MEF

# Business Opportunities from Billing and Settlement of Digital Services using DLT

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# 1 Abstract

This White Paper explains how Information and Communications Technology Service Providers (ICT-SP) or simply '**Service Providers**' including telecoms companies, MSOs, cloud providers, 5G operators and IoT operators, can achieve immediate major commercial and operational benefits by utilizing Distributed Ledger Technology (DLT) within their commercial and operational frameworks.

This document also introduces the term **'Bilateral'** to describe the combination of Master Services Agreement defining the commercial relationship, the resulting commercial transactions and commercial state between two Service Providers. Furthermore, this document introduces the term **'Smart Bilaterals'** as those Bilaterals that are implemented using a DLT.

Implementation of Smart Bilaterals, in parallel to existing manual or even automated commercial bilateral arrangements without changing existing ERP and other IT systems, is explained together with benefits for Service Providers and example use cases such as Billing and Settlement.

# 2 Introduction

Enterprises throughout all parts of the private, plural[1] and government sectors of the economy are increasingly reliant on an ever-increasing range of digital applications for their business success. This has been brought into sharp focus in early 2020 due to the Covid-19 pandemic with the unparalleled shift of large parts of the economy to working from home to support public health social distancing measures while maintaining business activity. This has resulted in enterprises increasingly outsourcing the supply of their data services to trusted ICT-SP (Information and Communications Technology Service Providers – **Service Provider** for short) such as telecommunications carriers, mobile service operators (MSOs), mobile network operators (MNO), cloud providers, data centre operators.

Data services, especially for large and international enterprise customers, can rarely be supplied by one Service Provider. Instead, the trusted Service Provider offering data services to their enterprise customers will in turn need to outsource elements of the data service to their trusted wholesale provider partners. Outsourcing to wholesale provider partners translates into commerce including billing and settlement with those partners, typically across multiple geographies and jurisdictions.

As the volume of bilateral commerce with each wholesale partner grows, and the number of wholesale provider partners of a given service provider steadily increases, billing and settlement of

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[1] https://ssir.org/articles/entry/time_for_the_plural_sector

increasingly complex and shorter duration services will become a significant barrier to growing business for many Service Providers.

While data services are the current main driver of this digital transformation, it is not the only such digital service. The 'as a Service' or XaaS sector is rapidly growing, whether it is software (SaaS), platforms (PaaS), infrastructure (IaaS) or functional components such as security, that are delivered in ever more short-lived, virtualized and functionally segmented forms. And most of those services are commercially realized through bilateral relationships between a Buyer and a Seller.

This White Paper lays out the opportunity for using DLT to transform bilateral commerce between Service Providers into scalable, cost effective, and secure digital services.



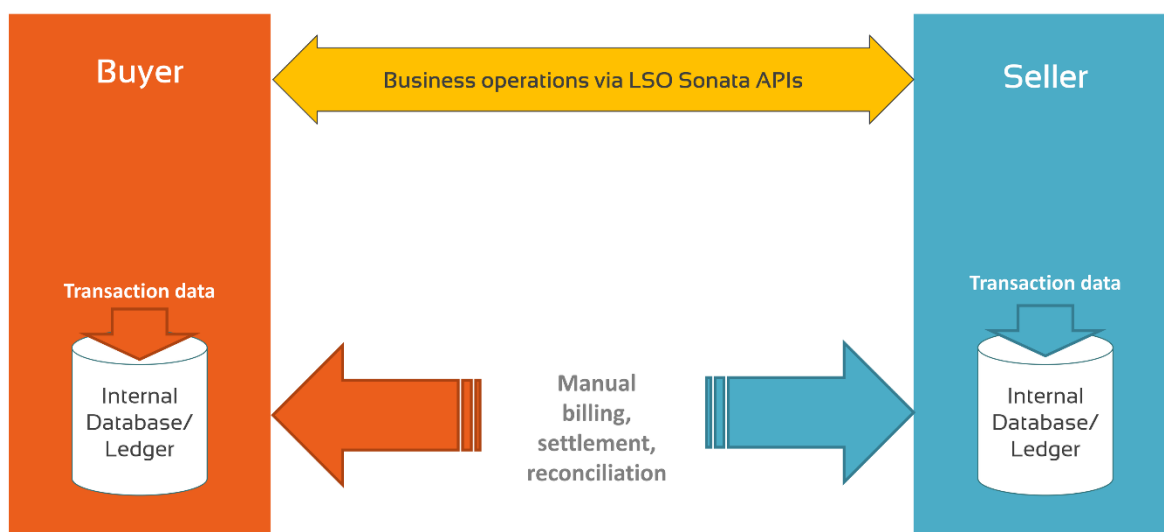Figure 1: Legacy Bilateral

## 3 Smart Bilaterals

Service providers spend hundreds of millions of dollars on ERP, CRM and other internal systems which are used, among other things, for external-facing commercial transactions (e.g., reconciliation,

