NETWORK TELEMETRY AND ANALYTICS IN THE AGE OF BIG DATA

RUTURAJ PATHAK/Senior Product Manager/INVENTEC

Open Computing Project (OCP) Participation

OPEN Compute Project

OCP ACCEPTED!

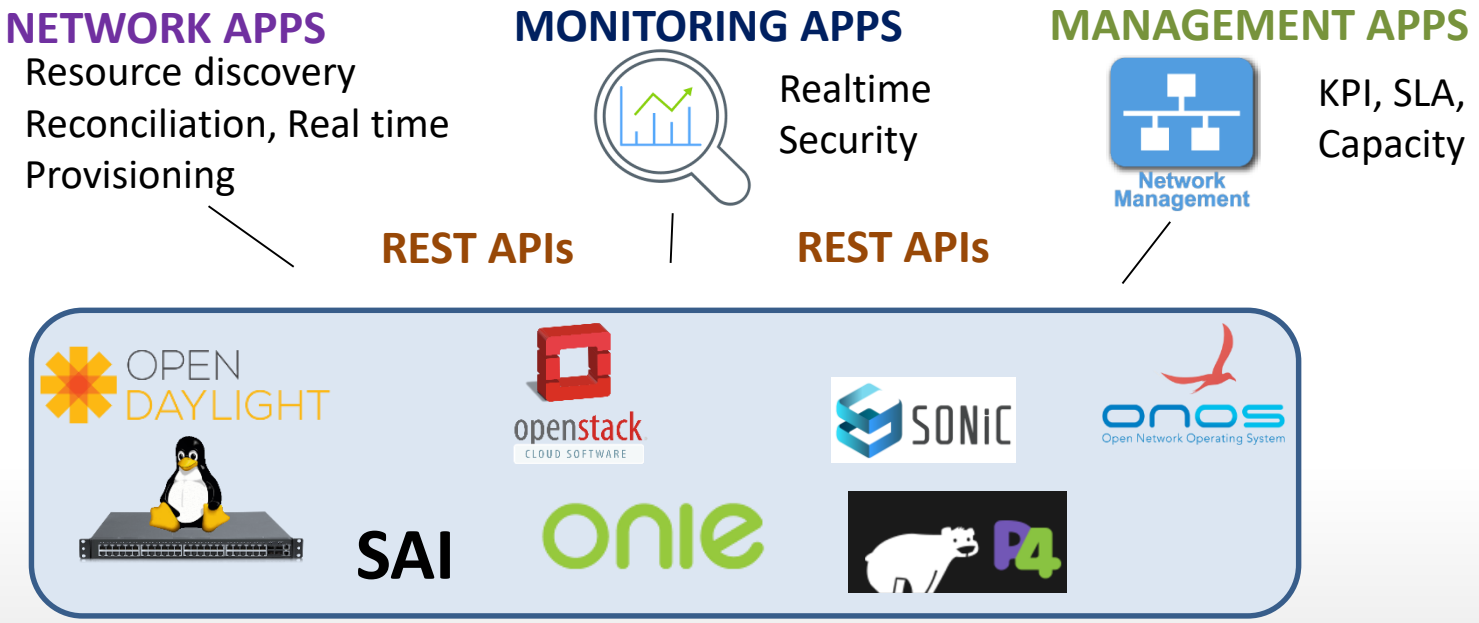
D6254QSBP and D6254QSBX

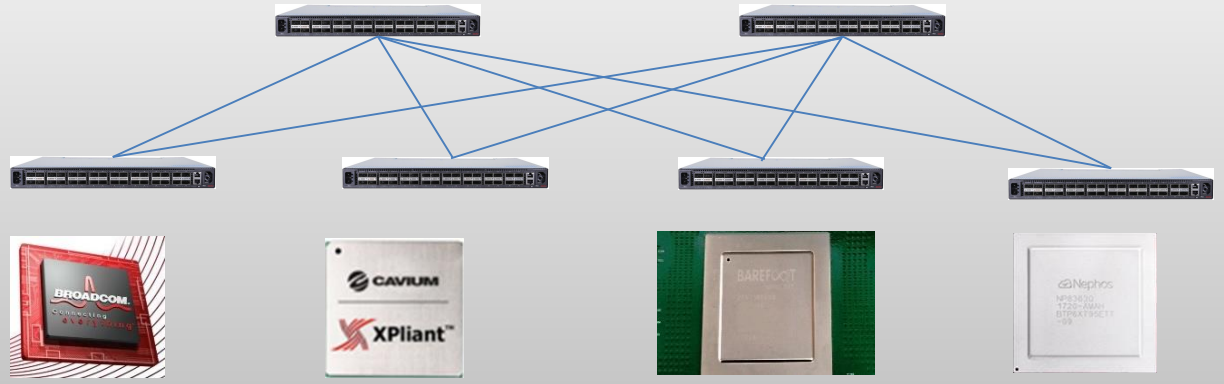
D7032Q28BP and D7032Q28BX

Inventec is a Platinum Member !!!

- NIDC Submissions for OCP Certification
  - Specifications Accepted by OCP as of January 2016
    - 10/40G: D6254QSBP and D6254QSBX
      - http://www.opencompute.org/wiki/Networking/SpecsAndDesigns#Inventec_DCS6072QS
    - 100G: D7032Q28BP and D7032Q28BX
      - http://www.opencompute.org/wiki/Networking/SpecsAndDesigns#Inventec_DCS7032Q28

Open Architecture





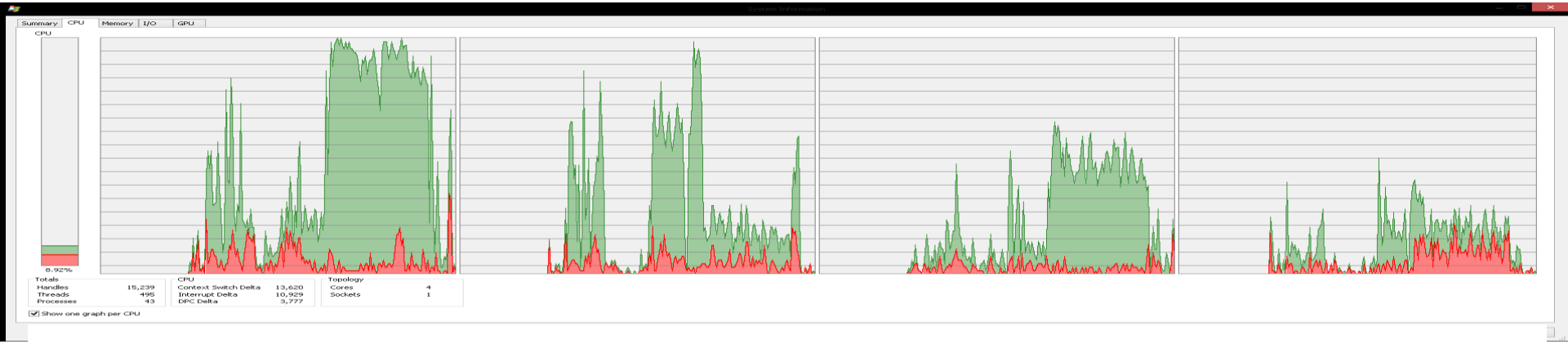
RUDIMENTARY TELEMETRY

root> show chassis alarms
1 alarms currently active
Alarm time Class Description
2014-07-29 07:27:12 UTC Minor Host 0 Temperature Warm

<Syslog Messages>
Jul 29 07:26:47 chassisd[1387]: CHASSISD_SNMP_TRAP6: SNMP trap generated: Over Temperature!
Red Alarm
2014-07-29 08:07:50 UTC Major Host 0 Temperature Hot
<Syslog Messages>
CHASSISD_RE_OVER_TEMP_WARNING: Routing Engine 0 temperature (73 C) over 72 degrees C, platform will shut down in 240 seconds if condition persists

Debugging based on such information is difficult

TELEMETRY today



•CLI sessions are not closed gracefully on the router. In this case, one would see mgd running high on CPU, starving the kernel of CPU cycles.
1059 root 1 132 0 24344K 18936K RUN 405.0H 43.75% mgd 26275 root 1 132 0 24344K 18936K RUN 353.5H 43.75% mgd CPU utilization
•One way to address this issue is to kill the mgd processes eating up the CPU.

