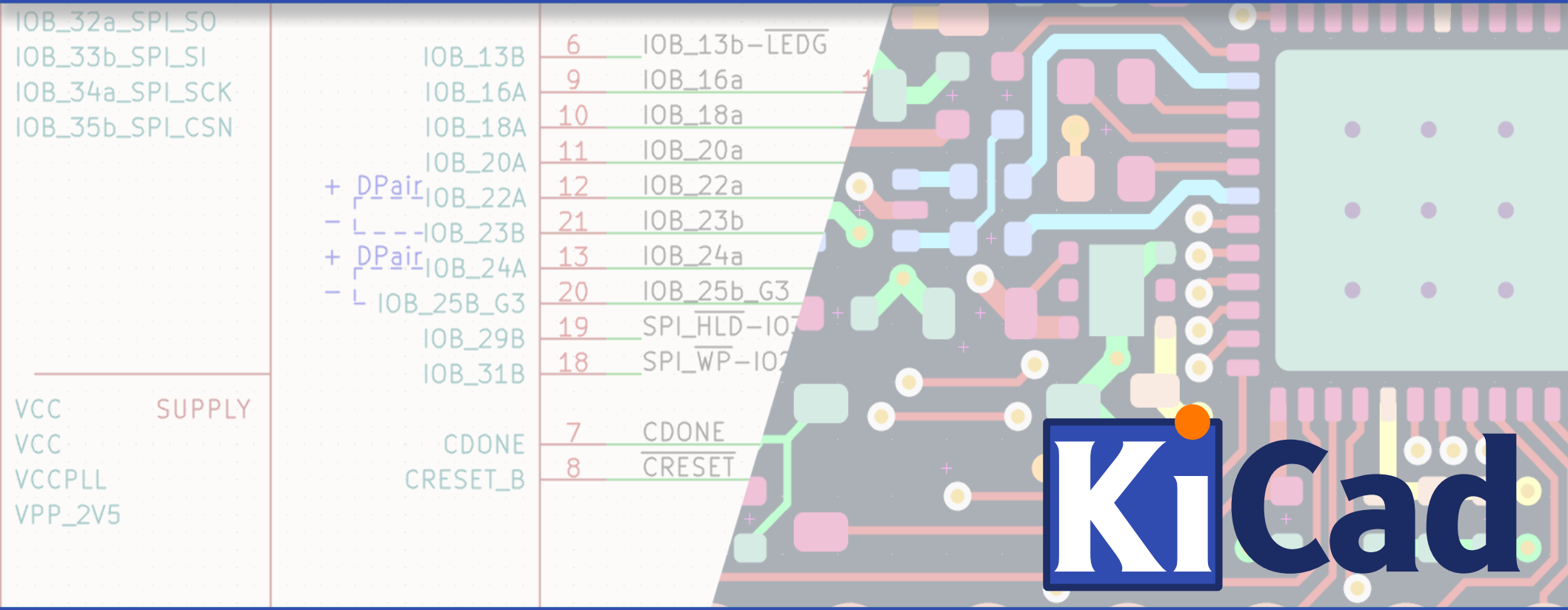
ECAD / MCAD collaboration with IDX



FABIEN CORONA

FOSDEM 2026

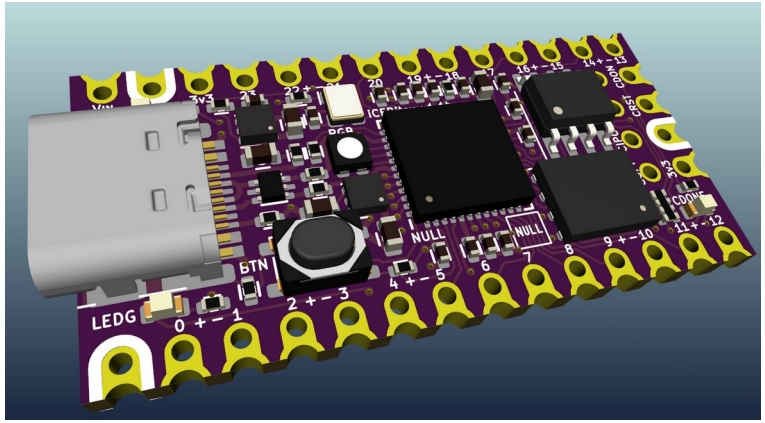
01/02/2026

ECAD : Electronic Computer-Aided Design
MCAD : Mechanical Computer-Aided Design

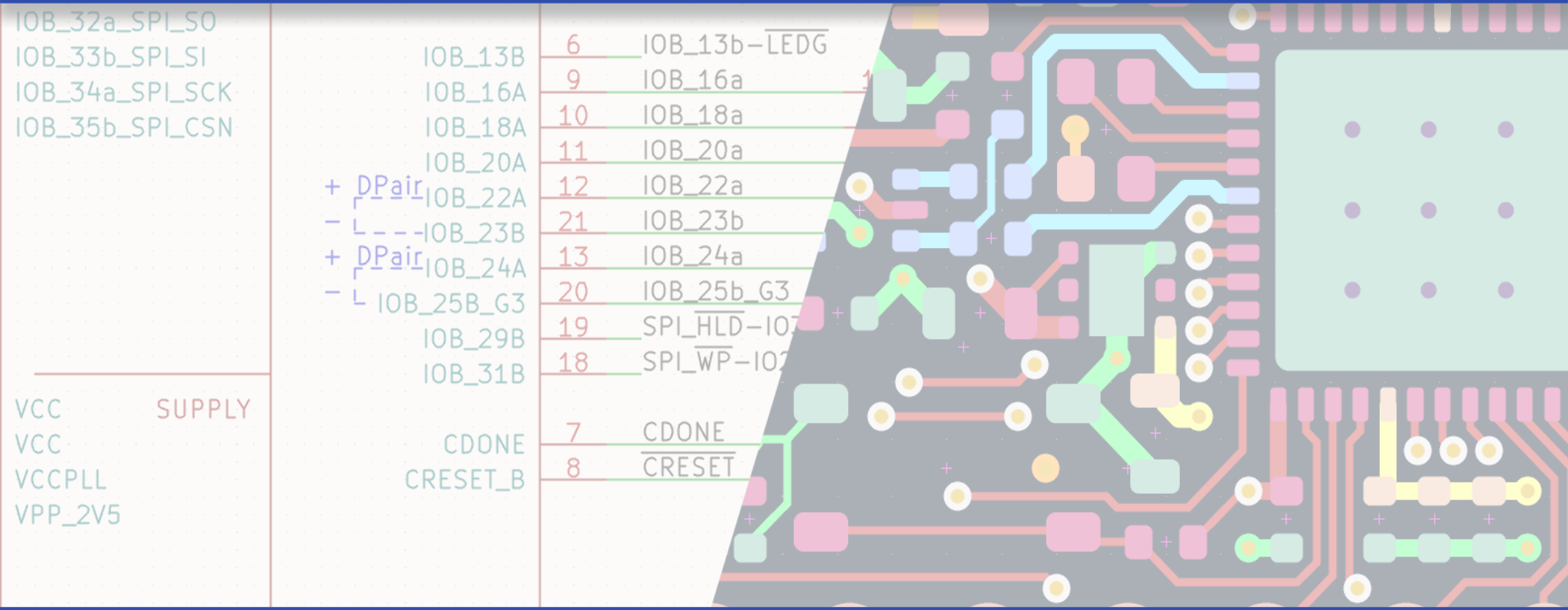
Topic : Collaborative design between ECAD and MCAD
Assumption : ECAD and MCAD are not a single package

In this presentation:

- Ways of doing ECAD / MCAD collaboration
- What is IDX :
  - Its features
  - How it works
- KiCad proof of concept



