MEDIATEK

Customization in NvRAM
Ver 1.2





Customization in NvRAM

- **Version 1.2**
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- **Version 1.0**
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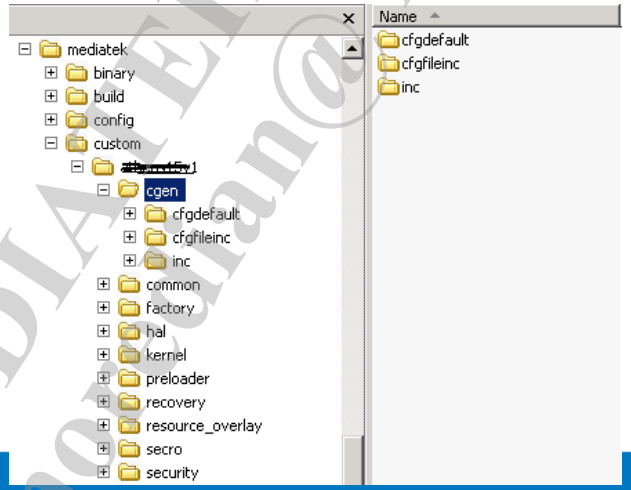
Customization in NvRAM

- **For the different requirements of projects, NvRAM modules also need to provide the supports of customization configurations, including default value and record data structure of NvRAM files.**
- **There are two parts of NvRAM data**
  - Common
    - For MTK platform NvRAM used
    - Customer can see the definition of related NVRAM record structure
    - But should not modify them
  - Customized for different projects
    - For customer NvRAM used
    - Customer can see the definition of related NVRAM record structure
    - Can modify them according to the requirements

Customization in NvRAM

- **The folder of NvRAM customization is located in the path**
  - mediatek\custom\ *[$PROJECT]*\ cgen
  - There are three folders in this customization folder
  - Cfgdefault
    - Used to define the default value of NvRAM files
  - Cfgfileinc
    - Used to define the record data structure of NvRAM file
  - Inc
    - Used to support general NvRAM module functionalities



Customization in NvRAM

- **Should modify the file**
  - mediatek\custom\ *[$PROJECT]*\ cgen\inc*CFG_file_info_custom.h*
  - Data structure of *g_akCFG_File_Custom*
- **The information of NvRAM file**
  - File path
    - The file path that the NvRAM files should be store
  - File version
  - Record size
  - Record numbers
  - The type of the default value
  - The default value
  - type of processing when version not match (Convert/Reset)
  - Data-convert function

Customization in NvRAM

- The data structure of *g_akCFG_File_Custom*

```
TCFG_FILE g_akCFG_File_Custom[]=

    { "/data/nvram/APCFG/APRDCL/Audio_Sph",        VER(AP_CFG_RDCL_FILE_AUDIO_LID),        CFG_FILE_SPEECH_REC_SIZE,
    CFG_FILE_SPEECH_REC_TOTAL,                     SIGNLE_DEFUALT_REC,    (char *)&speech_custom_default,  DataReset, NULL),

    { "/data/nvram/APCFG/APRDEB/GPS",          VER(AP_CFG_CUSTOM_FILE_GPS_LID),          CFG_FILE_GPS_CONFIG_SIZE,
       CFG_FILE_GPS_CONFIG_TOTAL,                  SIGNLE_DEFUALT_REC,                (char *)&stGPSConfigDefault, DataReset, NULL),
```

- The default value of *stGPSConfigDefault*

```
ap_nvram_gps_config_struct stGPSConfigDefault =
{
    /* "/dev/ttyMT1" */
    {'/','d','e','v','/','t','t','y','M','T','1',0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0,0x0},
    /* 0:s/w, 1:none, 2:h/w */
    1,

    /* 16.368MHz */
    16368000,
    /* 500ppb */
    500,
    /* 0:16.368MHz TCXO */
    0,

    /* 0:mixer-in, 1:internal-LNA */
    0,

    /* 0:none */
    0
};
```

Note: the sequence of a_akCFG_File_Custom must be the same as LID definition table(Page 9)

