

# Composite Device User's Guide

## 1 Overview

This document describes steps to implement the composite device based on the USB stack.

The USB Stack provides two composite device demos, *hid+audio* and *msc+cdc*. However, users can create composite devices to fit their needs. This document is a detailed step-by-step guide to create a customizable composite device.

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## 2 Introduction

The composite device combines multiple independent functionalities by unifying independent functionality code into one example. For example, the single functionality code for CDC is provided in the CDC example and the single functionality code for MSC is provided in the MSC example. Creating the CDC+MSC composite device example requires combining the CDC example code and MSC example code into a single example.

Composite device descriptors are combined from the single-function device descriptors. There are two single-function devices and each device has only one interface descriptor in its configuration descriptor. If the composite device is combined using two single function devices, the interface descriptor of each device should be merged into the composite device configuration descriptor.

Implementing a composite device involves combining the descriptors and the functionality of the single function devices.

## 3 Setup

Before developing the composite device, the user needs to:

1. Decide how many classes to include in this composite device.
2. Decide which types of classes to include in this composite device, for example, HID + AUDIO, HID + HID, etc.
3. Prepare the device descriptor depending on use case. Particularly, the IAD should be used for AUDIO/VIDEO class, (see [www.usb.org/developers/docs/whitepapers/iadclasscode\\_r10.pdf](http://www.usb.org/developers/docs/whitepapers/iadclasscode_r10.pdf))
4. Ensure that the functionality of the single function device code is valid.

### 3.1 Design Steps

1. Prepare the descriptor-related data structure to ensure that correct information about the customized composite device is relayed to the USB device stack. See Section 4.
2. Prepare the descriptors array and ensure the descriptors are consistent with the descriptor-related data structure. See Section 5.
3. Implement the specific descriptor-related callback function which the USB Device stack will call to get the device descriptor. See Section 5.

## 4 USB Composite Device Structures

All these structures are defined in the USB stack code. The structures describe the class and are consistent with the descriptor. They are also used in examples.

## 4.1 usb\_composite\_info\_struct\_t

This structure is required for the composite device and relays interface numbers and endpoint numbers of each interface to the class driver.

This is an example for a composite device MSD + CDC:

```
static usb_composite_info_struct_t usb_composite_info =
{
    . count    = 2,
    . class    = usb_dec_class,
};
```

The variable “count” holds the number of classes included in the composite device. Because composite device MSD+CDC includes two classes, the value of variable “count” is 2.

The type of “class” is `usb_class_struct_t`. See the next section for more information.

## 4.2 usb\_class\_struct\_t

This structure is required for the composite device and provides information about each class.

This is an example for the composite device MSD + CDC:

```
static usb_class_struct_t usb_dec_class[USB_MSD_CDC_CLASS_MAX] =
{
    {
        . type = USB_CLASS_CDC,
        . interfaces = USB_DESC_CONFIGURATION(2, usb_cdc_if),
    },
    {
        . type = USB_CLASS_MSC,
        . interfaces = USB_DESC_CONFIGURATION(1, usb_msd_if),
    },
};
```

*Type* represents the type of each class included in the composite device. For example, the type of MSD class is `USB_CLASS_MSC`.

*Interfaces* include detailed interface information about the class, including interface count, ep count, ep type and ep direction. See next section for more information. Number “2” means that the CDC class has two interfaces. The interface list is “usb\_cdc\_if”. Number “1” means that the MSD class has one interface. The interface list is “usb\_msd\_if”. See next section for more information.

## 4.3 usb\_interfaces\_struct\_t

This structure is required for the composite device and provides information about each class.

### Prototype:

```
typedef struct _usb_interfaces_struct
{
    uint8_t          count;
    usb_if_struct_t* interface;
```

```
} usb_interfaces_struct_t;
```

**Description:**

*count*: interface numbers for each class.

*interface*: interface information list.

## 4.4 usb\_if\_struct\_t

This structure is required for the composite device and provides information about each interface.

**Prototype:**

```
typedef struct _usb_if_struct
{
    uint8_t          index;
    usb_endpoints_t  endpoints;
} usb_if_struct_t;
```

**Description:**

*index*: interface index in the interface descriptor.

