5G DISSAGGREGATED NWDAF

NETWORK DATA

ANALYTICS FUNCTION

SAS provides the advanced analytical AI capabilities to address all major use cases across the life cycle of **planning**, **designing**, **building** and **operating** a telecommunication **network** to optimize investments and maximize **quality**.

DigitalRoute enables **self-sufficiency** and centralized data collection in a multi-vendor landscape by **supporting** complex event processing, including handling of massive data volumes and sophisticated aggregation to reduce raw volume of **data**, spanning across multiple **network** generations.

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NWDAF, a new framework for the future of network automation

SAS is a recognized leader by analysts in AI/ML and data management with scalable, flexible, and transparent solutions.

What is NWDAF?

Network Data Analytics Function (NWDAF) is a 3GPP Data Analytics Framework standard, and part of 5G System Architecture which defines a set of protocols and interfaces to support machine learning (ML) and artificial intelligence (AI) in 5G network systems. 5G networks are complex systems and NWDAF's goal is to improve systems efficiencies. Improvement could be to automatically handle network systems failures, optimize network and third party applications' performance, improve overall customer experience and optimize network resources allocation.

Why SAS & DigitalRoute for NWDAF?

Throughout the 3GPP NWDAF releases, the use cases are constantly growing. It's important for Communications Service Providers (CSP) to choose the right partner providing a low code / no code AI & ML platform, allowing the flexibility of adding new use cases, as NWDAF will continue to evolve. Relying on any vendor to add them, or open-source technology and community can lead to vendor lock-in and long delivery cycles. In addition, it's important to have an analytics lifecycle management solution (Model Ops), to handle the large number of use cases and data volumes on a carrier-grade quality level.

We are frontrunners and experts in our respective areas, with extensive experience in building revenue and operational solutions for telecoms, that now include NWDAF and automated operations. We understand the value and difference a flexible, vendor-agnostic, and easily configured solution provides to the bottom line. Our disaggregated NWDAF doesn't only include best-of-breed from a data and advanced analytics perspective but also from a data repository and messaging framework perspective enabling CSPs to leverage already made investments in the area of network operations.

SAS/DR NWDAF - Beyond the Standard Solution

DR/SAS NWDAF solution has as mentioned already been used for high-volume Network Analytics and Service Assurance for decades – but it has also been used for revenue management and below the line marketing purpose. So the DR/SAS solution will not only bring you the best of breed solution for the basic purpose NWDAF namely "Closed loop service assurance automation", but is also natively built for supporting your business analytics and revenue management in order to monetize on top of exceptional experience that NWDAF brings.

DR/SAS NWDAF solution doesn't only natively support you to deliver an unwitnessed service experience but it also natively gives you the means to capitalize on other non-5G SA core network or 3GPP defined use cases – this is unique on the market.

Why Disaggregated NWDAF?

Reduced TCO
• Leverage existing investments in storage, messaging frameworks and analytics

Openness
• Not tied to specific product releases, CRs etc.
• Support use cases beyond 3GPP and network analytics (e.g. enterprise analytics)

Best of Breed
• Best of breed data collection, storage and analytics layers
• Compliant to R17 3GPP architecture

Convergence
• The same platform can also be used to support legacy network architectures including 3G/4G/Fixed

NWDAF's AI and Advanced Analytics

3GPP has defined so far (release 17), several use cases spanning across the categories of UE related analytics, service experience analytics, and load and performance analytics. The consumers of these different analytic services can be internal or external to the service operator's environment.

An example of an external consumer could be the use of UE related analytics such as UE mobility patterns for a 3rd party application function (AF) that for instance controls drones or delivery robots. These UE mobility patterns could be used by the 3rd party AF not only to run the actual service but can also be used as input for AI/ML to optimize the application service. This is also a typical example of how service operators not only can offer analytics to external consumers but also a great monetization opportunity for selling analytics-as-a-service (AaaS).

