Link/Unlink Analysis
pHIE – XDS-I

Creation Date: February 4, 2010
Document Version : 1.1

Table of Contents

Document Revision History

Version	Version Date	Summary of Changes	Author
V0.1	05/26/2009	First Draft	N. Domeij
V0.2	05/29/2009	Edits	N. Domeij
V0.3	06/3/2009	Incorporating feedback	N. Domeij
V0.4	06/11/2009	Incorporating feedback from R. Fleury	N. Domeij
V0.5	07/26/2009	Adding Discussion on IHE reasons for omission.	N. Domeij
V0.6	12/03/2009	Updates to discuss 2 different link/unlink scenarios after meeting with Agfa. Addition of research on ITI-8, ITI-10 and ITI-30 for merge/link discussions.	K .Patton
V0.7	12/07/2009	Edits and Updated Appendix A.	N. Domeij
V0.8	01/25/2010	Added Link/Unlink analysis to end of doc.	K. Patton
V0.9	02/03/2010	Added Appendix B and C Added further discussion on Link/Unlink Semantics Added Discussion in Proposed Solutions and corresponding sequence diagrams	N. Domeij K. Patton
V1.0	02/04/2010	Final Edits	N. Domeij
V1.1	03/04/2010	Revised after receiving comments from InfoWay.	N. Domeij

1. Introduction

1.1 Purpose

The intent of this document is to highlight and discuss the issues with the Link and Unlink functionality as it pertains to the IHE XDS-I Profile and Alberta's implementation of the Patient Identity Source. This document presents a concrete use case for Link and Unlink and poses potential solutions to fill that gap within the IHE specification, focusing on the message transport mechanisms required to facilitate the link and unlink between the Patient Identity Source and the Document.

1.2 Background

The AHS EMPI is used to manage a patient's identity as it crosses many domains and clinical care sites within the province. To manage these, the AHS EMPI links and unlinks local identifiers with the patient's Enterprise Client Identifier (ECID).

Link/unlink however is not supported by the IHE XDS-I Profile and, in fact, has been intentionally omitted by IHE. The following was taken from the "*IHE IT Infrastructure Technical Framework Supplement 2009-2010 - Cross-Enterprise Document Sharing (XDS) Patient Identity Merge*" *section 1.2. Closed Issues:*

The IHE Profiles do not support Link\Unlink for the following reasons:

a. *Merge is documented in transaction ITI-8 that is already integrated into XDS. Link/UnLink requires the integration of transaction ITI-30 as well. This is considered too much to introduce at this time without concrete use cases to support it.*

b. *We understand that Japan and others favor Link over Merge semantics. We will consider this when we have concrete use cases from these regions.*

c. *Additionally, Link/UnLink semantics introduce issues which are difficult to manage in XDS. A document added to a folder where the document and folder have different but linked patient identifiers would be legal. But a subsequent UnLink of the document and folder patient identifiers would render the folder/document combination illegal under the rules of XDS. This needs to be solved before Link/UnLink can be introduced into XDS.*

d. *Introducing Link would require a change in semantics of Registry Stored Query so that Document Consumers would be required to ignore the patient identifier returned in metadata from a Registry Stored Query.*

e. *The semantics of Link/Unlink are not well understood. The discussion of Link in the PAM profile [transaction ITI-30] indicates that two lists of patient identifiers are linked. Additional clarification would be needed from HL7 on how this is to be interpreted.*

This document discusses the action of linking and unlinking and the potential impacts this may have on Alberta's XDS-I project.

1.3   Link/Unlink Semantics

There are two different scenarios that require changes in the relationships between the enterprise identifiers (eCID) and the local identifies: (i) link/unlink and (ii) merge/unmerge. it was discovered during analysis that the semantics of these scenarios are often confused. For clarification, this document considers the movement of any Local or Source Identifiers such as a ULI, RHRN, MRN from one ECID to another, as shown in Figure 1, as a Link/Unlink.
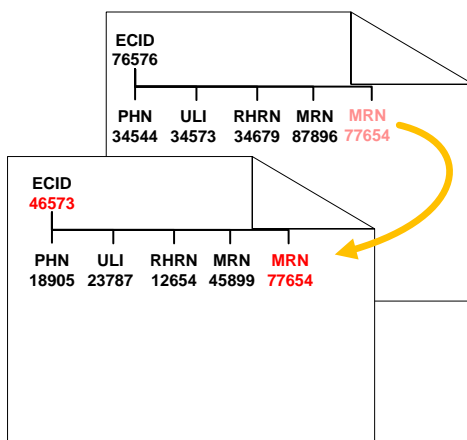

Figure 1 – Local Identifiers From One ECID To Another

In cases where two unique ECID's are combined resulting in the destruction of one ECID and the remaining ECID being updated with the other Local or Source Identifiers, as shown in Figure 2, is considered a merge. In this case the two ECID's are merged into one with a destructive result, meaning that once the merge has been performed there is no ability to reverse or unmerge the ECIDs.
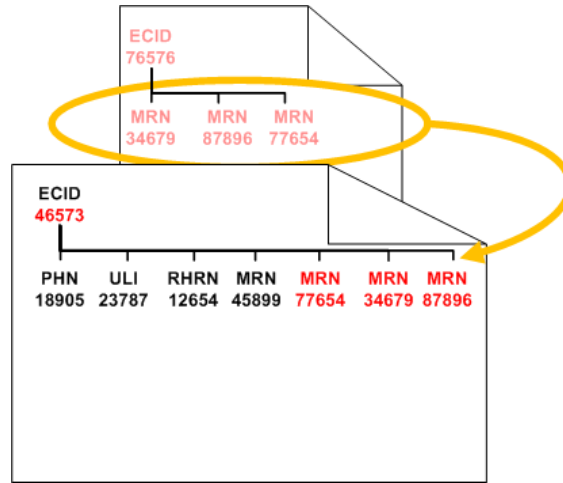

Figure 2 – Link More Than One ECID

The Alberta XDS-I solution has an issue with linking and unlinking local identifiers to a particular ECID that is not handled by the IHE specifications. This is the scenario discussed within the rest of this document. For further analysis on the sequence of events within the AHS EMPI please refer to appendix C of this document.

2. XDS-I Link/Unlink Discussion

2.1 AHS EMPI Link/Unlink

Patients in the AHS EMPI have multiple source system identifiers associated with their ECID. Each time a patient presents at a clinical care site there is the potential that they can be assigned a new system identifier. Once a new identifier is assigned it is linked with the patient's ECID within the AHS EMPI. For example, a patient presents in Calgary and has never presented there before is assigned a new RHRN. Likewise, a new patient in Edmonton that presents at a clinical care site could be assigned a new MRN. Once these identifiers are assigned the AHS EMPI links them to the patient's ECID.

The relationship between the ECID and the source identifier are not known nor communicated to the original signing authority of the identifier. The signing authority will maintain the patient's identity with the local identifier that it has assigned to the patient, but it is not aware of the relationship the Patients ID has with ECID or any other local identifiers assigned by other domains.

An Unlink occurs when it is discovered that the ID (MRN in Figure 3) was linked, in error, to the wrong ECID in the EMPI. This can occur when the demographic information associated the local identifier is updated and as a result of deterministic processing is deemed to be associated with the incorrect ECID. To correct this, the offending source system identifier is unlinked from the ECID and then linked to the correct ECID.
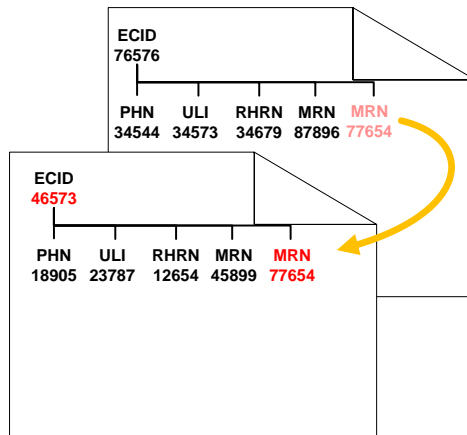

Figure 3 – Unlink

To facilitate this, the AHS EMPI publishes an ADT^A43 message as part of its distributor feed notifying subscribing systems of the change to the patients' identifiers. Typically these subscribing systems include other EMPI's within the province, Alberta's Provincial Client Registry and the EHRi which is the index for Netcare Portal. Below is a sample ADT^A43 message that would be used to facilitate Link/Unlink shown in Figure 3. The message states the local identifier to be

moved and its current parent ECID in the MRG segment, and then the target ECID of the move in the PID segment.

```
MSH|^~\&|EMPI||EHRI|CH|20100126113930||ADT^A43|20100126000022537083|D|2.4
EVN|A43|20100126113925
PID|46573^^^^ECID^EMPI|77654^^^^MRN^CH|||||||||||||||||||||||||||||||N
MRG|77654^^^^MRN^CH|||76576^^^^ECID^EMPI
```

Figure 4 - Sample ADT^A43

This modification to the ECID is transparent to the local system as the move only has an impact on the patient's ID at an enterprise level and not within the local assigning system.

2.2   XDS-I

Within the context of the IHE XDS-I profile, when a new document is to be entered into a Repository the Imagining Document Source Actor initiates a PIX Query (IHE ITI-9) to the Patient Identity Source to obtain the patient's ECID. The Imagining Document Source builds a manifest with the patient's ECID and submits the document to the Repository. The Repository, in turn registers the document manifest with the XDS-I Registry. Each document within the registry is associated with only the ECID of the patient.
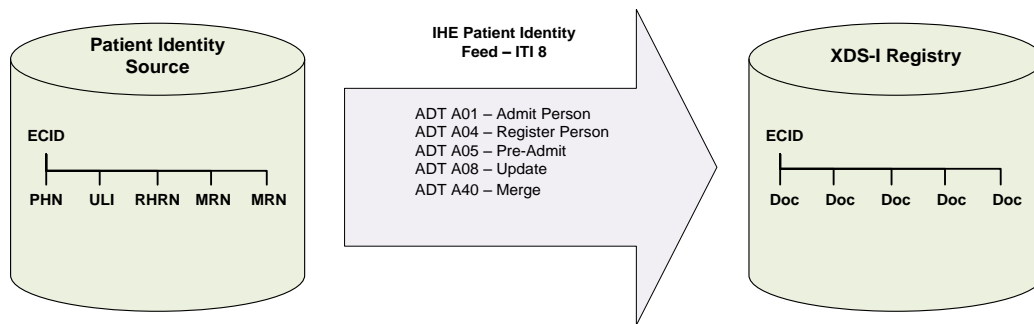

Figure 5 - IHE ITI-8

To ensure the ECID within the Registry is in sync with the Patient Identity Source (the AHS EMPI), there is a Patient Identity Feed (IHE ITI-8) that sends updates from the Patient Identity Source to the XDS-I Registry.

