

DC³ Conference

From cryptocurrencies to CBDCs

25 – 27 January 2022

<https://itu.int/go/dc3c>

Moderator: Herve Tourpe, IMF
Jacques Francoeur, SINOW USA
John Kiff: Self, Industry Expert, former IMF



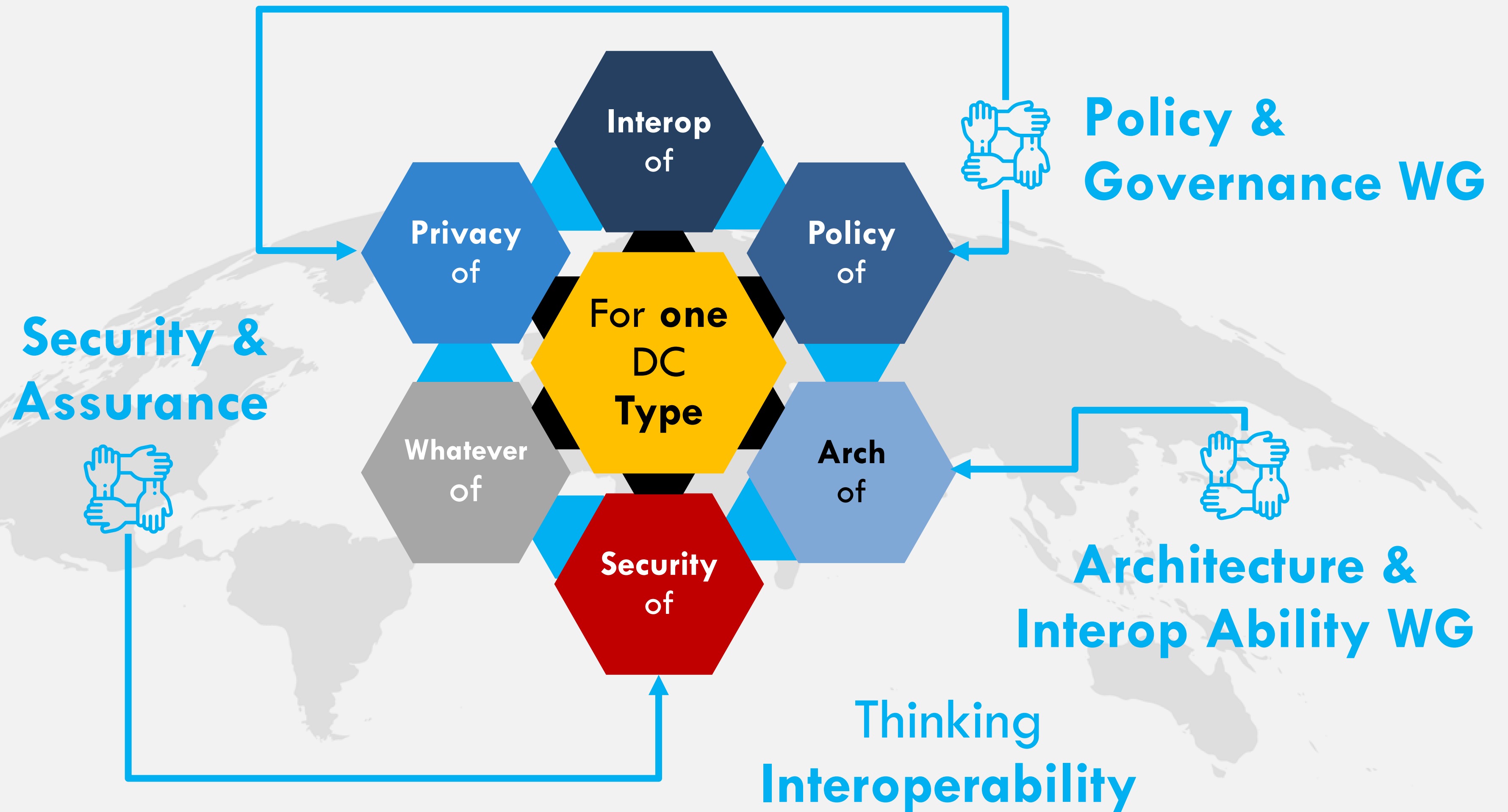
An event of the Digital Currency Global Initiative

Organized jointly:





ITU DCGI - **One** DC Type Vision





Kiffmeister's DC Policy Taxonomy

?	Retail CBDC	Wholesale CBDC	Synthetic CBDC	Bank and E-Money	Asset-Backed Stablecoins	Crypto-Assets
Denominated in jurisdiction's unit of account	✓	✓	✓	✓	✓	
Backed by jurisdiction's monetary authority	✓	✓	✓	?		
Issued by and direct liability of jurisdiction's monetary authority	✓	✓				
Broadly accessible to the public for general-purpose usage	✓		?	?	?	?
Available 24/7 and may be used in peer-to-peer (P2P) transactions	✓	B2B	?	?	?	✓
Subject to same rules and regulations as the jurisdiction's other units of account	✓	✓	?			
Legal tender?	?	?	?	?	?	?
Runs on Distributed Ledger Technology	?	✓	?	?	✓	✓