An example of an internal consumer of analytics services is the Slice Load Level Analytics. In this use case, NWDAF provides real time insights to a slice orchestrator regarding the CPU and memory load of a specific slice for the slice orchestrator to react accordingly and take decisions about a potential scaling-out event.

How does NWDAF work? What are the functions of the solutions?

NWDAF is a key enabler for streamlining, generating insights and taking actions on how 5G core network data is produced and consumed, in order to enhance end-user experience.

Applying ML, and AI in 5G network systems offers a great opportunity to realize these improvements and insights. Network functions (NFs) request NWDAF to calculate either statistics or predictions on the available data. The 3GPP defines these standard interfaces so NFs can obtain data analytics predictions and statistics from historical and streaming data.

The integrated DigitalRoute and SAS NWDAF solution provides the full lifecycle from data extraction and management to analytical model development and governance, to intelligent decisioning and direction. DigitalRoute and SAS NWDAF supports:

• Integration to the 5G Core SBA
• Integration to the 5G NFs through the Event Exposure APIs
• Integration to O&M through the generic performance assurance and fault supervision management services
• ML inference services or insights to any type of Analytics consumer
• Analytics exposure through Event Subscription and Analytics Info APIs
• Integrate to existing data repositories (data lakes) and messaging frameworks to leverage already-made investments

Solution Functions:

The DigitalRoute and SAS NWDAF solution collects the required data to be analysed from 5G network systems via the Data Coordination and Collection Function (DCCF). It interfaces with connectors and APIs and streams data in real-time by means of a Messaging Framework Adapter Function (MFAF) and uses connectors to Kafka or RabbitMQ message brokers.

At the core of the NWDAF framework we have the Analytical Logical Function (AnLF) whose main responsibility is to determine predictions and statistics for a use case. Each use case NF is identified by a unique ID and managed by the AnLF. The solution determines the most optimal ML algorithm to analyse incoming new streaming data or historical stored data in the Analytical Data Repository Function (ADRF). Once the machine learning model is trained, it is deployed by the Model Training Logical Function (MTLF) into production. The MTLF is also responsible to monitor the model performance. As data changes, models degrade and data drifts, a new model retraining would be required. Model Serving provides the runtime to deploy the model at the edge.

