Battlefield Tactical Communications and Information Systems (BATCIS) Delivery Team

LE TacCIS MORPHEUS

SYSTEMS ENGINEERING MANAGEMENT STRATEGY FOR THE MORPHEUS SUB-PROGRAMME

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Approvals

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Ref.	Description	Version	Date
1.	MORPHEUS Blueprint	V1	31/10/16
2.			
3.			
4.			
5.			

List of Abbreviations

Abbreviation	Meaning
ART	Agile Release Train
AWG	Architecture Working-Group
BAU	Business As Usual
BCIP	Bowman COMBAT Infrastructure Platform
BMA	Battlefield Management Application
BMS	Business Management System
CCR	Contract Change Request
CDO	Co-ordinating Design Organisation
CDE	Collaborative Data Environment
CIG	Capability Integration Group
CIWG	Capability Integration Working Group
CWE	Collaborative Working Environment
CUC	Capability Use Case
D&D	Design and Develop
DA	Design Authority
DaaP	Defence as a Platform
DLoD	Defence Lines of Development
DSA	Dismounted Situational Awareness
DT	Delivery Team
ECD	Evolutionary Capability Delivery
eMTRC	Enduring MORPHEUS Test and Reference Centre
ESCoT	EvO System Coherency Team
EvO	Evolve to Open
FLC	Front Line Command
FoTFT	First-of-Type Field Test
GBA	Generic Base Architecture
GDMS-UK	General Dynamics Mission Systems-UK
GSA	Generic Soldier Architecture
GVA	Generic Vehicle Architecture
ID&C	Installation Design and Certification
ICT	Information Communication Technology
iMTRC	Interim MORPHEUS Test and Reference Centre
IPR	Intellectual Property Rights
ISS	Information Systems and Services
ITEA	Integrated Test, Evaluation and Acceptance
ITEAP	Integrated Test, Evaluation and Acceptance Plan
JFC	Joint Forces Command
JPO	Joint Programme Organisation
LAC	Logical Architecture Conformance

Abbreviation	Meaning
LBAT	Lab-Based Acceptance Test
LE TacCIS	Land Environment Tactical Communications and Information System
LTA	Land Technical Authority
MAMT	MORPHEUS Assurance Management Tool
MEF	MORPHEUS Enterprise Functions
MFaC	MORPHEUS Fielding and Conversion
MIDAC	MORPHEUS Installation Design and Certification
MPPS	MORPHEUS Platform Processing System
MSP	Managed Service Provider
MTRC	MORPHEUS Test & Reference Centre
NFR	Non-Functional Requirement
OBS	Organisational Breakdown Structure
OEM	Original Equipment Manufacturer
OSM	Operational Support Management
PAC	Physical Architecture Conformance
PBS	Product Breakdown Structure
PI	Program Increment
PTC	Makers of Integrity Modeller
RTC	Rational Team Concert
SAFe	Scaled Agile Framework
SBB	Solution Building Blocks
SDA	System Design Authority
SDE	Shared Data Enviroment
SEMP	Systems Engineering Management Plan
SEMS	Systems Engineering Management Strategy
SG	Steering Group
SI	System Integrator
SME	Subject matter Expert
SQEP	Suitably Qualified and Experienced Person
SRD	System Requirement Document
TacCIS	Tactical Communications and Information System
TAF	Tactical Architecture Forum
TCG	Technical Coherency Group
TIBR	Tactical Internet Broadband Radio
TOM	Target Operating Model
TP	Transition Partner
VS	Value Stream
WBS	Work Breakdown Structure
WG	Working Group

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1. INTRODUCTION

Background and Context

1. MORPHEUS is a Defence Project that will deliver the next generation of Tactical Communications and Information Services (TacCIS) capability. It will introduce a more agile TacCIS solution (both technical and business) that will enable emergent technology to be rapidly exploited for User benefit and be more responsive to changes in User need. It will also realise efficiencies in the way in which TacCIS capability is acquired, supported and critical system obsolescence is managed.

2. The legacy TacCIS systems have been incrementally improved over the past decade and in pure functional terms provide a capability that broadly satisfies military need. However, there are shortfalls in legacy system usability, training burden and other pan Defence Lines of Development (DLoD) areas that need to be addressed. Dismounted Situational Awareness (DSA) capability will be delivered through MORPHEUS. In addition the current prime contract and closed system inhibits the cost effective introduction of change and the rapid exploitation of technological advances.

3. MORPHEUS seeks ownership and control of a technically and commercially open architecture to deliver TacCIS, which is fully integrated with the wider enterprise architecture, and responsive to changing user needs and emerging technology, in line with the Defence Information Communication Technology (ICT) and Defence as a Platform (DaaP) strategies.

4. Work conducted during the Assessment Phase illustrated that adoption of Replace or Evolve options, without General Dynamics Mission Systems UK (GDMS-UK) (as incumbent prime), would not be viable or preferable due to Intellectual Property Rights (IPR) constraints and operational impact. As such, MORPHEUS is adopting an Evolve to Open (EvO) approach, which by working with GDMS-UK as EvO Transition Partner (TP) will transition from the current closed system and static supply chain, to a more open and agile technical and commercial position that will maximise the use of open standards and comprise sub-elements that can be readily updated or replaced through competition (known as Business As Usual (BAU)).

5. A key objective for MORPHEUS is to transition to an architecture and business model that maximises the use of open standards and comprises sub-elements that can be readily updated or replaced through competition. This will be enabled by both technical and business solutions for which the Target Operating Model (TOM) and Blueprint defines the Business Operating Model and the business change required. This blueprint defines the intermediate Business Model states that are to be realised at the end of each tranche of delivery.

6. The engineering element of the BATCIS Team is called the Co-ordinating Design Organisation (CDO). The CDO is tasked with providing the engineering effort to support the Joint Project Office (JPO) in ensuring:

a. The successful delivery of EvO;

b. The delivery of the MORPHEUS Architecture;

c. The business transforms to an organisation capable of owning, maintaining and developing the MORPHEUS system design.

7. The CDO is not intended to be the Design Authority. That role will be provided by the ISS Design Pillar with delegated functions passed down to the CDO. This delegated authority is known as the System Design Authority (SDA). The SDA comprises mainly of engineers from the CDO, Programme Management, commercial and finance. The MORPHEUS Enterprise Functions (MEF) defines the functions performed by the CDO and ISS Design Pillar. Current work is defining the SDA role in full and that will be reflected in the MEF.

8. The CDO also provides resource to the Project Design and Delivery function to support the competitions for organisations (e.g. MORPHEUS Test and Reference Centre (MTRC)) to fulfil the future operating model (as defined in the MORPHEUS Blueprint [2] and the competitions for supply of products (e.g. Battle Management Application (BMA)).

Project Context

9. The MORPHEUS project exists within the following contexts which provide different requirements and constraints on the engineering approach:

- **Land Environment Tactical Communications & Information Systems (LE TacCIS)**. MORPHEUS is a constituent project within the LE TacCIS portfolio.
- **MOD Information Systems & Services (ISS). BATCIS Delivery Team,** which is responsible for delivering MORPHEUS, is an organisational unit within ISS, and comes under its architecture/engineering governance.

Scope and Purpose

10. The MORPHEUS Systems Engineering Management Strategy (SEMS) provides high-level engineering direction across the whole project.

Document Scope and Context

11. The MORPHEUS SEMS provides high-level direction across the whole project (including DSA, initial MORPHEUS Baseline, MORPHEUS CR1 with a 10 year planning horizon.

12. The SEMS is one of the four key strategy documents for the project as illustrated in Figure 1.

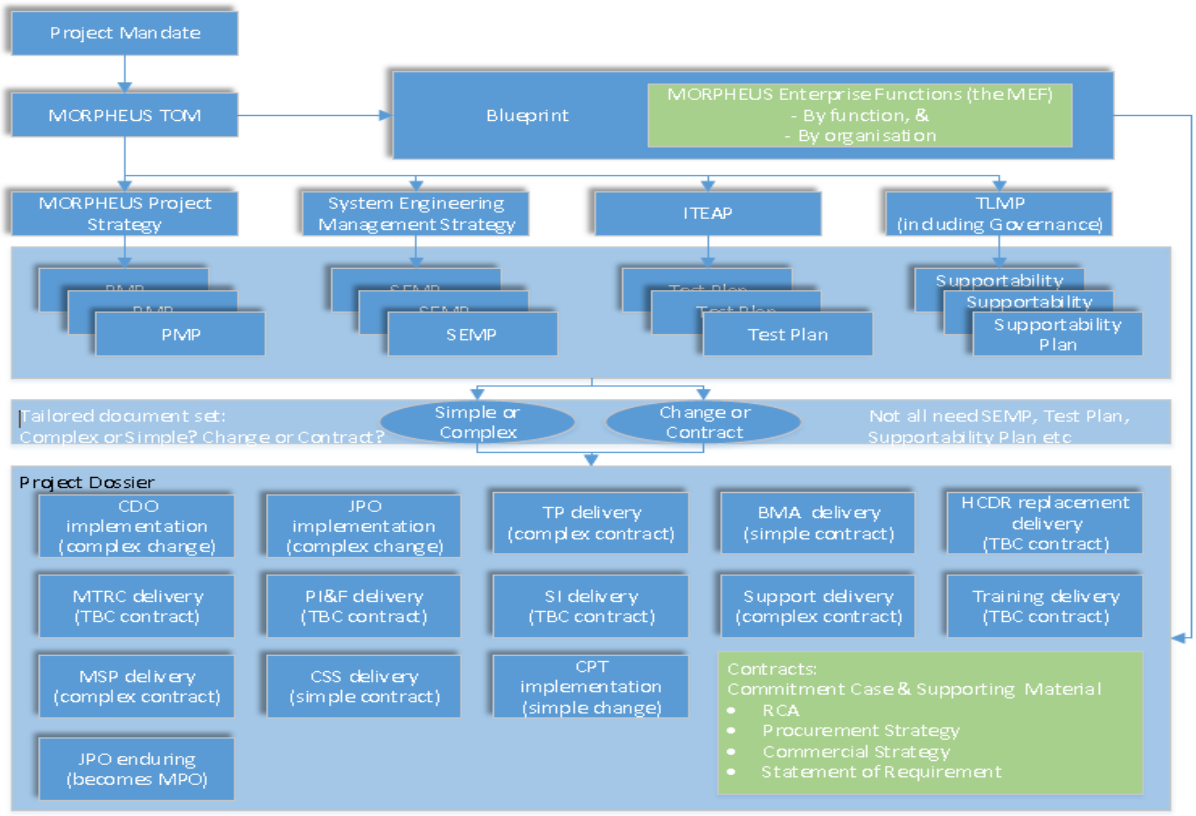

Figure 1 - MORPHEUS Project Documentation Map

13. The SEMS is an engineering strategy document with the aim of providing high level direction and guidance on engineering within the MORPHEUS Sub-programme. The SEMS aligns with the Procurement Strategy – providing the strategy for procurement of services and equipment, and the Integrated Test, Evaluation and Acceptance (ITEA) Strategy – providing the strategy for the test, evaluation and acceptance of the MORPHEUS system.

