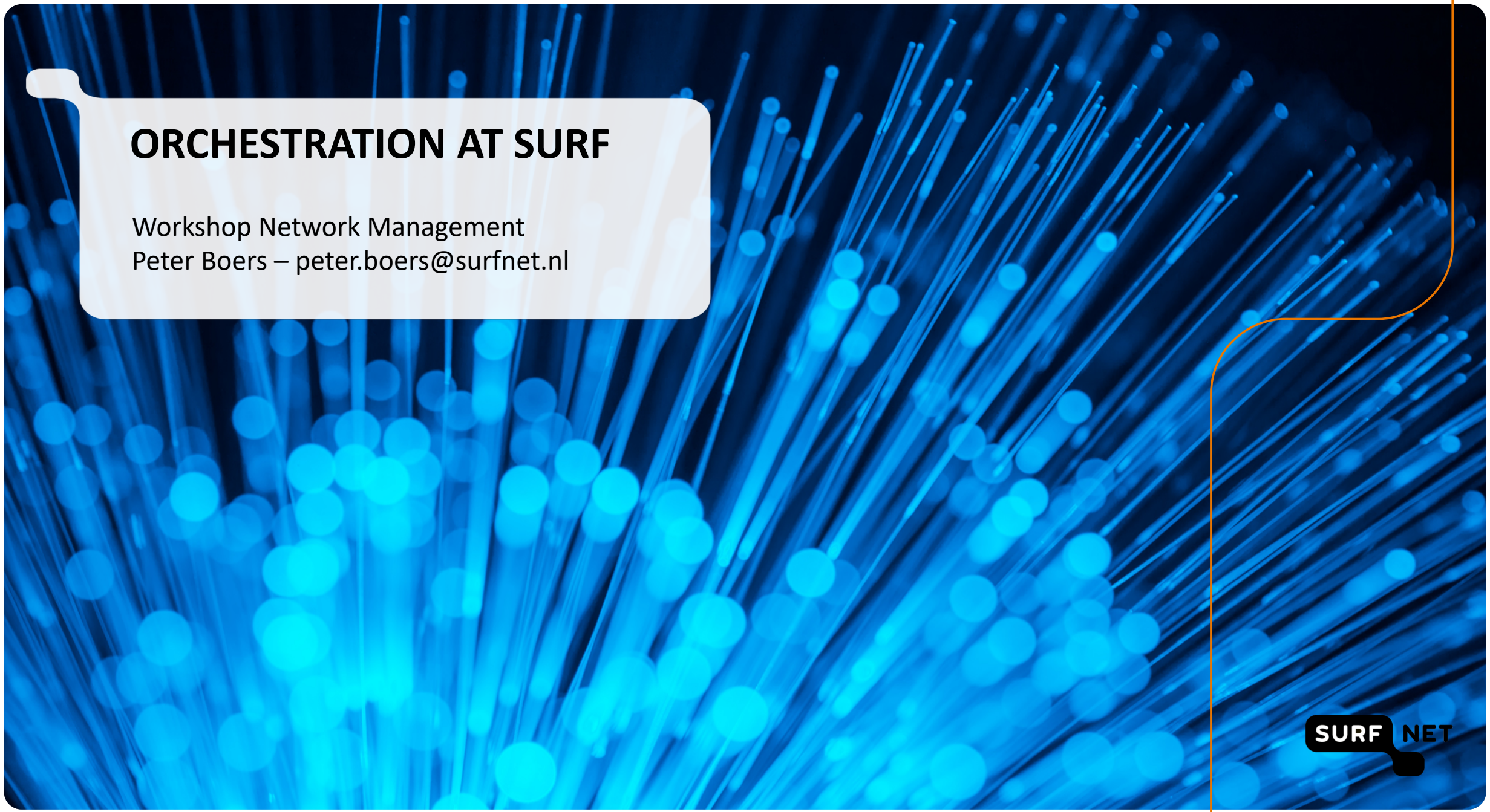


ORCHESTRATION AT SURF

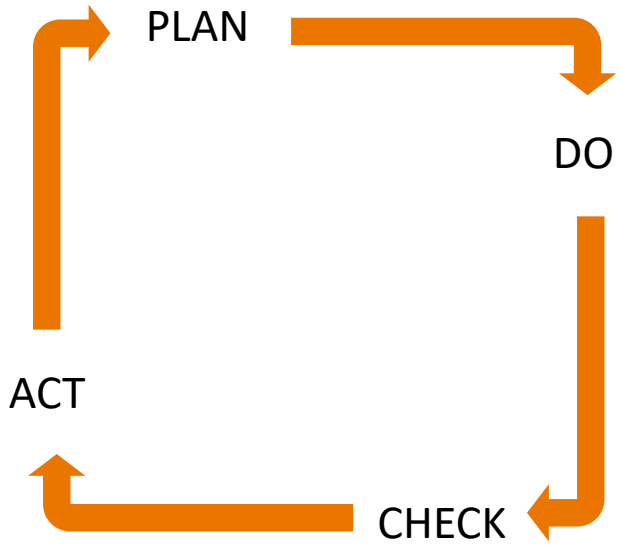
Workshop Network Management

Peter Boers – peter.boers@surfnet.nl

Automation != Orchestration

- Automation

- Orchestration



2 years and counting…

1972	workflows ran in the past **2 years**
3188	**subscriptions** in the database; nodes, corelinks, prefixes, services
3500	background workflows **per day** verifying the network
82	supported **workflows**
100	**products** available in the **orchestrator**
2017	active **SURFnet 7** customer services
209	active **SURFnet 8** customer services

Key take-aways

- Orchestration is the **heart** of SURFnet 8 service delivery
- The SURFnet network A&O platform is used **for all customer** services on SURFnet 7 & 8
- Orchestration can only be achieved by cleaning up your database and maintaining **data integrity**
- Provisioning through programmable **workflows**
- Orchestration requires **new internal processes**
- Orchestration allows **multi-resource** provisioning
- No **CLI provisioning** for SURFnet 8

Why?

