WebOpt embedded optimization

Version 2.37

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1 Introduction

WebOpt is an embeddable optimization software for nearly any operation system. It can be run from command line (shell) or with web interface. Therefor a browser is required. At the moment the following optimization types are supported:

1.1 Cutting

- Bars [1D].
- Panels [2D].
- Circle (one diameter).
- PCB panel (one layout).

1.2 Palletizing

- Unmixed packages (exact). May need more time due to the given problem.
- Unmixed packages (fast, a few seconds).
- Mixed packages in one layer (same height).
- Circle / Cylinder (one diameter).

1.3 Import

- XML files.
- TXT files.
- XLS Excel © 95 or 97 file.

1.4 Export

- PDF. Full report including panel or pallet scheme. One pdf file.
- HTML. Full report including panel or pallet scheme. One html file with PNG image files.
- XML. Solution data. One XML file.

1.5 Invoking WebOpt

WebOpt can be started from shell. The following example shows a XML-Import and PDF-Export.

```
$ webopt -cmd -pdf myproject.xml
```

1.6 Invoking WebOpt with Browser GUI

WebOpt is spawning an internal webserver automatically if no options are passed. The webserver is an additional license option !

```
$ webopt
```

1.7 Embed WebOpt into your application

WebOpt is available as external program or linked as dynamic library.

Type	Windows	Unix	Call
WebOpt program	.exe file	bin file	External process. Invoked via system() call.
WebOpt shared lib	.dll lib file	.so lib file	Dynamically linked. Function call in your thread or process.

We also offer additional services to integrate WebOpt into your product or environment. Robots, CNC controls, database server for example. Please contact us for special customization.

1.8 Contact

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2 Installation

2.1 Windows

Please start the WebOpt installer and follow the instructions.

2.2 Linux / Unix

Untar the package file

```
$ tar -xjf WebOpt.tar.bz2
```

2.3 Mac OS X

Unpack WebOpt.app.zip (double click). Copy the WebOpt.app into your application folder.

3 Invoking options

Usage:

```
$ webopt <options> <project file (*.opt,*.txt,*.xml) >
```

Option	Description
help | /? | --help	Short help text.
-cmd	Switch to the command line mode. Must be first!
-log	Create a log file.
-xml	Write solution as XML file.
-summaryxml	Write solution summary as XML file. No layout data.
-pdf	Write solution as PDF file.
-startviewer	Start the internal PFD viewer, e. g. Acrobat Reader.
-stripe	Use the stripe Algorithmus for cutting optimization.
-bub | -wincut2	Use the bub Algorithmus for cutting optimization (nested).
-bestcut | -allcut	Use all internal cutting algorithus and write the best solution.
-dir <directory>	Poll the order dir. Read any (*.opt) optimization input file and start the optimization. The input files are renamed (*.done) after the optimization.
	Webserver single user GUI options
-de	Force german language.[Webserver single user GUI only]
-en	Force english language.[Webserver single user GUI only]
-prism	Start WebOpt in prism browser.[Webserver single userGUI only]
-chrome	Start WebOpt in google chrome browser.[Webserver single user GUI only]
-root	Overwrite root directory for data and ressources.[Webserver single user GUI only]

The options are casesensitive !

3.1 Examples command line only (no gui)

Input file is TXT, output is PDF.

```
$ webopt -cmd -pdf Project0815.txt
```

Input file is TXT, output is PDF. Start PDF Viewer after optimization.

```
$ webopt -cmd -pdf Project0815.txt -startviewer
```

Input file is XML, output PDF and XML.

```
$ webopt -cmd -pdf Project0815.xml
```

Input file is XML, output is PDF and XML. Start PDF Viewer after optimization.

```
$ webopt -cmd -xml Project0815.xml -startviewer
```

Server mode. Read opt files. Write PDF. Optimization type: best cut.

```
$ webopt -cmd -pdf -bestcut -dir
```

3.2 Examples local webserver GUI (single user)

Run webopt in chrome browser in english. Looks like a standard application.

```
$ webopt -chrome -en
```

Run webopt in prism browser in german. Looks like a standard application.

```
$ webopt -prism -de
```

4 TXT input format

4.1 TXT Import input format overview

The TXT format is only for input use at the moment (read only). Valid file extensions are *.opt and *.txt .

```
Project
  |---Project data, e. g. name, id, label
Settings
  |---Saw limits, optimization type, etc.
Panels
  |---panel list
  | Panel 1
  | Panel 2
  | ...
  | Panel n
Parts
  |---part list
  | Part 1
  | Part 2
  | ...
  | Part n
```

We use TAB separators (ASCII value 9 (0x9 or \t)).

