The RPKI & Origin Validation

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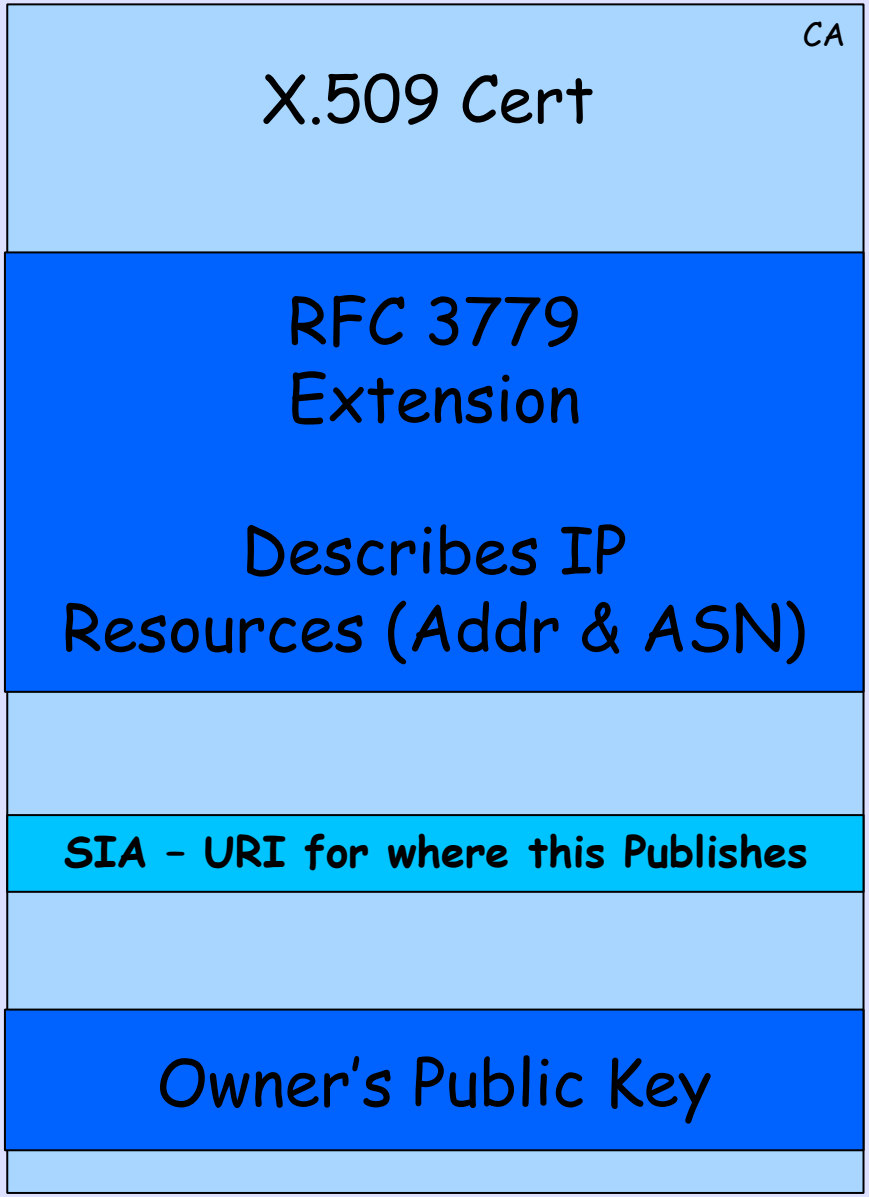
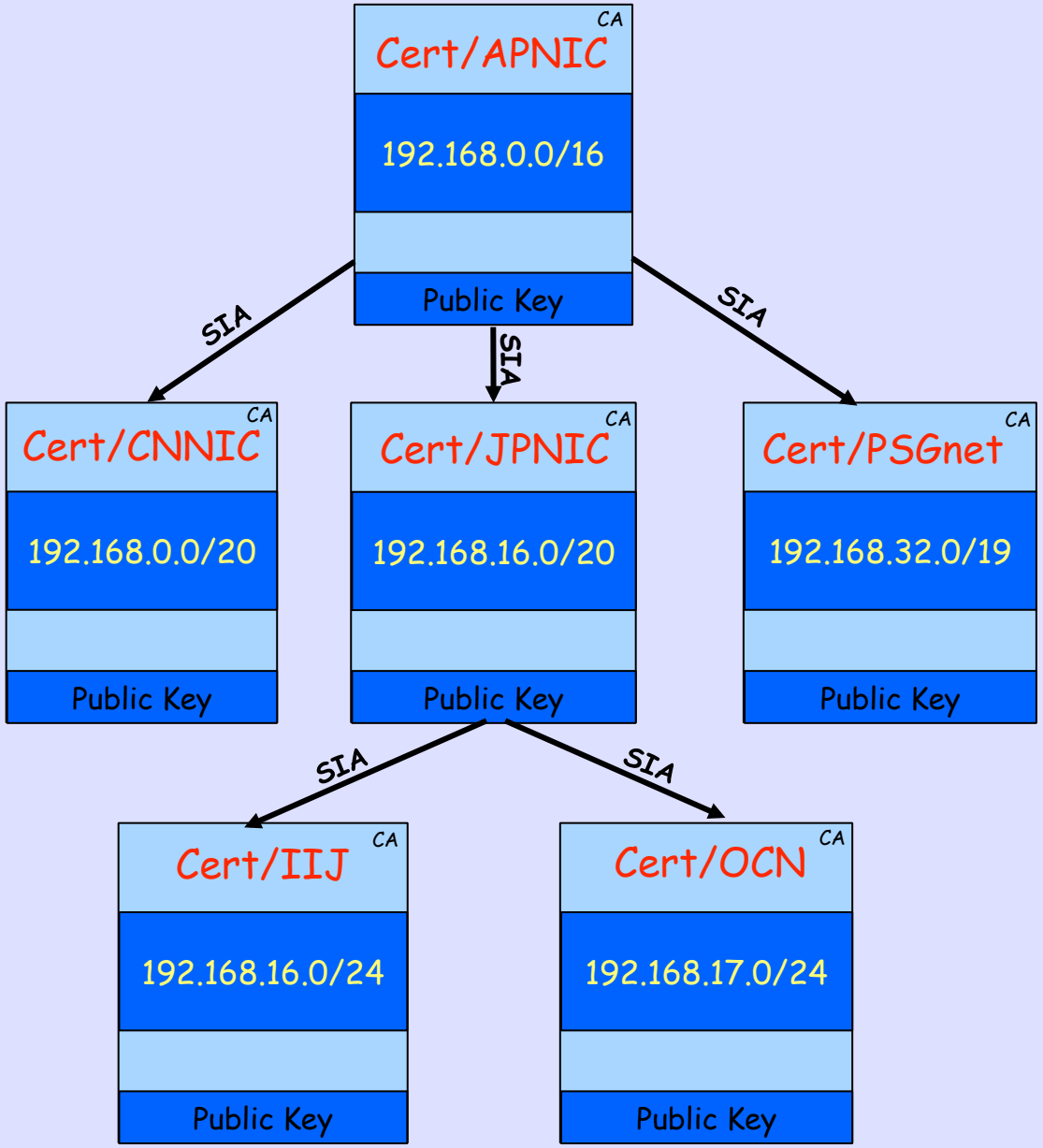
<http://archive.psg.com/090615.all-rpki.pdf>

