While submission of CMS user jobs to the Global Pool is mostly managed by CRAB3, the standard analysis workflow management even has been made driving machine learning forward. Programming languages such as Python and C++, two popular

can have thousands of cores and faster bandwidth to memory.

Deep learning and GPU resources

In order to use machine learning tools with Global Pool resources, the framework dependences (i.e. TensorFlow, Keras, etc) need to be resolved first. CMS works mostly with Red Hat based Operating Systems (6 and 7), but TensorFlow officially supports Ubuntu only, so installing it by hand is not necessarily an easy task for a user.

To help with this, the CMS framework provides such dependences via CVMFS, but its support is at the CPU-level only, since the integration with GPU resources can get tricky due to potential conflicts with GPU library dependences. For instance, different TensorFlow versions can require specific versions of libraries.

In order to use machine learning tools with Global Pool resources, the framework dependences (i.e. TensorFlow, Keras, etc) need to be resolved first. CMS works mostly with Red Hat based Operating Systems (6 and 7), but TensorFlow officially supports Ubuntu only, so installing it by hand is not necessarily an easy task for a user.

To help with this, the CMS framework provides such dependences via CVMFS, but its support is at the CPU-level only, since the integration with GPU resources can get tricky due to potential conflicts with GPU library dependences. For instance, different TensorFlow versions can require specific versions of libraries.

In order to use machine learning tools with Global Pool resources, the framework dependences (i.e. TensorFlow, Keras, etc) need to be resolved first. CMS works mostly with Red Hat based Operating Systems (6 and 7), but TensorFlow officially supports Ubuntu only, so installing it by hand is not necessarily an easy task for a user.

To help with this, the CMS framework provides such dependences via CVMFS, but its support is at the CPU-level only, since the integration with GPU resources can get tricky due to potential conflicts with GPU library dependences. For instance, different TensorFlow versions can require specific versions of libraries.

In order to use machine learning tools with Global Pool resources, the framework dependences (i.e. TensorFlow, Keras, etc) need to be resolved first. CMS works mostly with Red Hat based Operating Systems (6 and 7), but TensorFlow officially supports Ubuntu only, so installing it by hand is not necessarily an easy task for a user.

To help with this, the CMS framework provides such dependences via CVMFS, but its support is at the CPU-level only, since the integration with GPU resources can get tricky due to potential conflicts with GPU library dependences. For instance, different TensorFlow versions can require specific versions of libraries.

In order to use machine learning tools with Global Pool resources, the framework dependences (i.e. TensorFlow, Keras, etc) need to be resolved first. CMS works mostly with Red Hat based Operating Systems (6 and 7), but TensorFlow officially supports Ubuntu only, so installing it by hand is not necessarily an easy task for a user.

To help with this, the CMS framework provides such dependences via CVMFS, but its support is at the CPU-level only, since the integration with GPU resources can get tricky due to potential conflicts with GPU library dependences. For instance, different TensorFlow versions can require specific versions of libraries.