

A Privacy Oriented Attribute Exchange in Shibboleth

Grid-Middleware Workshop, 23rd APAN
Meeting, Manila, Philippines, Jan. 25, 2007

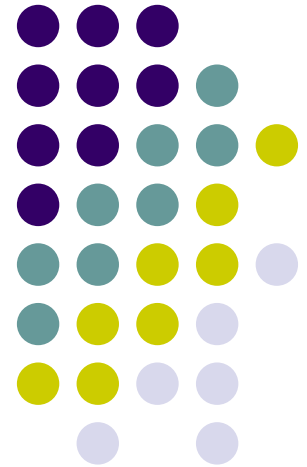
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† : Graduate School of Informatics, Kyoto Univ.

†† : Academic Center for Computing and
Media

Studies, Kyoto Univ.





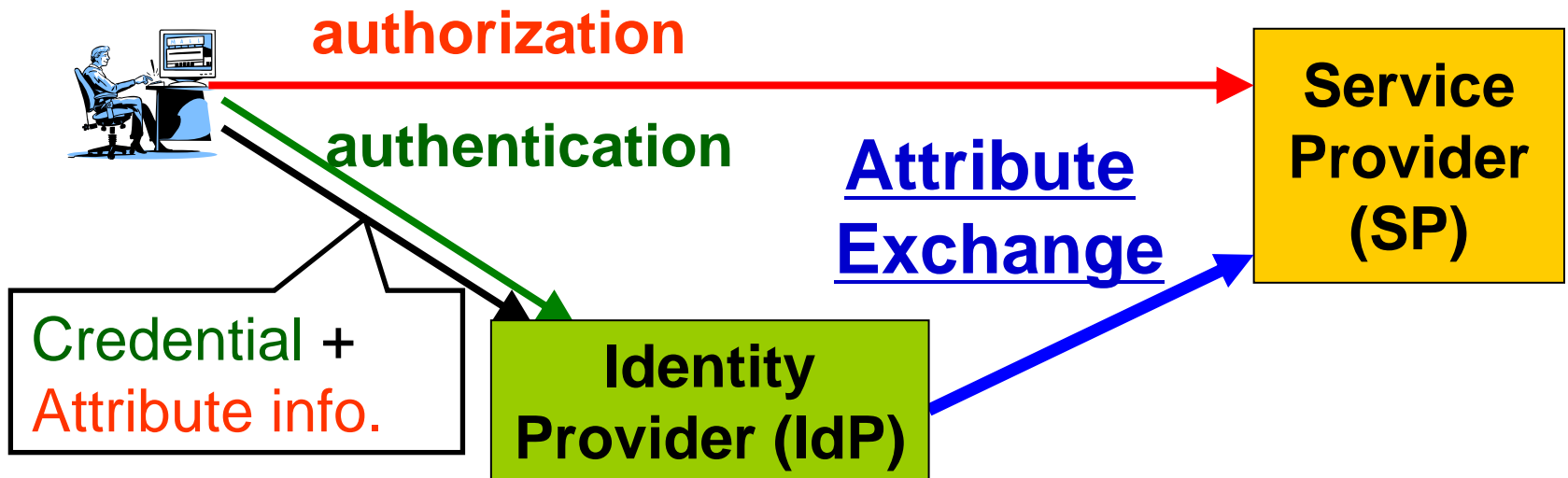
Agenda

- Outline of our work: extending attribute exchange to enhance privacy in Shibboleth ←
- Design and implementation
- Summary and future works



Background

- Necessary processes and a deployment framework for Web services

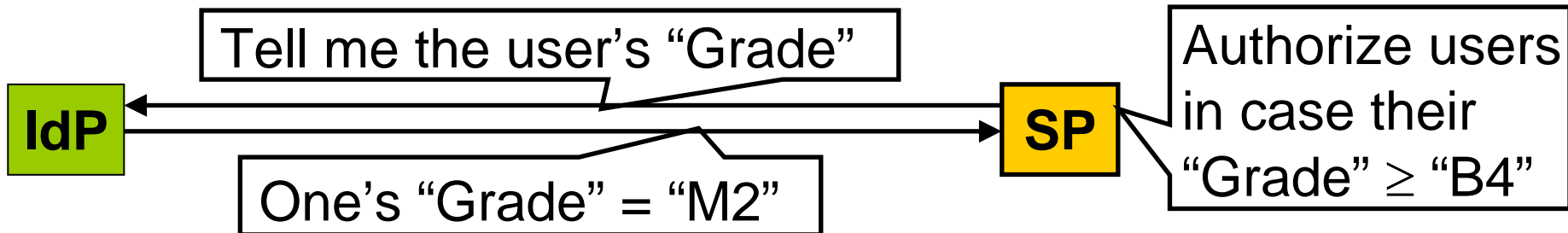


- Identity: Information required for AuthN/AuthZ
- Shibboleth: a project of Internet2/MACE

What we did: Extension of Attribute Exchange in Shibboleth



- Current protocol

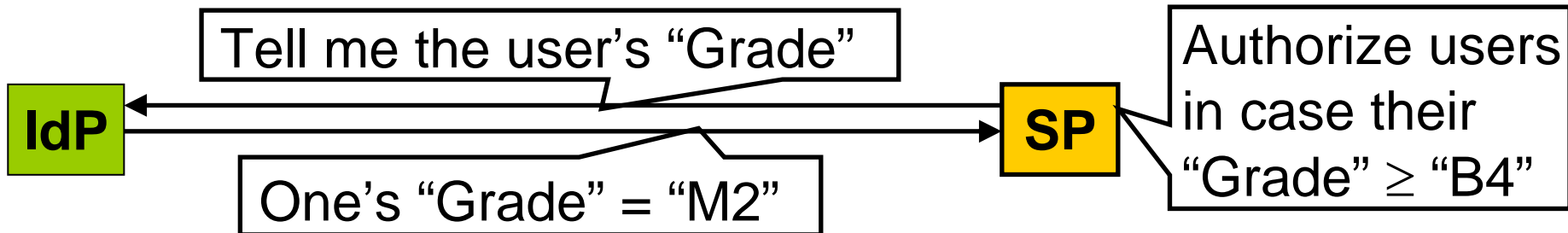


- **privacy risk: attribute information for the SP is often unnecessarily detailed**

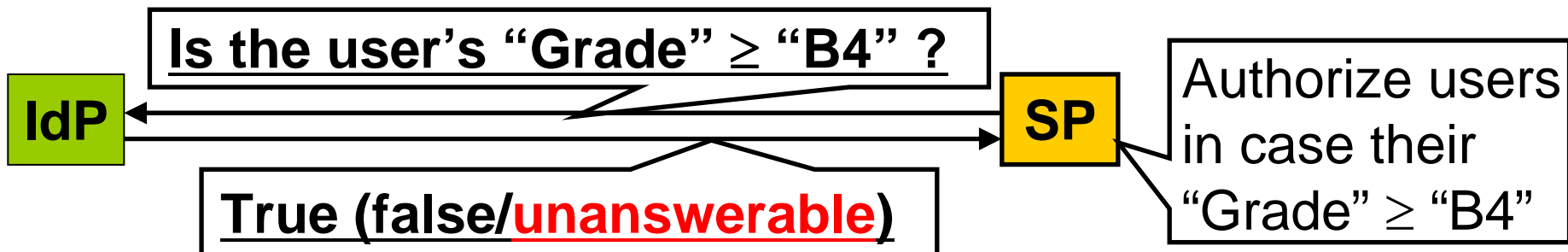
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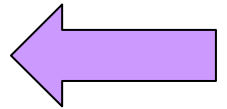
- **privacy risk: attribute information for the SP is often unnecessarily detailed**
- Proposal: SP presents AuthZ conditions





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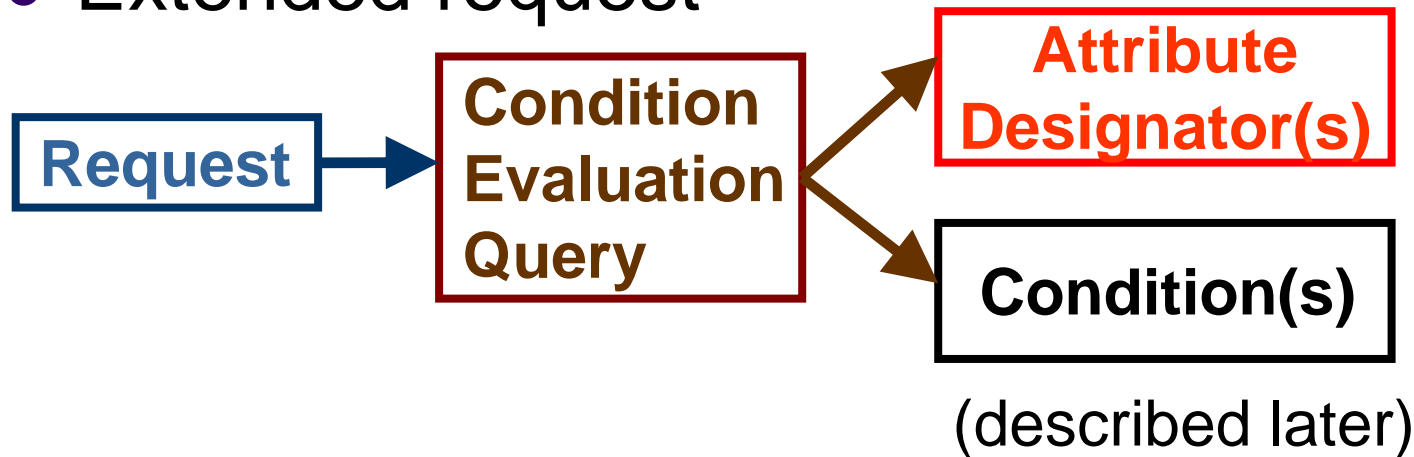
Protocol Message Extension (Request from SPs to IdPs)



- Existing attribute request



- Extended request



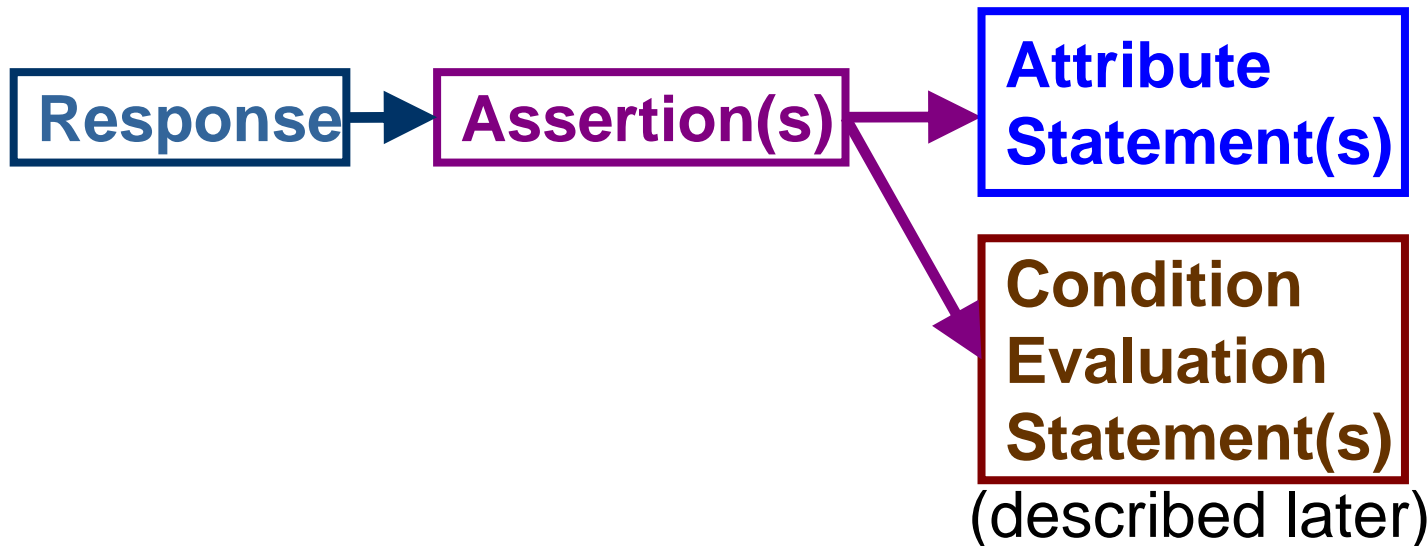
Protocol Message Extension (Response from IdPs to SPs)



