JHS 193 Unique identifiers of geographic data

Annex 3. Generation of lifecycle rules for geographic features

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Contents

1 Introduction

This document describes what lifecycle rules of geographic features mean, what their significance is in the processing and modelling of geographic features and in the design of geographic information systems, in which contexts they should be used and how they can be produced. This document includes a ready-to-use template and examples on how to produce lifecycle rules.

The collection of comprehensive lifecycle rules is often a laborious task, unless they have already been documented. Therefore, the use of a revision with timestamps (start/end dates of the validity of the feature) is a feasible model. Identifiers of deleted features must also be available.

In practice, the supplementation of lifecycle rules and revision information can be started from revised data which the data producer sends to customers as responses.

2 General

Lifecycle rules of a geographic feature represent changes in the geographic feature throughout its lifecycle. In most cases, they consist of processing rules of data processes. They are needed to solve whether a change in a geographic feature causes changes in its identity and unique identifier (new feature) or only a new version identifier. For example in a property land survey process, the survey type determines whether a new property is formed or whether the attributes of an existing property are changed. Therefore, lifecycle rules may concern significant changes in the attributes or geometry of a feature.

Lifecycle rules form an important part of geographic information modelling where use cases define how the lifecycle of an instance is created, changed and removed. Processing rules in accordance with lifecycle rules must also be taken into account in software design and implementation. Accordingly, software processes geographic features, on which the management of unique local identifiers is based.

3 Event types and their subcategories

Any changes in the lifecycle rules of geographic features significant to users are classified. Changes in geographic information can usually be represented by four event types and their subcategories:

1. Generating a new geographic feature
2. Removing a geographic feature
3. Changing the features of a geographic feature
4. Changing the attributes of a geographic feature

If the attributes or geometry of a geographic feature change, subcategories may include:

- Division of the geographic feature into parts
- Combination of geographic features
- Reclassification of geographic features
- Correction of a location error (including the specification of the location)
- Processing rules for the topological consistency of linear objects, if required

Changes may be caused by changes in real-world objects or by other reasons. Changes independent of real-world objects include:

- Correction of errors
- Correction of geometry
- Changes in data structure.

4 Lifecycle rules in modelling geographic information

When modelling geographic information (*JHS 162 Modelling of the geographic information for data transfer*), clear lifecycle rules should be defined for data objects on the basis of the use cases included in the data process. Change events of use cases include the event types and their subcategories in accordance with the previous chapter, and their conditions must be defined in more detail case-by-case. When defining lifecycle rules, it must also be decided what types of unique local identifiers or identification mechanisms are used for data objects. Instructions for the use of local identifiers are given in *Chapter 7* of this recommendation. Using lifecycle rules, it is also possible to test the suitability for using an existing identifier as a permanent unique identifier.

Special attention must be paid to lifecycle rules concerning changes in attributes. For example, when the classification of a data object changes, its identity may also change (residential building – office building). Changes in the attributes of data objects should be reviewed closely when modelling geographic information.

Changes in geometry may change the identity of an object, depending on the case. For example, changes in the boundaries of properties in the detailed plan area in accordance with the lot division form a completely new property, in which case the object obtains a new thematic property identifier.

It is also important to understand that, if a real-world object is removed, the geographic feature which models it will never be removed. It is only assigned a removal date. It must always be possible to return to historical data in the future.

If the dimensions of a feature change, the general European practice is that, for example, if a building's footprint area more than doubles, it must be regarded as a new feature and, therefore, it obtains a new identifier. As a result, precise threshold values should be defined for footprint areas and other geometry variables in conjunction with modelling.

5 Use of lifecycle rules of geographic features

The lifecycle rules of geographic features should be used in the following use cases:

When modelling geographic information as part of data product specifications

When modelling geographic information, lifecycle rules must be defined for data object types on the basis of use cases included in the data process and the processing rules included in them.

Lifecycle rules must be taken into account in data system design

Lifecycle rules planned in modelling geographic information, on the basis of which unique identifiers are managed in the data system, must be taken into account in data system design. In addition, software logic can be implemented on the basis of the processing rules of lifecycle rules. This reduces the amount of deduction made by people and the possibility of errors.

Verification of customer needs

When preparing and maintaining lifecycle rules, customer needs may need to be revised, and this also benefits customers if their data needs are specified directly using unique identifiers and version identifiers in the maintenance of information updates. The modelling of lifecycle rules requires that the customer's operating process is verified.

