Scientific User's Perspective on Lustre

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Schematic Global Climate Model

Horizontal Grid (Latitude-Longitude)

Vertical Grid (Height or Pressure)
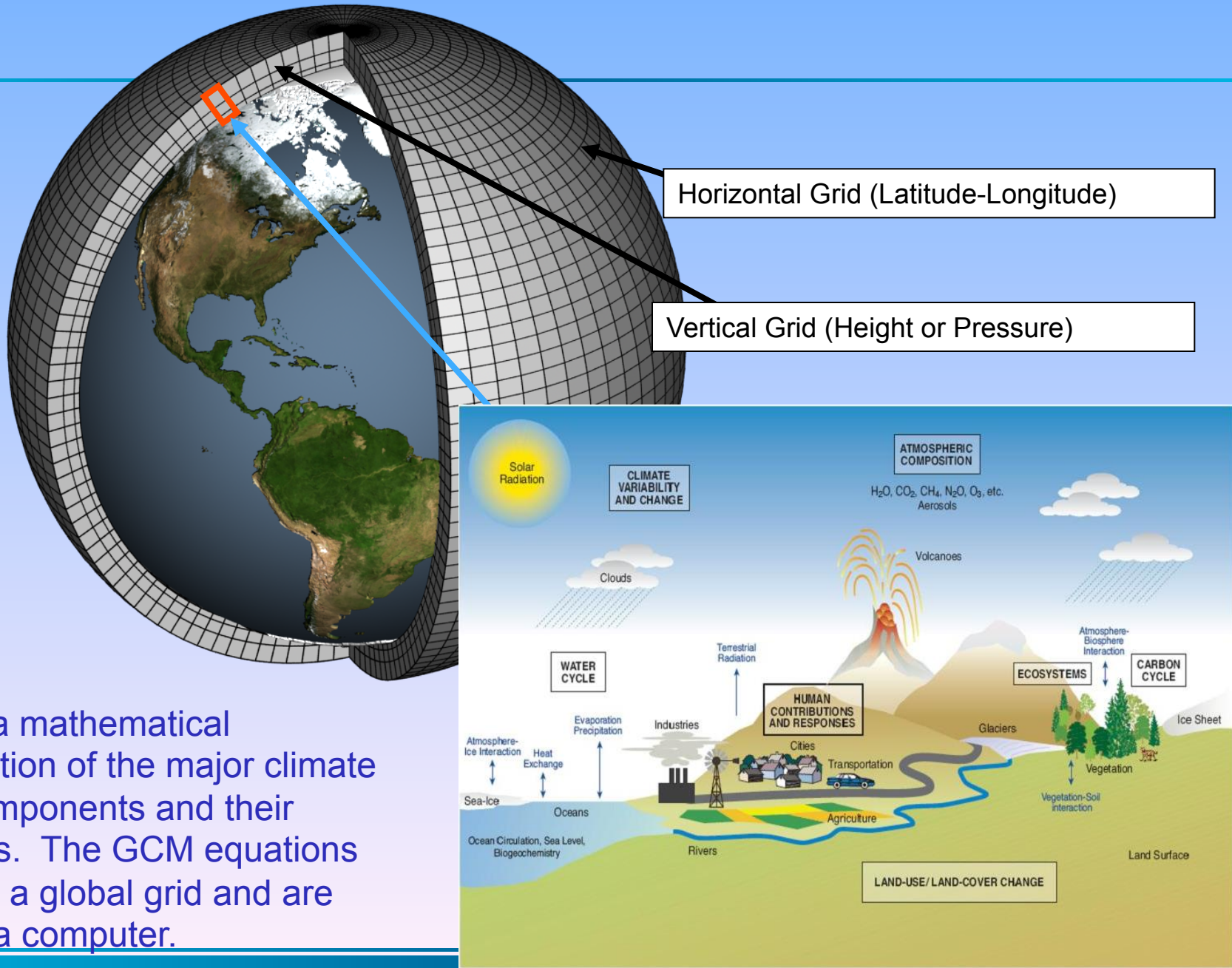
A GCM is a mathematical representation of the major climate system components and their interactions. The GCM equations operate on a global grid and are solved on a computer.

The User Community

At GFDL we have a variety of user experience levels with lustre.

Some have years of experience with large installations, others have just recently been introduced to lustre on Gaea.

I obtained information on the user perspective by interviewing members of the GFDL user community.