ECAD / MCAD


IOB_32a_SPI_SO
IOB_33b_SPI_SI
IOB_34a_SPI_SCK
IOB_35b_SPI_CSN
VCC SUPPLY
VCC
VCCPLL
VPP_2V5
IOB_13B
IOB_16A
IOB_18A
IOB_20A
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18 SPI_WP−IO
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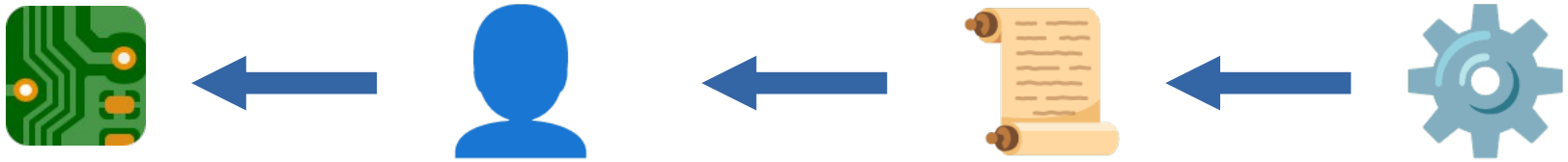
Goals of ECAD / MCAD collaboration :
- Designing both mechanical parts and PCB together
- Taking MCAD constraints into account when designing the PCB (and vice versa)
- Making sure the board fits the mechanical part (enclosure, moving parts, etc...)

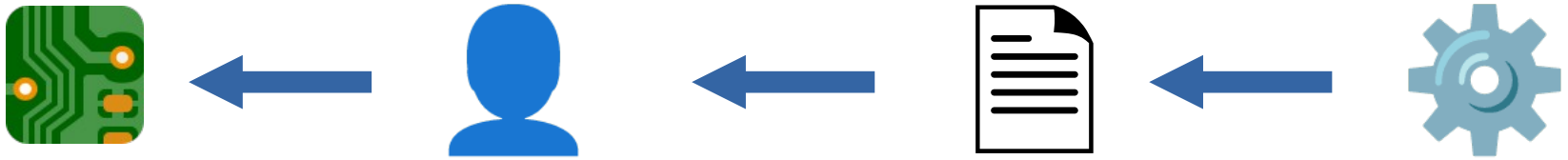
with the correct revision !

Example of an MCAD-driven design



- This process is slow, the ECAD user needs to convert the information to the ECAD software
- Prone to errors
- Feedback from the ECAD user to the MCAD user is not easy

Example of an MCAD-driven design



- Process is simple
- Errors are limited
- Feedback from the ECAD user to the MCAD user is not easy

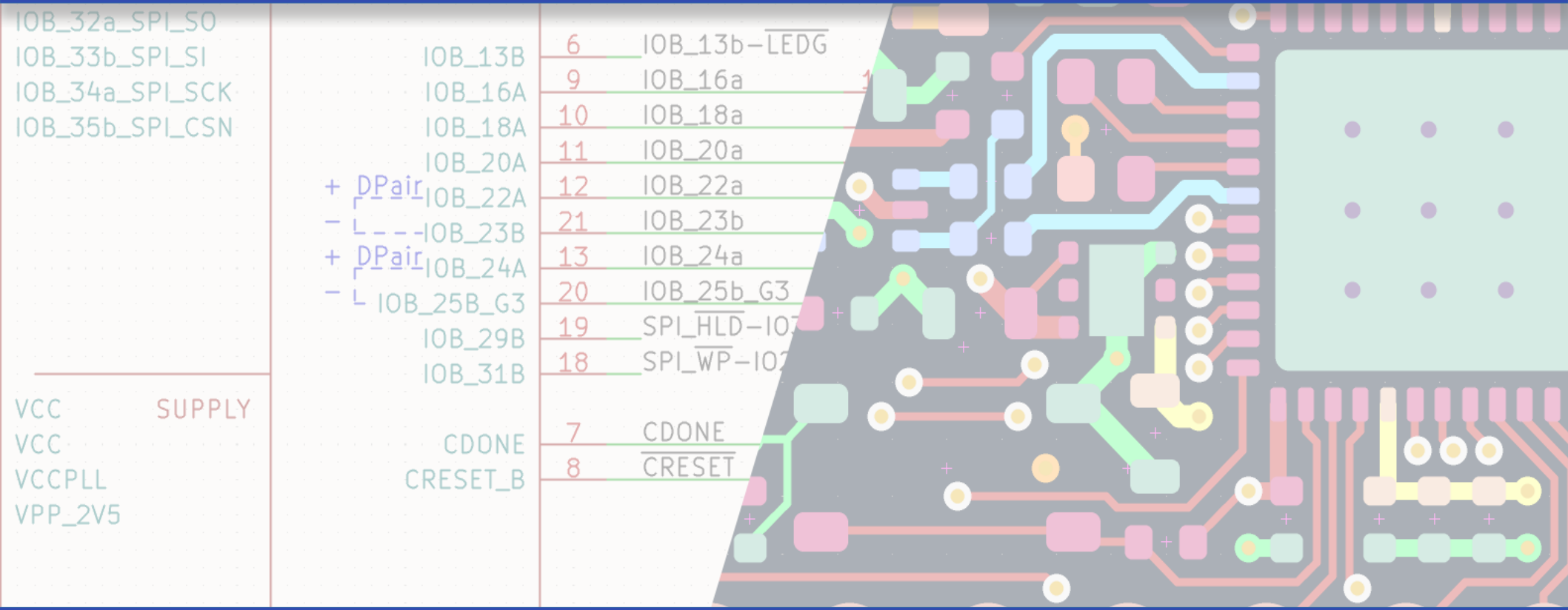
ECAD → MCAD : step, idf

MCAD → ECAD : dxf, svg, idf

Synchronized collaboration

- Process is simple
- Errors are limited
- ECAD and MCAD softwares use the same file format: Feedback is easy

What is IDX ?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IDX = Incremental **D**esign e**X**change

Specifications : www.ecad-mcad.org

IDX key features:

- Board outline, rule areas, components
- Incremental changes, accept / reject changes, history, comments on changes
- Add / remove / replace objects
- Object ownership
- Synchronous or asynchronous

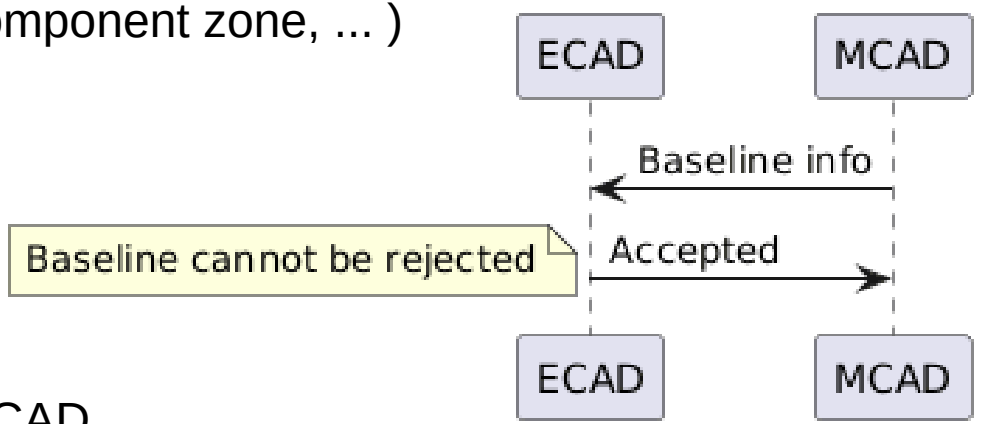
IDX is adapted if:

- There are several iterations
- Multiple ECAD / MCAD users (not fully implemented)

Baseline : first exchange, base for incremental changes

Information usually include:

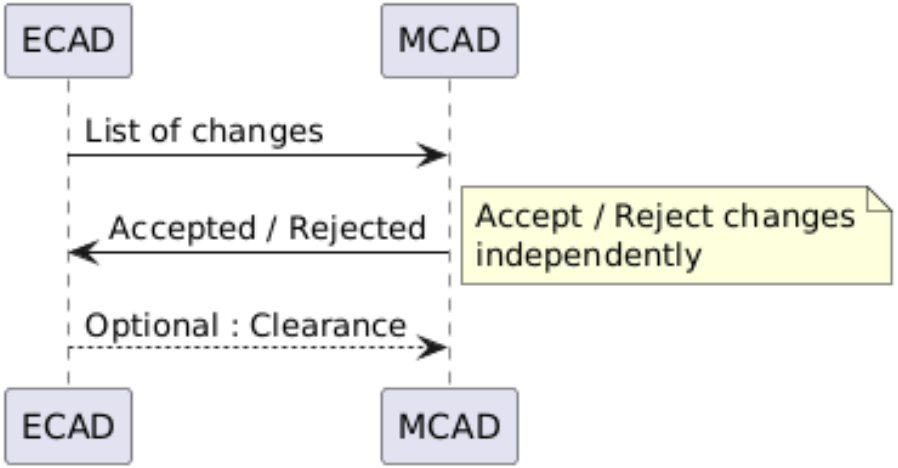
- Board outline
- Collaboration information (author, date, software, …)
- Constraints (limited height zone, no component zone, ...)



This can be initiated from both ECAD and MCAD

A change can be:

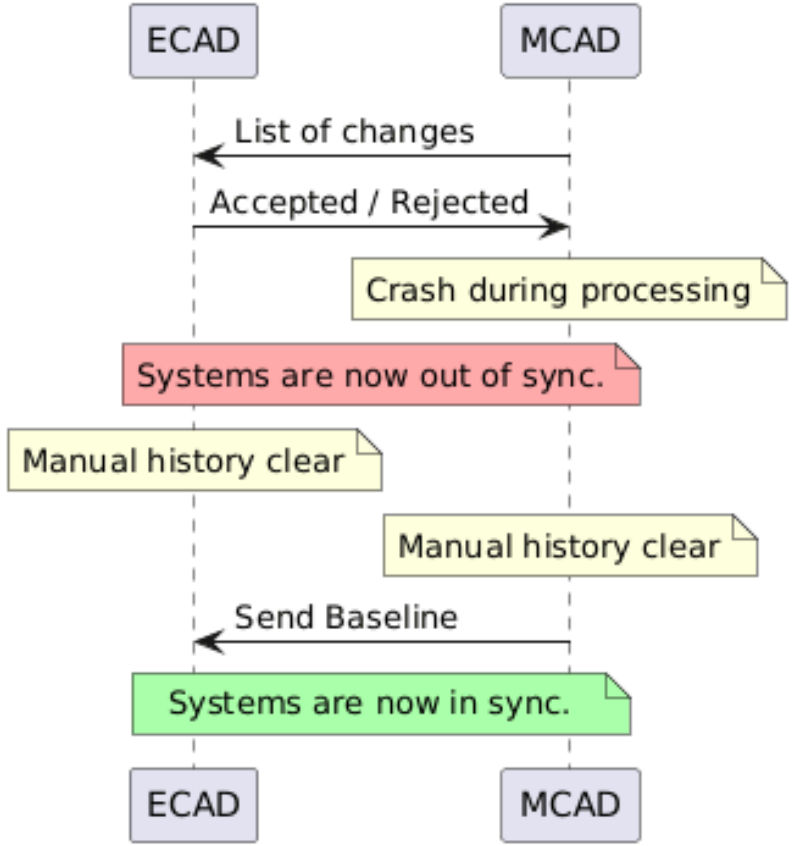
- Moving an element
- Adding / Removing an element
- Replacing an element



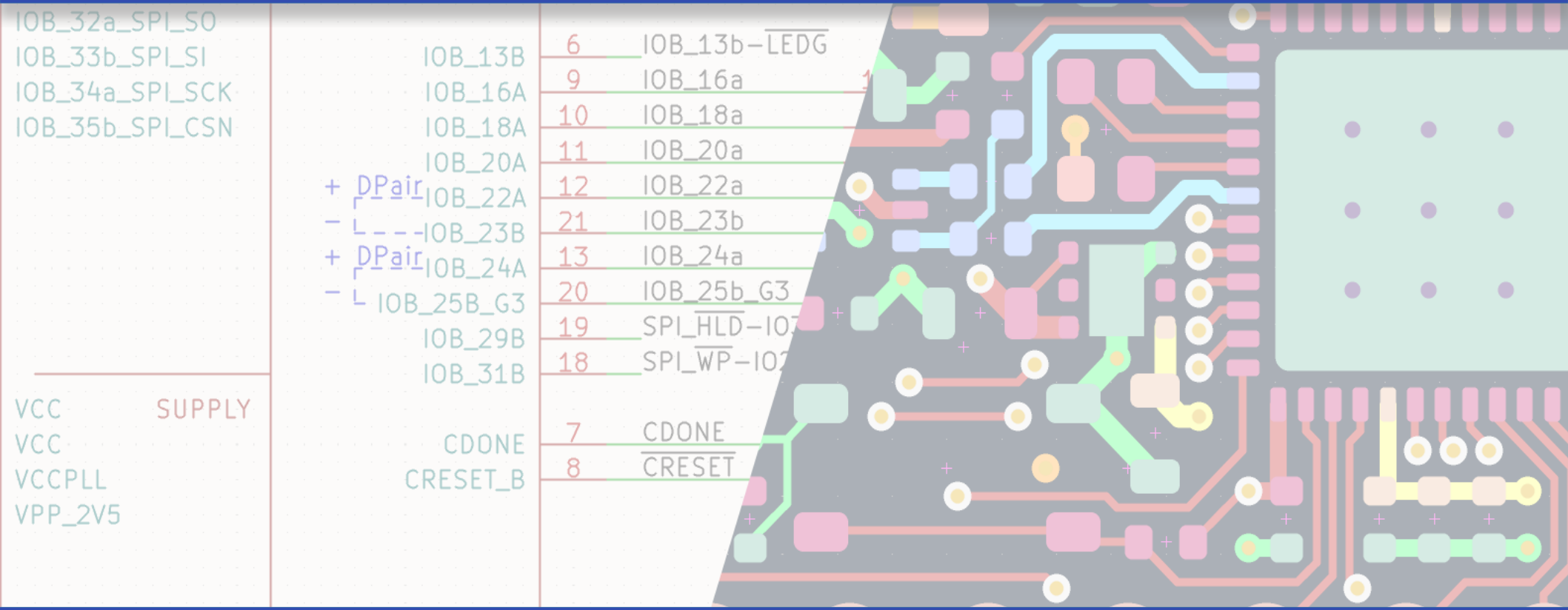
This can be initiated from both ECAD and MCAD

Re-baselining : action of resetting the collaboration

Should only be used if the collaboration is out of sync.



