07 Tencent Cloud Video and Communication Services

Course Objectives

- At the end of this course, you will have a better understanding of:
  - The common use cases of audio and video services and how they work
  - The features, advantages, use cases, and billing plans for Tencent Cloud video services
  - The features, advantages, use cases, and billing plans for Tencent Cloud communication services

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Chapter 1 Basics of Audio and Video Technologies

1.1 Common Use Cases of Audio and Video Technologies

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VOD

- Recorded and viewed on demand
- Downstream only
- Video websites, UGSV apps

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LVB

- Live streaming
- Upstream & Downstream
- Gaming, sports, live events

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ILVB

- Live streaming with interaction
- Upstream and downstream
- E-commerce shopping guides, online education

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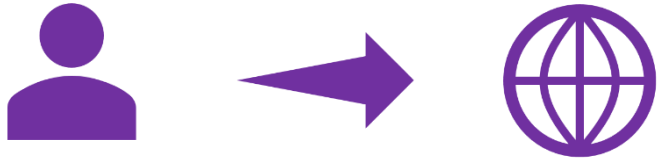
IM

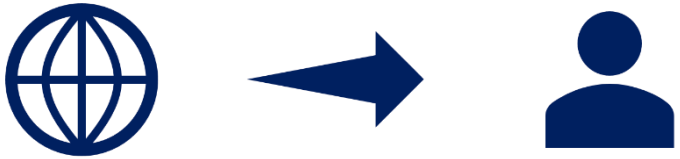
- Real-time file transfer, voice messaging, video chat
- Upstream and downstream
- Chat, file transfer

1.1 Common Use Cases of Audio and Video Technologies



Upstream only: Ingest

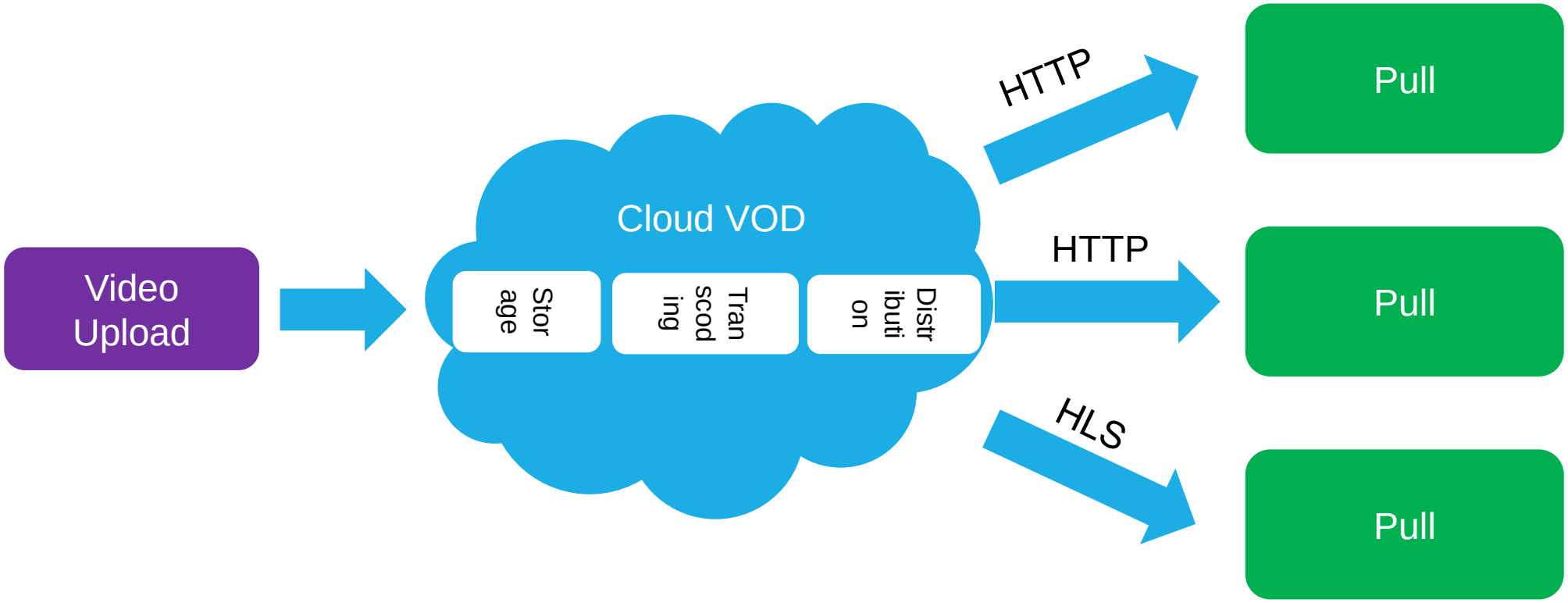
Upstream and downstream: Live video broadcast



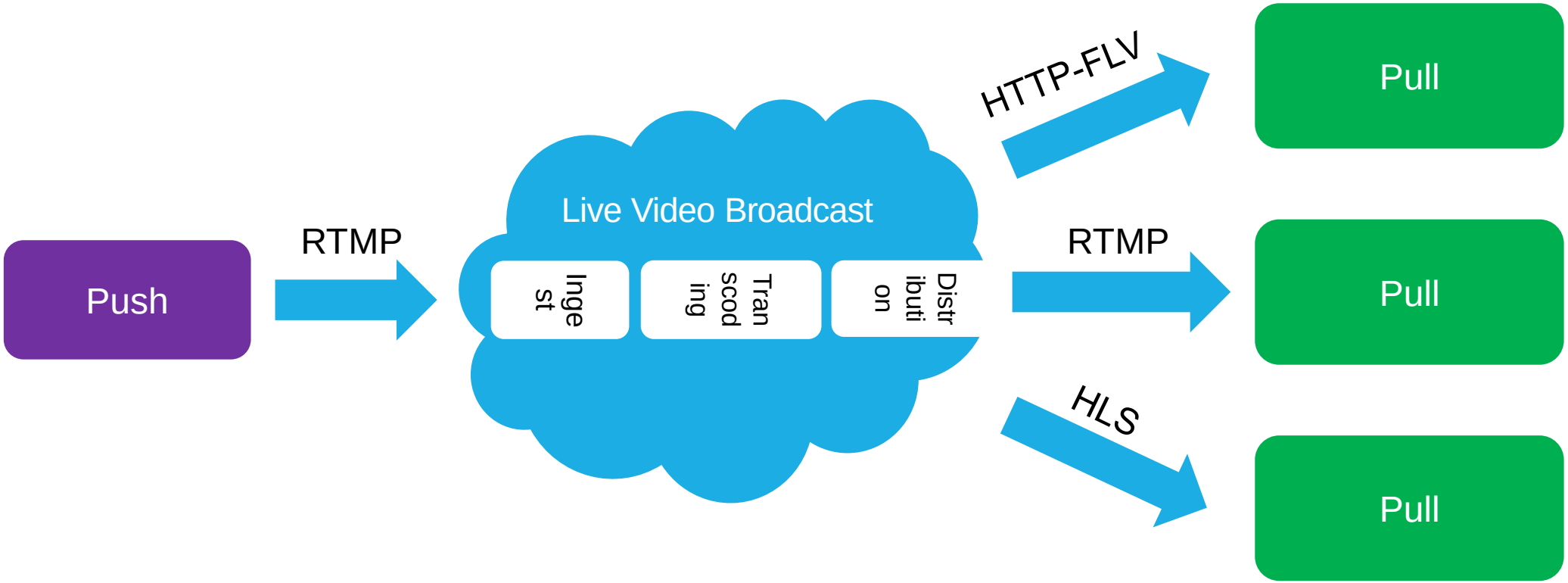
Downstream only: VOD

Upstream and downstream:
Real-time audio and video

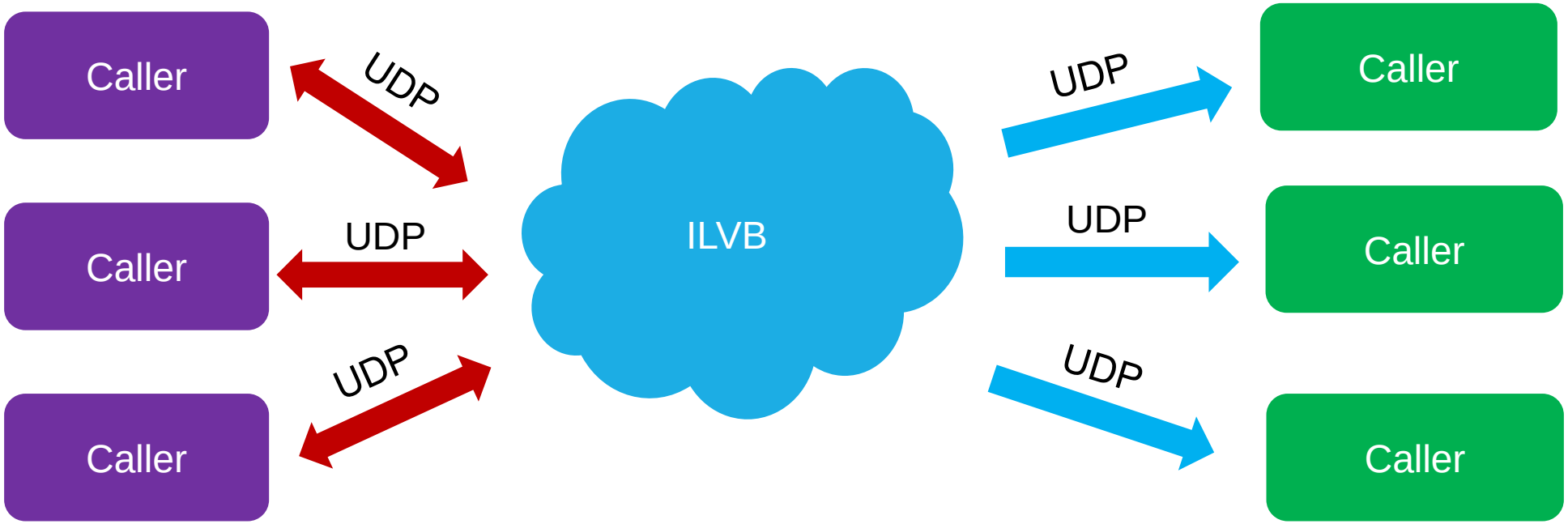
1.1 Common Use Cases of Audio and Video Technologies: VOD



