Outline

- What is GENI?
- The GENI system concept
- GENI Spiral 1
- How can you participate?

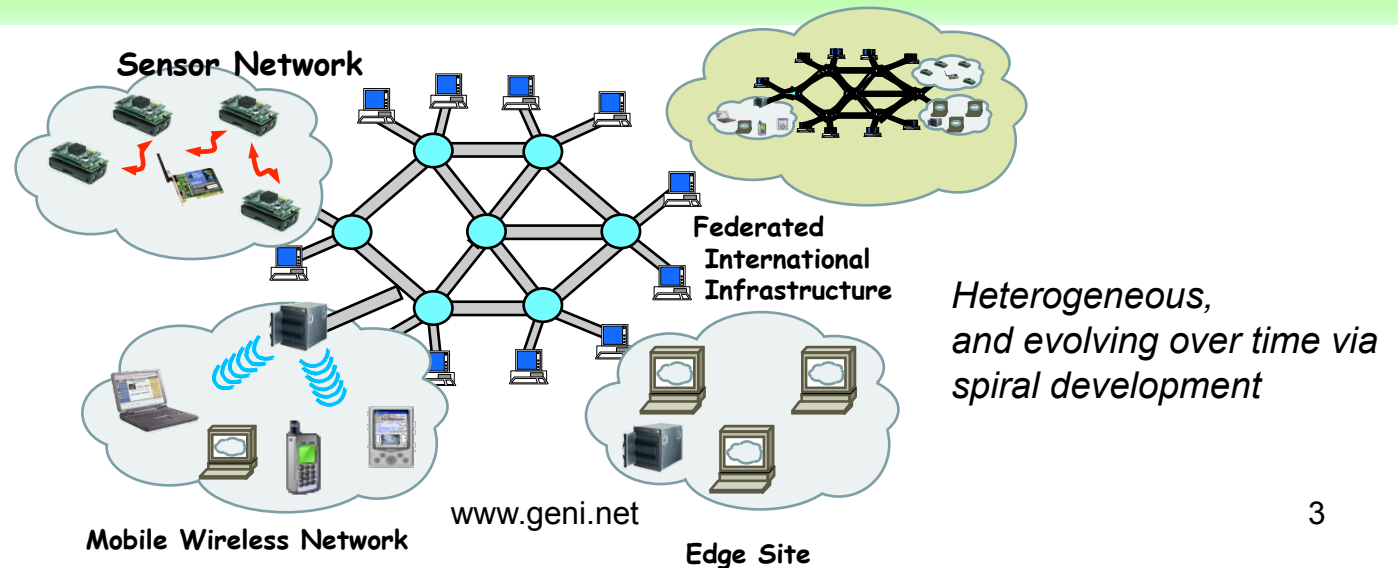


The GENI Vision

A national-scale suite of facilities to explore radical designs for a future global networking infrastructure

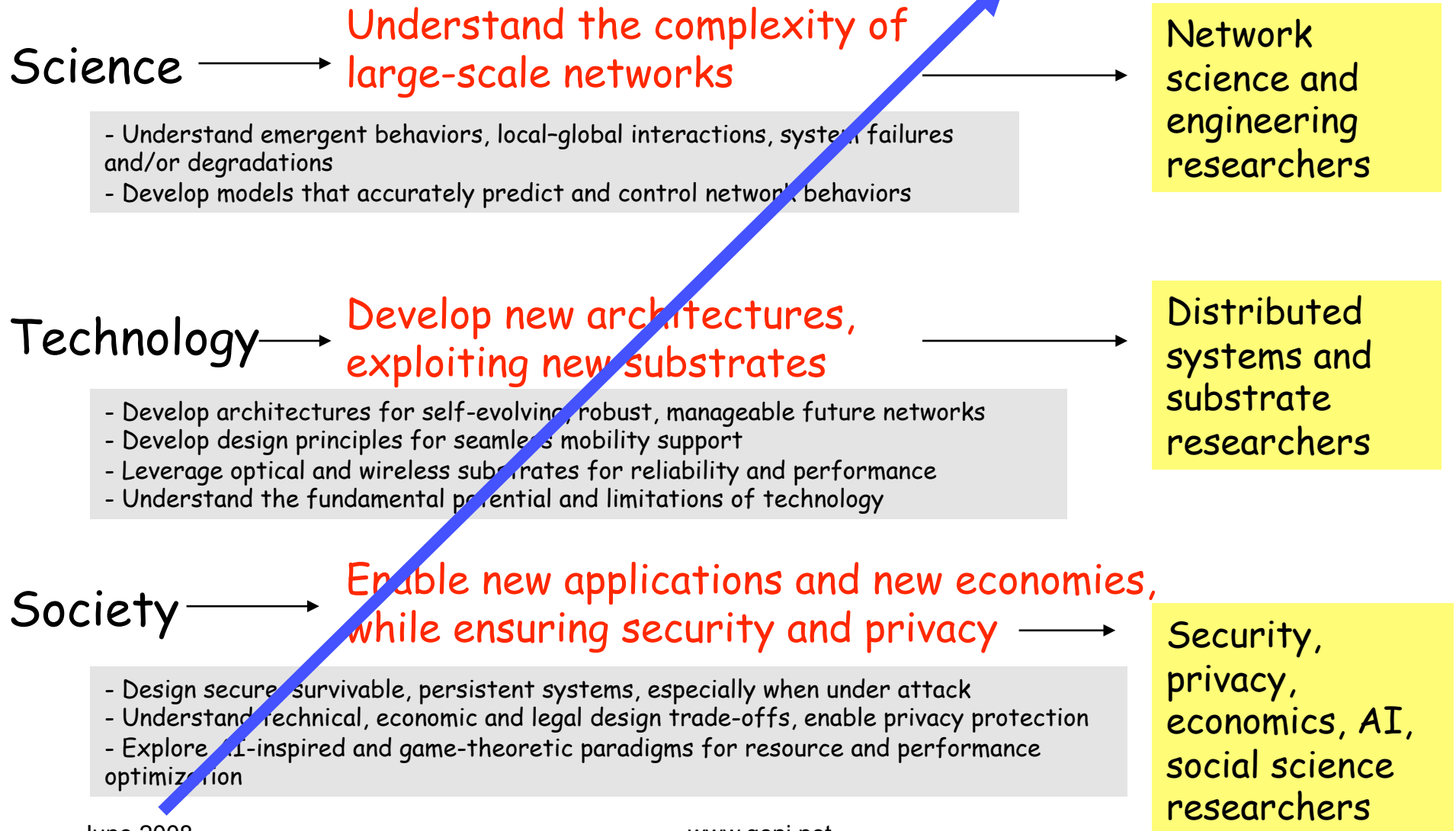


Programmable & federated, with end-to-end virtualized “slices”