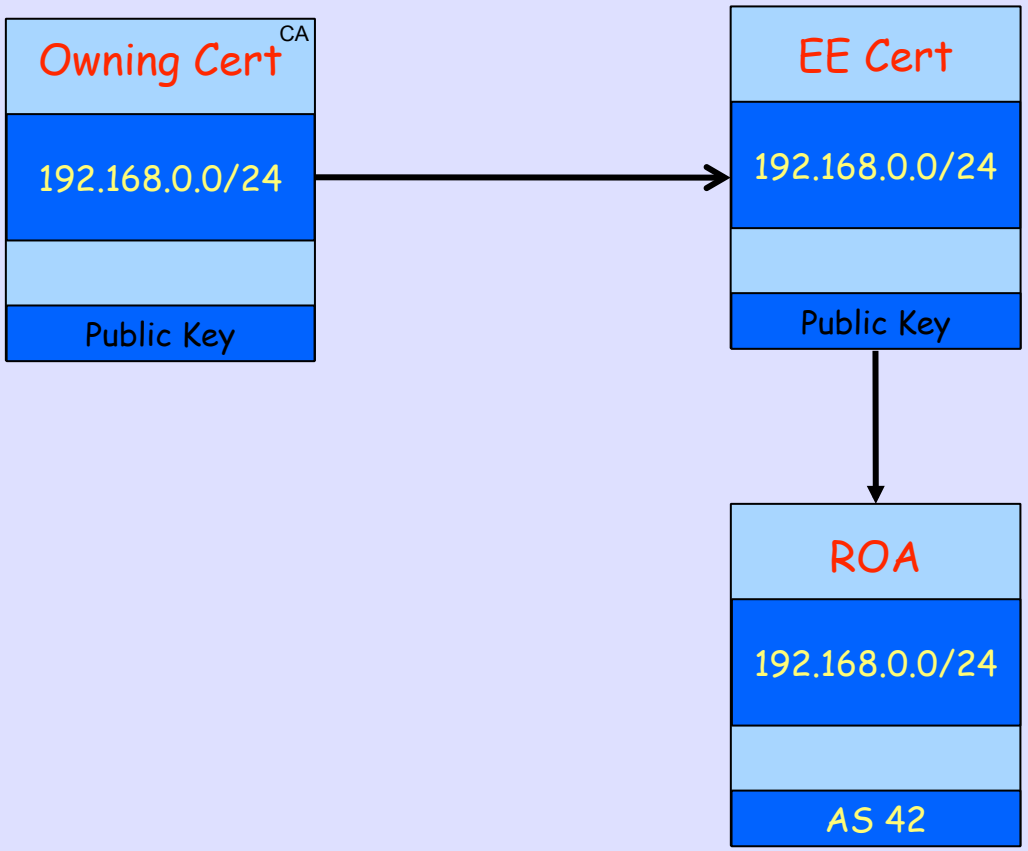
X.509 Certificate w/ 3779 Ext



Certificate Hierarchy follows Allocation Hierarchy



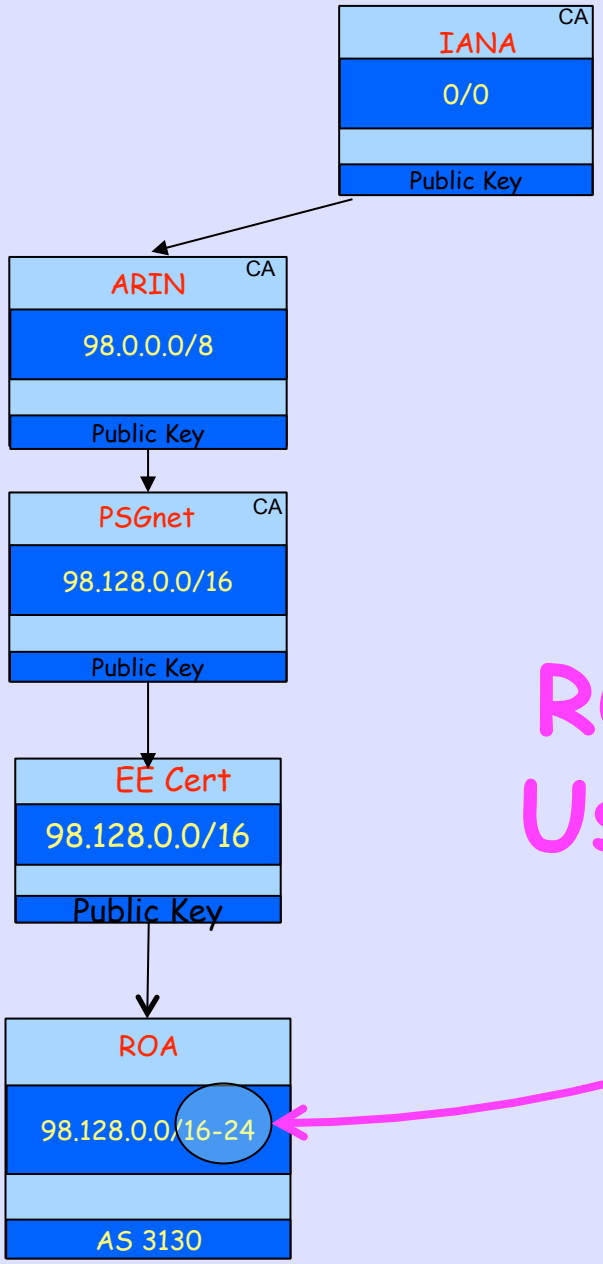
Route Origin Authorization (ROA)



PSGnet /16 Experimental Allocation from ARIN

Announces 256 /24s

Too Many EE Certs and ROAs, Yucchhy!