- Existing response to attribute request



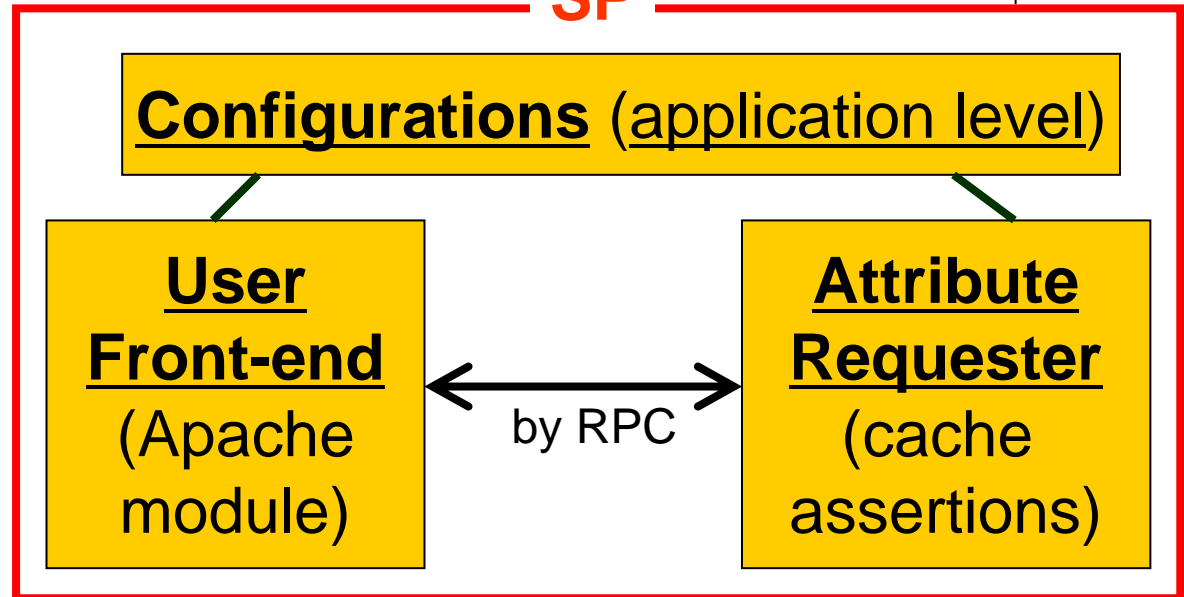
- Extended response





Protocol in detail

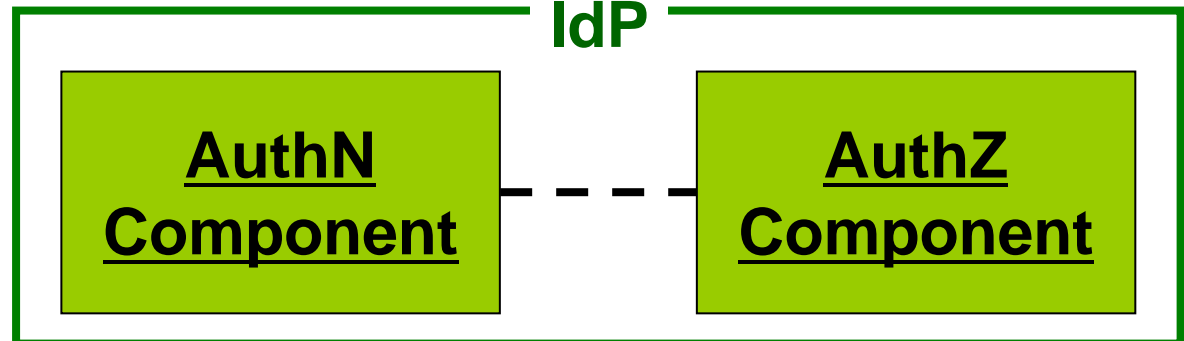
SP



User

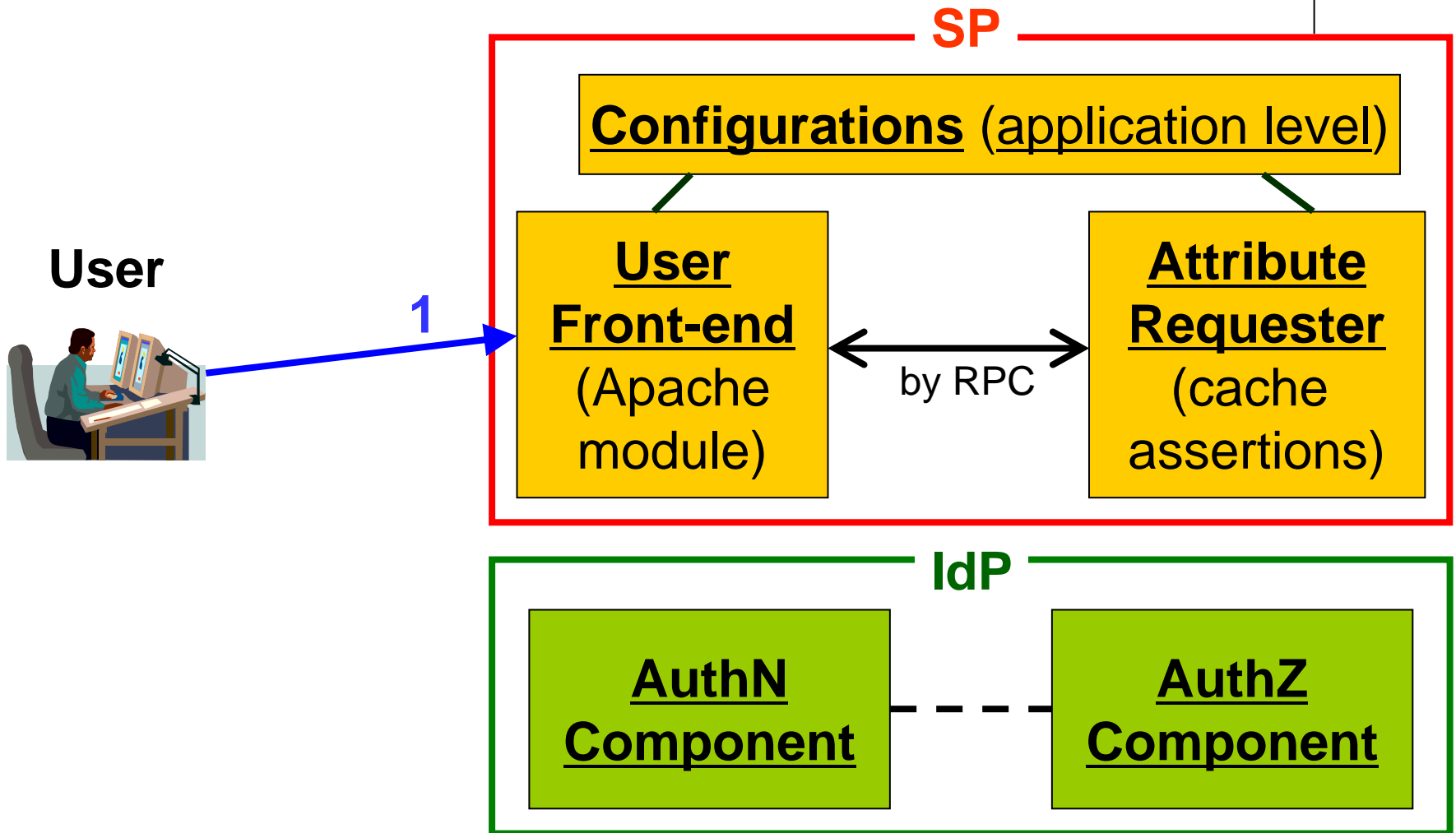


IdP

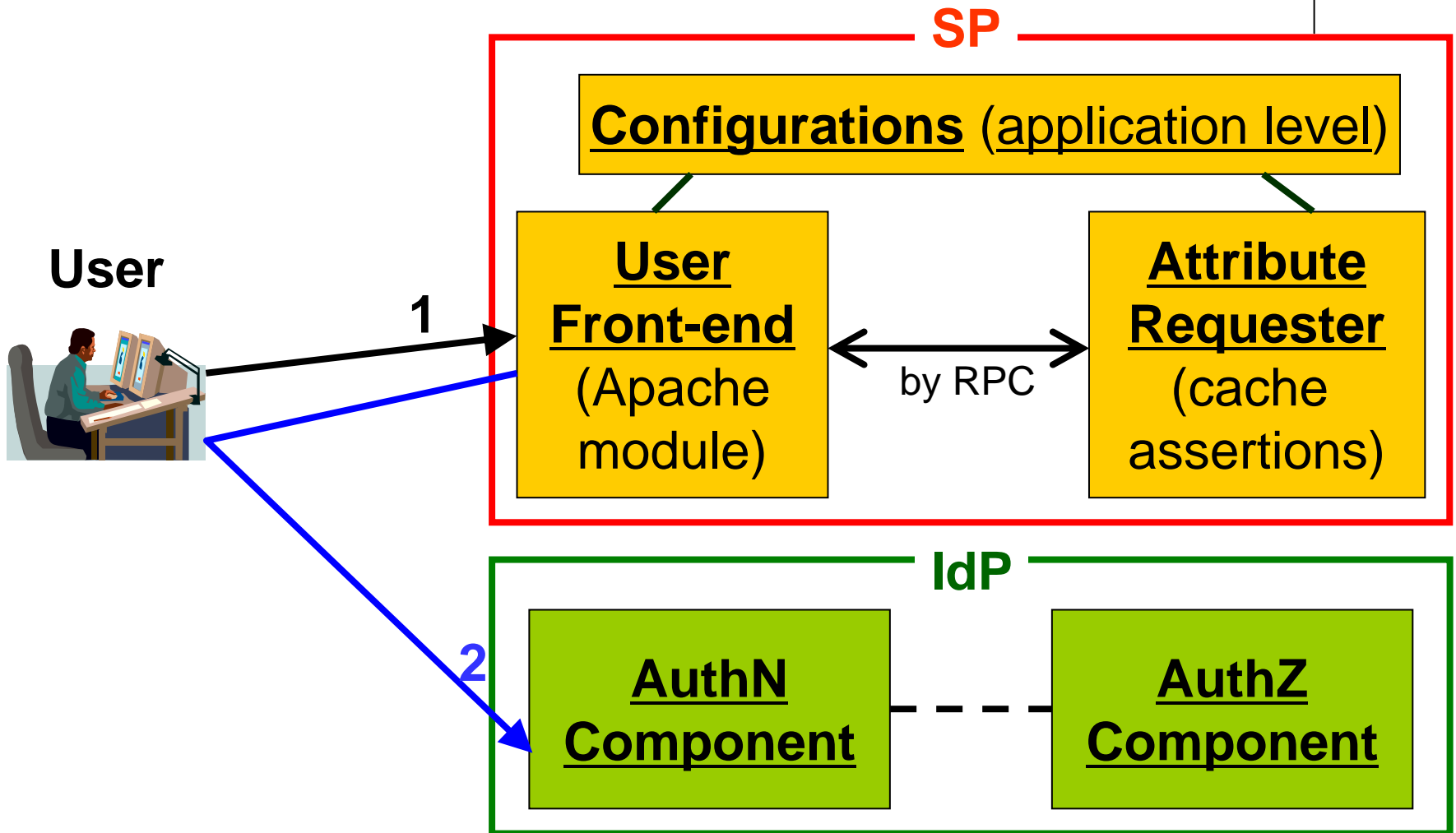




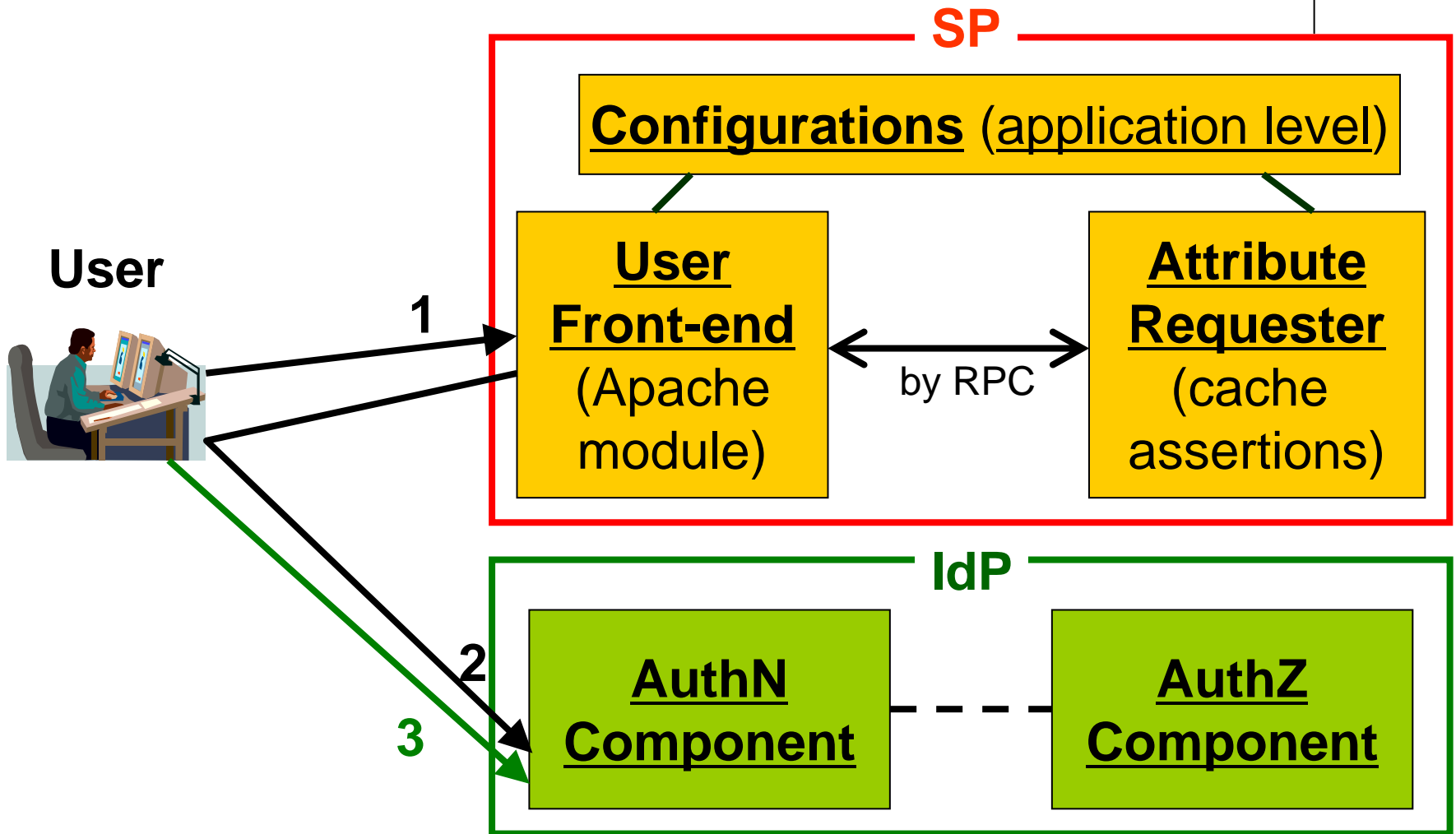
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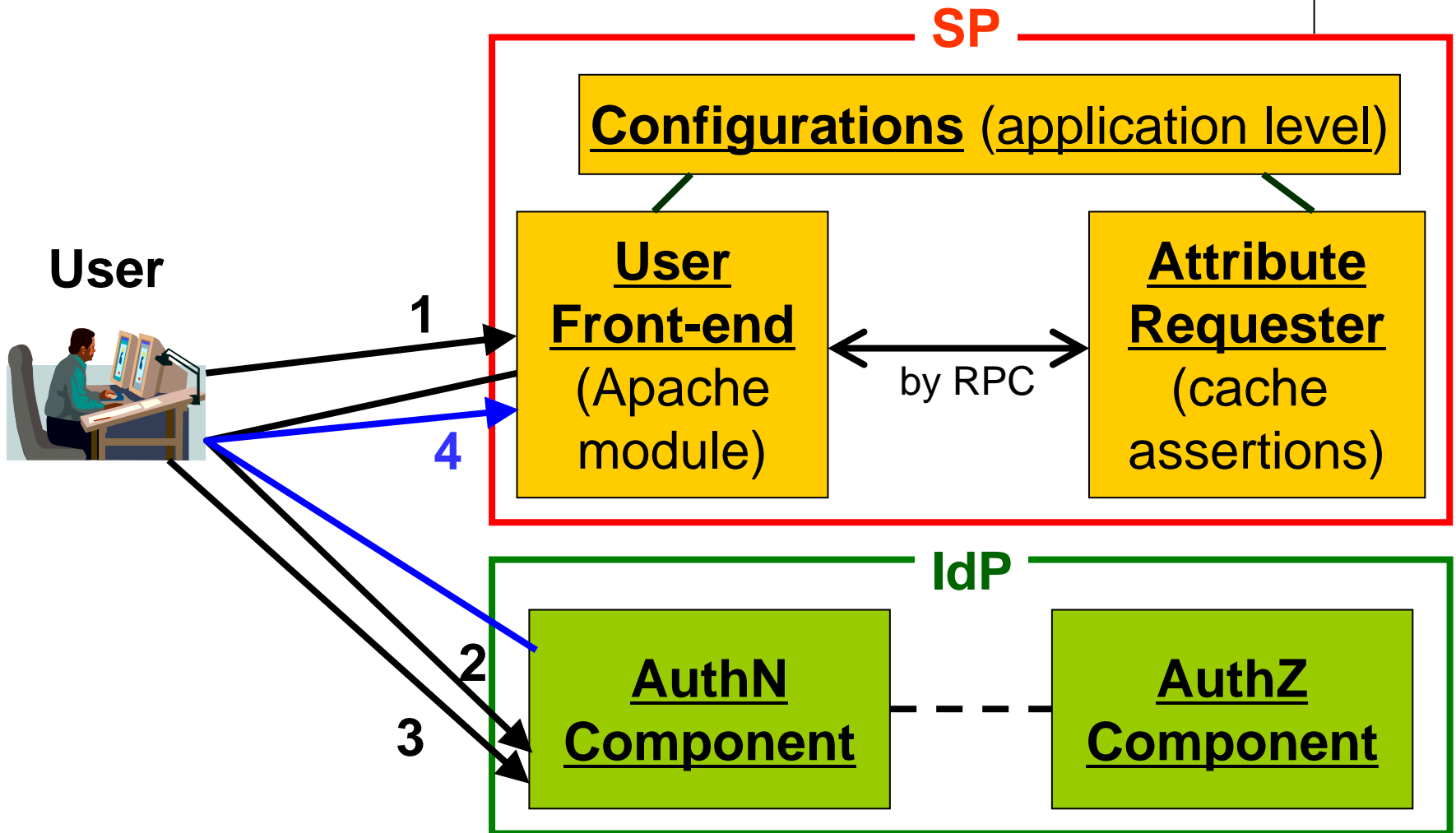
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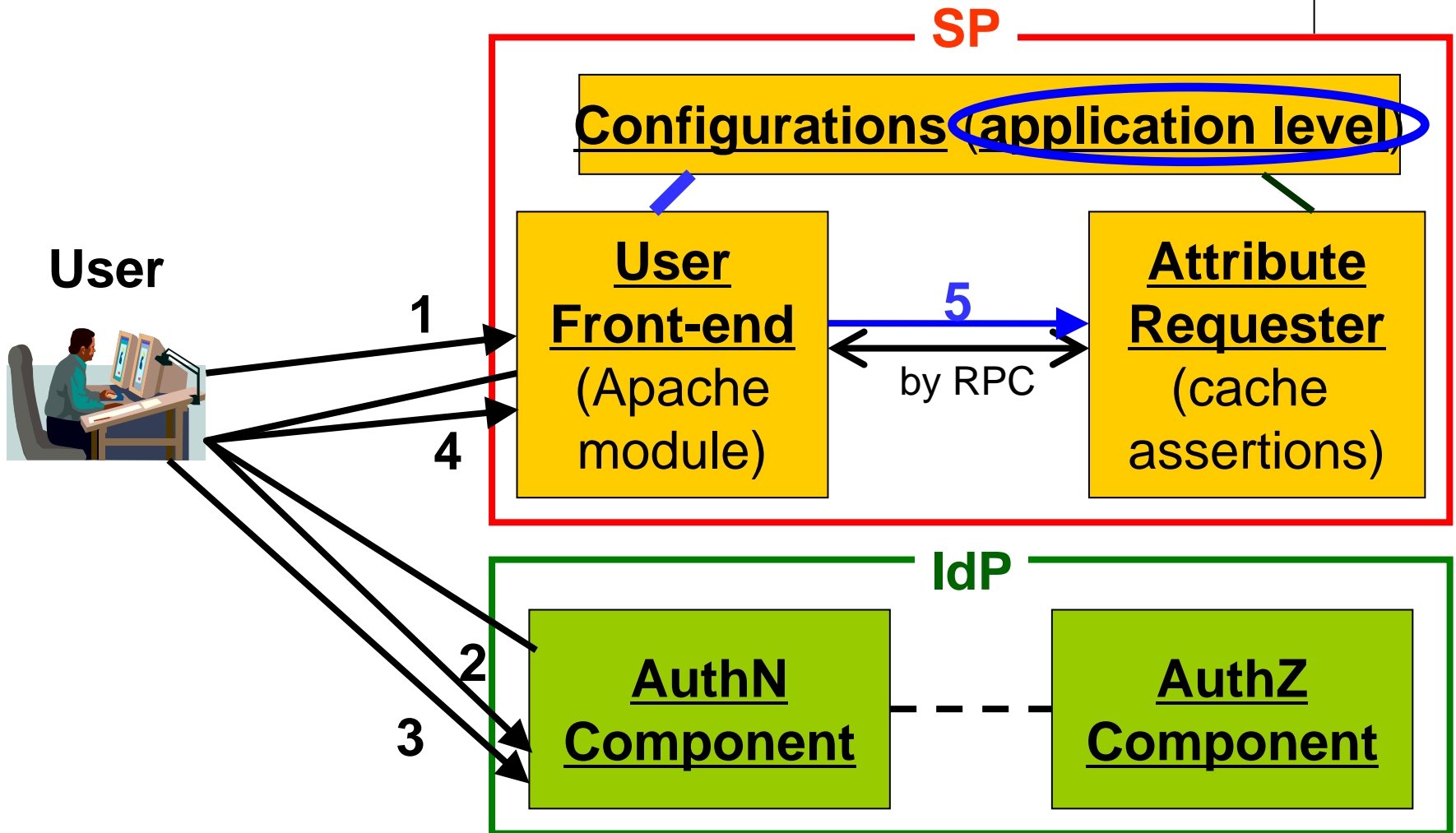
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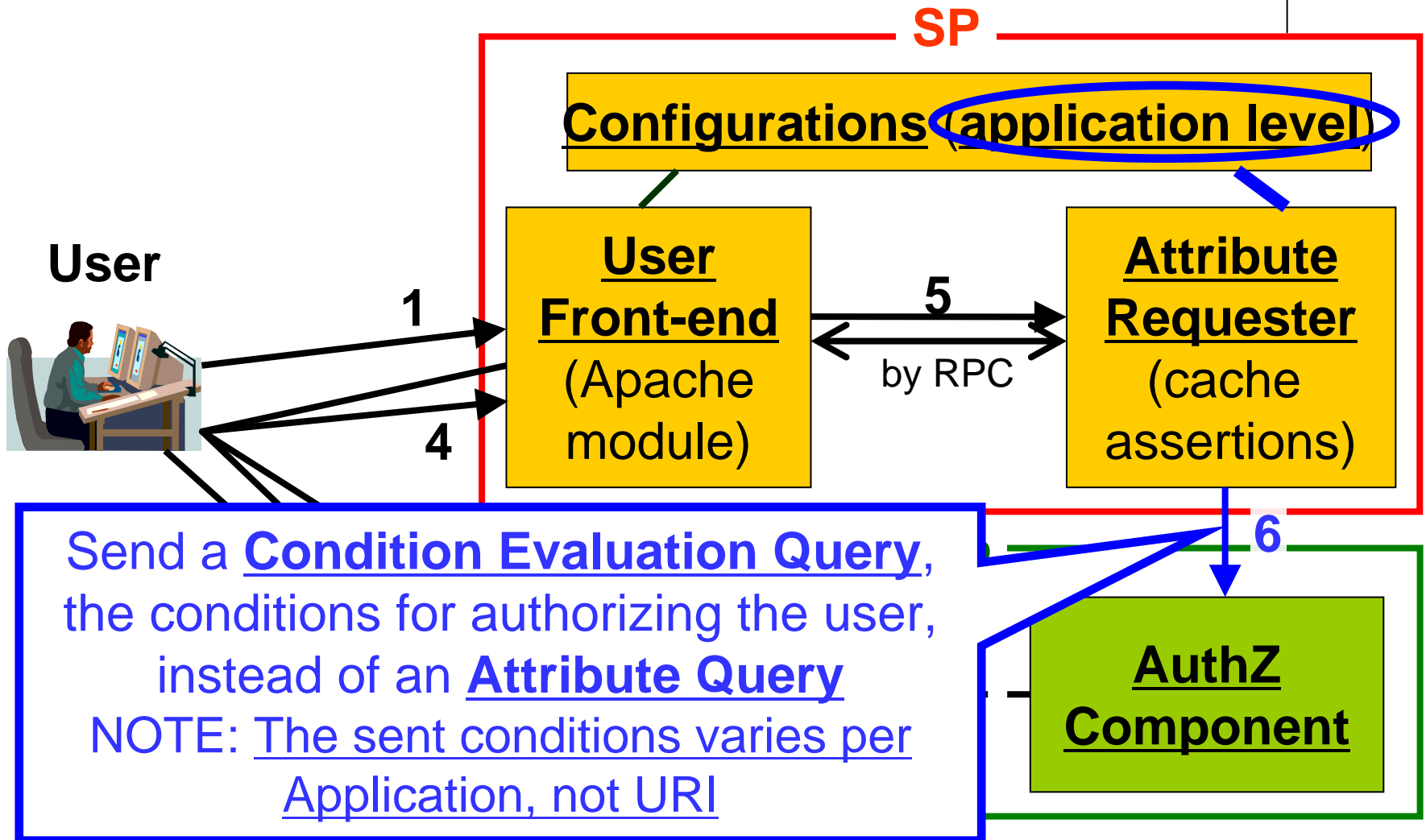
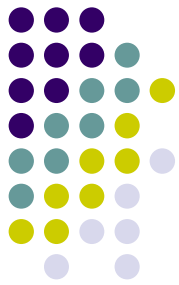
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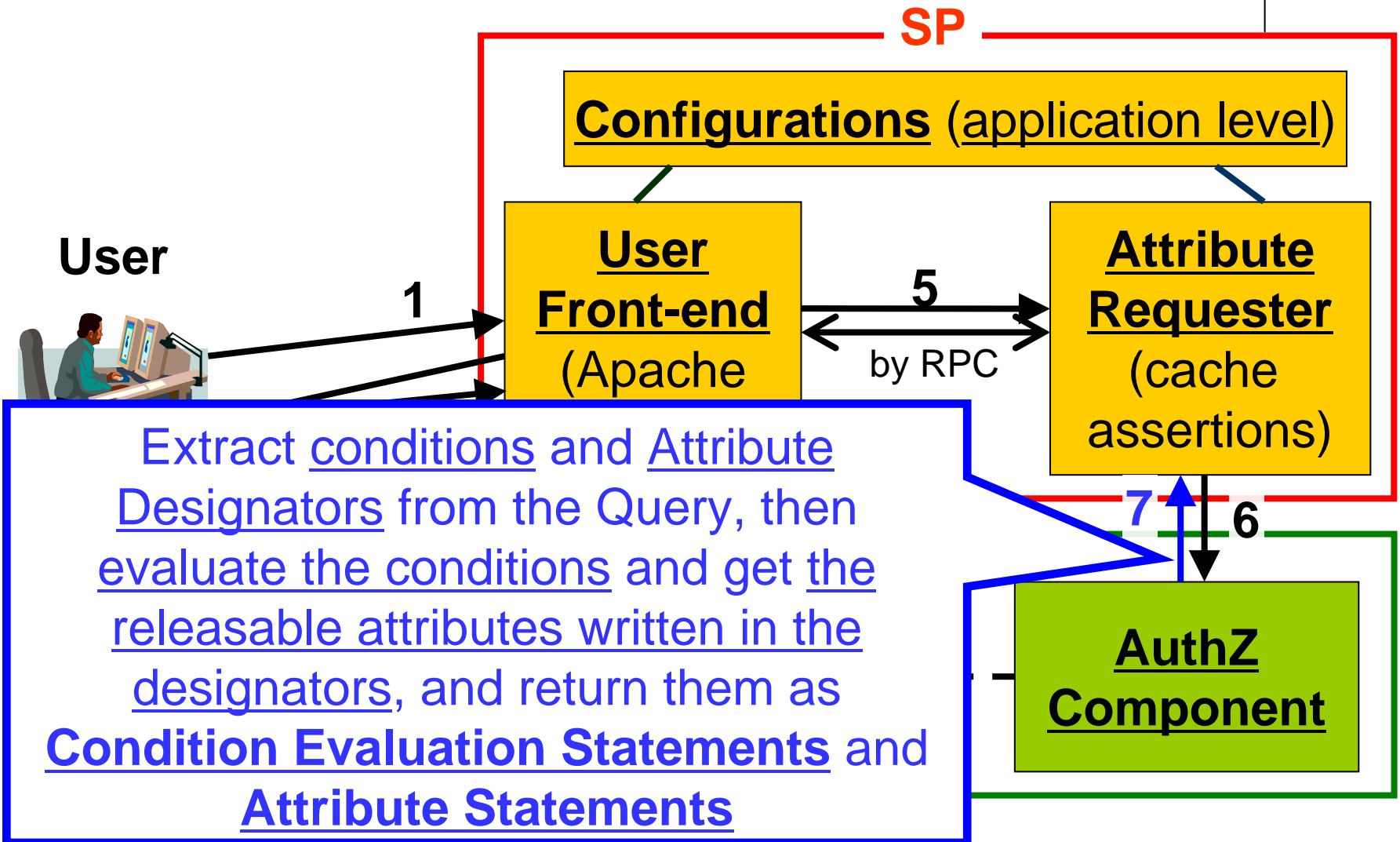


