COMMUNICATIONS BUSINESS

CBAN

AUTOMATION NETWORK

Working Draft

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MVP Definition International Voice

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This draft represents CBAN work in progress and is subject to change.

Disclaimer

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1 Abstract

International ICT-SPs have been exchanging voice traffic for many years. While the underlying network technologies have evolved over time, from traditional TDM networks to more flexible SIP-based VoIP interconnections, the billing and settlement process among ICT-SPs remains largely unchanged. By using Distributed Ledger Technology (DLT) as a "single source of truth", ICT-SPs can increase transparency of voice traffic termination. The timely exchange of information in a trusted environment can reduce the manual effort ICT-SPs spend on handling disputes. Furthermore, blockchain provides a trusted data source to verify ICT-SP network origination and destination, which are not easily available in current environment. Such information can help reduce fraudulent traffic and streamline the settlement of disputes. This document describes the current inter-ICT-SP settlement issues, while outlining high-level functional requirements for the Minimum Viable Product (MVP) that can provide the desired benefit to the ICT-SP communities.

2 Terminology and Abbreviations

Term	Description	Notes
Business Sub System (BSS)	Systems involved in the Business processes as: billing, rating, reporting, etc.	sometimes also known as the "Business Support System", although it's the same definition and the same acronym.
Calling Line Identity (CLI)	The calling party phone number	
Carriers	A provider of wholesale communication services	Define as distinct from "Carrier"
ICT-SP	Information and Communications Technology Service Provider	May include carriers, operators, cloud providers, and more.
Communications Blockchain Network (CBAN)		

Term	Description	Notes
Contract attributes	Specific items of contract data. e.g. The rate for international premium rate termination in Belgium for Proximus.	
Contract data	The set of data which fully describes the contractual relationship between two parties on the CBAN.	This includes data relating to ICT-SP contact details and bank accounts, number plans and rates.
Contract metadata	Synonymous with 'Contract attributes'	
Call Detail Record (CDR)	Official record of call transactions	
Digital fingerprint	Message digest, the output of a one-way function when applied to a stream of data.	
Distributed Ledger Technology (DLT)		Examples include Corda, Ethereum, Hyperledger, and ORBS.
E.164 format	International standard format of phone number representation that includes a leading "+" character before the country code.	Reference: https://en.wikipedia.org/wiki/E.164
EEA	European Economic Area (EEA)	The General Data Protection Regulation (EU) 2016/679 (GDPR) is a regulation in EU law on data protection and privacy for all individual citizens of the European Union (EU) and the European Economic Area (EEA). It also addresses the transfer of personal data outside the EU and EEA areas.

Term	Description	Notes
FAS	False Answer Supervision. Type of fraud that involves ICT-SP answering calls to start billing prior to the call being answered by the intended called party.	
GDPR	The GDPR is a European Union regulation on data protection and privacy that was implemented in May 2018 and marked a significant evolution in data protection law in Europe. There are similar laws that are either implemented or in the process to become mainstream. These laws are important to ensure the personal data of an individual is not used for any unwanted purpose and empower the user to practise "right to be forgotten".	While the GDPR governs how personal data relating to individuals inside the European Economic Area (the EEA) may be processed, it also has a wide-ranging extra-territorial application. The GDPR applies first and foremost to entities that are processing personal data in the context of a European establishment, regardless of whether or not the processing takes place in the EEA. Additionally, the GDPR can also apply to entities established outside the EEA that are offering goods or services to (or monitoring the behaviour of) individuals in the EEA. GDPR might also require "Pruning"
Numbering Plan	A Number Plan is a grouping of destinations and the dialed digits associated and attributes with these destinations. IN the case of international voice ICT-SPs typically define their view of a number plan for routing traffic and selling termination.	
Operator		Define as distinct from "Carrier"
Origin Based Rating (OBR)	Rating of international voice calls based on where the call originates. For example, a	

Term	Description	Notes
	call originated from within the EU has different rates from call originated from outside the EU.	
OSS/BSS	Operations support system/business support system. Typically, a range of systems that are used collectively to support operators in delivering telecommunications services.	
PAI	P-Asserted Identity (SIP header)	The P-Asserted-Identity header field is used among trusted SIP entities (typically intermediaries) to carry the identity of the user sending a SIP message as it was verified by authentication.
Payment	Transfer of monetary funds from payer to payee. A payment may cover multiple Services or products.	
Personal Data	In relation to the GDPR, personal data is any information relating to an identified or identifiable natural person. It includes names, addresses, identification numbers, location data, and IP addresses.	The GDPR also sets out special categories of personal data subject to stricter regulation. This category includes personal data revealing racial or ethnic origins, political opinions, religious beliefs, and health data. In case of CBAN the personal data for Inter-ICT-SP Settlement use case will be the A & the B Numbers.
PII	Personally identifiable information (PII), or sensitive personal information (SPI), as used in information security and privacy laws, is information that can be used on its own or with other information to identify, contact, or locate a single person, or to identify an individual in context.	The abbreviation PII is widely accepted in the U.S. context, but the phrase it abbreviates has four common variants based on personal / personally, and identifiable / identifying. Not all are equivalent, and for legal purposes the effective definitions vary depending on the jurisdiction and the purposes for which the term is being used.

Term	Description	Notes
		The voice MVP when applicable has explicitly called out any PII it needs to operate.
Pruning	The process of deleting historical blocks on the Blockchain that pre-date a certain point in time.	Maybe we should clarify if archiving nodes are required (for example "Pillar" nodes) or if we should not allow them at all (GDPR requiremen for pruning?)
RURI	Request URI (Uniform Resource Identifier) field of the SIP protocol.	
Settlement	The process of analyzing the amount a Payer is invoiced by the Payee, comparing the resource usage and the monetary amounts associated with use of the resource as per commercial agreement, identifying the differences between the Payee's records and calculations to those of the payer. The differences may be settled either automatically or manually through algorithms.	
Shortstopping	International calls intercepted by downstream ICT-SPs and failed to terminate to intended destination. Calls are fraudulently answered to incur expense for upstream ICT-SPs.	
TDM (Time Division Multiplexing)	The legacy telephony technology using switched service to provide call processing and routing.	
SIP (Session Initiation Protocol)	(SIP) is a signaling protocol used for initiating, maintaining, modifying and terminating real-time sessions that involve video,	

Term	Description	Notes
	voice, messaging and other communications applications and services between two or more endpoints on IP networks.	
VoIP	Voice over IP	

134

135 **Table 1 – Terminology and Abbreviations**

136

3   Business Overview

The billing and settlement for voice calls that involve multiple telecoms ICT-SPs (e.g., those that involve a subscriber of one ICT-SP calling a subscriber of another ICT-SP) by its nature requires a process that spans multiple business entities: at a minimum the ICT-SPs involved, and perhaps a third party who acts as an intermediary or clearing house.

For example, in an end-to-end international call, many parties are involved: a call is originated by the *Origin-Operator* and transits through one or more ICT-SPs up to the final *Destination-Operator*. In such a chain for an end-to-end call, each operator and/or ICT-SP in the path deploys its own voice network equipment and BSS to manage the traffic and business processes. Not only that, but the network components and BSS often come from a variety of different vendors, resulting in a variety of formats for the data (generally CDRs) used for the billing and settlement across the chain of providers. These formats, and conventions for measurement, often produce records of the same call that do not immediately and obviously align, requiring some sort of reconciliation process to verify that they are indeed describing the same call.

Many elements of this process are already automated, but significant human intervention is still frequently required, especially in the management of exceptions and reconciliation of errors and disputes. In some extreme, but not uncommon, cases, those disputes can result in legal action.

4   Pain Points

Service providers in the international voice market are impacted by several issues, including the need to detect fraudulent use of voice services, verification of Caller Line Identity (CLI), and the highly manual settlement process and the resolution of billing disputes with partners.

New legal mandates, notably Origin Based Routing, also increase the complexity of the pricing, rating, and billing processes, and can also create new opportunities for the fraud.

These issues and their impacts are detailed below.

4.1   No Single Source of Truth

There is no single source of truth as each switch, each OSS/BSS system or each user captures the pricing, contract or transaction details as they see it leading to discrepancies in enforcement, which in turn, can lead to settlement differences that may prolong the settlement processes.

4.2   Length of Time to Settle

Even when automated, the overall reconciliation and settlement process involves multiple disparate steps and a general lag in payment and final settlement (a lag which is only increased by disputes and litigation). Even without disputes, the delay in settlement can result in corresponding delays in discounts and rebates that often result in de facto "interest-free loans" between ICT-SPs. Furthermore, even if the ICT-SPs agree on the dispute, the resulting modification is time consuming and involves lots of rework.

4.3   Differences in CDR Data and Formats

CDRs are generated by equipment and systems from a variety of manufacturers and providers and their formats are not standardised. Moreover, even if the format is apparently consistent between two manufacturers, the data in each field of the CDR can still differ in the following ways:

- **Time Stamp:** each ICT-SP uses the most convenient time zone for them, which means they are not consistent. The operators normally use their local time zone and ICT-SPs use UTC or a common regional time zone.

- **Clock Sync:** the clocks of an ICT-SP's voice network are not necessarily synchronised, so the time stamps for calls may have inconsistencies.

