Making cloud networks better

Brent Yates CEO

iex

iex exchange

IEX's flagship business, a U.S. securities exchange trading on average more than $14B worth of shares every day.

swXtch.io

Launched in Jan 2021, swXtch.io is builds easy-to-use high performance networking products for the cloud.

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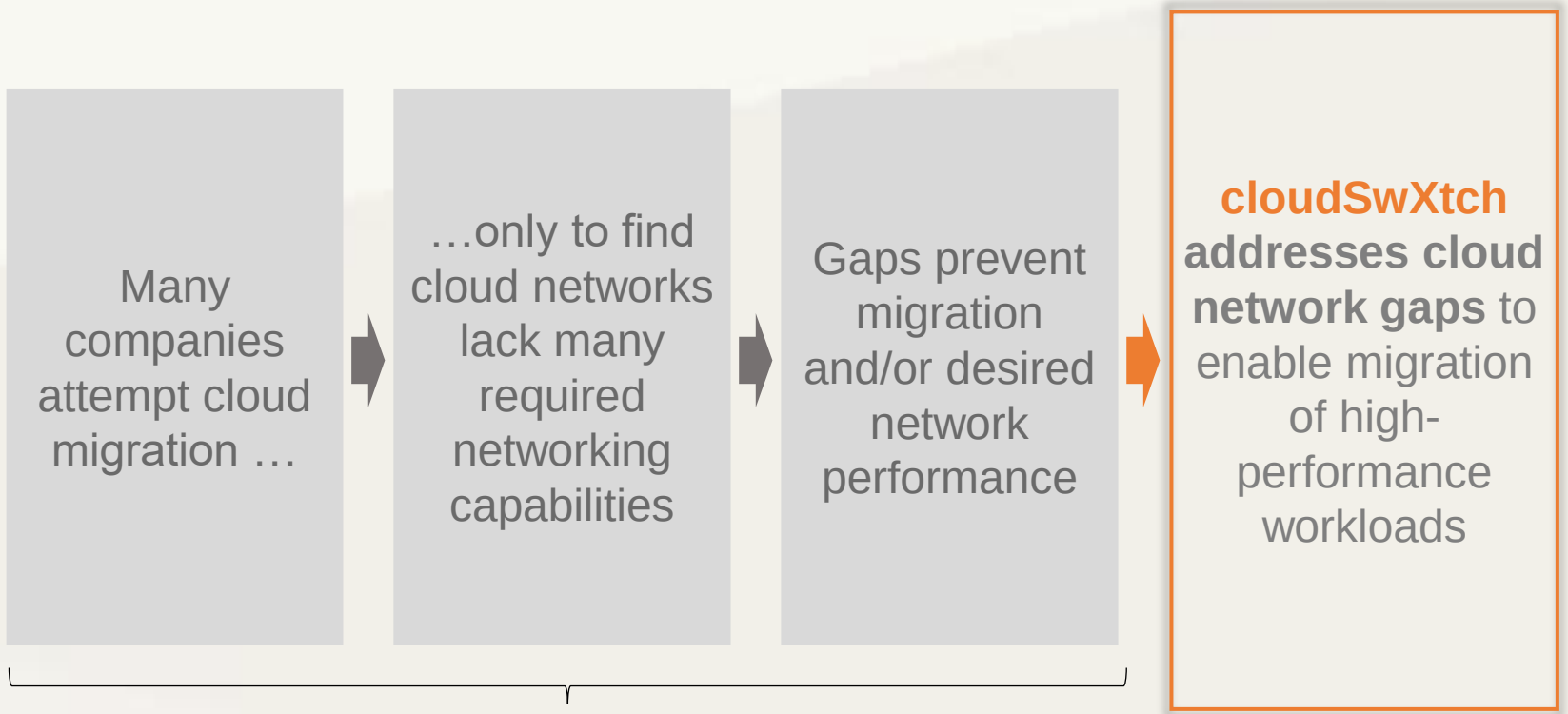
Making cloud networks better

Who Benefits?

Any customer moving to the cloud who needs exceptional network performance and features without changing their existing software

Problem worth solving

Common journey to discover cloud networking feature gaps



*Gap discovery typically occurs only **after investing cloud migration resources***

*"DevOps required an environment with market exchange performance parity – high volume, high-speed, low-latency traffic…**Cloud platforms did not support our multicast requirement**, among other features, initially preventing migration.*