*endpoints*: ep information struct.

This is an example for the composite device MSD + CDC:

**CDC:**

```
static usb_if_struct_t usb_cdc_if[2] = {
    USB_DESC_INTERFACE(0, 1, cic_ep),
    USB_DESC_INTERFACE(1, 2, dic_ep),
};
In USB_DESC_INTERFACE(0, 1, cic_ep):
```

Number “0” holds the index of the CDC class control interface. In other words, in the interface descriptor, the interface number is 0.

Number “1” means that the ep number of this interface is 1.

“cic\_ep” is ep detail information structure. See section 4.6 for more information.

**MSD:**

```
static usb_if_struct_t usb_msd_if[1] = {
    USB_DESC_INTERFACE(2, 2, msd_ep),
};
In USB_DESC_INTERFACE(2, 2, msd_ep):
```

The first number “2” holds the index of the MSD class control interface. In other words, in the interface descriptor, the interface number is 2.

The second number “2” means that the ep number of this interface is 2.

“cic\_ep” is ep detail information structure. See next section 3.6 for more information.

## 4.5 usb\_endpoints\_t

This structure is required for the composite device and provides ep information for each interface.

## 4.6 usb\_ep\_struct\_t

This structure is required for the composite device and provides ep information.

This is an example for the composite device MSD + CDC:

This is CDC class control interface endpoint information.

```
usb_ep_struct_t cic_ep[CIC_ENDP_COUNT] = {
    #if CIC_NOTIF_ELEM_SUPPORT
    {
        .ep_num = 5,
        .type = USB_INTERRUPT_PIPE,
        .direction = USB_SEND,
        .size = 16
    }
    #endif
};
```

# 5 USB descriptor functions

## 5.1 USB descriptor

The descriptors for each class can be obtained from the class-related examples and class spec. For composite device, the user should combine multiple class descriptors. Note:

1. Interface number in the configuration descriptor must be the correct interface number value.
2. The endpoint number value in each endpoint descriptor must be consistent with the structures in Section 1.

## 5.2 USB\_Desc\_Get\_Descriptor

This function provides all standard descriptors, such as descriptor for device and class. All composite devices must implement USB\_STRING\_DESCRIPTOR and USB\_STANDARD\_DESCRIPTOR. If the class has a class-specific descriptor, it needs to be added to this function. For example, for HID class, the USB\_REPORT\_DESCRIPTOR needs to be added.

USB\_Desc\_Get\_Descriptor is provided in the example when a composite device is HID + HID. Omit part can be a reference in the USB Stack.

```
uint8_t USB_Desc_Get_Descriptor(...)
```

```
{
```

```

switch(type)
{
    case USB_REPORT_DESCRIPTOR:
        {
            if(index == HID_GENERIC_INTERFACE_INDEX)
            {
                *descriptor = (uint8_t *)g_generic_report_descriptor;
                *size = GENERIC_REPORT_DESC_SIZE;
            }
            else if(index == HID_MOUSE_INTERFACE_INDEX)
            {
                *descriptor = (uint8_t *)g_mouse_report_descriptor;
                *size = MOUSE_REPORT_DESC_SIZE;
            }
            else
            {
                *descriptor = NULL;
                *size = 0;
            }
        }
        break;
    ...
} /* End Switch */
return USB_OK;
}

```

### 5.3 USB\_Desc\_Get\_Entity

This function provides information about a class driver. Any composite equipment must implement the USB\_COMPOSITE\_INFO and the USB\_CLASS\_INTERFACE\_INDEX\_INFO.

For Audio class, add the USB\_AUDIO\_UNITS.

For MSC, add the USB\_MSC\_LBA\_INFO.

For PHDC, add the USB\_PHDC\_QOS\_INFO.