Transition Partner (TP) EvO Contract

14. The Transition Partner role is provided by GDMS-UK.

15. As per the contract, the TP will deliver the following:

    a. Software, hardware and middleware, design and development, know-how, intellectual property rights, training support and ancillary deliverables;

    b. Goods and materials in support of potential future manufacturing activity and undertake future manufacturing activity and additional ancillary deliverables;

    c. Enable the Authority (amongst other things) to act independently and properly as the System Design Authority and otherwise in respect of the Contractor Deliverables (including the MORPHEUS System Architecture, the EvO System Architecture, the EvO System Design and the EvO System) and to facilitate procurements and other work in support of such activity;

    d. Testing of (amongst other things) Openness and Vendor Independence of the MORPHEUS System Architecture, the EvO System Architecture, the EvO System Design and the EvO System.

2. Co-Ordinating Design Organisation

Current Status of the CDO

16. The CDO is the engineering resource group for the MORPHEUS delivery team. The CDO provides resource into projects, competitions, architecture development and technical assurance activities. The TP will develop, in conjunction with the Authority, an SDA function that will be resourced by members of the CDO, Programme, Commercial and Finance and will operate within the Joint Project Organisation (JPO) construct. The MOD will need to develop and recruit staff, design and test processes, establish new toolsets and vastly improve knowledge management to fulfil this function.

17. The CDO also provides subject matter expertise to projects and industry competitions within the MORPHEUS framework. This activity takes place outside of the JPO construct.

CDO Vision Statement

18. CDO will provide resource to the System Design Authority responsible for delivering innovative evolutionary technical solutions to the tactical end user. Engaging with Industry bodies to ensure the latest concepts and thinking can be tested and delivered to a modern Defence organisation whilst ensuring adherence to technical standards.

19. The CDO's target is to be comprised 50% MOD civil servants supported by private sector support Subject matter Experts (SMEs).

CDO Transition

20. During the development of the EvO system by the TP, the CDO's main task is to provide Assurance of the design. This is achieved by the co-location of several engineers with the TP developers, being on hand to answer questions and to provide guidance and to assist in prioritisation of development activities.

21. Whilst this Assurance activity is being undertaken, the CDO's capability to be a System Design Authority will be developed in conjunction with the TP over the duration of the EvO project. This capability will comprise processes, an organisational structure to support the activities of an SDA, tools and techniques and a set of templates and documentation. In addition, the TP are responsible for ensuring Knowledge Transfer occurs from the TP to key roles in the CDO, ideally roles that are filled by MOD personnel.

22. The SDA capability will be developed over the timeframe of the EvO contract. When the TP contract has delivered EvO, the TP will support the CDO for a further period of up to a year.

23. Once the CDO has the capability to perform as an SDA, it will be possible to expand the CDO's remit beyond MORPHEUS to include TRINITY and other communication projects delivered and operated by BATCIS and possibly the entire deployed (tactical) space. This operating model will need to tie in with ISS transformation. The timeframe for such an expansion has not been determined but is assumed to be beyond the EvO timeframe.

3. Organisational Roles

24. This section describes the organisations / organisational roles within MOD and its supply chain that have engineering responsibilities relevant to the project's technical objectives. The Procurement Strategy[1] provides a rationale for the way that delivery responsibilities have been assigned to different organisations and the way that it is intended that the organisational resources will be sourced (through supply side contracts, client-side contracts etc.).

25. Governance bodies (which also play organisational roles) are explored in the following Section.

26. The Organisational Blueprint defines the JPO an organisational construct that will contain both project management and engineering management staff from multiple companies, operating to a common set of management processes (e.g. risks, assumptions, change)[2]. This document will refer to the CDO as including the engineering management resources within the JPO utilising those common processes as well as those specific to technical management. Outside the JPO it is recognised that the CDO has an enduring role to manage emerging requirements and technical policies and to provide technical input into competition datapacks. The following diagram provides a snapshot of the organisational structures that it is intended will be put in place to deliver the project in the longer-term.

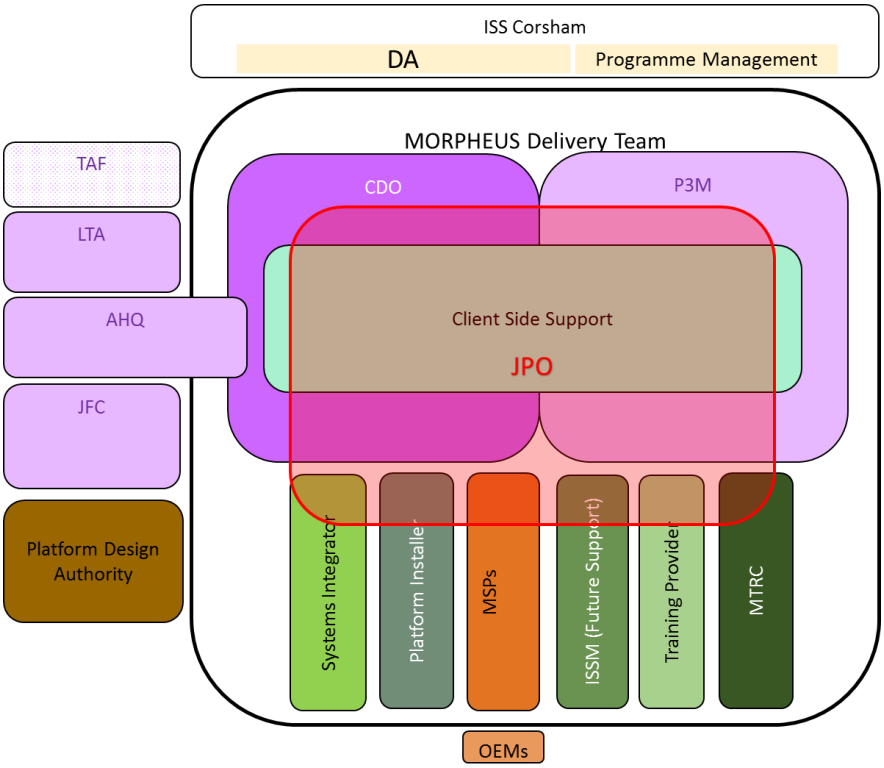

Figure 2 - Overview of Organisational Structures

[1] 20170131-Proc_Strat_to_RN4-V2.4 (https://modgovuk.sharepoint.com/teams/1745/Strategy/Proc%20Strat/20170131-Proc_Strat_to_RN4-V2.4-OS.doc?d=we1b649cbcdbb4a9ca0b30c85d1e1a596&csf=1)
[2] JPO Blueprint

Organisations supporting MORPHEUS

27. The organisations supporting engineering for MORPHEUS are shown in Table 4.

Table 1 - Organisations supporting MORPHEUS

Organisational Role	Primary Responsibilities
Co-ordinating Design Organisation (CDO)	Day-to-day responsibilities for supervising all aspects of design, development, test and acceptance (i.e. the full engineering life-cycle) Responsible for the ownership and maintenance of the architecture and supervision of the system design work Ensuring ISS technical policies are implemented within the project Approvals and Business Case support, including cost, risk and schedule Business change support Architecture assurance Design assurance Security Assurance Coordination (SAC) Specification support for purchase and supply of competed products
Front Line Command (FLC)	Executive user organisation that participates in governance across the MORPHEUS project life-cycle Responsible for articulating the user requirement / capability need, including relative priorities
ISS Design Authority	Executive responsibilities for all aspects of design, development, test and acceptance.
Managed Service Provider (MSP)	Manage a specified segment of the industry solution space under the direction of the CDO and overseen by the System Integrator. Maintain the system Physical Architectures Delivery and operation of an integrated product for the capability segment it is responsible for Provision of information to enable end to end integration by the System Integrator. Developing and maintaining relevant catalogues and roadmaps for products

Organisational Role	Primary Responsibilities
MORPHEUS Test & Reference Centre (MTRC)	Provide an independent assurance facility to support MORPHEUS engineering within ECD including provision of Evolutionary Capability Testing to facilitate testing during the ECD phase De-risk MORPHEUS Systems Integration and test the solution in a representative environment including • Test competed products for conformance to tests/harnesses/APIs/Stubs/etc. • Maintain gold standard test data • Support to System Integrator, support & experimentation. Provide a experimentation facility for supplier products for current and future baselines as well as enabling experimentation by MOD stakeholders
Original Equipment Manufacturer (OEM)	Develop product(s) to MORPHEUS requirements, possibly in an agile collaborative environment Offer product(s) for evaluation/experimentation If required, manufacture product(s) in quantity
Operational Service Management / Support Provider (OSM)	Provide direct support and manage 3rd party support (back to SI, MSP or OEMs as necessary)
Platform Design Authority	Own the design for a particular class of military platform Be responsible for the platform safety case through installation Work with the PI&F to install MORPHEUS capabilities on the platform and to provide the final certification that the platform as fit to operate
MORPHEUS Fielding and Conversion (MFaC)	Installation, conversion and certification of the First of Type platforms, all remaining EvO Design Lines, and the Fielding and Conversion of all EvO platforms.
MORPHEUS Installation Design and Certification (MIDaC)	Platform installation design activity for the EvO platforms, as well as installation, conversion and certification of the FOT platforms

Organisational Role	Primary Responsibilities
System Integrator (SI) *Note: includes Platform Integration but not Platform Installation*	System design based on requirements, architecture and high level design direction provided by the CDO. Maintain the Target System Logical Architecture Test planning, system build, test execution and evaluation functions against the design it defined. Platform integration requirements, system design and platform integration design Sub-system requirements, verification and acceptance System integration, certification and transition Platform integration and integration certification: Integration of MORPHEUS equipment capabilities with platform systems
Tactical Architecture Forum (TAF)	Maintain view of openness of MORPHEUS Architecture as it evolves Suggest opportunities for improvement to MORPHEUS Architecture Suggest solutions or design patterns to implement parts of the MORPHEUS Architecture
Training Provider	Maintain and uplift as necessary the Training Needs Analysis (TNA), generate course content and training material, conduct uplift training according to the selected training model for each capability release and maintain the Statement of Training Requirement for individual and collective conversion and steady state training. Work alongside the training team within BATCIS to manage • delivery of training materials from equipment providers, then preparation and delivery of these into conversion training in accordance with the fielding plan • steady state training delivered by MOD's training organisations
Users	End users (operators and maintainers) of the operational equipment delivered by the MORPHEUS Project Delivery Strand 2 Contribute to acceptance of CR1 Baseline system

Engineering Approaches

28. A brief description of the project approach is given for each engineering dimension below.

Architecture Management

29. The following approaches will be adopted:

(1) **Architecture Layers:** The Architecture is divided into 4 layers: Business Need, Services, Logical and Physical.