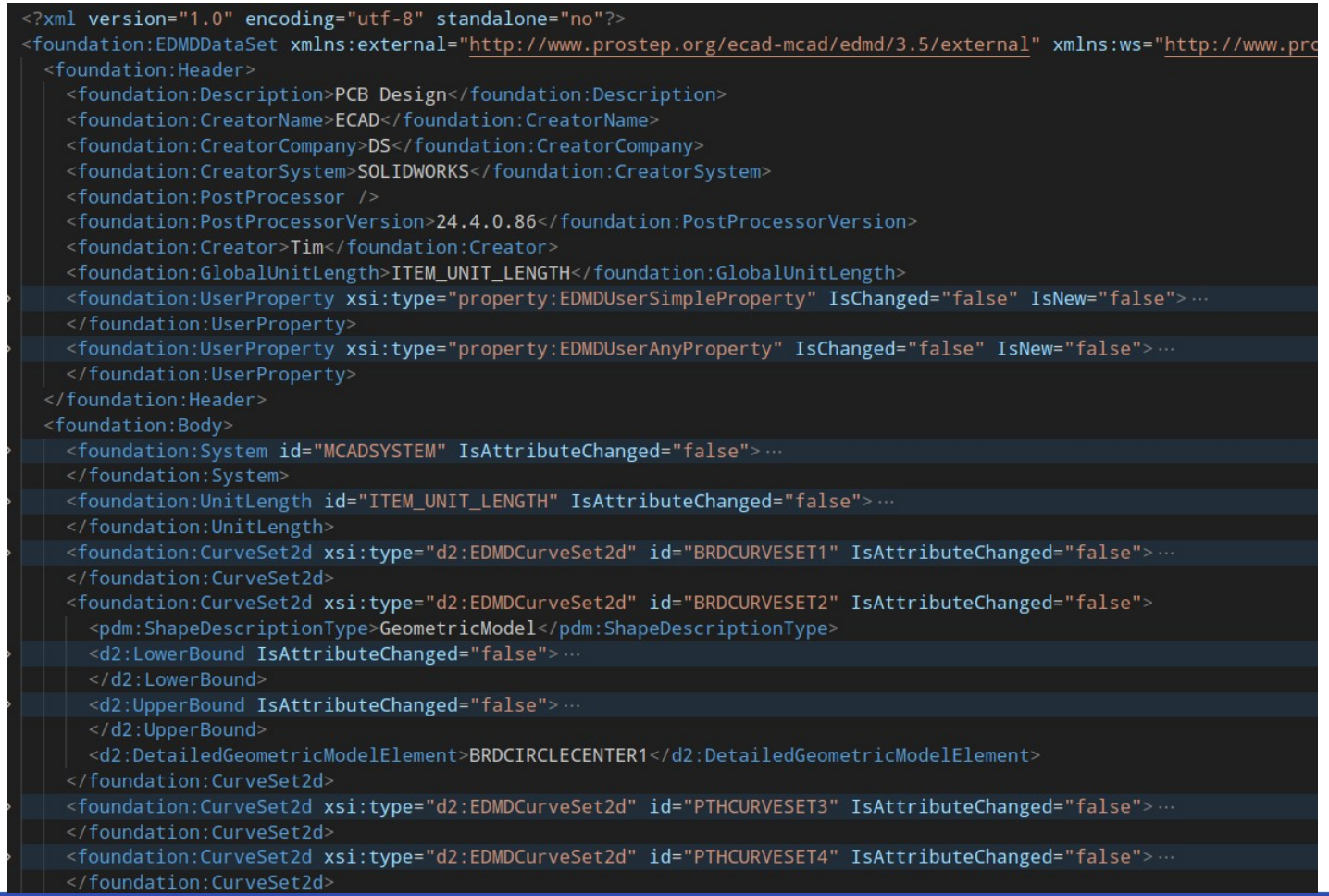
In practice: IDX files



Baseline idx file

Header with:
Info about participants
Info about softwares
Default length unit

Body with:
Info about items



```
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<foundation:EDMDDataSet xmlns:external="http://www.prostep.org/ecad-mcad/edmd/3.5/external" xmlns:ws="http://www.pro
  <foundation:Header>
    <foundation:Description>PCB Design</foundation:Description>
    <foundation:CreatorName>ECAD</foundation:CreatorName>
    <foundation:CreatorCompany>DS</foundation:CreatorCompany>
    <foundation:CreatorSystem>SOLIDWORKS</foundation:CreatorSystem>
    <foundation:PostProcessor />
    <foundation:PostProcessorVersion>24.4.0.86</foundation:PostProcessorVersion>
    <foundation:Creator>Tim</foundation:Creator>
    <foundation:GlobalUnitLength>ITEM_UNIT_LENGTH</foundation:GlobalUnitLength>
    <foundation:UserProperty xsi:type="property:EDMDUserSimpleProperty" IsChanged="false" IsNew="false">…
    </foundation:UserProperty>
    <foundation:UserProperty xsi:type="property:EDMDUserAnyProperty" IsChanged="false" IsNew="false">…
    </foundation:UserProperty>
  </foundation:Header>
  <foundation:Body>
    <foundation:System id="MCADSYSTEM" IsAttributeChanged="false">…
    </foundation:System>
    <foundation:UnitLength id="ITEM_UNIT_LENGTH" IsAttributeChanged="false">…
    </foundation:UnitLength>
    <foundation:CurveSet2d xsi:type="d2:EDMDCurveSet2d" id="BRDCURVESET1" IsAttributeChanged="false">…
    </foundation:CurveSet2d>
    <foundation:CurveSet2d xsi:type="d2:EDMDCurveSet2d" id="BRDCURVESET2" IsAttributeChanged="false">
      <pdm:ShapeDescriptionType>GeometricModel</pdm:ShapeDescriptionType>
      <d2:LowerBound IsAttributeChanged="false">…
      </d2:LowerBound>
      <d2:UpperBound IsAttributeChanged="false">…
      </d2:UpperBound>
      <d2:DetailedGeometricModelElement>BRDCIRCLECENTER1</d2:DetailedGeometricModelElement>
    </foundation:CurveSet2d>
    <foundation:CurveSet2d xsi:type="d2:EDMDCurveSet2d" id="PTHCURVESET3" IsAttributeChanged="false">…
    </foundation:CurveSet2d>
    <foundation:CurveSet2d xsi:type="d2:EDMDCurveSet2d" id="PTHCURVESET4" IsAttributeChanged="false">…
    </foundation:CurveSet2d>
```

Change idx file

Process instructions with:
Reference to the previous and the new versions.

Both versions can be found in the body.

(Here, a board cutout change)

```
<foundation:Body xsi:type="foundation:EDMDDataSetBody">…
</foundation:Body>

<foundation:ProcessInstruction id="MGC::Project13.asm::10/7/2025 16:49:49" xsi:type="c
  <computational:Actor>fcoro</computational:Actor>
  <computational:Changes xsi:type="computational:EDMDTransaction">
    <foundation:Description></foundation:Description>
    <computational:Change xsi:type="computational:EDMDChange">
      <computational:Actor>fcoro</computational:Actor>
      <computational:NewItem xsi:type="foundation:EDMDIdentifier">
        <foundation:Name>PCB</foundation:Name>
        <foundation:Description>THIS IS THE NEW VERSION</foundation:Description>
        <foundation:SystemScope>MCADSYSTEM</foundation:SystemScope>
        <foundation:Number>MGC::ExpeditionPCB_Project13.asm::1</foundation:Number>
        <foundation:Version>1</foundation:Version>
        <foundation:Revision>0</foundation:Revision>
        <foundation:Sequence>1</foundation:Sequence>
      </computational:NewItem>
      <computational:PredecessorItem xsi:type="foundation:EDMDIdentifier">
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        <foundation:Description>THIS IS THE PREVIOUS VERSION</foundation:Description>
        <foundation:SystemScope>MCADSYSTEM</foundation:SystemScope>
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        <foundation:Revision>0</foundation:Revision>
        <foundation:Sequence>0</foundation:Sequence>
      </computational:PredecessorItem>
    </computational:Change>
  </computational:Changes>
</foundation:ProcessInstruction>
```

Direct communication:

IDX is mostly implemented by closed source softwares.
There is no public IDX library, therefore there are many implementations.
A server should be implemented as ECAD and MCAD softwares may not be online.