4.2 My first TXT Project

A simple TXT sample project with one panel + 2 parts looks like this:

```
ProjectName Order123
ID 1343
SawWidth 3

Panels
No Count XL YL ZL Material Information Comment
1 200 2540 1270 1 MDF - -

Parts
Nr Count XL YL ZL Material Turnable Information Comment
1 6 600 497 1 MDF Y - -
2 2 620 1034 1 MDF Y - -
```

Project sample: order1.opt

```
ProjectName%Order123:)
ID%_1343:)
Language%_en:)
:)
SawWidth%_3:)
:)
Panels:)
:)
No%_Count%XL%_YL%_ZL%_Material%_Information%Comment%:)
1%0%2540%_1270%_1%MDF%Panel to be cut%no margins. Unlimited panels:)
:)
Parts:)
:)
No%_Count%XL%_YL%_ZL%_Material%_Turnable%_Information%Comment:)
1%6%600%497%1%MDF%Y%bottom plate%_no grain:)
2%2%620%1034%_1%MDF%Y%door plate%_no grain:)
```

Sample TXT project showing TABS and CR.

4.3 My first TXT Project Solution

Project Order123

ProjectID: 1343

Saw width: 3

Max cut depth: 3

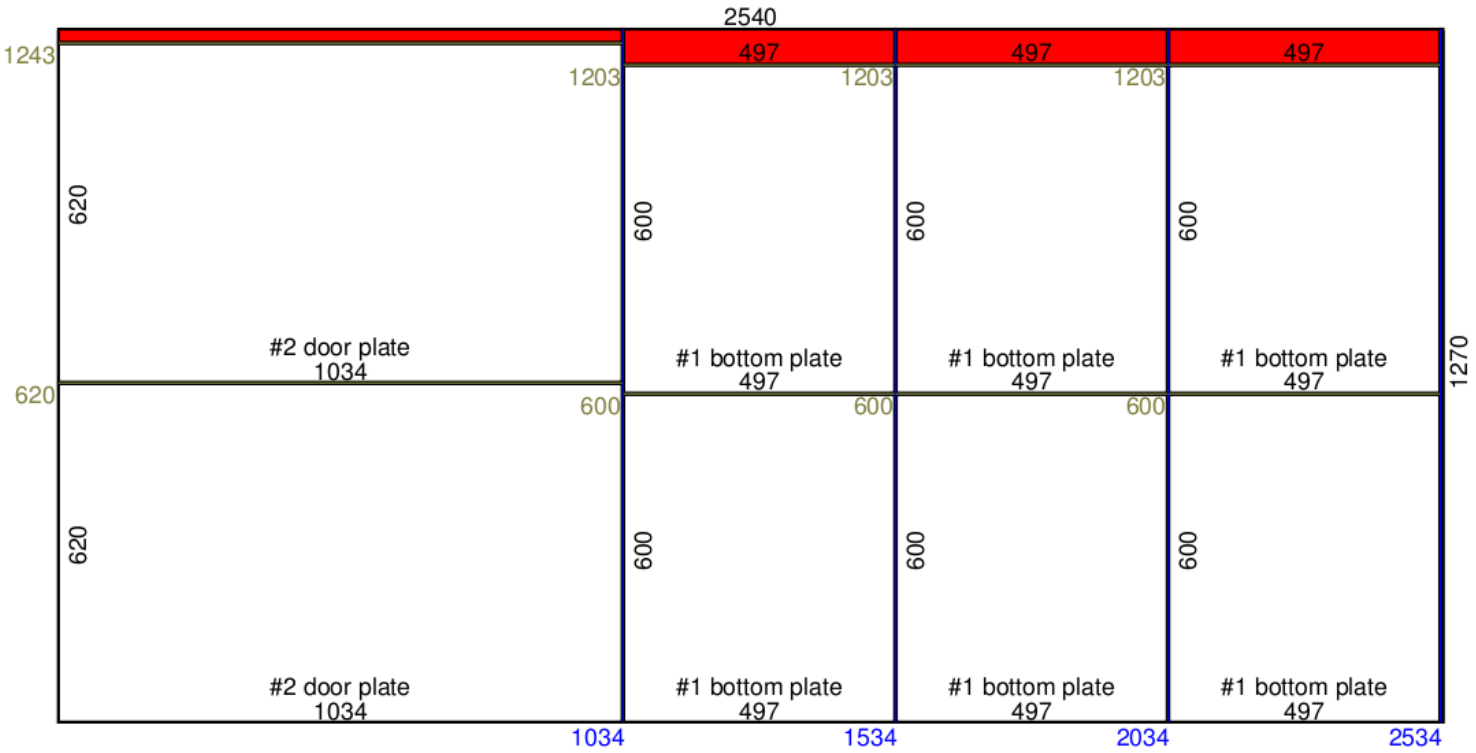
Input Panels/Parts