(a) The Business Need Architecture is owned and managed by Army HQ;

(b) The System Integrator manages the Logical Architecture but it is owned by the System Design Authority;

(c) The MSPs manage their portion of the Physical Architecture but it too is owned by the System Design Authority;

(d) The Services Architecture is split into 2 layers, the DaaP Services Architecture owned and managed by the Design Authority and the TACIS Segment Service Architecture owned and managed by the System Design Authority in the JPO.

Design Authority

30. The Authority has set the strategic outcome to be an Intelligent Customer and provide Design Authority leadership.

(1) **Design Authority Board**: ISS has set up a Design Authority (DA) Board with executive authority to endorse technical recommendations made by the project. This will also be the formal mechanism for providing technical direction to the project.

(2) **SDA:** The project will establish and sustain a System Design Authority to act on behalf of the DA for the LE TacCIS problem space. The SDA will comprise authority members of the JPO, mainly from the CDO supported by the SI.

(3) **Decision Management:** A decision management process is used that defines the scope of decision makers and the quorum required for decisions at various levels of decision making.

(4) **Engineering Documentation Management:** The JPO Collaborative Working Environment (CWE) will be the central repository for all engineering documentation. The CWE is a Sharepoint based service offering both a information repository and business management system hosting processes, policy, guidance and templates.

(5) **Engineering Reviews:** Due to utilising the Scaled Agile Framework (SAFe), engineering reviews effectively occur on a cadence of 2 weekly for minor demonstrations and 12 weekly for major demonstrations of the complete system.

(6) **Stakeholder management:** The project will ensure that appropriate stakeholders have been identified and involved across the project lifecycle in order to ensure that the relevant stakeholders' needs and concerns have been elicited, and where appropriate, addressed by the project.

Platform Integration and Installation

31. The following approaches will be adopted:

(1) **Scaling:** scaling data will be maintained (in conjunction with MORPHEUS project cost modelling) which will to a large extent be based on understanding scaling of platforms as a profile over time.

(2) **Platform Integration:** Integration at a systems level (with host-platform systems) will be the responsibility of the System Integrator.

(3) **Platform Installation:** Integration of new hardware onto host-platforms (mechanical integration) in accordance with the Installation Design & Certification (ID&C) process, shall be the responsibility of the Design Organisation (Platform OEM), with technical assurance and management of this process provided by MIDaC.

(4) **Prototype Platform Installation:** Prototype installation will be conducted to support small-scale test on a representative set of platforms to provide confidence that the MORPHEUS capability is installable and will work effectively once installed.

Requirements Management

32. The following approach has currently been adopted:

(1) In addition to the MORPHEUS Systems Requirement Document (SRD), the MORPHEUS requirement is also described as a set of Capabilities provided to Users operating in the Tactical LE. The Capabilities with user-facing aspects are broken down into a number of Capability Use Cases (CUCs) which give a high level description of the features and functionality of each Capability and how the end-user will exploit them to address their military business need.

(2) The Design and Development stage of the EvO project now follows the SAFe Agile methodology. This process has its own series of artefacts to describe the functionality that the system should provide: in increasing order of detail, these products are Epics, Capabilities, Features and Stories. As these artefacts are created over the D&D phase, they will be scrutinised by the CDO and representatives of the end-user community, to ensure that the intent of the original EvO SRD has been preserved and not mistranslated. Further, the Agile artefacts will be mapped back to the SRs held in the EvO SRD, to maintain traceability and preserve the 'Golden Thread'.

Speciality Engineering Integration

33. The following Specialty Engineering areas will be integrated into the Systems Engineering activities of the project:

a. Safety and Environment

b. Security

c. Integrated Logistic Support

d. Human Factors Integration

e. Spectrum

f. Training

g. Electromagnetic Compatibility.

34. The following approaches will be adopted:

(1) Using the SAFe Agile approach, all Features will have a definition of 'Done' that will include the non-functional requirements.

(2) Specialty Engineering will be invited to demonstrations to ensure the non-functionals are being met.

(3) The Non-functionals within the SRD will be individually tested during verification.

Technology Management & Innovation

35. The following approaches will be adopted:

(1) **Technology Management:** The project will ensure that technology maturity risks and technology opportunities across the system lifecycle are appropriately identified and managed. The project will use an agreed set of readiness levels as a reference by means of which the risks to the project in relation to technology availability will be assessed on a periodic basis.

(2) **Vendor Independence:** The project seeks as soon as possible to establish a MORPHEUS architecture that is both open and for which all rights rest with the MOD. This will enable component parts of the system to be upgraded and replaced from the widest possible supplier base once the MSPs are in place. A set of openness criteria is being agreed and needs to be used in the context of a vendor independence management plan. This assessment by the ISS Design Authority will be supported in part by TAF outputs.

(3) **Experimentation & Innovation:** In consultation with HQ Army, an experimentation strategy for the project is being developed that also touches upon operational innovation. The Evolutionary Capability Delivery (ECD) phase of the project will enable technical innovation, supported by the MTRC.

(4) **Proactive Obsolescence Management:** The project will identify upcoming obsolescence events and conduct assurance that system designs address obsolescence risks. During the ECD phase, it will be possible to apply agile techniques to be more proactive in managing obsolescence in support of the DaaP 'evergreening' goal.

System Integration

36. The following approaches will be adopted:

(1) EvO Timeframe: During the EvO timeframe, the Transition Partner will perform Continuous Integration of the whole system on a 12 weekly cadence. Suppliers ideally will fit into this cadence. System Integration will take place in the TP's System Integration Lab.

(2) Post EvO Timeframe: To be defined.

Test and Reference

37. The following approaches will be adopted:

(1) Assurance will take place throughout the Design and Develop phase of the ITEA process and is intended to give confidence to the Authority that all activities, documents and deliverables will be fit for purpose and will pass Acceptance. Tracing the requirements through the process will provide further assurance that EvO will provide sufficient coverage of the requirements to deliver the required Capabilities. Acceptance will be the formal process to confirm compliance of the EvO system with the stated Capabilities.

(2) **Architecture Test and Acceptance:** Acceptance of the architectures will predominantly be a paper exercise, relying on the jointly agreed outcome of the Architecture Requirements Review and Architecture Review, along with the acceptance criteria that define the functionality, interfaces and protocols of the elements that make up the architectures.

(3) **System Integration and Acceptance:** The collection of evidence to support Acceptance will happen throughout the Design & Develop phase as the emerging EvO system is tested, both at product and system level. Additionally, there will be two further events at which the capability will be tested (at the whole-system level), with the aim of generating additional evidence to ultimately enable System Acceptance. These are the Lab-Based Acceptance Test (LBAT) and the First-of-Type Field Test (FoTFT). However the tests performed at the LBAT and FoTFT will not be simply based on the system requirements in the EvO SRD.

(4) **Functional Requirements:** The functional aspects of the EvO system will be accepted against 39 Technical Capabilities. Each of these capabilities is decomposed in to a number of CUCs that describe the capability (and how the end-user will make use of it) in a greater level of detail. It is these Capability Use Cases (CUCs) that will be used as the basis for Acceptance for the EvO System.

(5) **Non Functional Requriements (NFRs):** Requirements in the EvO SRD that are identified as NFRs will have a Closure Method marked against them of either 'Assure' or 'Accept'. Those described as Accept will be developed into Non-Functional Verification Test Cases/Procedures. As in the case of the functional requirements, these Test Cases/Procedures will be performed at the LBAT and FoTFT. Those identified as 'Assure' will be verified using one of the following Verification Methods; Test, Inspect, Demonstrate, Analyse or User Centred Design.

38. Using an appropriate combination of available resources (facility and personnel), the Initial **MORPHEUS Test and Reference Centre (iMTRC) capability** will undertake the following tasks:

a. Logical Architecture Conformance – described at Para 41;

b. Physical Architecture Conformance – described at Para 42;

c. System Verification Testing – iMTRC staff will initially observe system verification activities at the GD SIL in Oakdale to inform system acceptance (between CDO and GD) during EvO;

d. Application Verification Testing – iMTRC staff will initially observe application verification activities at the GD SIL in Oakdale to inform application acceptance (between CDO and GD) during EvO;

e. Initial/limited experimentation – it *may* also be possible to allow the BATCIS DT and OEMs to test proposed solutions at early stage.

