Progetto ACINO
Application-Centric IP/Optical Network Orchestration

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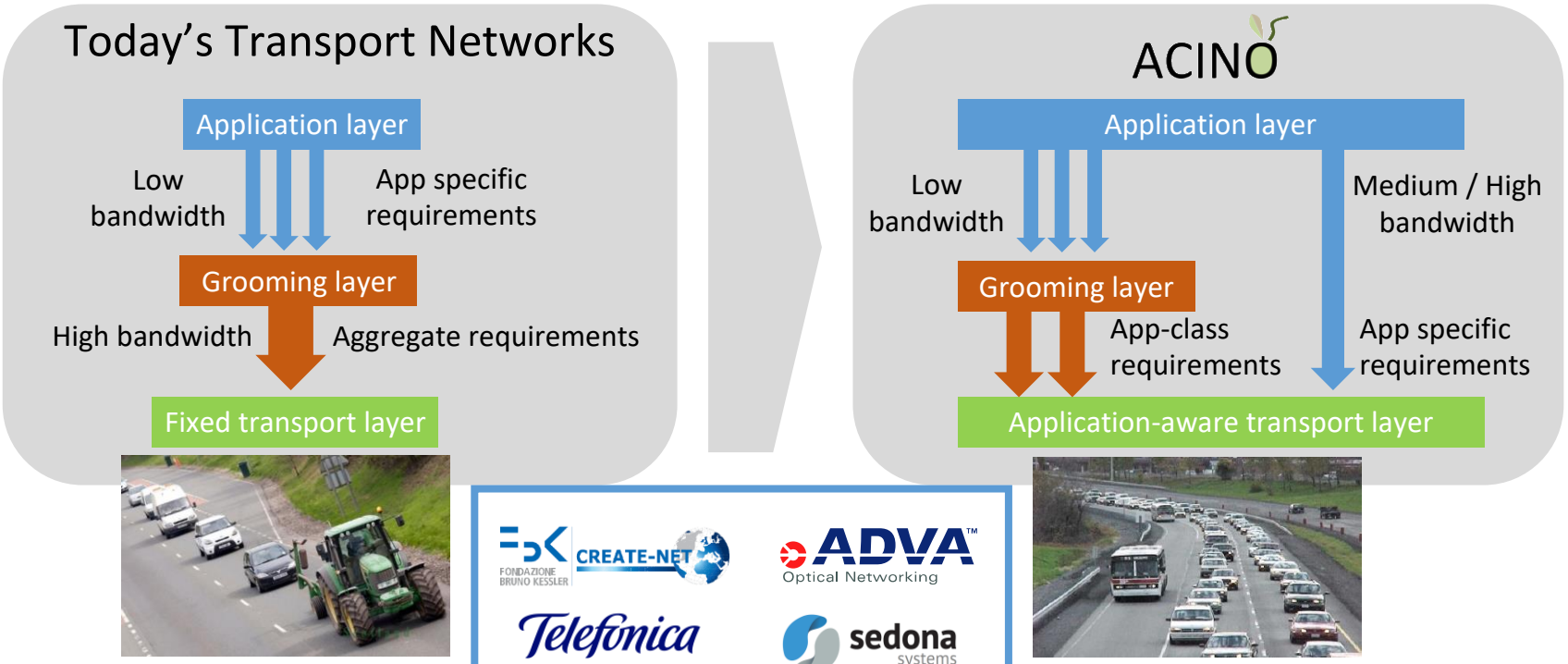
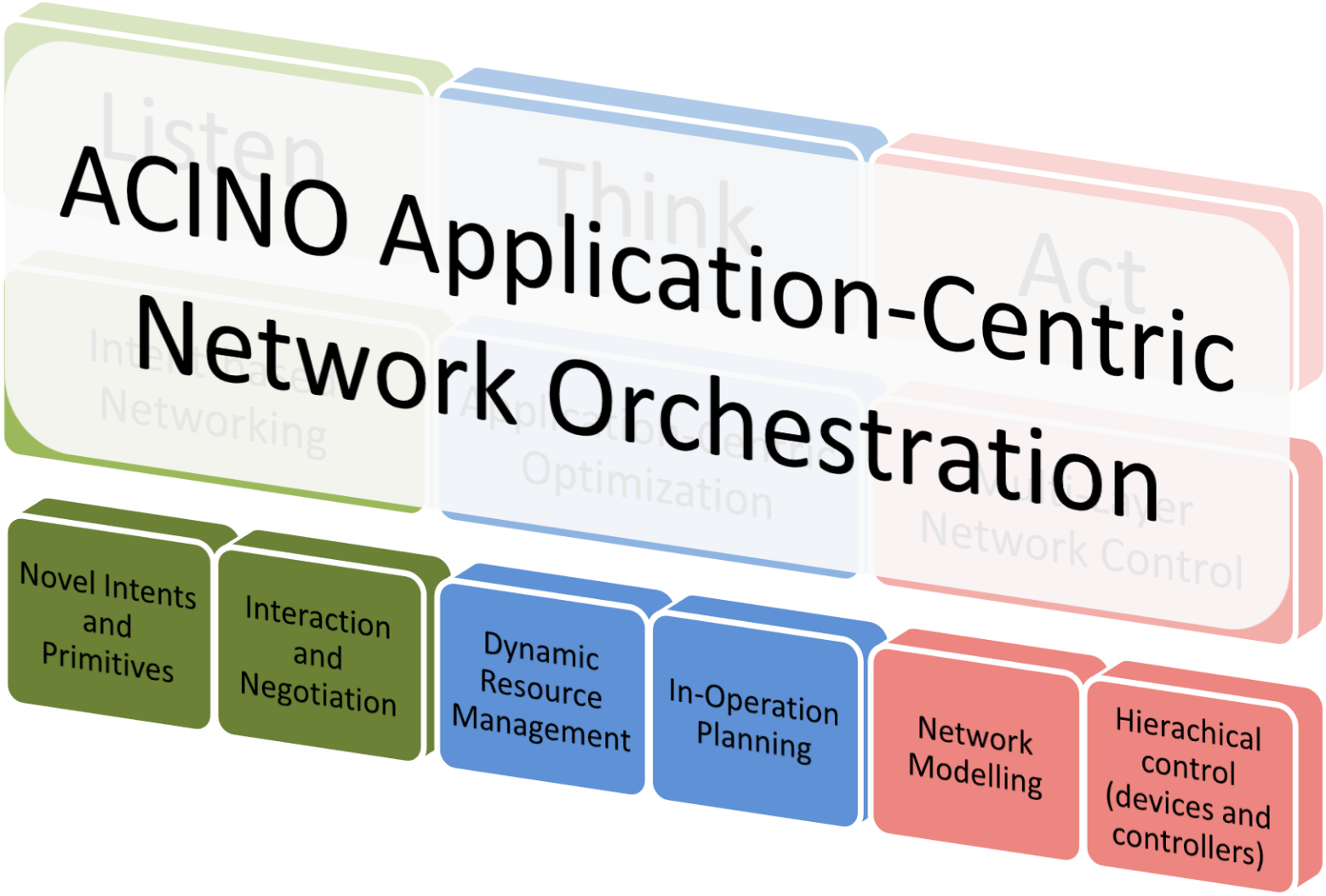
Application-centric concept

