

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

January 15, 2009



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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

January 15, 2009



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University of New Hampshire

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**



January 15, 2009



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University of New Hampshire

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

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Institute of Electrical & Electronics Engineering

- 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

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- **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**

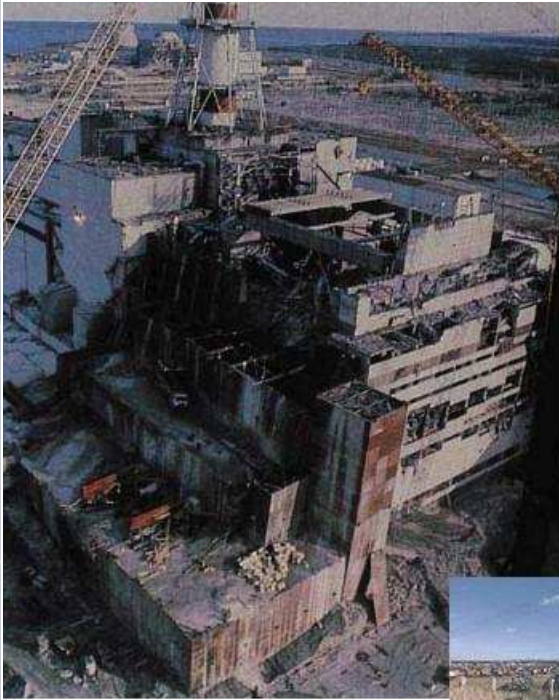
Outline

- **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**

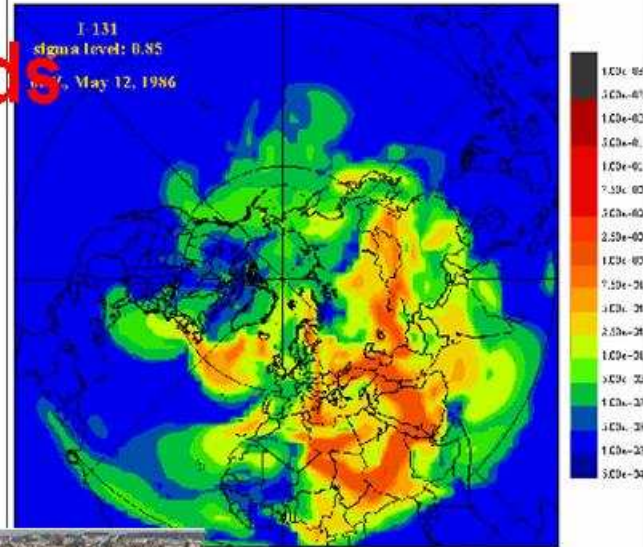
Motivation: New Science and Education for Global Security

- **UN General Assembly Resolutions**
- **UNECE Initiatives**
- **Computerized TIR Procedure (eTIR)**
- **Global Security: Role of Science**
- **Vision: All-Hazard Safety and Security Strategy**

All Hazards



All Hazards



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December 2008 Ice Storm



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December 2008 Ice Storm

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

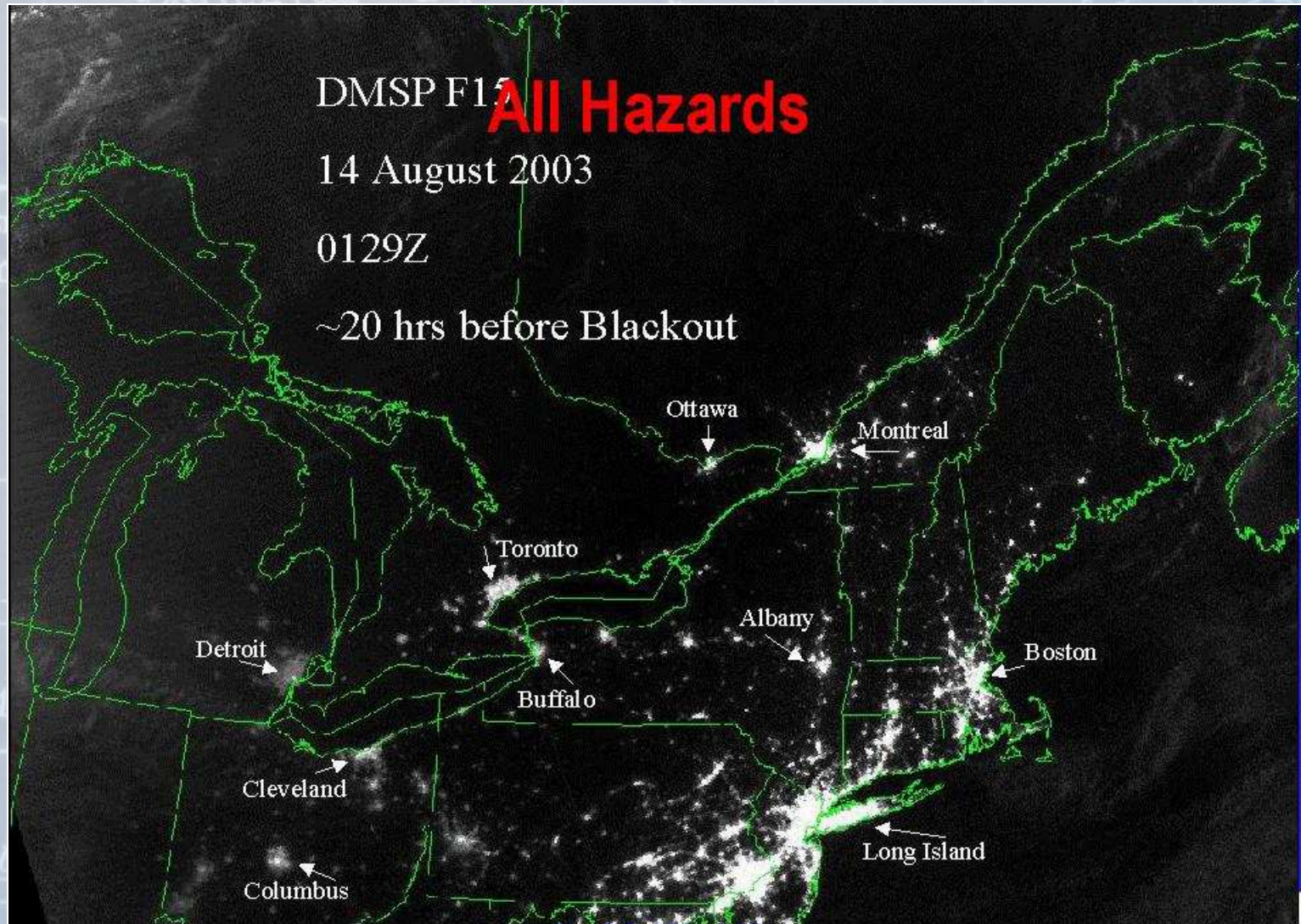
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All Hazards



