

# Validating TAP Services with taplint

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# Outline

- Validation: what, why and how
- Taplint description
- Taplint example/demo

## Context: Service Compliance

There are lots of (TAP and other) services operating in the VO

Not all of them operate perfectly

- Implementation bugs
- Errors in input data
- Out of date with respect to standards
- Incomplete implementations (limited effort)
- Poorly-written/unimplementable standards
- ...

This can cause problems for service consumers

- Poor user experience
- More effort for client software developers

# Validation: What and Why

## What is validation?

- Run a series of automated tests to assess compliance of services with standards
- All VO standards\* should have validation tools
  - ▷ Required by IVOA [Document Standards](#) specification
  - ▷ Monitored by the Operations IG (see [IvoaValidatorsSummary](#) wiki page)

## Why should service operators validate their services?

- Find out what's compliant and what's not
- Enable to improve service compliance
- Provide a good experience for service users
- Central validators do validate registered services (TAP, SCS, SIA, SSA)
  - ▷ They *may* contact you with issues, but it's a best-efforts service
  - ▷ Better to address issues early (pre-registration), only operators can make the fixes

\* where applicable

# Validation: How

## General validation guidelines:

- It's an iterative process like debugging
  - ▷ Fixing one issue may cause others to appear or disappear
- May require interaction with validator providers
  - ▷ Failures can be complex, might need explanation not obvious from validator output
- Validation errors are not always in the validated service
  - ▷ Sometimes the validators have bugs
  - ▷ Sometimes the standards need correction or clarification (→ document errata or updates)
- Validate often
  - ▷ Once valid doesn't mean always valid — new data, software upgrades, standards changes etc can introduce new problems
  - ▷ Consider running validation as part of service deployment process
- Don't rely too heavily on validators
  - ▷ Validators can't test everything — no error reports doesn't guarantee your service is perfect
  - ▷ Some services have multiple validators — you can look at results from several
  - ▷ Do your own testing too
- Address reported errors/warnings!
  - ▷ ... but sometimes 100% compliance is not feasible
  - ▷ Main criterion: provide a good user experience

## Validator for TAP services

- Part of [STILTS](#) package

## Usage:

- Point it at a TAP URL, it runs tests and tells you what's not compliant or looks questionable
- You can run it from the command line, output to stdout
  - ▷ Just requires Java and [stilts.jar](#)  
(`java -jar stilts.jar taplint tapurl=http://example.com/tap`)
- It is also the basis of TAP validation provided by other services (there's currently only one TAP validator)
  - ▷ These may use older taplint versions

## Functionality:

- Tries to test lots of things, including many protocols
  - ▷ TAP, UWS, VODataService, ADQL, VOResource, VOSI, TAPRegExt, DALI, VOTable, UCD, VOUnits, ObsCore, ObsLocTAP, EPN-TAP, HTTP, ...
- ... but can't test everything
- Reports Error and Warning messages for incorrect/suspicious behaviour
- Reports Info messages to summarise service behaviour and tests run

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*"Taplint? Our best friend!"  
— Alberto Micol, this meeting*

# Example

This is STILTS taplint, 3.4/308a680 (2021-01-11)

Static report types: ERROR(141), WARNING(57), INFO(25), SUMMARY(9), FAILURE(23)

Section TMV: Validate table metadata against XML schema

I-TMV-VURL-1 Validating <http://vlkb.neanias.eu:8080/vlkb/tap/tables> as tableset (<http://www.ivoa.net/xml/VODataService/v1.1>)

E-TMV-BBUE-1 (1.295, c.56): cvc-complex-type.2.2: Element 'dataType' must have no element [children], and the value must be valid.

E-TMV-BBUE-2 (1.1876, c.56): cvc-complex-type.2.2: Element 'dataType' must have no element [children], and the value must be valid.

E-TMV-BBUE-3 (1.1892, c.56): cvc-complex-type.2.2: Element 'dataType' must have no element [children], and the value must be valid.

