Collaborated Editing on ODF

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Who am I

- Svante Schubert
  - Started 1999 at Sun Microsystems, later Oracle
  - Freelancer on Standardization / File Format Software
  - Apache Incubator ODF Toolkit (Committer/PPMC)
  - Chair of OASIS Advanced Document Collaboration SC

Change-Tracking (CT) Interoperability ODF with Microsoft Offices (MSO)

- All MSO throw away all ODF changes
  - MS claims ODF underspecified for change-tracking (template styles)
  - No subset implemented in MSO, instead everything ignored
  - No business document ping-pong possible between LO/AO and MSO
  - Problem Solution: Fix of specification for ODF 1.3

Standard Importance

- Microsoft ODF promise to EU

“Microsoft’s Primary PC Productivity Applications shall support the ODF Standard … for ten years from the effective date of this Undertaking, within 9 months of final publication by ISO of a new ODF Standard Microsoft shall support that version..”

http://www.microsoft.com/en-us/news/press/2009/dec09/12-16statement.aspx

Standard in a Nutshell

- OASIS / ECMA
  - OASIS / ECMA standardization have company members
  - OASIS / ECMA lead by industry for global usage
  - OASIS / ECMA comparable easy to evolve a standard
- ISO (International Organization for Standardization)
  - Slogan after II. World War: "World Peace through World Trade"
  - ISO is an international organization of national standardization groups (National Bodies)
  - Government may influence National Bodies
  - ISO “de jure”/ may dictate usage by law

Summary: Reason of a Standard

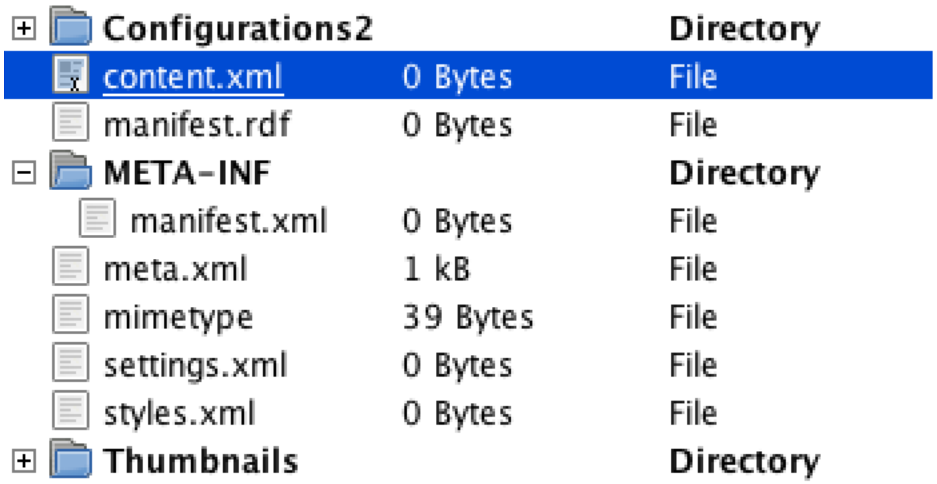
- Blueprint for ODF applications
- Base for Office Interoperability
- Independent place to settle disagreements (OASIS list)
- Leverage to get ODF implementation in MSO

CT Interoperability:
ODF and OOXML

- Problem of ODF change-tracking
  - Not caused by the difference of OOXML and ODF
  - Not caused by OOXML feature superset
  - Caused by underspecification in ODF (Style & Table changes)

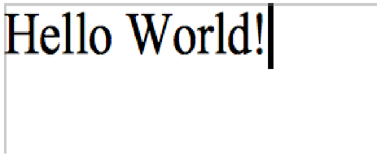
ODF Details

- ODF document:
  - Shock frozen state of a “living document”
  - Directory within ZIP file container
  - Contains content.xml (or styles.xml) as minimum



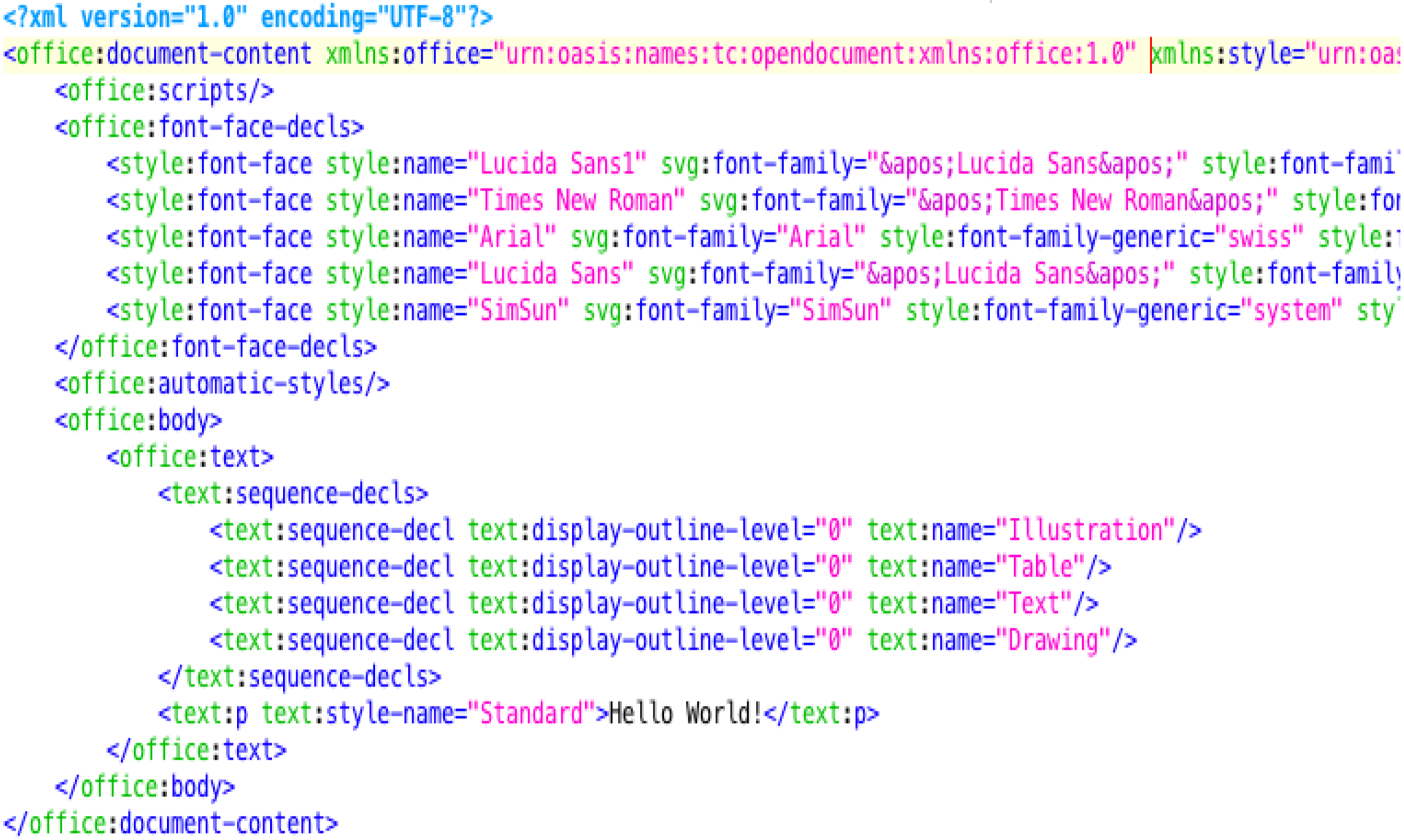
⊞ Configurations2		Directory
content.xml	0 Bytes	File
manifest.rdf	0 Bytes	File
⊟ META-INF		Directory
manifest.xml	0 Bytes	File
meta.xml	1 kB	File
mimetype	39 Bytes	File
settings.xml	0 Bytes	File
styles.xml	0 Bytes	File
⊞ Thumbnails		Directory

ODF Details (content.xml)



Hello World!

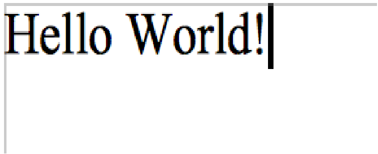
- Sure, could be less boilerplate..



```
<?xml version="1.0" encoding="UTF-8"?>
<office:document-content xmlns:office="urn:oasis:names:tc:opendocument:xmlns:office:1.0" xmlns:style="urn:oas
    <office:scripts/>
    <office:font-face-decls>
        <style:font-face style:name="Lucida Sans1" svg:font-family="&apos;Lucida Sans&apos;" style:font-fami
        <style:font-face style:name="Times New Roman" svg:font-family="&apos;Times New Roman&apos;" style:for
        <style:font-face style:name="Arial" svg:font-family="Arial" style:font-family-generic="swiss" style:
        <style:font-face style:name="Lucida Sans" svg:font-family="&apos;Lucida Sans&apos;" style:font-famil
        <style:font-face style:name="SimSun" svg:font-family="SimSun" style:font-family-generic="system" sty
    </office:font-face-decls>
    <office:automatic-styles/>
    <office:body>
        <office:text>
            <text:sequence-decls>
                <text:sequence-decl text:display-outline-level="0" text:name="Illustration"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Table"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Text"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Drawing"/>
            </text:sequence-decls>
            <text:p text:style-name="Standard">Hello World!</text:p>
        </office:text>
    </office:body>
</office:document-content>
```

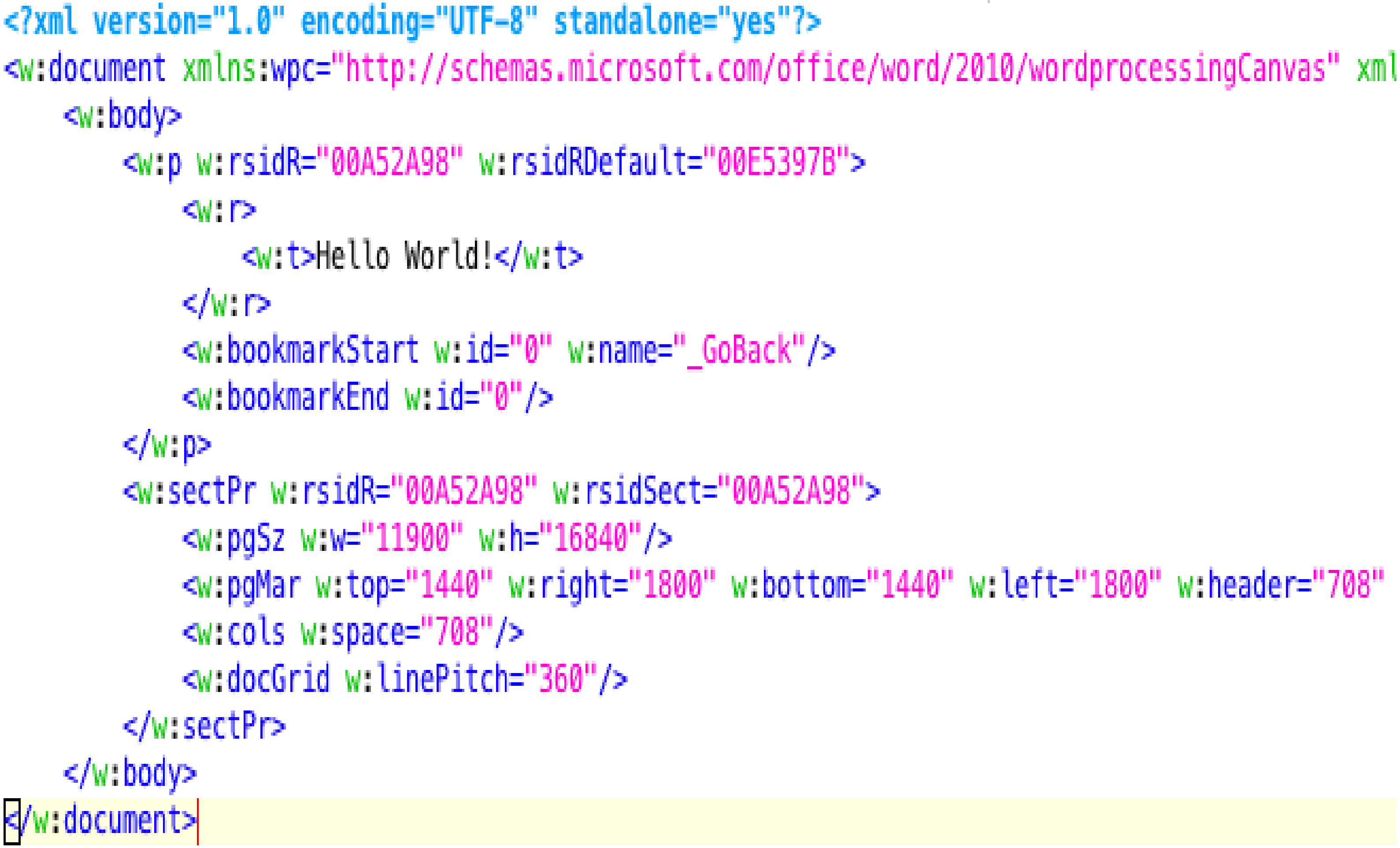
Flaws of current Change-Tracking

OOXML Details (document.xml)



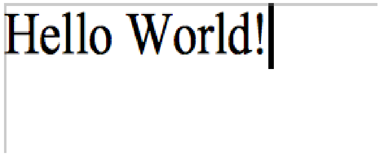
Hello World!

- Similar boilerplate..



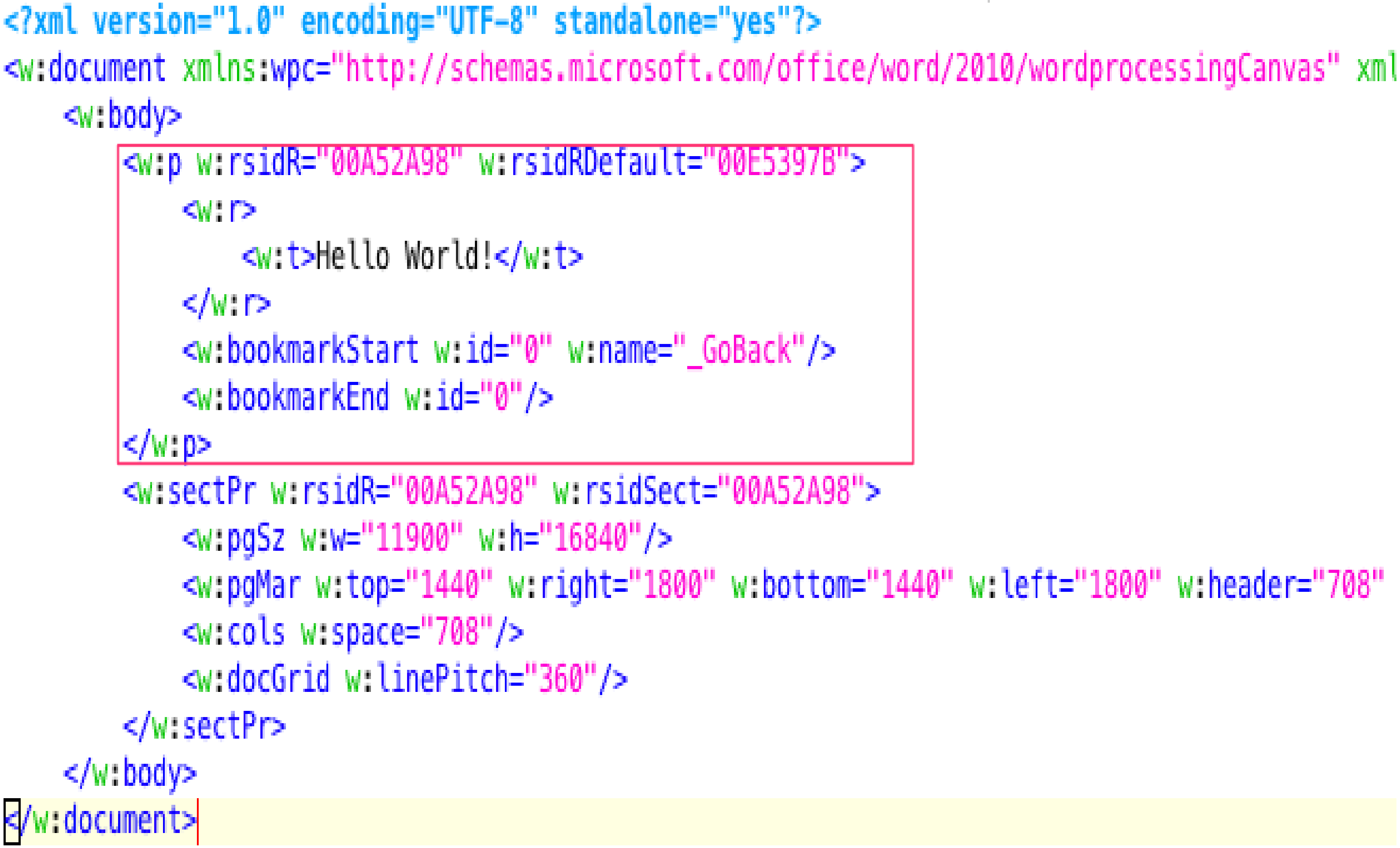
```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<w:document xmlns:wpc="http://schemas.microsoft.com/office/word/2010/wordprocessingCanvas" xml
    <w:body>
        <w:p w:rsidR="00A52A98" w:rsidRDefault="00E5397B">
            <w:r>
                <w:t>Hello World!</w:t>
            </w:r>
            <w:bookmarkStart w:id="0" w:name="_GoBack"/>
            <w:bookmarkEnd w:id="0"/>
        </w:p>
        <w:sectPr w:rsidR="00A52A98" w:rsidSect="00A52A98">
            <w:pgSz w:w="11900" w:h="16840"/>
            <w:pgMar w:top="1440" w:right="1800" w:bottom="1440" w:left="1800" w:header="708"
            <w:cols w:space="708"/>
            <w:docGrid w:linePitch="360"/>
        </w:sectPr>
    </w:body>
</w:document>
```

OOXML Details (document.xml)



Hello World!

- Similar boilerplate..



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<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<w:document xmlns:wpc="http://schemas.microsoft.com/office/word/2010/wordprocessingCanvas" xml
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            <w:bookmarkStart w:id="0" w:name="_GoBack"/>
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            <w:cols w:space="708"/>
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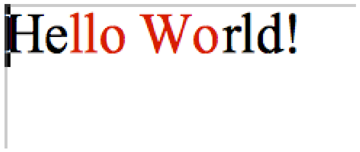
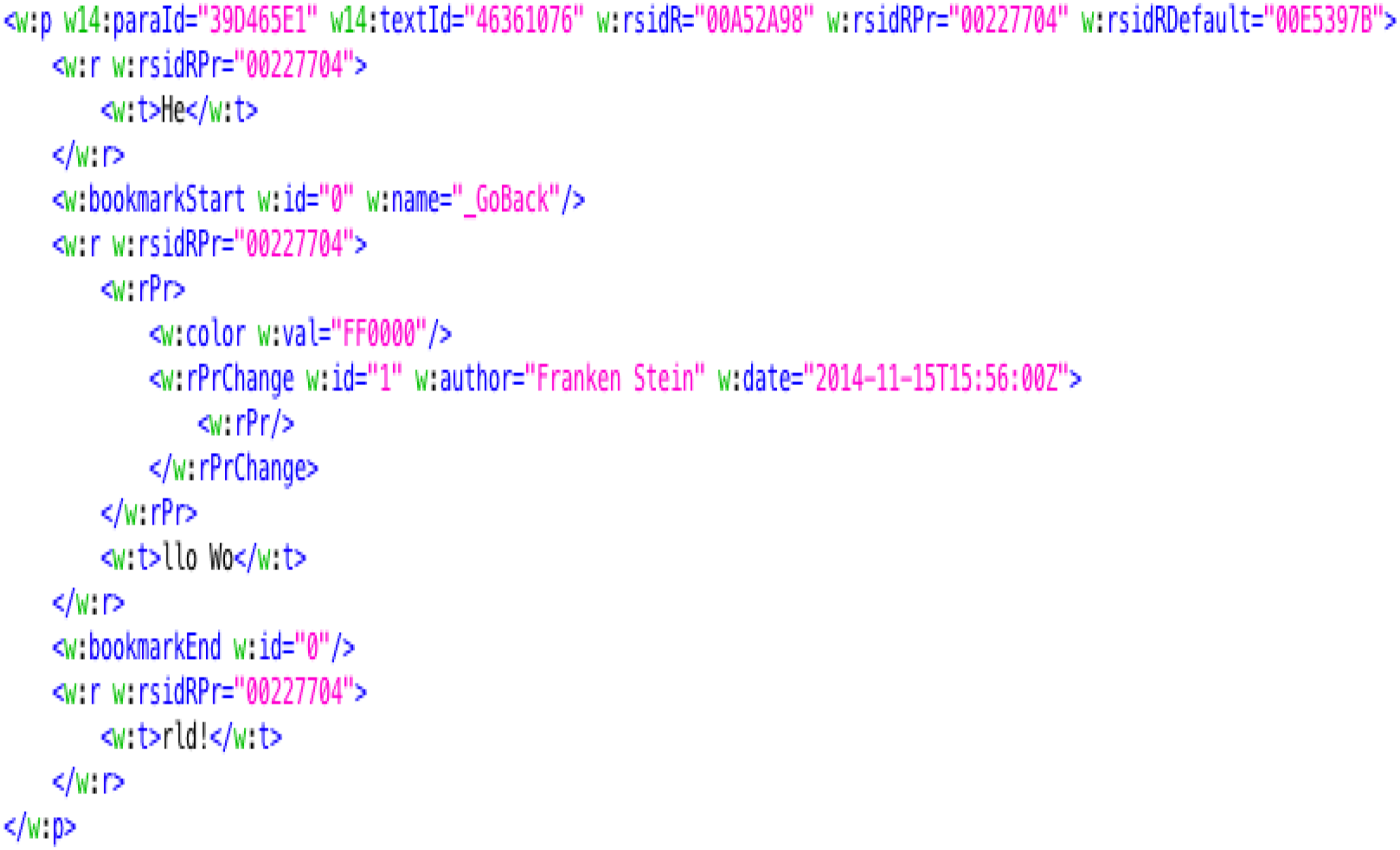
OOXML Change-Track Details



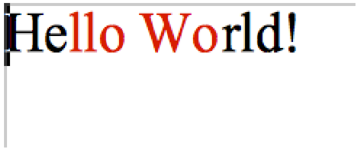
Hello World!

- Change-tracked text format..



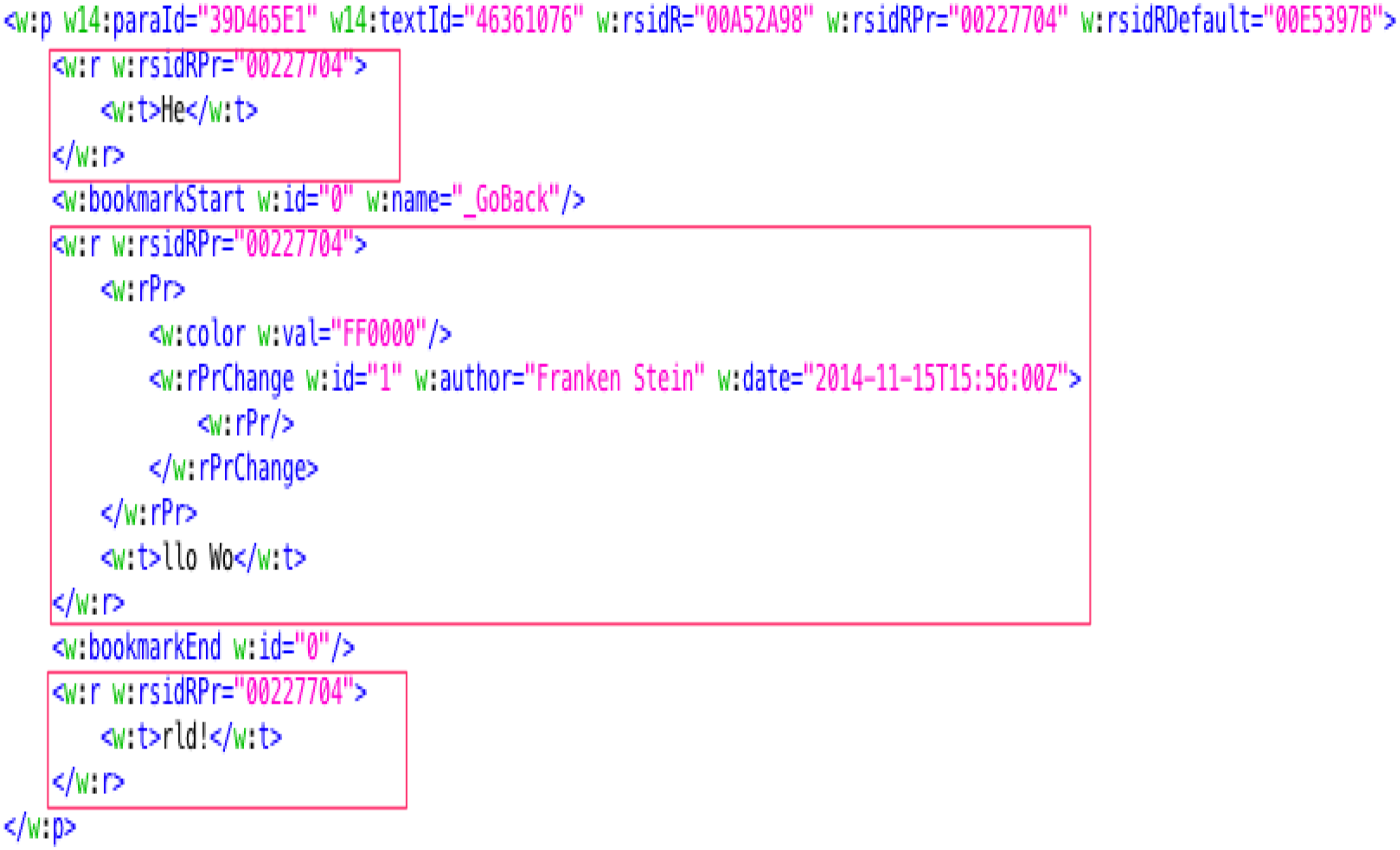
```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details



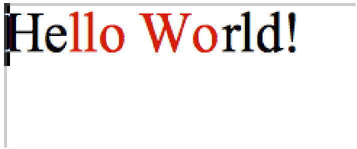
Hello World!

- Change-tracked text format..



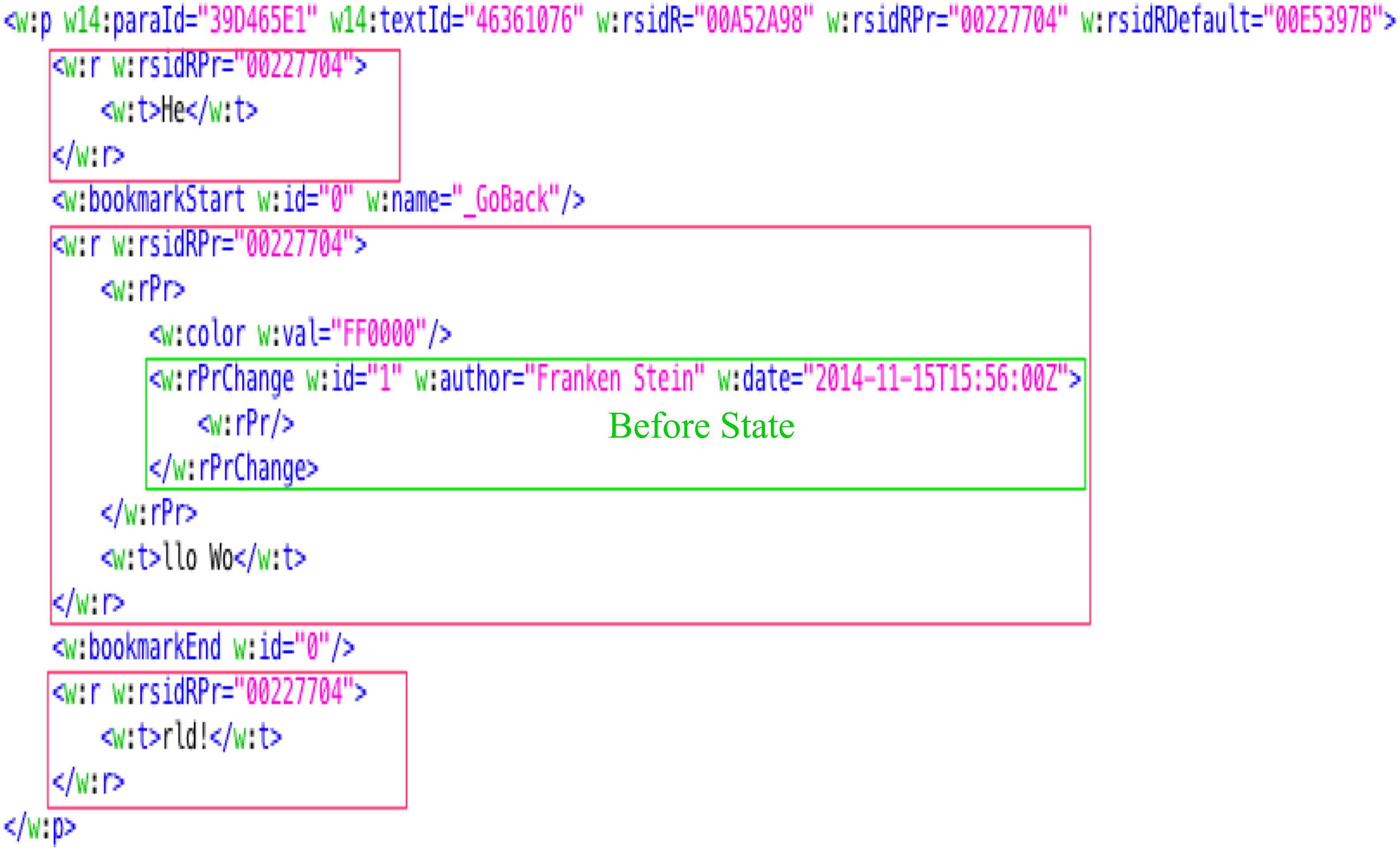
```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details



Hello World!