39. Thereafter, the **Enduring MTRC (eMTRC) capability**[3] will continue to undertake, post-EvO, tasks b. to e.[4] above plus:

a. Support to Release & Deployment – to carry out the checks and activities undertaken to ensure consistency of the versions of the MORPHEUS system as they are fielded. This activity will require close working with the System Integrator;

b. In-Service Support – to support the identification of faults experienced during in-field operation i.e. problem management;

c. Experimentation – providing an experimentation capability to help foster innovation and to enable OEMs to test their developing tactical capabilities on the MORPHEUS system;

d. System Performance Modelling – maintaining, updating and validating the System Performance Model, to be delivered by GD at the end of EvO D&D. The model consists of software designed to simulate the behaviour of the network of nodes running the EvO baseline at a scale larger than the eMTRC's physical equipment will allow. The model will provide for both hardware in the loop and the opportunity to model new MORPHEUS elements, for example Routing/transport protocols, new bearers, etc before large scale testing;

e. Platform Integration Verification Testing – on an ad-hoc basis, to check that the platform integration has worked.

Openness Testing

40. The following approach will be adopted:

(1) **Openness Testing:** will ensure the various System Architectures and System Designs that fall under the MORPHEUS umbrella are sufficiently open as to facilitate competition in the future. The tests will primarily focus on two characteristics:

(2) **Technical Openness**: concerns the openness of both the MORPHEUS and EvO System Architectures and EvO Design, such that the Authority is able to pass all relevant information to apposite third parties to enable them to develop products that comply with the MORPHEUS System Architecture, EvO System Architecture and EvO System Design.

(3) **Commercial Openness:** concerns the ability for industry to compete for the provision of components or services necessary to deliver the architecture. As well as the viability of competitors for each Solution Building Block (SBB), there is also a test for the market alignment of the partitioning of the architecture as a whole.

Logical Architecture Conformance (LAC) Testing

41. The following approach will be adopted:

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[3] As yet, location(s) options awaiting DIO analysis.

[4] Logical Architecture Conformance (i.e. documentation review-only) will likely have ceased by the time the eMTRC is implemented.

(4) **Logical Architecture Conformance (LAC):** LAC will test and evaluate the architectural elements of the emerging EvO system. LAC will broadly comprise three key tasks:

(a) Checking that the developing EvO System Architecture complies with the MORPHEUS architectural principles;

(b) Testing that the emerging EvO System Design is aligned with the EvO System Architecture;

(c) Ensuring that those elements of the MORPHEUS architecture (SBBs) which are not being instantiated in the EvO System Design, have sufficient detail and clarity that a supplier could successfully deliver against them in the future.

Physical Architecture Conformance Testing

42. The following approach will be adopted:

(5) Following the definition and maturation of the EvO System Architecture, there will be an activity to ensure that the instantiated system conforms to the documented MORPHEUS and EvO architectures. This will be performed by Physical Architecture Conformance (PAC) testing. PAC testing will use physical equipment, test stubs or test equipment to test new interface designs by an independent team.

4. Engineering Management and Governance

43. The purpose of engineering management governance is to ensure that the project's technical direction is suitably controlled throughout its lifecycle, in order to satisfy its technical objectives. Engineering management controls include the identification and management of appropriate technical organisations (OBS), activities (WBS), reviews and outputs (PBS), across the lifecycle, in accordance with the project's characteristics and available resources.

44. A specific aim is to ensure that the governance structures are sufficient in order to maintain alignment between the technical objectives of the project and its strategic direction (including legislative and regulatory frameworks).

45. It is a critical success factor for the project to ensure that all of the required resource types (Suitably Qualified, Experienced Person (SQEP), buildings, equipment, supplies, information, tools and supporting teams etc.) are identified, acquired, and made available in a timely manner and managed to support delivery of the project's technical objectives through life. This strategy will identify the ENDS in respect of resource management, sub-ordinate System Engineering Management Plans[5] (SEMPs) will define the WAYS and organisation-specific implementation plans will set out the MEANS.

Engineering Management Structures and Mechanisms

46. The MEF is the business model that provides the primary functional responsibilities and accountabilities for the MORPHEUS organisational roles and functions specific to BATCIS Delivery Team (DT). These responsibilities change through different phases of the project.

The Co-ordinating Design Organisation

47. The CDO has the lead for engineering management across all phases of the project. The CDO is accountable to each of:

a. LE TacCIS Programme Board (via the MORPHEUS 1* Steering Group and Capability Integration Group (CIG))

b. ISS Design Authority (DA)

c. Land Technical Authority (LTA).

48. The MORPHEUS Architecture Working Group (AWG) is the primary mechanism for managing contentions between these reporting lines (issues passed to the AWG can be escalated as explained in the next section).

49. Further, CDO architects report to the ISS Design Authority whilst being embedded with, and contracted by, BATCIS DT. This is intended to strengthen the relationship with the ISS Design Authority with the aim of aligning MORPHEUS Architecture with the ISS Enterprise Architecture[6].

50. The CDO will need to provide engineering inputs into the Capability Integration Working Group (CIWG)/CIG for capability integration. The CIWG (reporting to the CIG) takes a pan-DLoD view of capability introduction.

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5 The requirements for subordinate SEMPs are defined in Annex A

6 Noting that the MORPHEUS Architecture should sit alongside and complement NSOIT(D)/DaaP and is not subordinate to it.

51. The relationship between the CDO and the JPO is explained in the JPO Implementation Plan. All on-contract EvO projects will eventually be managed from the JPO. The elements of the CDO inside the JPO provide technical assurance support to the Project Managers.

52. As lead for engineering management, the CDO will own and manage project engineering risks, opportunities, dependencies and assumptions (using JPO defined processes) within its remit. The CDO will also take the lead in establishing and maintaining a project engineering Decision Log[7] which will provide a record and audit trail for key technical decisions taken by the project.

53. The CDO has a responsibility to implement technical policies in consultation with ISS Design Authority[8] and standards in consultation with LTA[9]. The architectural management approach adopted by CDO will conform to structures being developed by Army HQ and ISS. Configuration management will be one area where JPO/CDO will need to benefit from the TP's knowledge transfer programme[10].

54. The CDO will be proactive in monitoring work of the TP and other suppliers through a series of reviews and evaluation events as detailed in the ITEA Plan (ITEAP)[11]. Test and evaluation will need to be conformant with the ISS Test Strategy[12] (and may draw upon ISS resources in addition to MTRC resources and facilities).

55. The organisation of the CDO, including Terms of Reference for the lead roles, will be developed based upon the following principles:

a. A **MORPHEUS Chief Engineer** will be accountable for systems engineering activities across the project with a particular focus on external interaction. In particular, the MORPHEUS Project Board, through the MORPHEUS Chief Engineer, will seek approvals from the Land Open Systems Architecture Board and the ISS Design Authority Board, as considered appropriate by the Authority.

b. A **CDO Engineering Manager** will be responsible for delivery of systems engineering outputs (to time and cost) with a particular focus on EvO in the short to medium term. The Engineering Manager will report to the Chief Engineer.

c. The **CDO Technical Authority** is responsible for the quality (accuracy, compliance, completeness etc.) of technical products whether produced in house or by partners or suppliers. The Technical Authority will report to the Chief Engineer.

d. A **CDO Lead Architect** will be responsible for developing, managing and exploiting the TacCIS Segment Service Architecture and will report to the Chief Engineer and liaise with ISS Design to ensure coherence with the DaaP Services Architecture.

e. The **CDO Engineering Manager** will have responsibility to report to the MORPHEUS Project Board on engineering matters (in accordance with JPO reporting processes).

f. The CDO will contain roles that fulfil the functions allocated to the CDO in the MEFs at a scale commensurate with the demands of the project.

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[7] https://modgovuk.sharepoint.com/teams/1732/CDO%20Management/Processes%20and%20Registers/20170808-MORPHEUS-Decision%20Making%20Process%20v1_0-OS.docx?d=w1da63bd854144467a1962f7b2e1c50ea&csf=1

[8] This may involve obtaining waivers or amending policy documentation to ensure it applies appropriately to the tactical domain. JSP604 remains the primary reference for these policies.

[9] Two key standards for MORPHEUS being GVA and GSA.

[10] Others may be detailed here for reference.

[11] http://cui6-uk.diif.r.mil.uk/r/195/4/29/3/Forms/Grouped.aspx

[12] Filename 'ISS SIAM Test Strategy v0.4'

g. The CDO will also have access to roles covering each of the specialist engineering areas.

h. Members of the CDO will be geographically dispersed with some roles permanently stationed in non-MOD establishment sites, e.g. Oakdale with the TP.

Collaborative working groups

56. The JPO is itself a collaborative organisation which has management / decision-making responsibilities. The discussion in this document is restricted to the role of the CDO and its interfaces to wider JPO processes.

57. The *EvO System Coherence Team (ESCoT)* is an Authority led collaborative working group with a remit to support the knowledge transfer necessary to enable the Authority to compete the System Integrator role post-EvO, through the 'worked example' of EvO. The justification is that the TAF is not the right forum for dealing with strategic EvO issues, thus a different forum is required.

58. The ESCoT coordinates all EvO architecture and design activities in an integrated manner as typically done by a Prime Systems Integrator[13], the difference being that it is a joint activity. It also provides the forum for agreeing the MORPHEUS Architecture[14]. The ESCoT has a range of stakeholders as illustrated in Figure 3.

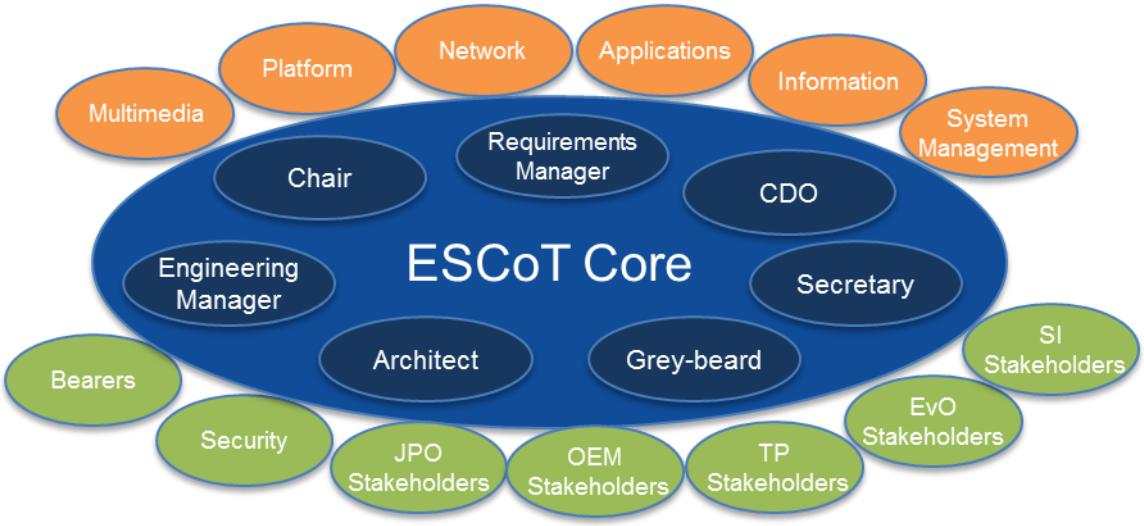

Figure 3 - Proposed ESCoT structure

59. The ESCoT is the primary forum (during the EvO D&D phase) for joint discussions with the TP and provision of guidance on how major issues or strategic alignment is addressed and planned for resolution. After the EvO D&D phase, the JPO will assume responsibilities of the ESCoT for future MORPHEUS spirals. In all phases, the ESCoT is potentially open to other suppliers (OEMs) who are on contract with BATCIS DT (and thereby part of the JPO)[15].