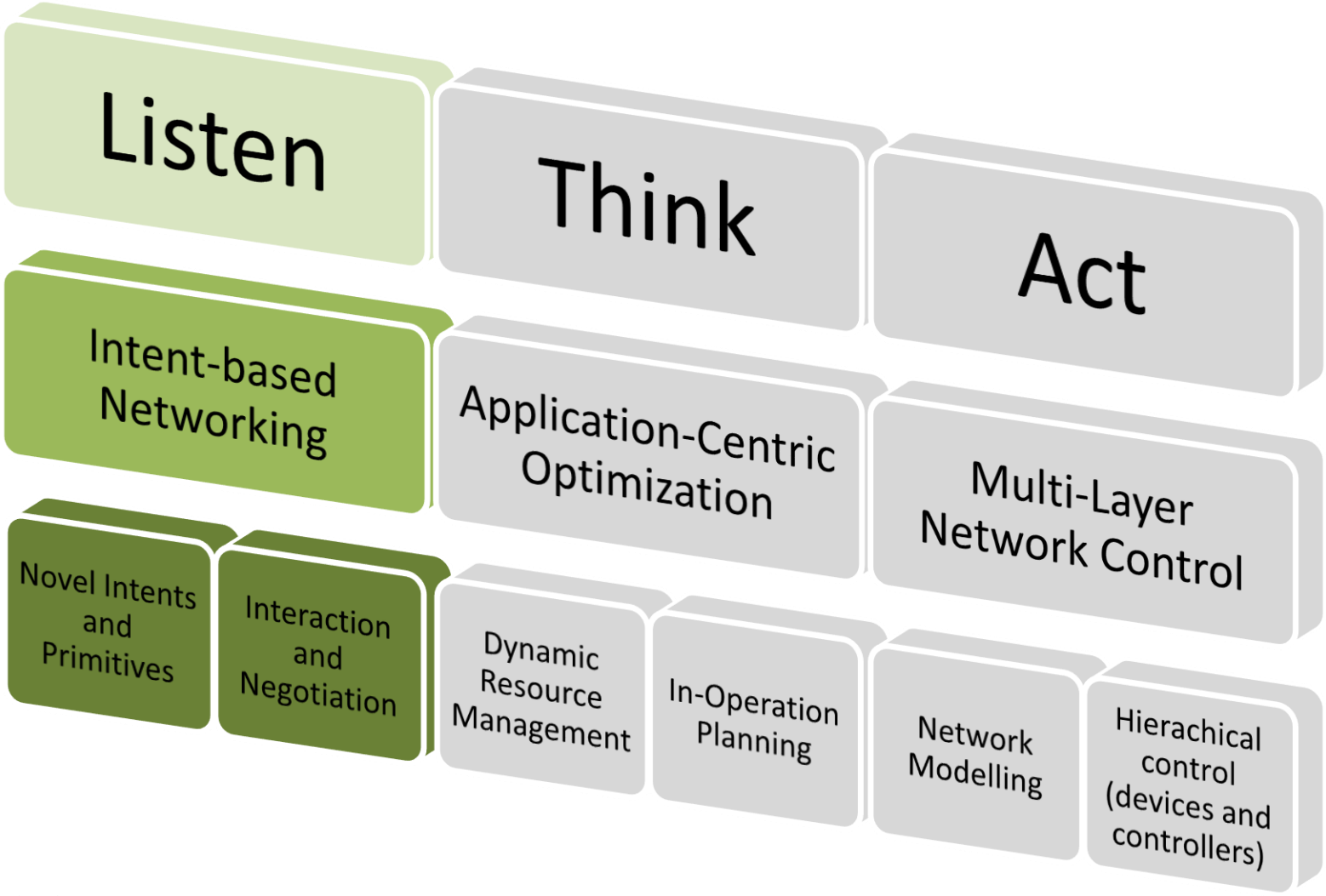
Overcome inaccurate mapping between applications' needs and the service they receive by ***differentiating the service offered to each application at each layer of the transport network, so to adapt the network to the needs of the applications***



