Cisco Silicon One

Cisco CKN Series

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Cisco Fellow
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Current State of the Market

An aging patchwork of solutions

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Networking Silicon Architectures

More than

Architectures

- 9 Custom ASIC Architectures
- 10 Merchant Silicon Architectures

- 6 Routing Architectures
  4 Custom, 2* Merchant
- 10 Switching Architectures
  3 Custom, 7 Merchant
- 3 Fabric Architectures
  2 Custom, 1 Merchant

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** – Two quite different markets*

Complexity Explosion

Many products per Form Factor

N

Fixed 1

Fixed N

3 Form Factors X

3

Fixed

Centralized

Modular

Many Devices per Architecture X

M

Many Architectures X

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Equipment Vendor or
Customer who builds their own HW or
Customer who writes their own SW
Customer who deploys networking equipment

Explosion of development cost

Explosion of complexity in planning, certification, and support

Common Network Operating System (NOS) is not enough to hide the architectural differences of the silicon

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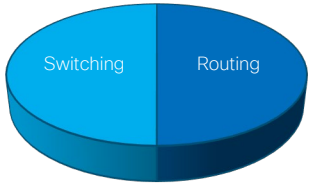
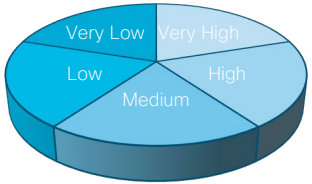
Justifying Unique Architectures

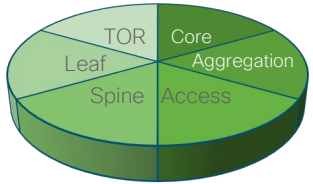
Category



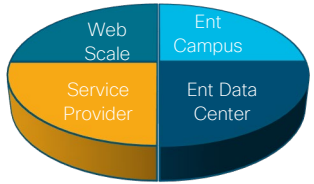
Bandwidth



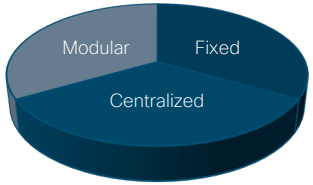
Network Role



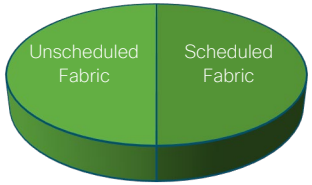
Customer Type



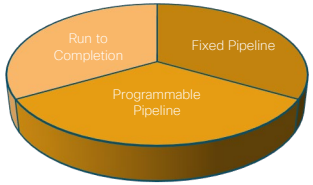
System Form Factor



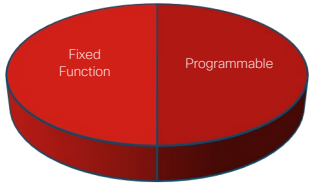
Fabric Dataplane



Processing Architecture



Programmability



Packet Buffer

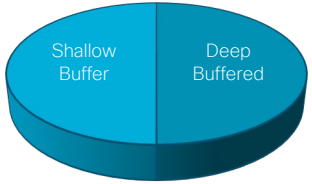
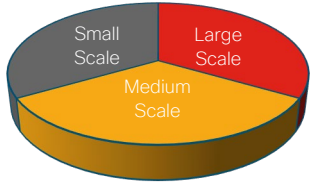
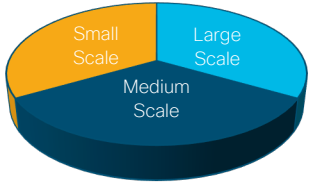


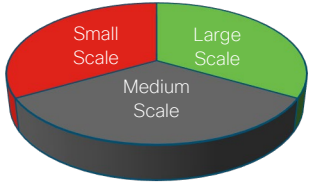
Table Scale



Counter Scale



ACL Scale



Doesn't fully explain 19 architectures

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What else is going on?

Melvin Conway

Famous computer scientist

Conway's Law

Any organization that designs a system (defined broadly) will produce a design whose structure is a copy of that organization's communication structure

Simplified view : Org Structure = Product

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Architectures

Clearly many of these architectures are a:

- Result of multiple organizations (companies) making similar products
- Multiple acquisitions or groups in the **same** company making similar products. Hard to unwind due to technical debt

… But there's more …

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What else is going on?

Rakesh Chopra

Nobody of note

Chopra's Law

If you approach a problem with the same organization and the same technology, you'll get the same outcome

Massive Investment

Over 7 years of research and over a billion dollars

New Organization

Focused on building One Architecture **across the network** and **across business models**

Silicon One

New Technology

Invented **fundamental** new technology to allow convergence of routing and switching

Fundamental Change in the Industry

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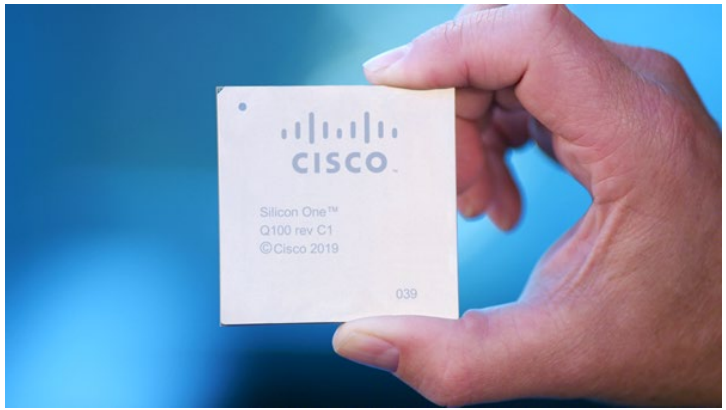
Cisco Silicon One Value Proposition

