



Enabling the Carrier Edge to capture the 5G opportunity ... starting with Content Delivery

October 2020





Theodore Tzeveleakis
Head of Business Development
Mass-Scale Infrastructure Group

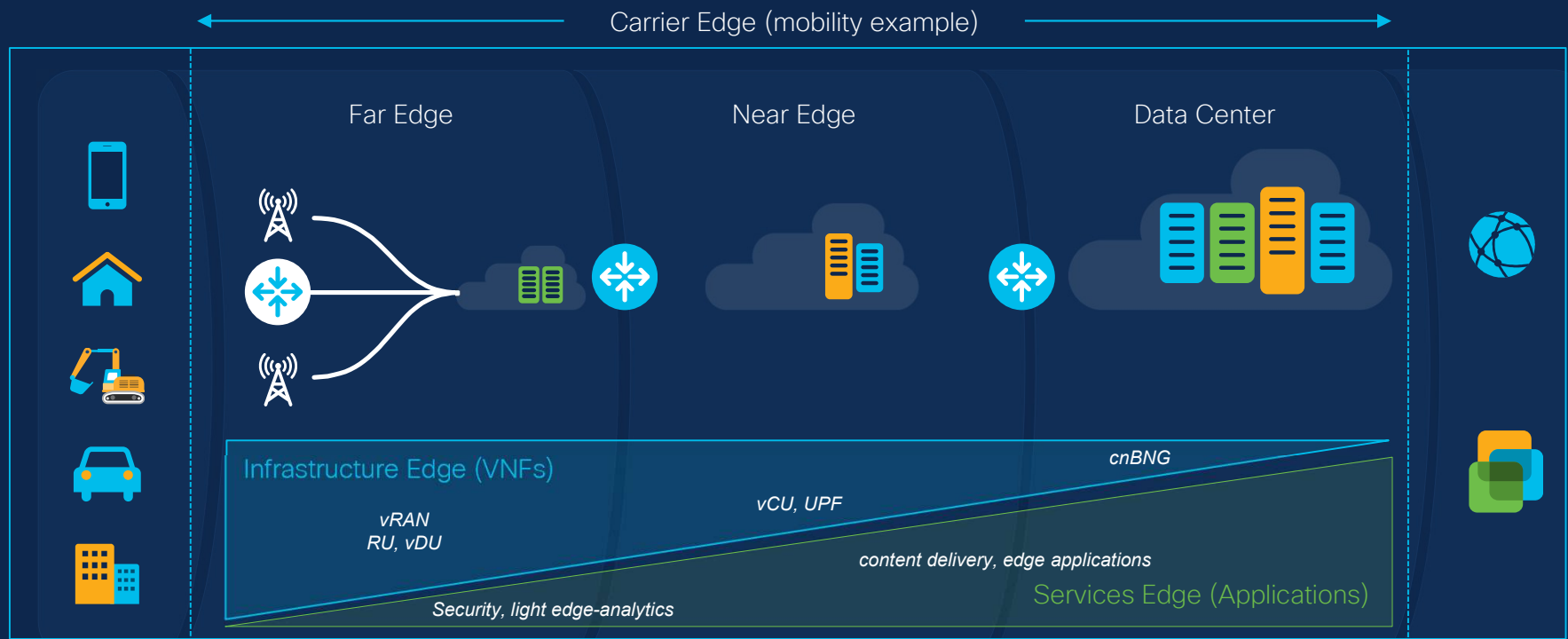


Udi Lerner
VP Product Management

Key messages

- The carrier edge is a unique **control point** that needs to be approached **holistically, yet pragmatically** across Infrastructure and Services
- While the carrier edge offers unique benefits to many applications, **Content Delivery** is now, more than ever, a **killer application** in a space that is **ripe for disruption**
- Our innovative offering across Cisco, Qwilt and Digital Alpha creates a **unique win-win across all stakeholders** in the content creation and delivery value chain
 - Best possible Quality of Experience for the **Viewers**
 - Optimized footprint, enhanced visibility and control for **Communication Service Providers (“CSP”)**
 - Globally consistent platform and open APIs for **Content Providers**
 - Ability for **CSPs** to monetize content delivery with no operational overhead, zero CAPEX and low-risk
- In partnership with BT, we’ve demonstrated that we can go from initial engagement to **live traffic in under 6 months**

The Carrier Edge needs to be approached holistically yet pragmatically



The Carrier Edge provides unique benefits to specific applications

Bandwidth Optimization



Content delivery (downstream)



