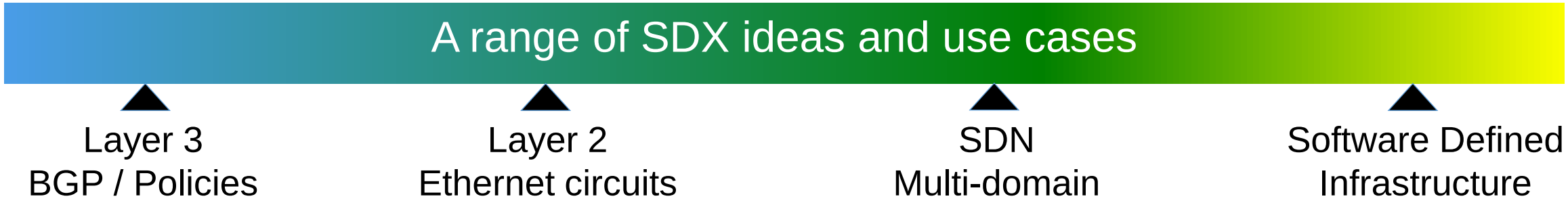
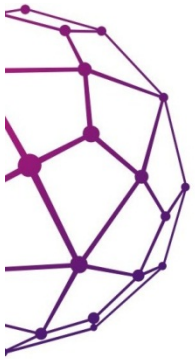
What does “SDX” mean ?



- “Networking” SDX – connectivity / routing
  - Layer 3 (IP) – e.g., connect AS’s
  - Layer 2 (Ethernet) – e.g., multi-domain circuits
  - SDN – connect SDN islands
- “Cloud service” SDX – with compute/storage
  - Connect SDI islands
  - Compute / storage / network / instruments
  - GENI as an early instance



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On Internet as Networks Federation

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Research Fellow
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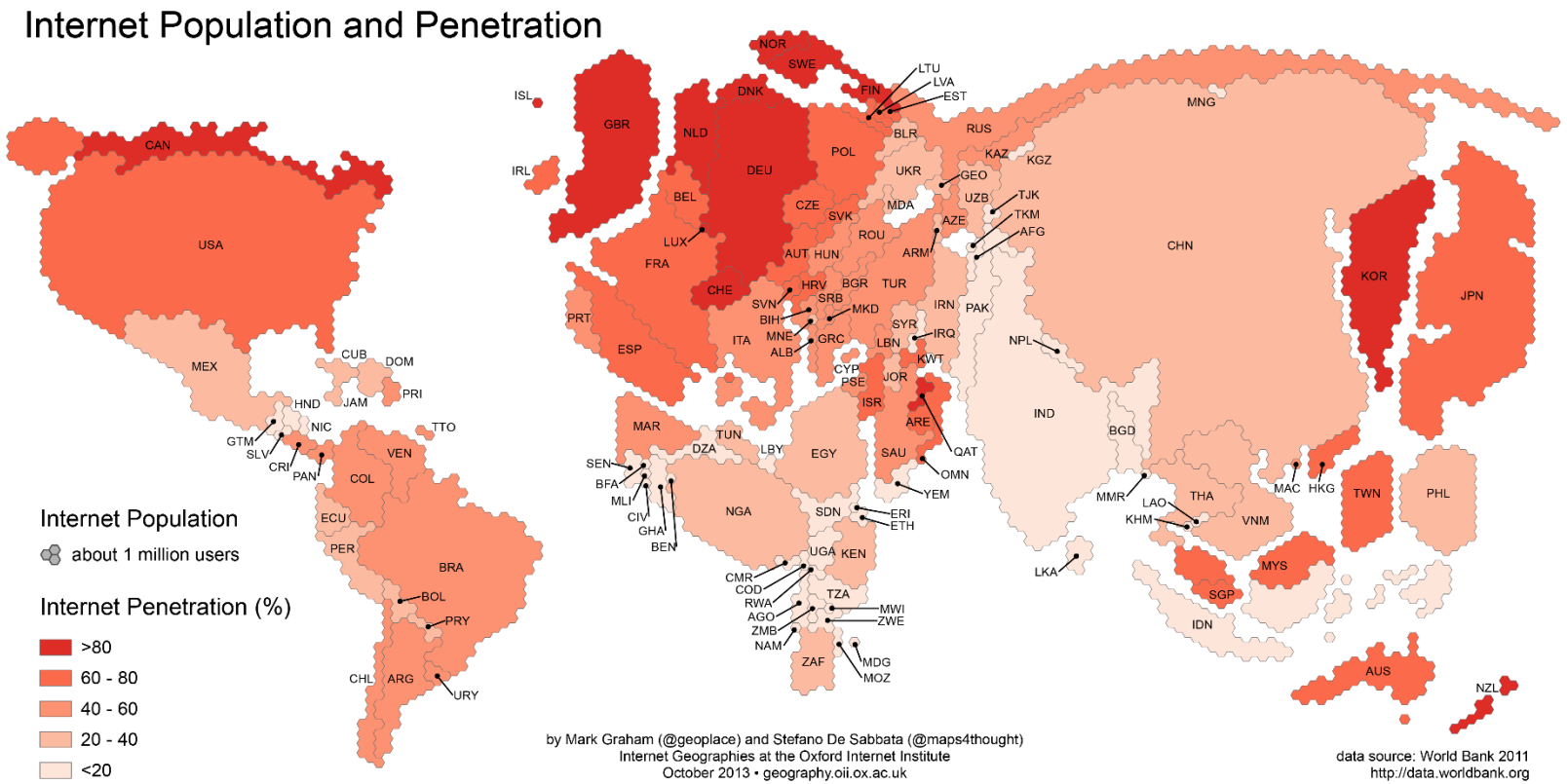
On Internet as Networks Federation

