# EFFECTIVE WI-FI AND CELLULAR NETWORK INTEGRATION:

*Alleviating congestion and enabling cost-effective service delivery*

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# About InterDigital

**InterDigital** develops **fundamental** wireless technologies that are at the **core** of **mobile devices**, **networks**, and **services worldwide**.

HSPA+
LTE
LTE-A
802.16
802.21

As a **long-standing contributor** to the wireless industry, we solve many of the most **critical** and **complex technical challenges years ahead** of market deploymen

Our advanced solutions support **more efficient wireless networks**, a **richer multimedia experience**, and **new mobile broadband capabilities**.


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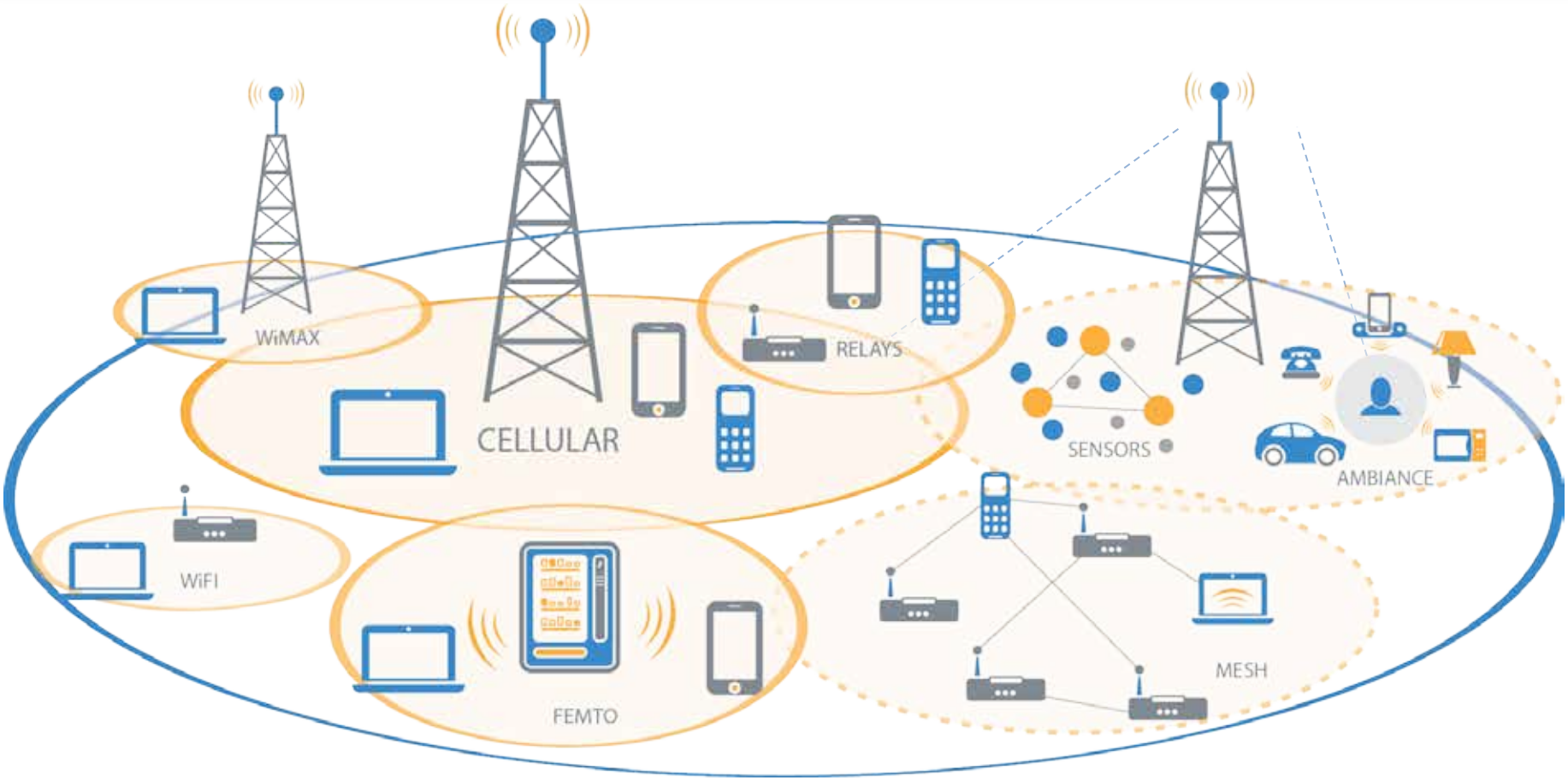
# Our Guiding Vision: The Network of Networks

