Technical Reference Manual
Version 4.1

September 2022

Applicable to
RDK Version 4.1
Protocol Version 4.0
Roku OS 11.0

Table of Contents

Change History

Version	Date	Comments
v1.0	February 2020	▪ Remove requirement for DALS from 1.0 release ▪ Update SetState and ReportState protocol to support backwards compatible feature set enhancements and optional features ▪ Update set of certification tests ▪ Document the 'soundmode' feature id
v1.0.1	April 2020	• Additional clarification added to feature set definition, default values on reset, mapping of option ranges between soundbar and RokuTV
v1.0.2	May 2020	• Additional clarification added to feature set definition, conditional displaying of options
v1.0.3	September 2020	▪ Added ability to test UI locally with a RokuTV ▪ Added tests to validate response for empty SetState message ▪ Added Documentation on major/minor packing of version ▪ Updated documentation with new Reset-message, which deprecates requirements on the value 0 being the default for all setting. ▪ Updated documentation with new optional firmware version message
v1.0.4	October 2020	• Restructured TRM • Added communication example
v1.2	February 2021	▪ Updated development process with new Featureset definition work flow ▪ Help URL character limit ▪ New manual test section ▪ Updated with guidance for RTVR International launch ▪ Minor clarifications
v2.0	March 2021	• Added HPD/EDID tests • New manual tests section • Feature ID and Product ID can now take up two bytes • New messages: ResetSession and UnsupportedVersion • Added RDK update via UI option • Updated post-cert process info
v2.1	April 2021	• Product ID must now be entered in decimal in RDK.

v2.1.1	May 2021	• Certification Process updated with Time-slotting procedure.
v3.0	September 2021	• Added latency table documentation • Updated text and graphics to match option menu redesign • Changed character limitations for title and hint texts • Change requirements for settings persistence • Added more manual tests
v3.0.1	September 2021	• Added System Audio Mode recommendations • Added eARC tests
v4.0	March 2022	• Make ReportFirmwareVersion mandatory from protocol version 4.0 • Add requirements for OSD names • Update Staging server deployment and validation process
V4.0.1	April 2022	• Various font and spacing cleanups
V4.1	September 2022	• Added process of cert bundle integration across portal and RDK

Glossary

<Some CEC Command>	References the CEC command or opcode inside the <> : see the HDMI spec for the list and definition of available commands
<Some CEC Command>[Parameter]	References a CEC message, the associate CEC command or opcode and a list of parameters passed with the message.
DUT	Device Under Test, the device to which the Roku TV Ready Development Kit is connected.
Feature set	The collection of options exposed by a device, as described in the section on Option Synchronization
HPD	HotPlug Detect
Partner	Supplier of RTVR certified devices
RDK	TV Ready Development Kit, used for testing and certification
RTVR	Roku TV Ready
RTVR Device	Used to describe the device implementing the Roku TV Ready protocol

Introduction

High Level Overview

Roku TV Ready is a communications standard and protocol for partners developing soundbars, AVRs and speaker products connected via HDMI-ARC to a Roku TV. Areas addressed include the use of a single remote and the integration of sound settings into the TV user interface for a "better together" user experience.

Roku TV Ready is based on the HDMI-CEC standard and uses existing standard CEC messages, extended with a set of Roku TV Ready specific CEC Vendor Commands.

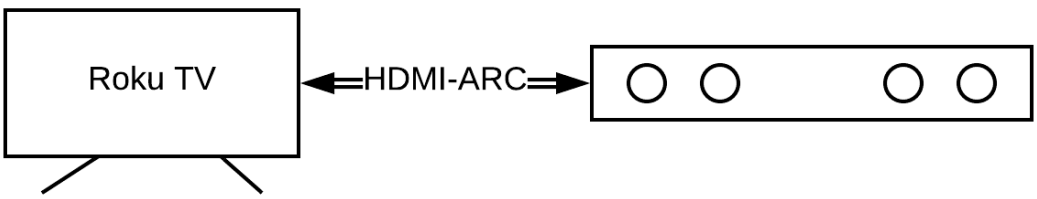
A versioned handshake mechanism and rules for signaling unsupported features are used to allow for future enhancements without breaking compatibility with existing devices.

To accompany the protocol, there is a development and test toolkit (hereafter referred to as RDK) and a certification process.

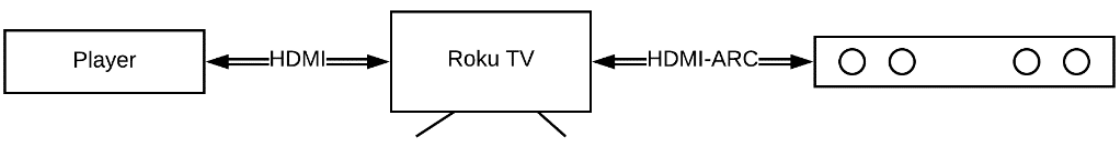
This document describes the certification process, how to use the RDK, and the protocol that must be implemented on the partner device.

Typical Topologies

The simplest and possibly most common topology is a soundbar connected to a Roku TV over HDMI-ARC:



Variations include having an external player, such as a DVD player, as a source input to a Roku TV:



Example Use Cases

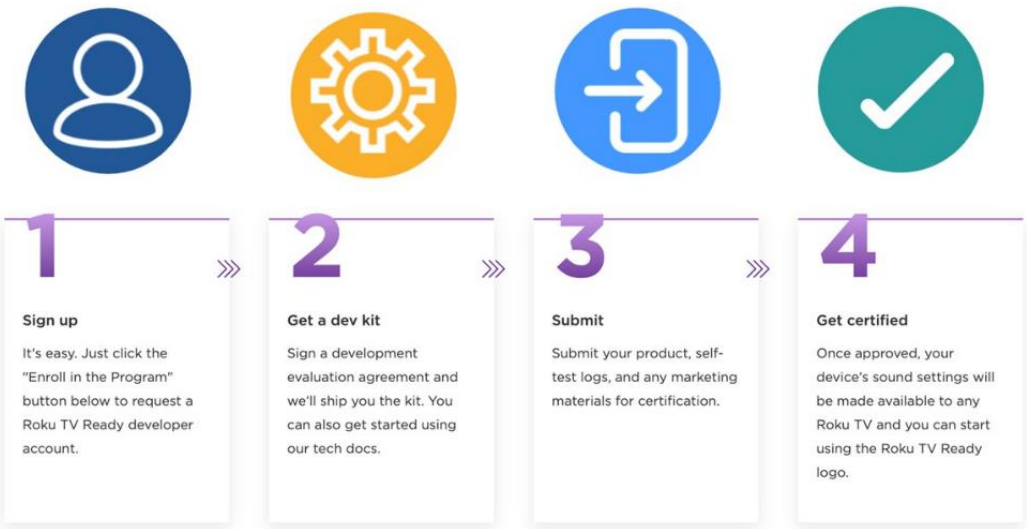
- When the user first plugs in a new soundbar to their Roku TV, the devices recognize each other and the user is offered the opportunity to configure them to work together. If the user accepts, the configuration information is exchanged automatically without the need for any further input from the user.
- Using the Roku TV remote, the user brings up the sound settings menu and can see and adjust the soundbar options; the Roku TV sends the new settings to the soundbar.
- The user uses a third party app to change sound settings on their soundbar; the UI on the Roku TV reflects the change.
- The user changes volume using the Roku TV remote; the Roku TV sends the volume change request to the soundbar which changes the output volume without the user needing to use the soundbar remote.
- The user changes volume using the Roku mobile app; the Roku TV sends the volume change request to the soundbar which changes the output volume without the user needing to use the soundbar remote.

Certification Process

This document and the accompanying RDK will have been received as a result of reaching an evaluation agreement with Roku. Before launching any products, a license agreement must be in place and the product must be certified by Roku.

Process Summary

Our RTVR certification portal enables partners to complete the process in just a few steps as seen below.



Note: The development kit is only applicable to the new partner who conducts RTVR development and testing with one set per partner. Additional applications will be communicated and approved case by case.

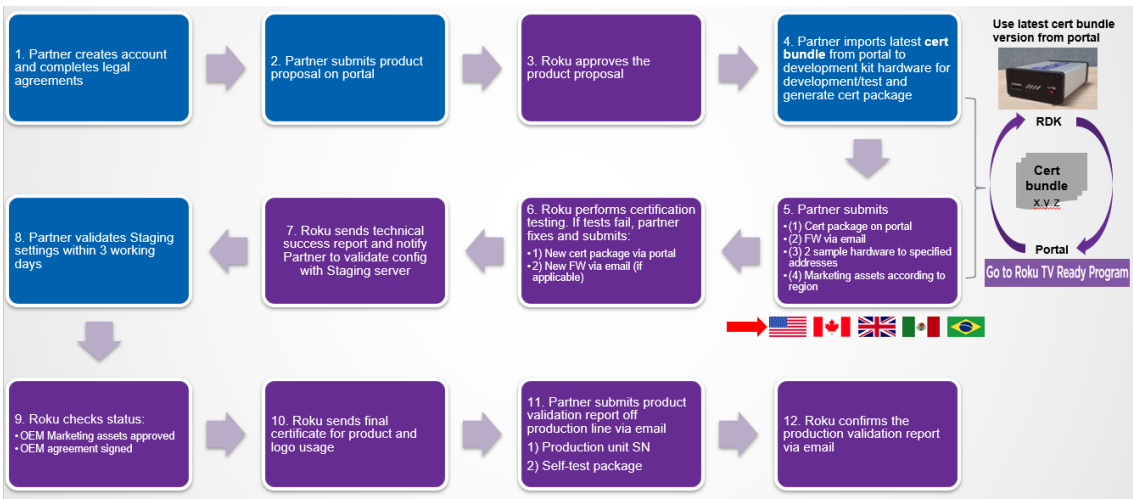
Requirements for Certification

Partners must complete the below items in order to fulfill the requirements for the RTVR certification process.

Note: A Roku TV Ready Logo License agreement is required in order to submit your product for certification. This agreement is done offline from the Developer Portal.

Process Overview

A more detailed overview of the certification process is outlined below.



1. Partner Creates Account and Completes Legal Agreements

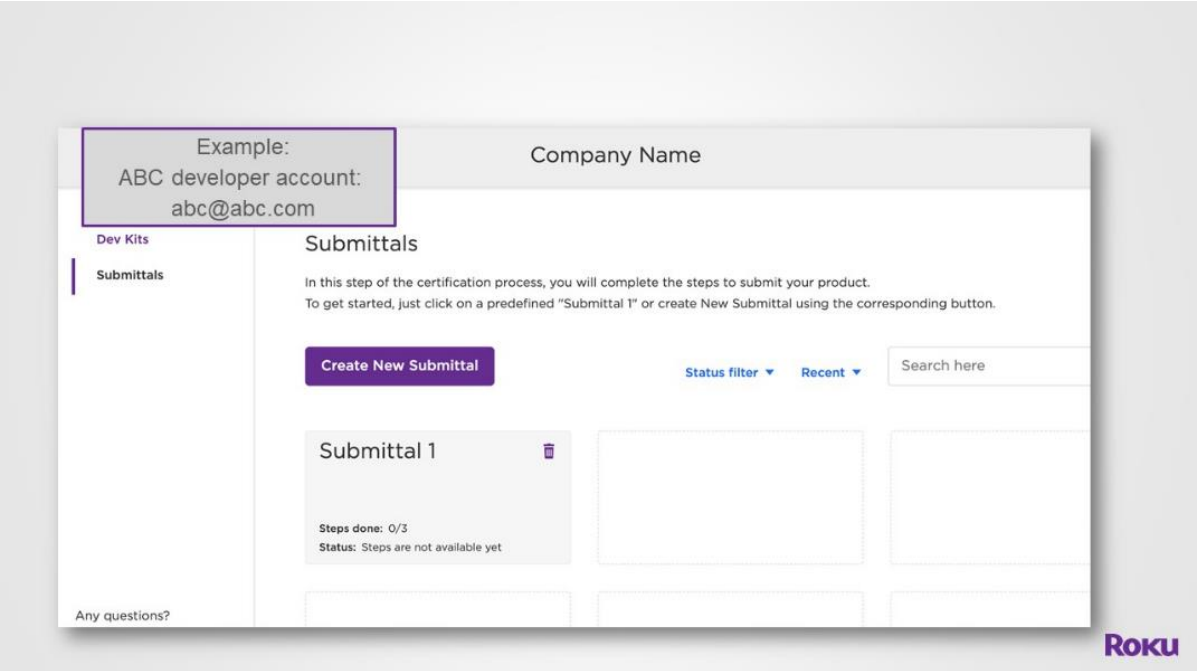
The first step in the certification process is to create an account on the Roku TV Ready Developers portal with the following steps:

1. Create a general Roku account here https://my.roku.com/signup
2. Log into the general Roku account

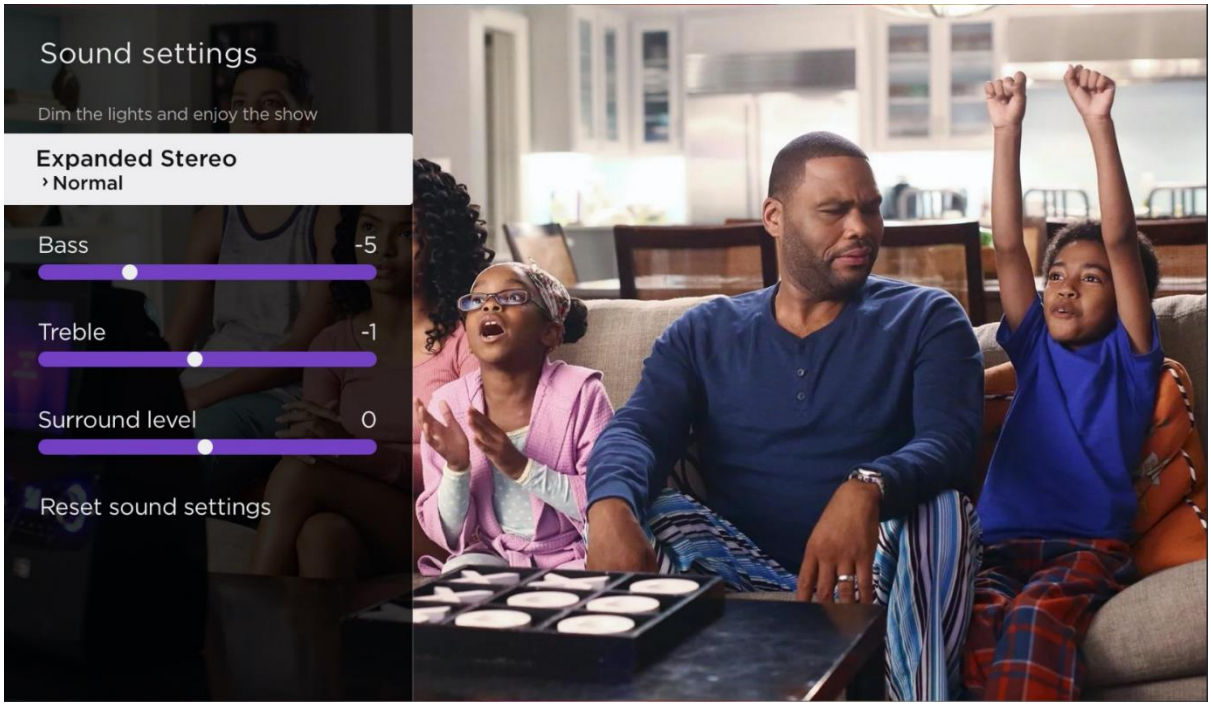
3. Then request a Roku TV Ready developer account here: https://developer.roku.com/rokutvready/overview
    1. Click the 'Enroll in the Program' button
    2. Fill in the contact info and submit it. A Roku admin will review and approve your application.

2. Partner Submits Product Proposal on Portal

Submit the product proposal via the Roku TV Ready Developers platform using the "Create New Submittal" button under "Submittals". Roku will review the product proposal, considering desired certification & launch schedule, and adherence to the RokuTV Ready UI guidelines.



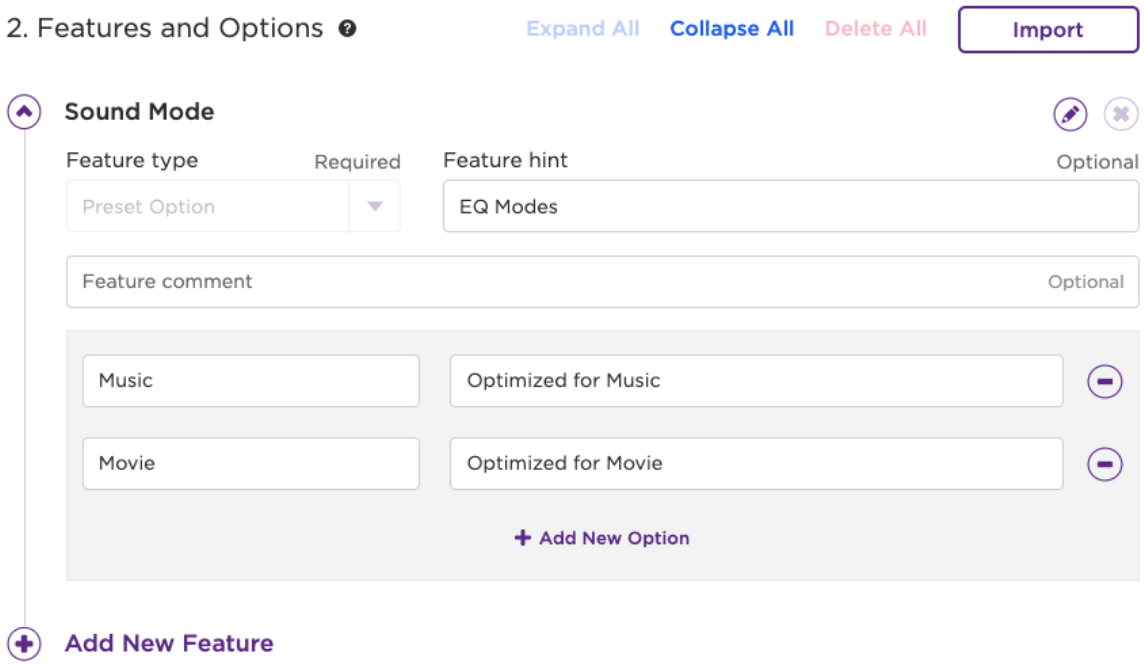
Features and options are submitted in a table format, as shown below. Please note, on the Roku TV the options will be presented to the user in either pop-over widget, that wraps around when it reaches the bottom/top or slider view to simply adjust numeric values.



For advanced setups the partner should provide product UI spec and remote-control buttons illustration to Roku for full evaluation. For instance, changing one option impacts other features (i.e., Selecting "Soundmode" as Bass Boost would change the bass slider) or hiding settings in some configurations.

The features and options entered in the portal must be in English, but if the product is certifying in additional regions, the translated versions could be submitted via the RDK.