One Architecture, One Experience



Many Devices

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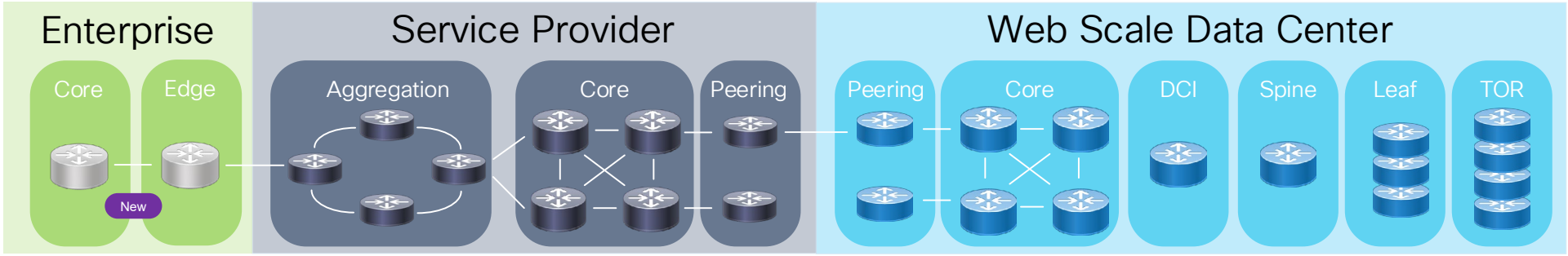
One Network – One Experience

Cisco Silicon One



Unified Architecture, SDK, & P4 Forwarding Code

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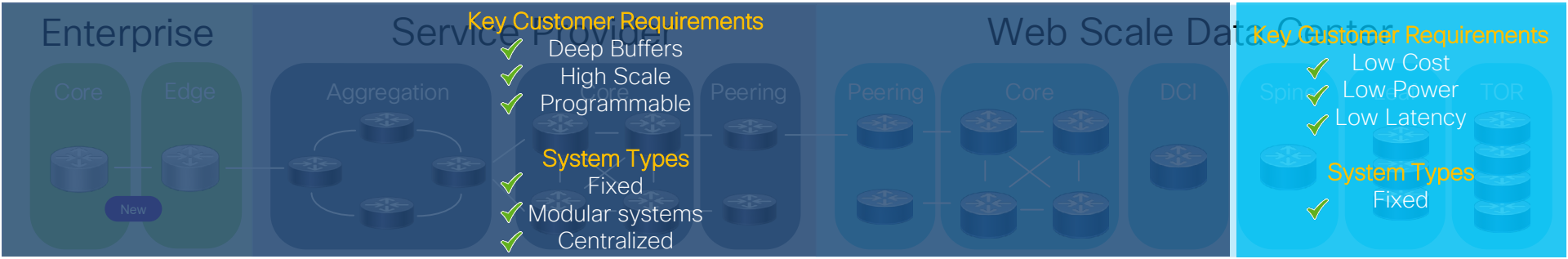
One Network – One Experience

Cisco Silicon One



Routing | **Switching**

Unified Architecture, SDK, & P4 Forwarding Code

Silicon One Q200 — 12.8T

Silicon One P100 — 19.2T

One Architecture

Multiple Devices

Silicon One G100 — 25.6T

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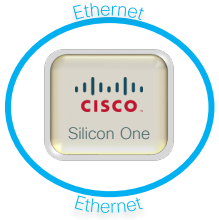
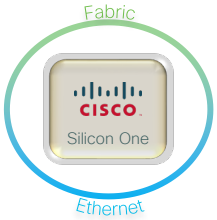
One Form Factor

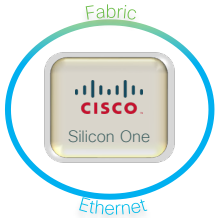
Fixed, Centralized, Modular, Disaggregated



Standalone Processor



Line-card Processor

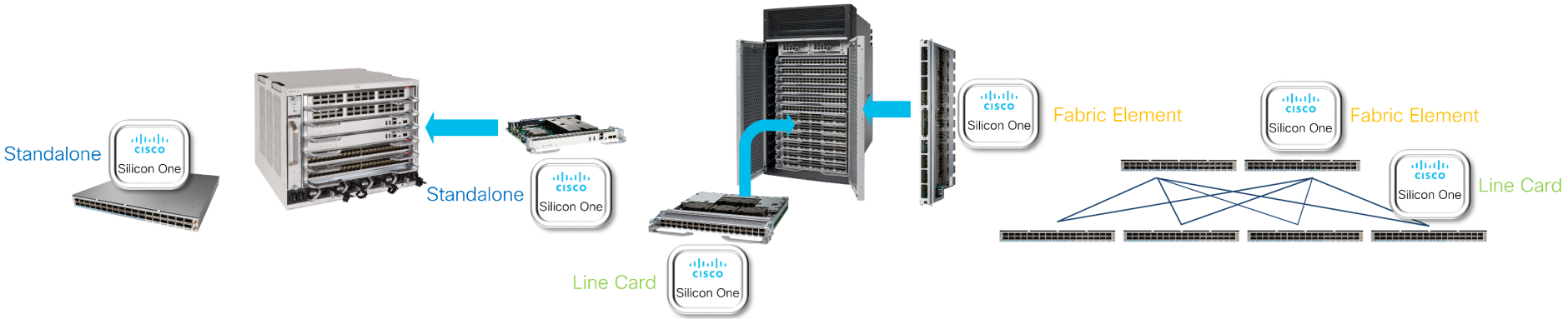


Oversubscribed Line-card Processor

Fabric Element

Cisco Silicon One

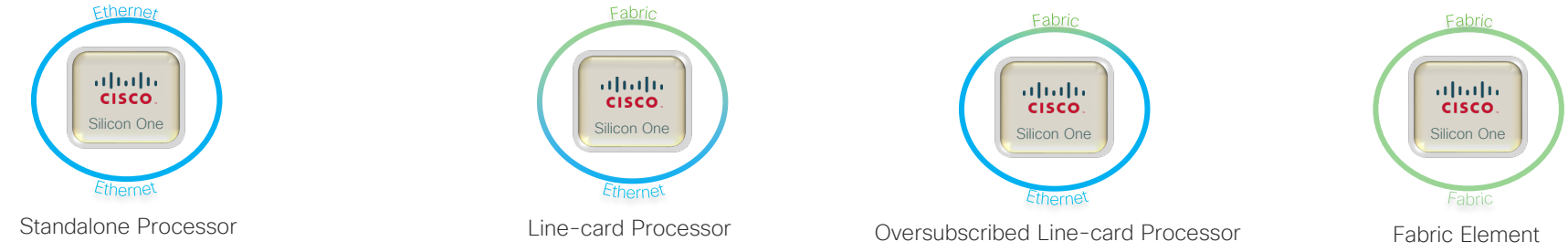
Fixed Box | Centralized System | Modular System | Disaggregated Chassis



