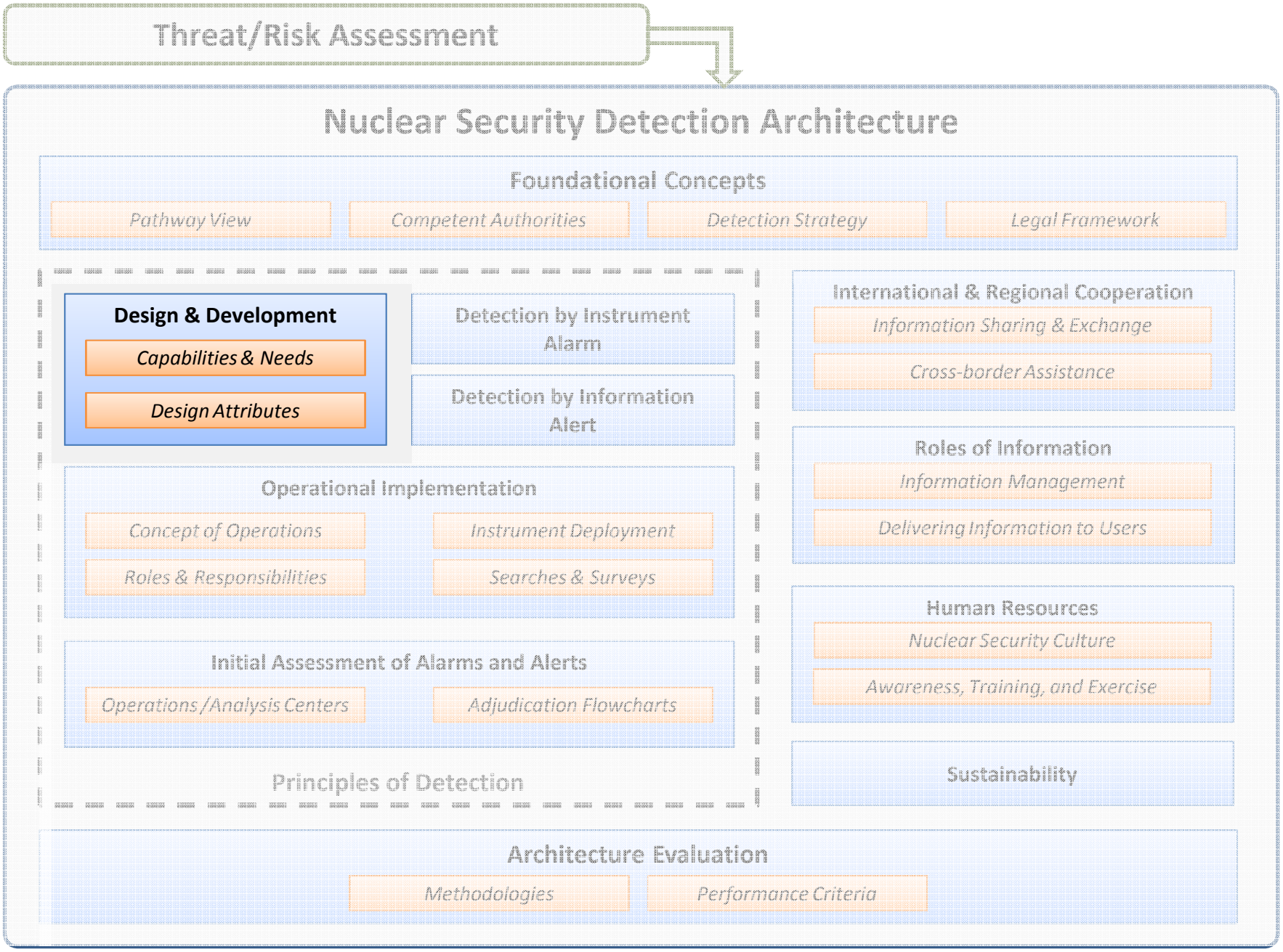
SAND2012-6062P

Architecture Design and Development

Nuclear Security Detection Architecture

Module E


Threat/Risk Assessment
Nuclear Security Detection Architecture
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Sustainability
Architecture Evaluation
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Performance Criteria

Module Objectives

Participants will become familiar with the basis for the effective design and development of a nuclear security detection architecture, including:

- Identifying baseline national capabilities
- Conducting an architecture needs assessment
- Identifying and prioritizing options for meeting architecture needs
- Applying architecture design attributes

