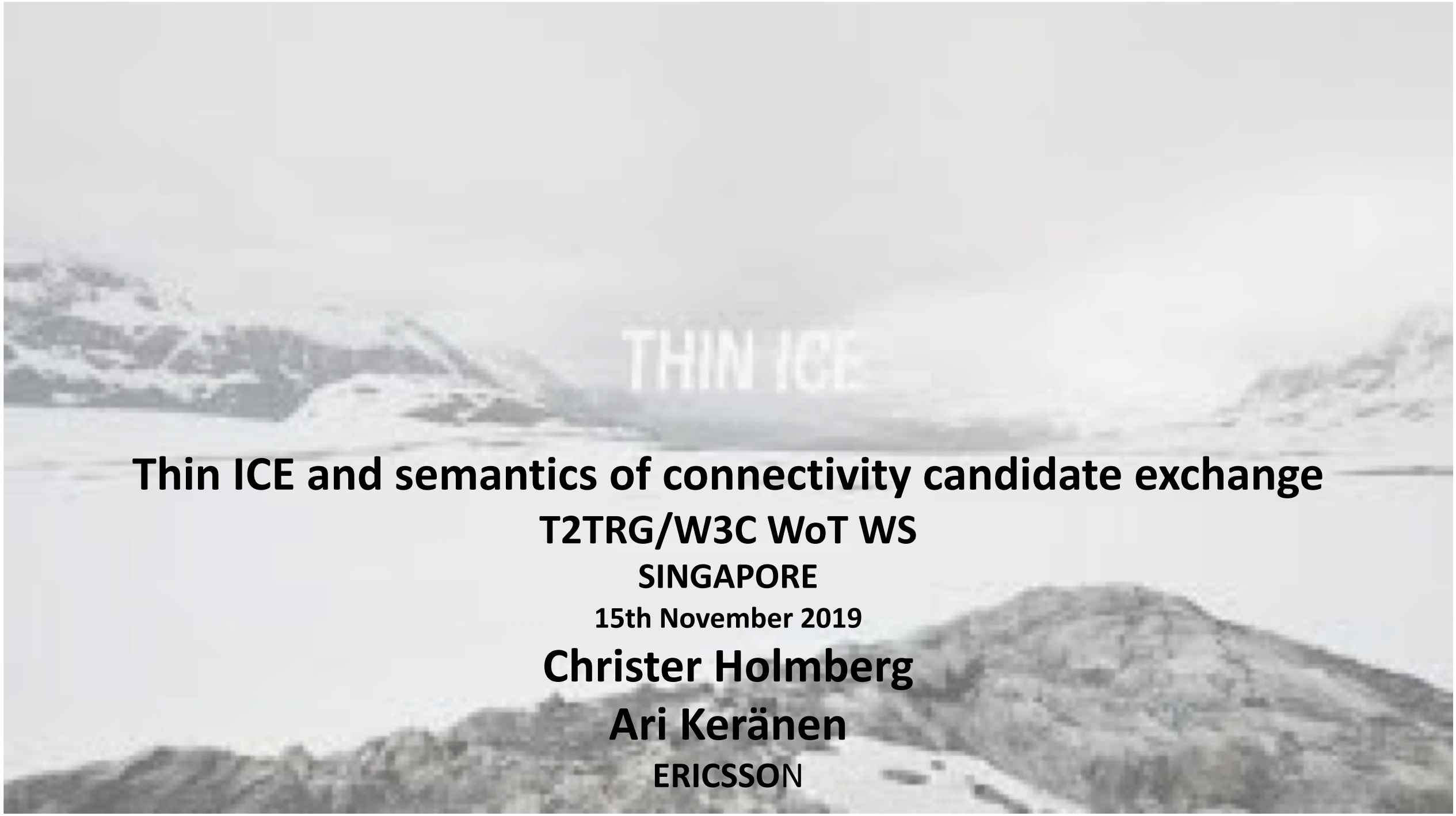

Thin ICE and semantics of connectivity candidate exchange

T2TRG/W3C WoT WS

SINGAPORE

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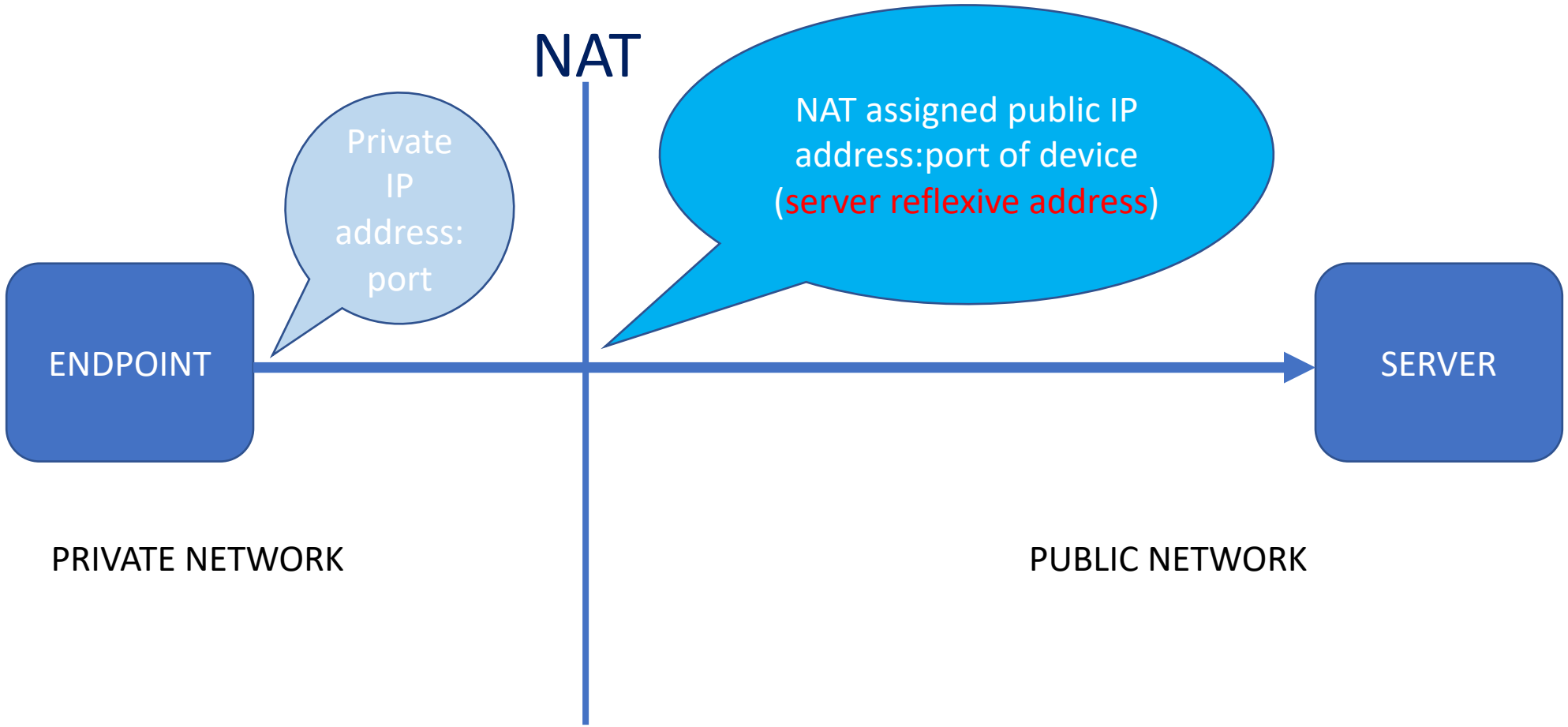
ERICSSON

ICE in 10 Seconds

- Candidate
  - Public IP address:port that can be used to reach an endpoint located behind a NAT
    - NAT assigned public IP address:port
    - Public IP address:port of relay
- ICE Steps
  - Fetch public IP addresses:ports
    - STUN protocol, STUN servers, TURN relays
  - Create candidates
  - Distribute/exchange candidates
    - Some signalling protocol (e.g., SDP)
  - Use candidates to establish connectivity

