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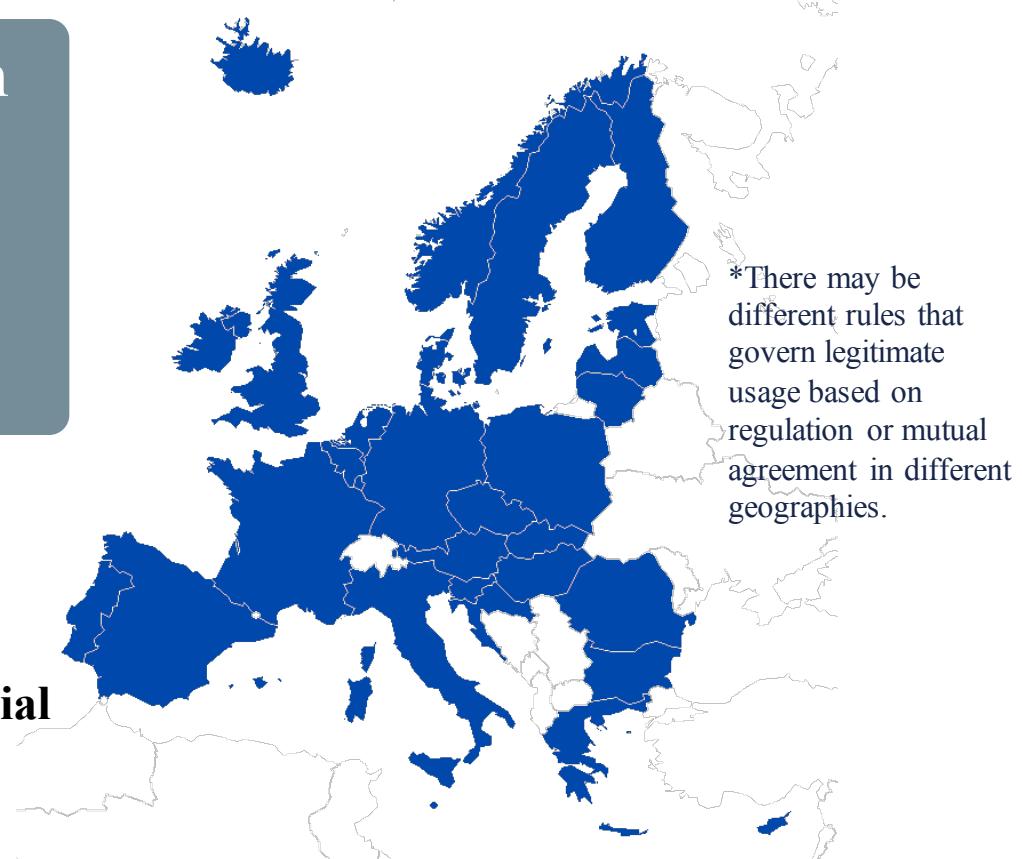


Permanent Roamer



Permanent Roaming (PR) Definition

Subscriber (or Machine) actively uses SIM card of an operator from country A – exclusively, or almost exclusively – either in his/her country of residence, which is different from country A, or in a number of countries other than country A.