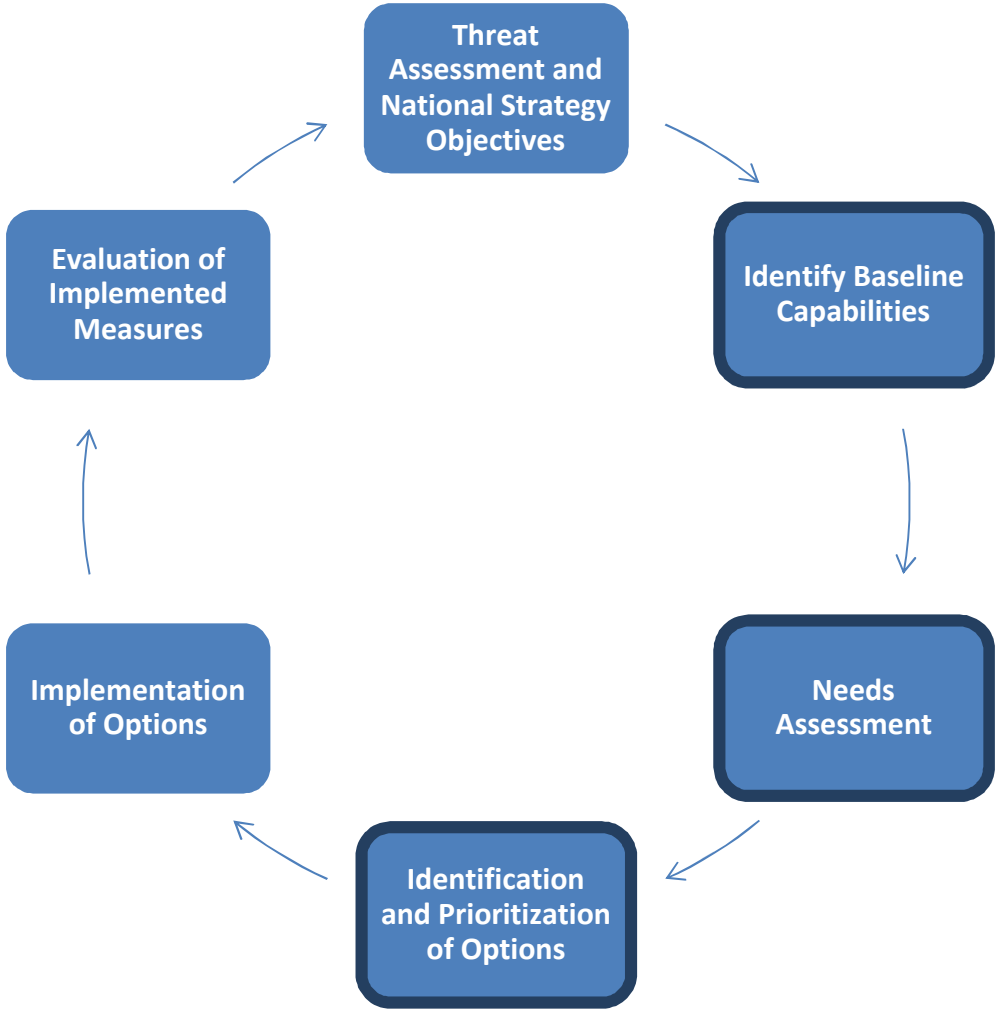
Country Self-Assessment Checklist

This module will enable or motivate the following questions:

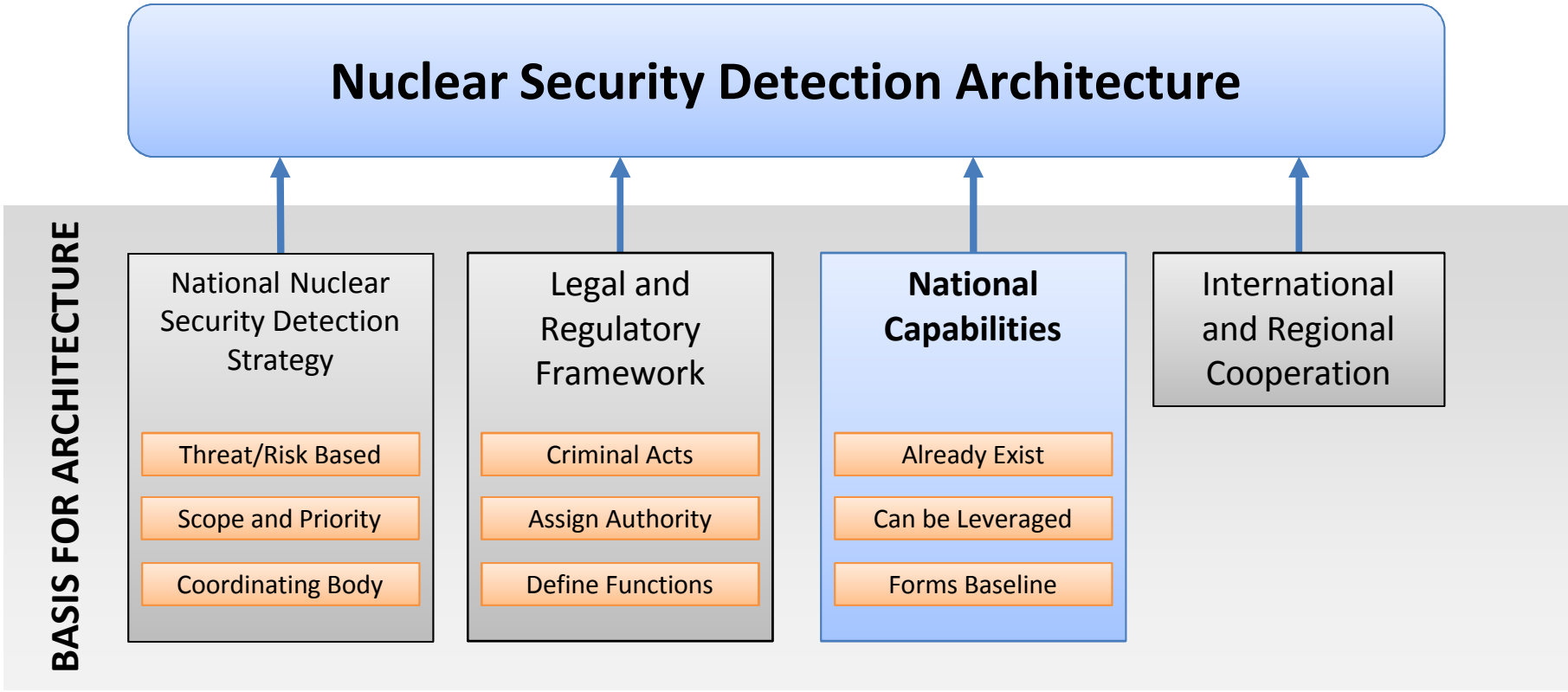
1. Based on the national nuclear detection strategy, have architecture requirements been defined?
2. Has an initial capabilities assessment (i.e., “baseline” assessment) been conducted?
3. Has a needs assessment been performed, comparing threat assumptions and targets against the initial capabilities assessment?
4. Have a range of options been determined for meeting identified detection needs?
5. Have the options been prioritized according to risk reduction benefits, costs, and other impacts?
6. Have existing and planned capabilities been integrated into an architecture design that reflects key NSDA attributes?