Maintenance of data system-independent geographic features

In the maintenance of data system-independent geographic information, knowledge of lifecycle rules is emphasised, and it is very important to define and set data product-specific lifecycle rules available to users in the spatial data infrastructure. "Maintenance of data system-independent geographic information" refers to the updates of data features using different software and terminal devices, in which case software might not include processing rules in accordance with lifecycle rules.

Often, lifecycle rules are generated from data processes so that the maintaining party is not even aware of any combinations of lifecycle rules. Many times, lifecycle rules are not modelled when modelling geographic information, meaning that they are not available in the spatial data infrastructure. In these cases, lifecycle rules must be described and made available for maintenance.

6 Production of lifecycle rules of geographic features

This chapter presents a general model for modelling lifecycle rules of geographic features. This model is recommended to be used to describe use cases included in data processes, their possible change events and their impact on the identity and lifecycle management of a feature.

This model describes general stages in the production of lifecycle rules. This model can be modified as desired, depending on the processing rules of the data processes and use cases.

Stages:

1. **Identify or verify customer needs.** Review the data process with the customer and verify its correctness. Verify whether the data features maintained in the data process have a unique local identifier or an identification mechanism. If they do not, define them at the following stage.

2. **Together with the customer, identify any real-time change events from the data process.** Identify the processing rules and conditions related to change events that cause the identity and unique identifier of the object to change or its lifecycle features, such as a new version identifier, to change.

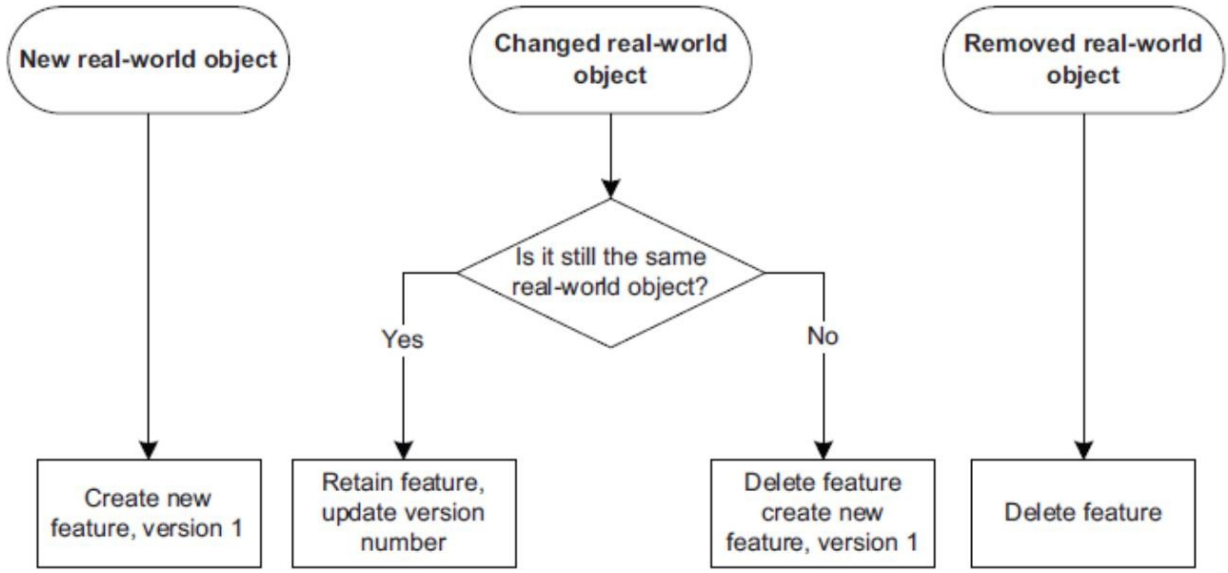


Figure 1. A new object or a new version. © Crown copyright 2008

3. **Create lifecycle rules.** Lifecycle rules are generated from the change events identified in the previous section and the processing rules included in them by using *Table 1* below. You can illustrate geometric change events by event type in accordance with *Table 2*. *Chapter 7* on presents examples of lifecycle rules.

Example table to create rules:

The left-hand column in the table lists possible event types. The right-hand column describes the existence of the feature (unique local identifier) and its impact on lifecycle attributes, i.e. versions and event dates. Note that dividing and combining are subcategories for the modification of geometry. Dividing and combining are also linked to the creation and removal of a new feature.

