



SENDs

*Science Enhanced
Network Domains and
Secure Social Spaces*

A Luddite's journey to Virtual Worlds

by Carl W. Hunt

"The Blogging Luddite"

Project Manager, The SENDs Project

Federal Consortium of Virtual Worlds Conference, May, 2011

Unclassified

Overview

- The backdrop – SENDS
- The task at hand – building a community
- The concept – an evolving idea
- Luddites and Virtual Worlds – a learning curve
- The vision – doing science in the virtual realm

The Future has Arrived

Why Cyberspace Operations and Security Must Change

- Threats* are more ad-hoc and self-organizing
 - Requires understanding of complexity/emergence
 - Counters will require same principles
 - ...based on local successes adaptively scaled upwards
 - ...tested through experimentation and science-based study
- Security must become more transdisciplinary
 - Defined through *Wicked Problem* techniques
 - Must reflect ecological interdependencies
 - ...and convergences of socio-technological perspectives
- Government-Industry approaches must synergize

* *And opportunities!*

Exchange and Emergence

Exchange

- Knowledge
- Goods/Services
- Social Insights

Dynamic Interaction

- Web-based Openness
- Constant Coevolution
- Self-organized Criticality

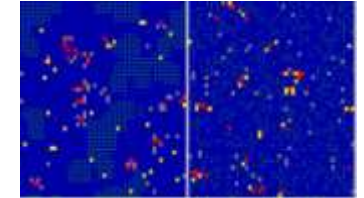
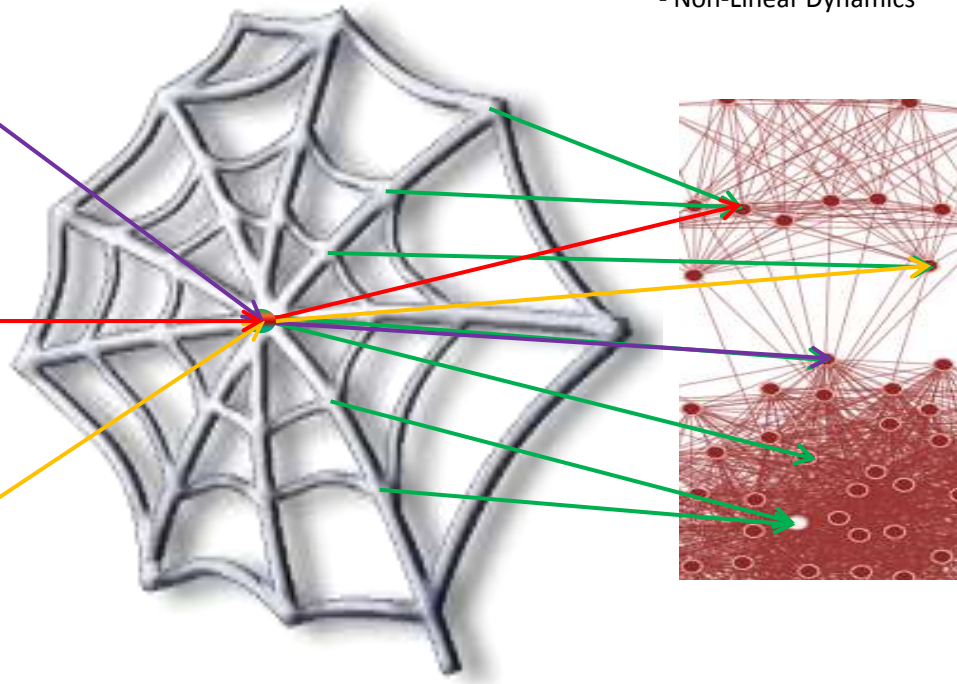
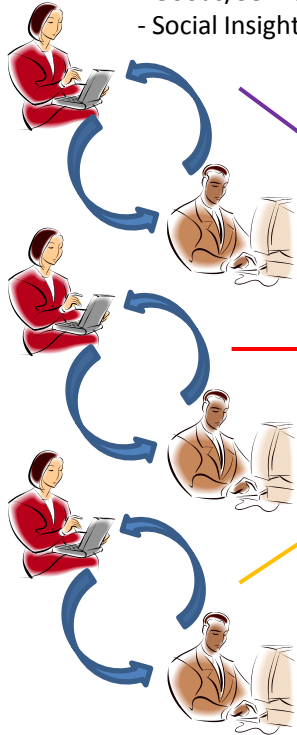
Self-Organization

