SASIG Long Term Archiving & Retrieval of Digital Product Definition Data Time Period Recommendation

FOREWORD

Many companies are migrating or have migrated their product definition and lifecycle management authoring processes from traditional hard-copy, paper based document management processes to processes that highly leverage computer aided/digital information creation techniques. As a consequence of this activity, new processes must also be defined to archive digital information and preserve access to it, in compliance with business and regulatory requirements.

Certain classes of product definition data specify multi-decade retention periods. Over these time periods, changes in both the editing and storage technologies impact an organization's ability to retrieve and use product information. All organizations which use digital product information will need strategies and processes that maintain the usability of the information over multiple generations of technology.

The SASIG Long Term Archiving & Retrieval Project is developing a set of recommendations to guide companies to effective and efficient archival and retrieval practices. The recommendations are partitioned into four topic areas: 1) Format, 2) LTAR Process, 3) LTAR Time Periods, and 4) Quality Assurance.

This document addresses the set of time period recommendations. In particular, this document aims to provide an organization with the key functional and technical elements to consider when choosing a LTAR time period for a particular artifact of product data. A LTAR time period is the span of time that an artifact of product data should be retained to meet governmental or organizational requirements. There are often multiple use case constraints that are factored into the determination of the time period. These constraints can be associated with the intellectual property verification and validation; maintenance and repair actions; legal obligations associated with patent litigation, product liability, and tax considerations; and an organization's design knowledge preservation desires. By correlation, the time period recommendation can be used to determine routine and timely disposal of a product data artifact.

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1. INTRODUCTION: LONG TERM ARCHIVING & RETRIEVAL

In today's engineering and manufacturing organizations, paper based product design and analysis approaches have been or soon will be replaced by computer-based solutions that digitally store and manage the product definition information. New business processes, information architectures and models, and hardware/software infrastructures have been deployed within the OEM and supply communities to effectively leverage the initial usage of this newly created digital information.

However, the processes, models, and infrastructural designs for addressing the long term archiving and retrieval (LTAR) of the digital information have not been widely deployed. Long term archival and retrieval has been a challenge because any solution requires alignment of storage media, data architecture, authoring/editing software, and hardware infrastructure. Such an alignment can be difficult to achieve because each of these components have their own unique lifecycle durations.

Until recently, the relative newness of digitally managed product definition and lifecycle information has afforded companies with the opportunity to ignore long term archival issues. However, many companies have now reached a level of maturity with digital product lifecycle information management that issues pertaining to data retention and reuse have become paramount with respect to their near-term business plans and economic viability.

The recommendations developed by this project have been designed to guide companies to effective and efficient archival and retrieval practices. Specific recommendations address Format for LTAR, the LTAR Process, LTAR Time Period, and Quality Assurance of LTAR. Figure 1 shows the relationship between the four recommendations with respect to the preparation, archival, and retrieval events. Figure 1 also depicts a planned project for developing a test bed capability for assessing an enterprise's LTAR capability.

Retention time period is an essential element in a LTAR approach. It defines how long a data artifact should be archived. A time period definition depends on three elements: a) Use Case, b) Data Type and c) Ontology. This document describes each of those elements, and how they are linked or dependent on each other. Section 2.2 describes use cases that are associated with the automotive industry. The role of an ontology model, as well as its implementation and usage in a LTAR project is specified in section 2.3. This section also includes a baseline ontology model that can be customized by an organization for its own use. Data types and related definitions are proposed in section 2.4 While section 2.5 and 2.6 address computing the time period start and end milestones when a company considers a complex system or a single part as the reference and managing product data format obsolescence before and during the LTAR process.

