

Quality of Service - Latest Developments in the Routing Industry

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Agenda

- Global Perspective
 - The Infranet Initiative
- Industry highlights in the area of QoS
 - Routing mechanisms under development
 - MPLS DS-TE
 - MPLS Multicast
 - Inter-domain TE
 - Service Signaling examples
 - Enterprise Infranet Controller
 - Service Signaling with SDX-300

The Infranet Standard Model

Large, Central site
Enterprise



Distributed,
Extended
Enterprise



Consumer
Broadband

CNI: Me
for artic
application
assur
require

- A single packet infrastructure for communications applications
 - Whether initiated by man or machine,
 - from anywhere to anywhere,
 - at any time,
 - with quality, security and reliability

Hosti
Resou
Aggreg



domain

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The Infranet Initiative - www.infranet.org

Executive



Working Group Participants

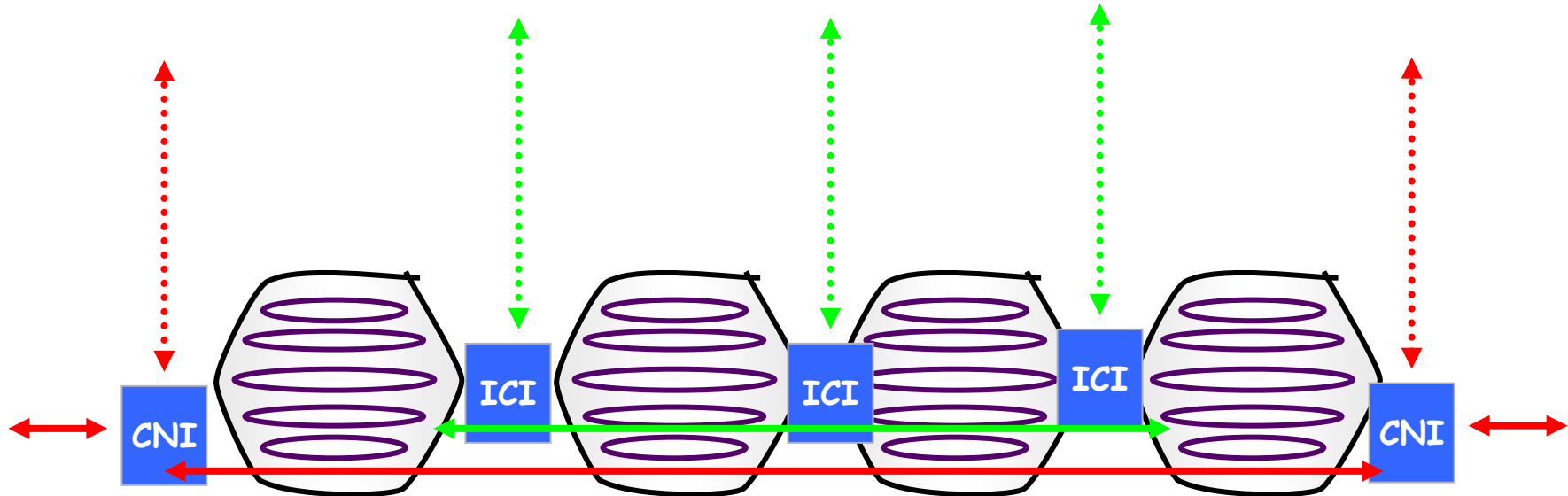


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The Infranet: "Horizontal" View

SSS : Service
Signaling Stratum

CNI protocols (red) and ICI protocols (green) may signal for service by being proxied upward into the vertical or SSS dimension, or be passed horizontally into the network.



Open interfaces pass control signaling without restriction or handling. Filtered interfaces apply policy rules to control signaling being passed (can be defaulted to OPEN or CLOSED), and proxied interfaces reflect the signaling to the SSS for handling, then accept SSS responses to control the interior behavior of the network.

Advanced Routing Mechanisms for QoS

- MPLS Diff-Serv Traffic Engineering
 - Single-class E-LSP, Multi-class E-LSP, Single-class L-LSP
 - Maximum allocation model (MAM) - Russian dolls model
 - Input policies - Automatic mapping of ATM classes
 - Juniper and Lucent - Cisco
- Multicast MPLS
 - Video Distribution in NGN Networks (deployments today)
 - Multicast over L2 and L3 VPNs, and over VPLS
 - P2MP LSPs: Multicast with all the benefits of
 - Traffic Engineering of Multicast Trees
 - Path Protection of Multicast Trees
 - Work in progress
 - draft-raggarwa-l3vpn-mvpn-vpls-mcast-xx.txt
 - draft-ietf-mpls-rsvp-te-p2mp-xx.txt
 - draft-ietf-mpls-p2mp-requirement-xx.txt
 - draft-to-become-l3vpn-2547bis-mcast-xx.txt
 - draft-raggarwa-l2vpn-vpls-mcast-xx.txt

Advanced Routing Mechanisms for QoS

Juniper Roadmap for Inter-Domain TE

PCE for path computation

Follow standard specification
PCE for Inter-area TE LSPs

Inter-AS TE solution

Inter-AS MPLS TE,
Other Improvements

Inter-AS MPLS TE applications
Policies, mappings, SLAs
Inter-AS TE Routing (ASBR-ASBR link),
Explore improvements - **dynamic FAs**

Inter-area TE solution ready

Inter-area
MPLS TE

Start with **inter-area TE**
Inter-domain TE routing - determining exit LSR from the domain
Per-domain path computation with **loose-hop expansion**
Additional inter-domain signaling functionalities, if any

LSP
Hierarchy

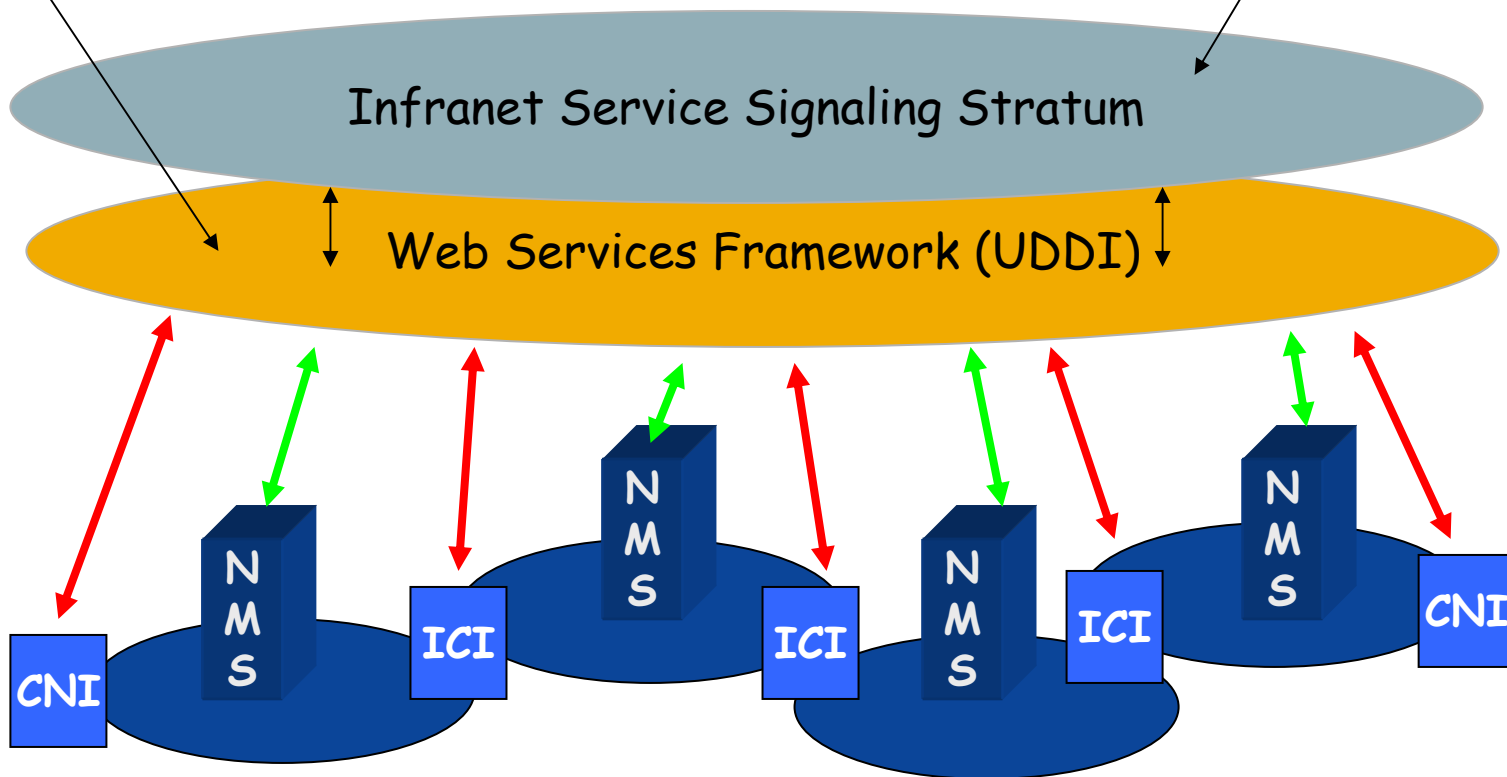
Nesting e2e LSPs into pre-provisioned FA LSPs
Scalability of control and data plane
Re-optimization and protection (**FRR**) of e2e LSPs over FA-LSP
Base for **inter-domain signaling**

The Infranet: "Vertical" View

UDDI : Universal Descriptor
Discovery & Integration
SOA: Service Oriented
Architecture

