Using NVDL with XML Signatures

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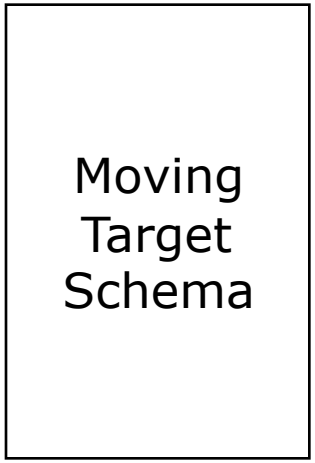
What is NVDL?

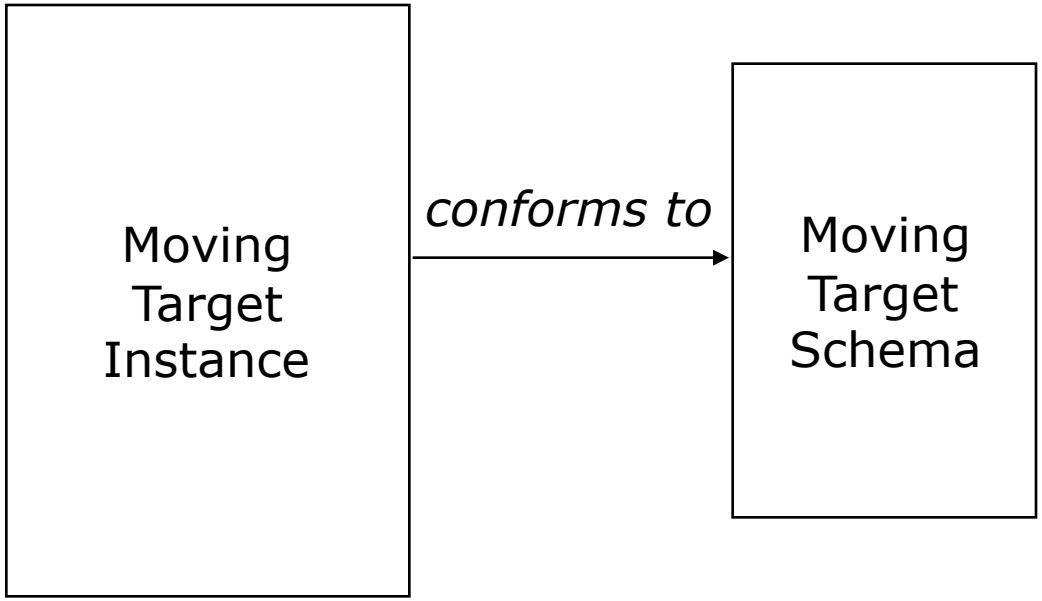
- NVDL = Namespace-based Validation Dispatching Language
- NVDL is an XML technology
- NVDL is an ISO standard
- NVDL enables you to independently develop data, then assemble the data into a single document, and then validate that compound document

Example

Scenario:

You've created an XML Schema to track moving targets

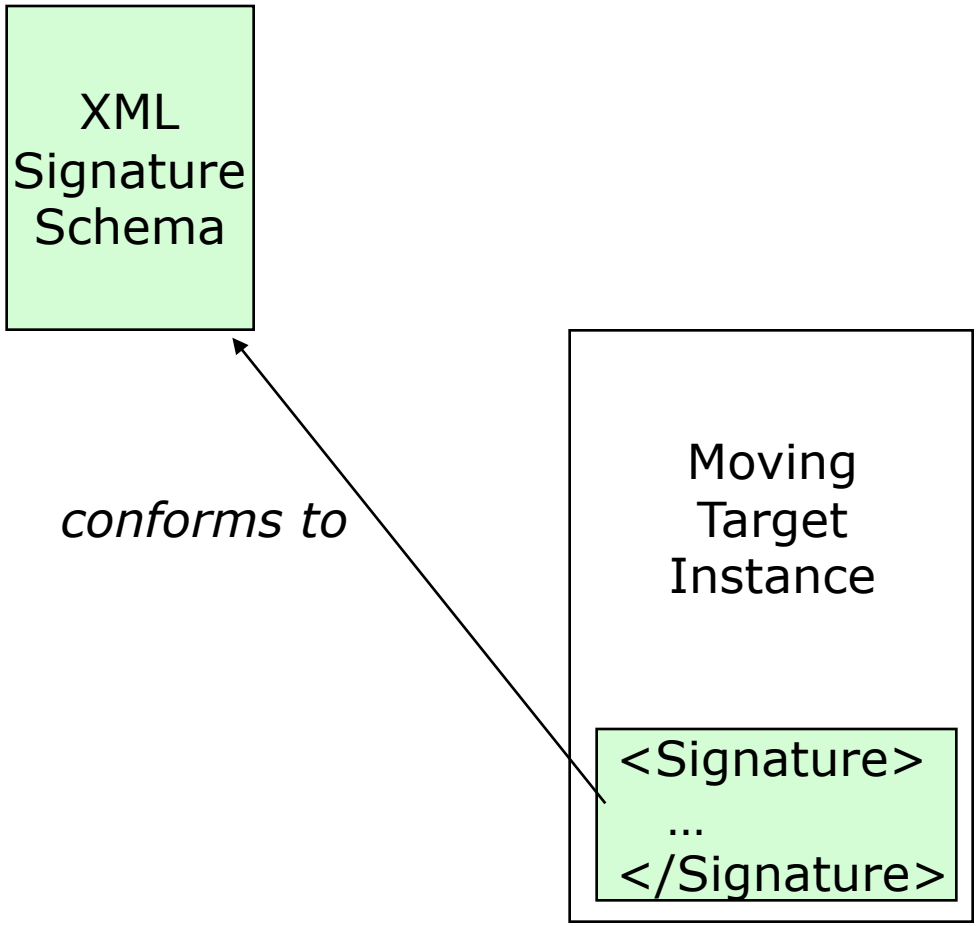

Moving
Target
Schema


Moving
Target
Instance
conforms to
Moving
Target
Schema

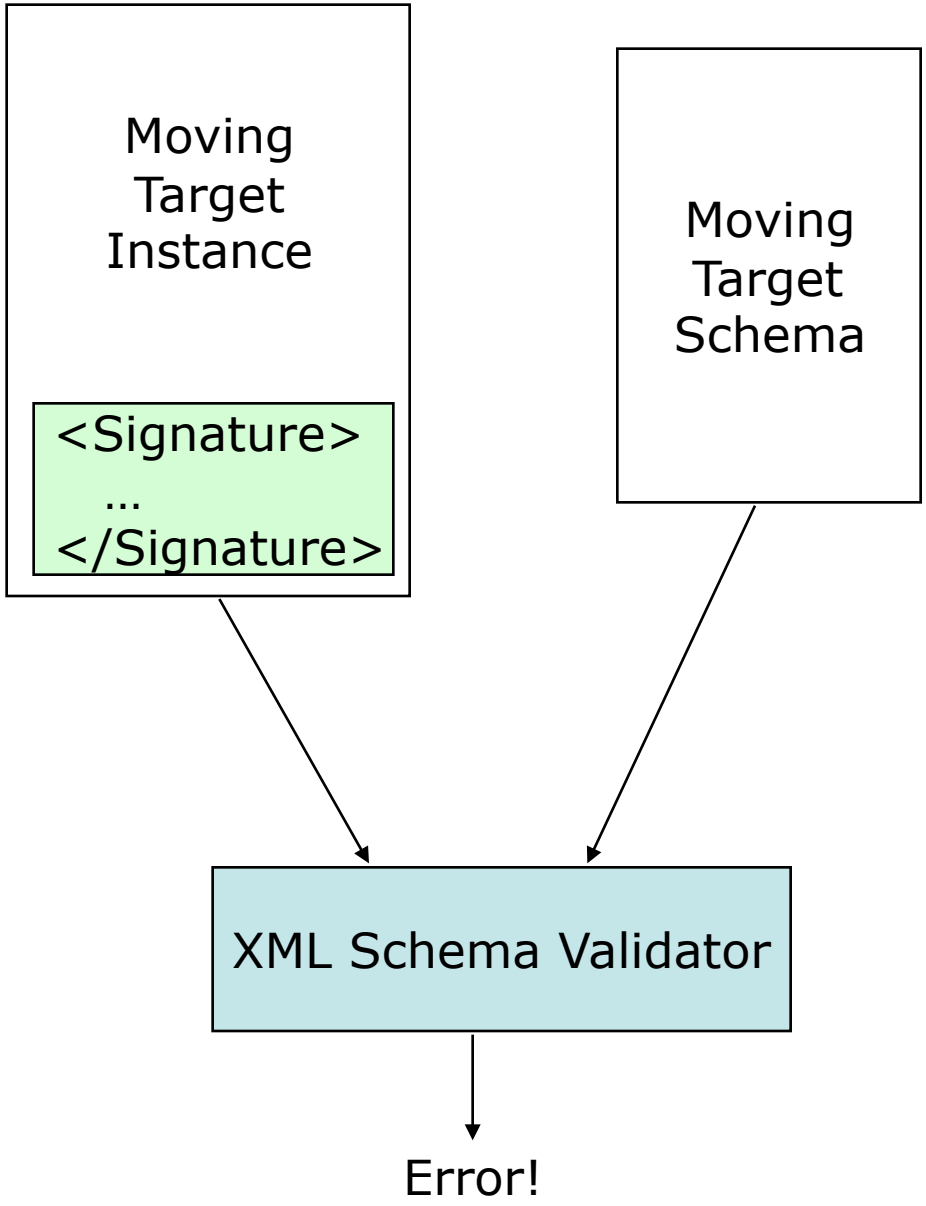
Later, you decide that you want to embed* an XML signature into the instances

* Enveloped XML Signature

xmldsig-core-schema.xsd

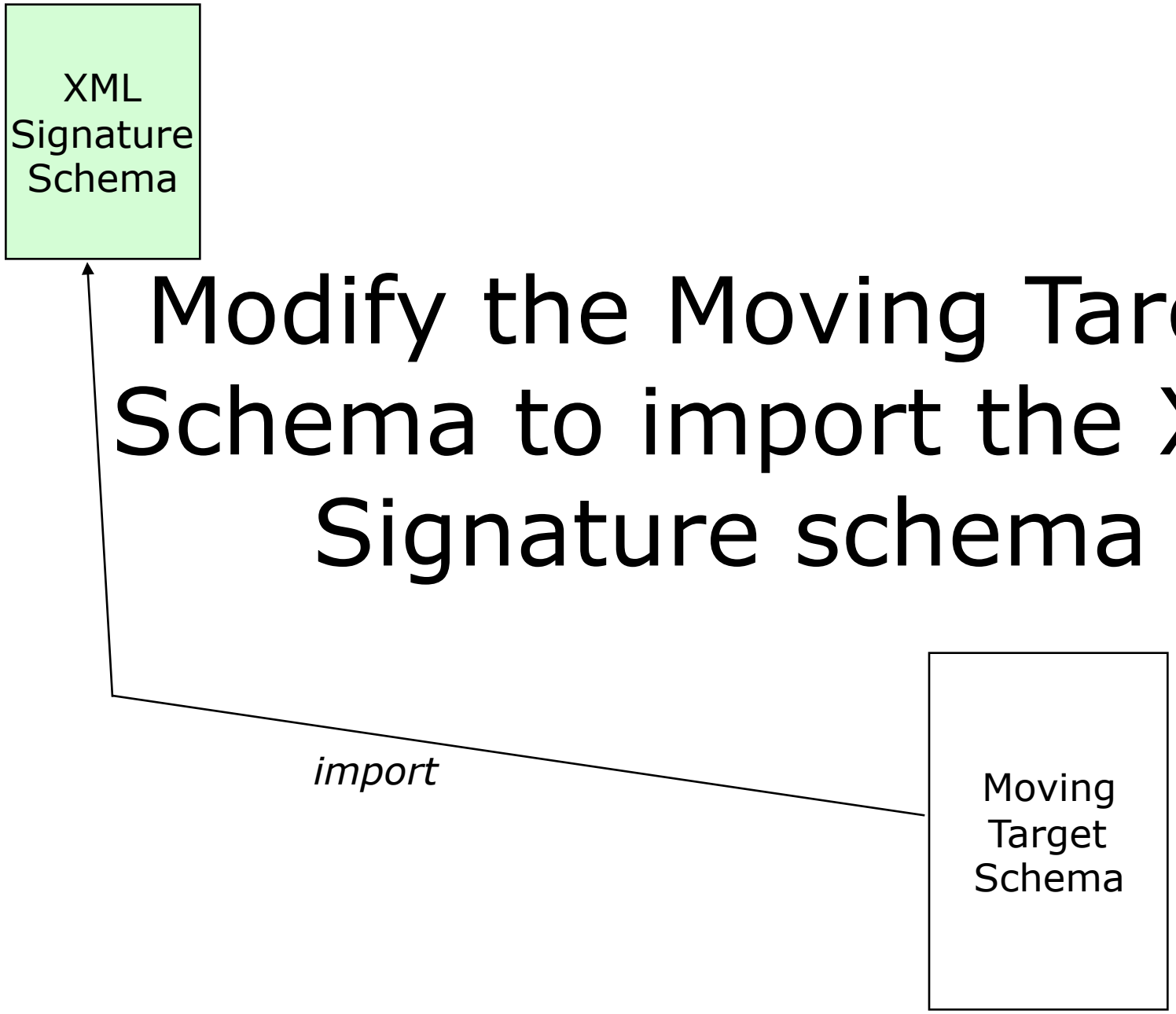


If the author of the Moving Target Schema didn't anticipate the use of XML Signatures …


Moving
Target
Instance
<Signature>
...
</Signature>
Moving
Target
Schema
XML Schema Validator
Error!

A solution?