No	Quantity	Length	Width	Height	Material	Turnable	Information	Comment	Prod.	Diff.
1	no limit	2540	1270	1	MDF	-	Panel to be cut	no margins.	1	-
#1	6	600	497	1	MDF	yes	bottom plate	no grain	6	0
#2	2	620	1034	1	MDF	yes	door plate	no grain	2	0

Solution Panels

Utilization: 95.21 % Offcut: 4.79 %

Quantity	Length	Width	Height	Material	Information	Comment
1	2540	1270	1	MDF	Panel to be cut	no margins



Solution layout for TXT sample

Layout 1 [1]: 1 x

MDF 2540 x 1270 x 1 Utilization 95.21 % Offcut 4.79 %

No	Quantity	Length	Width	Information	Comment
	1	1034	24		Offcut
	3	497	64		Offcut
	1	3	1270		Offcut
#1	6	497	600	bottom plate	no grain
#2	2	1034	620	door plate	no grain

4.4 TXT keyword reference

4.4.1 Project

Project options. All values are optional.

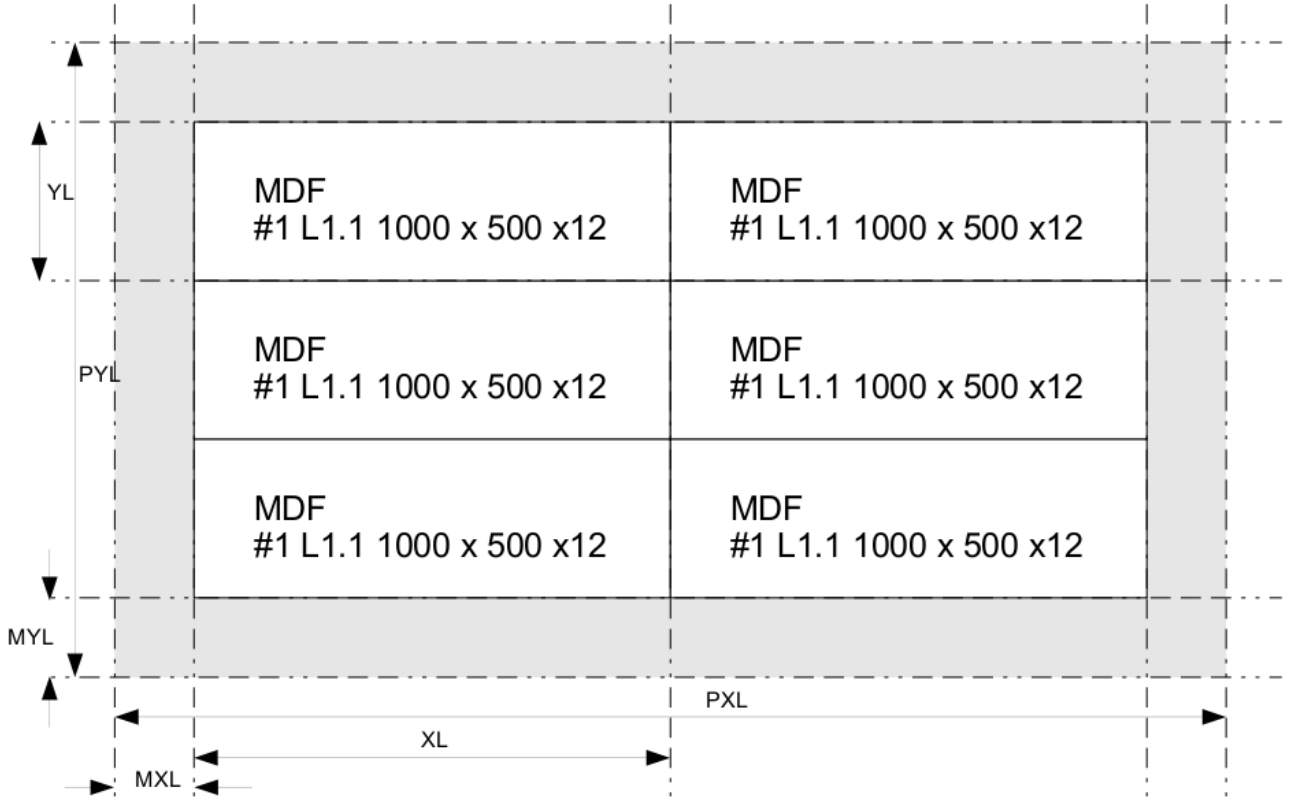
Keyword	Decription	Type
ID	project id	String
Name	project name	String
Information	project information	String
Commment	additional commments	String