W3C and WS/SOA Standard Syntax

IIC Standard Messages



↔ = Standard NMS/TMN protocols, LDAP ↔ = Policy Protocols, COPS

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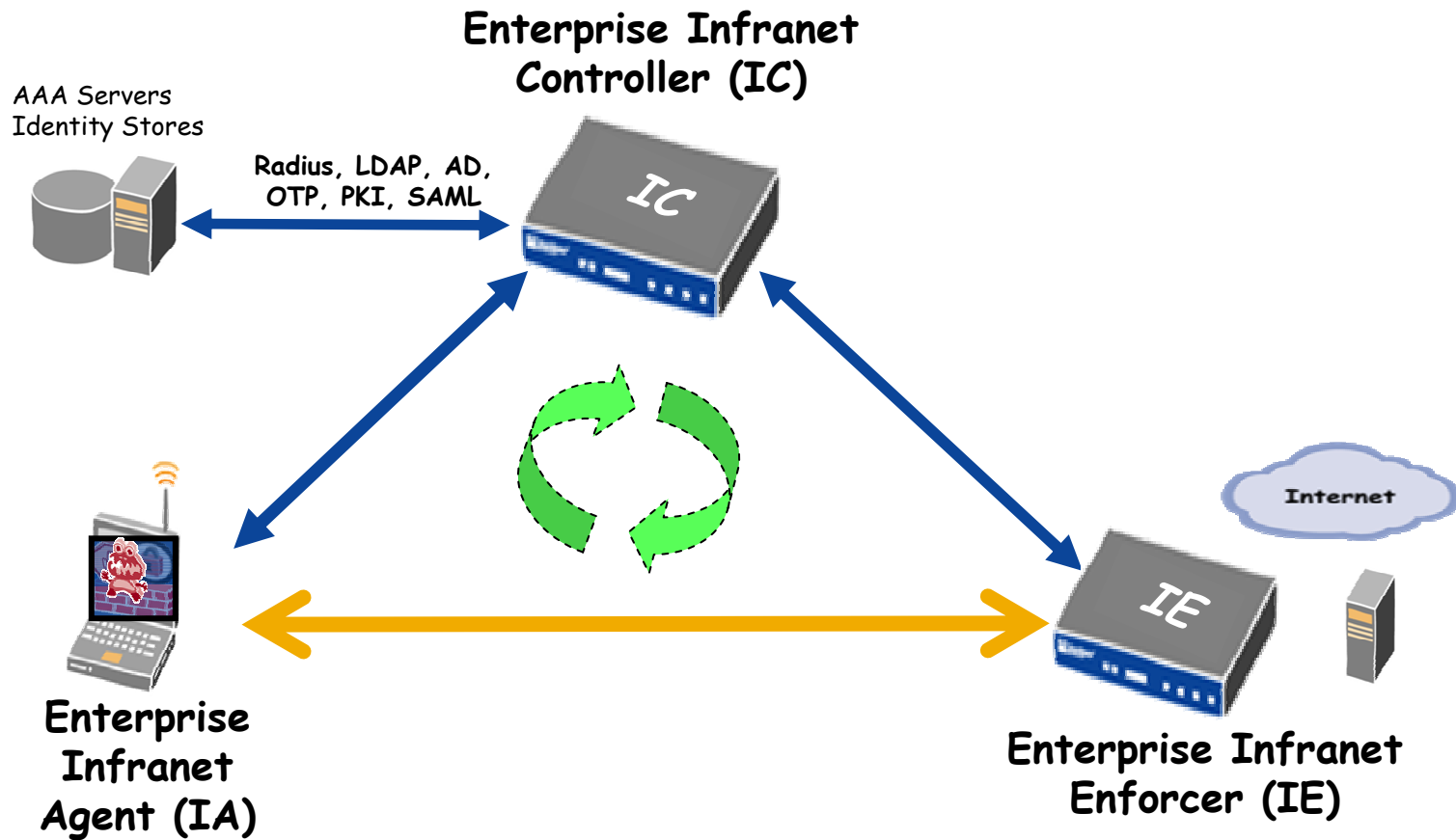
Enterprise Infranet - Extended Enterprise



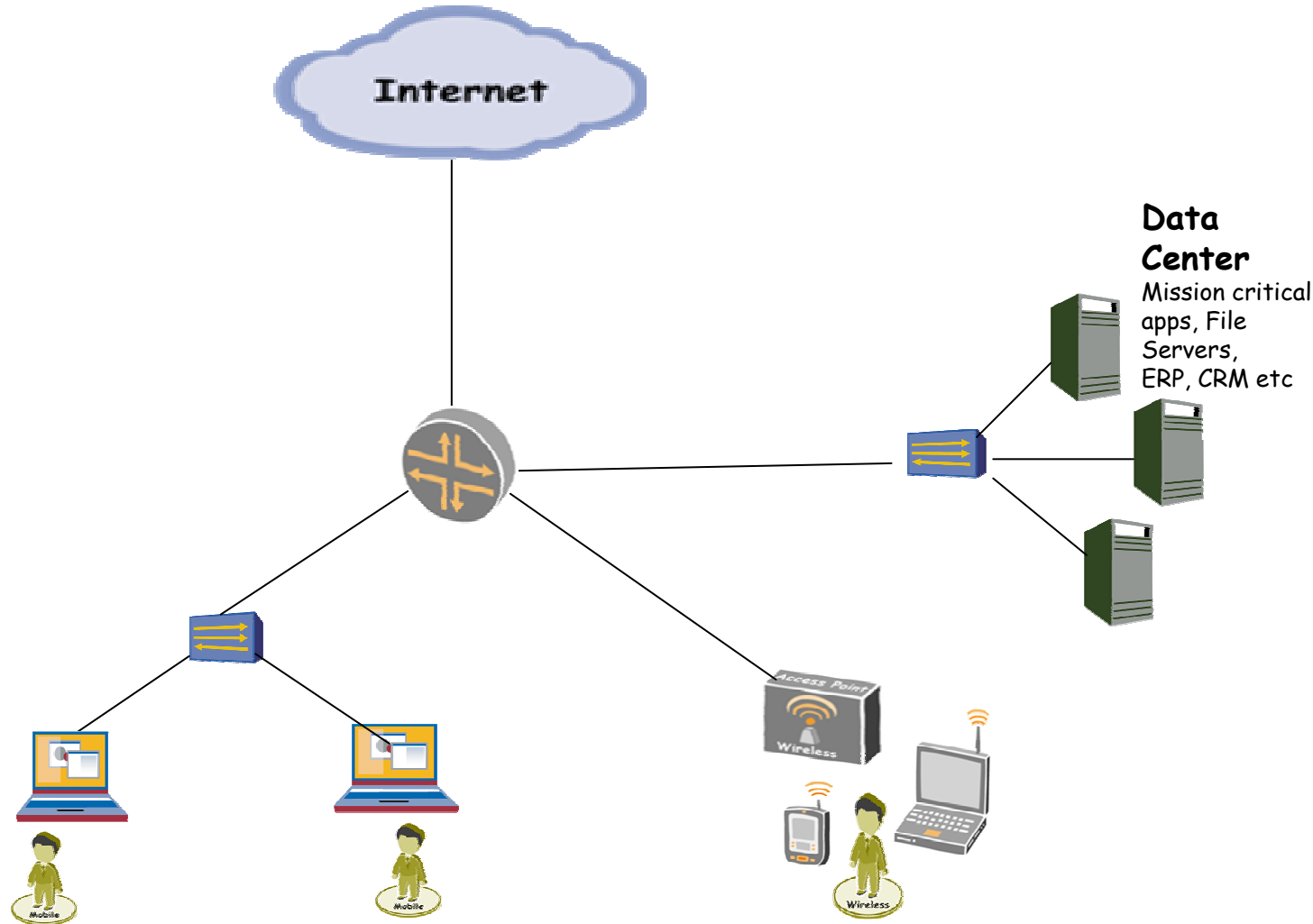
JEDI: Juniper Endpoint Defense Initiative

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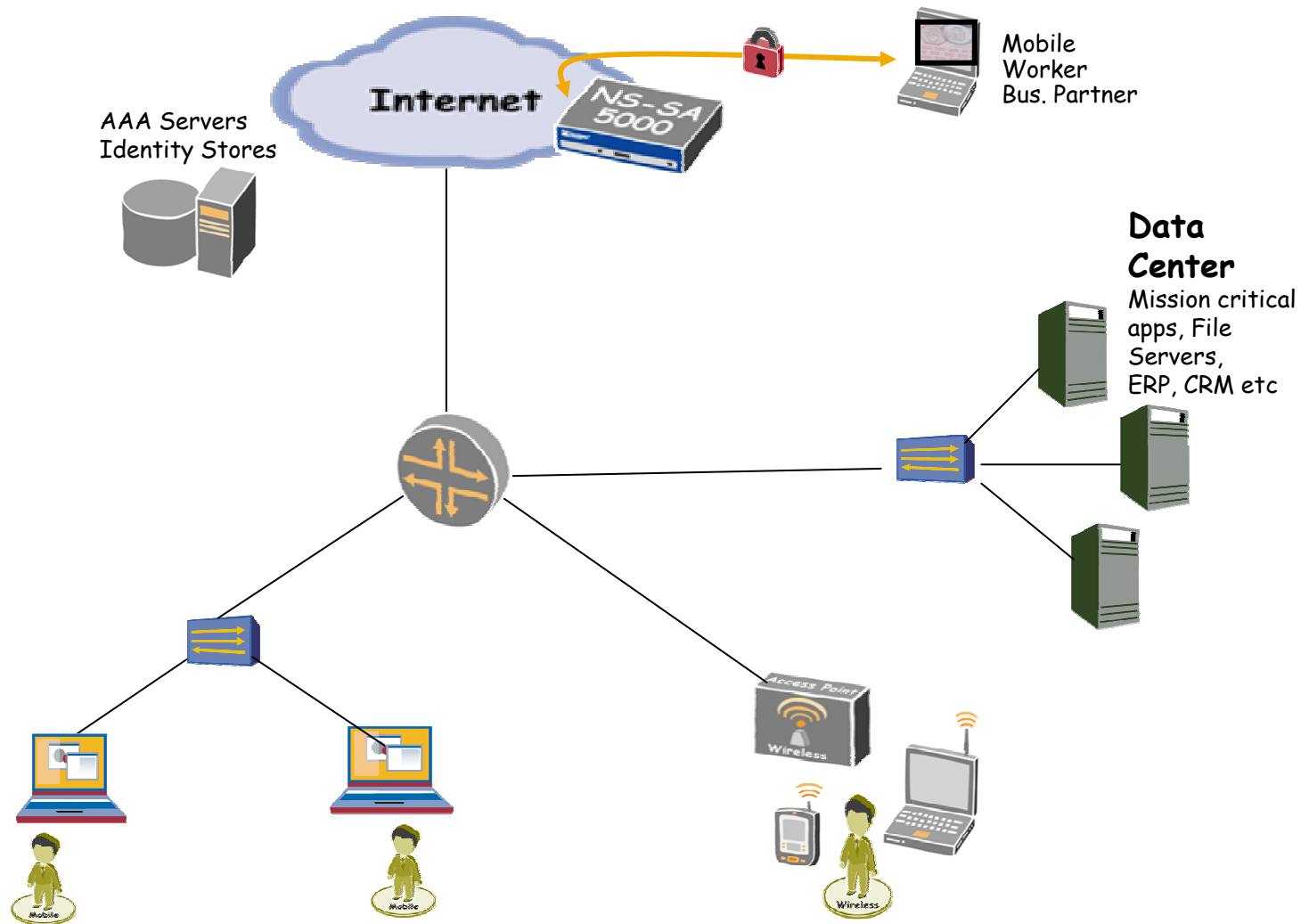
Enterprise Infranet Service Control Layer Components