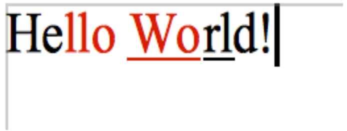
- Change-tracked text format..



```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```

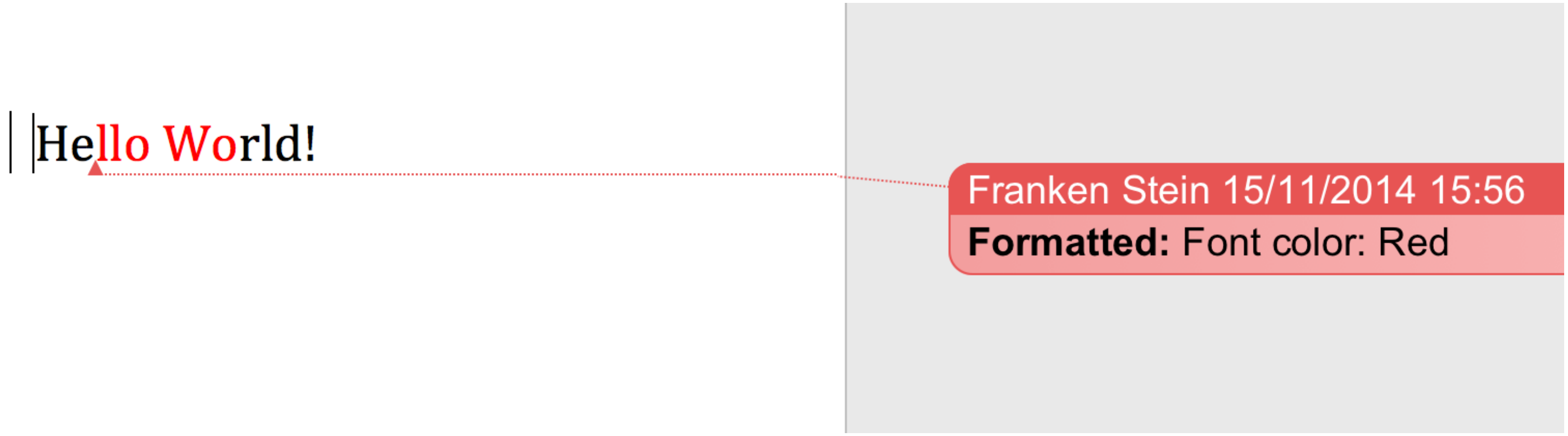
Before State

Status Quo: Change-Tracking


Hello World!

- Users does a “change reject”
  - Reanimates state of “before state box”
- Problematic with overlapping Changes
  - Reanimation not sufficient in case of dependencies
  - Reanimated state influences content of other “before state box”
- DEMO – Downside old concept - MS Office 2011 on Mac

Demo: MS Office2011 Mac
Change 1: Format substring “llo Wo” red



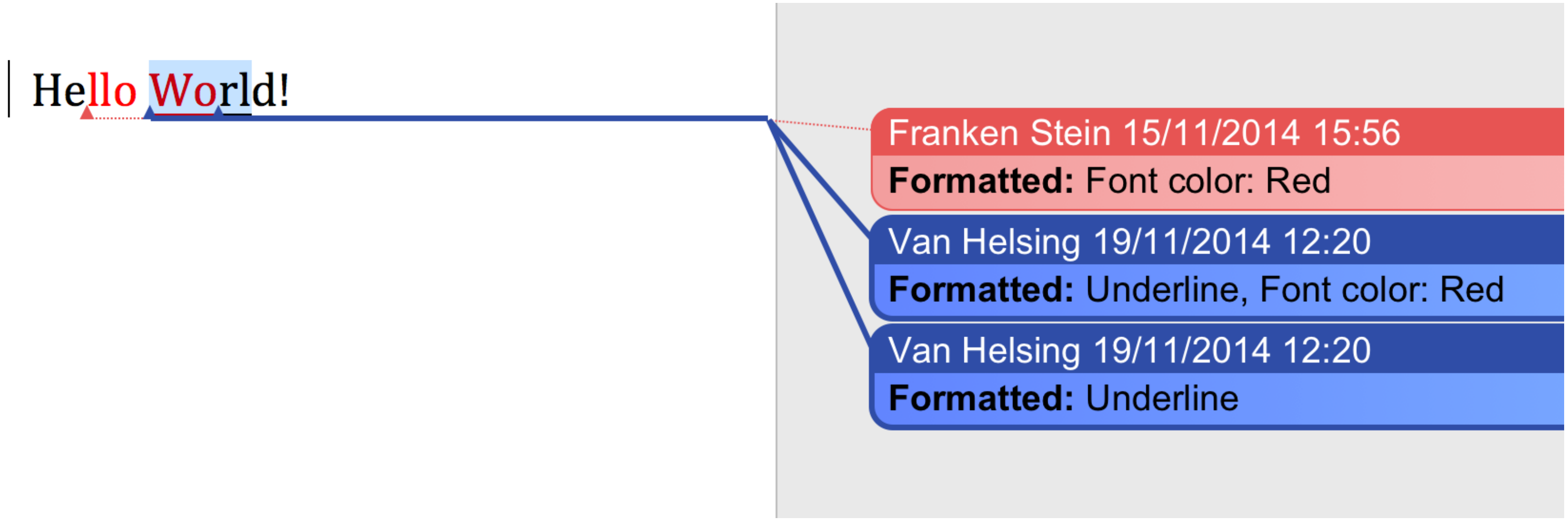
Hello World!

Franken Stein 15/11/2014 15:56

Formatted: Font color: Red

Demo: MS Office2011 Mac
Change 2: Format substring “Worl” underline

Why are there two changes for 1 Change?



Hello World!

Franken Stein 15/11/2014 15:56

Formatted: Font color: Red

Van Helsing 19/11/2014 12:20

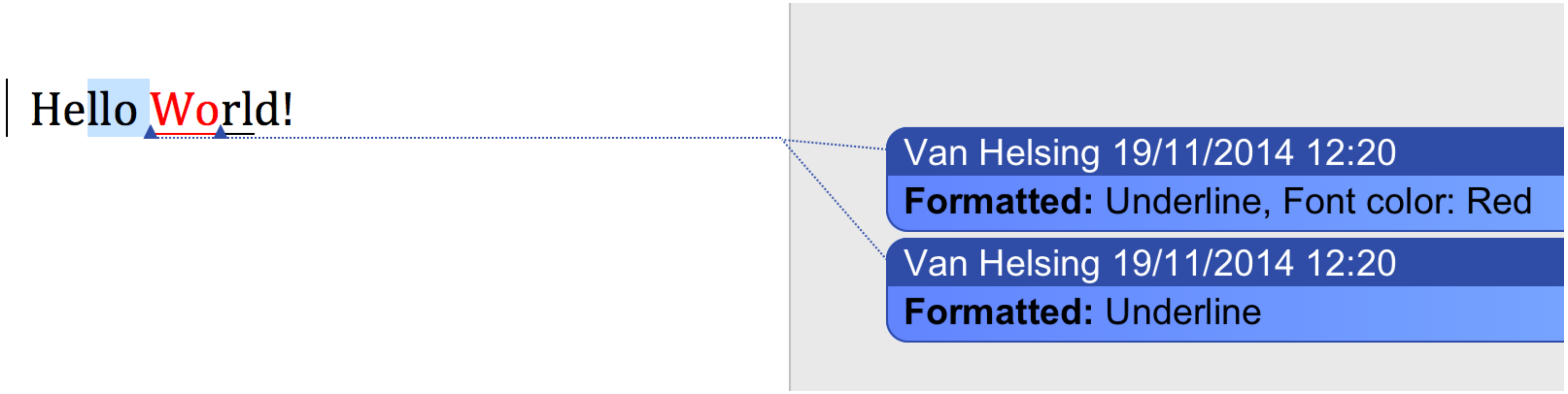
Formatted: Underline, Font color: Red

Van Helsing 19/11/2014 12:20

Formatted: Underline

Demo: MS Office2011 Mac
Change 3: Undo first Change (no red format) → Broken!

Why is there still red format?

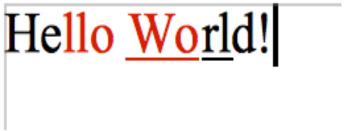


Hello World!

Van Helsing 19/11/2014 12:20
Formatted: Underline, Font color: Red

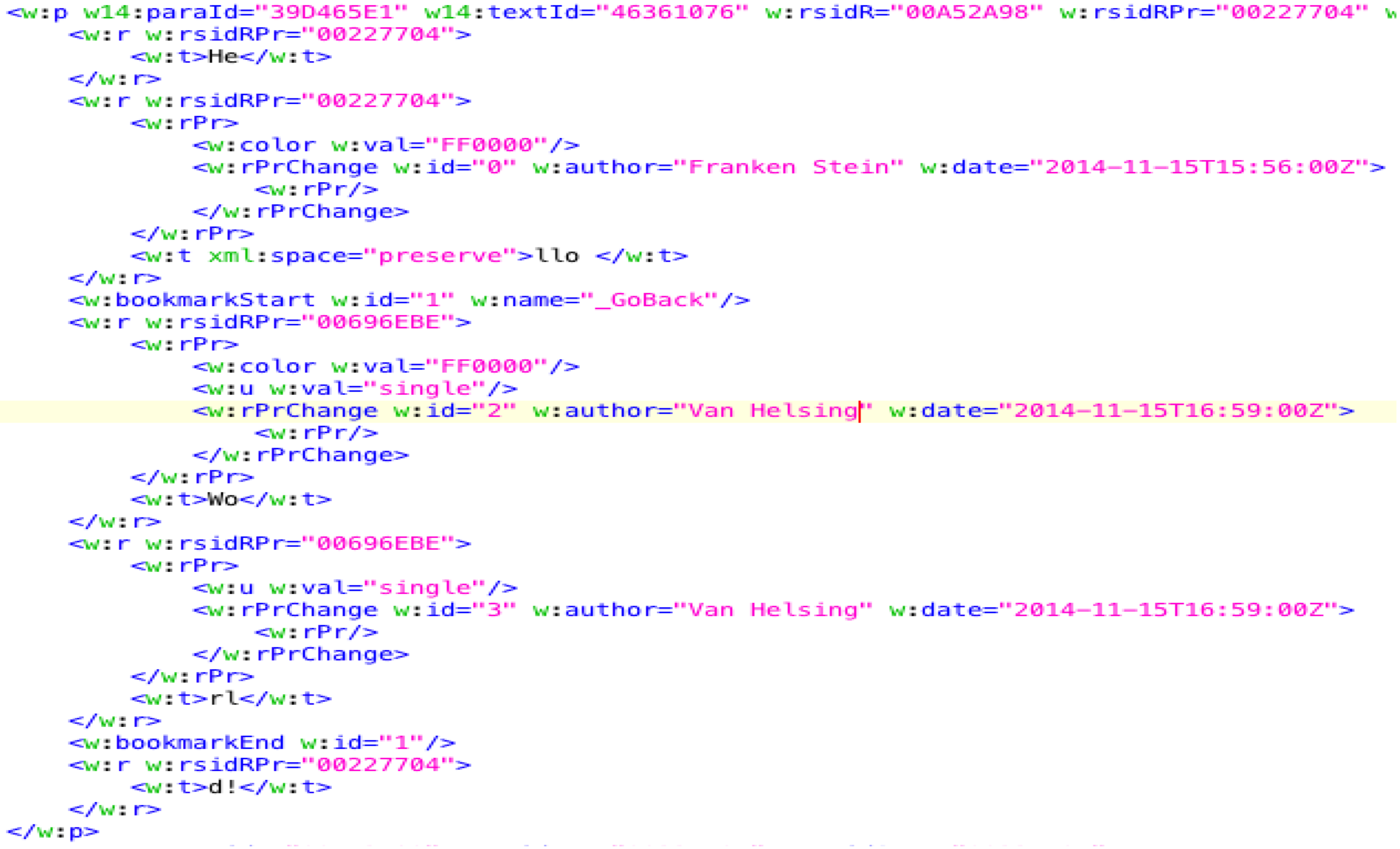
Van Helsing 19/11/2014 12:20
Formatted: Underline

OOXML Change-Track Details



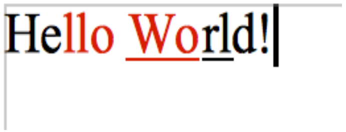
Hello World!

- Change-tracked text format..



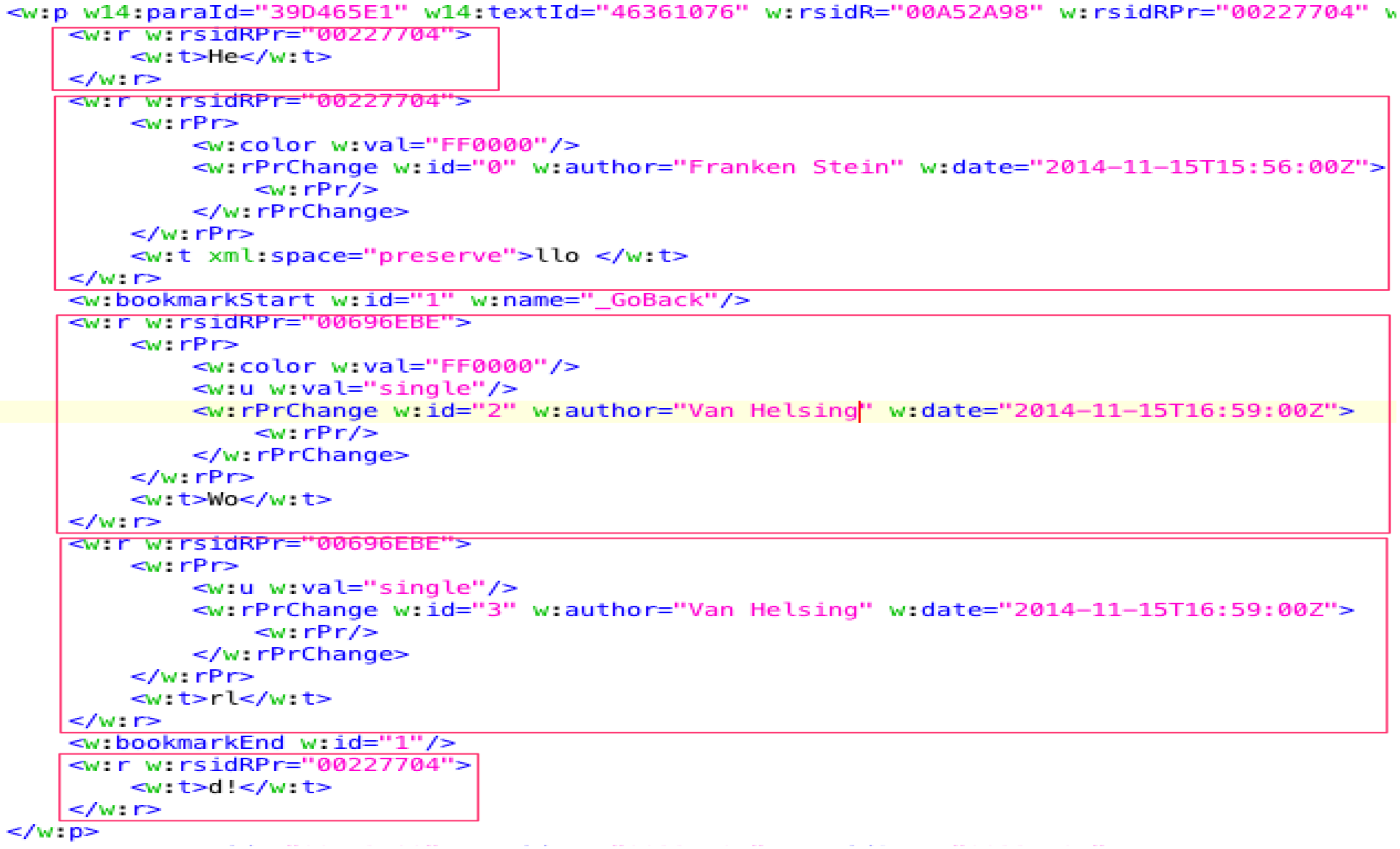
```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
    </w:r>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:u w:val="single"/>
            <w:rPrChange w:id="3" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>rl</w:t>
    </w:r>
    <w:bookmarkEnd w:id="1"/>
    <w:r w:rsidRPr="00227704">
        <w:t>d!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details



Hello World!

- Change-tracked text format..



```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
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    <w:r w:rsidRPr="00696EBE">
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            <w:u w:val="single"/>
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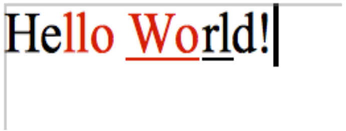

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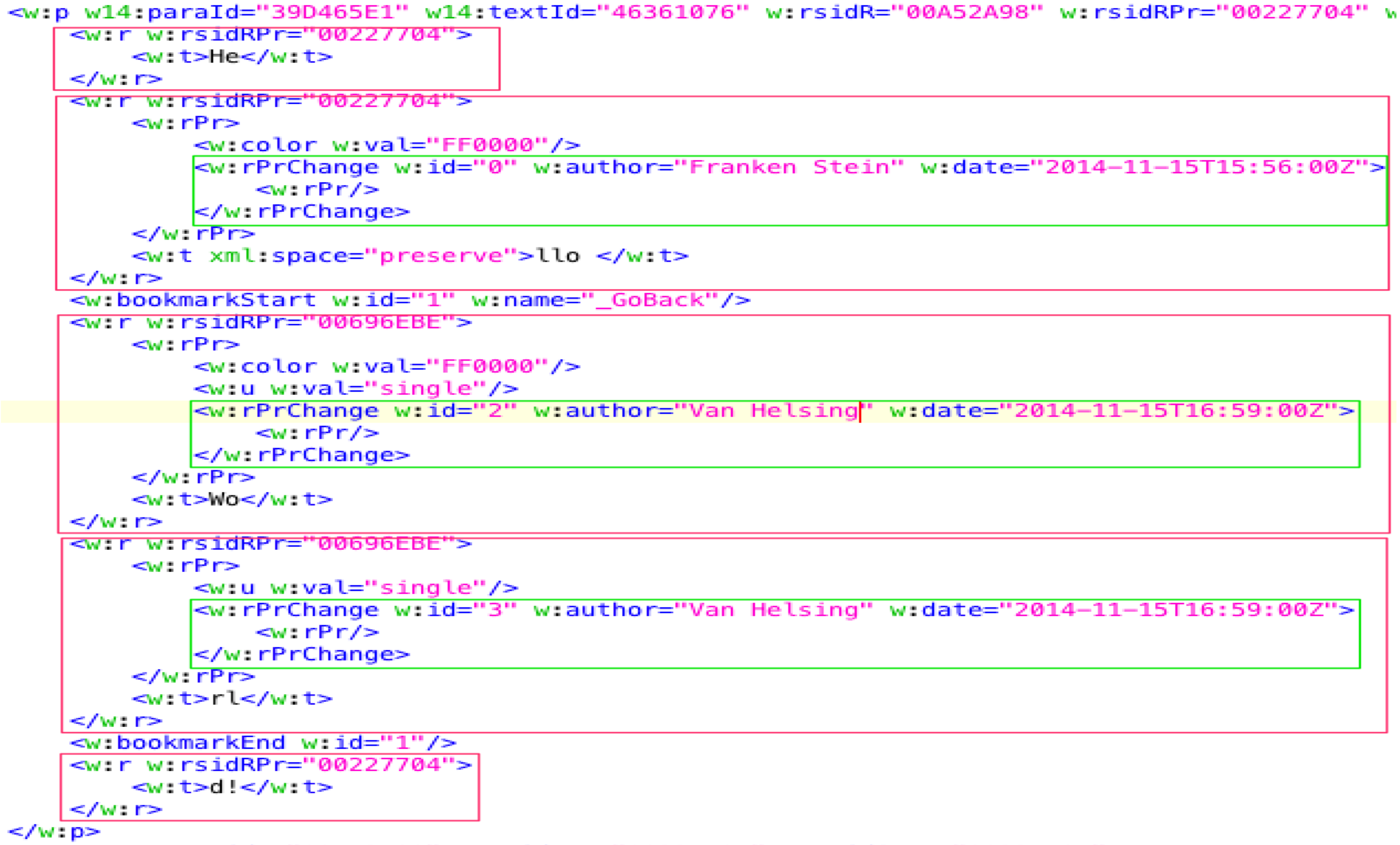

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<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
    </w:r>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:u w:val="single"/>
            <w:rPrChange w:id="3" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>rl</w:t>
    </w:r>
    <w:bookmarkEnd w:id="1"/>
    <w:r w:rsidRPr="00227704">
        <w:t>d!</w:t>
    </w:r>
</w:p>
```

Alternatives?

Use “changes” for change-tracking!

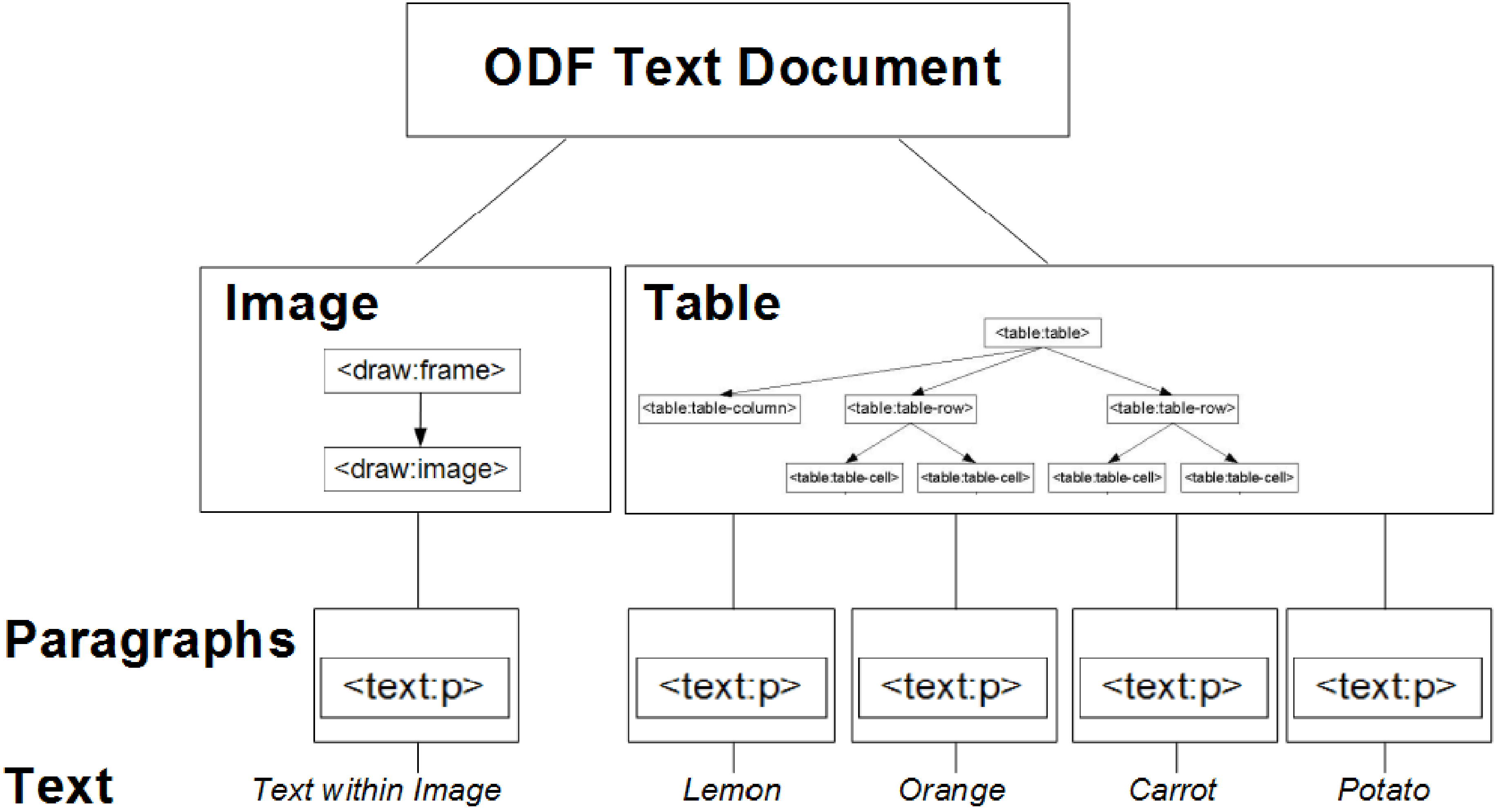
Change what?

