

# Introduction to ONOS

(Open Network Operating System)

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# Outline

1. What is ONOS?
2. SDN background introduction
3. ONOS features
  - GUI
  - CLI
  - API
  - ONOS cluster
4. ONOS development and discussion, one example of mine
5. Summary

# What is ONOS?

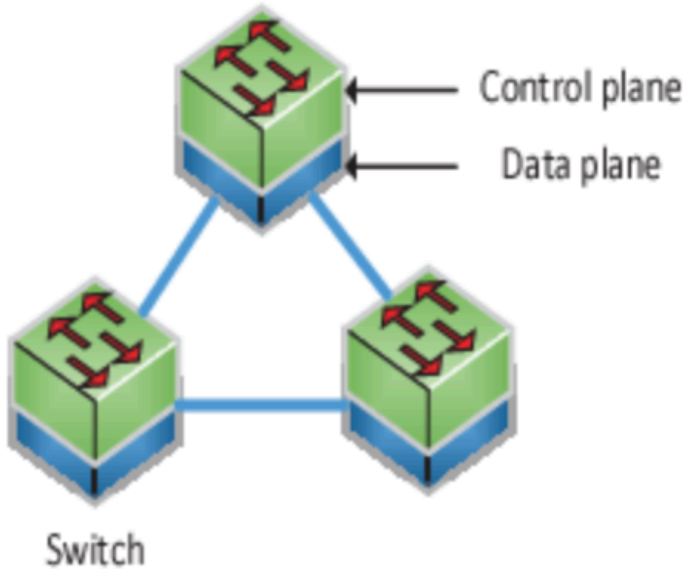
ONOS™ is building a better network.

ONOS is the only **SDN controller** platform that supports the transition from legacy "brown field" networks to SDN "green field" networks. This enables exciting new capabilities, and disruptive deployment and operational cost points for network operators.

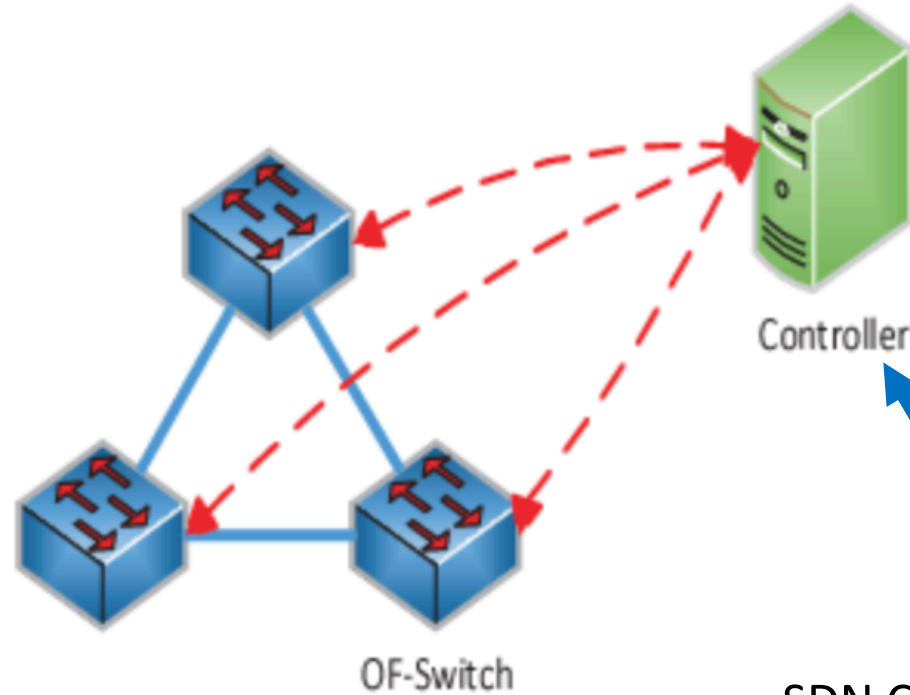
SDN: Software-Defined Networking

# SDN Background Introduction

Traditional Network



Software-Defined Network



Traditional (legacy) switch:  
limited functionalities, vender  
specific.

SDN: dynamic, **programmatically  
efficient**, cloud computing ...

