Design of config.bcm unification

Document Information

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| --- | --- | --- | --- |
| Rev | Date | Author | Change Description |
| 0.1 | Oct 17, 2023 | zhaohuisun | Draft version |
| 0.2 | Dec 4, 2023 | zhaohuisun | Add approach I |
| 0.3 | Jan 25, 2024 | zhaohuisun | Add use case |

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# Motivation

## Background knowledge

We have so many different types of platforms and HardwareSKUs in SONiC so far:

Here is the list of all HardwareSKUs for different Broadcom ASICs.

TD2:

x86\_64-dell\_s6000\_s1220-r0:

Force10-S6000-Q24S32

Force10-S6000-Q20S48

Force10-S6000-Q28S16

Force10-S6000

x86\_64-arista\_7050\_qx32:

Arista-7050-QX32-Flex

Arista-7050-QX32

Arista-7050-Q16S64

x86\_64-arista\_7050\_qx32s:

Arista-7050QX-32S-S4Q31

Arista-7050QX-32S

Arista-7050QX32S-Q32

TD3:

x86\_64-dellemc\_s5224f\_c3538-r0:

DellEMC-S5224f-P-25G

x86\_64-dellemc\_n3248pxe\_c3338-r0:

DELLEMC-N3248PXE

x86\_64-dellemc\_s5232f\_c3538-r0:

DellEMC-S5232f-C8D48

DellEMC-S5232f-P-25G

DellEMC-S5232f-P-10G

DellEMC-S5232f-C32

DellEMC-S5232f-P-100G

x86\_64-dellemc\_s5212f\_c3538-r0:

DellEMC-S5212f-P-25G

x86\_64-dellemc\_s5296f\_c3538-r0:

DellEMC-S5296f-P-10G

DellEMC-S5296f-P-25G

x86\_64-dellemc\_s5248f\_c3538-r0:

DellEMC-S5248f-P-25G

DellEMC-S5248f-P-10G

x86\_64-arista\_7050sx3\_48c8:

Arista-7050SX3-48C8

x86\_64-arista\_7050sx3\_48yc8:

Arista-7050SX3-48YC8

x86\_64-arista\_7050cx3\_32s:

Arista-7050CX3-32S

Arista-7050CX3-32S-D48C8

Arista-7050CX3-32S-C32

TD4:

x86\_64-dellemc\_z9432f\_c3758-r0:

DellEMC-Z9432f-O32

DellEMC-Z9432f-T64C64O8-DPB

x86\_64-arista\_7050dx4\_32s:

Arista-7050DX4-32S

TH:

x86\_64-cel\_seastone-r0:

Seastone-DX010-50-40

Celestica-DX010-D48C8

Celestica-DX010-C32

Seastone-DX010-50-50-40

Seastone-DX010-25-50

Seastone-DX010-10-50

Seastone-DX010

Seastone-DX010-50

x86\_64-dell\_s6100\_c2538-r0:

Force10-S6100

x86\_64-dell\_z9100\_c2538-r0:

Force10-Z9100

Force10-Z9100-C8D48

Force10-Z9100-C32

x86\_64-arista\_7060\_cx32s:

Arista-7060CX-32S-T96C8

Arista-7060CX-32S-D48C8

Arista-7060CX-32S-C32

Arista-7060CX-32S-Q24C8

Arista-7060CX-32S-Q32

Arista-7060CX-32S

TH2:

x86\_64-dellemc\_z9264f\_c3538-r0:

DellEMC-Z9264f-C64

DellEMC-Z9264f-C8D112

DellEMC-Z9264f-Q64

x86\_64-arista\_7260cx3\_64:

Arista-7260CX3-D96C16

Arista-7260CX3-64

Arista-7260CX3-D108C10

Arista-7260CX3-D108C8

Arista-7260CX3-Q64

Arista-7260CX3-C64

TH3:

x86\_64-dellemc\_z9332f\_d1508-r0:

DellEMC-Z9332f-M-O16C64

DellEMC-Z9332f-O32

DellEMC-Z9332f-C32

x86\_64-arista\_7060dx4\_32:

Arista-7060DX4-C32

Arista-7060DX4-32

x86\_64-arista\_7060px4\_32:

Arista-7060PX4-32

Arista-7060PX4-C64

Arista-7060PX4-O32

TH4:

x86\_64-arista\_7060px5\_64s:

Arista-7060PX5-64S

x86\_64-arista\_7060dx5\_32:

Arista-7060DX5-32-200Gx48-100Gx32

Arista-7060DX5-32

Arista-7060DX5-32-25Gx96-100Gx8-200Gx8

x86\_64-arista\_7060dx5\_64s:

Arista-7060DX5-64S

Currently, each HardwareSKU under each platform has its own config.bcm(SAI initial config file) file which defines all kinds of properties used by SAI (Switch Abstraction Interface).

In this design document, we focus on Broadcom ASIC, not including Mellanox or Cisco or Marvell ASIC (application-specific integrated circuits).

## Pain points

Now we have 7 Broadcom ASIC types in sonic-buildimage:

TD2, TD3, TD4, TH, TH2, TH3, TH4

If there is a general change for specific ASIC, we have to change many config.bcm files all at once, across different HardwareSKUs and different platforms. It’s easy to miss some or update incorrectly.

Actually, even config.bcm files are scattered in different HardwareSKU folders, they still share some common properties for the same ASIC type.

In order to manage config.bcm easily and conveniently, config.bcm needs to be unified based on ASIC type for all common parameters and only have port related parameters (HardwareSKU specific) to be in HardwareSKU folder.

## Use cases

Based on the scenarios we may face for changes in config.bcm, let’s classify into 3 use cases

1. Add or modify a common property for one or more ASICs
2. Add or modify a common property for one or more HardwareSKUs
3. Add or modify a port related property for one or more HardwareSKUs

We will discuss how to apply these 3 use cases before and after unifying config.bcm.