First, the Positive

What do the users think?

- Users have a generally good perception of Lustre.

- Lustre provides the scientists with a platform on which to do large scale experimentation.

- Lustre also provides the scalability that supports the users needs to scale the science.

Users Perceptions

- Performance
  - Model initialization took 15 mins before now it takes 8 mins.

- Reliability
  - Generally it's a reliable and stable filesystem.

- Size
  - Scalability allow for large filesystems, less data movement, and larger experiments.
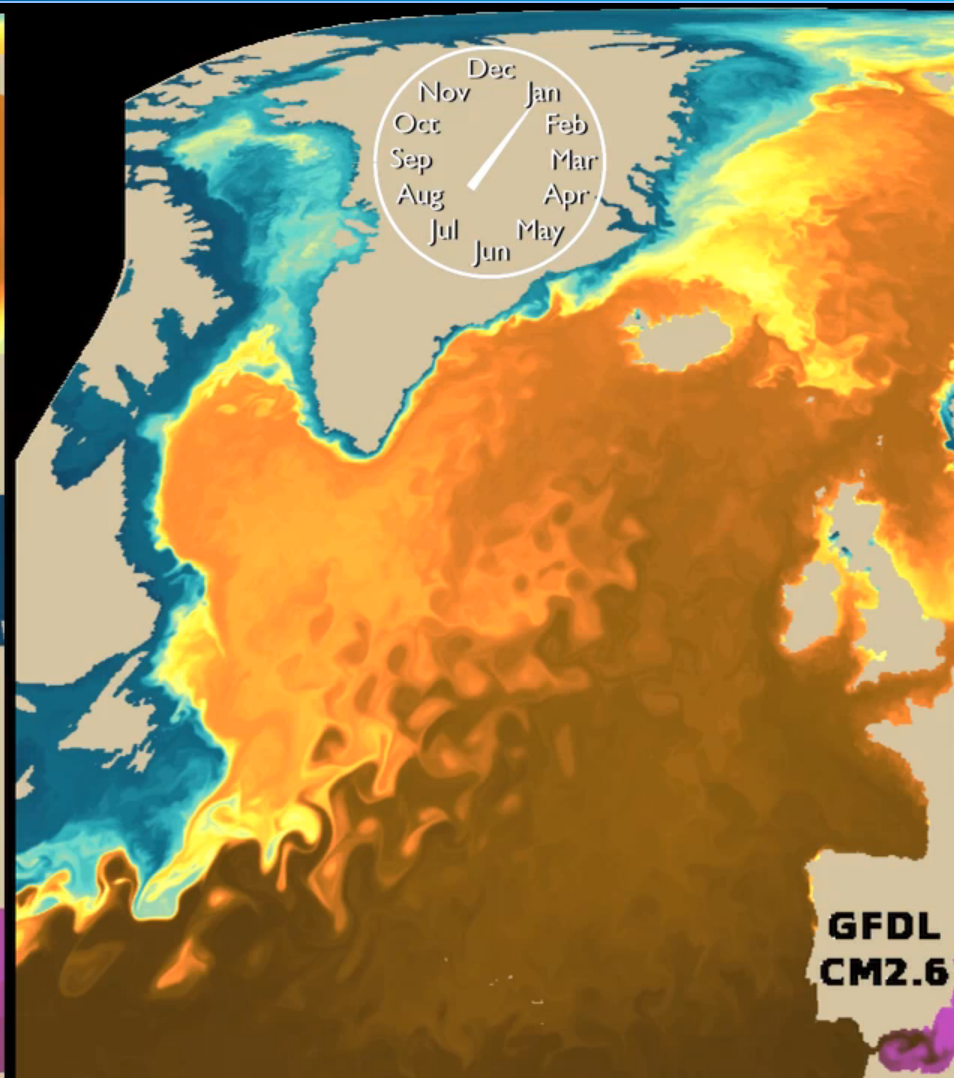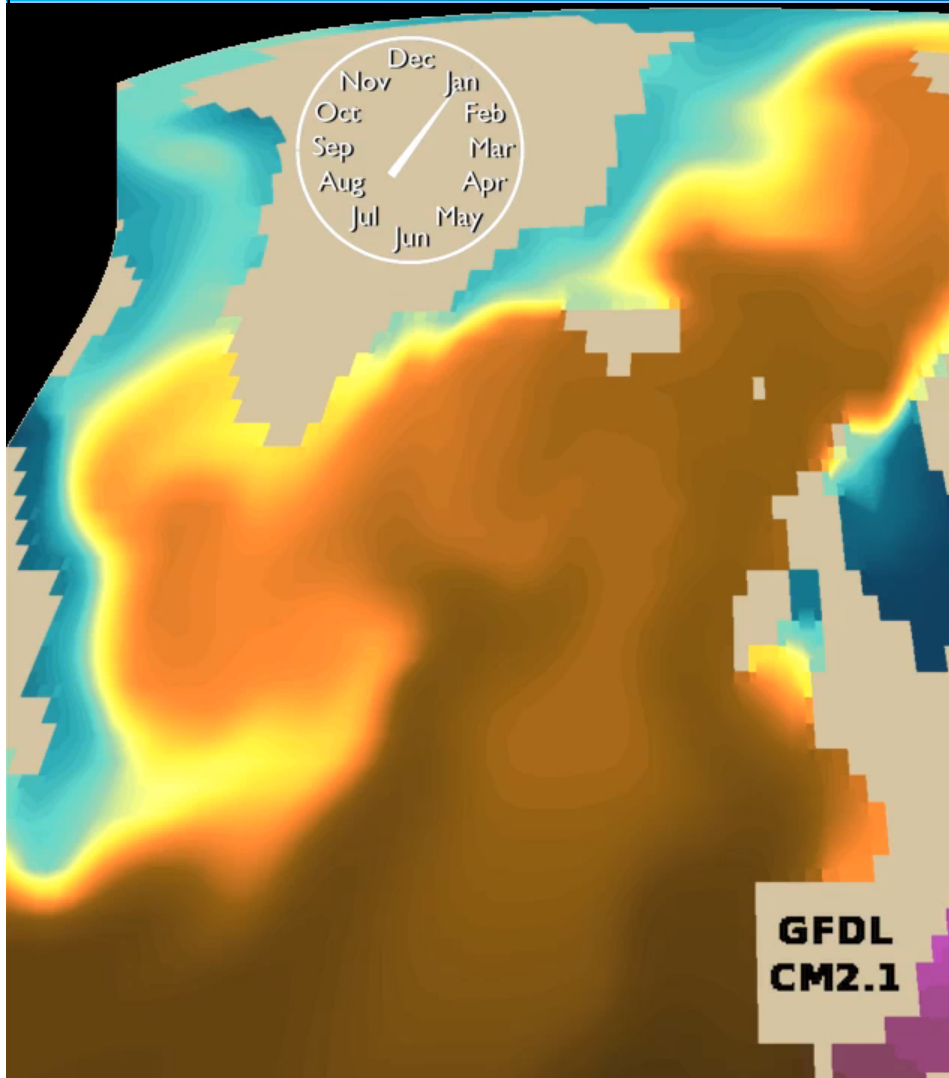
Transition to Lustre