A **FEDERATION** is a union of partially self-governing bodies (federate) under the central federal body. In a federation, the self-governing status of the bodies, as well as the division of power between them and the federal government, are typically constitutionally entrenched and may not be altered by a unilateral decision of either party body or the central federal body.

A **SOVEREIGNTY** is the full right and power of a partially self-governing body to govern itself without any interference from outside sources or bodies within power granted by constitution.

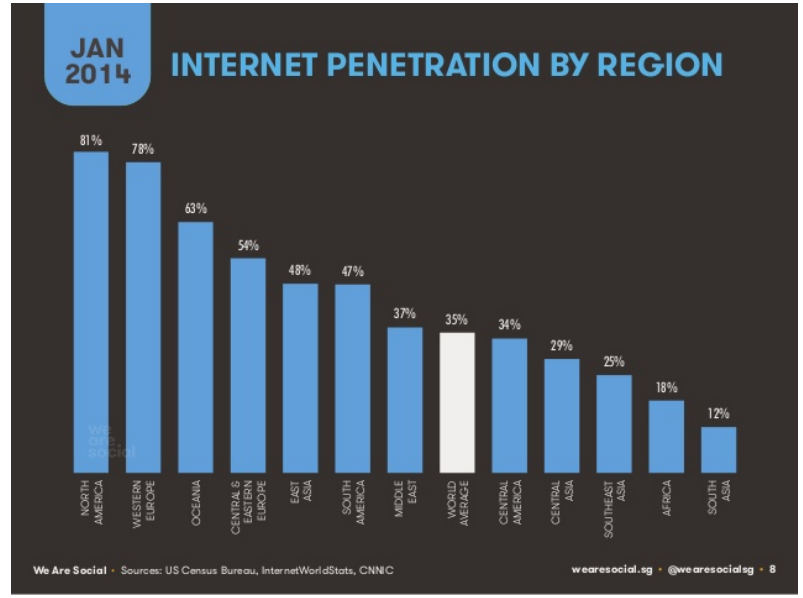
Internet - a strategic resource

economy | information | education | security | e-government



"We Know Where You Are. We Know Where You've Been. We Can More Or Less Know What You're Thinking About."
Eric Schmidt, Google CEO

“ Man can indeed do what he wants, but he cannot will what he wants.”
A. Schopenhauer, Philosopher



There are now 3 billion Internet users worldwide in 2015 (the world population is 7.2 billion people)

Competition is the oldest form of collaboration, when the ability of each of its subjects to unilaterally affect the general market conditions is eliminated or limited.

