

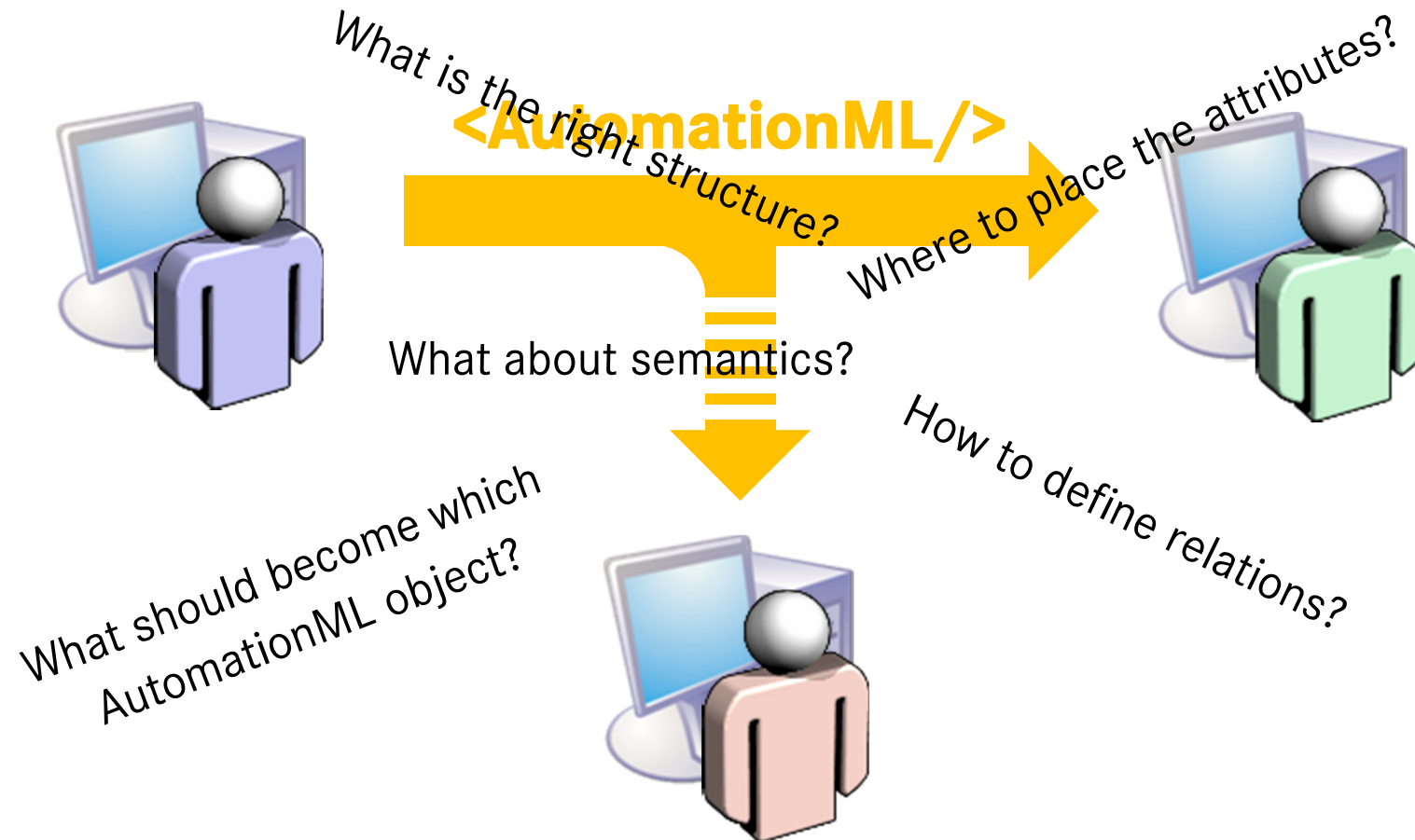
Data modelling with AutomationML understand – structure – classify

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Björn Grimm, TF/VAS
14.10.2015

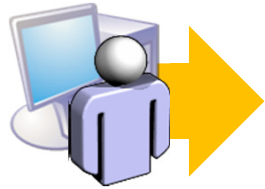


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Das Beste oder nichts.