Modify the Moving Target Schema to import the XML Signature schema

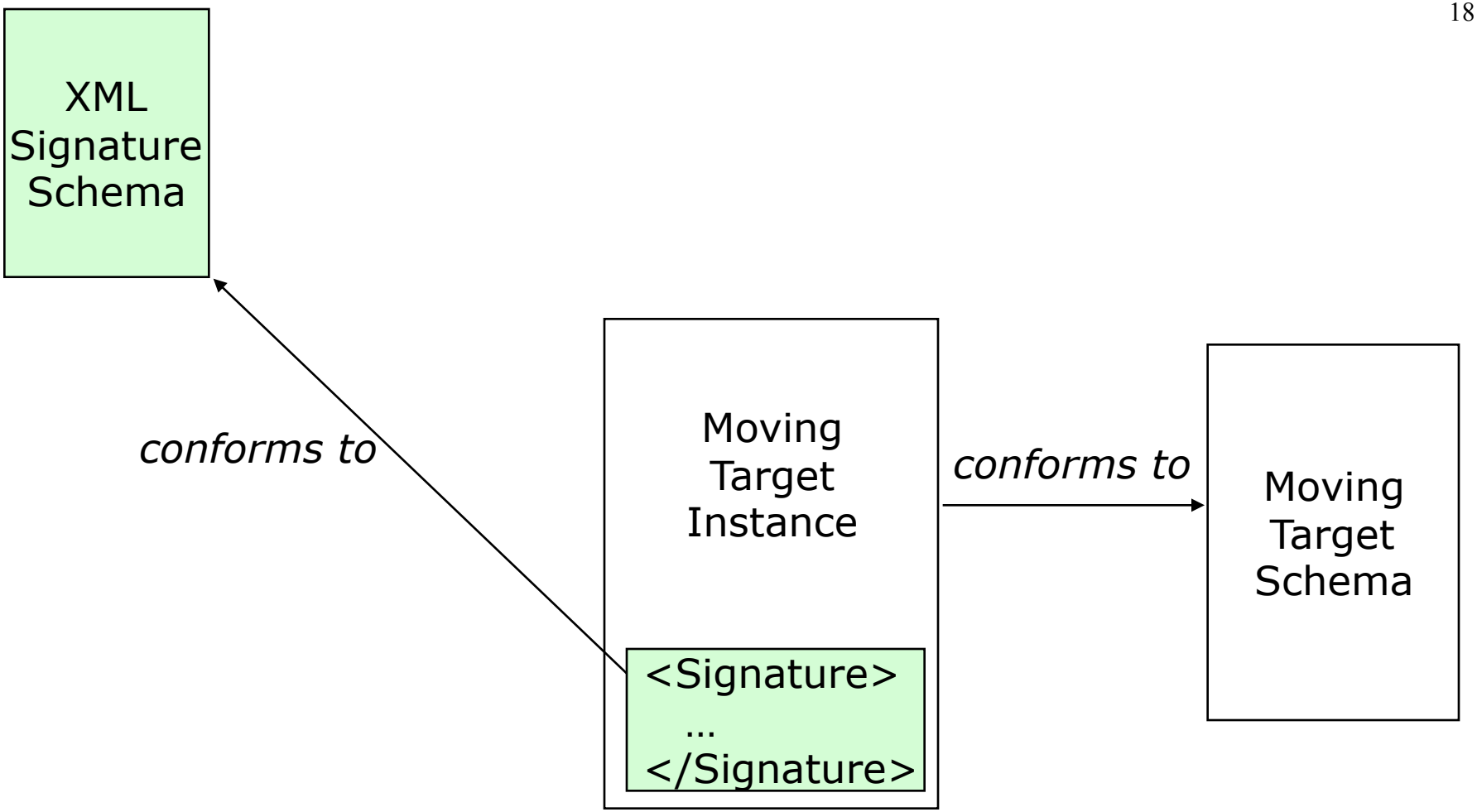


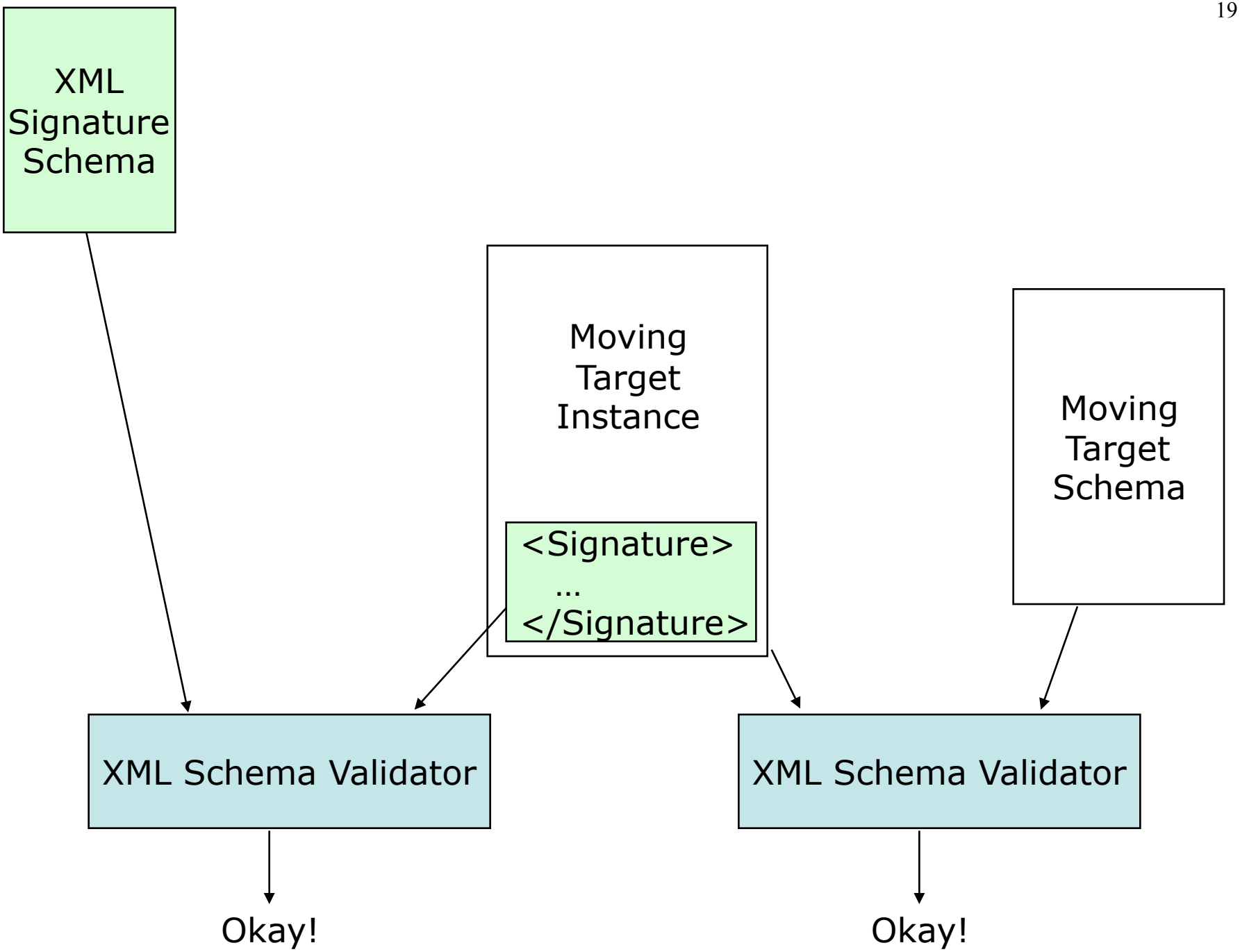
Two problems with this solution →

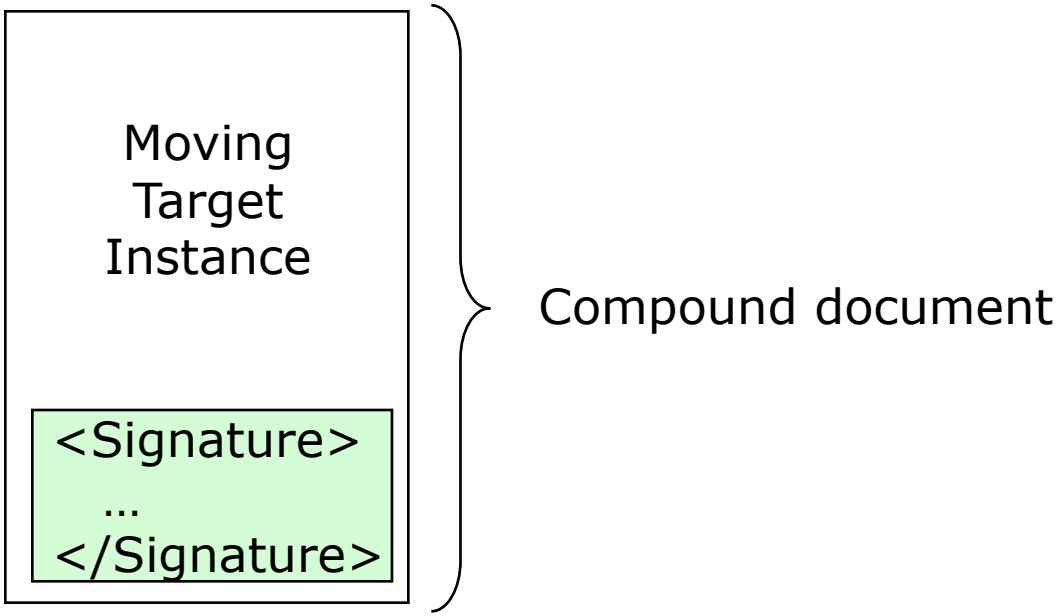
Tightly coupled schemas: you have to modify Moving Target Schema to import the XML Signature Schema and you have to insert an element declaration that references an element or type within the XML Signature schema. If at a later date you no longer want to use XML Signature, or you want it nested at a different location within your documents, then you will have to remove/alter your schema.