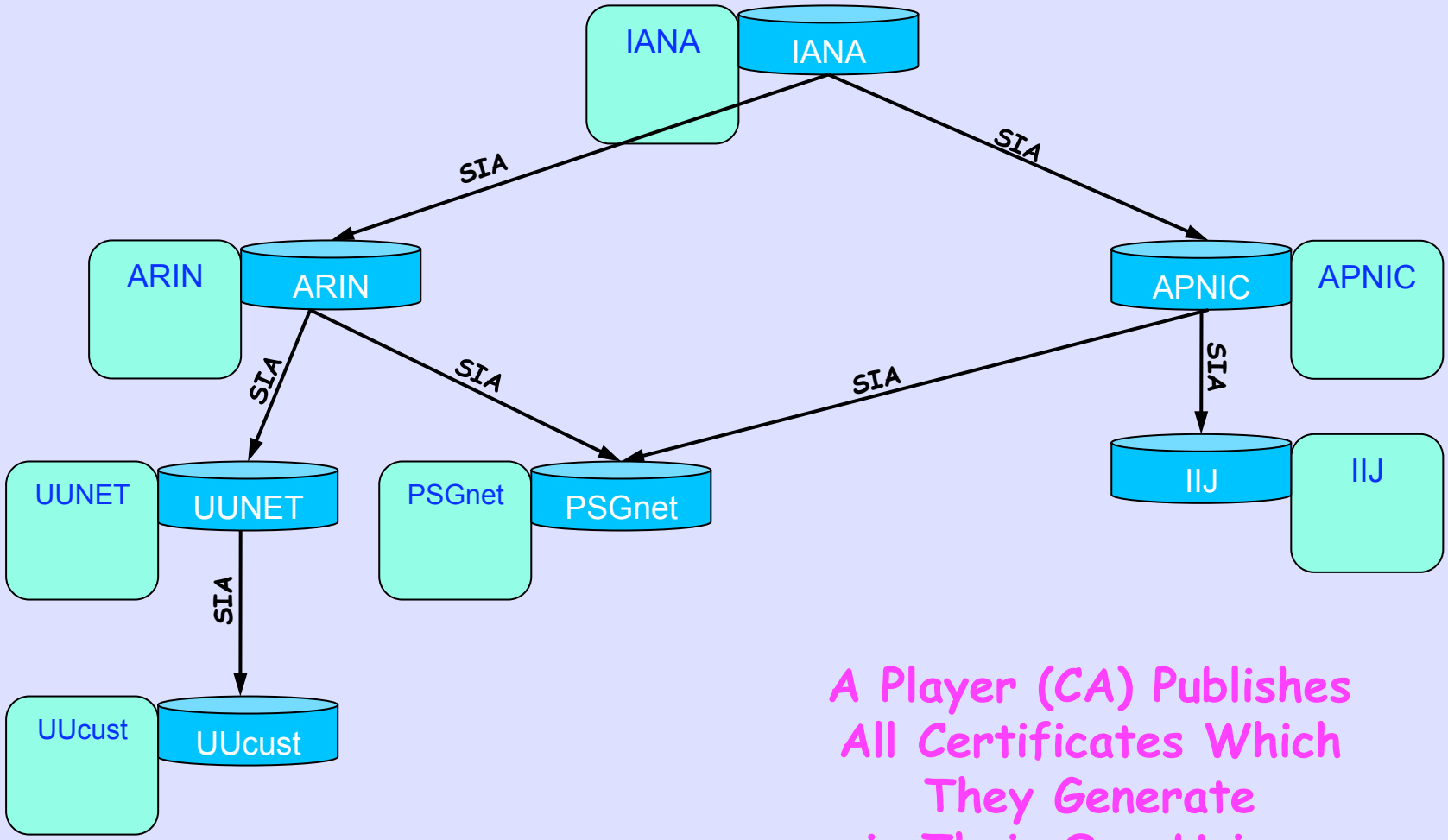


ROA Aggregation Using Max Length

Big, Centralized, & Scary

We Don't Do This

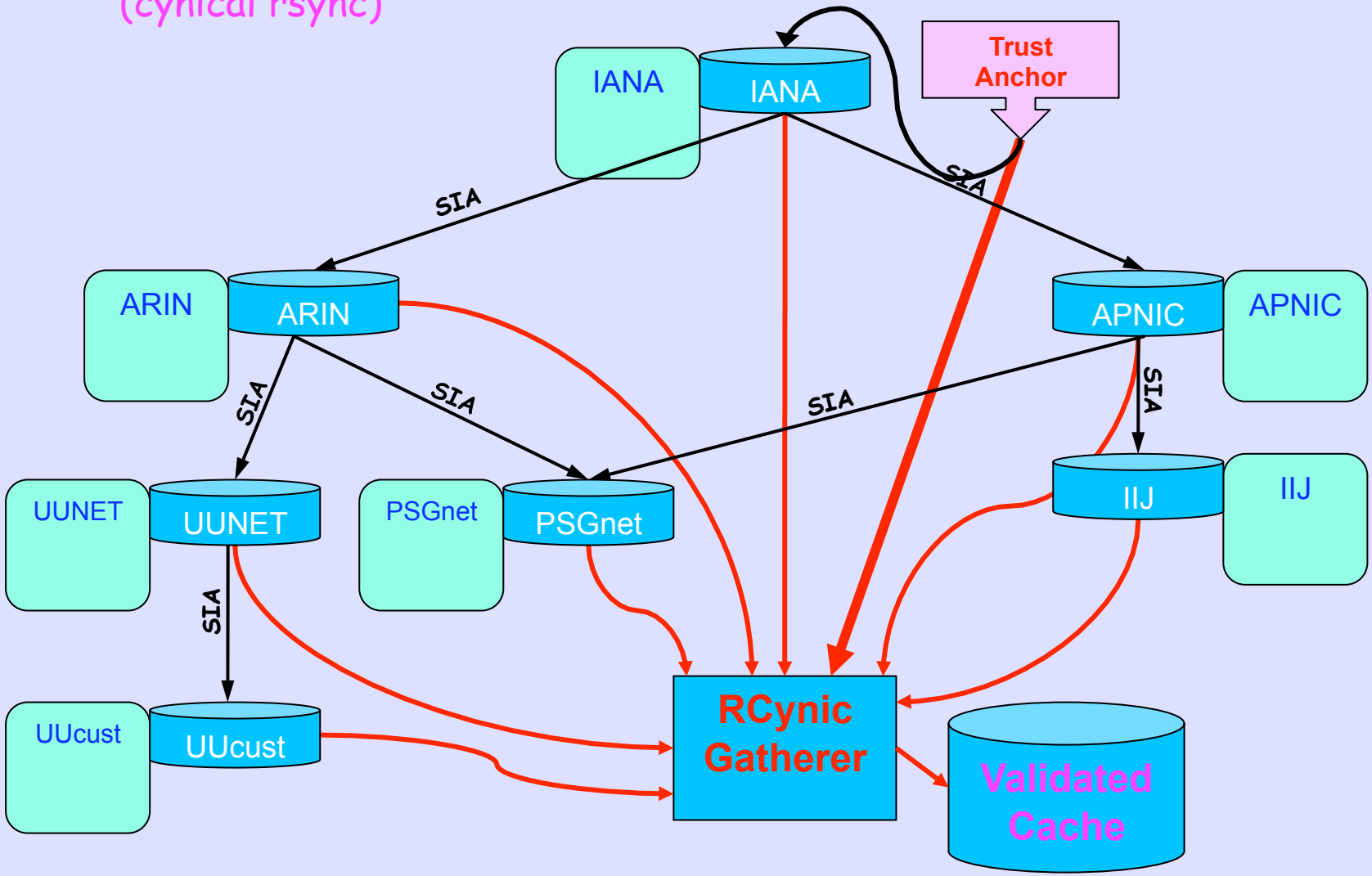
Distributed RPKI DataBase



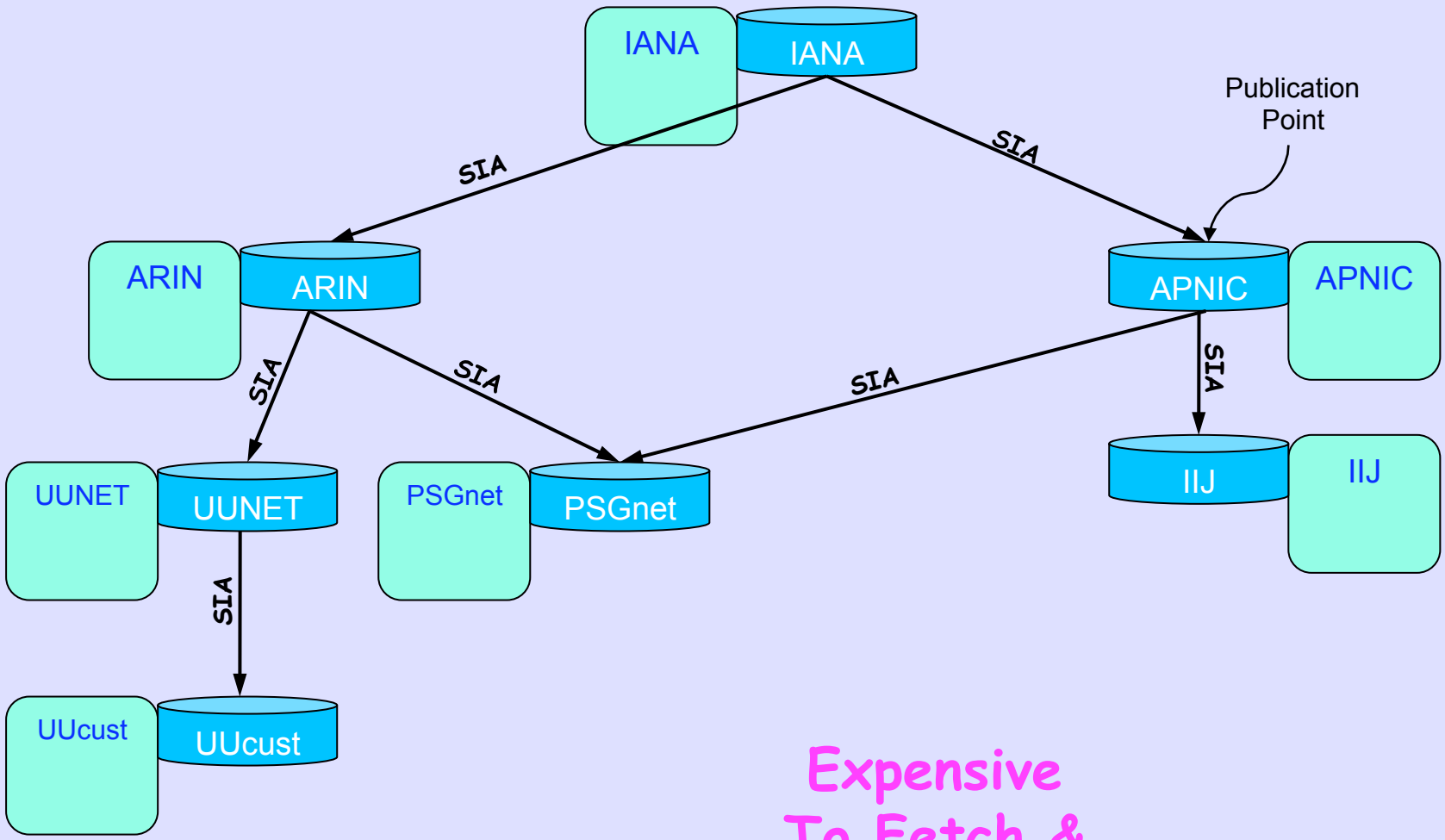
A Player (CA) Publishes
All Certificates Which
They Generate
in Their Own Unique
Publication Point

RCynic Cache Gatherer

(cynical rsync)

