The Switching System Vendor Viewpoint

Opportunities and Challenges

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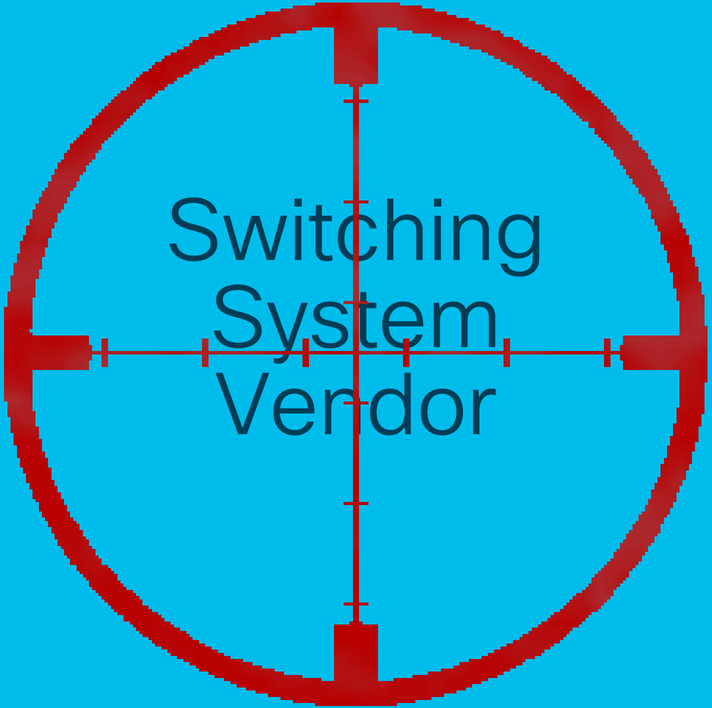


Switching System Vendor

Develops, sells, supports full systems

- Hardware
  - (ASIC)
  - Platform
- Data plane functions
- Operating system
- Control applications

Why focusing on switching system vendors?

- Device users are accustomed to their products
  - Familiar CLIs and APIs
  - Documentation
  - Technical support SLAs
- Turn-key switches might provide a smooth adoption path for P4
  - Less disruptive change
  - Less risk
  - With some exceptions (e.g., hyperscalers)

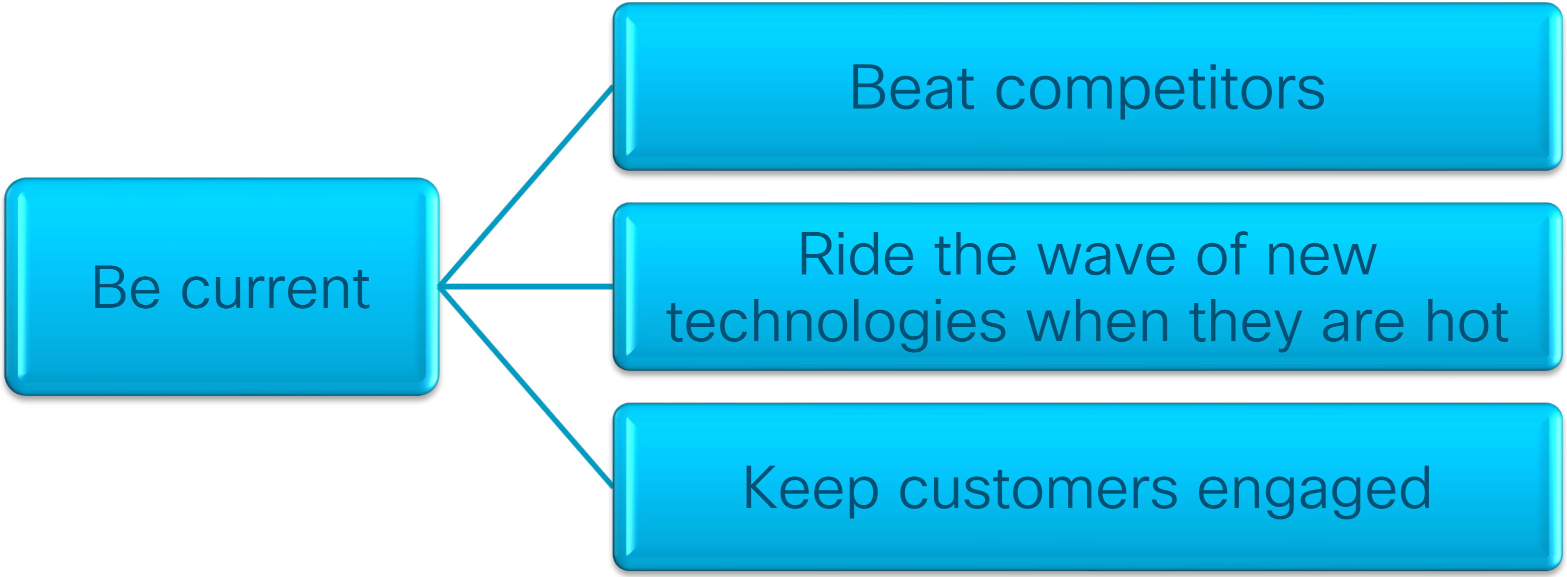
It is key that switching system vendors benefit from P4

