

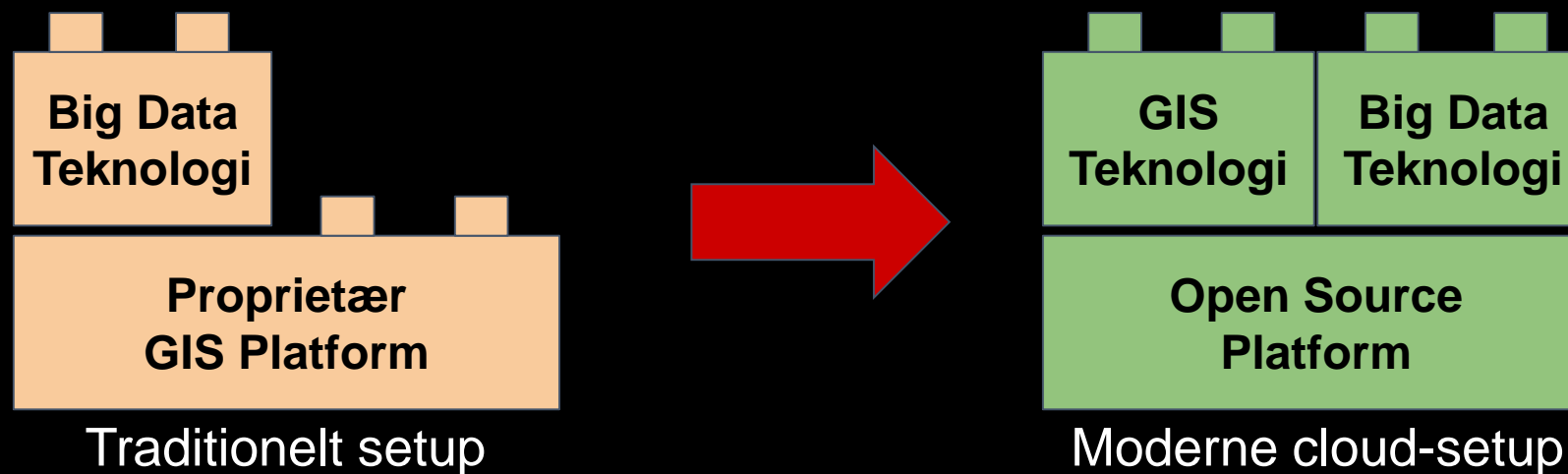
Open Source trace-baseret ledningsregistrering

Jesper Ladegaard, DAX ApS
jesper@dax.dk



Agenda:

- En lærerig historie fra de varme lande
- Tracé-koncept som bindeled mellem geodata og big data
- Eksempler på hvordan, tracé-konceptet i kombination med Open Source teknologi, kan effektivisere arbejdsgange og gøre livet lettere for slutbrugeren