Language	de - german en - english Default is german.	String
OptMode	Optimization mode: 1 - cutting 2 - palettizing Default value is 1.	Integer
OptType	Optimization type: 6 - palettizing circle /cylinder unmixed 7 - 2D cutting (stripe mode) 8 - 2D cutting (nesting /complex mode) 9 - palettizing in layers unmixed fast 10 - palettizing in layers unmixed exact (needs more time) 12 - 2D best cutting algorithmus. Run algorithmus 7 and 8. Take best solution. 13 - Bar cutting 1D 14 - palettizing 3D unmixed fast 15 - palettizing 3D unmixed exact 16 - Circle cut optimization 17 - palettizing mixed layer Default value is 12 (best cut).	Integer
Email	In server mode the solution can be send via email.	String

4.4.2 Labels

Optional labels are created for any part as PDF file (<InputfileName>-label.pdf). All values are optional.

Keyword	Decription	Type
LabelLength	Length [XL]. Unit is mm.	Double
LabelWidth	Width [YL]. Unit is mm.	Double
LabelMarginX	Label margin in X [MXL]. Unit is mm.	Double
LabelMarginY	Label margin in Y [MYL]. Unit is mm	Double
LabelCountX	Number of labels in X.	Integer
LabelCountY	Number of labels in Y.	Integer
LabelPageLength	Length [PXL]. Unit is mm. Example 297 (A4 length)	Double
LabelPageWidth	Width [PYL]. Unit is mm. Example 210 (A4 width)	Double



Label overview

4.4.3 Settings

The optimization settings for machines, saw or CNC controls. All values are optional.

Keyword	Decription	Type
TimeLimit	Time limit for any panel layout in seconds. Default is 5 seconds.	Double
PartMarginXL	Margin for all parts in X.	Double
PartMarginYL	Margin for all parts in Y.	Double
PartMargin	Margin for circle or cylinders.	Double
BasePartMarginXL	Margin for all panels or pallets in X.	Double
BasePartMarginYL	Margin for all panels or pallets in Y.	Double
SawWidth	Saw width, e. g. 3.2 . Default is 0.	Double
MaxCutDepth	Max cut depth. Maximum direction change count (e. g. 1,2,3,4). Opt-Type 8 (nesting). Default is 3.	Integer
FilterMinVolumeUsage	Minimal volume usage, e. g. 75 % (75.0). Only palletizing mode.	Double
FilterMinLayoutUsage	Minimal layout area usage, e. g. 80 % (80.0). Only palletizing mode.	Double

4.4.4 Panels or pallets

The panels or pallets are listed after the **panels or pallets keyword**. At least one panel or pallet is required!

Keyword	Decription	Type
No	Numeration (0...N). This value is ignored.	Integer
XL	Length	Double
YL	Width	Double
ZL	Height	Double
MarginXL	Margin in X.	Double
MarginYL	Margin in Y.	Double
Material	Material (cutting mode only).	String
Information	Information	String
Comment	Comment	String
Count	Number of panels or pallets. 0 value means unlimited.	Integer
MaxHeight	Max pallet load height. Only palletizing mode.	Double
Weight	Empty pallet weight. Only palletizing mode.	Double
NetWeight	Pallet net weight. Only palletizing mode.	Double
SheetHeight	Sheet height. Only palletizing mode.	Double

4.4.5 Parts

The parts are listed after the **parts keyword**. At least one part is required !