- **Question**:
  How can office applications with different internal model...
  - Exchange their model changes?
  - Save in the end the same document?

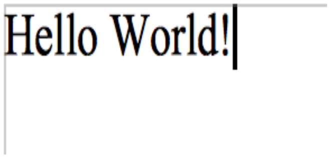
Change what?

- **Question**:
  How can office applications with different internal model...
  - Exchange their model changes?
  - Save in the end the same document?
- **Answer**:
  - Simplified Virtual Model
  - Similar as humans would explain the location

Logical XML groups (Components)



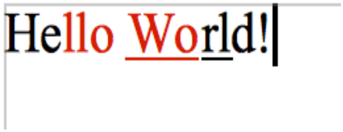
Document equal to the Sum of Changes



Hello World!

- The “Hello World” for ODF/OOXML could be
  - <add type=”paragraph” start=”/1” />
  - <add type=”text” start=”/1/1”>Hello World!</add>
- Or in one operation
  - <add type=”paragraph” start=”/1”>Hello World!/>
- DEMO – Web Office based on Changes
  - Apache Incubator ODF Toolkit in backend (for now just a fork)

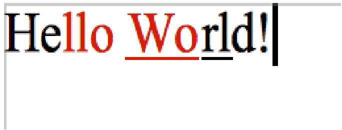
Example: OOXML/ODF Changes as JSON



Hello World!

- Undoing the change:
  - {"**name**":"**format**","**start**":[1,7],"**end**":[1,10], "**attrs**":{"text":{"underline":null}}},
  - {"**name**":"**format**","**start**":[1,3],"**end**":[1,7], "**attrs**":{"text":{"color":null}}}

Example: OOXML/ODF Changes as JSON



Hello World!

- Undoing the change (inverse operation):
  - {"**name**":"**format**","**start**":[1,7],"**end**":[1,10],
    "**attrs**":{"text":{"underline":null}}},
  - {"**name**":"**format**","**start**":[1,3],"**end**":[1,7],
    "**attrs**":{"text":{"color":null}}}

- Doing the change:
  - {"**name**":"addText","**start**":[1,0],"**text**":"Hello World!"}
  - {"**name**":"format","**start**":[1,3],"**end**":[1,7],
    "**attrs**":{"text":{"color":{"type":"rgb","value":"FF0000"}}}},
  - {"**name**":"format","**start**":[1,7],"**end**":[1,10],
    "**attrs**":{"text":{"underline":true}}},

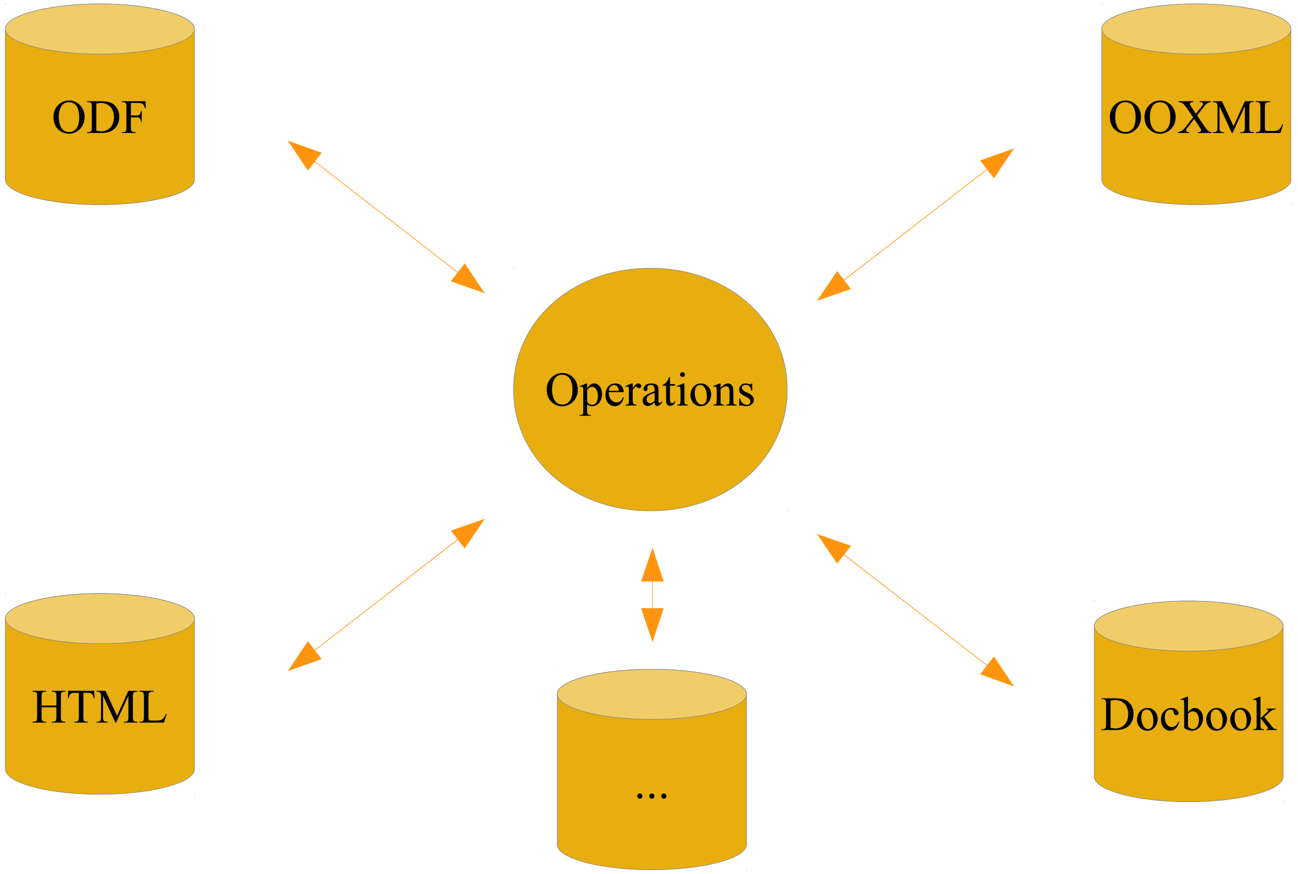
Limitations

- Possible conflicts..
  - One is working on a table cell, the other removed the table
  - Text of first and last paragraph different, but redundant with same meaning
  - Different names being used for the receiver of the love letter

Operations as Lingua Franca?

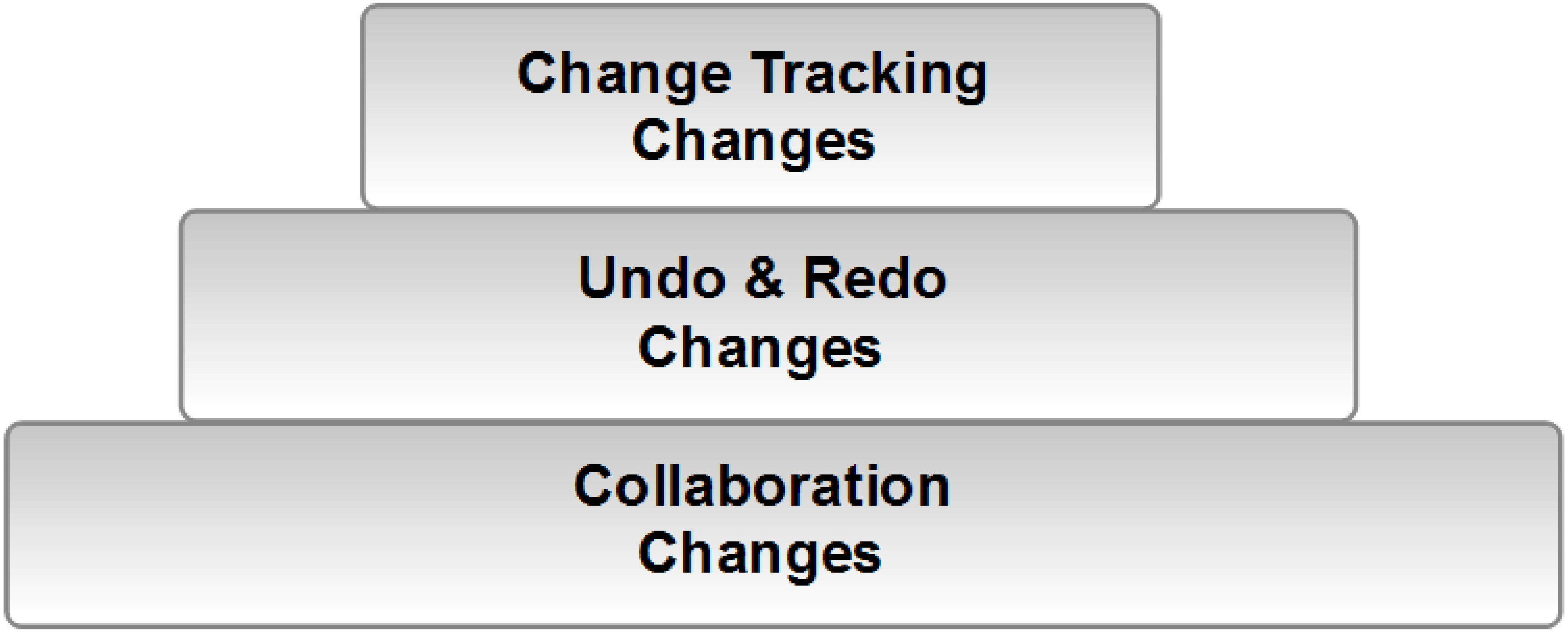
Operations: Lingua Franca of Documents

- Decouple Transformation Complexity:



Reuse of
Change Design

Relationship of Changes



Change Tracking Changes

Undo & Redo Changes

Collaboration Changes

ODF Interoperability / Next Feature Set

- ODF Document Interoperability (covered)
  - ODF Applications exchange documents via Floppy Disc (Mail)
- ODF Change Interoperability (desired)
  - ODF Applications exchange changes via Net

Document Interoperability by Changes

- Earlier: Black Box Change Handling
  - ODF 1.0 to 1.2: Before/After XML subtree
  - Application used “forensic” diff to identify change (e.g. move row)
- Now: Specifying Changes
  - Applied on a logical standardized component (e.g. image, table, character)
  - State (ODF XML) transition from one valid state to another
  - Basic changes: Add/Delete/Modify (and Move/Replace)
  - Ability to resolve dependencies by Operational Transformation (OT)
  - Every Operation's position relative to current document state
  - Movement of Operation withing List is like changing execution time

Any Document equal to Change List

Document with “A” Content

add A @1 ← <CHANGE> <SOMETHING> <SOMEWHERE>

Change List

Document with “AB” Content

add A @1

add B @2

Change List

Document with “ABC” Content

add A @1

add B @2

add C @3

Change List

Document with “ABC” Content

add A @1

add B @2

add C @3

add C @1

Change List

Document with “ABC” Content

add A @1	*add C @1*
add B @2	*add B @1*
add C @3	

Change List

Document with “ABC” Content

add A @1	*add C @1*
add B @2	*add B @1*
add C @3	*add A @1*

Change List

Document with “ABC” Content

add A @1	*add C @1*	*add C @1*
add B @2	*add B @1*	***add B @1***
add C @3	*add A @1*	***add A @1***

Change List

Document with “ABC” Content

add A @1	*add C @1*	*add C @1*
add B @2	*add B @1*	***add A @1***
add C @3	*add A @1*	***add B @2***

Change List

Document with “ABC” Content

add A @1	*add C @1*	***add A @1***
add B @2	*add B @1*	***add C @2***
add C @3	*add A @1*	add B @2

Change List

Document with "ABC" Content

add A @1	*add C @1*	*add A @1*
add B @2	*add B @1*	***add C @2***
add C @3	*add A @1*	add B @2

Change List

Document with “ABC” Content

add A @1

add B @2

add C @3

add C @1

add B @1

add A @1

add A @1

add B @2

add C @3

Change Stack

Status - 1

```
<add type=”paragraph” start="/2">First Change!</add>
```

Change Stack

Status - 1

```
<add type=”paragraph” start="/2">First Change!</add>
```

Status – 2

```
<add type=”paragraph” start="/5">Second Change!</add>
<add type=”paragraph” start="/2">First Change!</add>
```

Time
(latest on top)

Change Stack & Time Travel

Status - 1

<add type=”paragraph” start="/2">First Change!</add>

Status – 2

<add type=”paragraph” start="/5">Second Change!</add>
<add type=”paragraph” start="/2">First Change!</add>

↑ Time
(latest on top)

Status – 2 (reordered)

<add type=”paragraph” start="/2">First Change!</add>
<add type=”paragraph” start="/4">Second Change!</add>

↓ Moving
operation
through time

Change Stack & Undo

Status – 2

<add type=”paragraph” start="/2">First Change!</add>

<add type=”paragraph” start="/4">Second Change!</add>

Time
(latest on top)

Status – 3 (1st change undone – always top change)

<add type=”paragraph” start="/4">Second Change!</add>

Undoing First Change

Summary: The new Change Approach

- PRO:
  - SIMPLICITY:
    - Changes are being defined, no need to find the semantic afterwards
    - Easy Merge as no before/after blackbox XML, but queue of changes
    - Allows overlapping changes
  - REUSE:
    - Same changes are being used for real-time collaboration & re/undo
  - TESTING:
    - Allows ODF state testing. First time state changes are defined.
    - Conformance Test on Standard Level in sight!

Summary: The new Change Approach

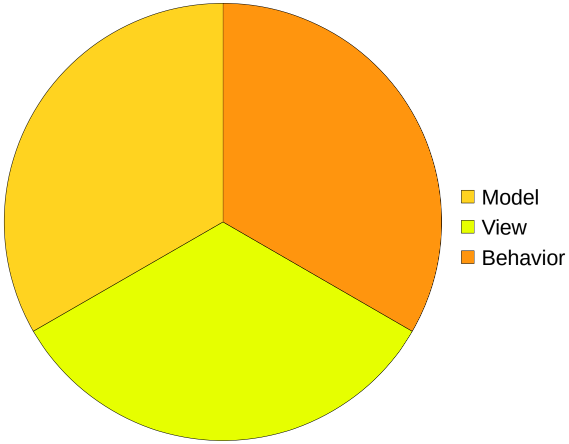
- PRO:
    - NEW OFFICE FEATURE:
        - Stable Merge/Branch/Versioning (ever user works on branch)
        - History Function possible (save similar to a 'commit')
        - Reject/Accept – now postpone
        - Semantic Global Changes – ReplaceAll as Future Warning (e.g. exchange "Sun Microsystems Inc." with "Oracle Inc.")
        - Apply a change (e.g. typo) to all branches (e.g. versions of contract)
        - Apply changes to read/only (remote or signed documents)
        - Efficient exchange of data (1billion Paragraph now Red!)
        - No Data Loss: Collaboration between Vi and MSO15 possible without data loss (roundtrip not requires full run-time model)

Summary: The new Change Approach

- CON:
  - Specification is more complex
    - Definition of change of ODF XML after load, user edit and save
  - Positioning of logical identities (components) is new to ODF applications
    - Without a major implementor the ivory tower will crumble

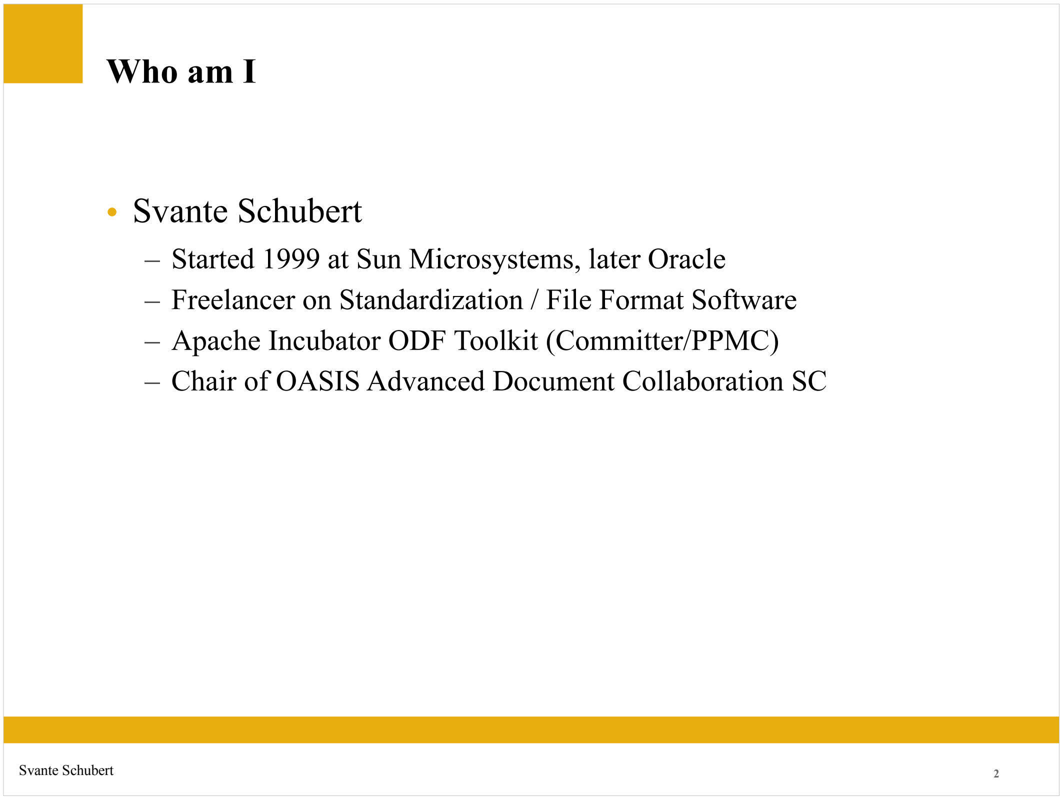
The Holy Grail: Full Document Interoperability

- Document Interoperability consists of:
  - **Model**: text, styles, metadata, signaturs, etc.
  - **View**: layout of glyphes, lines, frames, pages, etc.
  - **Behavior**: allowed changes, even macros



Collaborated Editing on ODF

Svante.Schubert@gmail.com



Who am I

- Svante Schubert
  - Started 1999 at Sun Microsystems, later Oracle
  - Freelancer on Standardization / File Format Software
  - Apache Incubator ODF Toolkit (Committer/PPMC)
  - Chair of OASIS Advanced Document Collaboration SC

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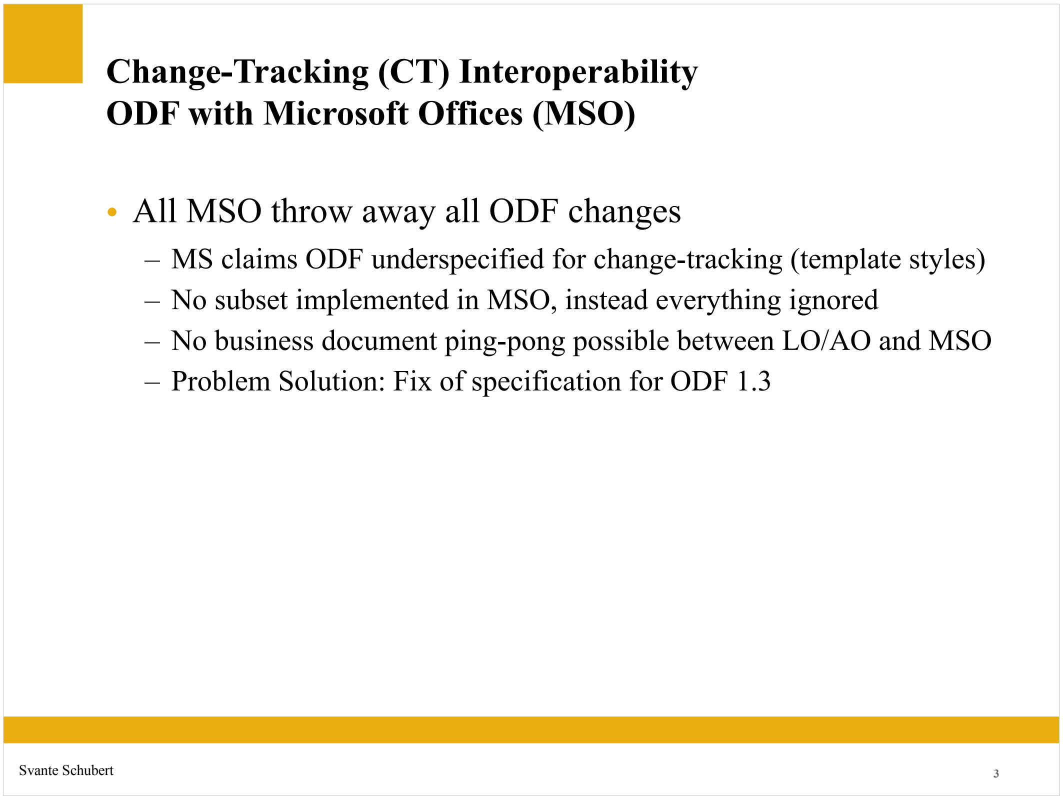
Chairing the OASIS ODF Advanced Collaboration Sub-Committee

https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=office-collab

Biography on LinkedIn: http://www.linkedin.com/profile/view?id=6765517&trk=tab_pro

NEXT: Why OASIS SC? Change-tracking PROBLEM!



Change-Tracking (CT) Interoperability ODF with Microsoft Offices (MSO)

- All MSO throw away all ODF changes
  - MS claims ODF underspecified for change-tracking (template styles)
  - No subset implemented in MSO, instead everything ignored
  - No business document ping-pong possible between LO/AO and MSO
  - Problem Solution: Fix of specification for ODF 1.3

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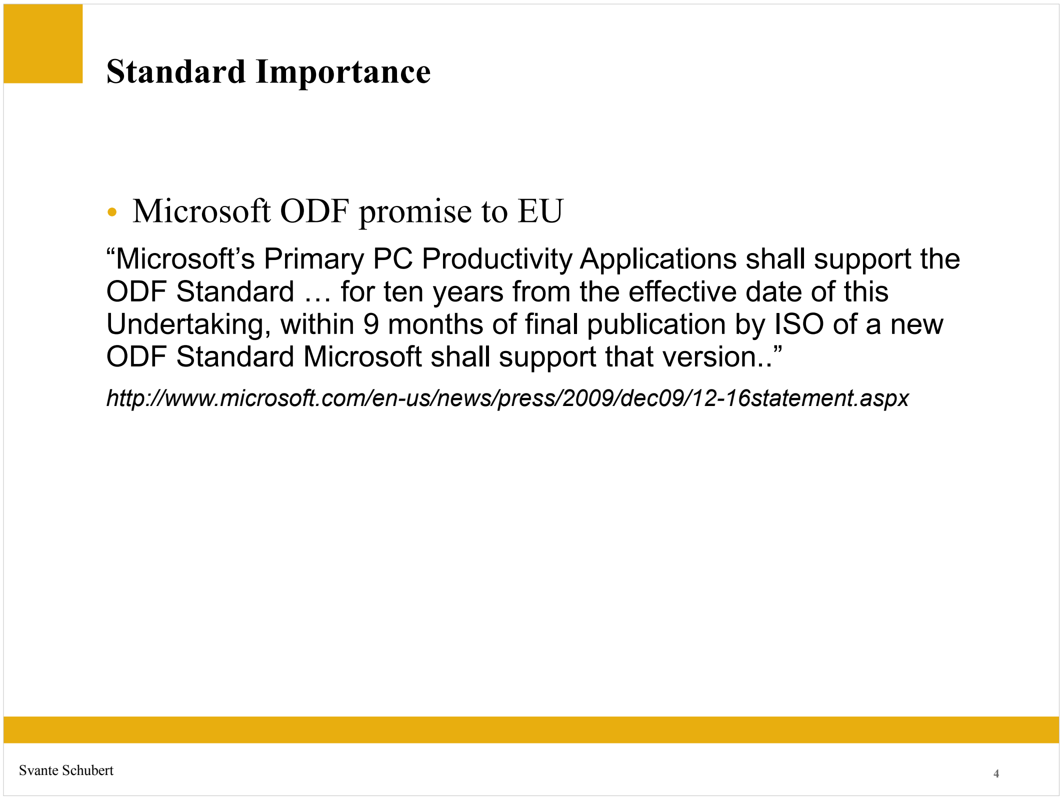
Why will a fix help?



Standard Importance

- Microsoft ODF promise to EU

“Microsoft’s Primary PC Productivity Applications shall support the ODF Standard … for ten years from the effective date of this Undertaking, within 9 months of final publication by ISO of a new ODF Standard Microsoft shall support that version..”

http://www.microsoft.com/en-us/news/press/2009/dec09/12-16statement.aspx

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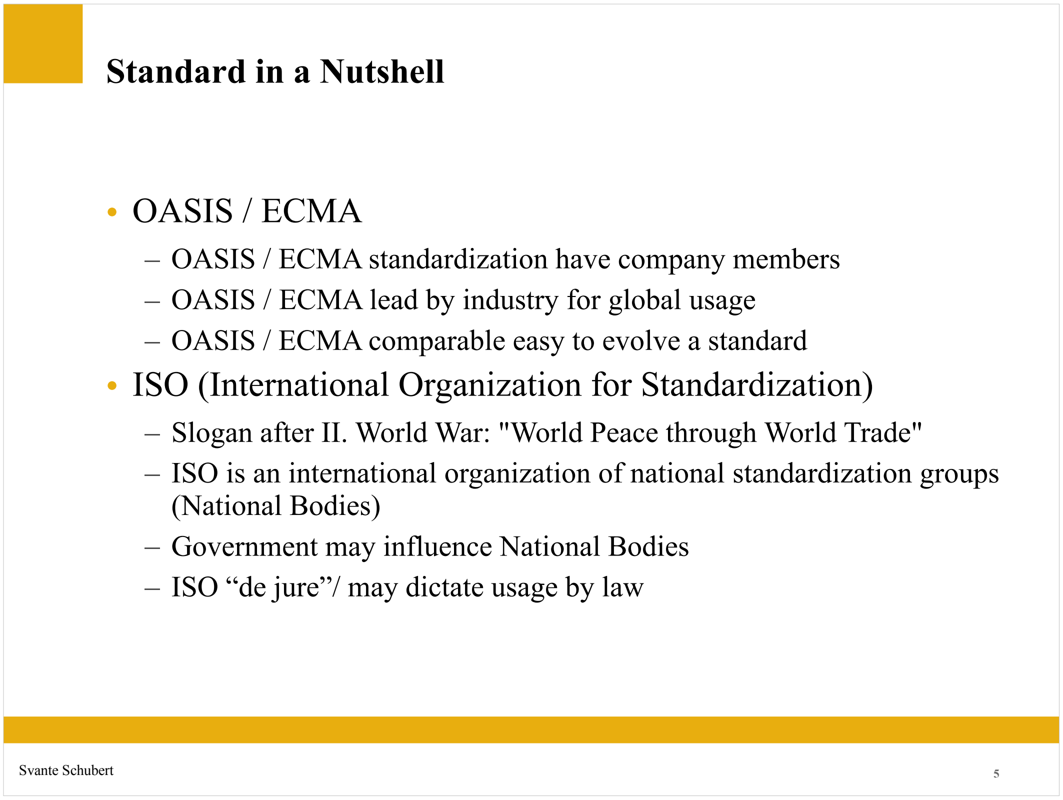
http://www.microsoft.com/en-us/news/press/2009/dec09/12-16statement.aspx

http://www.microsoft.com/en-us/news/presskits/eu-msft/docs/microsoftinteroperabilityundertaking16dec2009.doc
“Microsoft’s Primary PC Productivity Applications shall support the ODF Standard … for ten years from the effective date of this Undertaking, within 9 months of final publication by ISO of a new ODF Standard Microsoft shall support that version..”