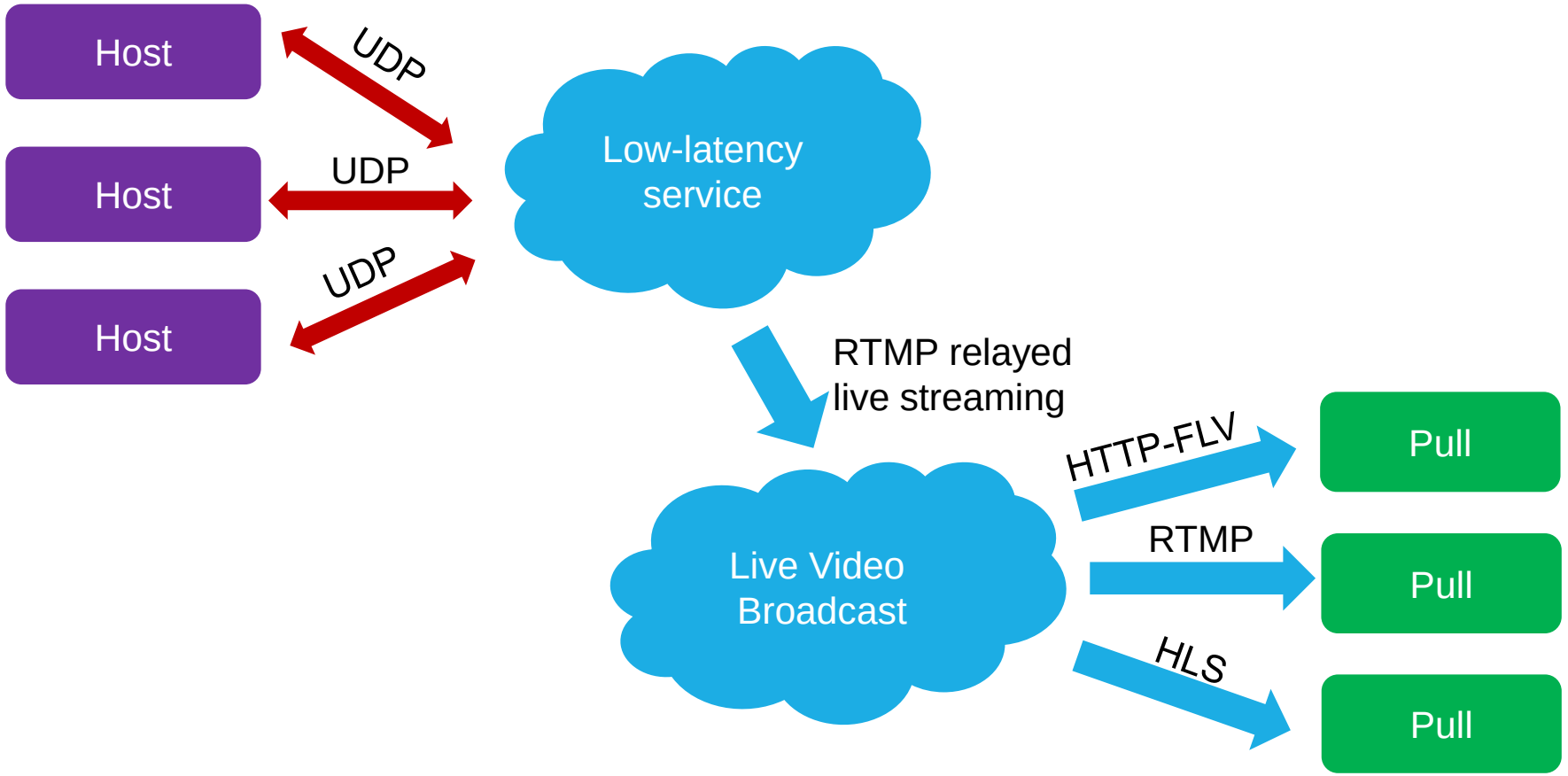
1.1 Common Use Cases of Audio and Video Technologies: LVB



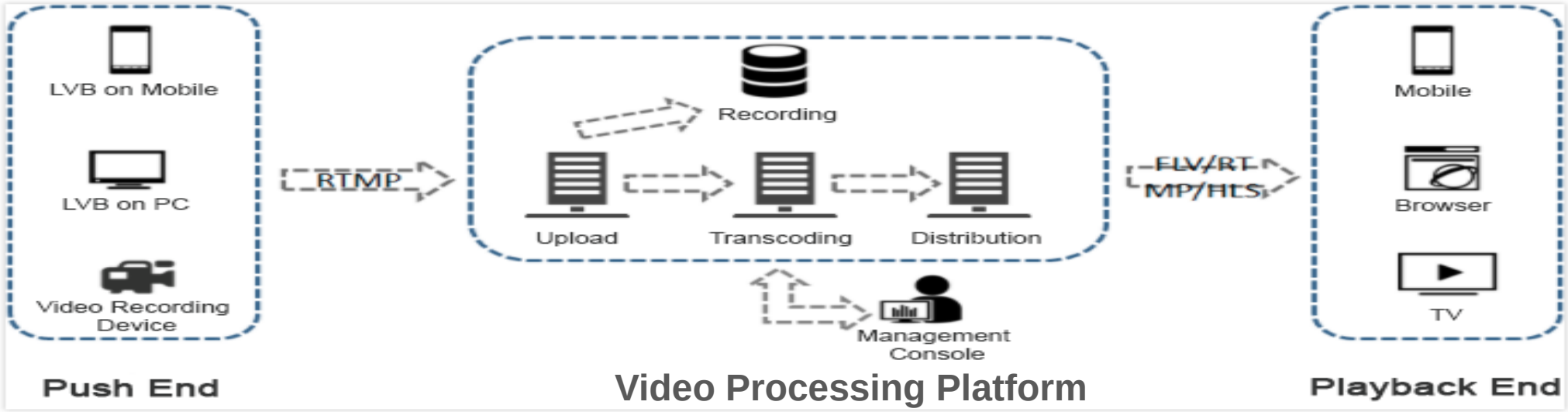
1.1 Common Use Cases of Audio and Video Technologies: ILVB