Keyword	Decription	Type
No	Numeration (0...N). This value is ignored.	Integer
XL	Length	Double
YL	Width	Double
ZL	Height	Double
MarginXL	Margin in X.	Double
MarginYL	Margin in Y.	Double
Material	Material (cutting mode only).	String
Information	Information	String
Comment	Comment	String
Count	Number of parts to cut or number packages to be palletized.	Integer
R	Radius. Only circle mode.	Double

D	Diameter. Only circle mode.	Double
Margin	Margin. Only circle mode.	Double
Weight	Part part weight. Only palletizing mode.	Double
NetWeight	Part net weight. Only palletizing mode.	Double
Turnable	The part is turnable. Values Y or N for cutting. X or Y or XY for palletizing.	char

5 WebOpt XML Format

5.1 XML structure overview

The XML file structure looks like this:

```
Project
   | (INPUT)
   |-------Settings
   |-------BaseParts (panels or pallets)
       |---BasePart0
       |...
       |---BasePartN
   |-------Parts (parts or packages)
       |---Part0
       |...
       |---PartN
   | (OUTPUT)
   |-------SolutionPallets (pallet data)
   |-------SolutionLayouts (cutting layout or pallet layer layout)
   |-------SolutionParts (solution part data)
   |-------SolutionCuts (solution cuts)
```

The solution data is referencing to the input data (BaseParts/Parts).

5.2 XML sample project

A simple XML example project with one panel and two parts:

Panels:	no limit	2000	x 1000	x 1	Material MDF	panel1
Parts:	9x	178	x 134	x 1	Material MDF	Part1
	2x	505	x 450	x 1	Material MDF	Part2

```
<?xml version='1.0' encoding='ISO-8859-1' standalone='yes' ?>
<Project Mode='1' Type='8' No='0' ID='ID1' Name='Project1' >
  <Panels Count='1'>
    <Panel No='0' Count='0' XL='2000' YL='1000' ZL='1' Material='MDF' Info='panel1' />
  </Panels>
  <Parts Count='2'>
    <Part No='0' Count='9' XL='178' YL='134' ZL='1' Material='MDF' Info='Part1' />
    <Part No='1' Count='2' XL='505' YL='450' ZL='1' Material='MDF' Info='Part2' />
  </Parts>
  <Settings TimeLimit='1' MaxCutDepth='3'/>
</Project>
```

XML sample project file

5.3 XML solution format

The XML solution for this example looks like this:

```
<SolutionLayouts Count='1' >
<SolutionLayout No='0' BasePartNo='0' LayoutCount='1' PartNo='0' PartCount='14'
  CutNo='0' CutCount='13' />
</SolutionLayouts>

<SolutionParts Count='15' >
<SolutionPart No='0' LayoutNo='0' PartNo='0' ID='0' X='0' Y='0' XL='178' YL='134' />
<SolutionPart No='1' LayoutNo='0' PartNo='0' ID='0' X='0' Y='134' XL='178' YL='134' />
<SolutionPart No='2' LayoutNo='0' PartNo='0' ID='0' X='0' Y='268' XL='178' YL='134' />
<SolutionPart No='3' LayoutNo='0' PartNo='0' ID='0' X='0' Y='402' XL='178' YL='134' />
<SolutionPart No='4' LayoutNo='0' PartNo='0' ID='0' X='0' Y='536' XL='178' YL='134' />
<SolutionPart No='5' LayoutNo='0' PartNo='0' ID='0' X='0' Y='670' XL='178' YL='134' />
<SolutionPart No='6' LayoutNo='0' PartNo='0' ID='0' X='0' Y='804' XL='178' YL='134' />
<SolutionPart No='7' LayoutNo='0' X='0' Y='938' XL='178' YL='62' Type='OFFCUT' />
<SolutionPart No='8' LayoutNo='0' PartNo='1' ID='0' X='178' Y='0' XL='505' YL='450' />
<SolutionPart No='9' LayoutNo='0' PartNo='1' ID='0' X='178' Y='450' XL='505' YL='450' />
<SolutionPart No='10' LayoutNo='0' X='178' Y='900' XL='505' YL='100' Type='OFFCUT' />
<SolutionPart No='11' LayoutNo='0' PartNo='0' ID='0' X='683' Y='0' XL='134' YL='178' Angle='90'/>
<SolutionPart No='12' LayoutNo='0' PartNo='0' ID='0' X='683' Y='178' XL='134' YL='178' Angle='90'/>
<SolutionPart No='13' LayoutNo='0' X='683' Y='356' XL='134' YL='644' Type='OFFCUT' />
<SolutionPart No='14' LayoutNo='0' X='817' Y='0' XL='1183' YL='1000' Type='OFFCUT' />
</SolutionParts>

<SolutionCuts Count='14'>
  <SolutionCut No='0' LayoutNo='0' X='178' Y='0' Length='1000' Angle='90' />
  <SolutionCut No='1' LayoutNo='0' X='683' Y='0' Length='1000' Angle='90' />
  <SolutionCut No='2' LayoutNo='0' X='817' Y='0' Length='1000' Angle='90' />
  <SolutionCut No='3' LayoutNo='0' X='0' Y='134' Length='178' />
  <SolutionCut No='4' LayoutNo='0' X='683' Y='178' Length='134' />
  <SolutionCut No='5' LayoutNo='0' X='0' Y='268' Length='178' />
  <SolutionCut No='6' LayoutNo='0' X='683' Y='356' Length='134' />
  <SolutionCut No='7' LayoutNo='0' X='0' Y='402' Length='178' />
  <SolutionCut No='8' LayoutNo='0' X='178' Y='450' Length='505' />
  <SolutionCut No='9' LayoutNo='0' X='0' Y='536' Length='178' />
  <SolutionCut No='10' LayoutNo='0' X='0' Y='670' Length='178' />
  <SolutionCut No='11' LayoutNo='0' X='0' Y='804' Length='178' />
  <SolutionCut No='12' LayoutNo='0' X='178' Y='900' Length='505' />
  <SolutionCut No='13' LayoutNo='0' X='0' Y='938' Length='178' />
</SolutionCuts>
```