The most important condition of perfect competition is the sovereignty of its subjects

- **Internet is a competition arena, which has no sovereignty, but vulnerability**

Ecosystem for competition supposes:

- Availability
- Security
- Resilience
- Sustainability

Global Traffic Map

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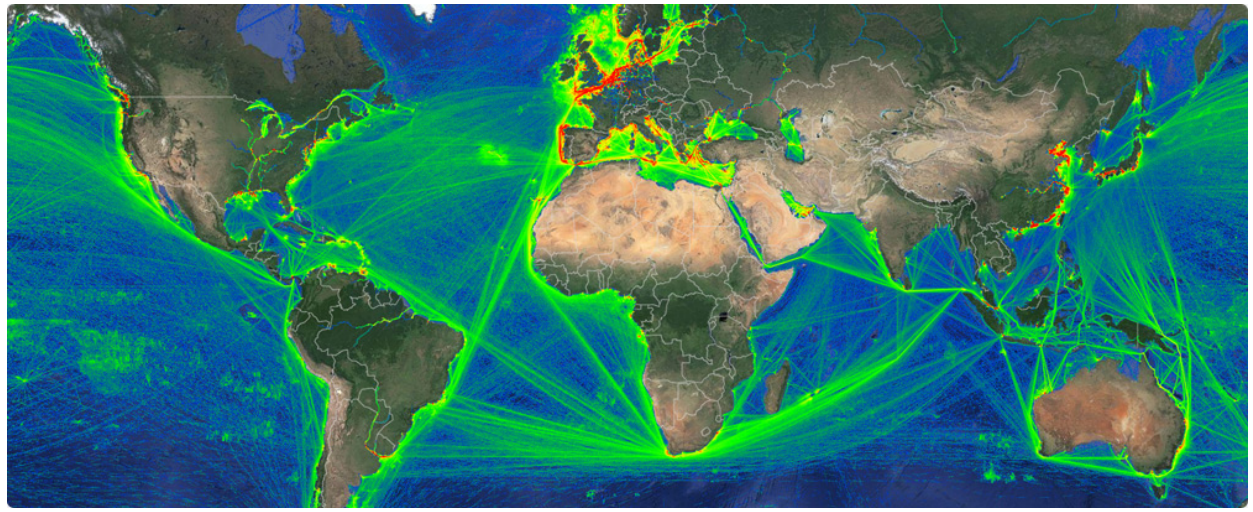
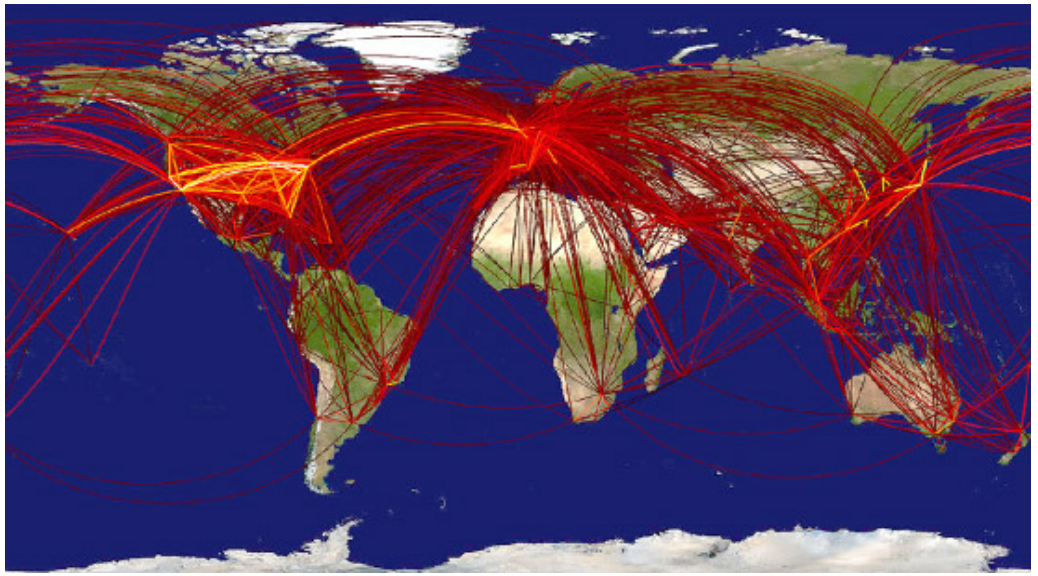
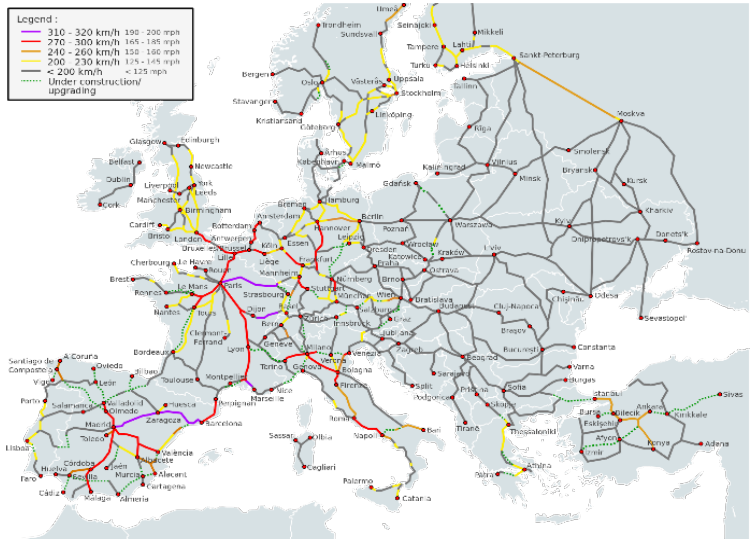
sea traffic map



