2021 Intel Network Technical Summit

更智能的企业网络边缘

Enterprise Edge solution powered with AI

Dec, 2021

Notices and Disclaimers

- Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at www.intel.com.
- Intel processors of the same SKU may vary in frequency or power as a result of natural variability in the production process.
- Intel does not control or audit third-party benchmark data or the web sites referenced in this document. You should visit the referenced web site and confirm whether referenced data are accurate.
- Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice. Notice Revision #20110804.
- The benchmark results may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system or workloads. The results are not necessarily representative of other benchmarks and other benchmark results may show greater or lesser impact from mitigations.
- Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.
  Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit www.intel.com/benchmarks.
- Performance results are based on testing as of 8/8/2019 and may not reflect all publicly available security updates. See configuration disclosure for details. No product or components can be absolutely secure.
- Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.
- The cost reduction scenarios described are intended to enable you to get a better understanding of how the purchase of a given Intel based product, combined with a number of situation-specific variables, might affect future costs and savings. Circumstances will vary and there may be unaccounted-for costs related to the use and deployment of a given product. Nothing in this document should be interpreted as either a promise of or contract for a given level of costs or cost reduction.
- No computer system can be absolutely secure.
-
- *Other names and brands may be claimed as the property of others.

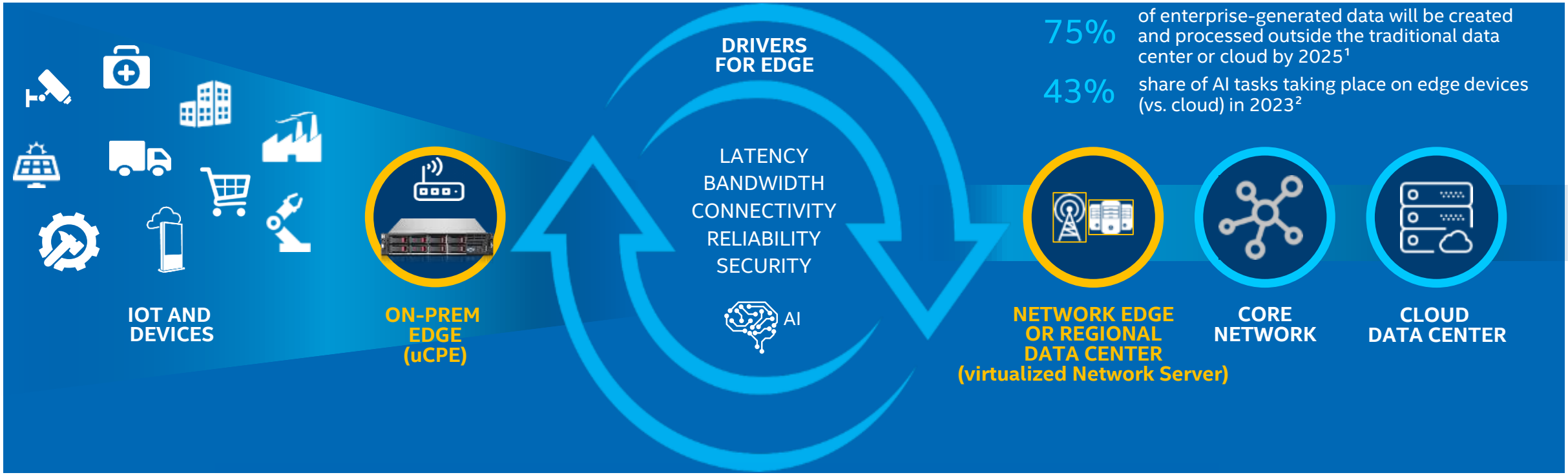
议程

企业网络边缘概述和参考方案

Intel TADK让网络更智能

总结

网络是边缘计算的关键驱动力



Devices/Things	Enterprise Edge	Network Edge	Core Network	Cloud Data Center
Latency expectation	Varies <1 ms	<5 ms	<10-40 ms	<60 ms	~100 ms

IOT Journey To The Edge

Convergence of
IT, OT & CT Workloads

Network Journey To The Edge

Workload convergence
a key enabler for service innovation

1. Gartner; https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders

英特尔推动企业网络创新

推动边缘云交付
网络安全服务

提供云化的网络和安全服务

Since 2019

3 **边缘云**

优化云实例，简化网络和安全应用的公有云部署

4 **网络边缘 (Edge POPs)**

网络和安全功能服务化
混合云部署，能力协同调度
就近接入，提升服务质量

Enterprise Network Edge

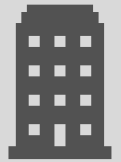
云上

云下

1 **固定功能网络设备** → **网络功能虚拟化**

专有硬件
Since 2000

标准服务器
Since 2012



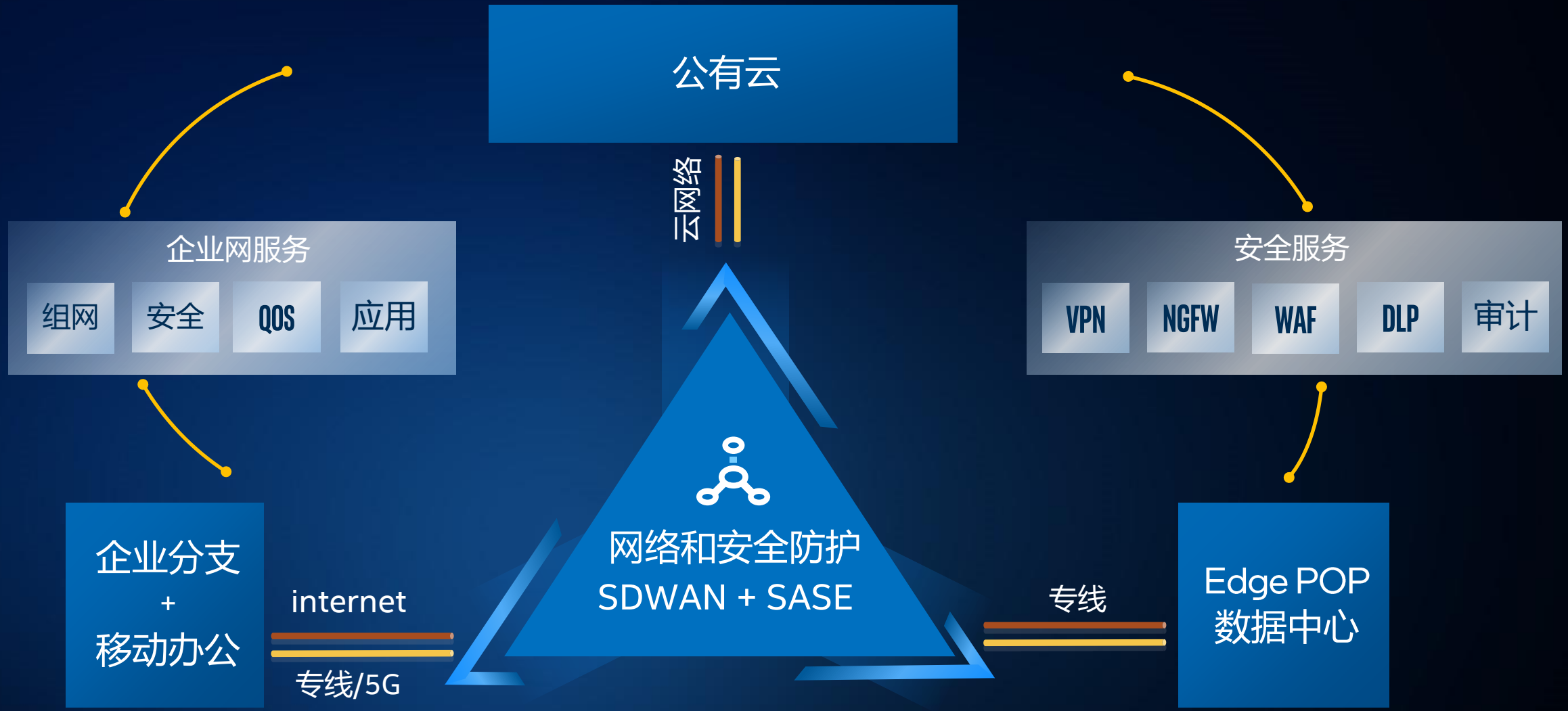
数据中心

2 **安全可靠的连接，智能化应用服务**

4 Security Analytics (Remediation) — paloalto, splunk>
3 Security SW — cisco, FORTINET, paloalto
2 SD-WAN SW — cisco aryaka, nuagenetworks, velocloud, vmware, VERSA
1 uCPE HW — ADVANTECH, DELL EMC, CASWELL, cisco, Lanner