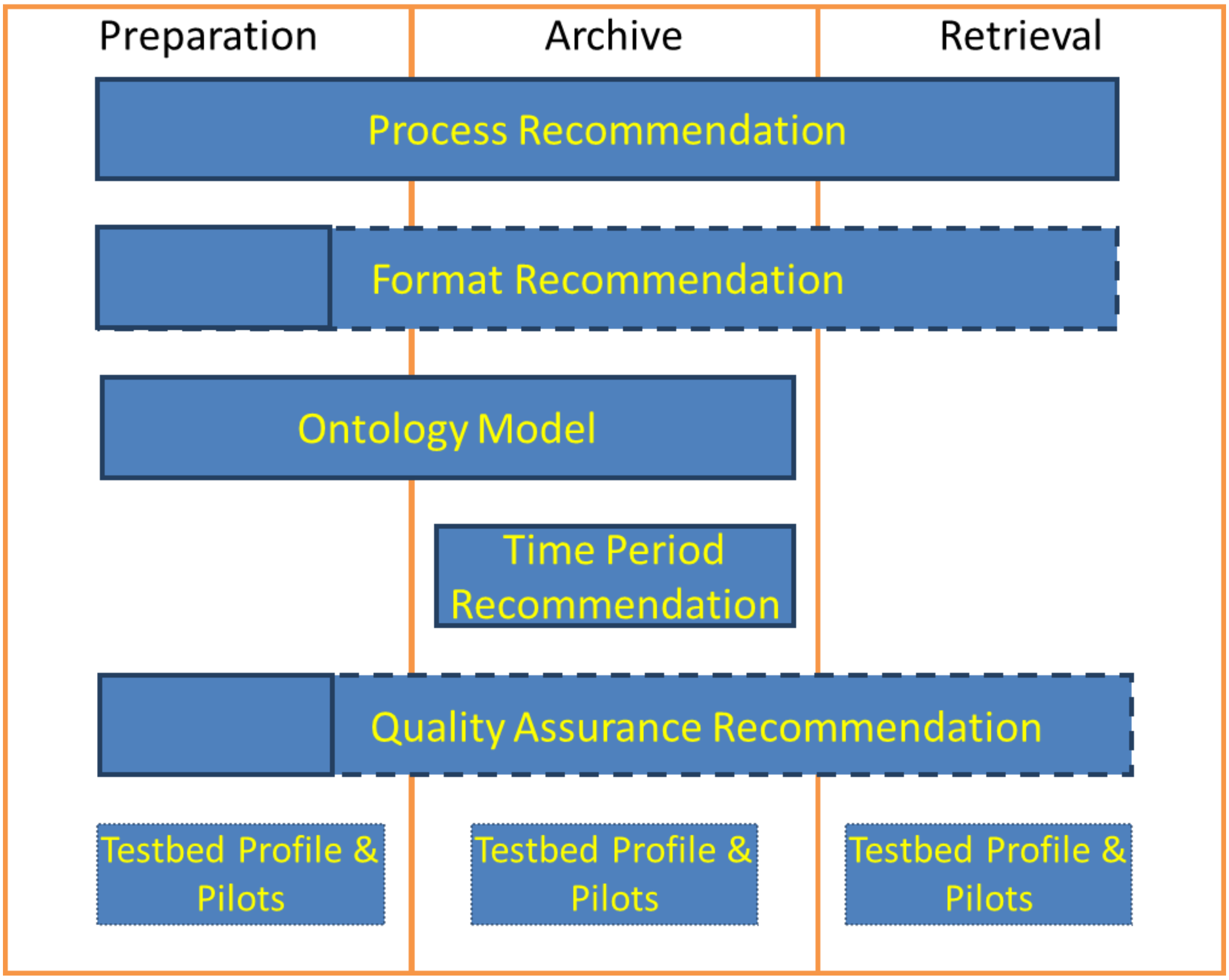


Figure 1 – Long Term Archiving Areas of Recommendation

2. TIME PERIOD RECOMMENDATION

2.1 Overview

This deliverable defines the time period strategy that should be applied during the LTAR process. LTAR strategy is based on Use Cases detailed in section 2.2. A Use Case summarizes the business motivations that justify a LTAR process. Then, different data types to be archived can be identified. The use case helps in determining the time period applicable to each corresponding data type.

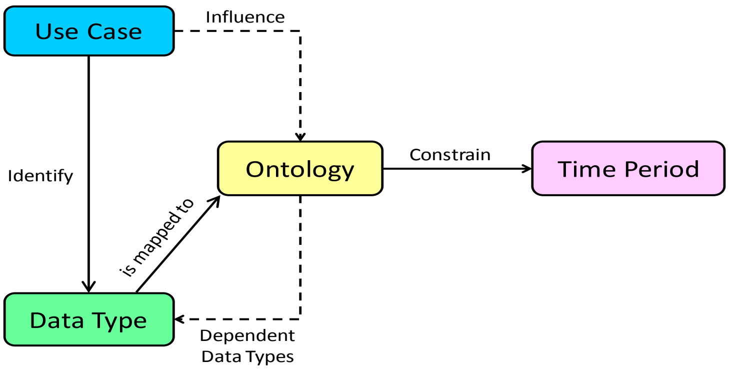


Figure 2 – Dependencies between Use Case, Data Type and Time Period based on Ontology

Figure 2 – Dependencies between Use Case, Data Type and Time Period based on Ontology represents the dependencies between Use Case, Data Type, Ontology and Time Period. Time Period is one of the key elements in a LTAR strategy. It defines when (events) and how long (retention period) a data will be stored for archival purpose.

2.2 Time Period Use Cases

LTAR strategy is led by different business motivations. Those motivations can be classified into 4 main use cases identified by SASIG-LTAR:

- **Product ownership proof** (Intellectual property): Intellectual property is essential to protect the owner of a product from any copy or a counterfeiting of this product. The only way to justify an intellectual property is to conserve all data produced during the design, manufacturing of the product. Those data may have several origins and representations: 3D models, 2D drawings, simulation results, etc. For example, part design (3D models/2D drawings) is the core information in the automotive industry. It is created by design engineers to communicate with related divisions such as suppliers and manufacturing engineering. It is released as final deliverable that handles related intellectually property.
- **Supply assurance of service parts**: The service parts mean replacement parts needed to maintain or repair vehicles. When a customer asks a dealer for repairing a vehicle, the dealer checks which service parts are required and order the necessary parts to the car manufacturer. Then, the after sales division of the car manufacturer checks in the after sale documentation or design data (3D model or 2D drawing), depending company organization, and deliver the corresponding parts directly or through an order to a supplier. Therefore, LTAR of the product

data such as 3D annotated models or 2D drawings is very important to assure the supply of service parts.

- **Legal obligations** (patent litigation, product liability cases, tax considerations, etc.): When selling automobile as a product, patent litigation rarely occurs. On this occasion, patent drawings/illustrations attached to an application document will be valid as a basis of claiming the patent's validity. Patent drawings/illustrations rely on product data which is officially released. The original product data can corroborate the patent if provenance information such as creator, creation date is clearly described. Therefore, LTAR of the product data which is officially released at each vehicle manufacturer is important to protect their own rights. Sometimes, submission of design or simulation proofs is requested in the product liability cases. In this discovery, if a plaintiff requests the defendant to submit some documents such as drawings, vehicle manufacturers assume legal obligation to submit them within a time limit. In the manufacturing/logistics domain, a variety of product data records are subject to data retention based on tax years. Records must be retained to defend or support corporate tax positions globally for all years in all open tax cycles, both at the national and regional level. So, making LTAR of necessary product data readily available is efficient to protect the vehicle manufacturers themselves.
- **Historical knowledge**: Past product data such as 3D annotated models or 2D drawings can be used as reference when developing advanced vehicles. Indeed, since the product data contains know-how information (design through manufacturing) about the product, interpreting the know-how about former product may help in solving problems or technology evolution. Therefore, LTAR supports capitalization of company know-how and provides capability to refer former design as input for ongoing design/development activities.

2.3 Ontology Model

Specifying the LTAR time period for a Product Data Type artifact can be difficult due to the complexity of the data type, multiple use cases to be supported, and the interdependencies between the different data types. Basically, ontology is a semantic model that defines a shared understanding that uses a common vocabulary. It is a way to formally capture and semantically represent the rules and dependencies between the different data types. In the context of this SASIG recommendation, the ontology model is a hierarchically organized representation of the Content Information artifacts (Product Data Types) that may undergo the archival process as defined in the SASIG LTAR Process Recommendation. Content Information is defined as the set of information that is the target of archival or that includes part or all of that information. It is an Information Object composed of its Content Data Object and its Representation Information. [1] The hierarchy is structured from a Content Data Object classification perspective with cross branch relationships defining creation dependency constraints or axioms (see Figure 3). The primary role of the ontology model is for defining consistency in LTAR time periods between the various Product Data Type artifacts.

