

A modular, layered neutrality for 5G?

... and what about best effort (IAS)?

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www.cnit.it



- National Inter-University Consortium for Telecommunications (**37 Italian Universities**)
- Mission: basic and applied research and advanced education in ICT
- 1300+ researchers; 100+ own employees
- Funding from private companies and competitive programs only:
 - H2020: 41 projects, **10 of them coordinated by CNIT**
 - 2018 budget: 124 projects (39 EU+37 Ntl+48 Industry, **including Huawei**)
 - 2018 results: **5 new EU projects on applications of ICT**; 3 new EU projects on 5G, **ranked #1 in their calls**, 1 on cybersecurity (EU competence network), 1 on autonomous vehicles
 - Flagship Graphene, Flagship Quantum Information

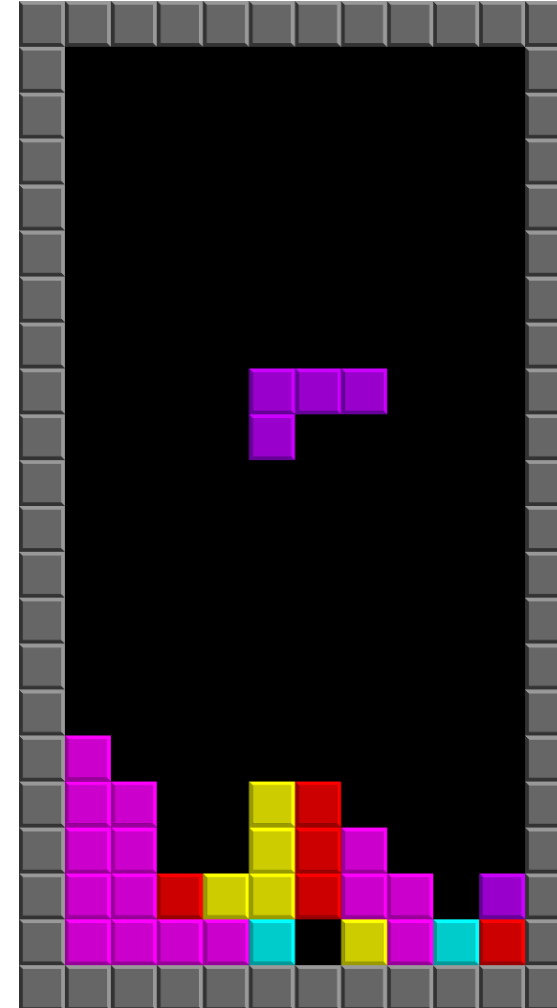


- Slicing->**Partiality**, not neutrality
 - nothing (conceptually) new: IPv4 TOS field, DiffServ,
- Net neutrality within slices->in principle straightforward (fairness)
- Resource allocation within single devices->established IT methodologies
- Issues:
 - Protection (and **definition!**) of best effort (QoE), or IAS
 - Distributed, network-wide allocation and configuration; inter-slice allocation
 - Overall control (inter-domain, inter-nation)

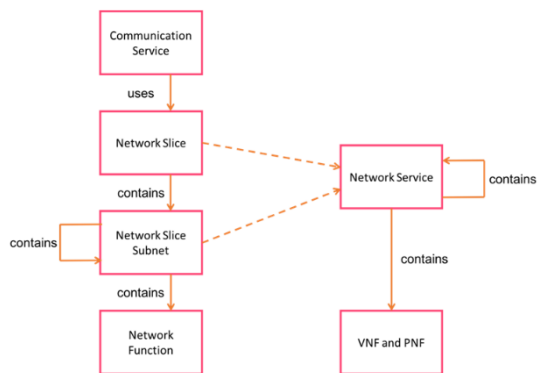
Processing
Storage
Bandwidth
Switching

We reject kings, presidents, and voting.
We believe in rough consensus and running code.