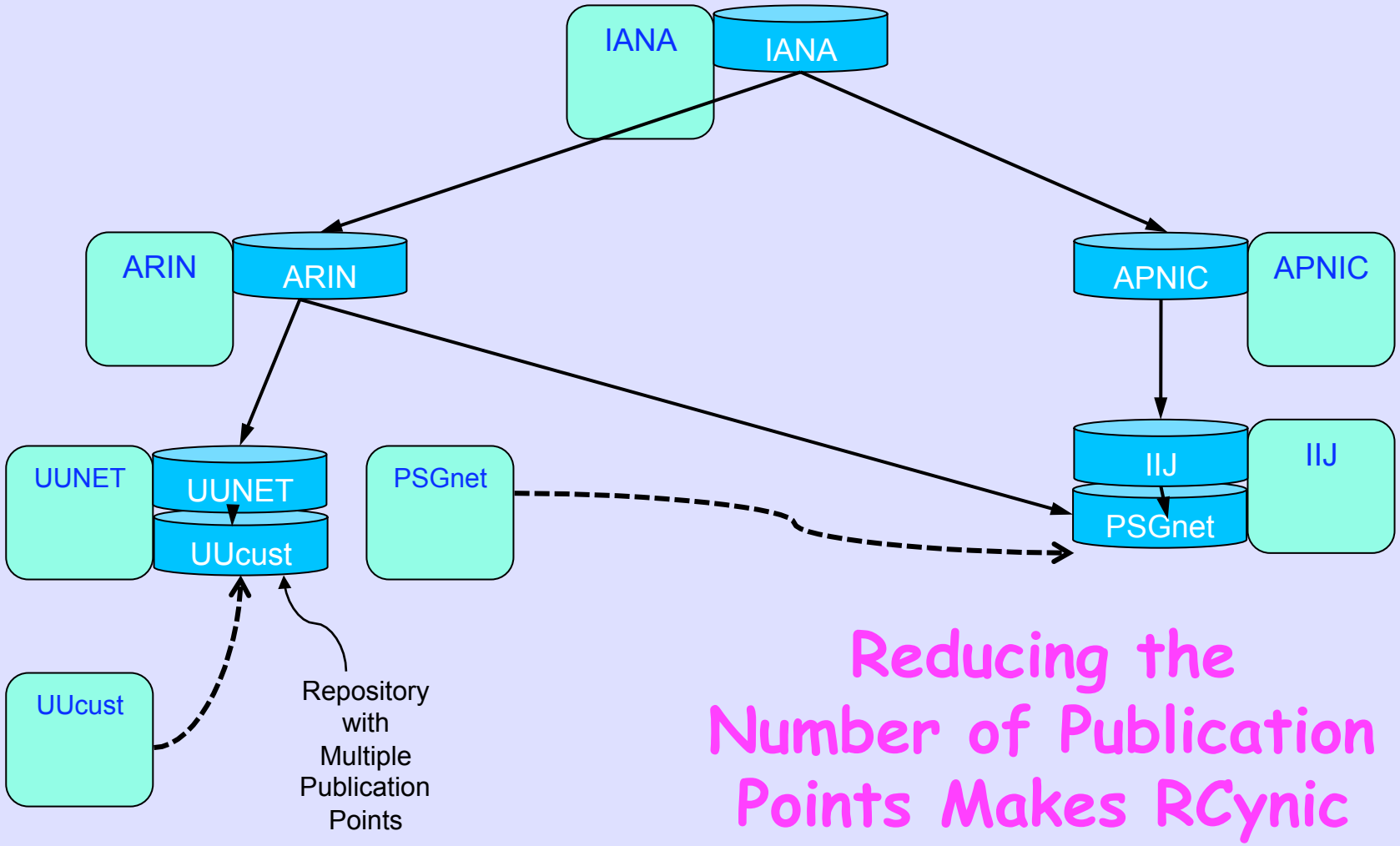


Reliability Issue



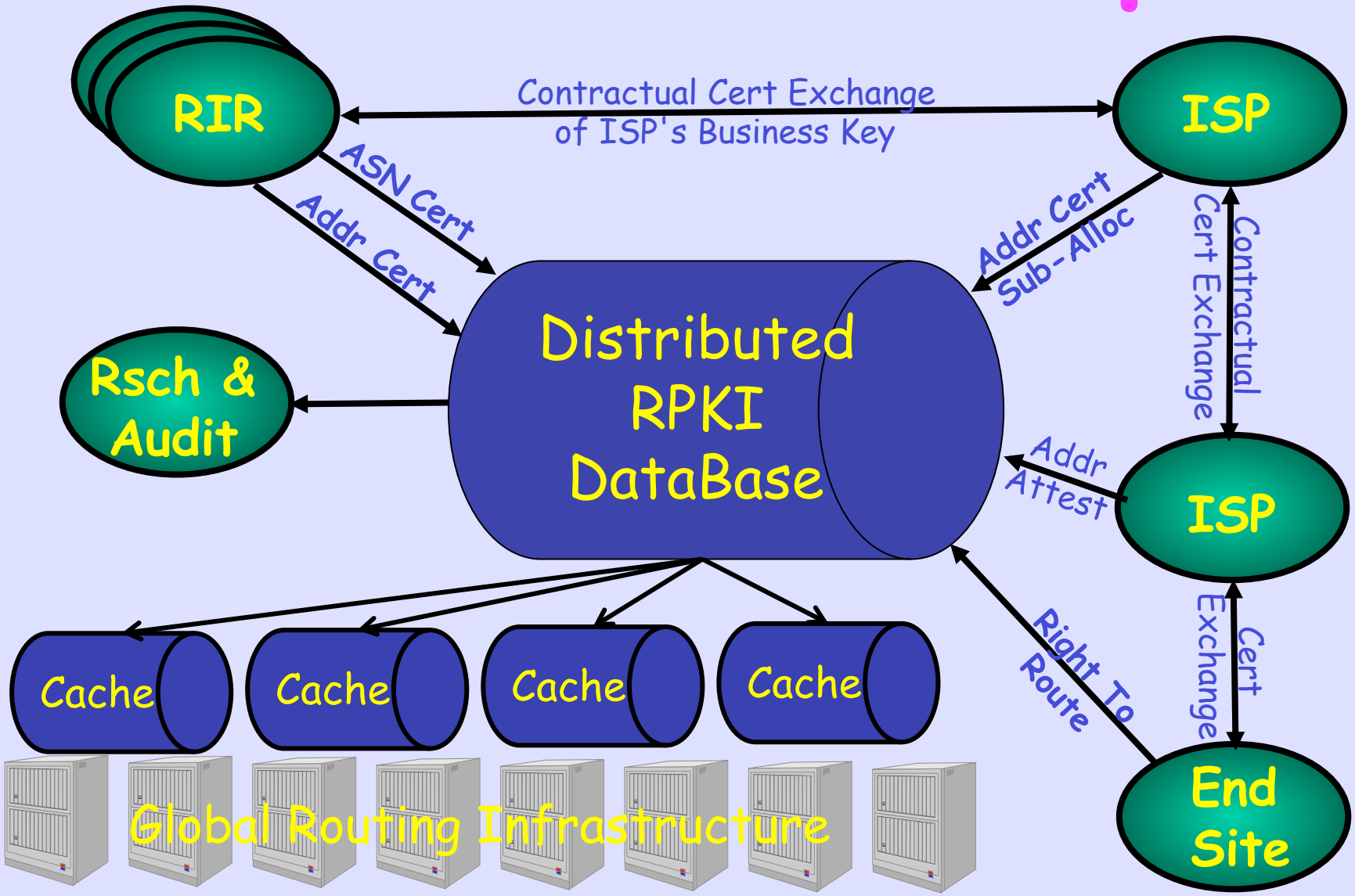
Expensive To Fetch & Unreliable

Reliability Via Hosted Publication



Reducing the Number of Publication Points Makes RCynic Much More Efficient

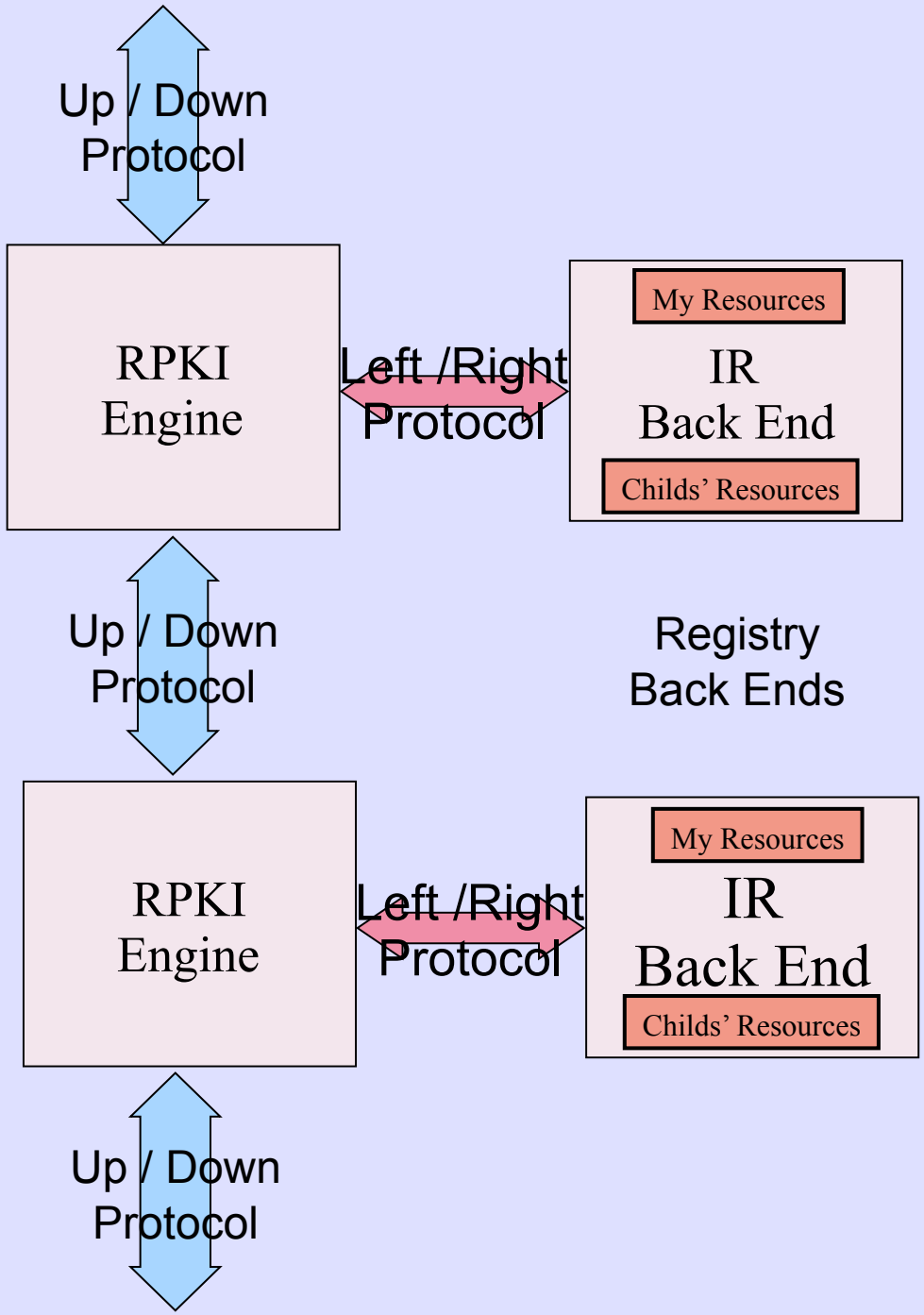
RPKI Relationships



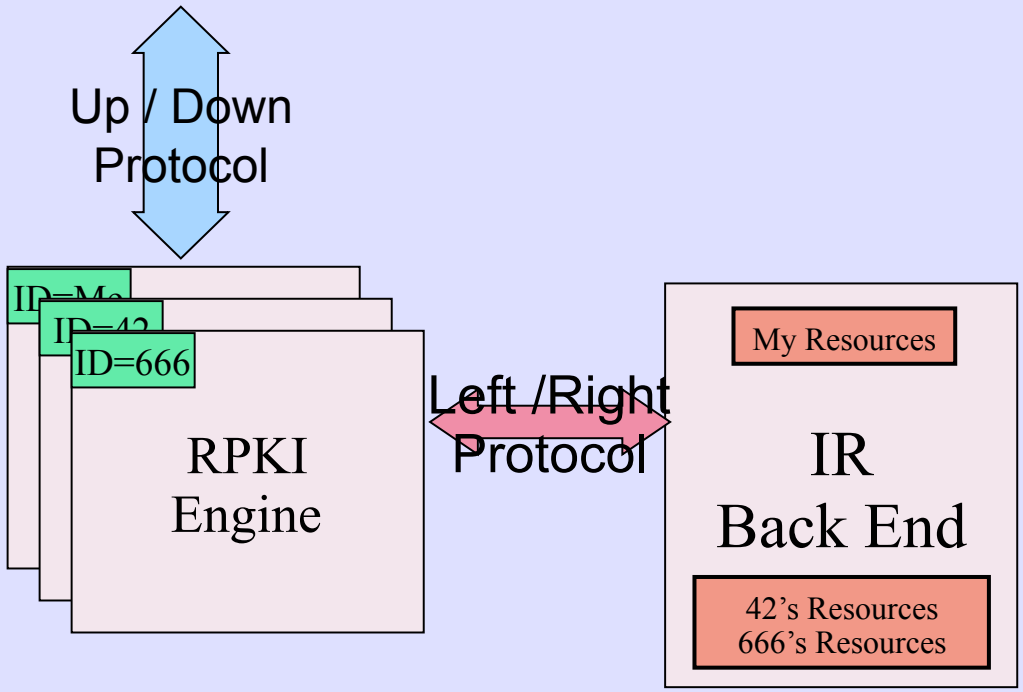
Running Code

And the Three RPKI Protocols

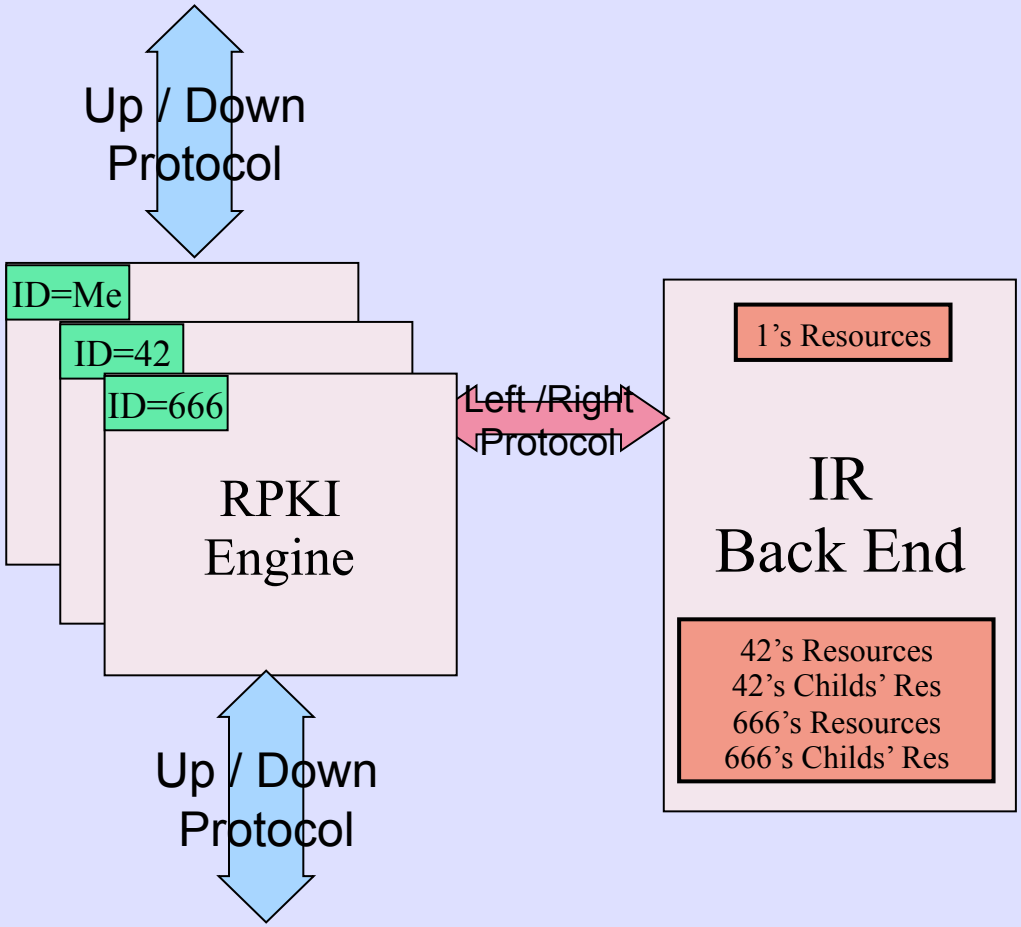
Simple Parent and Simple Child



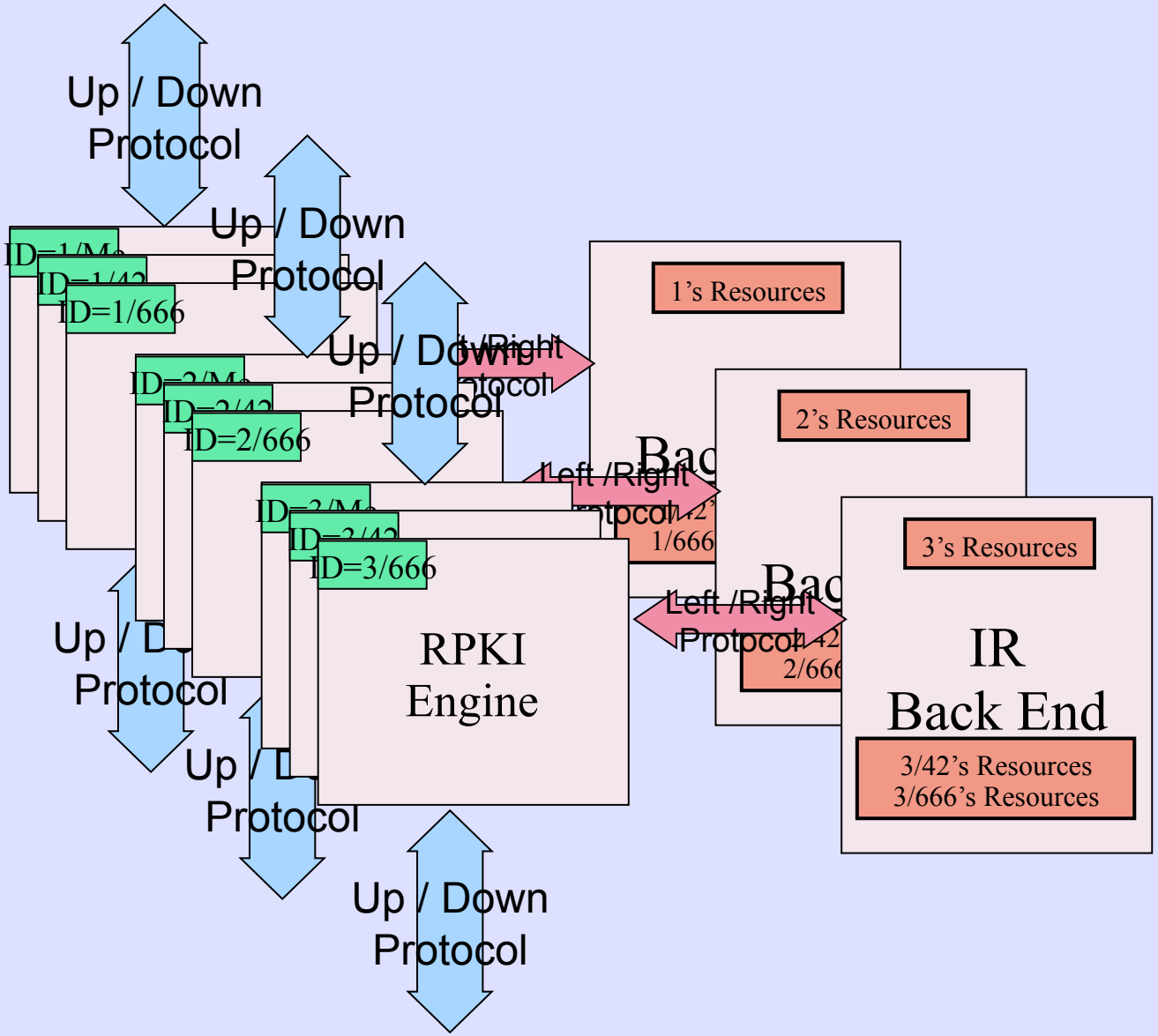
Hosting of Stub Children