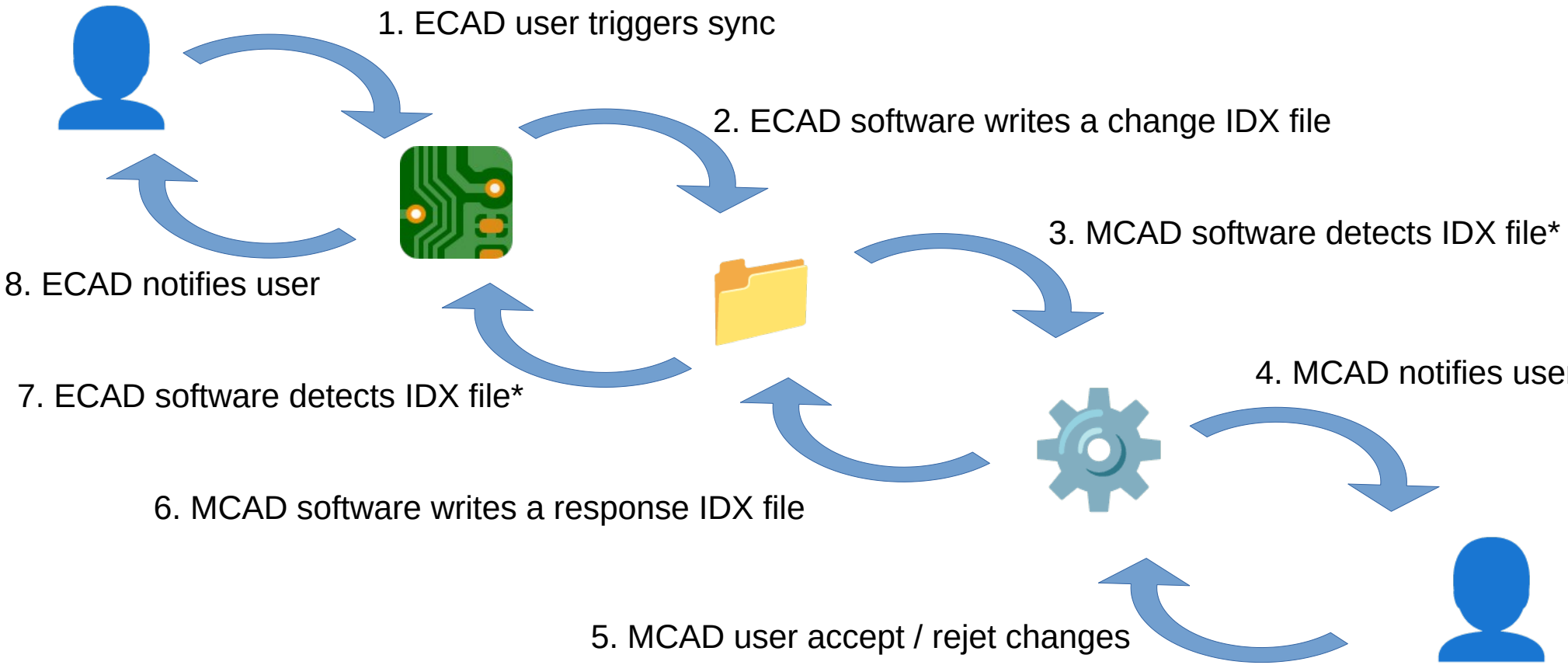
Network shared folder:

This is usually the method used.
The ECAD / MCAD software write the file in the shared folder

Emailing / message the files:

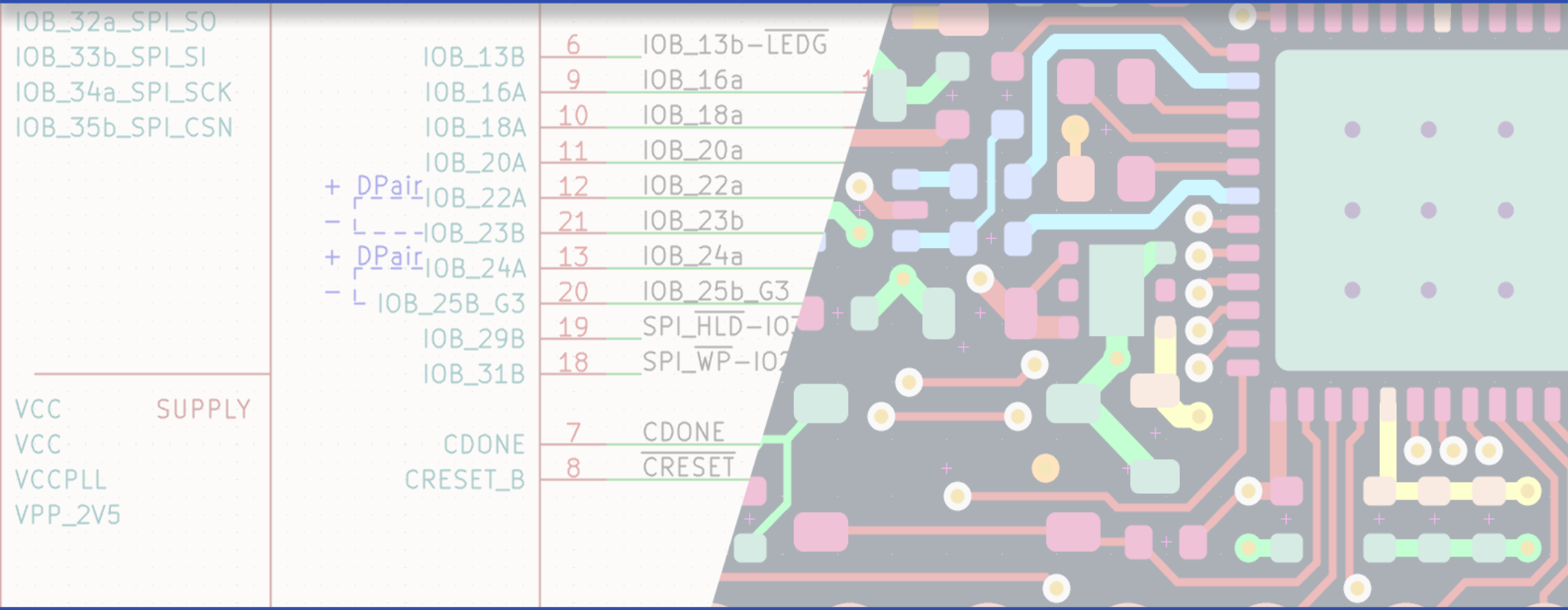
Not efficient and prone to errors

Example with a shared folder



*detections can be replaced with user messaging each other and loading the files

Status in KiCad



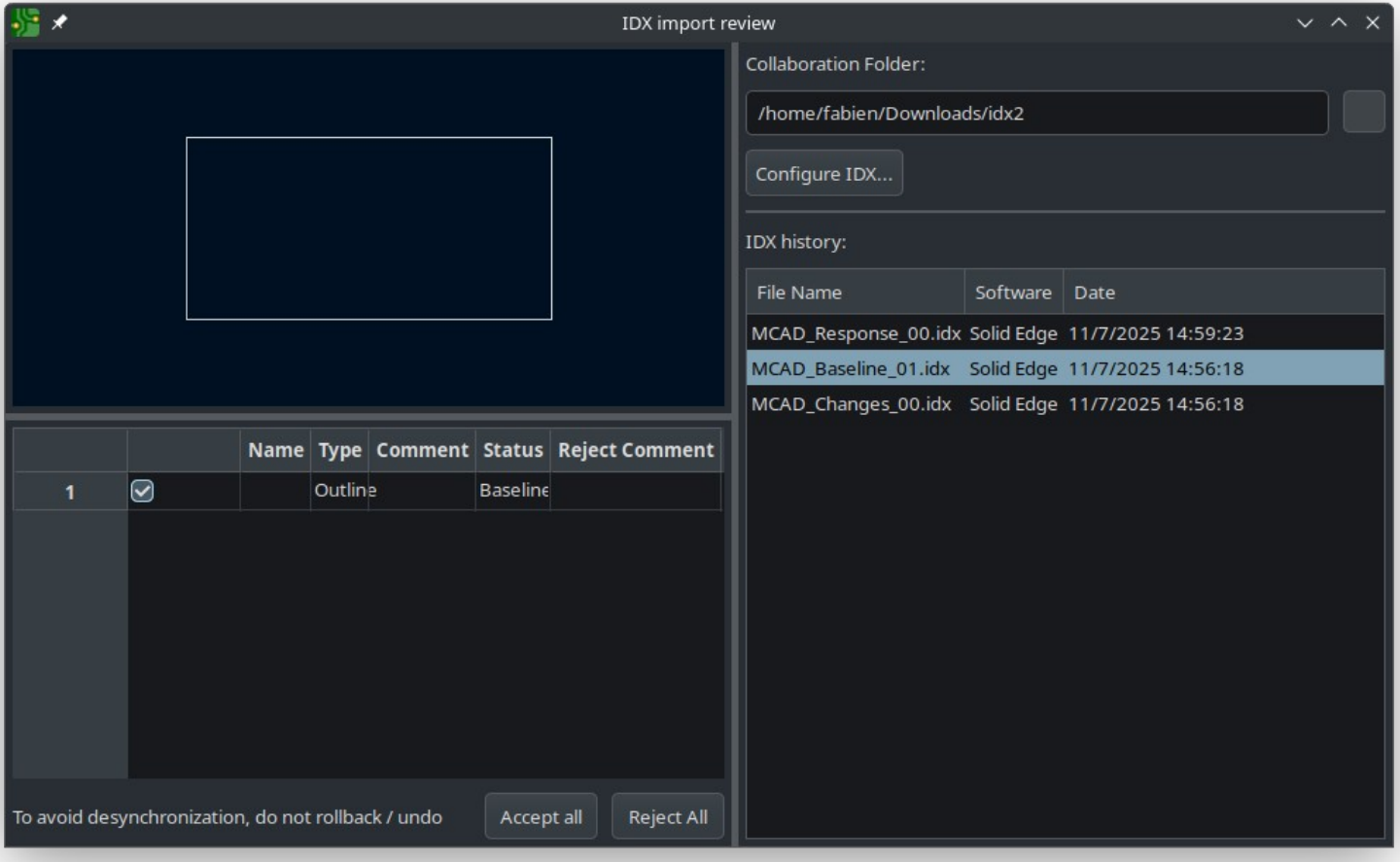
An MR for IDX support is open :
https://gitlab.com/kicad/code/kicad/-/merge_requests/2341

Maybe in KiCad v11 (2027) ?

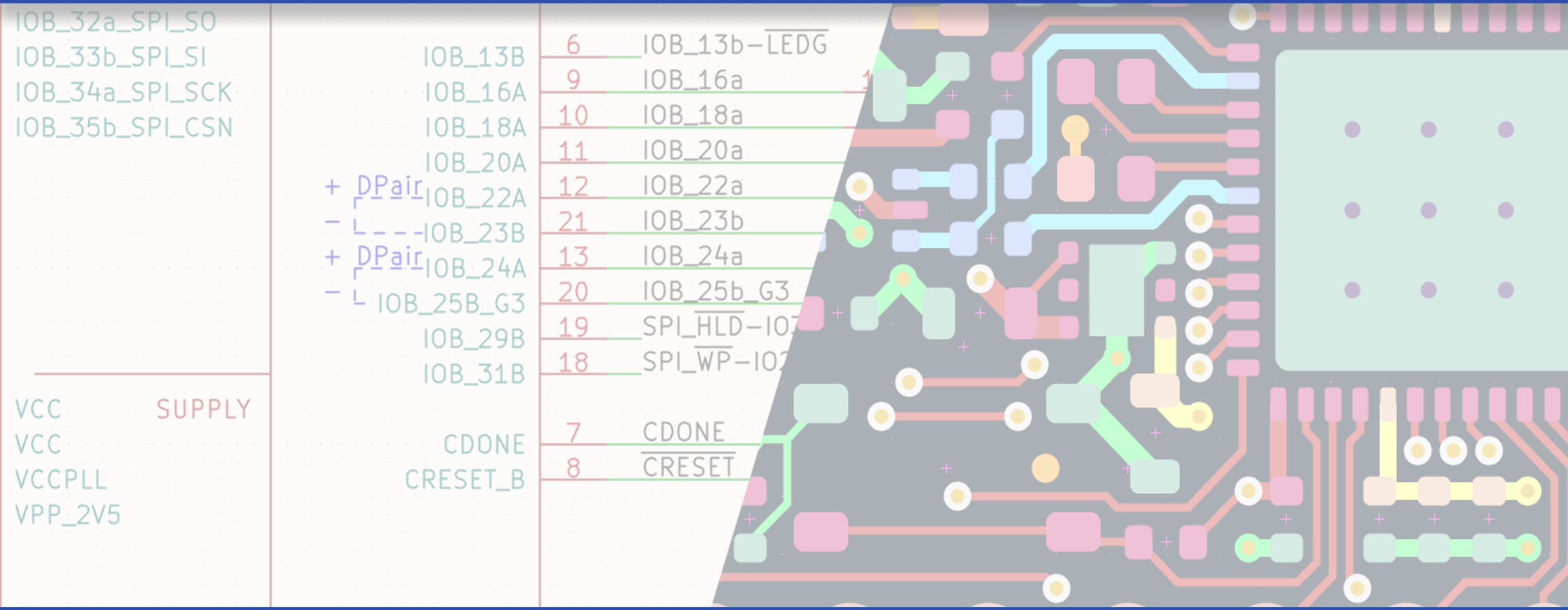
The current MR focuses on receiving information from MCAD.
It is has been tested with Siemens Solid Edge

	ECAD → MCAD	MCAD → ECAD
Generating baseline	❌	
Receiving baseline		✅
Generating changes	❌	
Receiving changes		✅
Generating change reponses		✅
Receiving change reponses	❌	
Diff viewer	🚧	🚧
Repository handling	🚧	🚧

