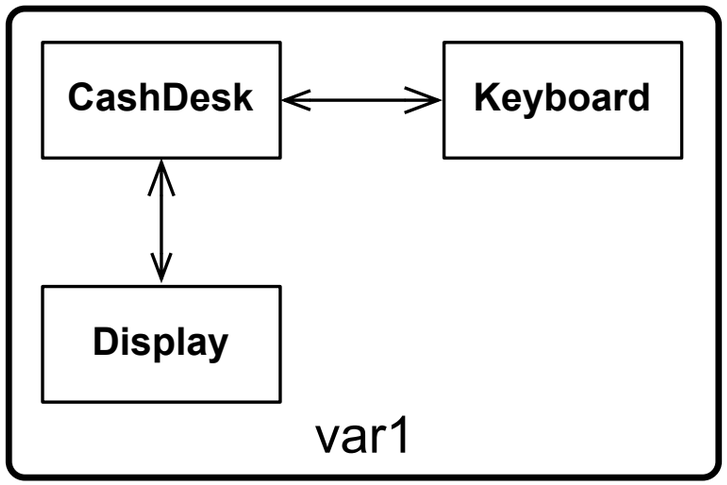
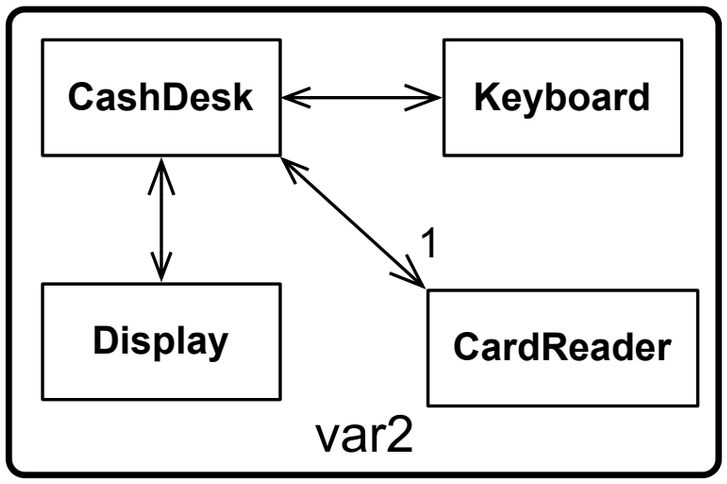
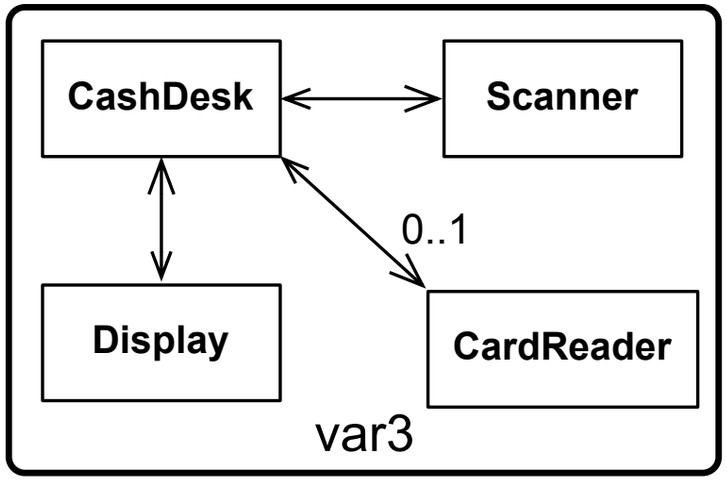
A brief overview of reuse mechanisms


CashDesk
Keyboard
Display
var1


CashDesk
Keyboard
1
Display
CardReader
var2


CashDesk
Scanner
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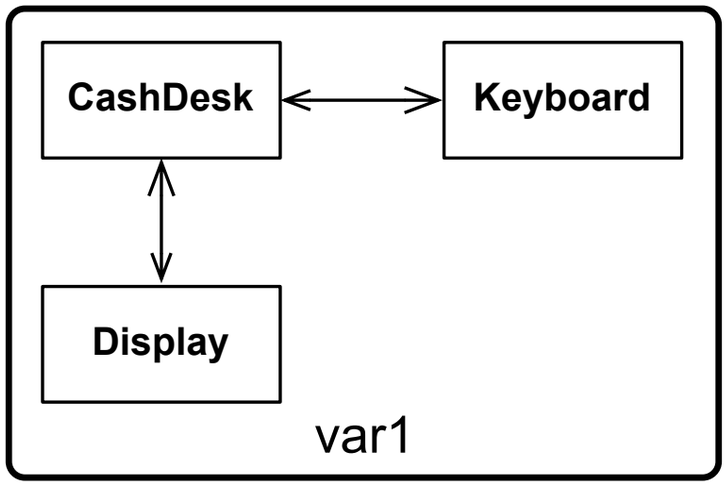

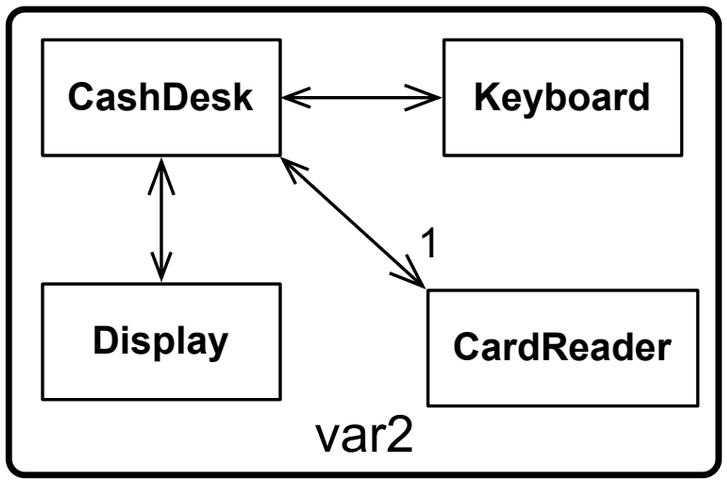

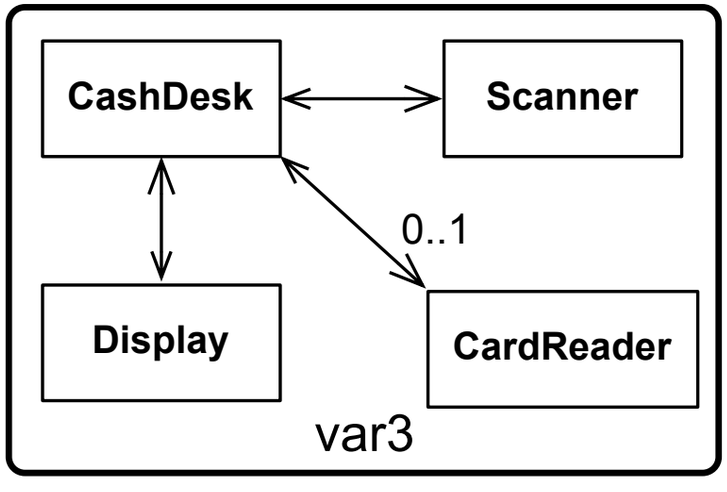

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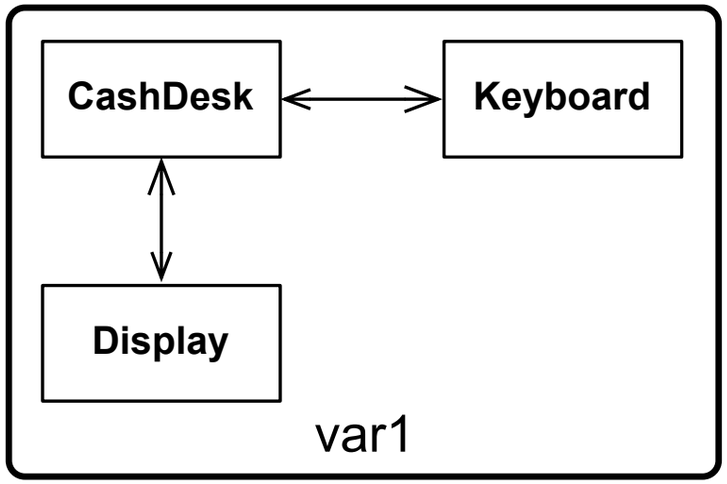

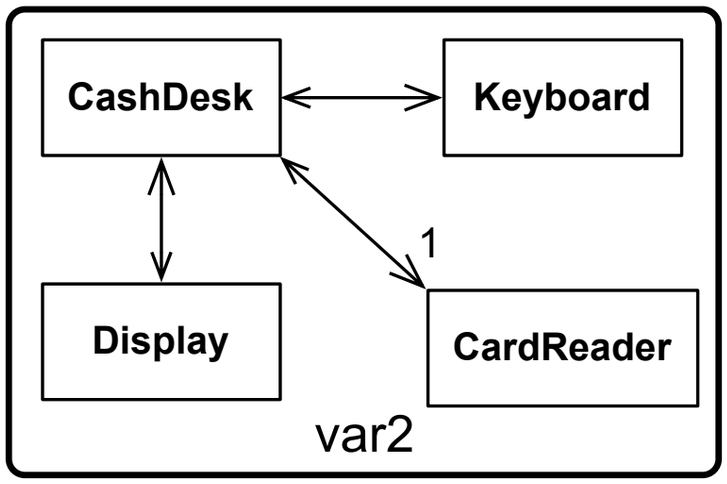

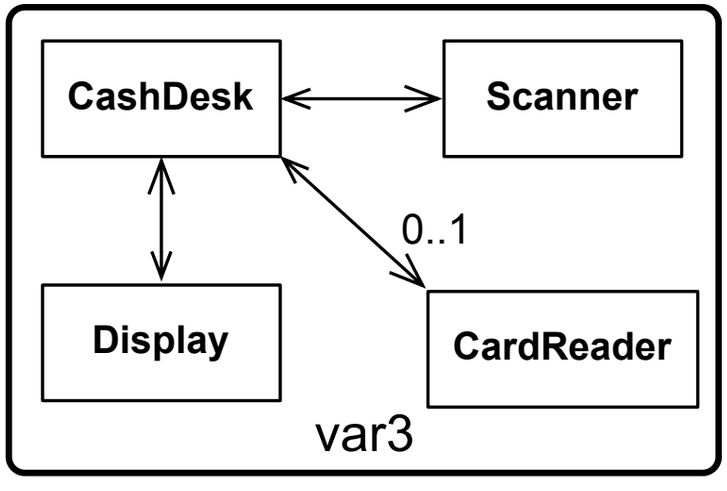

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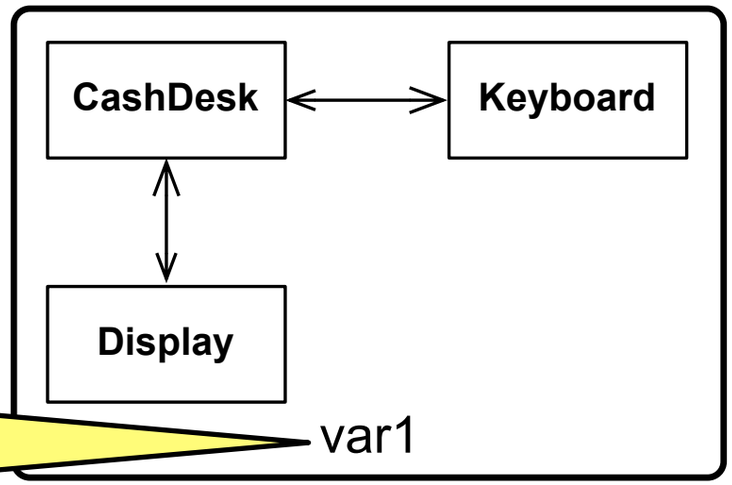
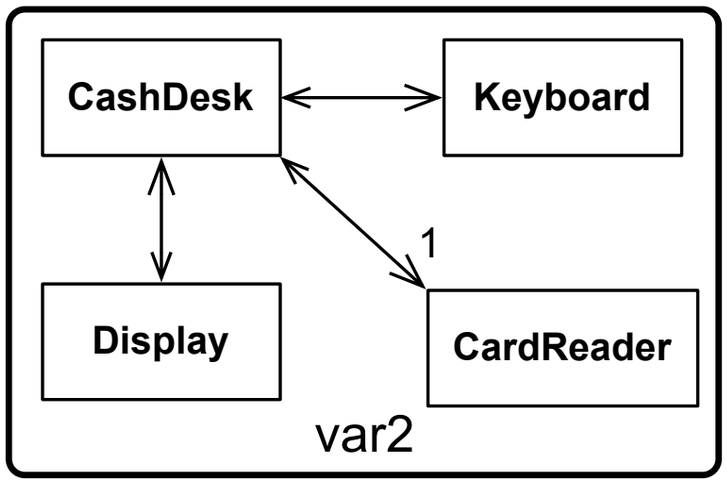
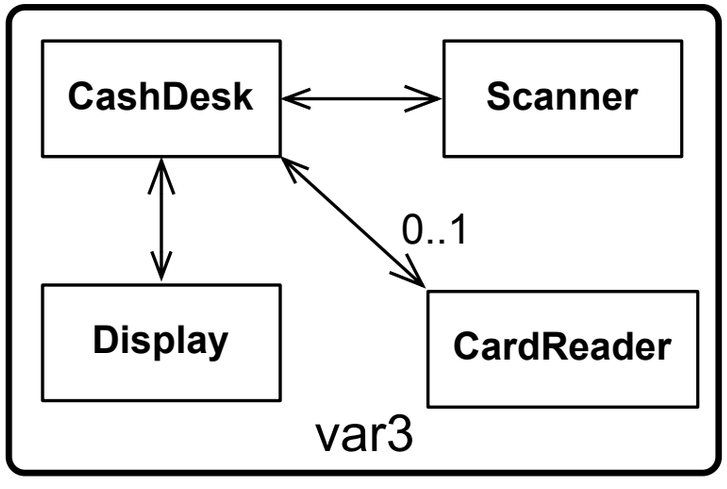


every variant is enclosed in a curved rectangle with a bold stroke and is named varX where X is a number.





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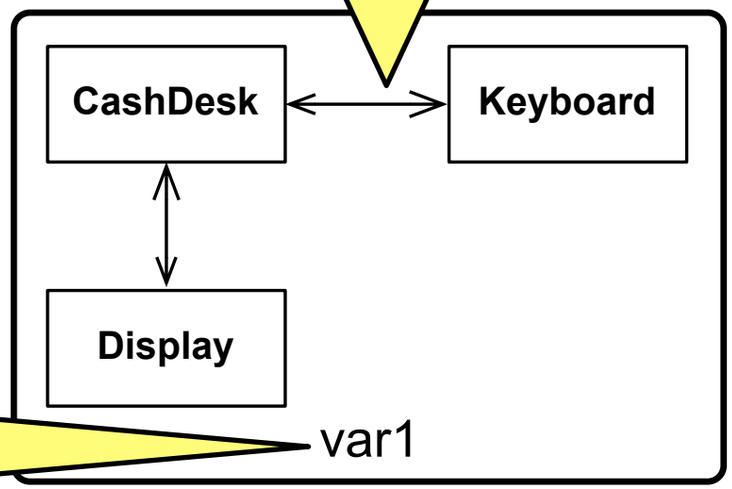

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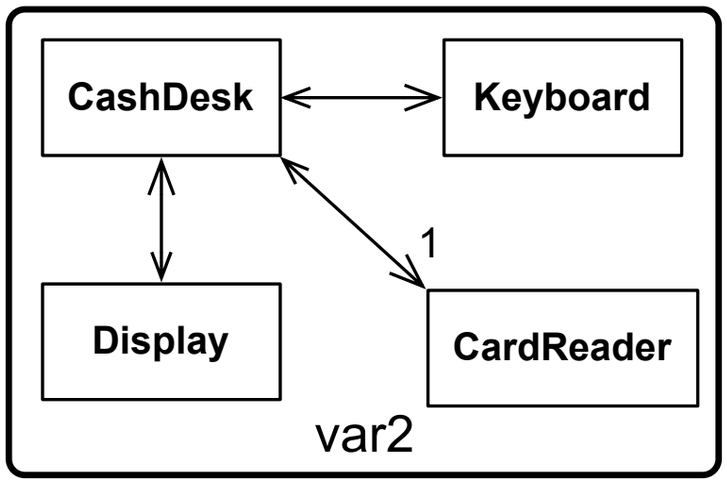

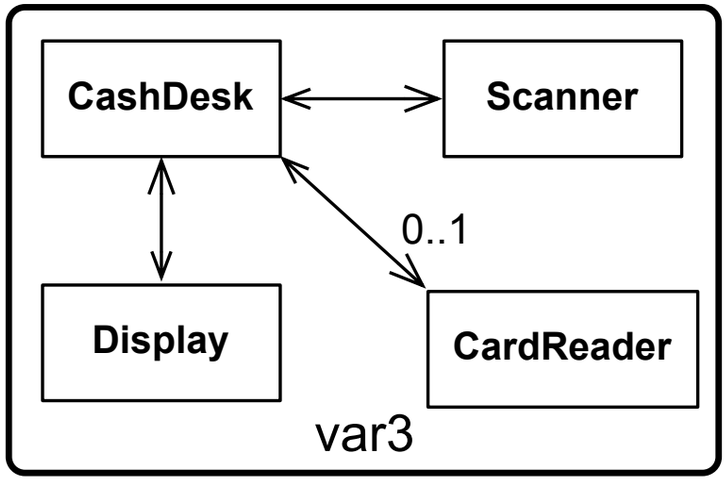

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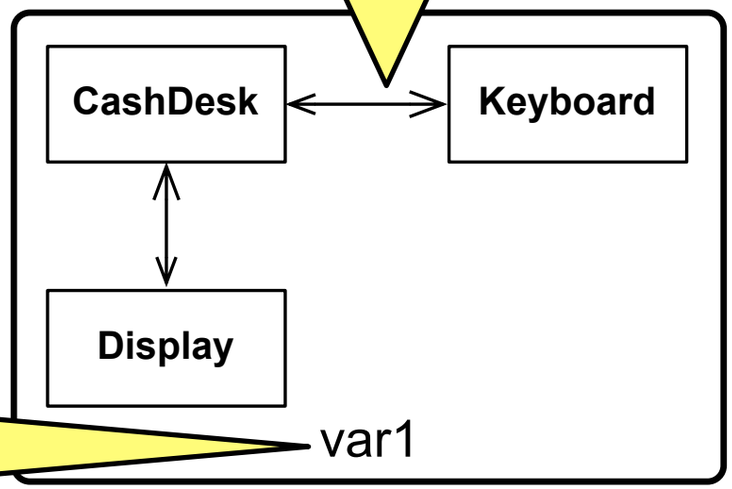

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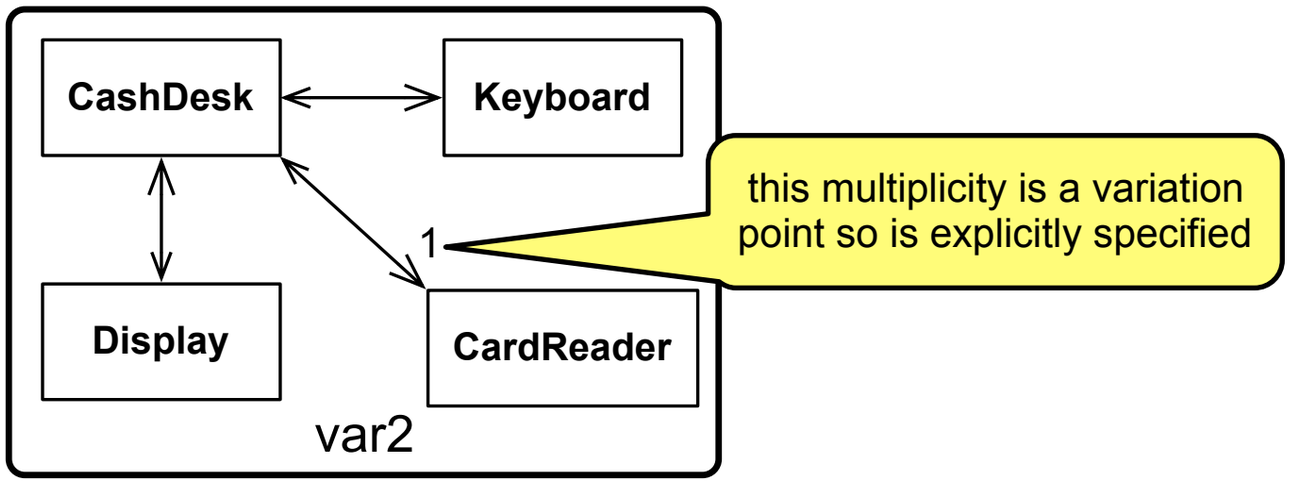
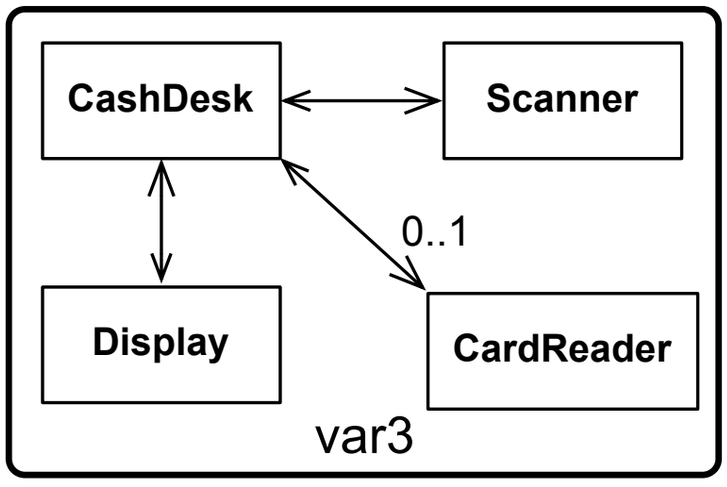


this multiplicity is a variation point so is explicitly specified



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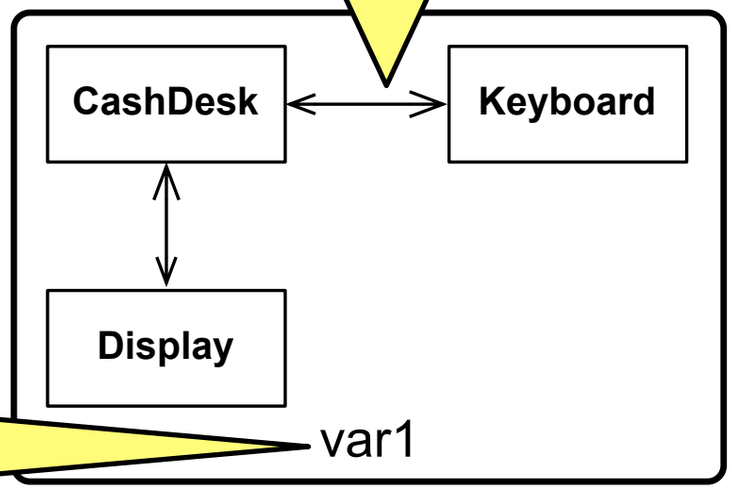

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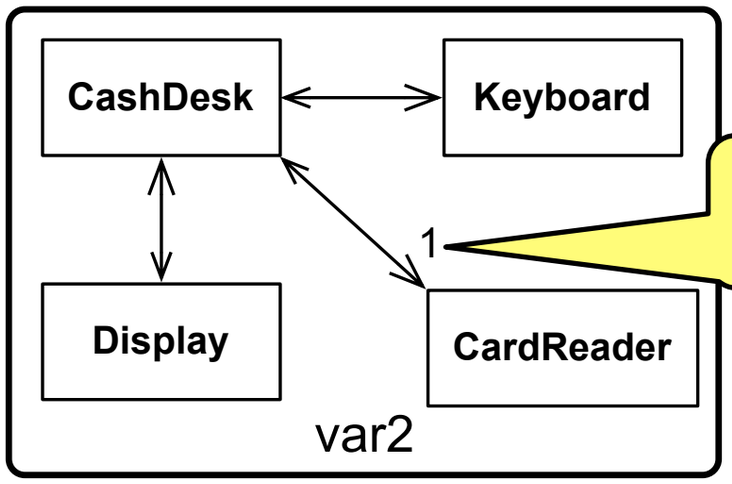

