• Business Need
• Conceptual Architecture and Context
• SBIR Phase I Project Completed
• SBIR Phase II Current Status
• Future Directions
• Discussion
NET ESOLUTIONS (NETE) OVERVIEW AND BACKGROUND

- Focused on Federal Research Agencies – support globally
- Focused on Technology Management Consulting and Applications Design and Development focused primarily on supporting biomedical research, clinical and bioinformatics, research grants reporting, data analysis and visualization domains/verticals ...
- NIH SBIR Award; completed Phase I; performing Phase II
- Collaborating with IU Team (Subcontractor)
Many organizations have a need to use advanced visualization techniques for:

- management of a research portfolio
- communication of complex information
- understanding the science of science

Research is complex

- can be analyzed in a variety of ways, beyond simple graphs and charts (one- or two-variable visualizations)
- there is a large number of public and internal requests for reports and presentations
- the elements of research projects are interlinked and are represented by large volumes of data
Objective

Develop an on-line platform for visualization that can portray the current state of research and developmental funding, scientific knowledge, and the evolution, current trends and emerging areas of science and pathways to research success...
Objective

Graphic Representation of Data with the purpose of telling a story

DATA -> CONVERGENCE, STATISTICS -> DISCOVERIES CONCLUSIONS

STORY -> INSIGHT -> DECISIONS

SCIENTIFIC RESEARCH -> PUBLICATIONS
Serve as an aggregator/portal to make solutions developed by Federal research agency or research organization customers and the community more accessible

- Integrate with existing reporting applications/data systems
- Make datasets more accessible
- Move solutions developed outside into the customer agency/organization secure environment for internal use
- Whenever possible, reuse/buy instead of build; promote community crowd sourcing
- Make training materials and analytics services available
- Serve as a knowledge portal to data and tools residing within the client or clients community
Long Term Goals: To Help with Big Picture/Science-of-Science Questions

• Who are investigators that customer is supporting who are doing particular kind of research?
• Who is this researcher collaborating with?
• Who else is working in this research area?
• What grants could be candidates for the research portfolio?
• Can I see this program’s big picture?
• How much funding was required in what areas of research to generate publications, citations and to support clinical trials?
• What are interconnections between people, projects, academic and industry organizations, investments and returns?
Select Data such as NIH awards, NIH publications, or both; filter the dataset by giving a year range and/or search term; QVR hit lists; RePORTER hit lists; upload data (e.g. NIH myMaps)

Select a View, e.g., to see the co-author network and to apply further filters such as top nodes (e.g., by number publications, award dollars, etc.) and graphical mappings (e.g., size coding of nodes by the number of collaborators);

Visualize Data (100’s of algorithms and tools possible due to community sourcing), some custom visualizations, also in full screen mode; and

Export Data by printing it or exporting it into Microsoft (MS) PowerPoint, PDF, Excel, XML as applicable.
Project Phase I
Cyberinfrastructure Shell (CIShell)

CIShell supports the plug-and-play of datasets and algorithms and their bundling into custom tools that serve the specific needs of a user group or research community. It has been applied to develop diverse custom tools, see below. Feel free to take plugins from any of these tools to design your personal dream tool.

The Science of Science (Sci²) Tool is a modular toolset specifically designed for the study of science. It supports the temporal, geospatial, topical, and network analysis and visualization of scholarly datasets at the micro (individual), meso (local), and macro (global) levels.

Sci² Tool
A Tool for Science of Science Research & Practice

RESTful Web Services
NETE A|V: New Visualization Architecture for the Web – Big Picture

BUILD TIME

NETE A|V Codebase
NETE Internal SVN
Automated Build Gradle

NETE A|V Continuous Integration Server Jenkins
OSGi bundle
Web Application OSGi Bundle

RUNTIME

GLASSFISH JAVA EE / OSGI CONTAINER
NETE A|V
bundle
bundle
bundle
CShell Core
bundle
bundle
bundle
Algorithms
Data Readers
Web UI
Web Services

Internal DB
RePORTER
ETL
External Data Source (VIVO, etc.)

