# UDI SCSI Drivers

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# Agenda

- **UDI SCSI Overview**
- **UDI SCSI Driver Architecture**
- **SCSI Metalanguage Interfaces**
- **Q & A**





# UDI SCSI Overview

- **Conformant UDI Driver**
- **Uses SCSI Metalanguage**
  - PD Driver Role
  - HD Driver Role
- **OS-neutral and platform-neutral**





# Key Features

- **Full SCSI-3 support**
  - Large SCSI addressing (64-bit target, LUN)
- **Uses ACA model for sense data**
- **Supports aborts, timeouts, and retries**
- **Tagged command queuing**





# SCSI I/O Addressing

- **Bus Number**
- **Target ID**
- **Logical Unit Number (LUN)**
- **Tag**





# HD & PD Responsibilities

- **HD Responsibilities**
  - Timeouts
  - Transfer Negotiation
  - Task/Queue Management
  - SCSI BUS/Link Errors
- **PD Responsibilities**
  - Retries
  - Aborts
  - Specifies Queue Depth





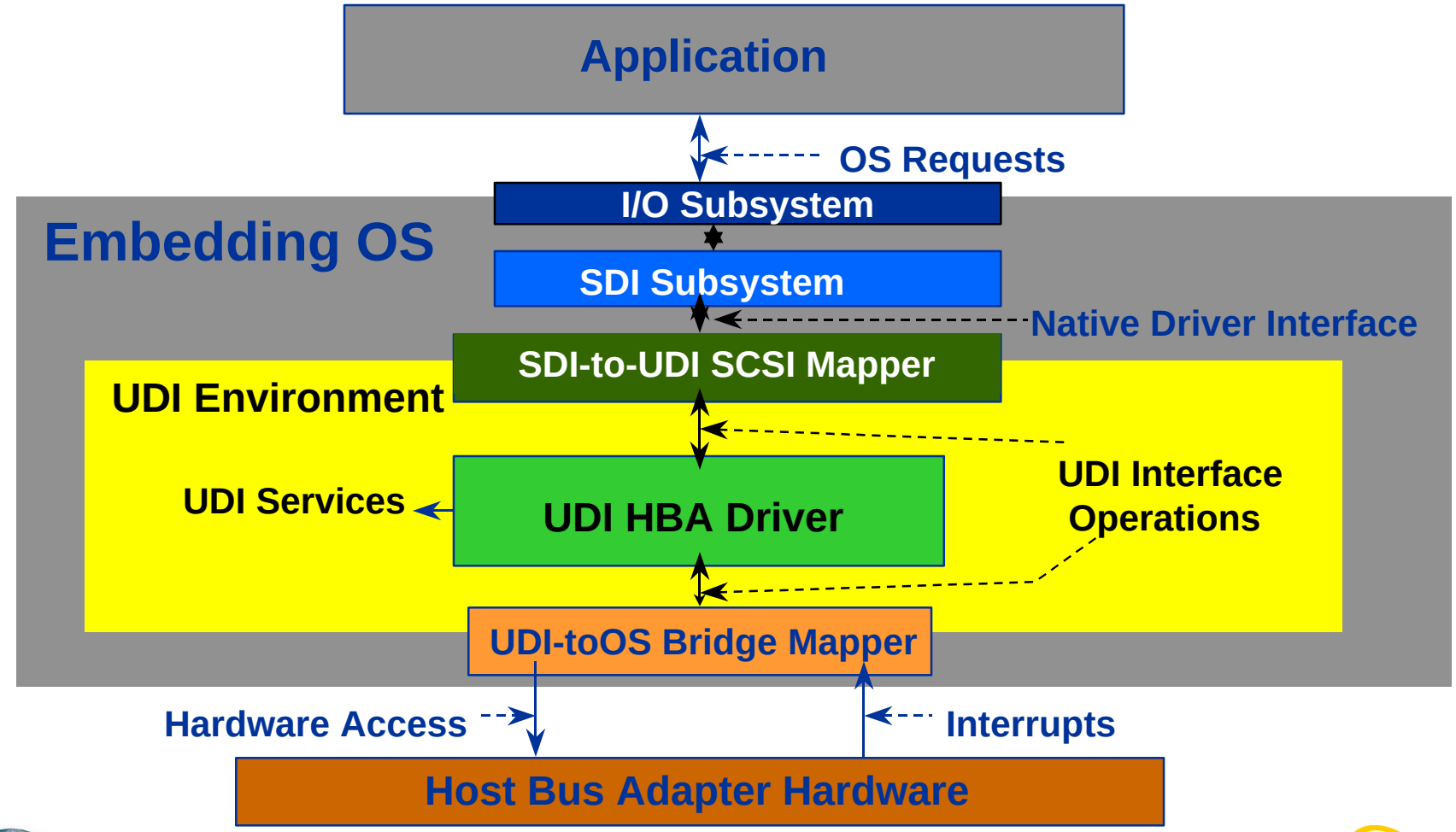
# Binding to the UDI Core

- **Bindings for Static Driver Properties**
- **Bindings for Transfer Constraints**
- **Bindings for Instance Attributes**
- **Bindings for Trace Events**

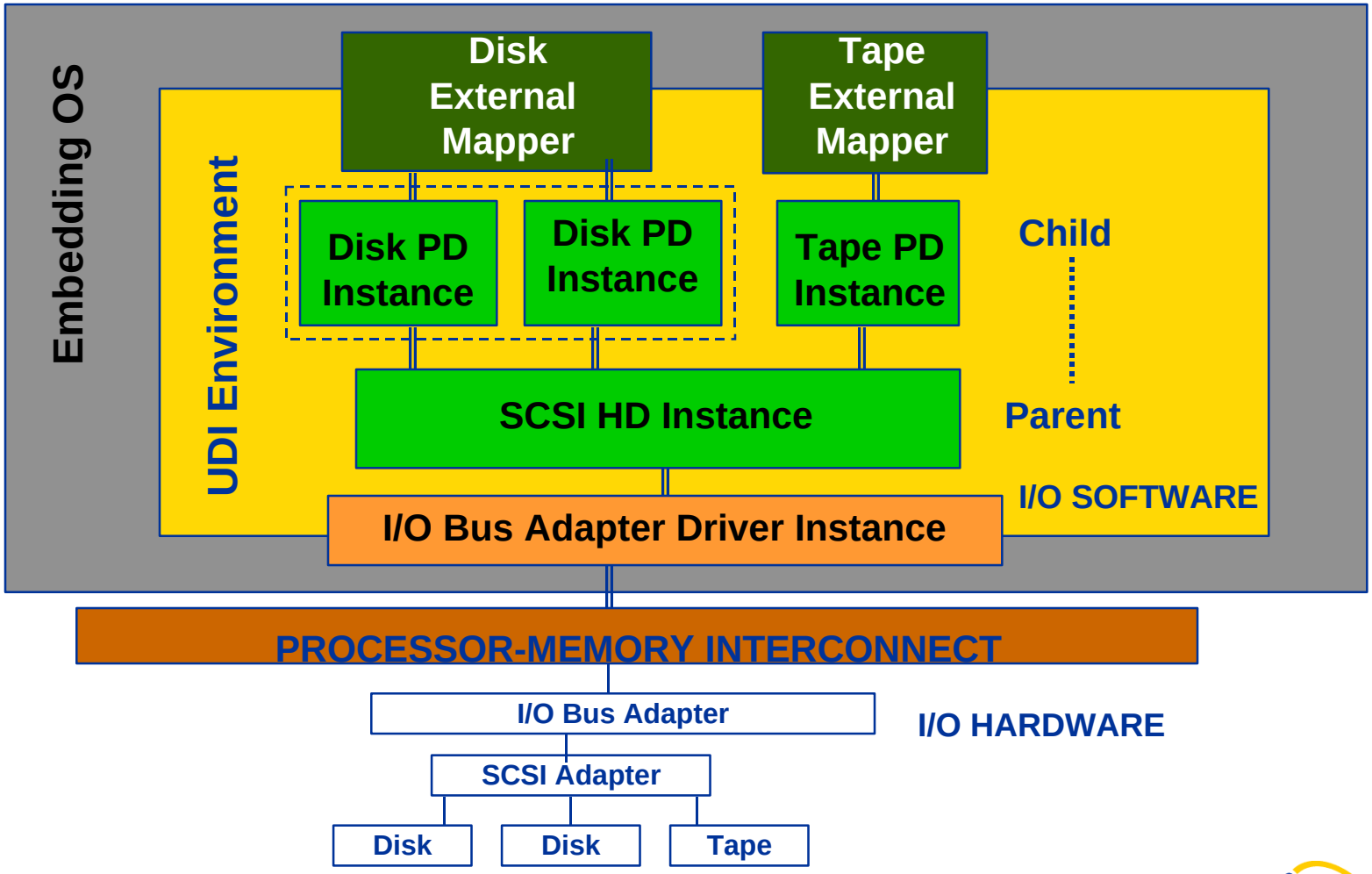




# Current UnixWare Implementation



# Example SCSI Driver Hierarchy



# Agenda

- UDI SCSI Driver Architecture
- SCSI Driver Requirements
- **SCSI Metalanguage Interfaces**
- Q & A





