सत्यमेव जयते

टीईसी का मानक दस्तावेज

टीईसी **57120**:2025

STANDARD DOCUMENT OF TEC

TEC 57120:2025

सभी प्रसारण प्रणालियों के अनुकूल सेट टॉप बॉक्स या टीवी में निर्मित सेट टॉप बॉक्स के निर्बाधित संचालन के मानक

STANDARD FOR GENERIC REQUIREMENTS OF INTEROPERABLE SET TOP BOX AS WELL AS FOR TV SET WITH IN-BUILT STB FUNCTIONALITY

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

• Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services

• Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)

• Field evaluation of Telecom Products and Systems

• Designation of Conformity Assessment Bodies (CABs)/Testing facilities

• Testing & Certification of Telecom products

• Adoption of Standards

• Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located in New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This standard for Generic Requirements outlines the technical requirements of an Interoperable Set-Top Box (STB). This standard outlines the important technical aspects such as Standardized Interface & Specifications, Encrypted Signal Handling, Middleware Compatibility, Future Proofing, Conditional access, Compliance with Standards, Hardware and Software Interoperability. These technical specifications aim to enhance the interoperability among Set-Top Box and to ensure that user have more freedom on which service provider they want to choose and the barrier to entry is reduced.

Table of Contents

HISTORY SHEET

S. No.	**Standard / document**	***Title***	***Remarks***
1.	Standard Number TEC 57120:2025	STANDARD FOR GENERIC REQUIREMENTS OF INTEROPERABLE SET TOP BOX AS WELL AS FOR TV SET WITH IN-BUILT STB FUNCTIONALITY	New Standard For GR

REFERENCES

S. No.	Title/ Name of The Document	Link
1	TRAI recommendation on Interoperable Set Top Box	Press Release | Telecom Regulatory Authority of India
2	Wikipedia	Wikipedia
3	Middleware Technologies for Cloud Computer of Things	[1705.00387] Middleware Technologies for Cloud of Things - a survey
4	"Future Proofing" set-top box design	'Future proofing' set-top box design - EE Times
5	Conditional Access System and Its functionalities	Conditional Access System and its Functionalities | GeeksforGeeks
6	Software-defined Radios: Architecture, State-of-the-art, and Challenges	[1804.06564] Software-defined Radios: Architecture, State-of-the-art, and Challenges
7	Interoperability of heterogeneous Systems of Systems: from requirements to a reference architecture	Interoperability of heterogeneous Systems of Systems: from requirements to a reference architecture | The Journal of Supercomputing

CHAPTER-1

Introduction

The Telecom Regulatory Authority of India (TRAI) has recommended interoperable Set Top Box (STB) for digital TV Broadcasting services. An interoperable set-top box refers to a device that can work seamlessly across multiple Direct-to-Home (DTH), cable, or IPTV service providers without requiring replacement or heavy reconfiguration. In essence, interoperability allows consumers to switch between service providers simply by changing the service connection or subscription, without needing to buy a new STB or undergo costly equipment upgrades.

This might seem like a straightforward convenience at first glance, but interoperability has far-reaching implications: it promotes **consumer choice**, enhances **market competition, reduces electronic waste (e-waste)**, and **fosters innovation** in the broadcasting and entertainment sectors.

In this introduction, we will explore why interoperable STBs have become a necessity in the modern broadcasting environment, the key challenges they aim to solve, and the major benefits they offer to consumers, service providers, and the broader economy.

Why are Interoperable Set Top Boxes necessary?

