Further Improvements to ICE

Fixing the "walk out the door" problem

The "walk out the door" problem

1. ICE completes on WiFi
2. WiFi goes away
3. Reconnect ICE on cellular ASAP

ICE restart is too slow

- Requires a signalling round trip
- If both sides can trigger it, we run into glare problems
  - Can this be fixed in ICEbis?
- Candidates and pinging are delayed
  - The restarting side needs to wait for candidates from the restarted side to ping (0.5 RTT)
  - The restarted side needs to wait for its candidates to arrive and for the restarting side to to Create Permission before a ping to a TURN candidate will succeed (0.5 RTT)
- If re-offers are expensive, ICE restarts will be delayed.
  - You'll make the "trigger policy" less aggressive
  - In WebRTC, createOffer/setLocal/signal/setRemote can be slow because it has big messages that include lots of other processing

Dimensions of choice

	ICE Restart	Continuous Nomination	Continual Gathering	Backup Pair	trickle/fast restart
change restarter ufrag/pwd	yes	no	no	no	yes
change restartee ufrag/pwd	yes	no	no	no	no
reuse restartee's candidates	no	yes	no	some	yes
either side can trigger	no	yes	yes	yes	yes
select unnominated	no	yes	yes	yes	yes
don't fully prune if receiving	no	yes	yes	yes	no
problems	slow	unbounded growth	conflicts with full restart	battery/ TURN server	???

Continuous Nomination

"Gathering never stops"

- Started off big
- We broke out "passive aggressive" separately
- We may want to break out "don't prune if you're receiving" as well, to allow for new (lower-priorty) candidate pairs to be used.
  - Simple rule: If you get a request, send a response, and wait at least N seconds before deleting/fully pruning
- Still has the problem of unbounded candidate pair growth

Continual Gathering

"Gathering can happen once in a while"

- Like continuous nomination without the unbounded pairs
  - Only pair with the currently used remote candidate(s).
- We implemented it, and it works well.
  - But it doesn't work all the time, so you need full restart
  - And it conflicts somewhat with full restart (if you get a candidate, is that for before or after the restart?)

Backup Pairs

"More than one connected candidate pair at a time"

- Either simultaneous WiFi/3G or backup TURN-based pair
- We prototyped WiFi/3G backup
  - It works really well
  - But it eats battery
- We're considering trying TURN-based pair backup
  - But it would only work well with TURN-mobility

Trickle/fast restart

"You restart when you like and I'll restart when I like"

- Each side restarts independently. *Doesn't wait* for the other side.
- "Trickle" new ufrag/pwd.
- Pair candidates *across* generations
- Just as fast as continual gathering, but works in more cases and naturally flows into a full ICE restart
- Or think of it as a faster ICE restart
  - Doesn't wait for a full signalling round trip
  - Both sides trigger it independently
  - It's cheap(ish). Trigger often (especially w/ TURN-mobility)
  - Reuses existing TURN candidates (especially w/ TURN-mobility)