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Framework supports complex event processing.
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Event driven framework that supports complex event processing for PM.
Propose an event driven framework for power management.
SYSTEM ARCHITECTURE

- Propose an event driven framework for power management.
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  - event generator
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- The ECA rules and event processing specification-rule base
- Contents of context storage get updated when relevant contexts change.
Architecture of event driven framework
Complex Event Processing

- Event-driven framework support complex event processing in the event processing agent

Difference between simple and complex event processing is in functionality. It also support event derivation and pattern matching, take into account the history of event occurrences, and generate events of higher abstraction levels based on changes in the patterns of event occurrences.
Complex Event Processing

- Event-driven framework support complex event processing in the event processing agent
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Comparison between simple event processing and complex event processing
Event Generator

- software component that generates events based on the changes in contexts.
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- software component that generates events based on the changes in contexts.

- Definition 1. An atomic state is a tuple: $S = (c, \text{op}, \text{val})$, where $c$ is the capability value, $\text{op}$ is one of the binary operators defined in a set: $<; >; ; ;=; ;$, and $\text{val}$ is the reference value of the capability.
Event Generator

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- Definition 1. An atomic state is a tuple: \( S = (c, op, val) \), where \( c \) is the capability value, \( op \) is one of the binary operators defined in a set: \( <; >; ; ; =; , \) and \( val \) is the reference value of the capability.

- Definition 2. An atomic event \( e \) indicates the change in a state from \( S_0 \) to \( S_1 \). It can be represented as \( e: S_0 \rightarrow S_1 \).
Event Processing Agent

- Event processing specification written in structural XML is loaded into the event processing agent.
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- event processing agent provides four logical functions of complex event processing.
  - event filtering
  - Instance partitioning
Event processing specification written in structural XML is loaded into the event processing agent.

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- event filtering
- Instance partitioning
- Event derivation
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- event processing agent provides four logical functions of complex event processing.
  - event filtering
  - Instance partitioning
  - Event derivation
  - Pattern matching
When loading a new rule, the scheduler checks if the newly loaded rule has any potential conflicts with the previously loaded rules.
Scheduler

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- If the installation of the new rule is successful, the scheduler will subscribe to the events that may trigger the new rule from the event processing agent.
IMPLEMENTATION-Event Generators

- Implemented the framework and the two applications in C++.
IMPLEMENTATION-Event Generators

- Implemented the framework and the two applications in C++.
- Two event generators
  - Traffic monitor
    - provides the atomic events.
    - implemented packet sniffing in a kernel module using Netfilter.
  - Network monitor
    - generates events for the changes in the network environment.
    - it does not passively listen for messages.
IMPLEMENTATION - Event Generators

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    - it pulls information directly through OS APIs
    - generates events that indicate changes in the predicted SNR.
Event Specification and ECA Rules

Define rules for event processing in the event processing agent.
**Event Specification and ECA Rules**

- Define rules for event processing in the event processing agent.
- ECA rules define event-driven adaptations to be scheduled.
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- Represent using structural XML.
Define rules for event processing in the event processing agent.

- ECA rules define event-driven adaptations to be scheduled.
- Represent using structural XML.
- Rule type includes four types of XML elements.
### XML Elements in Event Processing and ECA Rules

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<tr>
<th>XML Element</th>
<th>Event Specification</th>
<th>ECA Rule</th>
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<tr>
<td>&lt;on&gt;</td>
<td>A type of event used as input.</td>
<td>The only type of event to be handled.</td>
</tr>
<tr>
<td>&lt;window&gt;</td>
<td>A window used for event instance selection</td>
<td></td>
</tr>
<tr>
<td>&lt;If&gt; &lt;do&gt;</td>
<td>Conditions. Actions to be invoked if conditions are satisfied</td>
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Event Processing Agent

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- get events out of the queue and also push back events that are generated during event processing.
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Event Processing Agent

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- get events out of the queue and also push back events that are generated during event processing.
- Instance partitioning divided into two types, segmentation-oriented partitioning and temporal-oriented partitioning.
- Segmentation-oriented partitioning - classifies event instances based on event attribute.
- Temporal-oriented partitioning divides the input into groups based on the timestamps of the event occurrence.
Events accepted by the input filter.
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Partitioned based on the connection identifier.
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- Partitioned based on the connection identifier.
- difference-event attributes used for differing event instances in segmentation-oriented partitioning are defined in the attributes of the <on> element.
- Events accepted by the input filter.
- Partitioned based on the connection identifier.
- difference-event attributes used for differing event instances in segmentation-oriented partitioning are defined in the attributes of the <on> element.
- Temporal-oriented partitioning-implement with a time window
The scheduler checks for potential conflicts whenever loading a new rule.
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parses the actions defined in the new rule into operations to be applied to certain hardware/software components.
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parses the actions defined in the new rule into operations to be applied to certain hardware/software components.

Rule that tries to set different values to the same parameter of the same component is found - conflict
proposed an event-driven framework for rule-based power management for wireless data transmission
CONCLUSION

- proposed an event-driven framework for rule-based power management for wireless data transmission
- The framework supports complex event processing,
proposed an event-driven framework for rule-based power management for wireless data transmission.

The framework supports complex event processing,

Provides potential for reducing the event processing overhead.
CONCLUSION

- proposed an event-driven framework for rule-based power management for wireless data transmission
- The framework supports complex event processing,
- Provides potential for reducing the event processing overhead.
- event driven framework can be extended to support the collection and sharing of context data between mobile devices and to utilize the context data that other users produce for saving energy.
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REFERENCES

1. IEEE TRANSACTIONS ON COMPUTERS, VOL. 61, NO. 12, DECEMBER 2012

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THANK YOU