Enterprise Intranet Service Control Layer Deployment Scenarios

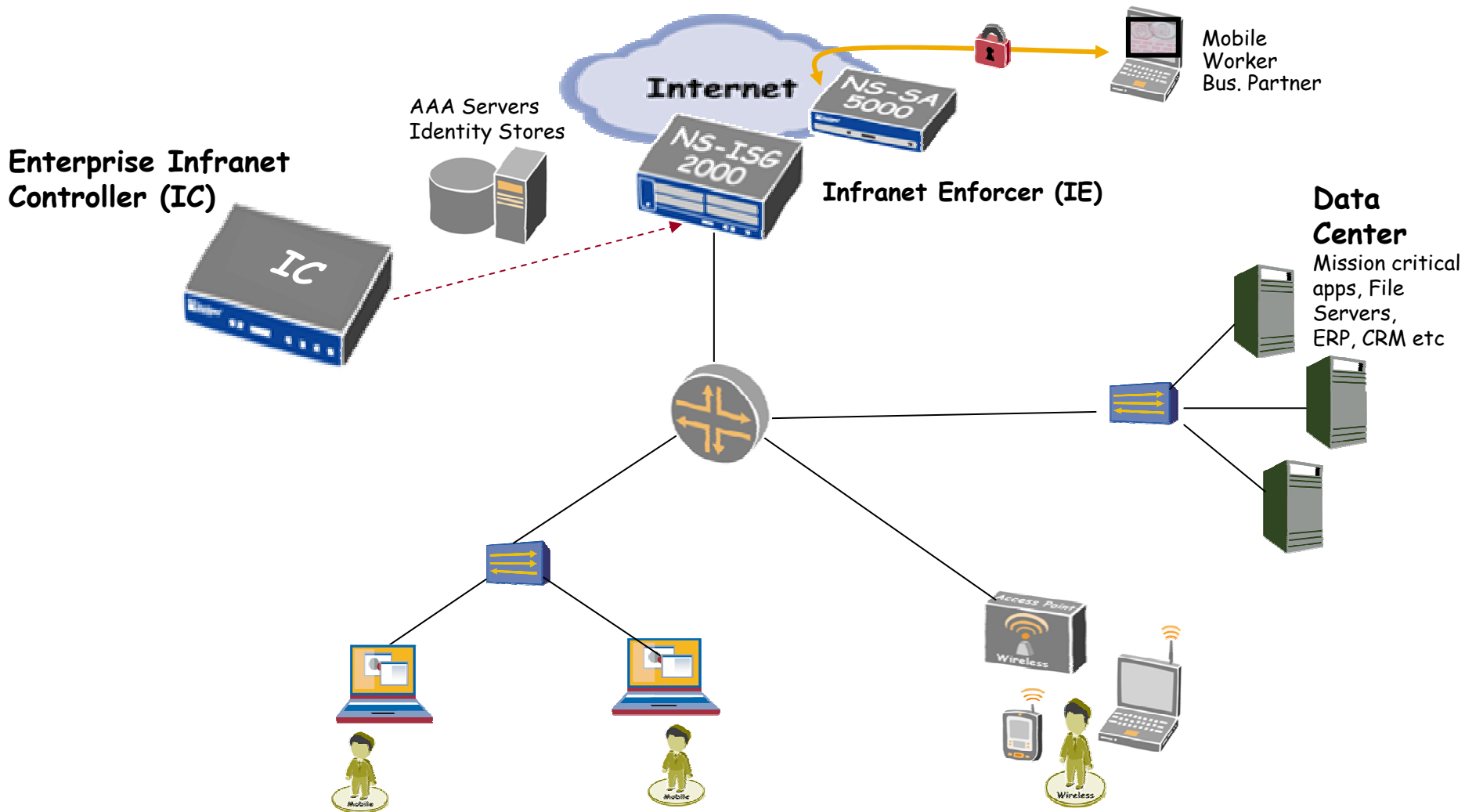


Enterprise Intranet Service Control Layer Deployment Scenarios



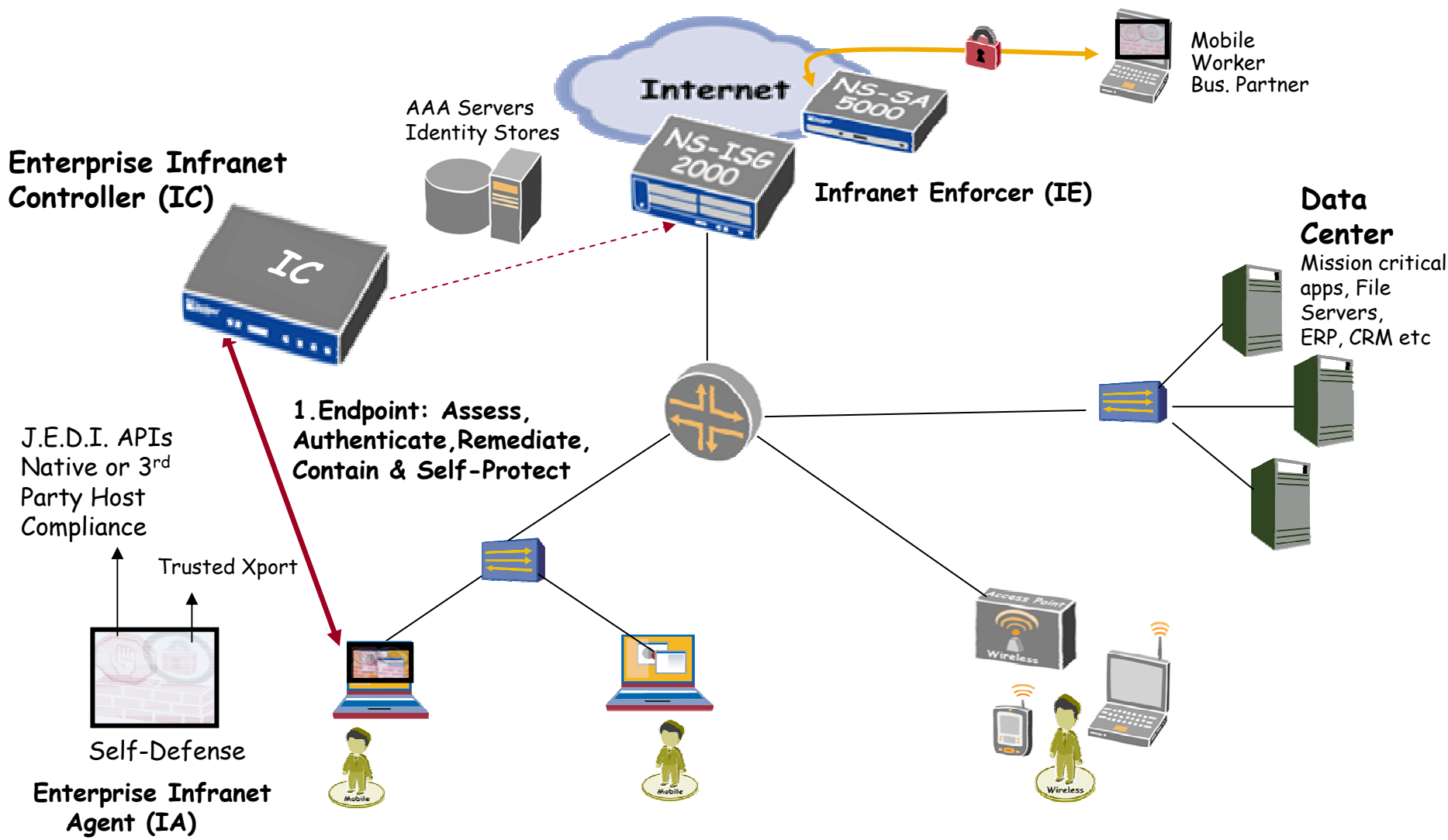
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Enterprise Infranet Service Control Layer Deployment Scenarios

