WPS4R

Creating WPS processes via R scripts

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Agenda

- About WPS4R
- Input / Output
- Architecture
- Deploy a WPS4R Process
- WPS4R Annotation Syntax
- Further Tasks

About WPS4R

- Module of the **52n WPS**
- Integrated middleware for WPS → R
- Allows WPS process creation via R-scripts
- R scripts contain **annotations**
  - Supplies process description, input and output information
- **Upload function**:
  - Upload processes during server runtime (administrator)
  - Processes are immediately ready to use

About WPS4R (Rserve backend)

- Processing backend is **Rserve**
- Rserve is an independent TCP / IP Server for R
  - Local or remote connection
  - Allows multiple connections (unix machines only!)

    → Thread safety
- Available as R package
- Binary transport of R objects (faster)

Input/Output

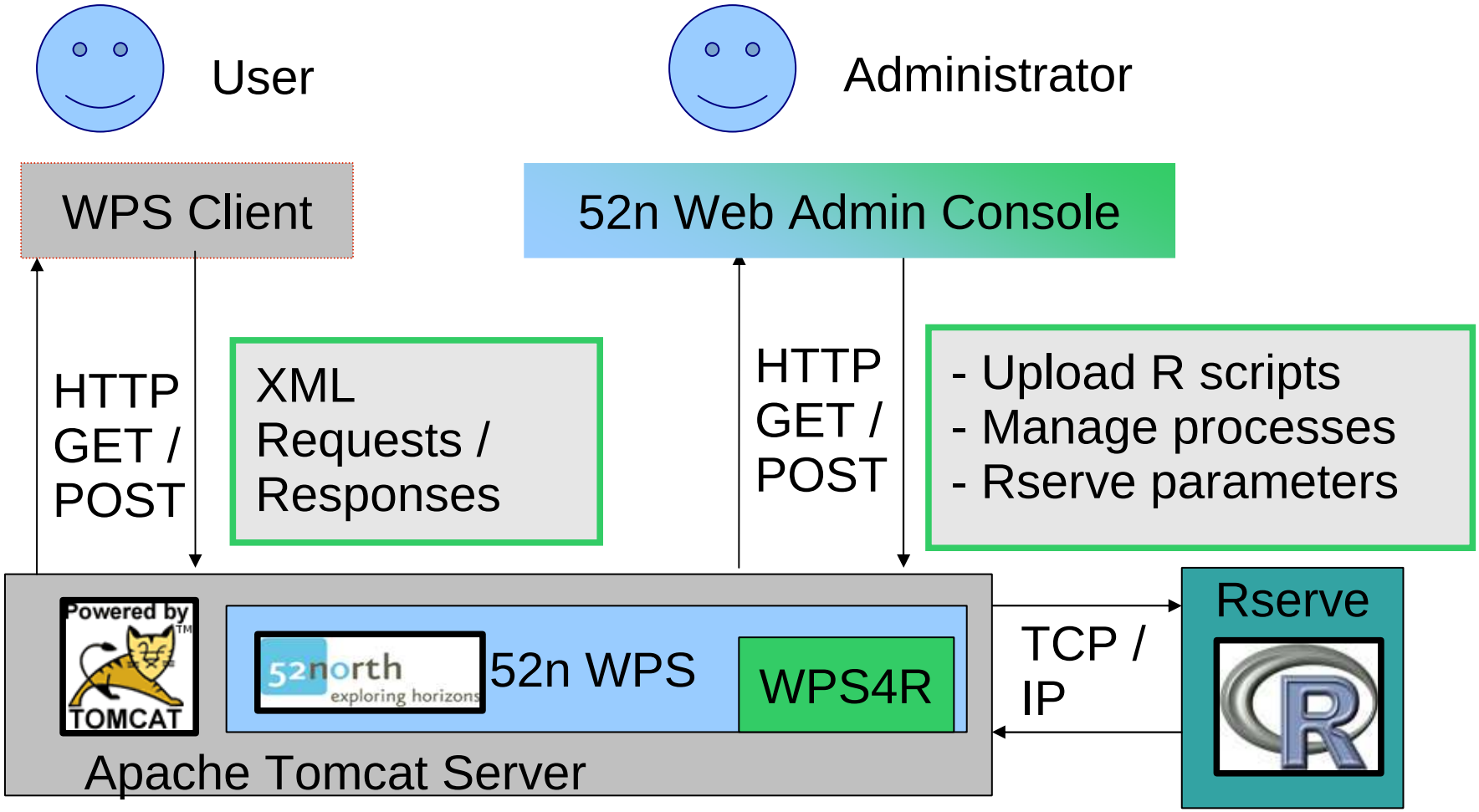
- In principle all data types can be used if…
  - R can read / write them
  - They are formally defined inside WPS4R

