MEF Specification
MEF 55.0.2

Amendment to MEF 55 - TOSCA Service Templates

October, 2017

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 members and the recipient or user of this document.

Implementation or use of specific MEF standards or recommendations and MEF specifications 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. The MEF does not, expressly or otherwise, endorse or promote any specific products or services.

© MEF Forum 2017. All Rights Reserved.

Table of Contents

List of Figures

List of Tables

1   List of Contributing Members

The following members of the MEF participated in the development of this document and have requested to be included in this list.

<div style="margin-left: 2em;">

CenturyLink	Ciena Corporation
Cisco Systems	PLDT Corp. Business Solutions
RAD Data Communications	Ericsson AB
Huawei	

</div>

2   Abstract

This document is an amendment to Lifecycle Service Orchestration (LSO) Reference Architecture (RA), MEF 55 [A5-5]. The changes to MEF 55 are:

- Changes to Section 3 (Terminology), Section 7.2 (Information Model), 7.3 (Business Process Flows) and Section 12 (References)

- New Appendix describing TOSCA Service Templates for deployment of MEF Services and the relevant MEF LSO entities that could use such templates. Additionally, example TOSCA Node Types and TOSCA Topology are provided for illustration purposes.

3   Changes to Section 3 of MEF 55 – Terminology and Acronyms

The following entries are added to the terminology table of MEF 55.

Term	Definition	Source
Topology and Orchestration Specification for Cloud Applications (TOSCA)	A specification defining the structure, properties and behavior expressed by TOSCA Service Templates	TOSCA [A5-1]
TOSCA Service Template	The combination of a TOSCA Topology Template and TOSCA Plans (or Orchestration processes). In this document, a TOSCA Service Template can be used for Products or Services or Resources in MEF LSO	TOSCA [A5-1]

Term	Definition	Source
TOSCA To-pology Tem-plate	A TOSCA Topology Template (also referred to as the to-pology model of a service) defines the structure of a service. It consists of a set of TOSCA Node Templates and TOSCA Relationship Templates that together define the topology model of a service as a (not necessarily connected) directed graph.	TOSCA [A5-1]
TOSCA Node Type	A TOSCA Node Type defines the properties and the opera-tions available to manipulate a component of a service.	TOSCA [A5-1]
TOSCA Node Template	A node in a topology graph is represented by a TOSCA Node Template. A TOSCA Node Template specifies the occurrence of a TOSCA Node Type as a component of a service.	TOSCA [A5-1], [A5-3]
TOSCA Rela-tionship Type	A TOSCA Relationship Type defines the semantics and any properties of the relationship between TOSCA Nodes.	TOSCA [A5-1]
TOSCA Rela-tionship Tem-plate	A TOSCA Relationship Template specifies the occurrence of a relationship between nodes in a TOSCA Topology Template.	TOSCA [A5-1]
TOSCA Plans	TOSCA Plans define the (Orchestration) process models that are used to create and terminate a service as well as to manage a service during its whole lifetime. In this document, TOSCA Plans are similar to the term Business Process Flows in some entities, e.g., SOF or ICM, of LSO RA.	TOSCA [A5-1]

Table A5-1: Terminology and Acronyms

4   Changes to Section 7.2 of MEF 55 – Information Models

Modify one sentence as shown below - Changes are shown as highlighted text:

The MEF Forum defines management information models supporting LSO, that describe the in-formation associated with the generalized management interactions using protocol neutral Uni-fied Modeling Language (UML) and TOSCA Service Templates.

5   Changes to Section 7.3 of MEF 55 – Business Process Flows

Modify one sentence as shown below - Changes are shown as highlighted text:

The details of the high level Operational Threads outlined in the LSO Reference Architecture and Framework are further expanded into more detailed Business Process Flows <mark>or TOSCA Plans</mark>.

6 Changes to Section 12 of MEF 55 – References

Add the following references in Section 12 of MEF 55:

[A5-1] OASIS TOSCA 1.0, http://docs.oasis-open.org/tosca/TOSCA/v1.0/os/TOSCA-v1.0-os.pdf , November 2013.

[A5-2] OASIS BPEL, *Web Services Business Process Execution Language Version 2.0.* OASIS Standard. 11 April 2007. http://docs.oasis-open.org/wsbpel/2.0/wsbpel-v2.0.html.

[A5-3] OASIS TOSCA *Simple Profile for Network Functions Virtualization (NFV) Version 1.0*, 17 March 2016. http://docs.oasis-open.org/tosca/tosca-nfv/v1.0/tosca-nfv-v1.0.pdf .