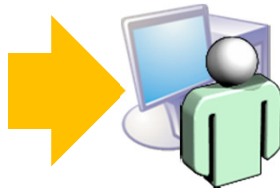
Motivation



Possible approaches



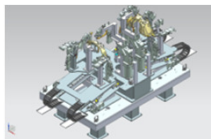
The exporting tool is master for structure and semantics.



The importing tool is master for structure and semantics.

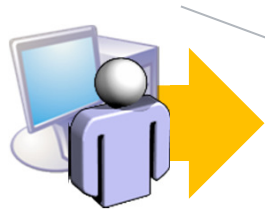


The export file is master for structure and semantics.

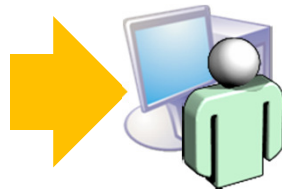


The data itself answers the questions.

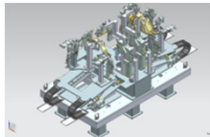
Evaluation of the approaches



- + less effort, because structure is given
- + the structure works for these use cases
- tool changes can lead to non fitting structure
- more effort to connect further tools



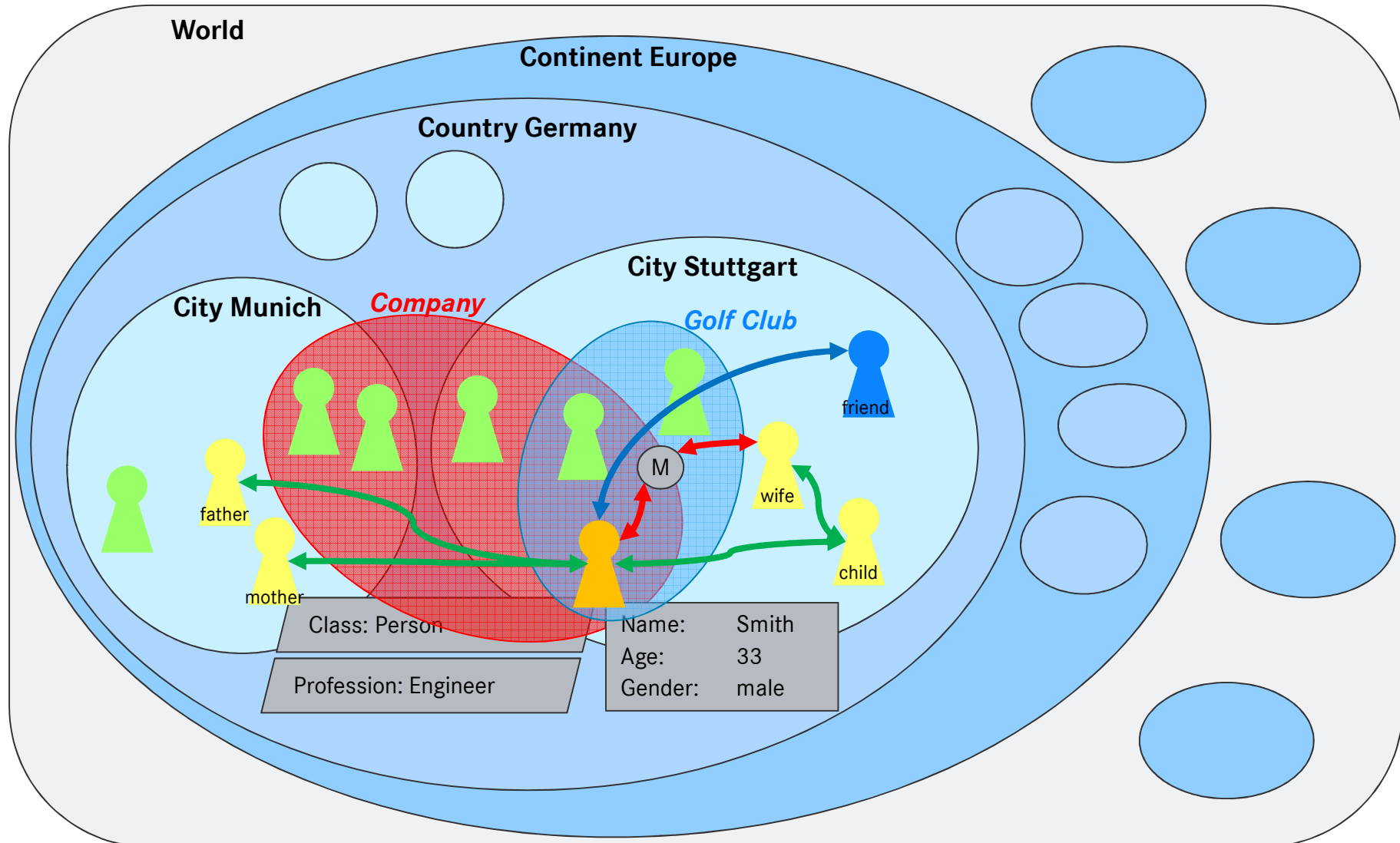
- + more knowledge about the data
- + easier to enrich the data for further use cases
- + data structure fits to all tools
- more effort before implementation of the interface



