“So What-Who Cares?”

A Three Level Approach to Creating Effective High Stakes Initiatives

Prof. Michael Silevitch

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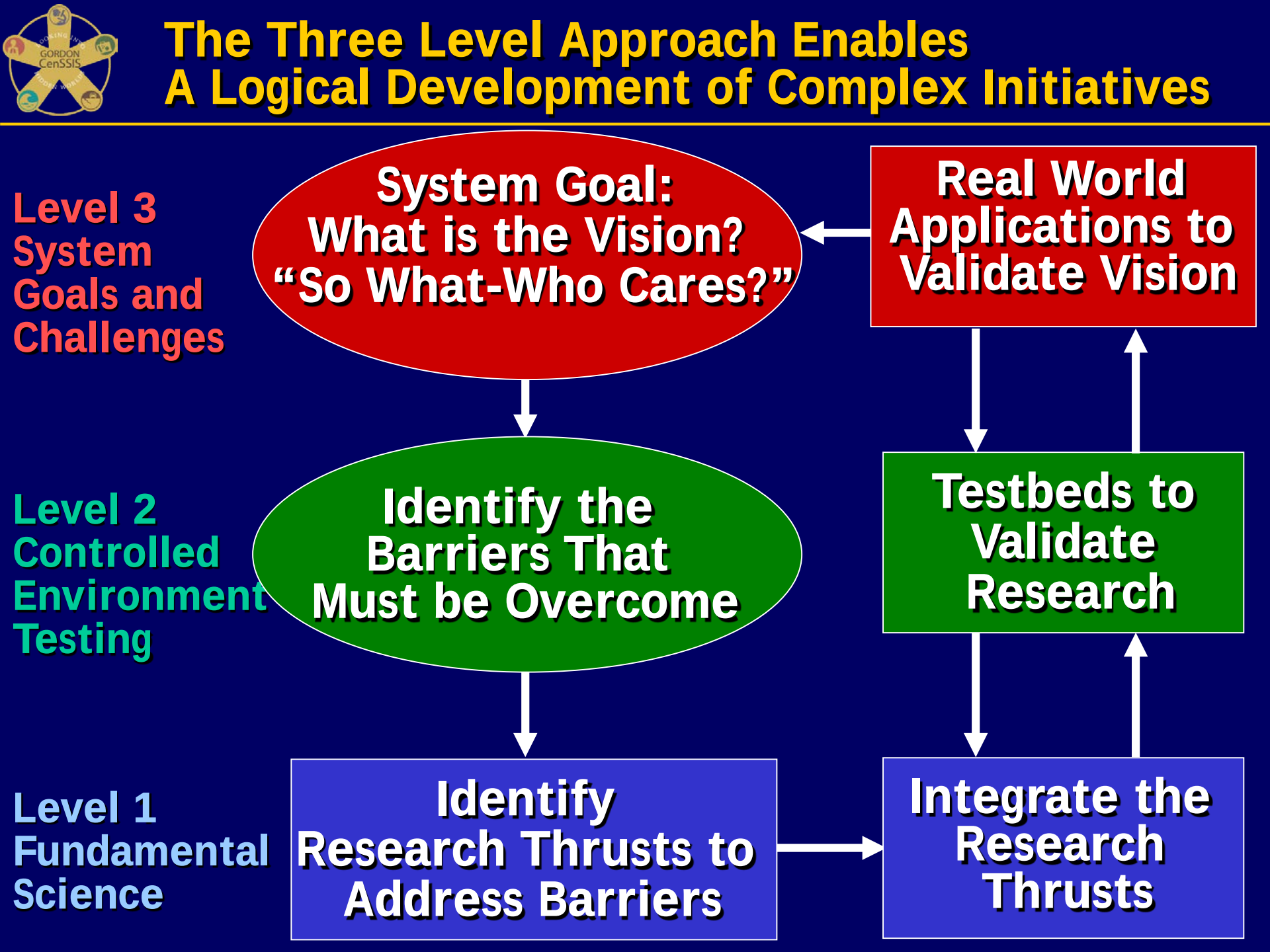
The Engineering Research Centers ERCs Pioneered the Three Level Approach

"So What-Who Cares"

- What is the central vision?
- Why is it compelling?
- What "Grand Challenges" must be addressed?
- Why can't this be done now?