Solution architecture and use cases it should cover as per 3GPP release 17

SAS & DigitalRoute NWDAF Functional Description
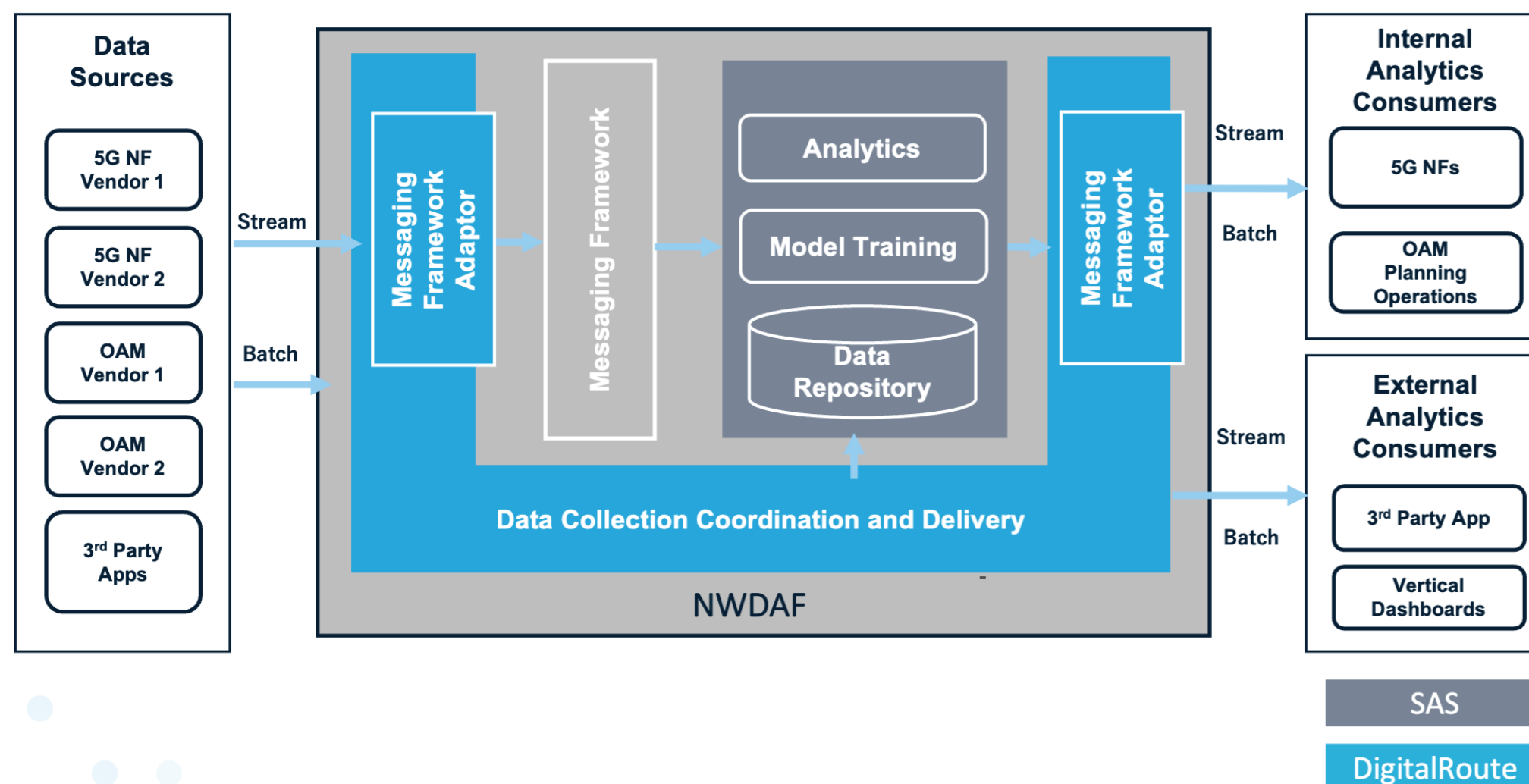
3GPP Use-cases

1. Slice load level analytics
2. Observed Service Experience
3. NF load analytics
4. Network Performance analytics
5. UE Mobility analytics
6. UE Communication analytics
7. User Data Congestion analytics
8. QoS Sustainability analytics
9. Dispersion analytics
10. DN Performance analytics
11. WLAN Performance analytics
12. Session Management congestion control
13. Redundant Transmission Experience
14. Abnormal behavior
15. User data congestion

| 1 | NWDAF, A NEW FRAMEWORK FOR THE FUTURE | 2 | NWDAF, THE GATEWAY TO DIGITAL SERVICES | 3 | A NATURAL FRAMEWORK FOR SAS AND DIGITALROUTE |

Key Proven Industry Leading Capabilities

SAS has focused its investments and efforts on innovation and decision-making. Over the past three years, SAS has committed $1 billion to AI through software innovation and expert services, among other areas, to refine the components of AI that include advanced analytics, machine learning, deep learning, natural language processing, and computer vision.

