

Introduction to the Lightning API

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Application programming interface (API)

... a set of clearly defined methods of communication between various components....

— *Wikipedia*

Why?

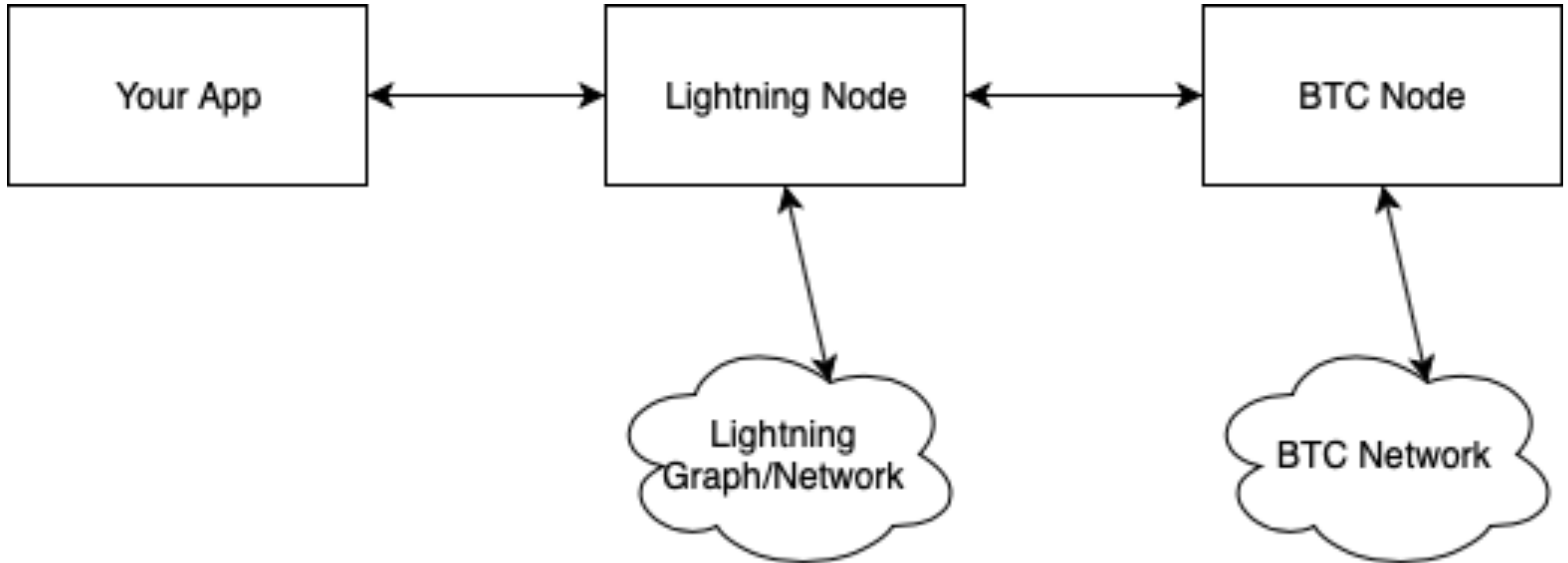
- Curious
- Help on existing projects
- Build Lightning enabled apps