Analysis of the data – the key questions

- What are objects?
- How to structure the objects?
- What are properties?
- How can the objects be classified?
- What are relations between objects?
- Which kind of relation is it?
- Which properties belong to objects, which properties belong to relations?
- What is the meaning of the properties?
- What is the meaning of the relations?

Data structure – an example



Data structure - analysis

- **Hierarchy-Levels:**

Person/Organisation – City – Country – Continent – World

- **Properties (of Persons)**

Name, Age, Gender

- **Classifications**

Person

Profession

- **Relations:**

Friendship

Father/Mother – Child (directed relation)



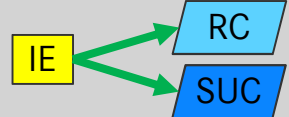
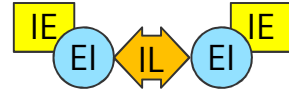
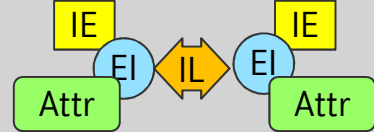
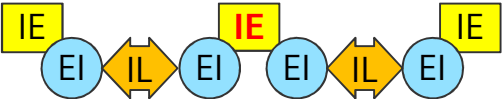
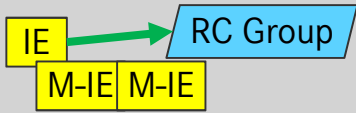
Marriage (Properties: date of marriage, place of marriage)

- **Groups:**

Company

Clubs

Mapping of the data structure to AutomationML

Data Element	Example	Mapping to AutomationML	
Hierarchy-Level, Object	Person, City, Organisation, ...	InternalElement (IE)	
Property	Name, Age, ...	Attribute (Attr)	
Classification	Person, Profession	Reference to RoleClass (RC) or SystemUnitClass (SUC)	
Simple Relation	Friendship	ExternalInterfaces (EI) connected with InternalLink (IL)	
Directed Relation	Father/Mother → Child	ExternalInterfaces connected with directed InternalLink, additional Attributes	
Relation with data	Marriage	ExternalInterfaces with Internal Element for relation data	
Groups	Company, Clubs	Group-Object with Mirror-Objects (M-IE)	

Note: All ExternalInterfaces shall reference to an InterfaceClass

Definition of Semantics and Classes

All Objects, Interfaces, Attributes shall be defined concerning their semantics, cardinality, data type, ...

- Objects
 - Child-Elements, Attributes, ExternalInterfaces
 - References to RoleClasses, SystemUnitClasses
- Attributes
 - Datatypes
- ExternalInterfaces
 - Attributes
 - Cardinality
 - References to InterfaceClasses

The meaning of each RoleClass, SystemUnitClass, InterfaceClass and Attribute shall be defined.

