



Something for the Cloud

Goals and Results from our research project

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Abstract

- The talk is about our research project '**Cloud-basierte Collaboration Software auf dem Weg zur Information 4.0 Welt von morgen**'
 - A collaboration between
Ingenieurbüro für Bauwesen Schmidt GmbH
Georg Heeg e.K.
Forschungsinstitut für Rationalisierung (FIR) e. V. an der RWTH Aachen
University of Essen
 - It is funded by the EU and Efre NRW. We want to find solutions to enable smooth collaboration between project participants using an office automation software which stores its data in a hybrid cloud.
 - It is implemented in VisualWorks and uses Postgres as its back-end. The following solutions were developed in the project:
 - aPart as a development framework (see presentation by Richard Uttner),
 - a generic GlorpPart framework to ease the development of UIs for domain objects stored in a database,
 - the DeltaLibrary for secure file storage using high speed retrieval and distribution in networks, avoiding shared drives
 - a dynamic translation mechanism for displaying e.g. names of domain objects,
 - an infrastructure to allow zooming of UIs to adapt for visually impaired users.
 - we use an automatic build and test framework to keep our development process agile.

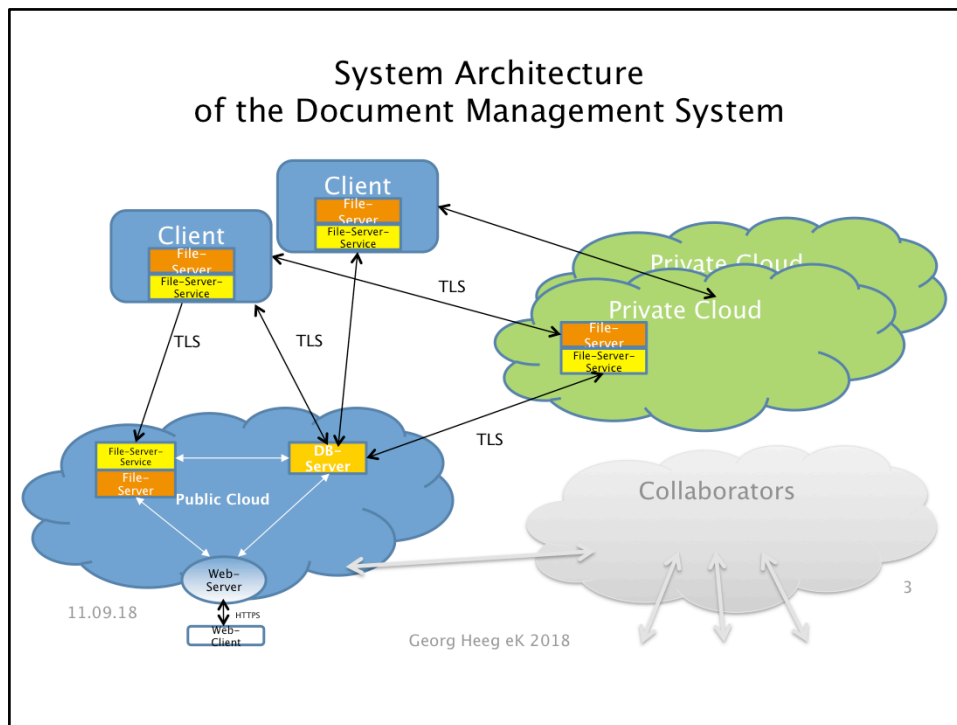


EFRE.NRW
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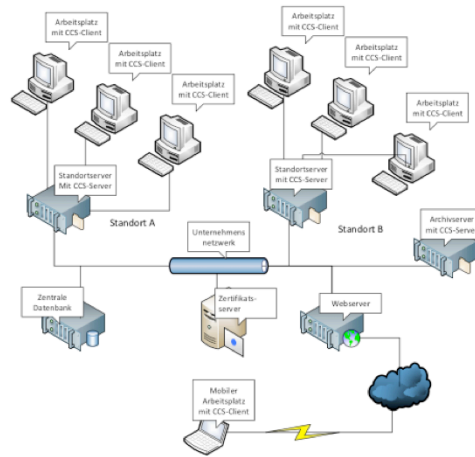


