Radiance for Lighting Designers

A (non-)programmers perspective
with pictures

Thomas Bleicher
BDPLighting

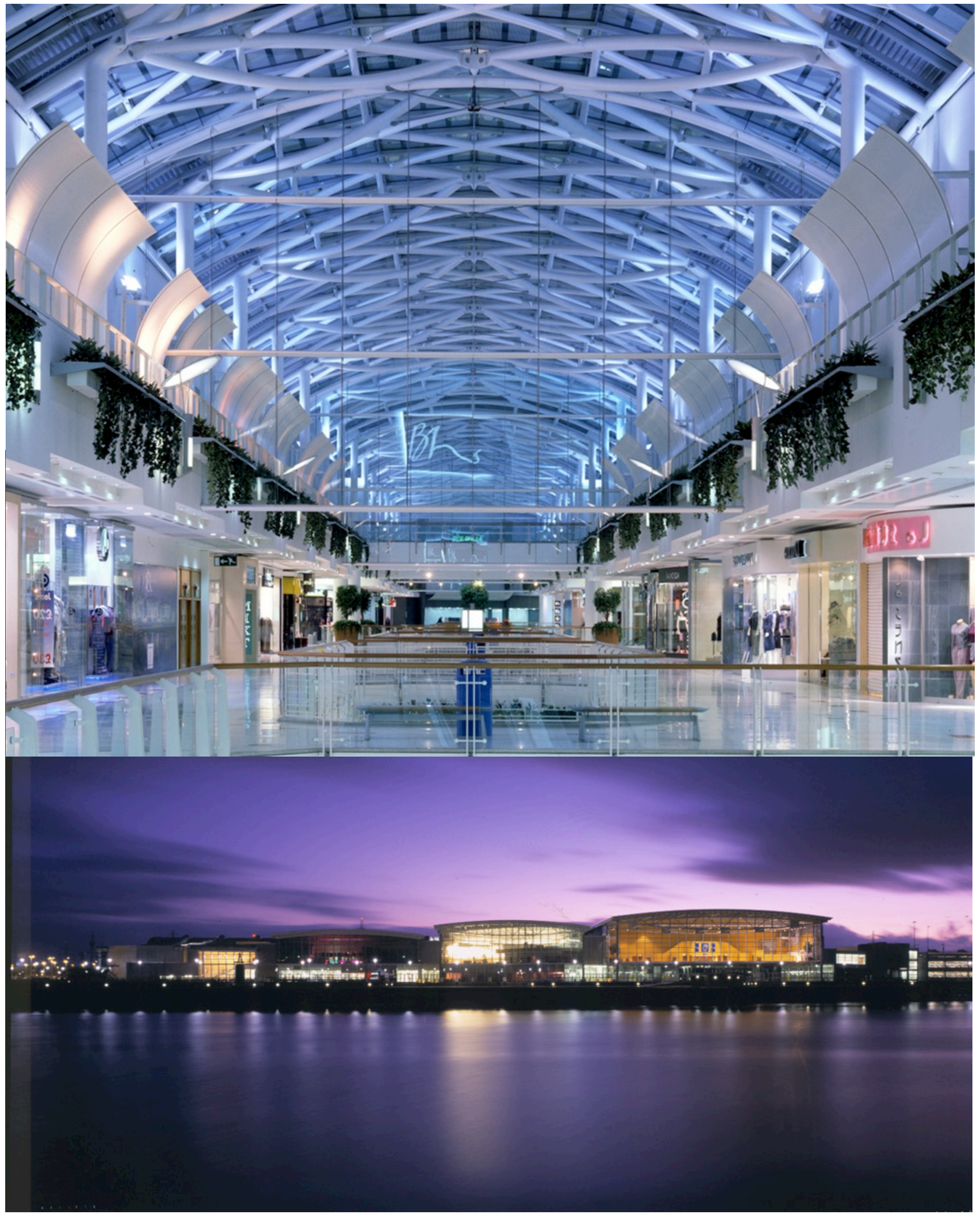
What BDP Lighting does

Historic/Art: Almshouses

Public: National Gallery

What BDP Lighting does

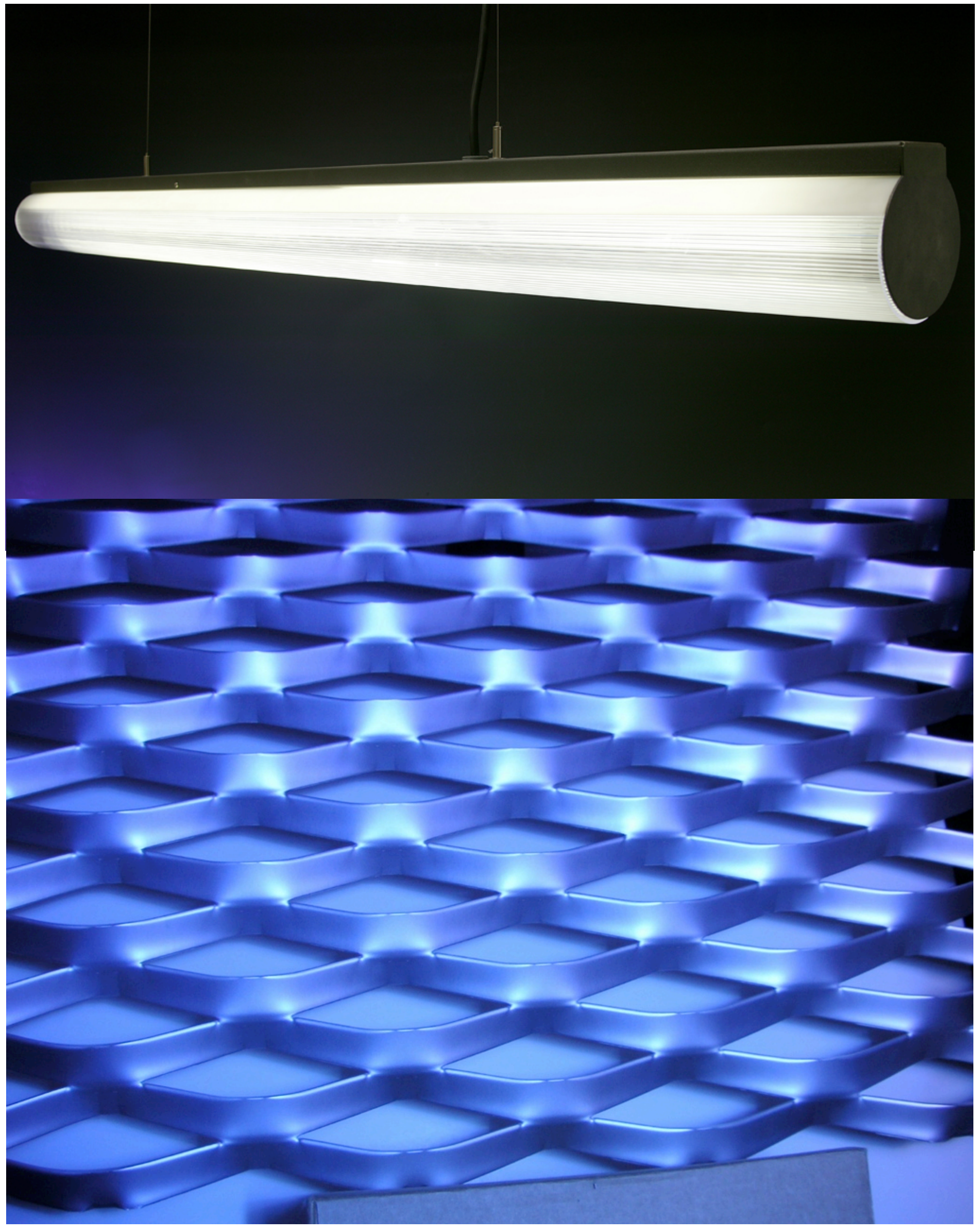
Office: Roche



Retail: Breahead

What BDP Lighting does

Schools: lots
Hapden Gurney



... always an eye on the detail

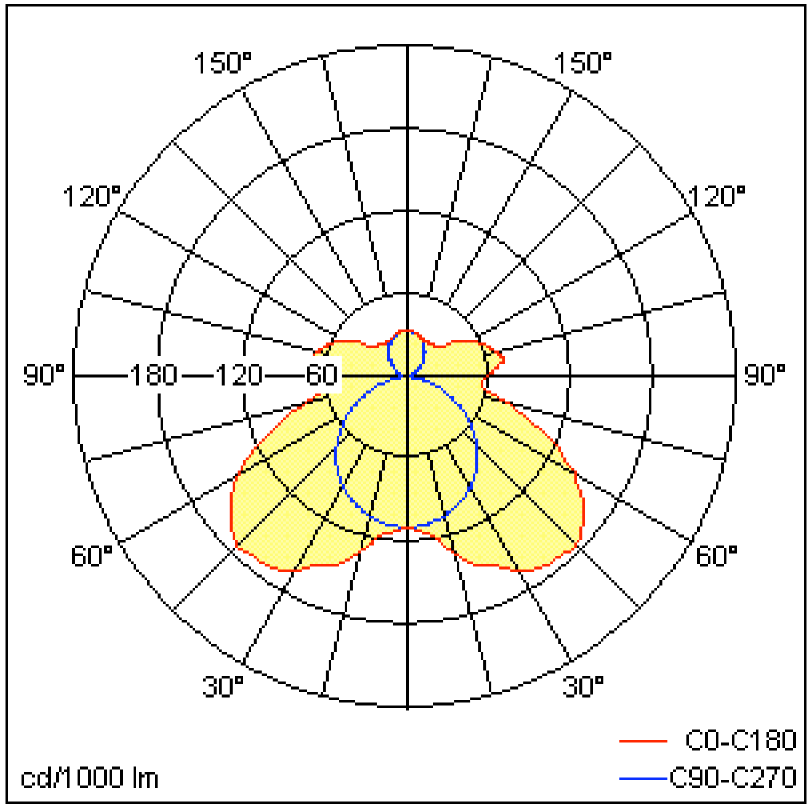
