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SDNRG WG

# Secure SDN Authentication

## (DNS based PKI model)

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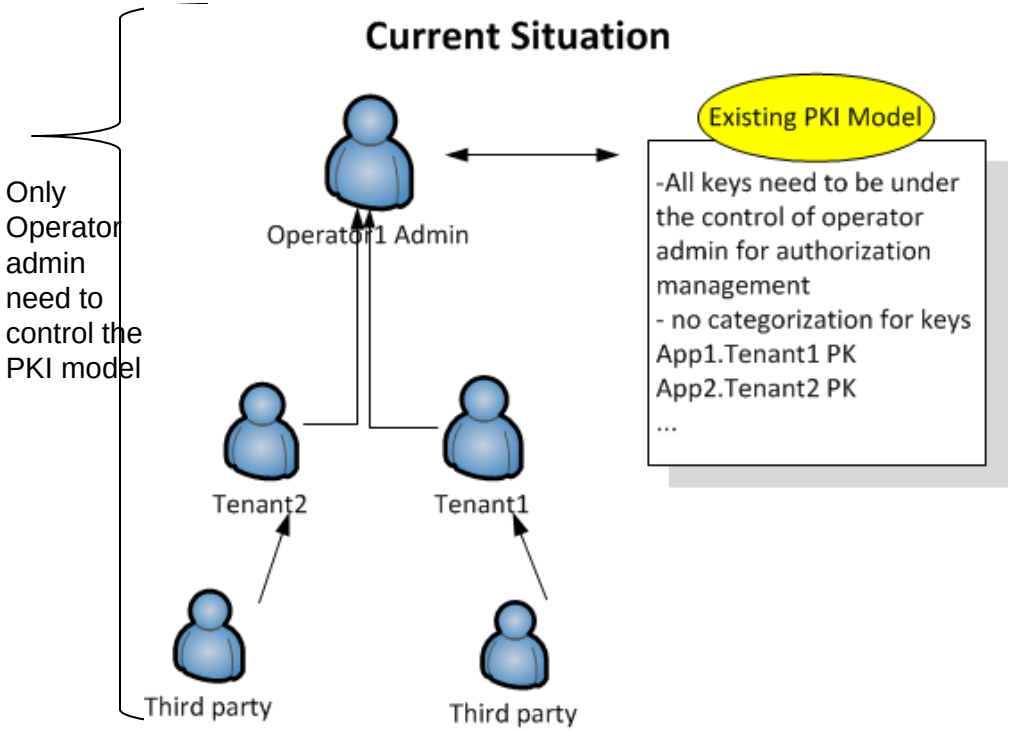
# Summary

Problem: No flexibly for PKI model

Solution: Combination of DANE, DNSSEC and DDNS to enable:

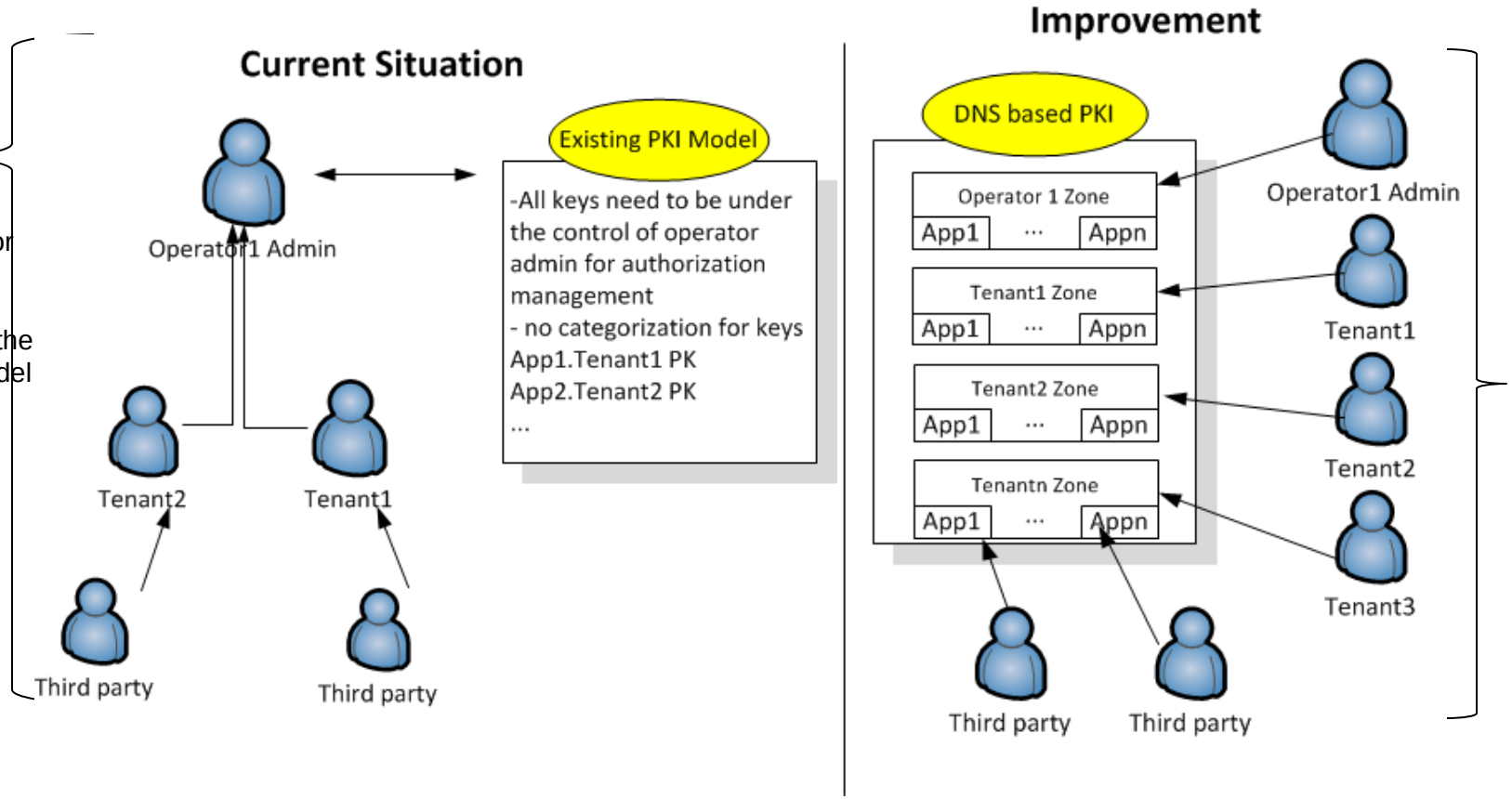
- ✓ Automatic update of certificates
- ✓ Enable Tenants to manage and assign resources themselves
- ✓ No need to maintain and administrate a/more PKI server(s) as well as DNS server
  - ✓ Only maintenance of DNS server is enough (Reduce CapEx)