Creating a feature	A new unique identifier has been created. Version 1 has been created. CreationDate is the current date. ModificationDate is blank. EndDate is blank.
Removing a feature	The unique identifier becomes terminated and the EndDate is given. EndDate is the current date. The unique identifier can never be reused.
Existence of a feature	The unique identifier remains. Lifecycle attributes remain unchanged.
Dividing	Two new features obtain a new unique identifier. The version of both features is 1. CreationDate is the current date. EndDate is blank.
Combination	A new feature obtains a new unique identifier. Version 1 has been created. CreationDate is the current date. EndDate is blank.
Modifying geometry	The unique identifier remains. The version number increases (how). The feature obtains a ModificationDate.

Modifying attribute data	The unique identifier remains. The version number increases (how). The feature obtains a ModificationDate.

Table 1. An example table for the modelling of lifecycle rules.

COMBINING A FEATURE

Before a change in geometry	After a change in geometry
	

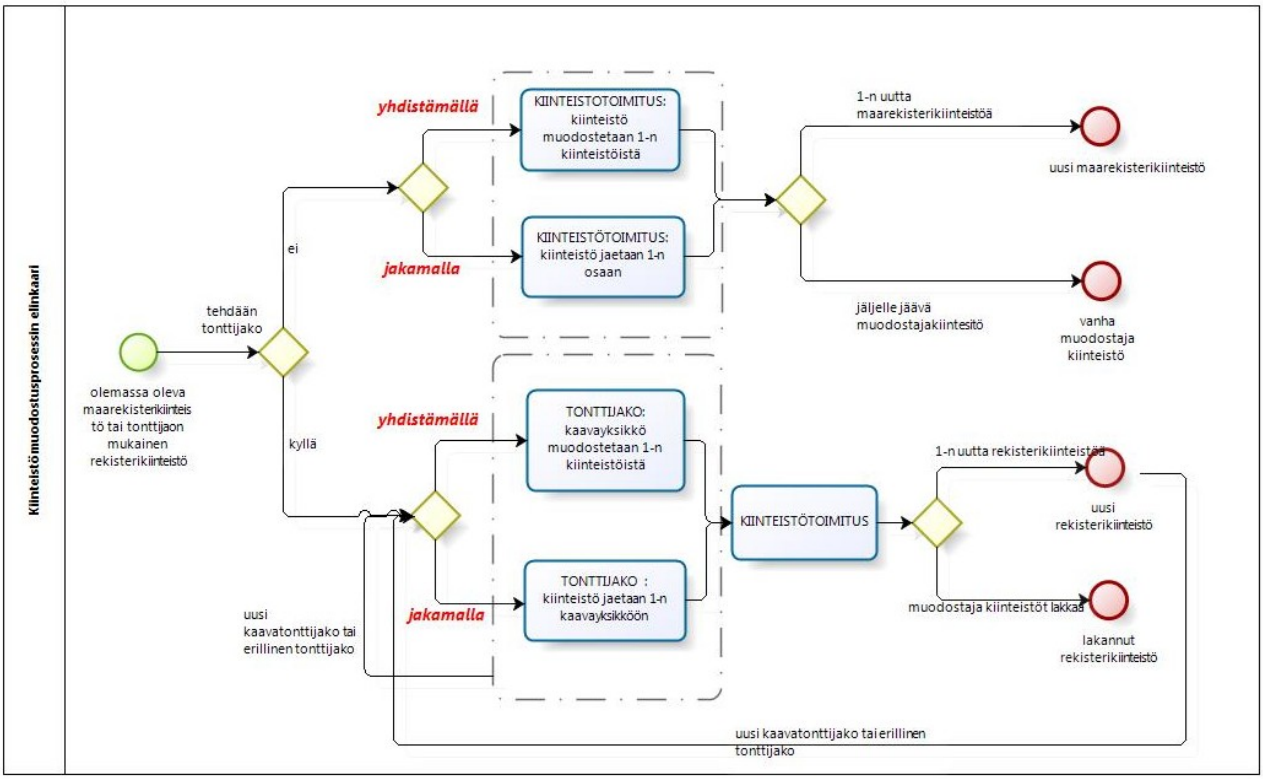
Table 2. An example of the portrayal of a change in geometry. Two features are combined to form a single new feature. The new feature obtains a new identity and, therefore, a new unique identifier. The new feature also obtains version number 1. Previous features cease to exist and obtain an end date.