What BDPLighting does

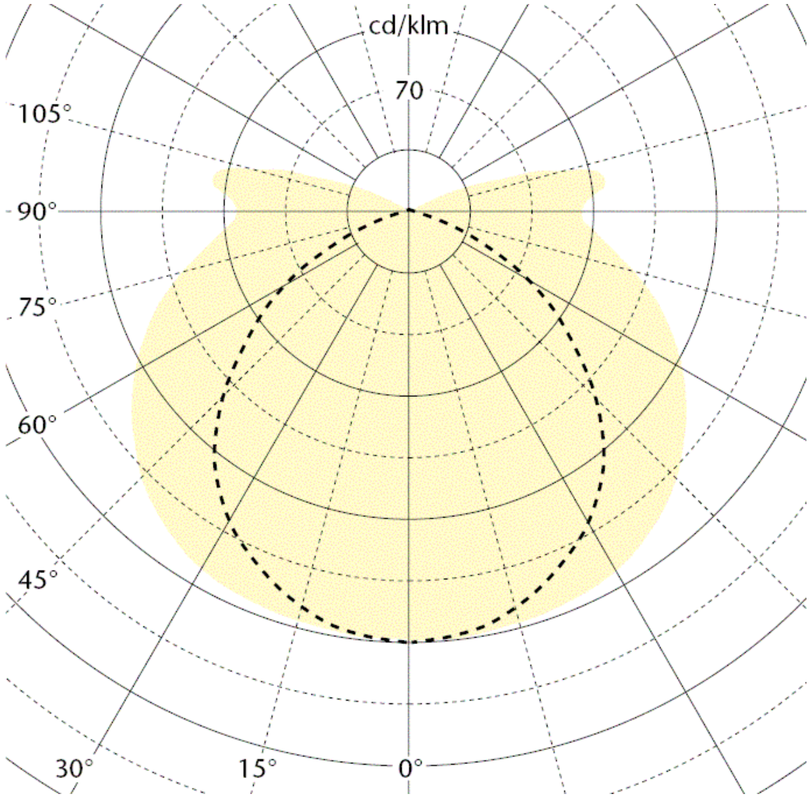
Exterior: Cardinal Place

but also: car parks

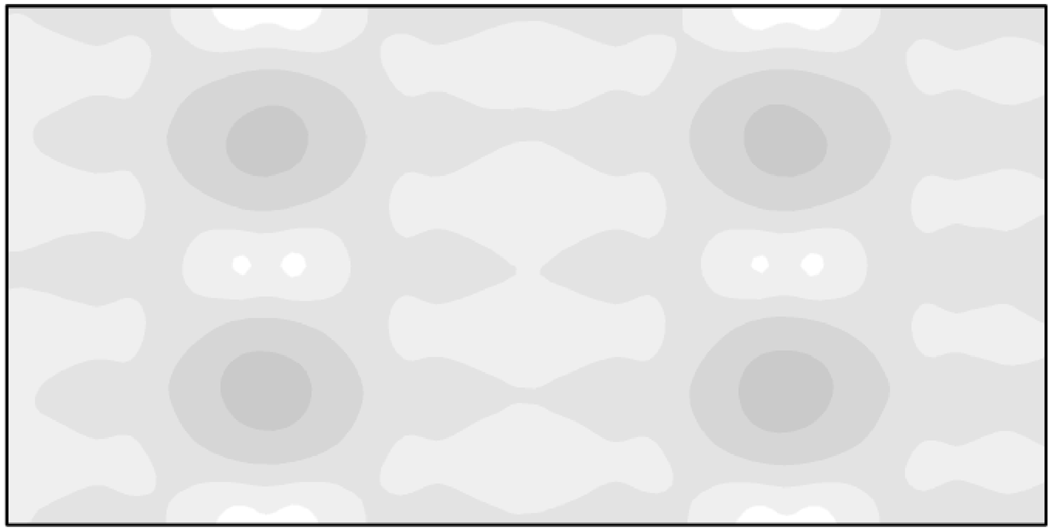
case study: car park

case study: car park

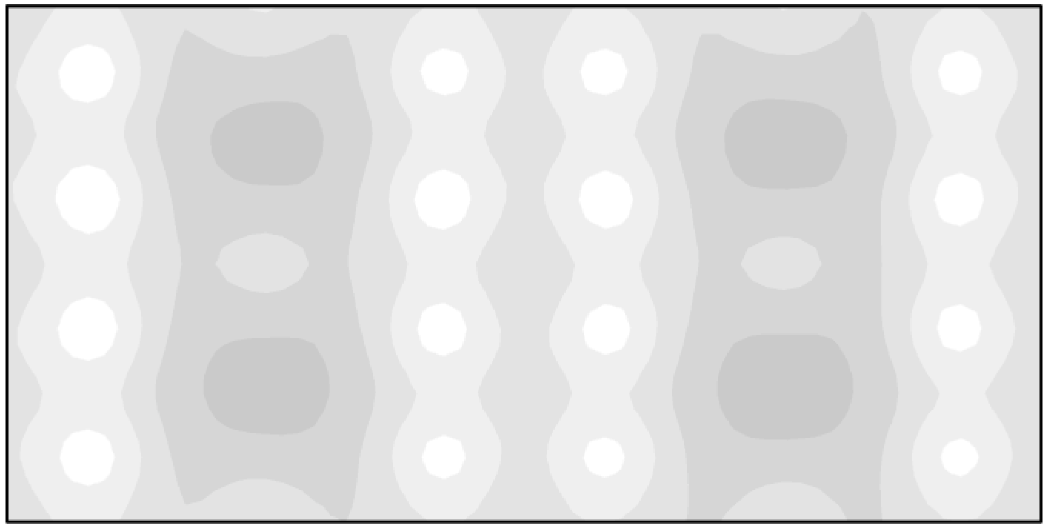




case study: car park



E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
187	103	268	0.55



E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
226	120	344	0.53

What’s Radiance ...

