



Visualisation Technologies

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- Outline the problem
- Description of how our users are attempting to use graphics
- Demonstration of some remote features (X2GO, X2GO + VirtualGL, ParaView with MRI data)

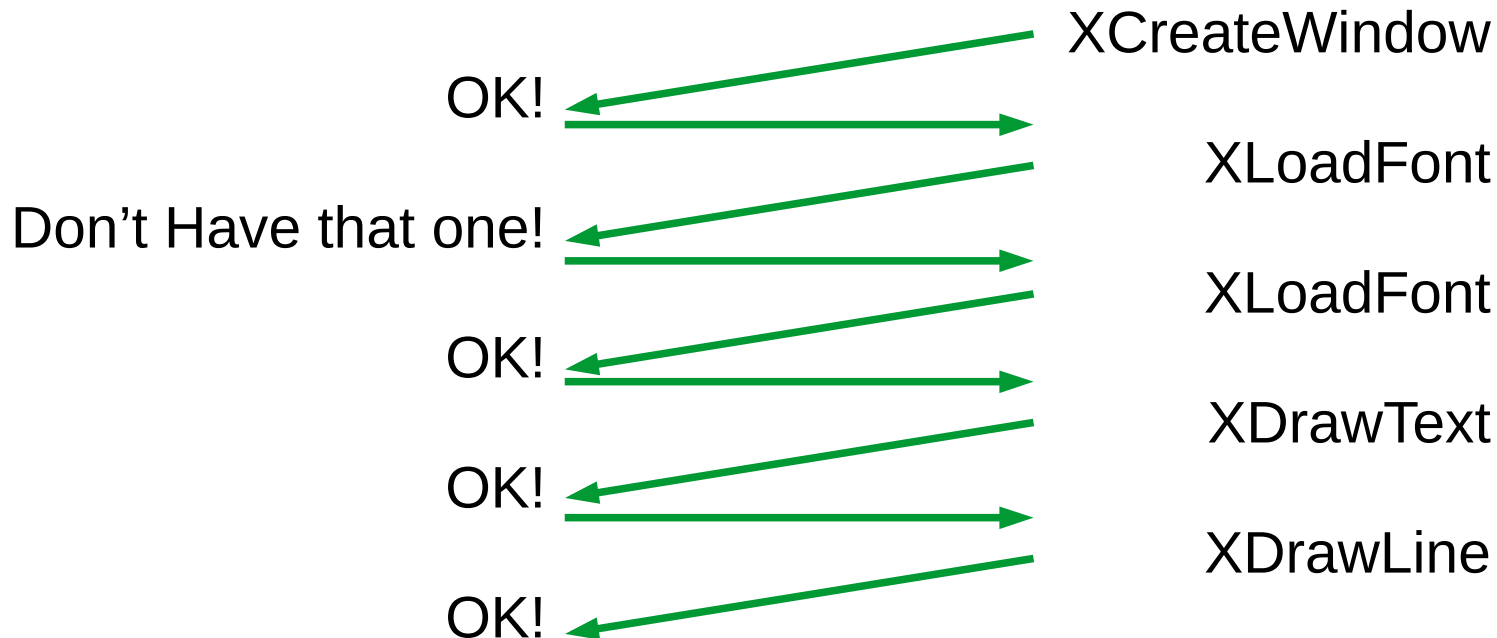
Visualisation with HPC clusters isn't straightforward.

- Graphics stacks optimised for games
 - Expect application and display hardware on same system
 - Remote X client/server OpenGL interoperability slow and often not tested properly
- High latency networks in the way
- Graphics geographically distinct from data / compute
- Security features in the way (firewalls, VPNs)
- The Wayland-pocalypse is on the horizon

X11 protocol is chatty and latency bound

X Server (display)

