How to Build a Call Placement Service (CPS) for Out-of-Band SHAKEN

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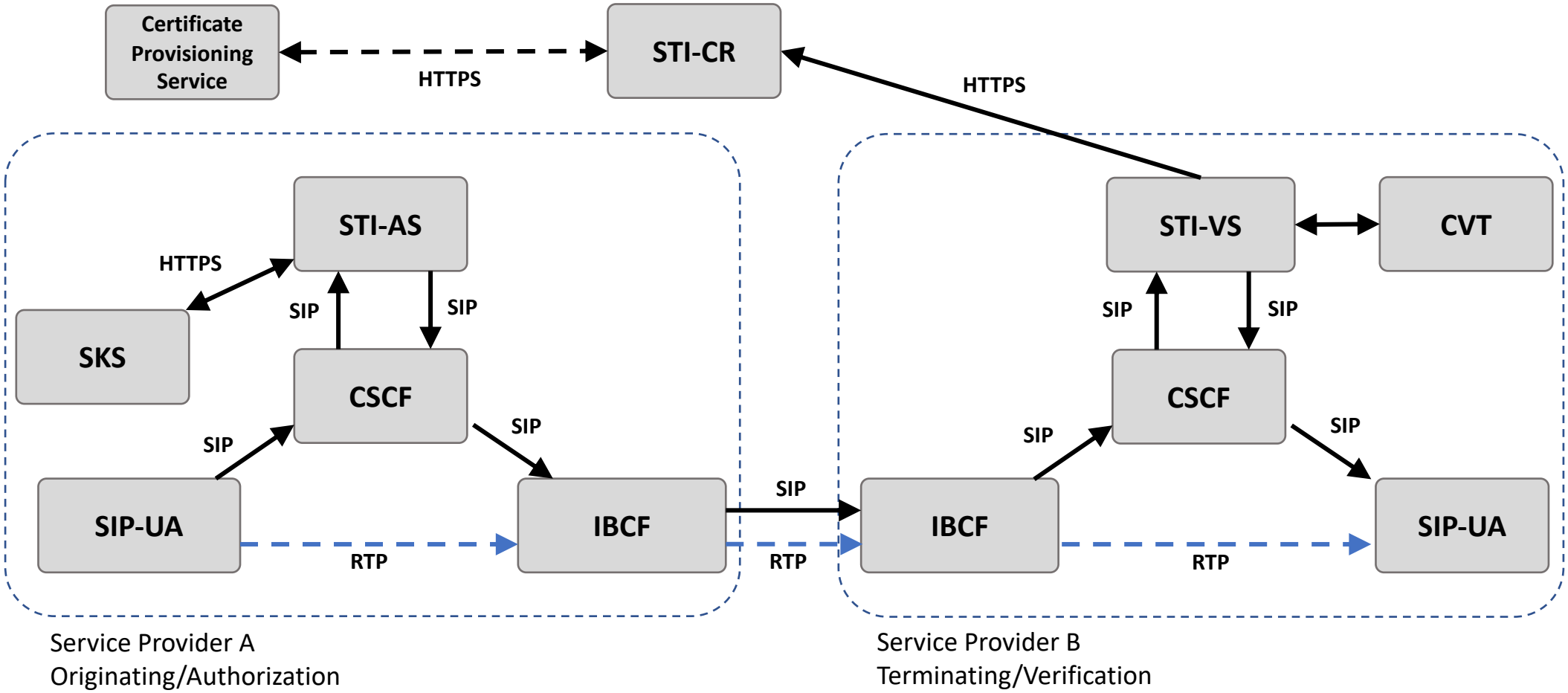
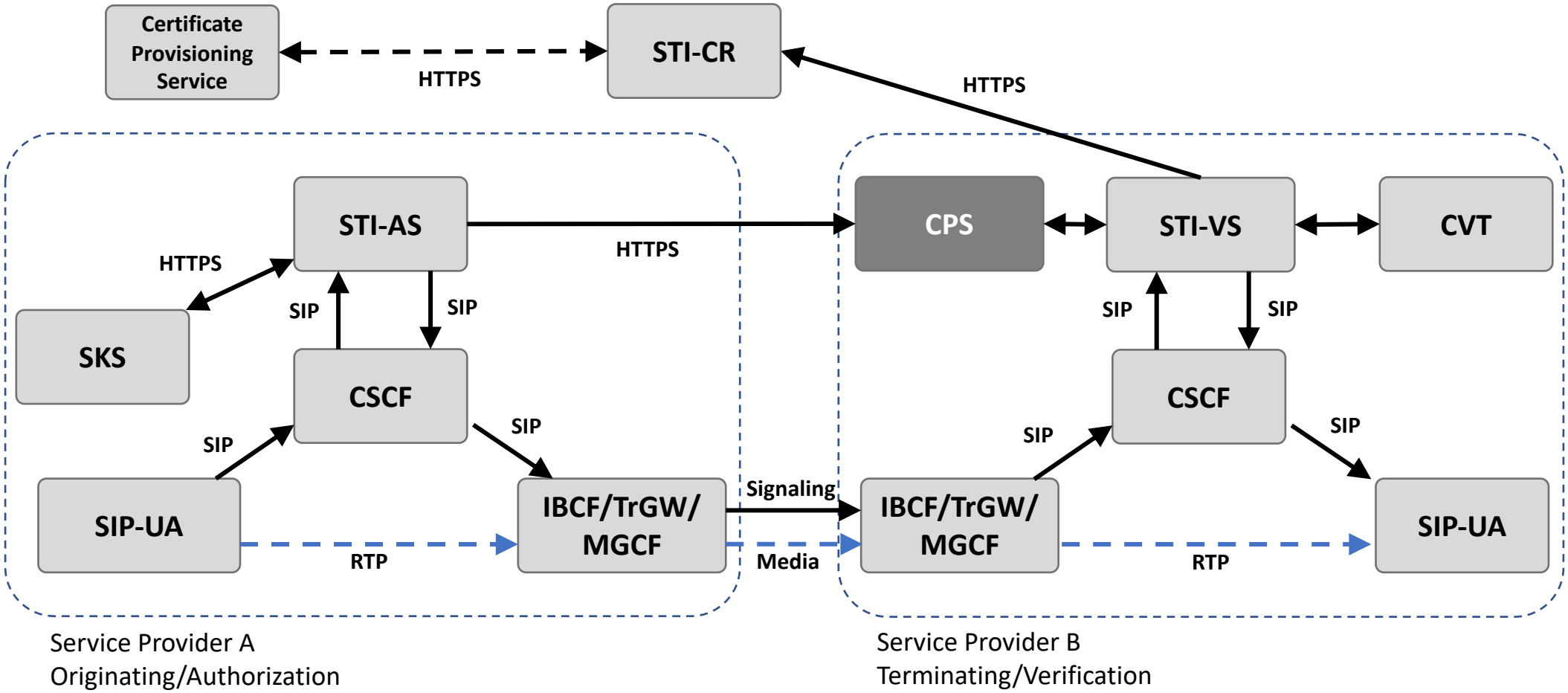
TransNexus