This is an example for the composite device HID + HID.

```

uint8_t USB_Desc_Get_Entity(uint32_t handle, entity_type type, uint32_t * object)
{
    switch (type)
    {
        case USB_CLASS_INFO:
            break;
        case USB_CLASS_INTERFACE_INDEX_INFO:
            *object = 0xff;
            for (int i = 0; i < COMPOSITE_CFG_MAX; i++)
            {
                if (handle == (uint32_t)g_composite_device.hid_generic.app_handle)
                {
                    *object = (uint32_t)HID_GENERIC_INTERFACE_INDEX;
                    break;
                }
                else if (handle == (uint32_t)g_composite_device.hid_mouse.app_handle)

```

```

        {
            *object = (uint32_t)HID_MOUSE_INTERFACE_INDEX;
            break;
        }
    }
    break;
case USB_COMPOSITE_INFO:
    g_usb_if_hid_generic[0].index = HID_GENERIC_INTERFACE_INDEX;
    g_usb_if_hid_generic[0].endpoints = g_usb_desc_ep_hid_generic;
    g_usb_if_hid_mouse[0].index = HID_MOUSE_INTERFACE_INDEX;
    g_usb_if_hid_mouse[0].endpoints = g_usb_desc_ep_hid_mouse;
    *object = (unsigned long)&g_usb_composite_info;
    break;
default :
    break;
}/* End Switch */
return USB_OK;
}.

```

### Note:

USB\_CLASS\_INTERFACE\_INDEX\_INFO get the index of class arrange. It is the position of usb\_class\_struct\_t array for a class.

## 5.4 USB\_Set\_Configuration

This is a most common configuration and the USB\_Set\_Configuration can be empty. For a composite device, if you complete this function, you should determine which class the handle needs.

This is an example for the two CDC devices:

```

uint8_t USB_Set_Configuration( cdc_handle_t handle, uint8_t config )
{
    for(i = 0; i < usb_composite_info.count; i++)
    {
        switch(usb_composite_info.class[i].type)
        {
            case USB_CLASS_CDC:
                if (handle == g_composite_device.cdc_vcom1.cdc_handle)
                    usb_dec_class[i].interfaces = usb_cdc_configuration[config - 1];
                else if (handle == g_composite_device.cdc_vcom2.cdc_handle)
                    usb_dec_class[i].interfaces = usb_cdc2_configuration[config - 1];
                break;
            default:
                break;
        }
    }
    return USB_OK;
}

```

## 6 USB Stack Configurations

### 1. Class Configuration

This section provides more information whenever two or more same classes are used in the composite device.

To reduce the footprint, the released USB stack does not support multiple instances of the same class in the default configuration. If two or more same classes are used in the composite device, the user needs to configure the class.

- For HID class, MAX\_HID\_DEVICE must be configured in the usb\_hid.h
- For CDC class, MAX\_CDC\_DEVICE must be configured in the usb\_cdc.h
- For MSD class, MAX\_MSC\_DEVICE must be configured in the usb\_msc.h
- For audio class, MAX\_AUDIO\_DEVICE must be configured in the usb\_audio.h
- For PHDC class, MAX\_PHDC\_DEVICE must be configured in the usb\_phdc.h
- For Composite class driver, CONFIG\_MAX must be configured in the usb\_composite.c

The value of the configuration depends on use cases and user's needs.

For example, for the composite device HID+HID, the MAX\_HID\_DEVICE must be set to 2, and the CONFIG\_MAX must be set to 2.

## 2. USB Stack Configuration

- For the composite device, the USBCFG\_DEV\_COMPOSITE must be set to 1 in the usb\_device\_config.h.

### **Note:**

USBCFG\_DEV\_MAX\_ENDPOINTS must not be less than “max used endpoint number + 1”. “max used endpoint number” means the max endpoint number the example uses.

## 7 Application template

The main difference between the composite devices and other devices is application. Designing a composite device application is to design a composite device demo.

### 7.1 Application structure template

For a general device, a demo contains only one class. However, for the composite device, a demo contains more than one class. Likewise, a structure is required to manage the application involving more than one class.

```
typedef struct composite_device_struct
{
    composite_handle_t      composite_device;
    Function 1 structure;
    Function 2 structure;
    ...
    Function n structure;
    composite_config_struct_t composite_device_config_callback;
}
```



```

    class_config_struct_t      composite_device_config_list[COMPOSITE_CFG_MAX];
}composite_device_struct_t;

composite_device: the handle point to composite device. Returned by USB_Composite_Init.
composite_device_config_callback: function callback list and count.
composite_device_config_list: function callback list.

Function n structure: structure to application of a class. Just like HID mouse,
hid_mouse_struct_t hid_mouse;
HID mouse is an example to show function n structure.