软件定义企业分支
Since 2015

SASE/SDWAN推动企业网边缘的基础设施



一致性架构加速云网安全融合

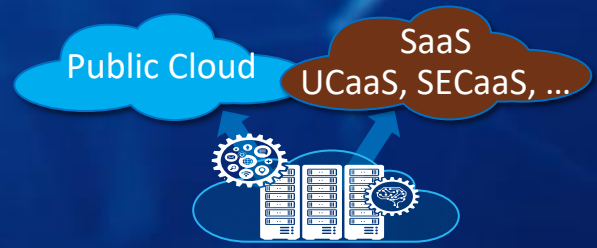
企业分支站点
(企业网边缘)

SDWAN

SASE PoP/私有云
(网络边缘)

云网络

公有云



SDWAN | 防火墙 | 广域网优化

VPN | 零信任网络 | 防火墙 | 审计 | SWG | CASB | IPS/IDS | 安全业务

英特尔产品：Atom, Xeon-D 网络SoC (2-24C)

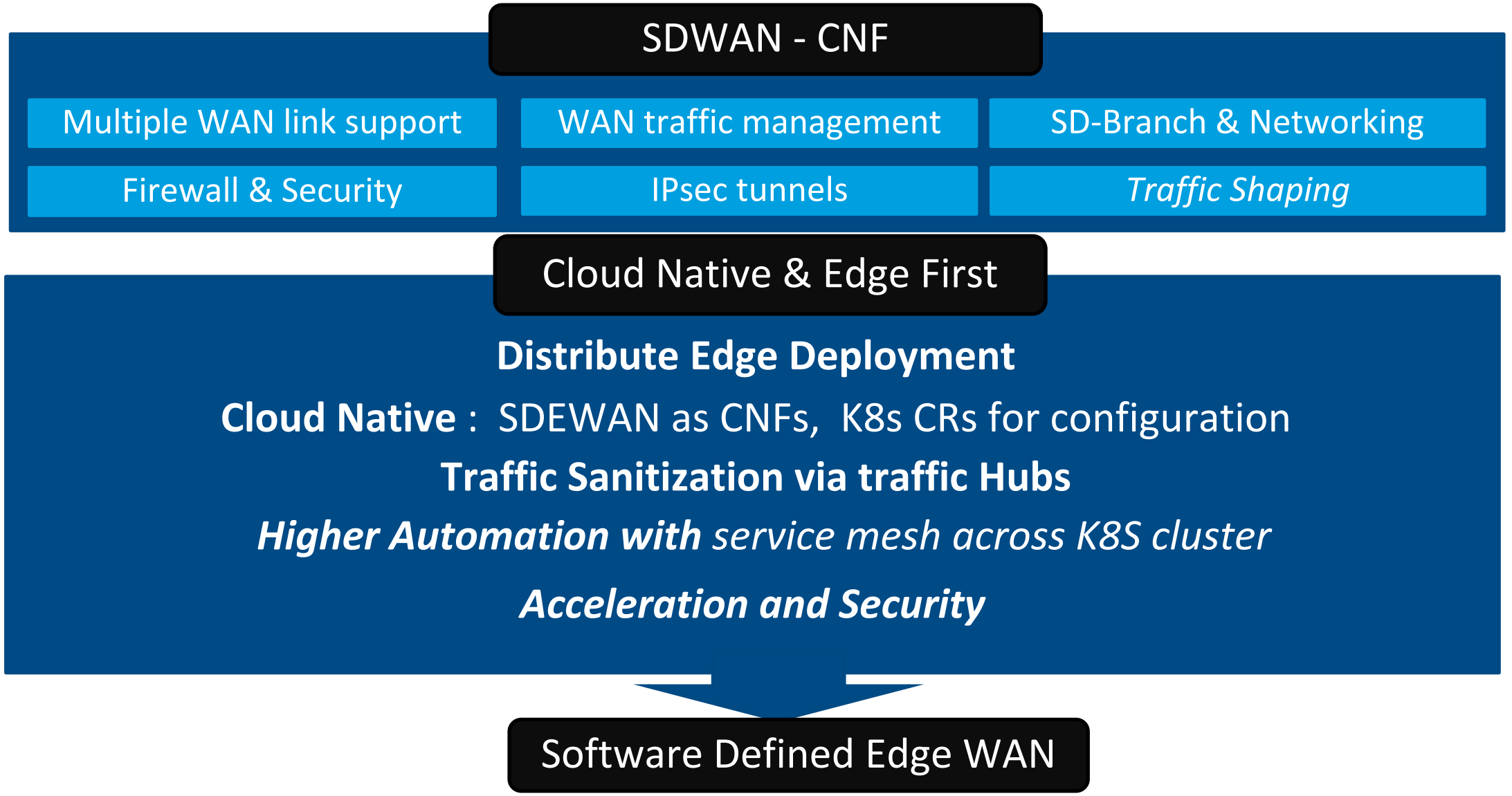
- 融合平台： uCPE（组网、互联，入云）
- 安全加速：IPsec/SSL/QUIC/WireGuard
- 应用加速：Intel TADK, Hyperscan, DPI
- 平台底座：Intel Smart Edge

英特尔产品：ICX-SP网络服务器, P4智能交换机, E810网卡, PTL加速卡

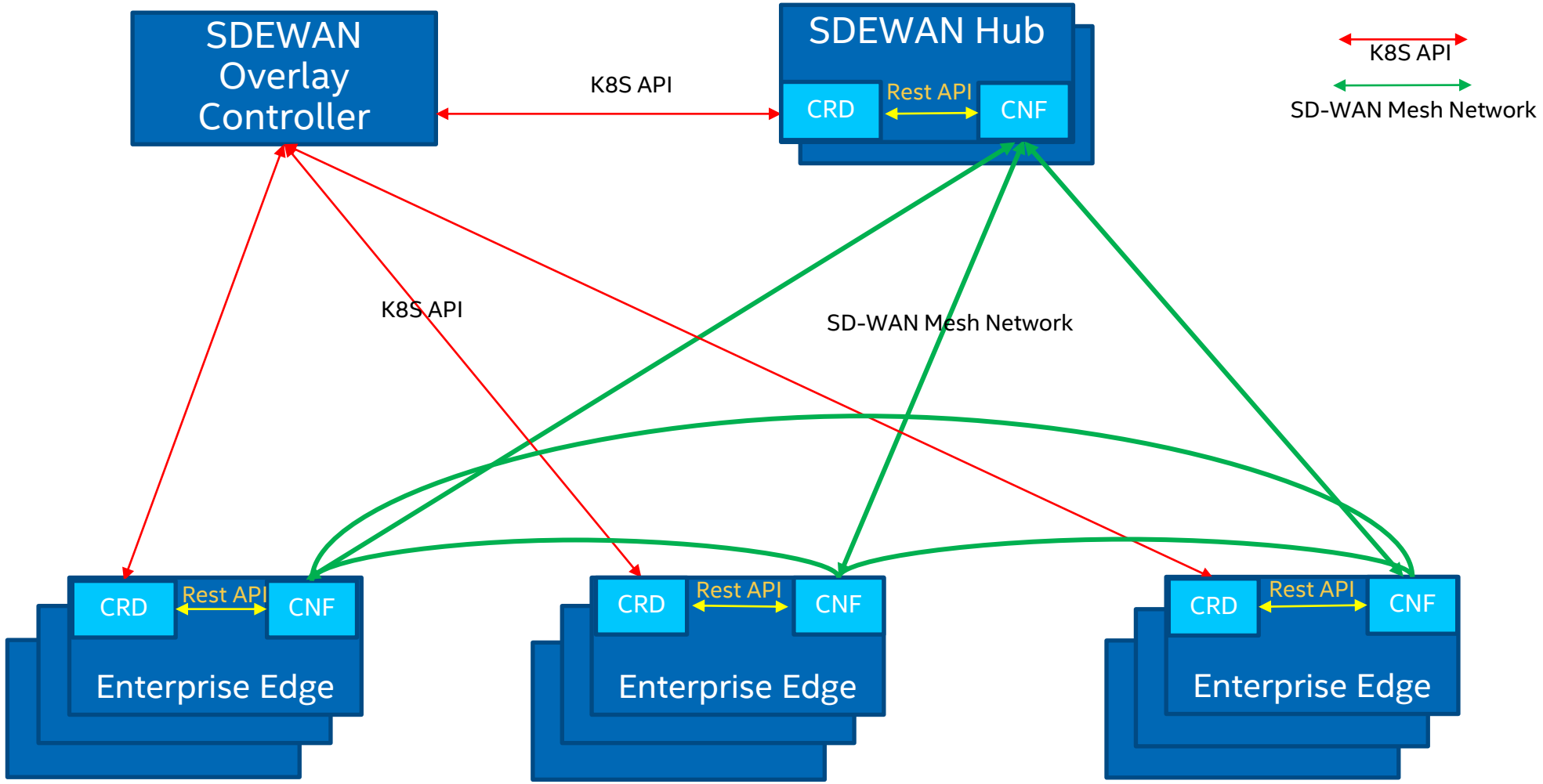
- Intel QAT, vAES: 可信网络加速 (IPsec/TLS/QUIC/WireGuard)
- Intel OpenVINO, OneAPI: 大数据分析/网络AI
- SGX: 机密计算（数据安全）
- Intel Smart Edge: 云原生底座参考设计

intel ATOM | intel XEON | Intel QuickAssist Technology | Intel® Smart Edge Open | DPDK | .io The Universal Dataplane | P4.org | SGX | OpenSSL Cryptography and SSL/TLS Toolkit | HYPERSCAN.IO