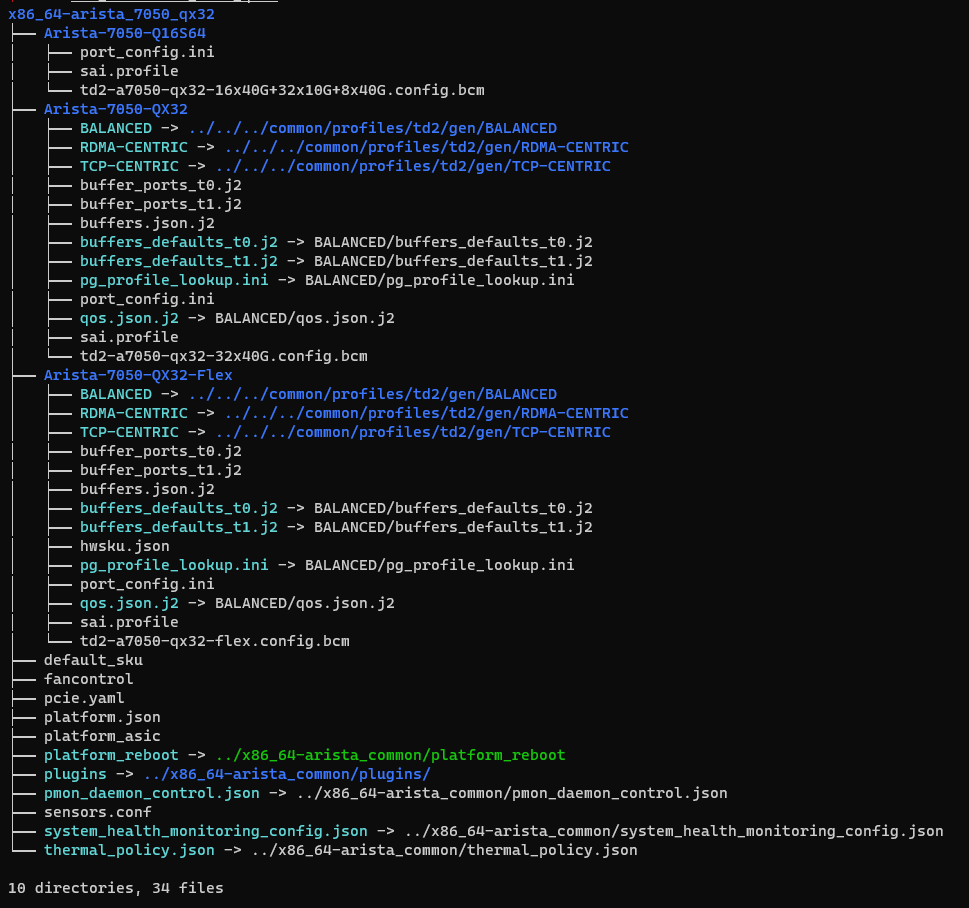
# Design

## Original file architecture

Let us take TD2 for example, there are three platforms for TD2:

* device/**dell**/x86\_64-dell\_s6000\_s1220-r0
* device/**arista**/x86\_64-arista\_7050\_qx32
* device/**arista**/x86\_64-arista\_7050\_qx32s

Here is the original file architecture for device/arista/x86\_64-arista\_7050\_qx32:



For x86\_64-arista\_7050\_qx32, it has 3 HardwareSKUs:

* + Arista-7050-Q16S64
  + Arista-7050-QX32
  + Arista-7050-QX32-Flex

It has one specific config.bcm file under each HardwareSKU folder.

How to make sure SAI can load its appropriate config.bcm correctly:

1. sai.profile
   1. Defines which config.bcm will be used in syncd.
   2. It’s located in /etc/sai.d/sai.profile in syncd container.

/etc/sai.d/sai.profile points to file /usr/share/sonic/device/arista/x86\_64-arista\_7050\_qx32s/Arista-7050-QX-32S/sai.profile in host.

*SAI\_INIT\_CONFIG\_FILE=/usr/share/sonic/hwsku/td2-a7050-q31s4-31x40G-4x10G.config.bcm*

*SAI\_NUM\_ECMP\_MEMBERS=64*

1. config.bcm
   1. Defines many properties for SAI, both common properties and port related properties.
   2. It is in /usr/share/sonic/hwsku in syncd container, which is mounted from /usr/share/sonic/device/x86\_64-arista\_7050\_qx32s/Arista-7050-QX-32S in host

In config.bcm, it defines different properties, such as ALPM, parity and other phy/serdes paramterers.

*# ALPM enable*

*l3\_alpm\_enable=2*

*ipv6\_lpm\_128b\_enable=1*

*l2\_mem\_entries=32768*

*l3\_mem\_entries=16384*

*# disables bcmALPMDH (ALPM distributed hitbit) thread. This thread is purely for debug purpose*

*l3\_alpm\_hit\_skip=1*

*# Disable Counting ACL Drop towards interface RX\_DRP counter*

*sai\_adjust\_acl\_drop\_in\_rx\_drop=1*

*# From old config file*

*os=unix*

*higig2\_hdr\_mode=1*

*# Parity*

*parity\_correction=1*

*parity\_enable=1*

*stat\_if\_parity\_enable=0*

*# l2 thread related config vars*

*l2xmsg\_hostbuf\_size=8192*

*l2xmsg\_mode=1*

*bcm\_num\_cos=10*

*bcm\_stat\_interval=2000000*

*lls\_num\_l2uc=12*

*max\_vp\_lags=0*

*miim\_intr\_enable=0*

*mmu\_lossless=0*

*module\_64ports=0*

*stable\_size=0x2000000*

*tdma\_timeout\_usec=5000000*

*tslam\_timeout\_usec=15000000*

*cdma\_timeout\_usec=15000000*

*dma\_desc\_timeout\_usec=15000000*

*###############################*

*serdes\_fiber\_pref=1*

*###############################*

*mdio\_output\_delay=0x0d*

*###############################*

*xgxs\_lcpll\_xtal\_refclk=1*

*tdma\_intr\_enable=1*

*tslam\_intr\_enable=1*

*table\_dma\_enable=1*

*arl\_clean\_timeout\_usec=15000000*

*bcm\_stat\_flags=1*

*bcm\_stat\_jumbo.0=9236*

*pbmp\_oversubscribe.0=0x1fffffffffffffffffffffffffe*

*pbmp\_xport\_xe.0=0x1fffffffffffffffffffffffffe*

*phy\_an\_c37\_1.0=3*

*phy\_an\_c37\_5.0=3*

*phy\_an\_c37\_9.0=3*

*phy\_an\_c37\_13.0=3*

*phy\_an\_c37\_17.0=3*

*phy\_an\_c37\_21.0=3*

*phy\_an\_c37\_25.0=3*

*phy\_an\_c37\_29.0=3*

*phy\_an\_c37\_33.0=3*

*phy\_an\_c37\_37.0=3*

#### How to apply use cases

If we need to apply the previous 3 use cases with current file architecture:

1. Add or modify a common property for one or more ASICs
   1. Find out all HardwareSKUs for these ASICs
   2. Check each HardwareSKU’s sai.profile and find out every config.bcm file
   3. Add or modify the common property in those config.bcm files
   4. The number of changed number files: **The number of HardwareSKUs for these ASICs**
2. Add or modify a common property for one or more HardwareSKUs
   1. Find out required HardwareSKUs’ sai.profile files
   2. Check every config.bcm file in those sai.profiles
   3. Add or modify the common property in those config.bcm files
   4. The number of changed number files: **The number of required HardwareSKUs**
3. Add or modify a port related property for one or more HardwareSKUs
   1. Find out required HardwareSKUs’ sai.profile files
   2. Check every config.bcm file in those sai.profiles
   3. Add or modify the port related property in those config.bcm files
   4. The number of changed number files: **The number of required HardwareSKUs**

## New file architecture

For managing config.bcm easily, we will use j2 template to generate the config.bcm, one config.bcm.j2 for one ASIC type. config.bcm.j2 is the original j2 template for all final config.bcm files of different HardwareSKUs for one ASIC type.

