

Data-centric security in software-defined networks

Dr.-Ing. Konrad Wrona

Introduction

Logistics E6T1N4

- Lectures (2 x 4 hours):
 - 13 Oct 2017, 17:35-21:00, Room 116/45
 - 14 Oct 2017, 11:40-15:05, Room 117/45
- Laboratories (2 x 4 hours, 17:35-21:00, Room 119/47, 22/47)
 - 17 Nov 2017
 - 15 Dec 2017
- Project
 - 17 Dec 2017, 11:40-13:15, Room 15/47 (2 hours)

Logistics E6G1S4

- Lectures (3 x 4 hours, 11:40-15:05):
 - 12 Oct, Room 117/47
 - 09 Nov, Room 33/75
 - 10 Nov, Room 33/75
- Laboratories (4 x 4 hours, Room 119/47):
 - 16 Nov, 11:40-15:05
 - 18 Dec, 11:40-15:05
 - 09 Jan, 08:00-11:25
 - 12 Jan, 08:00-11:25
- Project (4 x 2 hours, Room 119/47):
 - 08 Jan, 11:40-13:15
 - 18 Jan, 11:40-13:15
 - 19 Jan, 11:40-13:15
 - 22 Jan, 09:50-11:25

In order to pass

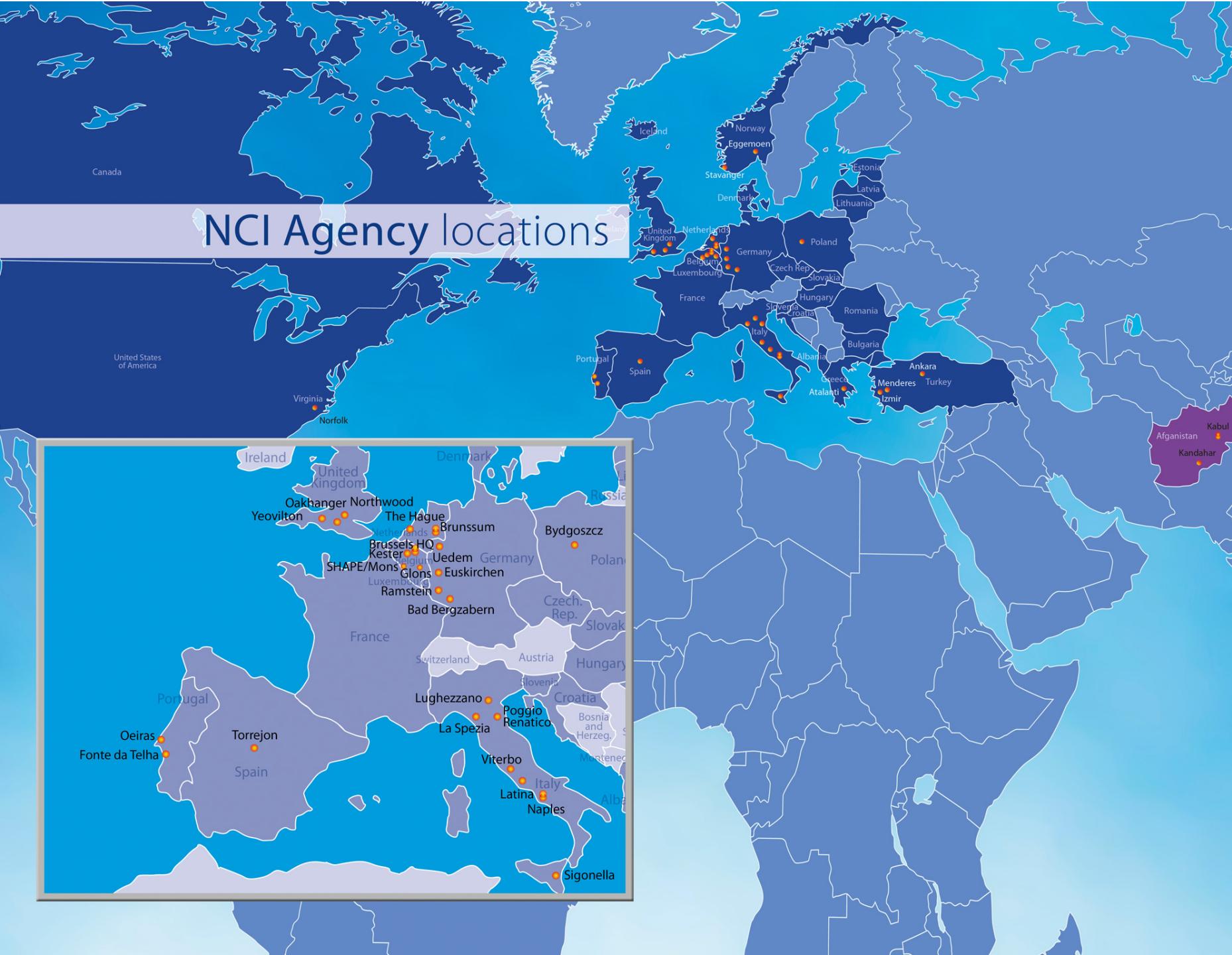
- Need to pass tests given prior to laboratory assignments
- Need to successfully complete laboratory assignments
- Need to receive at least 50% of points for the project

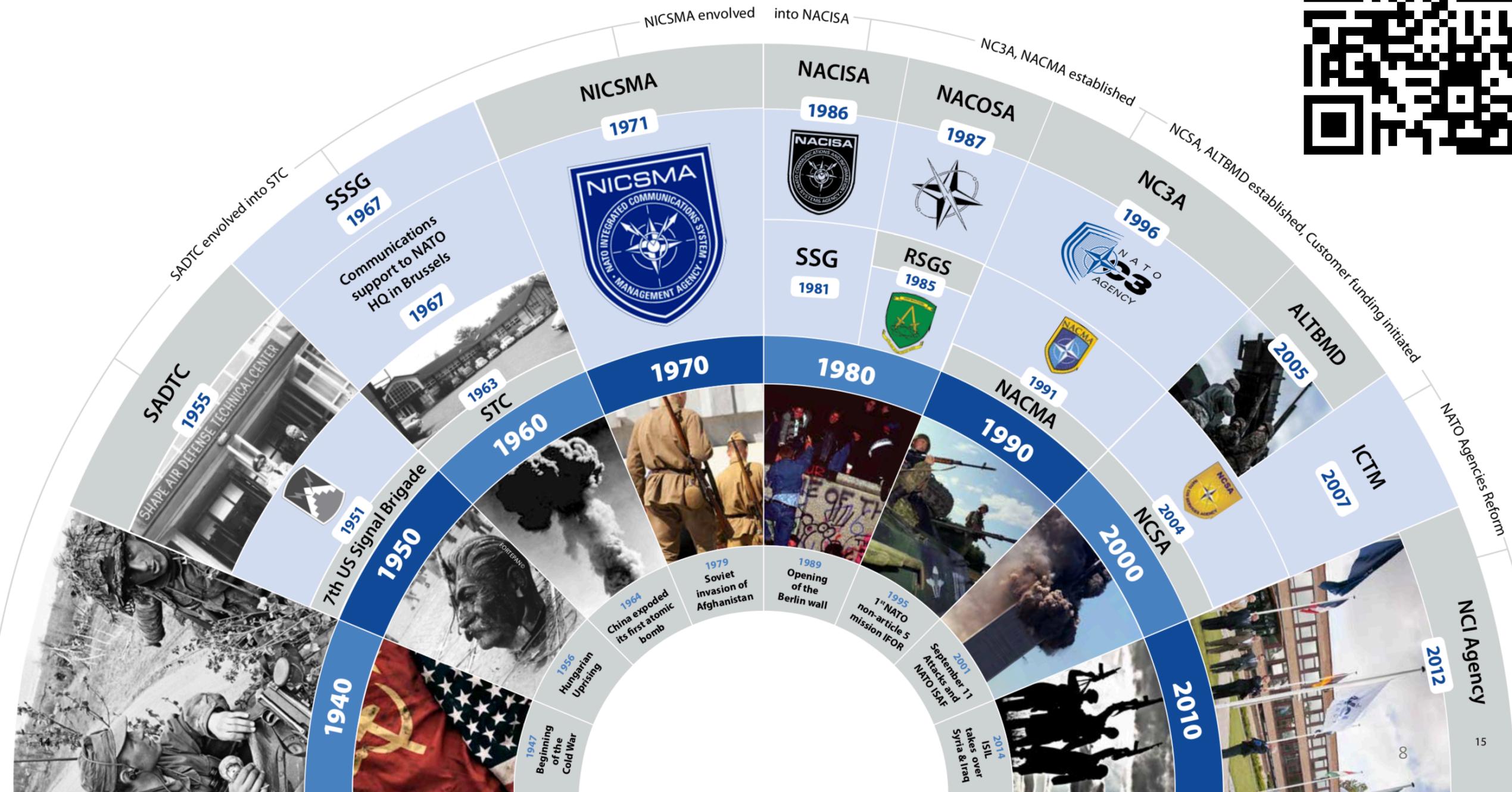
Contact info

Email: konrad.wrona@wat.edu.pl

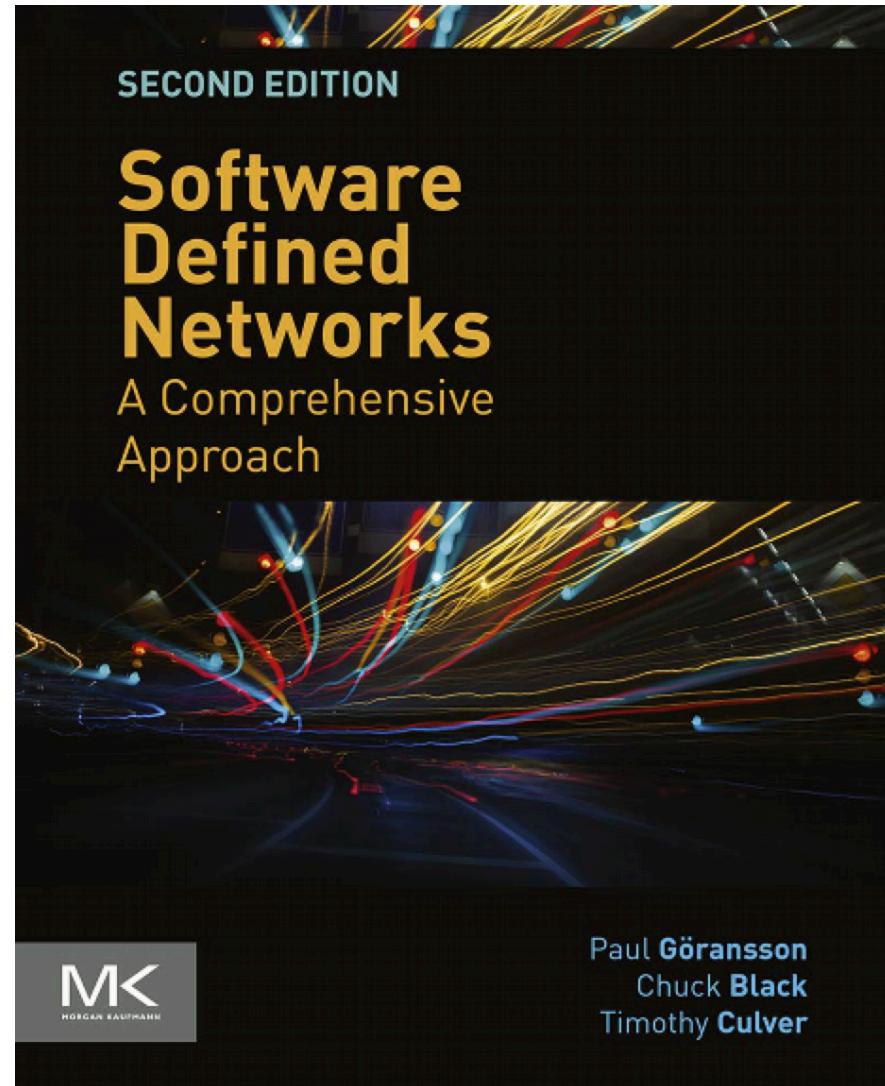
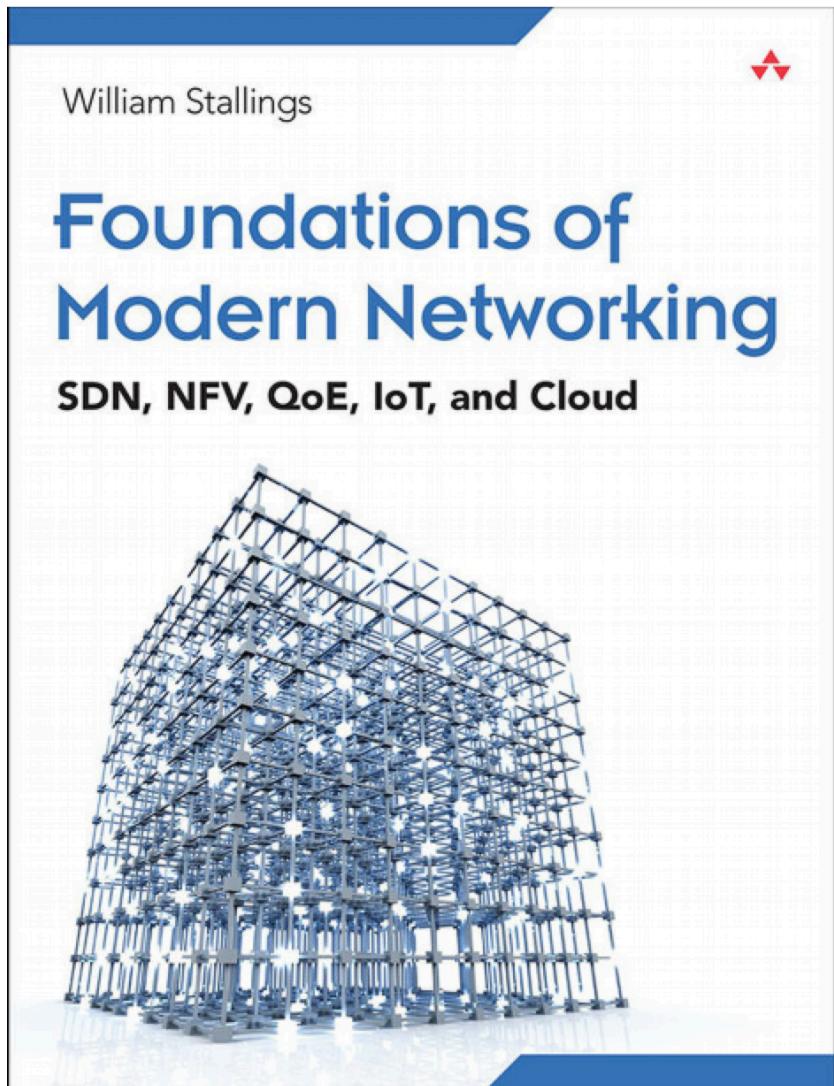
Open hours: On request







