



ArcGIS for the Military: MIL-STD-2525D Joint Military Symbology

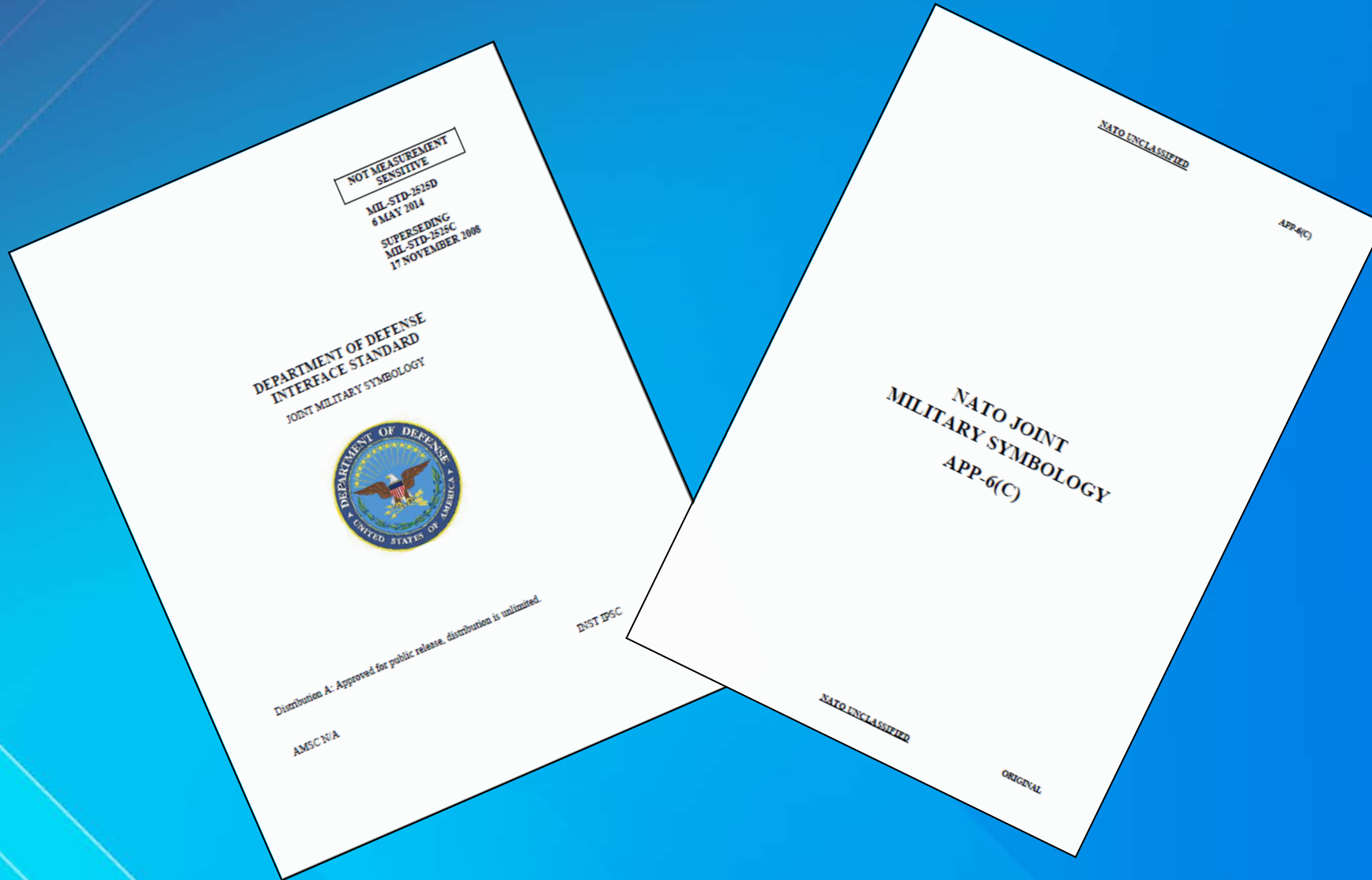
Andy Bouffard

Jim Weakland

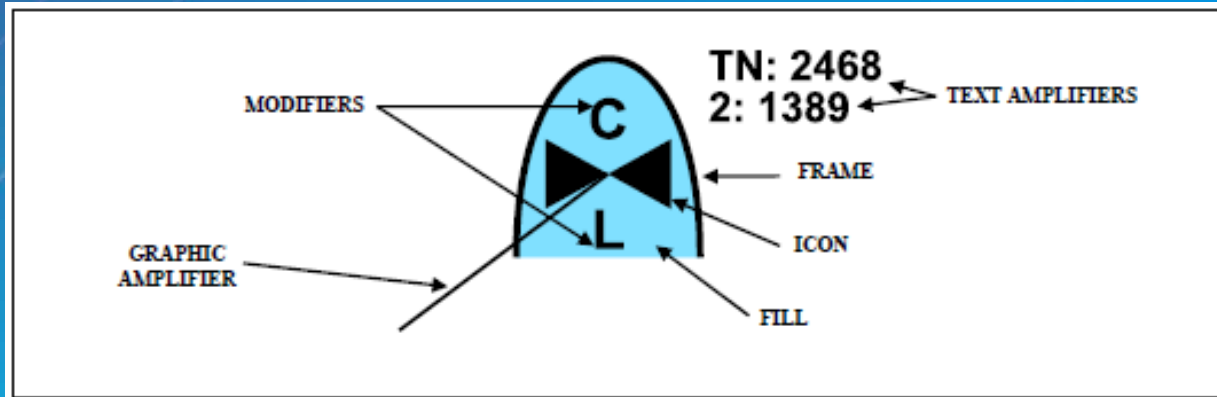
Topics...

- **Military Standards**
- **Military Symbology in Desktop**
- **An Example: ArcGIS Pro**
- **Dictionary Renderer**
- **Military Symbology in ArcGIS Runtime**
- **Building Military Symbology**
- **Customizing Military Symbology**
- **Additional Resources**

MIL-STD-2525 and NATO APP-6



Anatomy of a Symbol


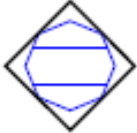











			LAND EQUIPMENT AND SEA SURFACE	SUBSURFACE	ACTIVITY/EVENT
			1.44L	1.3L	1.44L
			1.44L	1.1L	1.44L
			1.2L	1.2L	1L
			1.2L	1.1L	1.5L
			1.1L	1.1L	1.1L
			1.1L	1.2L	1.1L
			1.44L	1.44L	1.3L
			1.44L	1.44L	1.5L
			1.44L	1.44L	1.44L
			1.44L	1.44L	1.44L

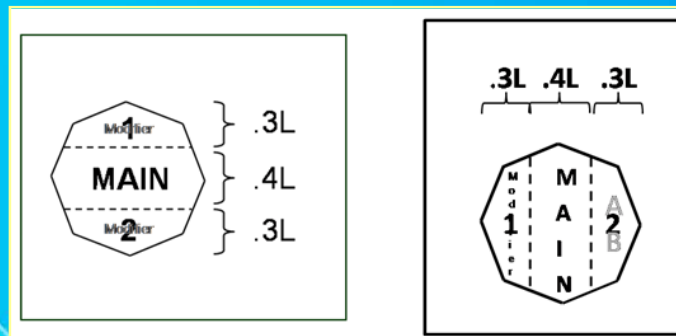
