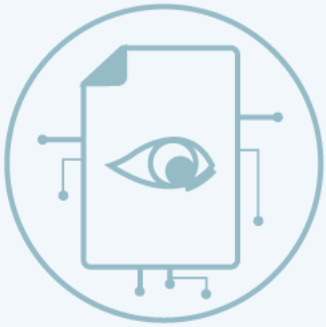
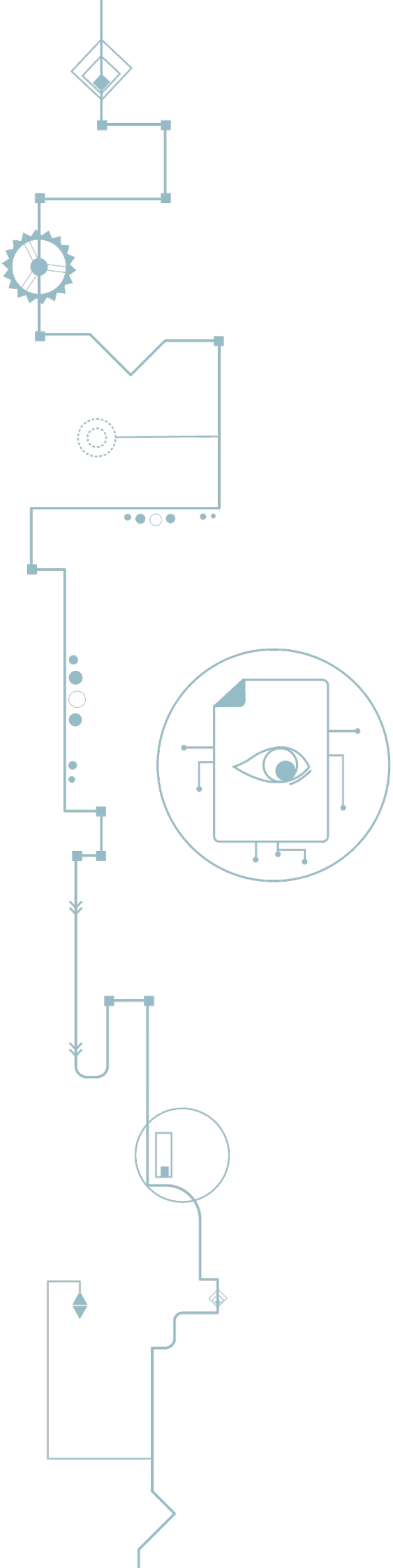
CUBRO
NETWORK VISIBILITY

OMNIA QM



SOLUTION BRIEF

JUNE 2023



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1. Introduction

Data analytics challenges in telecommunications networks originate from the fact that data volumes are very high. Many CSPs (Communication Service Providers) have Tbps user plane bandwidth. Monitoring tools often require lots of investments in both hardware and in software. Modern technologies such as Hadoop allow limitless data storage capacity, however Hadoop is not best suited for data retrieval and analytics.

Many CSPs are therefore looking for database systems that would allow storage of huge amounts of data and fast data retrieval. In telecommunications data retrieval is more challenging with small packet size. There are less big packets compared to small packet size with the same bandwidth. Therefore smaller packets require generally more CPU and memory resources due to the higher number of records. All these challenges leave less time and resources for data analytics.

Omnia QM Solution using Call Detail Records (CDRs) provides an efficient method of optimizing data and can potentially help CSPs to monitor data with less HW and SW resources.

2. Omnia QM Solution Overview

Cubro offers a CDR solution that optimizes the amount of data, in some cases even with a ratio of 1000 : 1.

The solution requires C- and U-plane feeds, correlates them and produces CDRs for both C- and U-plane that can be used in monitoring systems.

The solution uses Cubro SmartNICs (Omnic) for the heavy processing and a server that houses those SmartNICs and processes the internal CDRs coming out from the SmartNICs.

3. Data extraction and interfaces

Cubro recommends data to be mirrored using optical tapping and network packet brokers.

Port spanning is only feasible if:

- Data volumes are small and there are enough ports available in the network elements such as routers, switches and firewall and those elements can reliably provide packets without packet loss
- The data can be extracted in such a way that correlation between interfaces is possible i.e. subscriber data from interface A can find its pair in interface B

Interfaces required for the 4G CDR creation are S1 (S1-MME and S1-U) and S11. After C- and U-plane packets have reached NPB they are directed to different SmartNICs located in the same server.