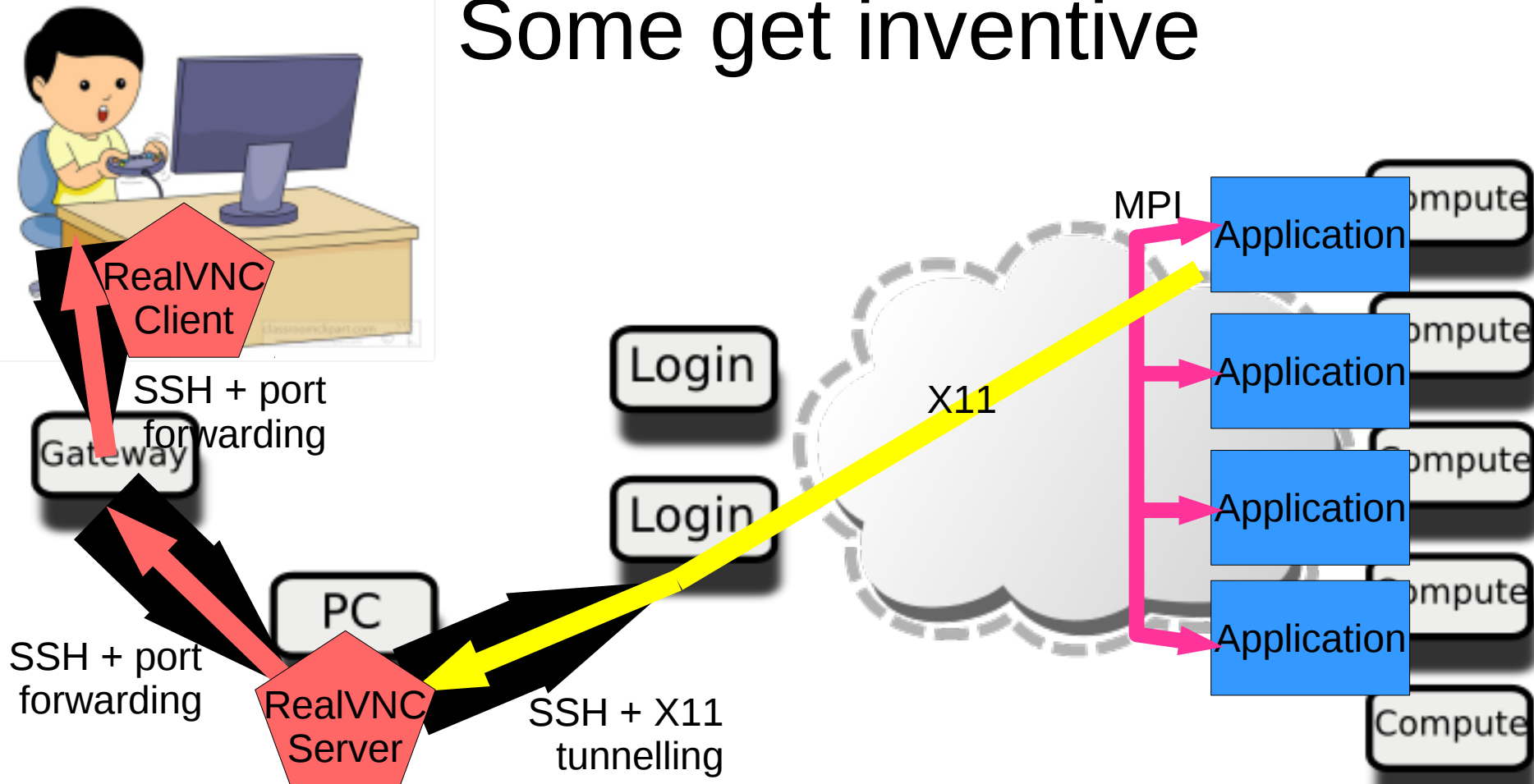
X Client (the program)



Whole bunch of ways to try and ‘fix’
visualisation.

What are our users doing?

