

Accelerating Digital Transformation and Business Assurance for CSPs (Communication Service Providers)

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1. Introduction

TM Forum is a global industry association for service providers and their suppliers in the telecommunications industry. Members include communications and digital service providers, telephone companies, cable operators, network operators, cloud providers, digital infrastructure providers, software suppliers, equipment suppliers, systems integrators and management consultancies.

TM Forum Open APIs are a set of standard APIs that are based on the latest industry standards and best practices and are designed to address the common business and technical challenges faced by CSPs. They provide a common language and set of guidelines for exchanging data and information between systems, enabling automation, and reducing manual work.

TM Forum's mission is to help its members and the wider industry drive digital transformation and achieve business success in a connected world. The organization provides its members with access to research, thought leadership, training, and networking opportunities, as well as a range of tools and frameworks to help them improve their operations, reduce costs, and create new revenue streams.

Capgemini and TM Forum have a strong relationship built on their shared commitment to driving digital transformation in the communications industry. TM Forum is a global industry association that brings together leading CSPs, technology providers, and other industry stakeholders to collaborate on the development of industry standards, best practices, and digital transformation initiatives. Capgemini is a long-standing member of TM Forum and is actively involved in several of its initiatives.

Capgemini brings its deep industry expertise and experience in digital transformation to the partnership, while TM Forum provides its industry-leading standards and best practices for digital transformation. Together, Capgemini and TM Forum collaborate on several initiatives aimed at driving digital transformation in the communications industry, including:

1. **Developing TM Forum Open APIs:** Capgemini is a strong proponent of the TM Forum Open APIs, which provide a standardized approach to building and deploying digital services. Capgemini has been actively involved in the development of these APIs and has contributed to several working groups focused on their development.
2. **Building a digital ecosystem:** Capgemini and TM Forum are working together to build a digital ecosystem that brings together CSPs, technology providers, and other industry stakeholders to collaborate on the development of new digital services and experiences.
3. **Supporting digital transformation initiatives:** Capgemini and TM Forum are working together to support CSPs in their digital transformation initiatives. This includes providing guidance on digital strategy, developing roadmaps for digital transformation, and implementing digital solutions that help CSPs improve their operations and customer experience.

Overall, the Capgemini and TM Forum relationship is focused on driving digital transformation in the communications industry, helping CSPs to stay ahead of the competition and meet the evolving needs of their customers.

2. Business Case

- **Improved Time-to-Market:** Open APIs can significantly reduce the time and cost involved in developing and integrating new services and applications. By adopting TM Forum Open APIs, service providers can speed up the delivery of new products and services to market and create new revenue streams quickly.
- **Enhanced Customer Experience:** Open APIs can help service providers deliver a more personalized and seamless experience to their customers by enabling real-time data sharing and interactions between different systems. For example, a telco could use Open APIs to provide customers with self-service tools that allow them to manage their accounts, add or change services, and troubleshoot issues without the need for human intervention.
- **Increased Efficiency:** Open APIs can help service providers streamline their operations by automating processes, reducing manual work, and minimizing errors. For example, Open APIs can be used to integrate different back-office systems, such as billing, inventory, and network management, to provide a single view of the customer and simplify internal processes.
- **Interoperability:** Open APIs can help service providers and technology vendors overcome the challenges of system interoperability and integration. TM Forum Open APIs provide a common language and framework that can be used across different systems and services, enabling seamless data exchange and interoperation.
- **Innovation:** Open APIs can help service providers drive innovation by creating a platform for collaboration and experimentation. By opening up their systems and services to developers and partners, service providers can leverage the creativity and expertise of a wider ecosystem of developers, driving new innovations and business models.

Overall, TM Forum Open APIs provide service providers with a range of benefits, from improving time-to-market and enhancing the customer experience to increasing efficiency, interoperability, and innovation.

