



# Trusted Content Storage (TCS Stack): Decentralized Twitter<sup>1</sup> (Dewitter) Platform Requirements List

Version 0.37 Review Draft – March 18, 2021

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*The publication of this document coincides with recent discussions (January-March 2021) about secure data storage solutions in the Decentralized Identity Foundation (DIF) Secure Data Storage working group (sds-wg) that were taking place during the development of the Confidential Storage specification.*

*This is not a DIF publication, unofficial, official, or otherwise.*

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<sup>1</sup> Twitter is trademark of Twitter but Twittad also owns it too.

Reference: <https://mashable.com/2011/10/10/twitter-tweet-trademark/>

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## CHANGE HISTORY

### Version 0.35

1. First version of the Dewitter platform requirements list

# ABSTRACT

The purpose of this document is to list the platform requirements for Decentralized Twitter (Dewitter) App Scenario based on the Trusted Content Storage Architecture (TCS Stack).

This requirements list is derived from the Decentralized Twitter (Dewitter) App Scenario whitepaper<sup>2</sup>.

The intended audience for this whitepaper is a broad range of professionals interested in furthering the application and use of a highly secure, modular, encrypted data storage solution for use in software apps, agents, and services. This includes software architects, application developers, and user experience (UX) specialists; as well as people involved in a broad range of standards efforts related to decentralized identity, verified credentials, and secure storage.

The work documented here was performed under the auspices of the Trusted Digital Web project in the Hyperonomy Digital Identity Lab of Parallelspace Corporation.

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<sup>2</sup> Michael Herman. *Trusted Content Storage Architecture (TCS Stack): Decentralized Twitter (Dewitter) App Scenario* (<https://hyperonomy.com/2021/03/05/trusted-content-storage-tcs-stack-decentralized-twitter-the-dewitter-use-case/>).

# CONTEXT

## Purpose

The purpose of this document is to list the platform requirements for Decentralized Twitter (Dewitter) App Scenario based on the Trusted Content Storage Architecture (TCS Stack).

This requirements list is derived from the Decentralized Twitter (Dewitter) App Scenario whitepaper<sup>3</sup>.

Dewitter is intended to be a completely standalone, fully decentralized implementation of a Twitter-like platform. Dewitter is not intended to have a physical connection or otherwise with the actual Twitter platform or app.

## Goals

The goal of the Dewitter requirements list is to influence the scope and detail of the Confidential Storage (or alternative) specification to support the design and implementation of a platform based on the Decentralized Twitter (Dewitter) App Scenario whitepaper.

## Intended Audience

The intended audience for this whitepaper is a broad range of professionals interested in furthering the application and use of a highly secure, modular, encrypted data storage solution for use in software apps, agents, and services. This includes software architects, application developers, and user experience (UX) specialists; as well as people involved in a broad range of standards efforts related to decentralized identity, verified credentials, and secure storage.

## Organization

This whitepaper contains the following sections:

- Context (this section)
- Dewitter Requirements List
- APPENDIX A: Resources
- APPENDIX B: Generic Replication Pipeline
- APPENDIX C: Licenses

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<sup>3</sup> Michael Herman. *Trusted Content Storage Architecture (TCS Stack): Decentralized Twitter (Dewitter) App Scenario* (<https://hyperonomy.com/2021/03/05/trusted-content-storage-tcs-stack-decentralized-twitter-the-dewitter-use-case/>).

# DEWITTER PLATFORM REQUIREMENTS

This requirements list is derived from the Decentralized Twitter (Dewitter) App Scenario whitepaper.

Each requirement item is defined by a bullet preceded by a capital letter (A, B, C, ..., AA, BB, CC, ...).

## Dewitter Platform Requirements

The Dewitter requirements list is organized section-by-section to match the outline of the Decentralized Twitter (Dewitter) App Scenario whitepaper.

## Assumptions, Principles, Requirements, and Other Considerations

### Abbreviations

- EDV = Encrypted Data Vault
- EDV App = Encrypted Data Vault-based App (Application or Service)

### General Assumptions

#### Dewitter Use Cases: #1

- A. User Case 1b. No centralized servers are required to support Encrypted Data Vaults for phone, tablet, or laptop-based applications.
  - EDV Server Instance runs on local device.
  - Personal agent uses a direct API to access EDVs attached to the EDV Server Instance.