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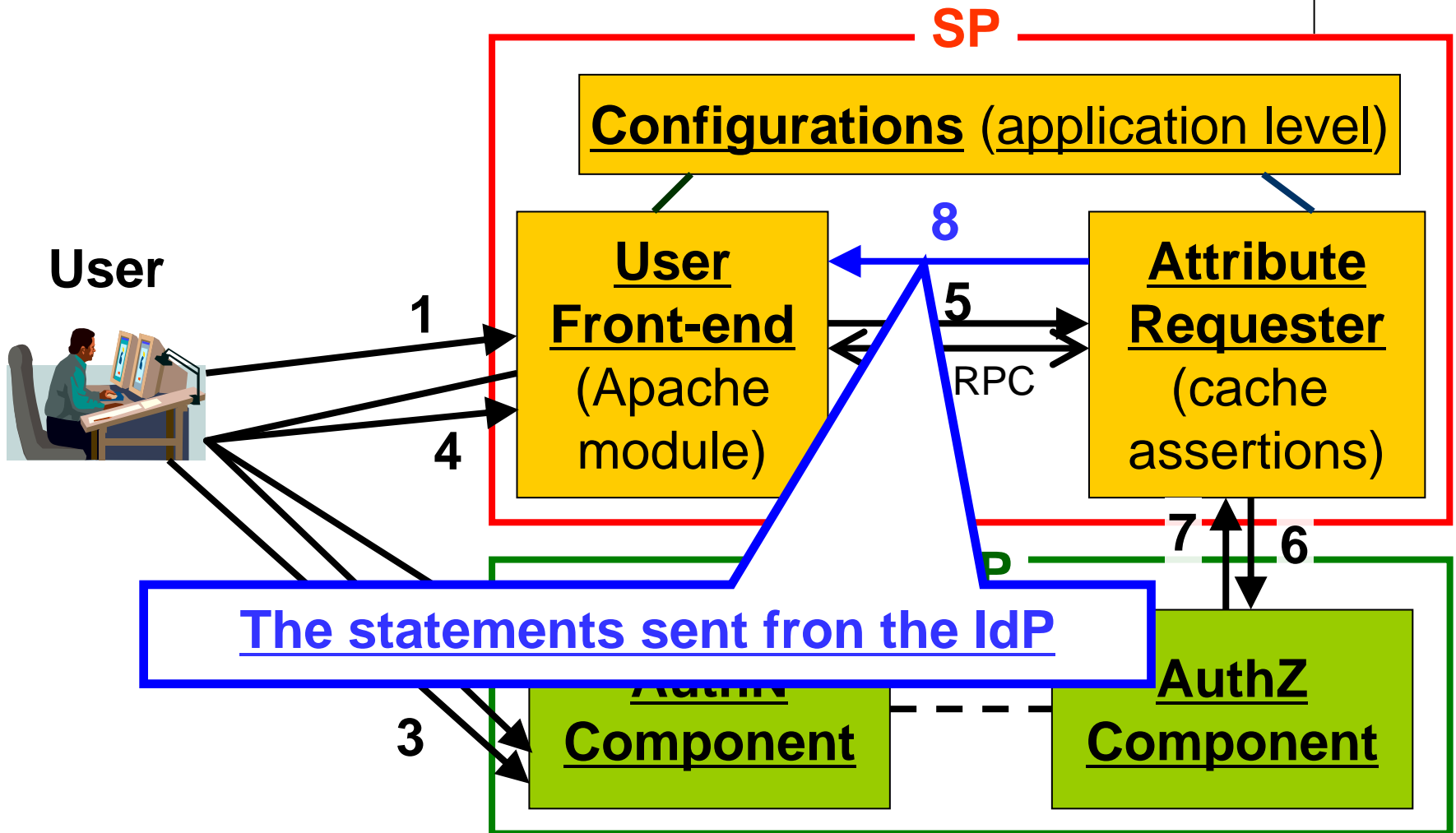


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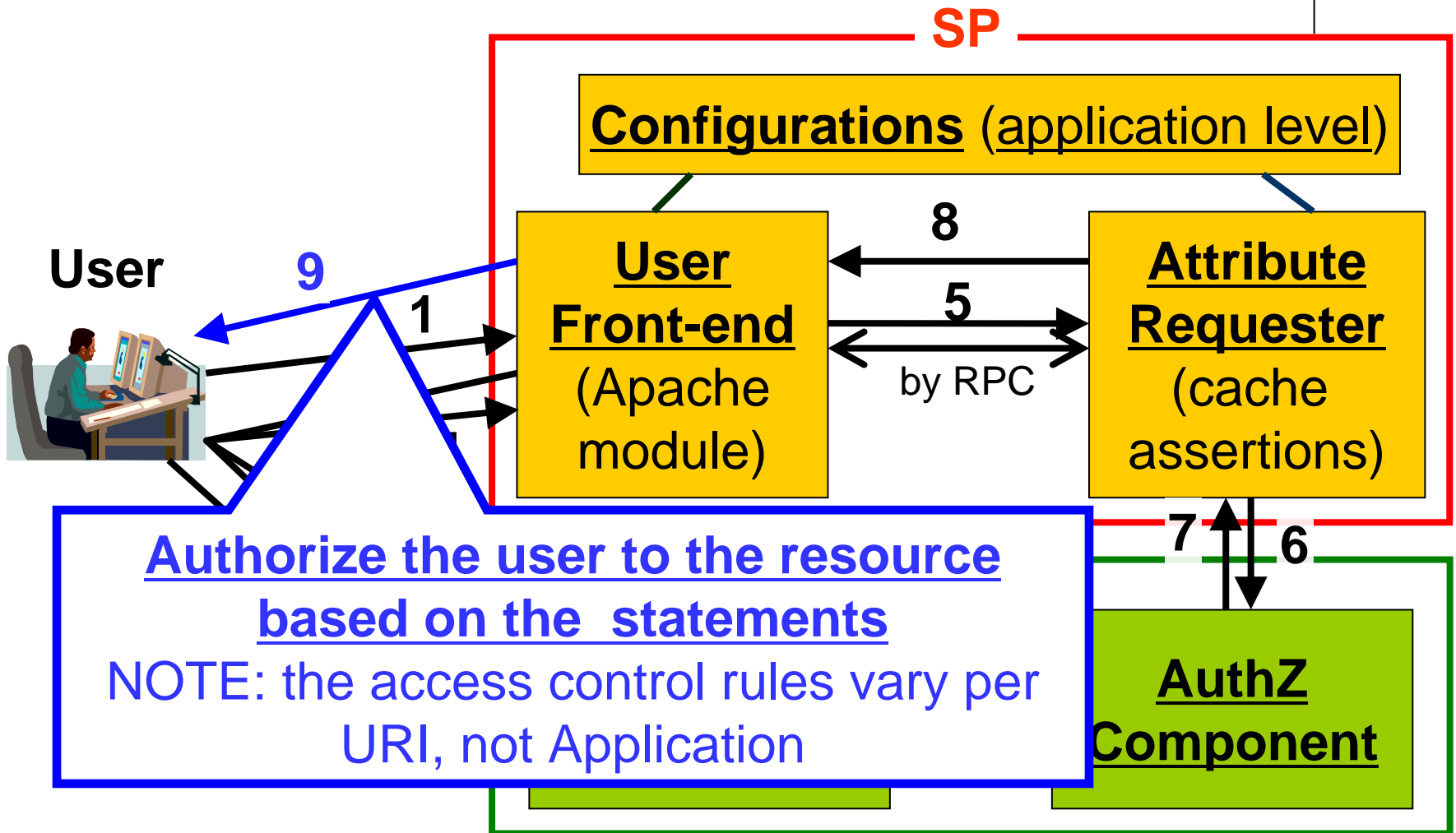


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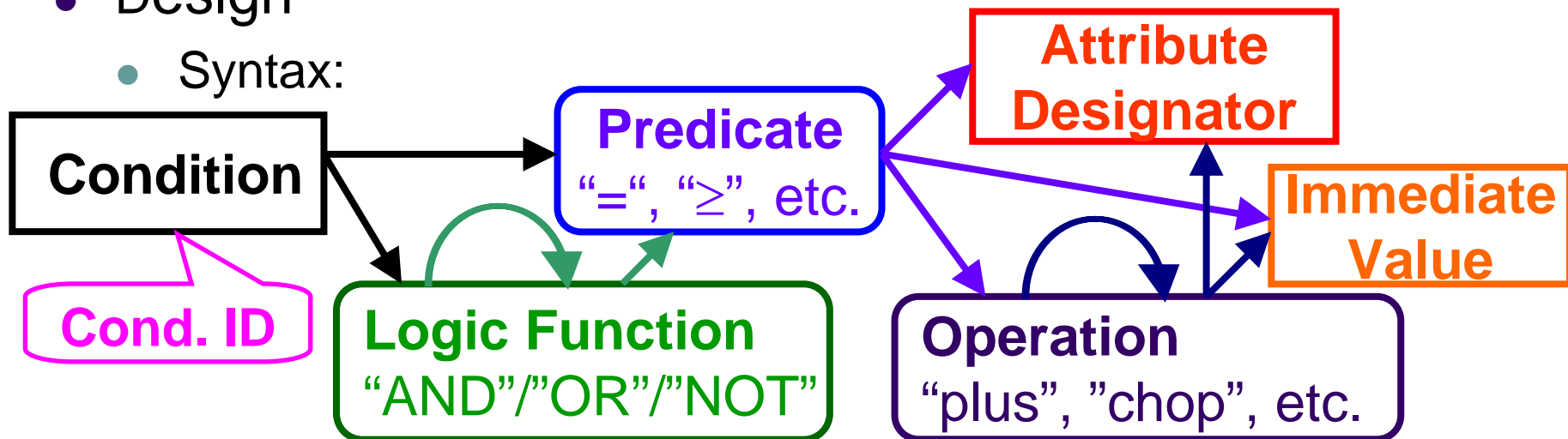
Protocol in detail



Language for Describing the Conditions



- Points
 - What to describe: AuthZ conditions about attributes
 - Compactness: XACML is too complicated
- Design
 - Syntax:

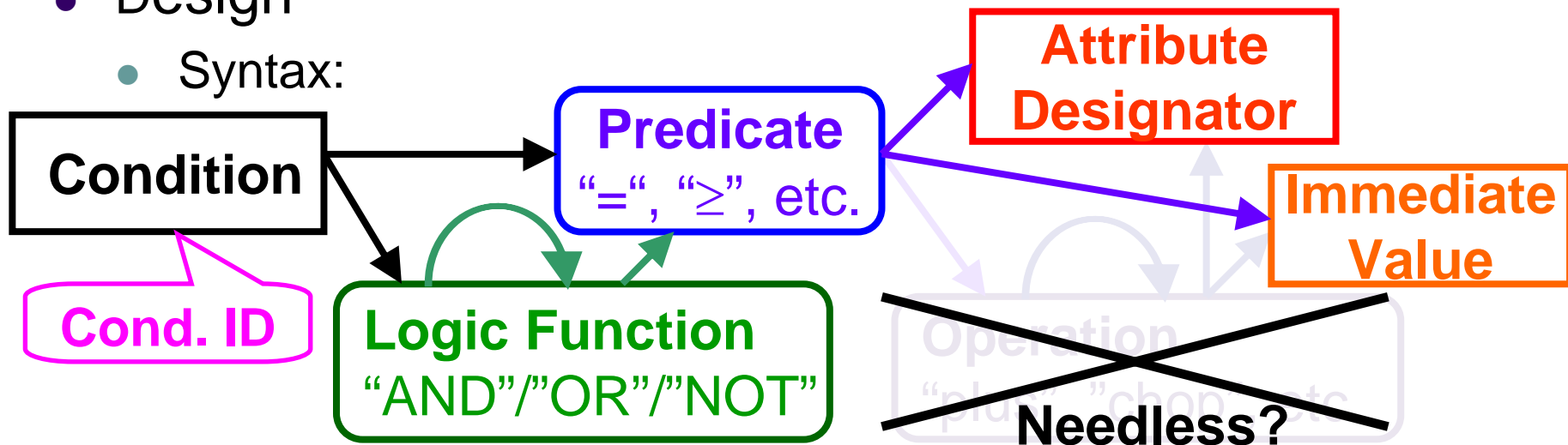


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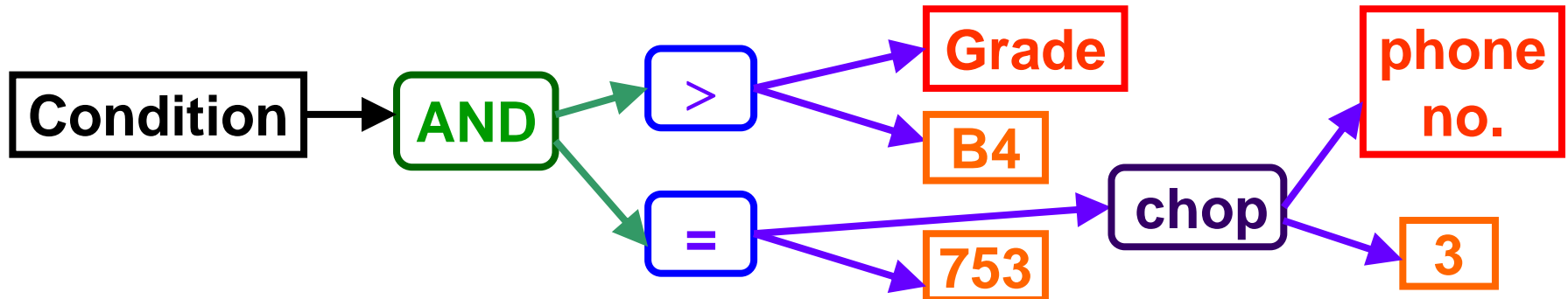
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Evaluation and its Result

- Evaluation: at IdPs

Condition: “Grade” > “B4” & first 3 digits of “phone no.” = “753”



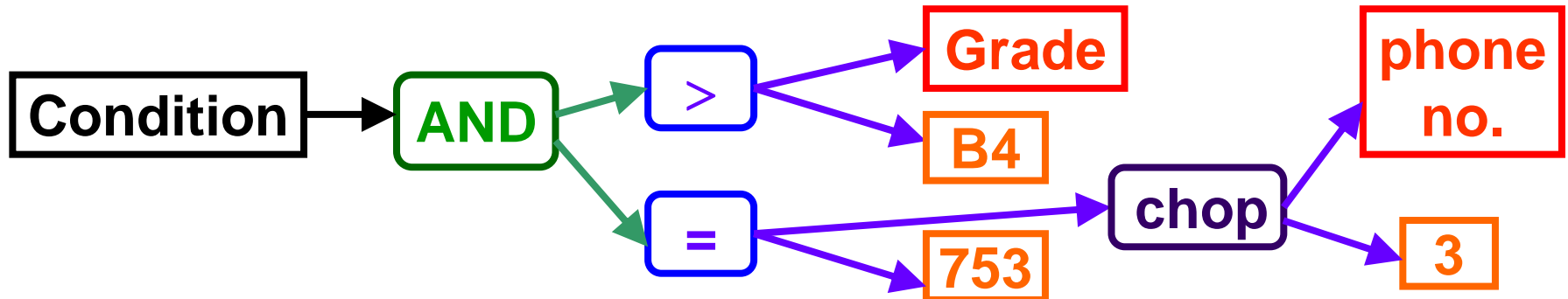


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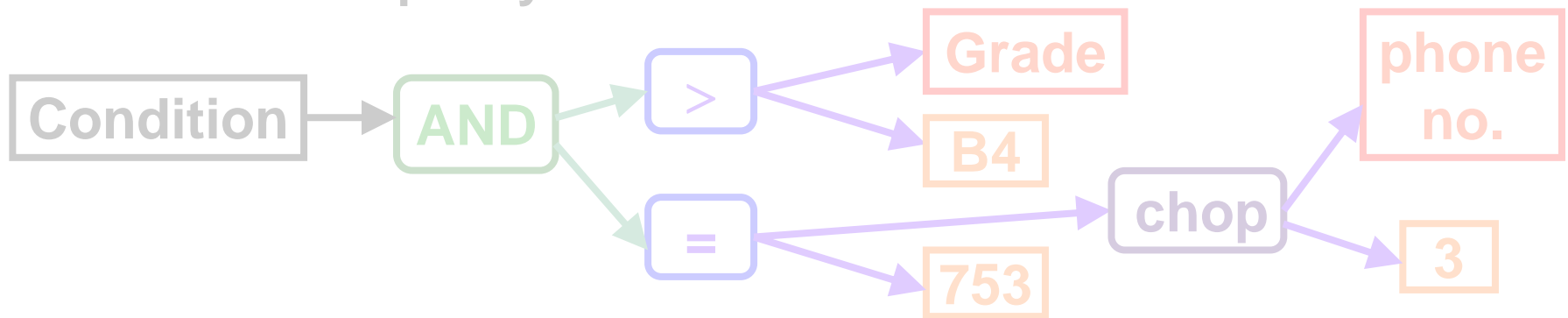




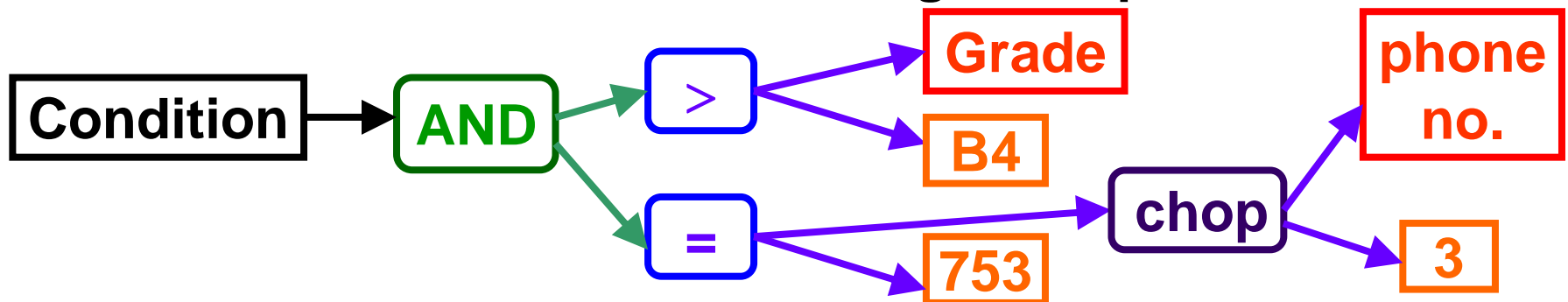
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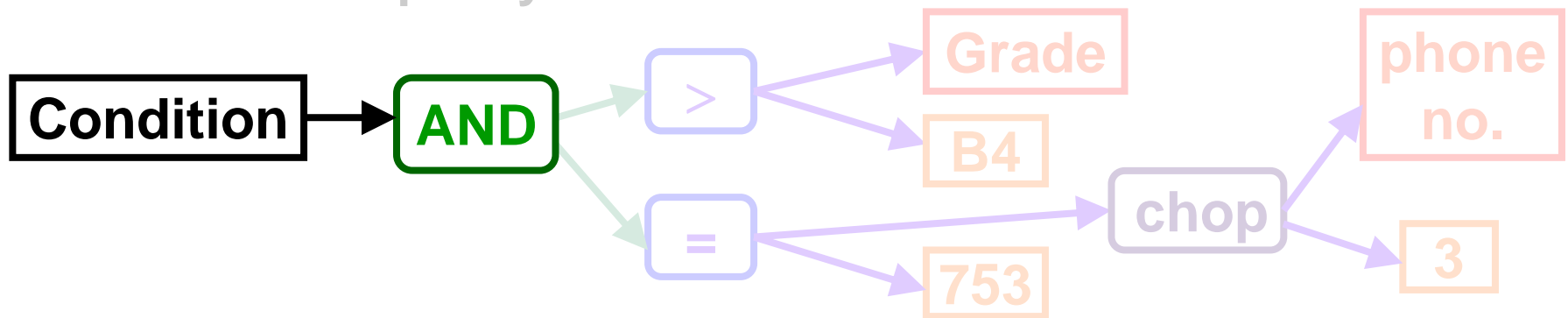




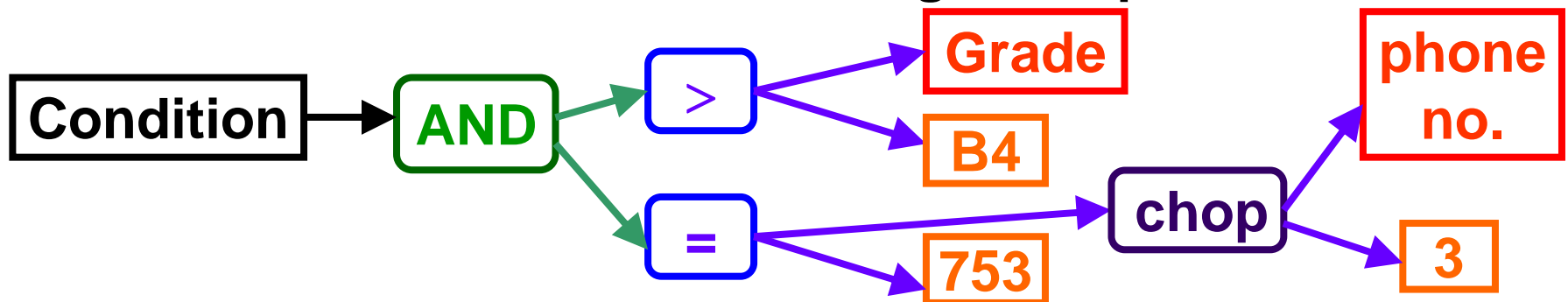
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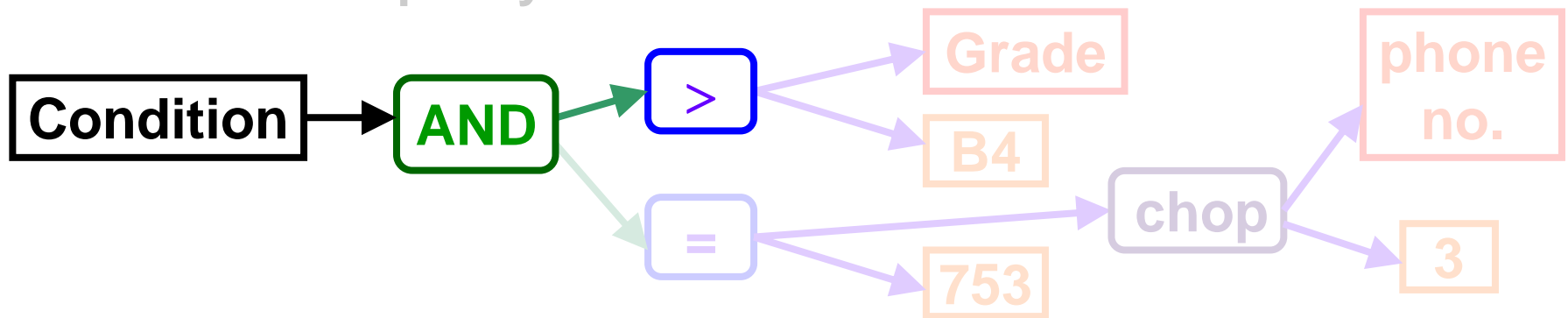




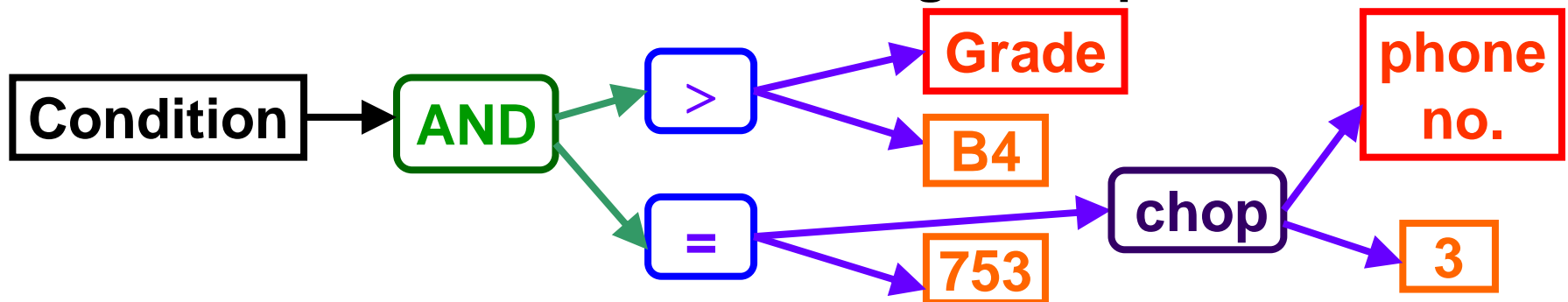
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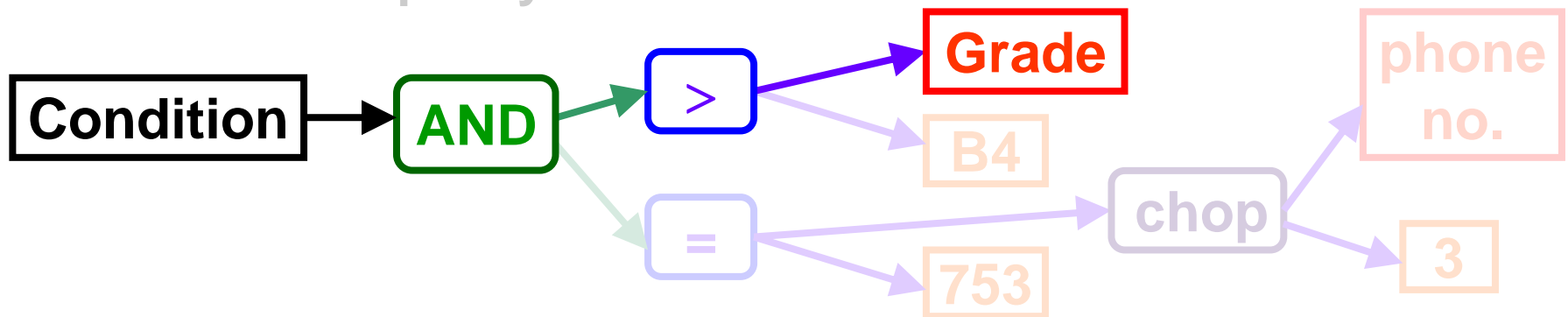