SHAKEN Call Flow



Out-of-Band SHAKEN Call Flow



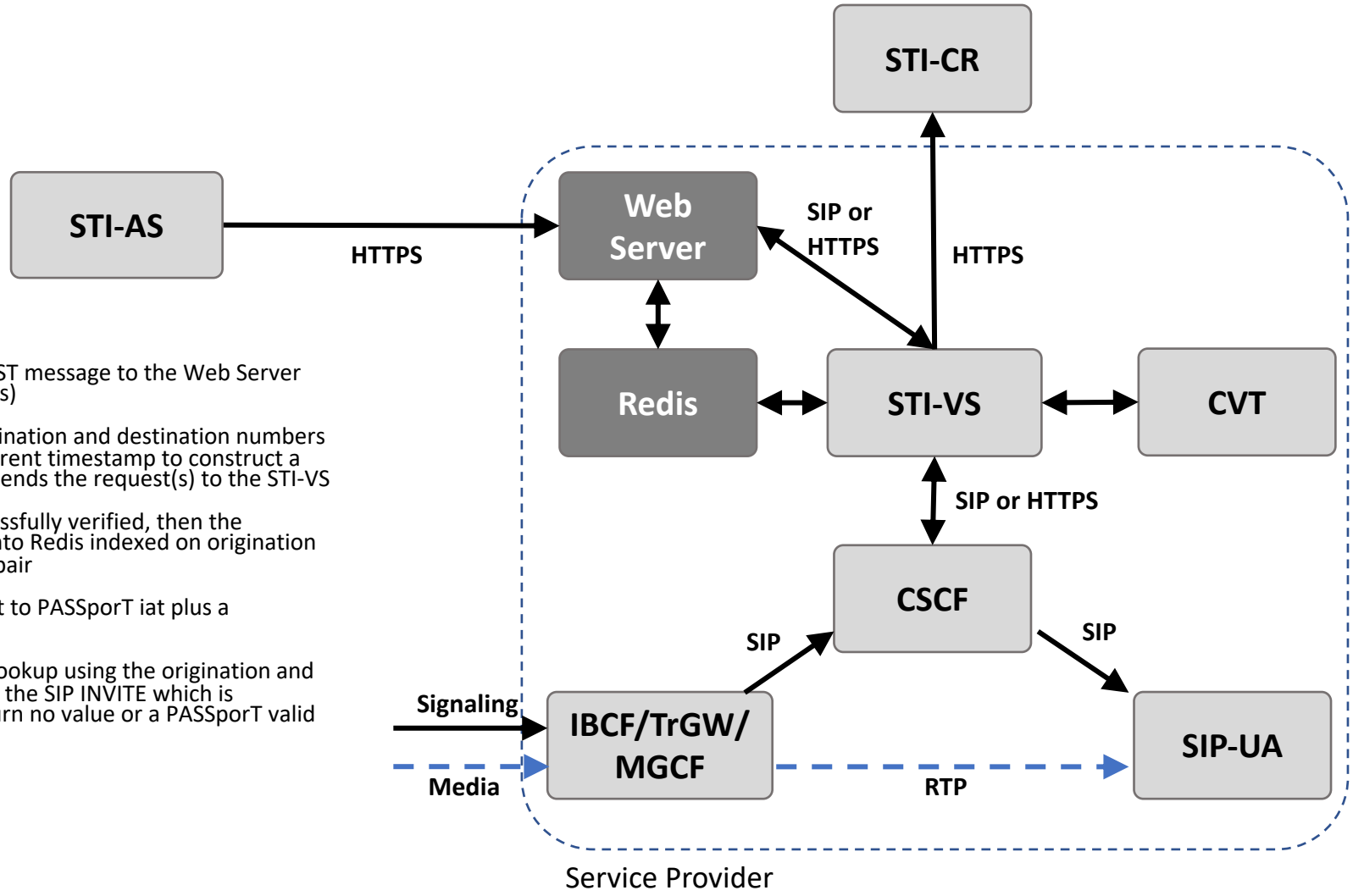
CPS Requirements

- Accept PASSporT(s) from an STI-AS via an HTTPS POST
  - Requires a **web server**
- Store PASSporT(s) until call arrives
  - Requires a **database**
- Verify PASSporT(s) before persisting
  - Requires communication with the STI-VS using HTTP or SIP
- Provide PASSporT(s) to STI-VS when call arrives
  - Requires integration with the STI-VS

Open Source CPS Components

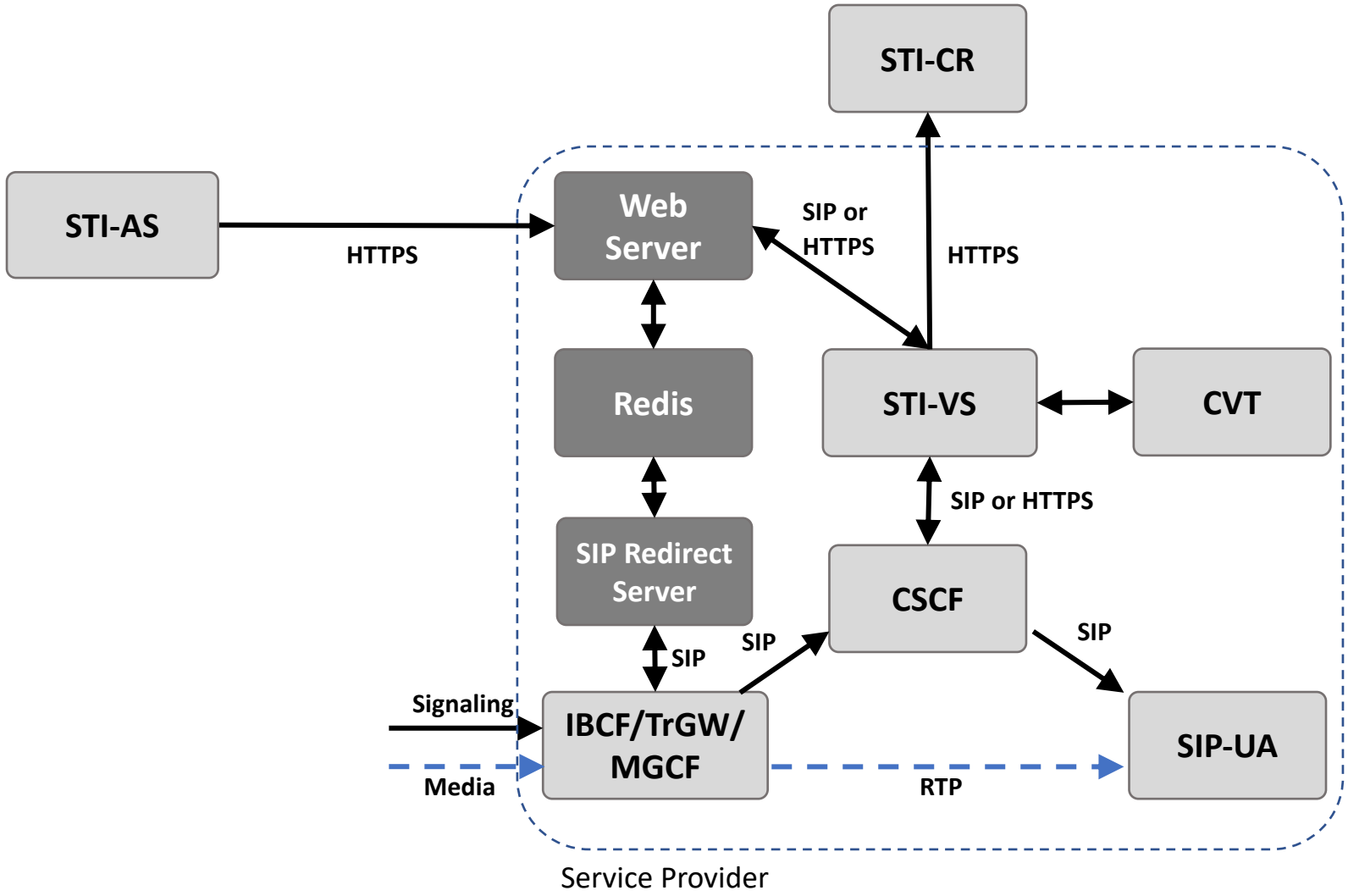
- Web Server
  - https://github.com/TransNexus/call-placement-service
  - Developed using Node.js
  - Supports HTTP STI-VS interface (defined in ATIS-1000082)
  - SIP STI-VS interface in development
  - Integrates with Redis
- Database
  - Redis