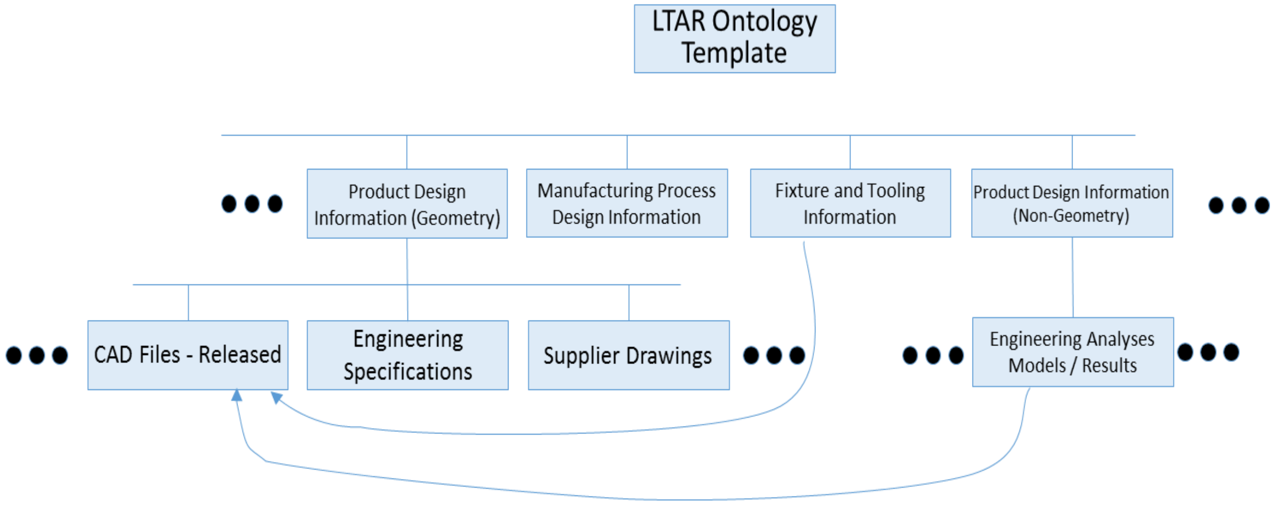


Figure 3 – Partial View of LTAR Ontology

Each Use Case may involve multiple Content Data Objects and/or multiple Content Information artifacts (Product Data Types). Some use cases are concerned about the Representation Information and others are only concerned about the Content Data Object. Additionally, one Content Data Object may be required to support the creation of another Content Data Object. Then, dependence between both LTAR time periods should exist. For example, a durability analysis report of a vehicle suspension component can only be created if design exists for the suspension component. The durability analysis report typically includes references to the product shape and if the design has LTAR time period of 10 years after production ends then the LTAR time period for the durability analysis must be less than or equal to the time period of the component design. That is the LTAR time period for the durability analysis report must be 10 years or less from the component production end date. The ontology formalizes the documentation of the rules and dependencies between the different data types.

Figure 2 summarizes the dependencies between Use Case, Data Type, Ontology and Time Period. The figure shows how the ontology stabilizes use case specific data type LTAR time period requirements into an optimized set of time recommendations. Thus, creating a LTAR ontology model, an organization will have a formalized and holistic approach for determining the time period applicable to each corresponding data type.

The complexity of today's automotive organization can result in an equally complex ontology. Luckily, there are a number of international and national standardization initiatives underway that can facilitate ontology definition. An organization may also elect to use a software reasoner to check if all of the rules and definitions in the ontology are consistent and manage the mapping of use case scenarios to data types and their definitions. More specifically, a reasoner is a software program that can infer logical consequences from a set of explicitly asserted facts and rules. [2] In this context, reasoning means deriving facts that are not explicitly expressed in the ontology model but rather can be derived from the ontology using the rules or other inference mechanisms. Thus, queries to the explicitly created model will return not only those statements that were present in the original data types but also additional statements that can be derived from the data using the rules or other inference mechanisms implemented by the reasoner. [3]

A common service provided by a reasoner is to test whether or not one Content Data Object is a subclass of another Content Data Object. By performing such tests on the Content Data Object in ontology, it is possible for a reasoner to compute the inferred ontology class hierarchy. Another service that is offered by reasoners is consistency checking. Based on the description (conditions) of a class, the reasoner can check whether or not it is possible for the Content Data Object (or Content

Information artifact) to have any instances. A class is deemed to be inconsistent if it cannot possibly have any instances.

The SASIG-LTAR work group has identified the following ontology template for use in this recommendation. Each company or organization should create their own LTAR ontology so as to fully capture their own unique rules and classifications. It is presumed that the SASIG LTAR ontology template, recommendations and standards such as ISO 10303 will be considered and incorporated where appropriate.

LTAR Ontology Template uses the Product Data Type classification hierarchy for the top tiers of the LTAR Ontology Template. The classification is then enhanced with cross branch relationships defining creation dependency constraints or axioms. The Figure 3 depicts a small portion of the LTAR ontology template; the boxes are example Product Data Types and the arrows represent the rules and dependencies between the different data types. In this figure, the arrow connecting Fixture and Tooling Information with Released CAD Files is representing the constraint that the tooling data is dependent on product data for defining the product's shape that is to be accommodated within the fixture. Likewise, the arrow connecting the Engineering Analyses Models / Results to the Released CAD Files is showing the dependency that the analysis model uses the released product CAD information for creating the 3D solid analysis model.