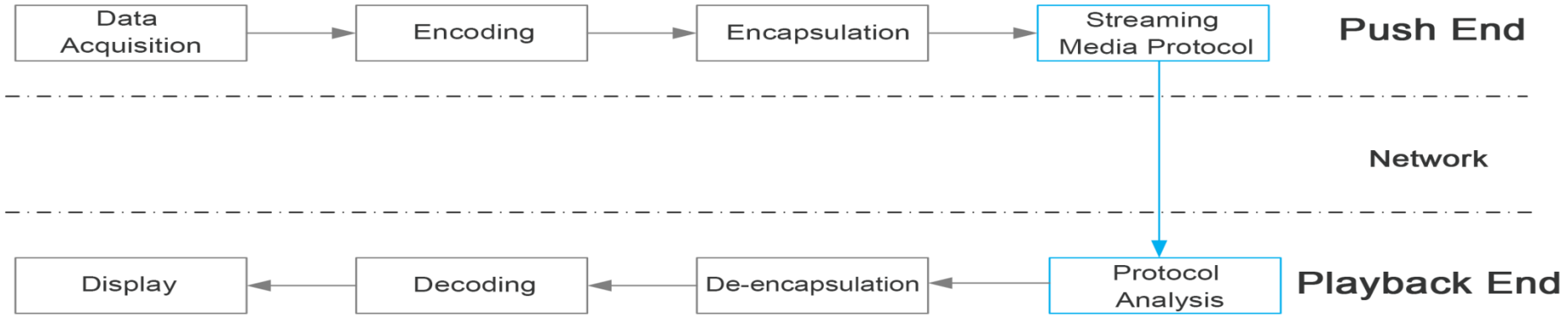


1.1 Common Use Cases of Audio and Video Technologies: Relayed Live Streaming

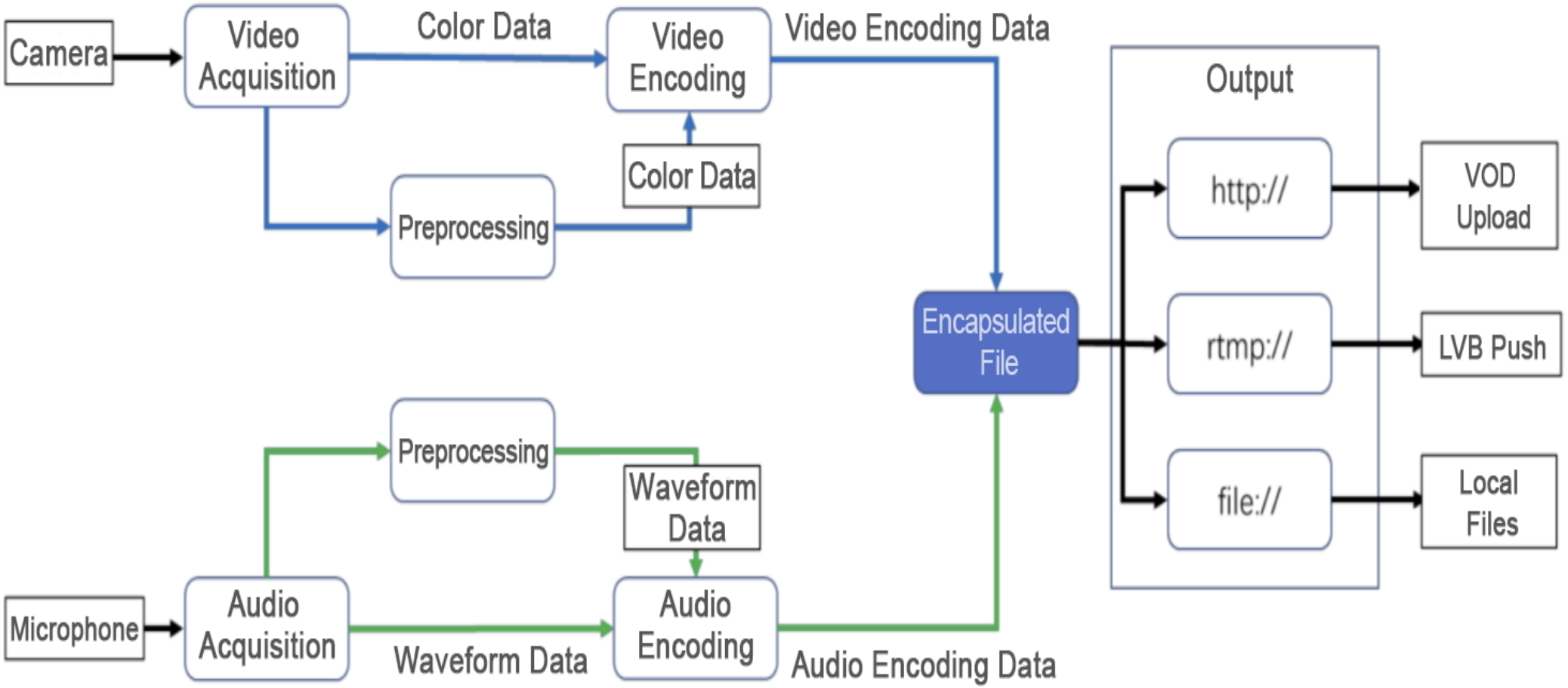


1.2 How Audio and Video Technologies Work

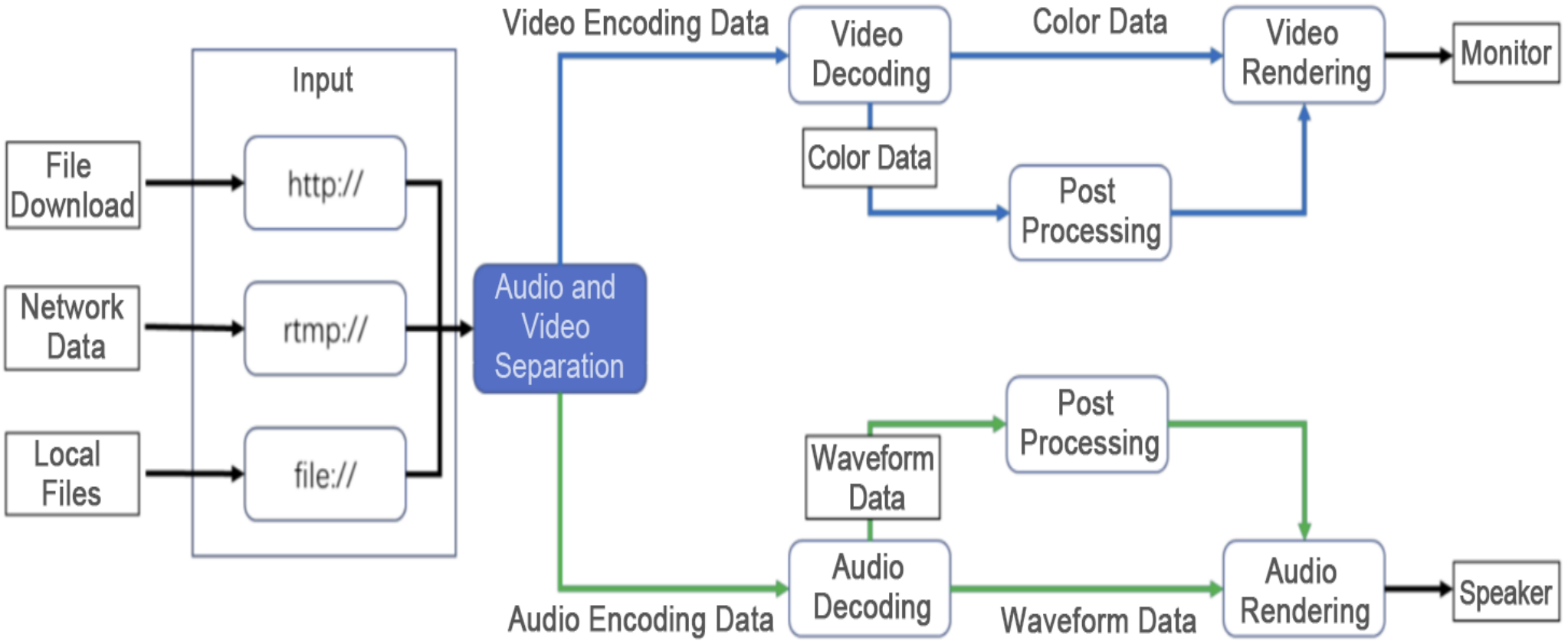




1.2 How Audio and Video Technologies Work: Push



1.2 How Audio and Video Technologies Work: Pull



1.3 Audio and Video Transmission Protocols

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Protocol	RTMP	HLS	HDL (HTTP-FLV)	Proprietary Protocols
Protocol	TCP persistent connection	HTTP short-lived connection	HTTP persistent connection	Usually UDP
How it works	Received data is forwarded immediately	Uses the data received during a period of time to generate TS slice files (three slices) and update the m3u8 index	Same as RTMP, but uses HTTP protocol (port 80)	Proprietary encapsulation based on UDP
Latency	1-3s	5-20s (depends on slicing)	1-3s	As fast as 100ms
H5 support	Supported via plugin	Yes	Supported via plugin	Depends on the implementation
Other	Flash support required	Multiple requests are made during playback, requiring high network bandwidth.	Flash support required	Non-standard protocol, poor compatibility, requires specific software support

1.3 Basic Audio and Video Parameters

Name	Description
Bit rate	The data transfer rate, expressed in bits per second, or bps (1 Byte = 8 bits).
Resolution	The size of screen size, generally expressed as the number of horizontal pixels x the number of vertical pixels, for example, 1280 x 720. Generally, at a given bit rate, the greater the resolution, the blurrier the image. At a given resolution, the higher the bit rate, the sharper the image.
Frame rate	Each still image in a video is a frame. The frame rate is the number of frames displayed per second, expressed in frames per second (fps). Generally, the higher the frame rate, the smoother the playback.
Sample rate	The number of times the audio signal is sampled per second, expressed in Hz. Common sample rates include 44100Hz (CD) and 48000Hz (recording studio).
Sample size	The number of bits used for each sampling point. Common sample sizes are 8 bits and 16 bits.
Number of sound channels	Sound channels refers to the independent audio signals in an audio stream. Mono indicates only one independent audio signal, while two sound channels (also called stereo) indicate two separate audio signals.

1.4 Basic Instant Messaging Concepts

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Concept	Description
Account	• Identifies a unique user • Requires an account authentication mechanism
Profile	• Indicates the characteristics of a user
Relationship chain	• Represents the relationships between accounts
Message	• Message types: text, image, multimedia, custom, etc. • Delivery methods: online reception, offline push
Status	• User statuses: online, offline, invisible
Use cases	• Private chat, group chat, chat room

1.4 Common IM Use Cases

	Forum	Private Chat	Group Chat	Chat Room
Number of users	Many	Few	Limited amount	Many
Immediacy	Weak	Strong	Strong	Strong
Attention to messages when offline	Weak	Strong	Strong	Weak
Attention to historical messages	Weak	Strong	Strong	Weak
Subject	Section/Topic	Friends	Groups	Room/Channel

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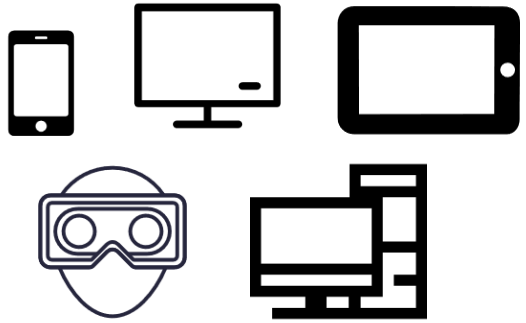
Chapter 2 Tencent Cloud Video Services

2.1. State of Video Services

- Evolution of video devices



1940s

Black and white TVs

1950s

Color TVs

1990s

Digital TVs

2000s

HD/Ultra HD digital TVs,

tablets, mobile phones, VR...

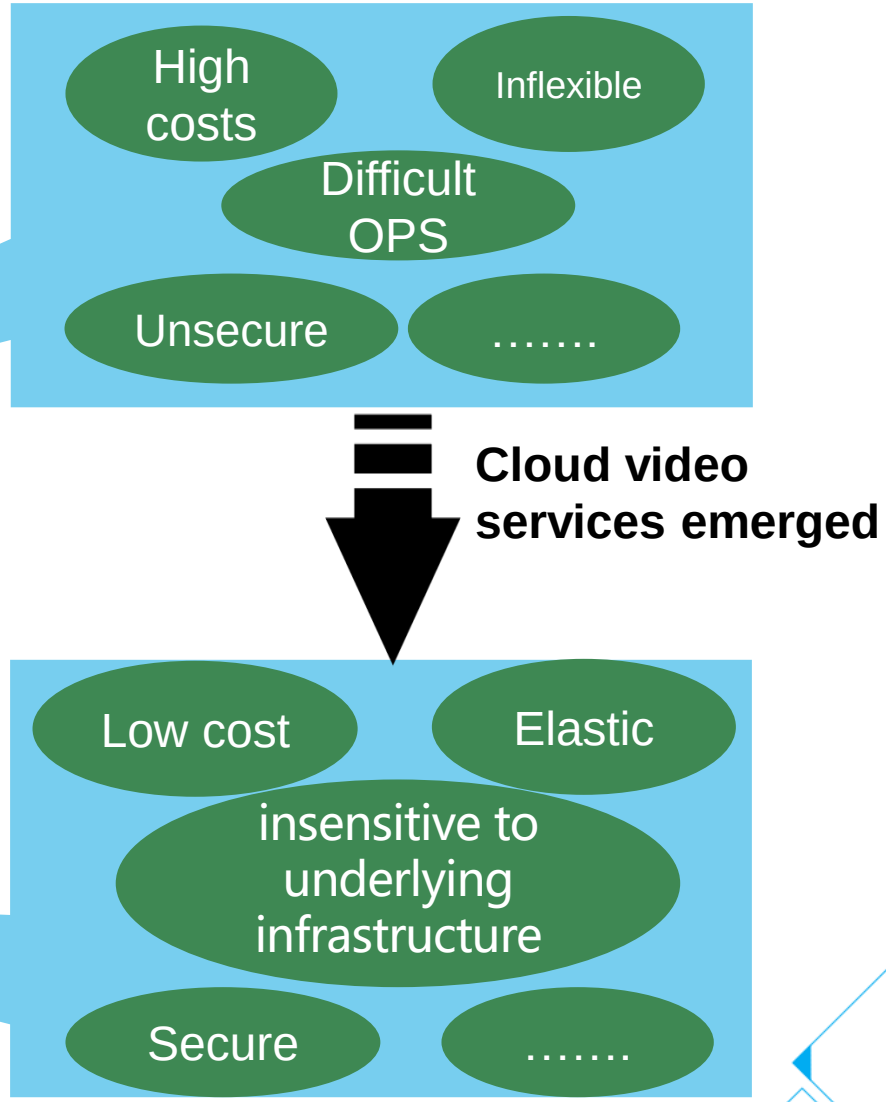
Streaming media content over the Internet

2.1. State of Video Services (continued)

- State of video services
  - Rapid technological development and the Internet liberated video from the cage that was the TV and brought it to many new devices. In response, video technology has adapted and diversified:
    - ✓ **Cable TV**: Users watch videos on their own TV, the traditional way to view video media
    - ✓ **Live**: Users watch videos in real time as the video stream is delivered to multiple devices
    - ✓ **Video on-demand**: Pre-recorded video content is delivered to multiple devices anytime, anywhere
    - ✓ **Time-shift viewing**: Users record live content for on-demand viewing; products provide replay, editing, and other extended features
  - Viewers demand higher and higher resolution:

2.1 State of Video Services (continued)

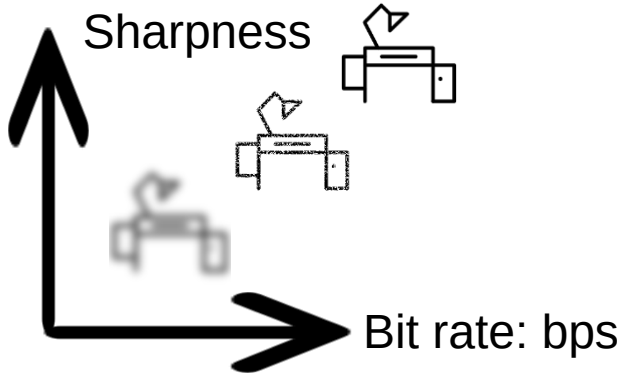
- State of video services
  - Traditional video services involve:
    - ✓ The construction of IT infrastructure
    - ✓ OPS management for IT infrastructure
    - ✓ Application development
    - ✓ Recording, uploading, transcoding, storage, distribution, playback, etc.
    - ✓ Video content
  - Cloud-based video services only need to focus on
    - ✓ The production and operation of video content



2.1.1 Key Elements of a Video Service

- Key Elements of a Video Service
  - Resolution, frame rate, and bit rate
  - Color space and bit depth
    - ✓ RGB, CMYK, Lab
    - ✓ The richer the image color, the more bits
  - Encoding and containers
    - ✓ mpeg-1, mpeg-2, mpeg-4, h.264, h.265
    - ✓ .mp4, .mkv, .rmvb

Resolution
4K (3840×2160) and below
2K (2560 x 1440) and below
FHD (1920 x 1080) and below
HD (1280 x 720) and below
SD (640 x 480) and below

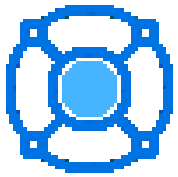


2.1.2 Classification of Video Services

- LVB
  - Live broadcast platform, live broadcast SDKs, voice chat during live broadcast, surveillance videos, live broadcasts for business, live sporting events
- VOD
  - UGSV, online video, e-commerce, online education, OTT media services
- Real-time audio and video

2.2.1 Live Video Broadcast

- **Live Video Broadcast (LVB):** Provides secure, reliable, and stable live streaming, transcoding, distribution, and playback services with high concurrency, low latency, and easy access.
- **host/viewer SDKs:** Provide complete end-to-end audio and video live streaming solutions.