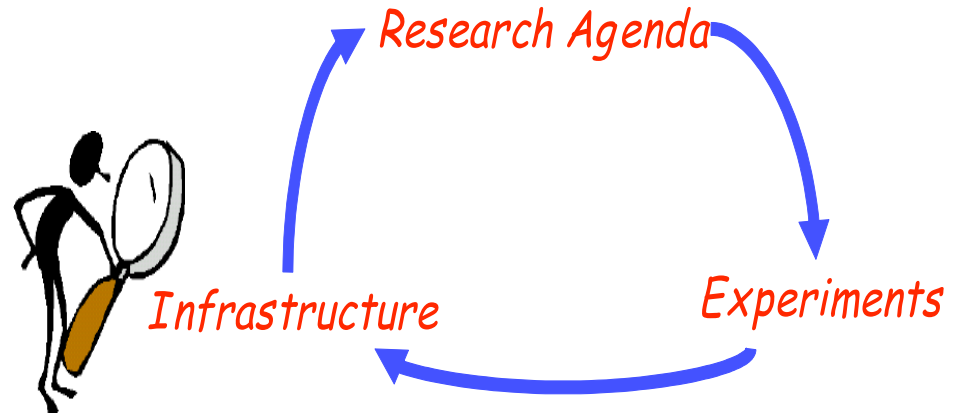
GENI supports Fundamental Challenges Network Science & Engineering (NetSE)





Research Agenda to Experiments to Infrastructure

- Research agenda
 - Identifies fundamental questions
 - Drives a set of experiments to validate theories and models
- Experiments & requirements
 - Drives what infrastructure and facilities are needed
- Infrastructure could range from
 - Existing Internet, existing testbeds, federation of testbeds, something brand new (from small to large), federation of all of the above, to federation with international efforts
 - No pre-ordained outcome



Existing Input

- | | |
|---|--|
| <ul style="list-style-type: none">• Clark et al. planning document for Global Environment for Network Innovations• Shenker et al. “I Dream of GENI” document• Kearns and Forrest ISAT study• Feigenbaum, Mitzenmacher, and others on Theory of Networked Computation | <ul style="list-style-type: none">• Hendler and others in Web Science• Ruzena Bajcsy, Fran Berman, and others on CS-plus-Social Sciences• NSF/OECD Workshop “Social and Economic Factors Shaping the Future of the Internet”• Current NSF “networking” programs<ul style="list-style-type: none">– FIND, SING, NGNI |
|---|--|



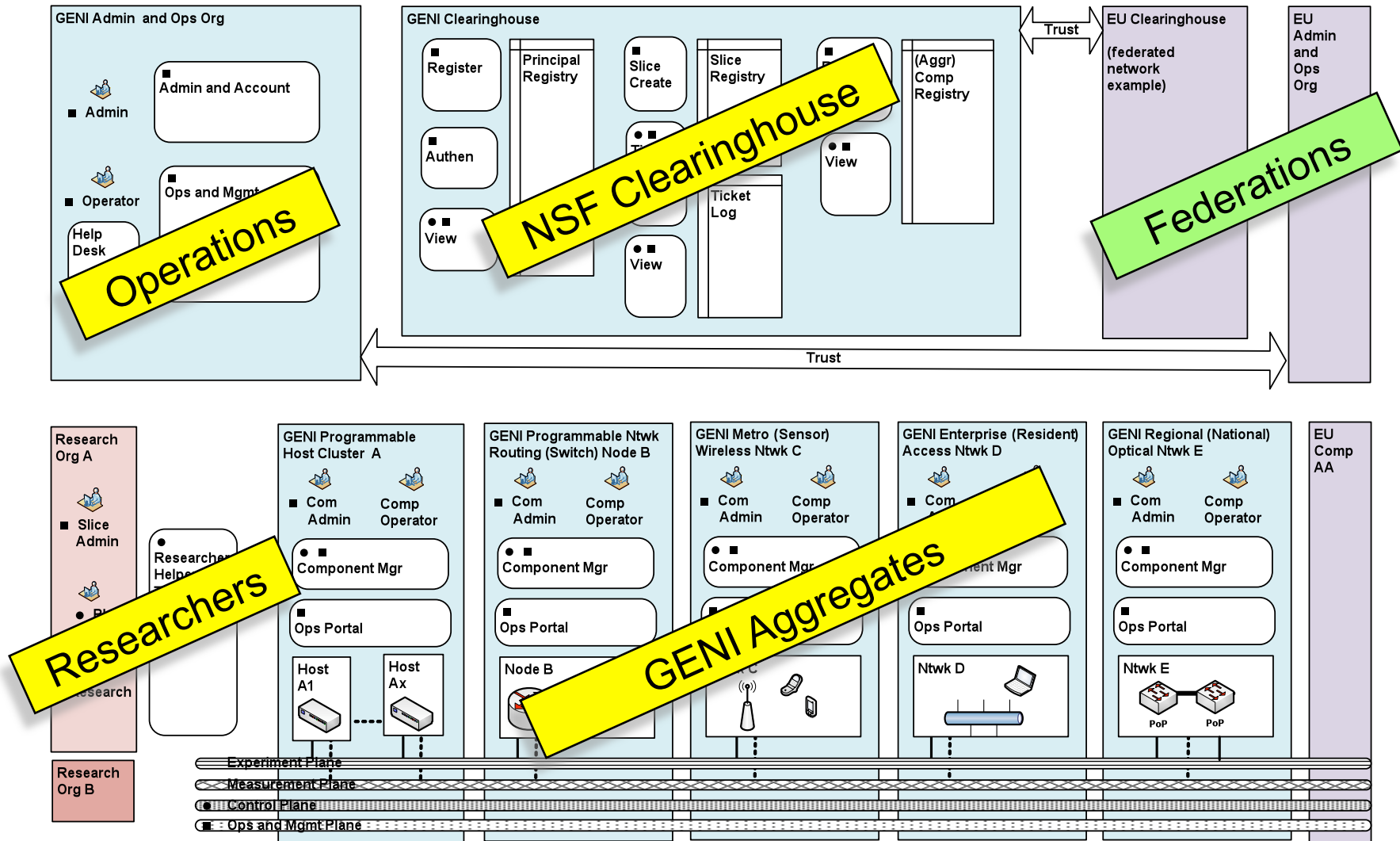
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GENI System Decomposition (simplified)