1. Vast consumer choice and no vendor lock-in
2. More competition among the service providers
3. Regulatory push for consumer Rights
4. Beneficial for the environment
5. Cost saving for consumer

The Authority recommends mandatory provisioning of USB port based Common Interface for all digital television sets in India. Ministry of Information and Broadcasting (MIB) in coordination with TRAI and Ministry of Electronics and Information Technology (MeitY) may request BIS to amend the specifications for digital television sets to include provisioning of USB based Common Interface port as per DVB CI Plus 2.0 standard based on ETSI TS 103 605 standards. Such specifications must mandate TV manufactures to:

a. Provide all digital television sets with minimum one open interface port based on DVB CI Plus 2.0 standards permitting simple connection of USB CAM to allow reception of television signals.
b. Provide the digital television sets with built in tuners to enable reception of television content through both satellite and cable platforms. [1]

'All the Set-Top-Boxes in India must support technical interoperability in principle, i.e. every STB provided to a consumer must be interoperable.' [1]

DESCRIPTION

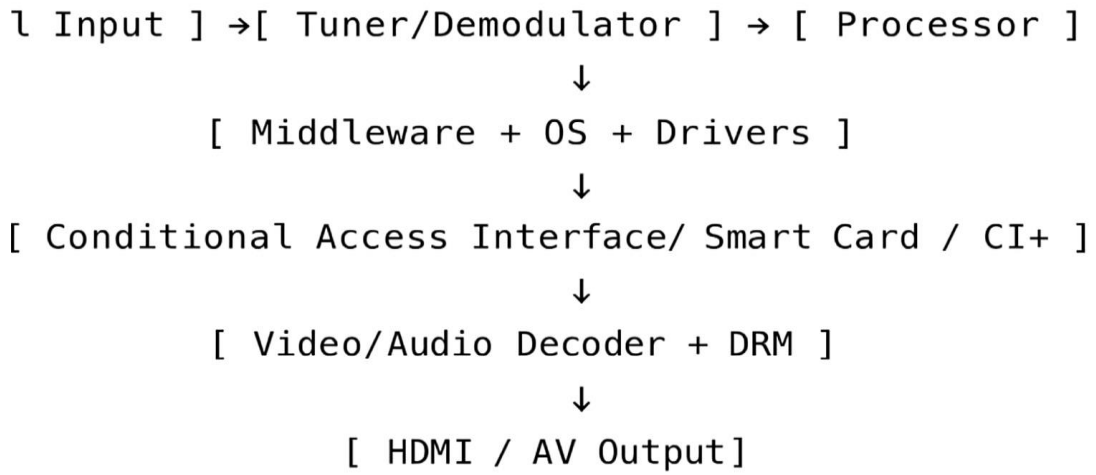
An interoperable set-top box is designed to work across different service providers (DTH, cable, IPTV) without needing replacement if you switch providers.

Normally, when you get a DTH or cable subscription, the STB is “locked” to that provider. Interoperable STBs break that lock by using standardized hardware and software interfaces, so a customer can just swap the smart card (or reauthorize the device) and start using another operator’s service without changing the box.

The basic idea:

1. Hardware stays the same.
2. Software is modular or multi-operator capable.
3. Conditional Access (CA) systems and middleware are decoupled or standardized.
4. Encryption and decryption are handled via removable or virtual modules tied to the service provider, not the box itself.

ARCHITECTURE OF INTEROPERABLE SET-TOP BOX:



Hardware Layer

- Tuner Module: Receives signals (satellite, cable, IP TV) — must support multiple standards (DVB-S2, DVB-C, DVB-T2, etc.).
- Demodulator: Converts modulated signals into baseband digital streams.
- Processor (CPU + GPU): Runs the software stack, handles IJI, decoding, encryption.
- Memory (RAM + Flash): For running the OS, apps, and storing settings.
- Smart Card Interface / Cl+ Slot / USB Cl Module: Allows plug-and-play of operator-specific Conditional
- Access Modules (CAMs).
- AV Interfaces: HDMI, optical audio, Ethernet, WiFi, etc.

Software Layer

- Operating System (OS): Often Linux or Android-based, with drivers for hardware.
- Middleware: The heart of STB software — handles EPG (Electronic Program Guide), channel
- management, remote control integration, etc.
- Conditional Access (CA) System Interface: Securely manages decryption keys and authorizations.
- Interoperability comes from using a common interface (Cl) or standardized software-based CAS (Virtual CAS).
- Application Layer. Apps for video playback, OTT integration, recording, etc.

