

# DESIRR

Semantic platform for  
organizing, sharing and reusing  
R functions

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# Context

## ■ Overview

- R functions
  - Great success in different scientific domains
  - High production of R functions
  - Authors from different sites, with authors turn over
- Challenge: Open “data” (*function*)
  - Share and reuse



# Context

## ■ Objectives

- Store and organize available R functions
- Give an easy and long-term access

## ■ How

- Create **formal description** for R functions based on **ontological approach**
  - Define concepts and relations between concepts (*Domain expertise*)
  - Controlled vocabulary for management and search facility
  - Build a function repository with powerful reasoning and search capabilities

## ■ Technologies

- Methods and tools of **Semantic Web** (W3C)  
(*Knowledge organization and management*)

# Ontology (Definition)

```
Leaf_Growth_Analysis <-  
function(para1, para2 ...)  
{  
  ....  
}
```

hasAuthor



# Ontology (Definition)

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```
Leaf_Growth_Analysis <-  
function(para1, para2 ...)  
{  
  ... ..  
}
```

hasAuthor



**Triplet representation**

*Subject*

*Predicate*

*Object*

<#Leaf\_Growth\_Analysis.R>

<#hasAuthor>

<#Vera>

# Ontology (Definition)

```
Leaf_Growth_Analysis <-  
function(para1, para2 ...)  
{  
  ....  
}
```

hasAuthor



## Triplet representation

Subject

Predicate

Object

<#Leaf\_Growth\_Analysis.R>

<#hasAuthor>

<#Vera>

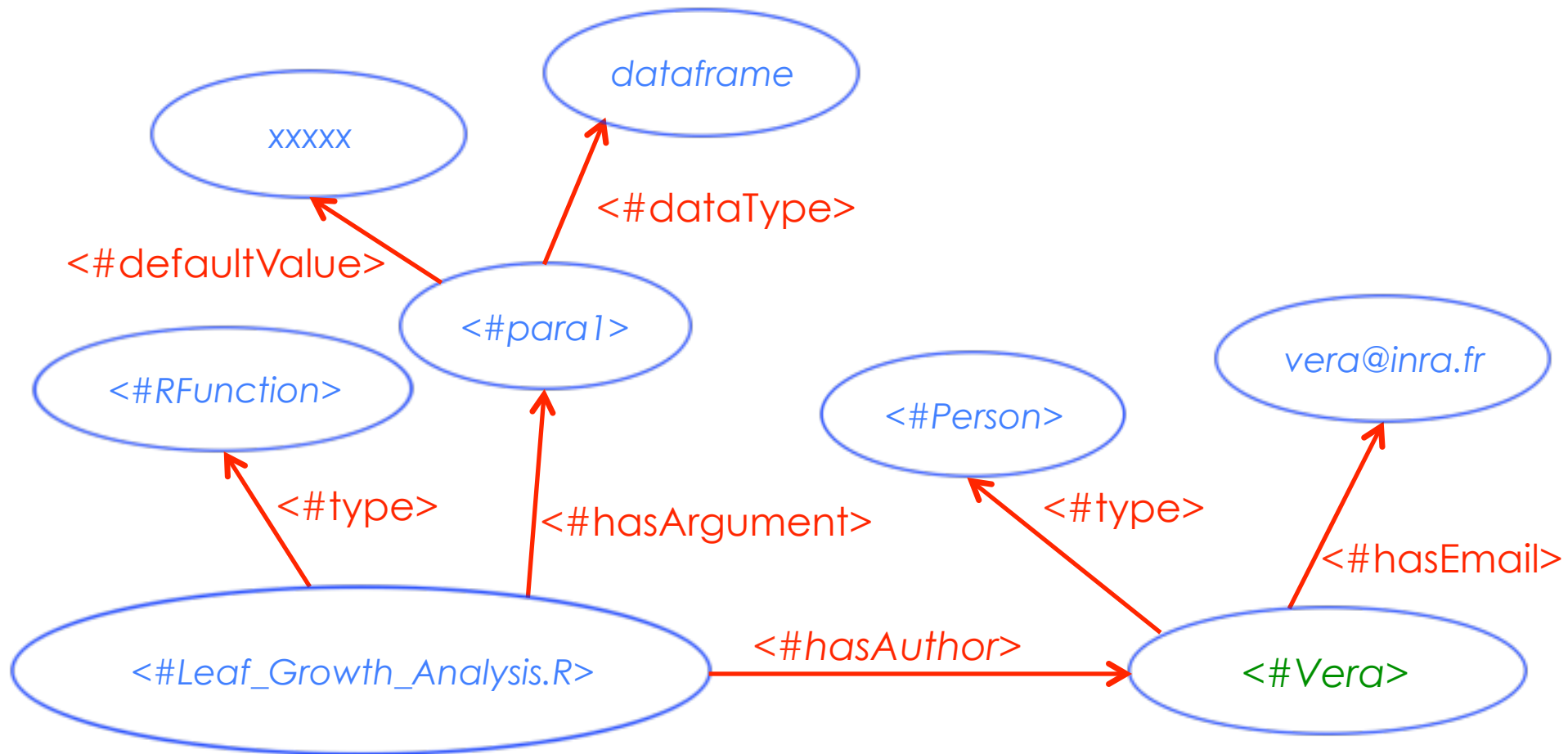
## Graph representation

<#Leaf\_Growth\_Analysis.R>

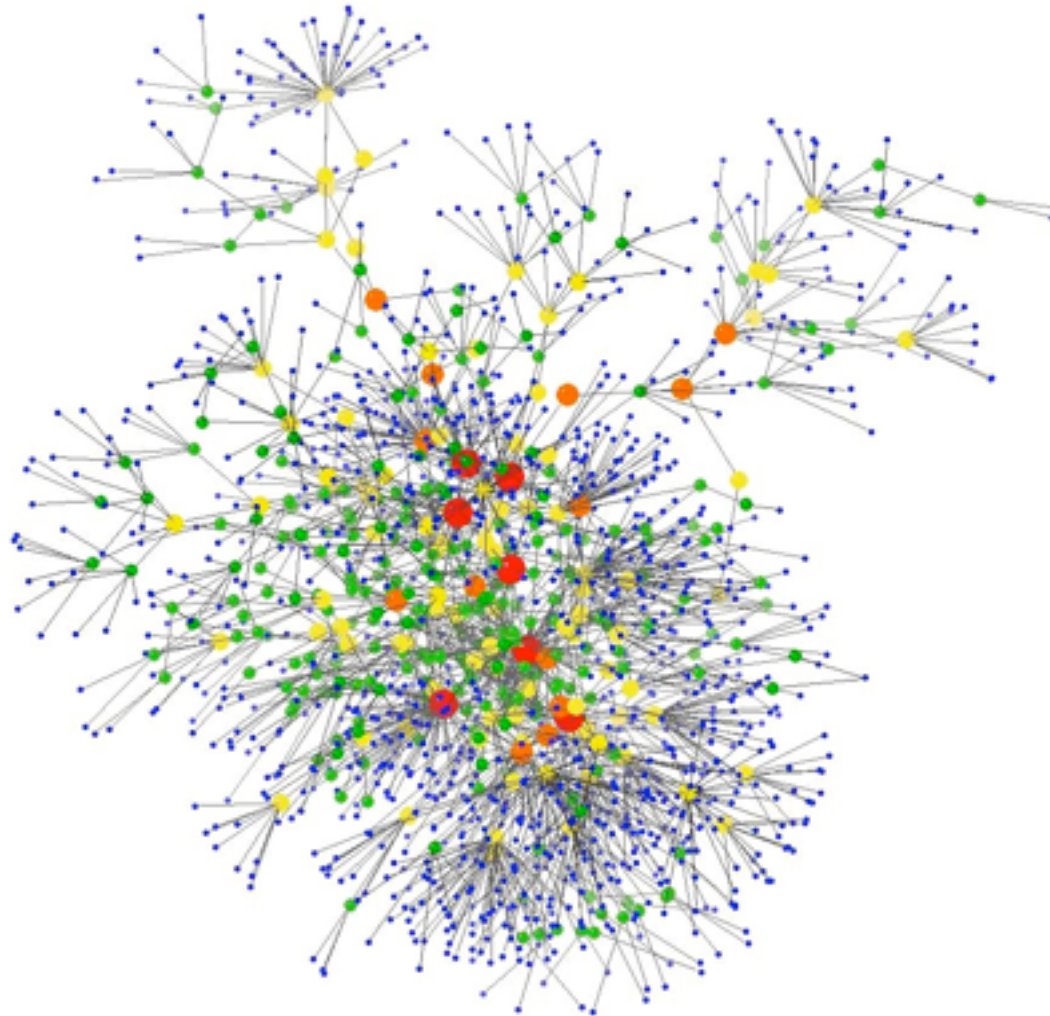
<#hasAuthor>

<#Vera>

# Ontology (Definition)



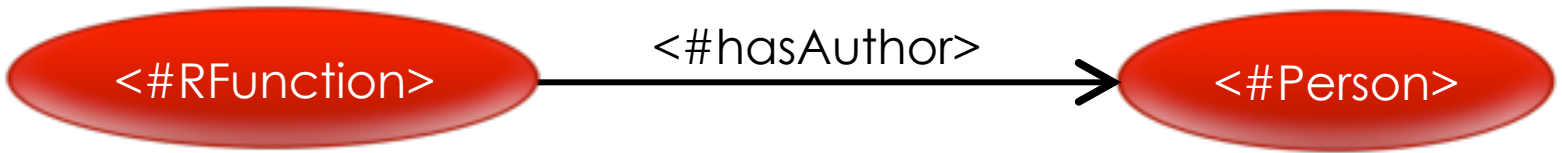
# Ontology (Definition)



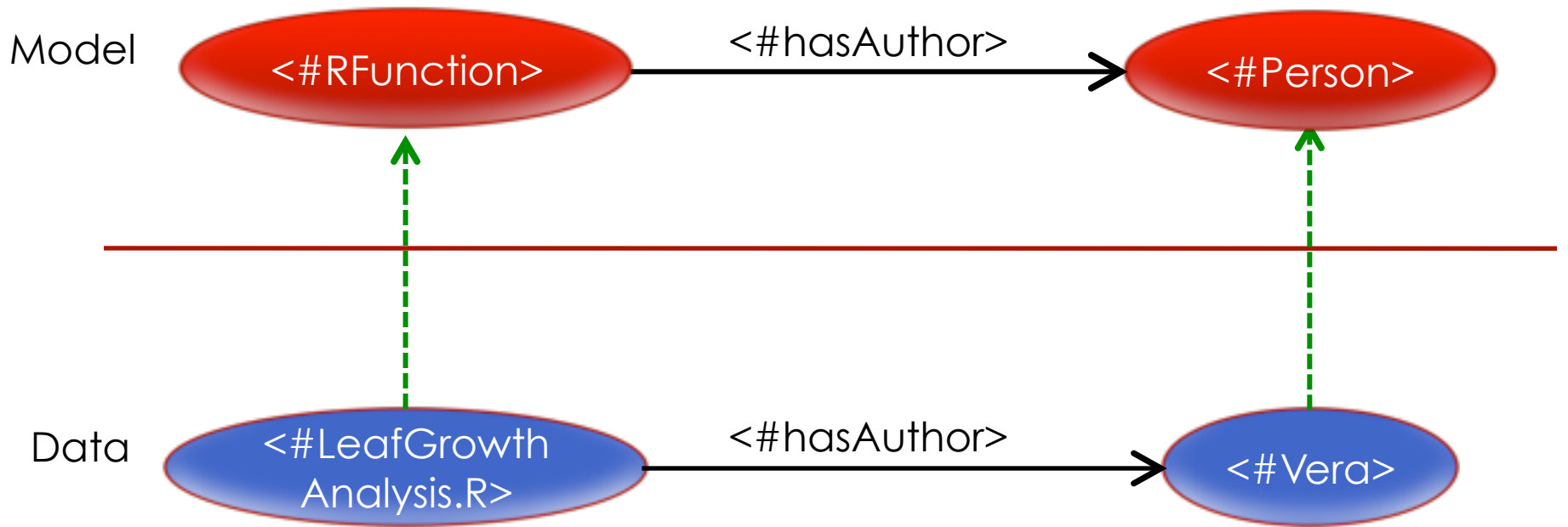


# Ontology (Model-Data)

Model

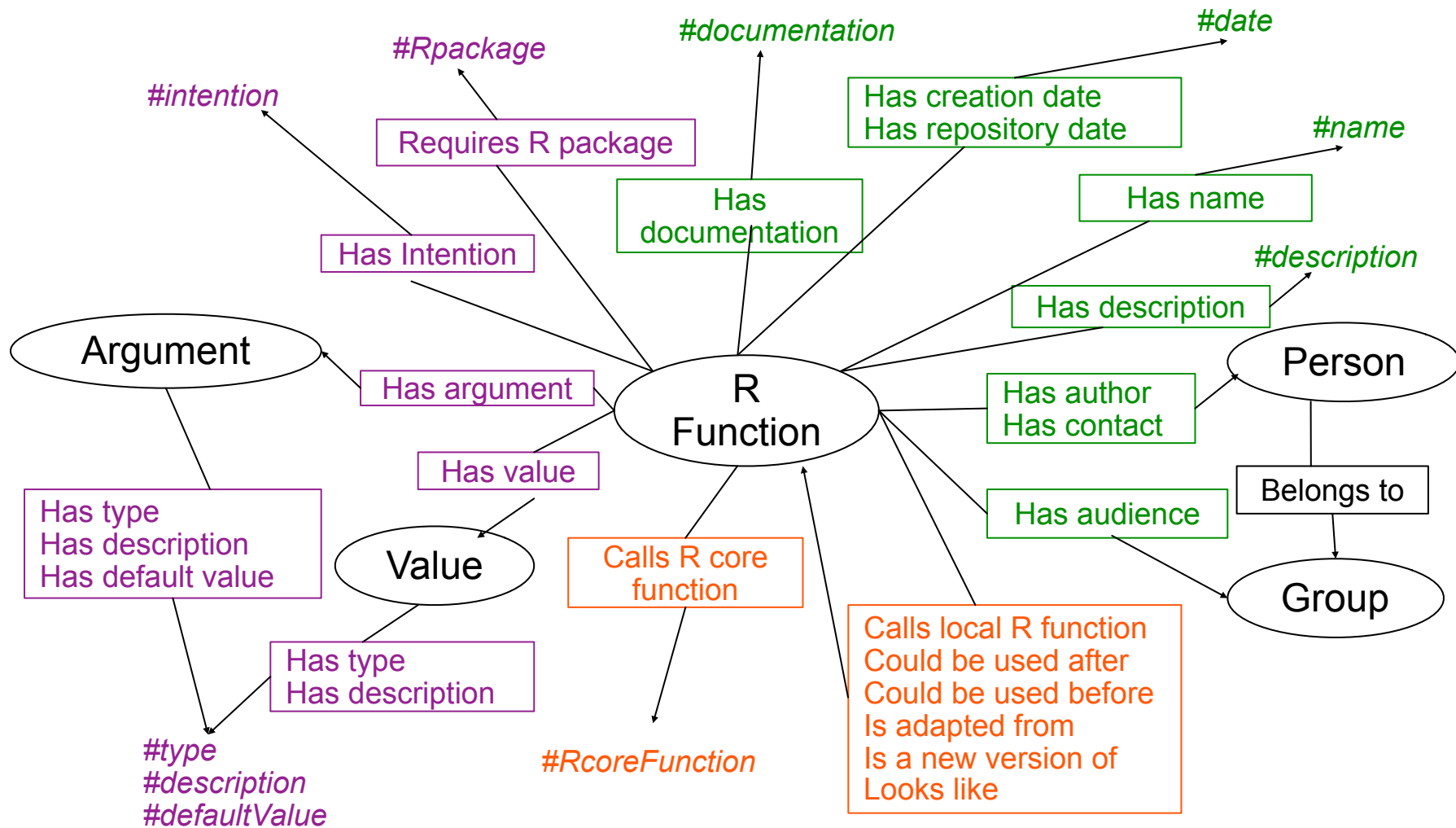


# Ontology (Model-Data)



# R function ontology (overview)

- General desc, Detailed info, Relationship between R functions

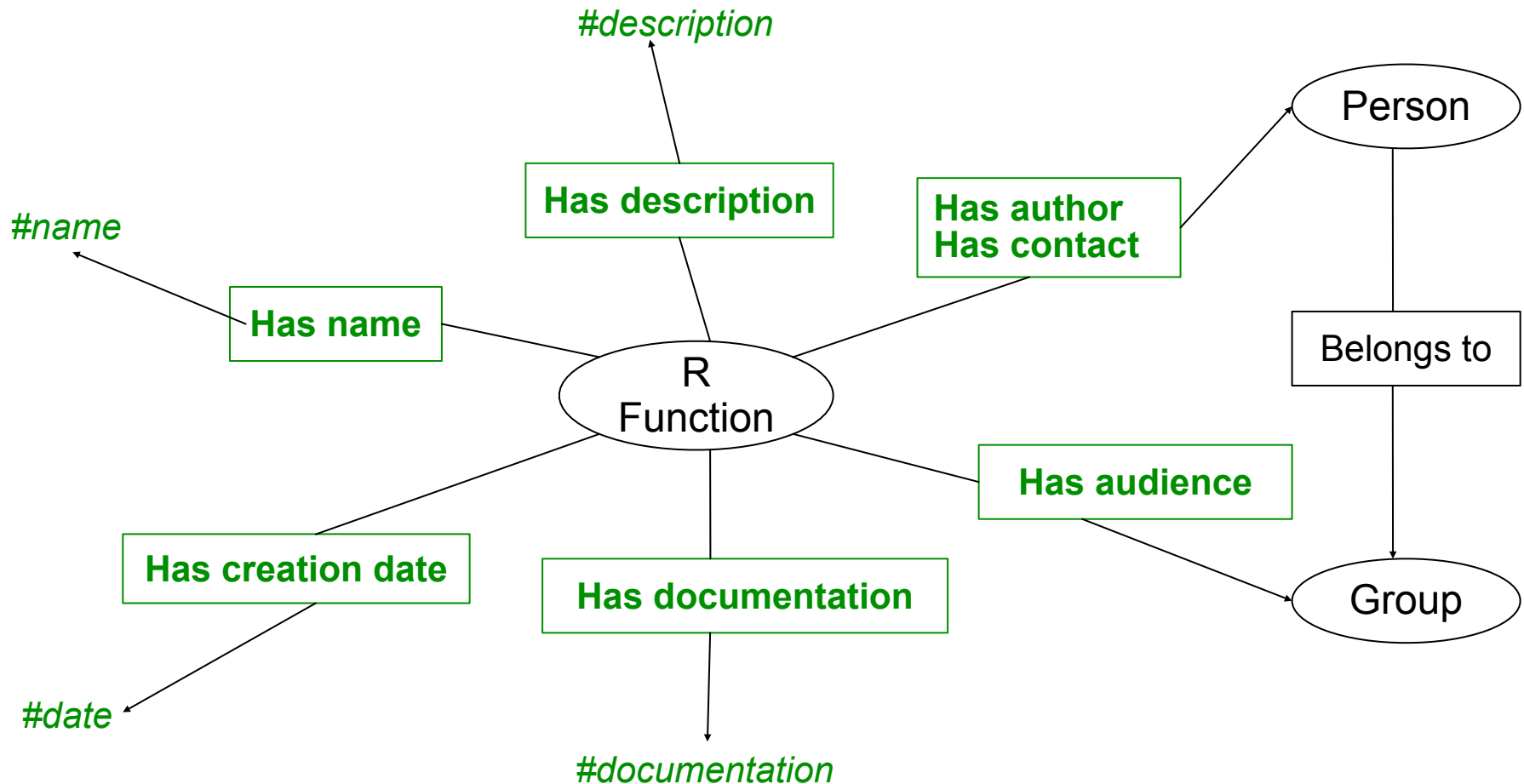


# R function ontology

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## ■ General description