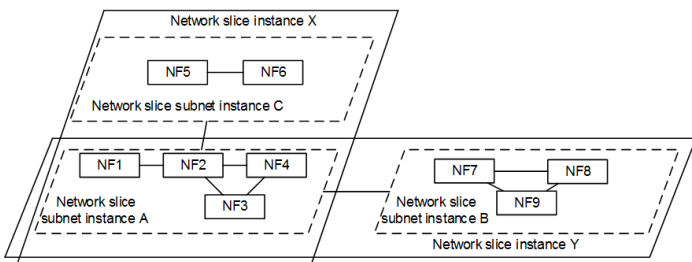
David Clark



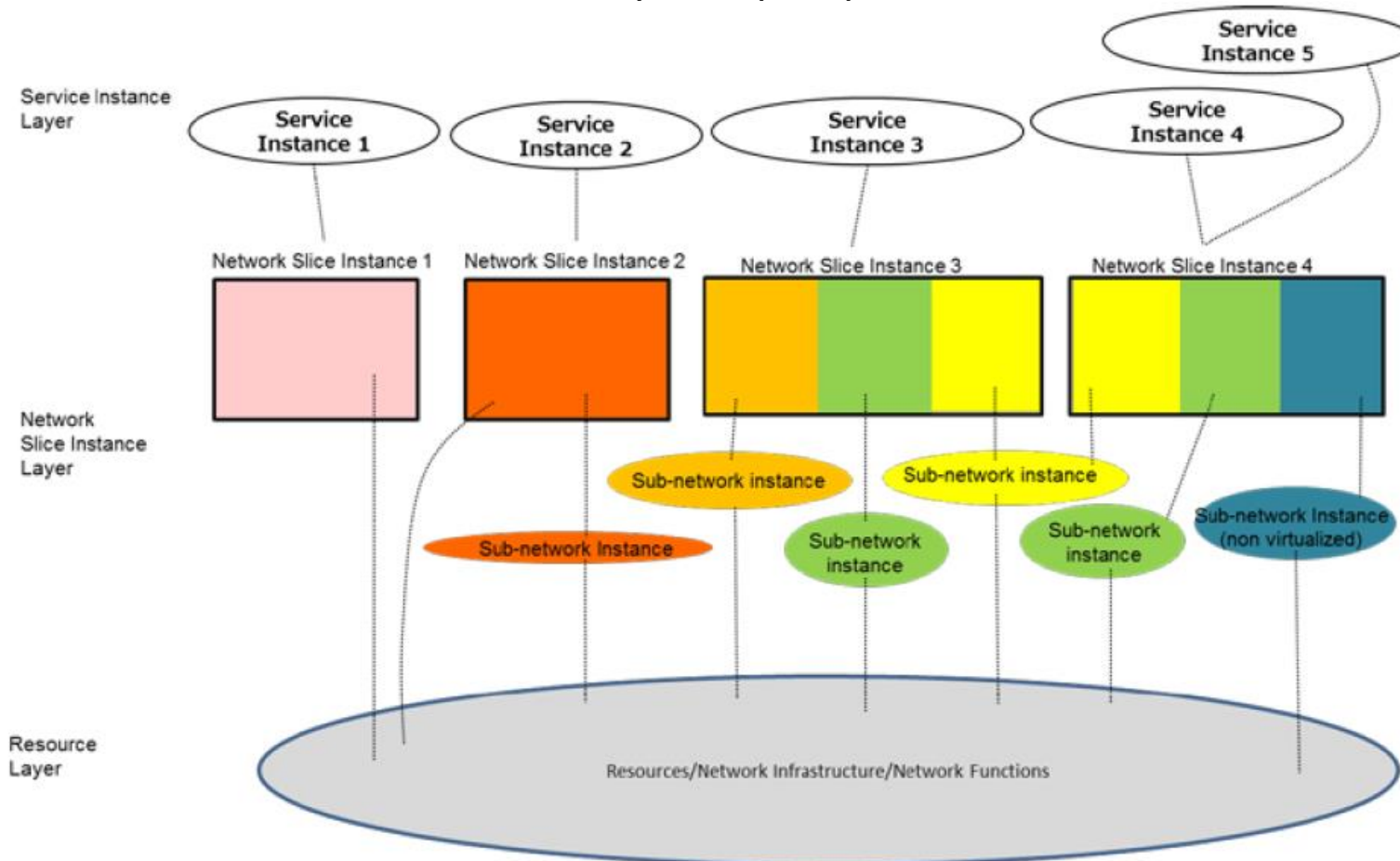
