

# Parallel Inception

MPP Databases

GPGPU

*Kyle Dunn*

# Me

Data nerd for  Pivotal.

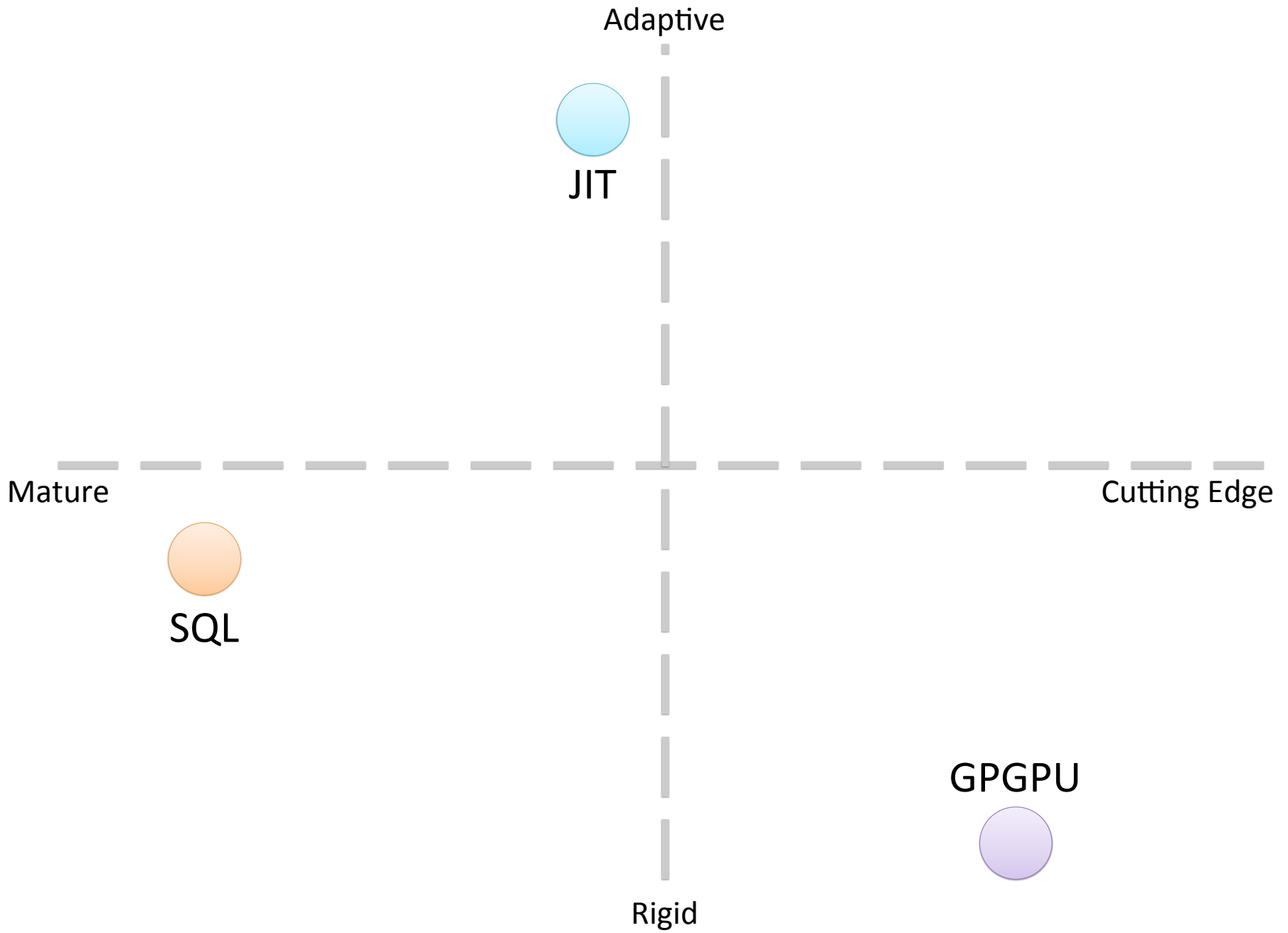
 pythonista

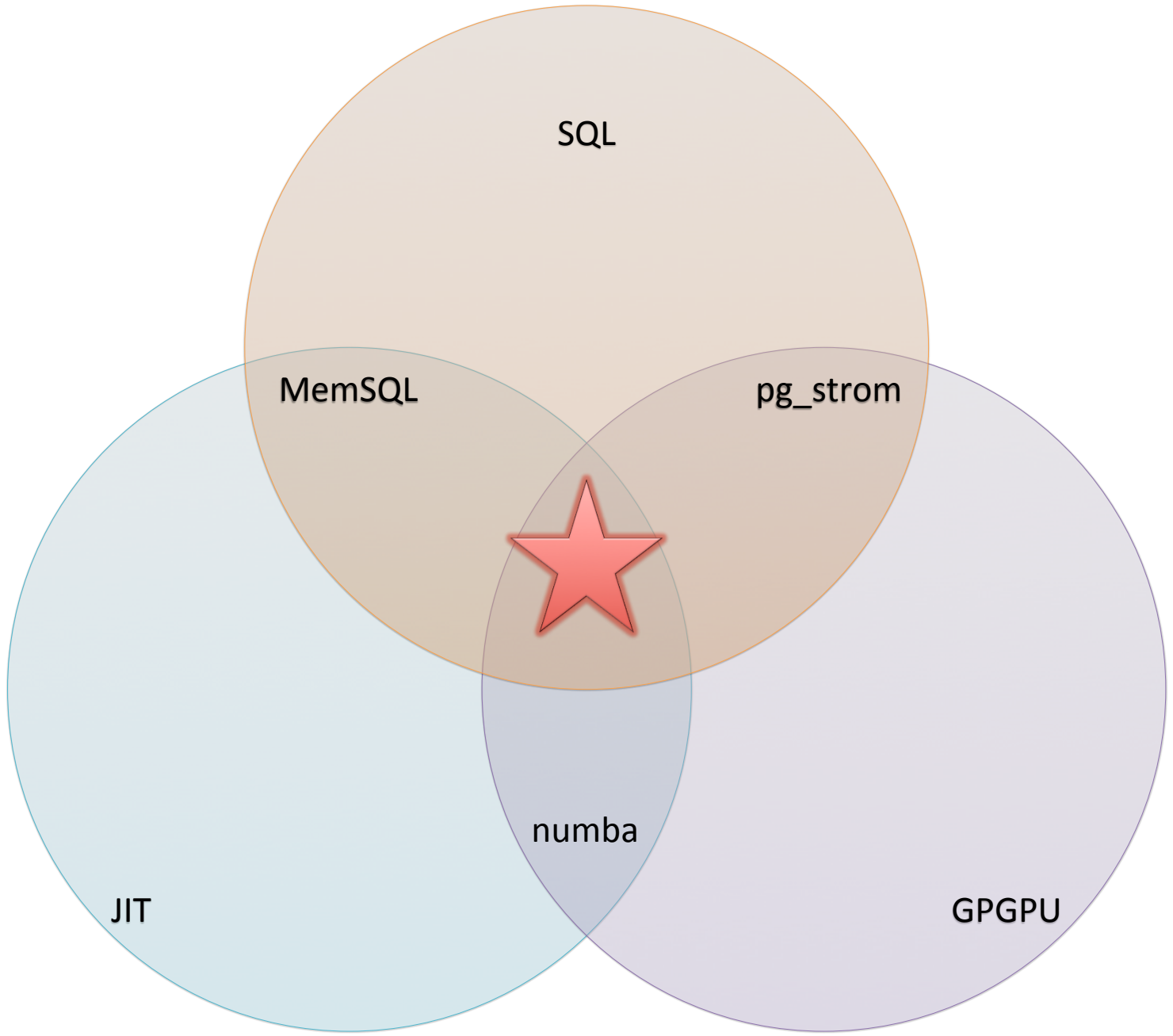