EUROPÄISCHE UNION
Investition in unsere Zukunft
Europäischer Fonds
für regionale Entwicklung



- 3-stufig, für Firmen mit mehreren Standorten
- Standort-Server entspricht Private Cloud, LAN-Zugriff durch Clients
- Public Cloud Server außerhalb der Firma für höhere Datensicherheit, WAN-Zugriff durch Client
- Dokumente liegen i.A. auf mehreren File-Server->Ausfallsicherheit
- Manuelle Konfiguration der Dokumentenverteilung, rudimentäre Automatismen
- File-Server-Service: Indexierung von Dokumenten, Previews, optimierte Dokumentenverteilung
- Markierung eines oder mehrere File-Server als Backup-Server->Automatische Verteilung der Dokumente bei Änderung
- Files-Server-Service optional, Client übernimmt Aufgabe bei Bedarf

System Architecture

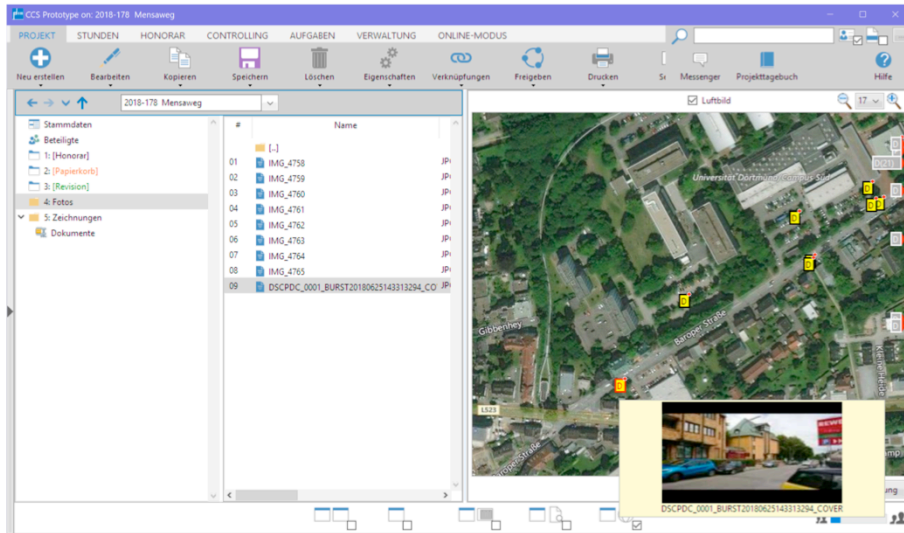


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Current State



What did we invent for this?

- Optimized File Transfer
- Glorp Support Objects for easier Application Development
- Dynamic Translation of Document and Folder Names
- Support for Visually Impaired Users

Secure & Optimized File transfer



[https://images.huffingtonpost.com/
2016-07-19-1468940023-8065906-CyberHorse1.jpeg](https://images.huffingtonpost.com/2016-07-19-1468940023-8065906-CyberHorse1.jpeg)



Secure & Optimized File Transfer

- **First goal:** eliminate the need for clients to mount server volumes,
 - A shared drive is giving Trojans a path to destroy server side data from a single corrupted/compromised client
 - Solution: Replacing VPN connections with TLS connections
- **Second goal:** increase the file transfer speed by shrinking the transported data size
 - using compression and difference analysis frameworks
 - using document distribution prediction

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- Bei Zip-Dokumenten ist das unter bestimmten Parametern tatsächlich so
- Zips sind wichtiger Bestandteil von PDM, da sie Grundlage für den Anschluss externer Bearbeitungsprogramme sind
- CPU \leftrightarrow Netzwerk \leftrightarrow Speicher
- Ermittlung sinnvoller minimaler Dateigrößen für Delta-Transfer unter Berücksichtigung der zur Verfügung stehenden Bandbreiten
- Beschränkung auf bestimmte Datei-Typen notwendig?
- Analysen laufen aktuell anhand Daten aus produktiven Systemen
- Sowohl DB-Zugriffe als auch Dateiübertragung ohne direkte Laufwerkzugriffe
 - Dadurch kann kein Trojaner auf einem Client die Dateien auf den Servern erreichen