XML solution (snippet)

The solution contains one layout with 11 parts. SolutionCuts contains 14 cuts.

- 9x Part1 (PartNo 0)
- 2x Part2 (PartNo 1)
- 2x rest + 2x offcut

Sample Project1 Solution

ProjectID: ID1

time limit: 1

Max cut depth: 3

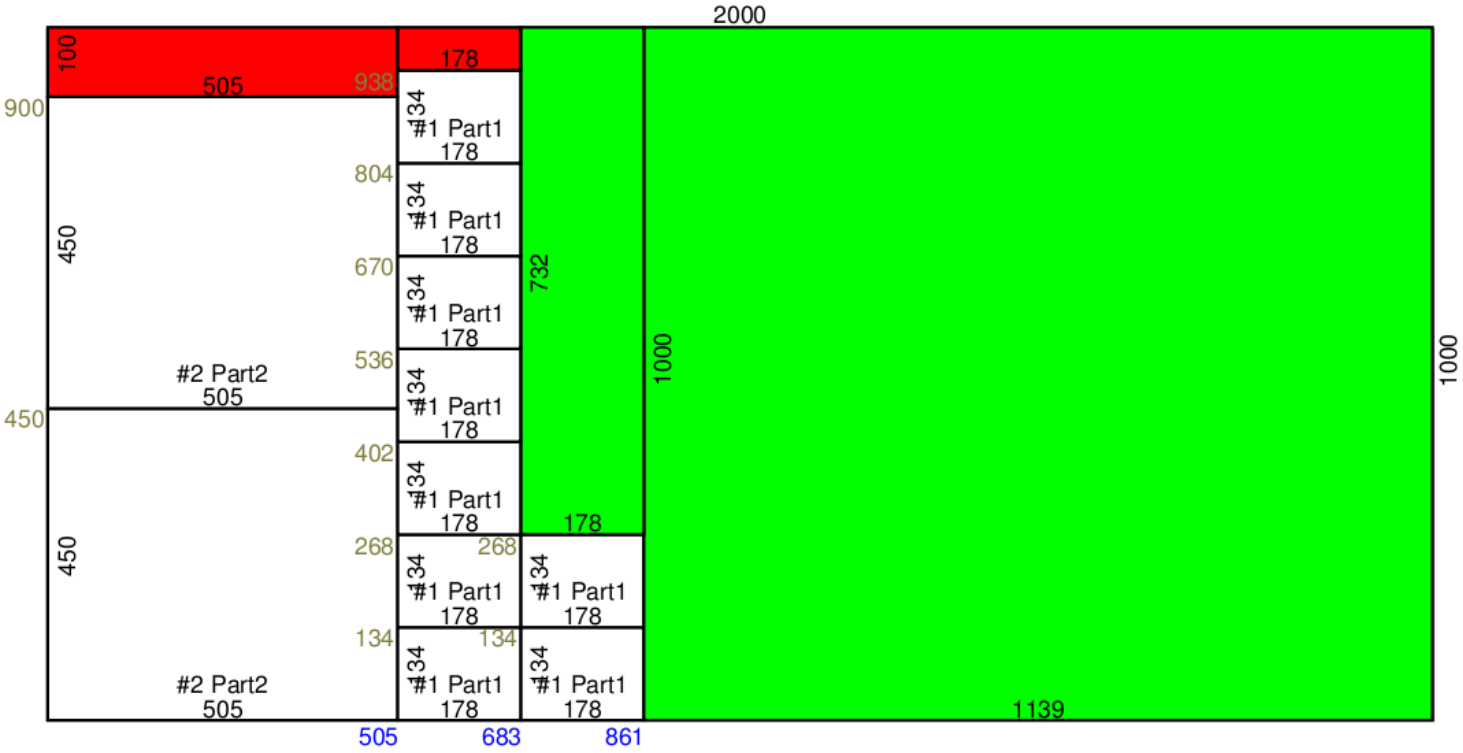
Input Panels/Parts

No	Quantity	Length	Width	Height	Material	Turnable	Information	Comment	Prod.	Diff.
1	no limit	2000	1000	1	MDF	-	panel1		1	-
#1	9	178	134	1	MDF	no	Part1		9	0
#2	2	505	450	1	MDF	no	Part2		2	0

Solution Panels

Utilization: 33.46 % Offcut: 66.54 %

Quantity	Length	Width	Height	Material	Information	Comment
1	2000	1000	1	MDF	panel1	



Solution layout for XML sample

Layout 1 [1]: 1 x

MDF 2000 x 1000 x 1 Utilization 33.46 % Offcut 66.54 %

No	Quantity	Length	Width	Information	Comment
	1	1139	1000		Rest
	1	178	732		Rest
	1	178	62		Offcut

	1	505	100		Offcut
#1	9	178	134	Part1	
#2	2	505	450	Part2	

5.4 Tag Reference

5.4.1 Tag Project

The project tag contains input data for the project and the output status.

<project ...ATTRIBUTES... />

Attribute	Description	Type
ID	project id	String
Name	project name	String
Information	project information	String
Commment	additional commments	String
Language	de - german en - english Default is german.	String
Mode	Optimization mode: 1 - cutting 2 - palettizing Default value is 1.	Integer
Type	Optimization type: 6 - palettizing circle /cylinder unmixed 7 - 2D cutting (stripe mode) 8 - 2D cutting (nesting /complex mode) 9 - palettizing in layers unmixed fast 10 - palettizing in layers unmixed exact (needs more time) 12 - 2D best cutting algorithmus. Run algorithmus 7 and 8. Take best solution. 13 - Bar cutting 1D 14 - palettizing 3D unmixed fast 15 - palettizing 3D unmixed exact 16 - Circle cut optimization 17 - palettizing mixed layer Default value is 12 (best cut).	Integer