Recommended books



Recommended Resources

- Online courses
 - <https://www.coursera.org/learn/sdn>, etc.
- Reading list and selected papers will be available at the portal

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Get started

Overview

FAQs

Creators

Software Defined Networking

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Starting Coming Soon

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Software Defined Networking

About this course: In this course, you will learn about software defined networking and how it is changing the way communications networks are managed, maintained, and secured.

Created by: Princeton University



Taught by: [Dr. Nick Feamster](#), Professor
Department of Computer Science





Advanced | Published: 01 April 2014

Software-Defined Networking with Windows Server and System Cen...

15 ★★★★★ | Rate

Microsoft
System Center

00:47:34



Playlist

Information

Contents

Transcript

0% COMPLETE

Forum >

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Software-defined networking (SDN) can streamline data center implementation through self-service provisioning, take the complexity out of network management, and help ...
[More](#)

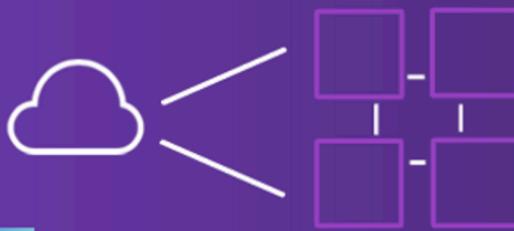
Time [Show All](#)

Demystifying Software-Defined Networking

- | | |
|--|----------|
| Demystifying Software-Defined Networking | 00:47:35 |
| Networking is rigid and inflexible | 00:05:39 |
| Delivering, Networking with boundaries | 00:12:27 |
| Critical Value | 00:29:58 |
| Slide Presentation | |
| Assessment | |



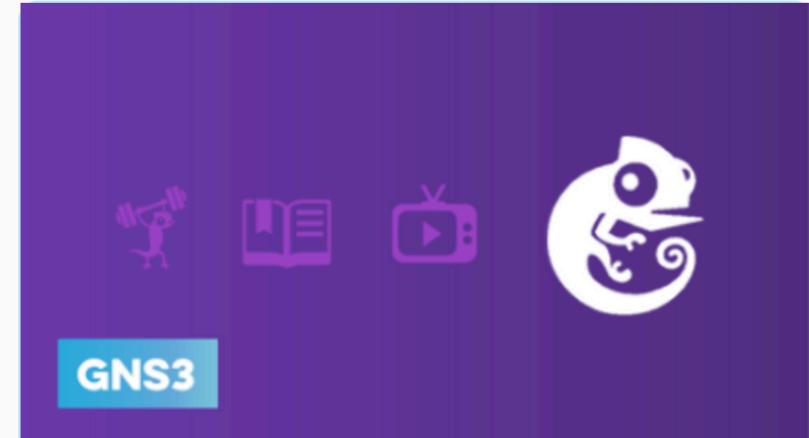
Search courses, author, systems...

**SDN**

Free: SDN and OpenFlow Introduction

 David Bombal0%
COMPLETE**GNS3**

GNS3, Docker, Open vSwitch, SDN, OpenDaylight and OpenFlow

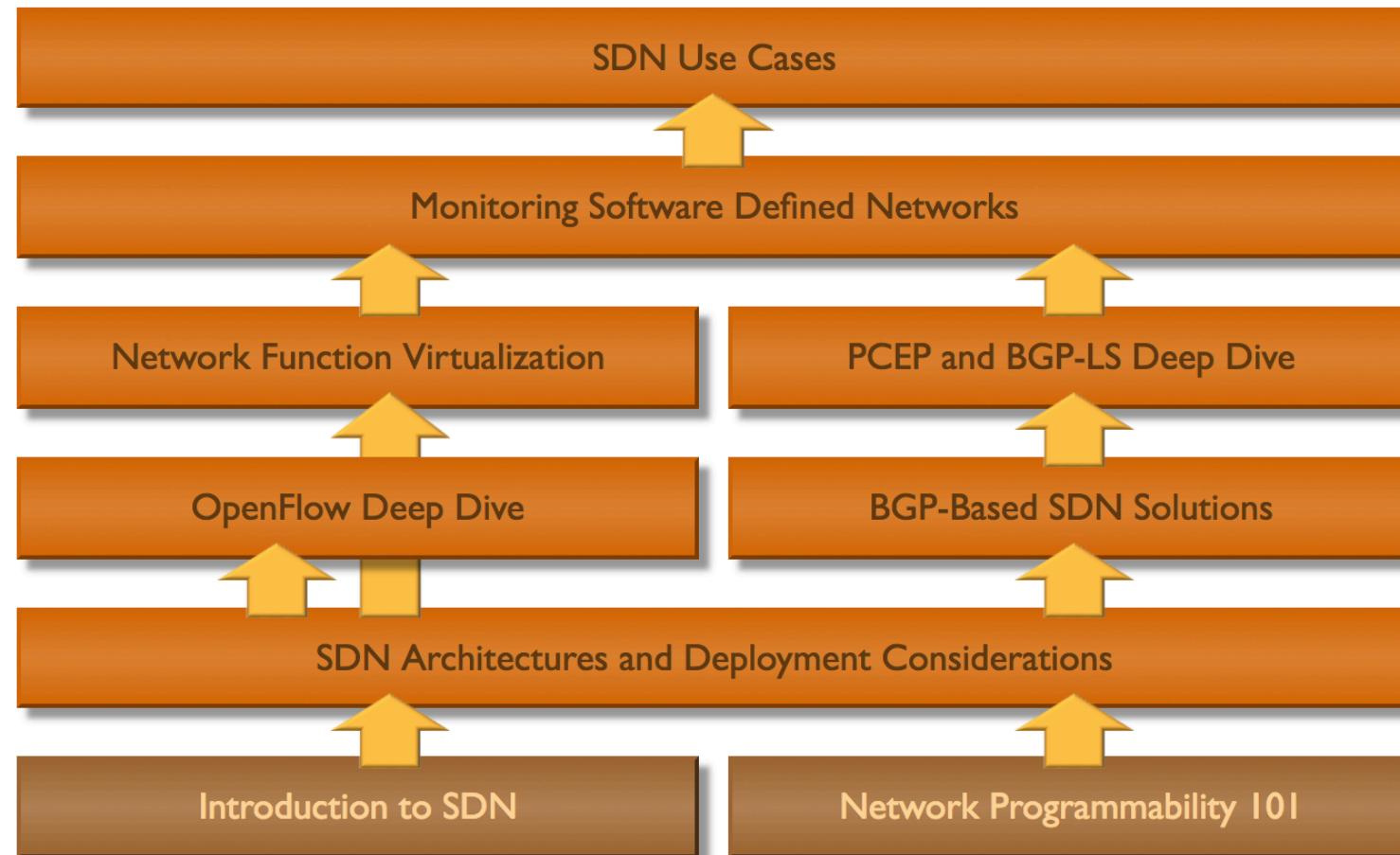
 David Bombal0%
COMPLETE**GNS3**

GNS3 Advanced Switching, IOSv, OpenFlow, SDN

 David Bombal

ROADMAP: SDN AND OPENFLOW

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OTHER ROADMAPS

- Cloud Computing and Networking
- Containers and Docker
- Data Center
- Internetworking
- IP Version 6
- Network Automation
- SDN and OpenFlow
- Security
- Virtual Private Networks
- Virtualization

OTHER BUNDLES

- SDN and OpenFlow
- SDN and OpenFlow

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Webinars

IEEE SDN and IEEE IoT Webinar: SDN in LANs: Programming the Network to Secure IoT Traffic - 9 November 2016



Presenters:

Matthieu Boussard and Nicolas Le Sauze, Nokia Bell Labs

The webinar will present results from an internal research project that aims at giving back to users control over their connected virtualization and software-defined networking we scout the future of connected environments, in which dedicated, isolated resources, and across administrative domains, are automatically set up on behalf of the users. The resulting solution provides means for fine-grained control over the sharing and composition of their IoT resources, by explicitly defining which resources should be shared.