... so that they'll embrace it

Opportunities

Accelerate Releases

Shorten the time between regular releases that contain new data plane features and bug fixes



Be current

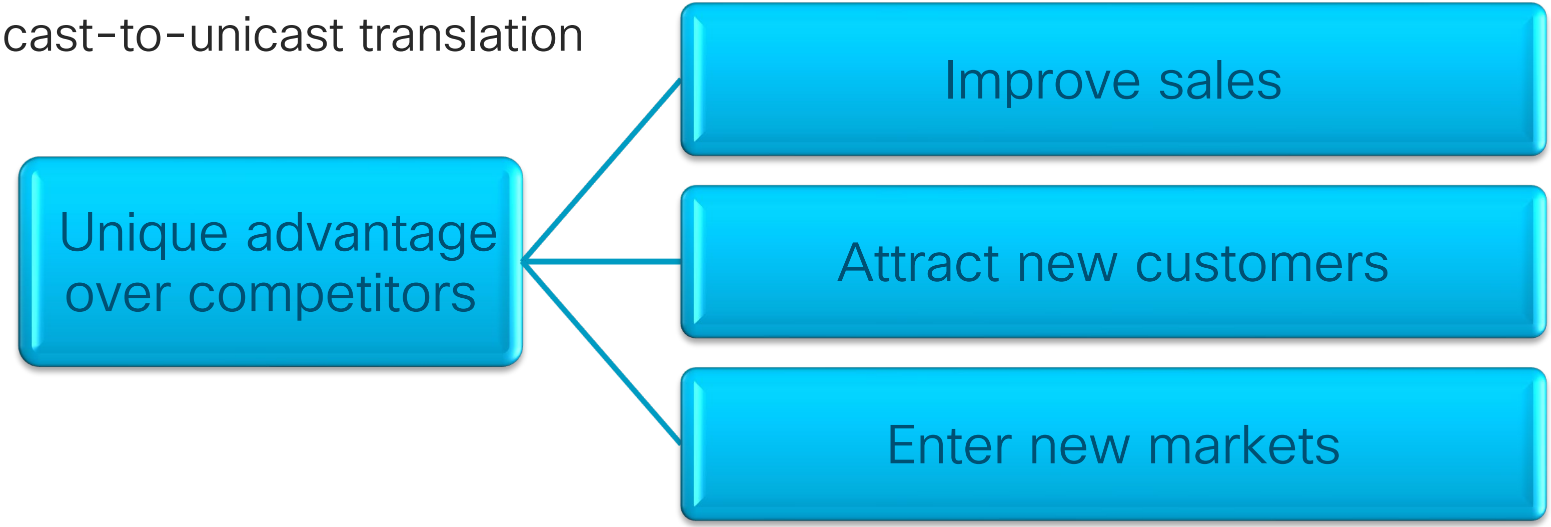
Beat competitors

Ride the wave of new technologies when they are hot

Keep customers engaged

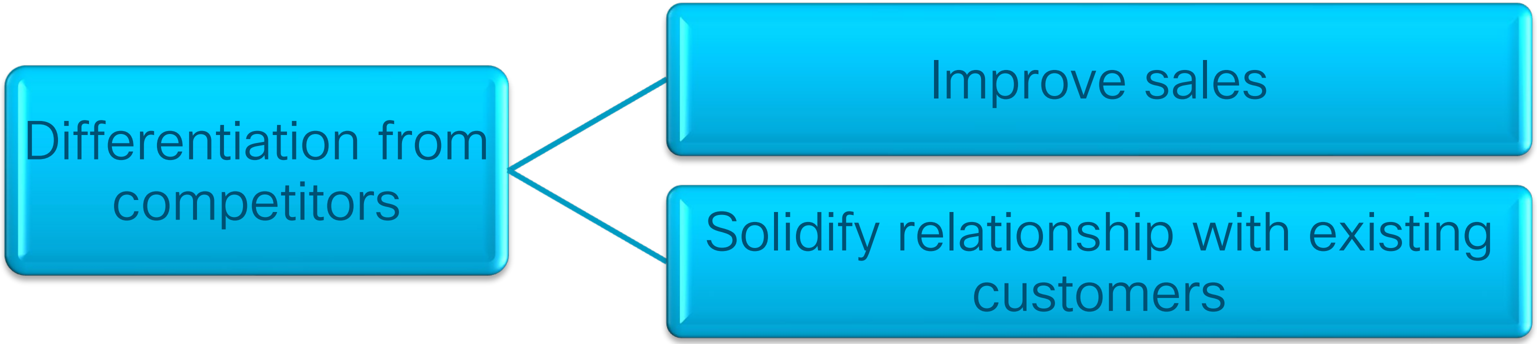
Unique Features Not Available in ASICs

- Unusual, possibly application dependent functions
  - Innovative load balancing algorithms
  - Big data and machine learning support
  - Deduplication algorithm in data broker
- As well as less fancy, but nevertheless important ones
  - Multicast-to-unicast translation



Customer Requested Features

- Examples/use cases
  - Existing protocols not yet widely adopted
    - MAP-T, SRv6, BIER
  - New protocols just standardized or not yet stable or specific techniques
    - Multicast address translation



Differentiation from competitors

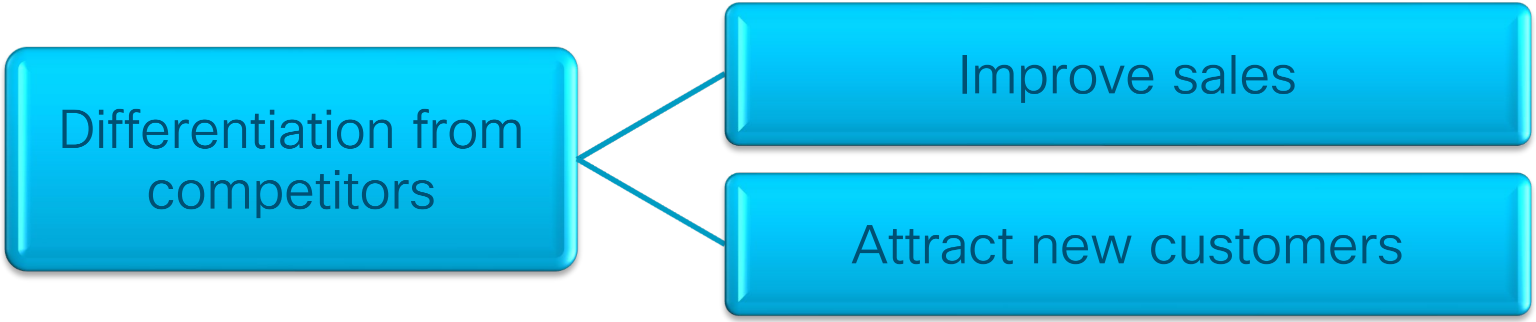
Improve sales

Solidify relationship with existing customers

Customer or Third Party Development

Enable customers to implement their own features on the switch, while taking advantage of existing pre-packaged features

- Examples/use cases
  - Proprietary techniques and protocols
  - Timestamp-based switching (Fox Advanced Technologies)
  - Channel stuffing (DISA SDN RFI MAC0098)



Differentiation from competitors

Improve sales

Attract new customers

Value Brought by Data Plane Programmability

Shorter time to market

- Accelerated releases

Reduced investment/commitment/cost required for the hardware implementation of a feature

- Unique and customer requested features

New “feature”

- Custom and third party development

Challenges

Let’s start from the end

Customer
or
Third Party Development

Challenges

Do not break what works

- Vendor data plane code is well tested
- … and we don’t want to need (very comprehensive) regression testing

Don’t want to show, don’t want to see

- Vendor code and custom code may be confidential
- Not practical to familiarize with a lot of vendor code to just write a few lines

