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What's New?

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MACE 2020 R1 Beta – What's New

Hello everyone! Today we are happy to announce that the MACE 2020R1 Beta is now available for download. We expect to have a formal release within the next few weeks; we are about 70% done with our test cases and most of the documentation has been updated. *Note that since we are still in Beta, this version is only recommended for testing outside of your production environments*. We wanted to give you a few weeks to test with the Beta before we release, so if you find any issues with this Beta please let us know!

Before we get into our summary of the new features, I would once again like to thank all of our MACE customers for your continued suggestions and feedback. We take these very seriously and there are several features in 2020R1 that came directly from a MACE user's suggestion. If you are a MACE user and find yourself saying "if only these guys would add such and such a feature, it would make my life so much easier/help meet additional training objectives" – then please tell us!

While this document contains a summary of improvements in MACE 2020R1, there are many smaller changes not mentioned here. So, if you encounter any changes to the MACE user interface not mentioned in this document, please reference the updated 2020R1 User's Manuals (which install with MACE and are accessible from the Help menu within MACE).

Resources

As a reminder, we have a series of <u>MACE Tutorial Videos posted on our YouTube page</u>. There are many <u>other</u> <u>videos posted on our YouTube page</u> as well, designed to demonstrate specific capabilities or new features.

Also, if you have any questions please e-mail us @ <u>support@bssim.com</u> and we will do our best to reply within one business day.

2021 MACE User's Group (MUG) Update

We've decided to postpone the 2021 MUG from April to September, as we anticipate that with a few more months of vaccine distribution behind us, a late September MUG will be safer and by then we hope more of you will be able to obtain permission to attend. We will send out an update once we firm up the dates.

Get your MACE!

Because this MACE is still in Beta, you will need to download it from the daily build repository, which is located here: <u>http://downloads.bssim.com/dev/mace/builds/</u> (usr: JT@C pwd: @!rp0wer).

Once we have a formal 2020R1 Release (in a few weeks) the download will move to the Latest Release repository: <u>http://downloads.bssim.com/MACE/Latest_Release/</u> (usr: JT@C_pwd: @!rp0wer). We will send out another notice in a few weeks once we promote 2020R1 from Beta to Release.

Thanks again everyone, and please let us know if you have any suggestions or encounter any issues with this new MACE. We're hopeful we can have our MUG later this year where we can give you all some hands-on training! -- The BSI Team.



Plug-in Manager

A plug-in manager has been added to MACE's System Settings, allowing for the runtime management of MACE plugins. Plugins can be loaded and unloaded from the plug-in manager without the need to restart MACE. MACE plugins now also support summary information that can be displayed in the plugin manager -- giving useful information like version number, the location of the button within the MACE UI, a listing of runtime dependencies, and a description of what the purpose of the plugin is. A MACE user's plugin preferences are saved and restored when MACE starts, and plugins can be loaded at runtime by simply checking their checkbox in the plugin manager -- no restart required!



Figure 1. MACE Plugin Manager.

Embedded Codescript Editor/Compiler

A powerful new feature in 2020R1 is the ability to edit and compile codescripts from inside the MACE plugin manager. Codescripts are small C# snippets that can be executed alongside the MACE runtime, and BSI has developed a full featured application programming interface (API) that gives the codescript or plugin developer direct access to many of the powerful underlying capabilities of MACE. While codescripts are not a new feature, in 2020R1 MACE users can now easily create new codescripts directly inside of MACE. You can edit them with modern IDE features like syntax highlighting, code completion, split windows, bookmarks, themes, and full intellisense integration of the MACE API (Figure 2). You can then compile your codescripts to check for any errors and run your codescripts from directly from inside the MACE plugin manager. We even give direct access to the MACE API documentation from inside the codescript editor (Figure 3).