Mapping of the data structures



- Definition of an example AutomationML file, which represents the data structure
- Mapping of the AutomationML data structures to the data structures of the participating tools

Implementation of the tool interfaces

Implementation

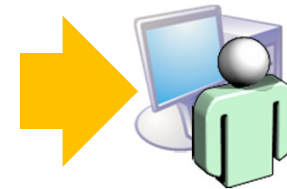
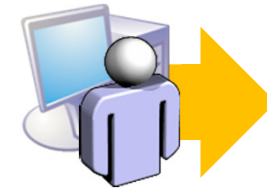
- Semantics should not be hard coded but configurable

Validation of AutomationML

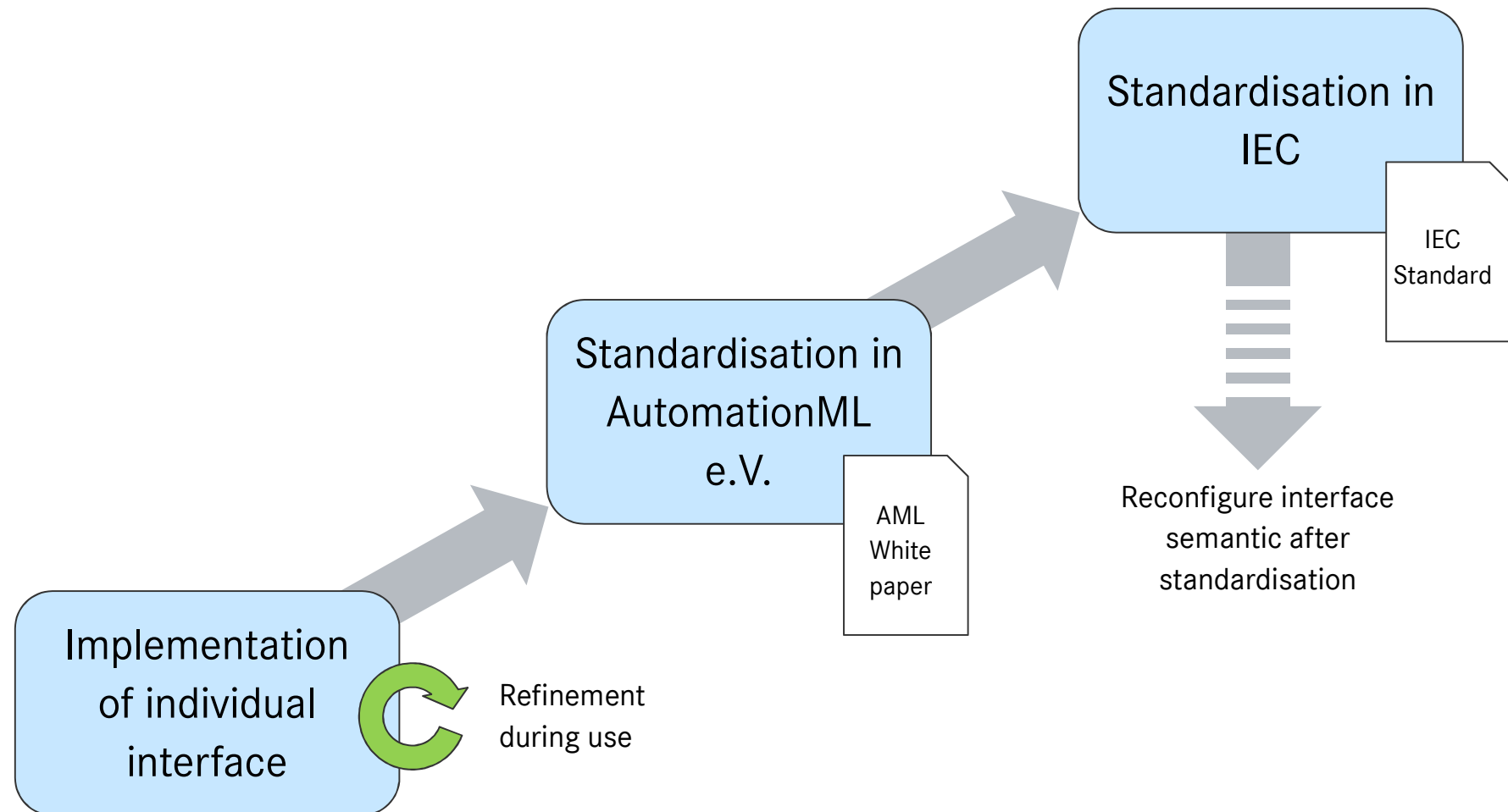
- Validation with AutomationML Editor
- Test with Testcenter