[A5-4] MEF Forum 7.3, *Carrier Ethernet Service Information Model*, February 2017.

7 Additional References (This document only)

[A5-5] MEF Forum 55, *Lifecycle Service Orchestration Reference Architecture and Framework*, March 2016.

8 New Appendix in MEF 55

The following section is added as a new Appendix A5-III in MEF 55

## Appendix A5-III TOSCA Service Templates

The TOSCA specification [A5-1] provides an approach for defining the relationships between Customers, Service Providers and developers of IT services, and can be applied to many service types, including connectivity services. A Service Provider can use a TOSCA Service Template to offer and orchestrate the deployment of services for Customers. The use of a standardized interface with automation tools enables easier interaction between Customers and Service Providers/Partners.

A TOSCA Service Template is a combination of a TOSCA Topology Template and one or more TOSCA Orchestration Plans as shown in Figure A5-1 below. The topology includes the TOSCA Components (i.e., TOSCA Node Templates) and relationships between them as described in TOSCA Relationship Templates.
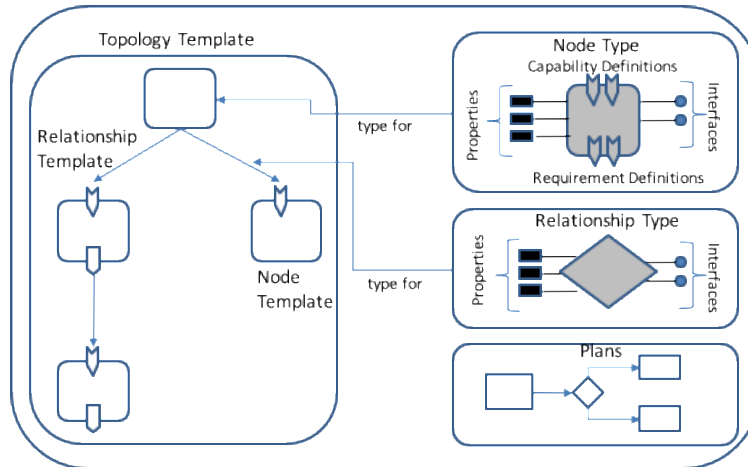
Figure A5-1: TOSCA Service Template (from [A5-1])

The Relationship between TOSCA Nodes, as a graph, can describe the associations between a given Service instance and one or more Service Components, or, between a given Service Component and one or more Resources. For example, Service Components can be Classes of objects and when instantiated in to Service instances, the TOSCA Topology Template can be used to show either a vertical relationship between Service and Resource layers or horizontal relationship within a given layer as shown in Figure A5-2.
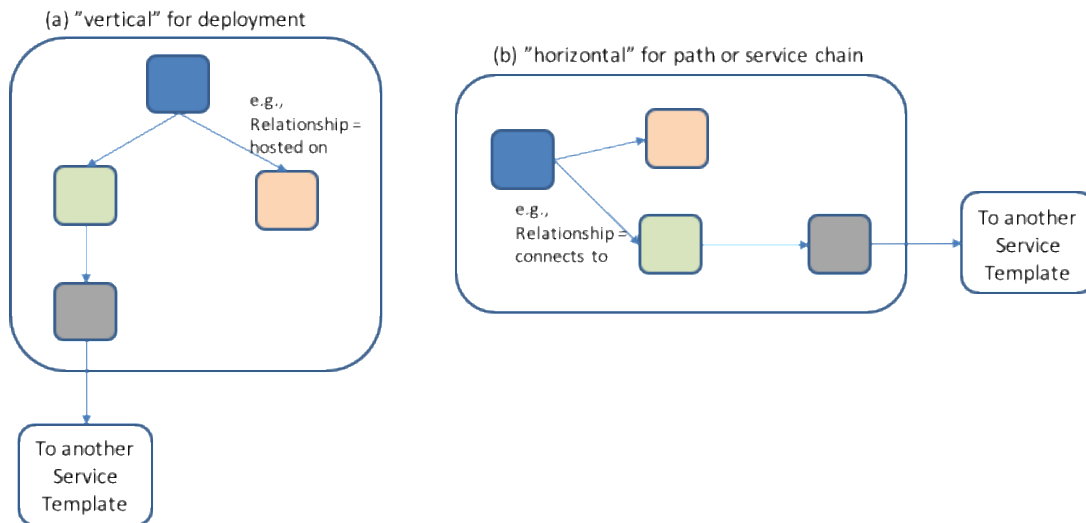
Figure A5-2: Use of TOSCA Topology Template

One example of a TOSCA Topology is in [A5-3]. The TOSCA Topology graph can also be used in a Topology API Service to client systems for sharing details such as graph of Service Components only or include more details such as graph of Resources for a given Service instance. TOSCA Service Templates could be nested, i.e., a TOSCA Node within a TOSCA Service Template can be another TOSCA Service Template.