- Education is important in the process:

  - Most users have an established methodology in there workstreams that depend on standard Unix tools.

    - Find replacement tools for the workstream.

  - The filesystem isn't monolithic.

Research HPC

CM2.1: 200 km atmosphere, 100km ocean   CM2.6: 50km atmosphere, 10km ocean

Now, what needs improvement

Other Perspectives

Users Perspective

- They are not insulated from the bad practices of misbehaving users.

- Do not have the necessary tools to manage the filesystems and user behavior.

  - Quotas

  - Slowness and potential issues with using standard unix commands

    - du, ls, find, etc.

Users Perspective

- Buffering Sensitivity

  - When moving from 1.8.4 to 1.8.5 users started to see holes in their data.

  - I/O patterns changed in applications tend to stay around a long time.

    - Users are reluctant to change I/O for what is perceived as a transient problem.

  - This issue usually surfaces intermittently, so it becomes difficult to plan for all end cases.

Users Perspective

- Confused with problems in their jobs resulting from OST or OSS failures.

- Users don't know if the I/O error they receive in their output is permanent or transient.

- If parts of the filesystem are offline, users and management want the ability to quickly see this and adjust the running workload to it.

  - Ideally, this would be automated.

Users Perspective

- Want API enhancements to signal jobs and/ or the scheduler when there are filesystem problems.

- Want better error messaging and reporting.

- All liked the fact the system was resistant to hardware issues.

Users Perspective

- Users and Management both view growing a filesystem is a painful process.