API Functionality

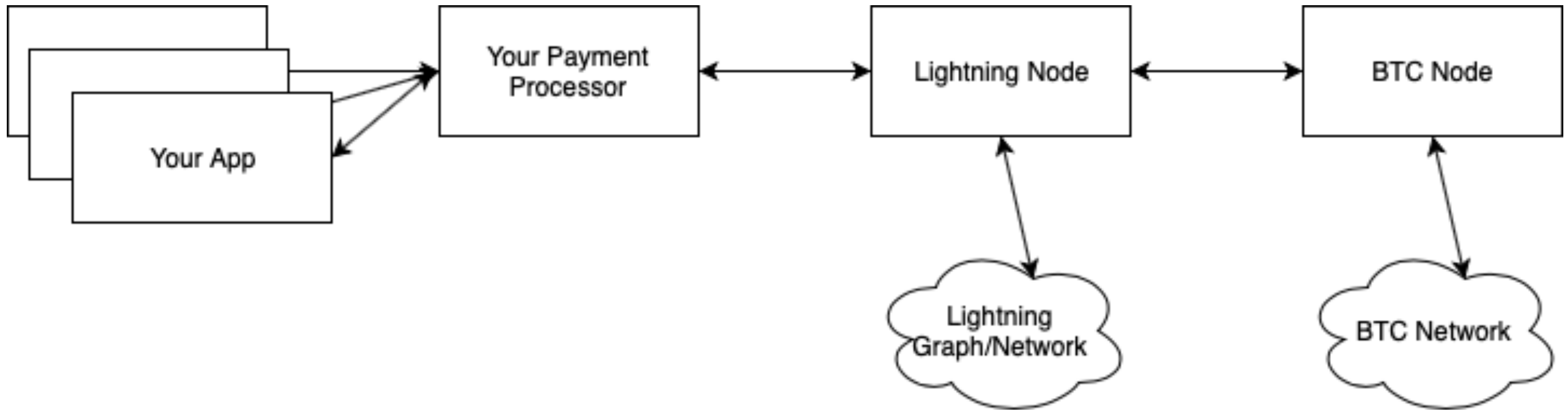
Custom / automated

- Wallet & invoice
- Monitoring and stats
- Management and optimization

Basic Architecture



Possible Architecture



BTC Backends

- Bitcoin
- BTCD
- Neutrino, Electrum, spruned

*Use testnet, simnet, regtest for development.

Lightning Nodes

- Lnd - [lightningnetwork/](https://lightningnetwork.org/)lnd
- C-Lightning - [ElementsProject/lightning](https://github.com/ElementsProject/lightning)
- Eclair - [ACINQ/eclair](https://github.com/ACINQ/eclair)
- Rust Lightning, lit, Ptarmigan, others?

Protocols

- JSON-RPC
- gRPC
- REST

JSON-RPC

Look at ElementsProject/lightning

```
# Write json to a http POST, socket, unix "file", etc.  
{  
  "method": "newaddr",  
  "params": {"addresstype" : "p2wkh"},  
  "id": some_id(),  
}
```

gRPC

rpc.proto

```
rpc NewAddress (NewAddressRequest) returns (NewAddressResponse) { ... }
```

```
message NewAddressRequest { AddressType type = 1; }
```

```
message NewAddressResponse { string address = 1 }
```

```
enum AddressType {  
    WITNESS_PUBKEY_HASH = 0;  
    NESTED_PUBKEY_HASH = 1;  
    UNUSED_WITNESS_PUBKEY_HASH = 2;  
    UNUSED_NESTED_PUBKEY_HASH = 3; }
```

Code - Look at [willcl-ark/ln_d_grpc](#)

```
stub.NewAddress(ln.NewAddressRequest(type='WITNESS_PUBKEY_HASH'))
```

First Technical Challenge

- Dev vs. Deployment
- Finding right combination and versions of LN & BTC nodes
- Boundary complications - one server / multiple servers / Docker
 - Directory & file locations
 - Networking - vpc, interfaces, CORS

Example - TLS cert, macaroons

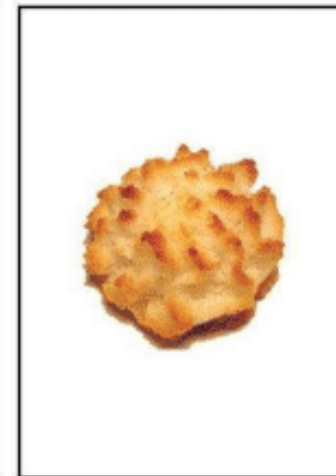
Macaroons



MACRON



MACARON



MACAROON



MACARONI



MARCONI



MICKEY ROONEY

macaroons

- Fancy (web) cookies
- Authorizations built in (like JWT?)
- LND creates
 - admin macaroon
 - read only macaroon
 - ... more in the future

Scenario

Create a minimal system where Alice can pay Bob over lightning.

<https://github.com/lightningnetwork/ln/tree/master/docker>

CLI - Start Processes

```
# Start alice's lightning node
```

```
$ lnd --bitcoin.active --bitcoin.simnet ...
```

```
# lets call --bitcoin.simnet etc... <config_params>
```

```
# create wallet
```

```
alice$ lncli <config_params> create ...
```

```
# start bob
```

```
$ lnd --lnddir=/tmp/bob <config_params> ...
```


CLI - Fund Alice's wallet

```
# Start btcd miner with alice's wallet address  
$ btcd <config_params> --miningaddr= ...
```

```
# mine some coin  
$ btcctl <config_params> generate 400 ...
```

```
# Get info and check her balance  
alice$ lncli <config_params> getinfo ...  
alice$ lncli <config_params> walletbalance ...
```

CLI - Connect and open a channel

Connect alice and bob

```
alice$ lncli <config_params> connect <bob_pubkey>@<bob_host>
```

open a channel from A to B

```
alice$ lncli <config_params> openchannel \
    --node_key=<bob_pubkey> \
    --local_amt=1000000
```

mine some blocks

```
$ btcctl generate 3
```

CLI Example - Invoices

Create an invoice from bob

```
bob$ lncli <config_params> addinvoice --amt=1000000
```

