Lean Services Architecture - Introduction

1 Overview

The Lean Services Architecture (LSA) is an open schema-based request/response and event message protocol and supporting architecture. It is designed to provide the features of a Services Orientated Architecture (SOA) in the operational and tactical military domain, or other similar environments using an implementation suited to such conditions unlike existing solutions.

The architectural principles behind Lean Services are:

- Adheres to the principles of SOA loose coupling between components
- Suitable for low powered computing devices and low bandwidth communications
- Operating system, programming language and transport protocol neutral
- Simple to understand in concept with no new programming skills or techniques needed to implement
- Allow enhancements for security and safety through future schema definition extensions
- Software only and provides low implementation overhead

The LSA is designed to be exploited in environments where existing middleware cannot, the typical environment will exhibit at least one of the following characteristics:

- A distributed environment without central server availability
- Servers with low computing power
- Communications that are unpredictable and/or low bandwidth
- Frequently changing network routing due to mobile participants
- Frequently changing end-point systems and participants.

The LSA includes definitions of message format, Lean Service calls and events, along with an architectural pattern for implementation which includes a Service Registry and a small number of essential messages.
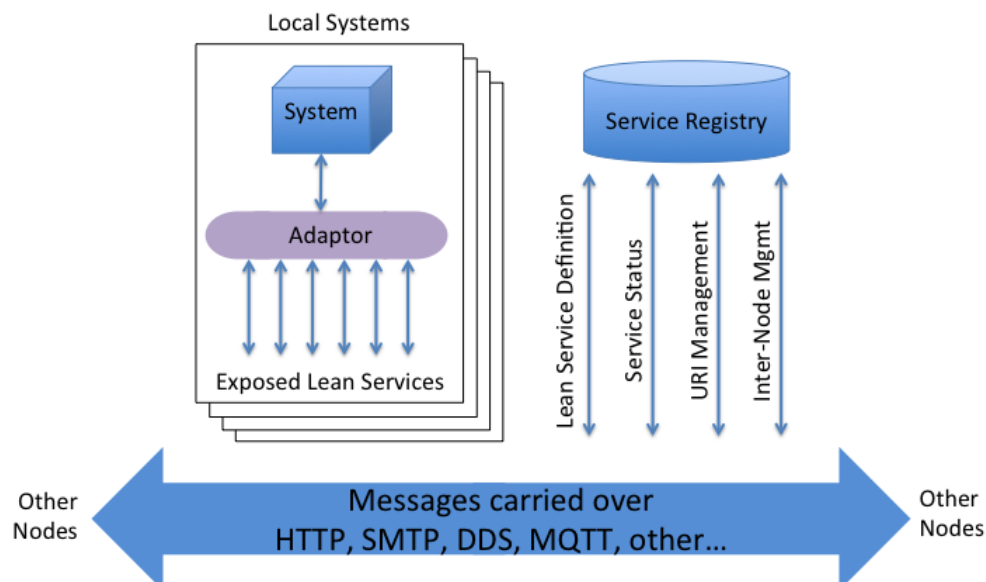
Any system can offer an interface using Lean Services, either directly or, as shown above, by using a software adaptor. The diagram above shows a single architectural node located on a platform which has a Service Registry and can have multiple local systems exposing Lean Services.

2 Background

Following completion of a UK Ministry of Defence (MoD) proof-of-concept (PoC) project funded through their Centre for Defence Enterprise[1] (CDE), 2iC created the Lean Services Architecture (LSA).

This was subsequently proposed for, and included in, the Generic Base Architecture (GBA) Defence Standard (DefStan 23-13[2]). The LSA has recently been proposed and is being reviewed for inclusion as part of the electronic architecture for Generic Soldier Architecture (GSA) and inclusion in the associated Defence Standard (DefStan 23-12).

In October 2012 2iC successfully trialled elements of the LSA as part of the MoD's Land Open Systems Architecture (LOSA) development programme. LOSA encompasses Generic Base, Vehicle and Soldier Architectures and is shaping the way the Land Domain does business. It is the target architecture for Army 2020[3]. This was a practical field trial using real military equipment working with existing defence suppliers to expose Lean Service Interfaces on their equipment.

3 Lean Services Context

The following diagram shows the Lean Services Architecture in context with other battlefield technologies. It is focused on the technology lean tactical environments and is followed by a description of the architectural layers and a glossary.