- Move from Equilibrium
- Phase Transitions
- Non-Linear Dynamics

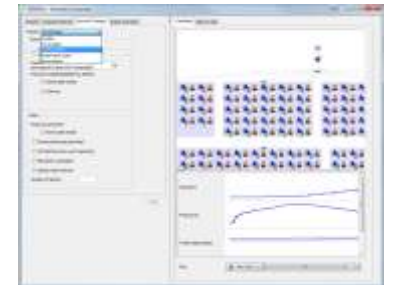
Emergence

- Novel Behaviors
- Fresh Opportunities
- New Organizations

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Typically
Unpredictable but
Inferred through
Simulations



Engine

Fueled by people
and information

Supporting Infrastructure

Framework for exchange; maximum
connectivity and rich interdependencies

Transmission

Lubricated by dynamic
and constant interaction

“Product”

Result of novel opportunity
and structure

← Continuous Dynamic Feedback →

The Gist of SENDS

- SENDS seeks to enhance Cyberspace Operations and Defense, holistically...
 - in the light of a ***socio-technological convergence***

Examines coevolving exchanges/interdependencies, seeking:

- Understanding of the future of security and prosperity
- Synergies of technological and social environments/behaviors
- Orientation/comprehension through M&S augmentations

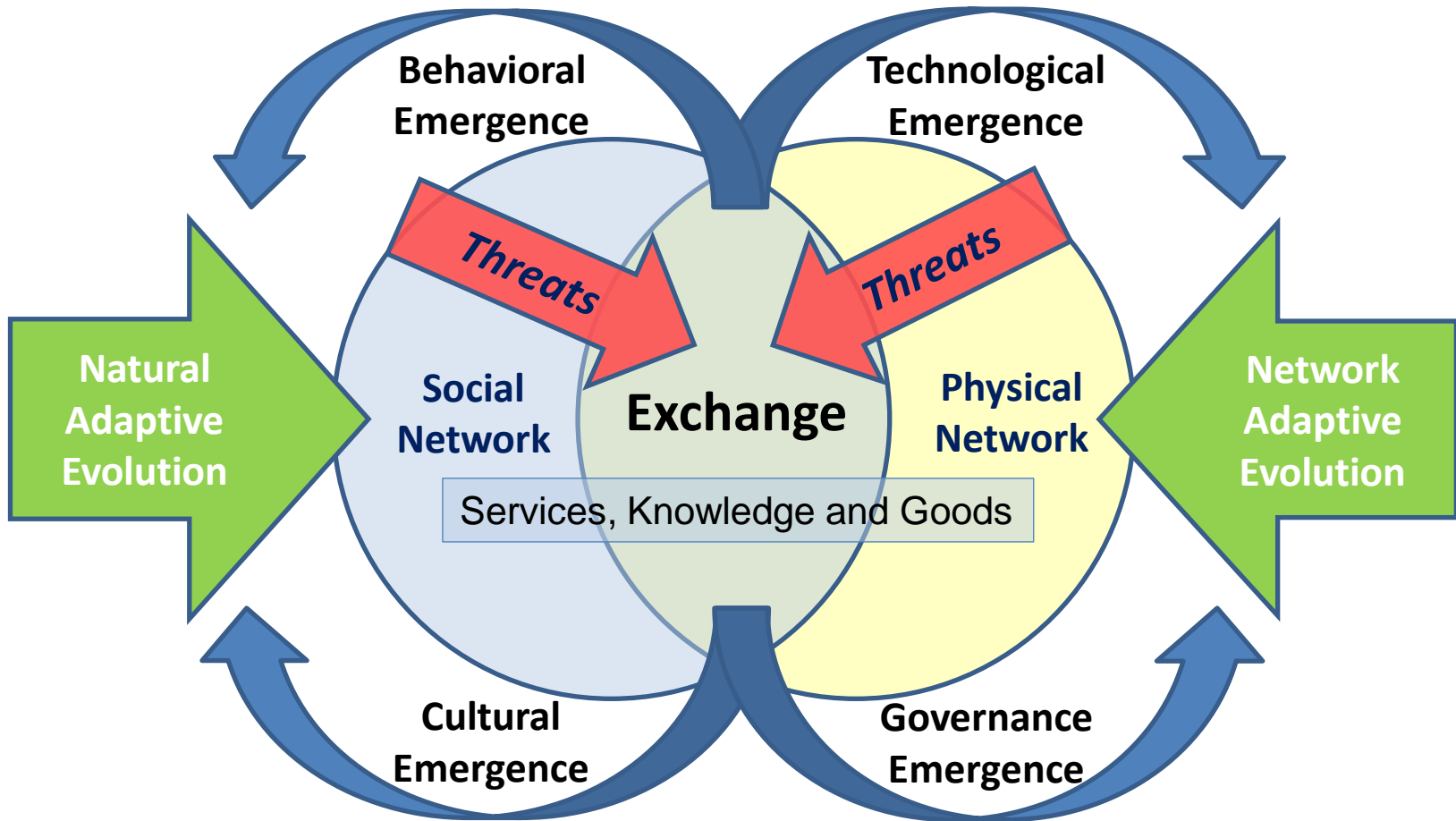
Leverages “transdisciplinary” perspectives in lab environments