There are 5 message event types defined as part of the IHE Identity feed to facilitate this. They are:

1. ADT^A01 – Admission of an in-patient into a Facility
2. ADT^A04 – Registration of an outpatient for a visit of the Facility
3. ADT^A05 – Pre-Admission of an in-patient
4. ADT^A08 – Update Patient Information
5. ADT^A40 – Patient Merge

These event types do not facilitate the action of the linking and unlinking local identifiers to the ECID as described in section 3. As local identifiers are moved from one ECID to another in the EMPI, the documents in the XDS-I Registry resulting from the patient's visit are **not** moved and remain associated with the original ECID.

The use case in the following section identifies a scenario where this could happen.

3. <u>Use Case</u>

The scenario presented below describes a case where the linking and unlinking of an MRN with an ECID may occur. In this scenario John A. Smith (Patient A) presents with a broken leg, at a clinical care site that he has not previously attended. John is assigned a new MRN during his visit to identify him at the clinical care site. John's new MRN is linked within the AHS EMPI to John B. Smith's (Patient B) ECID accidentally as they have similar names and demographic information. The following describes a sequence of events which would occur at a clinical care site and between each of the XDS-I the components:

1. Patient A presents at the clinical site.
2. Patient A is assigned a new local identifier (MRN 77654).
3. Patient A's new MRN is associated with Patient B's ECID (ECID 76576) within the Patient Identity Source. (For a further break down of the sequence of events within the AHS EMPI when adding new patient identifiers refer to appendix B.1.)
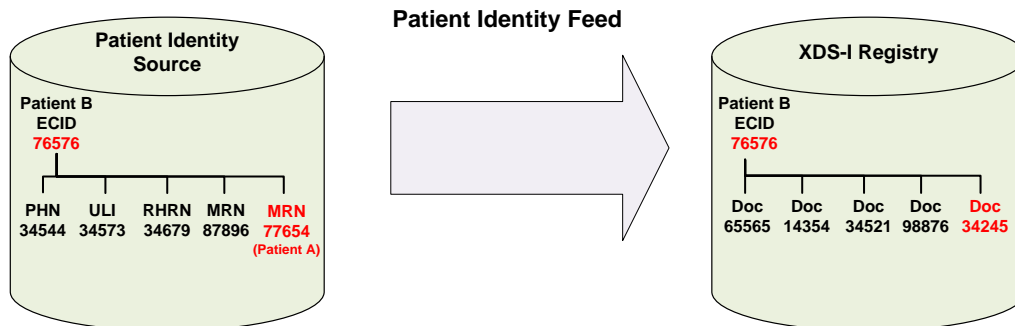

Figure 6 - Link

4. Patient A has a study conducted (X-Ray) of a broken leg.
5. The results of the study are entered into the Imagining Document Source.
6. The Imagining Document Source performs a PIX Query (IHE ITI-9) on the Patient's MRN (MRN 77654 of Patient A) to retrieve the ECID of the Patient.
7. The Patient Identity Source returns the ECID 76576 (of Patient B).
8. The Imagining Document Source builds the document manifest with ECID 76576 (of Patient B).
9. The Imagining Document Source submits the document to the Document Repository for storage (IHE RAD-68).
10. The Document Repository registers the Document Manifest with the Document Registry (IHE ITI-42).
11. It's discovered that Patient A's MRN (MRN 76654) was associated (linked) to an incorrect ECID (ECID 76576 of Patient B) within the AHS EMPI.

12. Patient A's MRN is unlinked from the incorrect ECID (ECID 76576 of Patient B), and then linked to the correct ECID (ECID 46573 of Patient A). (For a further break down of the sequence of events within the AHS EMPI for linking and unlinking patient identifiers refer to appendix B.2.)

4. Impacts

The impact of not having the ability to link and unlink within the XDS-I registry is that it could lead to documents being associated with the incorrect ECID in the XDS-I registry.

In the EMPI, when it is discovered that a MRN is associated with the incorrect ECID, the MRN is unlinked with the ECID and then linked with the correct ECID of the patient.

The message types that are defined within IHE transaction ITI-8, however, cannot facilitate the communication of the movement of an MRN to the new ECID. Therefore, when a link/unlink occurs in the EMPI, documents in the XDS-I Registry will remain associated with the incorrect ECID.

Figure 7 shows the result of the unlink in the scenario presented in section 3. The MRN is moved to the correct ECID; however the document remains associated with the original ECID in the XDS-I Registry.

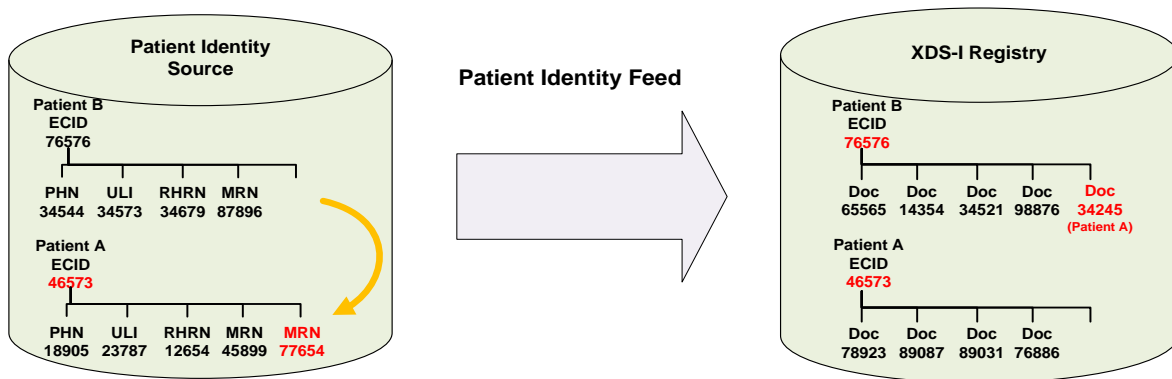**Figure 7 - Unlink MRN**

When the Registry is queried for documents with the correct ECID the query will **not** return the correct and complete document set for the patient. Also, in this case when documents are queried with the previous ECID the query will return documents that should have been moved and associated with a different ECID. In both cases, the treatment of the patient may be impacted.

5. Number of Occurrences

Currently the AHS EMPI produces a number of messages in order to keep subscribing systems in sync with the changes that occurred to the patient demographic information within the EMPI. The following message events are sent out to subscribing systems:

- ADT^A29 – Delete Person Event.
- ADT^A31 – Add/Update which is use to notify systems of patient updates for sex and DOB.
- ADT^A34 – Merge Patient ID Event is used to facilitate a move of one ECID to another ECID, which implies all the identifiers and associated documents in the old ECID move over to the new ECID.
- ADT^A43 – Move Patient Information Event is used facilitate a move of one source or local identifier from one ECID to another ECID (link/unlink).

The table below indicates the number of occurrences of each type of message from the AHS EMPI for the June 2009 time period. For a daily break down of monthly message events please refer to Appendix A.

HL7 Event Type	Average Daily number of occurrences June 09
ADT^A29	0
ADT^A31	54505
ADT^A34	1960
ADT^A43	9

The number of ADT^43 message events explicitly indicates the link and unlink events that are communicated as part of this message feed on daily basis. However, It is important to note that the statistics for the remainder of the message events do not necessarily have a one to one correlation with activities impacting a patient's ECID.

For example the association of a new local identifier to an ECID within the AHS EMPI will result in a sequence of message events being sent to subscripting systems. In the context of the AHS EMPI this new association is considered a link, however due to internal processing within the EMPI to accommodate this the association is communicated to subscribing systems as a merge. A sequence diagram outlining the messages produced as part of this transaction is included in section B.1.

6.   Proposed Solutions

During the analysis of this gap and discussion with third parties it has been determined that accommodation of the link/unlink scenario may be resolved by the implementation of one of two IHE integration profiles --: ITI-10 of the Patient Identifier Cross-referencing (PIX) profile or ITI-30 of the Patient Administration Management (PAM) profile. Each of the available IHE profiles is described below.

It is important to note that in order to accommodate the linking and unlinking of local identifiers from the ECID the local identifier that was used to execute the PIX Query must be included in the metadata of any document set registered within the XDS-I registry. This local identifier can be populated within the sourcePatientID of the XDS Registry attributes.

With the implementation of the proposed solutions below it is envisioned that no further modifications are required to any of the other actors within the XDS-I profile. With the exception of the inclusion of the local identifier within the document sets metadata, the implementation of both the Imaging Document Source and Imagine Document Consumer should remain consistent with the current XDS-I Profile. Any patient demographic information stored within the Document Registry apart the local identifier and the corresponding ECID should be ignored as the Patient Identify Source is the source of truth for the patient demographics.

6.1   IHE Patient Identifier Cross-referencing (PIX) Profile

The PIX Integration Profile supports cross-referencing of patient identifiers from multiple Patient Identifier Domains via the following interactions:

- Transmission of patient identity information from an identity source to the patient identity cross-reference manager (ITI-8)
- Ability to access the list of cross-referenced patient identifiers via query/response or update notification. (ITI-9, ITI-10)

The actors required within the pHIE implementation of the PIX profile would be the Patient Identity Source (AHS EMPI) and Patient Identifier Cross-reference Manager (XDS-I Registry).

On review of the IHE Profile it suggests that the use of ITI-10 could act as a message transport mechanism to notify the XDS-I registry of changes in the relationship between the ECID and local identifiers. The ITI-10 transaction consists of the following message:

- ADT^A31 – Update Person Information

To accommodate the link/unlink scenario, the ADT^A31 message could include all the patient local identifiers, and on inspection it could be determined which local identifiers have been linked or unlinked to the ECID. On receipt of this message event the XDS-I registry would have to determine which studies have been submitted with the local identifiers affected by this message, and break their relationship with the parent ECID. The studies would remain orphaned until a corresponding ADT^A31 message is received linking the identifier to another ECID. This effectively breaks the rules for XDS-I registry, at least temporarily until the link event is received.

