# NETWORK PERFORMANCE MANAGEMENT

*for 5G Healthcare Networks*

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## OVERVIEW

### *The Future of Healthcare using 5G Networks*

Cirries predicts that the global healthcare analytics market size will reach over 95 billion by 2030, growing at a CAGR of 15.3 from 2021 to 2030. Combining Artificial Intelligence (AI) Machine Learning (ML), IOT connected devices, and virtual care using 5G networks is going to lead to an absolute explosion in the kinds of healthcare experiences that will truly improve people's lives.

5G can improve the accessibility of high-resolution medical data, increase capacity for real-time high-definition video transmission, support for massive number of connected devices such as e-health wearables, robust mobility support, and support applications such as remote healthcare and precision medicine with the use of bio-connectivity, and remote robotic surgery. Checkups and medical visits can be done in the comfort of a home using low-cost connected IOT devices with high data throughput, low latency, and near real-time connectivity.

In bio-connectivity applications, the trend is to decentralize care, and provide care at home or on the move as in ambulances. Electronic medical records, and real time data analysis can enable predictive healthcare, as well as to provide individual pharmaceutical analysis. Remote tele-surgery can provide high quality healthcare regardless of location. The latest tele-robotic surgical systems, are equipped with auditory, visual, and tactile sensations, including the force or pressure felt while making an incision. It is critical for these remote systems to have the lowest latency possible and ensure the network performance meets the key performance indicators (KPIs) for a safe and effective procedure.

Mobile health (mHealth) can be defined as providing healthcare services such as remote monitoring, remote diagnosis, prevention, and treatment. The applications include support and assistance provided at a distance using ICT, such as fall alarms or reminders of medicine intake and the continuous monitoring of chronic conditions.

The data available because of 5G in the healthcare industry is set to improve patient care significantly as more and more patient data shifts to the digital world. Electronic Medical Records (EMRs) are increasingly moving online, and the deployment of medical imaging applications are also generating huge storage and network bandwidth needs.

## Why the Network Matters

The backbone of the system that must handle the ongoing data explosion is the underlying communication networks that handle the transfer of data and provide access to geographically dispersed users. These networks must ensure the constant availability of the data, meeting all compliance requirements, and providing off-site data storage backup and retrieval.

Healthcare organizations need to adopt a high bandwidth, low-latency network such as 5G to support the increase in digital health records and to enable accessibility from anywhere. Bandwidth-heavy applications add further to network demands. Such a network must be effectively programmed to prioritize the availability and transfer of traffic. Real-time telesurgery video and data, for example, must take precedence over less critical, non-clinical institutional network traffic.

Healthcare providers need 5G networks to define KPIs to specific applications and the set-up of Service Level Agreements (SLAs) for performance including latency, jitter, and packet loss rates. Data prioritization is also key for backup and disaster recovery for critical clinical systems.

The 5G network must work in conjunction with a secure Wi-Fi connection to maximize patient safety. Medical devices like infusion pumps, patient monitors or MRI/CT ultrasound scanners require a rigorous set of security protocols and continual connectivity. These devices continuously measure key parameters of a patient including blood pressure, heart rate, and respiratory rate so they need to be continuously connected to ensure accurate data and generate instant alerts. 5G can support Internet of things (IoT) devices using network slicing to separate critical sensors from other wireless functions.

This new world of healthcare will need infrastructure and performance management (NPM) software that can process data in real time. To that end, NPM/APM/DEM become critical to network uptime, traffic capacity planning and anomaly resolution.