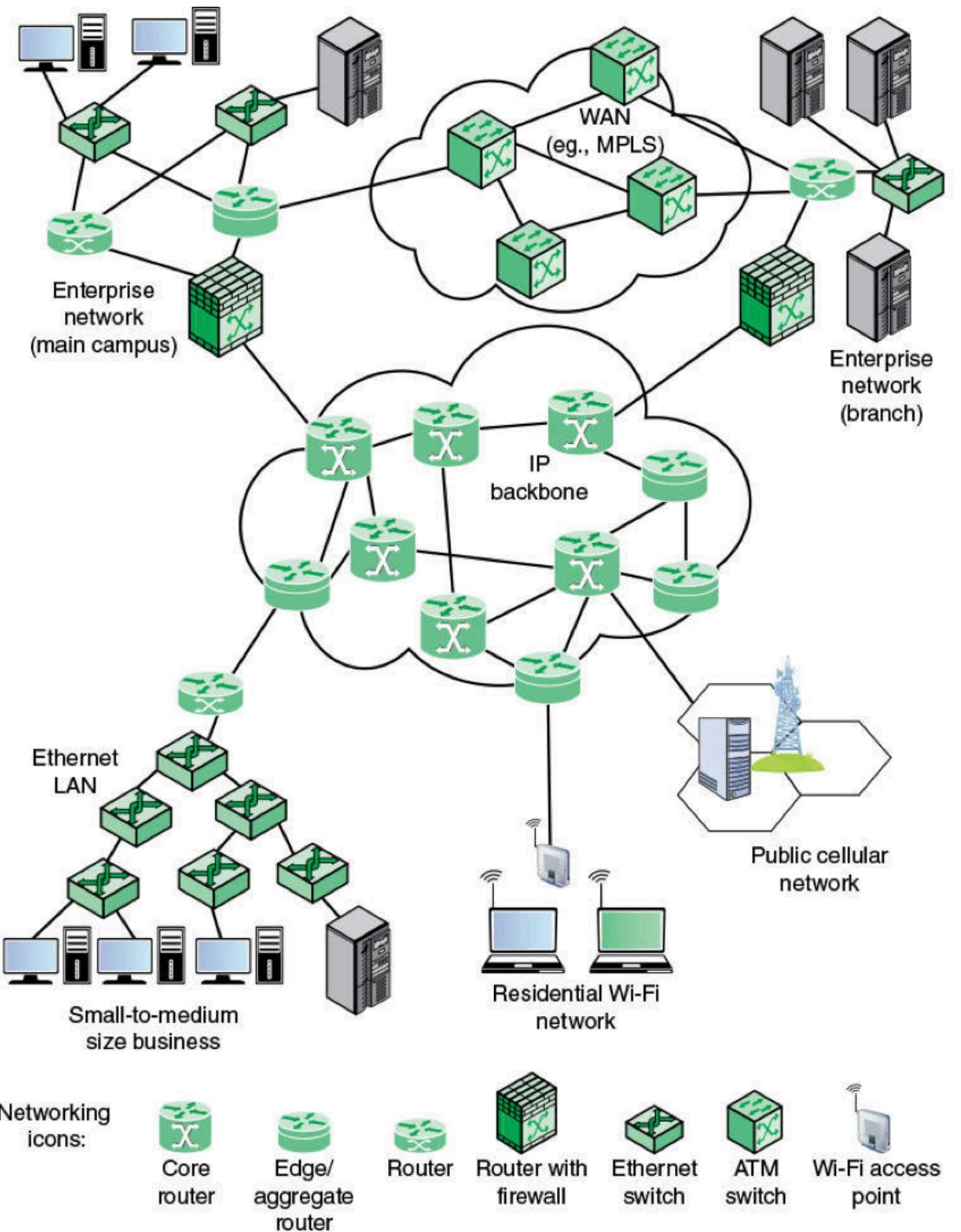
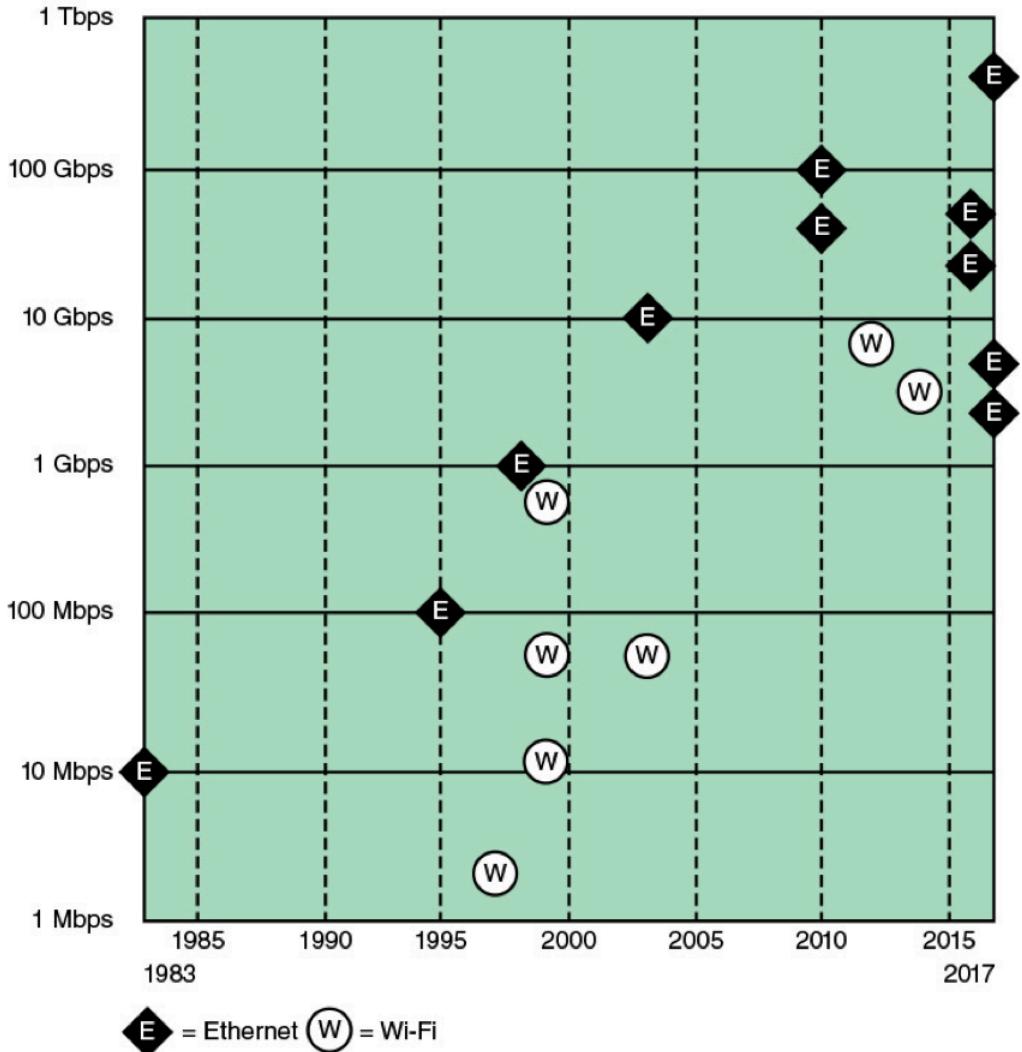


Lecture 1: Introduction to a modern networking environment

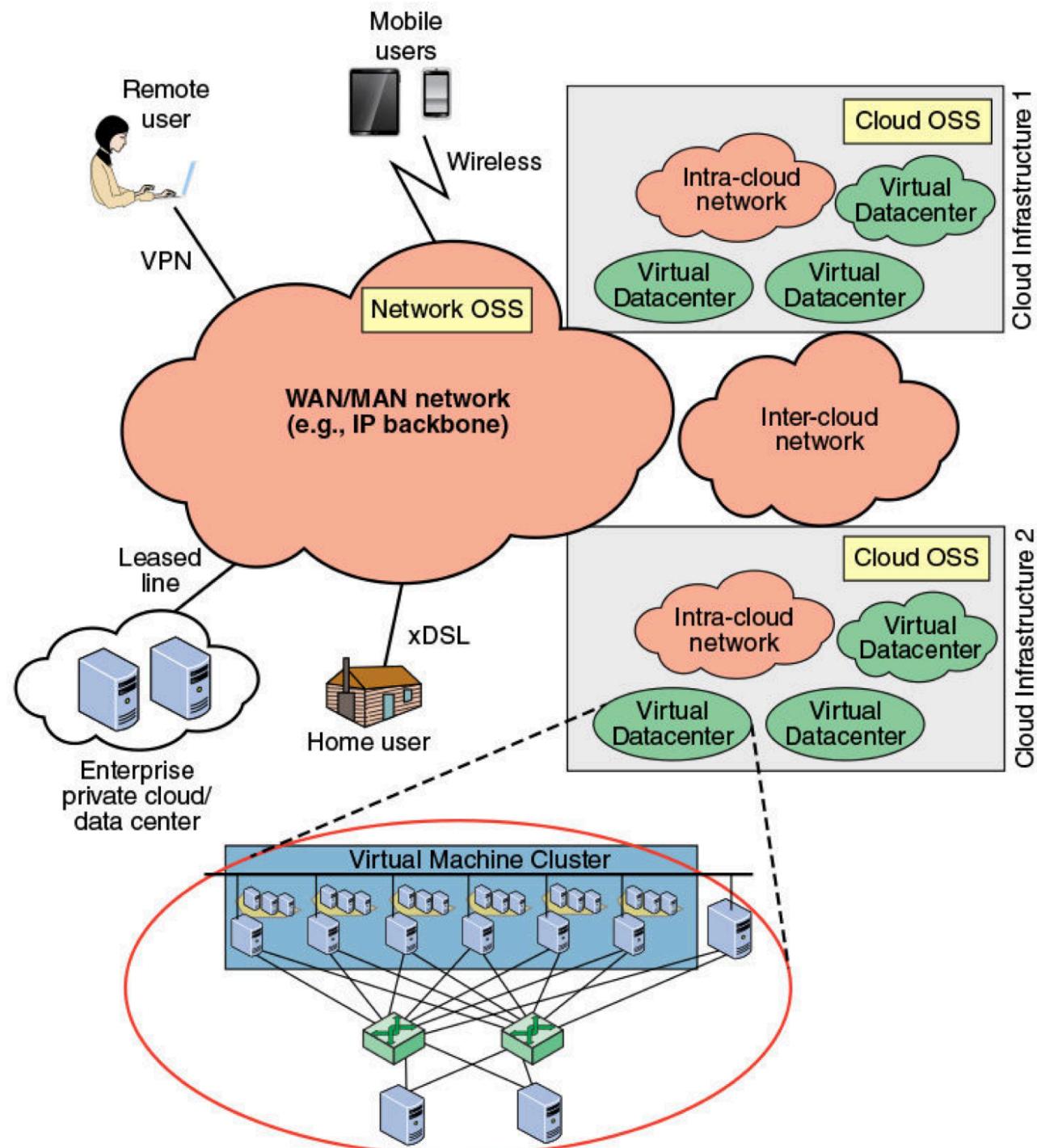
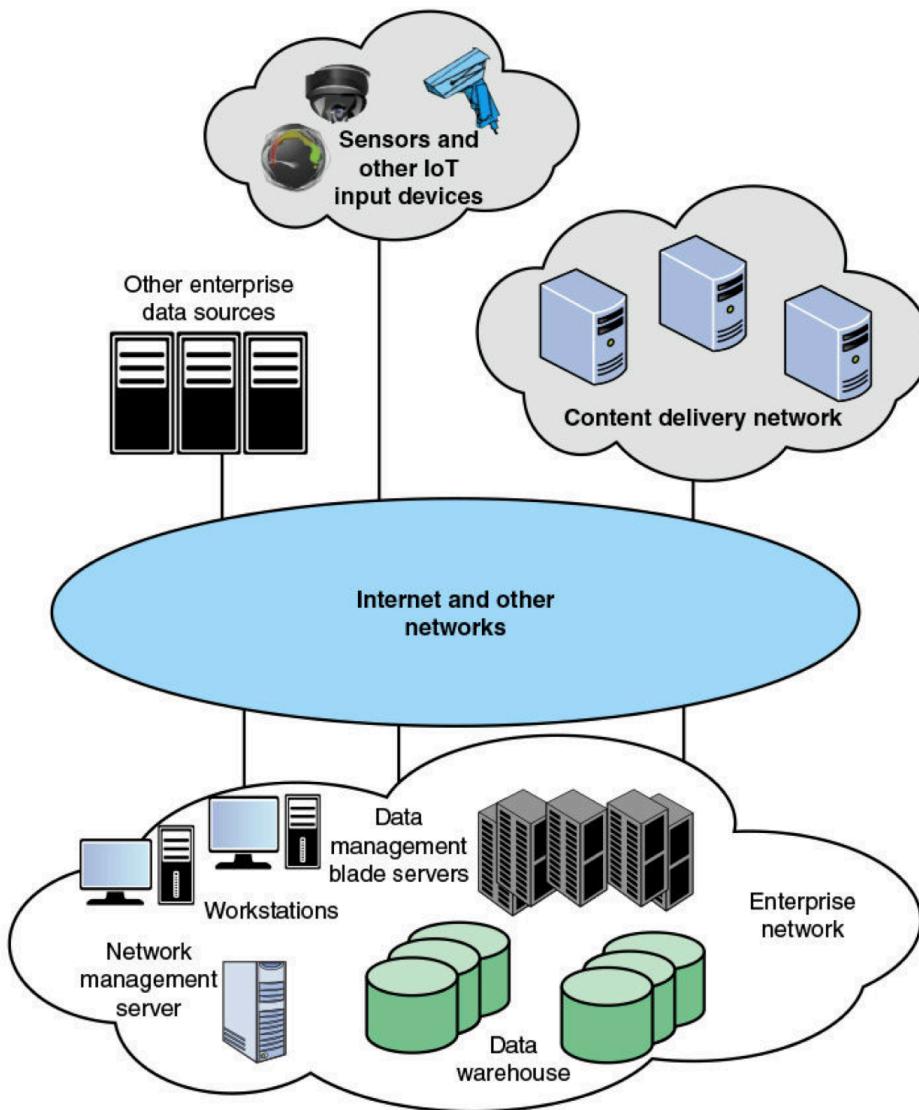
Roadmap Lecture 1

- Main trends in evolution of civilian networks
 - Cloud, virtualization, and data centers
- Main trends in evolution of military networks
 - Protected Core Networking
 - Federated Mission Networking

