1. Background on SDN

Software-Defined Networking (SDN) architecture

Main components of SDN
- Data plane, Control plane, Application plane
- Southbound interfaces, northbound interfaces

2. Security Issues of SDN

Threats from the internal network application
- Code injection
- Command injection

Threats from the external network application
- API abuse

3. S2-Controller Design Principle

S2-Controller architecture
- Split
- Security-by-design

4. Prototype Implementation

Main components of S2-Controller
- Controller agents
- Policy engine
- Application sandbox and resource controller
- Authentication and Authorization modules

5. Performance Evaluation

- S2-Controller processing time for delivering 20 thousands packet_in messages
- The latencies can be maintained less than 5 milliseconds in long term

6. Conclusion & Future Work

- S2-Controller can protect SDN controller against command injection, code injection, and API abuse
- S2-Controller can be implemented in the existing SDN controller
- The packet_in messages delivering time in S2-Controller architecture can be maintained in 5 milliseconds in long term
- S2-Controller architecture would be applied to the distributed controllers in the SDN-enabled network