DIDCOMM SUPER STACK (DIDSS)

CREATING HIGHLY SCALABLE DIDCOMM AGENTS USING .NET, TRINITY, AND OKAPI WITH EASE (FT. VCTPS PROTOCOL)

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TRUSTED DIGITAL WEB PROJECT

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Trusted Digital Web

trinsic-id/**okapi**

Okapi

2 Contributors | 0 Issues | 0 Stars | 0 Forks

microsoft/**GraphEngine**

Microsoft Graph Engine

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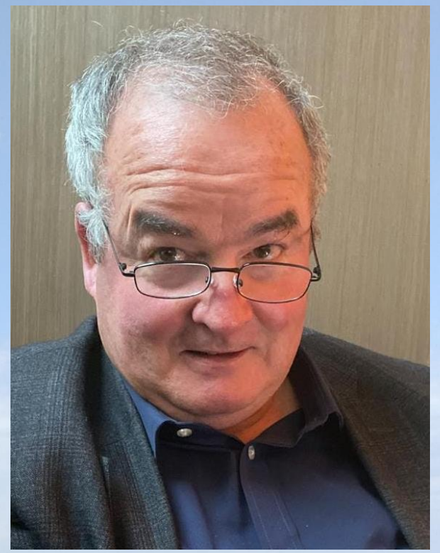


SINGULAR GOAL

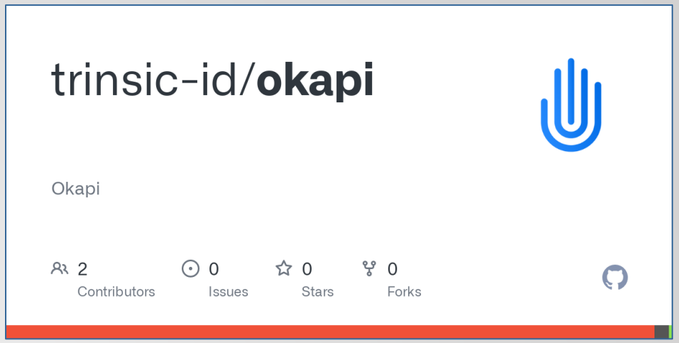
- Making decentralized agent design and development easier for C# and .NET developers

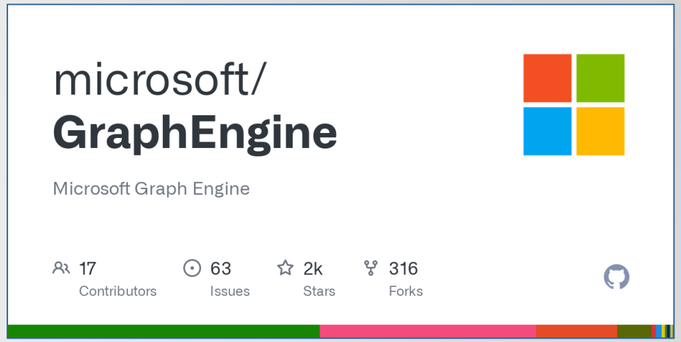
1. Model-based Automatic Code Generation
2. Structured Credential Model
3. Trinsic DID and DIDCOMM Libraries

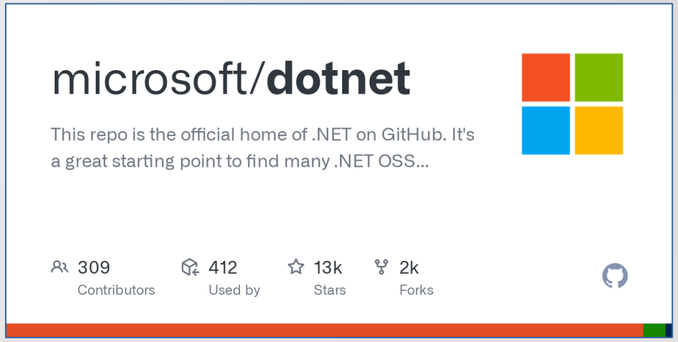
DIDCOMM SUPER STACK (DIDSS)

- Application framework for creating Verifiable Capability Authorization-enabled, highly scalable decentralized agents using .NET and DIDCOMM (featuring the VCTPS DIDCOMM Protocol)

