Globally Integrated Security Environment (GISE)

by

Prof. Andrzej Rucinski
IEEE & University of New Hampshire, USA

presented to

UNECE
Multidisciplinary Inland Transport Security Expert Group

Geneva, Switzerland
January 15, 2009
The Roadmap to
Global “All-Hazard” Security Engineering

as part of
the Barbara Rucinska Memorial Global Security Engineering Workshop Series

by
Prof. Andrzej Rucinski
IEEE & University of New Hampshire, USA

UNECE WP.30 Session
Geneva, Switzerland

June 4, 2008
University of New Hampshire

Former Presidents George H.W. Bush and William Jefferson Clinton are Keynote Speakers at the University of New Hampshire’s 137th Commencement. May 19.
Fundamentals of Security Engineering

ECE668. Introduction to Computer Engineering

January 25, 2008, 11:10am to 12n
Kingsbury, Room S-320

- Introduction to the elements of security
- A typical physical security system
- Physical security system elements
- Project: "Take Me to the Ball Game"

Mr. Lennart E. Long and Mr. George Neat
Guest Speakers, Electrical and Computer Engineering Department

University of New Hampshire
©2008 – Lennart E. Long
• 350,000+ Members Worldwide
• Global Reputation for Standards (e.g. 802.11, 1149)
• Professional, Ethical Conduct, and Intellectual Honesty
• The World’s Largest Technical Publishing Enterprise
• Highest Quality Conferences and Publications
Role

- **Maintainer of Standards**
  - Technology – e.g., 8.02.11..., 1149
  - Professional Integrity
  - Education Assessment and Curricula
    - ABET -- Bologna
- **Provider of Continuing Education**
  - Technical Currency Certification
- **Guardian and Disseminator of Knowledge**
  - Web and “Paper” Publishing
  - Global Trusted Design Repository
  - Design Certification
Outline

• Motivation: New Science & Education for Global Security
• Globally Integrated Security Environment (GISE)
• Globally Integrated Security Engineering and Globally Integrated Security Economics
• Globally Integrated Security Education
• Safe and Secure Silk Road & Transatlantic Security Initiative
• Recommendations
• Acknowledgements & Contact
Motivation: New Science and Education for Global Security

- UN General Assembly Resolutions
- UNECE Initiatives
- Computerized TIR Procedure (eTIR)
- Global Security: Role of Science
- Vision: All-Hazard Safety and Security Strategy
All Hazards
Ice storm darkens homes of a million across N.E., N.Y.

By Jessica Fargen, Friday, December 12, 2008
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• 550,000 homes and business customers in eastern New England and New York
• 8,000 square miles of service area in Massachusetts, New Hampshire, New York and Rhode Island
• more than 1,800 crews and 2,300 support personnel – one of the largest concentrations of utility workers in the Northeast in more than a decade
• more than 4,000 individual damage incidents in New England
• repair or replace more than 416,000 feet of distribution wire in New England

“We continue to be amazed at the extent of the destruction that was wrought by this storm,” Christopher E. Root, Senior Vice President Electricity Distribution Operations, National Grid
All Hazards

DMSP F15
14 August 2003
0129Z
~20 hrs before Blackout
Somali Pirates

January 15, 2009
Somali Pirates

Al-Shabaab Pirate "Mother Ship" the Burum Ocean

Al-Shabaab Pirate "Mother Ship" the Arena and/or Athena
All Hazards

Global Security
Protection of Critical Infrastructure
Against All Hazards

- Nature
  - Direct
  - Trigger
- Accident
  - Design & Implementation
  - Operations
- Malicious Actions
  - Sabotage (Internal)
  - Terrorism (External)
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Rainbow Framework for Global Security Engineering

- United Nations Economic Commission for Europe
- US Government
- Science and Technology Gap
- Global Secure Transport System e.g. IRU
<table>
<thead>
<tr>
<th>Geographical Categories/Human Activities</th>
<th>North America</th>
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<td>Commercial Sphere</td>
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**New GIS Definitions**

- Under the leadership of Professor Andrzej Rucinski, The Critical Infrastructure Dependability Laboratory (CIDLab) at the University of New Hampshire has been pioneering a new approach to the Critical Infrastructure and the key systems that make possible the modern “Western Lifestyle.”

