



Australia's National
Science Agency

AMT v3 to AMT v4 & SNOMED CT-AU Package Changes

Comparison and Migration Guidance

March 2024

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1 Introduction

1.1 Target audience

This document is targeted at those directly involved in implementing the SNOMED CT-AU (including AMT) within software and related applications. This guide primarily caters to the following key roles:

- Software Developers
- Database Administrators
- Data Analysts
- Implementation Stakeholders

Please contact NCTSOoffice@csiro.au if you have any questions or would like to discuss any of the changes associated with AMT v4 and SNOMED CT Package.

1.2 Purpose and scope

This document is intended to serve as a quick guide for vendors to determine how AMT v4, or planned packaged changes to SNOMED CT might impact their system.

This document provides a brief overview of how AMT v3 components are represented in AMT v4. It is not a comprehensive description of all the properties of AMT v4 and is intended only as a guide for vendors transitioning from AMT v3 to AMT v4 to understand how they might be impacted. Scope is limited to describing the changes to AMT v3, and options for change management to get to V3.

Within this document, the phrase “7 box” is used to refer to the traditional view of the “AMT 7 box model”. Where the notable concepts were one of the following 7 boxes:

- Medicinal Product (MP)
- Medicinal Product Unit of Use (MPUU)
- Medicinal Product Pack (MPP)
- Trade Product (TP)
- Trade Product Unit of Use (TPUU)
- Trade Product Pack (TPP)
- Containered Trade Product Pack (CTPP)

1.3 Impact Matrix

The impact of AMT v4 changes will vary among vendors based on their specific implementations of the Australian Medicines Terminology (AMT). Implementers can determine which of the following broad categories align with their existing implementation to help refine their approach to adapting to the AMT v4 changes.

- **Flat File Users** – These vendors are only using the experimental “Flat File” published each month. These systems use only the Concept ID and Terms in this file and identify related concepts by the

row associations described in this file. They are only interested in (one or more) of the “7 boxes” and their association with each other, and possibly the ARTGID.

- **RF2 Users** – These vendors use the RF2 release of SNOMED CT-AU and either import directly into their system or preprocess the files to populate. These vendors may only be using a subset of the terminology (e.g. Concepts and Terms, or a specific refset) or using the whole terminology.
- **Relationship Users** – These vendors use the AMT attributes to support functionality within their systems and processes.

Examples might be filtering a list of MPUUs based on a selected dose form. These vendors may be using RF2 or Terminology Services and will likely be using SQL or ECL. This includes the use of the concrete domains (e.g. strengths and pack sizes) as machine-readable properties.

Importantly, these "types" are not mutually exclusive. Vendors may fall into any combination of these categories. For instance, an RF2 user may engage in mapping local codes to specific reference sets, display SNOMED CT descriptions on the interface, and incorporate decision support based on relationships. This nuanced understanding highlights the diverse landscape of AMT implementation among vendors.

Additionally, these users will include AMT in one of two ways.

- **Native** – These vendors are using SNOMED CT-AU on the interface, and throughout. The descriptions within the terminology, are those seen by end users.
- **Mappers** – These vendors are using local codes and mapping these SNOMED CT-AU. SNOMED CT-AU is included for interoperability with message exchange or integration with other systems, while the vendor's system itself operates almost exclusively on local codes.

The below matrix indicates if a vendor may be impacted, and is provided as a guide to determine the potential impact of the transition to AMT v4. Each of the

Change	Flat File	RF2	Relationship	See:
Descriptions in AMT v4 will adopt Sentence case convention consistent with wider SNOMED CT editorial.				2.1
Concept class names have changed (e.g. MPUU is now CD)				2.2
AMT MPs, Substances, Units, Forms, Containers have been replaced by SNOMED CT equivalents.				0
Semantic tags for most concepts have changed				2.1
Concrete domain refsets are replaced by Relationship Concrete Values				2.3
Changes to file naming and bundle structure				2.4
Concept Model Changes (changes to relationship type Ids)				2.5
Bandages and other non-Medicinal products have moved to by subtypes of 49062001 Device (physical object)				2.6
Preferred FSN within the Language reference set				2.7
Inclusion of International (en-GB and en-US) dialect reference sets within the Language reference set file.				2.4
All mass and volume units have been normalised to mg and mL, respectively.				2.8

2 Overview of Changes

2.1 Change to existing AMT descriptions

Change to “term casing”

The adoption of “sentence casing” is to align with the existing SNOMED CT editorial rule¹. The lowercase style used in AMT v3 is primarily a legacy of how AMT descriptions were generated through concatenation and the available technologies.