Why?

Short term

- Gaining insight into processes
- Cleaning up our service administration
- Single point of truth for service delivery

Long Term

- More flexible service types
- Easy service life-cycle management
- Composed services
- Self-service
- **Faster service delivery (?!)**

Why?

- Start of customer migration

4 minutes

- End of customer migration

Daryll 4:25 PM
ik ben ready

ODF4 P5

robf 4:25 PM
Moment

Even de instelling bellen

Daryll 4:26 PM
ok

robf 4:28 PM
@Daryll je mag de poort omsteken

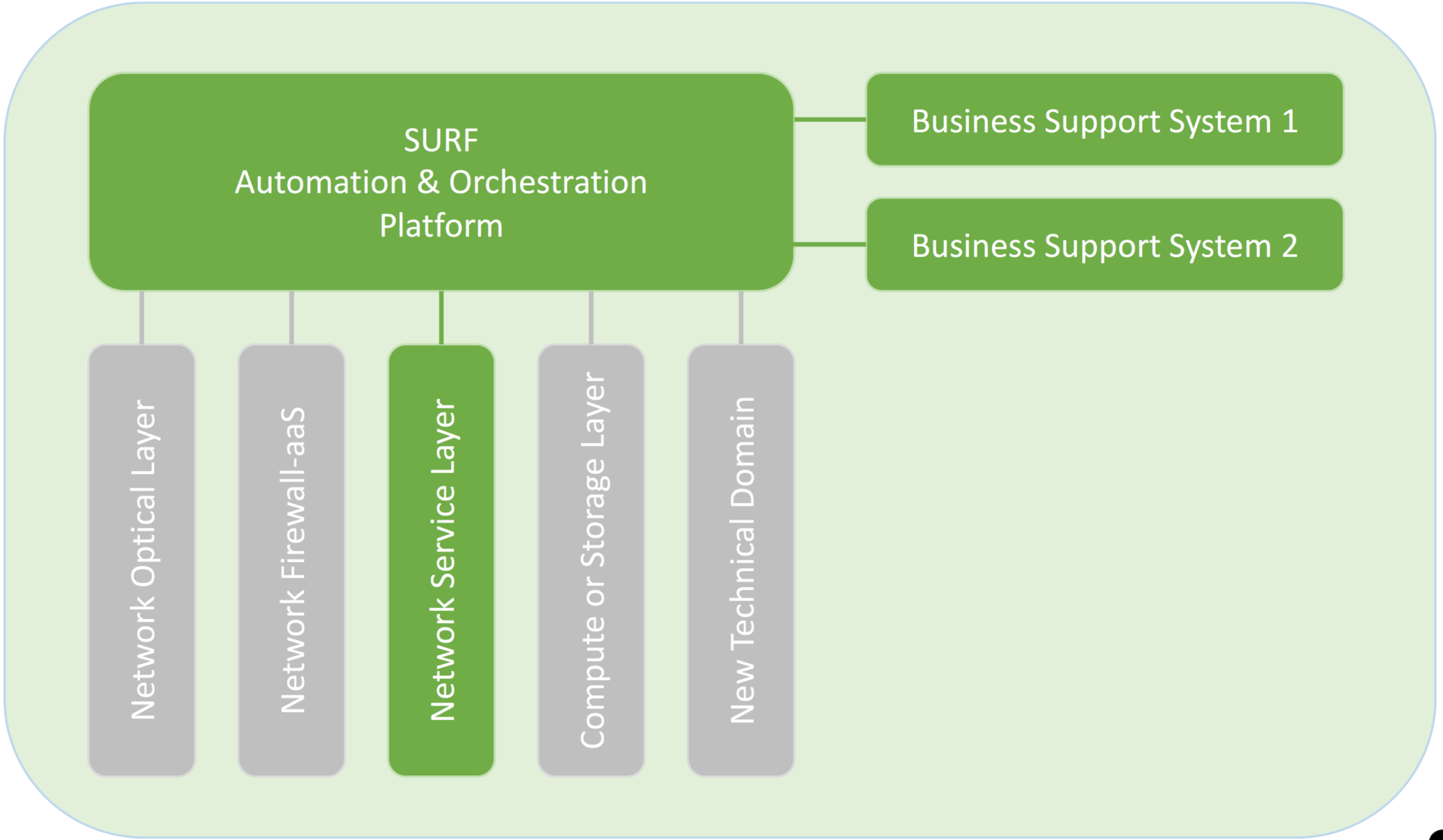
Daryll 4:29 PM
done

robf 4:29 PM
k poort is up lichtwaardes zijn ok:
Laser receiver power : 0.5781 mW / -2.38 dBm