•'Sampling' is enabled on the router. This sometimes leads to high kernel CPU; to address this, reduce the rate at which you are sampling on the router.

Checking for CPU events and setting up notifications may not work

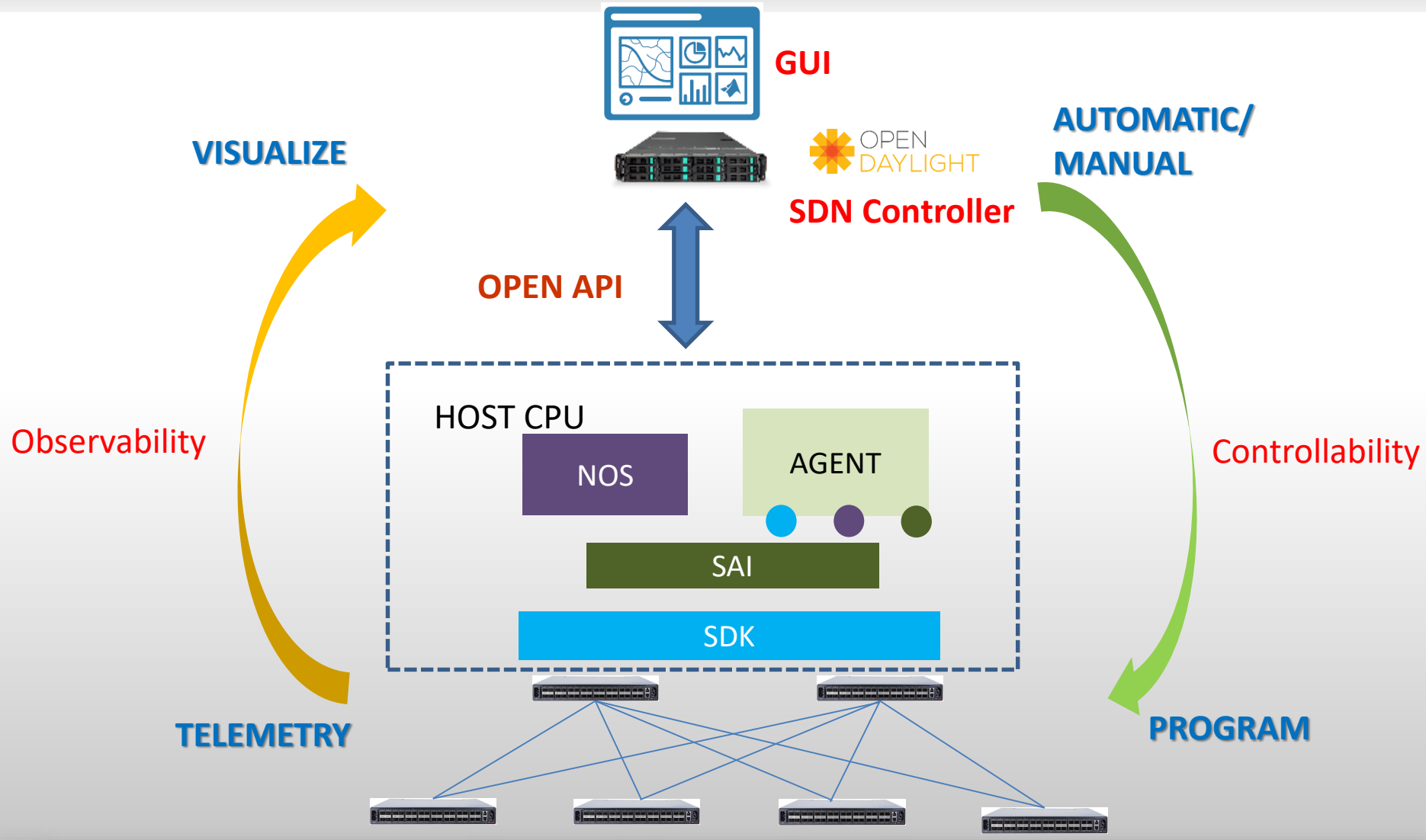
TELEMETRY issues

SNMP SYSLOG CLI Scripts

- Quite coarse data granularity
