Cryptography in DNS

D. J. Bernstein
University of Illinois at Chicago

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How big was the query packet?

Some general questions

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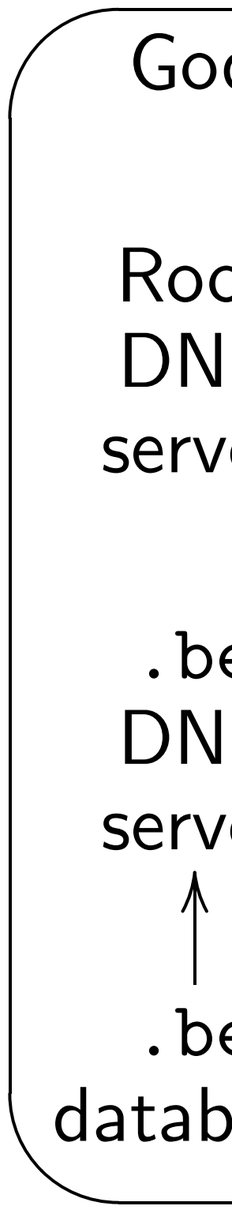

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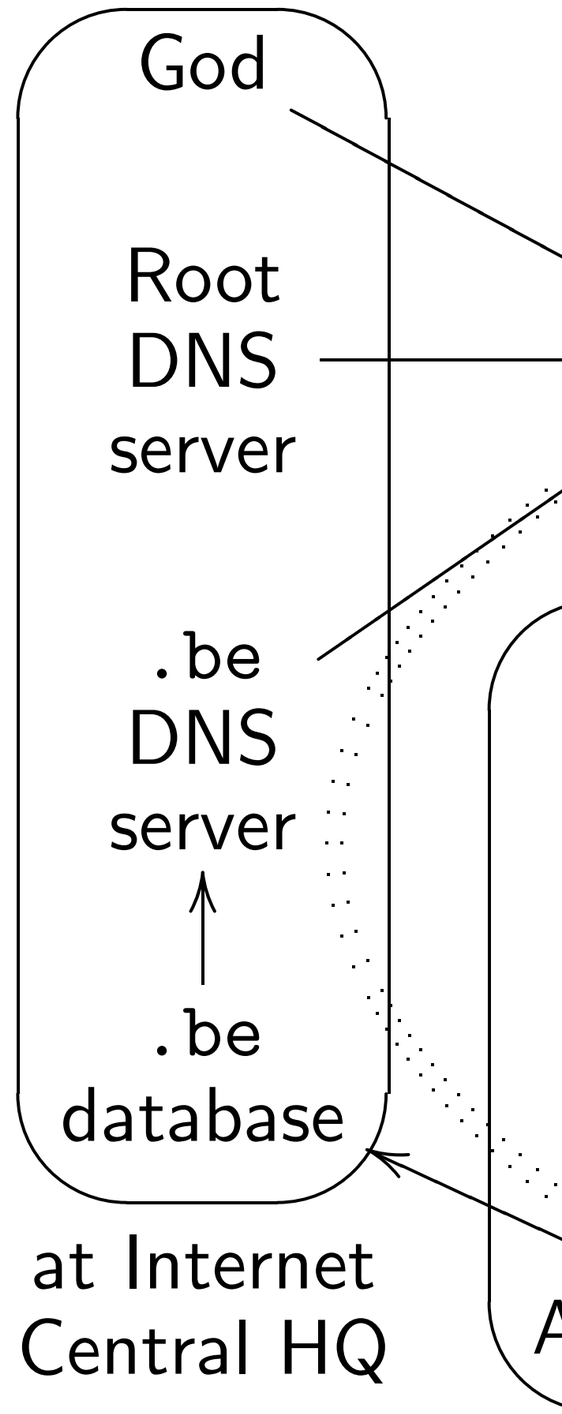