ok migratie is afgerond

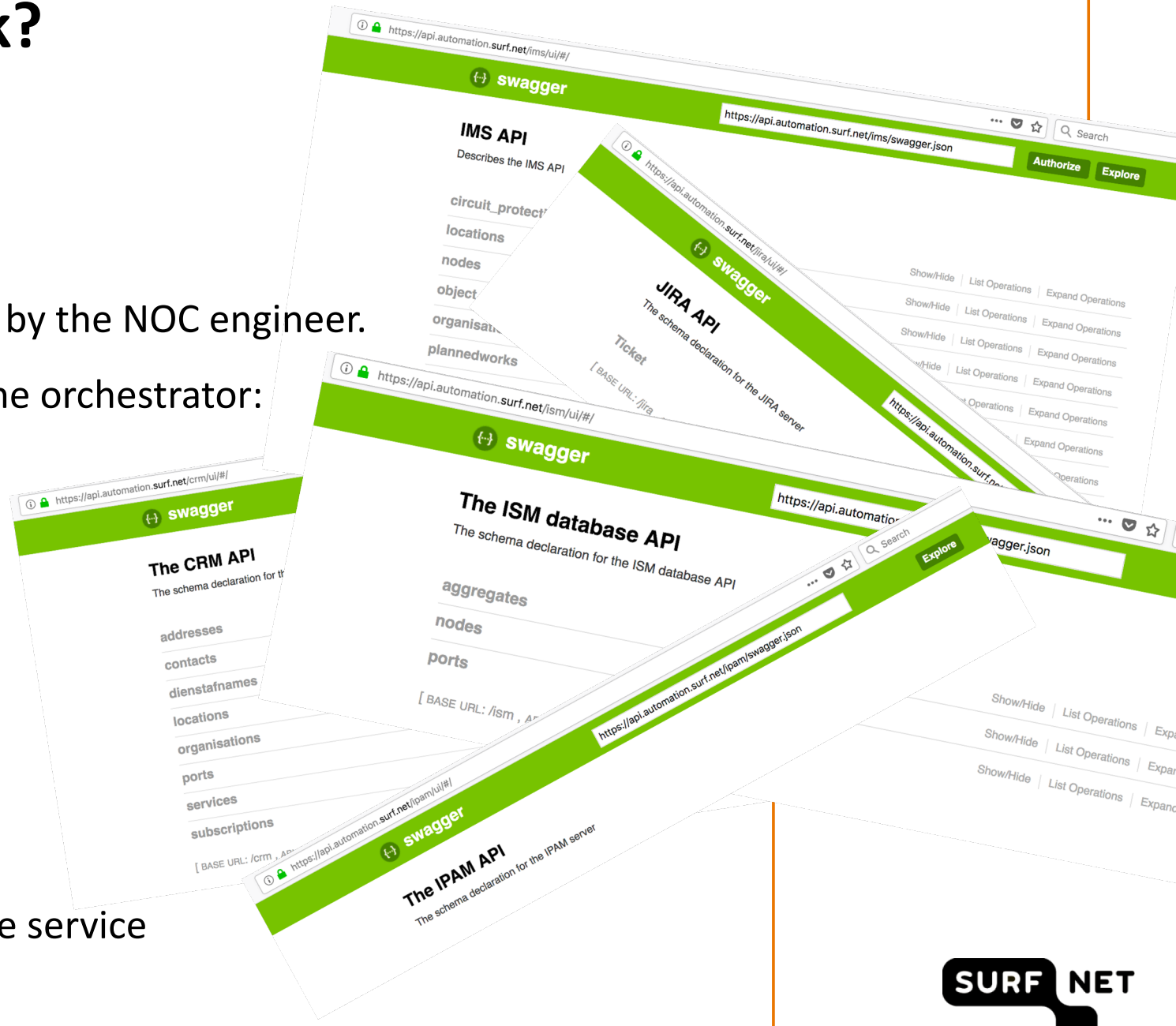
nu wachten tot 17:00 uur voor de volgende

How?


SURF
Automation & Orchestration
Platform
Business Support System 1
Business Support System 2
Network Optical Layer
Network Firewall-aaS
Network Service Layer
Compute or Storage Layer
New Technical Domain

How does the process work?