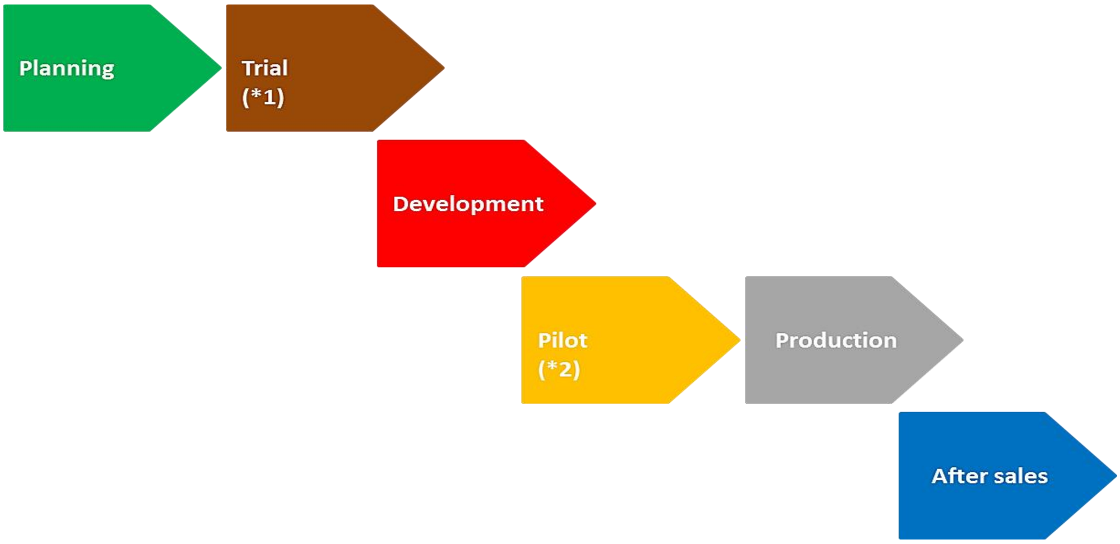
2.4 Product Data Types classification

The retention time periods for the different types of product data currently vary widely between and within organizations. There is even considerable variation for what appears to be the same type of product data. A goal of this recommendation is to provide a method and a starting foundation for harmonizing the time periods.

Six high level vehicle engineering business processes were identified as being important with respect to the management of vehicle product data within the confines of the section 2.2 use cases. They are Planning, Trial, Development, Pilot, Production, and After Sales. Figure 4 shows the time phased sequencing of the six vehicle engineering business processes. The Trial high level process refers to conformation testing done before development, while the Pilot process refers to conformation testing to validate capability to mass produce part/system.

Further analysis of the use cases resulted in the identification of numerous data types. Each data type was mapped to one or more of six vehicle engineering business processes. Table 1 – General classification of data types provides a general list of vehicle product data types and resultant process mapping.

Based on this general classification, each national organization will define their specific set of data types. This specific classification will be obtained by filtering or adding to the general classification through a data type selection that should fulfill requirements of local companies and regulations. It is proposed the result of each national organization's work should be placed in appendix A.



*1：Trial conformation test before development

*2：Pilot conformation test to validate capability to mass produce part/system

Figure 4 – Engineering Processes to be used for data types classification

No	Data Type	Process					
		Planning	Trial	Development	Pilot	Production	After sales
1	Equipment Maintenance and Repair	×	×	×	×	×	×
2	Product Feature Information	×					
3	Program Cycle Information	×					
4	Manufacturing Source List	×				×	
5	Feasibility Information		×				
6	Advanced Engineering Information		×			×	
7	Product Design Information (Geometry)			×			
8	Product Design Information (NonGeometry)			×			
9	Mfg Process Design Information			×		×	
10	Product Test Information			×	×	×	
11	Service Tools and Equipment Information			×	×		
12	Technical Vehicle Owner Information			×	×		
13	Inspection and Test Information				×	×	
14	Product Regulatory Compliance				×	×	
15	Fixture and Tooling					×	

	Information						
16	Plant Layout Information					×	
17	Process Control Information					×	
18	Purchasing Bill of Material					×	
19	Part Termination Information					×	×
20	Field Service Information						×
21	Product Warranty Information						×
22	Repair/Problem Reports						×

Table 1-Generalized list of data types, proposed by SASIG-LTAR, mostly used in the automotive industry, and classified according to the six major vehicle engineering business processes

2.5 Definition of LTAR Time Period Milestones

2.5.1 End of Production and Service Periods

End of Production (EOP) is the point in time when the production of an element finishes. In the automotive industry, EOP of a complex system (e.g. a car, an engine, a cooling system, etc) and EOP of a single part have unique rules and processes. Regardless of the product type, EOP is a major milestone to consider in a LTAR strategy. It usually defines the starting point of the LTAR Time Period. Of course, in the daily practices, parts and complex systems have strong connections and interrelationships since a complex system is built with parts. Therefore, in a LTAR strategy, it necessary to respect both set of EOP rules when defining milestones for the complex system or for the single part; for the lifecycle of one item may have to be considered as reference for the other. National regulations and/or company specific policies may also dictate single part and complex system connections and interrelationships.

Service periods can also be a factor in defining the time period milestones. Specifically, two service period scenarios were analyzed with respect to the lifecycle interdependency of a part and a complex system:

- Service Period 1: The OEM and its suppliers have to maintain the production of parts (expendable parts, safety critical parts, etc) during a given period after complex system EOP milestone is reached. This service period is driven by legal laws, regulations and customer demand.
- Service Period 2: Once Service Period 1 has passed, OEM discontinues production of parts (EOP of part), and discards relevant manufacturing support products, for example part dies and jigs. The OEM may have or build stocks or inventories of those parts prior to the discarding of manufacturing support products. Service Period 2 corresponds to the time period during which the OEM provides parts from this stock or inventory.

Figure 5 provides an overview of EOPs, and associated service periods.