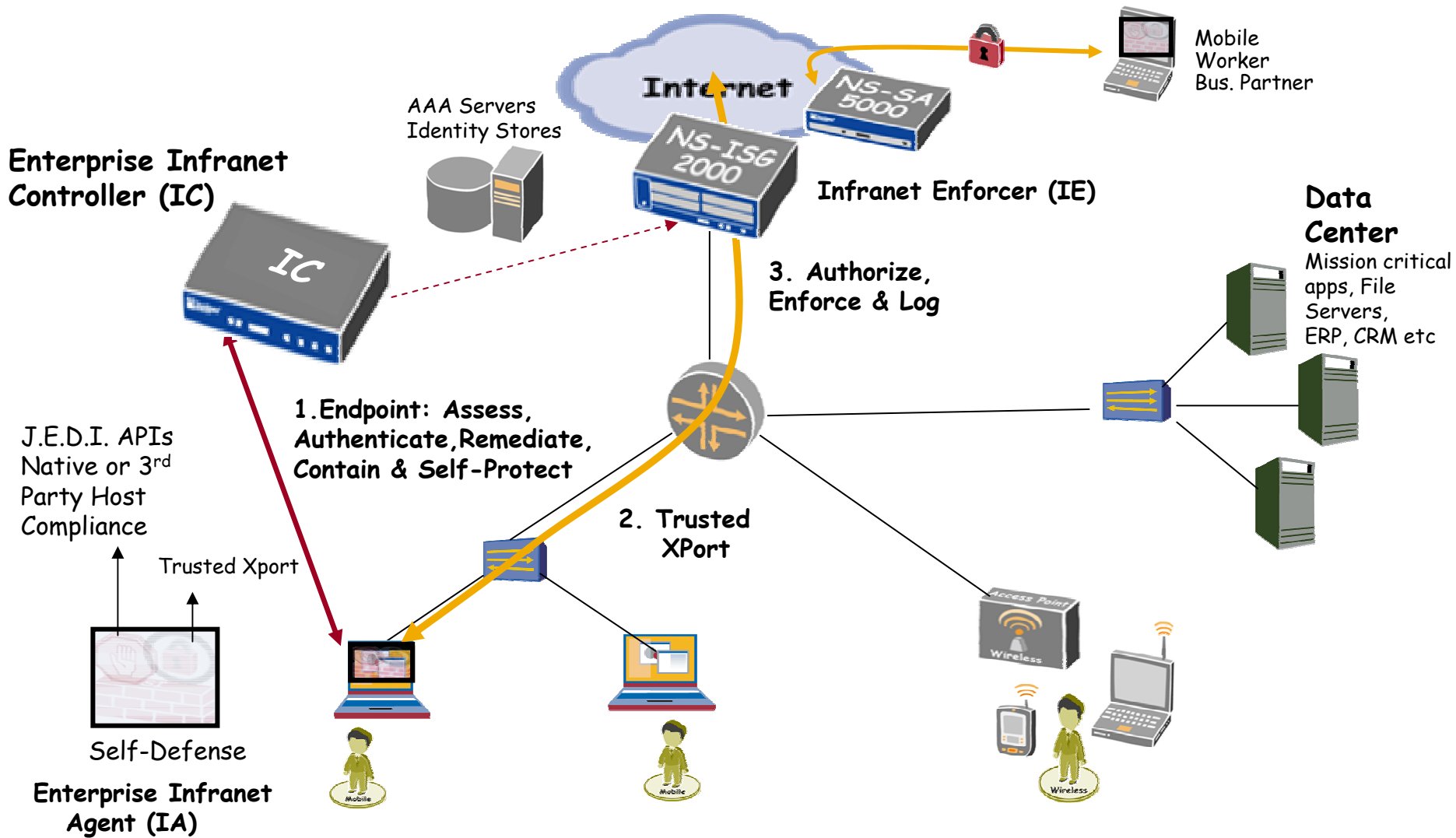


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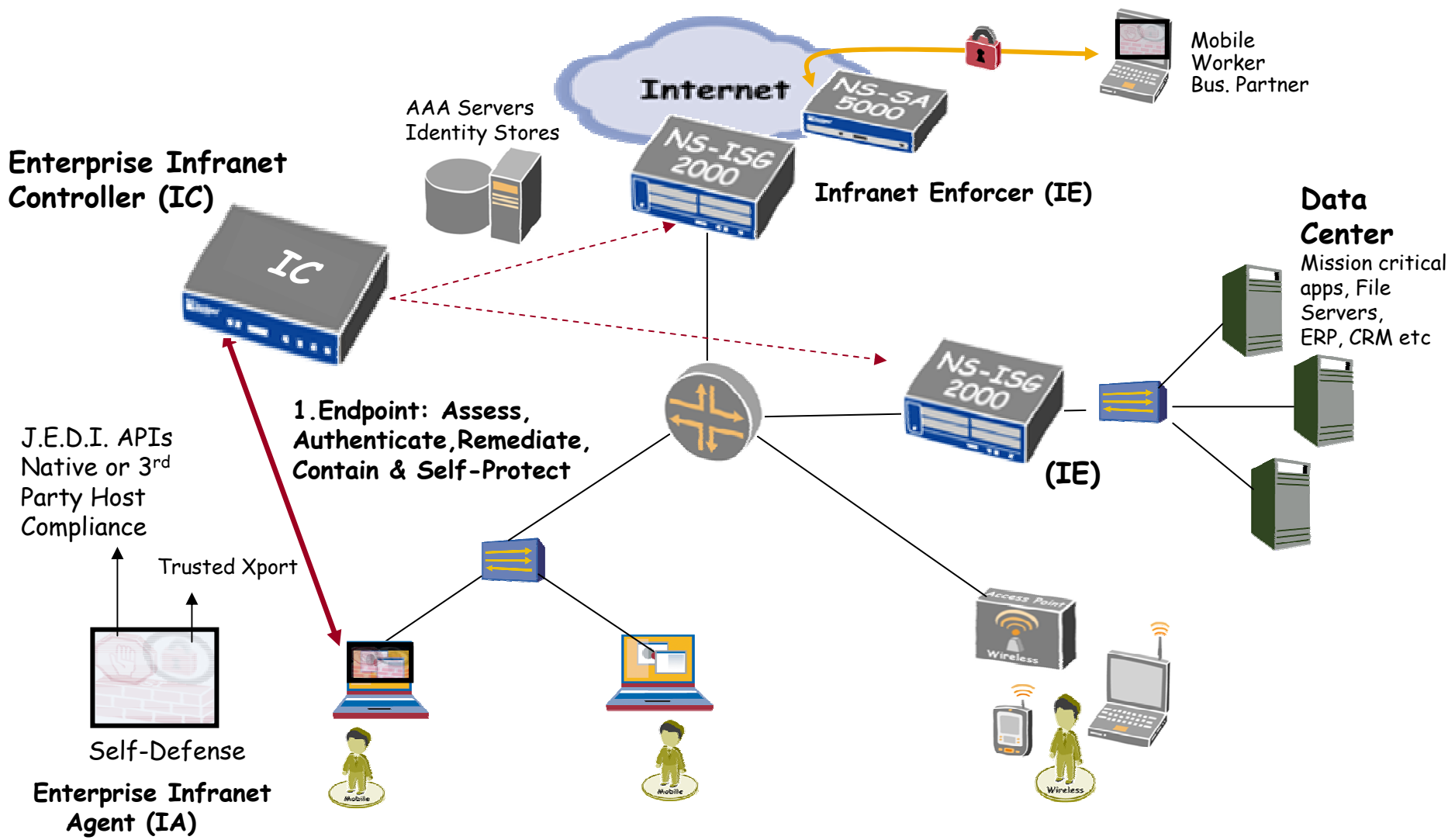
Enterprise Intranet Service Control Layer Deployment Scenarios



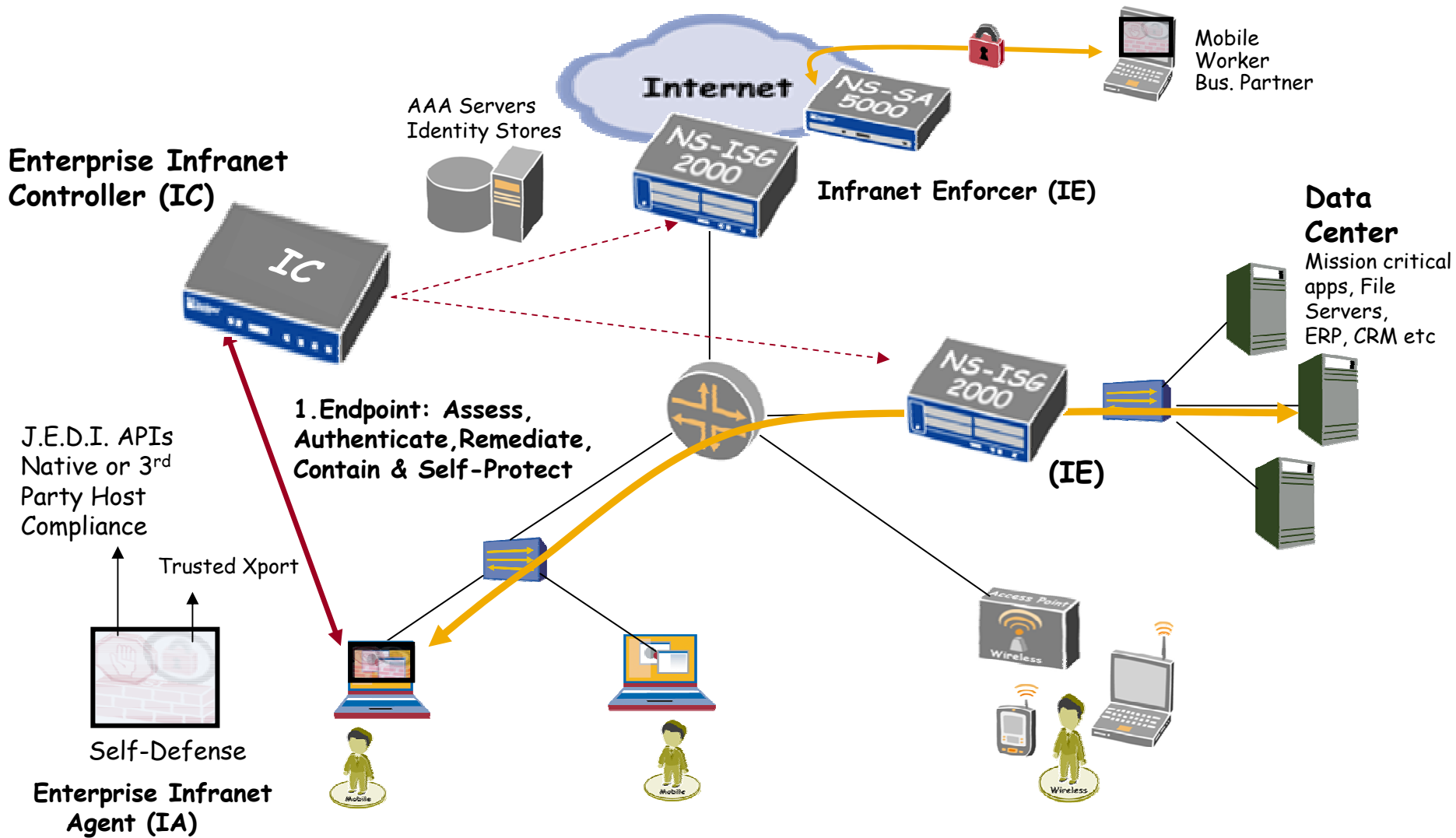
Enterprise Intranet Service Control Layer Deployment Scenarios