The Delta Library

- A server image running on each file server
- Each client may connect to multiple DeltaServers
- Some Implementation details
 - DLL for threaded communication and non-blocking operation
 - OctoDiff - only transfer differences
 - xDelta - calculate differences fast
 - Compression - be smaller if you can

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Delta Library Secrets I

- DLL for threaded communication and non-blocking operation
 - Multiple transfers for multiple clients using a bunch of sockets
- Compression
 - only applied to files bigger than 2k



Delta Library Secrets II

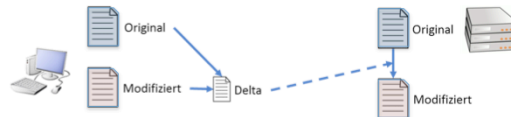
- Octodiv

- Support to transfer only differences from server to client



- xDelta

- Support to transfer only differences from client to server



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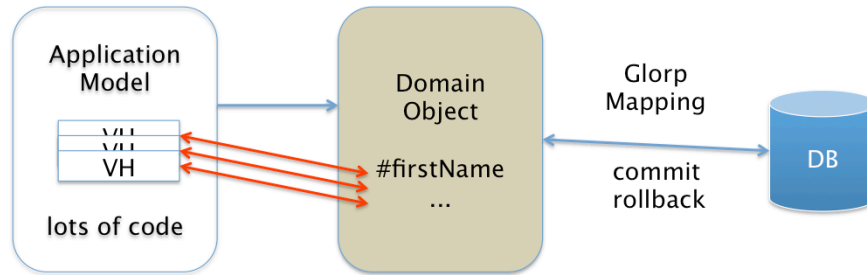
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OctoDiv provides a block map of a file to the server, which calculates a Delta for the client, enabling it to create the modified server version of the document

xDelta calculates the delta for the server, so he can create a new version of the document.



GlorpParts for easy editors



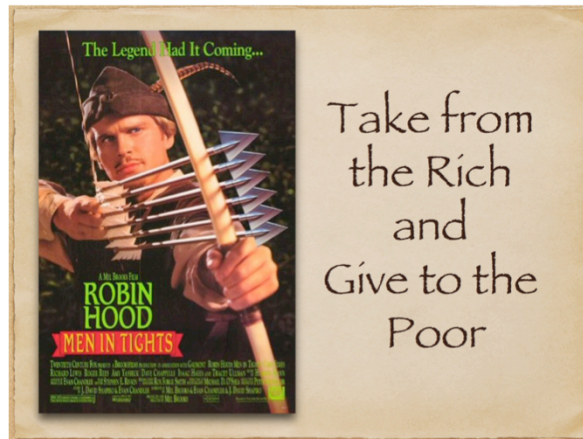
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Where is the logic to control the transaction boundary?
BVH could help, but they have to be build manually!

GlorpParts for easy editors



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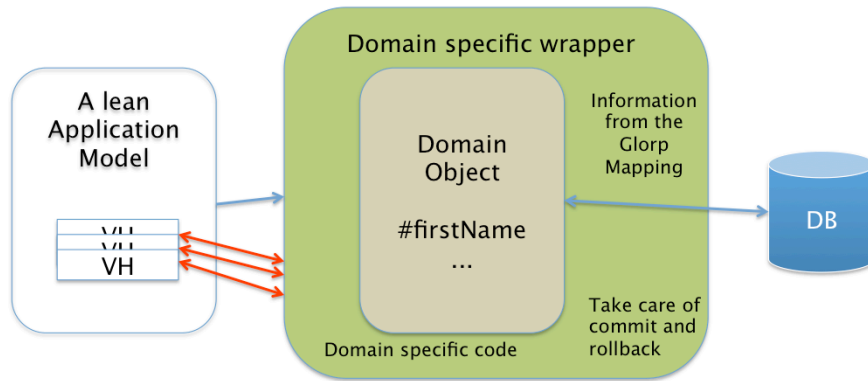
Poor domain objects, only modelling their target domain specific behaviour.