The sequence of events and event triggers resulting from the implementation of ITI-10 are shown in the sequence diagram below.
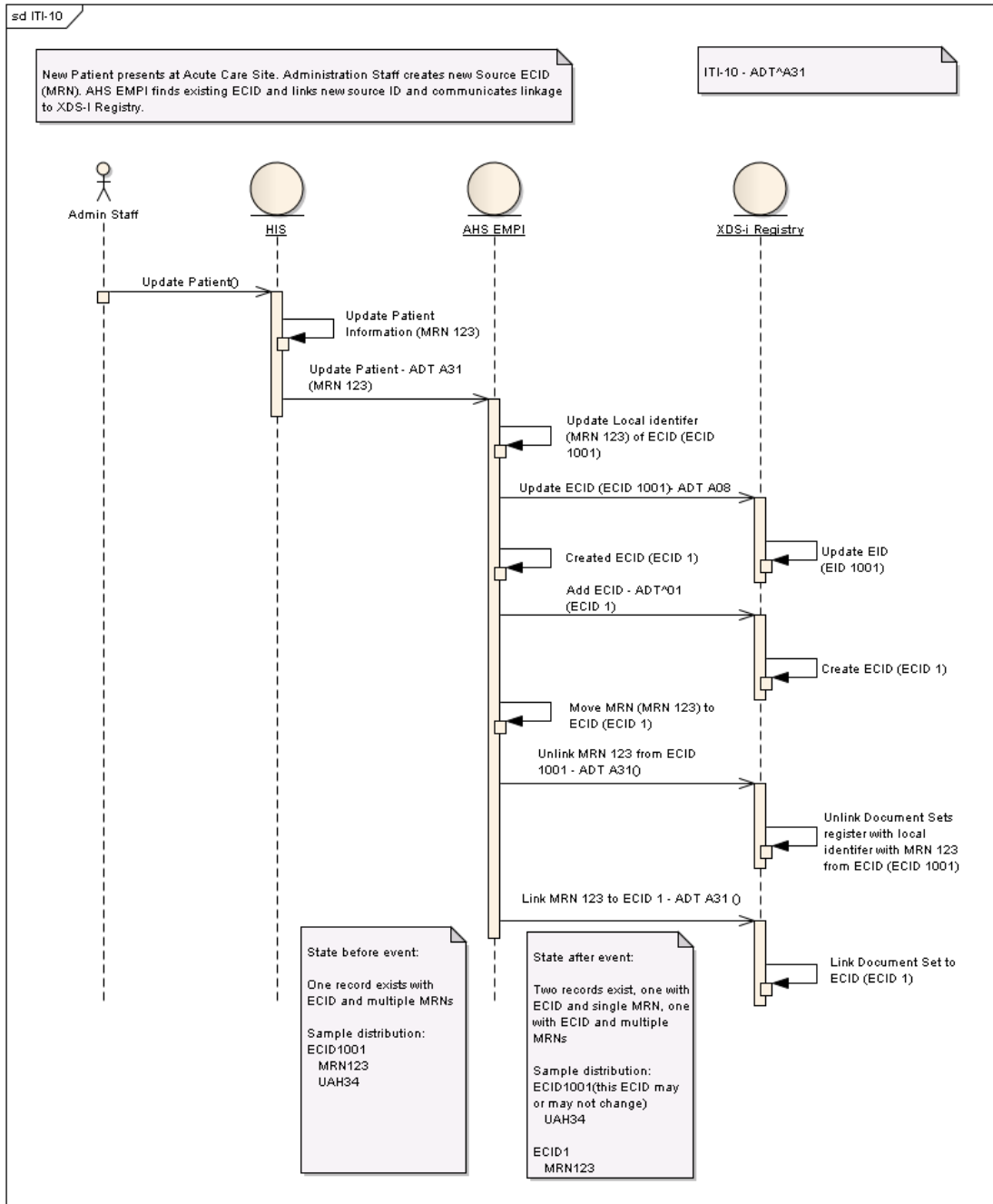
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03/04/10

Figure 8 - ITI 10

6.2   IHE Patient Administration Management (PAM) Profile

The PAM Integration Profile establishes continuity and integrity of patient data. It coordinates the exchange of patient registration and update information among systems that need to be able to provide current information regarding a patient's encounter status and location. It transmits

patient demographics in a patient identification domain (i.e. assigned by the same assigning authority). The PAM integration profile includes the following 2 interactions:

- Patient Identity Management (ITI-30)
- Patient Encounter Management (ITI-31)

The PAM profile contains a large number of options to support the exchange of patient demographic and encounter data. The actors required within the pHIE implementation of the PAM profile would be the Patient Demographics Supplier (AHS EMPI) and Patient Demographics Consumer (XDS-I Registry). Within this profile there is the option to implement a Merge or a Link/Unlink transaction. The differences are summarized below:

- Merge – defines the information exchange needed to manage the merging of patient identifiers
- Link/Unlink – defines the information exchanges needed to manage the linking and unlinking of patient identifiers

In addition, the PAM profile may not be used standalone. Its actors and transactions will be leveraged by other domain integration profiles (XDS Sharing).

The PAM profile implemented with the PIX profile may be able to provide a complete patient identity feed to the Alberta solution. For more details refer to IHE IT Infrastructure Technical Framework volume 2b section 3.30

6.2.1 ITI- 30 Transaction with Merge

The ITI-30 transaction using merge consists of the following messages:

- ADT^A28 – Create New Patient
- ADT^A31 – Update Person Information
- ADT^A40 – Merge Patient – Patient Identifier List
- ADT^A47 – Change Patient Identifier List

The ADT^A47 – change Patient Identifier List trigger event could be leveraged to notify the XDS-I registry of changes to local identifiers associated with an ECID. Implementation of this event trigger would be similar to AHS EMPI's use of the ADT^A43 trigger event to convey changes to the patient identifier list (see Figure 4 - Sample ADT^A43 for an example of how this event trigger is implemented). This would allow for the linking and unlinking of local identifiers in a single transaction. On receipt of this message event the XDS-I registry would have to determine which studies have been submitted with the local identifiers affected by this message, and break their relationship with the parent ECID. The registry would the associate the affected studies with the ECID provided in the trigger event.

The sequence of events and event triggers resulting from the implementation of ITI-30 with merge are shown in the sequence diagram below.
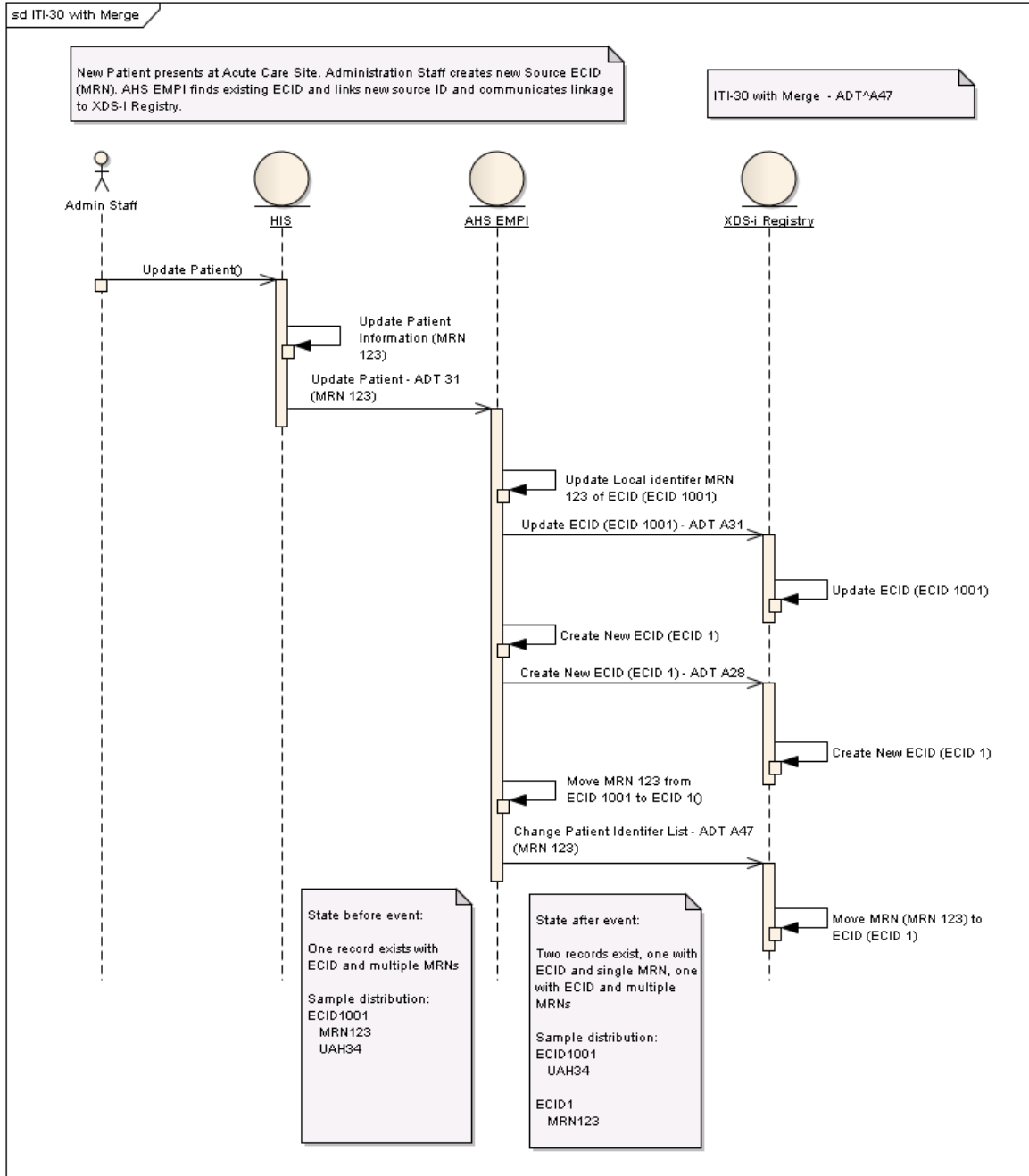
Figure 9 - ITI 30 with Merge

6.2.2 ITI- 30 Transaction with Link/Unlink

The ITI-30 transaction using link/unlink consists of the following messages:

- ADT^A28 – Create New Patient
- ADT^A31 – Update Person Information
- ADT^A24 – Link Patient Information
- ADT^A37 – Unlink Patient Information
- ADT^A47 – Change Patient Identifier List

The ADT^A24 – Link Patient information, and ADT^A37 – Unlink Patient Information message could be leveraged to notify the XDS-I registry of changes to local identifiers associated with an ECID. On reception of a ADT^A37 message event the XDS-I registry would have to determine which studies have been submitted with the local identifiers affected by this message, and break their relationship with the parent ECID. The studies would remain orphaned until a corresponding ADT^A24 message is received notify the XDS-I registry to link studies with the identifier(s) to another ECID. This effectively breaks the rules for XDS-I registry, at least temporarily, until the link event is received.