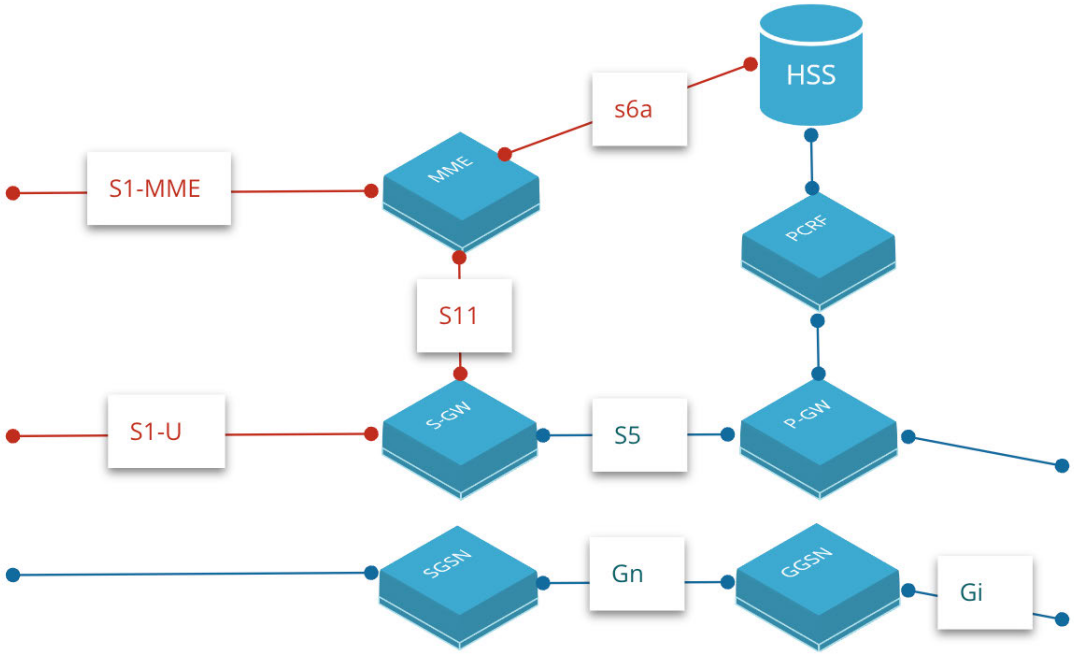

Figure 1: Required interfaces for 4G

The graphic has a generic illustration of U- and C-plane required interfaces. Please do note that the C-plane can be handled by different types of appliances.

Required 5G interfaces are N2 and N11 and preferably also N4.

4. Solution components

Cubro solution is a server equipped with Omnics (Cubro SmartNICs). Any NPB capable of separating C- and U-plane and able to do packet slicing for U-plane can be used.

Figure 2: Solution components

Cubro prefers Supermicro servers, but any server with sufficient CPU, memory and PCIe support can be used. Cubro SmartNIC, Omnic, has 25G and 100G variants. You can find Cubro Omnic details in table 1.

Each SmartNIC requires a full-height slot and 6-PIN PCIe power supply. Omnic is based on ARM CPU.

Figure 3: Cubro Omnic

Category		Smartnic 4x 25G	Smartnic 2x 100
Interface	Network Interface	4*25GE SFP28	2*100GE QSFP28
	Host Interface	PCIe*16 Gen3.0/Gen4.0	
	Management Interface	1*Console Micro USB, 1*GE RJ45 OOB Port	
Power & Dimension	Power Consumption	100W	
	Dimension (W*H*D,mm)	111.15mm*21.8mm*167.65mm	111.15mm*21.8mm*184.16mm
	Weight (kg)	0.8	
	Operating Temperature	0~35℃	
	Operating Humidity	10%~90%(non-condensing)	
Core CPU	Architecture	DPU	
	Part Number	CN96XX	
	Number of Processor Cores	24	
	Core Clock Frequency	1.8GHz	
	Number of CPU Part	1	
	Cache Capacity (MB)	L2 5MB, L3 14MB	
Memory & Storage	Memory Capacity	Single memory 8GB, 16GB or 32GB, configurable up to 2	
	Memory Type	DDR4 ECC SODIMM	
	Memory Capacity Expansion	64GB	
	Flash Storage (GB)	32GB/64GB EMMC 5.1	

Table 1: Omnic Data Sheet

5. Architecture Overview of the CDR generation

Cubro CDR generation utilizes Omnic for processing U-plane and C-plane.