# UDI SCSI Metalanguage

- **Defines SCSI specific communication between SCSI peripheral driver (PD) and SCSI HBA Driver (HD).**
- **Defines Channel Operations, their arguments and guidelines for their use.**
- **Defines Control Block data structures.**





# *UDI SCSI Metalanguage* (cont…)

- **Defines SCSI specific Status Codes.**
- **Defines SCSI specific Attributes.**
- **Defines Driver Responsibilities.**





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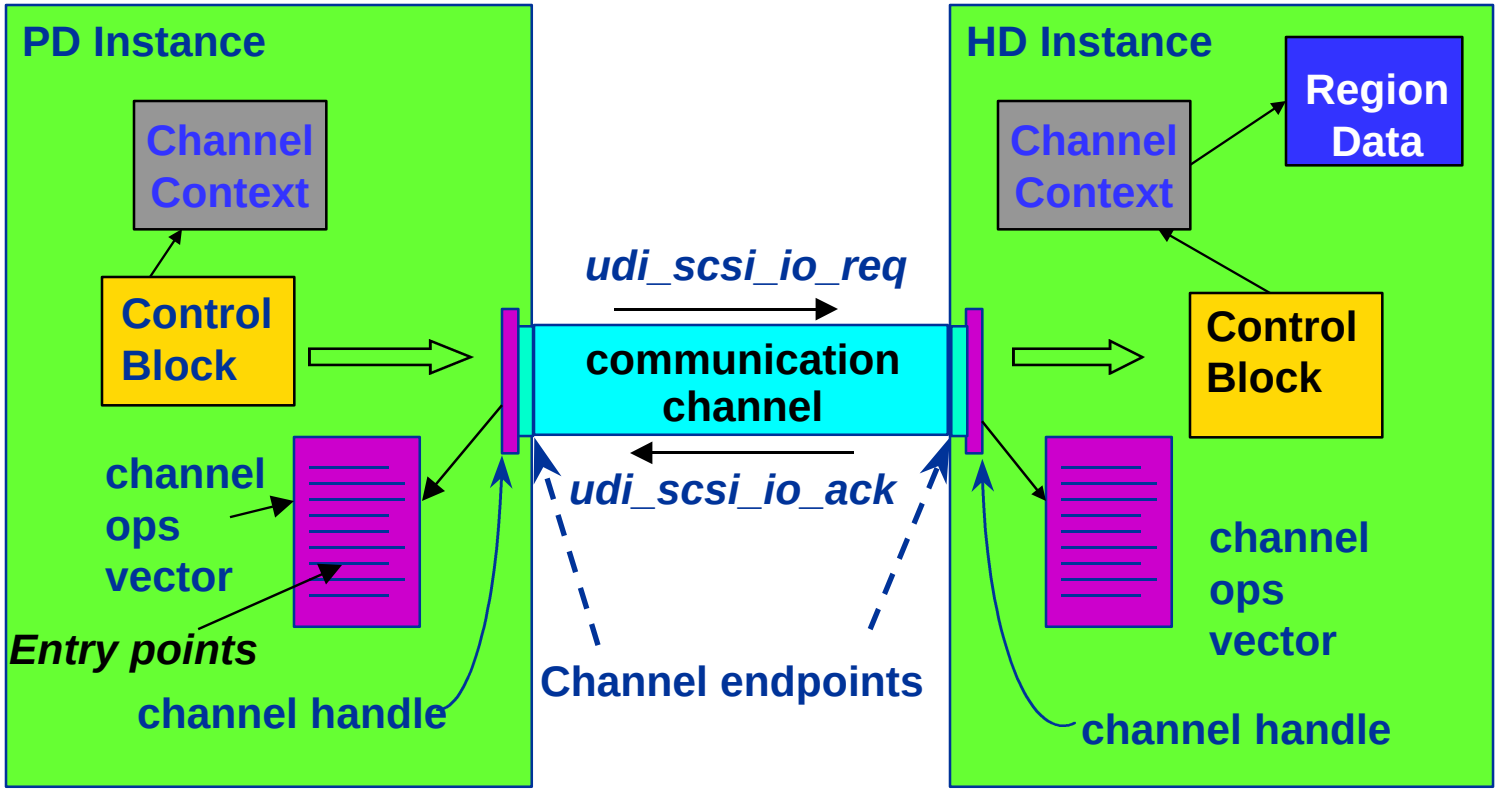
# Channel Operations