- Investigates through an Exchange-Emergence-Inquiry model
- Employs M&S as a laboratory for exploring cyberspace
- Seeks solutions and resolutions through virtual extensions

- Command and control of cyberspace can now be augmented through ***emergence***

Cyberspace Ecosystem

The Lens for Examination of the Environment



The network must learn to coevolve and adapt on its own

Overview of SENDS Pilot Project Tasks

Science Enhanced Network Domains and Secure Social Spaces (SENDS) *explores cyberspace operations and defense through a collaborative, transdisciplinary, interagency approach that enforces the principles of science at its very core...*
...seeks understanding through emergent behaviors

Pilot Project Tasks

- Build and utilize advanced Modeling & Simulation in defense problem
- Prototype a Center for the Science of Cyberspace
- Review and Recommend Academic Curricula
- Expand and Enhance the SENDS Consortium

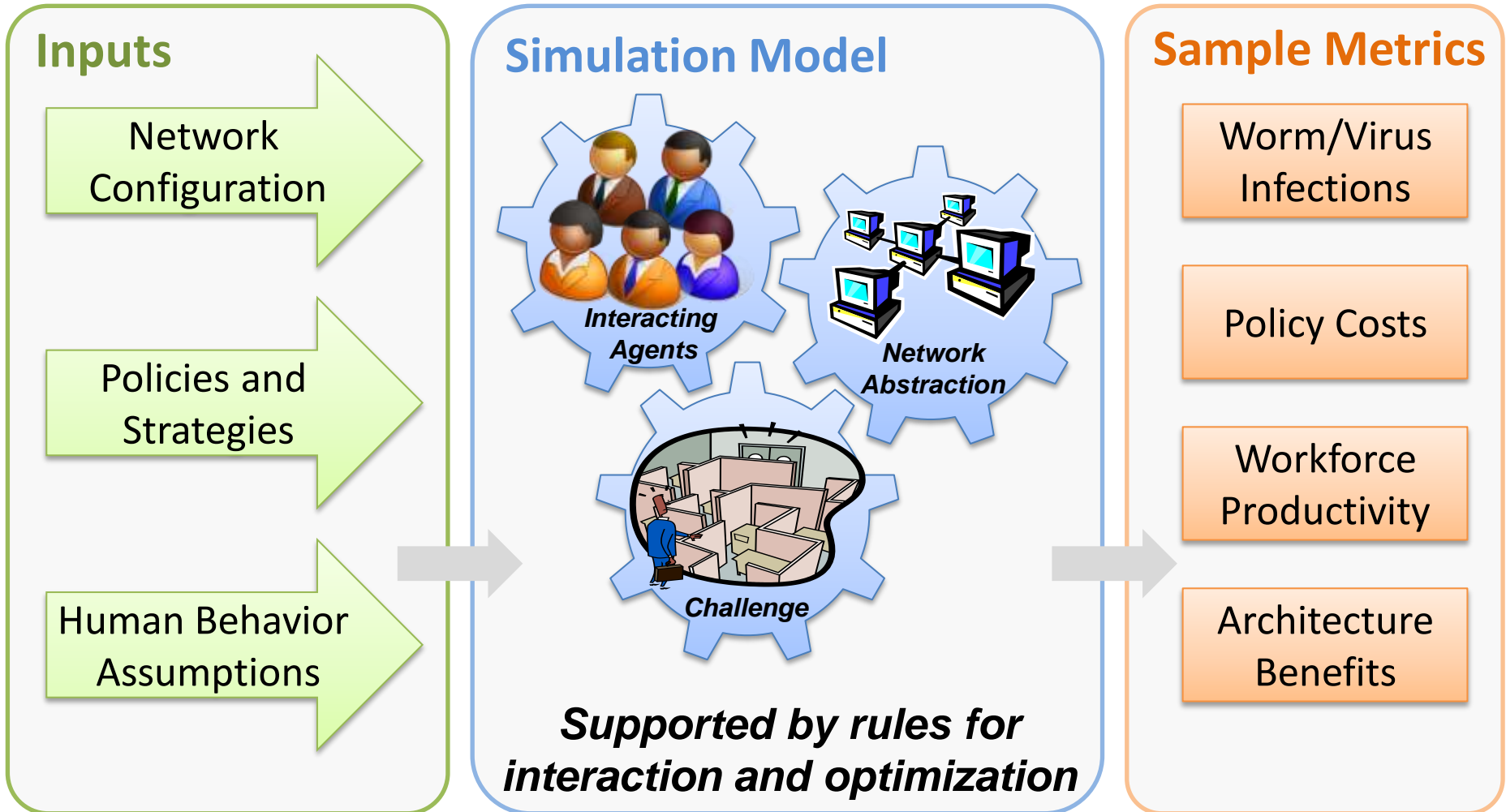
The M&S Task

SENDS Goal: Transform M&S into a deeper, more immersive and distributed, interactive capability. Provide a laboratory for cyberspace science...

“The form of publication of Mr. Dicken’s works must be attended with bad consequences. The reading of a novel is not now the undertaking it once was, a thing to be done occasionally on holiday and almost by stealth...It throws us into a state of unreal excitement, a trance, a dream, which we should be allowed to dream out, and then be sent back to the atmosphere of reality again, cured by our brief surfeit of the desire to indulge again soon in the same delirium of feverish interest. But now our dreams are mingled with our daily business.”

The North British Review, 1845, on the British Novel
quoted from *The Art of Immersion*, Frank Rose, Norton, 2011

M&S as a Laboratory



SENDSim

as of May 2011

Describe people and their network

Describe the current security strategy and explore new ones

Simulate attack scenarios for existing future threats