### Actors, Roles (Personas), and Roles (Followers, Following, Neighborhoods)

#### Dewitter Use Cases: #2-4

- B. Use Case 2. Users of an EDV-based application can have multiple accounts (identities) associated with themselves and their EDV Apps.

### EDV Server Instances, EDV Data Vaults, and Containers

#### Dewitter Use Cases: #5

- C. Use Case 5a. Local EDV Service Instances are capable of running standalone on a personal device (e.g. phone, laptop, or tablet).
- D. User Case 5c. Each Local EDV Service Instance can host (have attached to it) 1 or more EDVs
- E. Use Case 5d. Each EDV has the capability of storing resources into a separate and secure resource Container (or the equivalent). An EDV can contain 1 or more Containers.
- F. Use Case 5x. Local EDV Service Instances automatically start and restart (after the device resumes from hibernation).

### Personal Data Vaults and Containers

#### Dewitter Use Cases: #6

- G. Use Case 6d. A resource is stored securely in a named Container in a personal local EDV.

## Personal Agents

### Dewitter Use Cases: #7

- H. Use Case 7e. Personal Agents can talk to each other and exchange messages (e.g. using DIDCOMM).
- I. Use Case 7f. A Personal Agent (or the equivalent) mediates all access to a personal Local EDV Service Instance, the attached EDVs, and the Containers of resources contained in the EDVs.
- J. Use Case 7h. Personal Agents automatically start and restart (after the device resumes from hibernation).

## Dewitter Data Vault

### Dewitter Use Cases: #8

- No requirement items

## Dewitter Data Model Definitions

This section describes how Tweet Items are stored in Dewitter's fully decentralized architecture.

### Dewitter Use Cases: #9-18 (Use Cases: 19-22 Reserved)

- K. Use Case 10. Any resource, optionally, can have plain-text properties associated with the resource for the purpose of querying and retrieving a single resource or a collection of resources (Simple Resource Key).
- L. Use Case 10. A resource property (Simple Resource Key) can have sub-properties (Resource Subkeys) – called a Resource Complex Key.
- M. Use Case 10. A specific Container can be queried for a single resource or a collection of resources given a Simple Resource Key or a Complex Resource Key.
- N. Use Case 14. A Local EDV Service Instance has an atomic, transaction-safe capability for updating the value of a property on a resource in a Container (e.g. incrementing the value of “counter” property on a resource).
- O. Use Case 14. A Local EDV Service Instance supports a general-purpose, atomic, transaction-safe capability for updating the value of a property on a resource in a Container *based on an arbitrary property value changing computation* on the specific resource.
- P. Use Case 15. A Local EDV Service Instance has a capability for storing, updating, querying, and retrieving stream resources from a client app or service (e.g. images, audio streams, video streams).

## Personal Agent to Local EDV Server Instance Communications

### Use Cases: #23

- Q. Use Case 23a. Capability for a Personal Agent to directly access a Local EDV Server Instance running on the same device using the Layer B EDV Trusted Content Storage Services API (not via one of the Layer B Trusted Content Storage Service remote access service endpoints (e.g. HTTP, Bluetooth, etc.).
- R. Use Case 23b. Capability for a Local EDV Server Instance Layer B EDV Trusted Content Storage Services API to talk directly to the Layer A Trusted Content Storage Kernel via an API (which, in turn, talks directly to the EDV Microkernel).
- S. Use Case 23c. An EDV Microkernel securely manages all access and operations against each of the attached EDVs.

## Dewitter Protocol Operations

NOTE: A Compound Query is a query parameter that includes multiple Resource Keys (Simple and Complex) and their key values.