For *native* AMT users, this should be approached as a benefit as it aligns with most User Interface recommendations^{2,3}. Advanced users who might be composing “complex sentences” combining SNOMED CT-AU terms may want to consider leveraging the case sensitivity values described in RF2.

For users who map to AMT. The change in casing may trigger alerts or warnings about term changes, depending on the case sensitivity of

Preferred Terms and Synonyms

No other specific changes to Preferred Terms or other Synonyms are proposed with AMT v4. Maintaining the “output” of the AMT Editorial Rules was a requirement. Any changes to descriptions will be a consequence of resolving editorial issues in existing content, or natural changes as a result of normal updates to the editorial rules.

Fully Specified Name (FSN) changes

Most notably the semantic tag for all but the “Medicinal Product” box will change with AMT v4.

As above, the FSN for most concepts will otherwise remain consistent.

The FSN for Medicinal Product concepts that are replaced by existing SNOMED CT equivalents, will show the FSN used by the International Drug Model.

Table 1: Comparison of v3 and v4 FSNs

AMT v3 FSN	AMT v4 FSN
paracetamol (medicinal product)	Product containing paracetamol (medicinal product)
zinc oxide (medicinal product)	Product containing zinc oxide (medicinal product)
amoxicillin + clavulanic acid (medicinal product)	Product containing amoxicillin and clavulanic acid (medicinal product)

¹ Case Significance - SNOMED CT Editorial Guide - SNOMED Confluence (ihtsdotools.org)

² User Interface Text - Win32 apps | Microsoft Learn

³ Why letter casing is important to consider during design decisions | by Quovantis | UX Planet

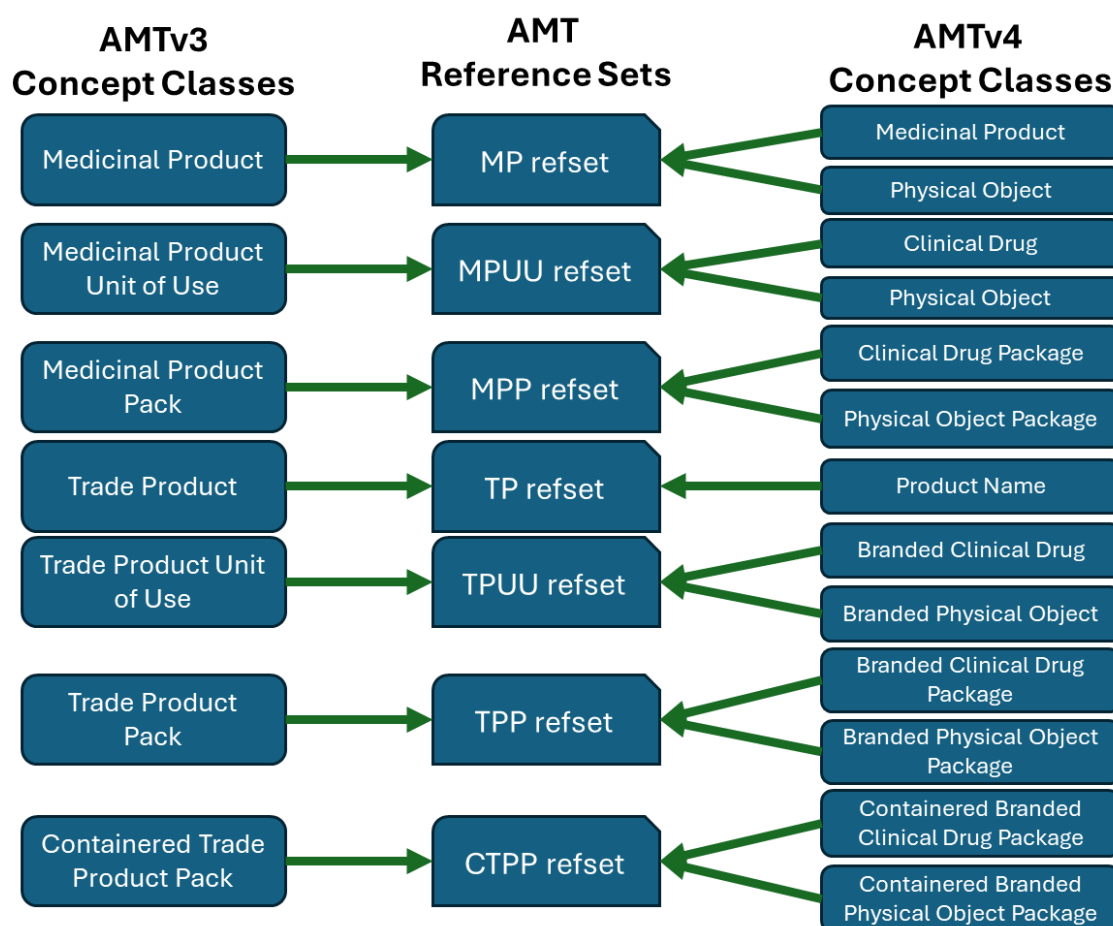
The AMT v4 FSNs are inherited from the International editorial rules and are intended to mitigate historical ambiguity around whether MPs meant “contains AT LEAST some substance” or “contains ONLY some substance”.

