# **PCCW Global®** Introduction to Blockchain PoCs

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- What is Blockchain?
- Why Blockchain?
- Examples of use of Blockchain
- Phase 1 of Wholesale Voice Settlement PoC
- Plans for Phase 2 of Wholesale Voice Settlement PoC
- Plans for additional PoCs







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#### **Traditional Database**

- Client-Server
- Server owned and operated by central entity.
- Data stored centrally, includes "cloud"

### **Blockchain Database**

- Peer-to-Peer
- No centralized owner. Co-ownership.
- Each Peer keeps a copy of all data.







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## What is **Blockchain?**

## **Traditional Database**

- Server is operated by a 3<sup>rd</sup> Party.
- Data stored Externally and secured by 3<sup>rd</sup> party.
- Clients reluctant to share information.
- Untrusted Relationship.



## **Blockchain in a Multi-Entity environment**

## **Blockchain Database**

- Each Peer operates their own server
- No centralized owner. Co-ownership.
- Data encrypted by peer prior to sharing.
- Access controls per peer.
- Trusted Relationships between nontrusting Partners.





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## **Traditional Ledger**

- Simply stores and retrieves data.
- Ignores history of data.
- Can not validate information.

## **Blockchain Ledger**

9090 PREPAYMENT DISCOUNT	Residential Commercial	\$27.81		\$27.81	2 Examples:
<u> </u>	Total	\$27.81		\$27.81	Initial Deposit
9091	Residential	\$43.40		\$43.40	initial Deposit
DISCOUNT	Commercial	-			Transaction
	Total	\$43.40		\$43.40	
9093	Residential	\$430.00		\$430.00	Transaction
CREDIT	Commercial	다 가지 않는 것이 같아.			Tue ne e eti e n
	Total	\$430.00		\$430.00	Iransaction
9095	Residential	\$114.00	\$-20,830.90	\$-20,716.90	Transaction
INSTALLMENT	Commercial		\$-100.00	\$-100.00	nanoaotion
	Total	\$114.00	\$-20,930.90	\$-20,816.90	Transaction
Summary	Residential	\$214,310.07	\$-214,310.07		Transaction
	Commercial	\$8,449.92	\$-8,449.92	18	
	Total	\$222,759.99	\$-222,759.99		validated lotal:

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## **Blockchain as a Ledger**

 Always calculates from "the beginning of time". • Every Transaction by Peer matched by an inverse Transaction by another Peer.

Provides validated current balance.

5000	Initial Deposit	5000
1000	Transaction	1000
-500	Transaction	-500
1000	Transaction	1000
-800	Transaction	-800
500	Transaction	500
-2000	Transaction	-2000
4200	Transaction	300
	Validated Total:	4500

- Owned by everyone, not by Someone. Hosted everywhere, not Somewhere.
- Access control on a per-peer and per-transaction basis.
- Equal-Level playing field. Size doesn't matter. All Peers are equal.
- Neutral, creating a trusted Relationships between non-trusting Partners.
- Cryptographic Security and Privacy.
- Provides a rapidly updating consistent global source of truth.
- Useful for ZKP (Zero Knowledge Proof) applications.
- Is NOT a computing or analytical mechanism itself
- Blockchain is disruptive, will disintermediate



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## Use-Case – Crypto-Currency (e.g. Bitcoin)

- There are thousands of Crypto Currencies
- The most notorious is Bitcoin (April 2018 value ~USD 9000).
- Others trade at lower values (e.g. Ethereum's April 2018 value ~USD 500).
- Bitcoin uses an outdated and inefficient version of Blockchain. Calculation slows down with growth.
- Typical Bitcoin transaction calculation time: ~10 minutes (as of April 2018).
- Mining would take 74M years on a desktop computer.



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ulation slows down with growth. 2018).



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# Wholesale Voice Settlement PoC



## **PoC – Underlying Industry Situation & Assumptions**

The Challenge: Industry disconnect between

#### Data exchange Layer is

- \* automatic,
- \* interconnected
- \* standardized

Proposed solution: A Unified Blockchain settlement layer which

Maintains the assurances of the business processes

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The benefits:

Multiple sources & processes inside & between companies implying:

- \* work-force intensity
- \* Inefficiencies
- \* risk of fraud



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#### **Rate-CDR-Settlement Layer is**

- \* human-based
- \* in silos
- \* non-standardized

Ensures unchanged use of the properties of the data exchange layer.

#### Replaced by

automated processes

- \* Agility
- \* Efficiency & Assurance

#### Maintaining

\* Uncompromised privacy.