Options Import / Logging Mission Defaults Data Paths Communication D	SNet TENA CIGI Window Configs Visual Joystick External Sim Plugins
File Edit Actorns 46 Triggers 48 AdjustIntertSpeed.cs 49 ActoEnableDatalinks.cs 50 Bink6.cs 51 EmiterFix.cs 53 EmiterFix.cs 54 EmiterFix.cs 55 MGRSTest.cs 55 RFOut.cs 56 SmBPLcs 59 SmBPLcs 66 WeypointTest.cs 66 VewpointTest.cs 66 Weapon Aero Plugins 70 Trid 71 Weapon Aero Plugins 71 73 73 74 73 75 73 76 77 77 78 79 80 81 85 85 86	<pre>Appearance Bookmarks Macro Build Help #region "Local Constants" private const double BANDWIDTH_HZ = 25.0e6; private const double BLINK_INTERVAL_SEC = 18; #endregion #region "Local variable declarations" private static IDevice _radar1; private static IDevice _radar2; private static IDeviceReceiver _receiver; private static double _lastMissionTime; private static double _lastMissionTime; private static double _lastSignalReceivedTime; private static bool _enable; private static bool _missionReload = false; #endregion #region "CodeScript Methods" /// <summary> /// Method called when the codescript object is initialized. Any timers or /// csummary> public static void Initialize(IMACEPlugInHost host) { // Blink is off _ enable = false // map the host instance _ host = host; // map the host instance _ host = host; // attack examt bandless // map the host instance _ host = host; // enable = false // map the host instance _ host = host; // enable = false // map the host instance // enable = false // map the host instance // enable = false // map the host instance // enable = false // enable = false // map the host instance // enable = false // map the host instance // enable = false // map the host instance // enable = false // map the host instance // enable = false // ena</summary></pre>

Figure 2. MACE Codescript Editor.



Figure 3. MACE API Documentation.



Scripting Improvements

BASIC Syntax in the Script Editor

With MACE 2020R1, the scripting tool gets some major improvements, including support for BASIC Operations such as If/Else If/Else/End If, While/End While, and Goto. This allows you to create complex decisions and actions in a single script.

	<u>▲ 100000 ▲</u>	_
ACTIO	V5	
Index	Action	Status
0	Turn <script platform=""></script>	

Figure 4: BASIC Syntax in the Script Editor

We also added a new Action called 'Raise Event' and a new Trigger called 'Event Raised' so that scripts can more easily communicate with one another.

🔡 Script Action Editor		_		×
Scripting 1 Scripting 2 Missio	n 1 Mission 2 Navigation 1 Navigation 2 Behavior Radio Environment	DI-Guy	Action	
C Execute Code Script	Source File 👻		Select	
			Properties	
© If	SelectTrigger			
◯ Else If	SelectTrigger			
○ Else				
◎ End If				
⊚While	SelectTrigger			
◯ End While				
O Goto Action #	Action #			
Raise Event	Enum: 100 Value: <script platfom=""></script>			



骎 Script Trigger Editor		- 🗆 X
Scripting Time Entity Input	t	
C Undefined		
C Script Executing	Script Index: 1	
C Script Not Executing	Script Index: 1	
C Random Number	% Chance: 50.00 + Check every: 1 = seconds.	
C Script Number Variable	Script Index Number Value is less than Value is	
C Script String Variable	Script Index Number 🗸 0 📩 string is	Case Sensitive
C Execute Code Script	Source File 🗸	Select
		Properties
C Laver Tag	Laver:Tag:Avoidance	🚽 le Set 🚽
Event Raised	Enum: 100 Value: FALCON11 Evaluate Assigned Entity:	

Figure 5: Raise Event Action and Event Raised Trigger

Action Template Improvements

Action Templates can now have individual scripts set to "Auto Assign" or "Quick Assign". Platforms with action templates with auto assigned scripts automatically get those scripts created and assigned to the platform when they're created. Quick Assign scripts can be assigned via a right click on the platform.