Video, software downloads and updates



Data reduction (upstream)



Surveillance, connected mobility, IoT, edge analytics



Mass customization



Live event coverage, in-band advertising, AR/VR



Localization



Peer-to-peer communication

Latency



Ultra-low latency/jitter reduction



Virtual and augmented reality

Location



Local reliability and survivability



Industrial automation

Edge connectivity and multi-cloud



Connectivity



Private backbone, global E2E SLA



Multi-cloud



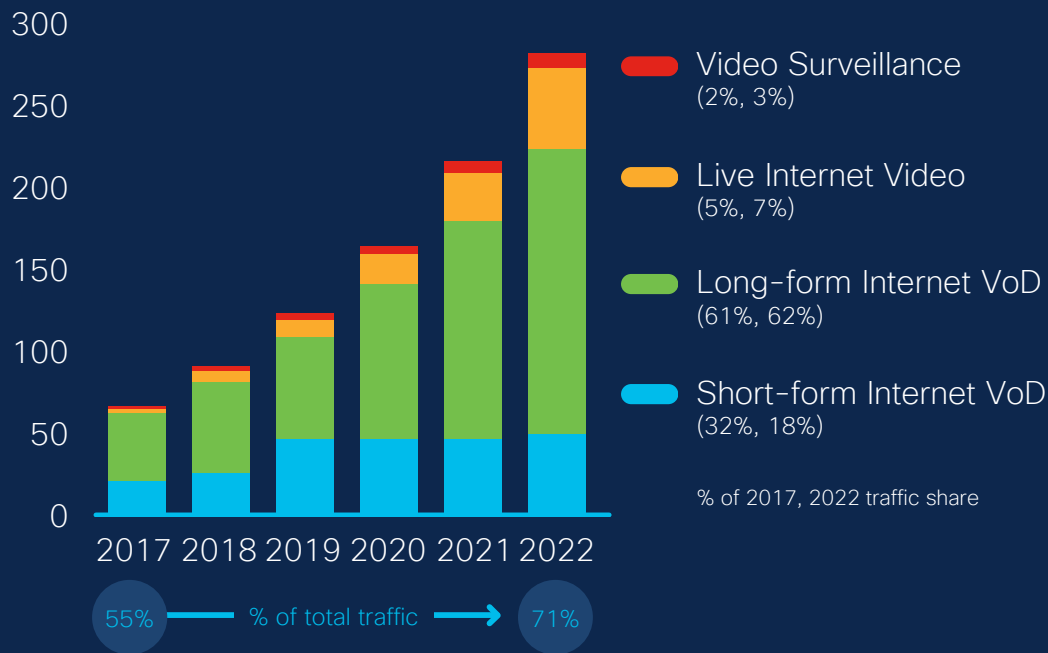
End-to-end security, multi-cloud onramp

Enabled by the carrier edge

Enabled by the co-lo edge

The streaming video industry is at an inflection point, due to three concurrent trends

Exabytes/month



Growth and share of video



Fragmentation of content



Explosion of live streaming

The traditional ways CSPs have been using for meeting demand are not sustainable

Big pipes	Dedicated single-tenant CDN	SP custom multi-tenant CDN	Public multi-tenant CDN	Best of both multi-tenant CDN worlds
<ul style="list-style-type: none">- Cost prohibitive to “build a Church for Easter Sunday” especially wrt live- Long-term un-economical to sustain baseline growth of video traffic	<ul style="list-style-type: none">+ End-to-end QoE control for CPs- Typically centralized with limited optimization for SP networks- Inability to scale across multiple major Content Providers	<ul style="list-style-type: none">+ Optimized for SP network+ Full control and visibility for SP- Typically custom, limiting appeal for CPs by driving complexity (many-to-many) and challenges in QoE assurance	<ul style="list-style-type: none">+ Global or regional platforms- Mostly delivering content over peering points with some exceptions- Typically centralized with limited optimization for SP network	<ul style="list-style-type: none">+ Optimized for SP network+ Enhanced control and visibility+ Global or regional platform+ Direct monetization+ Zero CAPEX

Our innovative approach to bringing content delivery to the Carrier Edge



Unmatched quality of experience



Turnkey aaS offering mitigating operational and business risk



Minimal investment; new revenue stream



CDN solution tailored for deployment inside SP networks including revenue sharing with carrier



Cisco-based compute/storage/networking infra and management technology and services



Adoption acceleration through synthetic equity and participation in revenue share

*“Streaming video may be the killer app for the internet, but it **doesn’t have to KILL the internet,**”*

Jonathan Davidson, SVP and GM, Mass Scale Infrastructure Group, Cisco.