ICE in 10 Seconds: Server Reflexive Address



thin ICE in One Sentence

”Usage of CoAP protocol and infrastructure to implement ICE”

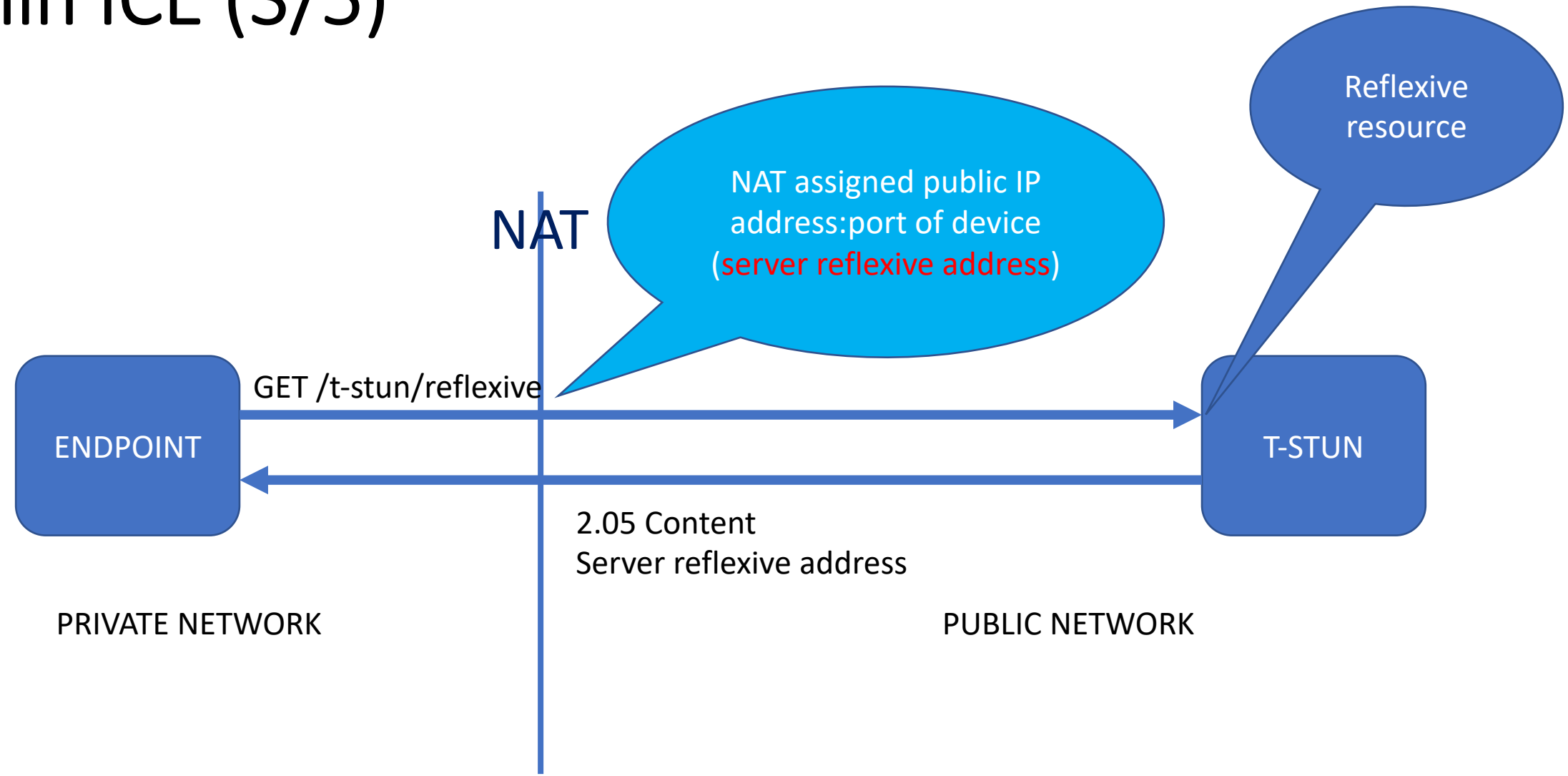
thin ICE (1/5)