The Three Level Approach Enables A Logical Development of Complex Initiatives



NSF Engineering Research Centers: A vehicle for transformative impact

ERCs are Similar to a Multi-Division Small Company

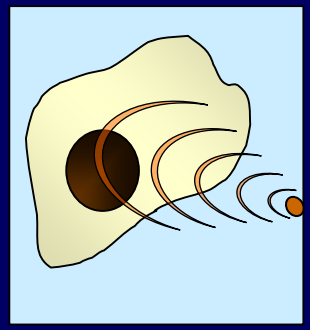
Prestigious Program ~2% Success Rate

Each NSF ERC Must:

- Define a Compelling Vision and Mission
- Address "Grand Challenges"
- Utilize a 3 Level Approach to Structure a **10 Year Transformative Research Program**
- Implement a Long Range Strategic Plan
- Create Testbeds to Validate Approaches
- Motivate Students & Develop Educational Programs
- Foster an Innovation Ecosystem and Industry Involvement

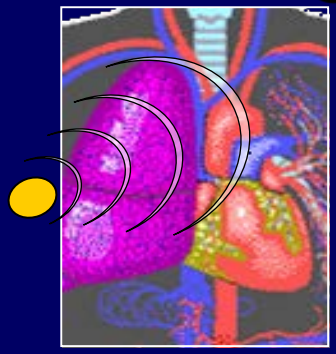
The CenSSIS ERC: Finding Hidden Things
Diverse Problems- Similar Solutions

Subcellular Biology



100nm - 100 μm

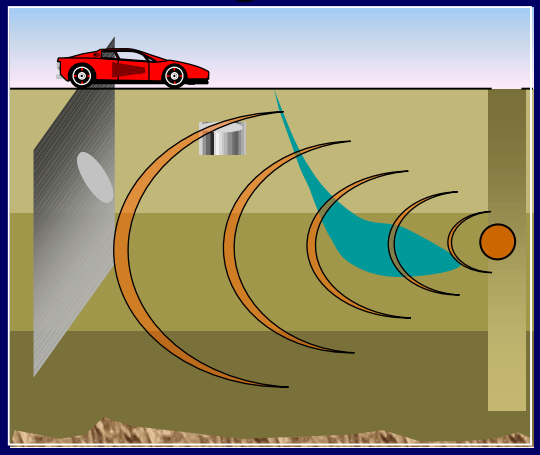
Tissues & Organs



10 μm - 10 cm

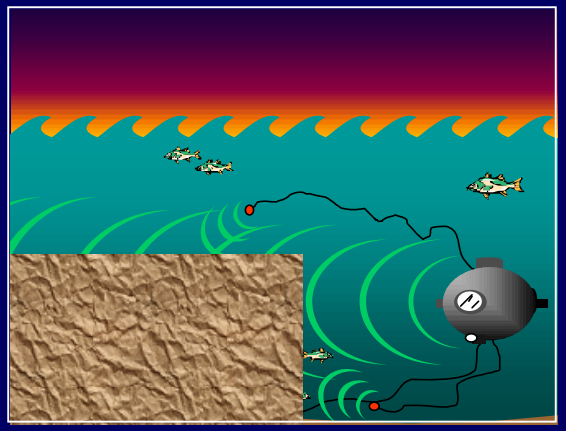
Optics	Ultrasound
Radar	Sonar

Underground Diagnosis



1 cm - 100 m

Underwater Exploration



10 cm - 1 km

Overview of The Three Level Approach Applied to The CenSSIS ERC.