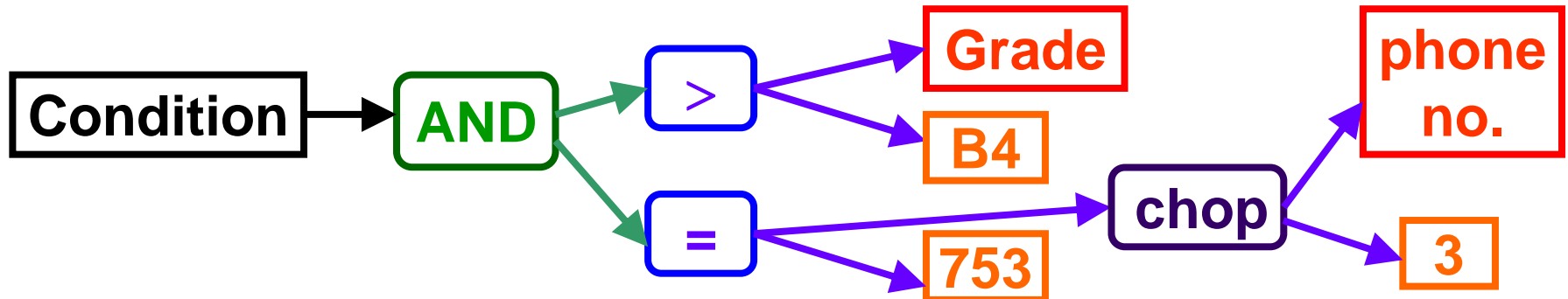
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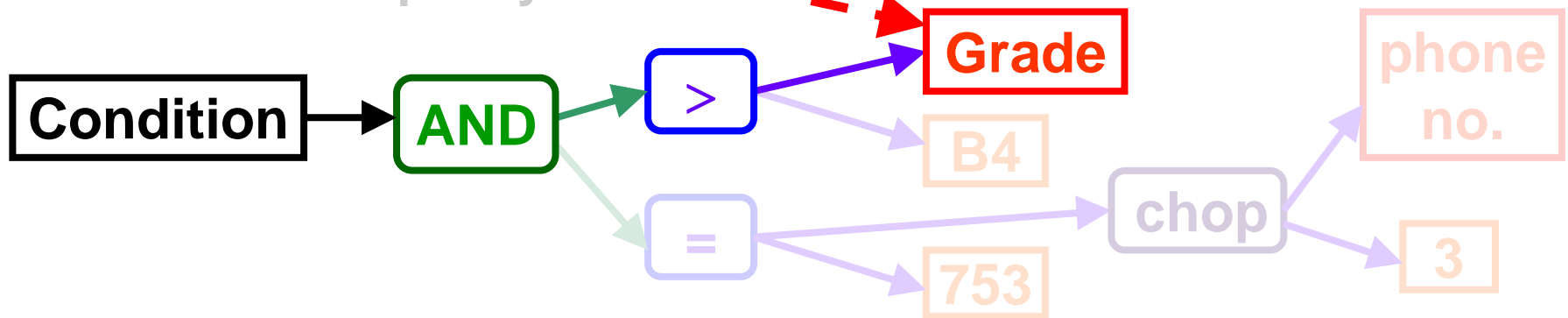




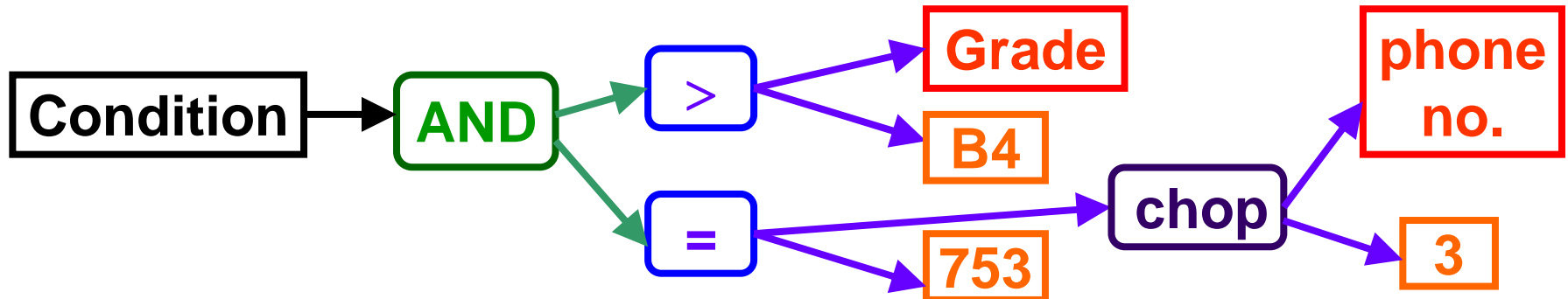
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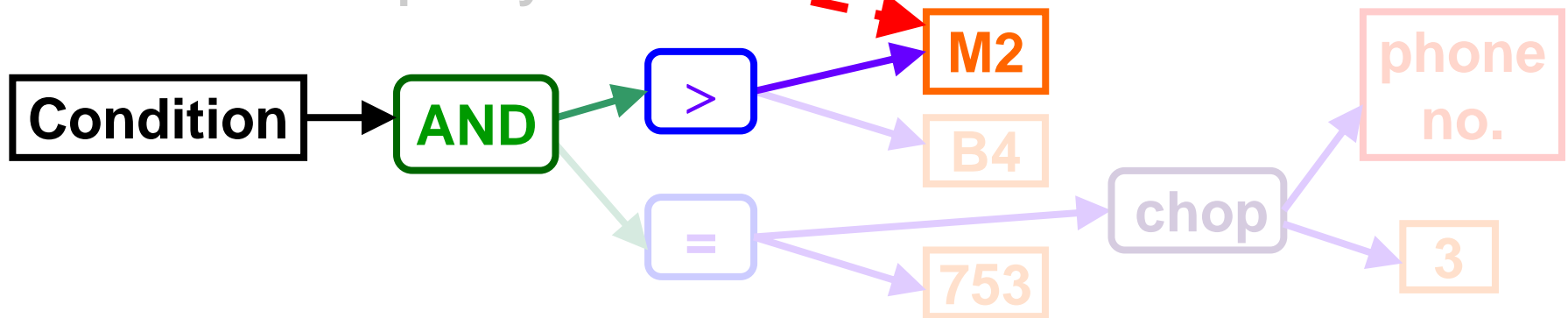




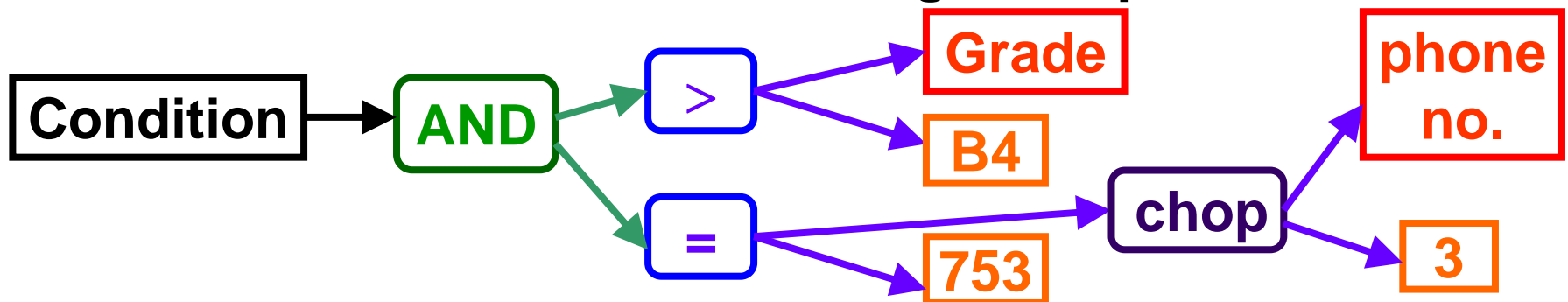
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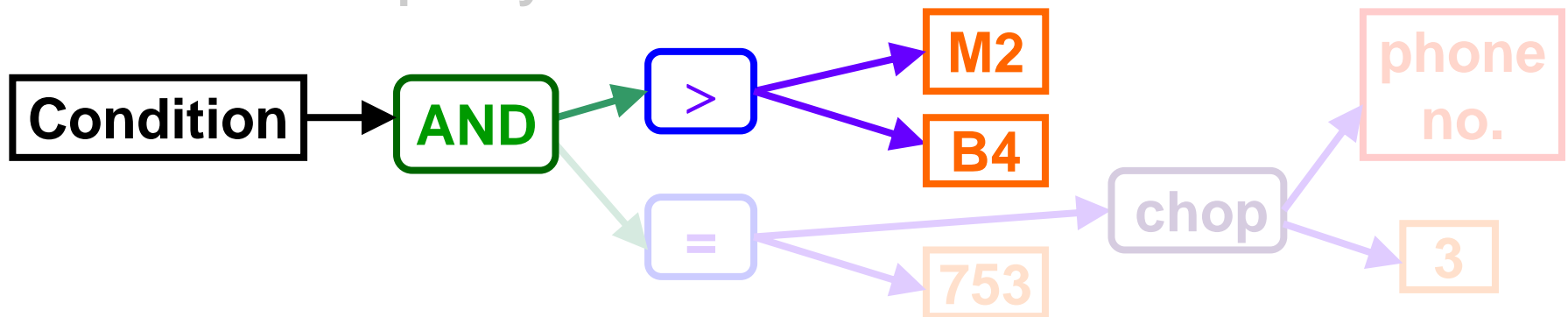




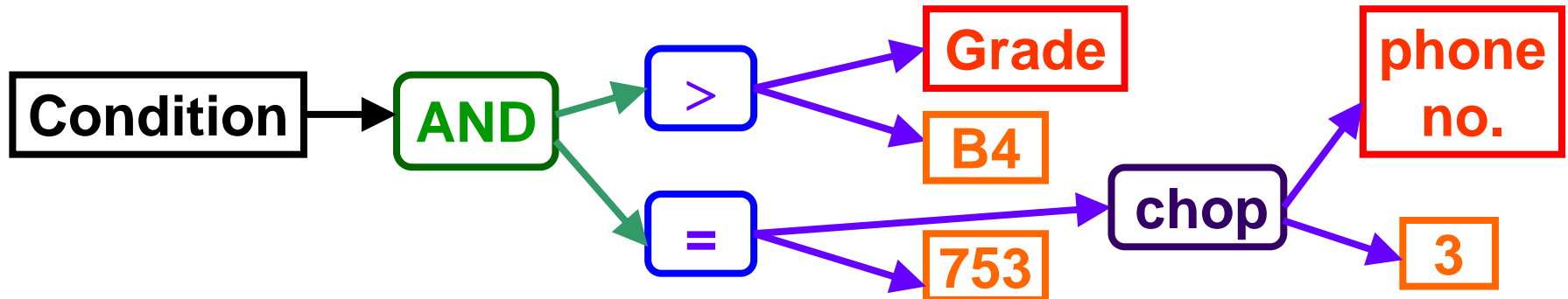
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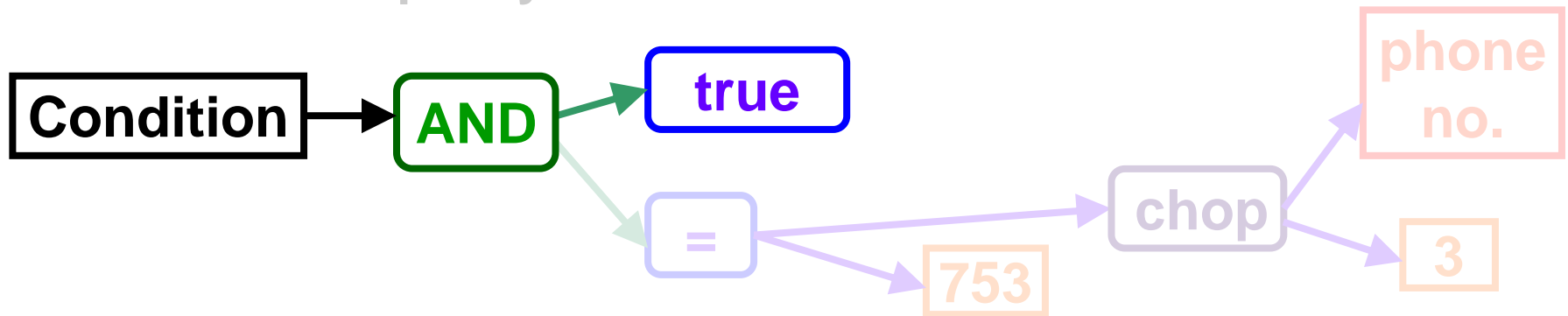




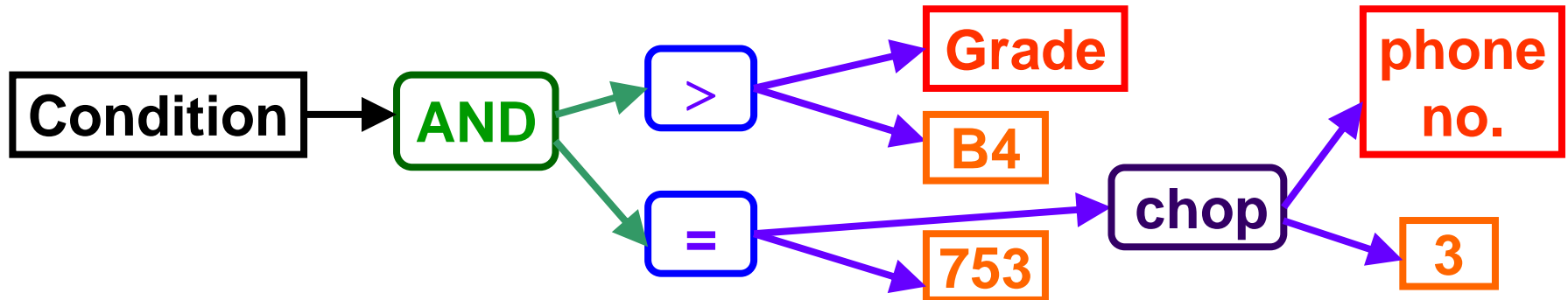
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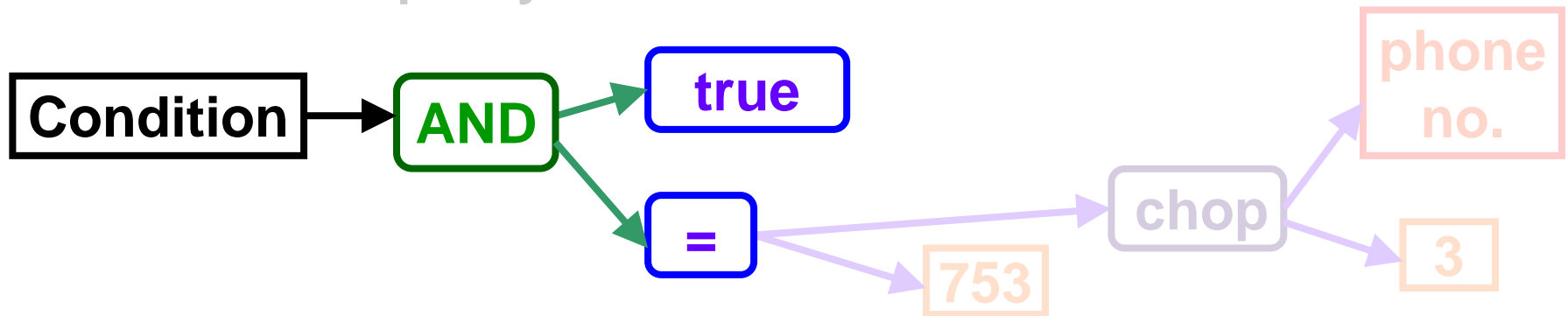




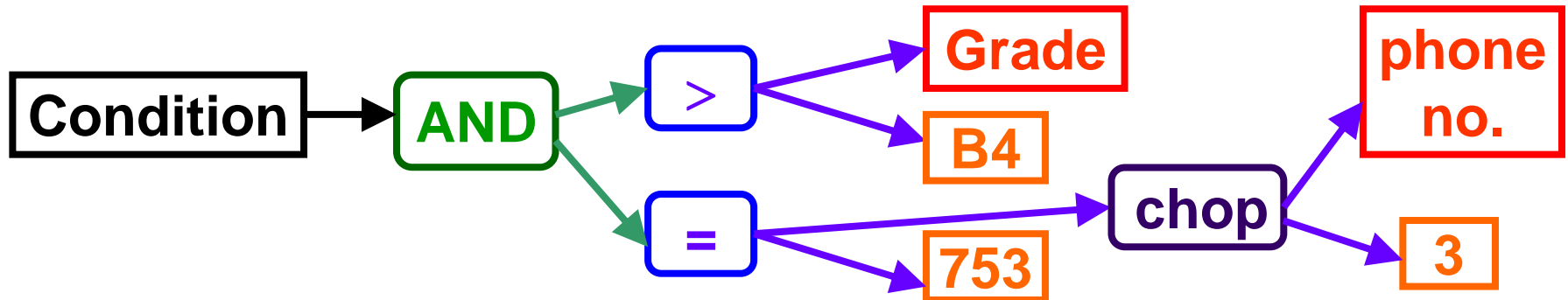
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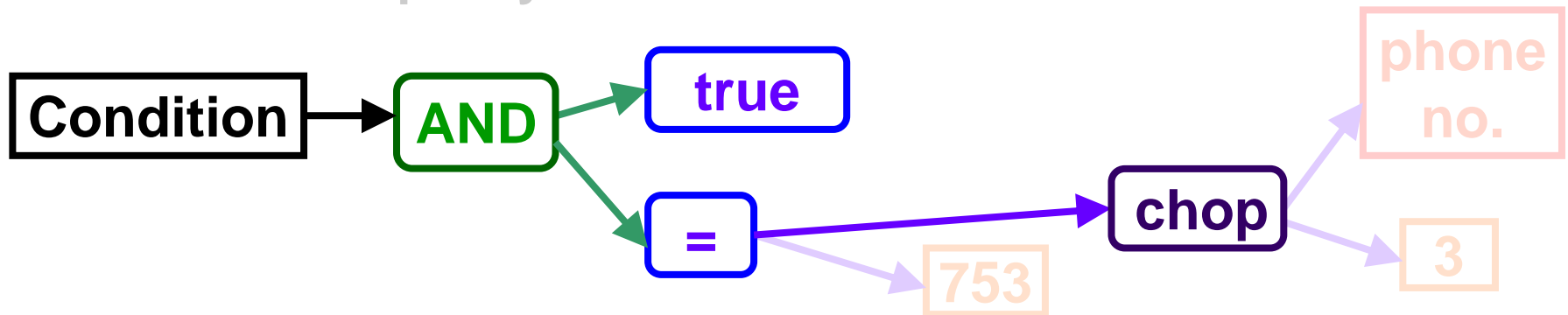