*- Input from a **Network Manager, global equities exchange***

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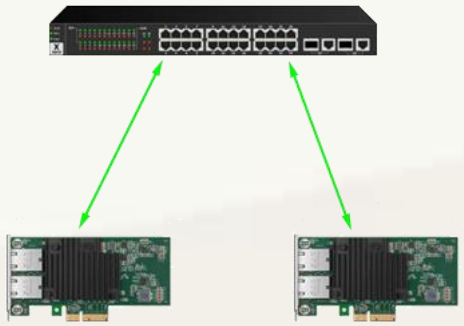
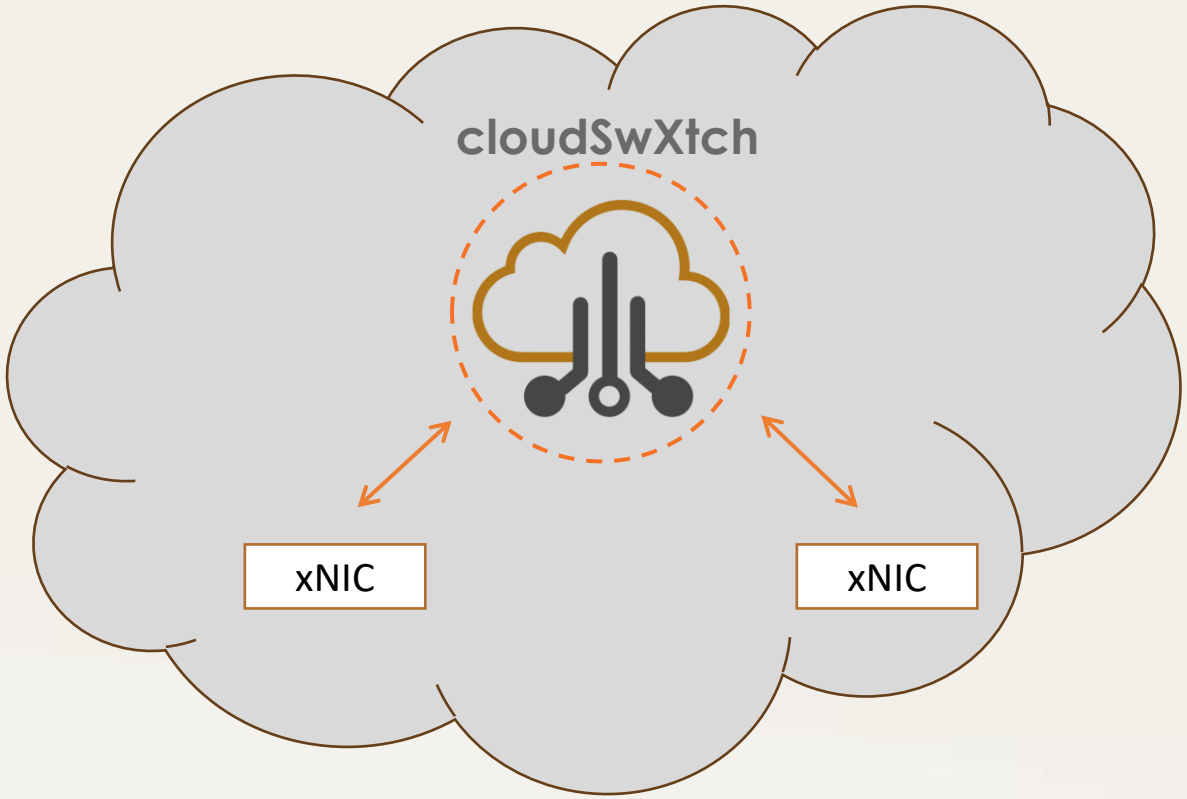
Introducing cloudSwXtch…



cloudSwXtch adds critical features to cloud networks that are typically found in physical switches and NICs with no changes needed to existing software.



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With cloudSwXtch, cloud networks now act Like Physical Networks - giving back control and increased flexibility

cloudSwXtch adds critical features to cloud networks typically found on-prem

- Multicast & Broadcast
- Dynamic Bridging
- Low-latency
- High bandwidth
- High availability
- PTP
- Protocol conversion
- Protocol fanout
- Packet capture
- Packet flow monitoring
- Global mesh of swXtches

No code changes means easy setup & deployment

- **Plug-and-play virtual image** that acts like a physical switches and NICs - *but in the cloud!*
- **Works on multiple clouds** across compute/ network resources in all regions
- **Simple cloud marketplace deployment** and fully scriptable with Terraform (IaaS)
- **Galactic data plane capabilities** for bidirectional on-prem to cloud, cross-vNet, cross-cloud, & cross-region
- **Elastic scaling** with ability to support thousands of end-points and traverse multiple clouds

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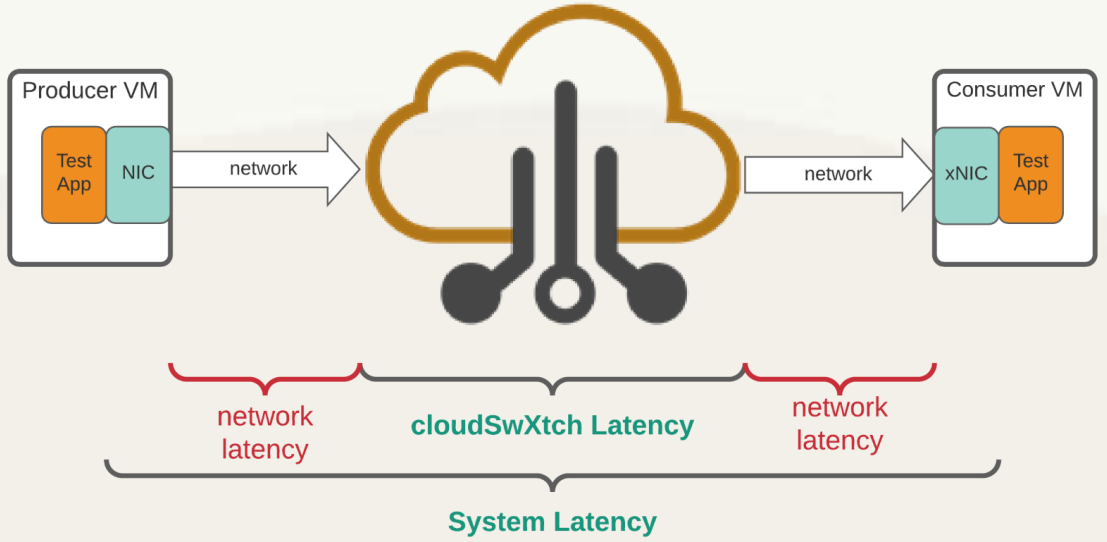
Performance is the cornerstone of cloudSwXtch

The latency measurements below are for a **cloudSwXtch system** with 1 producer (2M-pps) and 1 consumer (2M-pps) and measure one-way latency from producer to consumer. (**3µs** dwell time through the swXtch)

All packets traversed the system in **<250µs. The average packet latency for all packets was between 60-65µs.**



TOTALS			THIS PERIOD			SYSTEM LATENCY				
RX PKTS	RX BYTES	RX DROPS	RX-PPS	RX-bps	RX-DPS	AVG uS	< 250us	< 500us	< 750us	< 1.0ms
117,642,856	20.47GB	0	2.00M	2.8Gbps	0	61.0uS	100%			
119,643,140	20.82GB	0	2.00M	2.8Gbps	0	61.4uS	100%			
121,642,870	21.17GB	0	2.00M	2.8Gbps	0	61.8uS	100%			
123,642,842	21.51GB	0	2.00M	2.8Gbps	0	62.2uS	100%			
125,642,853	21.86GB	0	2.00M	2.8Gbps	0	62.6uS	100%			
127,642,851	22.21GB	0	2.00M	2.8Gbps	0	63.0uS	100%			
129,642,944	22.56GB	0	2.00M	2.8Gbps	0	63.5uS	100%			
131,642,941	22.91GB	0	2.00M	2.8Gbps	0	63.9uS	100%			
133,642,948	23.25GB	0	2.00M	2.8Gbps	0	64.3uS	100%			
135,642,978	23.60GB	0	2.00M	2.8Gbps	0	64.6uS	100%			
137,642,841	23.95GB	0	2.00M	2.8Gbps	0	64.9uS	100%			
139,643,041	24.30GB	0	2.00M	2.8Gbps	0	65.0uS	100%			
141,643,014	24.65GB	0	2.00M	2.8Gbps	0	65.1uS	100%			
143,643,002	24.99GB	0	2.00M	2.8Gbps	0	65.1uS	100%			
145,643,014	25.34GB	0	2.00M	2.8Gbps	0	64.9uS	100%			
147,643,034	25.69GB	0	2.00M	2.8Gbps	0	64.7uS	100%			

Top Use-Cases

Industrial IOT & Gov

- Testing and simulation
- Live IP-video distribution
- Distributed databases – Real-time data sharing
- Emergency response & tactical edge
- CAD / CAE rendering

Media & Entertainment

- Live production workflow in the cloud
- Format & frame rate conversion
- Channel Assembly and remote production
- Create a global broadcast network – OTT distribution
- Distributing uncompressed video to the cloud

Financial Services

- Market data distribution (e.g., SIP)
- Functional environment migration (QA, test, lab, etc.)
- Disaster recovery environment migration
- Primary matching engine deployment to cloud

Other – Industry Agnostic

- Galactic Data Plane for cloud WAN and content delivery

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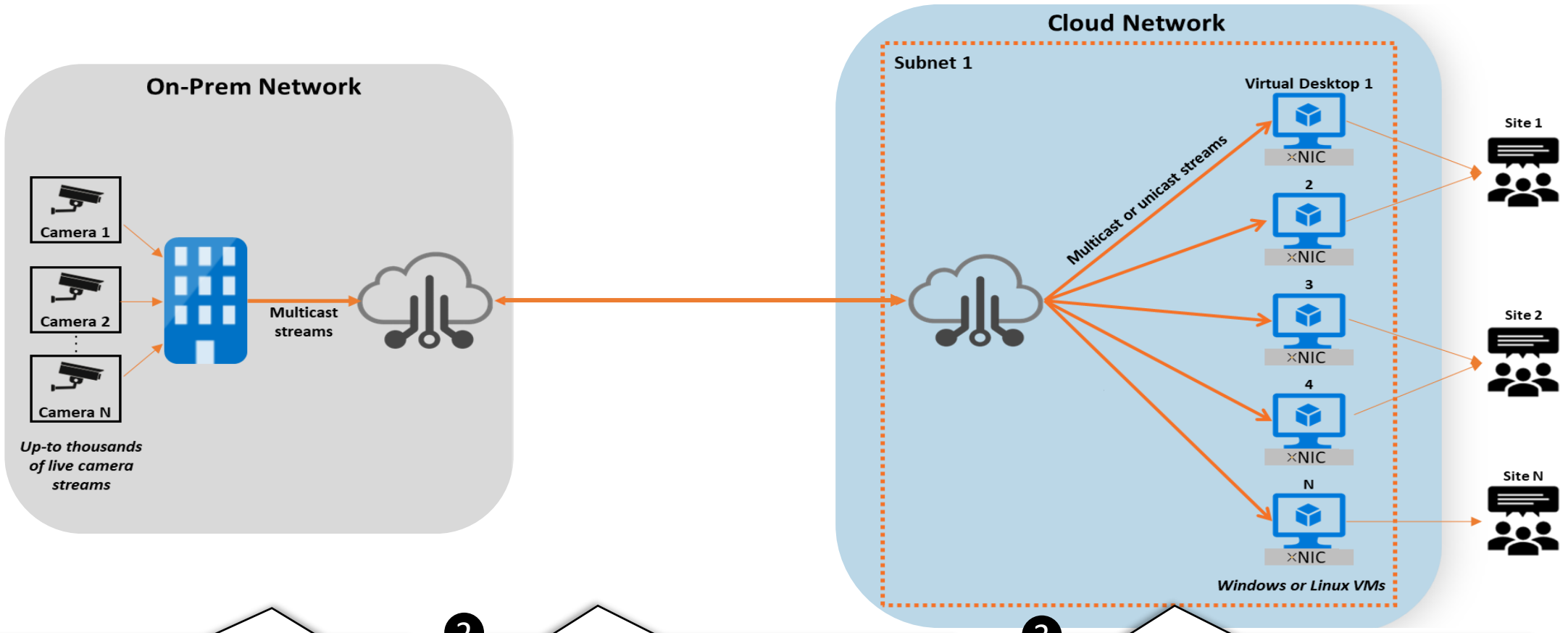
And many more…

Case Study– On-prem multicast to cloud



1. **Multicast** can be distributed from on-prem to cloud networks

2. Virtual desktops can dynamically cycle through and **select on-prem streams for cloud distribution**

3. cloudSwXtch can **fanout on-prem multicast streams** to an unlimited number of endpoints