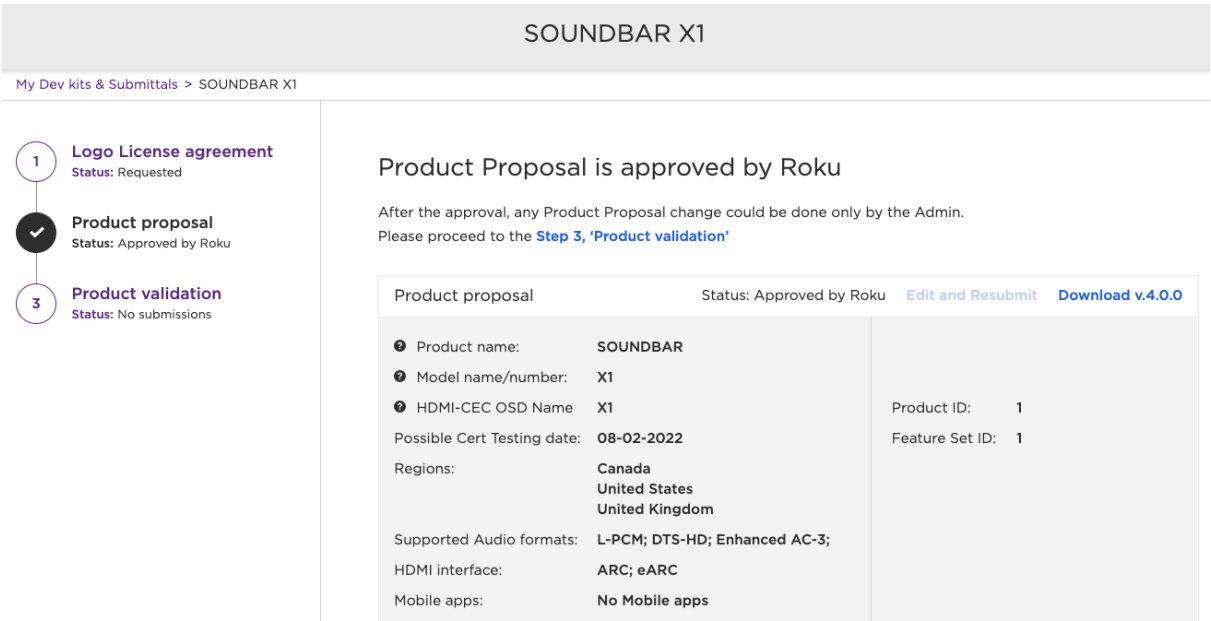
Please follow a similar order to the below example. Note that pressing ‘up’ on option 0 will jump to the last option on the list.

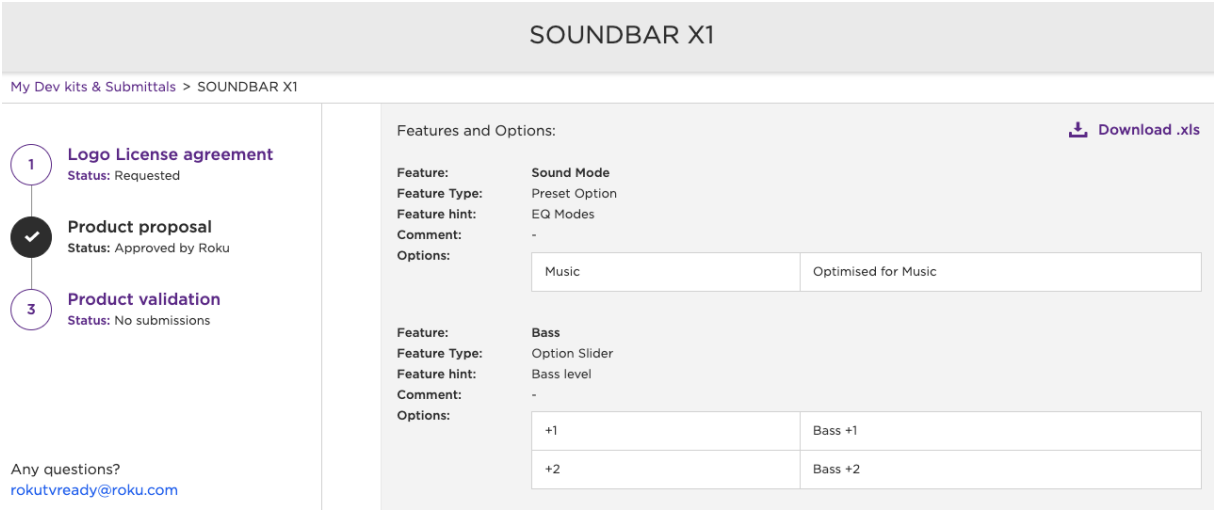


3. Roku Approves the Product Proposal

Each new product will be issued with a unique product ID and it is required that the product identifies itself over Roku TV Ready using this identifier. Depending on the feature set to be exposed, Roku will specify the feature set ID to be used. This may be a new feature set ID or may be an existing feature set ID used by the same product family.

The Partner will receive an email notification once Roku approves the submitted product proposal with IDs allocated. Then partners can access the portal https://developer.roku.com/rokutvready/overview to download cert bundle of approved product config.





4. Partner imports latest Cert Bundle from Portal to Development Kit Hardware for development/test and generates CERT Package

A development kit (RDK) that is shippable worldwide will be sent to provide soundbar developers the complimentary license and tools to develop a Roku TV Ready certified soundbar. The RDK must be requested via the Developer Portal, and reception of it must be confirmed via the Portal as well. The RDK simulates plugging into a Roku TV and all the certification tests are built-in and accessible through a web browser.

The Partner must download the latest cert bundle from the portal to do development and test using the RDK. Any changes related with product config must be approved by Roku via Portal and will be reflected in a new version of cert bundle made available from the portal. The Partner will receive an email notification from the portal about the new cert bundle download, which is mandatory used in next submission.

The changes may come from:

- Partner introduces product config changes to the RDK, like importing aligned feature set translations to support multi regions, or CEC OSD name change etc. The changes should be fully communicated with Roku before adoption.
- Roku admin edits product config data from the Portal end

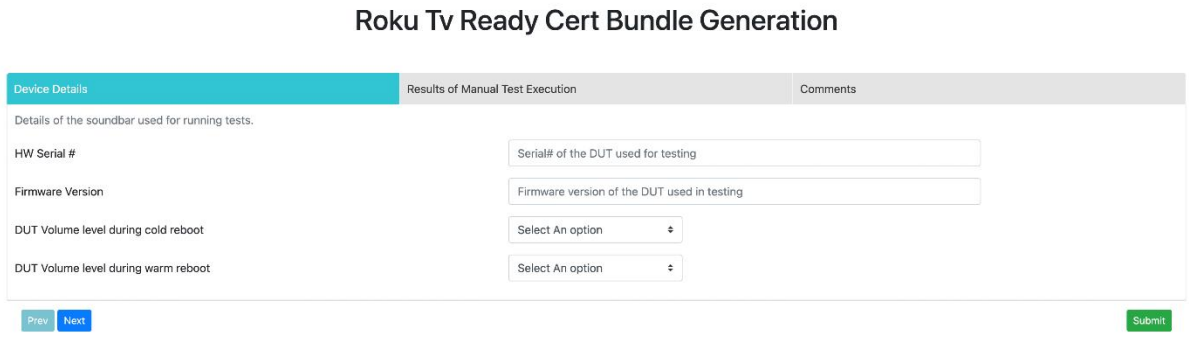
It is recommended for the partner to run manual test with a Roku TV before cert package submission. The manual test result can be submitted via the RDK cert package generation.

Read more about the development process in the Development Process section.

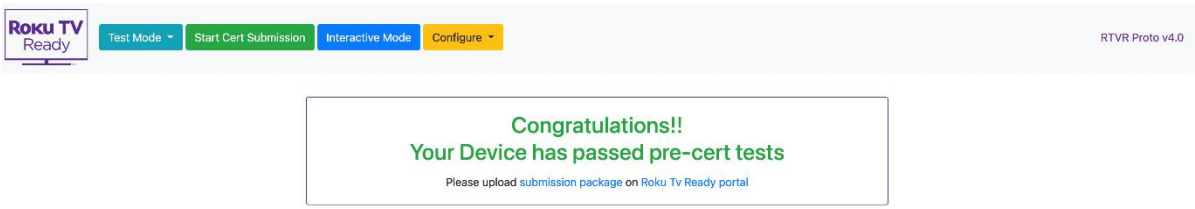
5. Partner Submits Cert package on Portal, FW via email, 2 samples of hardware and Marketing Assets According to Cert Region

Once the Partner implements the RokuTV Ready protocol on the product, the certification submission is initiated by pressing the "Start Cert Submission" button in the RDK (read more about the RDK in Overview of Development Process section). This will run all the necessary tests and collect the logs and configuration data. In addition, it will prompt for the

information that will be needed to safelist the product, including the final product name and help URL that will be shown to the end-user via the RokuTV UI. A Wizard will also let you mark the status of Manual Test case execution.

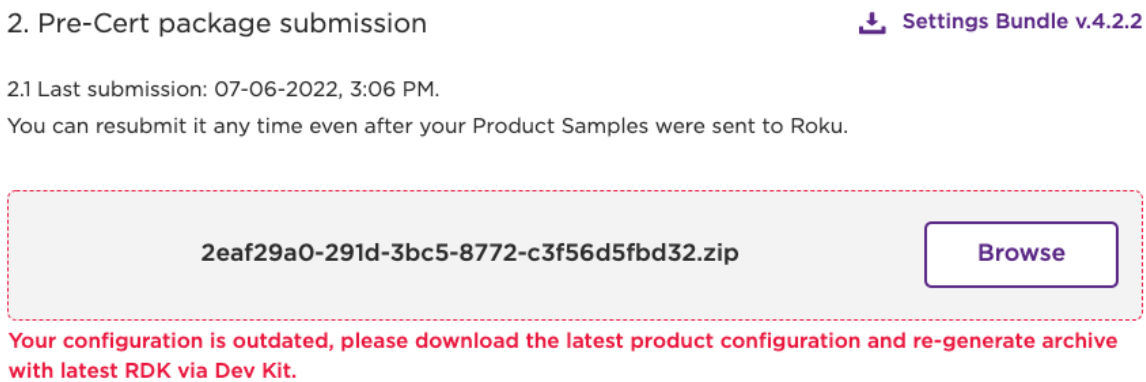


The tool will create a compressed file containing all the information which can be downloaded from the tool and then uploaded to the Roku TV Ready developer's portal.

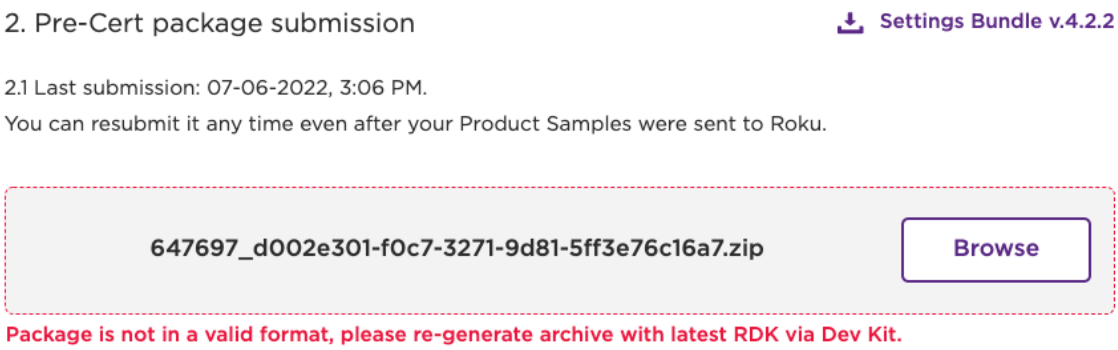


The following errors might be met during the upload.

- If the Partner has uploaded a pre-cert package with outdated bundle, the below error will be seen to remind to download the latest cert bundle from the portal and re-generate a new pre-cert package.



- If the Partner has uploaded unrelated or manually edited pre-cert package, below error will be seen and partner should re-upload the pre-cert package originally generated through the RDK without any modification.



Roku will need at least two sample hardware units to test, which must be clearly labeled with the allocated Product ID, as well as the model name. If there is any special flash tool used to upgrade FW, it should be shipped along with test samples. The shipping address will be advised in response to the certification request. The FW for the products used to generate the cert package must also be submitted via email to Roku. Please note that only the final MP FW must be submitted to Roku for testing. Along with the FW image, partners should provide a clear FW upgrade procedure, FW version check and factory reset instructions.

All marketing assets corresponding to the certification region must be submitted to Roku for review and approval **at least 4 weeks ahead of the intended marketing approval date**. For more information on the requirements per region, please see the "Docs" menu in the RTVR developer's portal https://developer.roku.com/rokutvready/docs.

6. Roku Performs Certification Testing

For each product submission, partners are requested to provide the following dates.

- Mass Production Firmware (MP FW) Date
- Press-Announcement Date
- On Shelf Date

For your technical RTVR certification, Roku will take into consideration your product MP date and slot availability and allocate time slots accordingly. Please note that due to the high volume of certification requests, it is possible that there are no time slots available prior to your intended MP date if this is too short notice, and your schedule will need to be modified. Also please be advised that **the RTVR technical certification process must start a minimum of 6 weeks prior to the intended MP FW date** as this is the shortest possible duration for completing the certification process.

-
    - Roku will pre-allocate 3 time slots, every second week, for testing your product. You will receive an email with the proposed slots, to which you are required to **reply within 3 working days to confirm**. If we do not receive your confirmation, these time slots will become available for other certifications, following which Roku will provide you with the next available time slots.

- If the required FW, cert package or any other item needed for testing by Roku is not submitted by the time slot allocated, this slot will be dedicated to another product's testing and you will be notified of the next available time slot.
- If you are aware of any delays in advance, **please notify Roku as soon as possible** so that we can re-allocate your existing time slot, and provide a new one according to your updated schedule.

Kindly note that the RTVR technical certification process kicks off only once:

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- 2 product samples have been received
- Instructions of FW version check and factory reset have been provided
- The following has been completed on the RTVR developers portal:
  - The product proposal has been submitted and approved by a Roku admin.
  - The first pre-cert package for the product has been generated by the partner (using the RDK) and submitted.

Please see the below table with an overview of the typical cert process.

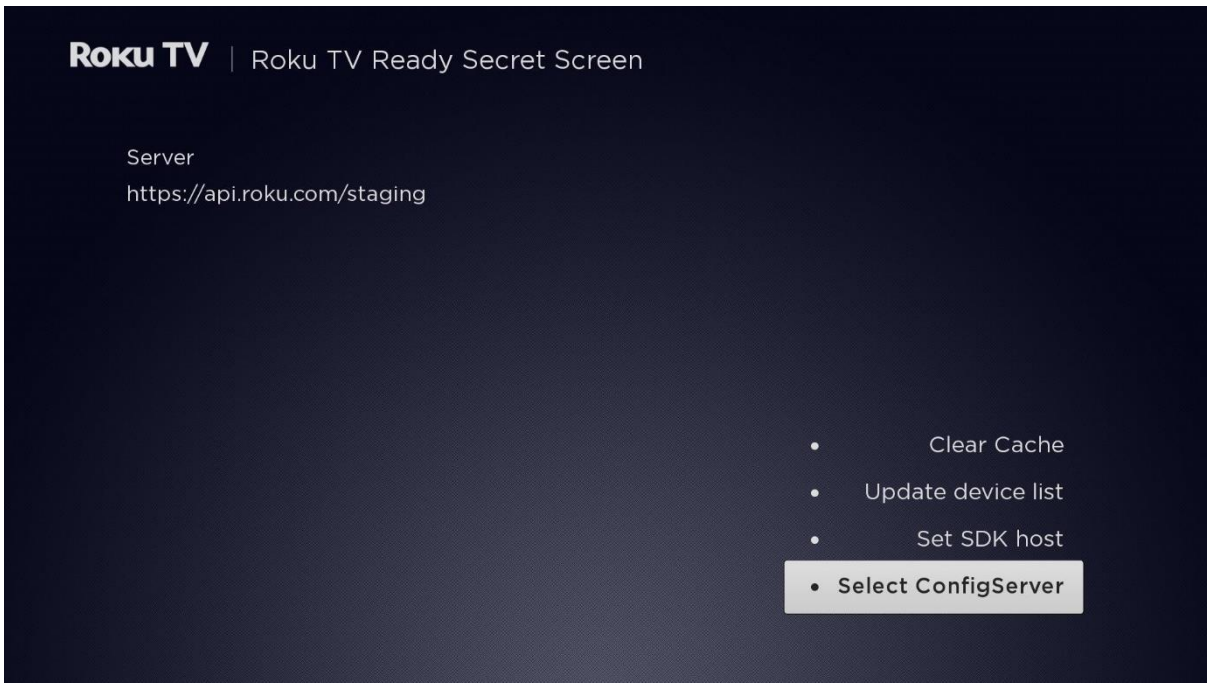
No.	Task	Details		Duration (Days)	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	
1	**Round 1**	**Description**	**Dependency**								
1.1	Roku Testing - Slot 1	Roku conducts the first cycle of testing and reverts to partner with success report or any bugs that may require fixing.	Product Samples, FW, and Cert package	5	Roku						
2	**Round 2**										
2.1	Partner Develops and submits new FW	Partner modifies the FW with bugfixes for issues reported, and provides Roku with the new FW and a new Cert package generated with the RDK and the updated FW.	Feedback from Roku on bugs requiring fixing	5		Partner					
2.2	Roku Re-testing - Slot 2	Roku conducts the second cycle of testing and reverts to partner with success report or any bugs that may require fixing.	FW with bug-fixes and instructions to flash + new cert package received by Roku	5			Roku				
3	**Round 3**										
3.1	Partner Develops and submits new FW	Partner modifies the FW with bugfixes for issues reported, and provides Roku with the new FW and a new Cert package generated with the RDK and the updated FW.	Feedback from Roku on bugs requiring fixing	5				Partner			
3.2	Roku Re-testing - Slot 3	Roku conducts the last (expected) cycle of testing and reverts to partner with success report.	FW with bugfixes and instructions to flash + new cert package received by Roku	5					Roku		
4	**Roku Product Publishing, & Partner Post Release Testing**										
4.1	Roku product publishing	Roku publishes the product to the cloud*. Partner then tests and validates the published settings within 3 working days.	*All requirements for RTVR are met.	2						Roku	
4.2	Partner post-release testing	Partner tests and validates the published settings within 3 working days.		3							Partner

7. Roku sends Success Report and notifies Partner to validate Product Config with Staging Server

After the product passes certification test, Roku will send a success report to the Partner and publish the product configuration to Staging server for partner to do verification test.

8. Partner validates Staging Settings within 3 working days

Once gets the notification, the Partner is requested to perform verification tests with a whitelisted Roku TV (Steps refer to Whitelist RokuTV) **within 3 working days** and revert test result to Roku as confirmation of the product configurations. Any issues are reported to Roku will get quick support within this time period after publishing.



9. Roku Checks Status of OEM Marketing Assets Approved and OEM Agreement Signed

The marketing assets must be approved and OEM agreement for request regions must be signed to achieve the complete certification.

10. Roku sends final certificate for product and logo usage

Roku will send a certificate to the Partner confirming that the products have been certified with RTVR. Roku will only publish product settings to the cloud if legal, marketing and technical requirements for RTVR are met and the Logo License Agreement has been signed.

11. Partner Submits Validation Report off Production Line to Roku via Email

Once the certified FW is rolled into production, the Partner should send a validation report with the production sample via email, including following data:

- Production batch, serial number of test unit
- RDK self-test package from production line

12. Roku Reviews the Production Validation Report via Email

Roku will review the validation report of production sample and confirm the certification process is completed via email.

Post Certification

Please see the section below for post-certification requirements and procedures.