settlement, invoicing) with Service Provider partners. Because these internal systems are typically not synchronized between Service Providers, there is considerable inefficiency, disruption, and waste in the commerce between Buyers and Sellers: disputes, lost inventory, inflated capital costs, regulatory actions, etc. This inefficiency can be mitigated by creating a common frame of reference for commercial transactions between two Service Providers for both communications (common language) and state (common understanding). Until now, this was achievable only for a common communications frame of reference and by investing in expensive bilateral integrations such as ERP connected EDI systems utilizing MPLS connections; the state of a commercial relationship is still managed individually on each side of the relationship. However, such integrations have not been practical for most Service Providers both because of high cost and the long integration times required.

In this document, we introduce the generic term **'Bilateral'** to collectively refer to the commercial relationship, transactions and state shared by Buyers and Sellers of digital services. As described above, the current generation of Bilaterals is based heavily on manual processes and/or expensive integrations between Service Providers that will not be suitable for the rapidly growing market of data services transacted between Service Providers.

Now, however, recent major advances in cryptography, messaging, and DLT (Distributed Ledger Technology)[2] make it possible to cost-effectively and dynamically deliver a secure and private common state frame of reference for Buyers and Sellers in addition to a common communications frame of reference. DLT can be used to achieve state synchronization between two or more Service Providers by establishing a shared state or ledger. In other words, Bilaterals can be efficiently implemented using DLTs. We refer to such Bilaterals as '**Smart Bilaterals**'.

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[2] Distributed Ledger Technology or DLT is a digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time. Unlike traditional databases, distributed ledgers have no central data store or administration functionality.
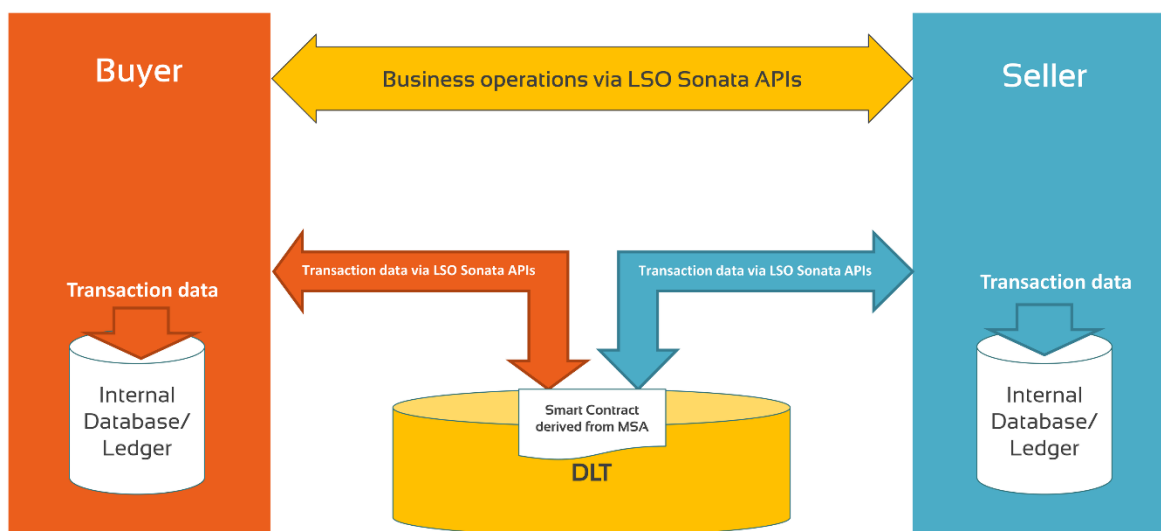
**Figure 2: Smart Bilateral**

# 4 Benefits of Smart Bilaterals

The benefits for Service Providers of using Smart Bilaterals fall into two main categories – cost reduction and enablement of new revenue streams.

## 4.1 Cost Reduction

A significant part of the cost of transacting digital services between Service Providers is the result of errors and associated additional overhead to correct those errors. For data services, the main digital services use case, errors happen mainly during the billing and settlement process and are introduced during rating and invoicing by the Seller, and the overhead for both the Buyer and the Seller occurs in the reconciliation and settlement of disputed invoices.

