

4. Software Requirements

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SmartCast TV features advanced applications to the end user using Google Cast if the consumer chooses to connect to the Internet. The software architecture for the client platform shall be developed using the following major technologies:

		Software Components
1	SE Linux version – Linux Kernel <ul style="list-style-type: none">• 5.15 for 5586L• 4.19 for 5691, 5583, 5695, 5695s• 5.11 for Novatek	
2	Toolchain - VIZIO internal version 5.38	
3	GoogleCast libraries – full featured cast receiver	
4	OpenGL ES 2.0	
5	Font renderer embedded both for Loki and Conjure (not externally provided)	
6	RSA 2048 sign support in secure processor	
7	Widevine level 1 security with 4K support	
8	PlayReady 4.0 or later required with support for 'cbcs' encryption (for Netflix) and SL3000 (Google Cast)	
9	Google Chromecast for casting only	
10	Apple AirPlay, version 4.0. Supports Apple HomeKit.	
11	Conjure chromium browser for HTML app support	

4.1 Cast Core Hardware Accelerated Media Playback

Cast Core applies to system for media playback. Cast core defines abstract audio and video pipelines to transfer the control and management of underlying hardware. Platforms are required to implement the abstractions using underlying platform SDK.

4.1.1 Cast Modes

Cast content can include:

- Cast of protected video content that is searched from a mobile device. DRM is Widevine (level 1 security) or PlayReady (4000)
- Cast of unprotected screens (such as from a Chrome browser on a Windows PC).

Cast from VIZIO mobile app uses Google cast APIs.

4.1.2 Wake on IP (Wi-Fi and LAN)

If powered off (quick start enabled) the TV will power on when content is cast over Wi-Fi, and if needed, switch to the **VIZIO Home** input.

4.1.3 Input Switch with Cast

Cast content always takes precedence. When content is casted, the TV switches to **VIZIO Home** from any physical input.

4.2 Graphics Management

Graphics Management can be via Loki or Cast core dependent on the app is use.

4.1.2 Font Support

VIZIO uses a free font (currently Benton Sans) which is licensed for use. Default text color is off-white, #F0F0F0.

4.3 Conjure Chromium support

Conjure is the VIZIO instance of Chromium. Platform supports **Conjure** Chromium running in the background. **Chromium is not running with OOBE or store demo.**

4.4 DIAL support for Two Screen Experience (new internal version)

Using Simple Service Discovery Protocol (SSDP) and the Discovery and Launch (DIAL) Service Discovery protocols, a second screen client (such as a mobile phone) can determine if a first screen server (TV) is available to support the Two Screen Experience. From the second screen, user can launch an application with selected content on the first screen device. This interaction is facilitated through the use of the DIAL REST Service. Content is not transferred via the DIAL protocol to TV, but rather, the definition of the required app and the content link are provided. To support DIAL and the two screen experience, both the first and second screen devices (TV and mobile device) are connected to the same home network. The following are required:

- Dial version 2.0 or greater.
- The first screen device (TV) **MUST** be discoverable by default using the DIAL protocol.
- The first screen device (TV) **MUST** launch the Partner application if requested to do so by a DIAL enabled second screen device.
- The DIAL server **MUST** be able to parse and forward multiple URL parameters in a single request.
- The DIAL client **MUST** be able to wake the Dial server (TV) from standby.
- The first screen device (TV) **MUST** support DIAL multiuser extensions for pairing multiple DIAL enabled second screen devices.
- Volume change support as per HTML 5 specification.
- Wake on LAN functionality. Pressing the Send to TV button from a DIAL device wakes the TV from standby mode.
- Extend the DIAL protocol so that a mobile device and the TV can pair without sending a pairing code. Instead, the TV sends a TBD unique screen id via DIAL that assists with the pairing process (supports YouTube and Netflix).