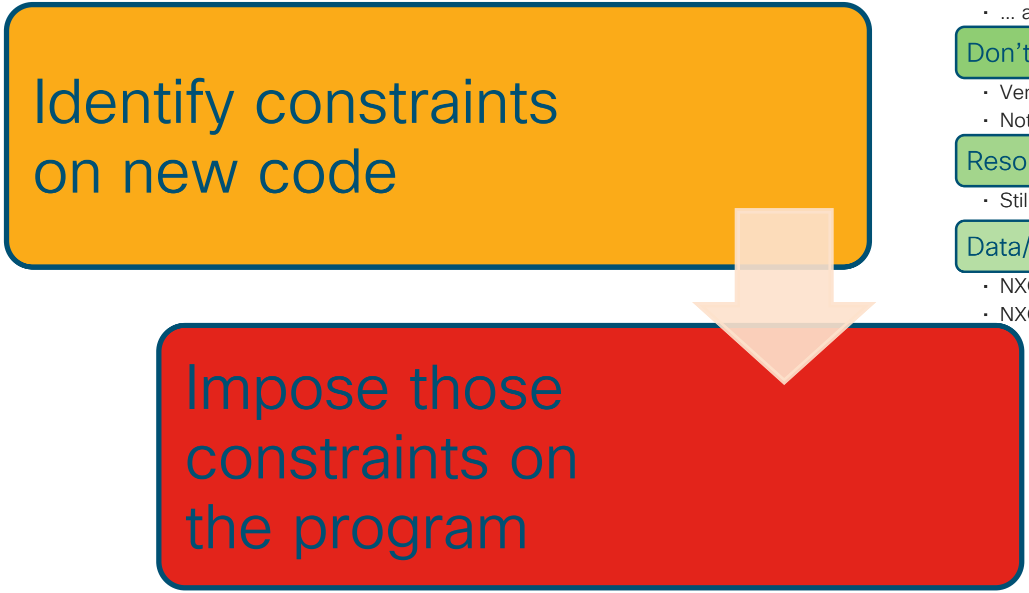
Resource availability

- Still “limited” on current chips

Data/control plane dependence

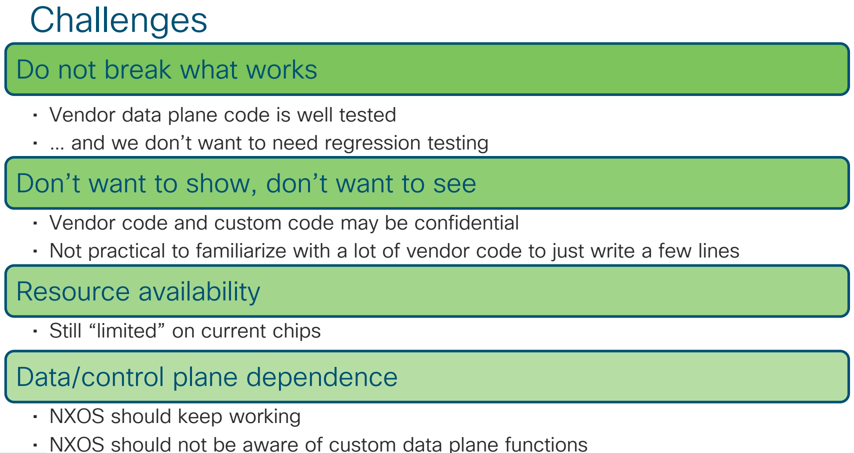
- Net OS should keep working
- Net OS should not be aware of custom data plane functions

daPIPE: DAta Plane Incremental Programming Environment



Identify constraints on new code

Impose those constraints on the program



Challenges

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- NXOS should keep working
- NXOS should not be aware of custom data plane functions

What about the other types of opportunity?

Value Brought by Data Plane Programmability

Shorter time to market

- Accelerated releases

Is this reduction significant?

Reduced investment/commitment/cost required for the hardware implementation of a feature