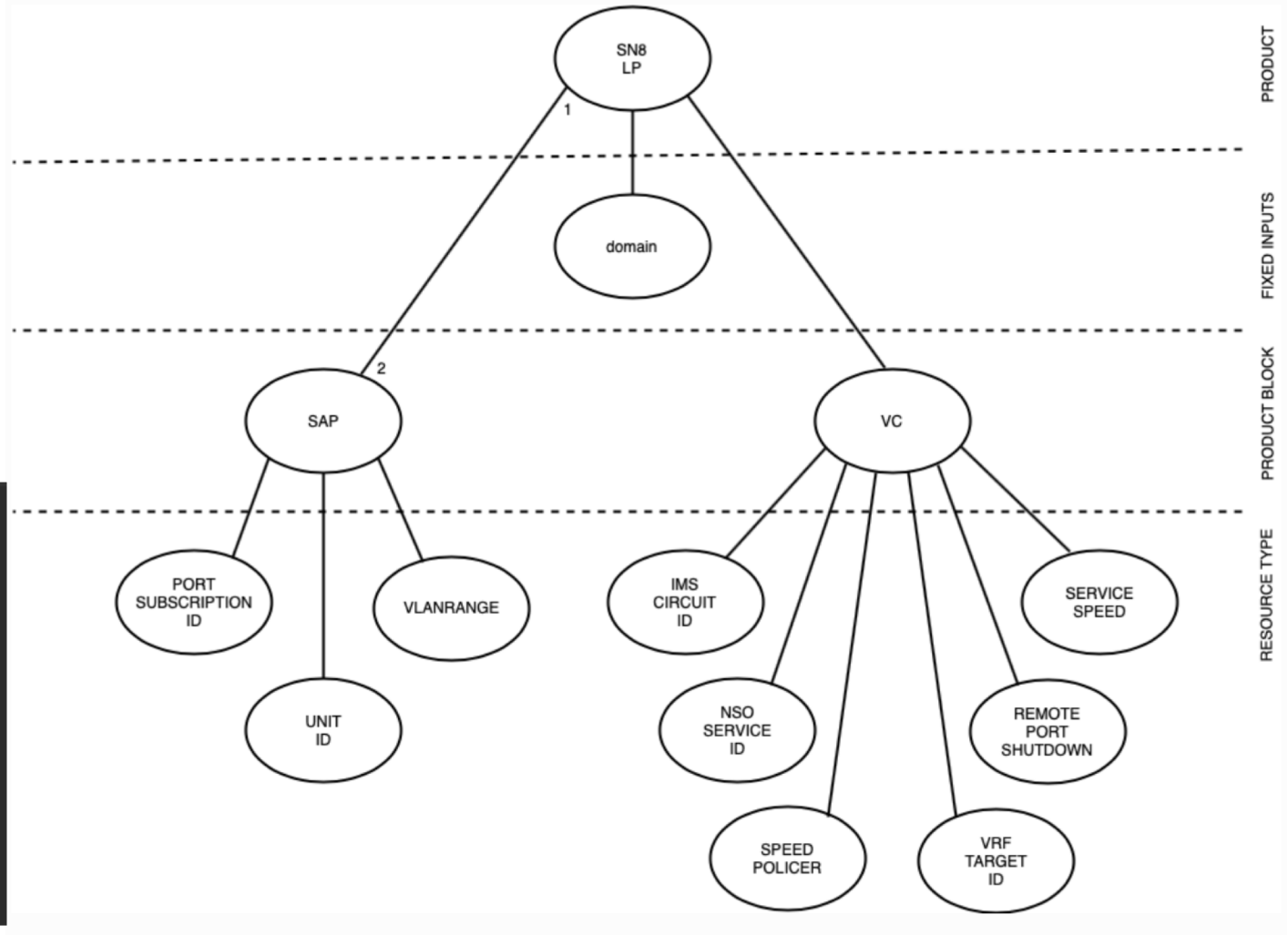
- Customer has a request
  - Ticket to NOC engineer
  - Automation workflow that will be used by the NOC engineer.
  - All other provisioning will be done by the orchestrator:
    - IPAM
    - Inventory
    - CRM
    - NSO
    - Customer Dashboard and API
    - Statistics
- Customer receives an email confirming the service



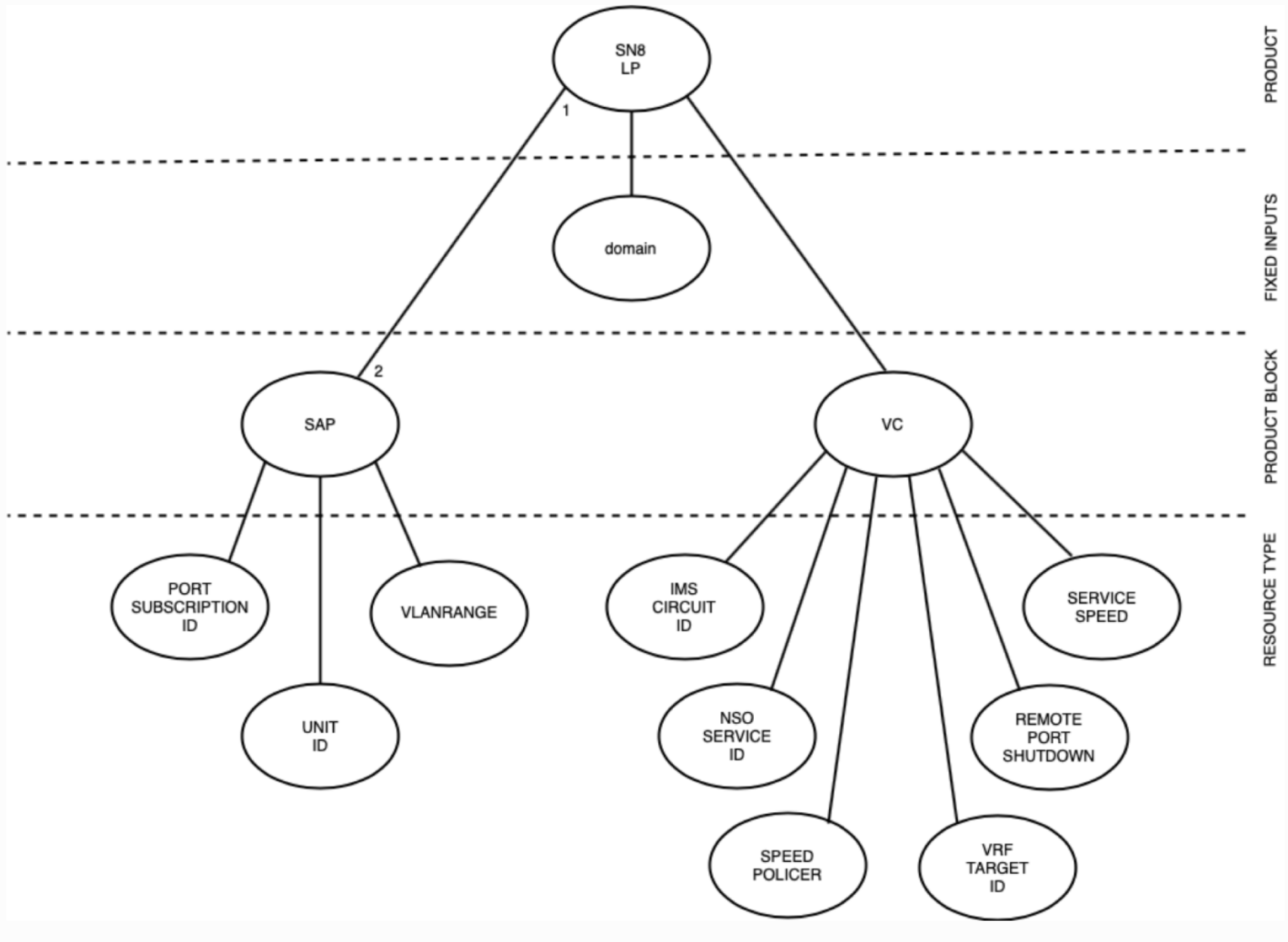
How does the orchestrator work?