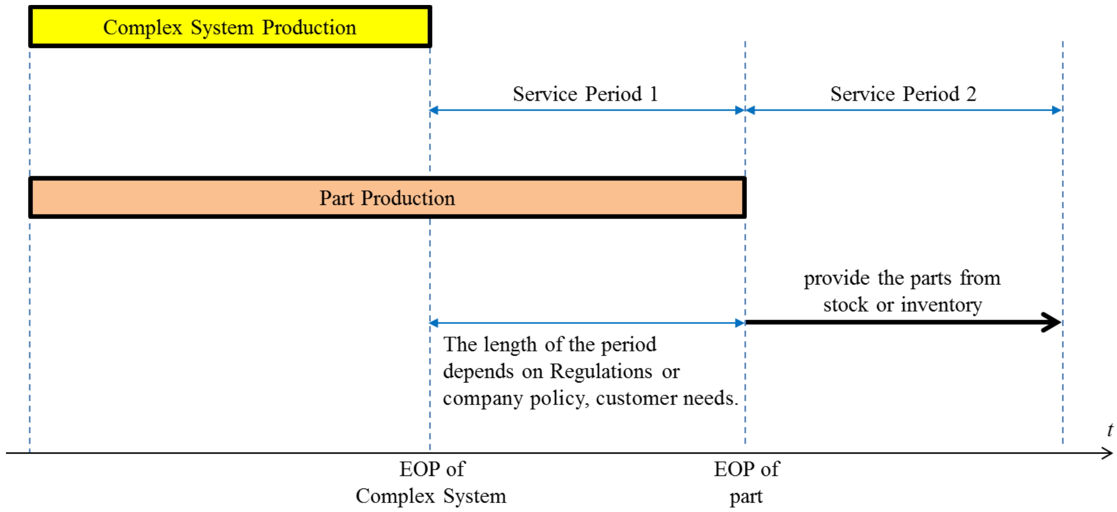


Figure 5 – Basic case of complex system data archival

It is also important to assess whether the complex systems or the single part should be used to define the starting point of the LTAR time period. These two alternatives were investigated and are described in the following two sections and are depicted in Figures 6 and 7.

2.5.2 Starting point Alternative 1-Complex system lifecycle is the reference

As far as the complex system lifecycle is concerned, the EOP of the complex system should be considered as the starting point of the LTAR time period. Nevertheless, service periods, usually defined by regulations or company specific policies, should be taken into account:

- Production of safety critical parts, and expendable parts (Service Period 1 on Figure 5),
- Part providing from stocks or inventory (Service Period 2 on Figure 5).

Since the complex system manufacturer remains the legal owner of those parts, these service periods should be included within the LTAR time period. If the production of a part, which is used in the production of a complex system, exceeds the EOP of the complex system, then the definition of the related service periods should only consider the complex system lifecycle, and not the whole part lifecycle.

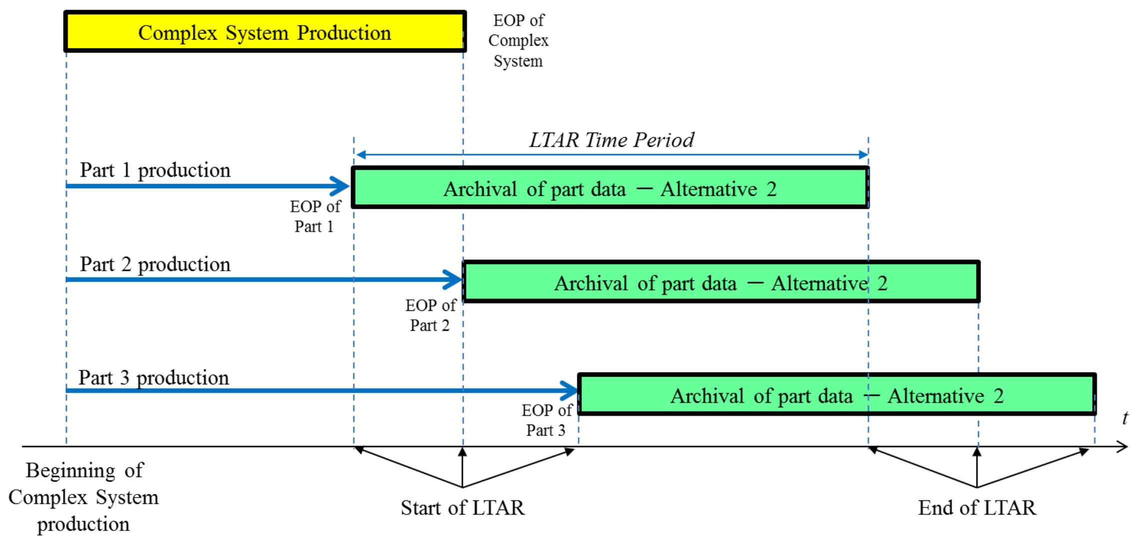


Figure 6 – Alternative 1: LTAR Time Period management

2.5.3 Starting point Alternative 2-Part lifecycle is the reference

As far as the part lifecycle is concerned, the EOP of the complex system should be considered as the starting point of the LTAR time period. Thus, service periods, usually defined by regulations or company specific policies, should be also taken into account. In this case, start milestone of LTAR is EOP of part regardless of safety-critical parts or expendable parts, and LTAR process should be applied part by part. Therefore, each part time period should be individually defined, independently from the complex system that uses those parts.