In fact, config.bcm.j2 template is already used for x86\_64-arista\_7050cx3\_32s and x86\_64-arista\_7260cx3\_64.

In our design, config.bcm.j2 has two parts:

* The first part of j2 file has **common properties**, it will have condition checks to set it accordingly for different HwSkus.
* The second part indicates which port.config.bcm file will be included for each HwSku.port.config.bcm file contains **port related properties**, which are fixed and specific for each HwSkus.

Those properties start with port\_/serdes\_/phy\_/portmap/xgxs\_tx/xgxs\_rx etc normally in this

port.config.bcm file.

So, all hardwareSKUs of one ASIC type share one j2 file, the condition check will decide which property will be used for each HardwareSKU. Each config.bcm.j2 under every HwSku is linked to the common config.bcm.j2 for specific ASIC.

We have two different approaches to implement it depending on whether cross venders or not.

### Approach I

This method is to apply one common config.bcm.j2 file for one type of ASIC across different manufacturers.

1. Comon config.bcm.j2

Create a new config.bcm.j2 file under **device/common/profile** folder for each ASIC type.

We have 7 ASIC types that need to be handled, so 7 new config.bcm.j2 files for these 7 ASIC types.

1. Link it to config.bcm.j2 for each HardwareSKU

Each config.bcm.j2 for every HardwareSKU is linked to the same config.bcm.j2 under this ASIC type’s common/profile folder.

1. port.config.bcmfiles

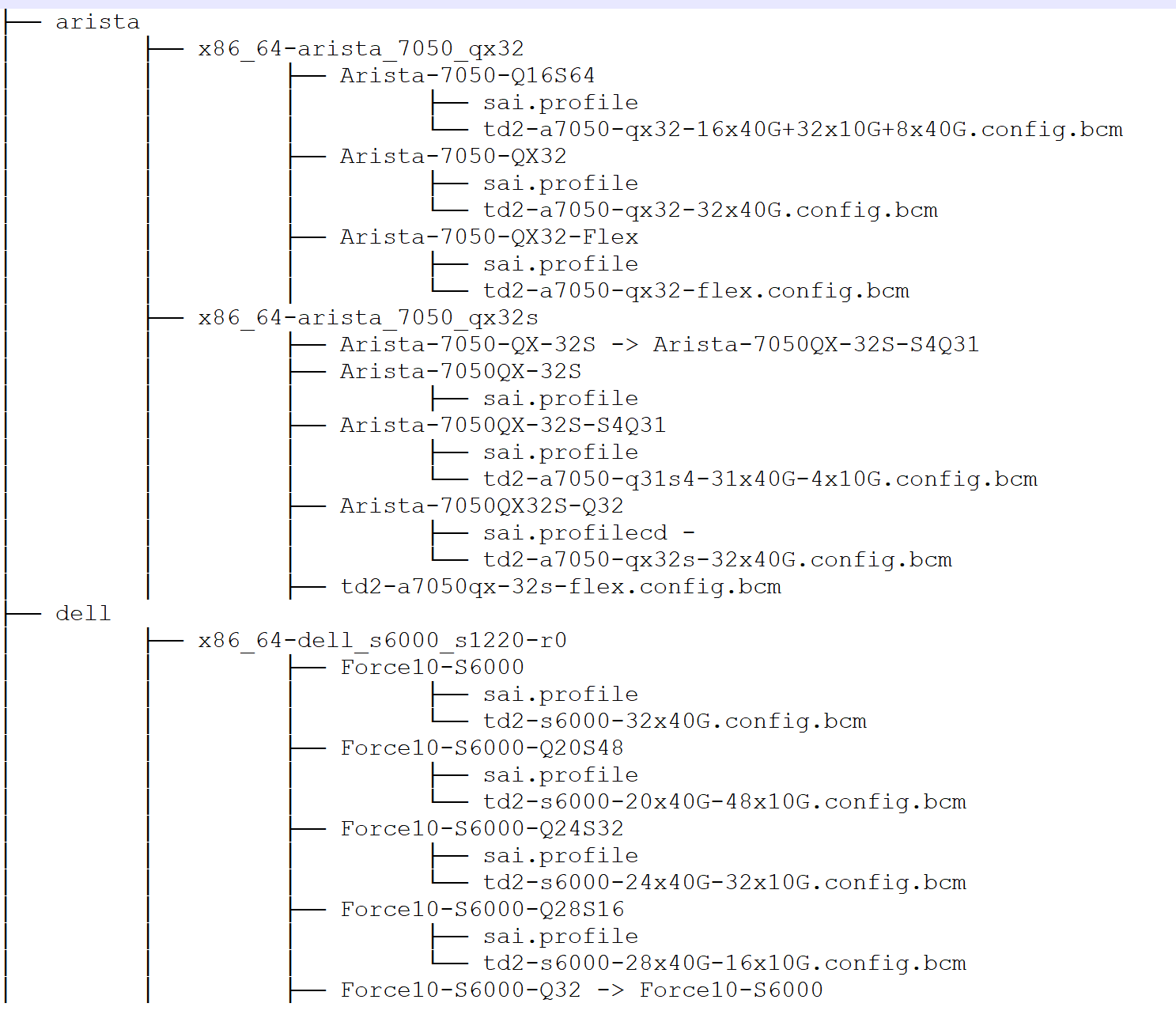
Each HardwareSKU still has its own port related config.bcm file which is located at the same position with original config.bcm file

#### File architecture changes

Still take TD2 for example, file infrastructure changes:

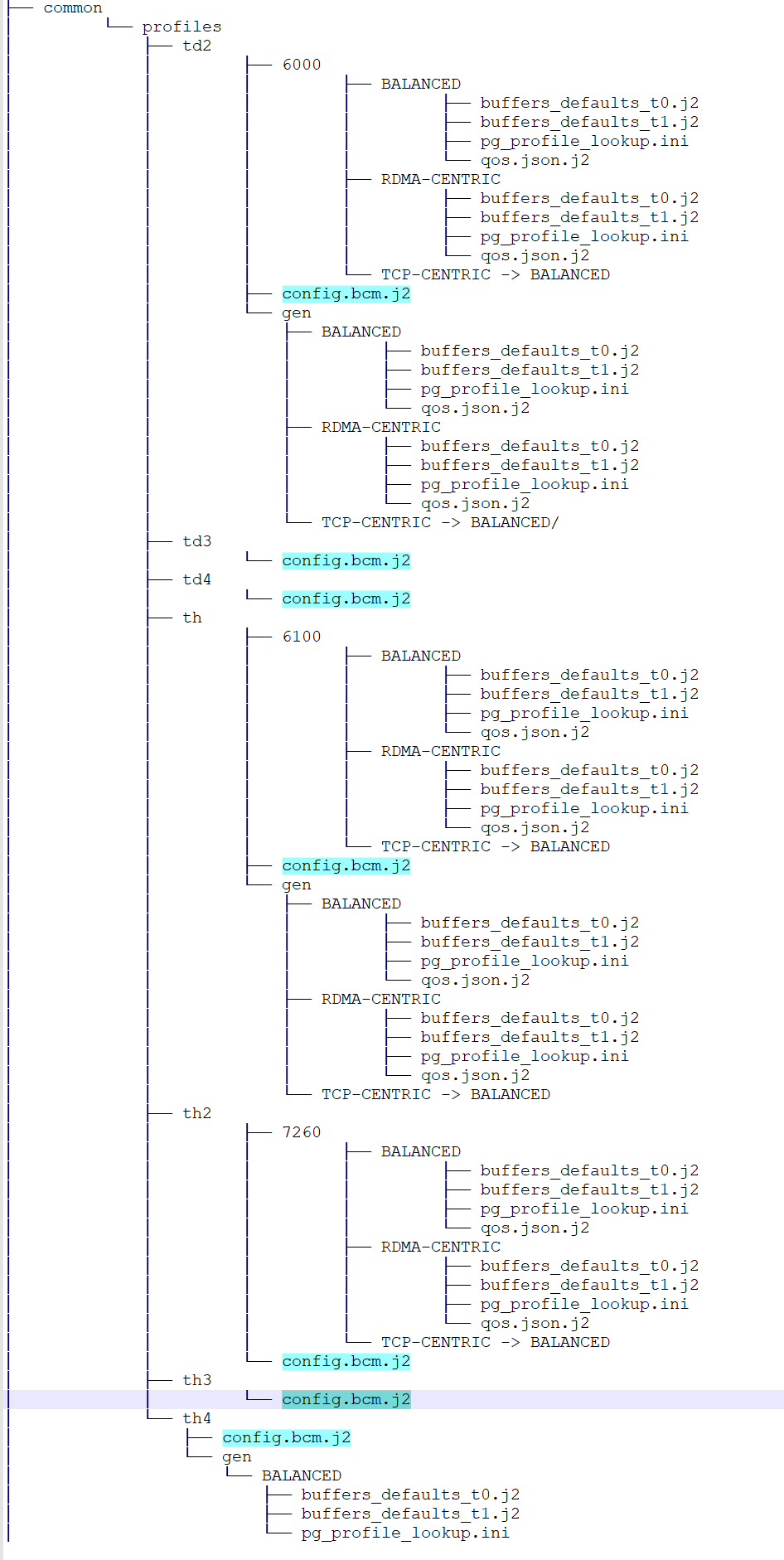
* Before:

Each HardwareSKU has its own specific config.bcm file.



* After:

Every HardwareSKU has a common config.bcm.j2 file which points to device/common/profile/td2/config.bcm.j2.





#### Config.bcm.j2 example

There are quite common variables in it, here is the content:

***###First part###***

*{# Construct config.bcm to include common properties per specific device metadata requirement #}*

*{%- set td2 \_common\_1 = '' -%}*

*{%- set td2 \_common\_2 = '' -%}*

*{%- set td2 \_common\_3 = '' -%}*

*{%- set td2 \_common\_4 = '' -%}*

*{%- set pbmp\_xport\_xe = '' -%}*

*{%- if DEVICE\_METADATA is defined and DEVICE\_METADATA['localhost'] is defined and DEVICE\_METADATA['localhost']['hwsku'] is defined -%}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex', 'Arista-7050-QX32', 'Arista-7050-Q16S64'] -%}*

*{%-         set td2 \_common\_1 = '*

*load\_firmware.0=2*

*pbmp\_oversubscribe=0x1fffffffffffffffffffffffffe*

*xgxs\_lcpll\_xtal\_refclk.0=1*

*mdio\_output\_delay.0=0x0d*

*serdes\_sgmii\_m=0*

*xgxs\_lcpll\_xtal\_refclk.1=1*

*xgxs\_lcpll\_xtal\_refclk.2=1*

*xgxs\_lcpll\_xtal\_refclk.3=1*

*tslam\_dma\_enable.2=1*

*tslam\_dma\_enable.3=1*

*table\_dma\_enable.0=1*

*table\_dma\_enable.1=1*

*table\_dma\_enable.2=1*

*table\_dma\_enable.3=1' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32'] -%}*

*{%-         set pbmp\_xport\_xe = '*

*pbmp\_xport\_xe.0=0x1fffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex', 'Arista-7050-Q16S64', 'Arista-7050QX-32S', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set* ***pbmp\_xport\_xe*** *= '*

*pbmp\_xport\_xe.0=0x1fffffffffffffffffffffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Force10-S6000-Q24S32', 'Force10-S6000-Q20S48', 'Force10-S6000-Q28S16', 'Force10-S6000', 'Arista-7050-QX32', 'Arista-7050-Q16S64', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set* ***td2\_common\_2*** *= '*

*l3\_alpm\_hit\_skip=1*

*sai\_adjust\_acl\_drop\_in\_rx\_drop=1' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set* ***td2\_common\_3*** *= '*

*tslam\_timeout\_usec=15000000*

*cdma\_timeout\_usec=15000000*

*dma\_desc\_timeout\_usec=15000000*

*mdio\_output\_delay=0x0d*

*table\_dma\_enable=1*

*pbmp\_oversubscribe.0=0x1fffffffffffffffffffffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S'] -%}*