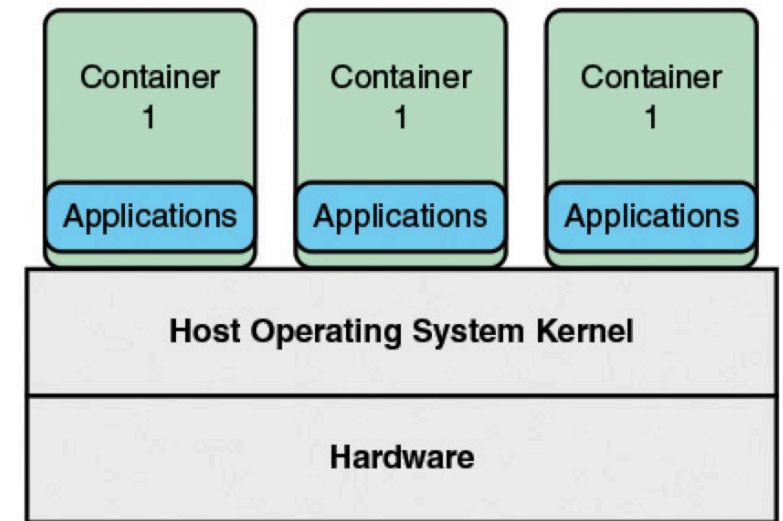
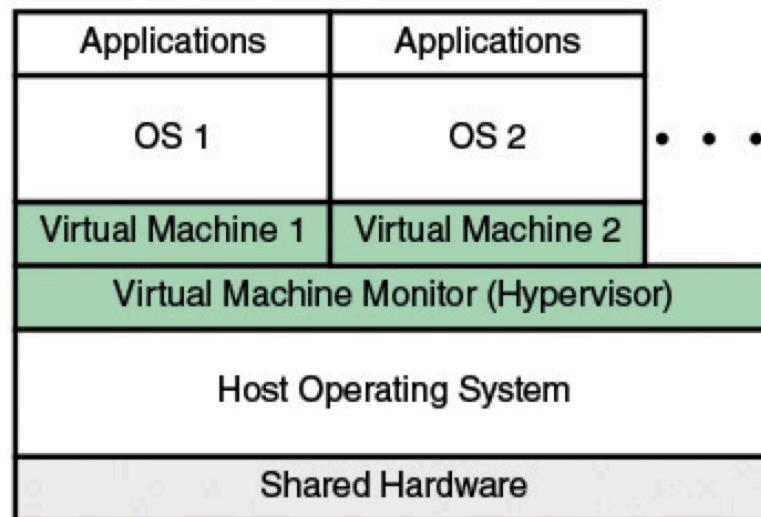
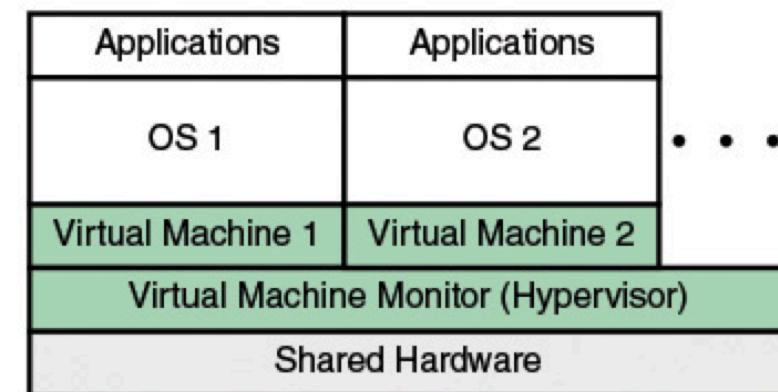
Increasing bandwidth and complexity



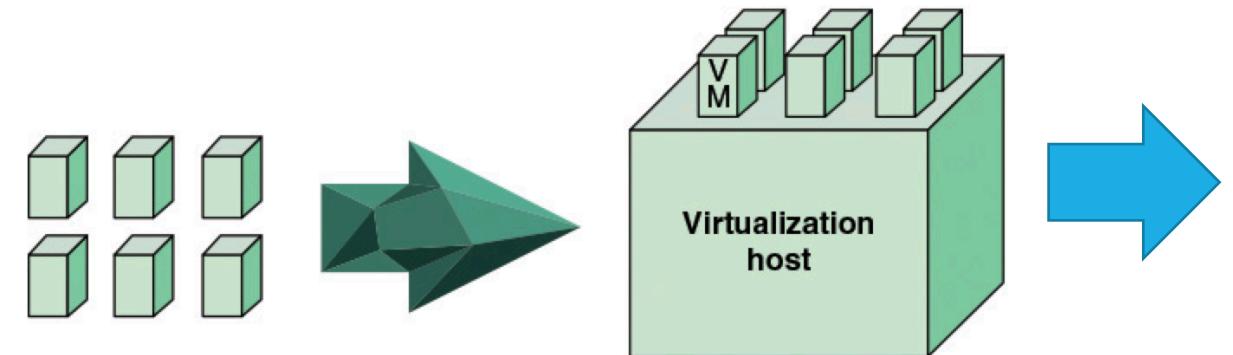
Service-oriented



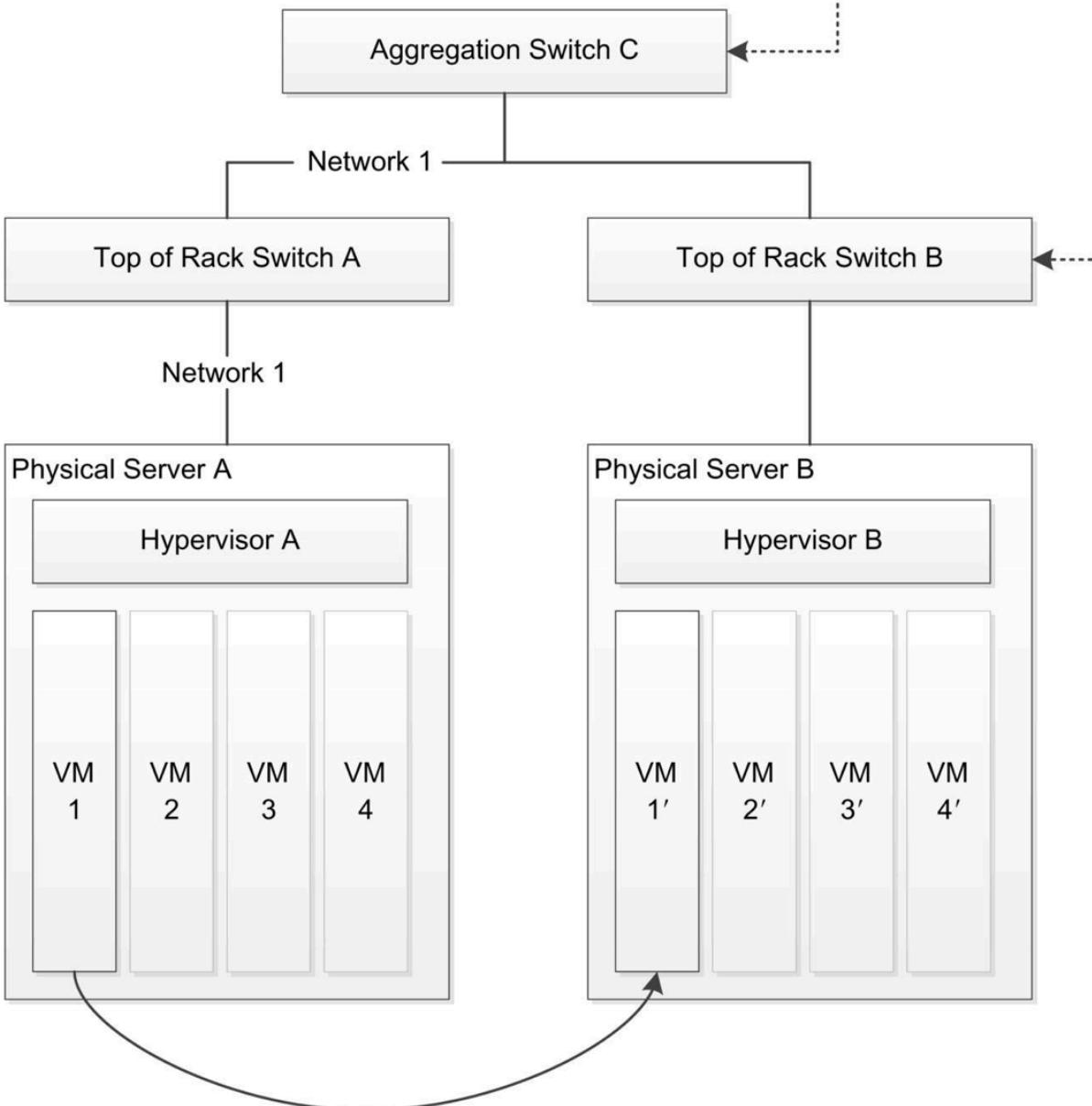
Types of virtualization



Virtualization in a data center requires speed!

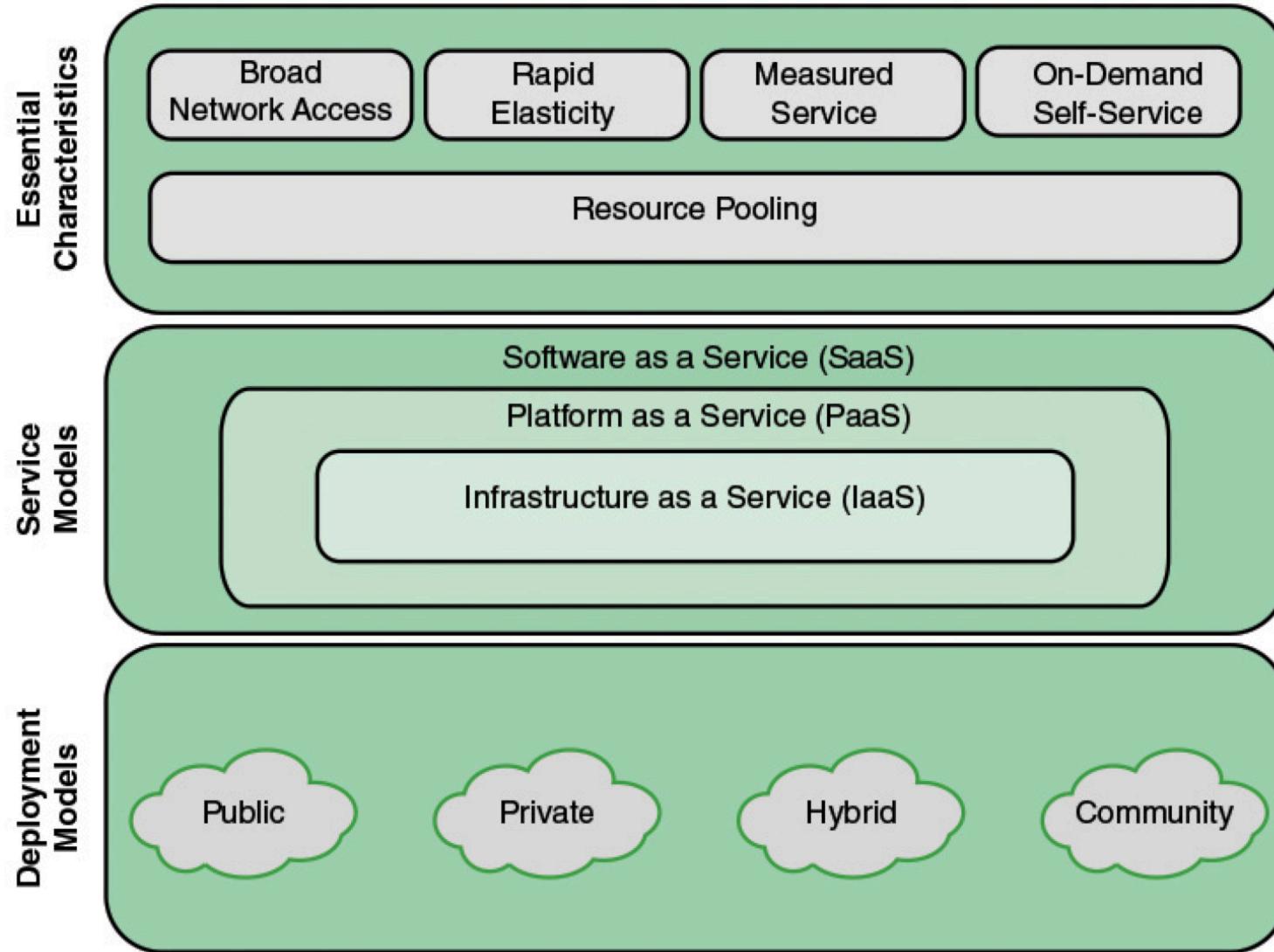


Create another instance of Network 1 on Switch B downlinks, uplink,
Aggregation Switch C downlink, etc.: **Elapsed time = DAYS**