Conditional Access System (CAS) / Digital Rights Management (DRM)

- This is where interoperability is tricky.
- Normally, each operator ties their encryption to their own CAS.
- For interoperability, the CAS must follow a standard interface or be swappable via a smart card, USB module, or virtual authorization.
- Examples: CI/CI+ modules (Common Interface), where the hardware decryptor can be changed without changing the box.

Technical Aspects of Interoperable STB :

Technical specifications of an Interoperable STB are :

Tuners

- Twin DVB-T/DVB-T2 (for HD terrestrial signals) — mostly UK; IPTV-only systems do not require tuners.

Operating System

- Embedded Linux 2.6.23+
- Android TV 9–11

CPU

- Quad-core up to ~2.6 GHz

GPU

- Android TV platforms typically include built-in GPU support for 4K rendering.

RAM

- 1–4 GB (varies by box; higher for Android TV-based systems)

Storage

- 500 GB HDD
- Cloud-based storage
- USB mass storage support

Video Output

- HDMI 2.0 (minimum)
- 4K HDR support

Audio Output

- TOSLINK optical or coaxial S/PDIF
- 5.1 surround sound support

Networking

- Ethernet 10/100 Mbps
- Wi-Fi 802.11n or higher (often optional via USB adapter or built-in)

USB Ports

- 2× USB 2.0
- Used for accessories or external storage.

Video Codecs

- H.264, H.265 (HEVC), VP9, AV1 (on newer Android TV models)

DRM & Security

- Widevine L1
- Other proprietary DRM schemes depending on provider

Features

- Google Cast + Google Assistant
- Electronic Program Guide (EPG) with backward scroll
- Access to OTT Platform like, Netflix, Disney+, Spotify, etc.
- OTT + IPTV integration

Power Consumption

- The STB shall operate on power from 90V to 260V, 50Hz.

Remote Control

- Standard IR remotes; some Android TV systems also support voice remotes.

Cloud Features

- Cloud recording

Current Television and Media Distribution Platforms

1. DTH (Direct-to-Home)

- **How it works**: Satellite signal is sent directly to your home via a **dish antenna**.
- **Example providers**: Tata Play, Airtel Digital TV, Dish TV.
- **Requirements**: Dish antenna + Set-Top Box.

2. Cable TV

- **How it works**: TV channels are delivered using **coaxial cables or fiber optics** from a local cable operator.
- **Example providers**: Den, Hathway, Siti Cable.
- **Requirements**: Cable connection + Set-Top Box.

3. OTT (Over-the-Top)

- **How it works**: Content is delivered **over the internet**, bypassing traditional TV services.
- **Example platforms**: Netflix, Amazon Prime Video, Disney+ Hotstar, YouTube.
- **Requirements**: Internet connection + smartphone/TV/laptop.

4. Terrestrial TV (antenna-based)

- **How it works**: Free-to-air channels broadcast using **ground-based towers**; received via an antenna.
- **Example**: Doordarshan in India (DD National).
- **Requirements**: Antenna + TV with tuner.

Feature	DTH	Cable TV	OTT	Terrestrial TV
Delivery	Satellite Dish	Coaxial/Fiber	Internet (Apps/Web)	Broadcast towers (RF)
Device Needed	Dish + STB	Cable + STB	Phone/Smart TV/PC	Antenna + TV
Internet Needed	No	No	Yes	No
Cost	Monthly charge	Monthly charge	Free or Subscription	Mostly Free
Content Type	Live TV channels	Live TV channels	On-demand & Live	Limited live TV

Transmission types and Streaming Protocols for Interoperable STB:

The interoperable set-top box shall support the following transmission types:

- Satellite broadcast via DVB-S/S2
- Cable broadcast via DVB-C
- Terrestrial broadcast via DVB-T/T2
- IP-based OTT streaming over Ethernet/Wi-Fi

It shall be compatible with the following streaming and broadcasting protocols and standards:

- MPEG-2, MPEG-4 (H.264), and HEVC (H.265)
- QAM, QPSK, 8PSK, COFDM modulations
- HLS, MPEG-DASH, RTMP, WebRTC for OTT
- DRM systems such as Widevine and PlayReady

