

# UDI SCSI Drivers

<http://www.sco.com/forum1999/conference/developfast/f12>

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This is the seventh in a series of eight UDI presentations for SCO Forum 1999.

This session describes the UDI SCSI Metalanguage and other aspects of UDI from the perspective of a SCSI HBA driver.

# Agenda

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



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## UDI SCSI Overview

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



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## 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**



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# SCSI I/O Addressing

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



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## HD & PD Responsibilities

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



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## Binding to the UDI Core

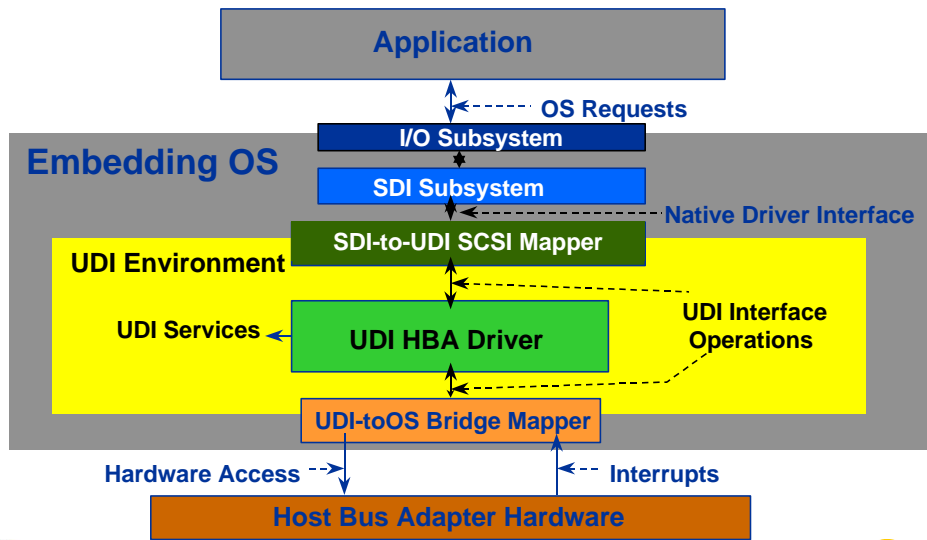
- Bindings for Static Driver Properties
- Bindings for Transfer Constraints
- Bindings for Instance Attributes
- Bindings for Trace Events



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# Current UnixWare Implementation

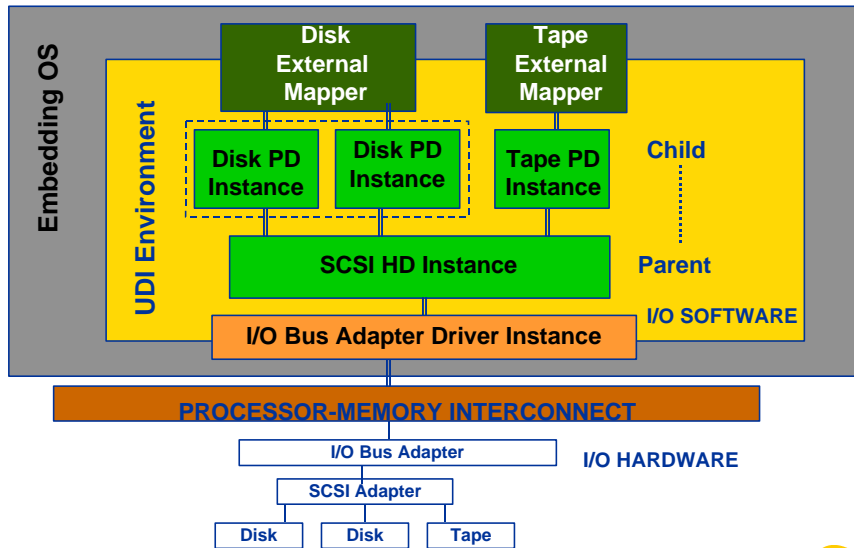


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# Example SCSI Driver Hierarchy



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# Agenda

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



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## ***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.**



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## ***UDI SCSI Metalanguage (cont...)***