Enterprise Infranet Service Control Layer Deployment Scenarios

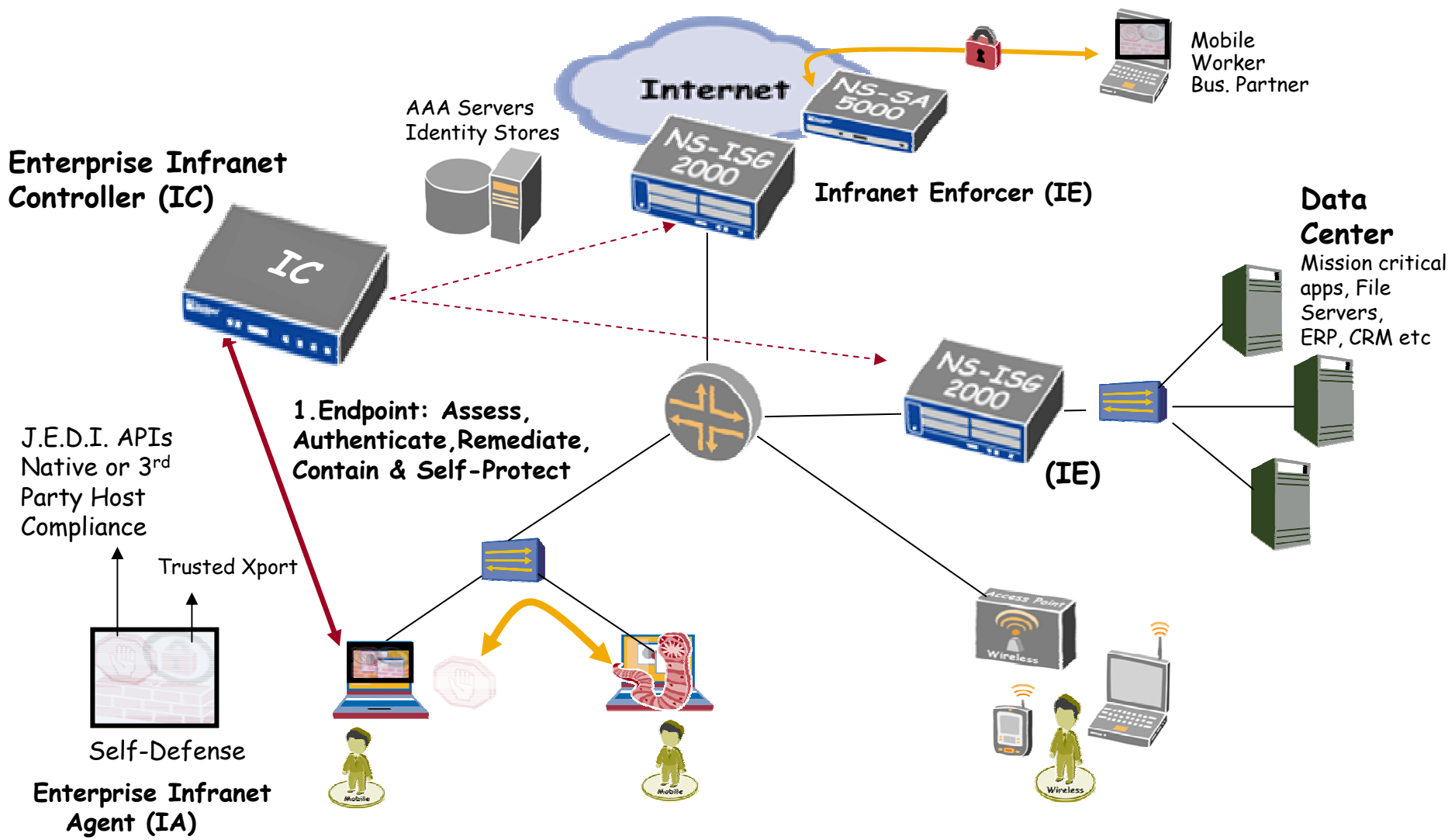


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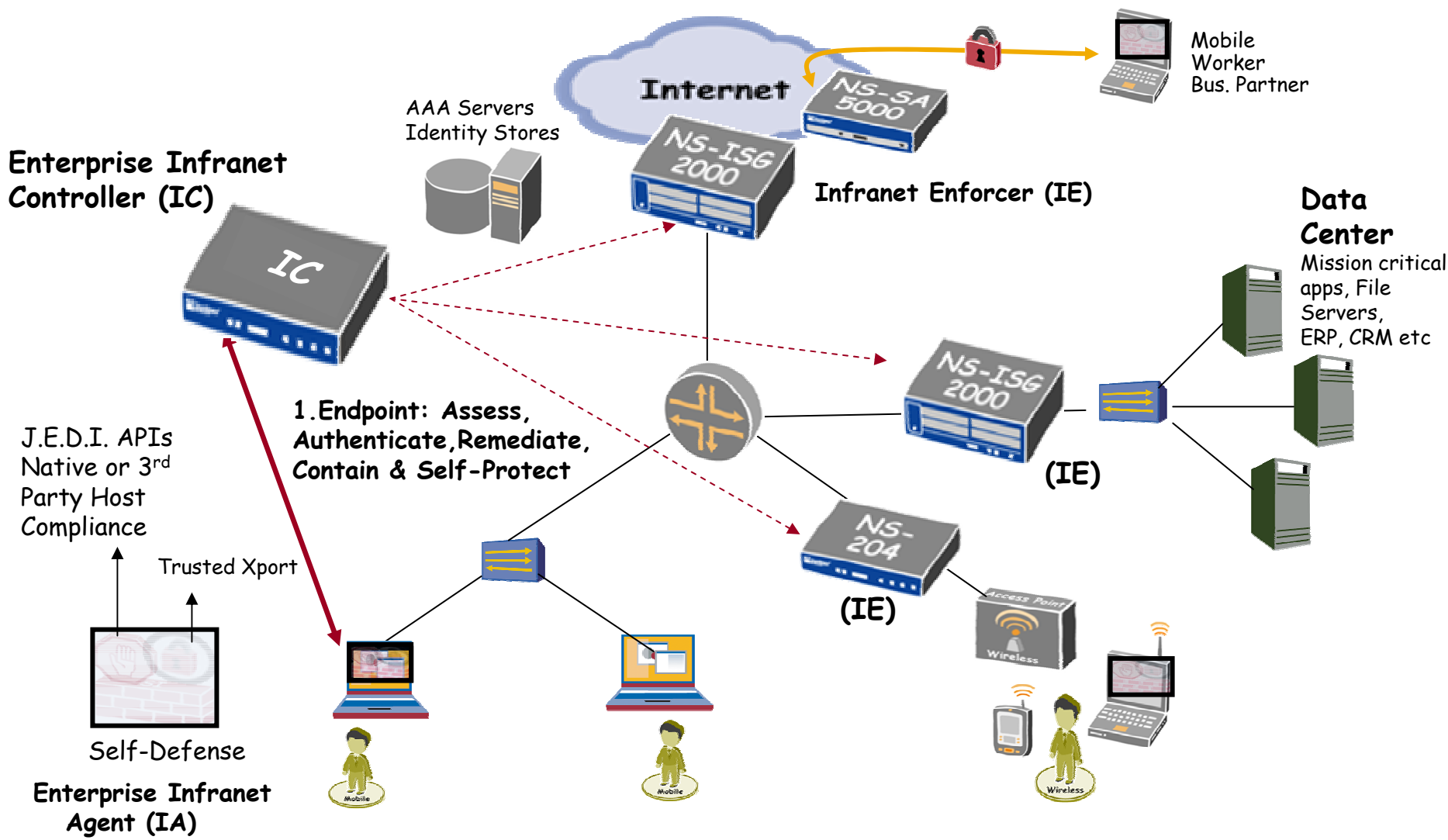


