Network operators like communication service providers (CSPs) face many challenges that span multiple business and operational aspects. These include the constant drive to increase revenue (top line), the need to reduce operational expenditure (OpEx) and increase profitability (bottom line) and the urgent desire to broaden their customer base and increase their competitive edge. One of the CSPs’ major operational challenges is the complexity of optical capacity engineering, a cumbersome process involving many steps: forecasting traffic demand; calculating the spectral allocation and expansion potential of deployed systems; purchasing, installing and testing new equipment and finally activating new capacity. This process is complicated and prone to human error, requires expensive “truck rolls” for equipment installation and takes months and months to complete. That translates into extended time to revenue with a direct negative impact on service providers’ top lines.

Infinera Instant Bandwidth—A Guinness World Record-setter for Fast Service Activation

Infinera solves CSPs’ challenges through the implementation of software defined capacity (SDC), which extends the principles of software-defined networking (SDN), which has primarily focused on the Ethernet and packet layers, to the optical transport layer. The industry’s first instantiation of SDC occurred when Infinera introduced the concept of Instant Bandwidth in 2012, enabling software activation of service-ready optical capacity in 100 gigabits per second (Gb/s) increments within just a few hours on networks powered by the DTN-X platform equipped with Infinera’s 500 Gb/s photonic integrated circuits.

In August of the following year, Instant Bandwidth was put to the test over a live link between Amsterdam and Hamburg with 8 terabits per second (Tb/s) of traffic – equivalent to the capacity of the entire internet back in 2005. The incredibly rapid provisioning of this link (19 minutes and 1 second, with one engineer) allowed Infinera and its collaborators to break the world record for “fastest provisioning of a long-haul fibre optic link” and add an official Guinness World Record – which still stands today – to its trophy case.
**Infinera Raises the Bar Again**

In 2015, Infinera introduced Time-based Instant Bandwidth, increasing the flexibility of SDC by enabling software activation of bandwidth licenses for limited durations. In 2017, Infinera raised the bar again by introducing Instant Network, a set of features and capabilities designed to bring service activation and automation to a whole new level. These solutions combine innovations in software, including license management, capacity planning/engineering and service activation, to the disruptive hardware innovation in Infinera’s Infinite Capacity Engine (ICE), which includes multi-terabit optical engines, terabit super-channels and optical sliceability. This creates a uniquely powerful solution to network operator capacity planning and service delivery challenges.

Infinera’s Instant Bandwidth solutions are true game-changers from both business and operational perspectives as they enable a perfect match between the timing of capital expenditure (CapEx) and service revenue, thus accelerating time to revenue from months to minutes. They also reduce OpEx by streamlining operations and eliminating truck rolls. Moreover, they are a key enabler of automation throughout the network and across all operational levels, which is a vital element in building the foundation for cognitive networking.

The following are brief descriptions of some of the capacity license models available today:

- **Fixed licenses:** In this model, once an Instant Bandwidth license is applied to a transponder, it is perpetual and follows that specific transponder.

- **Transferable licenses:** This model introduced the ability to use software to move bandwidth licenses across the network without restrictions as traffic demands change, whether planned or unplanned, or fiber cuts occur. Bandwidth licenses are not fixed to a specific transponder or chassis. A bandwidth license activated on a particular line module can later be transferred so that the capacity can be activated on a different line module in the network. This helps reduce CapEx by reducing idle capacity provisioned specifically for network resiliency and making deployed licenses more agile to suit the network’s requirements.

- **Time-based licenses:** Instant Bandwidth also offers a time-based on-demand capability. It enables network operators to temporarily activate line-side bandwidth in 100 Gb/s increments depending on the application, with deactivation at the end of a customer-specified time period. It helps fine-tune bandwidth characteristics to more closely match traffic patterns, service demands and network disruptions.

- **Bandwidth License Pools:** Service providers can store and reuse an approved pool of software licenses when and where needed, without the need to submit a purchase order, thus allowing the deployment of capacity in minutes, at the same time as a revenue-generating service is activated.