- SNMP polling puts lot of load on CPU and has severe scaling issues
- CLI Scripts break and need frequent changes
- Even IPFIX Flow sampling misses important information
- No Data Correlation
- Reactive, yet no information or hint given on root cause

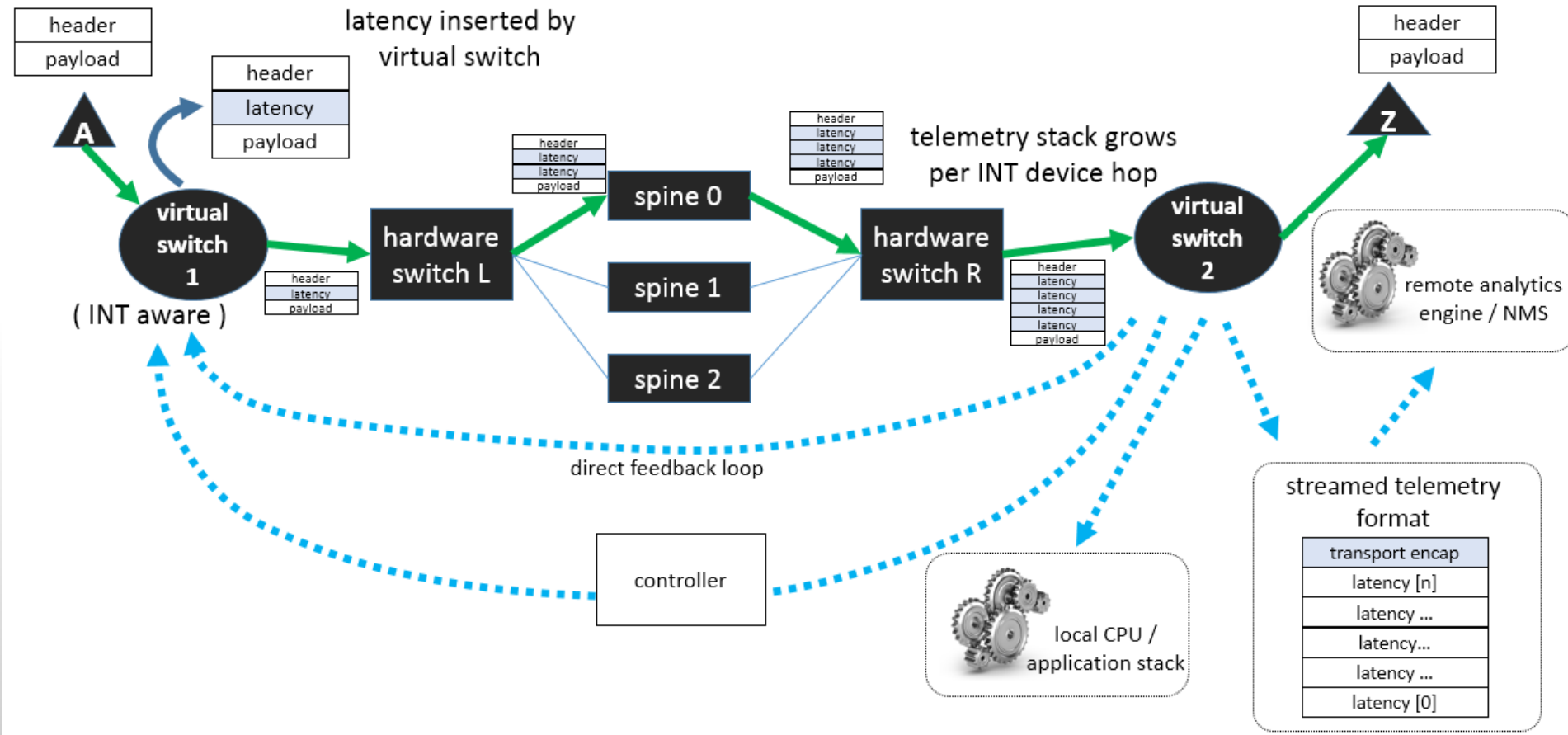
A shift in the way we optimize and diagnose the networks is required