The sequence of events and event triggers resulting from the implementation of ITI-30 with link and unlink are shown in the sequence diagram below.
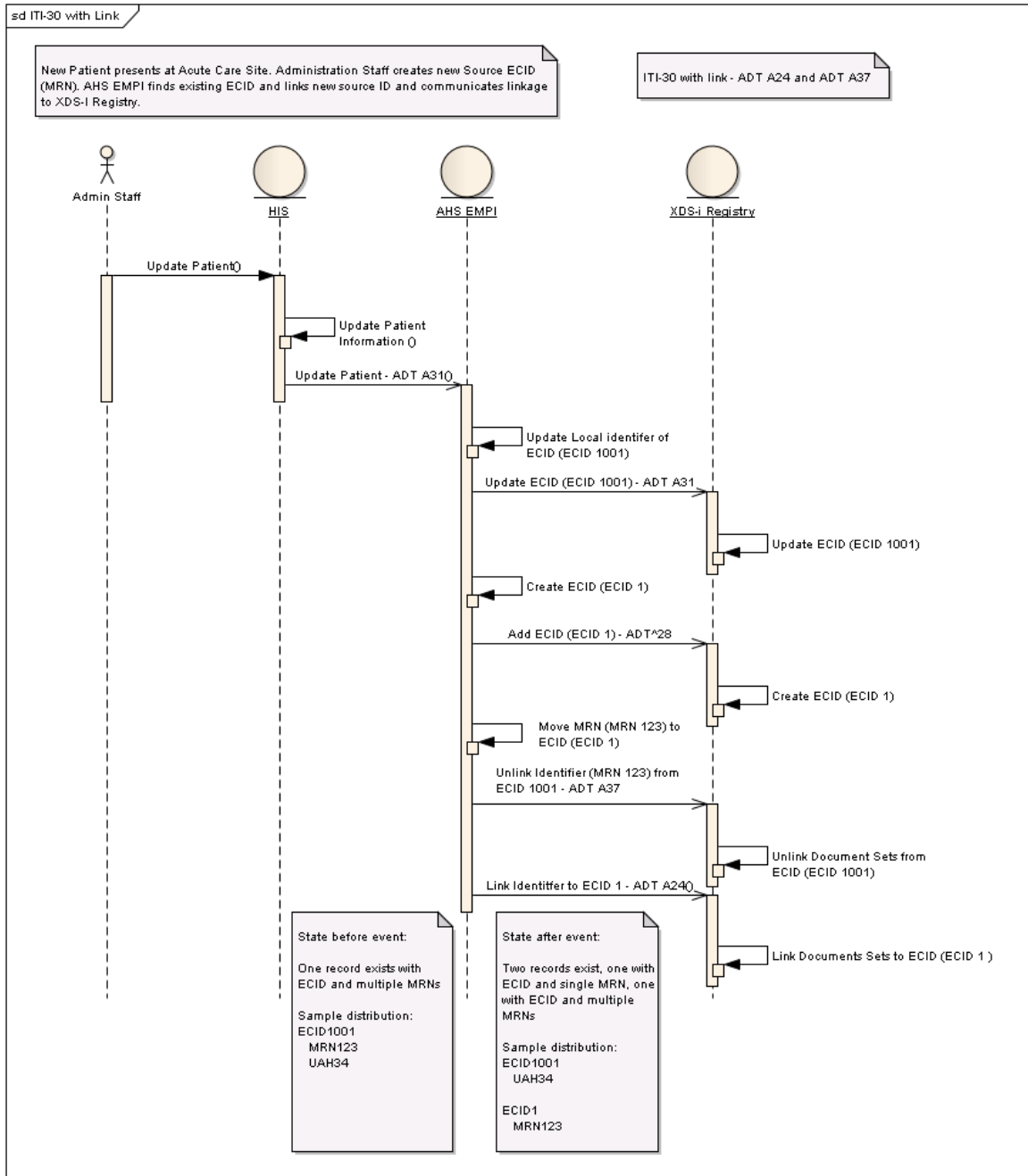
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pHIE – XDS-I
Link/Unlink Analysis

Figure 10 - ITI 30 with Link/Unlink

Appendix A   Current AHS EMPI Distributor Feed Transactions

The Following is a daily break down of the message events produced by the AHS EMPI
Distributor Feed in the month of June 2009.

AHS EMPI Distributor Feed - June 09				
Day	**A31**	**A34**	**A43**	**Total per Day**
1	60577	2618	18	63213
2	66152	2761	23	68936
3	64209	1885	10	66104
4	55820	2353	17	58190
5	53976	2058	6	56040
6	19063	565	1	19629
7	18921	864	0	19785
8	68066	2467	9	70542
9	64460	2769	9	67238
10	64325	2568	9	66902
11	64508	2645	11	67164
12	69125	2167	11	71303
13	24441	838	2	25281
14	17027	580	0	17607
15	73740	2382	21	76143
16	70548	2333	15	72896
17	72147	2662	12	74821
18	67545	2553	16	70114
19	68384	2462	5	70851
20	24921	575	7	25503
21	17797	714	0	18511
22	75459	2763	15	78237
23	72866	2579	5	75450
24	71992	2174	5	74171
25	66864	2524	16	69404
26	63977	2092	4	66073
27	17610	596	2	18208
28	20138	628	1	20767
29	69715	2148	2	71865
30	70775	2485	8	73268

Totals	**1635148**	**58808**	**260**	**1694216**

Average per Day	**54504.93**	**1960.27**	**8.67**	**56473.87**

# Appendix B   AHS EMPI Use Case Sequence Diagrams

The following sequence diagrams shown are the sequence of messaging events between the assigning Hospital Information System (HIS), the AHS EMPI, and the EHRi as it relates to the use case as outlined in section 3 of this document. Alberta refers to its ECID as an EID as a result the scenarios below reference EIDs as they are written from the Alberta perspective using its terminology. It is important to note that the AHS EMPI is currently being upgraded from Initiate 6.5 to Initiate 9.0. All sequence diagrams included in this document are based on the current EMPI. Further analysis will be required on the upgraded EMPI.

The follow messages are sent as part of the AHS EMPI's distributor feed and used to keep subscribing systems synchronized:

- ADT^A29 – Delete Person Event.
- ADT^A31 – Add/Update Patient Event
- ADT^A34 – Merge Patient ID Event is used to facilitate a move of one EID to another ECID, which implies all the identifiers and associated documents in the old EID move over to the new EID.
- ADT^A43 – Move Patient Information Event is used facilitate a move of one source or local identifier from one EID to another EID (link or unlink).

B.1   Add New Patient Identifier

The following sequence diagram shows the sequence of events and the messages sent between each of the applications involved in the creation of a new local identifier for a patient.
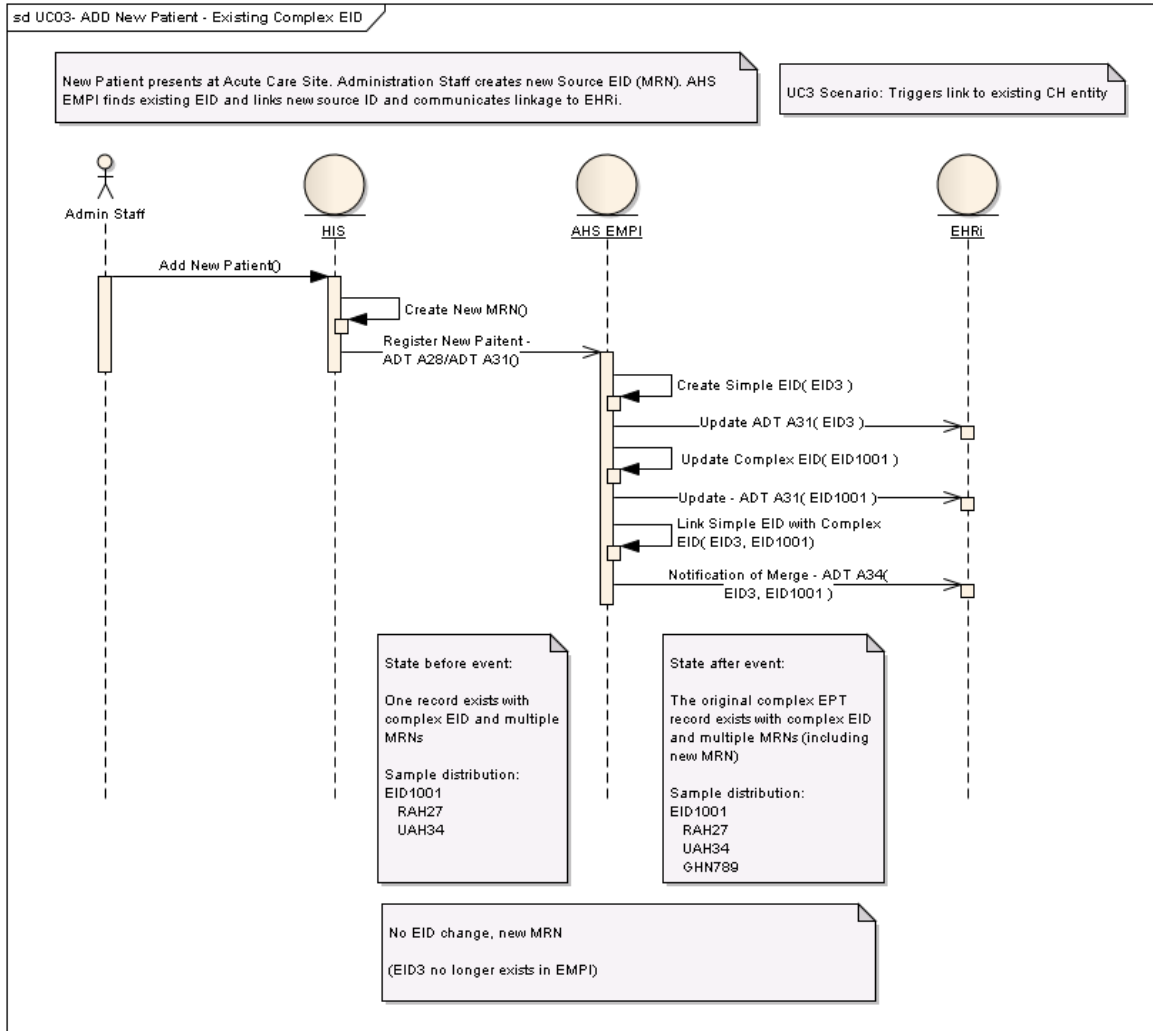
1. A new local identifier is created within an assigning application which sends a notification to the AHS EMPI.

2. The AHS EMPI then creates a Simple EID[1] with the local identifier.

3. The AHS EMPI then updates the EHRi with the new EID.

4. It then searches its records for a Complex EID[2] that shares the same patient demographic information and based on a deterministic algorithm deems it to be the same patient.

5. The AHS EMPI updates the Complex EID, and sends an update message to the EHRi.

6. It then merges the Simple ECID with the Complex EID and sends a merge message to the EHRi. Within the context of the AHS EMPI this action is considered a Link, however the synchronization of this event is communicated with a merge message.

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[1] A Simple EID is an EID with only one local identifier associated with it. The EID differs from the Complex EID in both format and length.

[2] A Complex ECID is an ECID that has more then one local identifier (ULI, RHRN, MRN) associated with it. It differs from the Simple ECID in both format and length.