The screenshot displays the SENDSim interface with the following components:

- Control Panels:**
 - People:** Includes fields for Number of workers (250), Worker labor cost (50,000 dollars/person/year), Number of IT administrators (10), IT administrator labor cost (65,000 dollars/person/year), and Number of workgroups (10).
 - General:** Features sliders for Standard deviation of workgroup size (0-24), Social connectivity of workers (low-high), Average threat appreciation (low-high), Peer pressure strength (low-high), and Average tech sophistication (low-high).
 - Infection Discovery:** Includes Likelihood that an infection is reported to administrative staff (50%) and Average number of coworkers told.
- Network Animation:** A central visualization showing a network of workers and their interactions. Labels include "discovered infection", "heard of infection", and "infection removed". A worker's profile shows Threat Appreciation 0.33 and Knowledge 0.19.
- Graphs:** Three stacked line graphs showing "Infections" (a step function), "Productivity" (a curve that rises and plateaus), and "Cumulative Cost" (a curve that rises and plateaus).
- Time:** A playback control bar at the bottom with play, stop, and reset buttons.

Visualize simulated workforce enabling and reacting to malware infection

Key metrics reflect emergent risks and opportunities



The Center Task

SENDS Goal: Enhance the exploration and exploitation of cyberspace through massively distributed scientific study. Leverage the SENDS M&S laboratory for cyberspace science...

*“We live in a moment when two modes of popular culture are vying for supremacy: passivity versus **participation**. Mass media versus deep media. Mass media are industrial, **manufactured** by someone else and consumed by you. The deep-media experience is digital; it offers a way to participate.”*

The Art of Immersion, Frank Rose, Norton, 2011

Questions: Who **participates** in and **manufactures** (discovers) science? Who should?