- Limitations:
  - No arrays
  - Only one input per identifier
  - One supported type per input / output

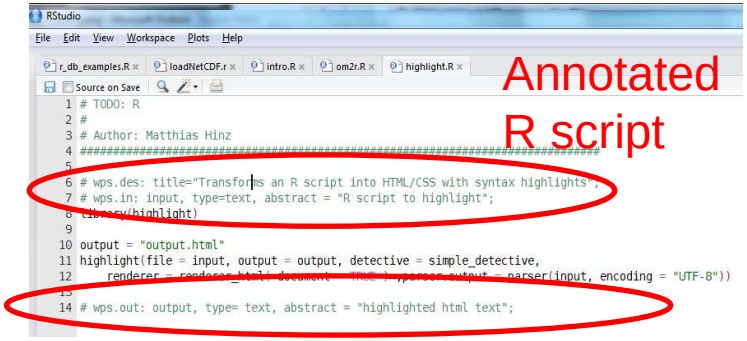
- Common spatial data formats (→rgdal drivers, …)
  - GeoTIFF, ESRI Shapefile, ERDAS Image file, NetCDF, (GML?)

- Simple data types (default values possible)
  - string, double, integer, boolean

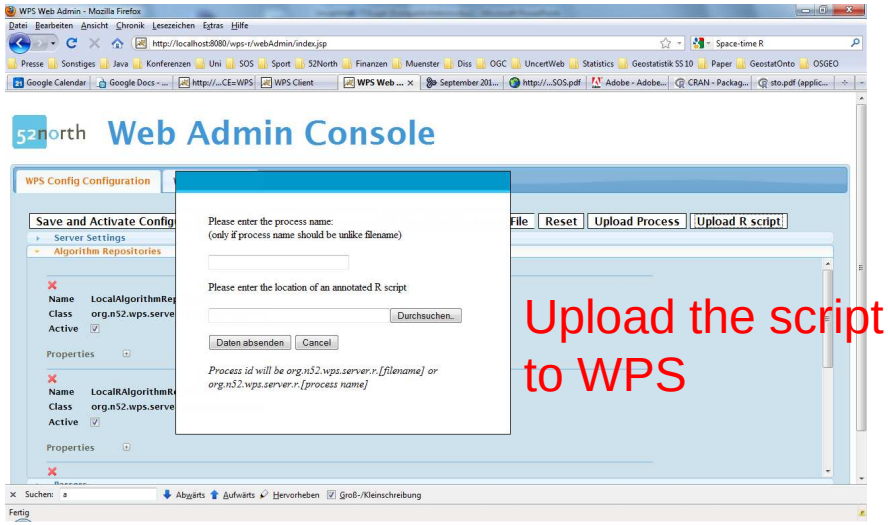
WPS4R Architecture



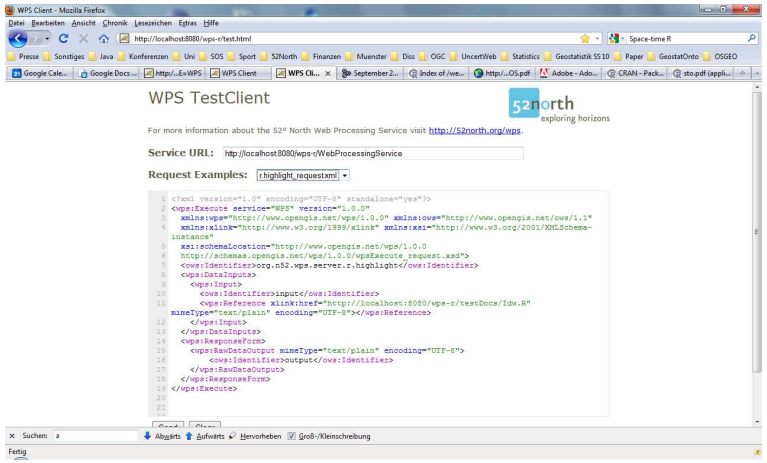
Deploy a WPS4R Process



Annotated R script



Upload the script to WPS



Run the script as a Web Service process

Deploy a WPS4R Process

- Write an R script
- Declare Process inputs (# wps.in: …)
- Declare process output (# wps.out: …)
- Add general process information (#wps.des: …)
- Upload script via Web Admin Console

  → Execute process

Deploy a WPS4R Process

1. Write an R script

```
# random number:
 min = 0
 max = 1
 output = runif(1, min=min, max=max)
```

Deploy a WPS4R Process

2. Declare inputs (e.g. identifier, type, default value)

```
# wps.in: min, double, value = 0;
# wps.in: max, double, value = 1;
# random number:
 min = 0
 max = 1
 output = runif(1, min=min, max=max)
```

Deploy a WPS4R Process

3.a Declare output (e.g. identifier, type)

```
# wps.in: min, double, value = 0;
# wps.in: max, double, value = 1;

# random number:
 output = runif(1, min=min, max=max)

# wps.out: output, double;
```

Deploy a WPS4R Process

3.b Declare output (Solution for complex output: textfile)

```
# wps.in: min, double, value = 0;
# wps.in: max, double, value = 1;

# random number:
x = runif(100, min=min, max=max)
output = "outputfilename"
write.table(x, output)

# wps.out: output, text;
```

Deploy a WPS4R Process

4. Add process description

```
# wps.des: id = R_andom, title = Random number
# generator, abstract = Generates a single
# random number within a defined interval;
# wps.in: min, double, value = 0;
# wps.in: max, double, value = 1;

# random number:
 output = runif(1, min=min, max=max)

# wps.out: output, double;
```