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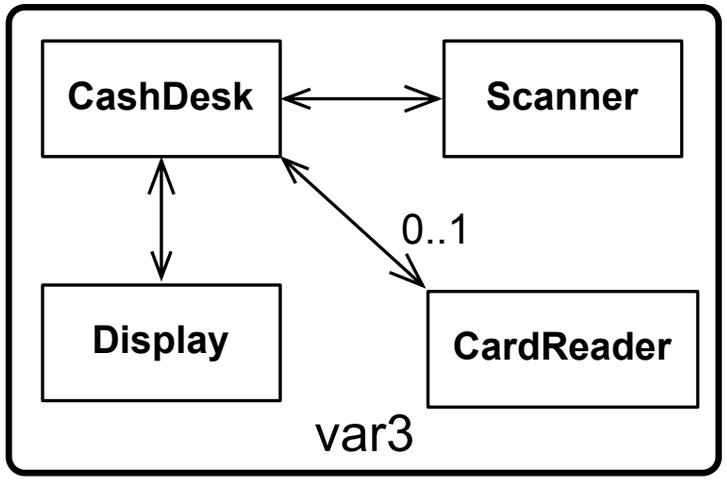

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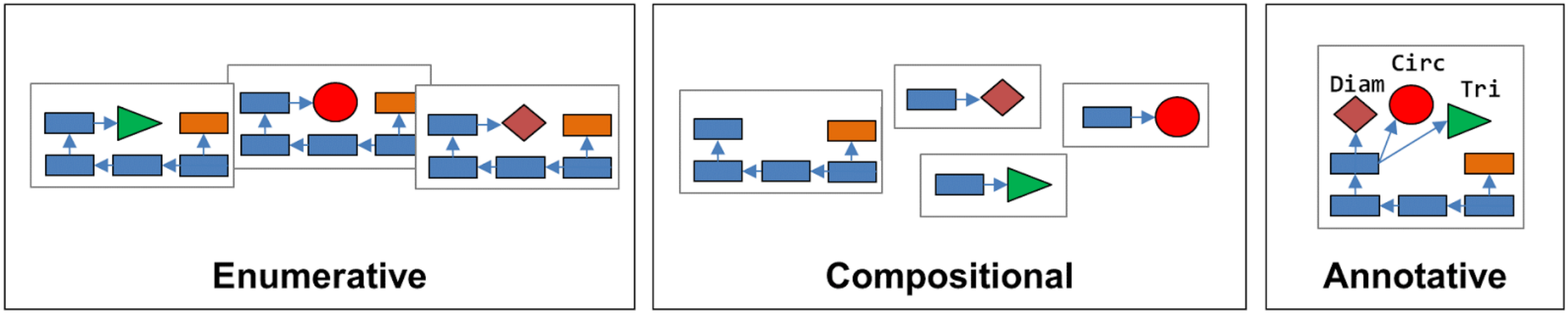
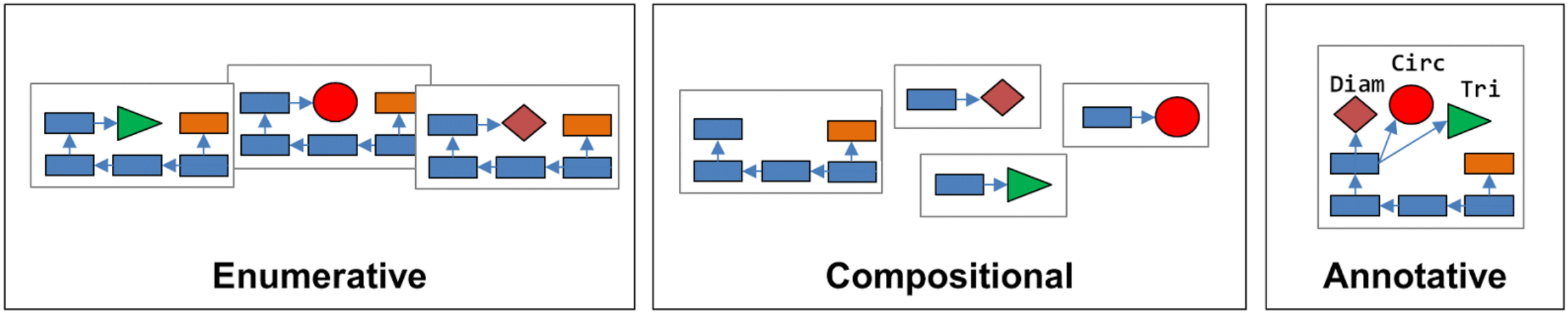
in the following, let us refer to both **classes** and **references** in a class diagram as **elements**


Enumerative
Compositional
Circ
Diam
Tri
Annotative

There exist different **reuse mechanisms** that support working with families of software artefacts.



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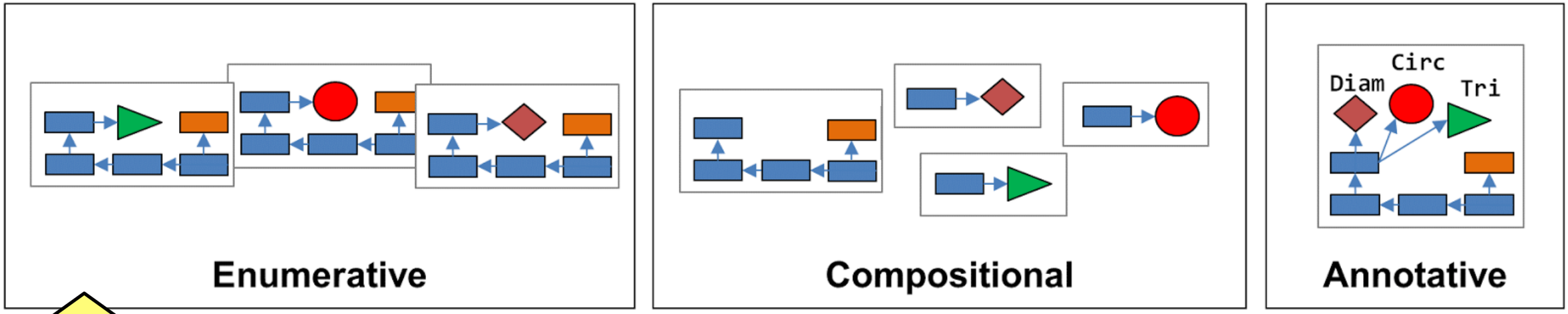

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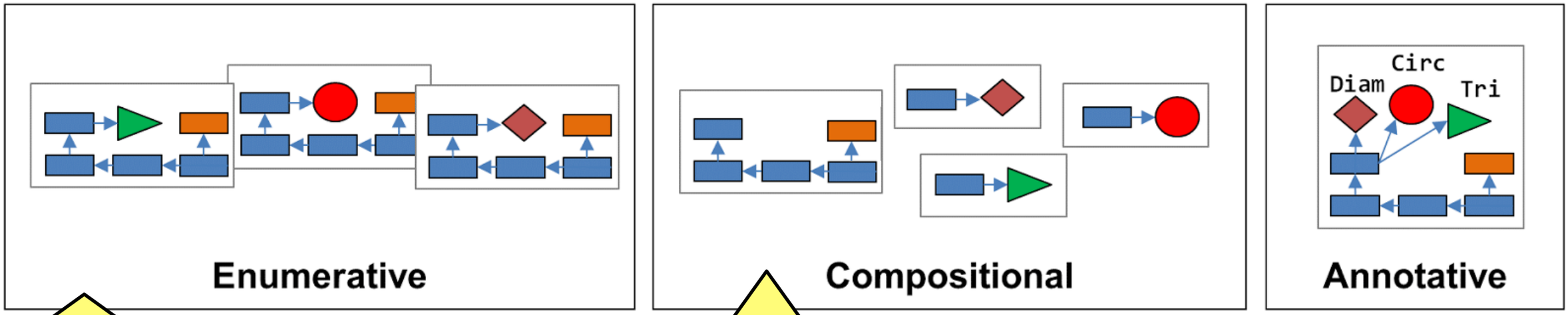

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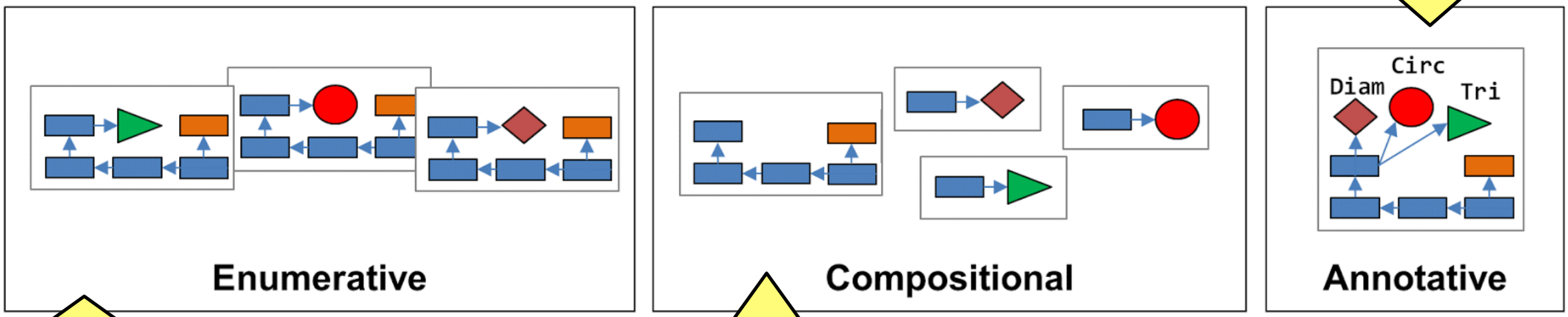
annotative mechanisms combine all artefacts into a single artefact with annotations that indicate which individual products contain which parts



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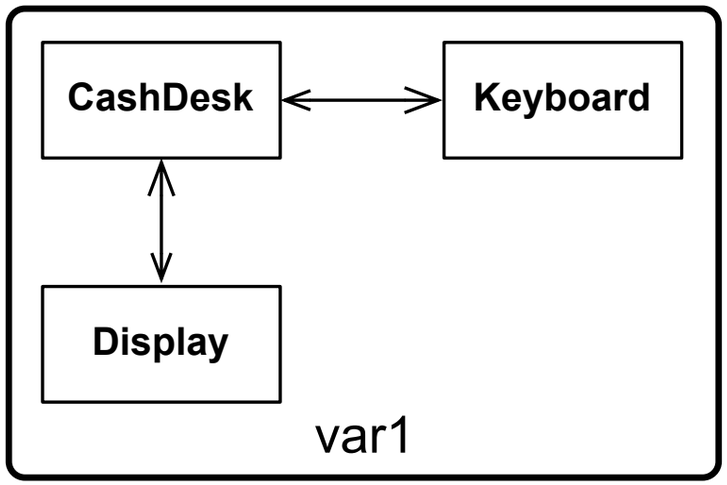
CashDesk
Keyboard
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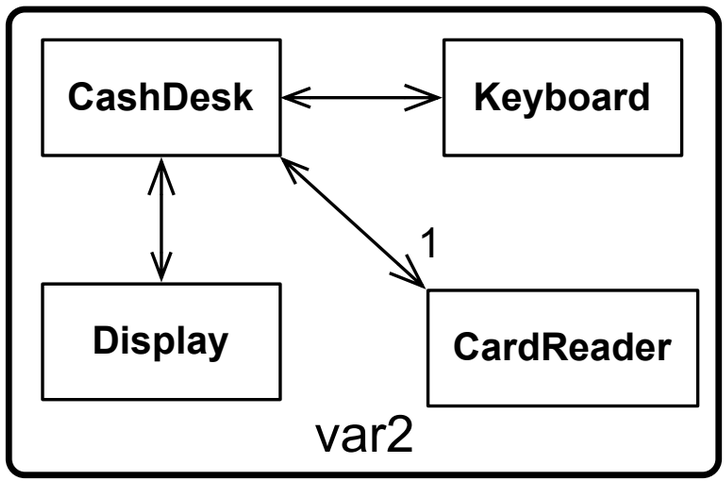
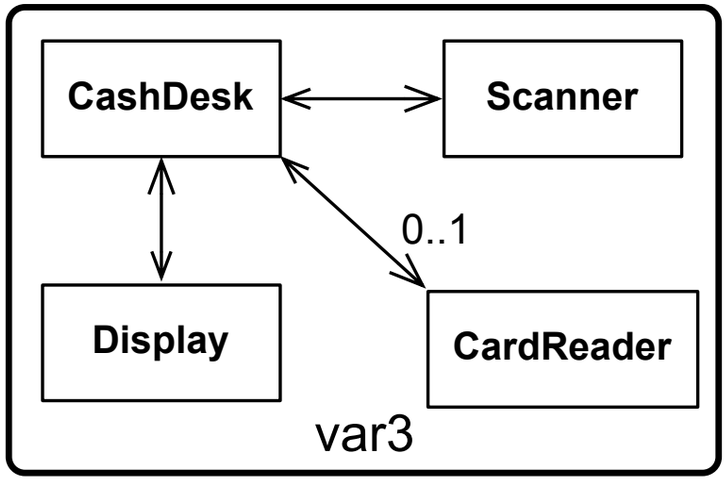
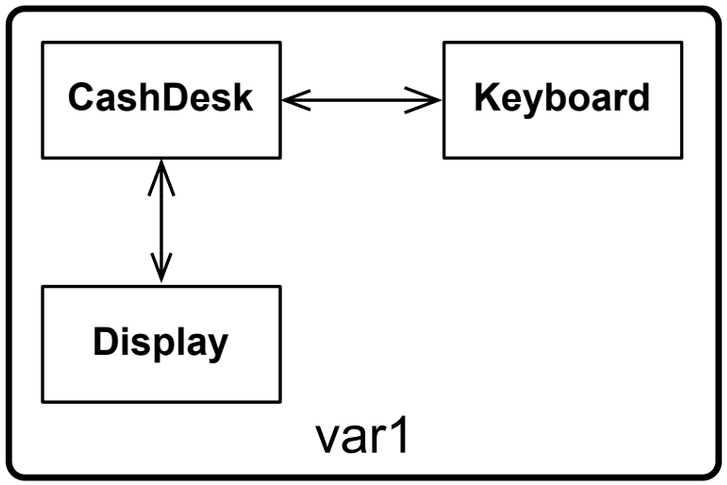
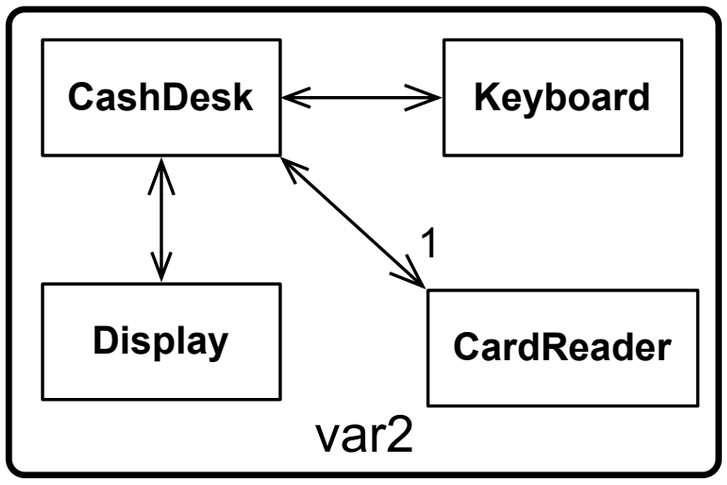
var1

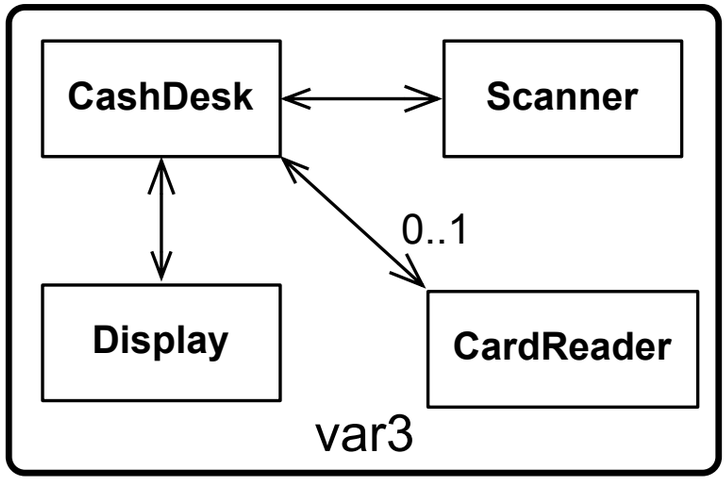

CashDesk
Keyboard
1
Display
CardReader
var2

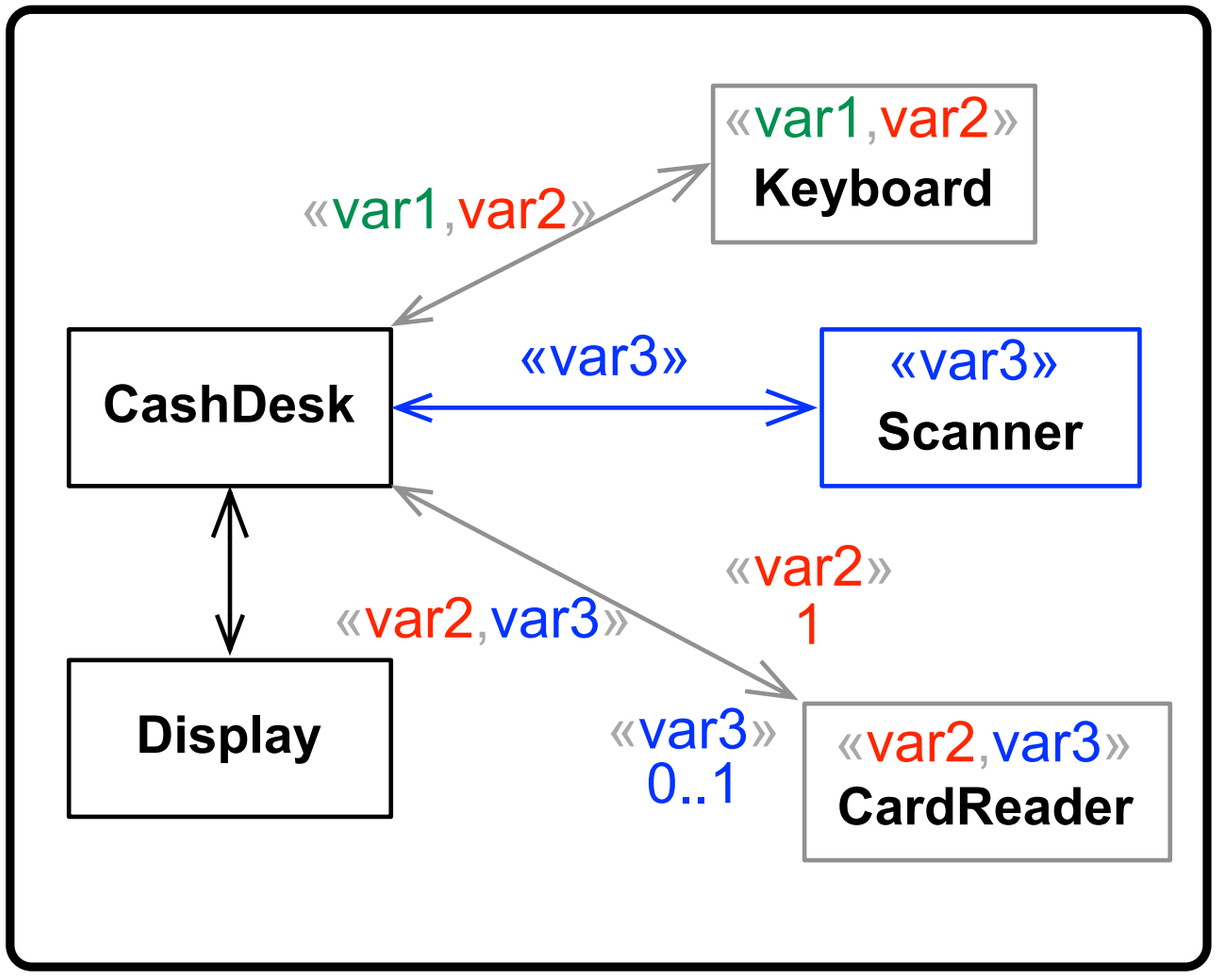

CashDesk
Scanner
0..1
Display
CardReader
var3

An **enumerative** mechanism illustrates the family by simply enumerating all variants as depicted here.

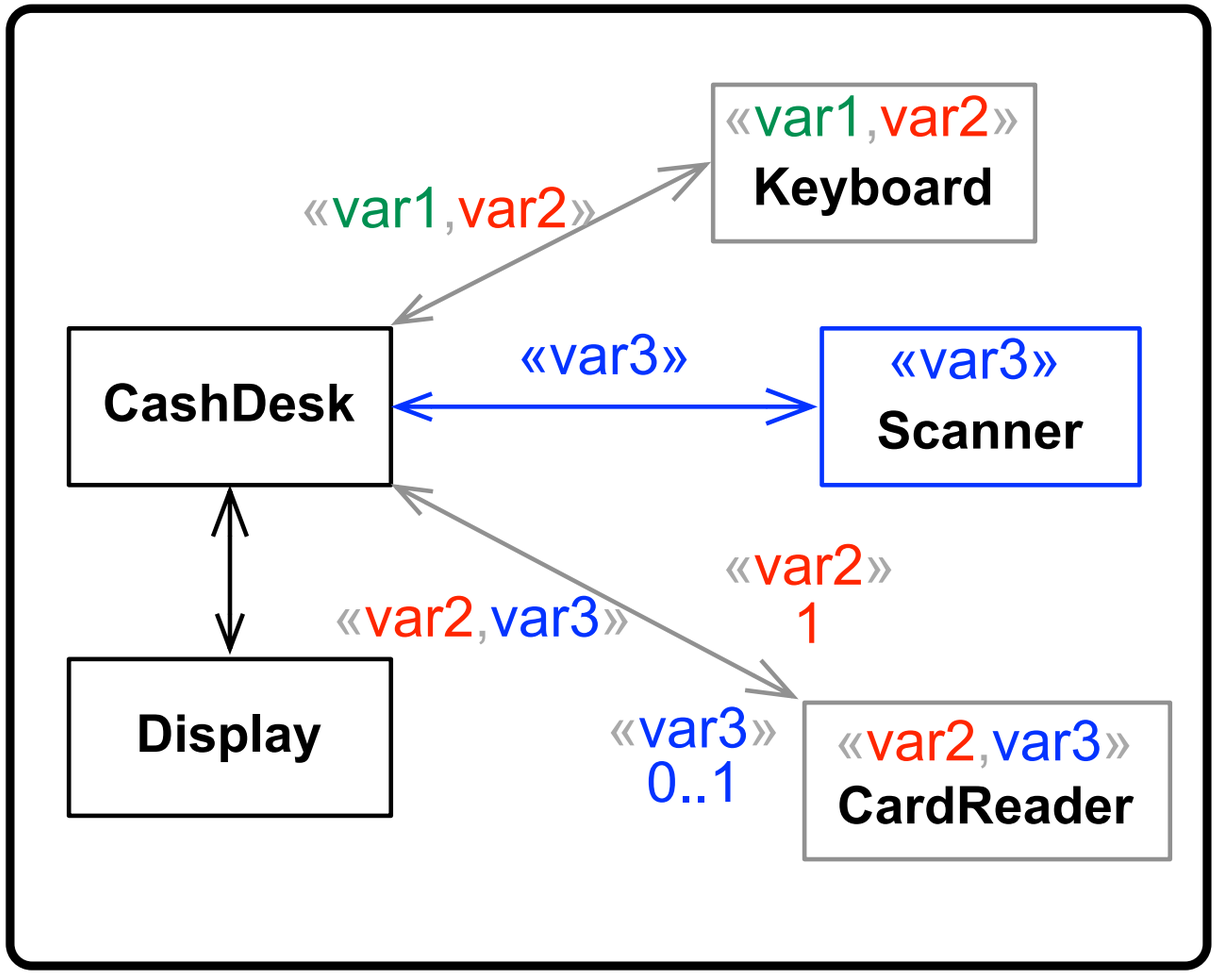







«var1,var2»
Keyboard
«var1,var2»
CashDesk
«var3»
«var3»
Scanner
«var2»
1
«var2,var3»
Display
«var3»
0..1
«var2,var3»
CardReader

An **annotative** mechanism allows combining all variants into a single representation with suitable annotations.