**Billions of subscribers | Trillions of Connections | Seamlessly Connected and Fully Integrated**





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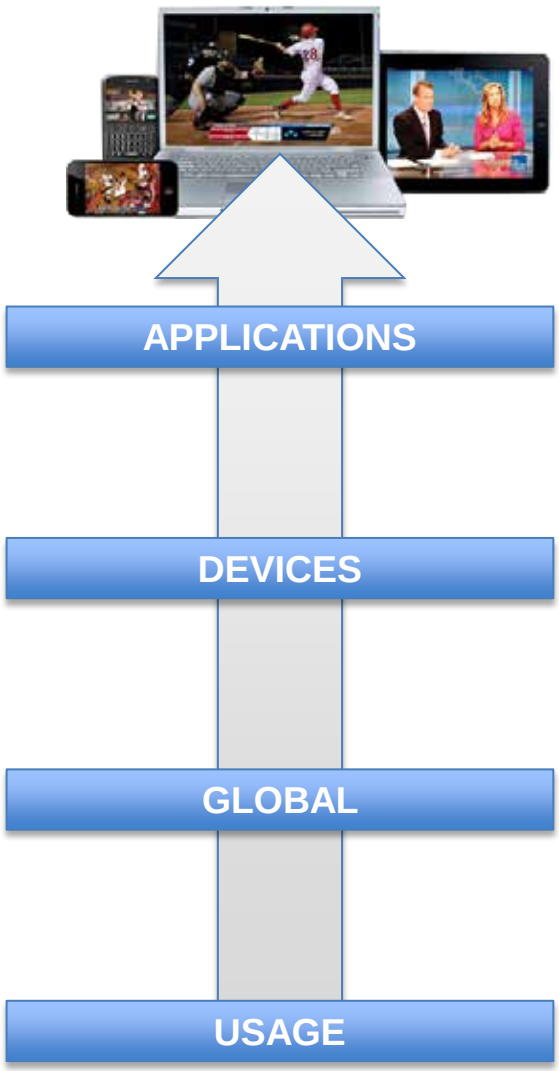
# Mobile Ecosystem Fuels Traffic Growth




**Mobile video traffic** will exceed 50% of the total for the first time in 2011.

In 2010, **3 million tablets and 94 million laptops** were connected to the mobile network generating 5x and 22x more traffic than the average smartphone.

**Global mobile data traffic** grew 2.6-fold in 2010, nearly tripling for 3rd year in a row.

Last year's **mobile data traffic** was 3x the size of the entire global Internet in 2000.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# Feeding a Growing Bandwidth Gap

- Mobile data traffic increases ~35x by 2014[1]
- Leading to a 300MHz spectrum deficit by 2014[2]

[1] Average of projections by Cisco, Coda and Yankee Group
[2] FCC, Mobile Broadband: The Benefits of Additional Spectrum, October 2010


