THE VALUE OF PERFORMANCE.

**NORTHROP GRUMMAN**

QUINTELL of ohio ,LLC.

# An architecture for detecting fissile materials and nuclear weapons in cargo shipments

Neil Siegel, Ph.D.
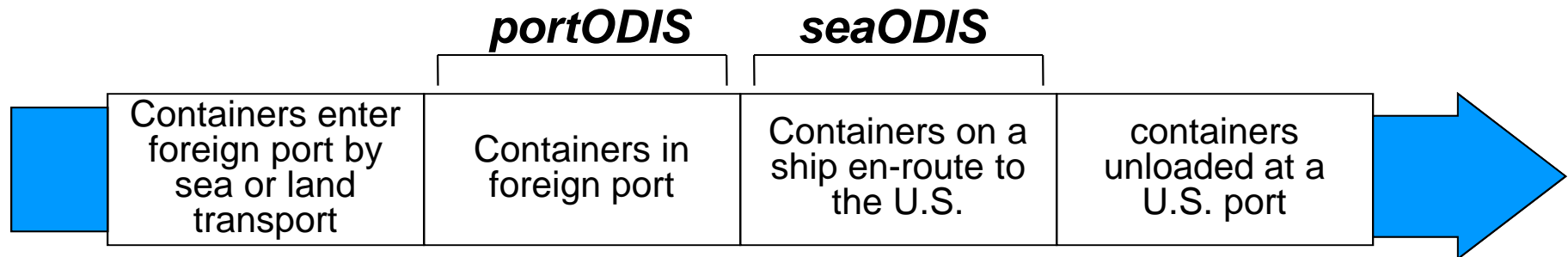Sector Vice-President & Chief Technology Officer
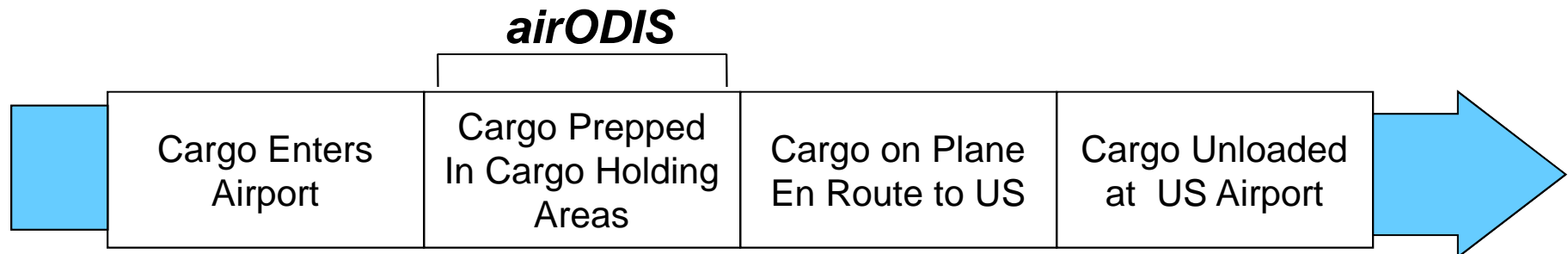Northrop Grumman

# Current Situation

- Active interrogation techniques (e.g., high-energy neutron beams, etc.) can operate with short dwell times, but are likely to be unacceptable with the public

- Passive interrogation techniques perform poorly with short dwell times

- Any method must be one that does not slow down commerce; at most, ~1 minute per scan

- We have developed architectures (for air and sea shipping channels) where passive interrogation can be employed, but *also* provide long inherent dwell times

# The 3 insertion points

## Sea transport

*portODIS*     *seaODIS*

| Containers enter foreign port by sea or land transport | Containers in foreign port | Containers on a ship en-route to the U.S. | containers unloaded at a U.S. port |
|---|---|---|---|

## Air transport

*airODIS*

| Cargo Enters Airport | Cargo Prepped In Cargo Holding Areas | Cargo on Plane En Route to US | Cargo Unloaded at US Airport |
|---|---|---|---|

ODIS = Offshore Detection Integrated System

# Obtaining long dwell time at sea

- 3 or 4 sensors temporarily affixed on each cargo container at the port of embarkation



Container in Array of Sensors

Container
Grid Lines for Clarity
Sensor

- Containers loaded and stowed on ship, creating an array that multiplies sensor detection capability and provides redundancy

- Radiation data securely relayed for duration of trip to a U.S. homeland Control Center, which merges the data with all other intelligence data, supports decision-making

- Provides time to decide – no split-second judgments required

- Detectors removed at port of debarkation, recertified, and distributed by air to foreign loading ports – not easily tampered with

- Life-cycle costs ~$150 container trip
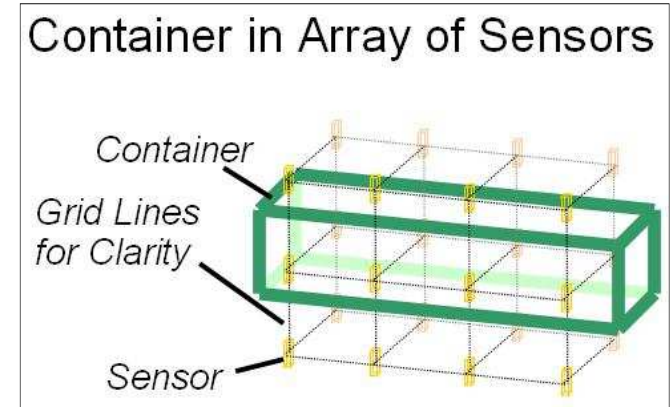
# Obtaining long dwell-times for air cargo

- Radiation sensors are temporarily attached to the containers or pallet netting in an airport cargo facility during pre-loading
    - 3 sensors per pallet with 2 to 4 hour dwell time
    - Larger, higher-gain sensors than seaODIS
    - Sensor data is transmitted to airport center encrypted, and relayed to a CONUS Center for threat detection and action
- Cargo handlers attach, remove and return sensors to the docking cart
- Life-cycle costs ~ $10 - $20 / pallet
- CONOPS designed to work within existing work-flow

*Deterrence for the air cargo channel*

sensors can hang from cargo nets

# Summary

- Nuclear transport modeling / sensor design shows that dwell-time in fact does solve the problem
- Could detect (and enable interdiction at-sea) of nuclear materials and weapons in sea cargo containers
  - Inherently addresses the detonation-on-detection and the "hot-potato" problems
  - Allows time to make informed, deliberate decisions
- Can be applied to air pallets, obtaining reasonable dwell times, and thereby, improved sensor performance
- Complements other elements of a multi-source container management system, and fits into layered defense
- At scale, cost per-container or per-palette is modest
  - Based on modeling of the system at scale: number of sensors, and the management of the sensor re-use cycle, etc.
- Excellent false-positive rates
- Incrementally deployable, upgradeable on the fly