En lærerig historie



Bill Gates

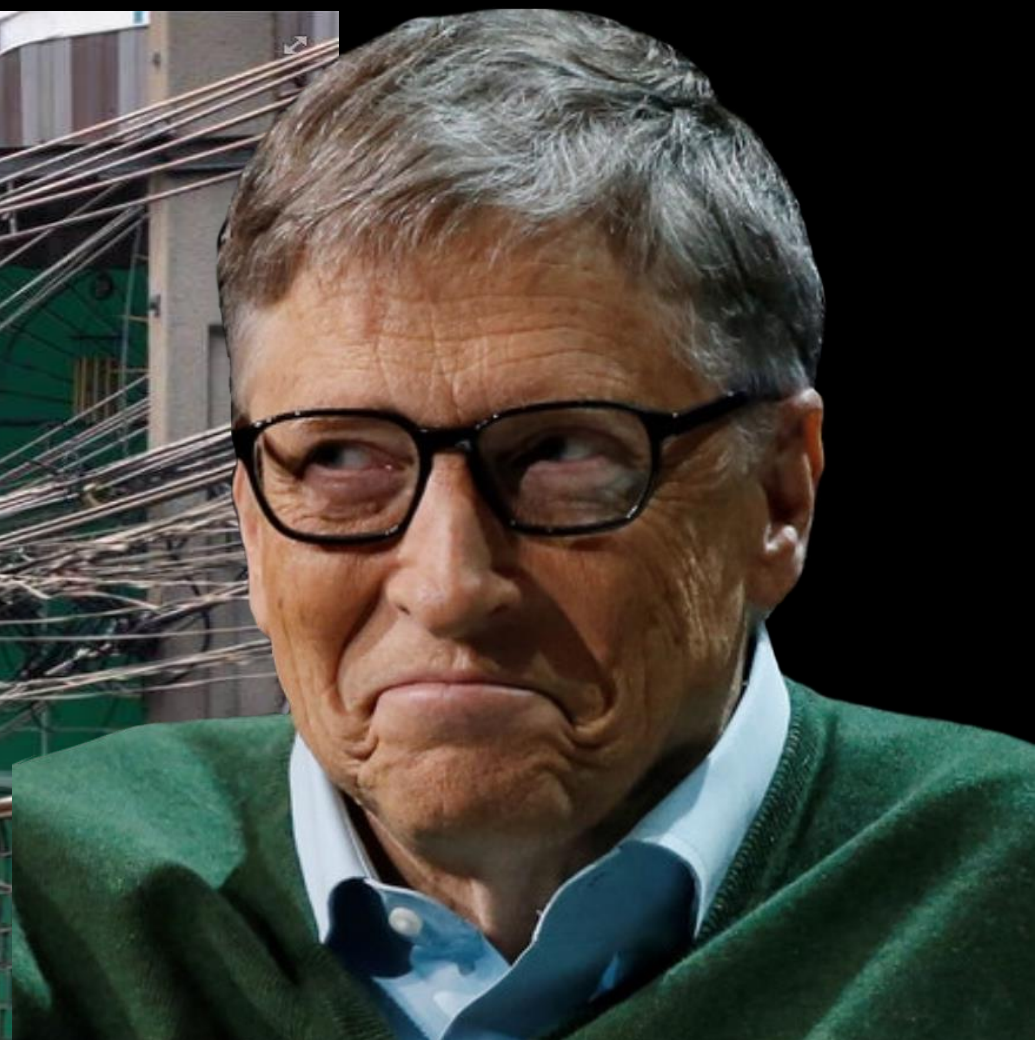
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LIVE WIRES

Due to faulty infrastructure, many urban areas suffer from frequent blackouts and power cuts, and the electrical grid often doesn't serve the people who need it most.

I've visited many cities filled with tangled wires such as those in this photo from Thailand, where people have illegally tapped into the grid on their own to get the power they need—at great personal risk.

👍 Like 💬 Comment ➦ Share



Gigantisk kabellægnings-projekt godkendt, blot 2 måneder efter Bill Gates post

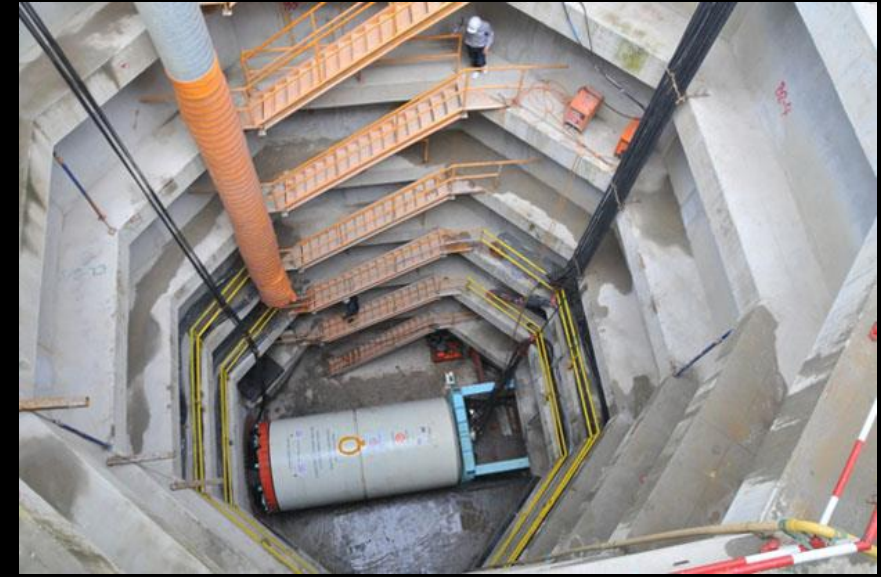


Asawin Kwanmuang, Bangkok Governor promotes underground cable project. Source: [Bangkok post](https://www.bangkokpost.com).

