Multi-Cloud Service Management

Accelerator Pack Introduction

Introducing TM Forum's approach to managing services built from multiple cloud and machine-machine components

TR194

Version 8.6

February, 2013

NOTICE

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1. FOREWORD

This introductory guide is part of the Forum's *Multi-cloud Management Accelerator Pack* aimed at helping readers address the challenges of delivering high quality services that are built from multiple cloud-based components, often from multiple sources. The issue to be solved is how each managed service component can expose sufficient operational and management information that the provider responsible for delivering the overall service can be sure that the service is meeting its design or contractual service levels.

Given the sheer variety of cloud based services that the market is generating, it is impossible to try to develop comprehensive management Application Programming Interfaces (API's) that cater for every type of cloud service, multiple industry verticals and machine-machine (M2M) services. The approach taken here is for a simple core set of basic management functions that can apply generically to many types of service and that can be easily extended to provide more service specific functions mapped to the myriad of proprietary API's that already exist.

Throughout this and related documents the terms *cloud service, digital service and service provider* are used. These are generic terms and can relate to any kind of digitized service or provider – e.g. content or application 'software as a service' (SaaS); platform services (PaaS, such as authentication, security or monitoring) or infrastructure services (IaaS) such as cloud computing, storage or networking services. The main focus of the accelerator pack is on managing SaaS types of service.

With the rapid growth of cloud computing, the consumerization of IT, the trend towards services and content created increasingly at the edge of the network, the exponential growth of exposed Application Programming Interfaces (APIs), and increasingly mobile endpoints means that this TM Forum work on end to end multi-cloud management has never been more relevant to contemporary industry needs. Since the approach described here defines only the *management* aspects of the service, not the actual service functions themselves, this makes it equally useful in any industry vertical such as Healthcare, Retail, Manufacturing, Financial, Logistics, Public Sector and Defense.

The full accelerator pack consists of a number of documents, reference implementation code and developer guidance. More details on these are available here.

2. THE MULTI-CLOUD SERVICE MANAGEMENT ACCELERATOR

MARKET TRENDS

While the digital world is full of innovative ideas, great marketing and often good access to capital, service providers won't survive for long if they can't get their services to market rapidly; deliver a great customer experience; fix problems when they occur and manage revenue while keeping down operating costs. This need for an excellent 'operations experience' is especially true in the market for enterprise-class digital services where companies are increasingly dependent on managed digital services to run their business. They demand reliability, security and a quality of experience that meets their contractual expectations – if the service fails to do that it is not just inconvenient, it directly impacts their ability to operate and their bottom line.

Digital service is an umbrella term for any kind of virtualized service such as cloud-based computing, storage, applications, content or networking. These cloud services are disrupting the status quo and forcing rapid convergence between previously discrete sectors of networking, web and IT and some of these key disrupters include:

- Growth of 'always-on' and mobile devices
- Maturity of web services standards
- The adoption of IP and SIP in telecom and cable networks
- Increasingly ubiquitous and higher speed broadband connectivity
- Proliferation of cloud platforms and Application Programming Interfaces (API's)

In addition, service providers are dealing with four major trends:

- **Trend 1**: *Multiple devices from a variety of manufacturers*: Service providers are faced with the reality of having to support an array of mobile devices from different manufacturers, using several different operating systems, having several different form factors, catering to the needs of businesses and consumers. There are feature phones, smart phones, PCs/Tablets/ iPads, game consoles, and TVs with some are connected via dedicated facilities such as IPTV or DOCSIS. Increasingly devices are embedded in cars, heath monitors, security systems, home automation systems etc. using Machine-machine (M2M) approaches. All of these devices are increasingly connected via Wi-Fi or cellular broadband services such as 3G/4G networks.

- **Trend 2:** *Complex developer ecosystems*: Applications are core to the generation of revenue for entire value chains. Today, each mobile device platform such as Apple or Google, comes with unique application development support requirements. The back-end platforms for hosted services also have unique application development and runtime support requirements. Enterprise IT Professional developers have certain requirements related to conformance with best practices and standards for technology use, identity management, security, and privacy. The growing community of 3rd party developers, empowered by the widespread availability of cloud based platforms has different needs, particularly requiring support for more lightweight standards (e.g., REST, OAuth etc.).

- **Trend 3:** *Exponential Growth of Service APIs:* Cloud based digital services have contributed to expediential growth in the number of published APIs and Service End Points. Efficient application development requires effective mechanisms to create, catalog and publish, maintain, and

consume these APIs. The dependencies that are created within applications that rely on the incremental bits of functionality must be understood.

