



Modular Advanced Fuze Interface Architecture (MAFIA)

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Outline

- Purpose
- What This Is Not
- Fuze Architectures & DoD Acquisition
 - Current Approach
 - Modular, Open Systems
- Why This Program?
Why Now?
- Distributed Fuzing
 - Perceived Benefits
 - Arguments Against
- Lessons Learned
- MAFIA Approach
- Summary
- Questions



846TS/TGTP



Purpose

- Stimulate Dialogue
 - Within Fuzing and Ordnance Communities
 - Diametric Shift in Systems Engineering
- Establish That Distributed Fuzing Can:
 - Provide Benefits Worth Having
 - Be Compatible with System Safety
- Encourage Community To Explore and Implement Distributed Fuzing For Safe, Viable Systems
 - Via Discussions/Ad-Hoc Working Groups



What This Effort Is Not:

- Erosion Of Any Safety Function Via:
 - “Standardization”
 - Interchangeable “Fuzes”
 - Interchangeable Modules (Unlimited “Mix-N-Match”)
 - Forced Functional Distribution
 - Unchecked Growth (To Include Technology)
 - Unverifiable Dependence



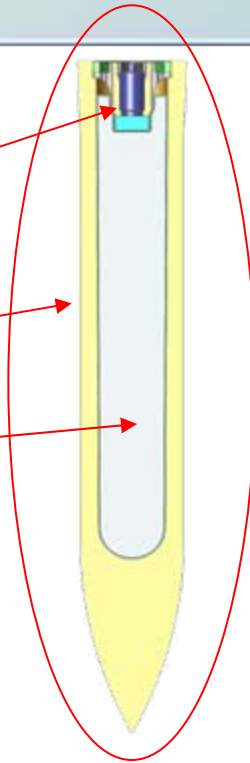
Current Fuze Architecture

Legacy Systems

- Fuze
- Warhead
- Explosive

Acquisition & Architecture

- Fuzes An Afterthought
- Fuzes Are Separate Acquisition Items
 - “Commodities”



- Fuzing System Responsibilities
 - Safety
 - Arming
 - Sensing & Target ID
 - Explosive Initiation
 - Communications
- Most Functions Are Co-Located Within Fuze “Can”
 - Legacy Weapon Fuzes Are Separate Components
 - Stored Separately
 - Imposes Capability Constraints



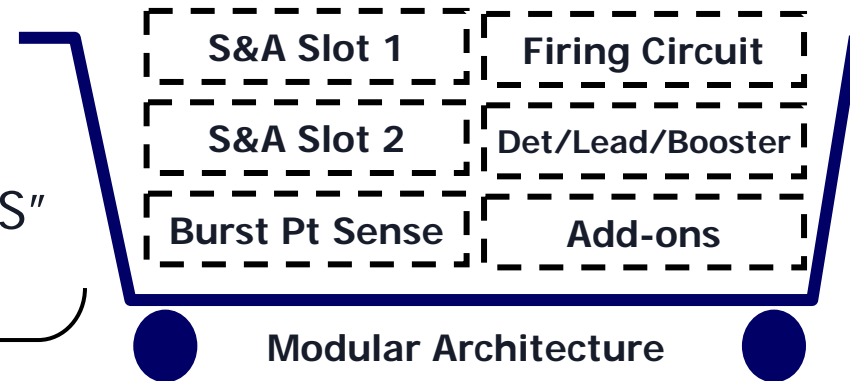
DoD Acquisition Preference

MOSA: Modular Open Systems Approach

- Integrated Business & Technical Strategy
- Preferred By DoD Acquisition Policy

Intent: Faster, Lower Cost Development, Integration

- Predicted Improvement In “-ilities”
 - Affordability, Reliability, Etc.
- Piecewise Capability Development
 - Incremental Acquisition Strategy
 - “Plug & Play” Compliant Systems
 - Multiple Subs For Multiple Modules
 - Modular Capabilities Become “COTS”
 - Service & Contractor Mix-N-Match



Good Topics for
Working Group Discussion



Why This Program? Why Now?

