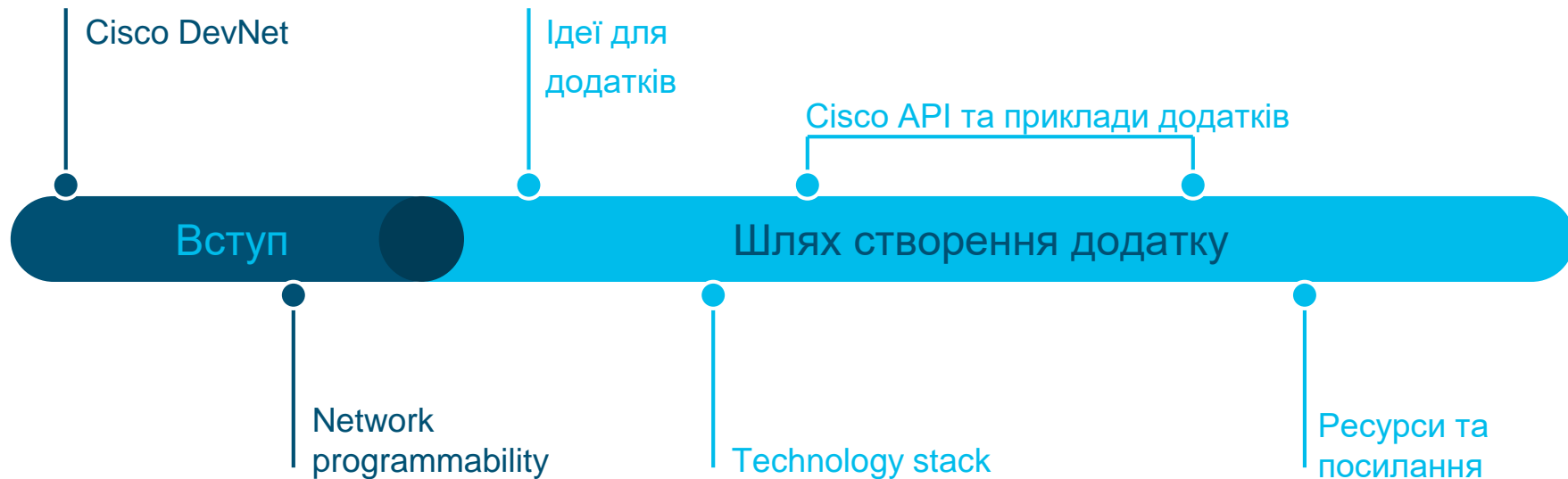




Створення додатків для програмованих мереж

Олексій Борисенко,
програмний спеціаліст Cisco DevNet

Обсяг



Cisco becoming a
SW company



Information-Era Network

From Manual, Rigid, Device-Centric to >

Closed and Hardware-Centric

Manual Box-by-Box Management

Perimeter-Based Reactive Security

IT and Historical Analytics

Digital-Ready Network

Automated, Flexible, Networkwide



Open, Programmable, Software-Driven



Networkwide, Policy-Based Automation



Proactive, Context-Based Security Everywhere



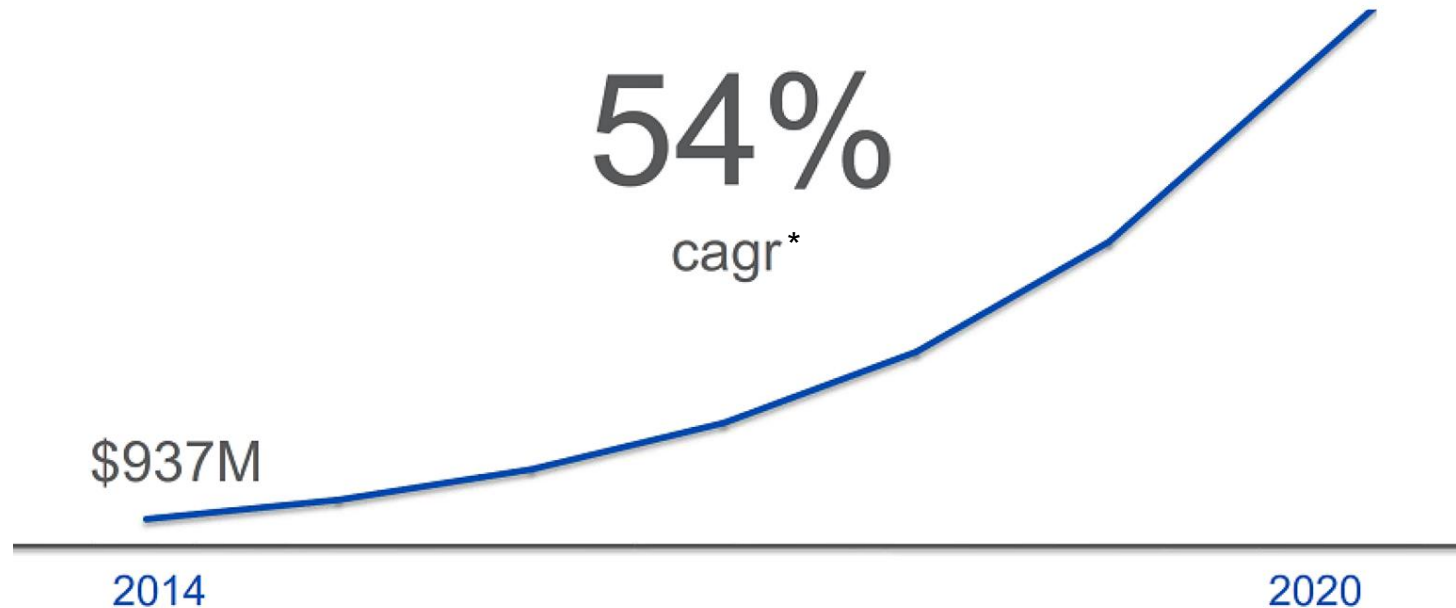
Business and Real-Time Analytics



Cisco DevNet - це програма для програмістів та інженерів, яка допомагає розробникам та фахівцям у галузі ІТ, які хочуть писати додатки та розвивати інтеграцію з продуктами, платформами та інтерфейсами Cisco.

