



# Testovanie ako predpoklad dosiahnutia interoperability prostredníctvom štandardizácie v oblasti geopriestorových informácií

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# Obsah prezentácie

- Motivácia a ciele nášho výskumu v problematike testovania technických komponentov IPI
- Kde sme boli minulý rok 2011?
- Kde sme teraz v roku 2012?
- Kde by sme radi išli v rámci ďalšieho výskumu?

# Ciele výskumu - motivácia

*“The objective of standardization in the field of digital geographic information cannot be completely achieved unless data and systems can be tested to determine whether they conform to the relevant geographic information standards.”*

*(ISO 19105:2000 Geographic information - Conformance and testing)*



International  
Organization for  
Standardization

# Hlavné ciele

- Navrhnuť a prakticky overiť metodiku na testovanie technických komponentov IPI prostredníctvom webových služieb založenú na súčasnej legislatíve a súvisiacich štandardoch
- Navrhnuť a vyvinúť webový testovací nástroj pre praktickú implementáciu metodiky v praxi, napr. v rámci NIPI
- Zabezpečiť efektivitu, prospešnosť a atraktivitu v záujme o používanie tohto nástroja koncovými používateľmi v rámci IPI

# Kde sme boli minulý rok 2011?

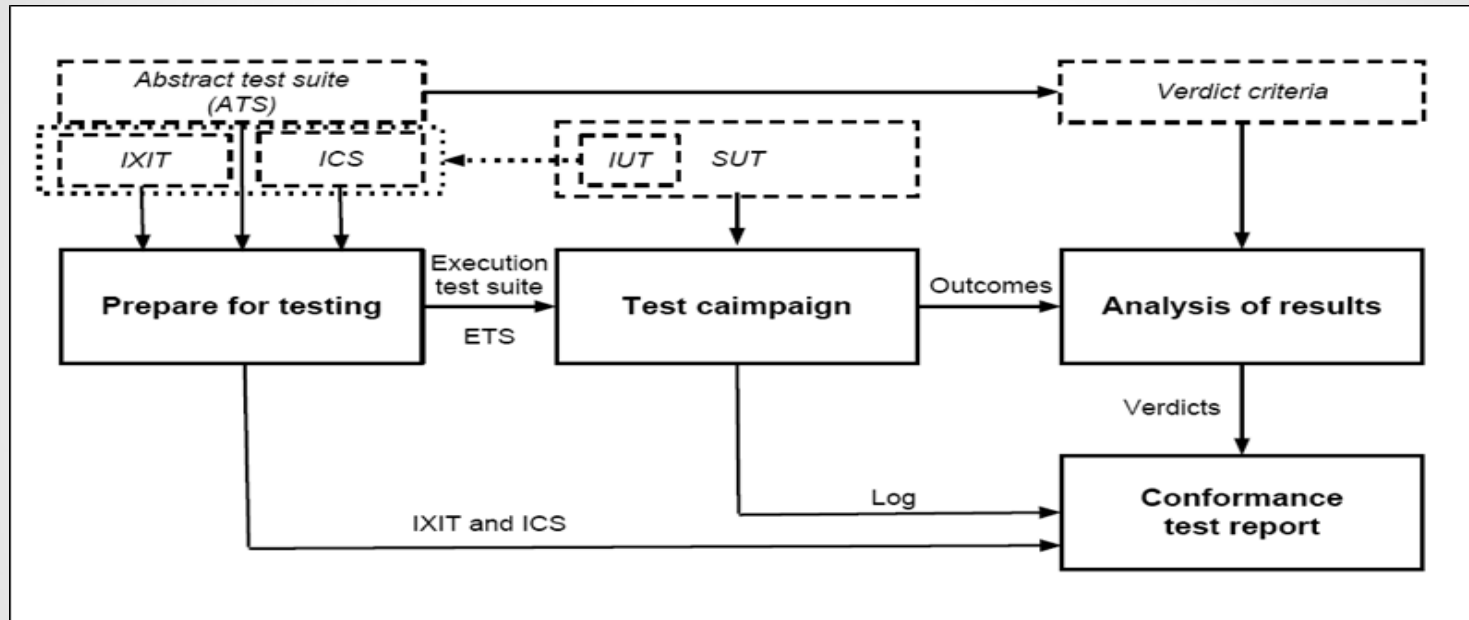
- Vytvorili dobrovoľné konzorcium 2 akademických (STU+SPU) a 1 organizácie verejného sektora (SAŽP) aktívne reprezentujúce SR v rámci medzinárodného projektu [PTB](#)
- Navrhli a prezentovali prvú verziu metodiky
- Predstavili prvú verziu testovacieho nástroja WebTest vyvíjaného na STUBA (Ing. Cibulka)
- Realizovali pilotné testovanie na komponentoch SAŽP a navrhli šablónu na reportovanie

# Kde sme teraz?

- Úprava testovacej metodiky podľa štandardu ISO19105 a jej rozšírenie podľa požiadaviek INSPIRE
- Testovací nástroj WebTest verzia 2.0
- Príklad aplikácie metodiky na zobrazovacej službe poskytovanej SAŽP

