Release Notes
For
Switch Software Development Kit

SDK 6.5.21

Table of Contents

Section 1: About This Document

This document provides a general description of the release and its new features. It also describes the chips supported by the release, BCM API additions or changes, resolved issues, and any relevant open issues. The reader should refer to prior release notes for 6.5.x, as only new features or issues are described in this version of the release notes.

Section 2: Product Documentation

The following documents are available through Broadcom's Customer Support Portal at https://csp.broadcom.com/group/customers/csp. They are the primary source of information and should be referenced when using this release:

Document	***Description***
56XX-PG6521.tar.gz	Network Switching Software Development Kit, Release 6.5.21.html This document describes the theory of operations of the API and all existing BCM APIs for this release.
SDK-PG822-R	*Network Switching Software Platform Guide* This guide describes the SDK source and Makefile structure, abstraction and porting layers, device specific interactions, and the platform/operating system specific features of the SDK. If this is your first time working with the SDK, start with this document. Available through SDS Software Request Portal and must be specifically requested.
56XX-PG-1001-R	*Network Switching SDK CINT Interface for Diagnostic Shell* This guide describes how to use the C interpreter (CINT) that runs under the diagnostic shell (Broadcom Shell utility). Available on docSAFE per request.
StrataXGS-AN300-R	*BCM Diagnostic Shell* This guide describes how to use the diagnostic shell, the primary CLI to the SDK. Available on docSAFE per request.
SDK-6.5.21-HSDK-Getting-Started-Guide	This guide describes how to compile HSDK and run it with the BCM56880 XGSSIM, BCMSIM or Broadcom SVK
StrataXGSV-AN101	Using Warm Boot with StrataXGSV Device Drivers
56XXX-AN301-R	Kernel Network Driver (KNET), this document describes and usage of KNET kernel driver module

Additionally, please review the RN-SDK65xDNX-R document for DNX Release Notes for SDK 6.5.x. This is a companion guide describing only specific DNX family device changes in this SDK release. Common changes and resolved issues are described within this document which is packaged in the release deliverable itself.

Section 3: New Devices added to this release

For any given SDK release, support for certain devices may be provided in Preview or Supported status. Devices in “Supported Switch Devices” have completed the full QA process and are intended for use in production systems. It is expected that customers would integrate the version of the SDK which provides "Supported" status for their use on actual development or production systems. For the full list of Broadcom switch and PHY devices supported in the SDK, please reference the file **SDK-6.5.21-Device-Matrix.xlsx** in the $SDK/RELDOCS directory in the release package.

Devices in “Preview Switch Devices” are provided to allow early integration of the customer's application with the SDK APIs that support that device. This software has not been fully tested on the physical target device and should not be expected to fully function.

Section 3.1: Newly Supported XGS Switch Devices in this release

Family	***Devices***	***Description***
BCM56780	BCM56780 A0	160x50G SerDes with 8.0 Tb/s
BCM56990	BCM56990 B0	64 x 400GbE switch
BCM56889	BCM56889 B0	20x400GbE 8.0 Tb/s
BCM56070	BCM56071N A0 BCM56072 A0	25G connectivity switch Centralized chassis line card switch with channelization support.

Section 3.2: Preview XGS Switch Devices

Family	***Devices***	***Description***
BCM56780	BCM56782 A0 BCM56788 A0 BCM56789 A0	160x50G SerDes with 8.0 Tb/s with MACSEC
BCM56175	BCM56175 A0 BCM56176 A0	Low power 24 port version when MACSEC is disabled 16-port SKU

Section 4: New Features per Device

Section 4.1: BCM56780 (Trident4-X9) A0 (GA) Support

The Broadcom® BCM56780 family is a class of high performance, non-blocking network switching devices supporting compiler-based programmability of forwarding and instrumentation functions. The device family features up to 160 lanes of 50G PAM4 SerDes and 72 logical ports. Port speeds of 10, 25, 40, 50, 100, 200, and 400GE can be simultaneously supported without the need for external PHYs. The BCM56780 delivers high bandwidth, glueless network connectivity up to 8.0 Tb/s on a single chip.

Section 4.1.1: SDK Features support

This release is based on NPL DNA 2.5.13 flexcode. Features listed in below tables are supported in this release.

Please note : SDK will continue to evolve as new DNA versions are developed to accommodate new customer feature requests and bug fixes. ,

Section 4.1.1.1: Legacy Feature support

The table below shows the status of legacy SDK features supported on BCM56780 A0 in this release.

Table 1. BCM56780 A0 *Legacy Features Maturity Level*

Feature	***Maturity***
Linkscan	GA
L2 switching	GA
L3 routing	GA
ALPM	GA
Flex Flow (VxLAN)	GA
IP Tunnel	GA
Multicast	GA
IPMC	GA
QoS	GA
ECN	GA
Mirroring	GA
VLAN	GA
STG	GA
Port	GA
Flex Port	GA
Trunk	GA
VPLAG	GA
ECMP	GA
DLB	GA
Cosq	GA
Rate	GA
Failover	GA
Hash output selection	GA

Resilient Hash	GA
HIGIG3	GA
Switch control	GA
MIB counter	GA
Packet I/O	GA
KNET	GA
LED	GA
SER	GA
FP	GA
UDF	GA
PORT	GA
Policer	GA
ETRAP	GA
Time and SyncE	GA
Flex Digest	GA
Flex counter 2.0	GA
Flex State	GA
Warmboot	GA

Section 4.1.1.2: New Feature support

The table below shows the status of new BCM56780 A0 SDK features in this release. The features in Preview are available for early access in this release. The complete maturity will be available in the upcoming release.

Table 2. BCM56780 A0 *New Features Maturity Level*

Feature	***Maturity***
Flex counter 2.0 enhancement	GA
Flex State enhancement	GA
Weighted ECMP	GA
Mirror-on-drop (IPIPE, EPIPE, MMU)	GA
IFA 1.x (INA)	GA
Flowtracker	GA
Stateless Latency Monitoring	GA
MACSEC/IPSEC	Beta
ALPM over FORTE	Preview
IFA 2.0	Preview
MPLS	Preview

Section 4.1.1.3: SerDes Feature Support

This release includes TSCBH7 Firmware Version D005_09 and API version A009_0A.

Speed modes supported in this release:

- 1-Lane: 10G, 25G, 50G
- 2-Lane: 50G, 100G
- 4-Lane: 40G, 100G, 200G
- 8-Lane: 400G

Section 4.1.1.4: Known limitations

Mirror-on-Drop (Also refer to the feature Knowledge Base: KB0029572)

- The sampler and trace drop event are different mirror sources and cannot be used to mirror a packet simultaneously.
- When a mirror destination is attached to an EP Recirculate profile entry, only one internal index (opaque_ctrl_id_c) can be updated with the corresponding mirror instance ID. Therefore a MOD report associated with the EP recirculate profile can only be sent to one mirror destination.
- PSAMP MOD packet format does not include packet drop count, so users need to check the drop counter for this information. Drop event counters will count the drop code of the highest priority drop event, not the first drop event.
- Some mirror-on-drop events might get dropped in the second pass before they can be learned by the flow tracker. This can be avoided by adding additional configurations. For examples for drop events MembershipCheckFail, OuterTpidCheckFail, and L3SameIntfDrop, add VFP action bcmFieldActionVpnSet to override VFI to default vlan.
- CPU port is not supported for mirror encapsulation and hence can not support as a Mirror-To-Port in the MOD scenario.
- Stateful MOD flow learning entries are installed in the flow table of the pipe where a packet gets recirculated. For IP/MMU MOD, it is the same pipe as the dummy mirror-to-port in the first pass; for EP MOD, it is the same pipe as the system destination of the original packet (original egress port).