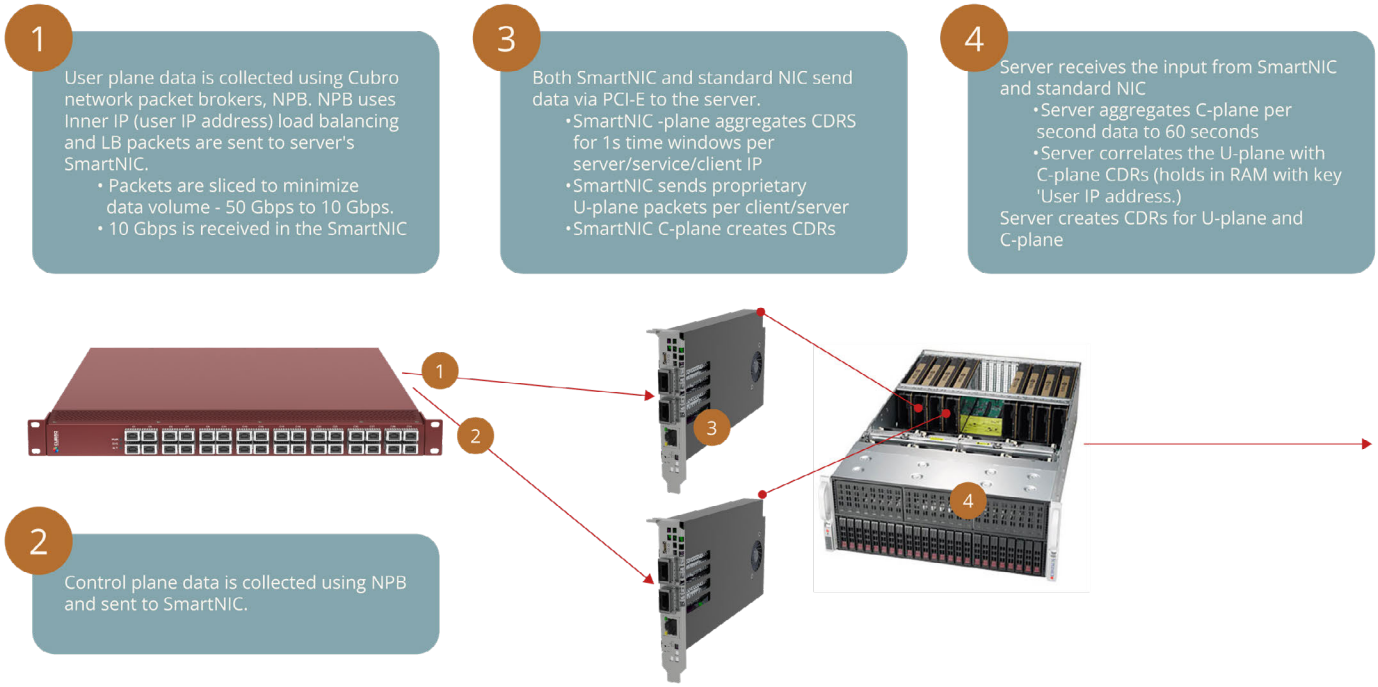

Figure 4: Data flow between units

NPB does packet slicing for U-plane reducing the data volume considerably and sends the sliced packets to Omnic. Omnic for C-plane creates two internal CDRs for GTP1 and GTP2. Required 5G interfaces are N2 and N11 and preferably also N4.

SmartNIC aggregates CDRs for 1s time window. Server correlates U- and C-plane CDRs and creates C- and U-plane CDRs including subscriber identification. The CDR is released by default every 60 seconds.

Cubro CDR solution includes IMSI whitelisting by having a configuration file with wanted IMSIs listed. Whitelisting makes it possible to get only requested IMSIs to be produced in the output. The output is one subscriber U-plane CDR and either GTPv1 or GTP2 based C-plane record. Please note that internal 'GTPv1' and 'GTPv2' are supersets of the output C-plane CDRs.

