MEF White Paper

Business and Operational Aspects of Implementing LSO Sonata

February 2020

MEF 2020029

Disclaimer

The information in this publication is freely available for reproduction and use by any recipient and is believed to be accurate as of its publication date. Such information is subject to change without notice and MEF Forum (MEF) is not responsible for any errors. MEF does not assume responsibility to update or correct any information in this publication. No representation or warranty, expressed or implied, is made by MEF concerning the completeness, accuracy, or applicability of any information contained herein and no liability of any kind shall be assumed by MEF as a result of reliance upon such information.

The information contained herein is intended to be used without modification by the recipient or user of this document. MEF is not responsible or liable for any modifications to this document made by any other party.

The receipt or any use of this document or its contents does not in any way create, by implication or otherwise:

a) any express or implied license or right to or under any patent, copyright, trademark, or trade secret rights held or claimed by any MEF member which are or may be associated with the ideas, techniques, concepts, or expressions contained herein; nor

b) any warranty or representation that any MEF members will announce any product(s) and/or service(s) related thereto, or if such announcements are made, that such announced product(s) and/or service(s) embody any or all of the ideas, technologies, or concepts contained herein; nor

c) any form of relationship between any MEF member and the recipient or user of this document.

Implementation or use of specific MEF standards, specifications, or recommendations will be voluntary, and no Member shall be obliged to implement them by virtue of participation in MEF Forum. MEF is a non-profit international organization to enable the development and worldwide adoption of agile, assured and orchestrated network services. MEF does not, expressly or otherwise, endorse or promote any specific products or services.

Contents

1 Abstract

This White Paper is aimed at service providers that have made a decision to create a standardized zero-touch/automated inter-provider commercial and business interface based on MEF's extensive LSO Sonata APIs and underlying standards.

This document specifically assists IT strategy decision makers in those service providers to successfully drive the process of developing, testing and scaling automated inter-provider commercial and business interfaces based on MEF work.

2 Introduction

Once the appropriate decision makers in a service provider have decided to implement MEF's standardized and automated inter-provider business interface at the LSO Sonata Interface Reference Point ("LSO Sonata") – see the companion MEF document "The Case for Standardized and Automated Inter-Provider Business Interface", the IT department of the service provider has a number of milestones in the implementation process to plan for and execute. This paper describes those milestones and proposes some typical solutions for managing the development and testing process to achieve a standardized zero-touch inter-provider commercial and business interface based on LSO Sonata.

3 Milestones

The following are the typical milestones to be expected by service providers during the course of implementing MEF automated inter-provider business interfaces (i.e. LSO Sonata).

3.1 Commitment

The first milestone is the formal approval by executive management in the service provider to implement automated LSO Sonata. This milestone has several aspects that need to be successfully implemented to complete the overall process.

3.1.1 Legal Entities

Many service providers comprise several legal entities (e.g., global group with several country subsidiaries: wholesale versus retail groups). A decision in one legal entity in the service provider may not be recognized by other legal entities in the service provider without effective inter-entity communications and joint decision making. The strategy and authority of the legal entity making the decision must be taken into account in planning propagation of the decision throughout all the legal entities that will be impacted by the enablement of MEF automated LSO Sonata in that organization.

Has the decision to implement LSO Sonata been approved by all the relevant legal entities?

3.1.2 Product Management

Service providers have different approaches to product management and technical strategy management across the organization. It is important to take this into account to make sure that the decision on LSO Sonata-enablement is integrated into the overall product management strategy. Issues of prioritization, timing and resource allocation may need to be coordinated by the product group in concert with the IT department.

Is the organization's Product Group coordinated on how to implement LSO Sonata?

3.1.3 Funding

The funding of both development and testing needs to be secured. Funding may be spread across more than one department in the service provider. Funding may be demanded from a single department even though the benefits of LSO Sonata enablement automation may be enjoyed across many different parts of the organization. This may cause resistance if, for example, a Carrier Ethernet service product manager is expected to fund the entire project even though it may benefit other departments involved in other products such as Optical Transport services and IP services.