Ontology Notions & Distinctions

The Ontology **Notion & Distinction** Matrix (OND) describe all Digital Currency **Types** (DCT)

ID	Digital Currency Type Ontology Notions
O1	Supply
O2	Value
O3	Own
O4	Agree
O5	Record

Distinctions provide options, choices impact **architecture & technology** of the DC Type

One unique DCT is defined by the ONM when distinction **choices** are **selected**

Change one choice, the DC Type changes

ID	Digital Currency Type Ontology Notions & Their Distinctions
1	Supply (of DCT Units)
1.1	Change Mechanisms
1.1.1	Increase Supply
1.1.1.1	Issuer Policy
1.1.1.2	Algorithmic (Programmatic)
1.1.1.3	Oracle
1.1.1.4	Voting
1.1.1.5	None
1.1.2	Decrease Supply
1.2	Form
1.2.1	Claim-based Form
1.2.2	Object-based Form
1.3	Properties
1.3.1	Programmability
1.3.1.1	Multi-Function: Specific Purpose
1.3.1.1.1	Use Constrained
1.3.1.1.2	Denomination Adjustable
1.3.1.1.3	Single Function: None- Non-Programmable: Single Function
1.3.2	Fungibility
1.3.2.1	Full
1.3.2.2	Restricted
1.3.2.3	Not
1.3.3	Representation
1.3.3.1	Generic: represent any form of value, Intrinsic or Extrinsic
1.3.3.2	Restricted: represent only some forms of value, e.g. Extrinsic Utility Value
1.4	Rights
1.4.1	Inherent
1.4.1.1	Acceptance
1.4.1.2	Mandated
1.4.1.3	Mandated, with Exception
1.4.1.4	Voluntary
2	Value (of DCT Units)
2.1	Value Determination
2.1.1	Intrinsic (Inherent) Mechanism
2.1.1.1	Tokenization of Inherent Value: beyond Utility, Token Economies, meritocratic (peer value)
2.1.2	Extrinsic (Derived) Mechanism
2.1.2.1	Determined by Market Supply & Demand
2.1.2.2	Determined by External Backing Mechanism
2.1.2.2.1	"Secured" by Lock-in (On-Chain)
2.1.2.2.2	"Secured" by Escrow (custodianship intermediary)
2.1.2.3	Backing Collateral Type
2.1.2.3.1	Commodity
2.1.2.3.2	Securities
2.1.2.3.3	Digital Currency
2.1.2.3.4	Digital Asset
2.1.2.3.5	Reserves
2.1.2.3.6	None (Credit)
2.1.2.4	Collateral Factor
2.1.2.4.1	Full (100%): 1
2.1.2.4.2	Partial <100%: 0.8
2.1.2.4.3	Over: 1.x
2.2	Value Behaviors
2.2.1	Increase in Value
2.2.1.1	Interest mechanism on DCT Amount Saved overtime
2.2.2	Decrease in Value
2.2.2.1	Fee mechanism (DC Activity Fee) + Service Value for Fee
2.2.2.2	Tax (DCT Amount Saved x%) No Value from -Value
2.2.2.3	Depreciation (interest rate), Inflation
2.2.3	No Change in Value
2.3	Supply Value Release
2.3.1	Immediate
2.3.2	Gradual
2.3.3	Conditional
2.4	Supply Value Controls
2.4.1	Fix Supply Value, Float DCT Units
2.4.2	Float Supply Value, Fix DCT Units
2.4.3	Fix Supply Value, Fix DCT Units
2.4.4	Float Supply Value, Float DCT Units
3	Own (DCT Amount Value)
3.1	Proof-of-Identity
3.1.1	Identification - does the ID exist, is it required (No = Anonymity)
3.1.2	If needed, Authentication - how do I make sure that ID is you
3.1.2.1	Authentication to >> Degree
3.1.3	Authorization - you get assigned rights (See Supply: DCT Units Rights)
3.2	Proof-of-Control
3.2.1	Direct Control
3.2.1.1	Verify/Validate
3.2.1.1.1	Vested/Verified: Verify-as-a-Service
3.2.1.2	Send/Validate
3.2.1.2.1	Exercise: Send/Verified
3.2.2	Indirect (Custodial) Control
4	Agree (on DCT Amount Value)
4.1	Agreement Elements
4.1.1	Participants: Parties
4.1.1.1	By-lateral
4.1.1.2	Multi-lateral
4.1.2	Smart Contract T & C as code
4.1.2.1	Off-Chain Oracles: Validated Data Sources
4.2	Value Liability