Alle el og tele-kabler lægges i jorden



> 250 km el-transmissions og telecommunications-backbone tunnel netværk



Pipe-jacking / micro- tunnelling

30-50 meters dybde under metrolinjerne

Pris ca. 100 mill. kr. per km!

Såden ser et stykke "bad ass" tunnel-tracé ud indefra

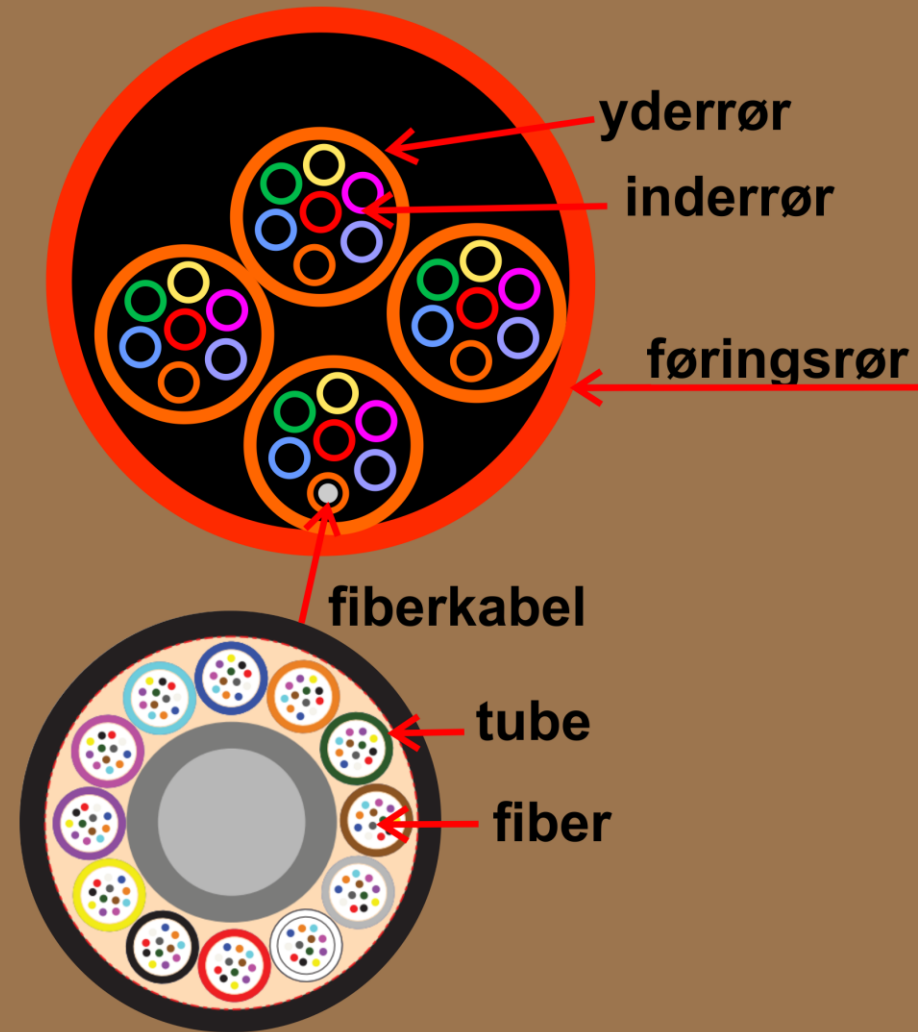


Frokost / street-food på vej

Telecom-backbone
fiberkabler
i multirør

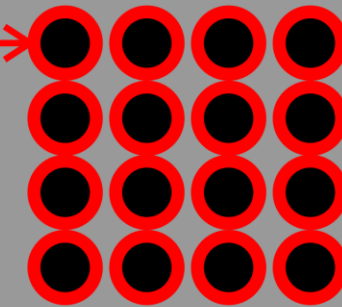
230 kV
vandkølet
el-kabel

2.450 km access-netværk som vi kender fra Danmark (blown fiber teknologi)