While most of the funding will be required for the initial launch of the LSO Sonata implementation, consideration also needs to be given to the ongoing funding required to support new releases as they become available which broaden the range of business functionalities supported and additional service types. Funding may also be required for ongoing testing whether internal or external.

Has a development and maintenance funding model been prepared and approved?

3.1.4 Business Processes

Another aspect to be taken into account is the need for reorganizing existing workflows in the service provider. Implementing business automation at the IT level of the organization has to be matched by adapting workflows within the organization that support those business functionalities (e.g., quoting, ordering, billing) Those workflows often involve extensive human intervention so changing those workflows will naturally involve retraining and/or redistributing the service provider personnel hitherto responsible for operating those workflows.

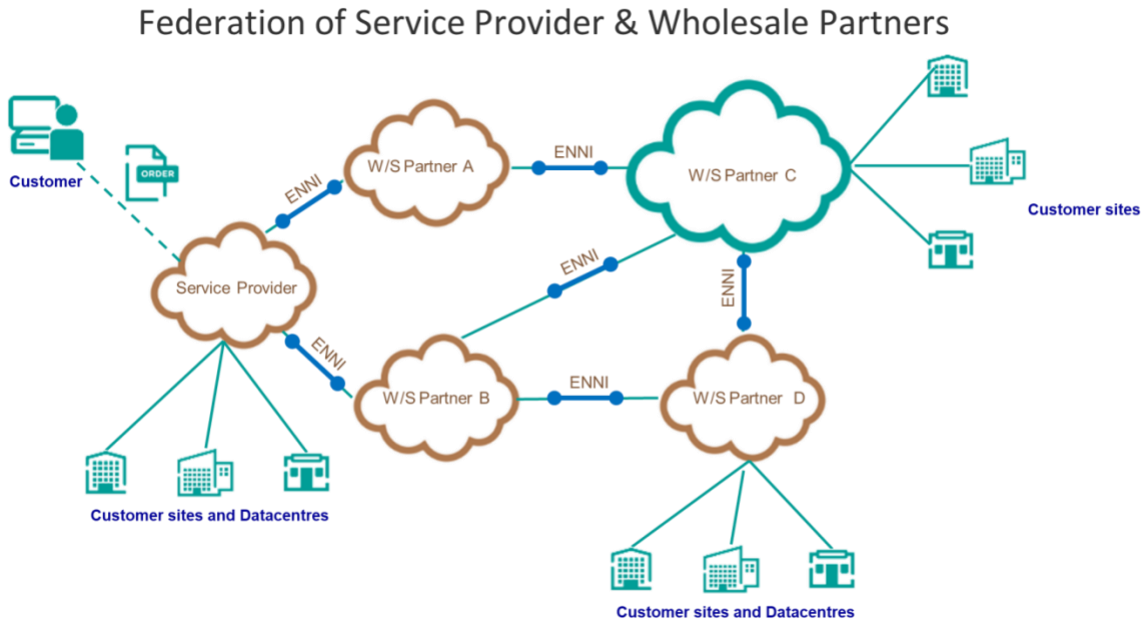

Figure 1: Federation of ICT Service Provider and Wholesale Partners

Business processes must also be adapted to support supply-chain management across multiple service providers and partners. While the LSO Sonata business and operational interface is used to manage supply between a service provider and a wholesale partner, it is also used to manage supply between that wholesale partner and their own wholesale partners. The process should be optimized to support the entire lifecycle of a service implemented through a supply chain. Optimally, the abstract process should be uniform across all parties in a supply-chain, though the actual detailed implementation can vary for each entity depending on their internal architecture and methods.

Have the business processes been re-designed for automation, and the impacts on personnel plans been prepared for?

3.1.5 Buyer-Seller

Service providers fall into three categories in terms of the inter-provider business interface:

- **Buyer** of wholesale data services from other partner operators in order to extend service footprint to off-net locations.
- **Seller** of data services to other service providers or to enterprise customers.
- Both buyer of data services from other providers and seller of data services based on their own networks to other providers or enterprise customers – **Buyer/Seller**

These may fall in different legal entities within the same group and have different business drivers. It may be that implementation of LSO Sonata will start with say the seller entity within the service provider or vice versa. It is important to understand and plan for this in the implementation strategy.