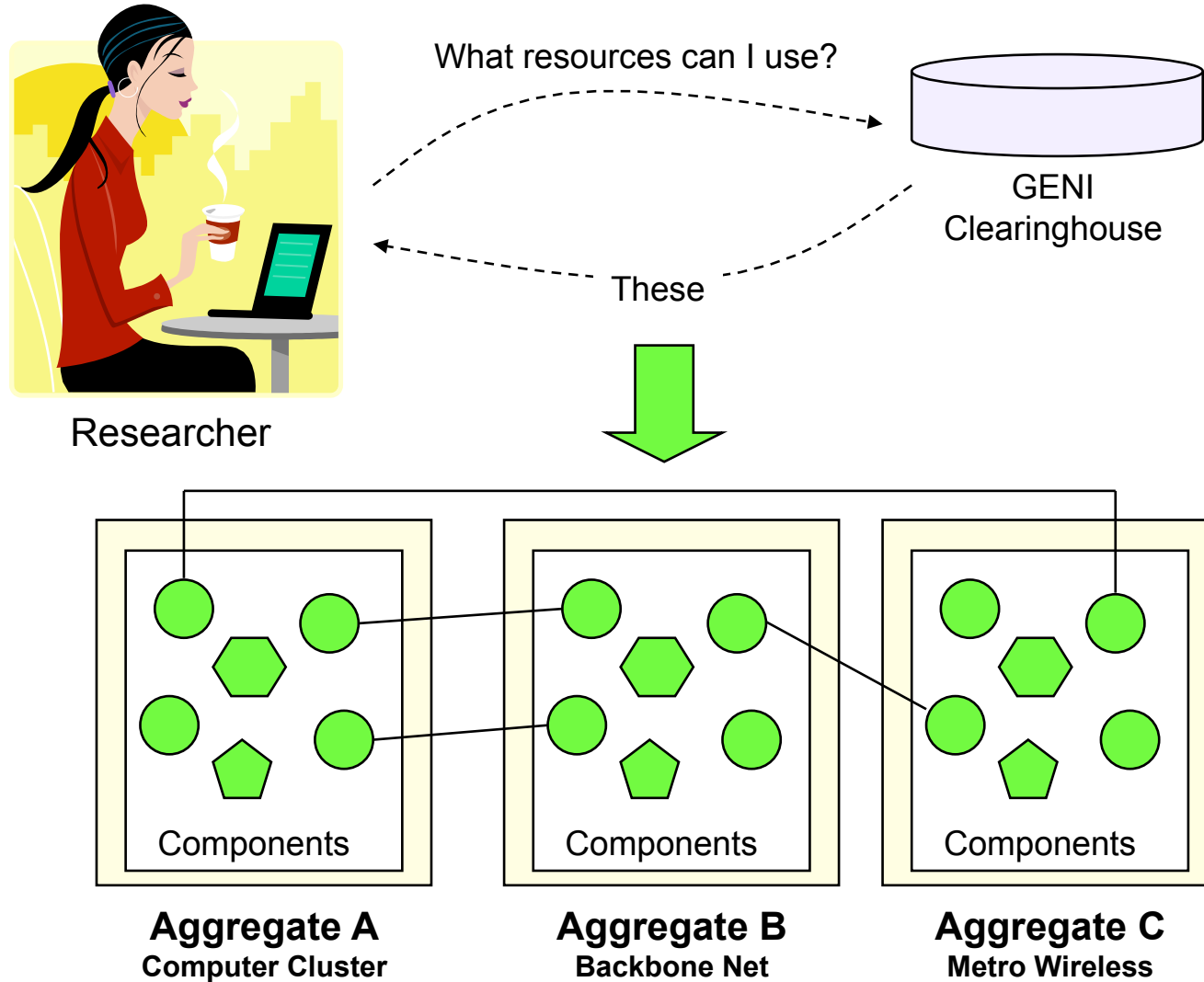
Engineering analysis drives Spiral 1 integration