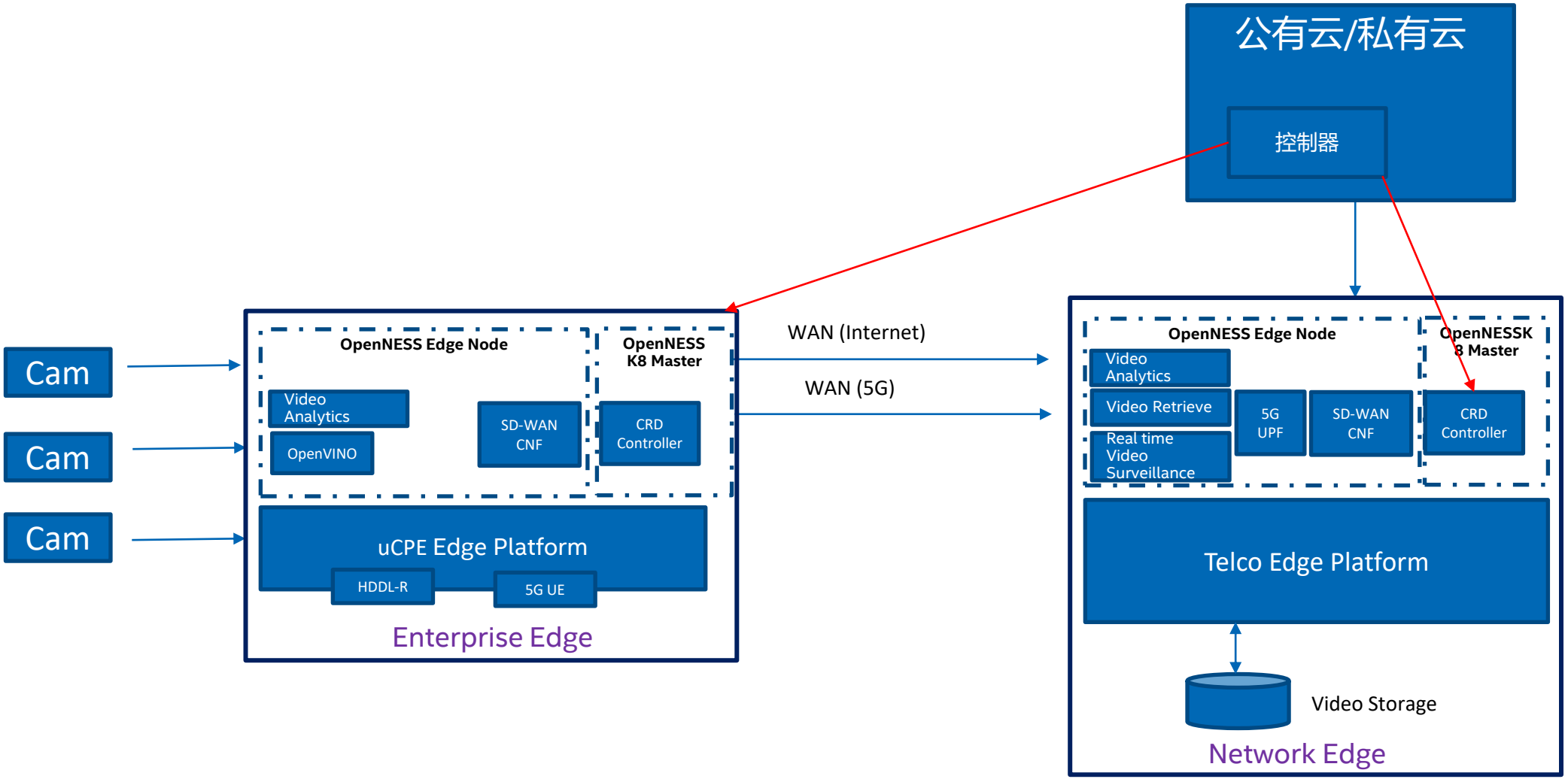
SDEWAN概述


SDWAN - CNF
Multiple WAN link support
WAN traffic management
SD-Branch & Networking
Firewall & Security
IPsec tunnels
Traffic Shaping
Cloud Native & Edge First
Distribute Edge Deployment
Cloud Native : SDEWAN as CNFs, K8s CRs for configuration
Traffic Sanitization via traffic Hubs
Higher Automation with service mesh across K8S cluster
Acceleration and Security
Software Defined Edge WAN