*{%-         set* ***td2\_common\_4*** *= '*

*arl\_clean\_timeout\_usec=15000000*

*bcm\_stat\_flags=1*

*bcm\_stat\_jumbo.0=9236' -%}*

*{%-     endif %}*

*{%- endif %}*

***# common properties for all HwSKUs***

*l3\_alpm\_enable=2*

*ipv6\_lpm\_128b\_enable=1*

*l2\_mem\_entries=32768*

*l3\_mem\_entries=16384*

*os=unix*

*higig2\_hdr\_mode=1*

*parity\_correction=1*

*parity\_enable=1*

*stat\_if\_parity\_enable=0*

*bcm\_num\_cos=10*

*bcm\_stat\_interval=2000000*

*l2xmsg\_hostbuf\_size=8192*

*l2xmsg\_mode=1*

*lls\_num\_l2uc=12*

*max\_vp\_lags=0*

*miim\_intr\_enable=0*

*mmu\_lossless=0*

*schan\_intr\_enable=0*

*stable\_size=0x2000000*

*tdma\_timeout\_usec=5000000*

***# common properties for different HwSKUs***

*{{ td2\_common\_1 }}*

*{{ td2\_common\_2 }}*

*{{ td2\_common\_3 }}*

*{{ td2\_common\_4 }}*

*{{ pbmp\_xport\_xe }}*

***###Second part###***

*{%- if DEVICE\_METADATA is defined and DEVICE\_METADATA['localhost'] is defined and DEVICE\_METADATA['localhost']['hwsku'] is defined -%}*

*{%- if DEVICE\_METADATA['localhost']['hwsku'] in ['Force10-S6000-Q24S32'] -%}*

*{%- include '/usr/share/sonic/hwsku/td2-s6000-24x40G-32x10G.port.config.bcm' %}*

*{%- endif %}*

*{%- if DEVICE\_METADATA['localhost']['hwsku'] in ['Force10-S6000-Q20S48'] -%}*

*{%- include '/usr/share/sonic/hwsku/td2-s6000-20x40G-48x10G.port.config.bcm' %}*

*{%- endif %}*

*{%- if DEVICE\_METADATA['localhost']['hwsku'] in ['Force10-S6000-Q28S16'] -%}*

*{%- include '/usr/share/sonic/hwsku/td2-s6000-28x40G-16x10G.port.config.bcm' %}*

*{%- endif %}*

*{%- if DEVICE\_METADATA['localhost']['hwsku'] in ['Force10-S6000'] -%}*

*{%- include '/usr/share/sonic/hwsku/td2-a7050-qx32-32x40G+8x100G.port.config.bcm' %}*

*{%- endif %}*

*{%- if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-Q16S64'] -%}*

*{%- include '/usr/share/sonic/hwsku/td2-s6000-32x40G.port.config.bcm' %}*

*{%- endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-Q16S64'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-16x40G+32x10G+8x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-flex.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-32x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-32x40G+8x100G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-q31s4-31x40G-4x10G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S'] -%}*

*{%-         include '/usr/share/sonic/platform/td2-a7050qx-32s-flex.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX32S-Q32'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32s-32x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%- endif %}*

#### How to apply use cases

If we need to apply the previous 3 use cases after this approach:

1. Add or modify a common property for one or more ASICs
   1. Find out config.bcm.j2 for these ASICs
   2. Add or modify the common property in config.bcm.j2
   3. The number of changed number files: **The number of config.bcm.j2 files for ASICs**
2. Add or modify a common property for one or more HardwareSKUs
   1. Find out required HardwareSKUs’ config.bcm.j2 files
   2. Add or modify the common property in those config.bcm.j2
   3. The number of changed number files: **The number of config.bcm.j2 files for required HardwareSKUs**
3. Add or modify a port related property for one or more HardwareSKUs
   1. Find out config.bcm.j2 for required HardwareSKUs
   2. Find out port related config.bcm files for required HardwareSKUs in config.bcm.j2
   3. Add or modify the port related property in port related config.bcm
   4. The number of changed number files: **The number of required HardwareSKUs**

### Approach II

This method is to separate venders, different config.bcm.j2 files for different manufacturers.

One common config.bcm.j2 for one ASIC type of one manufacturer.

Generally speaking, keep Dell’s TD2 hardwareSKUs separate from Arista’s TD2 hardwareSKUs.

Still take TD2 for reference, the common j2 file is **td2-7050-qx32.config.bcm.j2**, which will be used for 2 Arista platforms, that is to say, for their all 7 HardwareSKUs.

#### file architecture changes

A screen shot of a computer program

Description automatically generated

A screen shot of a computer program

Description automatically generated

We can see the comparison clearly from the following graphs.

* Before:

A screenshot of a computer code

Description automatically generated

* After:

A screenshot of a computer program

Description automatically generated

#### config.bcm.j2 example

There are quite common variables in it, here is the content:

***###First part###***

*{# Construct config.bcm to include commom properties per specific device metadata requirement #}*

*{%- set td2\_7050\_qx32\_common\_1 = '' -%}*

*{%- set td2\_7050\_qx32\_common\_2 = '' -%}*

*{%- set td2\_7050\_qx32\_common\_3 = '' -%}*

*{%- set td2\_7050\_qx32\_common\_4 = '' -%}*

*{%- set pbmp\_xport\_xe = '' -%}*

*{%- if DEVICE\_METADATA is defined and DEVICE\_METADATA['localhost'] is defined and DEVICE\_METADATA['localhost']['hwsku'] is defined -%}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex', 'Arista-7050-QX32', 'Arista-7050-Q16S64'] -%}*

*{%-         set td2\_7050\_qx32\_common\_1 = '*

*load\_firmware.0=2*

*pbmp\_oversubscribe=0x1fffffffffffffffffffffffffe*

*xgxs\_lcpll\_xtal\_refclk.0=1*

*mdio\_output\_delay.0=0x0d*

*serdes\_sgmii\_m=0*

*xgxs\_lcpll\_xtal\_refclk.1=1*

*xgxs\_lcpll\_xtal\_refclk.2=1*

*xgxs\_lcpll\_xtal\_refclk.3=1*

*tslam\_dma\_enable.2=1*

*tslam\_dma\_enable.3=1*

*table\_dma\_enable.0=1*

*table\_dma\_enable.1=1*

*table\_dma\_enable.2=1*

*table\_dma\_enable.3=1' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32'] -%}*

*{%-         set pbmp\_xport\_xe = '*

*pbmp\_xport\_xe.0=0x1fffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex', 'Arista-7050-Q16S64', 'Arista-7050QX-32S', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set pbmp\_xport\_xe = '*