Resource discovery

Aggregates publish resources, schedules, etc., via clearinghouses

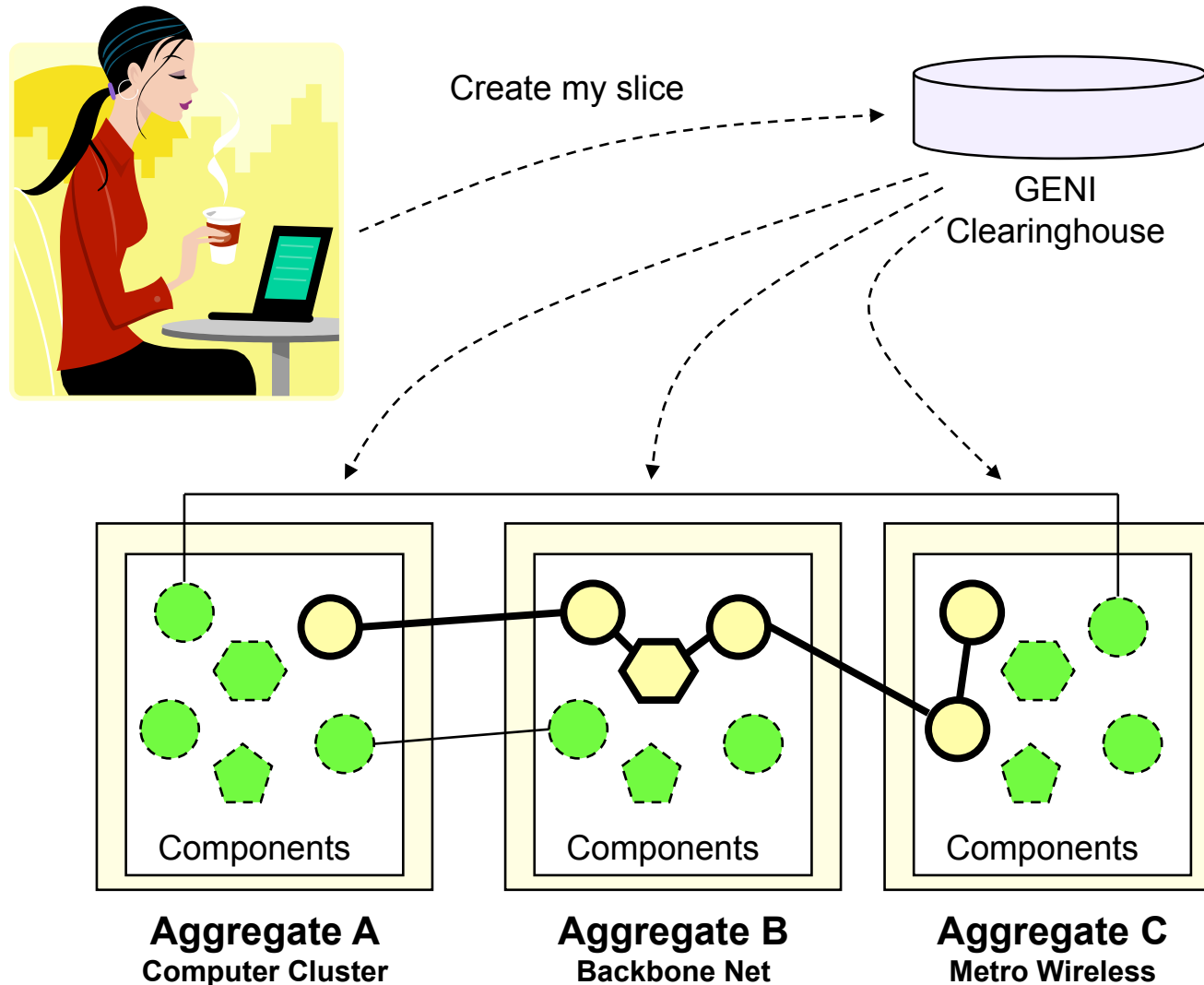




Slice creation

Clearinghouse checks credentials & enforces policy

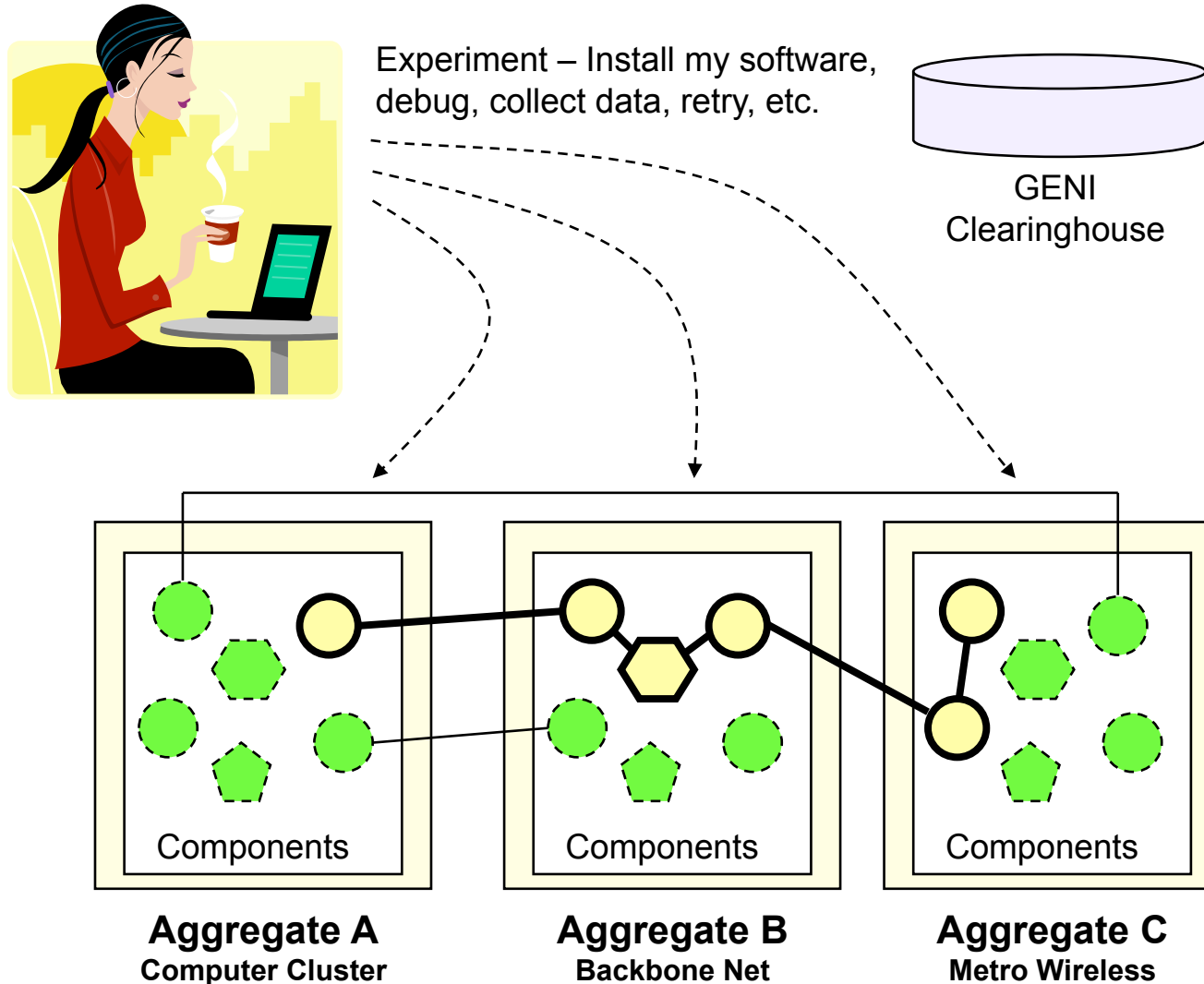
Aggregates allocate resources & create topologies