NSDA Design and Development

- Threat analysis and detection strategy objectives will inform the design and development process, including:
  - Identifying "baseline" national capabilities
  - Assessment of gaps, vulnerabilities, and architecture needs
  - Identifying, analyzing, and prioritizing potential options for addressing needs



National Capabilities



National Detection Capabilities

- Most countries already have architecture-relevant capabilities
- Some capabilities directly relate to detection missions; others may need to be adapted
- These existing capabilities form the “baseline,” and should be inventoried through a national capabilities assessment

National Capabilities: Security of Radioactive and Nuclear Material

- Security measures at the source can prevent materials from leaving regulatory control
- Security measures can also provide first notification of material diversion
- Some security capabilities – while not necessarily part of the NSDA – may also be leveraged to support detection, including:
  - Technical detection systems
  - Technical expertise
  - Trained personnel

National Capabilities: Regulatory Controls

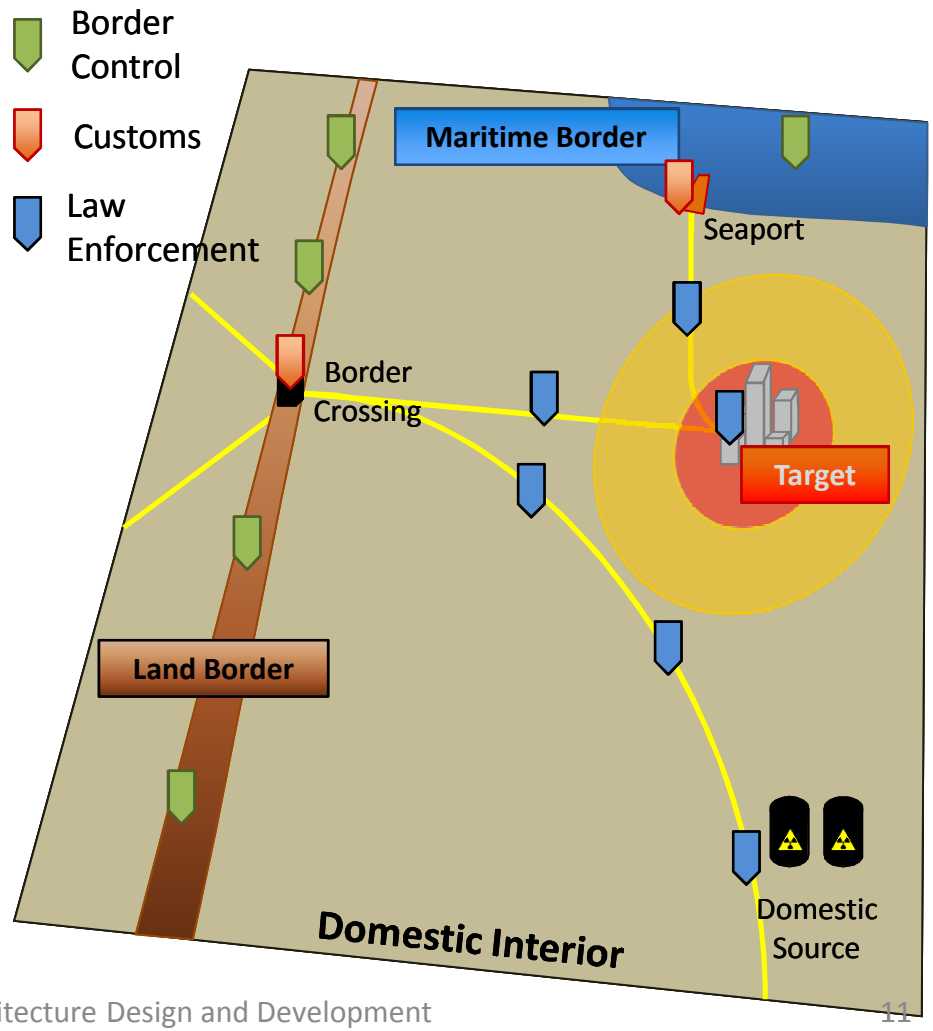
- Regulatory measures provide guidance and legal authority for detection activities
- Includes guidelines for secure use, storage, and transport of radioactive and nuclear materials
- Includes legal capacities for prosecuting illicit trafficking activities
- Also includes legal provision for routine screening activities in which detection measures can be integrated, including:
  - Activities of emergency first responders
  - Customs and trade screening
  - Highway weigh stations and checkpoints
  - Law enforcement search & seizure
  - Special event security protocols