### Use Cases: #24-35

#### Create/Update a Tweet Item or Stream Item in a Personal Local EDV Service Instance

- T. Use Case 24a. Capability to *create* a new resource in a Container in a Data Vault attached to the Local EDV Service Instance.
- U. Use Case 24b. Capability to *update* a new resource in a Container in a Data Vault attached to the Local EDV Service Instance.
- V. Use Case 24c. Capability to *tombstone* a new resource in a Container in a Data Vault attached to the Local EDV Service Instance.
- W. Use Case 24x. Capability to ensure no one but the owner can update a resource in a Container in the Data Vault attached to the Local EDV Service Instance (*block*).

#### Query a Personal Local EDV Server Instance for a List of Tweet Keys or a Collection of Tweet Items

- X. Use Case 25a. Capability to query a Local EDV Server Instance for a *list of Resource Keys* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- Y. Use Case 25b. Capability to query a Local EDV Service Instance for a *list of Resource Items* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- Z. Reserved

#### Query Another Personal Agent or List of Personal Agents for a List of Tweet Keys

- AA. Use Case 26a. Capability to *query another Personal Agent for a list of Resource Keys* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- BB. Use Case 26b. Capability to *query a List of Personal Agents for a list of Resource Keys* given a list of Simple Resource Keys or a Complex Resource Keys or a Compound Queries.



#### Query Another Personal Agent or List of Personal Agents for a List of Tweet Items

- CC. Use Case 27a. Capability to *query another Personal Agent for a list of Resource Items* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- DD. Use Case 27b. Capability to *query a List of Personal Agents for a list of Resource Items* given a list of Simple Resource Keys or a Complex Resource Keys or a Compound Queries.

#### Block a Query from Another Personal Agent

- EE. Use Case 28a. *Capability for a receiving Personal Agent to block the receipt and acceptance of a query* for a resource from another Personal Agent.

#### Query a Personal Local EDV Server Instance for a List of Stream Keys or a Collection of Stream Items

- FF. Use Case 29a. Capability to *query a Local EDV Server Instance for a list of Resource Keys* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- GG. Use Case 29b. Capability to *query a Local EDV Service Instance for a list of Resource Items* given a Simple Resource Key or a Complex Resource Key or a Compound Query.

#### Query Another Personal Agent or List of Personal Agents for a List of Stream Keys

- HH. Use Case 29y. Capability to *query another Personal Agent for a list of Resource Keys* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- II. Use Case 29z. Capability to *query a List of Personal Agents for a list of Resource Keys* given a list of Simple Resource Keys or a Complex Resource Keys or a Compound Queries.

#### Query Another Personal Agent or List of Personal Agents for a List of Stream Items

- JJ. Use Case 30a. Capability to *query another Personal Agent for a list of Resource Items* given a Simple Resource Key or a Complex Resource Key or a Compound Query.
- KK. Use Case 30b. Capability to *query a List of Personal Agents for a list of Resource Items* given a list of Simple Resource Keys or a Complex Resource Keys or a Compound Queries.

#### Update a Resource Item in Another Personal Local EDV Service Instance

- LL. Use Case 35. Capability, *given a Resource Key, update an existing Resource Item in a Container in an EDV Data Vault attached to a personal Local EDV Server Instance.*

#### Dewitter Use Cases

##### Use Cases: #36-51

- MM. Use Case 48. *A Local EDV Service Instance has an atomic, transaction-safe capability for updating the value of a property on a resource in a Container* (e.g. incrementing the value of “counter” property on a resource). (Same as Requirement Item N.)

#### Notes on Notes

##### Dewitter Notes: #1-4

- NN. Note 1. Support for offline Personal Agents.
- OO. Note 2. Support for offline Local EDV Server Instances.

PP. Note 3. For secure logging on an EDV-by-EDV basis: all actions against the Containers in a particular EDV stored in a secure Logging Container for that EDV.

QQ. Note 3. Support for EDV-to-EDV replication at the Container-by-Container level.

### Distwitter Platform Requirements

The requirements for the Distributed Twitter (Distwitter) architecture variation of the Dewitter platform are out of scope for this version of this document.

# CONCLUSION

*If I have seen further, it is by standing on the shoulders of Giants.*

[Issac Newton, 1675]

The purpose of this document is to list the platform requirements for Decentralized Twitter (Dewitter) App Scenario based on the Trusted Content Storage Architecture (TCS Stack).