3. Problem Statement

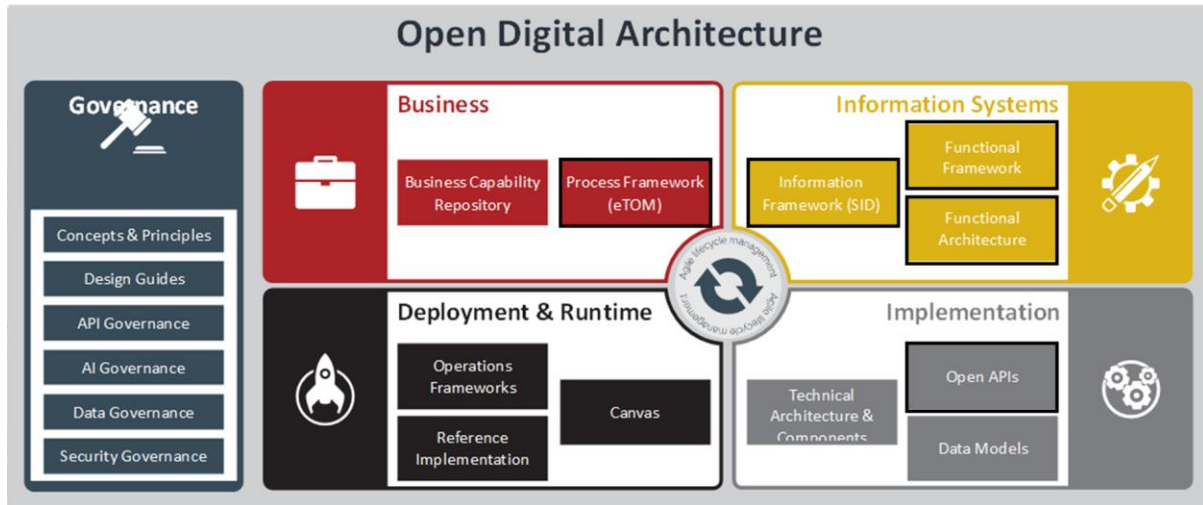
In today's Telecom business, CSPs are facing increased competition, demands for more personalized and innovative services, and expectations for faster time-to-market. To remain competitive, CSPs need to be able to integrate new systems and services rapidly and easily, and to exchange data and information between them.

So, there is need to have common set of "integration language" that makes it easier for the teams to communicate on integration approach. Also need to encourage current partners or future partners to support these open standards to further reduce integration costs. This requires standardization and simplification of data exchange methods, which the TM Forum Open APIs provide.

Here are the problem statements that TM Forum Open APIs can address:

- **Integration Challenges:** Service providers and technology vendors often use different systems and technologies, which can make it challenging to integrate different services and applications. Open APIs provide a standard interface and a common language that can be used to bridge different systems and services, enabling seamless data exchange and interoperation.
- **Time-to-Market Pressures:** Service providers are under constant pressure to deliver new products and services to market quickly. Open APIs can help accelerate time-to-market by reducing the time and cost involved in developing and integrating new services and applications.
- **Customer Experience:** Service providers need to deliver a seamless and personalized customer experience to remain competitive. Open APIs can help service providers provide a real-time view of customer data and interactions, enabling a personalized experience that meets the unique needs and preferences of each customer.
- **Data Silos:** Service providers often have multiple systems and data sources that are not integrated, creating data silos that make it difficult to gain a holistic view of the customer or the business. Open APIs can help break down these data silos by enabling seamless data exchange between different systems and services.
- **Innovation:** Service providers and technology vendors need to drive innovation to remain competitive and meet the changing needs of customers. Open APIs provide a platform for collaboration and experimentation, enabling service providers to leverage the creativity and expertise of a wider ecosystem of developers and partners.

4. Proposed Solution(s)



- Adoption of TM Forum Frameworks:** TM Forum has developed a set of industry-standard frameworks, such as the Open Digital Architecture (ODA) and the Business Process Framework (eTOM), which provide a common language and framework for service providers and technology vendors to use. By adopting these frameworks, service providers can align their systems and services with the industry standards, simplifying the implementation of Open APIs.
- API Management Platforms:** An API management platform can provide a centralized way to manage and monitor APIs. These platforms enable service providers to create, publish, and manage APIs, as well as monitor usage and performance. Some examples of API management platforms include Apigee, Mulesoft, and Kong.
- Developer Portals:** Service providers can create developer portals that provide access to their APIs and enable developers to experiment with and build new applications and services. Developer portals can help service providers create a community of developers and partners who can collaborate and drive innovation.
- Internal IT Processes:** Service providers can integrate Open APIs into their internal IT processes, such as billing, inventory, and network management. By integrating these processes with Open APIs, service providers can create a more holistic view of their operations, simplify processes, and improve efficiency.
- Training and Education:** Service providers can invest in training and education programs to help their teams learn about the use of Open APIs and the TM Forum frameworks. This will help ensure that the organization has the necessary skills and knowledge to adopt Open APIs effectively.
- API Design Studio:** Capgemini has developed a tool that automates the creation of APIs based on TM Forum Open API standards. This tool helps

CSPs to build APIs quickly and ensure that they are compliant with the TM Forum Open API standards.