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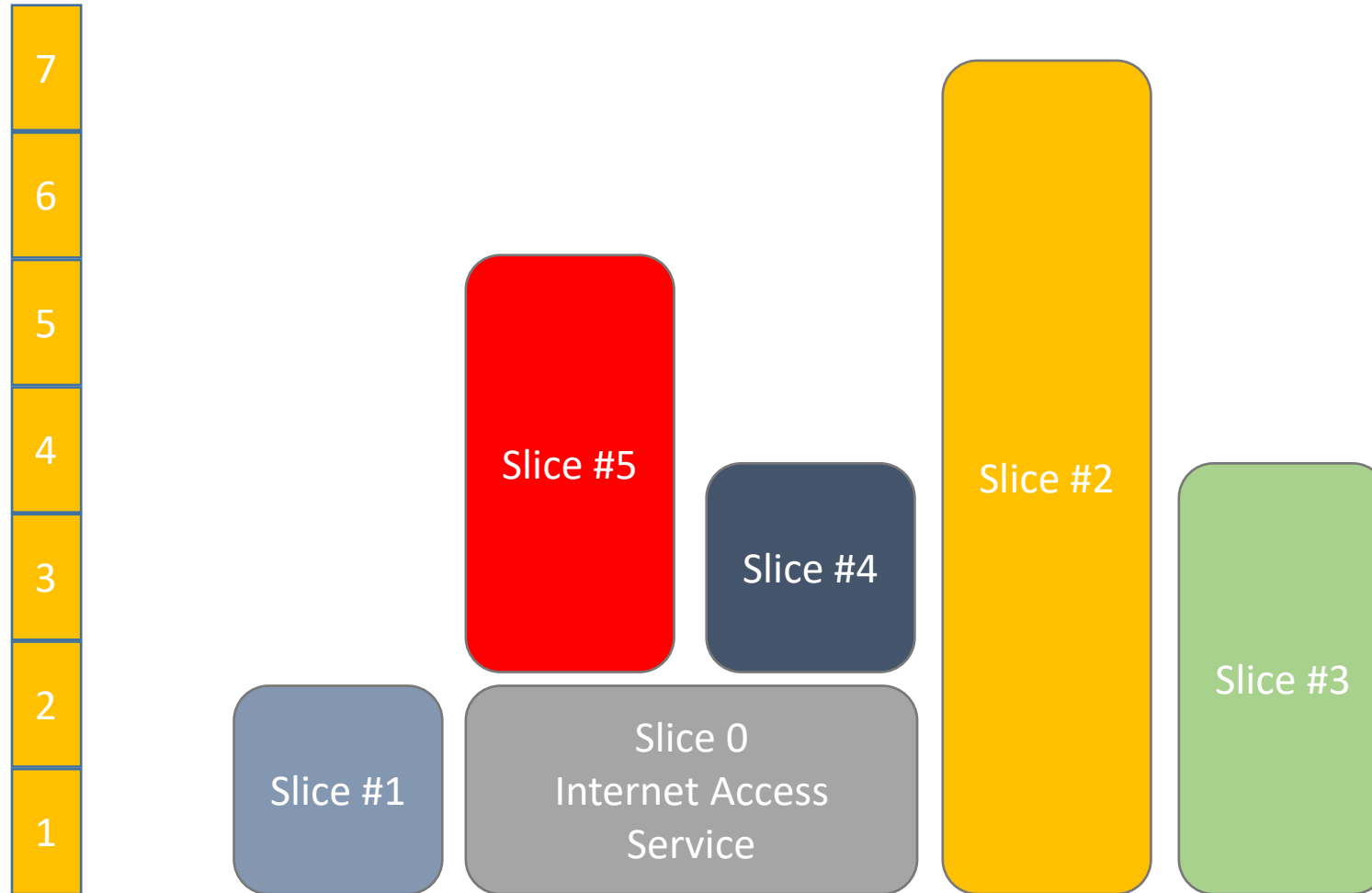