Doesn't scale: after XML Signature you may need to add Dublin Core (metadata), security markings, encryption, and so forth. You will find yourself in constant XML Schema update mode. ($$$)

A nice solution →

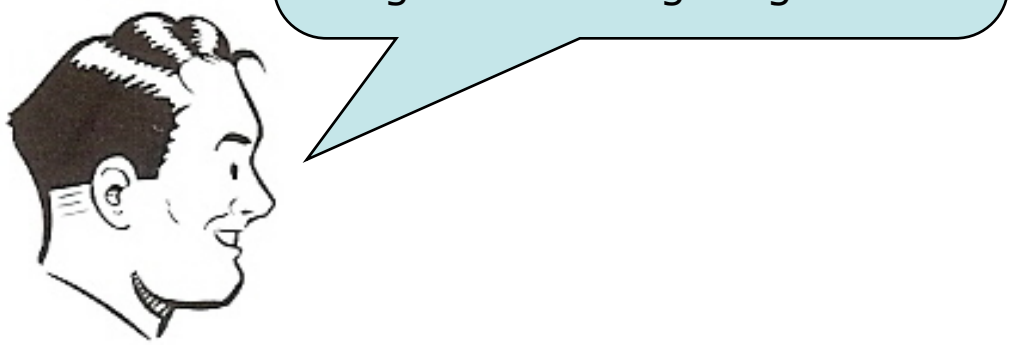

XML
Signature
Schema
conforms to
Moving
Target
Instance
<Signature>
...
</Signature>
conforms to
Moving
Target
Schema

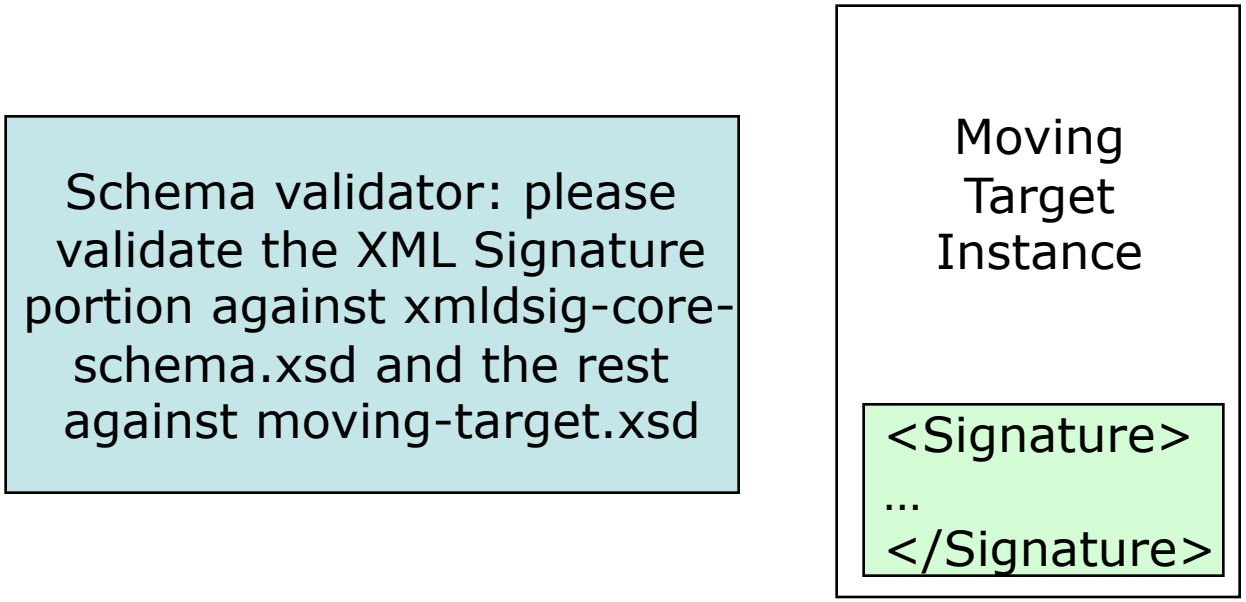

XML
Signature
Schema
Moving
Target
Instance
<Signature>
...
</Signature>
Moving
Target
Schema
XML Schema Validator
XML Schema Validator
Okay!
Okay!