2.2 Changes to concept classes

Revising the 7 notable concept classes in AMT v3 was a primary objective of the AMT v4 project. In AMT v3 there was a direct mutual relationship between the 7 concept classes and the notable box reference sets. They were effectively one and the same. This made making improvements to the concept model difficult.

In AMT v4, different concept classes are used to model different types of content - most notably, device products are modelled as devices, rather than medicinal products. The AMT 7 box reference sets are retained unchanged though (except the MP refset). Figure 1, shows the current relationship between the concept types and reference sets.

Figure 1: Relationship between Concept Classes and Reference Sets



Although the refsets in v4 now have an obvious mix of concept classes in them, this was already the case in AMT v3 where, for example, the CTPP refset contained concepts with different modelling - CTPP concepts, Multipack CTPP concepts, and Composite Pack CTPPs.

This current relationship between the AMT v4 concepts and refsets may evolve in the future, but the type of content represented by each of these refsets will

Inactivation of AMT v3 concepts

A key driver for the evolution of AMT to v4 was better integration with the broader SNOMED CT terminology. Most significantly this is through the adoption of SNOMED CT substances, which were previously replicated as a parallel AMT-specific hierarchy.

Table 2: AMT Concept ranges replaced by SNOMED CT

AMT v3	AMT v4
30497011000036103 medicinal product (medicinal product)	763158003 Medicinal product (product)
30388011000036105 medicinal substance (AU substance)	105590001 Substance (substance)
30428011000036107 unit of measure (AU qualifier)	767524001 Unit of measure (qualifier value)
30383011000036100 form (AU qualifier)	736542009 Pharmaceutical dose form (dose form)
30446011000036105 container type (AU qualifier)	49062001 Device (physical object)

As part of the v3 to v4 process – the above AMT v3 concept ranges (including subtypes) were replaced by the existing SNOMED CT-AU concepts (AMT v4 column above) and marked as duplicates in the terminology history. Where there was no existing SNOMED CT-AU in the target range, an AMT concept was moved to become part of this new domain.

Replacements for inactivated concepts can be identified through the existing change mechanisms that existing within SNOMED CT-AU.

Reason for inactivation indicator reference set

This reference set specifies the reason for a component's inactivation. E.g. “Duplicate”, “Ambiguous” etc. Details of this reference set are described in [SNOMED CT Release File Specification](#).

Historical Association Reference Set

This reference set, details associations between inactive concepts and potential active concept alternatives. The name of the reference set indicates the type of association, e.g. “Same as”, “Possibly equivalent to”, “Replaced by”. The associations are generally relative to an “Inactivation Reason”. For example, a concept retired as “Duplicate” may have a “Same as” association to an active concept.

Details of this reference set are described in [SNOMED CT Release File Specification](#).