*“At BT we connect for good and streaming video has never been more **important than in today’s challenging times.** Our mission at BT is to ensure our customers have the best experience every time and with record levels of streaming we needed to disrupt the status quo. **Qwilt’s pioneering open caching platform together with Cisco’s cloud infrastructure gives BT the first 5G MEC capability in the UK to deliver premium quality video and on demand services.**”*

Neil McRae, Chief Architect, Managing Director for Architecture and Technology Strategy at BT

News Release

Cisco, Qwilt and Digital Alpha Define the Future of Content Delivery with New Open Caching Solution for Service Providers

© October 08, 2020



News Summary

- Companies introduce new model for streaming media delivery leveraging Open Caching architecture deployed at the edge of the service provider networks; it offers unprecedented levels of quality with open, global APIs endorsed by the Streaming Video Alliance
- Innovative business model enables zero-capex and limited-risk deployment, helping service providers generate new revenue as active participants of the content delivery value chain
- BT has adopted this solution to deliver high-quality streaming experiences across its network to its customers on behalf of global content providers

*“The way we consume video has changed, and **content delivery must change with it,**”*

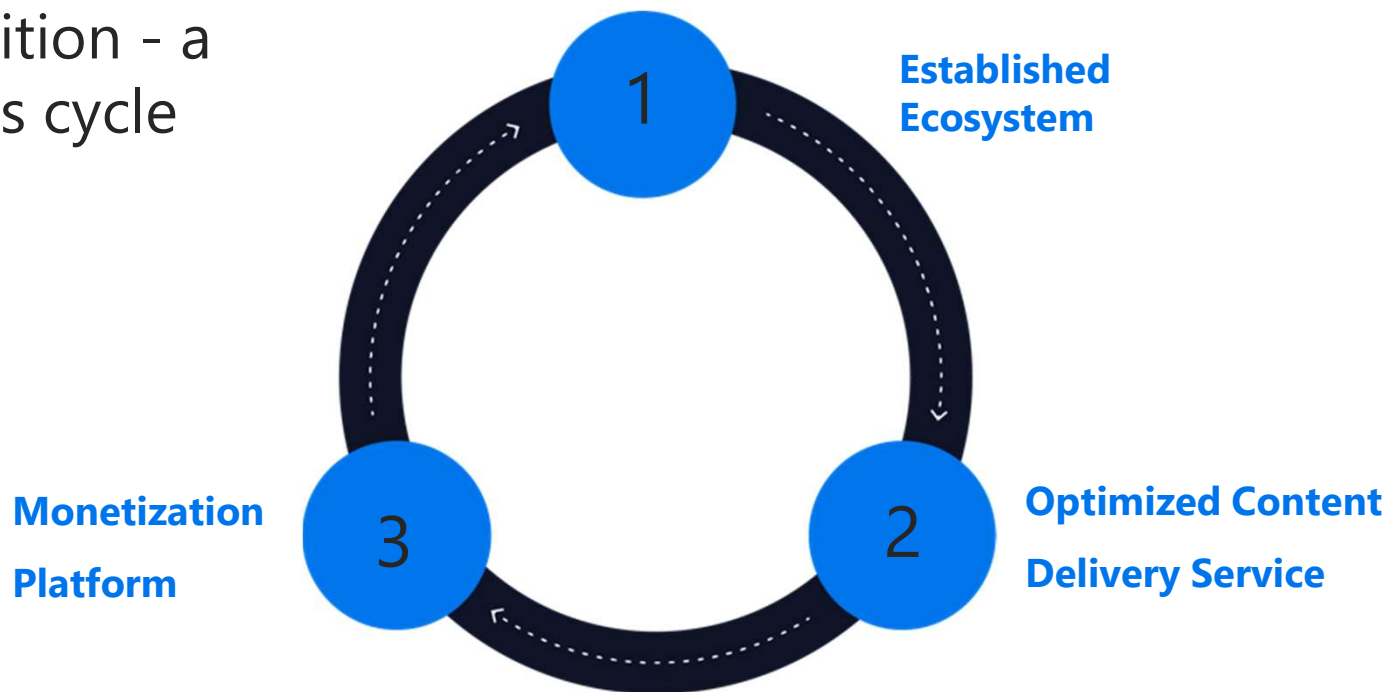
Alon Maor, CEO and Co-founder of Qwilt

*“Working with our partners in conjunction with the leading content providers, we are **committed to scaling this platform to service providers globally in the months ahead.**”*