Experimentation

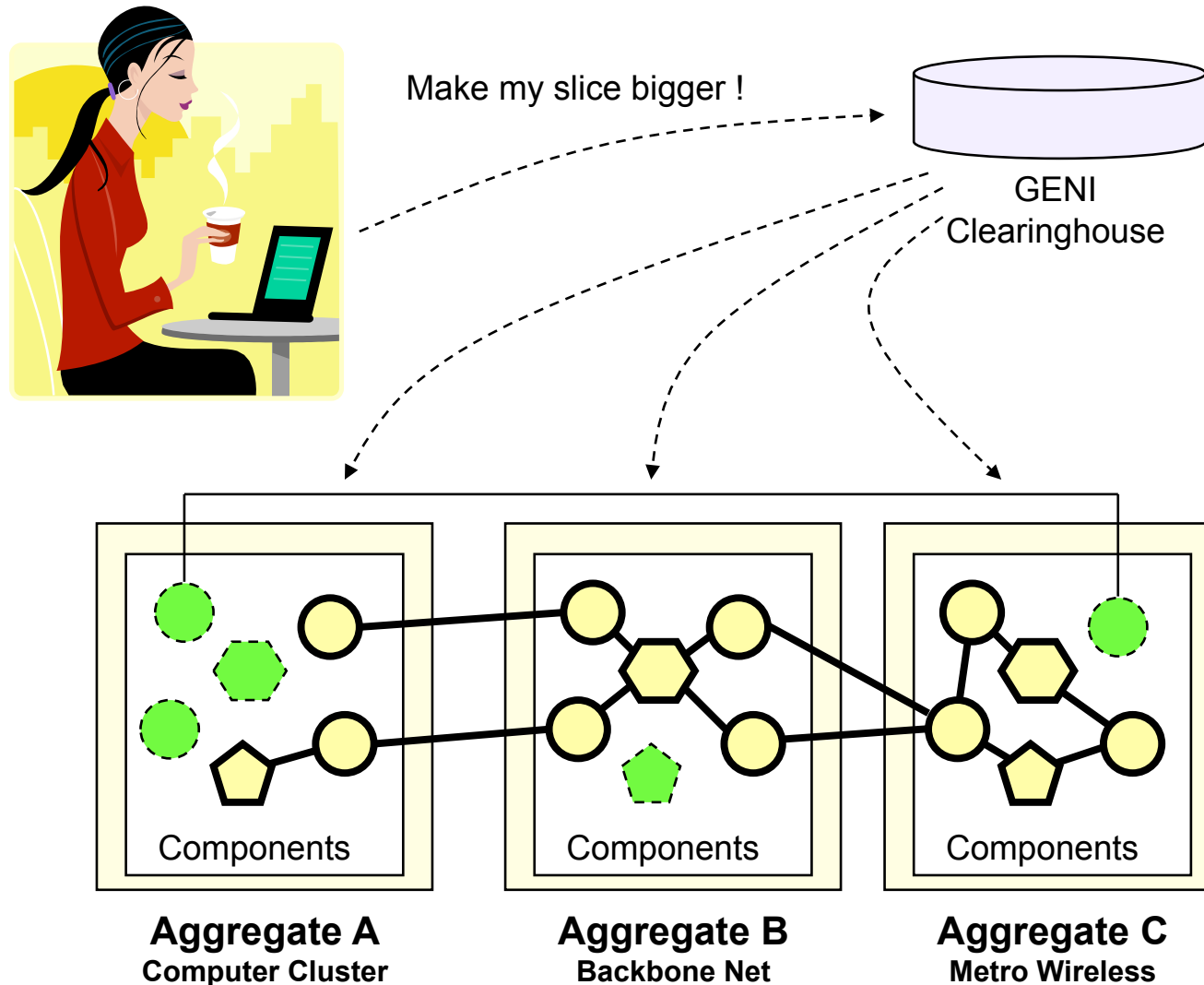
Researcher loads software, debugs, collects measurements





Slice growth & revision

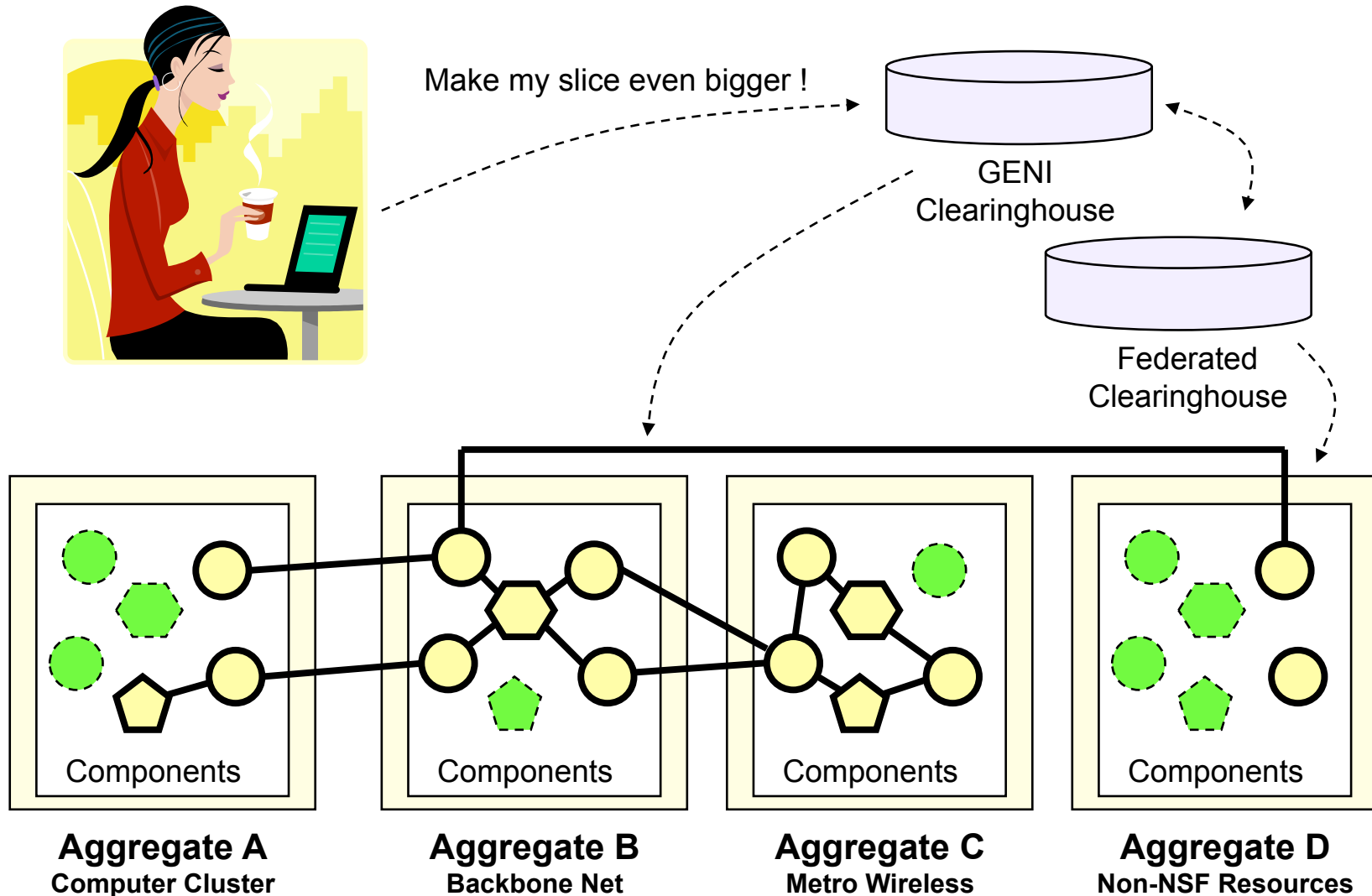
Allows successful, long-running experiments to grow larger