- Fuze “Commodity” Approach
 - Imposes Constraints
 - Lost Intended Benefits
- Available Technologies Do Make A Difference
 - Less Sensitive Booster Materials
 - Mission Programmability
 - Post-Impact Survivability & Functionality
- Fuzes Are Getting Squeezed
 - Smaller Weapon Systems
 - Parts (Electronic) Obsolescence
 - Disproportionate Cost Focus
- Why not?
 - Challenge Traditional Thinking
 - Perhaps This (Modularization) Is The Way To Go
 - Somebody’s Got To Try It!
- What Is The Larger Picture?
 - What About Readiness?
 - Easier To Develop/Mature Pieces Than The Sum Total
 - Pro-Active Involvement Means Having A Say In How It Is Accomplished



Perceived Benefits of Distributed Fuzing

- Allow Target Detection Device (TDD) To Remain With Warhead
 - Nose Fuzing (TDD) Is Desirable For Penetrator Applications
 - Liberation From Tail Slap
 - Reduce TDD Sensor Latency
 - Eliminate Traditional “Fuze Well”
 - Exploit Energetic Rebound (and Not Be A Victim of It!)
- Facilitates Standardized Communication
 - Launch Platform to Weapon
 - Weapon to Fuze
 - Fuze to Module



Perceived Benefits of Distributed Fuzing

- Smaller Functional Modules Could:
 - Support Trend Towards Smaller Weapons
 - Allow Diverse Placement Within Weapon Systems
 - Example: Redundant Fuzing
 - Allow For Multiple Sourcing (Procurement)
 - Reduce Acquisition Cycle
 - Developmental Testing According To Need
 - Qualify/Re-Qualify According To Need
 - Support/Instrumentation Demands Reduced
 - Commit To Physical Segregation Between Safety & Non-Safety Functions
 - Allow For Trending In Mature Design (Over Time)



Arguments Against Distributed Fuzing

- No Legacy Business Case
 - Large Inventory Of Legacy Weapons
 - Significant Investment Within Inventory Unitary Fuzes
- No Prime/Sub Contractor Incentives For New Systems
 - Use “Off-The-Shelf” Fuzes
 - Regurgitate All or Part of Existing Designs
- Requires Significant Up-Front Investment
 - Personnel & Program Funds
 - No Obvious Short Term “ROI”
- Establishing Joint Rules Challenging/Time-Consuming
 - Requirements Document(s)
 - Safety
 - Systems/Subsystems Interface
 - Environments
 - Test/Verification
 - Post Mission Features



Lessons Learned

- Society Of Automotive Engineers (SAE)
Fuze Standardization Working Group (AS1-B6)
- **Intent:** Standardize Air-Delivered Ordnance Fuzing
 - Met Quarterly Over Approximately Three Years
 - Group Consisted Of:
 - Foreign and Domestic
 - Government (Tri-Service) and Contractors
 - Second Group Formed (AS1-B7) To Address Mechanical Standardization Such As Fuze Well



Lessons Learned

- Group Struggled With What To “Standardize”
 - “Fuze” Verses “Fuzing System”
 - Continued Push For Subsystem Interchangeability Before System Interoperability Established
 - Contractor Influence Not Always Constructive
 - Non-Fuze Influence Not Constructive
 - SAE Limitations
 - Specialty Attitude That “Only ____ Can Solve Everything Right”
 - ITAR/Foreign Dialogue Limited (UAI Not Discussed)
 - Effort To Accommodate Legacy Systems “Ball-&-Chain”
 - Perception of Constant Safety “Adult Supervision”



MAFIA Approach

- Design/Promote A Modular Fuze Architecture By:
 - Parsing Fuzing System Functional Allocations
 - Communication
 - Safety
 - Target Detection Device (TDD)
 - Determining/Defining Interfaces
 - Interface Control Document (ICD) Style
 - Establish Rules/Conditions That Can Allow “Plug & Play” Functionality
 - Determine Certification, Conformance, Metrics
 - Set Minimum Qualifications To Satisfy Requirements
 - Support Legacy Weapon Systems (As Reasonable)



