

# VFramework

## Framework for Verification of Preserved and Redeployed Processes

Tomasz Miksa

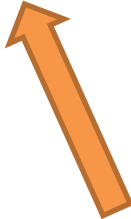
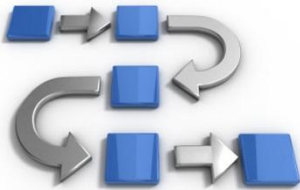
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# Agenda

- VFramework
  - Relation to process preservation
  - Objectives
  - Framework steps
- Experiment
  - Use case
  - Application of the VFramework
  - Results
- Conclusions

# Process preservation - VFramework

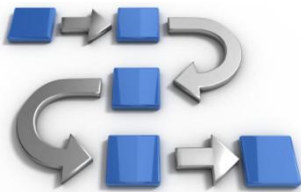
Original environment



Repository



Redeployment environment



Are these processes the same?

# VFramework

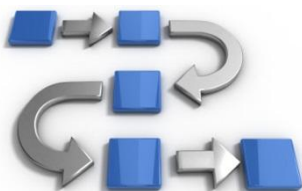
- Objectives
  - assess redeployed processes in view of users requirements
  - collect evidence
- Independent of
  - the purpose of the redeployment
    - e.g. litigation case, rerun of scientific experiment
  - the ways of process specification
    - e.g. workflows, verbal description
  - the drivers for their preservation
    - e.g. legal obligations, good practice

# VFramework

- Independent of
  - the preservation strategies applied
    - to the whole process or to its parts
    - e.g. migration, emulation, etc.
  - the redeployment environments
    - What external components are available?
    - How does the new platform differ?
  - the type of redeployment
    - full
    - partial