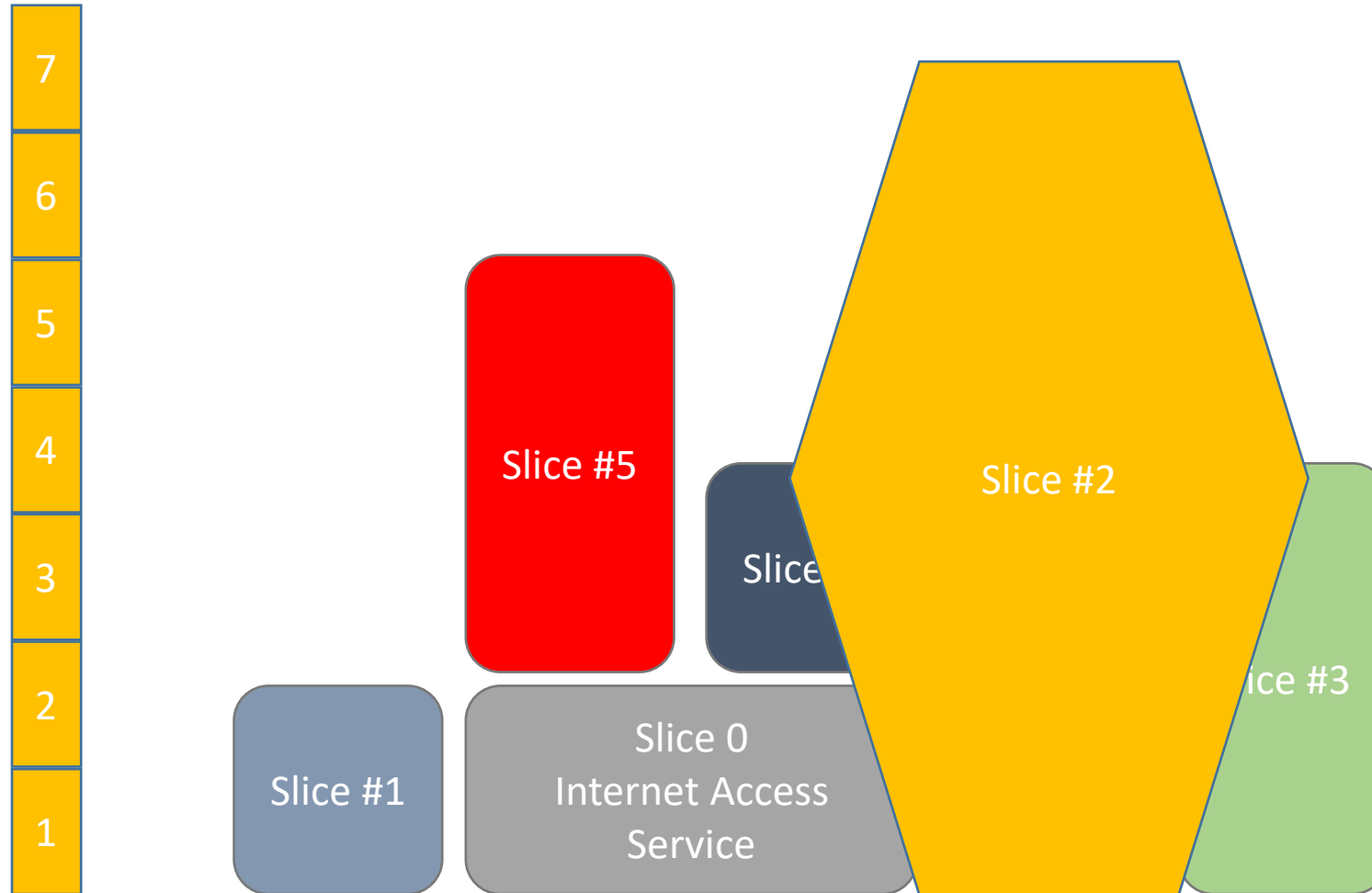
3GPP

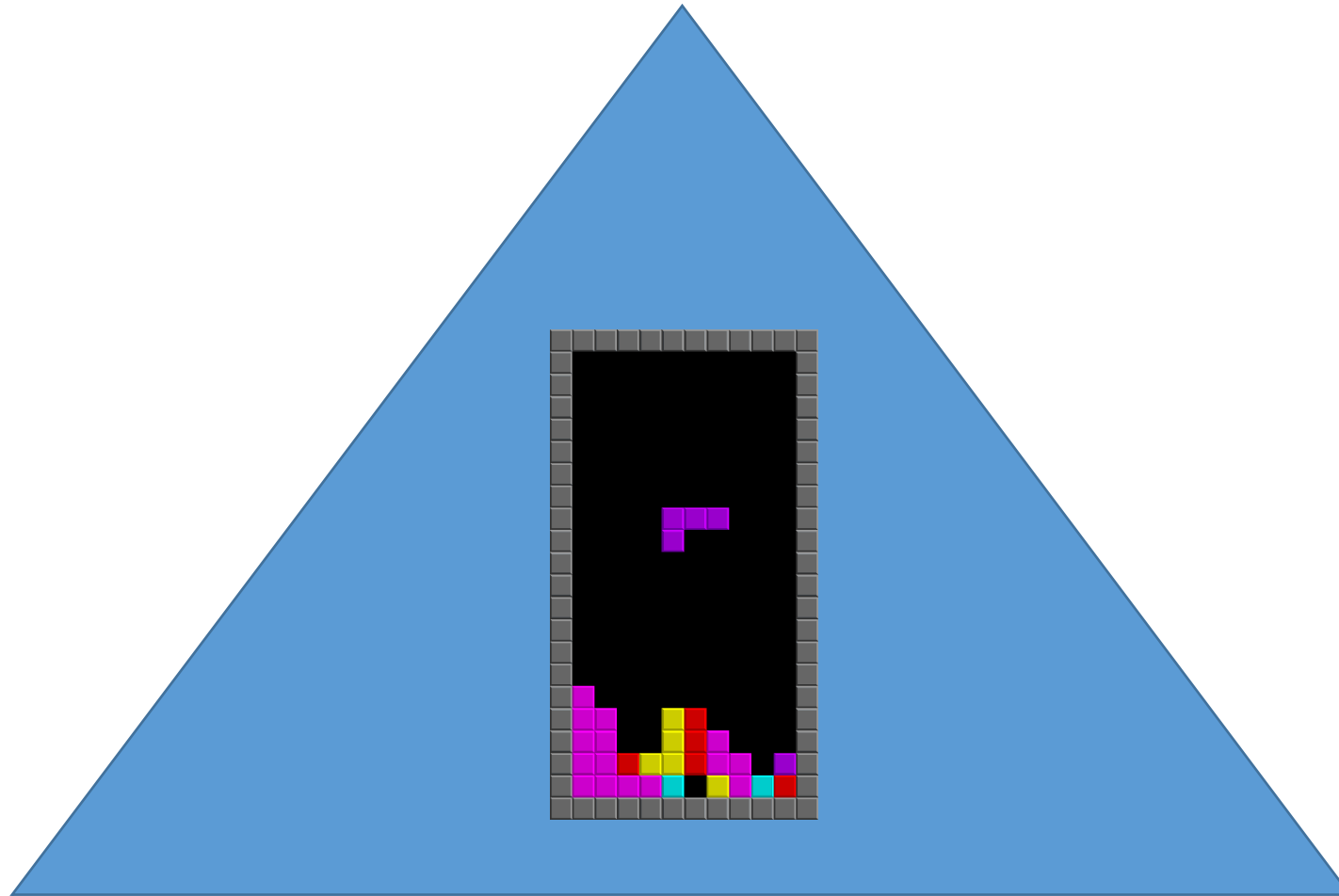


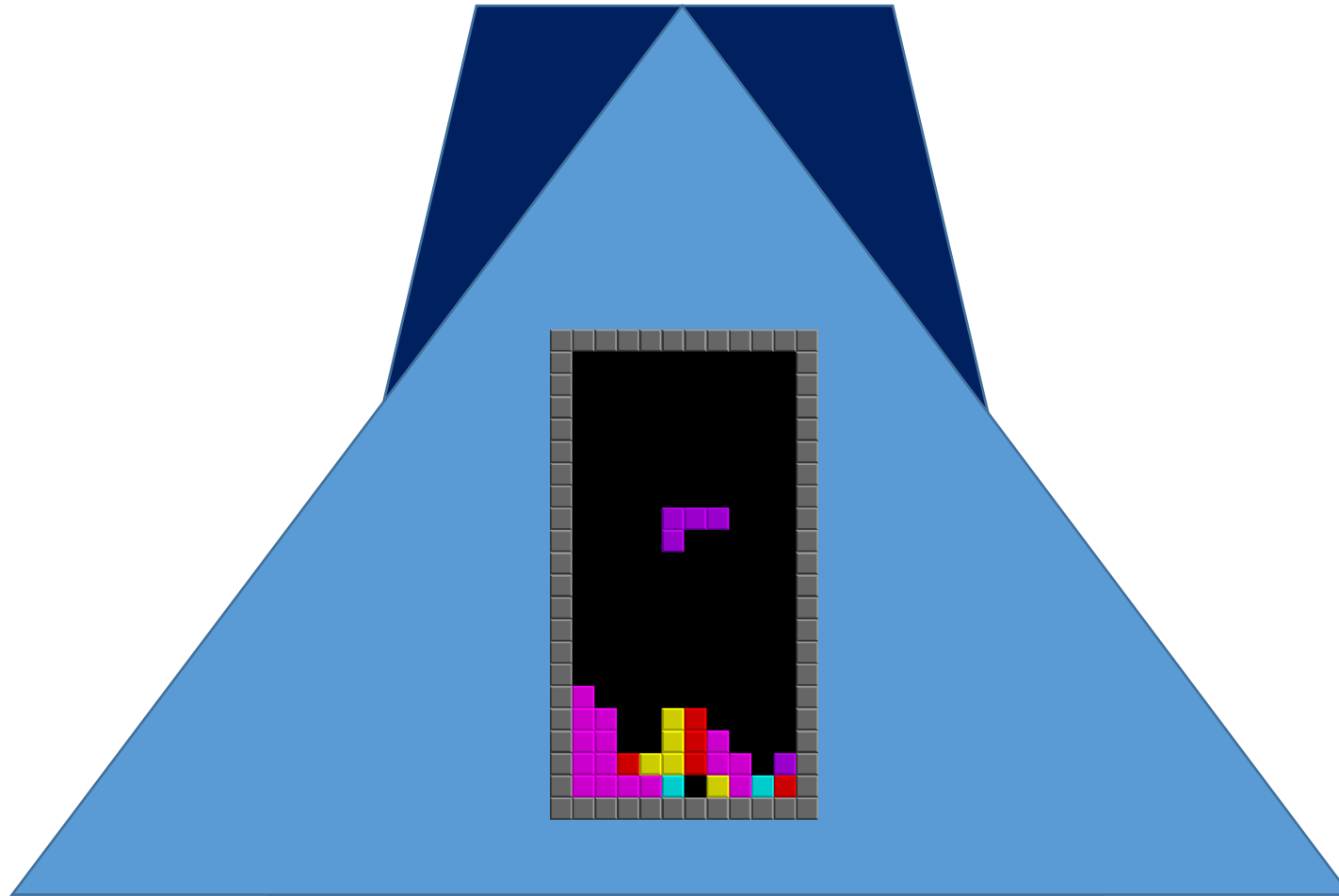
NGMN 3-layered perspective