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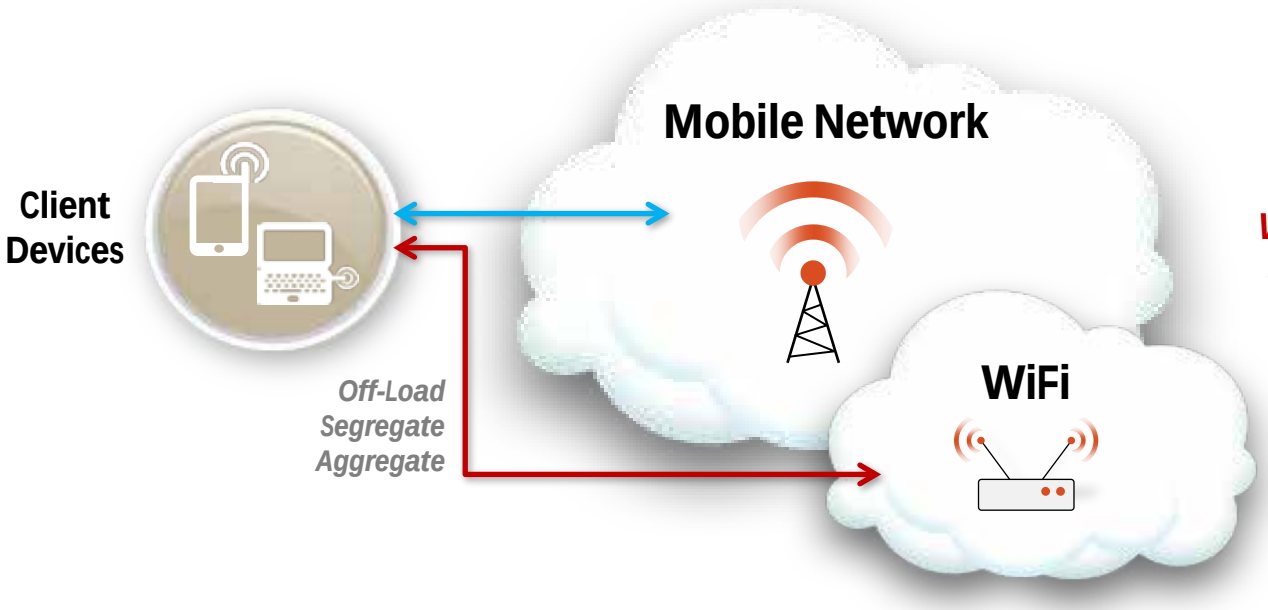
# Plenty of Bandwidth If You Integrate Wi-Fi!

Ubiquitous Coverage | Mobility Support | QoS | Services | Roadmap




***Smart Integration of Wi-Fi with Cellular Can Significantly Alleviate the Problem!***

| 802.11 a/b/g | 802.11n | 802.11ac | 802.11ad |
|---|---|---|---|
| Max Data Rate = 80Mbps | Max Data Rate = 250Mbps | Max Data Rate = 6.9Gbps | Max Data Rate = 6.75Gbps |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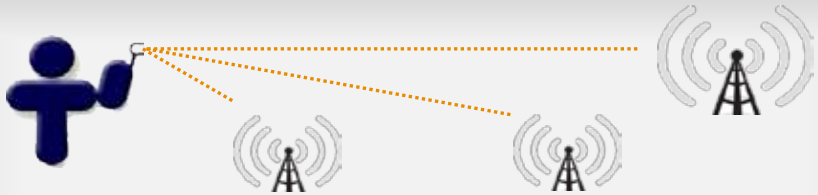
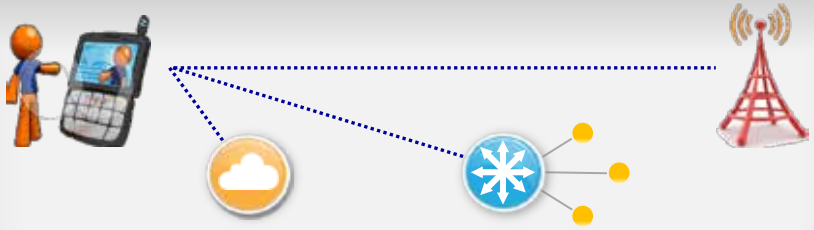
# Via Smart Allocation of Traffic to Networks…

## USE ALL AVAILABLE SPECTRUM



## LEVERAGE ALL AVAILABLE NETWORKS

## INTELLIGENTLY MATCH APPS TO NETWORKS



**UTILIZE WIDE AREA, LOCAL AREA AND IP NETWORKS FOR OPTIMAL PERFORMANCE AND USER EXPERIENCE**



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# Not an All-or-Nothing Offload Scheme Like This…