*pbmp\_xport\_xe.0=0x1fffffffffffffffffffffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32', 'Arista-7050-Q16S64', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set td2\_7050\_qx32\_common\_2 = '*

*l3\_alpm\_hit\_skip=1*

*sai\_adjust\_acl\_drop\_in\_rx\_drop=1' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S', 'Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S', 'Arista-7050QX32S-Q32'] -%}*

*{%-         set td2\_7050\_qx32\_common\_3 = '*

*tslam\_timeout\_usec=15000000*

*cdma\_timeout\_usec=15000000*

*dma\_desc\_timeout\_usec=15000000*

*mdio\_output\_delay=0x0d*

*table\_dma\_enable=1*

*pbmp\_oversubscribe.0=0x1fffffffffffffffffffffffffe' -%}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S'] -%}*

*{%-         set td2\_7050\_qx32\_common\_4 = '*

*arl\_clean\_timeout\_usec=15000000*

*bcm\_stat\_flags=1*

*bcm\_stat\_jumbo.0=9236' -%}*

*{%-     endif %}*

*{%- endif %}*

*# common properties for all HwSKUs*

*l3\_alpm\_enable=2*

*ipv6\_lpm\_128b\_enable=1*

*l2\_mem\_entries=32768*

*l3\_mem\_entries=16384*

*os=unix*

*higig2\_hdr\_mode=1*

*parity\_correction=1*

*parity\_enable=1*

*stat\_if\_parity\_enable=0*

*l2xmsg\_hostbuf\_size=8192*

*l2xmsg\_mode=1*

*bcm\_num\_cos=10*

*bcm\_stat\_interval=2000000*

*lls\_num\_l2uc=12*

*max\_vp\_lags=0*

*miim\_intr\_enable=0*

*mmu\_lossless=0*

*module\_64ports=0*

*schan\_intr\_enable=0*

*stable\_size=0x2000000*

*tdma\_timeout\_usec=5000000*

*serdes\_fiber\_pref=1*

*xgxs\_lcpll\_xtal\_refclk=1*

*tdma\_intr\_enable=1*

*tslam\_intr\_enable=1*

*# common properties for different HwSKUs*

*{{ td2\_7050\_qx32\_common\_1 }}*

*{{ td2\_7050\_qx32\_common\_2 }}*

*{{ td2\_7050\_qx32\_common\_3 }}*

*{{ td2\_7050\_qx32\_common\_4 }}*

*{{ pbmp\_xport\_xe }}*

***###Second part###***

*{%- if DEVICE\_METADATA is defined and DEVICE\_METADATA['localhost'] is defined and DEVICE\_METADATA['localhost']['hwsku'] is defined -%}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-Q16S64'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-16x40G+32x10G+8x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32-Flex'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-flex.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050-QX32'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-32x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32-32x40G+8x100G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S-S4Q31', 'Arista-7050-QX-32S'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-q31s4-31x40G-4x10G.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX-32S'] -%}*

*{%-         include '/usr/share/sonic/platform/td2-a7050qx-32s-flex.port.config.bcm' %}*

*{%-     endif %}*

*{%-     if DEVICE\_METADATA['localhost']['hwsku'] in ['Arista-7050QX32S-Q32'] -%}*

*{%-         include '/usr/share/sonic/hwsku/td2-a7050-qx32s-32x40G.port.config.bcm' %}*

*{%-     endif %}*

*{%- endif %}*

#### How to apply use cases

If we need to apply the previous 3 use cases after this approach:

1. Add or modify a common property for one or more ASICs
   1. Find out config.bcm.j2 for these ASICs’ different venders HardwareSKUs
   2. Add or modify the common property in config.bcm.j2
   3. The number of changed number files: **The number of these ASICs**
2. Add or modify a common property for one or more HardwareSKUs
   1. Find out required HardwareSKUs’ config.bcm.j2 files
   2. Add or modify the common property in those config.bcm.j2
   3. The number of changed number files: **The number of required HardwareSKUs’ ASIC**
3. Add or modify a port related property for one or more HardwareSKUs
   1. Find out config.bcm.j2 for required HardwareSKUs
   2. Find out port related config.bcm files for required HardwareSKUs in config.bcm.j2
   3. Add or modify the port related property in port related config.bcm
   4. The number of changed number files: **The number of required HardwareSKUs**

### Comparison

|  |  |  |
| --- | --- | --- |
| **Methods** | **Pros** | **Cons** |
| Current | A change for one specific HardwareSKU is simple  Granularity is hwSKU | Lots of config.bcm files needs to be updated for one common property |
| Approach I | Granularity is ASIC  One config.bcm.j2 per ASIC  Only one file change for common property | A big code change for implementation  Need logic in config.bcm.j2 |
| Approach II | A smaller granularity than approach I | More config.bcm.j2 files |

1. Genera speaking, Approach I is better than Approach II. It moves config.bcm.j2 to common/profiles folder which already saves other common configuration files too.
2. A single change for common property could only ask for one single change in config.bcm.j2 file under common/profiles folder, it meets our original requirements.
3. Approach II is a smaller change than Approach I, limiting the change scope for one manufacturer one time.

We will use Approach I as final design in the following sections.

### yml formatted config.bcm

For TD4 and TH4, config.bcm is using yml formatted config.

Yml file is naturally separated into global and ports parts.

We can just move **bcm\_device global** and **device DEVICE\_CONFIG** configuration into common config.bcm.j2 file, others are remained as port.config.bcm file.

Taking device/dell/x86\_64-dellemc\_z9432f\_c3758-r0/DellEMC-Z9432f-T64C64O8-DPB/td4-z9432f-32x400G.config.yml for example:

*---*

*bcm\_device:*

*0:*

*global:*

*l2\_table\_default\_view: 1*

*pktio\_mode: 1*

*vlan\_flooding\_l2mc\_num\_reserved: 0*

*shared\_block\_mask\_section: uc\_mc*

*ctr\_evict\_enable: 0*

*uat\_mode: 1*

*uft\_mode: 4*

*sai\_brcm\_sonic\_acl\_enhancements: 1*

*sai\_tunnel\_support: 1*

*multi\_network\_groups: 1*

*sai\_field\_group\_auto\_prioritize: 1*

*sai\_modify\_hash\_flexdigest: 1*

*sai\_fast\_convergence\_support: 1*

*...*

*---*

*device:*

*0:*

*DEVICE\_CONFIG:*

*# CORE CLOCK FREQUENCY*

*CORE\_CLK\_FREQ: CLK\_1350MHZ*

*# PP CLOCK FREQUENCY*

*PP\_CLK\_FREQ: CLK\_1350MHZ*

*VARIANT: DNA\_4\_9\_5\_0*

*...*

*---*

*device:*

*0:*

*PC\_PM\_CORE:*

*?*

*PC\_PM\_ID: 1*

*CORE\_INDEX: 0*

*:   # Same as PM\_ID\_0*

*RX\_LANE\_MAP: 0x05471326*

*TX\_LANE\_MAP: 0x53016724*

*RX\_POLARITY\_FLIP: 0x44*

*TX\_POLARITY\_FLIP: 0x56*

*RX\_POLARITY\_FLIP\_AUTO: 0*

*TX\_POLARITY\_FLIP\_AUTO: 0*

*RX\_LANE\_MAP\_AUTO: 0*

*TX\_LANE\_MAP\_AUTO: 0*

*...*

Apply the same rules as legal config.bcm, but using separate ways to extract common attributes.

1. Create the common config.bcm.j2 under common/profiles/td4 or common/profiles/th4
2. Move **bcm\_device global** and **device DEVICE\_CONFIG** in config.bcm.ymlinto config.bcm.j2
3. Rename original config.bcm.yml file to port.config.bcm.yml, the content is remained part of config.bcm.yml
4. config.bcm.j2 combines these two parts together and generate different config.bcm.yml file for different HardwareSKU
5. sai.profile indicates to use common config.bcm.yml which is generated in step 4.

# Implementation

## Parse original config.bcm files - utility

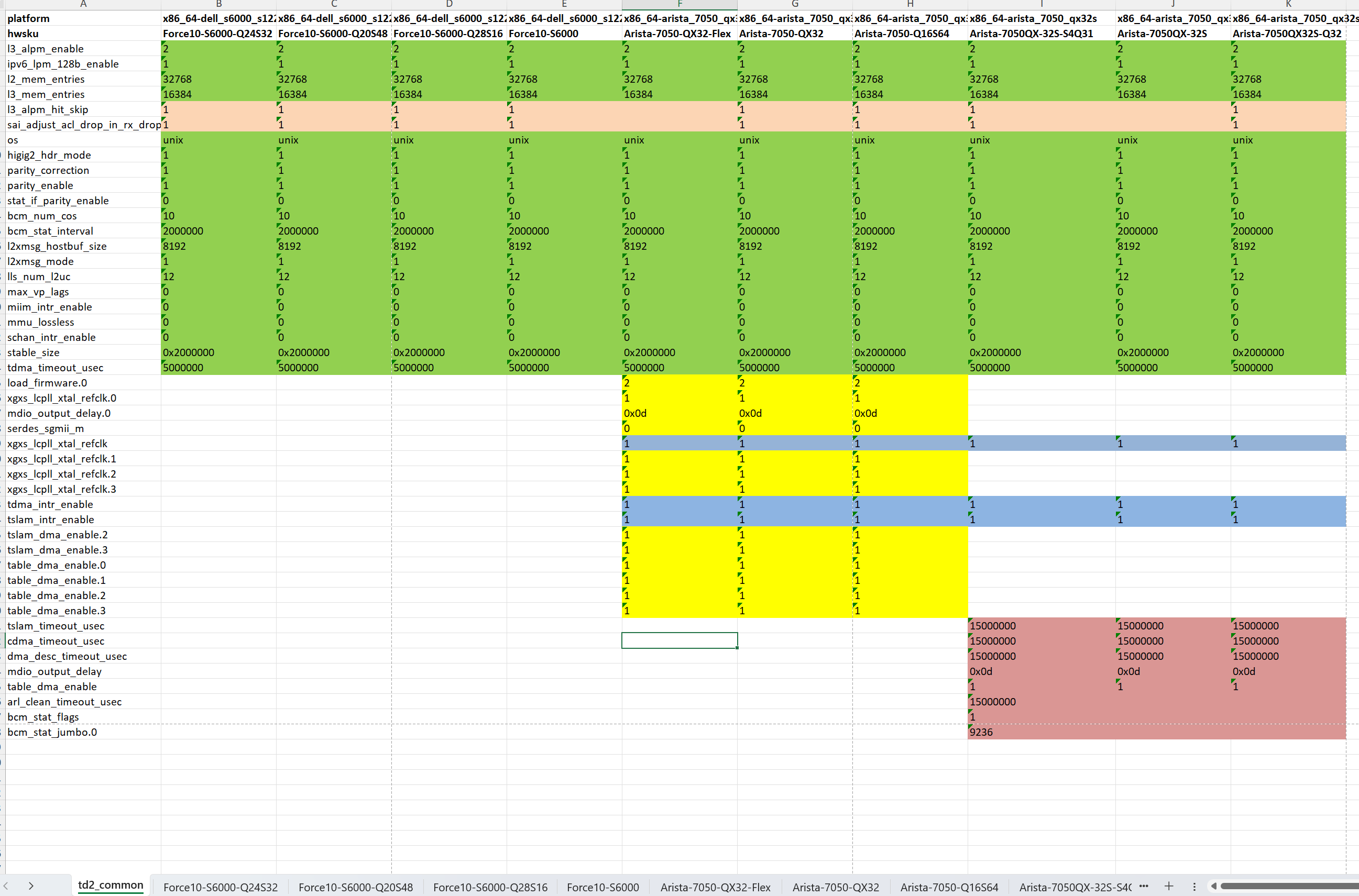
How to extract properties from different config.bcm files?

Since there are so many files involved, manual work is not reliable.