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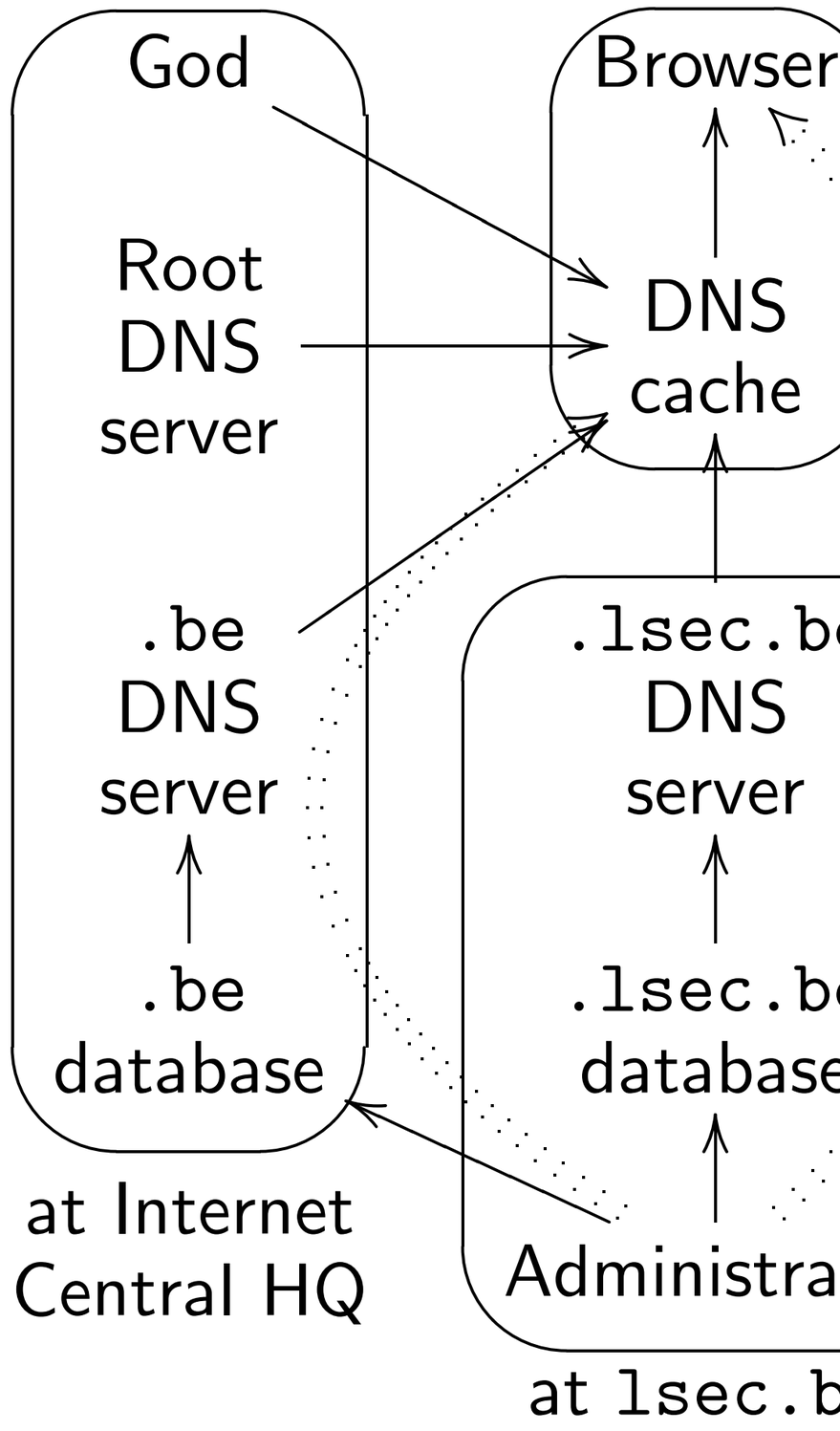