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



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## ***Channel Operations***

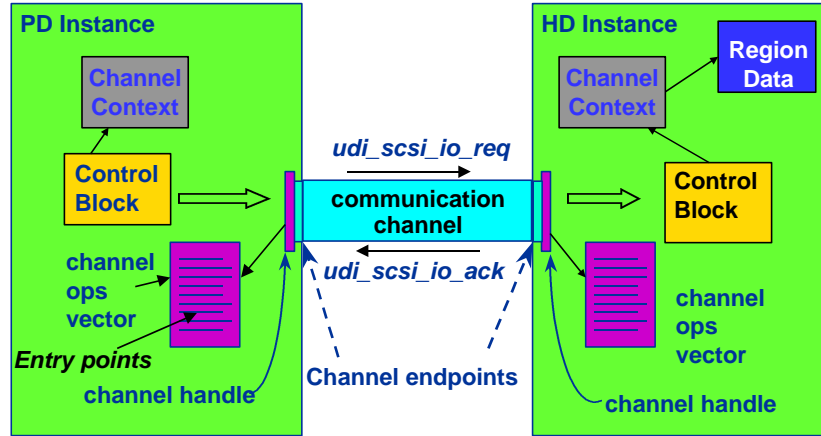
- **SCSI Bind/Unbind Operations**
- **SCSI I/O Operations**
- **SCSI Control Operations**
- **SCSI Async Event Operations**



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# UDI Channel Communications



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## ***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
```



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## ***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
```



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## 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)
```



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## 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 );
```



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## 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 );
```



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## 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;
```



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## 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 );
```



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## 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
```



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## 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
```



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## 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)*

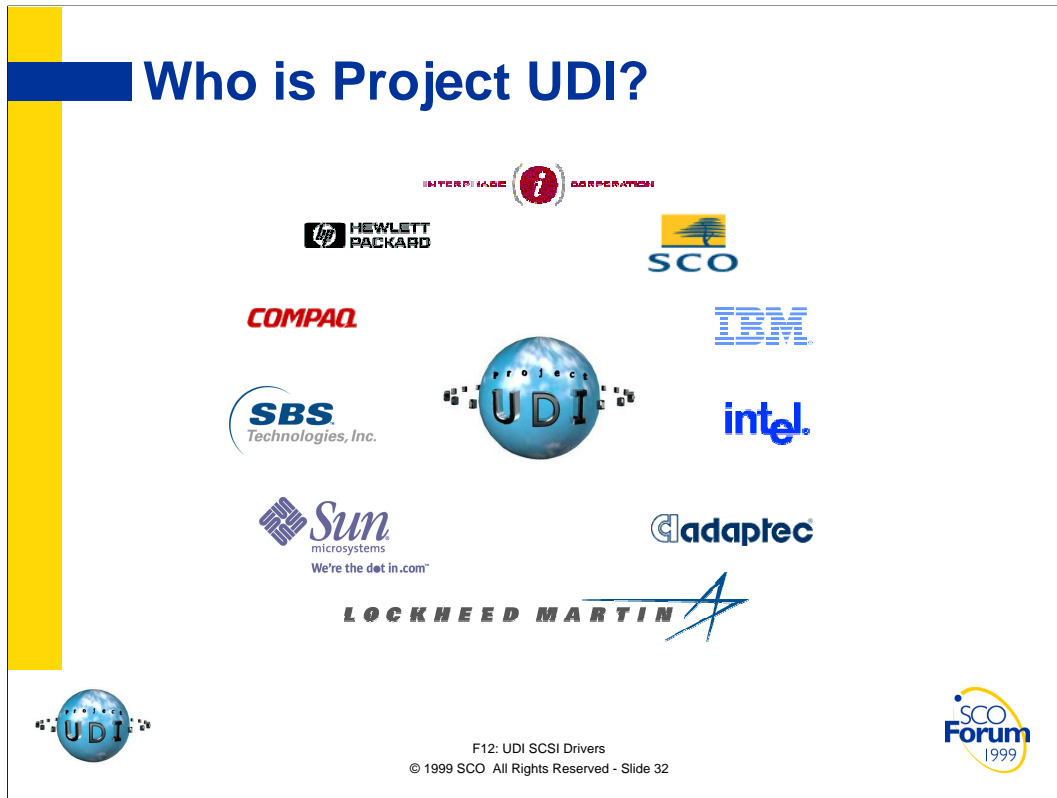
```
void udi_scsi_event_res ( udi_scsi_event_cb_t *cb );
```



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# Who is Project UDI?



## OS & Platform Vendors:

Compaq\*, HP\*, IBM\*, SCO\*, Sun\*, Lynx Real-Time\*

## IHVs:

Adaptec\*, SBS Technologies\* (formerly Bit3\*),

## Interphase\*

## Others:

Intel\*, Lockheed-Martin\*

## Latest list of participants at:

<http://www.sco.com/UDI/participants.html>

\*All brands and names are the property of their respective owners.



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