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All Hazards



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Somali Pirates

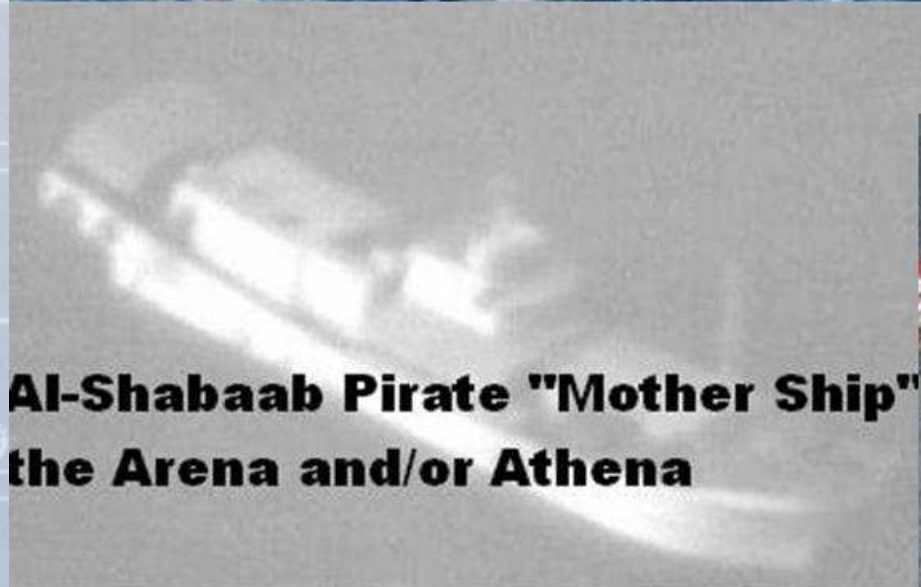


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Somali Pirates



Somali Pirates



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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

Rainbow Framework for Global Security Engineering

Category	North America		Europe
	DARPA Track	Commerce Track	
Government + International Safety and Security Standards	[Dark Blue Bar]		
	[Medium Blue Bar]		
	[Light Blue Bar]		
Technology Gap	[Green Bar]		
	[Light Green Bar]		
	[Yellow-Green Bar]		
	[Yellow Bar]		
	[Light Yellow Bar]		
	[Orange Bar]		
	[Red Bar]		
Dependable Critical Infrastructure	[Orange Bar]		
Secure Commerce	Commerce Gap	[Red Bar]	[Red Bar]

- **United Nations Economic Commission for Europe**
- **US Government**
- **Science and Technology Gap**
- **Global Secure Transport System e.g. IRU**

Globally Integrated Security (GIS)

Globally Integrated Security (GIS)

Geographical Categories/Human Activities	North America	New England	Europe
Political Sphere			
Science & Technology & Engineering Sphere			
Commercial Sphere			

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

GIS Environment

Geographical Categories/Human Activities	North America	New England	Europe
United Nations			
GISE Engineering			
GISE Economics			

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

Global Maritime Domain Awareness

Maritime Domain Awareness

Geographical Categories/Human Activities	North America	New England	Europe
United Nations	USA		
GISE Engineering			
GISE Economics			

Director Global Maritime Situational Awareness

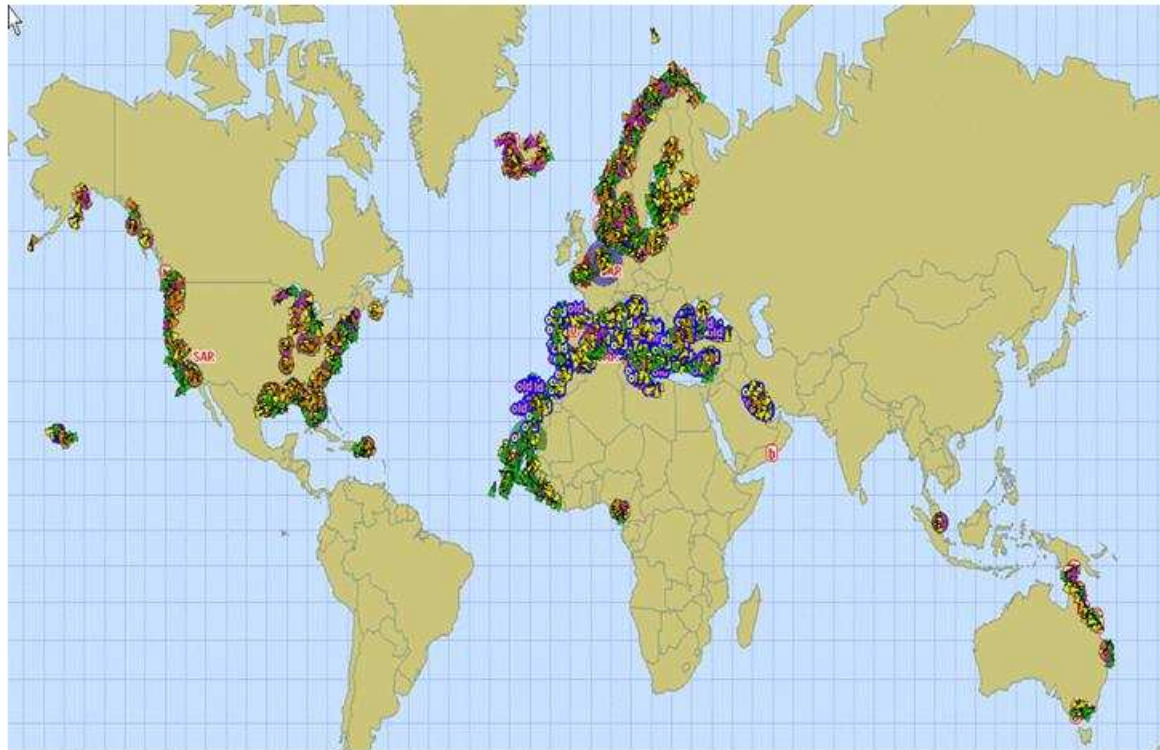


Office of Global Maritime Situational Awareness

- **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 Maritime Info Sharing System

Global Maritime Info Sharing System



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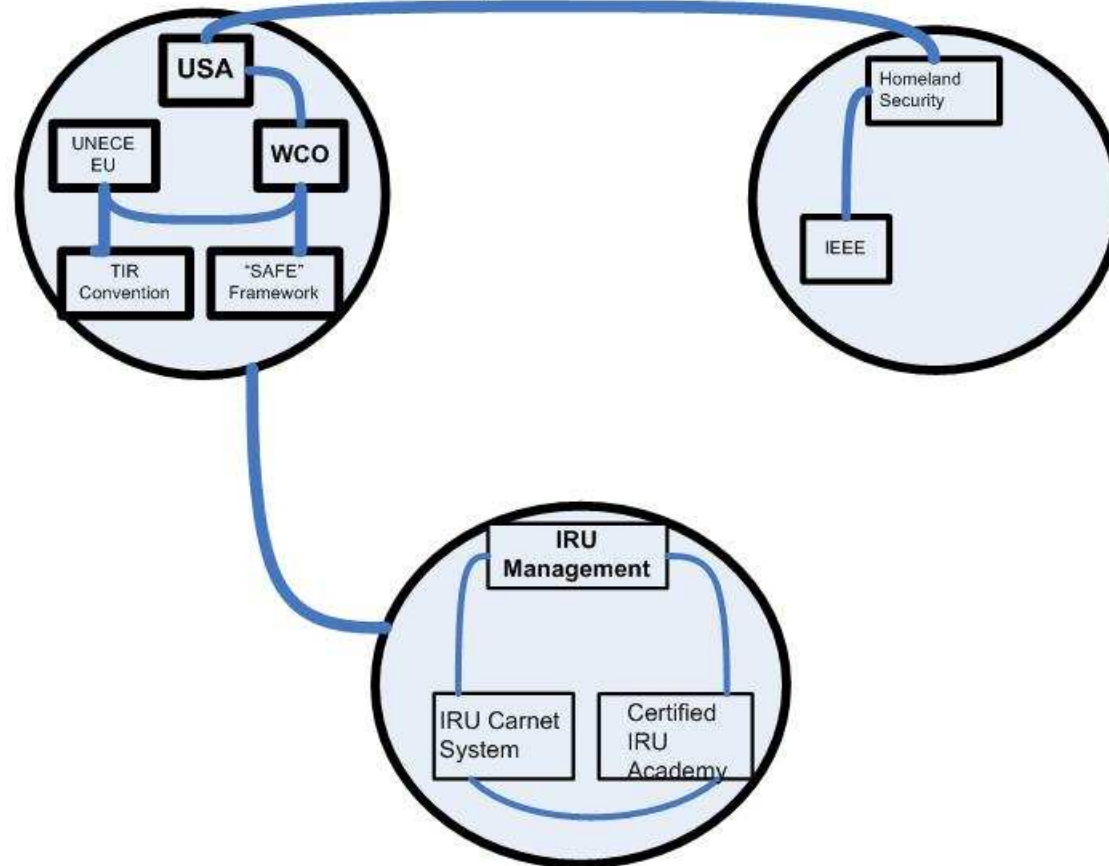