TOSCA Plans explicitly define which Nodes will be deployed and how they will be connected. TOSCA Plans are typically expressed as Business Process Execution Language (BPEL, [A5-2]) or shell scripts.

A5-III.1   TOSCA Service Templates in MEF LSO RA

One possible use of TOSCA Service Templates is in the Service Orchestration Function (SOF) entity of MEF LSO Reference Architecture (Figure 2) for the orchestration of Service Components across one or more domains. The templates can also be used in an Infrastructure Control and Management (ICM) entity for the orchestration of Resources within a domain, in support of one or more Service Components. Additionally, as discussed in Section 11.1, a Product Offering in a Product catalog would represent what is externally presented to the market with appropriate mapping to one or more Services. Thus, a Product can be represented as a TOSCA Node Type and/or TOSCA Service Template for marketable entities.

TOSCA Service Templates are defined more broadly than MEF Services and can be used to describe more than just MEF Service Components or Forwarding Domains. They include metadata to orchestrate the service lifecycle via the TOSCA Plans, i.e., 'how' to deploy a service, whereas, a MEF Service describes the behavior as seen by an external observer, i.e., the 'what'. In other words, a MEF Service can be shown as a TOSCA Node Type in a TOSCA Topology view and used, as example for a Virtual Link, in the TOSCA Simple Profile for NFV [A5-3]. Additionally, a MEF Service can be made up of a hierarchy of TOSCA Nodes and TOSCA Relationships as shown in Figure A5-2. However, while TOSCA Plans provide for orchestration of the service lifecycle, Operational Threads and Policy based Management are also required to address behaviors for the entire lifecycle of the Service.

One key value of using TOSCA Service Templates is interoperability with structure of the Service, i.e., Service composition/definition, and deployment lifecycle. TOSCA Service Templates could be part of the Service Catalog in a SOF or Resource Catalog in an ICM. Some TOSCA Service Templates in a Service Catalog can be exchanged with other Operators across Sonata (via Business Applications entity) or Interlude reference points to request a specific deployment configuration. Standardized TOSCA Service Templates as part of a Service Catalog, for example, can enable interoperable definitions as well as implementations. Standard TOSCA Service Templates can also allow for Service composition when components are deployed in different domains within a Service Provider or different Operators. Service composition can be dynamic, e.g., at the time of request for a given Service, with choice of suitable TOSCA Node Templates and TOSCA Relationship Templates. Both the structure of the Service as well as the TOSCA Plans (or Business Process) could help with interoperability when Services span multiple domains.

Section 11 and Section 11.2 describe the Service View as consisting of one or more Service Components within the Service Provider's infrastructure. Some of the Service Components in a Service Provider's management system, for example an OVC, maybe viewed as a Service by an Operator. Additionally, Section 8.2.2 has a number of requirements related to Service configuration and activation including topology, determining the necessary Service Components and configurations, etc.

In particular, Section 8.2.4 identified the need for coordinated execution of the service delivery orchestration plan for Service Components implementation. To enable this coordinated execution, a TOSCA Service Template can be useful since it provides the required set of Service Components, Resources and the relationship as well as dependencies for a given Service instance.

A5-III.2 Example – TOSCA Topology Model for MEF Services

An example TOSCA Topology Model is discussed for illustration purposes only. Formal definition of TOSCA Topology Template, TOSCA Node Template and TOSCA Relationship Template is outside the scope of this document.

A topology model for a MEF Service can be for the Service View as well as the Resource View and the dependencies between them. As example, the TOSCA Node Types for TOSCA Topology of MEF Services can be as shown in Table A5-2 and can be related directly to the classes or objects in MEF Information Model specifications.

TOSCA Topology	Example TOSCA Node Types	Reference
Service View	1. MEF CE Service 2. EVC 3. EVC EndPoints 4. UNIs 5. OVC 6. OVC EndPoints 7. ENNIs	MEF 7.3 Classes [A5-4]
Resource View	1. FCs 2. LTPs 3. Ports 4. VNFs	ONF TR-512 OASIS TOSCA [A5-3]
Facilities View	Equipment, Media (e.g., Fiber)	

**Table A5-2: Example TOSCA Node Types for MEF Services**

Node Types can be based on individual Service attributes like EVC Type instead of the entire EVC class. Such granularity could help with dynamic Service composition by choosing suitable TOSCA Node Types and TOSCA Relationship Types. The Node Type definitions are left for further study.