What is Network Programmability?

Network Programmability



Ідеї для додатків

- Serverless architecture (function as a service, FaaS) on Kubernetes cluster
- моніторинг пристроїв в мережі
- сервіс з використанням локації та пересування пристроїв на основі CMX
- взаємодія з IoT пристроями використовуючи Aironet Developer Platform (ADP)
- взаємодія та конфігурація SD-WAN мереж
- IOS XE/XR programmability
- IOS Programmability NETCONF-RESTCONF-YANG
- інтеграція CRM/ERP систем використовуючи APIC-EM/DNA-C

Моделі взаємодії

SaaS

- Software as a service

PaaS

- Platform as a service

IaaS

- Infrastructure as a service

On-Premises

- MaaS

On-Premises

Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking

Infrastructure as a Service

Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking

Platform as a Service

Applications
Data
Runtime
Middleware
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Servers
Storage
Networking

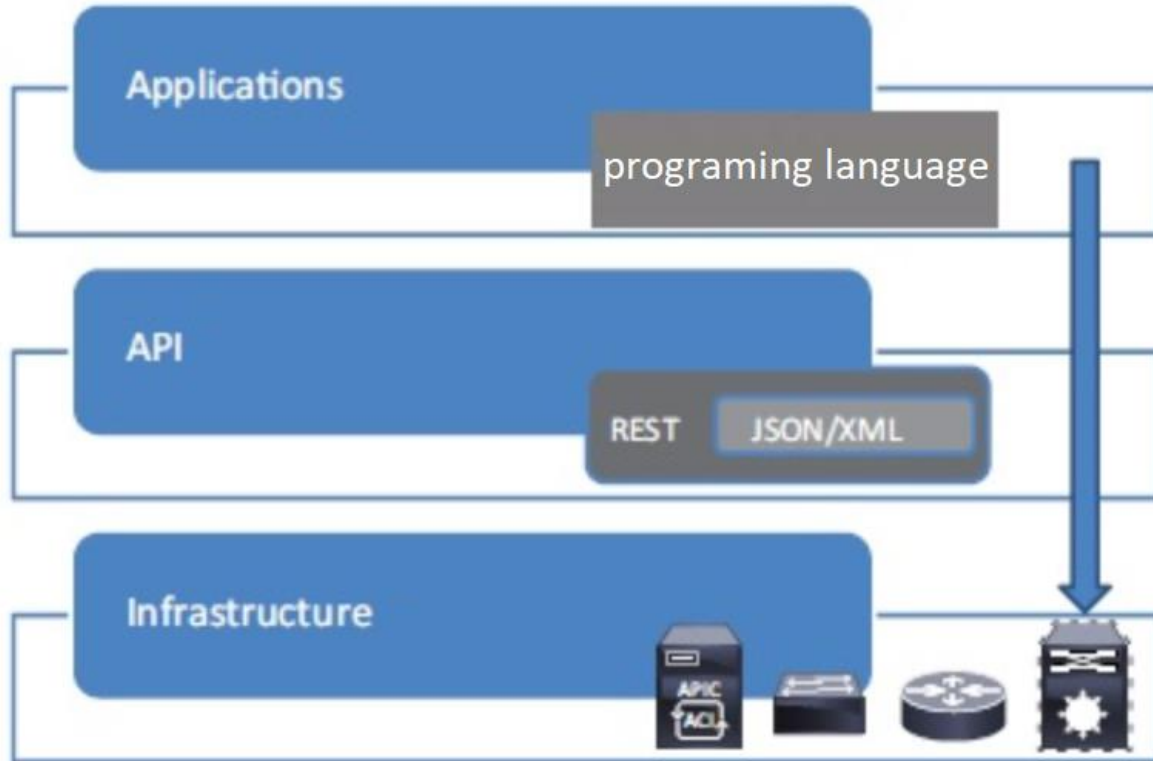
Software as a Service

Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking

You Manage

Other Manages

Network Programmability



Technology stack

Go: docker, kubernetes, prometheus, grafana

Python: Ansible, Salt

C/C++

C#

PHP

JS (Angular, Node.js, Vue.js, React.js)

Java

Swift, Objective-C

HTML, CSS



Front end vs. Back end.

revision control
distributed | centralized



PERFORCE

Робота над проектом

The screenshot displays the JIRA Software interface for the 'Teams in Space' project. The left sidebar contains navigation links for Backlog, Agile board, Releases, Reports, All issues, Components, and Add-ons. Below these are project shortcuts including 'Mars Team HipChat Room', 'Space Station Dev Roadmap', 'Teams in Space Org Chart', 'Orbital Spotify Playlist', and 'Hyperspeed Bitbucket Repo'. The main area is titled 'Backlog' and includes quick filters for Product, Recently updated, Only my issues, Server, and UI. It shows two sprints: 'Sprint 1' with 14 issues and 'Sprint 2' with 6 issues, starting on 10 Aug 2015 and releasing on 9 Oct 2015. A 'Start sprint' button is visible. Below the sprints, a list of issues is shown, each with a status icon, a priority icon, a key, a description, and an assignee. The issues are: TIS-25 (Engage Jupiter Express for outer solar system travel) assigned to SeeSpaceEZ Plus; TIS-37 (When requesting user details the service should return prior trip info) assigned to Large Team Support; TIS-9 (After 100,000 requests the SeeSpaceEZ server dies) assigned to Local Mars Office; TIS-7 (500 Error when requesting a reservation) assigned to Large Team Support; TIS-10 (Bad JSON data coming back from hotel API) assigned to Space Travel Partners; and TIS-18 (Enable Speedy SpaceCraft as the preferred individual transit provider) assigned to Large Team Support. At the bottom, a 'Backlog' section shows 49 issues, with the same set of issues listed below it. A 'Create sprint' button is also present.