# VFramework

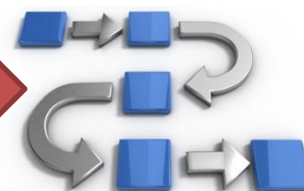
Original environment



Repository



Redeployment environment



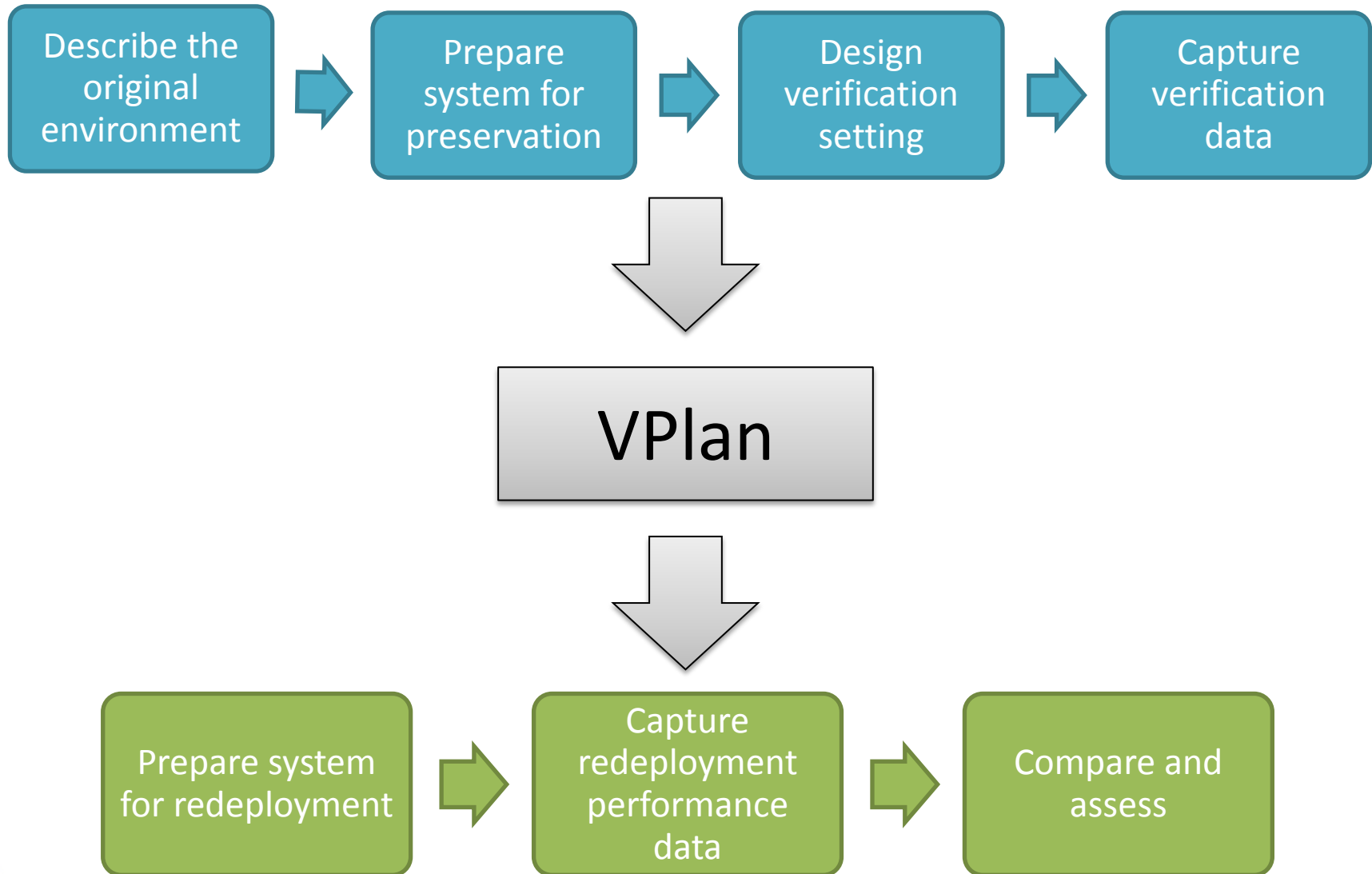
DIRECT COMPARISON NOT POSSIBLE

COLLECT EVIDENCE



COMPARE EVIDENCE

# VFramework



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- **Experiment**
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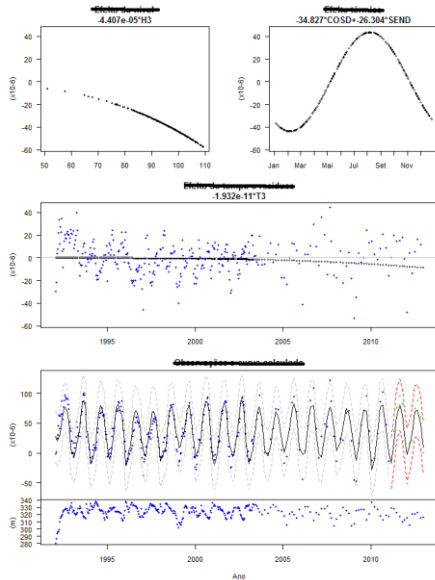
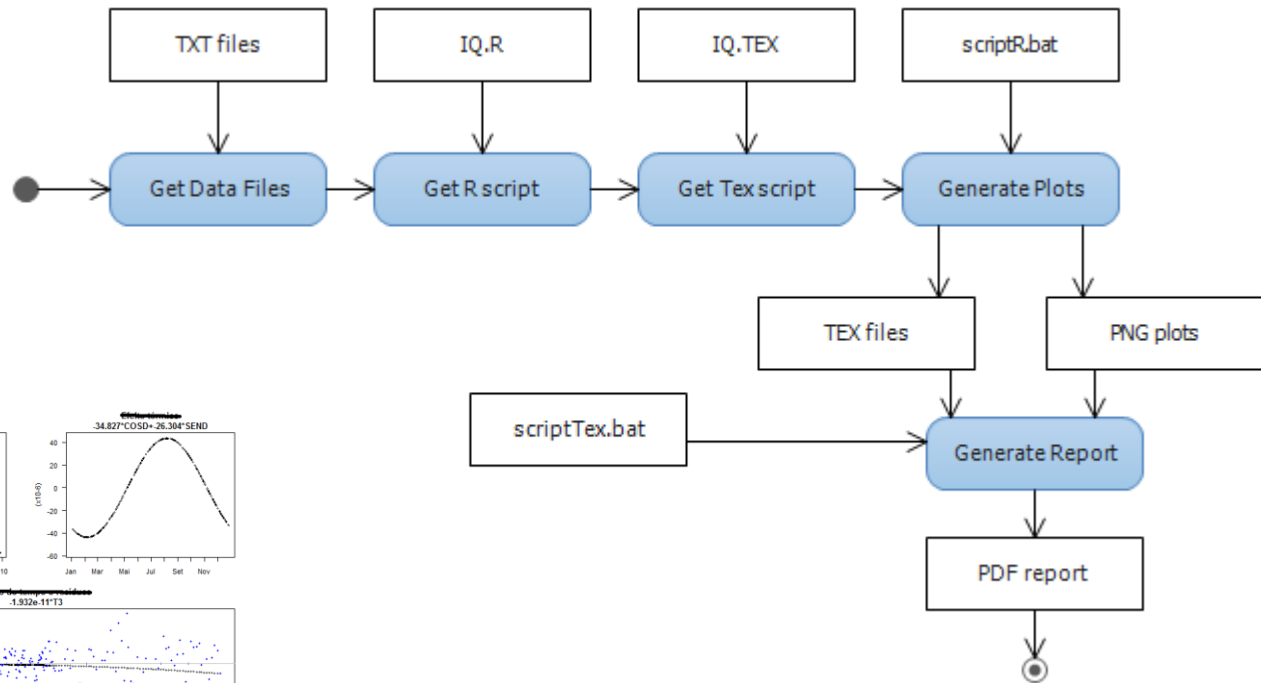


