

Distributed Cloud Intelligence: Implementing An ETSI MANO-Compliant Predictive Cloud Bursting Solution using Openstack and Kubernetes

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Distribute Cloud Intelligence (DCI)

- Cloud bursting
- Avoid peak IT demands
- Overflow traffic directed to the central cloud
- Limited set of system metrics based on threshold
- Proactive control to prevent overflow situations
- Two types of metrics to be collected:
 - Application Level Metrics (Response time)
 - System Level Metrics (CPU usage)





System Architecture

Monitor and alert the system before overloading





Pre-processing tasks at the edge

Method

- > Data collection: historic data for the system
- Data pre-processing stage
 - Transform the time series data so that it is stationary
 - Transform the time series into a supervised learning problem
 - Feature scaling (*data normalization*)
- Select of the Model: LSTM Model



Experimental Results

Time Series Forecasting Models

Cpu Usage Forecasting CPU Usage Forecasting Actual Units - Fredicted by HATS Predicted by SES Fredicted by Maving Average 600000 500000 -400000 h 300000 200300 203000 100000 True



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CPU Usage Forecasting

Conclusions

- Cloud bursting: avoid overflows in resource utilization
- New cloud platform (DCI)
- Predictive control methods
- Real-time auto-scaling processes



Future Works

- Alternative solutions
- DL-based solution independent of distributed frameworks
- Support for new emerging technologies (5G)
- New distributed Edge-centric ML methods (Federated Learning)