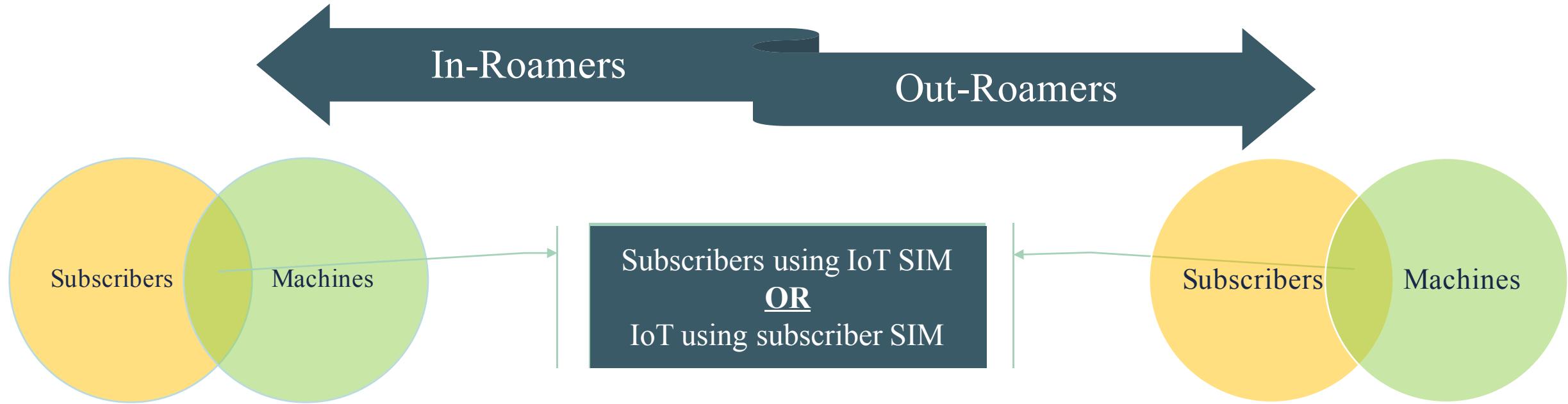


European Union: CEPT ECC report 194 definition of Extra-territorial use of E.164 numbers and IMSIs

“Extra-territorial use of E.164 numbers: Use of one country’s E.164 numbers in another country on a permanent basis. E.g. in the context of M2M communications: use of numbers from country A (e.g. France) in electricity meters in country B (e.g. Belgium)”.



Permanent Roamers



EU Roam-Like-At-Home scenario could have a positive or negative financial impact

Travel SIM Companies (“Alternate Roaming Providers”)

Unauthorized IoT roaming usage could result in loss of global IoT business opportunities

Abusers & Fraudsters could fly “under the radar”

PR determination based *solely* on TAP usage will not uncover many PRs



Different “Personas” of Permanent Roamers



Seasonal Workers /
Cross Border Workers / OFW



Business Travelers /
Business men with “local presence”



Retirees /
Winter “migrants”



Students



IoT / M2M Devices

Each of them shows a different pattern in usage, signaling, duration of stay, seasonality of travel, etc.

And, of course, the Abusers and Fraudsters...



Mobileum's approach to Permanent Roamer

Presence and Consumption Module

- Build presence model for EU and Domestic.
- Build consumption model via real + non real time sources for EU and domestic consumption
- EU defined Permanent Roamer Logic based by join of Presence & Consumption Indicators

Benefits Home Operator

- **Opportunity to levy Roaming Surcharge of up to (excluding taxes)**
- € 7.7 per GB per PR on Data
- 3.2 cents per minute for Voice
- 1 cent per SMS

Real-Time Actions

- Notifications to potential abusers after 4 months (T Time period) observation period
- Notifications of applicability of roaming surcharge in T+2 weeks to final set of abusers



Permanent Roamer: Rule Designer

Enables definition of Outbound / Inbound Permanent Roamer via Presence and Consumption objective indicators



Presence Models

To detect subscriber location (Home / Roaming) and trip durations

Consumption Models

To measure Roaming and domestic consumption

Type 1 Permanent Roamer View Construct

MARK ALL ROAMERS AS "Permanent Roamer Outbound Type 1" WITH

Attribute Trip duration	Operator Less than or equal to	Value 20 days	Context In last	Context 60 days	Condition And
Attribute Visited countries	Operator Equal to	Value Germany	Condition And		
Attribute Roaming Usage	Operator Greater than	Value 75 % Pack Allowance	+		

Intuitive Rule Designer to derive segments as per Business Requirements



IOT-PR detection fingerprinting approach

Combination of Deterministic and Analytics driven approach for IOT / M2M roaming device detection

Deterministic Approach

Dedicated MCC/ MNC (IMSI range)
Extended MSISDN
Dedicated sub range of MNC
Dedicated APNs for M2M traffic
Device TAC