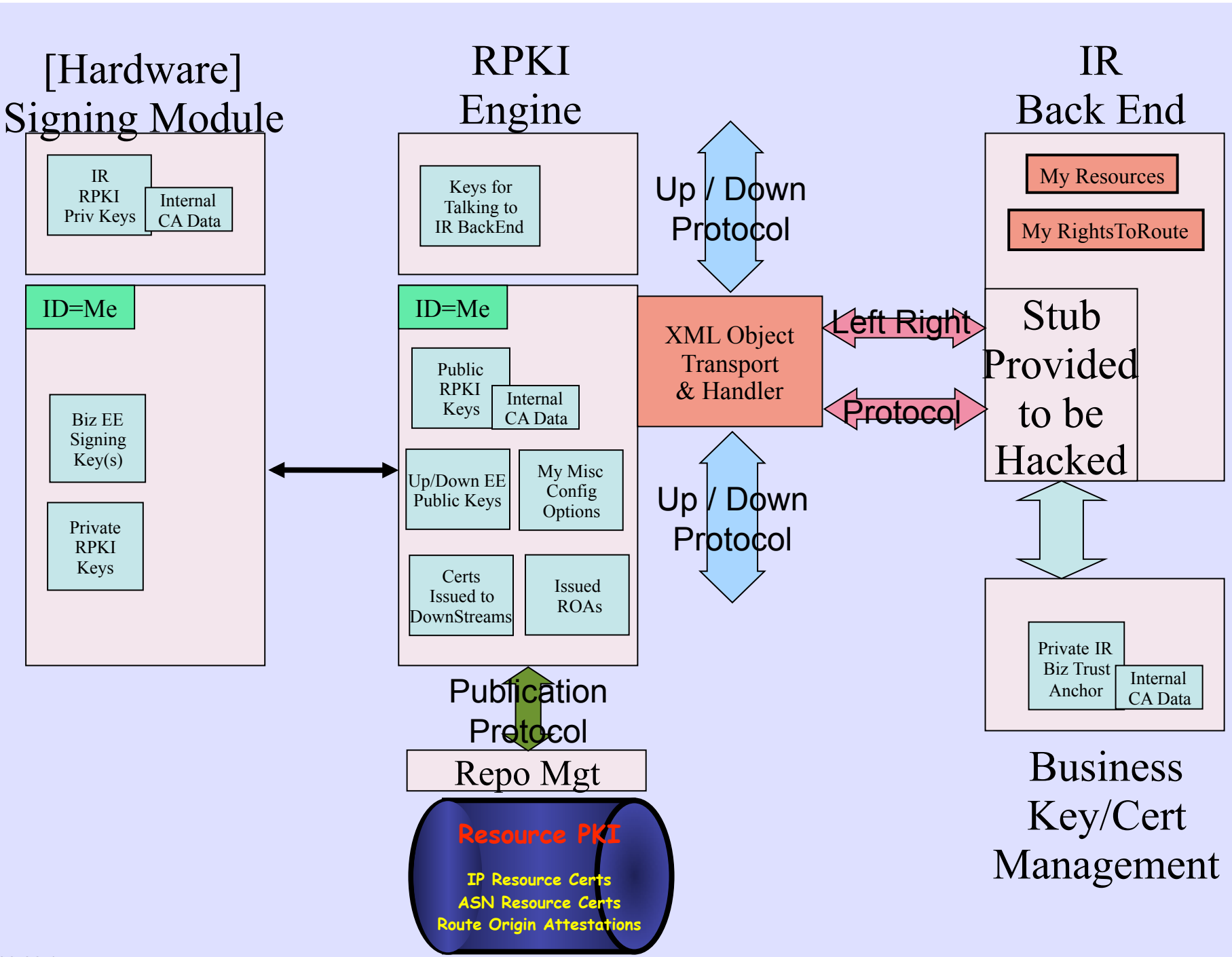


Hosting of a Sub-Allocator



Hosting of many Sub-Allocators



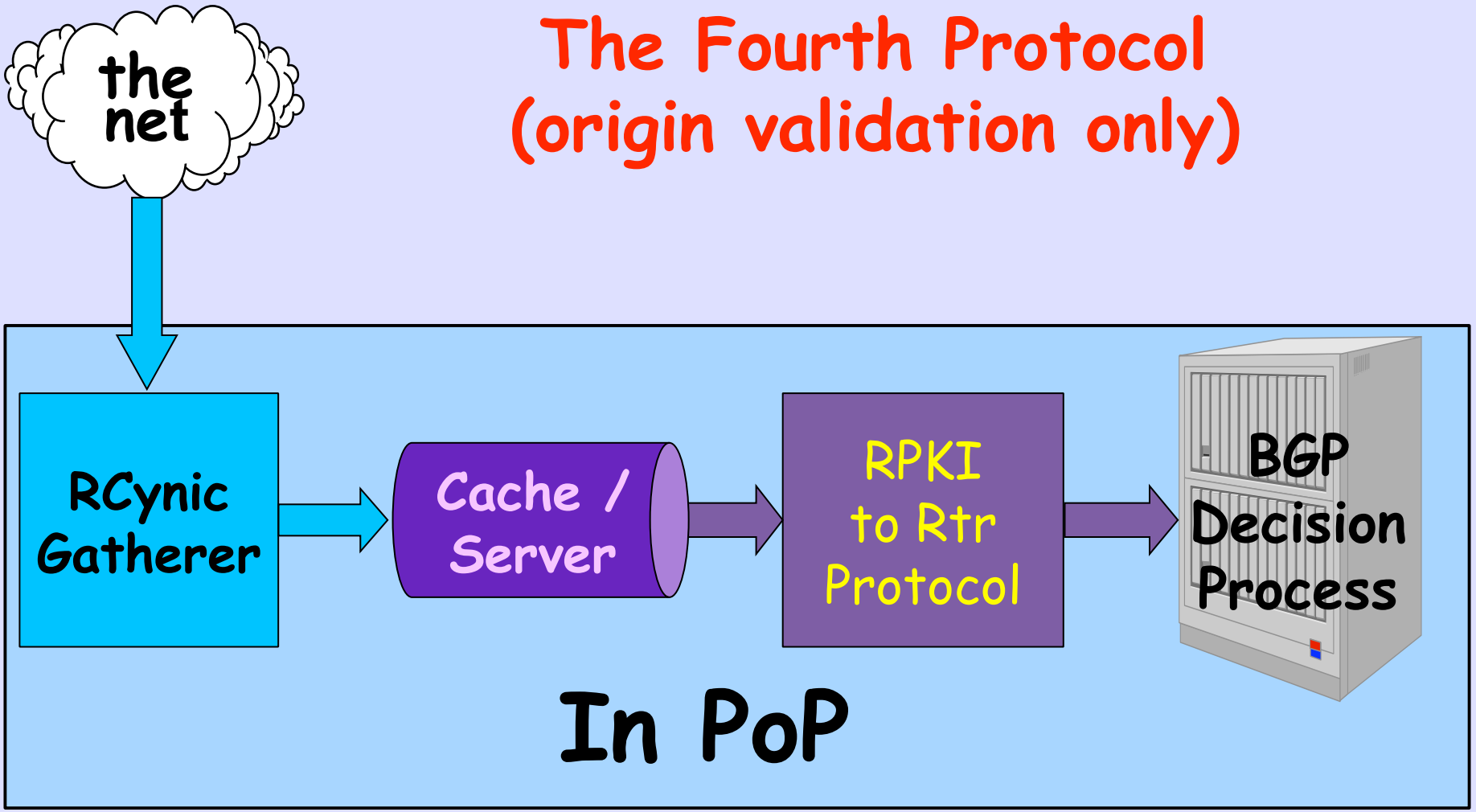

[Hardware]
Signing Module
IR
RPKI
Priv Keys
Internal
CA Data
ID=Me
Biz EE
Signing
Key(s)
Private
RPKI
Keys
RPKI
Engine
Keys for
Talking to
IR BackEnd
ID=Me
Public
RPKI
Keys
Internal
CA Data
Up/Down EE
Public Keys
My Misc
Config
Options
Certs
Issued to
DownStreams
Issued
ROAs
Up / Down
Protocol
XML Object
Transport
& Handler
Up / Down
Protocol
Left Right
Protocol
IR
Back End
My Resources
My RightsToRoute
Stub
Provided
to be