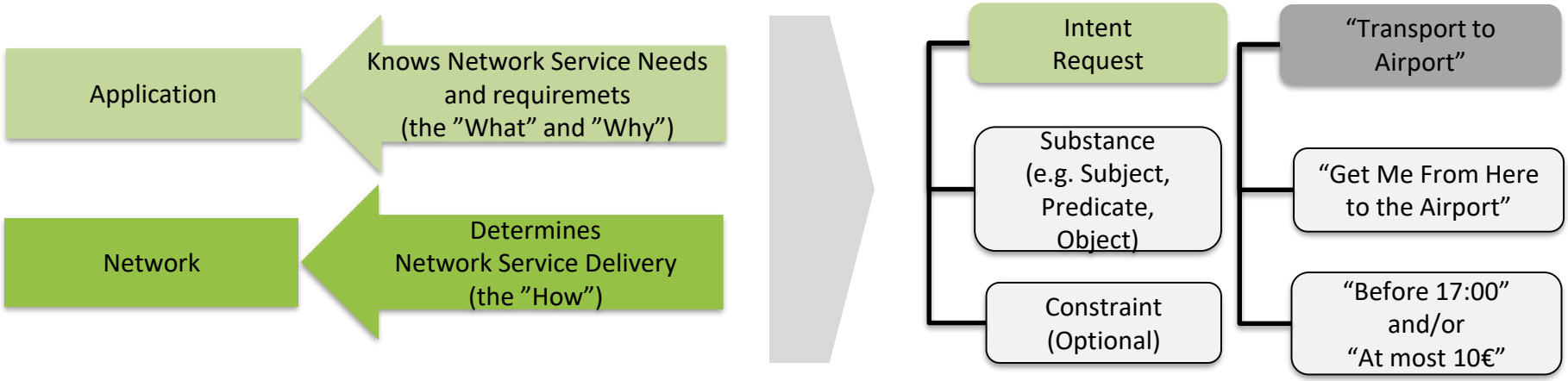
Technical Pillars

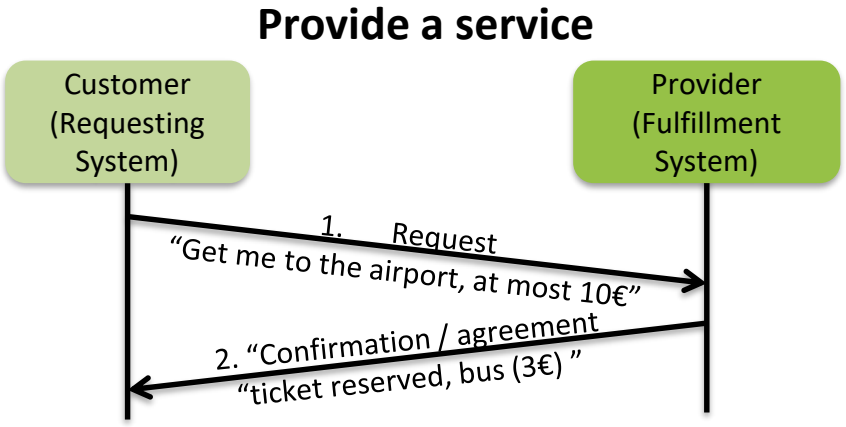


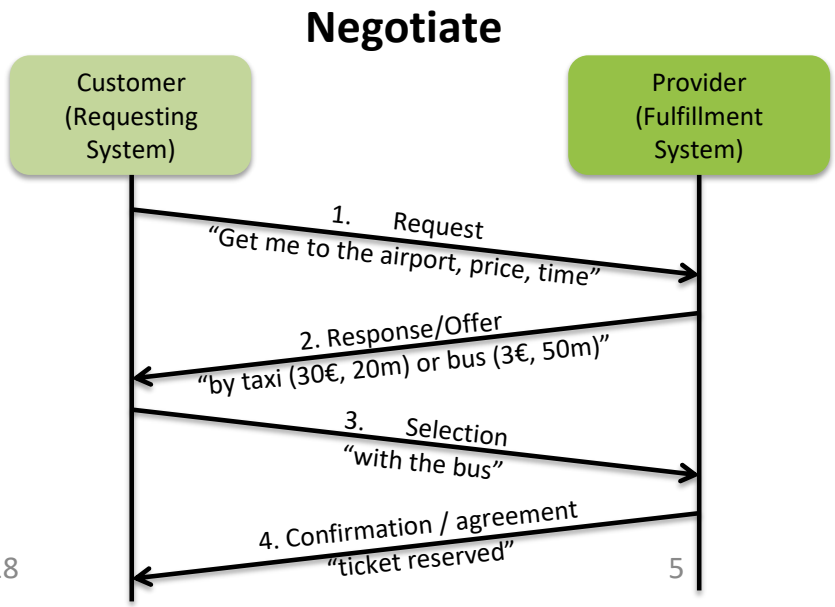
Listen to apps' needs



Intent-based Networking