Recovering HPC/GPGPU researcher





Poll





SQL

MemSQL

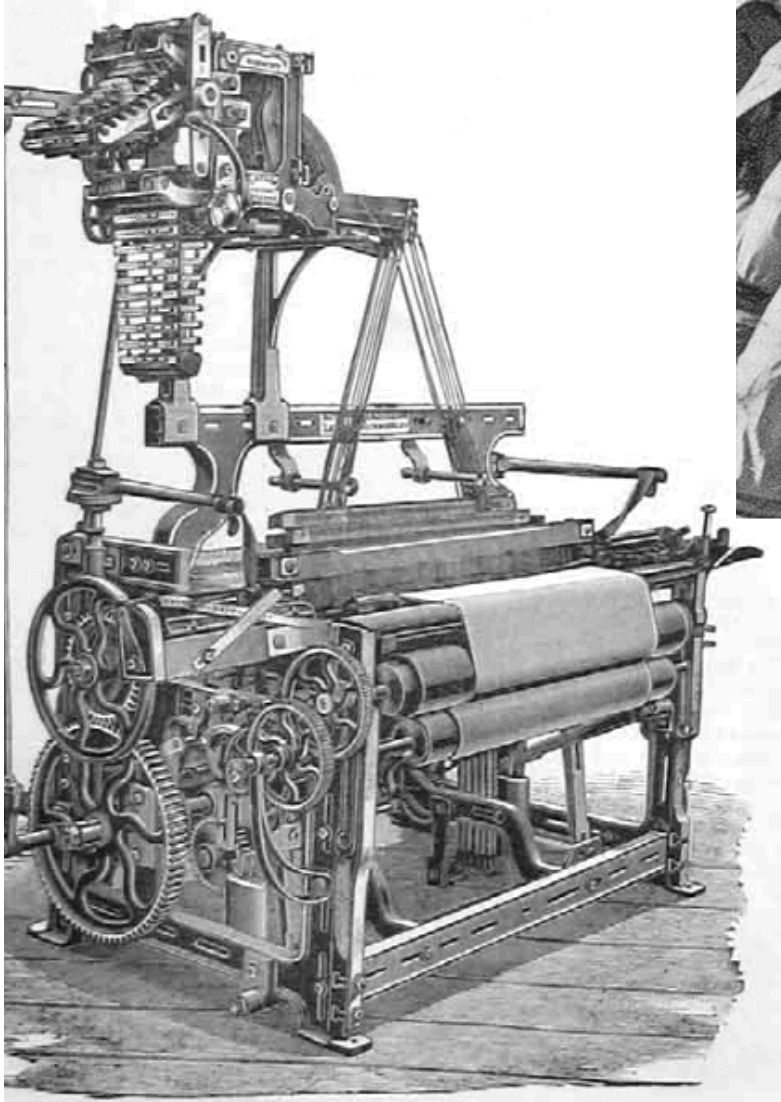
pg\_strom

JIT

numba

GPGPU

Edmund Cartwright (1784/5)