# Existing PKI Model



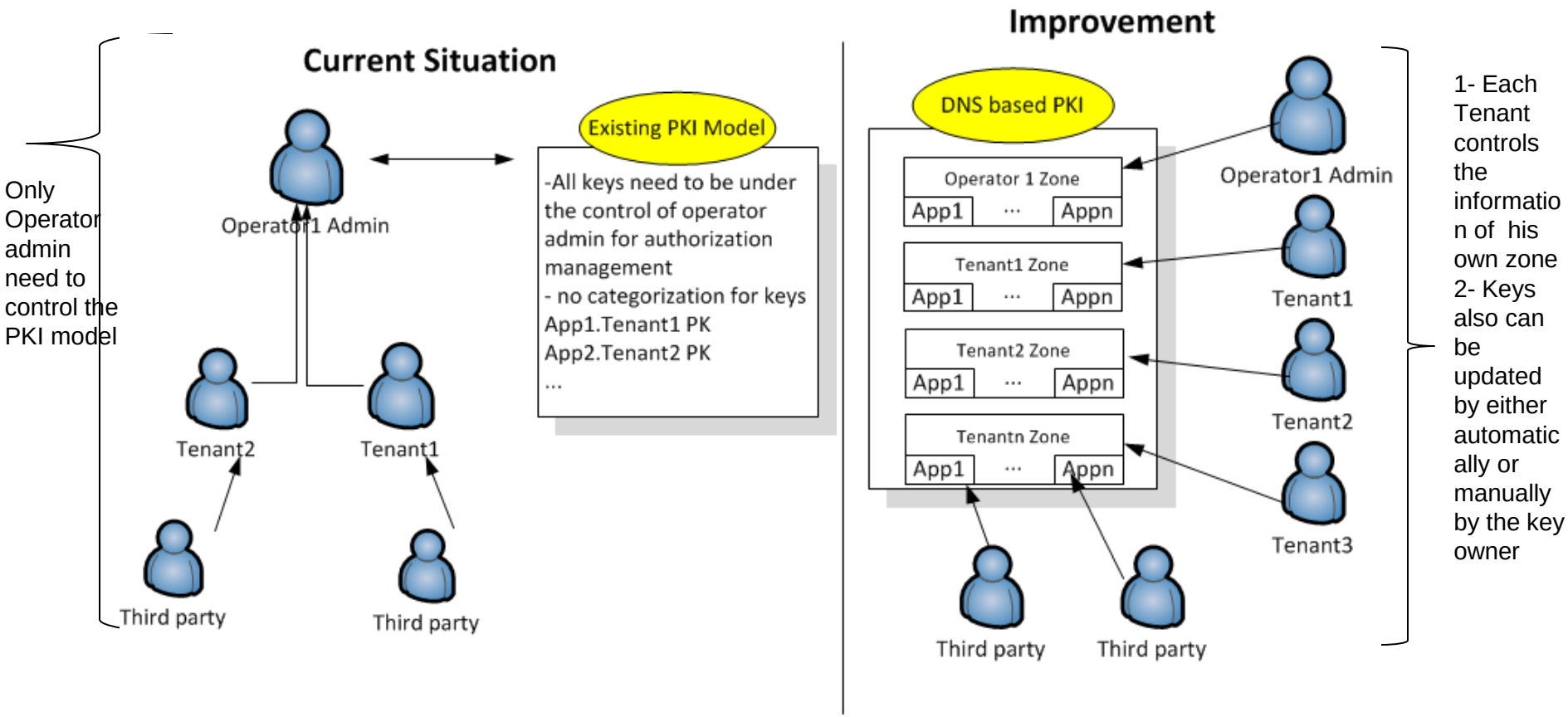
# Enable Tenants to manage and assign resources themselves

Only Operator admin need to control the PKI model




1- Each Tenant controls the informatio n of his own zone
2- Keys also can be updated by either automatic ally or manually by the key owner

# Enable Tenants to manage and assign resources themselves




- Each customer access its own zone and can update key for its own resources
- Operator1 can define some access control templates for tenants and assign to them
- Each Tenant can assign access control itself to third party without major dependency to operator1