***Requires a more granular solution that offloads selectively and makes optimal use of network resources***



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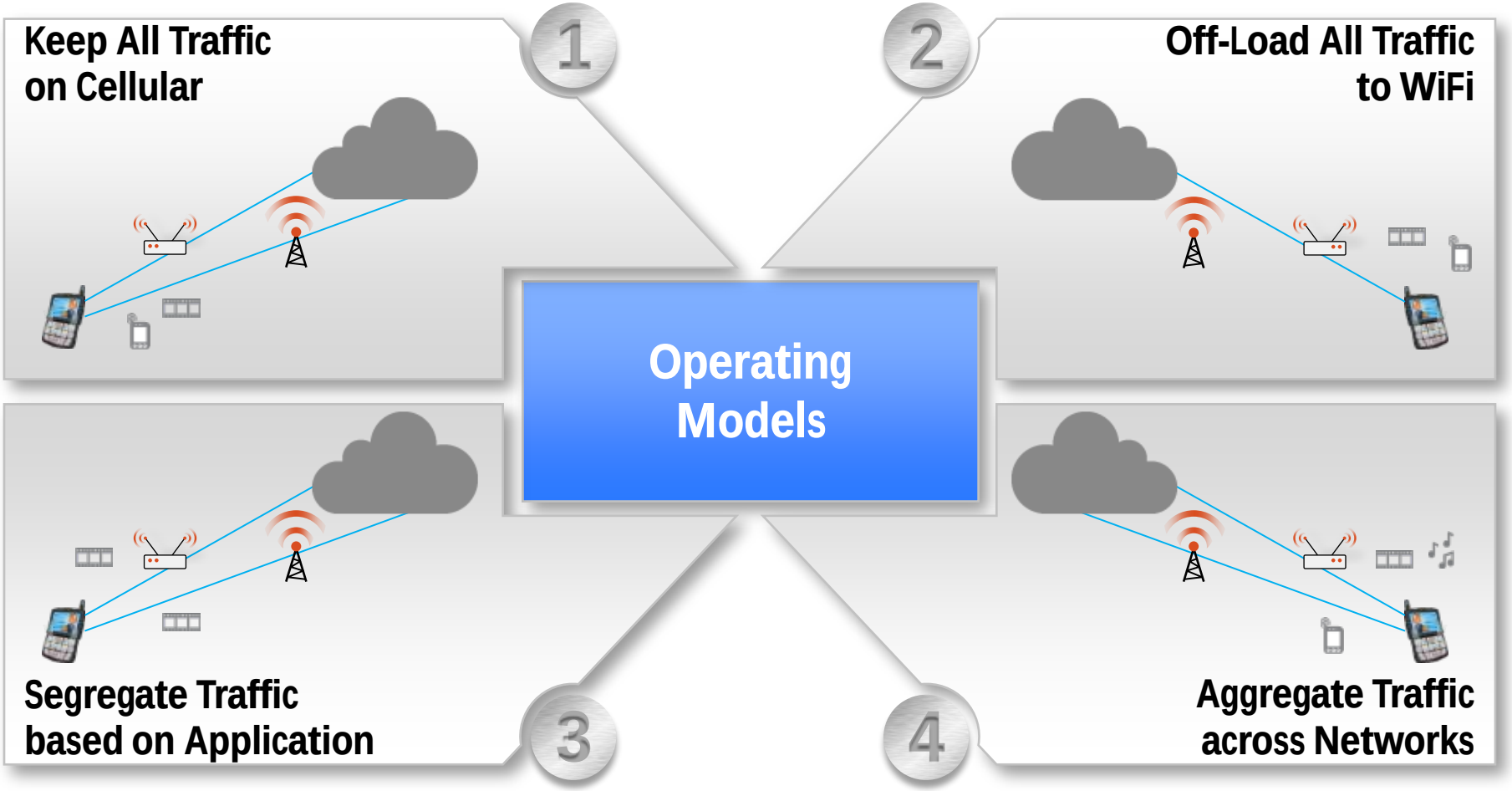
# But Intelligent Bandwidth and Mobility Management