IFA 1.x (Also refer to the feature Knowledge Base: KB0029580)

- In IFA 1.x initiator, the L2 switching packet does not update IP checksum properly. It remains the old IP checksum value despite IFA base header is inserted and IP length is updated.
- IFA Ingress node not support both VxLAN tunnel encap and IFA encap
- For initiator nodes, the source port in the metadata of IFA packet is not the original source port but the loopback port.
- For initiator nodes, the sequence number and sender handle in the metadata of IFA packet is always 0.
- UDP length is recalculated (with IFA header/IFA metadata length) and checksum forced to 0 for both IPv4 and IPv6 packets.
- TCP checksum unchanged (same as in the transmit packet) for both IPv4 and IPv6 packets.
- IP header payload length doesn't reflect truncation in IFA initiation flow.

Flowtracker (Also refer to the feature Knowledge Base: KB0029582)

- The group level flow count is limited to 16 bits. Hence, if there are more than 65535 flows learnt as part of a flowtracker group, it would cause rollover. So, the NOS is expected to maintain the group level flow count and handle the rollover.
- The FT group level flow threshold check (bcm_flowtracker_group_flow_limit_set SDK API) has been disabled for group ID = 1 in HW. This is to enable users to have one group to use all the entries in the HW table if they want to. For example, the HW has 128K entries per pipe (max single wide when M_TOP is not used) and that requires 17 bits whereas FT_GROUP_TABLE_CONFIGm.FLOW_THRESHOLD has only 16 bits. So, if someone is using only one group and wants to use the full hash table, it is not possible currently. In order to overcome this limitation, group_id = 1 is granted special status so that this FT_GROUP_TABLE_CONFIGm.FLOW_THRESHOLD check is not done for the same. This would be useful for the user who would like one FT group to use all the hash table entries.

- If soc property “flowtracker_flexctr_alloc_enable” is set to 1, the flex counters module need to be set in pipe unique mode using the config LT configuration CTR_EFLEX_CONFIG.CTR_ING_EFLEX_OPERMODE_PIPEUNIQUE = 1.
- If soc property “flowtracker_flexctr_alloc_enable” is set to 1, the flowtracker module implicitly takes up the HW action index 0xf (15) for allocating flex counters.
- If the learn notification FIFO becomes full, there is currently no mechanism which would notify either the flows that failed to get learnt or number of flows that failed to get learnt if the FIFOfull behavior was set to “stop learning on FIFOfull”.

Stateless Latency Monitoring

- Latency threshold configuration is not through setting a specific value but needs to be done by exponential check with an EFP rule, or approximated check with multiple EFP rules.
- When the residence time field is available in the report PSAMP packet, the ingress port and drop reason will be unavailable in the packet. Considering ingress port is essential information for application, the residence time can be exported via egress FlexCtr. The cascaded {residence time + queue ID} counter value as CTR_B and the latency breach time value as CTR_A can be exported as a pair of counter values configured in egress FlexCtr which is associated with the EFP rule. Note the residence time and queue ID only reflect the latest flow which hits EFP rule.

xFP

- The added support for stat action bcmFieldActionStatGroup for FP_EM stage should not be used along with bcmFieldActionAssignVxlanGbpId or bcmFieldActionAssignOpaqueObject0 because they map to the same LT field. Action StatGroupWithoutCounterIndex cannot be used with the opaque object bcmFlexctrObjectIngEmFtHitIndex0/1 for stage bcmFieldQualifyStageIngressExactMatch on X9.
- Drop Codes for ingress pipeline drops happening after VFP/IFP stage will not be available to that particular stage while Drop Codes for egress pipeline drops happening after the EFP stage will not be available to EFP. This is the pipeline behavior.
- VFP stat should not be applied on internal 2nd pass packets with EP NIH header as the same physical container is allocated to capture timestamp from the packet.
- Parser1 and parser2 carry outer and inner header info. Forwarding bus will carry either parser1 or parser2 whichever header is used for forwarding based on whether it is a tunnel initiator node, transit node or termination node.

Tunnel

- Tunnel based controls for DSCP/DOT1P copy in VxLAN encapsulation is yet supported as part of bcm_flow_tunnel_initiator_create() API while the same in VxLAN decapsulation can be supported via IFP with field APIs.

UFT modes

- Available UFT modes are 1~13 and 15~21.
- L2 forwarding would fail in UFT mode 8.

L2 learning

- The L2 learning rate is less than 3000 pps when sending packets from 2 ports in the same PP pipe. When the L2 learning test is conducted with rate > 3000 pps, there are always several MAC addresses that can not be learned.

Section 4.2.2: MACSEC support

MACSEC software is delivered in the package `xflow-macsec-1.0.12.tar.gz`.

To compile with the SDK:

1. untar `xflow-macsec-1.0.12.tar.gz` in any directory.
2. Add `XFLOW_MACSEC` to the FEATURE_LIST in `$SDK\make\Make.local` file.
3. set the environment variable `XFLOW_MACSEC_HOME` to point to the location of the xflow-macsec directory.

Section 4.2: BCM56990 (Tomahawk4) B0 (GA) Support

The Broadcom® BCM56990 family is a class of high performance, non-blocking network switching devices. The device family features up to 512 lanes of 50G PAM4 SerDes and 256 logical ports. Port speeds of 10, 25, 40, 50, 100, 200, and 400GE can be simultaneously supported, without the need for external PHYs. The BCM56990 delivers high bandwidth, glueless network connectivity up to 25.6 Tb/s on a single chip.

Section 4.2.1: SDK Features support

The table below shows the status of legacy SDK features supported on BCM56990 B0 in this release. SDK DVAPI regression testing has been ongoing using BCM56990 B0 silicon validation kits. The summary of the current test status as of this release are provided below.

Section 4.2.1.1: Legacy Feature support

Table 3. BCM56990 B0 *Legacy Features Maturity Level*

Feature	***Maturity***
Linkscan	GA
L2 switching	GA
L3 routing	GA
ALPM	GA
IP tunnel	GA
MPLS	GA
Multicast	GA
IPMC	GA
Qos	GA
ECN	GA
Mirroring	GA
VLAN	GA
STG	GA
Port	GA
Flexport	GA
Trunk	GA
ECMP	GA
DLB	GA
Cosq	GA
Rate	GA
Failover	GA
Resilient Hash	GA
Switch Control	GA

MIB counter	GA
Packet I/O	GA
KNET	GA
SER	GA
FP	GA
UDF	GA
Policer	GA
Etrap	GA
Latency Histogram	GA
Time&SyncE	GA
ECMP	GA
Warmboot	GA

Section 4.2.1.2: New Feature support

The table below shows the status of new BCM5990 B0 SDK features in this release.

Table 4. BCM56990 B0 *New Features Maturity Level*

Feature	***Maturity***
Flex counter 2.0	GA
AACL	GA
INT 1.0	GA
INT 2.0	Preview
FlexFlow	GA
HECMP	GA

Section 4.2.1.3: SerDes Feature Support

This release includes:

- TSCBH7 Firmware Version D005_0B and API version A009_07
- BCM API support for PRBS functionality

Section 4.2.1.4: Known issues or Limitations

- BFD is not supported for BCM56990 B0 in this release. The build option of “BFD” must be removed from the feature list in Make.local when building the image for BCM56990 B0.
- Packetized MMU statistics is not supported in this release.
- PFC monitor is not supported in this release.
- BCM56991 SKU is not supported in this release.
- MMU dynamic threshold adjustment is not supported in this release.

