# Are We Confident in the Reliability of Information?

## A Generic Theory of Authentication to Support IS Practice and Research

### Roger Clarke

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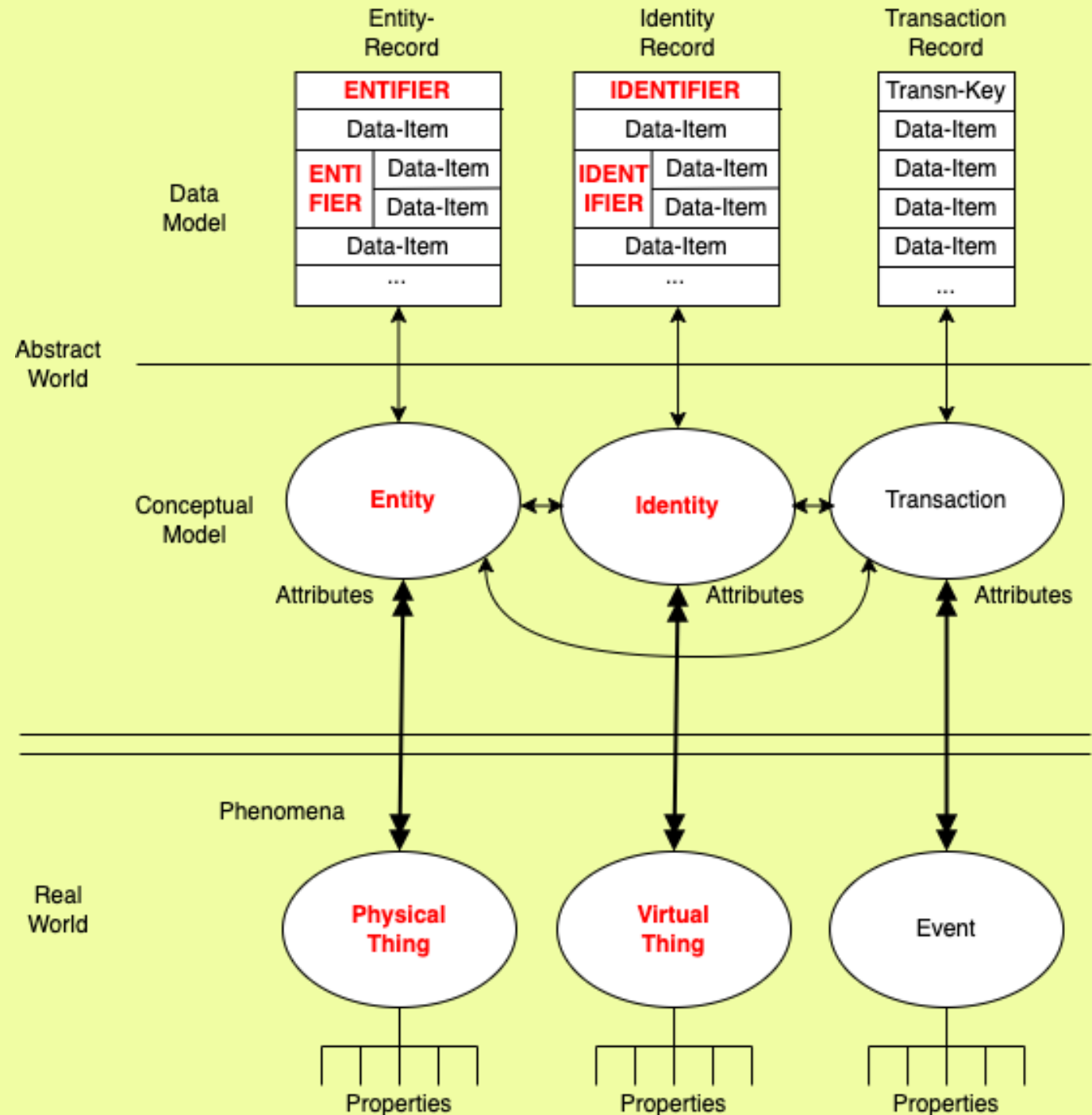
**ACIS #34  –  6 December 2023**

http://rogerclarke.com/ID/PGTA  {.html, .pdf}

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**Key Differences about the Pragmatic Metatheoretic Model**

Clarke (2021)
at ACIS #32
http://www.rogerclarke.com
/ID/PMM.html

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# Physical Things and Virtual Things

- **Inanimate Objects** (Inventory-Items, Equipment)
  - Containers ⊃ Pallet-Loads ⊃ Boxes ⊃ Cartons

- **Active Objects**
  - Mobile-Phone/Handy/Cellulare  ⊃  **SIM-Cards**
  - Computer  ⊃  **Processes**
  - Car  ⊃  **Convoy-Lead, Get-Away Car, Speed-Check, ...**

- **Organisations** (Companies, Associations, Govt Agencies, ...)