air traffic map



voice traffic map



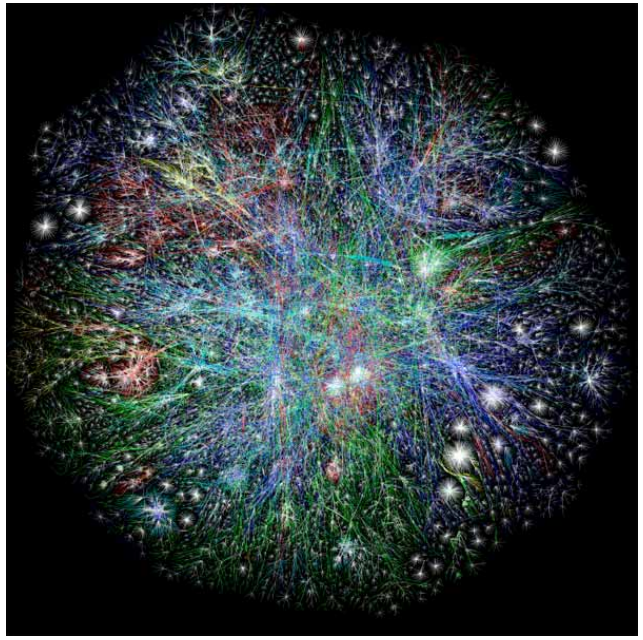
railroad traffic map

IT global trend №1

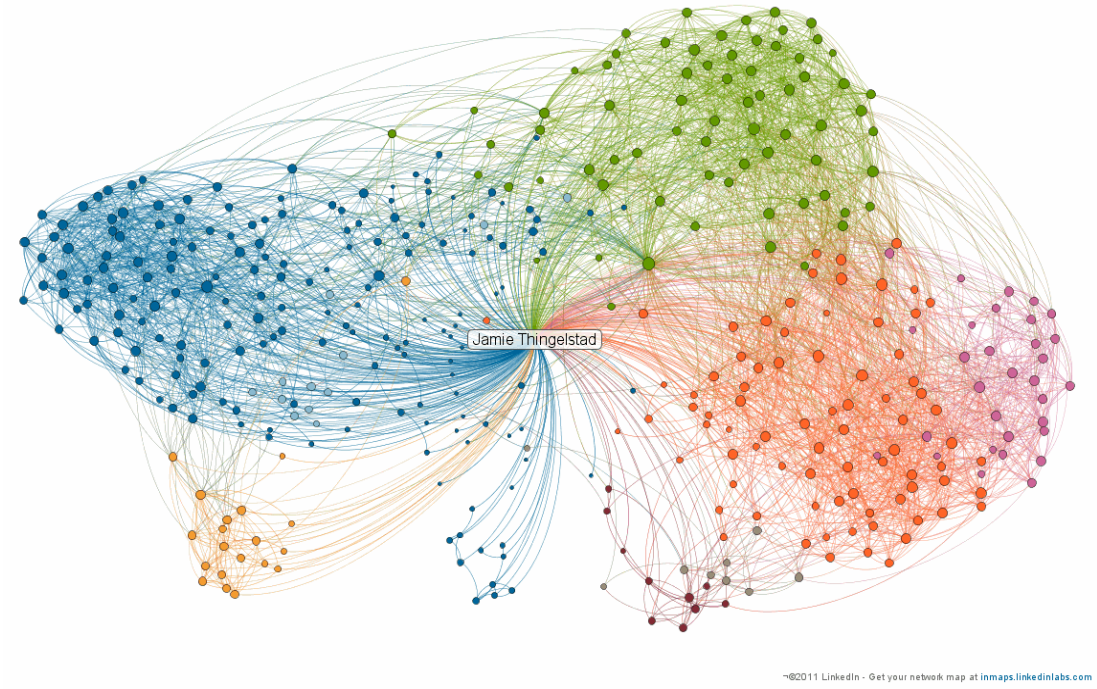
Sovereign national networks as Internet Federates:

- independed maintaining of the informational network belong to its territory;
- controlling and regulate the national security question;
- ability to have equal influence / take the initiative / offer solutions on the Global Internet.

Internet traffic map



before