DigitalRoute collects and processes any type of data from any system in real-time. DigitalRoute provides multiple data management steps to turn raw data into useful information. Data is normalized and transformed into a consistent and usable format. Data quality steps clean and correct data. Data is combined, aggregated, evaluated and enriched with other data sources.
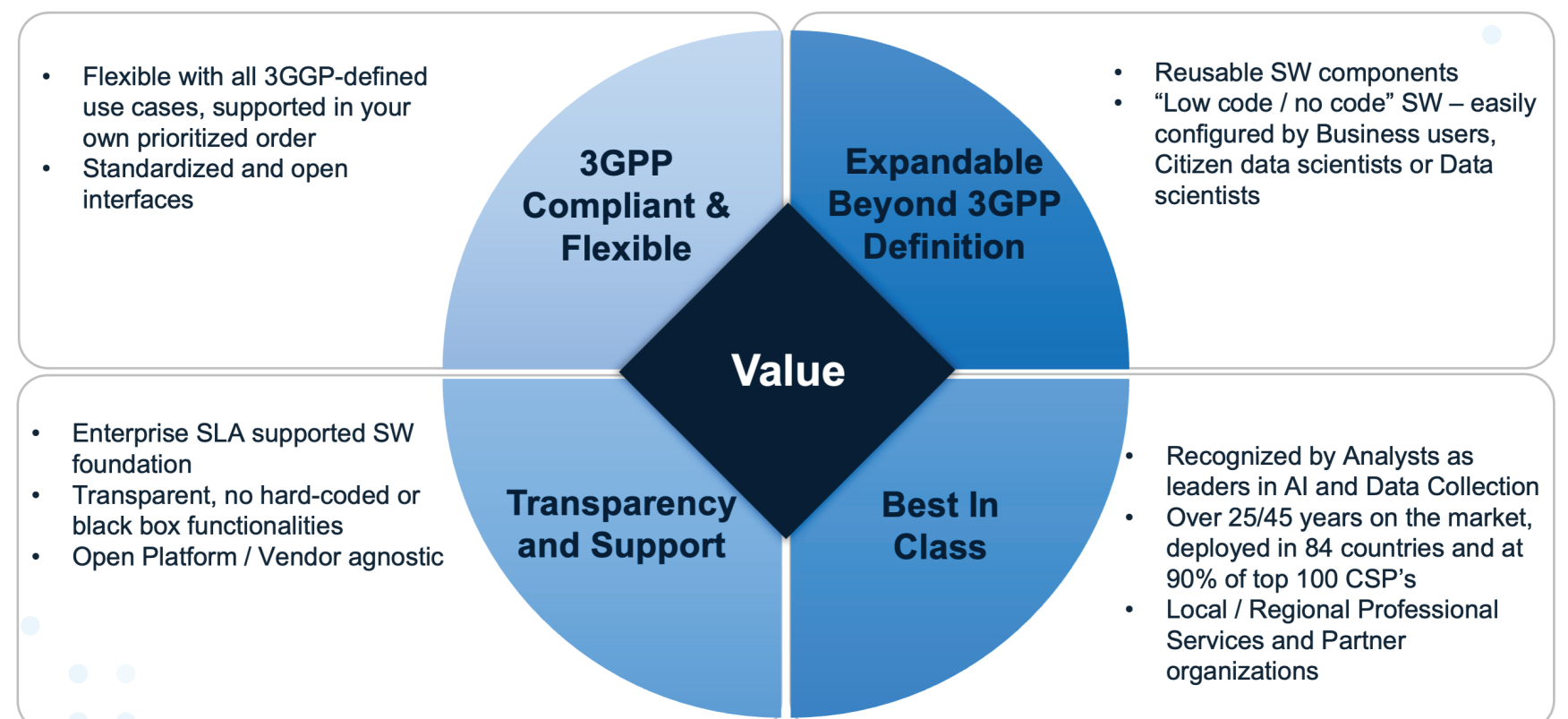
SAS then provides the advanced analytics, enabling algorithmic selection, model training, model monitoring, model deployment, and intelligent decisioning. Automation in model deployment is enabled with auto-tuning and hyperparameter selection. SAS can update models seamlessly as the data changes in real-time at the edge.

Value of our Integrated Solution

This integrated solution not only helps CSPs introduce intelligent automation quickly, but also ensures that all decisions are auditable and explainable—earning the confidence of customers, employees, and regulators. The solution also follows TM Forum Open Digital Architecture (ODA) approach, as a standardized and reusable architectural component.

