



# What Is SDN?

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Network Architect

ipSpace.net AG

# Who is Ivan Pepelnjak (@ioshints)

## Past

- Kernel programmer, network OS and web developer
- Sysadmin, database admin, network engineer, CCIE
- Trainer, course developer, curriculum architect
- Team lead, CTO, business owner



## Present

- Network architect, consultant, blogger, webinar and book author

## Focus

- Large-scale data centers, clouds and network virtualization
- Software Defined Networking and NFV
- Scalable application design



# The Challenges

- Increase flexibility while reducing costs
- Faster application deployments
- Compete with public cloud offerings



**Network Functions  
Virtualisation ISG (NFV)**



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OPEN  
LIGHT

Will SDN and NFV  
Save the Day?

ONS



SDN  
&NFV  
SOFTWARE DEFINED NETWORKING  
& VIRTUALISATION



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# Technology Is an Enabler, Not a Solution

# What Is SDN?

**SDN is the physical separation of the network control plane from the forwarding plane, and where a control plane controls several devices**

**(Open Networking Foundation)**



SDN is the physical separation of the network control plane from the forwarding plane, and where a controller controls several devices.

**Mostly Useless**

(Open Networking Foundation)

**SDN is packet forwarding done  
in software (on x86 platform)**

SDN is packed with things done  
in software (platform)

**Exciting but  
Nothing New**

**SDN is whitebox switching  
(running software on third-party  
cheap hardware)**

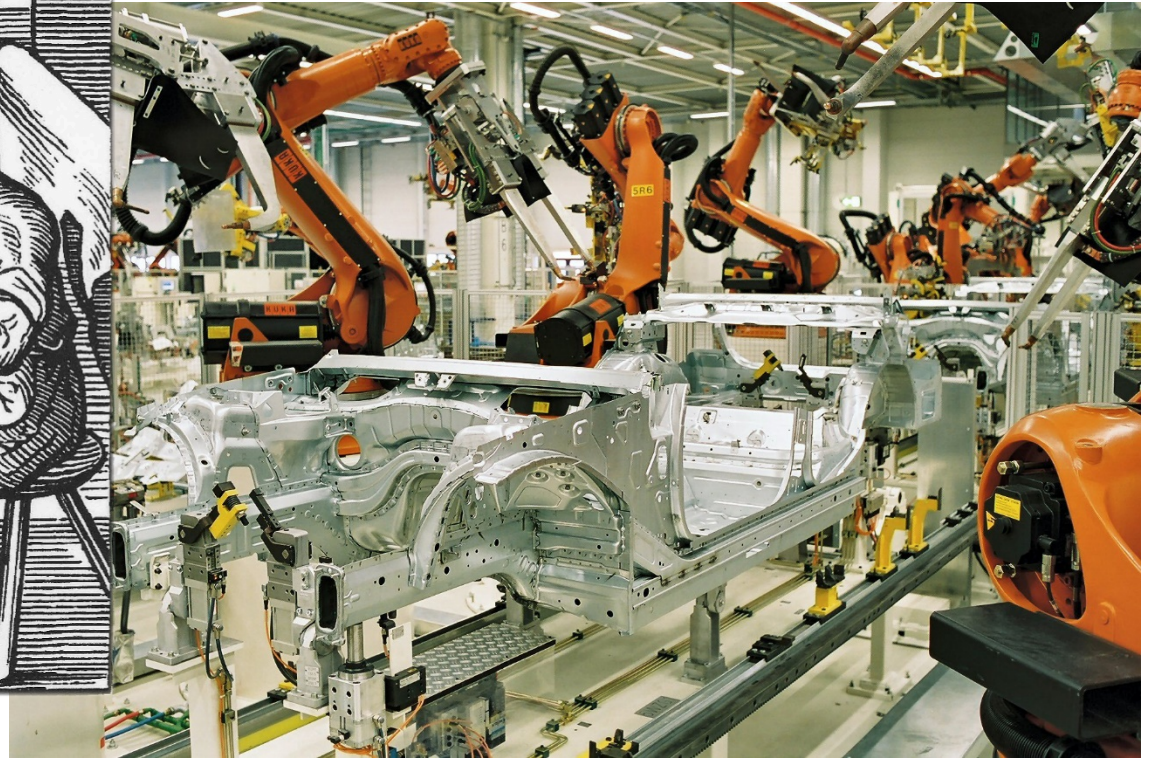
SDN is whiteb  
(running s  
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third-party

# Margin Shifting Exercise

**SDN is an approach to computer networking that allows network administrators to manage network services through abstraction of lower level functionality**