... for the Lighting Designer?

- too !|>& complicated
- very technical (units, concepts)
- for special cases (like daylight)
- “miracle without price tag”
- slow

The Lighting Designer’s friends

AGI32, DIALux, ~~Dulux~~, Pollux, Relux, ...

- accurate enough *(at least, we hope they are ...)*
- supported by manufacturers
- specialised for artificial lighting
- simple *(but restricted)*
- integrated solutions
  (setup, calculation, visualisation, report, ...)
- fast (radiosity)
- free, expensive - who cares?

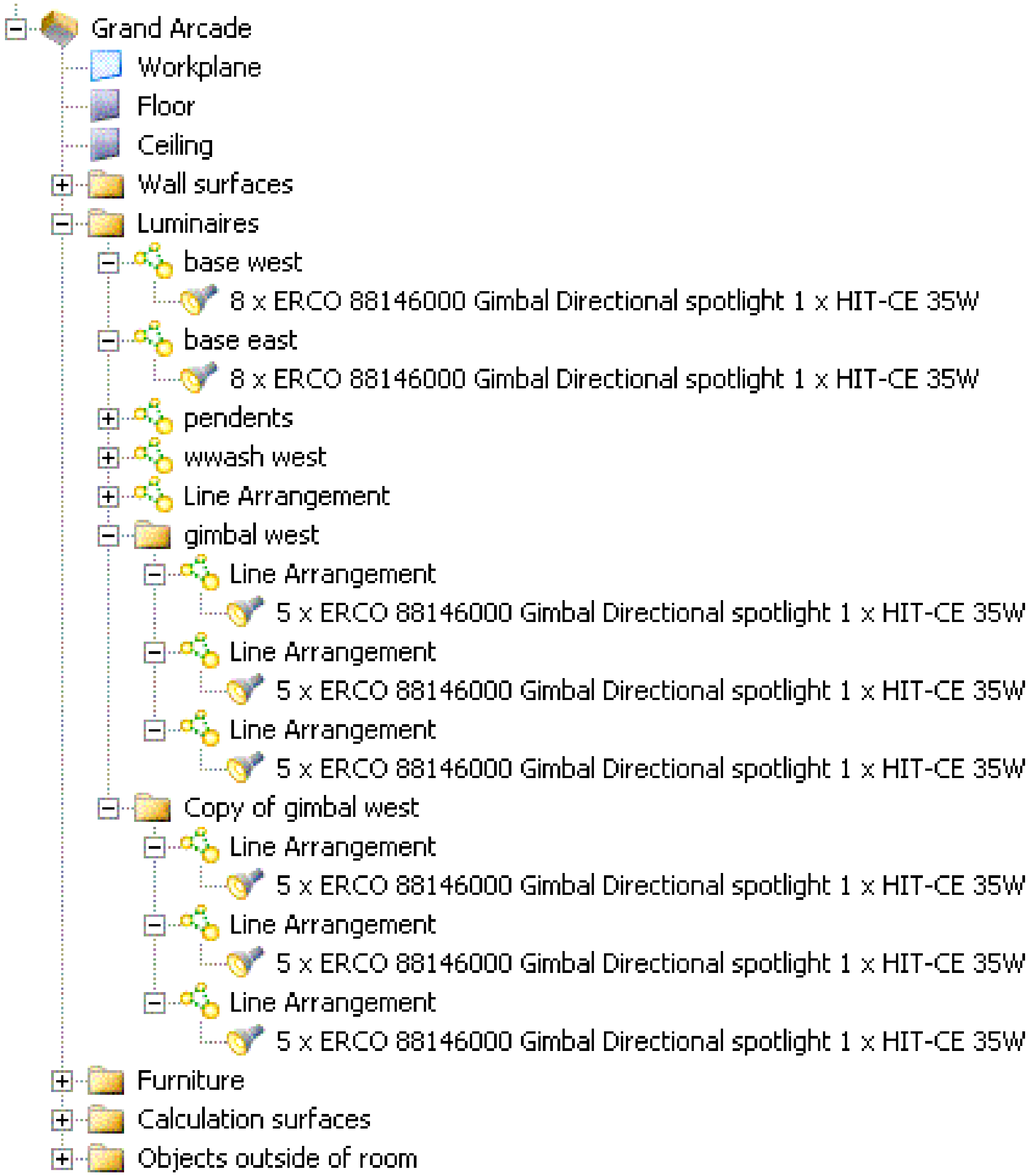
example: DIALux

- financed, supported and promoted by the *DIALux Consortium*
- developed by DIAL AG, Germany
- radiosity based, closed source
- Windows only
- freeware
- luminaire support via files, plugins, online DBs, drag-n-drop
- POVray as optional renderer