4.2.1	Direct Liability
4.2.1.1	Public Direct Liability
4.2.1.2	Private Direct Liability
4.2.2	Indirect Liability
4.2.2.1	One Degree-of-Separation Intermediary
4.2.2.2	Two Degree-of-Separation Intermediary
4.2.2.3	Three Degree-of-Separation Intermediary
4.2.3	Insured Liability
4.4	Agreement Outcomes
4.4.1	Ownership Impact
4.4.1.1	Change in Ownership of DC Amount
4.4.1.2	Change or restrictions in DCTU Rights governing DCT Amount.
4.4.2	Known Outcome
4.4.2.1	Fixed Outcome: Single Result Known Before
4.4.2.2	Variable Outcome, Result Unknown
4.4.2.3	Conditional: If/Then/Else: Do Result
4.5	Agreement Bi-Participant Activity
4.5.1	Intra Ecosystem: DCT1 Ecosystem Internal, both Participants internal to ecosystem
4.5.1.1	Transfer (DCTA from DCT Store 1 and 2 which is in same DCT1 by definition): 2 state changes
4.5.1.1.1	Source -> Transfer: DCT1 Amount (amount) from Sender DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)
4.5.1.1.2	Destination Transfer: DCT1 Amount applied to Receiver DCT1 Store 2 (DCT1E + DCT1A to DCT1S2)
4.5.2	Inter Ecosystem: DCT1 Ecosystem to Outside Ecosystem, one Participant external to ecosystem
4.5.2.1	Transfer (Using DCT1 Buyer to transact for Digital Asset, Physical Asset, Digital Currency)
4.5.2.1.1	Digital Asset Transmission
4.5.2.1.1.1	Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)
4.5.2.1.1.2	Agree: Digital Asset Value Normalization: DCT1A/DA-V (set by Owner) = 1 accept, < 1, reject
4.5.2.1.1.3	Destination Transfer: Add DCT1A into Seller DCT1S2
4.5.2.1.1.4	Send Digital Asset to Buyer
4.5.2.1.2	Physical Asset Transmission
4.5.2.1.2.1	Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)
4.5.2.1.2.2	Agree: Physical Asset Value Normalization: DCT1A/PA-V (set by Owner) = 1 accept, < 1, reject
4.5.2.1.2.3	Destination Transfer: Add DCT1A into Seller DCT1S2
4.5.2.1.2.4	Send Physical Asset to Buyer
4.5.2.1.3	Digital Currency Exchange
4.5.2.1.3.1	Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)
4.5.2.1.3.2	Digital Currency Value Exchange Rate: DCT1-U/DCT2-U
4.5.2.1.3.3	Destination Transfer: Add DCT2A into Buyer DCT2S1
4.6	DC Amount Transfer from Source DCT Store to Destination DCT Store Paths
4.6.1	Internal Path: Intra Ecosystem: DCT1 Ecosystem Internal
4.6.1.1	Local Path: collocated, same Store Space
4.6.2	External Path: Inter Ecosystem: DCT1 Ecosystem to Outside
4.6.2.1	Custodial Path: hosted Store Space, Internal DC Store to External DC Store
4.6.2.2	Distributed Path (DCT1 Amount stored in a Distributed DCT Store)
5	Record (Update DCT Amount Value Ownership Change)
5.1	Transaction Finality
5.1.1	Settle Now
5.1.2	Settle Later
5.1.2.1	Asynchronous Process
5.1.2.2	Hold
5.2	Update
5.2.1	One Ledger Update
5.2.1.1	Centralized ledger/register
5.2.1.2	Distributed validation and updating by consensus/agreement
5.2.2	More than One Ledger Update
5.2.2.1	Distributed validation and updating by consensus/agreement
5.2.2.1.1	Public/unpermissioned validators/updaters
5.2.2.1.2	Permissioned validators/updaters
5.2.2.2	Defi: Many Different Ledgers, Interlinked: Cross chain Bridging
5.2.3	None
5.3	Update DC Store Connectivity: Where is the DC Store where I need to do update
5.3.1	Connected: Accessible - Hot (Online)
5.3.1.1	Internal Storage
5.3.2	Disconnected: Inaccessible - Cold (Offline)
5.3.2.1	Paper
5.3.2.2	Physical Storage