- **Trend 4:** *Reality of Multi-Cloud Service Delivery:* Virtually every service has other services upon which it depends or creates dependencies has soon as it is consumed. It is very rare today to find 100% of the resources living in a "walled garden". This collection of services typically resides in multiple different service domains and a service owner may not, in fact, be able to directly control prerequisite services. Service delivery today requires multiple clouds and multiple service domains to work together in harmony throughout the entire lifecycle of that service. Multi-cloud environments can also be found within single providers, enabling a provider to manage its own complexity as well as to scale from within to multiple partners to establish the digital ecosystem without constantly revamping its fundamental service delivery and management architecture.

THE OPERATIONAL REALITY OF MANAGING ACROSS MULTIPLE CLOUD SERVICES

The business of ensuring that service creation and delivery produces highly reliable, predictable and massively scalable services, while keeping operating costs in check doesn't happen by accident: it is a core competency of any successful service provider. This is a complex enough task where the provider has end-end control of all of the assets in the service delivery chain but it becomes orders of magnitude more complex where the overall service is comprised of multiple virtual services connected together. Each component service may be manageable on an individual basis, but the end user sees the net sum of all of the operational issues within the ecosystem and the final service provider – the one who contracts with the customer – inherits the problem of managing across the entire chain.

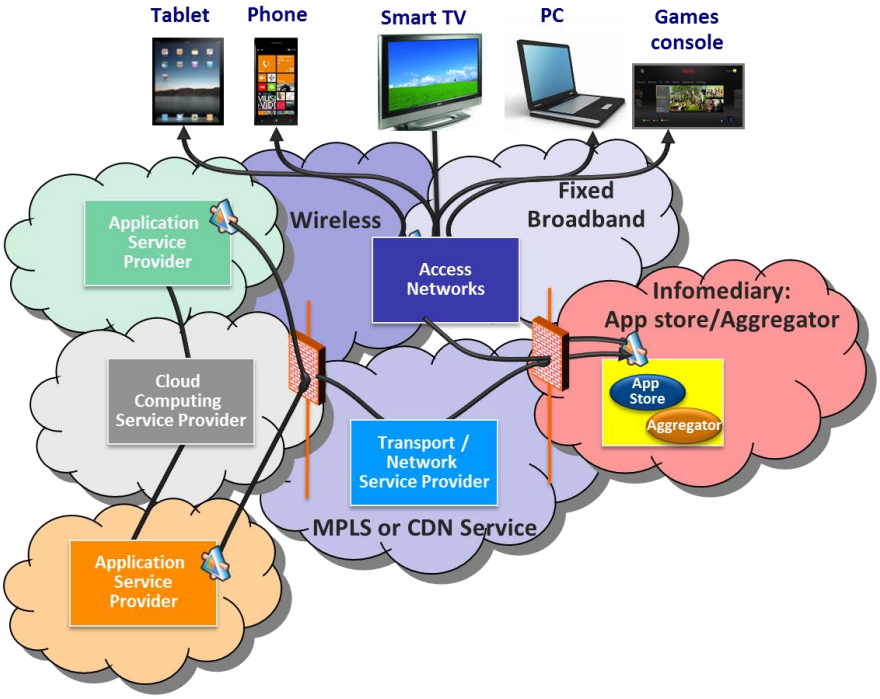

Figure 1 – The Multi-Service Nature of Service Delivery

There are two principal issues with digital services that make the problem of managing their resources difficult. First is the virtualization at the elastic compute and elastic network layers as well as the sheer scale of that virtualization. The second difference is that multiple clouds and multiple enterprise domains are increasingly involved in the delivery of digital services further complicating resource management.

THE OPEN DIGITAL WORLD

Improving speed to market by reducing the need for custom integration between services and improving operational productivity by eliminating manual intervention, cost and errors in routine operational business processes are key operational goals for digital service providers since they directly impact service profitability. Moreover, the more that discrete services can be aggregated into overall user solutions allows for wider uptake of those services into the marketplace.

Process automation and integration, if done correctly, has long been recognized as a highly effective way of improving service to customers while reducing costs. In a digital world, and especially an M2M environment, the idea of managing countless billions of devices that involves some form of manual intervention is prohibitive from both a cost and practical standpoint. However, if the management information and service control is isolated in individual cloud 'islands', then automated end-end management is impossible. Disparate management interfaces limit the value of interactions between management systems, as shown in Figure 2.