60. The JPO will be responsible for flowing programme board decisions down to the ESCoT, which will in return flow recommendations and architecture/design artefacts back. In the early

[13] This is a lesson learned from BOWMAN development. During the early days of the Bowman programme execution, GD involved MOD in the design process, calling this the System IPT.
[14] There will be a point early in the EvO D&D phase when the MORPHEUS Architecture will need to be baselined. The EvO architecture and solution design and development will be tied to that baseline. Under the control of the MORPHEUS AWG, the MORPHEUS Architecture may evolve further – the project will have to manage the risk of any divergence between the MORPHEUS and EvO Architectures.
[15] The need will be decided on a case-by-case basis so this is not a blanket rule.

stages of EvO the ESCoT will provide guidance to the TP and OEMs, i.e. act as the intelligent customer. This responsibility will be taken on by the System Integrator in later phases.

61. MOD has established an industry engagement collaborative working group called the *TAF.* The TAF is a MOD lead forum supported by industry that will provide the System Design Authority with advice regarding the MORPHEUS Architecture from the perspective of alignment to the market and openness. Its initial scope will be EvO[16]. In the short-term (prior to and during the TP contract) it will assess and comment upon the architectural artefacts provided by the TP; in the longer-term (beyond the TP contract) it will aid the evolution of the Architecture, supporting its development in line with suitable external technological and market drivers.

62. The TAF is a pan-MOD and Industry body governed by ISS Design. It will consist of a MOD-only Steering Group (SG), which provides strategy and guides the work. Below the SG will be a Technical Coherence Group (TCG) that will cap a collection of Working Groups (WGs)[17]. A Plenary Group will be used to brief strategy, plans and conclusions to a wider audience.

63. The TAF will be able to raise Candidate Change Requests (CCRs) that will be judged on their merits (for MORPHEUS) and in the context of the wider architecture. If the TAF identifies a requirement for a change to the Service Architecture, then it will inform the DA. The DA will report to the MORPHEUS Project Board who will decide on whether the change is implemented, informed by impact analysis undertaken by the CDO/JPO.

Engineering Governance Framework

64. Engineering governance needs to address:

a. Technical change management;

b. Architecture coherence;

c. Steerage by the Programme Board and subordinate Working Groups (and engineering team reporting to these bodies);

d. Engagement with standardisation bodies, including the Land Technical Authority.

65. Mechanisms for engineering governance include organisation structures (governance bodies) and processes (for management reporting, issue resolution, change proposal sentencing etc.). This section will describe the governance framework (wiring diagram for governance bodies) but refers to the Through Life Management Plan (TLMP) for Terms of Reference. Descriptions of processes are beyond the scope of this version of the SEMS although technical change management is described briefly below[18].

[16] The aspiration is to broaden the TAF to the full breadth of the Land Environment Tactical CIS (LE TacCIS) space (and perhaps beyond).

[17] As a default these WGs will be aligned to the Defence as a Platform (DaaP) service framework rather than specific programmes or projects. However, this alignment is flexible. Alternative alignments will be considered and supplemental temporary special-interest WGs will also be used where appropriate.

[18] Working level processes are expected to be documented in the JPO & CDO implementation plans. A view of the complete set of management information that is needed to support these governance structures will be developed when progress has been made in documenting the processes.

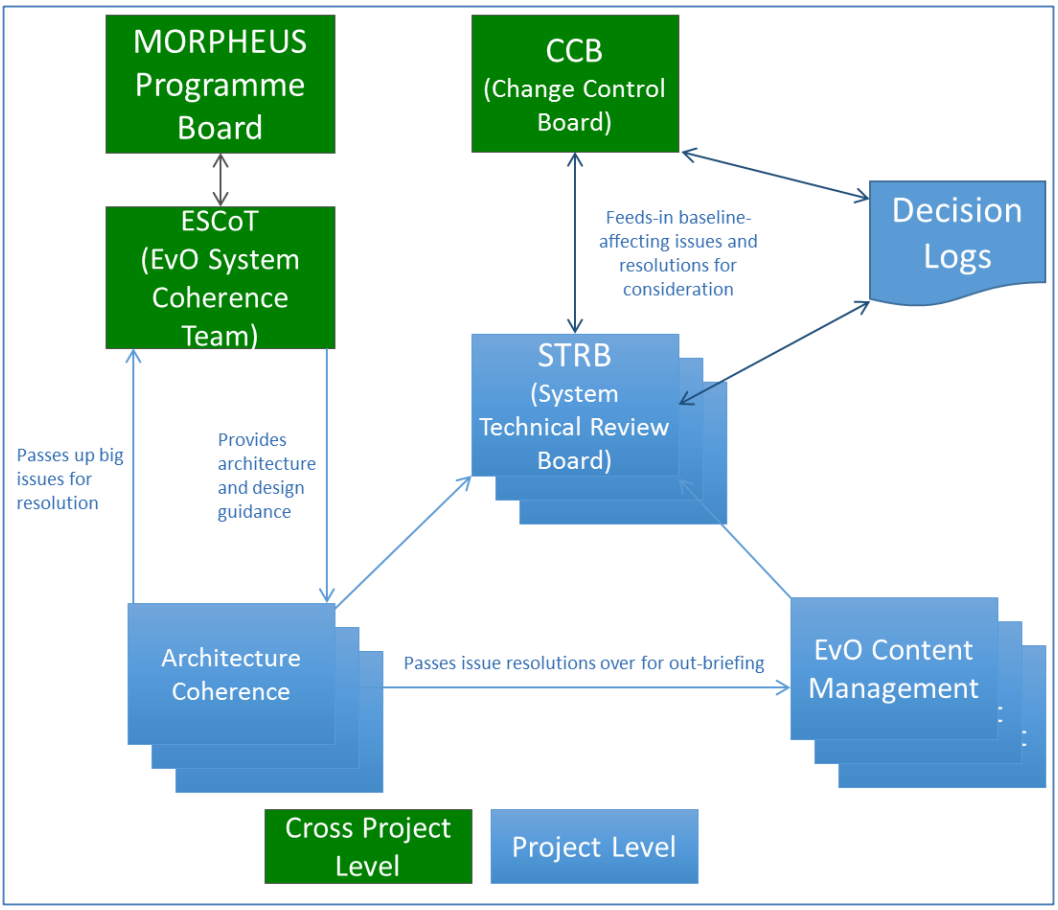

Figure 4 - MORPHEUS Project Technical Governance Framework

66. The technical governance structure for the TP contract is shown in Figure 4. This is expected to be mirrored by other EvO projects (i.e. BMA, MTRC, TIBR).

67. Each project will have its own Technical Review board which agree changes to be passed up to the MORPHEUS Change Board. This is a simplified illustration as each project (e.g EvO, BMA, MTRC) will have its own governance structure.

68. Technical change management disciplines will be applied to ensure that delivery of capability is controlled but also responsive to change.

69. The basic process for change control encompasses the following steps:

a. Identify need for change from agreed baseline and record the required need for change.

b. Analyse impact and effect on stakeholders.

c. Assess response options and impacts of each according to time, cost, performance, scope, benefit contribution, viability and effect on everyday business and other projects

d. Recommend and decide on course of action with the involvement of sponsor and stakeholders.

e. Report to governing or approving authority, if required.

f. Implement and record course of action in response to change.

g. Update plan and schedule, if required and inform stakeholders affected by the change.