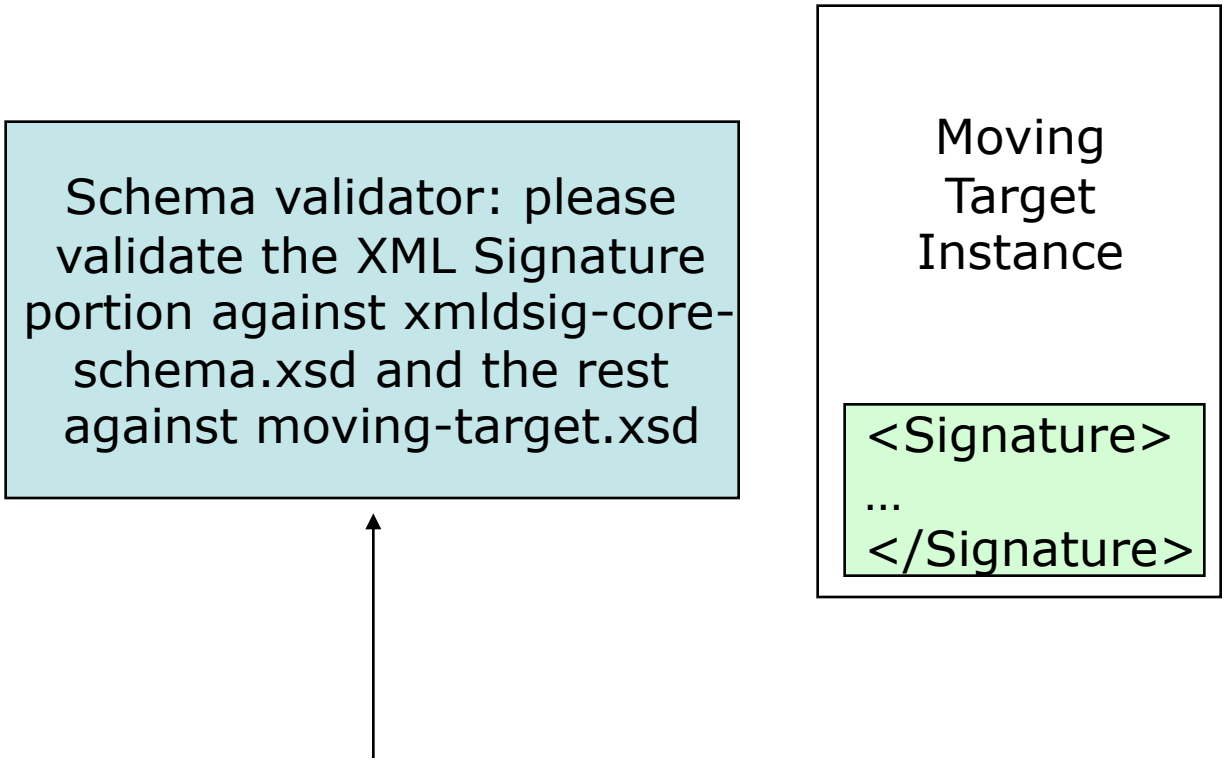

Moving
Target
Instance
<Signature>
…
</Signature>
Compound document

Moving
Target
Instance

<Signature>
…
</Signature>

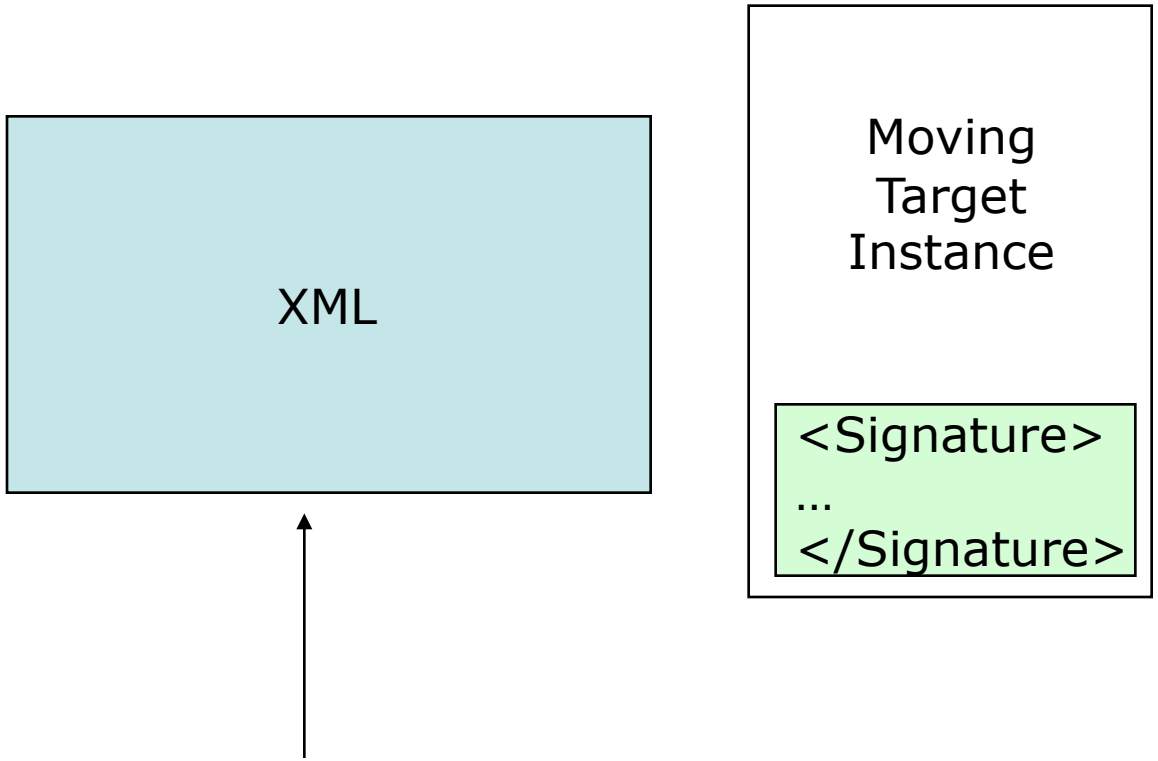



Schema validator: please validate the XML Signature portion against xmldsig-core-schema.xsd and the rest against moving-target.xsd
Moving Target Instance
<Signature>
…
</Signature>