Is it clear whether the LSO Sonata implementation is targeted for enabling automation as a Buyer, Seller or as a Buyer/Seller?

3.2 Review MEF Information

Once the service provider has decided to implement LSO Sonata, the next step is to access information on the latest LSO Sonata implementation. This may have started earlier as part of the research required before the Commitment milestone described in section 3.1, but at this stage such a review is essential for progress in implementing the automated business interface. Some of the information links provided are for service providers who choose to develop the LSO solution themselves. However, it can also be useful for those service providers to consider assessing vendor-supplied solutions that themselves track the latest progress in MEF (see Build versus Buy in the next section).

To simplify this process, MEF maintains

a) A central home page on its Wiki with links to all the relevant locations of the latest information on LSO Sonata and the associated API suite developed to support it.

b) The LSO Sonata SDK (Software Development Kit) is a set of deliverables that enable market adoption of LSO Sonata through MEF-developed APIs. It is publicly available on GitHub. The repository contains all the relevant documents, software artifacts and tools that enable a developer to rapidly implement LSO Sonata APIs within their business systems. Detailed information is provided on a dedicated page on the MEF Wiki. The LSO Sonata SDK is updated on a 6-monthly basis with Release 4 (R4) being the current version (as of February 2020). Examples of content in the LSO Sonata SDK include

    a. Swagger specifications with API schemas and definitions for serviceability (address validation, site queries, and product offering qualification), product inventory, quoting, and ordering

    b. Product payload specifications composed of MEF 3.0 services for the following structures that are used with the APIs:

        i. JSON representations for Product Spec descriptions (initially for MEF Access E-Line services)

        ii. JSON representations for the UNI attributes (sourced from MEF 57.1)

    c. Published and draft standards covering business requirements, use cases, and attributes that serve as the basis for the associated APIs and data models

d. Example JSON files with API requests – to be included in LSO Sonata SDK R5

e. API Developers Guide (MEF Interface Implementation Specification or IIS for LSO Sonata) – IIS for Product Offering Qualification function (MEF W87) is currently under development by MEF members (as of Dec 2019). This IIS as well as IIS documents for the other LSO Sonata functions will be included in the SDK.

f. References to LSO Sonata example implementations

c) LSO Sonata reference implementations

a. The example implementation of MEF LSO Sonata APIs on the Buyer side (provided by Amdocs) is available on GitHub (MEF Members only). This example code is part of the solution between a Tier 1 North American operator, Amdocs and a UK provider that was put into production in April 2019. (It does not provide an executable or runnable project and is based on older versions of the APIs.)

d) MEF 3.0 Service & Technology Certification information page including details on the MEF 3.0 LSO Sonata certification pilot program for inter-provider service automation. The initial focus of this pilot program is on automating ordering of MEF 3.0 Carrier Ethernet Access E-Line services. There is ongoing work on the MEF 92 document which defines the MEF LSO Sonata Certification Test Requirements for Buyers and Sellers of MEF 3.0 compliant Access E-Line and UNI products. Note that LSO Sonata APIs are expected to support additional MEF-defined services in the future.

e) The LSO Developer Community is managed by a MEF resource – the LSO Community Manager – on GitHub where developers from different service providers can interact with each other, and with the LSO Community Manager, to ask questions, make suggestions and contribute to software development under Apache 2.0 where appropriate.

3.3 Internal Analysis

After gaining an understanding of the requirements to implement LSO Sonata, it is important to analyze the gap between the service provider's existing tooling and the requirements of LSO Sonata implementation (e.g., the MEF-developed SDK and APIs). This section summarizes the key questions and decision points.

3.3.1 Product

For which product(s) will this be applicable? Currently LSO Sonata only supports Carrier Ethernet but in the future additional MEF-defined services (e.g., Internet Access products) will also be supported. Does the provider have an On-Demand product supporting real-time delivery of an existing Carrier Ethernet product?