Reset to Default

Type	Descriptions
SINGLE_DEFAULT_REC	If multiple records have same default value, this type should be used to minimize the Ram size. It only need define the default value of one record, NvRAM module will use the default value of this record to initialize all of records
MULTIPLE_DEFAULT_REC	If NvRAM has different default value for different records, this type should be used. It will use default value which is define in the cfg_file, then writes to NvRAM file
DEFAULT_ZERO	The default value is 0, the property of default value will not be cared
DEFAULT_FF	The default value is 0xff, the property of default value will not be cared

Step by Step to Add NvRAM Data

1. **Add one header file which describes the definition of its record data structure, record size and record numbers**
   - In the path of *mediatek\custom\ [$PROJECT]\ cgen\cfgfileinc*

```
#ifndef _CFG_CUSTOM1_FILE_H
#define _CFG_CUSTOM1_FILE_H

typedef struct
{
    unsigned int Array[1];
}File_Custom1_Struct;

#define CFG_FILE_CUSTOM1_REC_SIZE    sizeof(File_Custom1_Struct)
#define CFG_FILE_CUSTOM1_REC_TOTAL   1

#endif
```

2. **Add header file which define its default value of NvRAM file**
   - In the path of *mediatek\custom\ [$PROJECT]\cgen\cfgdefault*

```
#ifndef _CFG_CUSTOM1_D_H
#define _CFG_CUSTOM1_D_H

File_Custom1_Struct stCustom1Default =
{
    1
};

#endif
```

Step by Step to Add NvRAM Data

3. **Add one lid in the enum definition of "*CUSTOM_CFG_FILE_LID*" and define the version number of NvRAM file**
   - In the path of

     mediatek\custom\ [$PROJECT]\cgen\inc\Custom_NvRAM_LID.h

```
/* the definition of file LID */
typedef enum
{
    AP_CFG_RDCL_FILE_AUDIO_LID=AP_CFG_CUSTOM_BEGIN_LID, //AP_CFG_CUSTOM_BEGIN_LID: this lid must not be changed, it is reserved for system.
    AP_CFG_CUSTOM_FILE_GPS_LID,
    AP_CFG_RDCL_FILE_META_LID,
    AP_CFG_CUSTOM_FILE_CUSTOM1_LID,
    AP_CFG_CUSTOM_FILE_CUSTOM2_LID,

    AP_CFG_CUSTOM_FILE_MAX_LID,
} CUSTOM_CFG_FILE_LID;


/* verno of data items */
/* audio file version */
#define AP_CFG_RDCL_FILE_AUDIO_LID_VERNO          "001"
/* META log and com port config file version */
#define AP_CFG_RDCL_FILE_META_LID_VERNO           "000"

/* custom2 file version */
#define AP_CFG_CUSTOM_FILE_CUSTOM1_LID_VERNO          "000"
/* custom2 file version */
#define AP_CFG_CUSTOM_FILE_CUSTOM2_LID_VERNO          "000"
/* GPS file version */
#define AP_CFG_CUSTOM_FILE_GPS_LID_VERNO          "000"
```

The sequence of lids in enum definition can't change. The newest lid must add at the end of the definition table.(before MAX_LID)

Step by Step to Add NvRAM Data

4. **Add one include path which added in the step 1**
   - In the path of
     mediatek\custom\ [$PROJECT]\cgen\inc\custom_cfg_module_file.h
5. **Add one include path which added in the step 2**
   - In the path of
     mediatek\custom\ [$PROJECT]\cgen\inc\custom_cfg_module_default.h
6. **Add the related information of NvRAM file into the definition of "*g_akCFG_File_Custom*"**
   - In the path of
     mediatek\custom\[$PROJECT]\cgen\inc\CFG_file_info_custom.h
7. **Add its related information, including record structure, NvRAM lid, and record number**
   - *In the path of*
     mediatek\custom\[$PROJECT]\cgen\inc\Custom_NvRAM_data_item.h

Add NvRAM File to Backup List

If your NvRAM File Need to Backup to BinRegion, add your module in aBackupToBinRegion[]