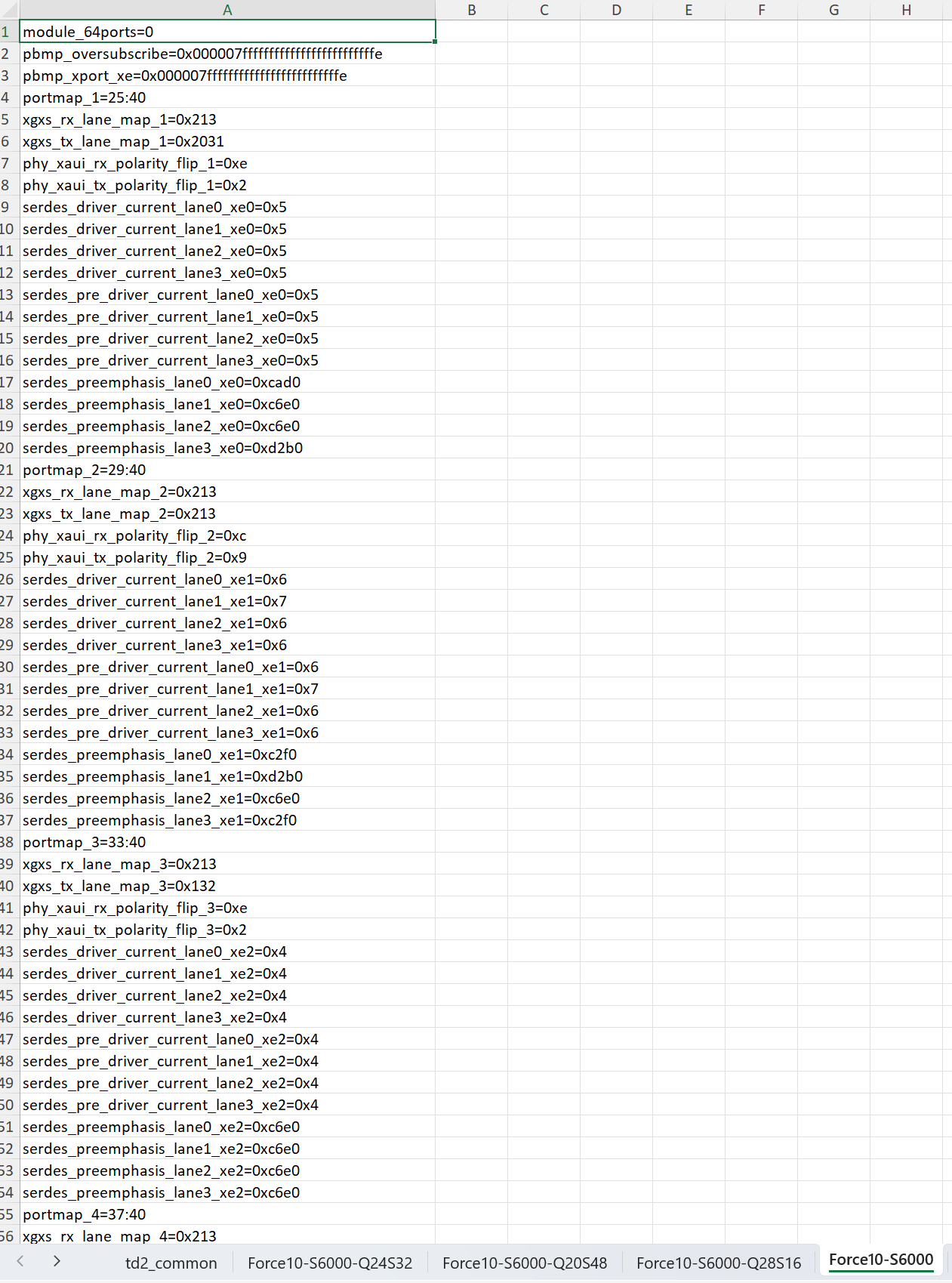
Script is needed to do parse job automatically. There are several steps to parse all config.bcm files under device folder. The following steps are what script will do.

1. Classify ASICs for all platforms/HwSkus
2. Loop each HwSku for one ASIC
3. Parse sai.profile file for every HwSku to get its config.bcm file location
4. Parse all config.bcm files for one ASIC type, sperate common properties and port related properties, save this information into excel workbook
   1. One sheet to save common property table for all HwSkus
   2. In other sheets, there are fixed port related properties for each HwSku, same content with their port.config.bcm file
5. Generate config.bcm.j2 according to the common property table, also create soft link files config.bcm.j2 pointing to it for each HwSku
6. Generate their port.config.bcm files under corresponding folders based on other hwsku tables

Common propriety table for TD2:



Other port related property table:



Workbook is a temporary file which is used for debugging.

Script should generate port.config.bcm and config.bcm.j2 directly and automatically.

## Generate config.bcm via j2 template

Now these two types of files are ready:

1. port.config.bcm files
2. config.bcm.j2 file which includes the content of port.config.bcm

The current mechanism supports generating config.bcm from j2 template already.

**platform/broadcom/docker-syncd-brcm/start.sh** defines that if there is config.bcm.j2, it will call sonic-cfggen to generate /etc/sai.d/config.bcm from j2 template.

start.sh will be executed during syncd booting up.

Here is the code from **platform/broadcom/docker-syncd-brcm/start.sh** script:

*…*

*if [ -f $HWSKU\_DIR/config.bcm.j2 ]; then*

*sonic-cfggen -d -t $HWSKU\_DIR/config.bcm.j2 > /etc/sai.d/config.bcm*

*fi*

*…*

sai.profile needs to be changed likes this:

*SAI\_INIT\_CONFIG\_FILE=/etc/sai.d/config.bcm*

*SAI\_NUM\_ECMP\_MEMBERS=32*

In summary, here are the changes regarding the whole design:

1. Generate port.config.bcm file for every HwSku
2. Add a common config.bcm.j2 file for all HwSkus of one ASIC type, one config.bcm.j2 per ASIC
3. Create config.bcm.j2 for each HwSku and link them to the common config.bcm.j2 file
4. Modify sai.profile for every HwSku

When syncd boots up, config.bcm will be generated via sonic-cfggen and located under folder /etc/sai.d/ in syncd container.

# Test and verification

For all platforms, there are about 7 ASIC types and dozens of HwSkus.

Even a single wrong property may cause ASIC not to work properly.

So, after implementation, the final config.bcm for every HwSku needs to be verified if it’s same with original one.

## Unit test

Unit test is needed after every single change of config.bcm. Ensure each change for config.bcm will be verified in sonic-buildimage repo

Depending on the existing sonic-config-engine unit test framework, write new cases for all new

config.bcm.j2 files.

1. Move original config.bcm files to src/sonic-config-engine/tests folder as sample output files for each HardwareSKU
2. Create soft link files for config.bcm.j2 under src/sonic-config-engine/tests, pointing them to specific ASIC’s config.bcm.j2 files
3. Write new cases for each HardwareSKU in test\_j2files.py, compare if the generated config.bcm matches with the original sample output file
4. Test every HwSku for all ASICs one by one
5. If config.bcm has been modified for new requirements, same config.bcm sample files need to be updated accordingly

For example, if we make a change to modify a common property in TD2 config.bcm.j2 file.

Unit test will fail if you do not update test sample files, because the newly generated config.bcm files for TD2 will be different from their original sample files.

Change the property in each TD2 HardwareSKU sample file, then rerun unit test to see if they are matched.