70. Some organisational structures to enable this are illustrated in Figure 5.

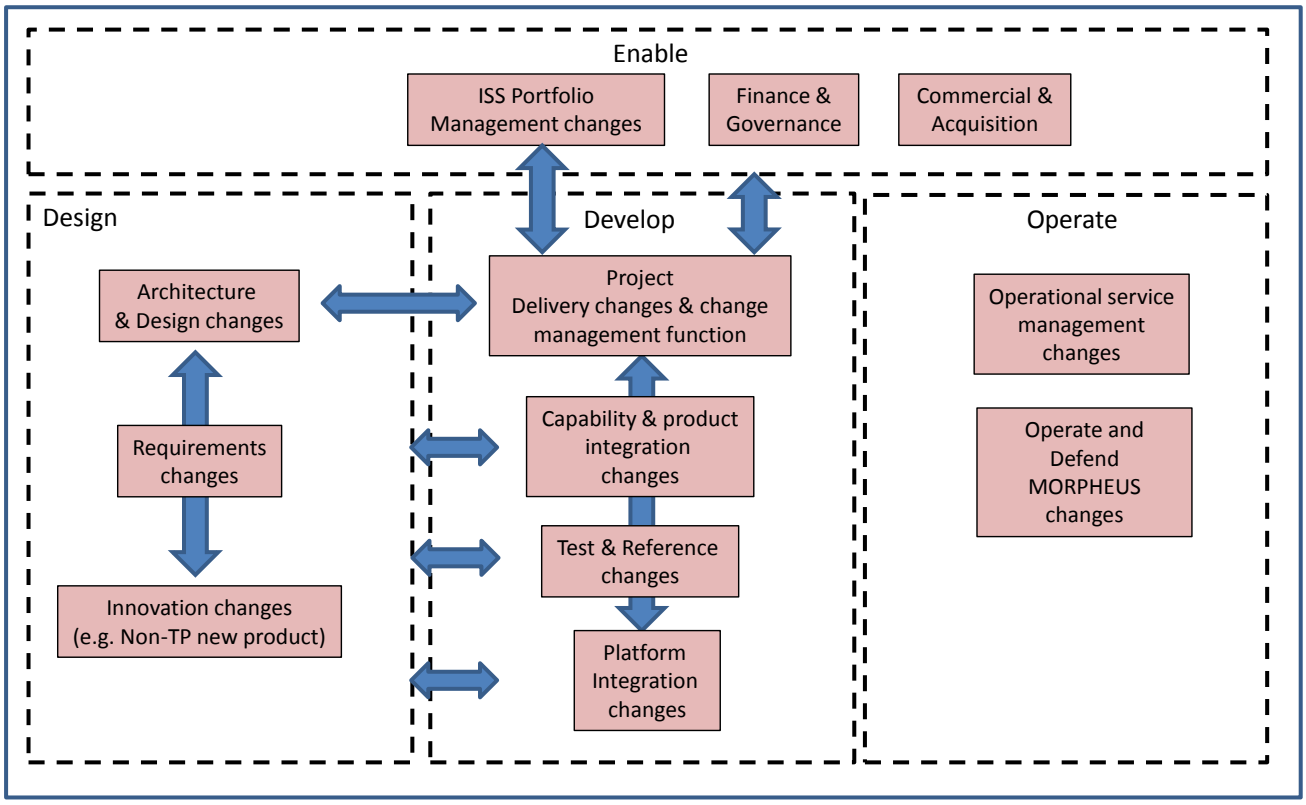

Figure 5 - Change and MORPHEUS Enterprise Functions (MEF)

71. The MORPHEUS Decision Process[19] describes how agreed changes, at the appropriate level, are presented to the MORPHEUS CCB.

72. The governance structure shown in Figure 6 has been designed to place the MORPHEUS Architecture Working Group[20] in the context of the different influences on the MORPHEUS Architecture (users via the LE TacCIS; emerging standards via LTA; ISS Enterprise Architecture via the ISS Design Authority).

[19] https://modgovuk.sharepoint.com/teams/1732/CDO%20Management/Processes%20and%20Registers/20170808-MORPHEUS-Decision%20Making%20Process%20v1_0-OS.docx?d=w1da63bd854144467a1962f7b2e1c50ea&csf=1
[20] http://cui6-uk.diif.r.mil.uk/r/195/4/24/1/20160722-MORPHEUS%20Architecture%20Working%20Group%20ToRs%20v1b.docx

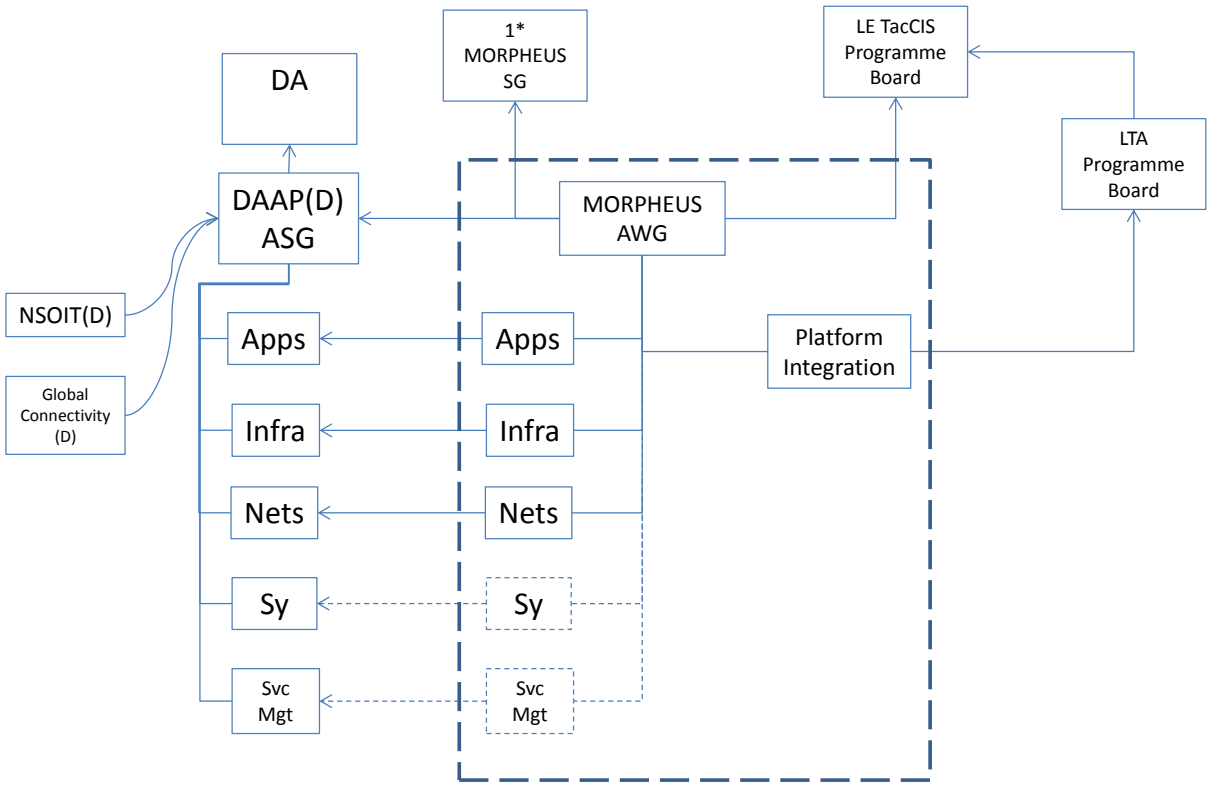

Figure 6 - Architecture Governance for MORPHEUS

73. It also recognises that, as defence architectures become increasingly delaminated, it will become possible to manage coherence via the architecture segments (applications, infrastructure, networks/bearers) with benefits of cost efficiencies and enterprise re-use. As can be seen in Figure 6. But it should be noted that 'architecture' is being used in its widest sense, so the Architecture governance also ensures coherence of solution, service and business architectures.

74. In addition the MORPHEUS AWG acts as the TAF Coherence Group, so will field Candidate Change Requests from industry that are raised through the TAF Working Groups. It is important that there is a responsive body empowered to take on technology opportunities that can add genuine value but handling of these opportunities must be tempered by the potential impact on coherence of the solution architecture.

Ensurance/Assurance management approach, structures and mechanisms

75. This section describes the proposed ensurance/assurance management approach, structures and mechanisms.

76. The project will support technical assurance through development of documentation to inform assurance processes and associated working groups. The document Assurance Process[21] describes how documents are reviewed across MORPHEUS. The principle will be to achieve 'ensurance' through proactive engagement with nominated assurance representatives. A model-driven approach to documentation will be taken wherever possible. This means that up-do-date 'documentation' will be available to stakeholders who wish to confirm progress against assurance objectives.

[21] Document Assurance Process

77. Examples of technical assurance activities include the following, many of which have been referred to above:

a. Specialist engineering (e.g. Security) working groups

b. JSP604 compliance assurance process and responsibilities

c. System Readiness Levels process and responsibilities

d. Support solution envelope process and responsibilities

e. Liaison with the Design Authority Board, principally through maintenance of a Design Passport for the project; this provides a single page view summarising the architecture[22].

78. All the Working Groups will be expected to be especially interested in the robustness of Risks, Assumptions, Issues, Dependencies and Opportunities (RAIDO) processes that record decisions and the associated assumptions and risks. The CDO will have primary responsibility for the engineering and technical aspects of these processes.

[22] Similar liaison with the LOSA Board is likely to be needed, the requirements for which are currently unknown.

4. High-Level Engineering Process

79. As part of the Transition Partner contract, GDMS have agreed to carry out a number of activities in supporting BATCIS DT's ambition to become the 'quasi prime contractor' and Design Authority, including but not limited to:

a. Knowledge transfer to enable skills to be uplifted within BATCIS;

b. Manage the introduction of EvO using Agile methodology, specifically the Scaled Agile Framework (SAFe) Version 4.0.

80. This section describes the agile framework currently in operation and managed from the JPO. New suppliers will be expected to fit into this agile framework.

SAFe

81. SAFe has evolved as an approach for developing complex systems and software in a Lean-Agile manner and draws from three primary bodies of knowledge: Agile development, systems thinking, and Lean product development. It is as an online, freely revealed knowledge base of patterns for implementing Lean-Agile software and systems at enterprise scale. More detail is freely available at www.scaledagile.com.

82. The following paragraphs will explain the current structure providing the SAFe framework, explore the relevant principles and seek to explain how SAFe is implemented in the context of EvO and MORPHEUS.

SAFe Structure

83. The TP are implementing SAFe by running a number of Planning Increments (PIs) in order to define requirements and develop the system architecture and its building blocks. The Teams are spread across 3 Agile Release Trains (ARTs) and split between GDMS based in Oakdale, Hastings and Calgary:

a. Beech ART – Modular Platform Processing System (MPPS). Provides interfaces for:

(1) Legacy BCIP

(2) Generic Architectures; vehicle (GVA); base (GBA) and soldier (GSA)

(3) Audio ancillaries

(4) Radios and bearers

(5) Gb LAN and power ports

(6) 10G Base LR single mode Ethernet

(7) USB

(8) GP10 and serial

b. Elm ART – Conductor. A logical grouping of decoupled, independent services that adhere to the principles, interfaces and functionality described in the MORPHEUS architecture.

c. Oak ART – Manage. A suite of applications to provide the system management functions in support of future LETacCIS based on the Open Tactical Management System to enable the following services:

(1) Planning

(2) Configuration Management

(3) Monitoring

(4) Collaboration

(5) Reporting

d. Each ART has a number of Solution Teams (scrums) currently working towards fixed goals in a series of Sprints within each PI. The CDO have a team based in Oakdale supporting the TP with advice and providing assurance for architectural and engineering products.

e. A fourth team (Ash) was dealing with System Engineering Solutions across the Value Stream (VS). For PI 3 the Ash Team was broken down and distributed to the ARTs with a small team remaining in order to decompose requirements and features at the VS level.

