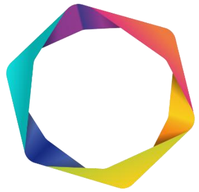


RADON

radon-h2020.eu

TOSCA

Sodalite

sodalite.eu

Modeling computing continuum applications with the RADON-SODALITE Hybrid Compute Profile

Presenter: Giuliano Casale (R)

With contributions from: Luciano Baresi (S), Pelle Jakovits (R) , Domenico Presenza (R), Dragan Radolović (S), Kamil Tokmakov (S) Damian A. Tamburri (R & S), Shreshth Tuli (R), Vladimir Yussupov (R), Michael Wurster (R),

RADON and SODALITE H2020 projects

6-month collaboration between the RADON and SODALITE H2020 projects:

RADON

- 3-year EU research project with 8 organizations:
  - Imperial College, JADS, XLAB, Engineering, U. Tartu, ATC, U. Stuttgart, Eficode
- Focusing on serverless and FaaS, but supports general purpose apps
- An advanced DevOps framework with IDE
- TOSCA - Winery and xOpera
- https://radon-h2020.eu/

SODALITE

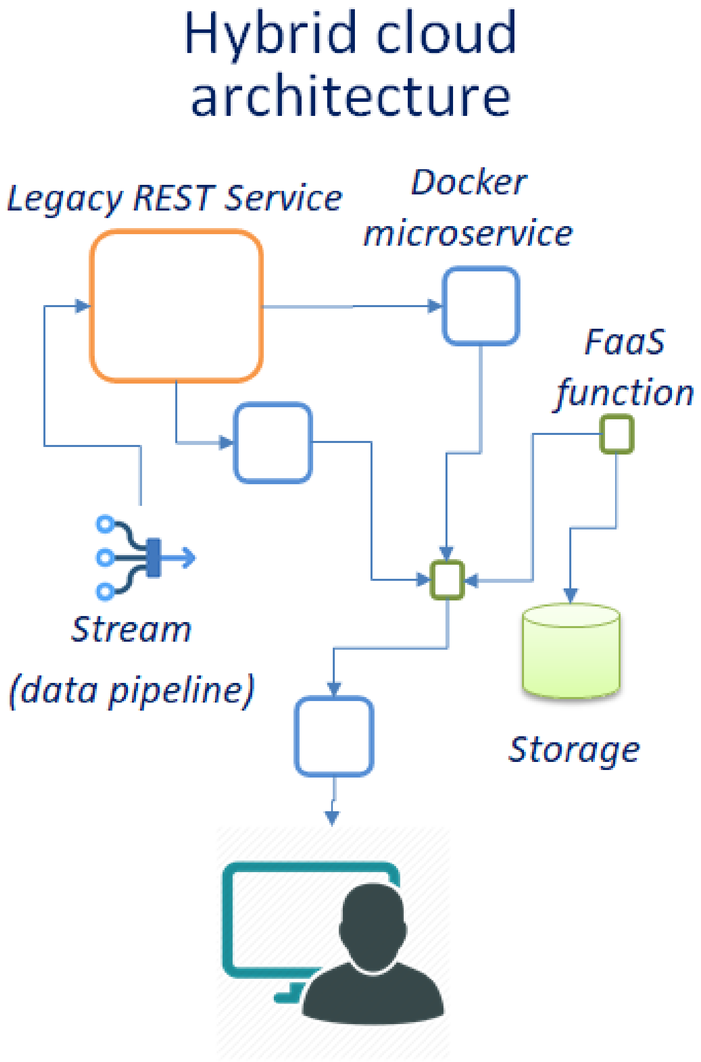
- 3-year EU research project with 9 organizations:
  - XLAB, HLRS, ATOS, Politecnico di Milano, Adaptant, IBM, ITI-CERTH, JADS, HPE
- Focusing on HPC & Cloud for optimal containerized application deployment
- Smart IDE, supported by ontologies and Performance optimization
- TOSCA - xOpera
- https://sodalite.eu/

