Beyond the network operations and customer experience functions, regulatory mandates and corporate financial accountability processes demand an accurate understanding of which assets are deployed where and for what purpose. Functions such as assets in service, asset depreciation, and spares inventory are crucial to meeting the accountability needed for accurate business management.

Asset management concerns are an issue for communications service providers with physical assets, with hosted network service providers, communications platform-as-a-service (CPaaS) providers, and mobile virtual network operators (MVNOs), wholesale connectivity providers, operations support systems (OSS) vendors, and business support systems (BSS) suppliers. A universal structure for identifying the equipment in operation today, who owns the equipment or virtualized functions, the location of physical assets, the placement of virtual assets for those with a need to know, and the type of functionality delivered by each item is a real necessity, particularly as partner ecosystems and 5G network technology move to center stage.

Why I

asset, such as a 5G antenna or cloud service, is physically located. CLLI codes are equally valuable in identifying partner-

and the overall level of generated revenue from those assets. For many, these factors must be reported on a regular and timely basis per specific general accounting, regulatory reporting, and financial reporting mandates. Accomplishing such reporting requires an automated approach for bringing operational insight from the network to the business office. Some of the more significant asset management and reporting needs addressed by a Common Language code strategy are:

- Identify and reduce or eliminate unwanted or duplicate assets.
- Align purchasing, procurement, inventory, and operations management.
- Optimize available inventory and the spare installed base.
- Standardize means for showing what assets are located where for financial audits.
- Maintain compliance with regulatory, insurance, securities reporting, and accounting requirements.
- Combat fraud and theft by monitoring the actual location of assets.
- Ascertain the value of assets at different stages of their life cycle, especially given that different assets have different useful lives and regulatory-defined depreciation schedules that do not align with business tax depreciation definitions.
- Eliminate unnecessary maintenance costs by accurate warranty monitoring and product change notice tracking.
- Recover stranded assets.
- Provide data for service cost calculations such as equity-asset ratio for the company, average margin per user, cost per gross addition of customers, opex per network site, revenue per mobile cell site, and a host of others.
- Accurately account for assets during the valuation process for mergers, acquisitions, and the sale of select assets.

Simplification, beyond the process of communicating essential data and parameter settings between network management systems and digital/physical network infrastructure, needs common nomenclature to aid other business functions, especially financial reporting. While only a few parts of financial management are noted in this paper, there are others such as positioning with federal, state, and local regulators for equipment valuations and right-of-way needs along with codevelopment of business solutions involving the latest network technology. In each case, and countless others, timely reporting of financial events by the global service provider community would not be practical without using some type of common naming strategy, especially as software-based network functions grow.

Market Trends Within the Evolving Communications Industry

The global communications services industry is going through unprecedented change, led by 5G network technology and iav

revenue is collected. Most importantly, the inner workings of all network resource functions need guidance through the right business processes via properly vetted identification.

Changes needed in support of 5G service deployments involve additional business and service management factors that are advancing through various degrees of maturity. These factors are now combining with advances from 5G network technology to create additional stress on existing systems, thereby requiring evolved ways to satisfy 5G service concerns. Some of these factors are:

- Building out the telco cloud (core access near edge) and in combining it within an MEC service architecture, where edge is defined by cloud functions and industry (e.g., private networks, mobile advertising, IoT, mobile health, real-time patient procedure analysis, drones, gaming, fleet management, augmented reality/virtual reality, collaborative robotics, smart retail, agriculture, and a growing list of others)
- Establishing VNF/CNF/PNF service-level orchestration within the same network resource assignment (In addition, VNF/CNF license management and SLA commitment aligned with network capability via slice management.)
- Transforming business and operations management processes to a digital services approach from the cloudification of OSS/BSS functions using secure and containerized microservices
- Establishing partner ecosystems to deliver higher value to customers (e.g., solutions to problems rather than just a network connection)
- Changing the connectivity service construct through B2C, B2B, and B2B2X business models with the associated influences that come from multipartner service arrangements (These include partner onboarding and revenue remuneration for partner contributions to E2E solutions – for example, enterprises selling services instead of products [B2B2X].)
- Engaging with multiple business models within the same service offering to dynamically support different schema for real-time charging based on traditional and nontraditional usage factors, initializing real-time assurance tied to various network operations parameters and revenue collection tied to SLA management

Each of the aforementioned factors plays a different role in how communications service providers can

customer experience management. In addition, systematic identification of the thousands to potentially millions of new network connectivity points from IoT deployments is strategically necessary to the owners of such devices and to the communications service providers delivering connectivity. Identification of geographic location and functionality type is critical to the connectivity path, regardless if this path is served from fixed broadband, fixed wireless, or mobile access assets.