B.2   Patient Update Triggers Auto-Unlink

The following sequence diagram shows the sequence of events and the messages sent between each of the applications involved in the automatic unlinking of a local identifier from one EID, and the linking to another. There are a few events that could result in this action being taken. This happens automatically when the patient demographics of an EID or local identifier are updated and based on a deterministic algorithm is deemed to be associated with the incorrect EID. This can also happen as the result of a manual review of an EID and its local identifiers.
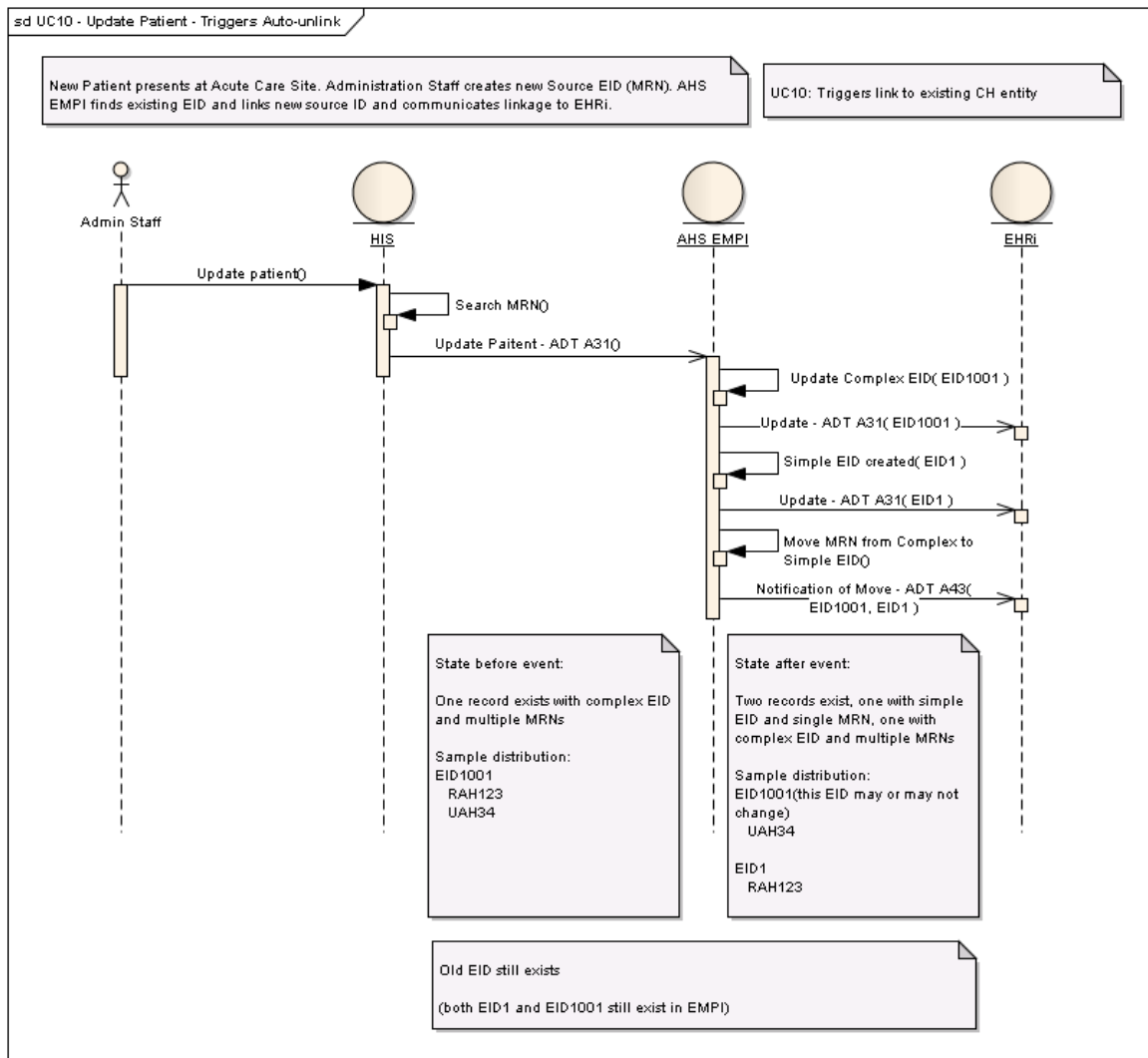
1. The assigning application updates the patient demographic information of a local identifier. The update is then communicated to the AHS EMPI.

2. The AHS EMPI updates the local Identifier's demographic information and communicates the update to the EHRi. As a result of the updated information the local identifier the deterministic algorithm deems the local identifier is associated with the incorrect ECID.

3. The AHS EMPI then searches for the appropriate ECID to link the local identifier to. If no ECID is found then the AHS EMPI creates a new simple ECID

4.   The AHS EMPI sends an update to the EHRi with the new simple ECID.

5. The local identifier is then unlinked with the complex ECID, and then linked with the simple ECID.

6. The AHS then sends a notification of the unlink and link to the EHRi.

Appendix C   AHS EMPI / ECID Analysis

This analysis is based on the Enterprise Architecture XDSi_20100125.eap file. The use cases mentioned are documented in entirety in the aforementioned file, while the summary scenarios are documented here. It is important to note that the AHS EMPI is current being be upgraded from Initiate 6.5 to Initiate 9.0. All sequence diagrams included in this document are based on the current EMPI. Further analysis will be required on the upgraded EMPI.

The link, unlink, merge or unmerge sections that follow are in reference to the EID's (not the local identifiers) in the scenario. Additionally, Alberta refers to it's ECID as an EID. All scenarios below are written from the Alberta perspective using it's terminology. Also in reviewing the scenarios the AHS EMPI contains two types of EID's, a Simple EID and Complex EID[3]. A Simple EID is an EID that has a relationship with a single local identifier, where as a Complex EID has a relationship with multiple local identifiers. Changes in number of local identifiers associated with an EID can also cause the EID itself to change. These EID's also differ from each other in length of the identifier.

C.1   EID Added

This scenario results in a new EID.

There is 1 additional use case that results in the AHS EMPI publishing the following message: (listed below).

- ADT A31 – Update Patient

Summary	
AHS EMPI Start State	**AHS EMPI End State**
No EID exists	An EID (simple or complex exists).

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[3] The notion of Complex and Simple EID's are a result of the AHS EMPI current implementation in Initiate 6.5. This is expected to change once AHS upgrades to Initiate 9.
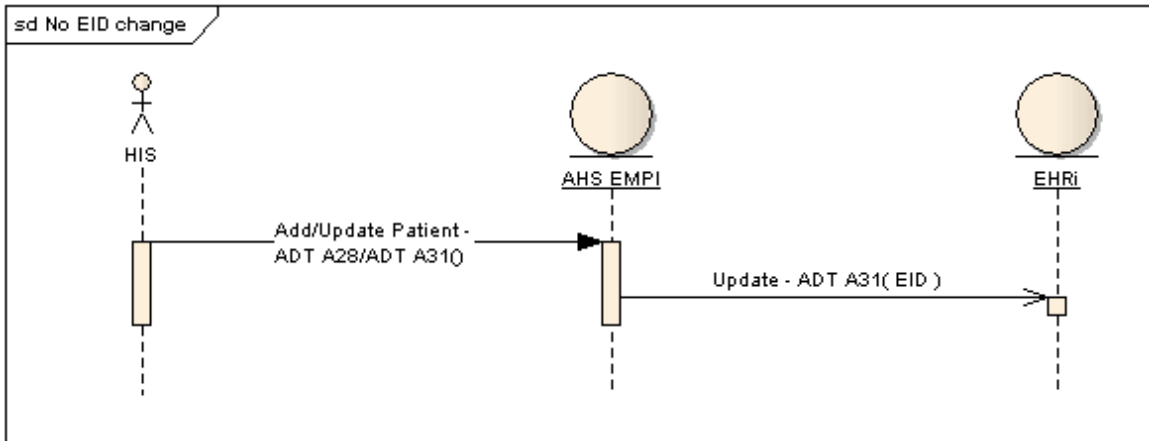
Use Case 1 – Add Patient

Within the AHS EMPI there is no EID before the event occurs; after the event a single simple EID exists with a single MRN.

C.2 <u>No EID Change</u>

This scenario does not result in any change to an EID. Only updates are performed.

There are 3 use cases that result in the AHS EMPI publishing the same message (listed below), but the end status of the EID can be different in each case.

- ADT A31 – Update Patient

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Contains an EID (simple or complex)	An EID (simple or complex exists is the same as it was before the trigger event.
	MRNs for Use Case 6 and 16 remain the same as before the trigger event. Use Case 1 adds a new MRN, while Use Case 23 removes an MRN.
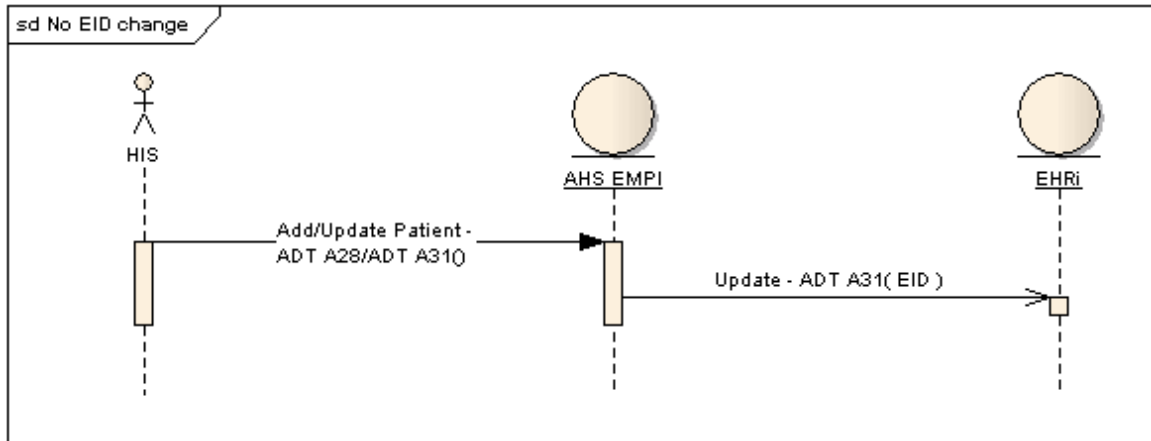
Use Case 6 – Update Patient

Within the AHS EMPI there is no change to the simple EID or the associated MRN.

Use Case 16 – Merge (move to historical records)

Within the AHS EMPI there is no change to the complex EID or associated MRNs.

Use Case 23 – Delete PD member

Within the AHS EMPI there is no change to the complex EID, but one of the MRNs has been removed.