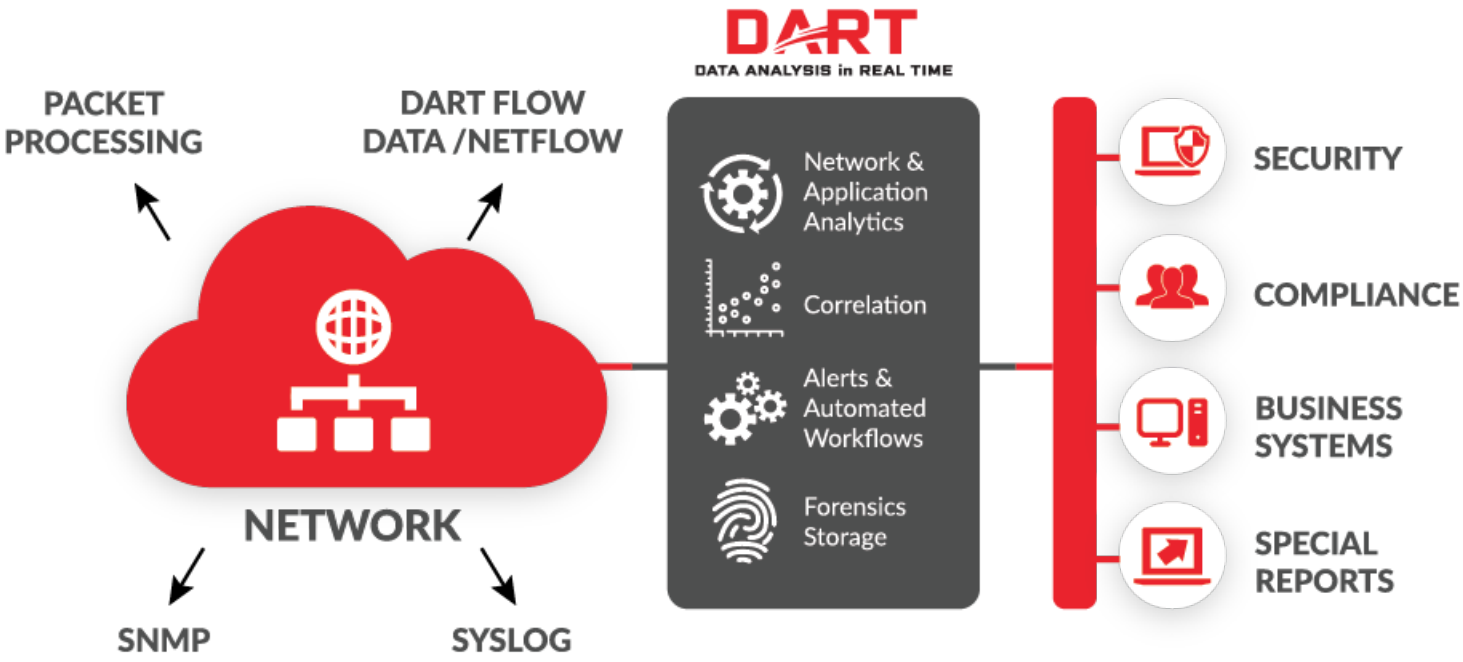
## DART Software is Perfect for Health Care Networks

Cirries DART (Data Analysis in Real Time) uses streaming network data to improve healthcare network experience, application performance, and to minimize capital expenditures.

It captures packets and metadata from the network for all sessions and then humanizes the data delivered as visual actionable metrics. The primary objective is always to efficiently deliver healthcare services, solve performance and threat issues faster, and mitigate risk more effectively than ever; maximizing the digital experience.

## The 4 Cornerstones of Data Analytics

Capturing all the network data is the only way to efficiently manage and protect your healthcare networks. The four cornerstones are illustrated below:



## Packet Processing

Cirries Packet Sensor provides on-demand packet recording, DART flow Data generation, and light packet brokering capabilities, including filtering, shunting, and load balancing to forward packets to other tool sets, i.e. security.

## DART Flow Data

Network flow or traffic is the amount of data being transmitted across a network over a specific period. Monitoring network flows is key to understand the typical behavior and performance of your network. DART provides flow generation to represent the traffic on the network for each session. Cirries Enriched Netflow capability exceeds traditional Netflow Generation and Analysis by first evaluating each and every packet in a flow, not sampled 1024:1 or higher by other Netflow Generators. This allows the ability to provide detailed metrics for each flow including latency and error conditions met along the flow path.

## SNMP Data

SNMP is an IP protocol to collect information about managed devices on IP networks. Devices that send SNMP data include cable modems, routers, switches, servers, workstations, printers, and more... Correlating this data with all the other data from your network is the key to finding erratic behavior or failures in network elements

## SYSLOG Data

Syslog is used by applications to send data about events, statuses, diagnostics, and more. Syslogs allows you to historically investigate incidents to determine and eliminate the root cause. As a result, it can eliminate the damage caused by similar future events thereby saving minutes or even hours of downtime.