7 Examples of lifecycle rules

7.1 An example of lifecycle rules for a property formation process

This example describes lifecycle rules for a land survey process. They roughly represent change events produced by cadastral surveys in accordance with the lot division and taking place in the land register area. As property formation is a complex process, not all exceptions have been presented in this example. This is only intended as an example.

An example of the progress and events of the land survey process:



An example of rules for a land survey process:

The tables below present the possible event types of the land survey and lot division processes (plan units) and their impact on the unique identifier of the object and changes in lifecycle attributes and geometries. The event types presented in the table are events in the process described above.

Rules of a registered property:

Creating a property	A new property obtains a property identifier. The property obtains a RegistrationDate. A blank EndDate is added for the property. The survey type attribute obtains the value: Registered property
Removing a property	The property and its property identifier are never removed; they are entered in the "terminated" status. The EndDate is added.
Existence	The property identifier remains. Features do not change.
Dividing	Land register property: 1–n properties surveyed obtain a new property identifier and other lifecycle attributes associated with the creation process. Registered property in accordance with the lot division: 1–n plan units are registered and lifecycle attributes are updated: RegistrationDate and SurveyType features obtain the value "registered property."
Combination	Land register property: A new property to be formed obtains a new property identifier and other lifecycle attributes associated with the creation process. Registered property in accordance with the lot division: A new plan unit is registered and lifecycle attributes are updated: RegistrationDate and SurveyType features obtain the value "registered property."
Modifying geometry	See dividing and combination.
Modifying attribute data	The property identifier remains.

Rules of a detail (city) plan unit:

Creating a plan unit	A new plan unit obtains a plan unit identifier. The plan unit obtains a CreationDate. The plan unit obtains a blank EndDate. The plan unit type attribute obtains the value: in accordance with the lot division.
Removing a plan unit	The plan unit and its plan unit identifier are never removed; they are entered in the "terminated" status. The EndDate is added.
Existence	The plan unit identifier remains. Features do not change.
Dividing	plan unit in accordance with the lot division: 1–n plan units obtain a new plan unit identifier and other lifecycle attributes associated with the creation process.
Combination	plan unit in accordance with the lot division: A new plan unit obtains a new plan unit identifier and other lifecycle attributes associated with the creation process.
Modifying geometry	See dividing and combination.
Modifying attribute data	The plan unit identifier remains.

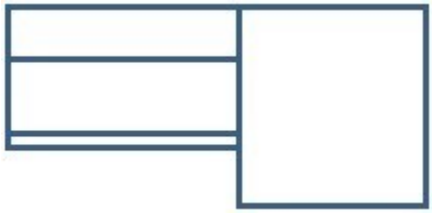
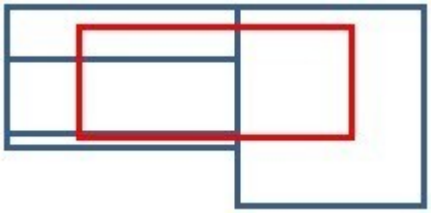
Examples of changes in the geometry and attributes of a land register property:

Combination:

Before	**After**
	

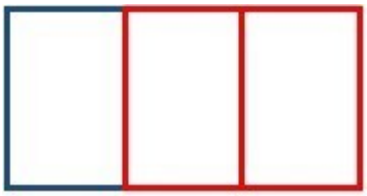
2–n land register properties are formed into a new land register property (new unique identifier).

Dividing 1:

Before	**After**
	

1–n land register properties are formed into a new land register property (new unique identifier).

Dividing 2:

Before	After
	

A land register property is divided into two or more properties. The new land register properties obtain a new property identifier (new unique identifier). The previous property identifier remains valid for the forming property. The features of the forming property are modified with regard to the footprint area.

Note:

- The combination of properties reduces the number of properties.
- The division of properties increases the number of properties.
- When the number of properties changes, new property identifiers are generated (unique identifiers).