Rick Shrotri, Co-Founder, Managing Partner, Digital Alpha

Qwilt's Unique Edge Cloud Value Proposition to Service Providers

3 pillars of our edge cloud value proposition - a virtuous cycle

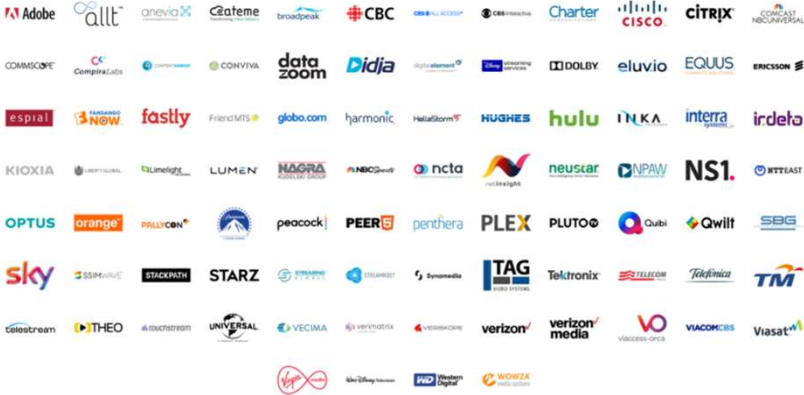


1 Established Ecosystem



Qwilt's Edge Cloud Uniquely Offers

- Best practice architecture consensus
- Pre-established global content provider relationships
- Globally consistent, federated platform

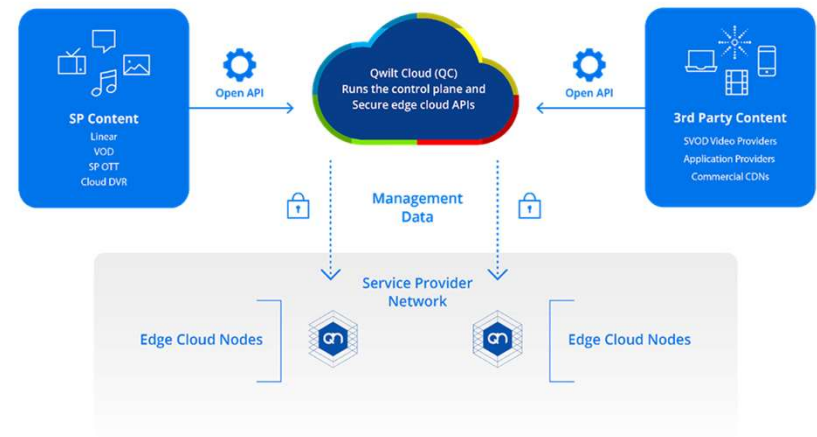


2 Optimized Content Delivery Service

Qwilt's Edge Cloud Uniquely Offers

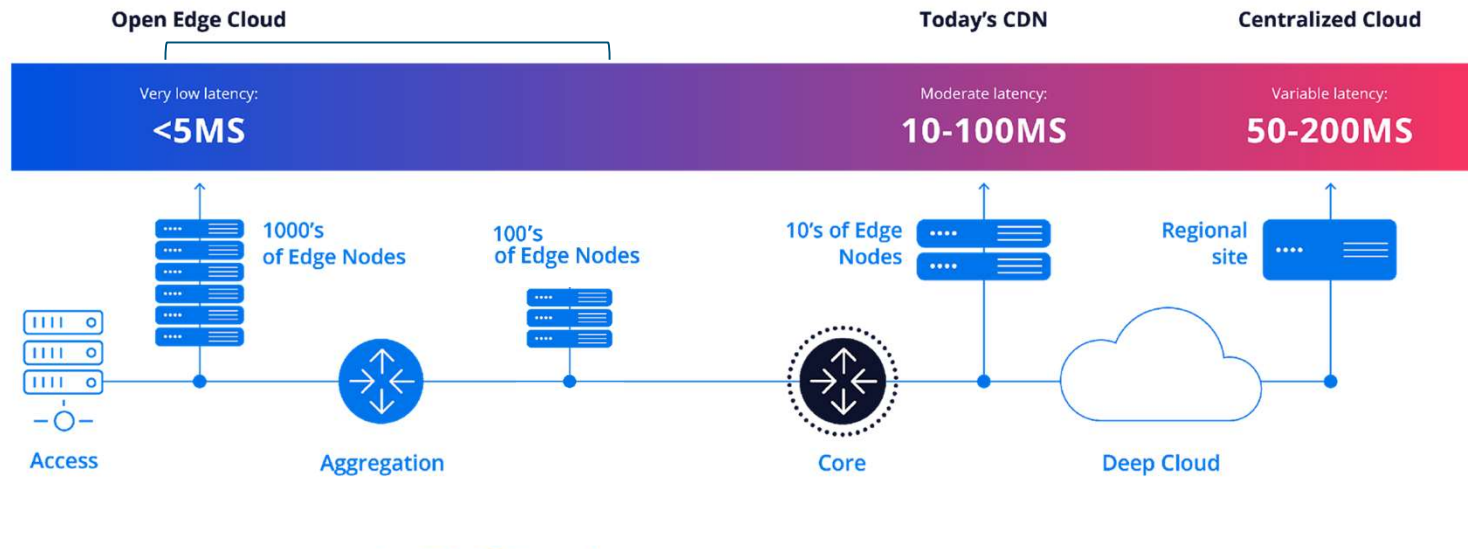
- Best possible Quality of Experience
- Optimized footprint in CSP network
- Enhanced visibility and control
- Unified platform for CSP and OTT content to server level
- Managed solution