- **A-number:** Although the i3forum has published recommendations for correctly forming SIP headers and rules stipulating that "A-Numbers" have to be used to avoid billing problems, not all operators and ICT-SPs follow this guidance. Additionally, some parties use the E164 format while others do not, resulting in problems for CDR comparison.

- **B-number:** Even though this field/number is the most common used to route the call and terminate it, and is normally provided in the E164 format, sometimes it is still presented in the national format, with prefix, truncated by system problems, etc.

- **Call Duration:** the recorded duration of the same call can differ between parties due to different rounding methods applied by each or simply due to the delay in ending the call during signalling process. Also, it can be caused by network problems during the call or fraud cases such as FAS.

4.4   Fraud Schemes, Detection, and Mitigation

The industry is faced with a variety fraud challenges and there is every reason to expect that new ones will be devised or attempted. While the various fraud schemes are different, many of them have common themes of deceiving operators and ICT-SPs at their points of interface. Currently, calls are passed from one ICT-SP to the next without transparency, and CDRs only indicate the immediate upstream and downstream ICT-SP.
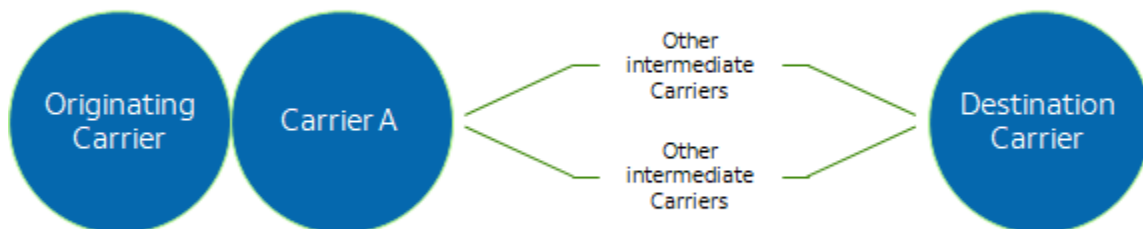
200 **Figure 1: Typical Call Path**

201 This situation enables fraud schemes, such as the following:

202 • Fraudulent calls are often "short stopped" by intermediate ICT-SPs and do not reach their
203 intended destinations.

204 • Smart FAS: calls are recorded and one part of the message is replayed after the B-party is
205 disconnected and the A-party is still in the line and charged, hearing the previous conver-
206 sation. Manipulations of different call duration need to be resolved.

207 The shared and trusted truth provided by a DLT solution has the potential to eliminate many of
208 these fraud attack vectors. DLT could provide transparency in combating fraud of this nature
209 through:

210 • Verification that the call was indeed terminated by the destination ICT-SP without inter-
211 ference.

212 • Verification of agreed call duration.

213 • Automated dispute process when discrepancies or fraud symptoms are detected.

214 Challenges that would need to be addressed include:

215 • Providing transparency without exposing downstream ICT-SP's commercial details.

216 • Fraud mitigation requires CDR level details and increase the volume of transactions in
217 CBAN.

218 • Persuading the destination ICT-SP(s) to participate in the CBAN

4.5 CLI verification

220 When ICT-SPs exchange voice traffic, the assumption is that the CLI will be passed along un-
221 changed to the destination recipient. In reality, a portion of the international voice traffic either
222 does not carry CLI, or contains modified CLI. There are many reasons why CLI verification is
223 important:

224 • **Originating region verification:** in Europe, many ICT-SPs have instituted origin-based
225 rating (see below). For example, a call originated from within the European Union (EU) is
226 charged a rate that is different from a call originated outside the EU. Verification of the
227 CLI is therefore important to ensure the correct rate is applied for the traffic.

228 • **Spam calls:** many spammed calls involve an originator from outside the country. Very
229 often, the spammer will mask the CLI with a local number in the target country to entice
230 the recipient to answer the call. Detecting and verifying that the call has the same CLI at
231 the originating and terminating end will help combat spam calls.

232   •   **Service Assurance:** roaming calls carry CLI for the roamer's home country. It is therefore
233   important that the CLI is propagated correctly from one network to another.

4.6   Origin Based Rating

235 Origin-Based Rating is used to conform to mandates such as the European Union's "roam like at
236 home" policy. While popular with subscribers, OBR poses challenges for operators and ICT-SPs,
237 including some opportunities for fraud.

238 OBR affects both the network and billing systems, since the operators and ICT-SPs must develop
239 solutions to analyse a call based on the combination of A-Number and B-Number information and
240 route it to the preferred/lower cost interconnection (ICT-SP). If the A-number is not given in the
241 E.164 format, then the call may be routed through an undesirable interconnection or even blocked.

242 Billing systems required modifications to support generation and reception of price lists and rat-
243 ing/billing for OBR, which increases potential for disputes and can add yet another element of
244 complexity to the comparison of CDRs, the detection of inconsistencies, and the resolution of
245 disputes.

246 The potential for fraud is increased since one participant in the voice supply chain may decide to
247 change the A-Number to avoid paying the surcharge for a specific OBR destination. When the A-
248 number is manipulated, ICT-SPs can check in the Numbering Plan of the country assigned to an
249 operator, but even when it is assigned to an operator, it is difficult to know if the number is assigned
250 to a end-user or enterprise, or if the number has call restrictions.

251 Inconsistencies arising due to OBR being used by one ICT-SP and not by the other could lead to
252 incorrect accruals. In most of the organisations, UBDE (unbilled extract) is booked automatically
253 in financial books from billing systems. And once the invoice is received from the supplier, vari-
254 ance is noticed in the cost due to OBR, which cannot be identified during the reconciliation process
255 and therefore finance teams have to make manual adjustments.

4.7   Dispute Process

257 While the basic initial transfer of data is largely automated, the process of dispute resolution is still
258 largely manual, and thus expensive. Moreover, disputes themselves are extremely common, the
259 resolution processes are long (often lasting months) and labour intensive, and the ICT-SPs them-
260 selves are often operating in an environment of both mutual suspicion and sensitivity to potential
261 fraud. Litigation in these disputes is not uncommon.

262 Tracking of disputes is also quite challenging. Once a dispute is raised and details are sent to
263 partner operators (typically via email), the continuous follow up until the dispute is resolved is
264 very manual and prone to human error and inattention. Unfortunately, the disputed amount con-
265 tinues to be a liability for the company and impacts P&L until a *credit note* is received or the
266 disputed amount is released as a payment to the supplier.

267 In some organisations, fraud is detected by one team, invoice reconciliation is done by another
268 team, and supplier payments are managed by a third team. In this process, from the initial identi-
269 fication of potential fraud case until the case is settled, there are many handshakes and a significant
270 amount of manual work.

271

Process Flow	Time duration
Billing cycle	Monthly (most common cycle) for bilateral Shorter cycle possible for International arrangement
Billing generation & distribution	5th / 6th of Every Month
Bill reconciliation	2-5 Days
Dispute identification & confirmation	15-45 Days
CDR reconciliation process	60-90 Days
Dispute analysis and resolution by partner	Months to Years

Process Artefacts and Issues	Details
Dispute claim form	- Destinations -Volume -Rate -Amount -Reason -Police Report for Fraudulent calls
Result	Blocked receivables and Write-offs in some cases
Overheads	Fraud Analysis, Police reports not accepted by partners

272 **Table 2: Process Flow, Artefacts, and Issues**

273 *Editor Note 1:* *The time duration is based on multiple operator interviews, this may slightly*
274 *vary from operator to operator*

275

276 # 5 Potential Benefits

277 This section provides a summary of the value propositions to the ICT-SPs who will eventually
278 subscribe to the MVP services provided by the technology vendors.

279 - Settlement benefits:

280   o A "single source of truth" between ICT-SPs

281   o Automated billing reconciliation between ICT-SPs

282   o Automated discrepancy management

283   o Reduced dispute activities

284 - Fraud verification and reporting benefits:

285   o Verification of call termination to intended destination

286   o Verification of CLI integrity

287   o Streamlined stop-payment request

288   o Collective blacklist management

289 ## 5.1 Benefits Details

290 While the pain points of the current billing settlement process are many and varied, it is believed
291 that timely exchange of information in a trusted environment will reduce the manual effort ICT-
292 SPs spend on handling disputes. The distributed ledger technology using blockchain provides a
293 trusted data source to verify ICT-SP information and is well positioned to help reduce fraudulent
294 traffic and settlement disputes. Below are the benefits the ICT-SP community would expect to
295 achieve by executing the functional requirements detailed by the international voice MVP.

296 A DLT solution can potentially integrate the entire settlement pipeline from processing call data
297 records (CDRs) through rating and discounting all the way to settlement. The actual settlement
298 could be handled via traditional electronic means (e.g., SWIFT transfers of fiat currencies) or
299 through the use of cryptocurrencies, possibly ones created specifically for the purpose of interICT-
300 SP settlement. It is envisioned that this system will evolve over time.

301 ### 5.1.1 Universal applicability across the ICT-SP ecosystem

302 Billing and settlement processes, including their dispute management solution, are found in many
303 use cases (International voice / Roaming billing and settlement etc..). The DLT solution has the
304 potential to become the international billing and settlement solution across the different use cases
305 by tightly integrating and cooperating with the existing billing and settlement ecosystem, and by
306 providing the additional benefits of an aligned source of truth for contract agreement and CDR
307 information.

