

Progetto ACINO

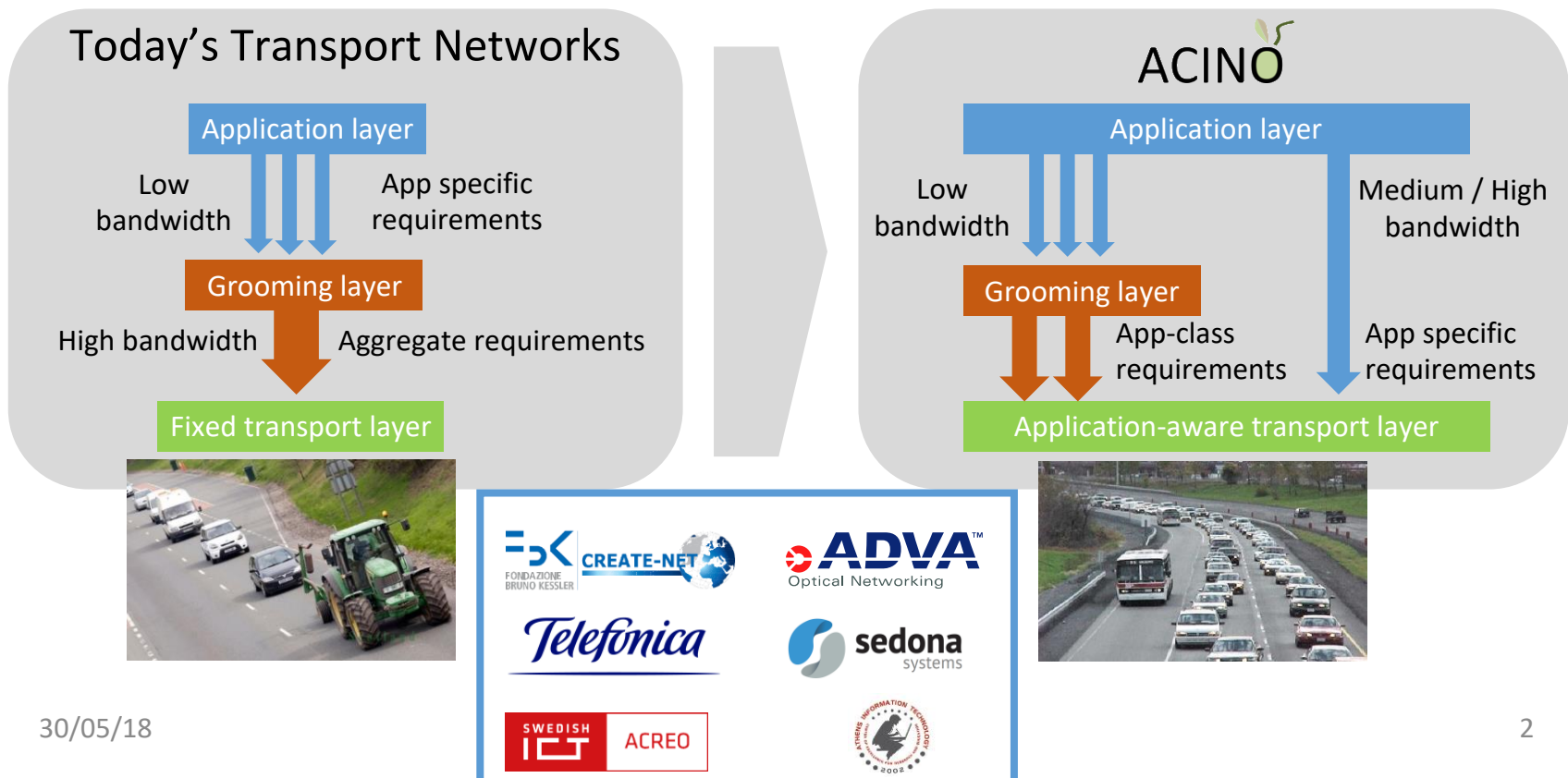
Application-Centric IP/Optical Network Orchestration