All DC Types
can be
described by
5 Ontology
Notions

ID	Digital Currency Type Ontology Notions
01	Supply
02	Value
03	Own
04	Agree
05	Record

5 Ontology
Notions
describe all
DC Types



ONTOLOGY NOTIONS ALL RELATE TO VALUE & OWNERSHIP

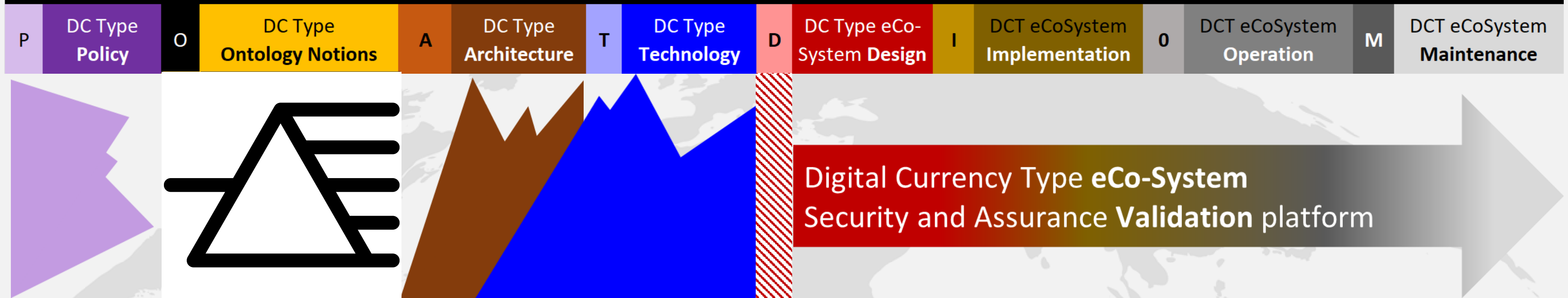
All DC Types
can be
described by
5 Ontology
Notions