Unified Architecture, SDK, & P4 Forwarding Code

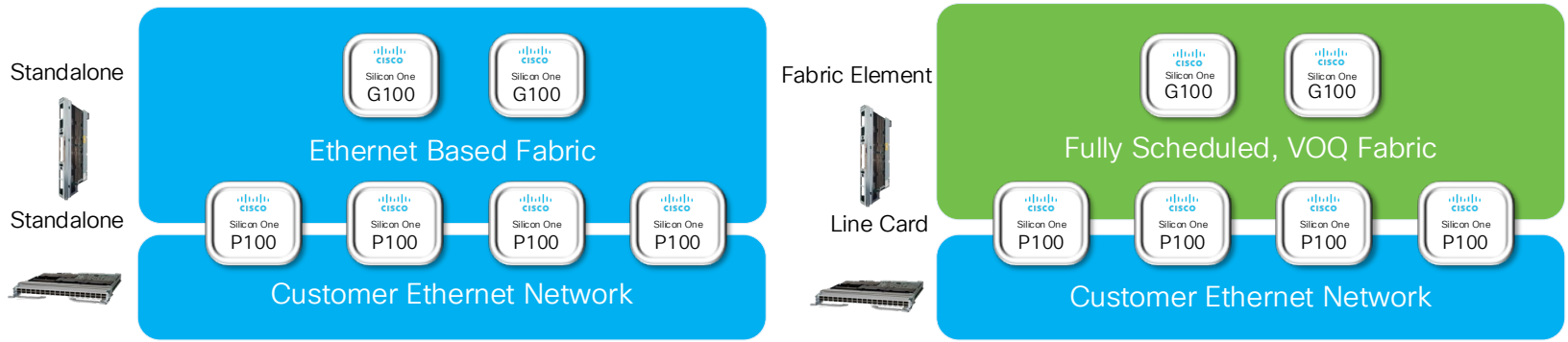
One Design

Ethernet ECMP or Fully scheduled Spray & Re-order



Cisco Silicon One

Chassis or disaggregated



One Architecture, SDK, & P4 Forwarding Code

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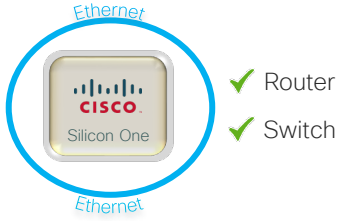
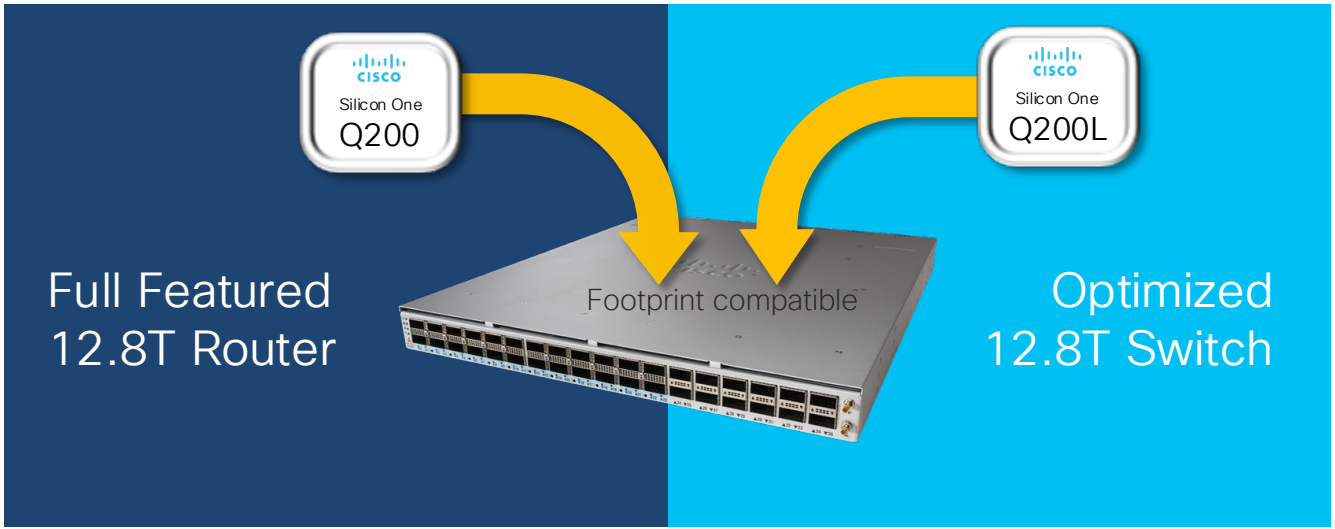
One Design
Routing and Switching