FIELDS from DOC saved as some proprietary XML, will not be loaded in next MS OFFICE Version!
WAIT! ISO earlier OASIS? What is the difference?



Standard in a Nutshell

- OASIS / ECMA
  - OASIS / ECMA standardization have company members
  - OASIS / ECMA lead by industry for global usage
  - OASIS / ECMA comparable easy to evolve a standard
- ISO (International Organization for Standardization)
  - Slogan after II. World War: "World Peace through World Trade"
  - ISO is an international organization of national standardization groups (National Bodies)
  - Government may influence National Bodies
  - ISO “de jure”/ may dictate usage by law

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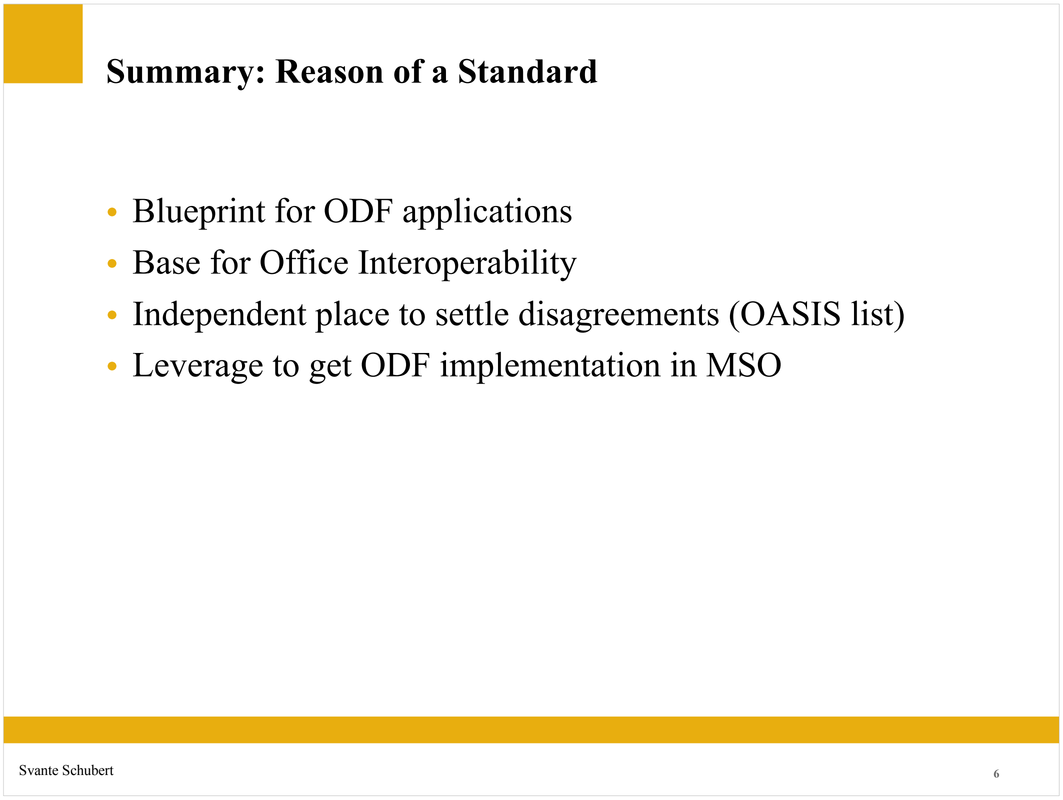
Answers:

1) Why are there TWO standards for ODF?

2) Why is ISO so much more important?



Summary: Reason of a Standard

- Blueprint for ODF applications
- Base for Office Interoperability
- Independent place to settle disagreements (OASIS list)
- Leverage to get ODF implementation in MSO

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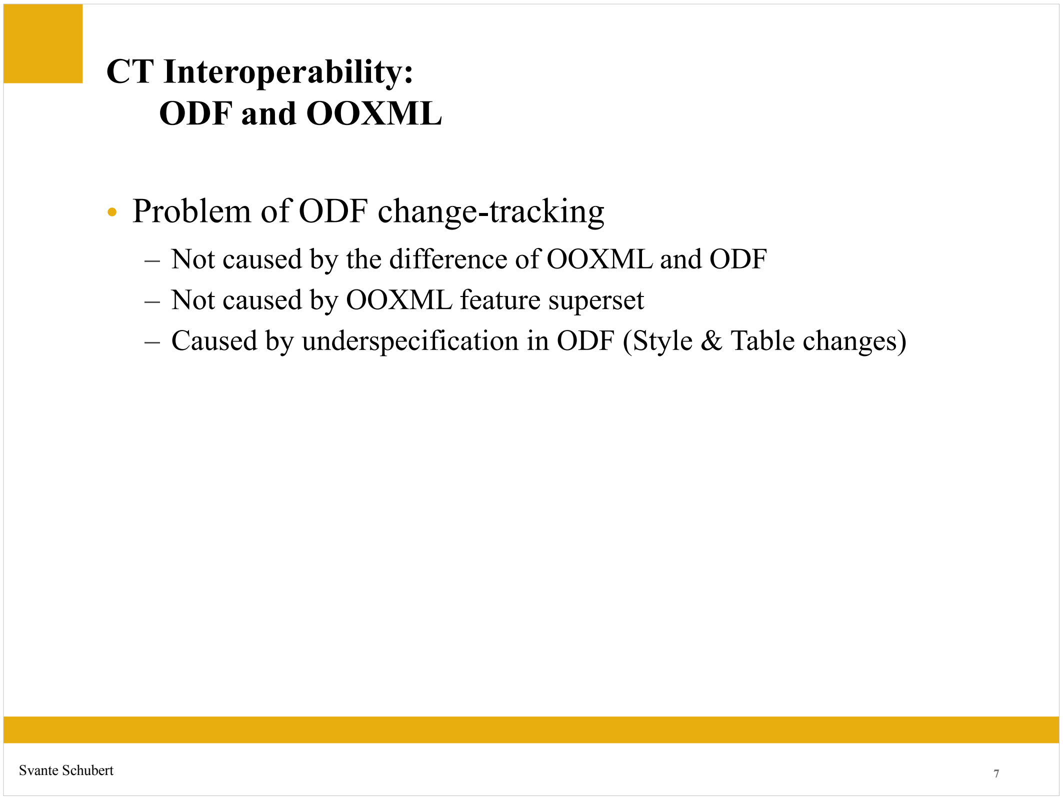
Remarks:
1-3) **Remember that there are other ODF applications** out there

AO vs. LO discussion sometimes reminds on “Life of Brian's” struggle between:
Judean People's Front,
People's Front of Judea,

4) User has high(er) expectations

BENEFIT OF ODF

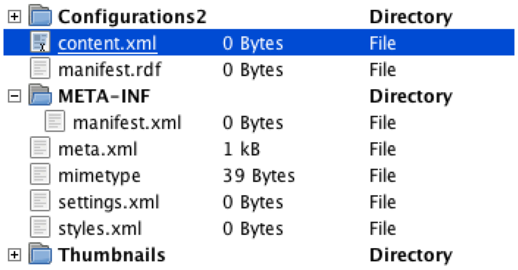


CT Interoperability:
ODF and OOXML

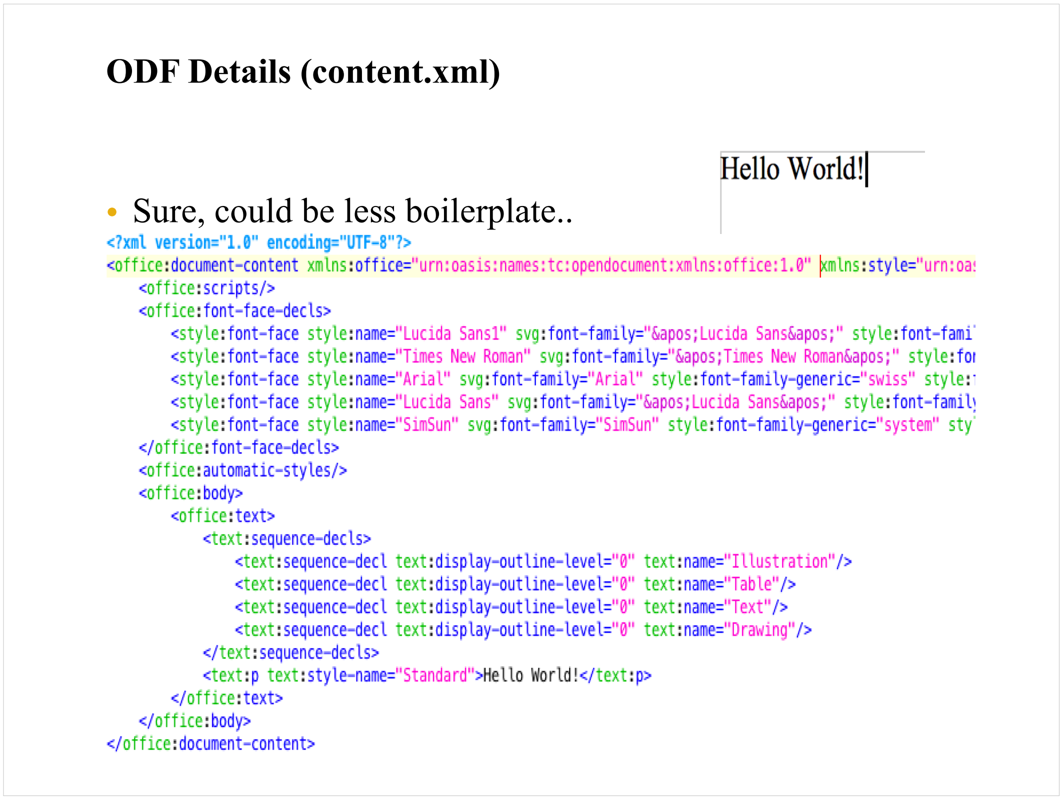
- Problem of ODF change-tracking
  - Not caused by the difference of OOXML and ODF
  - Not caused by OOXML feature superset
  - Caused by underspecification in ODF (Style & Table changes)

ODF Details

- ODF document:
  - Shock frozen state of a “living document”
  - Directory within ZIP file container
  - Contains content.xml (or styles.xml) as minimum



⊞ Configurations2		Directory
content.xml	0 Bytes	File
manifest.rdf	0 Bytes	File
⊟ META-INF		Directory
manifest.xml	0 Bytes	File
meta.xml	1 kB	File
mimetype	39 Bytes	File
settings.xml	0 Bytes	File
styles.xml	0 Bytes	File
⊞ Thumbnails		Directory



ODF Details (content.xml)

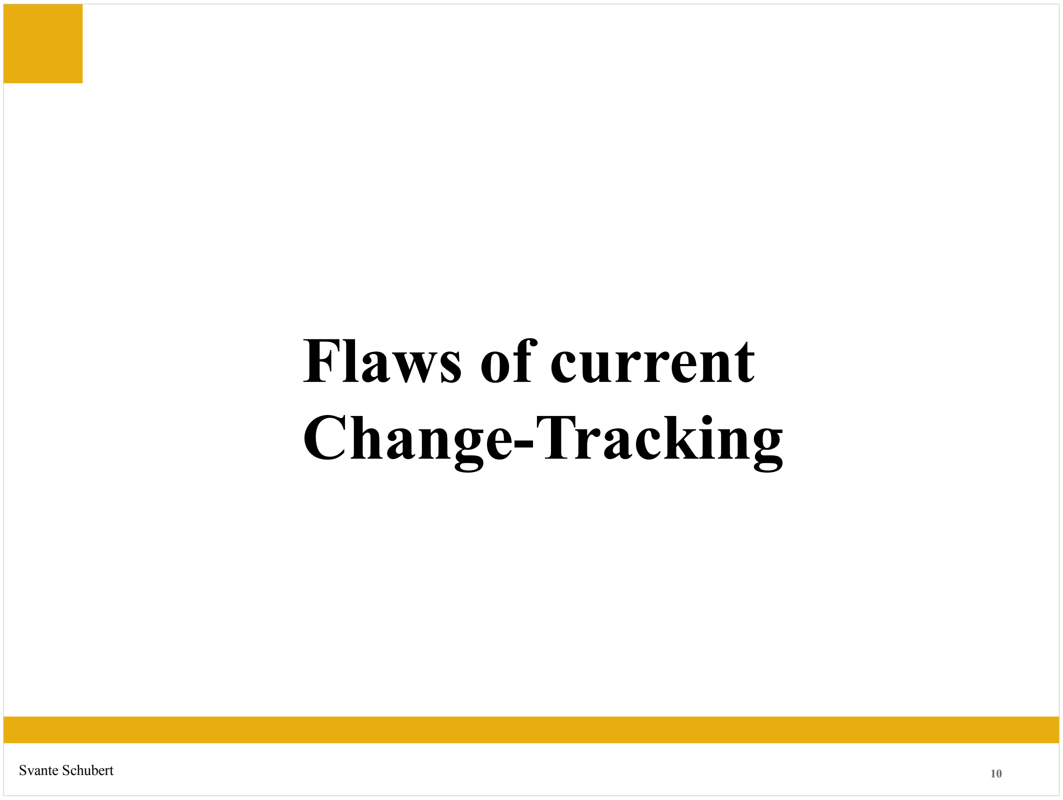
Hello World!

- Sure, could be less boilerplate..

```
<?xml version="1.0" encoding="UTF-8"?>
<office:document-content xmlns:office="urn:oasis:names:tc:opendocument:xmlns:office:1.0" xmlns:style="urn:oas
    <office:scripts/>
    <office:font-face-decls>
        <style:font-face style:name="Lucida Sans1" svg:font-family="&apos;Lucida Sans&apos;" style:font-fami
        <style:font-face style:name="Times New Roman" svg:font-family="&apos;Times New Roman&apos;" style:fo
        <style:font-face style:name="Arial" svg:font-family="Arial" style:font-family-generic="swiss" style:
        <style:font-face style:name="Lucida Sans" svg:font-family="&apos;Lucida Sans&apos;" style:font-famil
        <style:font-face style:name="SimSun" svg:font-family="SimSun" style:font-family-generic="system" sty
    </office:font-face-decls>
    <office:automatic-styles/>
    <office:body>
        <office:text>
            <text:sequence-decls>
                <text:sequence-decl text:display-outline-level="0" text:name="Illustration"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Table"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Text"/>
                <text:sequence-decl text:display-outline-level="0" text:name="Drawing"/>
            </text:sequence-decls>
            <text:p text:style-name="Standard">Hello World!</text:p>
        </office:text>
    </office:body>
</office:document-content>
```

Why HEADER/BODY in a multipart file?

Convention over Configuration – define an EMPTY document



Flaws of current Change-Tracking

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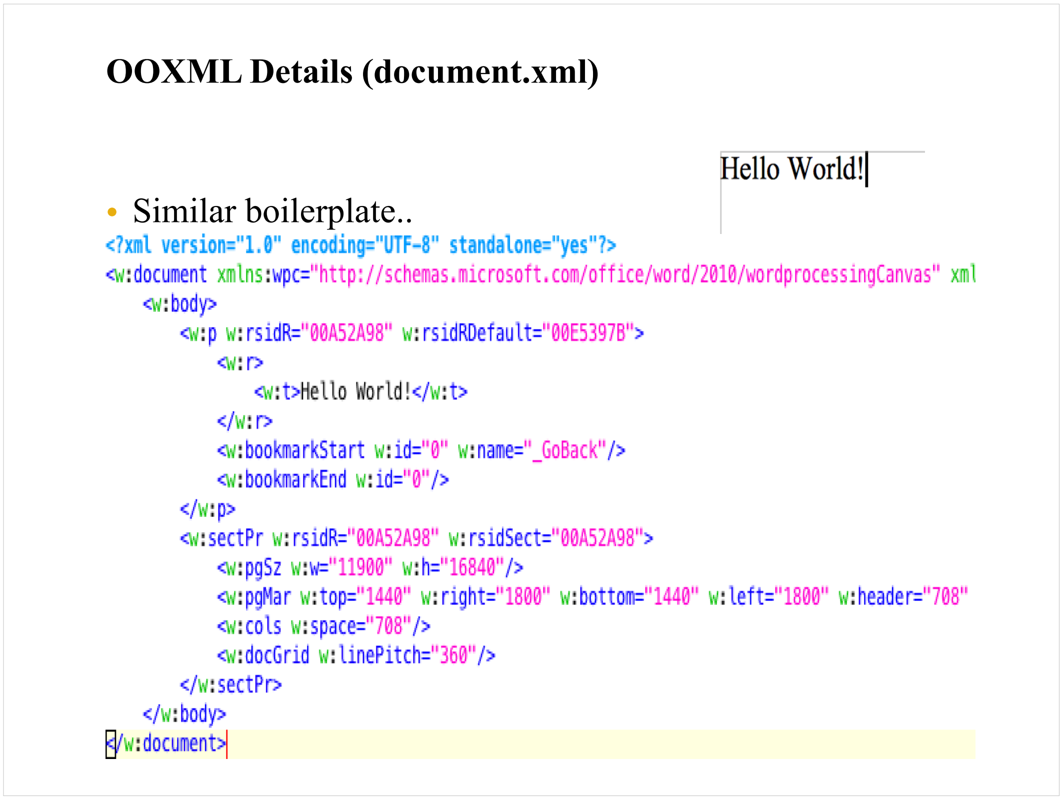
As Microsoft claimed the current ODF change-tracking being broken, let's try out OOXML change-tracking (using MS Office 2011 on a Macbook)



OOXML Details (document.xml)

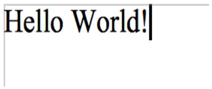
Hello World!

- Similar boilerplate..

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<w:document xmlns:wpc="http://schemas.microsoft.com/office/word/2010/wordprocessingCanvas" xml
    <w:body>
        <w:p w:rsidR="00A52A98" w:rsidRDefault="00E5397B">
            <w:r>
                <w:t>Hello World!</w:t>
            </w:r>
            <w:bookmarkStart w:id="0" w:name="_GoBack"/>
            <w:bookmarkEnd w:id="0"/>
        </w:p>
        <w:sectPr w:rsidR="00A52A98" w:rsidSect="00A52A98">
            <w:pgSz w:w="11900" w:h="16840"/>
            <w:pgMar w:top="1440" w:right="1800" w:bottom="1440" w:left="1800" w:header="708"
            <w:cols w:space="708"/>
            <w:docGrid w:linePitch="360"/>
        </w:sectPr>
    </w:body>
</w:document>
```

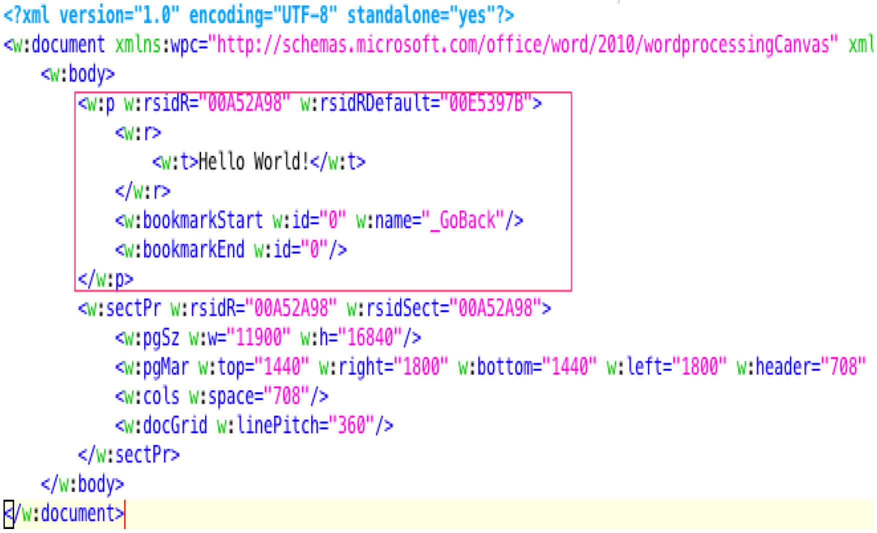
Why HEADER/BODY in a multipart file?
Convention over Configuration –
We should define an EMPTY document for ODF & OOXML.

OOXML Details (document.xml)



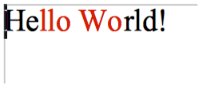
Hello World!

- Similar boilerplate..

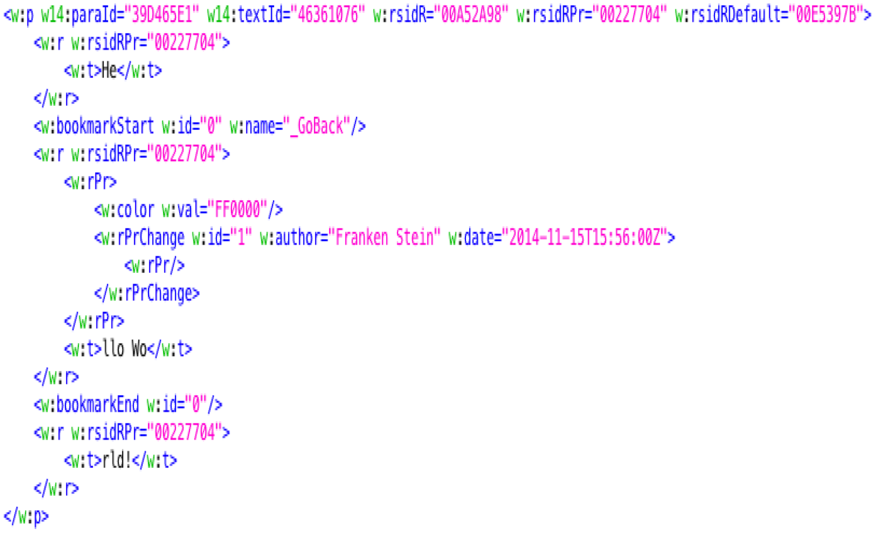


```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<w:document xmlns:wpc="http://schemas.microsoft.com/office/word/2010/wordprocessingCanvas" xml
    <w:body>
        <w:p w:rsidR="00A52A98" w:rsidRDefault="00E5397B">
            <w:r>
                <w:t>Hello World!</w:t>
            </w:r>
            <w:bookmarkStart w:id="0" w:name="_GoBack"/>
            <w:bookmarkEnd w:id="0"/>
        </w:p>
        <w:sectPr w:rsidR="00A52A98" w:rsidSect="00A52A98">
            <w:pgSz w:w="11900" w:h="16840"/>
            <w:pgMar w:top="1440" w:right="1800" w:bottom="1440" w:left="1800" w:header="708"
            <w:cols w:space="708"/>
            <w:docGrid w:linePitch="360"/>
        </w:sectPr>
    </w:body>
</w:document>
```

OOXML Change-Track Details

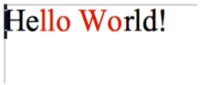

Hello World!

- Change-tracked text format..



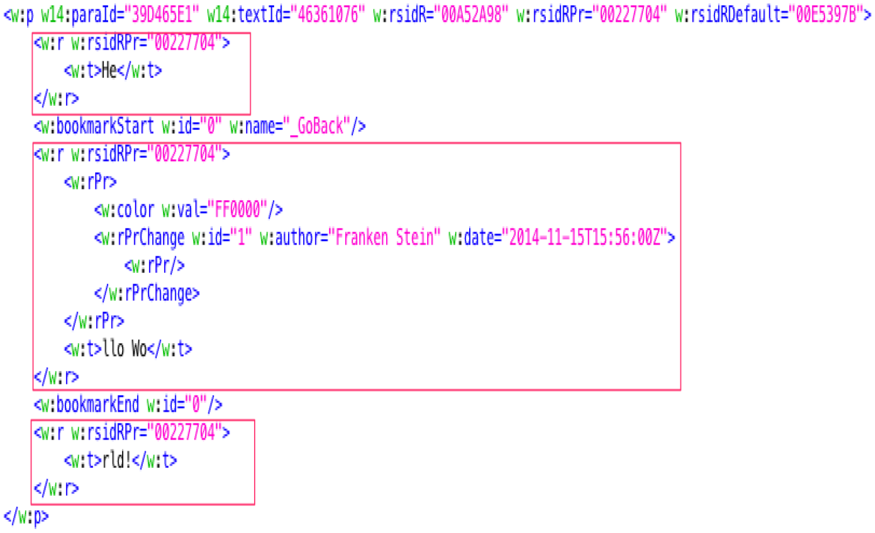
```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details

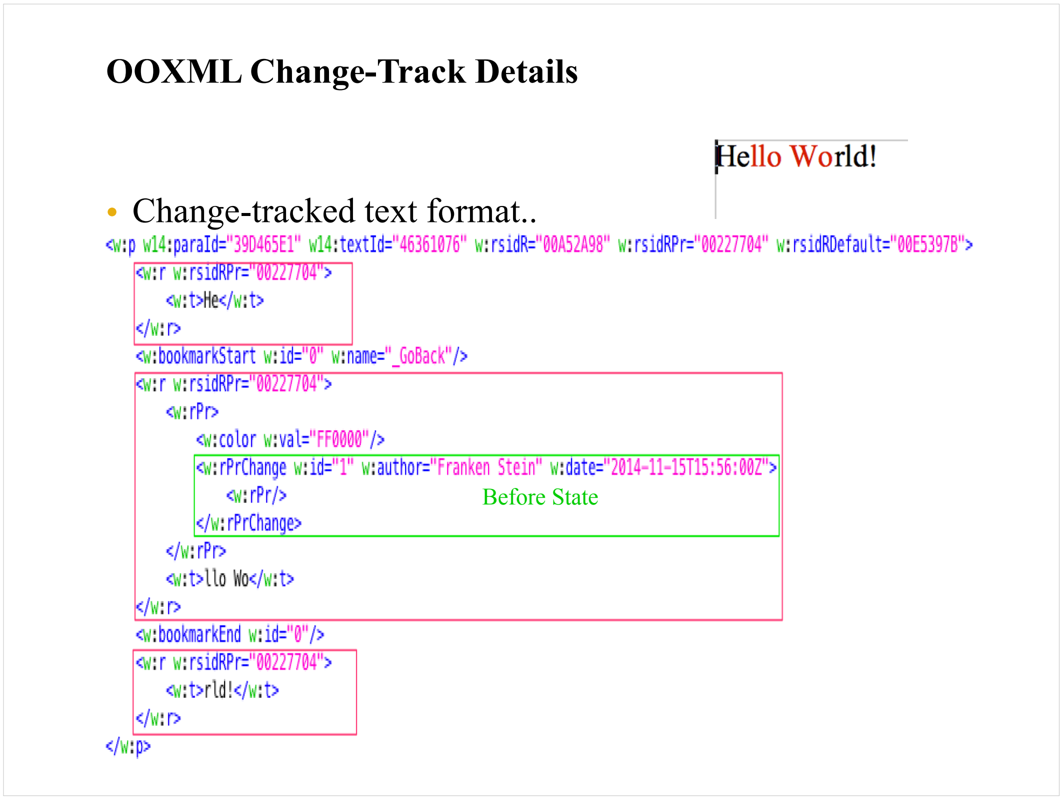


Hello World!

- Change-tracked text format..



```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```



OOXML Change-Track Details

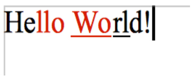
Hello World!

- Change-tracked text format..

