Computing Resources

- First Compute Nodes – 1996
  - goal: being able to run Autocad and Radiance
- Standalone Compute Nodes – 1997
  - goal: offload rendering to standalone hardware
- HPC Clustering
  - goal: batch multiple jobs over cluster, run and forget
    - OpenMosix - 2003
    - OpenSSI - 2004
    - Warewulf - 2006
      - http://warewulf.lbl.gov
      - http://metacluster.lbl.gov
- AWS EC2 – 2008
  - goal: cost, power, availability, scalability, don't want to own hardware

Why use AWS?

- cost
  - fixed rate hourly use
    - biddable (spot) rate use
  - fixed rate for storage GB
- flexibility
  - power – wide range of instance types
  - availability – when you need them
  - scalability – how many do you need
- Radiance on AWS
  - cost and flexibility

What are the key components to AWS?

- EC2 – Elastic Compute Cloud
  - AMI – Amazon Machine Image
  - Types – hardware specs
    - http://aws.amazon.com/ec2/instance-types/#instance-details
    - http://aws.amazon.com/ec2/pricing/#on-demand
    - http://aws.amazon.com/ec2/pricing/#spot
  - Instance – a running instance of an AMI on a selected type
- EBS – Elastic Block Store
  - block level storage - $0.10/GB-month
- Security
  - public key encryption
  - security group firewall

How to setup Radiance and AWS

- Setup an AWS account
  - http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/get-set-up-for-amazon-ec2.html
- Launch a default AMI
- Install Radiance and any other desired tools
- Create a new custom AMI from the running instance

Creating a Custom AMI

- launch an instance based on a default AMI (ex)
  - select default ami
    - Ubuntu 13.04 Server
    - Ubuntu 13.04 Server for HVM Instances
  - select a low cost instance type
    - t1.micro
    - m3.xlarge
  - add an EBS volume for storage of simulation/visualization data
  - login and setup a default user
  - configure ssh
  - setup the EBS volume for use

Install Radiance

- install prerequisites for compiling and running Radiance
  - csh emacs libX11-dev g++ tk make
  - optional - imagemagick
- setup directories (Rlib format)
- install source
- edit pcomb.c for file open size at 4096
- copy additional cal file to radiance lib dir – ray/src/cal/cal
- setup .profile for radiance
  - PATH and RAYPATH
  - ulimit -n 4096
- create an AMI from the running instance
  - creates snapshot that captures all the changes customizations to the default instance