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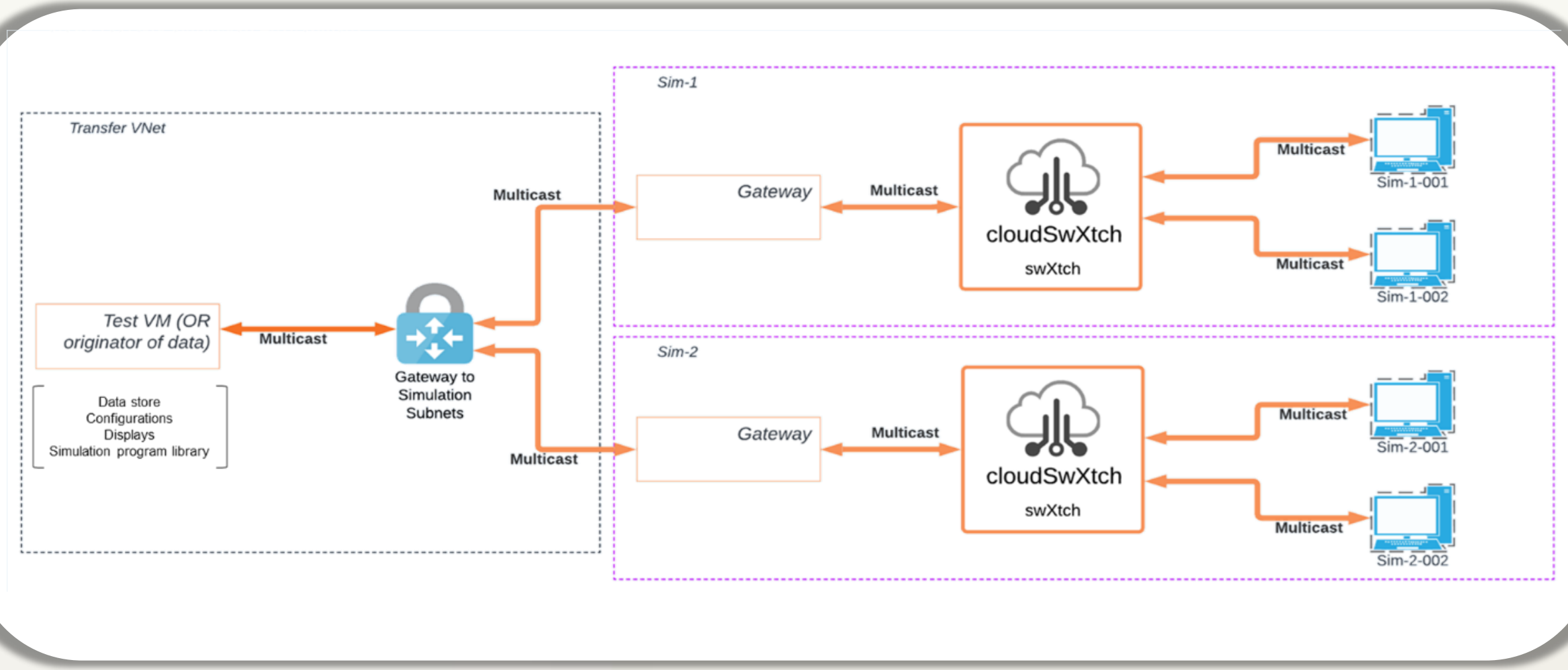
Case Study– Test, Model, & Simulation



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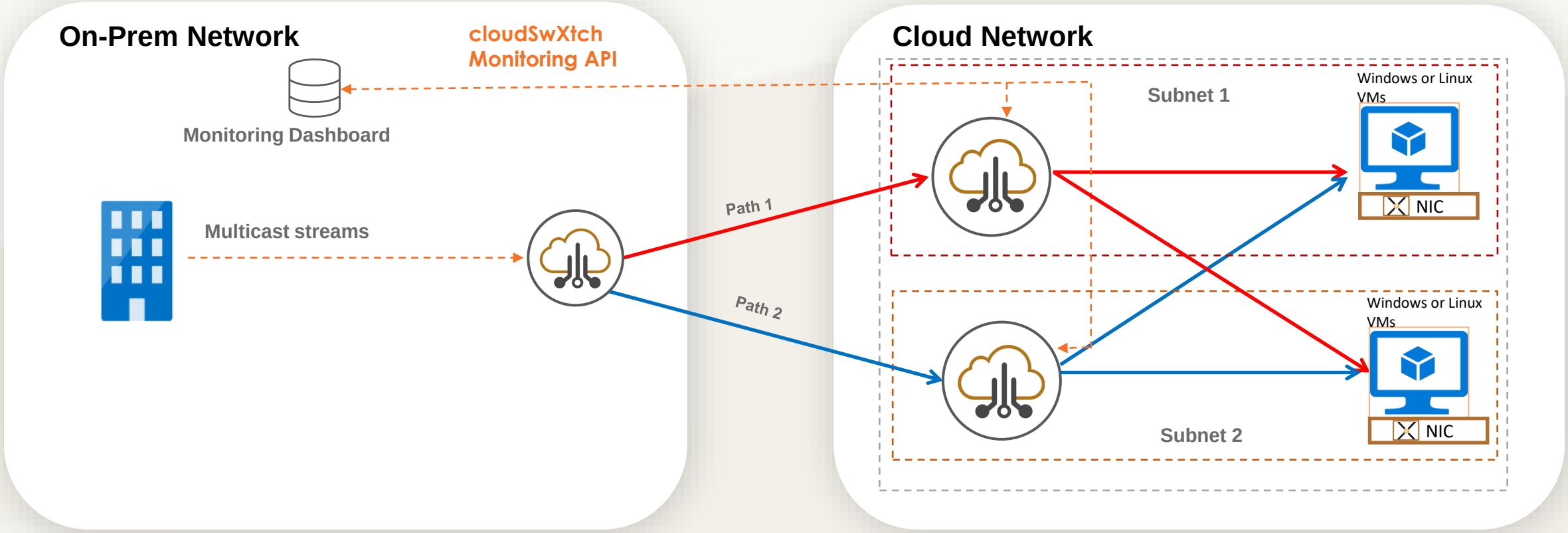
Case Study – High Availability