5.1.2 Bilateral and multilateral relationships.

A bilateral relationship can be managed between two parties directly, without the need of a neutral, third party referee, although a third party might be required for some trading scenarios. As an evolving step further, the DLT solution may suggest a framework for multilateral relationships (A-B-C-D etc.) with the proper balance of transparency and privacy among trading parties.

5.1.3 Trust-over-SC (smart contracts)

A trust relationship between two parties may be underpinned by the use of smart contracts to process data openly between the parties and resolve most disputes automatically, based on rules negotiated and agreed between the two parties in advance that cover how the most common types of discrepancies are to be resolved. Contract Data written into smart contracts might trigger alerts, notifications, requests etc. automating currently manual processing. The DLT solution could eventually be a single source of truth and should be able to receive, and at a later stage distribute, contract information to the legacy billing and settlement solutions.

5.1.4 Automated settlement pipeline

The DLT solution can potentially integrate the entire settlement pipeline from processing call data records (CDRs) through rating and discounting all the way to settlement, with the actual settlement itself being handled via traditional electronic means (e.g., SWIFT transfers of fiat currencies) or through the use of cryptocurrencies, possibly ones created specifically for the purpose of interICT-SP settlement. CBAN may use hybrid approach to settlements, where it is neither fiat nor crypto, but rather both as a combined solution. Within the CBAN network a settlement token \ coin might be used to speed-up transactions. For money in \ money out transactions (bank-to-bank) traditional rails – international payment providers - still work well.

5.1.5 Fraud mitigation

A DLT solution also has the potential to mitigate fraud, both by preventing it from happening (by detecting and preventing attempted fraudulent calls in real time) and by quickly surfacing misbehaviour which may have occurred as part of the resolution process (a capability which itself should have a deterrent effect).

5.1.6 Transparent privacy across partner chain (A-B-C-D-E model)

International voice traffic goes through a chain of partners (from A to B, from B to C and so on). Although it is important to create transparency that enables visibility of all the participants across the traffic flow, this transparency should be balanced with the need for privacy to respect and protect commercial aspects (e.g. B does not want A and C to see each other). We think this balance between transparency and privacy can be achieved through the use of capabilities offered by DLT.
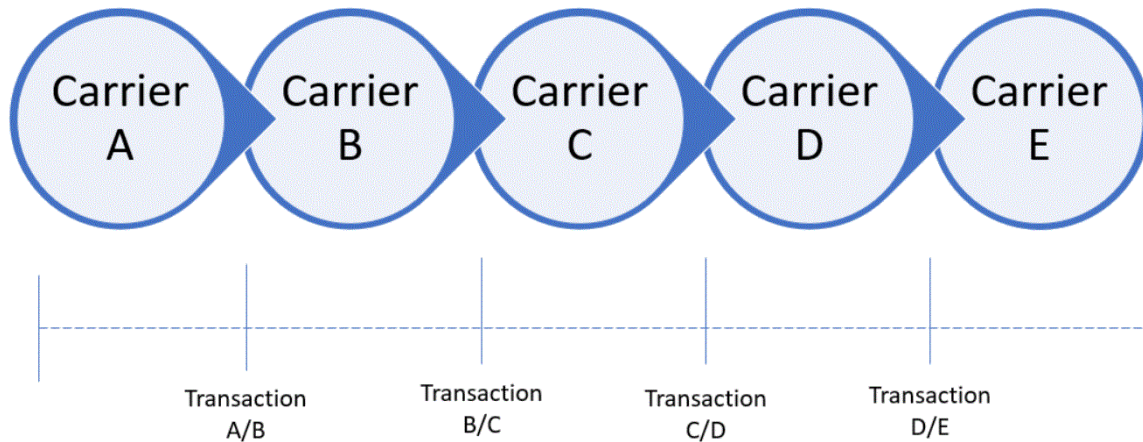
342   **Figure 2: Typical Partner Chain**

5.1.7   Unified CDR format

As already noted, for historical reasons, there is a fair amount of inconsistency across the CDR formats that are currently being used. This inconsistency is found in the CDRs themselves and in the fields that they contain. A unified format with normalised fields would enable better tracking of CDRs throughout the chain of ICT-SPs. Such tracking can help identify fraudulent activity (call stretching, short-stopping / short-transit, other IRSF scenarios), jointly identify issues at the source, and solve disputes faster and even in real time due to:

- The tracking of problems within the records

- The sharing of CDR information across ICT-SPs in the call/event chain

- Full visibility and traceability of the event with single audit Trail

Also, the CBAN can go beyond just CDR format. The DLT solution can help create a Unified CDR (called: 1CDR) for the entire call with a unique call information (A-number, B-Number, Timestamp, duration, etc), which is used by all the parties in the call chain for billing. The 1CDR will resolve most of the dispute cases. A DLT solution based on 1CDR will also facilitate the detection of fraud cases, as previously mentioned.

Even though the traceability of the events provides trust, the full visibility of the parties involved in a call cannot be allowed due confidentiality and business reasons. Each party should be able to see only from whom the call was received and to whom it is delivered, i.e. no end-to-end visibility.

5.1.8   Fewer disputes

The CBAN, envisions a system that brings transparency and a common approach across the ICT-SP community that facilitates discrepancy and fraud identification, as well as settlement and dispute resolution. A common approach, in which a minimum set of agreed data is exchanged (summarized traffic and single CDRs) via the CBAN, will enable verification and initiate reconciliation,

366 fraud identification and discrepancy resolution on the DLT. This will bring structure and speed to
367 a highly manual process and ultimately drive down the number of disputes.

368 # 6 High level Functional Requirements

369 ## 6.1 Production Phases and Minimum Viable Products

370 This document captures the CBAN requirements for international voice; some of those require-
371 ments will be accepted for each release, constituting a Minimum Viable Product (MVP). The first
372 phase will produce MVP1, and subsequent phases will have their own MVPs. Each release is ex-
373 pected to address more requirements and requirements will be added over time, as shown in the
374 graphic below.

375 For example, MVP1 may not include any "Contract" attributes, other than registering the fact of
376 an agreement and possibly holding a copy of the contract documentation digitally signed.

377 It is envisioned that the Phase One MVP (MVP1) will enable:

378 1. Registration of a minimum set of agreed elements from an International Voice Settlement
379   contract agreement between two ICT-SPs needed to support agreed functions, including
380   the signing or storage of a copy of signed of contract documentation for reference.

381 2. Sharing of daily rated traffic summaries.

382 3. Automatic reconciliation of shared traffic summary data.

383 4. Detection of discrepancies between summaries presented by the parties of the agreement.

384 5. Automated CDR-level reconciliation for identified summary discrepancies.

385 6. Automated resolution proposals, based on CDR analysis.

386 7. Sharing of periodic (normally monthly) invoice totals and invoice details.

387 8. Support for manual invoice dispute creation and resolution process.
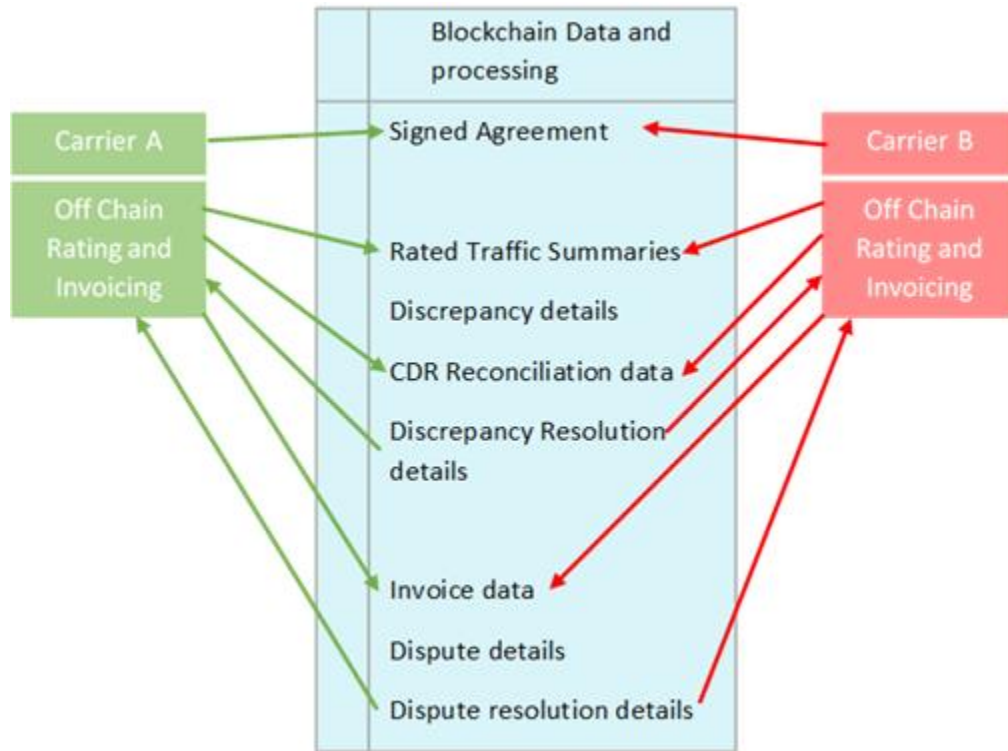
Figure 3: MVP1 Features

6.2 Contract Data

The DLT will hold data relating to the aspects of the contract agreements between the CBAN member and other CBAN members (a.k.a. "Contract Data") needed to support the functions defined by the International Voice MVP, specifically the reconciliation and dispute resolution processes noted above. It may also hold a defined set of Contract Data relating to contracts with external parties (non-CBAN Members).