JIRA Software

Teams in Space
Scrum: Teams in Space

Backlog

QUICK FILTERS: Product Recently updated Only my issues Server UI

EPICS

- All issues
- SeeSpaceEZ Plus
- Large Team Support
- Space Travel Partners
- Summer Saturn Sale
- Afterburner Plus
- Local Mars Office
- Hyper-speed shuttles
- New launch platforms
- Delicious Space Nutrition
- Spacertainment

Sprint 1 14 issues

Sprint 2 6 issues

Start: 10 Aug 2015 — Release: 9 Oct 2015

Issues:

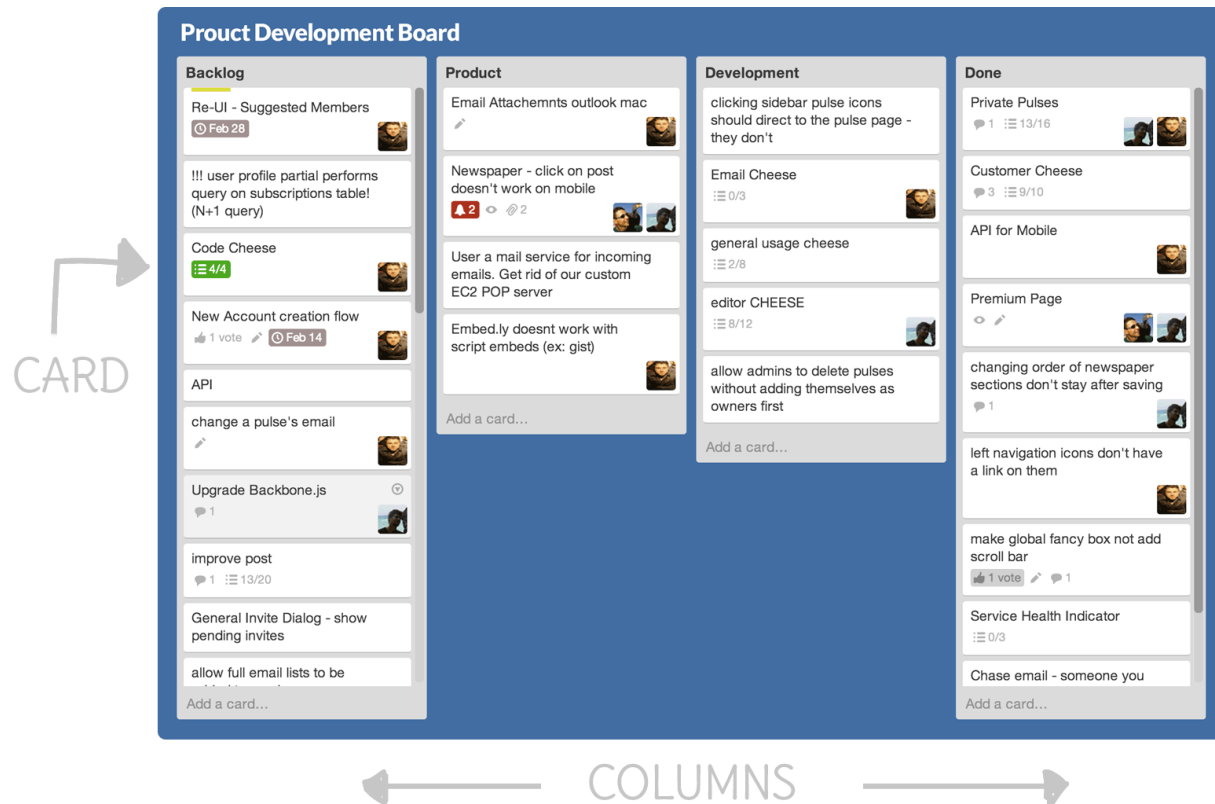
- TIS-25 Engage Jupiter Express for outer solar system travel (SeeSpaceEZ Plus)
- TIS-37 When requesting user details the service should return prior trip info (Large Team Support)
- TIS-9 After 100,000 requests the SeeSpaceEZ server dies (Local Mars Office)
- TIS-7 500 Error when requesting a reservation (Large Team Support)
- TIS-10 Bad JSON data coming back from hotel API (Space Travel Partners)
- TIS-18 Enable Speedy SpaceCraft as the preferred individual transit provider (Large Team Support)

Backlog 49 issues

Issues:

- TIS-25 Engage Jupiter Express for outer solar system travel (Local Mars Office)
- TIS-37 When requesting user details the service should return prior trip info (Space Travel Partners)
- TIS-9 After 100,000 requests the SeeSpaceEZ server dies (Space Travel Partners)
- TIS-7 500 Error when requesting a reservation (Local Mars Office)