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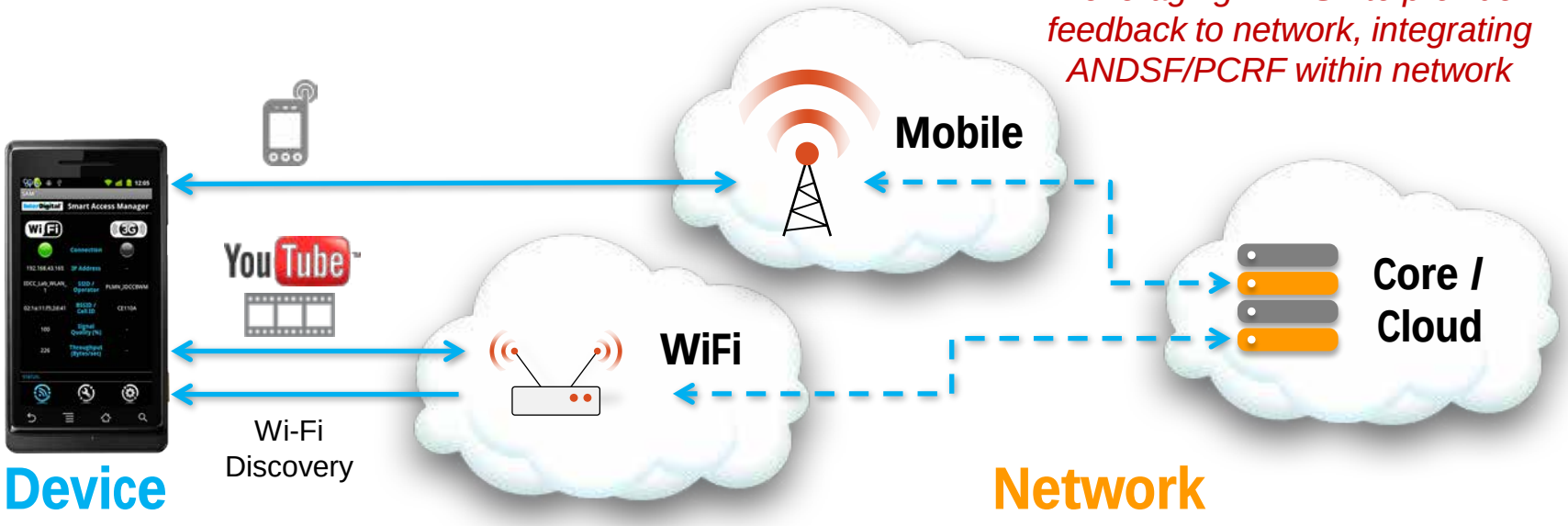
# Guided by Policy – Terminal and/or Network Driven

*Leveraging ANDSF to provide feedback to network, integrating ANDSF/PCRF within network*




- Applications
- Network Conditions
- Context and Location
- User Preferences

- Operator Policy
- Subscriber Profile
- Applications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# Serving the Needs of Key Stakeholders