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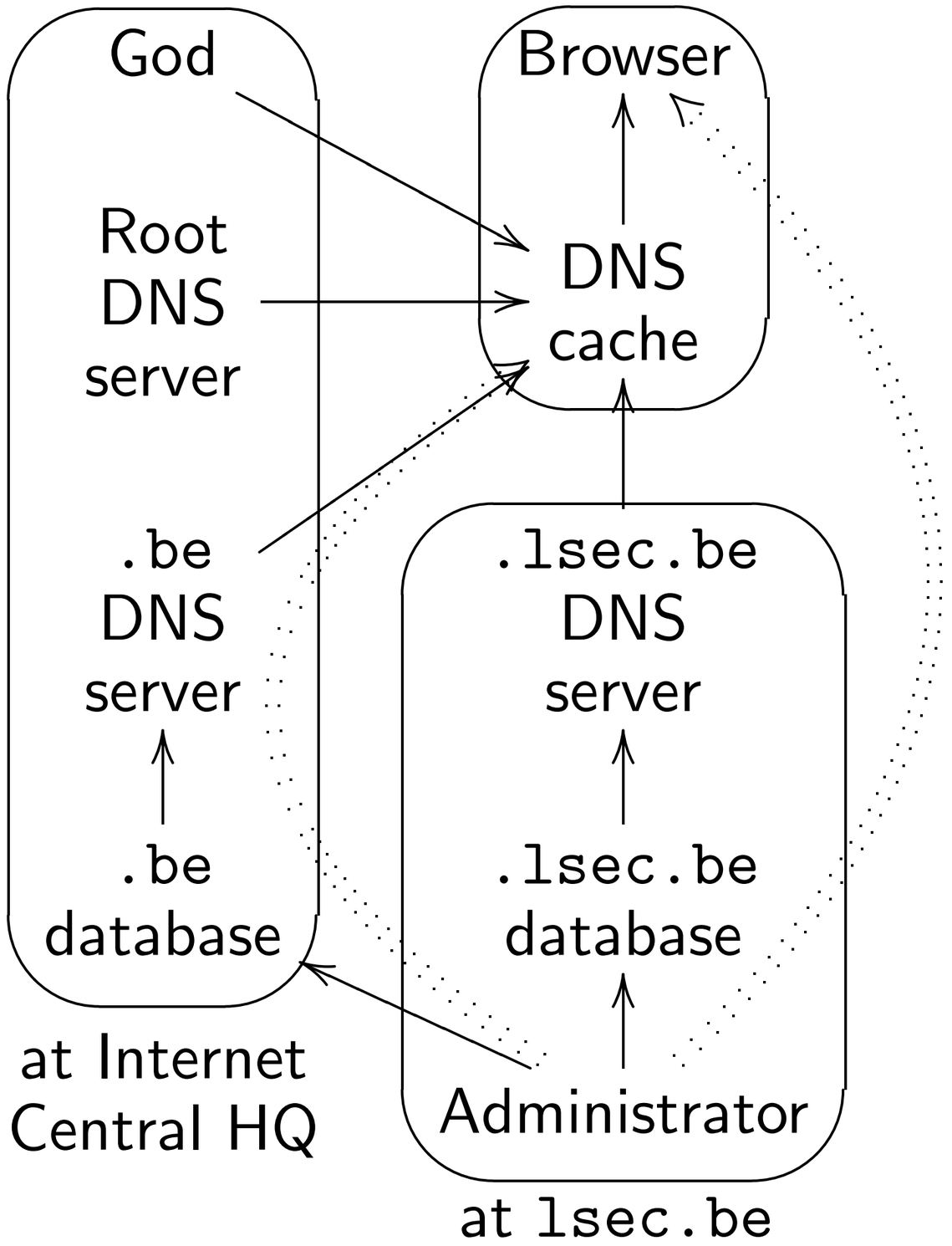
2003: Shamir–Tromer et al. concluded that 1024-bit RSA was already breakable by large companies and botnets.

2003: RSA Laboratories recommended a transition to 2048-bit keys "over the remainder of this decade." 2007: NIST made the same recommendation.

But *most users don't know this*.
Why aren't they using DNSSEC?

Recall the DNS architecture:



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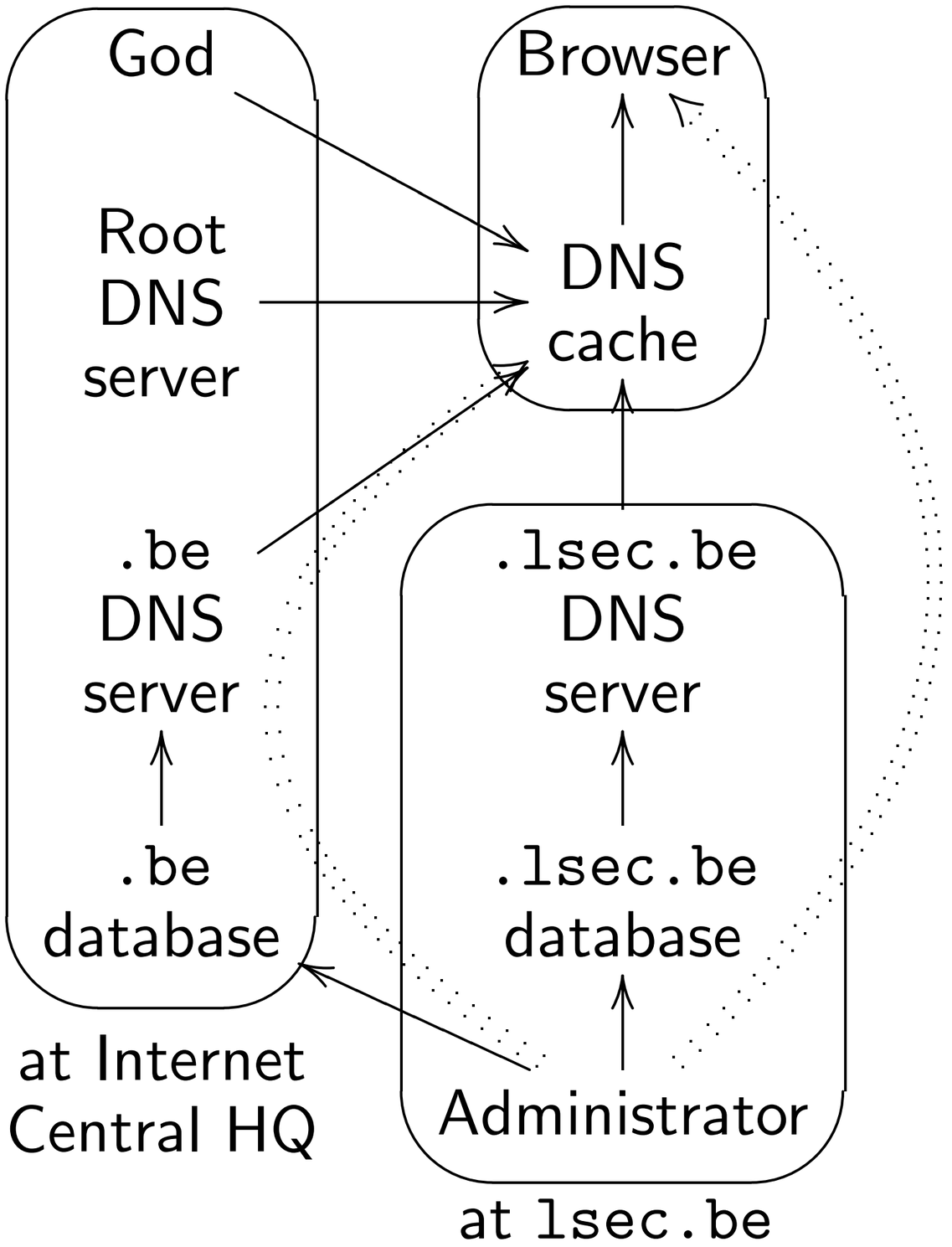

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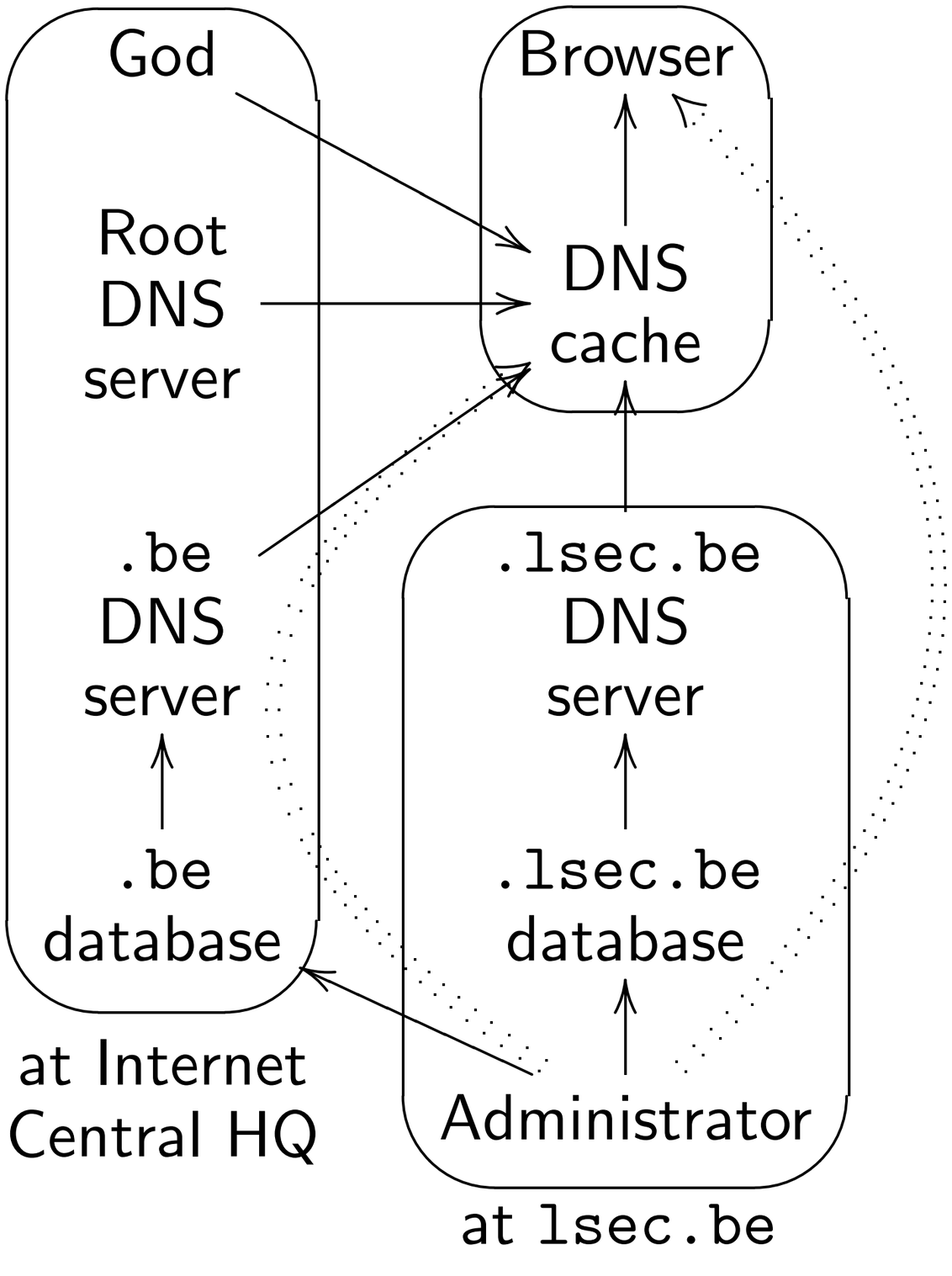