```

This is an example for a composite device hid mouse + keyboard:

### Prototype:

```

typedef struct composite_device_struct
{
    composite_handle_t      composite_device;
    hid_keyboard_struct_t   hid_keyboard;
    hid_mouse_struct_t      hid_mouse;
    composite_config_struct_t composite_device_config_callback;
    class_config_struct_t    composite_device_config_list[COMPOSITE_CFG_MAX];
}composite_device_struct_t;

```

## 7.2 Application initialization process

1. Before initializing the USB stack by calling the USB\_Composite\_Init, the composite\_device\_config\_list and composite\_device\_config\_callback are assigned values respectively. For example, for hid mouse, the steps are as follows:
  - o g\_composite\_device need to be declared as global variables, as the type composite\_device\_struct\_t.
- b. Declare: class\_config\_struct\_t\* hid\_mouse\_config\_callback\_handle;
  - o Then hid\_mouse\_config\_callback\_handle = &g\_composite\_device.composite\_device\_config\_list[HID\_MOUSE\_INTERFACE\_INDEX];
- c.
  - o hid\_mouse\_config\_callback\_handle->composite\_application\_callback.callback = hid\_mouse\_app\_callback;
  - o hid\_mouse\_app\_callback amended as Hid\_USB\_App\_Device\_Callback
  - o hid\_mouse\_config\_callback\_handle->composite\_application\_callback.arg = &g\_composite\_device.hid\_mouse;
  - o hid\_mouse\_config\_callback\_handle->class\_specific\_callback.callback = hid\_mouse\_app\_param\_callback;

- hid\_mouse\_app\_param\_callback
- amended as
- Hid\_USB\_App\_Class\_Callback
- hid\_mouse\_config\_callback\_handle->class\_specific\_callback.arg = &g\_composite\_device.hid\_mouse;
- hid\_mouse\_config\_callback\_handle->desc\_callback\_ptr = &g\_desc\_callback;
- hid\_mouse\_config\_callback\_handle->type = USB\_CLASS\_HID;
- OS\_Mem\_zero(&g\_composite\_device.hid\_mouse, sizeof(hid\_mouse\_struct\_t));

2.

- g\_composite\_device.composite\_device\_config\_callback.count = 2;
- g\_composite\_device.composite\_device\_config\_callback.class\_app\_callback = g\_composite\_device.composite\_device\_config\_list;

3. Call USB\_Composite\_Init

- USB\_Composite\_Init(CONTROLLER\_ID, &g\_composite\_device.composite\_device\_config\_callback, &g\_composite\_device.composite\_device);

4. Get a handle for each class.

For example, hid mouse:

- g\_composite\_device.hid\_mouse.app\_handle = (hid\_handle\_t)g\_composite\_device.composite\_device\_config\_list[HID\_MOUSE\_INTERFACE\_INDEX].class\_handle;

5. Initialize each class application.

Such as, hid mouse:

- hid\_mouse\_init(&g\_composite\_device.hid\_mouse);

## 8 CDC+CDC Composite device example

For this section, we use CDC+CDC composite device as an example.