Framing a Symbol

DIMENSION STANDARD IDENTITY	UNKNOWN	SPACE	AIR	LAND UNIT	LAND EQUIPMENT AND SEA SURFACE	LAND INSTALLATION	SUBSURFACE	ACTIVITY/ EVENT
PENDING (YELLOW)								
UNKNOWN (YELLOW)								
FRIEND (CYAN)								
NEUTRAL (GREEN)								
HOSTILE (RED)								
ASSUMED FRIEND (CYAN)								
SUSPECT (RED)								

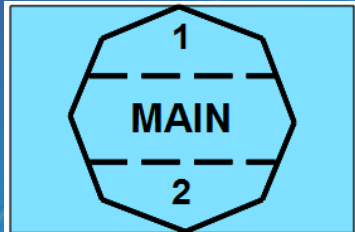
“Parts Box” Approach

SYMBOL COMPONENTS					
					
BOUNDING OCTAGON	FRAME	FILL	ICON	MODIFIER 1	MODIFIER 2
1 GRAPHIC AMPLIFIER			20 TEXT AMPLIFIER		
COMPLETED SYMBOL					
					

FRIENDLY	HOSTILE
	
NEUTRAL	UNKNOWN
	



Full Frame or Main Icon



Code: 120300

Icon Type: Full Frame

ANTITANK/ANTIARMOR

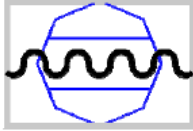



Type: Entity Type
Entity: MOVEMENT AND
MANEUVER
Symbol Set Code: 10
Code: 120400
Icon Type: Full Frame