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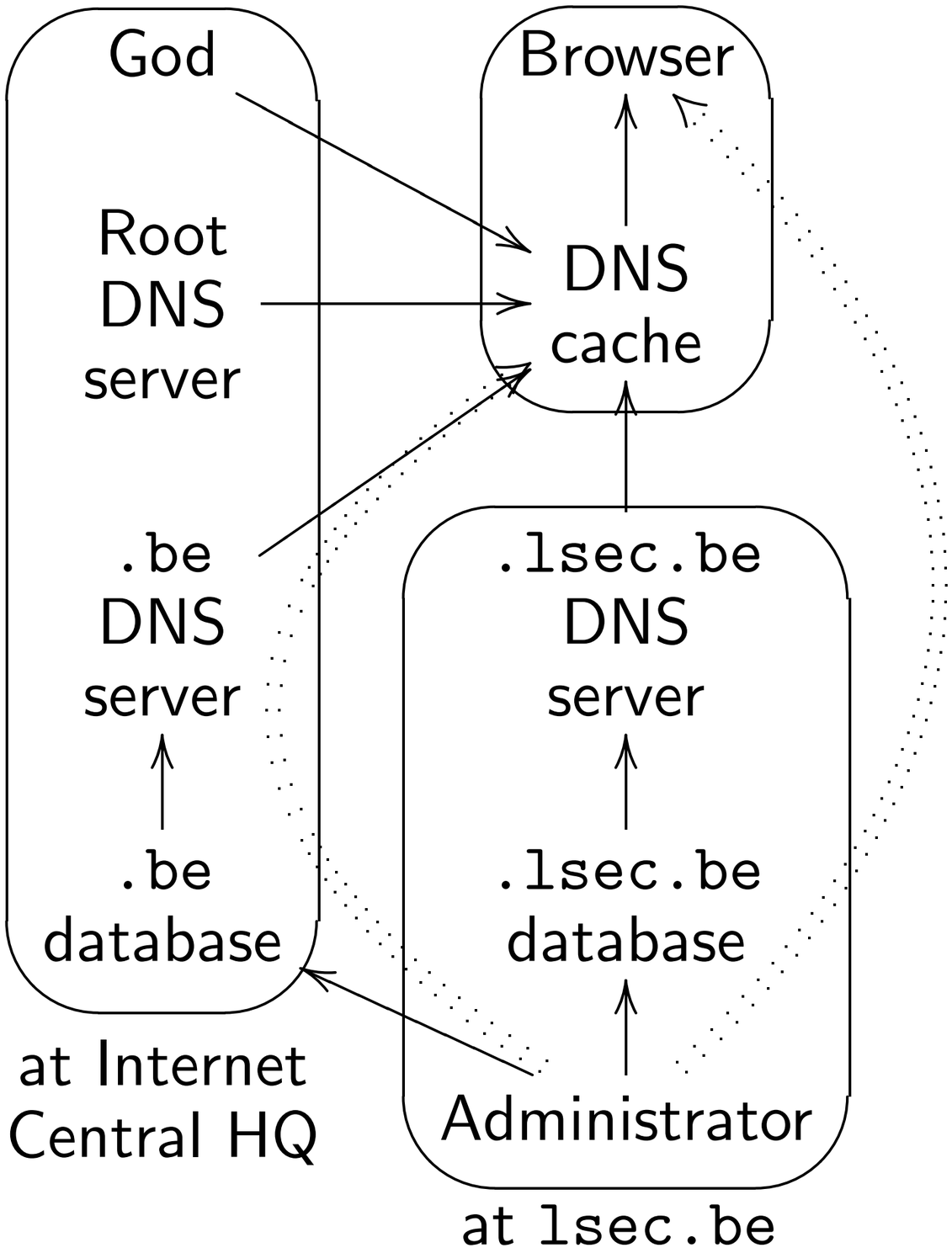