Level 3 System Goals and Challenges

Level 2 Controlled Environment Testing

Level 1 Fundamental Science

Reveal Obscure Subsurface Regions: Diverse Problems-Similar Solutions

Attack Real World Subsurface Problems

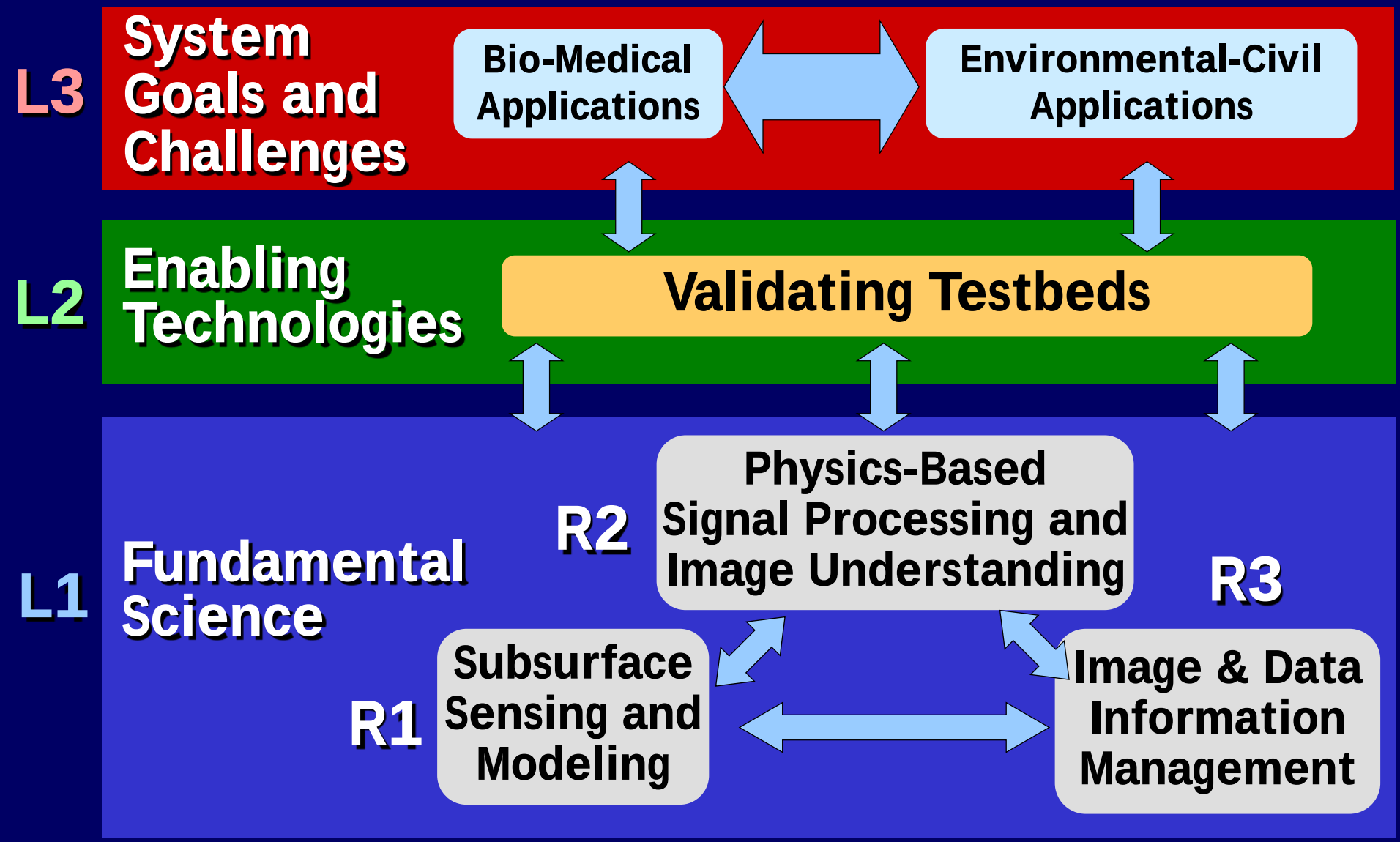
Identify the Barriers That Must be Overcome

Testbeds to Validate Research

Identify Research Thrusts to Address Barriers

Integrate the Research Thrusts

The CenSSIS Program Is Structured Around the Implementation of the Three Level Approach

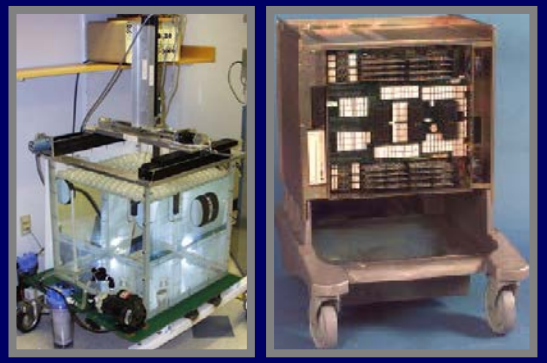


Four Validating TestBEDs Represent the Diverse Applications Inherent in the CenSSIS Vision