6. CDR format

Cubro provides two CDRs, one or several for C-plane and one for the U-plane. By default the format is CSV, JSON or AVRO. Below you find examples of both C- and U-plane CDR in JSON format.

```
{
    "sessionInfoID": -1562282617,
    "siteID": 1,
    "msisdn": "991234567890",
    "imsi": "77701123456789",
    "imei": "387191100794179",
    "typeAllocationCode": "10228",
    "radioAccessType": "EUTRAN",
    "apn": [
        {
            "name": "operator.1020.mnc005.mcc232.gprs",
            "IPv4": "10.1.1.1",
            "IPv6": null,
            "ambrUp": null,
            "ambrDown": null,
            "QCI": null
        }
    ],
    "locationInfo": {
        "MCC": "777",
        "MNC": "01",
        "CGI": null,
        "SAI": null,
        "RAI": null,
        "TAC": 10228,
        "ECGI": {
            "eNodeB": 112164,
            "Cell": 11
        },
        "LAC": null
    }
}
```

```
{
    "siteID": 1,
    "flowID": 1650874860000,
    "timestamp": 1650874860000,
    "network": "IPv4",
    "transport": "udp",
    "classification": "Netflix",
    "group": "Streaming",
    "attributes": null,
    "resolution": 60,
    "counter": [
        {
            "sessionInfoReference": -1562282617,
            "offset": 14,
            "bytesUp": 0,
            "bytesDown": 59226,
            "packetsUp": 0,
            "packetsDown": 45,
            "retransmittedUp": null,
            "retransmittedDown": null
        },
        {
            "sessionInfoReference": -1562282617,
            "offset": 18,
            "bytesUp": 0,
            "bytesDown": 682564,
            "packetsUp": 0,
            "packetsDown": 476,
            "retransmittedUp": null,
            "retransmittedDown": null
        },

    ],
    "latency": null
}
```

Figure 5: Example of C-plane CDR (left), U-plane CDR (right)

7. Streaming based data transfer

Cubro's solution uses data streaming to provide an efficient and scalable solution for the monitoring systems. The solution creates Kafka topics written to a Kafka cluster. Inside the Kafka cluster the brokers provide the topics to the consumers. Open source version of Kafka is used. Kafka has several benefits such as high throughput, low latency, fault tolerance, scalability, and high concurrency to mention a few.

Earlier figure 4 shows Cubro's solution architecture. Kafka producer is located in the server indicated with number 4 in the same figure. Cubro expects customers to provide the Kafka cluster.

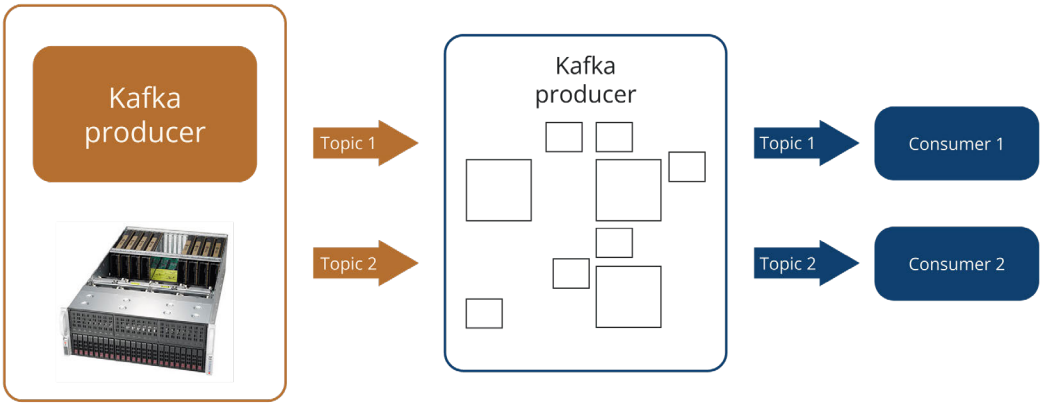

Figure 6: Kafka streaming

Earlier figure 3 shows Cubro's standard solution architecture. Kafka producer is located in the server indicated with number 4 in the same figure.

8. Summary

Omnia QM offers several benefits:

- **High Compression Ratio that results in significant cost saving:** Up to 1000:1 compression ratio means that if bandwidth is 1,000 Gbps with raw packets, the CDR based solution only requires 1Gbps. Cubro's solution reduces customer investment dramatically in the analytics and monitoring systems by lowering CAPEX.

- **Compact Hardware Design resulting in lower HW footprint:** Our advanced Cubro Omnic enables efficient traffic management with just one server, capable of handling 500 Gbps of traffic. The compact hardware design not only maximizes performance but also reduces power consumption, cooling requirements, and rack space. Experience lower CAPEX and OPEX with our streamlined solution.

- **Seamless Scalability:** Our solution offers excellent scalability without the need for additional rack space, as long as the 10 NIC limit is not reached. You can easily expand your capacity by adding another Omnic, enabling a "pay as you grow" approach.

- **Utilize Existing Infrastructure:** Our solution seamlessly integrates with your existing TAP and NPB infrastructure, such as the EXA64100 with packet slicing capability. This compatibility ensures a smooth transition and lowers your CAPEX by leveraging your current investments.