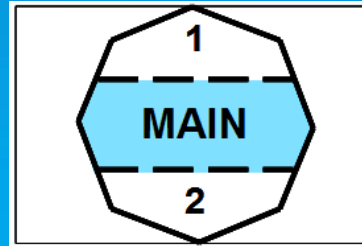
ARMORED

Type: Entity Type
Entity: MOVEMENT AND
MANEUVER/
ANTITANK/ANTIARMOR
Symbol Set Code: 10
Code: 120401
Icon Type: Full Frame

MOTORIZED

Type: Entity Type
Entity: MOVEMENT AND
MANEUVER/
ANTITANK/ANTIARMOR
Symbol Set Code: 10
Code: 120402
Icon Type: Full Frame

	ICON	REMARKS
		The grey box is not to be drawn. It is shown here only as a reference to position and proportion of the icon within the frame.
		The grey box is not to be drawn. It is shown here only as a reference to position and proportion of the icon within the frame.
		The grey box is not to be drawn. It is shown here only as a reference to position and proportion of the icon within the frame.
		The grey box is not to be drawn. It is shown here only as a reference to position and proportion of the icon within the frame.






Entity: MOVEMENT AND
MANEUVER
Symbol Set Code: 10
Code: 121600
Icon Type: Main

SPECIAL FORCES

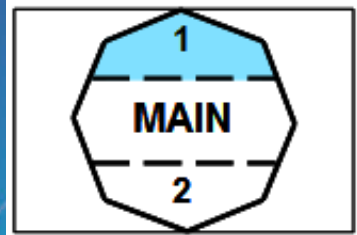
Type: Entity Type
Entity: MOVEMENT AND
MANEUVER
Symbol Set Code: 10
Code: 121700
Icon Type: Main

**SPECIAL OPERATIONS FORCES
(SOF)**

Type: Entity Type
Entity: MOVEMENT AND
MANEUVER
Symbol Set Code: 10
Code: 121800
Icon Type: Main