# Problem with the existing PKI Model

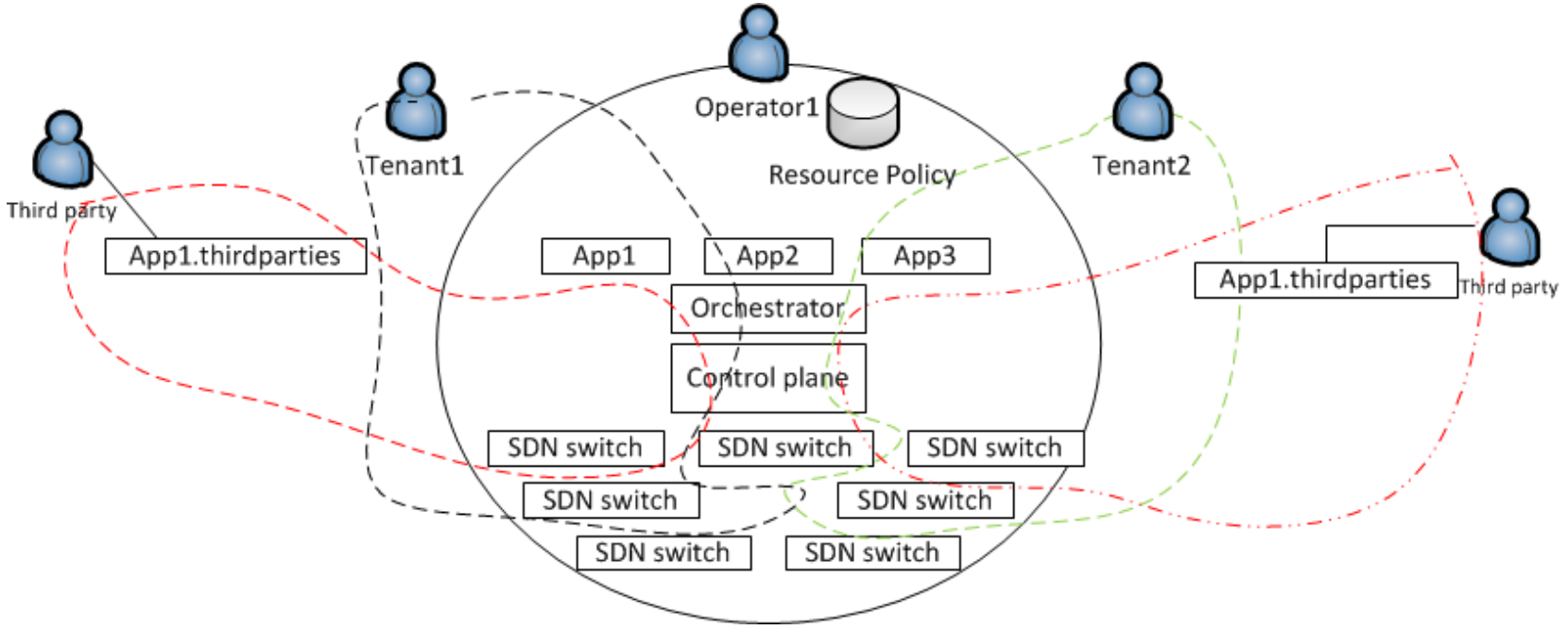
- SDN authentication is usually based on TLS or certificates
- Problem with certificates based authentication
  - Self-Signed Certification (Spoofing, MITM attacks, Key management)
  - Public CA (PKI)
    - Compromised CA → compromised all resources that uses that CA database
    - Single operator accessibility and dependency to the main admin of the CA to define and control keys and other resources → Disallow resell of a part of the network in multi-tenancy
    - Self-update of certificates are not possible
  - Local CA (PKI)
    - This is similar to public CA but only the chance of having compromised CA is lower

# Advantages of The Proposed Model - I

- Improve the existing PKI models, for SDN and NFV use cases
  - Reduce the scope of possible attacks on PKI mode (multi-tenancy and remove the need for maintenance and administration of PKI servers.
- The use of existing protocols and existing infrastructure
  - DNS (RFCs 1034,1035) , DANE (RFC 6698), DDNS (RFC 3007)
- Provide a secure authentication model for different components of SDN and NFV solutions. Two example scenarios:
  - vCPEs controlled by ISPs who are the customers of operator
  - A part of vEPCs infrastructure sold to a customer and resold to third parties that they want also to resell it to end customers (IPsec keys can be updated via this model)
- Allow each tenant to control access (authorization) on own resources with no dependency to the operators. →Solve the high level authorization problem for SDN ad NFV solutions

# A Solution for Hierarchical Multi-Tenancy Problem

- Allows operators to sell part of their infrastructure to their customers
- Allows their customers to re-sell a part of their leased infrastructure to third parties
- Allows third parties to re-sell their leased resources to end customers