# Experiment – use case

- eScience process
  - civil engineering domain
- Long term sensor data analysis
- Used to make predictions
- Process needs to be rerun
  - with new datasets
  - with new parameters
- Process performed manually by scientists



# Experiment – use case

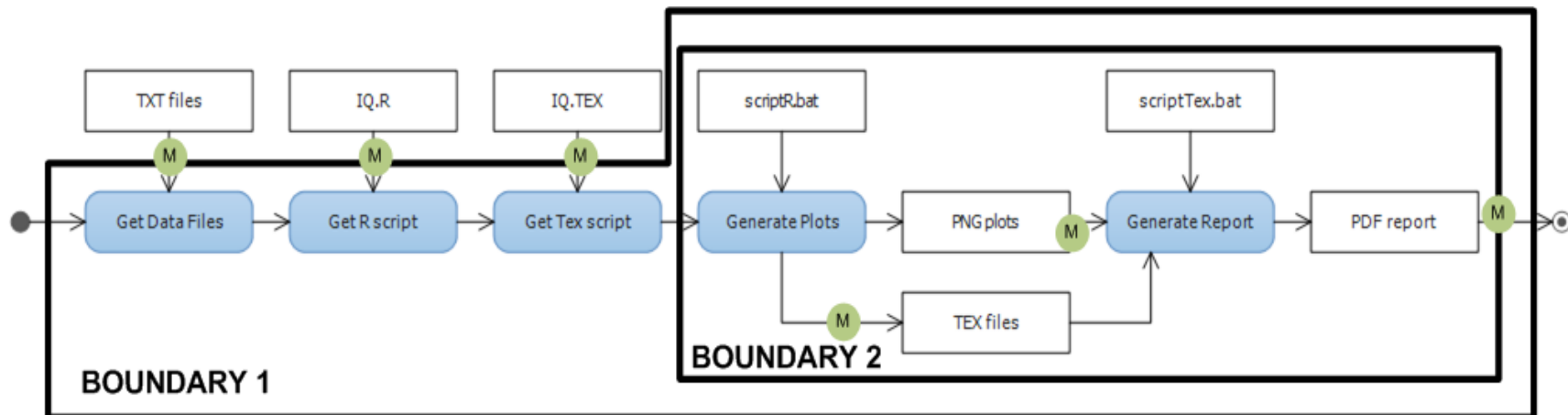


# Experiment

- Simulation of obsolescence by redeployment in a different environment
  - Original: Windows
  - Redeployment: Linux
- Two scenarios
  - Full process redeployed
  - Part of the process redeployed

# Experiment

- Defined, collected and compared
  - Process boundaries
  - Significant properties
  - Measurement points and levels of comparison
  - Metrics



# Example – verification setting

<b>ID:</b> R3.5	<b>Name:</b> Graphical Representation
<b>Significant property:</b> The system must provide graphical representation of the following concepts: <ul style="list-style-type: none"><li>• Residuals vs. Fitted,</li><li>• normal Q-Q,</li><li>• Scale-Location,</li><li>• Cook's distance,</li><li>• Residual vs. Leverage,</li><li>• Cook's dist. vs. Leverage</li></ul>	
<b>Boundary:</b> 1 and 2	
<b>Measurement point:</b> M4 (PNG file which is an output of <i>Generate Plots</i> step)	
<b>Level of comparison:</b> Rendered form	
<b>Metric</b>	<b>Target Value</b>
Resolution	Exact
Colour space	Exact
Histogram	Exact