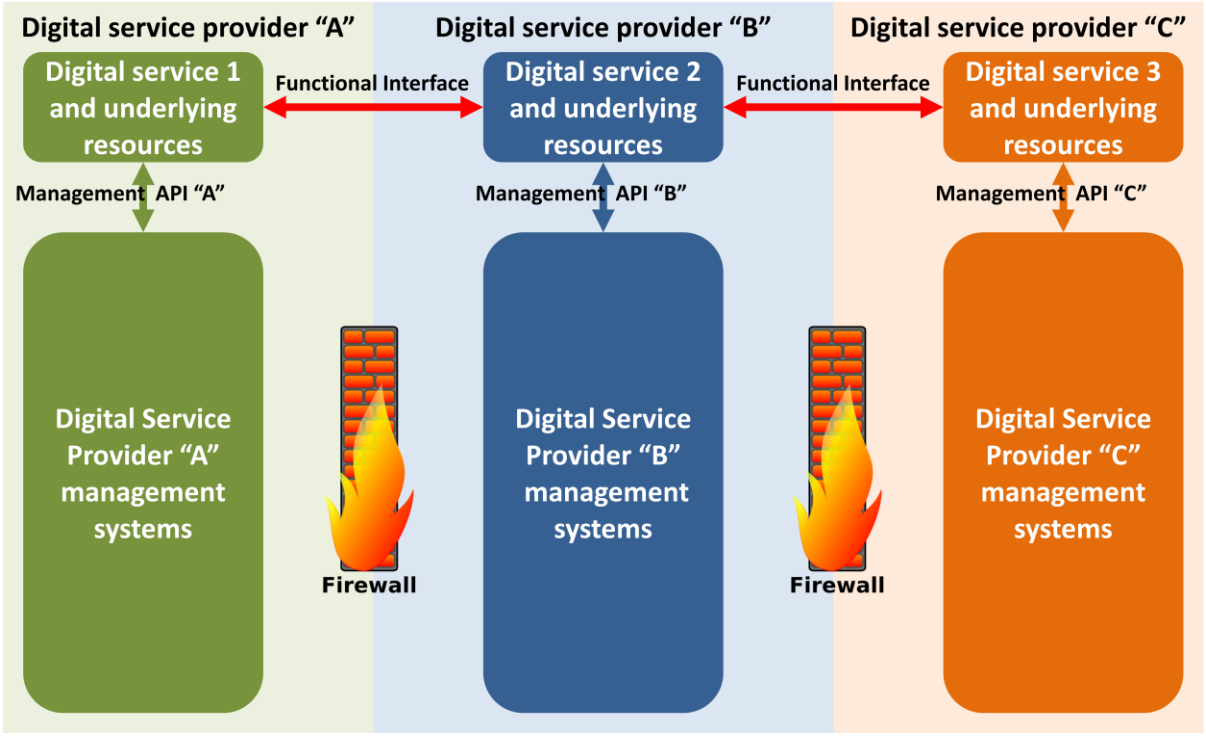

Figure 2 - Management locked within each component digital service

What is needed is exposure of a common set of management information at the 'edge' of the service (i.e. the point of interconnection). Currently, service aggregation has to be based on expensive time consuming and inflexible 'hard-wiring' services together in a chain using complex, customized integration techniques. Historically this is only effective when the business model and services are stable and rarely change but impractical in a fast moving, cloud-based, service market which has to accommodate speed, variations of services and changes of business models.

THE FRAMEWORX MULTI-CLOUD PACK

To address these issues, the approach taken by the TM Forum is aimed at solving that problem by exposing a common core of basic management information at the 'point of touch' between digital services. It's called the Frameworx Simple Management API (or Frameworx SM-API) and is part of a package, code, tools developer eco-system and supporting documentation designed to help rapid implementation. The sheer range of service complexity and a multitude of market needs means that it is very difficult to try to standardize every management function that will ever been needed. However, by standardizing a common core of generic management functions, allowing developers to easily extend that functionality and publish the results, the functionality of the core will extend over time. The approach allows companies to extend the functionality of those interfaces to suit particular business needs and easily map the common interface to proprietary interfaces. Note that it does not constrain the service provider to any particular functionality provided by the service

While the need for competitive differentiation ensures that it is unlikely that providers will want to standardize the services themselves, the management information exposed in common format is a positive business driver because it increases the market applicability of the service by ensuring that it can be marketed through multiple channels and in combination with other services as part of a comprehensive customer solution. This is a fundamental plank of the drive for an open digital economy based on the ability of any digital service to 'trade' with any other digital service, as common management information facilitates syndication.

Thus the Forum's approach concentrates on two areas:

- The Frameworx Simple Management API (SM-API) which defines a design pattern for an API that reveals how to manage any given service from a Provisioning, Assurance and Usage/Charging perspective.
- The Frameworx Service Lifecycle Management (SLM) defines best practices and requirements for establishing a role based software/services factory and a Lifecycle Management Meta Data model. This is aligned to the rest of Frameworx and ITIL.

