



2iC TOOLKIT for Lean Services Architecture - Services Definition

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1. 2iC TOOLKIT for Lean Services Architecture

The 2iC TOOLKIT product is a subscription-based service for software and systems engineers to quickly research, develop and test their own modular, open and interoperable systems. TOOLKIT provides customers with software and technical support services.

TOOLKIT delivers immediate benefits:

1. **Rapid development and integration**—engineers can rapidly adapt and integrate existing and new products into a Modular Open Systems Architecture allowing them to reuse modules and components from any supplier across the entire life cycle.
2. **Cost savings on manpower**—its low-code and no-code simplicity negates the need for a large team of expensive engineers as it includes low-code Software Development Kits (SDK) for Java, C++ (Windows and Linux), Android & Microcontroller C, plus an ever-increasing library of software adaptors to integrate with existing devices, such as GPS and drones. A no-code visual tool is also provided that allows the dynamic re-configuration of workflows and systems' behaviours.
3. **Reduced end-to-end system complexity**—the modular, open system allows developers to focus on optimising their own products and solutions as the plug-and-play approach eliminates integration concerns with other components in the overall system.
4. **Technology refreshes**—it supports the delivery of new capabilities or replacement technology without the need to change all components in the entire system, and so avoids the high cost of inventing and then supporting proprietary data interfaces.

Included in TOOLKIT is the 2iC NODE Commercial off the Shelf (COTS) software which is the underpinning product of the 2iC software suite that provides the key architectural element in any system-of-systems (SoS).

2iC also offer 3 priced add-ons to TOOLKIT which unlock wider and specific benefits to users. These add-ons are priced per-user per-quarter and are limited to Research and Development purposes.

a) 2iC rTAK Software add-on

ATAK and the wider TAK ecosystem has become dominant in the deployed tactical military networks across the 5EYES and related civilian agencies. TAK offers great capability and was designed for small teams operating on relatively stable and reliable MANET networks. It is not optimised for use over low bandwidth bearers (such as satcom) or fractured networks (such as distributed teams on tactical radios).

To address this, 2iC have developed rTAK which adds reliable send/receive of chat messages and dynamic throttling of Situational Awareness (SA) traffic between TAK environments using the 2iC Gateway at its core.

rTAK capabilities:

Seamless Integration Across TAK Networks: rTAK excels in bridging TAK networks without requiring stable networks or a dedicated TAK server, ensuring:

- The extension of TAK positioning data and communication channels to a broader audience with reliability.
- Efficient operation in DDIL (Denied, Disrupted, Intermittent, and Limited) environments, maintaining network performance.
- Simplified merging of Situational Awareness (SA) and communication streams across multiple operational teams, eliminating the need to alter communication plans on radios.

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Page 2 of 6	www.2iCworld.com	V20240425-1

- Compatibility with low data rate networks, such as satellite communications, enabling SA data to reach further up the Command Chain or to Friendly/Allied units.

Data Optimisation: With features tailored for data filtering and consolidation, rTAK is ideal for:

- Minimising network load and streamlining security classifications by transmitting only pertinent information to users.
- Creating Centre of Mass overlays that aggregate positioning data from team members into a single data point, representing the area of operation.
- Merging information from various teams to generate a unified Common Operating Picture (COP) at headquarters.

Automated Response Capabilities: rTAK can trigger automatic workflows based on location data, for instance:

- Sending automated alerts if a team or member enters a restricted area.
- Providing warnings to prevent friendly fire incidents when multiple teams converge, and potentially enabling automatic integration of SA data in the future.

Flexible and Modular Setup: Designed for ease of installation, rTAK:

- Works in tandem with TAK, negating the need for different plugin files for various TAK versions.
- Offers compatibility with non-TAK devices, allowing for their integration into the broader TAK network and COP.

b) 2iC Video Dissemination software add-on

The video dissemination software has 2 parts, a user interface that allows a user to enter details of existing video streams (for example from a UAS) on the network and an ATAK plugin that auto discovers these streams and auto-populates the video player in ATAK, removing operator error.



Fig1 – Render of auto-discovered streams on ATAK device.

2iC can supply the video dissemination software as an extension to a TOOLKIT for an additional subscription fee.

c) 2iC Trust software add-on

The 2iC TRUST Software is offered as an extension to a TOOLKIT subscription for use in Research, Demonstration, trials and testing environments.