3.3.2 LSO Sonata MEF-developed API Release

Which release(s) of LSO Sonata MEF-developed APIs is the service provider planning on implementing? The service provider also needs to decide on their version strategy, e.g., current and -1 version. This will also depend on which other service providers they wish to buy and sell from and the APIs that those service providers are using. Consideration should be given to the time scales of the development project and the MEF API release schedule to avoid developing to a release which will soon be superseded.

3.3.3 Build versus Buy

Providers need to assess whether to build their own LSO Sonata implementation as an extension of their existing BSS or use a vendor supplied LSO Sonata-compliant solution. More specifically, the options to be considered are:

1. Build the solution with internal resources only
2. Hybrid solution with elements built internally and some external elements integrated
3. Completely outsource the implementation of LSO Sonata to a third party

The factors to assess include:

a) Suitability of the existing BSS for extension

b) Cost and effort involved to extend the BSS

c) Availability and skillset of internal resources for development and integration

d) Availability and cost of third-party ready-made modules for integration

e) Cost/investment commitment of licensing, implementing, and maintaining a vendor-supplied solution

f) Projected volume and value of inter-provider business that the system would support

g) Available budget

Service providers should prepare an ROI to assess which option is most suitable for them (see MEF companion White Paper “The Case for Standardized and Automated Inter-Provider Business Interface” for detailed examples)

3.3.4 Systems Analysis

A detailed internal analysis of the service provider’s current processes & tooling for inter-provider interactions is required. LSO Sonata is designed for synchronous, deterministic actions. For each LSO Sonata process step, a key question to answer is whether the service provider’s internal (or vendor-supplied where applicable) tooling is capable of providing a deterministic response and taking

deterministic actions in a synchronous manner. As an example – a quote or feasibility request must be answered with a deterministic/binding quote and a binding commitment to deliver the quoted resources. Such commitments may, of course, be limited in validity, e.g., "quote and resources will be reserved for the next 5 minutes". Another example would be – a utilization report is sent at predetermined intervals, and the invoice (in case of a usage-based billing option) is based on the respective reports. To avoid doubt: budgetary quotes and non-binding feasibility statements such as "subject to survey at time of order" cannot be accepted in an on-demand environment.

3.3.5 Existing APIs or other inter-platform automation tools

Does the service provider have existing proprietary APIs or automation tools with similar functionality and what is the current inter-provider automation strategy? If APIs are already in use, it may be simpler to develop a mediation layer ("API gateway") to support exchange with other ICT-SPs that have adopted the MEF-developed LSO Sonata APIs rather than replace existing API functionality. Service providers who choose a vendor-supplied API-based solution would likely prefer a solution that supports the MEF-developed LSO Sonata APIs.

3.3.6 Mediation Layer

The service provider needs to decide whether to implement a mediation layer (e.g. API gateway) in its core tooling, develop a mediation layer or introduce a vendor-supplied solution. There is no single right answer since this depends on factors such as the service provider's existing tooling strategy.

3.3.7 Gap Analysis

A comparison between the service provider's current inter-provider machine-to-machine capability and LSO Sonata automation requirements is required. This comparison will help in the definition of the service provider's development project.

3.3.8 Funding Approval

Obtain funding approval to initiate the development project. Depending on the Buyer, Seller or Buyer/Seller strategy and the decision on which LSO Sonata SDK release to use, the development may be single phase one or split into multiple phases.

3.4 Buyer-Seller Comparison

Entities that take part in a wholesale supply chain perform both Selling and Buying functionalities. This section looks at both the Buying functionality and the Selling functionality of an ICT-SP in an ICT wholesale supply chain and the interaction with other entities such as other ICT-SPs (telcos, MNOs, cloud providers) or enterprise customers.

3.4.1 Buy / Sell

Is the provider planning to use LSO Sonata to buy wholesale ICT products (e.g. geographical extension, last-mile access, cloud compute or storage, "X"aaS), to sell ICT products (e.g. local access, edge compute) or for both buy and sell? This may vary geographically, for example, in the provider's home geography they may want to sell access products but in other geographies they may want to buy access products. Therefore, there is a key choice whether to implement LSO Sonata only on the Buy-side, only on the Sell-side or on both Buy and Sell sides.