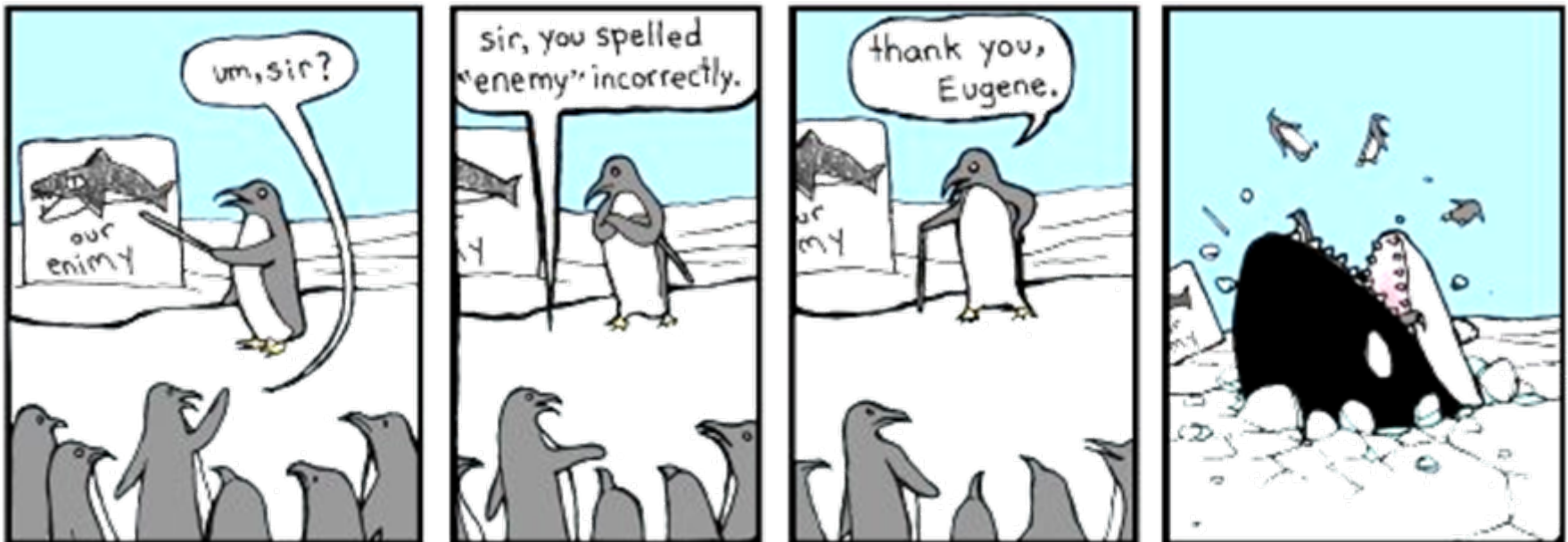
MAFIA Status

- Unfunded program (for now)
 - Related Air Force Program Slated To Begin In FY10
- Beginning Socialization and Groundwork
 - Government Advocacy
 - DoD Fuze IPT
 - Other Fuze Communities (Technical & Acquisition)
 - DoE-DoD Technical Coordinating Groups (TCG's)
 - Fuze Engineering Standardization Working Group (FESWG)
 - Support Is Welcome Now



Summary

- Modular Fuzes Can Provide Significant Technical & Acquisition Advantages
 - Decentralized Location
 - Incremental Acquisition
 - Technology Improvements
- Legacy Fuze Approach
 - Imposes Constraints On System Performance
 - “Way It’s Always Been Done”
- Ramping Program Up Now
 - Long Road Ahead