SDN is an approach to computer networking that allows network administrators to manage network settings through abstracted, higher level functions. This makes sense

**This Makes Sense**



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**SDN and NetOps is a lifestyle change**



# Finding the Sweet Spot

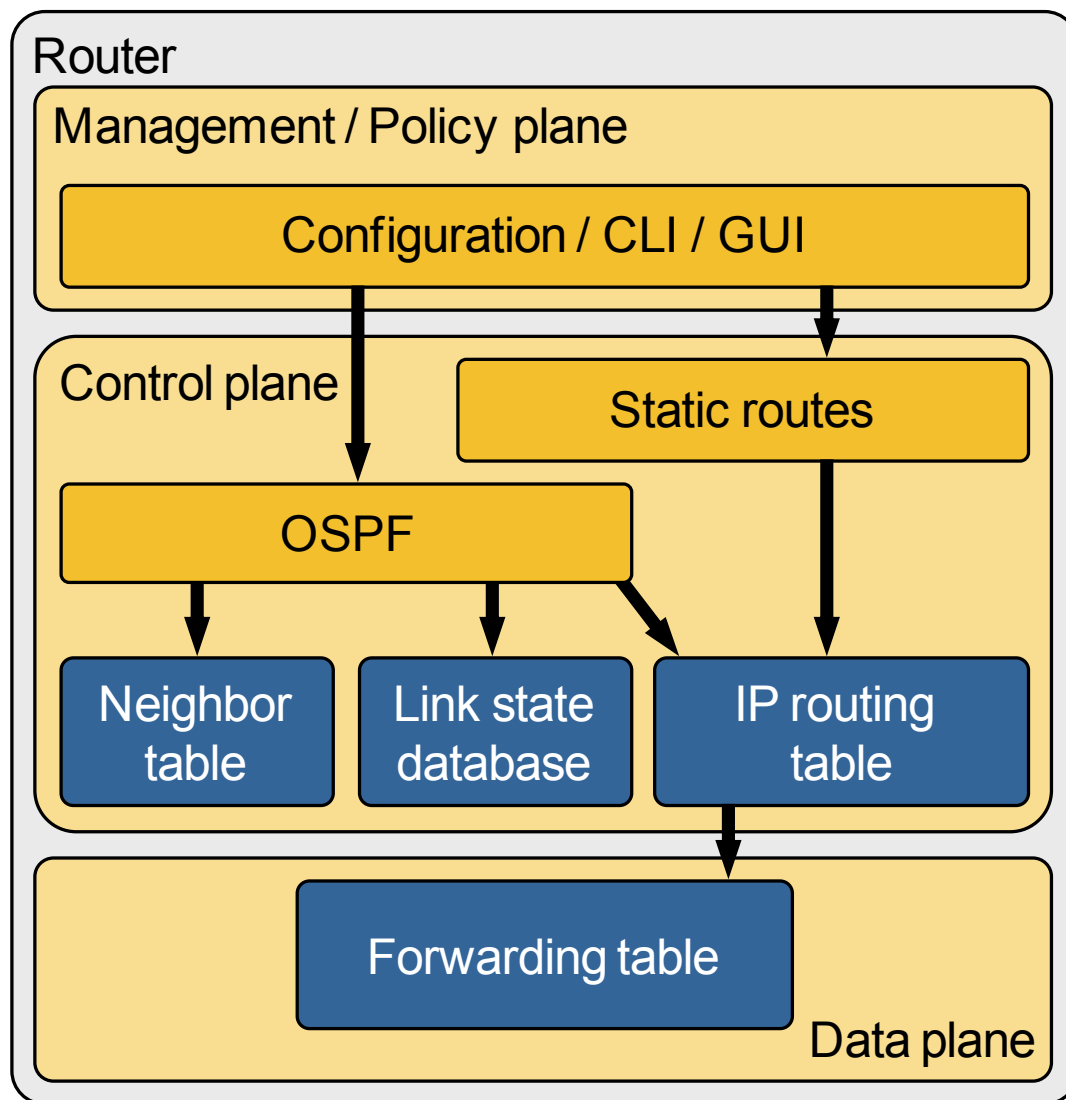
Device provisioning  
(orchestration) system