As contract management and rating for voice settlement agreements between ICT-SPs will at least initially still take place off-chain, the Contract Data in the DLT will serve as the single agreed reference data set for the minimal set of data elements needed for reconciliation and settlement activities initiated between the agreement parties on the CBAN.

Any CBAN member will be able to register an agreement contract on the CBAN. The agreement contract will only come into effect when all parties to an agreement have verified it.

For a contract between two parties (e.g. A and B), the Contract Data falls into two categories:

- Agreement required between A and B: examples include payment terms, deal thresholds, and rates.

- Agreement not required between A and B: examples include A's bank details.

406 The DLT holding the Contract Data must allow for consensus between the CBAN members who
407 are party to the agreement (normally two in a bilateral agreement) to be achieved before the Con-
408 tract Data comes into effect, or changes to Contract Data come into effect.

409 Digital signatures on the Contract Data as well as the agreement partner's digital fingerprints on
410 any transactions carried out, will ensure a simple, auditable and trusted process for signing private
411 agreement data, as well as a way to verify contract acceptance by all parties.

6.2.1 Contract types for Voice settlement

413 The currently defined contract and agreement types for Voice settlement within the CBAN Voice
414 Settlement MVP are:

6.2.1.1 *B-Number destination rating*

416 A simple agreement, which includes the ICT-SPs publishing call rates for destinations. Destina-
417 tions are defined by B-Number prefixes, or groups of B-Number prefixes. Rates do not normally
418 change with time of day or Point of Interconnect (POI).

419 *Editor Note 2:*   *Although this contract type is typical of international refile and hubbing, it can*
420   *also be used for any national scenario or other agreement that uses the same*
421   *rating factors.*

6.2.1.2 *Origin Based Rating (OBR) A to B-Number Rating*

423 Rating of international voice calls based on where the call originates for example, a call originated
424 from within the EU has different rates from call originated from outside the EU, is becoming more
425 common, ICT-SPs are publishing rates based on the combination of originating, A-Number pre-
426 fixes, and destination.

427 A simple agreement, with ICT-SPs publishing call rates for destinations, destinations are defined
428 by B-Number prefixes, or groups of B-Number prefixes. Some destinations will have different
429 rates depending on the origin of the call. Call origins are defined by A-Number prefixes, or groups
430 of A-Number prefixes. Calls with no A-Number information are normally charged with the highest
431 rate, or with a penalty rate. Rates do not normally change with time of day or Point of Interconnect
432 (POI).

433 *Editor Note 3:*   *Although this contract type typical of international refile and hubbing with OBR,*
434   *it can also be used for any national scenario or other agreement which uses the*
435   *same rating factors.*

6.2.1.3 *Simple bilaterals*

437 Simple bilaterals consist of special discounted rates to certain destinations offered to a single ICT-
438 SP, normally in return for discounted rates offered by that other ICT-SP. Bilateral rates are nor-
439 mally, but not exclusively offered for termination of traffic in a ICT-SP's home country.

440 *6.2.1.4* **Complex bilaterals**

441 An extension of the simple bilateral contract, these contracts can be of arbitrary complexity, de-
442 pending on what the negotiating salespeople can think up. Complex bilaterals normally apply for
443 a defined period and describe the voice traffic delivery required by each party in order to benefit
444 from special rates. For example, threshold agreements and swap agreements.

445 As part of the CBAN International Voice Settlement MVP workshop, we have identified the fol-
446 lowing common forms of complex bilaterals:

447 6.2.1.4.1   Simple threshold agreements

448 A simple threshold agreement is based on rating a defined set of invoiced traffic based on the total
449 volume for that set of traffic in a defined period.

450 Agreement data required:

451 • Traffic selection criteria [Direction] [Product] [Destination set] [Time Period] etc…

452 • Volume thresholds define the amount steps and the slabs of traffic for which rates apply

453 • Rates which apply to traffic both per duration/amount rates and flat rates

454 • Rate calculation rules - back to first minute, back to Nth step

455 • Volume calculation rules - carry forward and grace period rules.

456 In this agreement type one set of traffic is selected, and both the volume thresholds and the rates
457 are applied to this traffic set.

458 6.2.1.4.2   Complex threshold agreements

459 A complex threshold agreement is based on rating a defined set of invoiced traffic based on com-
460 plex criteria not necessarily related just to the rating traffic set, such as:

461 • Traffic volumes for a traffic set different to that selected for rating.

462 • Percentage of any traffic set conforming to some criteria e.g. at least 20% mobile originat-
463   ing, or not more than 10% with premium rate destinations.

464 • Total Traffic volumes for the ICT-SP's Group Company.

465 6.2.1.4.3   Swap agreements

466 Swap agreements are based on an agreed exchange of traffic between ICT-SPs. In these agree-
467 ments a rate is agreed for incoming traffic as well as commitment level and similar a rate is agreed
468 for the outgoing traffic as well as a commit level. The rates and destination structure are typically
469 defined via the normal international hubbing price lists.

470   ### 6.2.1.5   *ITU accounting rates*

471   An historic, but still occasionally used contract type, where the call path end to end ([Origin ICT-
472   SP][Via ICT-SP][Destination ICT-SP]) determines both the rate and the settlement type. defining
473   characteristics of ITU settlement are:

474   - Pay when paid for ITU transit

475   - Declarations (ICT-SPs declare traffic before being billed for it)

476   - Quarterly net settlement

477   ### 6.2.1.6   *National interconnect agreements (Fixed, Mobile MVNO)*

478   National voice telephony international interconnect contracts differ widely from country to coun-
479   try. There is little to no standardization. Existing highly configurable solutions are capable of sup-
480   porting most national agreements. Normally the legal and regulatory frameworks that apply to
481   national settlement and processing are different to those which apply to international.

482   It may be possible to define a generic process for national settlement, in line with the process for
483   international settlement, but defining standard data or processes for all countries and regions is out
484   of scope for this document.

485   ## 6.2.2   Number portability in agreements

486   For any agreement type, it may be necessary to take number portability data for the associated
487   countries for the origin and destination. In these cases, access to number portability data, and a
488   ported number lookup will be required in order to correctly derive the call rate/price. This means
489   that operators without access to the number portability data will not be able to accurately determine
490   the appropriate contracted rate for a call.

491   *SUPPORT FOR NUMBER PORTABILITY LOOKUP IS NOT MANDATORY FOR THE CBAN INTERNA-*
492   *TIONAL VOICE SETTLEMENT MVP.*

Contract Data Supported	MVP Phase	Comment
Verified minimum set of signed contract attributes and supporting documentation	One	An interface/API for digitally signing the contract documentation will be required. Interface/API to existing sources of contract data.
Parameters relating to reconciliation and dispute resolution. • Aggregation keys for Summary CDR data and invoice detail data	One	Required to allow automation of the discrepancy and dispute process as defined in this document.

Contract Data Supported	MVP Phase	Comment
• Reconciliation rules and thresholds • Dispute resolution rules and thresholds		
Refile and Hubbing sell rates for both agreement parties. Including OBR (A-Number dependant rates) Simple Bilaterals.	Optional in Phase One	Support for B-Number rates only was not viewed as a viable phase. Bi-directional APIs for loading, retrieving and authorizing these rates will be required.
Swap Agreements	Optional in Phase One	
Complex bilateral Agreements	Optional in Phase One	

493 **Table 3: Supported Contract Data**

494 ### 6.2.3 Contract/Agreement management functions

495 A Contract/Agreement management module will apply process rules for managing data within the
496 DLT, using APIs to interact with the DLT, and providing the ability to ensure that all Contract
497 Data within the DLT is approved as necessary by both agreement parties before coming into effect.

498 The Contract management module will control the entry and validation of Agreement data, ensur-
499 ing that only data agreed by all contracted parties, can be used in rating and settlement.

500 #### 6.2.3.1 Contract data entry

501 APIs are required to add and modify all contract data items.

502 #### 6.2.3.2 Contract data view and verification

503 APIs are required to view all contract data items.

504 APIs are required to verify agreement with contract data entered by another agreement party.

6.2.3.3 *Contract data function security and audit*

All access to contract data shall be audited and must be associated with a valid identity associated with one of the agreement parties.

6.2.4 **Contract data description**

Editor Note 4: *Contract data does not include DLT specific information, such as security key, access information, etc. need to be decided in the CBAN architecture.*

6.2.4.1 *General Contract Attributes*

All data will be marked with its effective period.

