Env2Vec
Accelerating VNF Testing with Deep Learning

Guangyuan Piao, Pat Nicholson, Diego Lugones
Eurosys 2020
Customer Network

New features

VNF Developer

Code ➞ Build ➞ Deploy ➞ Release ➞ Operate
New features
Upgrades

VNF Developer
Code

VNF testing

5 9's
SLO's
Assurance
...

Customer Network

Code
Build
Deploy
Release
Operate

VNF

Time-consuming
VNF testing

KPI's

Cloud stack

- VNF
- Middleware
- OS
- Virt/Container
- HW

Config
high-dimensional parameter space
Env2Vec
Accelerating VNF Testing with Deep Learning

1) Robust to environment variations
2) Simple single ML model
3) Work in previously unseen environments
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Deep Learning Architecture

- Anomaly detection
- FNN
- GRU
- Embeddings

Contextual Features ➔ Historical data ➔ Environment Metadata

VNF ➔ Middleware ➔ OS ➔ Virt/Container ➔ HW

Training

FNN: FeedForward Neural Network
GRU: Gated Recurrent Units
Book (wikipedia) embeddings by genre

Environments Embeddings by test case

Build type D (debug), T (test), S (stable), etc.
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Deep Learning Architecture

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Environment Metadata
- Historical data
- Contextual Features

KPI's
- VNF
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Training
- VNF
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Runtime
KDN dataset (public)
Open Virtual Switch
Snort
SDN-enabled firewall

Carrier-grade VNF for multiple
Testing environments
Build types
Services Under test

Accuracy 86.2% - 100%
False alarms reduced by 20.9% to 38.1%

Simplified adoption: single model competitive against multi-model proposals
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