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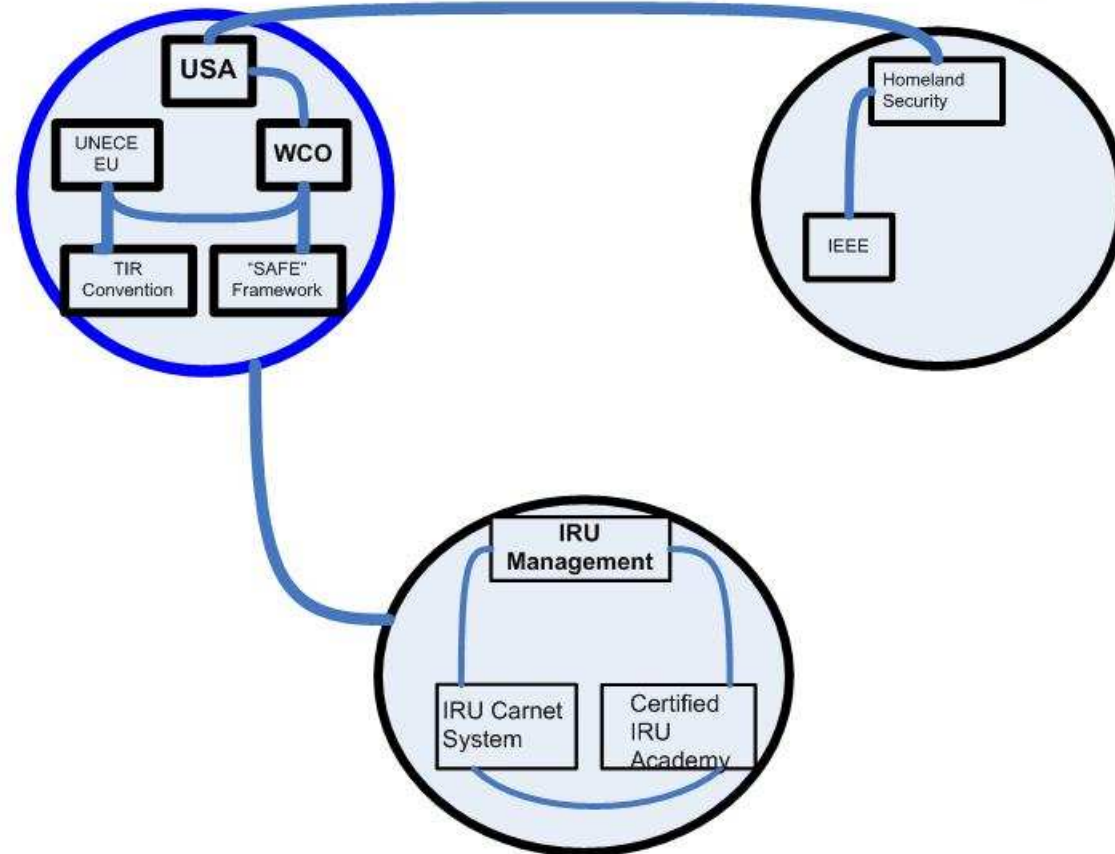
Global Security Transportation: Current Status

Global Security Transportation: Current Status



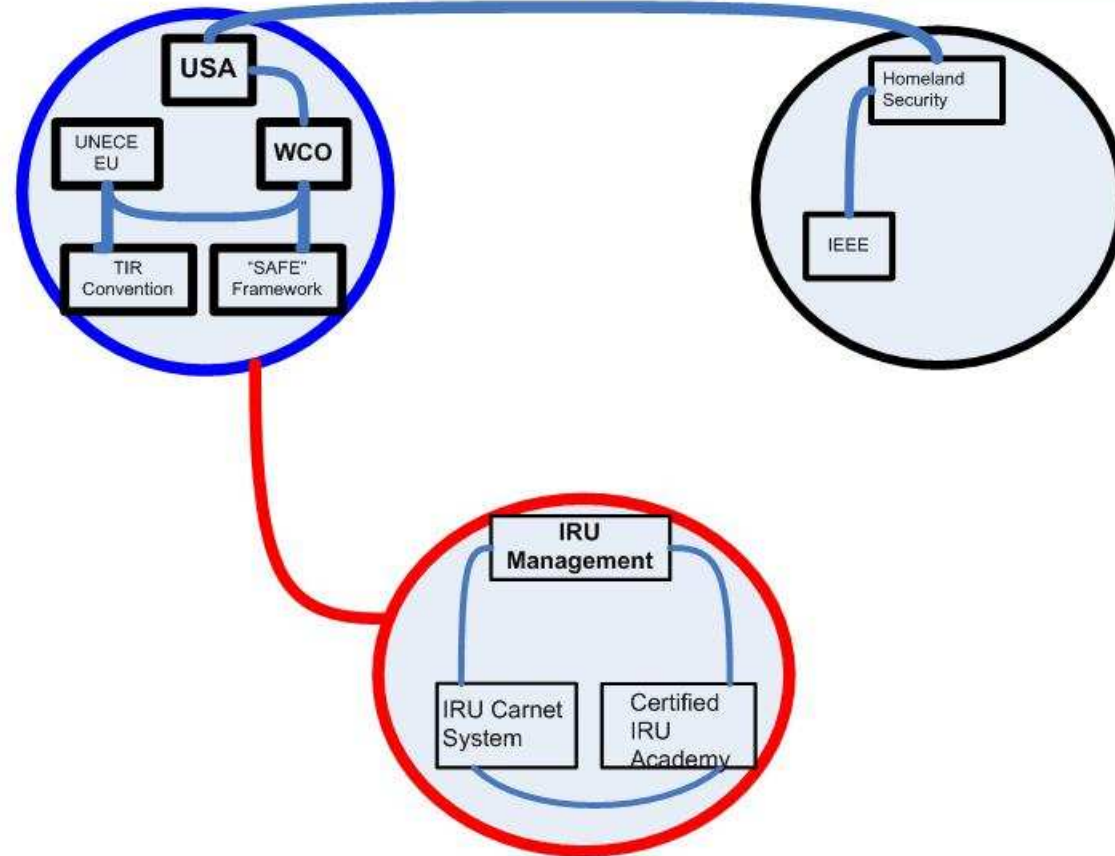
Global Security Transportation: Political Sphere