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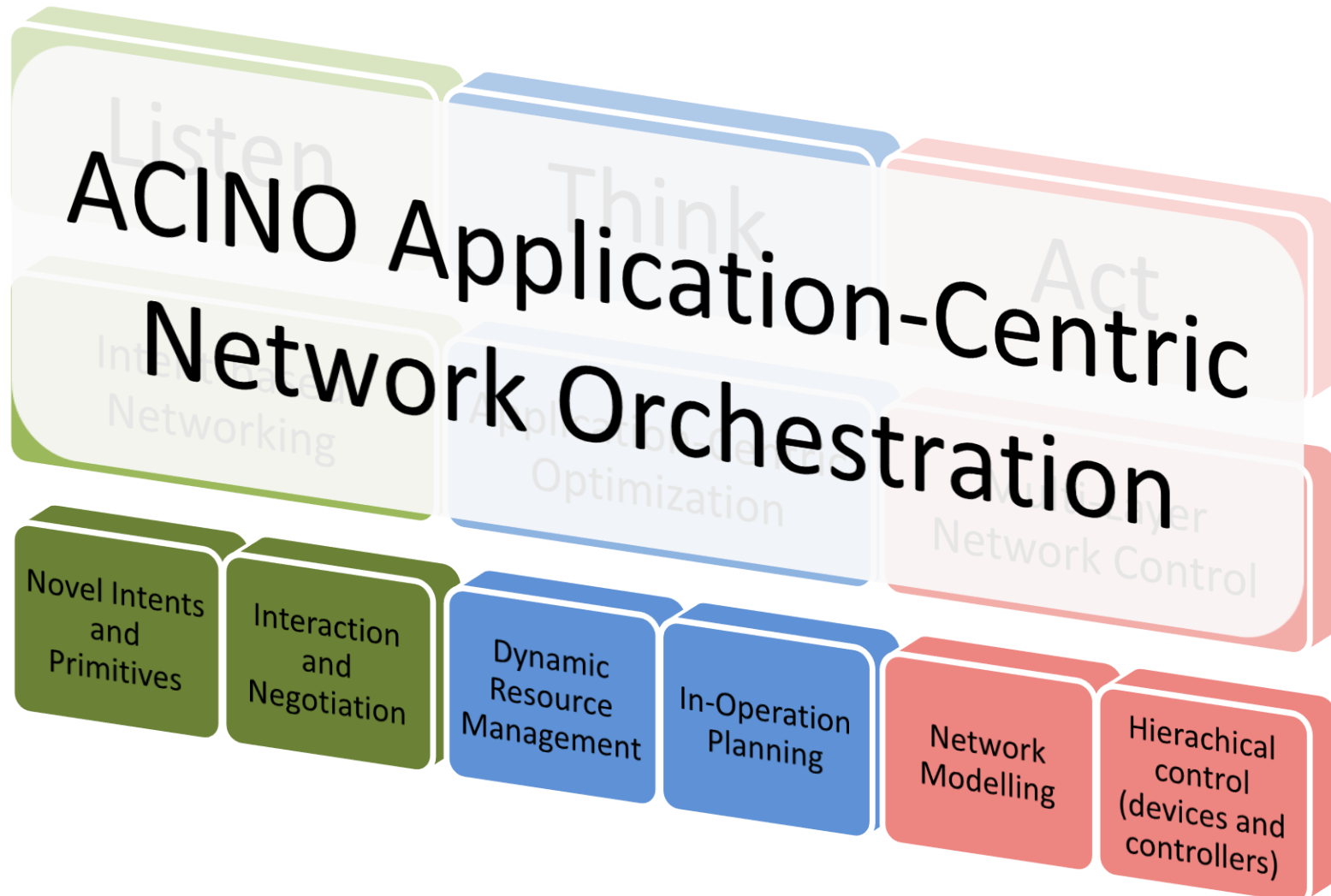
Workshop GARR 2018
Rome, May 30th 2018

Application-centric concept

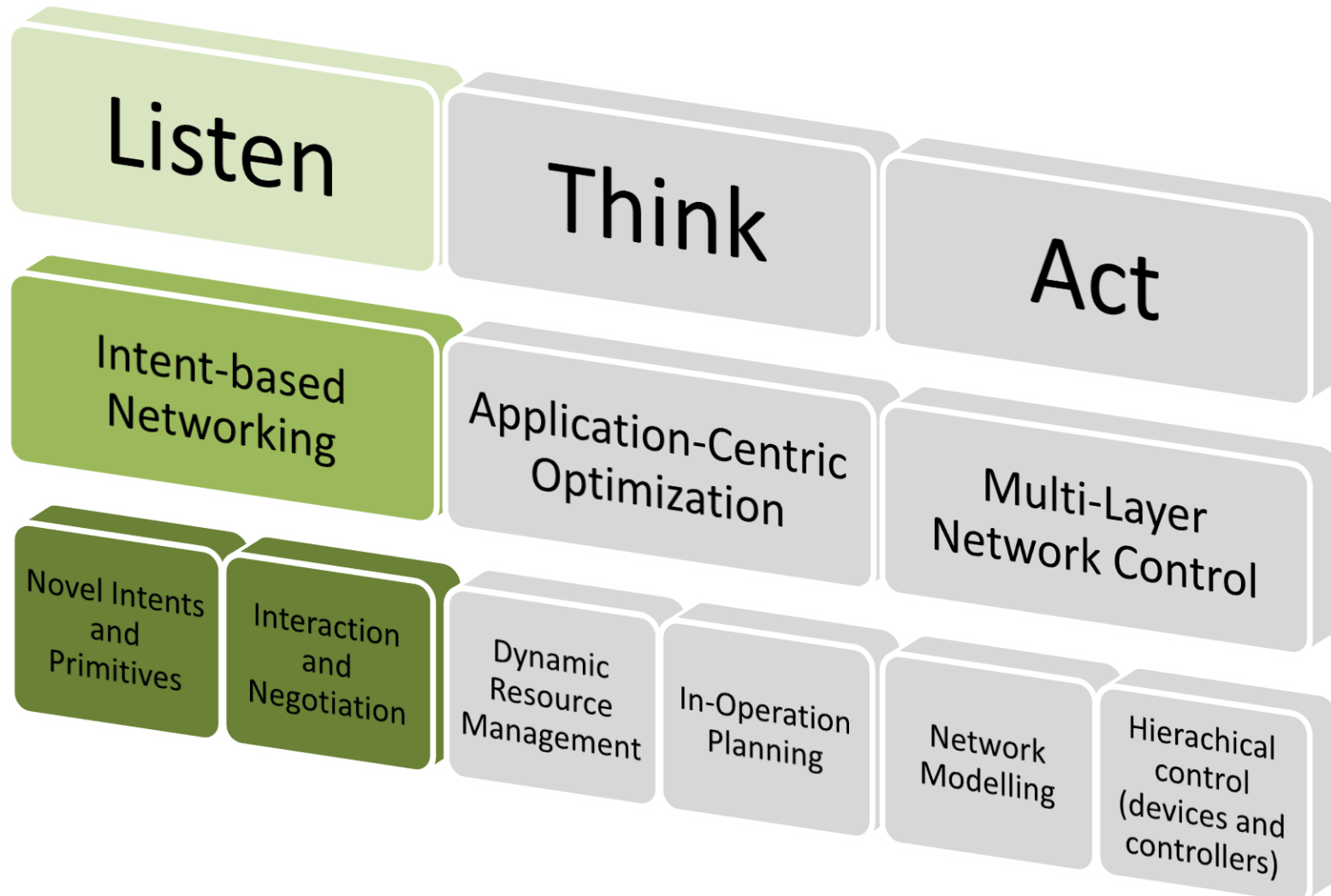
Overcome inaccurate mapping between applications' needs and the service they receive by ***differentiating the service offered to each application at each layer of the transport network, so to adapt the network to the needs of the applications***