National Capabilities: Technical Expertise

- Technical experts in engineering, physics, and other fields can support:
  - Design and evaluation of detection systems
  - Assessment of instrument alarms
  - Data and trends analysis
  - Identification of detected materials
- Technical expertise often resides in existing institutions, including:
  - Universities
  - National research institutions
  - Private sector
  - Government agencies
  - Non-government organizations

National Capabilities: Border Control, Customs, and Law Enforcement

- Existing security institutions often form the "front line" of a detection architecture
- Border control, customs, and law enforcement have authority over key transit pathways



National Capabilities: Information Gathering, Processing, and Sharing

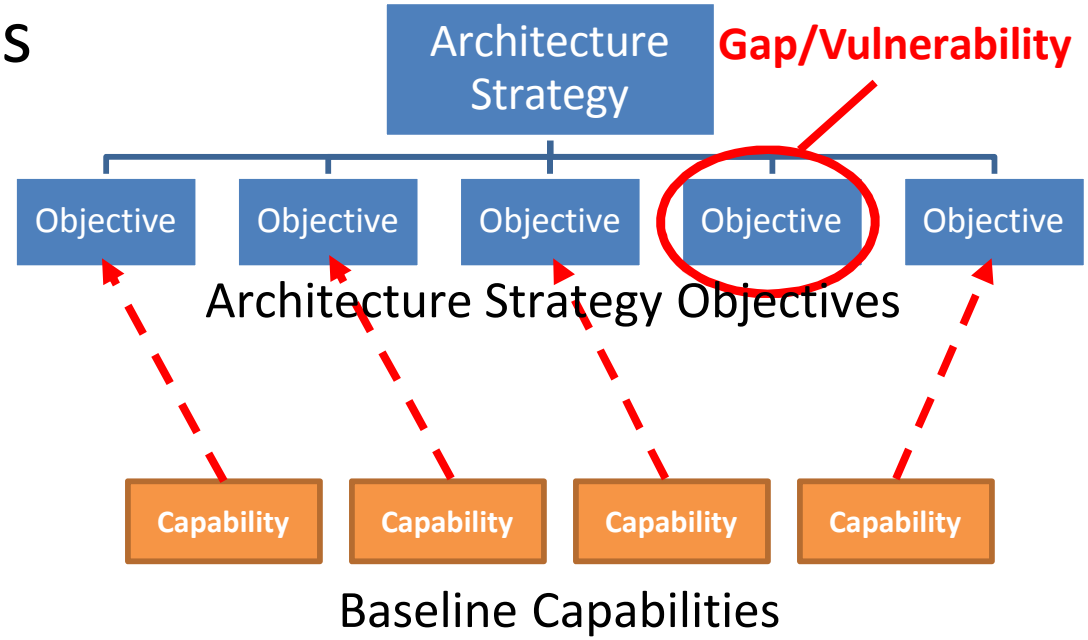
- Information capabilities are often pre-existing, including:
  - Operational information
  - Analytical capabilities
  - Technical information gathering assets other than detectors
  - Protocols for secure exchange of information
- Architecture performance is enhanced through information sharing across stakeholders
- Formalized protocols and agreements can facilitate efficient and timely information sharing

National Capabilities: Private and Public Sector

- Existing private and public organizations can also provide capabilities in support of the NSDA
  - Suppliers and users of radiological and nuclear materials
  - Detection technology vendors
  - Operators of critical infrastructure including roads, ports, railways
  - Postal and shipping services
  - Emergency first responders, hospitals, and medical personnel
- Through awareness-building and partnerships, the public and private sector can support and even enhance detection capabilities