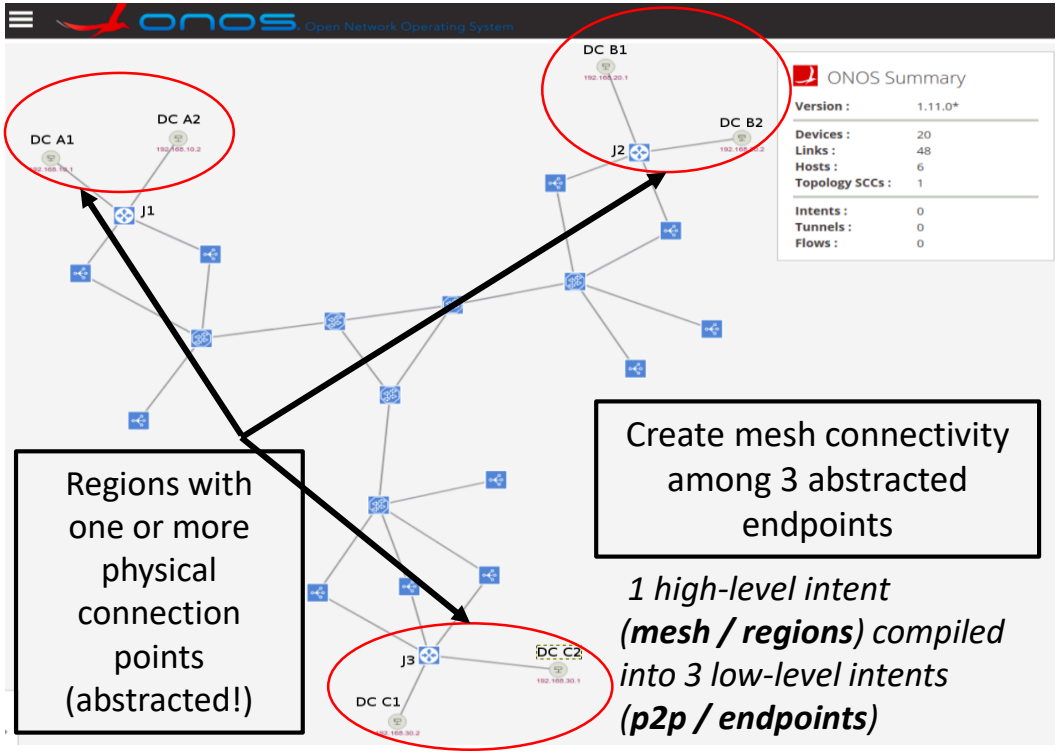


Intent-based interface: DISMI

Dynamic Intent-driven Service Management Interface

- **Grammar** defines how primitives can be combined to express an intent (verb, nouns, modifiers, etc.)