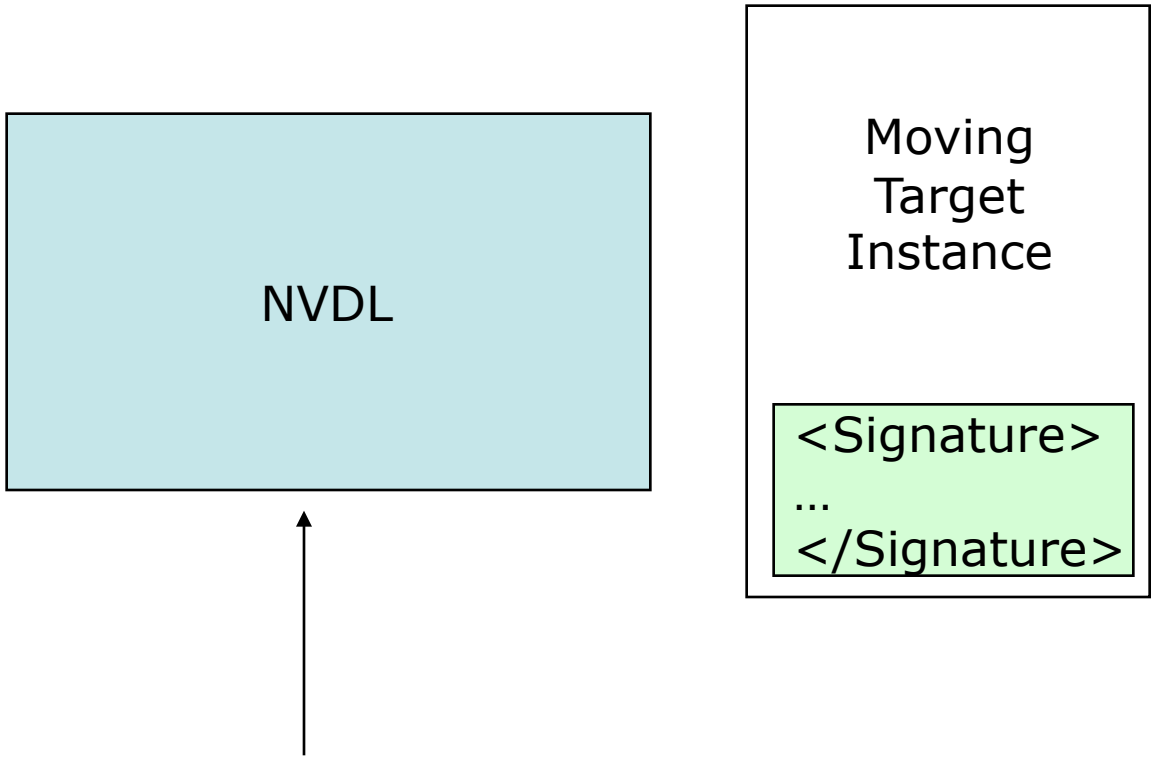


English prose isn't very good for machines. Want to express this in a way that is good for machines.

XML!