Standalone Processor

Cisco Silicon One



Unified Architecture, SDK, & P4 Forwarding Code

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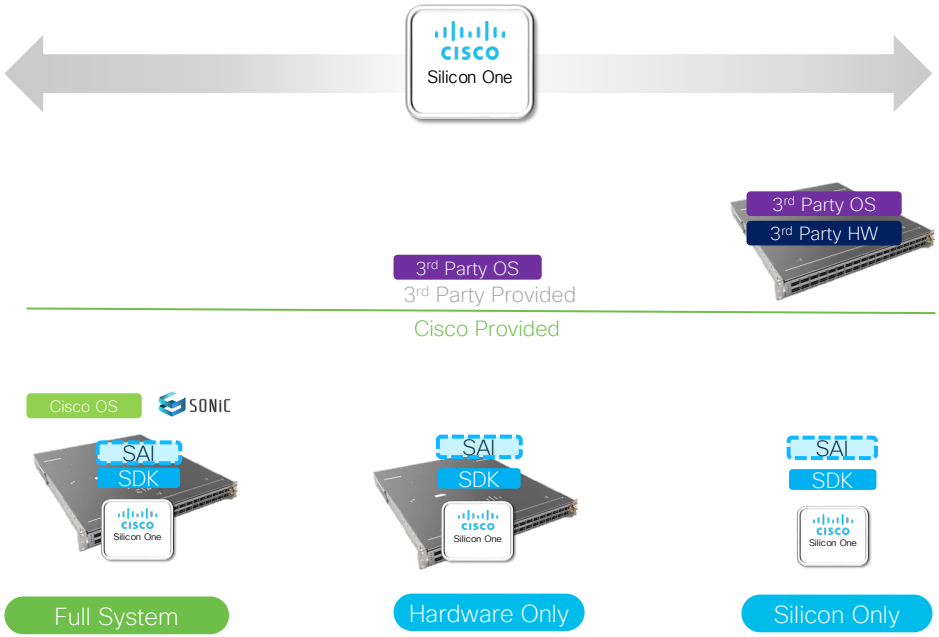
One Architecture, Multiple Business Models



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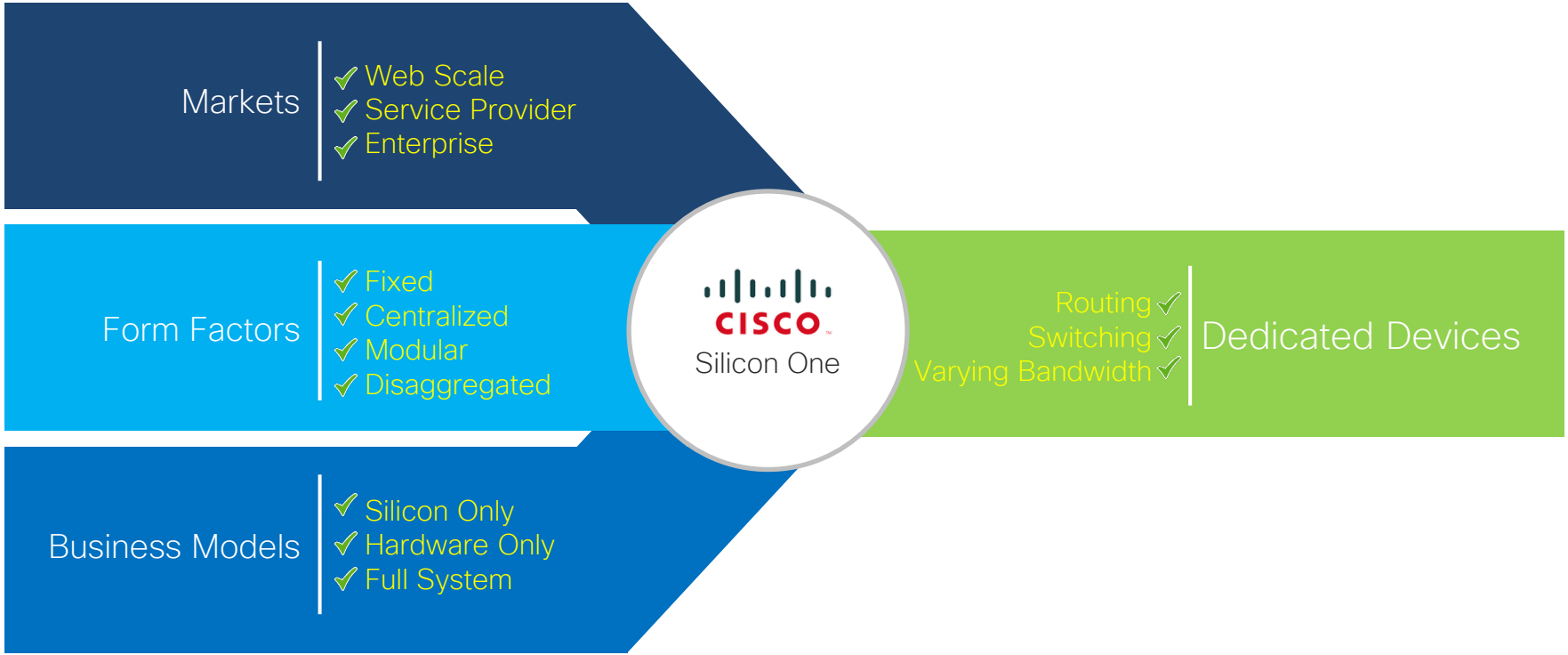
Cisco Silicon One Value Proposition

Convergence without Compromise



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Cisco Silicon One
What and How

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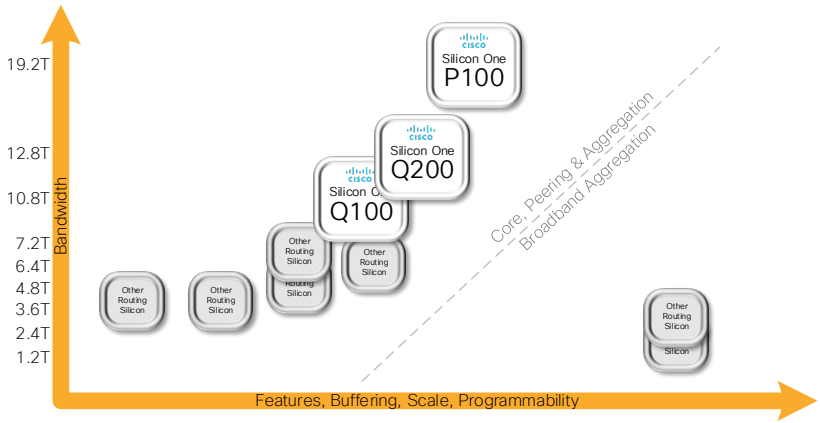
Setting the Stage