ID	DCT Ontology Notions	
	Relationships with Unit -vs- Value	
01	Supply	- of DCT Units
02	Value	- of a DCT Unit
03	Own	- DCT Amount of Value
04	Agree	- on DCT Amount of Value
05	Record	- change in DCT Amount Value Ownership



Where Ontology Notions fit in DCT Perspectives

Digital Currency Type - from Policy through Ontology to Architecture, Technology & Validation





Ontology Notions: Level 2 Distinctions

ID	Digital Currency Type Ontology Notions & Their Distinctions
1	Supply (of DCT Units)
1.1	Change Mechanisms
1.2	Form
1.3	Properties
1.4	Rights
2	Value (of DCT Units)
2.1	Value Determination
2.2	Value Behaviors
2.3	Supply Value Release
2.4	Supply Value Controls
3	Own (DCT Amount Value)
3.1	Proof-of-Identity
3.2	Proof-of-Control
4	Agree (on DCT Amount Value)
4.1	Agreement Elements
4.2	Value Liability
4.4	Agreement Outcomes
4.5	Agreement Bi-Participant Activity
4.6	DC Amount Transfer from Source DCT Store to Destination DCT Store Paths
5	Record (Update DCT Amount Value Ownership Change)
5.1	Transaction Finality
5.2	Update
5.3	Update DC Store Connectivity



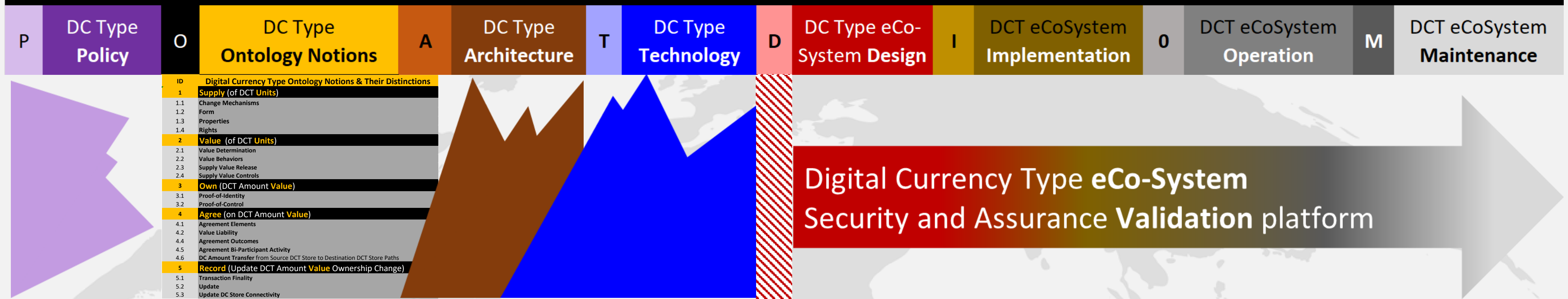
Ontology Notions: Level 3, 4 Distinctions

ID	Digital Currency Type Or	Digital Currency Type Ontology	Digital Currency Type Ontology Notions & Their Distinctions
1	Supply (of DCT Units)	1	Supply (of DCT Units)
1.1	Change Mechanisms	1.1	Change Mechanisms
1.2	Form	1.2	Form
1.3	Properties	1.3	Properties
1.4	Rights	1.4	Rights
2	Value (of DCT Units)	2	Value (of DCT Units)
2.1	Value Determination	2.1	Value Determination
2.2	Value Behaviors	2.2	Value Behaviors
2.3	Supply Value Release	2.3	Supply Value Release
2.4	Supply Value Controls	2.4	Supply Value Controls
3	Own (DCT Amount Value)	3	Own (DCT Amount Value)
3.1	Proof-of-Identity	3.1	Proof-of-Identity
3.2	Proof-of-Control	3.2	Proof-of-Control
4	Agree (on DCT Amount Value)	4	Agree (on DCT Amount Value)
4.1	Agreement Elements	4.1	Agreement Elements
4.2	Value Liability	4.2	Value Liability
4.4	Agreement Outcomes	4.4	Agreement Outcomes
4.5	Agreement Bi-Participant Activity	4.5	Agreement Bi-Participant Activity
4.6	DC Amount Transfer from Source DCT Store	4.6	DC Amount Transfer from Source DCT Store
5	Record (Update DCT Amount Value)	5	Record (Update DCT Amount Value)
5.1	Transaction Finality	5.1	Transaction Finality
5.2	Update	5.2	Update
5.3	Update DC Store Connectivity	5.3	Update DC Store Connectivity