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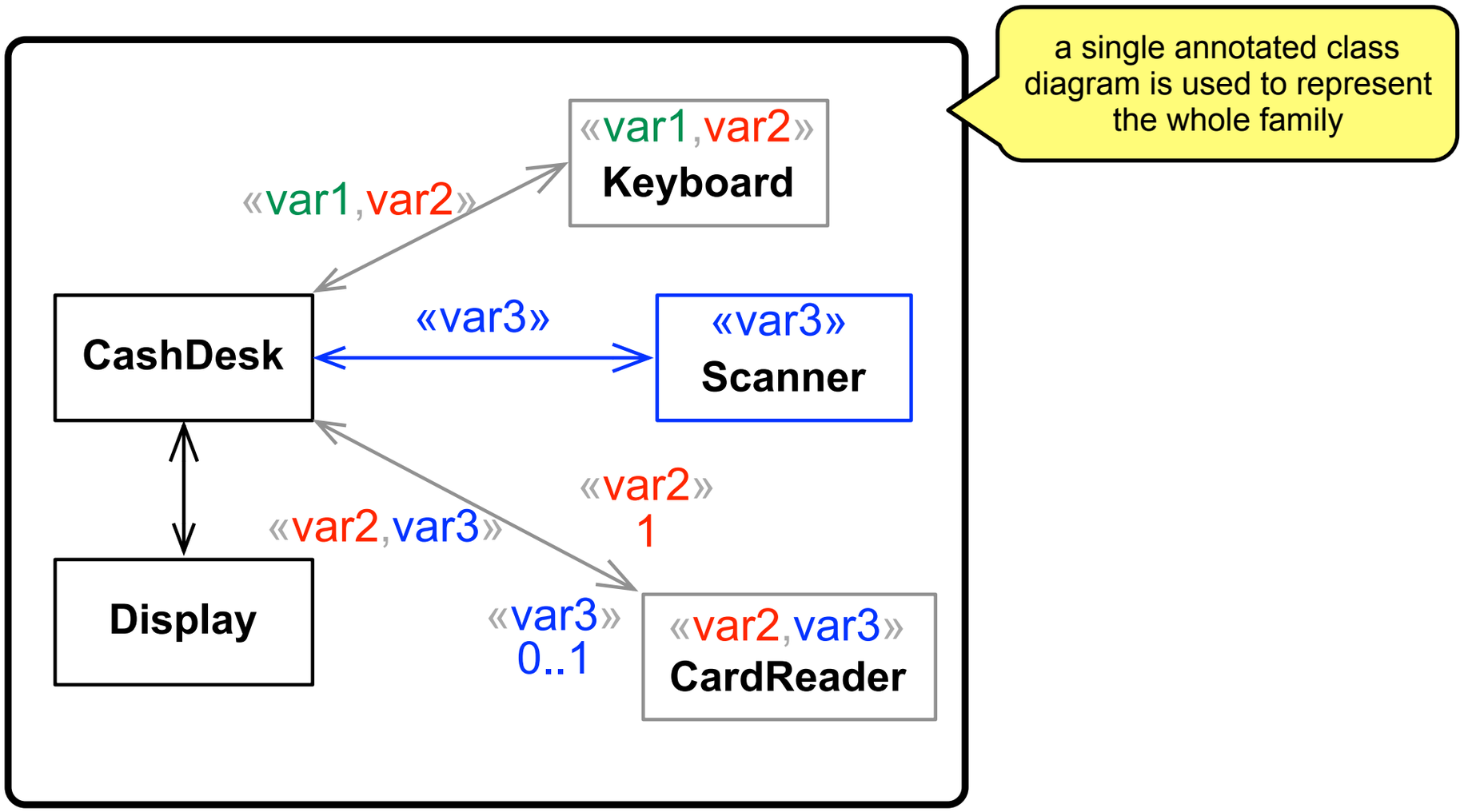

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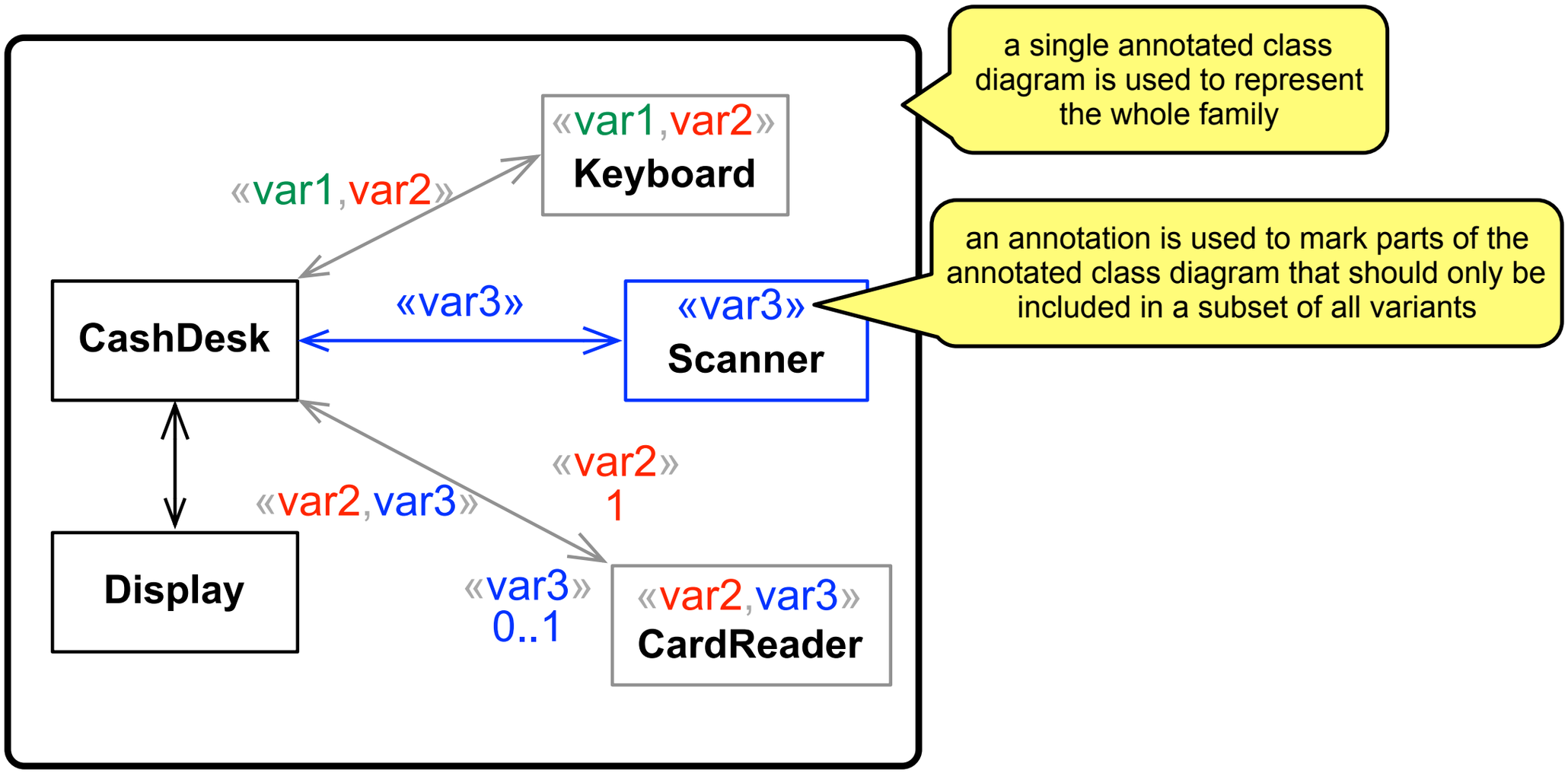

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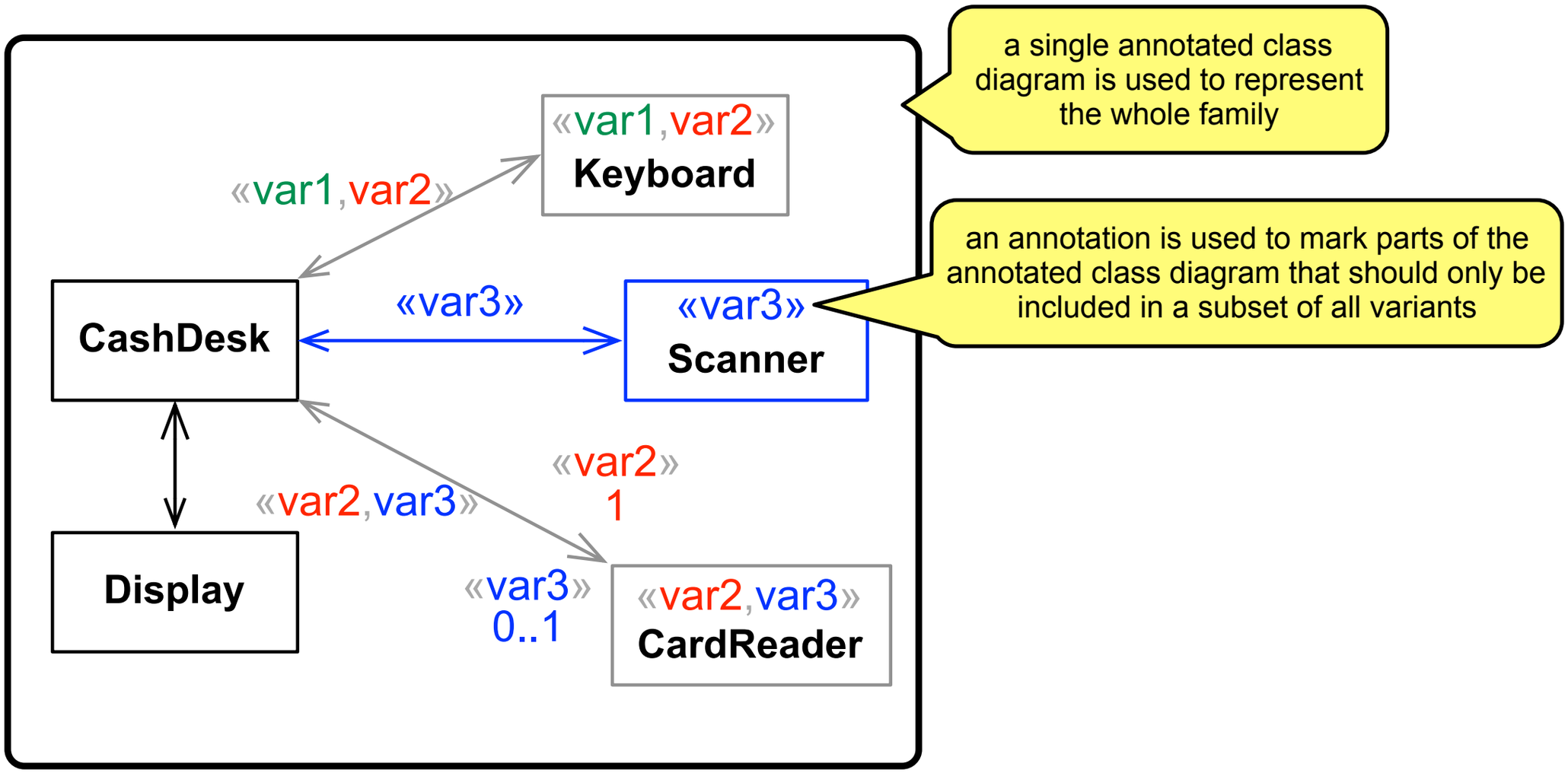

a single annotated class diagram is used to represent the whole family

an annotation is used to mark parts of the annotated class diagram that should only be included in a subset of all variants

colours provide additional visual support:

- elements with a **black outline** belong to all variants
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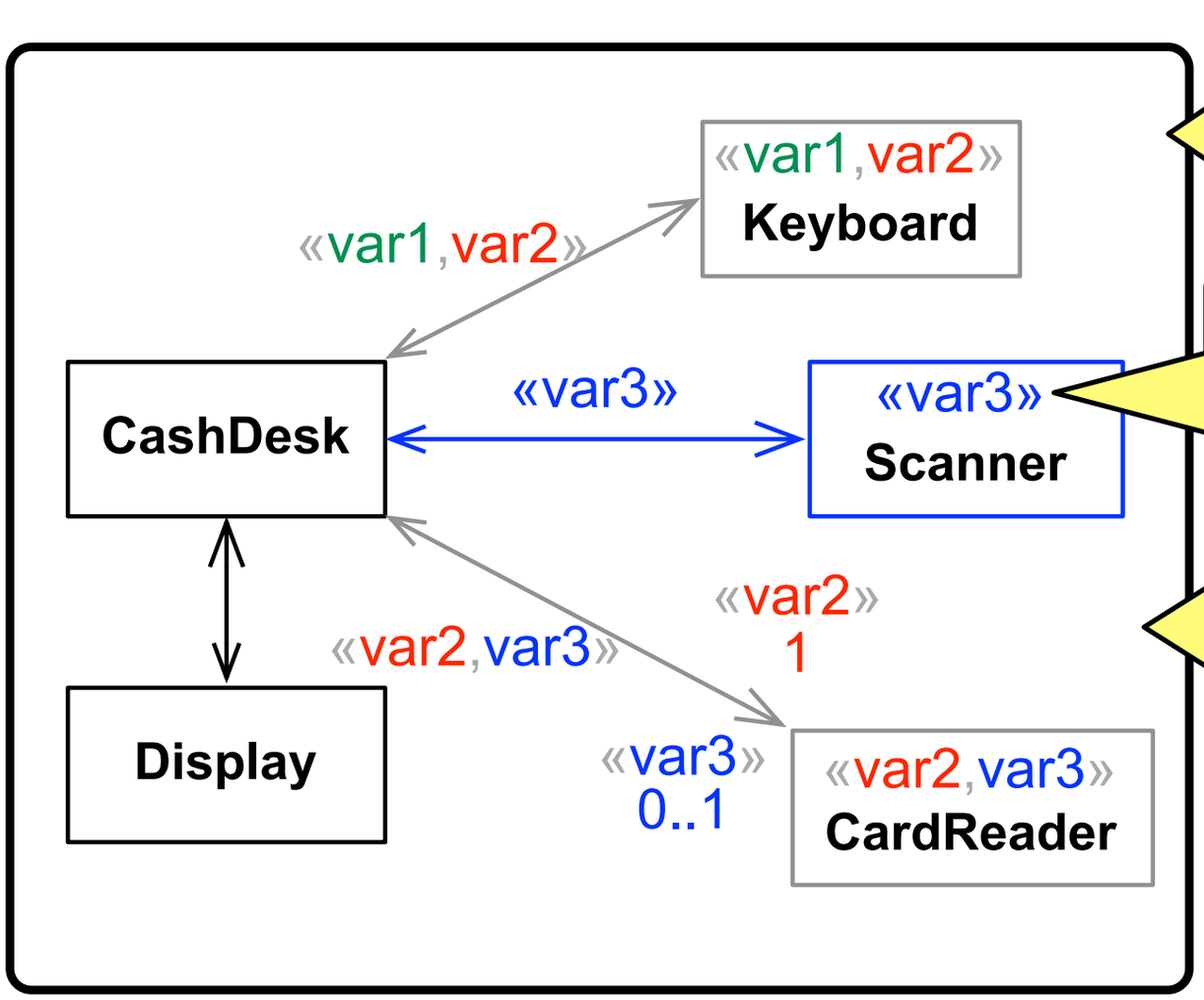

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variants of the family are generated by:
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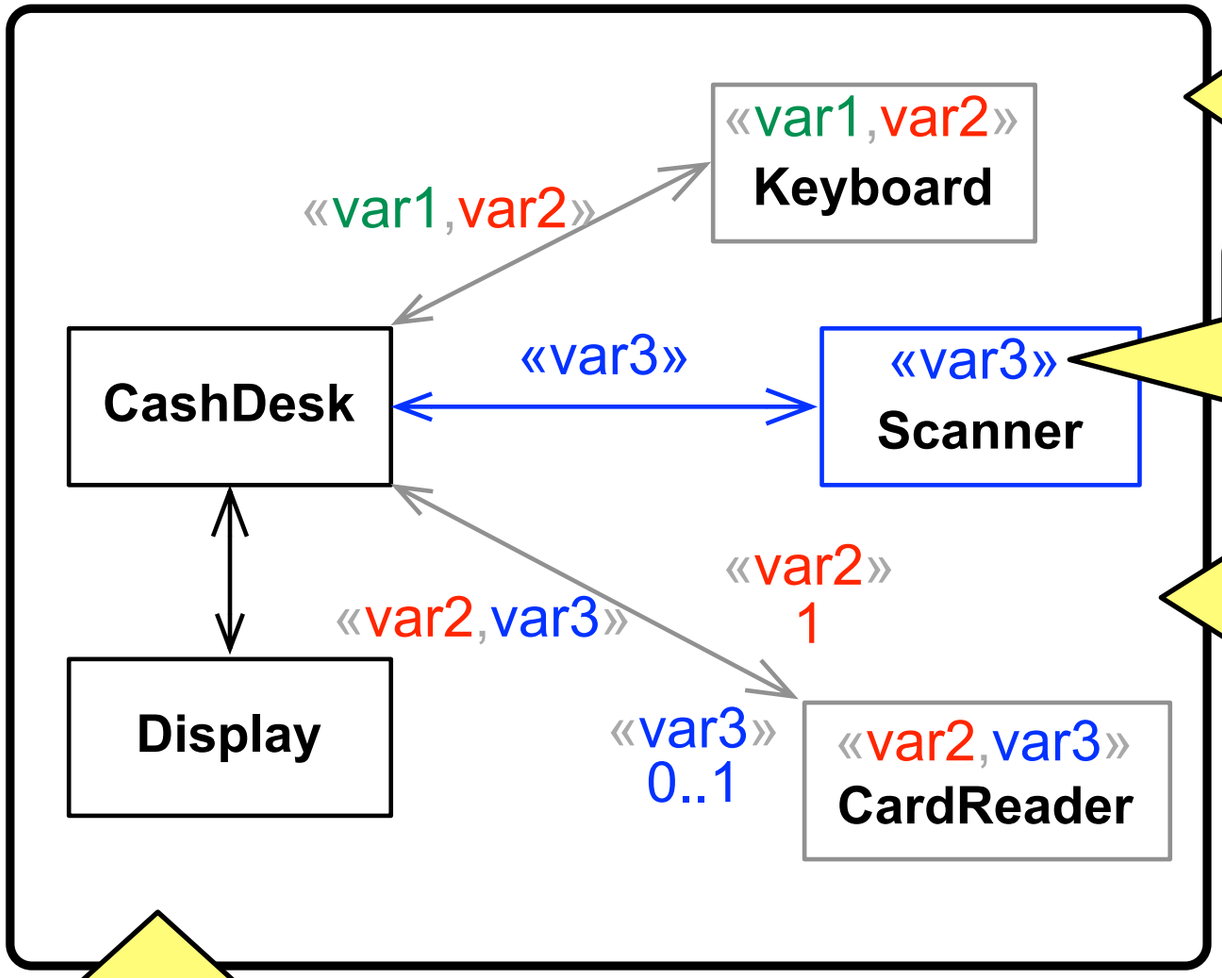

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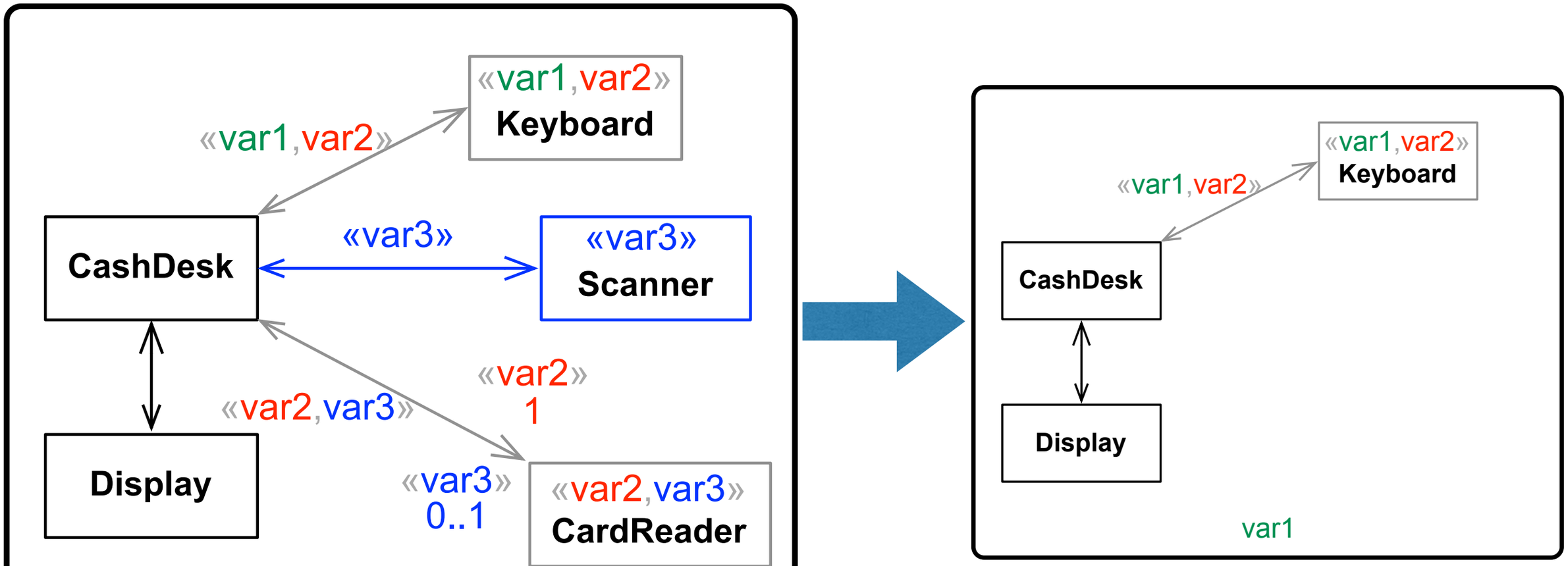