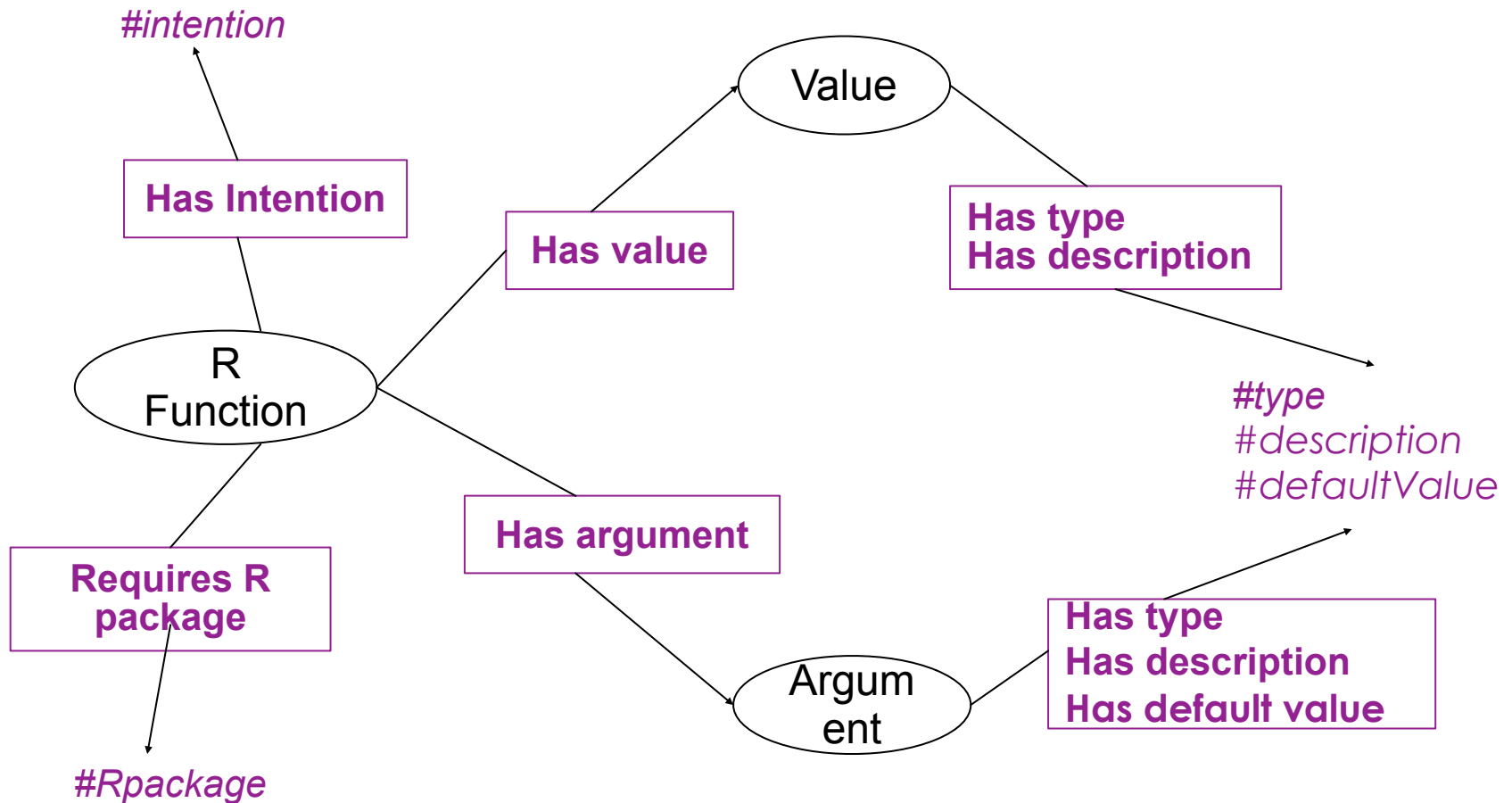
*name, creationDate, desc, author, contact, audience, documentation*



# R function ontology

## ■ Detailed information

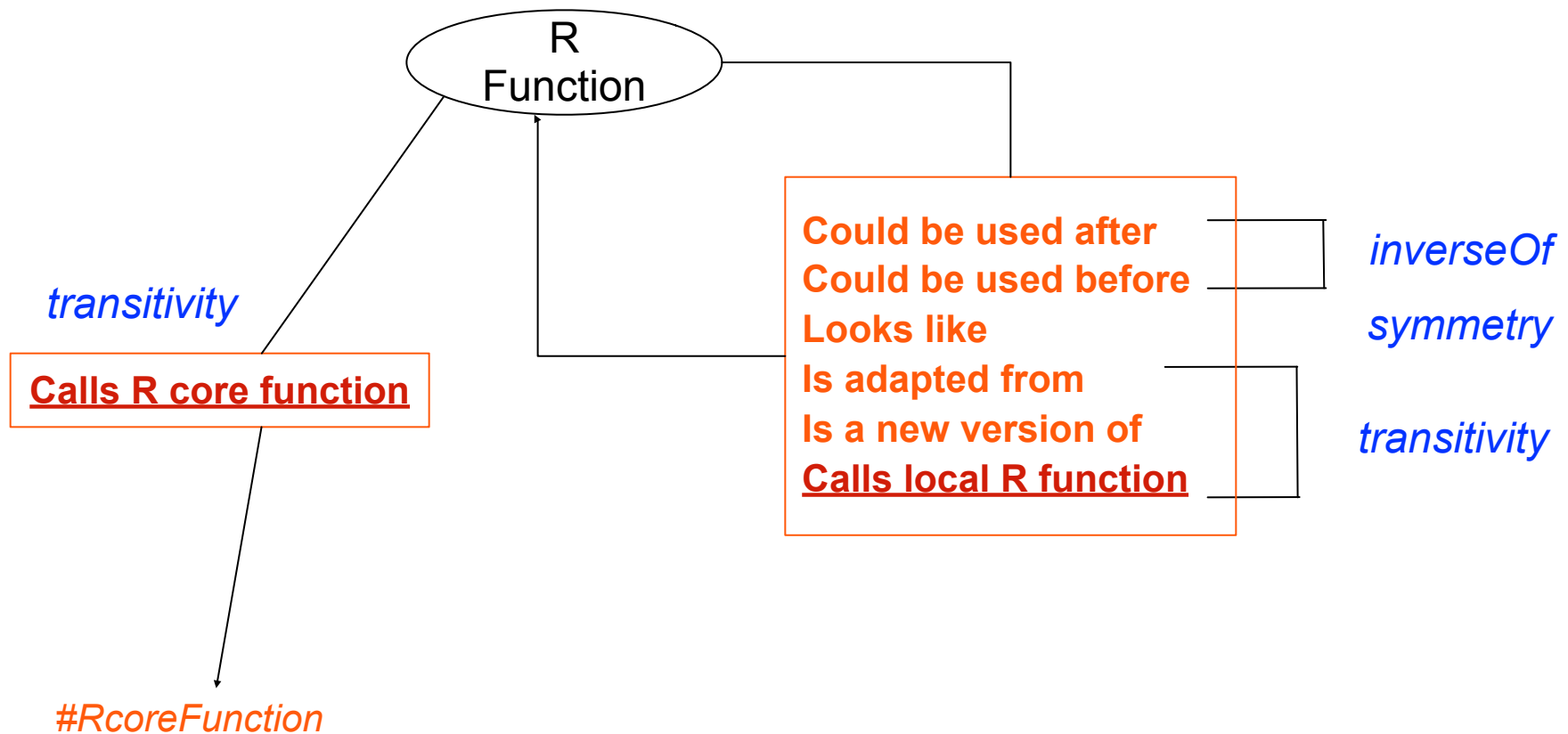
*requiresPackage, hasArgument, hasValue, hasIntention, etc.*



# R function ontology

## Relationship between R functions

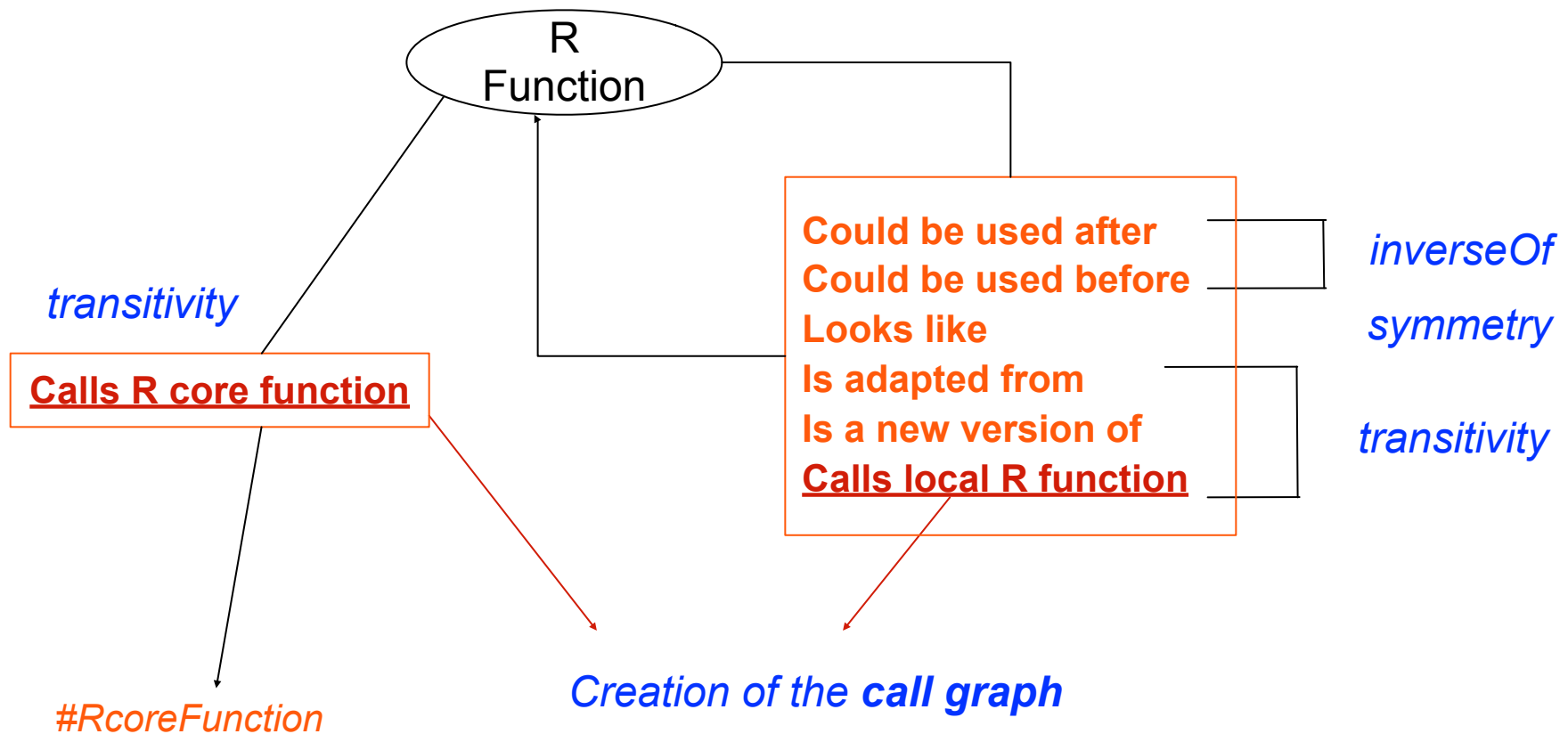
*callsRCoreFunc, callsLocalFunc, couldBeUsedBefore/After, looksLike, isAdaptedFrom, isNewVersionOf.*



# R function ontology

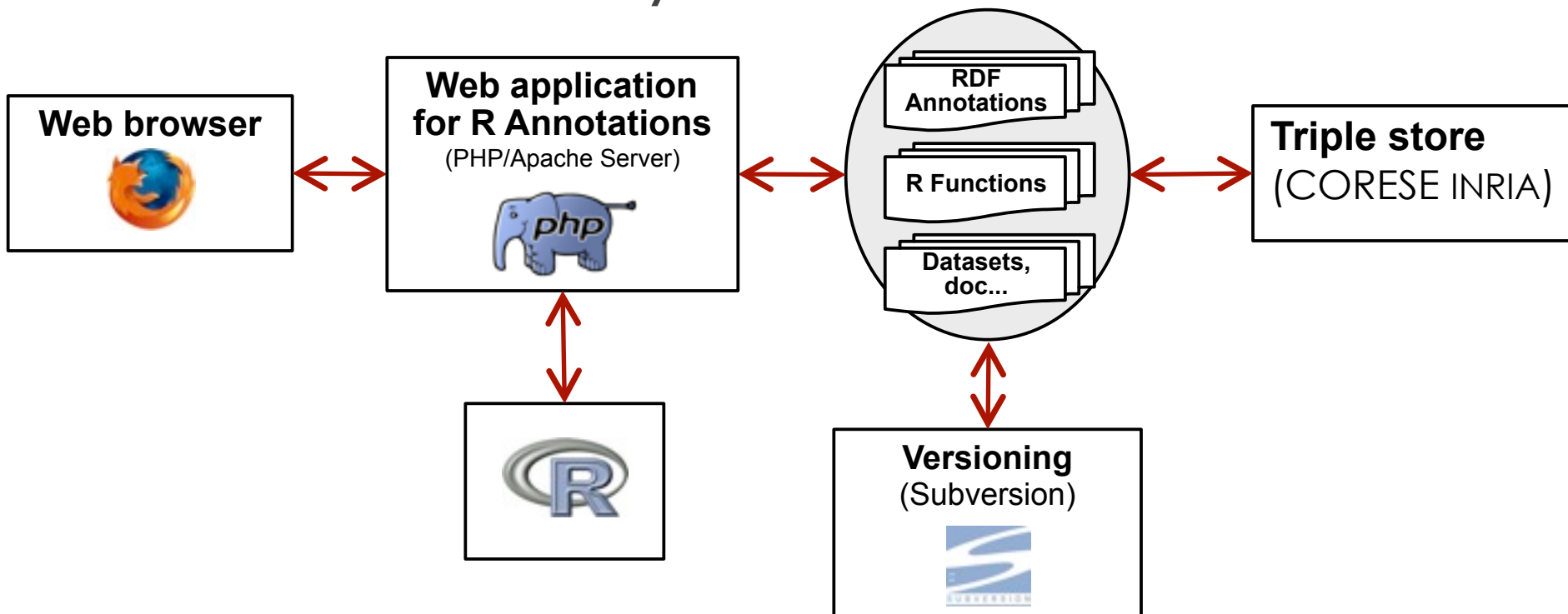
## Relationship between R functions

*callsRCoreFunc, callsLocalFunc, couldBeUsedBefore/After, looksLike, isAdaptedFrom, isNewVersionOf.*



# Application (architecture)

- Application **web** (works with a web browser)
- **R terminal** (parser and validate the uploaded R files)
- **Description storage** in the **server** and in a specific **data base**
- **Version** and **concurrency control**





# Application (use case)

- New description creation

# Application (use case)

14