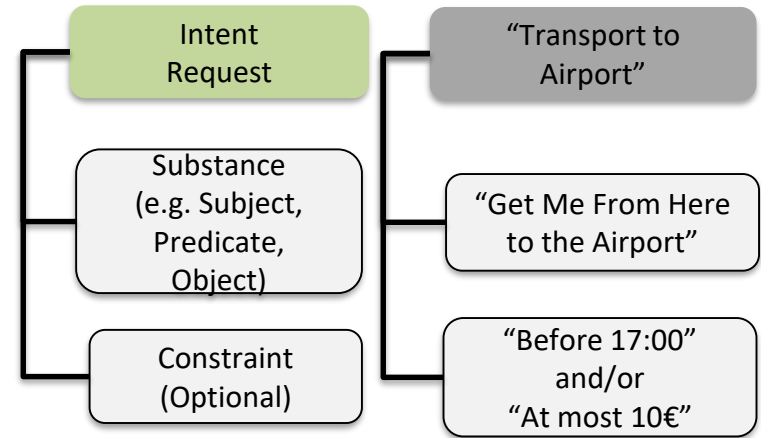
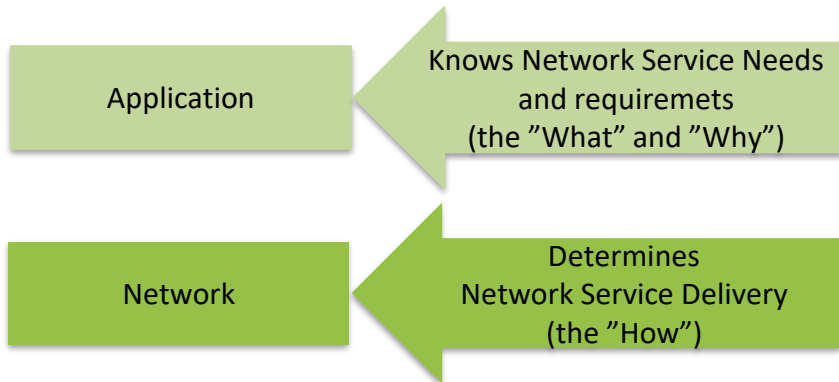
Technical Pillars