BioBED

100nm - 100 μm

MedBED



10 μm - 10 cm

SoilBED

1 cm - 100 m

SeaBED

10 cm - 1 km

The System Level Applications Are Built Around Important Real World Problems

Biological-Medical Applications

- **S1** 3D Imaging of Cellular Structure
- **S2** 4D Image Guided Therapy
- **S3** 3D Multi-Mode Breast Imaging

Environmental-Civil Applications

- **S4** Remote Assessment of Benthic Habitats
- **S5** 4D Underground Assessment

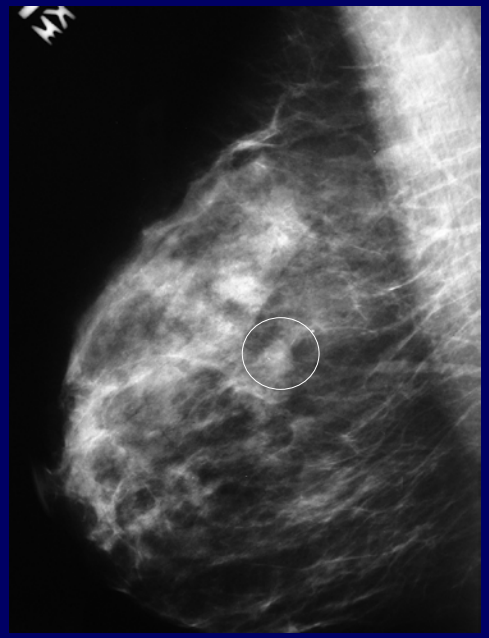
Real Time Imaging and Sensor Fusion: Augmenting X-Ray Mammography