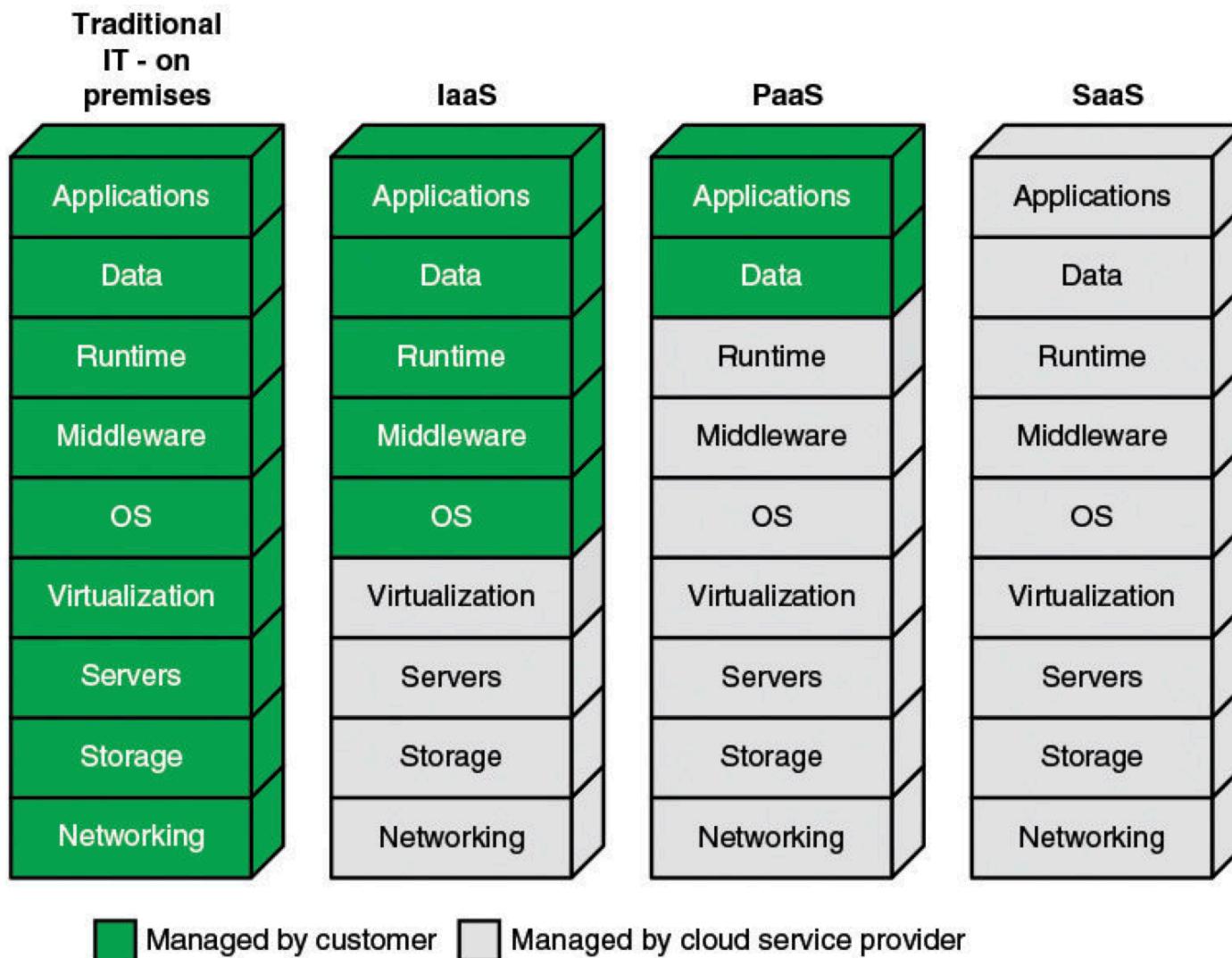


Create another instance of VM1 on Physical Server B: **Elapsed time = MINUTES**

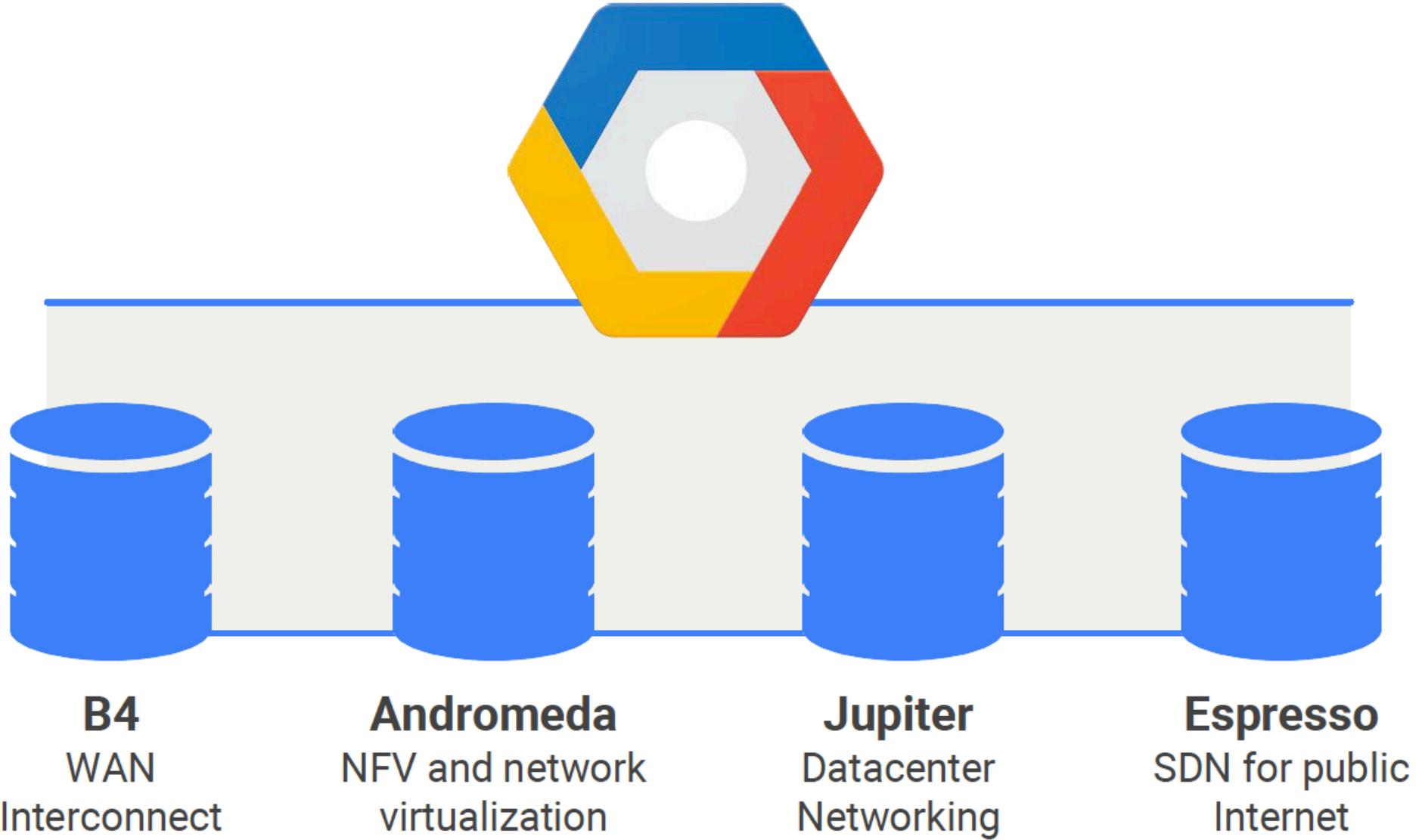
Raise of clouds



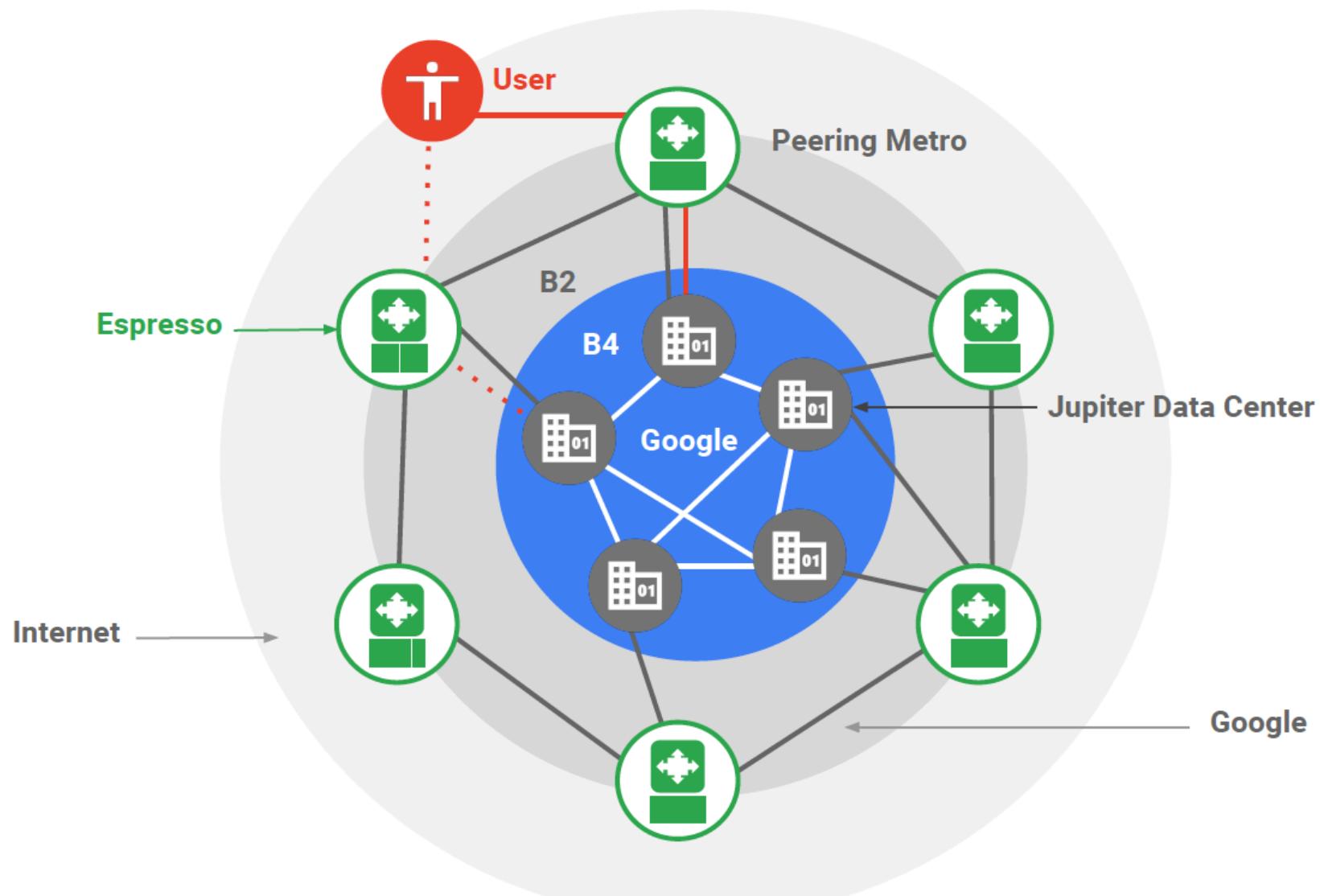
From on-premises to cloud services

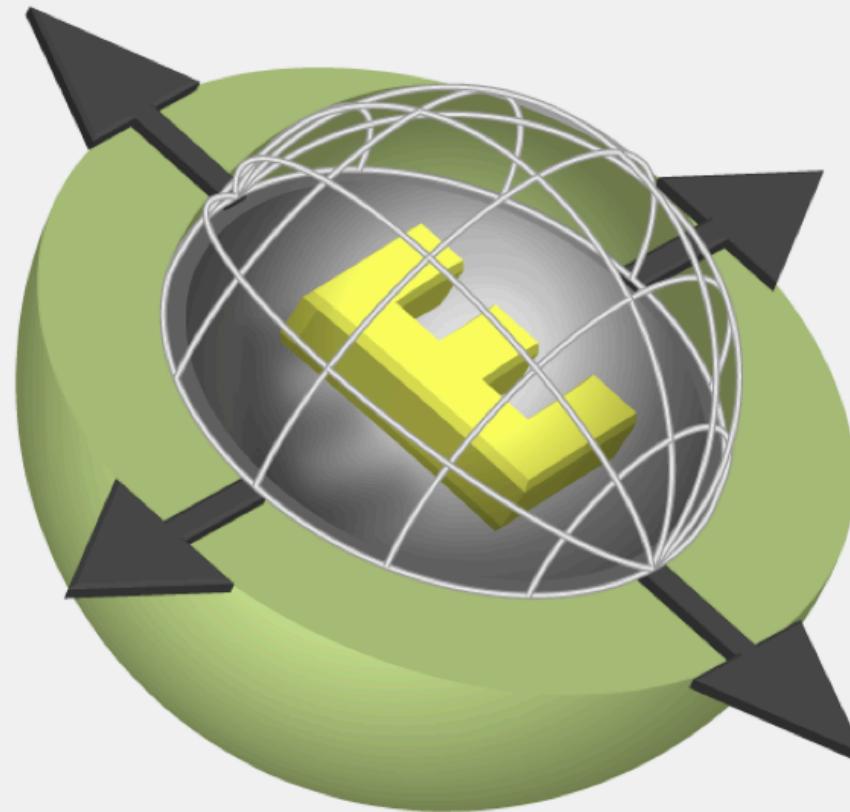


Google networking



Google networking



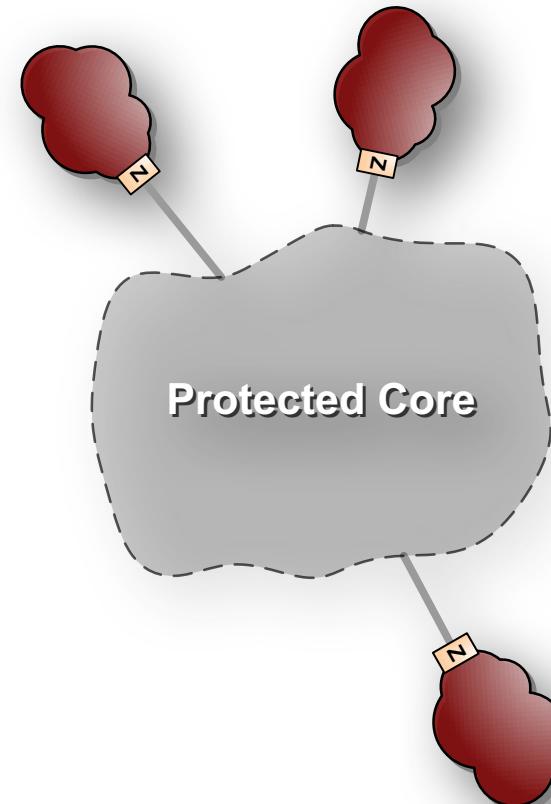


PCN

***Protected Core
Networking***

Protected Core Networking (PCN): Concepts and motivation

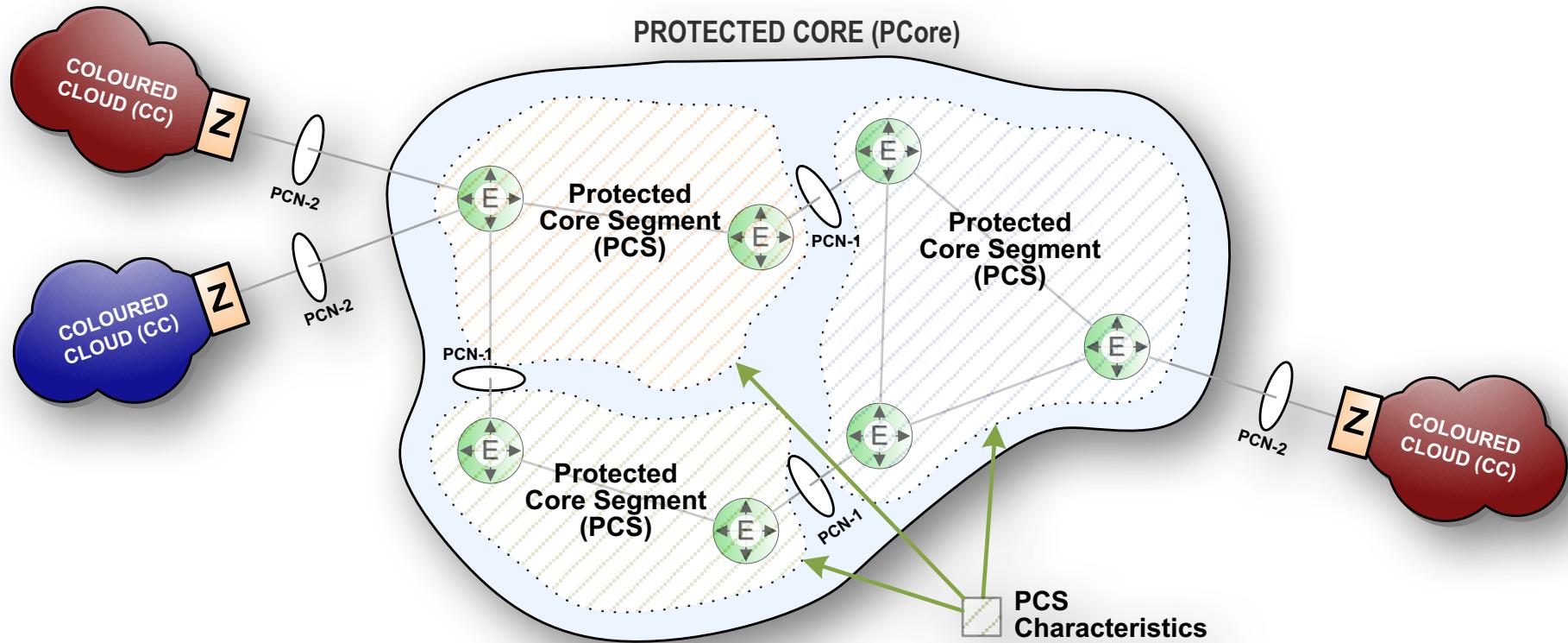
- Protected Core Networking (PCN) is an approach: describes principles upon which a Protected Core (PCore) can be built
 - Federation: federated military operations based on network enabled capabilities
 - Availability (reliability)
 - Security and Flexibility: a secure and flexible transport service that allows high speed of command, rapid adaption to changing situations, and self-synchronization