- Our role has been to:
  - develop the concepts at the policy level
  - propose core technologies, processes, and education that are all associated with enabling the dependable operation of the Critical Infrastructure
## GIS Environment

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Globally Integrated Security

• There are three fundamental axioms of Globally Integrated Security (GIS):
  1) Commerce is global and so is the threat
  2) Better security equals better commerce
  3) Security is “proof” against “All Hazards”
Key GIS Terminology

• **All Hazards** – describes catastrophic failures precipitated or triggered by either the capricious natural phenomena or human action whether malicious or negligent.

  • Ultimately, after triggering, these failures may have deterministic aspects (the system’s “Achilles Heel”) that are related to their design, implementation, and / or their operation.

• **GIS Environment** – Globally Integrated Security Environment -- specifies the set of Critical Infrastructure and key systems that are GIS Compliant and thus are robust against All Hazards or at least degrade gracefully insuring some minimum level of access to critical resources in the face of system wide catastrophic failure.
Key GIS Terminology (continued)

- **GIS Engineering** -- Globally Integrated Security Engineering -- the new Engineering Discipline involved with the design, implementation, and operation of the transportation and energy delivery and other Critical Infrastructure and systems that make possible the “Western Lifestyle”

- **GIS Education** -- Globally Integrated Security Education – is the new curriculum that incorporates GIS principles to educate the cadre of policy makers, engineers and technicians required to insure that GIS Environment can be designed, implemented, operated and maintained
Key GIS Terminology (continued 2)

- **GIS Economics** -- Globally Integrated Security Economics – the accounting and management practices and business rules that together enable the GIS Environment taking into consideration the true costs and benefits of GIS Compliance

- **GIS Informatics** -- Globally Integrated Security Informatics – specifies the data flows, sources, acquisition and processing that enables the GIS Environment
GIS Policy Guidance

• Science and technology in the absence of guidance from policy makers and commerce is insufficient. We also realize that there exist a plethora of political, scientific, and commercial security initiatives.

• **GISE** can integrate, optimize, and harmonize these existing efforts.

• We believe that **GISE** cannot be successfully implemented without your interest, leadership, and support.

• We offer our expertise to your organization and are open to establishing a dialog to formalize the framework of our cooperation.
### Maritime Domain Awareness

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**Global Maritime Domain Awareness**

January 15, 2009
• The Mission of the Director Global Maritime Situational Awareness is to facilitate the creation of a collaborative global, maritime, information sharing environment through unity of effort across entities with maritime interests.

• In order to achieve Global Maritime Situational Awareness, we must increase the discoverability and share-ability of information relevant to those engaged in managing the security, safety, environment and commerce associated with the maritime domain.
Global Security Transportation: Current Status

Global Security Transportation: Current Status

USA
- UNECE
- EU
- WCO
- TIR Convention
- "SAFE" Framework

Homeland Security
- IEEE

IRU Management
- IRU Carnet System
- Certified IRU Academy
Global Security Transportation: Political Sphere

Global Security Transportation: Political Sphere

- USA
- UNECE
- EU
- TIR Convention
- WCO
- "SAFE" Framework
- Homeland Security
- IEEE
- IRU Management
- IRU Carmet System
- Certified IRU Academy

January 15, 2009

CIDLab
Global Security Transportation: Commerce

Global Security Transportation: **Commerce**

[Diagram showing connections between USA, UNECE, EU, WCO, TIR Convention, "SAFE" Framework, Homeland Security, IEEE, IRU Management, IRU Carnet System, Certified IRU Academy.]
Global Security Transportation: Science
Magnetometer System for Space Research in Polar Region

- **South Pole ULF magnetometer installed by UNH and AGO (Automatic Geophysical Observatories) sites in Antarctica**

Magnetometer System for Space Research in Polar Region

[Image: Courtesy of Hyomin Kim]
Magnetometer System for Space Research in Polar Region

- **Spitbergen ULF magnetometer array installed by UNH, Aug. 2006**
Example of Current Magnetometer System for Space Research in Space

- Satellite- and rocket-borne
- Magnetometers

Courtesy of Hyomin Kim
GIS “Disruptive Innovation”