3.4.2 Service Provider Partners

Who will be the service provider's partners? As more and more service providers adopt LSO Sonata it is important to plan which partners the service provider wants to onboard first. On one hand priority would be given to partners that add more business value (e.g., by offering a large geographical footprint or a vast service portfolio). On the other hand, readiness of the counterparts needs to be taken into account as it may affect both timeline and complexity of on-boarding. Readiness of the counterpart will also drive the decision as to which LSO Sonata SDK release(s) to implement. It may be necessary to support multiple LSO Sonata releases in order to onboard multiple provider partners who are at different stages of implementation.

3.4.3 Unified Information Models

A Unified Information Model needs to be adopted. Whilst LSO Sonata provides a strong framework to standardize inter-provider automation between business applications, it is also important to understand how each service provider partner's internal inventory and tooling work, and to ensure they map to a unified Information Model that allows deterministic information exchange and prevents ambiguity. For example, country names can be represented as full text or stored as ISO codes and the exchange between ICT-SPs must follow one agreed representation.

3.5 End-to-End Testing Approach

Early in the project the service provider needs to develop a structured test strategy that handles on-demand services that span multiple ICT-SP domains. Principally this needs to include:

3.5.1 Test Environment

What test environment will be used? This may use a standards-compliant third party test environment which can also be used for certification testing. Alternatively, the service provider may create a specific test environment with the service provider they want to onboard.

The test environment may need to cover only Sell functionality or Buy functionality or both Buy & Sell.

The test environment should allow for testing to cover the entire supply chain that sits behind each federated ICT-SP. The responsibility and accountability for performance will always be between the buyer and seller where the seller is accountable and responsible for the performance of the entire supply chain it operates in order to deliver the service to the buyer.

3.5.2 Test Plan

In an on-demand environment, an ICT-SP may not be able to test each service upon activation (as it will go into production seconds or even less after it had been ordered), but may need to test the automation tools, such as MEF LSO Sonata APIs or a bilateral blockchain ledger, prior to releasing them to production.

Additionally, it should be determined if the service provider is planning to test the APIs sequentially as they are developed or test and implement all the APIs together. In fact, both approaches may be relevant.

It is possible that many service providers and wholesale partners currently only have the Address, Product Offering Qualification and Quote processes automated while the Order, Billing, Settlement remain manual. In view of this, it is recommended that the test plan is flexible to enable testing only of those process steps that are already automated. A good use case could be that of Quote automation with manual Order and Provisioning. This can cut down the high-volume manual quote response among wholesale partners and help speed up the automation process to extend to Order and Billing.

The service provider needs access to suitable use cases and test scripts for the testing. These may be available from MEF, developed internally to the service provider or a combination of the two.

In the case of Order testing, it is recommended to consider designing initial tests be based on the Seller's known on-net locations. Once successfully tested, it is recommended to then run additional tests using actual customer order details to better understand how responses to Address Validation, Site Retrieval and Product Offer Qualification behave.

3.6 Buyer-Seller Implementation Approach

3.6.1 Security

Buyer and Seller must agree on a coordinated approach to securing the bilateral transactions and access to their respective business functionalities – for example use of OAuth 2.0 on APIs. Note that work is underway in MEF for defining best practices for securing LSO APIs (MEF 93).

3.6.2 Certification

Buyer and Seller should agree whether to complete LSO Sonata Certification testing prior to implementation and interconnection.

3.6.3 Operational Considerations

Buyer and Seller should ensure all service lifecycle operational processes such as Billing and Reporting support on-demand wholesale supply chain management.

3.6.4 Integration with Legacy platforms

It is highly likely that the automation platform will not instantly replace the existing legacy platforms. Both Legacy and New will co-exist for a period (which may last years). Certain levels of integration will be required covering inventory management, billing, and SOAM.