# Testovacia metodika

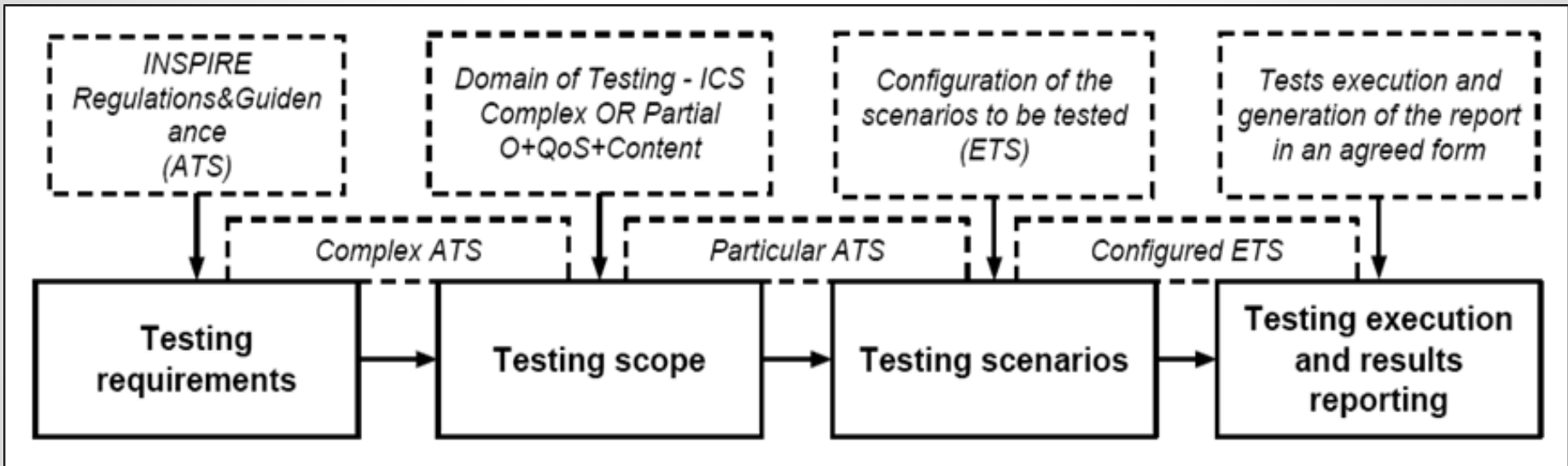
- Metodika testovania zhody podľa ISO19105



- Proces vyhodnotenia úrovne zhody testovaného systému
  - ISO definuje 4 fázy
  - komponenty: ATS, IXIT, ICS, SUT (IUT), ETS