No	Projectnumber	Integer
Status [from V2.08]	Status: 0 - Optimization success(AU_OPT_SUCCESS).	Integer

[Output!]	1 - Unknown error (AU_OPT_UNKNOWN_ERROR). 2 - Error: no parts (AU_OPT_NO_PARTS). 3 - Error: no panels or pallets (AU_OPT_NO_BASEPARTS). 4 - Error: no project (AU_OPT_NO_PROJECT).	

5.4.2 Tag Customer

The customer tag contains the input information about the customer.

<customer ...ATTRIBUTES... />

Attribute	Description	Type
No	CustomerNumber	Integer
ID	ID	String
FirstName	first name	String
LastName	last name	String
Phone	Phone	String
Fax	Fax	String
Street	Street	String
Zip	zip code	String
State	State or Country	String
Email	Email	String
MobilePhone	Mobile phone	String
Phone1	Second Phone	String
Info	Comment	String
Comment	Comment	String

5.4.3 Tag Settings

The Settings tag contains the input settings for machines, saw and CNC controls.

<Settings ...ATTRIBUTES... />

Attribute	Description	Type
TimeLimit	Time limit for any panel layout in seconds. Default is 5 seconds.	Double
PartMarginXL	Margin for all parts in X.	Double
PartMarginYL	Margin for all parts in Y.	Double

PartMargin	Margin for circle or cylinders.	Double
BasePartMarginXL	Margin for all panels or pallets in X.	Double
BasePartMarginYL	Margin for all panels or pallets in Y.	Double
SawWidth	Saw width, e. g. 3.2 . Default is 0.	Double
MaxCutDepth	Max cut depth. Maximum direction change count (e. g. 1,2,3,4). Opt-Type 8 (nesting). Default is 3.	Integer
FilterMinVolumeUsage	Minimal volume usage, e. g. 75 % (75.0). Only palletizing mode.	Double
FilterMinLayoutUsage	Minimal layout area usage, e. g. 80 % (80.0). Only palletizing mode.	Double

5.4.4 Tag BasePart

The BasePart tag contains the input data for panels and pallets.