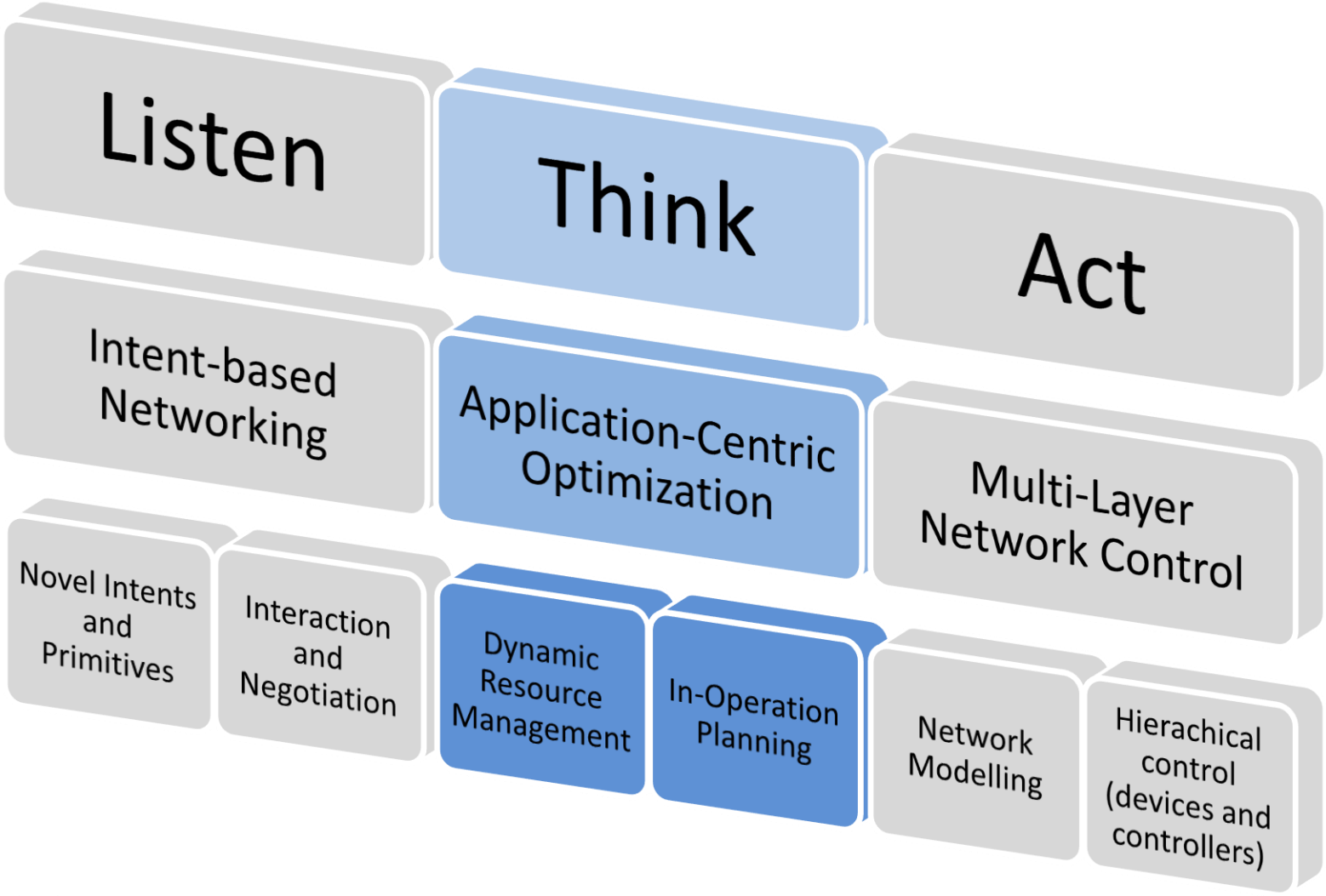
DISMI **validates** and **compiles** complex high-level intents into low-level intents (network layer)