Section 4.3: BCM56880 (Trident4-X11) B0 (GA) Support

The Broadcom® BCM56880 family is a class of high performance, non-blocking network switching devices supporting compiler-based programmability of forwarding and instrumentation functions. The device family features up to 256 lanes of 50G PAM4 SerDes and 144 logical ports. Port speeds of 10, 25,

40, 50, 100, 200, and 400GE can be simultaneously supported, without the need for external PHYs. The BCM56880 delivers high bandwidth, glueless network connectivity up to 12.8 Tb/s on a single chip.

Section 4.3.1: SDK Features support

This is a GA version of SDK release for BCM56880 (Trident4 X11) and its variant SKUs (BCM56881/BCM56883/BCM56889). BCM56889 is newly added in this release. It's the same as BCM56881 SKU except not supporting ETRAP and DLB. Customers can use this release for production deployment.

This release is based on TD4 X11 DNA version 4.7.11 (NPL label is 4.7.9). It is subject to change based on new DNA releases, ongoing software improvements, regression tests, and bug fixes.

For BCM56880 and its variants, this release adds the support for:

- BCM56889 new SKU;
- New UFT mode 17 and 20;
- BFD, broadsync APIs;
- ISSU starting from this release for DNA NPL-4.7.11
- soc APIs for ISSU and HA memory management;
- Miscellaneous API enhancements across multiple modules.

For the complete changes and bug fixes, please refer to the table which lists all the resolved issues and improvements for this release.

The tables below show the status of SDK features supported on BCM56880/1/3/9 B0 in this release.

Table 5. BCM56880 Legacy Features Maturity Level

Feature	***Maturity***
Linkscan	GA
L2 switching	GA
L3 routing	GA
ALPM	GA
Flex Flow (VxLAN)	GA
IP Tunnel	GA
MPLS	GA
Multicast	GA
IPMC	GA
QoS	GA
ECN	GA
Mirroring	GA
VLAN	GA
STG	GA
Port	GA
Flex Port	GA
Trunk	GA
VPLAG	GA
ECMP	GA
DLB	GA
Cosq	GA
Rate	GA
Failover	GA

Hash output selection	GA
Resilient Hash	GA
HIGIG3	GA
Switch control	GA
MIB counter	GA
Packet I/O	GA
KNET	GA
LED	GA
SER	GA
FP	GA
UDF	GA
PORT	GA
Policer	GA
ETRAP	GA
BFD	GA
Time and SyncE	GA
Warmboot	GA
ISSU	GA

Table 6. BCM56880 New Features Maturity Level

Feature	***Maturity***
Flex Digest	GA
Flex counter 2.0	GA
Flex State	GA
Trace and drop event counter	GA
Packet trace and DOP	GA
Latency-based ECN	GA
Mirror-on-drop	GA
Event BST	GA
Packet integrity check	GA
Packet protocol control	GA
VxLAN GBP	GA
Access SVP/DVP	GA
AACL	GA
IFA 2.0	Preview

Section 4.3.2: SerDes Feature Support

This release includes:

- TSCBH7 Firmware Version D005_09 and API version A009_0A
- BCM API support for PRBS functionality

Section 4.3.3: Known Issues or Limitations

- Please note two ISSU APIs (bcm_switch_issu_upgrade_start, bcm_switch_issu_upgrade_done) are deprecated in this release and equivalent soc APIs are provided for the same purpose;
- While “techsupport” CLI command is available for most modules, it doesn’t support BFD yet;

- There is an intermittent issue where ALPM operation might be started but it turns out to be a resource full in the end of that operation, in which case, we will see an error "Got abort when WAL state is not IDLE (wal_bypass), enable_atomic_trans = 0.".
  Presumably, when that happens, the HW state still matches with SW state, in which case this is not a real issue except it's against SDKLT rule. In the worst case, it may result in HW state being not aligned with SW state, and causing issues to following operations;
- When multiple matches are mapped to a customer-facing flex flow port (via bcm_flow_match_add) and the port is added into a VPLAG, the traffic from the port could not be forwarded as expected;
- When egress mirroring is programmed on a port, the flex port operation on another port will fail due to clearing mirror port setting returns error. As a WAR, users can detach the mirror destination first.

Section 4.4: BCM56072 (Firelight) A0 GA support

The Broadcom BCM56072 is a class of high-performance, non-blocking network switching devices supporting up to a maximum of 3x (4x10Q Serdes core) and 4x (4x25G Serdes core), as well as various combinations of these port configurations. The BCM56072 delivers high-bandwidth, glueless network connectivity for up to 420 Gb/s on a single chip. The BCM56072 can be used as a channelized adjunct line card port fan-out switch for BCM56470 in a Centralized Ethernet Switching system (CES), as an unchannelized uplink line card for BCM56470, and in a standalone mode. BCM56072 A0 support is available as part of this release.

Section 4.4.1: SDK Features support

As this is the GA version of SDK for BCM56072 (Firelight), customers can use this release for product development. The table below shows the status of BCM56072 A0 SDK features in this release.

Table 7. BCM56072 *New Features Maturity Level*

Feature	***Maturity***
COE tag Forwarding	GA
Channelized Flow Control	GA

Table 8. BCM56072 *Legacy Features Maturity Level*

Feature	***Maturity***
L2	GA
VLAN	GA
STG	GA
PORT	GA
PKT/TX/RX	GA
STAT	GA
MULTICAST	GA
MIRROR	GA
VXLAN	GA
PROXY	GA
RATE	GA
QoS	GA
SWITCH	GA
TRUNK	GA

STACK	GA
NIV/PE	GA
MIM LITE	GA
Custom PKT HDR	GA
OAM	GA
ECMP	GA
FIELD	GA
POLICER	GA
L3/IPMC	GA
RTAG7	GA
TSN	GA
SER	GA
KNET	GA
I2C	GA
TIME/TIMESYNC	GA
M0 Firmware For LED and FW Linkscan	GA

Section 4.5: BCM56071N (Firelight) A0 GA support

The Broadcom BCM56071N is a class of high-performance, non-blocking network switching devices supporting up to a maximum of 3x (4x10Q Serdes core) and 4x (4x25G Serdes core), as well as various combinations of these port configurations. The BCM56071N delivers high-bandwidth, glueless network connectivity for up to 320 Gb/s on a single chip. The BCM56071N can be used as a channelized adjunct line card port fan-out switch for BCM56470 in a Centralized Ethernet Switching system (CES), as an unchannelized uplink line card for BCM56470, and in a standalone mode. BCM56071N A0 support is available as part of this release.

Section 4.5.1: SDK Features support

As this is the GA version of SDK for BCM56071N, customers can use this release for product development. The table below shows the status of BCM56071N A0 SDK features in this release.

Table 9. BCM56071N *New Features Maturity Level*

Feature	***Maturity***
COE tag Forwarding	GA
Channelized Flow Control	GA

Table 10. BCM56071N *Legacy Features Maturity Level*

Feature	***Maturity***
L2	GA
VLAN	GA
STG	GA
PORT	GA
PKT/TX/RX	GA
STAT	GA
MULTICAST	GA
MIRROR	GA
VXLAN	GA

PROXY	GA
RATE	GA
QoS	GA
SWITCH	GA
TRUNK	GA
STACK	GA
NIV/PE	GA
MIM LITE	GA
Custom PKT HDR	GA
OAM	GA
ECMP	GA
FIELD	GA
POLICER	GA
L3/IPMC	GA
RTAG7	GA
TSN	GA
SER	GA
KNET	GA
I2C	GA
TIME/TIMESYNC	GA
M0 Firmware For LED and FW Linkscan	GA

Section 4.6: BCM56770 (Trident3-X5) Family Updates

The Broadcom® BCM56770 family is a class of high-performance,non-blocking network switching devices supporting up to a maximum of 20x100GbE, as well as various combinations of these port configurations. The device family features a maximum of 20 integrated high speed SerDes cores,each with four integrated 25G SerDes transceivers and associated PCS for native support of a multitude of 10G,25G,40G,50G, and 100G standards without requiring external PHYs, and Broadcom's proprietary HiGig2. BCM56770 delivers high bandwidth, glueless network connectivity for up to 2.0 Tb/s.