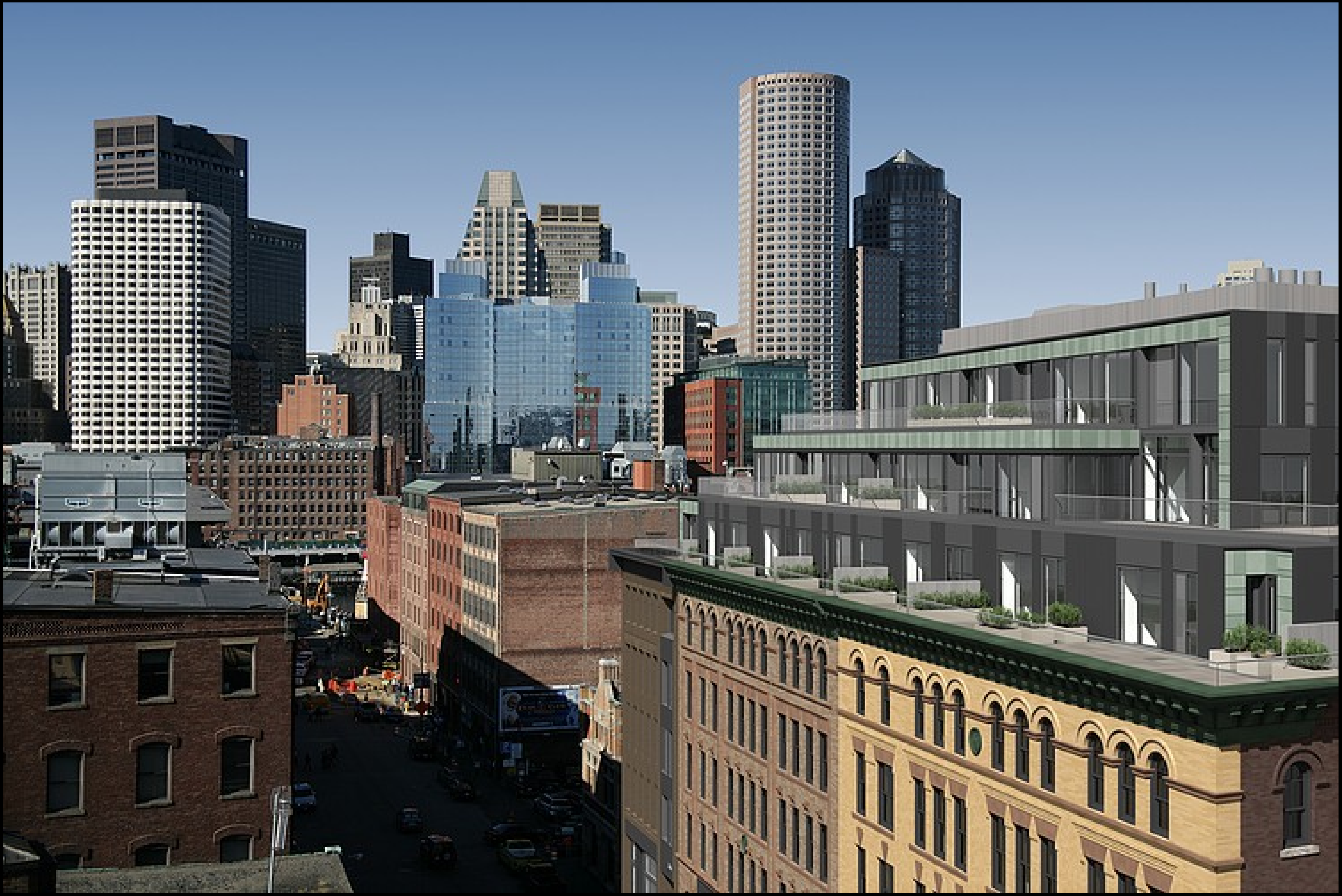
How to run Radiance jobs on AWS

- basic approach
  - ssh to connect
  - scp to transfer data
  - run jobs with nohup
  - terminate vs stop
- fancy approach
  - automated – cli
    - instance startup
    - data transfer in
    - job run
    - data transfer out
    - instance terminate

Closing

- things to watch for
  - leaving volumes hanging around
- benchmark
  - http://markjstock.org/pages/rad_bench.html#smp_results
  - seem to be hitting limit of processing spawning
  - would be interesting to test rtrace with this
  - what would be a suitable benchmark for rcontrib
- further work
  - using a ramdisk on instance with large memory
  - using Dropbox, Ubuntu One for xfer in/out automation
  - clustering on AWS