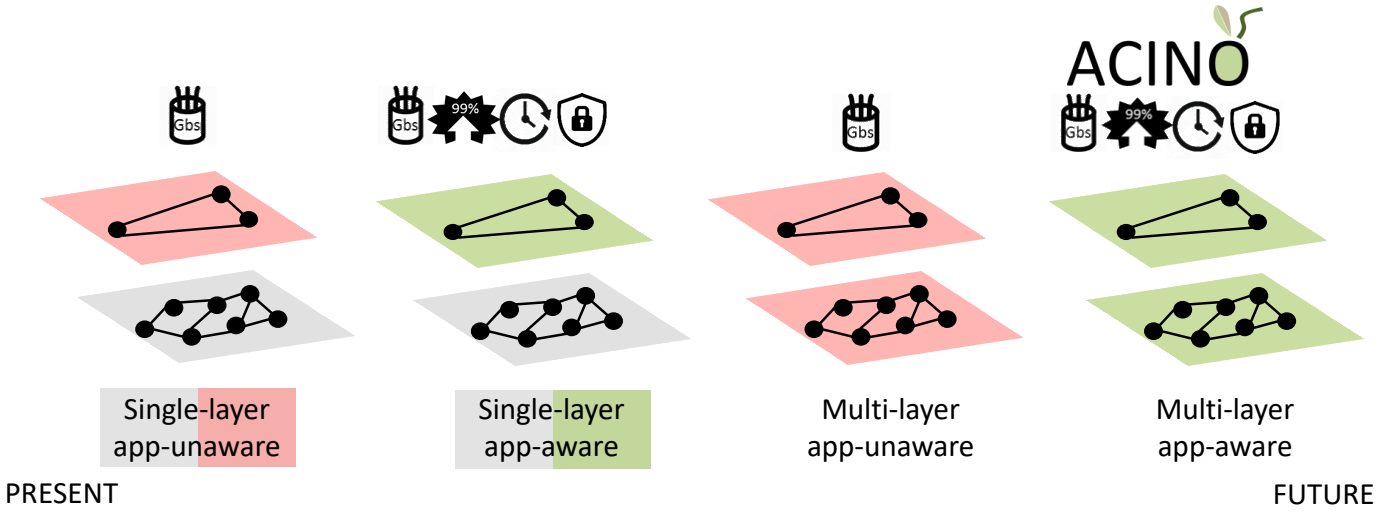
Ease creation of innovative services

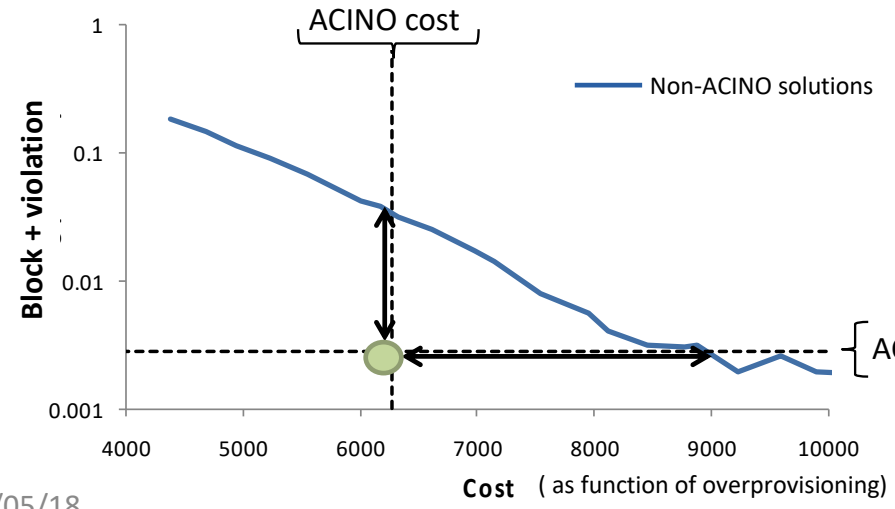
Availability, security, location awareness