Attribute	Description	Man-datory
CBAN member details	Data concerning the CBAN Members participating in the contract agreement: • Short Name • Full Name • Contact Details • Bank Details	Yes

Payment terms	Payment terms applicable to traffic settled using this con-tract:
	
	• Prepay terms
	
	• Post-pay terms
	    o Bill/Settlement period
	    o Payment period
		Yes

Credit limits and thresh-olds	Any credit limits or balance amount thresholds applica-ble to this contract.	No
Settlement workflow process rules	Parameters relating to the end to end process for contract agreement, modification and settlement	No

Attribute	Description	Man-datory
	• Minimum periods for notification of rate changes • Aggregation keys for Summary CDR data and invoice detail data • Reconciliation rules and thresholds • Dispute resolution rules and thresholds	
Rating and settlement parameters	Configurable parameters relating to the way rating and the creation of financial settlement data is carried out: • Rounding Rules • Aggregation keys for summarization • Financial Transaction aggregation rules • Bill/Invoice Period aggregation rules • Reporting Aggregation Rules • Settlement terms (Single or Multi-party)	No
Agreed technical details for settlement processing.	Details concerning the rating type to be applied to traffic to which this contract applies, and how to select the traffic which this contract applies to. • Record Format/s • Traffic guiding/selection filters • Rating method/s • Rating Error processing rules	N

513 **Table 4 - General Contract Attributes**

514 ### 6.2.4.2 *Contract Attributes Reconciliation, Discrepancy and Dispute*

515 The tables specified below indicate the data which may be held to allow reconciliation and auto-
516 matic discrepancy detection to occur.

517 6.2.4.2.1   Code Group Mapping Tables

518 By default, it should be assumed that origin and destination code group names will be shared, as
519 these are defined in price lists (i.e. both ICT-SPs will use the same code group names/identifiers
520 as defined in the destination ICT-SP's sell price list). However, in the case that ICT-SP systems
521 use different naming conventions, mapping tables may be required. Mapping can be one to one, or
522 one to many.

Field	Comment	Man-datory
Origin ICT-SP	The combination of ICT-SPs specifies the data mapping between each ICT-SP's code group names. The assumption is that code group definitions are common and form part of the contract agreement, but may differ depending on call direction.	Yes
Destination ICT-SP		Yes
Origin ICT-SP code group name		Yes
Destination ICT-SP code group name		Yes

523 **Table 5 - Origin Code Group Mappings**

Field	Comment	Man-datory
Origin ICT-SP	The combination of ICT-SPs specifies the data mapping between each ICT-SP's code group names. The assumption is that code group definitions are common and form part of the contract agreement but may differ depending on call direction.	Yes
Destination ICT-SP		Yes
Origin ICT-SP code group name		Yes

Field	Comment	Man-datory
Destination ICT-SP code group name		Yes

524 **Table 6 - Destination Code Group Mappings**

525 6.2.4.2.2 Product Mapping

526 Product naming may vary between ICT-SPs. The product mapping table will support one-to-one,
527 and one-to-many mapping.

Field	Comment	Manda-tory
Origin ICT-SP	The combination of ICT-SPs specifies the data mapping between each ICT-SP's product names.	Yes
Destination ICT-SP		Yes
Origin ICT-SP product name		Yes
Destination ICT-SP product name		Yes

528 **Table 7 - Product Mappings**

529 6.2.4.2.3 Service Level Mapping:

530 Service Level naming may vary between ICT-SPs. The Service level mapping table will support
531 one to one, and one to many mapping.

Field	Comment	Man-datory
Origin ICT-SP	The combination of ICT-SPs specifies the data mapping between each ICT-SP's service level names.	Yes

Field	Comment	Mandatory
Destination ICT-SP		Yes
Origin ICT-SP service level name		Yes
Destination ICT-SP service level name		Yes

532   **Table 8 - Service Level Mappings**

533   6.2.4.2.4   Discrepancy threshold levels

Field	Comment	Mandatory
Origin ICT-SP		Yes
Destination ICT-SP		Yes
Destination ICT-SP product	The combination of Product and Service level allows different thresholds to be applied to different traffic types.	No
Destination service level		No
Duration threshold value	Note: at least one of the thresholds must be populated. If multiple thresholds are specified, then a discrepancy is raised if any are breached. Thresholds apply on a + or - basis.	No
Duration threshold percentage		No

Field	Comment	Manda-tory
Amount threshold value		No
Amount threshold percent-age		No
Call count threshold value		No
Call count threshold per-centage		No

534 **Table 9 - Summary Discrepancy Threshold Levels**

6.2.4.3 Contract Attributes Refile/Hubbing

535

Attribute	Description	Mandatory
Products/Des-tination	Data relating to Voice products: • Product short name • Product Full Name • Product determination rules (if product is not deter-mined by mediation)	Yes
Buy and sell rates	Rates applicable to this contract • per-minute rates • per-event rates • tiered rates	No
Destinations	Data to allow destination determination from the CDR B-Number • number plan	Yes

Attribute	Description	Mandatory
	• destination groups	
Calendars and time periods	Where time of day or day of week is a rate affecting factor, data to determine the applicable rate period.	No
Rating con-figuration	Rating will apply a rate determined by the following factors derived from the CDR: • Product • Destination Group • Rate period (optional) • CDR start time (used for determining which rating reference data applies to this CDR).	No

Table 10: Contract Attributes Refile/Hubbing

6.2.4.4   Contract Attributes Refile/Hubbing with OBR

All data applying to Refile/Hubbing above, will also apply to Refine/Hubbing with OBR, but in addition:

Attribute	Description
Origins	Data to allow origin determination from the CDR A-Number • number plan • origin groups
Rating con-figura-tion	Rating will apply a rate determined by the following factors derived from the CDR: • Product • Destination Group • Origin Group

Attribute	Description
	• Rate period (optional) • CDR start time (used for determining which rating reference data applies to this CDR).

540 **Table 11: Contract Attributes Refile/Hubbing with OBR**

541 *6.2.4.5 Contract Attributes Simple Bilaterals*

542 Simple bilaterals do not require additional data compared to the above contract attributes.

543 *6.2.4.6 Contract Attributes Complex Bilaterals*

544 All data will be marked with its effective period.

Attribute	Description
Volume deal	Data concerning the volume deal as a whole: • Deal Name • Full description
Traffic selection	Data allowing a filter to be set up to select traffic for this volume deal: • Product/s • Destination/s • Origin/s • Period over which the deal applies (start and end date/time)
Thresholds	Volume thresholds to which deal rates apply: • Threshold volume 1 • Threshold volume 2 • Threshold volume 3

Attribute	Description
	• Threshold volume n
Threshold rates	Rates which apply to each slab of traffic between thresholds: • Per duration rates • Flat rates • Rate application rules (e.g. back to first minute) • Discount percentages • Penalties (for not meeting a threshold) can be either flat amount or a penalty rate.

545 **Table 12 - Contract Attributes Complex Bilaterals**

546 ### 6.2.5 Number Portability Data

547 Number portability can be optionally flagged in the summarized and detail CDRs as agreed be-
548 tween the CBAN members. The supporting of number portability data could be useful for per-
549 forming analysis during the discrepancy process. However, given that there is no single number
550 portability database available for worldwide coverage, getting access to such data requires sub-
551 stantial effort and investment. The MVP phase 1 will not include such data but could be considered
552 for future feature expansion.

553 ### 6.2.6 Domestic Voice Settlement

554 There is no specific requirement at this time to support domestic (in any country) voice settlement.
555 Given the variety and variations of domestic settlement requirements, it is difficult to come up
556 with generic requirements for domestic settlement.
557

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6.3 Ratings & CDR Format

559 Due to performance, security, and regulatory compliance requirements, which are often unique to
560 each ICT-SP, rating, at least initially, is expected to be implemented off chain. As technology and
561 the CBAN matures, rating may move into smart contracts and on the chain in order to improve the
562 transparency/auditability of the rating process.

563 The baseline operating principles for rating are summarised below:

564 - Rating, wherever performed, will need to be flexible enough to:

565   o Support the agreed universe of contract and agreement terms and their attributes for
566   voice settlement.

567   o Support the MVP as defined under section "contract types".

568   o Support new and agreed formats as they come into play.

569 - The CBAN requires a common minimum set of information, comprehensive enough to
570 anchor each CDR back to the on-chain contract and the associated agreement terms and
571 attributes to facilitate the voice settlement process and provide end-to-end auditability

572 - The CBAN has defined the minimum set of information for two types of CDRs needed for
573 ICT-SPs that agree to use the CBAN for settlement -"*Summarized CDR*" and "*Individual
574 CDR*." Both CDR types are shareable, traceable and built upon an agreed format that will
575 contain a minimum set of common fields needed to perform dispute analysis. Additional
576 fields may be needed as new features are developed in the MVPs – for example, it has been
577 suggested that all CDRs carry a unique, random identifier.

6.3.1 Summarized CDRs

579 "Summarized CDRs" contain summarized data for an agreed period of time (e.g., daily). and pro-
580 vide the basic data needed for recording into the distributed ledger for the MVP to perform an
581 initial discrepancy analysis.