C.3 Update Patient - Link

These scenarios result in the addition of a local identifier to an existing EID. To facilitate this update the AHS EMPI creates a new Simple EID and an association to the new local identifier. The AHS EMPI then merges the new EID with appropriate existing EID. From the context of the AHS EMPI this action is considered a link, however the message event used to convey this action is a Merge.
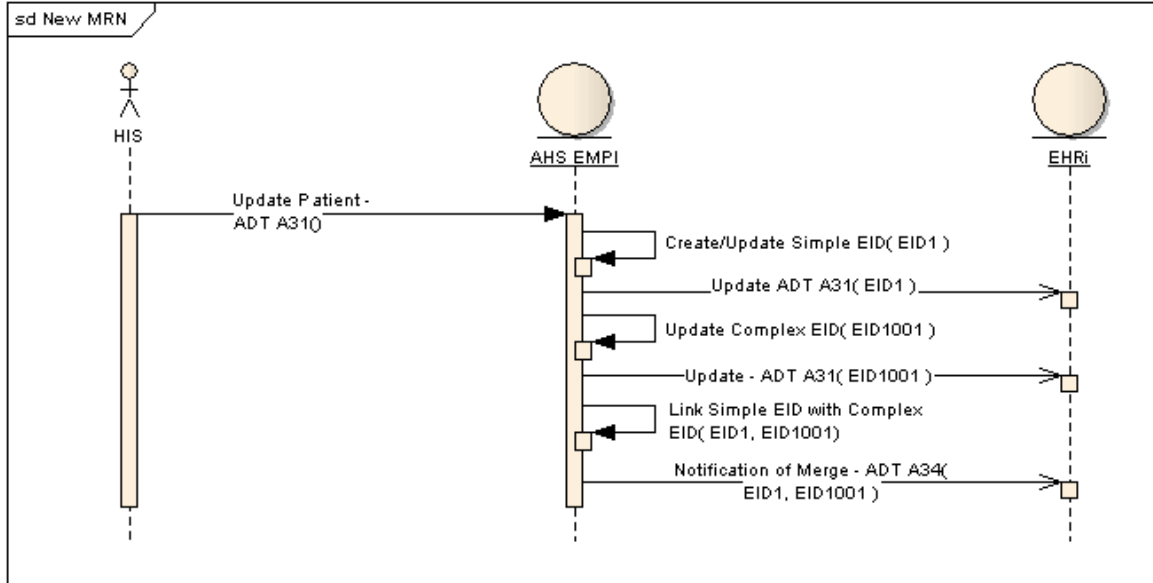
A. New MRN

There are 2 use cases that result in the AHS EMPI publishing the same set of messages (listed below), but the end status of EID can be different in each case.

- ADT A31 – Update Patient
- ADT A31 – Update Patient
- ADT A34 – Notification of Merge

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Can contain a complex EID with multiple MRNs; or	The same complex EID exists containing the MRNs from the original complex EID plus a new MRN (either created during the process

Can contain a complex EID with multiple MRNs and a simple EID with a single MRN	or moved from the simple EID). The simple EID and/or any simple EIDs created during the process do not exist at the end state.

Use Case 3 – Add Patient

Within the AHS EMPI there is a complex EID with multiple MRNs before the event occurs; after the event the same complex EID exists with an additional MRN. A simple EID used to create the new MRN no longer exists in the final state.
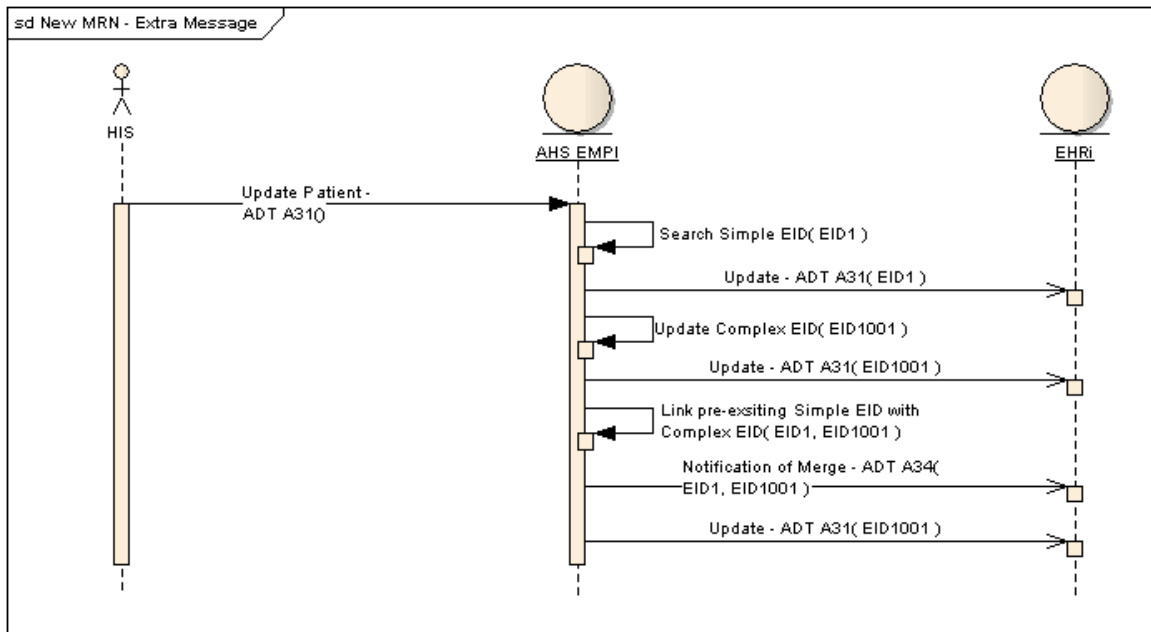
Use Case 8 – Update Patient

Within the AHS EMPI there is a simple EID with a single MRN and a complex EID with multiple MRNs before the event occurs; after the event the same complex EID exists with an additional MRN. The original simple EID no longer exists in the final state.

B. New MRN, Extra Message

There is 1 use case that results in the AHS EMPI publishing the following set of messages (listed below). There seems to be little difference between Scenario 4 and Scenario 3 above. Scenario 4 has an extra ADT A31 Update Patient at the end, but the EID end state seems to be the same as in Scenario 3.

- ADT A31 – Update Patient
- ADT A31 – Update Patient
- ADT A34 – Notification of Merge
- ADT A31 – Update Patient

Summary (same end state as above scenario?)	
AHS EMPI Start State	**AHS EMPI End State**
Will contain a simple EID with a single MRN and a complex EID with multiple MRNs	The same complex EID exists containing the MRNs from the original complex EID plus a new MRN (moved from the simple EID). The simple EID does not exist at the end state.

Use Case 9 – Update Patient

Within the AHS EMPI there is a simple EID with a single MRN and a complex EID with multiple MRNs before the event occurs, after the event the same complex EID exists with an additional MRN. The original simple EID no longer exists in the final state.

C.4 Unlink

This scenario results in an MRN moving from one EID to a newly created EID.

Split MRN to new EID

There are 2 use cases that result in the AHS EMPI publishing the same set of messages (listed below), but the end status of EID can be different in each case.

- ADT A31 – Update Patient

- ADT A31 – Update Patient
- ADT A43 – Notification of Move

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain a complex EID with a multiple MRNs	The same complex EID exists containing the MRNs from the original complex EID but one of the MRNs has been moved to a new simple EID. There is a chance that the original complex EID may change.
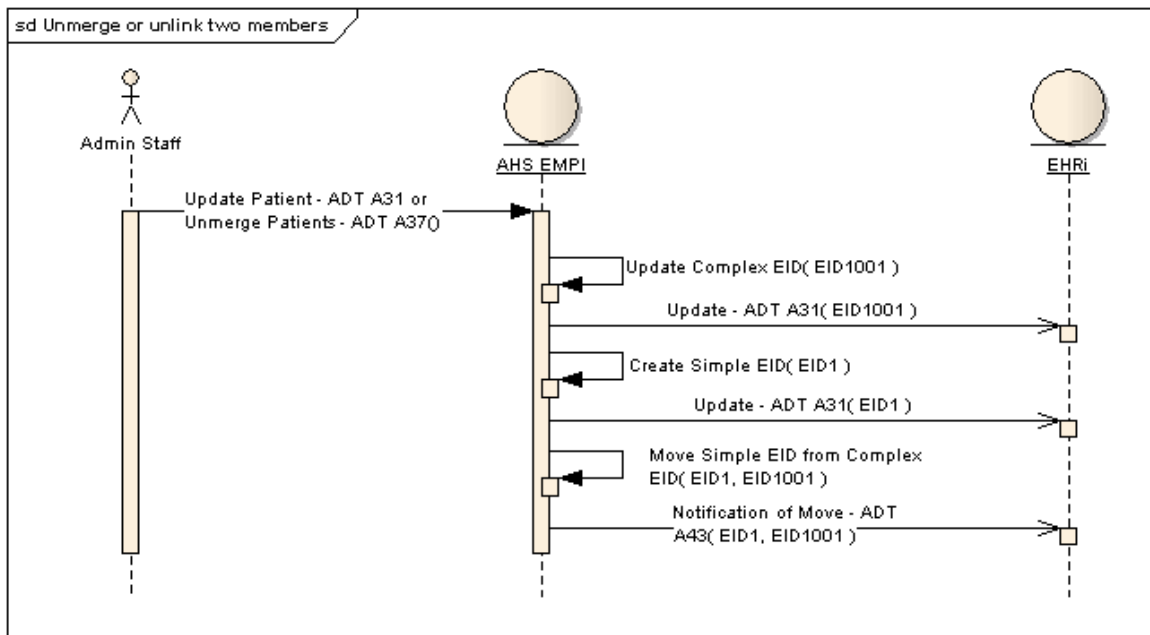
Use Case 10 – Update Patient

Within the AHS EMPI there is a complex EID with multiple MRNs before the event occurs, after the event the same complex EID exists, but one of the MRNs has been moved to a new simple EID. (There is a note that the original complex EID may or may not change).

Use Case 24 – Unmerge Two PD Members

Within the AHS EMPI there is a complex EID with a multiple MRNs before the event occurs, after the event the same complex EID exists, but one of the MRNs has been moved to a new simple EID.

C.5 Unlink and Link

These scenarios result in an MRN moving from one EID to another existing EID. In effect unlinking from the original EID and linking to a secondary EID.

A. Move MRN from One EID to Another

There is 1 use case that results in the AHS EMPI publishing the following set of messages (listed below).

- ADT A31 – Update Patient
- ADT A34 – Notification of Merge
- ADT A31 – Update Patient
- ADT A43 – Notification of Move

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain a simple EID with a single MRN and a complex EID with multiple MRNs	Two complex EIDs exists containing the MRNs from the 2 simple EIDs. One is the original complex EID, the other is a new complex EID. The MRN from the original simple EID and an MRN from the original complex EID are both moved to the new complex EID.