SDN TELEMETRY & ANALYTICS- Agent Based



Closed loop feedback

Inband Network Telemetry with P4



insert or modify packet headers with custom metadata

Discovering information

- *This fan speed increase is in response to abnormal behavior in chip…*
- *This switch A is seeing more congestion @ 3PM because of …*
- *Bit error rate is increasing on interface x/y/z due to … Packet loss in 3 min.*

Optimize Network for Data Center SLAs

- *Latency*
- *Network Jitter*
- *Packet Loss*
- *Bandwidth Guarantees*

Do we need a Crystal Ball to answer the above questions and ACT on it?

Why Deep learning now?

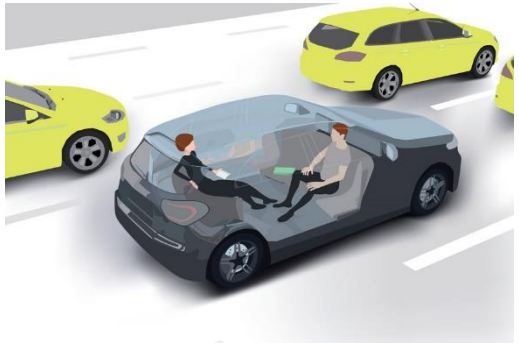
- Plethora of Data available
- Lot of cheap compute power and storage available now
- More layers of NN are required to solve complex problems
- Introduction of GPUs : Perfect for matrix multiplication
- NN Algorithms have matured and can be scaled
- Lot of research is being conducted in this field

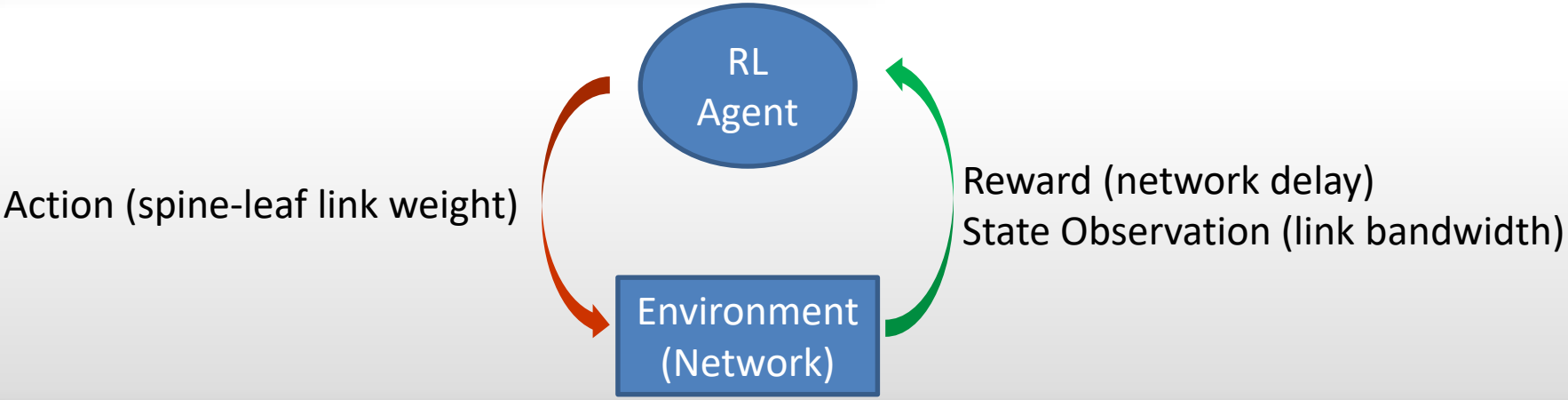
NN can be used to control nonlinear dynamic system

SDN is the key enabler!