Reality of Routing Silicon

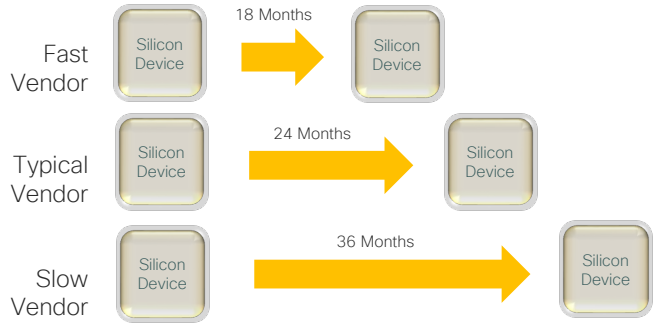


Be careful! Most companies play marketing tricks

- Half-duplex accounting (i.e., 100G = 200G)
- Pre-announce silicon

Cisco Silicon One is 2.6x higher BW than ANY other routing silicon

Typical Silicon Development Timeline



Most companies release new devices once every 18-36 months

We'll show you something very different...

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New Technology Innovations

New Dataplane Architecture

Fully Scalable

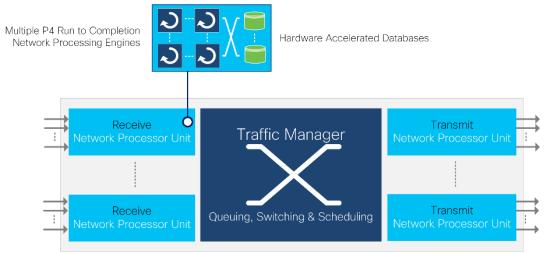
New category of routing silicon

Common approach with switch silicon
Previously impossible for routing silicon

Routing at Switch Bandwidth

New Processing Architecture

Fully Scalable



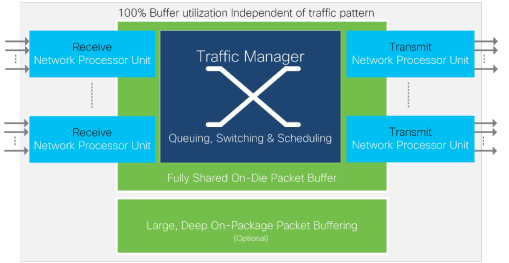
New processing paradigm

Flexibility of run to completion
Efficiency of pipeline

Routing with Switching Efficiency
Switching with Router Programmability

New Memory Architecture

Fully Scalable



New levels of efficiency

No segmentation of packet buffer
Ultimate burst performance
Write once, read once

Highly Efficient Router
Highly Efficient Switch

Industries first truly scalable networking silicon

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Cisco Silicon One

Gen1

Core/DCI Routing

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Cisco Silicon One

Gen1 | Gen2

Core/DCI Routing

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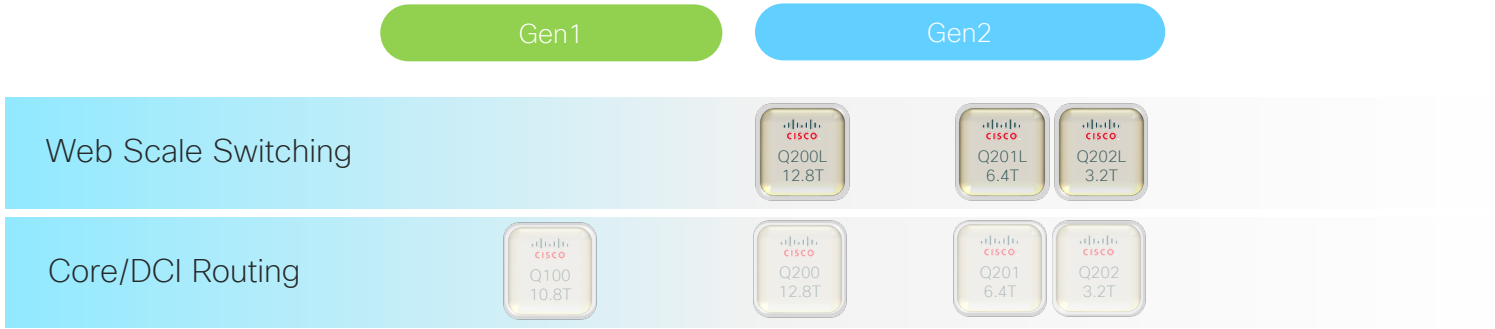
Cisco Silicon One



One Architecture, No Compromise

One Architecture
One SDK
One P4 Forwarding
One Form Factor
One Design

Multiple Devices
Multiple Markets
Multiple Business Models

One Network
One Experience

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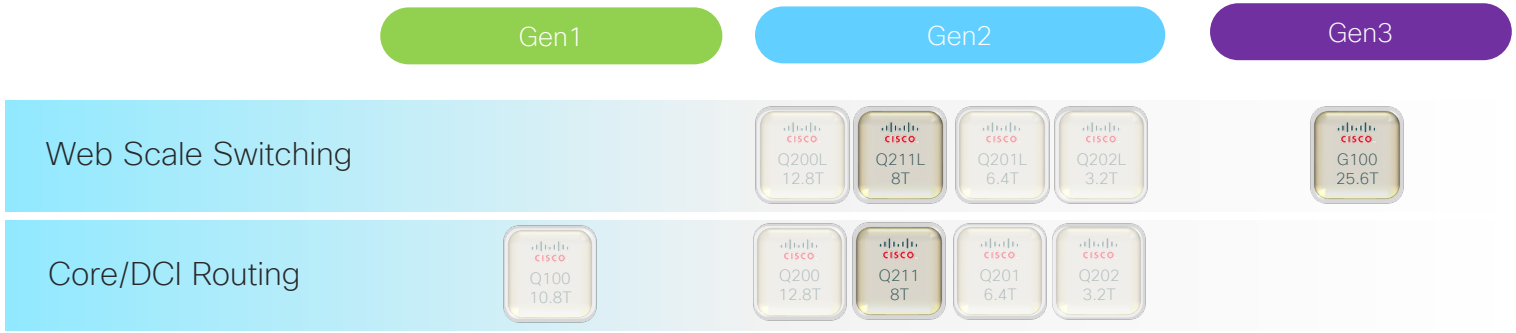
Cisco Silicon One