- **API Testing Framework:** Capgemini has developed a framework that automates the testing of APIs to ensure that they are performing as expected. This framework helps CSPs to identify and fix any issues in their APIs before they are deployed.
- **API Catalog:** Capgemini has developed a catalog that provides CSPs with a repository of APIs that they can use to accelerate the development of new digital services. This catalog includes APIs for common use cases, such as customer management, billing, and network management.
- **API Integration Framework:** Capgemini has developed a framework that helps CSPs to integrate their existing systems with new digital services. This framework provides a standardized approach to integration and helps CSPs to reduce the time and cost of integration.

Open APIs are specifically designed for functional integrations and the ODA to address the challenges of deploying, configuring, and operating in a complex application landscape. As open API is considered the de facto standard for telecoms interfaces, ODA is a component-based architecture that can be viewed as the de facto standard for open digital platforms, which provides a consistent way for components to fully interoperate end-to-end across multivendor ecosystems

TMF Open APIs along with ODA is the futureproof approach designed with an outside-in perspective. It can provide the plug-and-play interoperability of components within their IT systems (and networks), reduce complexity and enable digitization of customer-facing systems and reduce cost of integration as well as time to market for new services digital services. This while also supporting both existing and new digital services and addressing the implementation of B2B2X digital ecosystems, which will be critical for operating and monetizing 5G and edge computing.

Also build a codeless API test automation framework for tmform use cases for better reusability across the markets and reducing the integration testing cost, which will further support on the faster deployments of solutions to clients

5.Introduction of Solution(s)

Conceptualize user experience layer from substantial set of legacy platforms through middleware based on TMF Open APIs. This will provide a standards-based API set to enable Digital and CRM platforms to have a reusable set of defined APIs for faster deployment. Also automate the use cases to reduce integration testing costs across multiple opcos and partners.

MuleSoft is a popular platform for implementing integration solutions and can play a significant role in the implementation of TM Forum standards. MuleSoft's Anypoint Platform provides a set of tools for designing, building, and managing APIs and integrations, making it an ideal platform for implementing TM Forum standards. With MuleSoft, organizations can quickly and easily connect disparate systems, automate business processes, and expose services in a standard and secure way.

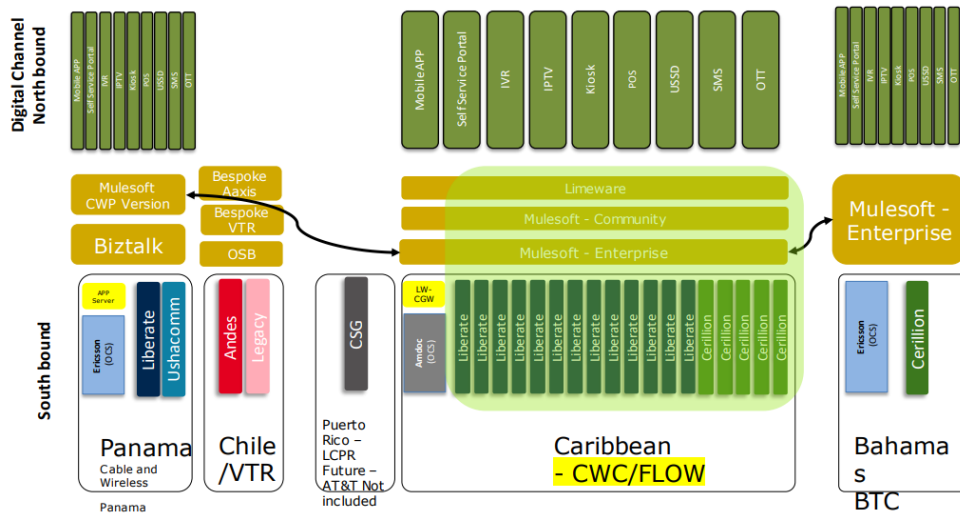
Capgemini has been an approved MuleSoft integration partner since 2008. Our close collaboration has led to many joint successes. Together, MuleSoft and Capgemini deliver an on-premise, cloud and hybrid integration platform based on open-source API connectivity. So, your businesses can connect applications, data, and devices – quickly, flexibly, and cost-effectively. Our digital integration center of excellence equips you to leverage APIs and connectivity to disrupt and transform with both agility and scale. Our digital integration strategic framework, meanwhile, enables you to accelerate development, and quickly onboard new systems and processes.

Overall, we accelerate innovation and deliver “connected W-world” customer experiences. We leverage our API-led modernisation approach and pre-built TM Forum. And we use APIs to accelerate innovation and deliver the digital transformation needed in the telecoms industry to support 5G services.