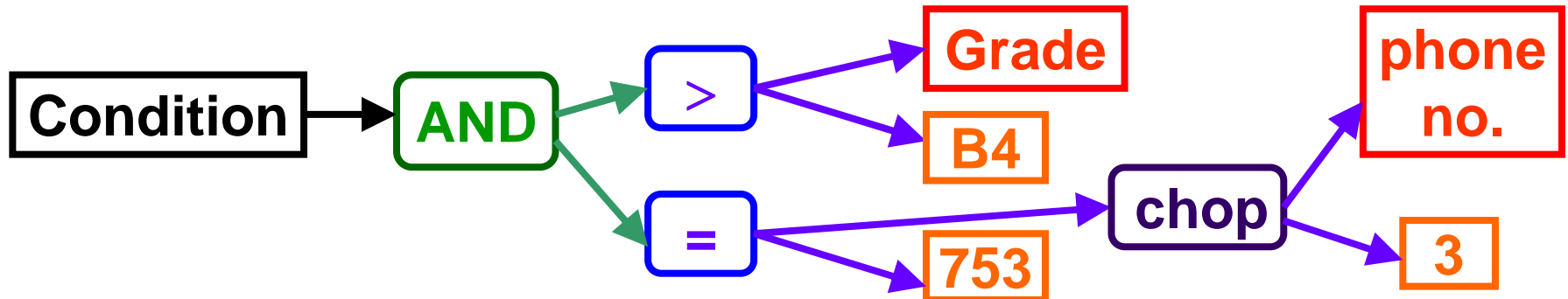
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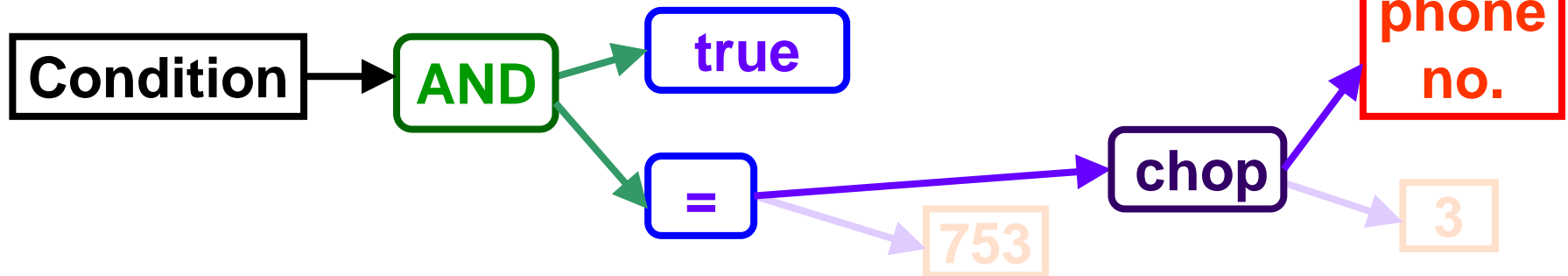




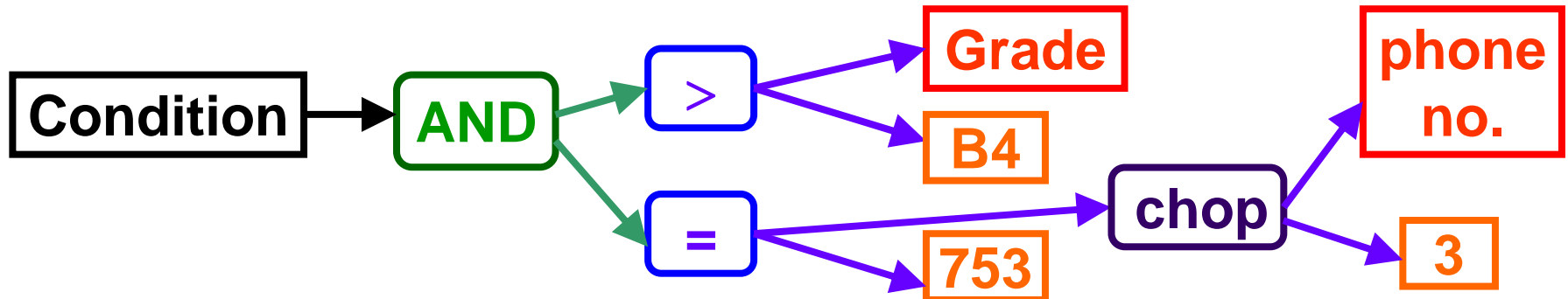
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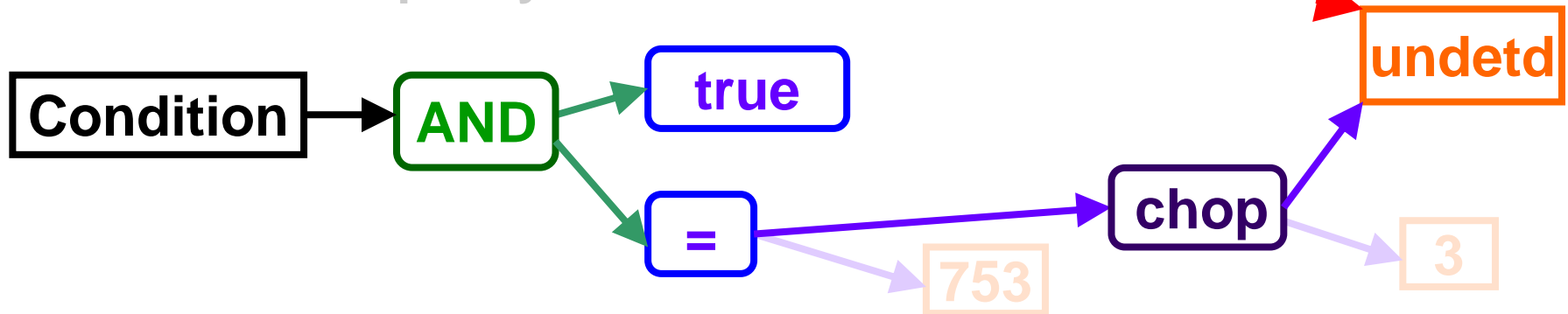




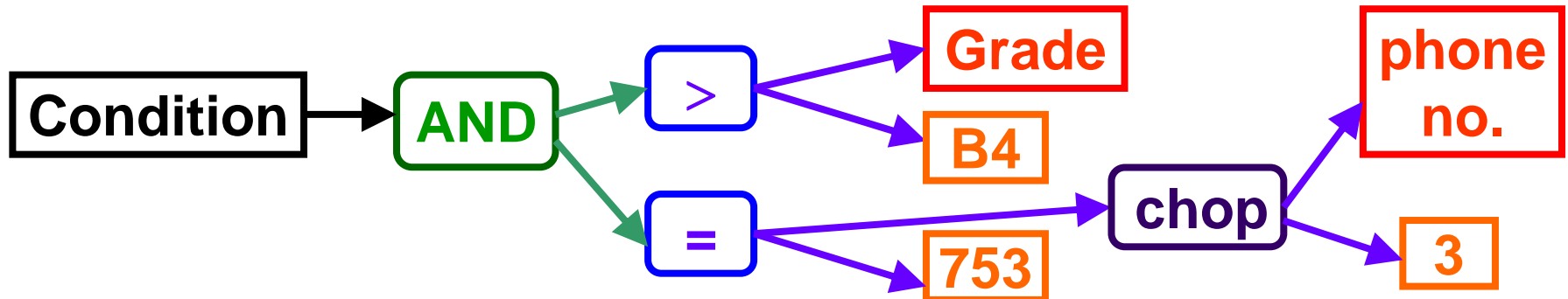
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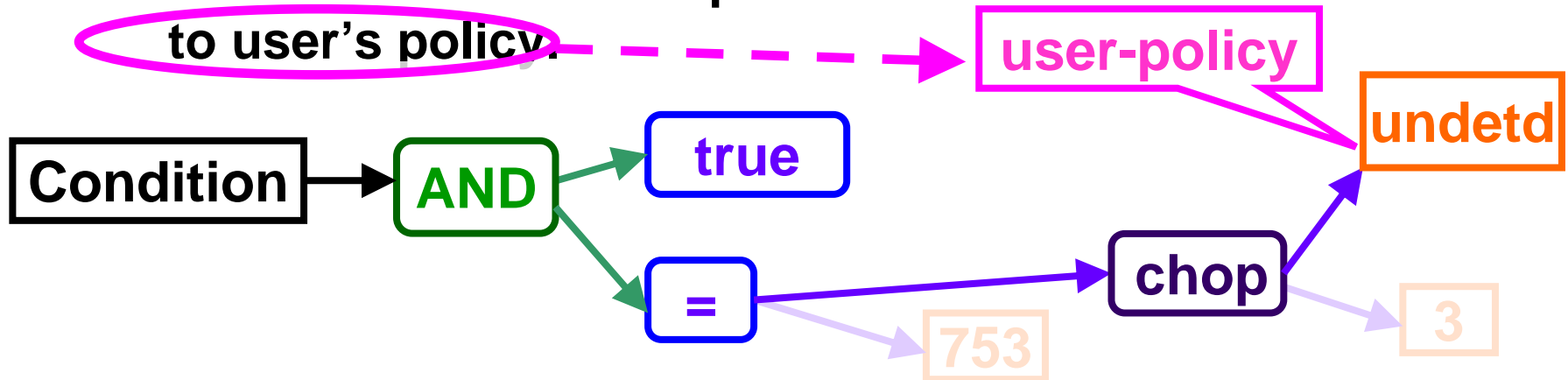




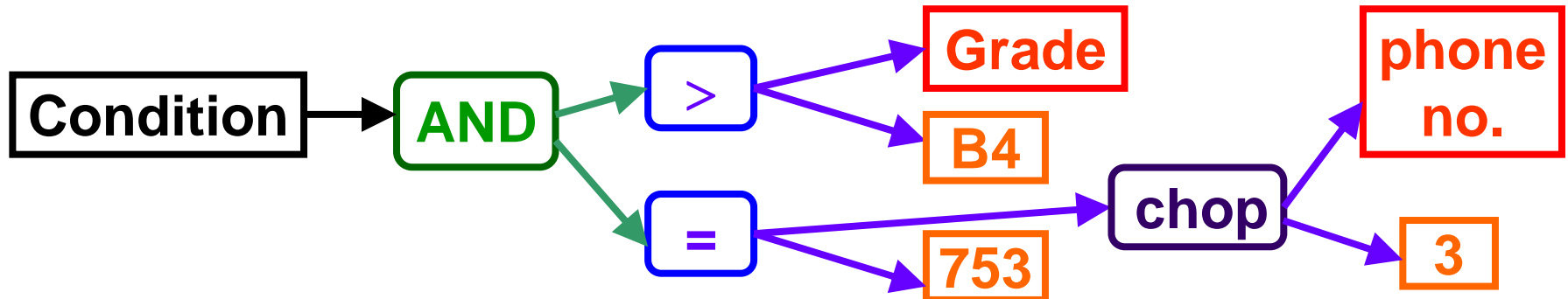
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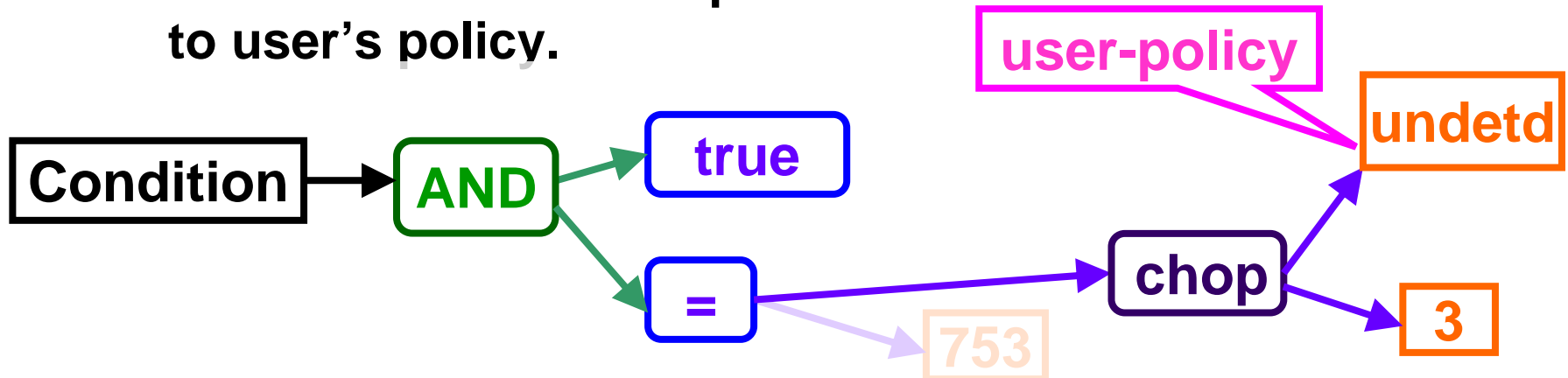




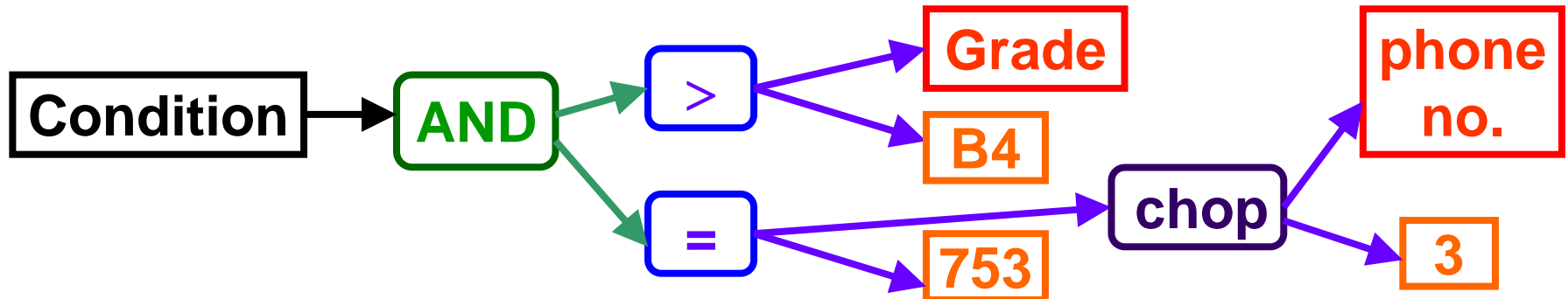
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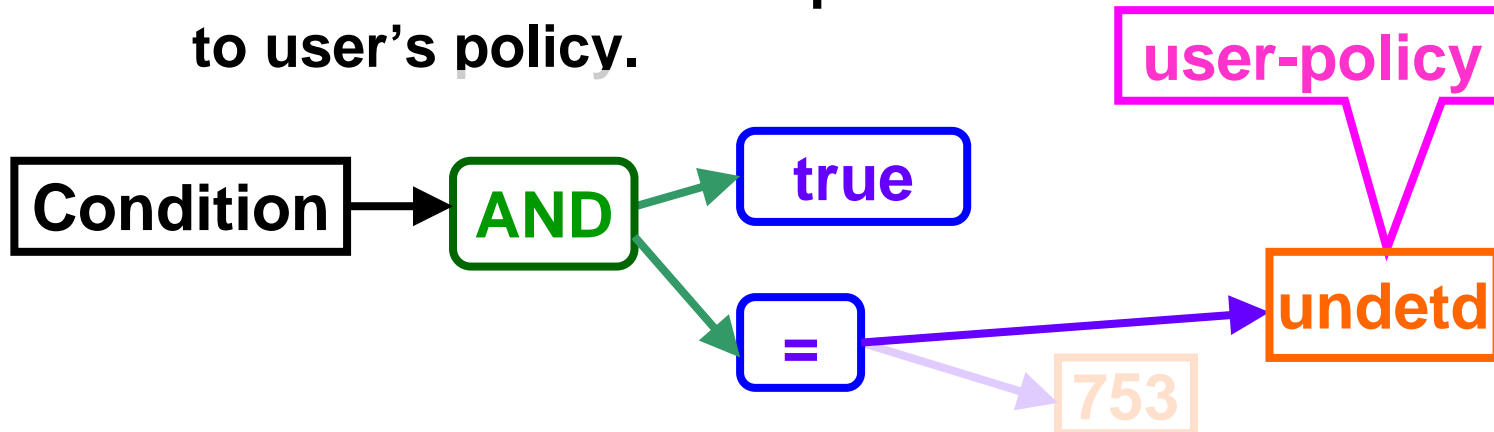