In the path of *mediatek\custom\ common\ cgen\CFG_file_info.c*

```
FileName aBackupToBinRegion[]=
{
    {"FILE_VER",AP_CFG_FILE_VER_INFO_LID},
    {"BT_Addr",AP_CFG_RDEB_FILE_BT_ADDR_LID},
    {"WIFI",AP_CFG_RDEB_FILE_WIFI_LID},
    {"AUXADC",AP_CFG_RDCL_FILE_AUXADC_LID},
    {"FACTORY",AP_CFG_RDCL_FACTORY_LID},
    {"BWCS",AP_CFG_RDCL_BWCS_LID},
    {"HWMON_ACC",AP_CFG_RDCL_HWMON_ACC_LID},
    {"HWMON_GYRO",AP_CFG_RDCL_HWMON_GYRO_LID},
    {"WIFI_CUSTOM",AP_CFG_RDEB_WIFI_CUSTOM_LID},
    {"GPS",AP_CFG_CUSTOM_FILE_GPS_LID},
                                  {"FileName In NvRAM",THE_LID_OF_YOUR_FILE}
};
```

Note:This Backup Mechanism can be triggered by Meta tool

NvRAM Library

- **NvRAM Interface For Module**
  - To provide related interface functions for modules to read, write NvRAM file
  - Interface of opening and closing nvram file is provided by Nvram library

Interface Function	Description
NVM_GetFileDesc	Get the description of nvram file and the information of record size and number
NVM_CloseFileDesc	close the file description

NvRAM Library

- **NvRAM Interface For Module (For MT6575)**
  - typedef struct {
    int iFileDesc;
    Int ifile_lid;
    } F_ID;
  - F_ID NVM_GetFileDesc(int file_lid, int *pRecSize, int *pRecNum, bool IsRead)

```
DESCRIPTION:
   this function is called to the desc of nvram file and the information of
   record size and number.

PARAMETERS:
     file_lid:          [IN]    the lid of nvram file
     pRecSize:          [OUT]   Pointer of the record size
     pRecNum:           [OUT]    Pointer of the rocord number
     IsRead:            [IN]     true is read-only, otherwise is read/write

RETURN VALUE:
          the file ID
```

NvRAM Library

- **NvRAM Interface For Module (For MT6575)**
  - bool NVM_CloseFileDesc(F_ID file_id)

```
DESCRIPTION:
     this function is called to close the file desc which is open by
   NVM_GetFileDesc.

PARAMETERS:
     file_id: [IN] the file ID

RETURN VALUE:
     true is success, otherwise is fail
```

NvRAM Library

- **NvRAM Interface For Module (For MT6575)**
  - Example

```
#include  “libnvram.h”
F_ID  fid ;
int rec_size = 0;
int rec_num = 0;
Int your_file_lid = YOUR_FILE_LID;
bool isread = false;
YOUR_LID_STRUCT  *your_lid_struct  = NULL;

your_lid_struct =(YOUR_LID_STRUCT *) malloc(sizeof(YOUR_LID_STRUCT ));
If(your_lid_struct == NULL)
        return false;
fid = NVM_GetFileDesc(your_file_lid, &rec_size, &rec_num, isread );
If(fd<0)
    return false;
If(rec_size != read(fid.iFileDesc,your_lid_struct,rec_size)){
    free(your_lid_struct );
    return false;}
……
free(your_lid_struct);
if(!NVM_CloseFileDesc(fid))
    return false;
return true;
```

Appendix

How to change structure in customer file

- **Sometimes you maybe just want to change structure in your customer file**
  - Add some item
  - Delete some item
  - Change some item type

example

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
} WIFI_CUSTOM_PARAM_STRUCT;
```

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
    UINT_32             u4ResvAdd;
} WIFI_CUSTOM_PARAM_STRUCT;
```

- **There are two ways to handle update structure**
  - When first boot up, Restore data from Binregion(Nvram partition) and Reset updated file to default data
  - When first boot up, Restore data from Binregion(Nvram partition) then Convert date in updated file to anything you want it to be