2.3 Concrete domain representation

Concrete Domains⁴ are used (amongst other things) to represent quantities within description logic such as:

- Strengths (Concentration and Total)
- Unit of Use Size
- Pack Sizes
- Multipack/Subpack/Composite Pack Quantities

The representation of Concrete Domains in SNOMED CT was first implemented (globally) through AMT(v3). This specification used reference sets, to *annotate* specific relationships with an associated quantity (value and unit). Although mature, this specification was not adopted by SNOMED International and a replacement *Relationship Concrete Value File Specification* was developed and adopted by the international standard. These “Concrete Value Relationships” effectively function as other attributes, but reference a *concrete domain*, rather than a *concept* as the destination value. A second, *companion-relationship* (within the same role group) describes the unit of measure associated with this value.

The below tables illustrate how the same concrete value is represented in the two formats. Note: These renderings are simplified for human readability. Please see the [Concrete Value File Specification](#), for the detailed specifications.

Concrete Values in AMT v3

Refset	ReferencedComponent	Unit	value
Strength refset	ibuprofen 400 mg capsule:HasBoSS=ibuprofen	mg/each	400
Strength refset	insulin aspart 100 units/mL injection, cartridge:HasBoSS=insulin aspart	units/mL	100
Strength refset	gentamicin 0.3% eye drops:HasBoSS=gentamicin	mg/mL	3
Strength refset	amoxicillin 500 mg + clavulanic acid 125 mg tablet:HasBoSS=amoxicillin	mg/each	500
Strength refset	amoxicillin 500 mg + clavulanic acid 125 mg tablet:HasBoSS= clavulanic acid	mg/each	125

Note: The referencedComponent in these reference sets is a specific relationship (id) from the relationship File.

⁴ Description Logics with Concrete Domains and General Concept Inclusions Revisited | SpringerLink

Concrete Values in AMT v4

Relationship Concrete Values file

Source	Value	Group	Type
ibuprofen 400 mg capsule	400	1	Has total quantity value
insulin aspart 100 units/mL injection, cartridge	100	1	Has concentration strength value
gentamicin 0.3% eye drops	3	1	Has concentration strength value
amoxicillin 500 mg + clavulanic acid 125 mg tablet	500	1	Has total quantity value
amoxicillin 500 mg + clavulanic acid 125 mg tablet	125	2	Has total quantity value

Relationship file

Source	Destination	Group	Type
ibuprofen 400 mg capsule	mg	1	Has total quantity unit
insulin aspart 100 units/mL injection, cartridge	IU/mL	1	Has concentration strength unit
gentamicin 0.3% eye drops	mg/mL	1	Has concentration strength unit
amoxicillin 500 mg + clavulanic acid 125 mg tablet	mg	1	Has total quantity unit
amoxicillin 500 mg + clavulanic acid 125 mg tablet	mg	2	Has total quantity unit

Note: The *Relationship Concrete Values* and *Relationship* have the same RF2 format, differing only in the datatypes used for Value and DestinationId fields, respectively.

Please consult the specification for the formal structure of the Concrete Domain representation.

2.4 Changes to file naming and bundle structure

Coinciding with the AMT v4 changes are changes to the SNOMED CT-AU bundle structure. These changes are to better align the Australian edition with what has become standard internationally. Changes that can potentially affect SNOMED CT-AU users are

Inclusion of International (en-GB and en-US) dialect reference sets

Currently, SNOMED CT-AU includes a single refset in the file “der2_cRefset_Language*-en-au_AU1000036_YYYYMMDD.txt” – 32570271000036106| Australian dialect reference set |.

To align with international practices, SNOMED CT-AU will also include

- 900000000000508004| GB English |
- 900000000000509007| US English |

Users who are determining the Preferred Term for concepts may be impacted if they are not currently explicitly filtering for refsetId = 32570271000036106 (See below examples).

Without an explicit filter for ADRS

```
PreferredTerm = SELECT term FROM description_snapshot
                WHERE description.conceptId = 5573011000036101
                AND description.typeId = Synonym
                AND description.active = 1
                AND description.id = (SELECT referencedComponentId
                                     FROM languageRefset_snapshot
                                     WHERE acceptability = Preferred
                                     AND active = 1);
```

With explicit filter for ADRS

```
PreferredTerm = SELECT term FROM description_snapshot
                WHERE description.conceptId = 5573011000036101
                AND description.typeId = Synonym
                AND description.active = 1
                AND description.id = (SELECT referencedComponentId
                                     FROM languageRefset_snapshot
                                     WHERE refsetId = 32570271000036106
                                     AND acceptability = Preferred
                                     AND active = 1);
```

If the specific refsetId is not specified, up to 3 Preferred Terms may be returned by the above query (one for each language refset).

