

TTC 2018 SOLUTION PRESENTATION

A JastAdd- and ILP-based Solution to the Software-Selection and Hardware-Mapping-Problem

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Idea

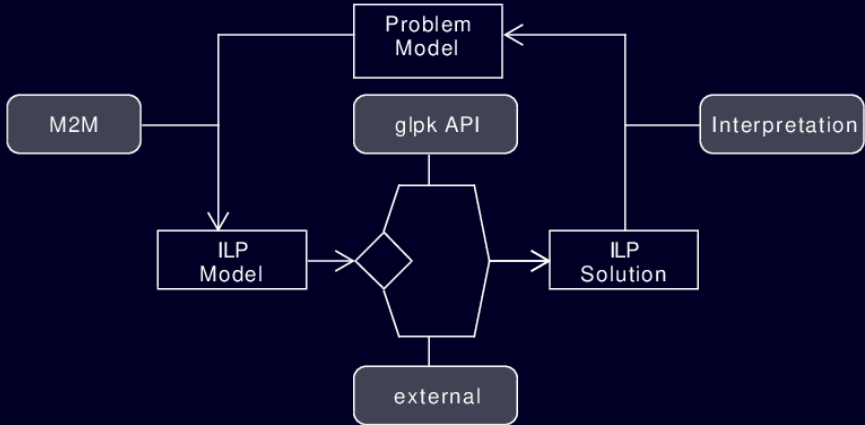
Step 1

- Transform problem into Integer Linear Program (ILP)

Step 2

- Solve ILP

Idea

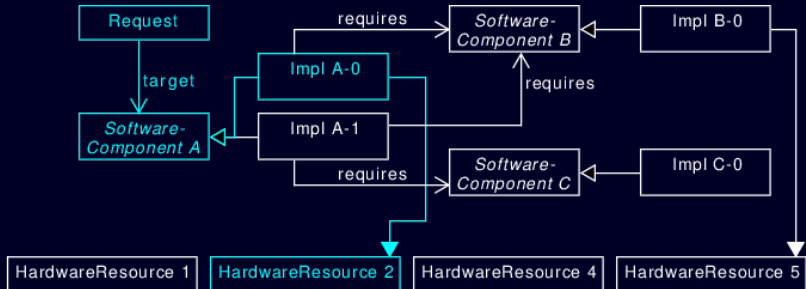


Step 1: Problem → ILP

- Utilize reference attribute grammars
 - Transform model with *higher order attributes*:
 1. Extend grammar to store ILP as subtree
 2. Transform problem into ILP using *nonterminal attributes*
 3. Use subtree to load ILP into solver
 4. Profit

Step 2: ILP → Solution

- Enumerate all mappings
- Assigning one binary variable to choose an implementation for a request deploying it on a resource



Name = request#implA0#res2

Validity and Optimization

Architectural constraints

- Max. 1 Impl/Component and max. 1 Impl/Resource

Request constraints

- Request target component chosen fulfilling requirements

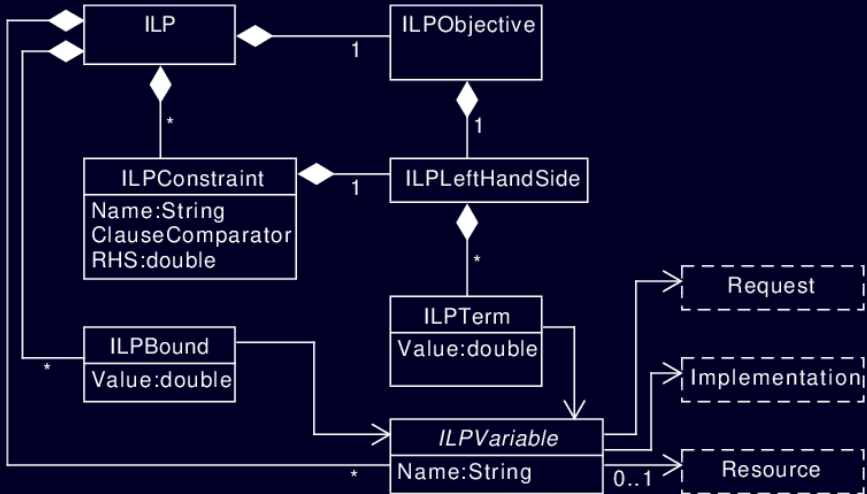
Negotiation constraints

- Deploy required components
- Fulfill component requirements

Optimize generation

- Exclude mappings with invalid hardware constraints

ILP intermediate model (Model)

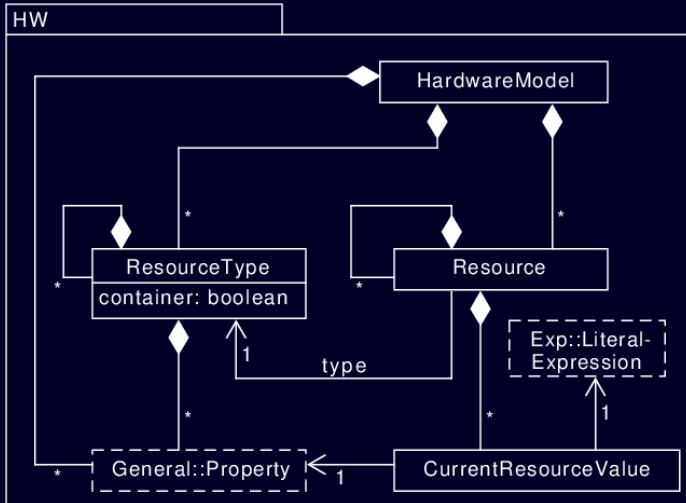


ILP intermediate model (Text form)