Best Possible Quality of Experience



Superior Architecture: Closer is Better

Deeply embedded edge delivery nodes



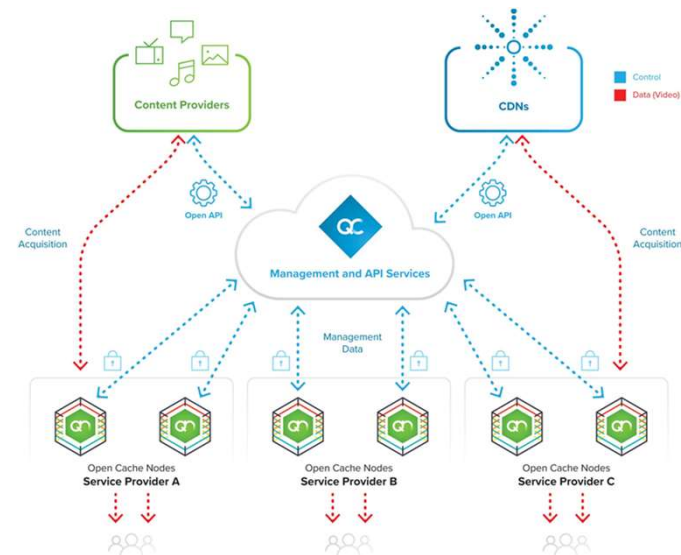
3 Monetization Platform

Qwilt's Edge Cloud Uniquely Offers

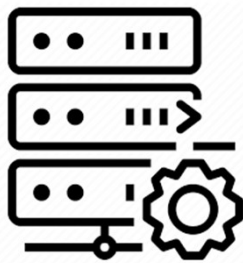
- CSPs can monetize content delivery with no operational overhead
- Zero capex and low risk business model
- Revenue sharing model rewards CSP as part of the OTT value chain
- WW onboarding using single cloud API for access to global Open Caching networks across many ISPs



Single API to Access Global OC Network



Easy to Deploy, Customize and Scale



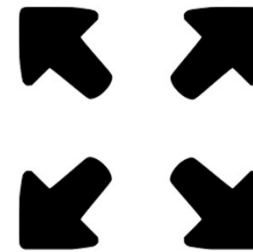
Easy to Deploy

- Managed solution
- Carrier-grade infrastructure



Easy to Customize

- Flexible model – faster deployments and less time to scale
- Support for broad set of ISP and OTT content delivery use cases



Easy to Scale

- Cloud-based scaling architecture
- Progressive scale operation

Key take-aways

- The carrier edge is a unique **control point** that needs to be approached **holistically, yet pragmatically** across Infrastructure and Services
- While the carrier edge offers unique benefits to many applications, **Content Delivery** is now, more than ever, a **killer application** in a space that is **ripe for disruption**
- Our innovative offering across Cisco, Qwilt and Digital Alpha creates a **unique win-win across all stakeholders** in the content creation and delivery value chain
 - Best possible Quality of Experience for the **Viewers**
 - Optimized footprint, enhanced visibility and control for **Communication Service Providers (“CSP”)**
 - Globally consistent platform and open APIs for **Content Providers**
 - Ability for **CSPs** to monetize content delivery with no operational overhead, zero CAPEX and low-risk
- In partnership with BT, we’ve demonstrated that we can go from initial engagement to **live traffic in under 6 months**

Questions?