Consolidation of Simple Type reference sets into a single file.

SNOMED CT-AU has included each simple type reference set⁵ in its own file. However, current international standard practice is to publish a single file, containing all of the reference sets. The change will effectively involve the current files being appended into a single file.

Implementers who are currently importing these reference sets based on the filename pattern should not be impacted and are unlikely to need to make any changes.

For example:

```
IMPORT "der2_Refset_*Snapshot_AU1000036_*.txt";
```

Implementers who are currently importing these refsets specifically by name, such as:

```
IMPORT "der2_Refset_AdverseReactionTypeSnapshot_AU1000036_*.txt";  
IMPORT "der2_Refset_MedicinalProductPackSnapshot_AU1000036_*.txt";  
IMPORT "der2_Refset_TradeProductUnitOfUseSnapshot_AU1000036_*.txt";
```

Will need to update their processes to import the single file (as above). If the implementation previously imported each file into a dedicated database table, some processing will be needed to either:

- Import the single file, then “SELECT INTO” the dedicated tables, based on the refset ID; or
- Process as part of the import operation.

2.5 Concept Model Changes (changes to relationship type Ids)

The most significant changes relate to a revision of the model itself. This involves replacing AMT v3 attributes, and concepts with either existing International values, or new ones created specifically for AMT v4. Additional attributes are also introduced as part of AMT v4 that do not specifically replace v3 properties.

The AMT v4 model is described in detail in the AMT v4 specification. However, the following three tables provide an overview of the correlation between v3 and v4 model attributes. Note, that most attributes are not 1:1 correlations. The “AMT Box” refers to the refset types, which persist through v3 and v4, even though the underlying concept types change.

⁵ Simple Reference Set - Release File Specification - SNOMED Confluence (ihtsdotools.org)

AMT v3 to AMT v4 attribute mappings

Table 3: Changes to "MPs"

	AMT v3 Properties		AMT v4 Properties		
AMT "Box"	Relationship TypeId	Preferred Term	Relationship TypeId	Preferred Term	Comments
MP	700000081000036101	has intended active ingredient	127489000	Has active ingredient	

Table 4: Changes to "Unit of Use" concepts

	AMT v3 Properties		AMT v4 Properties		
AMT "Box"	Relationship TypeId	Preferred Term	Relationship TypeId	Preferred Term	Comments
MPUU/TPUU	116680003	Is a (TP)	774158006	Has product name	TPUU only
	700000081000036101	has intended active ingredient	127489000	Has active ingredient	<i>Has precise active ingredient</i> is a sub-property of <i>Has active ingredient</i> and “replaces” the <i>Has active ingredient</i> property of the parent MP when the precise ingredient is a subtype or modification of the MP ingredient.
			762949000	Has precise active ingredient	
	30364011000036101	has Australian BoSS	732943007	Has BoSS	
	700000111000036105	Strength reference set	999000041000168106	Has total quantity value	- Strengths in AMT v4 are represented using concrete relationships, rather than the previous reference sets. - Discrete form products (e.g. “tablet”) have a total quantity (strength) - Continuant form products (e.g. “solution”) (usually) have a concentration strength. - Continuant forms may have both strength representations if the pack size is known. - Continuant forms might only have a total quantity if the concentration is unknown.
			999000051000168108	Has total quantity unit	
			999000021000168100	Has concentration strength value	
			999000031000168102	Has concentration strength unit	
	30523011000036108	has manufactured dose form	411116001	Has manufactured dose form	<i>Has device type</i> is used for products like patches, and implants where the device acts as a delivery mechanism but itself is not “consumed” in the process (disposed of after delivery). It is not a container; the medication is <i>embedded</i> rather than <i>contained</i> .
			999000061000168105	Has device type	
	30548011000036101	has unit of use	30465011000036106	Has container type	This role group is only used when required in AMT v4. Where the v3 Unit of Use duplicated the v3 manufactured dose form; this redundant information is not repeated in v4.
	700000141000036106	Unit of use size reference set	1142142004	Has pack size value	
			774163005	Has pack size unit	

					Where the (v3) unit of use describes a container, this is modelled using the Has container type property. with associated "Pack size" describing the quantity of product.
--	--	--	--	--	---