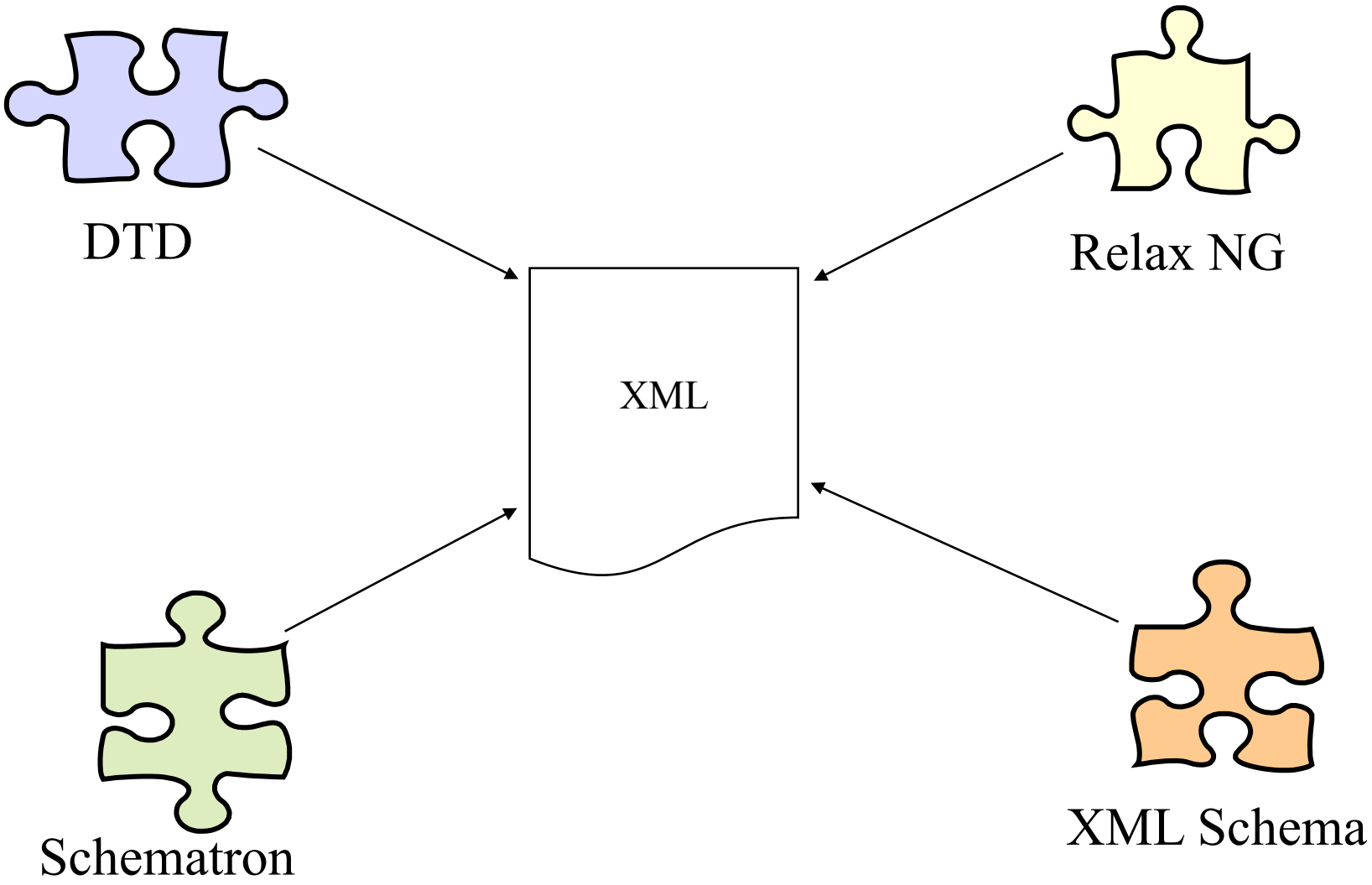
Need a standardized XML vocabulary



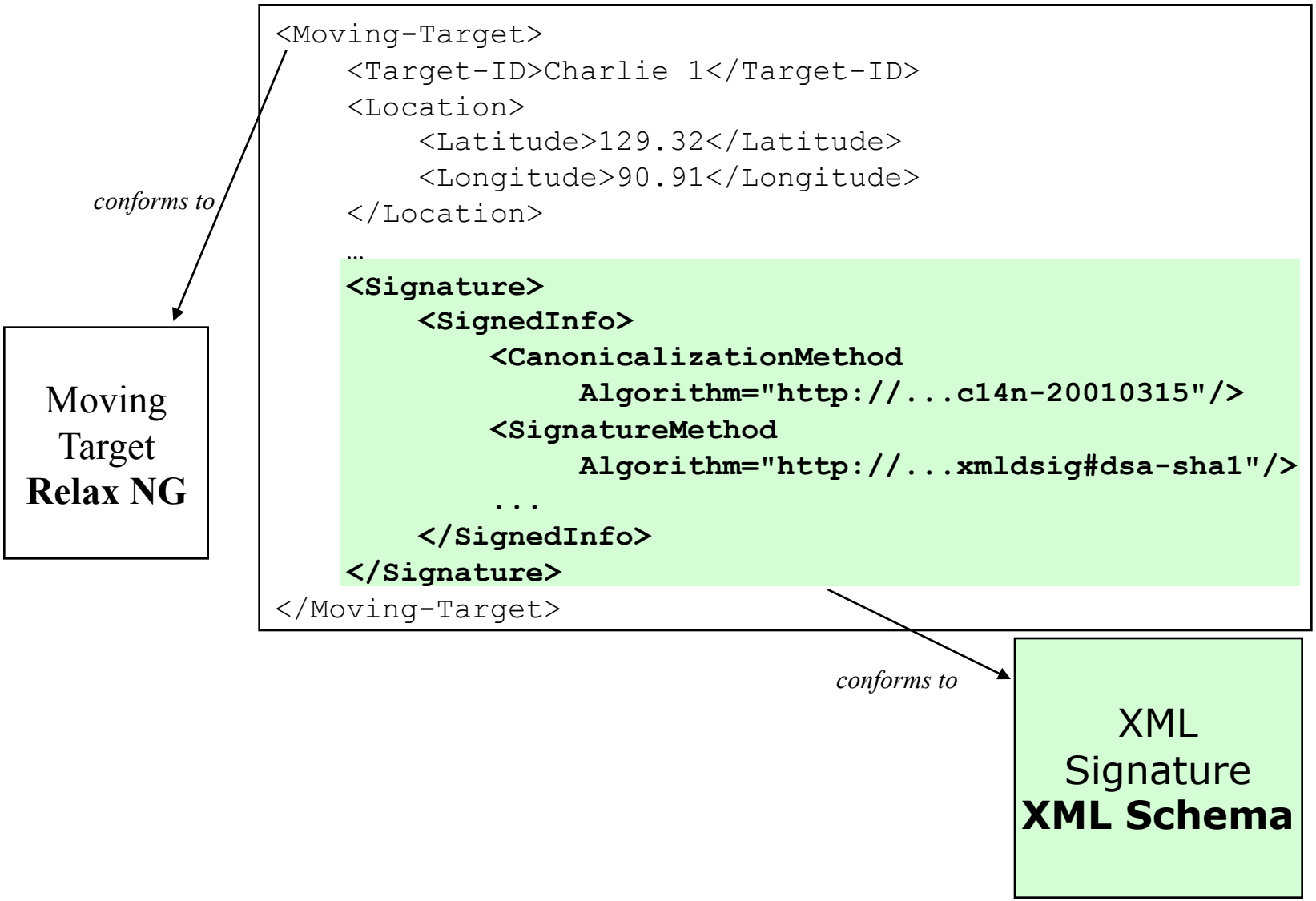
NVDL is a standardized XML vocabulary for expressing how the instance document should be "sectioned" and how each section should be validated

A Few Details

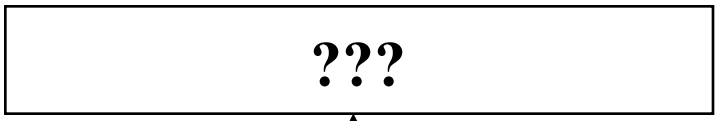
Schema-Neutral Assembly of Data Components



Schema-Neutral Assembly of Data Components



The Whole Document Conforms to ???



conforms to

Each individual data component conforms to a schema, but what does the whole document conform to?

```
<Moving-Target>
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
    <Signature>
        <SignedInfo>
            <CanonicalizationMethod
                Algorithm="http://...c14n-20010315"/>
            <SignatureMethod
                Algorithm="http://...xmldsig#dsa-sha1"/>
            ...
        </SignedInfo>
    </Signature>
</Moving-Target>
```

Meta-Schema

- What is needed is a meta-schema.
- A meta-schema specifies the schemas that may be collectively used to create an XML instance document. Thus, a meta-schema is a schema for schemas.

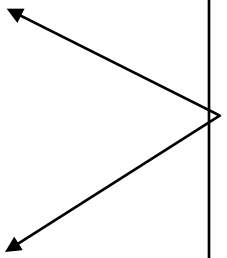
NVDL is a Meta-Schema Language

- With NVDL you can make statements like this:

  The XML instance document must be comprised of an Moving Target Data Component and an XML Signature Data Components.

Data Components are Identified by their Namespace

```
<Moving-Target xmlns="http://www.dod.gov/moving-target#">
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
        <SignedInfo>
            <CanonicalizationMethod
                Algorithm="http://...c14n-20010315"/>
            <SignatureMethod
                Algorithm="http://...xmldsig#dsa-sha1"/>
            ...
        </SignedInfo>
    </Signature>
</Moving-Target>
```



These namespace declarations enable an NVDL processor to partition (section) this XML instance document

NVDL Processor "Sections" the XML Instance Document

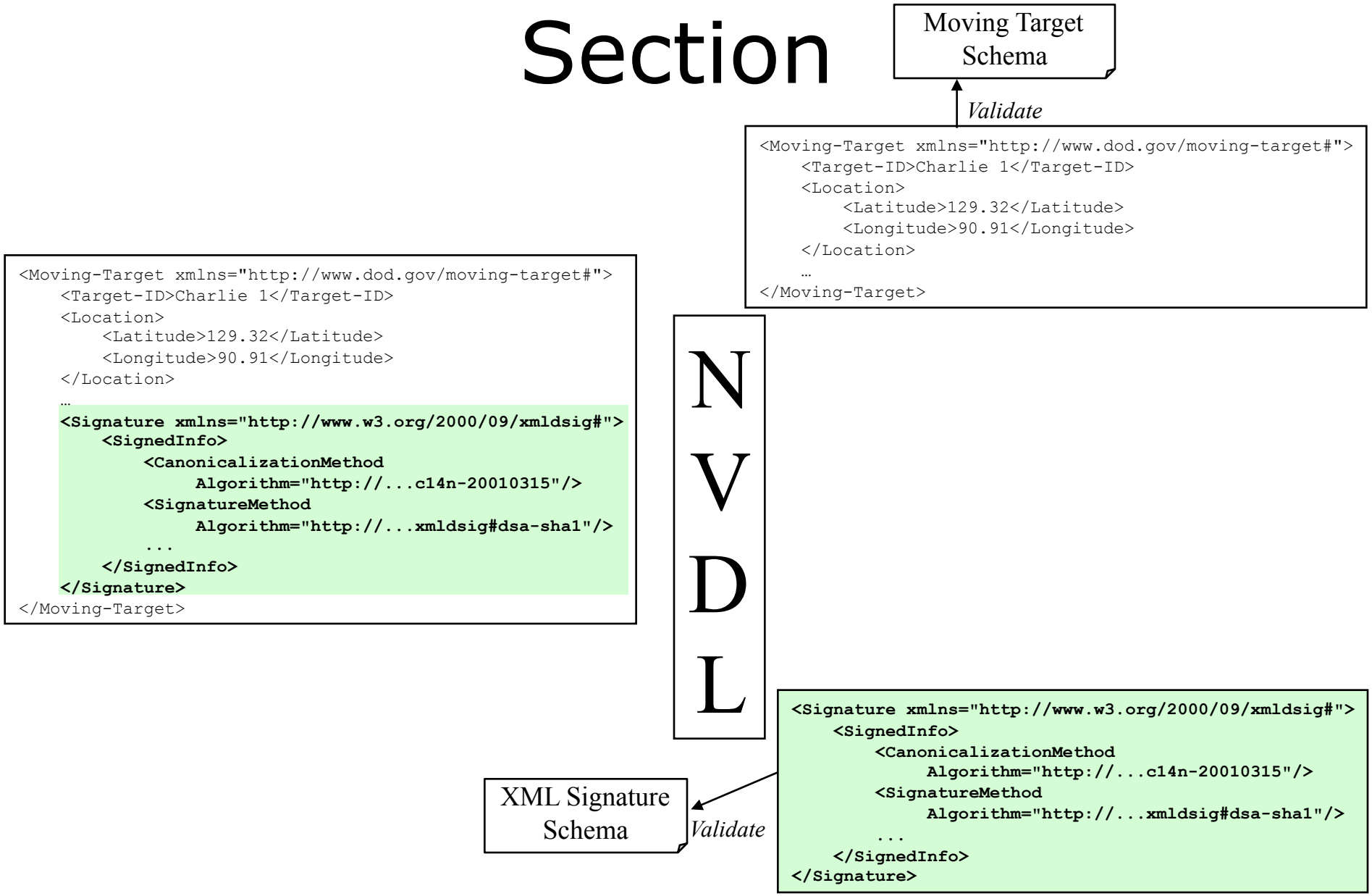
```
<Moving-Target xmlns="http://www.dod.gov/moving-target#">
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
        <SignedInfo>
            <CanonicalizationMethod
                Algorithm="http://...c14n-20010315"/>
            <SignatureMethod
                Algorithm="http://...xmldsig#dsa-sha1"/>
            ...
        </SignedInfo>
    </Signature>
</Moving-Target>
```