Selected Works



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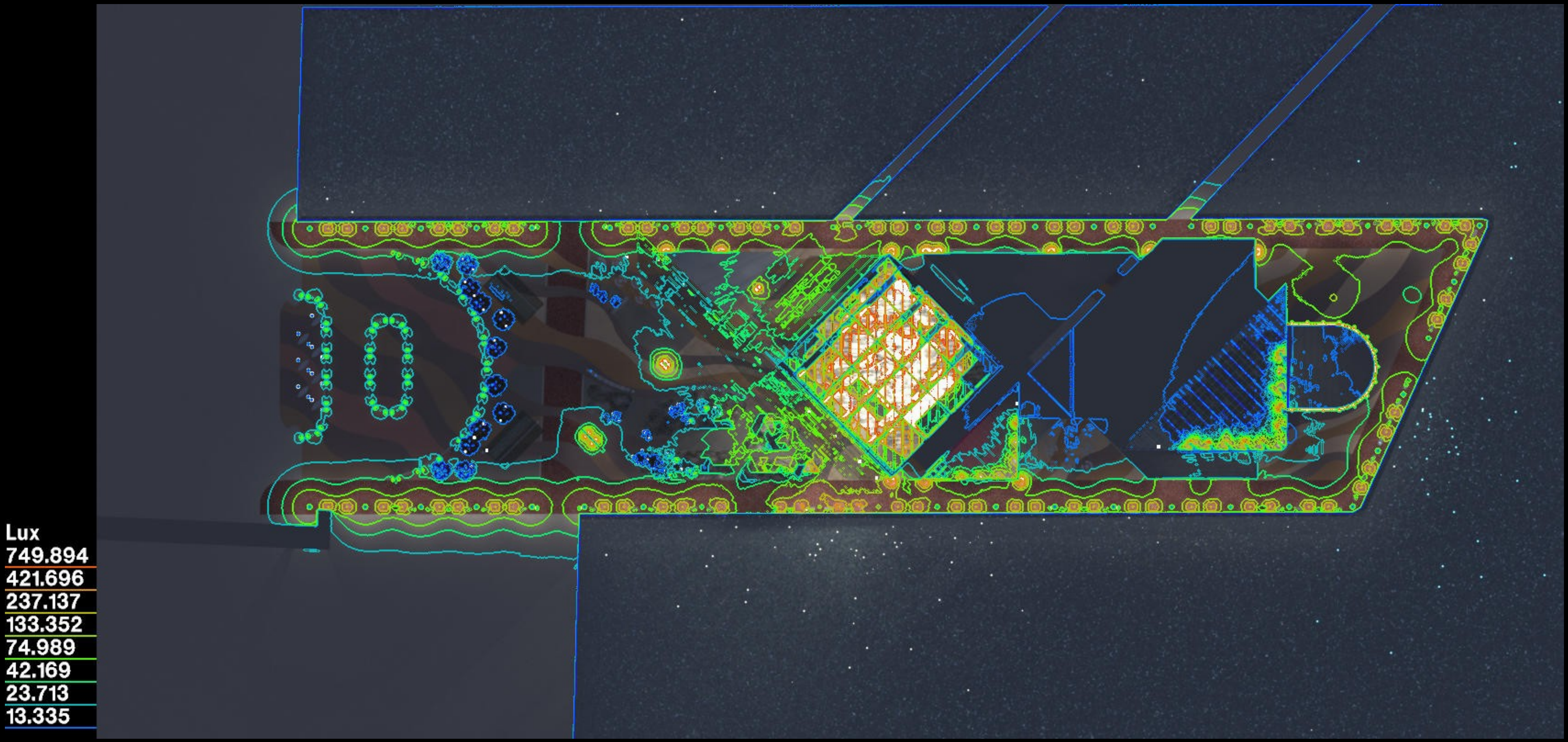