Action Templates				_		
New Rename Delete	Add Delete	Show Folder Na	ames on Platform Action Men	u		
Template Name	Script Name	Relative Path	Full Path	Auto Assign	Quick Assig	jn
<unassigned templates=""></unassigned>	Go_to_Church_Soon.xml	Pattern of Lif	C:\Users\clint\Document			
Fighter Aircraft Section Lead Template	Go_To_Lunch_Now.xml	Pattern of Lif	C:\Users\clint\Document	\checkmark		
Fighter Aircraft Template	Go_To_Lunch_Soon.xml	Pattern of Lif	C:\Users\clint\Document	v		
Pattern of Life	Go_To_Random_Building	Pattern of Lif	C:\Users\clint\Document			
TLAM	Go_To_Random_House_N	Pattern of Lif	C:\Users\clint\Document			
	Go_To_Work_Soon.xml	Pattern of Lif	C:\Users\clint\Document		V	
	Send_Text_Message.xml	Pattern of Lif	C:\Users\clint\Document			
						-
Status						

Figure 6: Auto-Assign Scripts via Action Templates

Analysis Tab Improvements

In prior versions of MACE, you were limited to one custom mask altitude. In 2020R1, there are seven separate mask layers that can be drawn, and you can specify the altitude for each one:





Figure 7: Radar Mask Improvements

Signal Generation Improvements

Bi-Static Radar Support

Reflections from a target 3D RCS are now calculated for dedicated receiver devices (such as SARH missile seekers) using the monostatic-bistatic equivalence theorem. In addition, a new weapon sensor processing module was added that allows any combination of multiple sensors per weapon. Visual and RF receiver beams are also now available in the Layer Manager.

Datalink Improvements

MACE 2020R1 adds support for toggling between datalink versions 6016D/F (for J-Series version), 47001C/47001D/47001D Ch 1 (for K-series headers) and 6017A/6017B (for K-series version):



MACE System Settings
Options Import / Logging Mission Defaults Data Paths Communication DISNet TENA CIGI Window Configs Visual Joys
These values apply to New missions. Existing mission settings are changed via the Mission Settings form.
AWACS / RJ Radio Calls C On New Activity O Never On First Resolve Default CIGI Database: 0
RADAR Activity Range Environment 'Trip' range for autonomous sites (% of TTR max range) 250 ÷ Winds Affect Aircraft Winds Affect Weapons
Platforms
Divert Aircraft on Bingo Fuel Intities as Avoidance Layer
Enable Collision Avoidance Image: Disable Collision Avoidance when Pathfinding
Equipment Reactive HARM Targeting Image: Selected Site in the selected Site in
Tactical Data Link
Enable TDL Network Signal Propagation Modeling
Automatically WILCO Incoming J12.0 Messages
J-Series Version: MIL-STD-6016D
K-Header Version: MIL-STD-2045-47001C 💌 K-Series Version: MIL-STD-6017A 💌
MIL-STD-2045-47001C TDL J2 Start Source MIL-STD-2045-47001D
Default TDL J3 Start MIL-STD-2045-47001D Ch1bts 511 = End: AB777
Default SADL Division ID Default SADL Channel Set

Figure 8: Datalink Version/Header Selection

We've also added the J2.0 (for Link-11), J7 Drop track, and J12.4 Controlling Unit messages



🖳 MACE Mission Settings — 🗆 🗙
Environment Data Link Behaviors Aggregates Database
Entities Networks Settings
Image: Selected Entity Selected Entity Image: Selected Entity Callsign: E-3AWACS_2 Image: Selected Entity Source: Internal Source: Internal Site: 7 Application: 100 Entity: 1002
Source: All Comain: All Comai
A-10C 1 [7:100:1001] Order: Control Change Order - Order addresse to new control agency. Control Channel: Best AWACS_2 [7:100:1002] New Control Agency: E-3AWACS_2 Image: Control Channel Channel: Image: Control Channel Channel Channel:
Radio: No Statement Secure Squawk Flash Voice: Undefined Freq: 225.000 Ch:
Incoming J12.4 Controlling Unit Change Delete All
Sender Recipient Message Details WILCO CANTCO HAVECO Status