    - Growth requires taking a long outage to rebuild the filesystem.

    - Both view this is something that would ease scientific growth and allow more flexibility in planning.

Summary

- GFDL users have a generally good perception of Lustre.

- Scalability and performance were viewed favorably.

- Educating the traditional user is important.

- The users perspective can be improved: better reporting, better error messages, allow for the use of standard Unix tools.

- Options for growth are important for planning and flexibility of an organization.
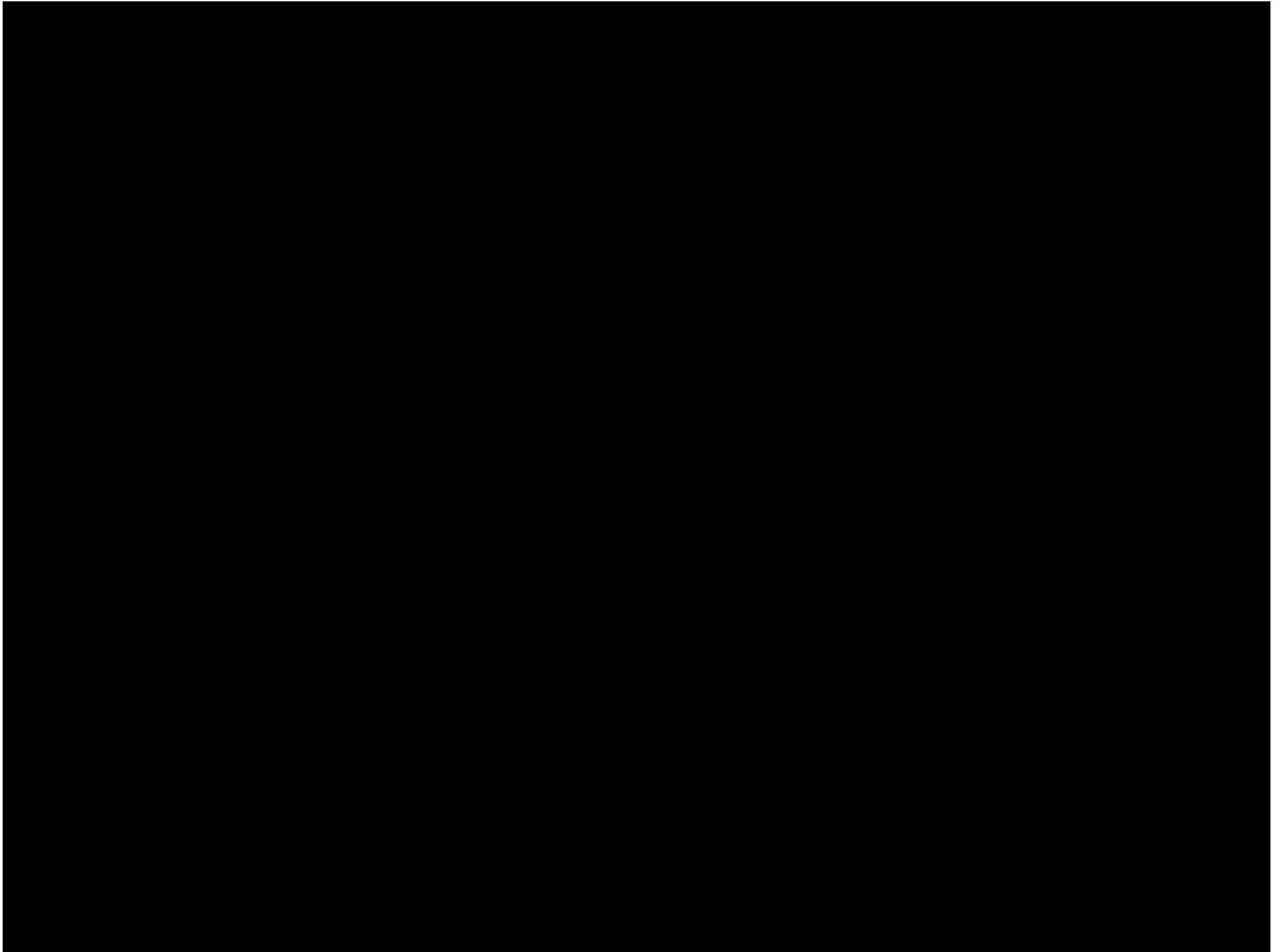
Thank You

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