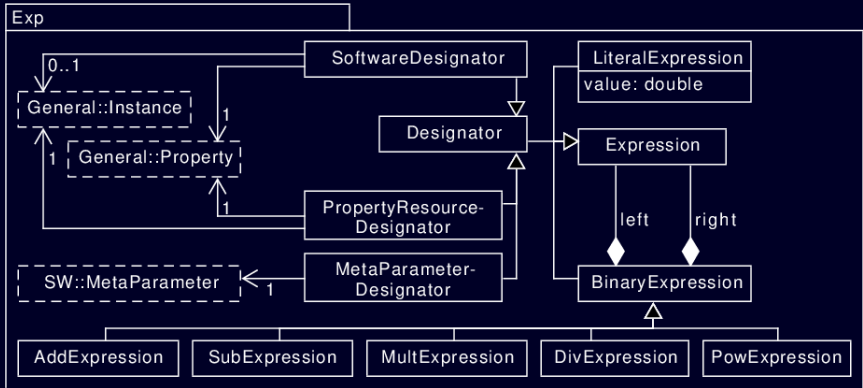
```
Minimize 123 req0#implA1#r1 + 125 req0#implA1#r2
Subject To
  req0#implA0+ req0#implA1 <= 1
Bounds
  0 <= req0#implA1#r1 <= 1
Generals
  req0#implA1#r1
End
```


Backup

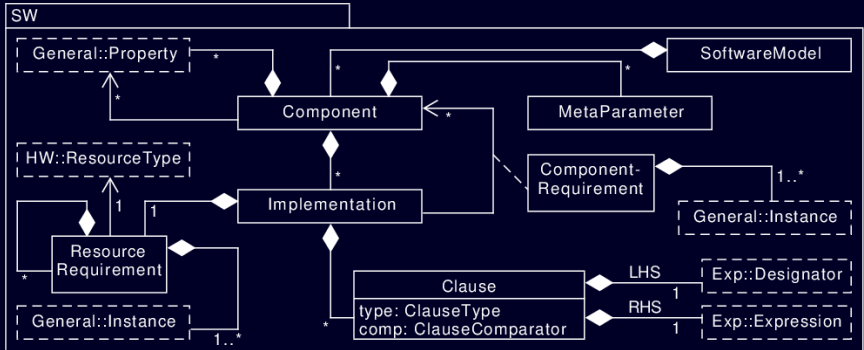
Grammar Hardware



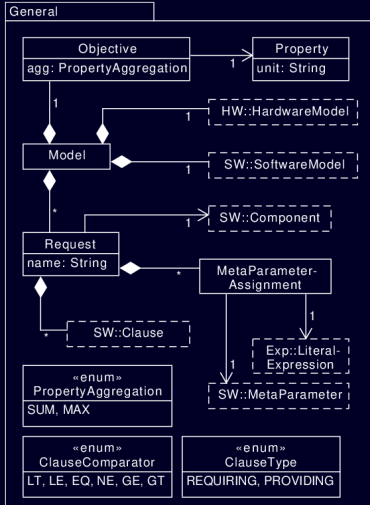
Grammar Expression



Grammar Software



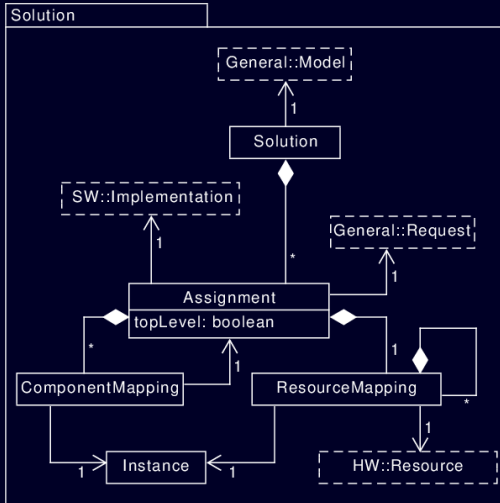
Grammar General







Solution
































General::Model

Grammar Solution



Measurement results

 = valid and in time
  = valid, but timeout
  = invalid
 = optimal (if known from ILP solver)

Scenario	ACO	EMFeR	ILP (direct/ext)	Simple
0 trivial	6 	194 	24 / 21 	1 
1 small	8  	212 	37 / 40 	6 
2 small-hw	11 	240 	44 / 61 	8 
3 small-sw	451 	7min52s 	377 / 572 	15min 
4 medium	1min33s  	8min22s 	8min28s  	15min 
5 medium-hw	4min48s 	11min15s 	15min  	15min 
6 medium-sw	15min 	11min15s 	15min 	15min 