84. SAFe is based on the following 9 Lean and Agile principles:

a. Take an economic view;

b. Apply system thinking;

c. Assume variability, preserve options;

d. Build incrementally with fast, integrated learning cycles;

e. Base milestones on objective evaluation of working systems;

f. Visualise and limit Work in Progress, reduce batch sizes and manage queue lengths;

g. Apply cadence, synchronise with cross-domain planning;

h. Unlock the intrinsic motivation of knowledge workers;

i. Decentralise decision making.

Take an economic view;

85. The entire chain of leadership, management, and knowledge workers must understand the economic impact of the choices they're making. The agile approach provides short learning cycles and regular feedback to stakeholders who can make informed decisions and prioritise work based of the demonstration of solution development. A system demo is performed by each ART every 2 weeks to a limited set of embedded users and every 12 weeks to a larger set of stakeholders from across the land environment. The 12 weekly Planning Conference is informed by steakholders with backlog items prioritized based on delivering highest value more quickly.

Apply Systems Thinking

86. Having a number of ARTs and Solution Teams working into the Value Stream allows the overarching control and direction of efforts to be viewed from a wide perspective rather than the traditional 'silo' perspective that existed within individual solution teams working in a waterfall methodology. The ability to do this early allows the VS to understand dependencies and touch points between teams and schedule effort in a more joined up manner.

Assume Variability, Preserve Options

87. Not committing to solutions early in the process allows the customer and supplier to keep options open, avoid sub-optimal solutions and make decisions with more certainty (i.e. decide later in the process when more is known). Having the BATCIS team embedded with GDMS enables collaboration in the decision making process, understanding is enhanced for both parties and allows low level decisions to be made relatively early before large investments in resources.

Build Incrementally, with Fast Integrated Learning Cycles

88. The SAFe methodology allows the solution teams to work on small, decomposed tasks that build solutions incrementally throughout the PI, allowing early interaction with BATCIS as the customer in order to validate products and if necessary, change direction.

Base Milestones on Objective Evaluation of Working Systems

89. Each Sprint ends in a System Demonstration, this does not have to be a piece of software or hardware. To date demonstrations have been of:

a. Models (software) showing how a solution may work;

b. Whitepapers to encourage further discussion or requirement refinement or;

c. Initial Design Documents for review.

90. Solution Demonstrations at the end of each PI are in general larger and bring together the cumulative results of each of the individual sprints into a more comprehensive whole. The Solution Demo may still be of the types discussed above.

Apply Cadence, Synchronise with Cross-Domain Planning

91. Under the TP contract the TP have committed to applying cadence, synchronisation and cross-domain planning, using the SAFe model, to the development of EvO products from Apr 18 to Dec 20. The development cycle is shown in Figure 7 below:

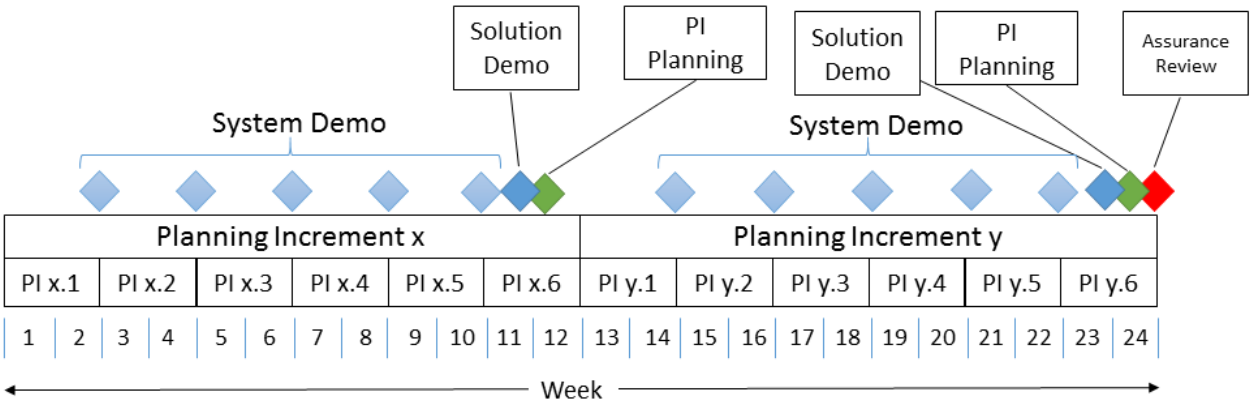

Figure 7 - Example Planning Increment and Sprint Cadence.

a. **Planning Increments:** A defined (12 week) programme of sprints each ending in a Solution Demonstration and an Assurance Review every 6 months (2 PIs).

b. **Sprints:** A 2 week focussed time box with fixed objectives ending in a System Demonstration. The final sprint (x.6) is reserved for any final work, PI Planning activities and the PI Conference for the next PI.

c. **PI Planning Conference:** A 3 day planning session for the following PI with the TP based in Calgary, Oakdale and Hastings (they travel to Oakdale) teams collaborating alongside Authority stakeholders to provide the cross domain view of the work of each of the ARTs. BATCIS DT have representation at both sites during PI Planning. At this point the key dependencies placed by TP on the Authority are articulated with agreed timelines for delivery. In general the requests are for User engagement or clarification of requirements with relevant SMEs.

d. **Assurance Review:** Assurance Reviews take place every 6 months (2 PIs) to enable GDMS and Senior Authority engagement; monitor progress against agreed deliverables; ensure the correct work is being carried out and that the products or artefacts are up to the correct standard. Prior to the Assurance Review the Authority carries out reviews of the artefacts.

92. During each PI the Value Stream run Kanban meetings with Authority involvement in order to test and adjust the current PI Plan, create the objectives for the next PI and plan the subsequent PI in outline. In theory this means that the Solution Teams are given their objectives before the start of PI planning and plan their sprints in accordance with them. In practice this works for the majority of the objectives although some testing and adjustment is carried out in PI planning as dependencies and levels of effort become more refined. At these meetings the requirement for user/SME engagement in the early sprints of the next PI should be identified.

Decentralise Decision Making

93. Centralising decision making can lead to delay, therefore BATCIS DT have authorised the representatives currently embedded with the Oakdale team (and when deployed to Calgary) to make decisions at their level of delegation. The MORPHEUS policy for Decision Making provides the team with their boundaries[23]. In short, the team are able to make decisions up to and including those that fall within the PCT envelope of EvO, that affect other products and that don't have significant impacts across the DLoDs.

Key Programme Event Timeline

94. Figure 8 shows the key programme milestones.

[23] https://modgovuk.sharepoint.com/teams/1731/Shared%20Documents/Decision%20Log/20170808-MORPHEUS-Decision%20Making%20Process%20v1_0-OS.docx?d=w146b2738e8544c309c7e2626a111403c&csf=1

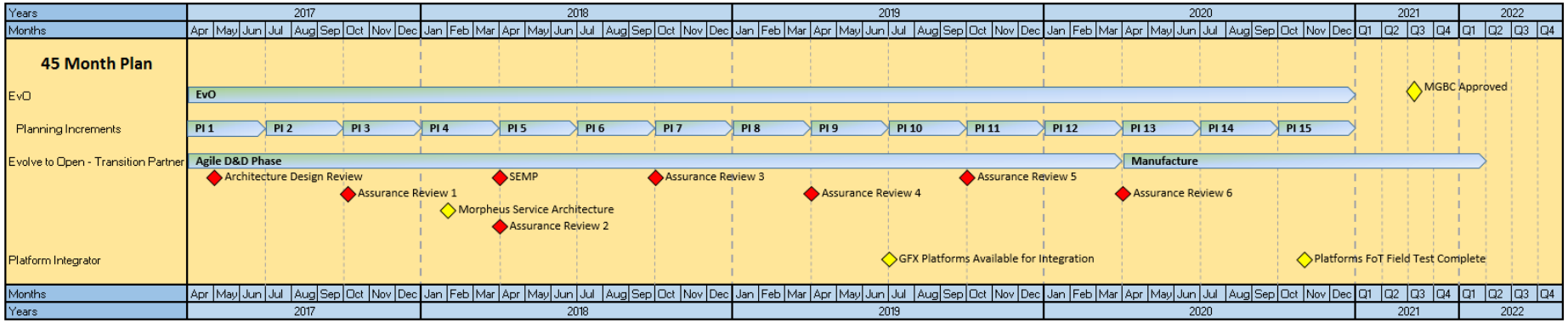

Figure 8 - Key Project Milestones

5. IT Infrastructure

95. The TP is providing the JPO operating environment during the EvO timeframe. The JPO CWE will become a MOD owned capability that provides access to MOD and external suppliers, currently, via a Citrix interface. The CWE will provide a Business Management System (BMS) comprising an Information Repository, a Business Process Library and a collaboration space.

96. During the EvO timeframe, the TP will host the architecture repository for the MORPHEUS Target System Architecture in PTC Integrity Modeller (PTC), the System Requirements in DOORS and agile management in Rational Team Concert RTC) on their Shared Working Environment (SWE). Limited access will be provided to those needing access to the live versions of RTC, PTC and DOORS. A synchronised version of each of the repository will be available on the JPO CWE for all other JPO users. N.B. The current date for instantiation of the new CWE is March 2018. The Authority is currently hosting Sharepoint on the TP provided Shared Data Environment. The BMS is being developed on the CWE but will not be available until March 2018.

97. In addition to these 2 environments, the MOD will continue to use MODNet for storing commercially sensitive information such as competition documentation.