ICON	ICON	REMARKS
		N/A
		N/A
		N/A

Sector Modifiers



Code: 01

AREA

Symbol Set Code: 10
Code: 02

ATTACK

Symbol Set Code: 10
Code: 03

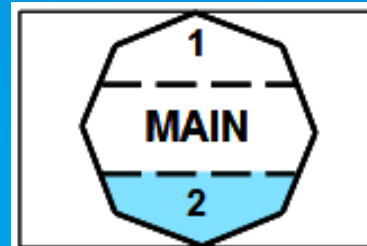
BIOLOGICAL

Symbol Set Code: 10
Code: 04

BORDER

Symbol Set Code: 10
Code: 05

CATEGORY	MODIFIER	REMARKS
MOBILITY		US only
CAPABILITY		N/A
CAPABILITY		N/A
CAPABILITY		N/A
CAPABILITY		N/A



ARCTIC

Symbol Set Code: 10
Code: 02

BATTLE DAMAGE REPAIR

Symbol Set Code: 10
Code: 03

BICYCLE EQUIPPED

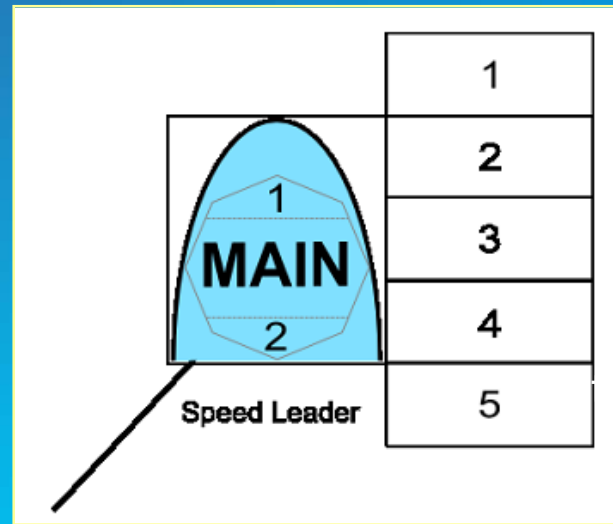
Symbol Set Code: 10
Code: 04

CASUALTY STAGING

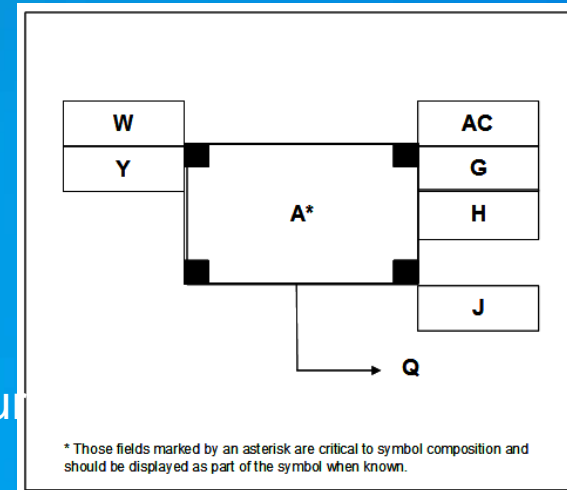
Symbol Set Code: 10
Code: 05

CATEGORY	MODIFIER	REMARKS
MOBILITY		N/A
MOBILITY		N/A
CAPABILITY		N/A
MOBILITY		N/A
CAPABILITY		Modifier is offset so that the modifier is not compromised by the main sector icon.

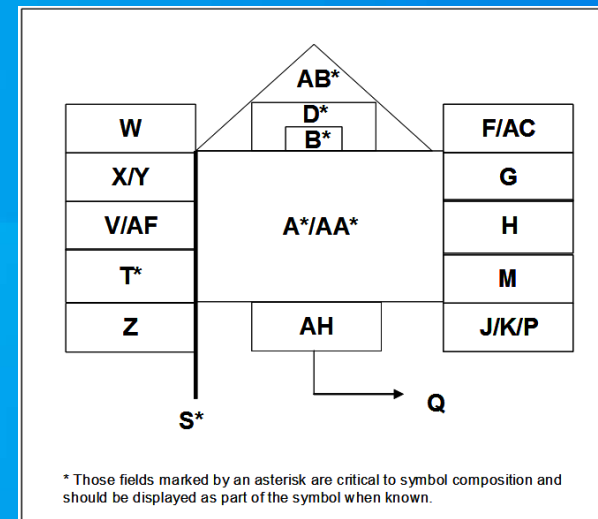
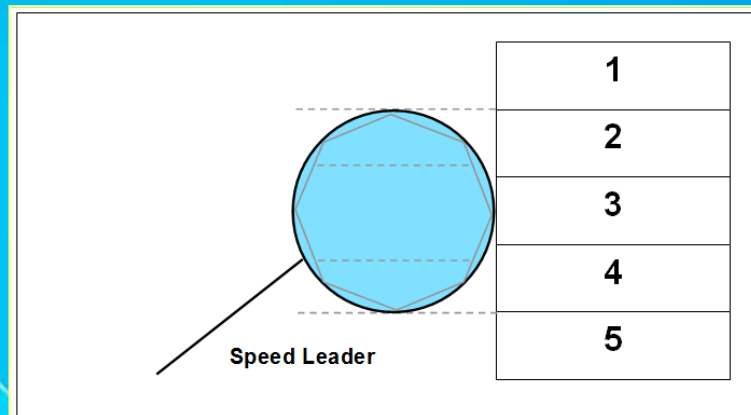
Amplifiers Differ by Dimension