- Hard to add all functionality of an editor to each ApplicationModel individually
- No support in Glorp as was existent for the ObjectLens framework

So enrich the poor objects by using wrapper objects added missing functionality in a generic way.



Why do we need help?



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Where is the logic to control the transaction boundary?
BVH could help, but they have to be build manually!



GlorpParts for easy editors

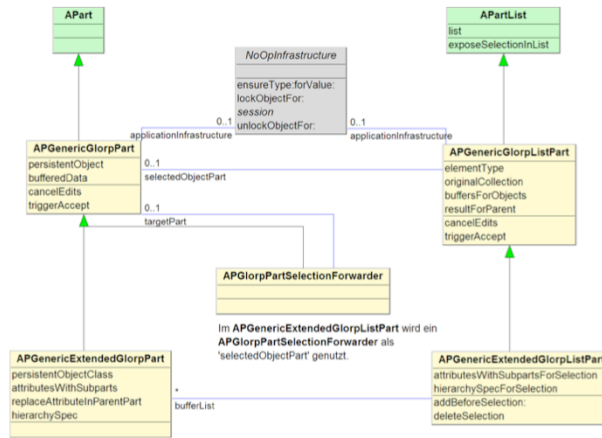
- Create one generic wrapper object for each domain object to be stored or retrieved via Glorp into a DB
 - Access glorp-mapped attributes with simple aspect paths from the widgets
 - Record any changes applied by widgets
 - Save or revert changes in one transaction
 - #triggerAccept or #cancelEdits
 - Retrieve any type information for attributes from the glorp descriptor system
 - Provide type checking in mutators, even limited string lengths for attributes may be checked
 - Provide lists for collection attributes
 - Handle add/remove silently
- 11.09.18 - Support for DataSets seorg Heeg eK 2018

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Extensible Framework I

- Concrete subclasses of the generic ones allow for specific extensions for instances of special domain classes
- Allow the developer to specify the desired hierarchy of wrappers for one domain object, using a hierarchySpec



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Extensible Framework II

- **NoOpInfrastructure**
 - a subclass has to provide a session, the used GlorpDescriptorSystem, and some type conversion support for all GlorpPart-Instances of one application working on this session
- **APGenericGlorpPart**
 - All simple attributes described in the descriptorSystem are created as APart aspects, the accessing is done using a doesNotUnderstand: implementation
 - Collection attributes are modelled using APGenericGlorpListPart, which reference the collection elements, handle changes to all the elements and provides the selected object in a APGenericGlorpPart
 - Because it is generic, it will probably build a much to big hierarchy of objects,
- **APGenericExtendedGlorpPart**
 - A hierarchySpec can specify, which attributes should be wrapped into a GlorpPart and which not
 - The GlorpPart classes to be used can be specified, along with other parameters
 - Collection attributes use APGenericExtendedGlorpListParts, which better support the list semantics of the UI (initial selectionIndex, add-remove elements etc.)

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Take from
the Rich
and
Give to the
Poor

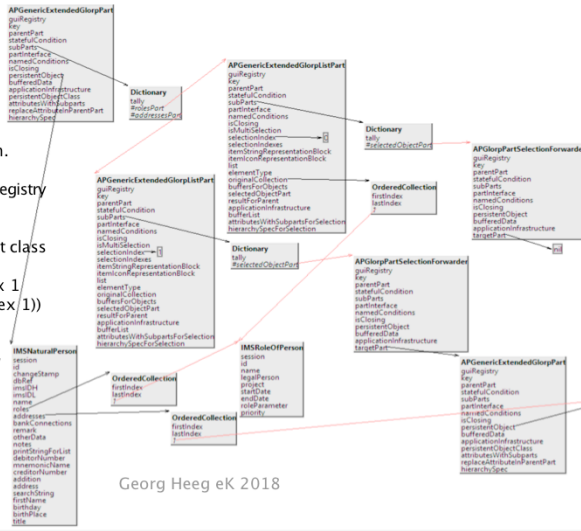
Example

```

| inst |
inst := self createComplexPerson.
^APGenericExtendedGlorpPart
onPart:APartcreateWithGUIRegistry
key: #test
withPersistenObject: inst
persistentObjectClass: inst class
partHierarchySpec:
##(#addresses ##(#_selectionIndex 1
#cables ##(#_selectionIndex 1))
#roles #())
infraStructure:
IMSInfrastructure new
  