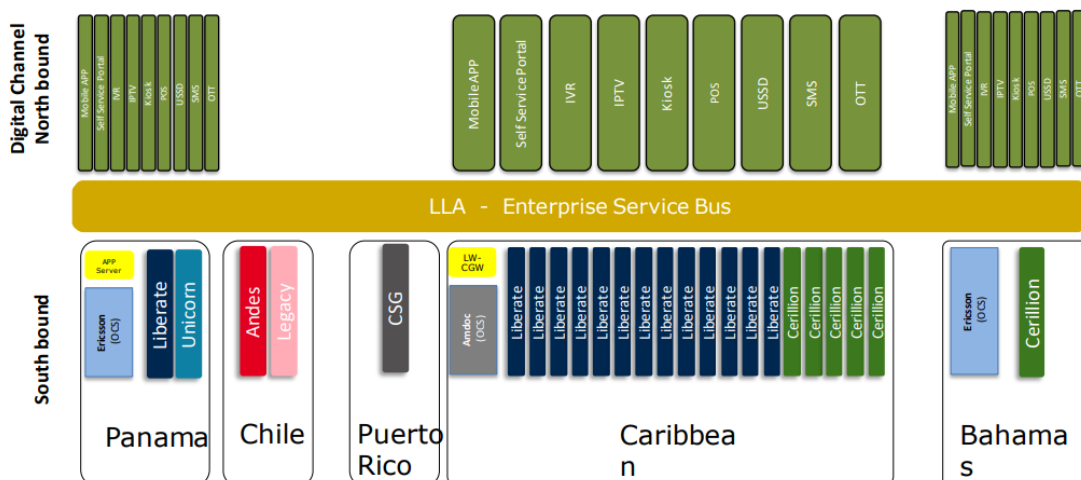
Also, we have built a customised codeless Rest-assured framework for automating the telco use cases. Rest-Assured is a convenient and powerful library for testing RESTful APIs in Java, making it an excellent choice for API automation testing. As the framework is codeless, opensource it is reusable for many projects. It is highly beneficial in reducing the Integration testing costs of the CSP's for multiple business units

Overall, the solutions provided by Capgemini are aimed to reduce the time for integration work of CSPs as we spend less time on design, development, and testing.

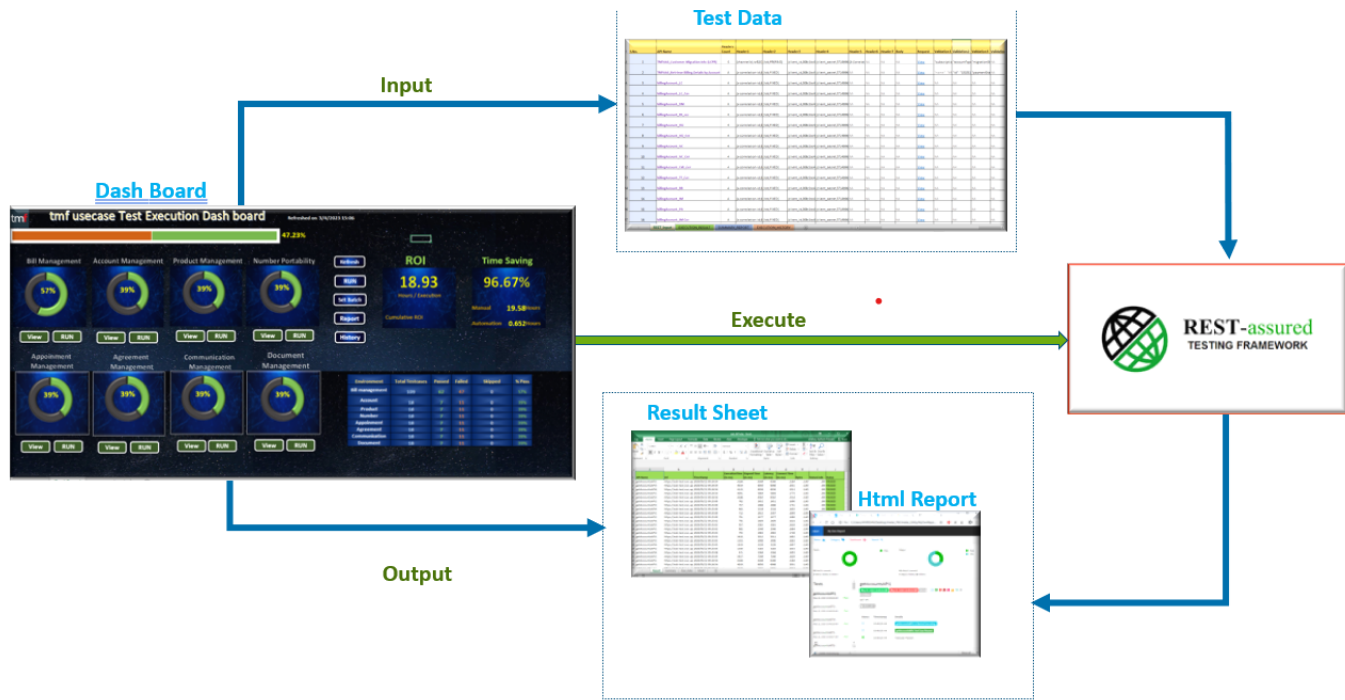
Middleware High Level Logical View - Previous