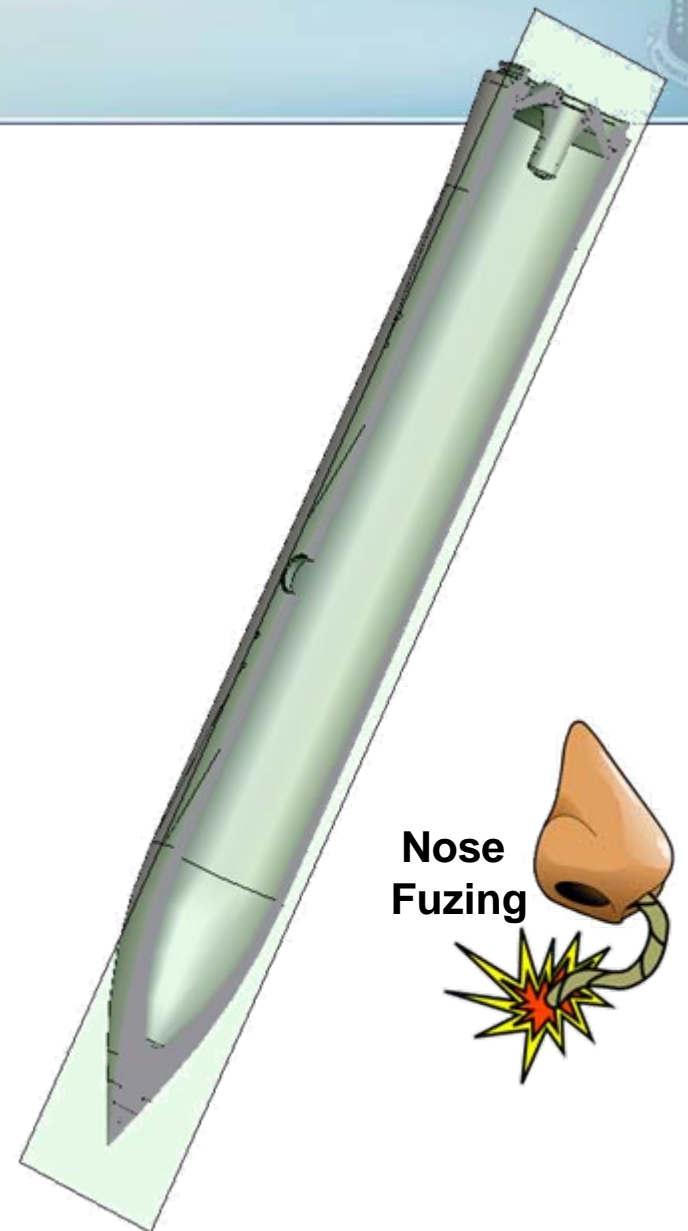




Questions?

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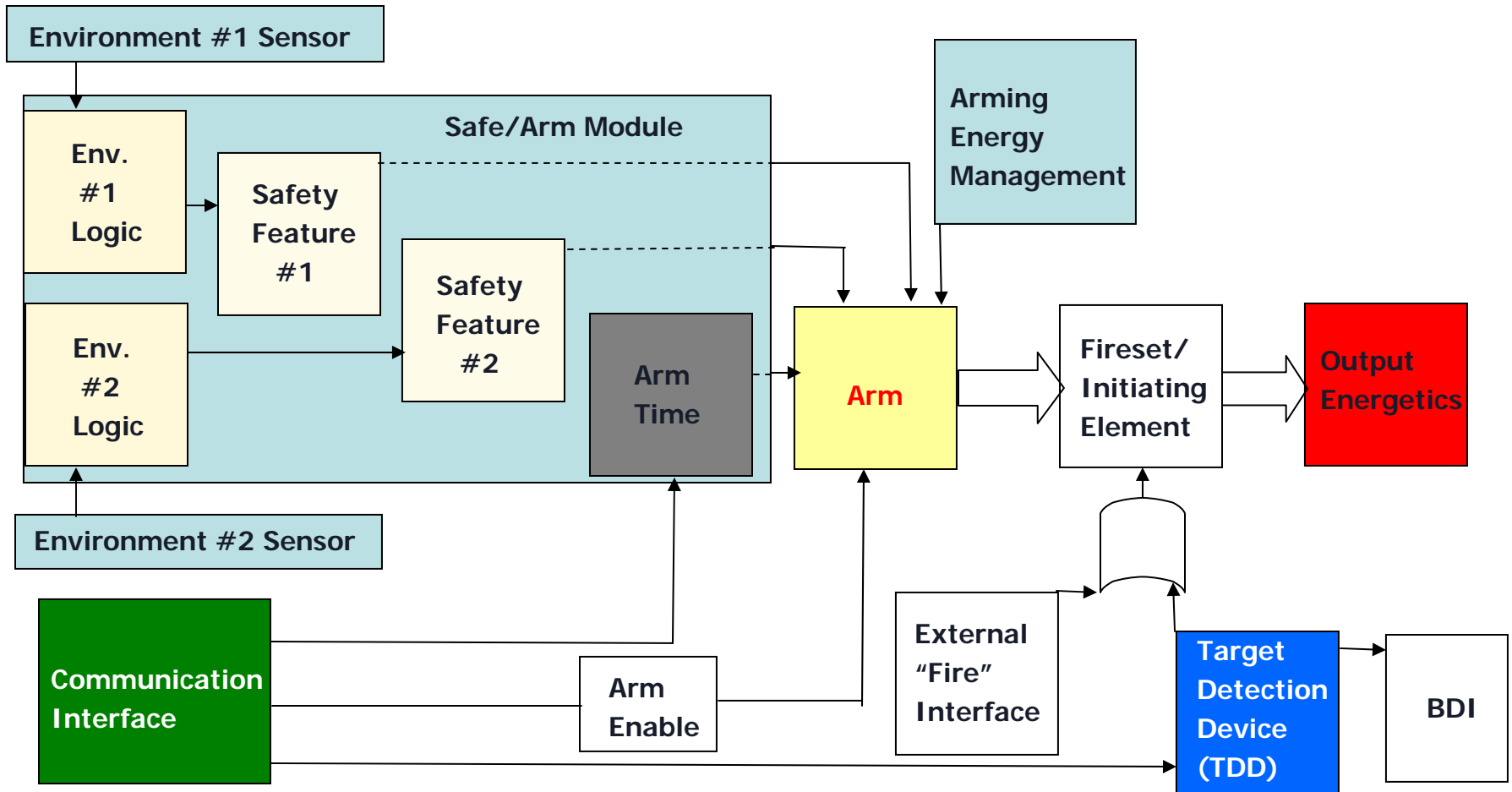