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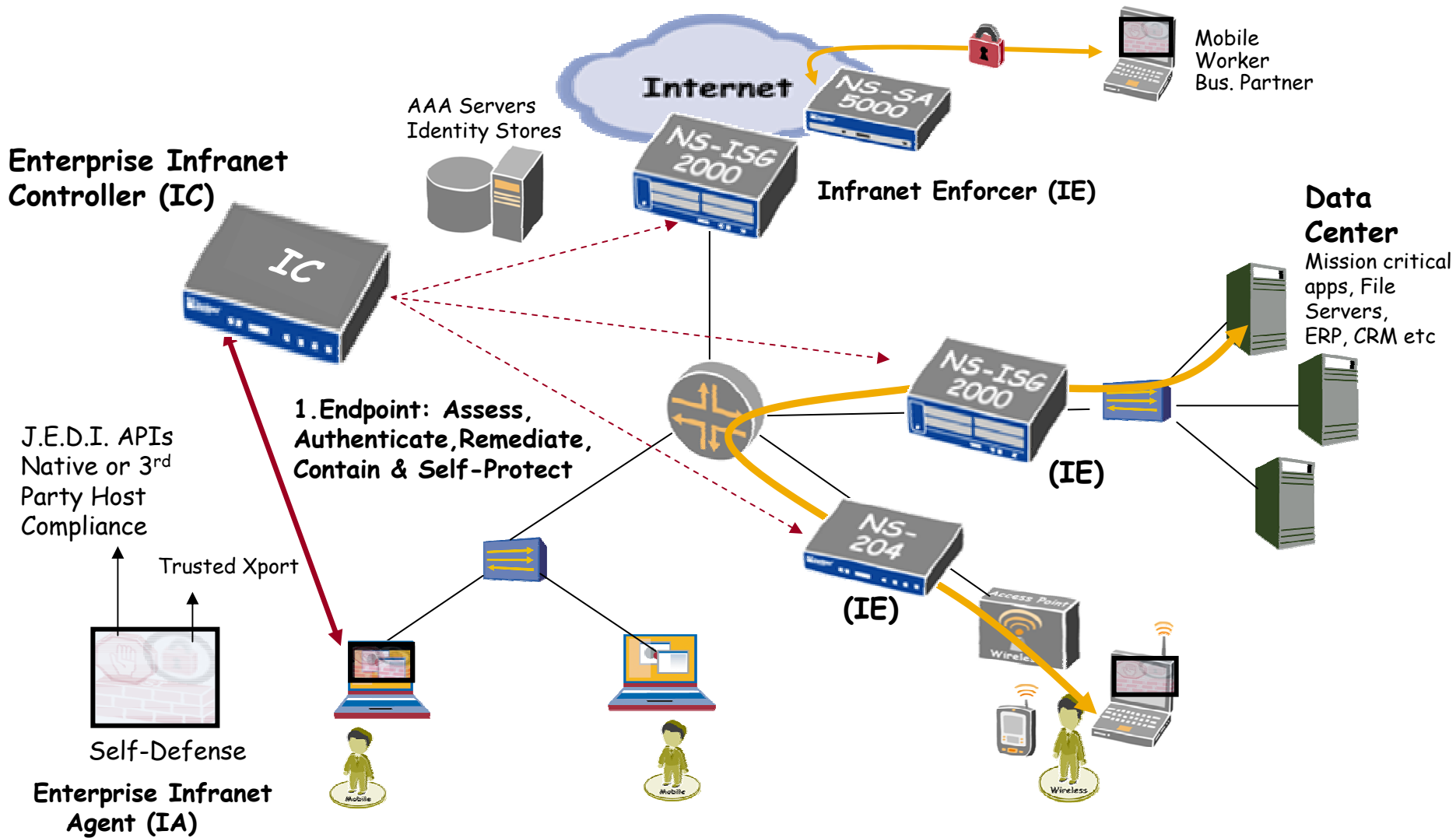
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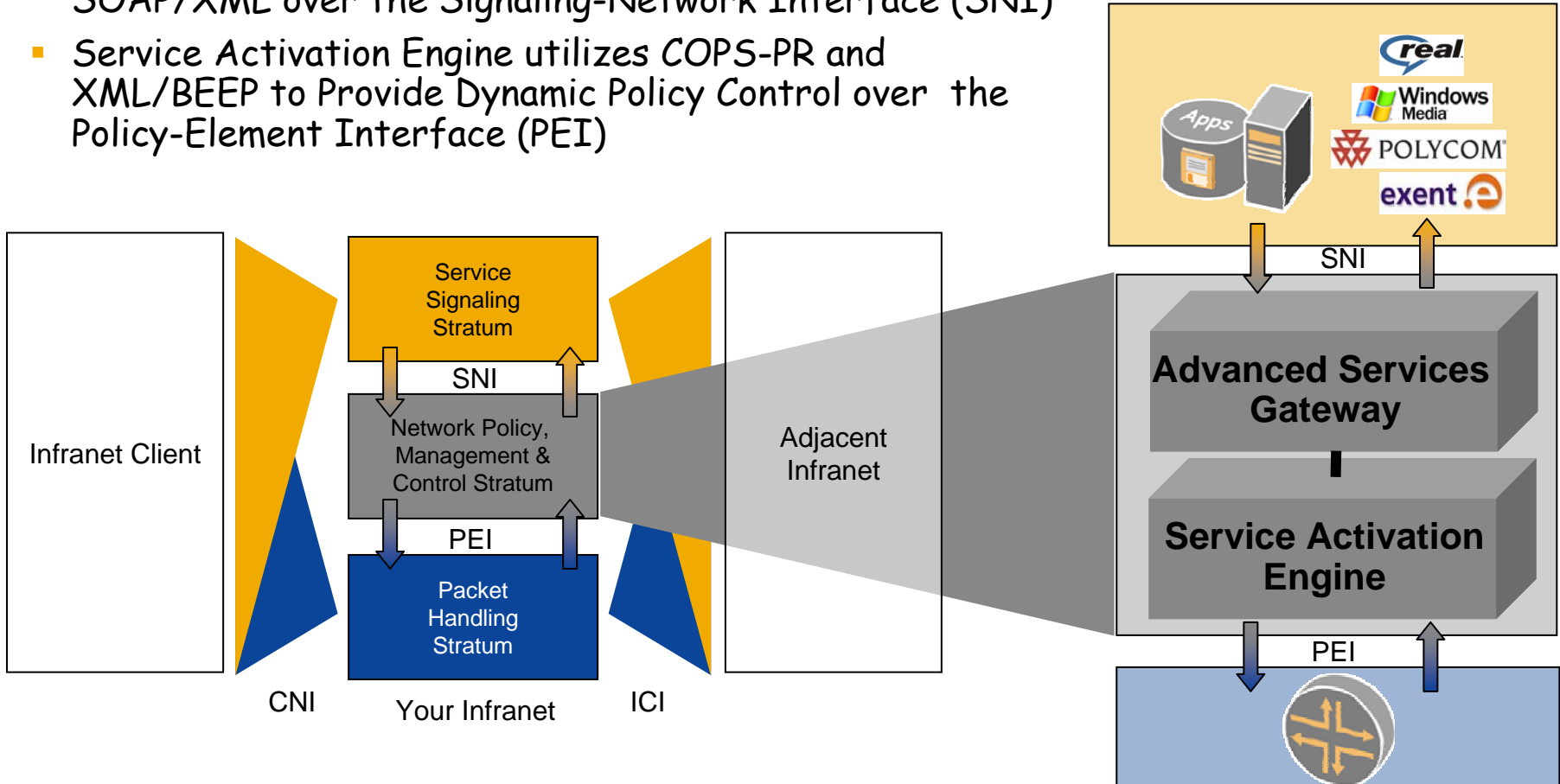


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SDX & The Infranet Architecture

A Pragmatic First Step Towards the True Infranet Model

- SDX Components fit in at the Policy & Control Stratum
- ASG provides a Web Services Signaling Interface via SOAP/XML over the Signaling-Network Interface (SNI)
- Service Activation Engine utilizes COPS-PR and XML/BEEP to Provide Dynamic Policy Control over the Policy-Element Interface (PEI)