This requirements list is derived from the Decentralized Twitter (Dewitter) App Scenario whitepaper.

The next steps are to proceed with a prioritization of the items in this requirements list.

## Acknowledgments

The responsibility for any errors or omissions lies with me alone.



# APPENDICES

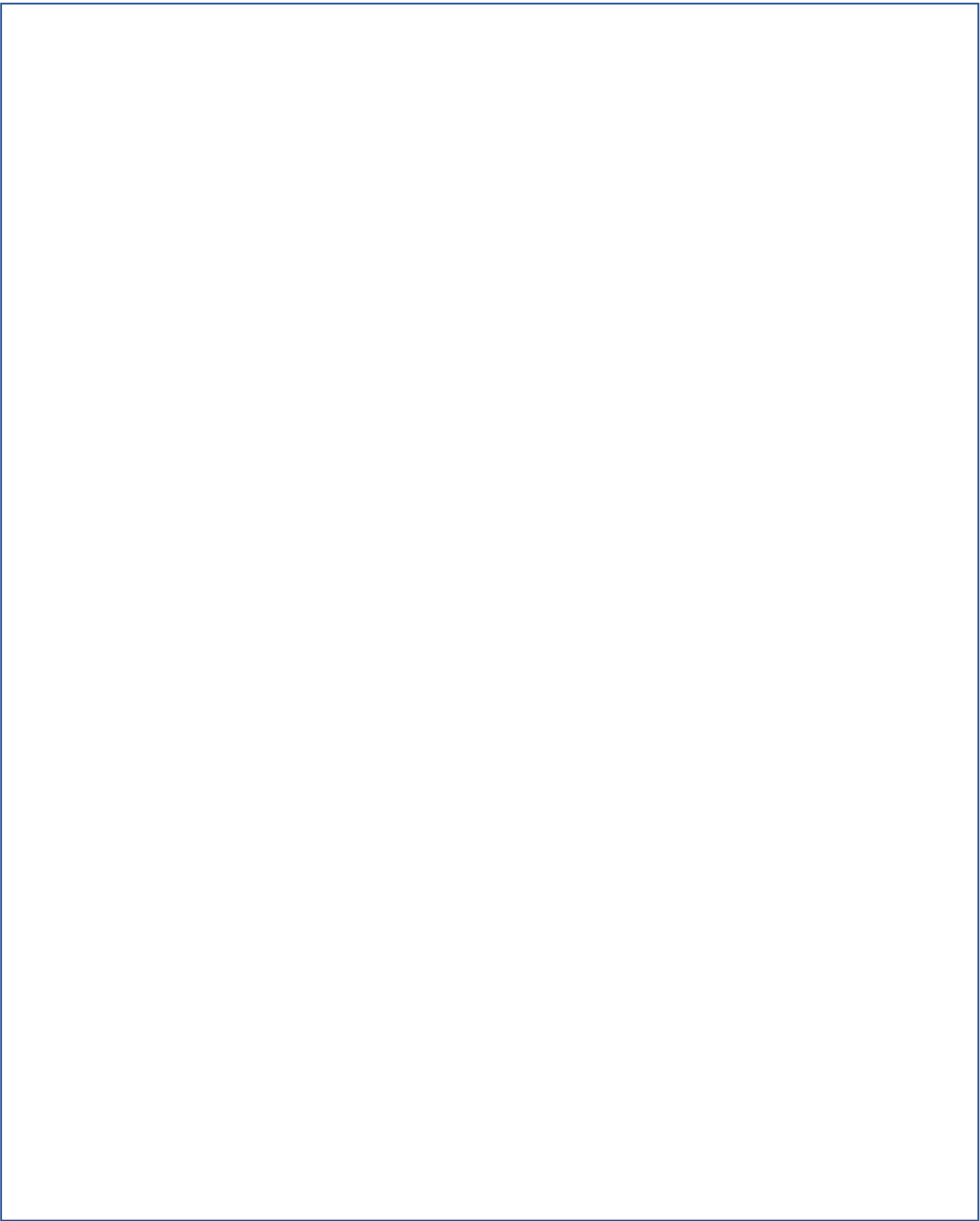
## APPENDIX A – RESOURCES

### Twitter Help Documentation

1. Using Twitter: <https://help.twitter.com/en/using-twitter>
2. Types of Tweets: <https://help.twitter.com/en/using-twitter/types-of-tweets>
3. Authorization use cases: <https://help.twitter.com/en/using-twitter/twitter-conversations>
4. Liking Tweets: <https://help.twitter.com/en/using-twitter/liking-tweets-and-moments>
5. Notifications: <https://help.twitter.com/en/managing-your-account/notifications-on-mobile-devices>
6. Policies: <https://help.twitter.com/en/rules-and-policies/twitter-limits>,  
<https://help.twitter.com/en/using-twitter/mentions-and-replies>
7. Glossary: <https://help.twitter.com/en/glossary>
8. Blocking and Muting: <https://help.twitter.com/en/using-twitter#blocking-and-muting>
9. Promoted Tweets: <https://business.twitter.com/en/help/overview/what-are-promoted-tweets.html>

### Android Inter-App Communication

1. Communicating between Android apps: <https://digital.ai/catalyst-blog/communicating-between-android-apps>
2. Application Fundamentals: <https://developer.android.com/guide/components/fundamentals>
3. Interacting with Other Apps: <https://developer.android.com/training/basics/intents>
4. Getting a Result from Another App:  
<https://developer.android.com/training/basics/intents/result>
5. What is a Service?  
<https://developer.android.com/reference/android/app/Service#WhatIsAService>



## APPENDIX B – A GENERIC REPLICATION PIPELINE

A generic Replication Pipeline is illustrated below.

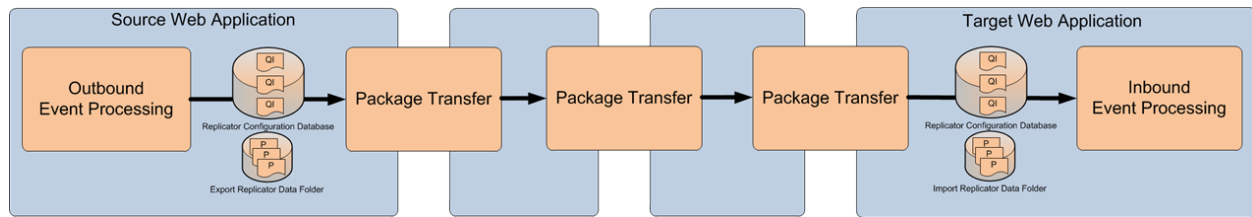