Feature-rich

Supports multiple protocols, terminals, and features

Global acceleration

1100+ domestic nodes, 200+ international nodes

Smart learning

Leading audio and video AI technology

Security

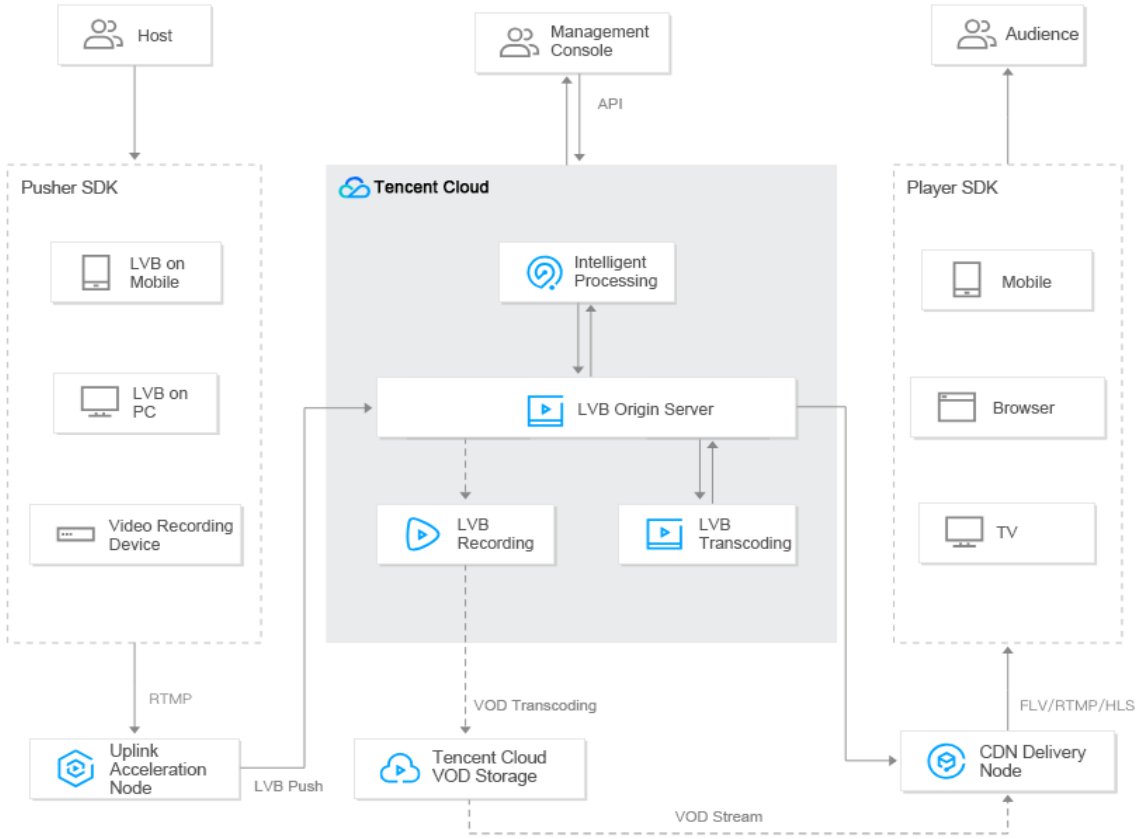
Push authentication and playback authentication

2.2.1 Live Video Broadcast (continued)

Solution	Target Customers and Strategies
LVB platform	• Fully cloud-based live broadcast solution designed for top-tier clients • Provides high quality, stable, and competitively priced LVB services • Ultra low-bitrate HD, P2P, content ecosystem
All-in-one LVB platform + LVB SDK + X-magic SDK	• Mid tier clients and, middle and long tail clients in the Internet industry • Provides an integrated, highly productized LVB solution for a wide range of entertainment use cases
Voice chat in LVB (interactive live broadcast)	• Customers with voice chat needs • Provides an interactive live broadcast solution integrating TRTC + relayed live streaming + SDKs
Surveillance camera recording	• Customers who deploy surveillance cameras • High-concurrency upstream transmission, very little downstream traffic, only requires recording and playback
Business LVB solution	• Customers who require a single live broadcast event • SaaS solution package created in cooperation with Vhall
Sporting event live broadcast	• Customers who broadcast live sporting events • Guaranteed game content ecosystem for the live broadcast of S9 and other major sporting events

2.2.2 Live Video Broadcast Architecture

- A live stream host pushes the stream to an origin server on Tencent Cloud LVB through an uplink acceleration node.
- The Tencent Cloud LVB platform processes the video in the cloud and then delivers the live stream through CDN acceleration nodes.
- Viewers can watch the video through the player SDK.
- As needed, the live stream can be recorded and stored on the Tencent Cloud VOD platform for viewing on demand.



2.2.3 Main Features of Live Video Broadcast

Recording	**Summary**: The live video content is copied for on-demand playback. Playback is not available until the recording is complete. **Use cases**: Rebroadcast after the live broadcast **Advantages**: URL parameters, controls the entire video, precise configuration, multiple recording configuration methods
Time shifting	**Summary:** Replay during live broadcast (HLS only) **Use cases:** Play highlights during a live match **Advantages:** Wider range of time shifting functions
Automatic merging	**Summary:** The platform automatically merges recorded live stream segments **Use cases:** Provide a URL for on-demand viewing of long live broadcast events **Advantages:** Completely automated, no manual operations needed
Watermarks	**Summary:** Adds a watermark to the stream during a live broadcast **Use cases:** File authentication, copyright protection, etc. **Advantages:** Adjustable watermark dimensions

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2.2.3 Main Features of Live Video Broadcast (continued)

Screenshot & porn detection	**Summary:** Takes screenshots of the live broadcast **Use cases:** Cover capture, key frame capture, content review (porn detection), etc. **Advantages:** High accuracy
Stream mixing	**Summary:** Mixes multiple live streams into one using a specific configuration **Use cases:** Host and audience interacts using voice during a live broadcast **Advantages:** Provides stream mixing and more
Hotlink protection & authentication	**Summary:** Verifies the validity of push or playback requests **Use cases:** Copyright protection, content protection **Advantages:** Comprehensive hotlink protection
APIs	**Summary:** Customers use APIs to control functions and retrieve statistics from the backend **Use cases:** Use APIs instead of Tencent Cloud console; batch operations, query, etc. **Advantages:** Greater flexibility, suitable for customers with technology prowess

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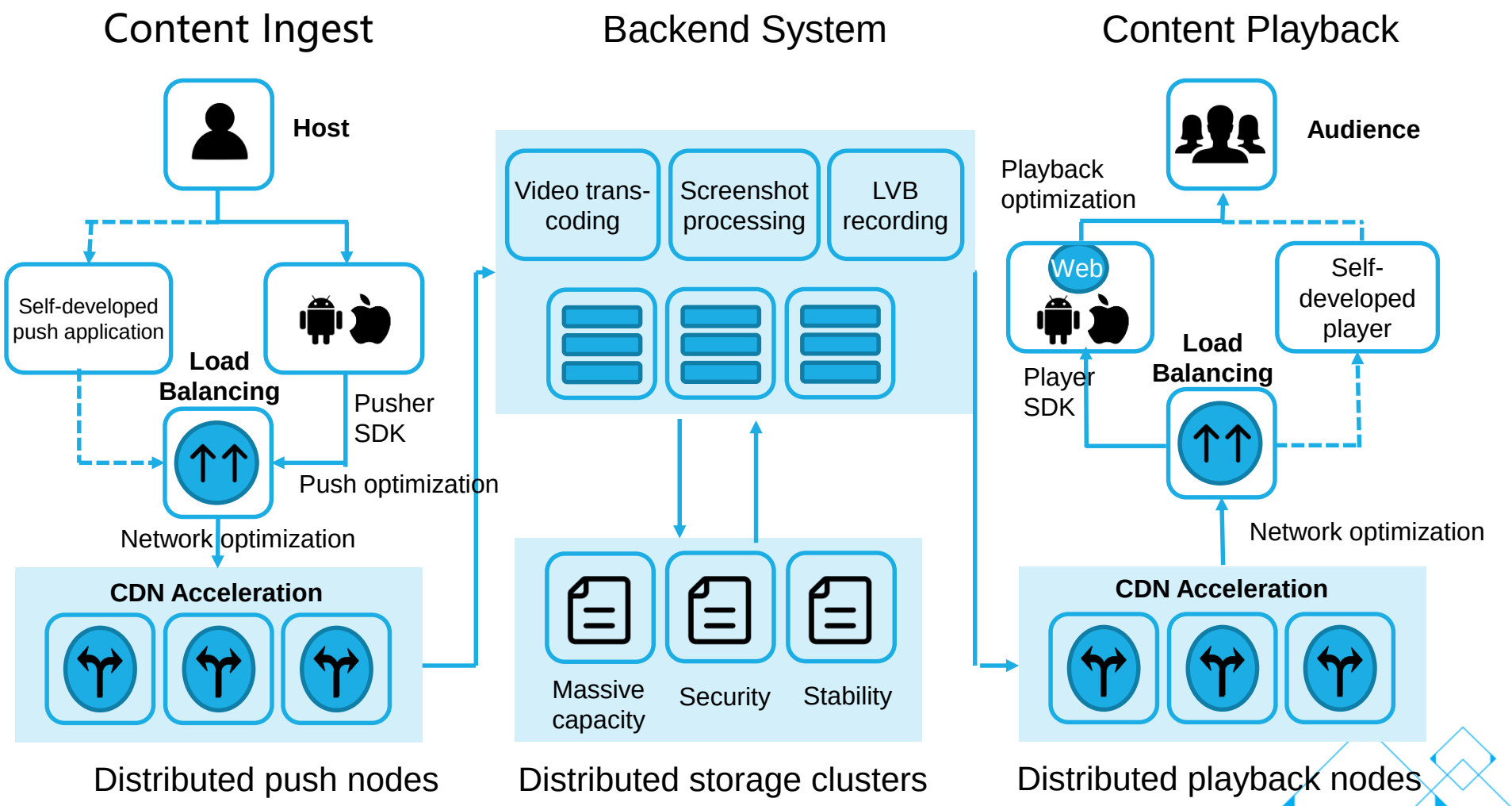
2.2.3 Main Features of Live Video Broadcast (continued)