Scale  
vs.  
Capability

# GPGPU

```
import numpy as np
import pyopencl as cl
import pyopencl.array

a_np = np.random.rand(50000).astype(np.float32)
b_np = np.random.rand(50000).astype(np.float32)

ctx = cl.create_some_context()
queue = cl.CommandQueue(ctx)

mf = cl.mem_flags
a_g = cl.Buffer(ctx, mf.READ_ONLY | mf.COPY_HOST_PTR, hostbuf=a_np)
b_g = cl.Buffer(ctx, mf.READ_ONLY | mf.COPY_HOST_PTR, hostbuf=b_np)

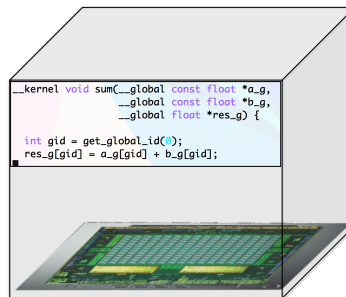
prg = cl.Program(ctx, """
__kernel void sum(__global const float *a_g, __global const float *b_g, __global
float *res_g) {
    int gid = get_global_id(0);
    res_g[gid] = a_g[gid] + b_g[gid];
}
""").build()

res_g = cl.Buffer(ctx, mf.WRITE_ONLY, a_np.nbytes)
prg.sum(queue, a_np.shape, None, a_g, b_g, res_g)

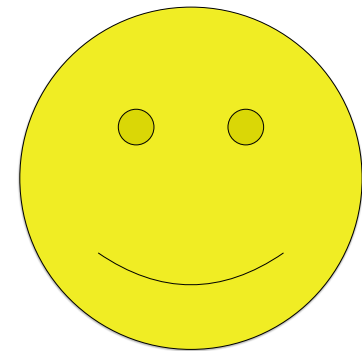
res_np = np.empty_like(a_np)
cl.enqueue_copy(queue, res_np, res_g)

return np.linalg.norm(res_np - (a_np + b_np))
```

