System Requirements

Bitfusion Guide
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System Requirements

FlexDirect can be installed for different modes of operation. Some modes include, in whole or in part, the abilities of other modes. This one document lists the requirements for each mode.

<table>
<thead>
<tr>
<th>FLEXDIRECT CLIENTS</th>
<th>FLEXDIRECT ANALYTICS</th>
<th>FLEXDIRECT SERVER</th>
<th>FLEXDIRECT MANAGER</th>
</tr>
</thead>
</table>
| • Ubuntu LTS 16.04  
  • CentOS 7 or  
  • RHEL 7.4+  
  NVIDIA Toolkit  
  • CUDA 7.5  
  • CUDA 8  
  • CUDA 9  
  • CUDA 10 | • Ubuntu LTS 16.04  
  • CentOS 7 or  
  • RHEL 7.4+ | • Ubuntu LTS 16.04  
  • CentOS 7 or  
  • RHEL 7.4+ | • Ubuntu LTS 16.04  
  • CentOS 7 or  
  • RHEL 7.4+ |
| NVIDIA GPU driver version 372 or higher | NVIDIA GPU driver version 372 or higher | NVIDIA GPU driver version 372 or higher | **Note:** Can also run Applications under FlexDirect Client, in which case NVIDIA Toolkit prerequisites are needed. |

Hardware Requirements

<table>
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<tr>
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<th>FLEXDIRECT MANAGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>• N/A</td>
<td>• Any generation CUDA-enabled NVIDIA GPU(s)</td>
<td>• Any generation CUDA-enabled NVIDIA GPU(s)</td>
<td>• Any generation CUDA-enabled NVIDIA GPU(s)</td>
</tr>
</tbody>
</table>
| 10Gbs or more  
  • Ethernet (TCP/IP)  
  • RoCE or  
  • Infiniband | Network Connectivity | 10Gbs or more  
  • Ethernet (TCP/IP)  
  • RoCE or  
  • Infiniband | 10Gbs or more  
  • Ethernet (TCP/IP)  
  • RoCE or  
  • Infiniband |
| System memory on the client CPU machines should be 1.5x the total aggregate GPU memory across all the GPUs in the largest GPU machine. | N/A | N/A | N/A |
Networking

FlexDirect makes use of several ports or ranges of ports for process to process communication. Please ensure that your firewalls do not block the ports below. Please ensure there are no port conflicts with other applications. Some of the ranges can be modified with command-line arguments.

<table>
<thead>
<tr>
<th>FLEXDIRECT CLIENTS</th>
<th>FLEXDIRECT ANALYTICS</th>
<th>FLEXDIRECT SERVER</th>
<th>FLEXDIRECT MANAGER</th>
</tr>
</thead>
</table>
| **56001**
  *Server Communication*
  *Outbound to:
  – Server nodes
  – Manager nodes*
| **56001**
  *Server Communication*
  *Inbound from:
  – Analytics nodes
  – Manager nodes*
| **56001**
  *Server Communication*
  *Inbound from:
  – Client nodes*
| **56001**
  *Server Communication*
  *Inbound from:
  – Client nodes*

*Note: Override with \(--srs_port 56008\), for example.*

| **55001-55100**
  *Dispatcher Communication*
  *Outbound to:
  – Server nodes
  – Manager nodes*
| **55001-55100**
  *Dispatcher Communication*
  N/A
| **55001-55100**
  *Dispatcher Communication*
  *Inbound from:
  – Client nodes*
| **55001-55100**
  *Dispatcher Communication*
  *Inbound from:
  – Client nodes*

*Note: Override with \(--srs_port 56008\), for example.*

| **45201-46225**
  *CUDA Communication*
  *Outbound to:
  – Server nodes
  – Manager nodes*
| **45201-46225**
  *CUDA Communication*
  N/A
| **45201-46225**
  *CUDA Communication*
  *Inbound from:
  – Client nodes*
| **45201-46225**
  *CUDA Communication*
  *Inbound from:
  – Client nodes*