Backup Slides



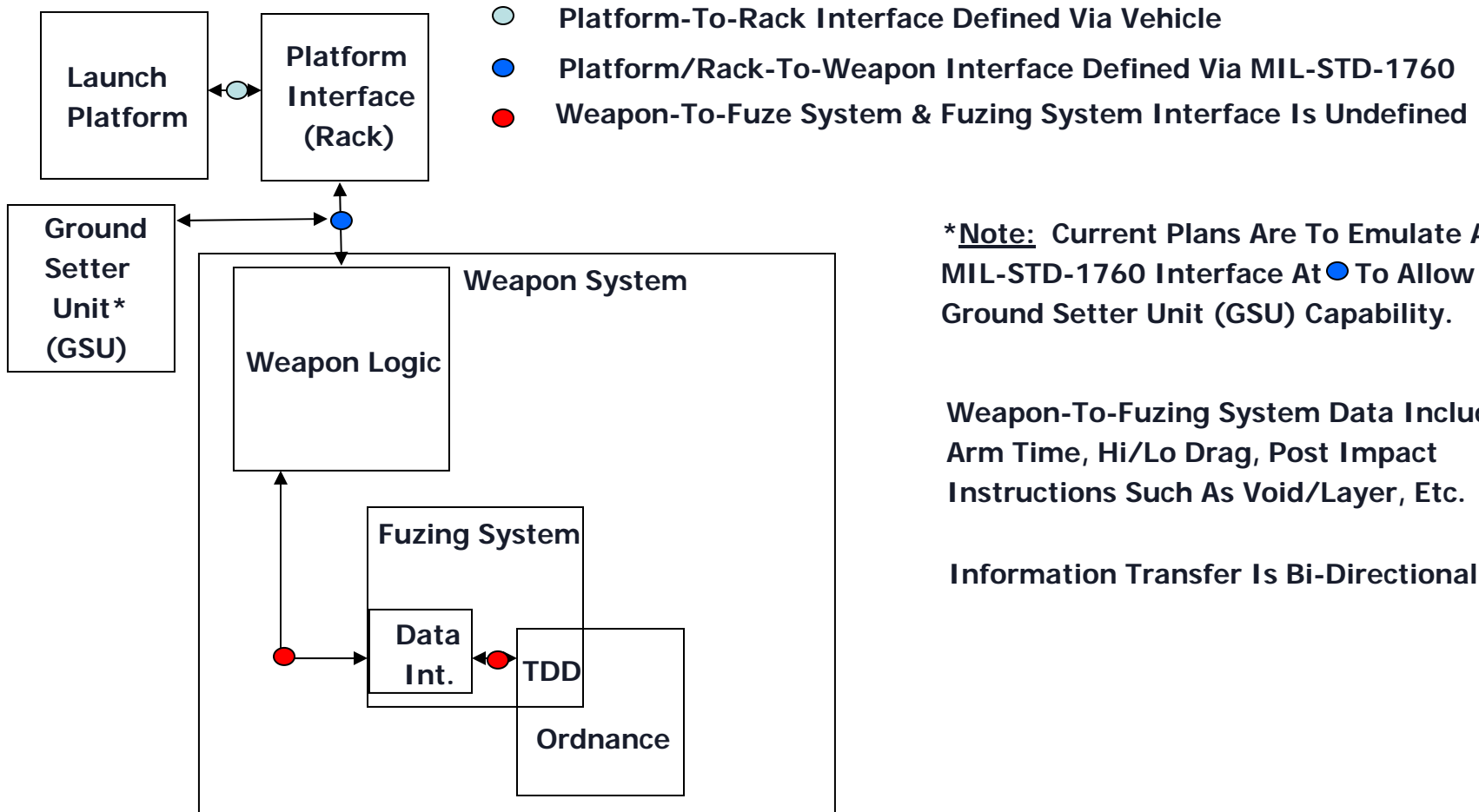


Notional Fuzing System Block Diagram





Parsing Example, Fuzing Program Data



***Note:** Current Plans Are To Emulate A MIL-STD-1760 Interface At ● To Allow A Ground Setter Unit (GSU) Capability.

Weapon-To-Fuzing System Data Includes Arm Time, Hi/Lo Drag, Post Impact Instructions Such As Void/Layer, Etc.

Information Transfer Is Bi-Directional



Parsing Example, Arm Decision/Stimuli