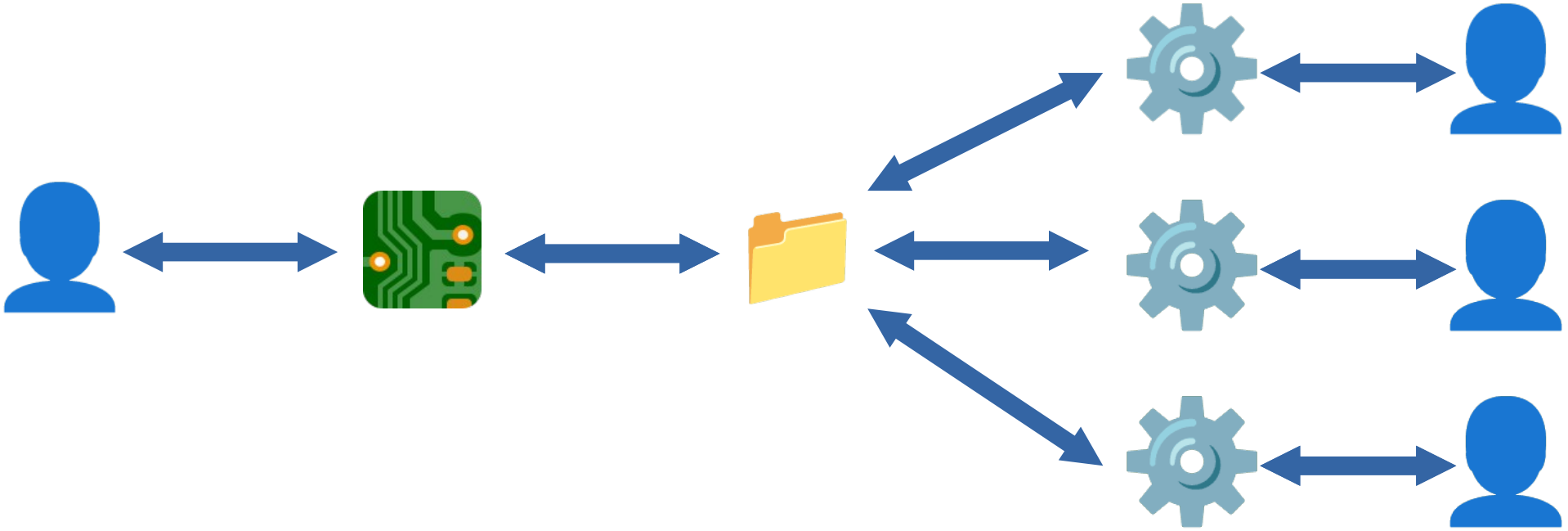
Prototype interface



IDX with extra steps

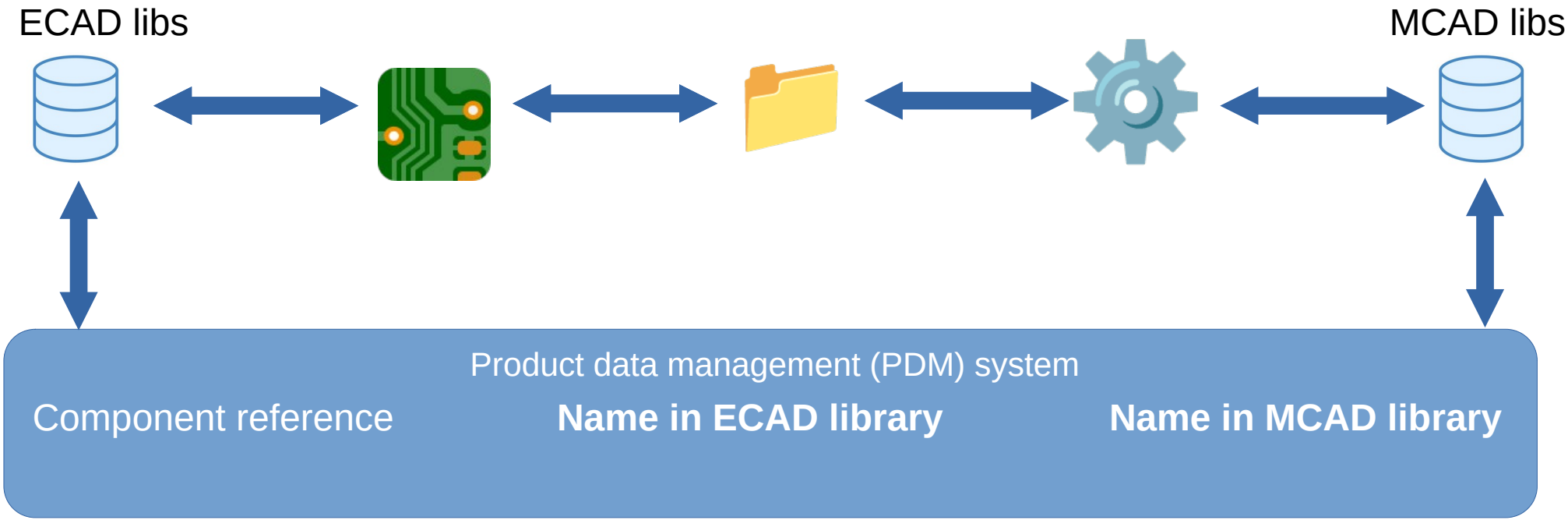


Example: a board integrates into several devices



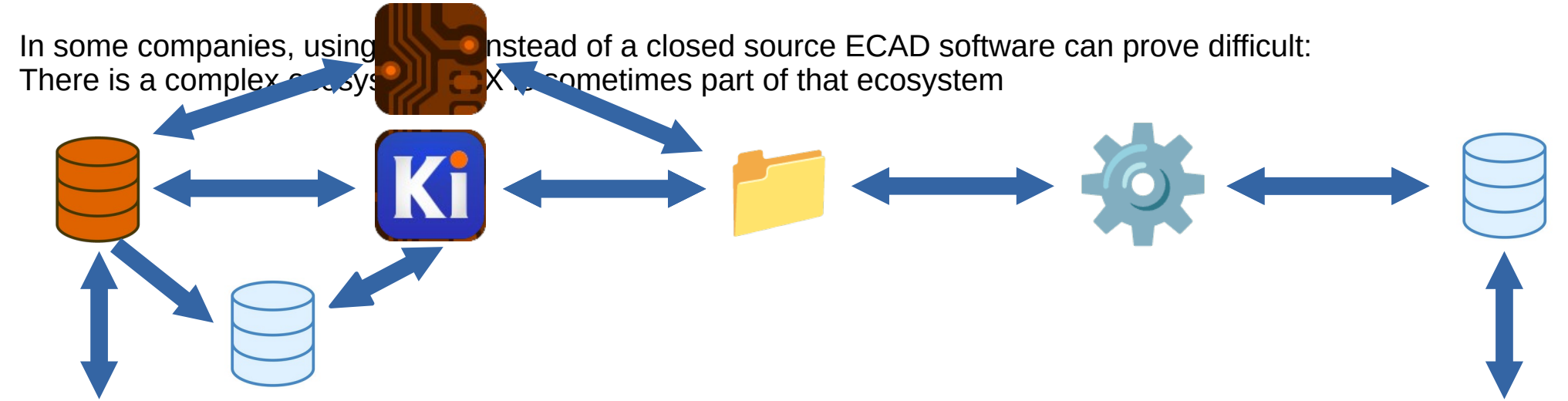
How adding a component in ECAD will lead to the correct 3D model in MCAD ?

Can an MCAD designer add an electronics component ?

