Advanced AI for Network Management

Reasoning on External Events

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External Events

- Triviality: **Network behavior is the result of user activity**.
  - More users = More traffic.
- **User activity** has a direct dependency on **events** that occur outside the boundaries of the networks they use.
  - A video becomes trendy => The load of the network that hosts the video increases, but also the load of any network with users watching the video.
  - A natural incident occurs (e.g. heavy rainfall, earthquake) => Users try to contact their relatives and the load of a telephony network increases.

Reasoning

- **Complex events** can be inferred from simple events:
  - They can be dispatched by internal or external detectors.
  - They are composed of **several events** that follow a **pattern**.
- **Causality** provides a powerful **relation between events and effects**:
  - Several events, **jointly** or **separately**, simple or complex, will impact the behaviour of a network => Effect.
  - **Knowledge** about causes and effects can be represented as a "**cause-effect graph**", also including the elements involved in both events and causes.
- **Reasoning** techniques extend the **knowledge graph**:
  - Additional knowledge items are **inferred** from previous items.
  - Effects can be **traced** to events.
  - Events can be used to **anticipate** posterior effects.
  - Solutions to the effects can be reasoned by considering an extended cause-effect-action, **countermeasure**, graph.

Research Challenges

- How to **integrate and process** the huge amount of information that can be available from external events into NM solutions:
  - Integration of **streaming processing solutions** with the management plane.
  - Design common (standard) **interfaces** and **message formats** for streaming external event information.
- How to **identify** which events are relevant to the network system without loosing causality relations:
  - Aggregation and filtering can **hinder some events**.
  - Rules set by administrators **cannot be complete**:
    - AI-based reasoning can identify situations (complex events) that administrators cannot identify by themselves.
- How to **interpret** the **effects** of the related **events** and **find out** the **countermeasures** to resolve them.

Thanks for Your Attention

Questions?

– EOF –