- Deterministic approach for Outbound M2M detection
- Operators assign static attributes to M2M devices

Machine Learning Approach

Multiple IMSIs with same MSISDN
Periodic Patterns
Recurrent Usage Patterns (duration / volume)
PS only subscription
Fixed IP subscription
Static devices

- Machine Learning Approach to detect Inbound M2M (Static attributes not available from Roaming Partners)
- Supplement Deterministic Approach



Evidence Pack for M2M Permanent Roamers

Explaining Machine insights

Roaming Analytics

PERMANENT ROAMER ANALYSIS

ID : PR-AUT-0234

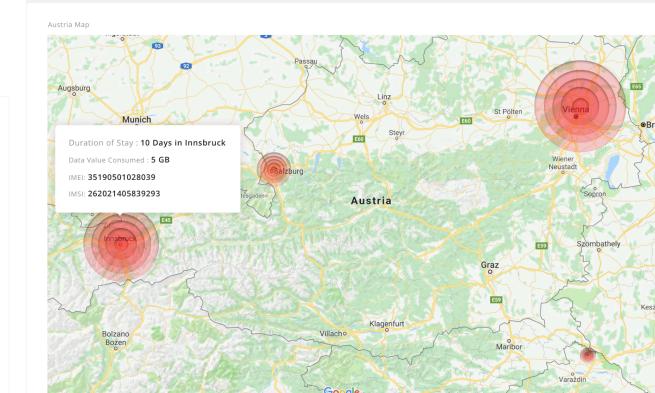
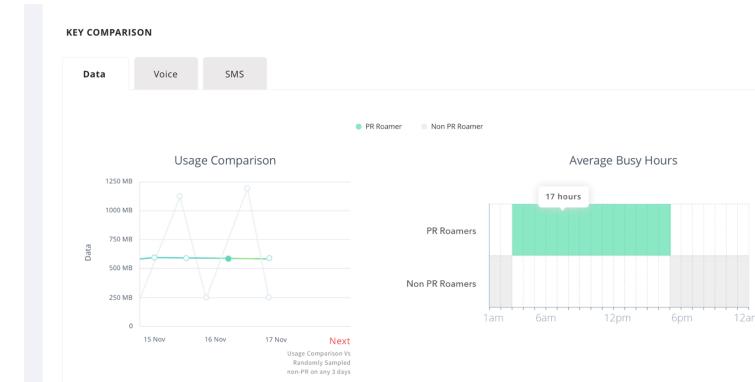
PR-AUT-0234 DETAILS

Created on 20 Dec at 3:17am
Current State: Under Analysis
Assigned to: Alex Sanders

PERMANENT ROAMER ATTRIBUTES

IMSI(S): 262021405839293* 262019931210625 262022104922398	Device Type: Sierra Wireless HiLoV2	Data Usage: 12.5 GB
IMEI: 35190501028039*	APN Used: iot.wireless.de, auto.web.at	MOU: 350 Mins
MSISDN(S): +49 1630 792 383 +49 1630 541 731 +49 1609 917 575	SMS Sent: 30	Location: Vienna, Innsbruck, Salzburg
Home MCC - MNC: 262 02 , Vodafone Germany	Days in Roaming: 29	MSU Sent: 5861
ML Classification: ● Red	€ Revenue: 25	€ Revenue: 25
Behaviour: IoT		
IoT Category: Plan;		
* - Primary Pairs		

Usage and Mobility patterns



Similar SIMs behaving as M2M Permanent roamers

SIMILAR CASES

PR -AUT-0235

IMEI: 35190501028031
Open on: 13 Sept
Usage: 1650
Category: ● Red

[View Detail](#)

PR -AUT-0236

IMEI: 35190501028032
Open on: 20 Sept
MOU: 1100
Category: ● Red

[View Detail](#)

PR -AUT-0237

IMEI: 35190501028033
Open on: 20 Sept
Usage: 2000
Category: ● Yellow

[View Detail](#)