Middleware High Level Logical View - Current



Test Solution framework Lifecycle



Framework Life Cycle

6. Application of Solution(s)

TM Forum's Open APIs are based on representational state transfer (REST). They are technology agnostic and can be used in any digital service scenario, including B2B, Internet of Things, Smart Health, Smart Grid, Big Data, NFV, Next Generation OSS/BSS and more.

Capgemini has implemented TM Forum Open APIs for Liberty Latin America (LLA) to help them achieve their digital transformation goals. TM Forum Open APIs are a set of standardized APIs that enable CSPs to build and deploy new digital services and applications more quickly and efficiently.

Capgemini worked with LLA to implement several TM Forum Open APIs, including the Service Inventory Management API, the Service Order Management API, and the Trouble Ticket Management API. These APIs helped LLA to streamline their service management processes, improve their service delivery speed and quality, and provide a better customer experience.

Specifically, the implementation of TM Forum Open APIs enabled LLA to:

1. **Automate service provisioning:** With the Service Order Management API, LLA was able to automate their service provisioning processes, reducing the time it takes to provision new services and reducing the risk of errors.
2. **Improve service quality:** With the Service Inventory Management API, LLA was able to better manage their service inventory, enabling them to quickly identify and resolve service issues.
3. **Enhance customer experience:** With the Trouble Ticket Management API, LLA was able to improve their trouble ticketing process, enabling them to resolve customer issues more quickly and efficiently.
4. **Increase agility:** By using standardized TM Forum Open APIs, LLA was able to rapidly launch new services and applications, reducing their time to market and increasing their agility.

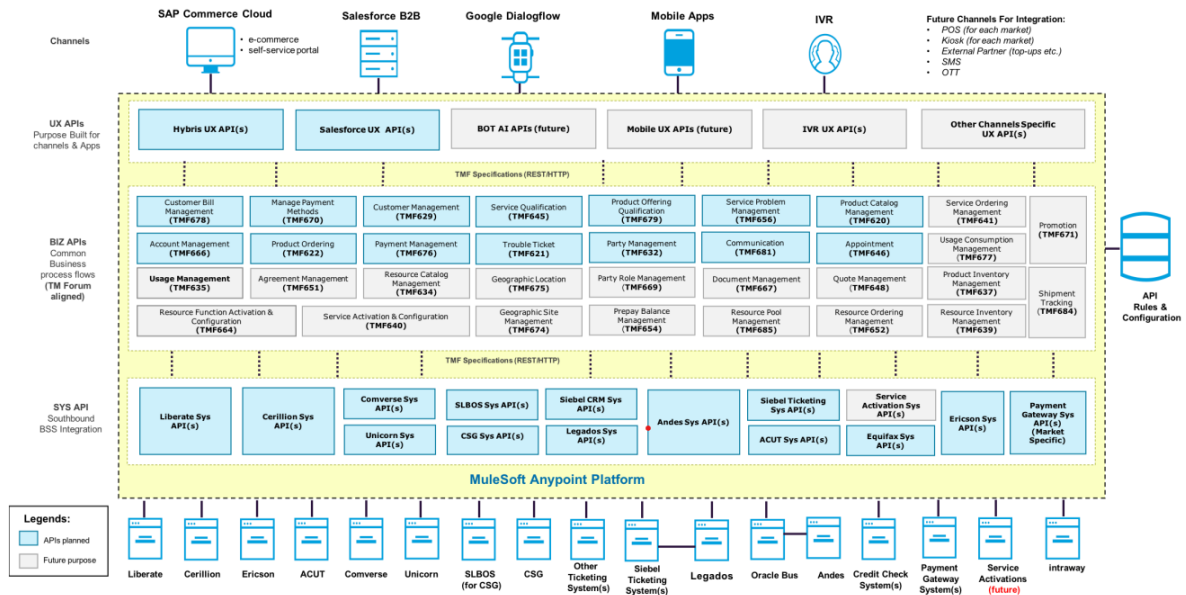
Overall, Capgemini's implementation of TM Forum Open APIs helped LLA to achieve their digital transformation goals, providing a better customer experience and helping them stay ahead of the competition.