For MEF Services, the TOSCA Topology view is a graph with Relationships between the TOSCA Node Types such as those shown in Table A5-2. The association between Service Components or the dependencies to Resources can be identified with the TOSCA Relationship Templates. As example, TOSCA Topology can be for a Product that might be offered as a bundle of multiple MEF Services (e.g., EVPL-1, EVPL-2 and EVPLAN-3) with TOSCA Relationships between TOSCA Node Types for Product and MEF Services. In this example, the MEF Services might be for different use cases of a given Customer, e.g., EVPL-1 for connecting Head Office to a Backup Site, EVPL-2 for connecting Head Office to peering with Cloud Provider, and, EVPLAN-3 for intranet. Each TOSCA Node for MEF Service can then shown to be with TOSCA Relationship to TOSCA Node(s) for Service Components.

Specifically, in the context of MEF 55, the TOSCA Topology description for Product, e.g., HQ Hub with three MEF Services, could be used at the Business Applications Layer for use across Cantata or Sonata reference points. Likewise, the TOSCA Topology description for each MEF Service could be in Service Orchestration Function for use across Legato reference points. The TOSCA Topology for Product to Service is as shown in Figure A5-3 below:
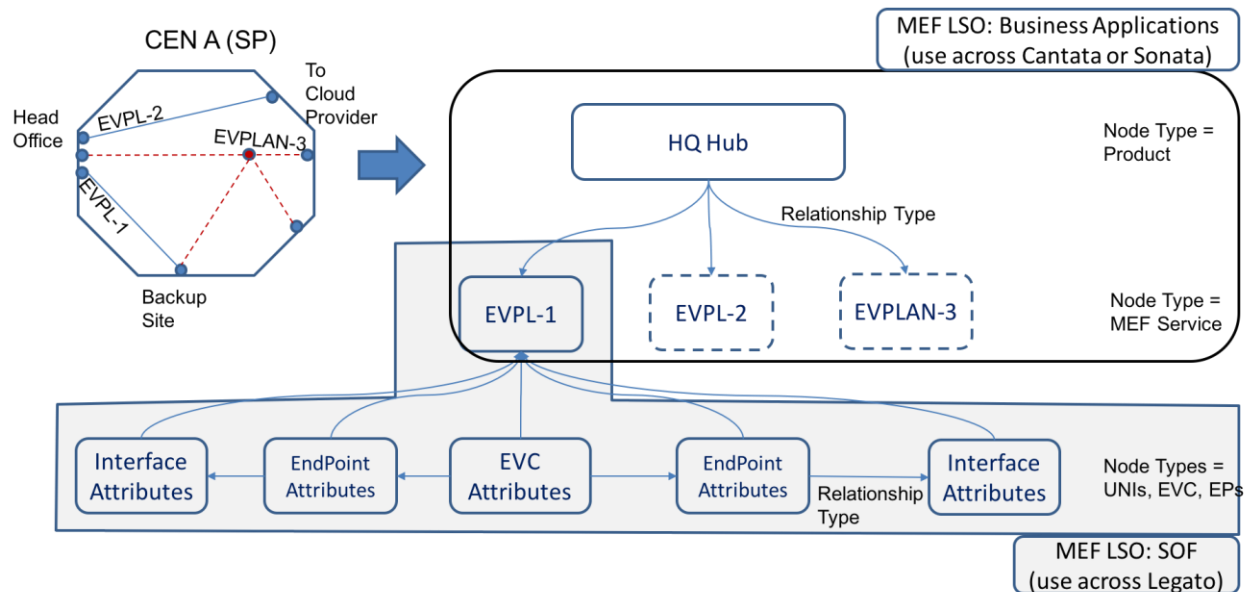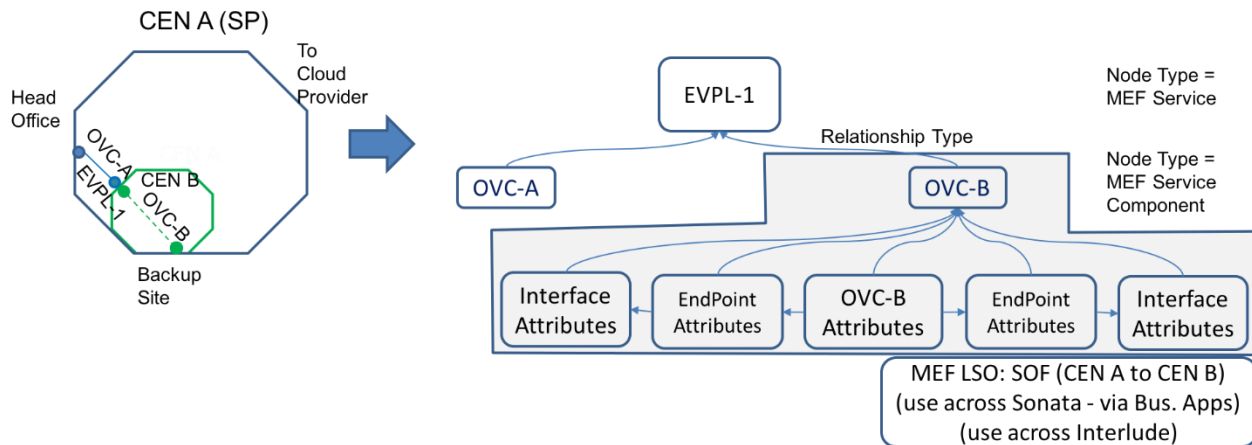

