FINDING THE TRIGGERS FOR DYNAMIC SERVICE SLICING

Rebecca Steinert, PhD
Head of the Network Intelligence group
Decisions, Networks and Analytics Lab
RISE SICS AB
ADVANCING THE SOTA OF RAN CONTROL FRAMEWORKS

- So far: Main focus on sophisticated mechanisms.

- Next step: Robust and proactive scaling of slices based on triggers.

- Triggers are:
  - Scalable.
  - Universal – applicable in HetNets.
  - Capable of quantifying uncertainty.
INFORMATION-DRIVEN TRIGGERS – THE ENABLER OF DYNAMIC SLICING.

- Proper triggers require sophisticated observation points/models that are:
  - Computationally lightweight.
  - Provide information-effective representations of the network state and its variability.
  - Decentralized / distributed for serving short-term / long-term control loops.
- Offloading observability processes to the networks reduces the monitoring overhead significantly*. 

Logically centralized control

Programmable infrastructure w. local observability points/triggers

Management framework w. triggers

Aggregated high-level composite models

DISTRIBUTED OBSERVABILITY.

EXAMPLE – THE HIDDEN ISSUE OF 5 MIN SNMP AVERAGES.

SURPRISE - PERSISTENT RISK OF LINK OVERLOAD.

For the sake of scalability and observability:

THOU SHALT NOT MEASURE CENTRALLY.

THOU SHALT MEASURE LOCALLY.

TRIGGER: RAW SIGNAL STRENGTH VS ESTIMATED ATTAINABLE THROUGHPUT.

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- Probability of fulfilling an SLO related to throughput requirements.
- RAT-agnostic representation by conditional probabilities for decision making and less monitoring overhead.
- Significantly reduced control signalling (due to handovers) and tamed control over the tolerated amount of performance violations.
A client with SLO: Minimum 12 Mbit throughput at 90% of the session duration.

<table>
<thead>
<tr>
<th>Serving Cell</th>
<th>Attainable throughput estimate</th>
<th>Serves client</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>( P(\text{est. TP} \geq 12) = 73% )</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>( P(\text{est. TP} \geq 12) = 95% )</td>
<td>X</td>
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CHALLENGES AND OPPORTUNITIES FOR RAN SLICING.

Grand challenges:
- Unified representation of heterogeneous RATs
- User/service-specific triggers for SLA/SLO
- Proactive adaptive control loops

Opportunities:
- Develop learning distributed systems
- Network intelligence
- ML & AI for networks

Gains:
- Improved resource utilization.
- Improved service reliability and quality;
- More clients and subscribers and profit.
FINAL THOUGHTS.

- Programmability and virtualization enables flexible observability.

- Advancements of ML at scale and computational capabilities paves the way for novel observability processes at different scales.

- Increased synergies between the telecom industry and open source communities is likely to accelerate development towards high-granular dynamic RAN-slicing.
THANKS FOR LISTENING.