**User Experience**

Client

**Bandwidth Management**

Server

**Network / Service Performance**

| Optimal User QoS / QoE | Applications Matched to Best Networks | Seamless WiFi Authentication and Offload | More Capacity and Optimal Spectral Use | Dynamic Policy Provisioning | Reduce CAPEX and Subscriber Churn |
|---|---|---|---|---|---|

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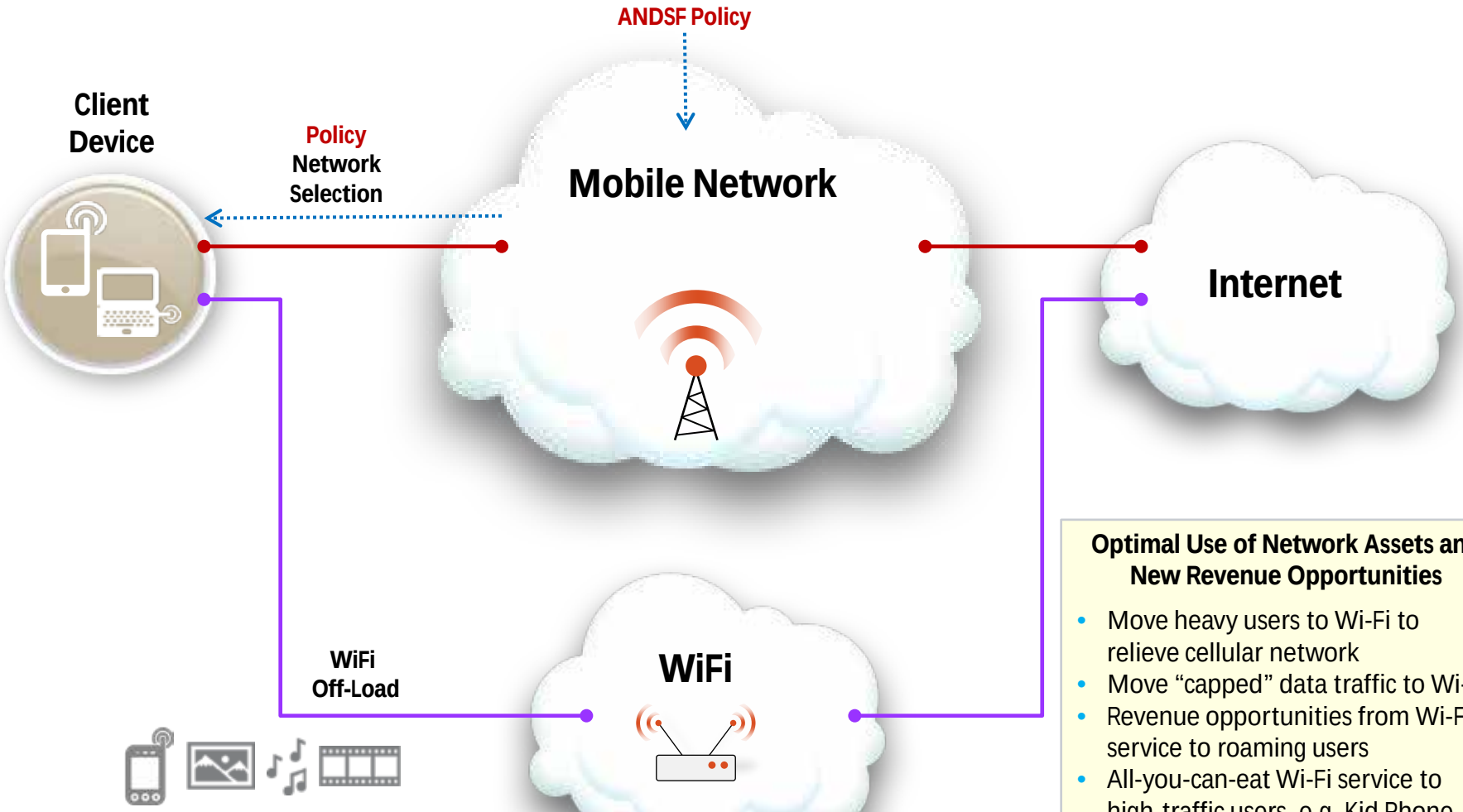
# Network Selection with Local Policy