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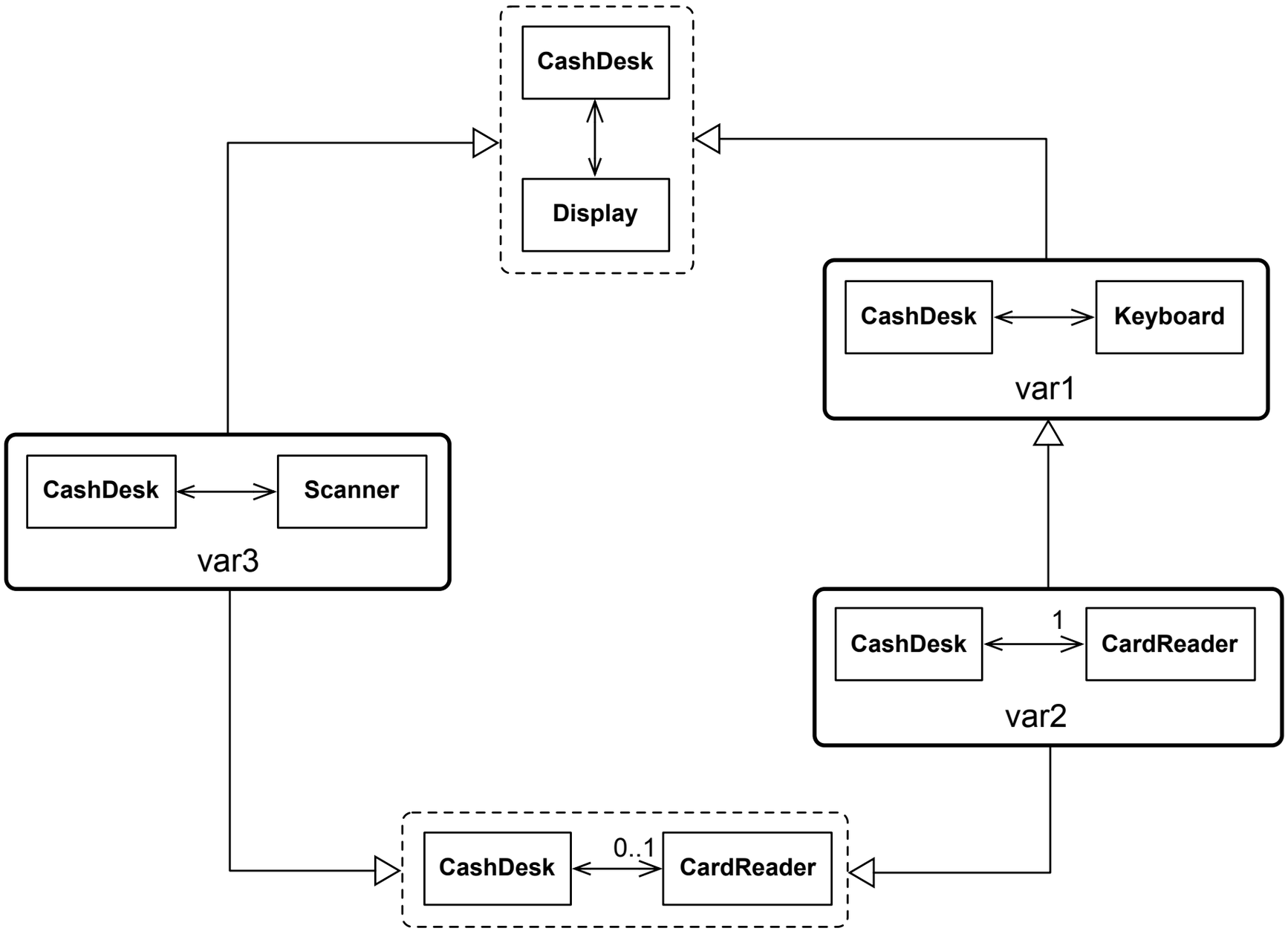
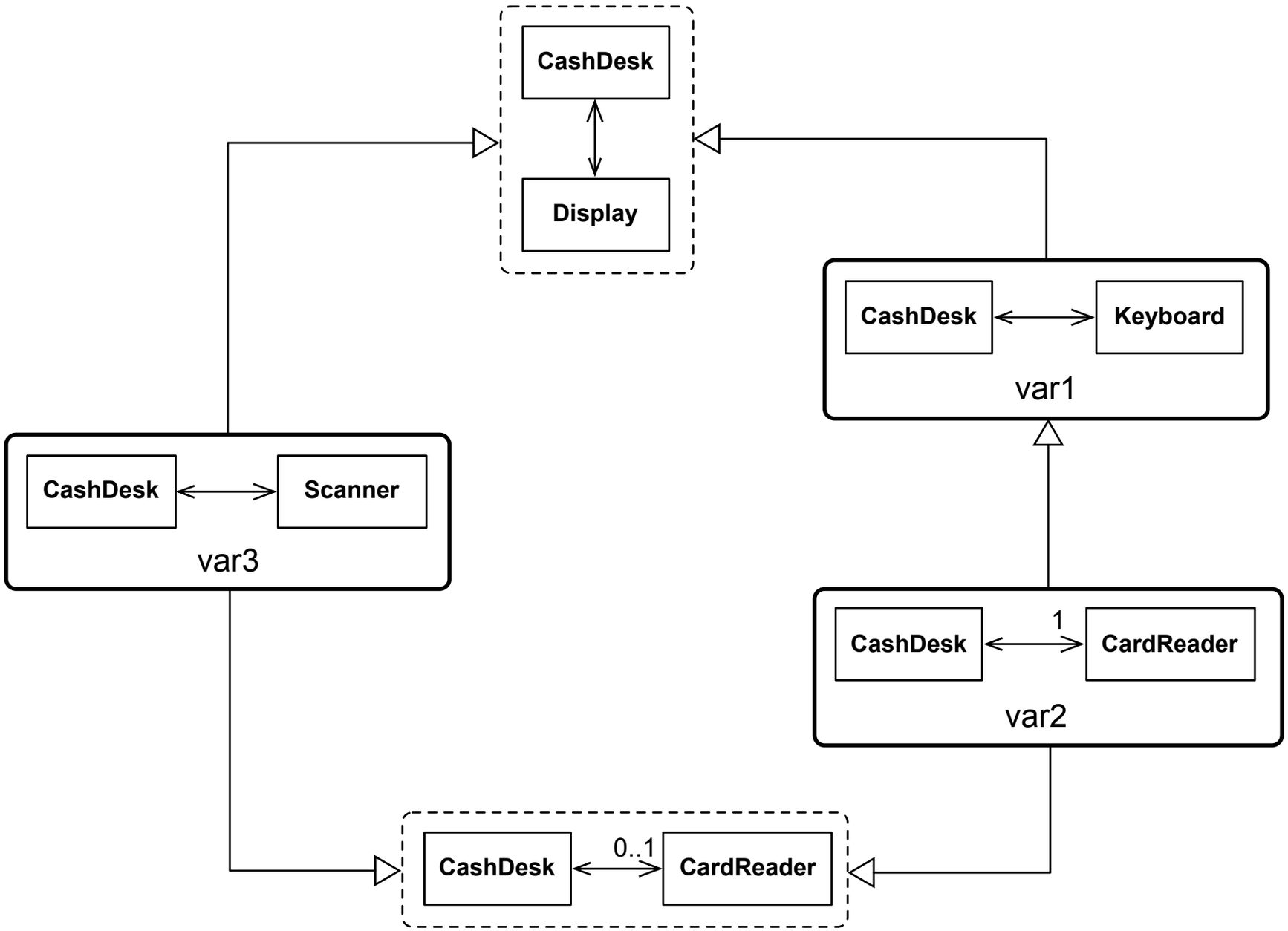

CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
CashDesk
1
CardReader
var2
CashDesk
0..1
CardReader

A **compositional** mechanism allows the artefacts to be split into reusable fragments that can be composed flexibly.



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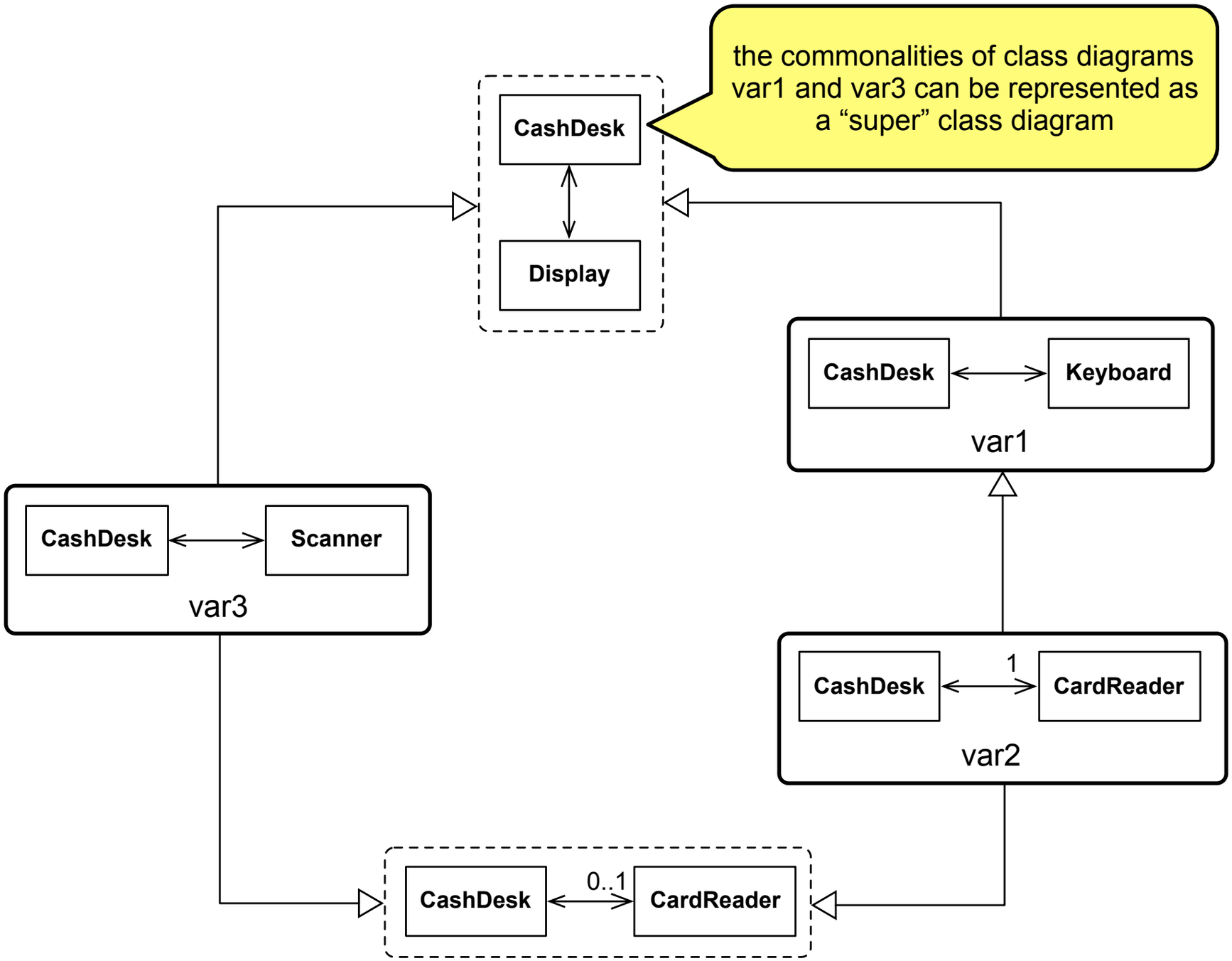

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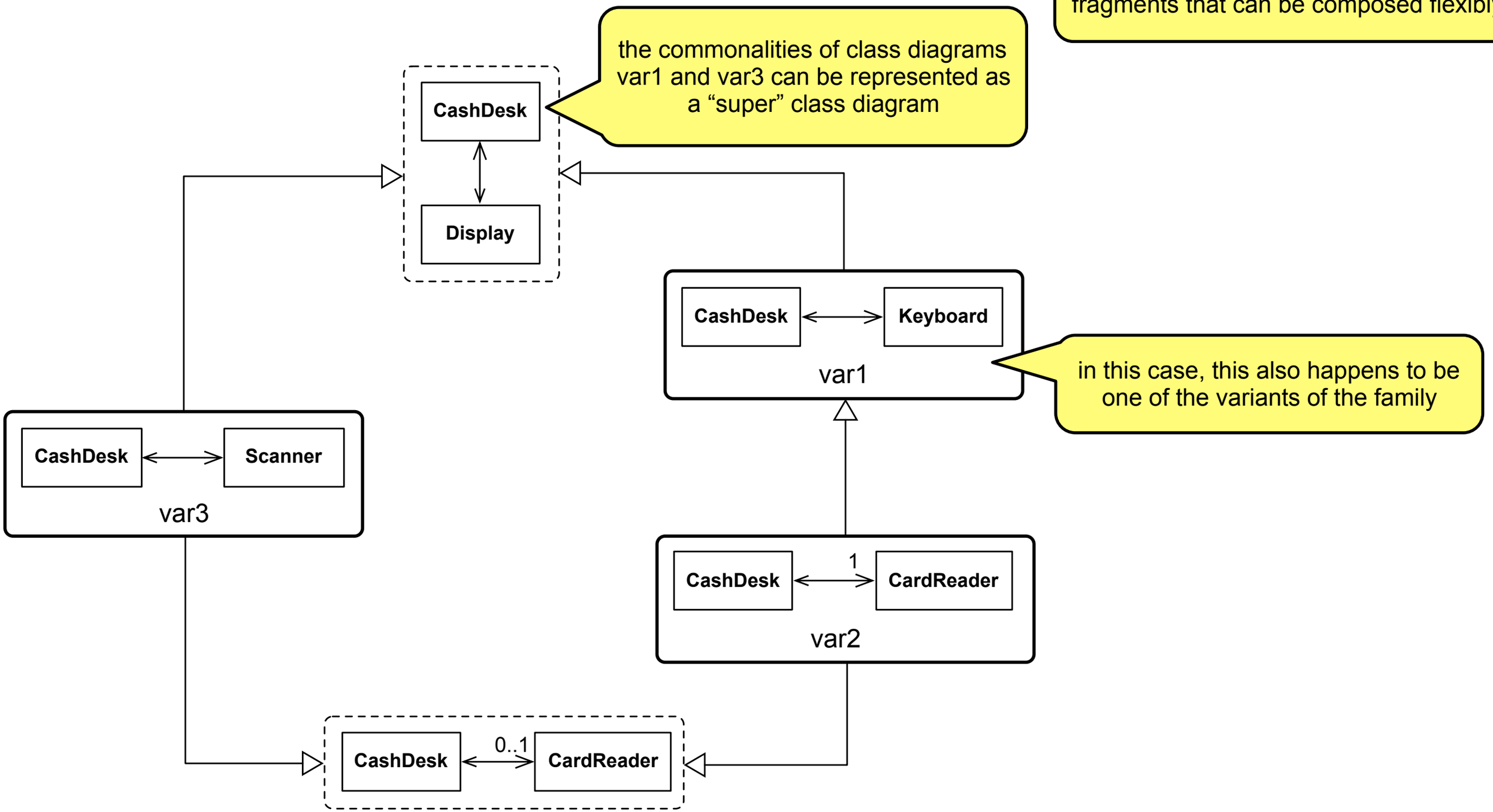

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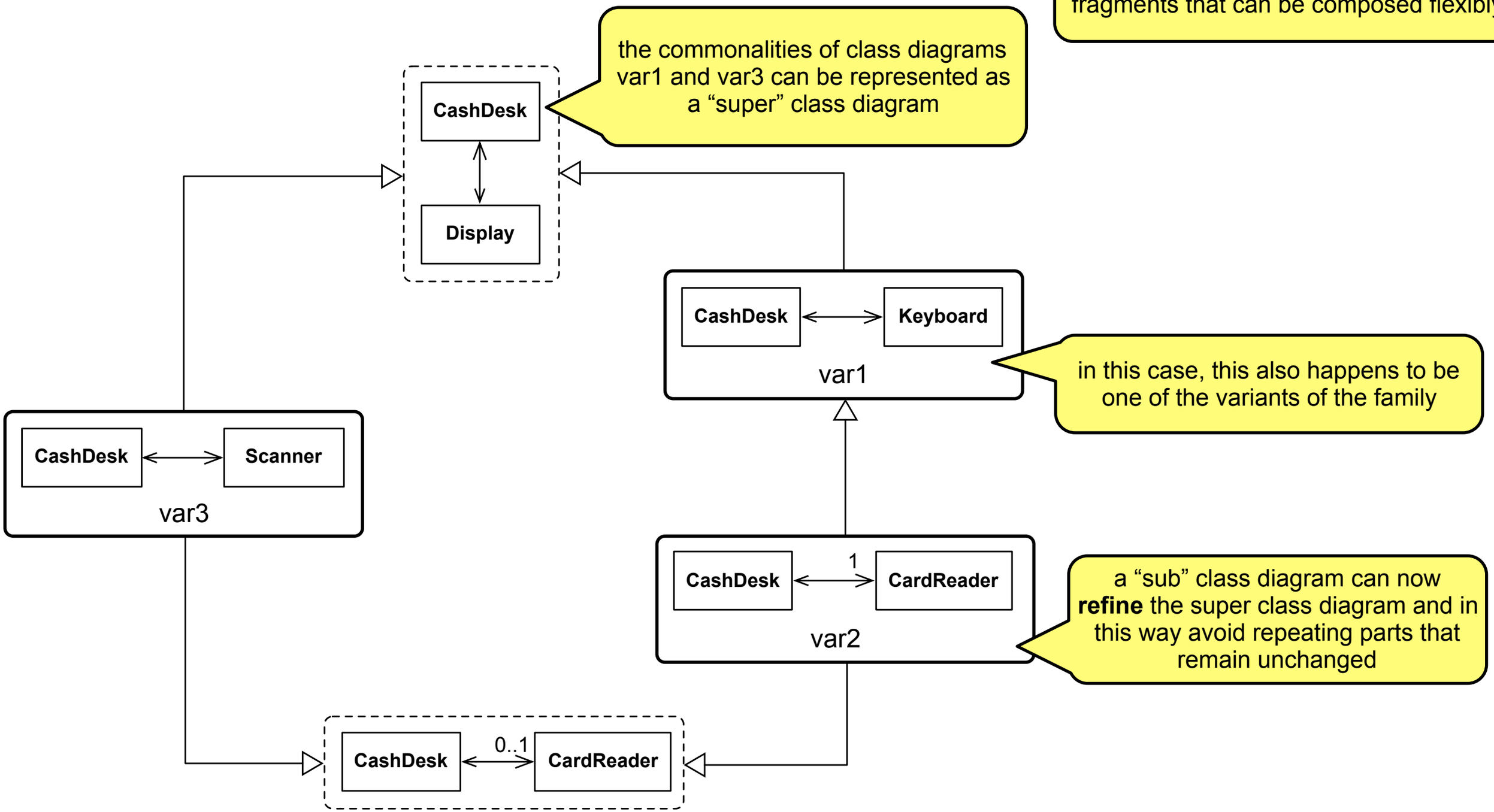