S3

Important Problem

Reliable Detection And Biopsy of Malignant Breast Tumors

MASSACHUSETTS GENERAL HOSPITAL

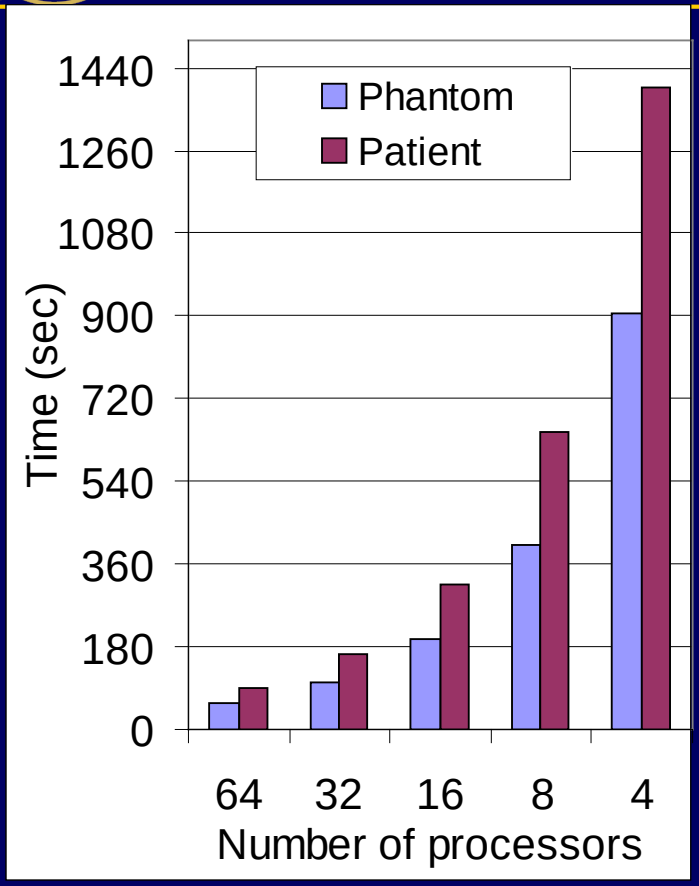


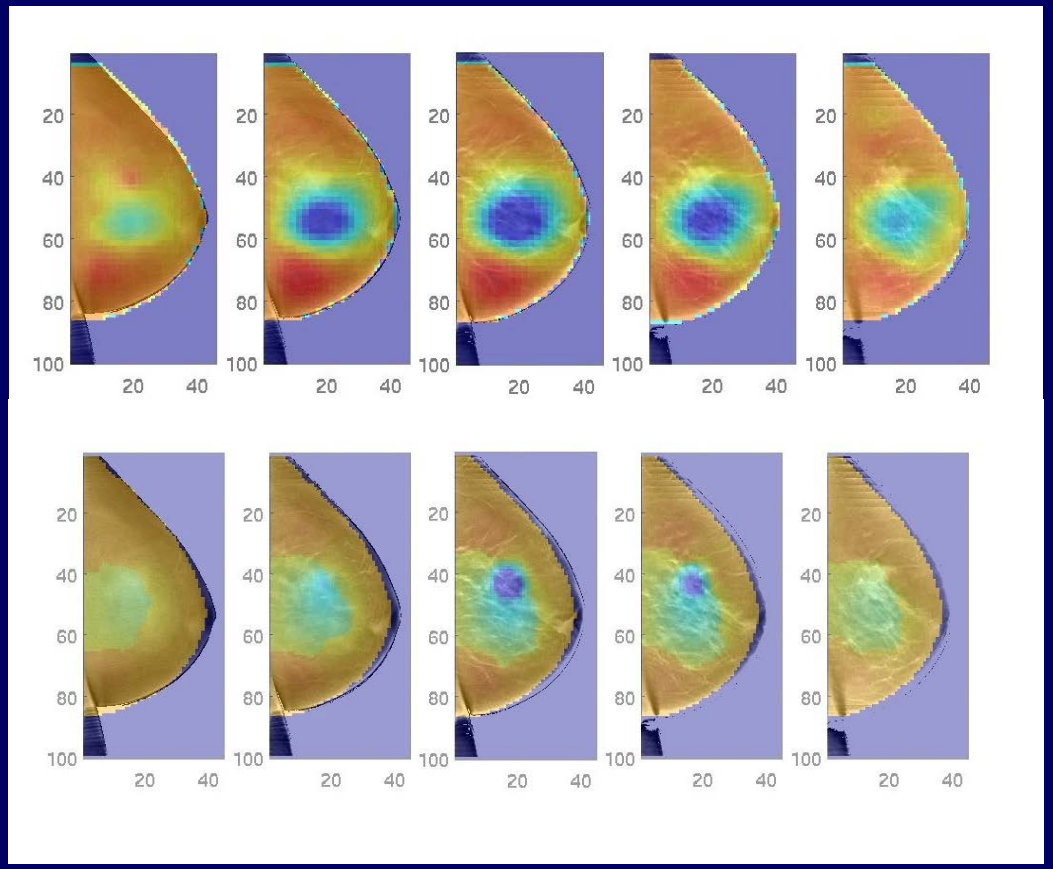
- Tomosynthesis
- MGH Platform
- Impedance
- Optical
- Microwave
- Elastography

⟷ **Sensor Fusion**

The S Level Requirements Spur Our Fundamental Science Efforts

S3





CenSSIS R3
Tomo Speedup
From ~ 3 Hours- Single PC
To ~2 Minutes - 64 PC
Project to ~ 10 seconds
With GPU Hardware

CenSSIS R1-R2
Fusion of Tomo
Model + Prior Info
With DOT
Leads to Better Localization

