SUMMER 2016: INTERNSHIP AT AT&T LABS

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Introduction

AT&T Labs, one of the world leaders in communication and network research. I have workes in their "AT&T Integrated Cloud (AIC)" project, part of the “Domain 2.0 Architecture and Design”, next-generation network initiative.

"Migrating AT&T businesses to a multi-service, multi-tenant platform implies replacing or augmenting existing network elements – which today are typically integrated to perform a single function. The replacement technology consists of a substrate of networking capability, often called Network Function Virtualization Infrastructure (NFVI) or simply infrastructure that is capable of being directed with software and Software Defined Networking (SDN) protocols to perform a broad variety of network functions and services."

https://www.att.com/Common/about_us/pdf/AT&T%20Domain%202.0%20Vision%20White%20Paper.pdf

Projects: summary

Performance analysis and capacity measurement in AIC and it's Virtual Network(VN) is a challenging and unexplored Research and Development (R&D) problem. As a part of AT&T Labs team, I have worked on two projects.

RabbitMQ KPI/KCI: RabbitMQ is a central point of failure in OpenStack environment. Identifying KPI/KCIs for control plane massaging node (RabbitMQ) and develop PoC for node failure/performance degradation detection and troubleshooting was the target of this project.

NFV failure prediction using machine learning techniques: With the performance statistics collected the virtual nodes and use proper tools and techniques, we **can detect failures ahead of time** and take necessary steps to mitigate the impact. Hence, QoS can be improved significantly by avoiding node failures and service interruption.

Learning and deliverables

1. Deeper understanding of the ecosystem containing virtual machines, SDN controllers, hypervisors, virtual routers and control messaging nodes.
2. Understanding of machine learning algorithm, statistical methods and how to choose the right one.
3. Identifying and defining key performance indicators (KPI) and key capacity indicators (KCI)
4. Proof of concept (PoC) development for the usecases for these indicators: for virtual node failure prediction and bottleneck entity detection
5. Using **machine learning** techniques (Artificial neural network, Random forest, Bayesian network, J48) and statistical analysis (Lasso regression, Principal component analysis (**PCA**), attribute selection) for virtual network and virtual machine failure/error prediction

Tools and techniques

1. **Data collection, parsing and formatting:** Python
2. **Machine learning and statistical analysis:** WEKA, scikit-learn
3. **Database:** MySQL, PostgreSQL
4. **Knowledge-base:** OpenStack, OpenContrail, AMQP, Mapping physical-virtual resources, Overlay network (vRouter, MPLS).

More!

1. Presenting the work properly is no less important than doing the work.
2. Research work can have significant impact when it solves a real-life problems. So always ask yourself, “whose problem am I solving?”
3. Industry looks into the problems differently than academia. Hence, we can learn a lot by looking into both world.
4. Hard work reflects success linearly, in most cases!
5. Keep learning! There is no limit to the things you can learn! (I have seen researchers at AT&T Labs, the know so much, yet they are so curious about new knowledge, they want to know everything in so much details!)
6. Ask questions. And asking questions without making the presenter uncomfortable is an art.

Questions?