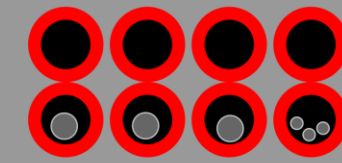


tracé

tele rørblok



el rørblok

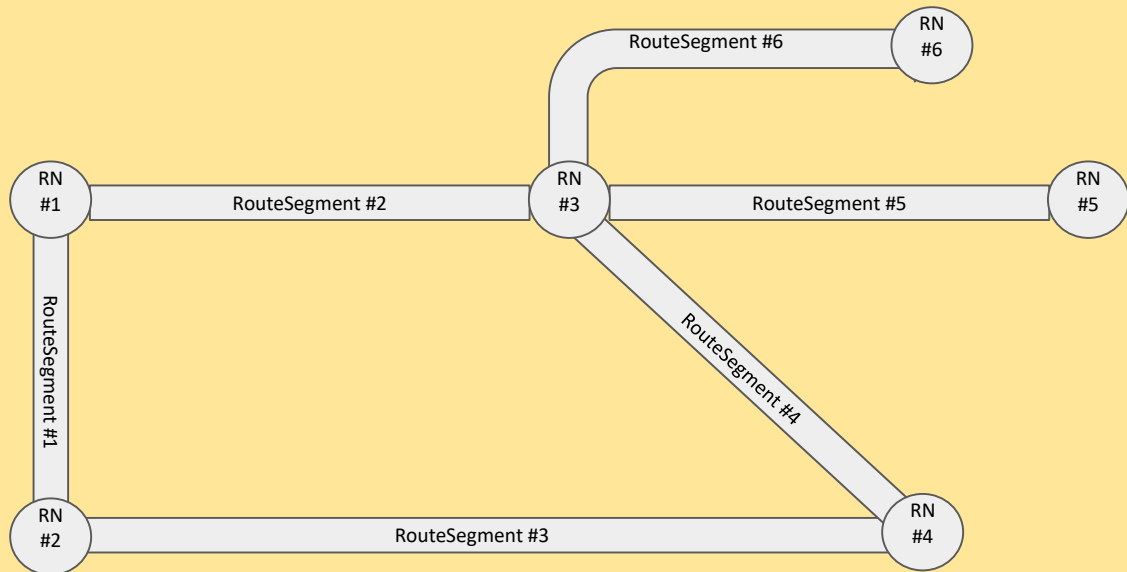


80 cm.

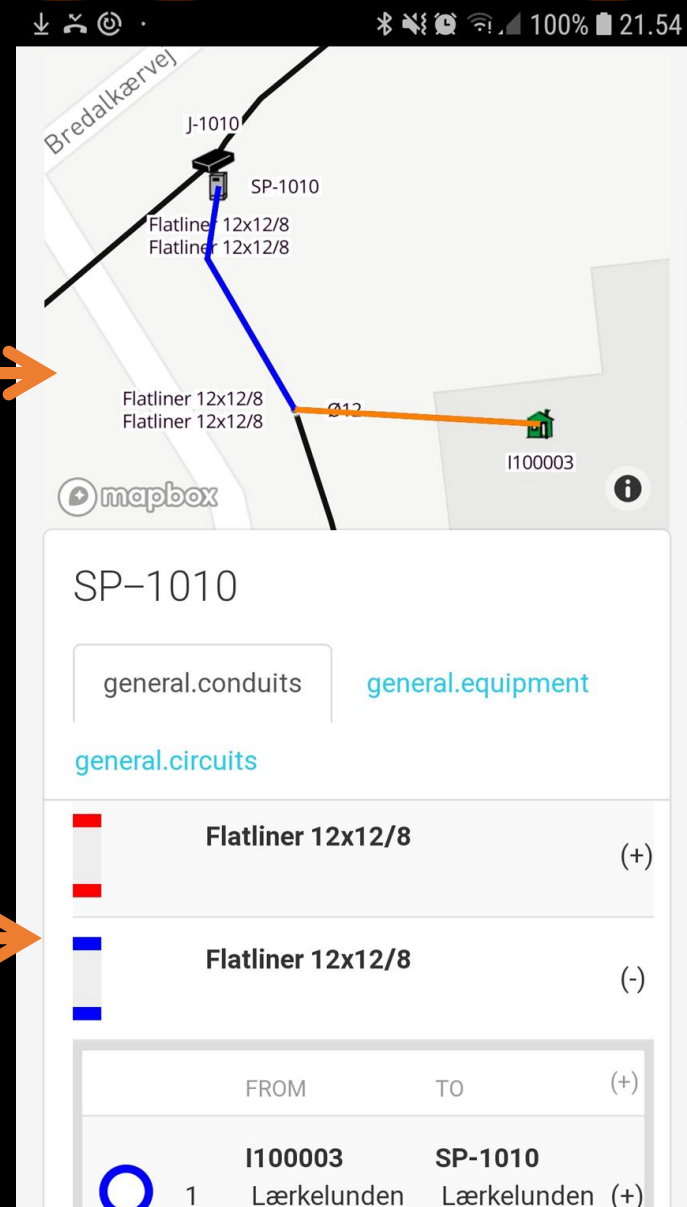
200 cm.