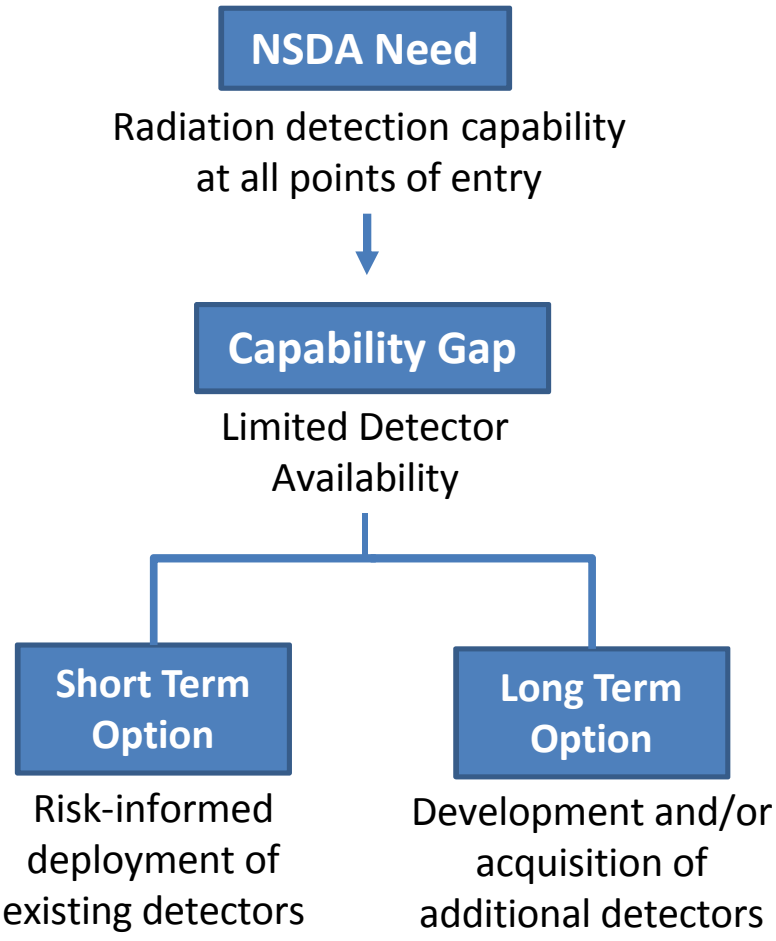
Needs Assessment

- Baseline capabilities should subsequently be evaluated in terms of their ability to:
  - Meet architecture objectives
  - Address identified threats and risks
- Identifying gaps & vulnerabilities is a major component of needs assessment