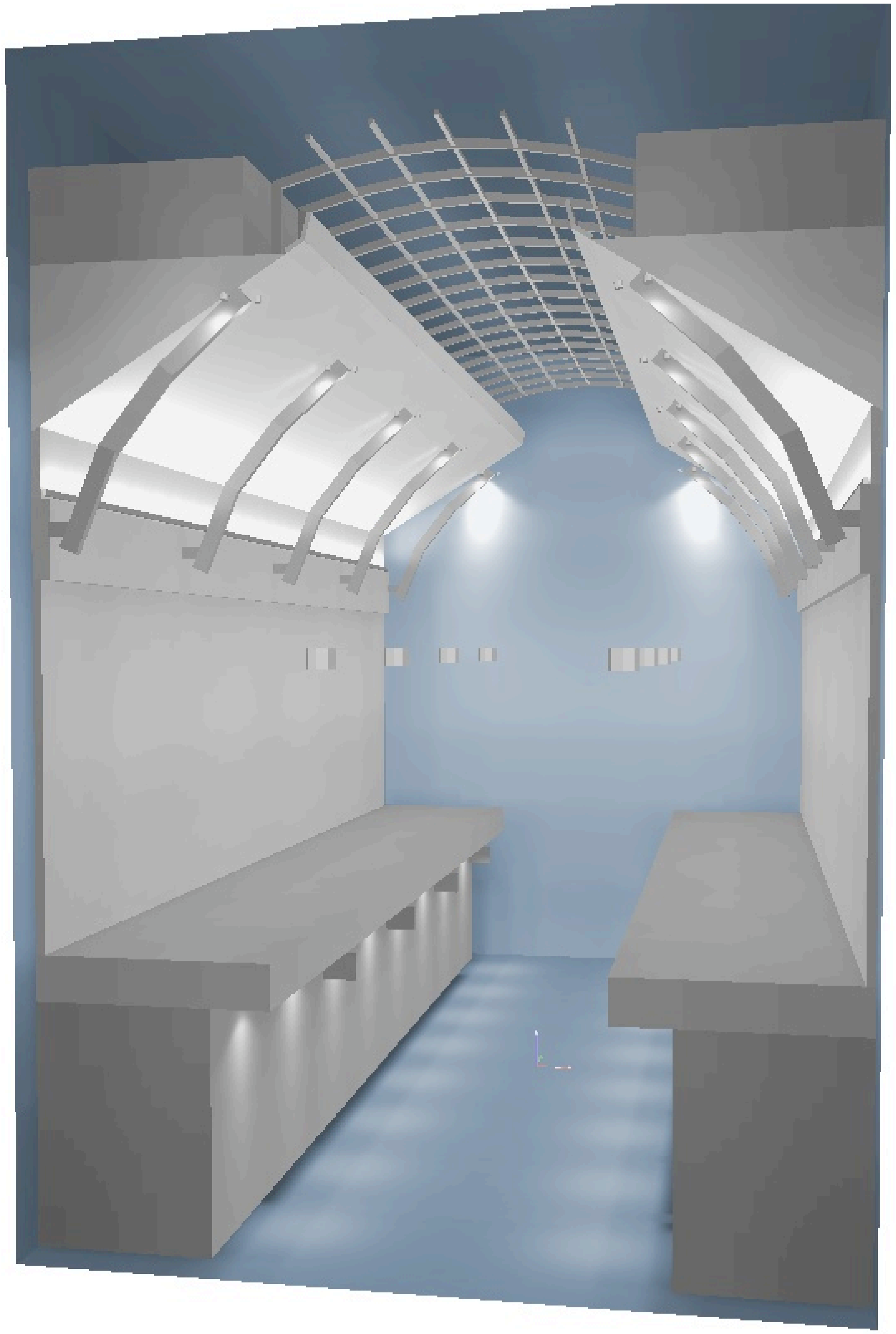
What DIALux does well

- quick setup of *simple* scenes
- luminaire layout options (line, grid, spacing)
- quick rendering of large scenes
- integration of standards (emergency etc.)
- 3D view with light distribution
- PDF reports (lots of details for luminaires)
- variable display of results (isolines, greyscale, falsecolour)

What DIALux does well



- Grand Arcade
  - Workplane
  - Floor
  - Ceiling
  - Wall surfaces
  - Luminaires
    - base west
      - 8 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
    - base east
      - 8 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
    - pendents
    - wwash west
    - Line Arrangement
    - gimbal west
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
    - Copy of gimbal west
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
      - Line Arrangement
        - 5 x ERCO 88146000 Gimbal Directional spotlight 1 x HIT-CE 35W
  - Furniture
  - Calculation surfaces
  - Objects outside of room



What DIALux does not so well

- interface
  - inflexible tree view
  - unintuitive and complicated
- implementation
  - grouping/editing of luminaires
  - variation/referencing of scene data
- data exchange
- compatibility with older versions
- user support and feedback
- *DIALux Cabal*

DIALux POVray export

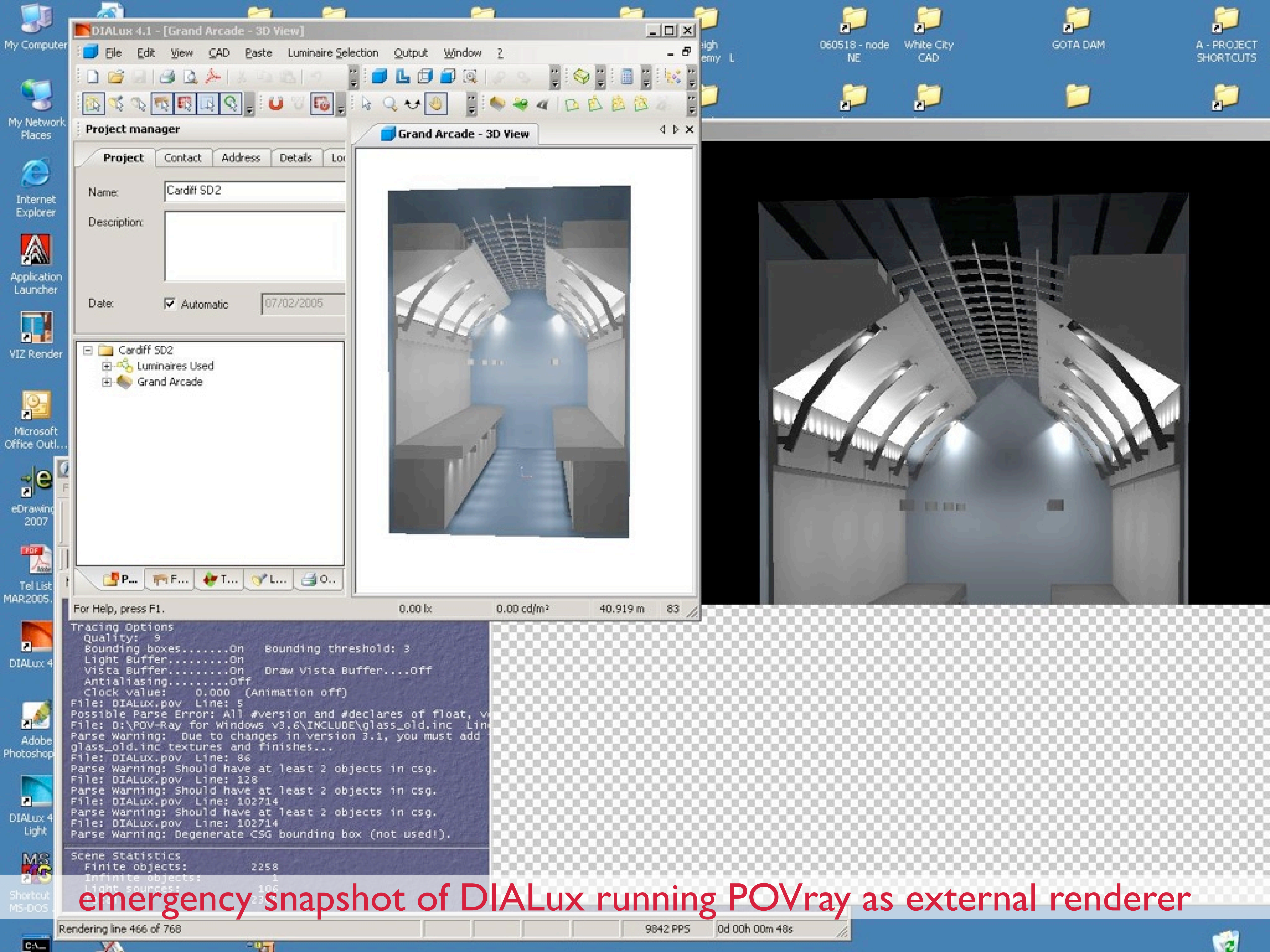
- simple polygon data (generated from cubes)
- textures and materials from predefined range
- no POVray scripting
- contains distribution data

➡ left-handed coordinate system

➡ y-axis is ‘up’

➡ only one viewpoint

➡ no ‘extra’ information (sky!)