ol Measur

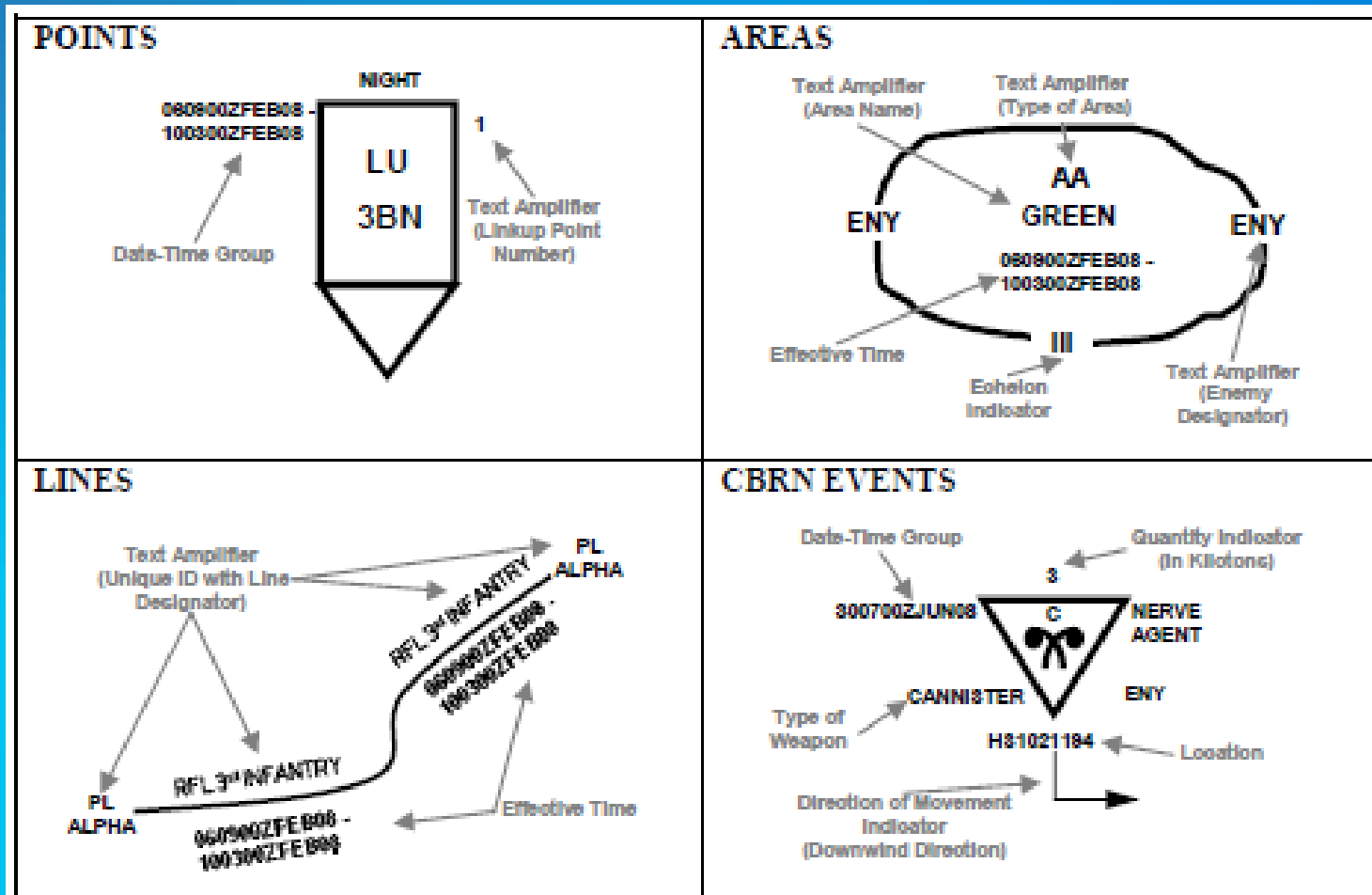


* Those fields marked by an asterisk are critical to symbol composition and should be displayed as part of the symbol when known.