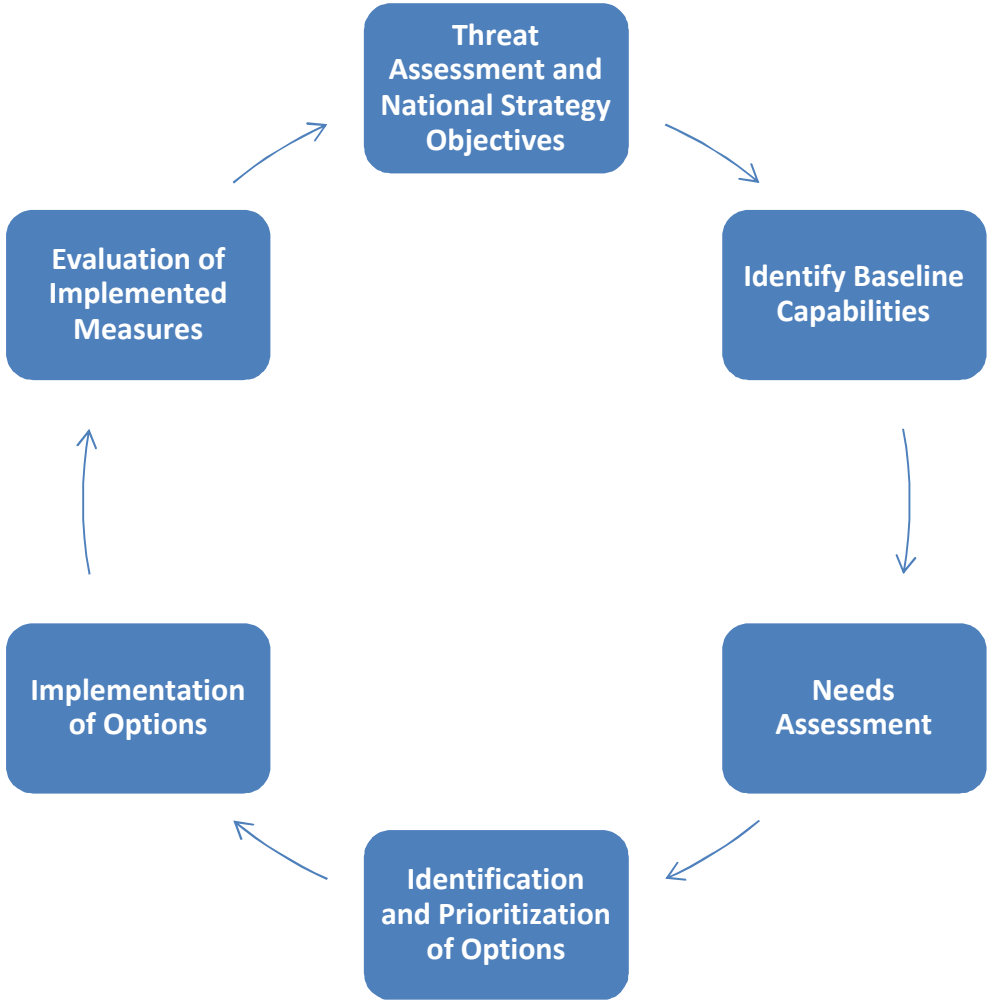
Identifying Options

- A set of options for addressing architecture needs should be developed, including:
  - Short-term risk-reduction options utilizing existing detection systems and measures
  - Long-term options that may include research and development on improved technologies, methods, and procedures
- Options should be evaluated and prioritized according to risk reduction, costs, and other impacts



Iterative Design Process

- Implemented measures should be evaluated for effectiveness, informing additional options and recommendations as appropriate
- The baseline should be periodically reassessed to ensure that the NSDA meets evolving objectives and threats

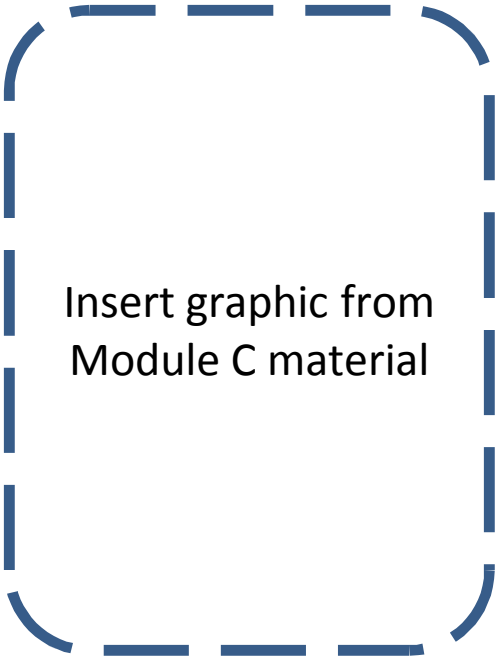


NSDA Design Attributes

- The IAEA Implementing Guide identifies key attributes of an effective nuclear security detection architecture
- These attributes should inform the design process, and can assist with:
  - Setting of architecture requirements
  - Needs assessment
  - Identification and analysis of options
  - Evaluation