One Architecture, No Compromise

One Architecture One SDK One P4 Forwarding One Form Factor One Design	Multiple Devices Multiple Markets Multiple Business Models	One Network One Experience

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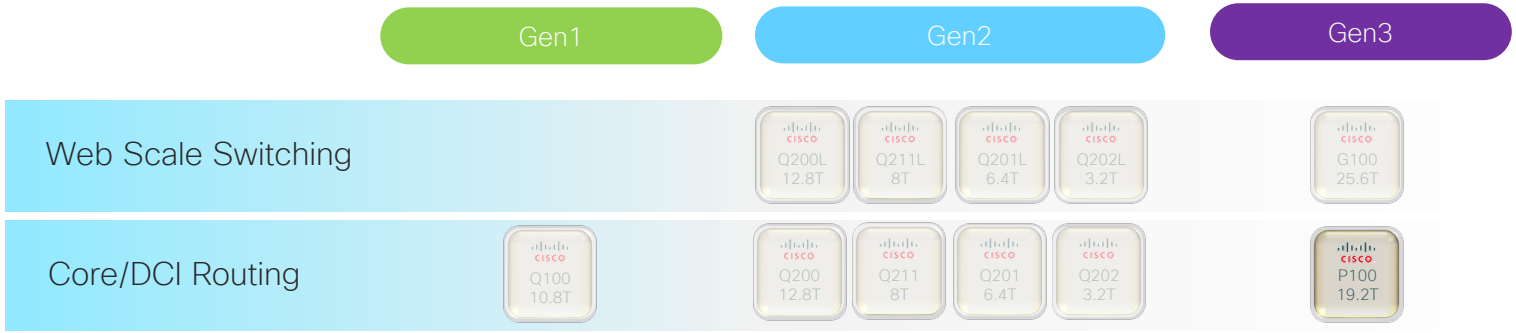

One Architecture, No Compromise

One Architecture One SDK One P4 Forwarding One Form Factor One Design	Multiple Devices Multiple Markets Multiple Business Models	One Network One Experience

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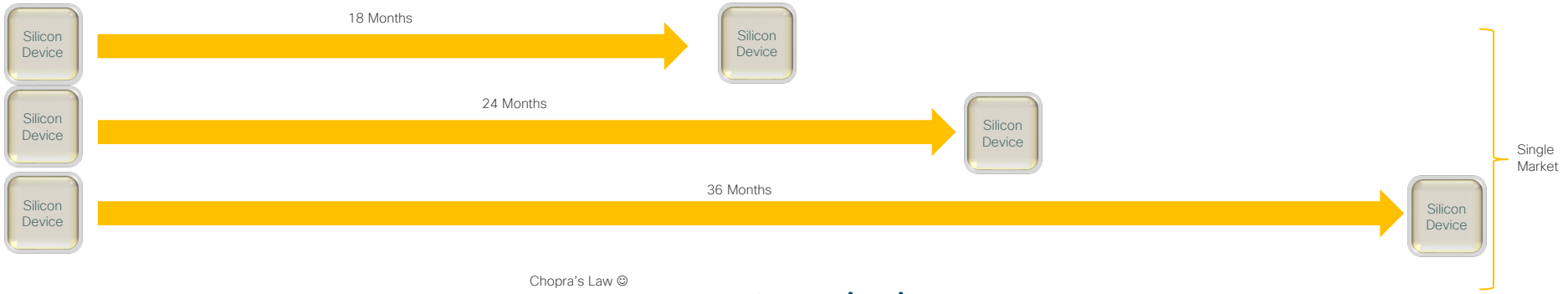
Massive Impact

Cisco's Architecture, Organization and Investment

Everyone Else



Cisco Silicon One

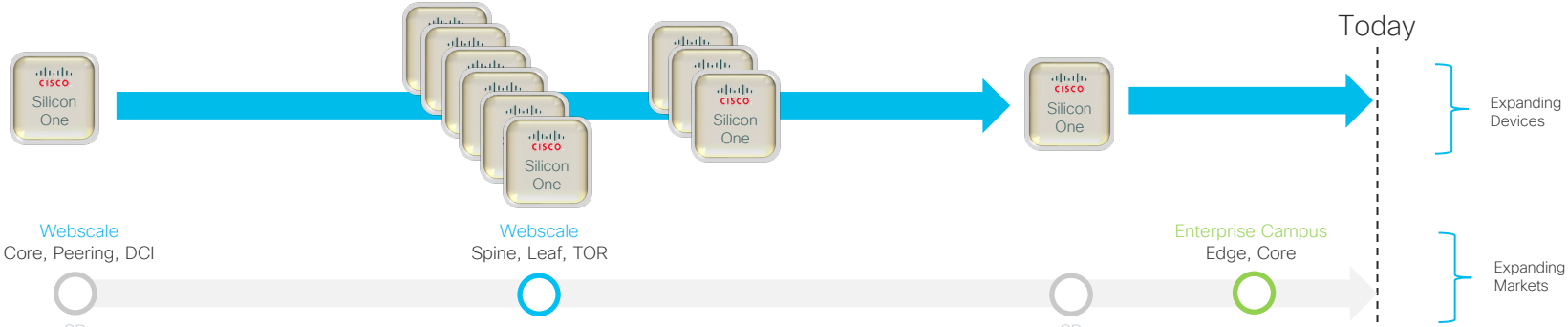
11 Devices, 11 Markets in two years

Chopra's Law ☺

If you approach the market with the same organization and the same technology, you'll get the same outcome