Section 4.6.1: CANCUN Feature support

Section 4.7: BCM56870 (Trident3-X7) Family Updates

The Broadcom® BCM56870 family is a class of high-performance, non-blocking network switching devices supporting up to a maximum of 128x 25GbE, 64x 50GbE, or 32x 100GbE, as well as various combinations of these port configurations. The BCM56870 delivers high-bandwidth, glueless network connectivity up to 3.2 Tbps on a single chip.

This SDK release packages contains CANCUN 5.3.3. To upgrade to premium CANCUN, please use "cancun_dir" config variable to point to the binaries in the directory $SDK/rc/flex/bcm870_a0.

Section 4.7.1: ISSU

SDK 6.5.18 no longer supports ISSU for CANCUN 5.1.8 upgrading from earlier SDK releases. Customers using CANCUN 5.1.8 must upgrade to CANCUN 5.3.3 through cold boot. ISSU to future SDK releases using CANCUN 5.3.3 will be supported. To upgrade to CANCUN bug fix releases in the future , cold boot is required.

Section 4.7.2: CANCUN Feature support

Please refer to Section 4.10 for further details on CANCUN features support. No new features/bug fixes are part of this release.

Section 4.8: BCM56370 (Trident3-X3) Family Updates

The Broadcom BCM56370 family is a class of high-performance, non-blocking network switching devices supporting up to a maximum of 3x (4x25G Serdes core), 5x (4x10G Serdes core) and 3x (4x10Q Serdescore), as well as various combinations of these port configurations. The BCM56370 delivers high-bandwidth, glueless network connectivity for up to 540 Gb/s on a single chip.

Section 4.8.1: CANCUN Feature support

Please refer to Section 4.10 for further details on CANCUN features support.No new features/bug fixes are part of this release.

Section 4.9: Trident3 Family CANCUN updates

Section 4.9.1: CANCUN support matrix

BCM56870, BCM56770, BCM56370, BMC56275 and BCM56470 are programmable devices released with flexible firmware. Below is the matrix of support between SDK version and Cancun load:

Table 13. Trident3 X7 Support Matrix

Cancun firmware load	***Supported SDK release***
B870.5.0.7	6.5.12
B870.5.1.8	6.5.13
B870.5.1.8 B870.5.2.3	6.5.14
B870.5.1.8 B870.5.3.3	6.5.15
B870.5.1.8 B870.5.3.3	6.5.16
B870.5.1.8 B870.5.3.3	6.5.17
B870.5.3.3-rev1	6.5.18
B870.5.3.3-rev3	6.5.19

B870.5.3.3- rev4	6.5.20
B870.5.3.3- rev4	6.5.21

Table 14. Trident3 X5 (BCM56770) Support Matrix

Cancun firmware load	***Supported SDK release***
B770.3.0.0	6.5.14
B770.3.1.2	6.5.15
B770.3.1.2	6.5.16
B770.3.1.2	6.5.17
B770.3.1.2-rev1	6.5.18
B770.3.1.2-rev3	6.5.19
B770.3.1.2- rev4	6.5.20
B770.3.1.2- rev4	6.5.21

Table 15. Trident3 X3 (BCM56370) Support Matrix

Cancun firmware load	***Supported SDK release***
B370.3.0.5	6.5.15
B370.3.0.5	6.5.16
B370.3.0.5	6.5.17
B370.3.0.5-rev1	6.5.18
B370.3.0.5-rev1	6.5.19
B370.3.0.5-rev3	6.5.20
B370.3.0.5-rev3	6.5.21

Table 16. Trident3 X2 (BCM56275) Support Matrix

Cancun firmware load	***Supported SDK release***
B275.3.1.0	6.5.19
B275.3.1.0	6.5.20
B275.3.1.0	6.5.21

Table 17. Trident3 X4 (BCM56470) Support Matrix

Cancun firmware load	***Supported SDK release***
B470.3.0.10	6.5.20
B470.3.0.10	6.5.20
B470.3.0.10	6.5.21

NOTE: The CANCUN loads B870.5.3.3-rev4,B770.3.1.2-rev4 and B370.3.0.5-rev3 are the latest updated versions with limited bug fixes.These limited bug fixes are SDK-agnostic post SDK 6.5.15, and are also drop-in compatible with older SDK releases downto SDK 6.5.15, , so the CANCUN version number for these does not change. These Bug Fix Base CANCUNs are also available to all customers separately in docSAFE as standalone files which can be used with the stated older SDK versions.

Section 4.9.2: CANCUN release notes

Details on features supported for programmable devices can be referenced via the CANCUN feature list documentation posted on docSAFE.

Please refer to the resolved issues (Section 11) for the details of SDK features and bugs fixes that are part of 6.5.21 release.

Section 4.10: Embedded Applications Updates

Section 4.10.1: Broadsync and KNETSync

- BroadPTP support is introduced for BCM56170
- KNETSync 1-step support is introduced for BCM56760
- Support enabled to timestamp ERSPAN packets
- APTS feature enhancements for BCM88470
- Broadsync EA on BCM56880

Please reach out to Broadcom business PoC for more info about the feature delivery

Section 5: Things to note

This section lists items that require special attention that are new to this release. Please see prior 6.5.x release notes for previously reported items that should also be noted.

Section 5.1: SDK releases out of active engineering support

The following releases are out of active engineering support, and therefore not supported for new customer developments:

- SDK 6.5.x releases: 6.5.16 downto 6.5.0
- All SDK 6.4.x, 6.3.x, and older releases

Customers are recommended to use this release for new product development or sustaining releases. Per Broadcom policy, as older devices are discontinued due to end of life (EOL), their SW support is also deprecated in SDK releases beyond the device EOL date. All releases earlier than SDK 6.3.5 and SDK 5.x.x are EOL.

Section 5.3: Warmboot Notes and Considerations

This section is to give information about warmboot specific activity in this release. In this case, warmboot allows for quick reboot by reinitializing the necessary components and processes.
Please note that the warmboot scache size requirements for a device for a particular release can be found by running the ‘warmboot storage’ command at the BCM prompt.

It is recommended that any customer perform their own warmboot testing for their specific environment and use these results and information as guidance only.
Note: Warmboot downgrade is not supported.

Section 5.3.1: Validated Warmboot upgrades

Warmboot like-to-like testing and issue resolution is focused on a majority of recently supported devices and is performed with a limited set of test cases. Warmboot testing is not complete on devices which have not yet reached supported status. Warmboot testing is not performed with PHY devices attached.

In-service software upgrade (ISSU) allows upgrade of SDK software from one version to a different version without impacting packet forwarding. This type of SDK warmboot upgrade from 6.5.20 to 6.5.21 has been validated on specific silicon validation kits (SVKs) in this release, and to a specific set of test cases..