Federation of Clearinghouses

Growth path to international, semi-private, and commercial GENIs

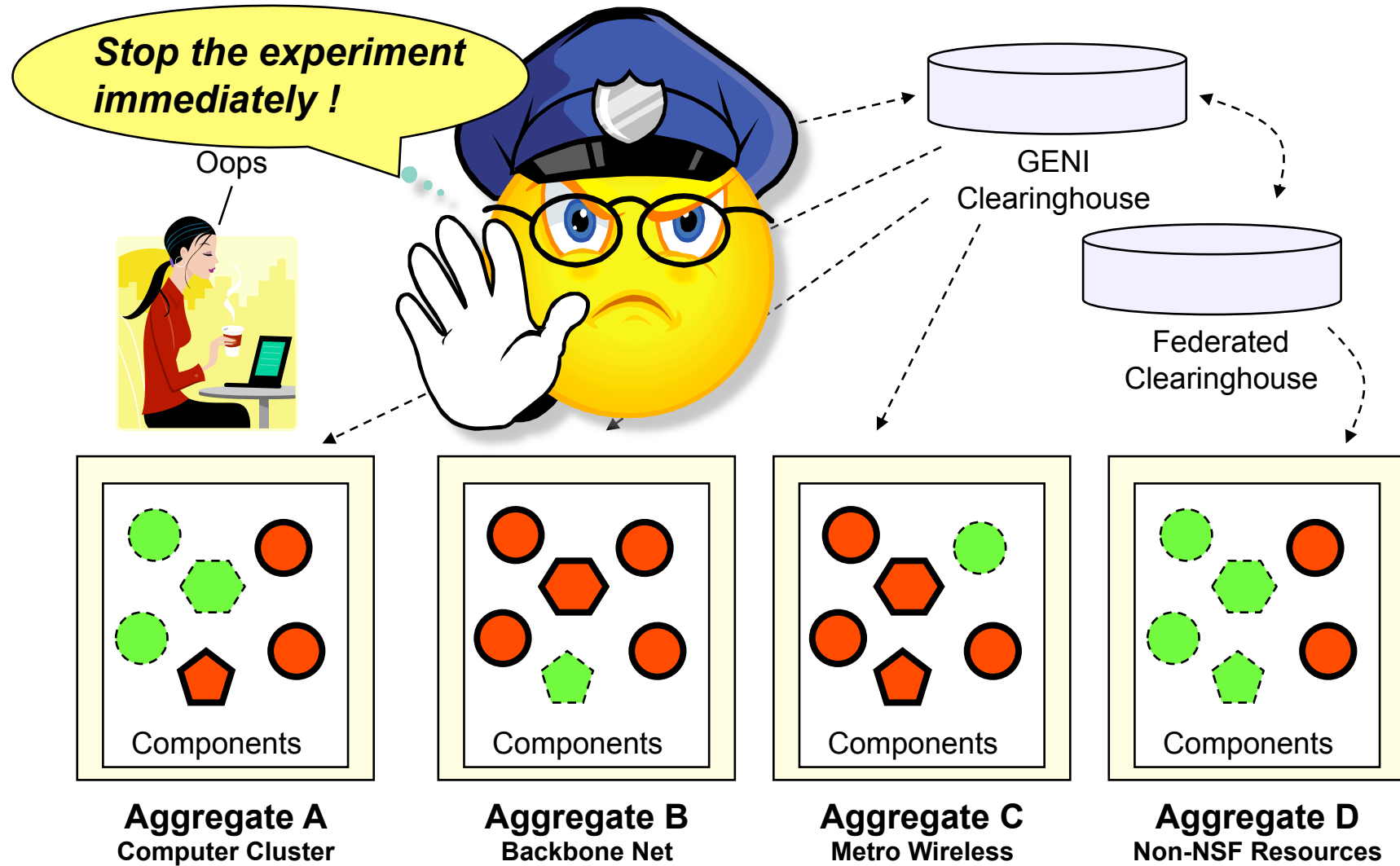




Operations & Management

Always present in background for usual reasons

Will need an 'emergency shutdown' mechanism