The original simple EID no longer exists. |
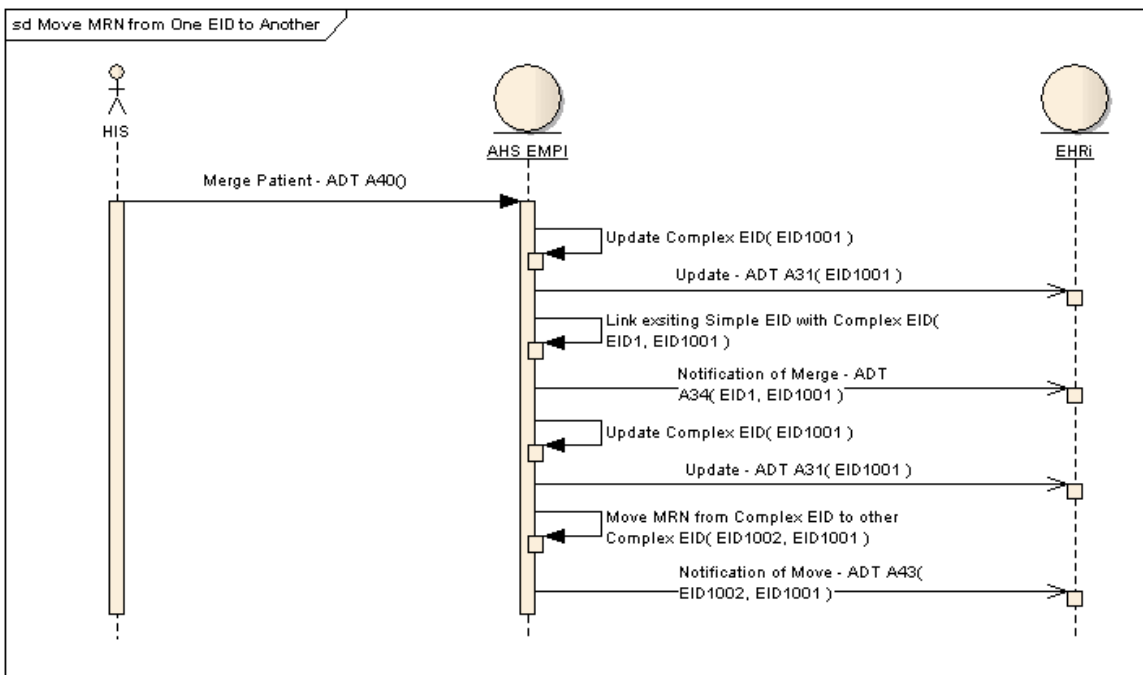
Use Case 15 – Merge Patient

Within the AHS EMPI there is a simple EID with a single MRN and a complex EID with multiple MRNs before the event occurs, after the event 2 complex EIDs exist. One is the original complex EID, the other is a new complex EID. The MRN from the original simple EID and an MRN from the original complex EID are both moved to the new complex EID. The original simple EID no longer exists in the final state.

B. Move MRN from a complex EID to another

There is 1 unlink/link use case that results in the AHS EMPI publishing the following set of messages (listed below). (Note this set of messages is also sent from the AHS EMPI during an unmerge (See Section C.7)

- ADT A31 – Update Patient
- ADT A34 – Notification of Merge

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain 2 complex EIDs with multiple MRNs or;	Same complex EIDs exists containing multiple MRNs. One of the MRNs has moved from one complex EID to the other complex EID.
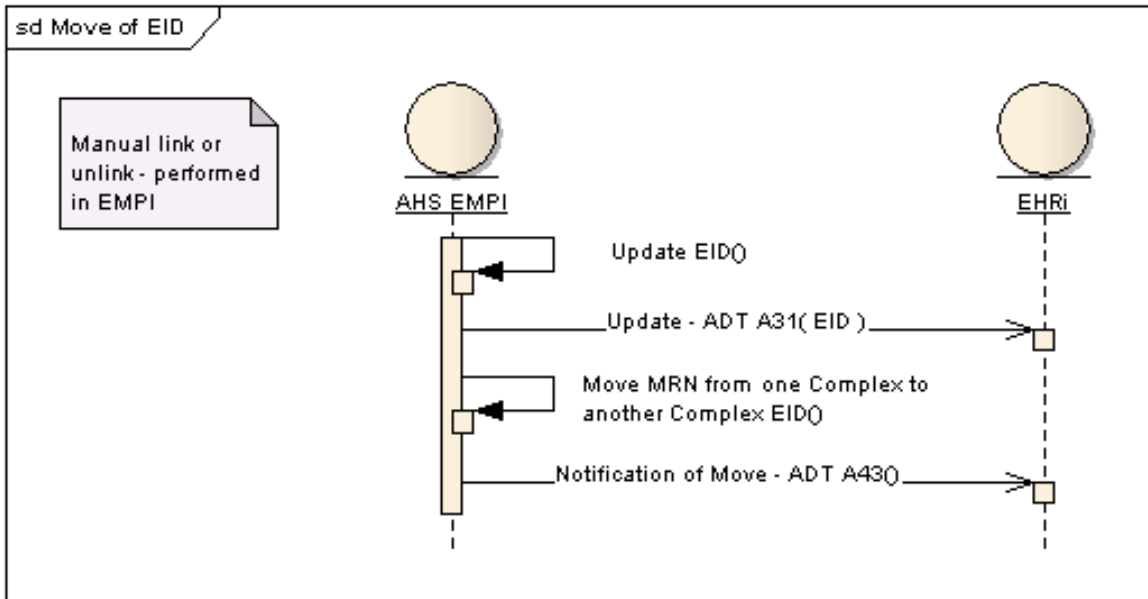
Use Case 18 – Manual Link

Within the AHS EMPI there two complex EIDs with multiple MRNs before the event occurs, after the event the same complex EIDs exists containing multiple MRNs. One of the MRNs has moved from one complex EID to the other complex EID. The original complex EIDs still exist in the final state.

C.6   Merge

These scenarios result two EIDs being merged into one and result in the destruction of an EID.
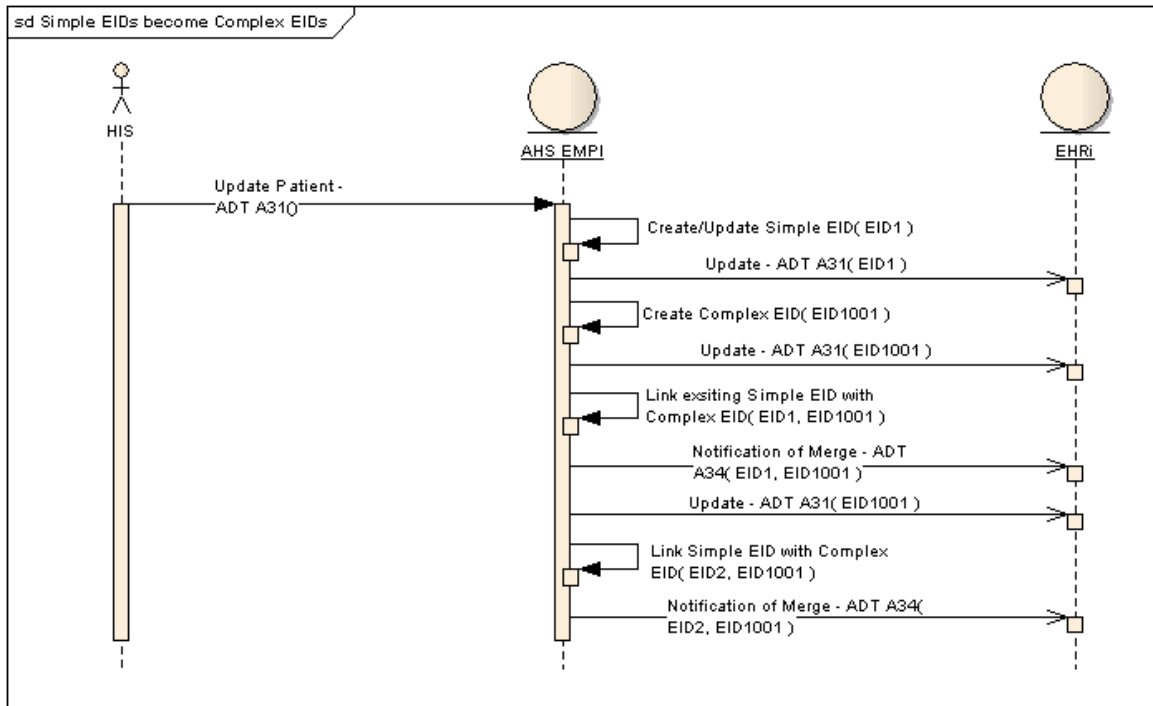
A. New Complex EID

There are 2 use cases that result in the AHS EMPI publishing the same set of messages (listed below), but the end status of EID can be different in each case.

- ADT A31 – Update Patient
- ADT A31 – Update Patient
- ADT A34 – Notification of Merge
- ADT A34 – Notification of Merge

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain one or two simple EIDs, each contains a single MRN.	A single new complex EID exists containing the MRNs from the original simple EIDs.

	The original simple EIDs and/or any simple EIDs created during the process do not exist at the end state.

Use Case 2 – Add Patient

Within the AHS EMPI there is a simple EID before the event occurs, after the event a new complex EID exists with multiple MRNs. The original EID and an EID used to create each MRN do not exist in the final state.
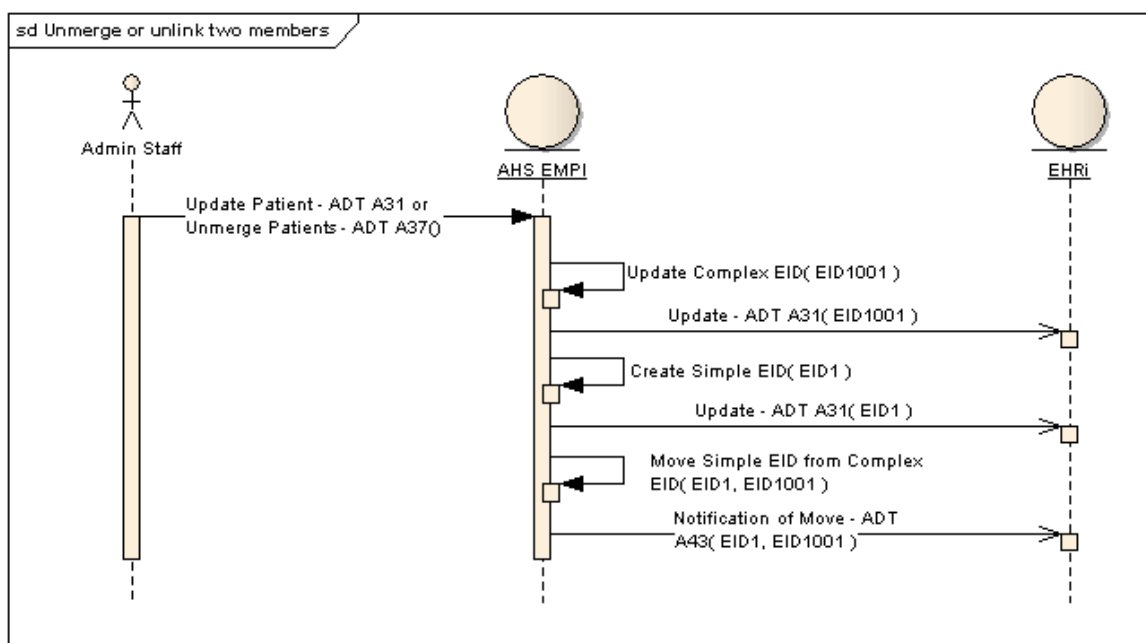
Use Case 7 – Update Patient

Within the AHS EMPI there is are two simple EIDs each with a single MRN before the event occurs, after the event a new complex EID exists with a multiple MRNs. The original 2 EID do no exist in the final state.