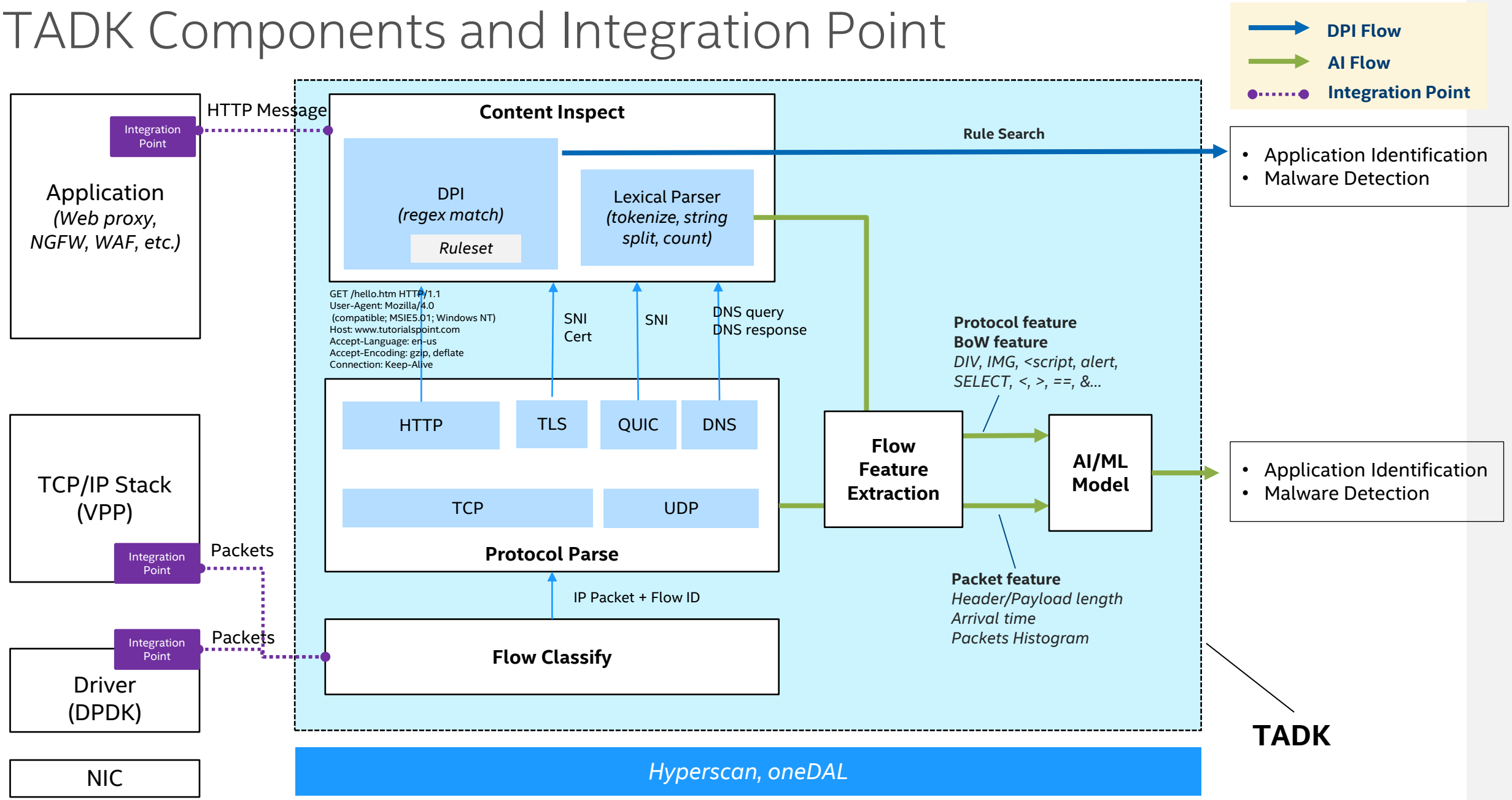
SDEWAN构建分布式边缘计算框架



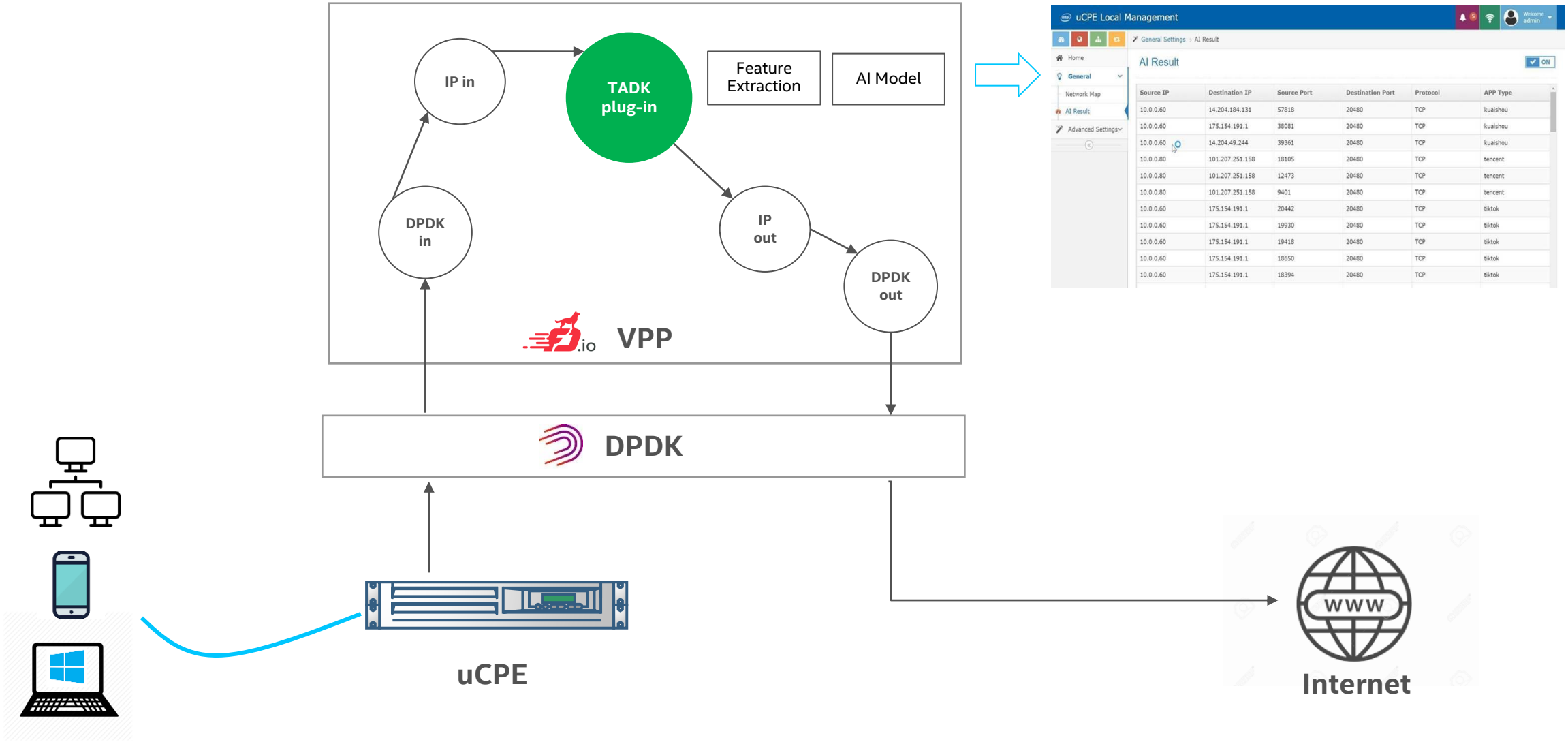
SDEWAN云边协同应用场景



TADK Components and Integration Point



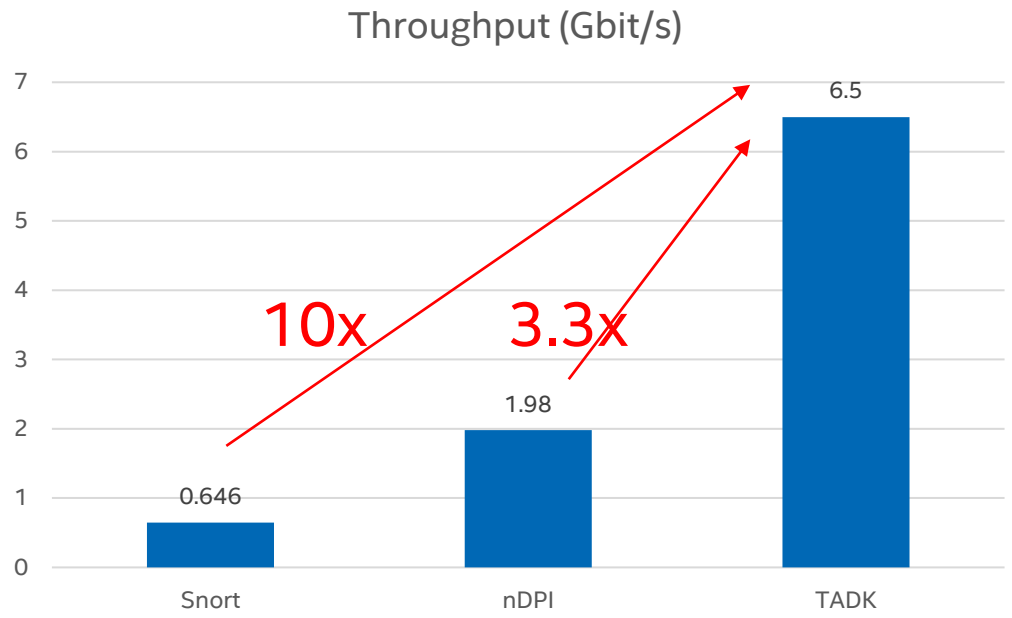
Usage: AppID in SD-WAN/uCPE

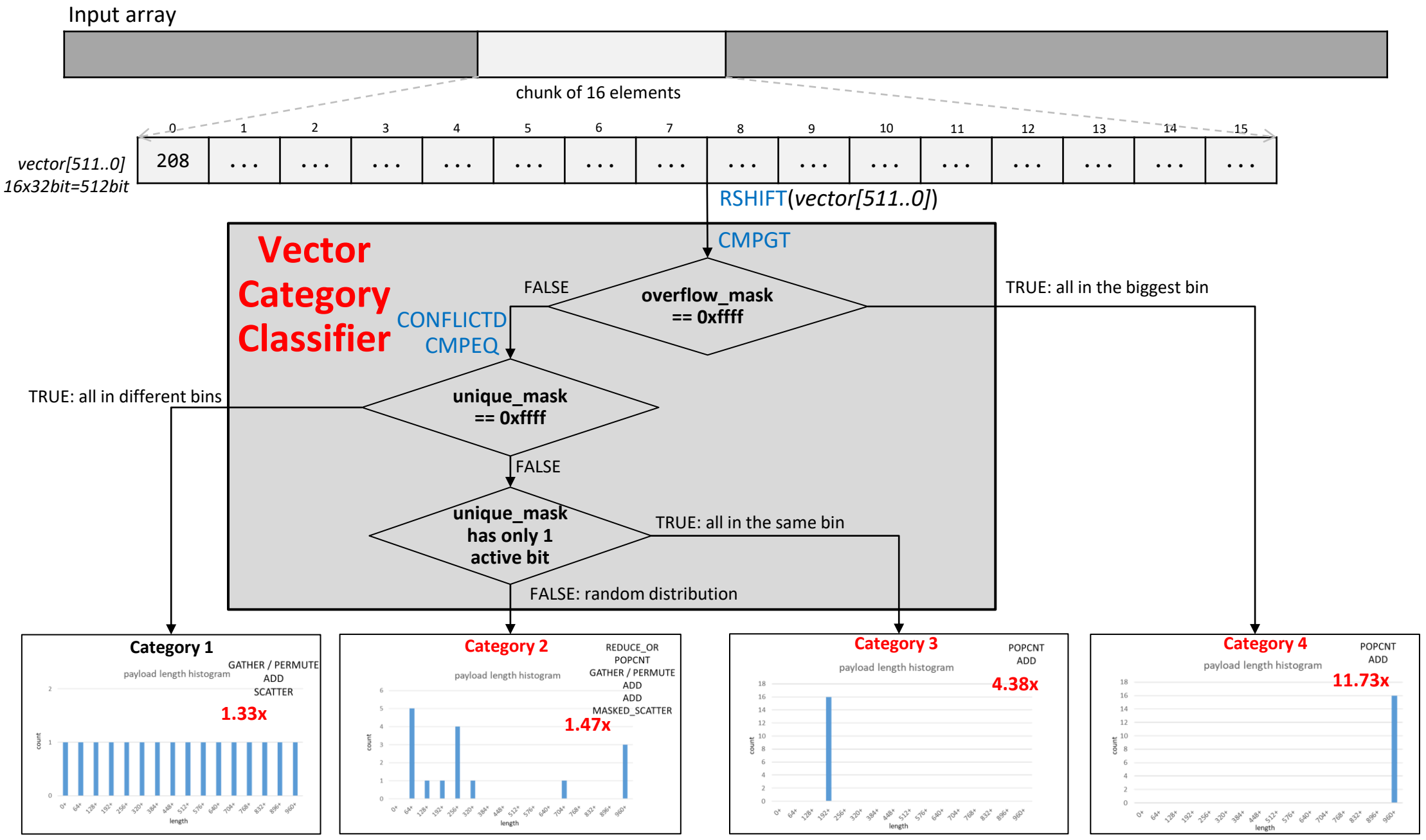


Traffic Classification

- Platform: Intel(R) Xeon(R) Platinum 8358 CPU @ 2.60GHz (ICX)

flow type	flow	packet	byte	pkt/flow	byte/pkt	flow/s	packet/s	Gbit/s
message flow	1,524	21,995	5,082,409	14	231	92,808	1,339,444	2.48
video flow	1,551	31,071	15,474,984	20	498	81,469	1,632,059	6.5




Input array
chunk of 16 elements
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
vector[511..0]
16x32bit=512bit
208
RSHIFT(vector[511..0])
Vector Category Classifier
CMPGT
overflow_mask == 0xffff
FALSE
TRUE: all in the biggest bin
CONFLICTD CMPEQ
unique_mask == 0xffff
TRUE: all in different bins
FALSE
unique_mask has only 1 active bit
TRUE: all in the same bin
FALSE: random distribution
Category 1
payload length histogram
GATHER / PERMUTE
ADD
SCATTER
1.33x
Category 2
payload length histogram
REDUCE_OR
POPCNT
GATHER / PERMUTE
ADD
ADD
MASKED_SCATTER
1.47x
Category 3
payload length histogram
POPCNT
ADD
4.38x
Category 4
payload length histogram
POPCNT
ADD
11.73x

String Feature (Bag of Words)

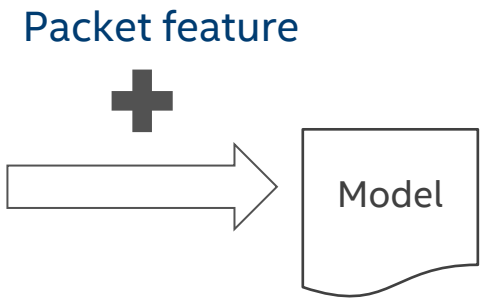
```
Server Name Indication extension
    Server Name list length: 30
    Server Name Type: host_name (0)
    Server Name length: 27
    Server Name: livepushstream.if.iqiyi.com