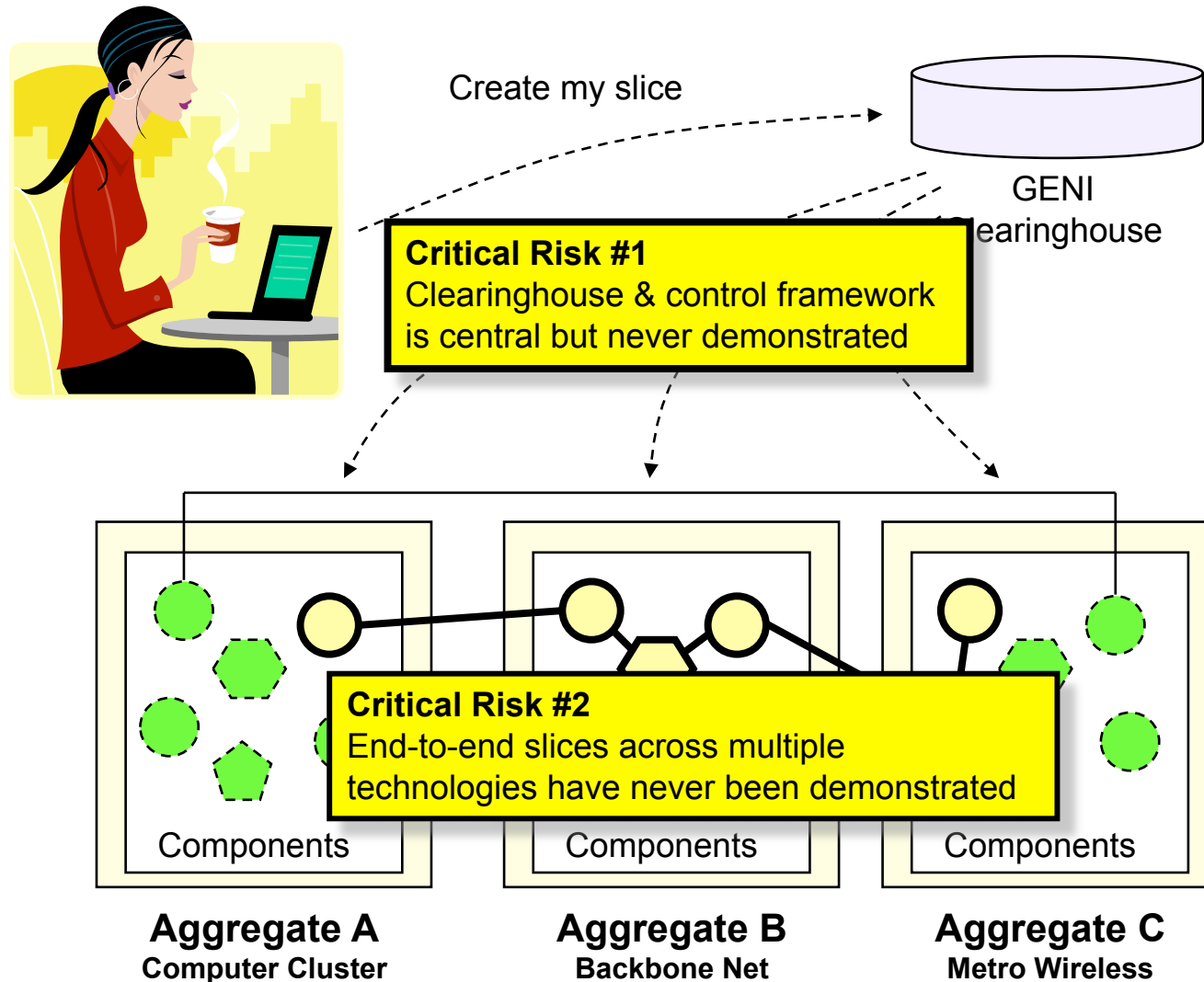
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GENI's Critical Technical Risks

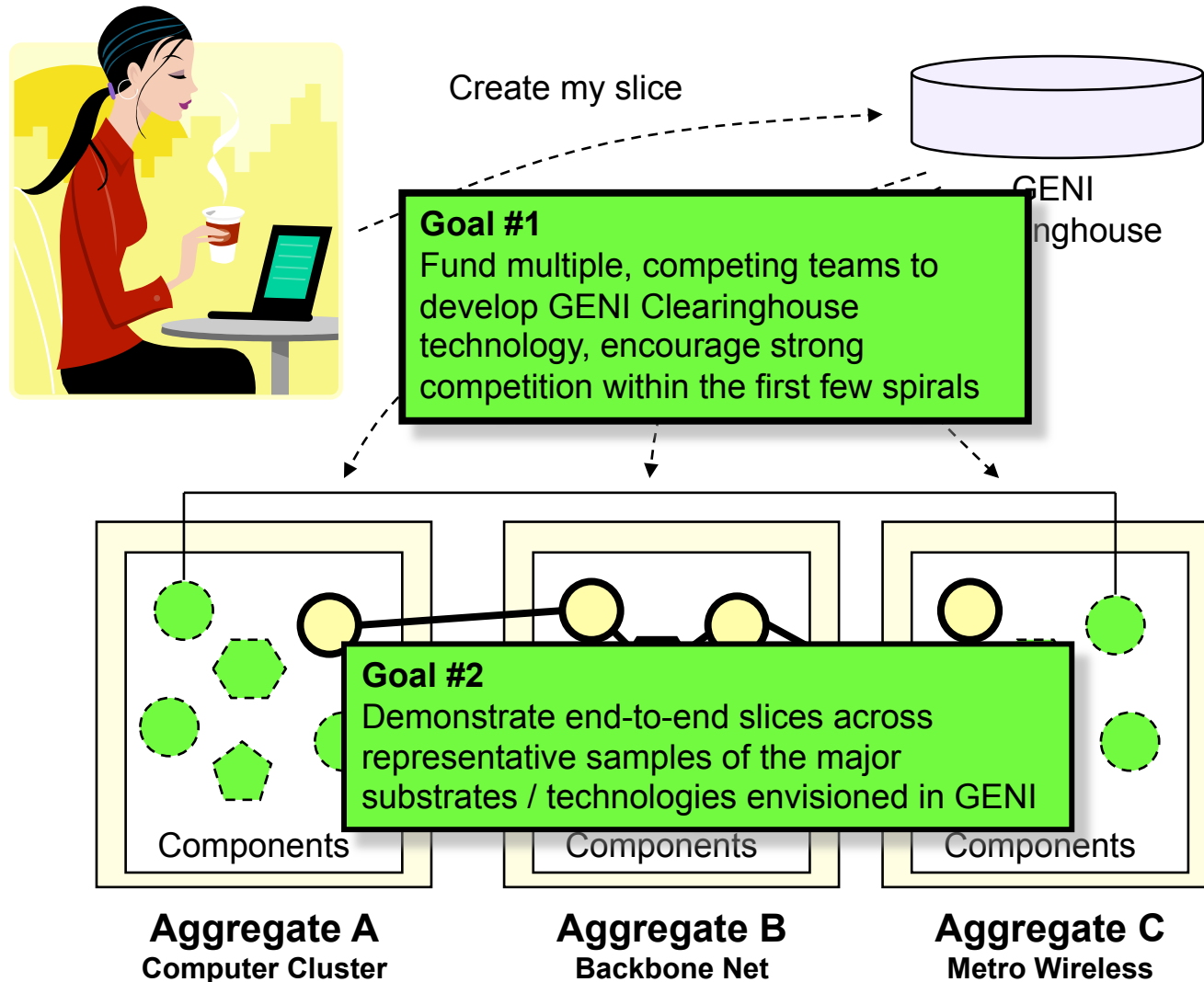
These risks drive the Prototyping Goals for GENI Spiral 1