after

How we can turn Internet into a Networks Federation?

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IT

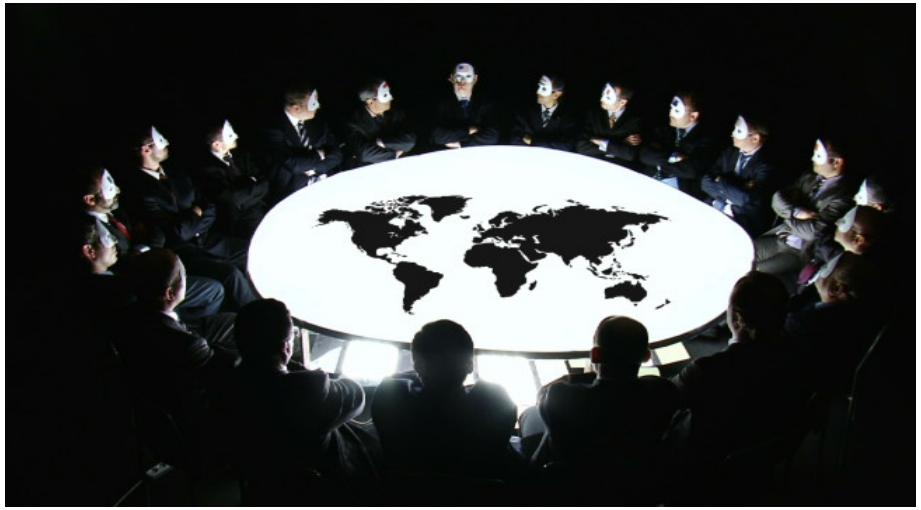
Technical implementation

Computer network of new generation (SDN)

- Its own autonomous network with desired policies;
- Each state has a «source/application aware entrance» in its network with input/output «points»;
- Interaction of flows differentiated on input/output «points»;
- Flows balancing within each national network.