Global Security Transportation: Political Sphere



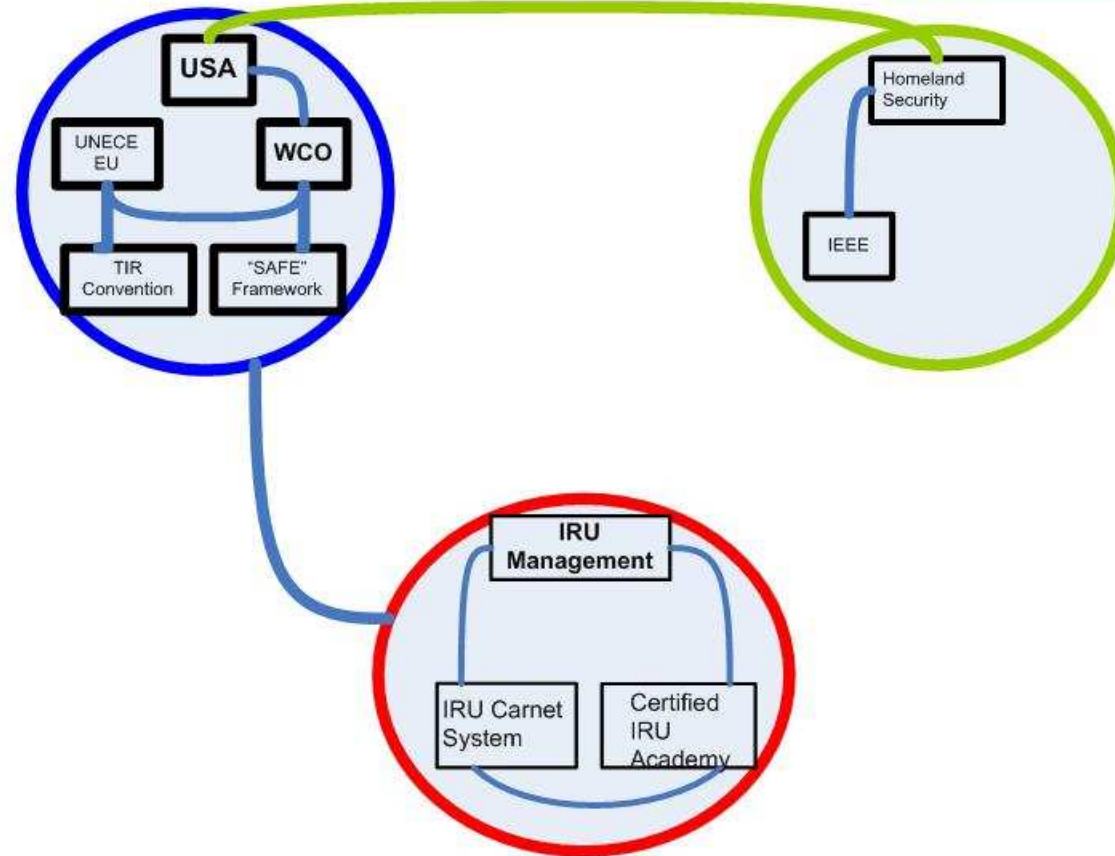
Global Security Transportation: Commerce

Global Security Transportation: Commerce



Global Security Transportation: Science

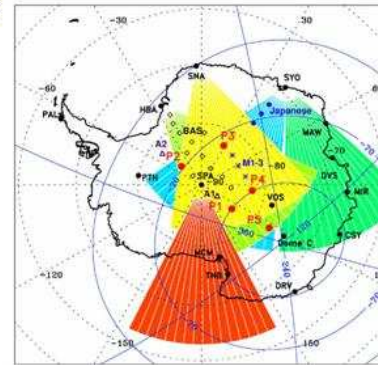
Global Security Transportation: Science



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

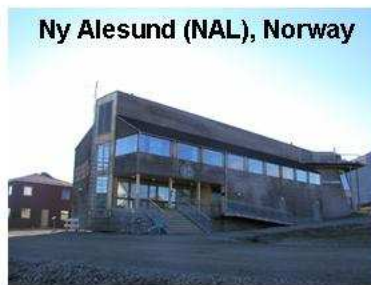


Courtesy of Hyomin Kim

Magnetometer System for Space Research in Polar Region

- *Spitbergen ULF magnetometer array installed by UNH, Aug. 2006*

Magnetometer System for Space Research in Polar Region



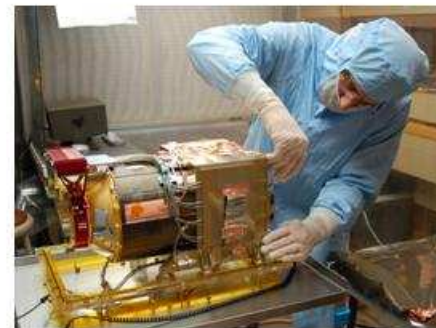
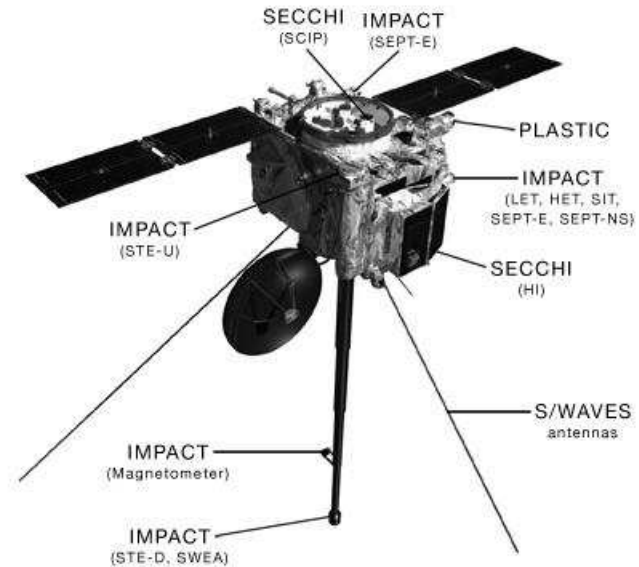
** Data Base with automatic update/scheduler*

Courtesy of Hyomin Kim

Example of Current Magnetometer System for Space Research in Space

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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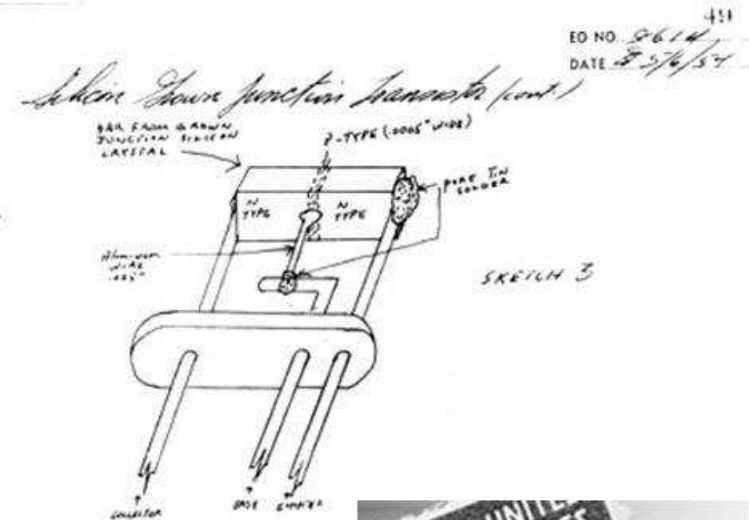
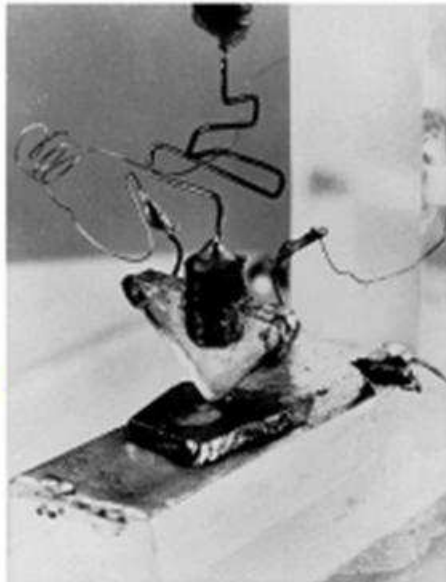