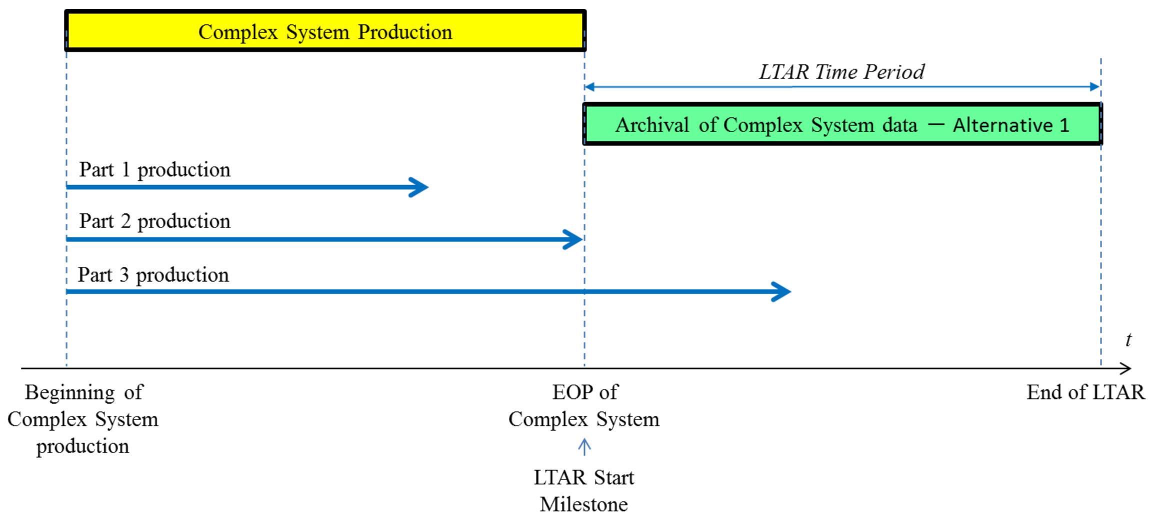


Figure 7 – Alternative 2 : LTAR Time Period management

2.5.4 Carry-over parts

This rule only considers a complex system project. Therefore, it is easily applicable to single parts used in a unique complex system. Nevertheless, since it does not take into account the new automotive product principles like carry over parts, automotive platforms, system modules, new recommendations shall be made to take into account these new principles in the LTAR process. These proposals shall take into account the following statements:

- A car project is built on a platform, and uses system modules.
- The lifecycle of a platform, a system module, and its parts is far longer than the lifecycle of a car project.
- A carry-over part is used by several system modules, including car projects.
- A module regularly evolves in terms of definition and production configuration, independently from any platform, system module, or car project.

These statements imply that relationships between car projects, platforms, system modules and carry-over parts, need to be considered into the LTAR time period management process (see Figure 8).

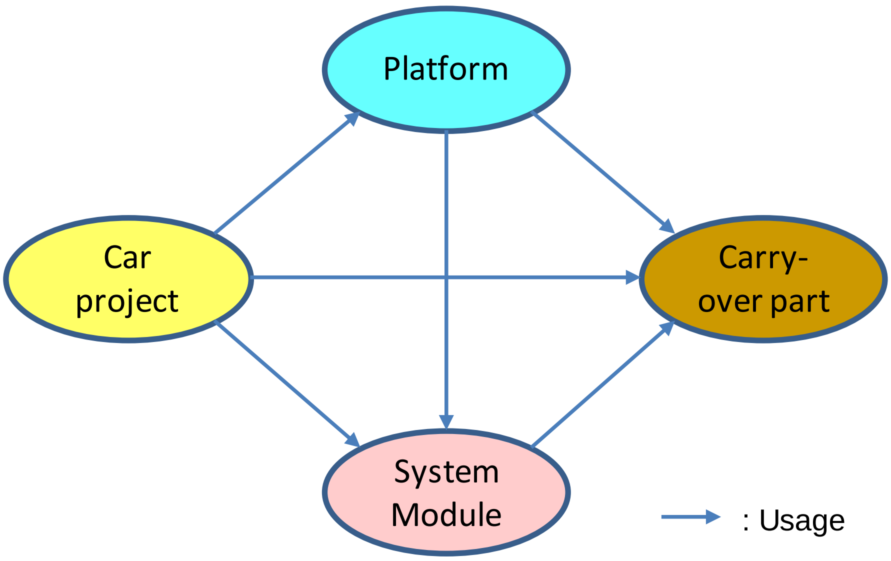


Figure 8 – Relationships and dependencies between car projects, platforms, system modules and carry-over parts

Considering those relationships and dependencies, LTAR rules need to be adapted.

In the cases of a part used in a platform, or a carry-over part, the considered part is used by several car projects. Then, this part may be pushed in the LTAR systems on:

- **The Release Milestone of the part**: Then, the end of LTAR time period of the data should remain empty while it is still in production. When the LTAR Start Milestone is reached, the end of LTAR time period of the data should be filled.
- **The LTAR Start Milestone***:* In this case, the national or company LTAR rules apply whether part or car project is considered as reference for the LTAR Start Milestone.

In this context, a carry-over can be defined as follows:

- If car project lifecycles overlap, then a part used in both car projects may be considered as a carry-over part.
- If the car project lifecycles are non-contiguous, the part reused from a past to a new car project may not be considered as a carry-over part because its initial manufacturing was terminated.

Finally, platform, car project or module using the considered part may be registered in the Package Description associated to the corresponding AIP.

2.6 Managing product data format obsolescence before LTAR

The experience shows that the time frame between the release of a part and the LTAR start milestone may span a long frame (e.g. 10 years), and far longer if we consider platforms and module parts. In terms of formats, if the LTAR rules are strictly applied, the native data should remain accessible and computable through the translation process that aims to produce the archival format with the relevant quality assurance (see Figure 9). This means that recommendations should be made to avoid native data format obsolescence that may involve computation problems when preparing the archival of data.

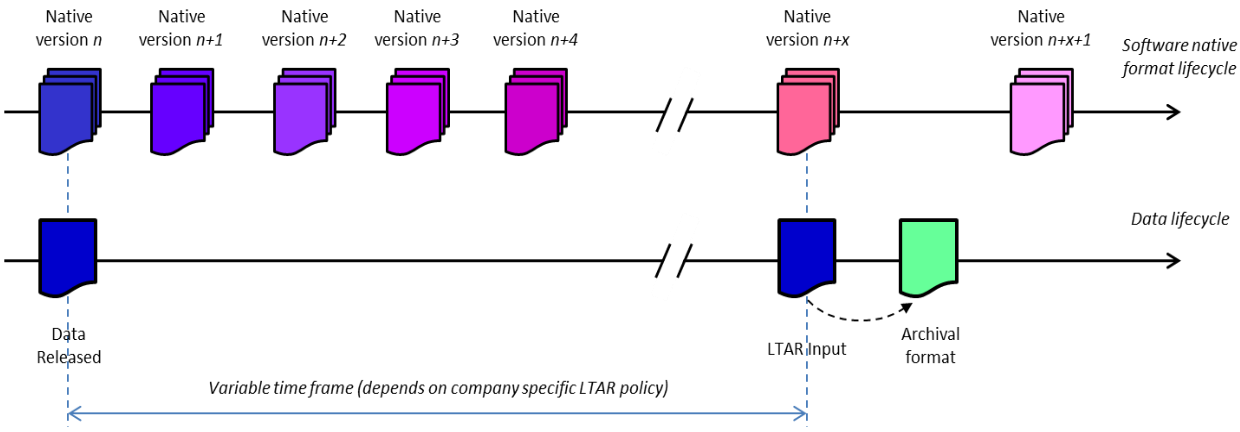


Figure 9 – Native format evolution along the lifecycle of data to be archived

An optional recommendation would be to translate the native format data into the selected archival format right after the part was released/frozen (see Figure 10). Then, to be in line with the LTAR rules and process, the result of this translation may be managed using one of the following process that may be extended with company specific processes which are not covered by this document:

- Store the archival format in the PLM system besides the native format. In this case, the archival format should be submitted to LTAR process when the LTAR start milestone will be reached.
- Early submit the archival format to the LTAR system. In this case, the end of LTAR time period of the data should remain empty while it is still in production. Then, when the LTAR Start Milestone is reached, the end of LTAR time period of the data should be filled.

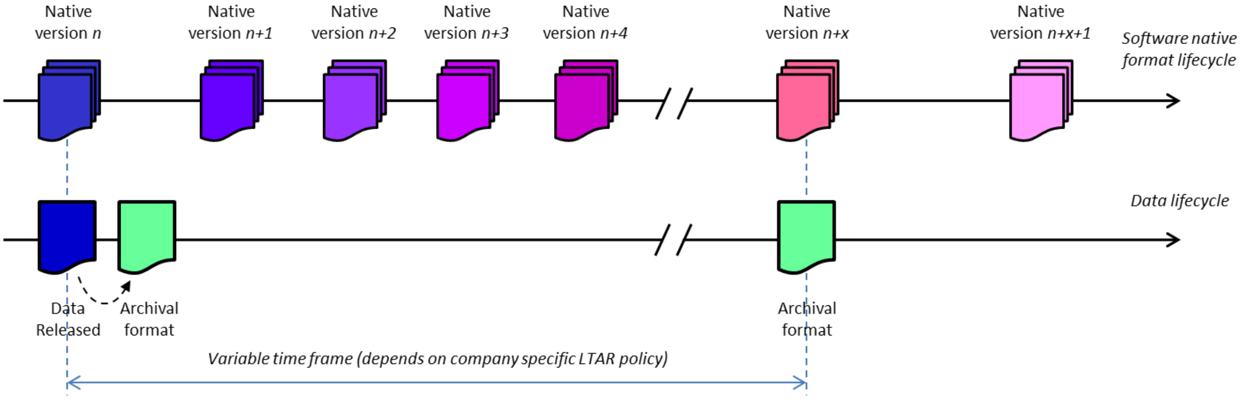


Figure 10 – Early archival format creation

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APPENDIX A

1. Data types definitions

No	Data Type	Definition	Information object
1	Equipment Maintenance and Repair	Equipment operation, repair and maintenance documentation; includes check sheets, routine preventative maintenance, calibrations/verifications, return information on equipment.	Equipment maintenance and repair records - Environmental
2	Product Feature Information	Documents which provide product or program direction.	Product/Investigation Letters
			Program - Features List Major & Minor
			Territorial Requirements
			Timing Charts and Work Plans
3	Program Cycle Information	Documents product and program management data.	Program Cycle Report
4	Manufacturing Source List	Documentation identifying the set of possible vendors that can be engaged for procuring a particular product, assembly or part.	Approved Source List - Manufacturing
5	Feasibility Information	Others types of reports, documents and data used to design and develop vehicle products.	Feasibility Study Requests
			Laboratory Testing Requests / Reports
			Product Engineering Reports - Complexity, Cost, Inspection, etc.
6	Advanced Engineering Information	Information on new and advanced methods, processes, and concepts studies and project files for product engineering.	Advanced Engineering Reports
			CAD Files - Advanced Design
7	Product Design Information (Geometry)	Part drawing and/or geometry data for released, production parts.	Aperture Cards and Drawings - Released
			CAD Files - Released
			Engineering Specifications
			Material Selection Requests
			Original Drawings from Suppliers

No	Data Type	Definition	Information object
8	Product Design Information (NonGeometry)	Records of product specifications and design from initiation to verifications and validation through ongoing improvement.	Bill of Material - Engineering/Design
			Change Issue and Alert Reports/Data - Design
			Concern/Issue/Inspection Reports - Engineering
			Design Verification and Product Reliability Reports
			Detailed Engineering Analysis Reports
			Engine/Vehicle Performance & Emission Data
			Engineering Analyses Models / Results
			Engineering Material Specification/Weld and Sealer Manuals
			Engineering Release System Data
			Failure Mode and Effects Analysis Reports - Engineering
			Product Direction / Development Statements
			Release Documents, Packages and Notice Database
			Repair Standards
			Requirements Deviation Requests
			Research & Engineering Advanced Technology Database
			Safety/Emissions checklists
			Technical Papers
			Test Requests/Reports and Continuation Sheets
			Vehicle Performance and Economy Analysis
			Worldwide Customer Requirements Reports
9	Mfg Process Design Information	Records which demonstrate the development and verification of the design of the manufacturing processes.	Assembly Concern Report - Manufacturing
			Drawings - In Process
			Failure Mode and Effects Analysis - Manufacturing
			Manufacturing Operations and Assembly Process Instructions
			Test Reports and Requests - Manufacturing