```

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Example

So the aspect path for the attribute 'street' of an address of a person would read:

```
#addressesPart selectedObjectPart street
```

And the path to attribute 'name' of a cable connection of an address of a person would read:

```
#addressesPart selectedObjectPart cablesPart  
selectedObjectPart name
```

```
•  
inst := self createComplexPerson.  
^APGenericExtendedGlorpPart  
  onPart: APart createWithGUIRegistry  
  key: #test  
  withPersistenObject: inst  
  persistentObjectClass: inst class  
  partHierarchySpec:  
    #(#addresses #( #_selectionIndex 1  
                   #cables #( #_selectionIndex  
1))  
11. #roles #()  
    infraStructure:  
      IMSInfrastructure new
```

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The benefit is the Save and the Cancel buttons, they simply call the actions #triggerAccept and #cancelEdits of the root part of the whole structure

That might be confusing, but it really is much simpler if you see the save/cancel buttons!



Dynamic Translation

- We have multi language support built into the application using the standard UserMessages framework
 - We do not support Italian, I just found out. Sorry, it was not specified!
- Our infrastructure for this is based on a VisualWorks application and Excel
 - Export all UserMessages into an Excel sheet, providing columns for the target languages
 - Use the Bing translation service to get initial translations, if none is there
 - Let professional translators check and correct the entries for their target language
 - Get a corrected Excel file back
 - Generate MessageCatalog files for each language, and ship them with one release
 - Adapt the UserMessages in code, if the default string for an entry was changed
- But that is static for one release!

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Only files and folders, so the constant entries 'Stammdaten' and 'Beteiligte' are not translated using this infrastructure. They are, however, translated using the static translations based on UserMessage catalogs.

Using the Microsoft Translation API inside Azure (<https://azure.microsoft.com/en-us/services/cognitive-services/translator-text-api/>).

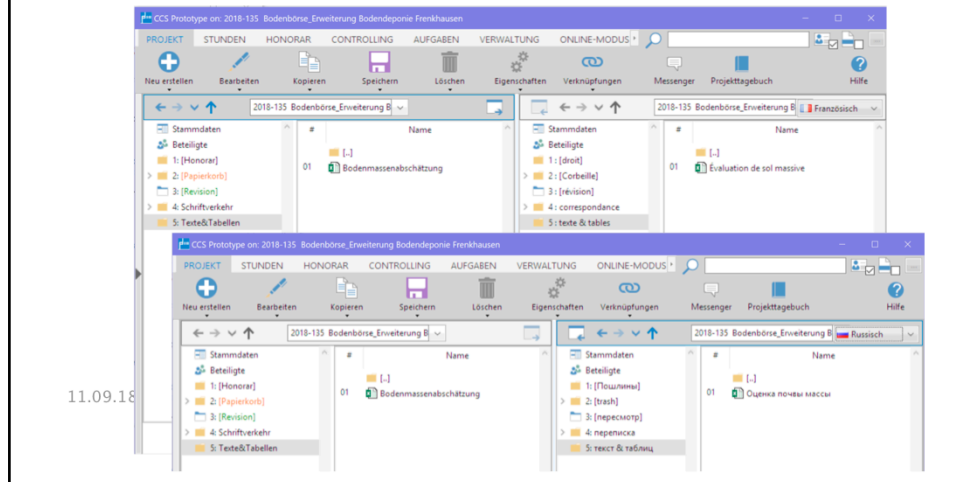
The service will only work with the WebServices versions of VisualWorks 8.3.1 and newer.