Requirement	Open Source Project
3. DID key generation, DIDCOMM messaging, and credential signing	Trinsic-id Okapi Library
2. Decentralized agent modeling and code generation	Microsoft "Trinity" GraphEngine
1. Development and execution platform	Microsoft .NET Platform







MICROSOFT "TRINITY" GRAPHENGINE

- Trinity Specification Language (TSL)
  - Agent protocol and message structure definition
- TSL Codegen
  - Automatic code generation of complete C# projects
  - Objects, messages, and message handlers
  - Automatic JSON serialization/deserialization
- Very fast, highly optimized in-memory object graph database
- Highly performant and scalable clustered deployment model
- Simple, easy and efficient to use

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TRINSIC-ID OKAPI API

- DIDKey
  - generate
  - resolve
- DIDCOMM
  - pack
  - unpack
  - sign
  - verify
- Oberon
  - create_key
  - create_token
  - blind_token
  - unblind_token
  - create_proof
  - verify_proof

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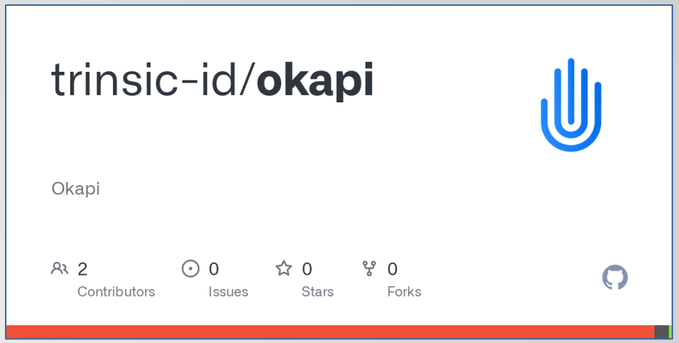
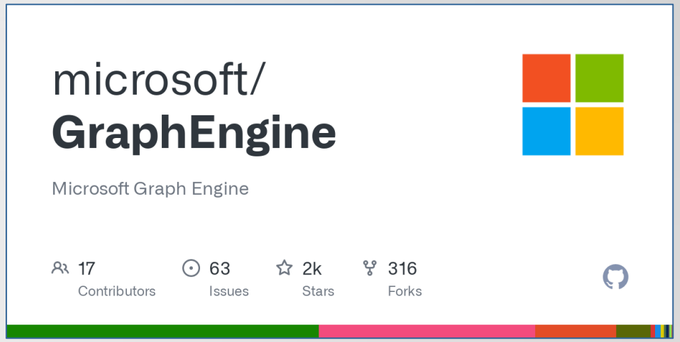
MICROSOFT .NET PLATFORM

- Build and execution platform
- Visual Studio 2022 IDE
- Visual Studio Code w/GitHub integration
- C# version 10
- Microsoft Common Language Runtime (MSCLR)