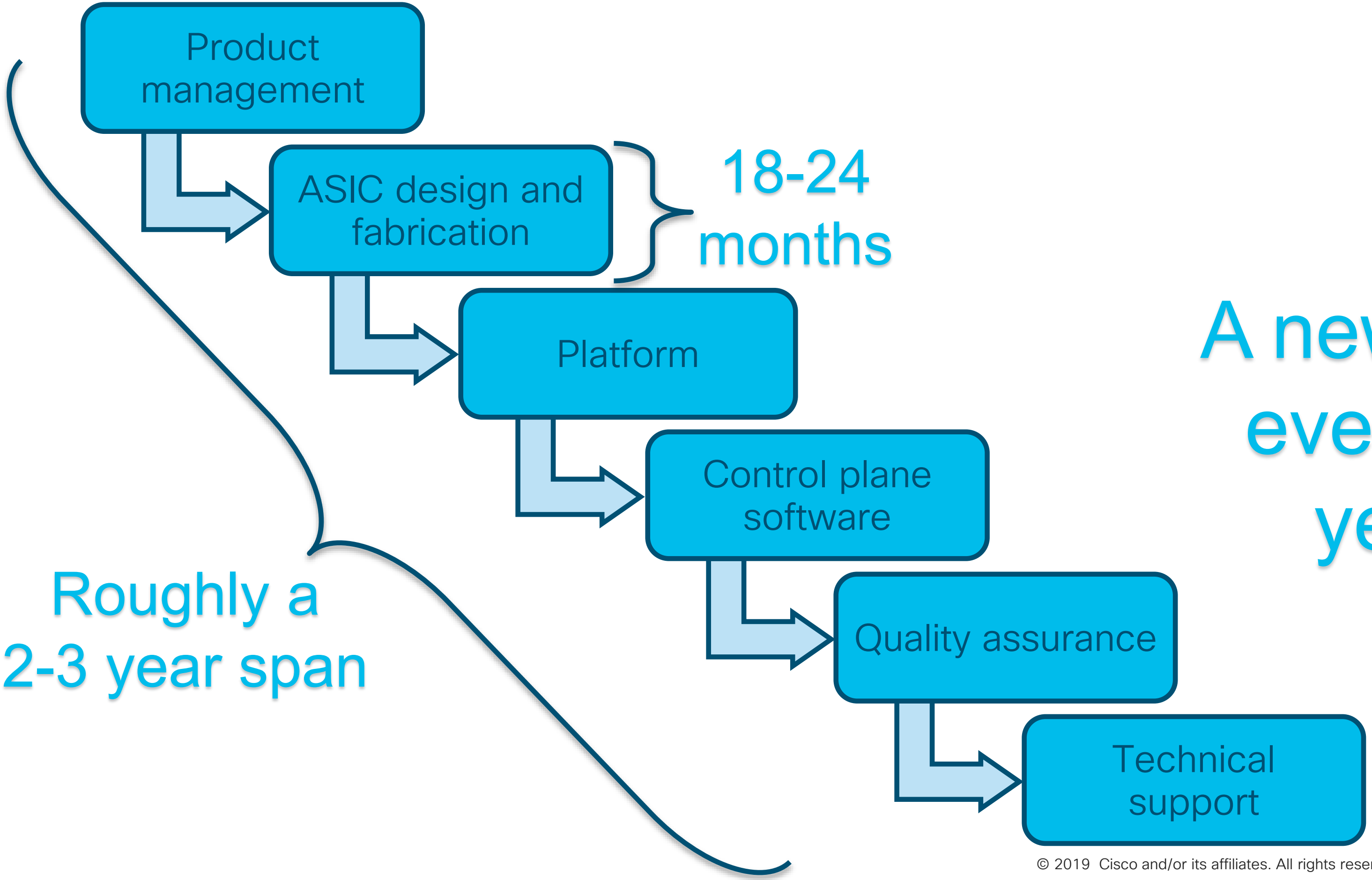
- Unique and customer requested features

New “feature”