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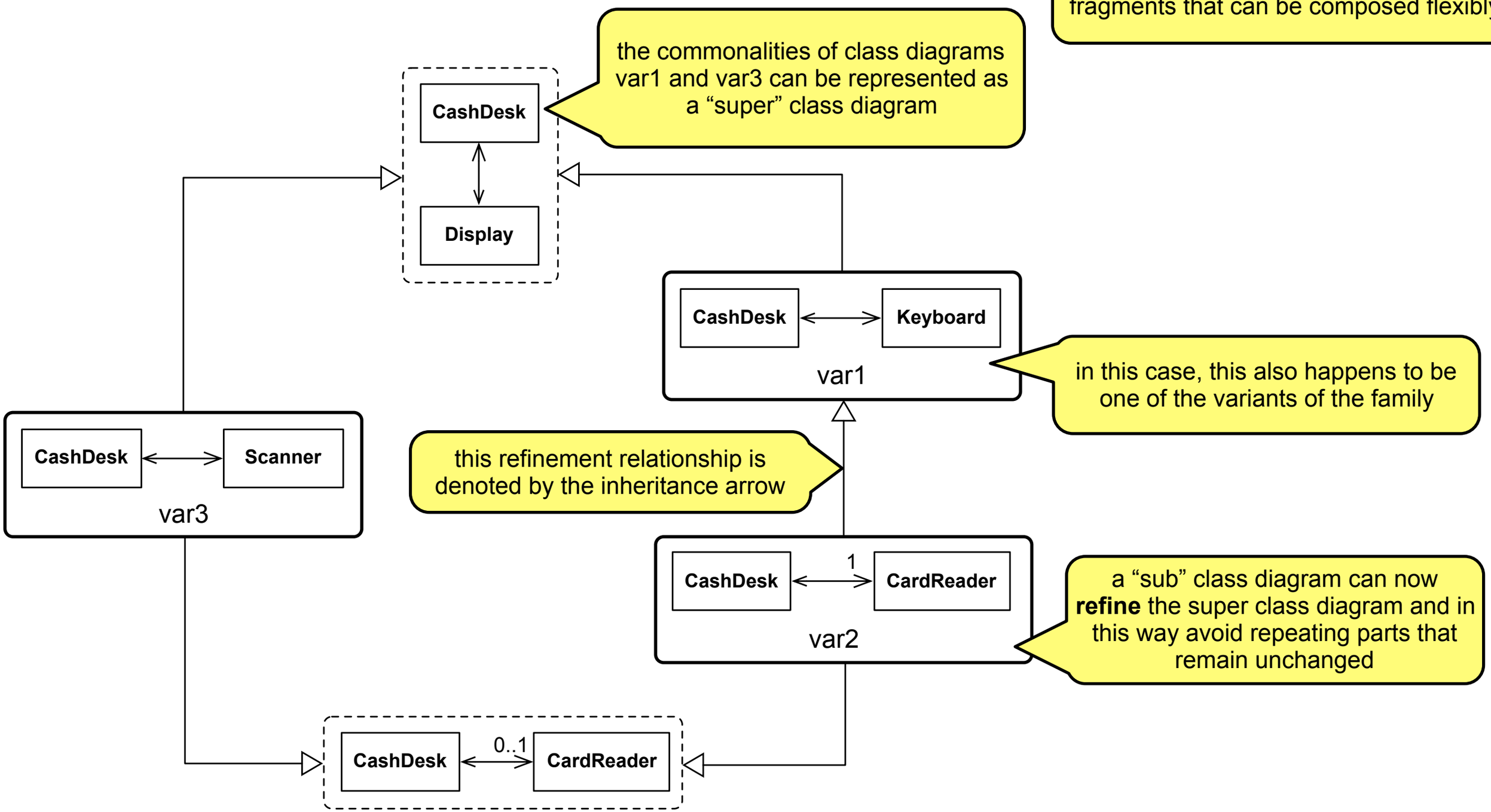
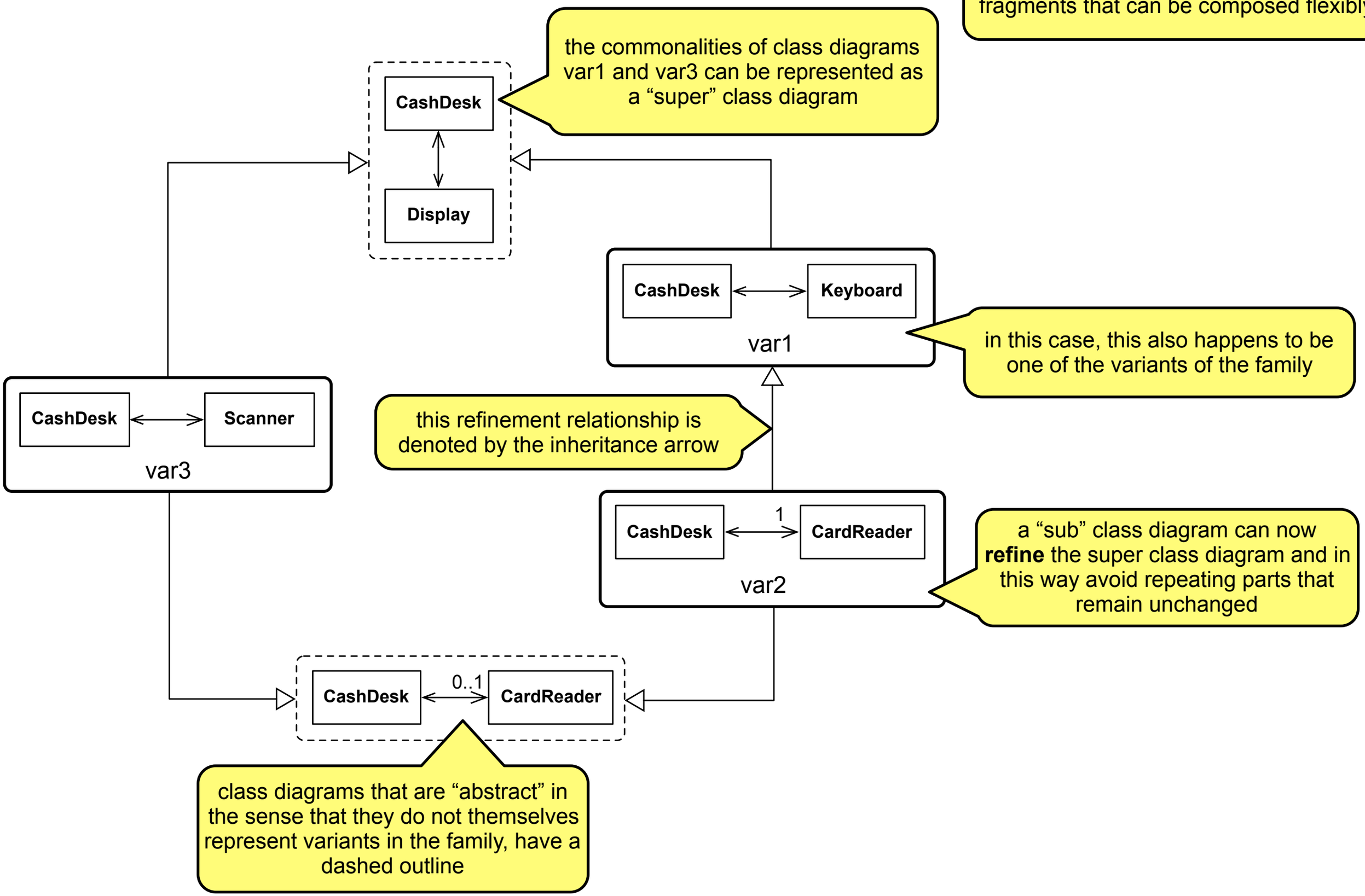
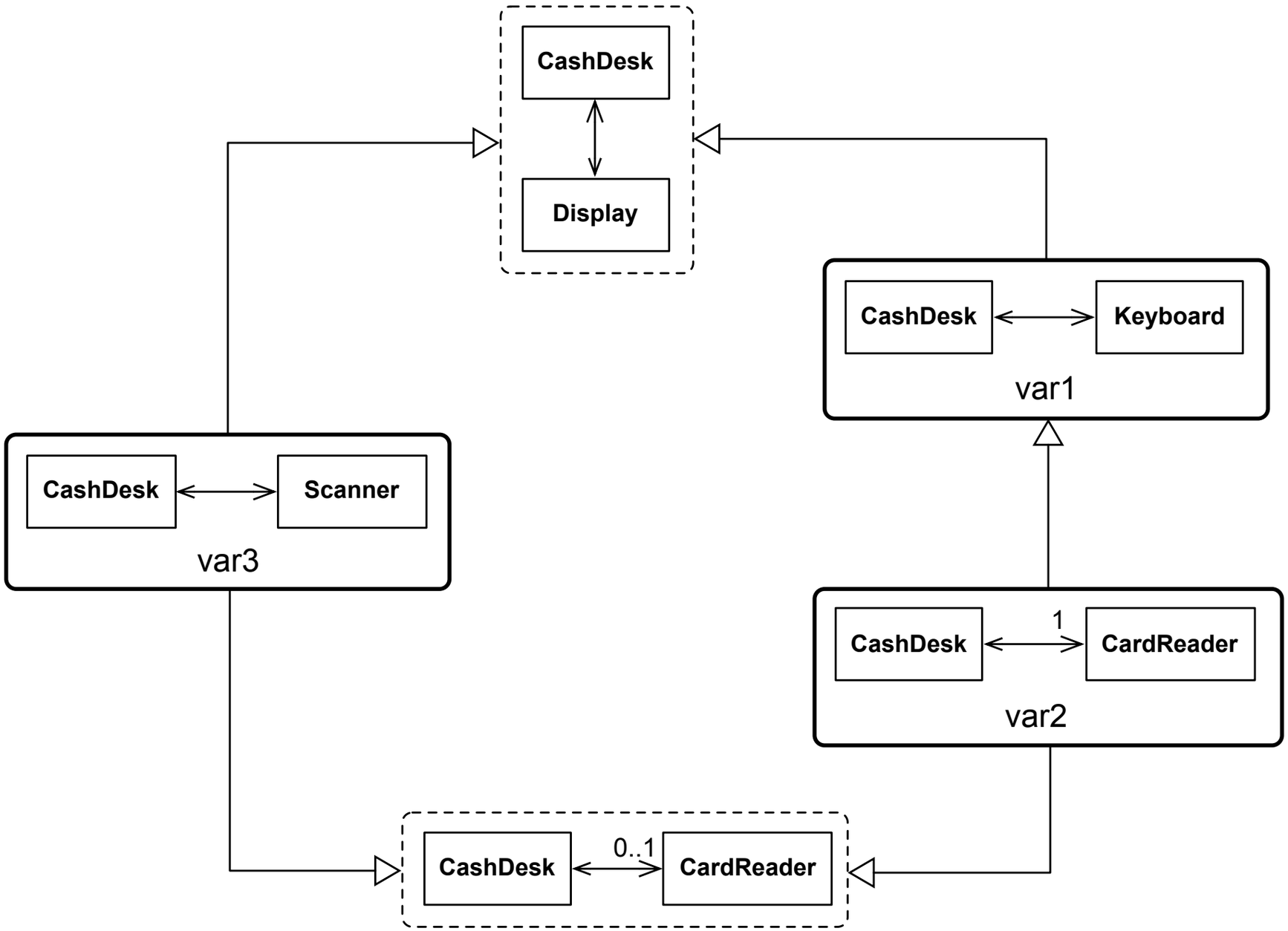
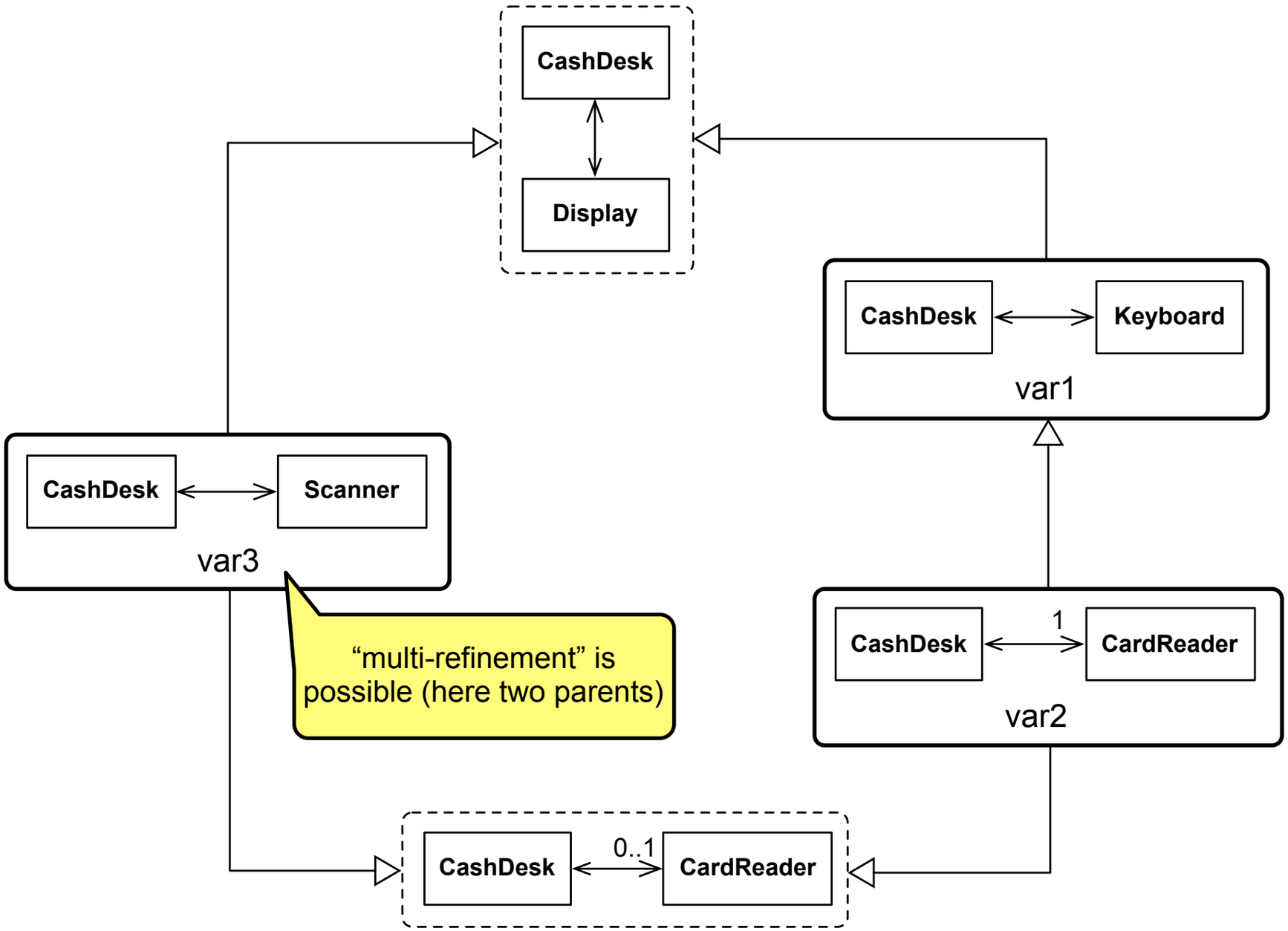
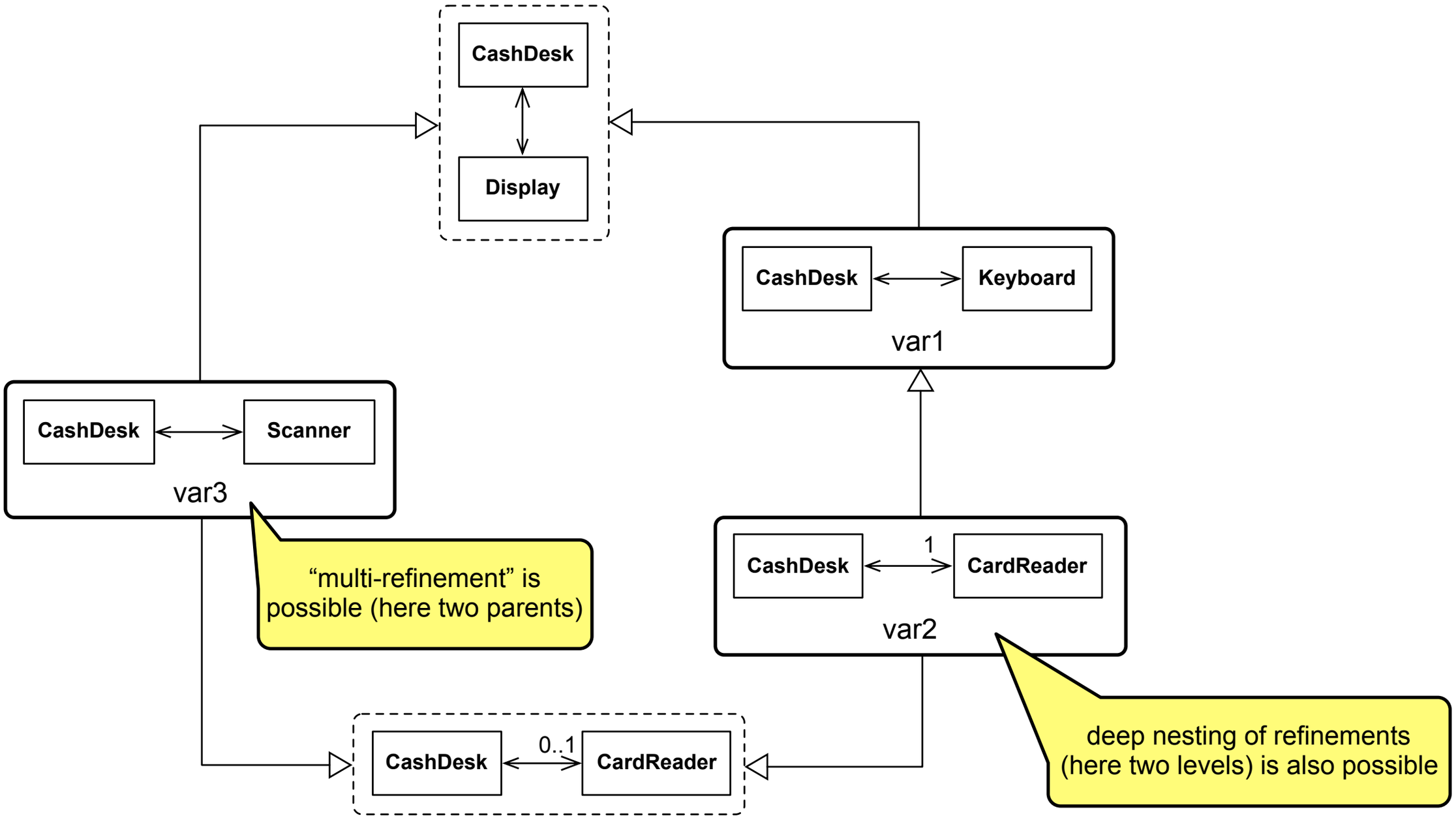


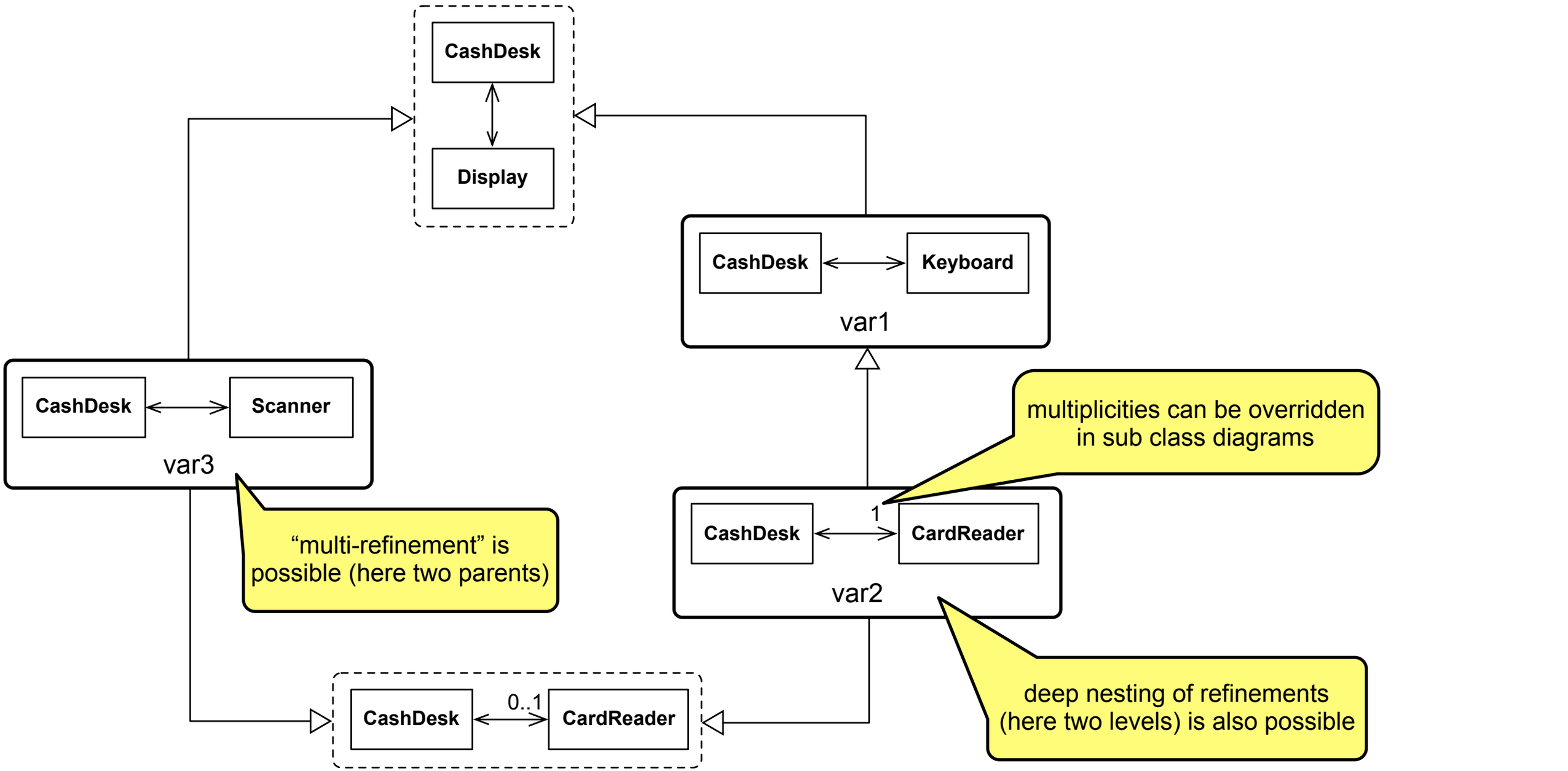
A **compositional** mechanism allows the artefacts to be split into reusable fragments that can be composed flexibly.

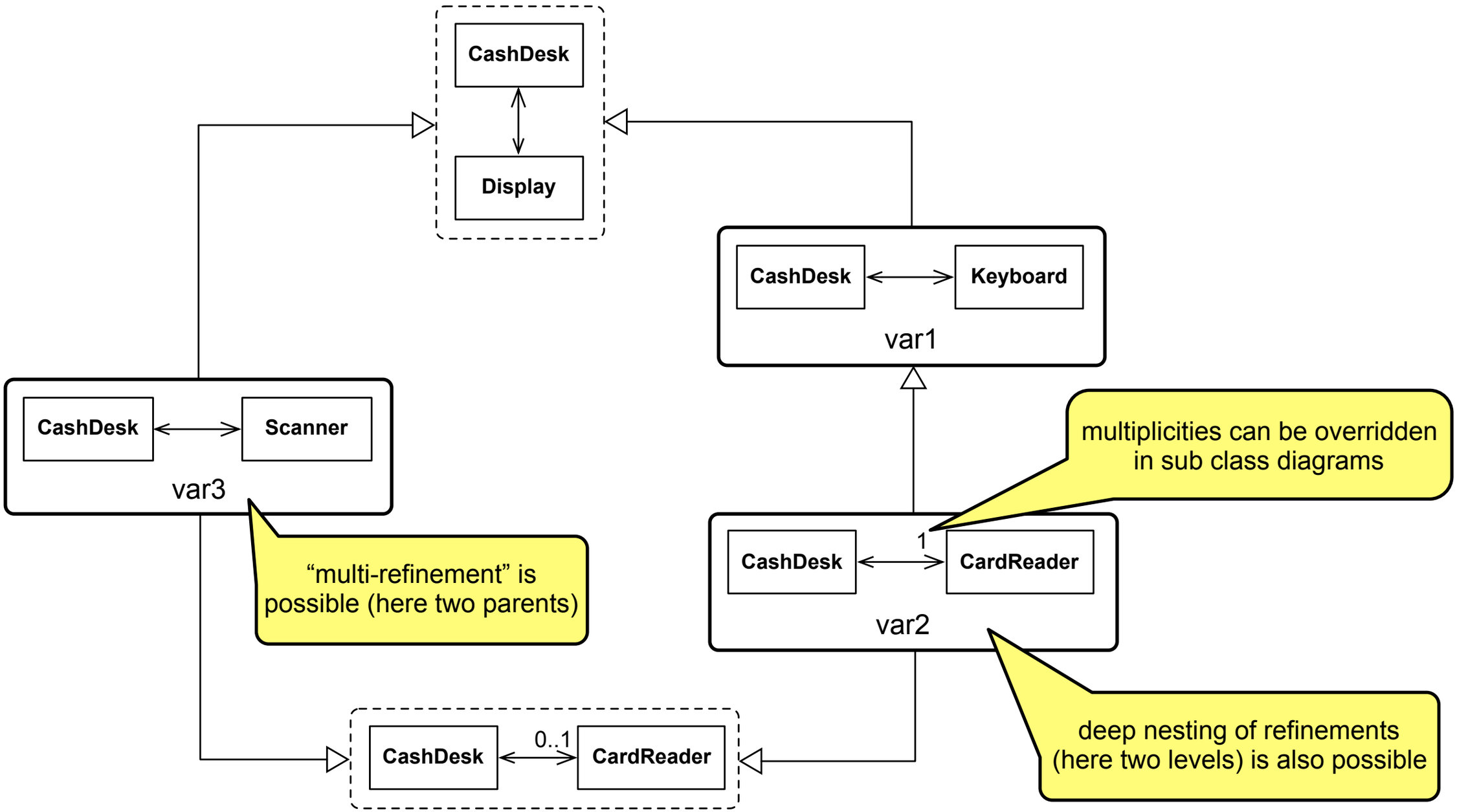



CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
CashDesk
1
CardReader
var2
CashDesk
0..1
CardReader

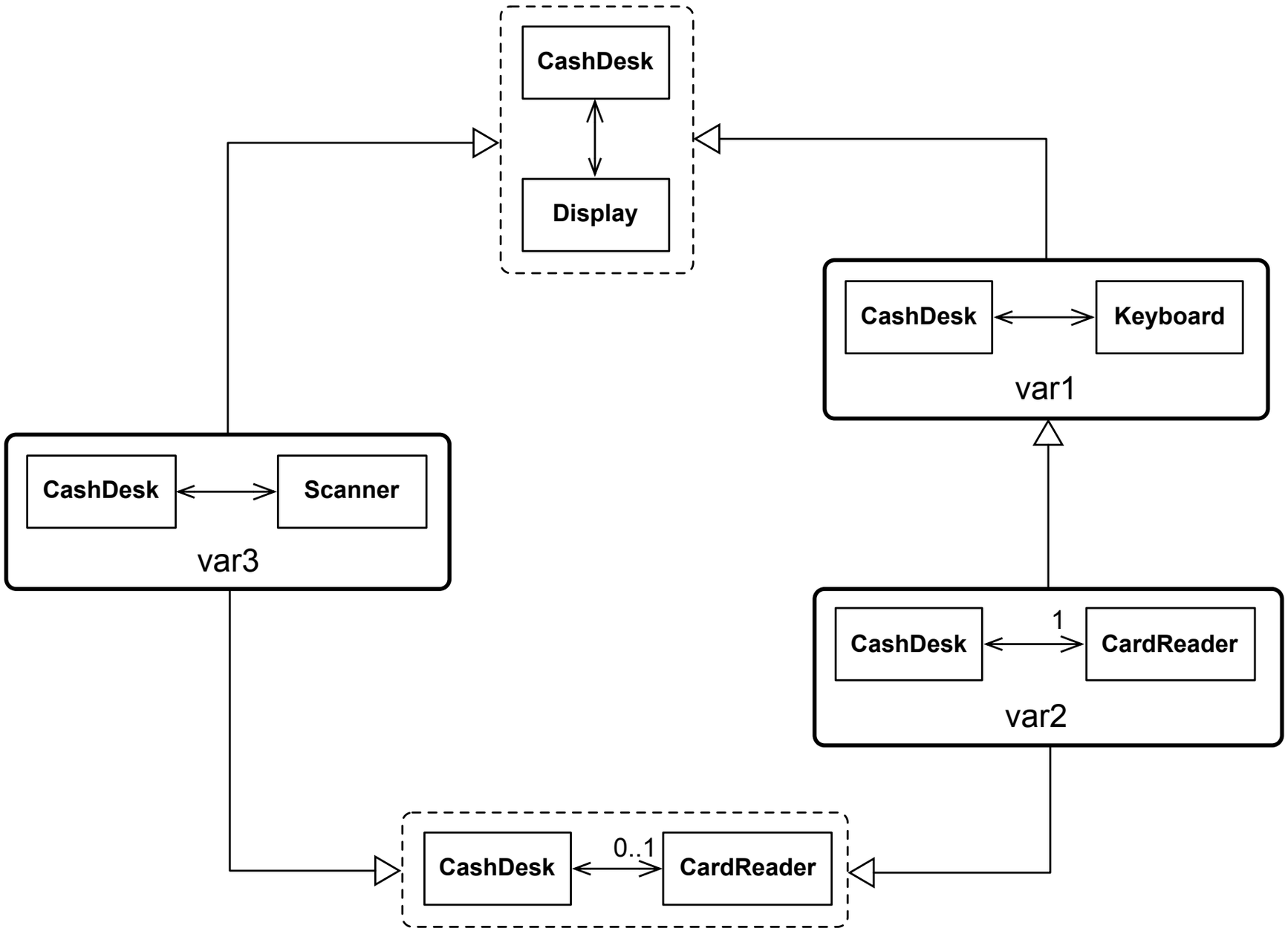

CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
“multi-refinement” is possible (here two parents)
CashDesk
1
CardReader
var2
CashDesk
0..1
CardReader