# Testovacia metodika

- Úprava ISO metodiky a jej rozšírenie podľa požiadaviek INSPIRE

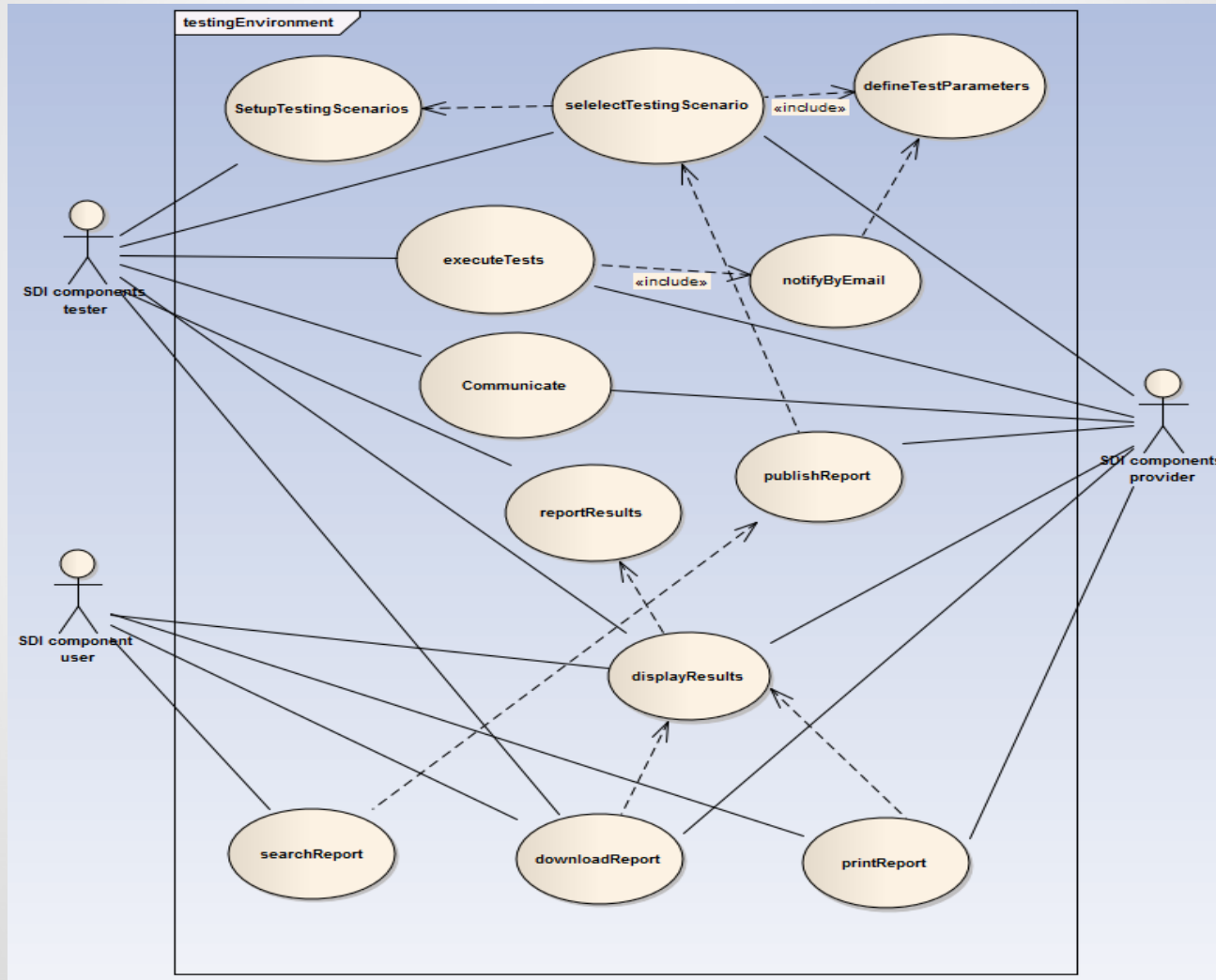


- Testovanie rozhrania služby a jej obsahu
  - Na potvrdenie zhody s implementačnými pravidlami INSPIRE a súvisiacimi technickými usmerneniami
- Kvalita služby – mimo rozsahu ISO 19105



# Testovací nástroj – návrh UC

- Návrh případů použití v UML diagrame použití

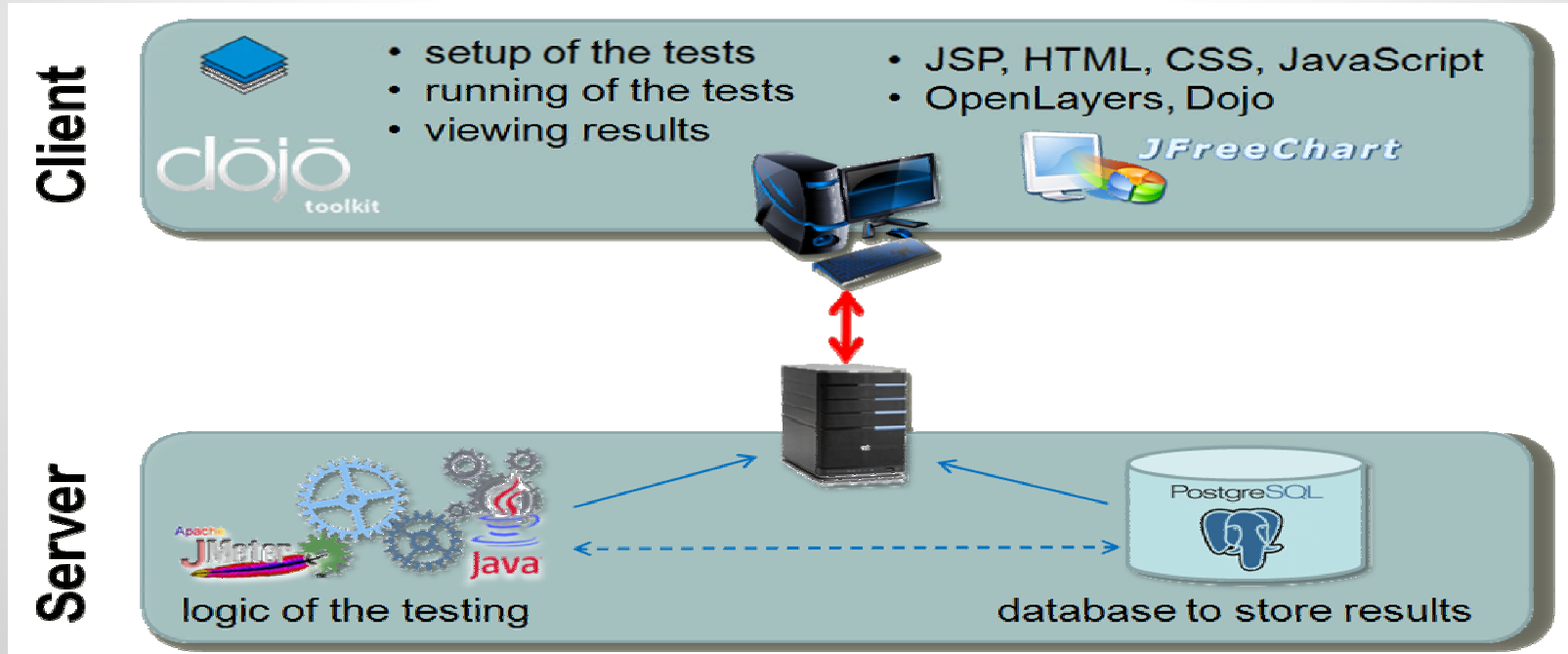


# WebTest v.2 – funkcionálnosť

- Validácia obsahu – komponent Validation
  - Validátor XML súborov voči online dostupným XSD schémam OGC, ISO a INSPIRE
  - Schematronová validácia- tvorba/upload/spúšťanie
- Testovanie kvality služby
  - Request builder – definícia koncového bodu služba + požiadaviek a tiež ich export (CSV, GML)
  - Tester – Definovanie testovacích scenárov (počet simultánnych požiadaviek, trvanie testu, oneskorenie)

# WebTest v.2 - technológia

- Testovanie kvality (HTTP GET požiadavky)
  - Java, JSP, Dojo Toolkit, OpenLayers, JMeter, PostgreSQL, JFreeChart
- Testovanie validity (Súbor/URL)
  - SAXON-HE – XSLT, Xquery and XPath