- New description creation

Upload a R  
func file

Parse & validate  
by R client

Fill the  
desc form

# Application (use case)

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- New description creation

Upload a R  
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Parse & validate  
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Fill the  
desc form


## 1 - General

 Fields followed by \* should be filled!

Name of the function \* :

The name should be of the following form: *MyFunction.R*

Description \* :

 Multiple selection or unselection: use <Ctrl>

Author(s):

Anne.Pellegrino  
Anne.Tireau  
Benoit.Boussuge  
Bertrand.Muller  
Caroline.Domerg  
Christian.Fournier

Create author

Person(s) to contact :

Christian.Fournier  
Christine.Granier  
Eric.Lebon  
Bertrand.Muller  
Vincent.Negre  
Anne.Pellegrino

# Application (use case)

14


- New description creation

Upload a R  
func file

Parse & validate  
by R client

Fill the  
desc form


## Argument description



 Describe all the different arguments of the function:

Argument 1 Name:  Type:  Description:  

Add argument

## Value description

 Describe all the different values of the function:

Value 1 Name:  Type:   Description:  

Add value

# Application (use case)

14

- New description creation

Upload a R  
func file

Parse & validate  
by R client

Fill the  
desc form

## 4 - Relations with other functions of the repository

Is a new version Of

Add

Remove

Show List

Is adapted from

Could be used after

Could be used before

Calls

Looks like

# Application (use case)

14

- New description creation

Upload a R  
func file

Parse & validate  
by R client

Fill the  
desc form

Save the R func  
& its desc

## 4 - Relations with other functions of the repository

Is a new version Of

Add

Remove

Show List

Is adapted from

Could be used after

Could be used before

Calls

Looks like

# Application (use case)

- Function consultation

# Application (use case)

- Function consultation

Input search conditions

**Example:**  
**isDedicatedTo** 'Phenodyn'  
and  
**hasIntention** of 'Visualization'