Figure 9: New Datalink Messages - J2 for Link 11, J7 and J12.4

And we've added additional options for relaying JREAP-C to DIS including from likely source entities and via SADL. Note that you can also use MACE to relay DIS to JREAP-C:

	E System Setting	JS Mineter Defector	Data Datha	Communication	DICN-	TENA	CICI	Window Confirm	Marriel	las settada	Estampl Con	Dhusing	CMTIE	×
tions	Import / Logging	Mission Defaults	Data Paths	communication	DISNet	TENA	CIGI	Window Configs	Visual	JOYSTICK	External Sim	Plugins	GMTIF	
	Gene	ral												
Detect	ed IP Addresses:	127.0.0.1												
Refre	esh	10.0.1.123												
									_					
									GF	PS				
		JREAF	2-C					GPS Device Po	rt					
								Autodetect Por	ts					
Rel	ay DIS to JREAP-	Sender ID:	100		_			GPS Baud Rate						
Rel	ay JREAP-C to DI	S 🔲 Via Entiti	es 🔲 Via	Link-16 🔲 Via	a SADL				C	onnection	Status: c	lisconnec	ted	
		TCP Se	rver			127.0	.0.1	IP Addı	ress for 1	TCP/IP GP	PS (###.###.##	##.###)		
🔲 En	able Port: [3888 📤				Sh 🗌	ow GPS	Feed (Must be co	nnected t	to a platfor	·m.)			
								6	Cureor o	n Target				
		TCP CI	ient							in raiger -				
🔲 En	able Port: 8	3888 🜩	Server IP:	127.255.255.255		Er 🗆 Er	able Col	Port: 1901	4 🌩	Changes I	require MACE	restart.	ļ	
								MACEV	Vorldwid	e Map Dat	abase			
		UDF	·]			Senve	er IP or N	ame: http:// 12	27001.	8080]	
🔽 Se	nd 🔲 Receive	Port: 8888 🌻	Send IP:	127.255.255.255		Jerve								
								1	Enable	Residentia	I-level Roads			

Figure 10: Relay JREAP-C to DIS



Improvements when using VRSG IG or Vital IG

Storm Systems

We've added support for Storm Systems in VRSG, including two volumetric cloud layers with precipitation / lightning effects within the more severe regions of the storm. Storm systems are defined as relative points in XML (user-creatable) and can be positioned and rotated anywhere on the map:

MACE Mission Settings	- 🗆 X
Environment Data Link Behaviors Aggregates Database	-
Time of Day Start Time (UTC): 18:00:00 December 04 Time Zone: (UTC) Coordinated Universal Time Local Time: 18:00:00 December 04	Phase
Visibility	
Ground Fog Ceiling MSL (ft): 0 Visbility (ft): 0	Pressure: 29.92 in Hg Abs Humidity: 0.00 g/m^3 Runway Condition: Image: Home Humidity: 0%
Continuous	Surface Winds
Cloud Model Simple Clouds Upper Layer 0/8 Clear	 Fixed Dir (deg): 0 → Spd (kts): 0 → Variable Min Max Dir (deg): 0 → 0 → Spd (kts): 0 → 0 → Winds Aloft Winds Alft Alt MSL (ft) Dir (deg) Spd (kts) Turbulence 0 0 0 ↓ Winds Affect Aircraft Winds Affect Weapons
● Storm System System Type: Storm3 ▼ Orientation: 45 ⊕ deg ♥ Display On Map Select Location Lat: 42.39 Lon: -84.06 Altitude Offset: 0 ♥ ft Growth/Decay Rate: 0 ♥ Span 100 ♥ nm	Contrails Lower Alt (ft): -1 Immediate Upper Alt (ft): Use -1 to automatically calculate when contrails generation. Immediate NVG Compatibility Immediate NVG Compatibility Immediate NVG Filter) Immediate NVG Mode (New Moon)

Figure 11: Create a Storm System; works with VRSG IG and Vital IG





Figure 12: Storm System as shown in VRSG and MACE

CIGI Control for VRSG

CIGI control for VRSG enables multiple viewports with a single VRSG channel. For example, picture-in-picture as shown below (one view is showing out-the-window and the other the camera view).