- Home grown application
  - Python and Postgres
  - Workflows for products that create subscriptions
- Well defined domain products
- Well defined domain objects

```
22    class ListOfSaps(ConstrainedList):
23        min_items = 2
24        max_items = 2
25        item_type = Sn8LightPathServiceAttachPoint
26        __args__ = [Sn8LightPathServiceAttachPoint]
27
28
29    class Sn8LightPath(SubscriptionModel):
30        domain: Domain
31        vc: Sn8LightPathVirtualCircuit
32        saps: ListOfSaps
33
```



How do products work?



How does a domain object work?

- Object manipulation example.

Loading and updating a subscription that's already stored in the database:

```
subscription_id = uuid.uuid4()
light_path = Sn8LightPath(subscription_id=subscription_id)  # type: ignore

# now you can change stuff
light_path.vc.service_speed = 900
light_path.vc.speed_policer = True

# and store it to the DB again
light_path.save()
```

Storing and updating a subscription in the workflow's state is also easy:

```
@step("Update LightPath in state only")
@either
@state_params
def update_lightpath(subscription: Sn8LightPath) -> State:
    light_path: Sn8LightPath = state["subscription"]
    light_path.vc.service_speed = 900
    light_path.vc.speed_policer = True
    return {"subscription": light_path}
```

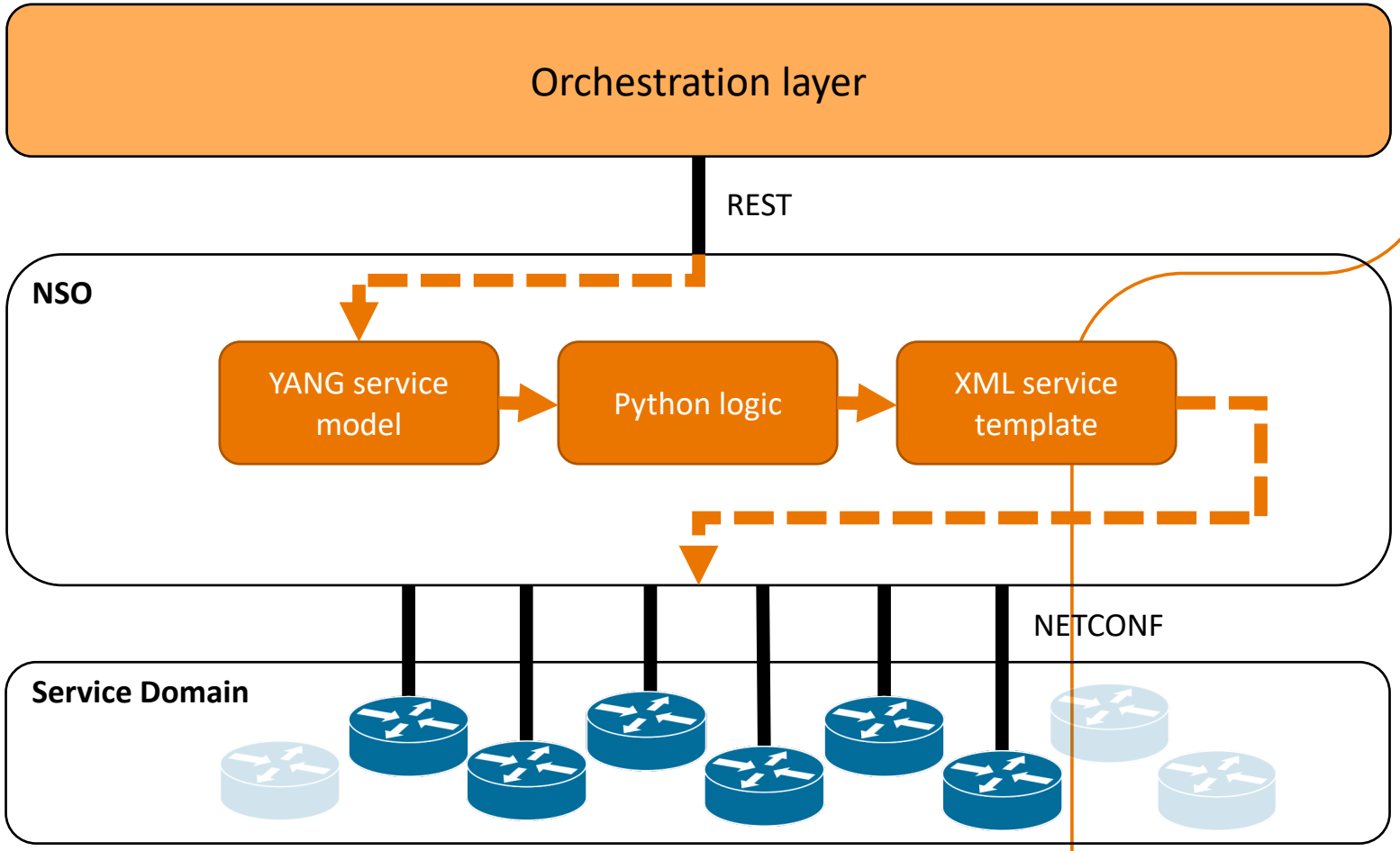
How does a workflow work?

