

# Synthesis is a sensor-agnostic situational awareness solution for high-confidence, real-time track association.



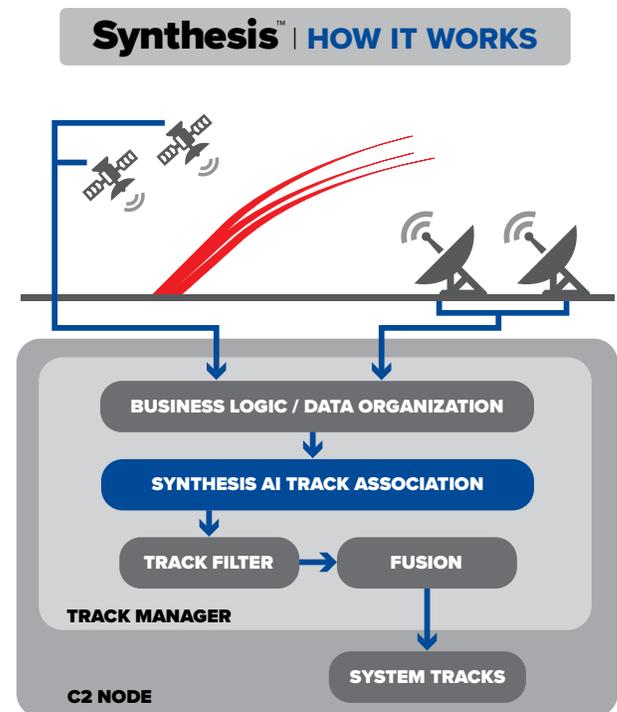
**OVERVIEW**

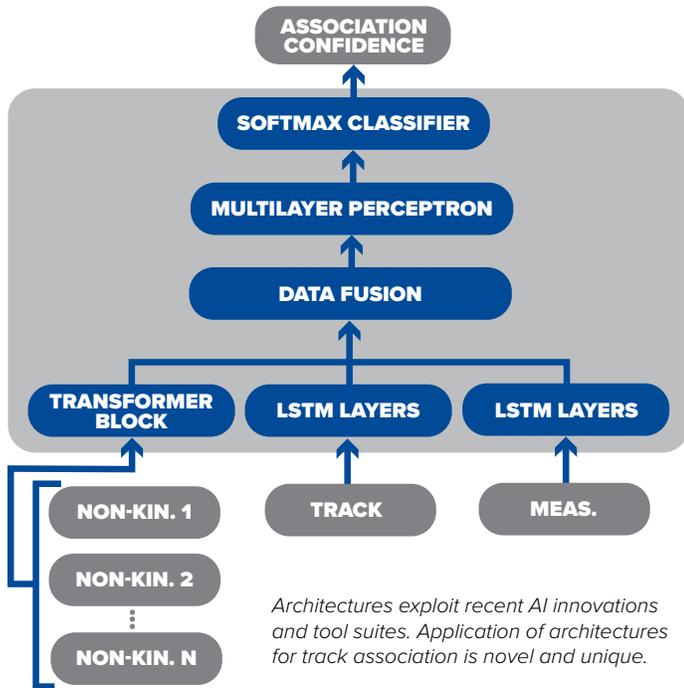
Accurate, real-time situational awareness is a serious problem in dense, multi-target environments. Data association from diverse sensors phenomenology is needed to enhance the Common Operating Picture. Traditional algorithms lack the ability to simultaneously address the challenges of track association ranging from the number of samples and hypotheses, to the ability to perform accurately in the presence of bias and noisy data. Current solutions are also limited by the inability to incorporate non-kinematic features. Synthesis is a sensor-agnostic deep reinforcement learning AI solution that addresses these issues with speed and accuracy for real-time association of sensor measurements to tracks.

**TECHNICAL**

Synthesis exploits deep reinforcement learning (DRL) algorithms, including normalization of incoming measurements and extraction of short track and measurement histories. Synthesis supplements kinematic features with additional sensor features or intelligence and correlates relative motion between sensors and threat. It also provides track association confidence values to ensure tracks and measurements are the same truth object. Synthesis uses multiple sensor measurements and source/system tracks to perform data association on all combinations of tracks to measurements. Associations are returned based on confidence threshold, with results sent downstream for processing.

**AI Data Association:** Long-Short-Term-Memory layers perform temporal feature extraction, and transformer block extracts features from non-kinematic inputs. Abstract features are fused followed by additional feature extraction and correlation with multilayer perceptron layers. Softmax classification returns association confidence for the given inputs.





### SECURITY / OPERATION

Synthesis security features include role-based login, application authentication and message encryption. Further, the Synthesis Application Programmer's Interface (API) operates inside a docker container isolating the API from the rest of the system as an extra layer of security while ensuring the software does not conflict with other required system dependencies.

Arcarithm provides required training on how to interface the Synthesis network with the database and how to understand the output, with onsite training available. A training manual is provided with each Synthesis license, and Arcarithm provides call center support as well.

### LOGISTICS & LICENSING

Synthesis can be activated on up to four different computers assigned to a single named user per license. A named user may not use a program on more than two computers simultaneously.

Licensing is available with two options — Perpetual and Annual. The license is restricted to a single country of operation. Global Individual licenses are available to serve users around the world. Software Maintenance Service is included with terms based on the type of license (Perpetual or Annual), includes the latest updates to Synthesis with twice-yearly updates, and worldwide technical support from specialized engineers.

### SYSTEM REQUIREMENTS

|                   |  |
|-------------------|--|
| CPU               | Intel Core i5 or AMD Ryzen 5 or higher                   |
| Memory (RAM)      | 64-bit System: 8GB minimum<br>32-bit System: 4GB minimum |
| Operating Systems | Ubuntu 18.04 or higher                                   |
| Graphics Card     | Nvidia GTX 2080 ti or higher                             |
| Storage           | 64GB minimum free space required                         |

Synthesis™ integrates with existing Big Data infrastructures via an extensible API that includes abstracted interfaces for interaction with any database type. Synthesis is delivered via direct digital download or a set of DVDs.

### PRODUCT DETAILS

|                          |                            |
|--------------------------|----------------------------|
| Manufacturer             | Arcarithm                  |
| Product Name             | Synthesis™                 |
| Version                  | 21.1                       |
| Manufacturer Part Number | A2021SYN                   |
| Product Type             | Single License             |
| Platform                 | Linux                      |
| Shipping Method          | Digital delivery (or DVDs) |

### ABOUT ARCARITHM

Deep Learning and Artificial Intelligence (AI) are buzz words commonly used throughout defense and commercial markets, often without true understanding of those terms. At Arcarithm, we are defining those terms and more, with proven solutions on par with multinational tech leaders. From the big picture distinction between strong and weak (or narrow) AI, to the fine-grained focus of deep versus shallow neural networks, Arcarithm delivers a depth of understanding and operational maturity beyond the capability of most companies. Our experience with every aspect of algorithm design, training, deployment and evaluation allows Arcarithm to produce quality products quickly and effectively, with the highest levels of reliability and accessibility.



866-533-1999 • randy.riley@arcarithm.com • arcarithm.com