Traffic prediction in WMN using process mining algorithms

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Problem Statement

Goal

- Develop and implement an algorithm to determine template network topologies in dynamic mesh networks

Tasks

- Model a set of dynamic mesh networks topologies
- Analyze traces with process mining techniques
- Define a set of process mining algorithms which are most appropriate for mesh networks
- Develop a metric based on the proposed algorithm
Problem on the picture
Related works

- Wavelet neural networks
- Clustering Approach
- Graph Mining
- Time series analysis
Process mining

$L_1 = [\langle a, b, c, d \rangle^3, \langle a, c, b, d \rangle^2, \langle a, e, d \rangle]$
General approach
Process mining for WMN

Network traffic (weighted graph)

Positions and moving directions

Dangerous process templates

Network process extraction → Processes comparing → Overload analysis

Recommendations for routes redistribution
Simple test network
Process mining process

NS-3 simulation

NS-3 event callbacks

NS-3 event callbacks

MXXML plugin

MXXML logs

ProM analysis

Wireshark analysis

XML report

«pcap» traces
Petri Network and Events

Network
- Start send packet
- Packet dropped
- Packet transmitted...

Moving
- Distance changed...

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Possibilities

Analysis and Optimization

– Conformance checking
– Repairing models
– Extending the model with frequencies and temporal information
– Constructing predictive models
– Operational support (prediction, recommendation, etc.)
Results & Further Work

Current Results

▪ Set of NS-3 simple dynamic mesh networks
▪ MXML plug-in for NS-3 as a library
▪ Network process is extracted by some algorithms in ProM framework
▪ Some algorithms are marked as improper

Further Work

▪ Elaborate an algorithm for routes optimization
▪ Implement routing metric in the mesh-network routing protocol in NS-3
▪ Integrate metric with QoS service
Questions & Answers

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