Service provisioning  
(orchestration) system

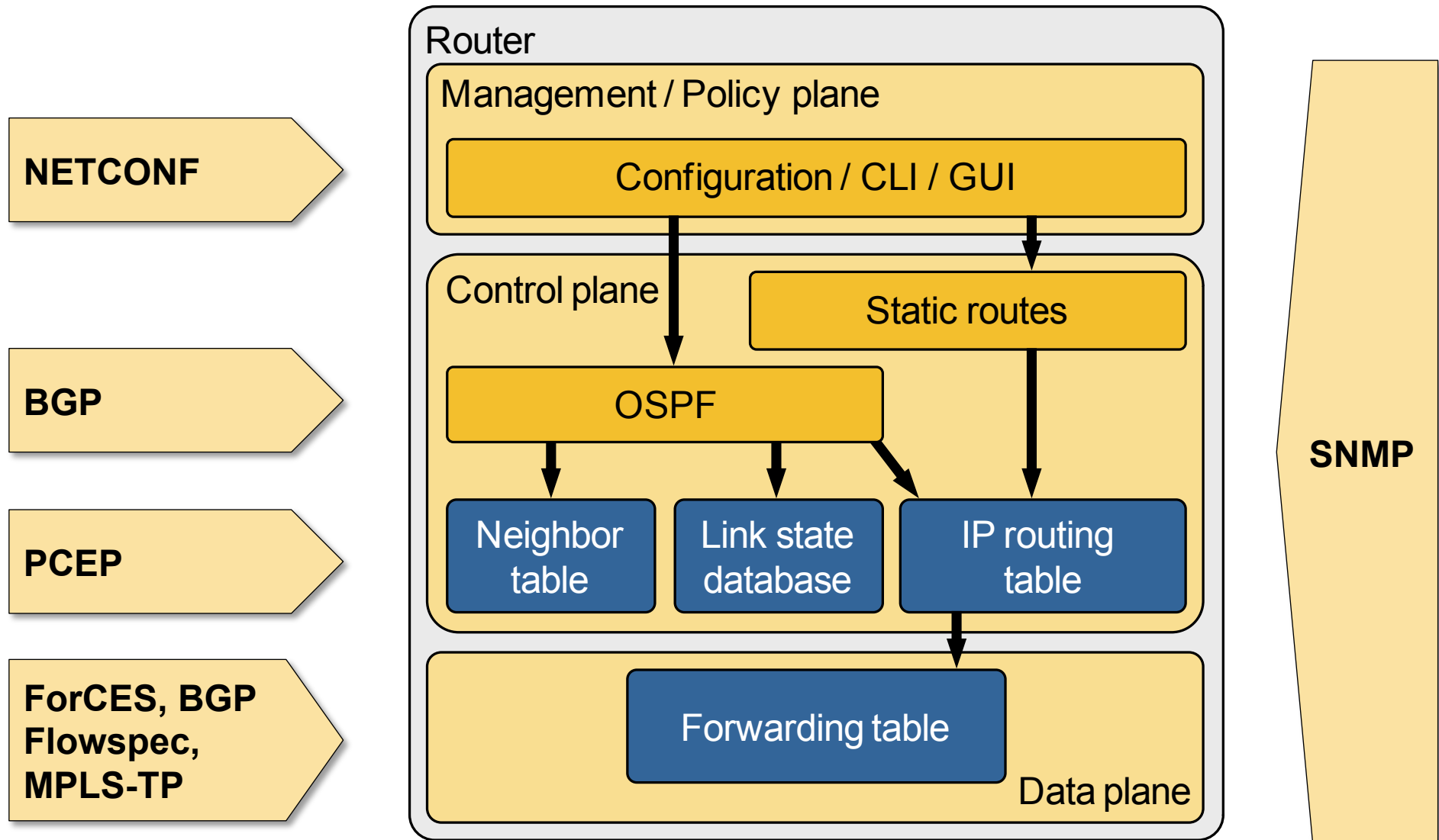
Device abstraction solutions

Forwarding adjustments  
(example: RTBH)