Live Video Broadcast modules

- Content Ingest
- Push and pull
- Video transcoding
- Screenshot processing
- LVB recording
- Porn detection
- Distribution scheduling
- Network optimization
- Mass storage
- Security authentication
- Load balancing
- Multi-terminal support



2.22.4 LVB Use Cases

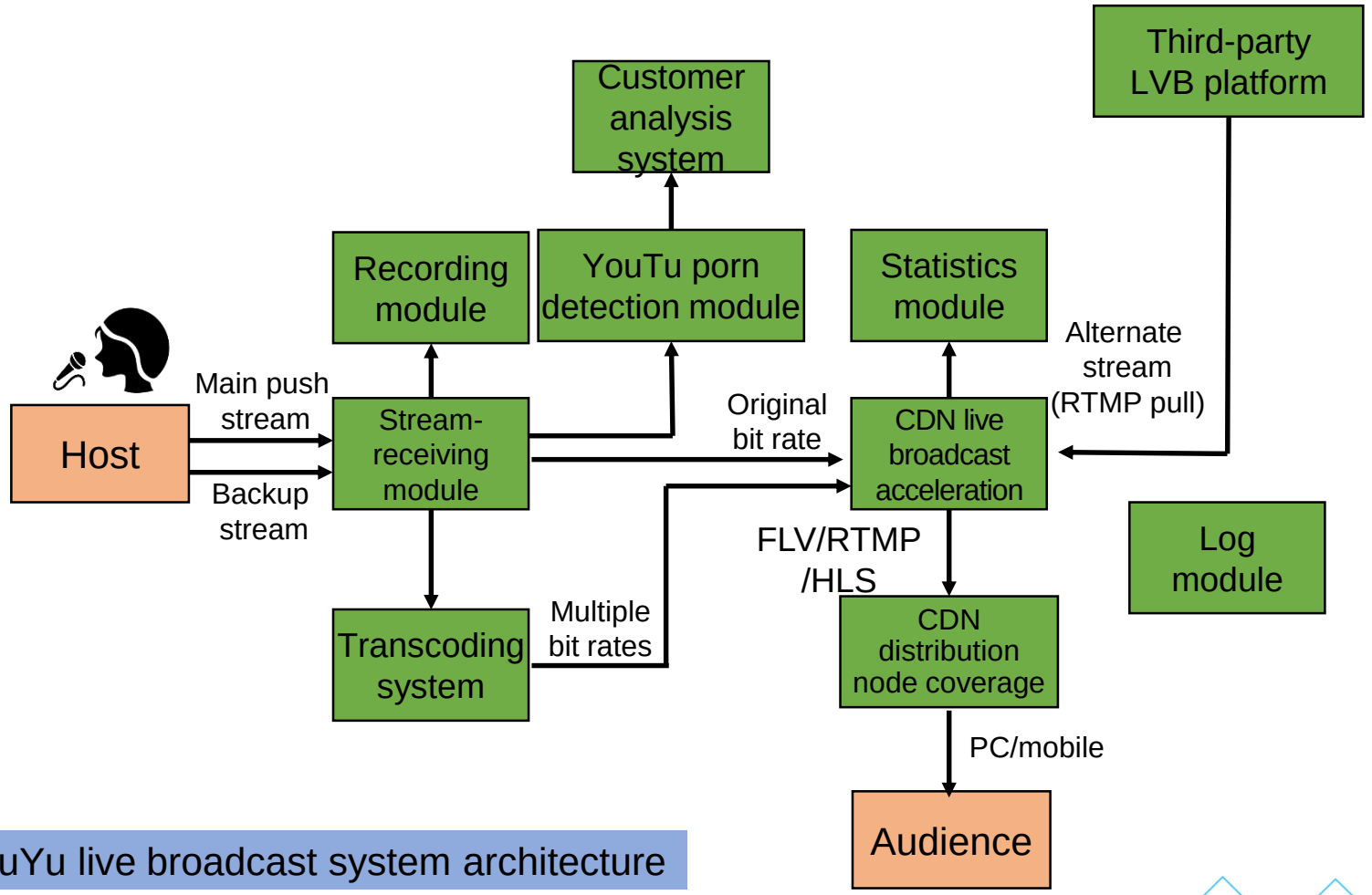
- Common challenges: Videos need to be recorded and played in real-time and delivered to a large number of users instantly.

- Gaming
- News
- Sports
- Education
- E-commerce
- Finance

2.2.5 Tencent Cloud LVB Use Cases

DouYu live broadcast system

- **7000+** LVB rooms
- **Millions** of concurrent users
- LVB **recording + playback**
- **Real-time porn detection** during live broadcast
- **Hundreds of millions** of screenshots per month



DouYu live broadcast system architecture

2.2.6 Live Video Broadcast Billing Plans

Tencent Cloud LVB billable services include the basic service and value-added services that you have signed up for. Basic services include the pay-as-you-go **traffic/bandwidth** fee. This is the fees for downstream traffic/bandwidth generated by connecting the user and the cache origin server.

Value-added services include **LVB transcoding**, **LVB recording**, **LVB screen capture** and **intelligent porn detection**. These services are also pay-as-you-go and you only pay for what you use.

See the following slides for more detail.

For pricing information about the pricing, see here.

2.2.7 Live Video Broadcast Traffic and Bandwidth Fee

The LVB traffic and bandwidth statistics detail the downstream traffic and bandwidth generated by connecting the user to the cache origin server. LVB offers two pay-as-you-go billing plans: Bill-by-traffic or Bill-by-bandwidth. The default plan for new users is bill-by-traffic.

Bill-by-traffic

LVB bill-by-traffic utilizes a tiered pricing rate with a daily billing cycle. See the table for rates.

Traffic tier	Price (USD/GB/day)
0 - 500GB	0.0459
500GB (inclusive) - 2TB	0.0441
2TB (inclusive) - 50TB	0.0406
50TB (inclusive) -100TB	0.0335
≥100TB	0.0282

Bill-by-bandwidth

LVB bill-by-bandwidth utilizes a tiered pricing rate billed by the daily peak bandwidth with a daily billing cycle. See the table for rates.

Bandwidth tier	Price (USD/Mbps/day)
0 - 500Mbps	0.1129
500Mbps (inclusive) - 5Gbps	0.1094
5Gbps (inclusive) - 20Gbps	0.1041
≥20Gbps	0.1024

For pricing information about traffic/bandwidth fee, see here.

2.2.8 Live Video Broadcast Transcoding Fee

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LVB provides standard transcoding and ultra-fast HD transcoding services which are billed according to the encoding method used, transcoding resolution and transcoding duration. The transcoding feature is disabled by default. If you need to use it, you can enable it in the LVB console or through cloud API. **If you use the watermark or stream mixing feature, transcoding fees will also be incurred, and the resolution will be the same as the resolution of the live stream to which the watermark is added.**

Transcoding fee = Encoding method - resolution - price x transcoding duration.

If no transcoding service is used, no fees will be incurred.

Encoding method	Resolution	Price (USD/minute)
H.264	480p	0.0028
	720p	0.0057
	1080p	0.0111
	2K	0.024
	4K	0.0491
H.265	480p	0.0141
	720p	0.0275
	1080p	0.0549
	2K	0.1183
	4K	0.2366

For pricing information about LVB transcoding fee, see here.

2.2.9 Live Video Broadcast Recording Fee

LVB can record and store live streams in VOD. The recording feature is disabled by default and can be enabled in the console or through cloud API. Use of the recording feature will incur a fee, and the bill will be calculated according to the peak number of concurrent LVB recording channels of the current month. See the following table for rates.

Billing type	Price (USD/channel/month)
Peak number of recording channels	5.2941

For pricing information about LVB recording fee, see here.

2.2.10 Live Video Broadcast Screen Capture Fee

LVB can take screenshots of the live stream. The screen capture feature is disabled by default and can be enabled in the console or through cloud API. Use of the screen capture feature will incur a fee. The first 1,000 screenshots are offered for free every month. Any additional screenshots taken will incur fees. The bill will be calculated according to the total number of screenshots taken for the month. See the following table for rates.

Screenshots	Price (USD/thousand screenshots)	Note
< 1,000	0 USD	First 1,000 screenshots each month is free
≥ 1,000	0.0176 USD/thousand screenshots	Screenshots less than 1,000 will be counted as 1,000 each month

For pricing information about LVB screen capture fee, see here.

2.2.11 Live Video Broadcast Intelligent Porn Detection Fee

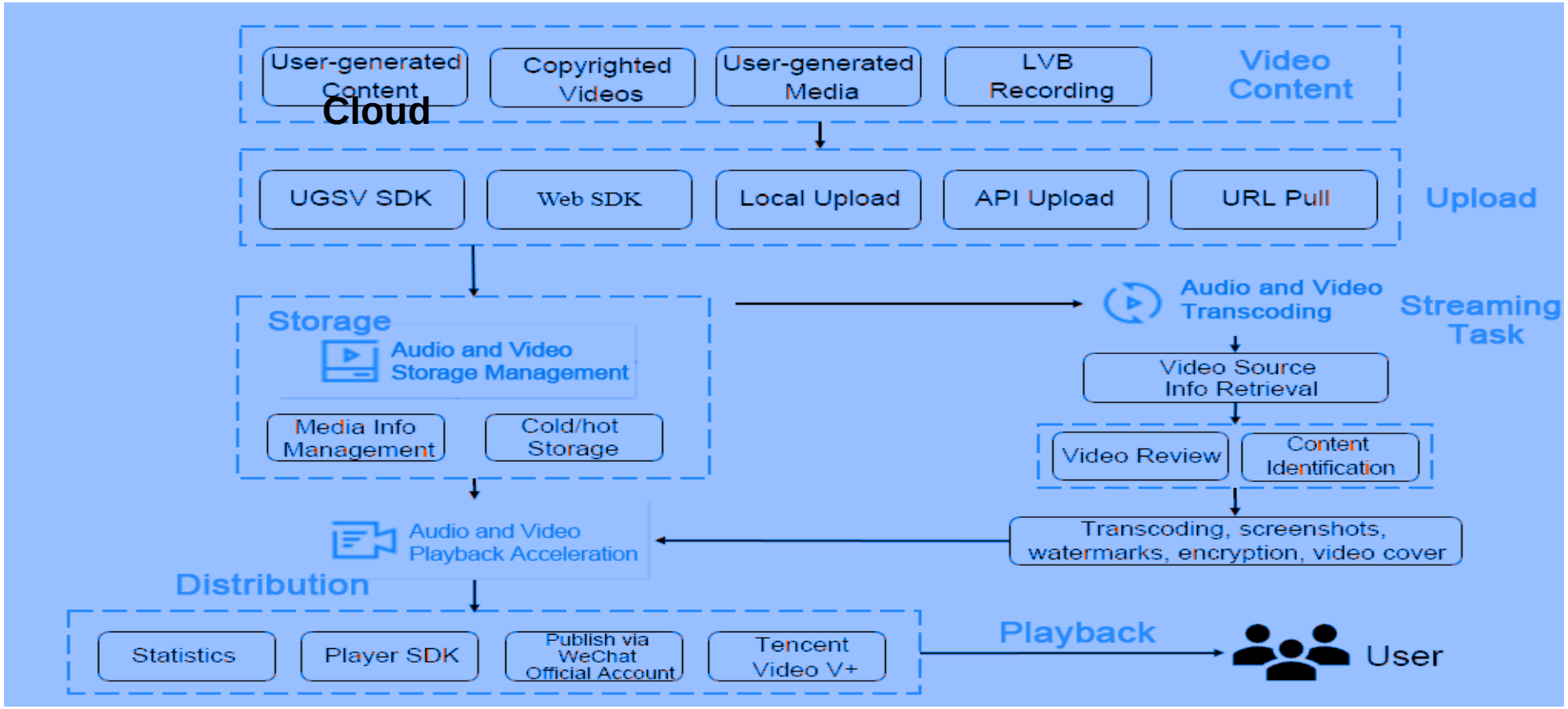
LVB can intelligently detect pornography in the live stream. The porn detection feature is disabled by default and can be enabled in the console or through cloud API. As the porn detection service requires taking screenshots of the live stream, enabling this feature will include fees for both porn detection and screen capture. The first 1,000 porn detection screenshots are offered for free every month. Any additional screenshots taken will incur fees. The bill will be calculated according to the total number of porn detection screenshots taken for the month. See the following table for rates.