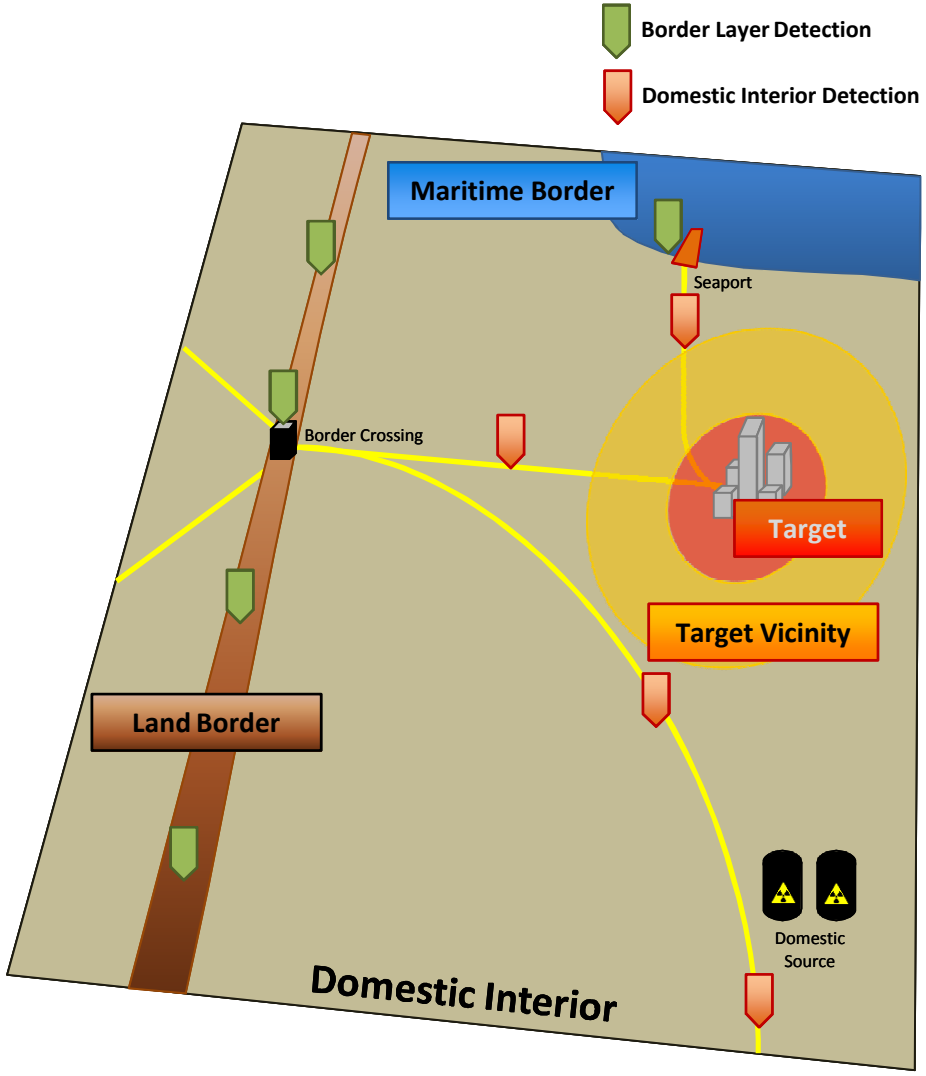
Attribute: Risk-Informed

- Careful analysis of threats, vulnerabilities, and potential consequences should inform design
- Balance needed between risk reduction, cost effectiveness, and other relevant factors



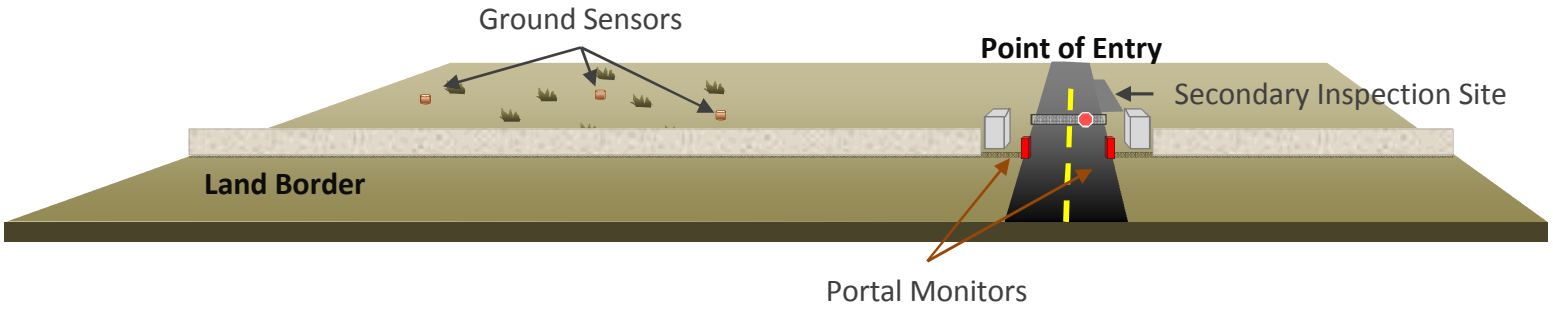
Attribute: Defense-in-Depth

- No single layer can be sufficiently effective or reliable
- Multiple layers increase the effectiveness of the architecture, including the likelihood of detection
- International cooperation can add additional layers



Attribute: Graded and Balanced

- Graded: recognize different risks are associated with different pathways
- Balanced: avoid over-emphasis on a small number of easily defended pathways while leaving other pathways unprotected



Graded: More infrastructure placed around POE because of greater threat
Balanced: Both POE and non-POE have protective measures in place

Attribute: Adaptive and Evolving Over Time

- Threats, technologies, and conditions change over time
- Detection systems and measures should be adaptive and evolving in response
- An adaptive/evolving architecture might include:
  - Responsive capacities for strategy and planning
  - Responsive capacities for research and development
  - Technical and non-technical assets that can be flexibly deployed

Attribute: Element of Unpredictability

- Unpredictability can provide strategic advantage, including increased deterrence
- Examples include:
  - Randomly scheduled additional screening
  - Randomized use of mobile inspection checkpoints
  - Deployment of mobile detection assets

Attribute: Not Reliant Solely on Radiation Detection Technologies

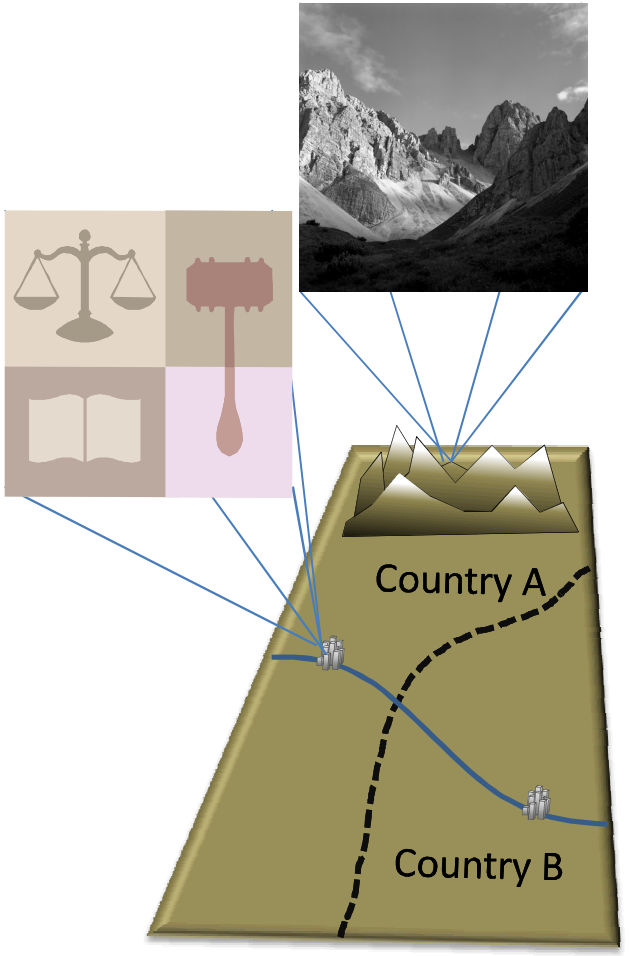
- Radiation detection technologies are only one means of detecting material out of regulatory control
- Radiation detection technologies have limitations
- Additional methods of detection should be employed to augment detectors, including:
  - Manual screening and inspection
  - Observation of behavioral cues and health indicators
  - Analysis of documentation (e.g. shipping manifests)
  - Operational information