No	Data Type	Definition	Information object
10	Product Test Information	Documents test data required to design, authorize and conduct requested/required tests.	Engine Test Results
			Test Back Up Data
11	Service Tools and Equipment Information	Design, analysis and related data used to support the development and specification of service related tools, equipment and processes.	Service Tools and Equipment Technical Data
12	Technical Vehicle Owner Information	Material which promote or describe services and products and provide customers with guidance and direction.	Owner/Operators Manuals - Service
			Service - Workshop Manual/Diagnostics Manual/Training Manual
13	Inspection and Test Information	General manufacturing quality reliability records used to manage product quality does not include agency/regulatory testing records. Examples include inspection tags, travelers.	Non-regulatory Inspection logs
			Parts Recall Inspection Reports
			Supplier Quality Assistance Data/Reports
			Machine Gauging Information and Inspection Reports - Manufacturing
			Special Tools Inspection Reports - Manufacturing
			Laboratory Test Reports - Manufacturing
14	Product Regulatory Compliance Information	Records showing compliance to regulatory standards; I.e. environment/regulatory test records, military standards, special test requirements records, certificate of compliance, third party testing records.	Certificates of Compliance
			Vehicle Identification Number Reports and Revisions that contain regulatory compliance information
15	Fixture and Tooling Information	Information which defines the fixtures and tooling required to manufacturing parts and vehicles. Includes CAD/CAM files and drawings, specifications, production feasibility status, etc.	Coordinate Measuring Machine (CMM) Data
			Drawings - Tooling and Fixtures
			Numerical Control (NC) Files
16	Plant Layout Information	Plant layout drawings, machine specs, reliability, production capacity, maintenance schedules, equipment history, etc. to specify the manufacture of components, subsystems, & vehicles.	Drawings - Plant Layout and Equipment
17	Process Control Information	Process control documentation that directly support the manufacture of a product, assembly or part. Such as control plans, SPC charts, etc.	Design Guides / Broad Process Instructions
			Engineering Change Information (that pertains to process operations)- Manufacturing

No	Data Type	Definition	Information object
			Manufacturing Capability Studies Machines and Equipment
			Repair Standards - Manufacturing
			Variation Simulation Analysis Data and Results
18	Purchasing Bill of Material	The documentation containing a list of the materials, parts, and/or assemblies that are required to build a product. The Purchasing BoM provides the manufacturer's part number (MPN) and the quantity needed for each listed item.	Purchasing Bill of Material
19	Part Termination Information	Examples of procurement or purchasing types of records using product data and requiring retention.	Notice of Part Termination
			Product Change Notice
20	Field Service Information	Documents related to customer product problems or defects, which may include the plan, notifications, announcements, customer lists, etc.	Technical Service Bulletins
21	Product Warranty Information	Documentation of product warranties and claims.	Warranty/Quality/ Durability, Quality, and Reliability Reports
22	Repair/Problem Reports	Documents related to problems encountered by customers and subsequent statistics.	Concern/Issue/Inspection Reports - Service
			Repair and Problem Reports - Service

Table 1 – General classification of data types

2. *Template for National Organization classification of specific data types*

Data Type	Recommended Time Period	Information object
Equipment Maintenance and Repair		Equipment maintenance and repair records - Environmental
Product Feature Information		Product/Investigation Letters
		Program - Features List Major & Minor
		Territorial Requirements
		Timing Charts and Work Plans
Program Cycle Information		Program Cycle Report
Manufacturing Source List		Approved Source List - Manufacturing
Feasibility Information		Feasibility Study Requests
		Laboratory Testing Requests / Reports
		Product Engineering Reports - Complexity, Cost, Inspection, etc.
Advanced Engineering Information		Advanced Engineering Reports
		CAD Files - Advanced Design
Product Design Information (Geometry)		Aperture Cards and Drawings - Released
		CAD Files - Released
		Engineering Specifications
		Material Selection Requests
		Original Drawings from Suppliers
Product Design Information (Non Geometry)		Bill of Material - Engineering/Design
		Change Issue and Alert Reports/Data - Design
		Concern/Issue/Inspection Reports - Engineering
		Design Verification and Product Reliability Reports
		Detailed Engineering Analysis Reports
		Engine/Vehicle Performance & Emission Data
		Engineering Analyses Models / Results

Data Type	Recommended Time Period	Information object
		Engineering Material Specification/Weld and Sealer Manuals
		Engineering Release System Data
		Failure Mode and Effects Analysis Reports - Engineering
		Product Direction / Development Statements
		Release Documents, Packages and Notice Database
		Repair Standards
		Requirements Deviation Requests
		Research & Engineering Advanced Technology Database
		Safety/Emissions checklists
		Technical Papers
		Test Requests/Reports and Continuation Sheets
		Vehicle Performance and Economy Analysis
		Worldwide Customer Requirements Reports
Mfg Process Design Information		Assembly Concern Report - Manufacturing
		Drawings - In Process
		Failure Mode and Effects Analysis - Manufacturing
		Manufacturing Operations and Assembly Process Instructions
		Test Reports and Requests - Manufacturing
Product Test Information		Engine Test Results
		Test Back Up Data
Service Tools and Equipment Information		Service Tools and Equipment Technical Data
Technical Vehicle Owner Information		Owner/Operators Manuals - Service
		Service - Workshop Manual/Diagnostics Manual/Training Manual
Inspection and Test Information		Engineering Specification Testing and Equipment
		Inspection logs - Regulatory/Non-regulatory

Data Type	Recommended Time Period	Information object
		Parts Recall Inspection Reports
		Supplier Quality Assistance Data/Reports
Product Regulatory Compliance Information		Certificates of Compliance
		Vehicle Identification Number Reports and Revisions
Fixture and Tooling Information		Coordinate Measuring Machine (CMM) Data
		Drawings - Tooling and Fixtures
		Numerical Control (NC) Files
Plant Layout Information		Drawings - Plant Layout and Equipment
Process Control Information		Design Guides / Broad Process Instructions
		Engineering Change Information - Manufacturing
		Gauging Information and Inspection Reports - Manufacturing
		Laboratory Test Reports - Manufacturing
		Manufacturing Capability Studies Machines and Equipment
		Repair Standards - Manufacturing
		Special Tools Inspection Reports - Manufacturing
		Variation Simulation Analysis Data and Results
Purchasing Bill of Material		Bill of Material Records - Purchasing
		Request for Specification Change - Purchasing
Part Termination Information		Notice of Part Termination
		Product Change Notice
Field Service Information		Technical Service Bulletins
Product Warranty Information		Warranty/Quality/ Durability, Quality, and Reliability Reports
Repair/Problem Reports		Concern/Issue/Inspection Reports - Service
		Repair and Problem Reports - Service

Table 2 – Template set of Data types classification

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