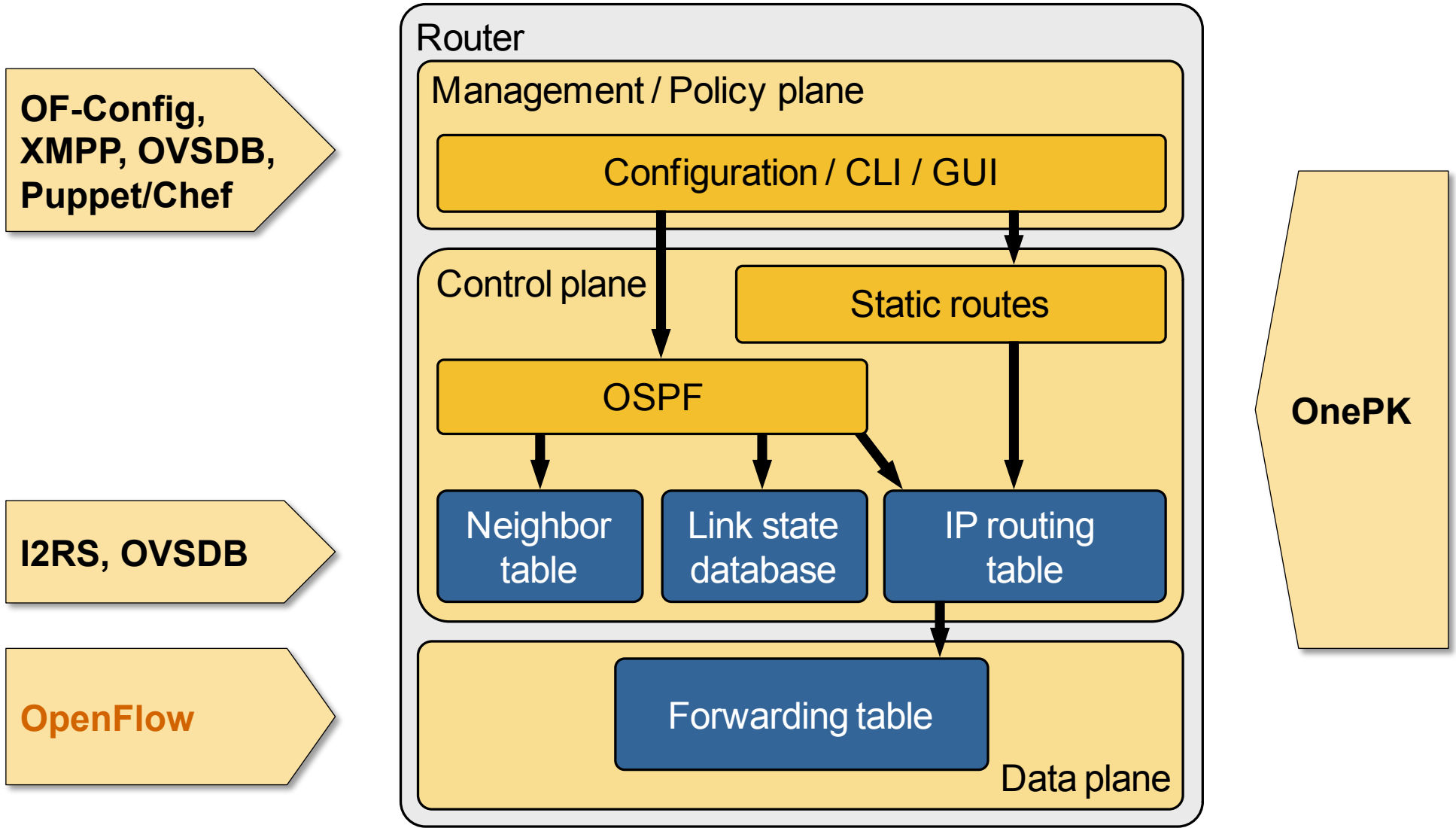
Control/Data Plane Separation  
(example: MPLS-TP, OpenFlow)



# SDN Toolbox: Existing Tools



# SDN Toolbox: Emerging Protocols



# Four Paths to SDN

## Control/Data plane separation

- OpenFlow

## Control- or Management plane interaction

- Existing or new control-plane protocols (BGP, BGP FlowSpec, I2RS)
- Existing or new management-plane protocols (NETCONF, XMPP, OpFlex)