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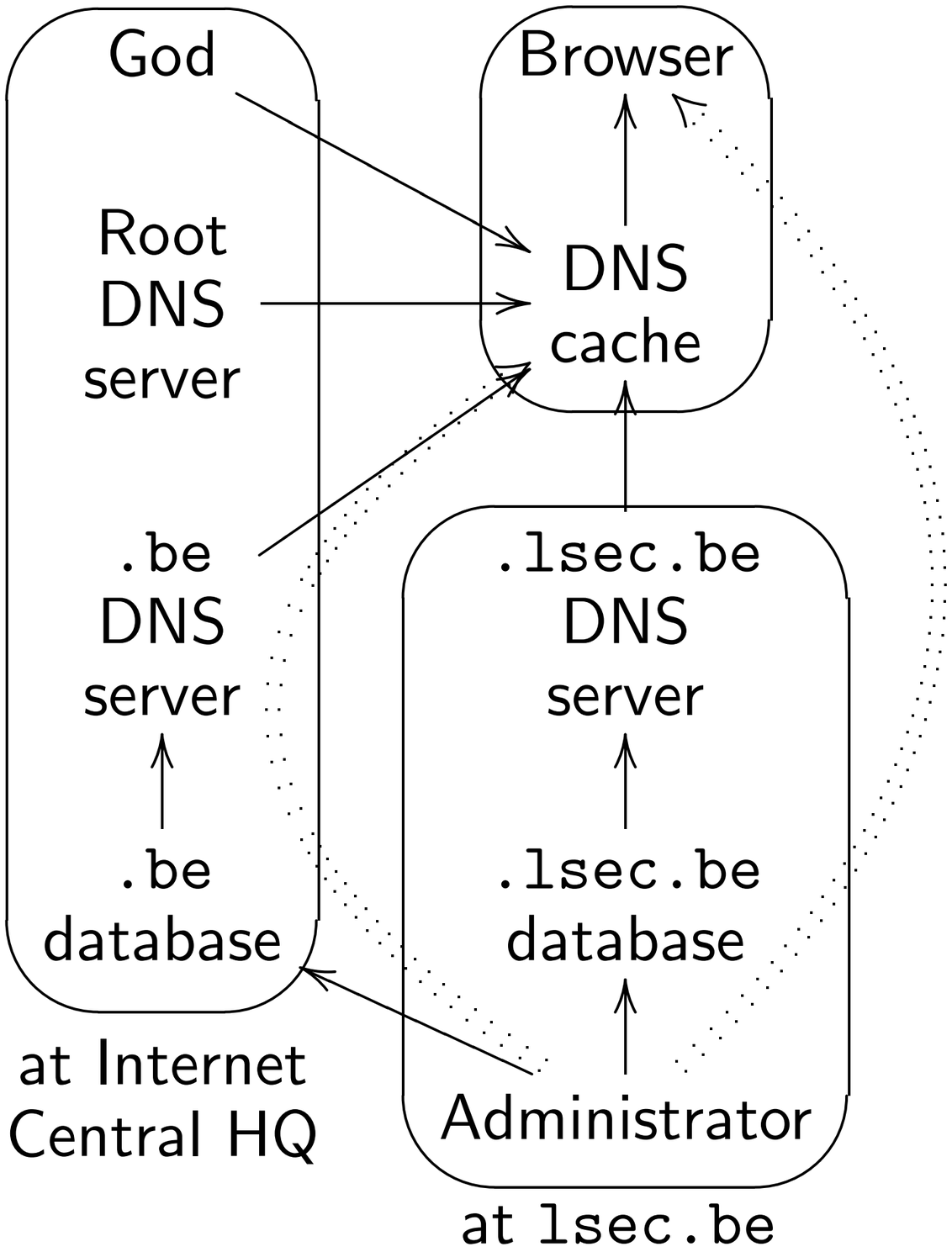