	Essential Fields	Comment	Mandatory
1	Origin ICT-SP	Reflects ICT-SP that the call originated from in the case of OBR settlement.	No
2	Destination ICT-SP	ICT-SP from which call was delivered to.	Yes

	Essential Fields	Comment	Manda-tory
3	Origin code group	Origin derived from either code prefix or network origin per portability database	Yes
4	Destination code group	Destination derived from either code prefix or network origin per portability database	Yes
5	Number porta-bility indicator	A flag to indicate if real network billing has been ap-plied or not as agreed between parties.	No
6	Product	As agreed between the ICT-SPs	No
7	Service level	Service level (e.g., Gold, Silver etc.) or service based on trunk	No
8	Timestamp	Time Period of the aggregation E.g. Hour, Daily, etc)	Yes
9	Raw duration	Summarised conversations seconds per network rec-ords	Yes
10	Amount	Rated Value	Yes
11	Currency	As agreed per ICT-SPs	Yes
12	Completion	Completed call count	Yes

582   **Table 13 - Summarized CDRs**

583 **6.3.2 Individual CDRs**

584 "Individual CDRs" If the MVP detects a discrepancy, Individual CDRs for each call during the
585 period in question, will be exchanged for comparison.

	Essential Fields	**Comment**	**Mandatory**
1	Origin ICT-SP	Reflects ICT-SP that the call originated from in the case of OBR settlement.	No
2	Destination ICT-SP	ICT-SP from which call was delivered to.	Yes
3	A-Number	Standard E1.64 format	Yes
4	B-Number	Standard E1.64 format	Yes
5	Origin code group	Origin derived from either code prefix or network origin per portability database	Yes
6	Destination code group	Destination derived from either code prefix or network origin per portability database	Yes
7	Number portability indicator	A flag to indicate if real network billing has been applied or not as agreed between parties.	No
8	Timestamp	HH:MM:SS	Yes
9	Timezone (offset)	e.g. UTC	Yes
10	Product	As agreed between the ICT-SPs	No
11	Service level	Service level (e.g., Gold, Silver etc.) or service based on trunk	No
12	Raw duration	Conversations seconds per network records	Yes

	Essential Fields	Comment	Mandatory
13	Rounded duration	Conversation seconds applying rounding rules	Yes
14	Price	Price / Minute as agreed per contract	Yes - unless CDR rated at CBAN
15	Currency	As agreed per contract	Yes - unless CDR rated at CBAN

586 **Table 14 - Minimum set of Individual Rated CDR Level Details**

587

588 ## 6.4 Reconciliation Process [Pre-Invoice]

589 It is envisioned that the MVP would provide functionality to enable ongoing reconciliation and
590 discrepancy identification throughout the billing lifecycle. Frequency of comparison and summa-
591 rization levels would be agreed between the parties and recorded as part of the terms of the rela-
592 tionship. The parties could be both CBAN members or a CBAN member and an invited ICT-SP.
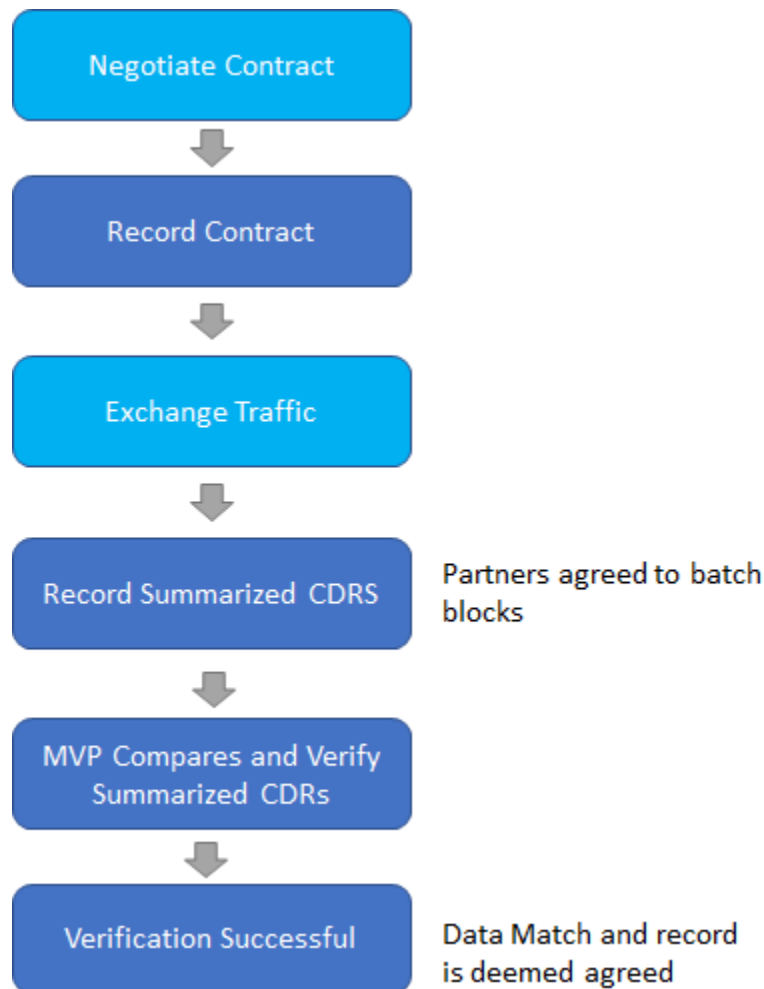
593
594 **Figure 4: Reconciliation Process**

595 ## 6.5   Discrepancy Resolution Process

596
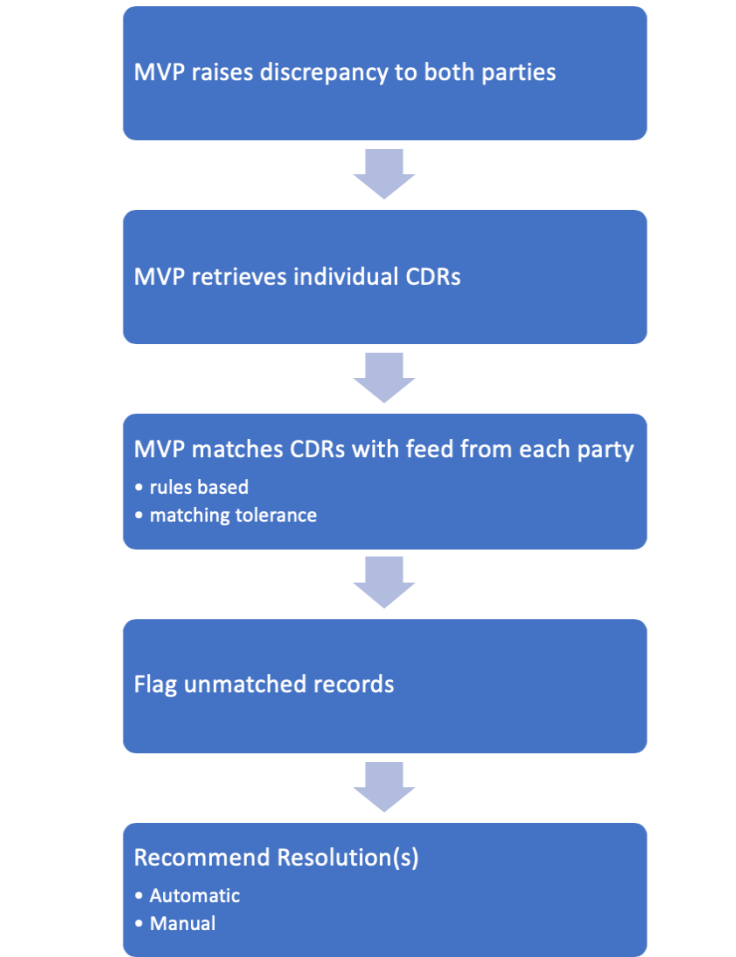
597 **Figure 5: Discrepancy Resolution Process**

598 This section addresses dispute resolution between CBAN members. It does not address dispute
599 resolution between a CBAN member and an external party. While the initial focus of MVP1 is to
600 facilitate resolution between CBAN members, the CBAN is interested in promoting wide adoption
601 across the industry. To that end, non-CBAN members can still exchange CDRs with CBAN mem-
602 bers using interfaces identified in the Integration Services and Interfaces section below. The
603 CBAN anticipates that in MVP1, non-CBAN members will be able to use CBAN services for
604 dispute management but not discrepancy analysis. Future MVPs may provide more services and
605 the successful delivery of these services may help drive enlarged CBAN membership.

606 Although one of the key objectives of the CBAN International Voice standards is to remove the
607 majority of causes for disputes, it is expected that, especially in the early adoption phases of the
608 CBAN there will still be some disputes between CBAN operators.

609 Possible examples of disputes include:

610   • Disagreements regarding traffic totals

611 • Inability to agree rates for traffic carried

612 • Contract interpretation differences

613 • Volume agreement calculation issues

614 • Identification of fraudulent activity

615 The CBAN will not mandate binding arbitration between members. All disputes will be settled by
616 the CBAN members and their invited ICT-SPs through bi-lateral negotiations and mutually agreed
617 terms.

6.5.1 Dispute Creation

619 A CBAN member can raise a dispute regarding a payment, which is requested by another CBAN
620 member or invited ICT-SP. If the original payment request covers an aggregate total of charges
621 (e.g. an invoice or equivalent), the CBAN member will only dispute those line items that they are
622 in disagreement with, withholding payment for only that portion of the invoice that is in dispute.
623 The undisputed total will be paid by CBAN member in full.

6.5.1.1 Dispute Registration

625 The CBAN will support the registration of and the reason for the noted dispute by a member ICT-
626 SP.

6.5.1.2 Dispute registration Details

628 When issuing a dispute, the CBAN member must supply the disputing party a minimum set data
629 including:

630 • An agreed minimum set of agreement/contract details to uniquely identify the dispute such
631   as name, date, term, parties involved.