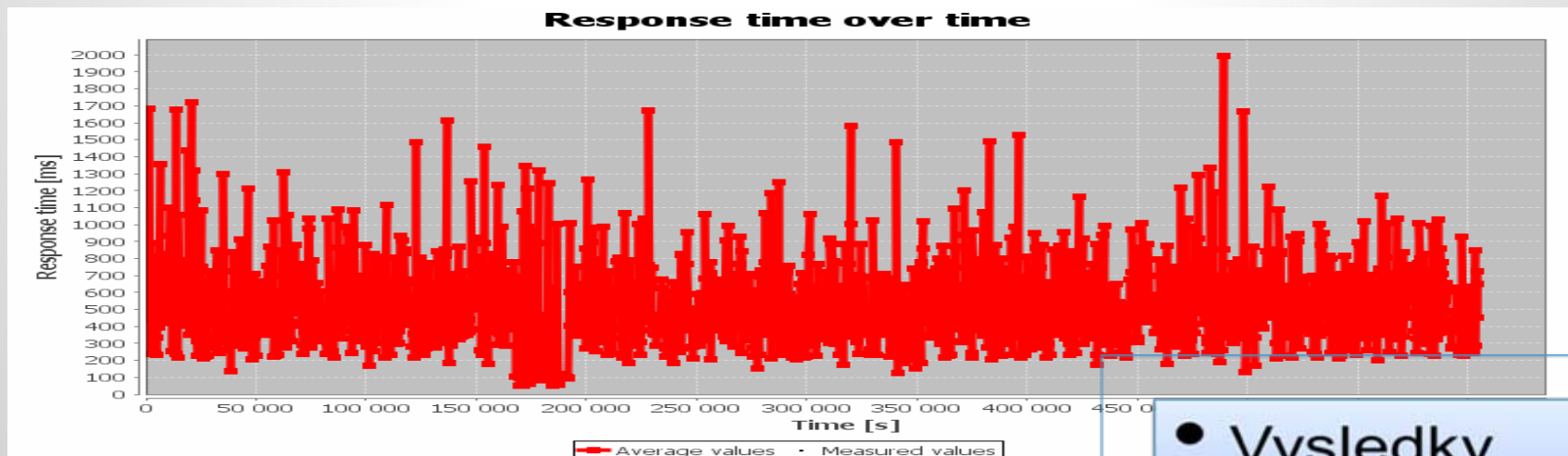
# Príklad aplikácie metodiky s využitím nástroja WebTest

- Testovaný systém – WMS, v.1.3.0 z ArcGIS server
- Požiadavky na testovanie - ATS
  - INSPIRE zobrazovacia služba - INS NS + TG VS 3.1
- Rozsah testovania
  - Kvalita služby
  - Rozhranie – operácie a parametre
- Testovacie scenáre
  - WebTest
- Realizácia testovania a reportovanie výsledkov
  - WebTest

# Kvalita služby - Výkonnosť

Pri 470 kilobajtovej snímke (napr. 800 × 600 pixlov s 8-bitovou hĺbkou farby) je čas odpovede na odoslanie počítačovej odpovede na požiadavku zobrazovacej služby "získať mapu" (Get Map) v bežnej situácii najviac 5 sekúnd. [INS NS]

- Scenár:  
WMS\_SAZP\_CHVU\_performance\_availability
  - 10 pož/hodinu počas 1 týždňa (1680 požiadaviek odoslaných)