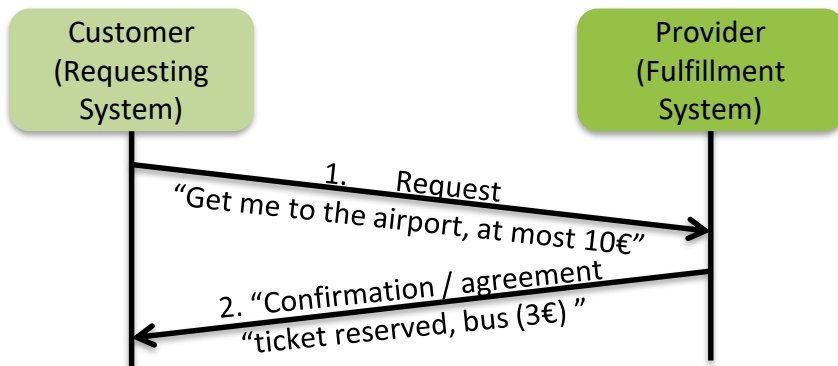
Listen to apps' needs



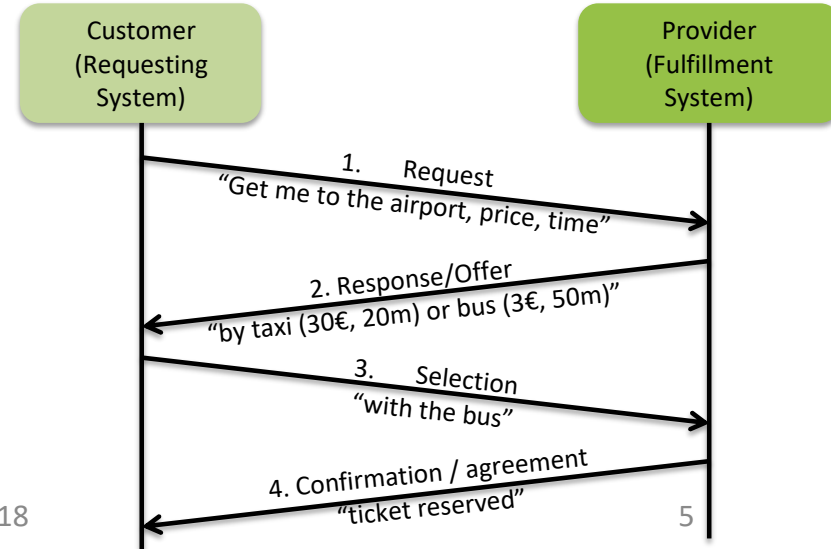
Intent-based Networking



Provide a service



Negotiate

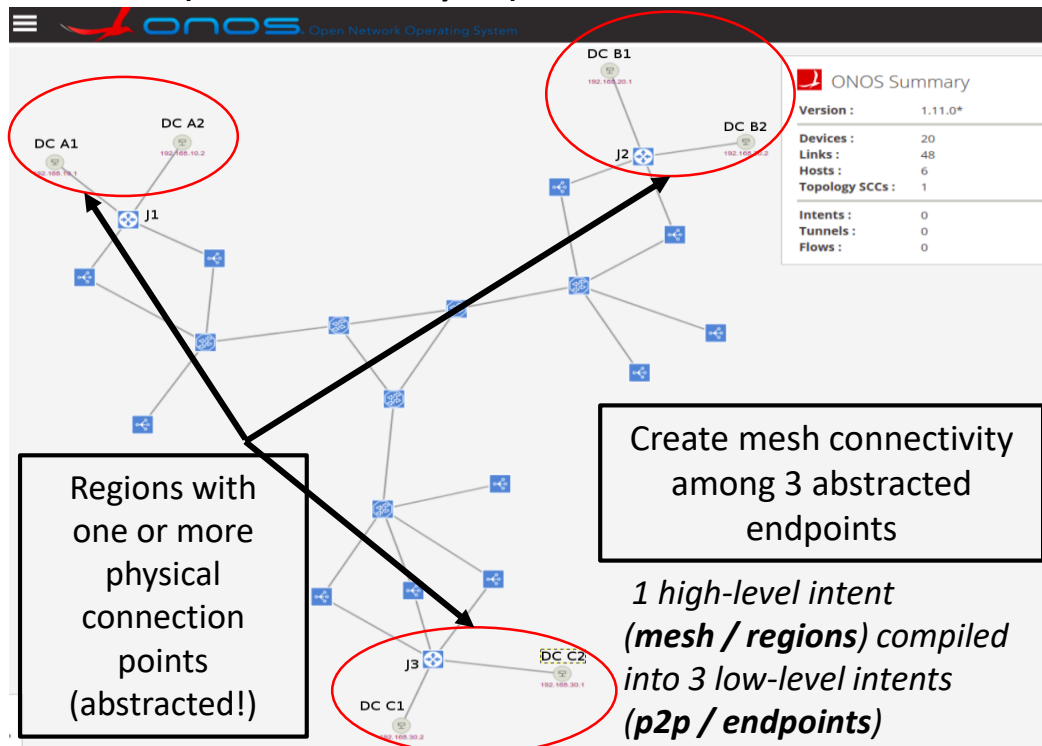