Table 5: Changes to "Pack" concepts

	AMT v3 Properties		AMT v4 Properties		
AMT "Box"	Relationship TypeId	Preferred Term	Relationship TypeId	Preferred Term	Comments
MPP/TPP/CTPP	700000101000036108	has TP	774158006	Has product name	TPP only
	30348011000036104	has MPUU	774160008	Contains clinical drug	MPP change
	30409011000036107	has TPUU	774160008	Contains clinical drug	TPP change
	700000131000036101	Unit of use quantity reference set	1142142004	Has pack size value	- For packs of discrete forms, the quantity is a count, and the pack size is always "each". - For continuants, the quantity is usually a mass (g) or volume (mL) unit of measure.
			774163005	Has pack size unit	
	30454011000036104	has subpack	999000011000168107	Contains packaged clinical drug	These are always counts of packs, and the pack size unit is always "each"
	700000121000036103	Subpack quantity reference set	1142142004	Has pack size value	
			774163005	Has pack size unit	
	700000061000036106	has component pack	999000011000168107	Contains packaged clinical drug	
	N/A		1142142004	Has pack size value	These are always counts of packs, and the pack size unit is always "each"
			774163005	Has pack size unit	
	30465011000036106	has container type	30465011000036106	Has container type	CTPP only

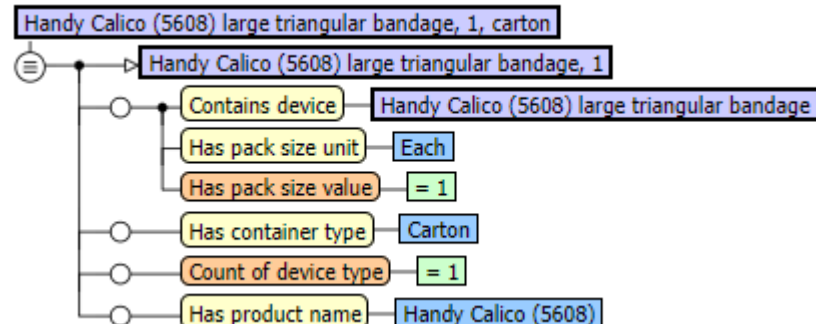
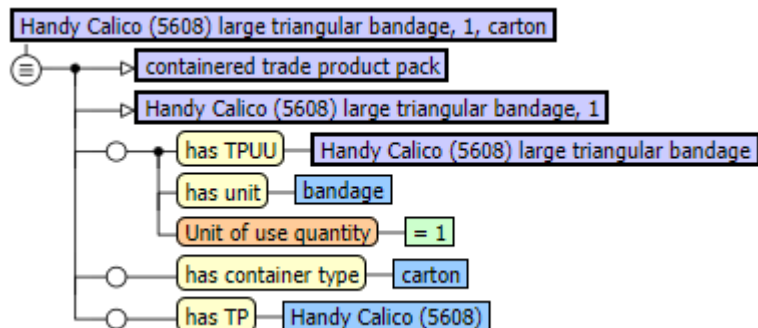
2.6 Bandages and other non-medicinal products

The AMT v4 model is not intended to describe Bandages and other “non-medicinal products”. Specific models, to describe such concepts may be developed as part of SNOMED CT-AU, or Internationally. The concepts used in the “AMT 7 Boxes” are retained though (unless replaced by International equivalents).

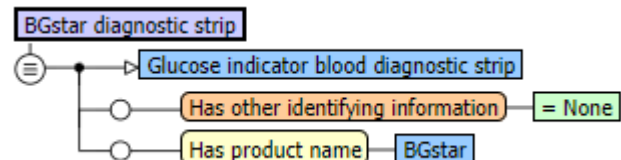
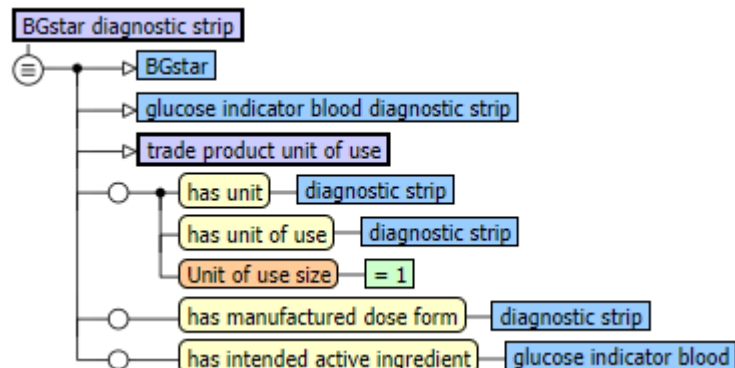
Table 6: Comparison of Non-Medicinal Products