Hacked
Private IR
Biz Trust
Anchor
Internal
CA Data
Business
Key/Cert
Management
Publication
Protocol
Repo Mgt
Resource PKI
IP Resource Certs
ASN Resource Certs
Route Origin Attestations

Origin Validation

- Prevent YouTube incident
- Prevent 7007 accident
- Prevents most accidental announcements
- Does not prevent malicious path attacks such as the Kapela/Pilosov attack
- That requires "Path Validation" and locking the data plane to the control plane, the next steps

RPKI -> Router

The Fourth Protocol
(origin validation only)



Origin Only Validation

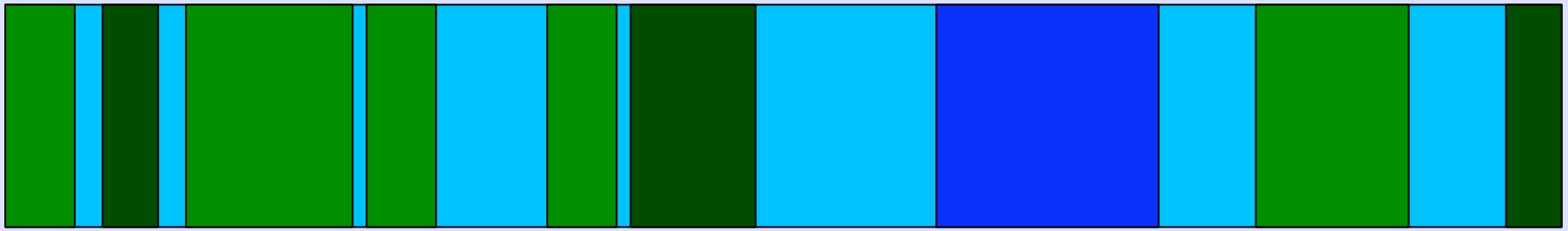
- Vendors are coding Origin Validation now
- We are exchanging clue with them
- We are doing research on estimation of compute and traffic loads
- Vendors will not do Path Validation if not first comfortable with Origin
- Need to get all vendors on board

The Contentious Bits

- Detestations / BOAs – assert that some space may not be announced by anyone
- This is not needed

- Root Trust Anchors – The RIRs demand independence from ICANN / DoC
- This is causing a technical kludge which is more open to error