## ● Výsledky

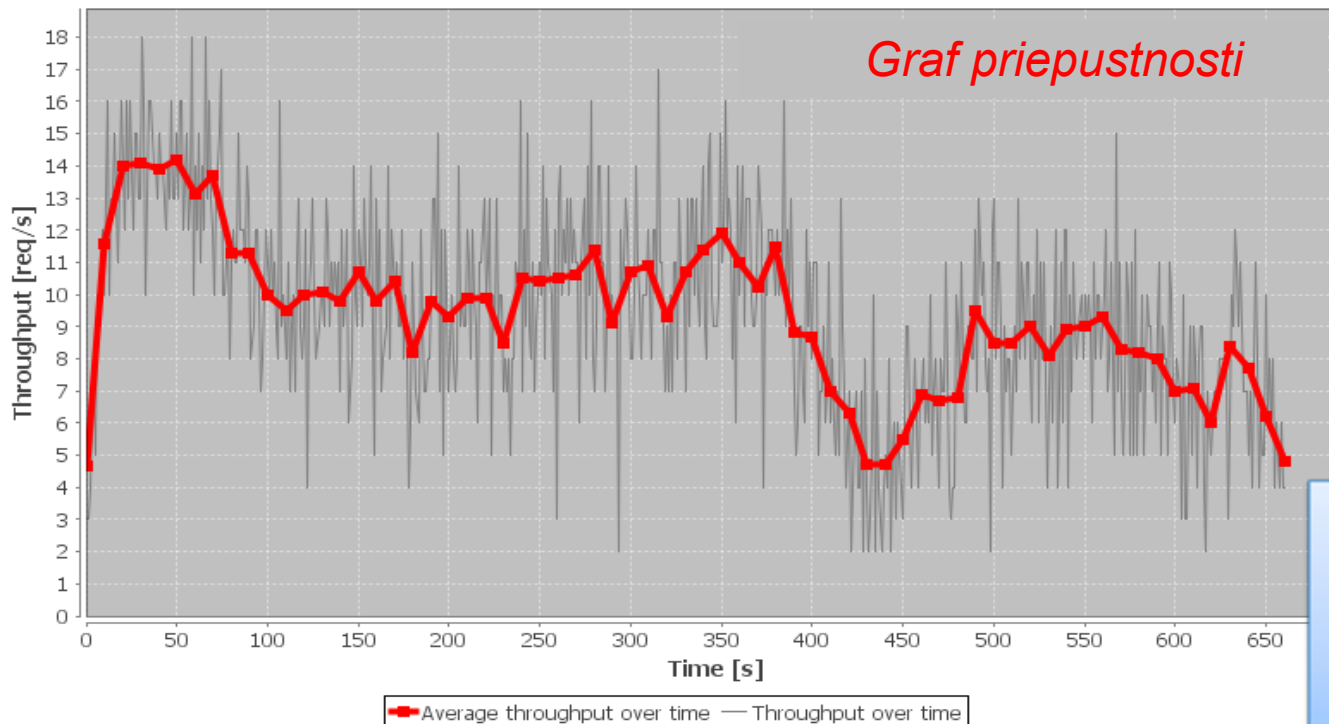
○  $\bar{X} = 0.522s$

# Kvalita služby – Kapacita 1/2

Minimálny počet simultánne vybavených požiadaviek na zobrazovaciu službu je 20 požiadaviek za sekundu na dosiahnutie naplnenia kvalitatívnych kritérií.. [INS NS]

- Scenár: WMS\_SAZP\_CHVU\_capacity
  - 20pož/s počas 10min (6222 požiadaviek odoslaných)