# Example – collected data

ID: R3.5	Name: Graphical Representation			
Metric	Target Value	Original environment	Redeployment environment	Fulfilled
Resolution	Exact	37.8x37.8	37.8x37.8	Yes
Colour space	Exact	sRGB	sRGB	Yes
Histogram	Exact	#Values	#Values	
		( 0,162,232,255) #00A2E8 srgba(0,162,232,1)	( 0,162,232,255) #00A2E8 srgba(0,162,232,1)	Yes
		( 0,162,236,255) #00A2EC srgba(0,162,236,1)	( 0,162,236,255) #00A2EC srgba(0,162,236,1)	Yes
		( 0,162,237,255) #00A2ED srgba(0,162,237,1)	( 0,162,237,255) #00A2ED srgba(0,162,237,1)	Yes
...	...	...	...	...

# Experiment - Results

- Compared processes in significantly different environments
- Compared fully and partially redeployed processes
- Compared modified processes
- Collected trustworthy evidence
- Proved that the redeployed process is correct
- Demonstrated applicability of the VFramework

# Conclusions

- VFramework
  - allows to compare processes
  - provides evidence needed for verification
  - guides the user through the verification process
  - is general enough to be applicable in many scenarios
  - is precise enough to ensure comprehensiveness of the evidence collected
- VFramework is applicable to eScience processes



# On-going work

- Automation of process characteristics extraction
- VPlan development
  - based on OWL ontology
  - allows to aggregate information about process without redundancy
- Application to further use cases
  - eHealth domain

Thank you!



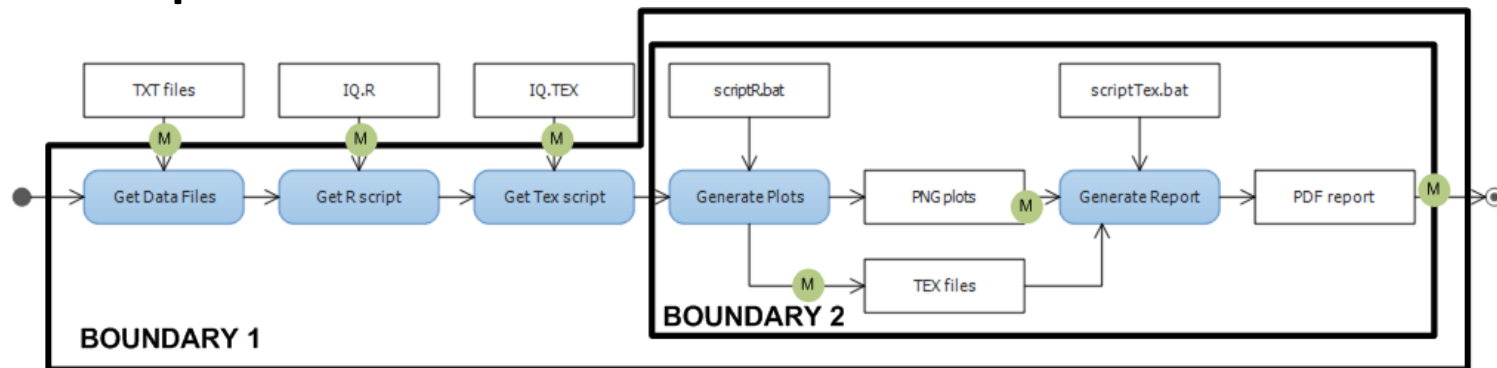
# Auxiliary slides

# VFramework

1. Describe the original environment
2. Prepare system for preservation
3. Design verification setting
4. Capture verification data
5. Prepare system for redeployment
6. Capture redeployment performance data
7. Compare and assess

# Process boundaries

- Specify which components belong to the process
- Depends on
  - redeployment scenario
  - access to components
- Must be precise



# Measurement points and metrics

- Specified for each of considered scenarios
- Measurement points
  - points of the process where data enabling reasoning about correctness of the process execution is collected
- Metrics
  - tangible and measurable metrics derived from significant properties
  - Must have their target value specified (e.g. equals original, not less than..., etc.)

# Levels of comparison