Deep Reinforcement Learning

- Learning Behaviors and skills
- No modeling
- Sequence of decisions is necessary
- Actions have consequences
- Environment Stateful



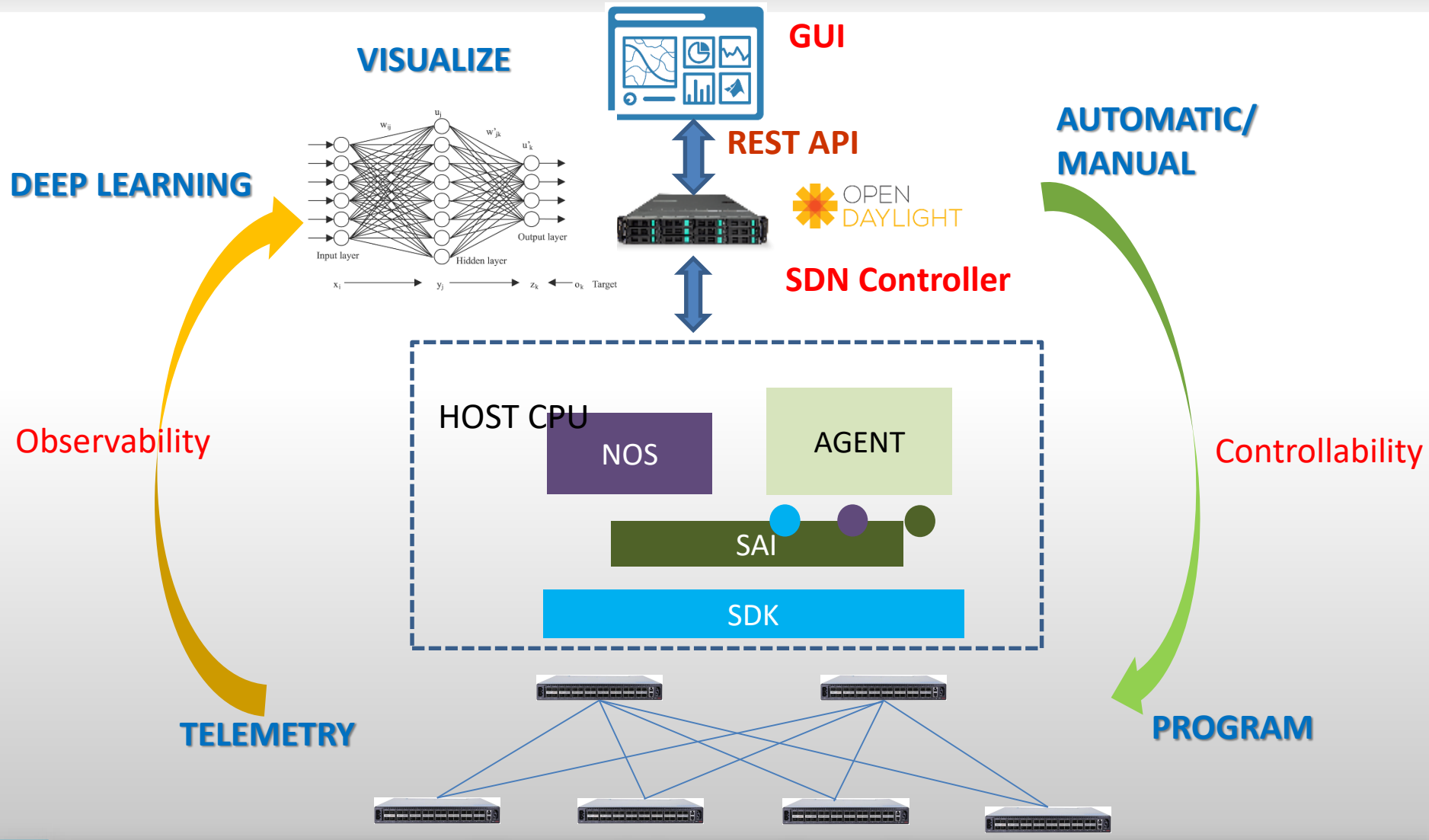


Sequence of states and actions: s_0, a_0, r_0, s_{T-1}, a_{T-1}, r_{T-1}, s_T, r_T

Transition Function : $P(s_{t+1}, r_t \mid s_t, a_t)$

Used for non linear complex multidimensional systems