Name: Cardiff SD2

Description:

Date: ☑ Automatic 07/02/2005

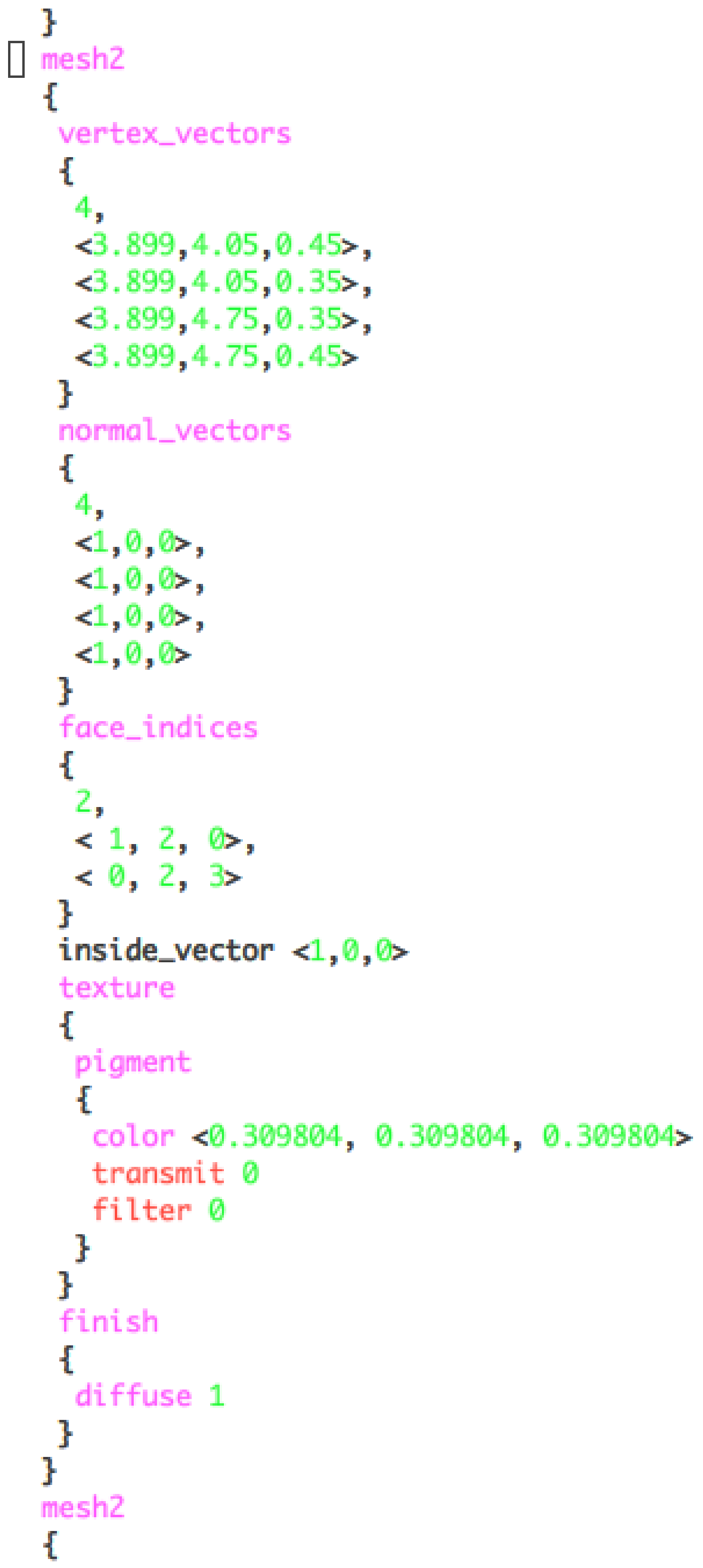
```
Tracing Options
  Quality:  9
  Bounding boxes.......On   Bounding threshold: 3
  Light Buffer.........On
  Vista Buffer.........On   Draw Vista Buffer....Off
  Antialiasing.........Off
  Clock value:    0.000  (Animation off)
File: DIALux.pov  Line: 5
Possible Parse Error: All #version and #declares of float, v
File: D:\POV-Ray for Windows v3.6\INCLUDE\glass_old.inc  Lin
Parse Warning:  Due to changes in version 3.1, you must add
glass_old.inc textures and finishes...
File: DIALux.pov  Line: 86
Parse Warning: Should have at least 2 objects in csg.
File: DIALux.pov  Line: 128
Parse Warning: Should have at least 2 objects in csg.
File: DIALux.pov  Line: 102714
Parse Warning: Should have at least 2 objects in csg.
File: DIALux.pov  Line: 102714
Parse Warning: Degenerate CSG bounding box (not used!).

Scene Statistics
  Finite objects:          2258
  Infinite objects:           1
  Light sources:            106
```