**Example of sell and re-sell of the resources**

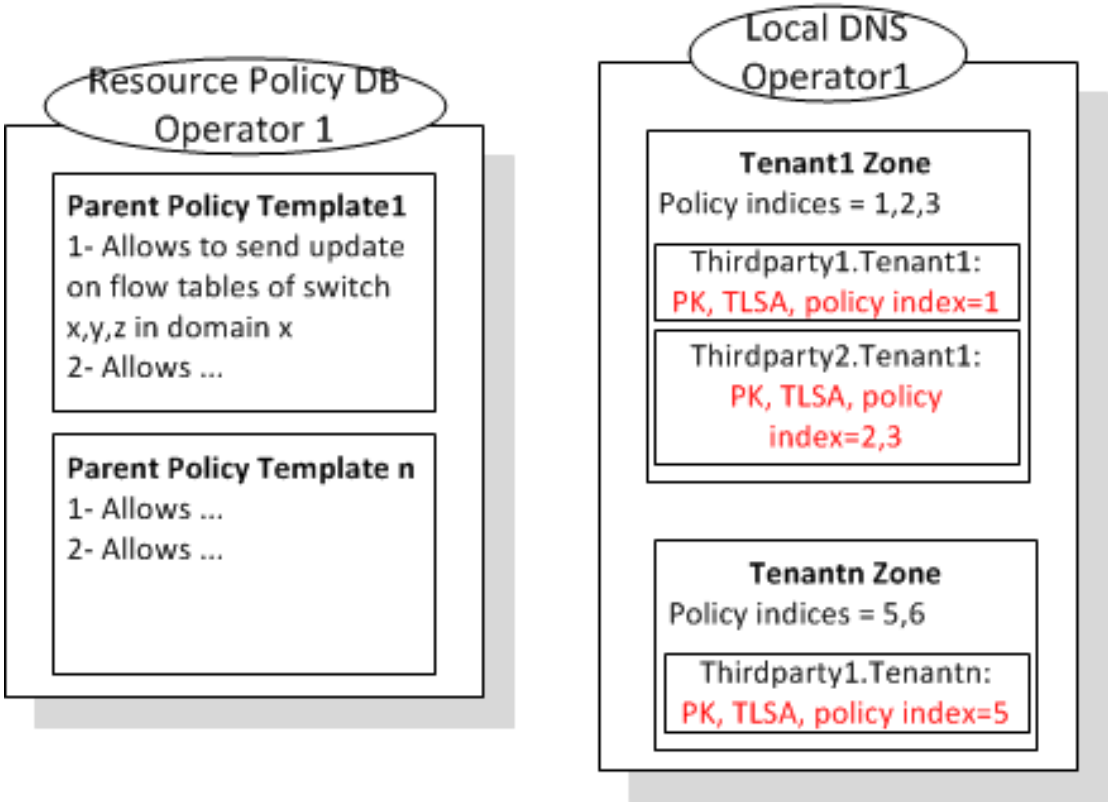
# SDN Example: Enable Tenants to manage and assign resources themselves

Operator1 defines different parent policy templates and store them in its resource policy database

**Step1:** Agreement between Tenant1 and Operator to use Operator1's resources

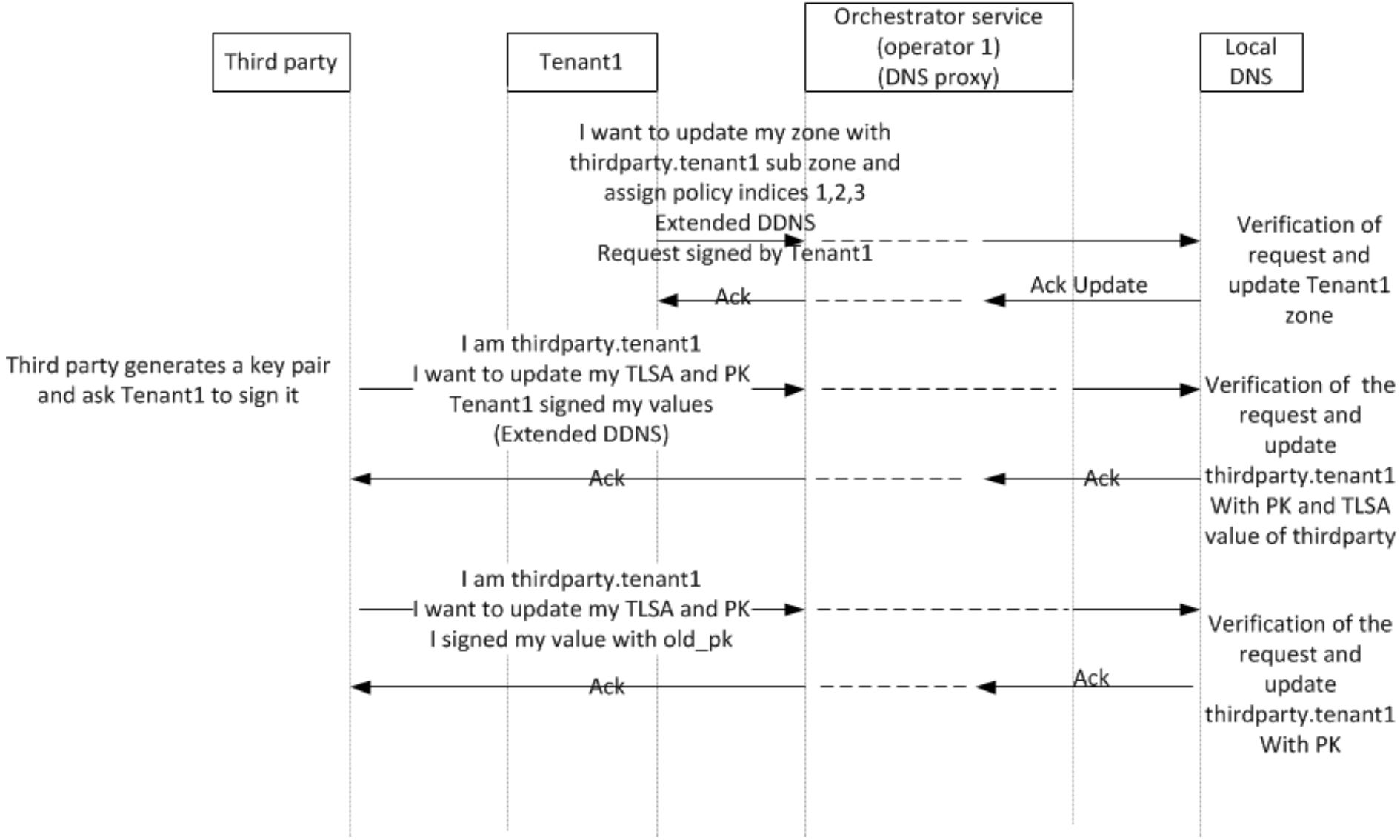
- Operator 1 defines Tenant1 zone and assign the policy indices to this Tenant1 which identifies its access control (only index the whole policy is in resource policy DB)