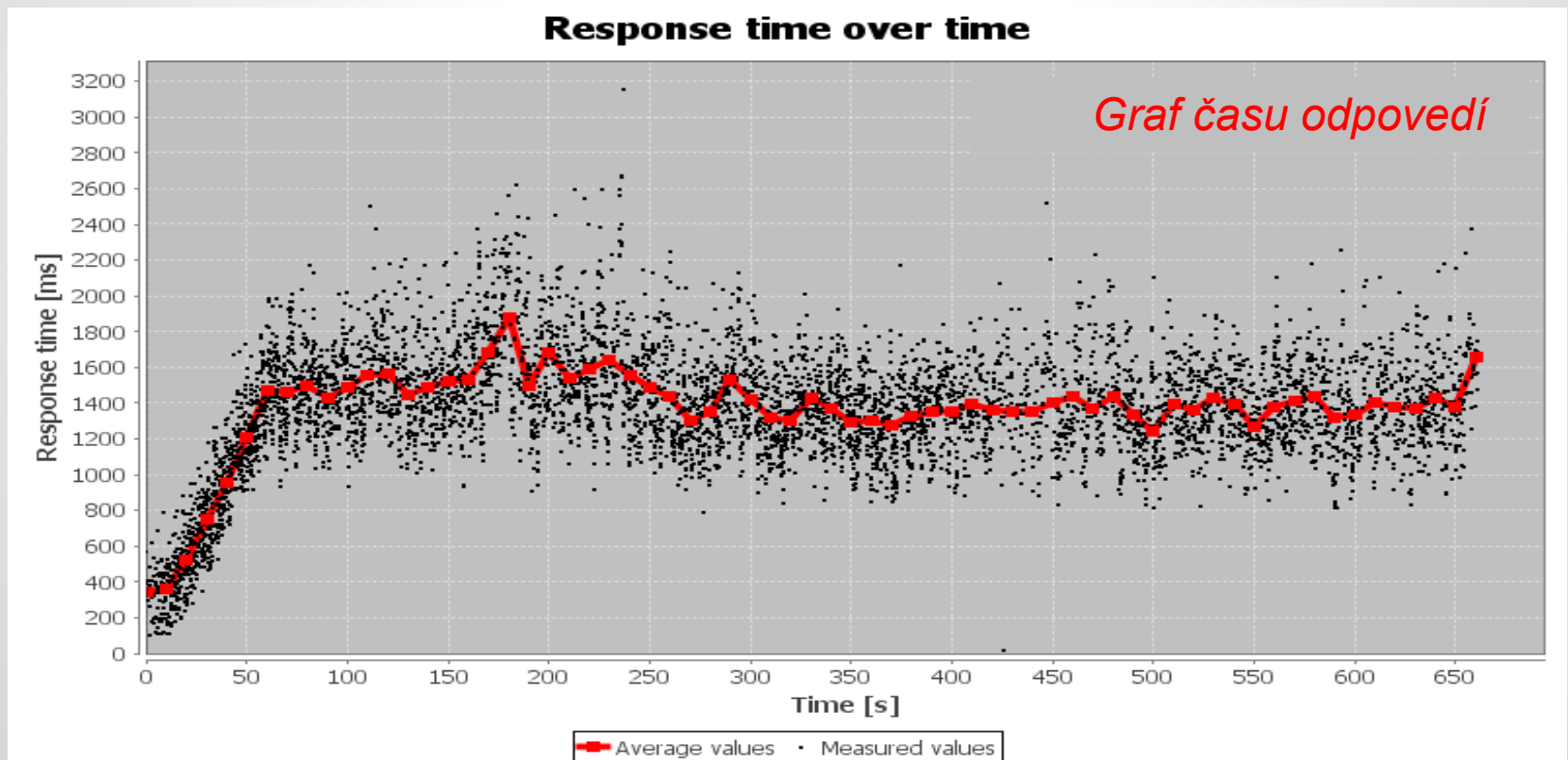
Throughput over time



- Results
  - $\bar{X} = 1.358s$
  - $r_{sec} = 9,42$

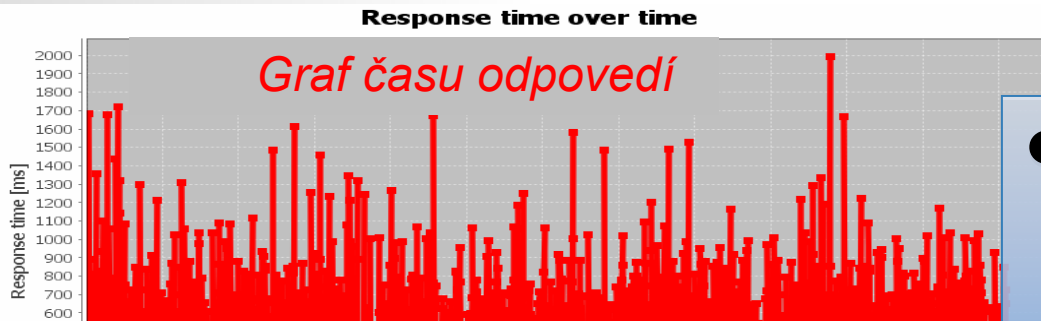
# Kvalita služby – Kapacita 2/2

- Scenár: WMS\_SAZP\_CHVU\_capacity
  - 20pož/s počas 10min (6222 požiadaviek odoslaných)



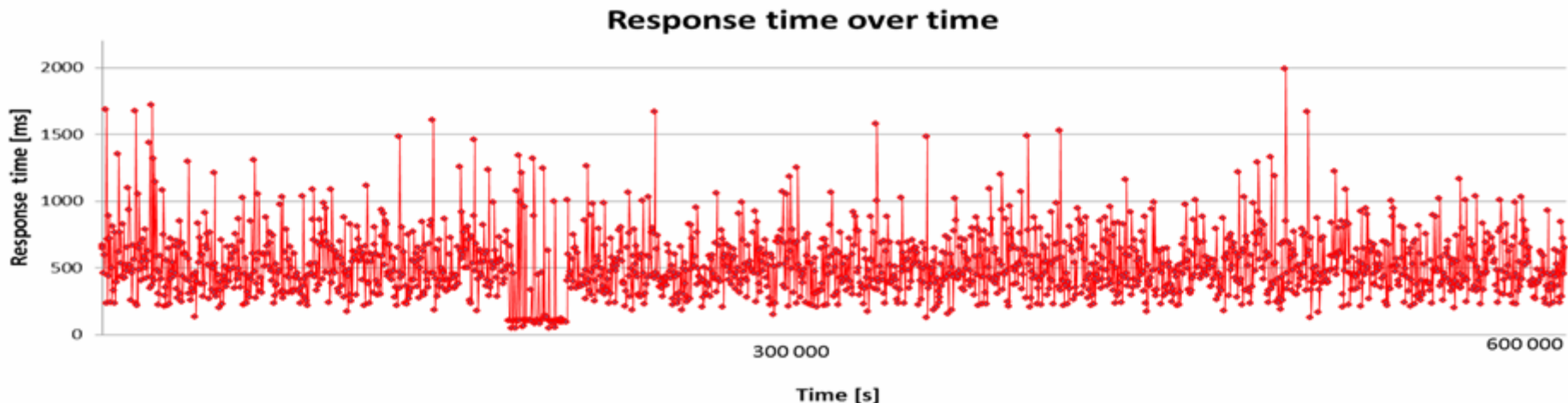
# Kvalita služby – Dostupnosť

- Scenario:  
WMS\_SAZP\_CHVU\_performance\_availability
  - 10 pož/hodinu počas 1 týždňa (1680 požiadaviek odoslaných)



## • Vysledky

- $r_{\text{succes}} = 1680$  (100%)





# Rozhranie služby

- Validácia obsahu odpovede na GetCapabilities
  - Testovací scenár: *INSPIRE view service - profile of ISO 19128*