```

```
GET /videos/other/20200731/76/64/4
  [Expert Info (Chat/Sequence): G
  Request Method: GET
  Request URI: /videos/other/2020
    Request URI Path: /videos/oth
    Request URI Query: pv=0.1&qyi
  Request Version: HTTP/1.1
Host: data.video.iqiyi.com\r\n
```

```
Hypertext Transfer Protocol
  HTTP/1.1 302 Found\r\n
  Connection: keep-alive\r\n
  Content-Length: 154\r\n
  Content-Type: text/html\r\n
  Date: Thu, 20 Aug 2020 12:04:47 GMT\r\n
  Location: https://www.baidu.com/\r\n
```

Tokenize: *TLS SNI, HTTP URI, Content-type, DNS, etc.*

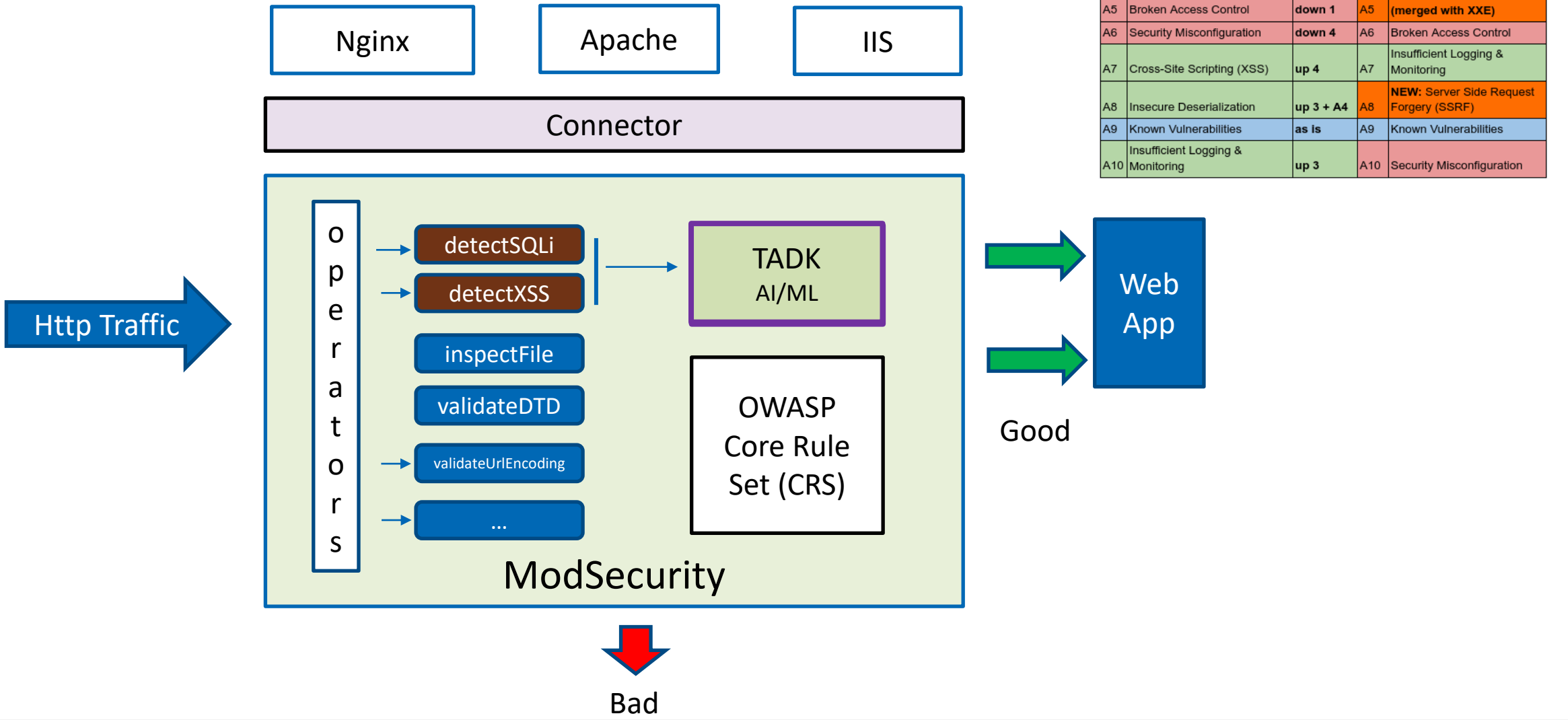
	"livepushstream"	"iqiyi"	"baidu"	"text"	"video"
App-Iqiyi	1	1	0	0	1
App-baidu	0	0	1	1	0



- Bag of words are self-learned/trained
- No need to maintain a big rule-set

Usage: WAF

OWASP Top 10 2017		change	OWASP Top 10 2021 proposal	
A1	Injections	as is	A1	Injections
A2	Broken Authentication	as is	A2	Broken Authentication
A3	Sensitive Data Exposure	down 1	A3	Cross-Site Scripting (XSS)
A4	XML eXternal Entities (XXE)	down 1 + A8	A4	Sensitive Data Exposure
A5	Broken Access Control	down 1	A5	Insecure Deserialization (merged with XXE)
A6	Security Misconfiguration	down 4	A6	Broken Access Control
A7	Cross-Site Scripting (XSS)	up 4	A7	Insufficient Logging & Monitoring
A8	Insecure Deserialization	up 3 + A4	A8	NEW: Server Side Request Forgery (SSRF)
A9	Known Vulnerabilities	as is	A9	Known Vulnerabilities
A10	Insufficient Logging & Monitoring	up 3	A10	Security Misconfiguration