Where Ontology Notions fit in DCT Perspectives

Digital Currency Type - from Policy through Ontology to Architecture, Technology & Validation



Digital Currency Type eCo-System Security and Assurance Validation platform



Notion: **Supply**

Digital Currency Type Ontology Notions & Their Distinctions	
ID	
1	Supply (of DCT Units)
1.2	Form
1.2.1	Claim-based Form
1.2.2	Object-based Form

1 Supply
1.2: Form

Claim-Based
Object-Based



Notion: Value

Digital Currency Type Ontology Notions & Their Distinctions	
ID	Value (of DCT Units)
2	Value Determination
2.1	Value Determination
2.1.1	Intrinsic (Inherent) Mechanism
2.1.1.1	Tokenization of Inherent Value: beyond Utility, Token Economies, meritocratic (peer value)
2.1.2	Extrinsic (Derived) Mechanism
2.1.2.1	Determined by Market Supply & Demand
2.1.2.2	Determined by External Backing Mechanism
2.1.2.2.1	"Secured" by Lock-in (On-Chain)
2.1.2.2.2	"Secured" by Escrow (custodianship Intermediary)
2.1.2.3	Backing Collateral Type
2.1.2.3.1	Commodity
2.1.2.3.2	Securities
2.1.2.3.3	Digital Currency
2.1.2.3.4	Digital Asset
2.1.2.3.5	Reserves
2.1.2.3.6	None (Credit)
2.1.2.4	Collateral Factor
2.1.2.4.1	Full (100%): 1
2.1.2.4.2	Partial < 100%: 0.#
2.1.2.4.3	Over: 1.x

2 Value

2.1: Value Determination



Notion: Own

Digital Currency Type Ontology Notions & Their Distinctions	
3	Own (DCT Amount Value)
3.1	Proof-of-Identity
3.1.1	Identification - does the ID exist, is it required (No = Anonymity)
3.1.2	If needed, Authentication - how do I make sure that ID is you
3.1.2.1	Authentication to >> Degree
3.1.3	Authorization - you get assigned rights (See Supply: DCT Units Rights -
3.2	Proof-of-Control
3.2.1	Direct Control
3.2.1.1	Verify Validate
3.2.1.1.1	Vetted Verified: Verify-as-a-Service
3.2.1.2	Send Validate
3.2.1.2.1	Exercise: Send Verified
3.2.2	Indirect (Custodial) Control



Notion:
Agree
-Top section

ID
4

Digital Currency Type Ontology Notions &
Agree (on DCT Amount Val

4 Agree: 4.4: Outcome

4.4

Agreement Outcomes

4.4.1

Ownership Impact

4.4.1.1

Change in Ownership of DC Amount

4.4.1.2

Change or restrictions in DCTU Rights governing DCT Amount.



ID

Digital Currency Type Ontology Notions & Their Distinctions

4

Agree (on DCT Amount)

4.5

Agreement Bi-Participant Activity

4.5.1

Intra Ecosystem: DCT1 Ecosystem internal, both Participants internal to ecosystem

4.5.1.1

Transfer [DCTA from DCT Store 1 and 2 which is in same DCTE1 by definition]: 2 state changes

4.5.1.1.1

Source "-" Transfer: DCT1 Amount removed from Sender DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)

4.5.1.1.2

Destination "+" Transfer: DCT1 Amount added to Receiver DCT1 Store 2 (DCT1E, + DCT1A to DCT1S2)

4.5.2

Inter Ecosystem: DCT1 Ecosystem to Outside Ecosystem, one Participant external to ecosystem

4.5.2.1

Transact [Using DCT1 Buyer to transact for Digital Asset, Physical Asset, Digital Currency]

4.5.2.1.1

Digital Asset Transaction

4.5.2.1.1.1

Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)

4.5.2.1.1.2

Agree: Digital Asset **Value Normalization**: $DCT1A/DA-V$ (set by Owner) = 1 accept, < 1, reject

4.5.2.1.1.3

Destination Transfer: Add DCT1A into Seller DCT1S2

4.5.2.1.1.4

Send Digital Asset to Buyer

4.5.2.1.2

Physical Asset Transaction

4.5.2.1.2.1

Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)

4.5.2.1.2.2

Agree: Physical Asset **Value Normalization**: $DCT1A/PA-V$ (set by Owner) = 1 accept, < 1, reject

4.5.2.1.2.3

Destination Transfer: Add DCT1A into Seller DCT1S2

4.5.2.1.2.1

Send Physical Asset to Buyer

4.5.2.1.3

Digital Currency Exchange

4.5.2.1.3.1

Source Transfer: Remove DCT1 Amount from Buyer DCT1 Store 1 (in DCT1E remove DCT1A from DCT1S1)

4.5.2.1.3.2

Digital Currency Value **Exchange Rate**: $DCT1-UV/DCT2-UV$

4.5.2.1.3.3

Destination Transfer: Add DCT2A into Buyer DCT2S1

Notion:

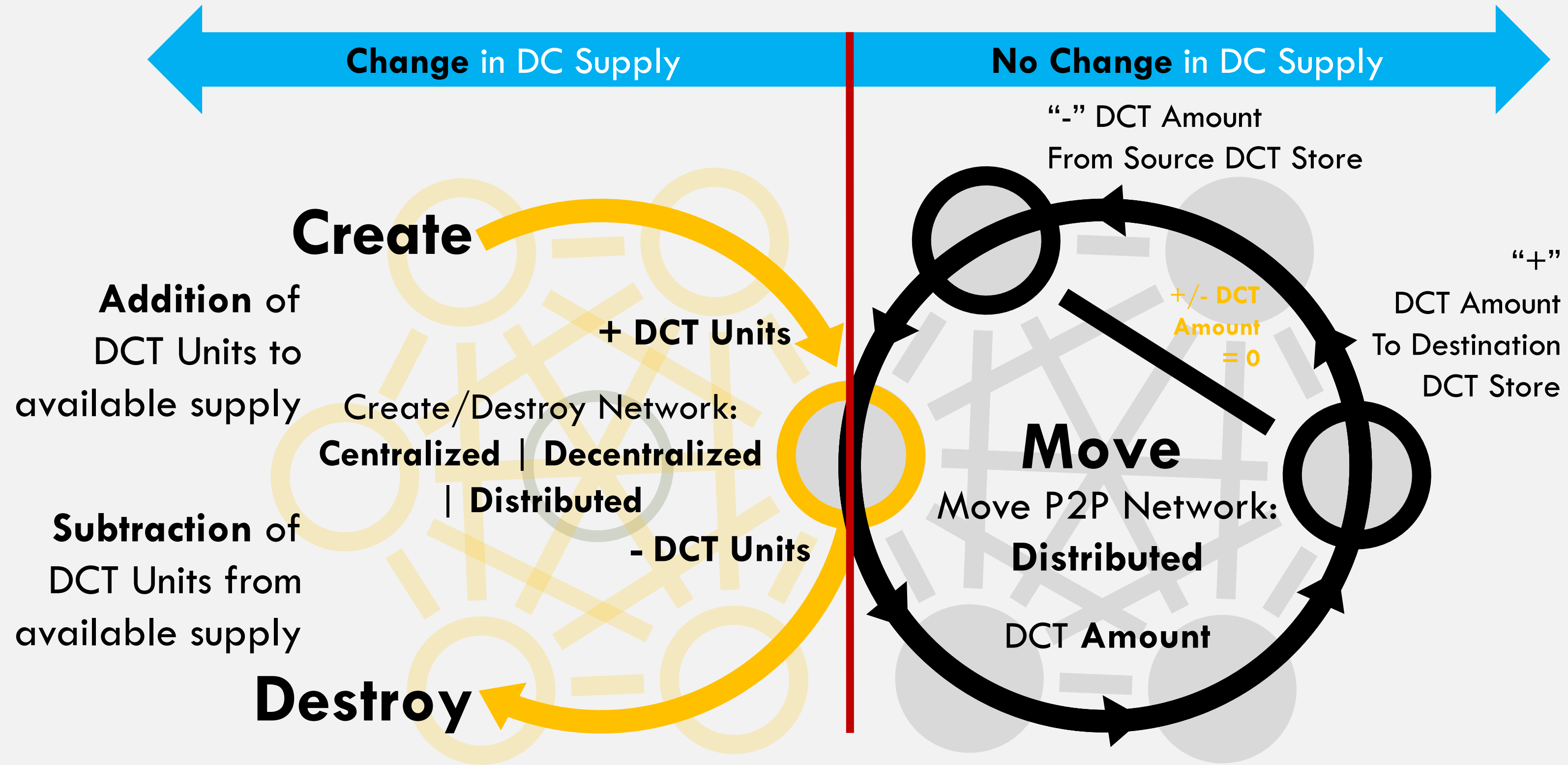
Agree

-Bottom section

4 Agree: 4.5: Bi-Participant Activity



DC Type Conservation of Supply Model



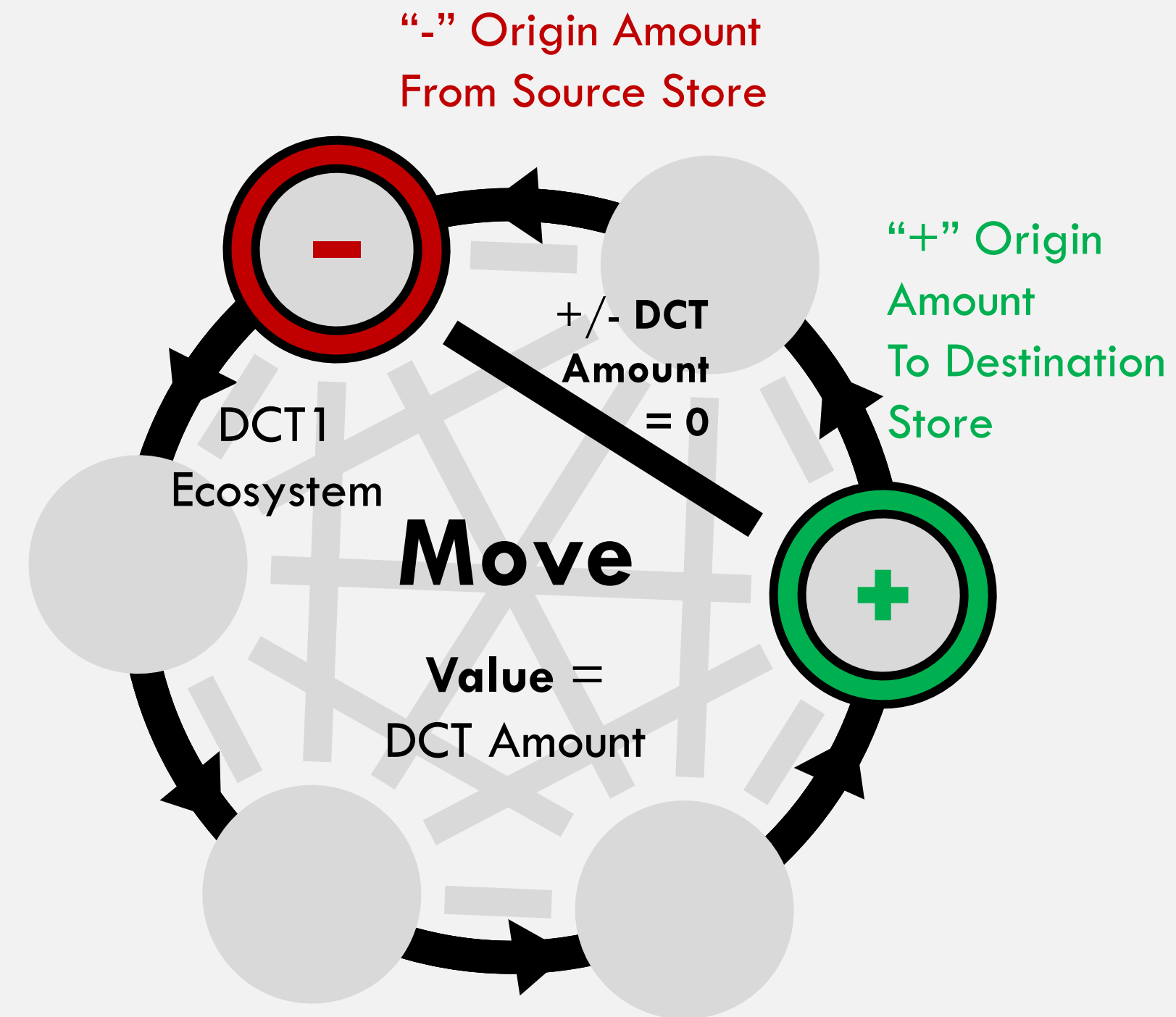
Move DCT **Amount** From **Source** DCT **Store** to **Destination** DCT **Source**



Subtract “-”
**Origin-Amount From
Source-Store**

“concurrently”