Updated FW

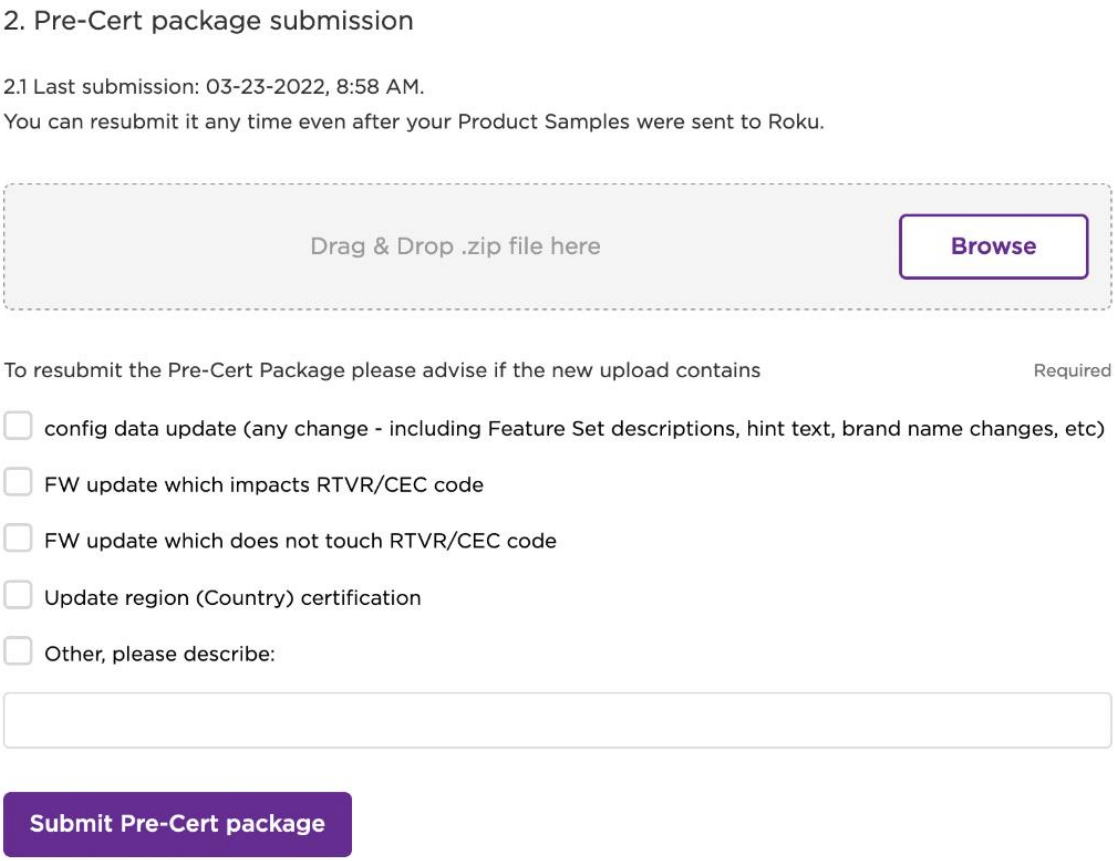
Updated FWs for RTVR certified products that are targeting customer release must be submitted to Roku, along with the results of a new pre-cert test from the RDK. The RDK used to validate the FW update shall at least be the version that was originally used to certify the product.

- If there are material changes in the RTVR integration (power mode management, source switching, CEC behavior), then the FW and cert bundle must be submitted two weeks prior to public/customer release for testing.
- If there are no material changes in the RTVR integration, then it is not required to share the FW and cert bundle prior to releasing to the public, but within a maximum duration of one week after the release.

For any updated FW re-certified or approved by Roku, the version will be added to the version history of the product certificate issued. If the new FW will be rolled into production, it is required to submit a validation report with a production sample using RDK within one week.

To submit the updated FW and cert bundle:

- Send the new FW via email, along with flashing instructions and a changelog.
- Generate and upload the new pre-cert package using the updated FW, and choose the relevant reason from the options provided below or specify another reason.


2. Pre-Cert package submission
2.1 Last submission: 03-23-2022, 8:58 AM.
You can resubmit it any time even after your Product Samples were sent to Roku.
Drag & Drop .zip file here
Browse
To resubmit the Pre-Cert Package please advise if the new upload contains
Required
config data update (any change - including Feature Set descriptions, hint text, brand name changes, etc)
FW update which impacts RTVR/CEC code
FW update which does not touch RTVR/CEC code
Update region (Country) certification
Other, please describe:
Submit Pre-Cert package

Updated Config

If any of the RTVR configurations are changed please generate and upload the new pre-cert package with the updated config, and upload the package to the portal, specifying the relevant reason.

Roku reserves the right to retest in the case of an FW update that impacts RTVR/CEC code, or updated RTVR configs, and will notify the partner if chosen to do so.

Re-certifying with the latest RDK version

It is not a requirement that currently certified RTVR partners re-certify with the newest RDK version, but it is recommended as it enables access to the new features added. The process requires that developers update the RDK with the newest version (available on the portal), generate a new pre-cert package, and upload that package to the portal for Roku to review.

Protocol

Standard CEC Messages

The following standard CEC messages must be supported.

Vendor ID

```
<GiveDeviceVendorID>
<DeviceVendorID>
```

System Audio Control

```
<Give Audio Status>
<Report Audio Status>
<Give System Audio Mode Status>
<System Audio Mode Status>
<Set System Audio Mode>
<System Audio Mode Request>
<Request Short Audio Descriptor>
<Report Short Audio Descriptor>
```

Remote Control Pass Through

```
<User Control Pressed>
<User Control Released>
```

Soundbars are required to support at least the `VolumeUp`, `VolumeDown` and `Mute` user operations.

System Standby

```
<Report Power Status>
<Standby>
```

Device OSD Name Transfer

```
<Give OSD Name>
<Set OSD Name>
```

DALS

```
<ReportCurrentLatency>
```

Roku TV Ready Messages

Messages specific to Roku TV Ready are defined as sub-operations of the standard <Vendor Command With ID> message, using the Roku OUI 8AC72E.

All Roku TV Ready messages have the same CEC <Vendor Command with Id> prefix:

Start byte	Length	Meaning	Example Values
0	1	[CEC] Source and destination	0x05: TV → RTVR device
1	1	[CEC] Vendor Command with Id	0xA0
2	3	[CEC] OUI	0x8AC72E

Extended Ids

The ID's for Product and Feature use extended ID's. So can use one or two bytes, ensuring a range of 0-16383.

The encoding uses a variable length encoding https://en.wikipedia.org/wiki/Variable-length_quantity

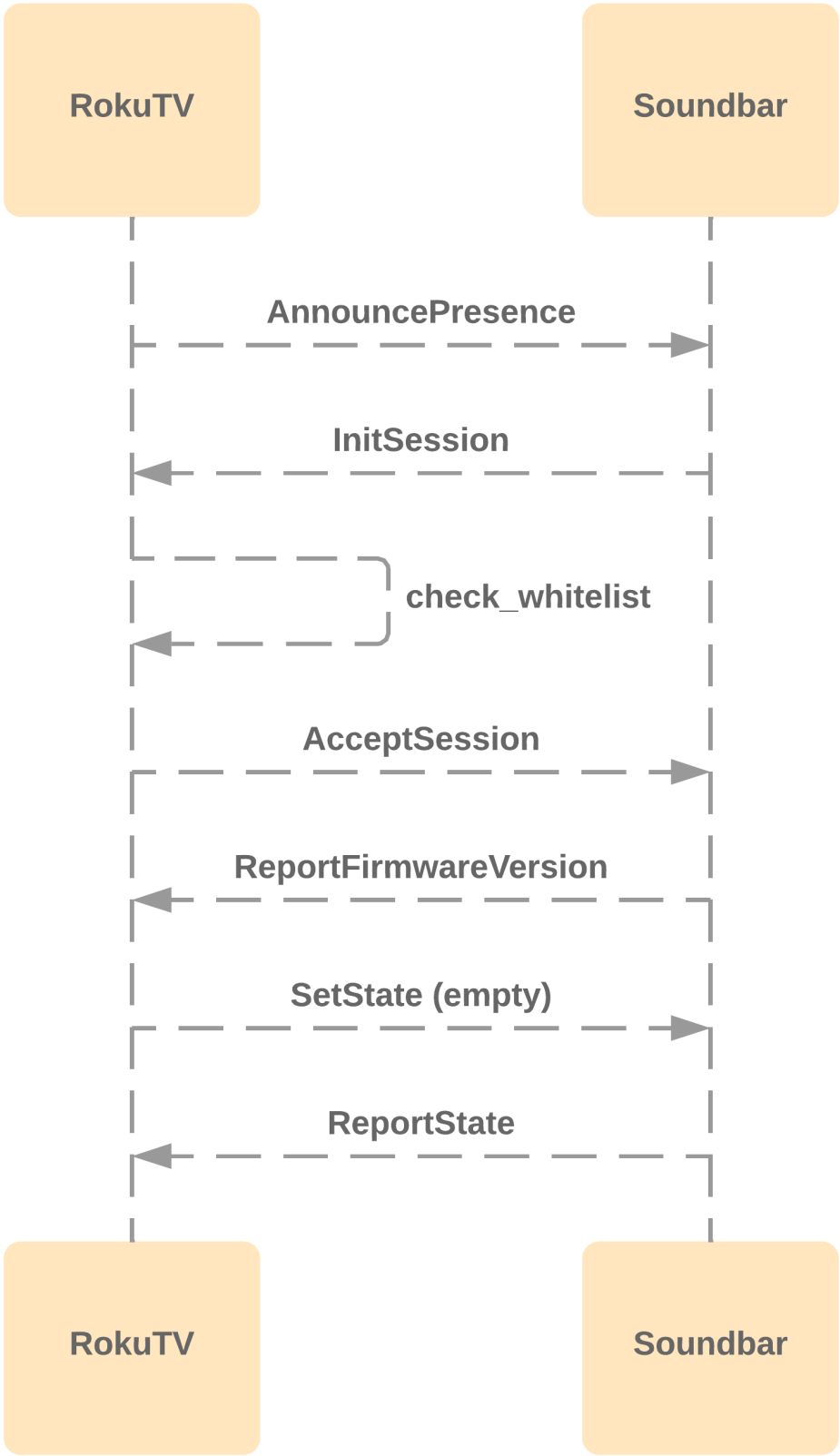
For the messages that contains Ids this means that there might be fewer bytes available in the CEC message for DeviceId (InitSesstion, ResetSession, UnsupportedVersion) and StateVector (SetState, ReportState). DeviceIds can be truncated, for the StateVector in Report/Set State messages it means that fewer settings are possible, i.e. 16 instead of 18 (each setting takes up four bits).

NOTE: Devices running on protocol version < 2.0 use one byte for ID's, limiting the range to 0-255.

Initial Handshake

When the user first plugs in a new RTVR device, the Roku TV will initiate the handshake sequence, checking the device against the safelist and the list of known devices and then display the setup screen.

When the device is next powered on, the Roku TV will recognize the serial number and re-synchronize the state of the configuration options.


RokuTV
Soundbar
AnnouncePresence
InitSession
check_whitelist
AcceptSession
ReportFirmwareVersion
SetState (empty)
ReportState
RokuTV
Soundbar

AnnouncePresence

This message is sent by the Roku TV to indicate that Roku TV Ready is available when it detects a compatible device has been plugged in. Any existing Roku TV Ready session should be assumed to have been torn down and no messages other than `InitSession` should be sent until an `AcceptSession` message is received. The version announced is the highest possible version the Roku TV supports.

Example: `[0F A0 8A C7 2E] 10 08`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x10: `AnnouncePresence`
6	1	Protocol version	0x08

InitSession

This message is sent by a RTVR device to the Roku TV to request a session. The device serial number in the message will be used to check that the device is an approved device. No messages should be sent until an `AcceptSession` message is received. The protocol version in the message must be the protocol version that the device is certified for.

Example: `[50 A0 8A C7 2E] 11 08 02 08 09 0A 0B 0C 0D 0E 0F`
Example: `[50 A0 8A C7 2E] 11 08 FF 7F 08 09 0A 0B 0C 0D 0E`

Start bytes	Length	Meaning	Example Values
5	1	Subopcode	0x11: `InitSession`
6	1	Protocol version	0x08
7	1 or 2	Product ID assigned by Roku	• 0x02 • 0xFF 0x7F (extended product id)
8 or 9	8 or 7	Device Serial number	• 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F • 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E (when extended product id is in use there is only room for 7 bytes device id)

AcceptSession

This message is sent by the Roku TV to a RTVR device to indicate that the device is approved, and that the accepted session is running at the protocol version returned.

Example: `[05 A0 8A C7 2E] 12 08 01 02 03 04 05 06 07 08 09`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x12: `AcceptSession`
6	1	Protocol version	0x08
7	9	Roku TV serial number for logging purposes	0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09

Protocol versioning

The version byte is interpreted as a Major and minor version packed with 5 bits for the Major version and 3 for the minor version. Major versions signifies new functionality in the protocol, whereas minor versions will be used for patch releases.

Values for the currently release versions

Byte	Bits	Major	Minor
`0x01`	`00000 001`	0	1
`0x02`	`00000 010`	0	2
`0x08`	`00001 000`	1	0
`0x10`	`00010 000`	2	0
`0x18`	`00011 000`	3	0
`0x20`	`00100 000`	4	0

Protocol version negotiation

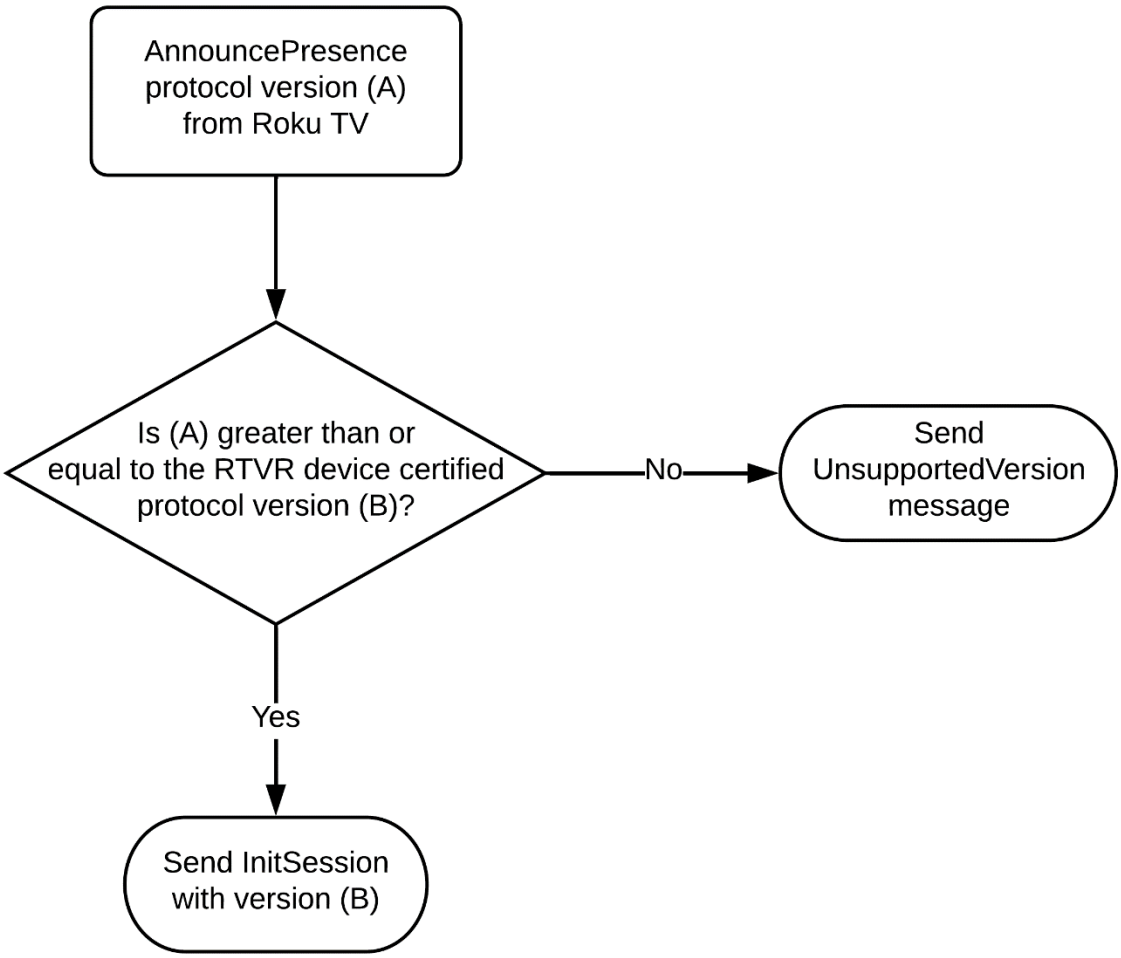
The protocol version to be used in a particular session is negotiated through the handshake. The Roku TV starts by sending the highest version number (A) it supports in the AnnouncePresence message, next the RTVR device shall send the InitSession message with the protocol version (B) it is certified with when (B) is less than or equal to (A). If is (B) is greater than (A) the RTVR device it shall send the UnsupportedVersion message.

Examples:

- If the soundbar is certified for 3.0 and the TV sends out AnnouncePresence message with 4.0 as protocol version, the soundbar should respond with InitSession 3.0.
- If the soundbar is certified for 4.0 and the TV sends AnnouncePresence message with 3.0, the soundbar should respond with UnsupportedVersion.

The Roku TV will complete the protocol version negotiation by returning the protocol version that must be used for the session in the AcceptSession message.

To summarize this means that it is possible to start a session with a lower or equal protocol version, but not a higher, than announced by the Roku TV.



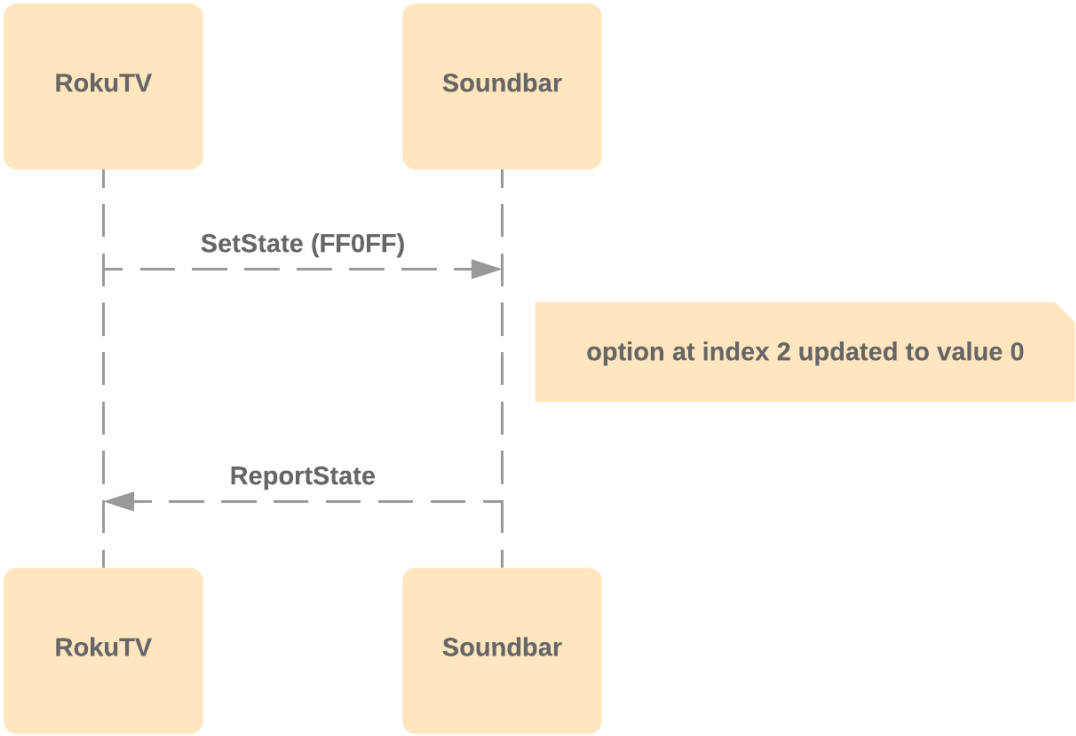
Option Synchronization

Options are grouped into feature sets. Each device supports exactly one feature set, and the same feature set can be reused across multiple devices. A feature set can contain a maximum of 18 options, however Roku recommends up to 8 options to fit them on a single screen without the need to scroll.

When the user displays the sound settings on the Roku TV, an empty SetState message will be sent to the device. The device must respond with a ReportState message with the current state of all the options. The value `0xF` can be used to indicate that an option from the feature set is currently unsupported on the device. This will cause the option to be hidden from the Roku UI. This is useful for options that should only be available if the device is in a certain state, or has optional peripherals like a subwoofer connected. There is one exception to this

rule: the mandatory `"soundmode"` option may not return `0xF`, as it always has to be supported.

When the user changes an option on the Roku TV, a `SetState` message will be sent to the device indicating the new value of the changed option and a value of `0xF` for all other options that have not changed. The device must respond with a `ReportState` message with the resulting state of all the options. This allows for both the case where the user's exact choice cannot be achieved and the case where changing one option affects one or more other options.



The device must also send `ReportState` messages when options are changed through some other mechanism, such as the device's native user interface.

Option Format

Options are encapsulated in a feature set and can be edited through the configuration menu of the RDK described in section ***UI Testing Interface***. This feature set definition is also part of the information that is provided to Roku during product certification.

The feature "title" is the text presented to the user, and the "hint" is the description of the feature. It is recommended to keep title and hint texts as short and precise as possible, and they must in no case be longer than the maximum limit.