Deliver app-centric optimization



App-centric Optimization

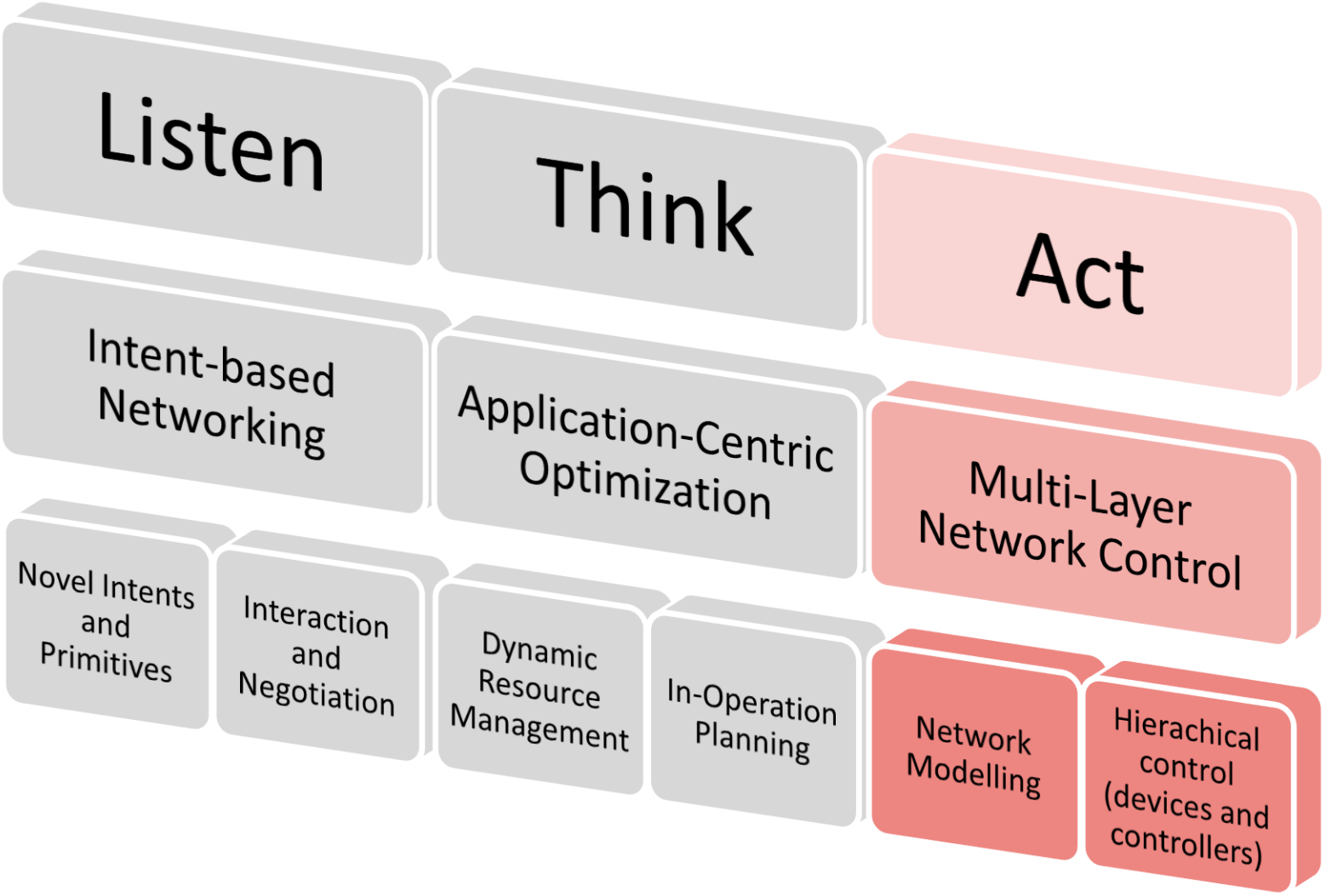




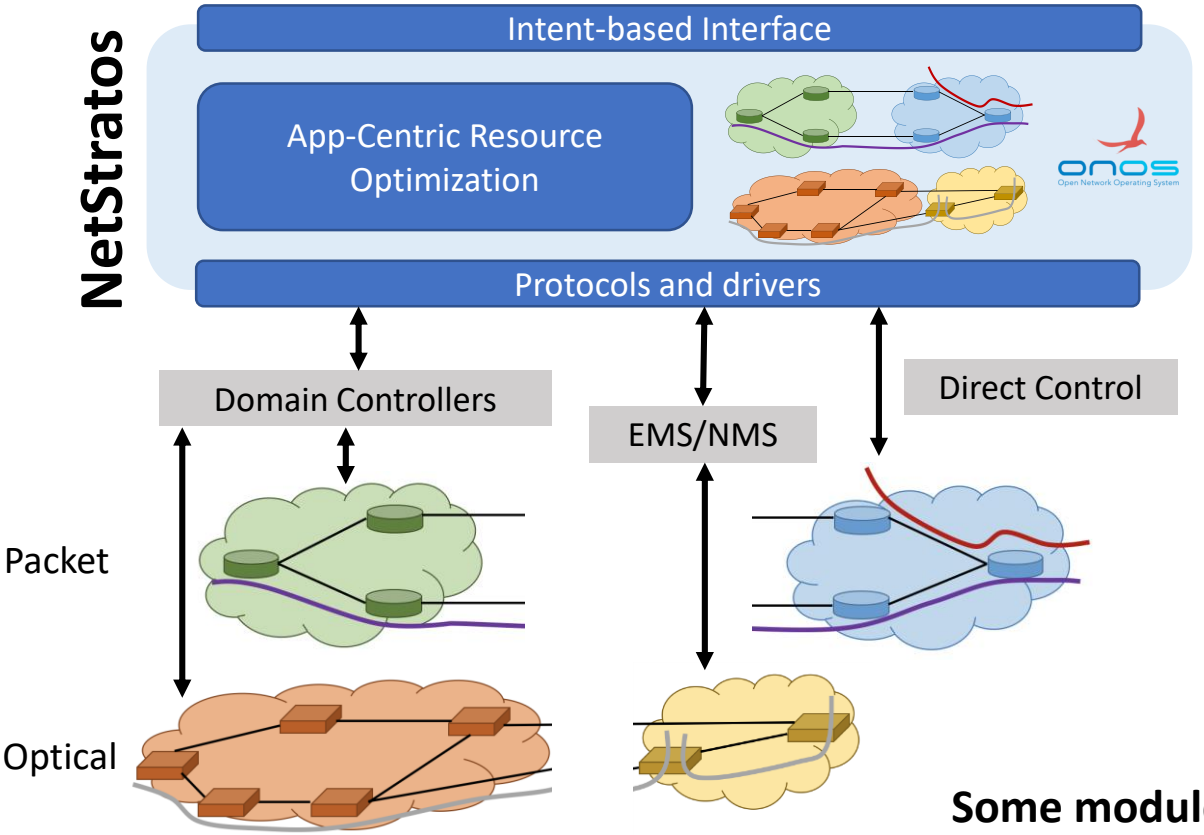
ACINO solution is superior
satisfies needs of applications & does interests of network operators (joint L3/L0 opt)

Same performance, ACINO smaller cost	*Same cost, ACINO better performance*

Provide multi-layer network control



Network Control: NetStratos



- **Visibility**
  - Service to fiber
- **Dynamicity**
  - Real time operations
- **Completeness**
  - Multi-layer
  - Multi-vendor