Infinera Instant Bandwidth goes beyond just service activation. It also offers the ability to analyze and engineer optical routes and provision capacity across the entire network to support upper-layer services and other changes in network demand, all while in service, without network downtime or service interruption. Its software applications, such as Automated Capacity Engineering (ACE), replace offline and manual network planning with real-time, network-aware and multi-layer optimal route selection and wavelength assignment that meet traffic engineering cost, distance and latency requirements.

**Tangible Benefits**

Instant Bandwidth solutions deliver significant and tangible benefits for CSPs, such as:

- Accelerated and increased revenue due to faster service activation, as depicted in Figure 1

![Figure 1: Higher Service Revenue Due to Faster Activation](image-url)
• Significantly lower operating costs through automated operations (no truck rolls or on-site provisioning visits)
• Improved return on investment by achieving a perfect match between the timing of CapEx and service revenue
• Reduced business risk by avoiding network capacity over-engineering for the uncertain capacity requirements of emerging applications such as 5G or the Internet of Things
• Increased competitive edge and addressable market due to quick service provisioning and activation

Target Applications
Service providers can leverage Infinera’s Instant Bandwidth solutions in a wide variety of applications to accelerate service turn-up, reduce costs and maximize return on investment (ROI). These applications include:

• **Network expansion**: Instant Bandwidth allows CSPs to quickly expand network coverage into other geographical areas. The fast activation of additional capacity reduces OpEx and accelerates time to completion while avoiding capital lock-in (i.e. an influx of capital while waiting for a project to be completed).
• **Network maintenance**: CSPs can leverage Instant Bandwidth features such as transferable licenses to route traffic over different spans during maintenance periods. This leads to maximum ROI by activating capacity on backup routes, thus eliminating the need for excess capital investment for capacity that will only be used for a short period of time, as shown in Figure 2.
• **Seasonal capacity spikes**: Instant Bandwidth’s features quickly provide additional capacity for seasonal, planned or unplanned spikes in traffic demand (summer festivals, major sporting events, etc.). Instant Bandwidth License Pools and transferable licenses ensure quick turnaround for capacity activation and lower operat-

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**Figure 2**: Transferable Licenses for Network Maintenance
ing costs by eliminating truck rolls and on-site provisioning visits, as shown in Figure 3, while avoiding capital lock-in for temporary capacity requirements.

- **Ethernet business services**: The remote, easy, fast activation of Ethernet services to enterprise customers enabled by Instant Bandwidth allows CSPs to leverage service velocity as a competitive edge, while achieving higher service revenue due to faster activation, resulting in shorter time to revenue.

- **Data center interconnect (DCI) as a service**: CSPs can use Instant Bandwidth’s transferable licenses to remotely increase capacity for DCI services based on the time of day or application requirements. Fast, remote in-service bandwidth increases require no truck rolls, and the ability to reuse bandwidth licenses for other requests allows CSPs to maximize ROI and reduce CapEx and OpEx, as shown in Figure 3.

- **Infrastructure for emerging technologies**: The network impact of new bandwidth-hungry technologies such as fiber to the home and 5G is often difficult to predict. CSPs can leverage the capabilities of Instant Bandwidth to deploy a forecast-tolerant infrastructure that supports the deployment of these technologies across their life cycles, from controlled field trials to limited geographical coverage to full deployment. Instant Bandwidth enables CSPs to provide the right amount of capacity without network overbuilds, while minimizing the business risks associated with deploying new technologies, like avoiding early or excessive CapEx and OpEx. Transferable licenses provide the flexibility to switch capacity from one test area to another, thus increasing a CSP’s ROI.

**Summary**

Infinera solves CSPs’ challenges with Instant Bandwidth, enabling software activation of service-ready optical capacity in minutes and taking service automation to a whole new level. Instant Bandwidth is a true game-changer from both business and operational perspectives as it enables a perfect match between the timing of CapEx and service revenue, thus accelerating time to revenue from months to minutes. It also reduces OpEx by streamlining operations and eliminating truck rolls.