FUJITSU

Technology Brief
The Virtuora® Ecosystem

Integrated software for virtualized, programmable networks

Expanding 5G adoption and the growing maturity of the Internet of Things are reaching into and changing every corner of the digital world. A growing number of connectivity-aware applications are beginning to generate and exchange vast quantities of data and information securely, freely and continuously among numerous endpoints. In this hyperconnected world, digital technology is more focused on people, and standardized services are replaced by new types of offerings that run the complete cycle of value creation. This is the foundation of the digital co-creation economy.

Connect, Control, Collect, Exchange
In this new digital economy, the connection-aware applications and microservices that control, collect, and analyze data also transform that data into valuable information, going beyond mere transactions into personal digital experiences. Throughout this value creation cycle, connected services are continuously learning from incoming data and adding intelligence to produce constantly tuned business and customer outcomes. Underpinning this fundamental transformation is the digital arena, an environment in which the customer's IT infrastructure is extended into the cloud and value is vested in individualized benefits and experiences that are co-created among service providers, their ecosystem partners, and end customers.

From Passive Pipes to Conscious Connections
This is the future vision. But bringing that vision into reality requires deep change to the communications network. Today's networks are still, essentially, "dumb pipes" passively carrying traffic to and from the cloud. But their time has passed; the network and cloud computing infrastructures are fusing to enable secure handoffs of meaningful and sophisticated information. Consequently, Information Technology (IT) and Communications Technology (CT) must do more than coexist; they must unite into the automated, conscious network able to support the digital arena.

### An Architecture for the Modern Network
Today, network operators and service providers employ a patchwork of tools and systems as they design, build, operate and maintain their networks. Not all of these tools and systems are capable of interoperating or even exchanging data with each other. There is a widespread lack of optimization among network layers and vendors. Resources are inefficiently utilized. As-built networks frequently do not conform to the originally planned design. Complex processes bog down every stage of the network and service lifecycle. A holistic approach is urgently needed if lucrative virtualized capabilities such as bandwidth on demand and network slicing are to become a reality.

A Total Network Vision, Powered by the Virtuora Ecosystem
The Virtuora Ecosystem unifies control and management of the network stack, unravels the complexity, and enables powerful functionality that includes physical as well as virtual network equipment. Virtuora products are part of the Fujitsu hybrid CT/IT infrastructure, expanding the reach, productivity, and value of the communications network within the overall enterprise.

Virtuora actualizes a total vision of a flexible, programmable, automated network that brings together service providers, network operators, vendors and customers to co-create a multilayer, multivendor connection and control environment. Virtuora envisions a network built around software paradigms rather than the hardware-constrained approach that predominates today.

Extending the Capabilities and Value of the Network
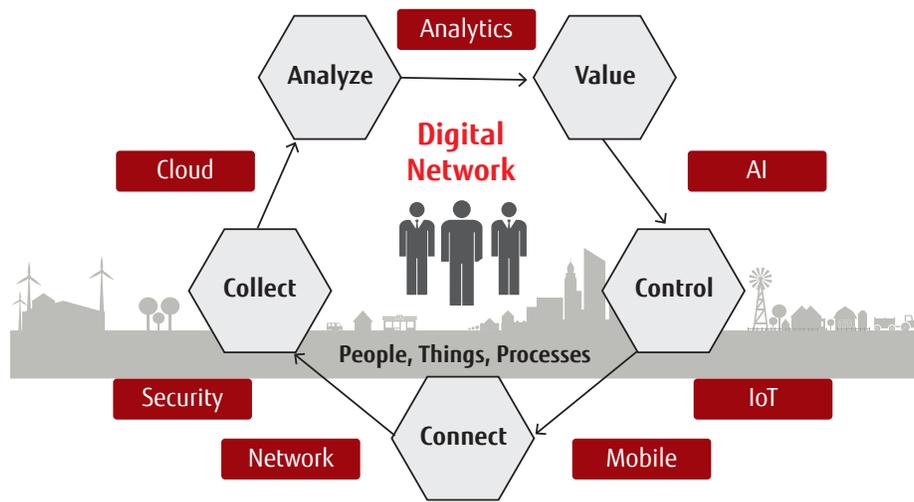
Managing the modern network in a hyper-connected world

Virtuora Ecosystem Highlights

The Virtuora Ecosystem is an adaptable, modular collection of integrated software products for implementing virtualized, programmable network solutions. Virtuora is based on open-source technologies to facilitate comprehensive, customized, multivendor solutions.