WAF (SQLi/XSS)

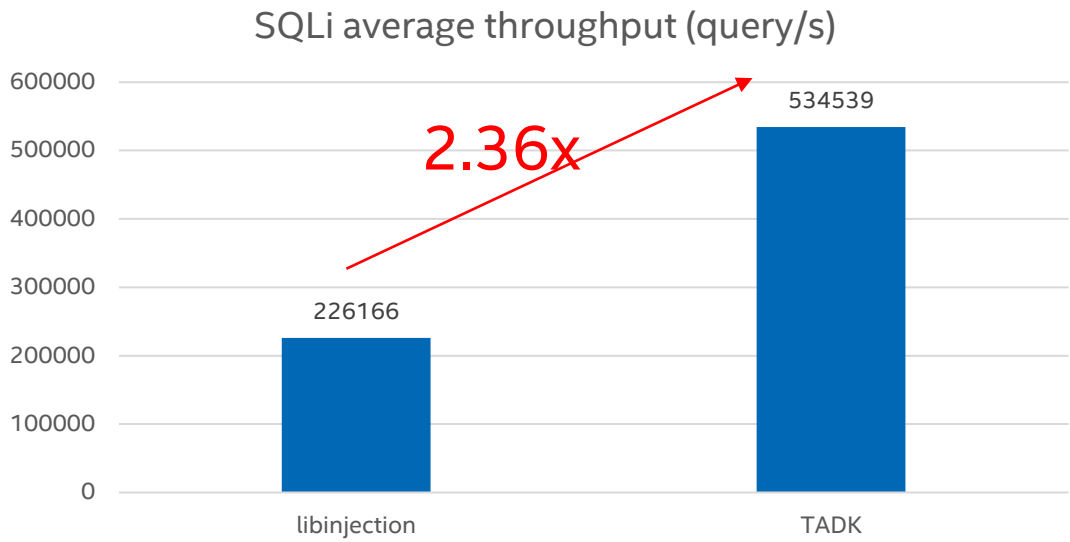
- Platform:
- Intel(R) Xeon(R) Platinum 8358 CPU @ 2.60GHz (ICX)

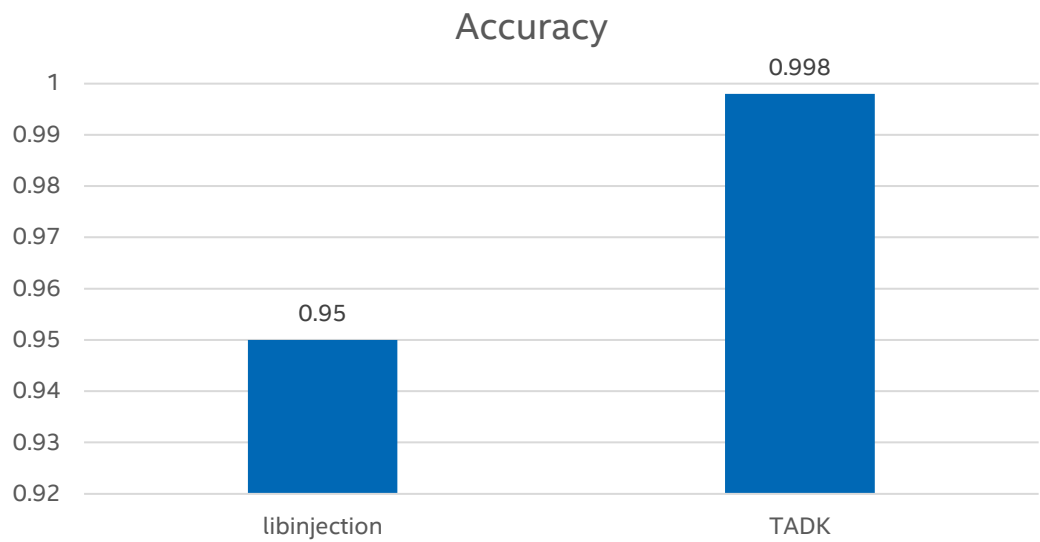
- Data:
- sqlmap_test.txt (10000 cases)
- XSStrike_test.txt (10000 cases)

TADK vs libinjection

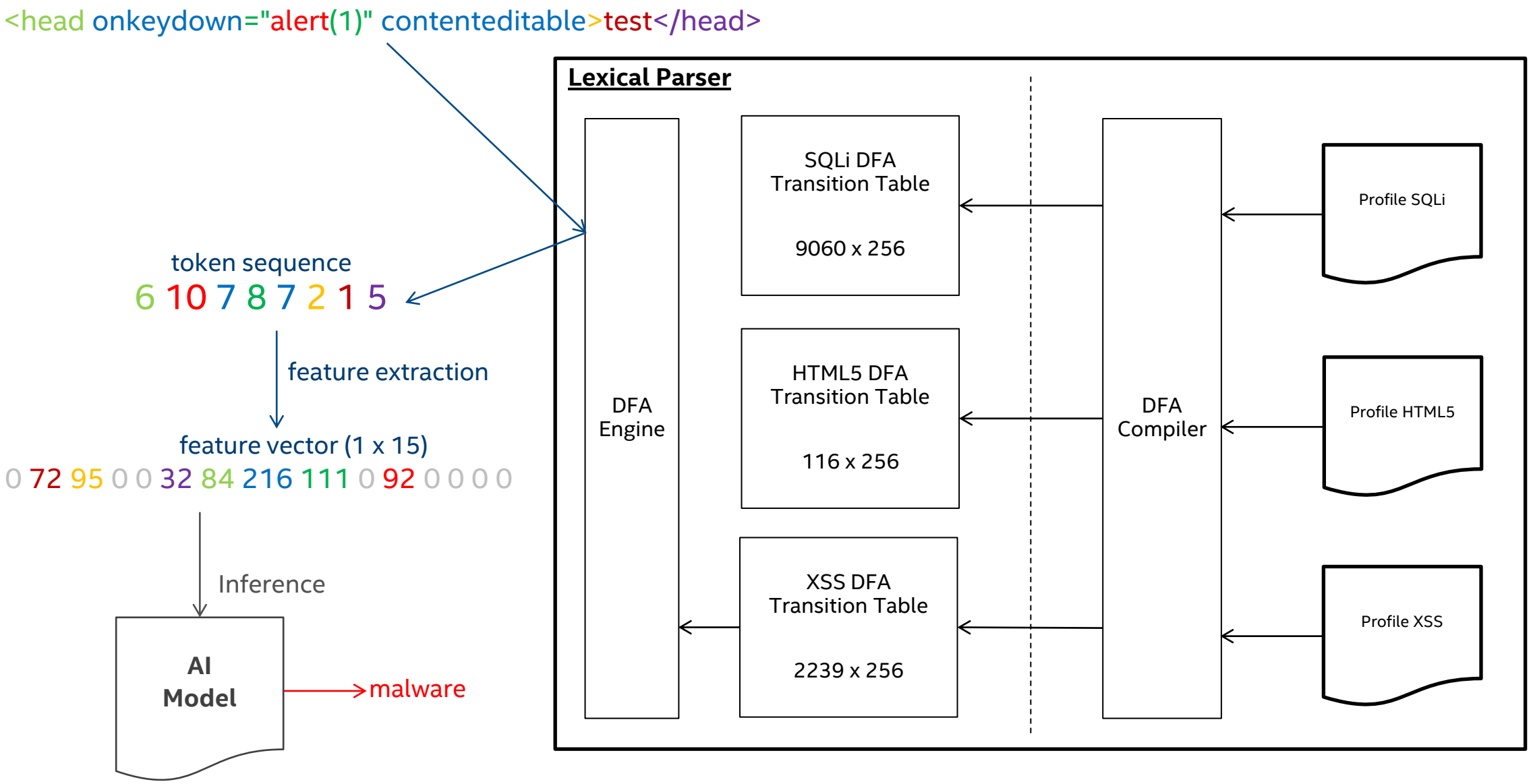
Average 2.36x in SQLi (best up to 24.04x)

Average 1.98x in XSS (best up to 28.82x)