Graf-baseret tracé-koncept som bindeled mellem geodata og big data teknologi

Geodata del, bestående af tracé-noder og tracé-segmenter



Eksempel på simpel kort-visning på smartphone



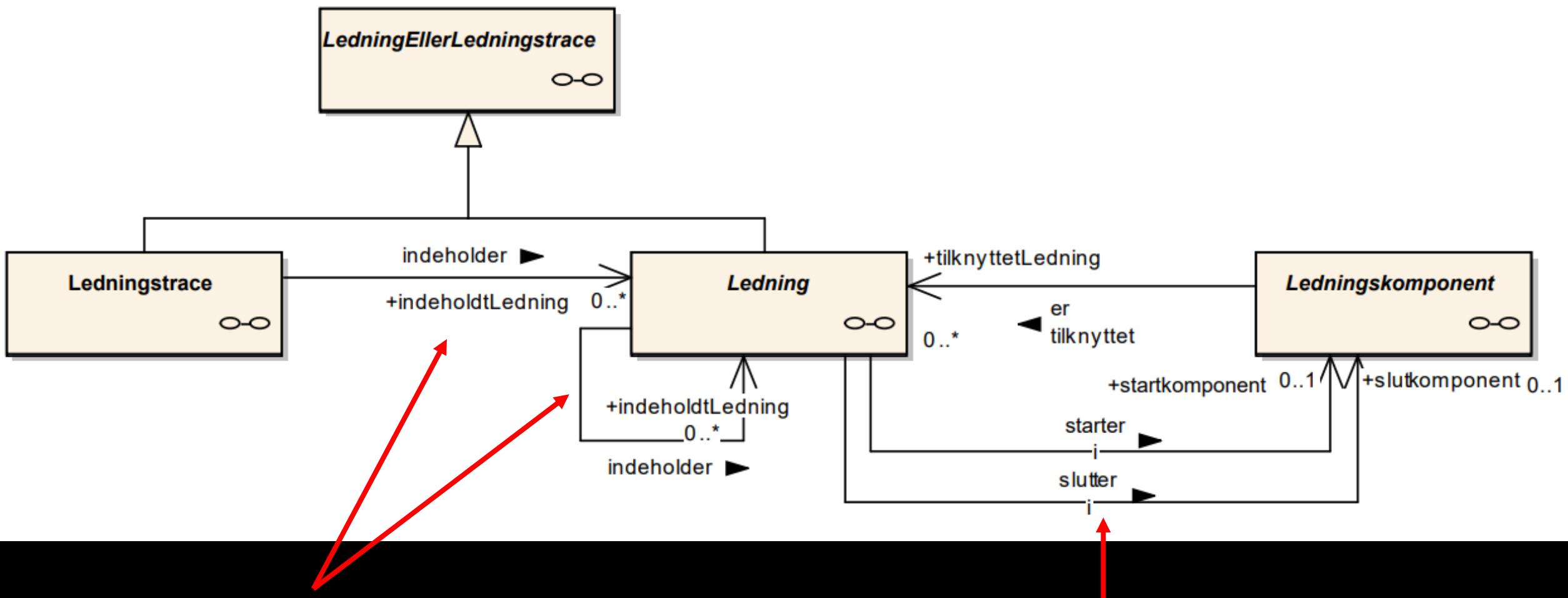
Big data del, som tager sig af tracé-indholdet:

- Rørbløkke og føringsrør
- Fiber multirør
- Kabler
- Kabel ledere/tubes/fibre
- Fysisk konnektivitet
- Kredsløb / logisk konnektivitet
- Node indhold - fx teleudstyr

Eksempel på tabulær visning af tracé-indhold

Tracé og relaterede datasæt er modelleret som graf-datastrukturer i et parent-child hierarki