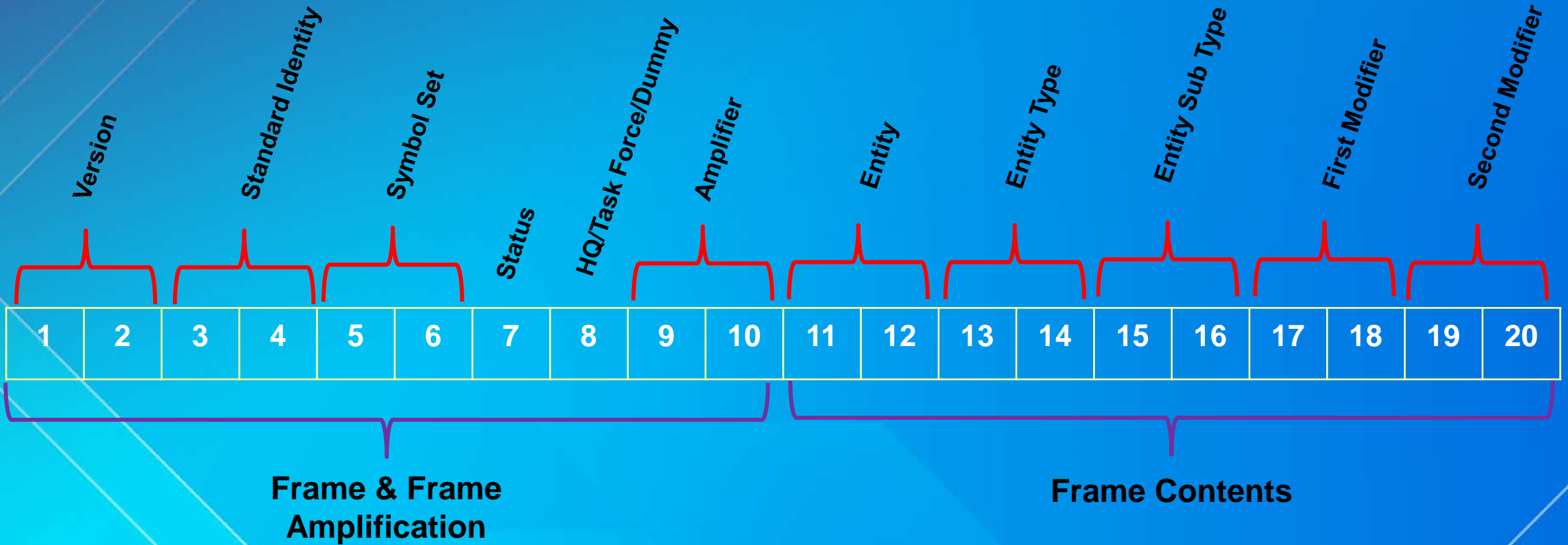


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Control Measures



Identifying a Symbol



Military Symbology in Desktop

Evolution of Solutions

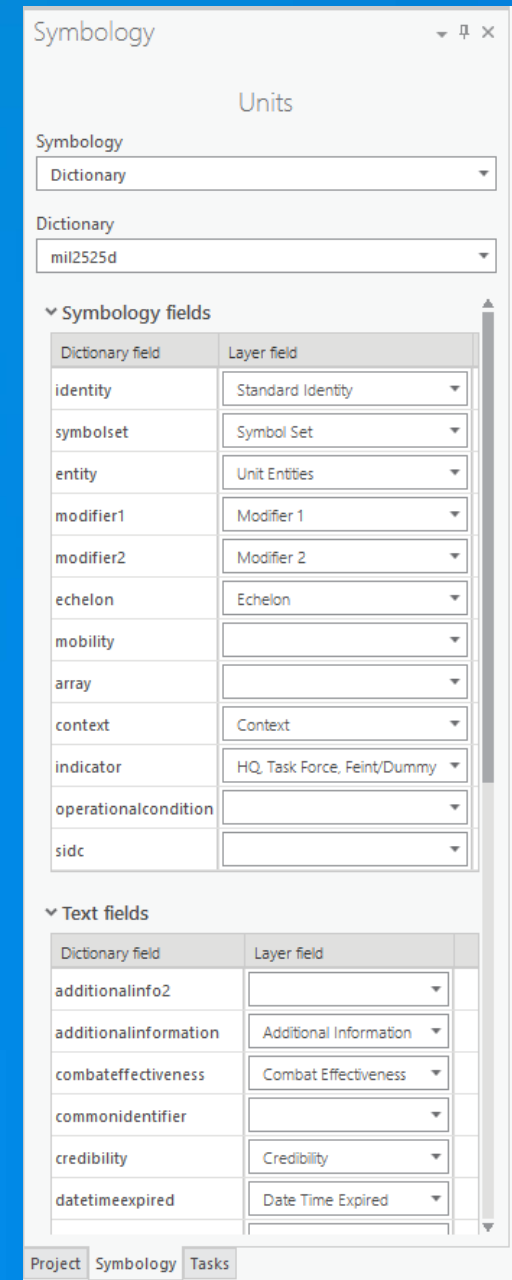
- **The “2000s” – Military Overlay Editor (MOLE)**
 - ArcObjects based custom layers and symbols
 - Initially built to create static tactical overlays
 - Provided an abundance of features and customizability
 - Worked in Desktop and Engine (not across the Enterprise)
 - Struggled when high performance was needed
- **The “2010s” - Military Feature Templates**
 - ArcObjects based using standard feature and symbology components
 - Initial replacement for MOLE, in Engine, Desktop, and through published map services
 - Basic edit and display of labeled military symbols, not overly customizable
 - Worked better across the ArcGIS Enterprise
 - Difficult to modify/use when new symbols are needed
- **Today – A New Feature Renderer in ArcGIS Pro**