SDN TELEMETRY & ANALYTICS- Deep Learning

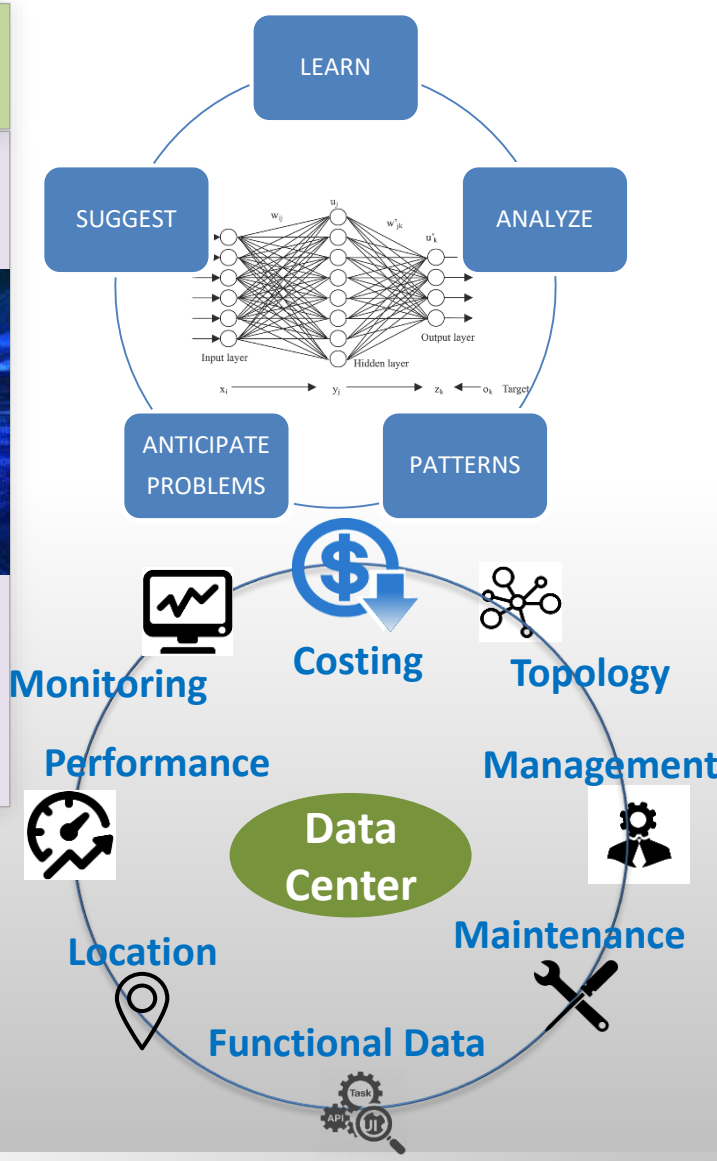


Closed loop feedback

Conclusion

AI/Robots will be Omnipresent by 2025

- Can we design proactive networks
- Can we get predictive insights
- Can we do Risk Mitigation
- Can we do Anomaly Detection
- Can we make networks more efficient?



Opinion: Yes

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