In cases deploying additional technology, such as MEC, several customer edge instances are needed to satisfy latency requirements. Edges are varied in purpose according to industry focus, and they offer levels of interaction according to E2E solution needs. Multiple operations and monetization systems may need to be instantiated, especially billing and assurance systems that will communicate and synchronize with core system deployments for E2E accountability. For example, automated service assurance can make a difference in how successful complex 5G and MEC services will be accepted by the market, especially when partner contributions are involved. The same applies with network slices – one or more virtual customized network configurations, each sharing a common physical infrastructure – which could number into the hundreds for certain situations and business conditions.

Some of the operations and monetization systems challenges in a 5G/MEC environment are:

- How will system-to-system synchronization be accomplished?
- How will data integrity be managed and maintained for the solution components that define each service?
- How will solution components be recognized by other business or operations functions?
- How will contributing resources from a communications service provider and each of its partners be uniquely identified and tagged for usage?
- How can the pain points with multipartner service definitions, either from multiple systems instances or from multiple network slices, be minimized?
- How will revenue flow from customers to the service manager if a service meets SLA requirements?
- How will partner contributions to each service be identified and anticipated compensation be calculated for settlement based on resource consumption levels and contract definitions?
- How will partner-provided digital resources be accounted for and weighed against usage dimensions? What changes if resources are physical items rather than digital ones?
- If SLA conditions are not met, how will credits flow (if any) to customers and penalties be applied to the offending resources if partner supplied?

For these situations and likely others, Common Language provides a means whereby assets are easily identified and accounted for, regardless of the business function involved.

Example 2: Virtualized Network Function License Management

Physical assets such as network nodes, switches, routers, and other types of network components are becoming "virtualized." The functionality that defines the operational uniqueness of these devices was previously embedded in the firmware contained as part of the network hardware design. Organizations bought computing and network functionality "boxes." Now, the box functionality is separated into software code containing VNFs and CNFs that run on generic computing hardware. The benefit of this separation has always been pitched as a cost saving, but more importantly, it means the network is able to scale elastically in short order (minutes) rather than the extended weeks and sometimes

months that a network capacity expansion project took using purpose-built devices. It also means there are several parameters that must be accounted for from an asset and inventory perspective.

Keeping track physically, logically, and logistically of each VNF and CNF is essential for ongoing business management – p

Will permissions be driven by functional type, developer name, or business intent of the purchaser (e.g., communications service provider versus cloud services provider versus other)?

Can software developers impose the use of multiple agreements for the sale of a VNF/CNF license based on functionality type or will a general agreement suffice if VNFs/CNFs from the same supplier are individually identified?

How will the resolution of this issue be conveyed to whatever systems must keep track of license assignments?

Can usage term limits of a VNF/CNF license be imposed based on functional type of VNF/CNF or a developer organization?

How can a VNF/CNF from a specific supplier be uniquely identified and how will the software license exist based on a customer's intended software architecture (e.g., node assignment)?

To understand service usage profitability, how will VNF/CNF deployment and revenue settlement be compared, especially when IoT solutions can theoretically consume large quantities of VNF and CNF licenses?

5G/MEC not only increases solution delivery complexity, but IDC believes this architecture will be the way in which critical business solutions involving both connectivity and partner-provided capabilities will be deployed to all enterprise customers in the weeks and months ahead. In this environment, traditional communications service provider roles are changed as connectivity becomes only part of an E2E solution to evolving business problems.

Unlike physical components, VNF/CNF software will need to be tracked and traced more closely than physical components, which must include stipulations on how a VNF/CNF license can be used, exchanged, updated, or modified. Without a commonly defined means for identifying what components are deployed where, IDC believes that a resource accountability challenge will reach astronomical proportions.

Example 3: Partner Ecosystem Management and Accountability

5G business solutions are a technology play that solves problems centered on ultralow latency, heavy bandwidth, and high-capacity volume loads along with mobile edge computing capabilities configured to meet personalized customer connectivity needs. Tunable contributions of these network attributes will play out eventually as personalized slices of network functionality when the full technology set for 5G network slicing is delivered to the industry from the 3GPP R17 standards process. Currently, R17 is rescheduled for release in late 2021, but will likely change again due to implications from the COVID-19 global pandemic.

5G solutions involve a customer and services play that works by using the strengths of multiple partners. Several operating examples engage partners that ultimately take on a substantial role in the 5G "solutions" designed to bring increased value to the customer experience. Often there will be a network part, a partner-provided edge device, and the unique software contribution of an app development partner with critical domain expertise pertinent to the business challenges addressed.

Tough operational challenges are more easily addressable if the components from contributing partners follow a common nomenclature. In this environment, complexity abounds from:

Implementing the right connectivity option for the type of business solution needed

Provisioning and activating the solution, which can dynamically change at any time

If a partner contribution is the cause of fault, how will refunds be applied to the end customer and what definition of proof is needed to support negative payments by the communications service provider to the partner at fault?

How can communications service providers

About IDC

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