- **Humans and The Roles Humans Play**

  Seller, buyer, supplier, receiver, debtor, creditor, payer, payee, principal, agent, franchisor, franchisee, lessor, lessee, copyright licensor, copyright licensee, employer, employee, contractor, contractee, trustee, beneficiary, tax-assessor, tax-assessee, business licensor, business licensee, plaintiff, respondent, investigator, investigatee, defendant, ...

# Authentication

OED 1, 3a, 3b, 4a, 4b, 5, 6

to { validate, approve, prove, confirm,
<u>establish as</u> genuine/<u>authentic</u>, verify } ...

... { <u>something/anything</u>, a statement, an account, truth,
existence, a reputed fact, a document, an artefact,
an artwork, a user identity, a process identity }

# Foundations of Authentication Theory

- *An Assertion is an expression of knowledge about one or more elements of the pragmatic metatheoretic model*

- May be made by a party, implied by context, inferred by a party, or postulated by a party.  Assertions may be about:
  - Particular Phenomena in the Real World;
  - Particular elements of an Abstract World;   or
  - Relationships between Real- and Abstract-World elements

  *'The number of Things in a particular storage-bin is correctly recorded in a particular Data-Item-Value'*

- *Authentication is a process that establishes an appropriate degree of confidence in the reliability of an Assertion*

  *'A physical stock-count of Things in a particular storage-bin identified a mis-match against the relevant Data-Item-Value'*

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# Categories of Assertion

(1) **(Id)Entity**

(2) (Id)Entity Match

(3) **Property** (Simple)

(4) Property (Complex)

(5) Principal-Agent

(6) Monetary **Asset-Value**

(7) Non-Monetary Asset-Value
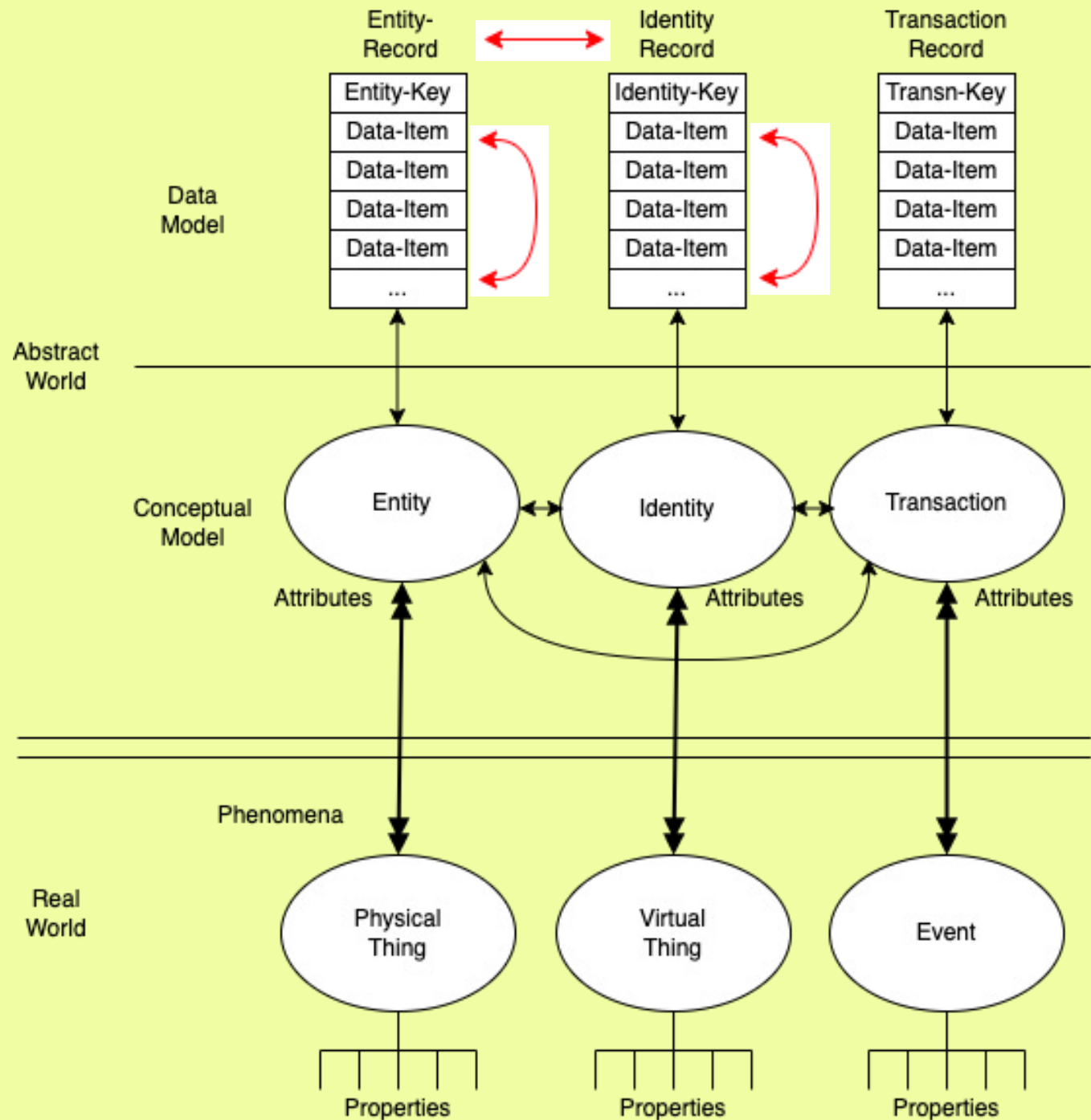
(8) **Content** Integrity