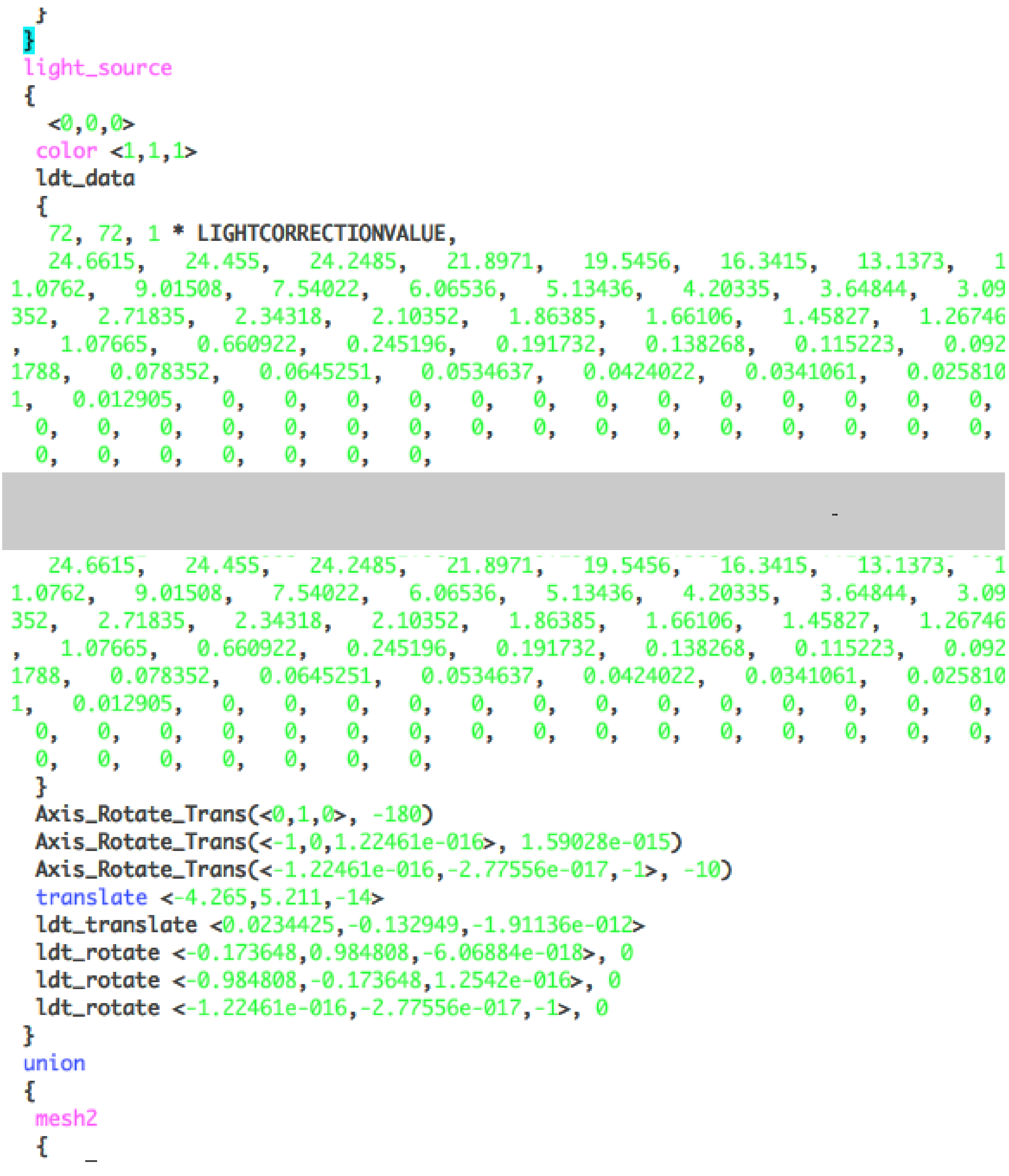
Rendering line 466 of 768

emergency snapshot of DIALux running POVray as external renderer

DIALux POVray export



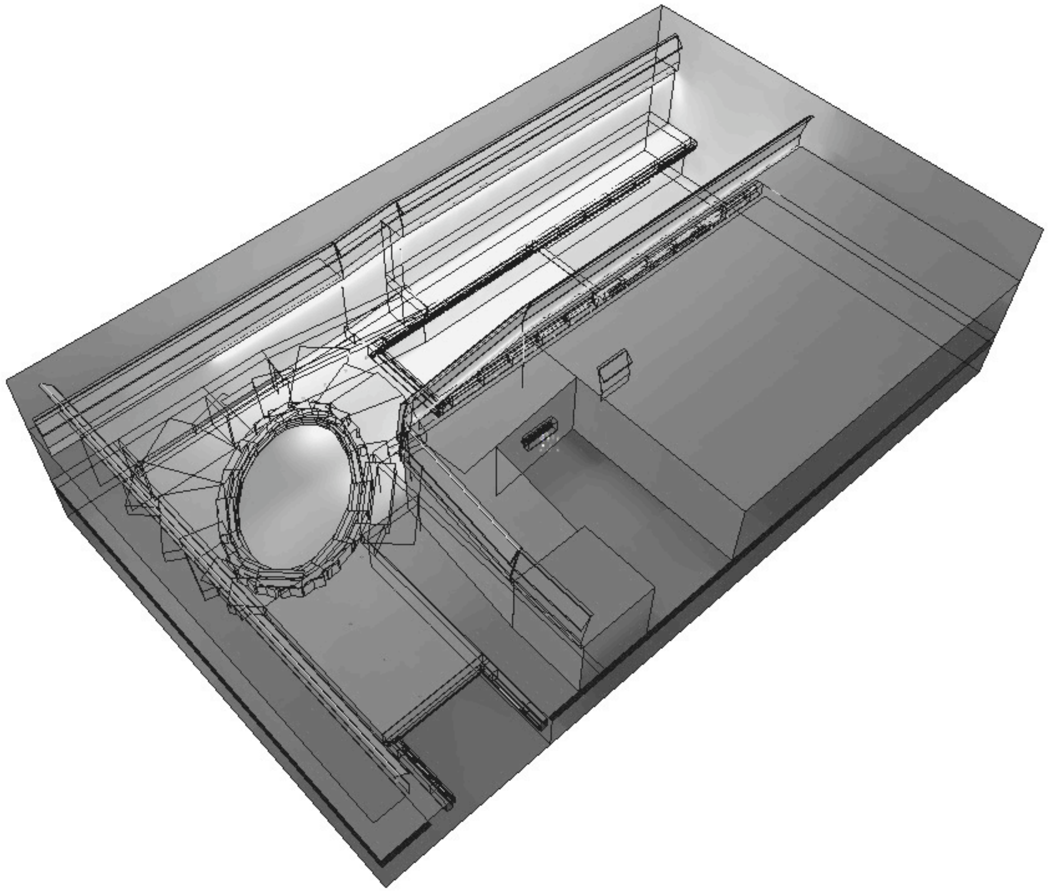
```
 }
□ mesh2
 {
  vertex_vectors
  {
   4,
   <3.899,4.05,0.45>,
   <3.899,4.05,0.35>,
   <3.899,4.75,0.35>,
   <3.899,4.75,0.45>
  }
  normal_vectors
  {
   4,
   <1,0,0>,
   <1,0,0>,
   <1,0,0>,
   <1,0,0>
  }
  face_indices
  {
   2,
   < 1, 2, 0>,
   < 0, 2, 3>
  }
  inside_vector <1,0,0>
  texture
  {
   pigment
   {
    color <0.309804, 0.309804, 0.309804>
    transmit 0
    filter 0
   }
  }
  finish
  {
   diffuse 1
  }
 }
 mesh2
 {
```

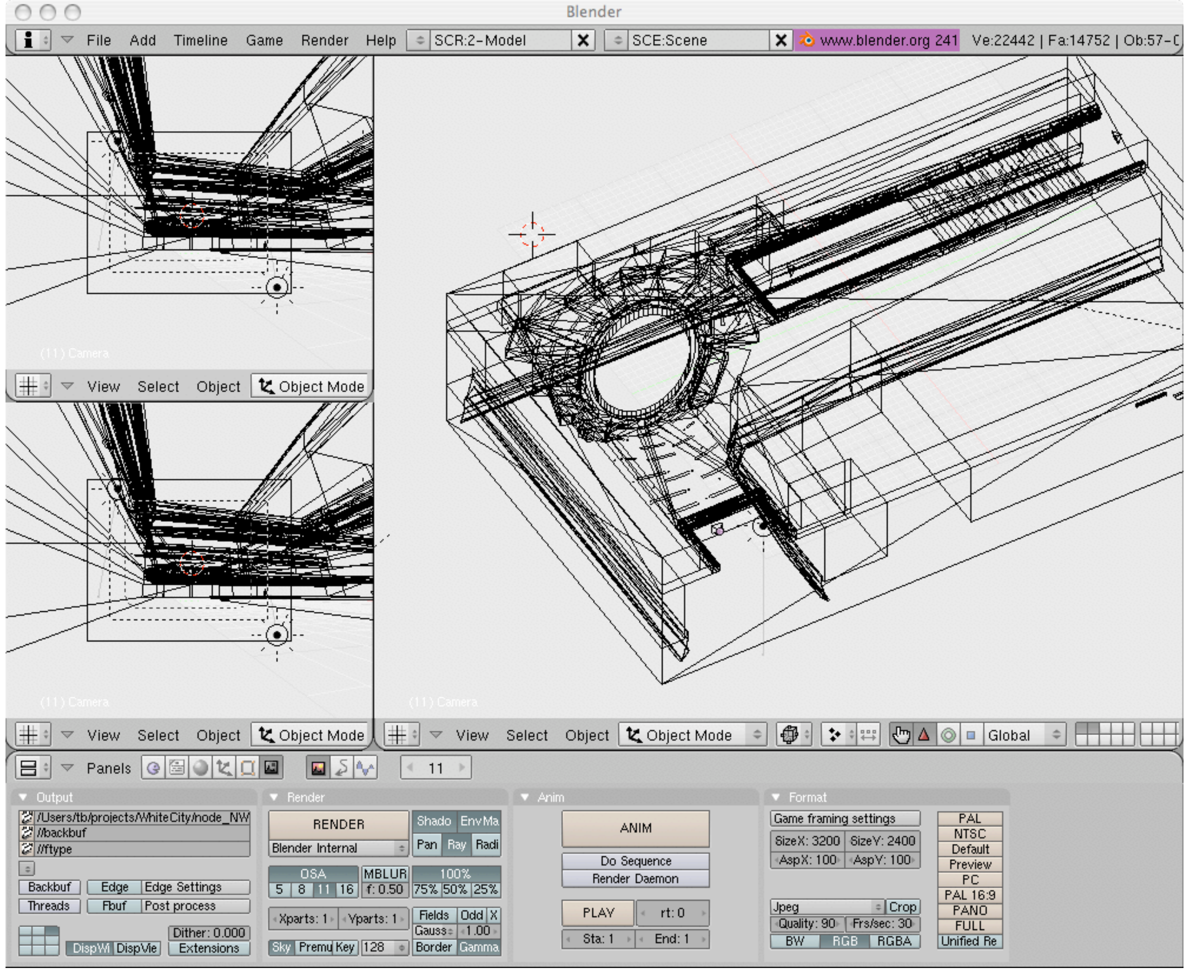


```
  }
 }
 light_source
 {
   <0,0,0>
  color <1,1,1>
  ldt_data
  {
   72, 72, 1 * LIGHTCORRECTIONVALUE,
   24.6615,   24.455,   24.2485,   21.8971,   19.5456,   16.3415,   13.1373,   1
1.0762,   9.01508,   7.54022,   6.06536,   5.13436,   4.20335,   3.64844,   3.09
352,   2.71835,   2.34318,   2.10352,   1.86385,   1.66106,   1.45827,   1.26746
,   1.07665,   0.660922,   0.245196,   0.191732,   0.138268,   0.115223,   0.092
1788,   0.078352,   0.0645251,   0.0534637,   0.0424022,   0.0341061,   0.025810
1,   0.012905,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
  0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
  0,   0,   0,   0,   0,   0,   0,

   24.6615,   24.455,   24.2485,   21.8971,   19.5456,   16.3415,   13.1373,   1
1.0762,   9.01508,   7.54022,   6.06536,   5.13436,   4.20335,   3.64844,   3.09
352,   2.71835,   2.34318,   2.10352,   1.86385,   1.66106,   1.45827,   1.26746
,   1.07665,   0.660922,   0.245196,   0.191732,   0.138268,   0.115223,   0.092
1788,   0.078352,   0.0645251,   0.0534637,   0.0424022,   0.0341061,   0.025810
1,   0.012905,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
  0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
  0,   0,   0,   0,   0,   0,   0,
  }
  Axis_Rotate_Trans(<0,1,0>, -180)
  Axis_Rotate_Trans(<-1,0,1.22461e-016>, 1.59028e-015)
  Axis_Rotate_Trans(<-1.22461e-016,-2.77556e-017,-1>, -10)
  translate <-4.265,5.211,-14>
  ldt_translate <0.0234425,-0.132949,-1.91136e-012>
  ldt_rotate <-0.173648,0.984808,-6.06884e-018>, 0
  ldt_rotate <-0.984808,-0.173648,1.2542e-016>, 0
  ldt_rotate <-1.22461e-016,-2.77556e-017,-1>, 0
 }
 union
 {
  mesh2
  {   _
```