<BasePart ...ATTRIBUTES... />

Attribute	Description	Type
No	Number (0...N)	Integer
Required [Output!]	Number of required panels or pallets	Integer
No	Numeration (0...N). This value is ignored.	Integer
XL	Length	Double
YL	Width	Double
ZL	Height	Double
MarginXL	Margin in X.	Double
MarginYL	Margin in Y.	Double
Material	Material (cutting mode only).	String
Information	Information	String
Comment	Comment	String
Count	Number of panels or pallets. 0 value means unlimited.	Integer
MaxHeight	Max pallet load height. Only palletizing mode.	Double
Weight	Empty pallet weight. Only palletizing mode.	Double
NetWeight	Pallet net weight. Only palletizing mode.	Double
SheetHeight	Sheet height. Only palletizing mode.	Double

5.4.5 Tag Part

The Part tag contains the input data for parts.

<BasePart ...ATTRIBUTES... />

Attribute	Description	Type
No	Numeration (0...N). This value is ignored.	Integer
XL	Length	Double
YL	Width	Double
ZL	Height	Double
MarginXL	Margin in X.	Double
MarginYL	Margin in Y.	Double
Material	Material (cutting mode only).	String
Information	Information	String
Comment	Comment	String
Count	Number of parts to cut or number packages to be palletized.	Integer
R	Radius. Only circle mode.	Double
D	Diameter. Only circle mode.	Double
Margin	Margin. Only circle mode.	Double
Weight	Part part weight. Only palletizing mode.	Double
NetWeight	Part net weight. Only palletizing mode.	Double
Turnable	The part is turnable. Values Y or N for cutting. X or Y or XY for palletizing.	char
Required [Output!]	Number of required parts (or palletized parts).	Integer

5.4.6 Tag SolutionLayouts

The SolutionLayouts tag contains the output data for layouts.

<SolutionLayouts ...ATTRIBUTES... />

Attribute	Description	Type
Count	Number of layouts.	Integer
BasePartArea	Total panel area.	Double
PartArea	Total part area.	Double
CutLength	Total cut length sum.	Double
VertCutLength	Total vert cut length sum.	Double

HorCutLength	Total hor cut length sum.	Double

5.4.7 Tag SolutionLayout

The SolutionLayout tag contains the output data for a single layout.

<SolutionLayout ...ATTRIBUTES... />

Attribute	Description	Type
No	Number (0...N)	Integer
LayoutCount	Number of equal layouts.	Integer
BasePartNo	Reference BasePart from input Tag BaseParts.	Integer
ID [from V2.08]	BasePart ID.	Integer
PartNo	Reference Part from Tag SolutionParts.	Integer
PartCount	Number of different parts in SolutionParts for this layout.	Integer
CutNo	Reference Cut in Tag SolutionParts.	Integer
CutCount	Number of cuts in SolutionCuts for this layout.	Integer
Usage	Layout usage (utilization) in %, e. g. 95.55 --> 95,55 %	Double
BasePartArea	BasePart (panel) layout area.	Double
PartArea	Part area sum in this layout.	Double
CutLength	Cut length sum in this Layout.	Double
VertCutLength	Vertical cut length sum in this Layout.	Double
HorCutLength	Horizontal cut length sum in this Layout.	Double

5.4.8 Tag SolutionPart

The SolutionPart tag contains the output data for a single part.

<SolutionPart ...ATTRIBUTES... />

Attribute	Description	Type
No	Number (0...N)	Integer
LayoutNo	Layout number (index) in tag SolutionLayout.	Integer
PartNo	Part number (index) in input tag Parts. If the attribute is empty, the part is REST or OFFCUT.	Integer
ID [from V2.08]	Part ID in input tag Parts.	Integer

X	X - Position.	Double
Y	Y - Position.	Double
XL	Length.	Double
YL	Width.	Double
Angle	0 - not turned 90 - turned.	Double
Type	REST or OFFCUT. If the attribute is empty, the part type is part (valid index).	String

5.4.9 Tag SolutionCut

The SolutionCut tag contains the output data for a single cut.

<SolutionCut ...ATTRIBUTES... />

Attribute	Description	Type
No	Number (0...N)	Integer
LayoutNo	Layout number (index) in tag SolutionLayout.	Integer
X	X - Position.	Double
Y	Y - Position.	Double
Length	Length.	Double
Angle	0 - not turned 90 - turned.	Double