Errors introduced by the Seller during invoicing may be as simple as Buyer details. More often, rates and discounts might have been applied incorrectly, or the data such as when the service was actually available or failed or was terminated might have been recorded incorrectly and the amount and tax charged for the service might be incorrect.

This can trigger a dispute process by the Buyer with considerable back and forth with the Seller to clarify aspects of the calculations or to correct Buyer details. The Buyer may also have recorded payment details incorrectly within their own ERP system resulting in additional communications by the Seller to follow up on late payments.

Moreover, because the overhead of settlement can be high, the frequency of settlement can be low (e.g., monthly) reducing revenue cash flows for the Seller.

In a Smart Bilateral, all the relevant information from the Master Service Agreement between the Buyer and Seller is encoded in software in the Smart Bilateral which is visible simultaneously to both Buyer and Seller. The Smart Bilateral which is a system of so-called Smart Contracts, is itself instantiated on a DLT network. When commercial and operational information is recorded by the Buyer and Seller on the Smart Bilateral (state change), the Smart Contract system on the DLT automatically and immediately executes actions as defined in the MSA including generation of invoices. Because rates, discounts and other terms and conditions have already been encoded, the resulting invoice is far less likely, if at all, to have errors. Also, once the service data is "recorded"[3] on the Smart Bilateral by either party, it is immutable and therefore cannot be repudiated. This increases the level of trust between the contracting parties and reduces disputes and associated costs.

Smart Bilaterals provide transparency of Order/Service/Billing status for a given service. Therefore, because the Buyer can see the information recorded by the Seller on the service start, end and other attributes immediately on the Smart Bilateral, notifications will be received immediately by the Buyer and compared with their own understanding of how the service is performing. Disputes over data can then be generated automatically in accordance with the requirements of the Buyer.

Smart Bilaterals also help prevent "double spend/commit" on resources thereby reducing the cost of accidental over-commit of resources required for a contracted service, and similarly increasing the efficient use of resources.

As invoices are generated immediately, payment or credits can be automated according to the MSA by the Smart Bilateral. This in turn can be used to automate and extend commercial Netting between the Service Providers.

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[3] Note that recording of service data does not mean that all the service data is stored on the DLT. Quite on the contrary, typically only the cryptographic fingerprint of the service data known as a cryptographic hash is stored in the Smart Bilateral to improve scalability and avoid data redundancy.

## 4.2 New Revenue Streams

The use of Smart Bilaterals between Service Providers not only reduces costs, but perhaps more importantly, enables new revenue streams for those Service Providers that are not possible when their commercial interactions for service transactions are slow, cumbersome, and inefficient.

Smart Bilaterals will cost-effectively support very high volumes of transactions for short-lived services which are increasingly important in the era of Bandwidth on Demand, IoT, NFV/5G, Slicing etc.

The use of Smart Bilaterals also means that more attributes of a service can be monetized – something that would not be worthwhile or feasible with manual processes, in particular, for billing and settlement. Examples of such attributes could be Classes of Service, service features such as security functions as well as reporting on application policy compliance.

# 5 Implementing Smart Bilaterals

There are roughly 3000 Service Providers worldwide each using a BSS/OSS, ERP, and CRM of some sort. Some are home grown, others are outsourced, and some are a mix of both. Such platforms are typically extremely complex and based on multiple sub-platforms with high levels of integration and interdependence. It is therefore critically important for Service Providers to understand how they can implement Smart Bilaterals without disruption to their current platforms and without risking revenues and business relationships. This topic is too complex to cover in detail in this document, but the following topic areas highlight the first areas of discussion for Service Providers considering the usage of Smart Bilaterals.

## 5.1 Distributed Ledger

Smart Bilaterals are logical abstractions and are implemented using software constructs called Smart Contracts which are executed on DLTs. DLTs have multiple nodes and utilize consensus between those nodes and cryptography to ensure immutability and non-repudiability of transactions and double-spend protection of assets represented on a DLT. These characteristics are critical for increasing system security while reducing the need to rely on the level of system security of the business partner in the Smart Bilateral. In other words, Smart Bilaterals 'connect' between only two parties but are implemented on DLTs together with other Smart Bilaterals between Service Providers.