SENDS Center for the Science of Cyberspace (SCSC)

- Purpose: Promote and advance the study of the Science of Cyberspace and its complement: the Science of Cyberspace Security
- Objectives:
 - Study, share and understand cyberspace through many disciplines and perspectives
 - Conduct research; test and apply through experimentation and prototypes, including virtual
 - Leverage SENDSim M&S laboratory environment
 - Provide an inclusive environment for transdisciplinary studies of cyberspace
 - Collaborate, share with similar efforts

SCSC, *cont'd*

- Task: Prototype a “Center for Cyberspace Study”
 - Now called SENDS Center for the Science of Cyberspace
- Attributes
 - Accommodates a distributed interactive audience
 - Provides a space to conduct business, share ideas and concepts, stay current on news and events
 - Increases ownership in the “new science”
 - Overcomes financial constraints
 - Documents progressiveness in cyberspace culture
 - Attracts diverse cultures
 - Demonstrates a place to build community
 - Avoids creating another monolithic “center”

The Beginning - SENDS Substrate:

<http://sendsonline.org>



Science Enhanced
Network Domains and
Secure Social Spaces

Home | Who We Are | Blog | Pilot Studies | Resources | Contact Us




SENDS seeks to explain and predict the nature of emergence and connectivity that cyberspace enables.




The Science of Cyberspace - Laying the Foundation White Paper

The focus on technological solutions to the defense and exploitation of cyberspace, while important, has distracted thinking about the broader issues of this remarkable interconnecting environment...



Science Enhanced Network Domains and Secure Social Spaces

"Globally accessible information networks enable rich interactions that create an environment for massive exchange of information, services and goods..." - Download the Latest Information Paper Here.



Academic Curricula Questionnaire

The SENDS Consortium developed a questionnaire on what is needed for a program of study supporting the science of cyberspace. We invite our readers to submit as much or as little as you are comfortable with. The questionnaire will close out on April 1st.

Goal

SENDS is integrating across the entire scientific landscape of study a transdisciplinary effort that seeks to explain and predict the nature of emergence and connectivity that cyberspace enables. The SENDS pilot will demonstrate that a "Science of Cyberspace" is just as necessary as the sciences that help us better understand life as a consequence and component of the physical environments of air, land, water and space.

Newest Blog Post

03/22/2011 SENDS Project Cyberspace Academics Questionnaire by Craig Harm: The academic perspective provides for the long-term potential success of our nation in cyberspace and indeed around the world. As we grow responsible cyberspace-empowered citizens...

SENDS in the News

Armed with Science People Empowering Technology: The Cyberspace Ecosystem

OhMyGov.com Interview with Dr. Carl Hunt

Pinellas County Science Center You Are The Future Of Cyberspace

Contact Us

Recent Blog Posts



Blog

22 SENDS Project Cyberspace Academics Questionnaire
posted by Craig Harm | category: Blog | comments: 0 Comments

The academic perspective provides for the long-term potential success of our nation in cyberspace and indeed around the world. As we grow responsible cyberspace-empowered citizens who better understand the nature of a connected environment and all that it entails, we may see the emergence of better, more sophisticated, and more productive behaviors of people who connect. No matter where they're from, they, in order to succeed with the electronic approach to cyberspace living, we need to address some important issues. We have discussed the

[Read More](#)

21 The Blogging Lucidite: Logos, Cyberspace and Golf
posted by Carl Hunt | category: Blog | comments: 0 Comments

Very soon, readers will see our new logo for SENDS throughout the entire website. As a preview, here it is. It was a bit more difficult to get to this new logo than I thought it would be when we first started doing SENDS. In fact, this is the fourth iteration in one website, but thanks to some expert design work from SENDS Executive Director and Major

[Read More](#)

14 The Laws of the Science of Cyberspace - A Beginning
posted by Craig Harm | category: Blog | comments: 0 Comments

By now, following our blog and web site, you have seen numerous references to when we at SENDS and a Science of Cyberspace. We've been thinking about what such a science would include and how it might be articulated since the beginning of SENDS ten years ago. We aren't started writing it "open source" or to demonstrate it wasn't something that could be developed exclusively in a lab somewhere by Ph.D.s and computer scientists. We'll be going into a discussion of when

[Read More](#)

10 The Blogging Lucidite: Conquering with Transformation
posted by Carl Hunt | category: Blog | comments: 0 Comments

It seems like we are finally starting a new series of blogs at SENDS, and then we never really end a series, some begin. Perhaps that's a characteristic of transformation in human life. Perhaps that's why happens in the socio-technological convergence we experience in the world of cyberspace... don't just seem to keep connecting and progressing all over the world's continents and sub-continents with our technology... well enough of that one.