```
PREFIX OntologyR: select ?fonction ?description where { ?fonction OntologyR:isDedicatedTo OntologyR:Phenodyn ?fonction OntologyR:hasIntention OntologyR:Visualisation ?fonction OntologyR:hasDescription ?description}
```



# Application (use case)

15

- Function consultation

Input search conditions

Generalize and run SPARQL query



Search a R-Function

- Basic Search (if you
- Advanced Search

isDedicatedTo

hasIntention

**Example:**

**isDedicatedTo** 'Phenodyn'  
and  
**hasIntention** of 'Visualization'

```
PREFIX OntologyR: select ?fonction ?description where { ?fonction OntologyR:isDedicatedTo OntologyR:Phenodyn ?fonction OntologyR:hasIntention OntologyR:Visualisation ?fonction OntologyR:hasDescription ?description}
```

# Application (use case)

15

- Function consultation

Input search conditions

Generalize and run SPARQL query

Show result list



There are 12 functions matching your request:

Name	Description
<a href="#">CRTempPlot_Caroline.Domerg.R</a>	This functions generates a pdf file with the response curves of the growth speed to the temperature, one plot per genotype and the coefficients and line on the regression are displayed. A csv file with the parameters of the regressions is also returned
<a href="#">CRpsiPlot_Caroline.Domerg.R</a>	This functions generates a pdf file with the response curves of the growth speed to the PSI, one plot per genotype and the coefficients and line on the regression are displayed. A csv file with the parameters of the regressions is also returned
<a href="#">ancCRpsi_Caroline.Domerg.R</a>	This function performs and displays covariance analysis on the response curves of the growth to the psi. It compares the response of a list of genotypes to a probe genotype to study the effect of the genotype on the response of the growth.
<a href="#">CRvpdPlot_Caroline.Domerg.R</a>	This functions generates a pdf file with the response curves of the growth speed to the leaf-EPD, one plot per genotype and the coefficients and line on the regression are displayed. A csv file with the parameters of the regressions is also returned
<a href="#">LERvalidation_Vera.Georgescu.R</a>	The general function of visualisation, automatic and manual correction of the Leaf Elongation Rate kinetics measured on the Phenodyn platform. This function runs on R version 2.6.2