- Describes business logic and simple actions that influence the lifecycle of a customers subscription to a product.

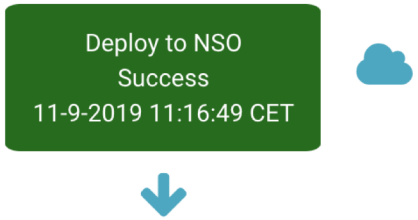
```
111  @create_workflow(name=WORKFLOW_NAME, initial_input_form=initial_input_form_generator, subscription_mapping={})
112  def create_sn8_light_path():
113      return (
114          init
115          >> construct_lightpath_model                    # Create the domain model and store it in the database
116          >> store_process_subscription(TARGET_CREATE)
117          >> plan_ims_circuit                             # Register the LP in our inventory.
118          >> set_status(SubscriptionLifecycle.PROVISIONING)   # Update status before network deployment
119          >> create_nso_service_model                     # Deploy to the network with NSO
120          >> take_ims_circuit_in_service(False)           # Set the LP to In Service in our inventory
121          >> set_status(SubscriptionLifecycle.ACTIVE)     # Activate the LP in our network dashboard
122          >> resync
123          >> done
124      )
```

How does the Orchestrator work with NSO?

```
augment /ncs:services {
    list ptp {
        tailf:info "Provide unique port ID";
        key name;
        unique "device interface";

        uses ncs:service-data;
        ncs:servicepoint ptp-servicepoint;

        leaf name {
            tailf:info "<uuid:string>";
            mandatory true;
            type string;
        }

        leaf device {
            tailf:info "Select device";
            mandatory true;
            type leafref {
                path "/ncs:devices/ncs:device/ncs:name";
            }
        }

        leaf interface {
            tailf:info "Interface on device (eg xe-1/0/2)";
            mandatory true;
            type string;
        }

        uses surfnet:workflow_customer_service;

        leaf speed {
            when "not( starts-with(../interface, 'ae'))";
            tailf:info "Interface speed";
            type enumeration {
                enum "1g";
                enum "10g";
                enum "40g";
                enum "100g";
                enum "other";
            }
        }
```



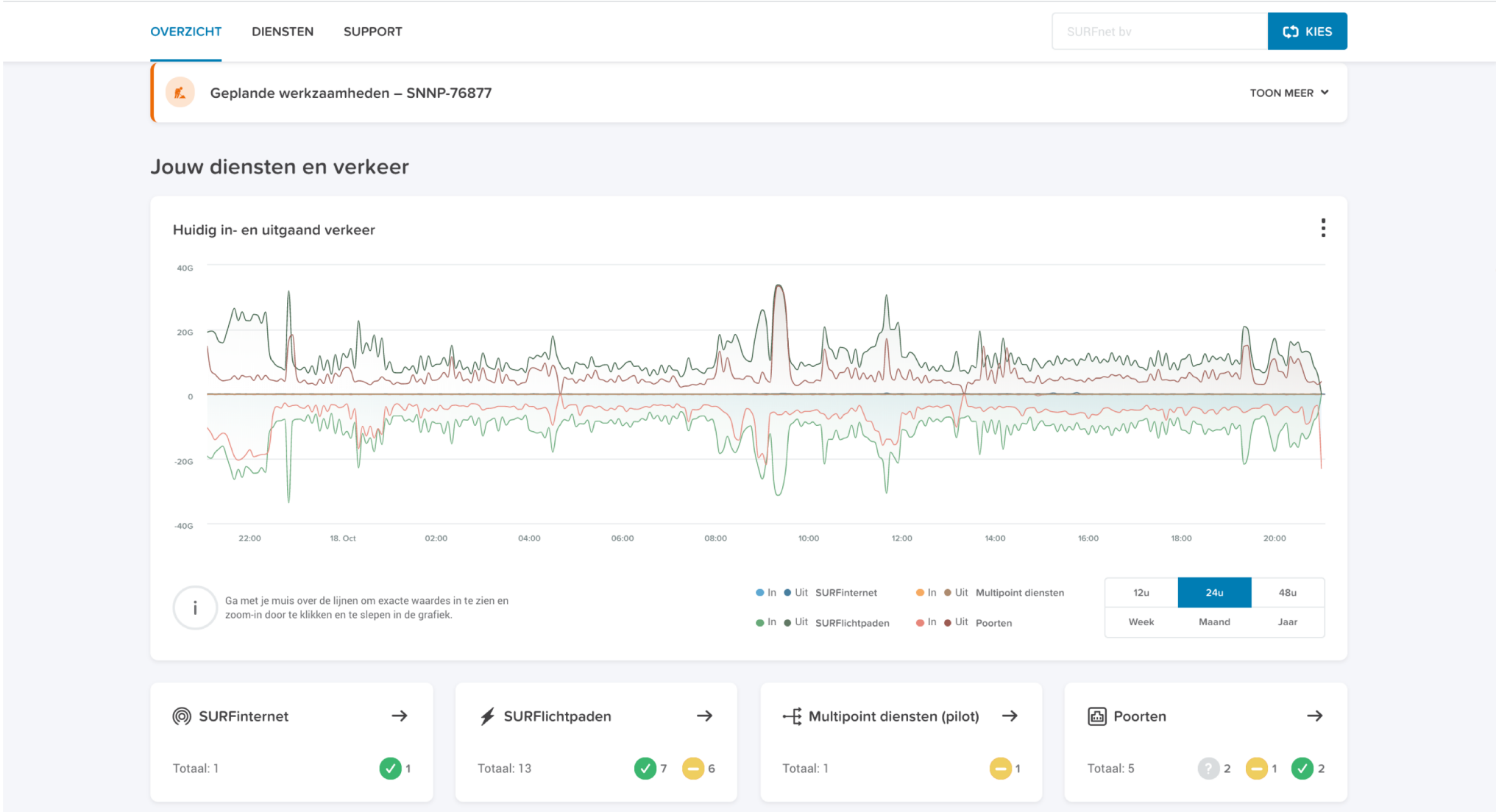
How does a subscription (start) work(ing)?