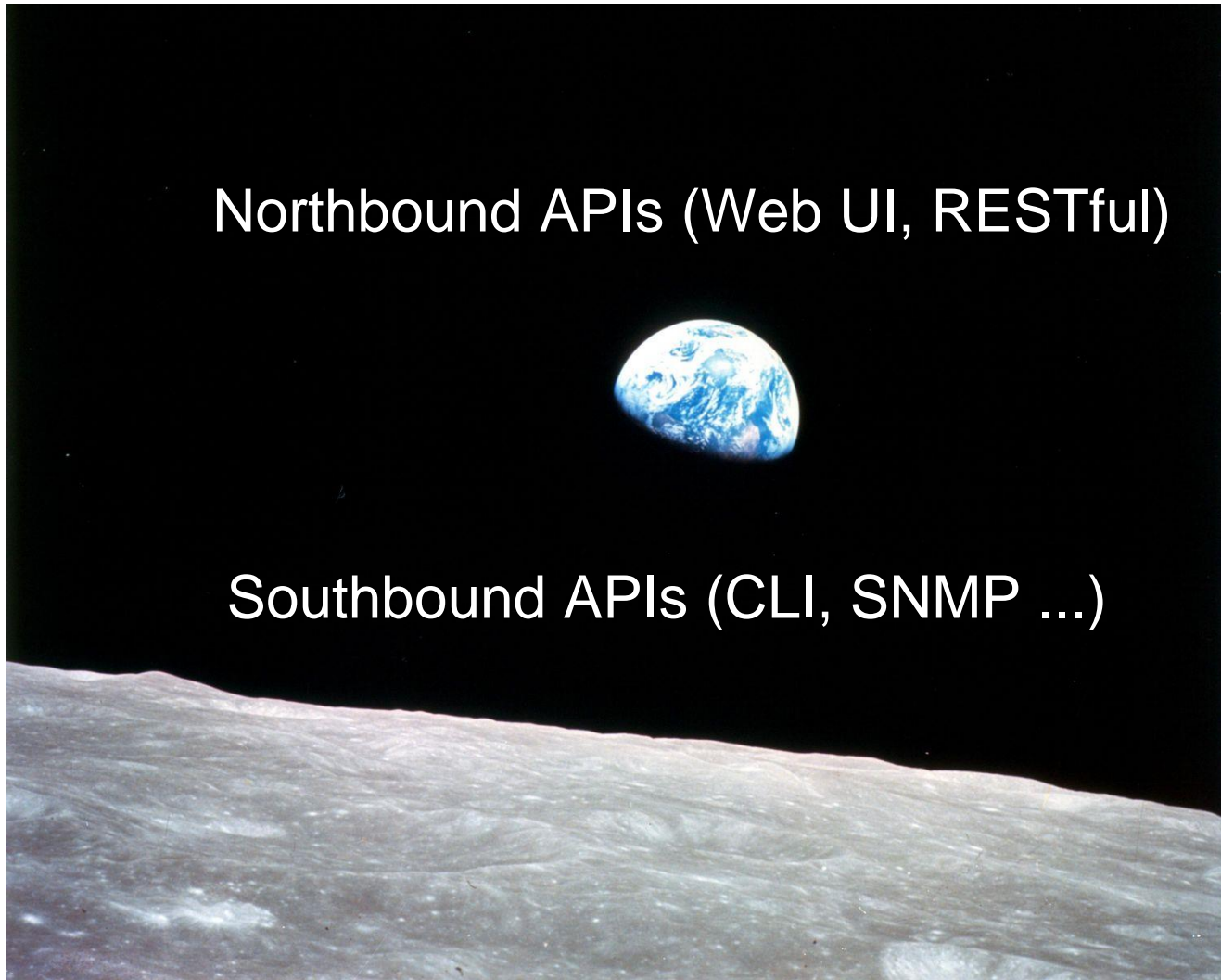
Робота над проектом



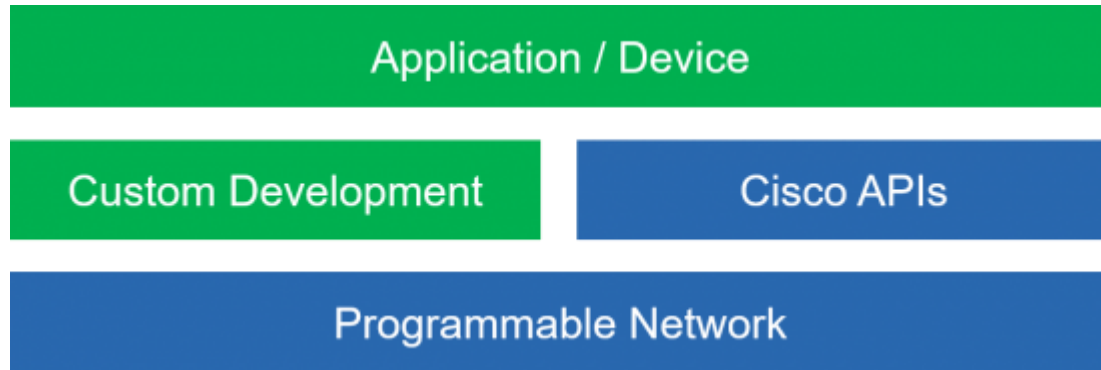
Interface

Northbound APIs (Web UI, RESTful)

Southbound APIs (CLI, SNMP ...)