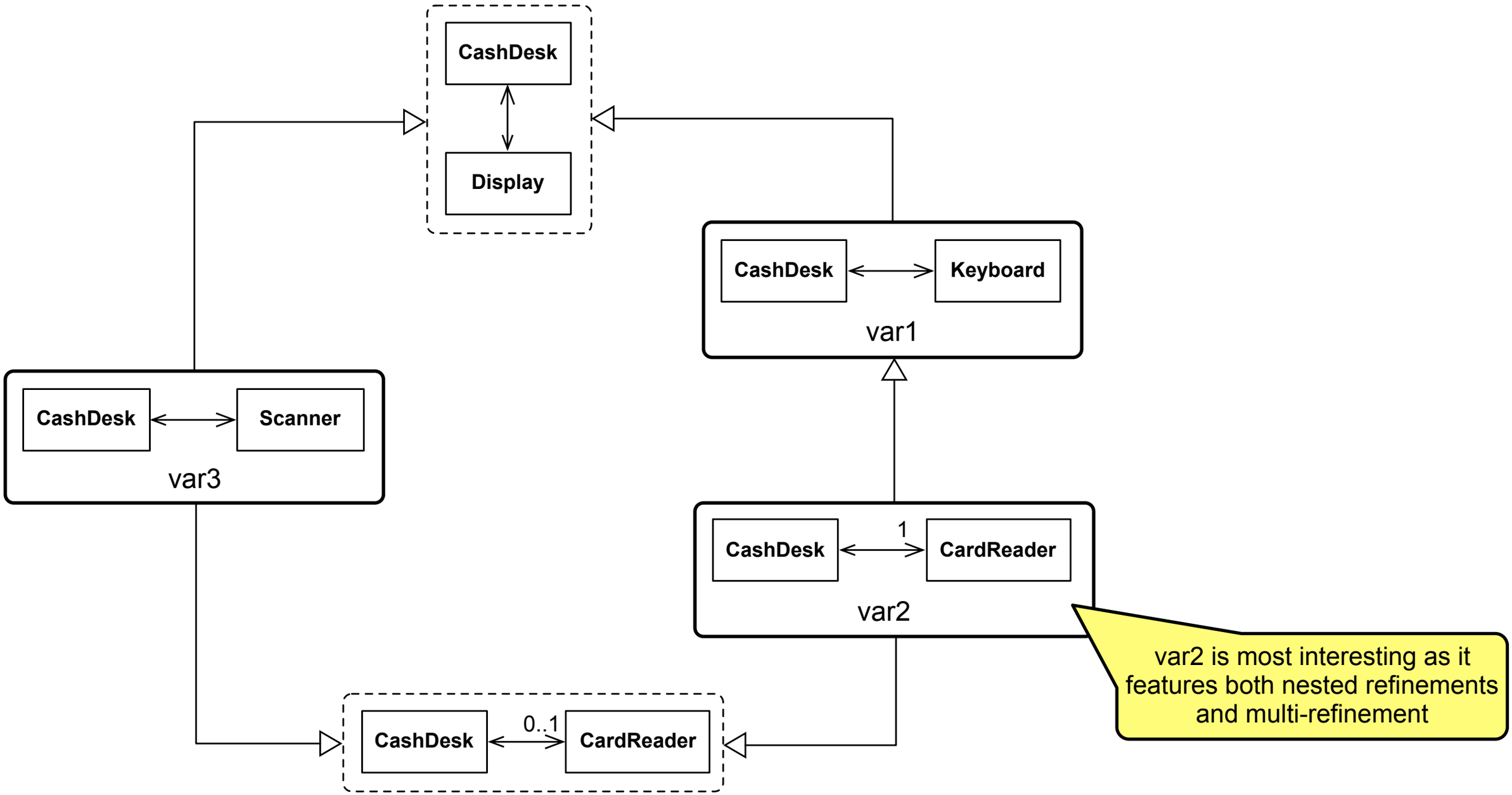

CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
“multi-refinement” is possible (here two parents)
CashDesk
1
CardReader
var2
CashDesk
0..1
CardReader
deep nesting of refinements (here two levels) is also possible

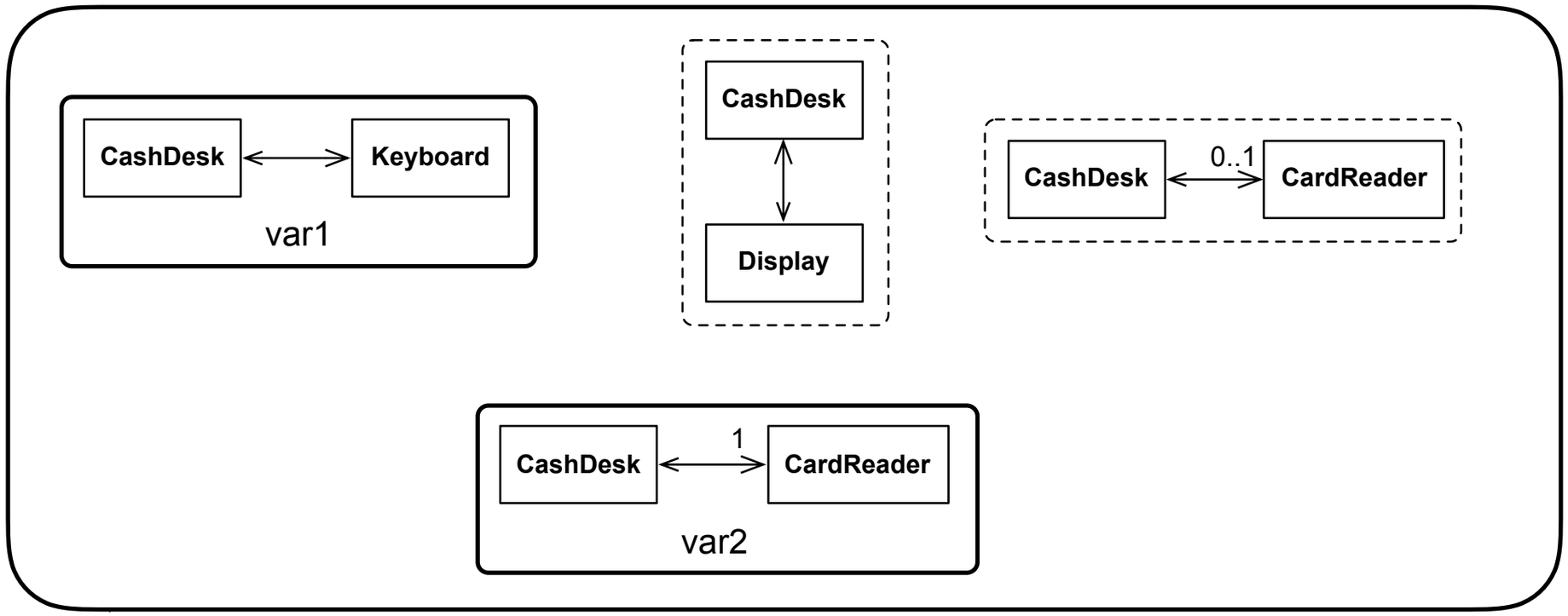

CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
multiplicities can be overridden
in sub class diagrams
“multi-refinement” is
possible (here two parents)
CashDesk
1
CardReader
var2
deep nesting of refinements
(here two levels) is also possible
CashDesk
0..1
CardReader



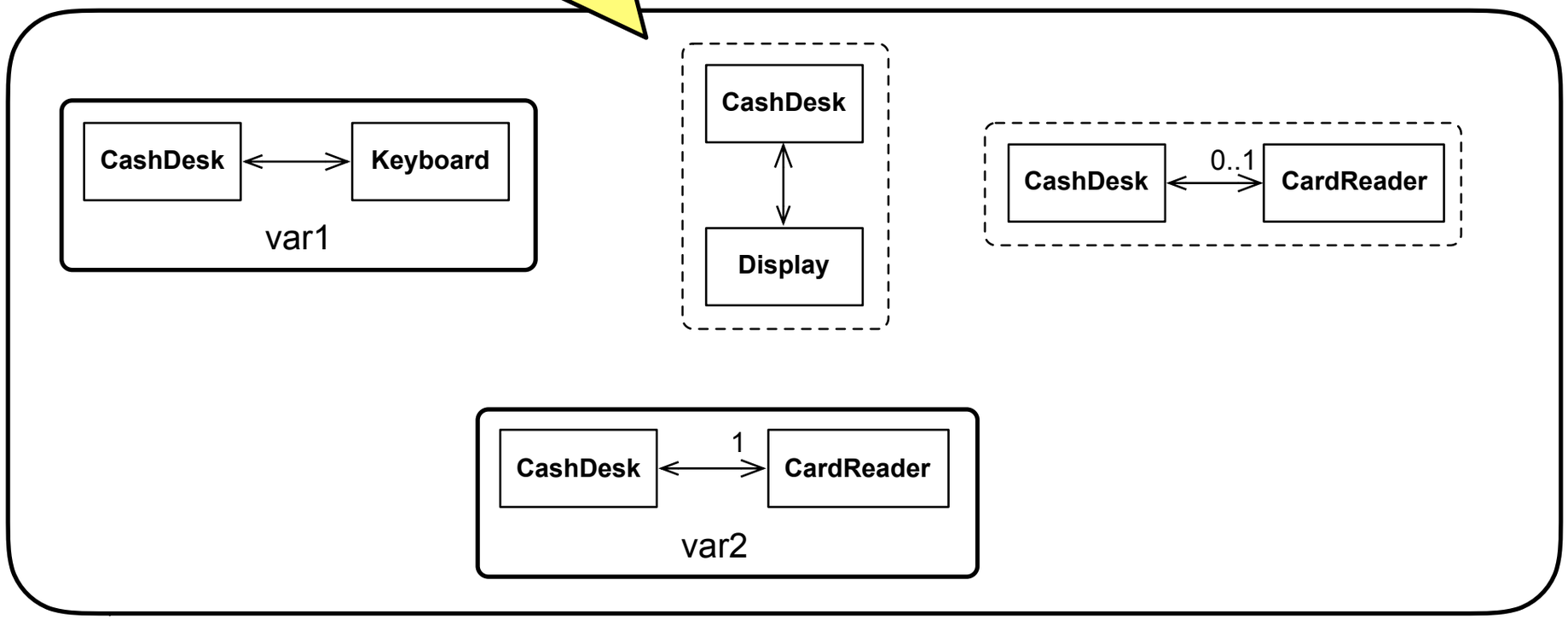
Let’s now see how to derive “flat” variants from such a refinement hierarchy.


CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
CashDesk
1
CardReader
var2
CashDesk
0..1
CardReader

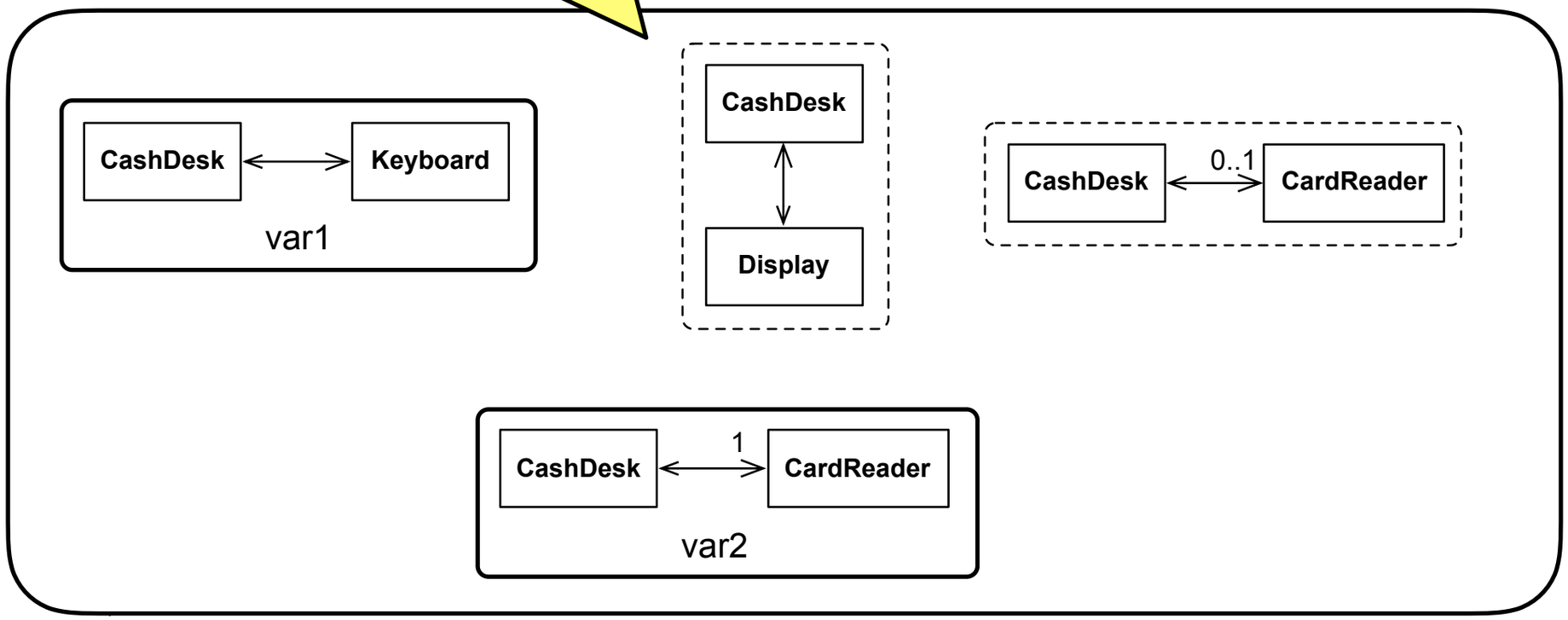

CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
CashDesk
1
CardReader
var2
var2 is most interesting as it features both nested refinements and multi-refinement
CashDesk
0..1
CardReader


CashDesk
Keyboard
var1
CashDesk
Display
CashDesk
0..1
CardReader
CashDesk
1
CardReader
var2

Step 1 (Union): Compute all transitive parents of the variant to be flattened and build a union of all these class diagrams together with the variant itself (here var2)



Step 1 (Union): Compute all transitive parents of the variant to be flattened and build a union of all these class diagrams together with the variant itself (here var2)



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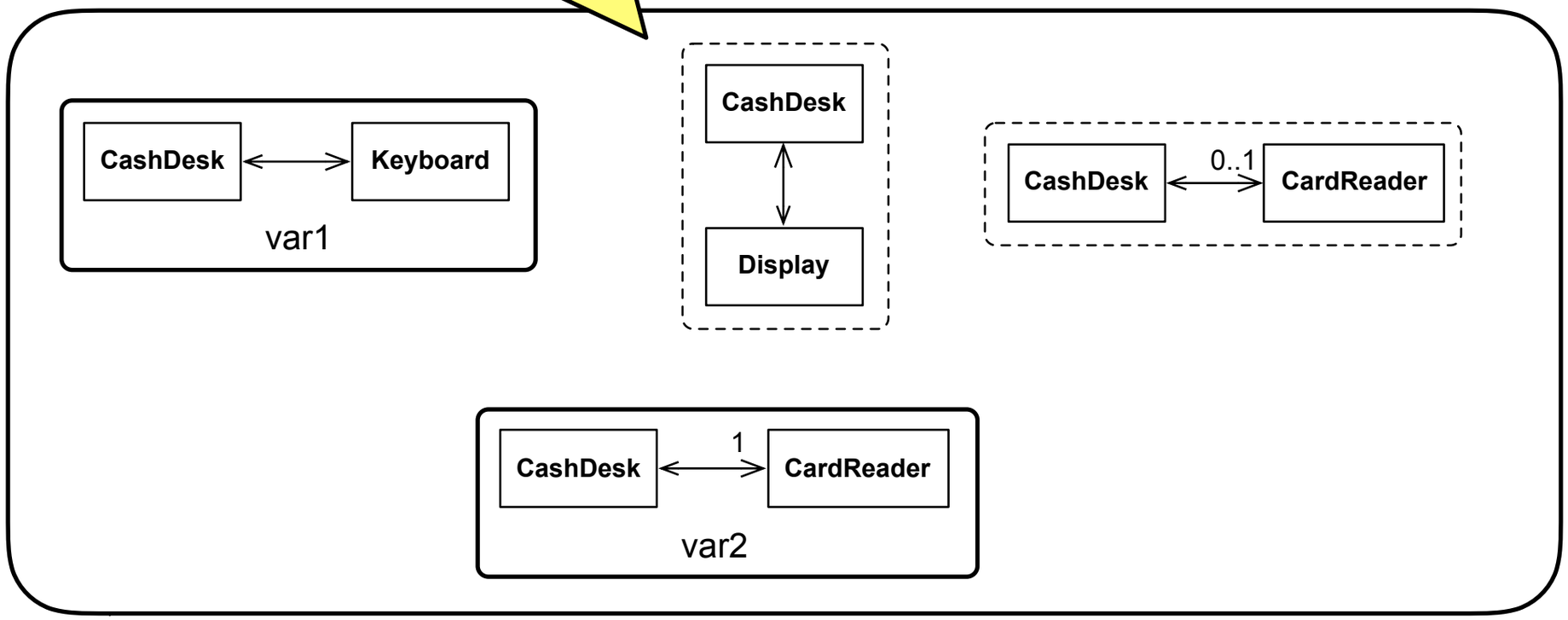