Add “+”
**Origin-Amount To
Destination-Store**

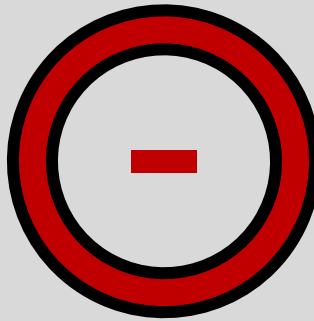




DCT1 Ecosystem

Move Value

“-” Origin Amount From **Sender Store**



DC Transfer

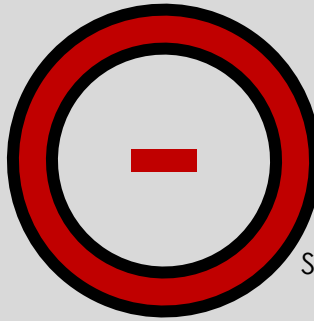
Intra-DC Type Ecosystem



“+” Origin Amount To **Destination Store**

Other Ecosystems

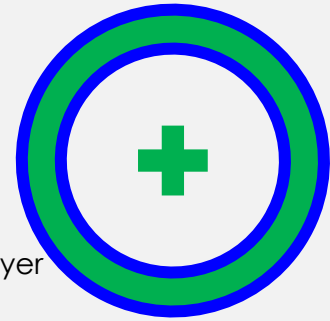
“-” Origin Amount From **Buyer Store**



Digital Asset Transaction

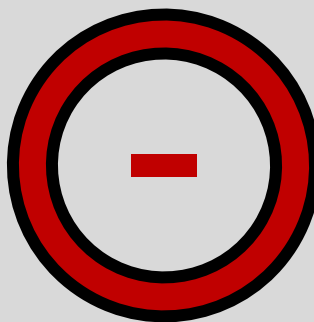
Agree DCT Amount/DA Value = 1

Seller changes ownership of DA to Buyer



“+” DCT Amount To **Seller Store**

“-” Origin Amount From **Buyer Store**



Physical Asset Transaction

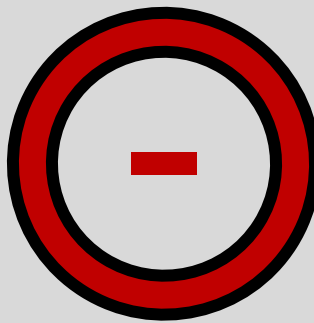
Agree DCT Amount/PA Value = 1

Seller delivers PA to Buyer



“+” DCT Amount To **Seller Store**

“-” DCT1 Amount From **Exchanger T1 Store**

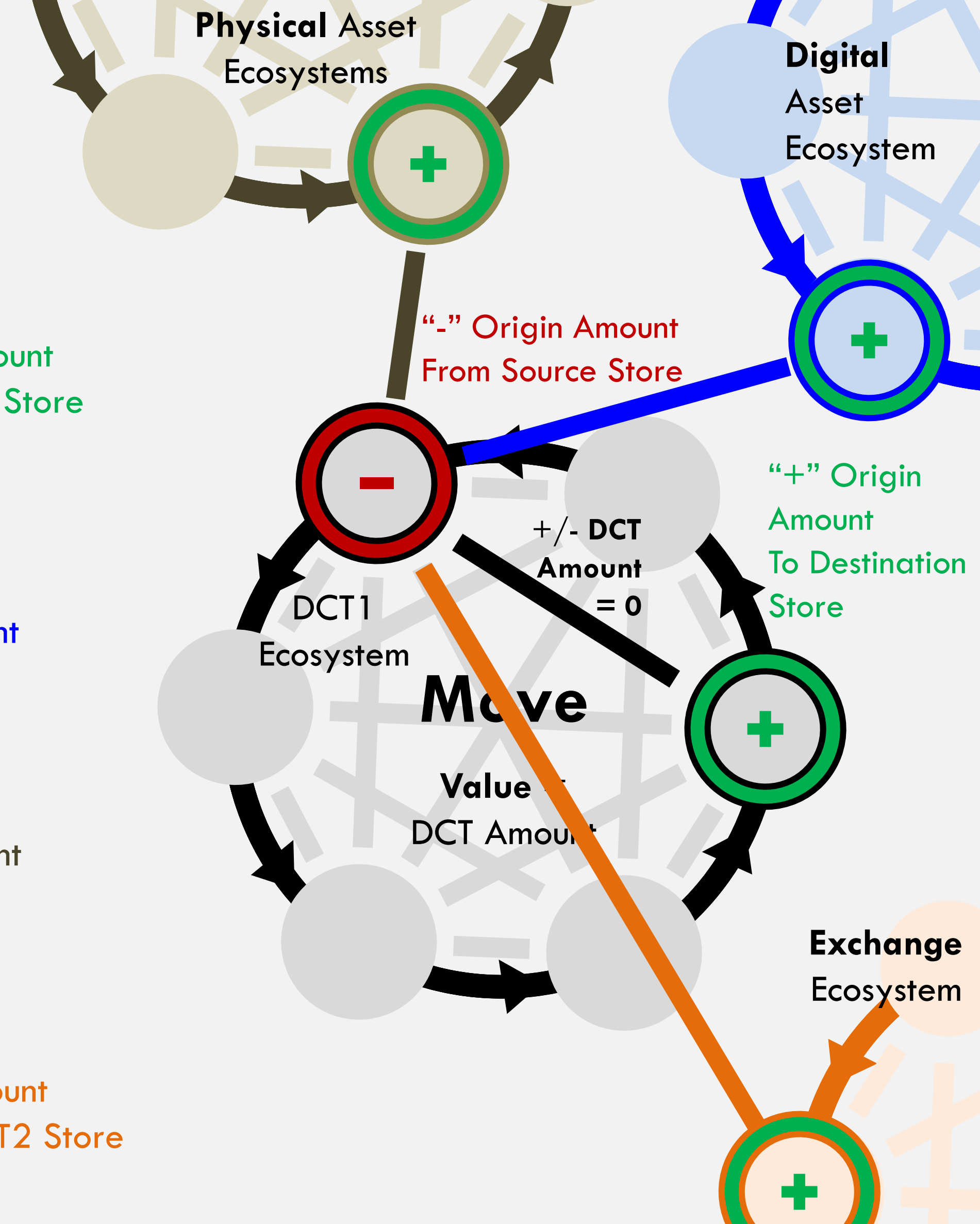


DC Exchange

Rate = DCT1 Unit/DCT2 Unit



“+” DCT2 Amount To **Exchanger T2 Store**





Notion: Record

ID	Digital Currency Type Ontology Notions & Their Distinctions
5	Record (Update DCT Amount Value Ownership Change)

5: Record, 5.2 Update

5.2	Update
5.2.1	One Ledger Update
5.2.1.1	Centralized ledger/register
5.2.1.2	Distributed validation and updating by consensus/agreement
5.2.2	More than One Ledger Update
5.2.2.1	Distributed validation and updating by consensus/agreement
5.2.2.1.1	Public/unpermissioned validators/updaters
5.2.2.1.2	Permissioned validators/updaters
5.2.2.2	DeFi: Many Different Ledgers, Interlinked: Cross chain Bridging
5.2.3	None

John jumps in here in first pass through slides. John comes back here from #23-24 to illustrate how CBDC fits





Next Steps:

