SOFTWARE DEFINED NETWORKS FOR MORE SECURE AND ROBUST NETWORKING

Every day, more business and commercial functions are being digitized and deployed at remote locations. As a result, the organizations that rely on these services need network architectures that give them both control and flexibility.

From manufacturing to retail and healthcare to transportation, operations teams in competitive industries are looking for ways to secure and scale their distributed networks. Commercial cellular routers are supporting more Internet of Things (IoT) applications every day, including in-store kiosks, factory-floor sensors, industrial equipment, transportation and more.

When a cellular connection fails, the consequences can be costly and even dangerous, and operations teams need to be able to readily identify and respond when their routers — or the devices they support — unexpectedly go offline. **Software-defined networking (SDN)** features have become key for modernizing network architecture for better reliability, improved security and lower operational costs.[1]

In contrast with traditional networking architectures, SDN allows organizations to improve operations in multiple ways:[2]

- **Reliability of critical network connections at remote sites**
- **Visibility, security and control over network traffic**
- **Management of distributed, often hard-to-reach commercial routers**

Enhancing the performance and scalability of the cellular routers organizations depend on can increase revenue opportunities and significantly reduce operations costs. To use SDN effectively to achieve these results, organizations have several challenges to overcome.

Challenges of Operating Cellular Routers at Remote Sites

Maintaining widely distributed fleets of IoT devices and routers can be unfeasible without built-in software solutions that allow remote connectivity testing. Unfortunately, most routers used today have a limited set of connectivity testing options.

Even among those devices that do support connectivity testing, the software may only detect an upstream outage or a cut connection, but little else. This is not useful for many commercial use cases, especially when routers are deployed at remote sites where they can be difficult to access.

Commercial routers need to support the ability to test and automatically recover connections in the event of an outage.

Cellular routers can be deployed at remote sites like oil rigs, transportation fleets, retail checkouts and free-standing ATMs or kiosks where onsite recovery is virtually impossible or cost prohibitive.

Enabling connection validation and resetting or rebooting capabilities protects against costly downtime and eliminates the need for pre-configuration, onsite support or truck rolls. Additionally, having to manage connections from multiple carriers across various sites and models of cellular routers can add logistical and security challenges when managing devices connected over cellular networks.

To support this level of connection validation and automated recovery, organizations need commercial routers that will allow them to take full advantage of the benefits of SDN.

Benefits of Software-Defined Networking for Commercial Use Cases

Today's enterprise organizations need SDN capabilities to manage and safeguard Internet traffic connecting critical digital services via commercial routers deployed at remote sites.[3] With SDN-enabled commercial routers, organizations can:

- **Improve network control and management by separating the application layer, the control layer and the infrastructure layer.**
- **Achieve the security and reliability needed for smart public transportation, supply chain management, traffic management and environmental monitoring.**
- **Simplify network operations, reducing the need for manual maintenance for commercial routers and allowing teams to focus on high-value work.**
- **Increase visibility over distributed networks and connected devices deployed at remote sites.**

[1] Open Networking Foundation, "Software-Defined Networking: The New Norm for Networks"

[2] Business Wire, "Worldwide Scalable Software Defined Networking Industry to 2026"

[3] Enterprise Storage Forum, "The Software-Defined Networking (SDN) Market in 2022"