E-TMV-BBUE-x (27 more)

S-TMV-VALI-1 SAX report: warnings 0, errors 60, fatal 0

Section TME: Check content of tables metadata from /tables

I-TME-CURL-1 Reading capability metadata from <http://vlkb.neanias.eu:8080/vlkb/tap/capabilities>

I-TME-TURL-1 Reading table metadata from <http://vlkb.neanias.eu:8080/vlkb/tap/tables>

E-TME-CRSV-1 Column name is ADQL reserved word 'distance' in table compactsources.sed\_view\_final - should delimit like '"distance"'

E-TME-CRSV-2 Column name is ADQL reserved word 'area' in table filaments.branches - should delimit like '"area"'

...

- Messages are structured (grep-friendly) 1-line reports with format **T-SSS-MMMM-N aaaaa**:

**T** : 1-character status: [E]rror/[W]arning/[I]nfo/[S]ummary/[F]ailure

**SSS** : 3-character reporting stage identifier

**MMMM** : 4-character code for exact message type

**N** : repeat count for repeated **T-SSS-MMMM**

**aaaaa**: free-form text giving all available detail

- Output intended to be read by humans
- Manageable length (repeated messages filtered out)
- *Tries* to give as much info as possible
- Logs queries as well as reporting errors where possible/practical to aid reproducibility
- Options available for truncating long lines, filtering messages, restricting tests, JSON output, etc



# Tests

## Test stages performed:

- TMV:** Validate /tables endpoint against VODataService schema
- TME:** Check content /tables endpoint for consistency
- TMS:** Check form and content of TAP\_SCHEMA tables
- TMC:** Compare table metadata from /tables and TAP\_SCHEMA
- UUC:** Check column UCDs and VOUnits
- CPV:** Validate /capabilities endpoint against TAPRegExt schema
- CAP:** Check content of /capabilities endpoint
- AVV:** Validate /availability endpoint against VOSI schema
- QGE:** Make example ADQL queries in sync GET mode
- QPO:** Make example ADQL queries in sync POST mode
- QAS:** Make example ADQL queries in async mode
- UWS:** Test asynchronous UWS/TAP behaviour
- MDQ:** Check table query result columns against declared metadata
- OBS:** ObsCoreDM data model
- LOC:** ObsLocTAP data model
- EPN:** EPN-TAP data model
- UPL:** Make example queries with table uploads
- EXA:** Examples document

# Capabilities

## Strengths:

- Tests all columns in all tables
- Metadata tests (consistency between TAP\_SCHEMA & /tables endpoint, ObsCore & ObsLocTAP DMs)
- Job submission tests (synchronous, asynchronous, UWS job control)
- Basic ADQL syntax and semantics (select columns, see if they are present and correct)
- TAPRegExt record tested if present
- Output VOTable syntax checked carefully (**votlint**)

## Weaknesses:

- Not very complicated ADQL queries
- Tests only service, not registration
- Can't be comprehensive
- Documentation/messages sometimes incomplete or inscrutable
- No doubt has bugs!

# Demo

```
java -jar stilts.jar taplint tapurl=http://vlkb.neanias.eu:8080/vlkb/tap truncate=150
```

*(thanks Marco)*

# Availability

- Download:

stable: <http://www.starlink.ac.uk/stilts/>

latest: <http://andromeda.star.bris.ac.uk/releases/stilts/pre/stilts.jar>

- Documentation:

STILTS manual: <http://www.starlink.ac.uk/stilts/sun256/taplint.html>

(but some output may require explanation from me, or examining the [source code](#))

- Support

- Questions always welcome by email: [m.b.taylor@bristol.ac.uk](mailto:m.b.taylor@bristol.ac.uk)
- Updates/improvements/bugfixes will be made as required between STILTS releases
- Find me this meeting (e.g. [gather.town](#)) and I'll help run it on your service!