Section 5.3.2: Upgrade considerations

- In the previous releases, 'iounmap' is not called when unloading kernel BDE module for IPROC integrated platform. This causes 'ioremap_nocache' API failing to create mappings after multiple time of loading and unloading BDE module. This has been fixed. (SDK-228403)
- IpType qualification IpTypeNonIp has an issue in releases before 6.5.21. The qualification was using the wrong mask and data. This will cause qualifer_get API to fail after upgrade since data and mask expected is different from value configured in older releases. Customer has to qualify IpTypeNonIp again after upgrading to avoid this. Please note that IpTypeNonIp is not working as expected in releases before 6.5.21. (SDK-237623)
- TD3x3 - added support for new port configuration for 56578 (SDK-230551)
- bcm_cpri_port_encap_get shows values different from what were set (SDK-227160)
- The issue is with _FP_MAX_NUM_PIPES being used to calculate the size of the slice bitmap. When the image built (dpart) is only for TH, it is set to 4. But for an image that is built for both TH and TH3(multi build), it is set to 8.Updated the code to sync and recover the _FP_MAX_NUM_PIPES value and recover the scache based on that value.(SDK-227205)
- Macsec memories were getting cached for non-Macsec FL devices. The fix was to skip the cache add operations for these memories. (SDK-238558).
- To support the mix of 40G and 20G on the same oversub PM4x25G quad on BCM56675, customers need to take patch from SDK-235794 for releases 6.5.21 and earlier.
- The API sequence to create a stand-alone ECMP group with underlay NextHops, associate this ECMP group to a member VP, and then call bcm_trunk_set() to setup a VPLAG. SDK resolves the ECMP group to generate the DVP, NextHop combinations. Note, any updates to the ECMP group (add/delete) requires bcm_tunk_set() to be re-called to update the DVP, NextHop combinations (SDK-228690).
- Queue level WRED has to be enabled always. Only when queue level enable, pool level, port pool level WRED can take effect.In previous releases, When WRED is configured at pool/portsp level, the associated queues will be programmed by SDK. In this release, the associated queues will not be programmed. User needs to enable queue WRED explicitly for required queues and SDK doesnot need to configure all queues mapped to a port/pool with the same values when the configuration is done at port/pool level (SDK-222830).
-

Section 6: Summary of BCM API changes and enhancements

Complete BCM API documentation is available in the Network Switching Software Programmer's Guide number `Network Switching Software Development Kit, Release 6.5.21.html`. BCM API changes in this release are no longer found in this document. Please refer to Appendix B: Summary of BCM API changes and enhancements in this release for further details.

For the full list of API support by Broadcom device, please reference the file `SDK-6.5.x-Support-Matrix.xls` in the sdk/RELDOCS directory in the release package. The API support matrix is not maintained for DNX devices, thus DNX devices are excluded from `SDK-6.5.x-Support-Matrix.xls`.

Broadcom does not guarantee API default values set within the SDK and changes to default values may be made between releases. If an API default value is required for application software to work properly, it must be explicitly set.

Refer to Summary of BCM API changes and enhancements for the API changes specific to this release.

Section 7: Test Statistics

Section 7.1: How to read the data

In cases where tables are shown below, the tables represent a spread of data gathered per device, per suite, and per release. The percentages represent the aggregate rate of failure for that suite when run against all variants of the family of devices. This data does not include results from DNX device regressions.

The below data is not meant to be a precise indication of quality but instead serves as a guideline for improvements release-over-release. Additionally, although some cells show 0% failures, this does not necessarily mean the feature is supported in the device - tests are run to validate the appropriate SDK support even for unsupported features on older devices to ensure graceful handling of all APIs. Finally, some devices have fewer columns listed if they were introduced recently.

Section 7.2: Overview

Each suite listed below is indicative of a specific module. Golden refers to a suite of tests that takes representation across multiple modules and serves as a sanity regression. Each suite contains tests of various types, loosely categorized as follows:

Test Categories	***Description***
Configuration Tests	Tests that verify that each API functions appropriately and can configure the device as expected.
Functionality Tests	Tests that further validate each of the API through functional use often requiring traffic to be run through the system.
Semantic Tests	Tests that ensure that the proper error handling mechanisms are working and users cannot crash the device through the API.

Section 7.3: Total Tests

The data below represents the number of unique cases for each release. The goal is to increase test coverage release over release but there may be instances where tests are consolidated which may yield a net reduction from one version to the next. Note that although a particular test case will execute for each and every chip, it is only counted once.

	sdk-6.5.21	***sdk-6.5.20***	***sdk-6.5.19***	***sdk-6.5.18***
golden	153	153	153	153

warmboot	8423	8305	8061	7408
auth	17	17	17	17
bfd	124	124	124	123
bhh	159	159	159	159
chip	10	10	10	10
coe	803	803	777	711
cosq	838	838	838	838
custom	7	7	7	7
ea	108	108	108	108
eav	19	19	19	19
extender	61	61	61	61
fabric	7	7	7	7
failover	15	15	15	15
fcoe	37	37	37	37
field	1866	1853	1852	1852
higigproxy	129	129	129	129
infra	114	114	114	114
ipfix	17	17	17	17
ipmc	138	138	138	138
l2	511	498	497	487
l2gre	33	33	33	33
l3	683	670	666	660

l3.alpm	774	771	771	732
link	27	27	27	27
mim	61	61	61	61
mirror	547	402	402	400
misc	28	28	28	28
mpls	743	737	705	694
multicast	67	64	60	54
niv	84	84	84	84
oam	402	402	402	402
pkt	74	70	70	70
port	595	589	582	568
proxy	49	49	49	49
ptp	141	141	140	140
qos	111	107	100	99
rate	21	21	21	21
rtag7	92	92	92	92
rx	65	65	65	65
ser	301	300	299	297
stack	130	130	130	130
stat	868	785	694	677
stg	42	42	42	42
switch	315	306	296	291

time	63	51	35	35
tlvMsg	13	13	13	13
trill	51	51	51	51
trunk	292	286	286	283
tunnel	201	200	196	194
subport	31	31	31	31
vlan	344	330	315	310
vxlan	383	383	383	383
wlan	17	17	17	17
Test Suite Total	21204	20750	20286	19443

Section 7.4: API Test Results

In this release, all tested devices passed DVAPI regressions with over 99.8% passing rate.

Section 7.5: Security Vulnerability Test Results

These are scaling and semantic testing which verify that we properly handle errors and scaling to the limits. The table below shows the passing rate on the security suite.

	Total Tests	***% Pass***
minigolden	1	100%
warmboot	32	100%
cosq	267	100%
e2ecc	5	100%
ea	6	100%

eav	16	100%
fabric	4	100%
fcoe	3	100%
field	26	100%
fieldScale	2	100%
higigproxy	43	100%
l2	69	100%
l3	30	100%
l3.alpm	254	100%
linkphy	7	100%
mim	1	100%
mirror	39	100%
mpls	32	100%
multicast	2	100%
oam	1	100%
oobfc	12	100%
packing	2	100%
policier	13	100%
port	105	100%
proxy	7	100%
ptp	79	100%
qos	6	100%

riot	49	100%
rtag7	2	100%
rx	27	100%
sat	29	100%
stat	53	100%
stg	13	100%
switch	22	100%
time	18	100%
trill	3	100%
trunk	65	100%
tunnel	19	89.47%
subport	7	100%
udf	6	100%
vlan	117	100%
vxlan	100	100%
Security Totals	1594 tests	99.87% pass rate

Section 7.6: Static Code Analysis

NOTE: Starting with SDK 6.5.17, the “pass by value” alert threshold was changed from 128 bytes to 160 bytes. This was required in order to accommodate the greater number of ports available in new Broadcom devices. Customers running their own version of Static Code Analysis need to make adjustments in their environment accordingly in order to avoid false positives.