Some get inventive



Most get frustrated #1



Application

SCP

Login

Login

SSH

+ SCP File Copy



Compute

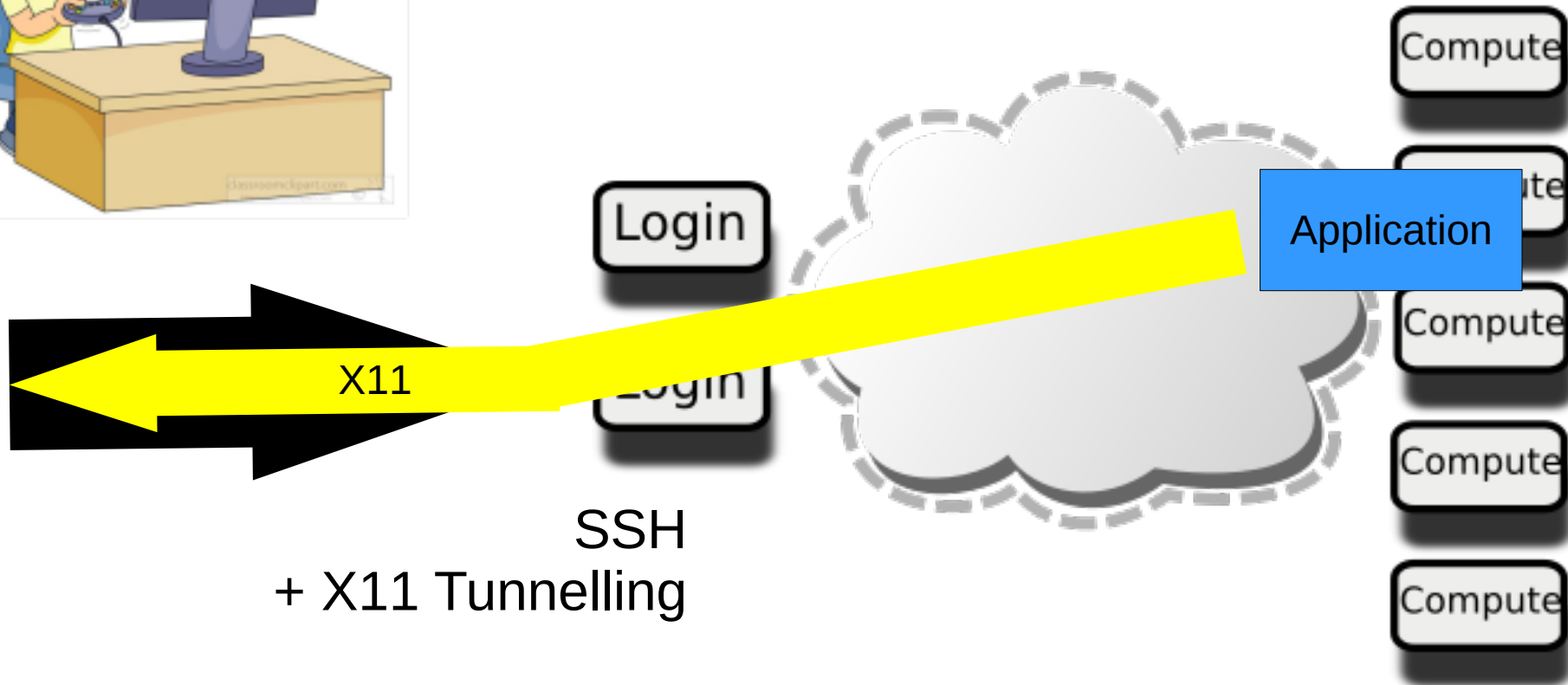
Compute

Compute

Compute

Compute

Most get frustrated #2



Some use cluster aware apps #1



Front
end

ParaView / VisIT/ Schrodinger
etc.