Towards the cloud continuum

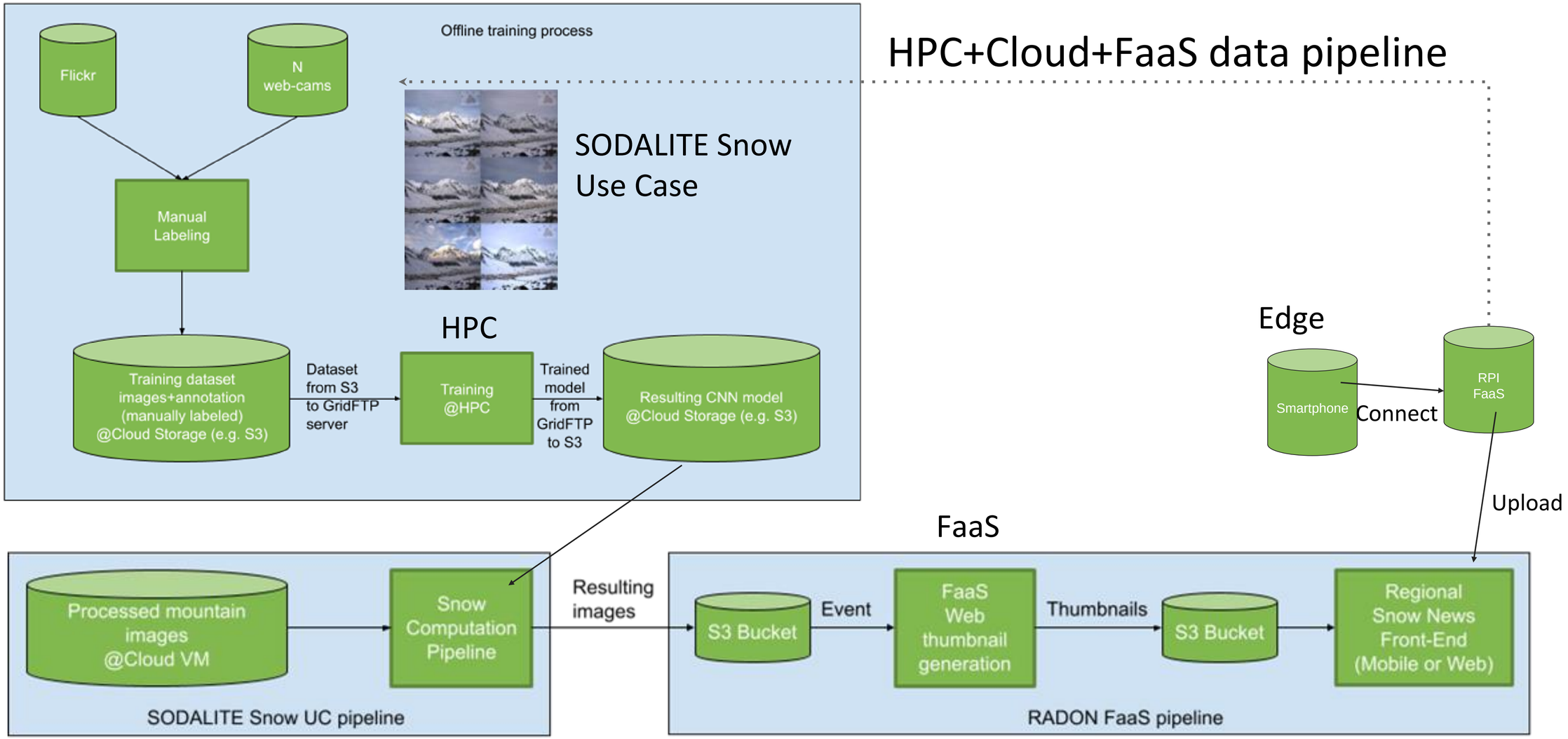
- Different architectural approaches co-exist today
- Yet, tools and software engineering frameworks are often container-specific, FaaS-specific, or cloud platform specific (eg Azure, AWS, ...)
- TOSCA can help resolve this issue but:
  - How to encompass event-driven behaviour (eg FaaS) ?
  - How to make data flows a primary citizen in TOSCA models?
  - How to build development frameworks leveraging this capability?
- RADON-SODALITE proposal: the Hybrid Compute Profile