Open Source CPS Deployment

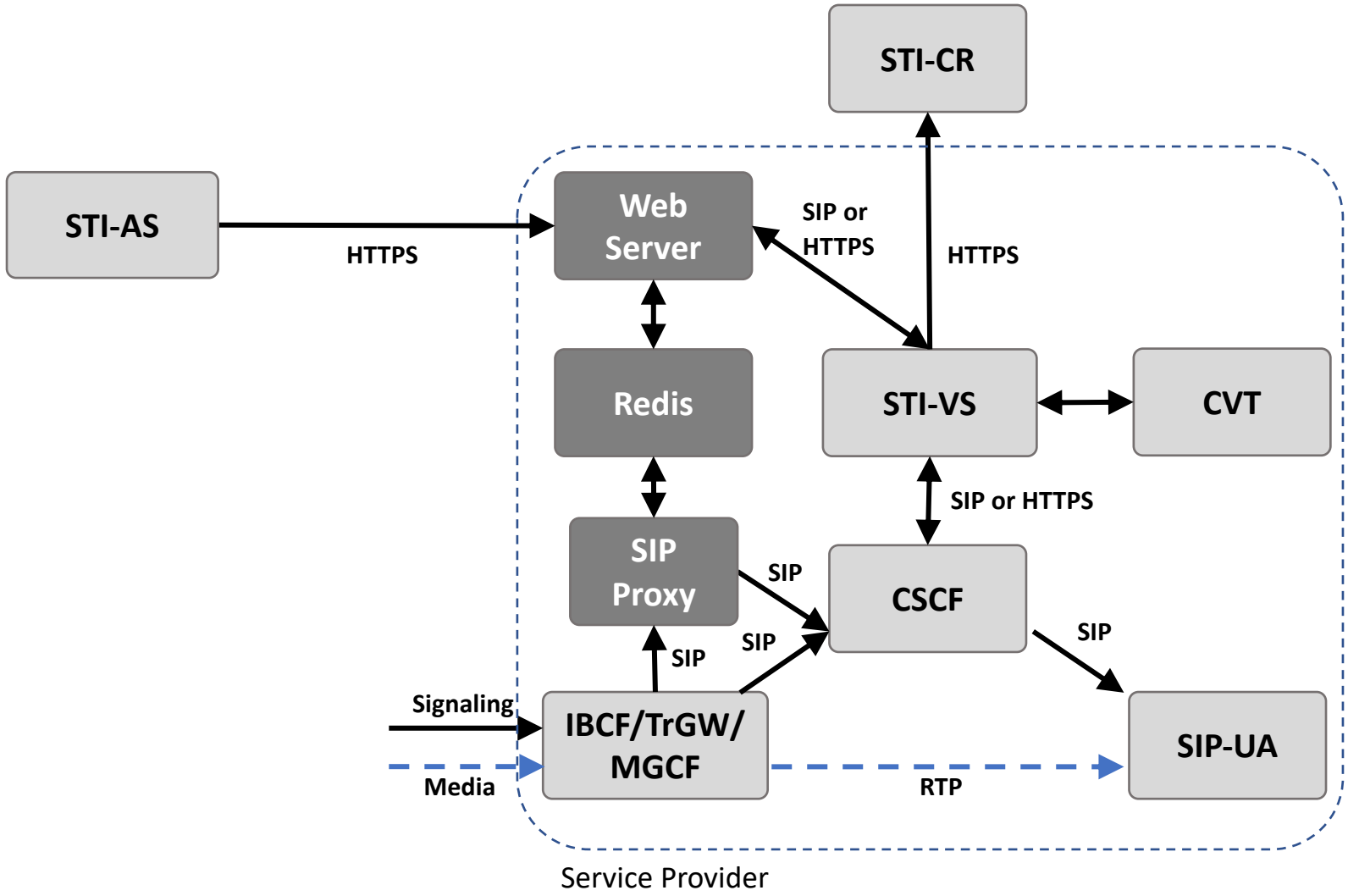


1. STI-AS sends an HTTP POST message to the Web Server containing the PASSporT(s)
2. Web Server uses the origination and destination numbers from the URL and the current timestamp to construct a verification request and sends the request(s) to the STI-VS
3. If all PASSporTs are successfully verified, then the PASSporTs are inserted into Redis indexed on origination and destination number pair
4. Redis key expiration is set to PASSporT iat plus a configurable freshness
5. STI-VS performs a Redis lookup using the origination and destination number from the SIP INVITE which is guaranteed to either return no value or a PASSporT valid for that call

Open Source CPS Deployment: SIP Redirect



Open Source CPS Deployment: SIP Proxy



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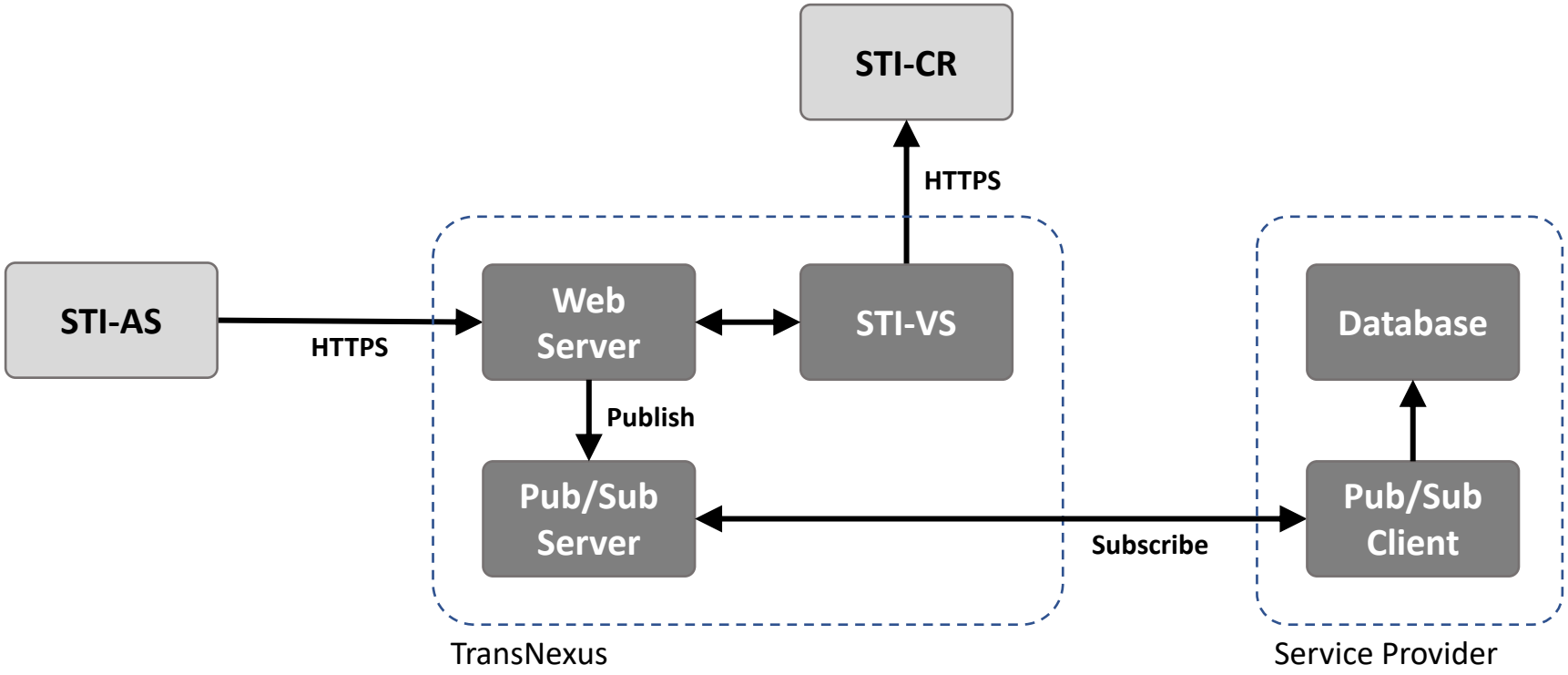
- Database
  - Redis
- SIP Redirect Server or SIP Proxy
  - Kamailio
  - OpenSIPS

