

Automatic Discovery, Quote, Ordering and Settlement in a Mesh of Interconnected ICT Service Providers

Section 1: Summary

Use Case Summary			
Use Case ID:	ICT-002	Use Case Type:	<i>Vertical</i>
Submission Date:	July 14, 2019	Is Use Case supporting SDGs	<i>no</i>
Use Case Title:	Automatic Discovery, Quote, Ordering and Settlement in a Mesh of Interconnected ICT Service Providers	Domain:	1-c 3-f
Status of Case	PoC	Sub-Domain	<i>If necessary</i>
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Proposing Organization	PCCW Global Limited. Hong Kong		
Short Description	PoC conducted at MEF18 event that demonstrated Automatic Discovery, Quote, Ordering and Settlement in a Mesh of Interconnected ICT Service Providers resulting in a significant decrease in time compared to legacy manual processes.		
Long description	<p>On October 2018 a team of 7 Carriers (PCCW Global, Infonias, Liquid Telecom, Singtel, Sparkle, and Tata Communications) together with two technology partners (Cataworx and Clear Blockchain Technologies) has presented a PoC where the process of obtaining a quote, ordering of a service, invoicing for such service, invoice reconciliation and final settlement for service delivered through a partial mesh of interconnected carrier networks were conducted through an automated system.</p> <p>Each carrier network was operating a catalogue of available services and upon receiving an inquiry from its customer through an eNNI it would search the catalogue for a matching entry and return a price if found. If no matching entry was found, the catalogue would then initiate an inquiry to its neighbour eNNI connected carriers that will then repeat this process until a matching entry is found in one of the catalogues (or until a pre-defined threshold has been reached, either time, or number of hops). If a price is returned by a downstream catalogue, the originating catalogue would then mark the price up according to defined commercial rules, and provide a quote to the upstream catalogue. This cascade of inquiries and quotes eventually provides the ultimate customer a quote for an end-to-end service that may span across multiple carrier networks.</p> <p>Once the ultimate customer places an order – a cascade of orders is placed downstream with all participating carriers.</p>		

	<p>Once service is terminated – invoices are being generated by each carrier based on their measured utilization (a combination of time, throughput and SLA metrics) and is then being reconciled with the measurement of the neighbour eNNI carriers.</p> <p>Once reconciliation is complete – the invoices are settled.</p> <p>The above proceeds, when handled manually on Carriers’ legacy OSS/BSS platforms, may take weeks to complete.</p> <p>The PoC has demonstrated that the inquiry, quote and ordering take less than 30 seconds, and invoicing and reconciliation takes less than two minutes.</p> <p>This may result in a significant reduction in both time and HR, as not only that the process is accelerated, it is also automated.</p> <p>The information is exchanged through private permissioned ledgers between each pair of carriers and this is a flat-hierarchy architecture with no top-level orchestrator. Reflecting the commercial environment of the wholesale ICT market. There is complete isolation of information and visibility and no one has end-to-end visibility and control.</p>		
SDG in Focus (when applicable)	Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation		
Value Transfer:	The solution includes financial settlement between each pair of entities.	Number of Users:	Millions
Types of Users:	<p>End users: Private, Enterprise and Wholesale ICT SPs.</p> <p>ICT SPs: Connectivity SPs (carriers), Compute and Storage SPs (Public and Private Cloud).</p>		
Stakeholders	<p>End users: Ability to buy on-demand services. Ability to pay per-use.</p> <p>ICT SPs: Ability to deliver on-demand services and Yield new revenue from existing infrastructure.</p> <p>IoT SPs: Ability to use managed-services on-demand.</p>		
Data:	<p>Inquiry details, Quote details, Order details, Utilization records, SLA performance, Invoice details, Settled amount.</p> <p>The respective data models are service-type specific (connectivity DM differs from Compute DM that differs from Storage DM). The information is shared between the two eNNI partners only.</p> <p>Catalogue interaction will be through an API.</p> <p>End user interaction is expected to be through an intent-based interface.</p>		
Identification:	<p>This is a permissioned ledger. Only pre-accepted members can participate. Governance is managed through a board consisting of representatives of members of the ledger.</p>		
Predicted Outcomes:	<p>As demonstrated in the PoC – Manual processes replaced by automation significantly accelerate enabling a host of new applications that are currently dependent on best-effort, unmanaged, resources.</p>		

Overview of the Business Problem or Opportunity

Problem:

Most ICT services traverse more than one network domain. Each such network domain (a carrier network, a data centre, a radio link, an enterprise LAN) is typically operated by a different administration and is using different methods to transport, process and manage the flows of information.

It is very seldom that all administrations along the information flow path use a common language/process to define and manage their portion of the end to end path. Furthermore – it is very seldom that true end-to-end visibility and management is available across all administrations.