Intent-based interface: DISMI

Dynamic Intent-driven Service Management Interface

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

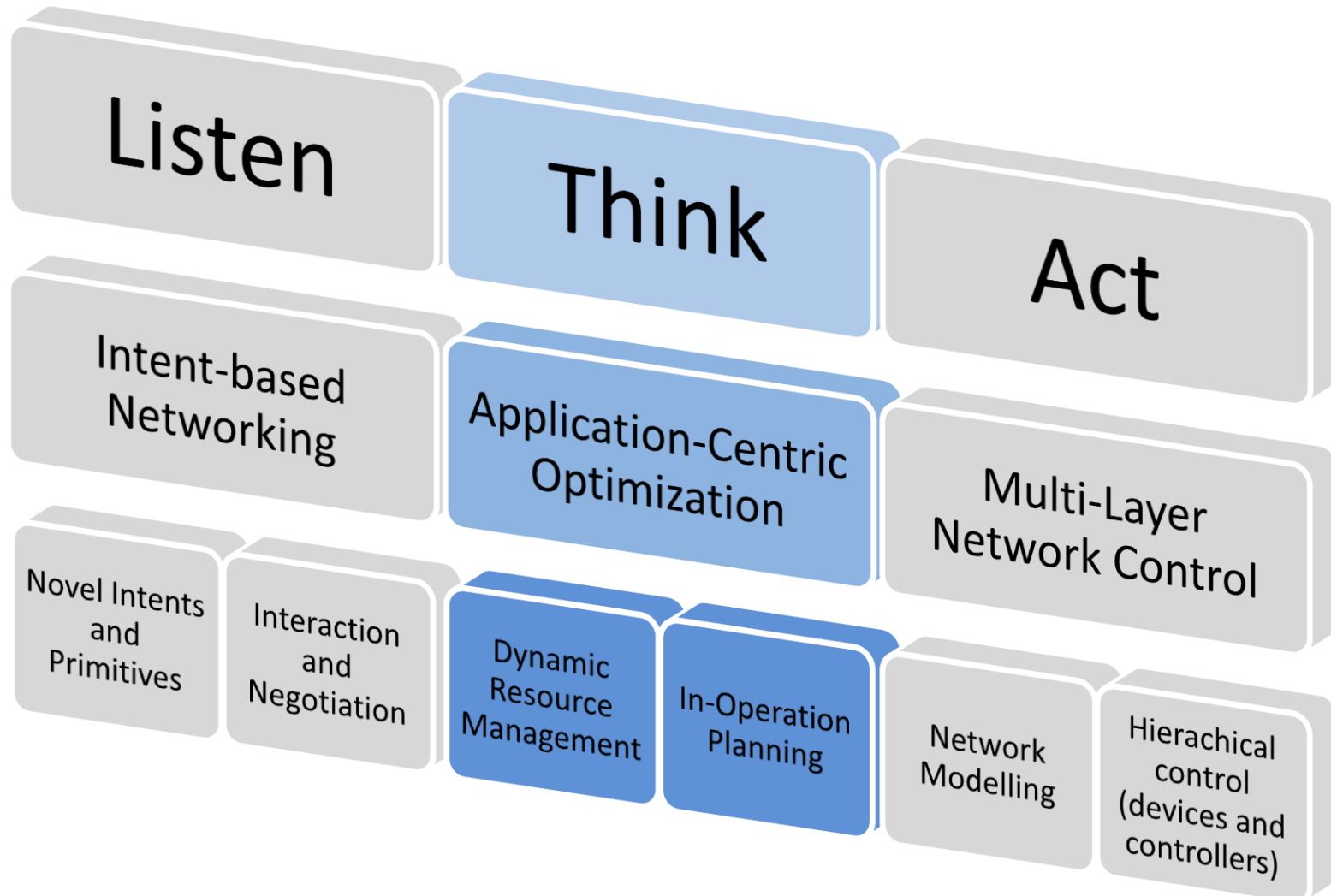