Screenshots	Price (USD/thousand screenshots)	Note
< 1,000	0 USD	First 1,000 porn detection screenshots each month is free
≥ 1,000	0.2294 USD/thousand screenshots	Screenshots less than 1,000 will be counted as 1,000 each month

For pricing information about intelligent porn detection fee, see here.

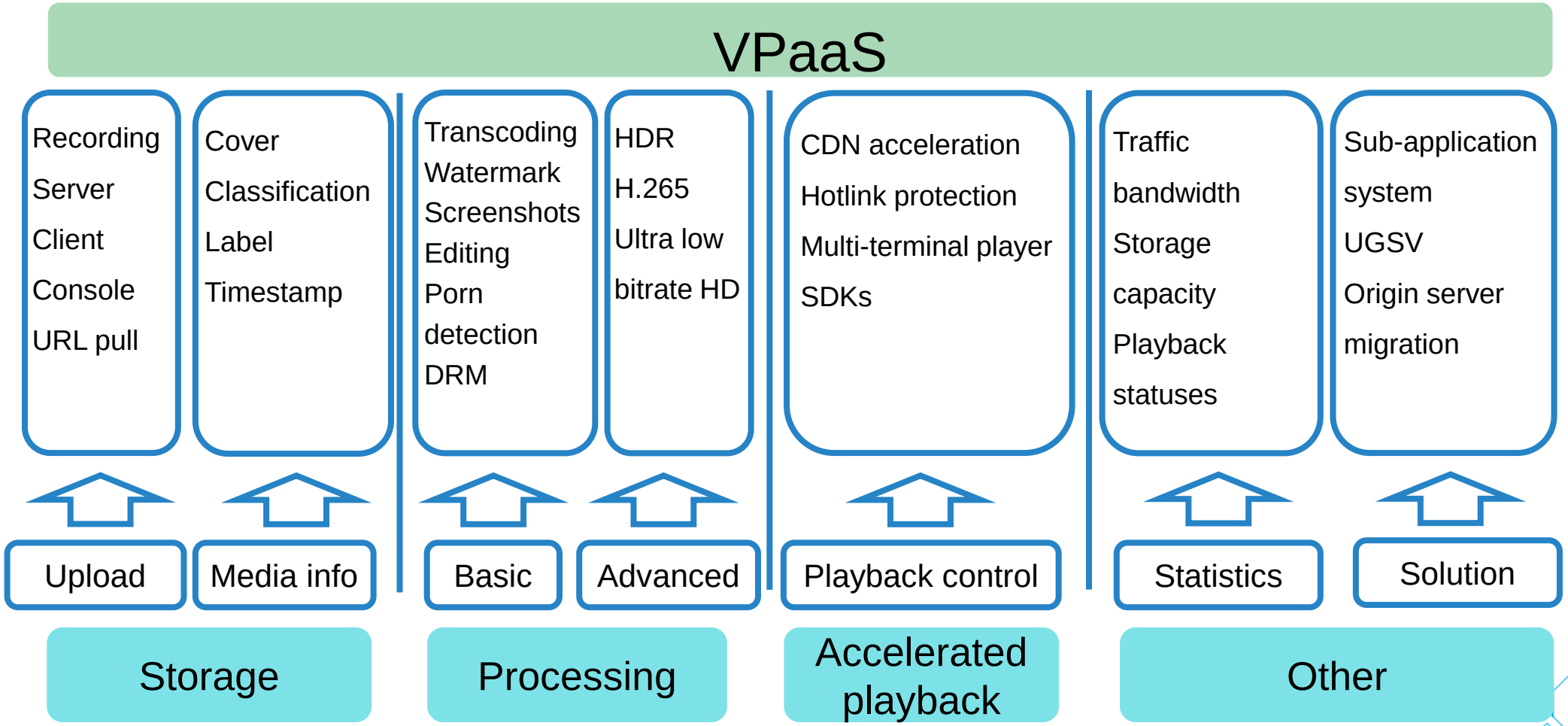
2.3.1 Video on Demand

- **Video on Demand (VOD):** A one-stop VPaaS (Video Platform as a Service) solution for audio and video uploading, storage management, automated transcoding, accelerated playback, media management, and audio/video communication.



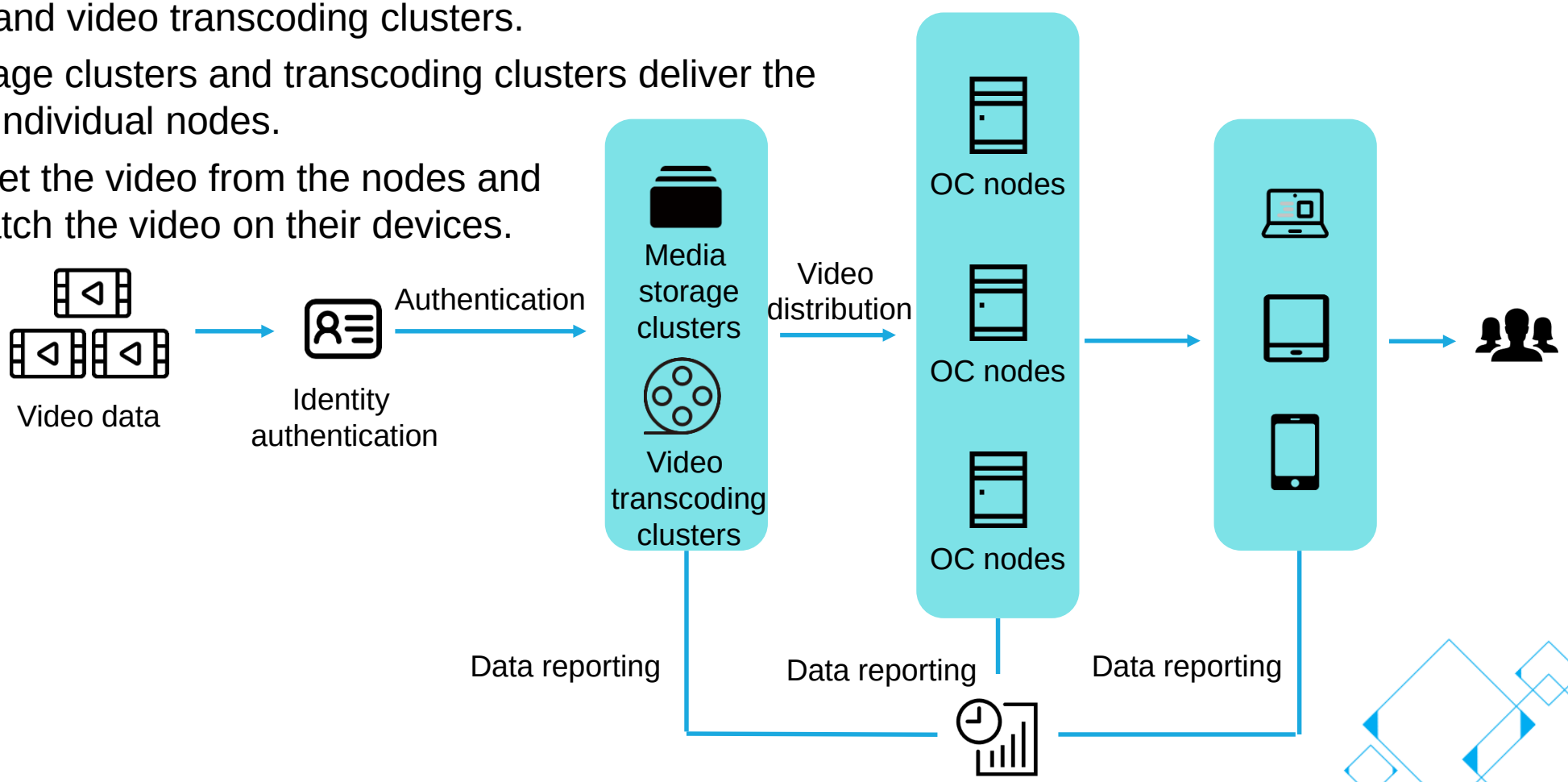
2.3.1 Video on Demand (continued)