The table below shows the SDK static analysis backlog for this release:

Section 7.6.1: Unresolved Static Code Analysis Issues

Area	*Open Issues SDK 6.5.21*	*Open Issues SDK 6.5.20*	*Open Issues SDK 6.5.19*	*Open Issues SDK 6.5.18*	*Open Issues SDK 6.5.17*	*Open Issues SDK 6.5.16*	*Open Issues SDK 6.5.15*	*Open Issues SDK 6.5.14*	*Open Issues SDK 6.5.13*	*Open Issues SDK 6.5.12*	*Open Issues SDK 6.5.11*	*Open Issues SDK 6.5.10*
DNX	1	0	0	2	57	12	5	3	11	1	0	7
XGS	3	18	5	6	31	9	14	8	13	1	2	12
SerDes	2	3	3	4	14	3	5	3	4	5	6	6
Common	4	4	2	5	11	5	9	2	10	3	3	4
Total	10	27	10	17	116	29	33	16	38	10	11	29

Section 8: Service Impacting Defects

A Service Impacting Defect (SID) is any defect (internal or external) that has high potential to severely disrupt network operations in a deployed system. The following table lists SIDs identified since our last SDK release.

Reference	*Chips*	*Affected Versions*	*Errata Synopsis*	*Details*
SDK-232635	56371_A0, 56371_A1, 56371_A2	6.5.17	Corrupted RX metadata, more cache issues	The rx metadata might be corrupt due to cache invalidate was not performed properly when using skb buffer for receive in KNET. The issue was fixed in this release.
SDK-225448	56370, 56370_A0, 56370_A1, 56370_A2	6.5.20	Missing blocks of data during RX DMA	The rx data might be corrupted due to the non cache-aligned DMA buffer when using skb buffer for receive in KNET. The issue was fixed in this release.
SDK-223441	56980_A0	6.5.16	Seg fault observed in _bcm_l2_register_callback () when bcm_l2_addr_unregister is issued while traffic is on	segmentation fault was observed when invoking bcm_l2_addr_unregister while traffic was running. In this release, this issue has been fixed.
SDK-227795	56069_B0, 56832_A1, 56850_A0,	6.5.14, 6.5.19	L3_DEFIP_PAIR_128 SER TCAM error does not get detected by memscan	memscan did not support adding a table size change memory into scan

	56850_A2, 56860_A0, 56960_B1, 56970_B0			in run-time. Now it has been supported. And previous releases had an issue in ser correction may cause continuous parity error reporting on TH devices. Now it has been fixed.
SDK-234100	56375_A0	6.5.20	Injecting SER into MMU_CTR_COLOR_DROP_MEM_XPE0_PIPE0 will cause deadloop	This release has SER fixes for MMU counter mems for TD3, MV2, HX5, HR4, FB6 family of devices
SDK-233864	56375_A0	6.5.20	Injecting SER into MMU_CTR_COLOR_DROP_MEM_XPE0_PIPE0 will cause deadloop	This release has SER fixes for MMU counter mems for TD3, MV2, HX5, HR4, FB6 family of devices
SDK-223609	56450_B1	6.5.19	Parity error after cold boot when switching between external and internal buffer	For BCM5645x family of devices, while switching ports from internal to external buffer memory and sending an traffic there was parity error reported in earlier releases. This has been fixed in this release.
SDK-227308	56275_A1, 56370_A0, 56470_A0, 56565_B0, 56760_B0, 56771_A0	6.5.14, 6.5.19	SER TDM Calendar error	Iif error occurred on active TDM_CALENDAR, ser correction caused traffic stopped. In this release, this issue has been fixed.
SDK-225923	56850_A0, 56850_A2, 56860_A0, 56960_B1, 56970_B0	6.5.14, 6.5.19	L3_DEFIP_PAIR_128 SER TCAM error does not get detected by memscan	memscan did not support adding a table size change memory into scan in run-time. Now it has been supported. And previous release had an issue in ser correction may cause continuous parity error reporting on TH devices. Now it has been fixed.
SDK-221245	All chipts		Repeated SER log messages for parity correction on SFLOW_ING_DATA_SOURCE	if one SER error occurred in SFLOW_ING_DATA_SOURCE during traffic was running, then multiple SER errors were introduced in other indices. In this release, this issue has been fixed.
SDK-231366	56960_A0		soc_tomahawk_idb_buf_reset: IDBBufferDrainTimeOut	TH TDM data might not be recovered correctly after warmboot if there was flex port operation in previous coldboot stage, which might lead to traffic struck and IDB buffer drain timeout. This has been fixed in this release.

SDK-224621	56960_A0, 56960_B0	TDM_CALENDAR SER issues on TH	if error occurred on active TDM_CALENDAR, ser correction caused traffic stopped. In this release, this issue has been fixed.
SDK-221783	56980_B0	Memory leak	Fixed the memory leak in soc_mem_cache_set()
SDK-232994	56850_A2, 56960_A0	BPM_LENGTH in L3_DEFIP_AUX_TABLE is incorrect	in ALPM mode, if hardware propagation is used, the BPM_LENGTH in the AUX table could be wrong for pivot 0/0 and may caused misforwarding issue onward after default route is installed. In this release, this issue has been fixed.
SDK-225412	56850_A0, 56860_A0, 56870_A0	TDM_CALENDAR SER issues on TD2/TD2+/TD3	If error occurred on active TDM_CALENDAR, ser correction caused traffic stopped. In this release, this issue has been fixed.
SDK-237278	56860_A0	segmentation fault at _soc_trident2_ser_process _mmu_err	if ser reported memory could not be decoded the memory would be INVALIDm, so before using the memory, we should check the validation of the memory first. Otherwise segmentation fault may occur. In this release, this issue has been fixed.

Section 9: Potential Security Vulnerabilities

Broadcom treats security vulnerability issues reported by customer Product Security Incident Response Teams (PSIRT) with very high importance and urgency. Please ensure that any such issues reported and filed by your organization through the Broadcom customer support portal specifically use the acronym “PSIRT” in the CSP case summary and/or description. This will allow the Broadcom engineering teams to track, analyze, and address these issues as quickly as possible.

Table 18: Security Vulnerabilities

Reference	*Chips*	*Affected Versions*	*Errata Synopsis*	*Details*
None				

NOTE: Please check the following link for any updates to PSIRTs issued previously applicable to previous releases-https://www.cvedetails.com/vulnerability-list/vendor_id-5420/Broadcom.html

Section 10: GNU tools versions

Broadcom uses GNU tools, specifically “gmake”, “gcc”, several Linux distributions and Linux kernel versions for SDK build and validation in-house. The following table summarizes the tools used in this release

Table 19: GNU tools versions

CPU	*gmake*	*gcc*	*Operating System*	*Linux Kernel*
SLK	4.1	4.9.2	Broadcom LDK 4.1.10	3.14.65
iProc	4.1	6.3.0	Broadcom XLDK 5.1.1	4.14.48
XLR	4.1	5.4.0	Broadcom XLDK	4.19.1
GTS	4.1	5.4.0	Broadcom XLDK	4.19.1
sim	4.1	7.1.0	RHEL 6	2.6.32
iProc64	4.1	6.3.0	Broadcom XLDK 5.1.1	4.14.48

In this release we performed code optimizations to support a more recent version of gcc. This version of SDK compiled cleanly with gcc 7.1.0 for the systems/sim target.

If there are any issues with running or compiling SDK with GCC versions higher than what is listed above, such issues should be reported via Broadcom Customer Support for evaluation. If the issue is caused by SDK coding or logic error, it will be resolved in a subsequent SDK release.

However, if the issue is caused by the nature of how new versions of GCC handle compilation and is not directly related to SDK coding or logic errors, it will be fixed on best-effort basis.