External Application
External Application
NETE A|V - Types of Analysis

- Temporal, Geospatial, Topical, Network Analysis

“*When*” questions are commonly addressed via temporal analyses
“Where” questions often involve the application of geospatial methods
“What” questions require topical analyses
“With whom” questions are often answered via network studies
• Find and select one or multiple PIs

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• Visualize portfolio of projects on the timescale
  o Projects with award amounts
  o Projects by IC funding
  o Projects by PIs
NETE A|V – WHEN - Temporal Analysis – Projects with Award Amounts

- Four-variable visualizations, e.g. time, amounts, PIs and projects
Find External Organizations with the projects
- By Name
- By State
- By Congressional District

Three-variable visualizations: location, amounts, organizations
NETE A|V – WHERE -Geospatial Analysis – Map of PI Projects

- Four-variable visualizations, e.g. location, project length, amounts and PIs
NETE A|V – WHAT - Topical Analysis – Publications in a Project Portfolio

- Four-variable visualizations: e.g. discipline, discipline relationships, number of publications, PIs
NETE A|V – WITH WHOM - Network Analysis – (Co-) PIs to Projects

- Four-variable visualizations, e.g. PIs, projects, amounts, project lengths

Circle Area: Total_Award_Amount
Edge Weight: Length of the Project_Years (x3)
Project Phase II
In Progress
Phase II - Technical

- Architecture replaces output renderer with HTML 5 / CSS 3 / JavaScript / SVG
  - Interactivity/Drill-down
  - Mature technology platform
  - Support for mobile devices/responsiveness
  - Future-proof technology/use-cases
  - Leap-frog sunset of Flash technology
- Architecture is built on Phase I
  - Keep JavaEE/OSGi as the underlying platform
- Additional Integration Capabilities
Phase II – Interactive Network Diagram

Bimodal Visualization
Relationship between Projects and External Organizations - Larry E. Humes, Bernice A. Pescosolido; Generated by NETE.

PI
- DJOUSSÉ, LUC
- IX, JOACHIM H
- ARNOLD, ANDREW
- ZIBMAN, SUSAN J
- REUE, KAREN
- KIZER, JORGE R
- ARNOLD, ANTHONY C
- ARNOLD, ARTHUR P
- ARNOLD, AMY
- ARNOLD, ALICE A.

Organization
- BETH ISRAEL DEACONESS MEDICAL CENTER
- UNIVERSITY OF CALIFORNIA LOS ANGELES
- WEILL MEDICAL COLLEGE OF CORNELL UNIV
- UNIVERSITY OF WISCONSIN MILWAUKEE
- JOHNS HOPKINS UNIVERSITY
- VETERANS MEDICAL RESEARCH FDV/SAN DIEGO
- BRIGHAM AND WOMEN’S HOSPITAL
- MASSACHUSETTS GENERAL HOSPITAL
- CALIFORNIA INSTITUTE OF TECHNOLOGY
Phase II – Interactive Geospatial Diagram

Proportional Symbol Map
Relationship between Projects and External Organizations - Larry E. Humes, Bernice A. Pescosolido; Generated by NETE March 5, 2014 | 9:34 AM EST
Phase II – Interactive Topical Diagram

Topic Analysis - Map of Science
Generated from Publications for top 20 projects - Jeffrey R. Alberta, Larry E. Humes, Bernice A. PescoSolido and 9 others; Generated by NETE.
Phase II – Interactive Temporal Diagram

Temporal Visualization
All projects with award amounts - generated by NETE

- Small molecule inhibitors of the vitamin D receptor coactivator interaction
- Determinants and Cardiovascular Consequences of Diabetes in Older Adults
- Molecular Pathogenesis of Hyperparathyroidism
- Sex chromosome effects on neural development
- Sex Differences in Dopamine Systems
- Genetic Determinants of Brain Sexual Differentiation
- Molecular Analysis of Estrogen Synthesis in the Brain
- Ischemic Optic Neuropathy Decompression Trial
- Novel Cyclin-like Candidate Oncogene on 11q13
- Molecular Genetics of Parathyroid Tumors
- Neural Regulation of Reproduction
- Neural & Hormonal Bases of Vocalization
- Steroid Influences on Neurons Involved in Behavior

Years:
- 1985
- 1990
- 1995
- 2000
- 2005
- 2010

LEGEND / INFO
Phase II – Interactive Sankey Diagram

Solar PV → Electricity grid
60 TWh
Phase II – Integrated COTS Visualizations
Phase II – Integrated COTS Visualizations (cont.)
Future Directions: Post Phase II/III
Future Directions - Functional

• Access publically available or licensed science datasets in NETE A|V or via Web Services or load users’ datasets

• Integrate COTS packages

• Store replicable visualization scenarios

• Share portfolios, visualization scenarios and generated visualizations with other users; Social Interaction
THANK YOU

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