4 Critical Capabilities for High-Performance Cellular Routers

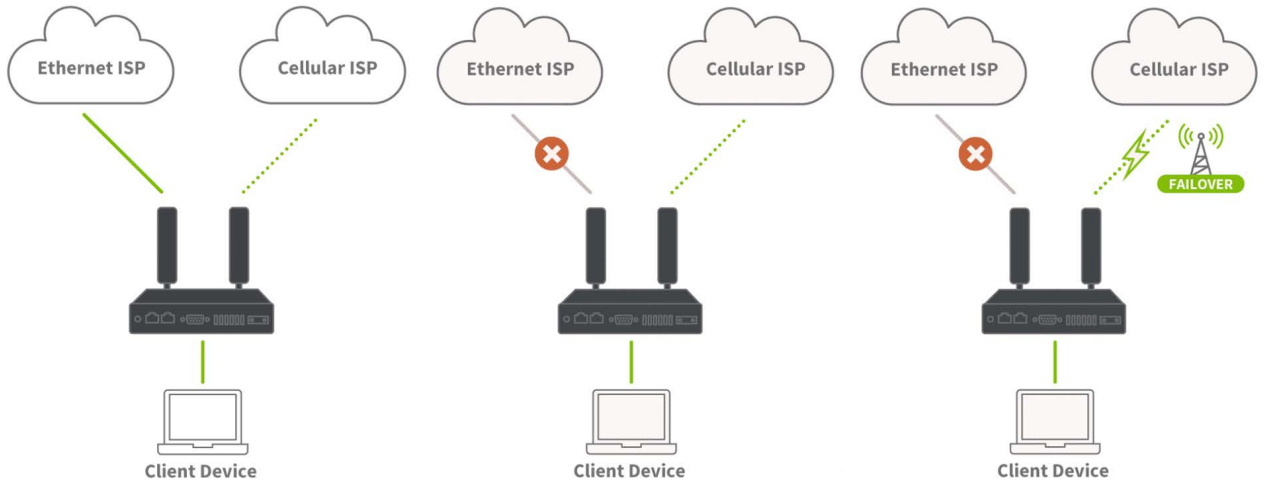
Many data-driven use cases that commercial or government organizations are targeting today require a combination of speed, stability and flexibility that traditional networking often fails to deliver. With high-performance commercial routers that offer reliability and customization — while supporting automation and intelligence — organizations in manufacturing, healthcare, retail and city planning can use SDN capabilities to streamline and scale network management.

1. Achieving Reliability with Distributed Networks

Robust commercial router connectivity requires capabilities that prevent downtime, which can threaten safety or result in lost revenue or productivity. Organizations relying on data-driven digital services need cellular router connectivity that supports reliability even under adverse conditions that their IoT and edge computing use cases demand.

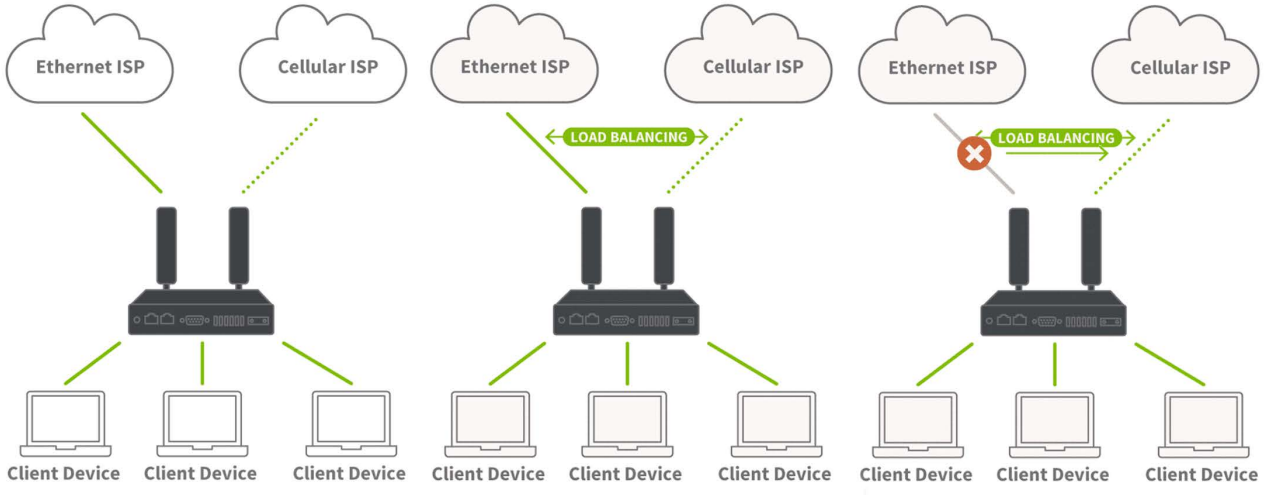
WAN Failover

WAN failover is one of the most common commercial router setups found in offices, work-from-home environments and public transportation vehicles. In this arrangement, a single router handles multiple Internet connections and provides connectivity to client devices on site. When that connection fails validation testing, the traffic is rerouted to another cellular router.



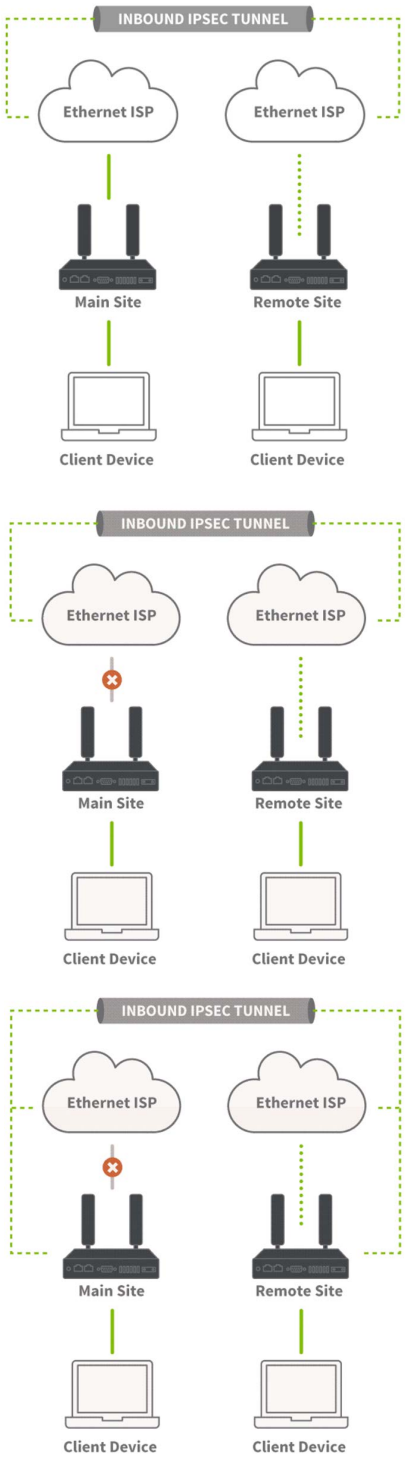
WAN Load Balancing and WAN Bonding

These networking methods allow Internet traffic to be shared across all available connections by enabling multiplanar connections that deliver increased bandwidth for multiple client devices. However, this setup requires continuous validation of network connections to transition traffic between connections in a way that provides a seamless user experience in the event of an outage.



Virtual Private Network (VPN) Tunneling

VPN tunneling has become increasingly common as more organizations have grown their hybrid and remote workforces. This setup is used for many corporate work-from-home environments to provide remote employees with secure connections to protected internal systems, and seamless VPN access in the event of an outage or failover is essential for uninterrupted productivity of remote workforces.



Virtual Router Redundancy Protocol Networks

Virtual Router Redundancy Protocol (VRRP) networks are fully redundant, providing smart failover between primary and backup routers. This protocol is common at remote sites that have traditionally relied on a primary router as the source of truth.

However, it is not ideal if an upstream component is the cause of the network failure. In such a case, without connection validation, client devices at the site would all lose network connectivity.

2. Automation for Connectivity Validation and Recovery

Investing in commercial cellular routers that allow automation of SDN functions means organizations with operations in remote locations can more easily scale and manage larger networks of connected devices.[4]

Adopting automation for SDN also reduces the potential for human error, abstracting the complexity of common router maintenance and system management tasks that can be complex or repetitive and are prone to costly mistakes.