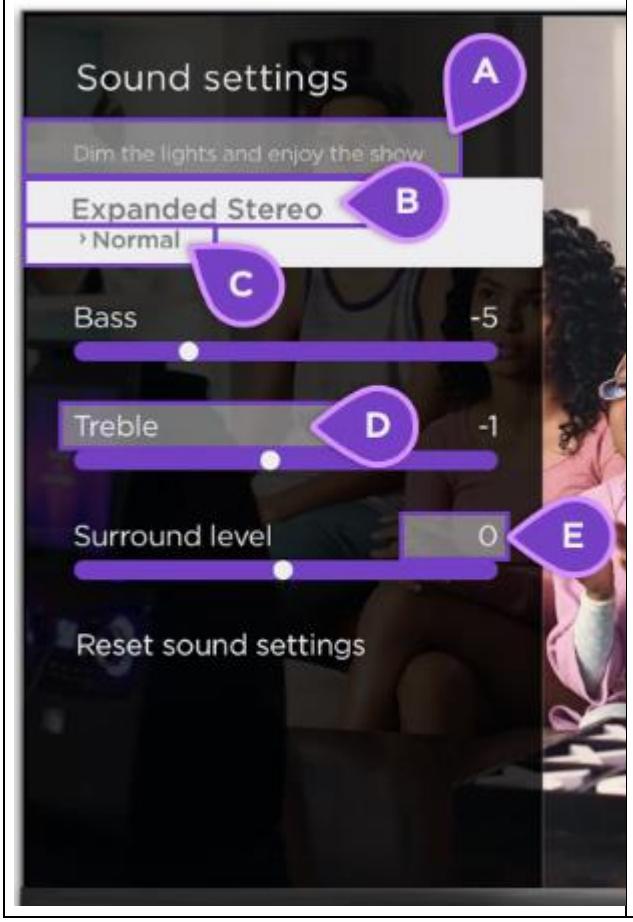
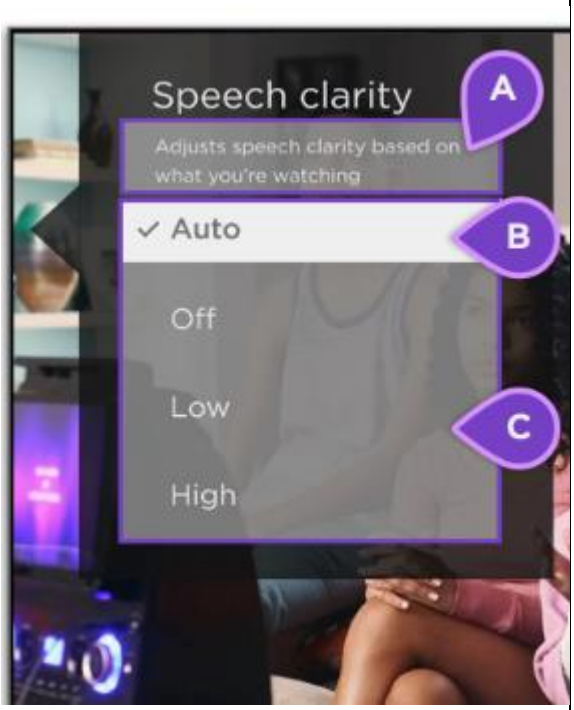
The option "title" is the text that is presented to the user as the selectable option, and "hint" is the text that is presented to the user as a detailed description of the option.

The "type" is describing how the settings is presented to the user, either as a popover list or as a slider.

Note that currently '.' is not supported in the strings of 'title' otherwise, it can not be imported to RDK for testing.

Character limits

Each element on the screen has a character limit, depending on where it is displayed.

General	Popover detail
	

For the options of the type 'Popover' the following string lengths apply:

Popover	Field	Limit	Shown
Setting			
	"title"	30	B - General "top" - Popover detail
	"hint"	40	A - General
Option			
	"title"	15	C - General B - Popover detail
	"hint"	40	A - Popover detail

For the options of the type 'Slider' the following string lengths apply:

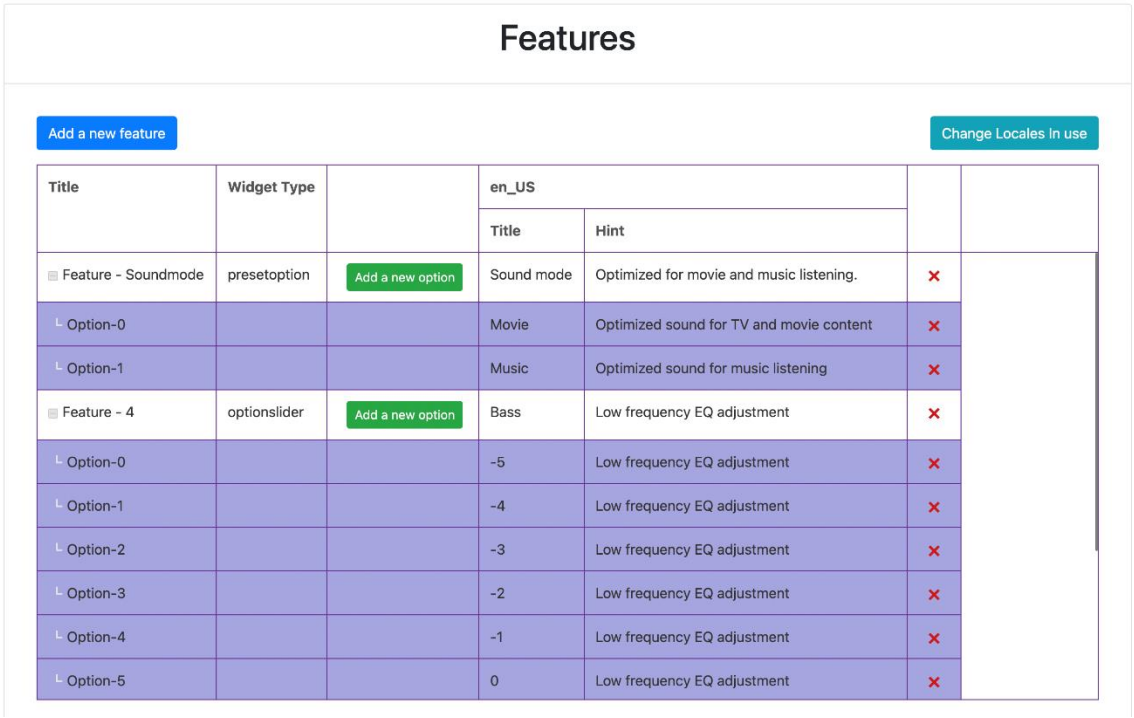
Slider	Field	Limit	Shown
Setting			
	"title"	20	D - General
	"hint"	40	A - General
Option			
	"title"	6	E - General
	"hint"	40	Not shown

As an example, let us use a soundbar exposing the following two features:

"Sound mode", which can be *Music* or *Movie*

"Bass" which can be a value between -5 and +5 and uses a slider.

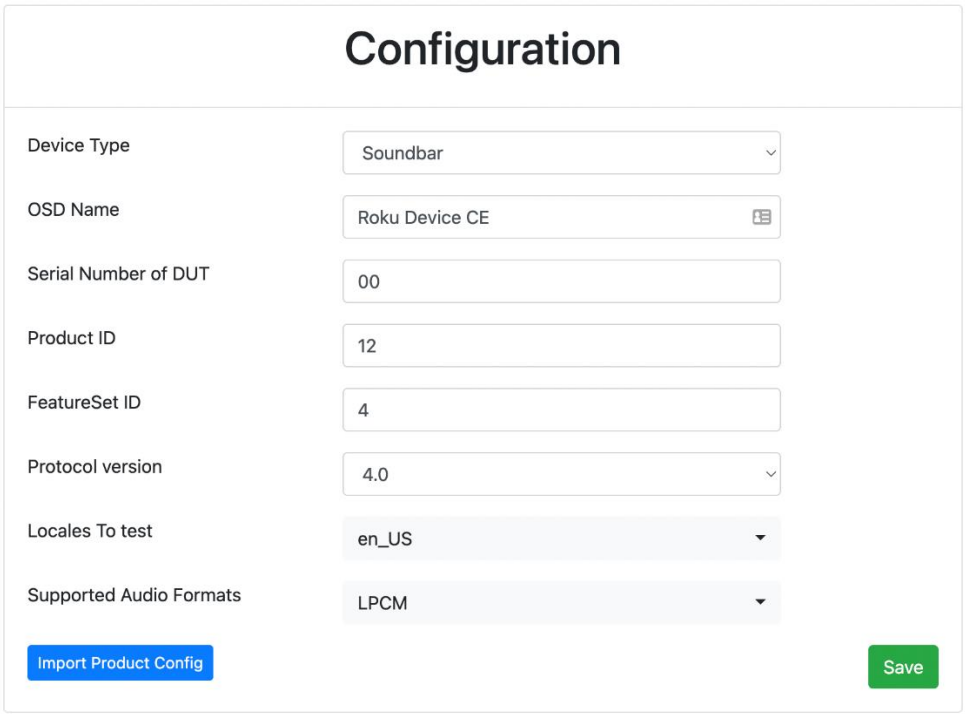
The features are described in the RDK UI:



Feature ID

A feature set id is a unique number that is allocated by Roku as part of the certification process, please see that section for further details.

Roku allocates a feature set id, "4" in this example.



Mandatory Feature

The first feature in the list "Sound mode" will be treated as the primary audio option for the device. The title of the feature may be different from "Sound Mode", but it is crucial that this is the first feature in the list. In the example below, the sound mode feature is titled "EQ Modes".

Option Order

The options of a feature will be presented to the user in a popover, that wraps around when it reaches the bottom/top.

Option Range

Each option is communicated in a nibble (4 bits), giving 15 options as `0xF` is a reserved value for "unsupported on this device".

For features that have a range of options, they shall be adapted to a maximum of 15 options and use the widget type *slider*.

Numerical options shall be used with the same value increments per step to give a continuous sequence. It is recommended to order options for a slider in the ascending order (eg -5 to 5 in the example above)

SetState

This message is sent by the Roku TV to an RTVR device to change a subset of the options in a feature set. Each option in the feature set is represented in sequence by the next nibble, giving 15 possible values for each option. the value `0xF` is reserved to mean 'unchanged'. A short form of the message containing only the subopcode (0x30) can be sent to request the current state.

Implementations **must** ignore and discard any unexpected trailing nibbles, irrespective of what value they contain.

If a message contains fewer option values than expected, implementations **must** accept the message and treat the missing values as if they were present and set to `0xF`.

When SetState is used by the Roku TV to poll the current state of the device, then the message will be empty, ending at byte 5, i.e. both feature set id and option values are not set.

After applying any changes the device **must** always respond with a `ReportState`, providing the currently used feature set ID and state of all options.

Example: `[05 A0 8A C7 2E] 30`
Example: `[05 A0 8A C7 2E] 30 01 F1 F0`
Example: `[05 A0 8A C7 2E] 30 01 F1`
Example: `[05 A0 8A C7 2E] 30 FF 7F F1`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x30: `SetState`
6	0, 1 or 2	Feature set ID, allocated by Roku	• <empty>: Not set if SetState is used to pull state of RTVR device • 0x01: Example feature set with 3 options • 0xFF 0x7F: Example of extended feature set ID
7 or 8	0, up to 8 or 9	Option values, packed into one nibble per value	0xF1 0xF0: • option 0 → unchanged • option 1 → set to 1 • option 2 → unchanged • Last nibble ignored. 0xF1 • option 0 → unchanged • option 1 → set to 1 • option 2 → unchanged <empty> • Not set if SetState is used to pull state of RTVR device (feature set ID is empty) • RTVR must reply with ReportState with all options

ReportState

This message is sent by a RTVR device to the Roku TV to report the current state of all the options in a feature set, either in response to a `SetState` message, or as a result of a change through some other means such as the device's own user interface, remote control or mobile application. Option values are represented as described for `SetState` except `0xF` means the option is currently not supported.

`ReportState` messages **may not** be sent with <500ms intervals.

Implementations **must** set any trailing nibble in the last byte to `0xF`. The Roku TV will assume that any missing values according to the featureset definitions is set to `0xF` (not supported). This enables extending an featureset, without updating firmware on devices already in the field.

The message **must** always be the current and full state of the device.

Example: `[50 A0 8A C7 2E] 31 01 12 3F`
Example: `[50 A0 8A C7 2E] 31 01 1F 3F`
Example: `[50 A0 8A C7 2E] 31 FF 7F 1F 3F`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x31: `ReportState`
6	1 or 2	Feature set ID, allocated by Roku	• 0x01: Example feature set with 3 options • 0xFF 0x7F: Example of extended feature set ID
7 or 8	up to 8 or 9	Option values, packed into one nibble per value	0x12 0x3F: • option 0 → current value: 1 • option 1 → current value: 2 • option 2 → current value: 3 • Last nibble ignored. 0x1F 0x3F: • option 0 → current value: 1 • option 1 → disabled • option 2 → current value: 3 • Last nibble ignored.

Reset

This message is sent by a Roku TV to request the RTVR device to reset its settings to the default state. After the settings is changed to default the device must reply with a `ReportState` message.

The usage of a dedicated reset-message ensures that the default value can depend on the device, a soundbar with/without a subwoofer may have distinctly different default settings within the same featureset.

Example: `[05 A0 8A C7 2E] 33`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x33: `Reset`

ResetSession

This message is sent by either endpoint to reset the session and announce that it will not respond to any other messages until a new session has been established. It is intended as a last resort if either end detects an invalid protocol state which cannot be otherwise recovered.

- When sent by the RTVR device to the TV to indicate that a new handshake is needed, the TV will send a AnnnouncePresence message to restart the handshake.
- If the TV needs to re-confirm the handshake it will send AnnouncePresence as on previous protocol versions. If the TV sends ResetSession message to the RTVR device it means that the TV will not accept/handle any RTVR messages until a new handshake has been initiated by the TV.

Example: `[05 A0 8A C7 2E] 15 10 01 02 03 04 05 06 07 08 09`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x15: `ResetSession`
6	1	Protocol version	0x10
7	9	Roku TV serial number for logging purposes	0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09

UnsupportedVersion

This message is sent by either endpoint as a response to a session initialization, where the endpoint is unable to support the required protocol version. This is applicable in the following scenarios:

- The TV sends AnnouncePresence with protocol version N, but the Device is certified to version >N
  - This can occur if the customer has failed to FW update their TV to a FW that supports the protocol version that the Device is certified to. Can be remedied by FW update of TV
- The Device sends InitSession with protocol version N, but the TV has flagged that version as unsupported
  - This can occur if Roku flags the specific protocol version as unsupported, for example due to discovery of a critical security bug. Can be remedied by FW update of the Device to a supported protocol version.

Note that UnsupportedVersion must only be send to a TV which runs Protocol Version 2.0 or greater. If the Roku TVs protocol version is less than version 2.0 the RTVR device shall not respond.

Example: `[05 A0 8A C7 2E] 14 10 02 08 09 0A 0B 0C 0D 0E 0F`
Example: `[05 A0 8A C7 2E] 14 10 FF 7F 08 09 0A 0B 0C 0D 0E`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x14: `UnsupportedVersion`
6	1	Protocol version	0x10
7	1 or 2	Product ID assigned by Roku	• 0x02 • 0xFF 0x7F - Extended Product ID
8 or 9	7 or 8	Roku TV serial number for logging purposes	• 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F • 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E

Other Messages

ReportFirmwareVersion (Required since protocol version 4.0)

This message is sent by the RTVR device to the Roku TV and lets the device inform the TV of the firmware version it is running. The firmware version will be visible to the end user.

This message should be sent immediately after receiving the AcceptSession message.

Requirements to the version payload:

- The version **must** be encoded as ASCII characters
- **Must** be at most 10 characters log
- **Must** only be made up of printable characters (0x20 to 0x7E)
- **Must** be received by the Roku TV within 5 seconds of AcceptSession is received by the RTVR device.

Example: `[50 A0 8A C7 2E] 34 31 2E 38 2E 30`

Start byte	Length	Meaning	Example Values
5	1	Subopcode	0x34: ReportFirmwareVersion
6	10	ASCII character values of firmware version	0x31 0x2E 0x38 0x2E 0x30: "1.8.0"

Message table

Overview of the messages supported by the Roku TV Ready protocol.

	Subopcode	Payload	Notes	Direction	Reply	Introduced in version
0x10	AnnouncePresence	<Version:1byte>	The version is one byte an interpreted as 5 bits for major, 3 bits for minor version	TV→Broadcast	InitSession	0.0
0x11	InitSession	<Version:1byte> <ProductId:1-2byte> <DeviceId:upto 8bytes>	The ProductId is given by Roku at certification, and the version must only be the version the device was certified at	Device→TV	AcceptSession	0.0
0x12	AcceptSession	<Version:1byte> <Id:upto 9bytes>	This is returned when the Roku Device Accepts the session. The session will be handled as running the returned version. The Id can be used for logging purposes.	TV→Device	None.	0.0
0x14	UnsupportedVersion	<Version:1byte> <ProductId:1-2bytes> <DeviceId:upto 8bytes>	Can be sent by either one of the endpoints as a response to the session initialization, if it does not support the requested version.	Device→TV TV→Device	None	2.0

0x15	ResetSession	<Version:1byte> <Id:1-2bytes> <DeviceId:upto 8bytes>	Can be used by either one of the endpoints to reset the session	Device→TV TV→Device	TV re-starts handshake	2.0
0x30	SetState	Possible Empty | <FeatureSetID:1-2bytes> <StateVector>	If the featureSet matches the device featureset, the device should change settings according to the StateVector.	TV→Device	ReportState	0.0
0x31	ReportState	<FeatureSetID:1-2bytes> <StateVector>	The current and full state of the device according to the FeatureSet description	Device→TV	None	0.0
0x33	Reset	Empty	Device must set all settings to their default values	TV→Device	ReportState	1.0
0x34	ReportFirmwareVersion	<VersionString:up to 10 bytes>	The VersionString must a valid ASCII characters	Device→TV	None	1.0 (optional) Required from PV 4.0

Communication Example

Below is an example of messages send between a Roku TV (TV) and a RTVR device (Device) in a fictive session. The first three messages are the handshake. (S* in column two stands for 'Subopcode')

Message				Subopcode	From	To
CEC base	S*	Payload	Payload description			
[0F A0 8A C7 2E]	10	20	Protocol version: 4.0	AnnouncePresence	TV	All
[50 A0 8A C7 2E]	11	20 02 08 09 0A 0B 0C 0D 0E 0F	Protocol version: 4.0 Roku product ID: 2 Device S/N:08 09 0A 0B 0C 0D 0E 0F	InitSession	Device	TV
[05 A0 8A C7 2E]	12	20 01 02 03 04 05 06 07 08 09	Protocol version: 4.0 RTV S/N: 01 02 03 04 05 06 07 08 09	AcceptSession	TV	Device
[50 A0 8A C7 2E]	34	31 2E 38 2E 30	Firmware version: 1.8.0	ReportFirmwareVersion	Device	TV
[05 A0 8A C7 2E]	30			SetState	TV	Device
[50 A0 8A C7 2E]	31	01 12 3F	Feature set ID: 1 Option values: 1, 2, 3, Unsupported	ReportState	Device	TV
[05 A0 8A C7 2E]	30	01 3F FF	Feature set ID: 1 Option value: 3, Unchanged, Unchanged, Unchanged	SetState	TV	Device
[50 A0 8A C7 2E]	31	01 32 3F	Feature set ID: 1 Option values: 3, 2, 3, Unsupported	ReportState	Device	TV

System Experience Requirements

To provide a consistent experience for the customer with a Roku TV and Roku TV Ready audio device, there is a set of requirements for system behavior that must be met.

Power mode transitions

Consistent system behavior on power-on shall focus on Roku TV as the input if the TV is on, while providing the ability for headless playback on the audio device while the TV is off.