Code blueprint

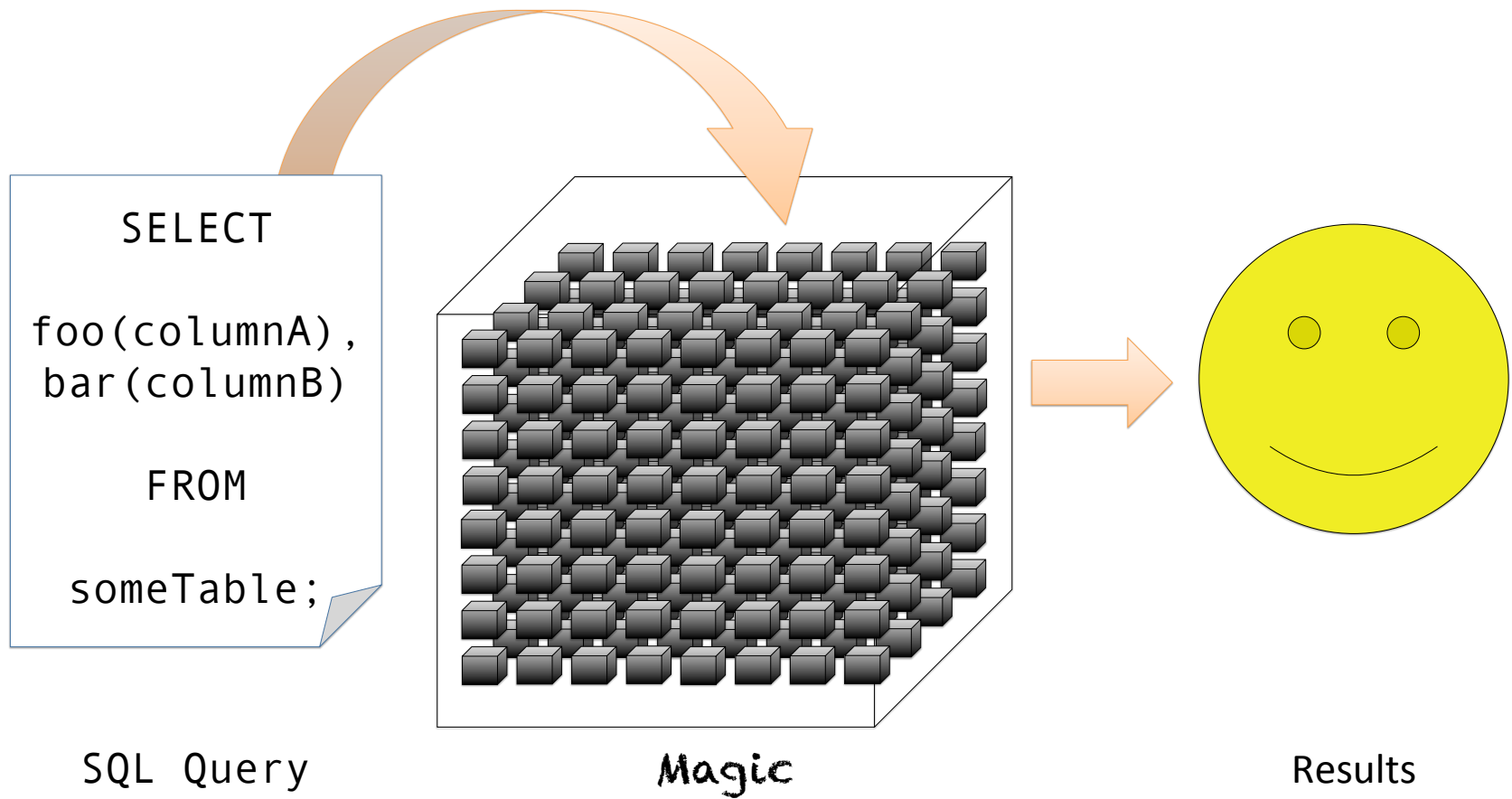


Magic

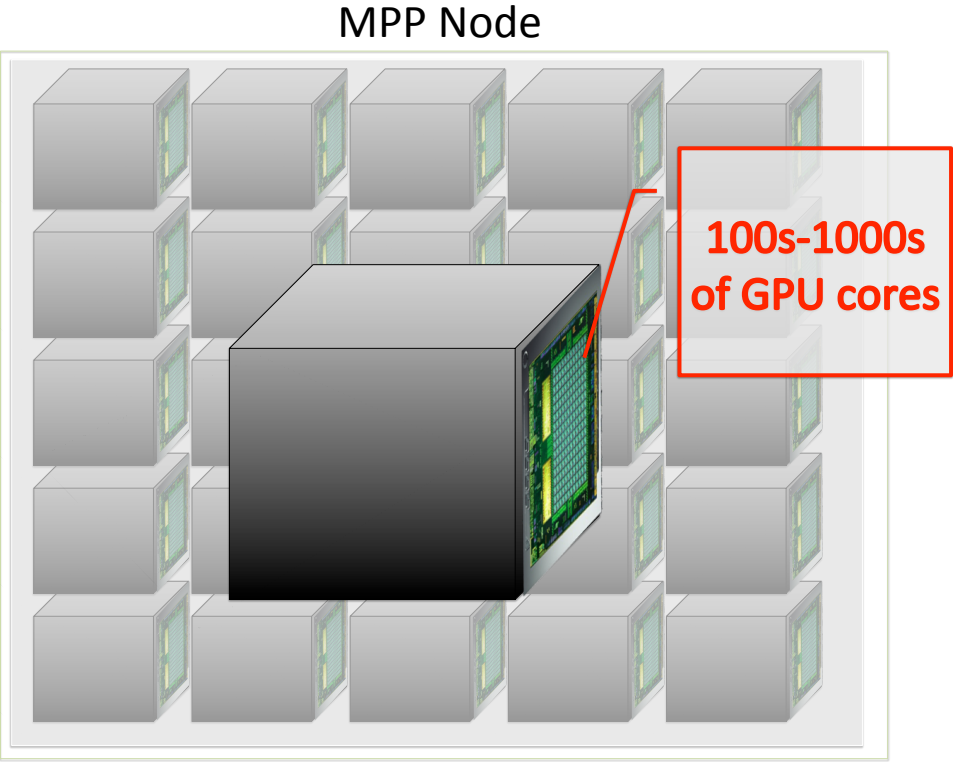
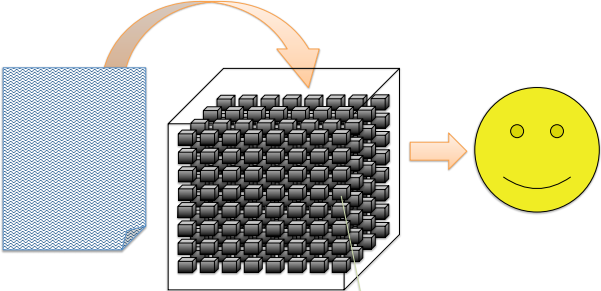