If Filenames contain \$_, it is helpful to break them up into tokens without \$_, translate them independently, and join them back afterwards.



Dynamic Translation

- What if file names were created in a language you don't understand or even cannot read?



Only files and folders, so the constant entries 'Stammdaten' and 'Beteiligte' are not translated using this infrastructure. They are, however, translated using the static translations based on UserMessage catalogs.

Using the Microsoft Translation API inside Azure (<https://azure.microsoft.com/en-us/services/cognitive-services/translator-text-api/>).

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Adapt for visually impaired users



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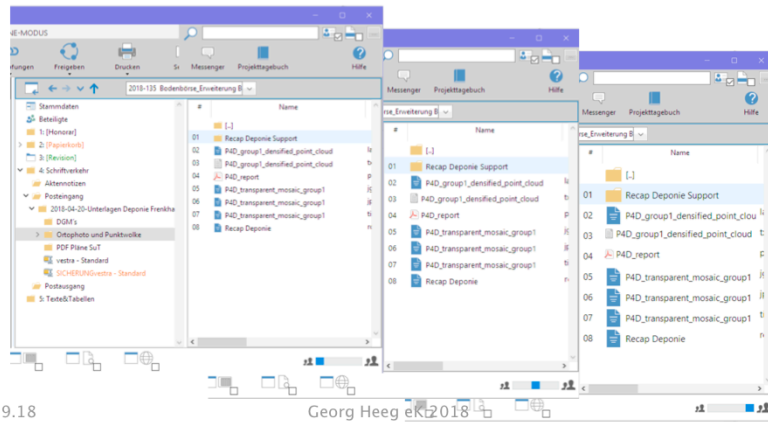
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Adapt for the visually impaired

- Adapt font sizes and Icon sizes



Font scaling:

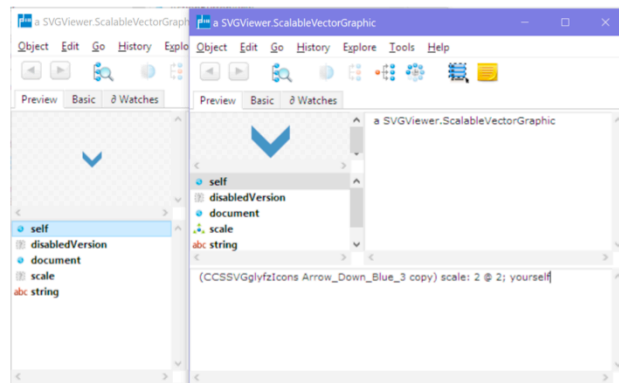
- Install four TextAttributes as named styles, like 'PRJ.default', 'PRJ.small', 'PRJ.medium', and 'PRJ.large'
- Set all UI text definitions to use your default style,
- On every zoom level adjustment, reinstall the 'default' TextAttributes with the one dedicated to a zoomlevel, and reset the views
 - TextAttributes styleNamed: #'CCS.Standard' put: self zoomAdaptedSystemFont.
 - TextAttributes resetViews



Adapt for the visually impaired

- Use SVG icons which can be scaled on demand without any performance drawback
- Bundle **SVGViewer** from the **PublicStore** allows to import SVG icon libraries as Assets
- Many thanks to Annick Fron and Maarten Mostert for this! We tuned it a bit support our icon set.