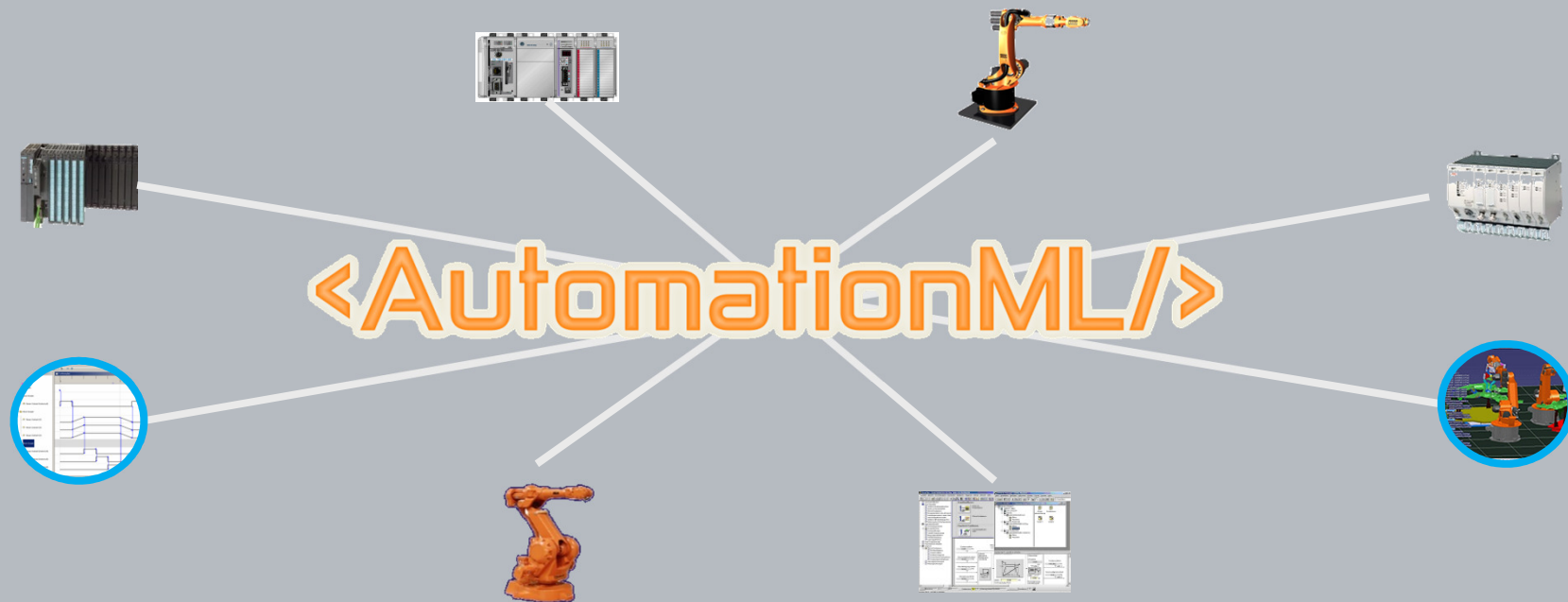
Testing

- Test with different tools concerning the Use Cases



Standardisation of the Use Case





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