```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w:rsidRDefault="00E5397B">
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:bookmarkStart w:id="0" w:name="_GoBack"/>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="1" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>                                   Before State
            </w:rPrChange>
        </w:rPr>
        <w:t>llo Wo</w:t>
    </w:r>
    <w:bookmarkEnd w:id="0"/>
    <w:r w:rsidRPr="00227704">
        <w:t>rld!</w:t>
    </w:r>
</w:p>
```

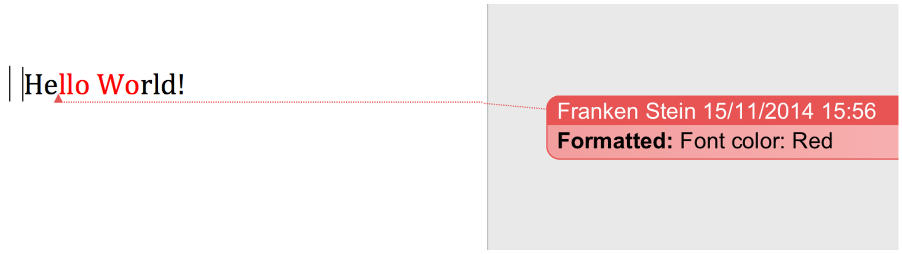
The gree is the BEFORE STATE being used, when rejecting the changet

Status Quo: Change-Tracking


Hello World!

- Users does a “change reject”
  - Reanimates state of “before state box”
- Problematic with overlapping Changes
  - Reanimation not sufficient in case of dependencies
  - Reanimated state influences content of other “before state box”
- DEMO – Downside old concept - MS Office 2011 on Mac

Demo: MS Office2011 Mac
Change 1: Format substring “llo Wo” red



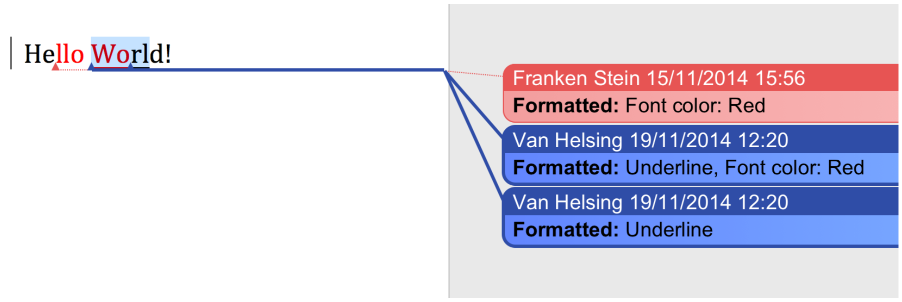
Hello World!

Franken Stein 15/11/2014 15:56

Formatted: Font color: Red

Demo: MS Office2011 Mac
Change 2: Format substring “Worl” underline

Why are there two changes for 1 Change?



Hello World!

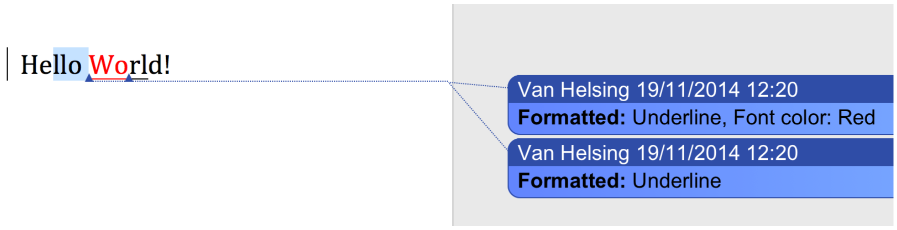
Franken Stein 15/11/2014 15:56
Formatted: Font color: Red

Van Helsing 19/11/2014 12:20
Formatted: Underline, Font color: Red

Van Helsing 19/11/2014 12:20
Formatted: Underline

Demo: MS Office2011 Mac
Change 3: Undo first Change (no red format) → Broken!

Why is there still red format?

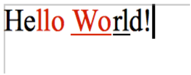


Hello World!

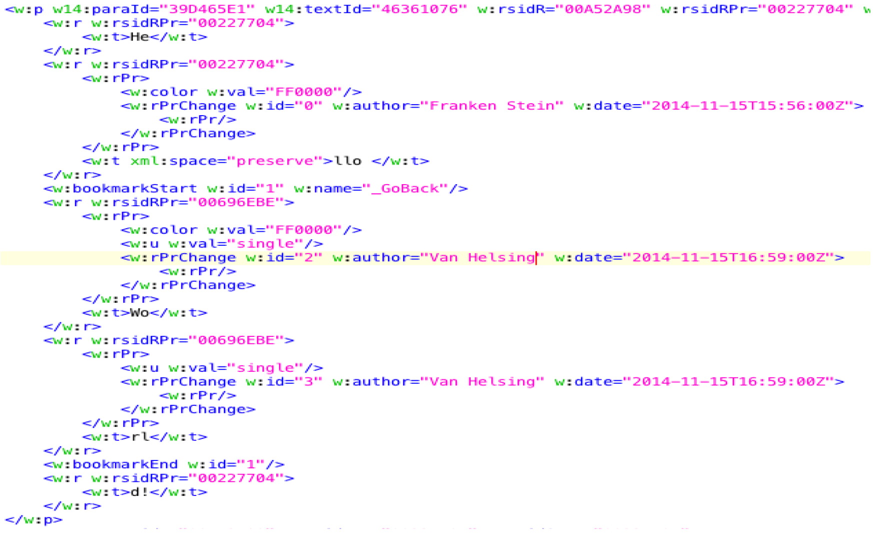
Van Helsing 19/11/2014 12:20
Formatted: Underline, Font color: Red

Van Helsing 19/11/2014 12:20
Formatted: Underline

OOXML Change-Track Details

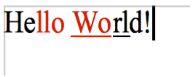


- Change-tracked text format..



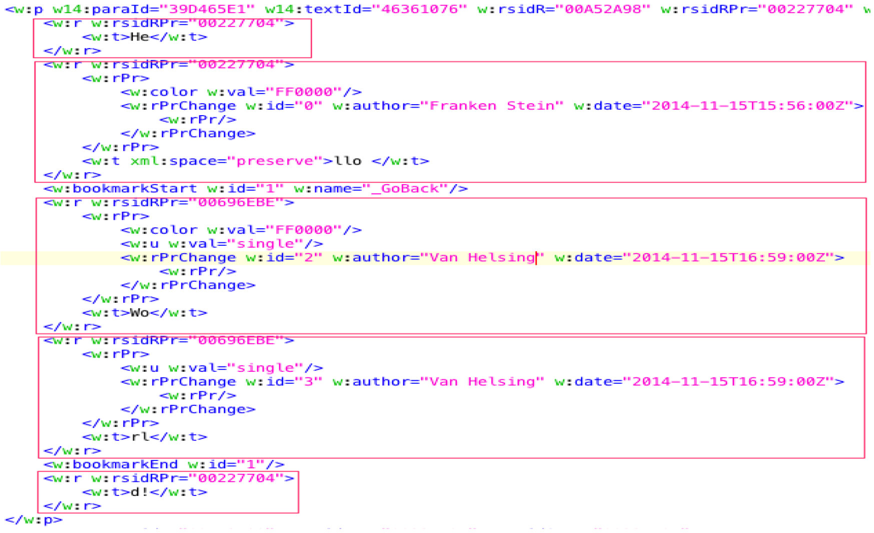
```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
    </w:r>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:u w:val="single"/>
            <w:rPrChange w:id="3" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>rl</w:t>
    </w:r>
    <w:bookmarkEnd w:id="1"/>
    <w:r w:rsidRPr="00227704">
        <w:t>d!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details



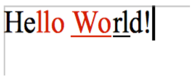
Hello World!

- Change-tracked text format..

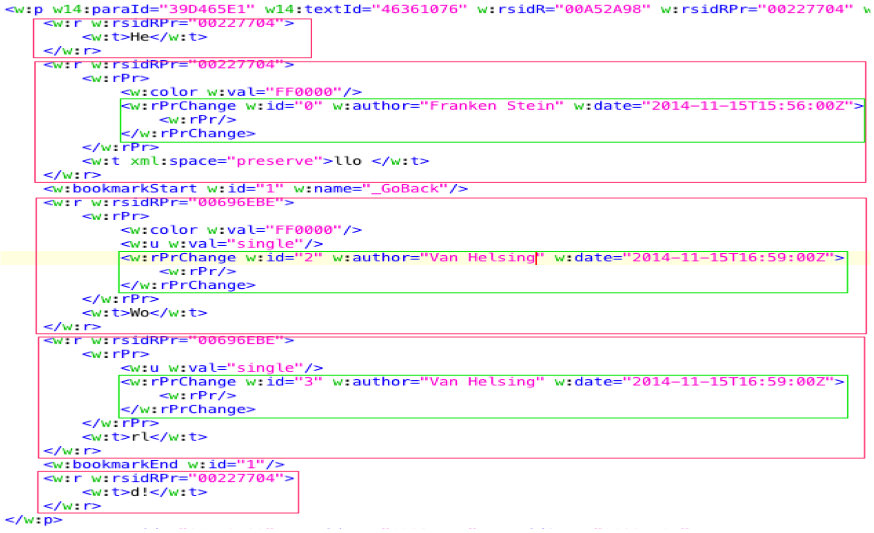


```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
    </w:r>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:u w:val="single"/>
            <w:rPrChange w:id="3" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>rl</w:t>
    </w:r>
    <w:bookmarkEnd w:id="1"/>
    <w:r w:rsidRPr="00227704">
        <w:t>d!</w:t>
    </w:r>
</w:p>
```

OOXML Change-Track Details


Hello World!

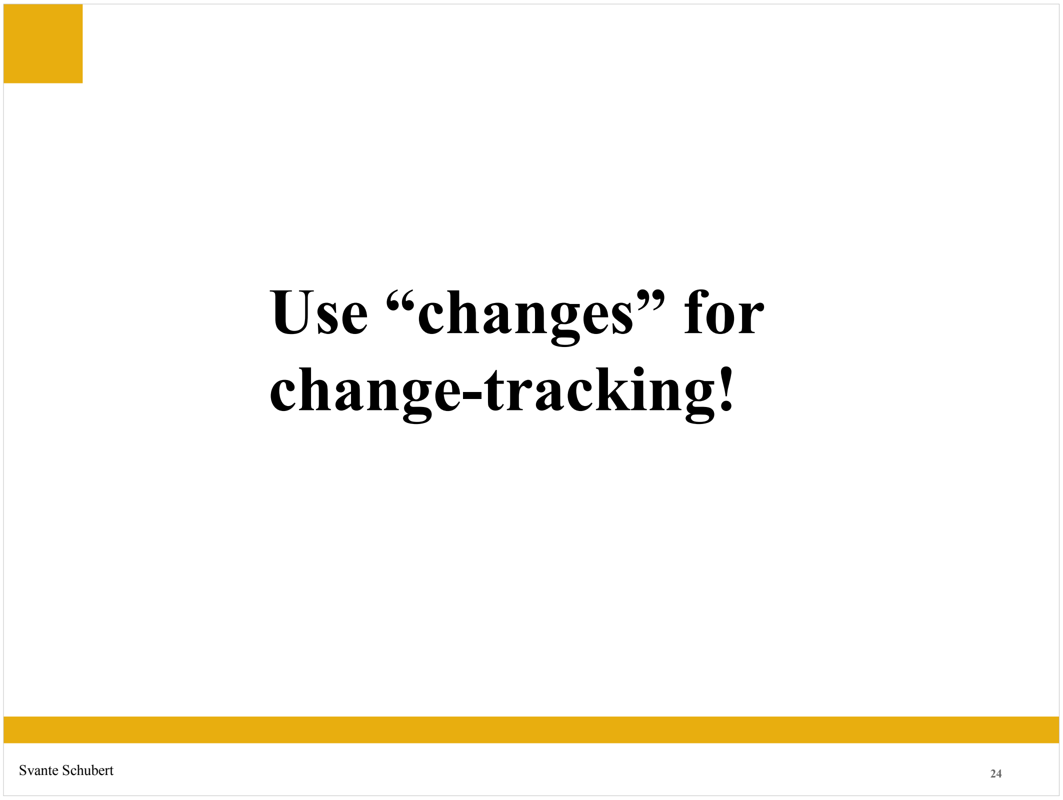
- Change-tracked text format..



```
<w:p w14:paraId="39D465E1" w14:textId="46361076" w:rsidR="00A52A98" w:rsidRPr="00227704" w
    <w:r w:rsidRPr="00227704">
        <w:t>He</w:t>
    </w:r>
    <w:r w:rsidRPr="00227704">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:rPrChange w:id="0" w:author="Franken Stein" w:date="2014-11-15T15:56:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t xml:space="preserve">llo </w:t>
    </w:r>
    <w:bookmarkStart w:id="1" w:name="_GoBack"/>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:color w:val="FF0000"/>
            <w:u w:val="single"/>
            <w:rPrChange w:id="2" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>Wo</w:t>
    </w:r>
    <w:r w:rsidRPr="00696EBE">
        <w:rPr>
            <w:u w:val="single"/>
            <w:rPrChange w:id="3" w:author="Van Helsing" w:date="2014-11-15T16:59:00Z">
                <w:rPr/>
            </w:rPrChange>
        </w:rPr>
        <w:t>rl</w:t>
    </w:r>
    <w:bookmarkEnd w:id="1"/>
    <w:r w:rsidRPr="00227704">
        <w:t>d!</w:t>
    </w:r>
</w:p>
```

Alternatives?

COUNTING ONLY THE COMPONENTS
NO BOILERPLATE



Use “changes” for change-tracking!

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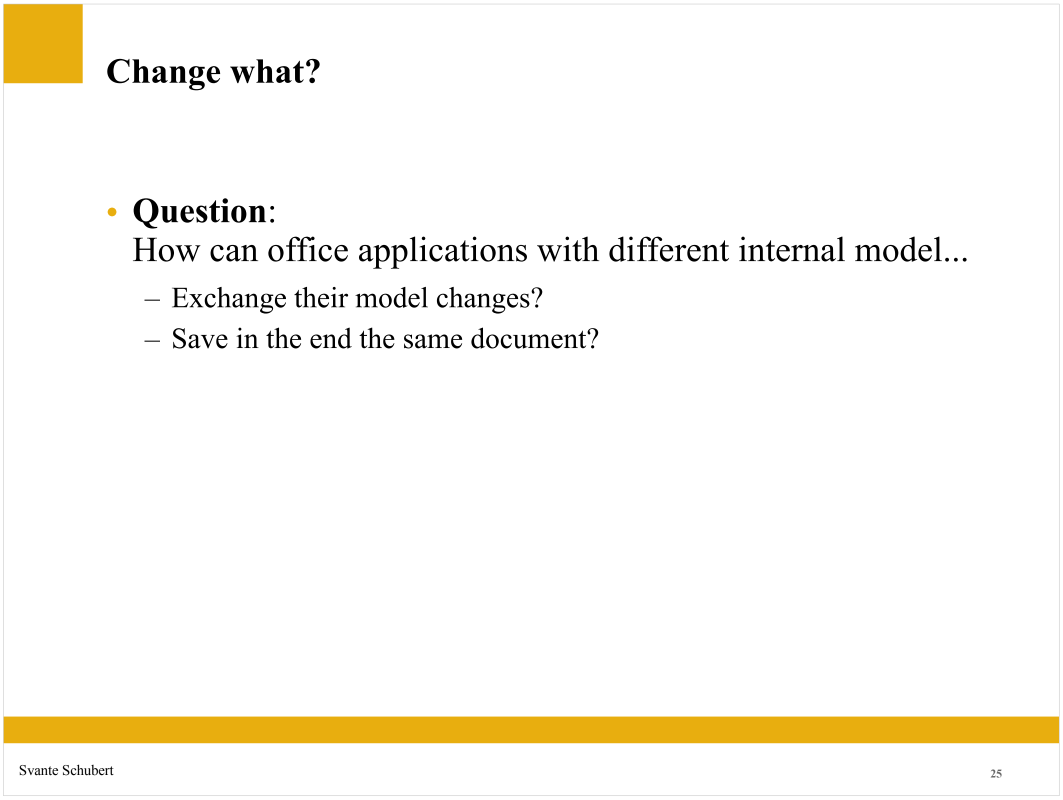
Strange: Earlier doing change-tracking without knowing what a change is! :D



Change what?

- **Question**:
  How can office applications with different internal model...
  - Exchange their model changes?
  - Save in the end the same document?

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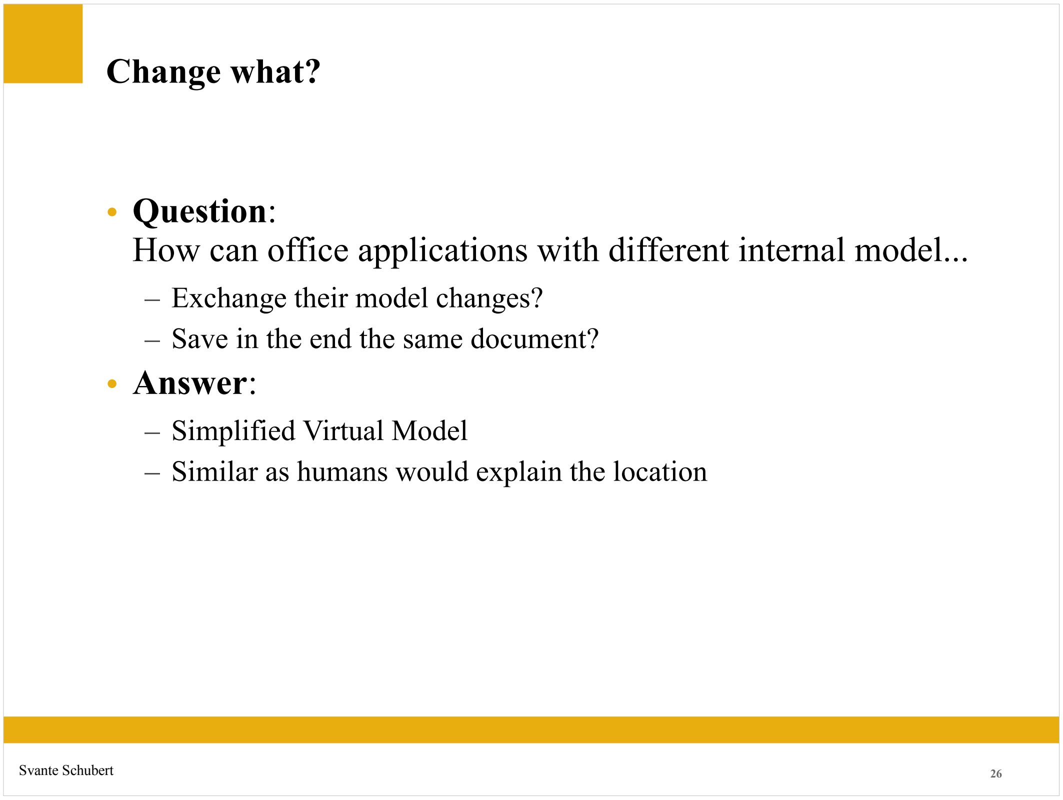
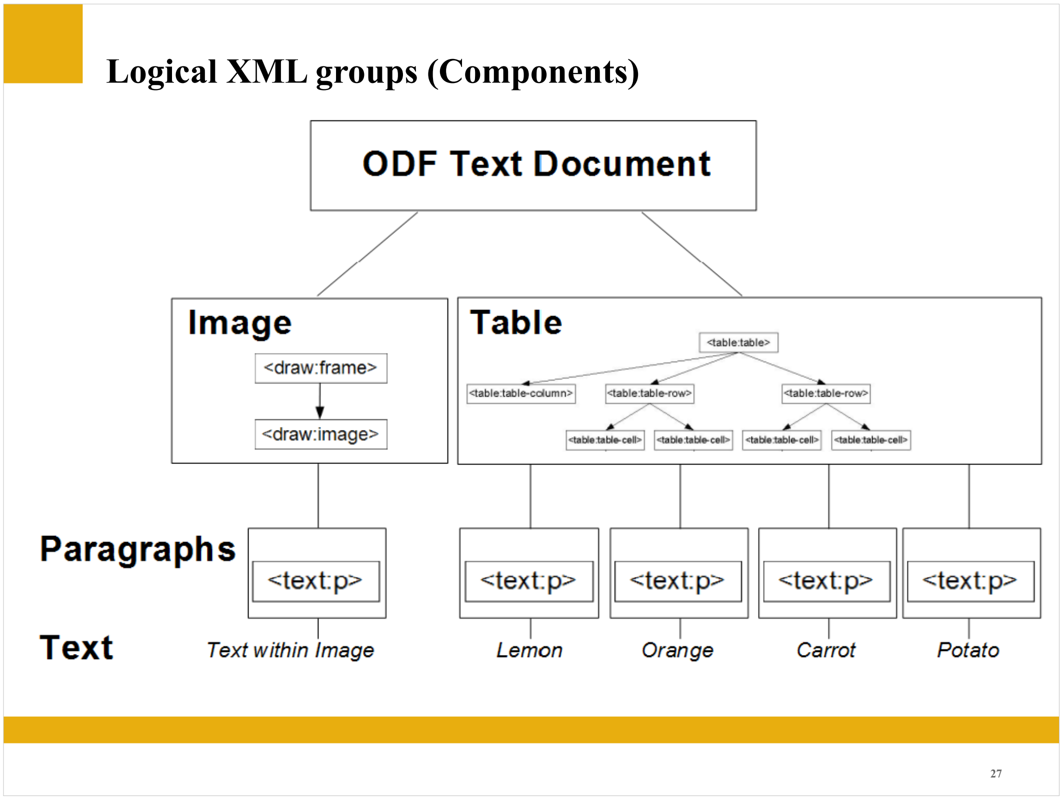
- Most ODF apps designed for **floppy discs** not for Internet
- Similar to source programming **not real-time** editing is required (necessarily), but ability to exchange changes via efficient patches (work asynchronous on large documents)
- Desired so there is the ”ODF Advanced Document Collaboration” subcommittee - https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=office-collab
- We **simplify** the ODF XML by abstracting the existing model



Change what?

- **Question**:
  How can office applications with different internal model...
  - Exchange their model changes?
  - Save in the end the same document?
- **Answer**:
  - Simplified Virtual Model
  - Similar as humans would explain the location

- Most ODF apps designed for **floppy discs** not for Internet
- Similar to source programming **not real-time** editing is required (necessarily), but ability to exchange changes via efficient patches (work asynchronous on large documents)
- Desired so there is the ”ODF Advanced Document Collaboration” subcommittee - https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=office-collab
- We **simplify** the ODF XML by abstracting the existing model



Logical XML groups (Components)

ODF Text Document

Image

<draw:frame>

<draw:image>

Table

<table:table>

<table:table-column>

<table:table-row>

<table:table-row>

<table:table-cell>

<table:table-cell>

<table:table-cell>

<table:table-cell>

Paragraphs

<text:p>

<text:p>

<text:p>

<text:p>

<text:p>

Text

Text within Image

Lemon

Orange

Carrot

Potato

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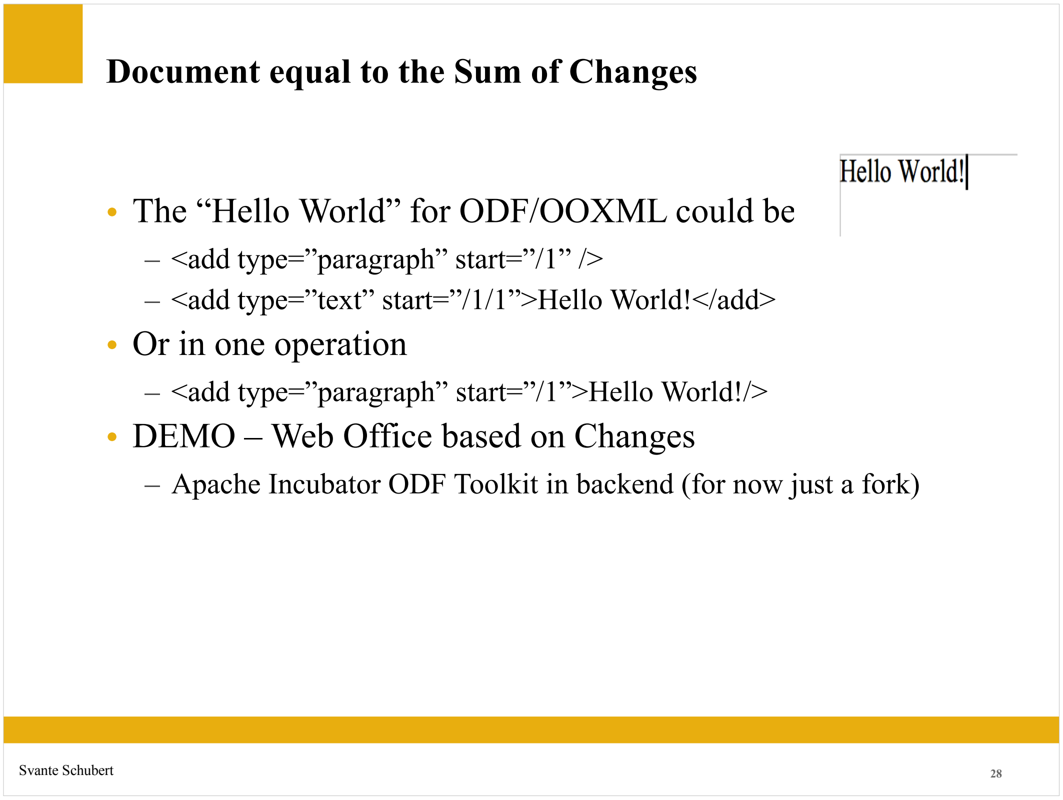
The model is the specification, but even the ODF 1.2 part 1 is listing
~600 elements / ~1300 attributes

Find logic puzzle pieces (components) based on user logic. Separate XML grammar tree on user logic and common user changes.

Rules of data encapsulation. Altering the component does not change anything outside the component.
Views – like content table (indices), table collections like row, column, cellranges..

NOTE: Table on graphic is simplified. Rows are a component as well.



Document equal to the Sum of Changes

Hello World!