SSH
+ SSH port forwarding

Login

Login

Back
end

Compute

Compute

Compute

Compute

Compute

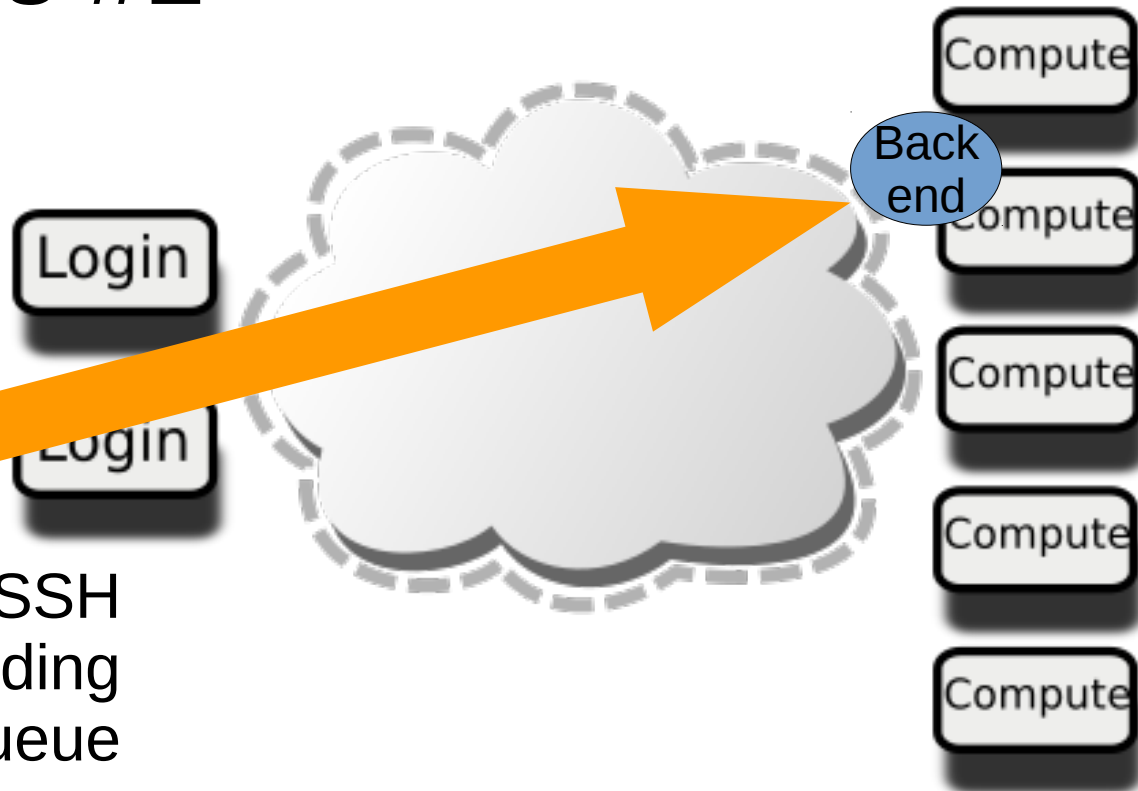
Some use cluster aware apps #2



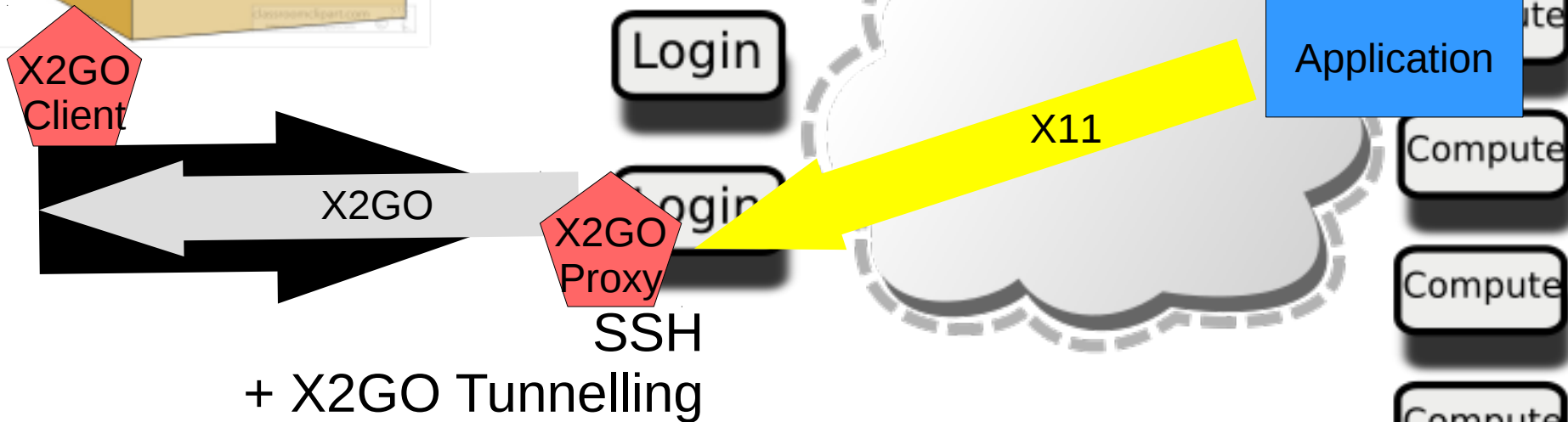
Front
end

ParaView / VisIT/ Schrodinger
etc.