- Tencent Cloud VOD Service Overview

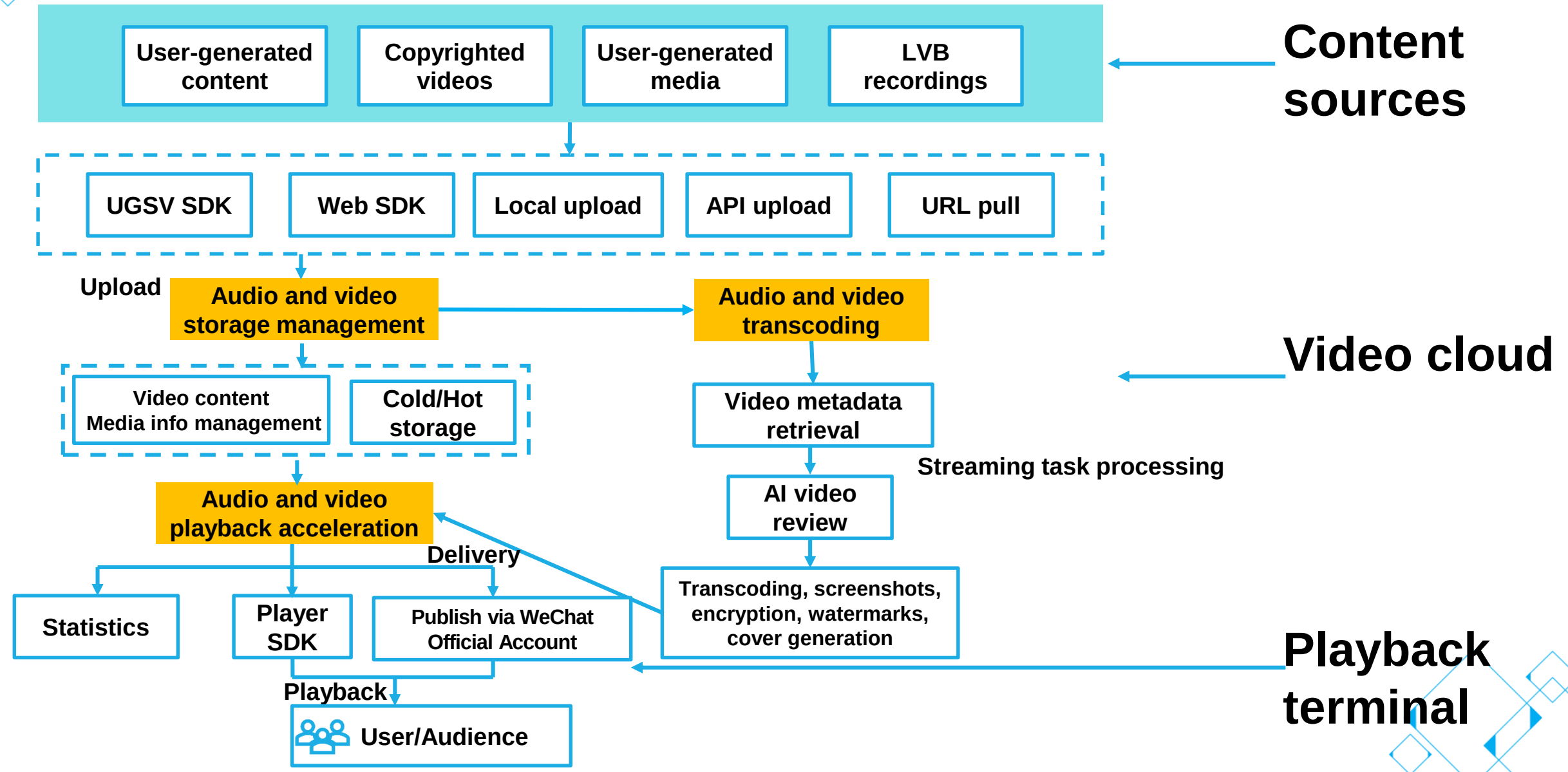


2.3.1 Video on Demand (continued)

- How the VOD Platform Works
  - A video is authenticated and uploaded to the storage clusters and video transcoding clusters.
  - The storage clusters and transcoding clusters deliver the video to individual nodes.
  - Clients get the video from the nodes and users watch the video on their devices.



2.3.1 Video on Demand (continued)



2.3.2 Main Features of Video on Demand

Audio and video storage management	Audio and video transcoding and processing	Audio and video distribution acceleration
• Upload • Storage • Media info management • Origin server synchronization	• Transcoding • Editing • DRM encryption • Porn detection	• Custom domain name • Hotlink protection • Player SDKs • Published through WeChat • Service statistics analysis

2.3.3 VOD Use Cases

- **Common challenges:** Numerous audio and video files need to be uploaded and processed, with a high-quality playback experience provided to users anywhere they are.

Video Portal

Online Education

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快手

斗鱼 DOUYU.COM

UGSV Apps

2.3.4 Tencent Cloud VOD Use Cases

- Common solutions for VOD
  - UGSV
    - ✓ Typical apps: Kuaishou, Tiktok
    - ✓ Tencent Cloud solution: UGSV SDK + VOD cloud + X-magic
  - E-commerce
    - ✓ Typical apps: JD, Vipshop
    - ✓ Tencent Cloud solution: VOD storage management + transcoding + video acceleration CDN + player SDK
  - OTT media services
    - ✓ Typical customers: Coocaa TV, TCL FFALCON
    - ✓ Tencent Cloud solution: VOD storage management + transcoding + video acceleration CDN

2.4.1 Tencent Real-Time Communication

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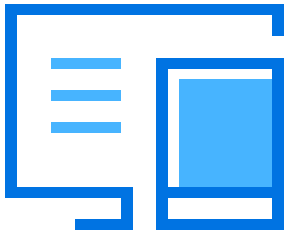
- **Tencent Real-Time Communication (TRTC):**
  - Provides high quality, customizable, and real-time interactive video calling services across platforms
  - Can be used with TBS (Tencent Browsing Service) WebRTC and Tencent Real-time Communication SDKs
  - Lets users build an audio and video communication platform without expertise or prior experience. See the demos below:

iOS	Android	Mac OS	Windows	Chrome Browser	WeChat Mini Program
		Click to download	Click to download	Click for Demo	

2.4.2 Features of TRTC

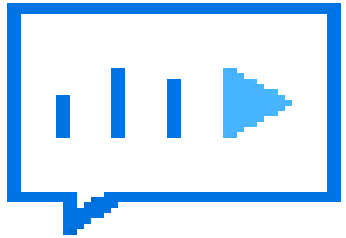


Multi-platform Connection

- Access WeChat, QQ, or QQ Browser via an H5 webpage or WeChat mini program
- PC, Macs, and apps can call each other by integrating an SDK

Integrated Solution

- Supports live broadcast, video on-demand, cloud communication, transcoding, and bypass streaming
- Supports interactive whiteboards, beauty filters, OCR identification, account integration, and other features



HD Video Experience

- Optimizes audio and video for sharpness, reduces pixelation, supports 720P HD video calling
- Provides a global end-to-end latency of less than 300ms and resistance to packet loss up to 40% and network jitter up to 1000ms

2.4.3 TRTC Use Cases

- Services that require real-time playback and viewing or support interaction

Video Customer Service

Online Interviews

Online Conferencing

Online Medical Services

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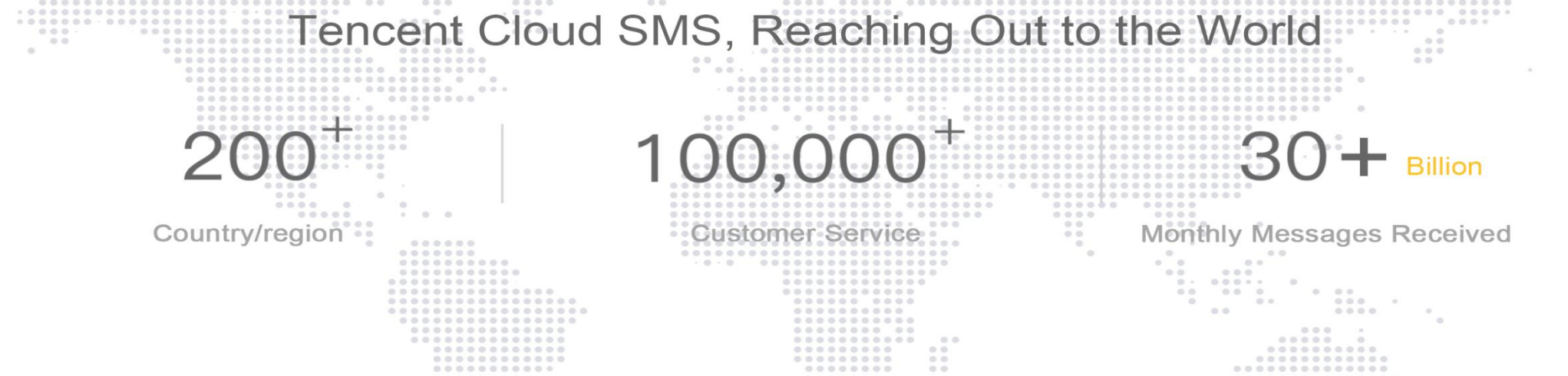
Chapter 3 Tencent Cloud Communication Services

3.1.1 Short Message Service

- Short Message Service (SMS) is backed by more than a decade of expertise and experience with SMS technologies. It provides domestic SMS, voice messaging, and international SMS services for mega platforms like QQ and WeChat, and 100,000+ customers.



Domestic SMS

Voice Message

International SMS

3.1.1 Advantages of SMS

Fast and Stable

High delivery rate of 99%, 90% of messages are delivered within 10s

Intelligent Scheduling

Intelligently schedules channels from multiple carriers and deploys disaster recovery backups in multiple locations

Convenient Access

Supports HTTPS, CMPP, SMPP, and other protocols, with multiple SDKs

Real-time Monitoring

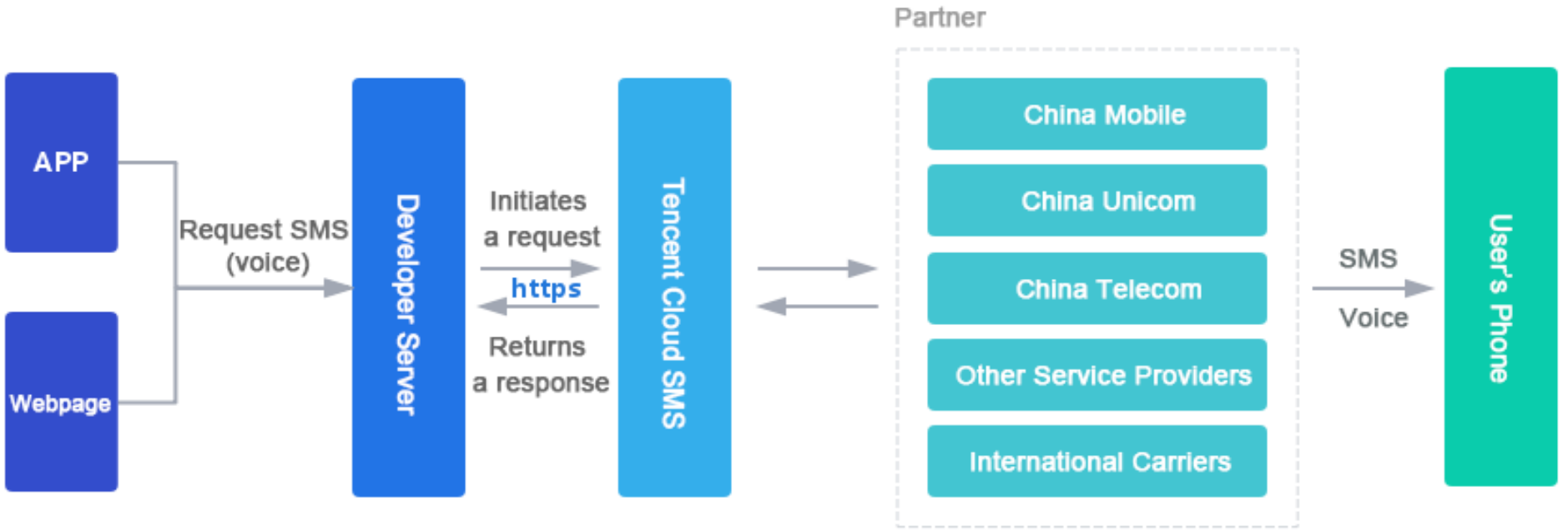
Real-time monitoring by region, carrier, and SMS type

Statistical Analysis

Generates reports using a multitude of statistics such as messages delivered, success rate, and causes of failure

3.1.2 SMS Request Process

- An SMS (or voice) request initiates the following process:

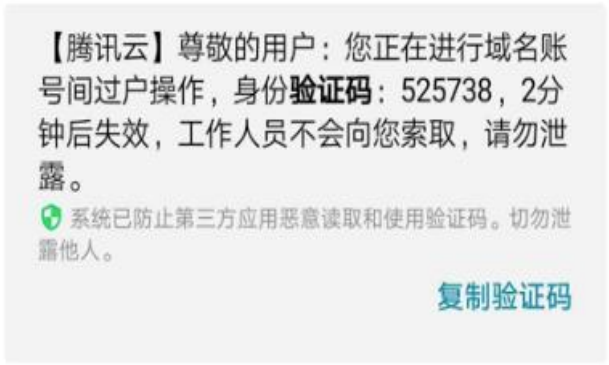


3.1.2 SMS Composition

- **SMS composition:**
  - **SMS signature**: Identifies a company or service, requires approval before use.
  - **SMS content:** Can be customized by using content templates, requires approval before use.