Interface Requirements

1. The STB shall support RF Interface as per the DVB-S/S2/DVB- C/)// ITU-T J.83 input stream using 75 ohms F type connectors.
2. The STB shall require to integrate an Ethernet network interface like the RJ 45 connector, IEEE 802.3 10/100Mbase-T, IPv6 (recommended).
3. The STB shall also support Ethernet/Wireless interface (IEEE 802.11) to Wi-Fi access points as per network topology.
4. The STB shall support a USB interface for programming and debugging of STB's.
5. The STB shall optionally integrate an S/PDIF interface (either an optical or coaxial connector) for digital audio output.
6. The STB shall support to integrate of an HDMI connector for digital video/audio output.
7. The STB shall support interconnection with the headset via wired/wireless mode.

Quality Requirements

1. The manufacturer shall furnish the MTBF value. The minimum value of MTBF shall be 500,000 hours. The calculations shall be based on the guidelines given in either QA document No. QM-115 {January 1997} "Reliability Methods and Predictions" or any other international standards.
2. The equipment shall be manufactured in accordance with the international quality management system ISO 9001:2015 or any other equivalent ISO certificate for which the manufacturer should be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted.
3. The equipment shall conform to the requirements for the Environment specified in TEC QA standards TEC 14016:2010 (earlier QM-333) "Standard for Environmental testing of Telecommunication Equipment's Standard No. TEC 57060: 2024 16 or any other equivalent international standard, for operation, transportation, and storage. The applicable tests shall be for environmental category "D" including vibration and corrosion (salt mist).

Security Requirements

The UHD STB shall comply with the security requirements of the CAS provider and at least the following features shall be supported:

i. Embedded advanced security CAS which will be defined by CAS providers and operators

ii. Embedded DRM client system for OTT/IPTV streaming which will be defined by the operator.

iii. Contain a secure bootloader that shall be stored in write protected flash area, secure boot process with signature verification shall be applied during boot up process, only the signed software can be executed

iv. Support high-definition content protection (HDCP) copy protection on HDMI output

Safety Requirements

The equipment shall conform to:

1. IS 13252 part 1: 2010 “Information Technology Equipment –Safety- Part 1: General Requirements” [equivalent to IEC 60950-1 {2005} “Information Technology Equipment –Safety- Part 1: General Requirements” IEC 62368-1: 2018 “Audio/video, information and communication technology equipment - Part 1: Safety requirements”

CHAPTER–2

2.1 Information for the procurer of product

Abbreviations

For the purpose of this document the following abbreviations apply:

STB : Set-Top Box
DTH : Direct-To-Home
MeitY: Ministry of Electronics and Information Technology
USB : Universal Serial Bus
HDMI: Hight Definition Multimedia Interface
EPG : Electronic Program Guide
CI : Common Interface
OTT : Over The Top
CAMs: Conditional Access Modules
GEM : Globally Executable MHP
MTOIS: Multi-Technology Operations System Interface
CAS : Conditional Access Systems
SDRs : Software-Defined Radios
MTBF : Mean Time Between Failures
MPEG: Moving Picture Experts Group
HEVC: High Efficiency Video Coding
QAM: Quadrature Amplitude Modulation
QPSK: Quadrature Phase Shift Keying
COFDM: Coded Orthogonal Frequency Division Multiplexing
HLS: HTTP Live Streaming
RTMP: Real-Time Messaging Protocol
WebRTC: Web Real-Time Communication

Annexure

Template for submitting Comments or Feedback

[Comments on each section/sub section/table/figure etc. of the draft TEC 57120:2025 be stated in a fresh row. Information/comments should include reasons for comments and suggestions for modified wordings of the clause]

Name of Commentator/Organization …….

S. No.	Section of the Draft Standard	Clause/Para/Table/ Figure No. of draft Standard	Comments/ Suggested modified Wordings	Justification for proposed Change
1.				
2.				
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Note- a) Kindly insert more rows as necessary for each clause/table, etc.
b) Comments may be sent in electronic form to jto-cb@gov.in, with a copy to dircb2.tec-dot@gov.in. & ddgcb.tec@gov.in , by 29-09-2025 .

Name:
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