Tracing and Monitoring Distributed Multi-core Systems

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Adaptative Fault Probing

- Efficient low-level building blocks: static and dynamic probing, dynamic conditions, efficient scalable buffering, kernel and user-space tracing, multi-session, new Common Trace Format.
- Additional support was obtained for this track.
- Remote tracing.
- Real-time tracing.
- Hardware tracing.
- Tracing DSP, Network Processor and Many-core systems.

Multi-level, multi-core distributed traces synchronization

- Synchronization of traces from multiple nodes, tracking cycle counter offset for virtual machines to reconcile VM traces, optimization of multiple nodes time synchronization, live streaming mode time synchronization.
- Trace command and retrieval at the cluster level.

Trace Abstraction, Analysis and Correlation

- See presentation of professor Abdelwahab Hamou-Lhadj.
- How to link raw and abstract events and navigate between the two?
- Anomaly detection.
- Integrating trace abstraction with the state system and its history database.

Automated Fault Identification

- See presentation of professor Béchir Ktari.
- How to link a detected fault with the events used to detect it and navigate between the two?
- Fault, abstract event, anomaly detection...

System health monitoring and corrective measure activation

- Complete architecture to look at identified fault alerts, predict intrusions, assess risk and select proper response. Sample implementation of the main algorithms involved.
- Test with numerous real attacks.
- Refine anomaly detection on hosts.
- Aggregate data and feed a network wide framework, ARMOUR.

Trace Directed Modeling

- See presentation of professor Lethbridge.
- Annotate tracepoints in the high level model. Correlate back events in traces to model-level artefacts.
- Operating System level modeling. See the state system and LTTng-top.
- Pluggable event handlers to define state changes in the generic state system. User-level applications state modeling.
- Generic state viewer to replace the control flow view.

Tracing and Monitoring Framework
Impact Prediction

- Measurements of the tracing impact on a node. Efficient generic state system to model and store information about the traced system.
- Model the network adapter as well as the node other resources to insure that tracing impact is not detrimental to the traced system.

Advanced Analysis Modules for Key System Parameters

- Latency analysis, statistics as part of the system state, lttng-top system characterization, dependency analysis.
- Extend dependency analysis to more and more complex dependencies.
- Efficient computation of statistics for intervals.
- Add new modules for more complex analysis.
- Real-time systems analysis.

Discussion

- The project went much beyond the targeted milestones in most areas.
- The industrial and governmental partners increased significantly their contribution over the initial plan.
- With a solid foundation we can now pursue more sophisticated developments.
- Convergence of fault identification, abstraction and anomaly detection.
- The system state and state history as a central interaction mechanism.