New Organization
New Technology

New Outcome



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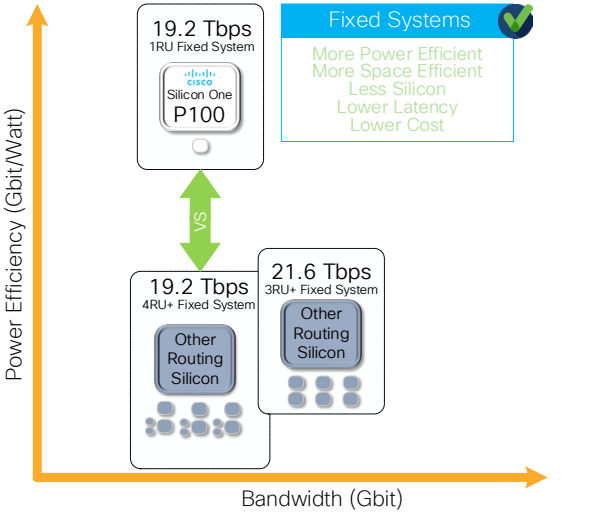
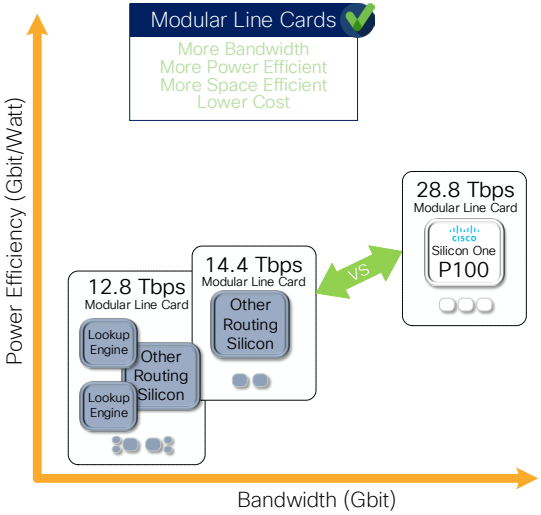
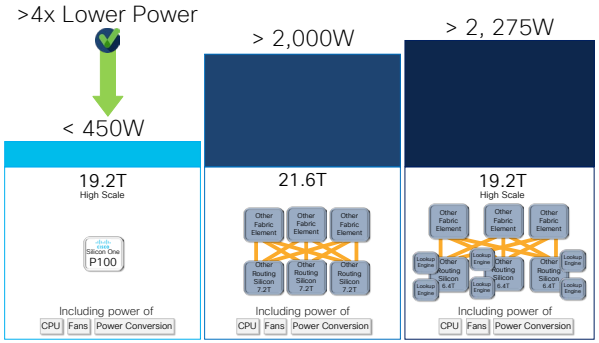
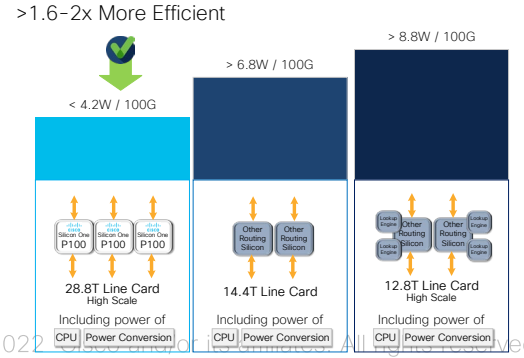
Cisco Silicon One P100

Industries highest BW Routing Silicon









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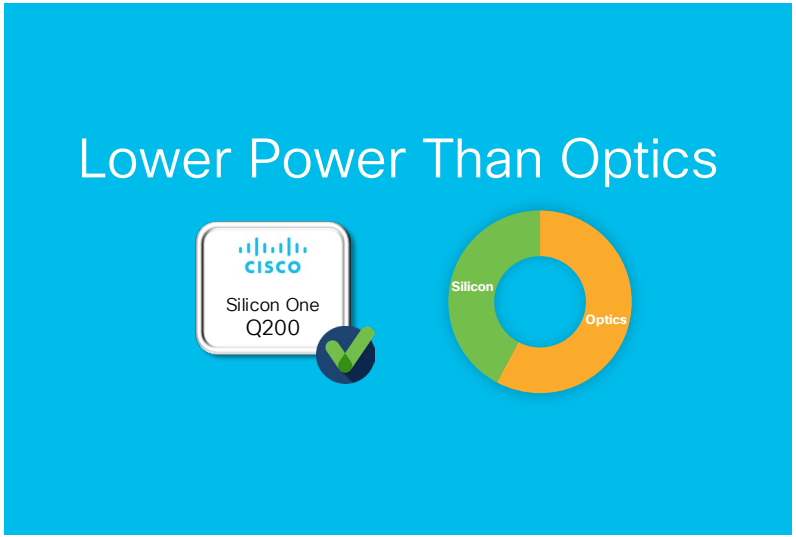
Power Efficient



Generation3 devices and Web Scale switching devices are **even more** power efficient

All the routing features:

- Programmability
- Scale
- Buffering

In less power than gray optics

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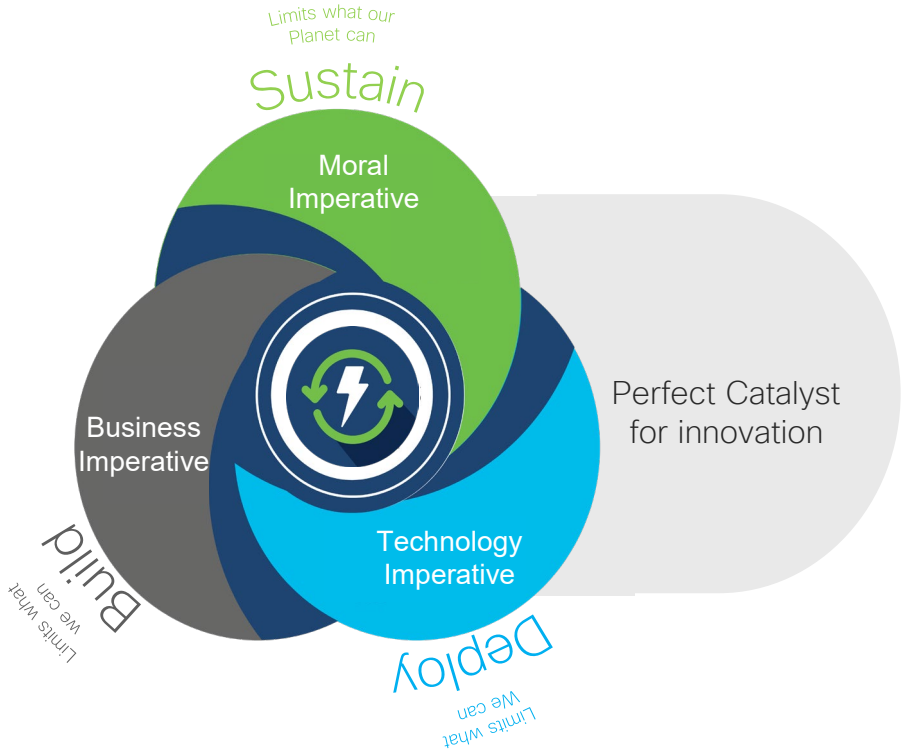
Power is THE Problem to Solve