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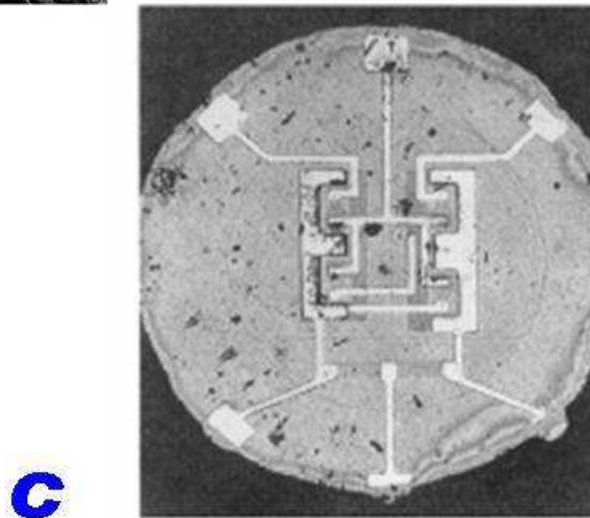
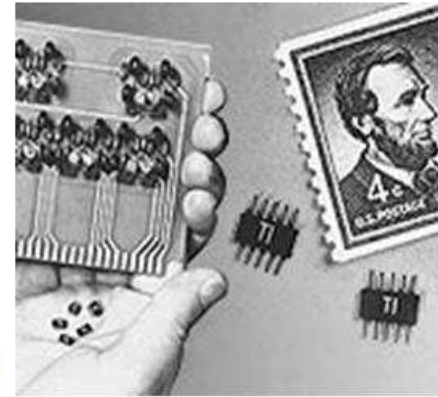
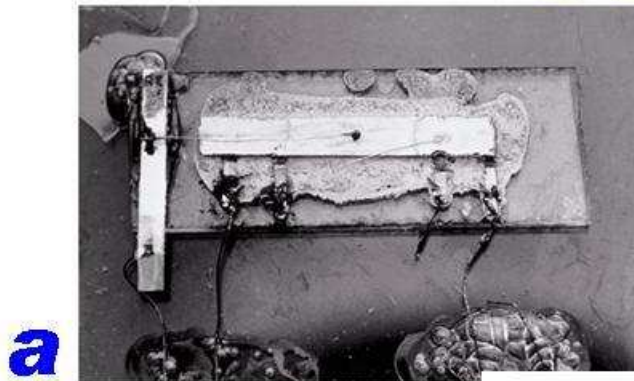
Transistor Era

The Transistor Era



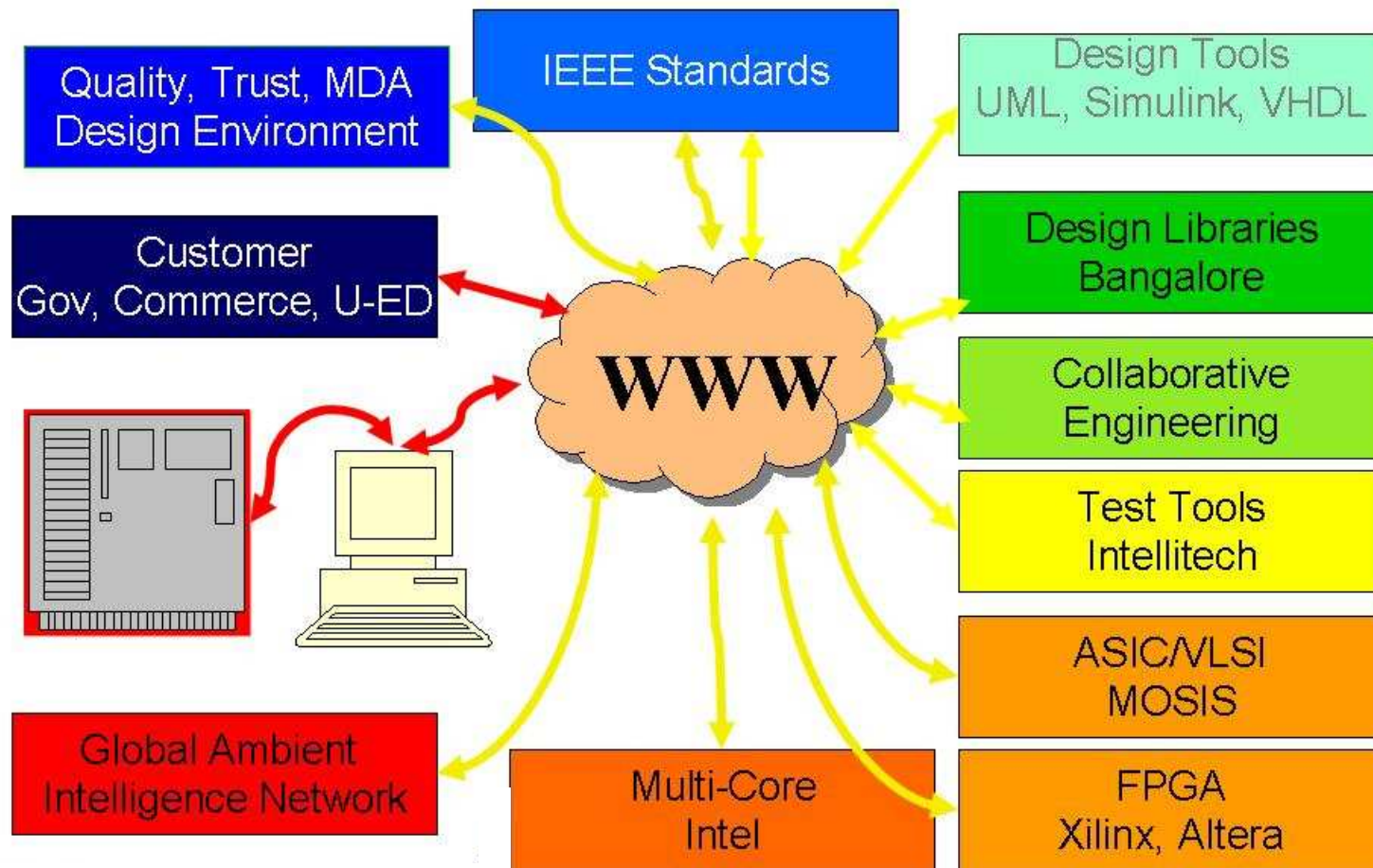
SSI Era

SSI Era



PSoC for GISE Era

Design for Globalization (DfG)