## Decoupling and abstracting

- Overlay virtual networks
- Wireless controllers
- VPN solutions

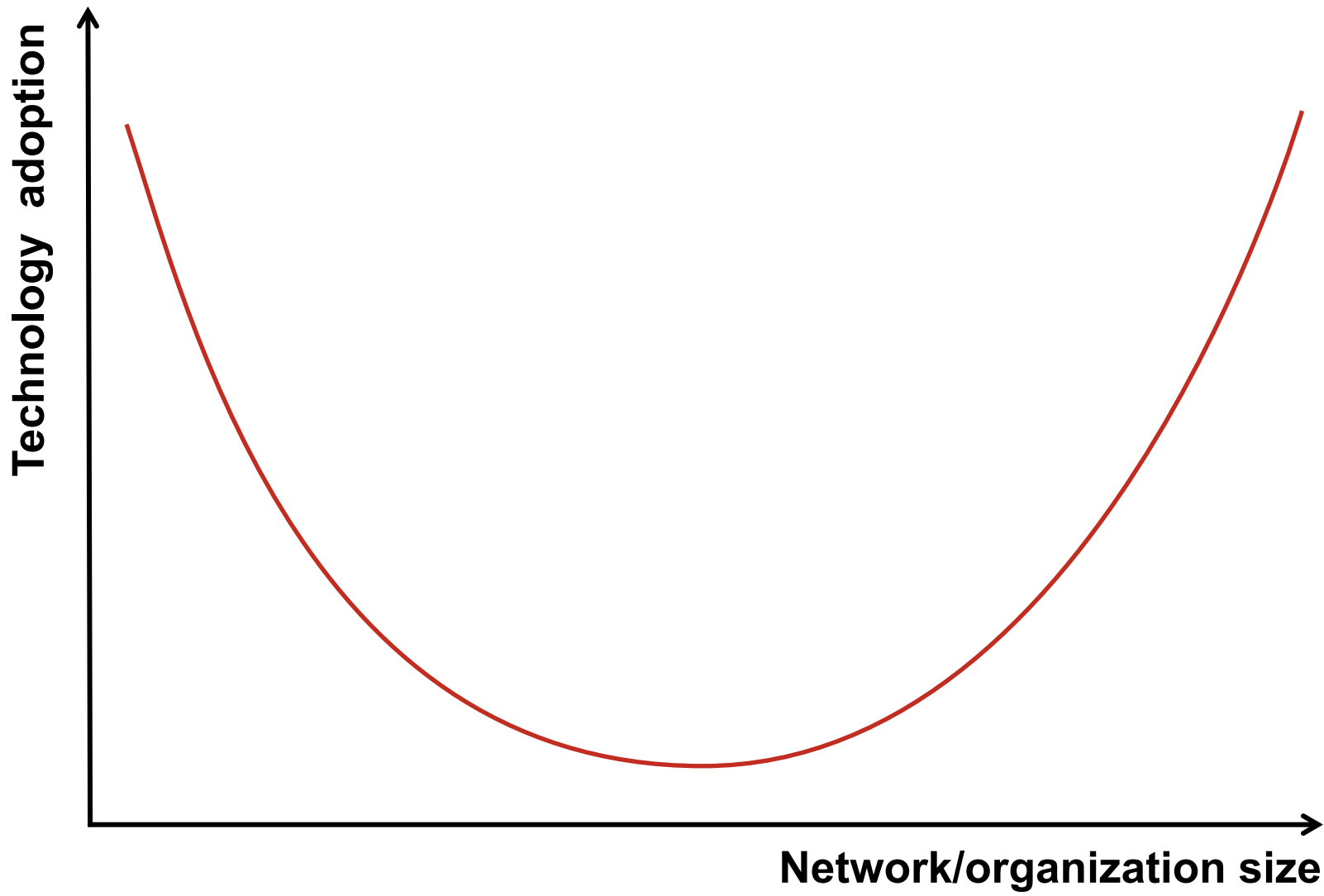
## Proprietary vendor API

- Juniper SDK, Cisco OnePK, Arista eAPI, F5 iControl...