The PoC therefore seeks to answer the following questions which will determine the outcome and future use:

	Can a wholesale settlement system be built on Blockchain?	<ul> <li>1<sup>st</sup> phase: Au Processes.</li> <li>2<sup>nd</sup> phase: N capabilities of</li> </ul>
	Can it	<ul> <li>Reduce (</li> <li>increase</li> </ul>
	Will it be <b>truly up to</b> industry requirements i.e.	<ul> <li>Secure</li> <li>Scalable (1:2)</li> <li>Stability and</li> <li>Fast</li> <li>Robust</li> <li>Yet remain flet</li> </ul>
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## **PoC – Fundamental Questions**

utomation of current Manual

lew Processes and Methods based on of Blockchain Technology.

Costs Agility ?

1 to many:1) Uptime

exible

## **Practically: Wholesale Voice Settlement – Today's process**



#### **Bilateral agreements**

- T&C, Payment and Credit terms, Legalities, Technicalities
- Periodical exchange of Rates for Services
- Dispute resolution algorithm

#### **CDRs are generated by each carrier**

- Periodical Rating of CDRs, generation of Invoices.
- Comparison of inbound Invoices with rated CDRs.
- Disputes are manually resolved.

#### Manual Invoicing and Settlement

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## Wholesale Voice Settlement – Automation PoC



#### **Bilateral agreements > Loaded to Ledger as Smart Contracts**

- T&C, Payment and Credit terms, Legalities, Technicalities ۲
- Periodical exchange of Rates for Services
- Dispute resolution algorithm

#### **CDRs are generated by each carrier**

- Periodical Rating of CDRs, Loaded to Ledger by both parties •
- Automated Comparison of rated CDR and Dispute Identification. ullet
- Automatic Dispute Resolution (defer to Manual based on threshold) lacksquare

#### **Generate Cryptographically enforceable invoices**

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	Paper Contract	PoC
Fees	Static or manually dynamic	Static or manually dynamic
Rating	Manual & Automatic, Simplistic	Automatic
Payment Terms	Manually Managed	N/A
Commitments	Manually Managed	N/A
Contract Management	Manual	Automatic
Invoicing	Manual	Automatic
Dispute Resolution	Manual, some simple, some complex	Automatic for some disputes
Settlement Speed	Weeks	Minutes
Other legal	Digital Document	N/A
Risk and Credit Management	Manual audits, Rely on external Resources.	N/A
Collection	Manual, Courts	N/A



## From Manual, Through PoC to Full Automation

#### **Full Automation**

Can be real-time dynamic

Automatic, multi-dimensional, multi-service

Automatically managed

Can be automatically managed

Automatic

Automatic

Automatic for even complex disputes,

Manual only for very exceptional situations

**Minutes-Hours** 

Blockchain stored & verified

Automatic Audits, Zero-knowledge

reputation System

Automatic, Co-signers, Insurance



### PoC uses a simplified threshold based algorithm:

- Ignores discrepancies below a certain threshold.
- Defers to manual processing if discrepancies are larger than a certain threshold.
- Uses agreed upon arithmetic formulas if dispute is between those thresholds, depending on magnitude of discrepancy.
- Assistive GUI allows access to CDRs and Rates to manually analyze cause of dispute.

### Future versions could include AI and ML

- May use Heuristics to analyze previous disputes and resolutions to same destination over time.
- May allow use of specific rules to specific destinations.
- May allow volume based rules.
- More...
- Algorithm can be agreed between parties and uploaded to Ledger as Smart-Contract.
  - Different rules to different wholesale counterparts
  - Bilaterally agreed and uploaded to Ledger. No third party involved.



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## **Dispute Resolution Automation**



### Extend PoC to Similar Lines of Business

Mobile ISMS

>> AA19

- Mobile SMS, Voice & Data Roaming
- Ported number Data Base

>> Sharing MPNDB for A2P Ported Number Updates

- Wholesale Voice CDR reconciliation: Shared bilateral CDRs eliminating discrepancy.
- Use Blockchain and AI/ML for other Telecom/Carrier applications
  - Federated Catalogues: Inventory, Product, Service, Resource.
    - The use of Blockchain overcomes the challenge of sharing information to a third-party/top-level entity in an environment of mutual-suspicion between the players.
    - Flattens the playing field. All players are equal.
    - Information is made available to partners on a need-to-know basis.
  - Federated Orchestration of on-demand services across multiple domains •
    - Eliminating the need for a top-level orchestrator across Carrier domains.
    - Resolves challenge of mutual-suspicion.
    - Eliminates commoditization and closed-user-group marketplaces.
  - Leading to Billable On-Demand Services



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## What's Next?



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