4.5 Binary Compatibility and Single Codebase

A single software binary file, which is compatible across model groups with common SOC firmware branches, (this includes multiple SKU's, sizes, ODMs), and shall support all of the diverse SmartCast SKU versions. Diversity shall be managed by inserting a specifically encoded model index into hardware non-volatile memory at manufacturing time. The firmware is divided into separately loadable component, such as TV firmware, ~~Cast firmware~~, **Conjure**, SmartCast Platform, AirPlay, PQ tuning, AQ tuning, etc. which then are executed based on the model index.

4.6 OSD and Content Rendering

OSD including **VIZIO** Home, status, notifications, etc. is rendered natively using the **Loki** graphics plane. Input and casted content is rendered using the video plane in **Conjure Chromium browser**. **Planned for replacement by native Loki player**. The following are launched and rendered by the Conjure Chromium browser:

Launch and Rendered Conjure Chromium Browser	
1	Apps launched from SmartCast Home

4.6.1 Loki Player

Loki player is a VIZIO native video player.

	Features	Settings	Notes
1	Video player is	<ul style="list-style-type: none"> Full screen (default) customized size and location 	
2	Volume	<ul style="list-style-type: none"> Enabled Disabled Adjustable (0 - 100) 	
3	Closed Captions	<ul style="list-style-type: none"> Enabled Disabled Specific audio track selected custom location and justification number of text lines selected 	
4	Streaming content supported	<ul style="list-style-type: none"> Live VOD Photo Progressive OTA 	H.265/HEVC not supported for D/VHD/VFD skus due to IP license cost required
5	Aspect ratio	<ul style="list-style-type: none"> Per original source Expanded to fill the video player 	
6	Video can be:	<ul style="list-style-type: none"> Paused Resumed 	
7	Video playback supports fast forward with remote	<ul style="list-style-type: none"> Fast options: 2, 4, 8, 16, 32 slow options: 0.25, 0.5, 0.75 	
8	Video playback supports reverse with remote	<ul style="list-style-type: none"> Fast options: -2, -4, -8, -16, -32 Slow options: -0.25, -0.5, -0.75 	
9	Video provider can:	<ul style="list-style-type: none"> Serve ads to video player 	
10	Error displays if playback error		

4.7 TV Control

When TV Control is managed by the **VIZIO mobile app**, then TV Power On, OOB E and TV101 Settings must be supported directly on the TV. The **SCPL** API and notifications are intrinsic to enabling TV control using the **VIZIO** Mobile app. Or the IR remote can be used for OOB E, TV101 settings and **VIZIO** Home.

4.7.1 Power On State

On startup, the system will immediately (<200mS from button press) display last input which may be SmartCast TV. If power on from a cold boot, then display a simple boot splash screen and then go straight into OOB E if the first time start up. If OOB E has been completed, then power on to last physical or virtual input. If the last source was casted content, power on to SmartCast Home.

If OOB E has not been completed, then power on to:

	Power On OOB E Not Completed
1	First OOB E screen: Language
2	A press of the BACK key from an IR remote with confirmation exits OOB E as complete to HDMI-1 with English, and no networking.

4.7.2 VIZIO Splash Screen Display

The VIZIO logo splash screen displays as follows:

	VIZIO Logo Splash Screen Display requirements	Notes
1	Logo splash screen is displayed by the kernel and for future in LOKI .	No longer stored in the boot loader
2	Local Dimming must be enabled if supported in the TV.	Splash displays against blank (black) screen: local dimming reduces noticeable panel imperfections.
3	Reduce Backlight to 60 Cd/m2.	Reduces the visibility of panel imperfections at power on.

4	Display of VIZIO logo splash screen if Eco mode enabled when TV is powered on from DC on.	
5	No display of VIZIO logo splash screen if Quick mode enabled from DC on as this would actually delay the display of video for the input	
6	After OOB is completed, AC on to standby, no logo display.	

4.7.3 OOB Application

VIZIO Logo Splash Screen Display requirements	
1	At initial power on, the TV Out-Of-Box-Experience (OOB) application is launched
2	OOB includes setup of networking, updating (if applicable), TV naming, TOS and account setup which also includes registration.