SDN Controller Platform:  
ONOS

# ONOS Features: Overview

A VERSION IS UNDER REVIEW AT IEEE JSAC




arXiv:  
1902.04491

## SDN Controllers: Benchmarking & Performance Evaluation

Liehuang Zhu, *Member, IEEE*, Md Monjurul Karim, Kashif Sharif, *Member, IEEE*, Fan Li, *Member, IEEE*, Xiaojiang Du, *Senior Member, IEEE*, and Mohsen Guizani, *Fellow, IEEE*

Name	Programming Language	Architecture	Northbound API	Southbound API	EastWestbound API	Supported Platform	Interface	License	Multithreading	Modularity	Consistency	Documentation
Beacon [42]	Java	Centralized	ad-hoc	OpenFlow 1.0	-	Linux, MacOS, Windows	CLI, Web UI	GPL 2.0	Yes	Fair	No	Fair
		Distributed		OpenFlow 1.0								
		⋮										
NOX [12]	C++	Centralized	ad-hoc	OpenFlow 1.0	-	Linux	CLI, Web UI	GPL 3.0	Yes (Nox-MT )	Low	No	Limited
Onix [56]	C++	Distributed Flat	Onix API	OpenFlow 1.0, OVSDB	Zookeeper	-	-	Proprietary	Yes	Good	No	Limited
ONOS [16]	Java	Distributed Flat	REST, Neutron	OpenFlow 1.0, 1.3	Raft	Linux, MacOS, Windows	CLI, Web UI	Apache 2.0	Yes	High	Yes	Good
OpenContrail [57]	C, C++, Python	Centralized	REST	BGP, XMPP	-	Linux	CLI, Web UI	Apache 2.0	Yes	High	Yes	Good
OpenDaylight [15]	Java	Distributed Flat	REST, RESTCONF, XMPP,	OpenFlow 1.0, 1.3	Akka, Raft	Linux, MacOS, Windows	CLI, Web UI	EPL 1.0	Yes	High	Yes	Good

# ONOS Features Example 1/4: GUI

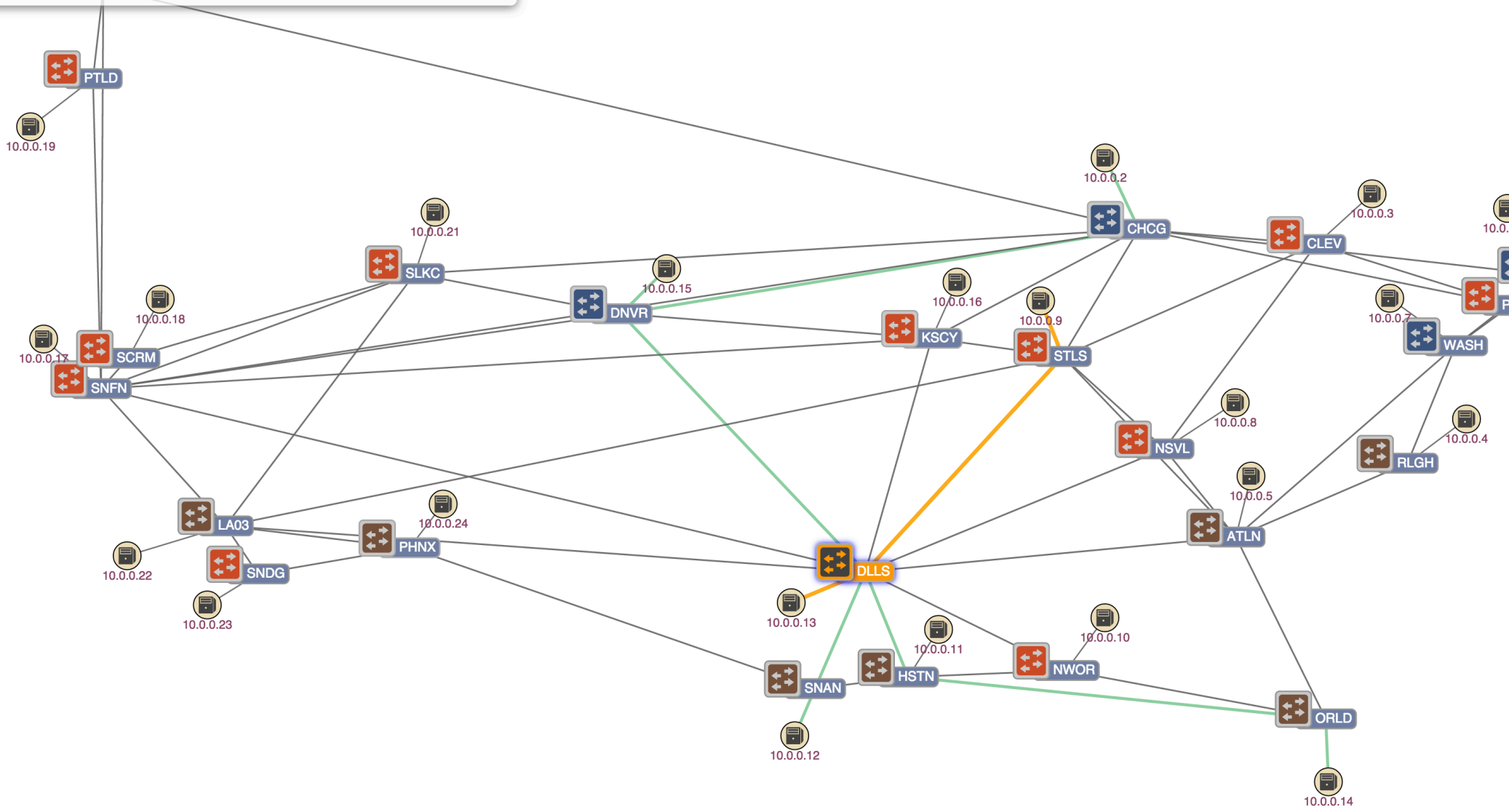
 <b>192.168.56.11</b> 192.168.56.11 # Switches: 4	 <b>192.168.56.12</b> 192.168.56.12 # Switches: 9	 <b>192.168.56.13</b> 192.168.56.13 # Switches: 12
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### ONOS Summary