Tighter Integration with ARMOR

ARMOR (Augmented Reality Mission Rehearsal and Observation) is BSI's Unity-based 3D viewer for MACE. ARMOR has also undergone major improvements in 2020, including support for user-generated, streaming, tilebased terrain and a much larger 3D model library.

Please see these videos for examples of what is possible with MACE and ARMOR:

Mission Rehearsal with BSI's MACE and ARMOR - Terrain Masking Briefover - YouTube

Malaysia Rescue Scenario: A Demonstration of MACE and ARMOR - YouTube

For more information about MACE and ARMOR, please see the additional documents posted here: <u>http://downloads.bssim.us/</u> (password: @!rp0wer)



Other Improvements to MACE

'Swarm' Formation

By popular demand! Swarms will cluster around the formation Leader, generally mimicking the leader's movements. Swarms are 'self-healing' and will fill gaps where platforms have been killed (if the Formation Leader dies a new one will be assigned).

You can also create swarms with a 'kamikaze' behavior (this is done by assigning the platform the 'kamizkaze' role in the MOCT). The kamikaze behavior will cause the entity to move to its assigned target and all the weapons carried by the platform will detonate upon impact. There are two pre-built drone swarms included in MACE 2020R1 – one where the drones are carrying low-power RF jammers and one where the drones are carrying low-power explosives (and in the latter case, are also assigned the kamikaze behavior). Live for the swarm!

Countermeasures

Chaff / flares completely handled in hard points. Each platform can have its own unique flare pattern with scriptable release

Sonic Booms

Based on customer request – we've implemented a simplified physics-based sonic boom propagation model for aircraft and missiles. It is a new setting located under Mission Settings -> Behaviors

When the setting "Calculate and React to Sonic Booms" is enabled, any Platform with "is Squirter = true" will squirt when it intersects any sonic boom carpet.

Elevation

- Greatly improved speed and efficiency of GeoTIFF based elevation data (for example, CDB).
- Interpolate GeoTIFF based elevation data.
- Support GeoTIFF water terrain tiles to identify terrain material. (Ships identify water, ground vehicles avoid water, people swim in water, bullets create splash effects.)

Mission Builder Toolbox

There's a new mini-UI on the Mission Builder tab – the Mission Builder Toolbox. It contains some common workflow items wrapped as single-button 'macro' type commands. For example, a single button to save and play the mission, and a single button to stop and reload the mission.





MACE API

- Manage newly created entities immediately (creation on background thread).
- Control MACE joystick via plugin.
- Control MACE camera via plugin.
- Control MACE environment / weather via plugin.

Camera Footprint – MACE will now draw an outline of a given platform's camera footprint on the ground as the camera is moved and as zoom level changes. This is enabled with the existing 'camera line' option on the Layer Manager.

New Plug-Ins

NOTE: There is some content that we add to the main MACE application, and other content that we add to MACE using the plug-in API. This is to keep the user interface as clutter-free as possible while exposing capability to those customers that want/need it.

As a result, we have decided not to cover the plug-in capabilities in the main MACE User's Manual, but instead to create a separate document, the MACE Plug-in User's Manual, where all plug-in capabilities are covered. Both of these documents install with MACE.

Sensor Sweep Plug-In

This plug-in shows sensor beam swept area on terrain as well as targets. The visual persistence (fade speed) can be adjusted from 0 to infinite in order to depict where a sensor has looked over time. The calculations that generate the detected areas are based on the sensors parameters and can be updated at runtime in the SGE.