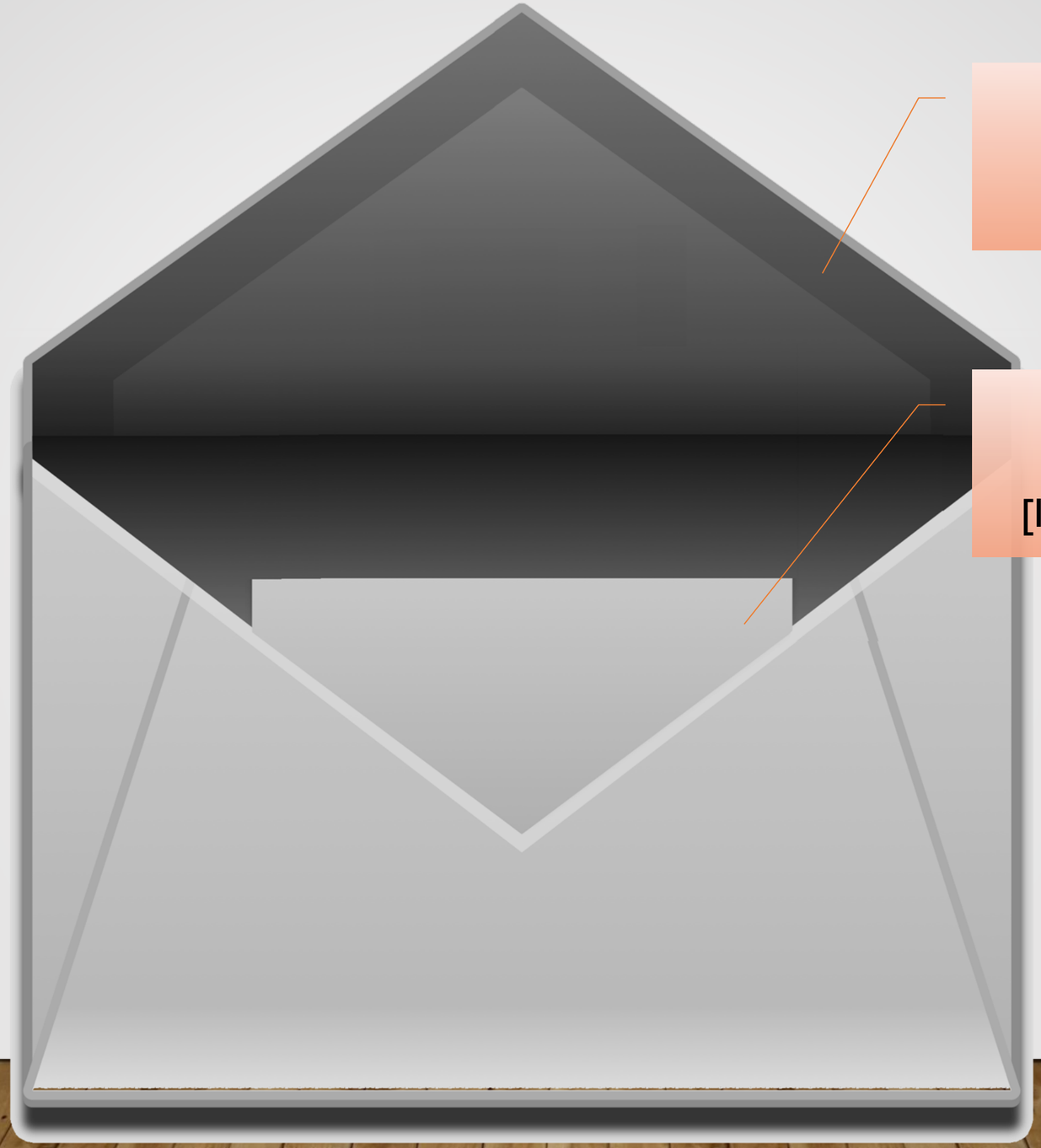
WHAT IS A STRUCTURED CREDENTIAL?