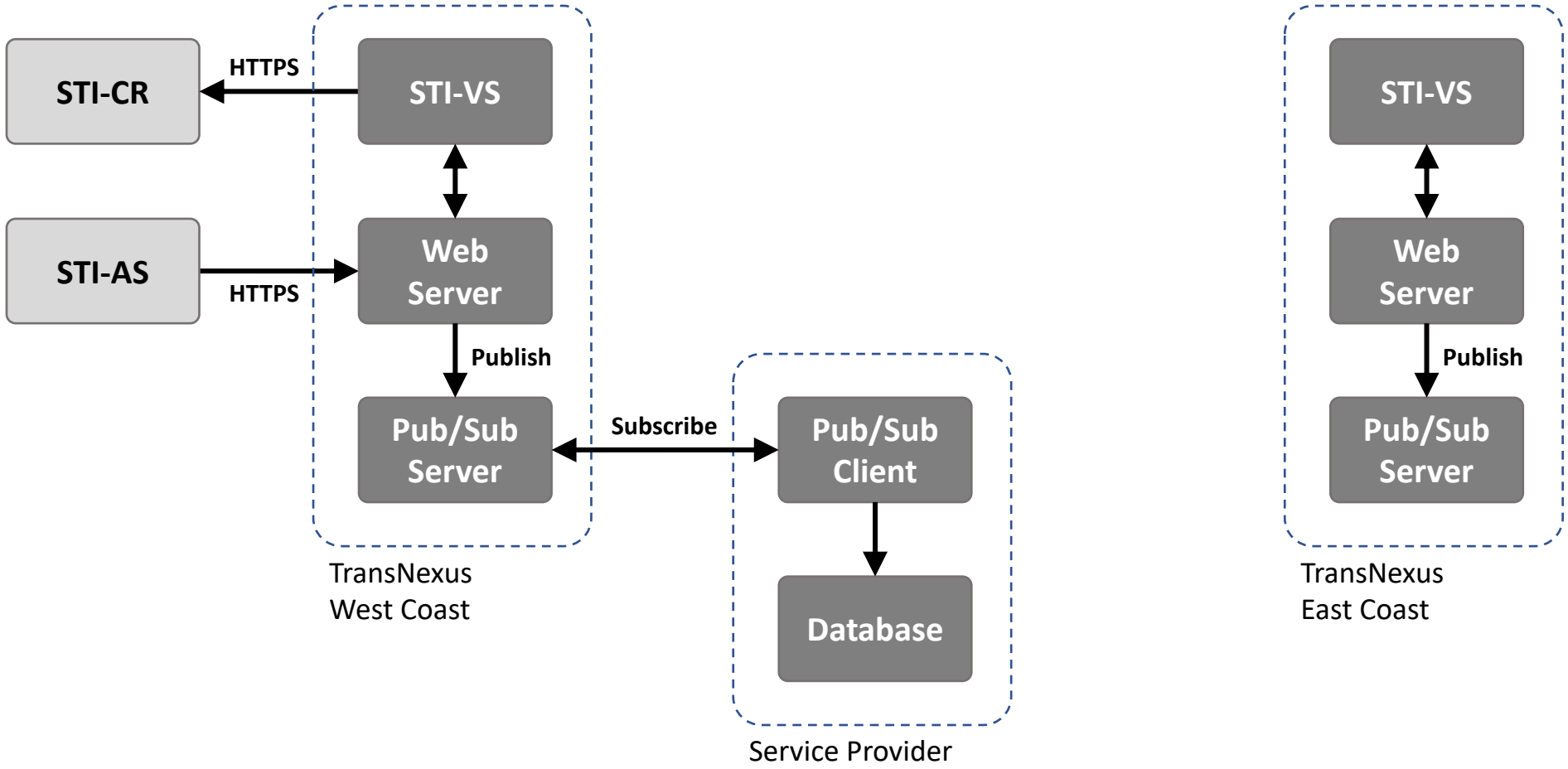
Announcing TransNexus CPS

- Managed CPS as a service
- Publish/subscribe model
- Redundant – 6 active data centers with anycast routing
- Scalable – tested at over 1 million HTTP POSTs / second
- Available starting today
- Completely free

TransNexus CPS Architecture



TransNexus CPS Geographic Message Routing



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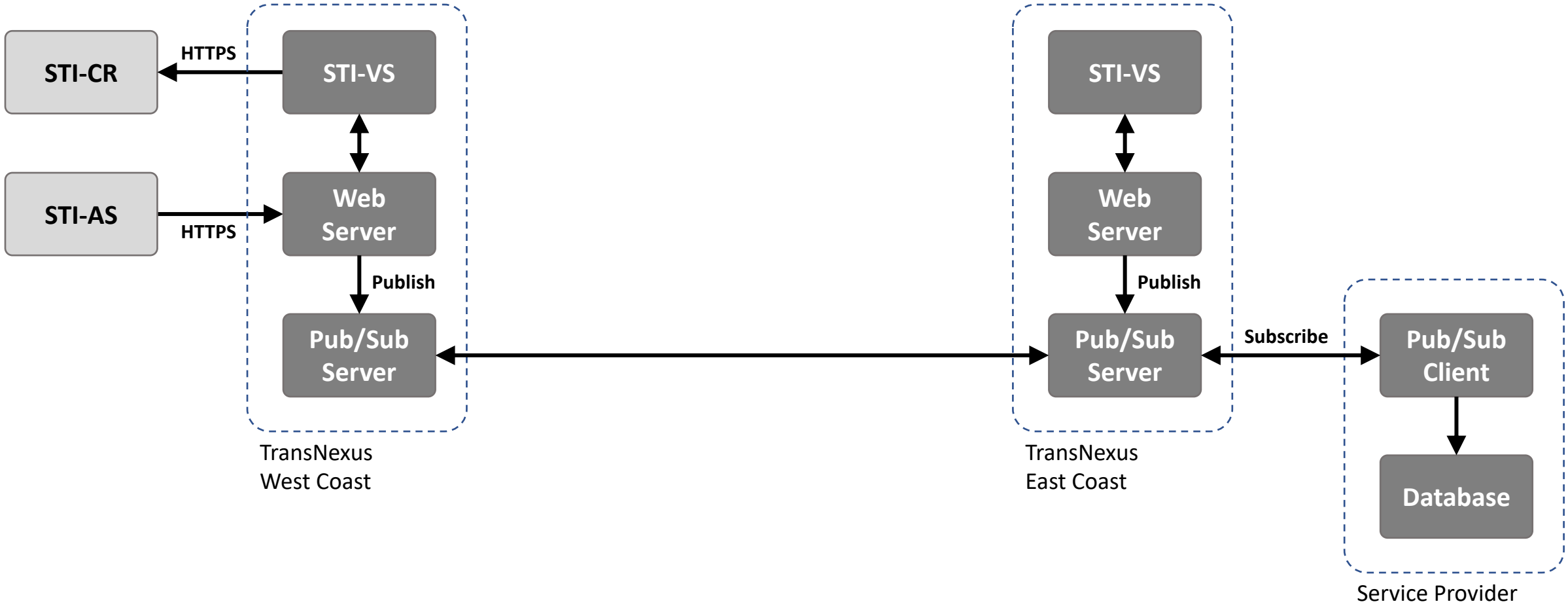
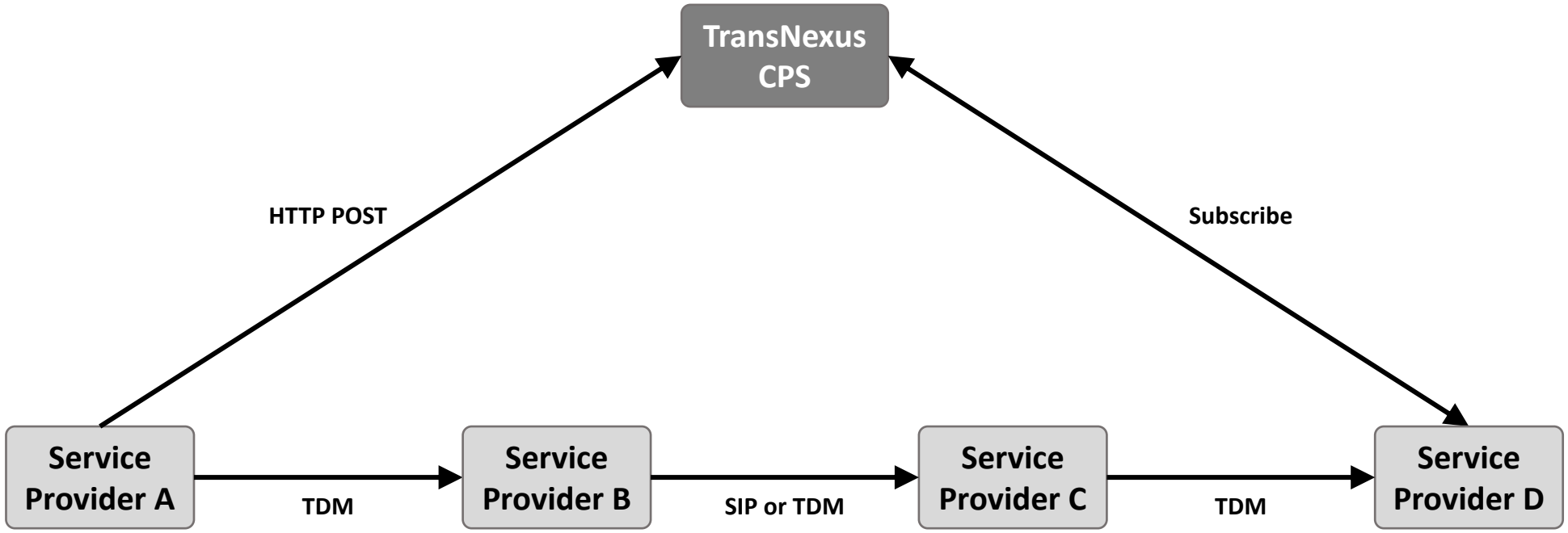
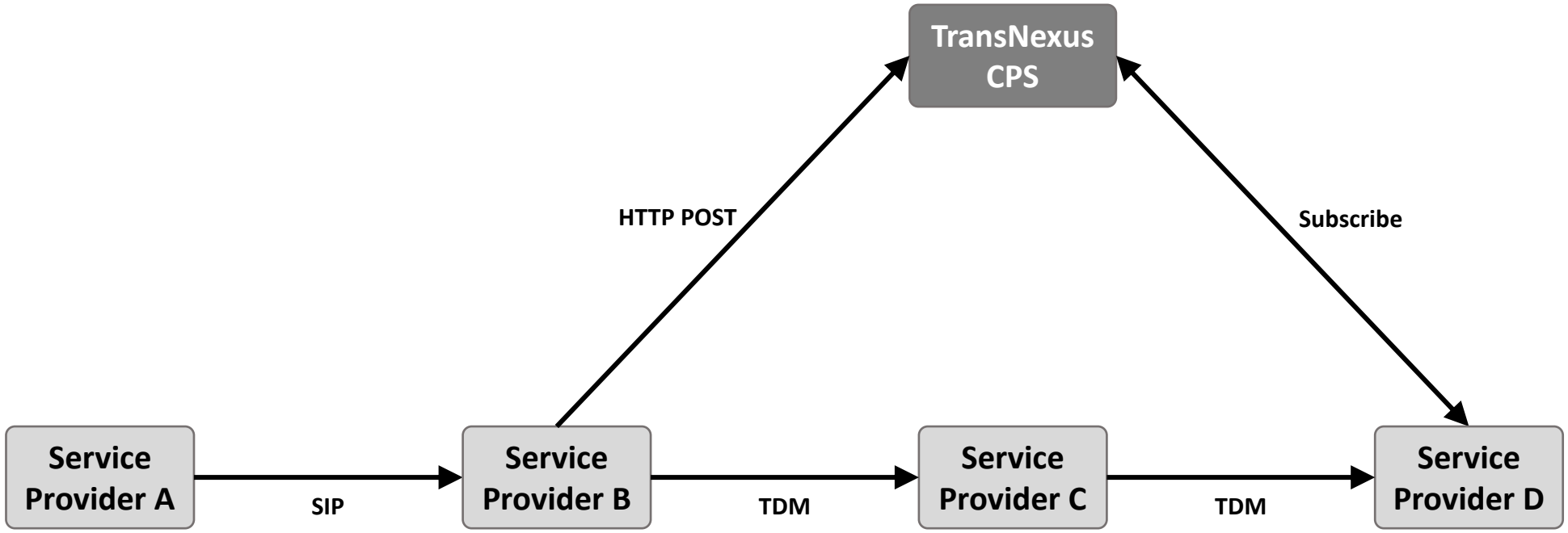