The typical process-flow is such that each two consecutive administrations along the end-to-end path have bilateral commercial and operational relations with each other that have overcome some of the differences in language/process. These relations are heavily dependent on manual processing of requests, manual provisioning of services, manual management, semi-manual invoicing and manual settlement. Such manual laden process-flow is time consuming and does not allow services to be activated on-demand but rather requires orders to be placed in advance, then be subject to delivery lead-times of weeks or months. For services that span across multiple administrations – the problem is further amplified as the service-related information now flows through a cascade/chain of bilateral agreements. Timelines stretch even further and management of the end to end service characteristics becomes very difficult.

Today's applications require resources to become available within minutes/seconds. Waiting months before establishing a video connection is not an option. While compute and storage resources are already available for on-demand consumption, and can be made ready for use within minutes or even seconds of notice, managed connectivity between the user and the compute/storage resources cannot be delivered instantly due to the reasons stated above. As a result – if managed connectivity was not made available in advance, the applications resort to the use of the public internet, which on one hand offers always-on any-to-any connectivity, but on the other hand offers no effective measures to manage the connectivity and guarantee performance.

Opportunity:

If we were able to guarantee quality of the end-to-end service, through management of each individual segment in the overall path, we could create an eco-system where all parties involved could benefit: The user will experience better quality services for which they will be willing (or forced) to pay. The ICT service providers will be able to charge for the use of their segments, provided that they manage and guarantee the quality and performance of their respective segment.

Why Distributed Ledger Technology?

ICT SPs operate in an equal-level playing field. There is no top-level administration that controls other administrations. Each ICT SP (administration) manages its own platforms as a “silo” using its own management system. No one will be willing to allow other administrations to administer their resources and services.

This creates a challenge when it comes to managing information flows across a chain of distributed administrations that have no hierarchy. That is where blockchain can play a role as a trusted mechanism to convey and manage information in a distributed environment. The fact that the information is owned by everyone and all nodes are at an equal hierarchical level makes it possible for administrations to exchange information related to services, and blockchain can then ensure integrity of the information across those multiple administrations.

The PoC has demonstrated how Quote, Order, Invoice, Reconciliation and Settlement information is exchanged across a chain of ICT SPs with timelines down to seconds on a per-pair of SPs basis, and minutes on a multi-SP environment.