CREDENTIAL ENVELOPE
CREDENTIAL CONTENT
PACKING LABEL
ENVELOPE SEAL

Trusted
Digital
Web

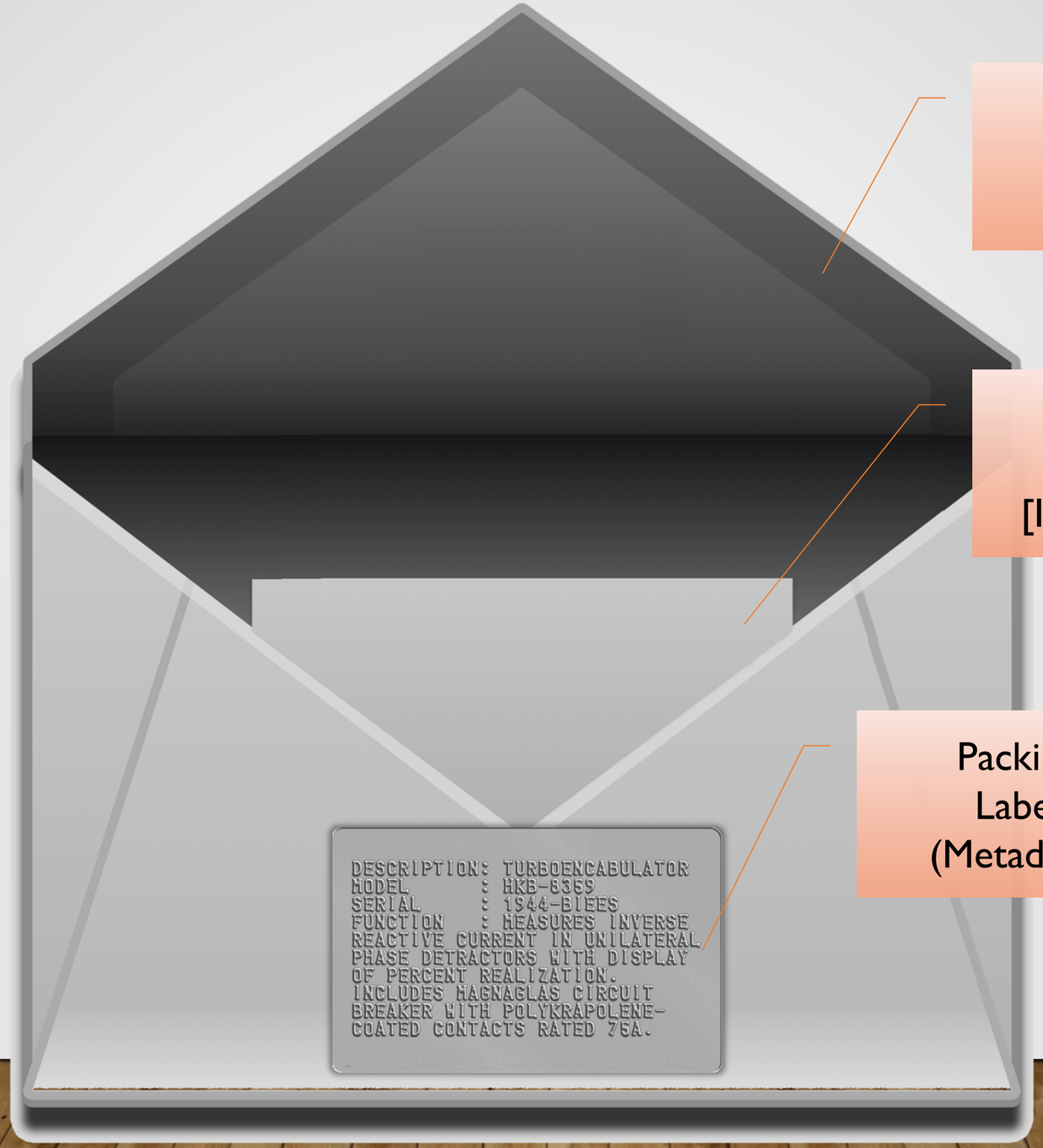
12

Credential Envelope (with ID)



Credential Envelope (with ID)

Credential Content [ID + Claims]



Credential Envelope (with ID)

Credential Content [ID + Claims]

Packing Label (Metadata)

DESCRIPTION: TURBOENCABULATOR
MODEL : HKB-8359
SERIAL : 1944-BIEES
FUNCTION : MEASURES INVERSE
REACTIVE CURRENT IN UNILATERAL
PHASE DETRACTORS WITH DISPLAY
OF PERCENT REALIZATION.
INCLUDES MAGNAGLAS CIRCUIT
BREAKER WITH POLYKRAPOLENE-
COATED CONTACTS RATED 75A.