International law

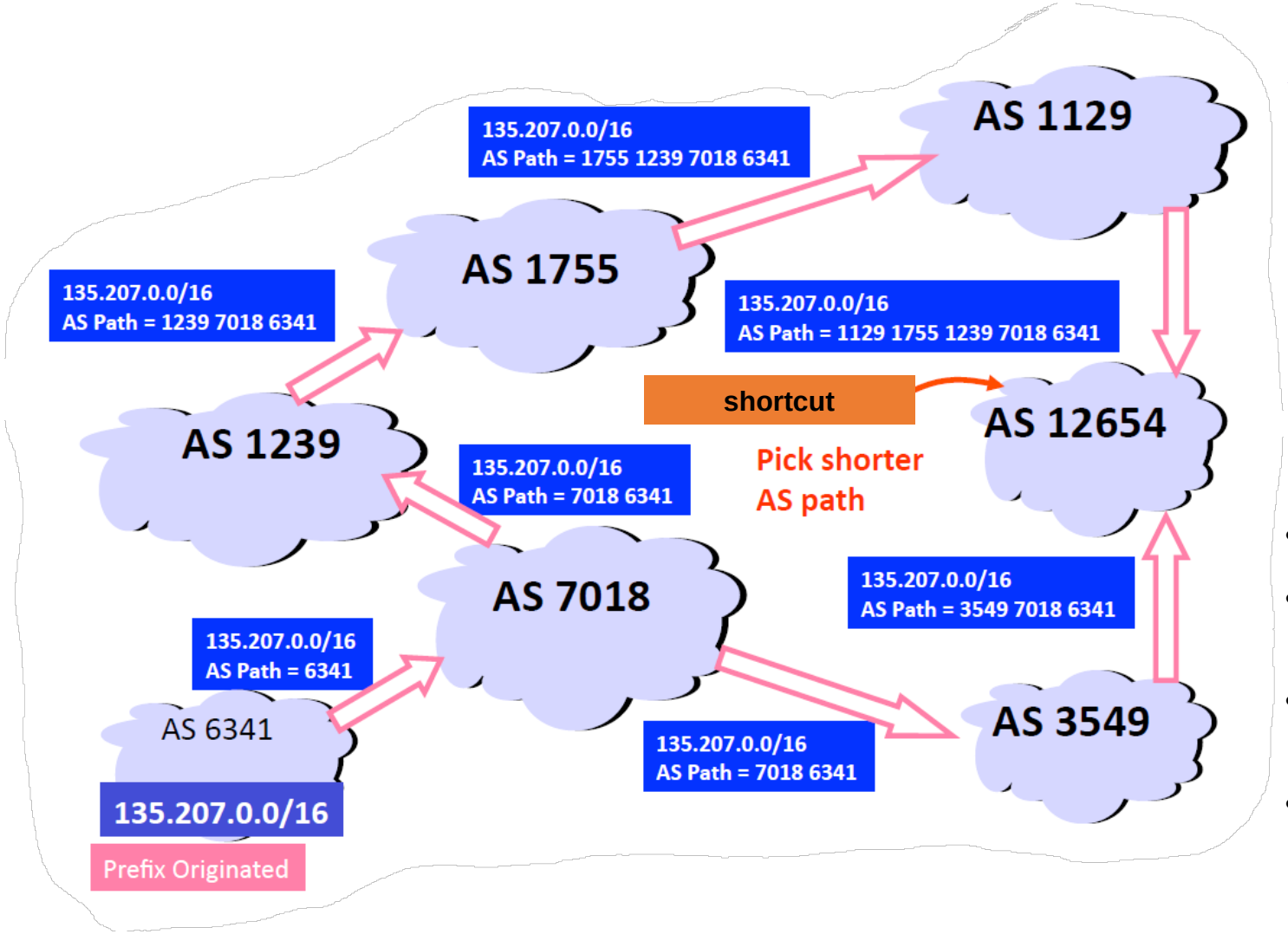
legal regulation of international relations on the Web



SDN | Software Defined Networks is a new approach to network architecture, where the control and data plans are decoupled.

SDN provides significant advantages in management and virtualization of network resources and in network quality of services.