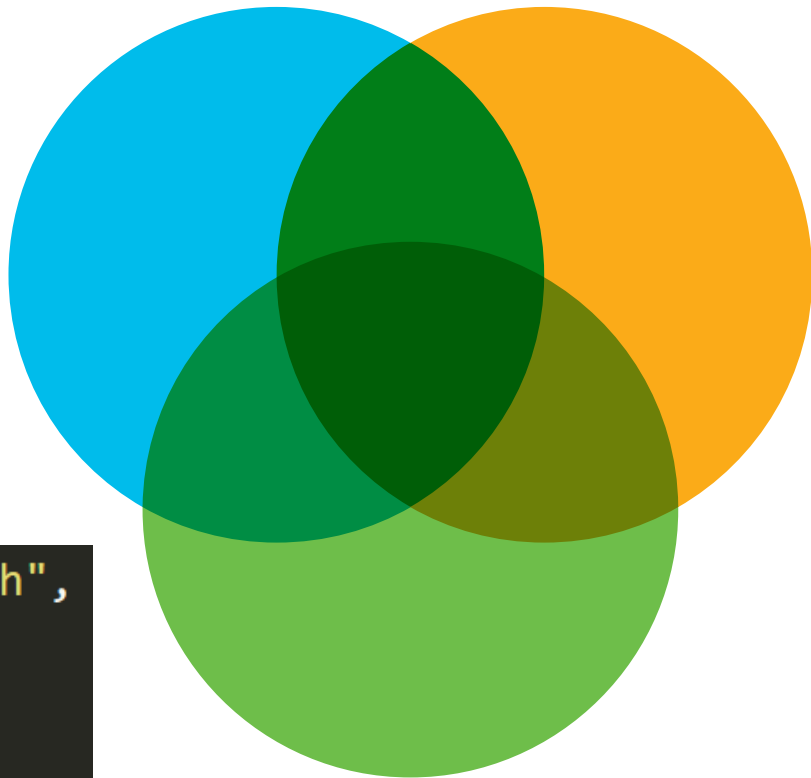
API ecosystem



Cisco API - це просто

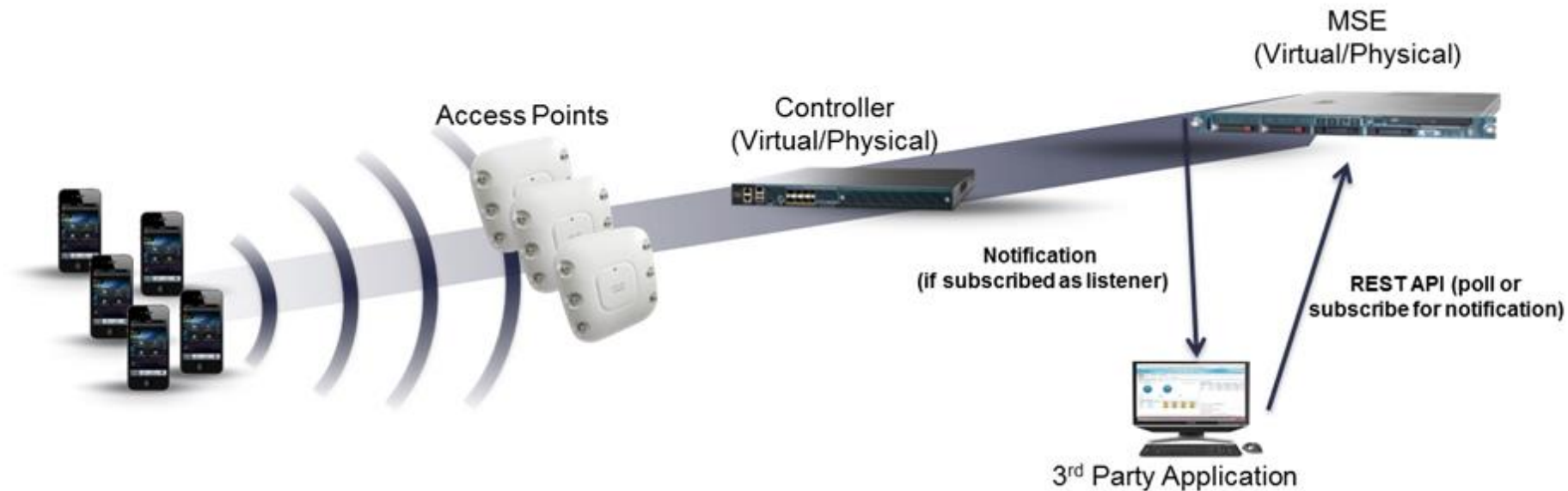
- формат JSON
- NETCONF
- RESTful

```
"type": "Cisco Catalyst 3560X-24P Switch",  
"family": "Switches and Hubs",  
"lastUpdateTime": 1534873901321,  
"upTime": "102 days, 16:40:34.12",
```