https://github.com/RADON-SODALITE/hybrid-compute-profile

Collaboration with TOSCA Emerging Compute Ad-HoC Committee



Hybrid Computing Profile Demo



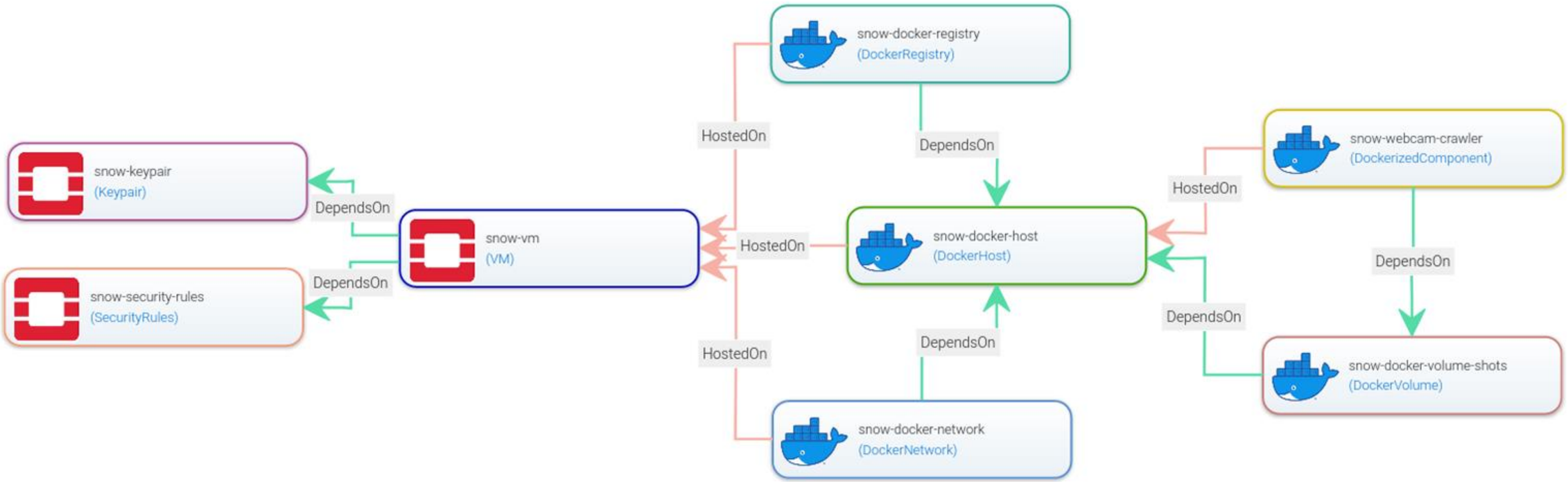
Hybrid Computing Profile (HCP)

- Cloud continuum platforms:
  - HPC: bare-metal performance and accelerators
  - Cloud: on-demand scalable, exclusive IaaS resources
  - Serverless, FaaS: scalability, on-demand code execution without infrastructure knowledge

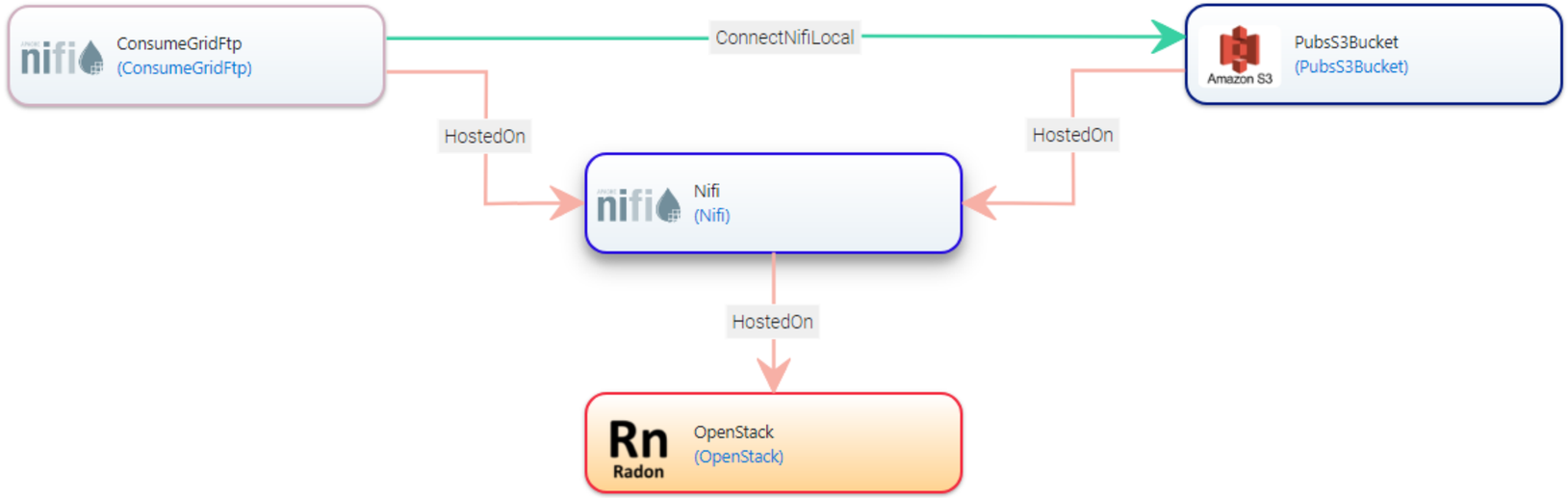
- We developed TOSCA node types / Ansible playbooks for deployment over:
  - HPC: Slurm, PBS-based, Singularity
  - Cloud: OpenStack, AWS, Docker
  - Serverless, FaaS: OpenFaaS, AWS Lambda, Azure and Google Cloud Functions