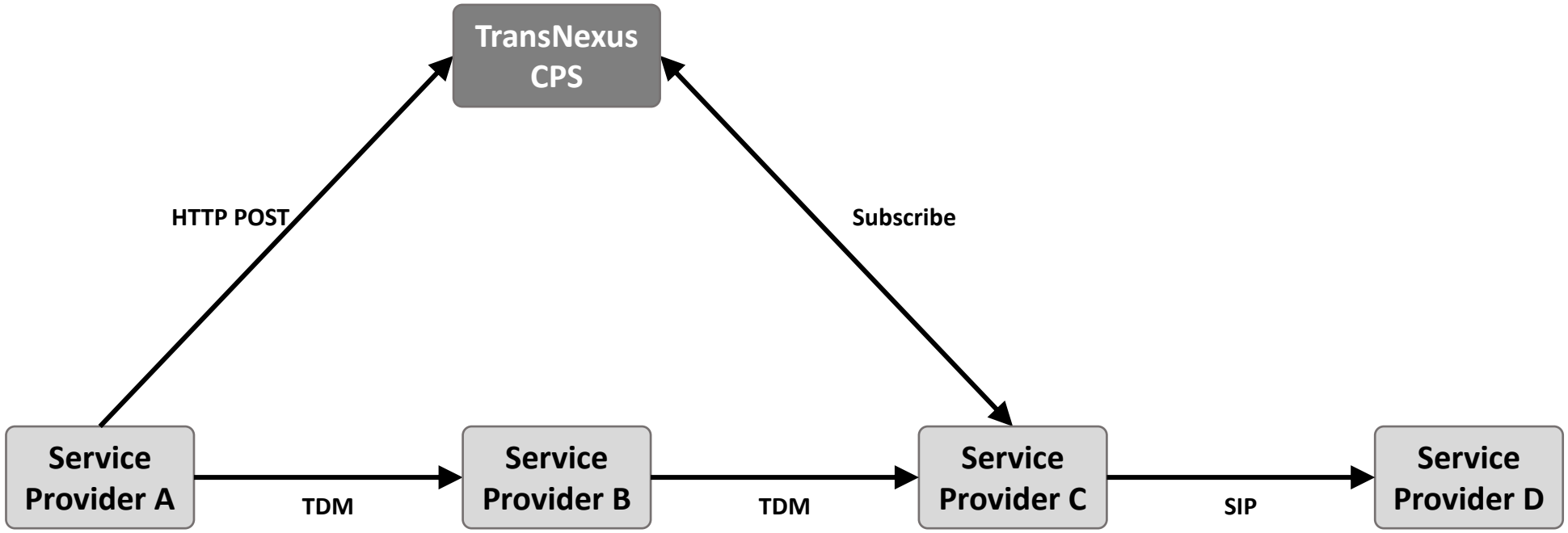
TransNexus CPS Standard Call Flow



TransNexus CPS Transit POST Call Flow



TransNexus CPS Transit Subscribe Call Flow



TransNexus CPS Publish

- Anyone can send PASSporTs via an HTTP POST
- PASSports are verified before being published
- All PASSporTs from the HTTP POST are published in a single message
- HTTP POST URL format:

  `https://cps.transnexus.com/DEST_SPC/DEST_NUMBER/ORIG_SPC/ORIG_NUMBER`

TransNexus CPS Subject and Message Format

Subject:

```
DEST_SPC.DEST_NUMBER.ORIG_SPC.ORIG_NUMBER
```

Message:

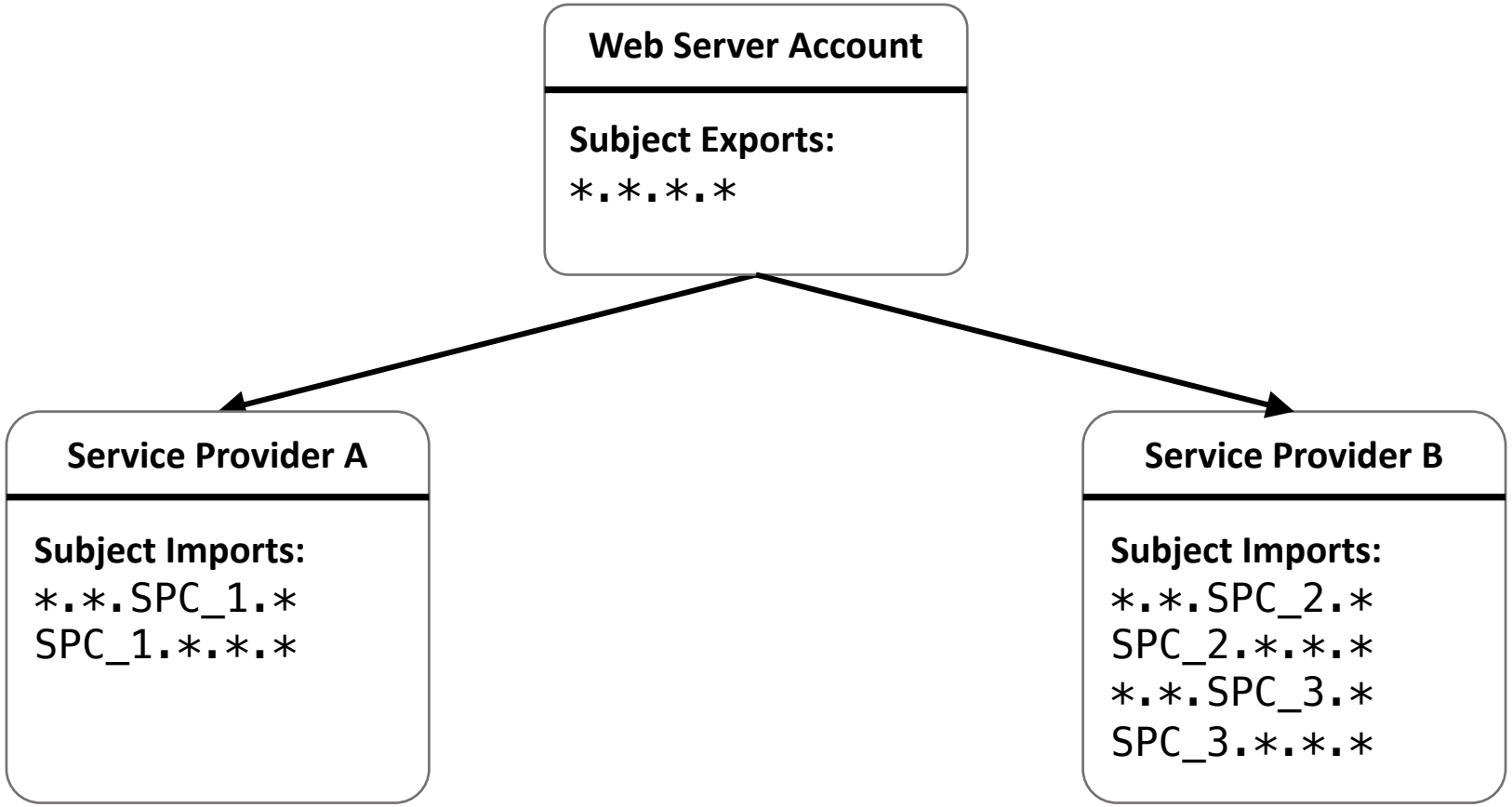
```
{
  "ip": "HTTP_POST_SOURCE_IP",
  "passports": [
    {
      "passport": "PASSPORT_1",
      "certificates": [ "PEM_SHAKEN_CERTIFICATE", "PEM_INTERMEDIATE_CERTIFICATE", "PEM_ROOT_CERTIFICATE" ]
    },
    {
      "passport": "PASSPORT_2",
      "certificates": [ "PEM_SHAKEN_CERTIFICATE", "PEM_INTERMEDIATE_CERTIFICATE", "PEM_ROOT_CERTIFICATE" ]
    }
  ]
}
```

TransNexus CPS Registration

- Only STI-PA approved service providers can register
- Registration requires an SPC token
- Multiple SPC tokens can be provided
- Service providers only receive messages if the subject DEST_SPC or ORIG_SPC matches one their SPCs
- Authentication uses NKEYs and JWTs
- Service providers supply their public NKEY during registration
- Behind the scenes TransNexus CPS issues an account JWT the defines the service providers permissions

TransNexus CPS Account Isolation

Subject: `DEST_SPC.DEST_NUMBER.ORIG_SPC.ORIG_NUMBER`



TransNexus CPS Subscribe

- A user NKEY pair must first be created
- Service providers authorize users by creating a user JWT that specifies the user's permissions and then service providers sign the JWT with their account NKEY
- User permissions can allow subscribing to to all subjects (within the account) or a subset:
  - Subscribe to all

```
*.*.*.*
```

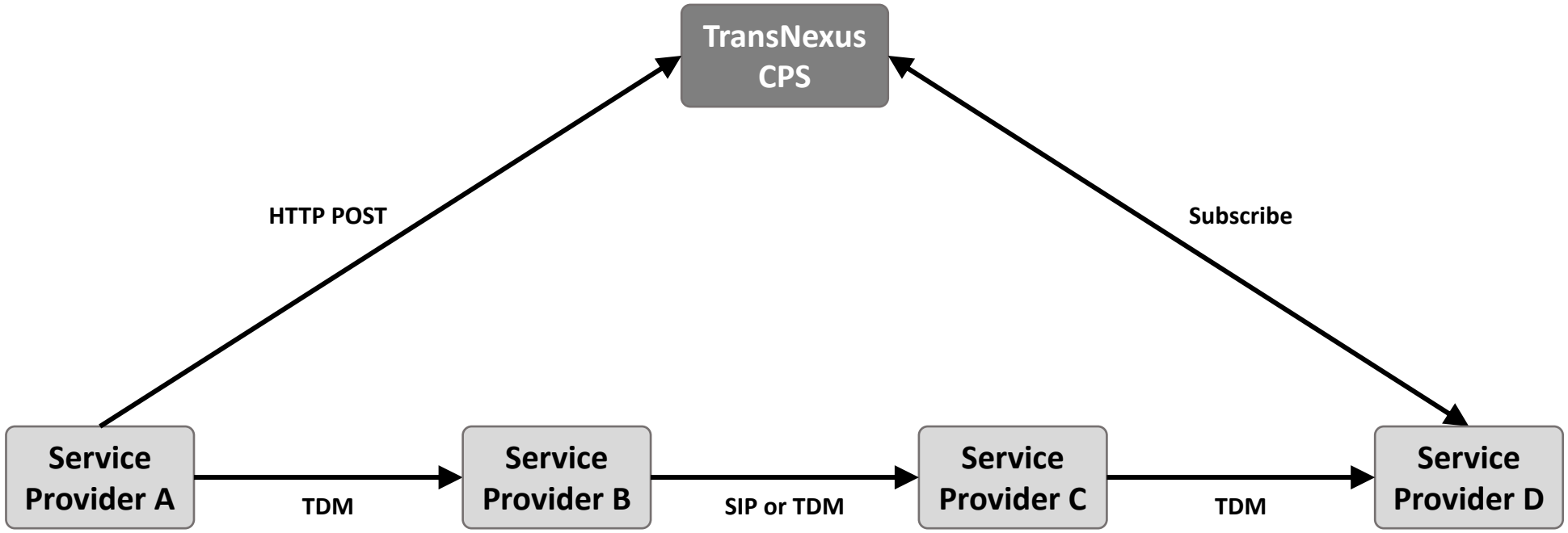
  - Subscribe to specific SPC

```
1234.*.*.*
*.*.1234.*
```

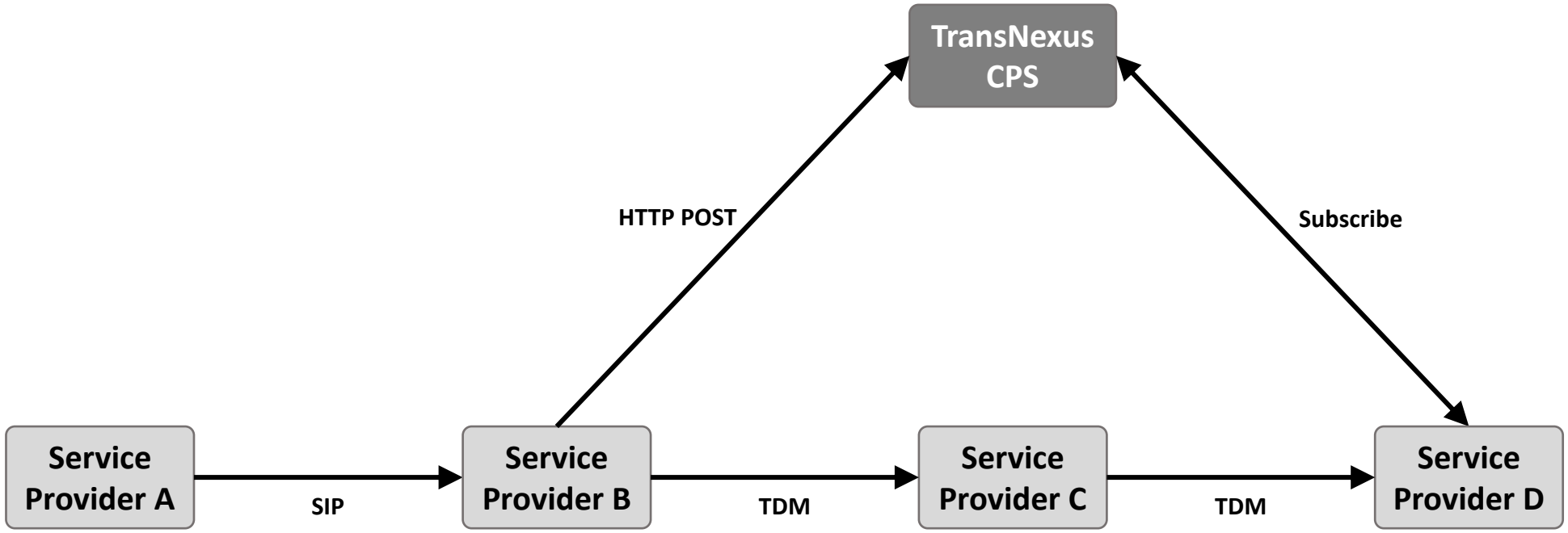
  - Subscribe to specific number

```
*.14045266060.*.*
*.*.*.14045266060
```