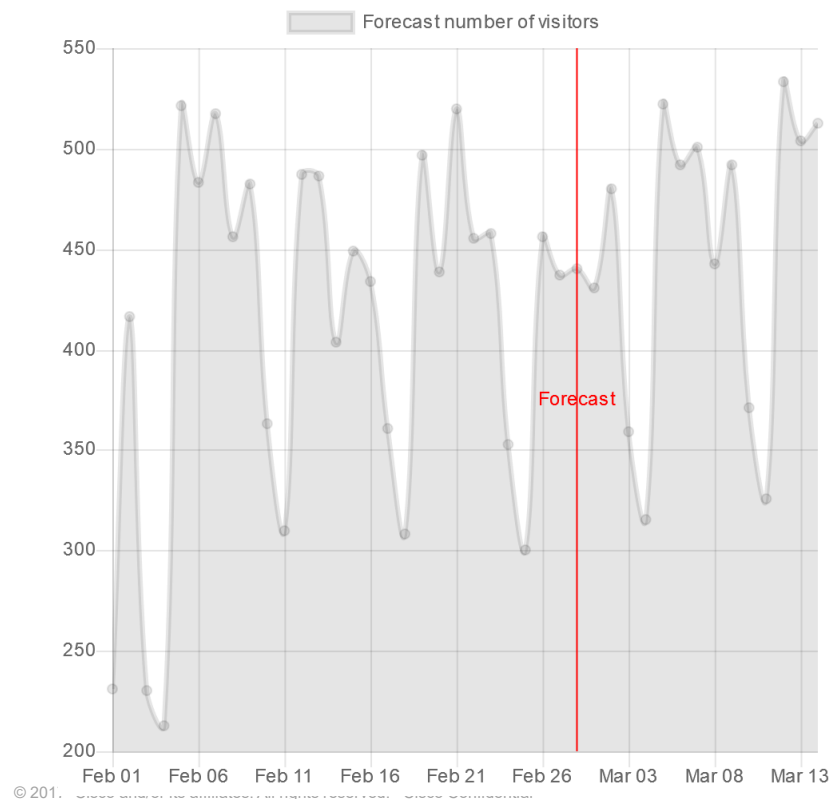


Огляд рішень та програм

CMX



Огляд рішень та програм



Прогнозування кількості відвідувачів
на 2-3 тижні вперед

Demo Case: DNA-C



Networking



IT and network system process adapters

ServiceNow	ITSM
Infoblox	IPAM
Tableau	Reporting

Third-party SDKs

Map third-party network devices to data model

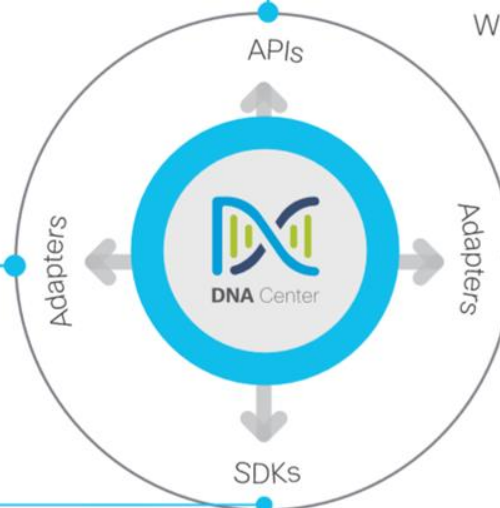
Level 1 operations support:
discovery, inventory, topology, availability, health score

Business and network intent APIs

Application Policy Assurance	Software Image Management (SWIM)
Wireless Provisioning	Network Inventory/Discovery
Plug-n-Play Topology	Command Runner
	Template Programmer
	eNFV Provisioning

Cross-domain adapters




Networking	Cisco Meraki
Security	Cisco Stealthwatch



Cisco DNA Center is the network management system, foundational controller, and analytics platform at the heart of Cisco's intent-based network

Monitoring with DNA-C

The screenshot shows a web browser window with the URL `localhost:8000/app/#/`. The browser tabs include "Cisco health", "Log in | Django site admin", "Discovery - APIC - Enterprise", and "(1) Webex Teams". The application interface has a blue header with the title "Network health" and user links "admin" and "Log out". A dark blue navigation bar contains the links "HOME", "MONITORING", and "TICKET LOG", along with a gear icon. The main content area features three stacked cards:

- About Network Health Check automatically report**
 - Cool tools for Service Providers**
 - Different level of reports (For CIO, IT director and DevOps)
 - Customer Satisfaction
 - Average mean time to recover from incidents
[TRY IT NOW](#)
- Monitoring**
 - Device status
 - Flow analytics
 - Automatic ticket creation
 - Mean time to repair
- Quick information module**
 - E-mail report
 - Integration with Webex (Bot)

The footer is an orange bar with the text "APIC-EM MONITORING AND REPORT SYSTEM".

Monitoring with DNA-C

The screenshot displays a web application interface for network health monitoring. The top navigation bar includes links for 'HOME', 'MONITORING', 'TICKET LOG', and a user profile 'admin' with a 'Log out' option. The main content area is titled 'Ticket log (Admin)' and features two summary cards: 'Average Mean time' (0:00:14 to repair, 0:01:35 to recover) and 'Service Level Agreement report' (21% availability, 1% satisfaction). Below these is a table of tickets, with two terminal windows overlaid showing network device logs.

Network health

admin Log out

HOME MONITORING TICKET LOG

Ticket log (Admin)

Average Mean time

to repair (MTTR) 0:00:14

to recover incident 0:01:35

Service Level Agreement report

Service/device availability 21%

Customer Satisfaction by day 1%

Ticket id	Date happened	Type
#612	Monday, July 2nd 2018, 9:53:15	unreach
#613	Monday, July 2nd 2018, 9:53:15	unreach
#614	Monday, July 2nd 2018, 9:53:15	unreach
#615	Monday, July 2nd 2018, 9:53:15	unreach
#616	Monday, July 2nd 2018, 9:53:15	unreach
#617	Monday, July 2nd 2018, 9:53:15	unreach
#618	Monday, July 2nd 2018, 9:53:15	unreachable 10.10.20.191 New
#619	Monday, July 2nd 2018, 9:53:15	unreachable 10.10.20.80 Solved Oleksii Petrenko (devops)
#620	Monday, July 2nd 2018, 9:53:15	unreachable 10.10.20.102 New
#621	Monday, July 2nd 2018, 9:53:15	unreachable 10.10.20.240 New