PAYLOAD


```
{
   "customer_name": "HVA",
   "device_interface": [
      {
         "device": "asd001a-jnx-hans82-vtb",
         "instance_id": "b9e39d10-5028-42d6-aea1-72faf2aa00bc",
         "interface": "ge-0/0/8",
         "tagged_info": {
            "outervlan": [
               "5"
            ]
         }
      },
      {
         "device": "gn001a-jnx-hans81-vtb",
         "instance_id": "79b5853e-3176-47c4-b568-e34c40835e10",
         "interface": "xe-1/0/0",
         "tagged_info": {
            "outervlan": [
               "6"
            ]
         }
      }
   ],
   "enforcepolicer": false,
   "name": "67cb2d53-41f2-467a-b397-b9fe45ce1923",
   "speed": 111,
   "subscription_id": "2d0f53d4-0588-4a6a-9e7b-ecb13e5e2cb2"
}
```

Resulting in



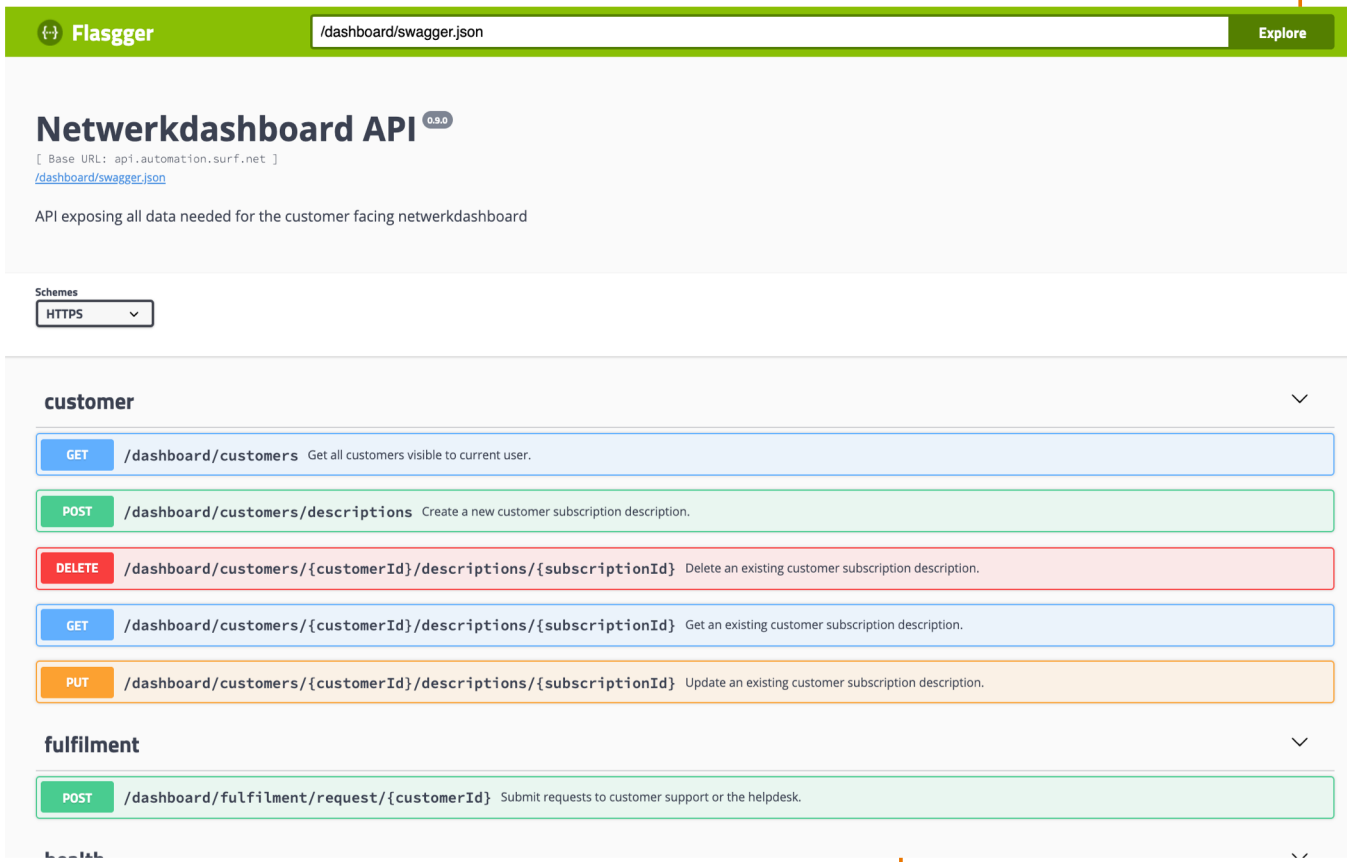
How do we make sure it stays like this?