WebTest user1














































Introduction

Validation

Available tests

New schematron


Upload Schematron

Test name	Description	Actions
INSPIRE Data Specifications - Bio-geographical regions spatial data theme	Schematron and XML schema for biogeographical regions generated by shapechange from UML model version 2.9	  
INSPIRE dataset - dev	todo	  
INSPIRE dataset&service metadata check	This Schematron define INSPIRE IR on metadata for datasets and services. Taken from the GeoNetwork trunk version.	  
INSPIRE dataset	todo	  
INSPIRE Discovery Service schema	Provides validation of OGC CSW GetCapabilities response against INSPIRE Discovery Service schema hosted at this URL: <a href="http://inspire.ec.europa.eu/schemas/inspire_ds/1.0/inspire_ds.xsd">http://inspire.ec.europa.eu/schemas/inspire_ds/1.0/inspire_ds.xsd</a>	  
INSPIRE download service - Atom	Test will provide a check of the Atom Implementation of Pre-defined Dataset.Download Service.	  
INSPIRE download service - WFS	Test will provide a check of the Web Feature Service (WFS - ISO 19142) Implementation of Pre-defined Dataset.Download Service.	  
INSPIRE metadata check - slovak	This Schematron define INSPIRE IR on metadata for datasets and services. Taken from the GeoNetwork trunk version.	  
INSPIRE view service - profile of ISO 19128	The base specification of an INSPIRE View Service relies on the [ISO 19128] International standard. An INSPIRE View Service shall implement the minimal mandatory behaviour of the [ISO 19128] service, extended with the extensions required by the INSPIRE Directive and the Implementing Rules for View services. An example of URL to be used in order to see what is expected is: <a href="http://npl.sazp.sk/arcgis/services/ing/chranene_uzemia/MapServer/WMSServer?request=GetCapabilities&amp;service=WMS">http://npl.sazp.sk/arcgis/services/ing/chranene_uzemia/MapServer/WMSServer?request=GetCapabilities&amp;service=WMS</a>	  
INSPIRE view service - profile of WMTS 1.1.0	This section specifies requirements and recommendations of an INSPIRE View Service Profile based on the OGC standard IOGC 07- 057r71 - Web Map Tile Service	  
INSPIRE View Service schema	Provides validation of INSPIRE View Service schema	  
ISO 19139 GMD XML Schema validation	Provides validation of ISO 19139 GMD XML Schema	  
ISO 19139 SRV XML Schema validation	Provides validation of ISO 19139 SRV XML Schema	  
template	Some description	  
TEST	Some description	  
WMS 1.3 Layers md check	This test checks if the WMS 1.3 Layers metadata is being tested	

**INSPIRE view service - profile of ISO 19128**

Type:

URL:





# Rozhranie služby

- Validácia obsahu odpovede na GetCapabilities
  - Výsledky časť A – validácia voči INSPIRE schéme

Schema validation results ([http://inspire.ec.europa.eu/schemas/inspire\\_vs/1.0/inspire\\_vs.xsd](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0/inspire_vs.xsd)):

Error count: 2

-  cvc-complex-type.2.4.a: Invalid content was found starting with element 'esri\_wms:GetStyles'. One of '{<http://www.opengis.net/wms>:\_ExtendedOperation}' is expected.
-  cvc-complex-type.2.4.a: Invalid content was found starting with element 'inspire\_common:SupportedLanguages'. One of '{<http://inspire.ec.europa.eu/schemas/common/1.0>:MetadataUrl, <http://inspire.ec.europa.eu/schemas/common/1.0>:ResourceLocator}' is expected.

Warning count: 0

- Výsledky časť B – root+extendedCapabilities+service MD

INSPIRE view service - profile of ISO 19128 - validation results:

- The WMS 1.3.0 namespace root element check results:
  -  XML is has a proper WMS 1.3.0 GetCapabilities response root element
- The INSPIRE view service extended capabilities element appearance check results:
  -  The element inspire\_vs:ExtendedCapabilities is present in XML Capabilities document
- View service metadata check results:
  -  Tested service does implement scenario 1 and provides its INSPIRE metadata record on this URL: <http://geo.enviroportal.sk/catalog-server/CSWStartup?service=CSW&request=GetRecordById&version=2.0.2&id=34e6b22d-2b73-4eb3-a1f8-6dde41c569a5&outputSchema=http://www.isotc211.org/2005/gmd&elementSetName=full>

# Rozhranie služby

- Validácia obsahu odpovede na GetCapabilities
  - Výsledky časť C – metadáta vrstiev

Layer number 1.

RESOURCE TITLE (TG VS 3.1 - 4.2.3.3.4.1 RESOURCE TITLE, page 33)

- 🔍 The title of the layer, used for human communication, for presentation of the layer e.g. in a menu
  - 🟢 Resource title of the layer is: VCHU

RESOURCE ABSTRACT (TG VS 3.1 - 4.2.3.3.4.2 RESOURCE ABSTRACT, page 33)

- 🔍 Narrative description of the layer
  - 🟢 Resource abstract is: VCHU

KEYWORD (TG VS 3.1 - 4.2.3.3.4.3 KEYWORD, page 34)

- 🔍 Additional Keywords describing the layer
  - 🔴 Layer does not provide keywords. ⚠️ Implementation Requirement 35 - Keywords shall be provided and mapped to the wms:KeywordList element

GEOGRAPHIC BOUNDING BOX (TG VS 3.1 - 4.2.3.3.4.4 GEOGRAPHIC BOUNDING BOX, page 34)

- 🔍 Minimum bounding rectangle in all supported Coordinate reference systems (CRS) of the area covered by layer
  - 🟢 Layer provides bounding box for: CRS:84 with values: minx= 16.6598940535731 miny= 47.6769361930721 maxx= 22.6186875444793 maxy= 49.7147158611705

UNIQUE RESOURCE IDENTIFIER (TG VS 3.1 - 4.2.3.3.4.5 UNIQUE RESOURCE IDENTIFIER, page 35)

- 🔍 The resource identifier code and its namespace.
  - 🟢 Layer identifier is: SK-SOPSR-VCHU within namespace: SK-SOPSR

NAME (TG VS 3.1 - 4.2.3.3.4.6 NAME, page 38)

- 🔍 The harmonised name of a layer for an INSPIRE spatial data theme as defined by implementing rules for interoperability of spatial data sets and services [INS DS].
  - 🟢 Layer Name is: VCHU

COORDINATE REFERENCE SYSTEMS (TG VS 3.1 - 4.2.3.3.4.7 COORDINATE REFERENCE SYSTEMS, page 39)