cloudSwXtch protects your data using High Availability - Network path redundancy

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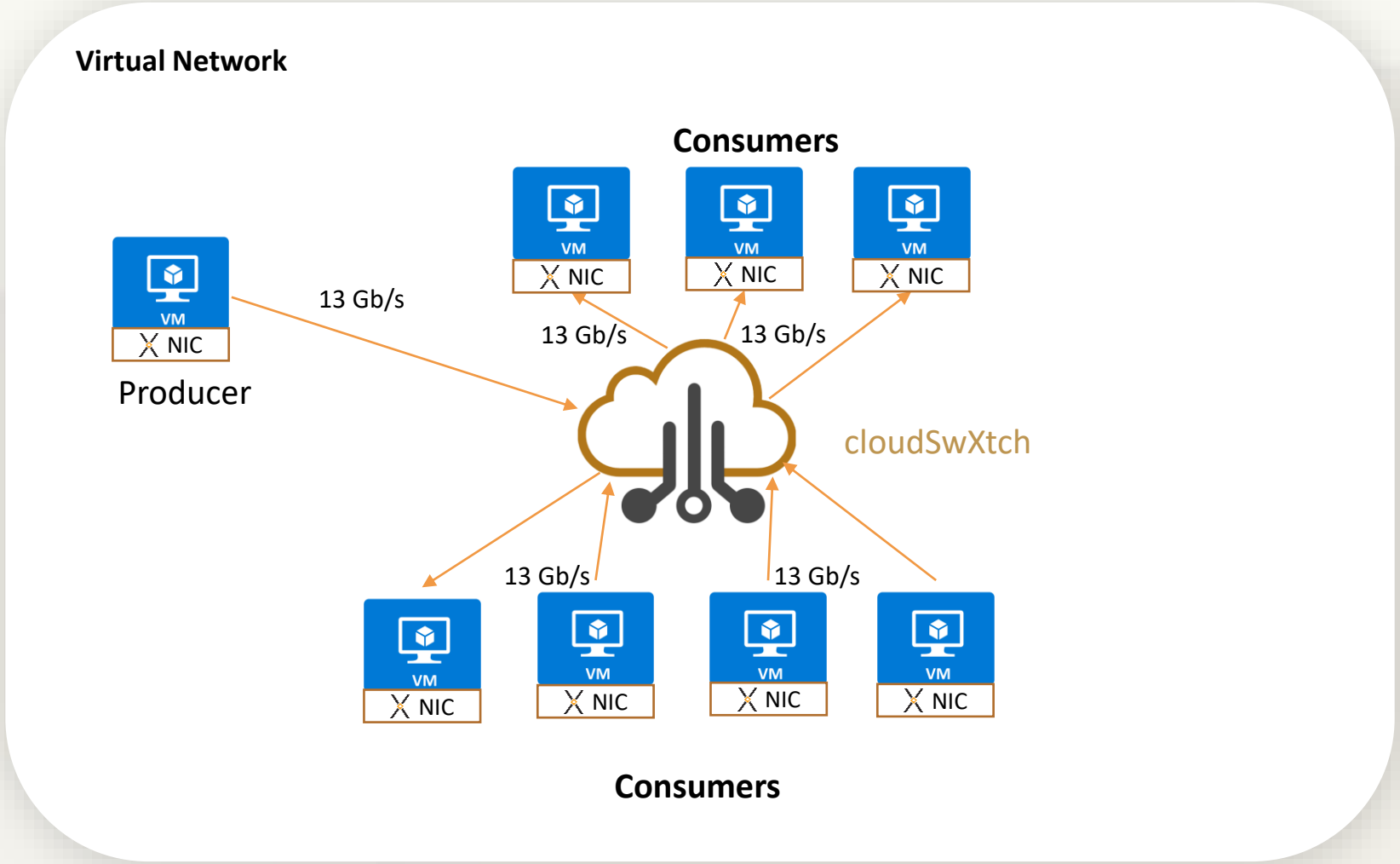
Case Study – High BW Performance Example