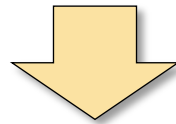
# From Here to There

# Networks are Mission-Critical Infrastructure

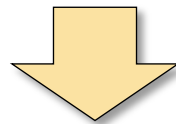
# Expect the U-Curve Adoption



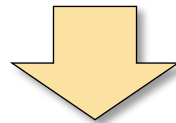
**Simplify**



**Standardize**



**Automate**

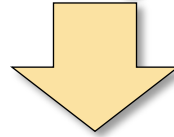


**Abstract**

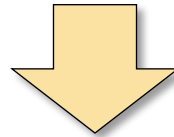


# Go for Low-Hanging Fruits

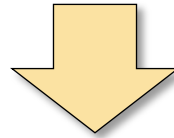
**Read-Only Access**



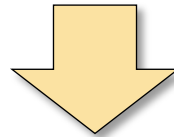
**Device Provisioning**



**Service Provisioning**



**Traffic Rerouting**



**Real-Time and Data Plane**

# What Is NFV?

# NFV 101

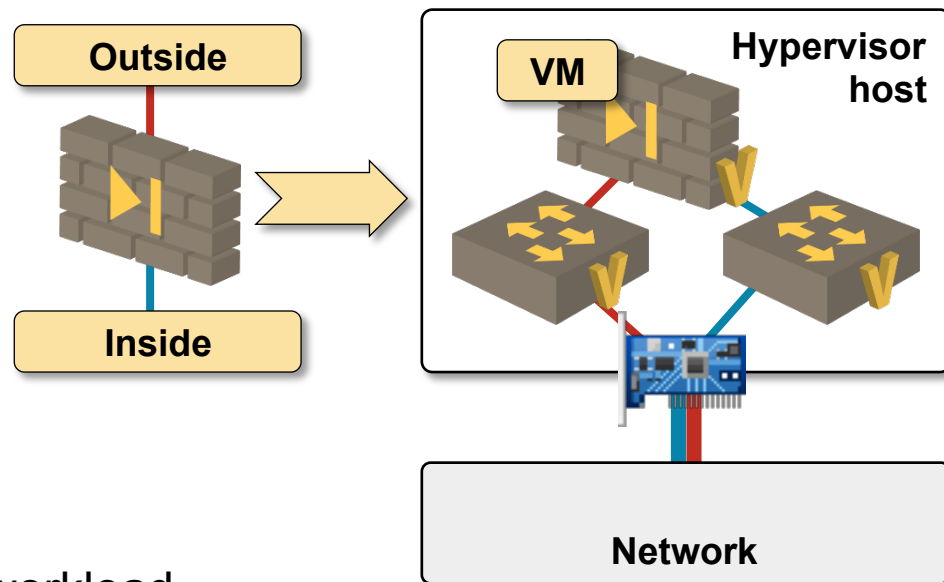
- Most L4-7 devices run on x86 CPU
- Why should they run on vendor-supplied hardware?
- We want to run them on third-party commodity hardware
- NFV  $\approx$  Network Services in VM format

## Perceived drawbacks

- CPU-based packet processing is expensive
- High hypervisor overhead with I/O intensive workload

## Sample products

- Routers: Brocade Vyatta, Cisco CSR, Juniper vMX
- Firewall: pfSense, Palo Alto, Fortinet, Juniper Firefly (SRX), Vyatta, vShield Edge (VMware), NSX Edge Services Router (VMware), vASA (Cisco)
- Load balancer: BIG-IP VTM (F5), A10, vShield Edge (VMware), Embrane, LineRate Systems (now F5), Citrix NetScaler



# NFV 101

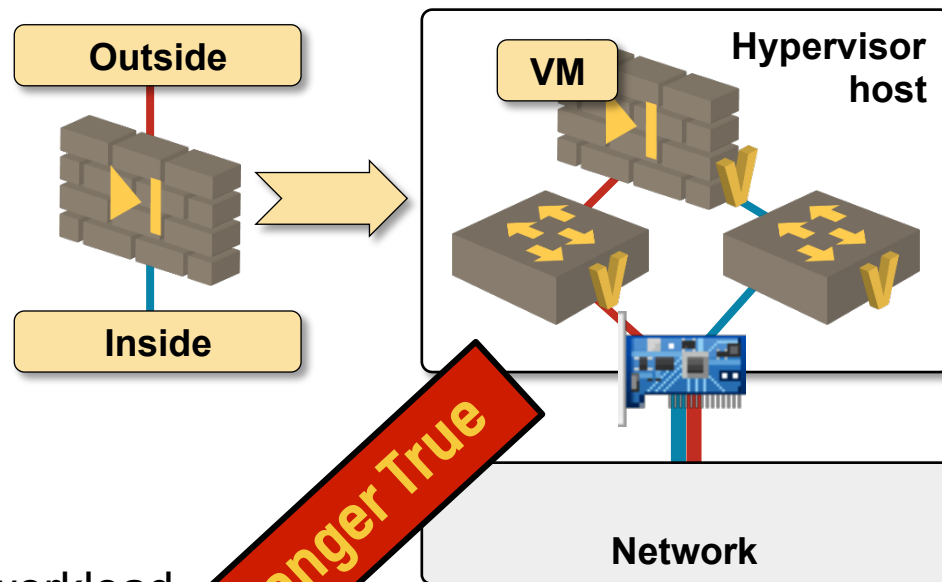
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**No Longer True**

# Will NFV Reduce Costs?

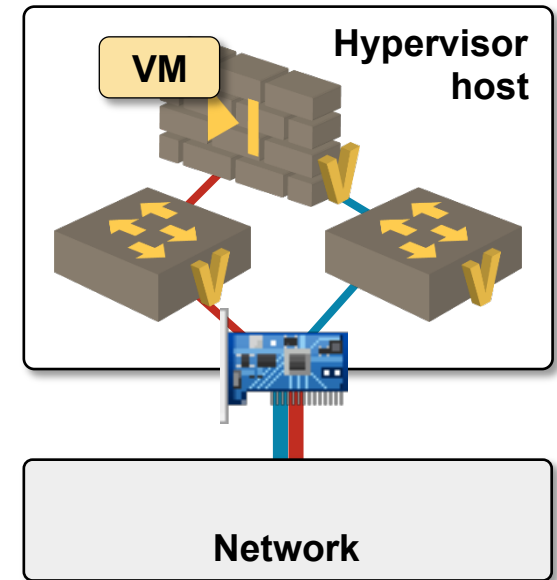
**Short answer:** probably not

## Benefits of NFV:

- Better hardware utilization
- Replacing CapEx (hardware) with OpEx (subscription)
- Pay-as-You-Go model
- Increased flexibility: deploy any service on a generic pool of compute resources
- Reduce time-to-deployment (no hardware provisioning)

## Drawbacks:

- New technology
- Increased complexity



# NFV Challenges

## Fundamental decisions

- Build or buy?

## Product delivery challenges

- Packaging
- Multi-vendor integration
- Support
- Licensing
- Integration with orchestration systems

## Provisioning challenges

- Service decomposition
- Service provisioning
- Service insertion and stitching
- VM orchestration

## Operational challenges

- High availability
- Auto-scaling
- Service monitoring
- Monitoring and auditing of scale-out infrastructure

# Getting Started



# Start Small

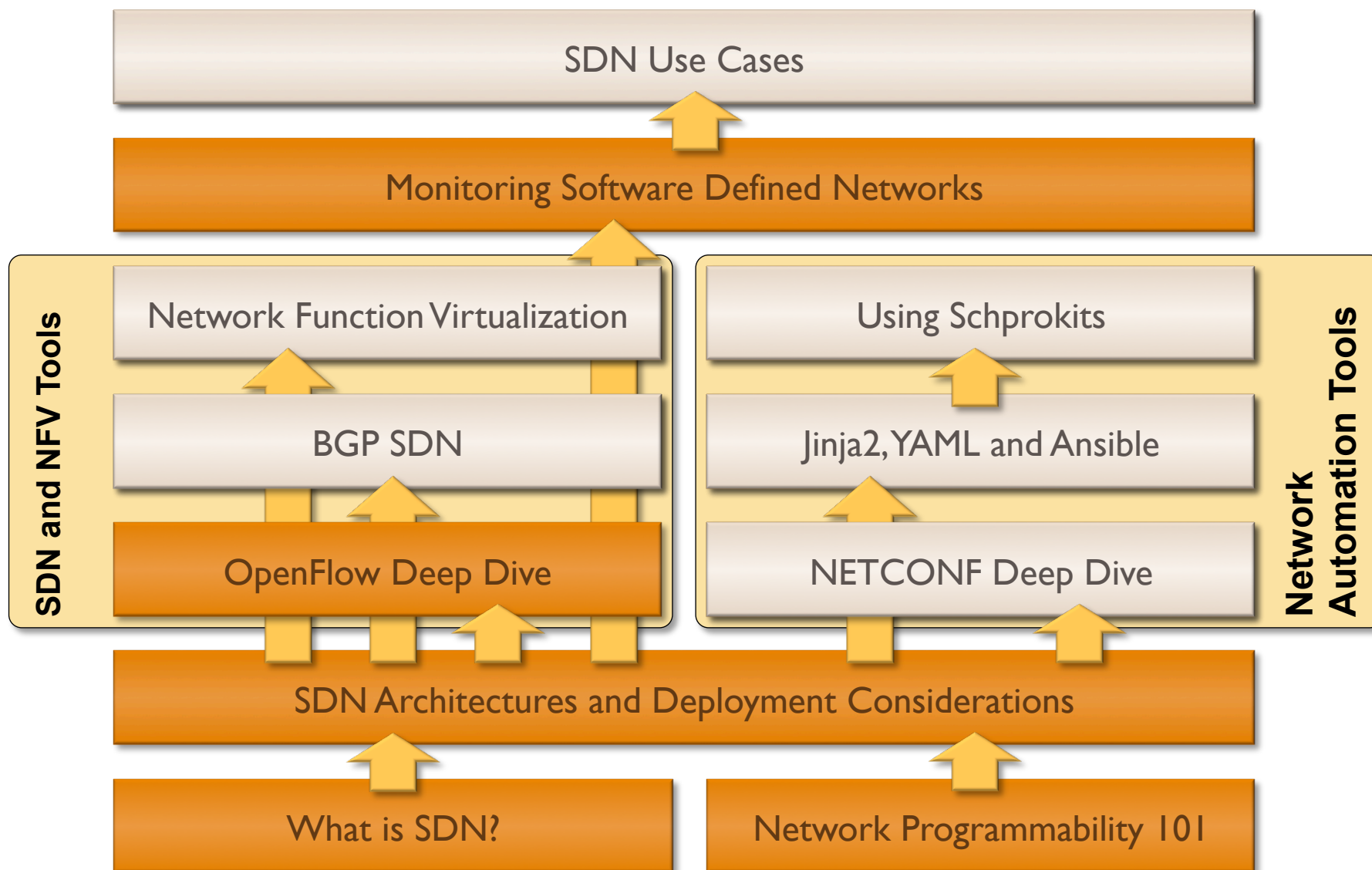
**Make It as Simple  
as Possible**

# Pilot First Integrate Next

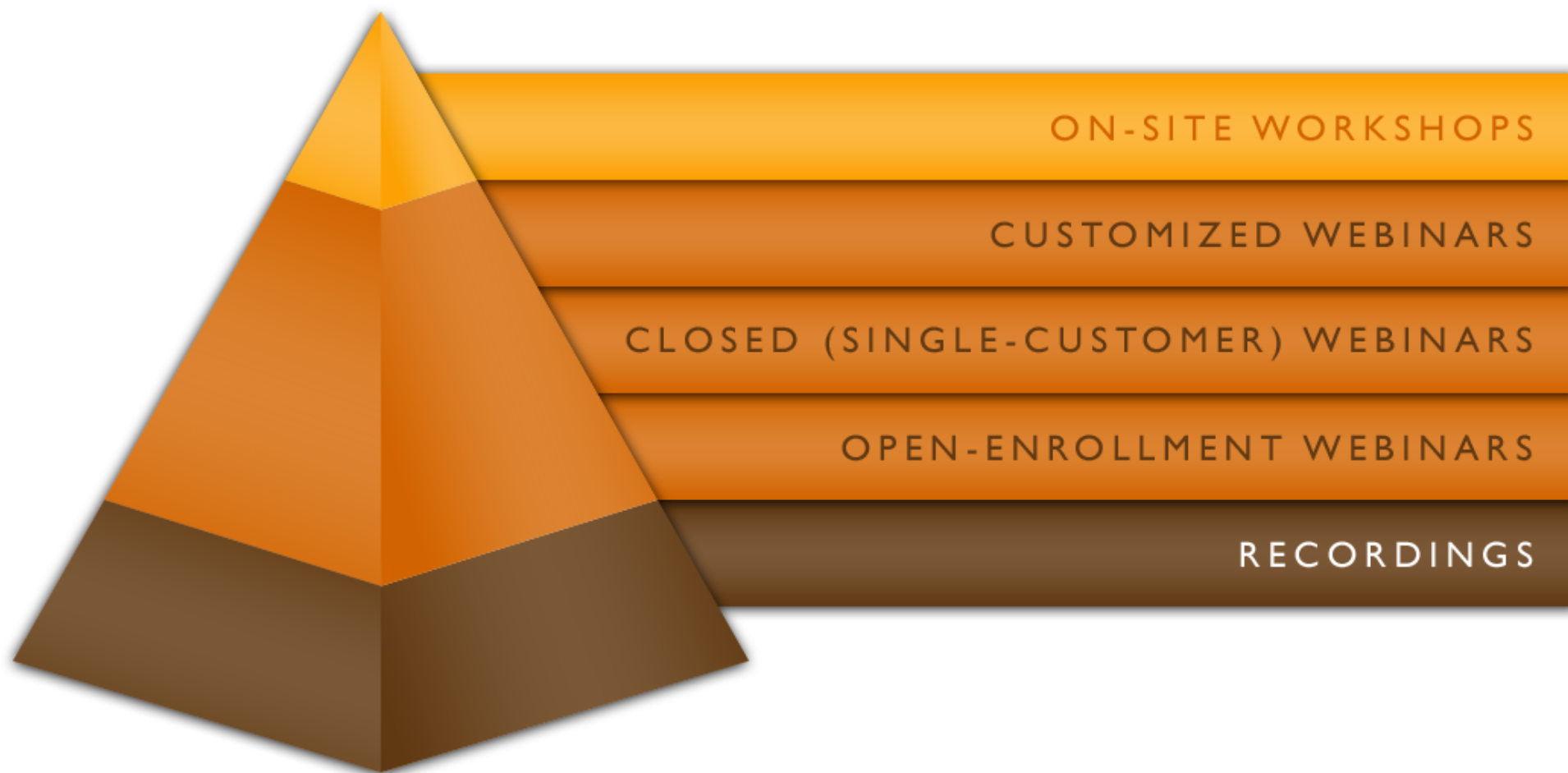
**Good Enough Is  
Good Enough**

**Start NOW**

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# Online, On-Site or Customized? The Choice Is Yours



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