N V D L

```
<Moving-Target xmlns="http://www.dod.gov/moving-target#">
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
</Moving-Target>
```

```
<Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
    <SignedInfo>
        <CanonicalizationMethod
            Algorithm="http://...c14n-20010315"/>
        <SignatureMethod
            Algorithm="http://...xmldsig#dsa-sha1"/>
        ...
    </SignedInfo>
</Signature>
```

… and then Validates each Section

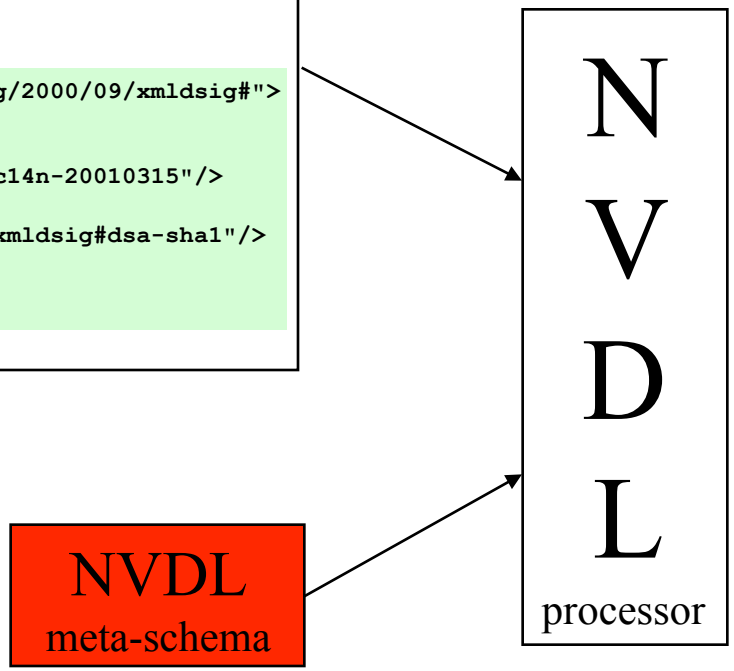


"Dispatch"

- The terminology is, "The NVDL processor **dispatches** each data component to the appropriate schema validator."

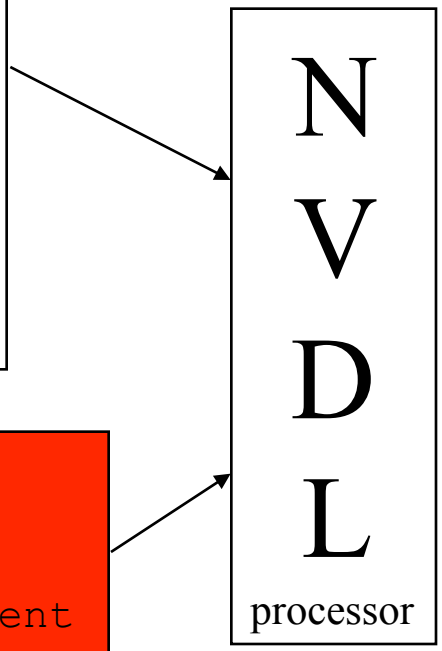
The **NVDL Meta-Schema** Instructs the NVDL Processor

```
<Moving-Target xmlns="http://www.dod.gov/moving-target#">
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
        <SignedInfo>
            <CanonicalizationMethod
                Algorithm="http://...c14n-20010315"/>
            <SignatureMethod
                Algorithm="http://...xmldsig#dsa-sha1"/>
            ...
        </SignedInfo>
    </Signature>
</Moving-Target>
```



The NVDL Meta-Schema Instructs the NVDL Processor

```
<Moving-Target xmlns="http://www.dod.gov/moving-target#">
    <Target-ID>Charlie 1</Target-ID>
    <Location>
        <Latitude>129.32</Latitude>
        <Longitude>90.91</Longitude>
    </Location>
    …
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
        <SignedInfo>
            <CanonicalizationMethod
                Algorithm="http://...c14n-20010315"/>
            <SignatureMethod
                Algorithm="http://...xmldsig#dsa-sha1"/>
            ...
        </SignedInfo>
    </Signature>
</Moving-Target>
```



"The XML instance document must be comprised of a Moving Target Data Component and an XML Signature Data Component. The Moving Target component must be validated against Moving-Target.rng. The XML Signature component must be validated against xmldsig-core-schema.xsd."

Wrap-up

NVDL Processors

- The folks at Oxygen XML have created a Java implementation of an NVDL processor, called oNVDL. It can be downloaded from:
  - http://www.oxygenxml.com/onvdl.html
  - Download the zip file and then unzip it. To use it, at a command line type this:

    java -jar *path-to-the-oxygen-onvdl-folder*/onvdl/bin/onvdl.jar *name-of-nvdl-file*.nvdl *name-of-xml-file*.xml
- SnRNV (Small nano Reconstruction NVDL Validator). SnRNV is a streaming NVDL validator, dispatcher, and reconstructor, which can be used with other JAXP based XML validators such as Xerces, MSV, and Jing (Note that you need JARV-JAXP bridge to use MSV or Jing). SnRNV can be downloaded from:
  - http://www.asahi-net.or.jp/~eb2m-mrt/nvdl/SnRNV-1.0.zip
- jNVDL is also a Java-based implementation of an NVDL processor. It can be downloaded from:
  - http://jnvdl.sourceforge.net/about-jnvdl.html

Who's Using NVDL

- OOXML
- Ecma-376 Office Open XML
- W3C Internationalization Tag Set
- W3C SVG Tiny 1.2
- Docbook v5.0

NVDL Tutorial

http://www.xfront.com/nvdl/