By automating connectivity validation and backup Internet connections, organizations can use multiple carriers via a single router, significantly reducing the risk of downtime. Additionally, automating device monitoring and software updates with en-masse staging simplifies the management of an entire fleet of cellular routers. This reduces the cost of maintenance long-term by limiting the amount of on-site staff needed without sacrificing security.

3. Intelligence to Improve Traffic and Performance

SDN can help intelligently route traffic to improve efficiency, performance and cost-effectiveness. But to do this effectively, organizations need cellular routers that can provide sufficient insight into the state of the network, using both historical and real-time data.

Controlling traffic to stay within data limits is one of the most common use cases for intelligence in SDN. The majority of cellular data plans operate on a fixed monthly data limit, which can become exponentially more expensive if any additional data is used beyond the monthly limit.

[4] Open Networking Forum, "Software-Defined Networking: The New Norm for Networks"

Being able to access and operationalize intelligence from cellular routers can ensure that SDN features route network traffic in a way that limits data usage and utilizes the fastest connection available at a given time. Routers with SDN features can also help organizations identify sources of excess data usage, allowing them to control traffic from the responsible devices via the router itself.

4. Customization for Industry and Organization-specific Use Cases

Commercial routers with SDN features can also support high levels of customization, allowing organizations to gain more useful insights into their specific network architecture and use cases. This can be valuable for not only ensuring that specialized connected equipment stays online but also allows that equipment to be monitored using metrics that make sense for its specific functions.

To achieve these benefits at scale, organizations need software that is easily customizable and interoperable with other solutions. For example, imagine a router has its serial port connected to a console of the programmable logic controller (PLC) that wouldn't normally have an Internet connection or be able to be remotely monitored.

A Python script or a shell script can be utilized to gather metrics from those external devices connected to the local router and post them as data points to the remote management platform — e.g. Digi Remote Manager.

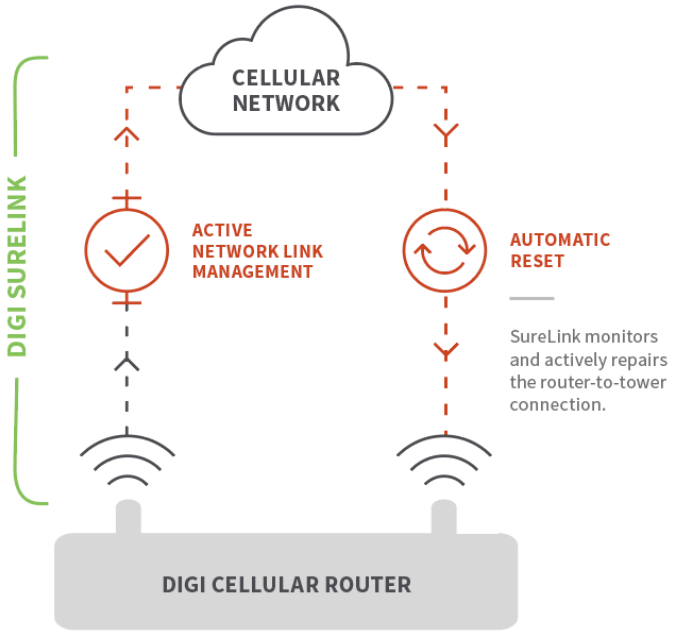
Cutting-edge SDN with Digi Commercial Routers

Digi's new generation of cellular routers and infrastructure management solutions all include these SDN capabilities and run the Digi Accelerated Linux operating system (DAL OS). DAL OS allows Digi technology to deliver on all four critical capabilities that commercial and government organizations need from their high-performance cellular routers: reliability, automation, intelligence and customization.

Reliability with Digi SureLink

Digi SureLink® is a custom feature developed by Digi that delivers relentless reliability for your infrastructure centered around the Digi router. This advanced validation tool can be applied to any network connection type, be it cellular modem, wired WAN, PPPoE connection, Wi-Fi as LAN, local LAN networks or VRRP redundant networks.