Choosing the specific DLT and its implementation requires care. For a permissioned DLT implementation, for example, a consortium of business partners is required to ensure the close coordination for its implementation of operating standards. A good example of this is the work of the

Communication Business Automation Network (CBAN)[4]. While choosing a public DLT as the underlying DLT for a Smart Bilateral reduces operating costs and typically has higher security guarantees than permissioned DLT implementations, great care must be taken to understand its exact operating conditions and associated security and privacy guarantees before implementing a Smart Bilateral. An example of such an effort is the Baseline Protocol[5].

Once the DLT has been selected, the implementation of a Smart Bilateral requires planning together with the participants in a Service Provider's Bilateral to align the impacted stakeholders across the two organizations. Even though data shared on one Smart Bilateral is not visible to other parties, the more business processes that are standardized the easier it becomes to implement and onboard additional business partners – in a similar fashion to that applying to ERP and CRM systems.

The key stakeholders that need to be involved in the implementation of a Smart Bilateral are Legal and Compliance, Finance, IT, and the business units providing or consuming the digital services represented on the Smart Bilateral. Apart from choosing the right DLT, the two most important implementation considerations are translating existing legal commercial agreements into code and integrating Smart Bilaterals into existing system architectures. We address both topics and how one can determine the resulting positive business impact in the next three subsections.

## 5.2 Master Service Agreement and Smart Contracts

The bilateral commercial relationship between Service Providers is governed by a legal contract (Master Services Agreement or MSA) that defines the general terms and conditions governing the entire scope of services between the two parties to the agreement.

Functional parts of the MSA need to be encoded in the Smart Bilateral through one or more Smart Contracts on the chosen DLT. Such Smart Contracts need to be reviewed and tested for accuracy by the legal departments of the respective Service Providers. This is feasible but the MSA and its translation need to be jointly understood by the participating Legal department(s) and the implementing developers in more detail and appropriately planned for. It is recommended that functional DLT experts with a proper business and/or legal background help in the translation exercise between Legal and Implementers to avoid costly "translation mistakes".

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[4] https://www.cban.net

[5] https://docs.baseline-protocol.org/

## 5.3 Smart Bilaterals integrated with APIs

APIs are typically used to communicate information directly between two Service Providers (e.g., ordering information). For example, MEF has defined a range of pre-Order and Ordering APIs at LSO Sonata for this purpose. DLTs, on the other hand, are used to synchronize the states between two or more Service Providers in a trusted and secure way. Already standardized or new APIs can be used together with Smart Bilaterals to enable simultaneous communication of information between Buyers and Sellers and real-time access to a shared System of Record with an audit trail which cannot be repudiated. This allows other Systems of Record related to the Bilateral such as an ERP system to synchronize their state to the shared state of the Smart Bilateral.

Smart Bilaterals can be integrated with existing APIs in one of two ways:

1.  Use of Smart Bilaterals to generate cryptographic proofs of synchronized state and proof of correct commercial state update to augment existing APIs that enable the real-time synchronization of the respective Systems of Record of two transacting Service Providers

2.  Smart Bilaterals used to externalize specific existing internal Service Provider functionality into a common Transaction System and System of Record shared by two transacting Providers.

Each approach has its advantages and disadvantages which need to be discussed and understood to plan for Smart Bilateral implementations. In either case though, it should be noted that existing APIs – such as the LSO Sonata APIs – can be used with DLTs with only *minor additions* to existing API data models.