- The “Hello World” for ODF/OOXML could be
  - <add type=”paragraph” start=”/1” />
  - <add type=”text” start=”/1/1”>Hello World!</add>
- Or in one operation
  - <add type=”paragraph” start=”/1”>Hello World!/>
- DEMO – Web Office based on Changes
  - Apache Incubator ODF Toolkit in backend (for now just a fork)

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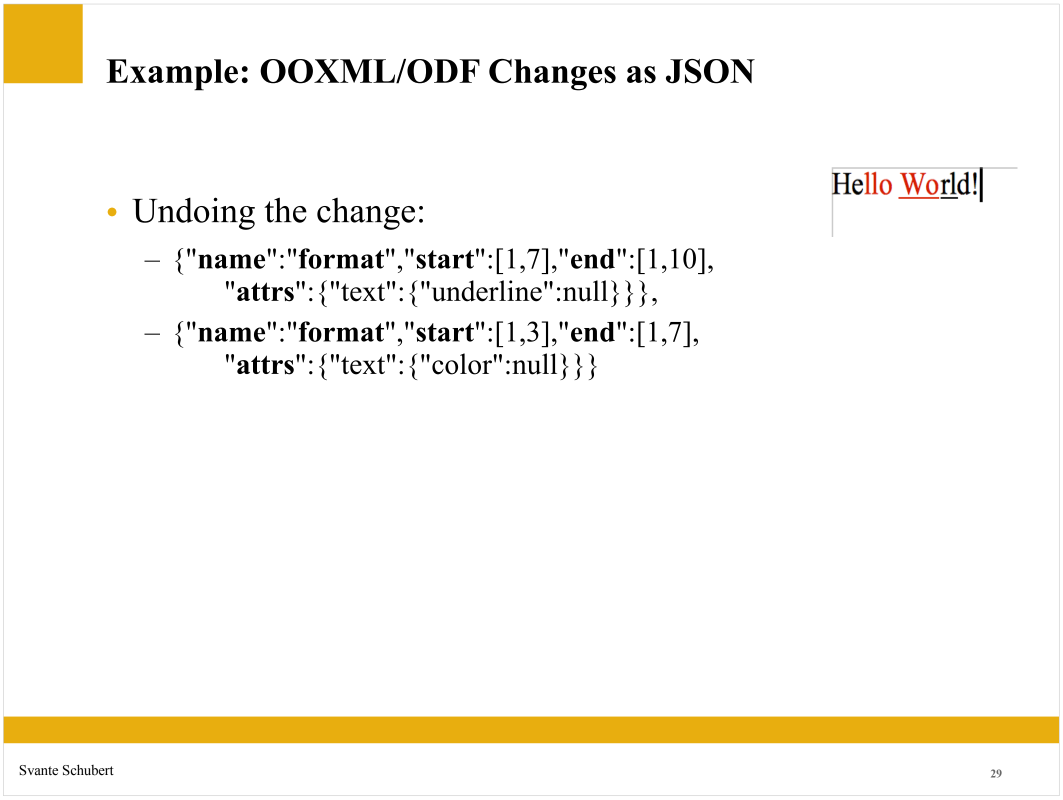
COUNTING ONLY THE COMPONENTS
NO BOILERPLATE

Using consistent model of changes for interchange of user actions/documents!



Example: OOXML/ODF Changes as JSON

Hello World!

- Undoing the change:
  - {"**name**":"**format**","**start**":[1,7],"**end**":[1,10], "**attrs**":{"text":{"underline":null}}},
  - {"**name**":"**format**","**start**":[1,3],"**end**":[1,7], "**attrs**":{"text":{"color":null}}}

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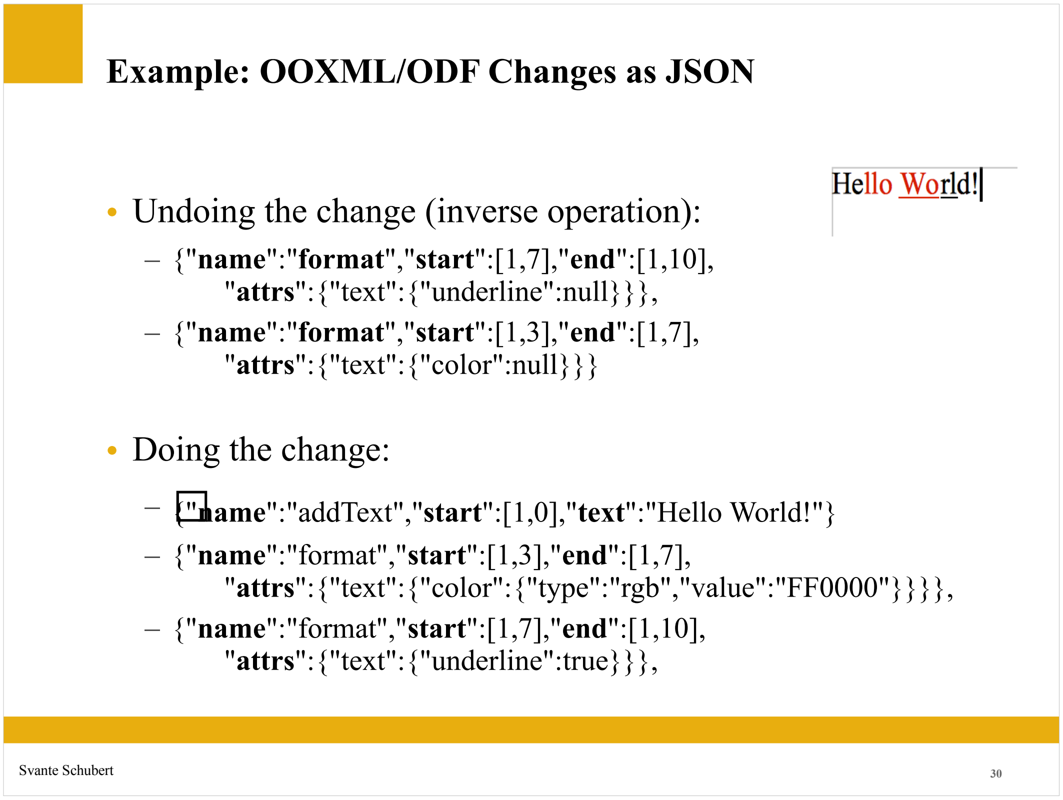
JSON being exchanged between Apache ODF Toolkit Incubator mapping an ODF to JSON Operations

Every BrowserEdit becomes a JSON operation as well.

Will be dispatched back to server, when document is being closed or downloaded.



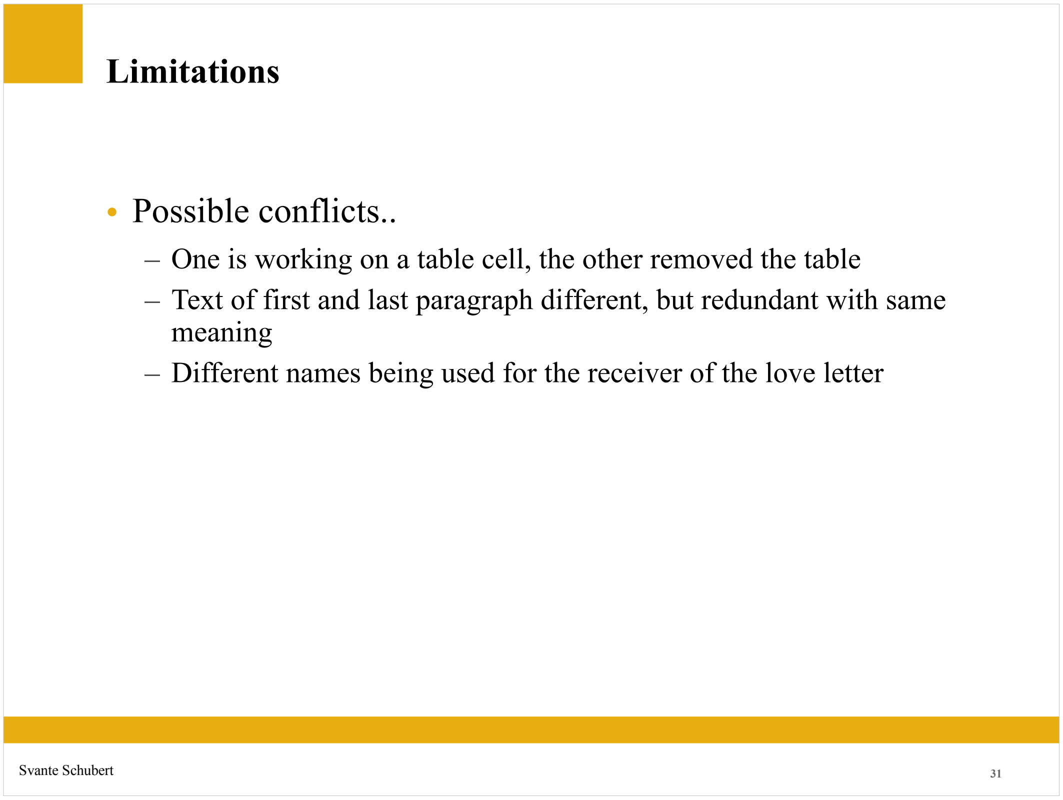
Example: OOXML/ODF Changes as JSON

Hello World!

- Undoing the change (inverse operation):
  - {"**name**":"**format**","**start**":[1,7],"**end**":[1,10],
    "**attrs**":{"text":{"underline":null}}},
  - {"**name**":"**format**","**start**":[1,3],"**end**":[1,7],
    "**attrs**":{"text":{"color":null}}}

- Doing the change:
  - {"**name**":"addText","**start**":[1,0],"**text**":"Hello World!"}
  - {"**name**":"format","**start**":[1,3],"**end**":[1,7],
    "**attrs**":{"text":{"color":{"type":"rgb","value":"FF0000"}}}},
  - {"**name**":"format","**start**":[1,7],"**end**":[1,10],
    "**attrs**":{"text":{"underline":true}}},

Every Operation has an INVERSE operation that UNDO it. Putting the document in the previous state!

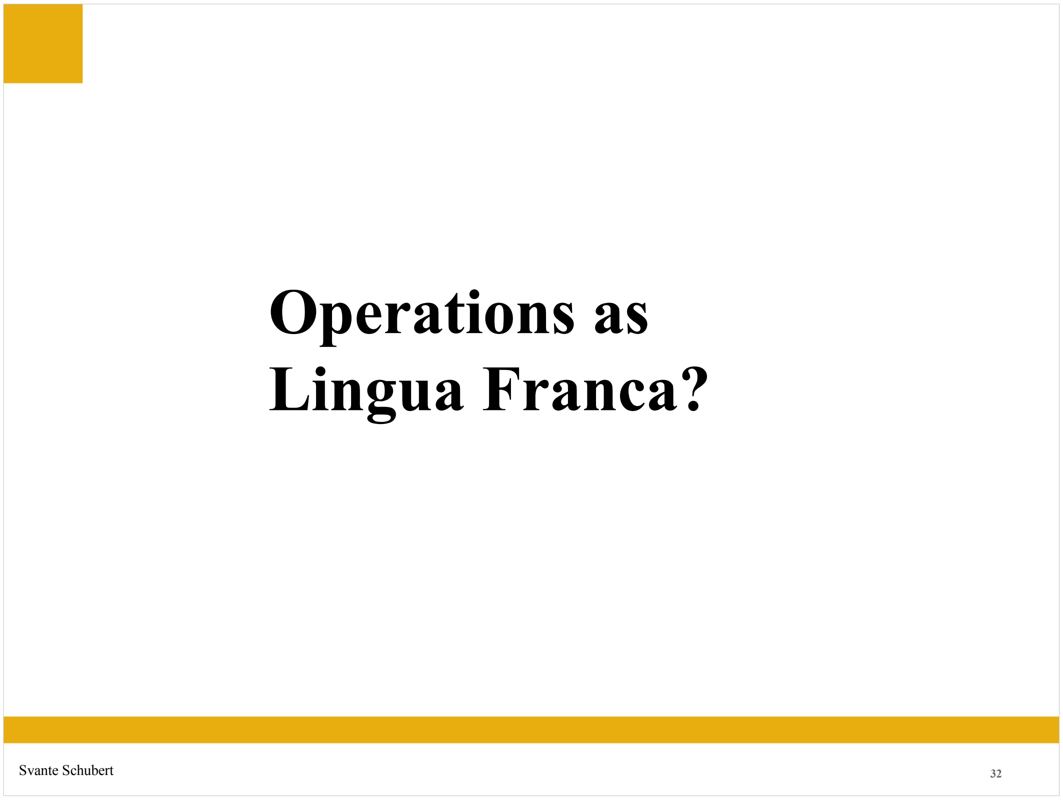


Limitations

- Possible conflicts..
  - One is working on a table cell, the other removed the table
  - Text of first and last paragraph different, but redundant with same meaning
  - Different names being used for the receiver of the love letter

- Automate what can be automated
- Abstract the technique from the user

STILL the above can & will happen!



Operations as Lingua Franca?

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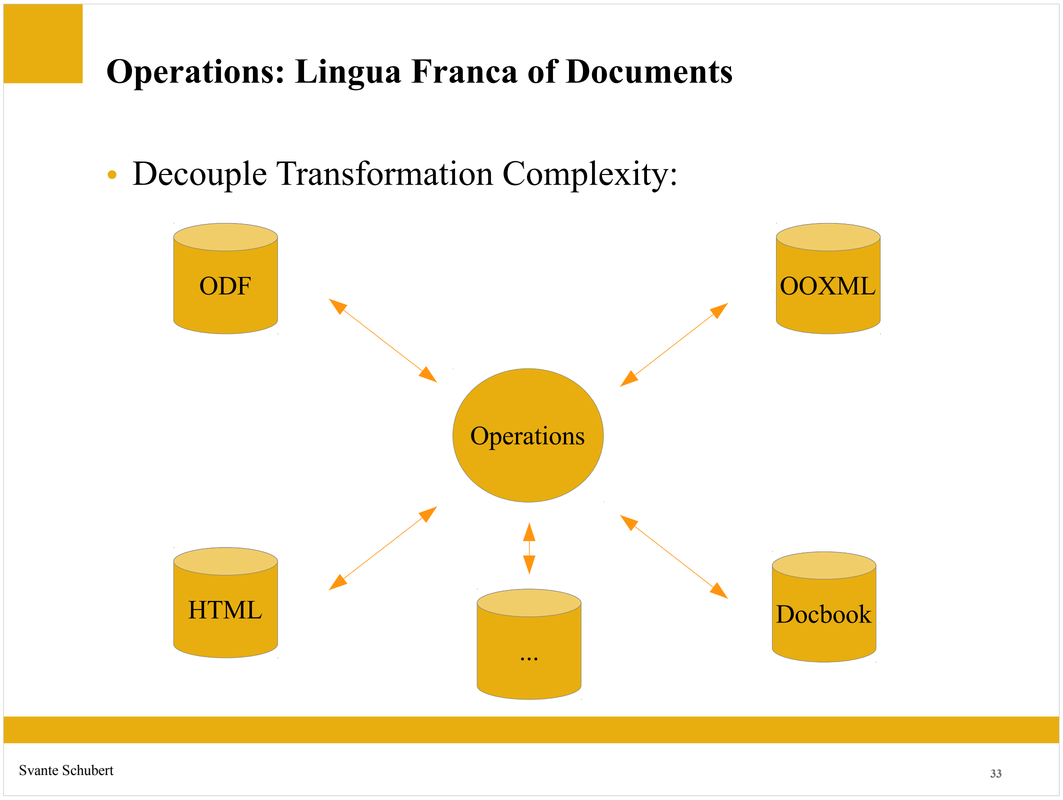
To make equal again what went different ways in the past..



Operations: Lingua Franca of Documents

- Decouple Transformation Complexity:

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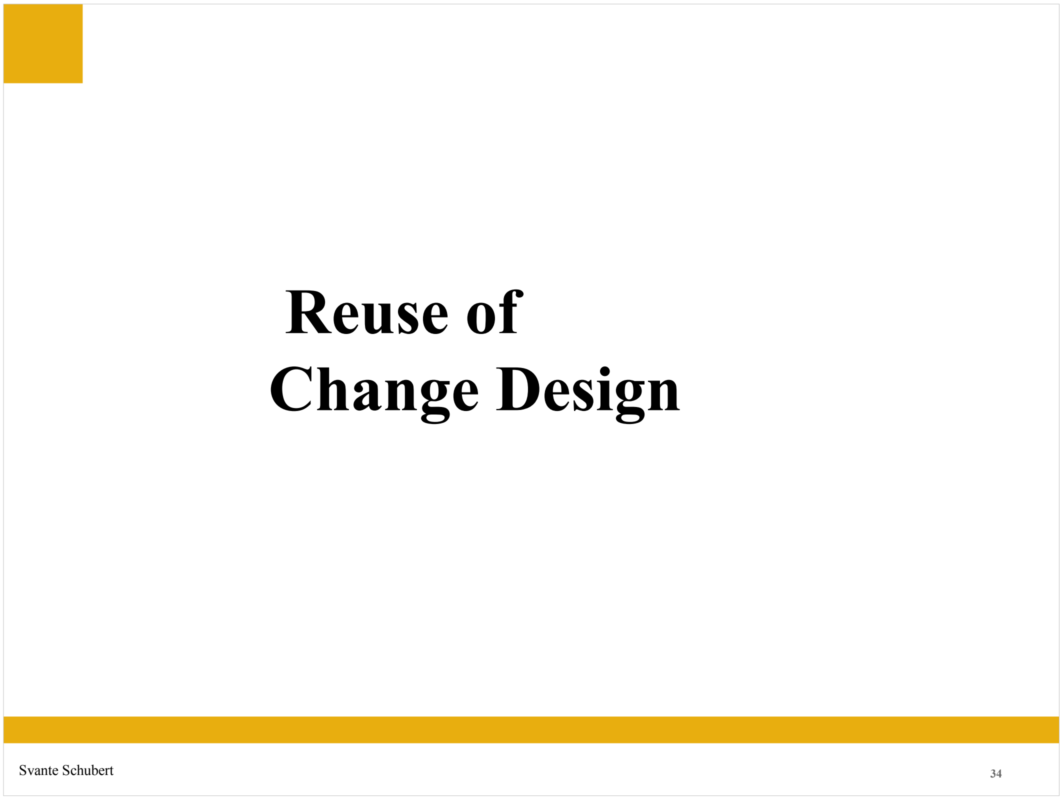
Operations/Changes can become a lingua franca creating a bridge between redundant standards.

Defining changes to be dispatched among document users.

Writing 10 years on a XSL transformation from ODF to HTML. Common problem was the problem in understanding of ODF or HTML? Able to reuse transformation from (or to) a format to ops and combine it differently.

Special features of a format will be ignored in the operation queue (kept in the queue) and can therefore be round-tripped!

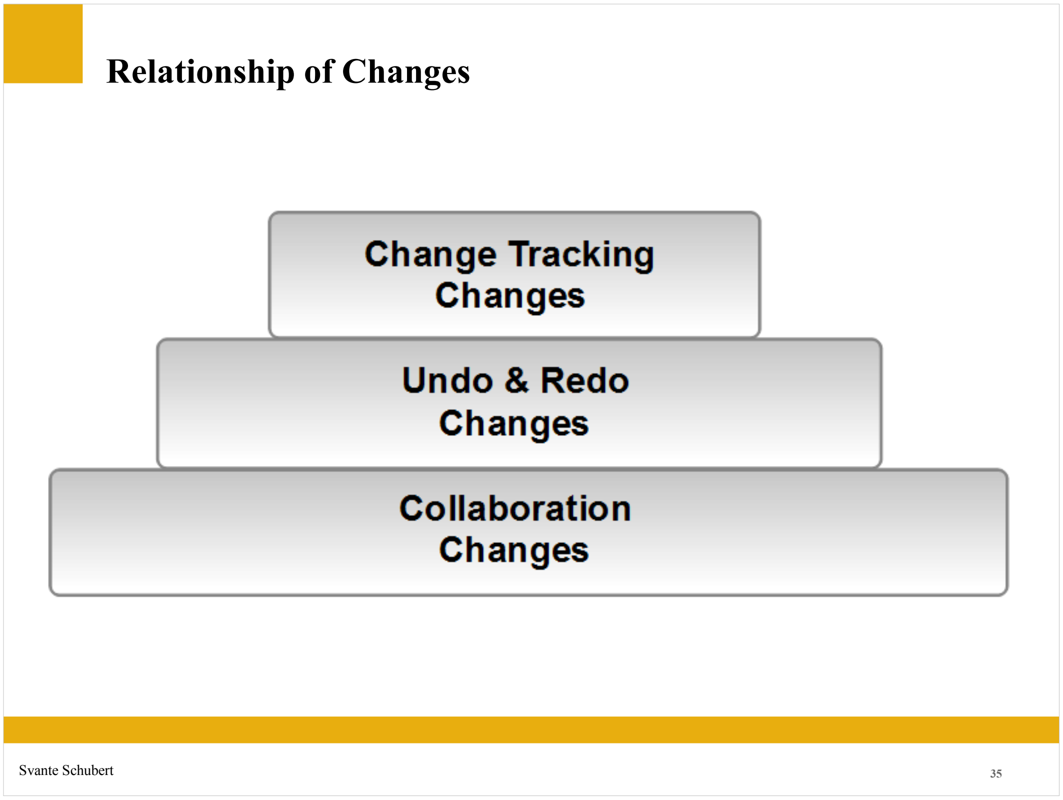
XSLT PROCESSING – INTERLEAVED MAPPING & IMPLEMENTATION



Reuse of Change Design

Software modules can be reused..

As Apache ODF Toolkit (Incubating) for testing purposes..



Relationship of Changes

Change Tracking Changes

Undo & Redo Changes

Collaboration Changes

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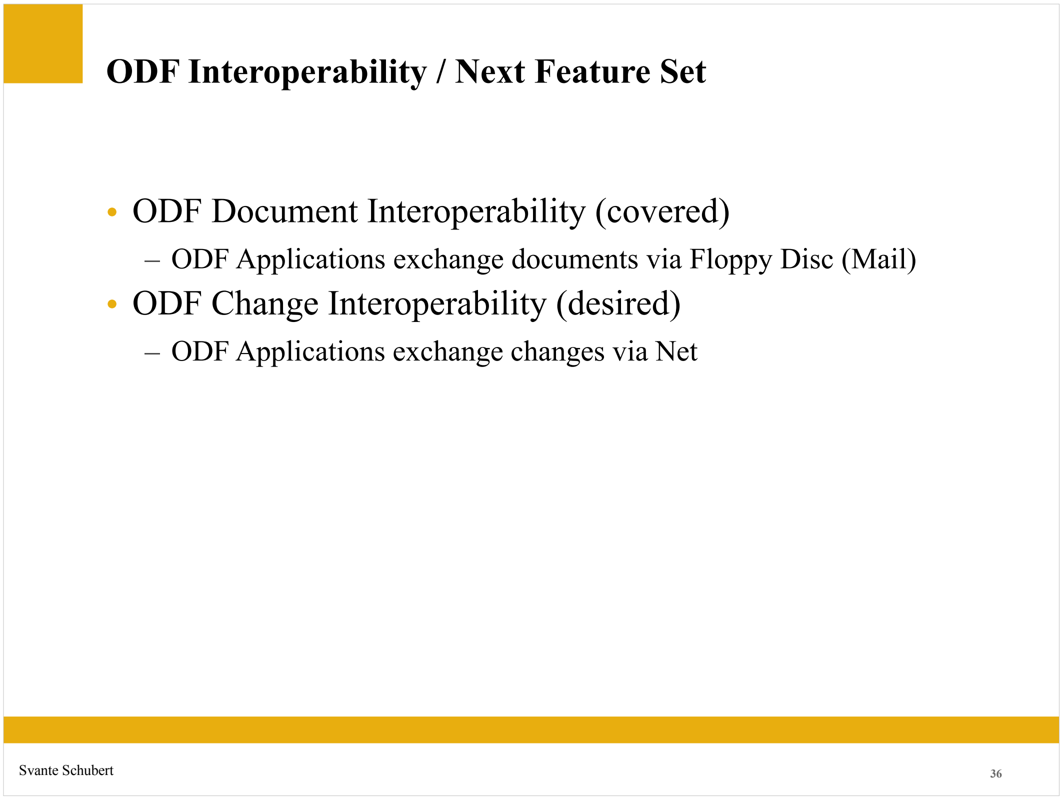
Finest granularity for Real-Time-Collaboration (bottom), required is change-tracking for ODF 1.3.

Aggregation of commands
STARTING FROM THE BOTTOM: Collaboration might dispatch every character change...

Undo & Do aggregation of Collaboration changes:only for one for user, usually not single character but undo/do by word granularity. Not saved in ODF.

Change Tracking further aggregation: Only the aggregated changes of user changes to previous state. In-between changes are not tracked.