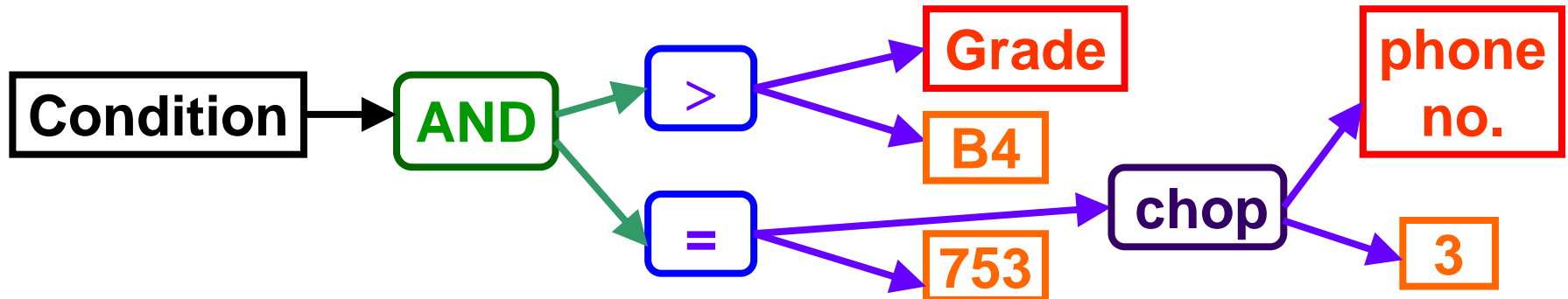
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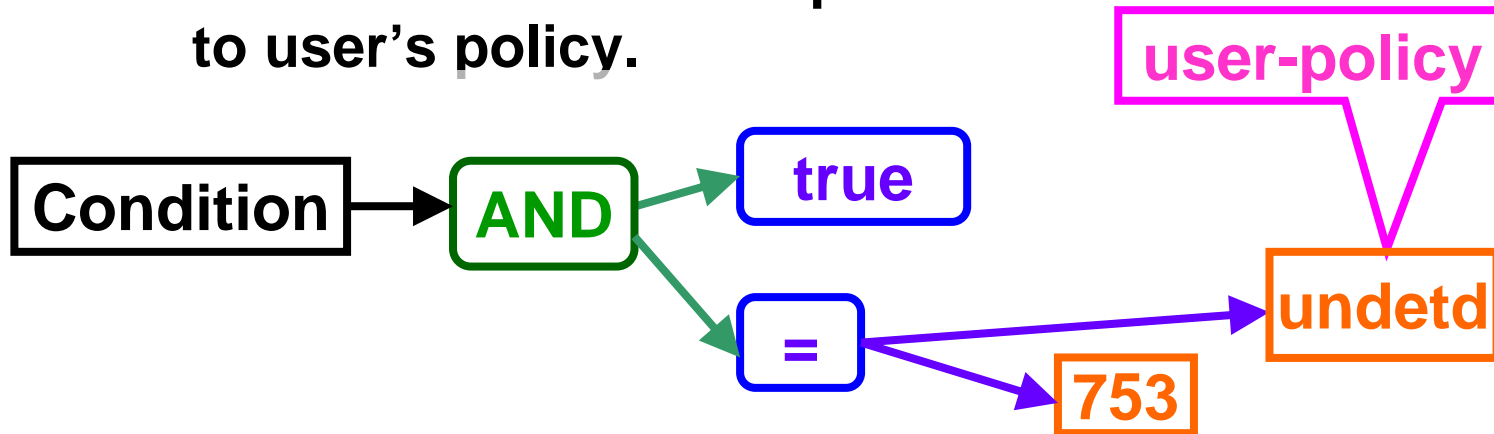




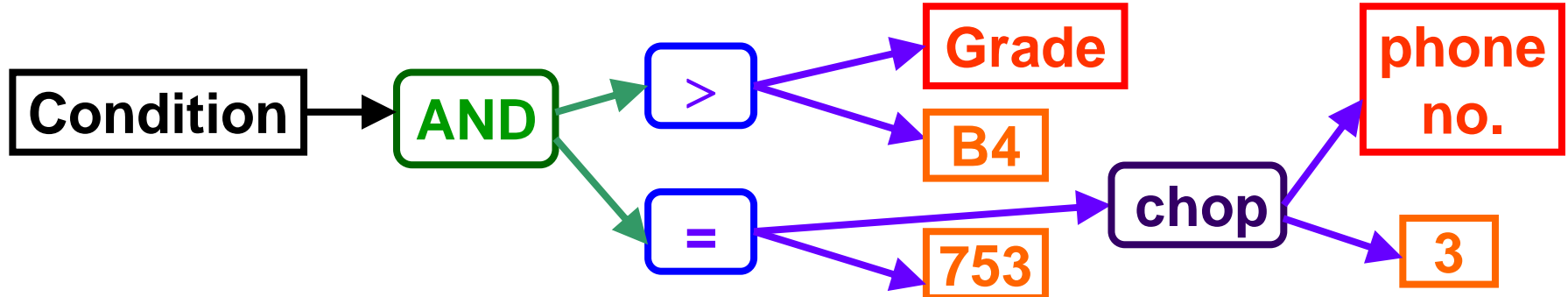
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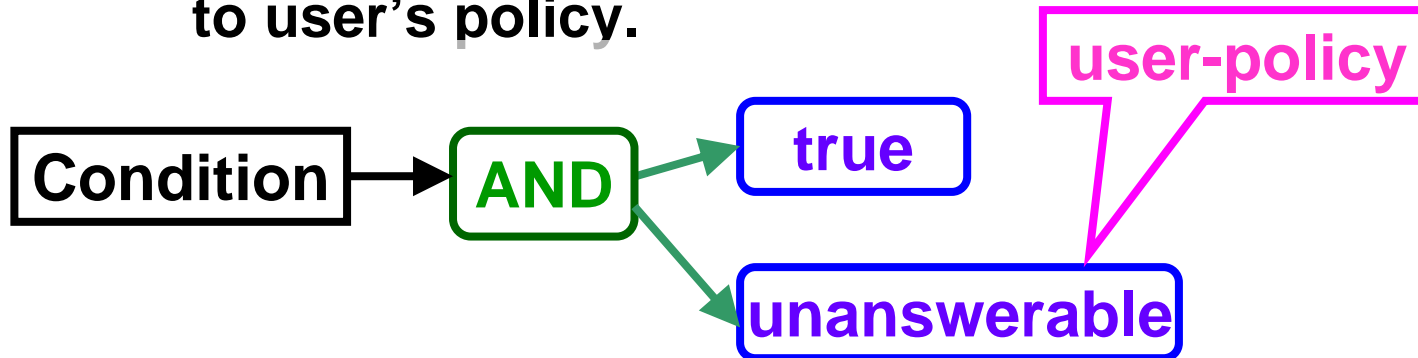




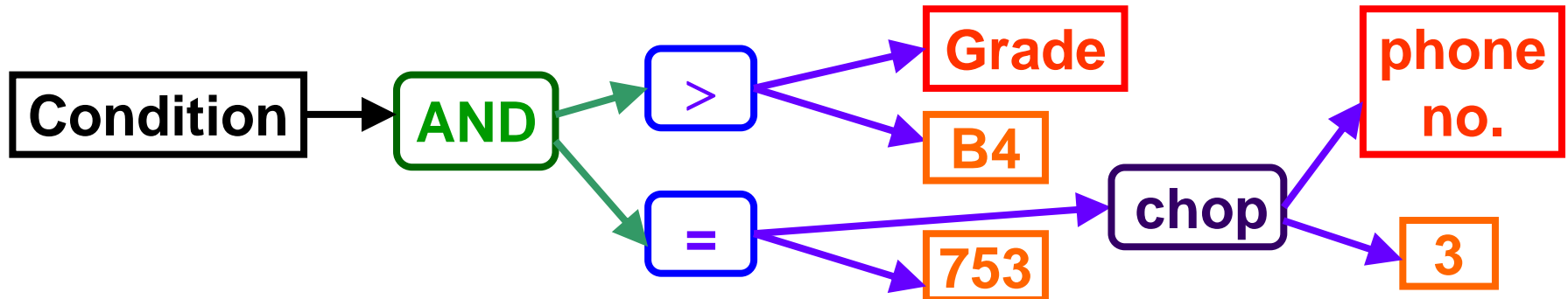
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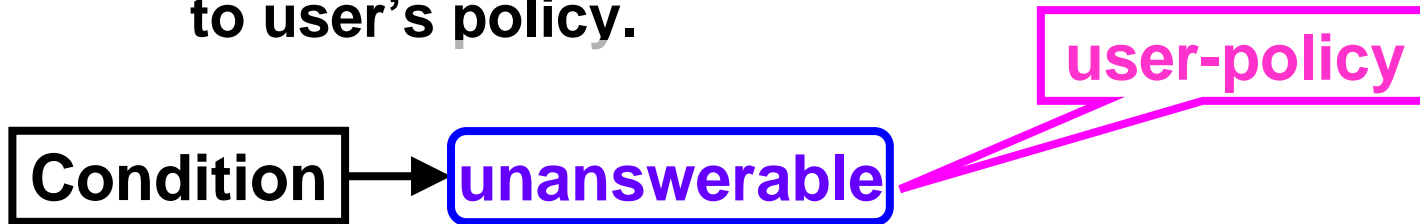




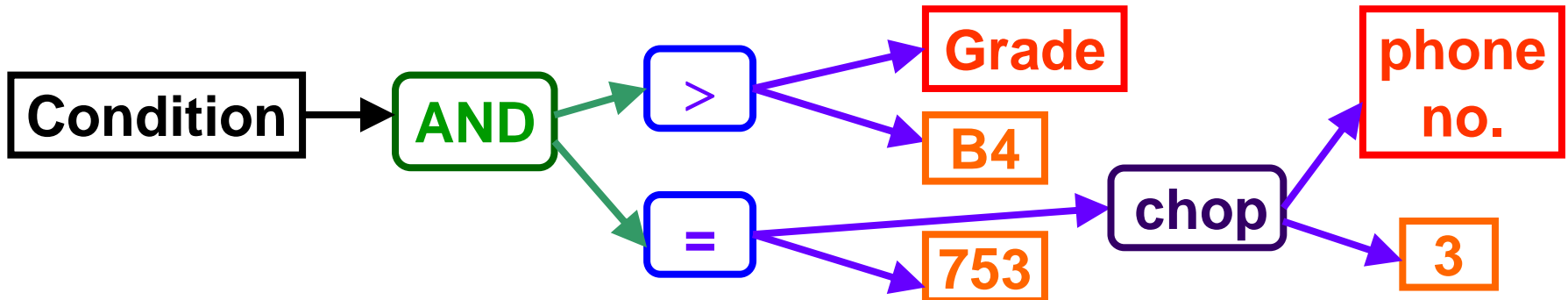
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Evaluation and its Result

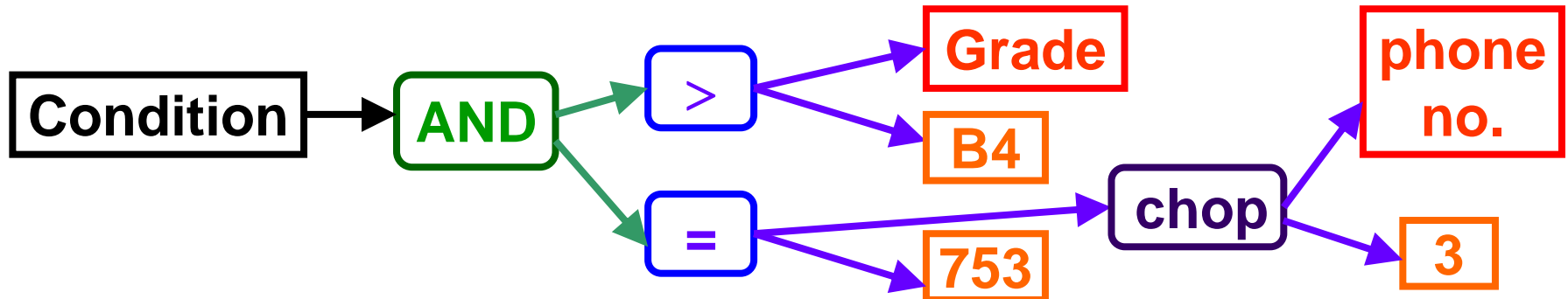
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user-policy

unanswerable

Condition: “Grade” > “B4” & first 3 digits of “phone no.” = “753”





Evaluation and its Result

- Evaluation

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user-policy

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- Result



Evaluation and its Result

- Evaluation

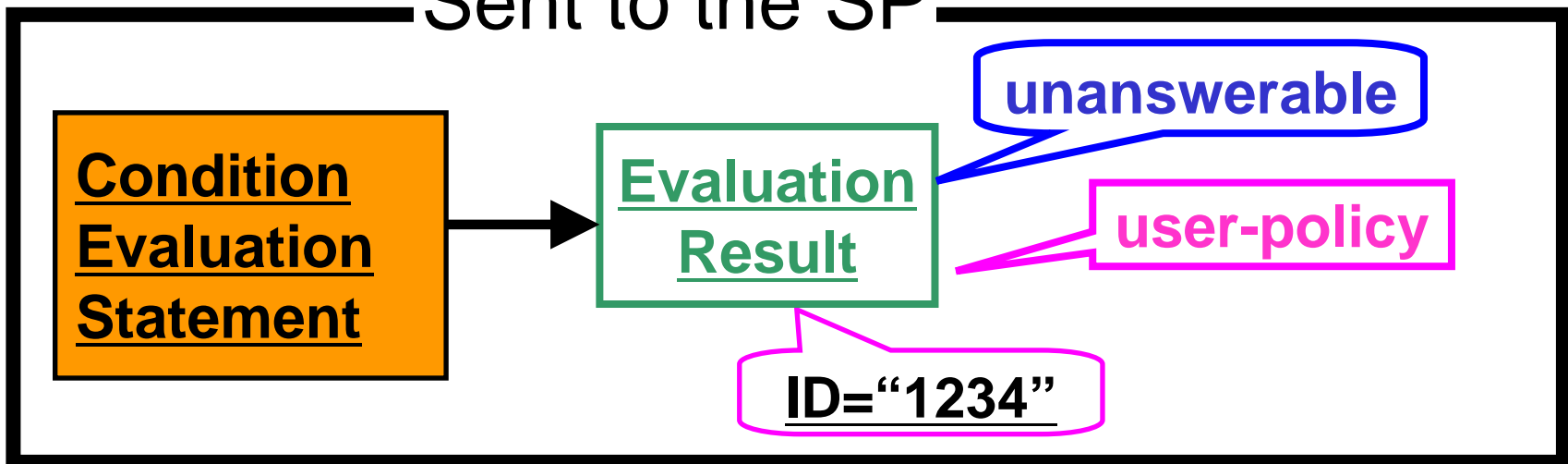
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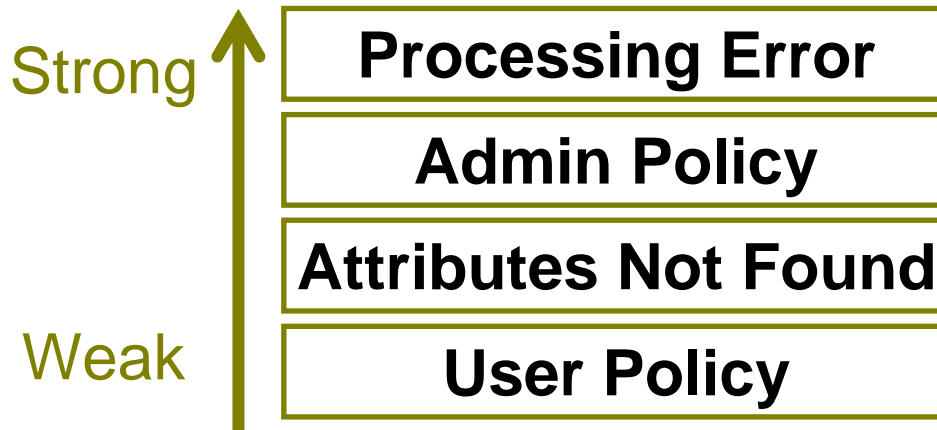
Sent to the SP





“Reasons” of “Unanswerable”

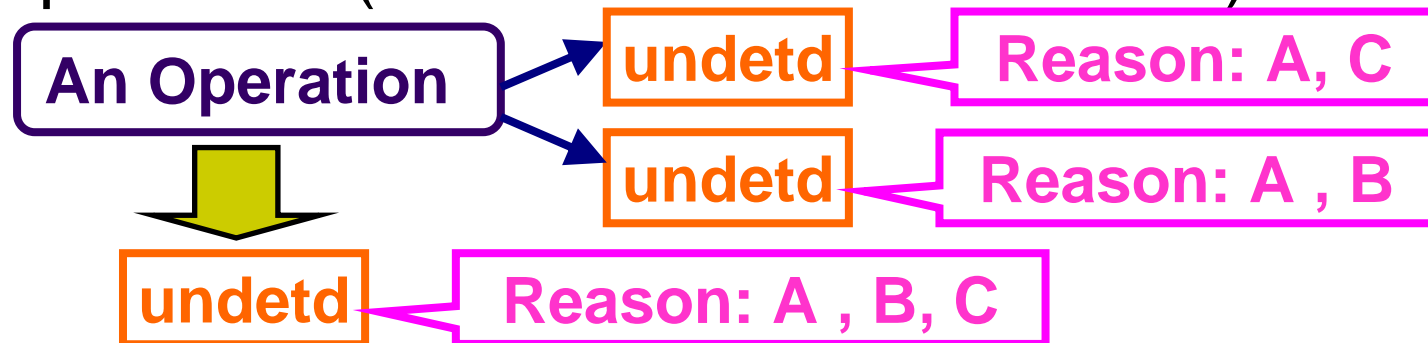
- To be ‘polite’ to users
- An IdP attaches just one “reason” to a evaluation result of “unanswerable”
- 4 Kinds of “reasons” of “unanswerable”



Calculation of “Reasons” @IdP



- Immediate Value: has no reasons
- Attribute Designator: calculates reasons based on ARPs actually applied for filtering if no values are obtained.
- Operation: (in case of “undetermined”)