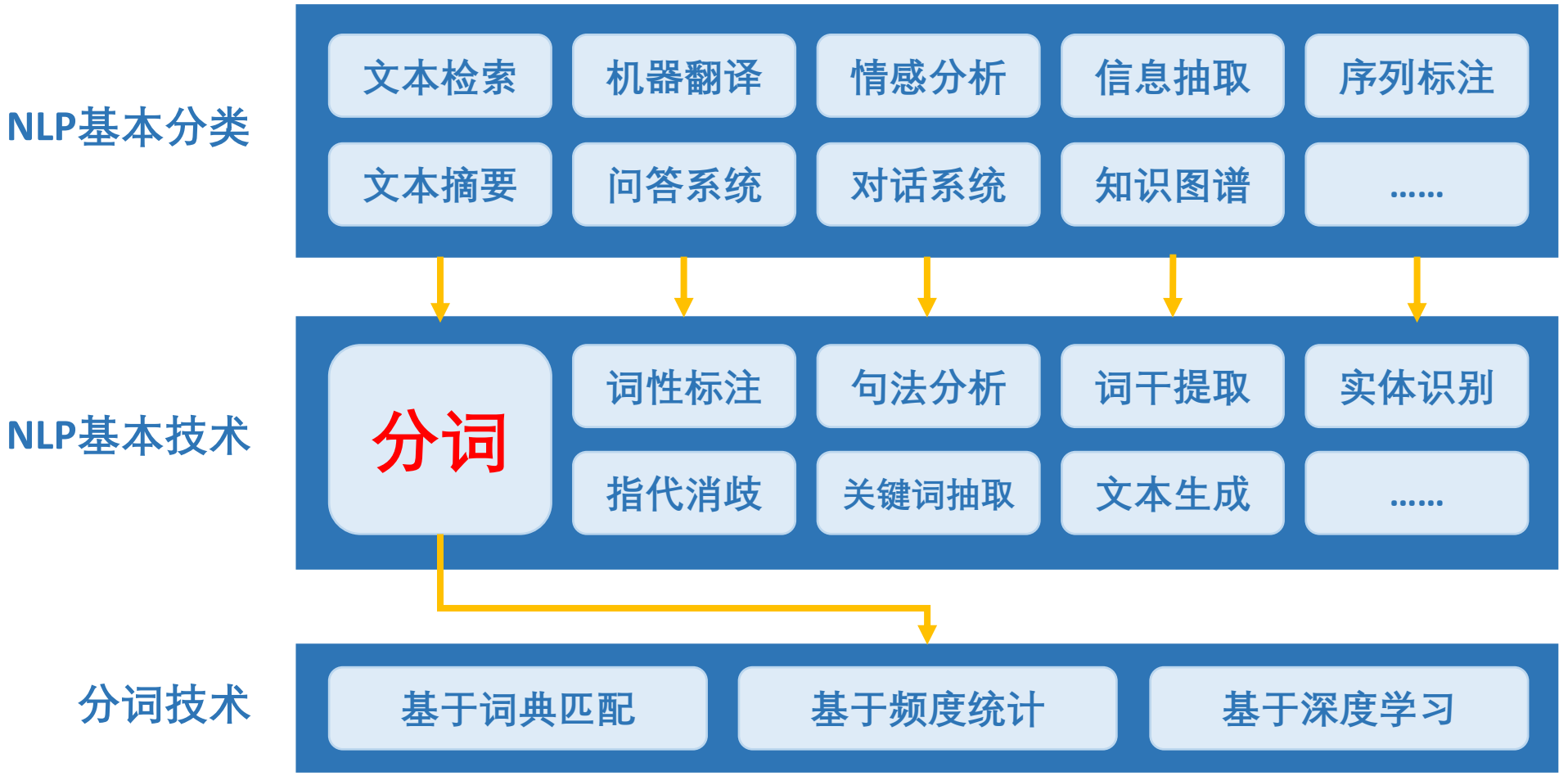




XSS detection



NLP (Natural Language Processing)

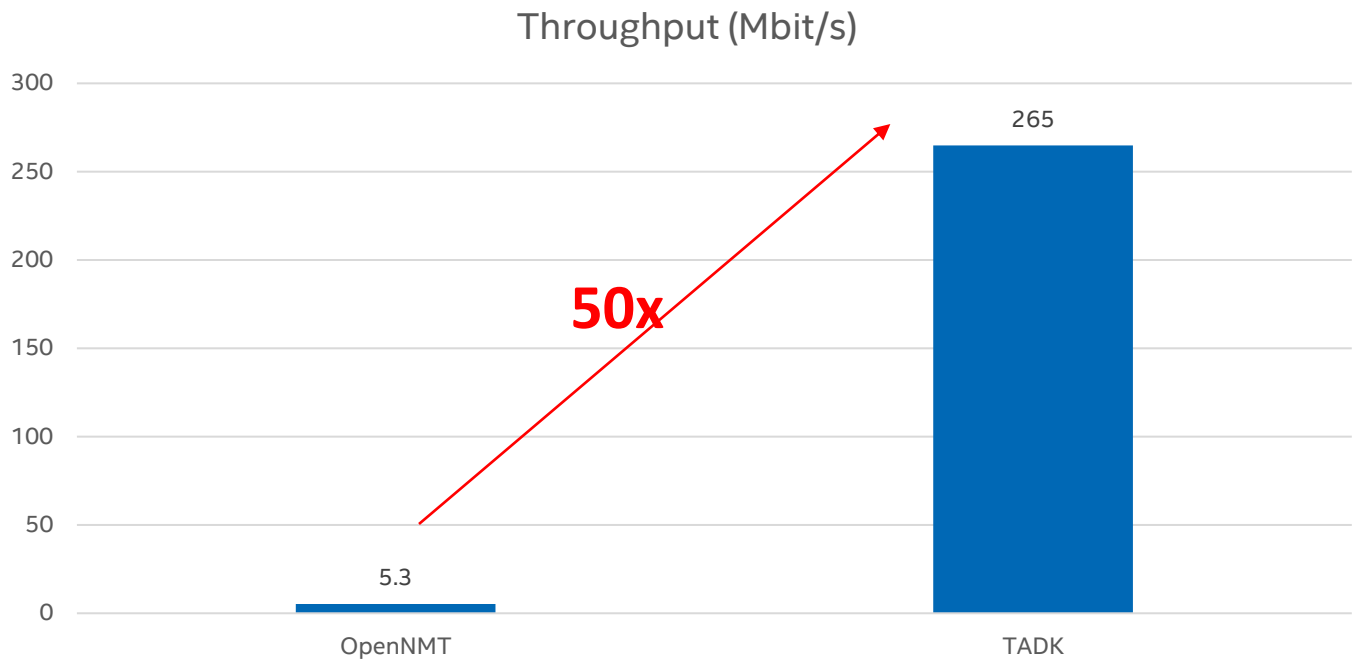


Tokenizer

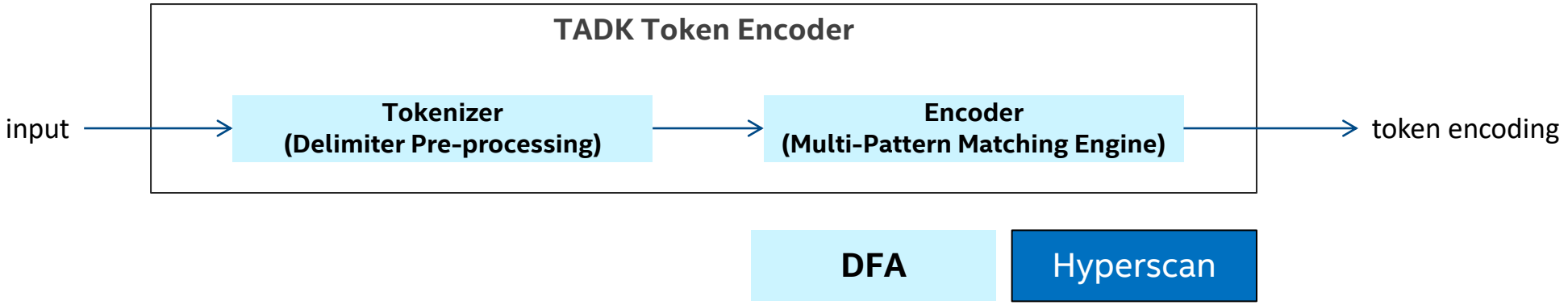
- Platform: Intel(R) Xeon(R) Platinum 8358 CPU @ 2.60GHz (ICX)
- Data: average 41kB input file