When the soundbar powers on, its power state and input source depend on the TVs power state and last used input. The table shall be read as:

- If the TV is *(TV power state)* and the device is *(Device power state)*, if the last input on the device was *(Last device input)*, the device shall power to *(Expected device state)* and be set to input *(Expected device input)*

TV power state	Device power state	Last device input	Expected device state	Expected device input
On	Powering on	Any	On	ARC
Off	Powering on	Any	On	Last device input
Powering on	Off	Any	On	ARC
Powering on	On	Any	On	ARC
Powering off	On	ARC	Off	None
Powering off	On	not ARC (Bluetooth, AUX etc)	On	Last device input

When powering on, if the device input is ARC, audio shall be audible no later than 30 seconds after power-on.

System Audio Mode

In order to provide an optimal user experience, it is recommended that the soundbar keeps system audio mode switched on at all times. That means if the soundbar starts playing audio from another source than the TV, it should not send system audio off.

Settings persistence

Consistent system behavior for settings focuses on persistence of sound modes for each input, and persistence of EQ related settings and volume across the system.

- If a device supports individual sound mode, virtual surround and similar settings per input, then these shall individually persist when changing inputs and across power cycles.
- If a device supports a single set of sound mode, virtual surround and similar settings regardless of input, then this set shall persist across power cycles.
- The device shall persist a single set of EQ related settings (Bass, Treble) across all of its inputs, also across power cycles.
- If, for technical reasons, settings cannot be persisted across a power cycle, they must be reset to default settings.
- For volume the device shall consistently either:
    - Boot to the previously set volume level.
    - Boot to a default volume level, but no higher than 60dB, corresponding to spoken voice level.

OSD Names

The RTVR device should have a OSD name that is not generic and reflects the model name or product name. Examples:

- A bad OSD name would be "Soundbar" since there is a high chance of it being used by other products.
- A good OSD name for a soundbar with the product name "BigBrand 230SB" would be "BB230SB" since it most likely will not used by other products and reflects the model number.

If the product at some point is shipped with the same product name but on a different platform the OSD name should reflect this, e.g. "BB230SB" could be "BB230SBV2" to indicate this is version two of the platform.

Remember OSD names can be at most 14 characters (ASCII).

Audio latency compensation (from version 3.0)

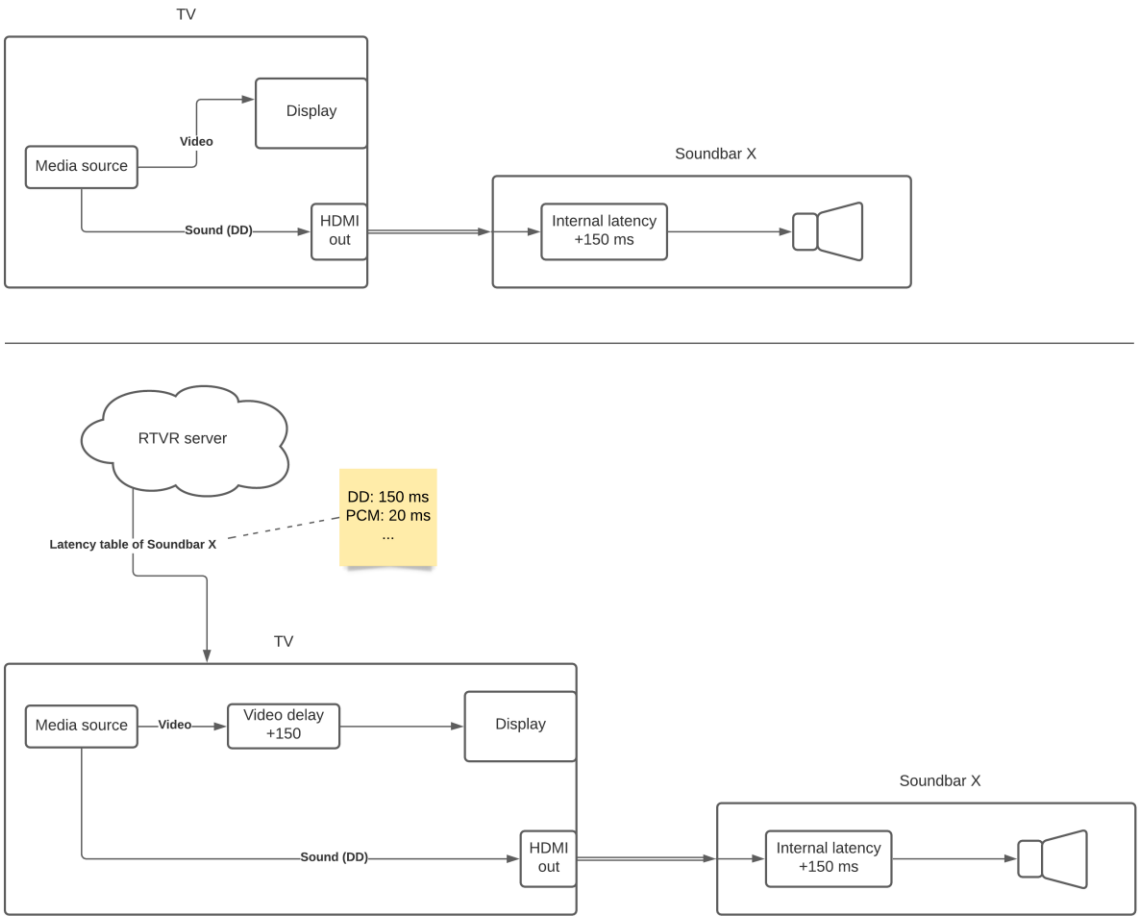
Some audio devices have a long audio processing time, for example if a soundbar extensively applies DSP processing to the audio. For some products this can be so bad that the audio latency becomes larger than the video latency of the TV it is connected to.

From Roku TV version 10.5 partners can specify the audio latency that the certified product has. The Roku TV will then compensate video latency to match the audio latency. This has the effect that video will be displayed at the same time as audio is played out on the audio device. The partner will have to specify the audio latency per format it supports, as the latency may vary from format to format.

The partner will specify the latencies during development on the RDK. The latency table is also referred to as the static latency table as it is received upon handshake on the TV and not dynamically adjustable. If an RTVR device needs to update audio latency dynamically please read the Dynamic latency section below.

The figure below shows two examples:

- The upper one which doesn't apply the audio latency compensation. In this case audio will be played out after the image. The difference between the audio and the video depends on how much video delay that given TV has build in.
- The lower examples shows the a device that has specified latencies for formats and the TV compensates for the audio delay by delaying video in a sufficient manner to match the 150 ms delay of the soundbar.



It is optional to use this feature, but it strongly recommended if the audio device has a build in audio latency that exceeds one or more of the limits defined in the table below.

Format	Maximum audio latency without compensation
PCM	120 ms
DolbyDigital (AC3)	155 ms
DolbyDigital plus (EAC3)	155 ms
Dolby MAT	95 ms

It is possible to specify audio latency for all formats supported by Short Audio Descriptor, but only PCM, AC3, EAC3 and MAT are currently supported by Roku TV. By specifying delays for other audio formats Roku TV can take that into account if a later TV release adds support for those formats.

A couple of limitations to be aware of:

- Video delay will not be applied when playing content from HDMI sources.
- There is a lower limit to how little video delay a TV will apply. TVs have internal delays of video, which is caused by things like picture processing, etc. If a soundbar requests a delay that is lower than the build in delay of the TV, the TV will not be able to accommodate the request and the TV will use its default video delay.
- Likewise, there is a higher limit to how much the TV can delay video.

Important: If the audio device makes use of the latency delay functionality the product must not react to DALS messages as the system may end up in a situation that causes incorrect sync. The Roku TV will try to compensate as best as possible.

Dynamic latency

Some audio devices have dynamic latencies, i.e. the latency changes based on some configuration, e.g. a soundmode that adds additional DSP processing or external wireless speakers that requires audio to be delayed in order to have time for transferring audio to the speakers. To accommodate this a message has been added to the protocol which allows the device to change the video latency of the Roku TV in these situations. Please be aware that this is not intended to adjust for small variations and latency should only be changed occasionally, i.e. the audio device needs to make sure the audio latency is stable and only changes if a user changes the configuration in some way.

If the product you are working on has dynamic audio latency and needs to compensate for this, then please reach out to the Roku TV Ready partner team and we will provide you documentation for how to use these messages.

Game Mode

When a device is using either latency tables or Dynamic Latency, the Roku TV will send DALS message <Report Current Latency> when on HDMI input. The <Report Current Latency> message may set the bit for lowlatency / gamemode. This can be used to adjust the Roku TV Ready Devices DSP to minimize delays, so the user gets a better gaming experience.

Development Process

Overview of Development Process

Please make sure to follow the Certification Process to receive a product id, feature id and RokuTV Ready Development kit, as they are prerequisites for implementation and certification of the product.

Roku TV Ready Development Kit (RDK)

Most development and testing can be done using the Roku Tv Ready Development Kit (RDK). It has the following options to help with development of a Roku Tv Ready device.

- Simulate a Roku TV over HDMI, and provide an interactive interface for developing the Roku Tv Ready protocol
- Certification test suite for running compliance checks
- Connect to a Roku TV over local network and temporarily safelist a DUT for testing

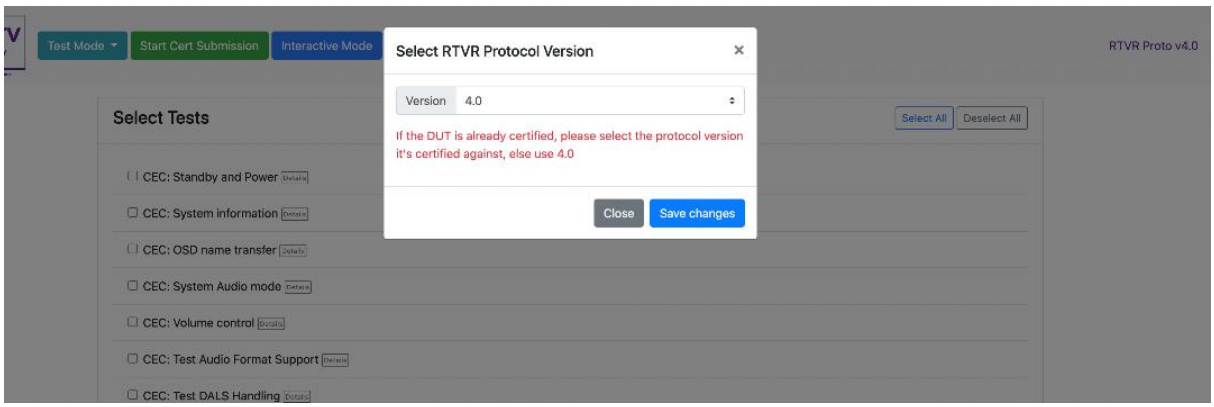
Quick Start guide

1. Connect the RDK hardware to your local DHCP enabled network (the network you plan to access it from). It will automatically acquire the hostname RokuCWxxx, where xxx is the last three octets of the device mac address.
2. Connect your **DUT (Device Under Test)** over an HDMI cable ready for testing.
3. Use a standard web browser to visit http://<hostname>.local to access testing UI (see below for details)
    1. If you run into issues with the DNS, please use the IP address instead

Setup and Configuration

When using the RDK for the first time, it will ask you for the protocol version to start the development on. If the DUT is already certified, please select the version it's certified against. If this is a new certification, use the latest protocol version.

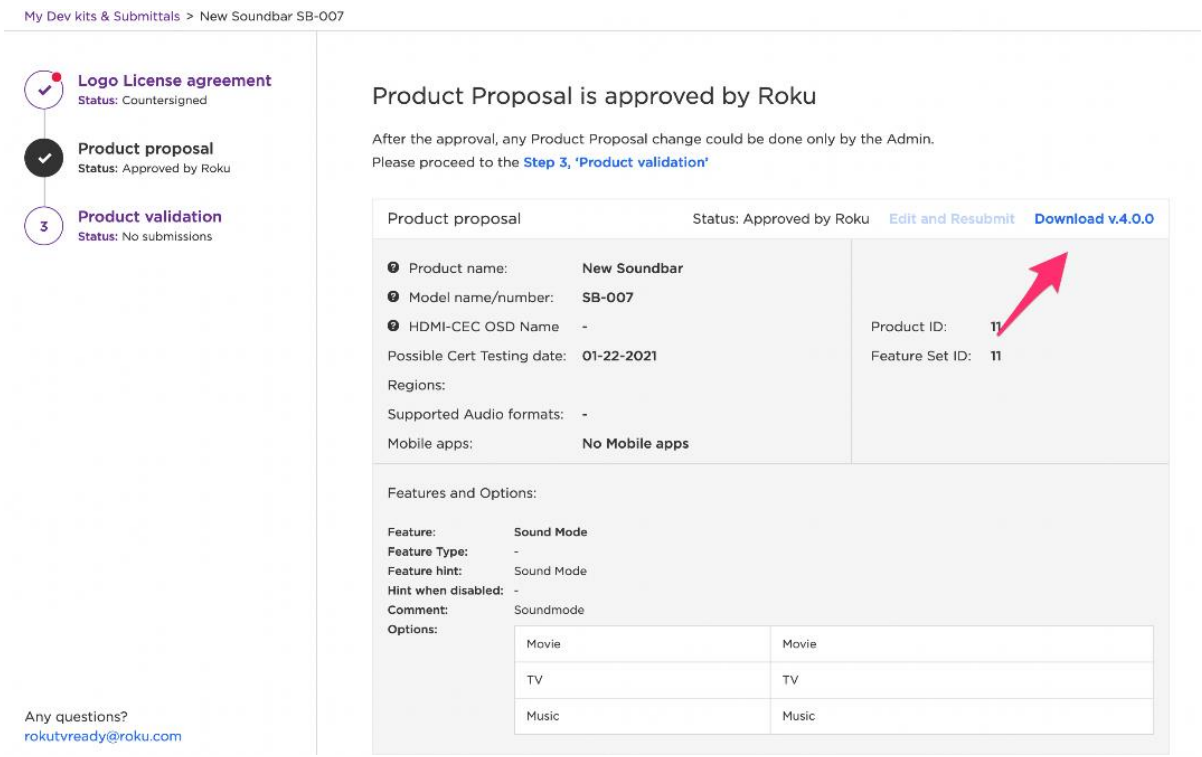
This can be changed anytime by clicking the protocol version link on the top right corner of the main RDK page



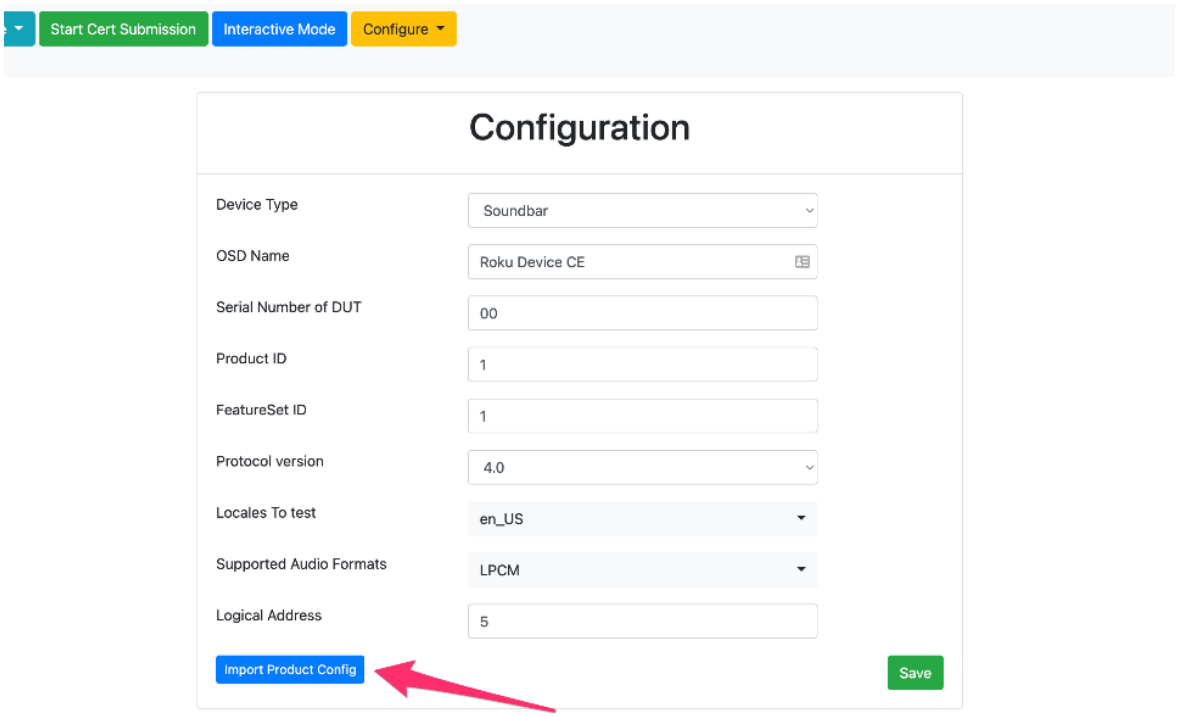
Defining Features

For exploratory testing/development, Featuresets can be created via **Configure → Featureset**. For product purposes, please start by submitting a product proposal including the featureset via the Partner Portal.

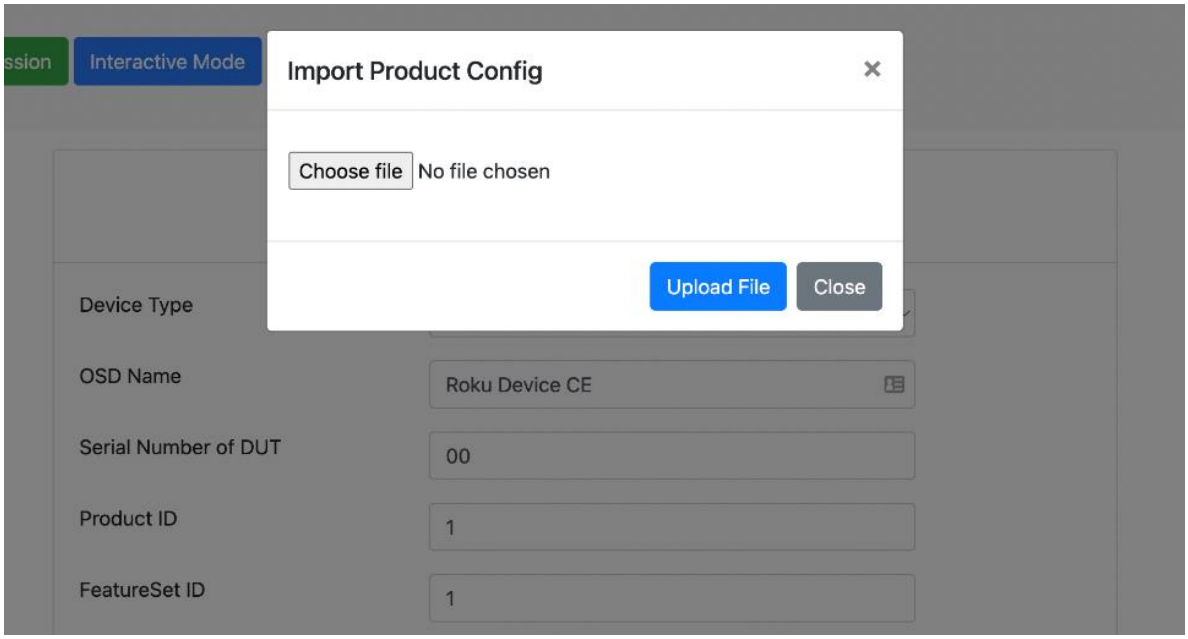
After entering the product proposal on the Portal, the configuration can be downloaded and imported into the RDK.



To use the product configuration downloaded from the Portal, go to **Configure → General** on the RDK and use the **Import Config** button.



Choose the product_config.tar.gz downloaded from the portal and press Upload File.



Once the import is completed, RDK should have all the features defined in the portal, as well as Product ID, Featureset ID configured.