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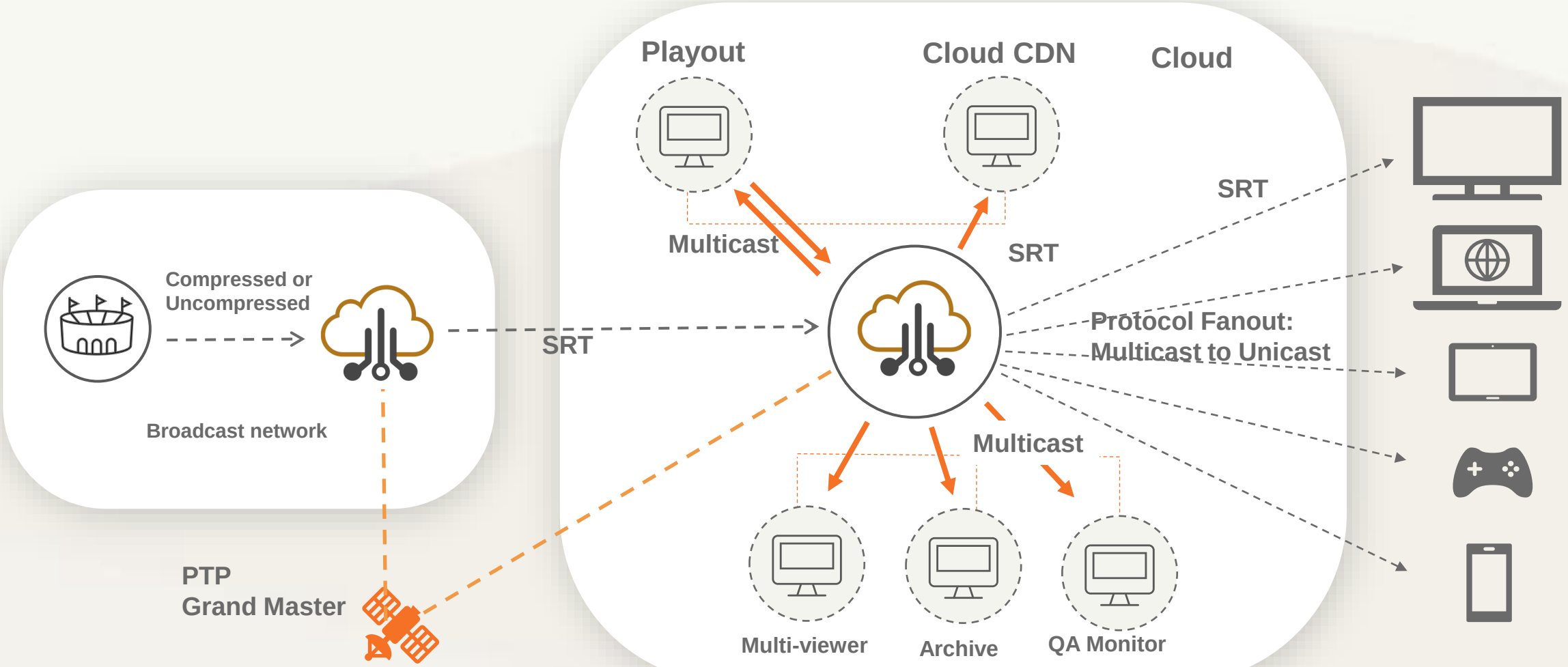
Case Study – Global broadcast network



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Thank you

- Brent Yates, CEO brent.yates@swXtch.io
- Documentation: docs.swXtch.io (requires self-registration)

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Appendix

- **Case studies (non-exhaustive)**

Enabling an efficient cloud network for real-time traffic camera monitoring system

Objectives

- **A US state-based Transportation Authority wanted to achieve cloud-based monitoring of 4,000 live camera streams** with capability to leave/join any 9 live-streams in each of three remote viewer stations
- **Business objectives:**
  - Maintain existing multi-viewer platform, including 3rd party viewer management software, & remote Windows10 desktop OS thin client
  - Allow multiple users on the same network to access any of the live video streams
  - Reduce server infrastructure costs
  - Avoid costly over-provisioning of network in support of 2,000 simultaneous high-volume, high-bandwidth streams (~800mbps)

Unexpected hurdle encountered

! **Multicast dependent application is not supported in cloud network hardware** and network included cameras from various manufacturers, with different stream types, many of which originate multicast

! **Limited link bandwidth** meant that it was not possible or pragmatic to send all 2,000 streams at once

! **No control of remote viewing environments** running Windows 10 Desktop OS

cloudSwXtch features that enable migration

Easy cloudSwXtch download from cloud marketplace to customer tenant, enabled:

- **True and seamless multicast transmission** over cloud to access all 2,000 cameras with reduced network strain & predictable bandwidth
- **Dynamic bridge** connecting on-prem network that receives camera feeds to secure public cloud and adding leave/join functionality and improved bandwidth management
- **Leave/join functionality** provides ability to select streams on-demand to pass through cloud to multi-viewer (manages ingress costs)
- Optimize bandwidth management in video applications by improving utility of bandwidth limited private cloud connection (Express Route)
- **No code changes** required