Section 2: Current process

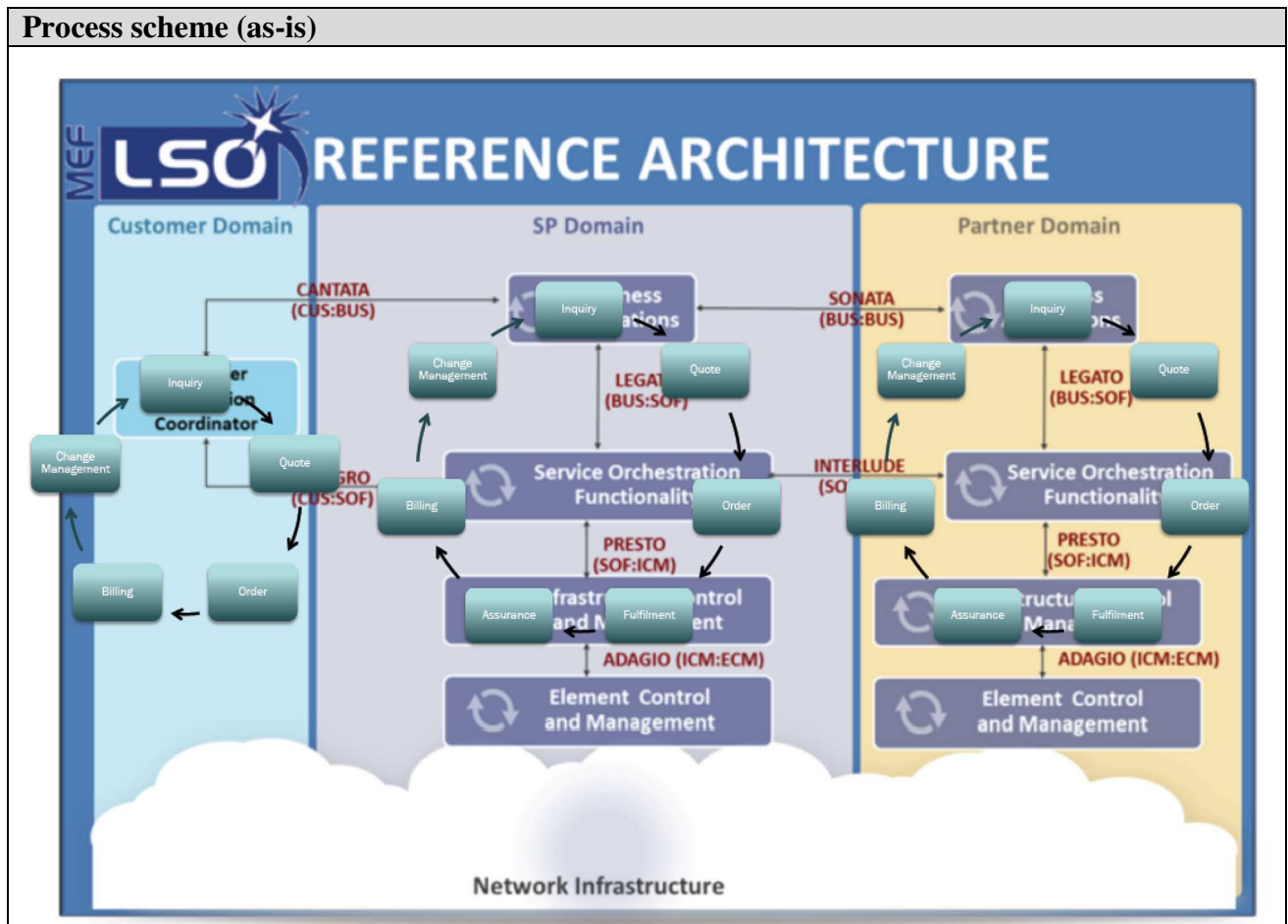
Current Solutions

Today there is no system offering end-to-end automation. There are automation platforms in existence that automate some (or all) of the lifecycle of services within a single administration, but each is confined to the limits of its own administration.

Existing Flow (as-is)

Step	User Actions	System (administration) Actions
1.	Make an Inquiry with an administration about availability and cost of a certain Service. User may send the same inquiry to multiple potential supplier administrations.	Manual processing of request. Analysis of the elements. Design a solution. Obtain cost of the solution-elements, including on-net (offered within the administration) and off-net (obtained from other administrations). Off-net inquiries trigger the same process with the downstream administration which may trigger additional processes with additional downstream administrations. The end result is that (if a solution is found and available) a Quote is returned to the User. This quote may include off-net quotes obtained from downstream administrations and may include mark-up of such quotes.
2.	Place an Order with the supplier administration.	Receive Order, send on-net elements of the order to provisioning, place order(s) for off-net elements with other administration(s). Those orders, once received by those other administration(s) may trigger additional orders with additional downstream administrations. Once the service has been provisioned and tested end to end it is handed-over to the user.
3.	Pay invoice on pre-agreed intervals (excluding SLA remedies)	Generate invoice on pre-agreed intervals based on agreement. Deduct SLA remedies if applicable. Pay invoices received from downstream administrations.

Existing Flow (as-is)		
Step	User Actions	System (administration) Actions
4.	Request termination of service from supplier administration (may be subject to term commitments).	Receive request for termination. Terminate on-net elements of service. Send termination requests to downstream suppliers for the off-net elements of service. The downstream supplier may then send termination requests to additional downstream suppliers. Off-net termination requests are subject to term commitments which do not necessarily correspond to the term commitment for the service ordered by the User.