Devices :	25
Links :	112
Hosts :	25
Topology SCCs :	1

---

Intents :	4
Flows :	2,154
Version :	1.1.0.tom



### DLLS

URI :	of:0000000000000000d
Vendor :	Nicira, Inc.
H/W Version :	Open vSwitch
S/W Version :	2.0.1
Serial Number :	None
Protocol :	OF_10

---

Master :	192.168.56.12
Latitude :	32.777665
Longitude :	-96.802064

---

Ports :	12
Flows :	228

Show Related Traffic

Show Device Flows



# ONOS Features Example 3/4: API

open-source, Java, maven

<http://api.onosproject.org/1.14.0/apidocs/>

All Classes

## Packages

org.onlab.graph  
org.onlab.junit  
org.onlab.metrics  
org.onlab.osgi  
org.onlab.packet  
org.onlab.packet.dhcp  
org.onlab.packet.ipv6  
org.onlab.packet.ndp  
org.onlab.packet.pim

## All Classes

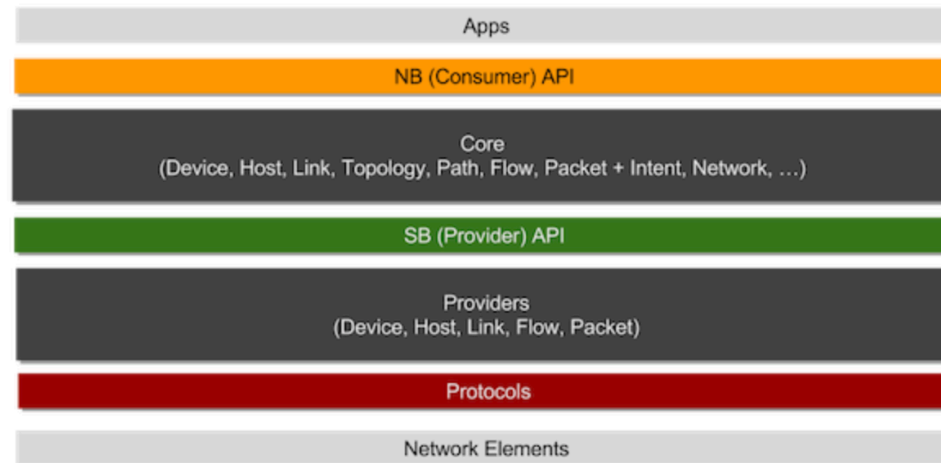
AbstractAccumulator  
AbstractAnnotated  
AbstractApiDocRegistrar  
AbstractBehaviour  
AbstractCellComparator  
AbstractCellFormatter  
AbstractChoicesCompleter  
AbstractCompleter  
AbstractDescription  
AbstractDeviceProvider  
AbstractDriverLoader  
AbstractEdge  
AbstractElement  
AbstractEvent  
AbstractExtension  
AbstractGraphPathSearch  
AbstractHandlerBehaviour  
AbstractHighlight  
AbstractIndependentDriverLoader  
AbstractInjectionResource  
AbstractListenerManager  
AbstractListenerProviderRegistry  
AbstractMapper  
AbstractModel  
AbstractPathService  
AbstractProjectableModel  
AbstractProvider  
AbstractProviderRegistry  
AbstractProviderService

OVERVIEW PACKAGE CLASS TREE DEPRECATED INDEX HELP

PREV NEXT FRAMES NO FRAMES

## ONOS Java API (1.14.0)

ONOS architecture is strictly segmented into a *protocol-agnostic system core* tier and the *protocol-aware providers* tier as shown in the figure below:



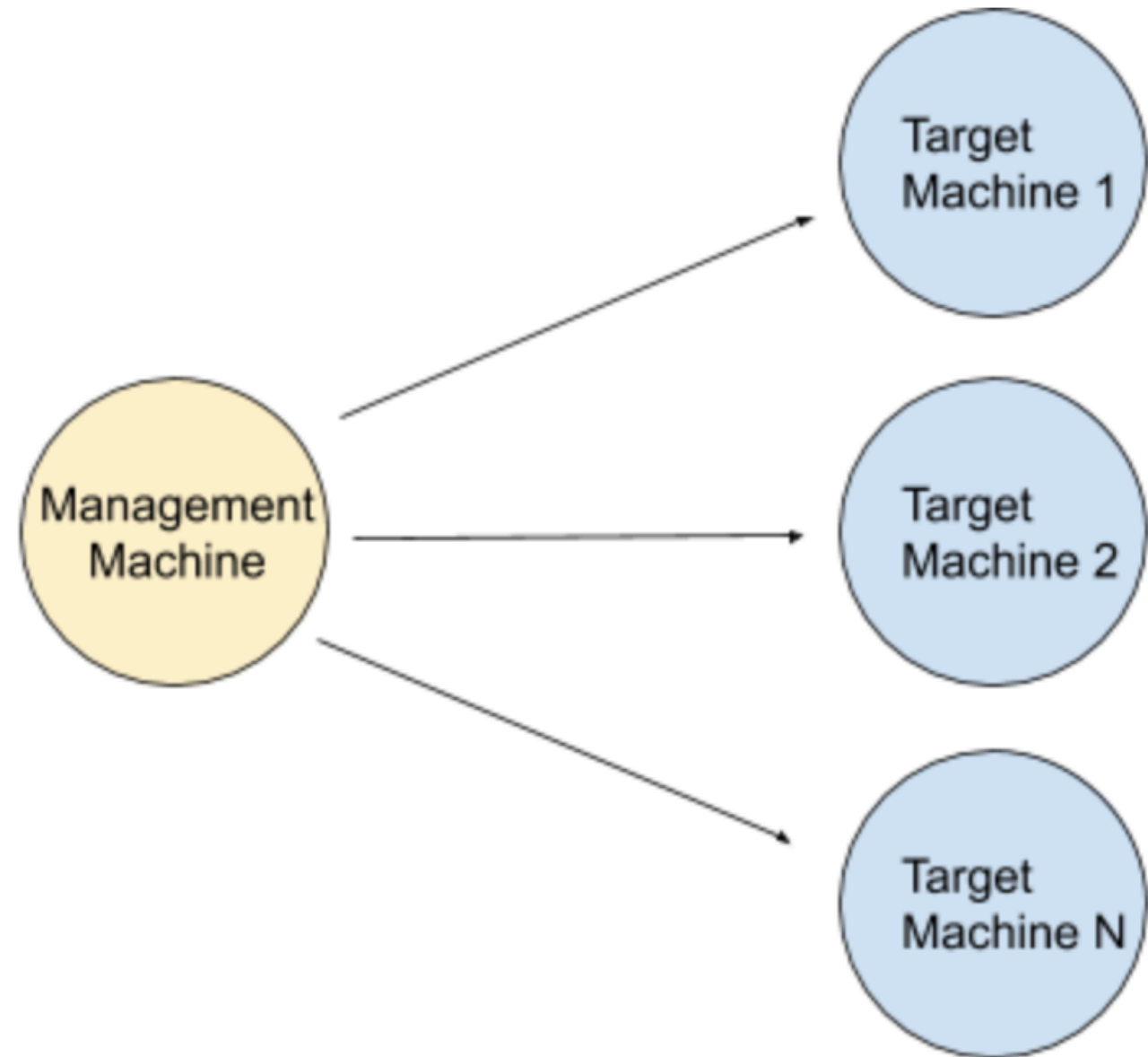
See: Description

## Network Model & Services

Package	Description
org.onosproject.app	Set of abstractions for managing network control applications.
org.onosproject.cfg	Set of abstractions for centrally managing component configurations.
org.onosproject.cli	Administrative console command-line extensions.
org.onosproject.cli.app	CLI commands for managing distributed inventory of applications.



# ONOS Features Example 4/4: ONOS Cluster



Management machine:  
where ONOS is built

Target machine:  
where ONOS instances are running  
running as services

# ONOS Development and Discussion

opennetworkinglab / onos

Watch

175

★ Star

721

Fork

581

Code

Pull requests 26

Projects 0

Security

Insights

Open Network Operating System

14,537 commits

24 branches

0 packages

167 releases

237 contributors

Apache-2.0

## Mailing Lists

ONOS™ uses Google groups for communicating via email lists. A few important ones are:

[onos-announce](#) Announcements about ONOS.

[onos-discuss](#) General ONOS discussion topics. [onos-discuss@onosproject.org](mailto:onos-discuss@onosproject.org)

[onos-dev](#) General developer discussions [onos-dev@onosproject.org](mailto:onos-dev@onosproject.org)

# ONOS Discussion Example


Jianing Zhuang

October 16, 2019 at 9:32 PM

JZ

[onos-dev] How to generate an onos cluster?

To: ONOS Developers

 This message is from a mailing list.

Unsubscribe 

Hi,