AS communication by BGP



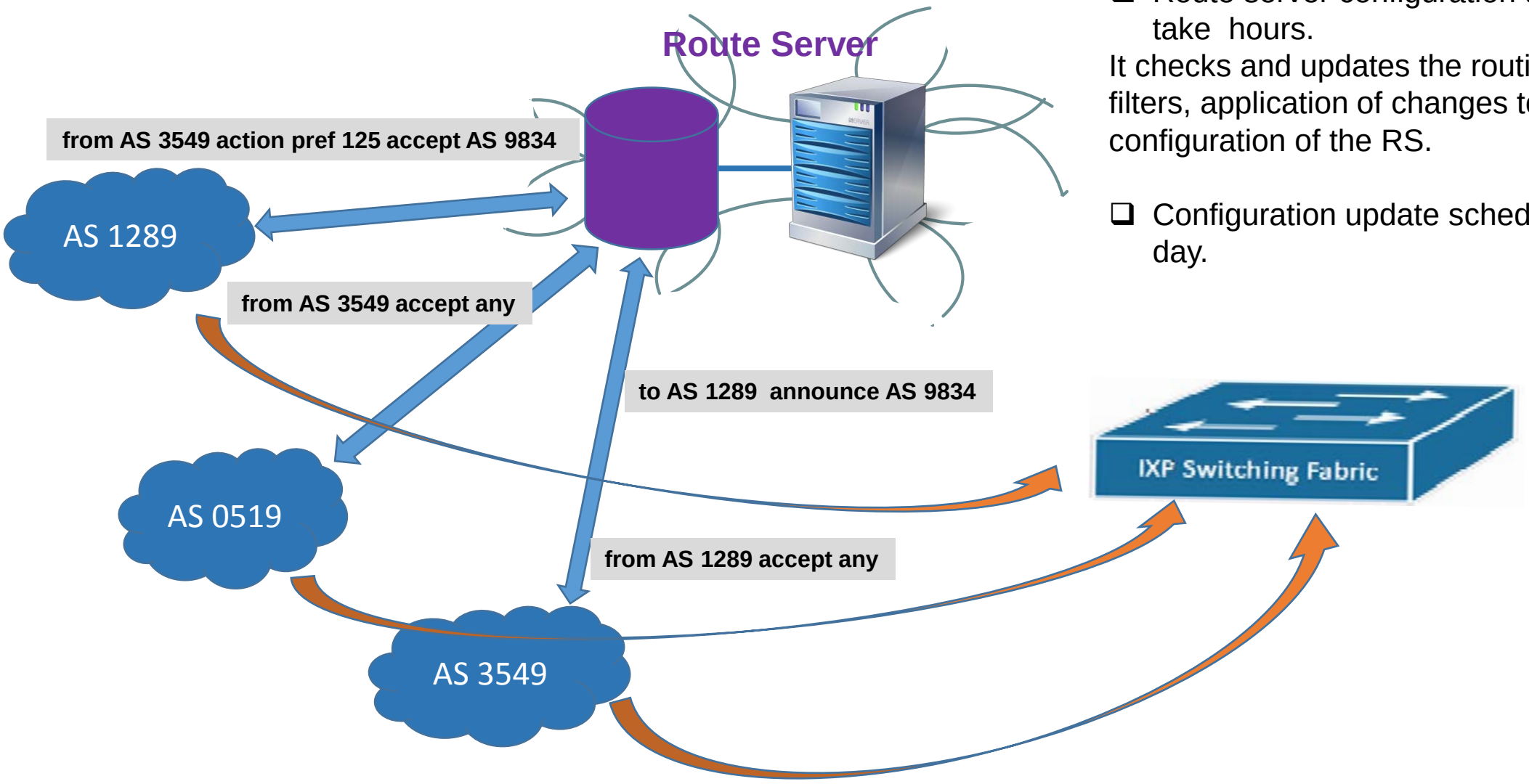
Advantages of BGP:

- get the reachable AS's and routes to them;
- select best routes based on priorities and filters;
- control what routes and to whom we announce.

Disadvantages of BGP:

- routing only on destination IP prefix;
- no control over what AS entrance point will be used for coming_in flow;
- no dynamic balancing of incoming and outgoing traffic;
- no differentiation of AS entrance/exit points depending on a data flow source.