Some modules available in

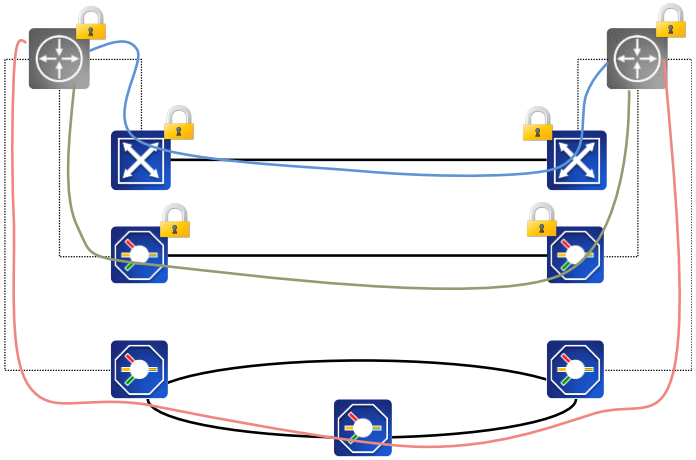
Github: https://github.com/acino-h2020

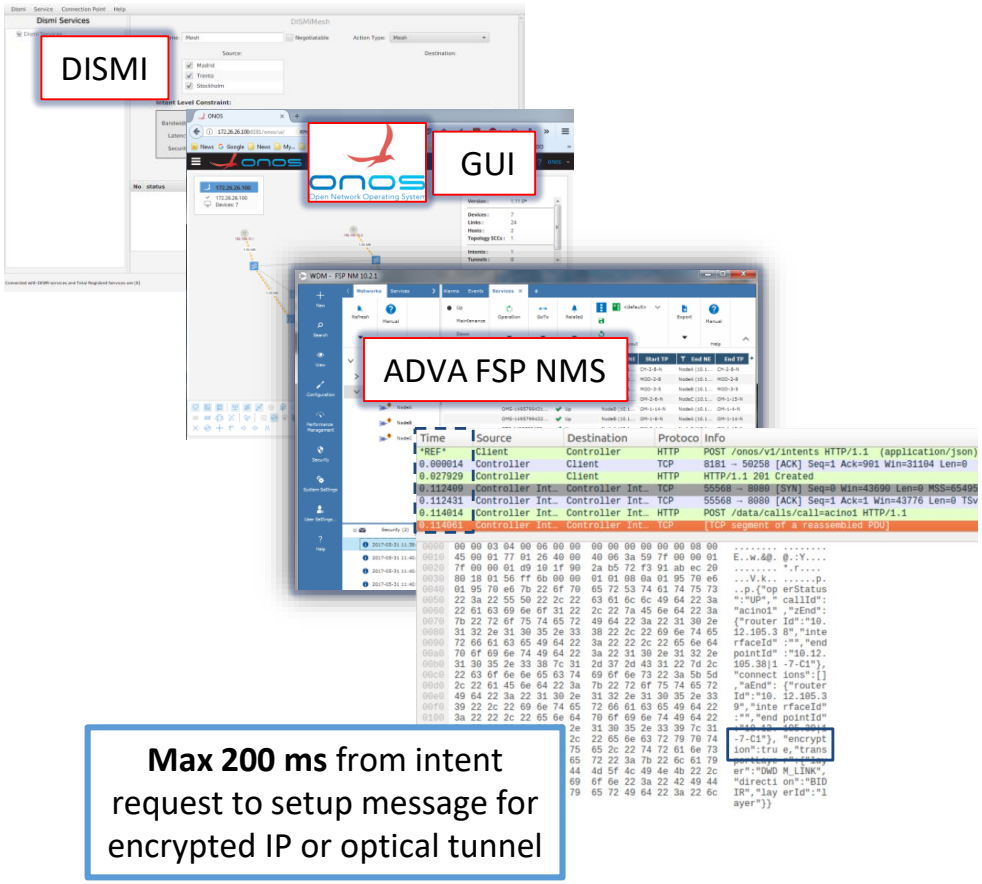
ACINO use-case: In-flight Encryption

- Mission critical infrastructures migrating to the Internet, distributed data centers or even cloud
  - Sensitive applications like government, banking and financial services
- Encryption at the endpoints not always available
- Solution: encrypt traffic during transmission according to applications' needs
  - Physical Layer (hardware-based)
  - Higher Layer (MACsec, IPsec …)
- <u>Move configurational complexity away from the client</u>

Metric	IPSec	MACSec	Physical
Latency	High	Medium	Low
Throughput	Low	Medium	No Overhead
Payload Size	Restricted (IP Packet)	Restricted (MAC Frame)	Up to 100G
Flexibility	High (L3 Network)	L2 Network only	OTN or SONET/SDH only
HW Availability	High	Carrier Ethernet Capable	Vendor Specific

In-flight Encryption: Experiment





Provisioning of encrypted services over the south-bound interfaces
IPSec over GRE tunnels using OpenVSwitch
MACSec on Ethernet with T-API (encryption flag)
Optical Encryption with T-API (encryption flag)

ECOC2016 OFC 2017 GÉANT TNC17

T. Szyrkowiec et al. “Automatic Intent-Based Secure Service Creation Through a Multilayer SDN Network Orchestration”, JOCN, April 2018.

Max 200 ms from intent request to setup message for encrypted IP or optical tunnel

Summary

- Applications are driving force for network evolution
- ACINO proposes a complete multi-layer orchestration framework to cater to applications' requirements
- Key contributions
  - **Learn**: advanced intent-based interface
  - **Think**: app-centric algos for dynamic allocation of resources
  - **Act**: multi-layer hierarchical network control
- Demonstrated concept with operator-driven use-cases
- Open-source development

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Thank you for your kind attention!

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