4.7.4 SCPL API

SmartCast **core** use the **internal SCPL** API as the mechanism for settings and commands for **VIZIO** Mobile app. This API will enable changes to the TV settings and commands to be received from multiple clients including iOS and Android. The **SCPL** server shall be architected to run directly on Linux using TLS/TCP/IP.

4.7.5 Notifications

Notifications display on the TV or SmartCast Mobile. Notifications are displayed on the TV if self-generated from the platform (e.g. firmware update or sleep timer notification). Examples of notifications include:

	Notification	Note
1	Firmware Update Installed	A notification after the TV is turned on advising a firmware upgrade has been downloaded and installed. Includes update version-to-version information.
2	System notifications generated by the TV	Timer warnings such as Sleep timer, loss of network on the TV and others.
3	System notifications during SmartCast Mobile adjustments	Changes to settings are annunciated on the TV with a notification.
4	Notification Style	Both icons and ear cons may be used at the discretion of the designer.

4.8 Voice Command support

The TV shall respond to voice commands. The remote includes a microphone to capture the voice command that is then sent to the TV via Bluetooth. Not all **BT** commands will be supported. A second stream and secondary client and controls (Alexa and Google Home) are required with client controlled via voice.

	Domains	Notes
1	Power <ul style="list-style-type: none"> Turn On Turn Off Power On Power Off 	no power off
2	Power Mode <ul style="list-style-type: none"> Change power mode to eco mode/quickstart Set power mode to eco mode/quickstart Switch power mode to eco mode /quickstart to eco mode/quickstart 	Either eco mode or quickstart Synonyms/Aliases <ul style="list-style-type: none"> Eco Mode: eco friendly, power-mode-eco Quick Start: quick start mode, lower-mode-quick-start
3	Sleep Timer <ul style="list-style-type: none"> Turn on sleep timer for 30 minutes Turn on sleep timer for 60 minutes Turn on sleep timer for 90 minutes Turn on sleep timer for 120 minutes Turn on sleep timer for 180 minutes turn off sleep timer 	Synonyms/Aliases <ul style="list-style-type: none"> 60 minutes: 1 hour 90 minutes: 1 hour 30 minutes 120 minutes: 2 hours 180 minutes: 2 hours, 30 minutes

4	Picture Mode	<ul style="list-style-type: none"> Change picture mode to Calibrated Change picture mode to Game Picture Mode Bright 	Picture Modes: <ul style="list-style-type: none"> Game Sports Vivid Bright Calibrated Calibrated Dark
5	Closed Captions	<ul style="list-style-type: none"> Turn on/off subtitles Turn on/off closed captions 	
6	Talk Back	<ul style="list-style-type: none"> Turn on/off Talk Back 	
7	Speech Rate	<ul style="list-style-type: none"> Change speech rate to <RATE> Switch speech rate to <RATE> Set speech rate to <RATE> 	<RATE> = <ul style="list-style-type: none"> slow normal fast
8	Zoom Mode	<ul style="list-style-type: none"> Turn on/off Zoom Mode Turn Zoom on/off Zoom Mode on/off 	
9	Surround Sound	<ul style="list-style-type: none"> Turn on/off surround sound 	
10	Playback control	<ul style="list-style-type: none"> Pause Stop Play OR Resume Fast Forward Rewind 	Alexa also supports: <ul style="list-style-type: none"> skip forward X seconds/minutes next previous Google supports <ul style="list-style-type: none"> seek X seconds forward seek X seconds backward
11	Volume	<ul style="list-style-type: none"> Mute unmute Increase volume Raise volume Set value to X Decrease volume Lower volume 	
12	Input Selection	<ul style="list-style-type: none"> Change input to <INPUT> Switch input to <INPUT> <INPUT> 	<INPUT> = <ul style="list-style-type: none"> HDMI 1 HDMI 2 Component Antenna Airplay SmartCast Home
13	Input Selector displays	<ul style="list-style-type: none"> Change the input Switch input 	
14	Change Channel	<ul style="list-style-type: none"> Channel Up Channel Down Change channel to NAME Change channel to X 	Tuner, WatchFree
15	Launch App	<ul style="list-style-type: none"> Launch APP Open APP APP Play CONTENT on APP Play CONTENT videos on YouTube 	APP: examples include Netflix, WatchFree Plus, Hulu, etc