- 3500 jobs run every day to verify the correct administration of services
- Modifications are not allowed on subscriptions when they are ”out of sync”
- Only one workflow allowed at a time per subscription
- Shared responsibility between SURFnet and NOC to change the way we work.

What do you need?

What do you need?

- Well defined interfaces between systems
  - OpenApi specification
  - REST
  - JSON
- Well defined service definitions
  - YANG
- Well defined product portfolio
  - Simplified portfolio for SURFnet8

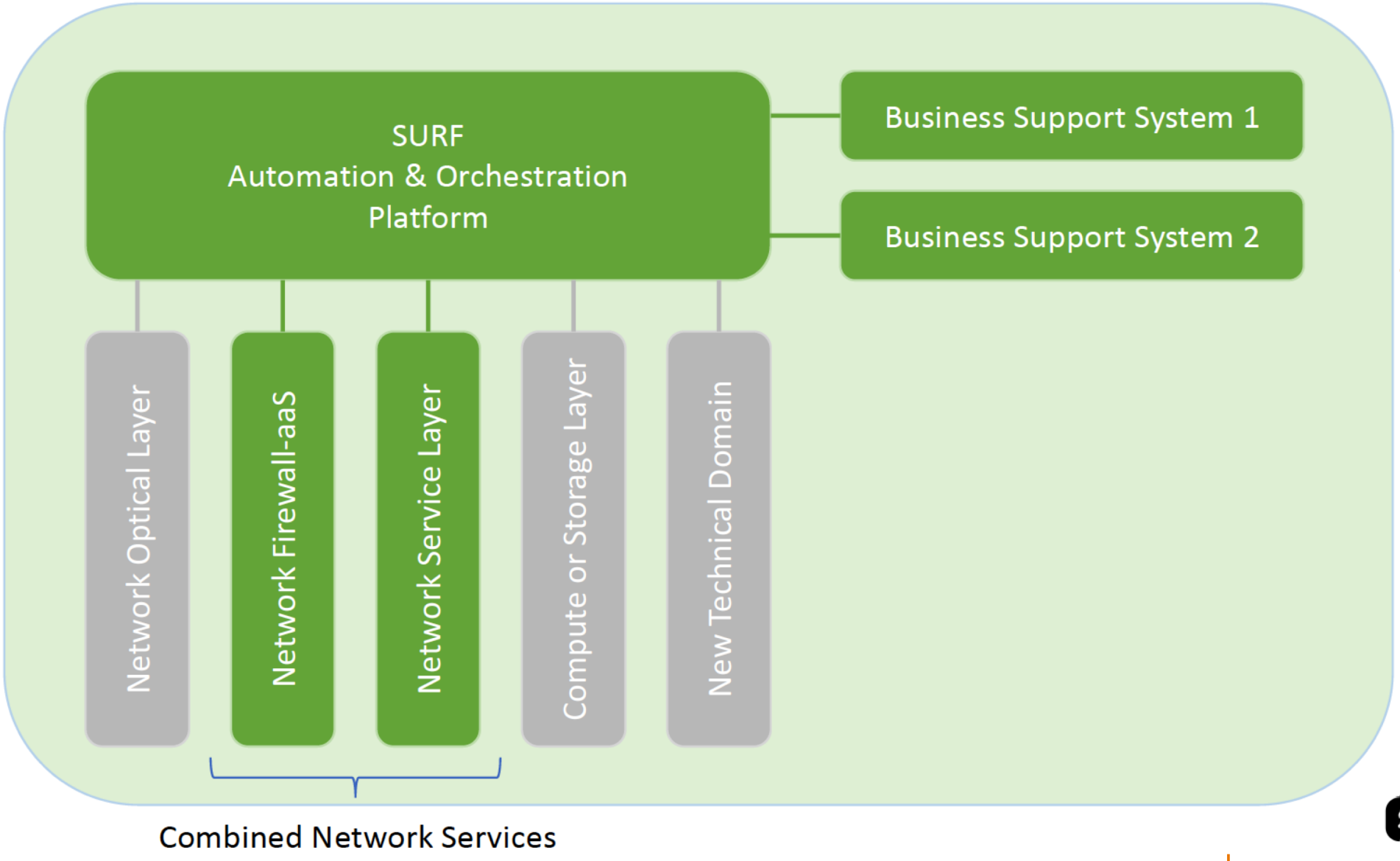


What do you need?

- Many iterations
  - 1 workflow used to take 1 to 2 months to perfect
  - Now we can create 1 new product and all its workflows in 4 to 5 weeks
- Perserverance
  - Change in the way people think
  - Change in the way people work
- Investment
  - 10 FTE full-time directly involved
  - On critical path of SURFnet8 migration
- **Faith in the process**

The Future

Short term - FWaaS integration



Road map

- Self healing subscriptions
- Opensourcing being seriously investigated
  - License
  - Governance model
- Campus integration
- NSI integration
- SURFsara HPC cloud integration
- Cloud Service provider integration

QUESTIONS?

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Driving innovation together