- **Single** network connection at a time
- **All Traffic** is off-loaded to WiFi networks based on policy

**Optimal Use of Network Assets and New Revenue Opportunities**

- Move heavy users to Wi-Fi to relieve cellular network
- Move "capped" data traffic to Wi-Fi
- Revenue opportunities from Wi-Fi service to roaming users
- All-you-can-eat Wi-Fi service to high-traffic users, e.g. Kid Phone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# Even Better: Selective Application-Based Offload

**Quality of Service / Experience**

§ Meet different user needs or levels of service

**Policy Driven Allocation of Applications to Networks**

§ Place the right traffic on the right network

**Spectrum & Network Optimization**

§ Provide most effective delivery



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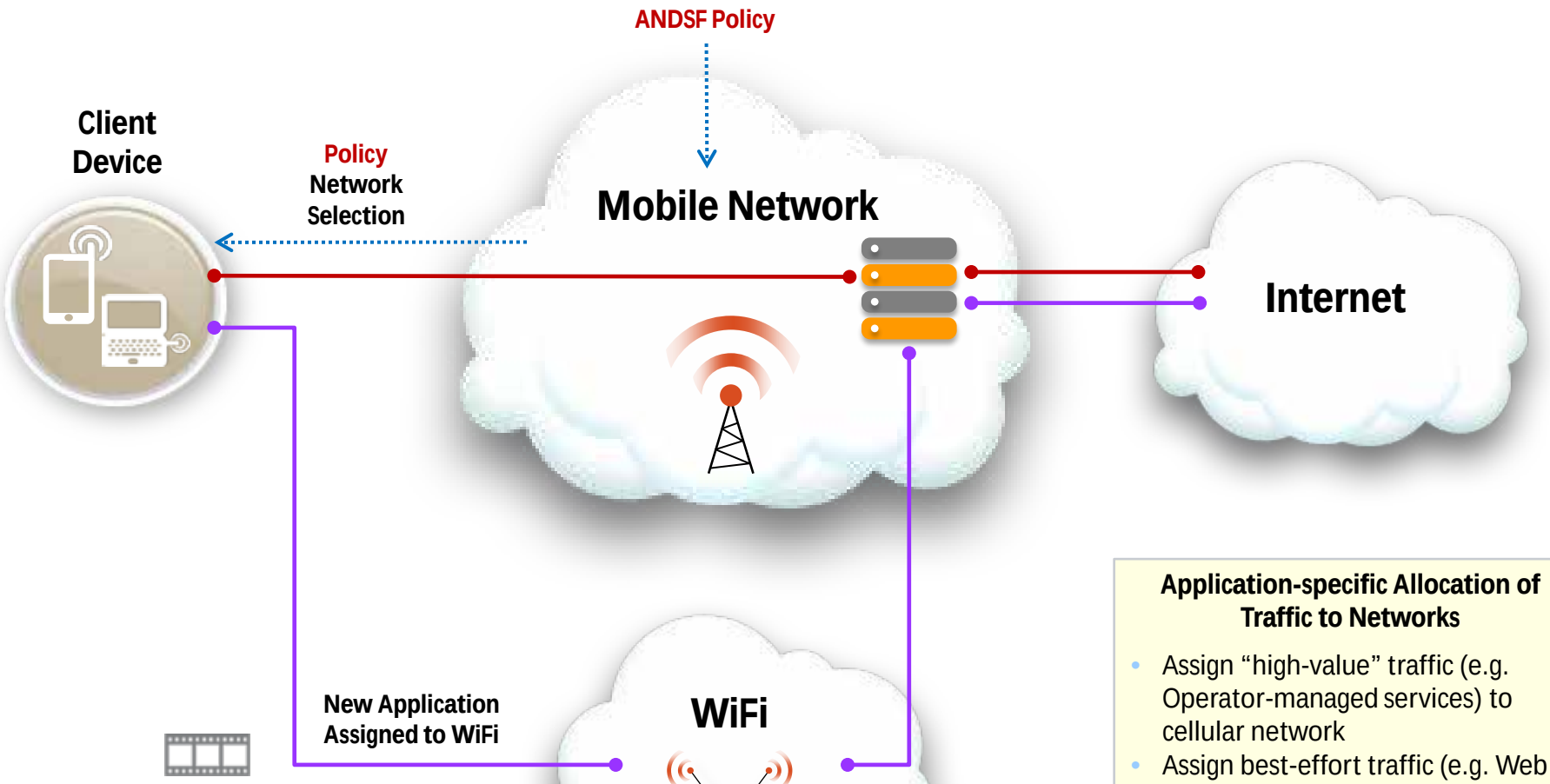
# Traffic Segregation and Mobility




- **Traffic Segregated** between networks based on policy (application, context, etc.)
- **Traffic Mobility** between networks based on changing conditions