- SCSI Bind/Unbind Operations
- SCSI I/O Operations
- SCSI Control Operations
- SCSI Async Event Operations





# UDI Channel Communications



# Control Blocks

- Bind Control Block
- I/O Control Block
- Control Control Block
- Event Control Block





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# *PD Channel Operations*
## (PD Entry Points)

- **Channel Event Indication**
- **SCSI Bind Ack**
- **SCSI Unbind Ack**
- **SCSI I/O Ack**
- **SCSI I/O Nak**
- **SCSI Control Ack**
- **SCSI Event Indication**





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# SCSI PD Channel Ops Vector

**udi_scsi_pd_ops_t** — *SCSI Peripheral Driver Entry point ops vector*

```
typedef struct {
        udi_channel_event_ind_op_t * channel_event_ind_op;
        udi_scsi_bind_ack_op_t * bind_ack_op;
        udi_scsi_unbind_ack_op_t * unbind_ack_op;
        udi_scsi_io_ack_op_t * io_ack_op;
        udi_scsi_io_nak_op_t * io_nak_op;
        udi_scsi_ctl_ack_op_t * ctl_ack_op;
        udi_scsi_event_ind_op_t * event_ind_op;
} udi_scsi_pd_ops_t;

/* Ops Vector Number */
#define UDI_SCSI_PD_OPS_NUM 1
```





# *HD Channel Operations*
## (HD Entry Points)

- **Channel Event Indication**
- **SCSI Bind Request**
- **SCSI Unbind Request**
- **SCSI I/O Request**
- **SCSI Control Request**
- **SCSI Event Response**





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# SCSI HD Channel Ops Vector

**udi_scsi_hd_ops_t** *SCSI HBA Driver entry point ops vector*

```
typedef struct {
        udi_channel_event_ind_op_t * channel_event_ind_op;
        udi_scsi_bind_req_op_t * bind_req_op;
        udi_scsi_unbind_req_op_t * unbind_req_op;
        udi_scsi_io_req_op_t * io_req_op;
        udi_scsi_ctl_req_op_t * ctl_req_op;
        udi_scsi_event_res_op_t * event_res_op;
} udi_scsi_hd_ops_t;

/* Ops Vector Number */
#define UDI_SCSI_HD_OPS_NUM 2
```





# Bind Control Block

**udi_scsi_bind_cb_t** *Control block for SCSI bind operations*

```
typedef struct {
        udi_cb_t gcb;
        udi_ubit16_t events;
} udi_scsi_bind_cb_t;

/* SCSI Events */
#define UDI_SCSI_EVENT_AEN                    (1U<<0)
#define UDI_SCSI_EVENT_DEVICE_RESET           (1U<<1)
#define UDI_SCSI_EVENT_BUS_RESET              (1U<<2)
#define UDI_SCSI_EVENT_UNSOLICITED_RESELECT (1U<<3)

/* Control Block Group Number */
#define UDI_SCSI_BIND_CB_NUM 1
```





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# SCSI Bind Operations

**udi_scsi_bind_req** *Request a SCSI binding (PD-to-HD)*

```
void udi_scsi_bind_req (
            udi_scsi_bind_cb_t *cb,
            udi_ubit16_t bind_flags,
            udi_ubit16_t queue_depth,
            udi_time_t timeout_granularity,
            udi_size_t max_sense_len,
            udi_size_t aen_buf_size );

/* Bind Flags */
#define UDI_SCSI_BIND_EXCLUSIVE      (1U<<0)
#define UDI_SCSI_TEMP_BIND_EXCLUSIVE (1U<<1)
```

# SCSI Bind Operations (cont…)

**udi_scsi_bind_ack** *Acknowledge a SCSI bind request (HD-to-PD)*

```
void udi_scsi_bind_ack (
            udi_scsi_bind_cb_t *cb,
            udi_ubit8_t max_targets,
            udi_ubit8_t max_luns,
            udi_ubit32_t max_temp_bind_excl,
            udi_status_t status );
```





# SCSI Unbind Operations

**udi_scsi_unbind_req** *Request a SCSI unbind (PD-to-HD)*

```
void udi_scsi_unbind_req ( udi_scsi_bind_cb_t *scsi_bind_b );
```