16	Navigation Control	<ul style="list-style-type: none"> • Move/Go/Nav/Navigate/Pan Arrow Up • Move/Go/Nav/Navigate/Pan Arrow Down • Move/Go/Nav/Navigate/Pan Arrow Right • Move/Go/Nav/Navigate/Pan Arrow Left • Select • Move/Go/Nav/Navigate/Pan Arrow Back • Home • Go Home • Nav Home • Navigate Home 	
17	Search	<ul style="list-style-type: none"> • Show me CATEGORY movies • Shown me ACTOR movies • Show me TITLE 	
18	Smart TV Commands		No support Alexa or Google Home unless noted
19	Check for Update	<ul style="list-style-type: none"> • Check for update 	
20	Reboot TV	<ul style="list-style-type: none"> • Reboot TV • Restart TV 	Also supported Google Home
21	Setup AirPlay	<ul style="list-style-type: none"> • Setup AirPlay 	
22	Setup Homekit	<ul style="list-style-type: none"> • Setup Homekit 	
23	Setup Google Assistant	<ul style="list-style-type: none"> • Setup Google Assistant • Google Assistant 	
24	Setup Alexa	<ul style="list-style-type: none"> • Setup Alexa • Alexa 	
25	Setup Wi-Fi	<ul style="list-style-type: none"> • Setup Wi-Fi • Show me wi-fi settings • Go to wi-fi settings 	
26	Go to <SC TV TAB NAME>	<ul style="list-style-type: none"> • Go to <SC TV TAB NAME> • SC TV TAB NAME 	SC TV TAB NAME = Shows/Live TV/Movies/Extras/Cast
27	Change aspect ratio	<ul style="list-style-type: none"> • Change aspect ratio to <ASPECT> • Aspect-ratio-<ASPECT> 	HDMI input only <ASPECT> = <ul style="list-style-type: none"> • Normal • Panoramic or Stretch • Wide • Zoom
28	Voice Help	<ul style="list-style-type: none"> • Voice Help • What can I say 	
29	Show me the weather	<ul style="list-style-type: none"> • Show me the weather 	
30	Launch Learn	<ul style="list-style-type: none"> • Launch Learn 	
31	What's new	<ul style="list-style-type: none"> • What's new 	

4.8.1 Voice Engine

The required Voice Engine is Houndify. When TV receives a voice command, Houndify decodes to a **SCPL (IOT)** command. Then the TV takes the requisite action for the command.

4.9 HDMI Automatic Low Latency Mode

TV supports Automatic Low Latency Mode for HDMI ports to detect presence of a game and automatically reduce latency by **bypassing** defined picture quality settings to reduce throughput delay. Steps for detection are:

	Automatic Low Latency Mode Requirements	Device
1	TV reports HDMI 2.1 support of Automatic Low Latency Mode (ALLM)	TV
2	When Device detects ALLM EDID from TV, then ALLM is enabled on the device.	Game Device

3	When HF-VSIF with ALLM_mode bit set to 1 is detected, low latency mode is enabled by setting Game/PC mode to On.	Game Device
4	When HF-VSIF with ALLM_mode bit set to 1 is no longer detected, then revert to previous low latency state, typically the default which is auto for the Game/PC Mode.	TV
5	When HF-VSIF with ALLM_mode bit is cleared to 0 then TV automatically restores the picture settings to prior to low latency mode. Examples of clearing the bit include: <ul style="list-style-type: none"> 1. Device content switched. 2. Game play stops 3. HF-VSIF no longer detected. 	TV

4.10 Peak Brightness Burst Mode DELETED