- DNS is a powerful database
- Tenant 1 will not have any dependency to operator1 for modifying authorization information to its third party
- Quick authorization in the same step as authentication by orchestrator (DNS proxy)



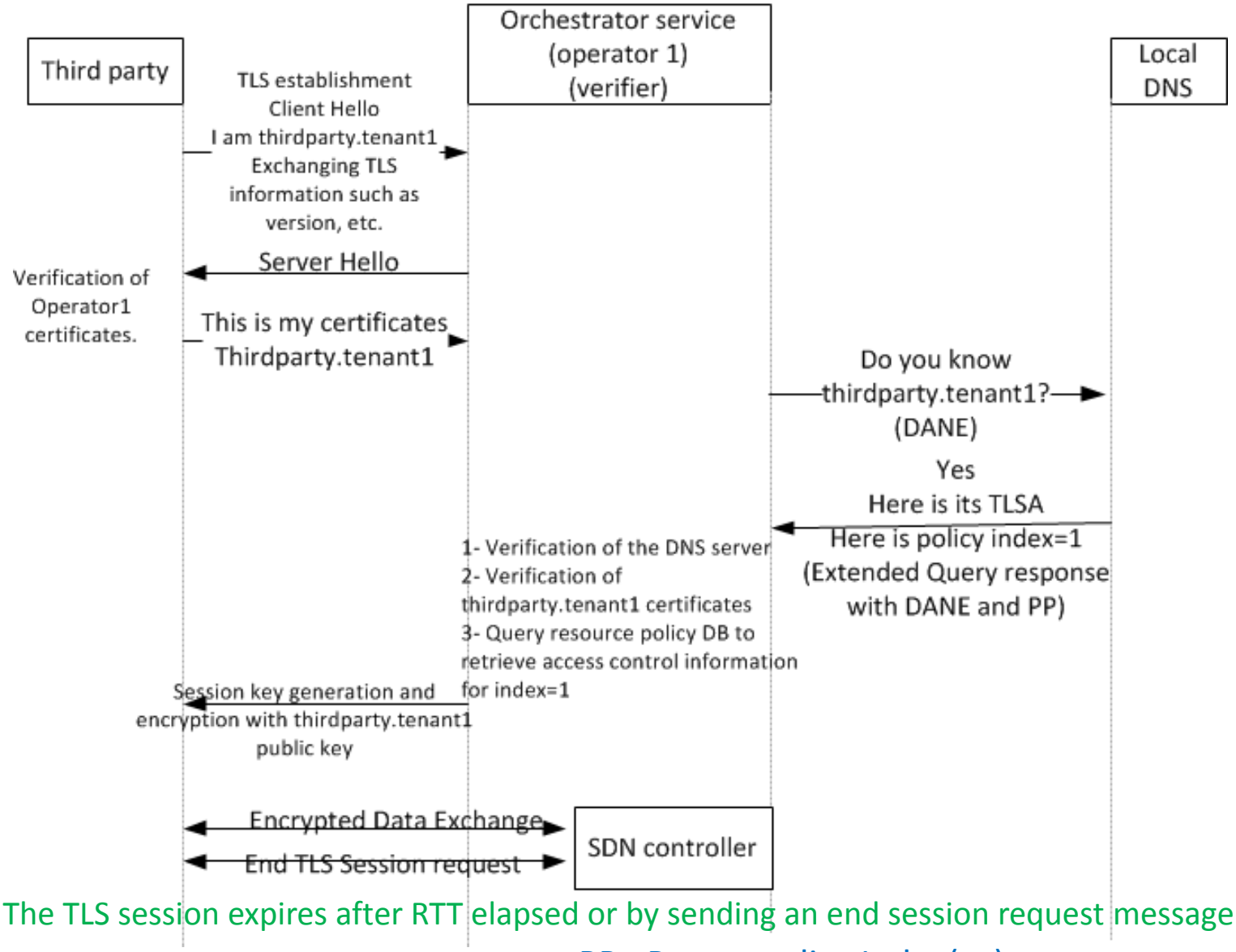
# SDN Example – Automatic Key update by Third party