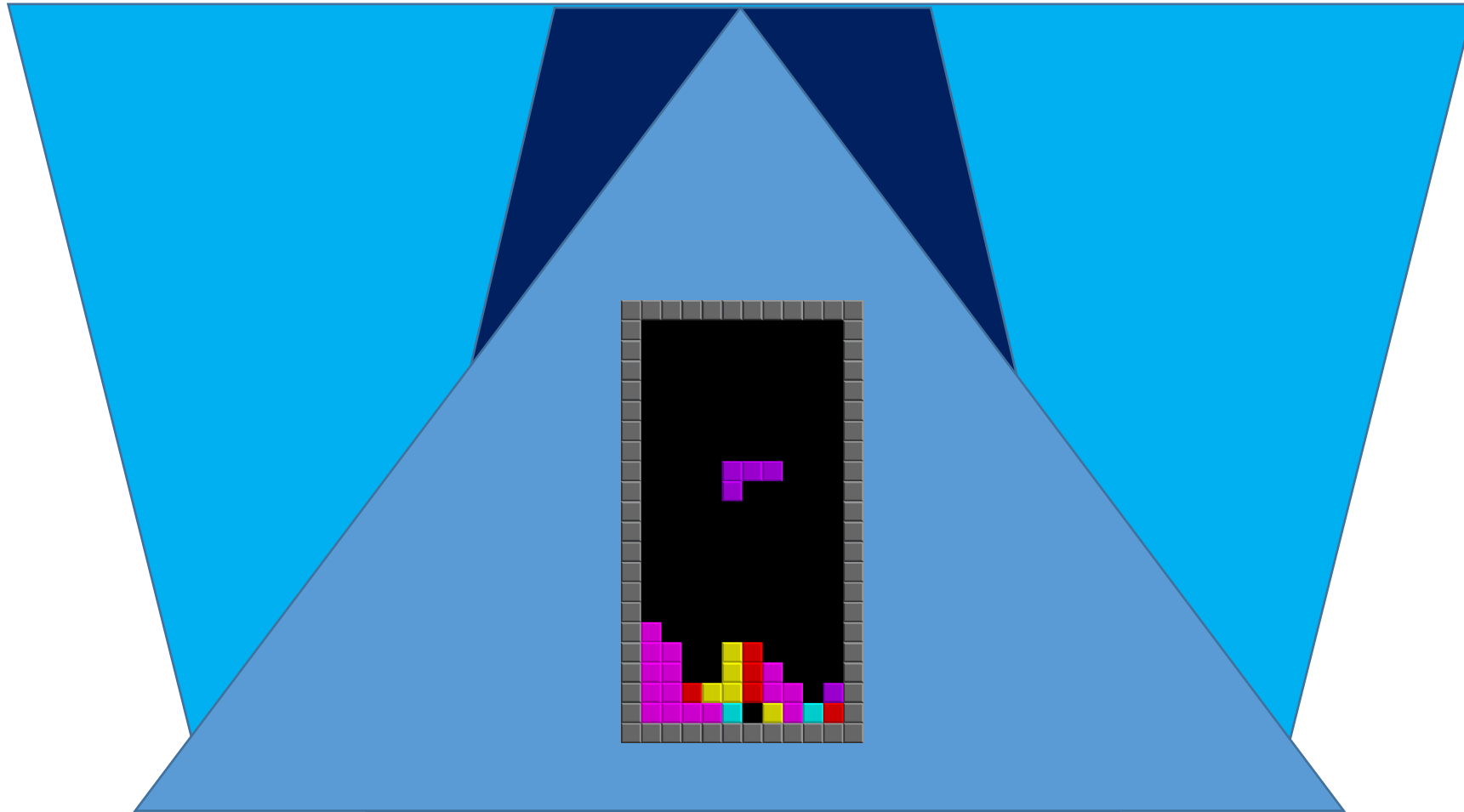












- Issues:
 - Protection (and definition!) of best-effort (QoE)
 - Distributed, network-wide allocation and configuration, inter-slice allocation
 - Overall control (inter-domain, inter-nation)

- Possible solutions:
 - Algorithms (fashionable=AI, ML)
 - Peering agreements (fashionable=blockchain)
 - Definition of best-effort (regulation)
 - Modular layered neutrality (regulation)
 - **Dynamic, flexible, ad hoc**
 - Layer 0 control (operator-customer interface)





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