Liberty Latin America operates in 20+ markets with 25+ BSS systems that are integrated with their API middleware. LLA continue to roll out the TMF APIs across their ecosystem. Their new IT BSS/OSS stack is based on TMF APIs. This enables significant reuse of our Digital and CRM development efforts to integrate with the new IT stack.

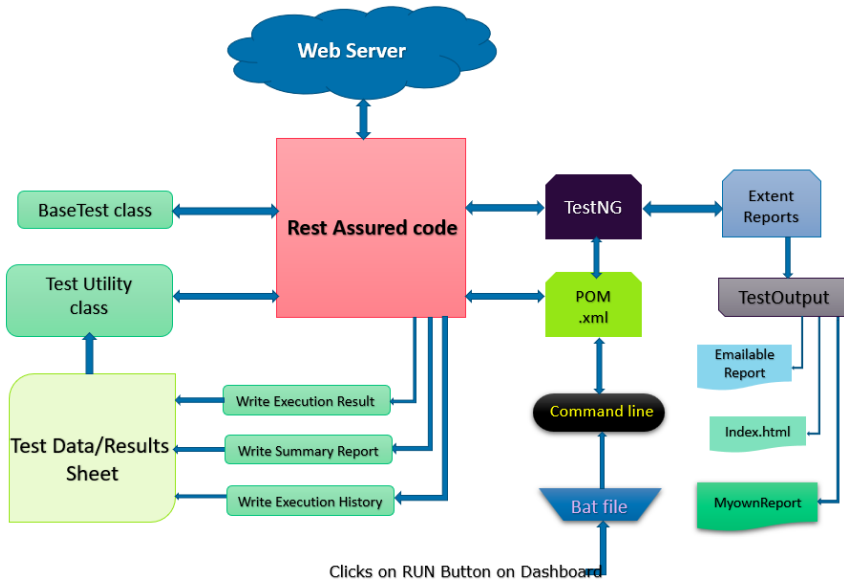
LLA have benefited from the reuse of tmforum APIs between supporting Digital Sales and Care functional areas. These APIs has enabled client's ability to open up to third parties such as MVNOs and OTTs.

It has provided client with a jump start by working with a documented and known set of APIs where we can collaborate with their vendors and partners.

API Architecture



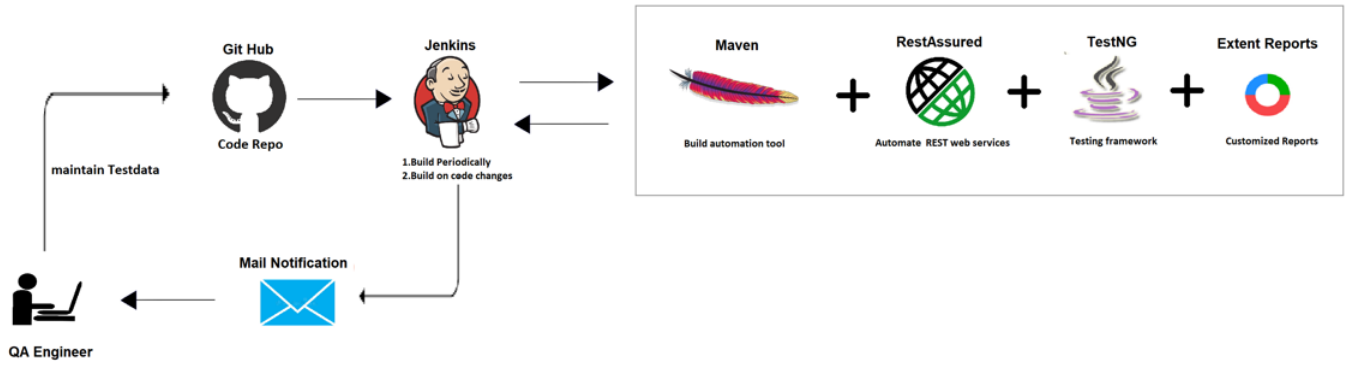
TEST SOLUTION FRAMEWORK ARCHITECTURE



Tools & Technologies

- JDK (Java Development Kit)
- Extent Reporting
- Eclipse
- Selenium (with JAVA)
- Excel VBA Script
- Rest Assured
- Maven
- CLI execution

Test Solution Execution Architecture



Solution Reusability Map

OpCo/Market	Project	620	621	622	629	632	637	640	643	645	646	651	654	656	666	670	676	678	677	680	681	685
Jamaica	B2B		█	█	█					█					█	█	█	█		█		
	B2B			█	█	█									█							
	BOT																					
Panama	B2C		█	█	█					█			█		█	█	█	█	█			█
	B2B**		█	█	█										█	█	█	█				█
	BOT		█												█			█				
	Self-Install			█				█		█												
	BizTalk Mig												█		█		█	█				
Puerto Rico	B2C		█	█	█					█					█	█	█	█	█			█
	B2B		█	█	█										█	█	█	█	█			█
	AT&T	█	█	█	█		█		█	█	█	█	█	█	█	█	█	█	█	█	█	█
	BOT														█							
Chile	B2C		█	█	█					█					█	█	█	█	█			█
	B2B														█							
	BOT																					
Costa Rica	B2C		█	█	█					█					█	█	█	█	█			█

7.Future/Long-Term Focus

The long-term focus of TM Forum's open APIs is to provide a consistent and interoperable interface for digital services, enabling the creation of new services, improving operational efficiency, and facilitating innovation.