632 • Invoice details and payment totals being disputed:

633   o Line item number/traffic defining keys (e.g. IDD, 6th August 2019, destina-
634   tion/origin, call total, traffic duration, rates, amounts, discount percentage etc)

635   o Type of dispute (Volume, rate, multiple, etc)

636   o Dispute Reason

637 • Alternative line details expected (e.g. revised duration/call totals, revised amount total)

638 • Any (off-DLT based) detailed data to back up the dispute

6.5.1.3 Dispute process

640 1. Dispute Response - the CBAN member being disputed will supply corresponding details
641   to back up its initial payment request, including any appropriate off-DLT data.

642   2. Dispute Analysis - dispute analysis will be done by both parties, with each party having
643   the right to request additional off-DLT data (e.g. raw CDR data).

644   3. Negotiated result details - the results of the dispute negotiation will be agreed data for the
645   disputed line details. These may be the originals specified by either party, or some other
646   amount (e.g. a "split the difference" total). There will be a standard form for data regarding
647   a dispute result, including a full list of details, on a line by line basis, for the disputed items.

648 The Dispute negotiation will be carried out between the two CBAN members. The process for the
649 ICT-SP-to-ICT-SP negotiation is not in scope for this document.

650 The negotiated results will replace the original requested payment details in the DLT and thus be
651 part of an audit-able record.

6.5.1.4 *Monthly Invoice process*

653   1. Invoices Exchange - exchange of invoices based on current processes and formats. The
654   invoices are loaded into the BC on summarised destination/country level.

655   2. Invoice Comparison - comparing the invoice with expected amount based on mapping rules
656   and feed of BSS.

657   3. Discrepancy Report – the result of the analysis is a discrepancy report. In case of no or a
658   minor delta (based on business rules), the financial process will be followed without raising
659   a dispute.

660   4. CDR Comparison - in case of a major delta the related CDRs will be pulled out of the BSS
661   of both parties and compared on individual level. There is also the opportunity to feed fraud
662   related CDRs into the BC dispute process at this stage. There will be an interface to share
663   and load CDRs of non-BC partners into or out of the BC.

664   5. CDR Comparison Report - based on the CDR comparison a detailed report will be shared
665   and reviewed by business partners based on contractual rules.

666   6. Dispute Raised - if no agreement or solution is achieved, a dispute will formally be raised
667   based on the result of the report and feedback of business partners. The financial and con-
668   tractual process will be followed.

669 The advantage of this process is that it will follow the current most common processes with a
670 higher degree of automation. Business and mapping rules can (or need) to be defined to achieve a
671 reduction in manual workload. It should be compliant to GDPR requirements as only relevant
672 CDR´s will be exchanged on bilateral level.

673
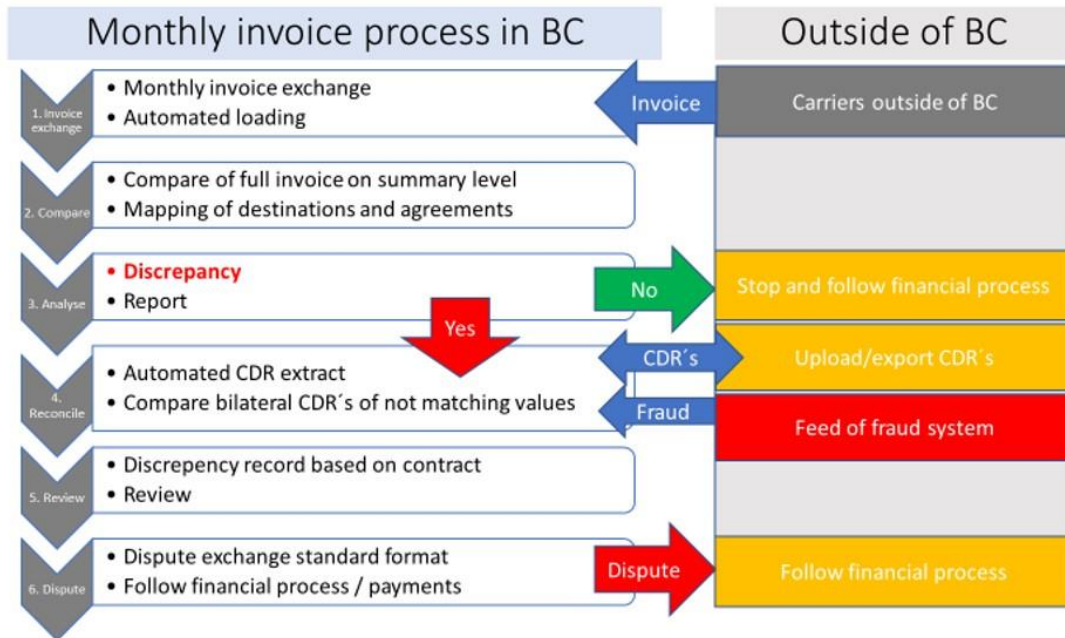
Figure 6: Monthly Invoice Process

674

675

6.6   Fraud Identification and Verification

Fraud comes in different forms. Some common fraudulent call types are:

- International Revenue Shared Fraud (IRSF)

- CLI Manipulation

- Call Stretching

- False Answer Seizure (FAS)

There is no intention of having the MVP provide real time fraud detection and analysis, at least initially, since doing so may impose unmanageable overhead in CDR transfer and processing in the MVP. However, the MVP can automate, to the extent possible, the fraud identification, verification and reporting process.

6.6.1   Call Integrity Verification

While each ICT-SP has its own way of detecting and combating fraud, the MVP can provide an extra layer of protection by providing evidence of whether fraud has occurred. At the minimum, based on the transactions between the ICT-SPs in the chain, the MVP can confirm the integrity of the call by verifying the duration, start and call time, etc.

Generally speaking, fraudulent calls occur in a subset of countries and code groups with high cost per minute. For many of these destinations, the amount of legitimate traffic is relatively small. It is only when fraud occurs that a spike in traffic volume appears. For these, a subset of high risk destinations, individual CDRs will be exchanged among the ICT-SPs within the call path. The MVP can then verify that the integrity of the calls is maintained throughout the supply chain.

6.6.2   Verification of Call Destination

Very frequently, fraudulent calls occur when enterprise customers are hijacked, and calls are placed to high cost destinations. The fraudster benefit by sharing the revenue ICT-SPs collected for these calls (hence "Revenue Share" scheme). Calls are often "short stopped" without the intended terminating ICT-SP (i.e., ICT-SP E in the diagram above) knowledge. Ideally, if all the ICT-SPs are part of the CBAN, then the MVP can easily verify that the calls are properly terminated into the destination ICT-SP. In reality, convincing call ICT-SPs to join and use the CBAN may not be feasible and at least not in the short term. However, the CBAN can create financial incentive to convince the terminating ICT-SP in high risk countries (i.e., ICT-SP E) to join and record their international inbound call transactions into the DLT.

707 # 7 Integration Services and Interfaces

708 This table lists the services that the International Voice MVPs will require from the shared CBAN
709 architecture, as well as noting points for integration, including integration with other OSS/BSS
710 systems which will provides services to the CBAN. (Some of these external systems may provide
711 functionality, such as rating, which may move into the CBAN over its evolution.)

Consumer	Name/Description	CRUD	East/West Integration	Legacy Integration	Comments
USER/API	Maintain Agreement/Contract	CRU	Y	Y	For a pair of CBAN Members defines the existence of a Bilateral Voice settlement agreement. *Can we include agreements with off CBAN ICT-SPs?*
USER/API	POST Contract Document	C	N	N	Store document off chain and add contract document hash to DLT.
USER/API	Verify (Agree/sign) Contract Document	U	Y	N	
USER/API	Maintain Contract Data	CRUD	Y	Y	Many different data items as defined in the Contract section of the voice MVP document
DISCREPANCY PROCESSES					
AUTO/API	POST Rated/Priced Daily Summary CDR Details	CR	Y	Y	Expected to occur daily on a repeating schedule. Will trigger the "Reconcile

Consumer	Name/Description	CRUD	East/West Integration	Legacy Integration	Comments
					Daily Summary CDRs" process.
AUTO/API	UPDATE/REPOST Rated/Priced Daily Summary CDR Details	C	Y	Y	Expected to occur on an exception basis. Will trigger the "Reconcile Daily Summary CDRs" process.
MVP Process	Reconcile Daily Summary CDRs	U	N	N	Triggers "Create Summary Reconciliation Discrepancy" if necessary
MVP Process	Create Summary Reconciliation Discrepancy	CRU	N?	Y	Triggers "Notify agreement parties of Reconciliation Discrepancy" and "CDR detail request for Discrepancy Traffic"
MVP Process	Notify agreement parties of Reconciliation Discrepancy	U	Y	Y	
AUTO/API	CDR detail request for Discrepancy Traffic	U	Y	Y	
AUTO/API	Upload CDR Details for Discrepancy	CRU	Y	Y	Upload performed by offchain storage provider/system. Triggers "Reconcile CDR Details"