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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

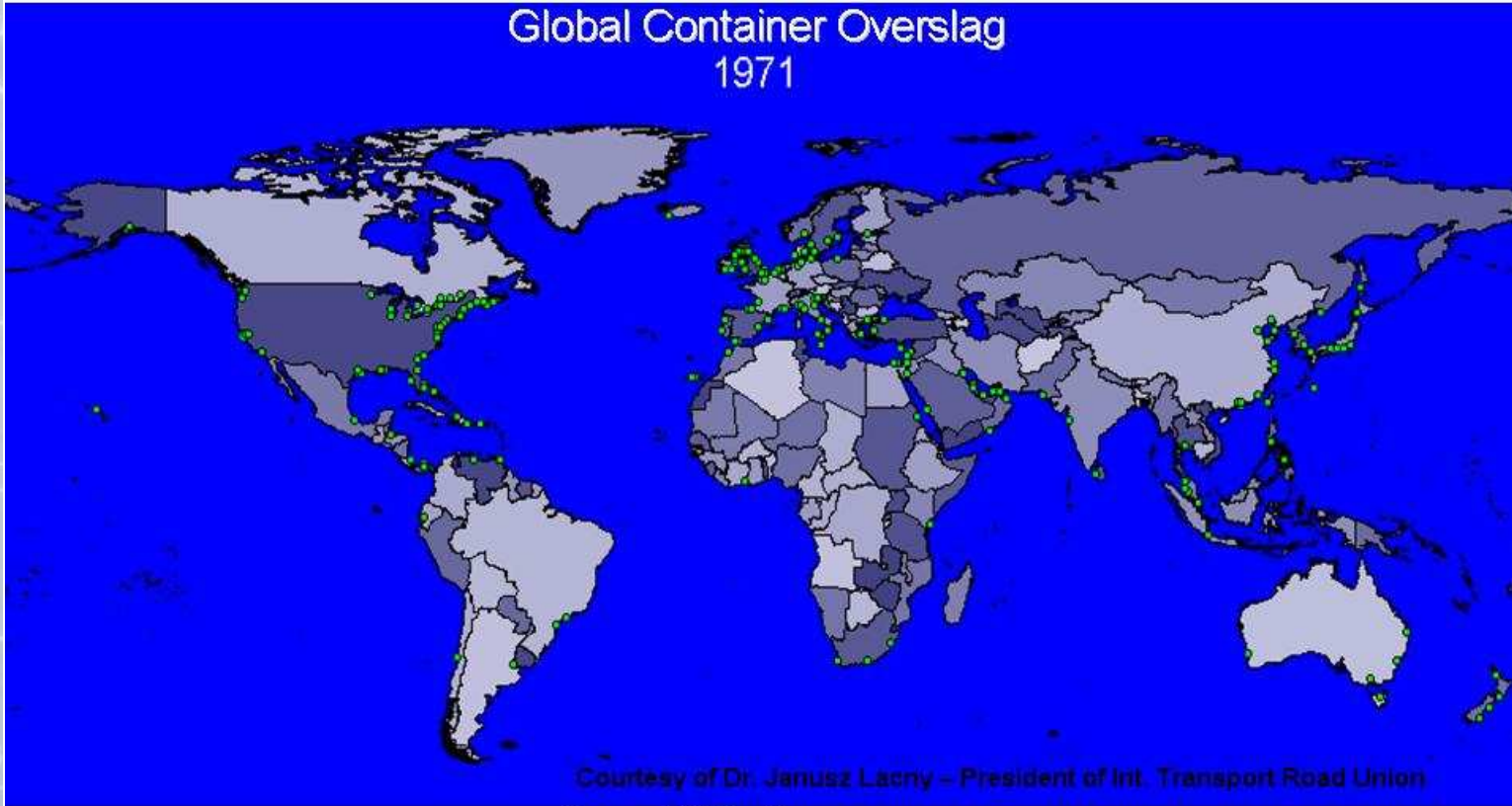
Safe & Secure Silk Road

Geographical Categories/Human Activities	North America	New England	Europe
United Nations			UNECE+ WCO SAFE
GISE Engineering			
GISE Economics			TIR+IRU