TM Forum's open APIs also aim to help organizations become more agile and responsive to customer demands by enabling them to quickly launch new services and features, as well as improve their customer experience by providing real-time access to service and billing information.

In the long-term, TM Forum's open APIs will continue to evolve to meet the changing needs of the digital services industry, including support for new technologies and business models. The organization will also work to expand the adoption of its APIs by promoting their use among its members and encouraging their adoption in new markets and industries.

Traditional service management and operational solutions were designed for static physical networks. They are simply not intelligent enough to address the complexities of 5G networking. MNOs need a transformation strategy that will take them into the future. In our new Telcom Transformation report, we at Capgemini Invent examine the varying demands of 5G networking, such as service dynamicity, Quality of Service (QoS) and latency requirements. We analyse the challenges MNOs will face in the immediate future and make recommendations on how to capitalize on the digital transformation of entire industries and enterprises. Find out which key capabilities MNOs will need to foster to make the successful transition to an organization with intelligent operations.

Also, CSPs should get leverage of **Capgemini Invent**, which has a strong track record of helping clients across a range of industries, including consumer products, retail, banking, insurance, healthcare, automotive, and telecommunications, among others. Some of the key services offered by Capgemini Invent include:

1. **Digital strategy consulting:** Capgemini Invent helps clients to develop and implement digital strategies that align with their business goals and help them achieve their digital transformation objectives. Capgemini Invent leverages its expertise in emerging technologies, customer insights, and data analytics to develop customized strategies that address the unique challenges and opportunities of each client.
2. **Customer experience design:** Capgemini Invent helps clients to create personalized and seamless customer experiences across channels by leveraging its expertise in customer experience design, data analytics, and emerging technologies.
3. **Data and analytics:** Capgemini Invent helps clients to leverage data and analytics to gain insights, optimize operations, and drive innovation. Capgemini Invent offers a range of services, including data analytics, data science, data management, and data visualization.
4. **Technology and innovation:** Capgemini Invent helps clients to innovate and transform their business by leveraging emerging technologies such as AI, blockchain, IoT, and cloud. Capgemini Invent also helps clients to identify and pursue new revenue streams and partnerships that can drive growth and differentiation.

5. **Organization and operating model:** Capgemini Invent helps clients to optimize their organization and operating model to improve agility, scalability, and flexibility. Capgemini Invent offers a range of services, including digital transformation, change management, and operating model design.
6. **Sustainability:** Capgemini Invent can help customers develop sustainable business models and strategies to reduce their environmental impact and support social responsibility.

Overall, Capgemini Invent's services are designed to help clients stay ahead of the competition, meet the evolving needs of their customers, and transform their business to succeed in the digital age. Capgemini Invent's expertise, innovative solutions, and industry partnerships make it a valuable partner for clients seeking to drive digital innovation and transformation in their organization.

8. Conclusion

Our solution help telcos to make the most of the digital opportunity, so they can accelerate their transformation from communications service provider (CSP) to digital service provider (DSP).

By reusable design, Development and Testing solutions of tmforum API for Telco customers achieve following benefits.

1. **Network Operations:** Automation of network operations can help to improve the speed and accuracy of network configuration, reduce manual intervention, and minimize human error.
2. **Service Fulfilment:** Automation of service fulfilment can help to improve the speed and accuracy of service activation and provisioning, reduce manual intervention, and minimize human error.
3. **Service Assurance:** Automation of service assurance can help to improve the speed and accuracy of service monitoring and troubleshooting, reduce manual intervention, and minimize human error.
4. **Customer Experience Management:** Automation of customer experience management can help to improve the speed and accuracy of customer support, reduce manual intervention, and minimize human error.
5. **Billing and Revenue Management:** Automation of billing and revenue management can help to improve the speed and accuracy of billing processes, reduce manual intervention, and minimize human error.

