What is Pre-Conditioning?

Pre-conditioning is an operation that forces a block storage device that is thin-provisioned to map all of it's advertised LBA's to non-volatile memory locations. Most RAID designs and SSDs for that matter, implement thin-provisioning. Thin provisioning is a method used to conserve internal storage locations used by the block storage device until they are needed. For example, every LBA exposed by a device must be mapped to a physical location once a write operation to that LBA takes place. Before this occurs, the LBA will not be mapped to a physical location, this is the basic definition of thin provisioning – "thin" describes the fact that the LBAs are not mapped until written too. When an LBA is mapped to a physical location a performance penalty will be incurred because additional time will be needed by the device to perform the mapping, adding latency to the write operation. To eliminate the performance penalty associated with mapping, the block storage device can be pre-conditioned by performing writes to every LBA making up the advertised capacity of the device. If consistent write performance is desired, this step should be performed to eliminate the first write additional latency due to the mapping operation.

This figure shows the performance benefits of pre-conditioning an SSD, results will vary. Prior to pre-conditioning, the SSD achieved a random write IOPS performance using 4KiB transfers of 1082. After pre-conditioning, three multi-hour runs were made to the same device showing a consistent improvement in random write IOPS performance of approximately 52%.