**Application-specific Allocation of Traffic to Networks**

- Assign "high-value" traffic (e.g. Operator-managed services) to cellular network
- Assign best-effort traffic (e.g. Web browsing, Youtube) to Wi-Fi
- Facilitates tiered services & pricing
- Enables Operator to balance load across available networks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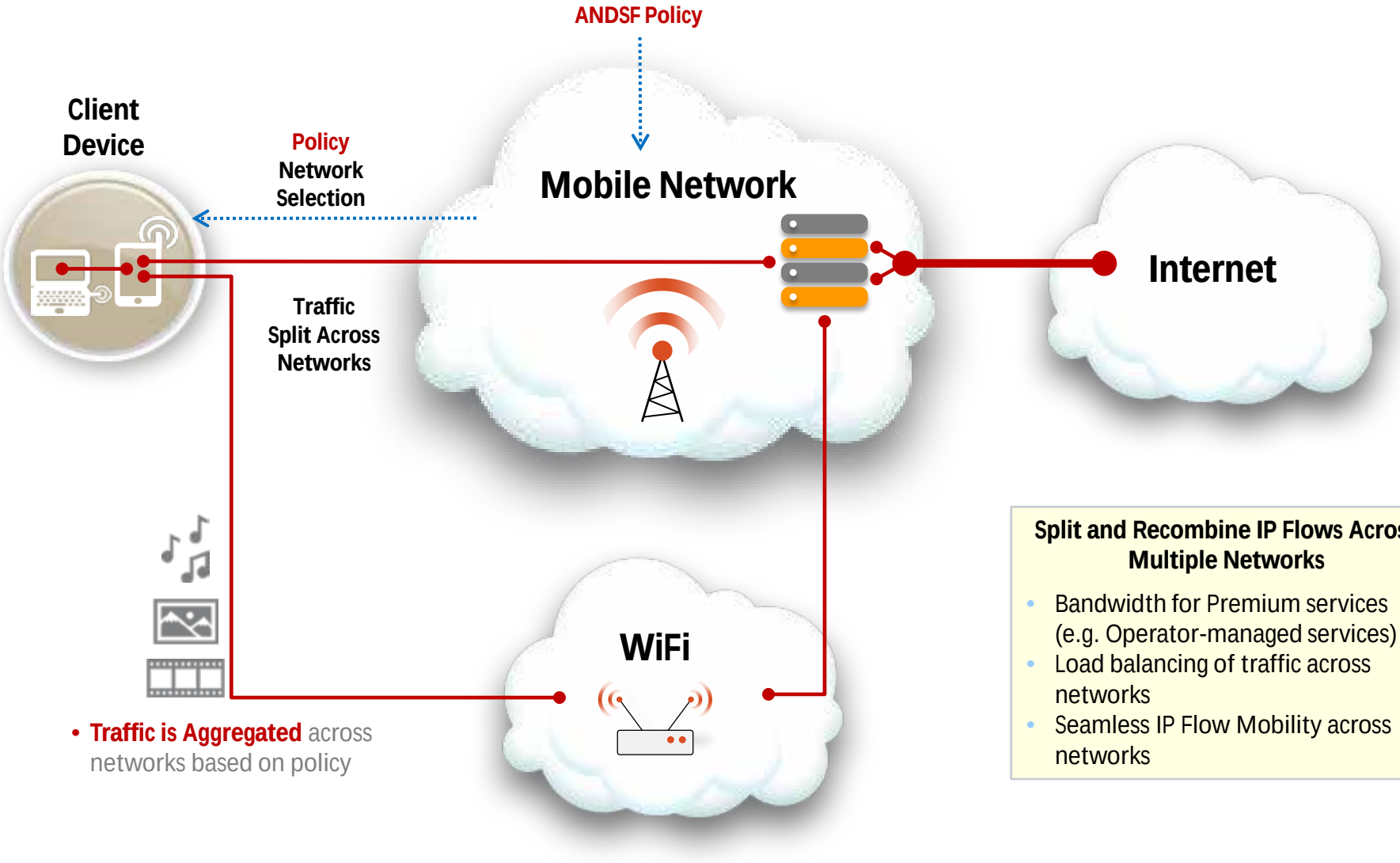
# Aggregation for High-Bandwidth / High-Reliability




**Split and Recombine IP Flows Across Multiple Networks**

- Bandwidth for Premium services (e.g. Operator-managed services)
- Load balancing of traffic across networks
- Seamless IP Flow Mobility across networks



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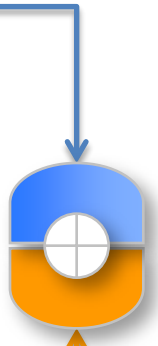
# Driven By 3GPP and WBA/WFA Standards Blueprint

## 3GPP (ANDSF Policy, Mobility, Traffic Management)

| Release 8 | Release 10 | Release 12 & Beyond |
|---|---|---|
| § Single Radio connection<br>§ NW Discovery & Selection<br>§ Intersystem Mobility, ANDSF Policy | § Application-Specific ANDSF Policy, Traffic Routing<br>§ Multiple radio connections<br>§ UE-driven IP Flow Mobility | § Network-driven IP Flow Mobility<br>§ Aggregation<br>§ Hotspot/NGH Discovery & Selection features |



*Convergence*

## Hotspot (WFA, WBA)

| Current | Future |
|---|---|
| § NW Discovery & Selection<br>§ Seamless Authentication, Wi-Fi Mobility | § Enhanced NW Discovery using NW Information<br>§ Multiple Service Connectivity<br>§ Load Balancing, Multi-Band Steering<br>§ ANDSF Policy Integration |



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# Smart Access Manager (SAM) Client for Android & Windows based Devices

- Enables “anytime, anywhere connectivity and bandwidth via the best available network
- Policy driven to maximize **throughput** and **QoS/QoE**
- **Operator-controlled** network access
- Supports Network **monitoring** and **reporting** from device
- Application and network awareness based optimization
- **Context-aware** access - location, battery, link quality, cost etc.
- **Real-time event management** - congestion, traffic shaping etc.
- 3GPP, IETF compliant **Connectivity and Mobility**
- Available for **Android & Windows based Smartphones, Tablets** and WWAN enabled **laptops/notebooks**

**Laptops and USBs** **Smartphones and Tablets** **CE Devices**



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# Thank You!

***See InterDigital's Smart Access Manager (SAM) Demonstration At Booth #3***

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