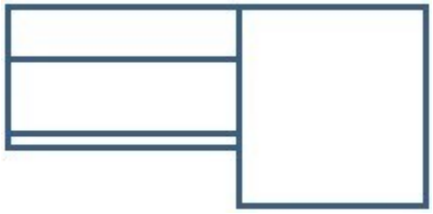
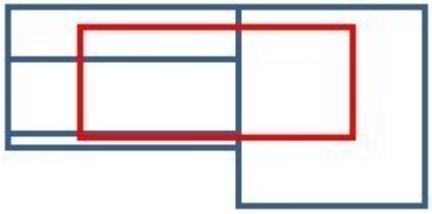
Examples of changes in the geometry and attributes of a registered property in accordance with the lot division:

Combination:

Before	After
	

2–n registered properties (before) are formed into a new plan unit (after). The plan unit obtains a new plan unit identifier (new unique identifier) which is later registered as a registered property through a cadastral survey, or they can later be formed into new plan units through a change in the lot division. During the registration, the plan unit type of the plan unit changes into a registered property (modified attribute data).

Dividing 1:

Before	**After**
	

1–n registered properties (before) are formed into a new plan unit (after). The plan unit obtains a new plan unit identifier (new unique identifier) which is later registered as a registered property through a cadastral survey, or they can later be formed into new plan units through a change in the lot division. During the registration, the plan unit type of the plan unit changes into a registered property (modified attribute data).

Dividing 2:

Before	**After**
	

A registered property (before) is divided into two or more plan units through a lot division (after). The new plan units obtain plan unit identifiers (new unique identifiers). The plan units are later registered as registered properties through a cadastral survey, or they can later be formed into new plan units through a change in the lot division. During the registration, the plan unit type of the plan unit changes into a registered property (modified attribute data). The features of the forming property are modified with regard to the footprint area.

Note:

- The combination of properties reduces the number of properties.
- The division of properties increases the number of properties.
- When the number of properties changes, new property identifiers are generated (unique identifiers).
- However, exceptions are formed by LEX Vantaa surveys where the geometry of a property remains unchanged but the property identifier changes.
- The property never disappears; it becomes a forming property. The survey history can always be reviewed later.

7.2 An example of lifecycle rules for a building

An example of rules for a building:

The table presents possible event types and their impact on the unique identifier of the feature and changes in lifecycle attributes and geometries.

Creating a building	The building obtains a permanent unique identifier. The building obtains a CompletionDate. The building obtains a ModificationDate which consists of the modifier and date (i.e. version). The building obtains a blank EndDate. The building obtains a blank ExpirationDate.
Removing a building	The permanent unique identifier is deactivated. The EndDate is added, or The ExpirationDate is added if the building project expires and the building is never completed.
Existence	The permanent unique identifier remains. Lifecycle attributes do not change.
Dividing	New objects, see Creating a building One of the divided parts of the feature maintains the previous existing permanent unique identifier with updated information. It obtains a new ModificationDate (version), and no other lifecycle attributes are changed.
Combination	One permanent unique identifier remains, attribute data is corrected (volume, footprint area, etc.). The removed building obtains an EndDate.
Modifying geometry	The permanent unique identifier remains. A new ModificationDate (version) is assigned. Other lifecycle attributes do not change.
Modifying attribute data	The permanent unique identifier remains. A new ModificationDate (version) is assigned. Other lifecycle attributes do not change.

Examples of changes in the geometry and attributes of a building:

Creating a building:

New building	
	The building obtains a new permanent unique identifier. The building obtains a CompletionDate. The building obtains a ModificationDate which consists of the modifier and date (i.e. version). The building obtains a blank EndDate. The building (project) obtains a blank ExpirationDate.

Modifying geometry:

Before	**After**

The building dimension is increased. The permanent unique identifier is updated, a new ModificationDate (version) is assigned, and other lifecycle attributes remain unchanged. Attribute data is corrected, e.g. volume, surface area, etc.

Dividing:

Before	**After**
	

During a subdivision survey, a building is divided into two parts, in conjunction with which one half of the building obtains a new permanent unique identifier. For the other half, the existing permanent unique identifier remains with updated data.

Combination:

Before	**After**
	

Two buildings are combined, in conjunction with which one building obtains an EndDate and the permanent unique identifier is deactivated. Information about the remaining building is updated, a new ModificationDate (version) is assigned, and the permanent unique identifier and lifecycle attributes remain.

Modifying feature data:

Existing building	

	For example, the purpose of use of a building changes (residential building – office building). The permanent unique identifier remains. A new ModificationDate (version) is assigned.

Note:

- A permanent unique identifier is always generated when a new building is created.
- The permanent unique identifier does not change during its lifecycle as a result of any event in accordance with the rules.
- When a building is removed, its permanent unique identifier is deactivated.
- VRK-PRT (permanent building identifier) is one possible permanent identification mechanism to be used as permanent unique identifiers of buildings.