AO/LOO DIFFERENT CT & UNDO IMPLEMENTATION



ODF Interoperability / Next Feature Set

- ODF Document Interoperability (covered)
  - ODF Applications exchange documents via Floppy Disc (Mail)
- ODF Change Interoperability (desired)
  - ODF Applications exchange changes via Net

- Most ODF apps designed for **floppy discs** not for Internet
- Similar to source programming **not real-time** editing is required (necessarily), but ability to exchange changes via efficient patches (work asynchronous on large documents)
- Desired so there is the ”ODF Advanced Document Collaboration” subcommittee - https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=office-collab
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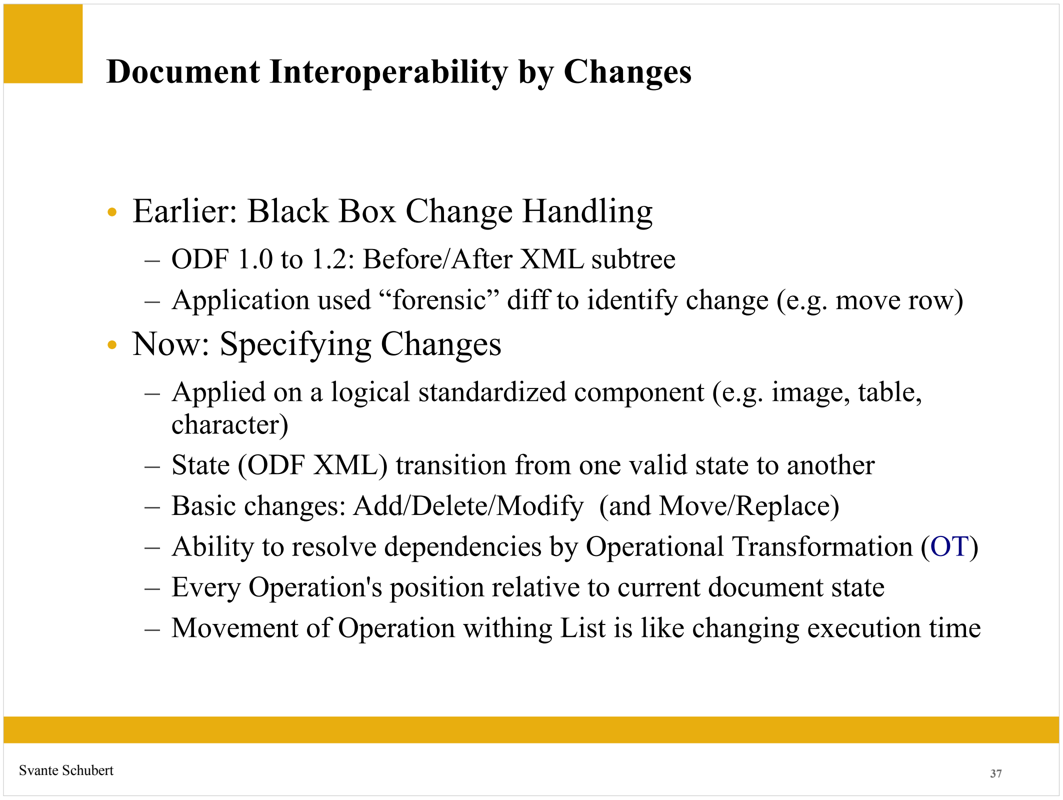
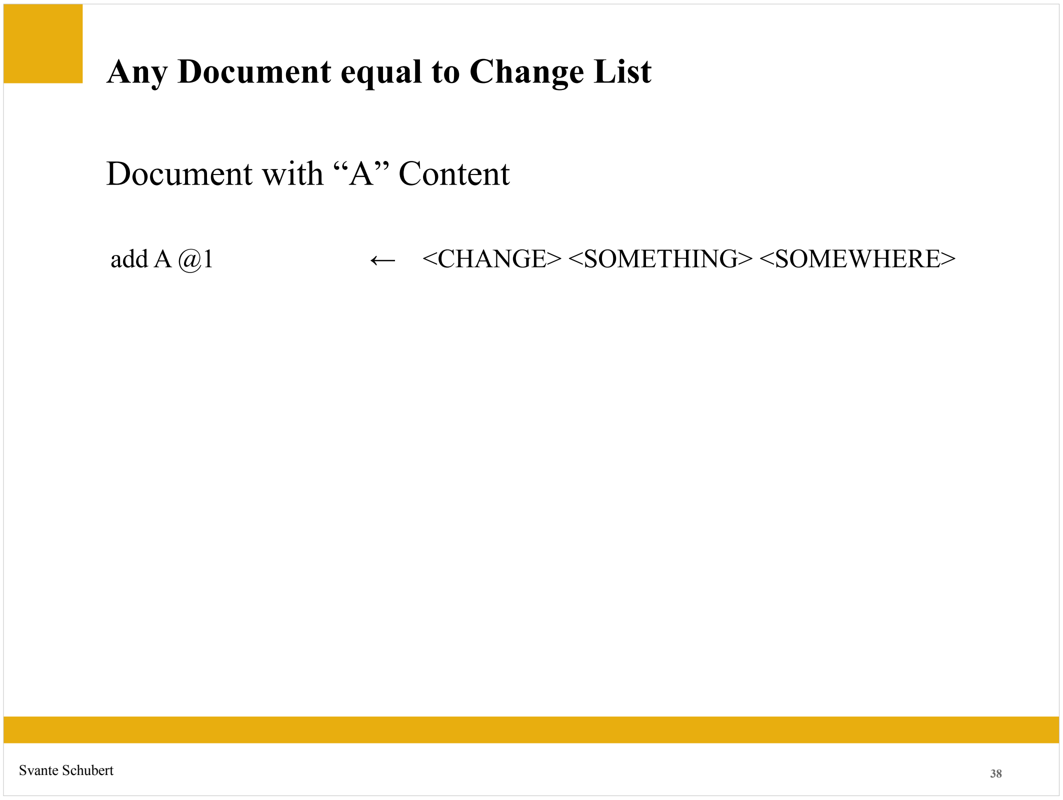


Document Interoperability by Changes

- Earlier: Black Box Change Handling
  - ODF 1.0 to 1.2: Before/After XML subtree
  - Application used “forensic” diff to identify change (e.g. move row)
- Now: Specifying Changes
  - Applied on a logical standardized component (e.g. image, table, character)
  - State (ODF XML) transition from one valid state to another
  - Basic changes: Add/Delete/Modify (and Move/Replace)
  - Ability to resolve dependencies by Operational Transformation (OT)
  - Every Operation's position relative to current document state
  - Movement of Operation withing List is like changing execution time

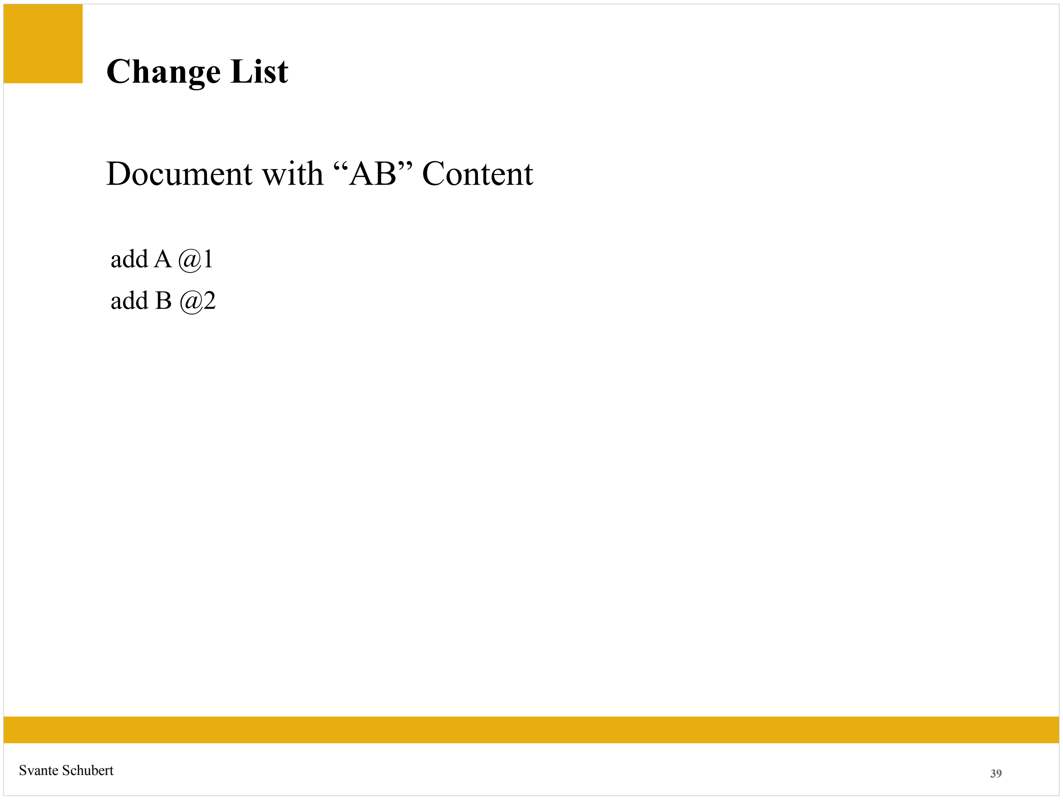
- Move the complexity in the specification not into the file format
- Also: Define reoccurred change pattern: Split/MergeParagraph, insertColumn,..
- Able to adapt change within queue of dependent changes (OT)



Any Document equal to Change List

Document with “A” Content

add A @1 ← <CHANGE> <SOMETHING> <SOMEWHERE>

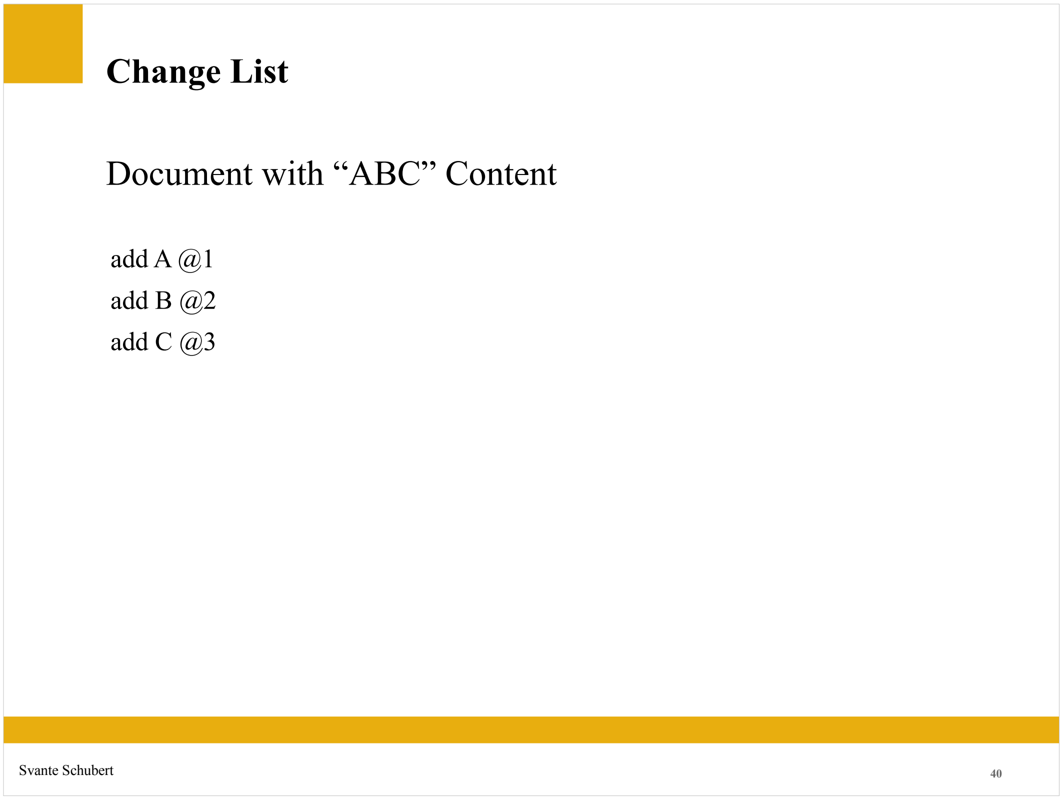


Change List

Document with “AB” Content

add A @1

add B @2



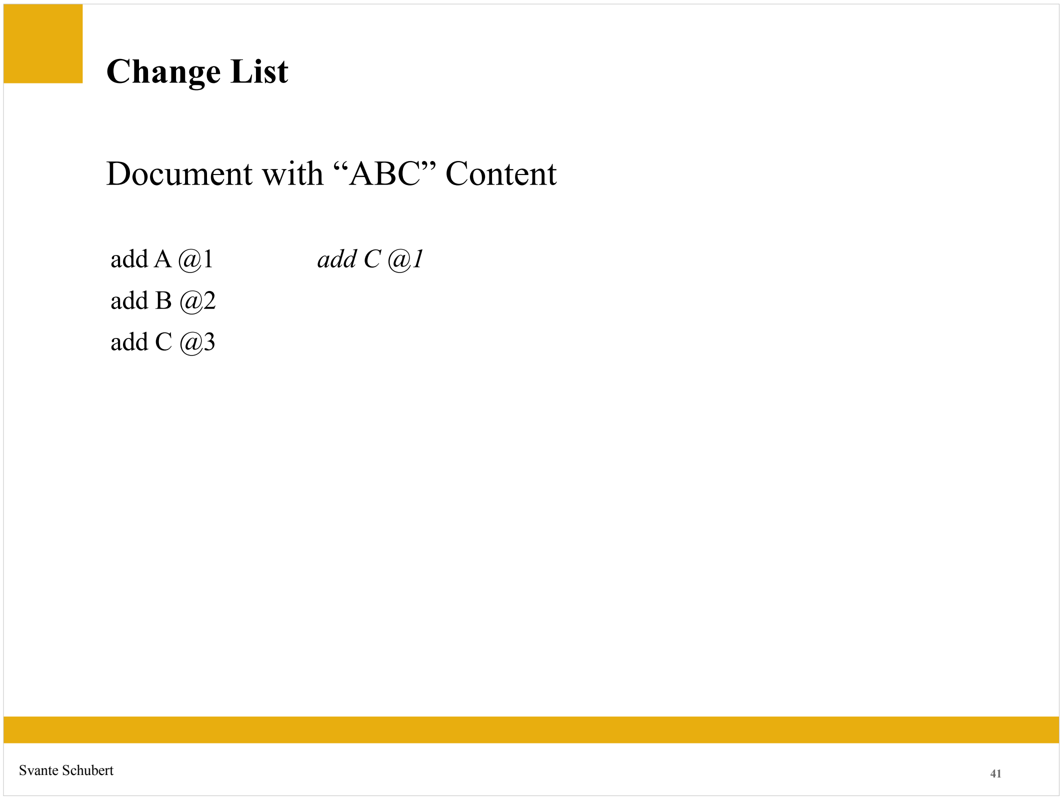
Change List

Document with “ABC” Content

add A @1

add B @2

add C @3



Change List

Document with “ABC” Content

add A @1 *add C @1*

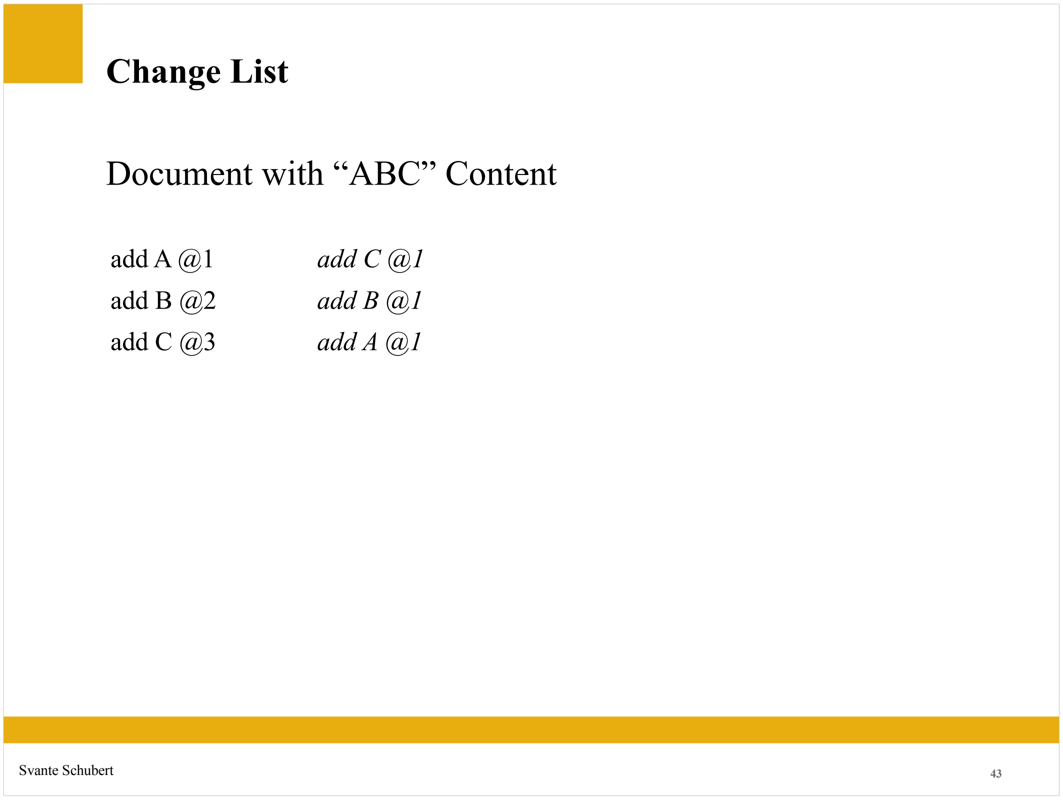
add B @2

add C @3

Change List

Document with “ABC” Content

add A @1	*add C @1*
add B @2	*add B @1*
add C @3	



Change List

Document with “ABC” Content

add A @1	*add C @1*
add B @2	*add B @1*
add C @3	*add A @1*

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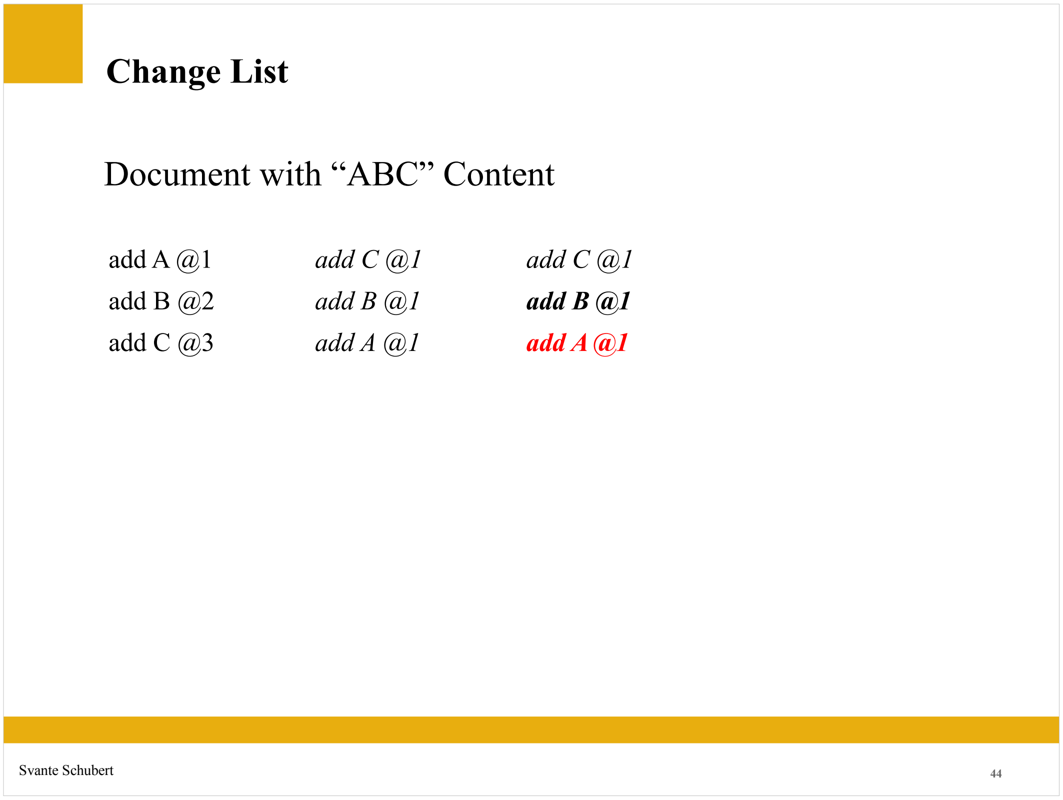
User can add the SAME document adding in sequence “ABC” or adding “C” and moving always the cursor back twice and finally end up with the same “ABC”.

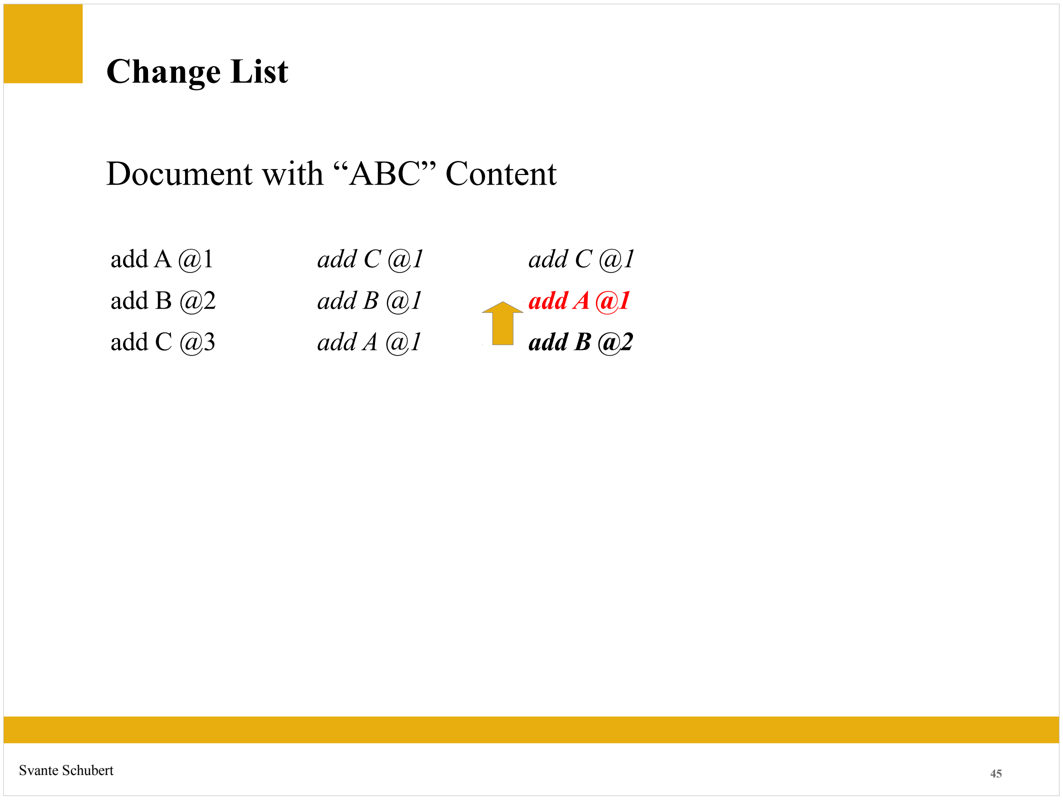
Two change list that result into same document are EQUAL!



Change List

Document with “ABC” Content

add A @1	*add C @1*	*add C @1*
add B @2	*add B @1*	***add B @1***
add C @3	*add A @1*	***add A @1***



Change List

Document with “ABC” Content

add A @1	*add C @1*	*add C @1*
add B @2	*add B @1*	***add A @1***
add C @3	*add A @1*	***add B @2***

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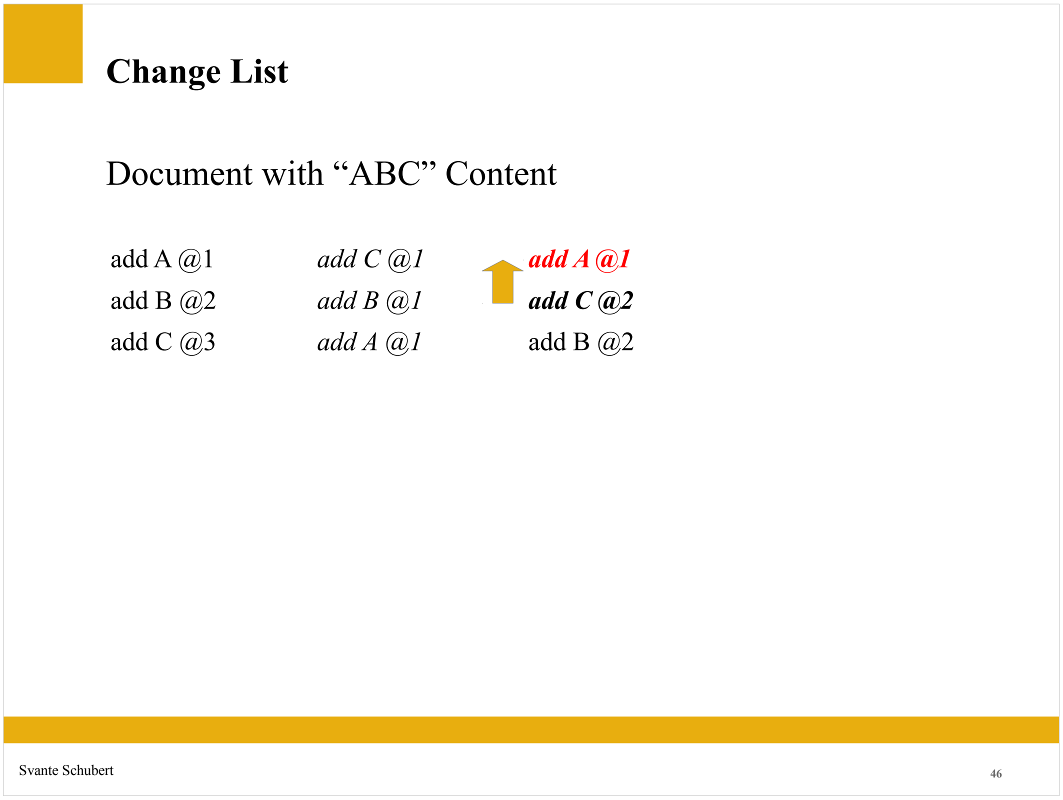
Whenever something was added before the index goes up.

Analogue index goes down for delete and for entities add/removed up in the tree.

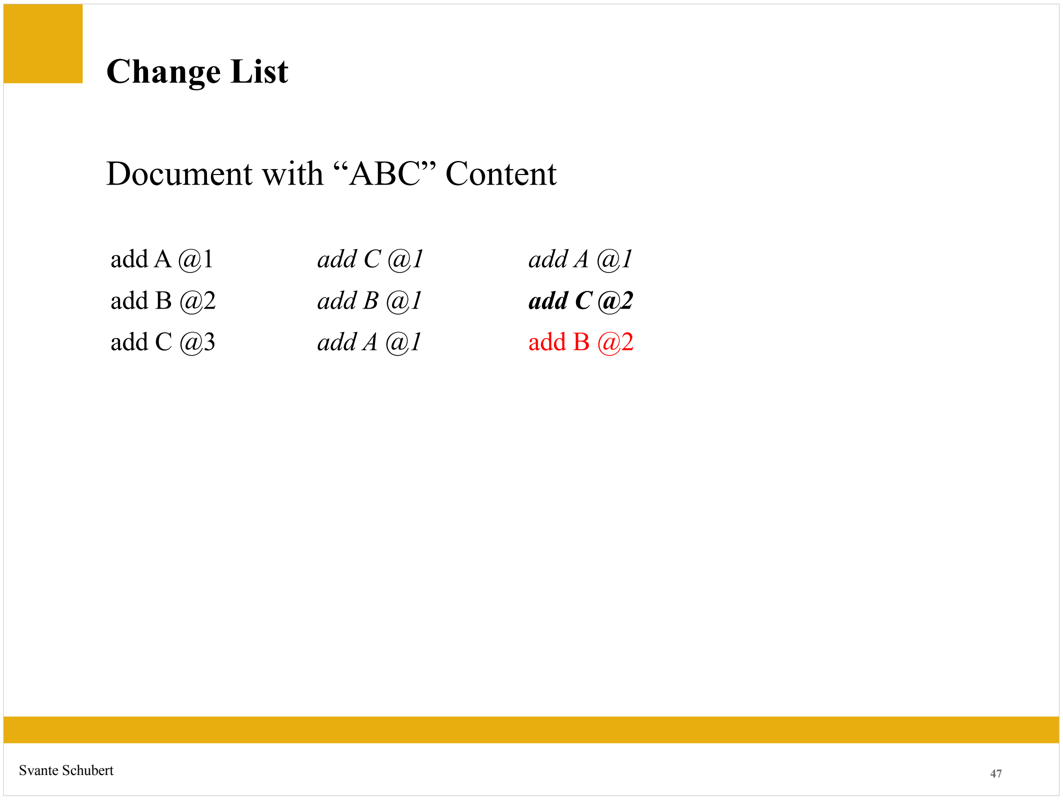
HERE: As “A” is now being inserted EARLER of “B” (by switching the order in the list representing the time order), the “B” is added BEHIND “A”, changing the position!