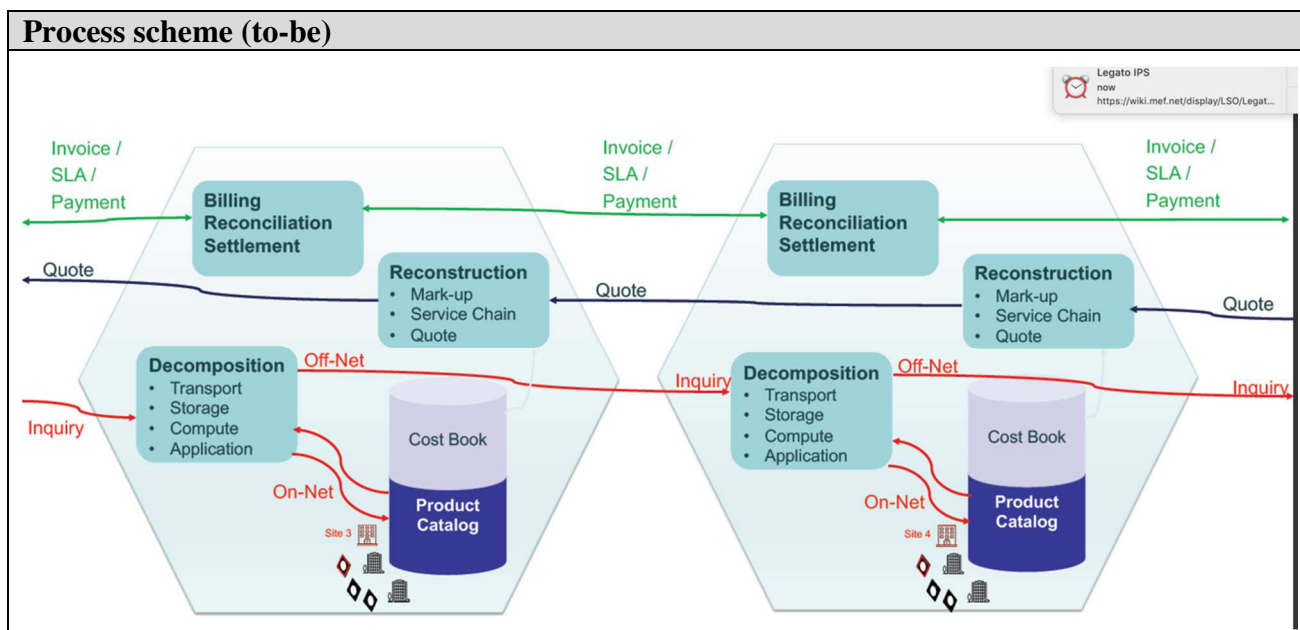
Data and information (as-is)		
Data	Type	Description
1	Documents	Cost books (Excel, PDF, on-line). Order forms (Excel, Fax, on-line). Invoices (PDF, on-line). Solution diagrams (Visio, PPT). Inventory management (on-line, Excel)
2	Payment transactions	Manual processing of invoices (that are generated automatically or semi-automatically)

Participants and their roles (as-is)		
Actor	Type/Role	Description
1	<i>Users</i>	An individual, and SME, a large enterprise, a Telecom carrier, Governments, Universities and any other entity that may buy ICT services from Administrations that supply ICT services.
2	<i>Administrations</i>	Entities that provide and sell ICT services.

Other Notes
<i>Any assumptions, issues</i>

Section 3: Expected process

Expected Flow (to-be)		
Step	User Actions	System Actions
1.a	Request a Quote for on-demand (Immediate or Delayed activation. No term commitment) using a portal	Automatic parsing of the requirement (possibly using an intent-based parser). Automatic quoting of on-net elements based on a product/service catalogue. Automatic request of a quote for off-net elements from downstream administrations. Return quote to user if end-to-end solution is found.
1.b	Activate an app based on a pre-existing rate schedule for on-demand services without term commitments.	Detect activation of app and initiate activation of services to support the app. Request activation of off-net elements from downstream administrations.
2.a	Request Activation of service based on Quote received.	Initiate activation of services to support the order. Request activation of off-net elements from downstream administrations.
2.b	(n/a)	
3.a	Request termination of service	Automatically terminate service and send termination requests to downstream administrations. Initiate invoicing for service based on commercial terms and measured usage (time, volume, bandwidth, distance etc.)
3.b	Close app	Automatically turn down the services that supported the app. send termination requests to downstream administrations. Initiate invoicing for service based on commercial terms and measured usage (time, volume, bandwidth, distance etc.)
4.	Pay invoice	Receive payment



Participants and their roles		
Actor	Type/Role	Description
1	Users	An individual, and SME, a large enterprise, a Telecom carrier, Governments, Universities and any other entity that may buy ICT services from Administrations that supply ICT services.
2	Administrations	Entities that provide and sell ICT services.

Data and information		
Data	Type	Description
1	Documents	On-net Catalogues, electronic quotes, electronic orders, SLA
2	Payment transactions	Blockchain based (may use crypto currency or FIAT currency)

Security and privacy	
<ol style="list-style-type: none"> 1. Based on a Permissioned ledger. 2. Each pair of administrations runs a bilateral blockchain session. 3. Shared ledger used for failover, ZKP and reputation 	

Main Success Scenario + expected time line
PoC successfully presented at MEF18 event in October 2018.
On-going standardization work initiated at MEF.

Conditions (pre- or post-)
<ol style="list-style-type: none"> 1. Requires agreement of all involved parties on common Service definitions, Common Information and Data models and a common Process.

2. Plenty of Standardization work is still ahead of us.

Performance needs

The solution is based on off-the-shelf servers such as those offered by public cloud providers.

Legal considerations

This is automation of an existing process so there are no legal complexities that have not already been solved.

Governance of the code, ledger membership and IP rights requires agreement between participating administrations.

Risks

Not that I can think of.

Special Requirements

See “Conditions” above

External References and Miscellaneous

MEF 6.2, MEF 7.4, MEF MCM, MEF 50.1, MEF 55, ONF TAPI

Other Notes