

ICE, STUN, TURN — production cheat sheet

Companion to the 2026 deep-dive article. Tape it next to the monitor.

1. Candidate priority — RFC 8445 §5.1.2

priority = $(2^{24}) \times \text{type_preference} + (2^8) \times \text{local_preference} + (256 - \text{component_id})$

Recommended type_preference: host 126 · peer-reflexive 110 · server-reflexive 100 · relay 0

Type	From	Gather time	When it wins	Priority
Host (126)	OS-reported address on a real interface	< 5 ms	Same-LAN peers; mesh on local network	2 130 706 431
Peer-reflexive (110)	Discovered during connectivity check itself	during check	Symmetric NAT mappings created mid-call	1 862 270 975
Server-reflexive (100)	STUN binding response (XOR-MAPPED-ADDRESS)	20–200 ms	Cone-NAT-to-cone-NAT direct paths	1 694 498 815
Relay (0)	TURN Allocate response (RFC 8656)	100–500 ms	Symmetric NAT, UDP-blocked, AI agents (100%)	16 776 960

2. iceConnectionState — what to do in each state

State	Caused by	Recommended application action
new	PC just created	no-op; gathering has not started yet
checking	gathering complete, checks running	show 'connecting...' spinner; expect < 1 s here
connected	first pair valid; media flowing	clear spinner; cancel any pending restart timer
completed	every pair in checklist tested	treat identically to 'connected' in most apps
disconnected	consent freshness probes failing	wait 5 s; ≈ 80% recover; then call restartIce()
failed	every pair has failed	restartIce() is mandatory; the state cannot self-recover
closed	pc.close() called	terminal; create a new RTCPeerConnection if needed

3. iceServers configuration template — 2026

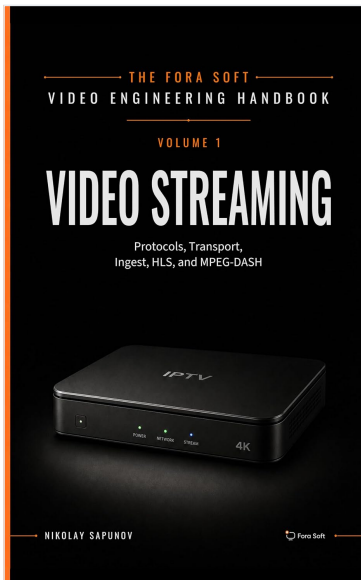
```
new RTCPeerConnection({
  iceServers: [
    { urls: 'stun:stun.l.google.com:19302' },
    {
      urls: [
        'turn:turn.example.com:3478?transport=udp', // cheap path
        'turn:turn.example.com:3478?transport=tcp', // for UDP-blocked nets
        'turns:turn.example.com:443?transport=tcp' // for everything-blocked nets
      ],
      username: shortLivedUsername, // HMAC-SHA1, server-issued, 600 s TTL
      credential: shortLivedPassword,
    }
  ],
  iceTransportPolicy: 'all', // 'relay' = force every byte through TURN
  bundlePolicy: 'max-bundle', // one transport for all tracks (RFC 9143)
  rtcMuxPolicy: 'require' // RTP + RTCP on one port
});
```

4. TURN deployment — pick the right pattern

Pattern	Time to ship	Cost @ 100 TB	Cost @ 10 PB	On-call	Fit
Managed (Cloudflare, Twilio)	1 day	\$5,000	\$500,000	none	< 10K MAU, no infra team
Self-hosted coturn / eturnal	1 week	\$1,000	\$25,000	high	mature infra team
Pion / STUNner on K8s	1–2 weeks	\$1,000	\$25,000	medium	Kubernetes-native shops
Hybrid (self + managed fallback)	1–2 weeks	\$1,000	\$25,000+	low	belt-and-braces production

5. Eight pitfalls — verify before launch

- ☐ STUN-only ICE servers (always include TURN)
 - ☐ TURN over UDP only (also expose TCP/3478 and TLS/443)
 - ☐ Long-lived TURN credentials in client JavaScript
 - ☐ Ignoring iceconnectionstatechange events
- ☐ Restarting ICE on every transient disconnect
 - ☐ Single-region TURN (deploy 3+ regions for global)
 - ☐ Not budgeting for the 100% relay case (AI agents)
 - ☐ Trusting iceTransportPolicy:'relay' as anonymity



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This sheet covers candidate priority, iceConnectionState handling, a production iceServers config and TURN deployment choices. Volume 2 explains the network layer these decisions sit on: NAT behaviour, TCP versus UDP, congestion control, QUIC and HTTP/3, and what the network does to a real-time stream.

WHAT YOU WILL FIND INSIDE

- NAT types and traversal behaviour
- Congestion control under loss
- Latency budgets glass to glass
- TCP vs UDP for real-time media
- QUIC and HTTP/3 transport

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