Virtuora software solutions enable end-to-end operational automation, service orchestration, and programmability. The suite is a foundation for resilient, self-healing networks that make full use of resources and support even the highest performance demands or latency-sensitive applications. The Virtuora Ecosystem encompasses SDN control, NFV orchestration, and virtual infrastructure management, in addition to the functions of planning, design, management, service fulfillment, and performance assurance on the physical network.

Virtuora Ecosystem Components

The Virtuora Ecosystem encompasses several functional domains that include software-defined network control, network and element management, orchestration, service lifecycle management, back office support, analytics, and virtual network functions (VNFs).

Network Control Solution

- **Virtuora Network Controller** – Provides SDN network control and connects southbound network elements to northbound applications, enabling intelligent resource discovery, service provisioning, multilayer path computation, network management, planning and design, and API-driven network automation
- **Virtuora WDM Control** – Automates services, including wavelength design and activation, and provides dynamic optical reach verification
- **Virtuora OTN Control** – Automates wavelength partitioning and bandwidth virtualization within a wavelength, in addition to providing protection and restoration

Built for Integration and Interoperability

- **Virtuora Packet Control** – Provides service lifecycle management, including automated Ethernet provisioning, foundational Layer 2/3 enablement, and drivers for critical packet devices
- **Virtuora Planning & Design** – A comprehensive network design, planning, and inventory solution with data analysis and reporting tools that aid in network planning, installation, provision, and maintenance

Network and Element Management

- **Virtuora Network Management** – Tunes and optimizes network elements to proactively prepare for, and even prevent, performance degradations in the network. Includes:
- **Multivendor management support** for Fujitsu FLASHWAVE®, 1FINITY™ and third-party devices
  - Automated performance optimization of network elements
  - Optimized service delivery in complex networks
  - Data-driven alarm and fault management and correlation
  - Network-wide visualization of topology, network element configuration, and individual shelves

- **NetACE** – Provides software-defined networking for legacy network gear, real time multivendor and service lifecycle management, as well as ultrafast onboarding of new services, vendors and technologies

Digital Infrastructure and OSS Integration

- **Virtuora Service Activator** – Orchestrates and manages the delivery and modification of hybrid networks and services, provides cross-domain orchestration to multivendor solution components, and includes flexible workflows and integration:
  - Agile fulfillment for physical and virtual devices
  - Flexible framework for service automation
  - Cloud security and automation
  - Self-adaptive security
  - SD-WAN end-to-end service orchestration over hybrid architecture
  - Virtualized services overlay orchestration

- **vSure® Service Assurance** – Provides integrated fault and performance management, multilayer fault correlation, and customized dashboard views.
  - Delivers complete next-generation visualization of physical, virtual, and service-level assets
  - Visualizes multiple domains and network segments
  - Includes comprehensive, multidiscipline device support

- **Fujitsu MicroApplications** – Containerized functions built on an open-source, collaborative framework

Analytics
- Conscious networking
- Trusted exchange of information between clouds

Building the Path Forward: A Shared Challenge
The digital economy, by nature, is based on the potential and promise of the open philosophy and its technology, APIs and architectures. The Fujitsu software solutions portfolio has been built to take full advantage of agile software architectures and open technologies, while supporting the useful lifespan of legacy systems. Through our unified approach to the network lifecycle and our commitment to co-creation and continuous improvement, we can enable a common language among technologies and networks, as well as operationalizing automation. The Virtuora ecosystem helps network operators develop sustainable business models with strong organizational capabilities for fast innovation and adoption, putting customizable, flexible technology to work providing network products and solutions built for integration and interoperation.

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