Hybrid Compute Profile: Cloud resource modeling

- SODALITE TOSCA types integrated in RADON Graphical Modelling Tool (Winery–based)



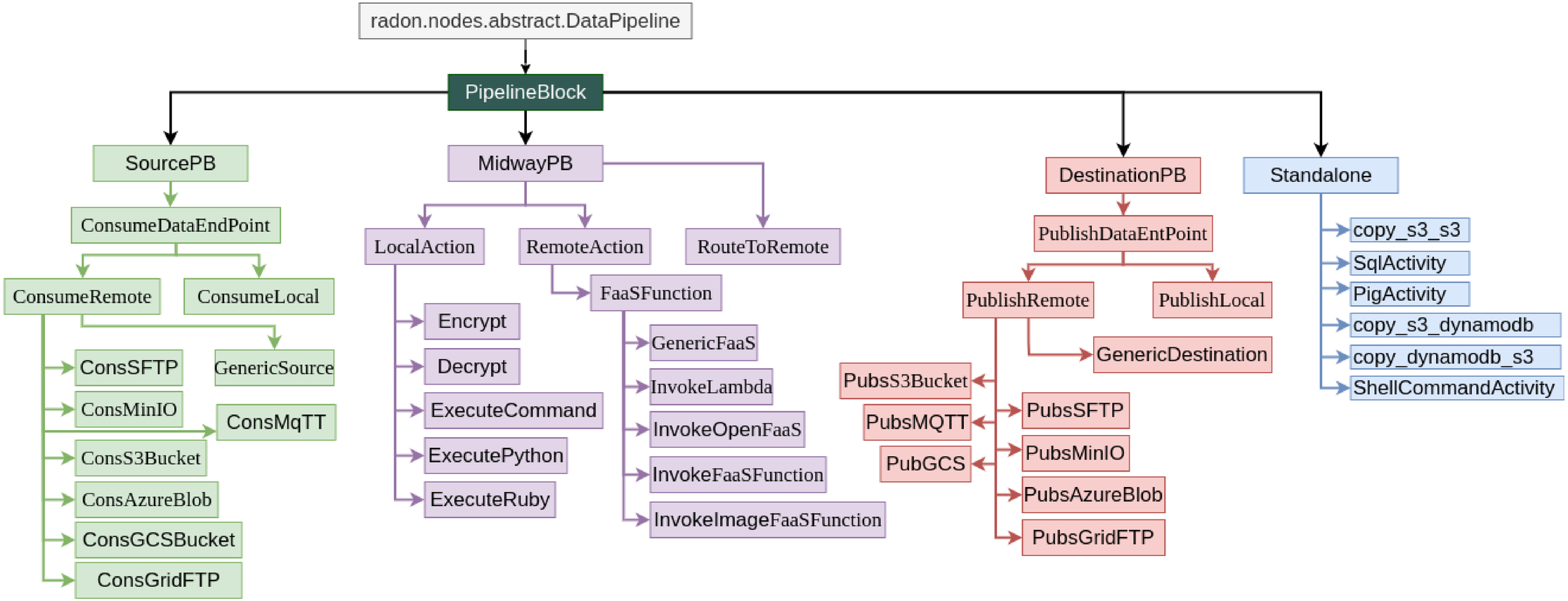
Data pipelines HPC-to-Cloud



Consuming from GridFTP and publishing to S3

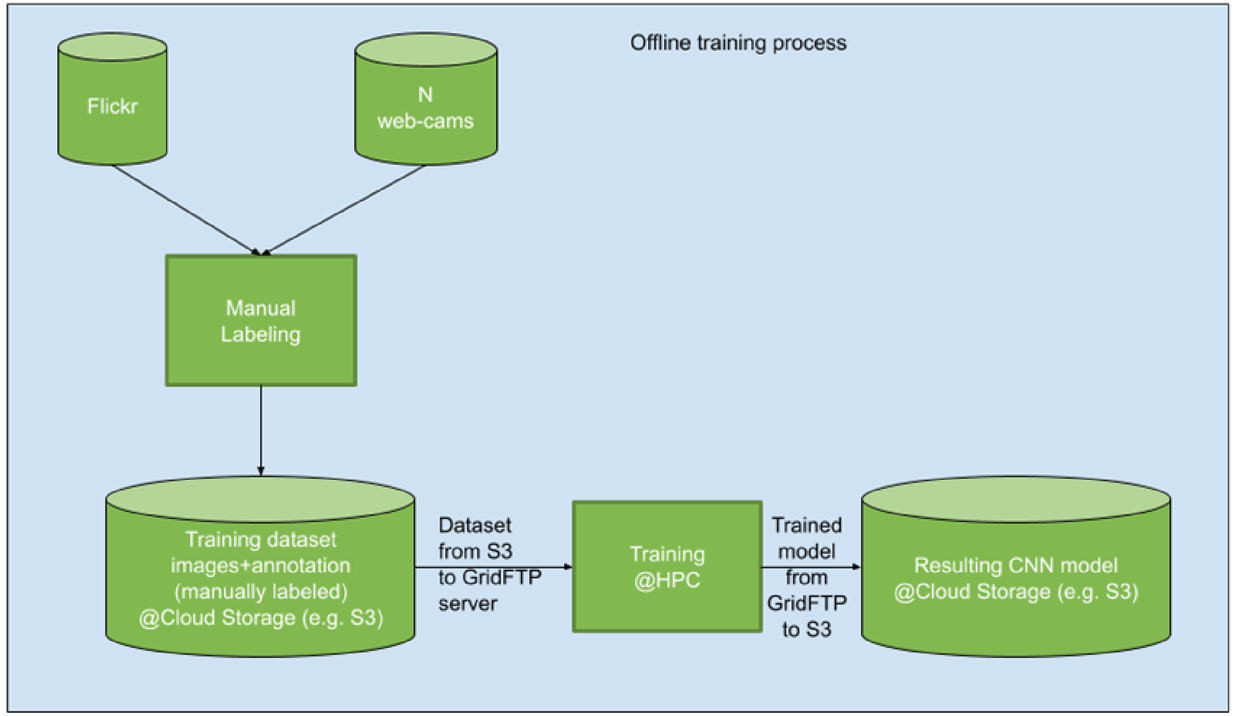
```
PubsS3Bucket:
  type: radon.nodes.datapipeline.destination.PubsS3Bucket
  properties:
       BucketName: "gridftp-result-bucket"
       cred_file_path: "/home/kml/.aws/nifi_credentials"
       schedulingStrategy: "EVENT_DRIVEN"
       schedulingPeriodCRON: "* * * * * ?"
       name: "sendToS3"
       Region: "eu-central-1"
  requirements:
       - host: NiFi

ConsumeGridFtp:
  type: radon.nodes.datapipeline.source.ConsumeGridFtp
  properties:
       gridftp_port: 2811
       intermediate_folder: "/tmp/nifi_gridftp_subscribe/"
       schedulingStrategy: "EVENT_DRIVEN"
       schedulingPeriodCRON: "* * * * * ?"
       name: "receieveFromGFTP"
       gridftp_user: "kamil"
       gridftp_host: "sodalite-fe.hlrs.de"
       gridftp_cert_path: "/home/kml/.globus"
       gridftp_directory: "~/radon-training/protobufs/"
  requirements:
       - host: NiFi
       - connectToPipeline:
       node: PubsS3Bucket
       relationship: con_ConnectNifiLocal
       capability: ConnectToPipeline
```

Data pipelines catalogue



HPC-S3 Data pipelines

- Data pipeline between S3 and GridFTP allows to overcome limitations of HPC infrastructures:
  - limited number of endpoints due to security (no http, ftp; only GridFTP, ssh)
- Used when data is in cloud storage and needs to be processed on HPC:
  - Other connectors can be developed: e.g. http/ftp based



Link to the repo:
https://github.com/RADON-SODALITE/demo-snow-hpc-training

Thanks!

More in our joint OASIS Webinar:

“Holistic Modeling of HPC, FaaS, and Edge Applications with RADON and SODALITE TOSCA Extensions”

https://youtu.be/jusRsRrlKds