**udi_scsi_unbind_ack** *Acknowledge a SCSI unbind (HD-to-PD)*

```
void udi_scsi_unbind_ack ( udi_scsi_bind_cb_t *scsi_bind_b );
```

# SCSI I/O Control Block

**udi_scsi_io_cb_t** *Control block for SCSI I/O operations*

```
typedef struct {
        udi_cb_t     gcb;
        udi_buf_t   *data_buf;
        udi_ubit32_t timeout;
        udi_ubit16_t flags;
        udi_ubit8_t  attribute;
        udi_ubit8_t  cdb_len;
        udi_ubit8_t *cdb_ptr;
} udi_scsi_io_cb_t;
```





# SCSI I/O Control Block *(cont…)*

```
/* I/O Request Flags */
#define UDI_SCSI_DATA_IN       (1U<<0)
#define UDI_SCSI_DATA_OUT      (1U<<1)
#define UDI_SCSI_NO_DISCONNECT (1U<<2)
#define UDI_SCSI_OVERRUN       (1U<<3)

/* SCSI Task Attributes */
#define UDI_SCSI_SIMPLE_TASK    1
#define UDI_SCSI_ORDERED_TASK   2
#define UDI_SCSI_HEAD_OF_Q_TASK 3
#define UDI_SCSI_ACA_TASK       4
#define UDI_SCSI_UNTAGGED_TASK  5

/* Control Block Group Number */
#define UDI_SCSI_IO_CB_NUM      2
```





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# SCSI I/O Operations

**udi_scsi_io_req** *Request a SCSI I/O operation (PD-to-HD)*

```
void udi_scsi_io_req ( udi_scsi_io_cb_t *cb );
```

**udi_scsi_io_ack** *Ack normal completion of SCSI I/O request (HD-to-PD)*

```
void udi_scsi_io_ack ( udi_scsi_io_cb_t *cb );
```





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# SCSI I/O Operations *(cont...)*

**udi_scsi_io_nak** *Ack abnormal completion of SCSI I/O request (HD -to- PD)*

```
typedef struct {
        udi_status_t req_status;
        udi_ubit8_t scsi_status;
        udi_ubit8_t sense_status;
} udi_scsi_status_t;

void udi_scsi_io_nak (
                udi_scsi_io_cb_t *scsi_io_cb,
                udi_scsi_status_t scsi_status,
                udi_buf_t *sense_buf );
```





# SCSI Ctl Control Block

**udi_scsi_ctl_cb_t** *Control block for SCSI control operations*

```
typedef struct {
        udi_cb_t gcb;
        udi_ubit8_t ctrl_func;
        udi_ubit16_t queue_depth;
} udi_scsi_ctl_cb_t;

/* Values for ctrl_func */
#define UDI_SCSI_CTL_ABORT_TASK_SET       1
#define UDI_SCSI_CTL_CLEAR_TASK_SET       2
#define UDI_SCSI_CTL_LOGICAL_UNIT_RESET   3
#define UDI_SCSI_CTL_TARGET_RESET         4
#define UDI_SCSI_CTL_RESET_BUS            5
#define UDI_SCSI_CTL_CLEAR_ACA            6
#define UDI_SCSI_CTL_SET_QUEUE_DEPTH      7
```

# SCSI Control Operations

**udi_scsi_ctl_req** *Request a SCSI control operation (PD-to-HD)*

```
void udi_scsi_ctl_req ( udi_scsi_ctl_cb_t *cb );
```

**udi_scsi_ctl_ack** *Ack completion of SCSI control request (HD-to-PD)*

```
void udi_scsi_ctl_ack (
            udi_scsi_ctl_cb_t *cb,
            udi_status_t status );
```





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# SCSI Event Control Block

**udi_scsi_event_cb_t** *Control block for SCSI event operations*

```
typedef struct {
        udi_cb_t gcb;
        udi_ubit8_t event;
        udi_buf_t *aen_data_buf;
} udi_scsi_event_cb_t;

/* Control Block Group Number */
#define UDI_SCSI_EVENT_CB_NUM 4
```





# SCSI Event Operations

**udi_scsi_event_ind** — *SCSI event notification (HD-to-PD)*

```
void udi_scsi_event_ind( udi_scsi_event_cb_t *cb );
```

**udi_scsi_event_res** — *Acknowledge a SCSI event (PD-to-HD)*

```
void udi_scsi_event_res( udi_scsi_event_cb_t *cb );
```

# Who is Project UDI?






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