Digi SureLink allows organizations to validate network connections with a set of configurable connectivity tests and options to automatically recover connections when validation tests fail.

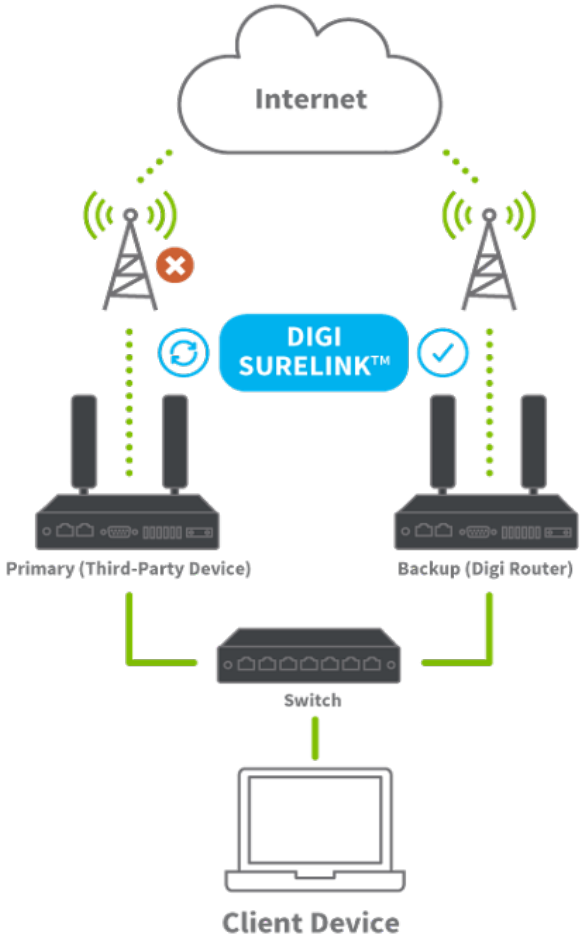


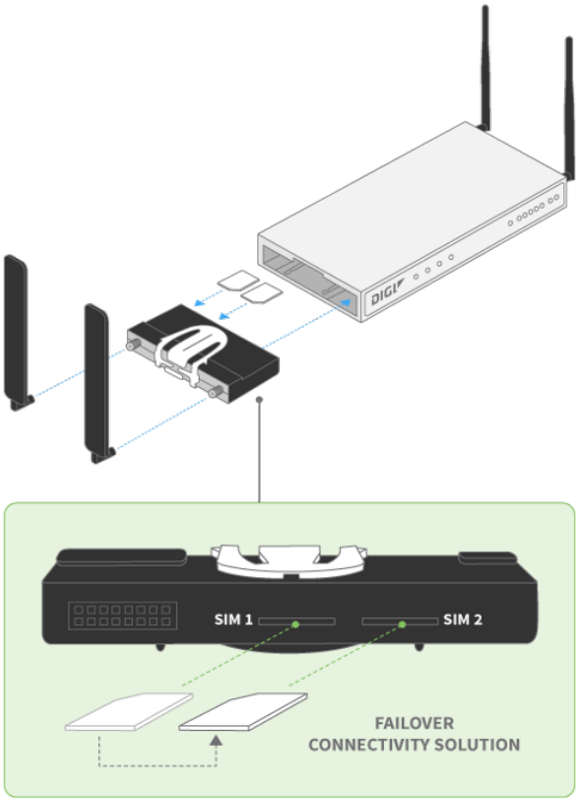
Automation with Digi Remote Manager

Digi Remote Manager® simplifies how organizations monitor and keep devices up to date. The platform supports carrier switching so organizations can integrate connection redundancy/failover via routers that support multiple SIM cards from different carriers.