DISMI **validates** and **compiles** complex high-level intents into low-level intents (network layer)



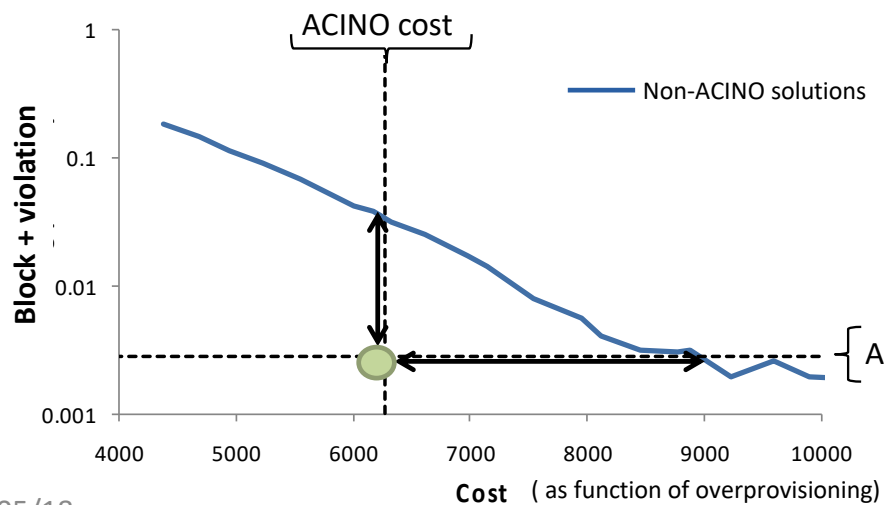
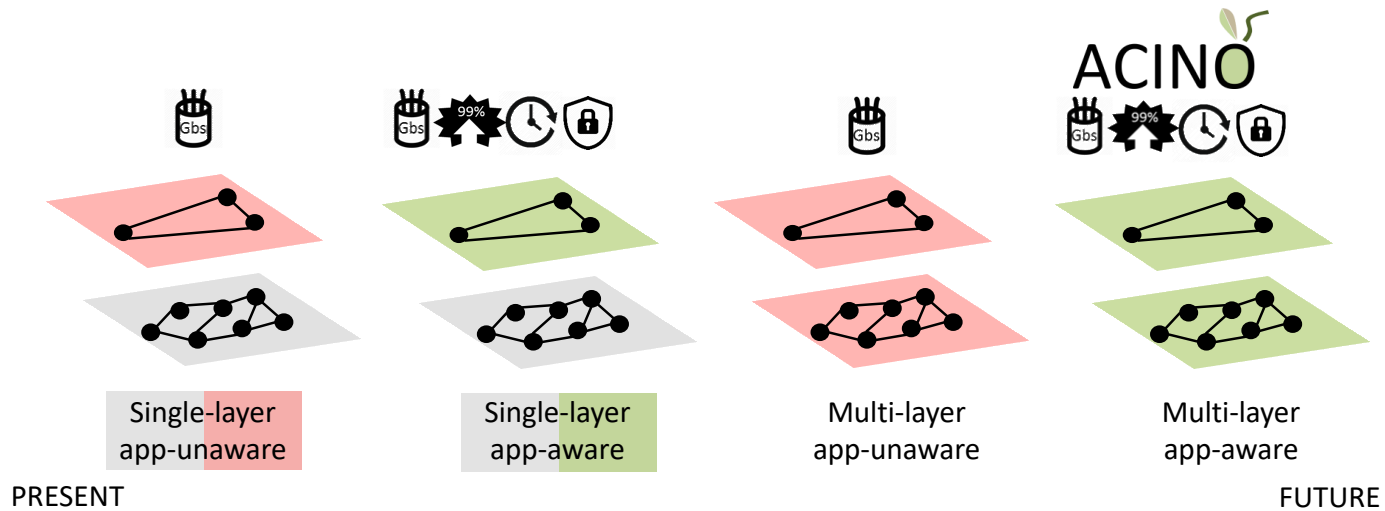
Ease creation of innovative services