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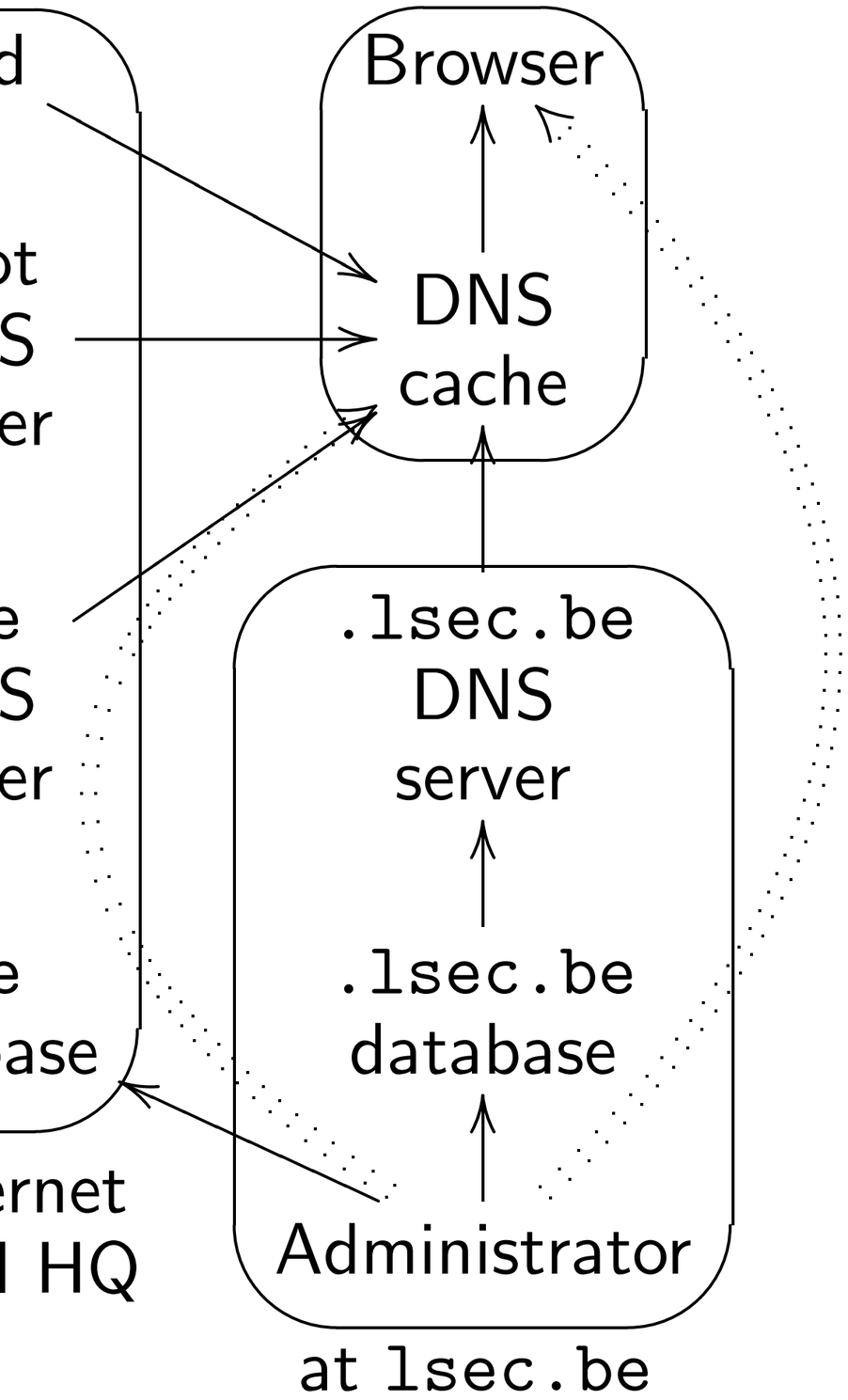