### 8.1 USB Composite Device Structure examples

```
/* two cdc classes */
```

```
static usb_composite_info_struct_t usb_composite_info =  
{  
    2,  
    usb_dec_class,  
};
```

```
/* two cdc classes definition */
```

```
static usb_class_struct_t usb_dec_class[USB_MSD_CDC_CLASS_MAX] =  
{  
    {  
        USB_CLASS_CDC,  
        USB_DESC_CONFIGURATION(USB_CDC_IF_MAX, usb_cdc_if),  
    },  
    {  
        USB_CLASS_CDC,  
        USB_DESC_CONFIGURATION(USB_CDC_IF_MAX, usb_cdc2_if),  
    },  
};
```

```
/* cdc1 definition: cdc has two interfaces */
```

```
static usb_if_struct_t usb_cdc_if[USB_CDC_IF_MAX] = {  
    USB_DESC_INTERFACE(0, CIC_ENDP_COUNT, cic_ep),  
    USB_DESC_INTERFACE(1, DIC_ENDP_COUNT, dic_ep),  
};
```

```
/* cdc2 definition: cdc has two interfaces */
```

```

static usb_if_struct_t usb_cdc2_if[USB_CDC_IF_MAX] = {
    USB_DESC_INTERFACE(2, CIC_ENDP_COUNT, cic_ep2),
    USB_DESC_INTERFACE(3, DIC_ENDP_COUNT, dic_ep2),
};

/* cdc1 endpoints definition: interface1 has one endpoint, interface2 has two endpoints*/
usb_ep_struct_t cic_ep[CIC_ENDP_COUNT] = {
    #if CIC_NOTIF_ELEM_SUPPORT
    {
        CIC_NOTIF_ENDPOINT,
        USB_INTERRUPT_PIPE,
        USB_SEND,
        CIC_NOTIF_ENDP_PACKET_SIZE
    }
    #endif
};

usb_ep_struct_t dic_ep[DIC_ENDP_COUNT] = {
    #if DATA_CLASS_SUPPORT
    {
        DIC_BULK_IN_ENDPOINT,
        USB_BULK_PIPE,
        USB_SEND,
        DIC_BULK_IN_ENDP_PACKET_SIZE
    },
    {
        DIC_BULK_OUT_ENDPOINT,
        USB_BULK_PIPE,
        USB_RECV,
        DIC_BULK_OUT_ENDP_PACKET_SIZE
    }
    #endif
};

```

```

    }
#endif

};

/* cdc2 endpoints definition: interface1 has one endpoint, interface2 has two endpoints */
usb_ep_struct_t cic_ep2[CIC_ENDP_COUNT] = {
    #if CIC_NOTIF_ELEM_SUPPORT
    {
        CIC2_NOTIF_ENDPOINT,
        USB_INTERRUPT_PIPE,
        USB_SEND,
        CIC_NOTIF_ENDP_PACKET_SIZE
    }
    #endif
};

usb_ep_struct_t dic_ep2[DIC_ENDP_COUNT] = {
    #if DATA_CLASS_SUPPORT
    {
        DIC2_BULK_IN_ENDPOINT,
        USB_BULK_PIPE,
        USB_SEND,
        DIC_BULK_IN_ENDP_PACKET_SIZE
    },
    {
        DIC2_BULK_OUT_ENDPOINT,
        USB_BULK_PIPE,
        USB_RECV,
        DIC_BULK_OUT_ENDP_PACKET_SIZE
    }
    }
};

```

```

#endif

};

```

## 8.2 USB Composite Device descriptor examples

Modify the product ID in device descriptor. The other does not need to change.

Change interface number as shown in configuration descriptor.

Copy two CDC configuration descriptors from the CDC example or msc+cdc example and change the endpoint number to be consistent with Section 8.1.

### 8.2.1 USB\_Desc\_Get\_Descriptor

```

/* string descriptor get from usb_all_languages_t g_languages */
/* other descriptor get from g_std_descriptors array */
uint8_t USB_Desc_Get_Descriptor(...)
{
    if (type == USB_STRING_DESCRIPTOR)
    {
        if(index == 0)
        {
            *descriptor = (uint8_t *)g_languages.languages_supported_string;
            *size = g_languages.languages_supported_size;
        }
        else
        {
            uint8_t lang_id=0;
            uint8_t lang_index=USB_MAX_LANGUAGES_SUPPORTED;

            for(;lang_id< USB_MAX_LANGUAGES_SUPPORTED;lang_id++)
            {
                if(index == g_languages.usb_language[lang_id].language_id)
                {
                    if(str_num < USB_MAX_STRING_DESCRIPTOR)
                    {
                        lang_index=str_num;
                    }
                    break;
                }
            }

            *descriptor =
                (uint8_t *)g_languages.usb_language[lang_id].lang_desc[str_num];
            *size =
                g_languages.usb_language[lang_id].lang_desc_size[lang_index];
        }
    }
    else if (type < USB_MAX_STD_DESCRIPTOR+1)
    {
        *descriptor = (uint8_t *)g_std_descriptors [type];
        if(*descriptor == NULL)
        {
            return USBERR_INVALID_REQ_TYPE;
        }
    }
}