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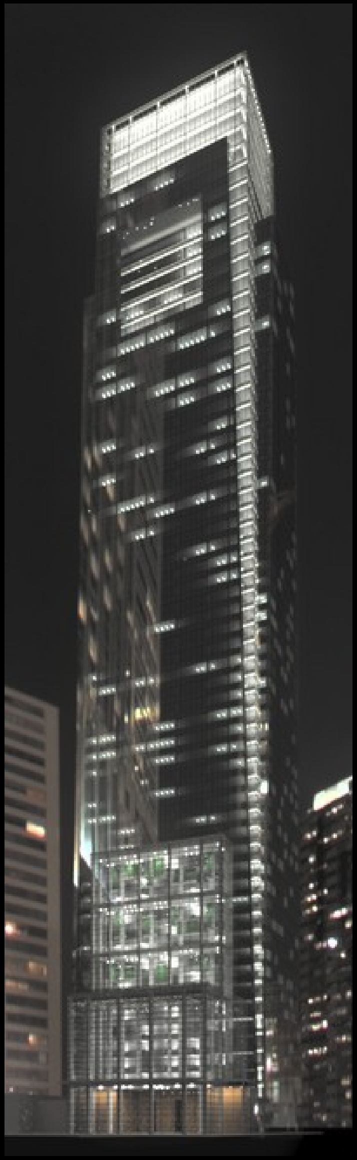
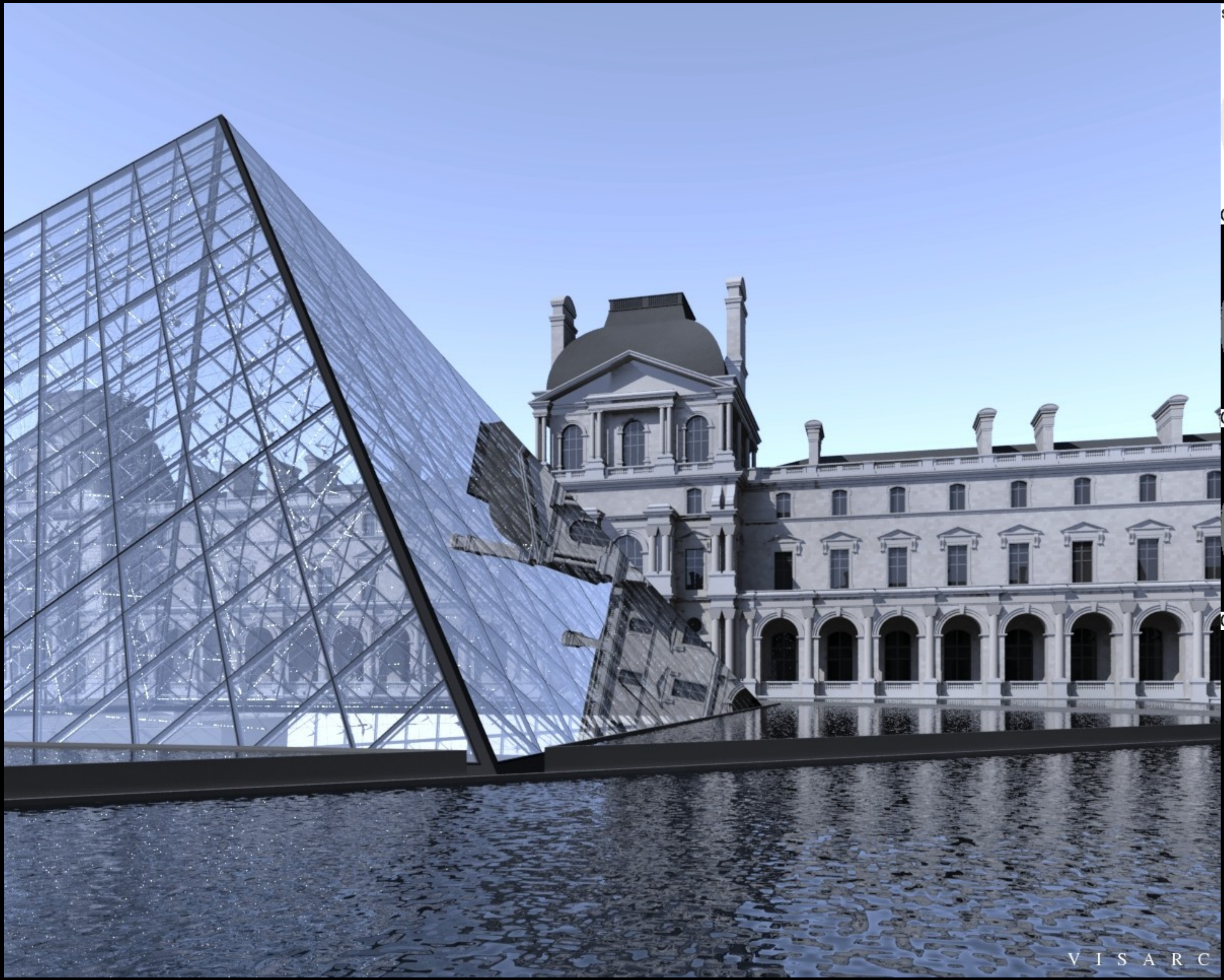
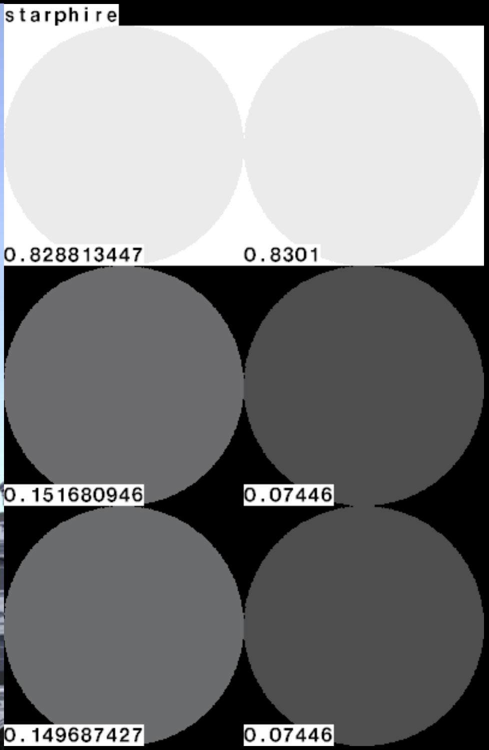