Several approaches exist to integration and migration:

1. Build new and migrate customers: This approach is based on building an automated platform in parallel to legacy platforms and gradually migrating existing customers to the automated platform. This is probably the cleanest way as it makes a clean cut between legacy and new, but it requires parallel build and maintenance of two platforms. It may also create complexities in inventory management (which resources are assigned to which platform) and billing (customer receiving invoices from two different platforms).
2. Automate existing platforms: This approach is based on automating the legacy platform which eliminates the need to migrate customers to another platform, eliminates confusion in inventory management and billing. However, it may be very difficult to automate certain elements of an existing BSS/OSS platform that were not initially designed to support on-demand services, and it may create complexities when a platform needs to simultaneously support two process types: Manual and Automated, which may conflict at times.
3. Hybrid approach: Build an automated platform that covers some of the lifecycle steps (e.g., inquiry-order-deliver-SOAM) and uses the legacy platforms for the remaining lifecycle steps (e.g., billing).

3.6.5 Commercial Considerations

Introduction of on-demand services and automation may require modification to existing bilateral Terms & Conditions, existing cost allocations and pricing schemes. Units of value may change from a fixed-duration (e.g., a month) to variable duration (e.g., number of seconds of activity between activation and termination of a service instance). As a result, the units of measurement and the methods of measurement may need to be adapted to support valuation of service.

Internal commercial and legal review and approval will be required.

Coordination should also cover order cancellation terms, minimum commitment term and billing frequency.

3.6.6 Pilot

It may be sensible to pilot in a limited geography at first in order to learn and resolve process issues before fully rolling out to all geographies. This may be particularly relevant to understanding how the Seller responds to real world addresses.

3.6.7 Production

Once in production the Buyer & Seller should run post implementation tests using dummy orders based on real world data to ensure all issues are resolved prior to processing real customer orders.

Learning and feedback from the test and pilot approach will help to adjust the Buyer and Seller internal processes, for example to ensure addresses are 'clean' in a machine-to-machine automated environment.

Once in production with real customer orders, the service provider can expand the LSO Sonata-enabled environment to cover additional in-scope geographies and product types.

3.7 Industry Scaling

The success of standardized and automated inter-provider business interfaces and processes is a function of its adoption by ICT-SPs (i.e., 'the network effect'). Once a service provider is LSO Sonata-enabled for some or all of its business functionalities for on-demand services, it is essential for that service provider to 'advertise' the fact as widely as possible to both existing and potential customers and partners. The following are examples of platforms for promoting such awareness:

3.7.1 RFIs and RFPs

Including references in RFIs and RFPs issued by the service provider is an effective way to communicate to relevant partners that the service provider is itself LSO Sonata-enabled and expects its partners to also be LSO Sonata-enabled at the earliest opportunity in order to maximize business between them.

3.7.2 MEF Members' Marketing

MEF has a range of means for highlighting implementation of its standards by its members including its public sites, its Wiki, industry events in which it participates, its own MEF annual event (e.g., MEF20) and its quarterly member meetings, MEF 3.0 PoCs, press releases and regular interactions with press and analysts through the MEF PR agency and so on. ICT-SP members of MEF should coordinate with MEF to maximize the value of these MEF marketing capabilities.

3.7.3 MEF 3.0 Certification

MEF has extended its widely recognized and highly respected MEF 3.0 Certification program to include LSO Sonata-enablement certification. Companies achieving this certification are highlighted in the MEF Certification Registry and on other MEF platforms. More information is available on the MEF site (www.MEF.net).

4 MEF LSO Roadmap

The LSO Sonata APIs comprise two parts - one is the product-agnostic business functionality, or Basic API Structure, and the second is the product-specific payload, or Information Payload, as shown in Figure 1.

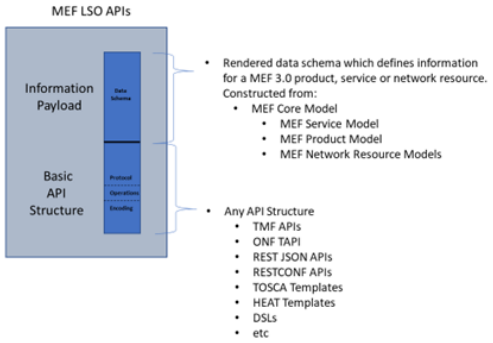

Figure 2: LSO Sonata API Base and Payload

The Information Payload is a rendered data schema which can define the data service being offered by a partner ICT-SP.