Deploy a WPS4R Process

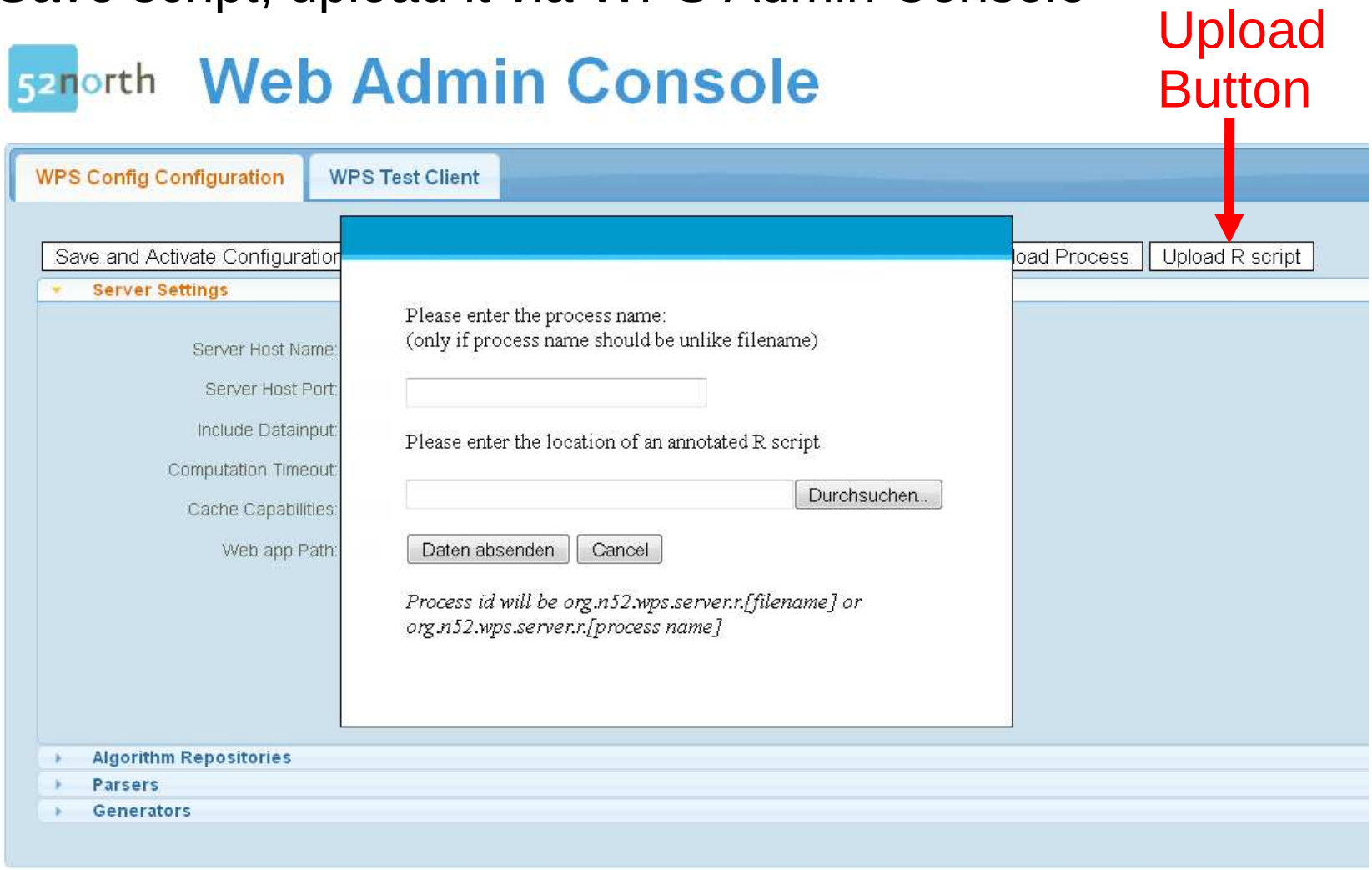
5. More process metadata (title, abstract for input / output)

```
# wps.des: id = R_andom, title = Random
# number generator, abstract = Generates a single
# random number for uniform distribution;
# wps.in: min, double,
# Minimum, All outcomes are larger than min,
# value = 0;
# wps.in: max, double,
# Maximum, All outcomes are smaller than max,
# value = 1;
 output = runif(1, min=min, max=max)

# wps.out: output, double, Random number;
```

Deploy a WPS4R Process

6. Save script, upload it via WPS Admin Console



WPS4R Annotation Syntax

wps.des: id, title = id, abstract = null;

→ General process description

wps.in: id, type, title = id, abstract = null,
value = null, minOccurs = 1, maxOccurs = 1;

→ Input description

→ WPS4R: value initialization

wps.out: id, type, title = id, abstract = null;

→ Output description

→ WPS4R: returns value / file

Further Tasks

- Online documentation
- Trunk merge
- Modifications according to use cases

Thanks for your attention.
Questions?

Useful Links

- About the 52n WPS:
  http://52north.org/communities/geoprocessing/wps/index.html
- About Rserve:
  http://www.rforge.net/Rserve/
- WPS4R SVN repository
  https://svn.52north.org/svn/geoprocessing/main/WPS/branches/WPS-R-Project

(More information will follow)

```
# wps.des: title = WPS IDW Demo, abstract = idw process
   demo for WPS;
# wps.in: points, shp;
# wps.in: raster, img;
# wps.in: attributename, string;
# wps.in: nmax, integer, value = 10, abstract = Optional
   input with default value;

points=readOGR(points,sub(".shp","",points))
raster=readGDAL(raster)

# inverse distance interpolation:
form=formula(paste(attributename,"~ 1"))
idw=idw(form,points,raster, nmax = nmax)
idw@data=data.frame(idw@data$var1.pred)
# parse output, return filepath
output=writeGDAL(idw,"output.img", drivername="HFA",
   mvFlag = 0)
result=paste(getwd(),output,sep="/")
# wps.out: result, img;
```