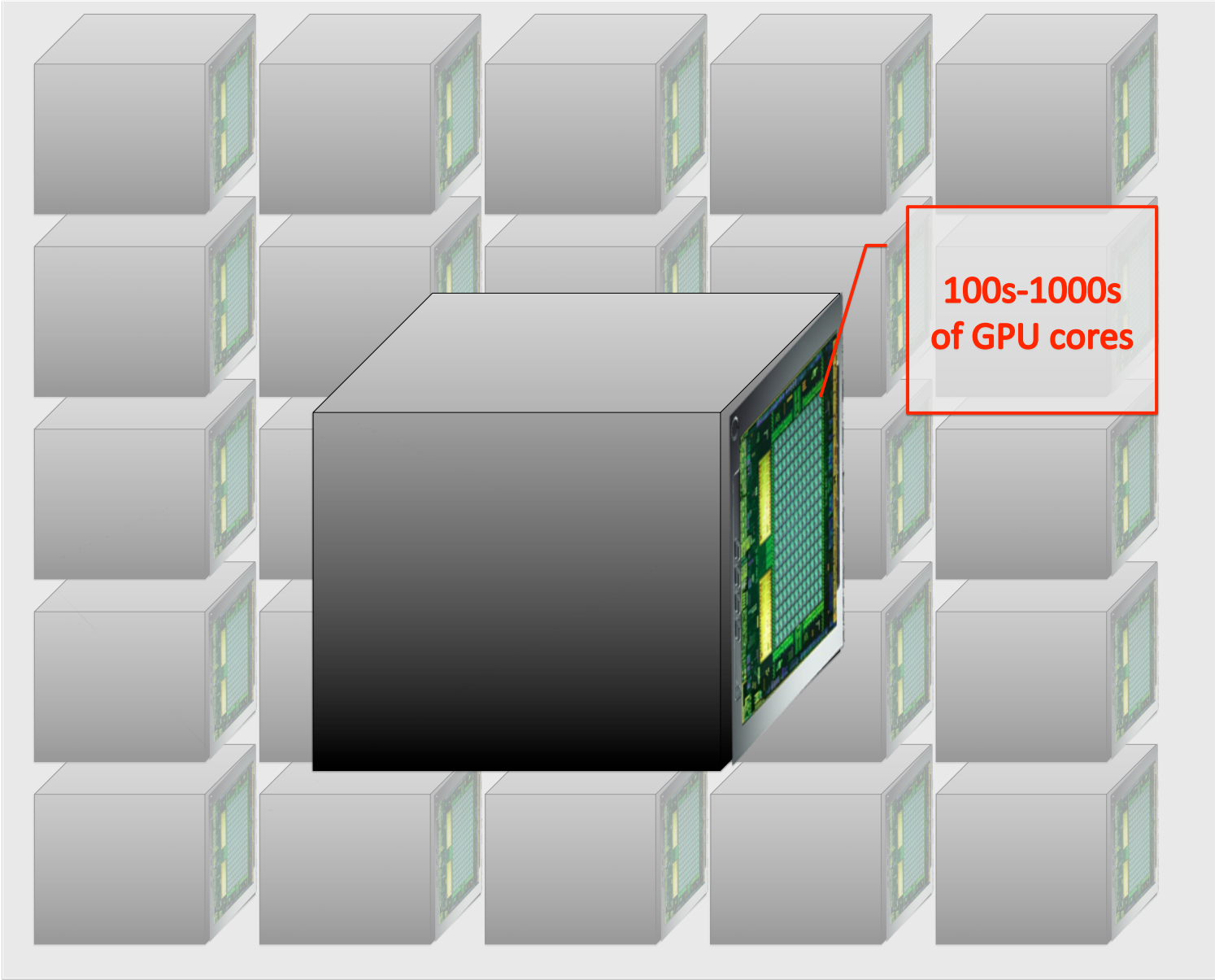
Results

# MPP



# The inception





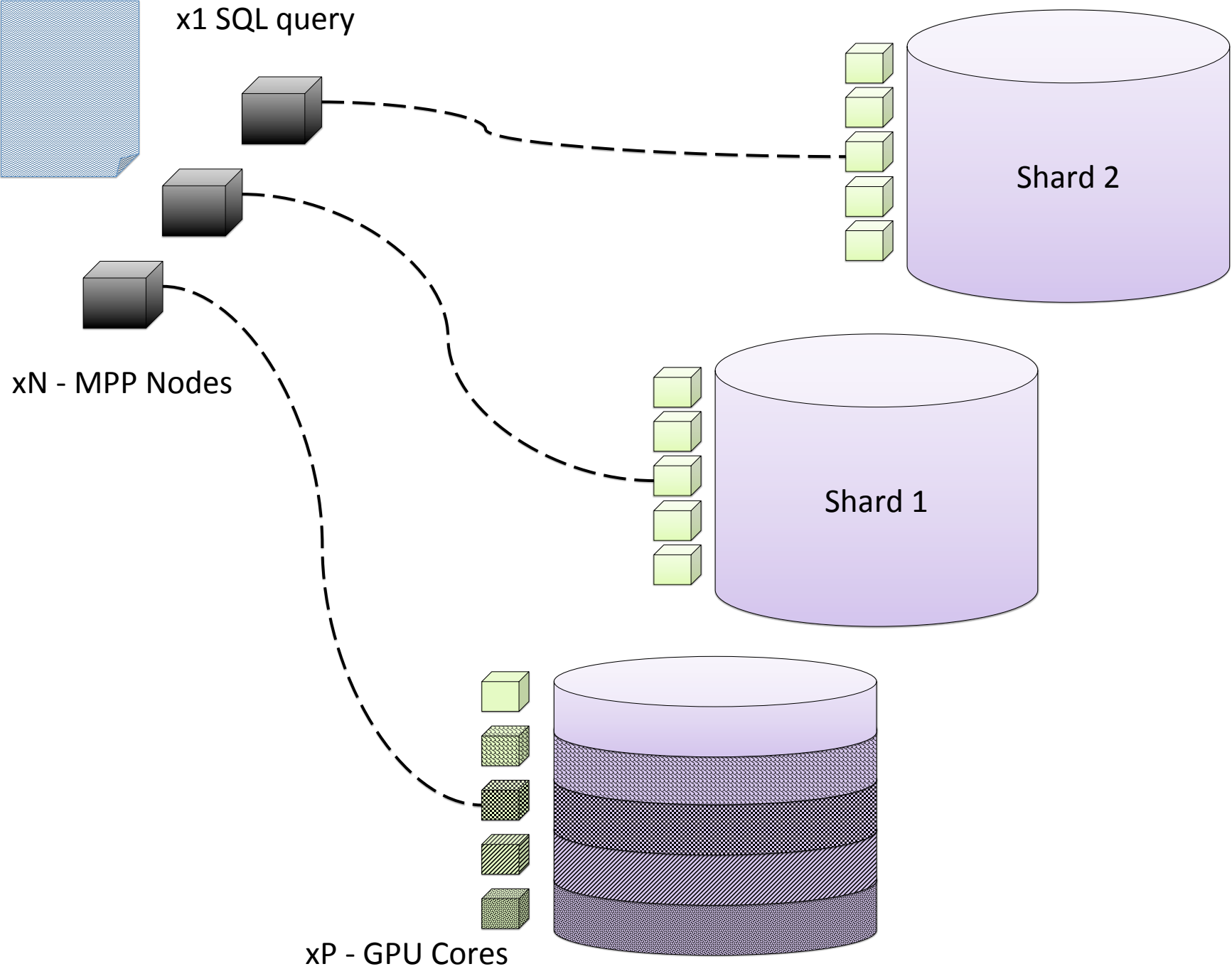
100s-1000s  
of GPU cores



**Ship it.**

So what?

$$\frac{Data^{BIG}}{Nodes_{MPP} \cdot Cores_{GPU}}$$



# Free lunch?

## 1. IO

- Depends on the restaurant...