```

```

        *size = g_std_desc_size[type];
    }
    else
    {
        return USBERR_INVALID_REQ_TYPE;
    }
    return USB_OK;
}

```

## 8.2.2 USB\_Desc\_Get\_Entity

```

/* USB_CLASS_INTERFACE_INDEX_INFO: Return different index based on different handle */
/* USB_COMPOSITE_INFO: return usb_composite_info defined in section 1*/
uint8_t USB_Desc_Get_Entity(uint32_t handle, entity_type type, uint32_t * object)
{
    switch(type)
    {
        case USB_CLASS_INFO:
            break;
        case USB_CLASS_INTERFACE_INDEX_INFO:
            *object = 0xff;
            for (int i = 0; i < 2; i++)
            {
                if (handle == (uint32_t)g_composite_device.cdc_vcom)
                {
                    *object = (uint32_t)CDC_VCOM_INTERFACE_INDEX;
                    break;
                }
                else if (handle == (uint32_t)g_composite_device.msc_disk.app_handle)
                {
                    *object = (uint32_t)MSC_DISK_INTERFACE_INDEX;
                    break;
                }
            }
            break;
        case USB_COMPOSITE_INFO:
            *object = (uint32_t)&usb_composite_info;
            break;
        default :
            break;
    }
    /* End Switch */
    return USB_OK;
}

```

## 8.2.3 USB\_Set\_Configuration

```

/* set different class configure based on different handle. */
uint8_t USB_Set_Configuration( cdc_handle_t handle, uint8_t config )
{
    for(i = 0; i < usb_composite_info.count; i++)
    {
        switch(usb_composite_info.class[i].type)
        {
            case USB_CLASS_CDC:
                if (handle == g_composite_device.cdc_vcom1.cdc_handle)
                    usb_dec_class[i].interfaces = usb_cdc_configuration[config - 1];

```

```

        else if (handle == g_composite_device.cdc_vcom2.cdc_handle)
            usb_dec_class[i].interfaces = usb_cdc2_configuration[config - 1];
        break;
    default:
        break;
    }
}
return USB_OK;
}

```

## 8.3 USB Composite Device application example

### 8.3.1 Class Configuration

USBCFG\_DEV\_COMPOSITE is set to 1 in usb\_device\_config.h

MAX\_CDC\_DEVICE is set to 2 in usb\_cdc.h

USBCFG\_DEV\_MAX\_ENDPOINTS is set to 9 in usb\_device\_config.h

### 8.3.2 CDC+CDC Application structure

```

/* cdc_struct_t represents cdc class */
typedef struct composite_device_struct
{
    composite_handle_t      composite_device;
    cdc_struct_t            cdc_vcom1;
    cdc_struct_t            cdc_vcom2;
    composite_config_struct_t composite_device_config_callback;
    class_config_struct_t    composite_device_config_list[COMPOSITE_CFG_MAX];
}composite_device_struct_t;

/* cdc_struct_t is as follow. */
/* It contain variables for one cdc class. */
typedef struct _cdc_variable_struct
{
    cdc_handle_t cdc_handle;
    uint8_t g_curr_recv_buf[DATA_BUFF_SIZE];
    uint8_t g_curr_send_buf[DATA_BUFF_SIZE];
    uint8_t g_recv_size;
    uint8_t g_send_size;
    bool start_app;
    bool start_transactions;
    uint8_t out_endpoint;
    uint8_t in_endpoint;
}cdc_struct_t;

```

### 8.3.3 CDC+CDC Application

1. composite\_device\_struct\_t g\_composite\_device;



2.

```
/* call cdc_vcom_preinit by parameter cdc_struct_t */
```

```
cdc_vcom_preinit(&g_composite_device.cdc_vcom1);
```

```
cdc_vcom_preinit(&g_composite_device.cdc_vcom2);
```

3. /\* Init cdc1: use callback functions defined by existing examples; use g\_composite\_device.cdc\_vcom1 as parameter for callback \*/

```
cdc_vcom_config_callback_handle =  
&g_composite_device.composite_device_config_list[CDC_VCOM_INTERFACE_INDEX];
```

```
cdc_vcom_config_callback_handle->composite_application_callback.callback =  
VCom_USB_App_Callback;
```