ALERT: Awareness and Localization of Explosives-Related Threats

A Department of Homeland Security Center of Excellence

For Explosives Detection Mitigation & Response

~$50M in Funding To Date

A Top Down Approach Enables ALERT To Create A Coherent Strategy of Operations

Level 3 System Goals

Grand Challenges: Comprehensive Defense Against Explosive Threats

Fieldable Products and Systems

Level 2 Testing Level

Integrated Multidisciplinary Approach Required: **No Silver Bullet**

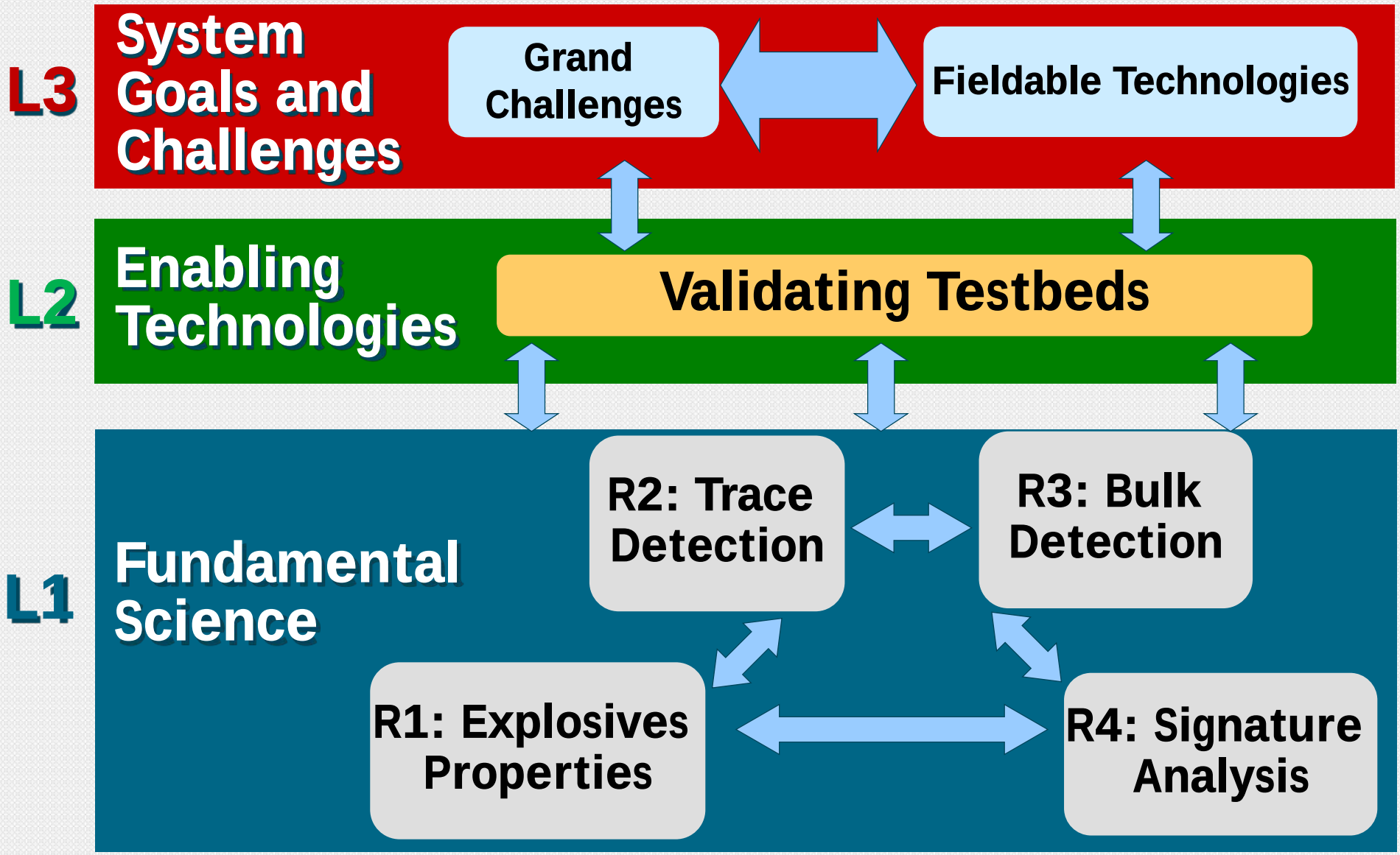
Validating Facilities & Testbeds

Level 1 Fundamental Science Level

Identify **Crosscutting** Research Thrusts

Innovative Research Results

The ALERT Three Level Approach Enables Spiral Development & Transition of Projects



SENTRY: Soft Target Engineering to Neutralize the Threat Reality:

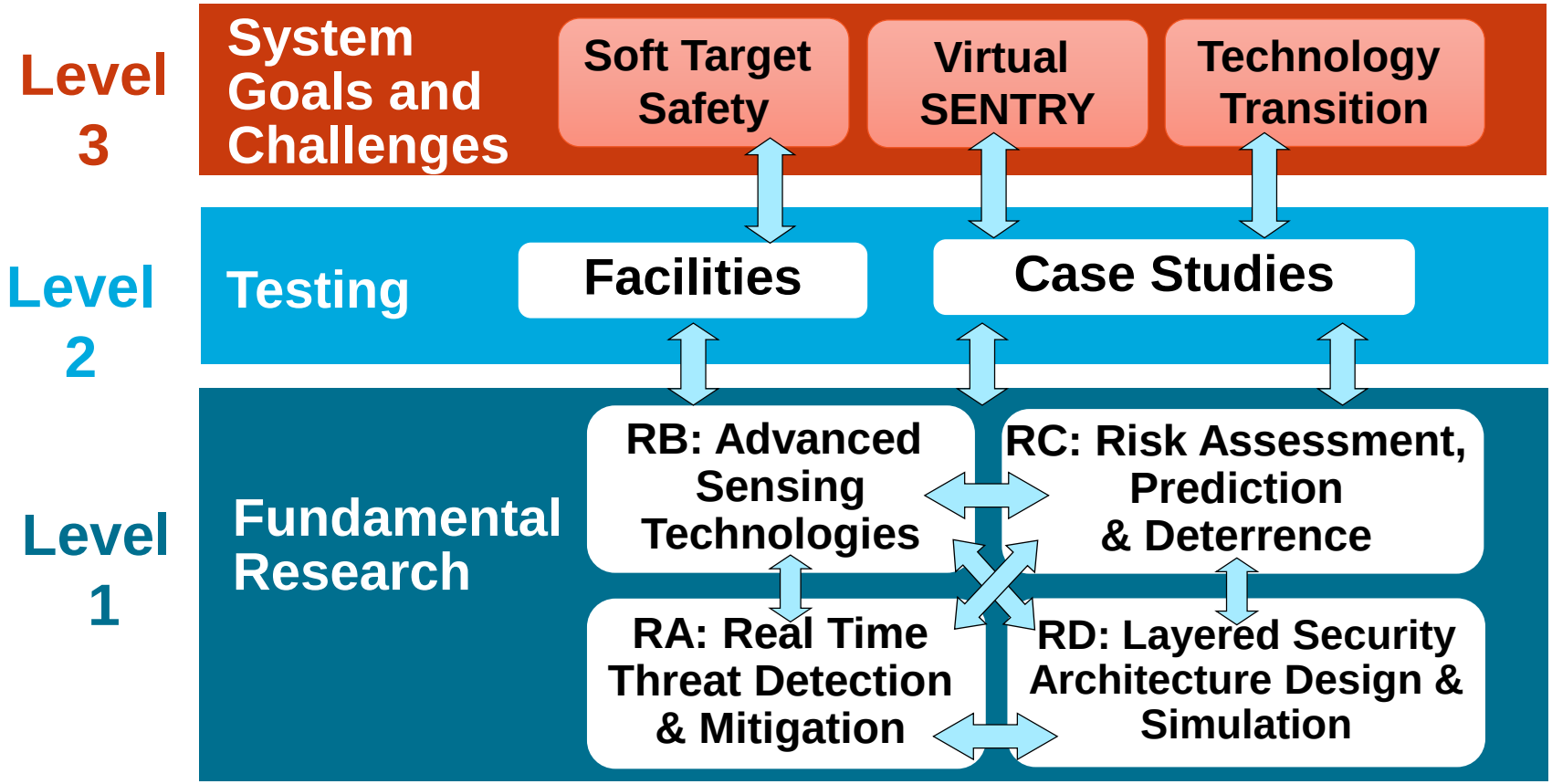
An Engineering Secure Environments
Department of Homeland Security Center of Excellence

Funding $37M+ over 10 years

Michael B. Silevitch, SENTRY Director

m.silevitch@northeastern.edu

The SENTRY Three Level approach provides **Spiral Development & Transition of Projects**



Engineering PLUS

(Partnerships Launching Underrepresented Students)

NSF INCLUDES Alliance

Award # 2119930

Karl Reid, PI
Senior Vice Provost and Chief Inclusion Officer
Director, Engineering PLUS
Northeastern University

Michael Silevitch, Co-PI
Robert D. Black Prof. of Engineering
Director of SENTRY DHS COE
Northeastern University