The Frameworx SM-API provides a light weight and consistent method for services to interact with service management applications in a single or multiple provider environments. Leveraging this capability enables complex service ordering and provisioning as well as customer dashboards to accurately display the status of a service including underlying service component not under the direct control of the local service provider or customer.

As illustrated in Figure 3 below, these management systems can maintain the relationship between an application instance and the specific virtualized resources supporting that instance, allowing access to relevant telemetry from that service and associated underlying compute and network resource layers. A standardized management interface - the SM-API - enables rich interactions between management systems.

In a scenario where different component services in the service delivery chain are all using the SM-API to expose management information, end-end management is made very much simpler and cheaper to perform. In cases where some component services expose management information in non-standard or proprietary formats, some form of mediation platform or Service Delivery Broker can be useful to help manage service creation and delivery in this environment.

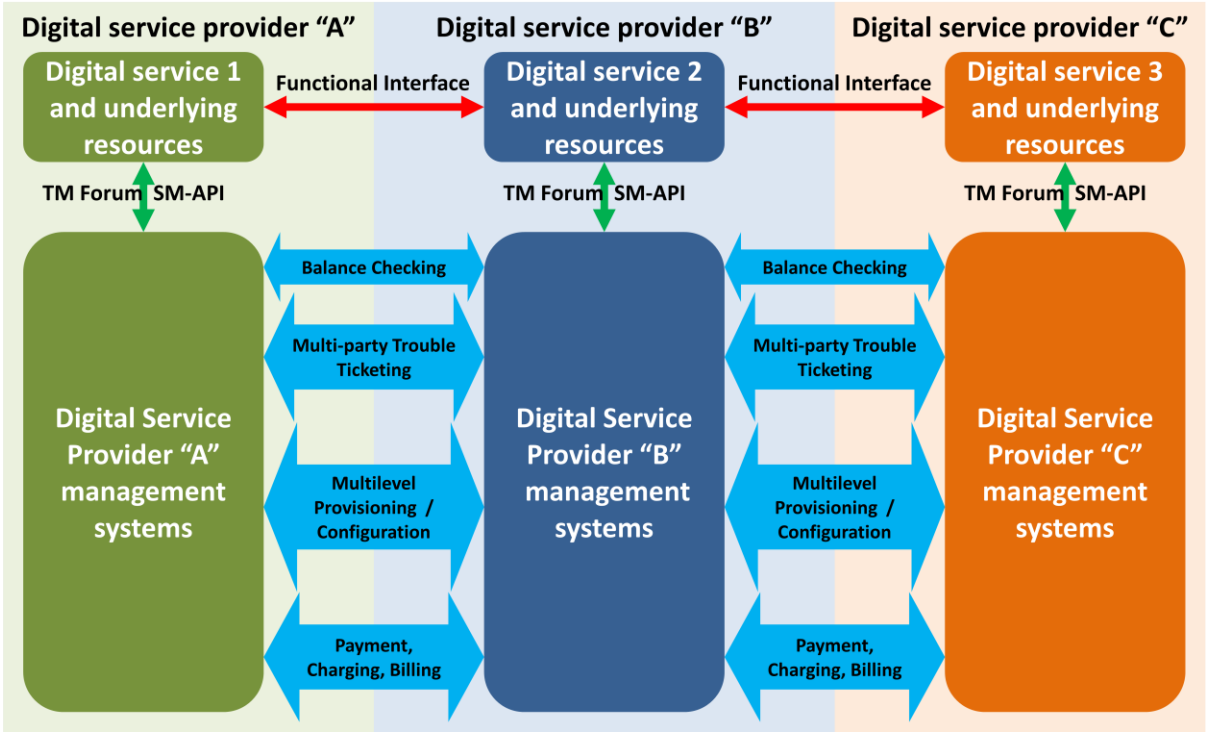

Figure 3 - Managing Services in a Virtualized Multi-Cloud Environment

Service Delivery Brokers can provide additional functionality to the simple mapping of management information from one format to another – they can provide additional services in their own right such as:

- common transports
- bindings and protocol mediation,
- support for all needed message patterns,
- common tasks such as security & access control,
- event processing engine,
- routings,
- performance / traffic monitoring,
- mechanisms for real time visibility into performance and usage including Dashboards.