TADK vs OpenNMT

50.1x boost in Tokenization



Tokenizer



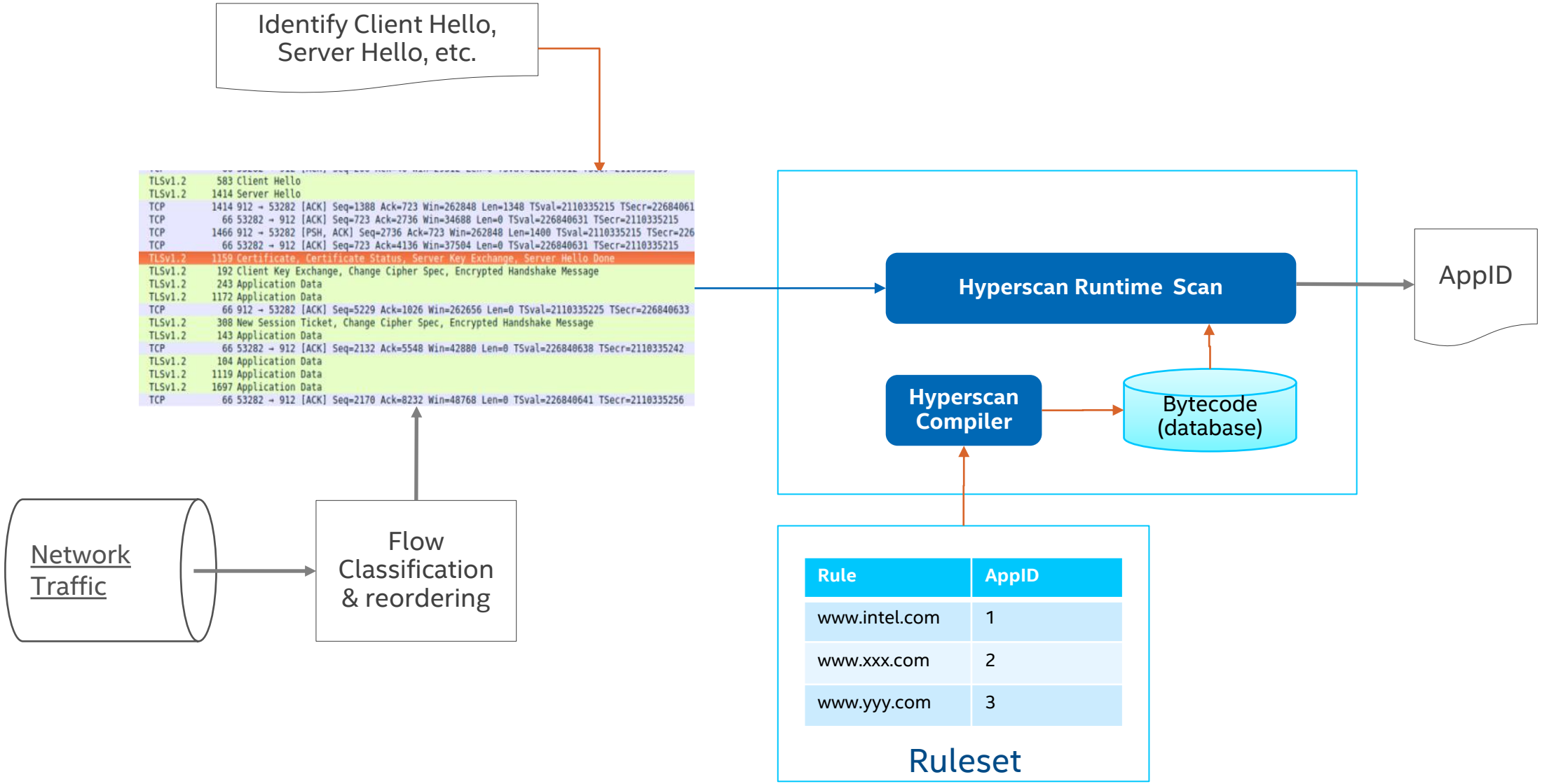
Tokenizer

normal/conditional/transparent delimiter
string grouping
AVX512 optimization

Encoder

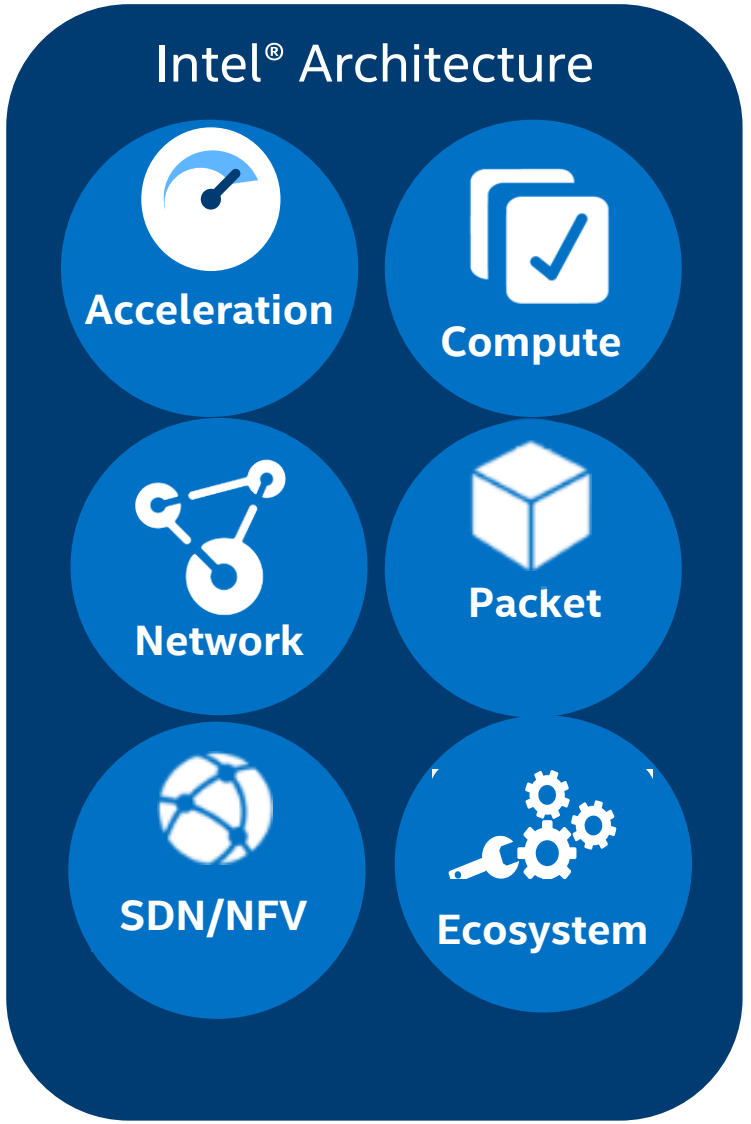
DFA/Hyperscan dual engine
Extended 32-bit DFA model (up to 2G states)
Normally 64MB table can support up to 10k rules

DPI Engine


Identify Client Hello, Server Hello, etc.
TLSv1.2 583 Client Hello
TLSv1.2 1414 Server Hello
TCP 1414 912 → 53282 [ACK] Seq=1388 Ack=723 Win=262848 Len=1348 TSval=2110335215 TSecr=22684061
TCP 66 53282 → 912 [ACK] Seq=723 Ack=2736 Win=34688 Len=0 TSval=226840631 TSecr=2110335215
TCP 1466 912 → 53282 [PSH, ACK] Seq=2736 Ack=723 Win=262848 Len=1400 TSval=2110335215 TSecr=226
TCP 66 53282 → 912 [ACK] Seq=723 Ack=4136 Win=37504 Len=0 TSval=226840631 TSecr=2110335215
TLSv1.2 1159 Certificate, Certificate Status, Server Key Exchange, Server Hello Done
TLSv1.2 192 Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
TLSv1.2 243 Application Data
TLSv1.2 1172 Application Data
TCP 66 912 → 53282 [ACK] Seq=5229 Ack=1026 Win=262656 Len=0 TSval=2110335225 TSecr=226840633
TLSv1.2 308 New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
TLSv1.2 143 Application Data
TCP 66 53282 → 912 [ACK] Seq=2132 Ack=5548 Win=42880 Len=0 TSval=226840638 TSecr=2110335242
TLSv1.2 104 Application Data
TLSv1.2 1119 Application Data
TLSv1.2 1697 Application Data
TCP 66 53282 → 912 [ACK] Seq=2170 Ack=8232 Win=48768 Len=0 TSval=226840641 TSecr=2110335256
Network Traffic
Flow Classification & reordering
Hyperscan Runtime Scan
AppID
Hyperscan Compiler
Bytecode (database)
Rule
AppID
www.intel.com
1
www.xxx.com
2
www.yyy.com
3
Ruleset

总结

- 英特尔推出多种全新解决方案，加速企业网边缘计算创新
- 英特尔SmartEdge和SDEWAN参考设计，可以用于构建面向业务的分布式，云边一体的优化Edge平台，简化云边协同和混合云部署的需求
- 英特尔TADK提供网络AI参考设计，让网络更加智能，应用级流量识别更加精准




intel