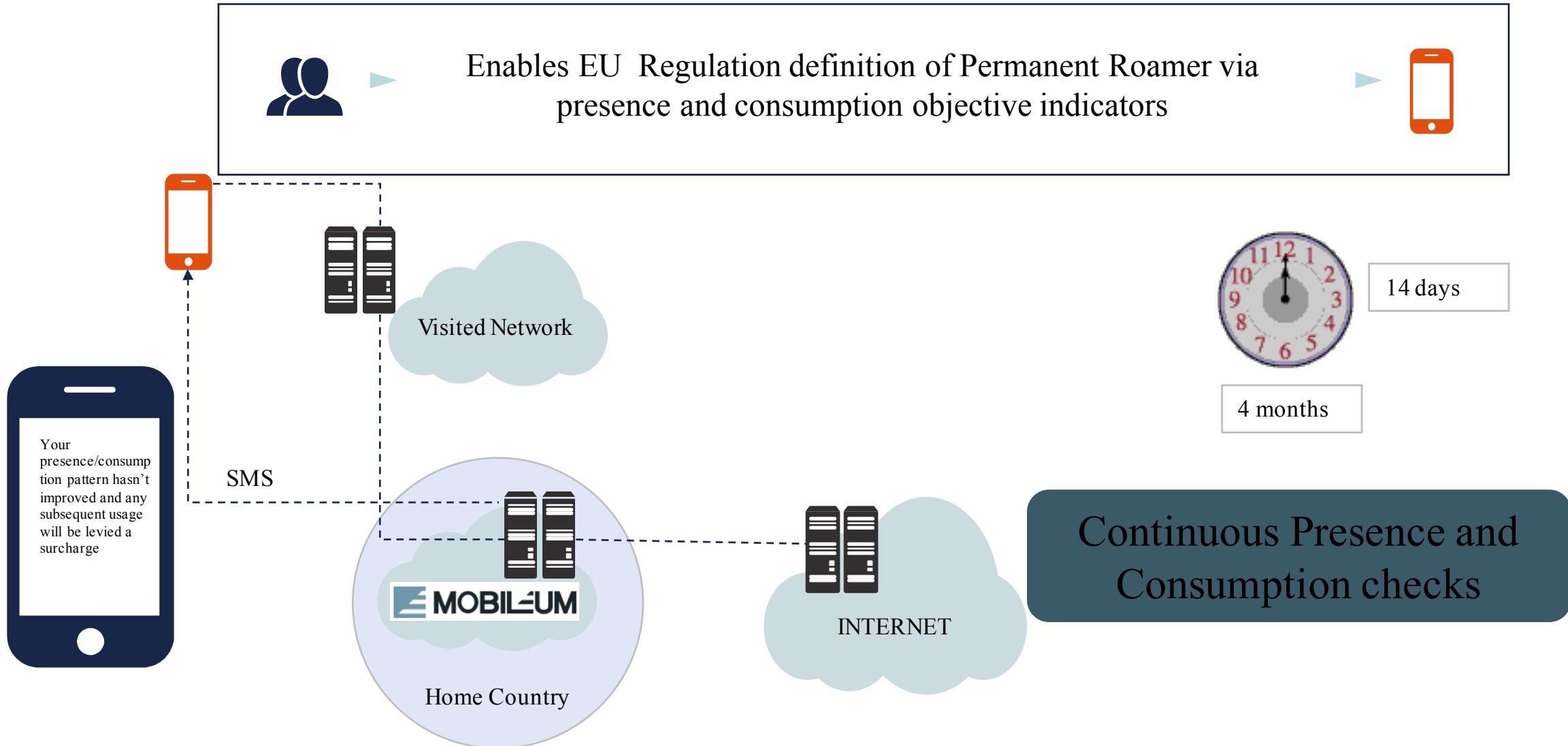
PR -AUT-0238

IMEI: 351905010280
Open on: 31 Oct
MOU: 1500
Category: ● Red



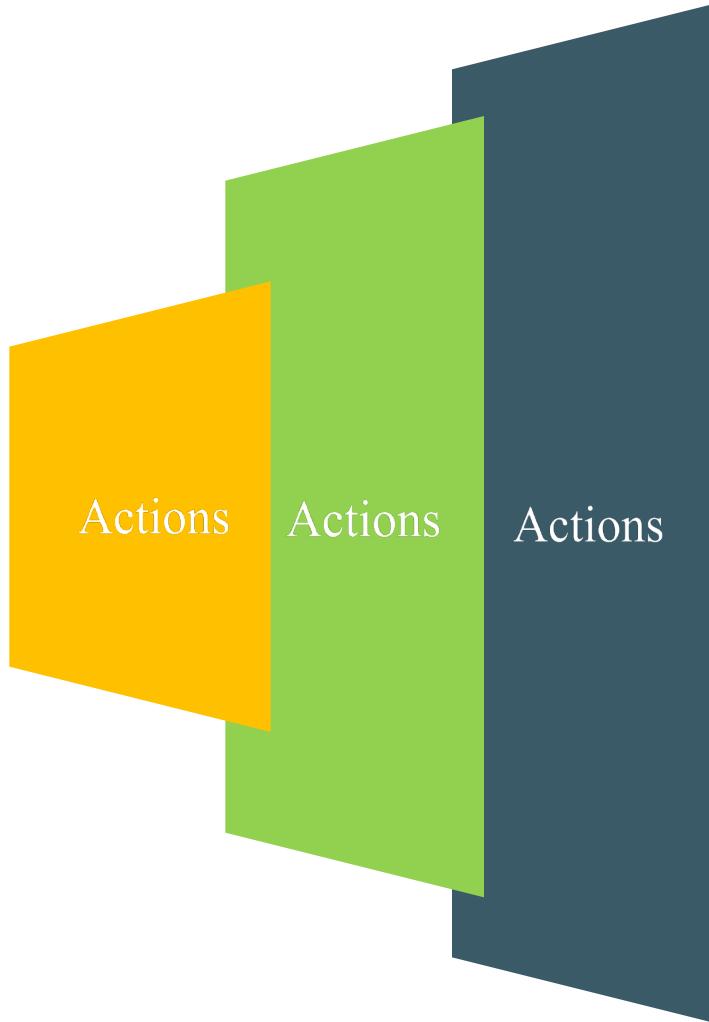


PR Action : Notifications





PR Action: Service Restriction for Out-roamers



Whisper announcement on MO calls

Deny MO calls

Deny MO SMS

Throttle data speeds

Deny data connection

Deny MT calls

Deny MT SMS

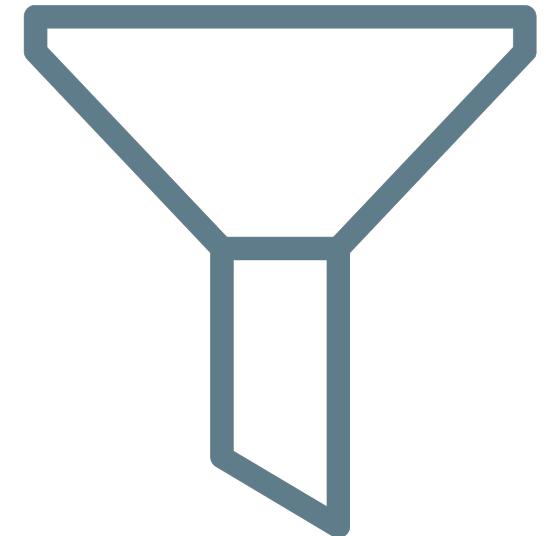


PR Action: Roam Filter for In-roamers

In-roamers with no revenue but excessive signaling usage are "proactively encouraged to leave the network" by limiting their services

Can be done on a location basis:

For example: Congested area or area where local competitor may have overlapping coverage





THANK YOU