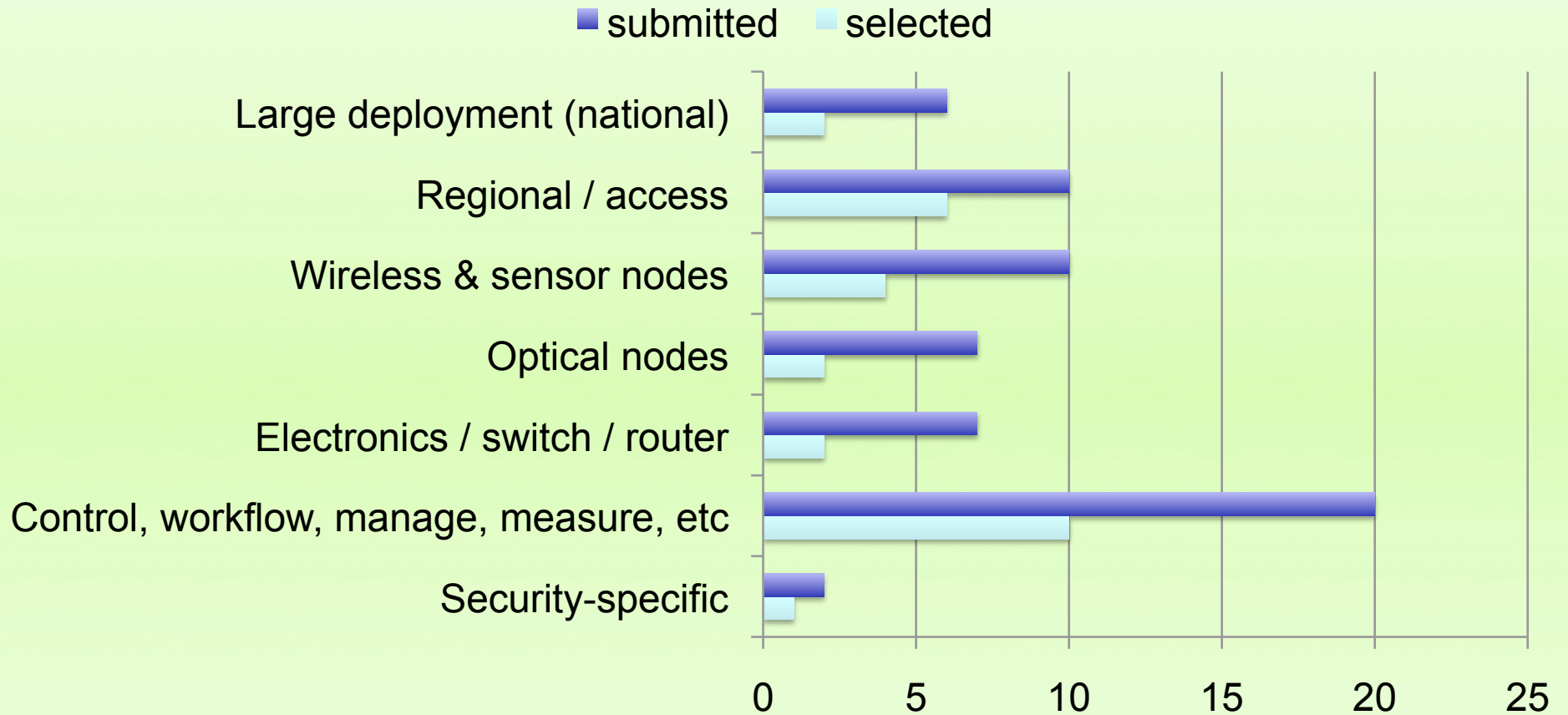
Key Goals for GENI Spiral 1

Drive down the critical technical risks in GENI's concept





1st GENI Solicitation – proposal areas





GENI Spiral 1

- Provides the very first, national-scale prototype of an interoperable facility suite for Network Science and Engineering experiments
- Creates an end-to-end GENI prototype in 6-12 months with broad academic and industrial participation, while encouraging strong competition in the design and implementation of GENI's control framework and clearinghouse
- Includes multiple national backbones and regional optical networks, campuses, compute and storage clusters, metropolitan wireless and sensor networks, instrumentation and measurement, and user opt-in
- Because the GENI control framework software presents very high technical and programmatic risk, the GPO intends to fund multiple, competing teams to integrate and demonstrate competing versions of the control software in Spiral 1

Nothing like GENI has ever existed; the integrated, end-to-end, virtualized, and sliceable set of facilities created in Spiral 1 will be entirely novel.



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GENI Working Groups (WGs)

Open to all, participate via **geni.net** email lists

- **Substrates**

All hardware, real-estate, facilities, etc., required for the GENI facility (including optical networks, wireless, computers, etc.) Includes Operational Expenses for the facility except Operations & Management costs.

- **Control Framework with Federation**

Written definitions of the core GENI mechanisms for providing experimental control of a node or collection of nodes. The very earliest version must incorporate federation.

- **Experiment Workflow**

Tools and mechanisms by which a researcher designs and performs experiments using GENI. Includes all user interfaces for researchers, as well as data collection, archiving, etc.

- **User Opt-In**

How do “real users” (not researchers) participate in GENI. Includes both mechanisms and considerations such as privacy, etc.

- **Operations, Management, and Security**

How do operators provision, operate, manage, and trouble-shoot GENI? Includes all mechanisms for securely operating the facility, and Operations & Management costs.



GENI Engineering Conferences

Meet every 4 months to review progress together

- **3rd meeting Oct. 28-30, 2008 in Palo Alto, open to all**
 - Reviews current GENI status, Working Group meetings
 - Also discuss GPO solicitation, how to submit a proposal, evaluation process & criteria, how much money, etc.
 - **Travel grants** to US academics for participant diversity
- Subsequent Meetings, open to all who fit in the room
 - Held at regular 4-month periods
 - Held on / near university campuses (volunteers?)
 - All GPO-funded teams required to participate
 - Systematic, open review of each Working Group status (all documents and prototypes / trials / etc.)
 - Also time for Working Groups to meet face-to-face
 - Results in prioritized list for next round of prototype funding areas (priorities decided by NetSE Council and GPO)



GPO Solicitations

Academic-industrial teams favored but not required

- **First solicitation closed recently**
 - February 2008
 - Over 70 proposals received
- **Second solicitation planned for late 2008/early2009**
- What kinds of proposals do we solicit?
 - Analyses & idea papers
 - Prototypes of high-risk GENI technology
 - Integrations and trials of prototypes
- How are proposals judged?
 - Merit review
 - Joint academic / industrial teams will be favored but not required
 - Open source will be favored but not required
(IP licenses on www.geni.net)



GENI is a Huge Opportunity

- **GENI is an unbelievably exciting project for the community**
 - Our research community has changed the world profoundly. GENI opens up a space to do it again.
- **We believe the whole community will 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.
- **GENI Spiral 1 is now underway !**
 - within a GENI project framework that is open, transparent, and broadly inclusive.

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