Potential questions

- Can you elaborate on “control and visibility” for SPs? What is offered and how?
- Benefit of fully integrated solution?

Questions



We would not initiate

- Can you elaborate on “control and visibility” for SPs? What is offered and how?

Questions we want asked

- Benefit of fully integrated solution?
- How do you measure QoE? (refer to DSS/Eric’s slide from SVA)
- What is the typical timeframe for a Tier 1 CSP deployment (answer - ≤ 6 months)
- What content publishers have you partnered with so far?
- What is the typical configuration of a cache in the CSP network?

Back Up

Open Caching QoE Metrics

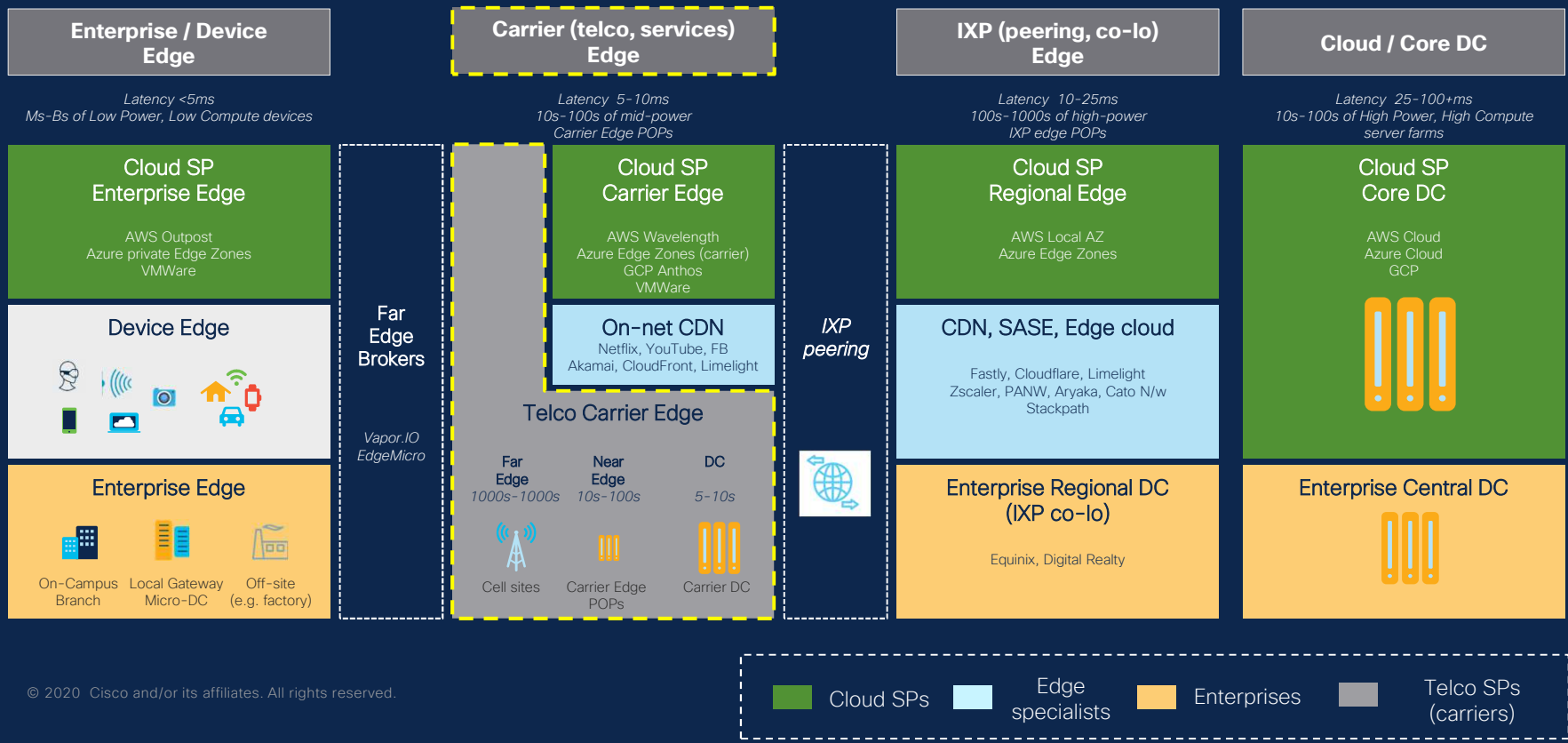
Higher Quality of Experience



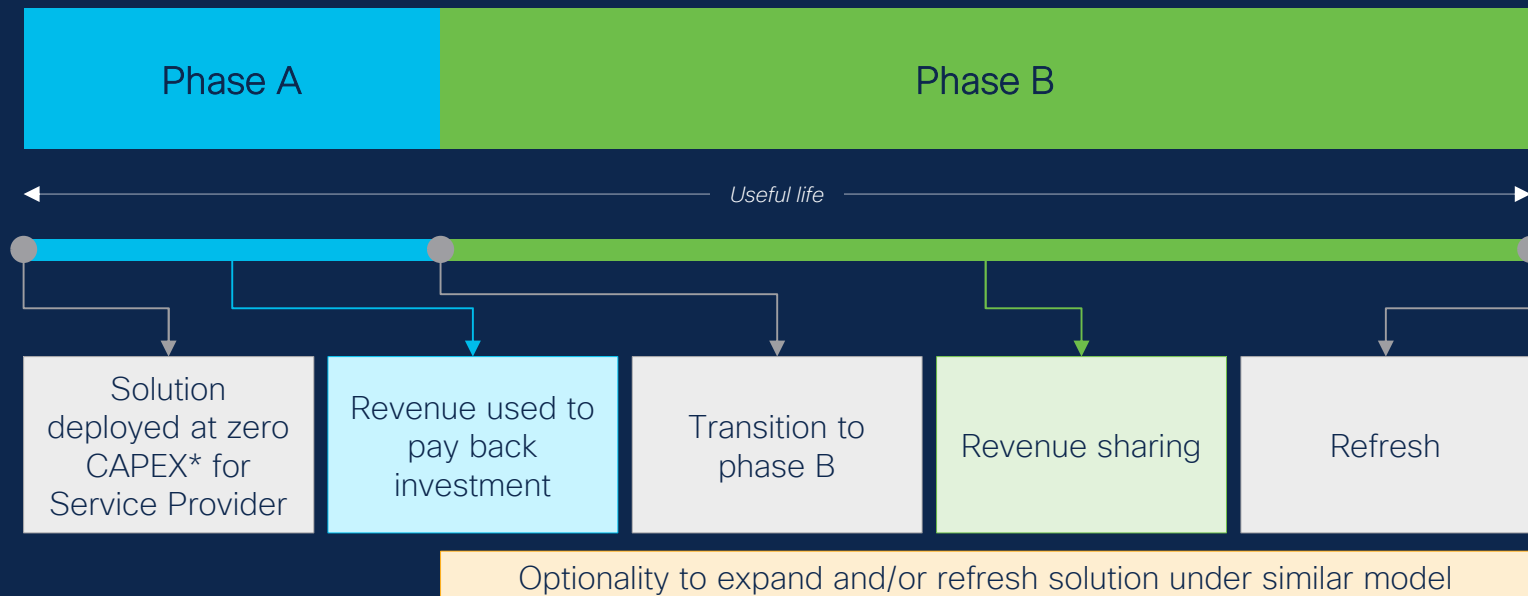
Preliminary Performance Results

- Connection Induced Rebuffering Ratio Improved ~20%
 - .056% vs. .077% for next closest CDN
- Video Start Time had nominal impact of 5-7%
 - Was a concern but seems to be mitigated by architecture
- Video Playback Failures reduced by 15%
 - Less chance for playback error inducing events