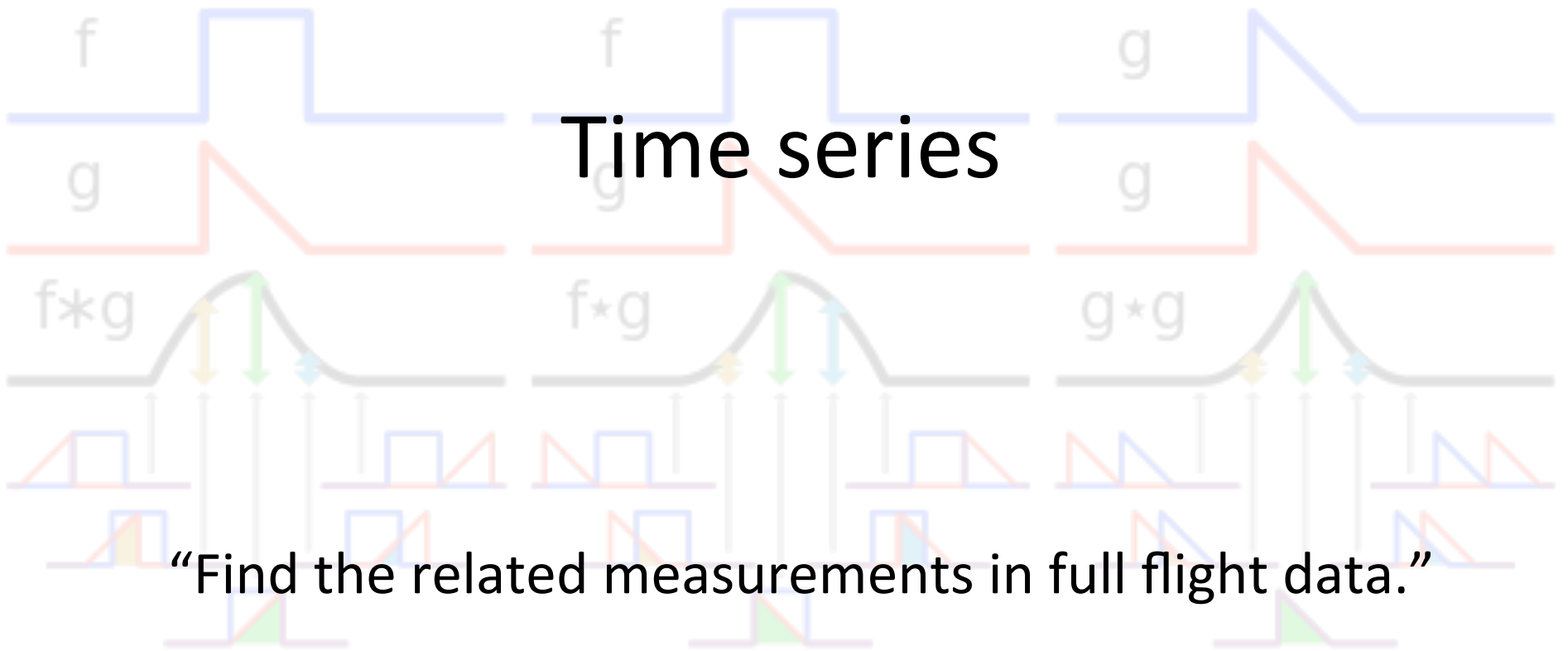
## 2. SIMD

- And the entrée...

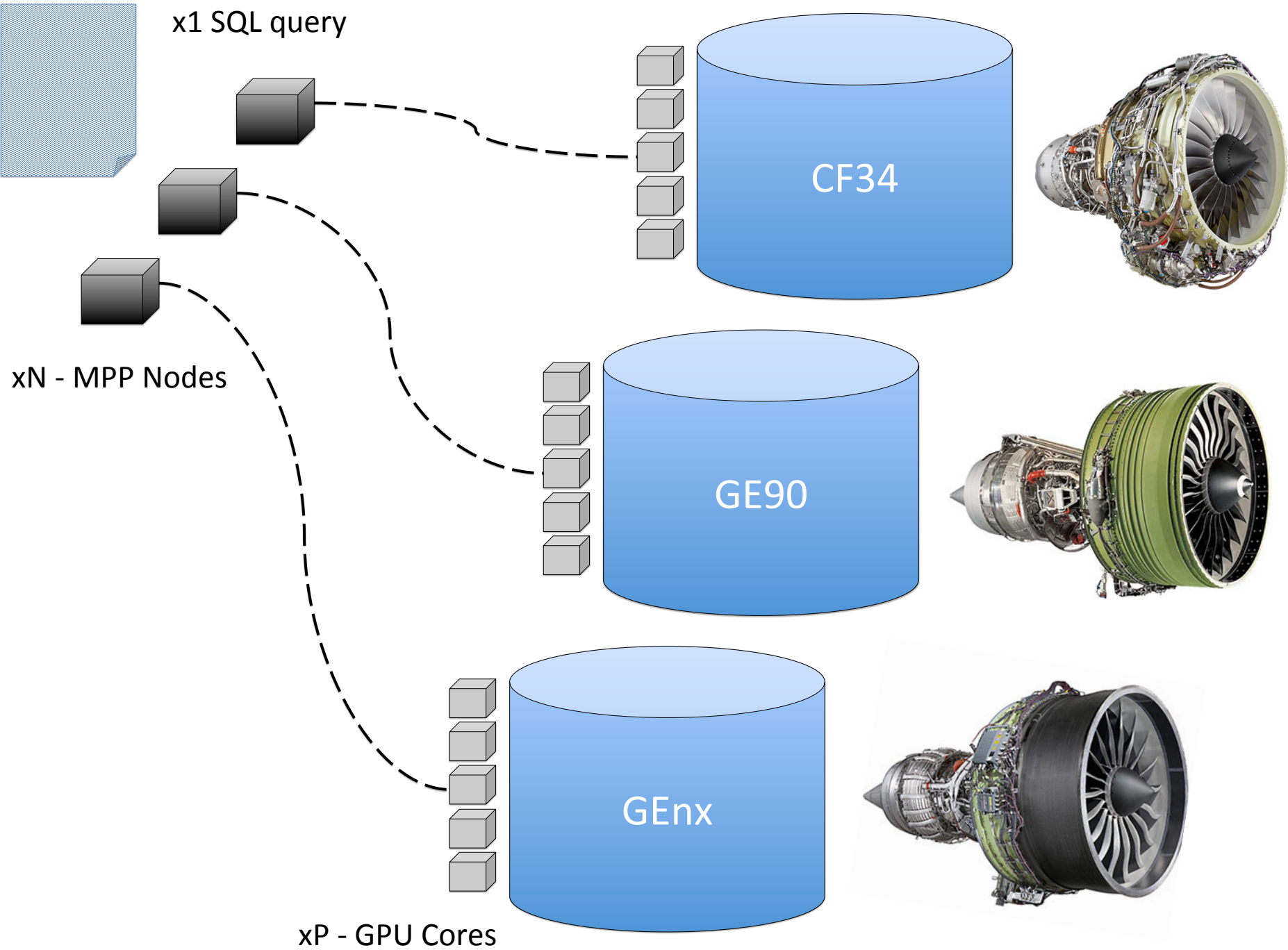
## 3. Concurrency

- Hoard your Pi[e]