# Application (use case)

15

- Function consultation

Input search conditions

Generalize and run SPARQL query

Show result list

Consult & modify descriptions

## R Calls

- Vera.Georgescu\_netmanuel.R
  - locator
- Vera.Georgescu\_kinetics30h.R
  - tk\_select.lst
  - lines
  - lm
  - layout
- tk\_select.lst
- lm
- layout

## R Calls

- ablne
- plot

## Sequence

Could be used after: [juliette.Fabre\\_LocusDiff.R](#)

# Application (use case)

15

- Function consultation

Input search conditions

Generalize and run SPARQL query

Show result list

Consult & modify descriptions

## R Calls

- Vera.Georgescu\_netmanuel.R
  - locator
- Vera.Georgescu\_kinetics30h.R
  - tk\_select.list
  - lines
  - lm
  - layout
- tk\_select.list
- lm
- layout

Call graph of the current function

## R Calls

- ablne
- plot

## Sequence

Could be used after: [juliette.Fabre\\_LocusDiff.R](#)

Relations with other functions

# Application (inference)

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*Leaf\_Growth\_Computation.R*

**Could be used  
after**

*Leaf\_Growth\_Analysis.R*

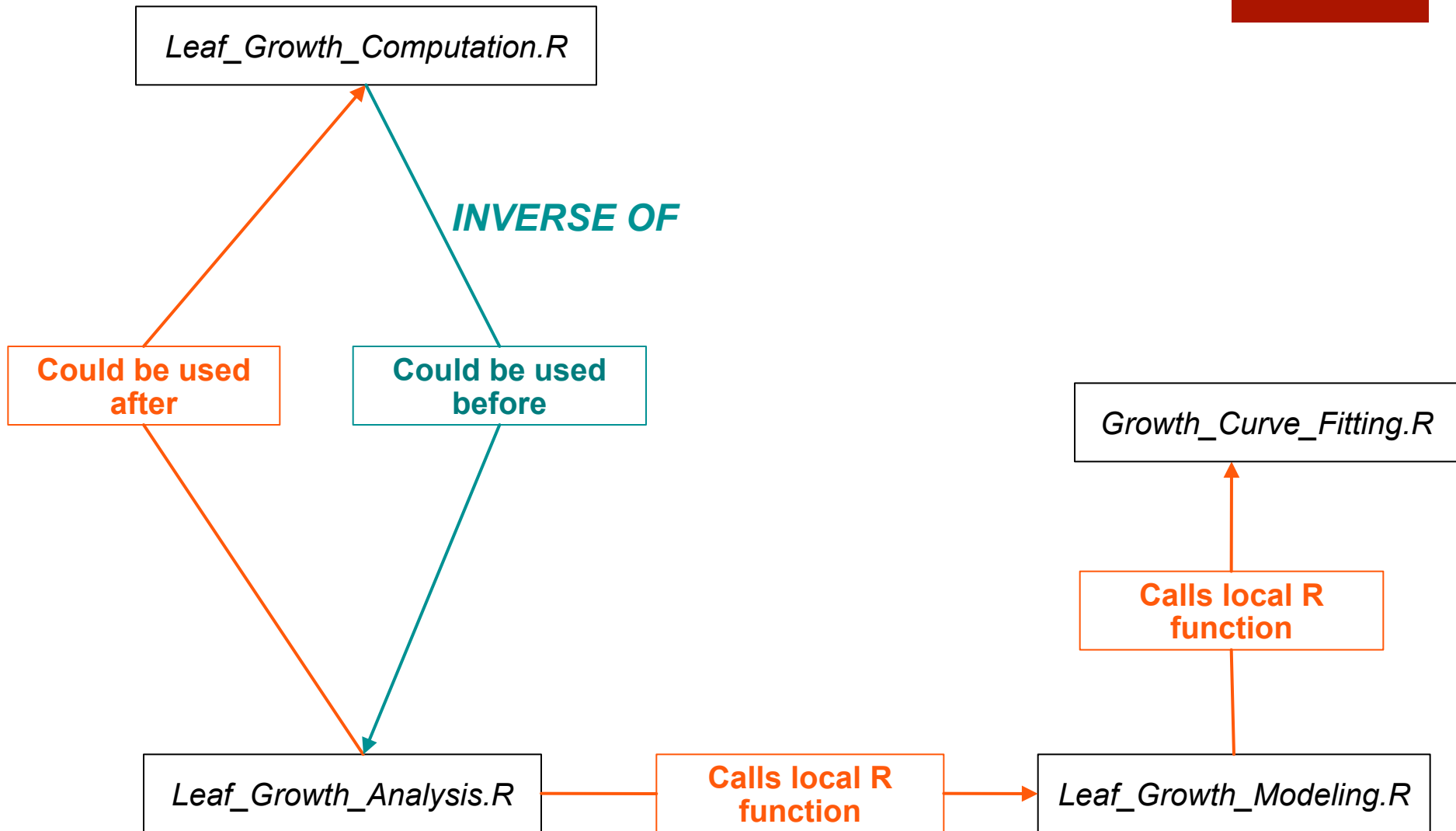
**Calls local R  
function**

*Leaf\_Growth\_Modeling.R*

*Growth\_Curve\_Fitting.R*

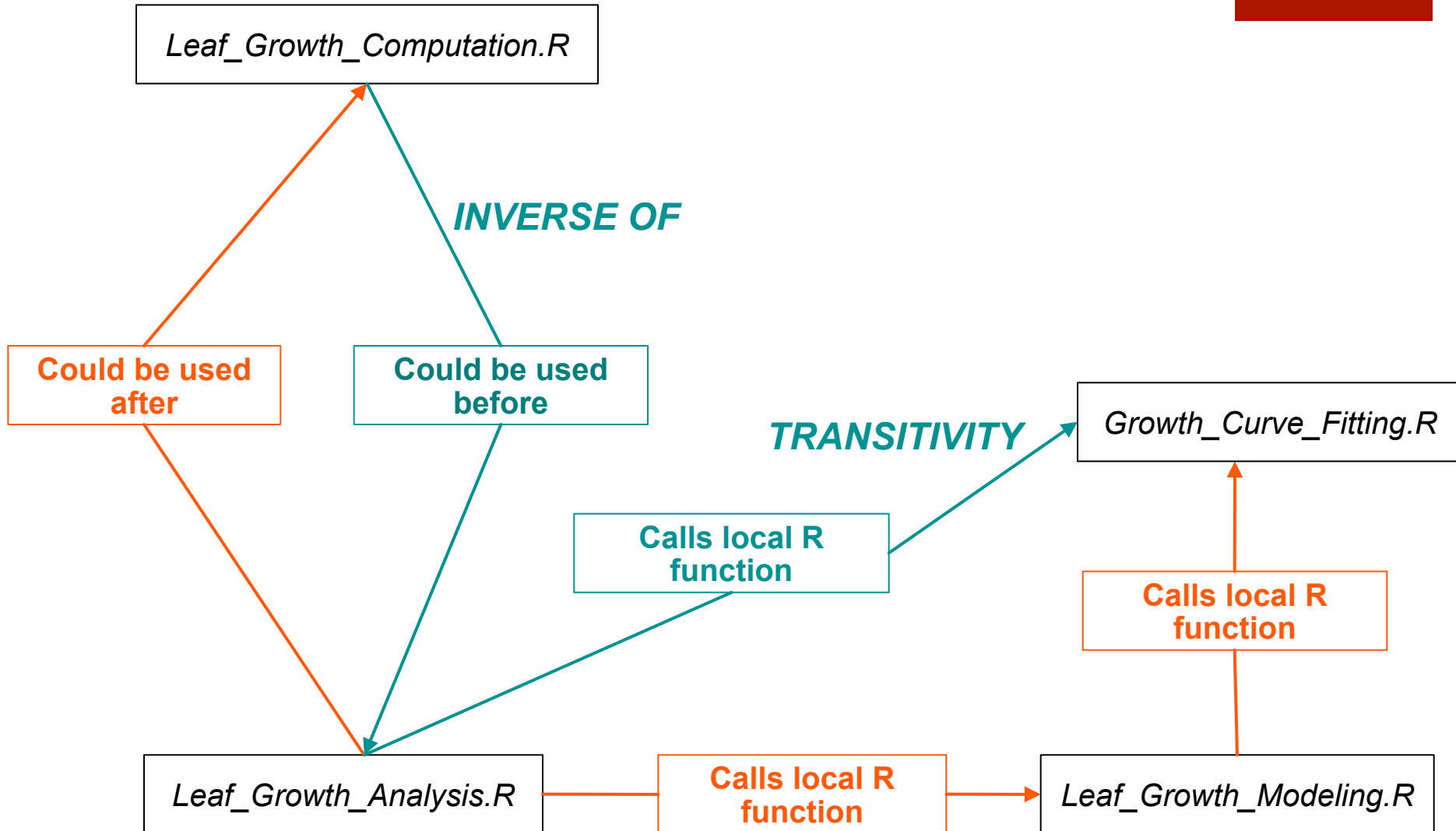
**Calls local R  
function**

# Application (inference)



# Application (inference)

16



# Application (use case)

- Inference example 1

- Upload Add.R



- Upload Add2.R

**Add2.R adaptedFrom Add.R**



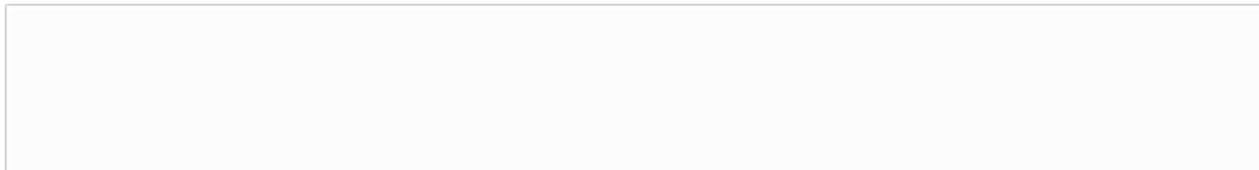
adaptedFrom

- Upload Add3.R

**Add3.R adaptedFrom Add2.R**



adaptedFrom





# Application (use case)

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## ■ Inference example 1

- Upload Add.R

Add.R

- Upload Add2.R

**Add2.R adaptedFrom Add.R**

adaptedFrom

Add2.R

- Upload Add3.R

**Add3.R adaptedFrom Add2.R**

adaptedFrom

Add3.R

Add3.R is adapted from which function(s) ?

# Application (use case)

- Inference example 1

- Upload Add.R



- Upload Add2.R

**Add2.R adaptedFrom Add.R**



adaptedFrom

- Upload Add3.R

**Add3.R adaptedFrom Add2.R**



adaptedFrom

Add3.R is adapted from which function(s) ?

**Sequence**

Is adapted from: [add2\\_Yuan.Lin.R](#)

# Application (use case)

■ Inference example 1