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*(1) (Id)Entity Assertion*

*A particular Thing is appropriately associated with one or more (Id)Entity-Records*

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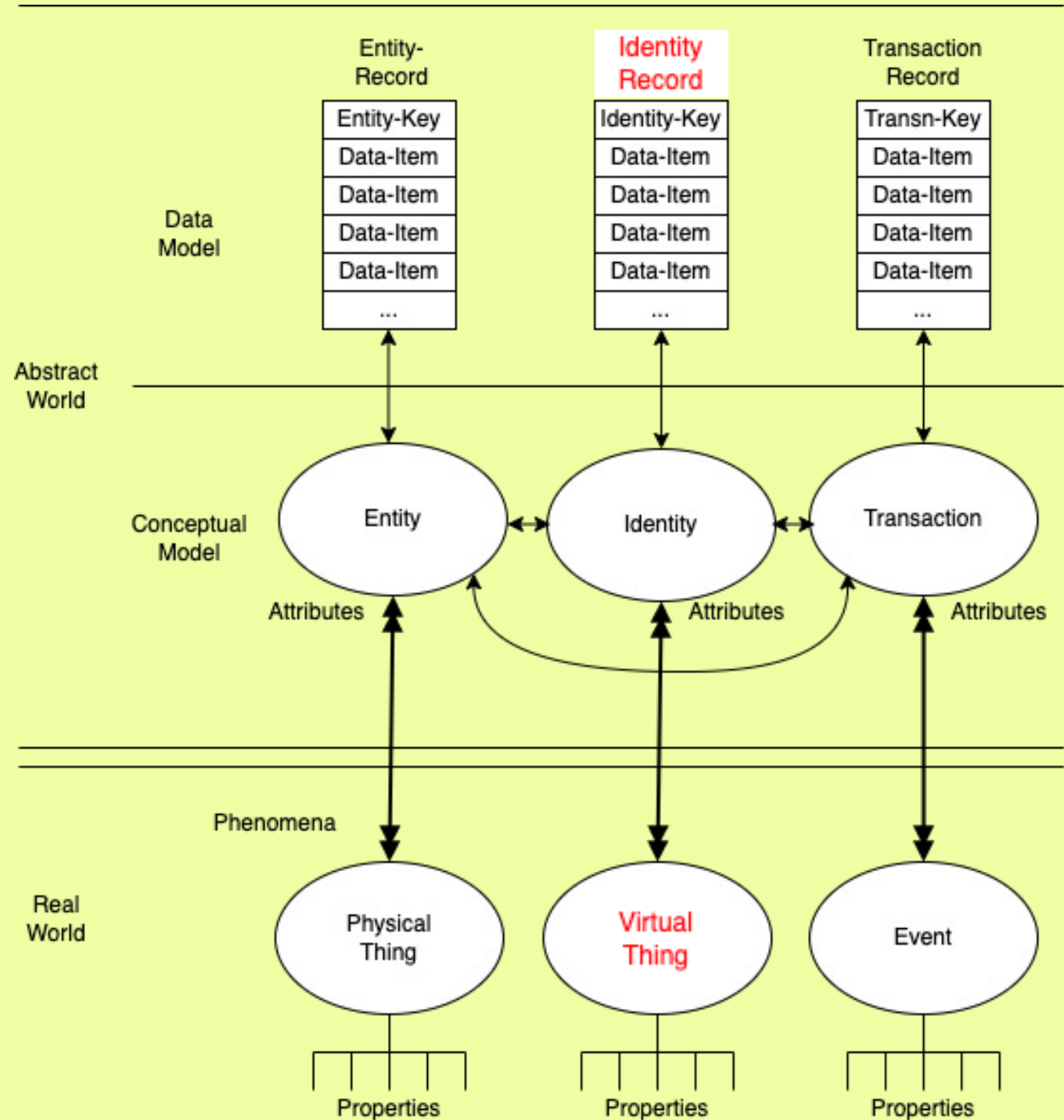
# (2) (Id)Entity Match Assertion