Rows per page: 10 1-10 of 52

```
2.25h
...|||||...
>>> APSC IM Beta 2 Labs <<<

UNAUTHORIZED ACCESS TO THIS NETWORK DEVICE IS PROHIBITED.

Individuals using this computer system without authority, or in excess of their authority, are subject to having all of their activities on this system monitored and recorded by system personnel.

Anyone using this system expressly consents to such monitoring and is advised that if such monitoring reveals possible evidence of criminal activity, system personnel may provide the evidence of such monitoring to law enforcement officials.

2921-A#enable
2921-A(config)#terminal
Enter configuration commands, one per line. End with CNTL/Z.
2921-A(config)#enable password NEWPASS
2921-A(config)#enable secret NEWSEC
2921-A(config)#end
2921-A#exit
Connection to 10.10.20.253 closed by remote host.
Connection to 10.10.20.253 closed.
c:\log>

1.5sh
UNAUTHORIZED ACCESS TO THIS NETWORK DEVICE IS PROHIBITED.

Individuals using this computer system without authority, or in excess of their authority, are subject to having all of their activities on this system monitored and recorded by system personnel.

Anyone using this system expressly consents to such monitoring and is advised that if such monitoring reveals possible evidence of criminal activity, system personnel may provide the evidence of such monitoring to law enforcement officials.

NEW#
NEW#
NEW#enable
NEW#hostname 2921
Translating "hostname"
% Unknown command or computer name, or unable to find computer address
NEW#config t
Enter configuration commands, one per line. End with CNTL/Z.
NEW#(config)#hostname 2921
% Hostname contains one or more illegal characters.
2921(config)#en
```

Monitoring with DNA-C

The screenshot displays the Cisco DNA-C Network health monitoring interface. The top navigation bar includes 'HOME', 'MONITORING', and 'TICKET LOG'. The main content area is titled 'Ticket log (Admin)' and features two summary cards: 'Average Mean time to repair (MTTR)' showing 0:00:14 and 'to recover incident' showing 0:01:35, and a 'Service Level Agreement report' showing 'Service/device availability' at 21% and 'Customer Satisfaction by day' at 1%.

A modal window for 'Ticket #640' is open, displaying the following details:

- Type: traffic
- Status: New
- Message: Flow connection problem between (device IP: 10.10.20.68 and device IP: 10.10.20.191)
- Solver: A dropdown menu is open, listing the following users: Mariya Petrenko (Ops1), Yevgen Kozak (Ops2), Olga Moroz (ops3), Sergii Sumskiy (ops4), and Oleksii Petrenko (devops).

The background shows a table of ticket logs with columns for Ticket id, Date happened, and Status. The table lists tickets #632 through #641, all with a status of 'New'.

Ticket id	Date happened	Status
#632	Monday, July 2nd 2018, 9:54:10	New
#633	Monday, July 2nd 2018, 9:54:12	New
#634	Monday, July 2nd 2018, 9:54:13	New
#635	Monday, July 2nd 2018, 9:54:15	New
#636	Monday, July 2nd 2018, 9:54:16	New
#637	Monday, July 2nd 2018, 9:54:17	New
#638	Monday, July 2nd 2018, 9:54:19	New
#639	Monday, July 2nd 2018, 9:54:20	New
#640	Monday, July 2nd 2018, 9:54:22	New
#641	Monday, July 2nd 2018, 9:54:23	New

Ticket log (Admin)

Average Mean time

to repair (MTTR)

0:00:14

to recover incident

0:01:35

Service Level Agreement report

Service/device availability

21%

Customer Satisfaction by day

1%



by status

Ticket id	Date happened	Type			
#612	Monday, July 2nd 2018, 9:53:15	unreach			
#613	Monday, July 2nd 2018, 9:53:15	unreach			
#614	Monday, July 2nd 2018, 9:53:15	unreach			
#615	Monday, July 2nd 2018, 9:53:15	unreach			
#616	Monday, July 2nd 2018, 9:53:15	unreach			
#617	Monday, July 2nd 2018, 9:53:15	unreach			
#618	Monday, July 2nd 2018, 9:53:15	unreachable	10.10.20.191	New	
#619	Monday, July 2nd 2018, 9:53:15	unreachable	10.10.20.80	Solved	Oleksii Petrenko (devops)
#620	Monday, July 2nd 2018, 9:53:15	unreachable	10.10.20.102	New	
#621	Monday, July 2nd 2018, 9:53:15	unreachable	10.10.20.240	New	


Rows per page:

10

1-10 of 52




Платформа для тестування

 **DEVNET**

LAB MANAGEMENT

BALEXEY DEVNET HELP TUTORIALS

Version 1.2.5




DNA Center
Hardware Lab 4

DNA Center Lab 4
DNA Center Release 1.2.5

RESERVE

16.8.1




IOS XE
on Catalyst 9000

IOS XE on Catalyst 9000
Check out Guest Shell, RESTCONF, NETCONF, YANG and more on IOS XE.

RESERVE

Version 16.8




IOS XE Programmability
with NETCONF/RESTCONF/YANG

IOS XE Programmability NETCO...
Get hands on with the programmability capabilities of IOS XE including YANG data

RESERVE


Version 6.4.1




IOS XR Programmability

IOS XR Programmability
Test drive APIs at every layer of the IOS-XR network stack

RESERVE






Meraki

Meraki Always On
Explore this shared Meraki network to sample what it has to offer!