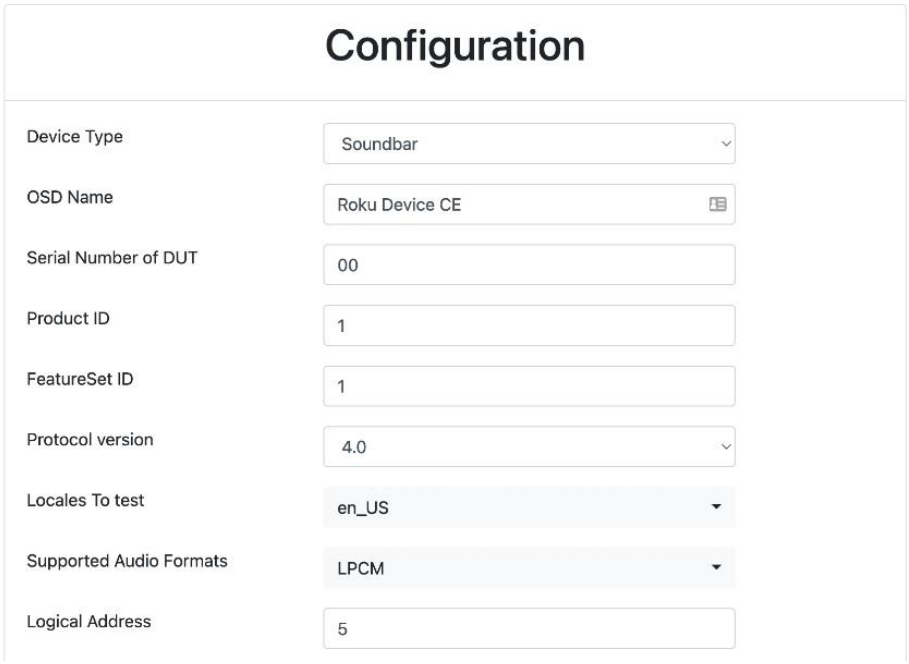
Updating Product Configuration

After importing product configuration, navigate to **Configure → General**. Please configure the values here to match the DUT.

The serial number should be in **hex format**, while Feature ID and Product ID in **decimal**.

The OSD name must be set **unique** per product (Product ID) as serving the purpose of RokuTV distinguishing devices.

Please also configure the Audio Formats supported by the DUT.

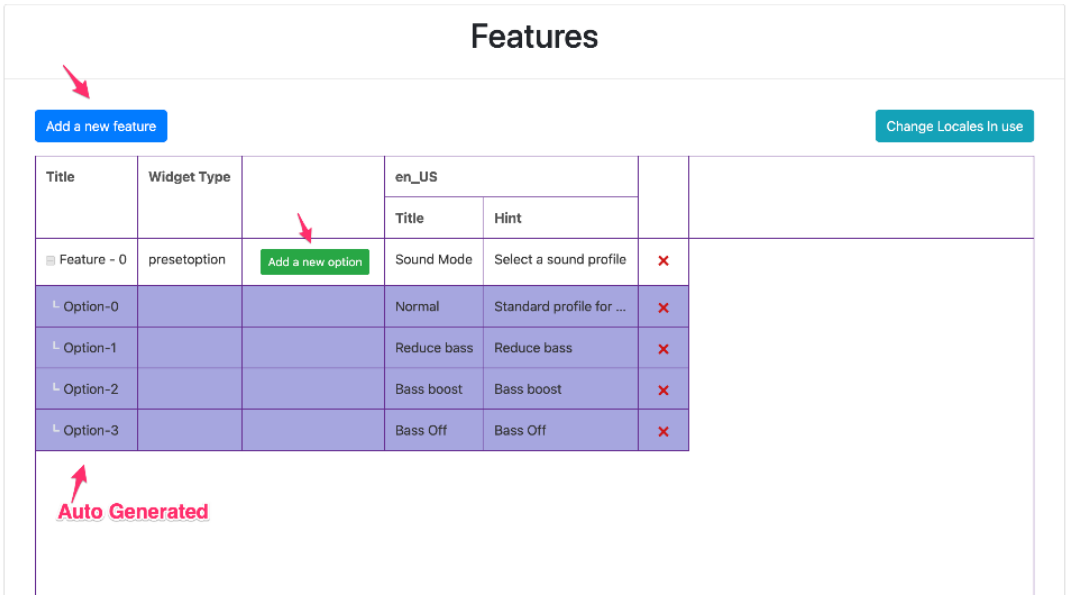


Updating Features

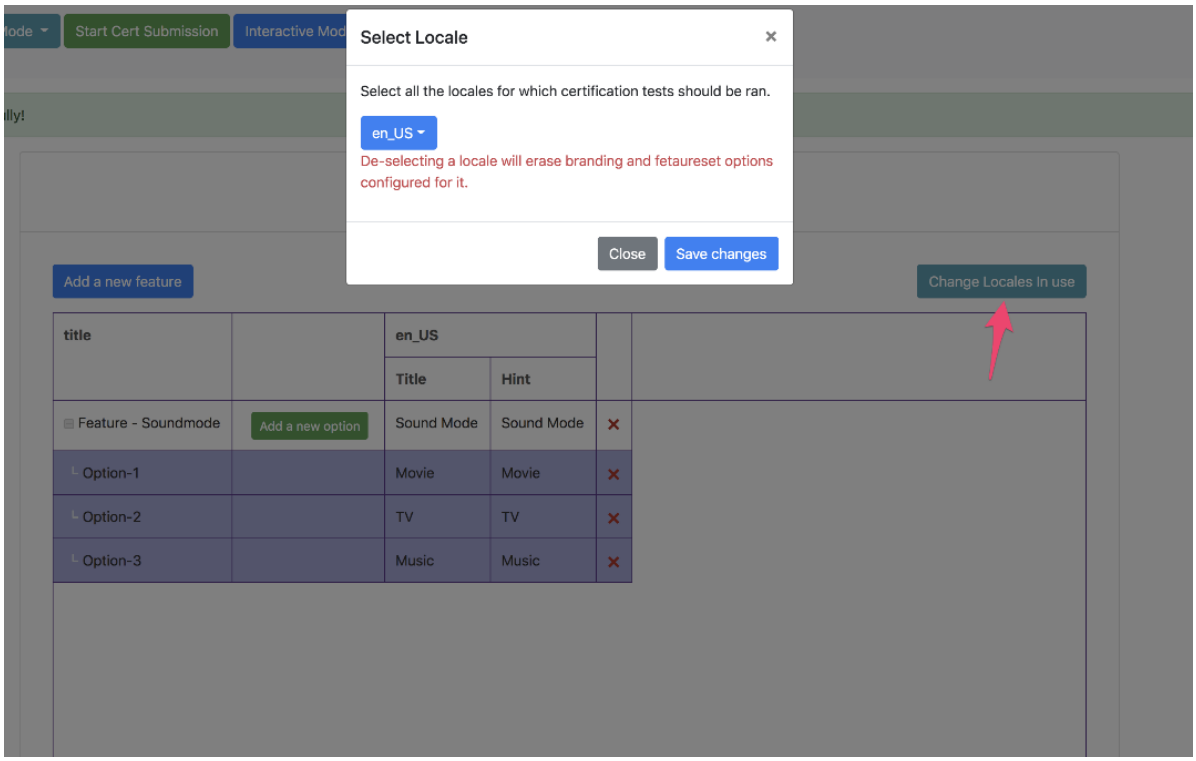
If for any reason, you want to modify the features supported by the DUT. Please navigate to **Configure → Feature Sets**.

Please note:

- The first column on the table is auto-generated and non-editable
- If a locale is selected, all texts must be filled.
- You could add new options to a feature or new feature itself using the buttons available.
- Any changes to the features must be communicated with Roku over email



For products that target multiple regions and locales, please use the Locale selector button to add/update the locales.



UI will refresh and allow you to enter text strings for the new locales selected. Each cell can be edited by clicking on it.

Import/Export Featureset

Besides the built-in feature set editor in the RDK, it is also possible to perform translation of the feature set outside the partner portal/RDK once features are defined.

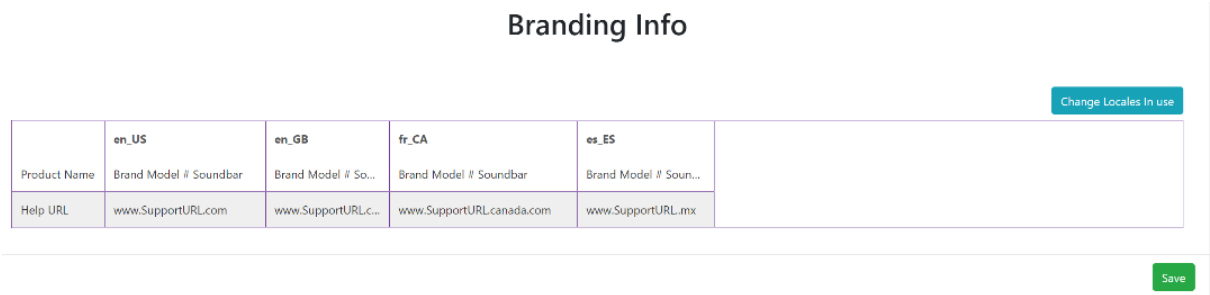
To do that, please select all the locales that the Soundbar will support. Then use the **Export** button to export all the data as CSV.

This file can be edited in a text editor or Excel. If editing in Excel, please save the file as **.xls.**

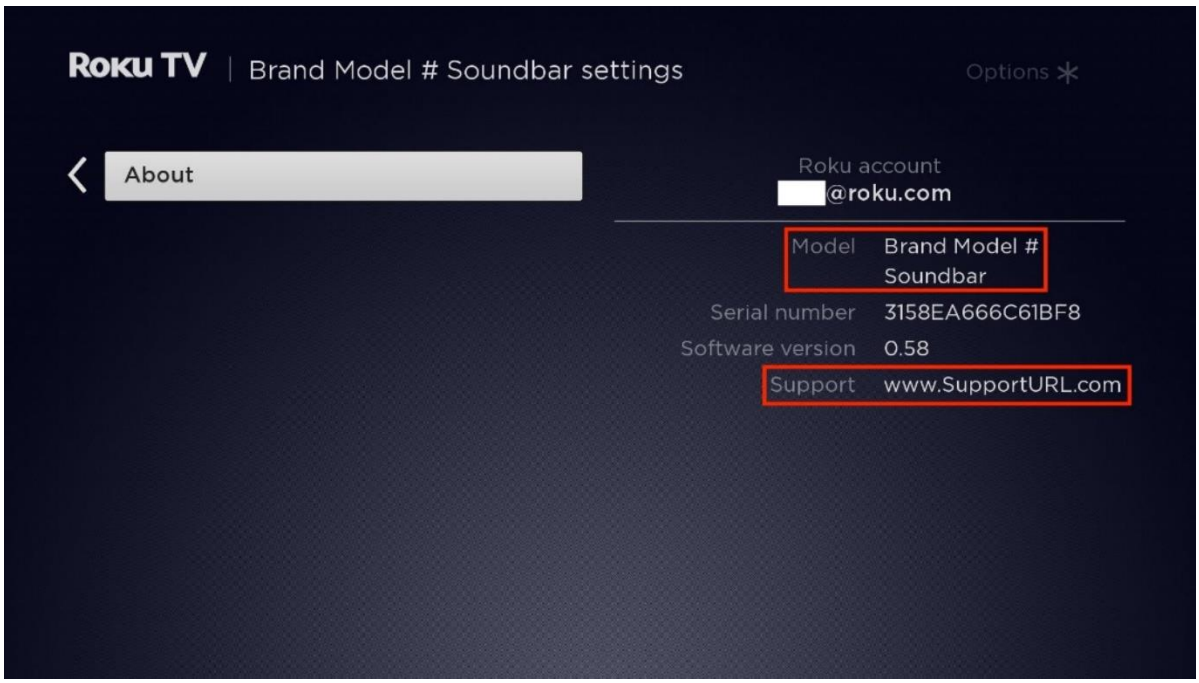
Once translations are done, the file including the new translations can be re-imported into the RDK.

Branding settings

Defining ‘’Product Name‘ and ‘Help URL’ per region through **Configure → Branding** in RDK. The ‘Help URL’ must be valid when the product is launched.



The set branding info will be shown under TV menu **Settings → Remotes & Devices,** recommend containing soundbar as postfix so that user can know connected device type.



Interactive Mode

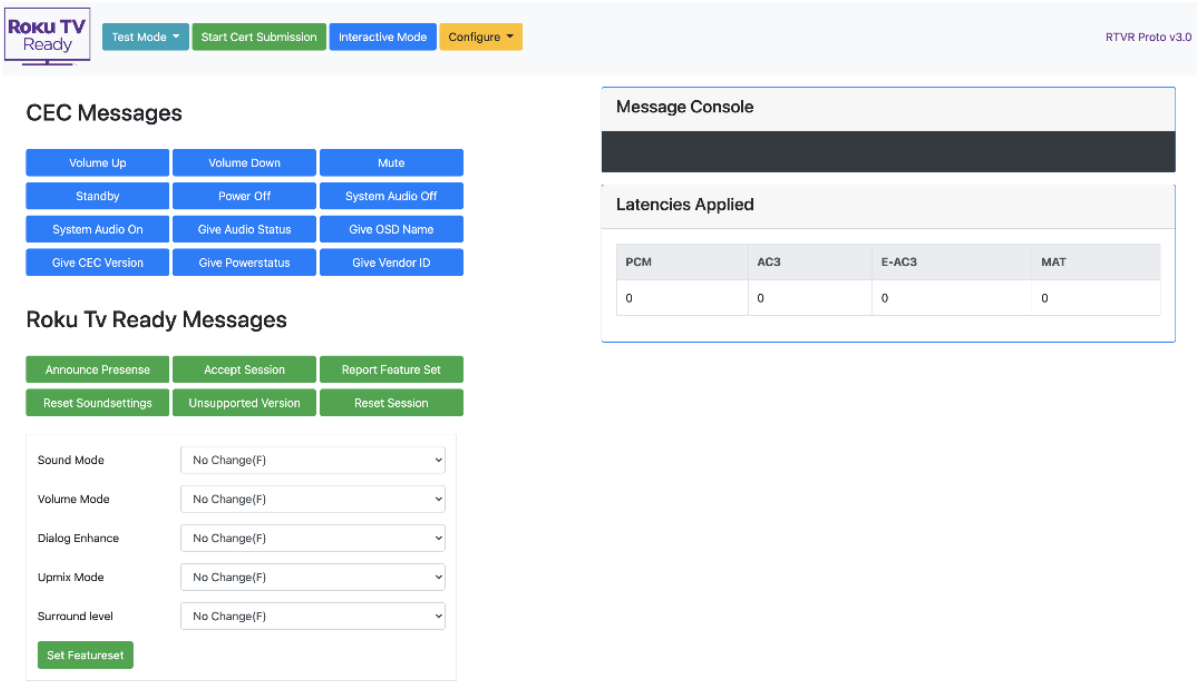
The interactive mode allows individual CEC and Roku TV Ready messages to be sent and received.

The buttons on the left are used for sending messages to the DUT and the message console on the right shows a log of what has been sent and received.

Note that entering interactive mode may take a few seconds as it re-asserts the HPD line to ensure that the session is starting in a clean state.

To use the feature set messages, it is first necessary to perform a Roku TV Ready handshake:

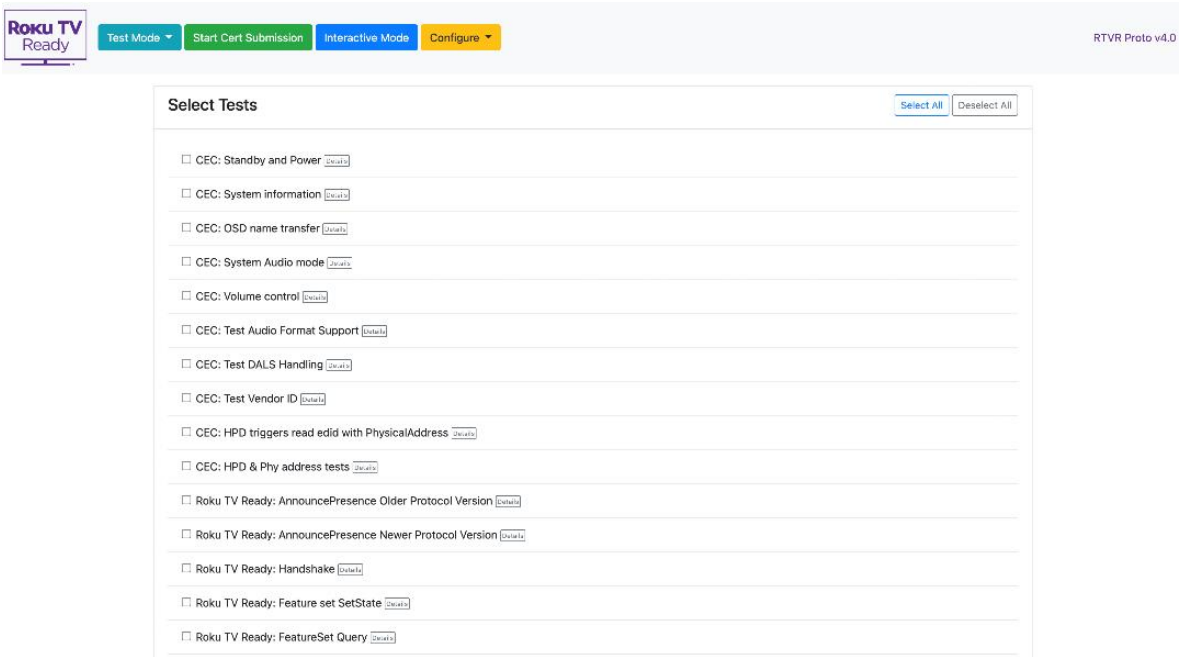
- Press the "Announce Presence" button and wait for the DUT to respond with an `InitSession` message
- Then press the "Accept Session" button
- The DUT should now be ready to send and receive feature set messages.

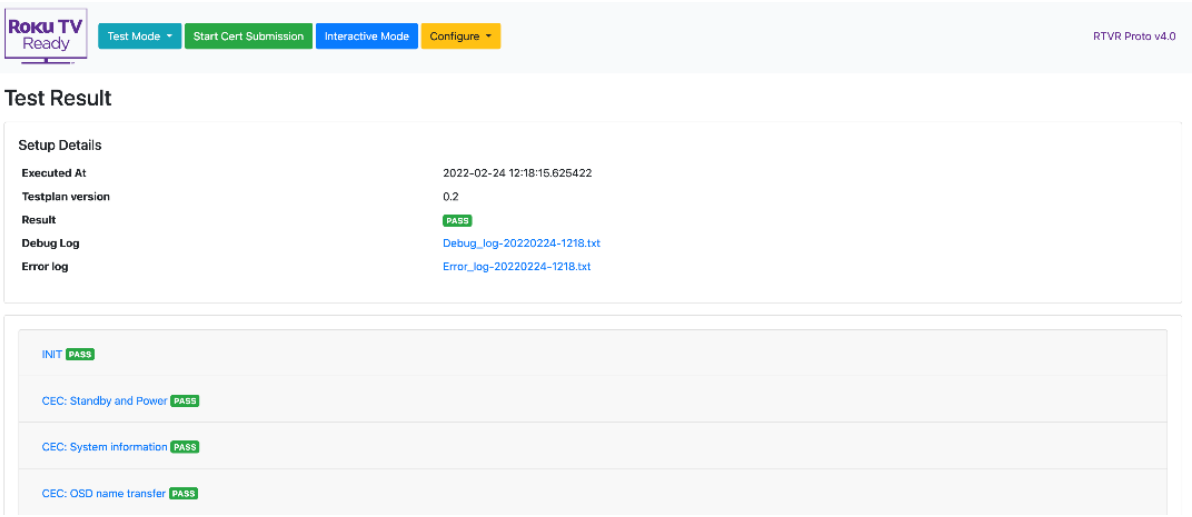


Test Mode

The test mode allows a set of tests to be selected and run. When the tests have finished, a summary list of results is displayed, together with access to the logs. The Error log includes the result of each test, with more detailed information about the nature of any failures. The Debug log includes more information about the sequence of messages for the entire test run.

When requesting help from Roku, please be sure to include both logs, a copy of your featureset CSV file, and the configuration parameters that you have set.