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Display support is using Cairo graphics!
SVG scaling:

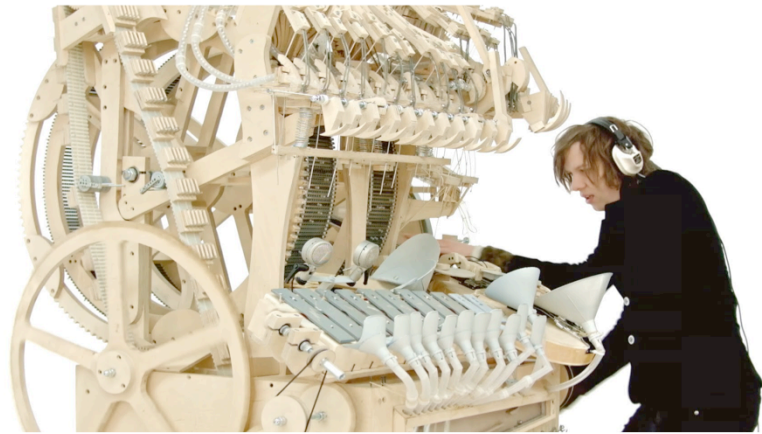
Arrow_Down_Blue_3

```
^[SVGViewer.ScalableVectorGraphic svgString: ('<svg
xmlns="http://www.w3.org/2000/svg" width="32" height="32"><path
fill="#4d82b8" d="M27 15V7L16 18 5 7v8l11 11-11z"/></svg>')]
once
```

Now scale it:

```
(SVGAssets Arrow_Down_Blue_3 copy) scale: 2 @ 2;
yourself
```

automatic build and test



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<https://www.youtube.com/watch?v=lvUU8joBb1Q>

<https://i.ytimg.com/vi/lvUU8joBb1Q/maxresdefault.jpg>



automatic build and test

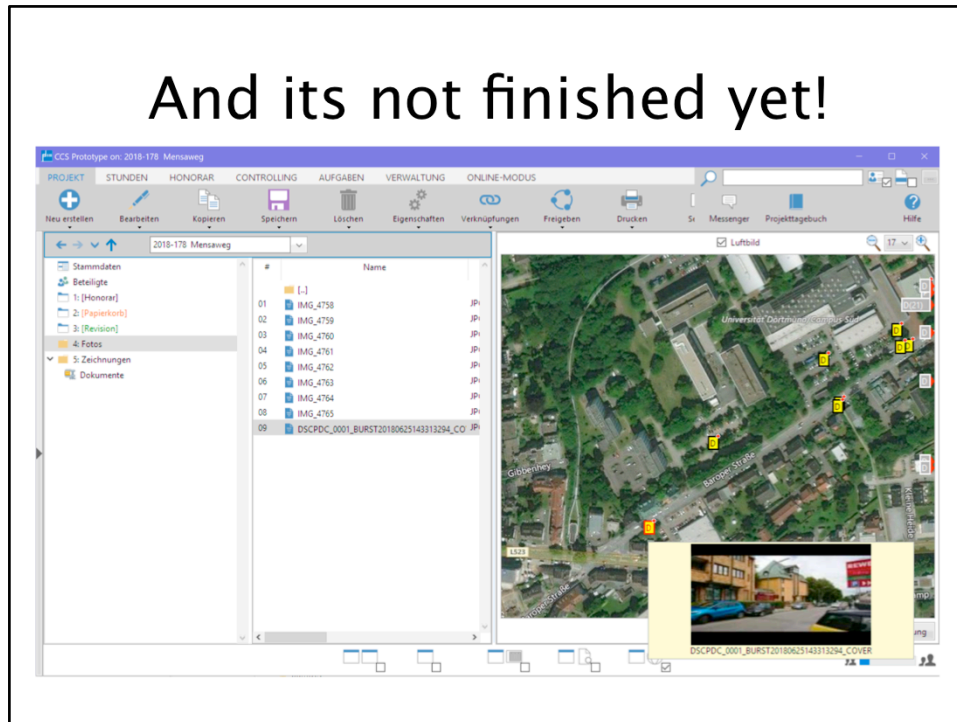
- SUnit and a little bit of code
 - Testing Drag&Drop
 - Testing UseCases and aPart objects without any UI
- Testrunner and build environment
 - Create an image each night
 - Run the test suite
 - Send notifications to developers

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And its not finished yet!



<https://www.youtube.com/watch?v=lvUU8joBb1Q>

<https://i.ytimg.com/vi/lvUU8joBb1Q/maxresdefault.jpg>