**One : Model abstraction**

The transcoding system can be abstracted as an input frame data, which consumes CPU and memory resources for processing. Output system for writing files. The inputs and resources of the system are unstable .

to control the transcoding rate in terms of unstable input and unstable resources . There are 16 possible scenarios in total :

流输出

流输入

CPU

转码器

Less input, lower cpu usage

Increased input, lower cpu usage

A lot of input, low cpu usage

Input jitter, low CPU usage

Less input, increased cpu usage

Increased input, increased cpu usage

A lot of input, increased cpu usage

Input jitter, increased cpu usage

Less input, higher cpu usage

Increased input, higher cpu usage

A lot of input, high cpu usage

Input jitter, high CPU usage

Less input, cpu usage jitter

Input increases, cpu usage jitter

A lot of input, cpu occupation jitter

Input jitter, cpu occupation jitter

are two control methods as follows :

**Two: input control: smooth input**

Algorithm: Record the reading interval t of each frame, and set the threshold limit \_fps . initial limit\_fps = video\_in\_fps \_

Calculate limit\_t = 1000/ limit\_fps every 1 000ms , when x>=y , l imit\_t ++, l imit\_t - - when x<y . reset x, y

When t <= limit\_t . extend t to limit\_t , count x ++

When t > limit\_t , keep t unchanged and count y ++

**Three: CPU congestion control**

1. Basic algorithm: TCP congestion control (see [TCP congestion control for details](https://zhuanlan.zhihu.com/p/59656144) )

cpu acquisition judges once every 1s

A total of 20 files are divided into 0\*fps 0.1\*fps 0.2\*fps ----- 2.0\*fps

Initially 1 stop 0.1\* fps

Ensure that the transcoding frame rate per second does not exceed the current gear setting

The basis is the TCP congestion algorithm: cwnd is initially at level 1 and ssthresh is at level 20. When the cpu is greater than 70 (this value can be set externally), it is considered to be congested. Halving backoff is performed, and cwnd is reset to 1.

1. When cwnd < ssthresh , use the slow start algorithm,

2. When cwnd >= ssthresh , use the congestion control algorithm.

2. CPU operator control

on the above , the state acquired by the CPU in each round affects the operator of the slow start and congestion control algorithm:

the cpu is 0-20, the operator is 2

the cpu is between 20-40, the operator is 1.5

cpu > 40, only use the congestion control algorithm to increase linearly, and the operator is 1

3. Fuse mechanism

On the basis of the above, a fusing mechanism is added.

When the cpu >80 occurs, the rate is reduced to 0. The circuit breaker lasts for 5 rounds before restarting. If it enters the fuse again immediately after restarting, the fuse time will multiply by 2. If cwnd increases to 20 after restarting , the fuse time is reset

4. Feedback mechanism

Based on the above, add message detection.

The time to detect writing a frame of audio is recorded as x. Record x\_avg = x\_avg \*0.9+x\*0.1. When x>1.5\* x\_avg , it is considered to be congested, and when x>2\* x\_avg , it is blown.

CPU超过70、拥堵、超时

CPU超过80、熔断