Change List

Document with “ABC” Content

add A @1	*add C @1*	⬆	***add A @1***
add B @2	*add B @1*		***add C @2***
add C @3	*add A @1*		add B @2



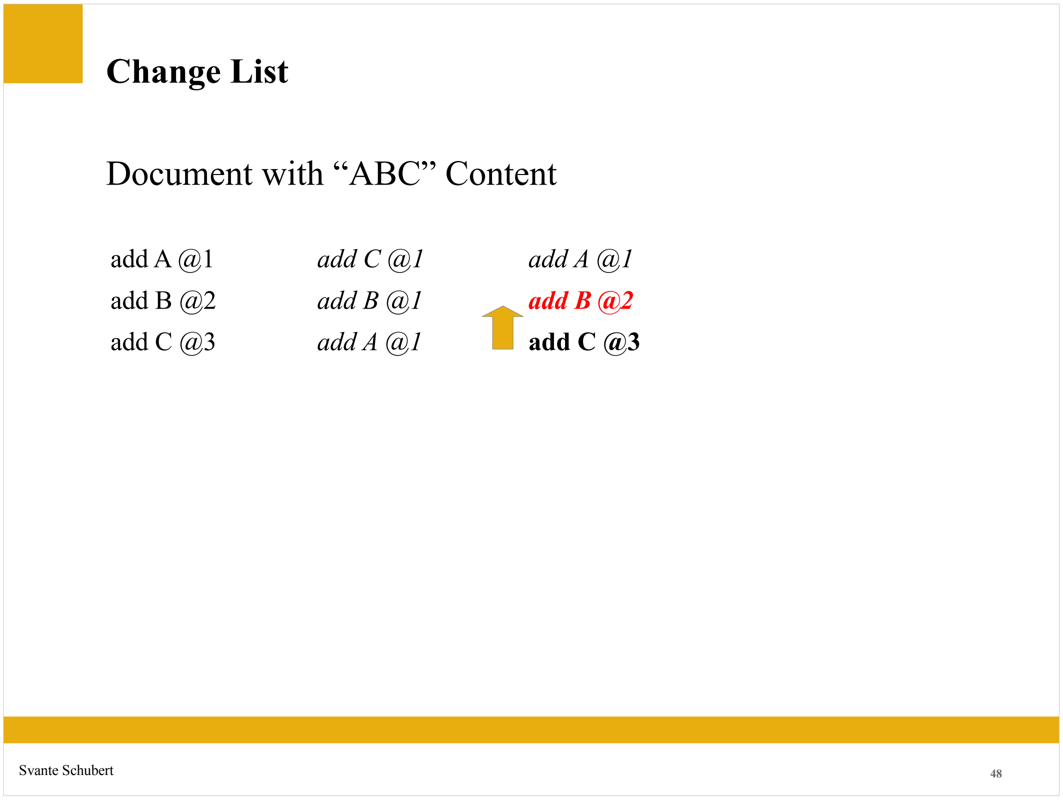
Change List

Document with “ABC” Content

add A @1
add B @2
add C @3

add C @1
add B @1
add A @1

add A @1
add C @2
add B @2



Change List

Document with “ABC” Content

add A @1	*add C @1*		*add A @1*
add B @2	*add B @1*		***add B @2***
add C @3	*add A @1*	⬆	**add C @3**

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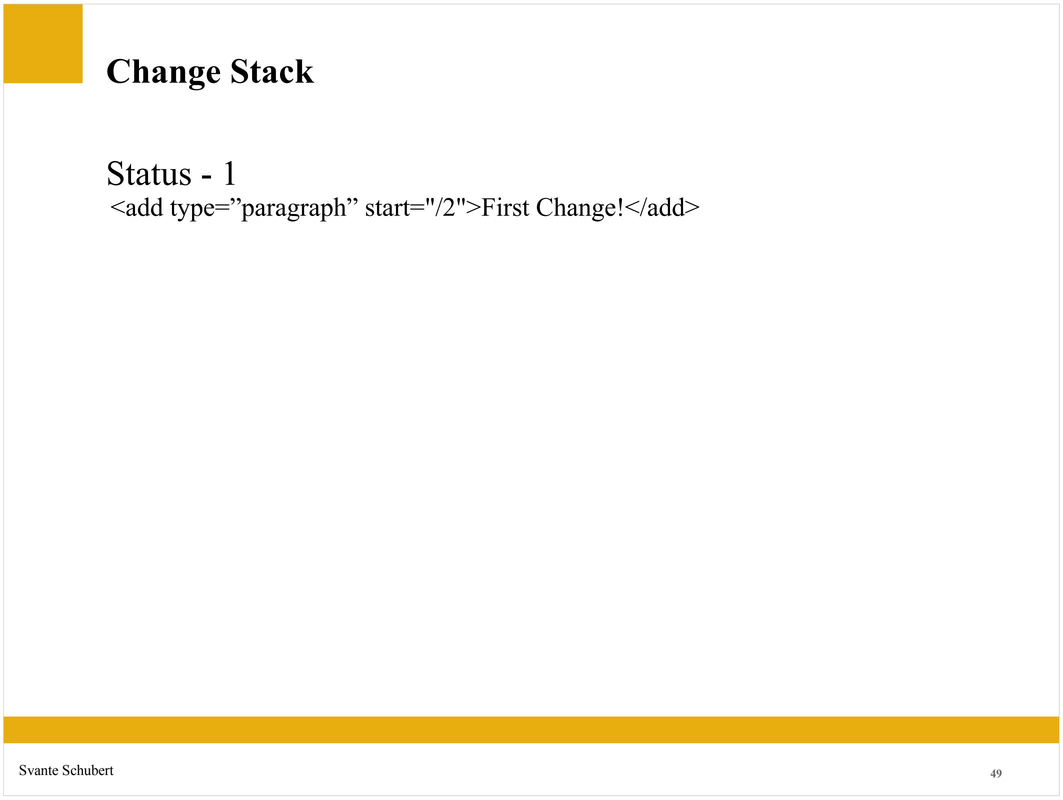


Change Stack

Status - 1

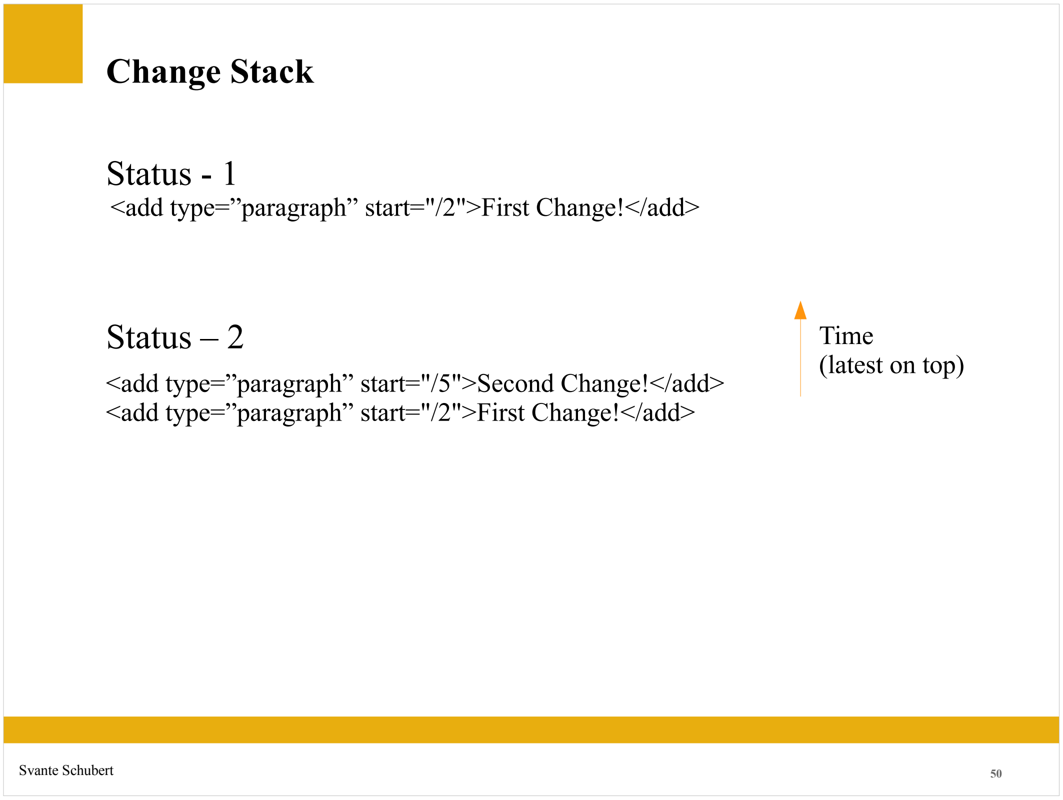
<add type=”paragraph” start="/2">First Change!</add>

Why operations are powerful!

Operational Transformation: http://en.wikipedia.org/wiki/Operational_transformation

http://www.waveprotocol.org/whitepapers/operational-transform

Every user working on the same document is creating a branch similar to GIT's versioning system's DAG - http://en.wikipedia.org/wiki/Directed_acyclic_graph.



Change Stack

Status - 1

```
<add type=”paragraph” start="/2">First Change!</add>
```

Status – 2

```
<add type=”paragraph” start="/5">Second Change!</add>
<add type=”paragraph” start="/2">First Change!</add>
```

Time
(latest on top)

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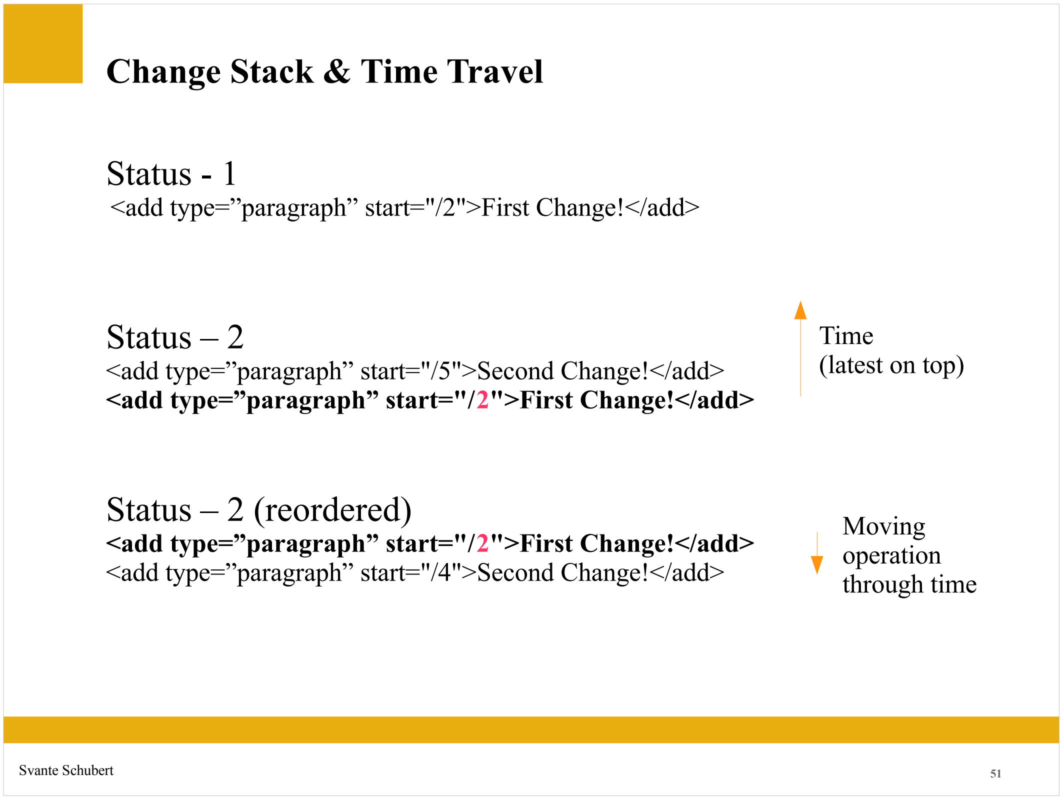
Operations can be represented as a list of changes.
Like a stack of cards, where on top the latest card is added.

Every change is dependent on the state of the document that existed at the time the change happened.



Change Stack & Time Travel

Status - 1
<add type=”paragraph” start="/2">First Change!</add>

Status – 2
<add type=”paragraph” start="/5">Second Change!</add>
<add type=”paragraph” start="/2">First Change!</add>

Time
(latest on top)

Status – 2 (reordered)
<add type=”paragraph” start="/2">First Change!</add>
<add type=”paragraph” start="/4">Second Change!</add>

Moving
operation
through time

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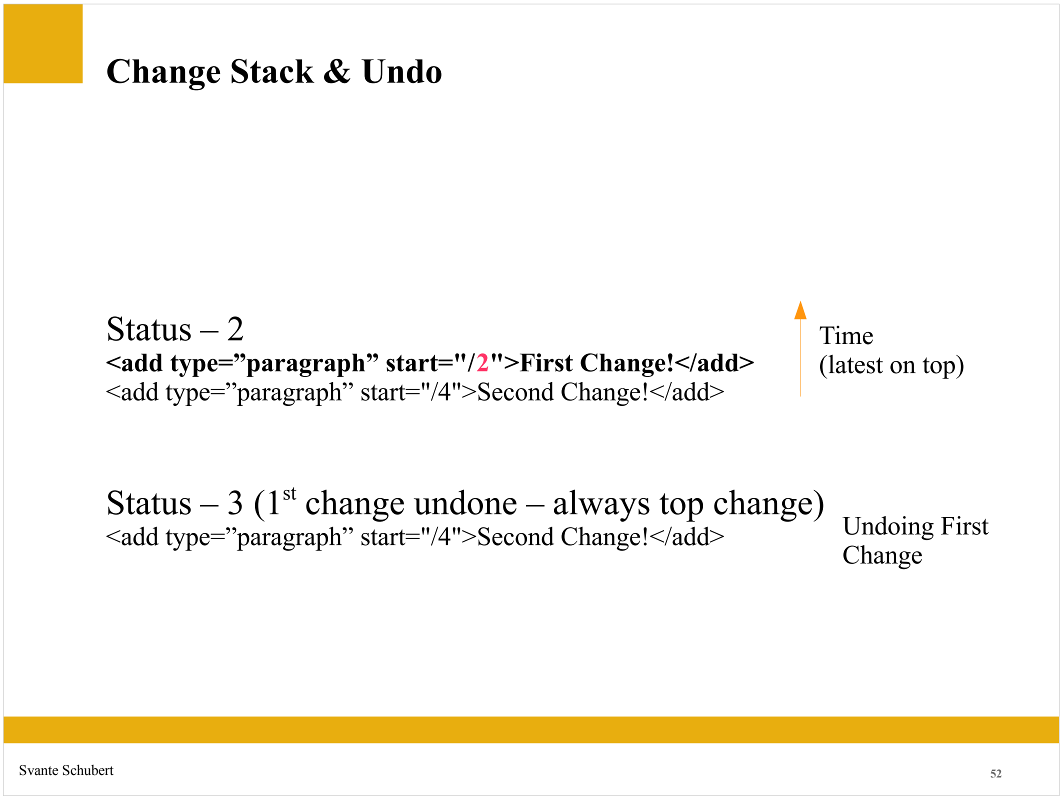
Different view on ODF files!
Instead of a ZIP of XML, the document might be seen as a list of changes. Makes merges/collaboration easier!

Changing the order of two adjacent operations in the stack is like pretending that the order in time the operations been executed has been changed.

When a users works on the 5th paragraph and a different friend has added a new 2nd paragraph, the user still wants to work with the same paragraph, which now naturally becomes the 6th paragraph. This change/transformation of position is called Operational Transformation (Paper of the 80ths).



Change Stack & Undo

Status – 2

<add type=”paragraph” start="/2">First Change!</add>

<add type=”paragraph” start="/4">Second Change!</add>

Time
(latest on top)

Status – 3 (1st change undone – always top change)

<add type=”paragraph” start="/4">Second Change!</add>

Undoing First
Change

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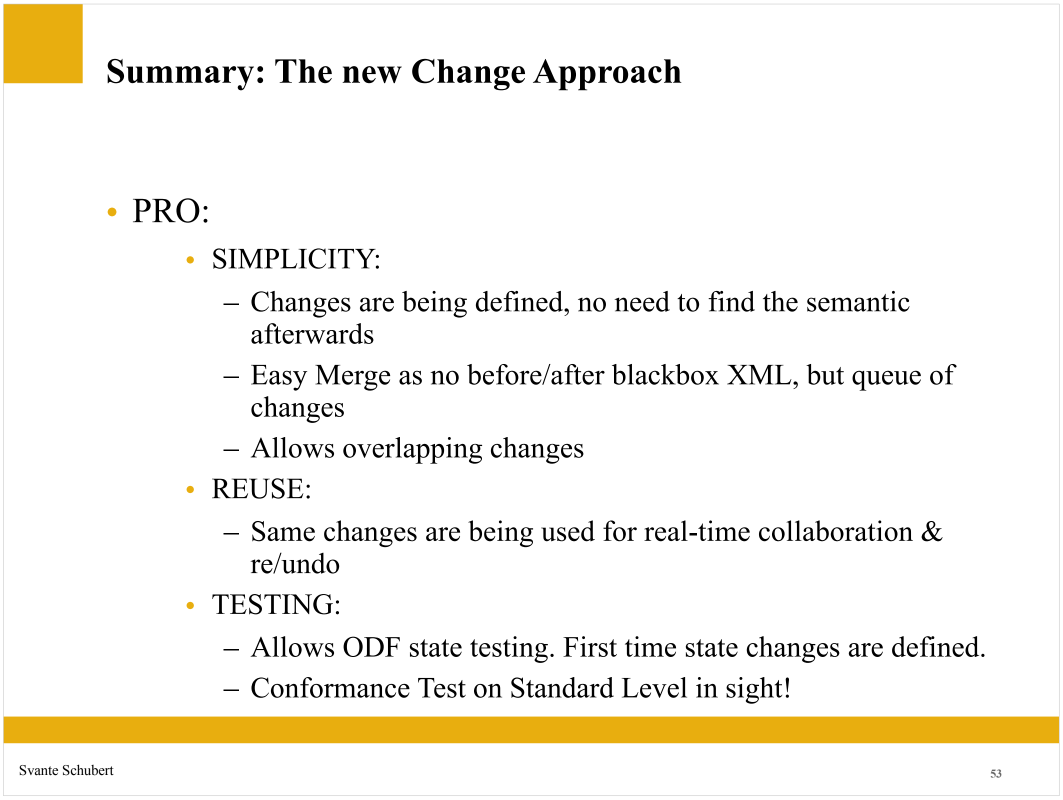
Only the top level of the card deck can be removed!



Summary: The new Change Approach

- PRO:
  - SIMPLICITY:
    - Changes are being defined, no need to find the semantic afterwards
    - Easy Merge as no before/after blackbox XML, but queue of changes
    - Allows overlapping changes
  - REUSE:
    - Same changes are being used for real-time collaboration & re/undo
  - TESTING:
    - Allows ODF state testing. First time state changes are defined.
    - Conformance Test on Standard Level in sight!

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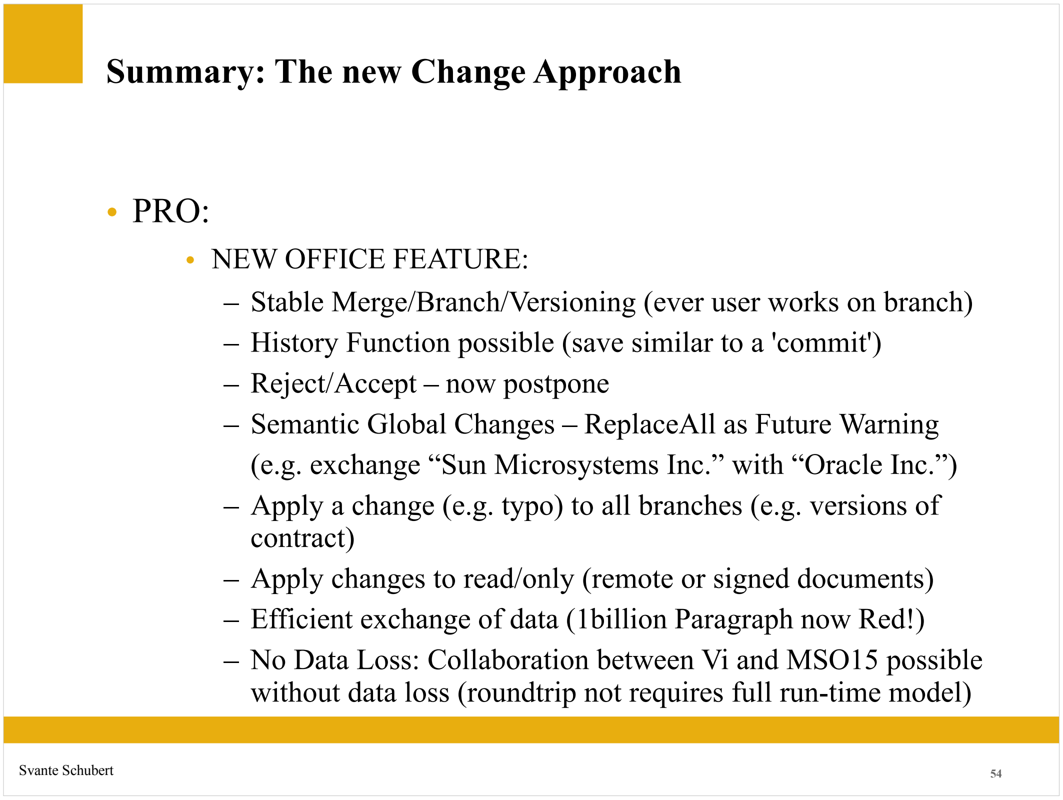
Document Collaboration is similar to Source Collaboration with using e.g. GIT.

Every user is working on its branch in the Directed Acyclic Graph.

A change not being accepted, can now only be rejected. Today I copy/paste it into new document. Now the changes could be moved out of the pointer declaring the current document, creating a “feature branch”.



Summary: The new Change Approach

- PRO:
  - NEW OFFICE FEATURE:
    - Stable Merge/Branch/Versioning (ever user works on branch)
    - History Function possible (save similar to a 'commit')
    - Reject/Accept – now postpone
    - Semantic Global Changes – ReplaceAll as Future Warning (e.g. exchange “Sun Microsystems Inc.” with “Oracle Inc.”)
    - Apply a change (e.g. typo) to all branches (e.g. versions of contract)
    - Apply changes to read/only (remote or signed documents)
    - Efficient exchange of data (1billion Paragraph now Red!)
    - No Data Loss: Collaboration between Vi and MSO15 possible without data loss (roundtrip not requires full run-time model)

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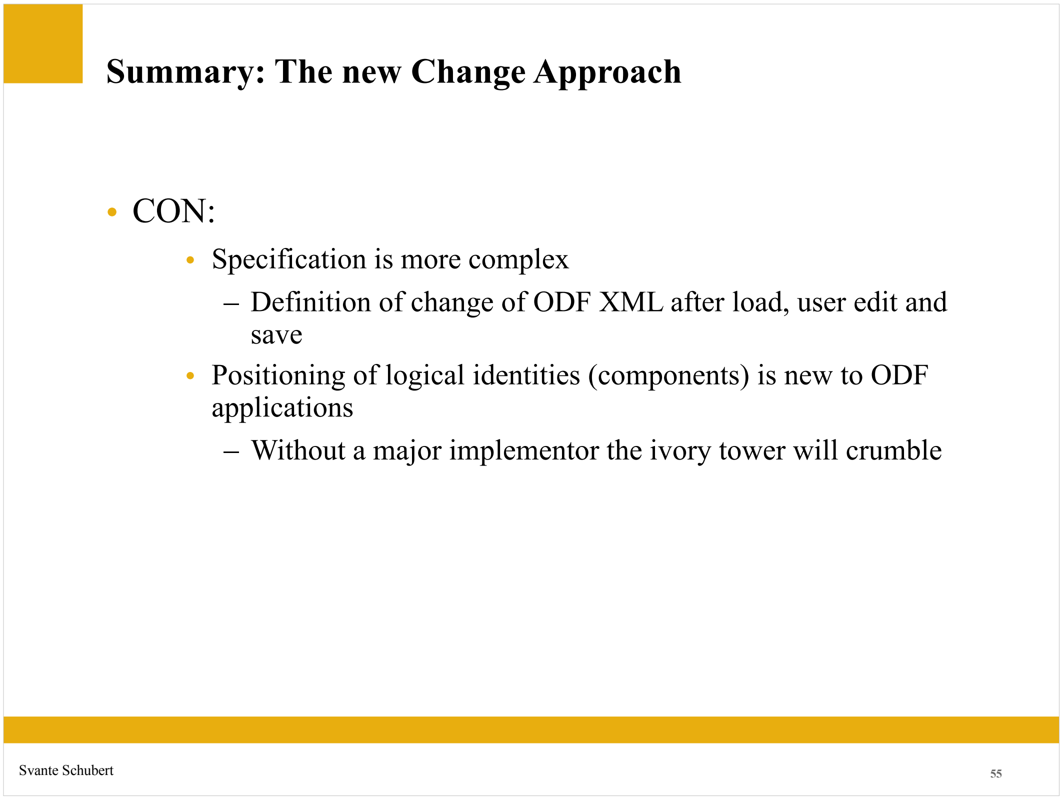
=> Merging
=> One user does ReplaceAll "Sun" to "Oracle" others bring in content using "Oracle" later! .

=>
Hello World!
vs.
World! Hello

=> Validation against Operations

=> Applications using different feature level: Vi vs. Word - transformation of changes
Problem KUK is viewn KK where add k KkUK or KUkK?

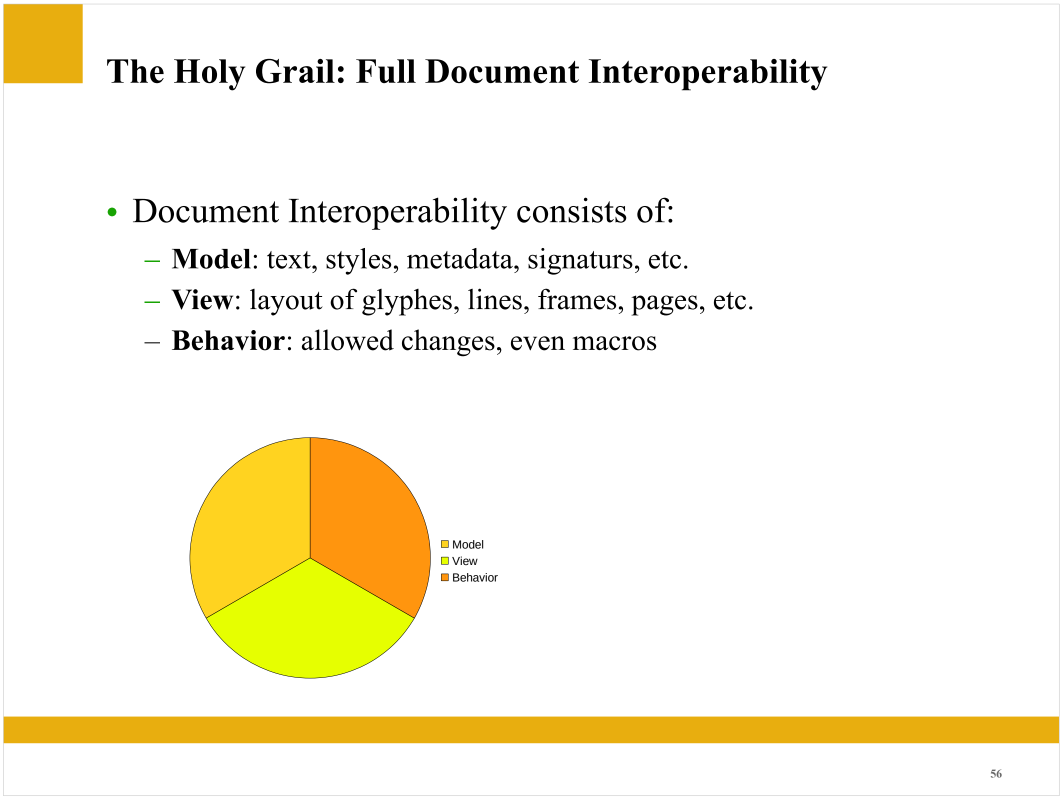


Summary: The new Change Approach

- CON:
  - Specification is more complex
    - Definition of change of ODF XML after load, user edit and save
  - Positioning of logical identities (components) is new to ODF applications
    - Without a major implementor the ivory tower will crumble

The spec have to be written, but there is a sponsorship in sight.

Still if there is no major implementor behind, it is meant to fail as for instance XHTML.



The Holy Grail: Full Document Interoperability

- Document Interoperability consists of:
  - **Model**: text, styles, metadata, signaturs, etc.
  - **View**: layout of glyphes, lines, frames, pages, etc.
  - **Behavior**: allowed changes, even macros

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Perfect Interoperability would consist of all three fields, but usually only one if perfect (usually the model ODF, OOXML, HTML) sometimes partly the other (e.g. DOM access, CSS View) is specified.

No give behavior support (as operation just described) or stable layout with editing.

Stable Corporate Identity / Design is in addition fully ignored by file formats although possible.