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Toll-Free Routing with FQDNs in the Routing Record

What a toll-free routing record holds today, and how adding FQDNs extends what a RespOrg can do with it in an all-IP network.

TFN Registry Record | Routing Domain | ENUM / DoH | ALIII Delivery

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The Toll-Free Routing Record Today

A toll-free number's routing record in the TFN Registry is a decision tree provisioned by the RespOrg. Every branch of it terminates in a destination identifier the RespOrg designates. Two exist today: a carrier identification code, or a ten-digit geographic number.

```
TFN +1-800-555-1234
  zone EAST    ->  CIC 0550              (toll-free carrier)
  zone WEST    ->  CIC 0555              (a different toll-free carrier)
  after hours ->  +1 303 555 7890       (geographic TN)
  default      ->  CIC 0550
```

Destination identifier: CIC names the toll-free carrier the RespOrg designated; the destination is resolved a second time, privately, inside it

Destination identifier: geographic TN the call then routes as an ordinary geographic number, with an LNP dip and LRN correction if that number has been ported

WHAT ALL-IP INTERCONNECTION BRINGS

Destination identifier: FQDN a new option all-IP enables: the RespOrg names the destination provider ingress directly

Origin, schedule and allocation are already in the record. What changes is the set of destination identifiers a routing result can carry.

One New Destination Identifier

A routing result that carries a CIC or a geographic number today can also carry a fully qualified domain name, the destination Routing Domain. RouteLink publishes both representations together, and the plan that holds them is already multi-region and multi-endpoint.

LEGACY RECORD, TODAY

```
zone EAST     ->  CIC 0550
zone WEST     ->  CIC 0555
after hours   ->  +1 303 555 7890
default       ->  CIC 0550
```

→

NEW ROUTELINK RECORD, BOTH REPRESENTATIONS

```
zone EAST     ->  CIC 0550
                  east.avsp.example
zone WEST     ->  CIC 0555
                  west.avsp.example
after hours   ->  +1 303 555 7890
                  overflow.avsp.example
default       ->  CIC 0550
                  east.avsp.example
```

- **The routing tree is unchanged** same branches, same zones, same schedules; the RespOrg populates the FQDN per routing result
- **Multi-region, multi-endpoint** each routing result resolves to the ingress serving it, the shape all-IP routing should take
- **Legacy stays, indefinitely** the floor under every number, and the record a legacy-regime provider uses
- **Designation stays with the RespOrg** a non-network RespOrg provisions an FQDN exactly as it provisions a CIC today

CIC to Routing Domain is the same substitution the geographic side is making from OCN- and LRN-associated identifiers.

Every Routing Rule, Per Number

ENUM over DoH is the example here, and the shape an all-IP lookup should take: one name construction for geographic and toll-free numbers alike. Bulk distribution carries the same record content. Every decision node a CPR uses today has a place to go, chosen per number by the RespOrg.

```
; same construction, geographic or toll-free
Called TN   +1-609-555-1234  ->  4.3.2.1.5.5.5.9.0.6.1.e164.example
Called TFN  +1-800-555-1234  ->  4.3.2.1.5.5.5.0.0.8.1.e164.example

; NAPTR response, record carrying both forms
  50 10 "u" "E2U+sip"
    "!^.*$!sips:+18005551234@east.avsp.example;user=phone!"
 100 10 "u" "E2U+sip"
    "!^.*$!sip:+18005551234;cic=+1-0555@tfnc.example;user=phone!"

; origin NPA-NXX in the query name, caller +1-212-555-0100
  4.3.2.1.5.5.5.0.0.8.1._from.5.5.5.2.1.2.e164.example
  ->  sips:+18005551234@east.avsp.example;user=phone

; RFC 3263 resolution of the all-IP record
  _sips._tcp.east.avsp.example -> SRV -> AAAA -> INVITE over mTLS
```

EVERY CPR DECISION NODE MAPS

Where the caller is calling from
the designated provider decides, or the caller's area code and prefix go in the query so the answer differs by region

The specific calling number
too fine for the query to carry, so the designated provider decides

Time of day, day of week, date
the designated provider decides, on the call it just received

Percentage split
the designated provider decides, where the live counters are

A RespOrg substitutes where it wants to, one routing result at a time, on its own schedule. Nothing else in the record moves.