Credential
Envelope
(with ID)
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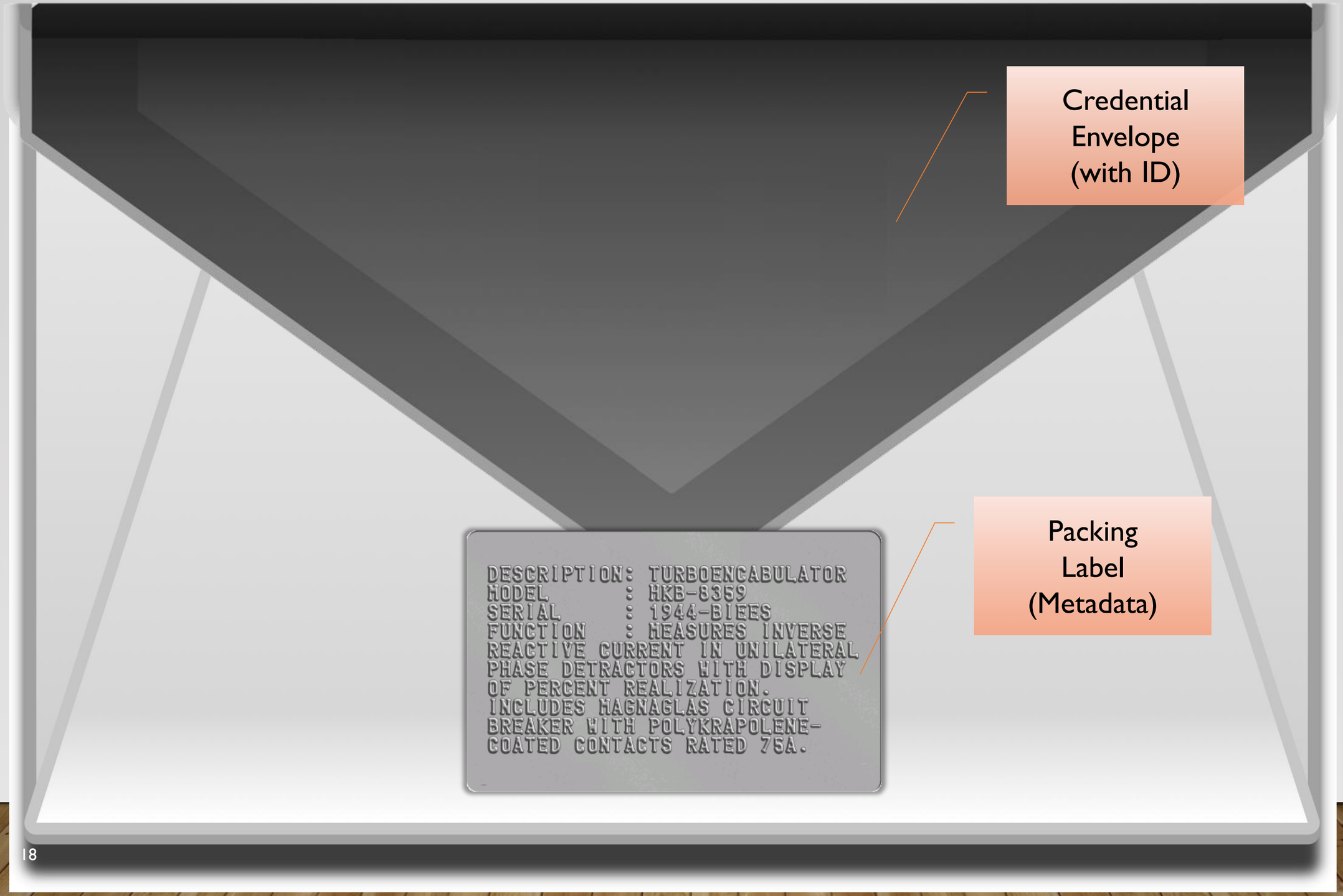
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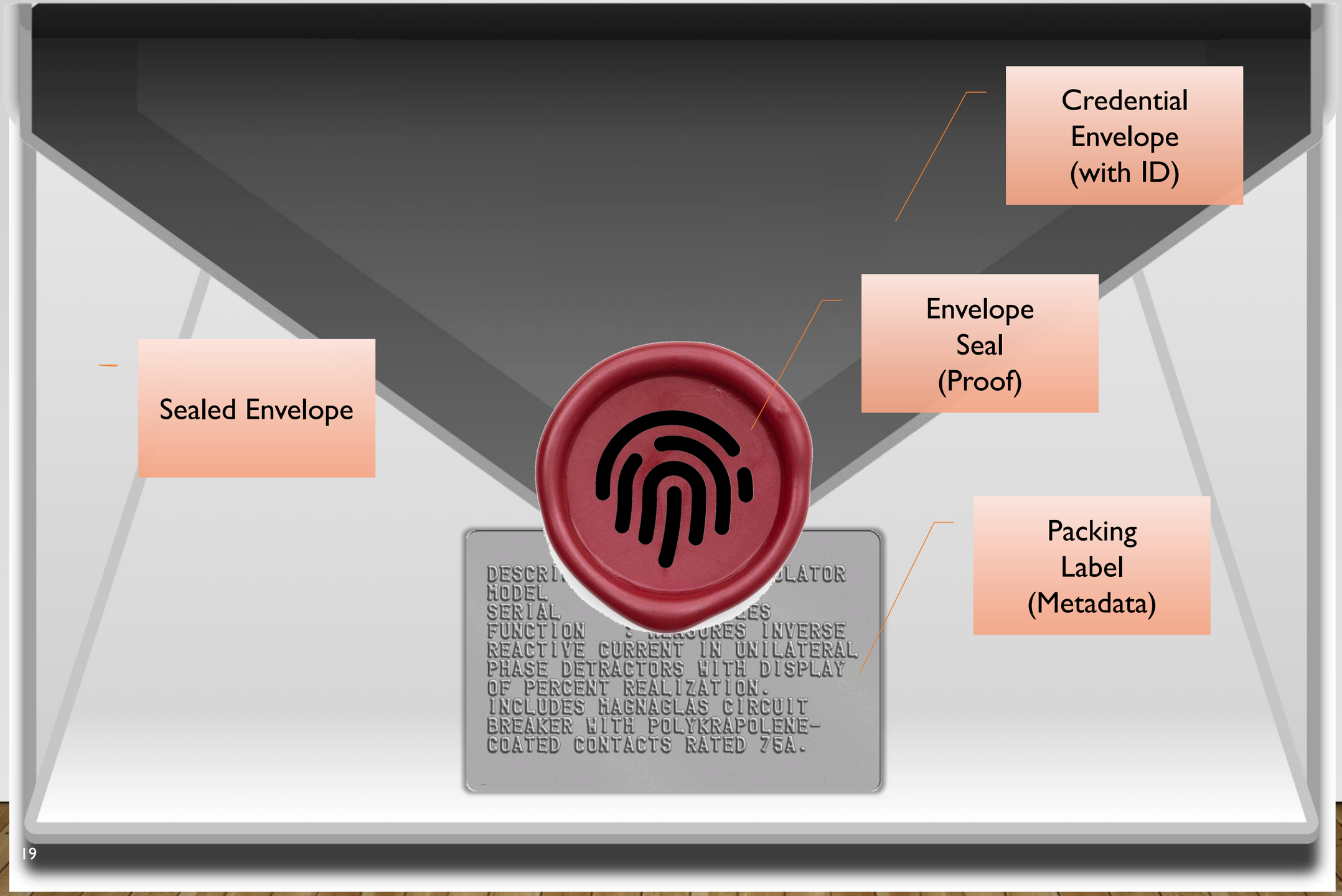
Credential Envelope (with ID)
Envelope Seal (Proof)
Sealed Envelope
Packing Label (Metadata)
DESCRI LATOR
MODEL
SERIAL
FUNCTION : MEASURES INVERSE
REACTIVE CURRENT IN UNILATERAL
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COATED CONTACTS RATED 75A.