Allocation in Reality



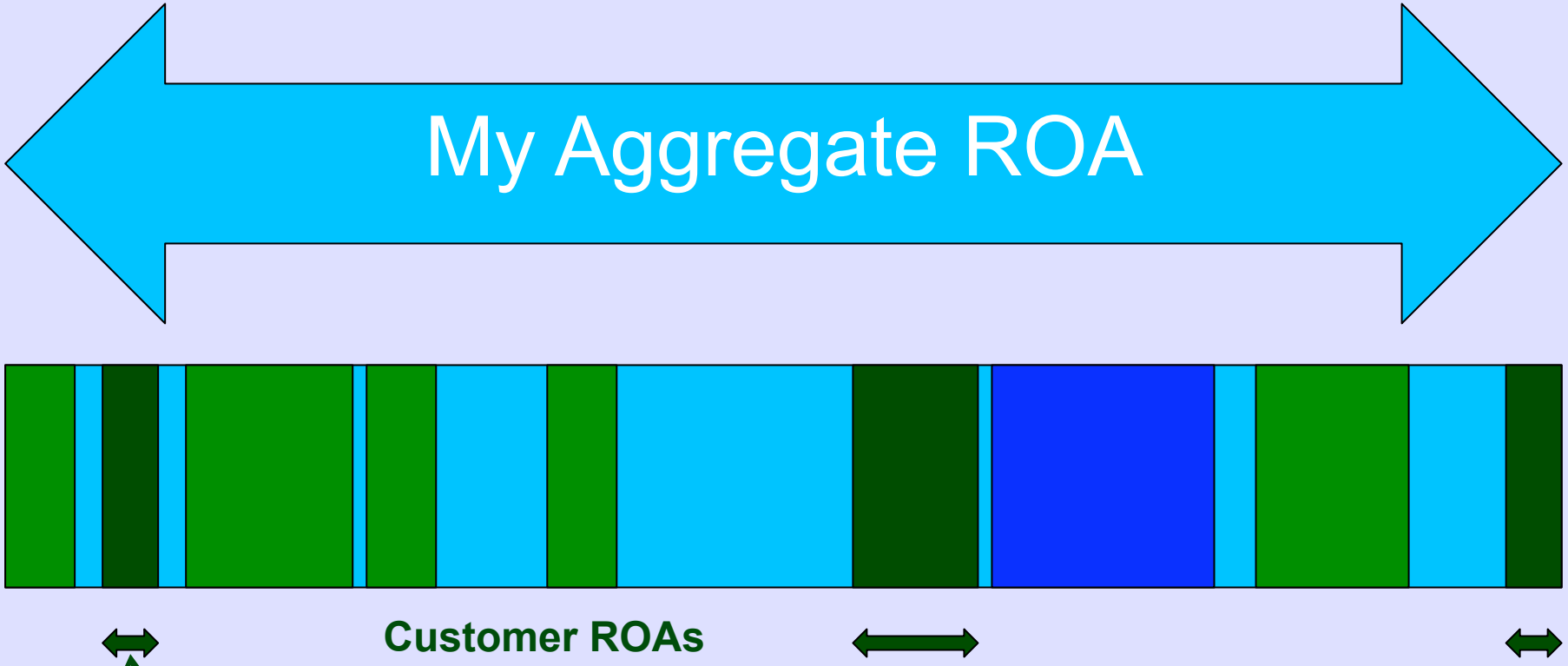
My Infrastructure

BGP Cust

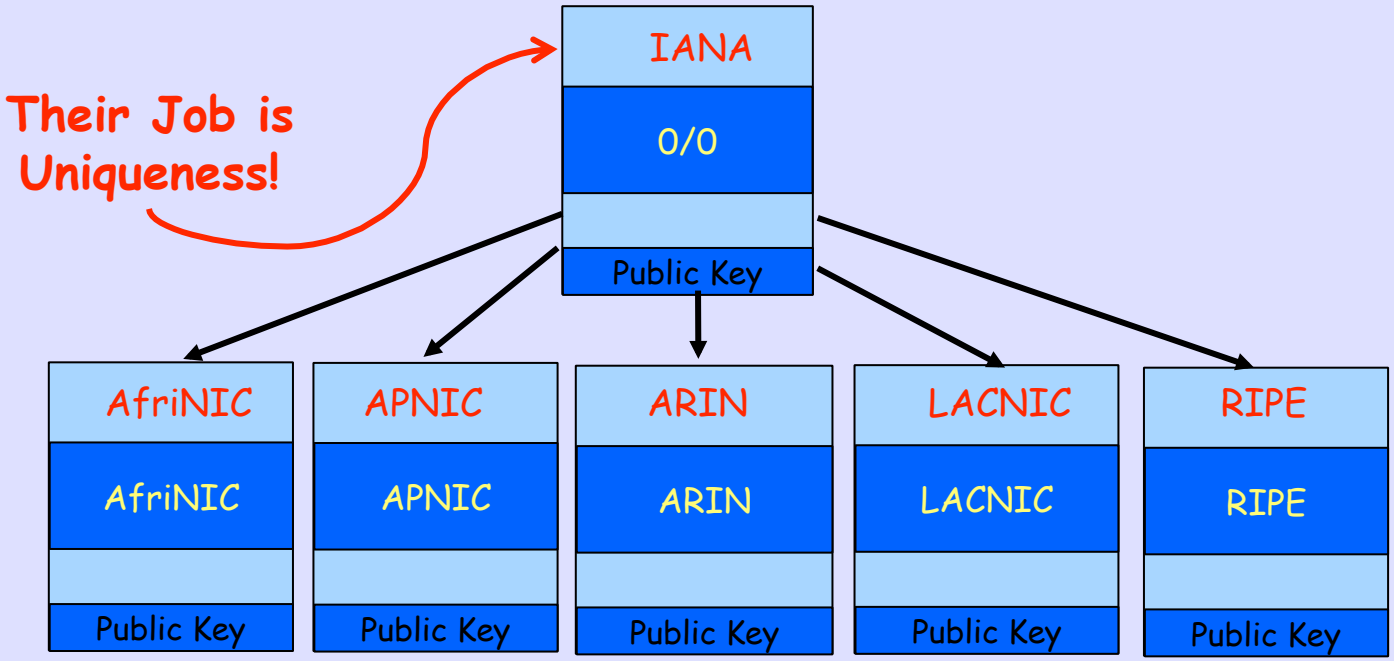
Static (non BGP) Cust

Unused

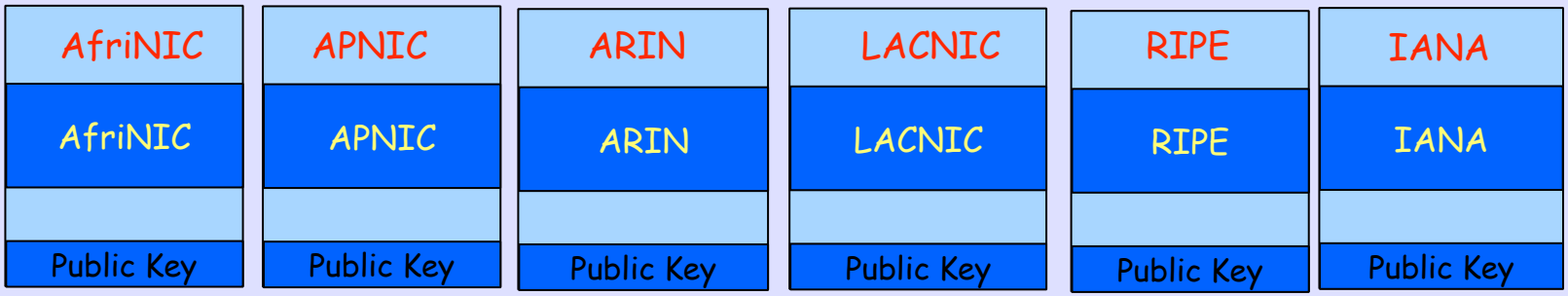
ROA Use


My Aggregate ROA
Customer ROAs
I Generate for 'Lazy' Customer
My Infrastructure
BGP Cust
Static (non BGP) Cust
Unused

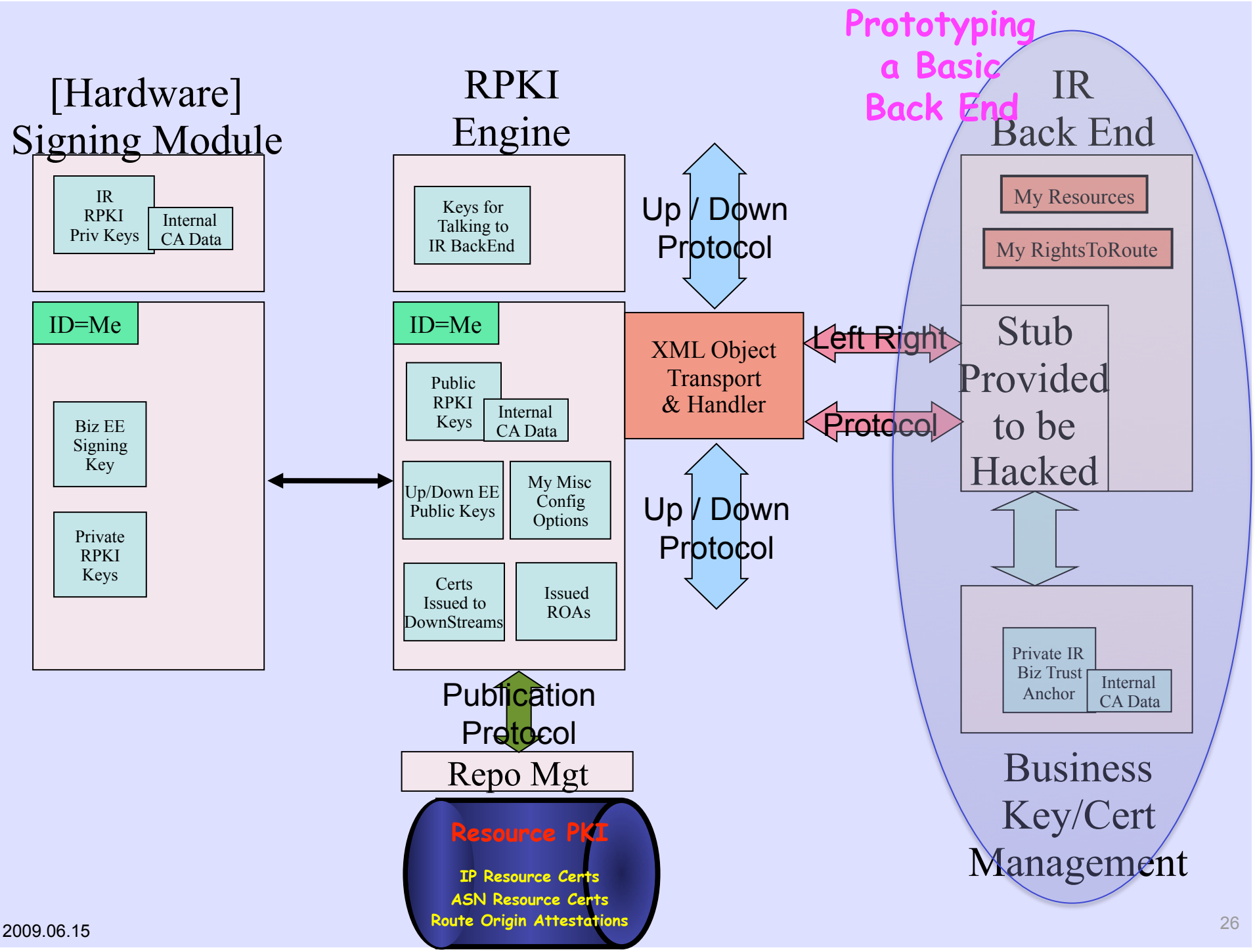
Single Trust Anchor



Multiple Trust Anchors



Highly Vulnerable to Overlap and Gaps


Prototyping a Basic Back End
[Hardware] Signing Module
IR RPKI Priv Keys
Internal CA Data
ID=Me
Biz EE Signing Key
Private RPKI Keys
RPKI Engine
Keys for Talking to IR BackEnd
ID=Me
Public RPKI Keys
Internal CA Data
Up/Down EE Public Keys
My Misc Config Options
Certs Issued to DownStreams
Issued ROAs
Up / Down Protocol
XML Object Transport & Handler
Left Right
Protocol
Up / Down Protocol
IR Back End
My Resources
My RightsToRoute
Stub Provided to be Hacked
Private IR Biz Trust Anchor
Internal CA Data
Business Key/Cert Management
Publication Protocol
Repo Mgt
Resource PKI
IP Resource Certs
ASN Resource Certs
Route Origin Attestations

Work Supported By

DHS / ARO / ARL Contract
W911NF-05-C-0113

Internet Initiative Japan

ARIN