Evolution of sea containers in ports

Evolution of sea containers in ports

Global Container Overlag
1971



Safe and Secure Silk Road

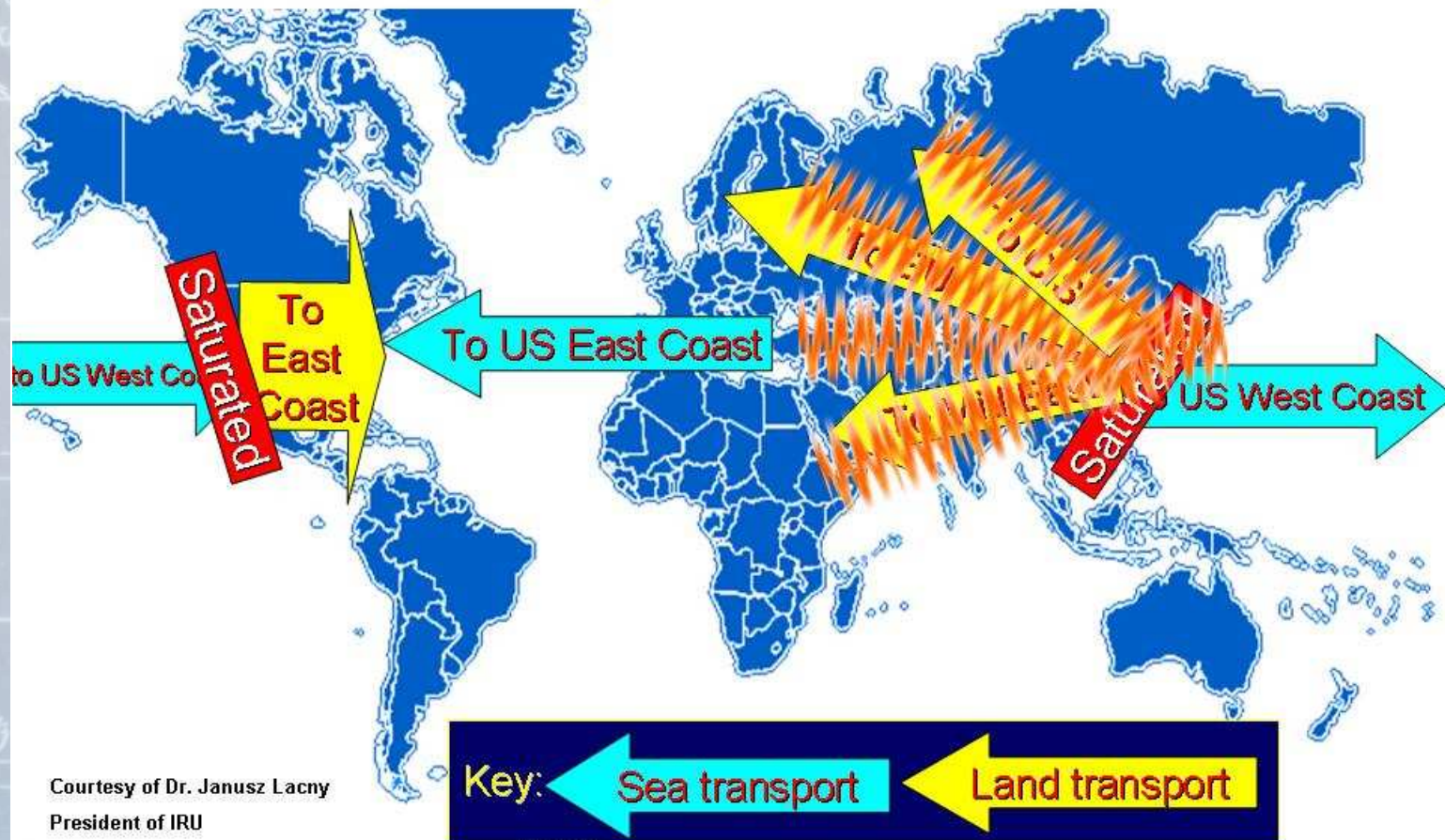
Safe and Secure Silk Road

Courtesy of Dr. Janusz Lacny – President of Int. Transport Road Union



Interconnecting all the businesses along the reopened Silk Road

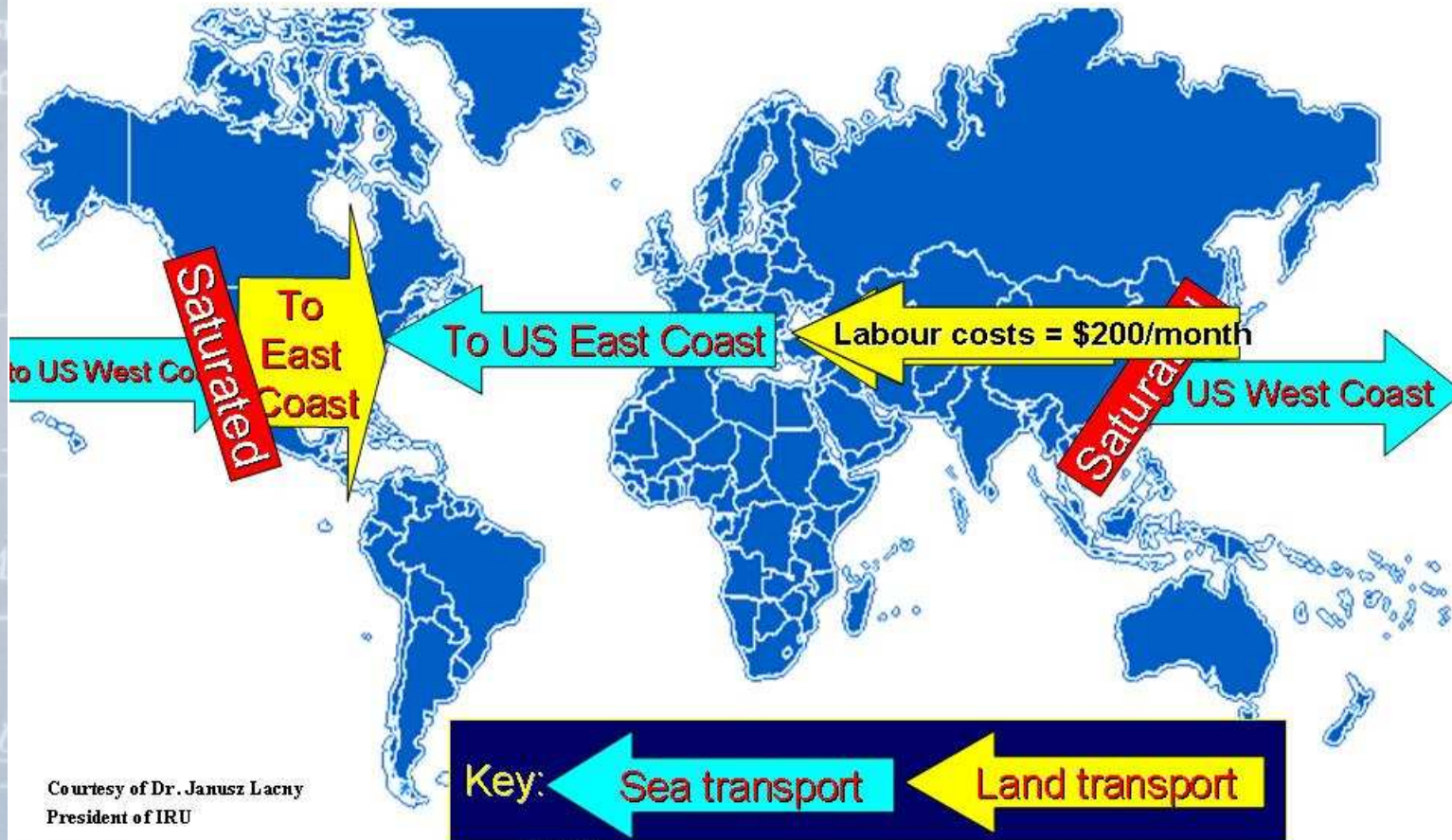
Interconnecting all the businesses along the reopened Silk Road



Courtesy of Dr. Janusz Lacny
President of IRU

Interconnecting all the businesses along the reopened Silk Road

Interconnecting all the businesses along the reopened Silk Road



Courtesy of Dr. Janusz Lachny
President of IRU

GISE Pilots

- Earth Magnetic Field Monitoring
- Safe and Secure EURO2012
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Canada US Transatlantic Cargo Security Pilot

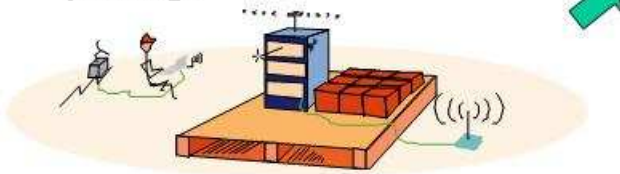
Canada US Transatlantic Cargo Security Pilot

Geographical Categories/Human Activities	North America	New England	Europe
United Nations	USA Canada	NH States Quebec	Germany
GISE Engineering		NI2	
GISE Economics			

Canada US Transatlantic Cargo Security Pilot

Canada US Transatlantic Cargo Security Pilot

1) Build & test prototype package



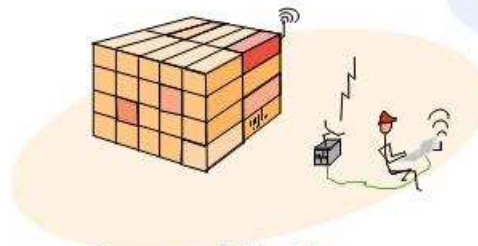
2) Install & verify package and scan at load point