PRIMARY COLORS: BOUND CREDENTIAL EXAMPLE

C: > TDW > TDW.Documentation > {} primarycolors-unbound-vc2.json >

Credential Envelope

Packing Label

Credential Content

Claims

Envelope Seal

```
{
    "id": "did:colors:primarycolorpallette",
    "type": [
        "VerifiableCredential",
        "ColorPalette"
    ],
    "@context": [
        "https://www.w3.org/2018/credentials/v1",
        "https://www.w3.org/2018/credentials/examples/v1",
      {
        "@context": {
            "claims": {
                "@id": "https://example.com/claims",
                "@type": "@json"
            }
        }
    }],
    "credentialSubject": {
        "id": "did:colorpallettes:1234",
        "claims": {
            "colors": [
                "red",
                "green",
                "blue"
            ]
        }
    },
    "proof": {}
}
```


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```
struct BTT_Invoice_EnvelopeContent
{
    string udid;
    List<string> context;
    optional string credentialsubjectudid; // bound credential
    Cac_Invoice claims;
    optional BTTEncryptedClaims encryptedclaims;
}
struct BTT_Invoice_Envelope
{
    string udid;
    BTTGenericCredential_PackingLabel label;
    BTT_Invoice_EnvelopeContent content;
}
struct BTT_Invoice_SealedEnvelope
{
    BTT_Invoice_Envelope envelope;
    BTTGenericCredential_EnvelopeSeal envelopeseal;
}
```

VCTPS PROTOCOL

Verifiable Capability Authorization (VCA) based

Secure Verifiable Credential Transport Protocol

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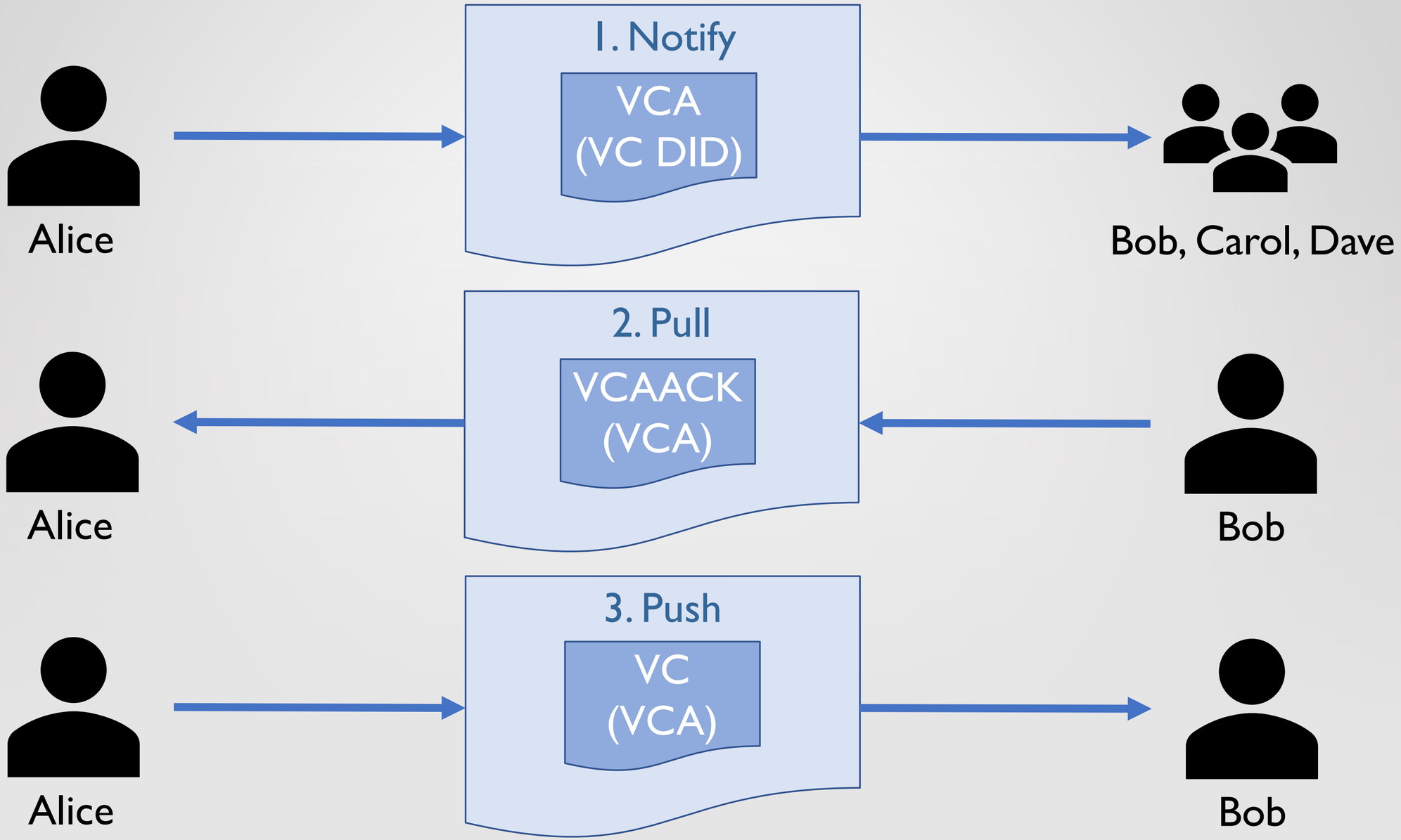
VCTPS DIDCOMM PROTOCOL – SEQUENCE DIAGRAM



TRUSTED DIGITAL WEB AND VCTPS PROTOCOL MODELS

Enterprise Architecture Domains	Extended OSI Model	Trusted Digital Web	VCPTS Protocol
Business Domain/Architecture	Business	did:bluetoquebizdoc	BPMN Workflows
Application Domain/Architecture	Application	did:vca + did:vcaack	VCTPS Protocol
	Presentation	did:key + did:object	DIDCOMM Messaging
Technology/Infrastructure Domain/Architecture	Session	Trinity Graph Engine	REST/HTTP
	Transport	TCP & UDP Protocols	TCP Protocol
	Network	IP (Logical Addressing)	IP (Logical Addressing)