- IBL sources
- LED sources at selected spandrel conditions
- Interior down lights at corner condition
- Office lights (randomized) at “punched” condition
- Lighting at atrium/lobby condition
- Randomized office lighting at typical conditions
- “background” HDRI
- Ambient term
- Tone mapping for human visual sensitivity

Selected Works





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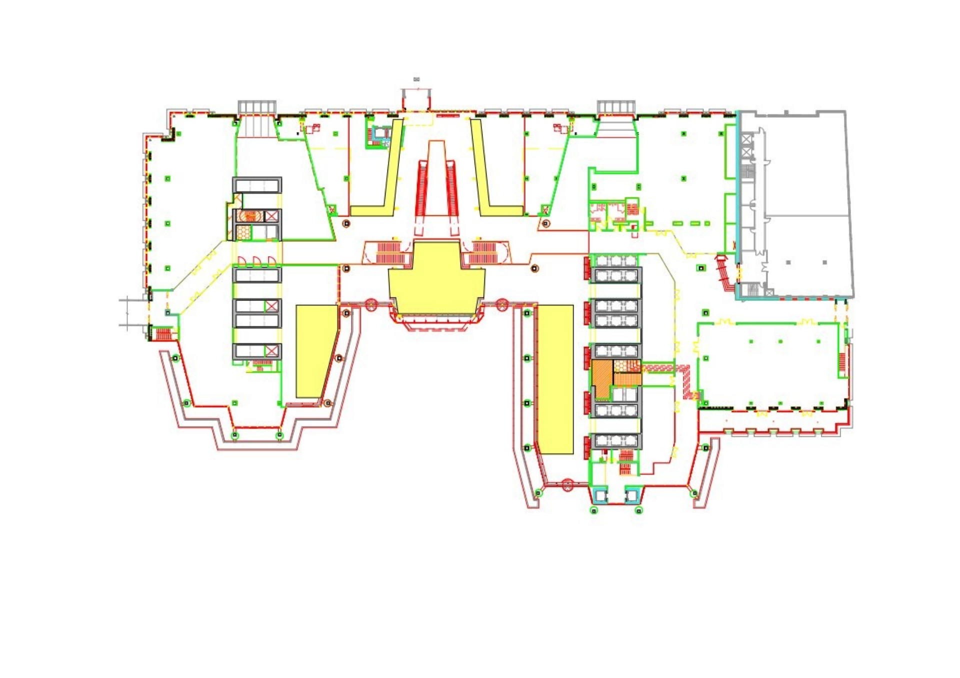

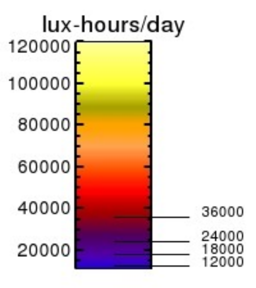

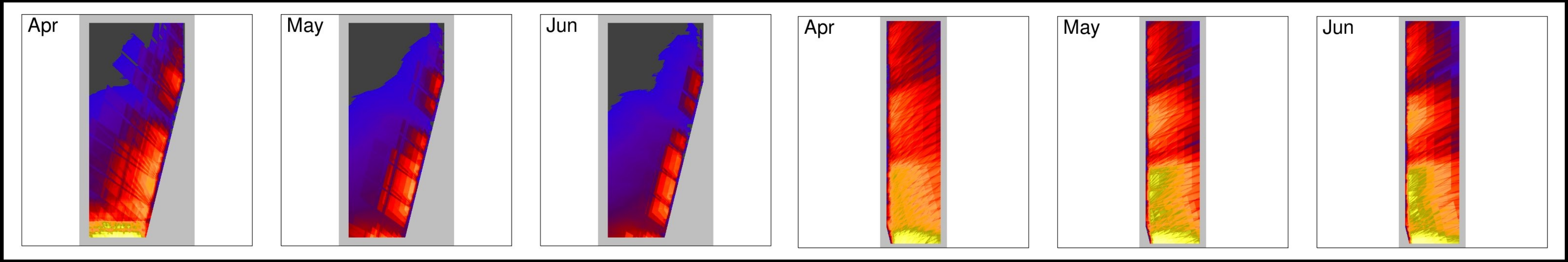

Thanks!