- thin ICE Steps
  - Fetch public IP addresses:ports (server reflexive address)
    - **CoAP protocol**
    - **CoAP server resources**
  - Create candidates
  - Distribute/exchange candidates
    - **CoAP protocol**
    - **Resrouce Directory (RD)**
    - **Resource links**
  - Use candidates to establish connectivity

thin ICE (2/5)

- Fetch server reflexive address
  - Send CoAP GET Request to CoAP Server
    - Referred to as T-STUN server
    - GET request addressed to ”**reflexive resource**”
    - Server reflexive address returned in GET response as reflexive resource representation
    - Subsequent GET request used as keepalive
      - Client can check keepalive response whether server reflexive address has been modified

thin ICE (3/5)


Reflexive resource
NAT assigned public IP address:port of device (server reflexive address)
NAT
GET /t-stun/reflexive
ENDPOINT
T-STUN
2.05 Content
Server reflexive address
PRIVATE NETWORK
PUBLIC NETWORK

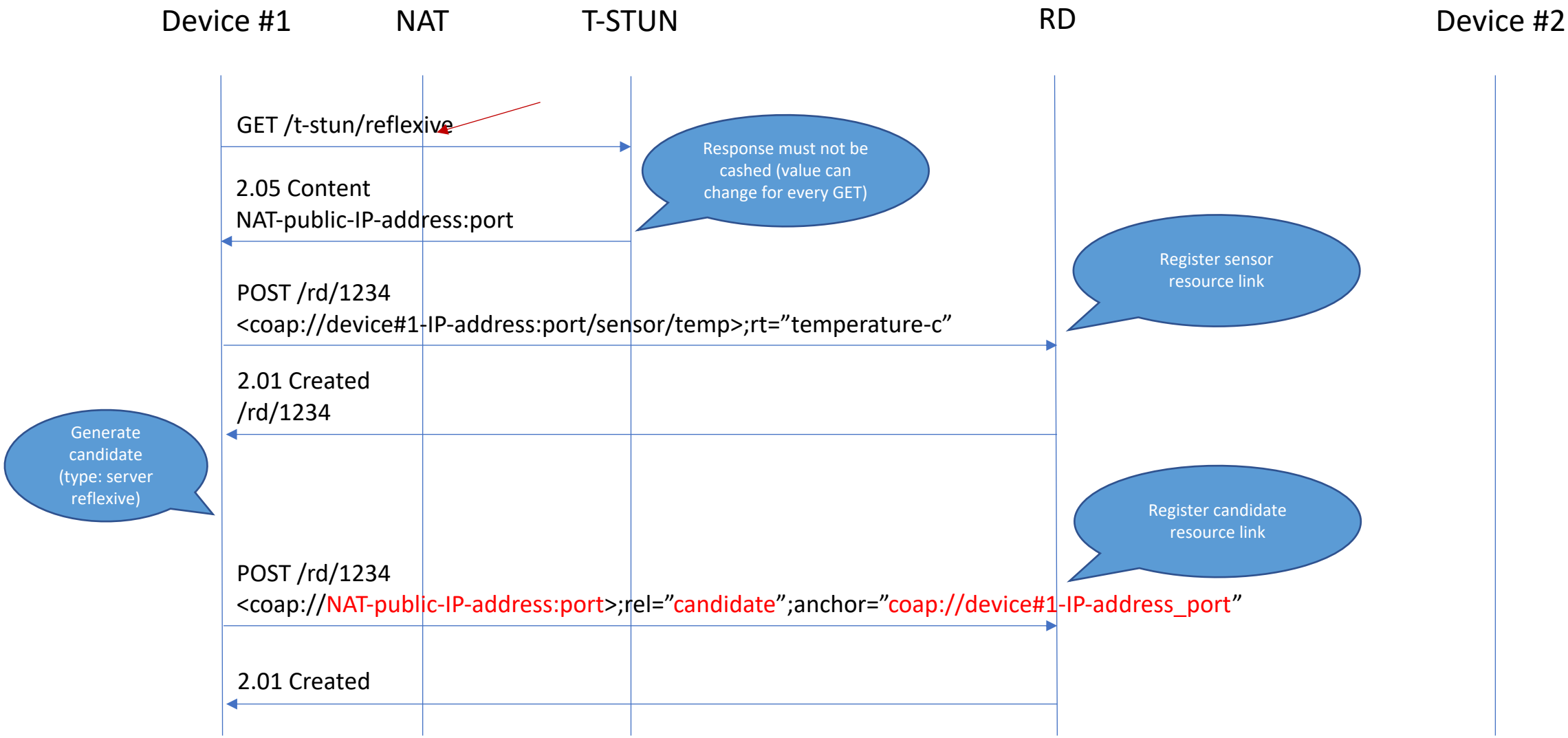
thin ICE (4/5)