ALWAYS-ON

Version 1.0



Multi-IOS Cisco Test Network

Multi-IOS Cisco Test Network
Multi Cisco network node topology using VIRL

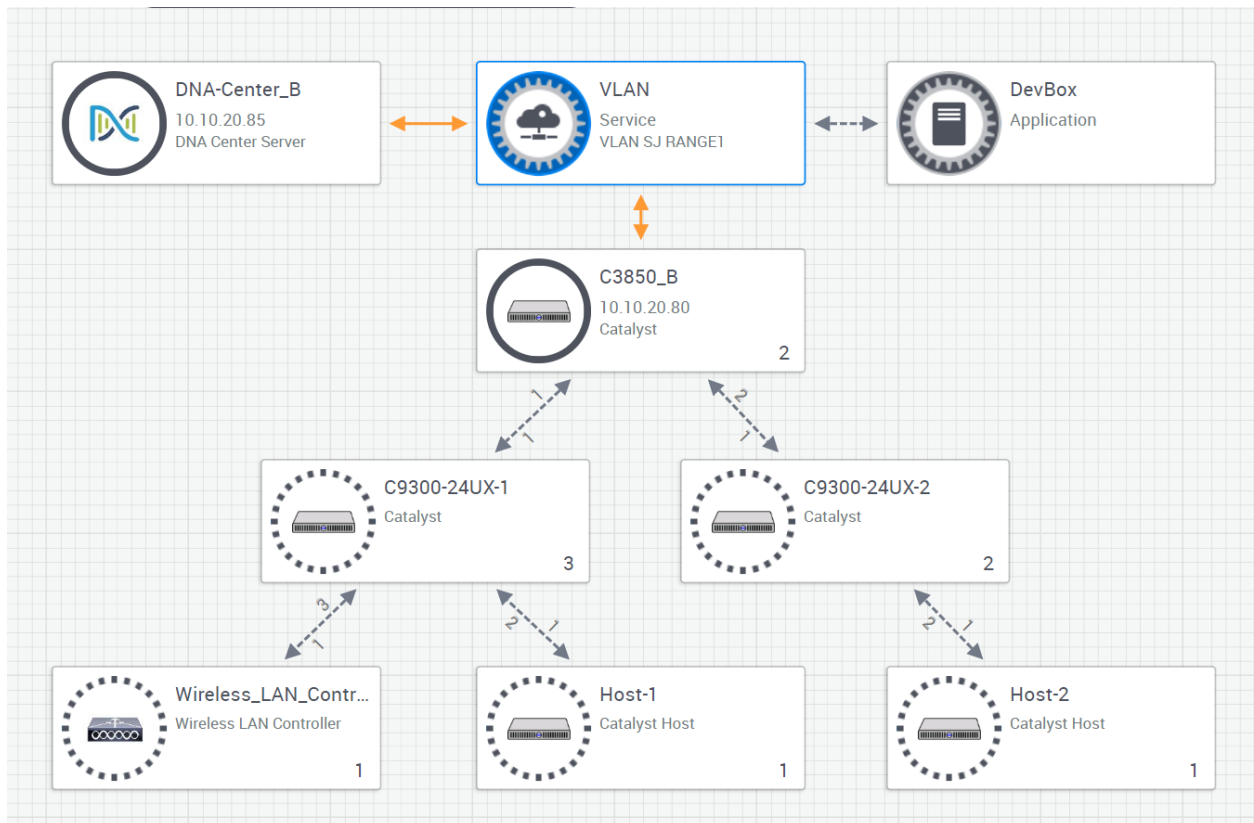
RESERVE

Contains a resource(s) that is currently unavailable

Back to too

<https://developer.cisco.com/site/networking/>

Платформа для тестування



Огляд рішень та програм

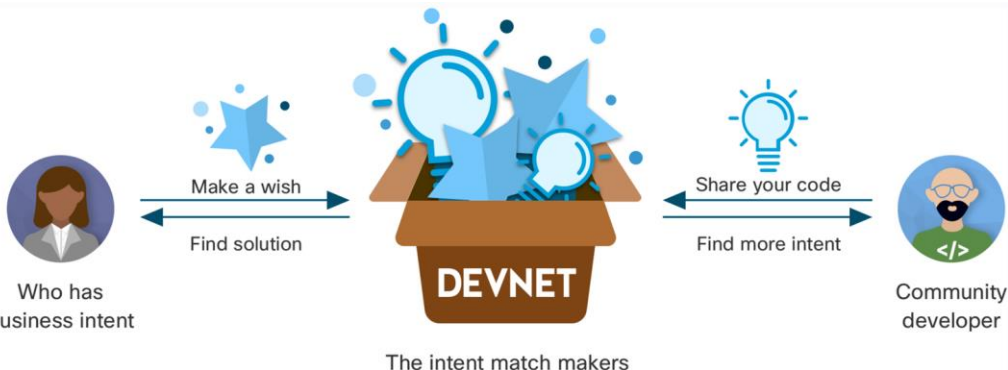


Marketplace

<https://marketplace.cisco.com/home>

Cisco Ecosystem Exchange

<https://developer.cisco.com/ecosystem/solutions/>



<https://developer.cisco.com/codeintent/>

Можливості Cisco DevNet

API

RESTful API з документацією та можливістю тестування

Простота

SDK & integrations

Software Development Kit's для різних рішень Cisco.
Великий вибір інтеграції з різними продуктами та сервісами (Trello, Salesforce, Jira, GitHub, Zendesk, Twitter та ін.)

Готові рішення

Ком'юніті

Модулі для навчання за різними напрямками на <https://learninglabs.cisco.com/>
Підтримка Cisco ком'юніті - <https://community.cisco.com/t5/technology-and-support/ct-p/technology-support>

Підтримка від спільноти

Open-source та інші МОЖЛИВОСТІ

- 1 <https://creations.devnetcloud.com/>
- 2 <https://github.com/cisco>
<https://github.com/CiscoDevNet>
- 3 **Code Exchange**
<https://developer.cisco.com/codeexchange/>
- 4 **Безкоштовні Sandbox та HW lab
для тестування коду / додатків**
<https://developer.cisco.com/site/sandbox/>
- 5 **NetDevOps site**
<https://developer.cisco.com/netdevops>

Activate Webex for Startups Program

The Cisco Webex Innovation Program provides startups up to \$10,000 in Webex hardware and Webex Meetings and Teams software for up to two years, which includes licenses, toll free dial-in and recording packages.

<https://www.webexinnovations.com/startups/>

E-mail & Cisco Webex Teams
balexey@cisco.com

Презентація та спілкування Webex Teams:
https://eurl.io/#BJo_NBv6X