*Note: Override with \(--srs_port 56008\), for example.*

| **54000**
  *Web Server*
  N/A
| **54000**
  *Web Server*
  *Inbound from:
  – Anyone with a browser*
| **54000**
  *Web Server*
  N/A
| **54000**
  *Web Server*
  *Inbound from:
  – Anyone with a browser*

*Note: Override with \(--web_port 12345\), for example.*
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**FLEXDIRECT CLIENTS** | **FLEXDIRECT ANALYTICS** | **FLEXDIRECT SERVER** | **FLEXDIRECT MANAGER**
--- | --- | --- | ---
54001 Statistics Collection N/A | 54001 Statistics Collection | 54001 Statistics Collection N/A | 54001 Statistics Collection

- Inbound/Outbound - localhost only

Note: Override with `--collection_port 54321` for example.

- Inbound/Outbound - localhost only

Note: Override with `--collection_port 54321` for example.

- Ensure your machines have ingress/egress internet access for access to downloads, licensing, etc.
- Check for other networking policies, such as outbound proxy or internal DNS, static versus dynamic IPs. Consult with the Bitfusion team if you are using dynamic IPs or have any proxies set up.

**Verifying System Health**

Once you have installed FlexDirect, you can validate your environment for the best results by running the FlexDirect health check.

**Shell**

```bash
# Assumes flexdirect is installed; see installation guide.
flexdirect health
```

The health check will run checks on the nodes of your cluster appropriate to their hardware (e.g., GPUs) or to their configuration (e.g. RoCE). So your output may differ from that shown below. Checks try to find settings or problems that will limit or prevent the high-bandwidth, low-latency communication needed for the best performance. The results should be self explanatory. Checks will be performed on the local host and on all configured GPU servers. Shown below is the output from the check on the local node.
Software Dependencies

When you run the default FlexDirect Installer from above, it downloads and installs all the software dependencies for you. If, however, you would like to install all the software dependencies manually, here is the list.

Ubuntu

Ubuntu Dependencies

```bash
$ apt -y install uuid libjson-c2 librdmacm1 libprocps4 procs
```
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CentOS and RedHat

Ubuntu Dependencies

$ yum install -y json-c-devel librdmacm libibverbs libuuid proc-ng-devel

List CUDA Libraries
CUDA libs might be missing if your installation is a minimal one. Copy/paste the files from /usr/local/cuda/lib64:

Shell

$ ls /usr/local/cuda/lib64

Verify the CUDA installation
The easiest way to do this will be to install the CUDA samples. *Here is the RPM for CUDA samples.* It is the RPM for RHEL 7 and CUDA 9.1.

After installing the samples, make sure deviceQuery can be run either directly (if it is a GPU machine) or with *FlexDirect* (if it is a Client CPU machine)

Schedule a test job using CUDA deviceQuery:

Shell

$ cd /usr/local/cuda/samples/1Utilities/deviceQuery
$ make all
$ flexdirect run -n 1 ./deviceQuery
$ flexdirect run -n 7 ./deviceQuery

CUDA Installation on CPU Nodes/VMs/Containers
In order to run GPU applications with FlexDirect on CPU nodes, VMs, or in containers which do not have direct access to physical GPU hardware, you still need to install CUDA—but there is no need to install any Nvidia driver components. The example below illustrates how to to install CUDA 9.1 in a few easy steps. The CUDA version that you install on the Client should match the CUDA version which is running on the server.

Shell

$ sudo dpkg -i cuda-repo-ubuntu1604_9.1.85-1_amd64.deb
$ sudo apt-key adv --fetch-keys http://developer.download.nvidia.com/compute/cuda/repos/ubuntu1604/x86_64/7fa2af80.pub
$ sudo apt-get update
$ sudo apt-get install -y cuda-toolkit-9-1
$ rm cuda-repo-ubuntu1604_9.1.85-1_amd64.deb