Richard Harris, Co-PI
Associate Dean, DEI & Director of Multicultural Engineering Programs
Deputy Director, Engineering PLUS Northeastern University

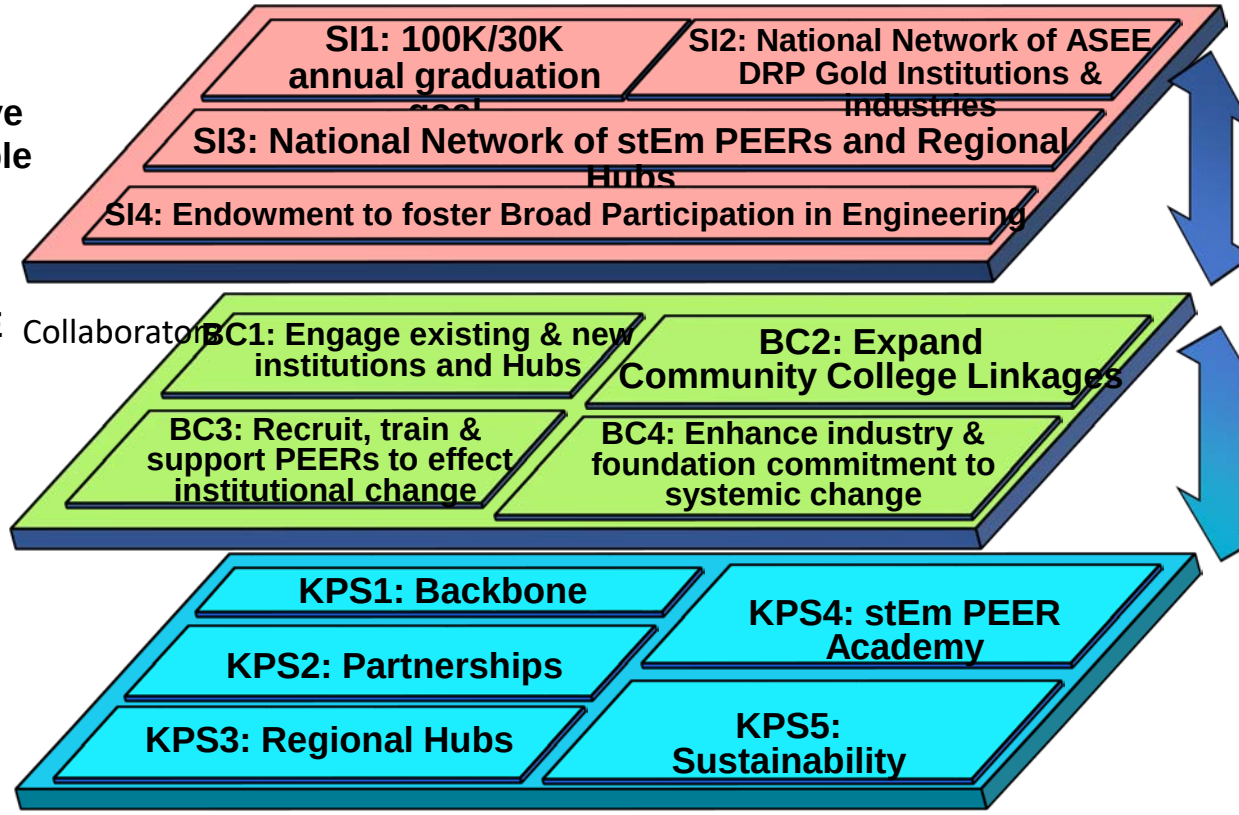
Claire Duggan, Co-PI
Director of Center for STEM Ed
Northeastern University

The NSF ERC 3 Level Model and the Engineering PLUS Strategic Plan
Enable Systemic Impact

Level 3
Systemic, Transformative and Sustainable Impact (SI1-4)

Level 2
Leverage ASEE DRP to Scale Best Practices and Build Capacity (BC1-4)

Level 1
Key Performance Strategies (KPS1-6)



The 3 Level Method is Extremely Flexible

Students Can Use The Three Level Approach For High Stakes Materials

Such as

MS Projects
or
PhD Thesis Proposals
or
Job Application Presentations

The 3 Level Approach: A means To Enhance The Winning Of High Stakes Endeavors

Remember

“So What-Who Cares”