Protected Core Networking (PCN): Benefits

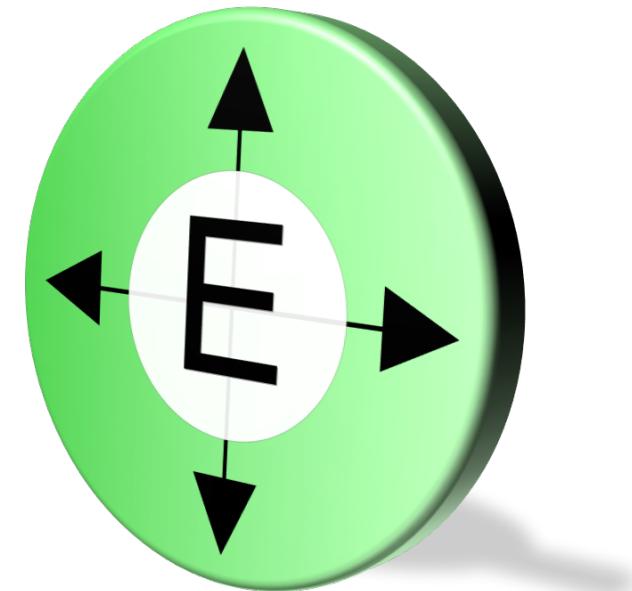
- Improves information sharing by enabling plug-and-play for federated communications
- Allows nations to specialize in specific communications assets and share in a manner of smart defence / connected forces initiative (e.g. SatCom)
- Reduces cost to Nations through provision of flexible network services
- Improves security and availability
- Standardizes NATO / National interconnections
 - Both classified and unclassified

PCN Overview and Terminology

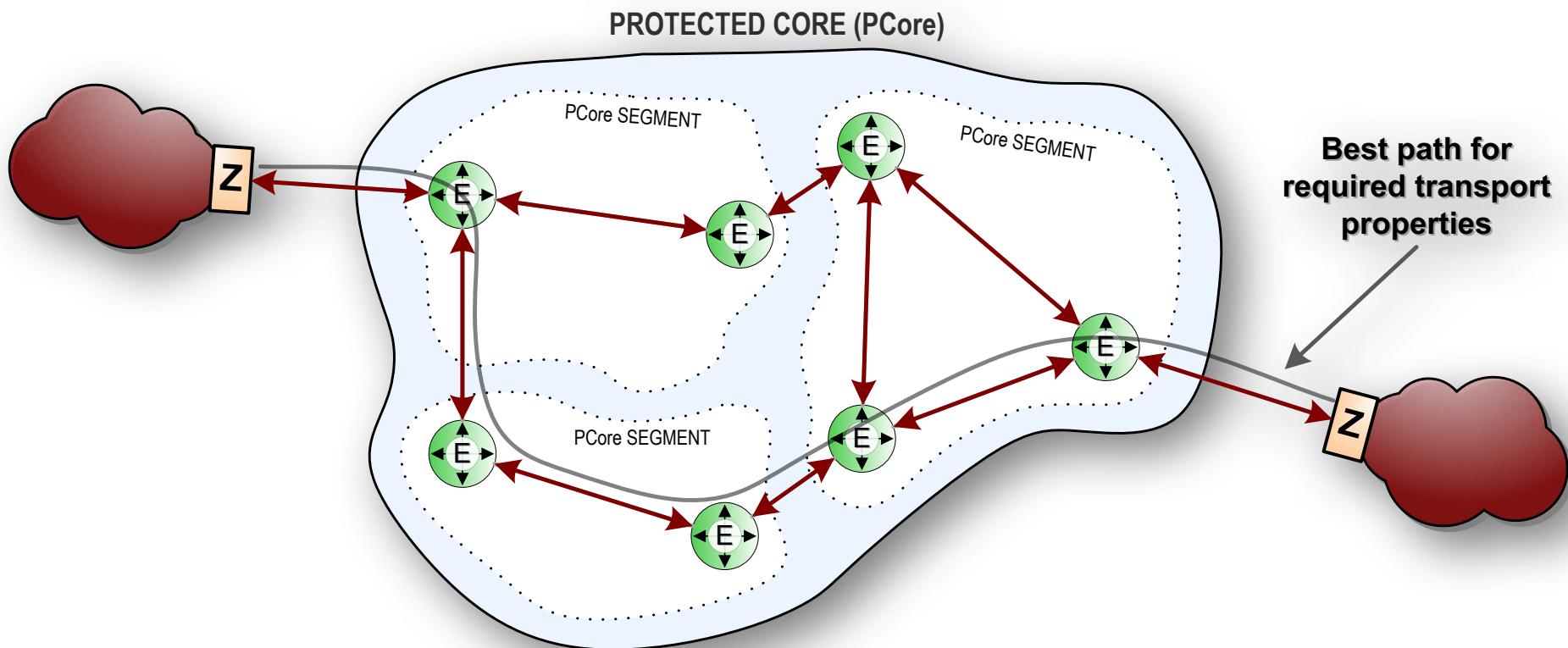


E-node functionality

- Enforcement
 - Authenticate entities and traffic
 - Police and shape traffic
 - Detect SLA violations
 - Isolate user traffic from PCore
- Management
 - Forward traffic to management layer
 - Capture link properties
- Traffic Handling
 - Forward traffic according to signaled properties