- Distribute candidate (endpoint hosting candidate)
  - Alt 1) Candidate Resource
    - Create ”**candidate resource**” (data contains server reflexive address)
    - Register candidate resource link
      - Link URI: server reflexive address (public IP address:port)
      - Link rel: ”candidate”
      - Link anchor: link URI of sensor resource links (sensors etc)
    - Register sensor resource link
  - Alt 2) Embedded Candidate
    - No candidate resource. No candidate resource link.
    - Register sensor resource link
      - Link URI: server reflexive address (public IP address:port)

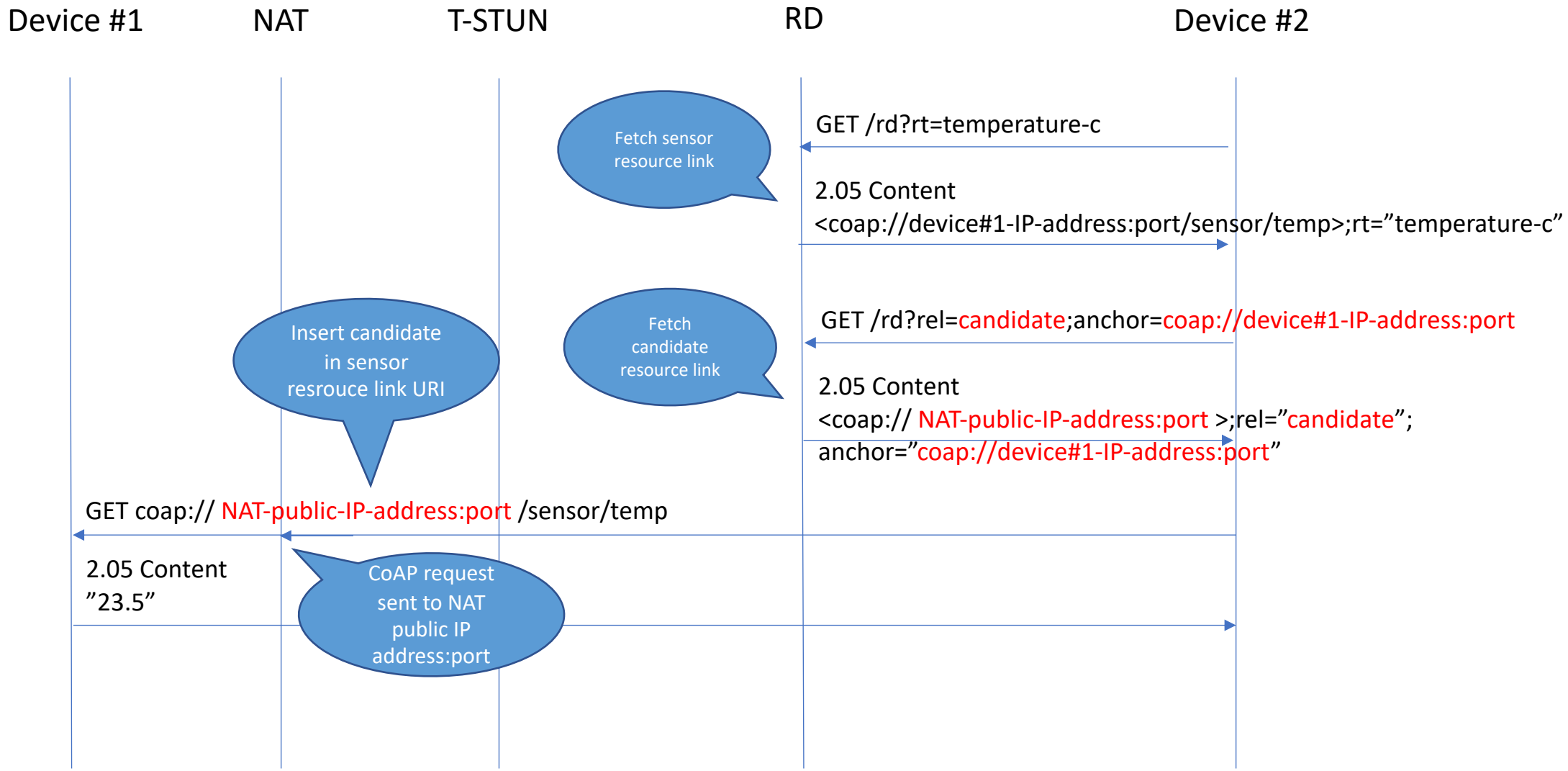
thin ICE (5/5)