LER 2.0 understøttelse



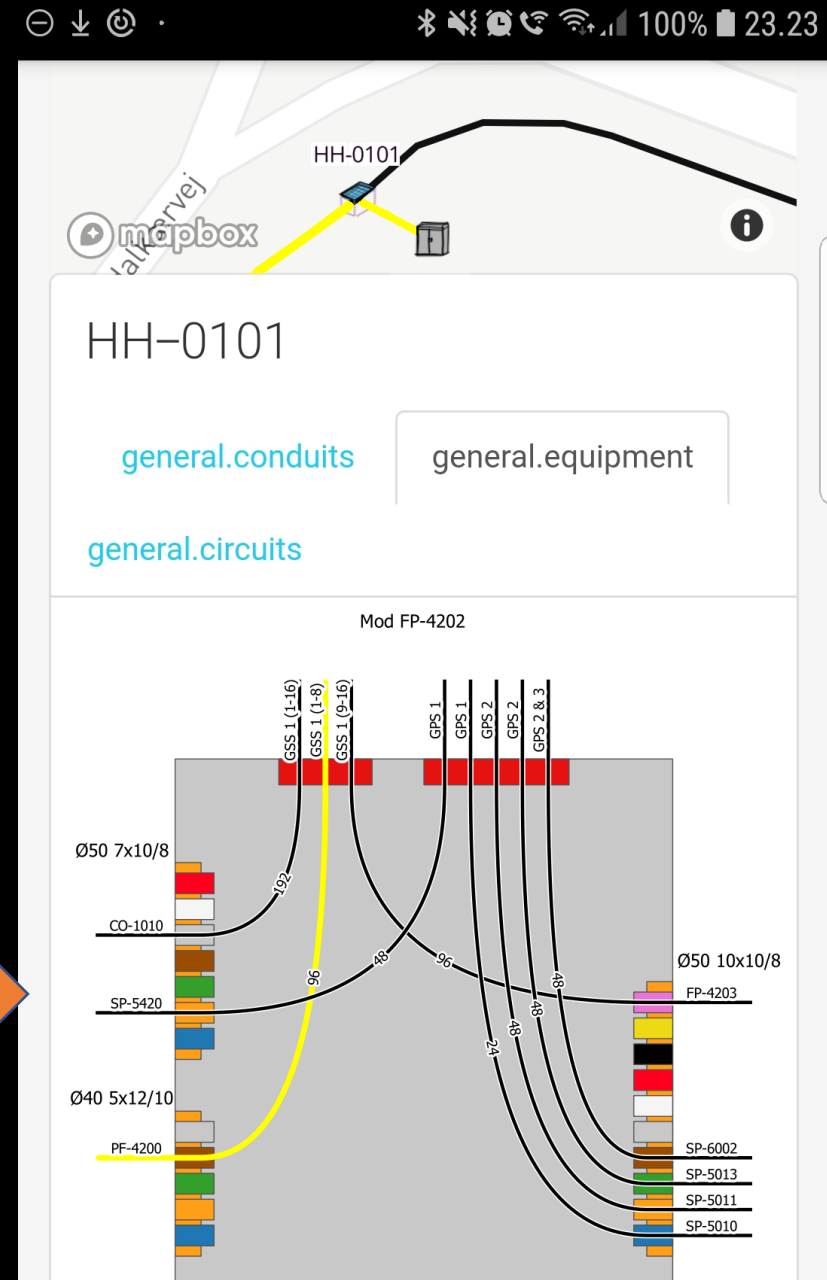
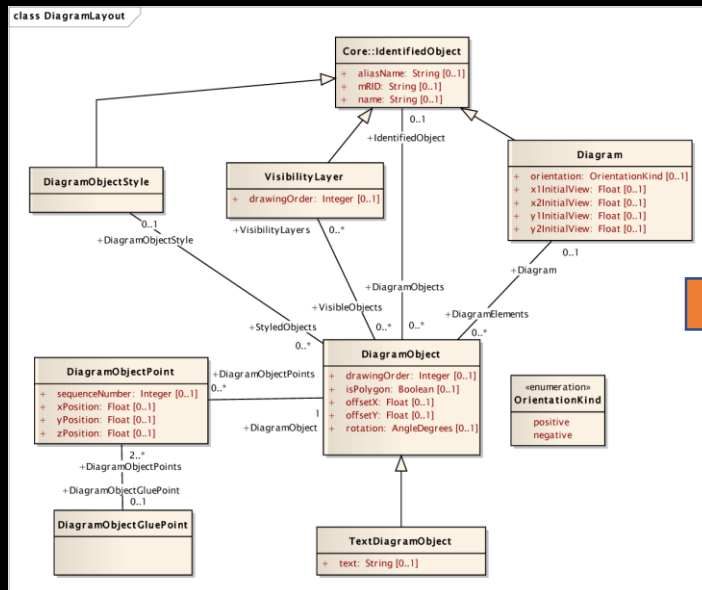
Komposit parent-child struktur

Et tracé kan indeholde ledninger (fx rør)
som igen kan indeholde andre ledninger.