B. Merge Simple and Complex EIDs

There is 1 use case that results in the AHS EMPI publishing the following set of messages (listed below).

- ADT A31 – Update Patient
- ADT A34 – Notification of Merge

| Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain a complex EID with a multiple MRNs and a simple EID with a single MRN	The same complex EID exists containing the MRNs from the original complex EID plus the MRN from the simple EID has been moved to the complex EID. The original simple EID no longer exists.

Use Case 13 – Merge Patient

Within the AHS EMPI there is a complex EID with multiple MRNs and a simple EID with a single MRN before the event occurs; after the event the same complex EID exists but the MRN from the simple EID has been moved to the complex EID. The original simple EID no longer exists in the final state.

C. Two EIDs Become One

There are 2 use cases that result in the AHS EMPI publishing the same set of messages (listed below), but the end status of EID can be different in each case.

- ADT A31 – Update Patient
- ADT A34 – Notification of Merge
- ADT A31 – Update Patient
- ADT A34 – Notification of Merge

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain 2 simple EIDs with single MRNs	A single complex EID exists containing the MRNs from the 2 simple EIDs. The original simple EIDs no longer exist.
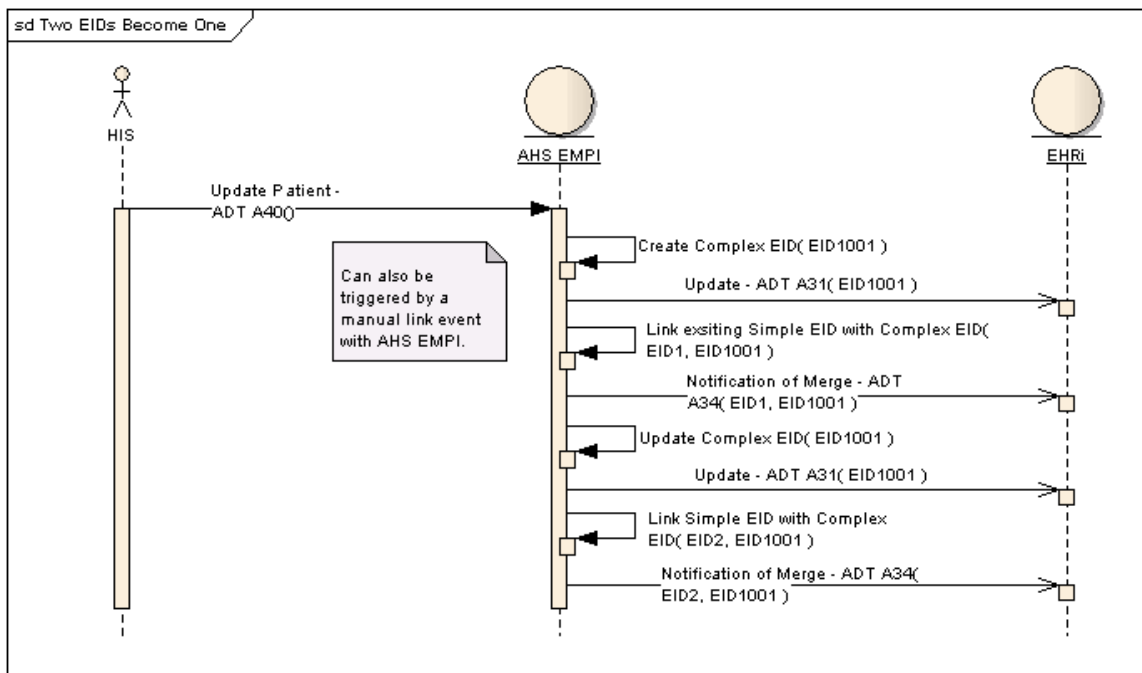
Use Case 14 – Merge Patient

Within the AHS EMPI there two simple EIDs with single MRNs before the event occurs; after the event a single complex EID exists containing the MRNs of the 2 simple EIDs. The original simple EIDs no longer exist in the final state.

Use Case 17 – Manual Link

Within the AHS EMPI there two simple EIDs with single MRNs before the event occurs; after the event a single complex EID exists containing the MRNs of the 2 simple EIDs. The original simple EIDs no longer exist in the final state.

C.7 Unmerge

This scenario results in a previously removed EID reappearing.

Unlink to Single Member – Performed in AHS EMPI

There are 3 use cases that result in the AHS EMPI publishing the same set of messages (listed below), but the end status of EID can be different in each case.

- ADT A31 – Update Patient
- ADT A34 – Notification of Merge

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain 1 complex EID with multiple MRNs	A single complex EID exists containing multiple MRNs and a new simple EID exists with one of the MRNs from the original complex EID. A previously removed EID reappears. Or; Two complex EID exists containing one or more MRNs. A previously removed EID reappears.
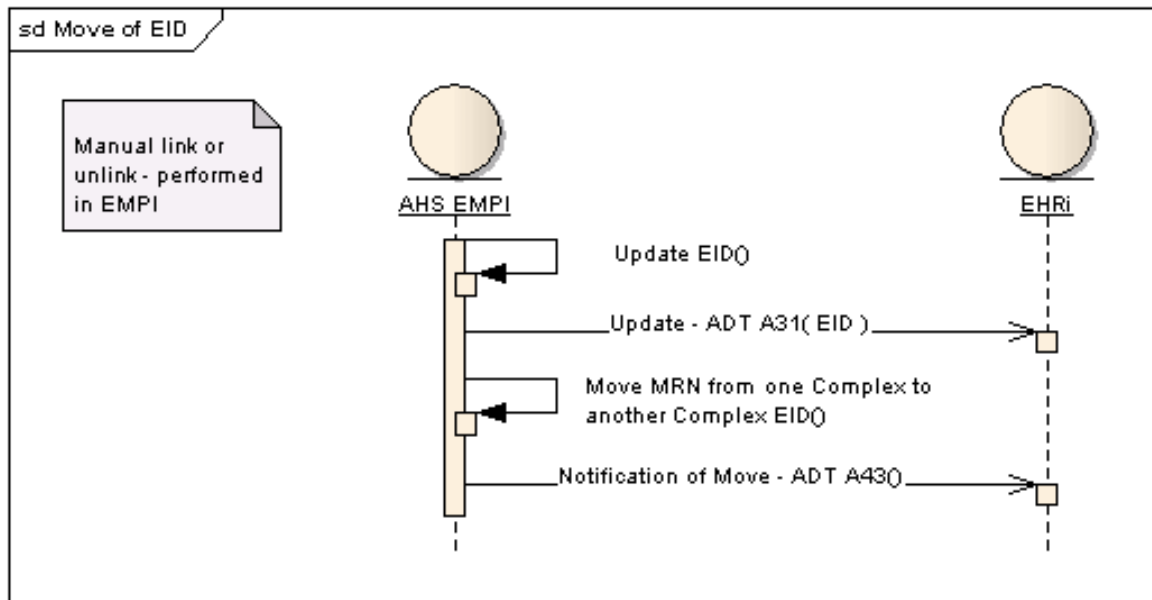
Use Case 20 – Manual Unlink

Within the AHS EMPI there is one complex EID with multiple MRNs before the event occurs; after the event a single complex EID exists containing multiple MRNs and a new simple EID

exists with one of the MRNs from the original complex EID. A previously removed EID reappears.

Use Case 21 – Manual Unlink

Within the AHS EMPI there is one complex EID with multiple MRNs before the event occurs; after the event a two complex EID exists containing one or more MRNs. A previously removed EID reappears.
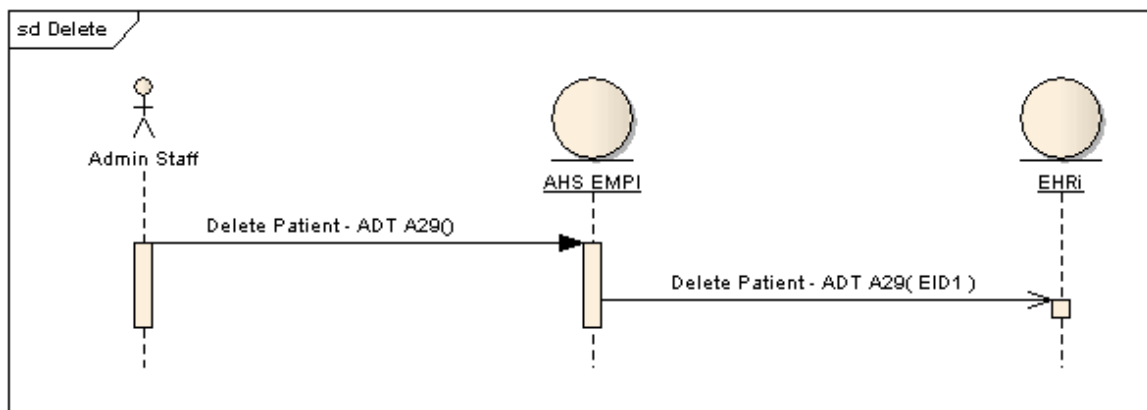
C.8   Delete

This scenario results in an EID being removed.

Scenario 10 – Delete

There is 1 use case that results in the AHS EMPI publishing the following message (listed below).

- ADT A29 – Delete Patient

Summary	
AHS EMPI Start State	**AHS EMPI End State**
Will contain a simple EID with a single MRN	No EID exists.

Use Case 22 – Delete Patient

Within the AHS EMPI there is a simple EID with a single MRN before the event occurs; after the event no EID exists. The original simple EID no longer exists in the final state.