- Distribute candidate (endpoint using candidate)
  - Alt 1) Candidate Resource
    - Fetch candidate resource link from RD
    - Fetch sensor resource link from RD
    - Add server reflexive address link URI of sensor resource link
    - Use sensor resource link to access resource
  - Alt 2) Fetch sensor resource link from RD
    - No candidate resource. No candidate resource link
    - Fetch sensor resource link from RD
    - Use sensor link to access remote resource
      - Link URI contains server reflexive address

THE FLOW (1/2)


Device #1
NAT
T-STUN
RD
Device #2
GET /t-stun/reflexive
Response must not be cashed (value can change for every GET)
2.05 Content
NAT-public-IP-address:port
Register sensor resource link
POST /rd/1234
<coap://device#1-IP-address:port/sensor/temp>;rt="temperature-c"
2.01 Created
/rd/1234
Generate candidate (type: server reflexive)
Register candidate resource link
POST /rd/1234
<coap://NAT-public-IP-address:port>;rel="candidate";anchor="coap://device#1-IP-address_port"
2.01 Created

THE FLOW (2/2)


Device #1
NAT
T-STUN
RD
Device #2
Fetch sensor resource link
GET /rd?rt=temperature-c
2.05 Content
<coap://device#1-IP-address:port/sensor/temp>;rt="temperature-c"
Fetch candidate resource link
GET /rd?rel=candidate;anchor=coap://device#1-IP-address:port
2.05 Content
<coap:// NAT-public-IP-address:port >;rel="candidate";
anchor="coap://device#1-IP-address:port"
Insert candidate in sensor resrouce link URI
GET coap:// NAT-public-IP-address:port /sensor/temp
2.05 Content
"23.5"
CoAP request sent to NAT public IP address:port

SEMANTIC CONSIDERATIONS

- Reflexive resource
  - Value is set when CoAP server hosting the resource receives GET request
  - Value based on source IP address:port (as seen by the CoAP server) of GET request
- Candidate resource
  - Not a value of the physical endpoint
  - Value assigned by NAT
- Candidate resource link
  - Resource link (link URI) contains actual value of candidate (server reflexive address)
  - Link rel: ”candidate”
  - Link anchor: link URI of sensor resource links
    - Used to associated a candidate resource link with a candidate resource link

THE END

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