Consumer	Name/Description	CRUD	East/West Integration	Legacy Integration	Comments
MVP Process	Reconcile CDR Details	RU	N	N	Triggers "Create CDR reconciliation results"
MVP Process	Create CDR reconciliation results (Report?)	CRU	N?	Y	
USER/API	Analyse CDR Reconciliation Results	R	N	N	Manual Process
USER/API	Maintain Discrepancy Resolution [	RU	Y	N	Update Discrepancy details with negotiated results
USER/API	Verify(Agree) Discrepancy Resolution	U	Y	N	
MVP Process/API	Apply Discrepancy Resolution	CRU	Y	Y	Update verified summaries with agreed resolution
Dispute Processes					
AUTO/API	POST Invoice Details	CRU	Y	Y	Per period (Monthly?). Triggers "Reconcile Invoice Details"
MVP Process	Reconcile Invoice Details	U	N	N	Triggers "Create Invoice reconciliation results" may trigger "Create Invoice

Consumer	Name/Description	CRUD	East/West Integration	Legacy Integration	Comments
					Reconciliation Discrepancy"
MVP Process	Create Invoice reconciliation results (Report?)	CRU	Y?	N	
USER/API	Analyse Invoice Reconciliation Results [R]	R	N	N	
MVP Process	Create Invoice Reconciliation Discrepancy	CRU	Y	Y?	Only has legacy integration if legacy supports dispute resolution process.
USER/API	Maintain Dispute Resolution	CRU	Y	Y?	May require a workflow
USER/API	Verify(Agree) Dispute Resolution	RU	Y	Y?	
MVP Process	Apply Dispute Resolution	RU	Y	Y?	
USER/API	Verify(Agree) Invoice for payment	RU	Y	Y	

712 **Table 15: Integration Services and Interfaces**

713

8   Data Governance Requirements

Data Privacy and compliance with regional and local data privacy regulations, including but not limited to GDPR, as well as full commercial confidentiality among the ICT-SPs must be honored across the CBAN and the voice MVP. The CBAN will support ICT-SPs across the globe and will consist of both EEA and Non-EEA members so a strict governance model that ensures that the data exchanged between these ICT-SP partners minimizes the sharing of personal data and protects ICT-SP confidentiality to the best extent possible will be critical. Current requirements call out:

- Anonymized summary data as agreed shall be exchanged to identify discrepancies and any direct exchange of personal information kept to a minimum.

- In case of discrepancy, and access to the individual normalized CDRs is required, these CDRs should be either managed off-chain or reside strictly on the nodes of the ICT-SP partners exchanging information.

8.1   Processing of Personal Data

It is recognized that a limited set of commercially sensitive and personal data/PII will be required for the voice MVP to deliver on the defined functionality. The following table defines those data elements that must be treated accordingly, stored, and ultimately purged in accordance with GDPR and other applicable privacy regulations, honoring ICT-SP confidentiality.

Data Type	Contract	Summarized Traffic	Individual CDR
PII	Email, Name, Phone	N/A	A Number B Number
Commercial	Terms & Conditions Rates	Traffic Details (Destinations, Volumes, Amounts)	Volume Rate

Table 16: Required PII and Commercial Data Elements

8.2   GDPR Statement of Compliance

The CBAN will support ICT-SPs across the globe and will consist of both EEA and Non-EEA ICT-SPs and as such the CBAN, and specifically the voice MVP, must be GDPR aware and compliant. The voice MVP acknowledges and agrees to comply with European data protection(GDPR) principles, e.g. the processing of data fairly and lawfully, and using data for specific, legitimate purposes only.

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739 It is recognized per the above table, that the MVP requires a minimum set of personal data to
740 deliver on the noted business functions as defined in this document, and in the case of this voice
741 MVP, the personal data noted will be shared and processed only for the specific business reasons
742 as defined in this voice MVP. [1]

743 ## 8.3   GDPR Acknowledgement

744 The GDPR defines the "processing" of personal data broadly including merely storing it. Block-
745 chain solutions that store or share personal data will inevitably be involved in the "processing" of
746 that personal data. Entities processing personal data under the GDPR fall into two categories: data
747 controllers and data processors.

748 A **data controller** is an entity that, alone or with another data controller, has primary responsibility
749 for the processing of personal data, and that determines the manner in which, and the purposes for
750 which, the personal data is processed.

751 A **data processor**, on the other hand, processes personal data on behalf of a data controller, under
752 mandatory contractual provisions set out in the GDPR.

753 In the CBAN Blockchain ecosystem, where decentralization is key, the variety of stakeholders
754 makes the controller/processor differentiation complex. In case of the CBAN and specifically the
755 Voice MVP declares the following classification of the stakeholders:

756 - **Controllers:** Telecom Operators

757 - **Processors:** Settlement solution and blockchain vendors

758 Anything that is irrelevant to the purpose of the use case/s as defined for the voice MVP as detailed
759 in this document should be strictly prohibited by the controllers from the access of the Processors.

760 ## 8.4   Data Processing Agreements

761 A data processing agreement should be in place between Controllers and Processors. This should
762 be between the Telecom Operator, Settlement Vendor and Blockchain Vendor to clearly define
763 what will be processed and why the data must be processed. This can be a common agreement
764 format across CBAN as per the use case, data format and standards to be common for all entities.
765 Processors should only process personal data in accordance with the instructions of the controller
766 and the agreement in the place.

767 ## 8.5   Data Access and Data Entry

768 The principles of confidentiality and privacy must carry across the onboarding process, contract
769 execution, the day-day transactions performed, and platform operations activity including report-
770 ing and archiving. The necessary system access controls (Roles, Profiles et) must be in place to
771 ensure ICT-SP confidentiality and privacy as commercial confidentiality and privacy amongst the
772 ICT-SPs is essential. Therefore, only the two parties entering into an agreement, or an agreed
773 trusted 3rd party auditor that has been granted access, should be able to view contract and its
774 associated transaction data.
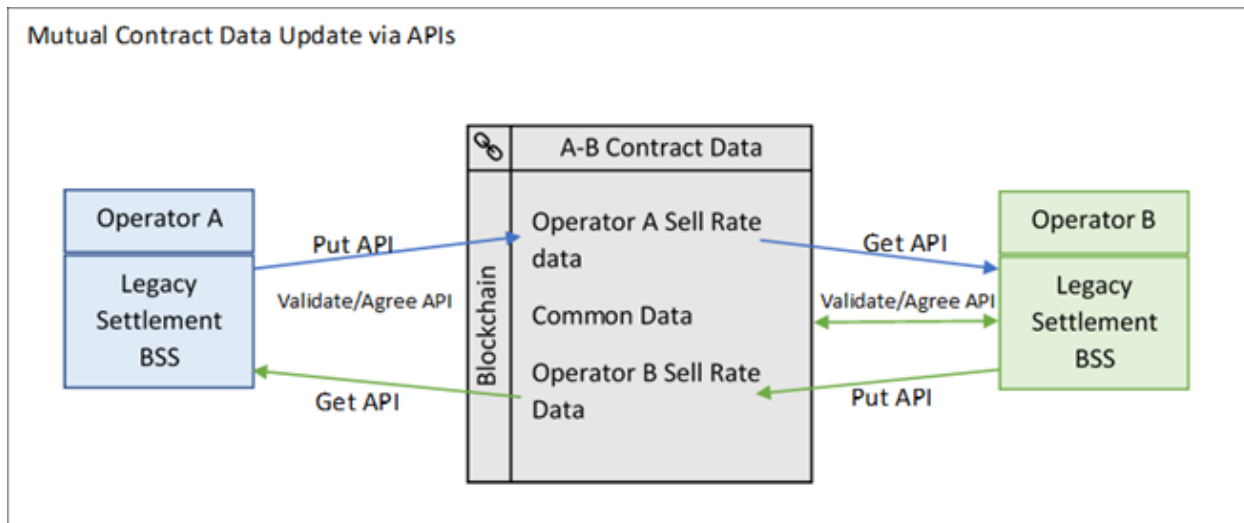
Figure 7: Mutual Contract Data Updated via APIs

It is understood that the CBAN must be able to use transaction data to support the commercial and business operations of the CBAN. Such use could be reporting of transactions recorded and measured statistics. The data could be used in a deidentified way or for ICT-SP specific statistics to be shared only with the ICT-SP.

8.5.1   Retention, Archiving, Purging and Pruning

It is recognized that personal data on a Blockchain network must be retained for a certain number of years to satisfy a legal or regulatory requirements. In addition, any CDR retention or purging requirements must comply as well with current ICT-SP and/or commercial obligations needed to support the settlement and dispute defined by this MVP.

Therefore, the appropriate policy must be defined to ensure that once the transaction or Contract data containing the PII is no longer needed, it is purged or pruned appropriately.

Default Retention period: Transaction details recorded on the chain will be defined to be seven years, unless called out as a specific exception for a particular ICT-SP relationship and the CBAN framework must require that all participants in the Blockchain network delete blocks of data that are greater than the agreed retention period.

8.5.2   GDPR Design Principles

Please refer below link to know more about Data Protection design principles.

Data Protection Principles

9   Summary

{tbd}

10 References

[1]   The Right to be Forgotten Meets the Immutable - A Practical Guide to GDPR-Compliant Block-chain Solutions Blockchain Now and Tomorrow – Assessing Multidimensional Impact of Distrib-uted Ledger Technology – European Commission

803 **Appendix A**

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