A FORUM TO INVESTIGATE/ADDRESS COMMAND AND CONTROL

(PERTAINING TO CYBER DEFENSE)

Neal Ziring
NSA IAD Technical Director

16 Feb 2016

Agenda

- Background
  - Problem Statement
  - Formation of the Working Group
- Design Principles/ Scope
- Work In Progress
- Next Steps
- Updates

The Problem Statement

- Modern Cyber Defense implementations:
  - Integrate products in a proprietary or unique manner
  - Statically configured
  - Upgrades to the functional blocks are intensive
  - Modifications may impact the efficacy of the system
  - Adaptations to new TTPs hard to accomplished in cyber-relevant time
- Future Defense implementations must support:
  - Sharing of indicators
  - Coordination of responses between domains
  - Synchronization of cyber defense mechanisms
  - Automated, multi-part actions at machine speed
- Standardization is a Key Enabler for Unambiguous C2

Formation of the Working Group

- Stakeholders
  - USG: DHS IACD, NSA Active Cyber Defense
  - Industry
    - Orchestration Vendors
    - Network, Endpoint, Application Vendors
    - Financial Sector
  - Academia
- Course of Action Working Group
  - Kickoff on July 29, 2015
  - 90 minute Teleconference/Meetings (biweekly)
  - Full Day Workshops (Quarterly)

Defense in Cyber Relevant Time

OpenC2 Design Principles

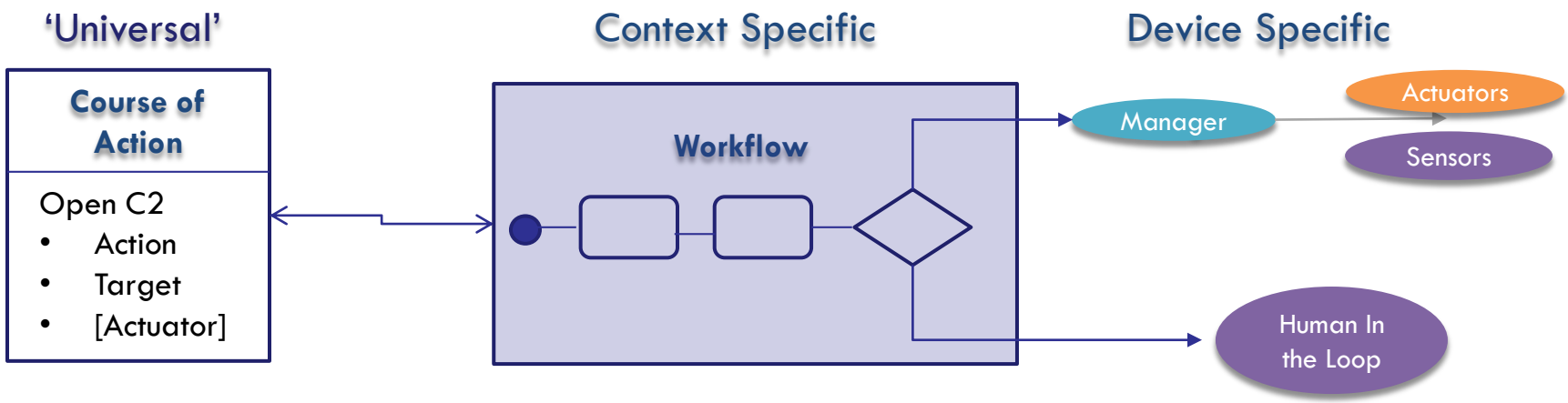
- Lightweight
  - Efficient Machine to Machine communications
  - Minimize the set of 'core' actions
- Abstract
  - Focuses on 'What' to do vice 'How' to do it
  - Permits different levels of abstraction
- Extensible
  - Address requirements for operational environment
  - Extensions enable additional precision and flexibility
- Agnostic
  - Transport, Authentication , Integrity controls etc.
  - Enables flexibility w.r.t. implementation

Enable Unambiguous Machine to Machine Command and Control Messages

Additional Considerations

- External Dependencies
  - Transport Layer
  - Information Assurance
    - Authentication Mechanism
    - Integrity
    - Availability
    - Confidentiality
  - Message Prioritization
  - Message Identification/ Acknowledgment
- Message Types
  - Tasking/ Response
  - Notifications
  - Effects based

Conceptual Model



Course of Action

- Focused on desired effect.
- A set of activities to mitigate specific attack to an information system.