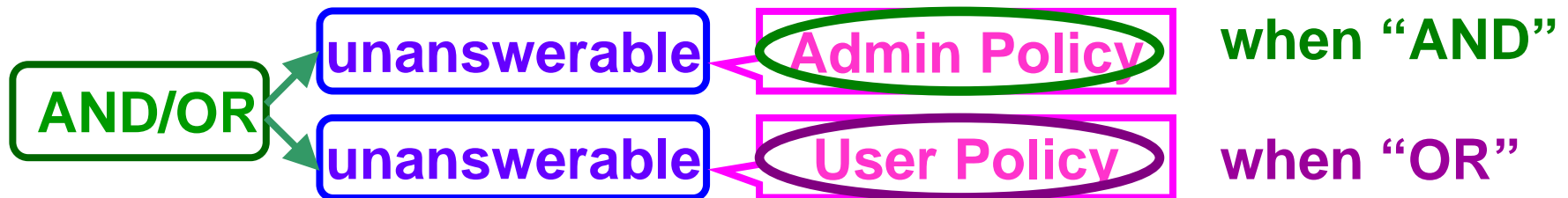


- Predicate: (in case of “unanswerable”)
 - As well as the case of “Operation”

Calculation of “Reasons” @IdP



- Logic Function (in case of “unanswerable”)
 - AND: “the strongest reason” in its operands
 - OR: “the weakest reason” in its operands
 - NOT: reasons of its operand

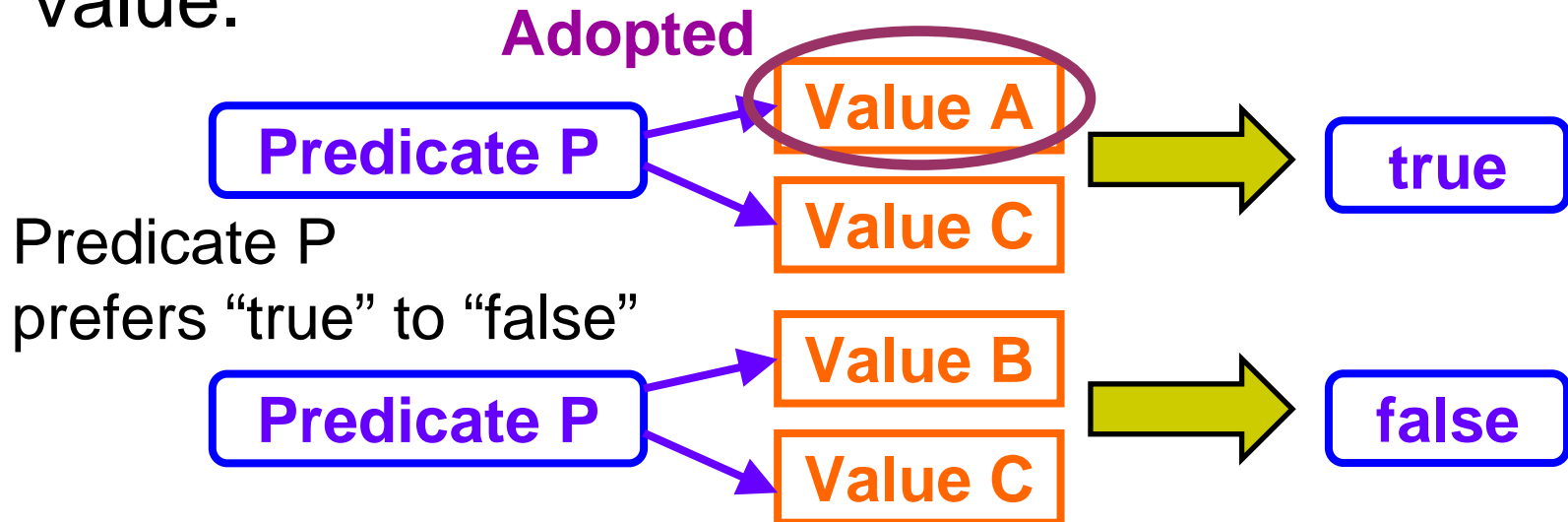


- Condition (in case of “unanswerable”): “the strongest reason” among its child node

Coping with Multivalued Attributes (to be implemented)



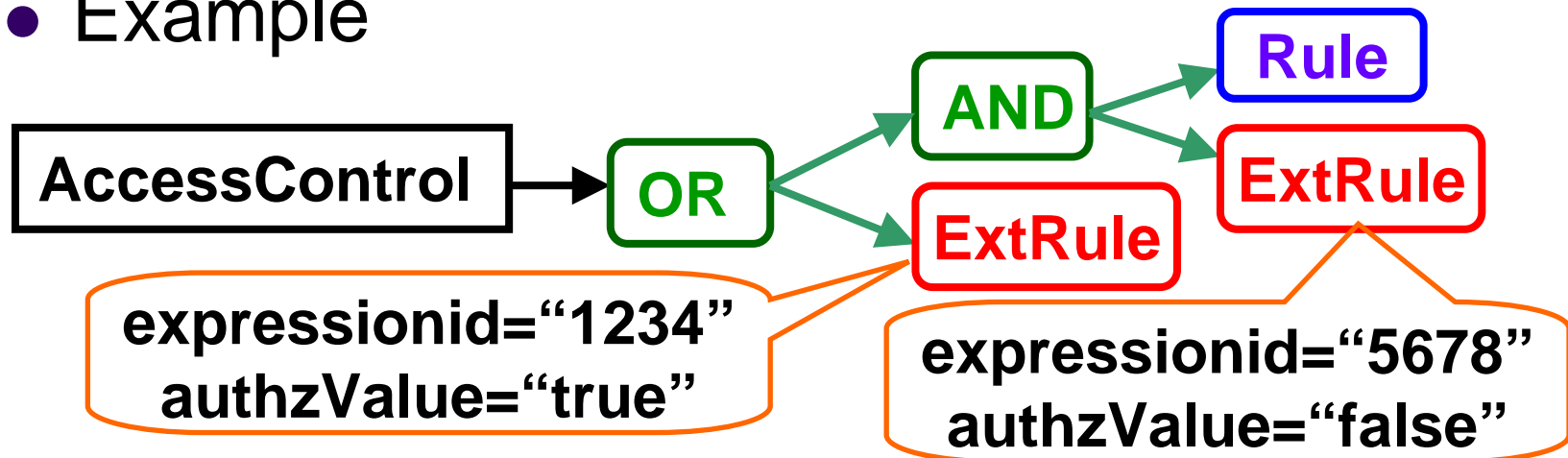
- Specify preference of each “Predicate” as to “true/false”
- Adopt the attribute value with which the predicate is evaluated as the most desirable value.



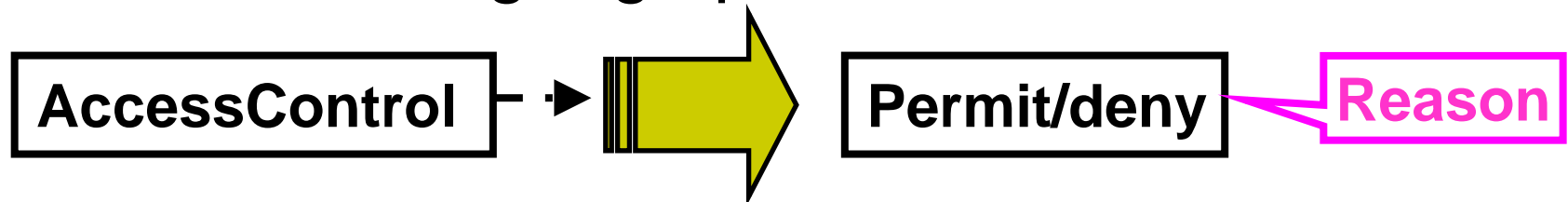


Access Control @SP

- Example



- Processing: in a similar way by which the condition language processed at IdPs



"unanswerable" with its reason → "deny" with the reason

Handling “unanswerable” (“deny”) According to “reason”



Shibboleth

Authorization Failed

Based on the information about you, you are not authorized to access the resource at "https://s".

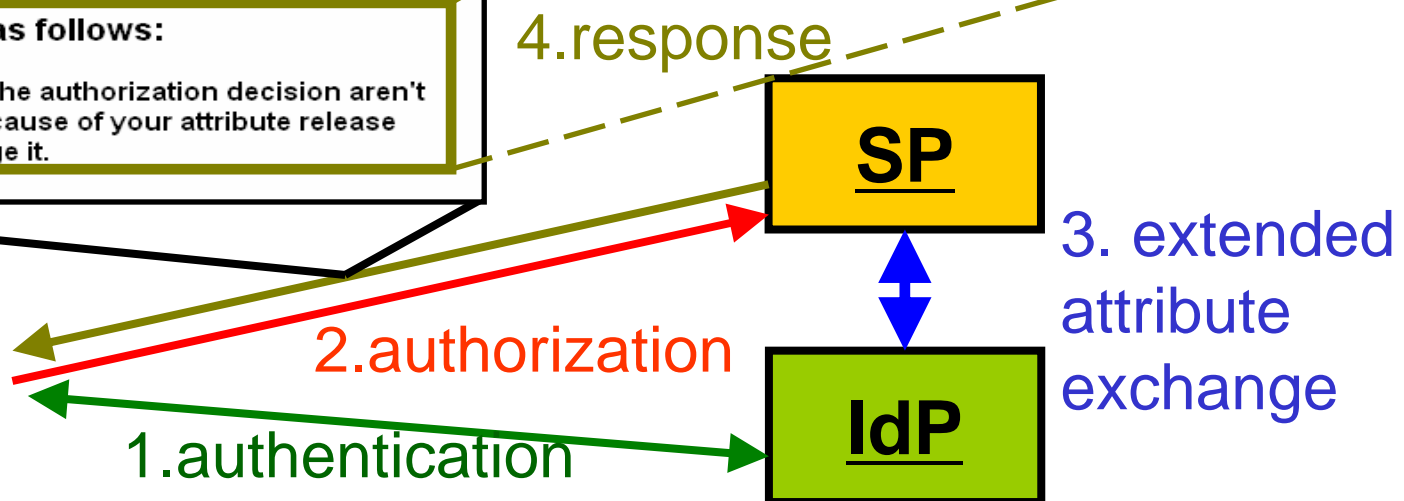
Please contact the administrator of this service or application if you believe this to be an error.

The reason of denial is as follows:

Some attributes required for the authorization decision aren't released to us, and this is because of your attribute release policy. So, you need to change it.

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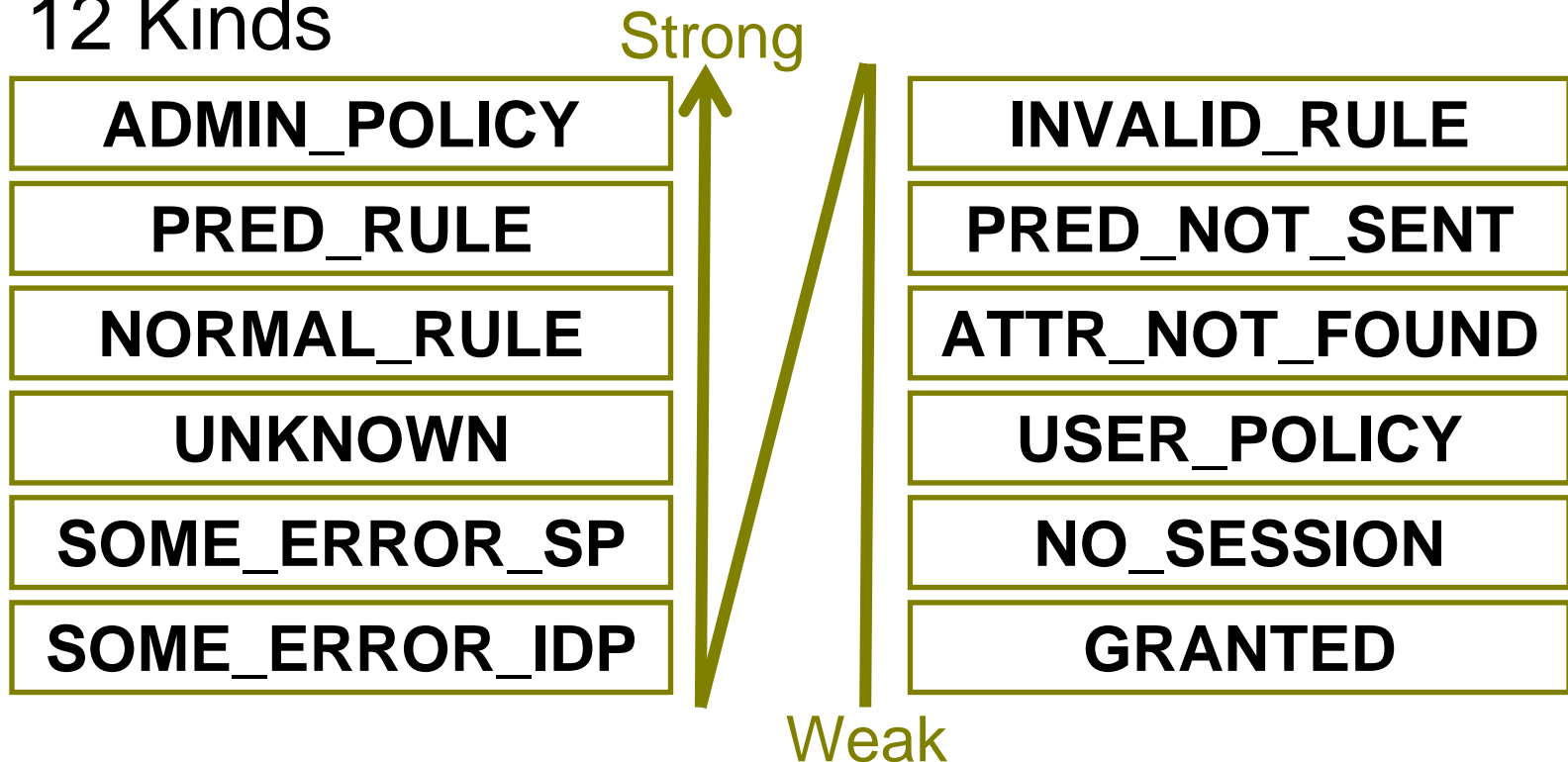
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“Reasons” of “Deny” @SP

- 12 Kinds

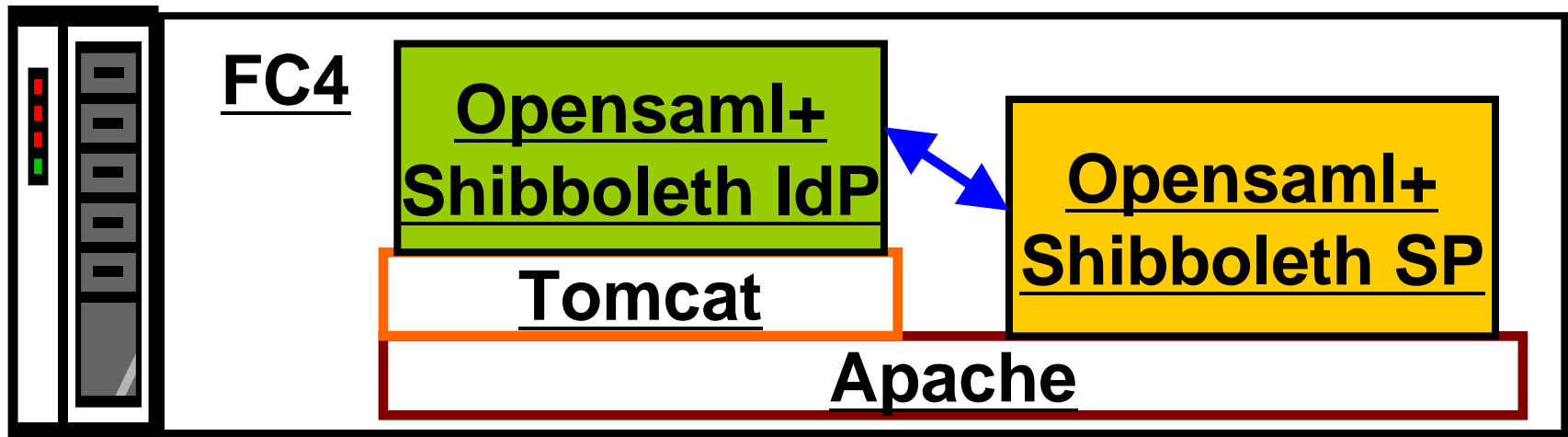


- IdP > SP > user (-side reasons)
- Definite “deny” > error > any shortages



Implementation

- Platform: Apache 2.0.58/Tomcat 5.5.20/
Java 2 SDK 1.5.0 on Fedora Core 4
- IdP: Opensaml 1.1b, Shibboleth 1.3c
- SP: Opensaml 1.1a, Shibboleth 1.3f (C++,
source code build)





Demonstration

- A user m1 tries to access a DEMO book rental service at an SP
 - AuthZ condition: user's grade \geq B4
- 1st trial: denied due to one of the user's policies
 - ↓ change the policy
- 2nd trial: successfully authorized



Agenda

- Outline of our work: extending attribute exchange to enhance privacy in Shibboleth
- Design and implementation
- **Summary and future works** ←



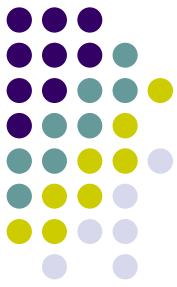
Summary

- An Extended protocol of attribute exchange in shibboleth to enhance user's privacy
 - An SP to an IdP: conditions for authorization
 - The IdP to the SP: their evaluation result with reasons why the IdP evaluated so
- How to control access requests
 - Utilizing reasons of “unanswerable” and “deny”
- Implementation and Demo.



Future Works

- Policy filtering
- Application to Shibboleth 2.0
- Verification of practicality
- Blend of the existing strategy of attribute release at IdPs and that of our extension



Thank you for your attention !
Questions ?