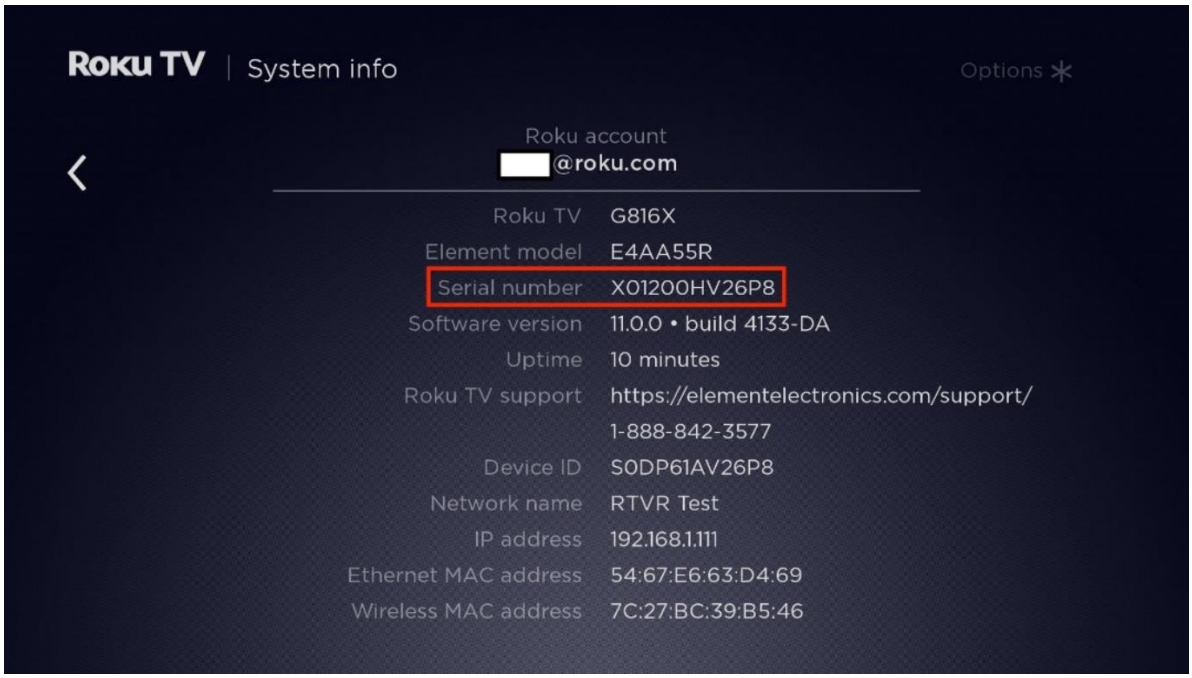


Testing with RokuTV

Testing with a RokuTV instead of the RDK provides the actual RTV UI experience and shall be done as an end-2-end test before final certification.

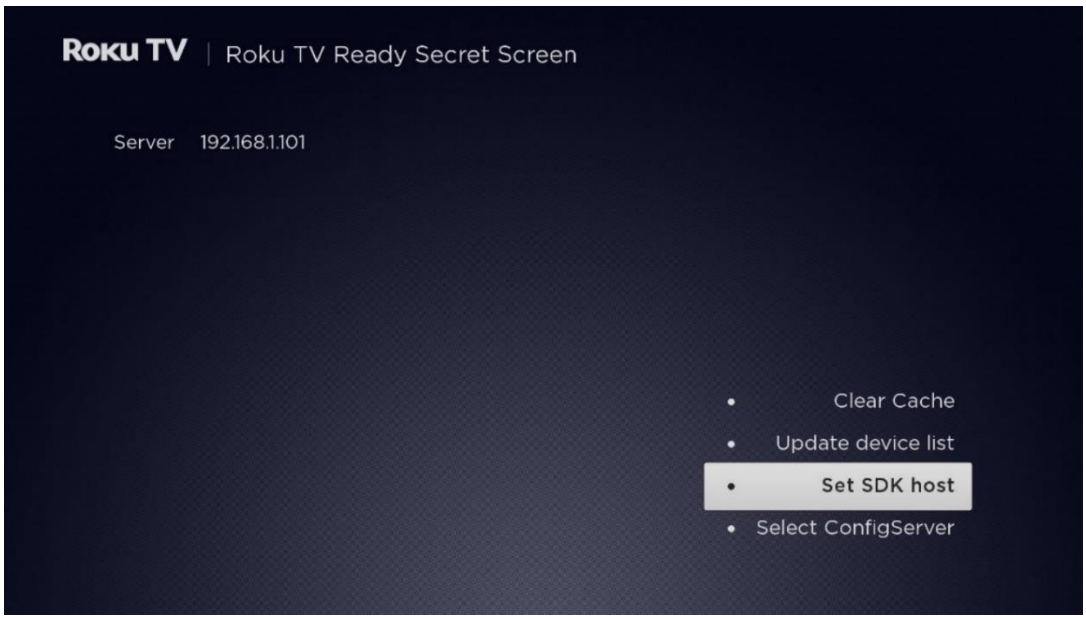
Whitelist RokuTV

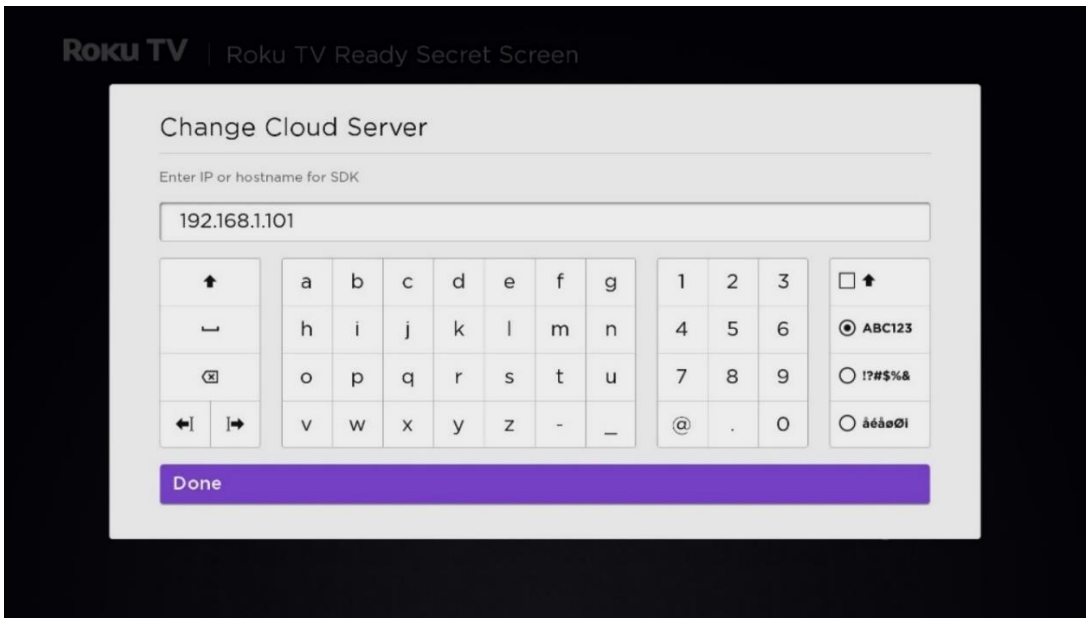
Please register your RokuTV Serial Number (**Homescreen -> Settings -> System -> About**) on the Developer Portal (https://developer.roku.com/rokutvready/overview) to get the TV on a FW build with additional debug features.



Steps to configure Roku TV

- Connect your TV and RDK to the same network.
- On the RDK:
  - **Configure → Branding info** configure the Brand name and Help URL (The help URL is limited to 40 characters.)
  - **Configure → CEC/RCW config** enter the product ID assigned by Roku for your device
  - **Configure → Feature Sets** configure the feature-set you want to test
- On the RokuTV:
  - Access the "Roku Tv Ready Secret Screen" by pressing 5xHome,Up,Right,Up,Right,Up on the TV remote. Note this screen will be available only if your TV is on the test FW described at the beginning of this section.
  - Use the **Set SDK Host** Option and enter the IP of your RDK, in the format **http://<IP of RDK>**
  - Now restart the TV and connect the device to the HDMI-ARC port. You should be prompted with the Roku TV Ready setup.





If you have changed any settings on the RDK you must reset the RTVR cache (Settings → System → Advanced system settings → Factory reset → Reset TV/ audio/picture settings). The TV stores which device is already set up, so if you want to go through the setup again you will have to "Clear cache" and go to the Home Screen and re-plug the soundbar. The "Update device list" entry shows the RTVR devices connected to the TV.

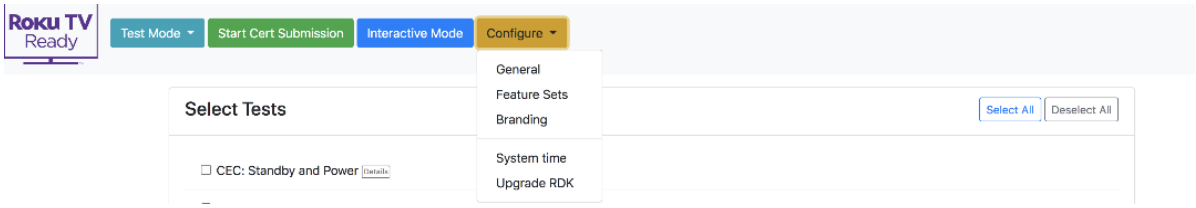
Restoring the default config

To change Roku TV back to normal operation after testing, under **ConfigServer** option, and select **Production** in the pop-up menu

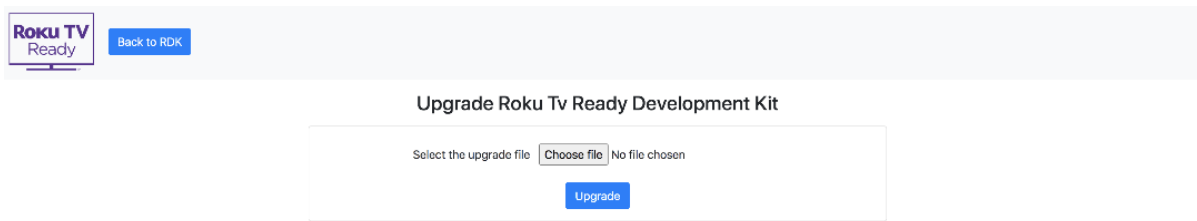
Updating the RDK

Option 1: Update via Web Interface

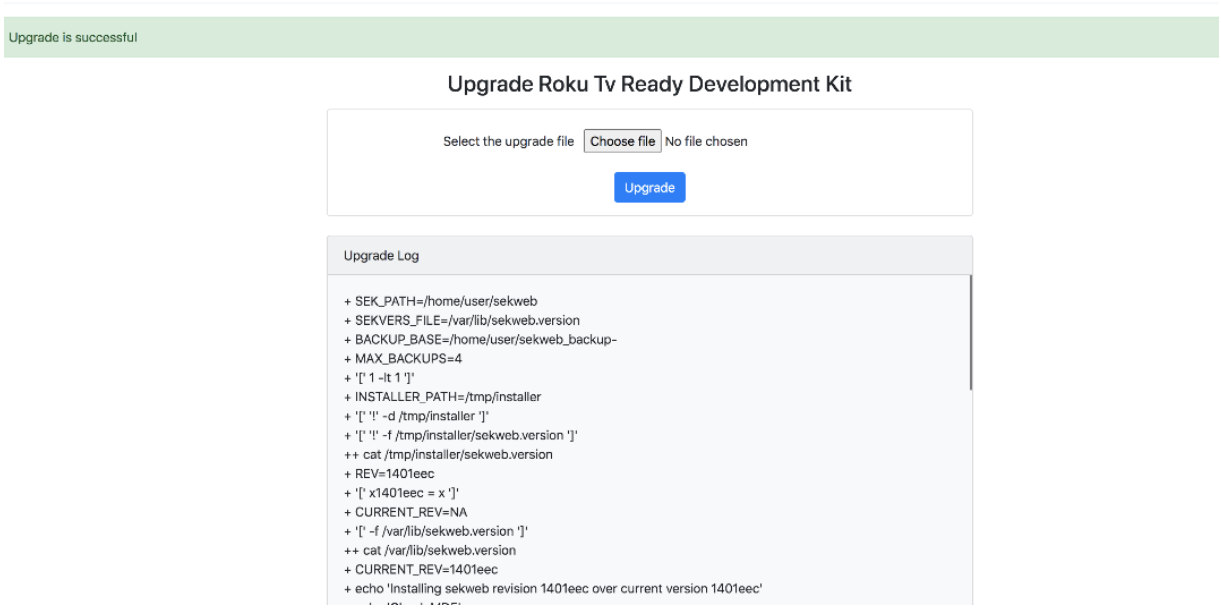
If you are upgrading from RDK version > 2.0, please use the **Upgrade RDK** option available under **Configure** tab.



Using the file browser, navigate to the **rdk-XXXX.tar.gz** file you have received from Roku and press upgrade.



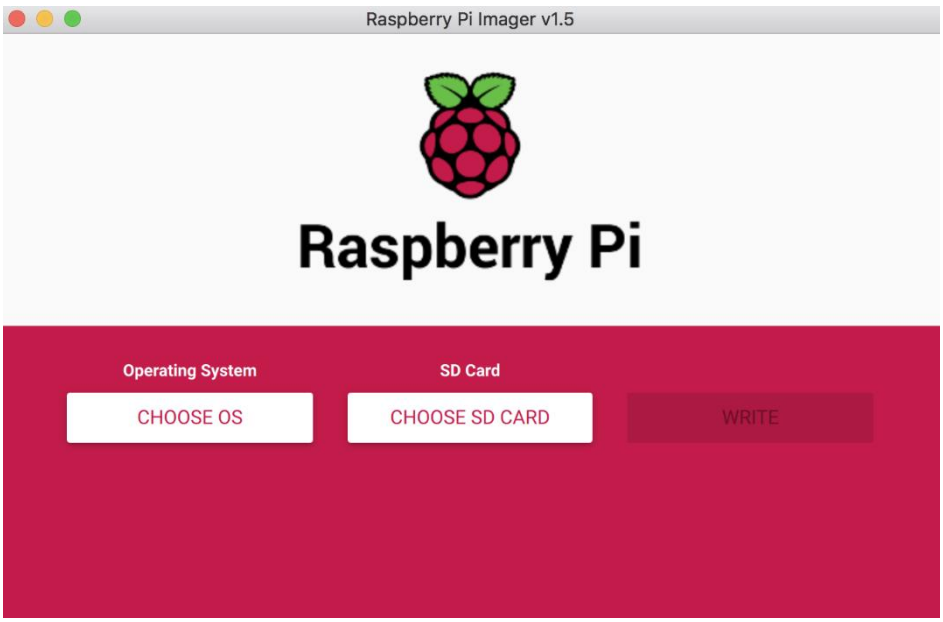
It would take about a minute to finish upgrading the RDK. In case of any errors during the upgrade, please reach out to Roku with the upgrade log. The log is accessible via **http://<IP-OF-RDK>/download/.syslog**.



Option 2: Update via SD Card

If upgrading from a version< 2.0 use this option. You would need the below details.

- The new image from Roku
- An SD Card writer
- Raspberry Pi Imager
    - https://www.raspberrypi.org/software/



The following instructions assume that you have installed Raspberry Pi Imager already.

1. Power off the RDK
2. Locate the micro SD card at the lower rear of the device and gently remove it
3. Place the card in an SD card writer, using an adapter if required
4. Open the Raspberry Pi Imager tool

5. Select Choose OS → Use Custom → Browse to the new image from Roku
6. Select the correct SD card and press Write.
7. Wait for the application to successfully write and validate the SD card.
8. Put the SD card back in the RDK, with the connectors facing up and re-power the device
9. Use a standard web browser to visit http://<hostname>.local to access the new UI (see below for details).

Certification Tests

Standard CEC Messaging Tests

Testing Methodology

The CEC tests all involve the RDK issuing a command and validating a response. In the event a CEC service is initiated by the DUT e.g. <initiate arc> these messages will be ignored, and will not be tested by this procedure.

All standard Request→Receive tests have a defined timeout before the test is considered failed.

All tests will be preceded by an initialization process as outlined below, and will be cancelled if this process fails. This is to confirm devices correctly assign and report their physical address on HPD assert.

Initialization Procedure

Before any tests are run the DUT must successfully initialize the CEC interface as follows.

As per the CEC standard, a sink device is able to pulse the Hot Plug Detect line low at any time, for a minimum of 100 milliseconds, and force a read of its EDID data structure over the HDMI DDC lines. The DUT is then expected to reassign its physical address based on the EDID, reassign its logical address and report this through the CEC bus with <report physical address>. The initialization test is as follows:

1. The HPD line is initially high, it is pulled low for 5 seconds, and then reasserted to high.
2. The device is expected to read the EDID structure over DDC, extract its physical address, reassign its logical address and broadcast <report physical address>.
3. The value of the physical address reported will be verified against the test configuration.
4. **Failure to complete either reading the EDID or <report physical address> will result in the cancellation of all future tests, as these will not be valid.**

HPD Timing - Basic

The purpose of this test is to confirm that the DUT correctly reacts to the HDMI spec minimal 100ms HPD pulldown and re-reads the EDID:

1. The HPD line is initially high, it is pulled low for 100ms seconds, and then reasserted to high.
2. The device is expected to read the EDID structure over DDC, extract its physical address, reassign its logical address and broadcast <report physical address>.
3. The value of the physical address reported will be verified against the test configuration.

HPD Timing - Extended

The purpose of this test is to confirm that the DUT correctly reacts to a broad range of HPD pulldown durations and re-reads the EDID:

1. The HPD line is initially high, it is pulled low for intervals between 200-800ms seconds, and then reasserted to high.

2. The device is expected to read the EDID structure over DDC each time, extract its physical address, reassign its logical address and broadcast <report physical address>.
3. The value of the physical address reported will be verified against the test configuration.

Standby and Power

The purpose of this test is to confirm that it is possible for a Roku TV to control the power state of the DUT, the test is as follows:

1. <Give Device Power Status> is sent, <Report Power Status> is expected and used to confirm the DUT is in the 'On' power state.
2. <Standby> is directly addressed to the DUT.
3. The DUT is given 10 seconds to go into standby, before <Give Device Power Status> is sent, <Report Power Status> is expected, and the power-state of the DUT must be 'Standby'.
4. <System Audio Mode Request>['3.0.0.0']is sent is directly addressed to the DUT.
5. The DUT is given <timeout> seconds to go into power on, before <Give Device Power Status> is sent, <Report Power Status> is expected, and the power-state of the DUT must be 'On'.

System Information

The purpose of this test is to confirm basic information needed for Roku TV Ready to operate can be obtained from the DUT, the test is as follows:

1. <Get CEC Version> is sent, <CEC Version> is expected, with an attached version reference of (at least) '1.4'**.**
2. <Give Physical Address> is sent, <Report Physical Address> is expected with [physical address] matched to the one provided during the initialization procedure.

OSD Name Transfer

The purpose of this test is to confirm the name of the DUT can be read and displayed in the Roku TV UI during Roku TV Ready Setup and on the Roku TV home screen. The test is as follows:

1. <Give OSD Name> is sent, <Set OSD Name> is expected, with the attached [OSD Name] matching that specified in the configuration dialog.

Audio System Settings (And Remote Control Pass-through)

The purpose of this test is to confirm the DUT is compatible with the Audio requirements of Roku TV Ready. These requirements are such that:

- The audio mode of the DUT can be configured and controlled by a Roku TV.
- The audio status can be read, and the volume of the DUT is controlled by a Roku TV.
- The DUT must support LPCM and may support other formats such as AC3 AAC and DDPLUS.

The tests are as follows:

System Audio Mode

1. <Give System Audio Mode Status> is sent, <System Audio Mode Status> is expected, the [Status] parameter is discarded.
2. <System Audio Mode Request>['0.0.0.0']is sent, <Set System Audio Mode> is expected, with the [mode] parameter required to be 'on'.
3. <System Audio Mode Request>['] is sent (with a null [Physical address] parameter), <Set System Audio Mode> is expected, with the [mode] parameter required to be 'off'.