Therefore, the product-agnostic business functionality support of the LSO Sonata APIs can evolve independently from the evolution of the product-specific payload. The current roadmap is shown in Table 1.

ICT-SP and vendor members of MEF can influence the direction and pace of development of support for each of these business functionalities and the service/product payloads. For more information, contact community_manager@mef.net.

	Services (Products)		
Business Functionalities	Carrier Ethernet (Access E-Line; Transit E-Line)	IP (Broadband IP Access)	Optical Transport (MEF 64)
Address Qualification	Available	Future	To be decided
Product Offering Qualification	Available	Future	To be decided
Inventory	Available	Future	To be decided
Quote	Available	Future	To be decided
Order	Available	Future	To be decided
Trouble Ticketing	Future	Future	To be decided
Billing/Settlement	Future	Future	To be decided

Table 1: Roadmap of Base API business functionalities at LSO Sonata and product specific payloads

5 LSO Developer Community

The MEF LSO Developer Community enables software developers – typically from service provider IT departments, technology vendor R&D groups and students and post-graduates from academia – to ask questions, respond to questions, and contribute tools and other forms of code for inclusion in the LSO SDKs. The community allows to interact with other members including industry professionals from MEF member companies whose primary purpose is to work together to develop the standards and related SDKs. It is the place to share the knowledge, discuss the current work and propose new features for the next releases.

The LSO Sonata Developer Community is built around the LSO SDKs, including the LSO Sonata SDK, and its main goal is to support the development and to enable the adoption of LSO Sonata data models and APIs as defined in MEF standards. The LSO Sonata SDK community uses the GitHub teams feature and the team discussions should be used as a community communication channel. Community members can post new questions and provide comments or join ongoing discussions.

The MEF LSO Developer Community is managed by a full-time resource provided by MEF. The LSO Developer Community Manager provides a day-to-day support of community members and is the point of contact for those who would like to adopt LSO SDKs, contribute to LSO SDKs or just join the Developer Community in order to interact with other members. The LSO Developer Community Manager can be contacted via email.

Joining the MEF LSO Developer Community is easy and free. As the developer community uses GitHub teams, it is required to have a GitHub account in order to join it. The GitHub account can be created here. Provide your GitHub account name to MEF Developer Community Manager and request to be added to the LSO Sonata Developer Community.

More information on the LSO Developer Community (including links to the LSO SDK Wiki and GitHub repositories) could be found on a dedicated Wiki page.

6 Summary

The implementation phase, following management commitment to adopt LSO Sonata APIs within the service provider, requires a range of actions including discussion and answers to key questions. Although they vary from one service provider to another, the typical ones are captured in this document and should provide a valuable starting point for any IT department or supporting system integrator or vendor to plan the successful implementation and deployment of LSO Sonata inter-provider business automation.

This document will evolve over time to reflect the latest understanding of service provider realities as well as the latest work of the MEF. Both service providers and system integrators/vendors are encouraged to contribute to both the updating of this document and the extensive underlying MEF standardization and certification development.

7 About MEF

An industry association of 200+ member companies, MEF has introduced the MEF 3.0 transformational global services framework for defining, delivering, and certifying assured services orchestrated across a global ecosystem of automated networks. MEF 3.0 services are designed to provide an on-demand, cloud-centric experience with user- and application-directed control over network resources and service capabilities. MEF 3.0 services are delivered over automated, virtualized, and interconnected networks powered by LSO, SDN, and NFV. MEF produces service specifications, LSO frameworks, open LSO APIs, software-driven reference implementations, and certification programs. MEF 3.0 work will enable automated delivery of standardized Carrier Ethernet, Optical Transport, IP, SD-WAN, Security-as-a-Service, and other Layer 4-7 services across multiple provider networks. For more information, visit https://www.mef.net/ and follow us on LinkedIn and Twitter @MEF_Forum.

8 Acknowledgements

Daniel Bar-Lev (MEF) Editor

Aidan Anderson (AT&T)

Mariusz Szypula (Amartus)

Divesh Gupta (PCCW Global)

MEF Doc#