Pay bob

```
alice$ lncli <config_params> sendpayment --pay_req="lnrb10m1..."
```

View payments

```
bob$ lncli <config_params> channelbalance
```

Getting Started

- Lnd w/ Neutrino & testnet
- Lnd w/ btcd & simnet
- C-Lighting w/ bitcoind & regtest
- Eclair w/ regtest

LND API Demo

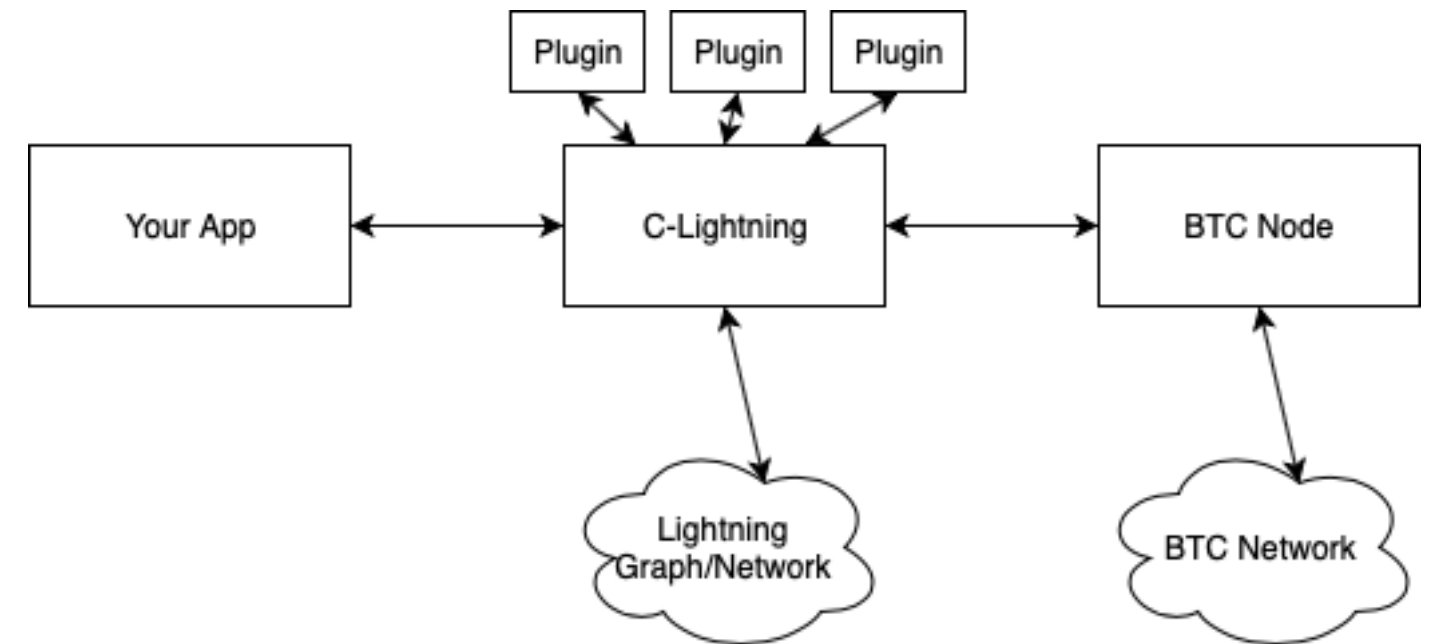
In python.

<https://api.lightning.community>

[lightningnetwork/lnrpc/rpc.proto](https://api.lightning.community/lightningnetwork/lnrpc/rpc.proto)

C-Lightning Plugins

- Super powerful
- Close integration with LN node
- Any language



Resources

<https://github.com/lightningnetwork/ln>

<https://github.com/ElementsProject/lightning>

<https://github.com/ACINQ/eclair>

<https://github.com/lightningnetwork/ln/tree/master/docs/grpc>

<https://github.com/lightningnetwork/ln/tree/master/docker>

<https://api.lightning.community/>

<https://github.com/alexbosworth/ln-service>

<https://github.com/ShahanaFarooqui/RTL>

<https://github.com/janoside/ln-admin>

<https://github.com/djmelik/ln-dash>

<https://github.com/PatrickLemke/ln-dashboard>

<https://github.com/lightningd/plugins>

<https://ai.google/research/pubs/pub41892>

Thank You! Questions?

E-String.com / @JulioBarros

Always happy to talk about:

- BTC/Lightning
- Machine learning
- Programming / tech

Interested in a longer LN workshop?

Slides github.com/JulioBarros/Presentations