2iC TRUST is commercial-off-the-shelf (COTS) cross-domain software that delivers assured digital interoperability between devices, systems and networks across different trust domains. These



differing trust domains can be defined by different security classifications or different boundaries where there is a need to separate systems, information and equipment.

TRUST is a further enhancement of the Lean Services Architecture and Decentralised Operating Procedures (DOP) capability as it controls the flow of information and, along with fine-grained content-checking, delivers two-way security with the necessary protocol breaks. It is rapidly adaptable to meet new or evolving operational requirements and can run on vehicle-borne, wearable and unattended platforms through to enterprise network devices.

The TRUST Software is typically installed on hardware at the boundary with parts with a 2iC NODE and Content Checker software installed on each side.

2iC can supply the TRUST software as an extension to a TOOLKIT for an additional subscription fee.



d) Appendix - 2iC TOOLKIT

The key software components within TOOLKIT comprise:

a. Lean Services Node

This low-footprint software is available for Windows, Linux and Android operating systems and provides the required Service Registry for a Lean Services Architecture implementation and manages local Lean Services availability. It also has an Event Handler for distributing events and Log Manager to simplify logging.

b. Lean Services Gateway

Gateway extends local Lean Services operations to battlespace-wide operations between nodes. A Lean Services call or event on any platform becomes fully interoperable and can be used from anywhere on the battlespace over any available communications bearer.

Gateway ensures that platforms automatically discover one another as it delivers automatic node-discovery and communication between numerous nodes. It is installed at every important network node where it extends the locally-connected systems and the connections to and from other networked nodes.

Gateway uses the Lean Services node-to-node (N2N) protocol and has an open pluggable transport architecture to allow custom protocols to be developed and executed with ease. It supports multiple bearers and is not fixed to any given set of battle management applications, information systems, sensors or bearer networks as its open protocol works over tactical radios such as ANW2, TSM, Wide band HF, BOWMAN, Iridium etc.

It is proven to enable digital interoperability in Denied, Degraded, Intermittent, or Limited bandwidth (DDIL) environments as well as enterprise environments. It also includes Service Boards to access controlled dynamic service advertising and discovery between platforms.

c. 2iC Software Development Kits (SDKs)

SDKs provide a simple way for developers to build open interfaces and adaptors for any type of system, platform or device—legacy, modern and future—so they can work seamlessly together within an open architecture environment.

The SDKs have been created specifically to make a new or existing system compatible and fully interoperable within a Lean Services Architecture.

The SDKs are supplied with all the necessary binary code, source files and online documentation needed to develop Lean Services systems. SDKs are available for Java, Android, C++ (Windows and Linux), 8-bit and 32-bit microcontrollers.

d. Access to the 2iC Community GitHub

The 2iC community GitHub provides access to an ever-increasing range of sample code (built using the SDK) to help developers get started with building systems, supplied as binaries ready to use and source code to extend and develop. These adaptors can be used as-is or extended, and examples include:

- Location (live GPS, ADS-B, and simulated positioning)
- Node-Red for rapid prototyping
- Simple Display (browser-based user interface to display text, images and ask questions, along with configurable buttons)
- Cameras

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Page 5 of 6	www.2iCworld.com	V20240425-1



- Parrot Anafi drones
- ATAK / WinTAK Plugins
- File manager
- Various Bluetooth devices, including body worn sensors.

e. Online documentation, training materials and support

2iC provides all the necessary documentation, training, self-help videos and technical support to ensure engineers derive the maximum value from using the 2iC software.

The training covers how to: install 2iC CORE; use the Lean Service Code Generator to create Lean Service System skeleton code; build and run a Lean Service System; test a Lean Service System and join a Lean Service to the Lean Service Network; configure 2iC CORE for your network.

2iC provides the following support:

1. Online Self-Help and Knowledge Base
2. Online ticket creation for incident support (with agreed Service Levels) covering:
 - a. Identifying and troubleshooting problems in the software
 - b. Assistance with issues during installation and upgrades
 - c. Identifying and creating required bug reports
3. In addition to the 2iC Standard Support Service, 2iC includes product updates and new releases as part of the overall support offering.