Verity files

ext4 supports fs-verity, which is a filesystem feature that provides Merkle tree based hashing for individual readonly files. Most of fs-verity is common to all filesystems that support it; see :ref:`Documentation/filesystems/fsverity.rst <fsverity>` for the fs-verity documentation. However, the on-disk layout of the verity metadata is filesystem-specific. On ext4, the verity metadata is stored after the end of the file data itself, in the following format:

> **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\filesystems\ext4\(linux-master)(Documentation)(filesystems)(ext4)verity.rst`, **line 6**); *backlink*
>
> Unknown interpreted text role "ref".

- Zero-padding to the next 65536-byte boundary. This padding need not actually be allocated on-disk, i.e. it may be a hole.
- The Merkle tree, as documented in :ref:`Documentation/filesystems/fsverity.rst <fsverity_merkle_tree>`, with the tree levels stored in order from root to leaf, and the tree blocks within each level stored in their natural order.

  > **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\filesystems\ext4\(linux-master)(Documentation)(filesystems)(ext4)verity.rst`, **line 17**); *backlink*
  >
  > Unknown interpreted text role "ref".

- Zero-padding to the next filesystem block boundary.
- The verity descriptor, as documented in :ref:`Documentation/filesystems/fsverity.rst <fsverity_descriptor>`, with optionally appended signature blob.

  > **System Message: ERROR/3** (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\filesystems\ext4\(linux-master)(Documentation)(filesystems)(ext4)verity.rst`, **line 25**); *backlink*
  >
  > Unknown interpreted text role "ref".

- Zero-padding to the next offset that is 4 bytes before a filesystem block boundary.
- The size of the verity descriptor in bytes, as a 4-byte little endian integer.

Verity inodes have EXT4_VERITY_FL set, and they must use extents, i.e. EXT4_EXTENTS_FL must be set and EXT4_INLINE_DATA_FL must be clear. They can have EXT4_ENCRYPT_FL set, in which case the verity metadata is encrypted as well as the data itself.

Verity files cannot have blocks allocated past the end of the verity metadata.

Verity and DAX are not compatible and attempts to set both of these flags on a file will fail.