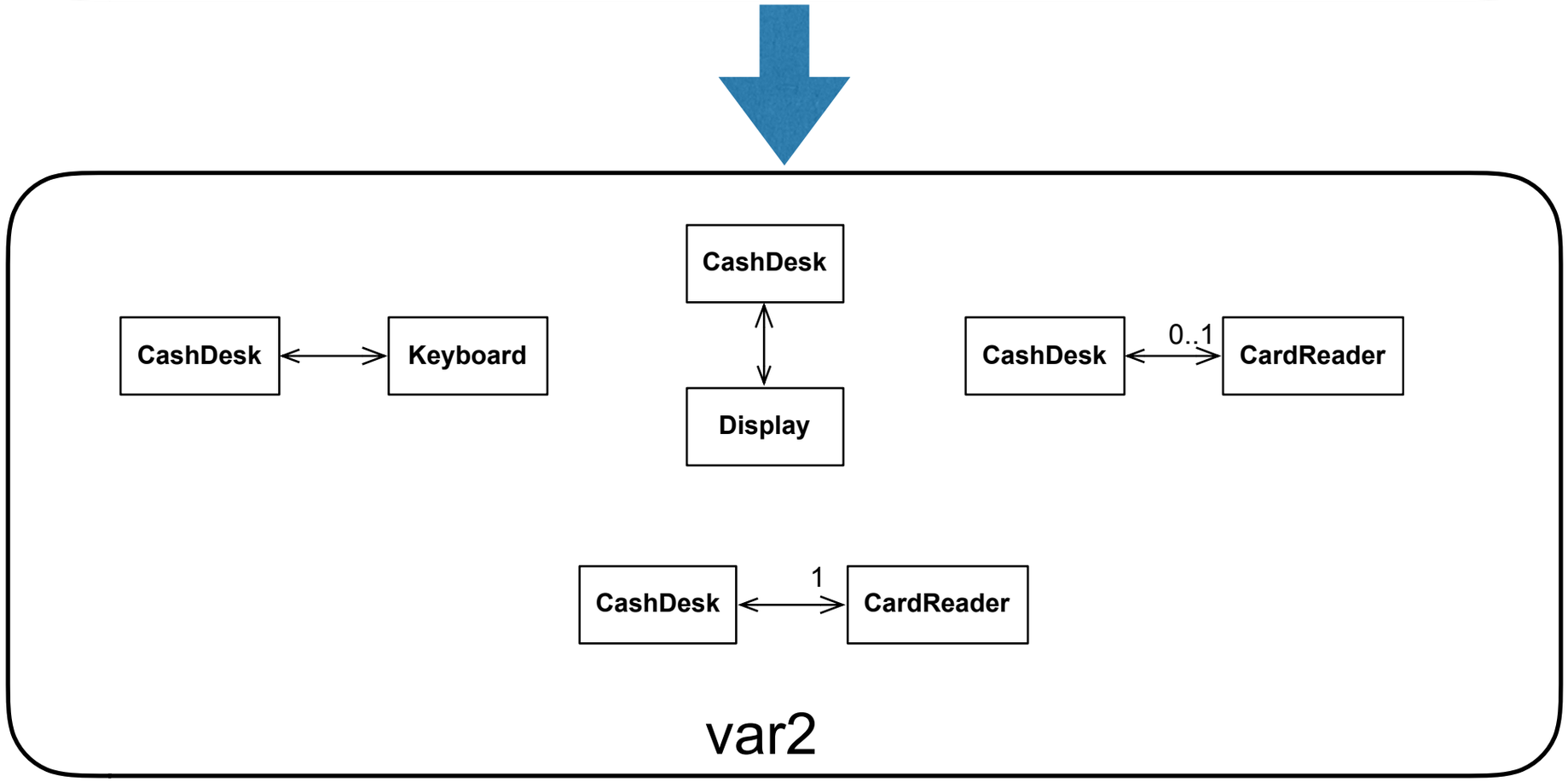

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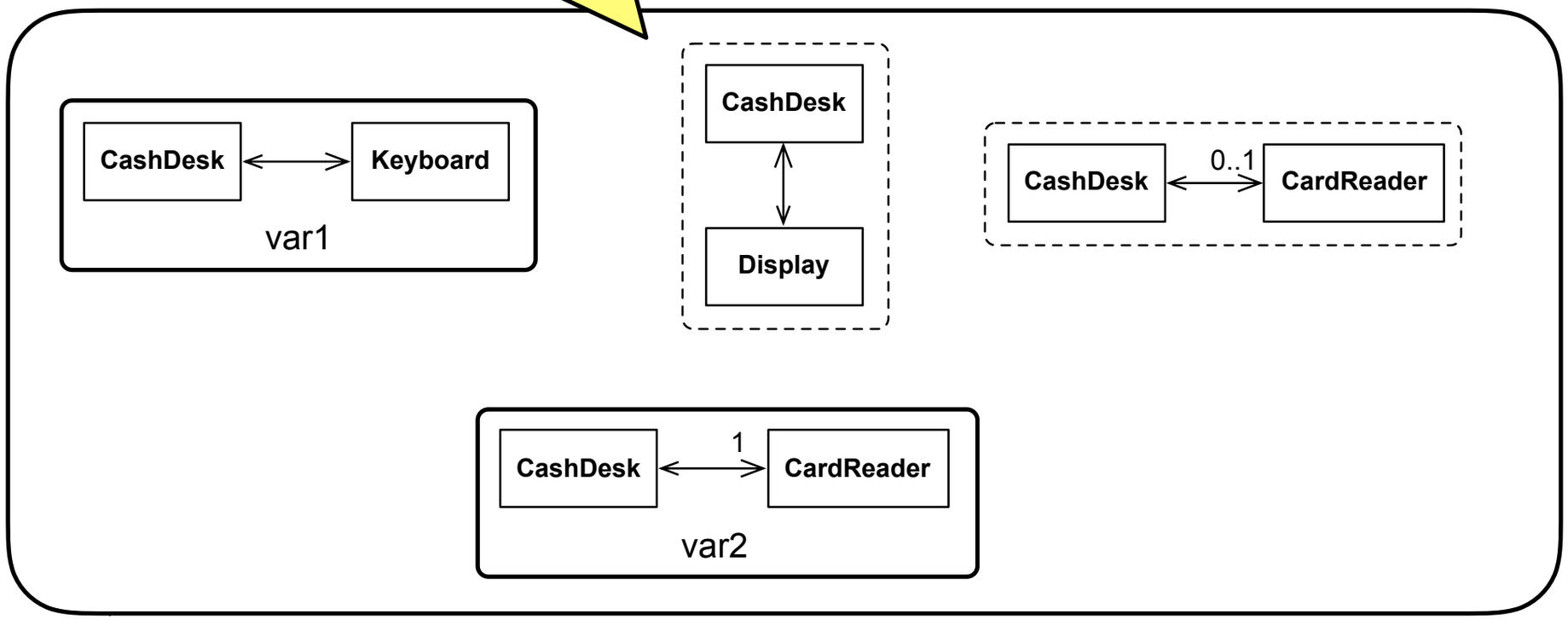
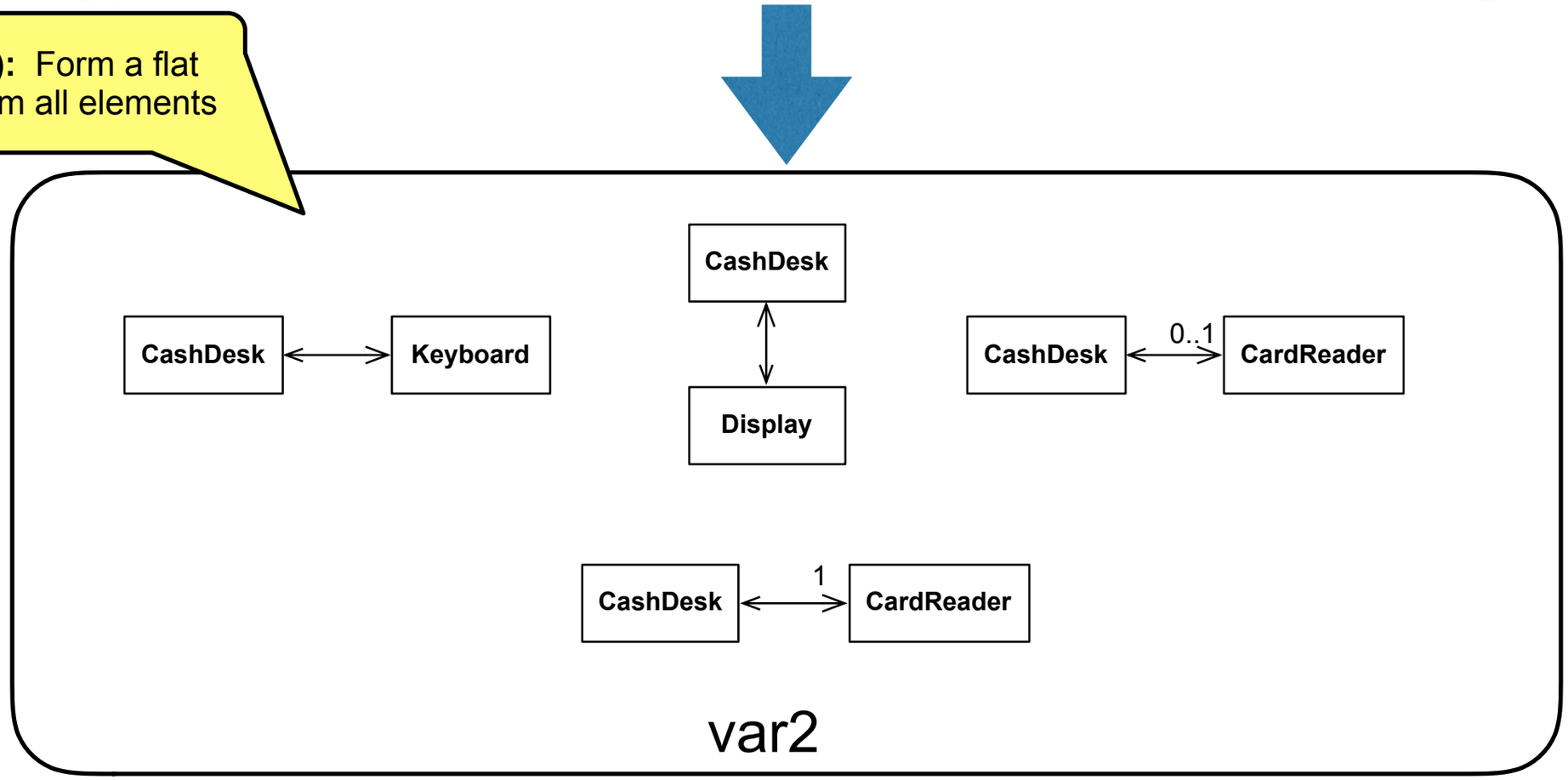
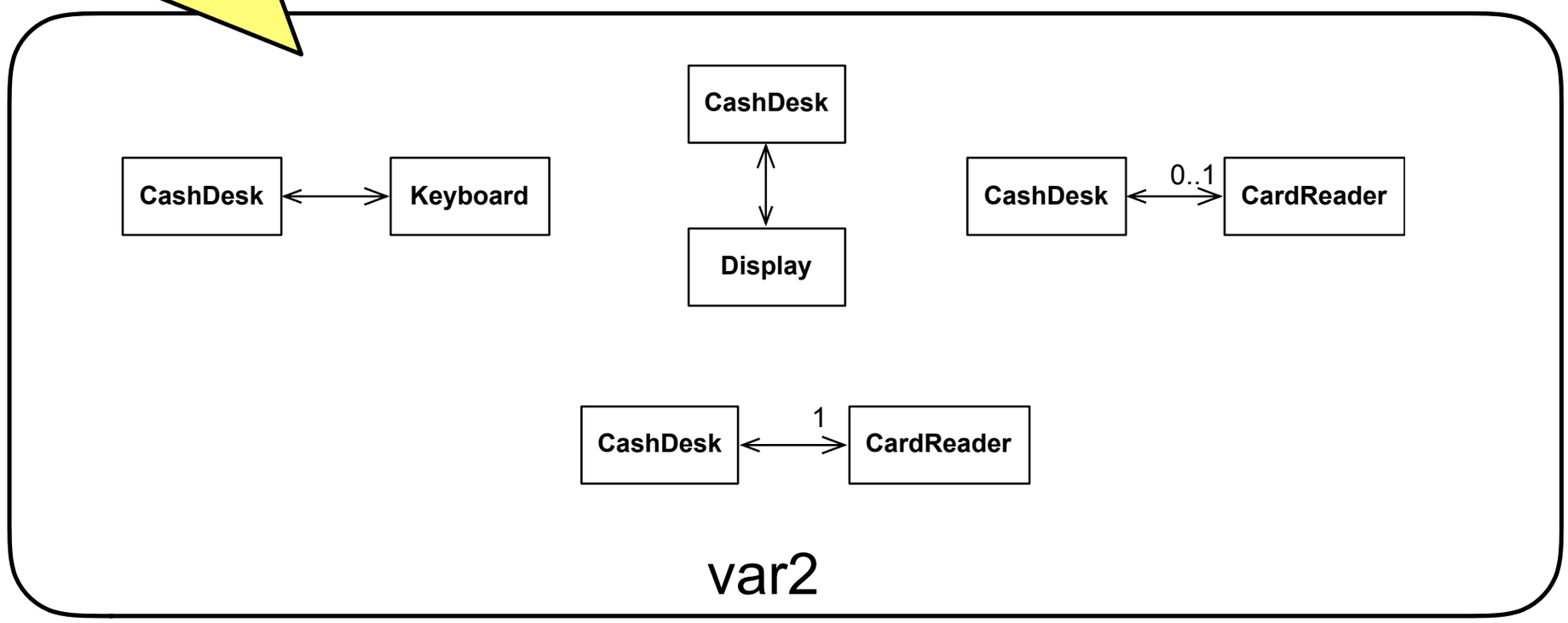


Step 2 (Flatten): Form a flat class diagram from all elements



Step 2 (Flatten): Form a flat class diagram from all elements



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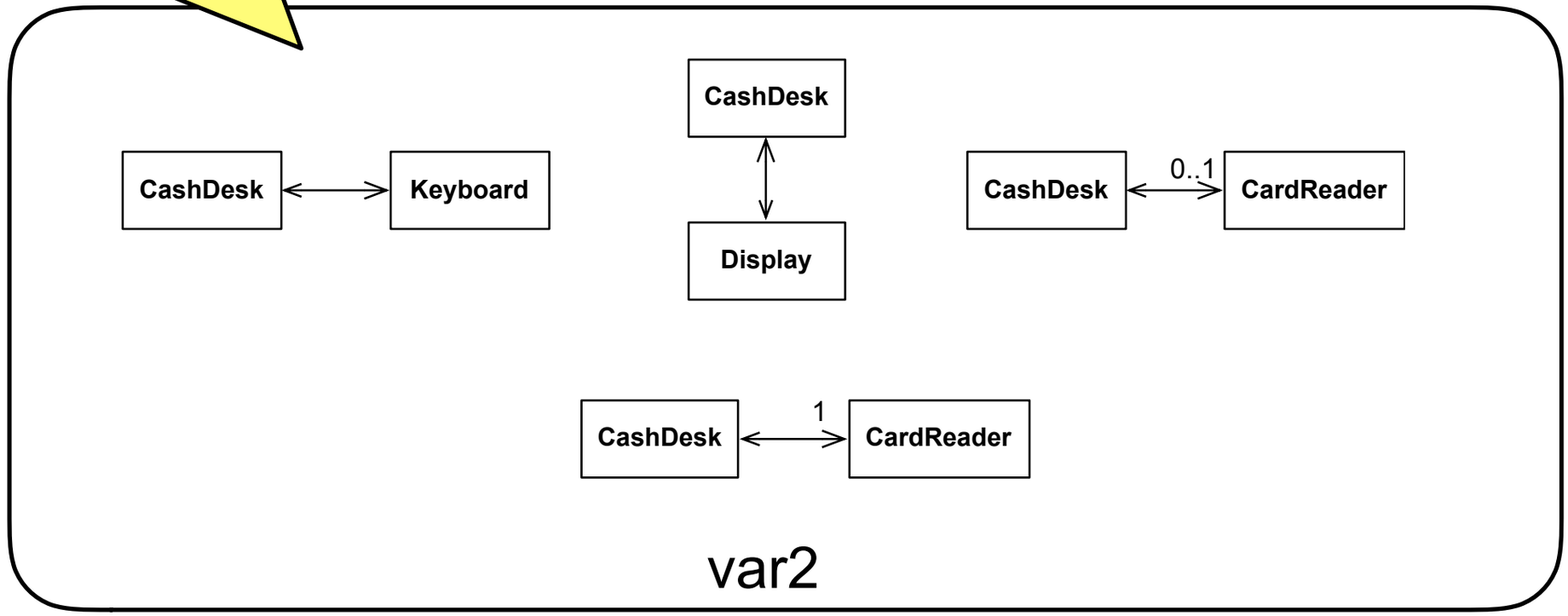
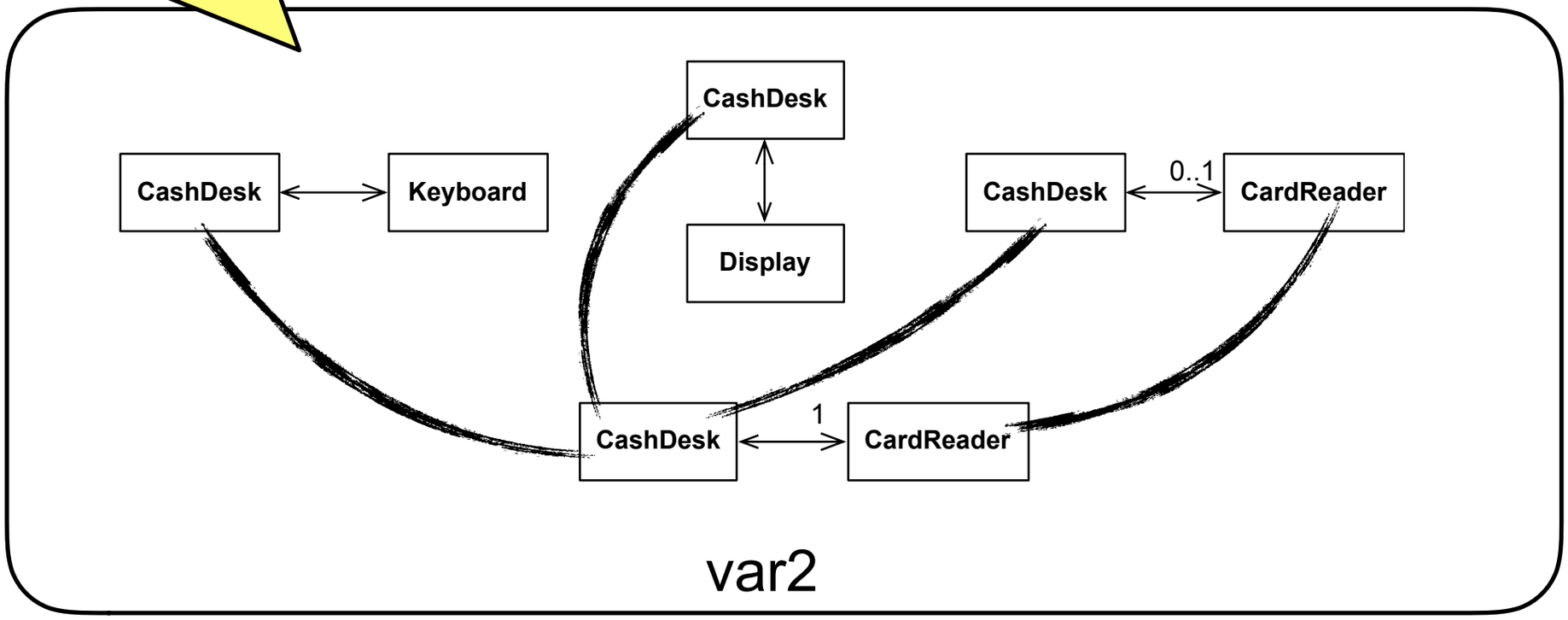
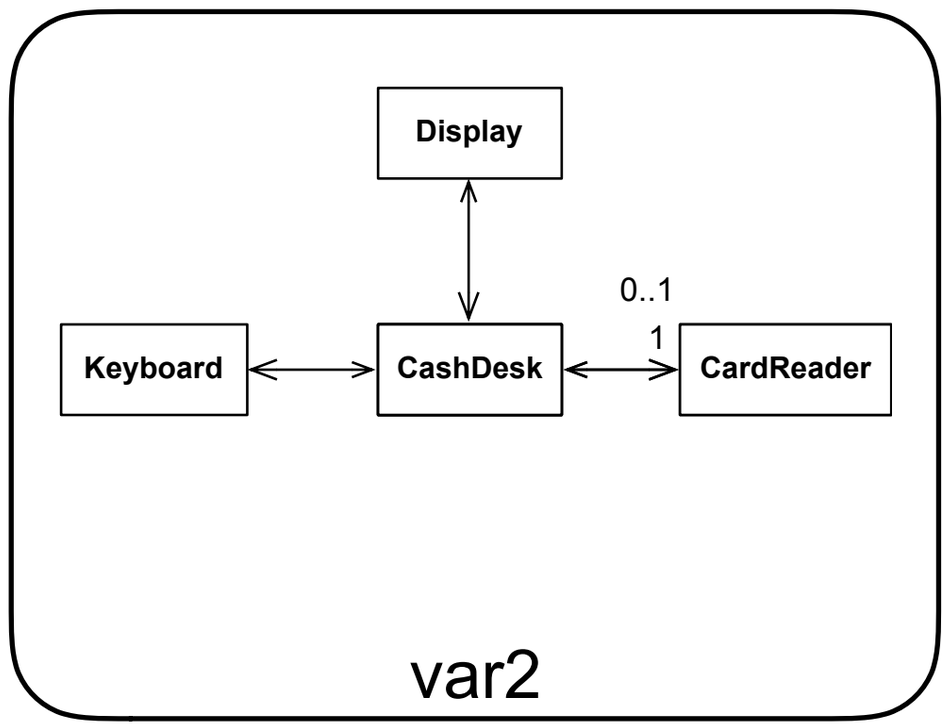
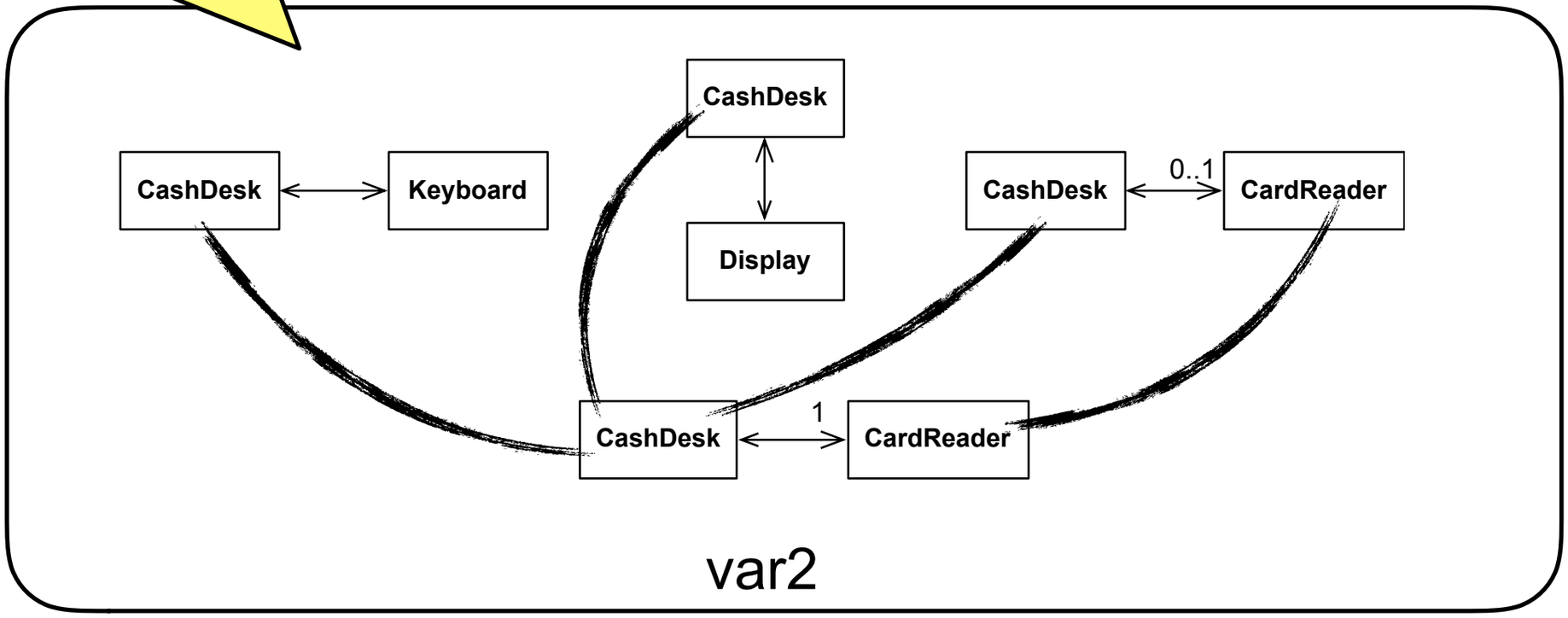


Step 2 (Flatten): Form a flat class diagram from all elements

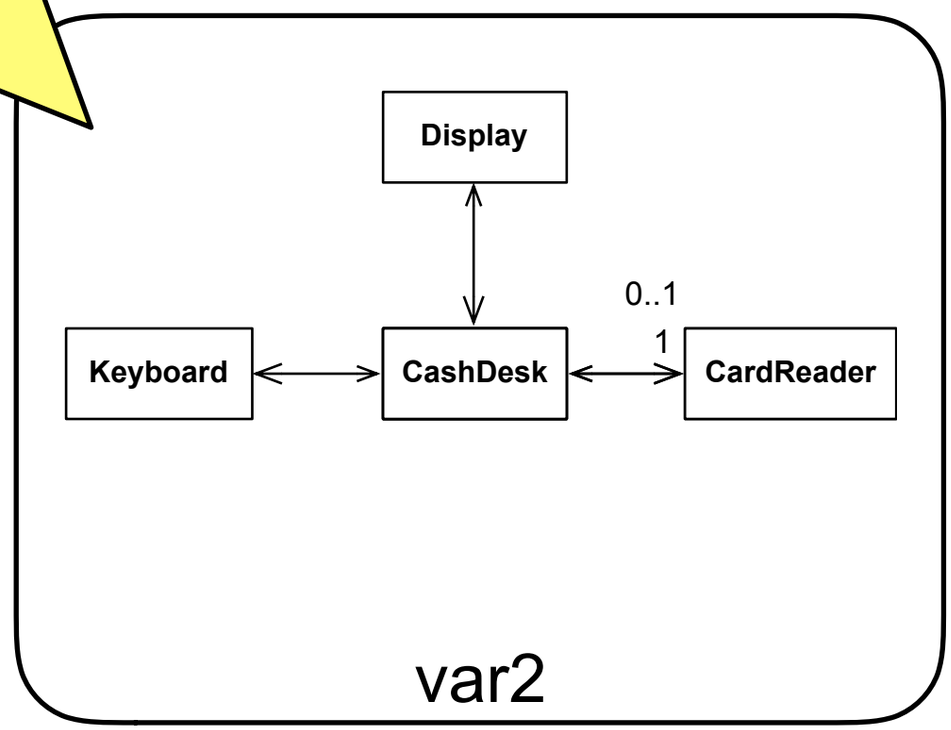




Step 2 (Flatten): Form a flat class diagram from all elements



Step 3 (Merge): Merge all elements with the same name together



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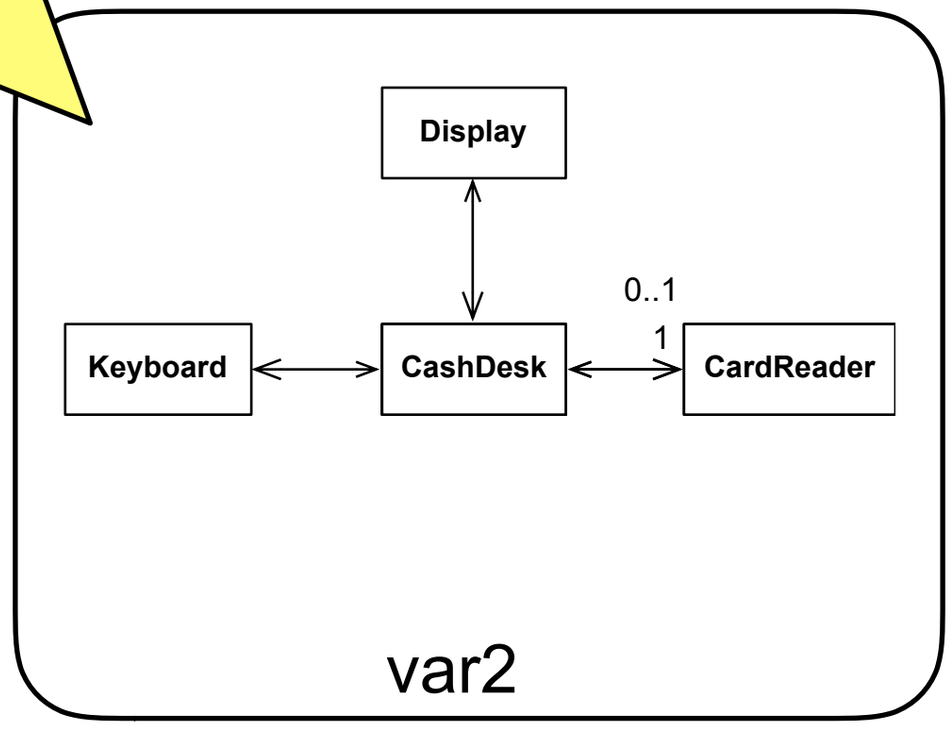