3.1.1.1 Architecture at a deployed node
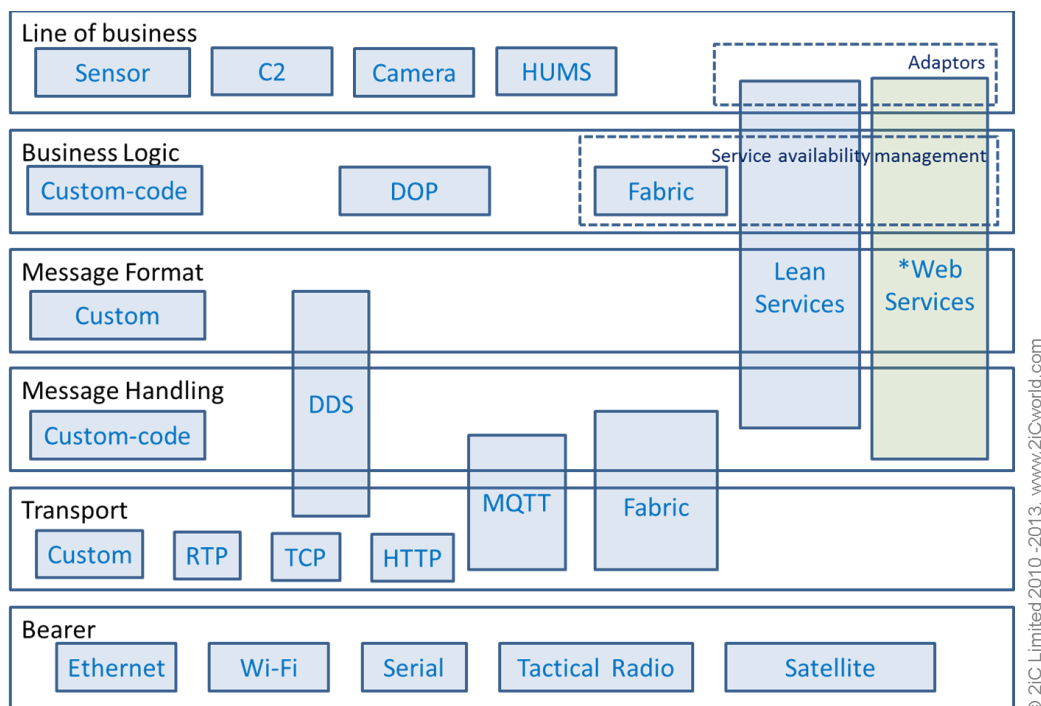
* Web services shown for comparison with enterprise computing environment.

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[1] http://www.science.mod.uk/engagement/enterprise.aspx

[2] UK MoD Defence Standard 23-13, Generic Base Architecture (GBA) Standards, Publication Date 21 September 2012

[3] http://www.army.mod.uk/documents/general/Army2020_brochure.pdf

3.1.1.2   Architectural Layers

Layer	Detail
Line of business	These are the functional systems, sensors and components designed to deliver specific capability. E.g. a Command and Control system or a logistics system. *Note: Adaptors are commonly used when a system was not built with a particular architecture in mind. Very common for legacy systems.*
Business Logic	When integrating any system or component there will be business functions for that integration. This logic needs to exist and run. *Note: In a Service Orientated Architecture there is a level of business logic built in around service availability management.*
Message format	When data is moving between components it needs a format the other-end can understand. This could be proprietary comma separated text through to complex binary formats.
Message handling	The message needs to be packaged and addressed so that it can be delivered. On arrival it needs to be read and acted on.
Transport	Data needs to be transported and a protocol for this is needed that both ends understand.
Bearer	This is the physical carrier of the data.

3.1.1.3   Terms used on diagrams

Term	Meaning
HUMS	Health and Usage Monitoring System.
DOP	Decentralised Operating Procedure. Provide flexible system coordination to achieve tangible goals.
Fabric	A service discovery system with integrated message delivery all under policy control. A joint US/UK defence funded programme.
Web services	Industry-standard architecture for interoperability in enterprise and high computing power environments. It is not suitable, and does not work in tactical environments.
DDS	Data Distribution Service. Real-Time Publish/Subscribe standard.
MQTT	Message Queue Telemetry Transport. Open message protocol for telemetry-style data.
RTP	Real-time Transport Protocol. Standard for audio and video over IP networks.
TCP	Transmission Control Protocol. One of the core Internet protocols.
HTTP	Hypertext Transfer Protocol. An underlying World Wide Web protocol.

4   Contact

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