> "Much more efficient to only stream a sub-set of all data streams versus sending all data."
>
> **– Sr Systems Administrator, Transportation Authority**

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Additional case studies available on request

Cloud-based power station simulation with digital twin technology for control system design & operation

Objectives

- **A global OEM of power infrastructure assets (turbines, controls, sensors) wanted to migrate a UDP broadcast-dependent power station simulation** workload from expensive on-prem infrastructure to cloud
- **Simulation workload is used to design, test, and implement** operator control systems and HMIs for new customers
- **Business objective was to complete more projects with fewer resources:**
  - Increase # of tests per engineer
  - Run multiple parallel tests
  - Duplicate environments down to IP
  - Run faster than real-time
  - Simulate greater # of scenarios and arrive at best answer faster

Unexpected hurdle encountered

! **UDP broadcast network traffic** is not supported in native cloud hardware; broadcast traffic originated from field devices and legacy on-prem simulation software was built to take broadcast inputs.

! **Precise time sync** required to ensure substation devices have accurate clocks for system control and data acquisition not available either

cloudSwXtch features that enable migration

Easy cloudSwXtch download from cloud marketplace to customer tenant, enabled:

- **True and seamless UDP broadcast** data flow enabled in cloud to allow device-control communications and emergency alert system
- **Cloud-based precision time protocol (PTP)** enables communication between clock and end-devices, sequence of events reporting, and can share the same infrastructure as control and data traffic
- **Easily replicable for re-utilization of platform** for each discrete project

> "It is a huge benefit to get product out the door because you can only physically build a power plant so quickly and allow teams to move on to the next project. It may also mean we don't need so many engineers on a specific project."
>
> **– Sr Director, Controls Team for Leading Power Gen Solutions Co**

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Additional case studies available on request

Enabling multicast and protocol fanout for a healthcare database management system

Objectives

- **Run a legacy 3rd party multicast-dependent health records system** in a Cloud Virtual Desktop while maintaining network security requirements
- **Business objectives:**
  - **Easy and secure access** to real-time health records for remote / distributed team of caregivers, patients, & researchers
  - **Reduced infrastructure costs**
  - **Easier collaboration and handover** between healthcare teams and providers

Unexpected hurdle encountered

! **Multicast is required and not supported by any cloud hardware** so multicast-dependent records system not compatible with Cloud network

! **High security and locked-down network** in accordance with health data sharing regulations meant customer could not host cloudSwXtch instance to their on-prem server

! **Reluctant cloud certification from Middleware** vendor related to performance meant the application could not be directly migrated

cloudSwXtch features that enable migration

Easy cloudSwXtch download from cloud marketplace to cloud VNet, enabled:

- **Preserving locked-down network** – Flexible provisioning model allows navigation around end-user's secure on-perm network. End-user provided a UDP unicast stream out of network via a Dedicated Connection since they were not allowed to send multicast.
- **Protocol fanout** – Unicast UDP was received by cloudSwXtch and converted to multicast. All other systems could see it as multicast, but actual initial transport protocol was unicast.
- **No code changes required** – Enables the 3rd-party health records software to work without code changes; make system work without deploying anything at all on the NHS network.

"We were able to get unicast out of the network; we couldn't take traffic off the as multicast because it is locked-down. We got them to give us unicast and fan it out as multicast. **There would be no other way to implement this.**"

– Head of Infrastructure and Integration, Health Records System ISV

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Additional case studies available on request

Cloud-based integrated development environment with digital twin capability for product testing & development

Objectives

- **A global aerospace & defense corporation wanted to deploy cloud-based containerized integrated development environment (IDE)** instance with performance at parity with their on-prem operating environment
- **Primary business objective was to increase innovation velocity** via processing advantages**:**
  - Real-time performance for all field applications
  - Support globally distributed real-time access
  - Support multiple parallel environments for testing software features and applications simultaneously with synchronization on the same clock

Unexpected hurdle encountered

! **Multicast is not supported on any cloud network hardware** *and a large portion of classified traffic on tactical networks is multicast, such as tactical radio systems and downrange IOT sensors*

! **Networking provisioning for containers that distribute multicast** to disaggregated base of endpoints are either non-performant or not supported by public clouds

cloudSwXtch features that enable migration

Easy cloudSwXtch download from cloud marketplace to customer tenant, enabled:

- **True and seamless IP multicast** network traffic enabled in the cloud
- **Containerized network support** using a Daemon Set and allows multicast and other protocols to traverse (bridge) pods and VMs
- **No code changes** required

"Multicast was an unexpected hurdle on several levels and could have been a deal-breaker for our dev ops cloud migration."

– Sr Manager, Cloud Native at System Integrator

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