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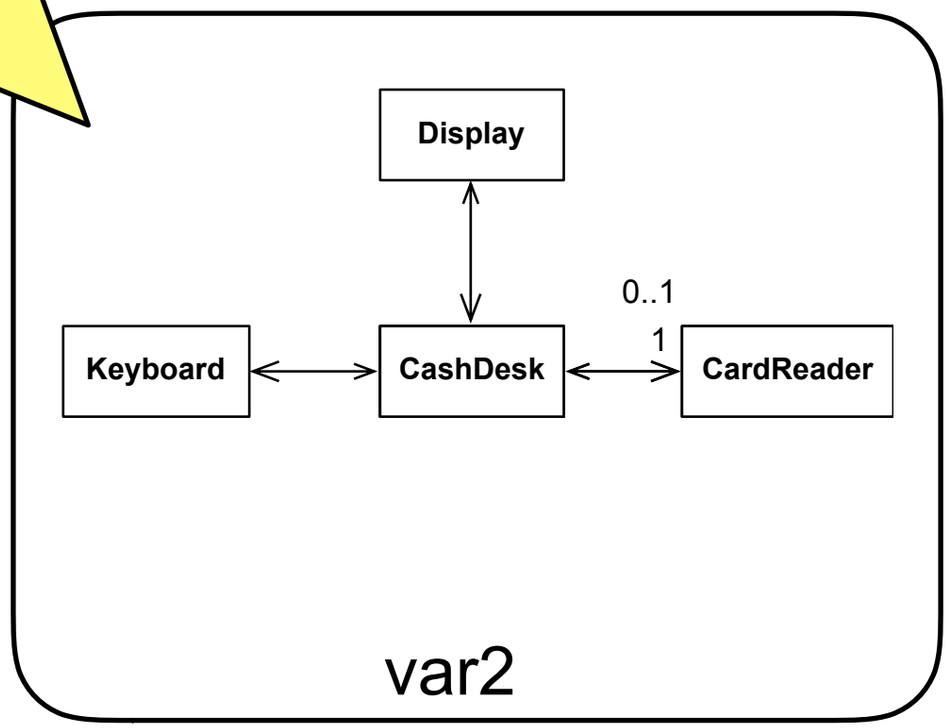

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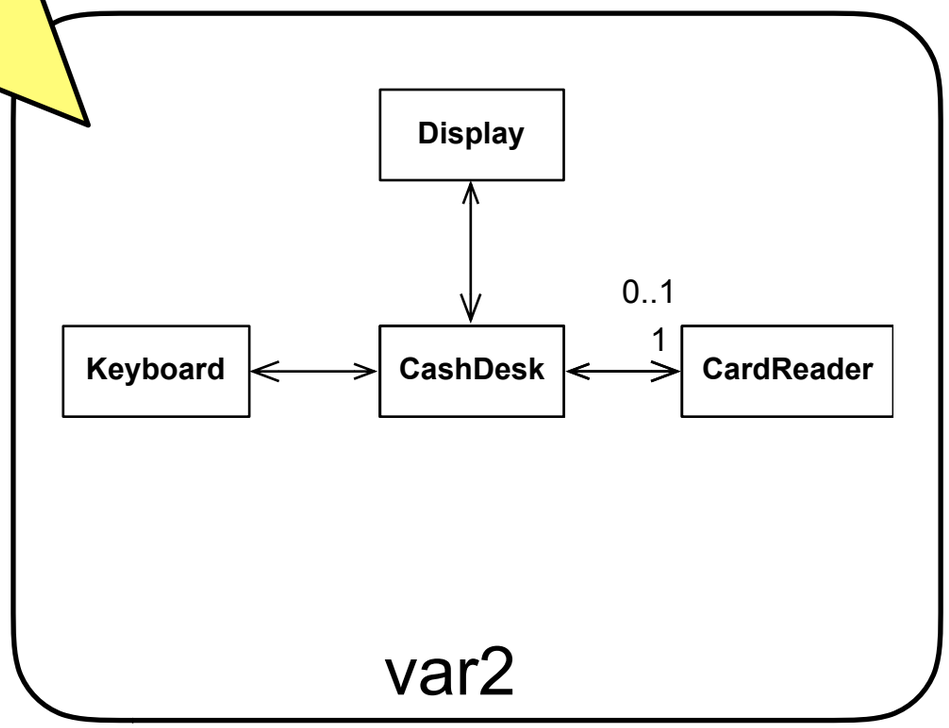

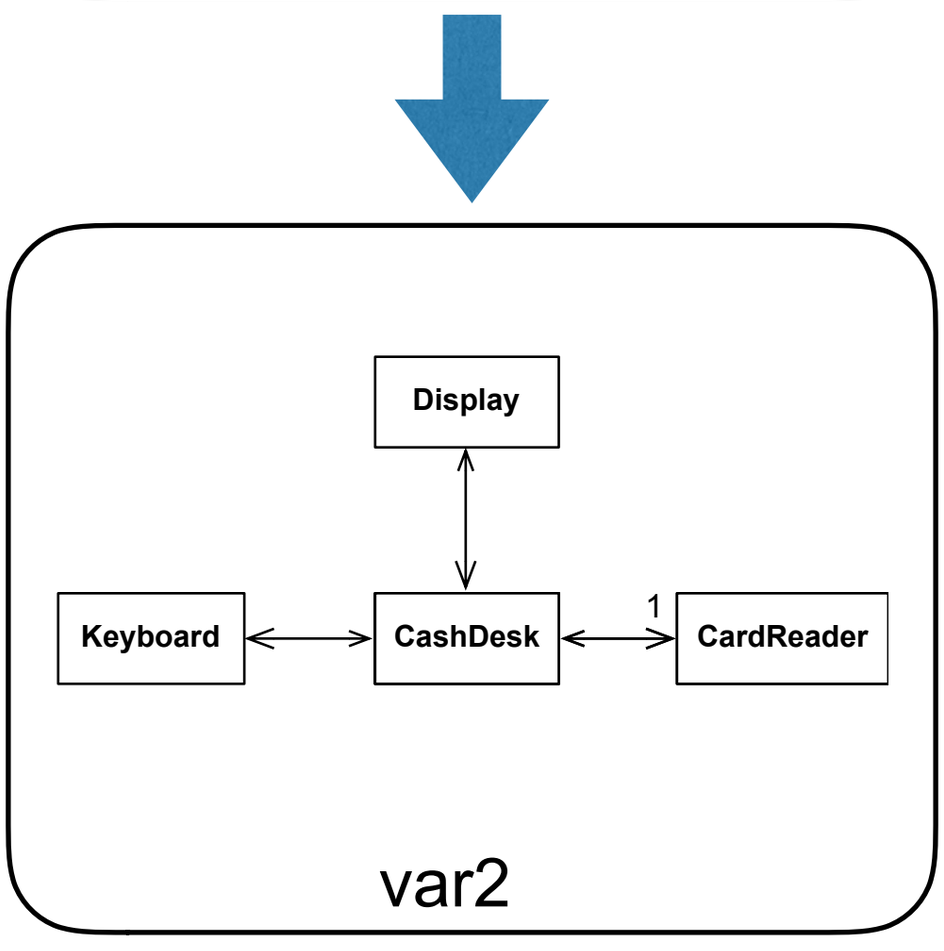

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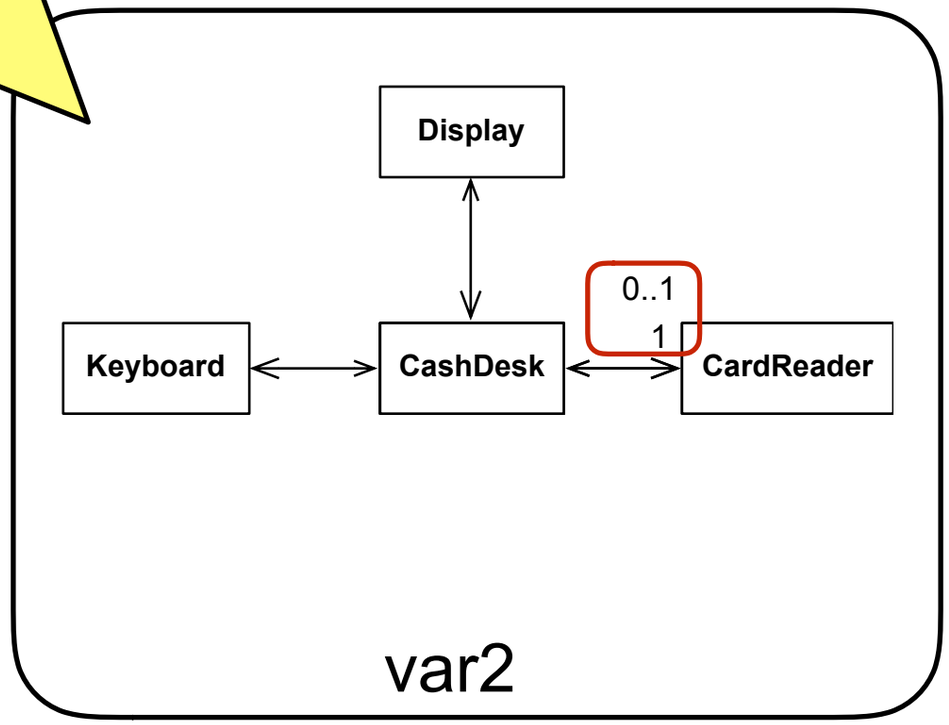
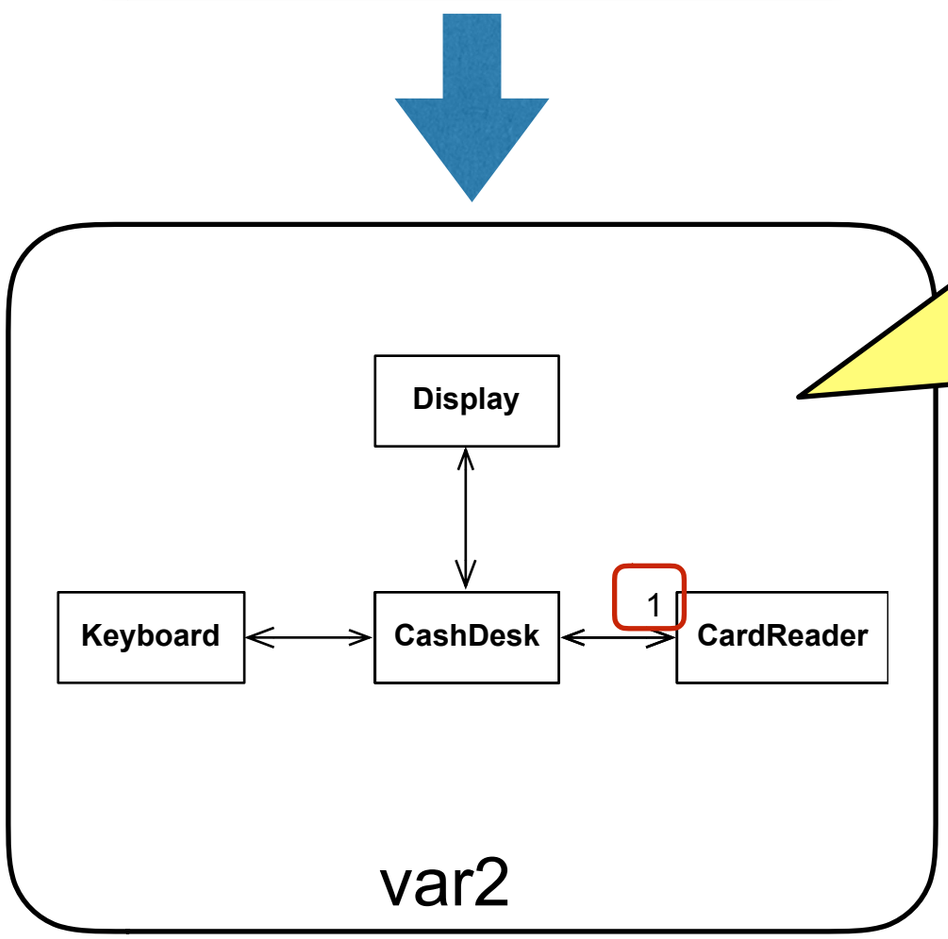
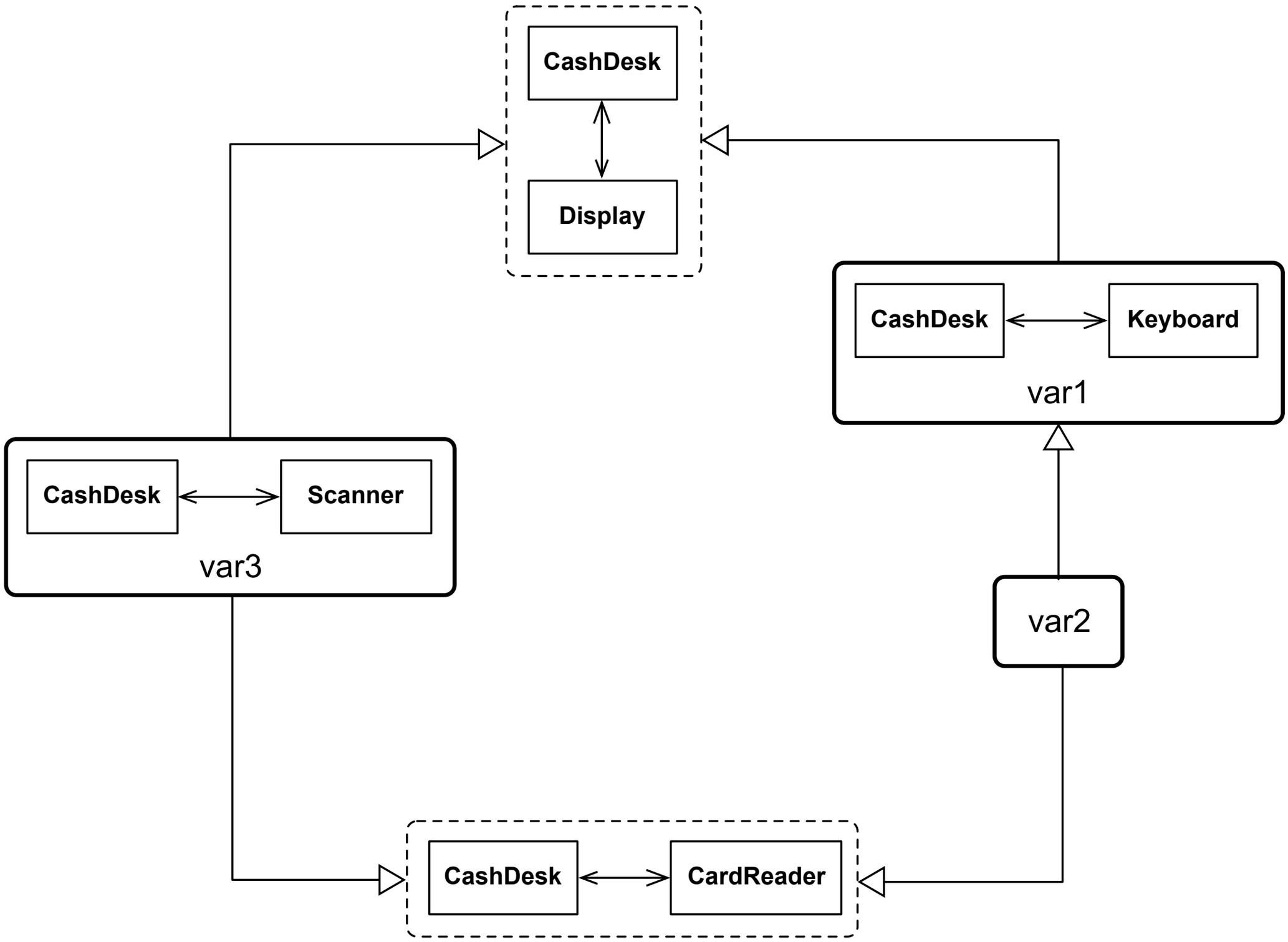
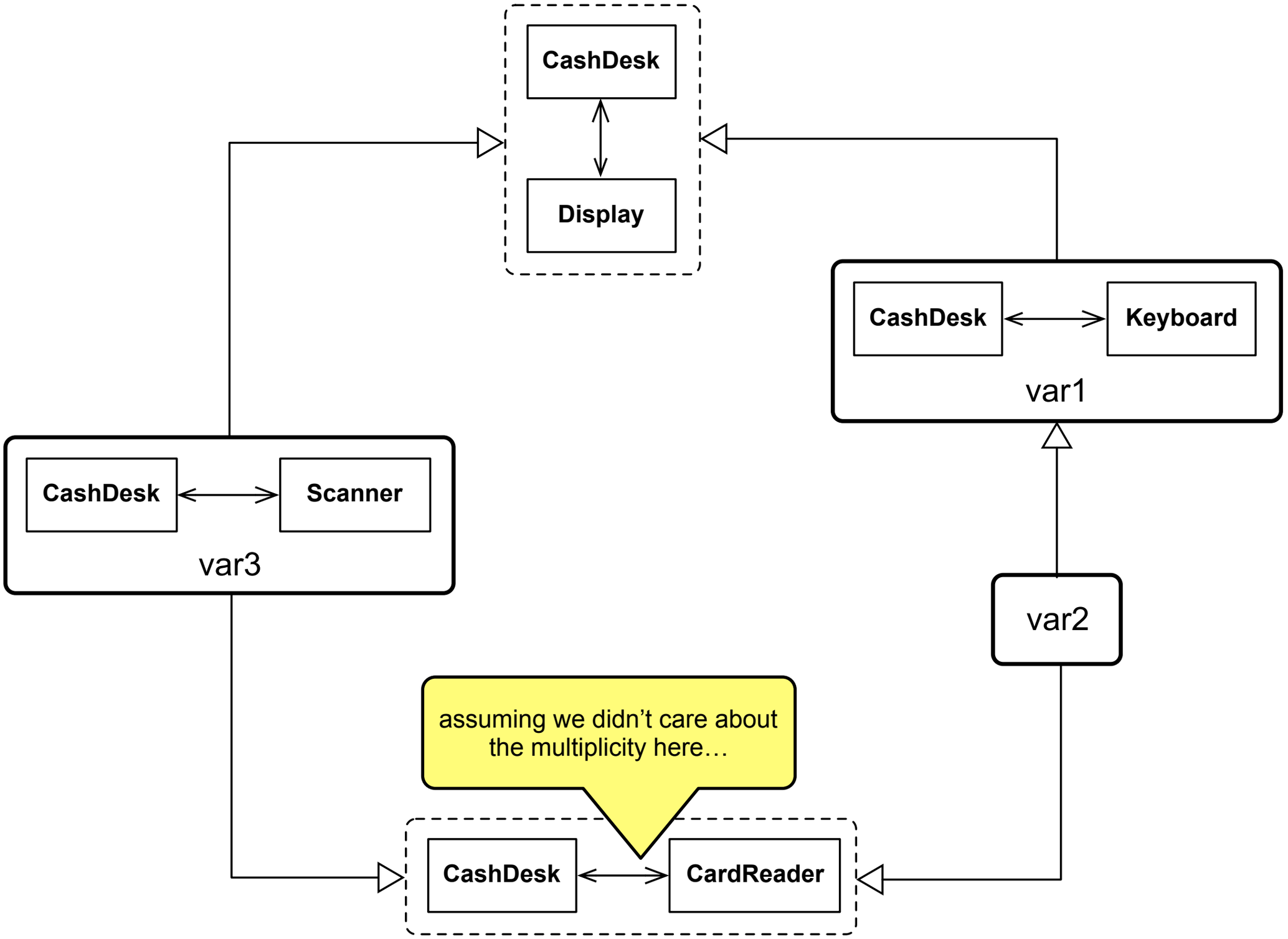
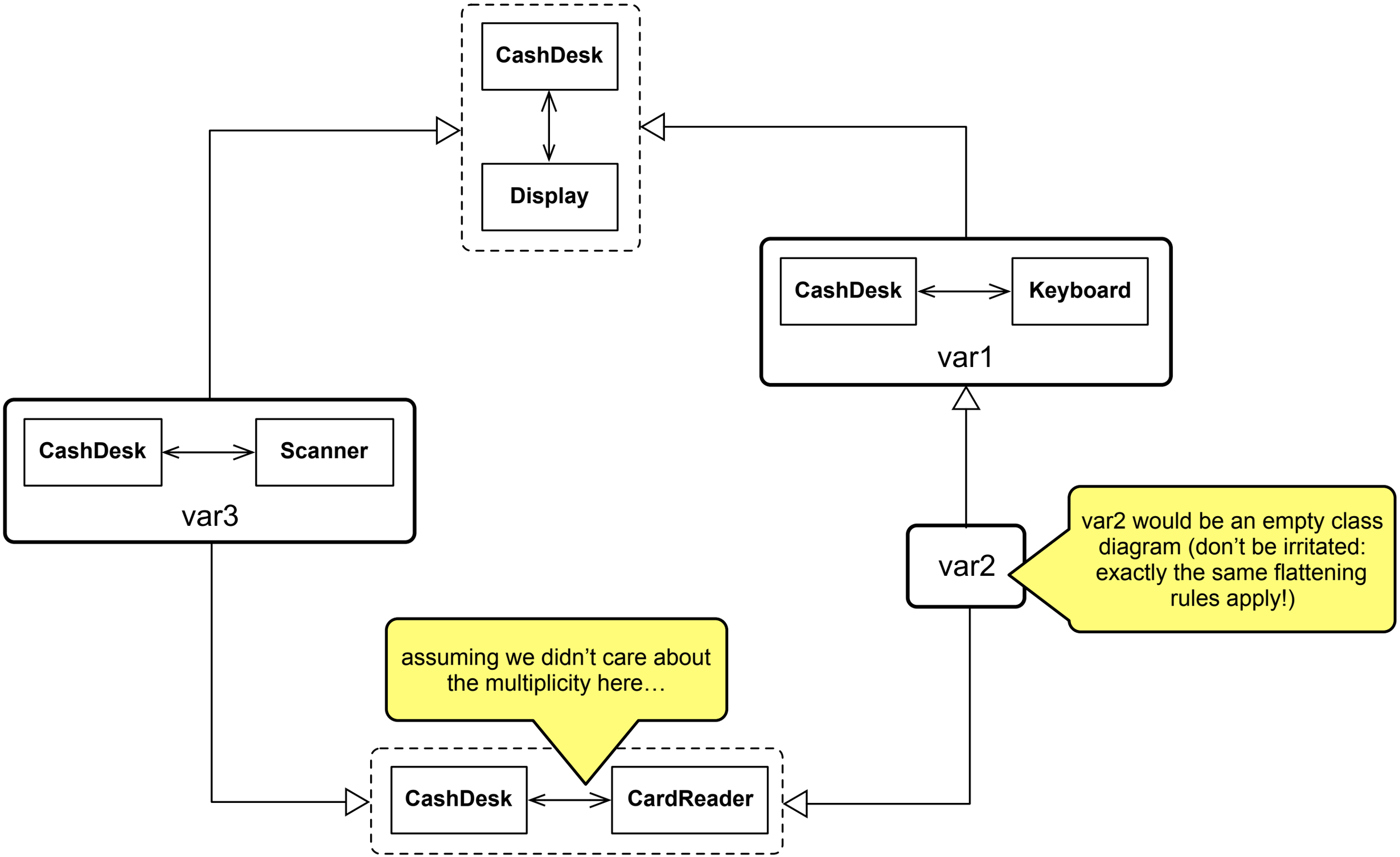


Step 4 (Resolve): Resolve any conflicts (subtypes win, multiplicities lower down in the refinement hierarchy win)




CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
var2
CashDesk
CardReader


CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
var2
assuming we didn’t care about
the multiplicity here…
CashDesk
CardReader


CashDesk
Display
CashDesk
Keyboard
var1
CashDesk
Scanner
var3
var2
var2 would be an empty class diagram (don’t be irritated: exactly the same flattening rules apply!)
assuming we didn’t care about the multiplicity here…
CashDesk
CardReader