Attribute: Emphasize Operational Flexibility

- Operational circumstances cannot always be predicted or planned for in advance
- Architecture design should emphasize flexibility in response to real-world requirements
- Examples of operational flexibility include:
  - Mobile detection assets
  - “Surge” detection capacities
  - Authorization and training for operational personnel to modify detection procedures as appropriate

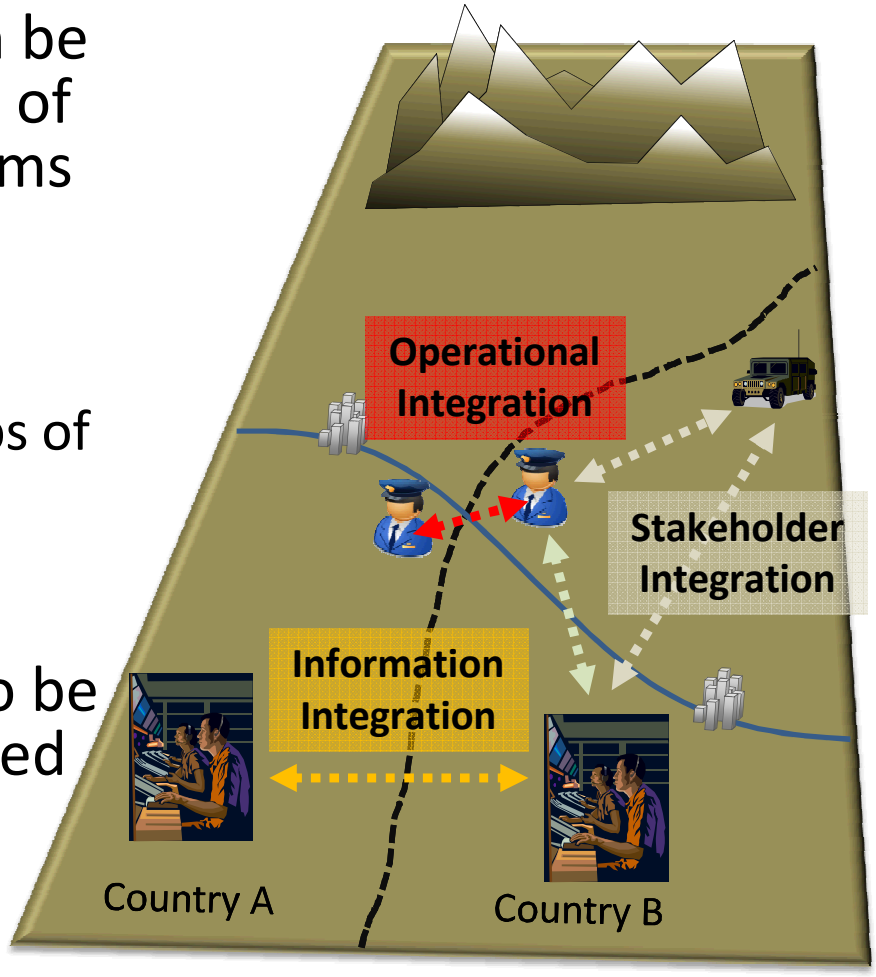
Attribute: Tailored to Specific Conditions and Circumstances

- There is no "one size fits all" design for a nuclear security detection architecture
- Every country presents unique conditions and circumstances, including:
  - Legal system
  - Culture
  - Threats
  - Resource availability
  - Technical capacities
  - Operational environment (e.g. transit pathways, terrain, climate, etc)
- An effective architecture is appropriately tailored to unique conditions



Attribute: Exploits Opportunities for Integration

- Architecture effectiveness can be enhanced through integration of detection measures and systems across:
  - National jurisdictions or boundaries
  - Regional or sub-regional groups of countries
  - The broader international community
- Sensitive information needs to be protected and not compromised through integration



Balancing Design Attributes

- There are benefits, costs, and tradeoffs associated with each attribute
- Not every country will necessarily emphasize each attribute equally
- NSDA design should attempt to achieve an appropriate balance given:
  - Identified threats and risks
  - Architecture requirements
  - Strategy goals/objectives
  - Available resources