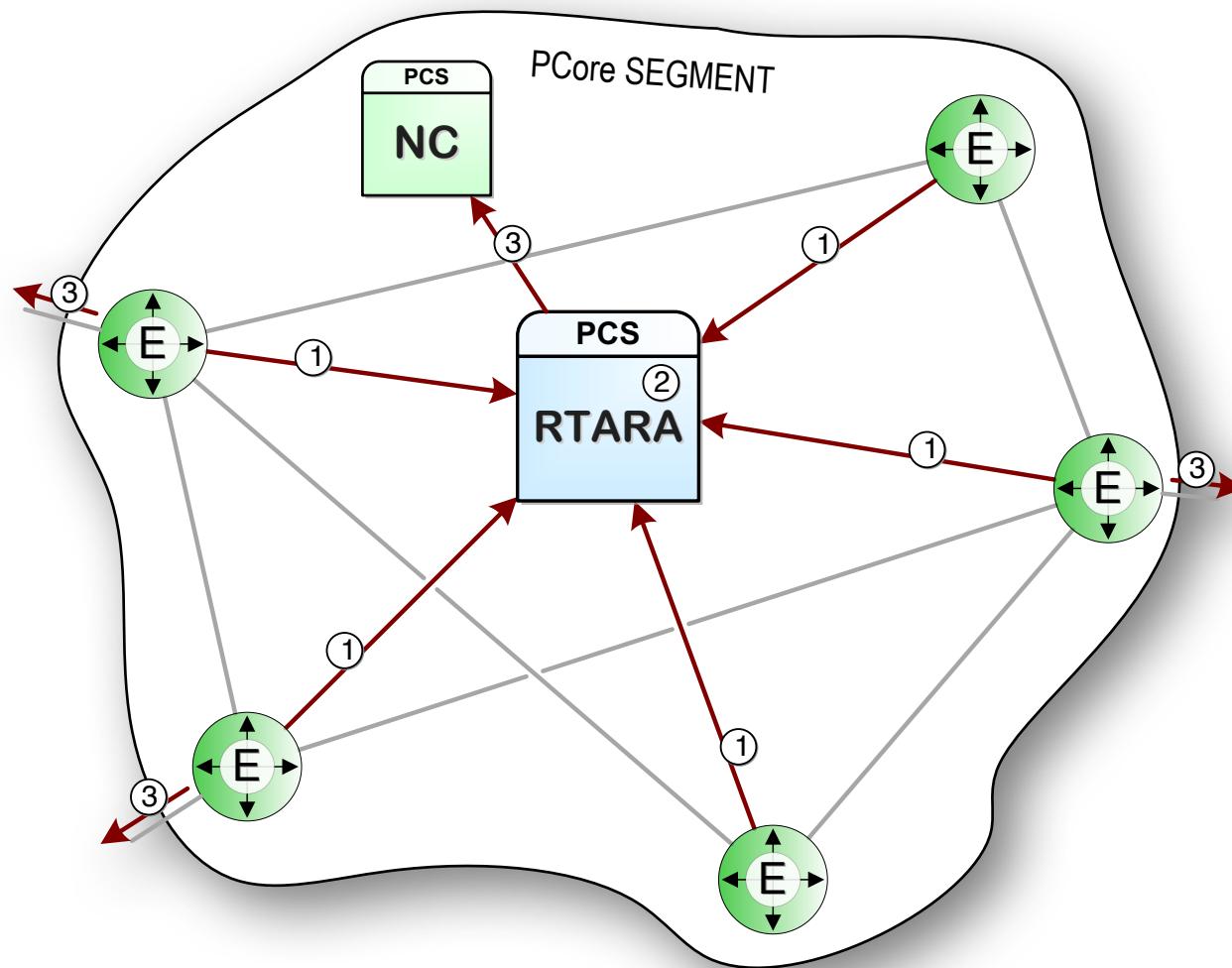
Transport Service



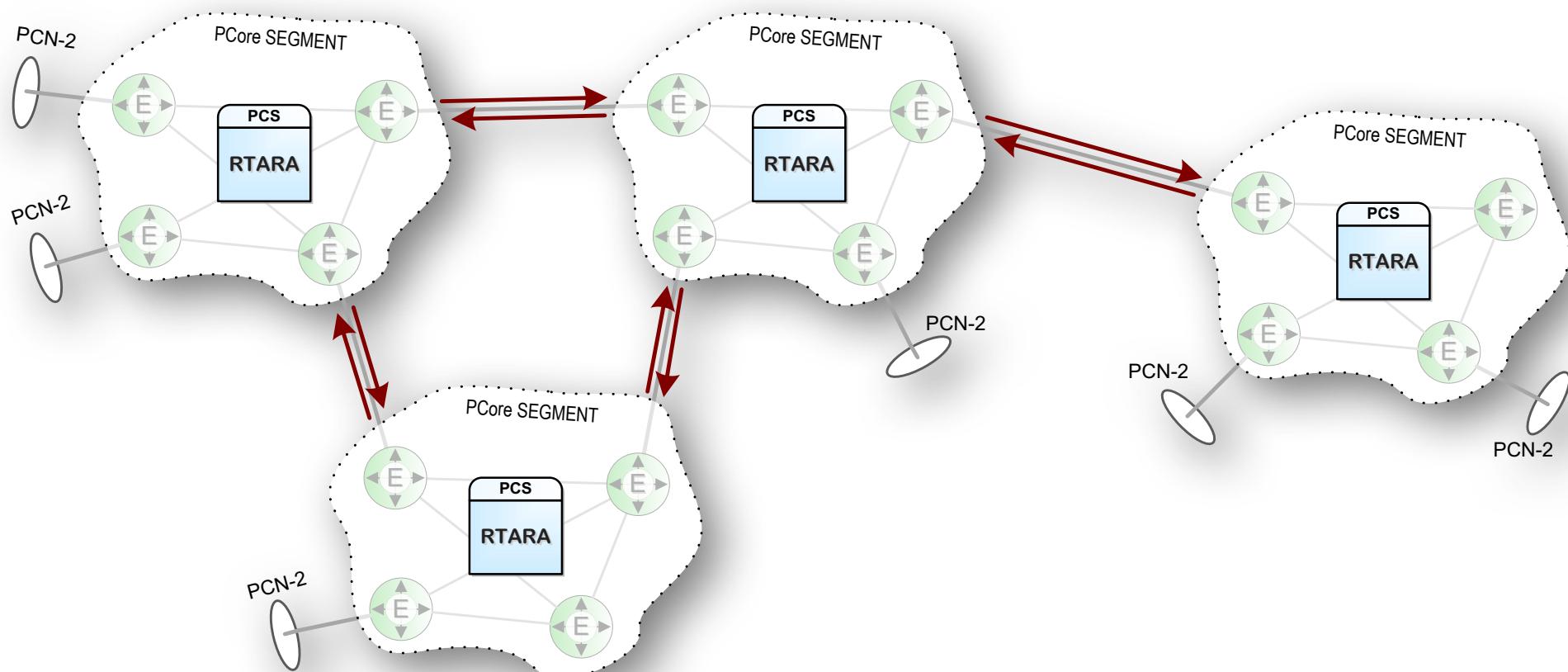
Transport Service

- Transport service properties
 - Bandwidth
 - Delay (latency)
 - Delay variation (jitter)
 - Precedence
 - Traffic flow confidentiality
- Required properties signalled from CC to PCore
 - Stateless signalling
 - Each packet marked individually
 - Stateful signalling
 - A flow is set up and packets are marked with flow IDs

Dynamic Risk Assessment



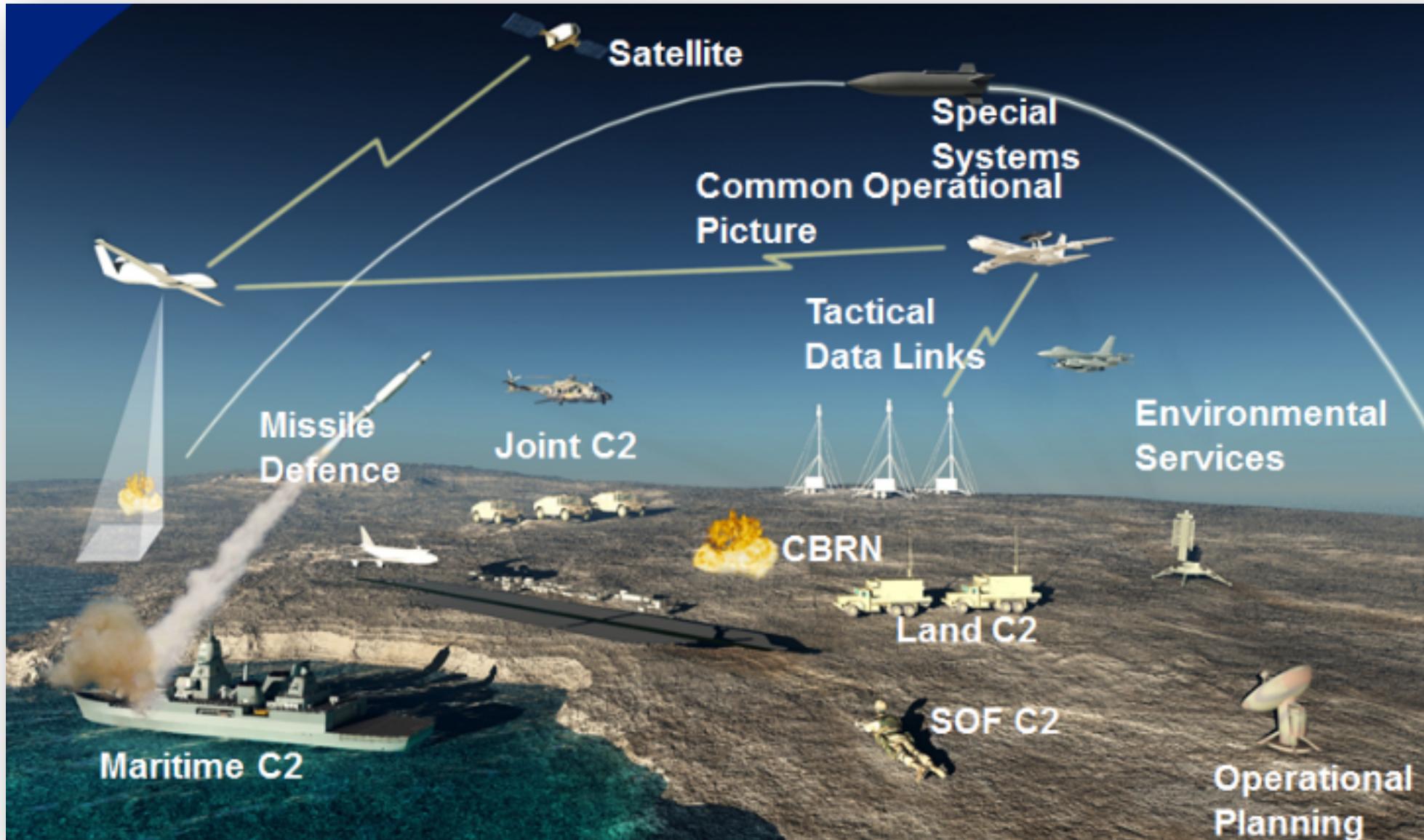
Exchange of risk signatures





**Federated
Mission
Networking**

Complex military systems



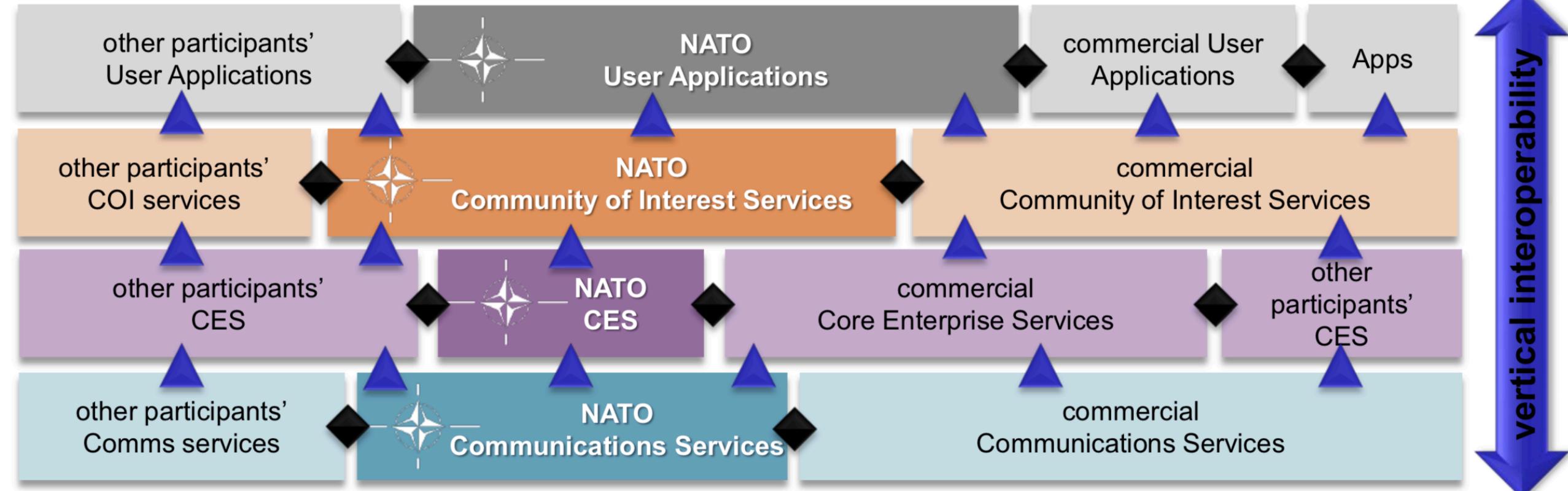
The Afghanistan Challenge

“Coalition forces within Afghanistan cannot communicate effectively and share theatre related operational Commander’s guidance, information and intelligence. These communication gaps increase risks to life, resources, and efficiency”.