# Time series

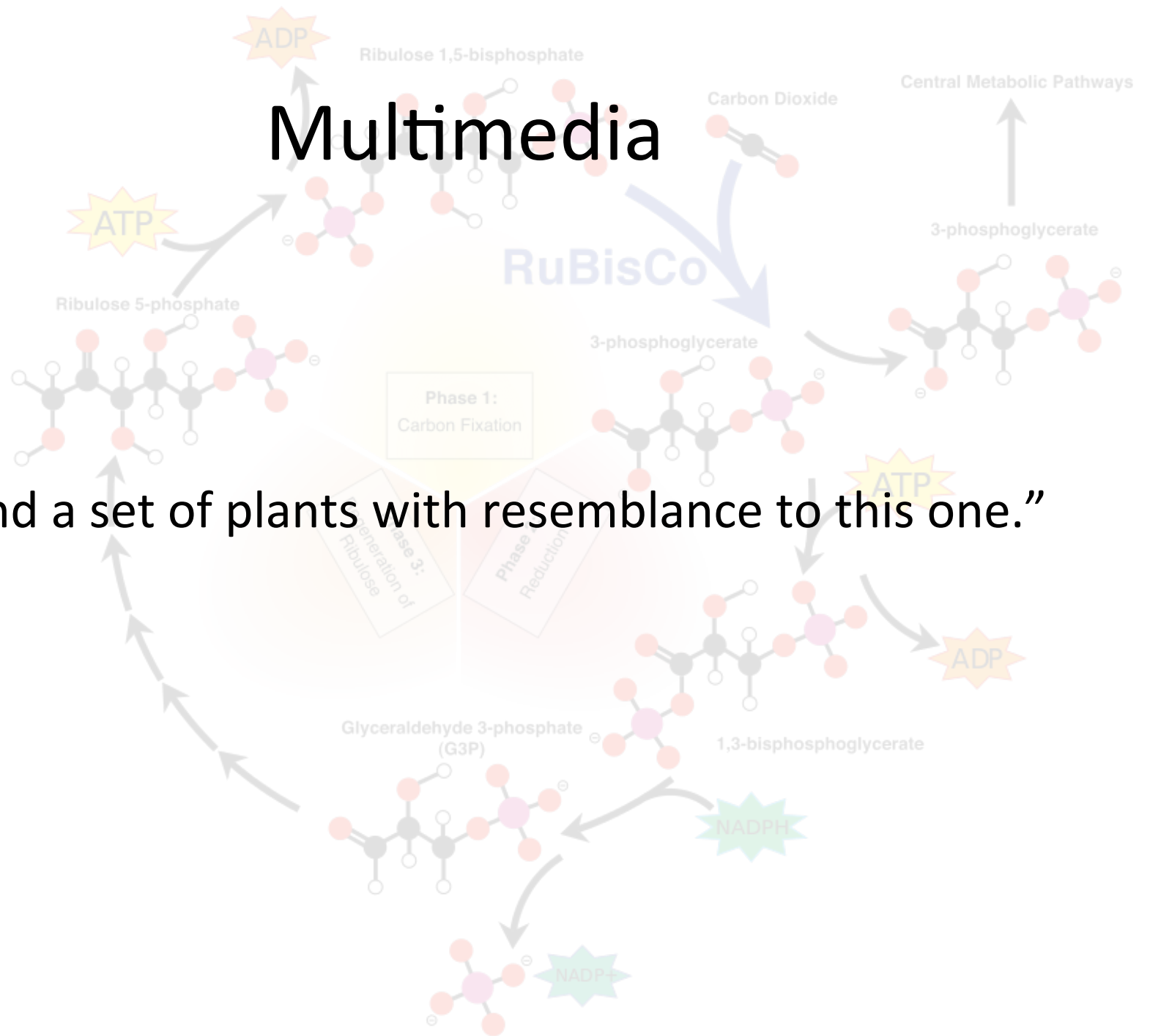


“Find the related measurements in full flight data.”