This use of appropriate management interchange standards and associated mediation or broker technologies of services enables the reference architecture to deliver three key value propositions:

- A High Quality User Experience – Users are able to access the business application or see the content in the manner they expect.
- A High Quality Developer Experience – Developers are able to more quickly create applications in a consistent manner that can be easily incorporated into SOA Service Compositions that are readily manageable from a QoS and SLA viewpoint.
- A High Quality Operations Experience – Service Providers are able to provide a great user experience because they have the information necessary to measure what is going on, quickly assess root causes and impacts, and react to problems in a proactive manner.

SUPPORTING EFFECTIVE CUSTOMER EXPERIENCE MANAGEMENT

Understanding and managing the customer's experience is a paramount concern for service providers. The use of a standardized, lightweight management interface for digital services provides a compact, consistent and efficient method for the collection of metrics and failures that is the foundation of customer experience management (CEM). In the Business Guide and the Technical Guide, this release of the accelerator pack provides explains in detail how multi-cloud service management supports and enables CEM.

IMPLEMENTING THE APPROACH

Producing industry standards and more importantly, getting traction in the marketplace, requires a very different approach in the cloud world than the telecommunications market. Historically, communications were closely governed by a relatively small number of often government controlled bodies. Standards developed by the International Telecommunications Union and other bodies could be adopted by common agreement and even when the market liberalized, new entrants needed to adopt common standards for say, international roaming, otherwise they could not do business.

The digital world has no such central governance and will not simply adopt standards just because they exist - the market is too fast moving and volatile for that. Standards have to emerge because they provide economic benefits to implementers such as providing a faster, cheaper, better way of achieving the business goals of the provider.

Thus the Forum's approach is aimed at developers rather than a traditional procurement-led standards conformance approach i.e. it aims to get in to the development bloodstream by providing developers with easy to use tools and development sandbox environments that helps them move faster by proving pre-built, management API's in a variety of technologies and formats, plus all of the developer eco-system to support this. Crucially, this also contains a library of pre-built mappings form stands API's to a variety of popular proprietary interfaces and the ability for users to place their own extensions and mappings for others to use (on a free or paid for basis).

The Forum therefore supports a range of developer tools and aids for implementing theapproach defined in this guide. Much more detail can be found in the *Frameworx Multi-cloud Developer Guide*. This describes the Forum's flexible and experimental web –based approach that:

- Provides an ecosystem of like-minded developers sharing best practice developing programmatic Application Programming Interfaces API and code snippets
- A 'show me' approach where developers can locate and try out APIs with sample code and examples
- Easy to follow web pages, tutorials, white papers, and code examples to show developer how to apply these interfaces to practical use cases.
- API development support e.g. test and sandbox,
- Documentation and presentation of API functionality
- Common and familiar licensing regimes

FIND OUT MORE ABOUT THE FORUM'S MULTI-CLOUD MANAGEMENT ACCELERATOR PACK **HERE**

3. RELEVANT WEB RESOURCES

[TM Forum Software Enabled Services] (SES) Management Solution working group		(link)
[TM Forum IPSphere] B2B framework and solutions working group		(link)
[TMF 061]	Software Enabled Services Architecture	(link)
[TMF617]	Software Enabled Services Management Solution Interface Information Agreement	(link)
[TMF618]	Software Enabled Services Lifecycle Management Metadata Information Agreement	(link)
[TR168]	SES Management Solution & Frameworx Relationships Technical Report	(link)
[TMF525]	Software Enabled Services Management Solution Interface Business Agreement	(link)

4. ADMINISTRATIVE APPENDIX

This Appendix provides additional background material about this document.

VERSION HISTORY

Version Number	Date Modified	Modified by:	Description of changes
1	14 July 2012	Keith Willetts	First draft
2	14 Aug 2012	Keith Willetts	Restructure and additional material
3	5th Sep 2012	Dave Milham	Restructure and re-organised fixed template issues
4	6th Sept 2012	Marco Giaccaglini	Added SM-API content
5	18th Sept 2012	Dave Milham	Additional materials and improved flow
8.1	21 Nov. 12	J. O'Brien	Review comments
8.2	21 Nov. 12	TM Forum Staff	Format adjustments and other corrections
8.3	26 Nov. 12	TM Forum Staff	Minor format adj. and typo. corrections
8.4	22 Feb. 13	John Wilmes	Replaced diagrams 2/3, fixed typos, wording
8.5	25 Feb. 13	TM Forum Staff	Minor corrections
8.6	26 Feb. 13	TM Forum Staff	Minor corrections prior to web posting

RELEASE HISTORY

Release Number	Date Modified	Modified by:	Description of changes
1.0	20/Nov/12	Keith Willetts	First issue of document
1.5	22/Feb/13	John Wilmes	Second issue of document

ACKNOWLEDGMENTS

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