VCom\_USB\_App\_Callback amended as VCom\_USB\_App\_Device\_Callback

```
cdc_vcom_config_callback_handle->composite_application_callback.arg =  
&g_composite_device.cdc_vcom1;
```

```
cdc_vcom_config_callback_handle->class_specific_callback.callback =  
(usb_class_specific_handler_func)VCom_USB_Notif_Callback;
```

VCom\_USB\_Notif\_Callback amended as VCom\_USB\_App\_Class\_Callback

```
cdc_vcom_config_callback_handle->class_specific_callback.arg =  
&g_composite_device.cdc_vcom1;
```

```
cdc_vcom_config_callback_handle->desc_callback_ptr = &desc_callback;
```

```
cdc_vcom_config_callback_handle->type = USB_CLASS_CDC;
```

4. /\* Init cdc2: use callback functions defined by existing examples; use g\_composite\_device.cdc\_vcom2 as parameter for callback \*/

```
msc_disk_config_callback_handle =  
&g_composite_device.composite_device_config_list[MSC_DISK_INTERFACE_INDEX];
```

```
msc_disk_config_callback_handle->composite_application_callback.callback =  
VCom_USB_App_Callback; //SG
```

VCom\_USB\_App\_Callback amended as VCom\_USB\_App\_Device\_Callback

```
msc_disk_config_callback_handle->composite_application_callback.arg =  
&g_composite_device.cdc_vcom2; //SG
```

```
msc_disk_config_callback_handle->class_specific_callback.callback =  
(usb_class_specific_handler_func)VCom_USB_Notif_Callback; //SG
```

VCom\_USB\_Notif\_Callback amended as VCom\_USB\_App\_Class\_Callback

```
msc_disk_config_callback_handle->class_specific_callback.arg =  
&g_composite_device.cdc_vcom2; //SG
```

```
msc_disk_config_callback_handle->desc_callback_ptr = &desc_callback;
```

```
msc_disk_config_callback_handle->type = USB_CLASS_CDC;
```

5.

```
g_composite_device.composite_device_config_callback.count = 2;
```

```
g_composite_device.composite_device_config_callback.class_app_callback =  
g_composite_device.composite_device_config_list;
```

6. /\* composite init function call \*/

```
USB_Composite_Init(CONTROLLER_ID,  
&g_composite_device.composite_device_config_callback,  
&g_composite_device.composite_device);
```

7. /\* save the handle for each cdc device \*/

```
g_composite_device.cdc_vcom1.cdc_handle =  
(cdc_handle_t)g_composite_device.composite_device_config_list[CDC_VCOM_INTERFACE_I  
NDEX].class_handle;
```

```
g_composite_device.cdc_vcom2.cdc_handle =  
(cdc_handle_t)g_composite_device.composite_device_config_list[1].class_handle;
```

8. /\* init some fields of g\_composite\_device.cdc\_vcom1 and g\_composite\_device.cdc\_vcom1\*/

```
g_composite_device.cdc_vcom1.out_endpoint = DIC_BULK_OUT_ENDPOINT;
```

```
g_composite_device.cdc_vcom2.out_endpoint = DIC2_BULK_OUT_ENDPOINT;
```

```
g_composite_device.cdc_vcom1.in_endpoint = DIC_BULK_IN_ENDPOINT;
```

```
g_composite_device.cdc_vcom2.in_endpoint = DIC2_BULK_IN_ENDPOINT;
```

9. /\* cdc\_vcom\_init call. Step8 can be moved to this function code. \*/

```
cdc_vcom_init(&g_composite_device.cdc_vcom1);
```

```
cdc_vcom_init(&g_composite_device.cdc_vcom2);
```

---

10. /\* app tasks: call cdc\_vcom\_task by cdc\_struct\_t parameter\*/

void APP\_task()

```
{
    while(TRUE)
    {
        cdc_vcom_task((void*)&g_composite_device.cdc_vcom1);
        cdc_vcom_task((void*)&g_composite_device.cdc_vcom2);
    }
}
```

## 9 Revision history

This table summarizes revisions to this document since the release of the previous version

Table 1 Revision History		
Revision number	Date	Substantive changes
0	12/2014	Initial release

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