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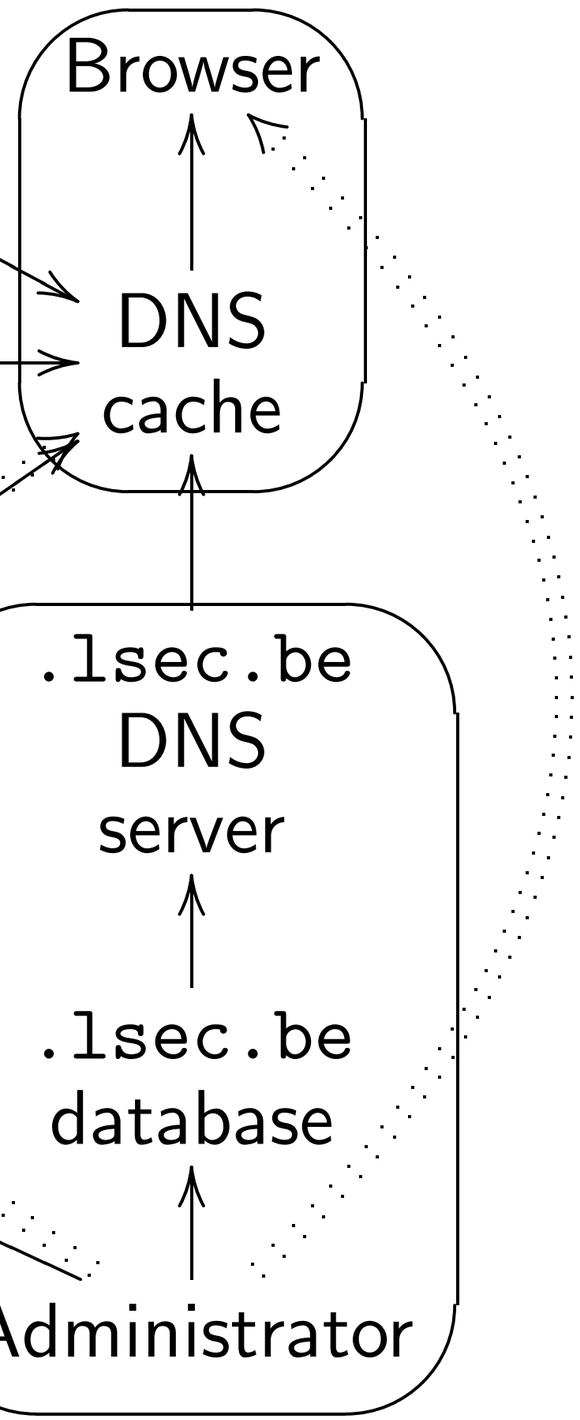

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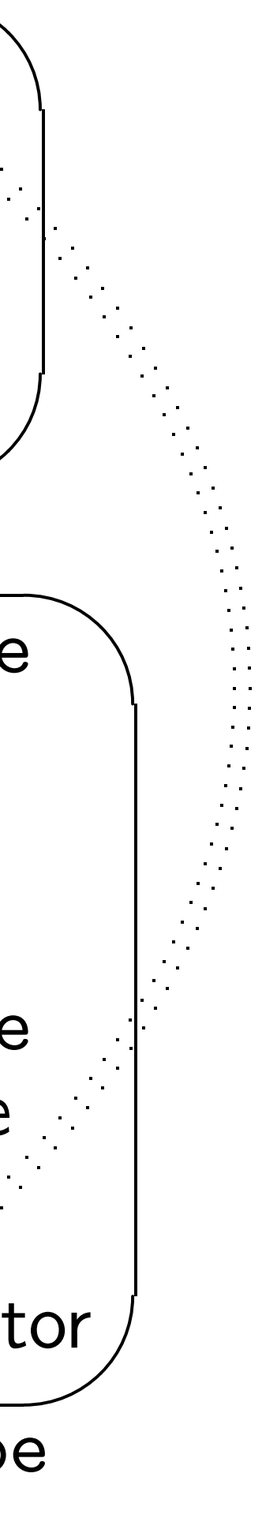

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100% CPU on 1/3 the traffic
before you've parsed a single DNS
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Cache has to be upgraded
to support DNSCurve.

Cache naturally sees the
encoded DNSCurve public key.
Cache encrypts and authenticates
DNS packets sent to that server.
Cache verifies and decrypts DNS
packets received from that server.

No extra packets.
Forged packets are
very efficiently discarded.
Denial of service becomes
much more difficult.

Kaminsky, 2008.12: "It's not
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does a crypto operation per query.
With DJB's sample code, a laptop
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Wrong. There is only one ECC
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Security advantage: User running a DNSCurve cache is protected from intermediate ISP modifying the administrator's DNS data.

Speed advantage: Per-user caches are actually *more* effective than a centralized ISP cache, *decreasing* DNS load.

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