Availability, security, location awareness

Deliver app-centric optimization



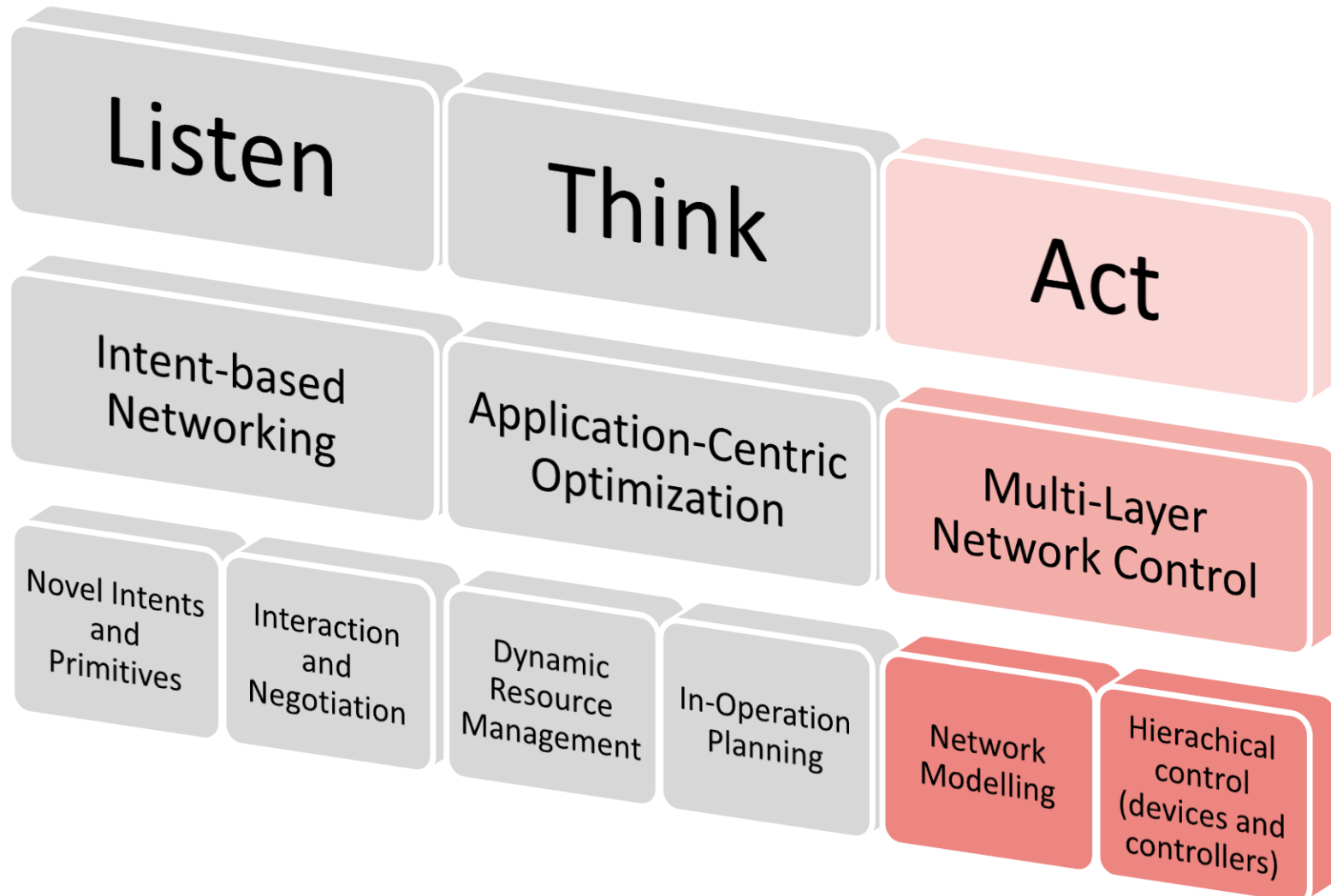
App-centric Optimization



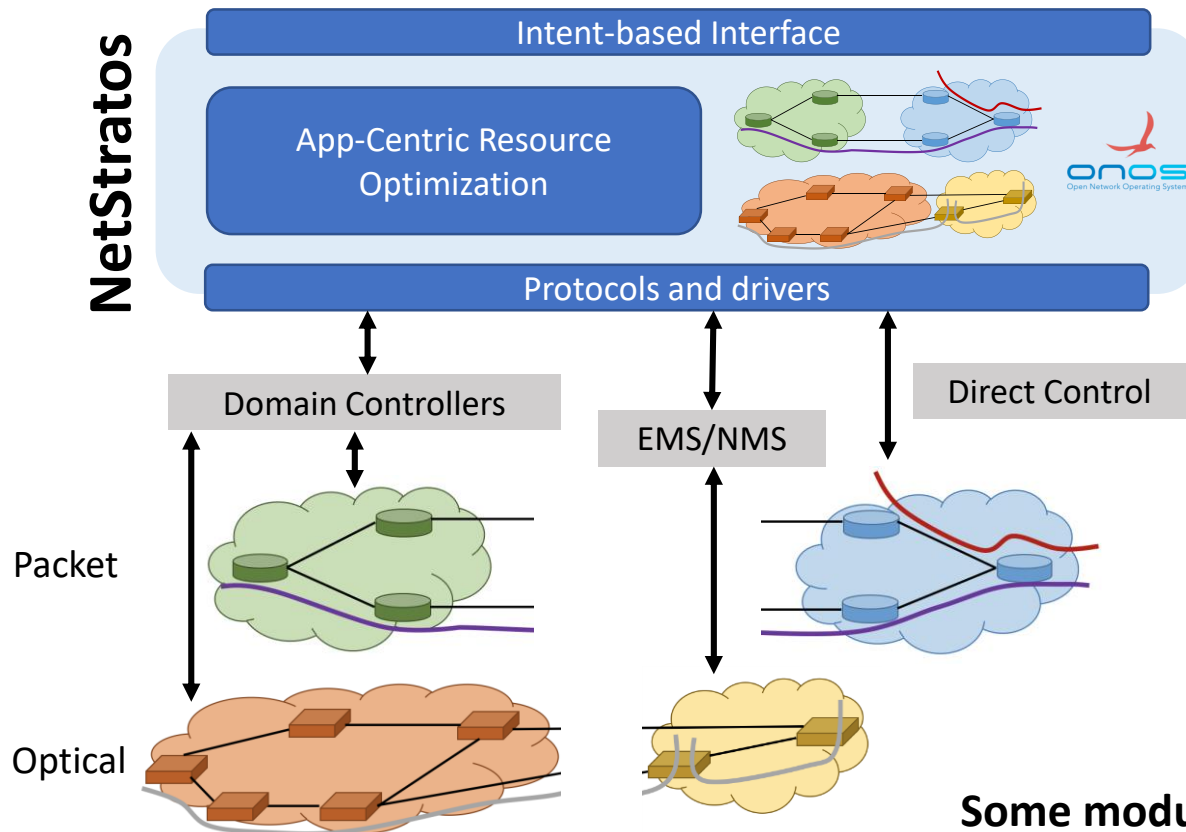
ACINO solution is superior
 satisfies needs of applications &
 does interests of network
 operators (joint L3/L0 opt)

<i>Same performance, ACINO smaller cost</i>	<i>Same cost, ACINO better performance</i>
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Provide multi-layer network control