## The Best NPM Solution for Healthcare Networks

DART network performance solution meets the following criteria needed for healthcare:

- **Scalability** – can grow as your healthcare network grows without limitations or replacement
- **Capturability** – can capture all your existing network protocols and data and all future protocols as you grow and evolve to a healthcare' architecture.
- **Virtual Sensors** - support nodes to join and leave virtual sensor networks, broadcasting and merging of networks.
- **Network Baseline** – captures network activity, establishes a baseline and alerts on anomalies
- Offline storage – able to download data to an external device for long-term analysis or regulatory requirements
- **Auto-Discovery** – identifies and discover network elements automatically and alerts when abnormal changes occur
- **Auto-Mapping** – geolocate your network locations on a map displayed on your start up screen using Lat and Long coordinates
- **Auto-Drill Down** – allows a location with an issue identified by a red icon on the map to be clickable to drill down to the root cause.
- **Workflows** – Eliminates manual investigation of anomalies by automatically investigate alarms and provide the most likely cause.
- **Machine Learning** – Uses machine learning to discover data trends not detectable otherwise.
- **Video QoE** – Monitors and alerts on video performance degradation
- **Application Performance** – Measures and reports performance metrics
- **Segment Breakout**- Discrete calculations for access latency, overall network latency, and application response.

## Implementation

DART can be deployed on physical servers, as virtual machines in a public cloud such as Amazon Web Services (AWS), or as virtual machines in a private cloud using KVM or VMware.

All the nodes can be deployed separately or combined in one or more nodes. Hybrid solutions, in which some components are physical servers and other components are virtual machines in the cloud, is also possible. Deployment as a combined node or as separate nodes is typically based on performance requirements or desired geographical topology.

Since DART is software only, a call to our technical team who will ask you a few simple questions on your network and advise on the requirements for your network deployment whether appliance-based, virtual or in the cloud. He will then provide a link for you to download the software. A quick start guide is available online and our technical team is available to assist with the download process and initial startup and then instruct you on how to get the most benefit from DART.

## Data Gathering

Network Dart Sensors allows you to monitor, capture, and assess the end-to-end network traffic moving throughout your physical and virtual healthcare environment. The benefits of network Dart sensors are:

- **Passive Monitoring** - Using a mirror port, network Test Access Point (TAP), or virtual switch/TAP, the network DART sensor only monitors copies of network packets. It does not impact the performance of your network.
- **Network Agnostic** - The network Dart sensor can passively analyze any environment that produces raw network traffic without the need for vendor-specific flow technologies.
- **Efficient Data Collection** - The networkDart sensor’s Deep Packet Inspection (DPI) engine generates distilled metadata, telemetry, and diagnostics from the packets it receives to provide actionable information in real time.
- **Ideal for Critical System Monitoring** - Due to its unobtrusive nature, the network Dart sensor is an ideal candidate to provide some network monitoring for coverage of critical systems.
- **Rapid Time to Value** - The network Dart sensors performs does not need specialized client software. No changes to your network are required. All you need to do is install the network Dart sensors package and connect your host machine to your traffic source to get instant visibility on network activity.

## Sensor Deployment

- Deploy sensors to monitor links to servers, server farms, and other critical network infrastructure.
- Gather data from infrastructure devices including packet brokers, load balancers, SD-WAN forwarders, and next generation firewalls.
- Leverage traffic mirroring from cloud service providers such as AWS, Google Cloud Platform, and Microsoft Azure to get visibility into cloud-hosted applications.
- Use Virtual sensors to gather data from cloud service providers such as AWS, Google Cloud Platform, and Microsoft Azure to get visibility into cloud-hosted applications.
- Deploy a Network Performance Management software platform such as Cirries DART to provide actionable insight into the data by providing dashboards that give you at-a-glance visibility into your network's underlying health and performance.
- Since you now have full visibility, quickly fix anomalies, eliminate congestion, and proactively manage usage to optimize and grow your network.
- Use Cirries Professional Services team to deploy and implement your NPM/APM/DEM platform and assist on site or remotely to create implementation plans, build your network specific dashboards and reports, review your network configuration and growth plans then suggest improvements to improve efficiency.

## Summary

DART provides a unique collection of next generation network tools for monitoring, securing, and traffic engineering your healthcare network to guarantee the best possible User Experience by maximizing network uptime and overall network performance.

Cirries' DART is a holistic network, user experience, and application performance monitoring software that provides complete visibility across physical, virtual, software-defined, and cloud network infrastructures. With a comprehensive set of network monitoring tools, DART tracks all network flows and application transactions across data centers and virtual environments, north-south and east-west. The result? All user experiences and all applications and server performances become known and visible to ensure quality of experience (QoE) across the organization.