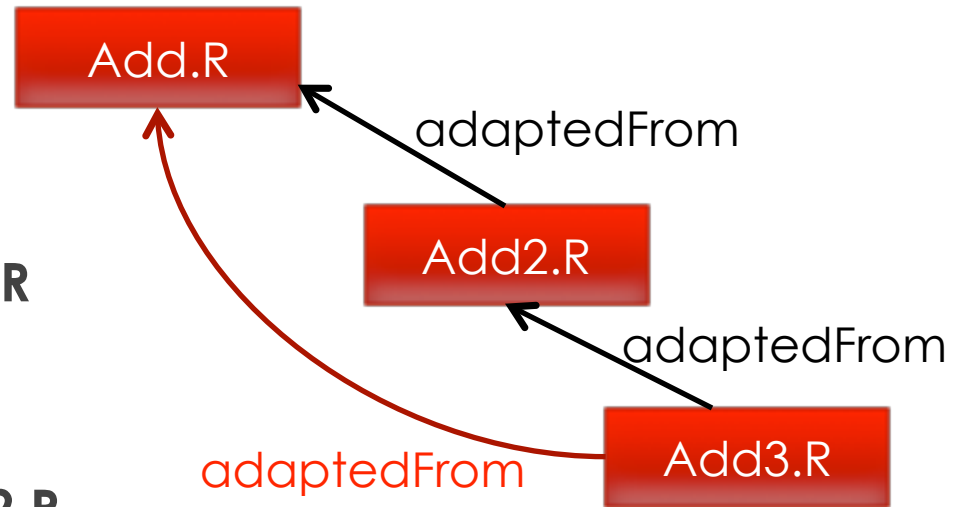
- Upload Add.R

- Upload Add2.R

**Add2.R adaptedFrom Add.R**

- Upload Add3.R

**Add3.R adaptedFrom Add2.R**



Add3.R is adapted from which function(s) ?

Sequence

Is adapted from: [add2\\_Yuan.Lin.R](#)

# Application (use case)

- Inference example 1

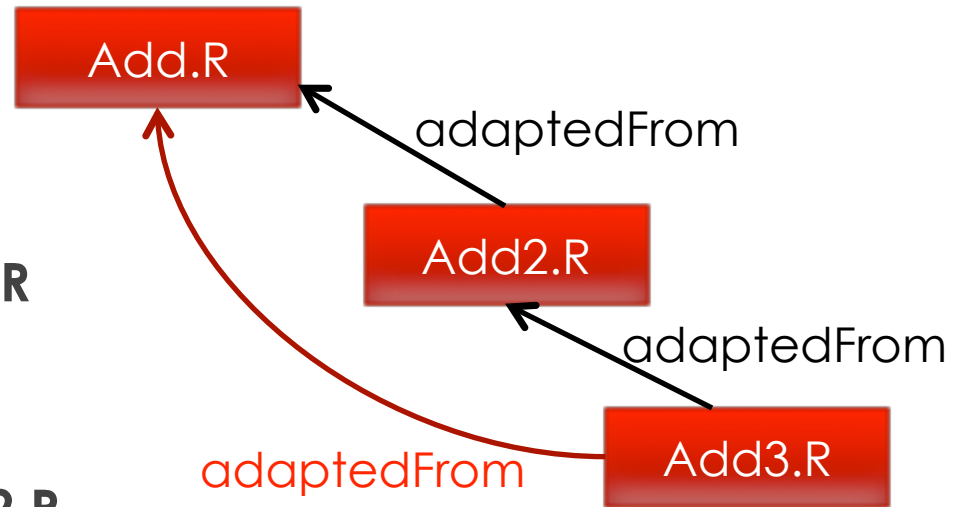
- Upload Add.R

- Upload Add2.R

**Add2.R adaptedFrom Add.R**

- Upload Add3.R

**Add3.R adaptedFrom Add2.R**



Add3.R is adapted from which function(s) ?

## Sequence

Is adapted from: [add2\\_Yuan.Lin.R](#)

Is adapted from: [add\\_Yuan.Lin.R](#)

# Application (use case)

- Inference example 2

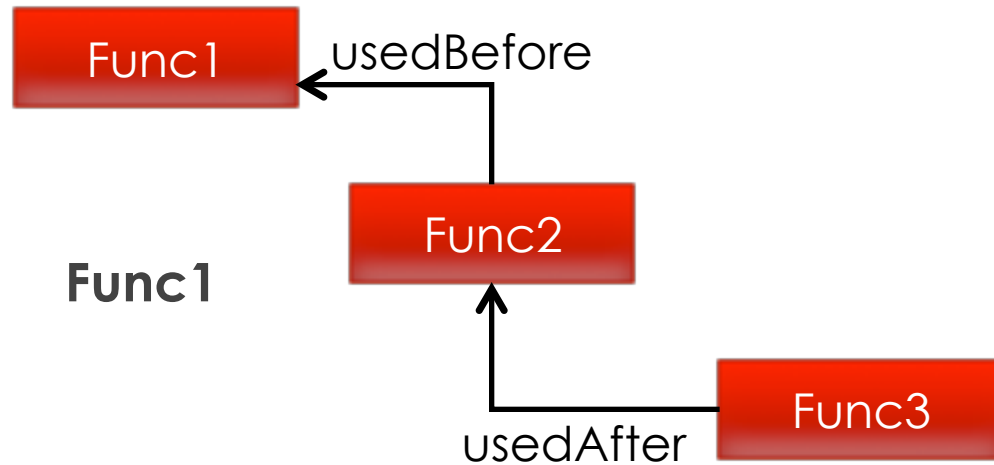
- Upload Func1

- Upload Func2

**Func2 couldBeUsedBefore Func1**

- Upload Func3

**Func3 couldBeUsedAfter Func2**



# Application (use case)

18

## ■ Inference example 2

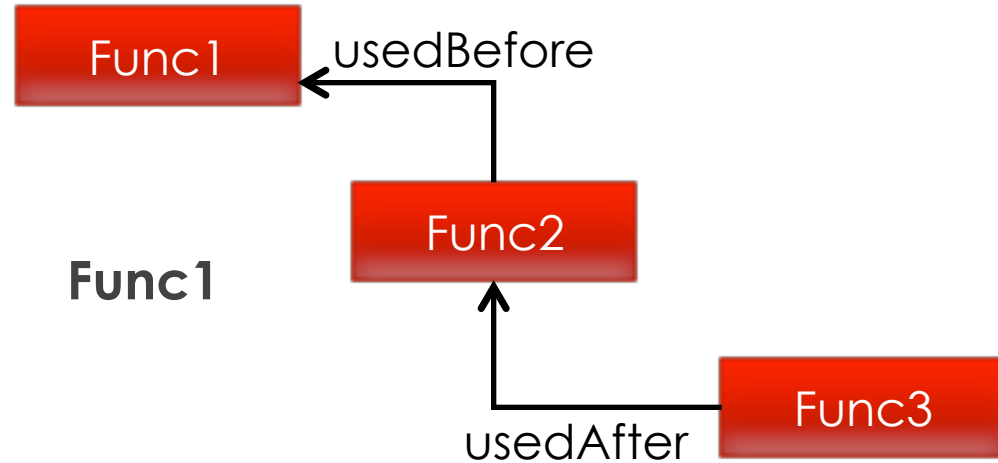
- Upload Func1

- Upload Func2

**Func2 couldBeUsedBefore Func1**

- Upload Func3

**Func3 couldBeUsedAfter Func2**



What are functions that could be used after Func2

# Application (use case)

18

## ■ Inference example 2

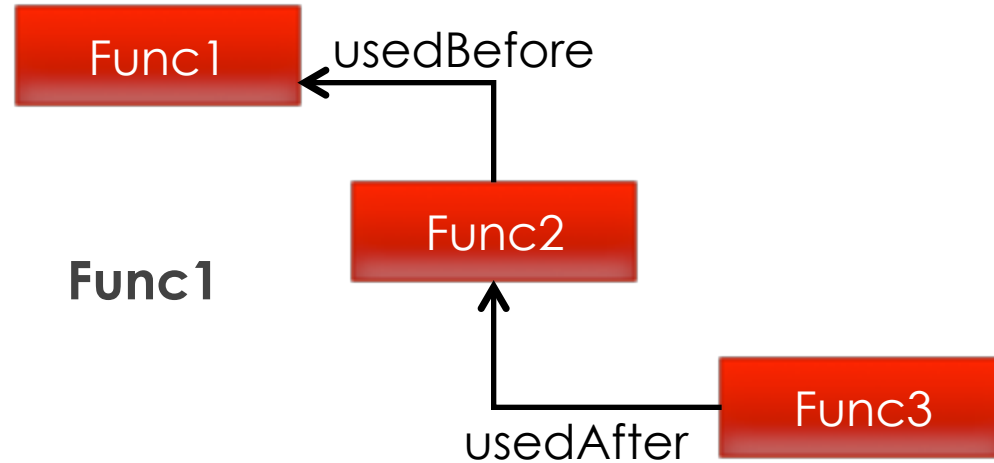
- Upload Func1

- Upload Func2

**Func2 couldBeUsedBefore Func1**

- Upload Func3

**Func3 couldBeUsedAfter Func2**



What are functions that could be used after Func2

Func3

# Application (use case)

18

## ■ Inference example 2

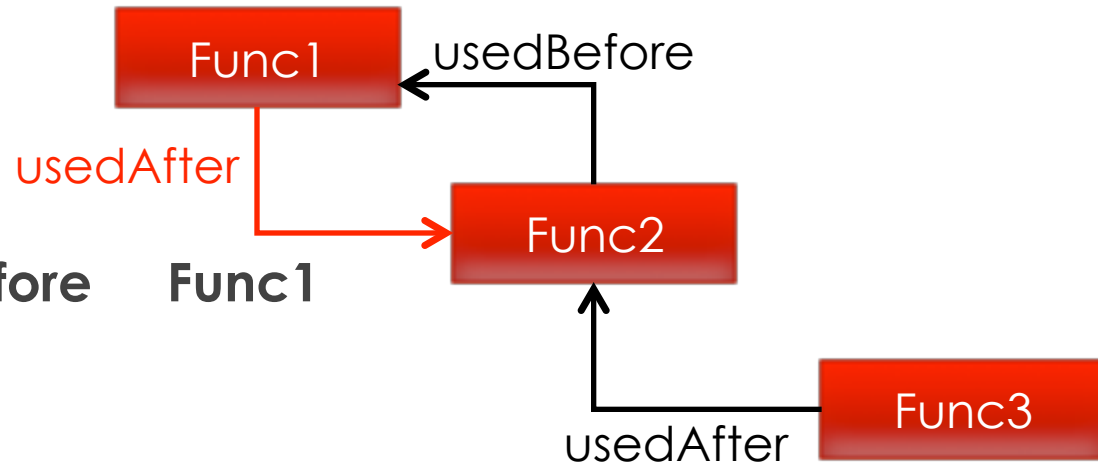
- Upload Func1

- Upload Func2

**Func2 couldBeUsedBefore Func1**

- Upload Func3

**Func3 couldBeUsedAfter Func2**



What are functions that could be used after Func2

Func3



# Application (use case)

18

## ■ Inference example 2

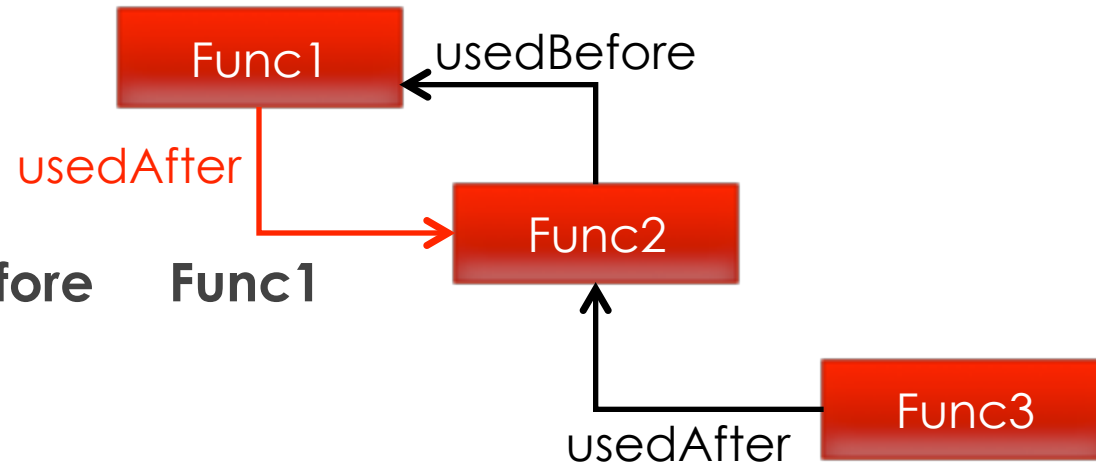
- Upload Func1

- Upload Func2

**Func2 couldBeUsedBefore Func1**

- Upload Func3

**Func3 couldBeUsedAfter Func2**



What are functions that could be used after Func2

Func3

Func1

# Conclusion

- Users find this repository relevant (*efficient search, easy annotating*)
- Semantic Web tools allow reasoning for an “intelligent” repository
- Models and software are easy to adapt :
  - for other research fields
  - for other programming languages
  - for mathematical models ?



*THE END*

**Thank you**

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