Overall, TM Forum Open APIs are a critical component in the digital transformation of CSPs, enabling them to integrate new systems and services rapidly and easily, and to exchange data and information between them. By adopting TM Forum Open APIs, CSPs can remain competitive in today's fast-paced digital economy and enhance the customer experience by providing more personalized and innovative services.

Our Liberty Latin America client has achieved the following benefits by implementing the tmforum open api use cases

1. **Improved Time-to-Market:** TM Forum Open APIs allowed LLA to launch new digital services faster by providing a common set of APIs that can be used across multiple systems and vendors. This enabled LLA to reduce the time and effort required for integration, testing, and deployment, resulting in faster time-to-market for new services.
2. **Enhanced Customer Experience:** TM Forum Open APIs helped LLA provide a more seamless and personalized customer experience. By integrating customer data across multiple systems, LLA was able to gain a 360-degree view of the customer, which enabled the company to offer personalized services and recommendations to customers.
3. **Greater Agility and Flexibility:** TM Forum Open APIs provided LLA with a more agile and flexible platform for its digital services. By using a common set of APIs, LLA was able to rapidly scale its services and easily integrate with new systems and vendors, which enabled the company to quickly adapt to changing customer needs and market conditions.
4. **Reduced Costs:** TM Forum Open APIs helped LLA reduce the costs associated with software development and integration. By using a common set of APIs, LLA was able to reduce the time and effort required for integration and testing, resulting in cost savings for the company.

5. **Improved Operational Efficiency:** TM Forum Open APIs helped LLA improve its operational efficiency by providing a common set of APIs that can be used across multiple systems and vendors. This enabled LLA to streamline its operations and reduce the time and effort required for manual data entry and system integration.
6. **Implementing Digital Sales Channels:** LLA has implement digital sales channels, including an e-commerce platform and mobile app, to make it easier for customers to purchase LLA's services. This has resulted in increased revenue for the company and improved customer satisfaction.

9. Appendix A – Scenarios

Few scenarios are listed below.

TMForum API Name	TMForum API #	Requirement Coverage	BSS Coverage/Down Stream systems	API Consumers	No. of Resources
Account Management API	TMF666	Retrieve Billing data using Contact#, Account#, Service# and Cedula	Liberate, Cerillion, Salesforce, CSG, Andes LCPR - Salesforce	Chat BOT & IVR Ecom - Hybris & Digital care app	14
Communication Management API	TMF681	To send SMS & Email notifications for Bill payments, Payment confirmation & static messages	Liberate & Cerillion, LCPR - Matrix & Aria Ecom - CSG, Lib, Cerillion and siebel	IVR Ecom - Hybris	4
Customer Bill Management API	TMF678	Retrieve Billing history	Liberate & Cerillion LCPR - Aria ECOM - CSG, Aria	BOT & IVR Ecom - Hybris & Digital care app	3
Payment Management API	TMF676	Retrieve payment history and post payments	Liberate & Cerillion LCPR - Aria Ecom - CSG, Aria, Liberate	Chat BOT & IVR Ecom - Hybris & Digital care app	4
Prepay Balance Management API	TMF654	Retrieve prepaid balances	Ericsson and convers one/Limeware LCPR - Matrixx	Chat BOT & IVR	8
Product Inventory Management API	TMF637	Retrieve products details	Liberate, LCPR- Matrixx & Salesforce Ecom - CSG	Chat BOT & IVR Ecom - Hybris & Digital care app	3
Resource Inventory Management API	TMF639	To reset the modem	Cerillion LCPR - CSG	BOT	1
Service Inventory Management API	TMF638	To retrieve list of services	Cerillion & Liberate Ecom	Chat BOT & IVR	2
Trouble Ticket Management API	TMF621	To retrieve trouble tickets and create trouble tickets	Liberate, Cerillion	Chat BOT & IVR	6
Usage Consumption Management API	TMF677	To retrieve customer usages details	LCPR & ECOM -Matrixx	IVR Ecom - Digital care app	3

10. Appendix B – References

<https://www.tmforum.org/>

<https://www.capgemini.com/industries/telecommunications/>

<https://capgemini-engineering.com/us/en/industries/telecom-media/>

<https://www.capgemini.com/gb-en/about-us/technology-partners>

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Part of the Capgemini Group, Sogeti operates in more than 100 locations globally. Working closely with clients and partners to take full advantage of the opportunities of technology, Sogeti combines agility and speed of implementation to tailor innovative future-focused solutions in Digital Assurance and Testing, Cloud and Cybersecurity, all fueled by AI and automation. With its hands-on 'value in the making' approach and passion for technology, Sogeti helps organizations implement their digital journeys at speed.

Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of over 325,000 team members more than 50 countries. With its strong 55-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2021 global revenues of €18 billion. Get The Future You Want | www.capgemini.com

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