Note: **If you want to enable this feature, Please request Path ALPS00261917**

Step by Step to Reset data(Example)

1. **Update the version of file in which data structure you what to change**
   - In the path mediatek\custom*[$PROJECT]*\cgen\inc\Custom_Nvram_LID.h

```
#define AP_CFG_RDEB_WIFI_CUSTOM_LID_VERNO                    "000"
```

↓

```
#define AP_CFG_RDEB_WIFI_CUSTOM_LID_VERNO                    "001"
```

2. **Change header file which describes the definition of data structure**
   - In the path of *mediatek\custom\ [$PROJECT]\ cgen\cfgfileinc\CFG_wifi_File.h*

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
} WIFI_CUSTOM_PARAM_STRUCT;
```

→

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
    UINT_32             u4ResvAdd;
} WIFI_CUSTOM_PARAM_STRUCT;
```

3. **Change header file which define its default value of NvRAM file**
   - In the path of
     mediatek\custom\ [$PROJECT]\ cgen\cfgdefault\CFG_WIFI_default.h

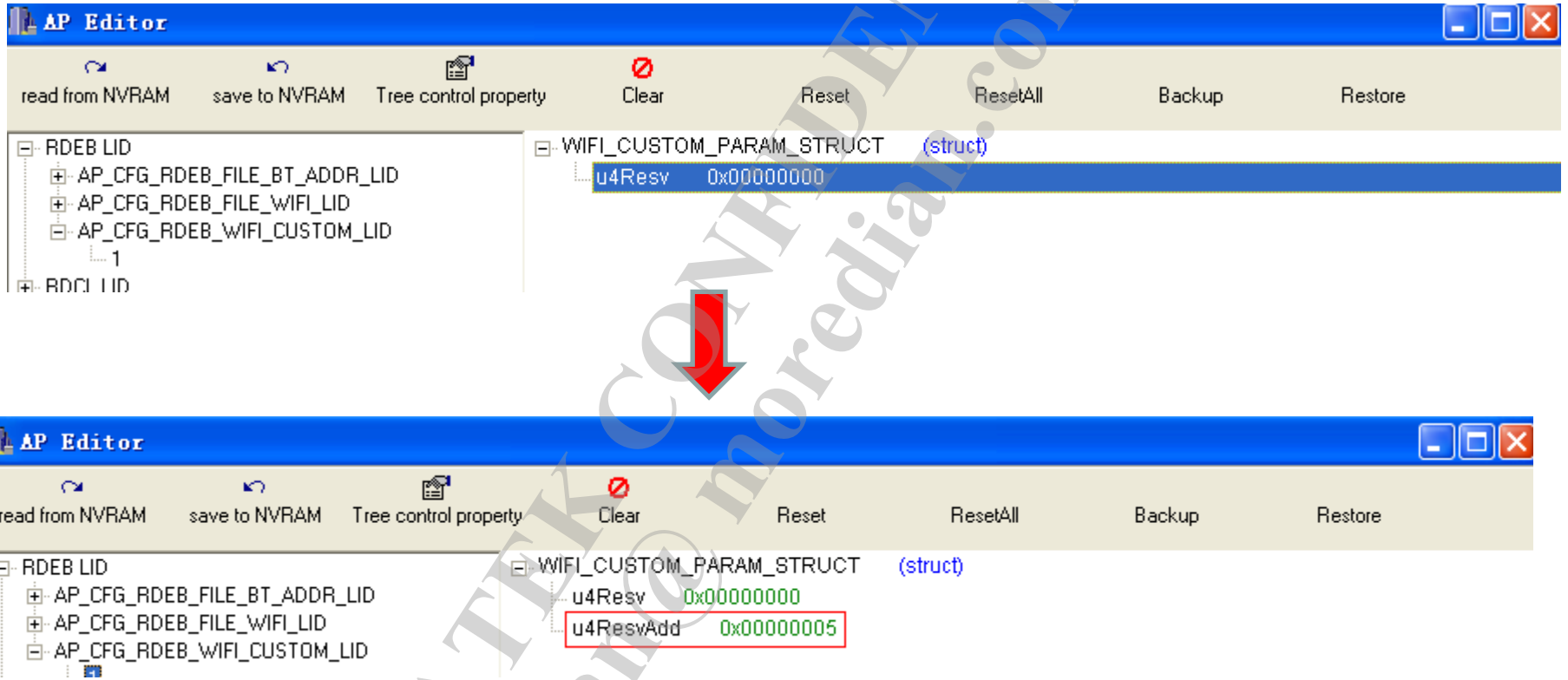
```
WIFI_CUSTOM_PARAM_STRUCT stWifiCustomDefault =
{
    0x0, // Reserved
};
```

```
WIFI_CUSTOM_PARAM_STRUCT stWifiCustomDefault =
{
    0x0, // Reserved
    0x5,
};
```