TransNexus CPS Standard Call Flow



TransNexus CPS Transit POST Call Flow



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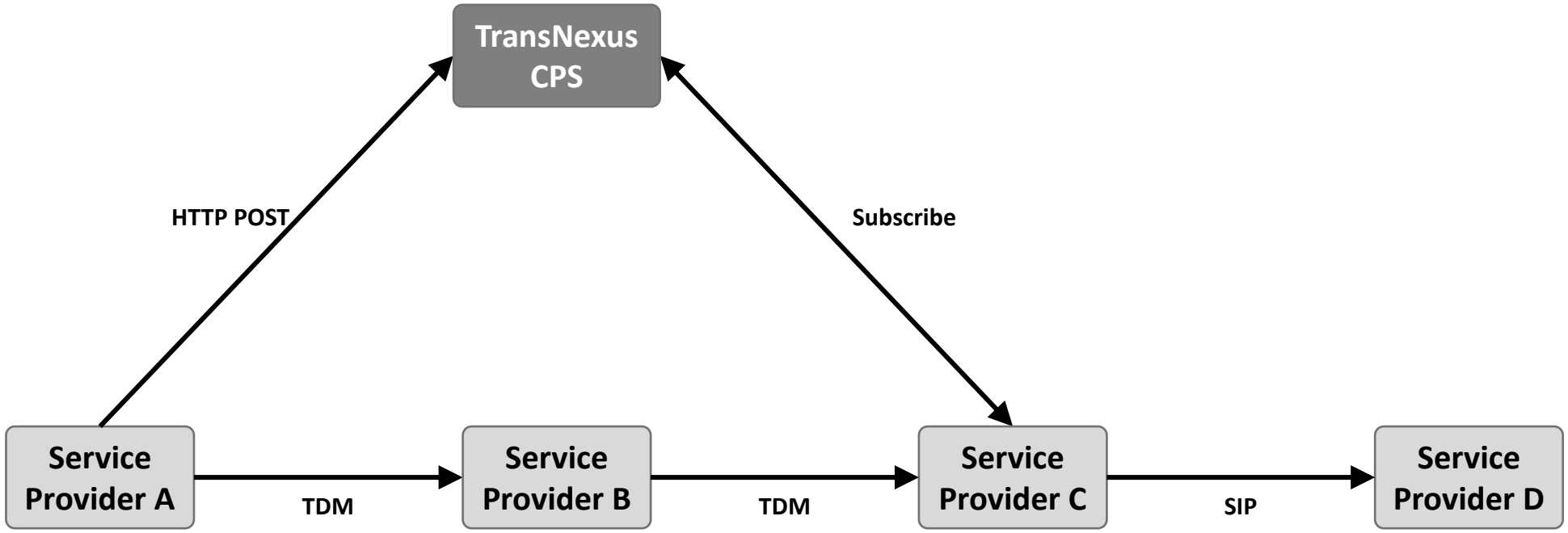


TransNexus CPS Transit Subscribe Method 1

- Service Provider D registers with TransNexus CPS
- Service Provider D issues user credentials for Service Provider C that can be optionally restricted to specific subjects:

```
SERVICE_PROVIDER_D_SPC.*.*.*
SERVICE_PROVIDER_D_SPC.*.SEVICE_PROVIDER_A_SPC.*
```

- Service Provider C subscribes to TransNexus CPS
- Service Provider A POSTs the PASSporT to TransNexus CPS
- Service Provider C receives the PASSporT

TransNexus CPS Transit Subscribe Method 2

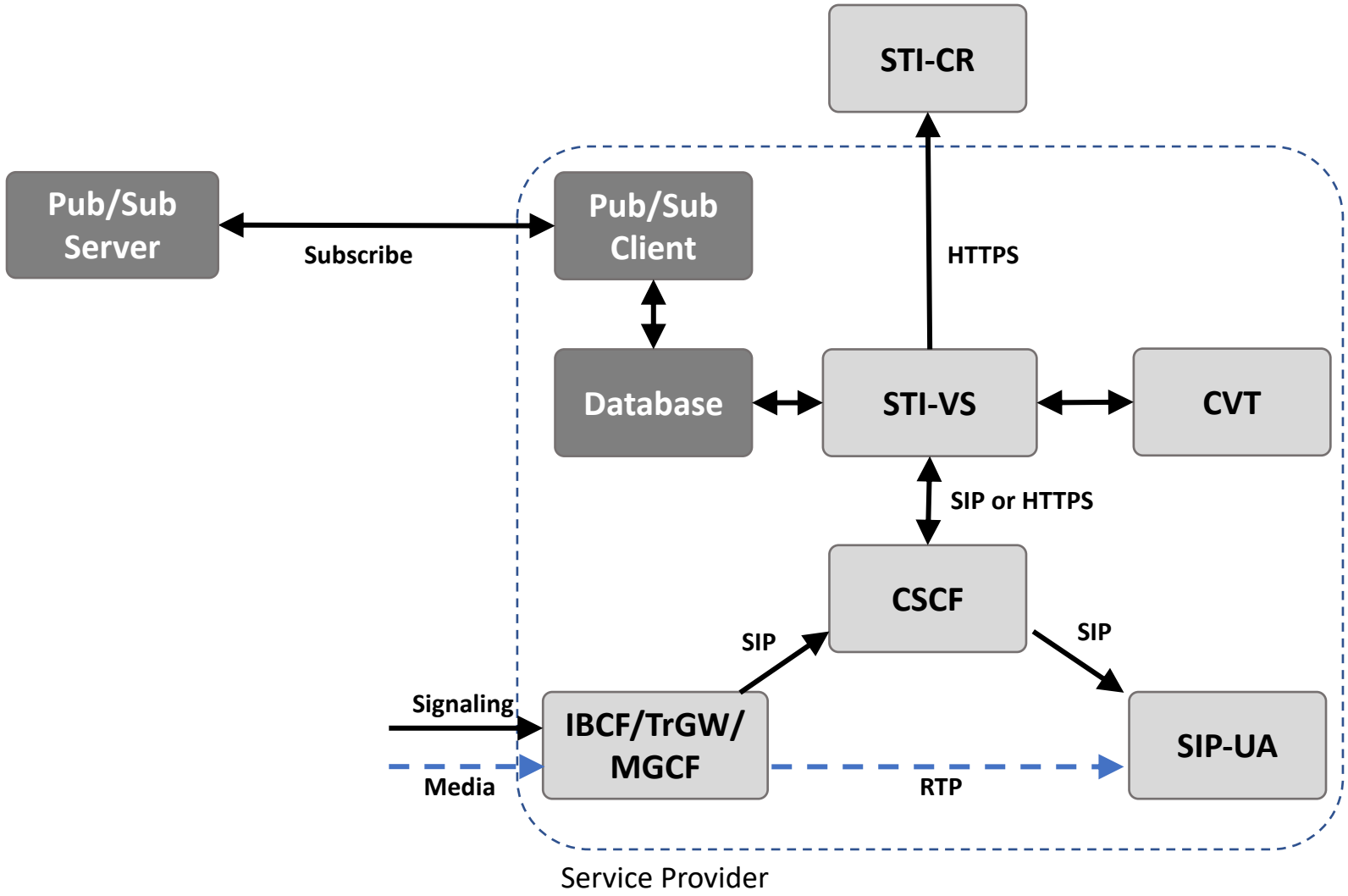
- Service Provider A registers with TransNexus CPS
- Service Provider A issues user credentials for Service Provider C that can be optionally restricted to specific subjects:

`*.*.SEVICE_PROVIDER_A_SPC.*`

`SERVICE_PROVIDER_D_SPC.*.SEVICE_PROVIDER_A_SPC.*`

- Service Provider C subscribes to TransNexus CPS
- Service Provider A POSTs the PASSporT to TransNexus CPS
- Service Provider C receives the PASSporT

TransNexus CPS Deployment



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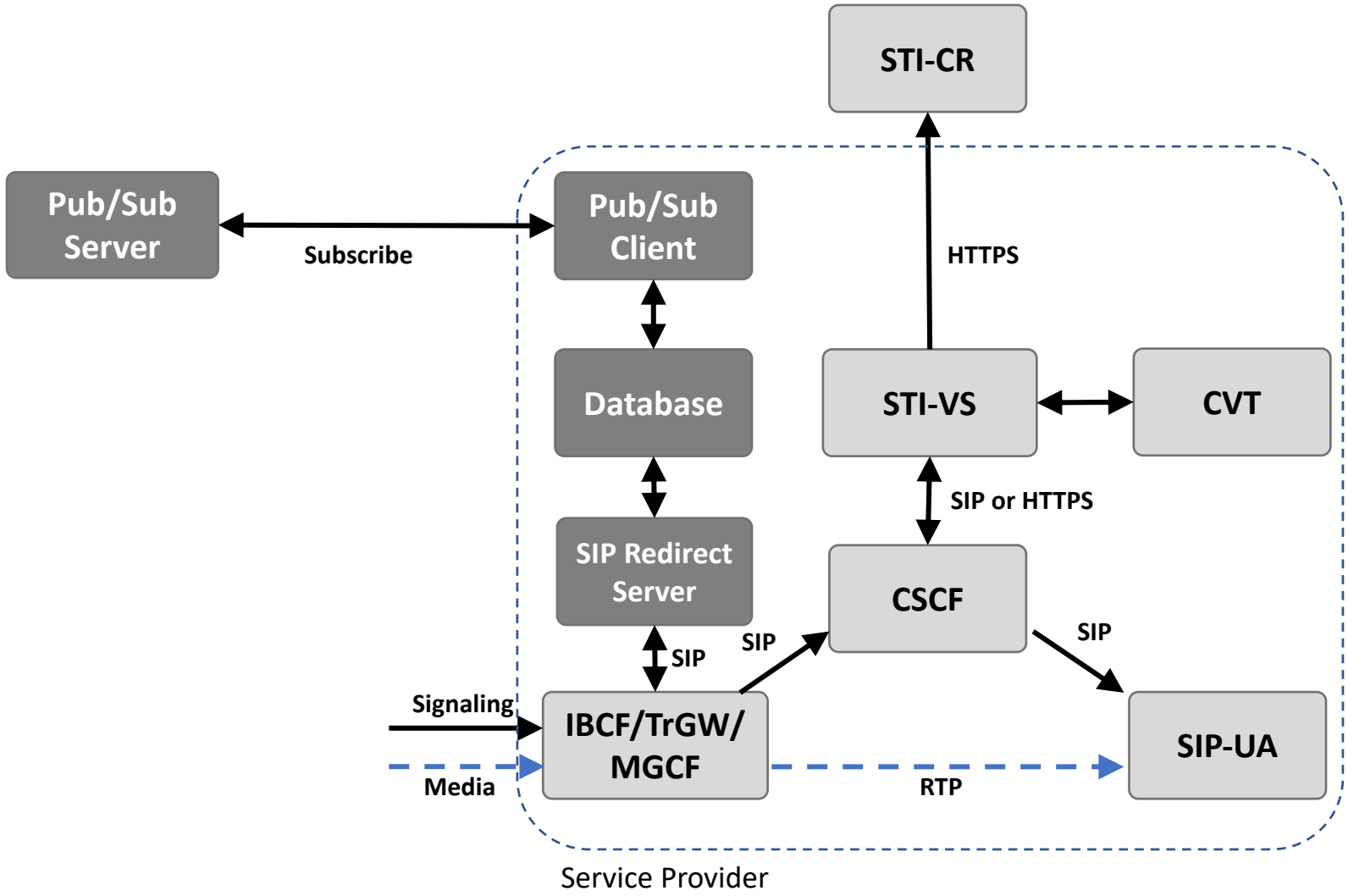

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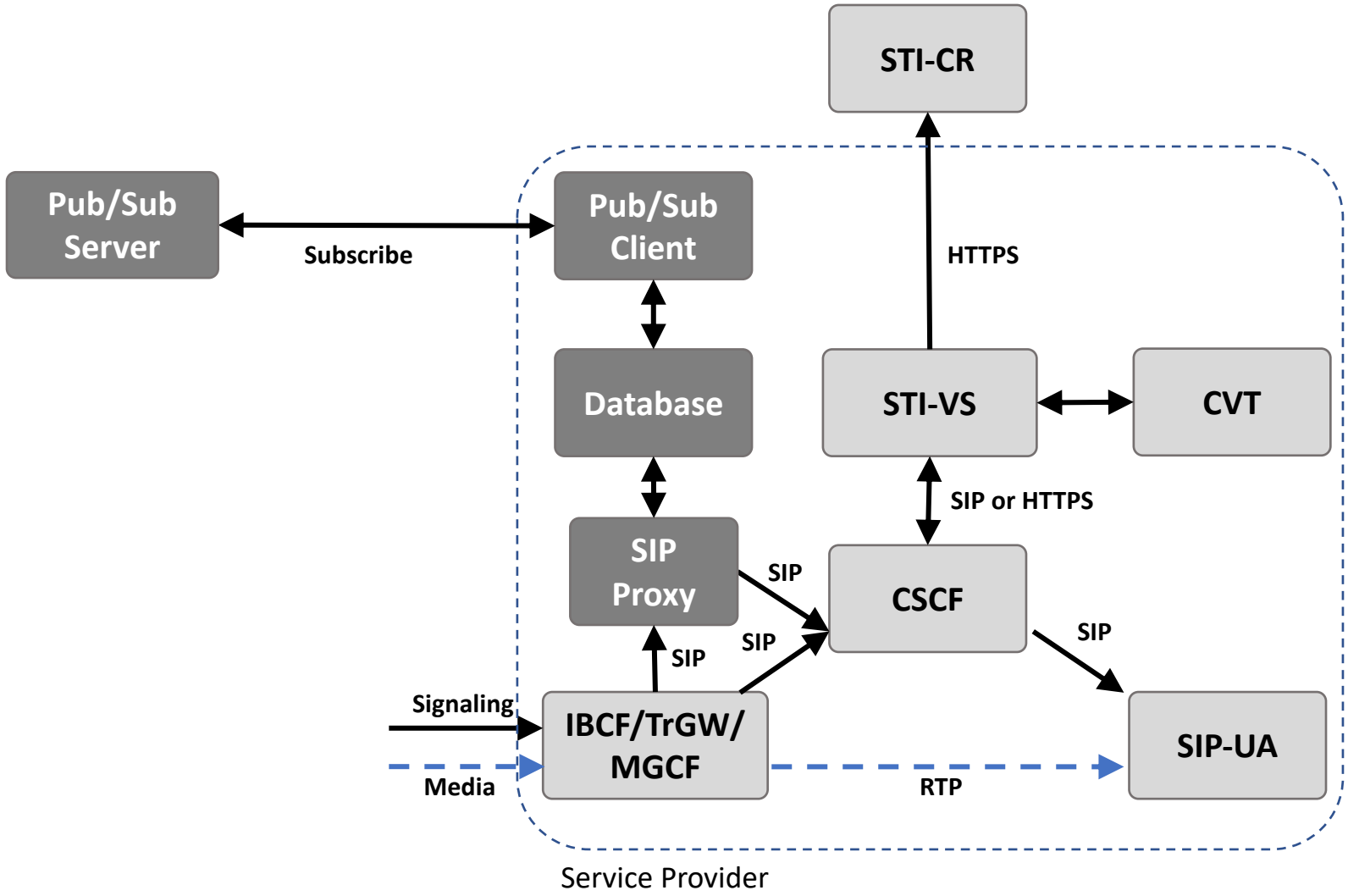

TransNexus®

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- Client: https://github.com/TransNexus/transnexus-cps-client
- Email me for a copy of the presentation: alec.fenichel@transnexus.com