Workflow

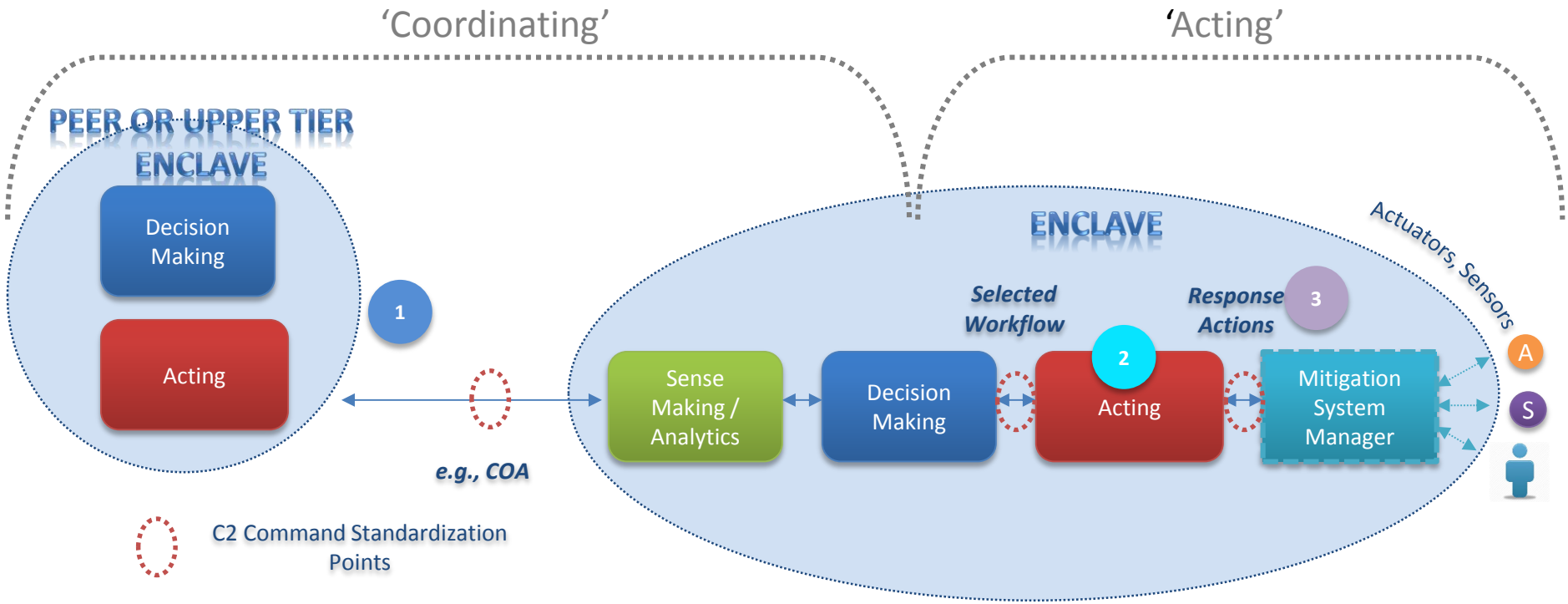
- Derived from a Course of Action
- An ordered or coordinated set of steps

Response Action

- One or more instructions for a particular sensor or actuator

OpenC2 to Support Integrated Defensive Cyber Operations

- Coordination/ Sharing using OpenC2 commands (i.e. Course of Action)
- Execution using OpenC2 Commands (i.e. Workflow)



Work In Progress: Syntax


```
<ACTION> (
     target (type=<TARGET_TYPE>, specifiers),
     [actuator (type=<ACTUATOR_TYPE>, specifiers)],
     [modifiers]
)
```

- **ACTION** ('The Verb')
  - What is to be done
  - All OpenC2 commands have an Action
- **TARGET** ('The Object')
  - What is affected by the ACTION
  - All OpenC2 commands have a target
- **ACTUATOR** ('The Subject')
  - What is executing the ACTION on the TARGET
  - Optional In Higher Level Commands
- ***Specifiers***
  - Further identify TARGET(s) and ACTUATOR(s)
- ***Modifiers***
  - Provide additional information for the ACTION (optional)

OpenC2 Syntax Flexibility

ACTION	TARGET	*SPECIFIER*	ACTUATOR	*SPECIFIER*	*MODIFIER*
Effects-based (no actuator specified); suitable for coordinating across enclaves					
DENY	ip	*address*			
Specify class of actuator					
DENY	ip	*address*	network		
Specify type of actuator					
DENY	ip	*address*	network.router		
Specify particular actuator					
DENY	ip	*address*	network.router	*BGP Speaker*	
Add a modifier to specify the action					
DENY	ip	*address*	network.router	*BGP Speaker*	Method= blackhole

Work in Progress: Lexicon

- ACTIONS
  - Converging on ~ 30 terms
  - Modifiers
- TARGETS
  - Leveraging CybOX objects
- ACTUATORS
  - Categories
    - Endpoint
    - Network/ Platform
    - Services/ Processes
  - Researching the ISCM and SACM efforts

Next Steps

- Continue Development of the language (Version 1.0)
- Reference Implementations
  - NSA/APL (Beginning January 2016)
  - NSA/G-2 Corporation (Beginning January 2016)
  - NIST Cyber-security Center of Excellence (Future)
- Integrate with Trusted Cyber Sensor (ongoing)
- Definition of TLV (Future)

Future Steps

- Finalize Working Group Charter
  - Draft Charter
  - Membership Agreement in progress
- Increase Participation in the Working Group
  - Financial Sector, DHS, Malware Detection vendors
- Engage OASIS
  - OpenC2 and STIX efforts complement each other
  - STIX COA Profile in progress
- Web Presence
  - http://openc2-org.github.io/public-website/

Questions?