Mapper 1:1 til graf-struktur

En ledning = graf link.
En ledningskomponent = graf node.

CIM Diagram Layout standarden faciliterer fleksibel skematisk funktionalitet



GraphQL faciliterer lynhurtige forespørgelser på graf-data

Q closure

M reset

Q routeNode

Q routeNode

Q diagramService

Q routeNode X

+

PRETTIFYHISTORYhttps://localhost:44345/graphqlCOPY CURL

```
1 {
2   routeNode(id: "0b2168f2-d9be-455c-a4de-e9169f000022") {
3     name
4     relatedConduits {
5       relationType
6       conduit {
7         id
8         kind
9         name
10        position
11        color
12        colorMarking
13        parent {
14          id
15          colorMarking
16        }
17        children {
18          id
19          position
20          color
21        }
22      }
23      conduitSegment {
24        line {
25          startRouteNode {name}
26          endRouteNode {name id}
27          allConduitSegments { id }
28        }
29      }
30    }
31  }
32 }
```

```
{
  "data": {
    "routeNode": {
      "name": "SP-1010",
      "relatedConduits": [
        {
          "relationType": "OUTGOING",
          "conduit": {
            "id": "ece18b83-e79f-e82e-184f-65bbe12cc24e",
            "kind": "MULTI_CONDUIT",
            "name": "R000067",
            "position": "0",
            "color": "CLEAR",
            "colorMarking": "RED",
            "parent": null,
            "children": [
              {
                "id": "2f47c8d4-8c79-49e3-b726-f2876f258230",
                "position": "3",
                "color": "GREEN"
              },
              {
                "id": "2bbfae82-a6ea-40a7-9ce5-67640ca9e183",
                "position": "1",
                "color": "BLUE"
              },
              {
                "id": "8aeaf874-b8e7-4a2d-8e3a-ff56c21b3dda",
                "position": "12",
                "color": "AQUA"
              }
            ]
          }
        }
      ]
    }
  }
}
```

QUERY VARIABLESHTTP HEADERS

TRACING

DOCS

SCHEMA

GraphQL faciliterer lynhurtige forespørgelser på graf-data

closure reset routeNode routeNode diagramService routeNode

PRETTIFY HISTORY <https://localhost:44345/graphql> COPY CURL

```
1 {
2   routeNode(id: "0b2168f2-d9be-455c-a4de-e9169f000022") {
3     name
4     relatedConduits {
5       relationType
6       conduit {
7         id
8         kind
9         name
10        position
11        color
12        colorMarking
13        parent {
14          id
15          colorMarking
16        }
17        children {
18          id
19          position
20          color
21        }
22      }
23      conduitSegment {
24        line {
25          startRouteNode {name}
26          endRouteNode {name id}
27          allConduitSegments { id }
28        }
29      }
30    }
31  }
32 }
```

Log

Get Started Statistics Inspectors AutoResponder

Request Count: 1
Bytes Sent: 2.002 (headers:534; body:1.468)
Bytes Received: 72.357 (headers:324; body:72.033)

ACTUAL PERFORMANCE

ClientConnected:	23:57:46.452
ClientBeginRequest:	00:00:23.005
GotRequestHeaders:	00:00:23.005
ClientDoneRequest:	00:00:23.005
Determine Gateway:	Oms
DNS Lookup:	Oms
TCP/IP Connect:	Oms
HTTPS Handshake:	Oms
ServerConnected:	23:57:37.573
FiddlerBeginRequest:	00:00:23.005
ServerGotRequest:	00:00:23.006
ServerBeginResponse:	00:00:23.044
GotResponseHeaders:	00:00:23.044
ServerDoneResponse:	00:00:23.048
ClientBeginResponse:	00:00:23.048
ClientDoneResponse:	00:00:23.050

Overall Elapsed: 0:00:00.045

45 millisekunder !

position: "12",
color: "AQUA",
},
{

QUERY VARIABLES HTTP HEADERS

TRACING

Tak for opmærksomheden

Spørgsmål?