

Babel: recent developments

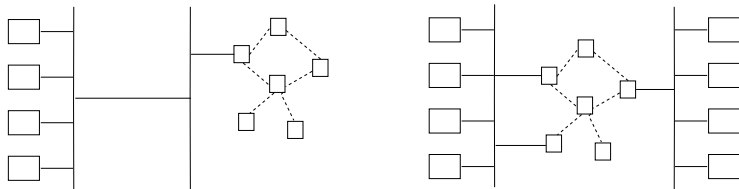
Juliusz Chroboczek
IRIF
Université Paris-Cité

29 July 2022

Babel

Babel is a (layer 3) routing protocol:

- designed for **hybrid networks**, e.g.
 - wired backbone with meshy bits at the edges; or
 - wired bits connected by a wireless mesh;



- the usual features of **traditional protocols**:
 - filtering, etc.
- competitive with dedicated **mesh protocols**.

Babel

Babel **IETF Standards Track** (RFC 8966, January 2021).

A number of **useful extensions**:

- (H)MAC authentication;
- **source-specific** routing;
- **v4-via-v6** routing;
- **RTT-sensitive** metrics.

These extensions are:

- **implemented** in both Babeld and BIRD;
- **interoperable** with the base protocol;
- (in principle) **protocol-agnostic**:
easily adapted to other routing protocols.

MAC authentication

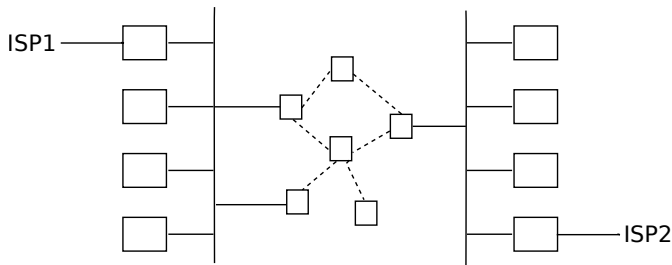
RFC 8967 defines an authentication protocol:

- **minimalistic** and easy to implement
 - RFC 8968 defines a more comprehensive protocol;
- **invulnerable to replay**
 - pen-and-paper proof;
- **minimal requirements**:
 - no real-time clocks,
 - no persistent storage;
- **protocol-agnostic**.

Source-specific routing

RFC 9079 defines **source-specific routing** for Babel:

- routes packets depending on their **source**;
- allows a cheap form of **network multihoming**;

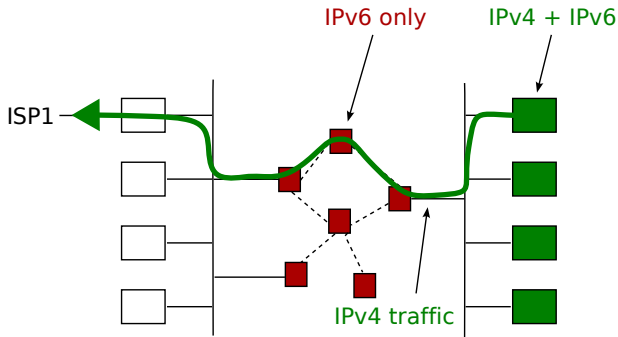


- requires **kernel support** (Linux 3.11 and later);
- requires **host changes** for best performance;
- **protocol-agnostic**.

V4-via-v6

RFC 9229 defines **v4-via-v6 routing** for Babel:

- **IPv4 routes** through IPv6 nodes;

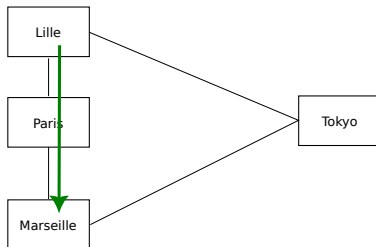


- no translation, no tunnelling:
 - almost **indistinguishable from magic**;
- required **kernel changes**:
 - IP: Linux 5.2,
 - ICMP: Linux 5.13 (Toke Høyland-Jørgensen);
- **protocol-agnostic**.

RTT-sensitive

Draft-ietf-babel-rtt-extension defines
RTT-sensitive metric for Babel:

- designed for **tunnels** (overlay networks):



- widely deployed in production since 2014;
- the draft needs more work
 - didn't prevent independent implementation in BIRD;
- somewhat **protocol-agnostic**.

Conclusion

Babeld and BIRD implement a **number of useful extensions** to the base Babel protocol:

- MAC **authentication**;
- **source-specific** routing;
- **v4-via-v6** routing;
- **RTT-sensitive** metrics.

These extensions are **protocol-agnostic**: they could easily be implemented in other routing protocols.

Please **steal our ideas** and adapt them to your favourite routing protocol.

(We'll take it as a compliment.)