Value of our Disaggregated NWDAF

Deep expertise in network data consumption and transformation combined with flexible, automated advanced analytics will accelerate your insights on network performance

3GPP Compliant & Flexible
- Flexible with all 3GGP-defined use cases, supported in your own prioritized order
- Standardized and open interfaces

Expandable Beyond 3GPP Definition
- Reusable SW components
- "Low code / no code" SW – easily configured by Business users, Citizen data scientists or Data scientists

Transparency and Support
- Enterprise SLA supported SW foundation
- Transparent, no hard-coded or black box functionalities
- Open Platform / Vendor agnostic

Best In Class
- Recognized by Analysts as leaders in AI and Data Collection
- Over 25/45 years on the market, deployed in 84 countries and at 90% of top 100 CSP's
- Local / Regional Professional Services and Partner organizations

Value

1 NWDAF, A NEW FRAMEWORK FOR THE FUTURE

2 NWDAF, THE GATEWAY TO DIGITAL SERVICES

3 A NATURAL FRAMEWORK FOR SAS AND DIGITALROUTE

SAS and DigitalRoute Qualifications and Contact

Optimize and improve network systems with Artificial Intelligence and Machine Learning.

SAS has been the only company in the Leaders segment of the Gartner Magic Quadrant for Data Science and Machine Learning for 8 years in a row. In addition, a Leader in Forrester's Enterprise Insights Platform wave and IDC's AI & Advanced Analytics Worldwide AI Software Platforms Market Shares.

• SAS has 45 years in advanced Analytics (AI&ML) and DigitalRoute has 25 years in transactional data processing with tangible business outcomes in the CSP network domain.

• Over 700 Telecom and Media companies in 84 countries rely on SAS or DigitalRoute systems.

• 90% of the top 100 Global Telecom providers use SAS with a 96% customer retention rate.

To learn more about how SAS and DigitalRoute can help you see beyond the hype and realise the full potential of NWDAF, reach out to us today: SAS at **sas.com** or visit **https://www.sas.com/en_us/industry/telecom-media-technology-analytics.html**

Digital route: https://www.digitalroute.com/contact/
Telecommunications solutions: https://www.digitalroute.com/solutions/telecommunications/

3GPP Use Case Outcomes and Experience

- Increased forecast accuracy resulting in CapEx savings of $22 MM (5% of budget)
- Proven real-time scalability with 1 million transactions per second
- Improved fault predictions with analytics: Reduced unnecessary truck rolls by 25%
- Service Quality related churn rate dropped by 17%
- 10 - 20% savings by avoiding unnecessary capacity upgrades on RAN Network

Network Planning — Optimize CapEx	Network Operations — Grow Revenue
• Network Access Planning Forecasting • Network Transport Planning Forecasting • Network Traffic Forecasting* • ARPU Cell Tower Identification • 5G Small Cell deployment Optimization • Private MEC deployment Optimization	• Network Anomaly Identification and Prediction* • Network Predictive Maintenance* • Network Fault Prediction and Management* • Network Traffic Analysis, Classification and Management* • Network Performance Optimization* • Network Energy Consumption Optimization • 5G Network Slicing Monitoring and Optimization*
Customer Experience — Optimize CapEx	**Network Service Assurance — Grow Revenue**
• e2e Customer Satisfaction Index* • Customer Experience Monitoring in real-time* • Customer Micro-segmentation • Customer Experience QoS Prediction*	• e2e Global Quality of Service (QoS)* • Root Cause Analysis (RCA) • Network Process Improvement • Network Provisioning Order fulfillment Analysis • Network Performance Monitoring and

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Apply analytics to every step of the customer journey
to improve operations and customer experience.

> **SAS for Network Analytics**

DigitalRoute

DigitalRoute for OSS

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