Network Control: NetStratos



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

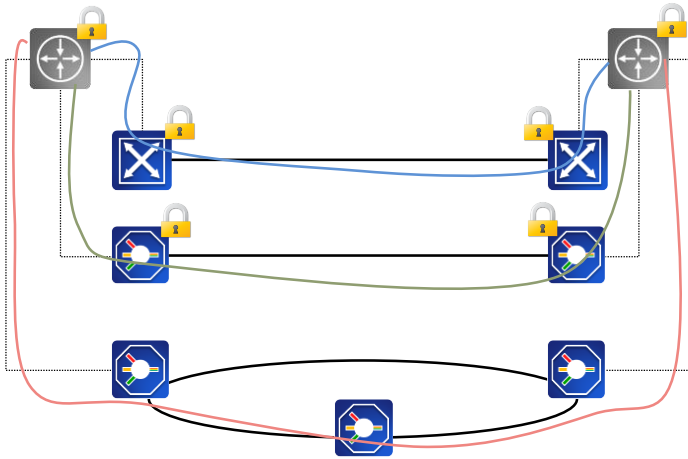
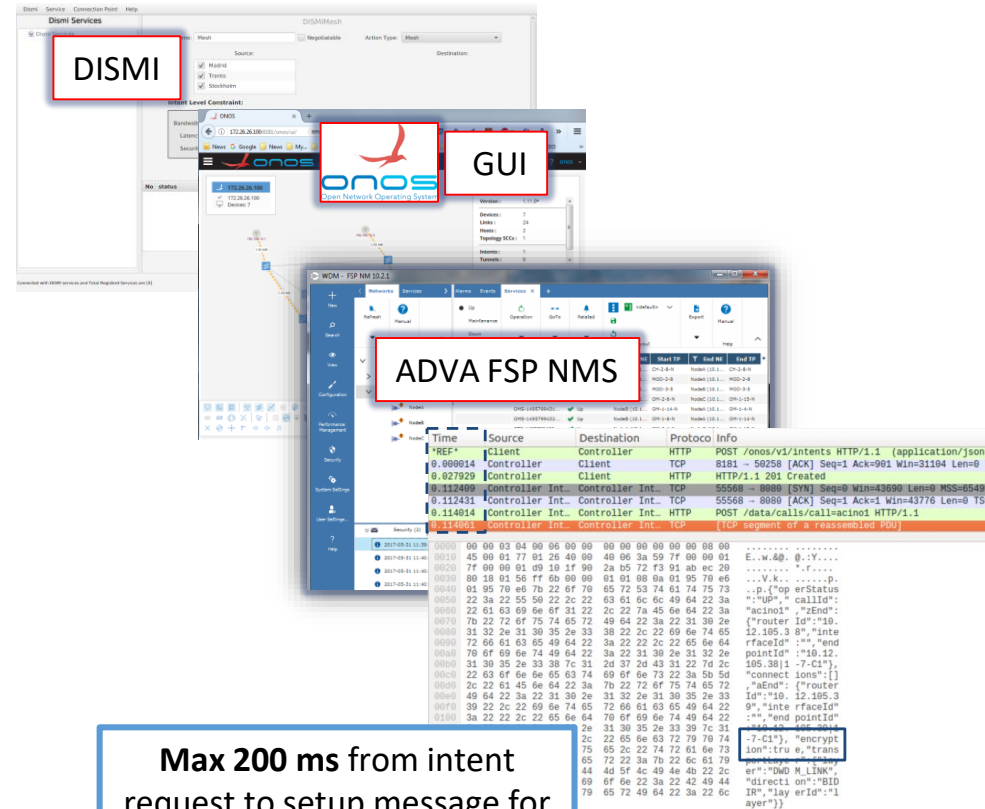
Some modules available in  
 Github: <https://github.com/acino-h2020>

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 ...)
- Move configurational complexity away from the client

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

DISMI

GUI

ADVA FSP NMS

Time	Source	Destination	Protocol	Info
0.009914	Client	Controller	HTTP	POST /onos/v1/intents HTTP/1.1 (application/json)
0.027929	Controller	Client	HTTP	HTTP/1.1 201 Created
0.114969	Controller Int.	Controller Int.	TCP	55568 -> 8080 [RST] Seq=0 Win=42690 Len=0 MSS=65490
0.114814	Controller Int.	Controller Int.	TCP	55568 -> 8080 [ACK] Seq=1 Ack=1 Win=43776 Len=0 TSV
0.114964	Controller Int.	Controller Int.	HTTP	POST /data/calls/call=acinoi HTTP/1.1
0.114964	Controller Int.	Controller Int.	TCP	[TCP segment of a reassmbed PDU]

```

0000 00 00 03 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0010 45 90 81 77 01 28 40 00 40 06 3a 59 7f 00 00 01 00 00 00 00 00 00
0020 7f 00 00 01 09 18 00 2a 85 72 f3 01 80 8c 20 00 00 00 00 00 00 00
0030 80 18 01 56 f7 00 00 00 01 01 08 0a 01 95 70 e6 00 00 00 00 00 00 00
0040 01 95 70 e6 7b 22 6f 70 85 72 53 74 01 61 74 75 73 00 00 00 00 00
0050 23 3a 22 65 69 22 c2 63 01 6c 6c 40 64 22 3a 00 00 00 00 00 00 00
0060 22 61 63 69 6e 6f 31 22 c2 22 7a 45 6e 64 22 3a 00 00 00 00 00 00
0070 7b 22 72 6f 75 74 65 72 49 64 22 3a 22 31 30 2e 31 32 2e 00 00 00
0080 31 32 2e 31 30 35 2e 33 38 22 c2 22 69 6e 74 65 00 00 00 00 00 00
0090 72 66 61 63 65 49 64 22 3a 22 22 c2 22 65 6e 64 00 00 00 00 00 00
00a0 78 6f 69 6e 74 49 64 22 3a 7b 22 72 6f 75 74 65 72 00 00 00 00
00b0 31 30 35 2e 33 38 7c 31 2d 37 2d 43 31 22 7d 2c 00 00 00 00 00 00
00c0 22 63 6f 6e 6e 65 63 74 69 6f 6e 73 22 3a 5b 5d 00 00 00 00 00 00
00d0 2c 22 61 45 6e 64 22 3a 7b 22 72 6f 75 74 65 72 00 00 00 00 00 00
00e0 40 64 22 3a 22 31 30 2e 31 32 2e 31 30 35 2e 33 00 00 00 00 00 00
00f0 39 22 2c 22 69 6e 74 65 72 66 61 63 65 49 64 22 00 00 00 00 00 00
0100 3a 22 22 c2 22 65 6e 64 7b 6f 69 6e 74 49 64 22 0e 00 00 00 00 00
    
```

- 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)



T. Szyrkowicz 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

Thank you for your kind attention!

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