IXP with Route Server (RS)

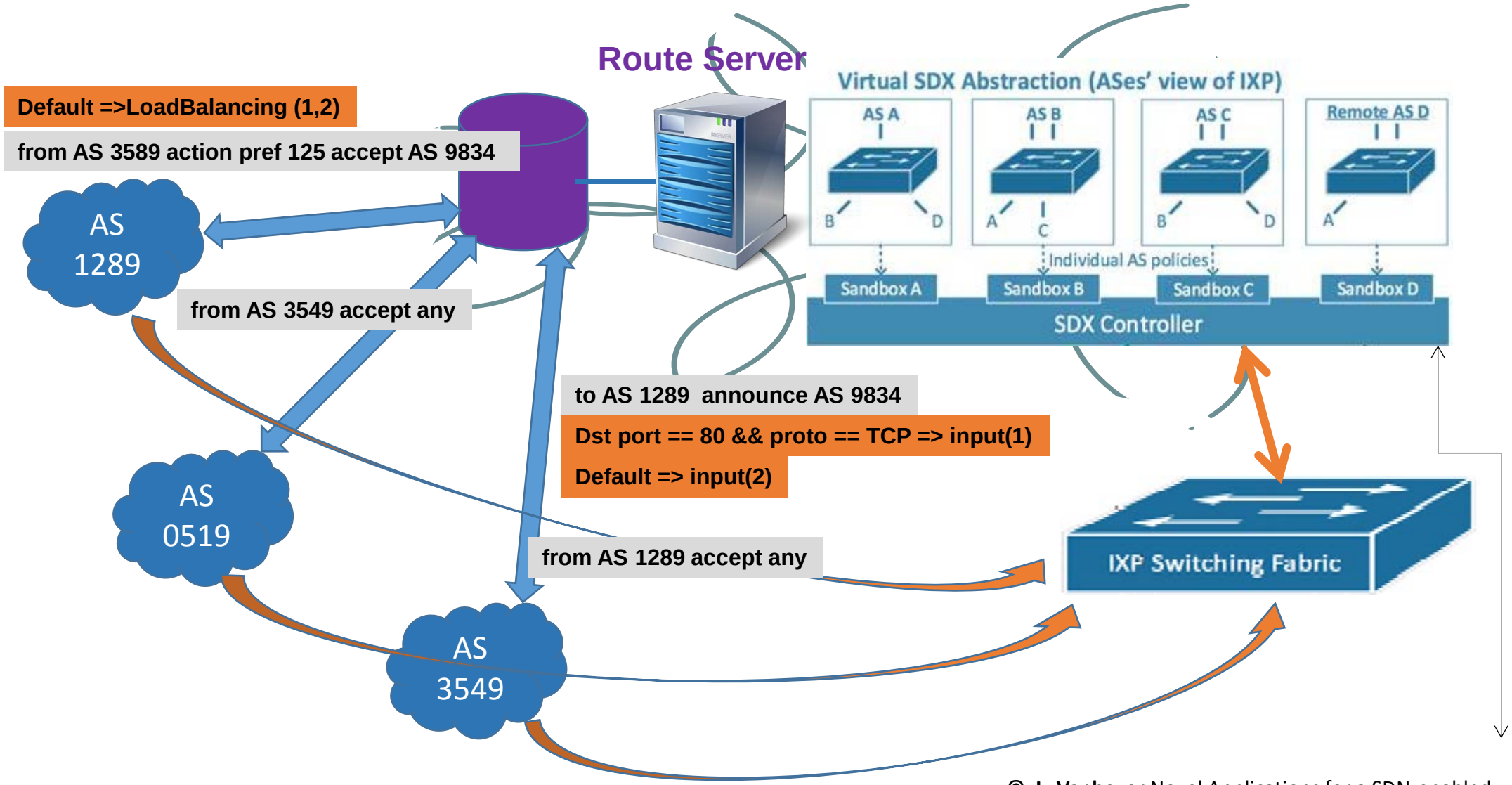


- Route server configuration updates take hours.

It checks and updates the routing policy filters, application of changes to the configuration of the RS.

- Configuration update schedule - once a day.

IXP with SDN&Route Server (SDX)



Conclusion

- SDX approach allows:
  - Get the reachable AS's and routes to them;
  - Select best routes based on priorities and filters;
  - Control what routes and to whom we announce.
  - Every federate AS can control what type of traffic flaw what entrance/exit to/from AS will use
  - Because SDN centralized control plane every federate AS can reconfigure forwarding policy on Route Server at any time automatically.

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Questions?

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