- 🔍 List of CRS in which the layer is available: CRS as defined in Annex I of the INSPIRE Directive
  - 🟢 Layer is available in the following CRS: CRS:84

STYLES (TG VS 3.1 - 4.2.3.3.4.8 STYLES, page 40)

- 🔍 List of rendering styles available for the layer. A style shall be composed of a title and a unique identifier
  - 🟢 Layer provides style with a name: VCHU and the Unique resource identifier: default

LEGEND URL (TG VS 3.1 - 4.2.3.3.4.9 LEGEND URL, page 41)

- 🔍 Location of the legend for each style, language and dimension pairs.
  - 🟢 Legend with dimensions: width= 76 and height= 16 and format: image/png has URL: [http://nipi.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?request=GetLegendGraphic%26version=1.3.0%26format=imagepng%26layer=VCHU](http://nipi.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?request=GetLegendGraphic%26version=1.3.0%26format=imagepng%26layer=VCHU)

DIMENSION PAIRS (TG VS 3.1 - 4.2.3.3.4.10 DIMENSION PAIRS, page 42)

# Rozhranie služby

- GetMap

- Povinné parametre požiadavky testované v rámci definície požiadaviek pre testovanie kvality služby

The screenshot displays a 'WMS Request Builder' interface. On the left, a form contains the following fields:

- URL: `s/services/ng/chrane_uzemia/MapServer/WMServer`
- Layer name: `VCHU`
- Version: `1.3.0`
- CRS/SRS: `EPSG:4326`
- Format: `image/png`
- Width: from `800` to `800`
- Height: from `600` to `600`
- Bounding Box: Left `16.6598940`, Right `22.6186875`, Top `49.7147158`, Bottom `47.6769361`
- Styles: (empty)
- Exceptions: (empty)
- Transparent: `true`
- Scale: map units `Degrees (4374)`, DPI `96`, from `391024` to `782048`
- Request count: `10`
- Buttons:  Display Map,  Display Icons, **BUILD REQUESTS**

The main map area shows a geographical map with several overlapping blue rectangular bounding boxes. Below the map, a list of generated requests is shown, with the second one highlighted by a red box:

- [http://nicip.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=49.06047150887956,21.239559957204474,49.712960097175326,22.10954474159883&STYLES=&EXCEPTIONS=&TRANSPARENT=true](http://nicip.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=49.06047150887956,21.239559957204474,49.712960097175326,22.10954474159883&STYLES=&EXCEPTIONS=&TRANSPARENT=true)
- [http://nicip.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.65190070518254,18.98834756010897,49.31478295643582,19.872190580446672&STYLES=&EXCEPTIONS=&TRANSPARENT=true](http://nicip.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.65190070518254,18.98834756010897,49.31478295643582,19.872190580446672&STYLES=&EXCEPTIONS=&TRANSPARENT=true)
- [http://nicip.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.718706054333126,16.919788557838544,49.65880496144248,18.172987100451017&STYLES=&EXCEPTIONS=&TRANSPARENT=true](http://nicip.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.718706054333126,16.919788557838544,49.65880496144248,18.172987100451017&STYLES=&EXCEPTIONS=&TRANSPARENT=true)
- [http://nicip.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.54511832914408,19.196455934932626,49.50898763230532,20.48161500581428&STYLES=&EXCEPTIONS=&TRANSPARENT=true](http://nicip.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.54511832914408,19.196455934932626,49.50898763230532,20.48161500581428&STYLES=&EXCEPTIONS=&TRANSPARENT=true)
- [http://nicip.sazp.sk/arcgis/services/ng/chrane\\_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.386574954000864,19.3788869756976007,49.230540198461195,20.504290082922118&STYLES=&EXCEPTIONS=&TRANSPARENT=true](http://nicip.sazp.sk/arcgis/services/ng/chrane_uzemia/MapServer/WMServer?REQUEST=GetMap&SERVICE=WMS&LAYERS=VCHU&VERSION=1.3.0&CRS=EPSG:4326&FORMAT=image/png&WIDTH=800&HEIGHT=600&BBOX=48.386574954000864,19.3788869756976007,49.230540198461195,20.504290082922118&STYLES=&EXCEPTIONS=&TRANSPARENT=true)

On the right side, a zoomed-in view of the map shows green outlines of land parcels.

# Možnosti a plány do budúcnosti...

- Ďalší vývoj na WebTest podľa navrhnutých požiadaviek (UC diagram, snímka 9)
- Ďalší vývoj na schematronových pravidlách
  - Zobrazovacia služba – WMTS 1.1.0 profil
  - Ukladacia služba – WFS a Atom profily
  - Dátové špecifikácie – Annex I-III
- INSPIRE - maintenance and implementation
  - Požiadavky konformity kominácií INSPIRE komponent
  - Sieťové služby (Update TG + IOC Support)
  - Údajové špecifikácie (INSPIRE Registry)
- IPI & Geoportálové prepojenia (EU, SK)
- Persistent Test Bed (rozšírenie SK participácie)
  - [Phase 3 - Call for Participation: Authenticated Access to European Spatial Data Sets](#) (Closing date: July 1st, 2012; Phase 3 runtime: Mid-2012 to mid-2013)



***Ďakujeme pekne za  
pozornosť!***

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<http://geo.vm.stuba.sk:8080/webtest>