POVray to Blender: *DIAray.py*





perspective view in DIALux

perspective view in Blender

DIAray.py

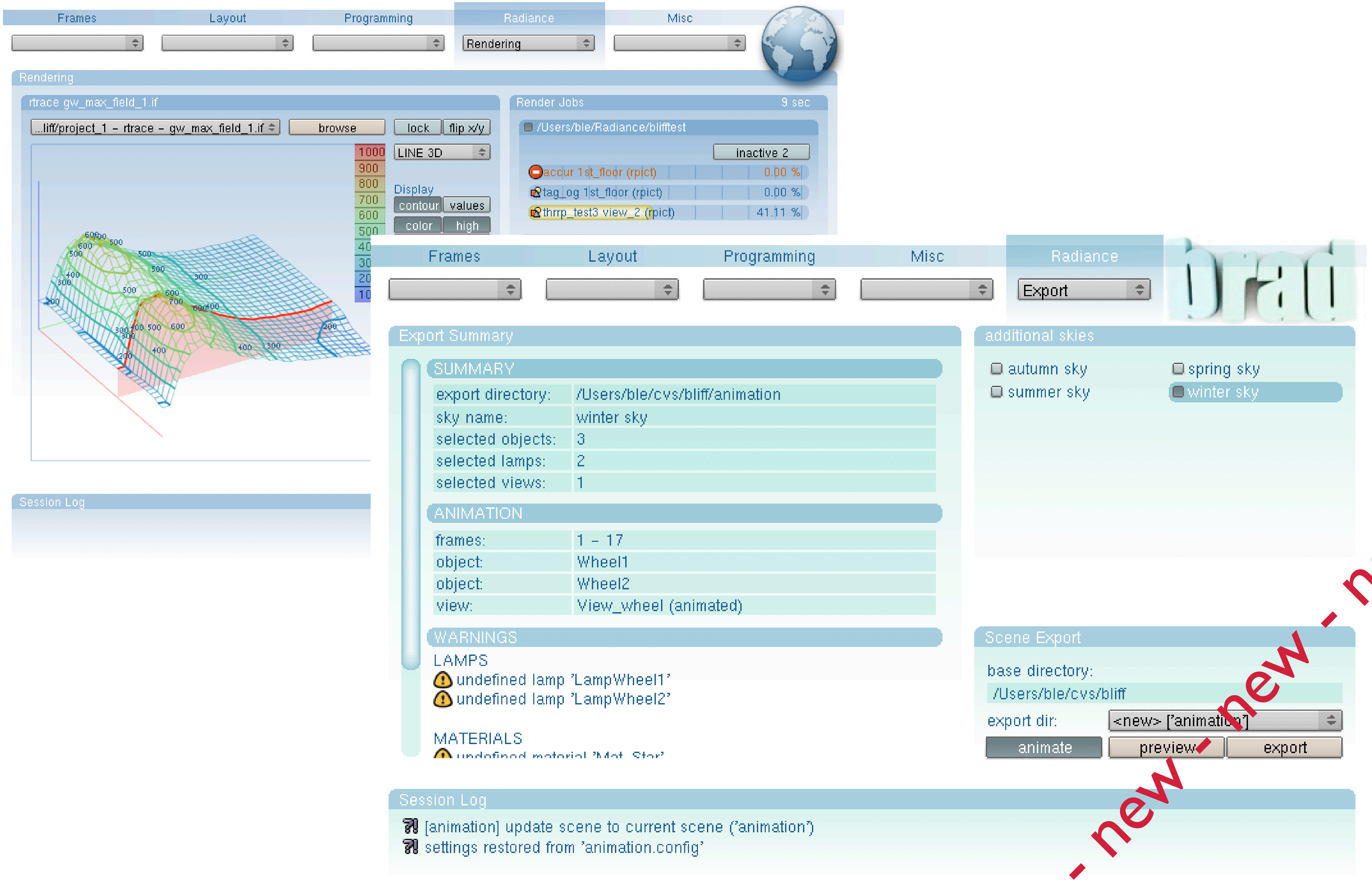
omissions and roadmap

- rotation of luminaires
- skylights
- import luminaire data
  - identify different luminaires
  - use data from *.pov file
- colour

- Radiance server with web frontend

➡ Radiance for everyone

Blender to Radiance: *b/rad 2.0*



accur 1st_floor (rpict) 0.00 %
tag_og 1st_floor (rpict) 0.00 %
thrrp_test3 view_2 (rpict) 41.11 %

Export Summary

SUMMARY

export directory:	/Users/ble/cvs/bliff/animation
sky name:	winter sky
selected objects:	3
selected lamps:	2
selected views:	1

ANIMATION

frames:	1 – 17
object:	Wheel1
object:	Wheel2
view:	View_wheel (animated)

WARNINGS

LAMPS

⚠ undefined lamp 'LampWheel1'
⚠ undefined lamp 'LampWheel2'

MATERIALS

⚠ undefined material 'Mat_Star'