*Two different (Id)Entity-Records are appropriately associated with one another*

Clarke (2023)
Bled eConference
http://www.rogerclarke.com/
ID/IEA-Bled.html

# (3)   Simple Property Assertion

- *A particular Data-Item-Value in a particular (Id)Entity Record is appropriately associated with, <u>and</u> reliably represents, a particular Property of a particular Thing*

  'This gem is a diamond and weighs 1 carat'

  'We have 13 widgets because the inventory system says we have'

  'This customer is a frequent-buyer who gets a loyalty discount'

  'This person is old enough to enter the night club'

  *'This person has a degree from XYZ University'*

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A particular *Data-Item-Value* in a particular *(Id)Entity Record* is appropriately associated with, and reliably represents, a particular *Property* of a particular *Thing*

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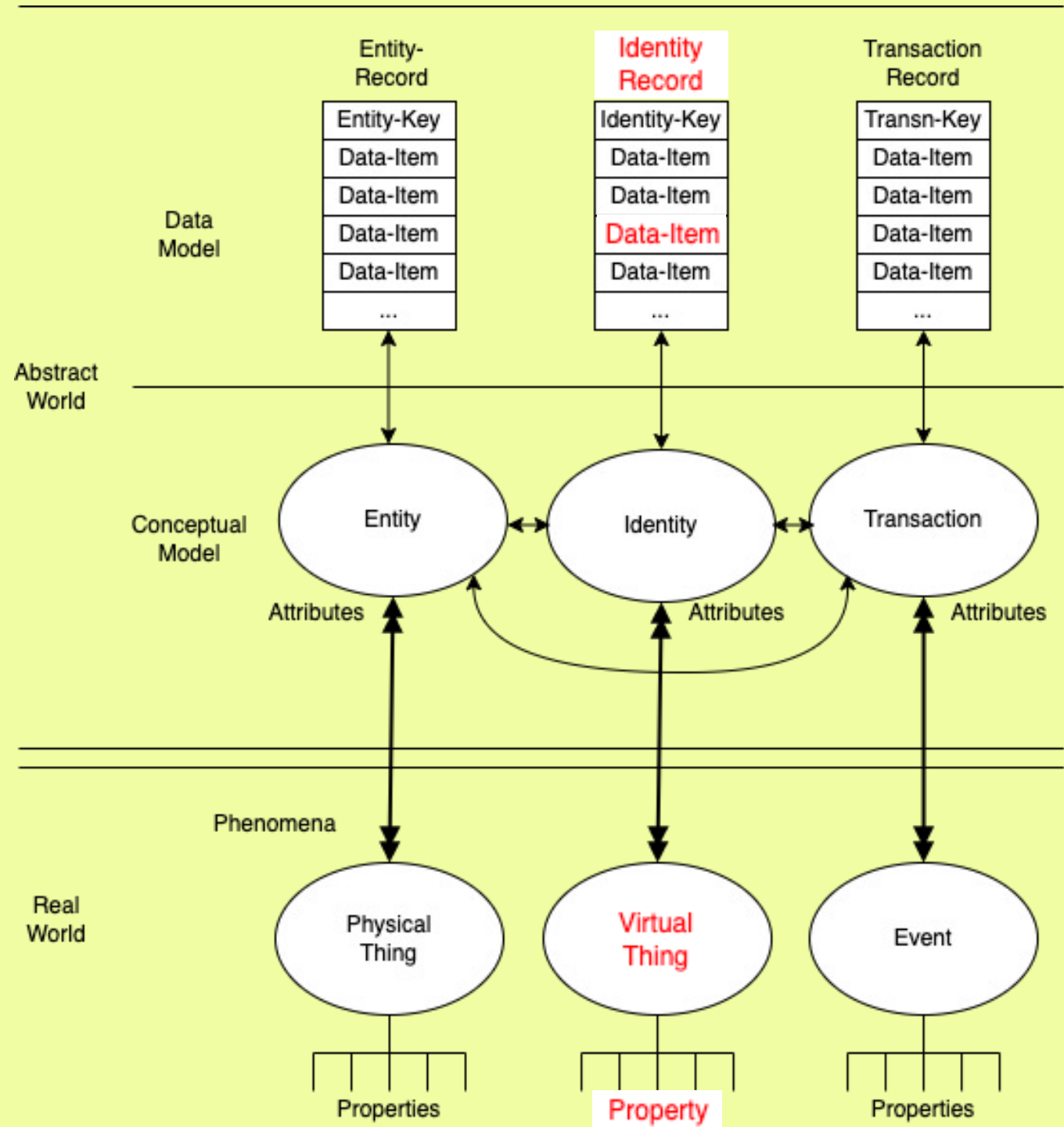
# (4)    Complex Property Assertion