COM/ISAF, General McChrystal

horizontal interoperability



FMN Profile (Interoperability Standards) - ADatP-34

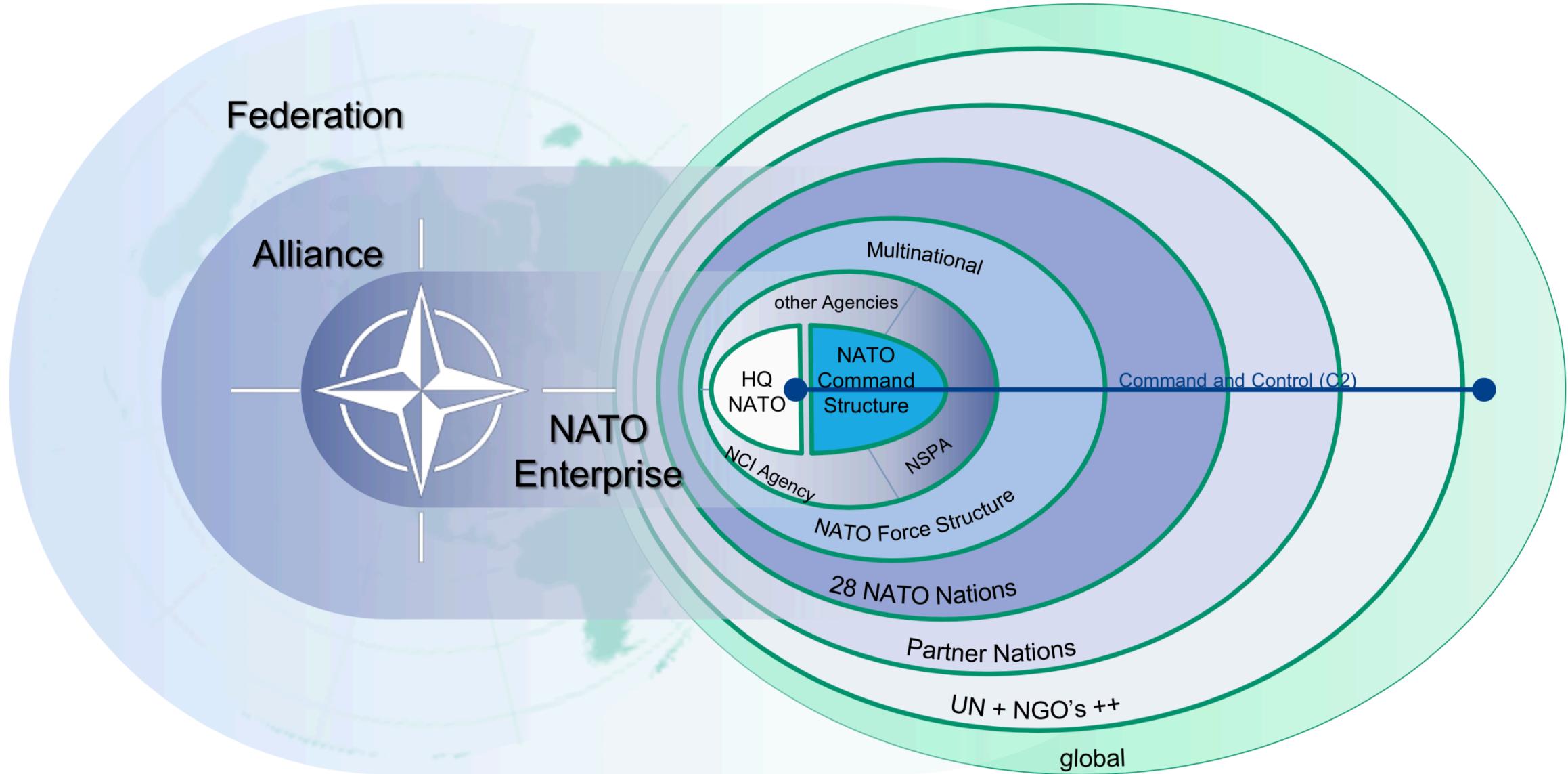


vertical service interoperability/integration point



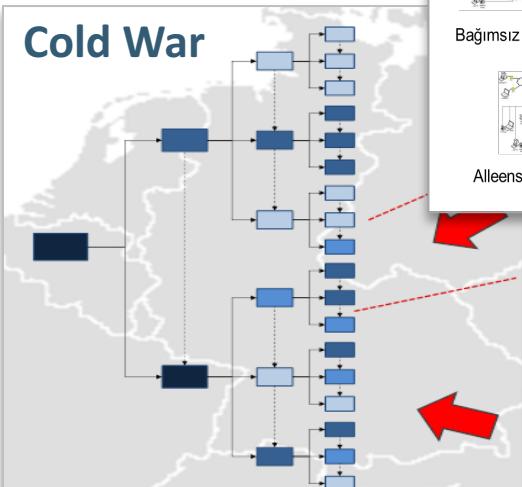
horizontal service interoperability point

NATO doesn't act alone

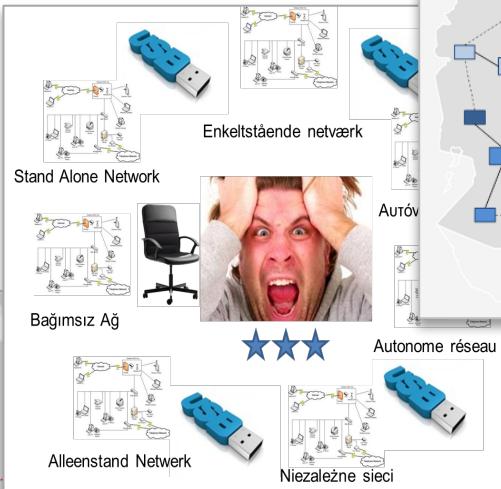


NATO's Mission Network Concepts

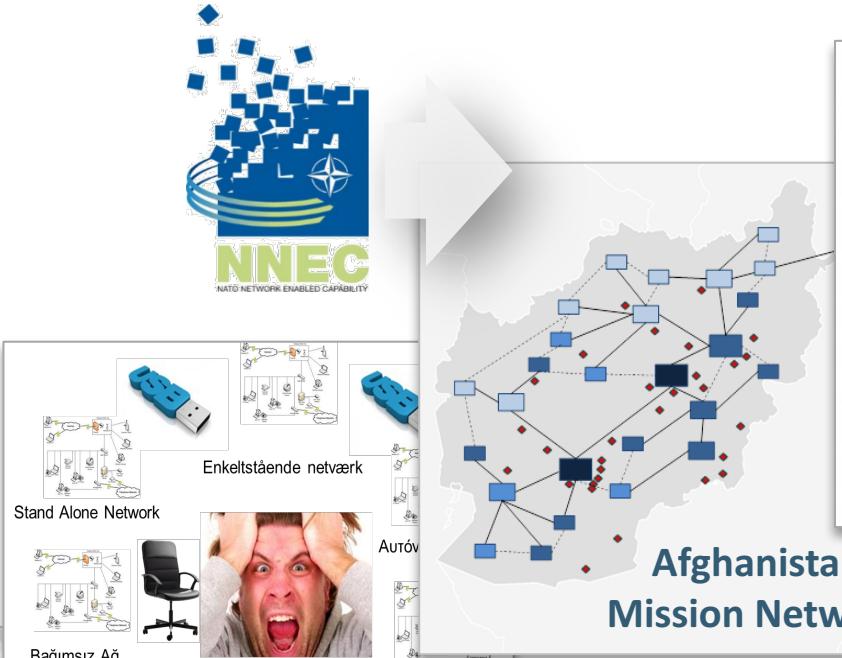
*Large national land
warfighting
formations (Corps)
STANAG 5048*



1949 - 1995



1995 - 2010



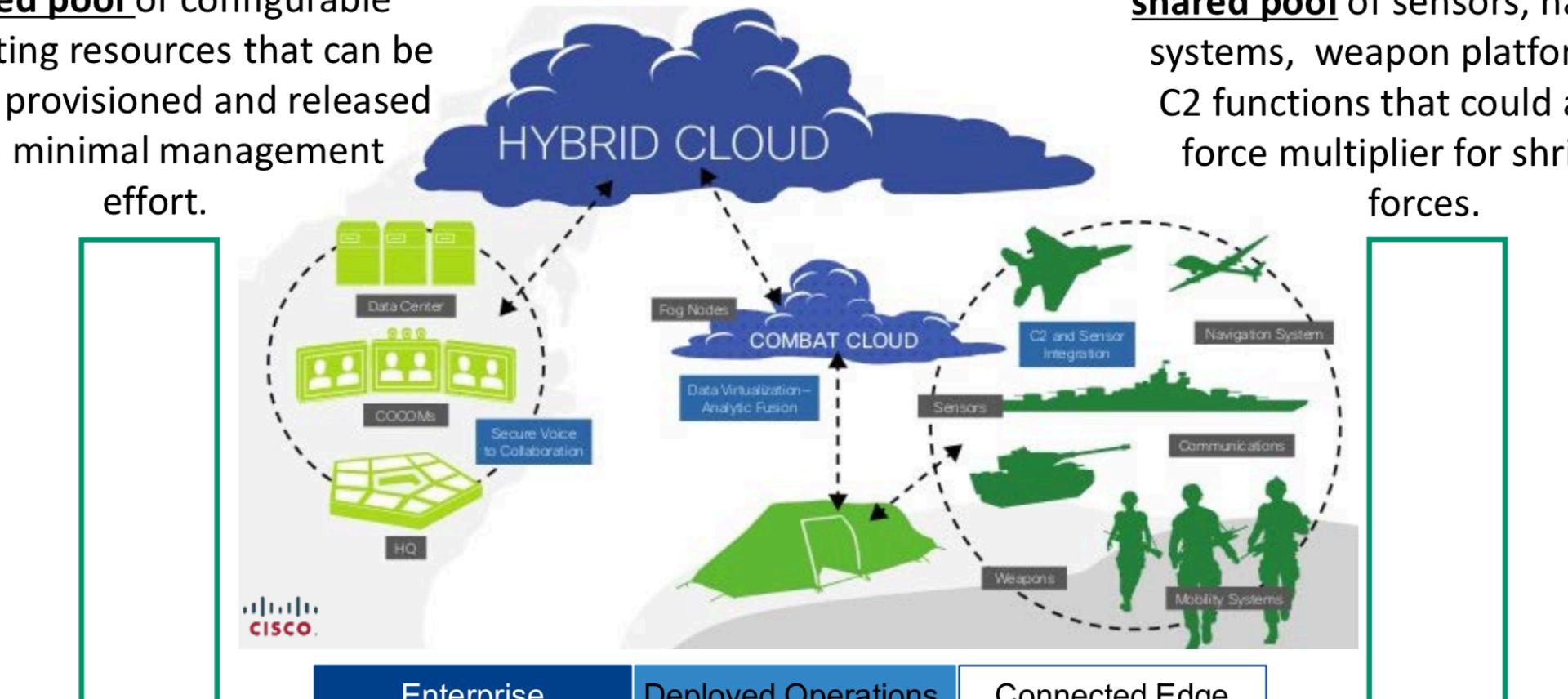
2010 – 2017... ?



*Smaller
multinational joint
formations
conducting
comprehensive
missions
(Brigade/Division)*

“Cloud computing” is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort.

“Combat cloud” is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of sensors, navigation systems, weapon platforms and C2 functions that could act as a force multiplier for shrinking forces.



requires the availability of high-capacity global interoperable networks



requires the availability of secure, federated mission networks