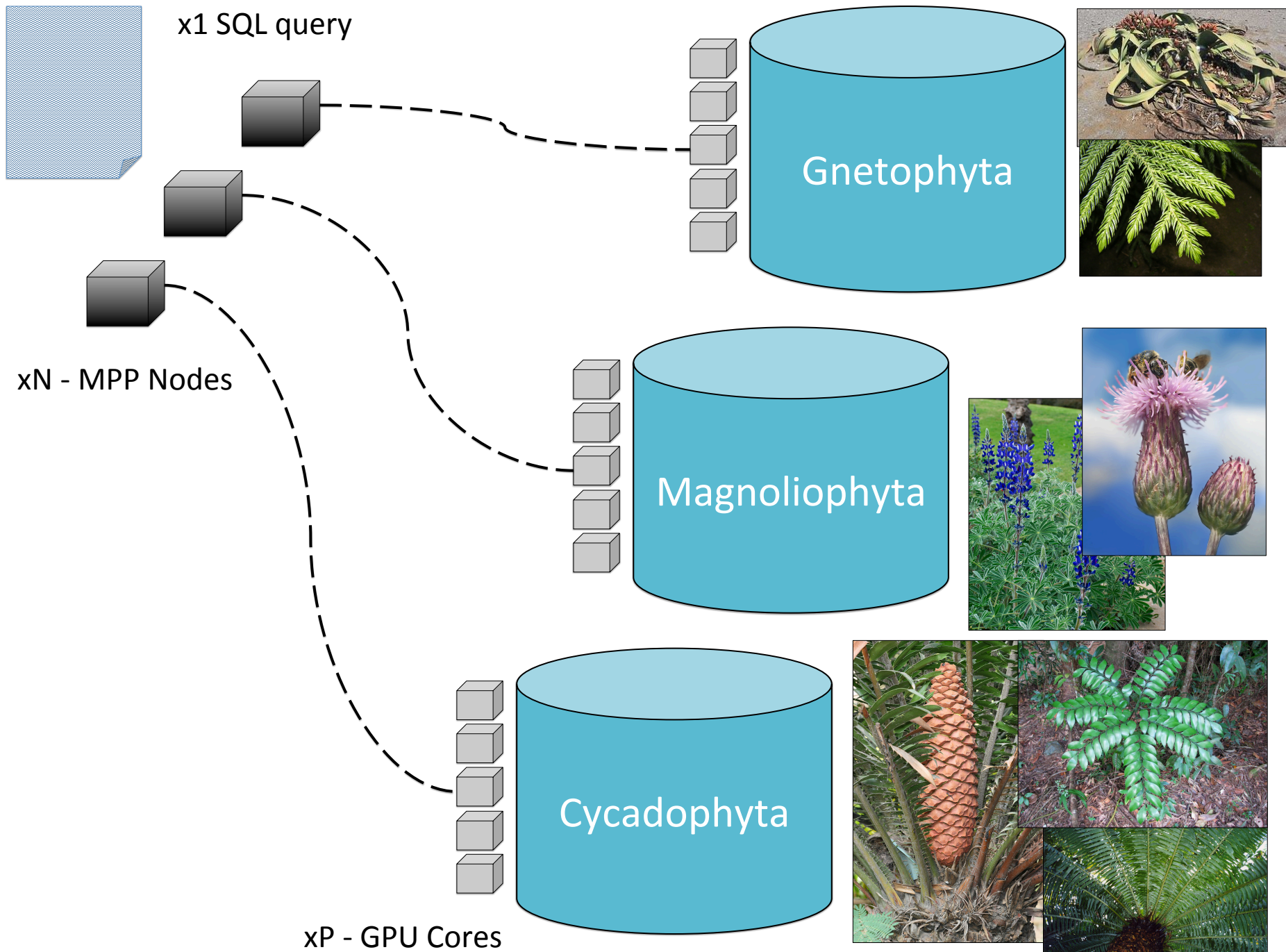


# Multimedia

“Find a set of plants with resemblance to this one.”



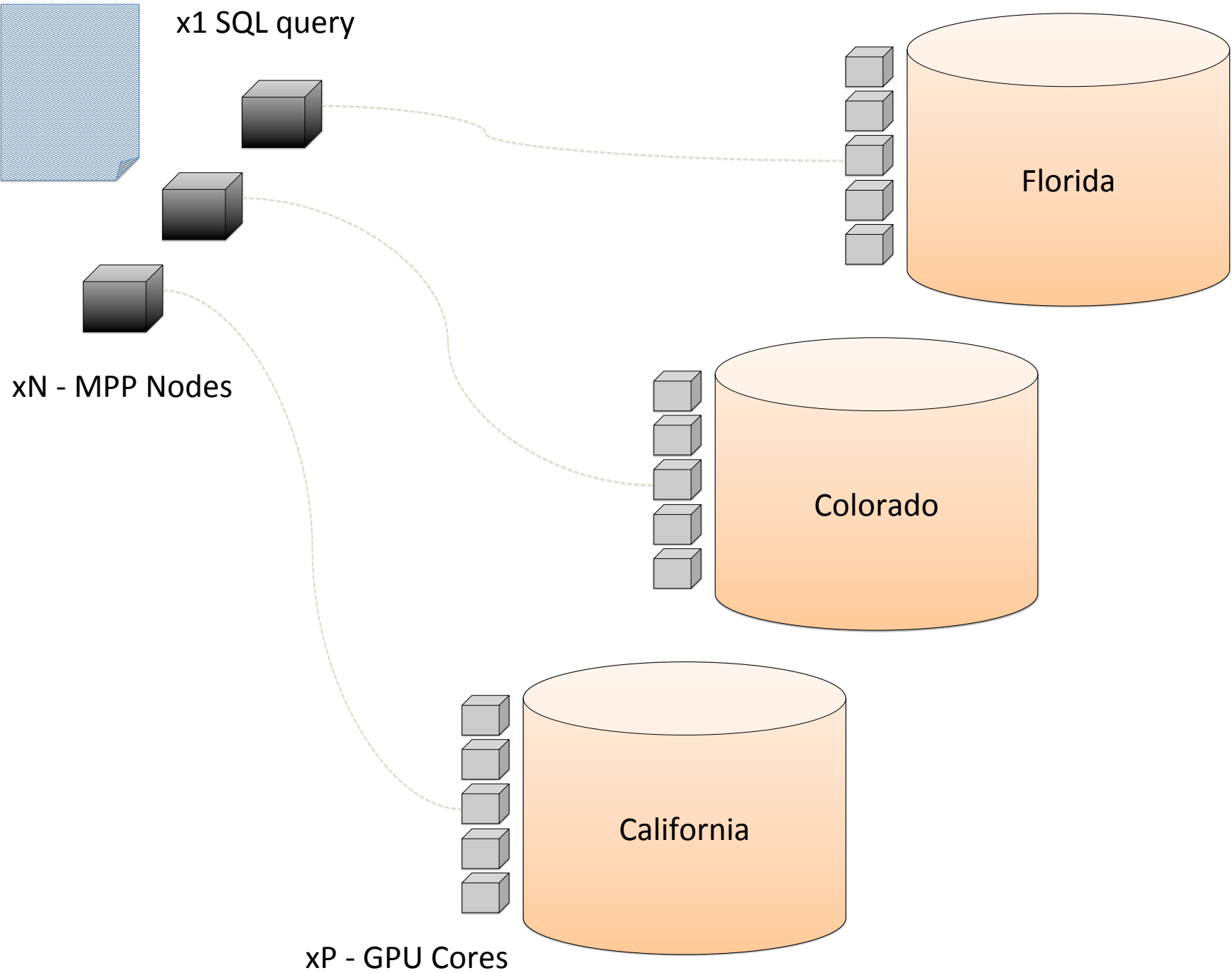




A world map with a color gradient representing solar insolation levels. The colors range from dark purple (low insolation) to bright yellow (high insolation). High insolation areas are concentrated in the tropics, particularly in the Amazon basin, central Africa, and parts of South America, Africa, and Asia. Lower insolation is seen in the high northern and southern latitudes.

# Geospatial

“Find locations with high historical solar insolation.”



# tl;dr

- Turn-key >> nuts and bolts
- JIT your code
- SQL lives (seriously though)

and then...

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