- *A particular Thing is inferred to have a particular Property, on the basis of <u>multiple</u> particular Data-Item-Values in one or more particular (Id)Entity Records,*

  *<u>and</u> on the assumption that those Data-Item-Values are appropriately associated with that Thing and reliably represent that Property*

  'This borrower is behind on their loan repayments'

  *'This welfare recipient has been overpaid because they understated their income'*

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# (5)    Principal-Agent Assertion

- *A particular Thing has a particular Property, based on one or more particular Data-Item-Values in one or more particular (Id)Entity Records,*

  *which are appropriately associated with that Thing and*

  *which reliably convey that <u>the particular Thing has the authority to act on behalf of another particular Thing</u>*

  *'This human/legal-person/software-agent is the approved representative of this customer/client/defendant'*

# (6)     Monetary-Asset Value Assertion

- *A particular Thing is inferred to have a particular (economic) value, on the basis of its Properties*

  *and/or one or more Data-Item-Values in one or more particular (Id)Entity Records,*

  *<u>and</u> the assumption that those Data-Item-Values are appropriately associated with that Thing and reliably represent particular Properties*

  'This banknote is legal tender'
  'Our bank has confirmed deposit of the funds into our account'
  *'The shares you just bought are what you think they are'*
  *'It says my blockchain wallet has received digital currency'*

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  'It says my blockchain wallet has received digital currency'

- *Authenticate the Value <u>but</u> don't record (or even collect) parties' (Id)Entifiers without good reasons to do so*

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# (7)    Non-Monetary-Asset Value Assertion

- *A particular Thing is inferred to have a particular (economic) value, on the basis of its Properties*

  *and/or one or more Data-Item-Values in one or more particular (Id)Entity Records,*

  *<u>and</u> the assumption that those Data-Item-Values are appropriately associated with that Thing and reliably represent particular Properties*

  **'This** consumer-durable / livestock / ticket / motor vehicle / collectible / real estate / **parcel of** shares / **loans** / insurance ...
  **is worth the value that I / others place on it / attribute to it'**

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# (8)      Content Integrity Assertion

- *A Real World Thing is reliably represented by
  an Abstract World Entity-Instance-Attribute-Value
  or an Entity-Record-Data-Item-Value*

Mere Syntactics:

'The number of Widgets Class A that we have in stock is 37,
as recorded in the Current-Stock-Count Data-Item in the stock file'

'The message I've received is identical to that which was sent'

Semantics:

**'The text in the message means what I think it means**

**'The audio / image / video in the message is authentic'**

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# Implications for IS Practice and Theory

- The Pragmatic Metatheoretic Model suggests that several changes in approach are needed in IS thinking

- Authentication is about the reliability of Assertions

- **A broadened Authentication notion encourages focus on Assertions that are relevant to purpose, and whose reliability can be effectively and efficiently assessed**

- Property Assertions and Value-Assertions are in many cases more important, easier, cheaper and less intrusive to assess than (Id)Entity Assertions

- Contingency theories are needed that show when each category of Assertions needs to be prioritised

- **The scope of IS needs to be extended to Assertions of Fact, in text, audio, image and video, and the Authentication of their semantic content integrity**

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# The Authentication of Identity Assertions

# Agenda

- Motivation

- A Pragmatic Metatheoretic Model to support IS practice and relevant research

- The Theory of Assertion Authentication

- The Rich Set of Assertion Categories

- Authentication Processes

- Implications for IS Practice and Theory

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