To: T10 Membership - RBC Working Group
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Re: RBC Generic Command Set Issues

REMOVABILITY COMMAND/FEATURE CONSIDERATIONS

Central Concept: devices that support removable media differ from hard drives primarily by the fact that capabilities change on the fly.

Main consideration: What does OS need, want, and expect that would be common to all removable and/or rewriteable storage devices?

INQUIRY command

An INQUIRY command should return the *current* device capabilities based on the media inserted. Even if the device is capable of various formats, capacities, etc. As an example, a DVD-RAM could read a CD-ROM, but not format or write it. Lockability would be device, media, and thus vendor specific.

Iomega Proposal

Four new bits for removable storage devices:
Readable, **W**riteable, **F**ormattable, **L**ockable (**RWFL**)

When enumerated on the bus, the device must send 'not ready' to the host, meaning bits RWFL shall be 0. This will allow for media spin-up, diagnostics, etc. When the device is ready, the RWFL bits are sent to the host.

W, F, and L bits may not apply to all removable media. For each bit that does not apply these bits shall be set to 0. When the host receives the RWFL bits with any set to a value other then 0, the host will assume the device is ready, with the capabilities relative to the set bits. Removable devices shall set the R bit to 1 when status is ready.

As new media is inserted, the RWFL bits will be properly reset, and resent to the host. To reset the current device capabilities, new media must be inserted, or a device reset generated. UNSOLICITED STATUS appears to be the best vehicle for this notification.

This method should work equally well for hot-swappable fixed drives, as well as Device Bay implementations.

READ and WRITE commands

Having the 3 bits DPO, FUA, RelAddr, all set to 0 for READ is very good.
What would it take to change the Transfer Length from 2 bytes to 3 bytes for these commands? This allows 8 GB transfers for future growth.

BUTTON PRESSED STATUS

Pressing the eject button forces the device to enter 'button-pressed state.' This state can only be exited with approval from the host, not on release of the button, nor on repeated press then release of the button. Actual ejection of media should be governed by the host. The eject button is a 'request to eject' rather than a command to eject. UNSOLICITED STATUS appears to be the best option for host notification.

EJECT command

An EJECT command from the host will be immediate. As far as the host is concerned, the device has two states: ready or not ready. Not ready includes ejecting, empty, or inserting. Ready

indicates that media is inserted and the device is available (RWFL bits received). Transition between states in both directions alters RWFL bits. Upon receipt of the EJECT command from the host, the RWFL bits shall be set to 0.

Removable devices need the capability to eject the media, if the cache is clean, without spinning up. This is obvious for power conservation reasons. If the device requires spin-up for ejecting the media, that could be a vendor specific option.

MEDIA STATUS

Device capabilities will be determined by MEDIA STATUS, in conjunction with the RWFL bits in combo. These bits represent device capability with respect to the media; they do not change as the time to complete a command changes (Power Management).

Media Accessible State:

Until the host receives the RWFL bits, the device is not accessible and the command will fail. Sampling the RWFL bits does not spin up media. The device returns 'not ready' (RWFL= 0000) until media is inserted. UNSOLICITED STATUS will be used.

The RWFL bits also allow for electromechanical device failure reporting capability.

FORMAT

This command is available when the F bit is set to 1. Upon receipt of the command the device will return bits RWFL as 001x (x = Vendor Specific).

The host will be notified by the device for every 1% of command completion through UNSOLICITED STATUS. When complete the device will send the RWFL bits reflecting the device capabilities. A successful format will return RWFL as 111x. If the media is bad, or the format failed, the device will return bits RWFL as 000x.

The device will return a 'not ready' for MEDIA STATUS, until the command has completed.

POWER MANAGEMENT

If the device changes power states due to vendor specific timing for power management, or any other reason, the host must be notified via UNSOLICITED STATUS.

CANCEL

The user shall have the ability to cancel a command. Upon receipt of a CANCEL, the device shall go to 'not ready' state (RWFL = 0000) regardless of the command being executed. The RWFL bits shall be resent to the host for status and capability notification.