5) Compare logged and real-time data



4) Scan at transshipment points

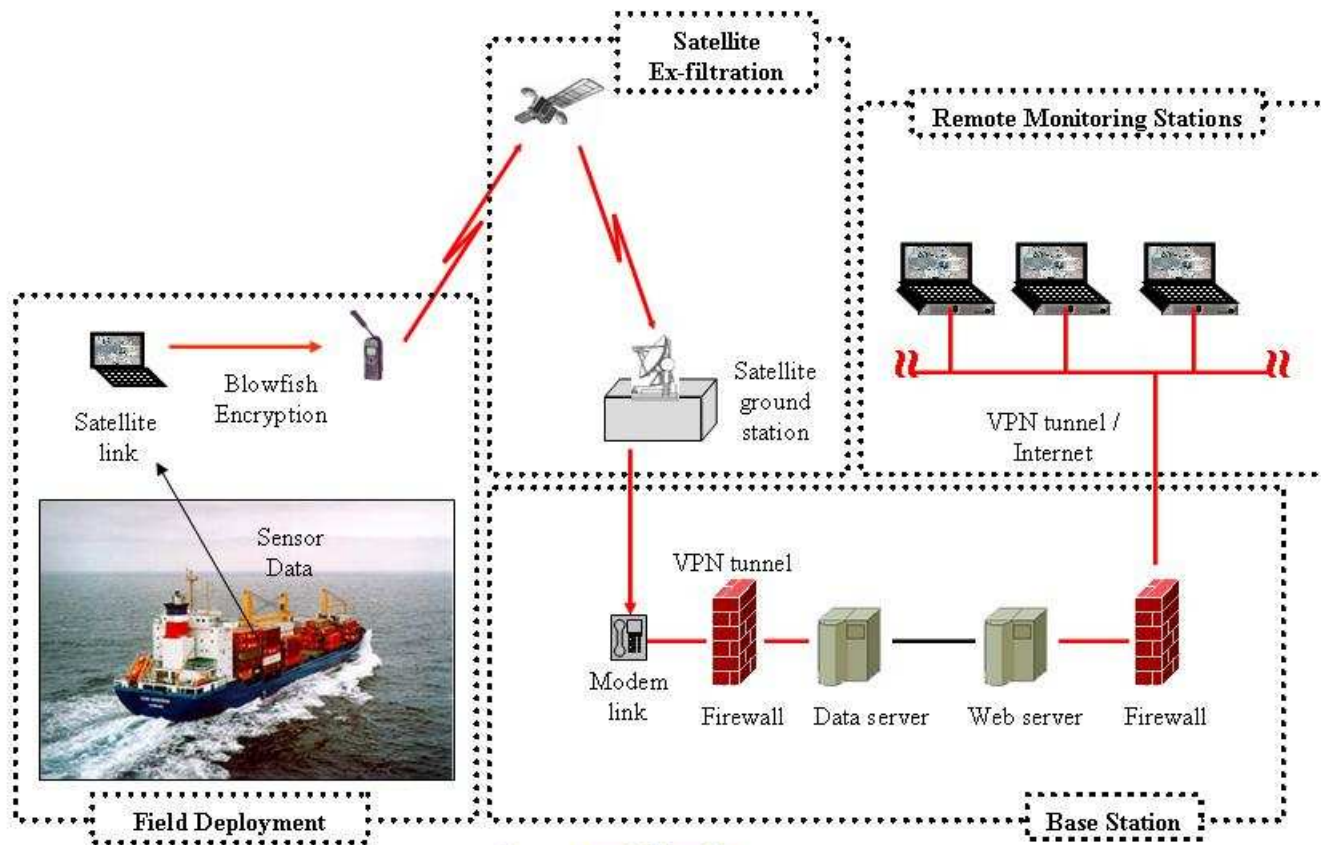


3) Track shipment, log data & report status to website



Canada US Transatlantic Cargo Security Pilot

Secure Testing Infrastructure



Canada US Transatlantic Cargo Security Pilot

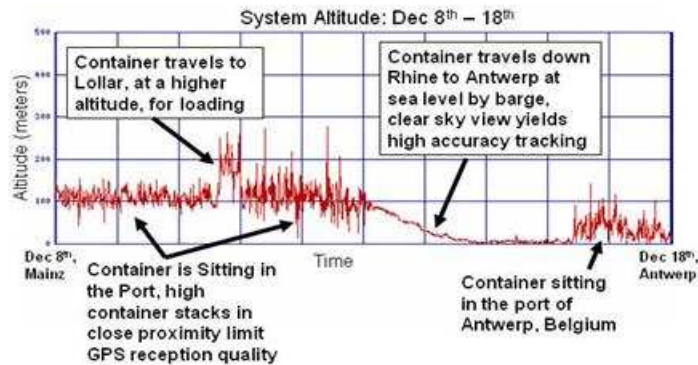
Real Time Tracking



Destination:
4700miles away
Londonderry,
New Hampshire



**Origin: Mainz,
Germany**



Outline

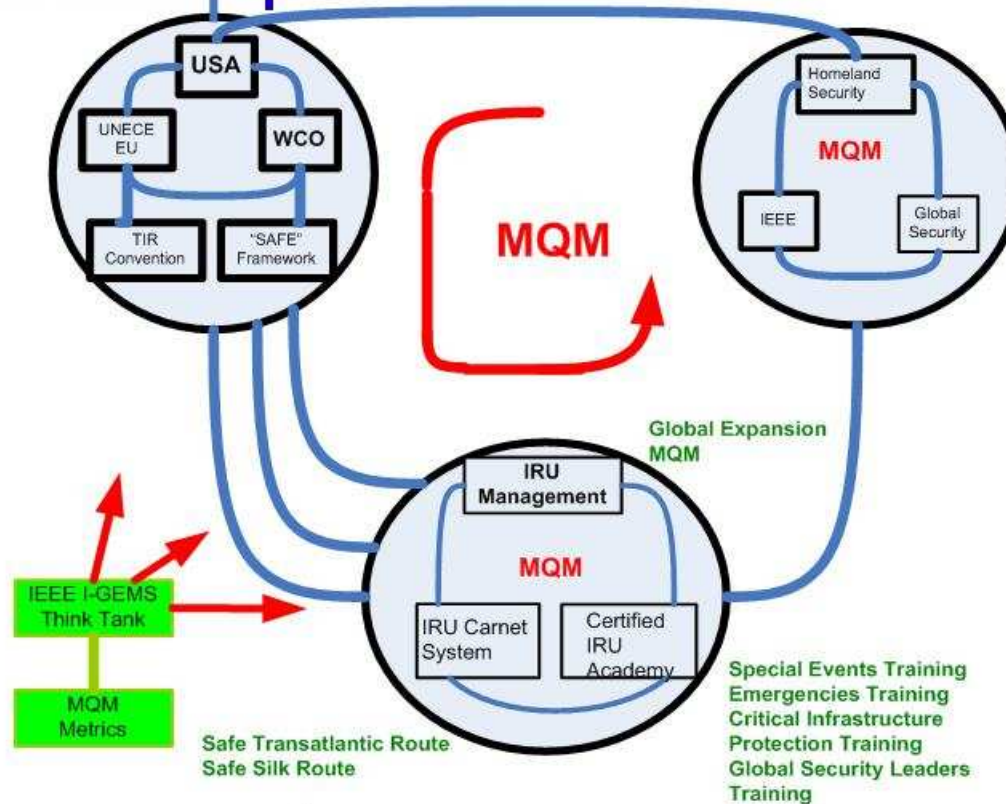
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Recommendations

- **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**
- **US & EU Forum → 2nd Transatlantic Security Initiative Workshop at University of New Hampshire, May 14, 2009**

Global Security Transportation: Rainbow Framework Implemented

Global Security Transportation: Rainbow Framework Implemented



Transatlantic Security Initiative

Transatlantic Security Initiative

Geographical Categories/Human Activities	North America	New England	Europe
United Nations	WCO USA Canada	WCO NH States Quebec	WCO
GISE Engineering		NI2	
GISE Economics	TIR+IRU	TIR+IRU	TIR+IRU

Karen Panetta & WIE Women and Globalization



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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Contact

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- CIDLAB Faculty and Students Visiting Intel Massachusetts