Third party wants update its keys and TLSA record



# SDN Example – Third party Gain Access to Resources

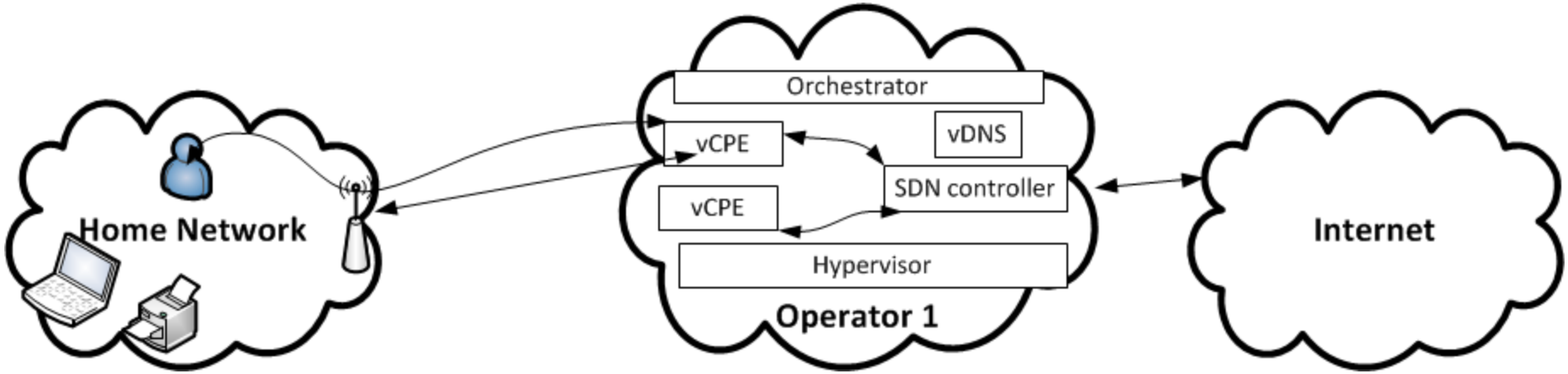
Third party via using an application wants to configure its resources in southbound via a SDN controller




The TLS session expires after RTT elapsed or by sending an end session request message

PP= Parent policy Index(es)

# vCPE Example Scenario




- vCPE assigns IP address and controls devices inside the “Home Network”
- End User can configure its vCPE via its web user interface
- Operator can configure vCPE according the network changes via SDN controller without sending any technician to home of end user to configure the CPE
- All authentication among these different components is based on keys and certificates
- vDNS is the PKI storage and authorization indexes

# Conclusion

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**Thank you!**