□ autumn sky
□ summer sky
□ spring sky
■ winter sky

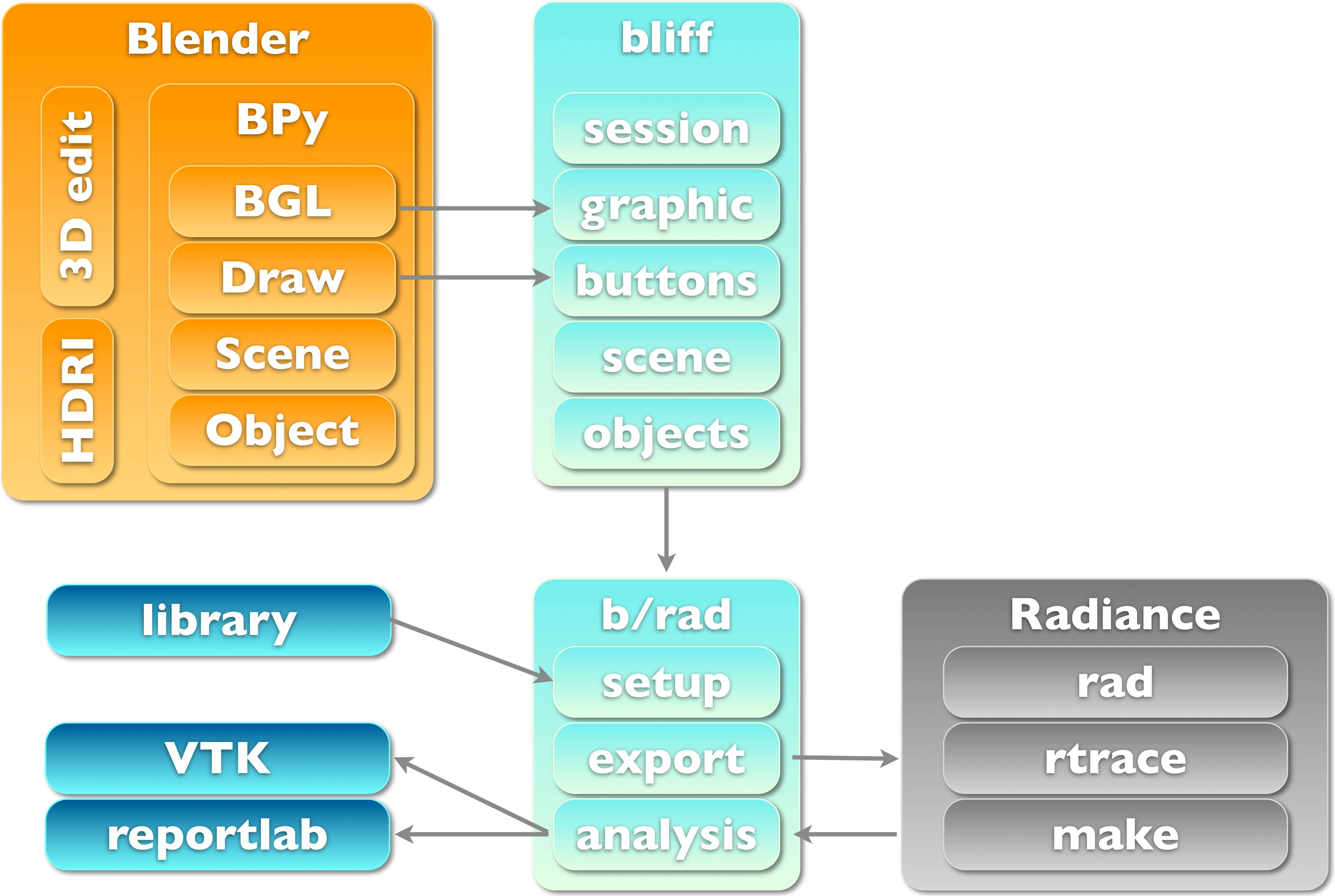
base directory:
/Users/ble/cvs/bliff

export dir: <new> ['animation']

```
[animation] update scene to current scene ('animation')
settings restored from 'animation.config'
```

ew - new - new - new - new

Blender - BPy - bliff - b/rad



Blender

3D edit

HDRI

BPy

BGL

Draw

Scene

Object

bliff

session

graphic

buttons

scene

objects

library

VTK

reportlab

b/rad

setup

export

analysis

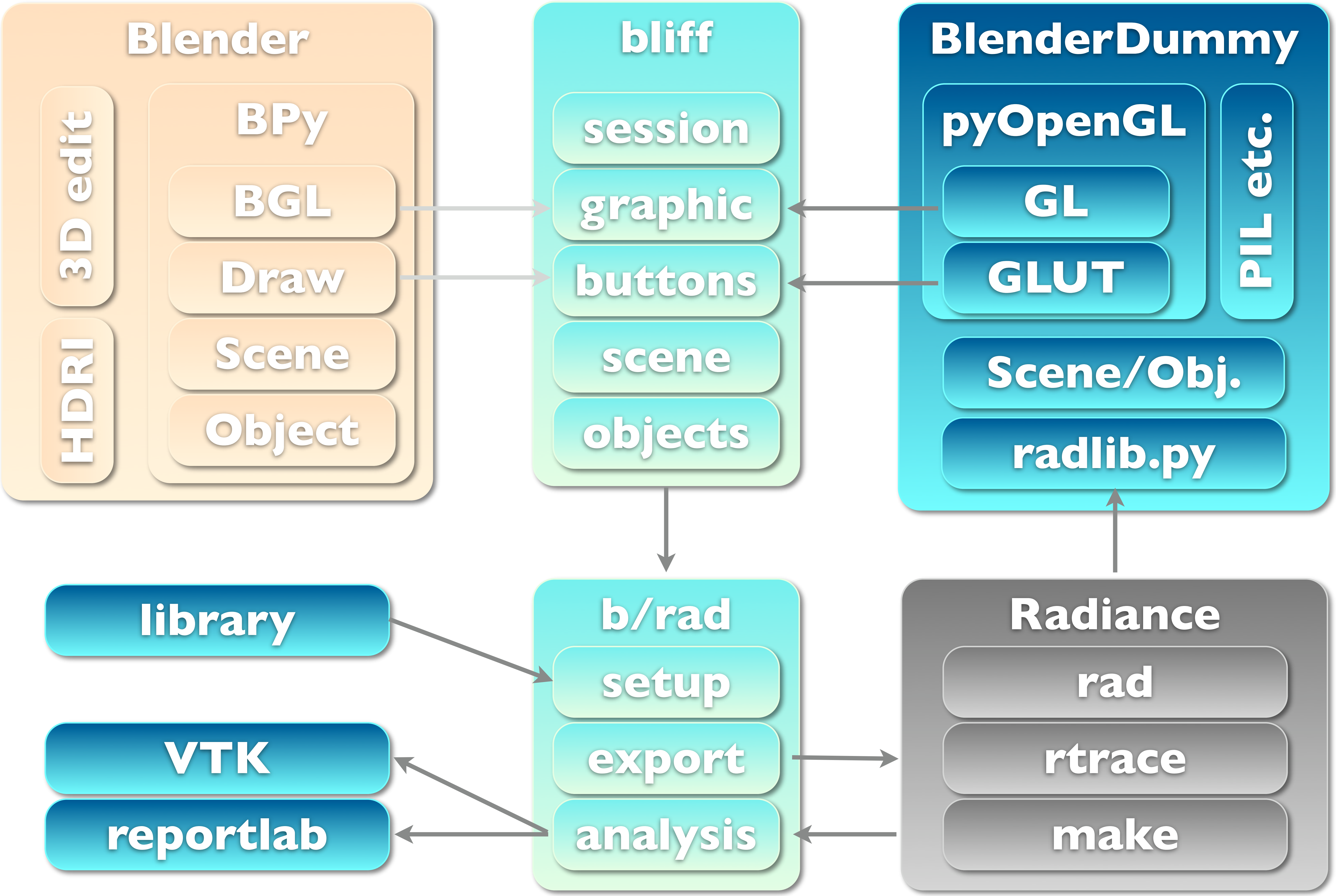
Radiance

rad

rtrace

make

Blender - BPy - bliff - b/rad



b/rad 2.0 roadmap

... or wishlist

- clean up and consolidate
- merge bliff and b/rad
- establish project structure (Rayfront)
- ultimate luminaire library
- Radiance scene import
- network libraries and rendering
- sync BlenderDummy functions
- Radiance library for Python