- **SMS example:** [Tencent, Inc.] Your QQ login verification code is 1234. It will expire in 5 minutes.
  - **SMS signature:** [Tencent, Inc.]
  - **SMS content:** Your QQ login verification code is 1234. It will expire in 5 minutes.
  - **Content template:** Your QQ login verification code is {1}. It will expire in {2} minutes. Here, {1} and {2} are variable parameters.

3.1.3 SMS Use Cases

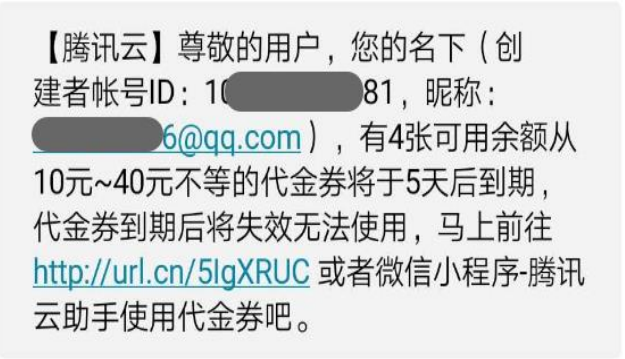


Verification Codes

Account registration and login/identity/payment authentication

Notifications

Status, security, fee, and service notifications



Marketing

Announcements for events, sales and offers, product promotions, and customer services

3.1.4 SMS Billing Plans

Billing Methods

SMS messages are billed postpaid monthly by length according to the number of fragment messages that forms the original message (including signature). SMS is available in over 200 countries and regions. For prices in different countries, please see here.

How to Calculate the Length of an GSMS Message

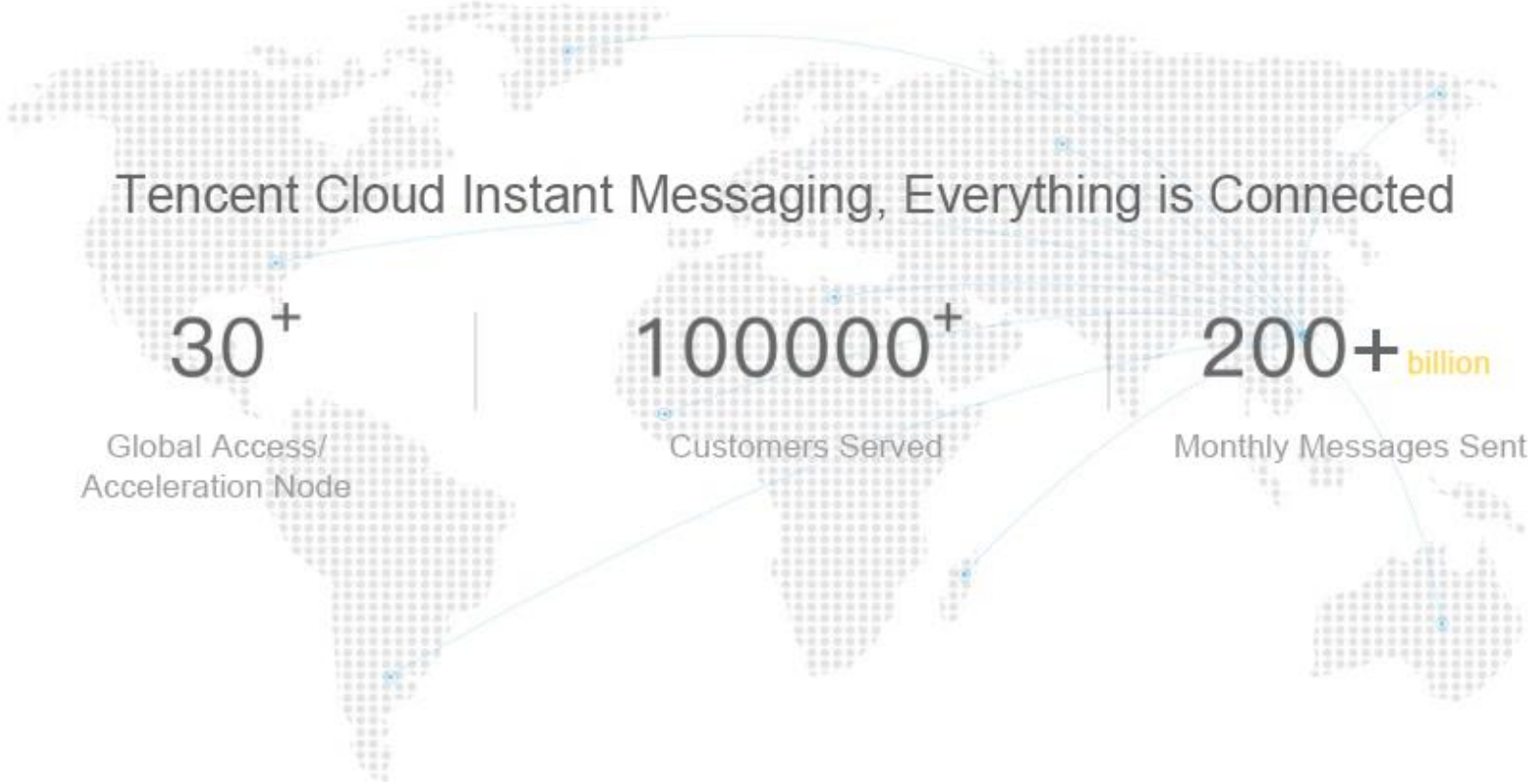
Number of characters in an SMS message = Number of characters in the signature + Number of characters in the SMS template

The SMS message sent at a time should not exceed 500 characters. A Chinese character, letter, number, space or symbol is counted as a character.

For more information about the pricing, see here.

3.2.1 Instant Messaging

- Instant Messaging (IM) is backed by the same technologies that serve nearly a billion QQ users. Tencent strives to help enterprises complete their digital transformations by providing a comprehensive suite of communication capabilities.



3.2.1 Advantages of IM

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Rich Social Features

- Supports private chats, group chats, and LVB rooms
- Text, emojis, images, voice, and video
- Customizations: red envelopes, receipts, likes, and more

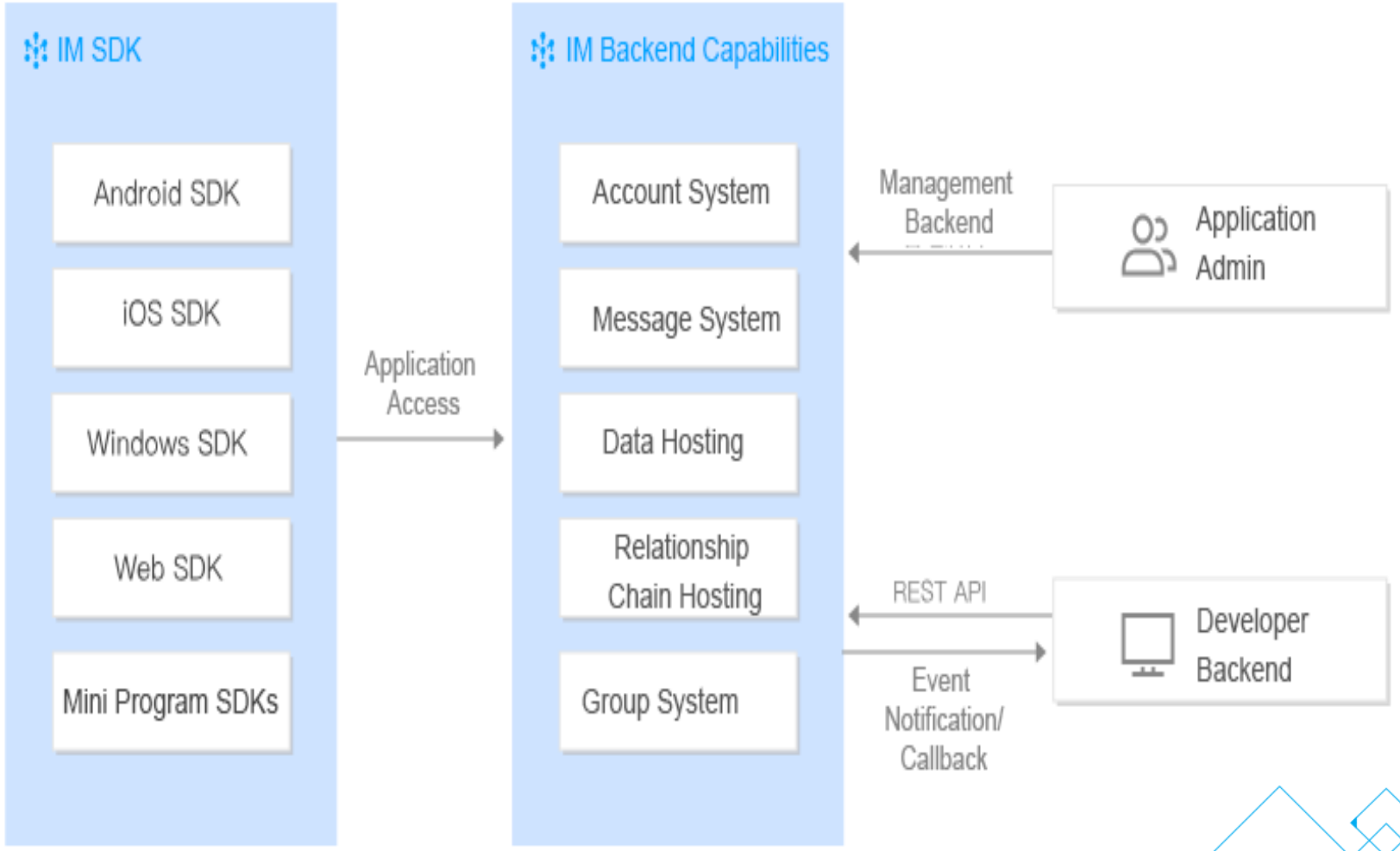
Stable and Highly Available

- Concurrent delivery of tens of millions of messages, with text and images delivered in seconds
- Global deployment, automatically selects the optimal path
- Powerful APIs with third-party callback capabilities

All-in-One Solution

3.2.2 IM Architecture

- **Features**
  - Integration service
  - Account system
  - Message system
  - Group system
  - Information hosting
  - Relationship chain hosting
- **Management and Monitoring**
  - Console
  - RESTful APIs
  - Third-party callback



3.2.3 IM Use Cases

In-app social interaction

Customer service

Office collaboration

In-game communication

Quiz

- What are some use cases of audio and video technologies?
- What key processes take place during audio and video communication?

Summary

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- This course covered the following subjects:
  - Basics of Audio and Video Technologies: common use cases, technical principles, and protocol parameters
  - Tencent Cloud Video Services: LVB, VOD, and TRTC
  - Tencent Cloud Communication Services: SMS and IM

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Thank you