Carriers' edge network is a key control point on the Edge compute continuum

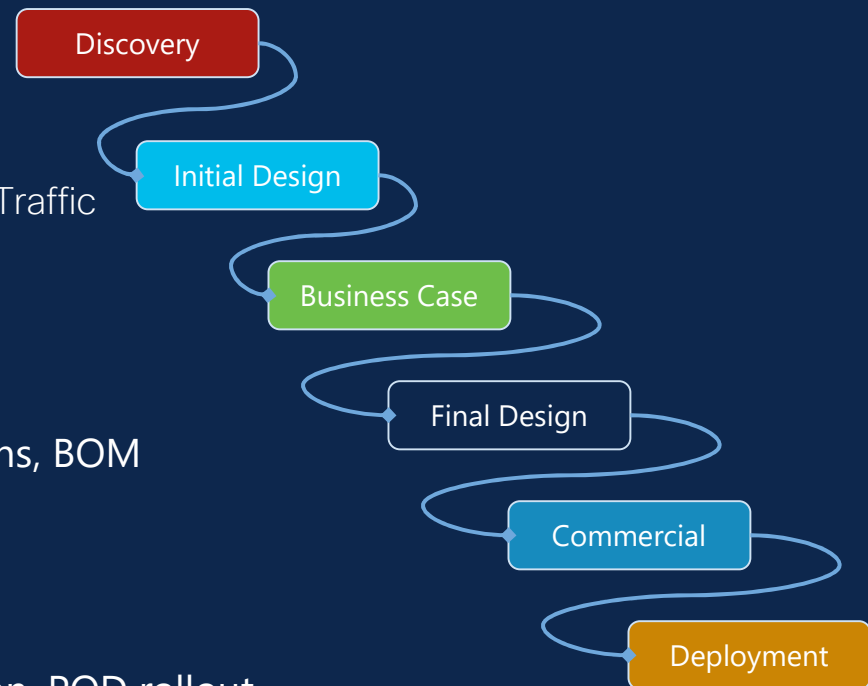


The business model is built around 2 phases



We have a well established process for engagin with customers

1. Design & **Discovery**
 - Questionnaire and review
2. Initial Design Review
 - High-Level Design, Site Selection, Traffic
3. **Business Case**
 - Bottom-up / Top-down analysis
4. Final **Design Review**
 - Finalize High and Low-Level Designs, BOM
5. **Commercial**
 - Contract, Purchase Order
6. **Deployment**
 - CDN and Network Deployment Plan, POD rollout



GTM Playbook & RACI



- E2E Processes
- Templates (Business Modeling, Solution Design, Collaterals, ...)
- RACI: Roles & Responsibilities
- Project Governance

Deployment and Support process - TIM CDN

Stage	Documentation	Task	Contracted				Final User
			Digital Alpha	NEC	Cisco	Qwilt	TIM
Solution Design LLD	Cisco and Qwilt will work with TIM B and provide the LLD	Provide a technical Questionnaire to understand network topology, edge sites and existing content delivery capacity			R	R	
		Calculate high level estimate of the peak capacity required			R	R	
		Deliver one technical workshop to validate the initial assumptions			R	R	
		Create RCM			R	R	
Customer agreement to proceed, sizing and		CX deliver Deployment and Support model and associated costs	R	R	I	I	I
			R	R			
					R	R	P

Customer Engagement RACI

Defined matrix of the engagement process and responsibility owner assigned to each task

Activities to Consider	Complete By	Expected Duration	TASK OWNER				Accountability	Consult
			Contractor	Contracted				
			Digital Alpha	Partner	Cisco	Qwilt	SP	
Initiation Identify AT, BU, CX Customer stakeholders identified (Ideally C-level) Update customer tracker with contacts with titles/roles Intro template to Cisco ATs Share AAG (Cisco Cloud Services Stack for Content Delivery) Present Value Prop to AT SP Edge & CDN Solution Qwilt overview Technical deep dive Buy-in from Cisco AT Utilize FAQs as needed Initial customer meeting scheduled		1-3 Days			R	R		Cisco
Preliminary value proposition Present Value Prop to broader Cisco Teams Edge strategy PPT Business model / Business case PPT Customize presentation with prelim sizing/offer for initial customer meeting Estimate traffic ramp based on outside-in data Local specifications (regulation, taxes, digital alpha validation) Build preliminary business case SR: requirements to do this? Validate DA Capex free model Add to box? DA preliminary approval (as applicable) Req/Qwilt Cost from Cisco/Partner Qwilt NDA Signature required DA NDA if applicable		1-3 Days	R		R	R		Qwilt
Customer/Partner Introduction Meet the customer/partner (Ideally C-level) interested in jointly exploring this opportunity Present edge strategy SP Edge & CDN Solution Qwilt overview presentation Present business model / Business case for CDN Qwilt QoE benchmark / Business case for CDN Share Draft LOI sheet (only if required) Ask MR or SR: benefits are limited, do we need? Identification on lead customer contact Agreement to schedule a technical workshop followed by a business model workshop SR to input help Respond to all questions/concerns Determine capacity requirements and agree on a high-level solution design with the customer Jointly perform a bottom-up estimate of 3-5 year capacity needs Jointly develop high-level solution design		1-2 Week	R	R	R	R		Cisco

Cloud gaming is built on three pillars, and requires a globally consistent edge delivery platform



Content Delivery

- Software distribution
- Video streaming
- In-game real-time content delivery



Optimized E2E connectivity

- Low-latency / low-jitter
- End-to-end, SLA-driven, reliable connectivity



Edge compute & GPU resources

- Video rendering at the edge
- Virtual Reality
- Augmented Reality