Apollo 13 – Universal Pictures

"Power is Everything"*

John Aaron– Apollo 13 Flight Controller



Adopt a power first design and deployment methodology

* – Thanks to Kraig Owen for the reference

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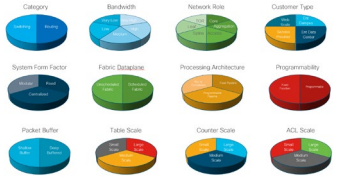
Then and Now….

Requirements drive unique architectures



Business models drive unique architectures

Merchant | Custom

Technical debt prohibits new architectures

=

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Stale Architectures

Now

CISCO Silicon One = One Architecture

Requirements drive unique Devices not architectures

Cisco enables multiple business models, Erase merchant vs. custom

- ✓ Silicon Only
- ✓ White Box
- ✓ Full System

Clean sheet, Investment, & Innovations enable One Architecture

NEW Clean Sheet ~~Technical Debt~~

Invested over $1B

Hardware Innovations

Accelerated Innovation | Accelerated Deployment | Easier Maintenance

A better and easier to maintain Network

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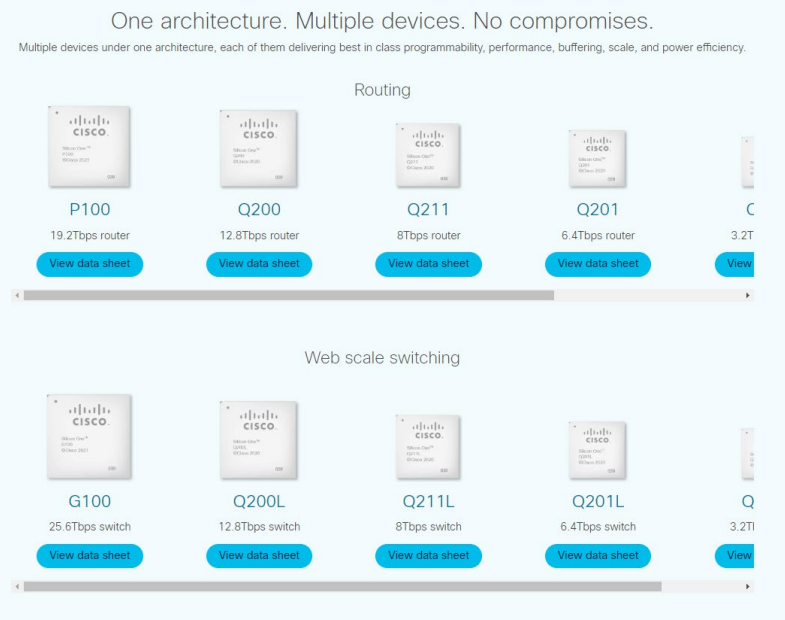
Additional Information

https://www.cisco.com/go/silicon-one

Data sheets available for every device



Large amount of white papers, blogs, videos, podcasts

Resources

White Papers

- System Benefits of Cisco Silicon One P100
- Cisco Silicon One Product Family
- Cisco Silicon One Web Scale Data Center Study
- Converged Web Scale Switching and Routing Becomes a Reality
- Designing a 12.8Tbps Fixed Box Router
- Importance of Architectural Fidelity

Blogs

- Cisco Silicon One Powers the Next-Generation Enterprise Switches
- Cisco and Meta Partner on Wedge400C Data Center Switch
- Cisco Silicon One's Lead Continues Growing
- Cisco Silicon One Enables the Best Routers
- Cisco Silicon One Easily Shatters the 25.6T Barrier
- Optimize Real-World Throughput with Cisco Silicon One
- Co-Packaged Optics and an Open Ecosystem
- Turn Router Power into Cash Savings with Better Silicon
- How Cisco Silicon One Can Help You Save Millions
- Five Principles at the Heart of Cisco Silicon One
- One Architecture on Multiple Devices with No Compromise
- Cisco goes SONiC on Cisco 8000
- Making an Eco-Friendly Network with Cisco Silicon One
- ONE Silicon, ONE Experience, MULTIPLE Roles

Press Releases

- Cisco and Meta Partner on Open Compute Project Contribution
- Cisco Revamps Routing Silicon With 19.2 Tb/s Power
- Cisco Redesigns Internet Infrastructure to Support a More Inclusive Future
- Colt Takes Network Innovation to New Heights with a 400G-Capable Routed Optical Networking Solution on its IQ Network
- Deutsche Telekom and Cisco Deliver Faster Internet to Connect More People Across Europe
- Silicon One, a Blazing Fast Chip for a Sustainable World

Videos

- Cisco Silicon One Easily Shatters the 25.6T Barrier (1:35)
- Breakthrough Innovation (1:20)
- Building a 12.8T Router (2:54)
- Expanding the Cisco Silicon One Portfolio (3:27)
- One Architecture (3:46)
- Power Efficiencies (2:11)

Podcasts and Other Resources

- Cisco Silicon One Back Story
- Addressing the Climate Crisis: How Cisco Technology Can Help

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