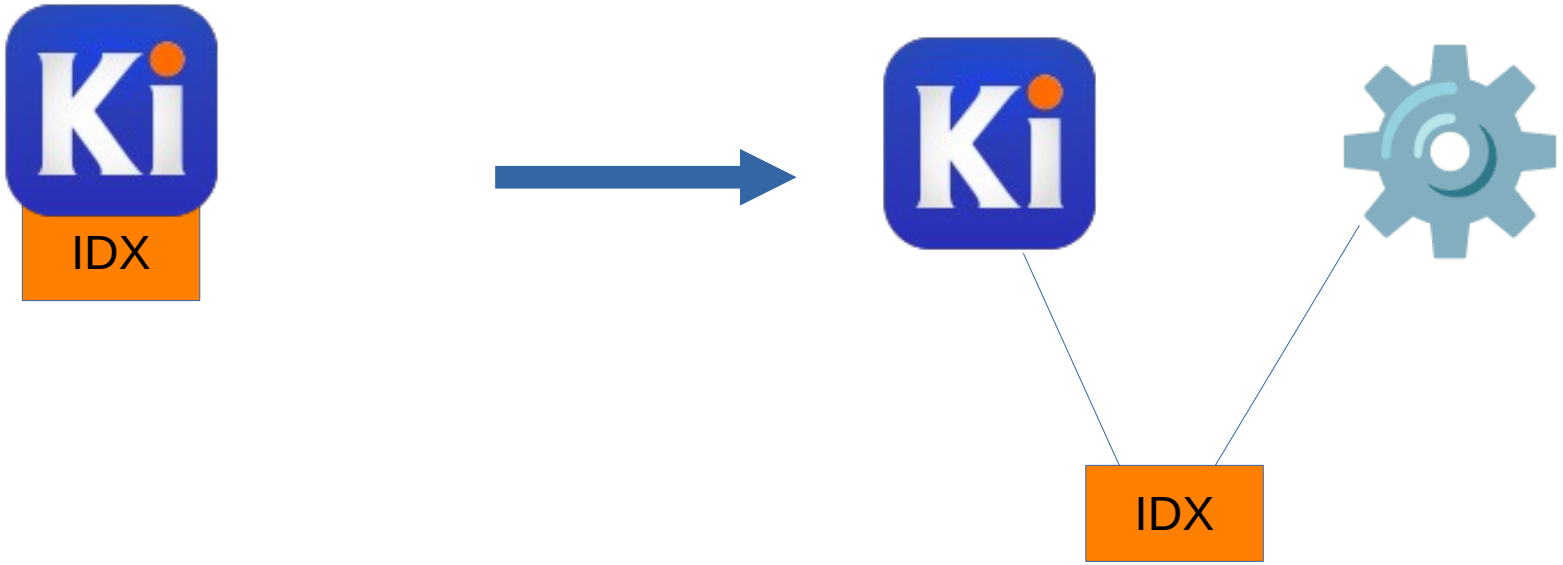


Enabling alternative worflows

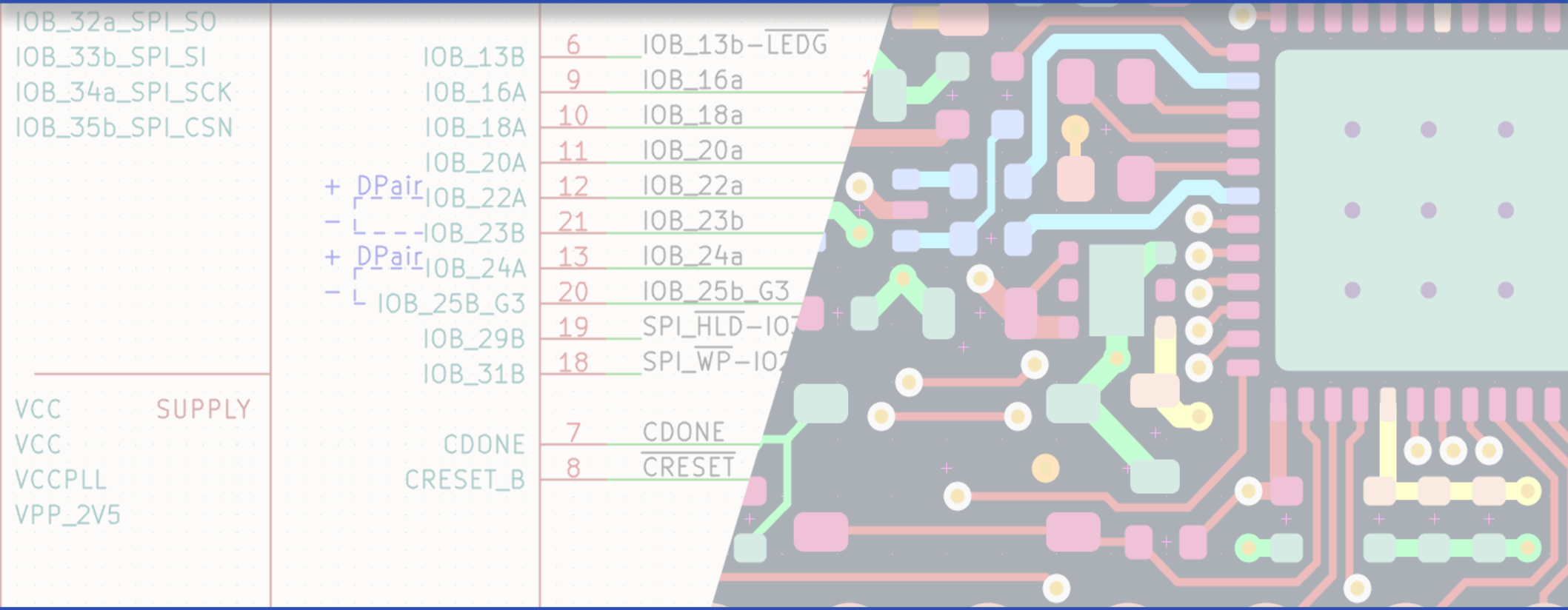
In some companies, using nstead of a closed source ECAD software can prove difficult:
There is a complex ecosys X sometimes part of that ecosystem



The IDX feature is being developped within KiCad for simplicity.
It has been coded so it can be extracted if needed, so other FOSS CAD tools can use it



Conclusion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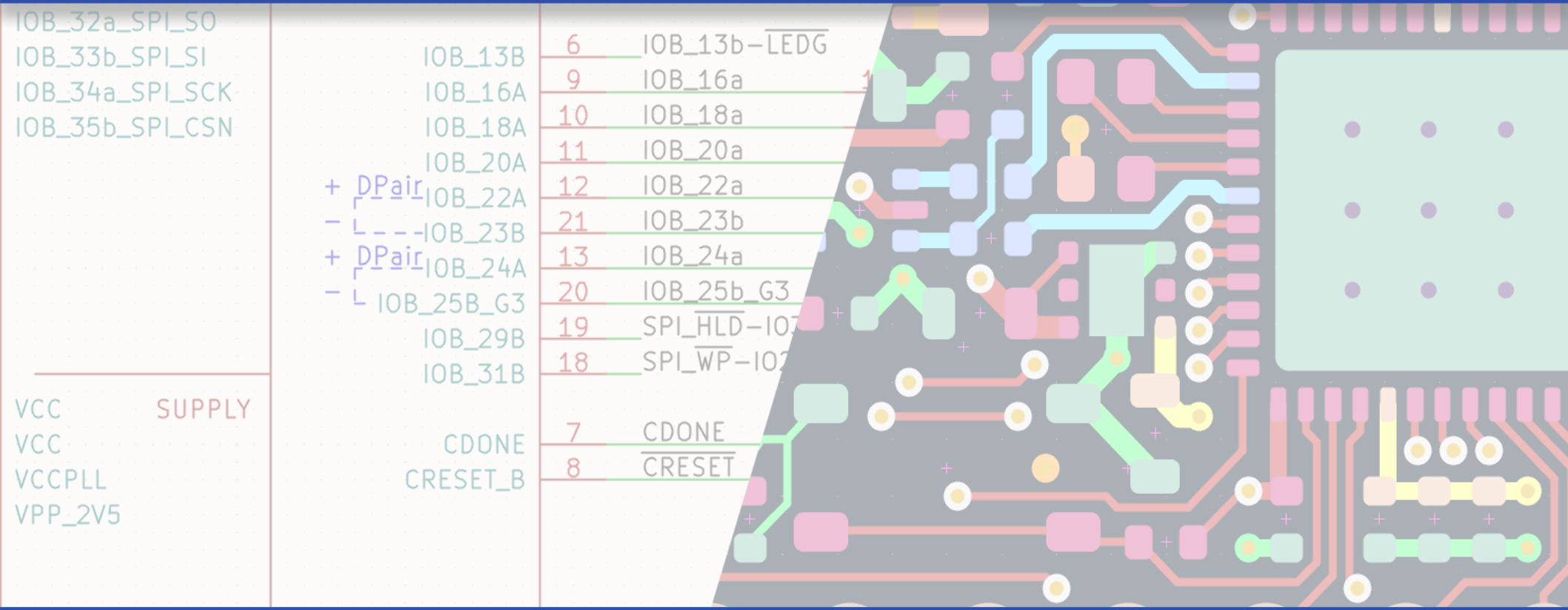
Conclusion

- IDX allows for synchronization between ECAD and MCAD
- Incremental changes allows for discussing and tracking changes
- It does not replace designers talking to each other

- KiCad proof of concept in development
- Looking forward to sharing implementation with MCAD software for testing

Thank you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