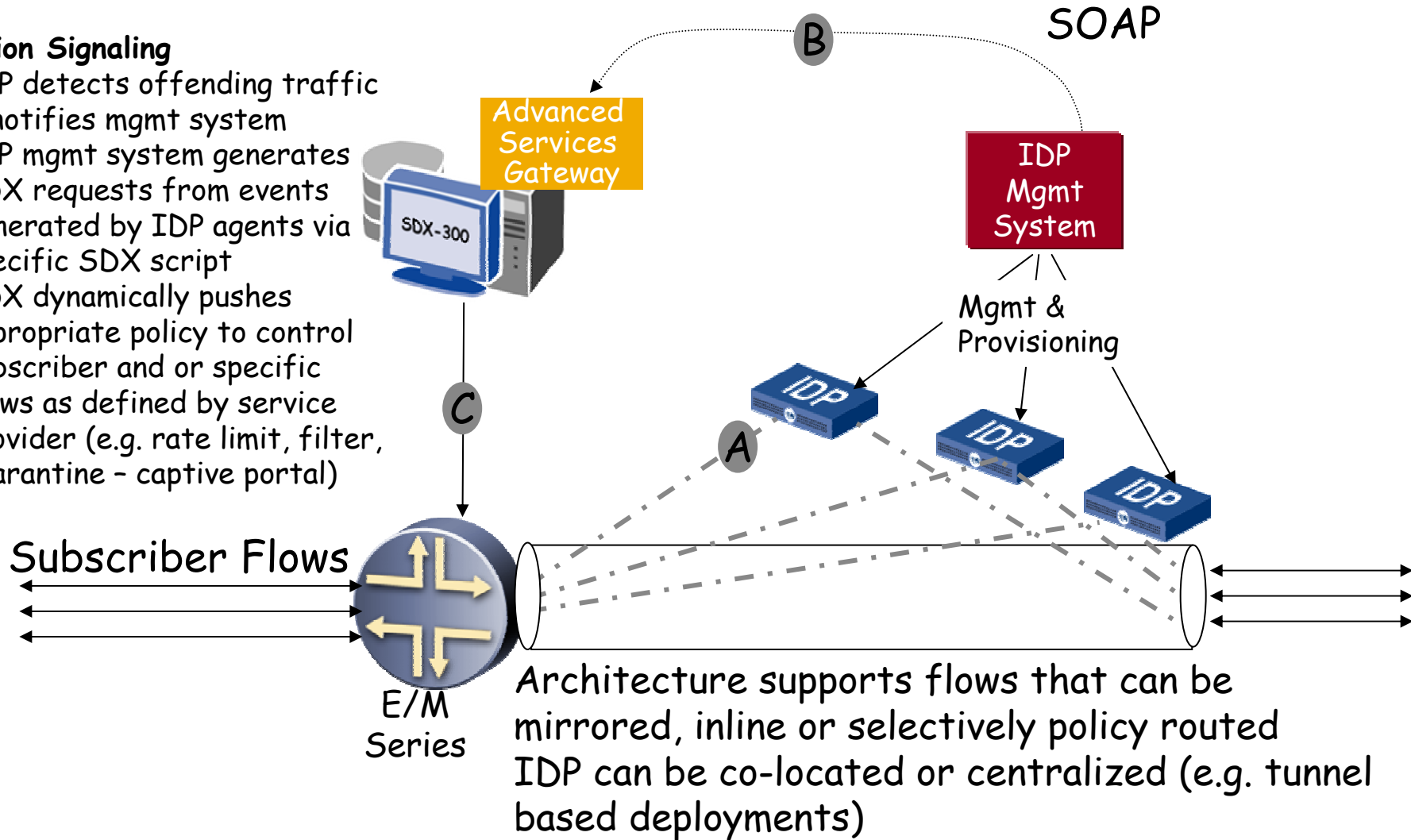


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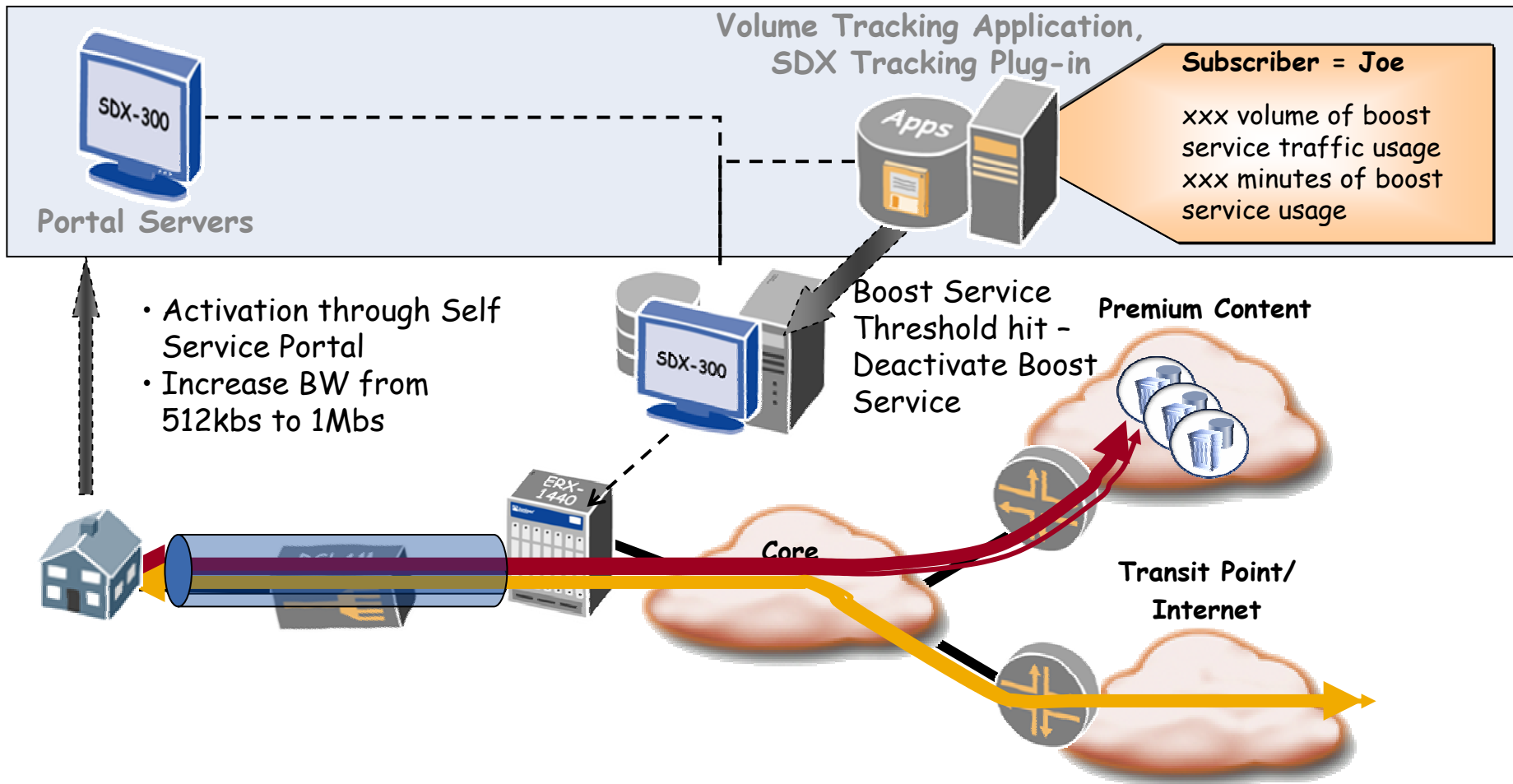
Worm/Virus Mitigation Service

Solution Signaling

- A) IDP detects offending traffic & notifies mgmt system
- B) IDP mgmt system generates SDX requests from events generated by IDP agents via specific SDX script
- C) SDX dynamically pushes appropriate policy to control subscriber and or specific flows as defined by service provider (e.g. rate limit, filter, quarantine - captive portal)