	Data Link	Physical Addressing (MAC)	Physical Addressing (MAC)
	Physical	Binary Transmission	Binary Transmission

DEMOS

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DEMOS

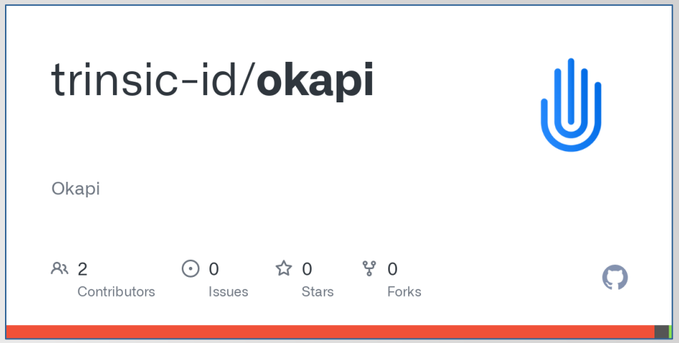
- Prototype1 Goals
  - Create a DIDCOMM agent that accepts encrypted DIDCOMM messages
  - Model the message structures, DIDCOMM protocols, and server implementation using the Trinity Specification Language (TSL)
  - Use automatic code generation to build the message structures and server implementation using C#
  - Send an "empty" DIDCOMM message to the DIDCOMM Agent
- Prototype 2 Goals
  - Use the Trinsic-id Okapi library to create an encrypted DIDCOMM message containing a (dummy) Verifiable Capability Authorization (VCA) resembling a Notify message in the VCTPS Protocol
  - Send the Notify VCTPS Protocol message (w/multiple recipients) to the Prototype 1 DIDCOMM agent
  - Have the DIDCOMM agent receive, accept, and decrypt the Notify message
  - Show a simple example of saving a Trinity structure (cell) to Trinity Local Storage

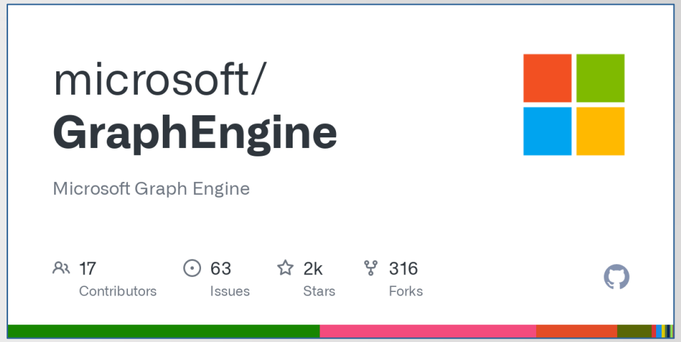
DEMOS

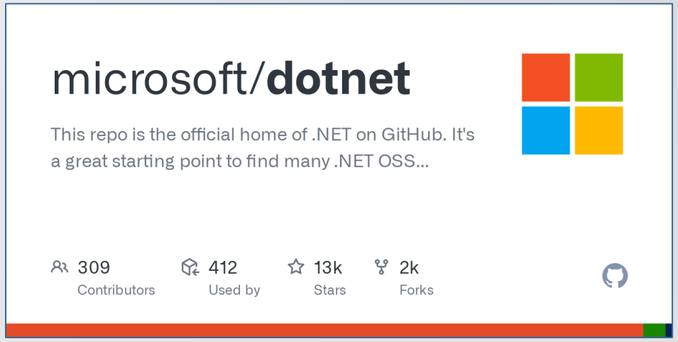
- Prototype 5 Goals
  - Structured Credential Programming Model using TSL autogenerated entities (C# classes)
  - Model Verifiable Capability Authorization (VCA) using TSL (and VCA ACK)
  - Replace dummy VCA used in Prototype2 with the VCTPS Protocol model expressed using TSL
  - Create helper methods for VCAs (as well as VCAACKs and UBL Invoices, Parties, and Items)
  - Create a VCA VC

RESOURCES

- Trinsic-id Okapi DID Libraries
  - GitHub: https://github.com/trinsic-id/okapi
  - Examples: https://github.com/trinsic-id/okapi/tree/main/dotnet/Tests/Okapi.Tests
- Microsoft "Trinity" GraphEngine
  - GitHub: https://github.com/microsoft/GraphEngine
  - Documentation: https://www.graphengine.io/docs/manual/index.html
  - Examples: https://www.graphengine.io/docs/manual/DemoApps/index.html
- DIDCOMM Super Stack (DIDSS)
  - Examples: https://github.com/mwherman2000/VCTPSPrototypes
- Structured Credential Model
  - https://www.youtube.com/playlist?list=PLU-rWqHm5p45dzXF2LJZjuNVJrOUR6DaD







QUESTIONS?

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