4. **Change the related information of NvRAM file into the definition of "*g_akCFG_File_Custom*"**
   - In the path of
     mediatek\custom\[$PROJECT]\cgen\inc\CFG_file_info_custom.h

```
{
    "/data/nvram/APCFG/APRDEB/WIFI_CUSTOM",    VER(AP_CFG_RDEB_WIFI_CUSTOM_LID),    CFG_FILE_WIFI_CUSTOM_REC_SIZE,
    CFG_FILE_WIFI_CUSTOM_REC_TOTAL,            SIGNLE_DEFUALT_REC,                  (char *)&stWifiCustomDefault, DataReset, NULL
},
```

Result of Reset



Step by Step to Convert data(Example)

1. **Update the version of file in which data structure you what to change**
   - In the path mediatek\custom*[$PROJECT]*\cgen\inc\Custom_Nvram_LID.h

```
#define AP_CFG_RDEB_WIFI_CUSTOM_LID_VERNO                    "000"
```

```
#define AP_CFG_RDEB_WIFI_CUSTOM_LID_VERNO                    "001"
```

2. **Change header file which describes the definition of data structure and declaration of convert function**
   - In the path of

     mediatek\custom\ [$PROJECT]\ cgen\cfgfileinc\CFG_wifi_File.h

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
} WIFI_CUSTOM_PARAM_STRUCT;
```

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
    UINT_32             u4ResvAdd;
} WIFI_CUSTOM_PARAM_STRUCT;
```

```
/*******************************************************************************
*                        F U N C T I O N   D E C L A R A T I O N S
*******************************************************************************
*/
extern int WifiCustom_ConvertFunction(int, int, char*, char*);

/*******************************************************************************
```

3. **Change header file which define its default value of NvRAM file**
   - In the path of
     mediatek\custom\ [$PROJECT]\ cgen\cfgdefault\CFG_WIFI_default.h

```
WIFI_CUSTOM_PARAM_STRUCT stWifiCustomDefault =
{
    0x0, // Reserved
};
```

```
WIFI_CUSTOM_PARAM_STRUCT stWifiCustomDefault =
{
    0x0, // Reserved
    0x5,
};
```

4. **Change the related information of NvRAM file into the definition of "*g_akCFG_File_Custom*"**
   - In the path of
     mediatek\custom\[$PROJECT]\cgen\inc\CFG_file_info_custom.h