SSH
+ SSH port forwarding
+ Batch queue



Others use an X proxy - software rendering



(Could use X proxy
with hardware render)



X2GO
Client

X2GO

X2GO
Proxy

SSH

+ X2GO Tunnelling

Login

Login

X11

Virtual
GL

Application

Compute

Compute

Compute

Compute

Compute

(Could use really special apps #1)



Front
end

ParaView / VisIT

Login

Login

SSH

- + SSH port forwarding
- + Batch queue
- + Hardware accel

Back
end

X
GL

Compute

Compute

Compute

Compute

Compute

Could use really special apps #2



Front
end

ParaView / VisIT

Login

Login

SSH

+ SSH port forwarding
+ Batch queue
+ MPI

MPI

Back
end

Compute

Back
end

Compute

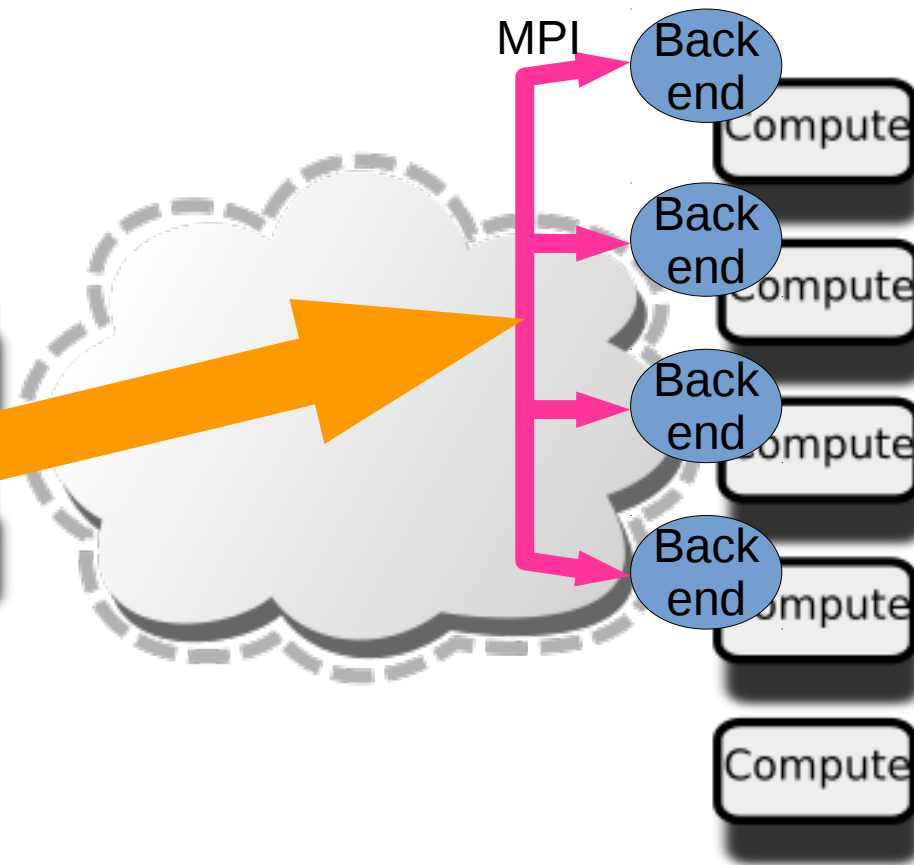
Back
end

Compute

Back
end

Compute

Compute



(Could use really special apps #3)



Front
end

ParaView / VisIT

Login

Login

SSH

- + SSH port forwarding
- + Batch queue
- + MPI
- + Hardware accel

MPI

Back
end

X
GL

Back
end

X
GL

Back
end

X
GL

Back
end

X
GL

Compute

Roadmap:

- Support ParaView and VisIT (done)
- Support X2GO (done)
- Integrate GPUs into batch queues (done)
- Integrate hardware accelerated X into batch queues (again)
- Simplify hardware accelerated X2GO
- Want to look at NVIDIA vGPU hardware

Whole bunch of ways to try and ‘fix’
visualisation.

Need to support multiple methods.

The challenge is to make it easy to use.



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