Figure 1. A Generic Replication Pipeline (Credit: Syntergy Replicator for SharePoint)

### Outbound Processing Service

Outbound Processing Service is responsible for capturing and recording Replication Events that occur in the Source Repository. Outbound Processing Service is controlled by Replication Maps which determine what Events need to be captured, packaged, and transferred to the Target Repository. Groups of Replication Events are packaged into two types of messages or objects: Queued Items and Replication Packages.

### Queued Item

A Queued Item is a unit of work to be transferred to a Target Repository for remote execution. The Replication Web Service on a Target Repository is called to push a Queued Item from the Source Repository to a Target Repository.

### Replication Package

A Replication Package is a collection of one or more Replication Events plus data about the changed information that is packaged in a format specific to the Replication Transport being used. When an Event is being processed, Outbound Processing Service calls the Source repository object model to extract the changed information from the Source Repository.

### Package Transfer Service

The Package Transfer Service activity is responsible for the transfer and receipt of Queued Items and the downloading Replication Packages (Packages) from the Source Repository to the Target Repository. Package Transfer is the process that sits between Outbound Processing Service (on the Source Repository) and Inbound Processing Service (on the Target Repository).

### Inbound Processing Service

Inbound Processing Service is responsible for processing the Queued Items and Packages received and accepted by the Target Repository and applying them to the repository. The Queued Items and Packages are applied to the Target Repository content base by calling the Target Repository object model.

## APPENDIX C – LICENSES

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