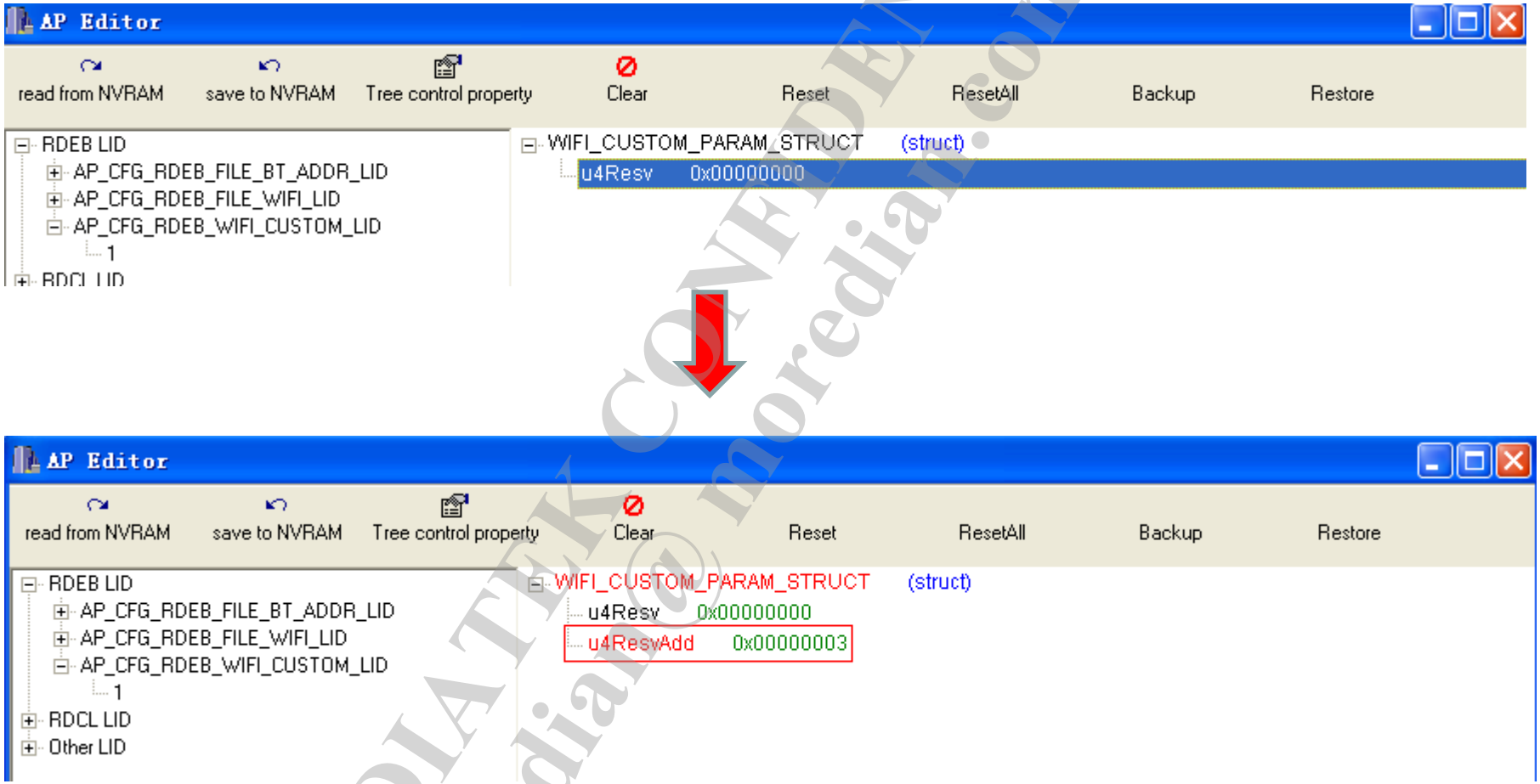
```
{
    "/data/nvram/APCFG/APRDEB/WIFI_CUSTOM",    VER(AP_CFG_RDEB_WIFI_CUSTOM_LID),    CFG_FILE_WIFI_CUSTOM_REC_SIZE,
    CFG_FILE_WIFI_CUSTOM_REC_TOTAL,            SIGNLE_DEFUALT_REC,    (char *)&stWifiCustomDefault, DataConvert, WifiCustom_ConvertFunction
},
```