I want to establish an onos cluster, and I refer to the documentation webpage <https://wiki.onosproject.org/display/ONOS/Forming+a+cluster>. The command line is straightforward, but I cannot find onos-form-cluster in the /tools/test/bin folder.

I also read <https://wiki.onosproject.org/pages/viewpage.action?pagelId=28836788>, but the executable atomix-agent file cannot be find either.

If you have any experience building an onos cluster, please help me. Thank you very much.


Best regards,  
Jianing Zhuang

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You received this message because you are subscribed to the Google Groups "ONOS Developers" group.

To unsubscribe from this group and stop receiving emails from it, send an email to [onos-dev+unsubscribe@onosproject.org](mailto:onos-dev+unsubscribe@onosproject.org).

To view this discussion on the web visit <https://groups.google.com/a/onosproject.org/d/msgid/onos-dev/d23ca954-a542-4dcd-816c-2bbfff6ccc11%40onosproject.org>.

Found in Inbox - UNR Mailbox 

qcorba

October 16, 2019 at 9:38 PM

Q

Re: [onos-dev] How to generate an onos cluster?

Details

To: Jianing Zhuang, Cc: ONOS Developers

Please check this for one way to do that: <https://wiki.opencord.org/display/CORD/ONOS+Installation+with+STC>

# Summary

1. ONOS is a powerful SDN platform
2. Open-source, Java, maven
3. ONOS features: GUI, CLI, API, ONOS cluster
4. ONOS development and discussion

**Thank you!**