Section 11: Resolved and Unresolved Issues for 6.5.21

Section 11.1: Resolved Issues and Improvements

For the full resolved list, please reference the file `SDK-6.5.21-Resolved-Issues-Improvements.xlsx` in the RELDOCS directory in the release package.

Section 11.2: Unresolved Issues

The following open Urgent priority issues remain unresolved in SDK 6.5.21. These are in process of being evaluated for inclusion in a future SDK release:

Number	*CSP*	*Chips*	*Errata For 6.5.21*
SDK-237644	CS00010700543	56880_B0	Resilient Hashing support for VPLAG
SDK-226526	NA	56880_B0	Requirement to provide VLAN tag addition on a per next hop basis
SDK-235071	CS00011361700	56670_A0	Oops messages during shutdown
SDK-238881	CS00011477327	56960_A0	MMU_WRED_UC_QUEUE_TOTAL_COUNT_FROM_REMOTE_XPE1_PIPE2 can't be recovered when inject ser error
SDK-238043	CS00011465291	56990_A0	TH4 Flex counter unique pipemode with Dropcount mode doesn't seem to work
SDK-238509	CS00011510016	56990_A0	There is not any counter for cpu in "show c" result.
SDK-234072	CS00011313650	56870_A0	CPU generated ETH packet erroneously hitting InPorts qualifier
SDK-234043	CS00011254913	56880_A0	T4 HSDK APIs consumes 10X more time-to-complete than T3 platforms SDK equivalent API (bcm_multicast_egress_add/delete)
SDK-234644	CS00011276233	56880_A0	bcm_flexctr_stat_get performance (used for vlan) is 3 times higher than bcm_vlan_stat_get in TD3
SDK-235130	CS00011009074	56270_A0	VPLS AC Virtual Port is Not populated correctly in CCM RX packets punted to CPU from EGRESS pipeline using OAM hardware endpoints

Section 12: Compatibility

Section 12.1: Broadcom Embedded Applications Firmware Compatibility Matrix

The following table shows new feature support added in Firmware releases for switch devices compatible with the corresponding SDK release. Please get in touch with Broadcom marketing on the delivery of firmware GA release

	SDK-6.5.21	SDK-6.5.20	SDK-6.5.19	SDK-6.5.18	SDK-6.5.17	SDK-6.5.16	SDK-6.5.15	SDK-6.5.14
4.3.15	BCM56850 BCM56960 BCM56970 BCM56980							
4.3.14		BCM88270 BCM56670 BCM56070 BCM56980 BCM56770						
4.3.13			BCM56870 BCM56970 BCM56980 BCM56670 BCM56880 BCM88480 BCM88800					
4.3.12 (planned				BCM56670 BCM56960				

)				BCM56850				
4.3.11					BCM56670 BCM56770 BCM56980 BCM56970			
4.3.10						BCM56980 BCM88690		
4.3.9							BCM88470 BCM88270 BCM56870 BCM56980 BCM56970	
4.3.8								BCM88375
4.3.7								

Section 12.2: BMACSEC SDK Compatibility Matrix

Switch SDK Release	*BMACSEC Release*
6.5.7	4.16
6.5.8	4.16
6.5.9	4.16
6.5.10	4.16
6.5.11	4.17
6.5.12	4.17

6.5.13	4.17
6.5.14	4.18
6.5.15	4.19
6.5.16	4.20
6.5.17	4.20
6.5.18	4.20
6.5.19	4.20
6.5.20	4.20
6.5.21	4.21

Section 12.3: iMACSEC SDK Compatibility Matrix

This software is specifically for use with the BCM54190 integrated PHY driver.

Switch SDK Release	*iMACSEC Release*
6.5.7	1.0
6.5.8	1.1
6.5.9	1.1
6.5.10	1.2
6.5.11	1.2
6.5.12	1.2
6.5.13	1.3
6.5.14	1.3
6.5.15	1.3

6.5.16	1.3
6.5.17	1.3
6.5.18	1.3
6.5.19	1.3
6.5.20	1.3
6.5.21	1.3

Section 12.4: PHY Firmware Compatibility Matrix

The following table identifies changes in PHY firmware for newer PHY devices and for the serdes core. For a view of supported switch and PHY combinations, please review the `SDK-6.5.x-Device-Support.xls` spreadsheet.

PHY Core	**6.5.14 Firmware Versions**	**6.5.15 Firmware Versions**	**6.5.16 Firmware Versions**	**6.5.17 Firmware Versions**	**6.5.18 Firmware Versions**	**6.5.19 Firmware Versions**	**6.5.20 Firmware Versions**	**6.5.21 Firmware Versions**
BCM84888	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07	A0: 1.01.07 B0: 2.02.07
BCM84858	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04
BCM84856	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04	01.03.04
Falcon	D10B_14	D10B_1F	D10B_1F	D10B_1F	D10B_1F	D10B_1F	D10B_23	D10B_23
Falcon dual PLL	D10B_1C	D10B_1C	D10B_1C	D10B_1C	D10B_1C	D10B_22	D10B_22	D10B_24
Falcon16	D103_0A	D103_0D	D103_0D	D103_11	D103_13	D103_13	D103_13	D103_18
Eagle	D10F_13	D10F_13	D10F_13	D10F_13	D10F_13	D10F_13	D10F_13	D10F_13

Eagle dual PLL	D10F_17	D10F_17	D10F_17	D10F_17	D10F_17	D10F_17	D10F_17	D10F_17
Merlin16	D102_09	D102_09	D102_09	D102_09	D102_09	D102_09	D102_09	D102_09
Merlin7	N/A	N/A	N/A	N/A	N/A	D000_02	D000_02	D000_02
Blackhawk	A0: D003_06 B0: D004_00	A0: D003_06 B0: D100_02	A0: D003_06 B0: D100_04	A0: D003_0A B0: D100_06	A0: D003_0C B0: D100_0A	A0: D003_0C B0: D100_0B	A0: D003_0C B0: D100_0E	A0: D003_0C B0: D100_0E
Blackhawk7 Dual PLL	N/A	N/A	N/A	N/A	N/A	D005_02	D005_02	D005_09
Blackhawk7 Single PLL	N/A	N/A	N/A	N/A	N/A	D004_09	D005_03	D005_0B
Osprey7 Single PLL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D001_01

Section 12.5: SDK and BCM88060 FW Compatibility Matrix

The firmware binary is part of the SDK release. Below table shows the firmware version compatible with which SDK release.

Switch SDK Release	***88060 FW version***
6.5.10	1.0.10
6.5.11	1.0.11
6.5.12	1.0.12
6.5.13	1.0.13
6.5.14	1.0.14
6.5.15	1.0.15
6.5.16	1.0.16

6.5.17	1.0.17
6.5.18	1.0.18
6.5.19	1.0.19
6.5.20	1.0.20
6.5.21	1.0.21

Section 12.6: SDK and PCIe FW Compatibility Matrix

Below table shows the firmware version compatible with which SDK release.

Switch SDK Release	*PCIe FW version*
6.5.21	2.9

Section 13: SDK Externally Licensed Software Components

The SDK contains a number of third-party externally licensed software components. This appendix contains information regarding these components, the license for each of these components, and where these components are used in SDK.