## 5.4 Smart Bilateral Validation

Each Service Provider has its working solution for billing and settlement based on existing ERP and CRM systems. Service Providers planning to implement Smart Bilaterals should continue to use their existing platforms in parallel to the additional DLT-based system by dividing their transaction volume between both systems. In addition, the Service Provider should regularly compare the billing and settlement KPI results between its existing systems and the DLT-based system running in parallel. Once the results of the comparison show both an improvement in KPIs and the correctness of results, the Service Provider can plan for a full switchover to a '100%' Smart Bilateral.
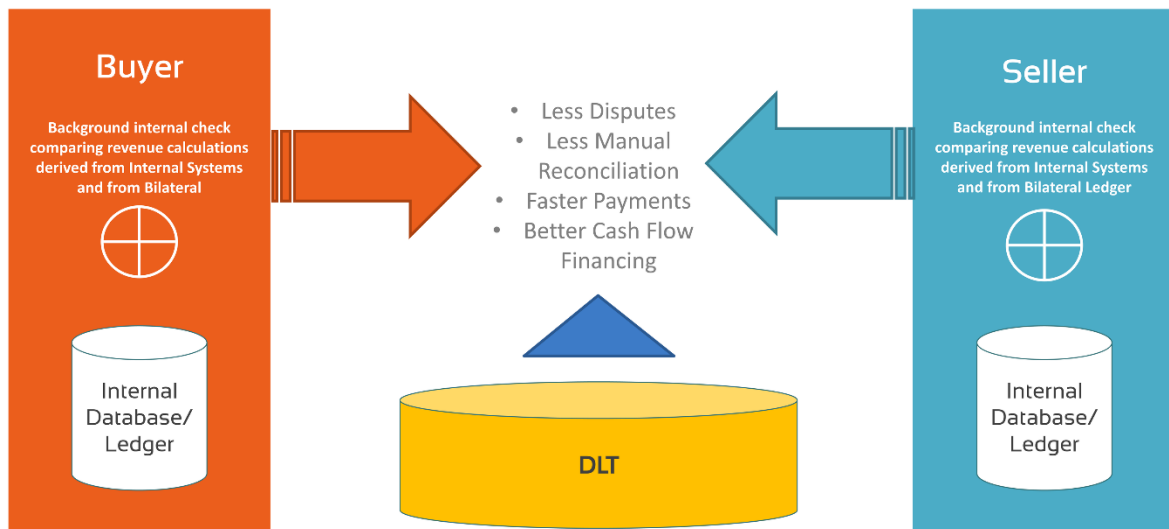
**Figure 3: Smart Bilateral compared to Legacy Bilateral**

# 6 Use Cases

## 6.1 SD-WAN and IP Access

SD-WAN is becoming an increasingly popular solution for enterprises that must have their employees operate outside enterprise branches and campus environments. As a result, many Service Providers are now offering managed SD-WAN services to enterprises. This often includes the Service Provider buying from small to medium wholesale partners IP broadband or Dedicated Internet Access last mile IP services on behalf of their enterprise customers to support effective and secure deployment of SD-WAN services to distributed workforces.

Commerce between the Service Provider and wholesale IP access partners ultimately involves billing and settlement on an increasingly large scale. Today, however, most wholesale partners use manual methods to generate invoices and Service Providers primarily use manual methods to review, reconcile and sometimes dispute those invoices.

## 6.2 Bandwidth-on-Demand

Elasticity of bandwidth of connectivity services is becoming an increasingly important feature for many service providers and datacenter providers. The ability to increase and decrease the bandwidth of a connectivity service requires dynamic billing and settlement systems.

Smart Bilaterals provide that required dynamism that is difficult to achieve with manual synchronization between Service Providers on 'standard' Bilaterals.

## 6.3 Invoice Discounting/Cash Flow Financing

Working capital is one of the most important metrics of a Service Provider. Given that Buyers are pushing for longer and longer terms on invoices, Sellers are often asked to operate like a bank, even though the loan terms extended to Buyers amount to interest free loans out of the Seller's cash flow. To mitigate cash flow challenges, Sellers have traditionally used invoice discounting methods (also known as cash flow financing and factoring). These are cumbersome, invasive for a Seller's customers, and expensive since resulting loans are given typically based upon the prime rate. Larger businesses such GE, John Deer, Merck, or Goldman Sachs do not have to go this route, because they can access significantly cheaper loans in the overnight paper market where rates are based off the interest rate banks charge each other (LIBOR) rather than the prime rate used in factoring. LIBOR

versus prime rate translates into a significant cost saving of hundreds of basis points for these businesses. This approach, however, requires acceptable collateral.

Smart Bilaterals can provide that acceptable collateral. Invoices generated on Smart Bilaterals have very low or even zero levels of error. They are based on non-repudiable data between two commercial partners with a non-repudiable payment history. Hence, they form a very robust form of collateral to back structured financial products such as repos. This allows Sellers that utilize Smart Bilaterals to obtain very low interest rate loans through, for example, the overnight paper market either individually or within a financing consortium. Smart Bilaterals therefore can improve a business' critical cash position and smooth out cash flow fluctuations.

## 7 Summary

Service Providers can immediately introduce Smart Bilaterals using DLT with any Service Provider partner with whom they already have an MSA in place. They can use the Smart Bilateral to improve the efficiency of any step in the service lifecycle.

Introduction of Smart Bilaterals allows the streamlining of commercial transactions between partners – especially billing and settlement – to reduce costs and enable new revenue-generating services without requiring changes to existing ERP systems.

Smart Bilaterals will be essential for commerce for rapidly emerging highly automated, complex, high volume and/or mission-critical data services as evidenced in use cases such as SD-WAN and bandwidth-on-demand connectivity.

## 8 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.

# 9 Acknowledgements

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