- Custom and third party development

Goal: maximize the benefits

Let’s look at the process



Product management

ASIC design and fabrication

Platform

Control plane software

Quality assurance

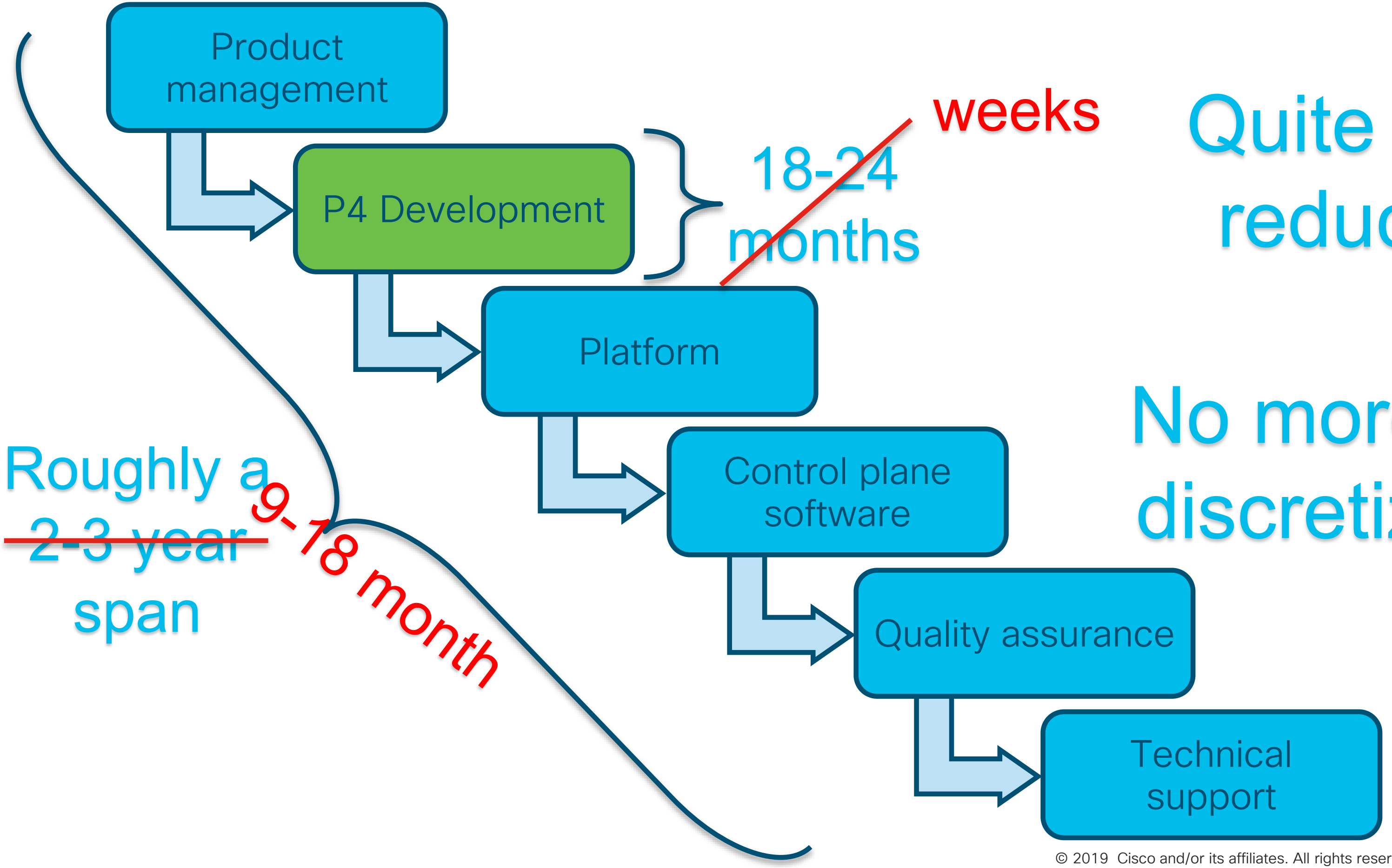
Technical support

18-24 months

Roughly a 2-3 year span

A new ASIC every 2-3 years

With a programmable data plane chip



Quite good reduction

No more “time discretization”

But we can do much better …

… with process changes

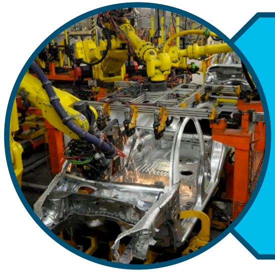
Product management can be more lighthearted

Development can be organized around smaller releases

- Small number of features
- Shorter cycles

… and with some technical changes

Very modular software



Heavy reliance on testing automation

In the meantime …

- Implementation of data plane function and fast implementation of control plane
  - Not tightly integrated with NOS
    - Possibly application running on it
  - Not dependent on the “normal” release cycle
  - Possibly using solutions for customer/third party programming
    - E.g., daPIPE
- Users start field trials/sales force proposes the solution
- Improvements are made based on results of field trials
- Confidence is gained on the market opportunity
- If feedback is positive, move to full integration with NOS

Conclusions

- Switching system vendors can have a key role in the widespread adoption of P4
- They can leverage P4 and programmable switching chips in different ways
- The value they can extract can be significantly different depending on which opportunities they are catching
- Immediate benefits are significant, however …
- … much bigger benefits are enabled by changes in the production process for switching systems