Remote Pass-through

1. <Give Audio Status> is sent, <Report Audio Status> is expected, and the [status] parameter is recorded.
2. <User Control Pressed>['Volume Up'] is sent, <Report Audio Status> is expected, and must contain a volume reading of one higher than the initially recorded status.
3. <User Control Released> is sent.

Note press and hold operation is not currently tested, but must be supported and may be tested in the future.

Audio Formats

1. <Request Short Audio Descriptor>[0]['DTS'] [0]['DDPLUS'] [0]['AC3'] is sent, <Report Short Audio Descriptor> is expected. All supported formats are recorded for debugging purposes. If the response is not in line with configured capabilities, test is failed.

DALS Messaging

The purpose of this test is to confirm the DUT is able to handle DALS messages. There is no validation on the behavior of the device, but this is purely here to ensure that the reply is not <FeatureAbort>

1. SDK sends out <ReportCurrentLatency> with Latency values of 110ms,222ms and 334 ms
2. DUT should not reply with FeatureAbort to any of these.

Vendor ID Test

The purpose of this test is to confirm the vendor ID is valid.

1. SDK sends out <GiveDeviceVendorID> to which DUT should respond with <DeviceVendorID>
2. The device should respond with a valid OUI.

Roku TV Ready Messaging Tests

Protocol Version Negotiation

AnnouncePresence With Older Protocol Version

The purpose of this test is to validate the DUT doesn't respond to a protocol version older than the one it certified for if the TV is using a protocol version earlier than 2.0 ("Test unsupported version" tests for protocol versions from 2.0)

1. RDK send out `AnnouncePresence` with a previous protocol version (< 2.0)
2. DUT shouldn't respond with `InitSession`

AnnouncePresence With Newer Protocol Version

The purpose of this test is to validate DUT respond with the correct protocol versioned `InitSession`, even when receiving a `AnnouncePresence` a message with a newer protocol version

1. RDK send out `AnnouncePresence` with a newer protocol version
2. DUT should respond with `InitSession` and correct protocol version

Handshake

The purpose of this test is to test the Roku TV Ready handshake. This test will be run before any and all other Roku TV Ready tests.

1. `AnnouncePresence` is sent, to which the DUT must respond with `InitSession`
2. `AcceptSession` is then sent, which the DUT must accept without any errors
3. An empty `SetState` is then sent, to which the DUT must respond with `ReportState`
4. For protocol versions >=4.0 the DUT must also send a ReportFirmwareVersion message during handshake.

Feature set SetState

The purpose of this test is to confirm synchronization of settings works correctly

1. An empty `SetState` message is sent; a `ReportState` message is expected, and the values are saved.
2. A `SetState` message is sent, with one option changed. A `ReportState` response is expected. Each feature value is checked that it is within the range defined by the feature set description.
3. Step 2 is repeated for the entire range of the feature set specification.

Feature set Query

The purpose of this test is to confirm if DUT is able to report the current feature set reliably to Roku TV.

1. An empty `SetState` message is sent. A `ReportState` response is expected. Each feature value is checked that it is within the range defined by the feature set description.
2. Wait for 5 sec and try again.
3. Repeat steps 1-2 for 5 times to ensure reliability.

Feature set Query with a trailing byte

The purpose of this test is to confirm if the DUT is able to report the current feature set reliably to Roku TV, even if `SetState` message has a trailing byte.

1. An empty `SetState` message is sent with a trailing null byte.

2. A `ReportState` response is expected. Each feature value is checked that it is within the range defined by the feature set description.

Feature set SetState NOP

The purpose of this test is to confirm that a `SetState` message with no-op values results in no changes to the feature set.

1. An empty `SetState` message is sent; a `ReportState` message is expected, and the values are saved.
2. A `SetState` message is sent with all options set to the **NOP** (`0xF`) value; a `ReportState` message is expected with the same values as the previous `ReportState` message.

Feature set SetState with wrong Feature set ID

The purpose of this test is to confirm that a `SetState` message with changes for a wrong feature-set id results in no changes to the feature set. But still cause the DUT to respond with its current state for the correct featureset id.

1. `SetState` message is sent. `ReportState` message is expected, and the values are saved.
2. `SetState` message is sent with a change and a wrong feature-set ID. `ReportState` message is expected with the same values as the previous `ReportState` message.

Feature set SetState with variable Options Length

The purpose of this is to check if the DUT is able to handle SetState messages of varying length properly.

1. A `SetState` is sent with just one option value and a `0xF` trailing nibble. A `ReportState` is expected with correct length.
2. A `SetState` is sent with just two option values. A `ReportState` is expected with correct length.
3. This is repeated with up to N+2 option values, where N is the number of options in the feature set.

Feature set Reset

The purpose of this test is to confirm if DUT handle the reset message and resets all the options to default

1. A Reset message is sent to DUT
2. A `ReportState` is expected with correct length and with options changed to default.

Feature set Reset with trailing bytes

The purpose of this test is to confirm if DUT ignore any trailing bytes presents in the Reset message

1. A Reset message is sent to DUT with extra trailing bytes
2. A `ReportState` is expected with correct length and with options changed to default.

Feature set Reset after the change

The purpose of this test is to confirm if DUT is able to revert all the options to default after few options are changed.

1. Reset message is sent. Valid `ReportState` is expected from DUT, store the result as default settings.
2. `SetState` message is sent that will change a setting. Valid `ReportState` is expected
3. Reset message is sent again. Valid `ReportState` is expected from DUT, with same default values as the first time.

Session Re-initialization

The purpose of this test is to ensure the DUT is able re-initialize session upon receiving `AnnouncePresence`.

1. Pre-condition is that a Roku Tv Ready session has already been established.
2. `AnnouncePresence` is sent, to which the DUT must respond with `InitSession`.
3. `AcceptSession` is then sent, which the DUT must accept without any errors.
4. An empty `SetState` is then sent, to which the DUT must respond with `ReportState`.

Session Re-initialization with trailing bytes in Announce Presense

The purpose of this test is to ensure the DUT is able re-initialize session upon receiving `AnnouncePresence with extra trailing bytes.`

1. Pre-condition is that a Roku Tv Ready session has already been established.
2. `AnnouncePresence` is sent with extra trailing bytes at the end, to which the DUT must respond with `InitSession`.
3. `AcceptSession` is then sent, which the DUT must accept without any errors.
4. An empty `SetState` is then sent, to which the DUT must respond with `ReportState`.

Session Re-initialization after HPD

The purpose of this test is to ensure the DUT is able re-initialise Roku Tv Ready session after HPD assert.

1. The HPD line is asserted.
2. The DUT reads EDID data, extracts its physical address and broadcasts <Report Physical Address>.
3. `AnnouncePresence` is sent, to which the DUT must respond with `InitSession`.
4. `AcceptSession` is then sent, which the DUT must accept without any errors.
5. An empty `SetState` is then sent, to which the DUT must respond with `ReportState`.

Session after standby

The purpose of this test is to confirm that the DUT is able to accept Roku TV Ready commands after coming out of standby.

1. Roku TV Ready handshake is completed and the DUT responds to `SetState` as above.
2. <Standby> is directly addressed to the DUT.
3. The DUT is given 10 seconds to go into standby, before <Give Device Power Status> is called, <Report Power Status> is expected, and the power-state of the DUT must be 'Standby'.
4. <System Audio Mode Request>['3.0.0.0']is sent is directly addressed to the DUT.
5. The DUT is given <timeout> seconds to go into power on, before <Give Device Power Status> is called, <Report Power Status> is expected, and the power-state of the DUT must be 'On'.
6. An empty `SetState` message is sent; a `ReportState` message is expected, and the values are saved.
7. A `SetState` message is sent with all options set to the nop (`0xF`) value; a `ReportState` message is expected with the same values as the previous `ReportState` message.

Test unsupported version

The purpose of this test is to confirm that DUT sends <Unsupported Version> if presented with a protocol lower than what the DUT supports, but larger than or equal to 2.0. Test is applicable only for DUTs running Protocol Version >= 3.0

1. RDK sends out <Announce Presence> which has a protocol version that is lower than what is selected in the Protocol Version dropdown (but >= 2.0).
2. DUT must respond with an <Unsupported Version> message.

Manual Tests

Introduction

This document describes the tests that must be passed before certifying a sound bar as Roku TV Ready (RTVR).

Pre-Requisites

Following conditions should be met before running this test.

- Soundbar must pass the automated pre-cert test suites
- Soundbar must be using the allocated Product ID and Feature Set ID

Setup

The setup consists of a Roku TV with ARC port, to which device under test will be connected. Soundbar needs to be safelisted using any one of the below methods.

- If the soundbar is safelisted by Roku after certification, no further steps are required
- If the soundbar is under development, use the Secret Screen and JSON files hosted in RDK to whitelist the device. (Development Process)

Tests

Setup wizard on first connection, power on first and connect HDMI later

The purpose of this test is to verify RTVR wizard is shown when connecting the soundbar for the first time.

1. Ensure that RTVR cache is cleared, go to "System → Advanced Settings → Factory Reset → Reset TV audio/picture settings"
2. Ensure that soundbar is in factory reset (** procedures might vary between Soundbars **)
3. Unplug soundbar power and HDMI cable, wait 2 minutes
4. Plug in the soundbar and then connect it to Roku TV's **ARC port**
5. Roku TV Ready wizard should pop up with correct brand name
6. Wizard should complete successfully
7. After wizard is completed, Roku Cinematic sound should play automatically
8. Soundbar should be visible under **Settings → Remotes & Devices**
9. If the soundbar supports protocol version 1.0+ and supports **ReportFirmwareVersion**, verify the value displayed**.**

Setup wizard on first connection, connect HDMI cable first followed by power

The purpose of this test is to verify RTVR wizard is shown when connecting the soundbar for the first time.

1. Ensure that RTVR cache is cleared, go to "System → Advanced Settings → Factory Reset → Reset TV audio/picture settings"

2. Ensure that soundbar is in factory reset (** procedures might vary between soundbars **)
3. Unplug soundbar power and HDMI cable, wait 2 minutes
4. Connect HDMI cable to Roku TV's ARC port first then plug in the power
5. Roku TV Ready wizard should pop up with the correct brand name
6. Wizard should complete successfully
7. After wizard is completed, Roku Cinematic sound should play automatically
8. Soundbar should be visible under **Settings → Remotes & Devices**
9. If the soundbar supports protocol version 1.2+ and supports **ReportFirmwareVersion**, verify the value displayed**.**

Setup flow with DUT first connected to non-ARC port

The purpose of this test is to verify RTVR wizard is shown when connecting soundbar for the first time.

1. Ensure that RTVR cache is cleared, go to "System → Advanced Settings → Factory Reset → Reset TV audio/picture settings"
2. Ensure that soundbar is in factory reset (** procedures might vary between soundbars **)
3. Connect soundbar to Roku TV's non **ARC port**
4. Roku TV Ready wizard should pop up with correct brand name
5. At the end of the wizard, Tv should detect that Sound bar is not connected to an ARC port.
6. Change the connection to the ARC port as asked, so the wizard completes successfully.
7. After wizard is completed, Roku Cinematic sound should play automatically
8. Soundbar should be visible under **Settings → Remotes & Devices**
9. If the soundbar supports protocol version 1.2+ and supports **ReportFirmwareVersion**, verify the value displayed**.**

Setup flow with eARC port

The purpose of this test is to verify that the soundbar works correctly with eARC ports. This test is applicable only if the soundbar supports eARC. For this test, the setup consists of a Roku TV with an eARC port, to which device under test will be connected.

1. Repeat the three above tests for eARC port
    1. Setup wizard on first connection, power on first and connect HDMI later (eARC port)
    2. Setup wizard on first connection, connect HDMI cable first followed by power (eARC port)
    3. Setup flow with DUT first connected to non-eARC port, then to eARC port

No Setup on reconnection

The purpose of this test is to verify setup wizard is shown only on the first connection.

1. Soundbar has run setup successfully on the first time.
2. Disconnect and connect the HDMI cable, verify that the wizard is not shown
3. Restart the soundbar, verify that wizard is not displayed
4. Restart the Roku Tv, verify that wizard is not displayed

Soundbar information display on TV

The purpose of this test is to verify the information of soundbar can be displayed correctly on TV.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Click Settings->Remotes & devices ->Audio devices->Soundbar->About on TV menu to check soundbar information
3. Model, Serial number, Software version(optional) and Support should display correctly on TV.

Sound Mode Values

The purpose of this test is to verify that all the sound mode options are properly visible on TV.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, press the * button on remote
3. There should be a '**Sound Modes**' item in the menu, which should be populated with '**soundmode**' options from **Featureset**.
4. Under **Sound Settings** all features supported by this soundbar should be visible.

Different language

The purpose of this test is to verify that all the language supported can display sound mode options correctly on TV. This test is applicable only if the soundbar is being certified for multiple regions.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Switch different languages in TV settings.
3. Play a video on the TV and while it is playing, press the * button on remote
4. Under **Sound Settings,** all features supported by this soundbar should be displayed correctly in different languages.

Sound Mode Reset to default

The purpose of this test is to verify that all the sound mode options can be reset to default from TV.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, press the * button on remote
3. Navigate to the **Sound Settings** menu and change all options to a non-default value
4. Now press "**Reset to Default**"
5. The soundbar should be set to default **Featureset** options.

Sound Mode Synchronization

The purpose of this test is to verify soundbar options can be changed from Roku TV

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, press the * button on remote
3. Change **Sound Mode** to different options and ensure that it's changed on soundbar (Either via a display on the soundbar or from audio difference)

4. Under **Sound Settings**, change each item to different values and check it's changed in the soundbar

Sound Mode Querying

The purpose of this test is to ensure that options changed from the * menu are not changed upon closing and opening the menu.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, press the * button on remote
3. Under **Sound Settings**, change each item to a value other than the default one
4. Close and open the menu using * and ensure that values are the same as the previous setting

Soundbar Remote Sync

The purpose of the test is to ensure that the soundbar is able to sync options changed using the soundbar remote.

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, using soundbar remote to change each and every feature supported in **Featureset**
3. Open the **Sound Settings** under * menu using Roku TV remote and check that the change is properly reflected
4. Keep the **Sound Settings** menu open, changes to features done via soundbar remote should be reflected in the Menu in real-time.

Volume sync

The purpose of this test is to ensure that volume control is working properly between Roku TV and the soundbar

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Play a video on the TV and while it is playing, using Roku TV remote, change the volume. Check that soundbar's volume is changed accordingly
3. Verify that volume displayed in Roku TV is changed properly
4. Now change the volume using the soundbar remote and ensure that it's indicated correctly on Roku TV
5. Validate mute/un-mute functionality using Roku TV remote and soundbar remote

Soundbar Power on/off

The purpose of this test is to verify that soundbar is able to automatically resume audio and keep the settings after a reboot

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Change all values under **Sound Settings** under * menu to non-default values
3. Play a video on the TV and while it is playing, using soundbar remote, power off the soundbar
4. Audio should switch to TV speakers
5. Wait for 2 minutes and switch the soundbar back on
6. Audio should switch back to soundbar

7. Check that **Sound Settings** under * menu using Roku TV remains unchanged.
8. The volume level should be set to the default value or previously set value as per soundbar spec.

Soundbar Power plug/unplug

The purpose of this test is to verify that the soundbar is able to automatically resume audio and keep the settings after a plugging out/in

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Change all values under **Sound Settings** under * menu to non-default values
3. Play a video on the TV and while it is playing, plug out the soundbar
4. Audio should switch to TV speakers
5. Wait for 5minutes and plug the sound bar back on
6. Audio should switch back to soundbar
7. Check that **Sound Settings** under * menu using Roku TV remains unchanged, also volume level should be the same as before restart

TV Power on/off

The purpose of this test is to verify that soundbar is able to automatically resume audio and keep the settings after TV power on/off

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Change all values under **Sound Settings** under * menu to non-default values
3. Play a video on the TV and while it is playing, using Roku TV remote, power off and the TV
4. Wait for 5minutes and switch the TV back on
5. Play a video on the TV and soundbar should switch on and the audio should start playing via soundbar
6. Check that **Sound Settings** under * menu using Roku TV remains unchanged, also volume level should be the same as before restart

TV Power plug/unplug

The purpose of this test is to verify that soundbar is able to automatically resume audio and keep the settings after a TV plugging out/in

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Change all values under **Sound Settings** under * menu to non-default values
3. Play a video on the TV and while it is playing, using Roku TV remote, power off the TV, and then remove the Tv power cable
4. Wait for 5minutes and switch the TV back on
5. Play a video on the TV and soundbar should switch on and the audio should start playing via soundbar
6. Check that **Sound Settings** under * menu using Roku TV remains unchanged, also volume level should be the same as before restart

Switching between different inputs in soundbar

The purpose of this test is that soundbar is able to automatically resume audio and keep the settings during an input switch. This test is applicable only if the soundbar supports multiple inputs like Bluetooth, Optical, etc

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Change all values under **Sound Settings** under * menu to non-default values
3. Play a video on the TV and while it is playing, using the soundbar remote, switch the input to a non-ARC one.
4. Wait for 5minutes and switch the input back to HDMI ARC
5. Check that **Sound Settings** under * menu using Roku TV remains unchanged, also volume level should be the same as before the input switch

Volume sync in non-ARC source

The purpose of this test is to check volume sync status when soundbar is in non-ARC source

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Check whether soundbar sends SetSystemAudioMode = ON or OFF in non-ARC source
3. If soundbar sends SetSystemAudioMode = OFF, TV audio should go back to TV speaker. The volume of the TV and soundbar are no longer in sync
4. If soundbar sends SetSystemAudioMode = ON, TV audio should keep muted. Use Roku TV remote to change the volume. Check that soundbar's volume is changed accordingly
5. Verify that volume displayed in Roku TV is changed properly
6. Now change the volume using the soundbar remote and ensure that it's indicated correctly on Roku TV
7. Validate mute/un-mute functionality using Roku TV remote and soundbar remote

Power mode transition - Soundbar powering on when TV is on

The purpose of this test is that soundbar is able to automatically switch to ARC input if Roku TV is on

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard.
2. Switch soundbar to a non-ARC input and power off
3. Keep the Roku TV powered on
4. Power on the soundbar
5. The soundbar should switch its input to ARC after the power is on.

Power mode transition - Soundbar powering on when TV is off

The purpose of this test is to verify the behavior of the soundbar during power on

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Switch soundbar to a non-ARC input and power off
3. Switch off the Roku TV
4. Power on soundbar
5. The soundbar should be on in the last input before it was switched off.

Power mode transition - TV powering off when soundbar is on and in ARC input

The purpose of this test is to verify that soundbar is able to automatically power off while in ARC along with TV

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Now power off the Roku TV via its remote
3. The soundbar should power off as well.

Power mode transition - TV powering off when soundbar is on and in non-ARC input

The purpose of this test is to verify that the soundbar stays on even when TV is powering off, while in a non-ARC input

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Switch the soundbar to a non-ARC input
3. Power off the Roku TV.
4. The soundbar should stay power on.

Power mode transition - TV powering on when soundbar is off and in ARC input

The purpose of this test is that Soundbar is able to automatically switch power-on when in an ARC input when TV is powering on

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Switch off Soundbar via its remote
3. Switch off TV via its own remote
4. Wait for 1 min and switch on the TV via its remote.
5. The soundbar should also power on.

Power mode transition - TV powering on when soundbar is off and in non-ARC input

The purpose of this test is that Soundbar is able to automatically switch power-on when in a non-ARC input when TV is powering on

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard
2. Switch the soundbar to a non-ARC input via its remote and power it off
3. Switch off TV via its own remote
4. Wait for 1 min and switch on the TV via its remote.
5. The soundbar should also power on and switch its input to ARC.

Power cycle TV when soundbar is in HDMI IN source

The purpose of this test is to check soundbar can obey the one-touch play rule. This test is applicable only for soundbars with HDMI IN Source

1. The soundbar is connected to Roku TV and has successfully run the Setup wizard

2. Use a BDplayer or set-top box to connect the soundbar's HDMI IN port, let the soundbar play HDMI IN source.
3. Switch off TV via its own remote, soundbar, and BDplayer should enter standby mode as well
4. Wait for 1 min and switch on the TV via its remote, soundbar, and BDplayer should be waked up and continue to play HDMI IN source.