The background features a blue gradient with abstract geometric shapes in purple and yellow on the left side. A small yellow map fragment with a grid pattern is visible within the purple shapes.

Military Symbology in ArcGIS Pro

Dictionary Renderer

- Introduced in Runtime
 - `Esri.ArcGISRuntime.Symbology.Specialized Namespace`
 - Used in conjunction with the `SymbolDictionary` and `MessageLayer` classes
 - Optimized for fast search and retrieval of given symbol
- New version developed for ArcGIS Pro
 - Rule-based
 - Multiple dictionary fields (the “keys”)
 - “Values” are used to identify specific symbol elements
 - Elements are “combined” to create a displayed symbol
- New version is being added to Runtime (Quartz)
 - In the future will work directly on Feature and Graphic layers
- Server development team is working on an implementation



Building Esri Military Symbology



Joint Military Symbology Markup Language (JMSML)

- An XML schema for 2525 and APP-6
- Configuration management database, not an information exchange format
- Provides a machine readable version of the valid AND invalid symbol definitions
- Implement changes to the standard, in systems, more rapidly
- More efficient and consistent means of interpreting these standards
 - Greatly reduce or even eliminate guess work
 - Joint systems become more joint with regards to symbols
- No Esri software license required

<https://github.com/Esri/joint-military-symbology-xml>

Military Features Data

- Source data for Esri defense and intelligence feature templates
- Used to create features and derived data products using military symbology
- Data for APP-6B, MIL-STD-2525C, and MIL-STD-2525D
- Conversion utilities and procedures
- Sample data
- Test applications and data
- Style and stylx files
- Requires Desktop and/or Engine licenses to run utilities and test apps

<https://github.com/Esri/military-features-data>

Military Feature Toolbox

- **Tools, Scripts, and Applications for use in ArcGIS Desktop**
 - Tools for importing/ appending non-military feature classes into a military feature geodatabase
 - Tools for converting military features to ArcGIS Runtime messages (and visa-versa)
 - Tools for setting the SIDC and representation rule fields on a military feature geodatabase
- **New 2525D related toolbox - nearing completion**
 - Add 2525D fields to an existing military feature class
 - Calculate 2525D SIDC (20 digit) values from 2525C SIDC (15 character) values
 - Calculate both 2525C and 2525D SIDC values from attribute values
 - Calculate attribute values from 2525D SIDC values

<https://github.com/Esri/military-feature-toolbox>

Customization Options

- **Modify content in JMSML**
 - Batch reconstruction of the style and stylx files
 - Follow the procedures found in the [military-features-data GitHub repo](#)
 - No need to understand the internals of style/stylx
- **Modify content in style/stylx directly**
 - Less work
 - Good choice for small changes
 - No representation of changes in “source” (JMSML) data
- **Create a new dictionary renderer plugin**
 - No “cookbook” for this yet
 - Requires more work
 - Provides for greatest level of customization



Creating an MV-22 Osprey Symbol

Military Symbology – The Road Ahead

- Symbology in Runtime (Quartz)
- ArcGIS Pro API – accessing and maintaining stylx
- Symbology in Server (10.4)

Further Resources

- **GitHub**
 - <https://github.com/Esri>
- **Solutions Website**
 - <http://solutions.arcgis.com/military/>
- **Blogs**
 - <http://blogs.esri.com/esri/arcgis/category/subject-defense/>
- **Twitter**
 - <https://twitter.com/EsriDefense>

Did We Do A Good Job?

We would like your feedback

- Please visit the following link:

<http://www.esri.com/events/session-rater#/UC/20330>



Any Questions?

Thank you for attending.



Understanding our world.