Courtesy of Hyomin Kim
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GIS Engineering & GIS Economics

- Adaptive Global Risk Assessment
- Better Security ↔ Better Commerce
- Open Critical Infrastructure Dependable Architecture = Open Architecture Supply Chain Security System
- Trustworthy Design, Implementation and Operation of Critical Infrastructure Dependable Systems
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I-GEMS Steering Committee

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  - Prof. Don Bouldin, University of Tennessee (USA)
    - MOSIS
  - Prof. Jim Aylor, University of Virginia (USA)
    - IEEE Computer Society and Computer Magazine
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  - Prof. Stuart Tewksbury, Stevens Institute of Technology (USA)
  - Dr. Bing Sheu, Honorary Professor, National Chiao Tung University (Taiwan)
The Transistor Era
SSI Era
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GISE Pilots

- Earth Magnetic Field Monitoring
- Safe and Secure EURO2012
- Safe and Secure Silk Road
- Canada – US Secure Cargo Project
## Safe & Secure Silk Road

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January 15, 2009

CIDLab
Evolution of sea containers in ports

Evolution of sea containers in ports

Global Container Overslag
1971

Courtesy of Dr. Janusz Lacny – President of Int. Transport Road Union
Safe and Secure Silk Road

Courtesy of Dr. Janusz Lacny – President of Int. Transport Road Union
Interconnecting all the businesses along the reopened Silk Road
Interconnecting all the businesses along the reopened Silk Road

Interconnecting all the businesses along the reopened Silk Road

Key: Sea transport  Land transport

Labour costs = $200/month

To US East Coast

To US West Coast

To East Coast

Saturated

January 15, 2009

CIDLab
GISE Pilots

- Earth Magnetic Field Monitoring
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- Canada – US Secure Cargo Project
## Canada US Transatlantic Cargo Security Pilot

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Canada US Transatlantic Cargo Security Pilot

1) Build & test prototype package
2) Install & verify package and scan at load point
3) Track shipment, log data & report status to website
4) Scan at transshipment points
5) Compare logged and real-time data
Canada US Transatlantic Cargo Security Pilot

Secure Testing Infrastructure
Canada US Transatlantic Cargo Security Pilot

Real Time Tracking

Destination: 4700 miles away
Londonderry, New Hampshire

Origin: Mainz, Germany

Container travels down Rhine to Antwerp at sea level by barge, clear sky view yields high accuracy tracking.

System Altitude: Dec 8th – 10th

Container is sitting in the port, high container stacks in close proximity limit GPS reception quality.

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Recommendations

- Integration of Fragmented Efforts i.e. US & EU → GISE
- Better Security = Better Commerce → GISE Economics
- Global Security as a New Scientific Discipline → GISE Engineering
- New Professionals in Security Design & Operation → GISE Education
Global Security Transportation: Rainbow Framework Implemented
## Transatlantic Security Initiative

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The Karen Panetta’s Women and Globalization

- Dr. Karen Panetta, Professor at Tufts University and IEEE Fellow
- IEEE Women in Engineering Magazine, Editor in Chief
- Special Issue on Women and Globalization
The Barbara Rucinska Memorial Global Security Engineering Workshop Series

- Stockholm EWME2006 (*Global Engineering Education*)
- San Diego MSE2007 (*Special Issue of IEEE Trans. on Education*)
- Boston HST2008 (*Proc. IEEE: Special Issue on Global Security Engineering*)
- Gdansk IT2008 (*EURO2012*)
- Budapest EWME2008 (*Bologna + ABET*)
- Geneva 2008 United Nations (*WP.30 Session*)
- Copenhagen WSS2008 (*Microelectronics for Maritime Security*)
- Geneva 2009 United Nations (*Inland Security Session*)
- Boston 2009 (*Special Issue of IEEE Women in Engineering*)
- Durham 2009 (*2nd Transatlantic Security Initiative Workshop*)
- San Francisco MSE2009 (*Special Issue of IEEE Trans. on Education*)
- Almaty 2009 TIR Congress (*Safe and Secure Silk Road*)
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- CIDLAB Faculty and Students Visiting Intel Massachusetts