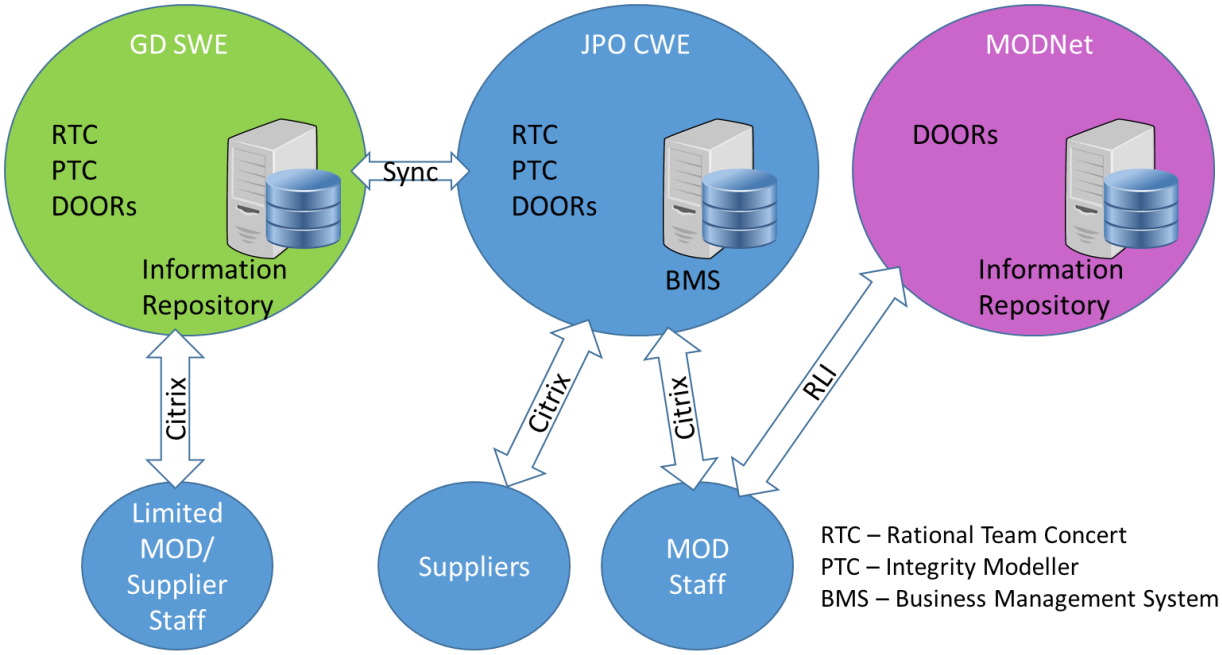

Figure 9 - Information Environments

TP Provided Tooling

98. A number of tools have been chosen by the TP to plan and execute the EvO project, they are currently available through the SDE using the Citrix portal for those who are authorised. The TP control access through Citrix and administer the tools. The following tools are being used by the TP (UK) and BATCIS DT in collaboration:

PTC Integrity Modeler (PTC)

99. PTC is a Software System Lifecycle Management (SSLM) and Application Lifecycle Management (ALM) platform. It provides a collaborative environment to manage the end to end process of development from requirements management, engineering change management, revision control and build management to test management and software deployment. In the EvO

context it is being used to capture requirements, Capability Use Cases and User Personas in order to model the EvO architecture and its building blocks.

IBM Rational Team Concert (RTC)

100. The tool to manage the EvO project, it is used to plan and execute the SAFe project development for EvO using its Kanban type planning tool as well as to act as repository for software under development. It is a client-server application to enable collaborative, simultaneous use by the ARTs and their teams.

Rational Dynamic Object Oriented Requirements System (DOORS)

101. Outputs form the tools above can be linked to DOORS and document sets created at various stages of the project. These are generally provided to BATCIS DT for assurance activities.

Tool Interaction

102. There are no linkages between RTC and the other two products but PTC and DOORS are closely aligned. In outline PTC is the definitive model, it is the most up to date architectural and model view. DOORS is synchronised to PTC with documents drawing artefacts from PTC in their production. Once a document set is complete both PTC and DOORS are baselined at that point and all new work takes place in a new baseline from that point forward.

BATCIS DT Tooling

MORPHEUS Assurance Management Tool (MAMT)

103. BATCIS DT are using the MAMT, created in MooD to track and assure the documents being produced by TP for the Authority. The documents loaded into the MAMT are those that have been released by the TP to BATCIS DT and are manually loaded. Currently the Oakdale Team do not have direct access to the GDMS document repository to enable access to early versions and/or collaborative artefact development to take place. This has led to a large number of documents being released to BATCIS DT in a single ‘drop,’ generally just before an Assurance Review.

SharePoint

104. BATCIS DT have a SharePoint site hosted on MODNET for internal team collaboration.

Annex A – Subordinate SEMPs

105. The aim of this Annex is to describe the minimum requirements for SEMPs that are subordinate to the SEMS (Figure 1).

106. A subordinate SEMP[24] will be expected to elaborate WAYS but its primary purpose is to describe the MEANS. The collection of the SEMPs, together with this SEMS, should therefore provide a complete and coherent set of engineering plans by means of which the ENDS will be met for each delivery strand.

107. An illustrative scope for a SEMP is presented below[25].

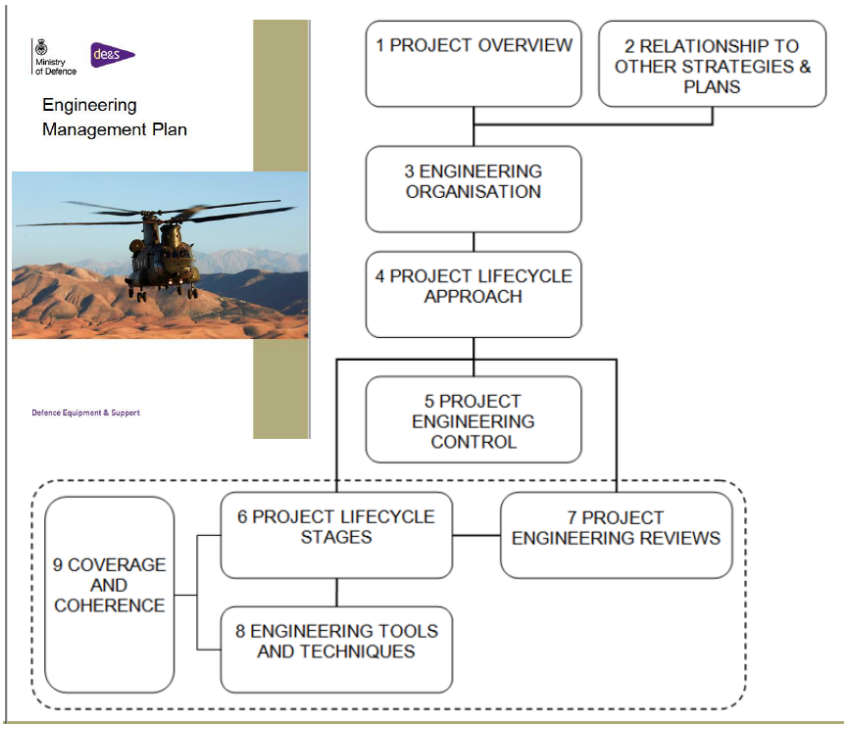

Figure 10 - Skeleton SEMP (Source – GEAR)

108. The rules are tabulated below. For convenience the subset of the overall project that is the subject of the SEMP is referred to as the Activity below.

[24] MOD guidance pertinent to contents of a SEMP can be found at the following link: http://aof.uwh.diif.r.mil.uk/aofcontent/tactical/engineering/content/proj_process/se_proc_proj_plan.htm

[25] An associated document template can be found here: http://webportal.wac.r.mil.uk/GEAR_Live/Controller.aspx?elementId=81E044D46B4B48E99EE3C4513681369B&elementType=Processes&modelMasterId=

Area	Rules
Process & Techniques	i. Define the organisation of engineering activities required to fulfil the Activity within a particular delivery strand, in terms of engineering processes and practices. The engineering processes and practices are to be consistent with the principles contained in the main body of this document. ii. The description of engineering activities will be expected to highlight decision points (particularly where there is expected to be Authority involvement in decisions), e.g. acceptance events. iii. Describe the key engineering decision-making mechanisms. iv. Identify the engineering reviews[26]. Each engineering review should be described in terms of: entry criteria (notably the information products that will be presented for review), planned date, required attendees and exit criteria (notably the quality criteria associated with the information products under review). Prior distribution to stakeholders is advisable of the products under review and should be planned for. v. Where multi-party collaboration is needed to achieve a particular goal, describe the mechanism proposed for facilitating such collaboration, including clarification of who is responsible for ensuring the collaboration is successful. vi. Elaborate any important techniques that are relevant to successful delivery of the Activity (e.g. evaluation or acceptance).
Organisation	i. Define the organisation of human resources required to fulfil the Activity, in terms of team structures, roles and responsibilities. ii. Identify the individuals who will take up key roles, with a summary of their qualifications and experience. iii. Describe any dependencies upon the Authority in respect of human resources (GFP).
Information	i. Define the engineering information sets that the Activity will need (e.g. architecture models, assumptions list) and who is responsible for managing each of these information sets. ii. Describe the tools that will be used to furnish these information sets as managed repositories. The tools are to be consistent with any guidance in Section 5 of this document. iii. Describe the information exchange mechanisms (including synchronisation formats and frequencies) that are needed to keep the repositories consistent and up-to-date. Evidence that agreement has been reached with the Authority is required for interoperation with any information sets that are managed by the Authority. iv. Identify and define any engineering terms that are needed to ensure common understanding of the plan for the Activity. These terms should extend (and not contradict) those in Annex A. v. Describe any dependencies upon the Authority in respect of information (GFI). Also any dependencies on 3rd parties.

[26] Guidance can be found at: http://webportal.wac.r.mil.uk/GEAR_Live

Area	Rules
Technology	i. Describe all tools that will be used to support the Activity, including numbers of licenses, location and tool configurations. In particular describe the tools that will be used to furnish the information sets as managed repositories and provide evidence these tools support the information exchange needs. The tools are to be consistent with any guidance in Section 5 of this document. ii. Describe what level of access the Authority will have to these tools or reports provided by means of them. iii. Describe any dependencies upon the Authority in respect of tools and facilities (GFX).
Schedule & Resourcing	i. Define the schedule of engineering activities for the Activity, including task inter-dependencies. The schedule is to be consistent with the high-level schedule in Section 4 of this document. ii. Highlight any milestones that relate to dependencies the Activity has to (or from) other Activities. iii. Describe the skills profile (by major engineering activity shown in the schedule) over time.

Table 2 - Rules for subordinate SEMPs

109. A process is in place to obtain a waiver from the MORPHEUS Chief Engineer in respect of non-compliance with any of these requirements. Evidence will need to be provided as to why information has not been included in the SEMP or an alternative approach taken.