[Read More](#)

Post a Blog

Have a topic for the blog? Would like to have it posted? Send it to us at news@sendsonline.org along with your name and we will post it.

Recent Posts

SENDS Project Cyberspace Academics Questionnaire

The Blogging Lucidite: Logos, Cyberspace and Golf

The Laws of the Science of Cyberspace - A Beginning

The Blogging Lucidite: Conquering with Transformation

A "Cyber-Career" for the Modern Education: Plans with Pathways through High School

Categories

- Academic Curricula
- Aviation/Space Center for Science of Cyberspace
- Community Complexity
- Ecology
- Education Emergence
- Governance
- Leadership
- Modeling
- Open-Source Science
- Open-Source Performance
- Pilot Study Programming
- Science Security
- SENDS Project Social
- Media Social Science
- Time
- Visual Media
- Vocabulary
- Wicked Problems

SENDS FCVW Conference May 2011
(Unclassified)

14

SENDS Substrate: *the Weblog*

SENDS & The Science of Cyberspace

Highlighting publicly accessible efforts to promote the science of cyberspace proposed by an interagency effort known as the Social Spaces (SENDS) Project.

This effort is
and Secure

WEDNESDAY, OCTOBER 13, 2010

Cyberspace's Laboratory



The Blogging Luddite: Coevolving with Transformation



It seems like we are always starting a new series of blogs at SENDS, and that we never really end a series once begun. Perhaps that's a characteristic of transformation in human life. Perhaps that's what happens in the socio-technological convergence we experience in the world of cyberspace...ideas just seem to keep connecting and propagating all over the web!

Life transforms at that kind of talk – entertainment (we

SENDS colleague Craig Harm recently challenged me to re-description of my inner nature's starting position might be England's early 1800's.

SATURDAY, NOVEMBER 13, 2010

Classrooms in Cyberspace

By Nelson Stewart

[Editor's Note: Nelson Stewart is a music, English, geography, and history teacher in Hamilton, Ontario. He is also a contributing subject matter expert on "Cyberspace Age" public education and the musical industry, as he describes in the

The Laws of the Science of Cyberspace A Beginning

By now, following our blog and web links, you have seen numerous references to what we in SENDS call a *Science of Cyberspace*. We've been thinking about what such a science would include and how it might be articulated since the beginning of SENDS two years ago. We even started calling it "open-source science" to demonstrate it wasn't something that would be developed exclusively in a lab somewhere by Ph.D.s and computer scientists.

Without going into a discussion of what the science of cyberspace is quite yet, I would like to discuss something common to almost all the sciences: laws and principles. You could say we're going back to basics at we've done already to recognize the work of those before us and sts." We want to integrate our open-source science with what may be ations about this new environment. As our White Paper points out, t.

The Initial Center Concept

- A traditional brick and mortar facility
- Attempt to locate near commercial transportation/ lodging centers
- Resident staff
- Organic network
- Computer labs
- Significant costs



SCSC Challenges

- Financial
 - Rent, outfitting, staffing
- Practicality
 - If you build it, will they come?
 - Escalating travel costs
 - Recurring overhead costs
 - Evolutionary nature of studying cyberspace

A traditional physical center may not seem credible

Luddites and New Beginnings

- The “metasphere” and Virtual Worlds
- The power of the SENDS Consortium
- Accounts, browsers and grids! Oh My!
- What we learned

Getting Past Luddism

- SL – a scary place
- Overcoming anxiety of the unknown
- So much to learn
- We are “rezzed”
- Our “cruise director” and guide angel

Our Learning Tour

...Brought to you today by MagnumH in Iowa!

Start <http://slurl.com/secondlife/Alchemy%20Sims/136/168/251>



SENDS FCVW Conference May 2011
(Unclassified)

We Became Believers

- Virtual Worlds provides the things we need and like, and the things that fit our task
 - Immersion. A sense of being part of the environment
 - Accommodates a distributed interactive audience
 - Increases ownership in the “new science”
 - Documents progressiveness in cyberspace culture
 - Demonstrates a place to build community
 - Collaboration
 - Provides a space to conduct business, share ideas and concepts, stay current on news and events
 - Attracts diverse cultures
 - Affordable
 - Overcomes financial constraints
 - Avoids creating another monolithic “center”