Concept	AMT v3	AMT v4
50841011000036101		
48773011000036108		

50240011000036101



26591000036106



2.7 Preferred FSN within the Language reference set

Only RF2 users may be impacted by this change.

To align with international conventions, the Australian Dialect Reference set, now also specifies a “Preferred FSN”, as well as a “Preferred Synonym”. Users may or may not be impacted by this change depending on how they have implemented SNOMED CT-AU now to identify Preferred Terms.

Consider these two SQL/pseudocode examples that determine the Preferred Term for 5573011000036101| Anusol ointment |

```
PreferredTerm = SELECT term FROM description_snapshot
WHERE description.conceptId = 5573011000036101
AND description.typeId = Synonym
AND description.active = 1
AND description.id = (SELECT referencedComponentId
FROM languageRefset_snapshot
WHERE refsetId = ADRS
AND acceptability = Preferred
AND active = 1);
```

This query will successfully return the Preferred Term for a concept now, and in the revised release bundle. Implementers who are explicitly specifying the description type as “Synonym” should not need to take any action.

Compared to this example:

```
PreferredTerm = SELECT term FROM description_snapshot
WHERE description.conceptId = 5573011000036101
AND description.active = 1
AND description.id = (SELECT referencedComponentId
FROM languageRefset_snapshot
WHERE refsetId = ADRS
AND acceptability = Preferred
AND active = 1);
```

This query will return the (single) Preferred term for the concept 5573011000036101 in SNOMED CT-AU before the package changes. However, in the updated bundle two terms will be returned – one for the synonym (try Preferred Term) and the other for the Fully Specified FSN.

It was not previously necessary to specify the descriptionType as SNOMED CT-AU did not specify a preference for FSN terms. The updated release package aligns with international standards and enables preferences to be assigned to different description types (synonyms, FSNs and text definitions).

2.8 Normalisation of mass and volume units

The units of measure used within medicine terms are determined by the AMT editorial rules, which are informed by industry guidelines. For example, where a numeric value is greater than 999, the unit of measure should be adjusted to render a smaller number. For example

- 1500mL is rendered as 1.5L

- 2000mg is rendered as 2g
- 0.5g is rendered as 500mg

AMT v3 introduced some normalisation to the modelling where “similar” products were modelled with the same unit. AMT v4 extends this such that mass units are always modelled with “milligram” and volume units are always modelled with “millilitre”. This provides a more consistent and predictable base to perform unit calculations, comparisons, and description logic evaluations. Examples of the different modelling between v3 and v4 are shown below.

Product	V3 “Pack Size”	V4 “Pack Size”
Sodium chloride 0.9% (27 g/3 L) solution, bag	3 L	3000 mL
Sodium chloride 0.9% (2.25 g/250 mL) injection, bag	250 mL	250 mL
triclosan 1% solution, 1.5 L	1.5 L	1500 mL
triclosan 1% lotion, 200 mL	200 mL	200 mL
Pholcodine 3 mg/mL oral liquid, 2.5 L	2.5 L	2500 mL
Pholcodine 3 mg/mL oral liquid, 30 mL	30 mL	30 mL
aqueous cream, 10 kg	10 kg	10000000 mg
aqueous cream, 500 g	500 g	500000 mg

Product	V3 “Strength”	V4 “Strength”
Alprazolam 500 microgram tablet	500 microgram	0.5 mg
Alprazolam 2 mg tablet	2000 microgram	2 mg
Calcitriol 0.25 microgram capsule	0.25 microgram	0.00025 mg
Calcitriol 1 microgram/mL injection, ampoule	1 microgram	0.001 mg
Meropenem 500 mg injection, vial	500 mg	500 mg
Meropenem 1 g injection, vial	1000 mg	1000 mg

Note: The actual units shown in terms remain unchanged, the normalisation only applies to the modelling.