Figure A5-3: Example TOSCA Topology for Product to Service View
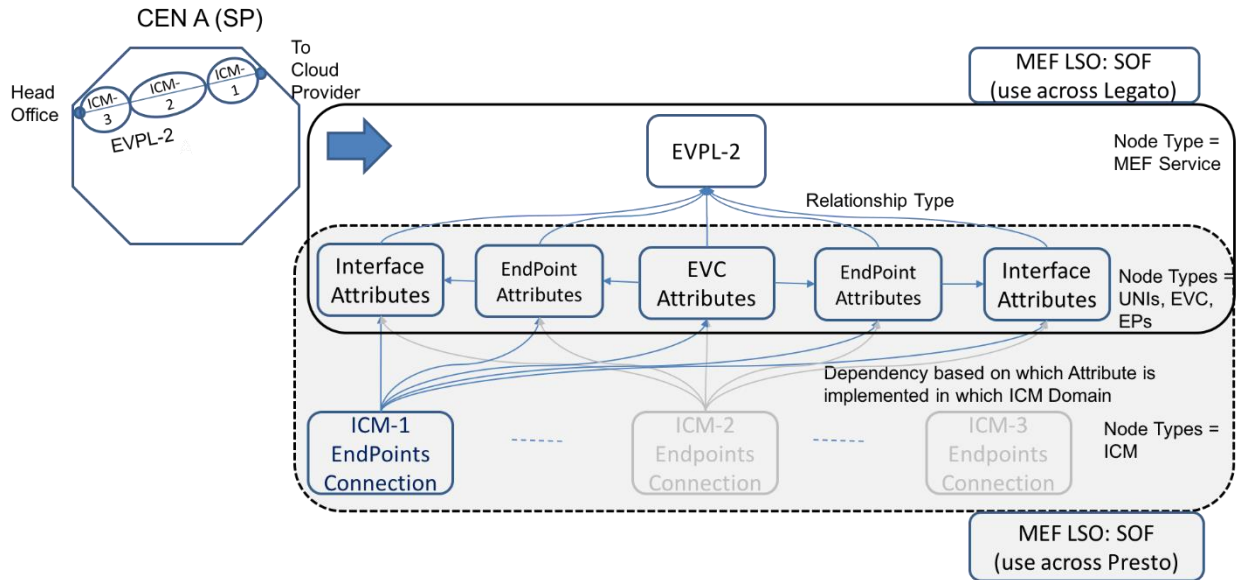
Figure A5-4: Example TOSCA Topology for Service to Domain View

CEN A might have one or more ICM Domains. For example, EVPL-2 might traverse three ICM domains. In addition to use of TOSCA description across the Legato reference point, SOF can express relationship of Service Components to a given ICM Domain as shown in Figure A5-4.

When the MEF Service is across more than one Operator domain, e.g., 2 CEN Operators, then, the TOSCA Topology view can be shown for each Service Component (OVC) in the EVC as in Figure A5-5 below. For example, EVPL-1 is shown to use OVC-A across CEN A and OVC-B across CEN B. With CEN A's SOF performing Service decomposition, TOSCA Topology descriptions can be used across Legato/Presto reference points within CEN A and across Sonata/Interlude reference points for requesting Service Components in CEN B. Figure A5-5 shows the SOF using Business Applications for sending the initial request for OVC-B related attributes via Sonata while using Interlude for Service Control.

Figure A5-5: Example TOSCA Topology for Service View across 2 Operators