SCSC

A New Vision

- Manifested in two ways in the SENDS Pilot
 - Physical Center: collocated with USAF Center for Cyberspace Research, Wright-Pat AFB, OH
 - Meetings likely held in DC Area
 - AFIT graduate students could augment SENDS research
 - Virtual Center:
 - Currently testing virtual world environments with NDU and Alchemy Sims
 - *SENDSonline.org* website, shared wiki spaces and blogs

Virtual World Environments *hosted in virtual world "Grids"*



*Smarter Technologies Group
Auditorium, Ziff-Davis
Publishing, Inc.*

*New Media Consortium Group,
developed under MacArthur
Foundation Grant*



SCSC Capabilities

- Community building
- Experimentation
- Modeling and simulation
- Meetings, conferences and campfires
- Data storehouse
- Library/reference repository
- Recordable for immediate or later playback
- Ease of entry
- Connectivity
- Learning center – education
- Research-friendly

Virtual Center Prototype



Concept Video

View the video here:

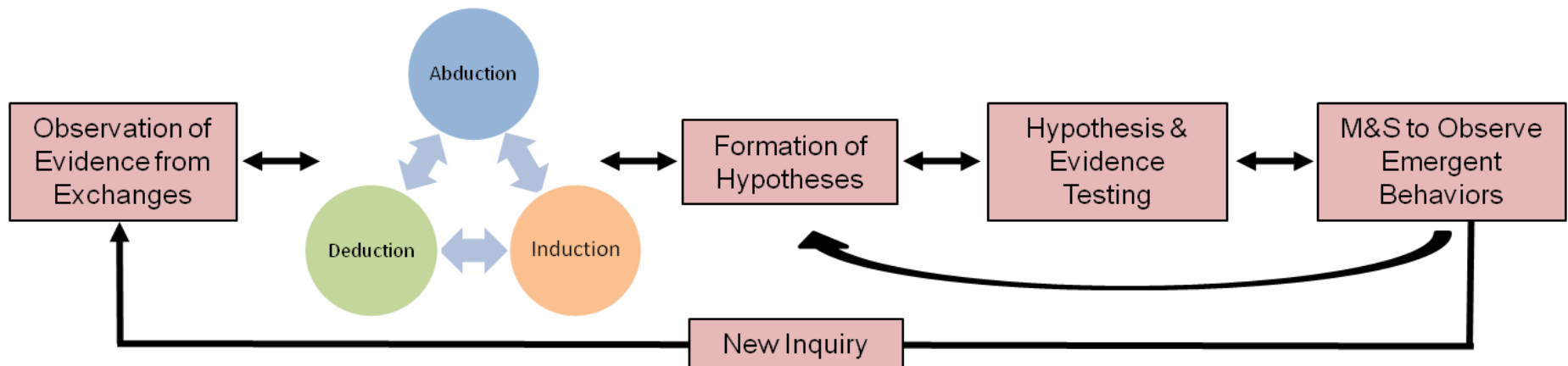
<http://sendsonline.org/pilot-studies/center-for-the-science-of-cyberspace/>

Doing Science in SCSC

- DOE White Paper: December, 2008
- SENDS White Paper in progress
- Science about cyberspace in cyberspace
- Leveraging virtual worlds in the SCSC
- SENDS Website: <http://sendsonline.org/>
- SENDS collaborative work space:
<http://www.sends.wikispaces.net/>

SENDS Model for Exchange-Emergence-Inquiry

- **Exchange**: *a set of transactions in which sharing of information, goods or services occurs via interactive, interdependent relationships*
- **Emergence**: *Higher level behaviors arising from interacting parts of non-equilibrium systems that may possess properties not found in the parts*
- **Inquiry**: *Seeking knowledge, resolving doubt, asking questions; based on induction, deduction or abduction as enhancements to inference*



Conclusions

- SENDS is a collaborative, multi- and trans-disciplinary, interagency approach
 - ...within a socio-technological cyberspace ecology*
- SENDSim provides a novel, cost-effective laboratory
- Three Year (+) Project offers potential for significant contributions for modest investment
 - Focus on Center for the Science of Cyberspace and SENDSim
- Offers to set tone for many science-based contributions for national prosperity and security in and out of cyberspace
- SENDS Website: <http://sendsonline.org/>
- SENDS collaborative work space: <http://www.sends.wikispaces.net/>



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