Component	*Origin*	*Location in Source Tree*
EDITLINE	/afs/athena.mit.edu/contrib/sipb/src/ editline	src/sal/appl/editline
LIBXML2	http://xmlsoft.org/downloads.html	src/shared/libxml
ED Editor	USENET comp.sources.misc Volume 9, Issue 36	src/appl/diag/edline.c
BITMAP	USENET comp.sources.misc Volume 9, Issue 36	src/appl/diag/edline.c
CINT	http://www.gnu.org/software/bison/	src/appl/cint/cint_parser.[ch]
BIGDIGITS	David Ireland, copyright (c) 2001-11 by D.I. Management Services Pty Limited <www.di-mgt.com.au>	src/soc/dpp/SAND/Utils/sand_u64.c
APIMODE	http://www.gnu.org/software/bison/	src/appl/diag/api/api_grammar.tab.[ch]

SFlow	http://www.inmon.com/technology/sflowlicense.txt	N/A - see Section 13.8

Section 13.1: EDITLINE License terms and conditions

```
--------------------------------------------------------------------------------

This package was obtained in 1999 and modified to fit the Broadcom
SDK. In 2015 is was modified further to perform terminal I/O through
call-backs, and several unused FSF compatibility functions were
removed. For SDK purposes, the library can still be replaced by the
FSF readline library.

The original library is maintained at GitHub:
https://github.com/troglobit/editline

--------------------------------------------------------------------------------

ORIGINAL DESCRIPTION

This is a line-editing library.  It can be linked into almost any
program to provide command-line editing and recall.

It is call-compatible with the FSF readline library, but it is a
fraction of the size (and offers fewer features).  It does not use
standard I/O.  It is distributed under a "C News-like" copyright.

--------------------------------------------------------------------------------
```

```
ORIGINAL COPYRIGHT

 Copyright 1992,1993 Simmule Turner and Rich Salz.  All rights reserved.

 This software is not subject to any license of the American Telephone
 and Telegraph Company or of the Regents of the University of California.

 Permission is granted to anyone to use this software for any purpose on
 any computer system, and to alter it and redistribute it freely, subject
 to the following restrictions:
 1. The authors are not responsible for the consequences of use of this
    software, no matter how awful, even if they arise from flaws in it.
 2. The origin of this software must not be misrepresented, either by
    explicit claim or by omission.  Since few users ever read sources,
    credits must appear in the documentation.
 3. Altered versions must be plainly marked as such, and must not be
    misrepresented as being the original software.  Since few users
    ever read sources, credits must appear in the documentation.
 4. This notice may not be removed or altered.

--------------------------------------------------------------------------------
```

Section 13.2: LIBXML2 - XML C parser terms and conditions

Package was obtained from http://xmlsoft.org/ and is used by diagnostics tool for miscellaneous input/output tasks

This README is part of SDK under src/shared/libxml and is as follows:

```
/*
 * $Id$
 *
```

```
 * $Copyright: (c) 2011 Broadcom Corporation
 * All Rights Reserved.$
 */

This package was obtained from http://xmlsoft.org/downloads.html
(ftp://xmlsoft.org/libxml2/libxml2-2.7.2.tar.gz)
and was modified for purposes of inclusion into the SOC diagnostics shell.

Only certain portion of package was included in SDK in 2 places:
    Under srs/shared/libxml
        chvalid.c, config.h, dict.c, encoding.c, entities.c, error.c
        globals.c, hash.c, libxml.h, list.c, Makefile, parser.c
        parserInternals.c, SAX2.c, threads.c, tree.c, uri.c, valid.c
        xmlIO.c, xmlmemory.c, xmlsave.c, xmlstring.c, xmlunicode.c
    Under include/shared/libxml
        catalog.h, chvalid.h, debugXML.h, dict.h, DOCBparser.h
        encoding.h, entities.h, globals.h, hash.h, HTMLparser.h
        HTMLtree.h, list.h, parser.h, parserInternals.h, pattern.h
        relaxng, SAX2.h, threads.h, tree.h, uri.h, valid.h, xinclude.h
        xlink.h, xmlautomata.h, xmlerror.h, xmlexports.h, xmlIO.h
        xmlmemory.h, xmlmodule.h, xmlregexp.h, xmlsave.h, xmlstring.h
        xmlunicode.h, xmlversion.h, xpath.h, xpathInternals.h, xpointer.h

No functionality was changed, but there were modifications to match SDK
requirements

Copyright

Except where otherwise noted in the source code (e.g. the files hash.c,
```

```
list.c and the trio files, which are covered by a similar licence but
with different Copyright notices) all the files are:

 Copyright (C) 1998-2003 Daniel Veillard.  All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy
of this software and associated documentation files (the "Software"), to deal
in the Software without restriction, including without limitation the rights
to use, copy, modify, merge, publish, distribute, sublicense, and/or sell
copies of the Software, and to permit persons to whom the Software is fur-
nished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in
all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FIT-
NESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.  IN NO EVENT SHALL THE
DANIEL VEILLARD BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CON-
NECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Daniel Veillard shall not
be used in advertising or otherwise to promote the sale, use or other deal-
ings in this Software without prior written authorization from him.
```

Section 13.3: CINT parser license terms and conditions

The C code for the CINT parser was generated by using GNU Bison parser generator from the file cint_grammar.y CINT is an optional diagnostic tool that can be included in your system by adding CINT to the FEATURE_LIST in SDK compilation flags.

Removed files:

None

Added files:

None

Changed functionality:

None

```
------------------------------------------------------------------------------
/* A Bison parser, made by GNU Bison 2.4.1.  */

/* Skeleton implementation for Bison's Yacc-like parsers in C

      Copyright (C) 1984, 1989, 1990, 2000, 2001, 2002, 2003, 2004, 2005, 2006
   Free Software Foundation, Inc.

   This program is free software: you can redistribute it and/or modify
   it under the terms of the GNU General Public License as published by
   the Free Software Foundation, either version 3 of the License, or
   (at your option) any later version.

   This program is distributed in the hope that it will be useful,
   but WITHOUT ANY WARRANTY; without even the implied warranty of
   MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
   GNU General Public License for more details.

   You should have received a copy of the GNU General Public License
   along with this program.  If not, see <http://www.gnu.org/licenses/>.  */

/* As a special exception, you may create a larger work that contains
   part or all of the Bison parser skeleton and distribute that work
   under terms of your choice, so long as that work isn't itself a
   parser generator using the skeleton or a modified version thereof
   as a parser skeleton.  Alternatively, if you modify or redistribute
   the parser skeleton itself, you may (at your option) remove this
   special exception, which will cause the skeleton and the resulting
   Bison output files to be licensed under the GNU General Public
   License without this special exception.

   This special exception was added by the Free Software Foundation in
   version 2.2 of Bison.  */

/* C LALR(1) parser skeleton written by Richard Stallman, by
   simplifying the original so-called "semantic" parser.  */
```

Section 13.4: BIGDIGITS license terms and conditions

```
Contains BIGDIGITS multiple-precision arithmetic code originally
written by David Ireland, copyright (c) 2001-11 by D.I. Management
Services Pty Limited <www.di-mgt.com.au>, and is used with
permission.

David Ireland and DI Management Services Pty Limited make no
representations concerning either the merchantability of this software
or the suitability of this software for any particular purpose. It is
provided "as is" without express or implied warranty of any kind. Our
liability will be limited exclusively to the refund of the money you
paid us for the software, namely nothing. By using the software you
expressly agree to such a waiver. If you do not agree to the terms, do
not use the software.
```

Section 13.5: APIMODE parser license terms and conditions

The C code for the APIMODE parser was generated by using GNU Bison parser generator from the file api_grammar. APIMODE is an optional diagnostics shell interface that can be included in your system by adding APIMODE to the FEATURE_LIST in SDK compilation flags.

See “CINT parser license terms and conditions” for the Bison licence.

Section 13.6: SFlow license terms and conditions

Broadcom provides several API modules that refer to SFlow by name, specifically Field, Mirror, Port, and Switch. All are implemented as per IETF RFC-3176. Please review the separate sflowlicense.txt file for terms of the agreement used by Broadcom in our implementation.