Figure 13: The Sensor Sweep Plug-In. Yeah we know... pretty cool :)

ECG Message Plug-In

This plug-in provides for the transmission of data formatted in the CD-2 format from EnRoute primary and beacon radar systems to ECG systems located at Air Route Traffic Control Center (ARTCC) facilities. Data is transmitted for EnRoute Communications Gateway Protocol (ECGP) in User Datagram Protocol (UDP) format.



ECGPlugIn					×
ECG Setup Test					
Enable ECG					
Show (Map) Selected ASR	Targets In Range		∏ S	how Target	ts
ARSR-4_2 ARSR-4_3 ARSR-4_4 ARSR-4_5 ARSR-4_6 ARSR-4_7 ARSR-4_9 ARSR-4_10 ARSR-4_10 ARSR-4_11 ARSR-4_15 ARSR-4_13 ARSR-4_15 ARSR-4_16 ARSR-4_17	Aircraft in range: 0				
ARSR-4_2: ECGMessageBeaconRTQC					
ARSR-4_2: ECGMessageSearchRTQC					
ARSR-4_3: ECGMessageSearchRTQC	✓ Frame Header Maglion	16		,	^
ARSR-4_4: ECGMessageBeaconRTQC	Status	1			
ARSR-4_4: ECGMessageSearchRTQC	APTCCDisplay				
ARSR-4_5: ECGMessageBeaconRTQC	ARTCODISPINY	0			
ARSR-4_5. ECGMessageBeaconRTOC	ARTCCO	0			
ARSR-4_6: ECGMessageSearchRTQC	ARTCCT	0			
ARSR-4_7: ECGMessageBeaconRTQC	ARTCCZ	U			
ARSR-4_7: ECGMessageSearchRTQC	MsgCode	1			
ARSR-4_8: ECGMessageBeaconRTQC	Sequence	94			
ARSR-4_8: ECGMessageSearchRTQC	ARTCC	0			v
ARSR-4_9: ECGMessageBeaconRTQC ARSR-4_10: ECGMessageBeaconRTQC ARSR-4_10: ECGMessageBeaconRTQC	MsgLen				



MOCT Improvements

Added the ability to highlight items in the MOCT that meet a search criteria. Supports two simultaneous search conditions (text color and background color indicate results).

MOCT Services	*		MOCT Object	5
Object Configuration	*	Equipment		
TO-to-MACE Entity Mappings		⊡ 100mm	AAA	
TO-to-MACE Equipment Mapping	s		Tank	
allistic Aeros		⊞ <mark>105mm</mark>	C7 DPICM	
ultural Features			C7 Illum	
quipment		⊞ <mark>105mm</mark>	C7 IR IIIum	
M Aeros			C7 WP	
FM Aeros		⊞ <mark>105mm</mark>	C8 DPICM	
eads-Up Display		⊡ ⊡ 105mm ⊡ 105mm	C8 HE/PD C8 Illum	
elicopter Aeros		⊞ <mark>105mm</mark>	C8 IR IIIum	
ydrodynamics		⊞ 105mm ⊞ 105mm	C8 VT C8 WP	
nown Places		⊞ <mark>105mm</mark>	DPICM	
issile Aeros		. ⊞~ 105mm	DPICM (Simulated Submunitions HE	s)
atforms		E. 105mm)
eapon Engagement Zones		Domain		
mitter Editor	-	4 Team:		
hreat Libraries		Name:		
		Name:		
		User Data:	Show All Values (no filter)	
				ngnt
Tools	*	Property (ext Color): DiastRadiusInFeet	•
allistic Aero Visualization		Is Greater	Than or Equal To 🚽 100	
issile Aero Visualization		Property (Back Color): effectCategory	•
atform Aero Visualization		Is Less Th	an or Equal To 🔹 1.5	
eapon Damage Effects	- I 1		Legend	
lobal Change Config Property		Black - BS	Master	
inappositio Tool	─	blue - Ose		
оримы	-		орабіа	