Digi cellular routers feature auto Access Point Name (APN) detection and connectivity. Once a router is connected, the carrier SIM card is automatically detected so the correct credentials are issued and the correct firmware is loaded. If a device has multiple SIM slots, the Digi SureLink functionality will automatically switch between those SIM cards should one carrier service become unavailable or not have coverage in the area.

The routers also automatically sync with the Digi Remote Manager cloud portal for updates to the device and monitoring of the device. With Digi cellular routers and Digi Remote Manager, you can automatically manage your fleet of devices with zero-touch configuration.





Intelligence with Intelliflow

Digi cellular routers can give you insight into your network with the Intelliflow feature, a tool that provides a graphical way of visualizing your network. This easy-to-understand representation of the activity on a network allows your organization to either update settings on your device or tailor your network to your site's needs.

Intelliflow also provides recent data and a historical reference to keep networks running smoothly. Intelliflow combined with Digi Remote Manager provides a powerful tool for combating excessive data usage. And Digi Remote Manager provides custom alarms that can be set up to notify you when you approach your monthly data limit or exceed your monthly data limit. You can use those alerts to know when an action is needed on your network to address excess usage.

Digi cellular routers also provide Content Filtering using enterprise-grade, industry-standard services such as Cisco Umbrella and OpenDNS. Users can also set up their own custom Content Filtering services and configure the Digi cellular router to utilize those services.

Customization with Digi Software

Not only do Digi cellular routers handle networking, but they also provide several customization capabilities that allow the Digi router to become part of a suite of tools to manage your entire network as opposed to just being a black box uni-tasker.

Digi software provides an easy plug-and-play experience out of the box, via Linux LXC containers, that is highly customizable. Your organization can add its own customized applications or tools to the Digi router. These containers can be managed, deployed and updated using our Digi Remote Manager portal.

With Digi's custom scripting functionality, your team can install custom Linux applications, Python applications and custom scripts onto your Digi router. This functionality also provides options to have those custom applications run at a scheduled time or interval, which allows you to automate your custom application.

Conclusion

Digi offers a unique solution with a large swath of testing options that can be used to validate entire networks and automatically recover connectivity when needed. With Digi routers, organizations have access to:

- **Reliability out of the box**
- **Automation through plug-and-play installation and management through the Digi Remote Manager portal**
- **Intelligence with insights into your network**
- **Customization that makes the Digi router a vital tool instead of a black box**

Commercial, government and transportation organizations can rely on Digi cellular routers and infrastructure management devices to provide sophisticated intelligence, reliability and customization needed for SDN use cases.

Why Digi?

Digi is a complete IoT solutions provider, supporting every aspect of your project, from mission-critical communications equipment to design and deployment services to get your application designed, installed, tested, and functioning securely, reliably and at peak performance.

Digi builds its products for high reliability, high performance, security, scalability, and versatility so customers can expect extended service life, quickly adapt to evolving system requirements, and adopt future technologies as they emerge. Digi embedded modules, routers, gateways, and infrastructure management solutions support the latest connected applications across verticals, from the enterprise to transportation, energy, industrial and smart cities use cases.

Our solutions enable connectivity to standards-based and proprietary equipment, devices, and sensors, and ensure reliable communications over virtually every form of wireless or wired systems. Our integrated remote management platform helps accelerate deployment and provide optimal security using highly efficient network operations for mission-critical functions such as mass configuration and firmware updates, as well as system-wide monitoring with dashboards, alarms, and performance metrics.

Company Background

- Digi has been connecting the “Internet of Things” — devices, vehicles, equipment and assets – since 1985
- Digi is publicly traded on the NASDAQ stock exchange: DGII
- Headquartered in the Twin Cities of Minnesota, Digi employs over 700 people globally, and has connected over 100 million devices worldwide

As an IoT solutions provider, Digi puts proven technology to work for our customers so they can light up networks and launch new products. Machine connectivity that’s relentlessly reliable, secure, scalable and managed — and always comes through when you need it most. That’s Digi.

Learn more on our About Digi page.

Contact a Digi expert and get started today

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