5. Add definition of convert function in C source file

– In the path of *mediatek\custom\ common\ cgen\CFG_file_info.c*

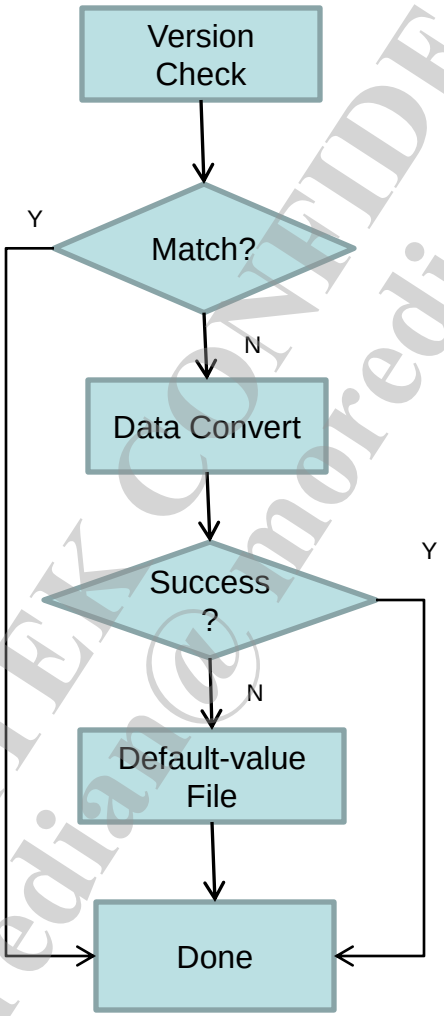
```
int WifiCustom_ConvertFunction(int CurrentVerID, int NewVerID, char* pSrcMem, char*pDstMem)
{
    |
    if(NULL == pSrcMem || NULL == pDstMem) {
        return 0;
    }
    else if (0 == CurrentVerID && 1 == NewVerID) {
        memcpy(pDstMem, pSrcMem, sizeof(unsigned int));
        *((unsigned int*)(pDstMem + 4)) = 0x3;
        return 1;
    }
    else {
        return 0;
    }
}
```

Result of Convert



Introduction of Convert function(1/n)

- ***WorkFlow***



Introduction of Convert function(2/n)

- ***Prototype***
  - Int XXXX_ConvertFunction(int CurrentVerID,int NewVerID,char *p SrcMem, char* pDstMem)
    - *CurrentVerID: The file version which restore from BinRegion in first boot up.*
    - *NewVerID: The file version which you have updated*
    - *SrcMem: the memory saved date in file which restore from Binregion when first boot up.*
    - *pDstMem: the memory saved data which you want the file to be after convert.(must match the structure in new version)*

```
WIFI_CUSTOM_PARAM_STRUCT stWifiCustomDefault =
{
    0x0, // Reserved
};
```

```
typedef struct _WIFI_CUSTOM_PARAM_STRUCT
{
    UINT_32             u4Resv;         /* Reserved */
    UINT_32             u4ResvAdd;
} WIFI_CUSTOM_PARAM_STRUCT;
```

Appendix II

Sync your thread with Nvram Daemon

- ***Why your private thread should sync with nvram daemon***
  - *After bring up, Nvram daemon will check /data/nvram folder and do some initialization. After that, other threads can access /data/nvram correctly. If other thread access /data/nvram before nvram_daemon ready, there may bring about unpredictable results. So your thread must sync with nvram daemon.*
- ***How your private thread should sync with nvram daemon***
  - *When nvram daemon is ready, it will set system variable "nvram_init" to "Ready" by property_set("nvram_init", "Ready").*
  - *You can get status of "nvram_init" by property_get, then check if nvram daemon is "Ready".*
  - *When nvram daemon is "Ready", you can access /data/nvram safely. Otherwise your private thread should wait.*

Sync your thread with Nvram Daemon

- ***Sample Code***

```
#define MAX_RETRY_COUNT 20
int read_nvram_ready_retry = 0;

while(read_nvram_ready_retry < MAX_RETRY_COUNT)
{
            read_nvram_ready_retry++;
            property_get("nvram_init",nvram_init_val,NULL);
            if(strcmp(nvram_init_val,"Ready") == 0)
            {
                break;
            }
            else
            {
                usleep(500*1000);
            }
}
NVRAM_LOG("Get nvram restore ready retry cc=%d\n", read_nvram_ready_retry);
if(read_nvram_ready_retry >= MAX_RETRY_COUNT)
{
            printf("Get nvram restore ready faild\n");
            NVRAM_LOG("Get nvram restore ready faild!!!\n");
}
```

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