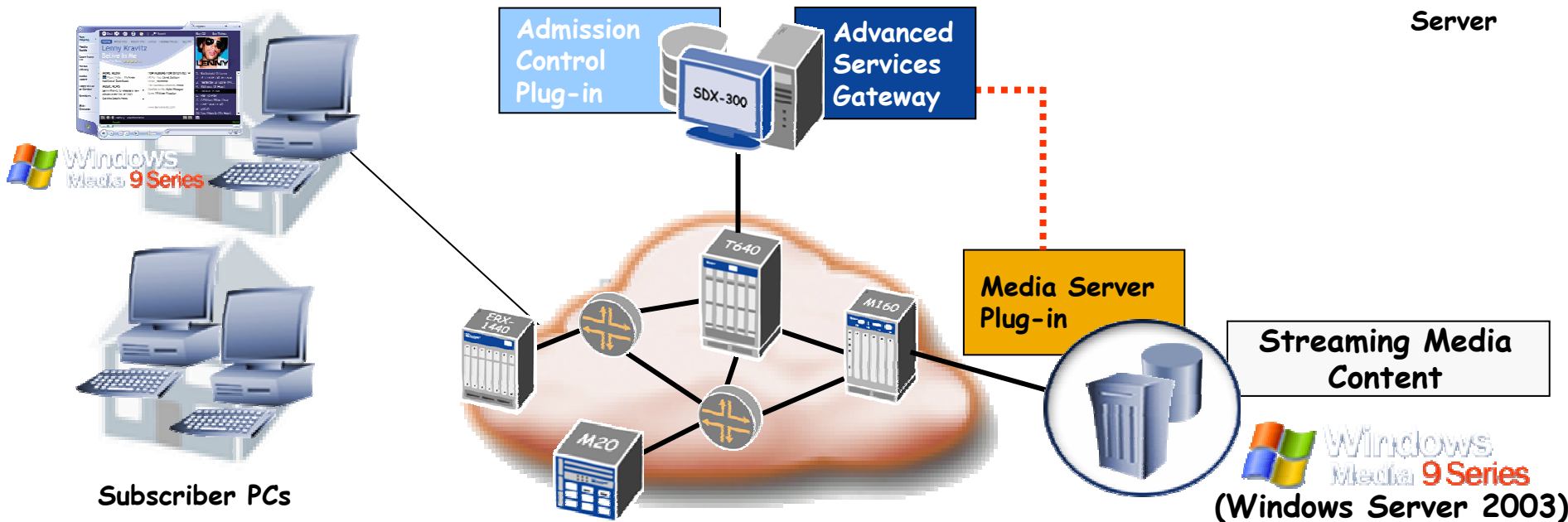
Internet Boost Service Architecture



Solution: Streaming Media Microsoft Windows Media Series

Helix

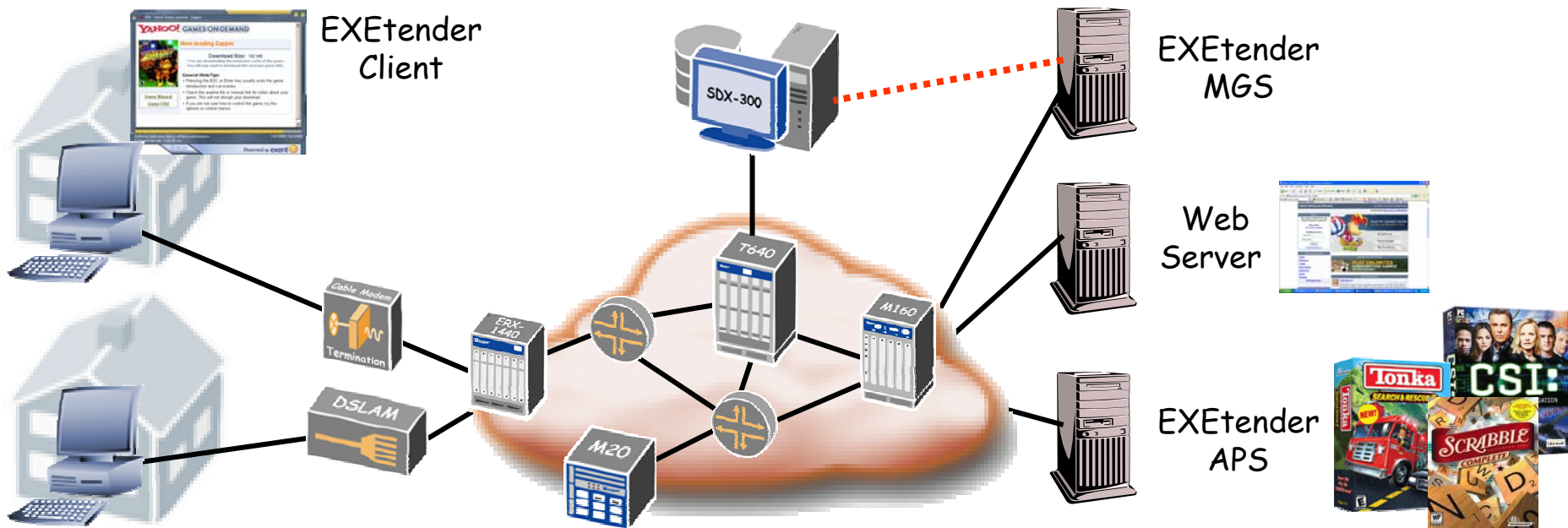
Also works with
Real's Helix
Server



- Dynamically, Without Manual User Intervention, Performs Admission Control And Upgrades Service Quality Based On Subscriber Profile, Network Resource Availability, And Content Requirements
- Supports Multiple Content/Applications That Leverage The Windows Media Series
- Objective To Offer 1000 Simultaneous Sessions and Custom Messaging To Subscribers Based on Network Resource Availability

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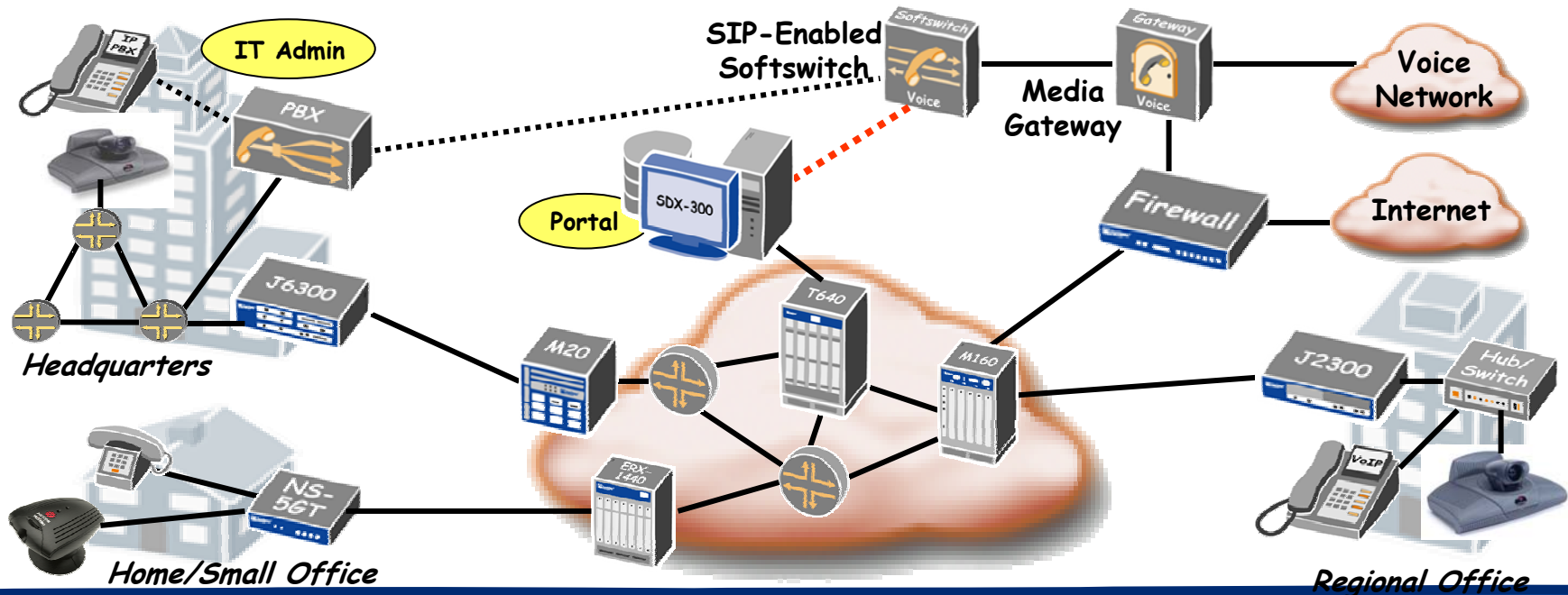
Solution: Games-on-Demand Exent Technologies



- Exent is Leading Solution Provider for Games-on-Demand Services
 - Offer Client and Server Software, Full Turnkey Services, and Content Aggregation
 - Powers Yahoo, Bell Canada, Telefonica, Comcast, FT, TeleNor and Other Provider Offerings
- Integrated SDX-Exent Solution Offers Faster Download of Client/Games Pre-Cache and Streaming of Game Play Updates in the Background - Enhances Gamer's Experience, Reduces Churn
- Technology also has applicability for Business Applications - i.e. Software Downloads

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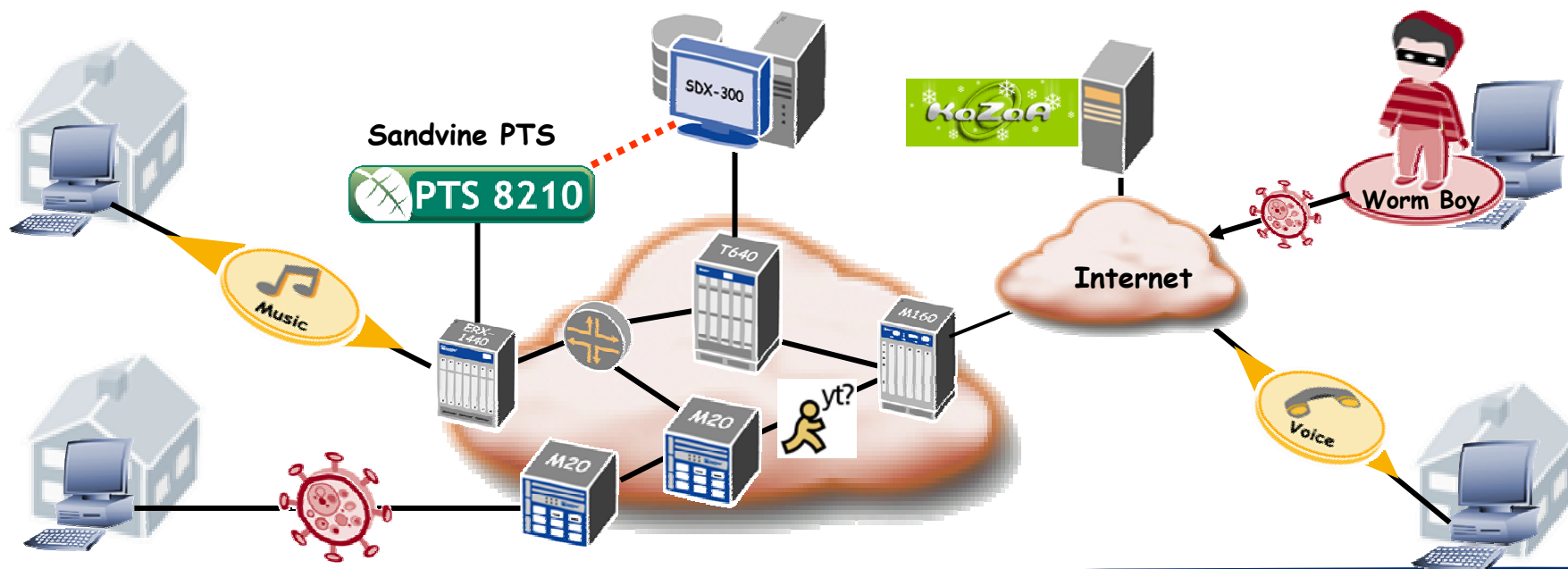
Solution: Video Conferencing Polycom



- ❑ Service Provider delivers Managed Video Conferencing Services with Assured QoS
 - Provides Customer Video Gear, Premises Routers/Gateway
- ❑ Softswitch interfaces with SDX for Dynamic QoS at Call Set-Up
 - Offers Upstream and Downstream QoS
- ❑ Supports Polycom Video Equipment - SIP or H.323 Appliances
- ❑ Businesses Can Leverage SDX Portal for Managing Partitioned Resources

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Solution: Application Traffic Control Sandvine



- ❑ Sandvine Provides An Application-Level Traffic Identification/Characterization Platform
- ❑ Service Provider Focus, Dominant Share in Cable Market, 25 Customers Worldwide
 - Product Applications - Understand Network Usage for New Services, Control, Planning
 - P2P Traffic and Security Applications; In-Line and Off-Line Configurations
- ❑ Sandvine Signals SDX to Enable Appropriate Network/Service Control Policies
 - Examples: Rate Limiting, Traffic Redirection for Security Assessment/Immunization

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Conclusion

- Evolution towards a global QoS service definition is underway
- Juniper Networks leads this trend
 - Actively working on standards
 - Providing pre-standard production-ready implementations
 - Initiating interaction between various actors of the industry (service providers & enterprises, application vendors, networking vendors)



Be ready for whatever is thrown at you!





Thank You

"Wow, sure am glad we picked the Infranet."



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