IIT Real-Time Communications Chicago – Oct 3, 2015

The Open Source Communications Framework (OSCF)

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Head of Research & Development

truphone

A World Without Borders

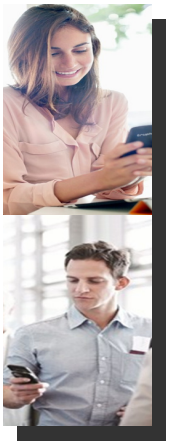
truphone

Introduction to Truphone

"Truphone – it's changing the way we communicate"

– Network Manager, Nasdaq 100 Biotech Company

- Formed 2006 by James Tagg
- Software Cellular Network – selling enabling technology to MNOs
- Became an operator – TRUPHONE - 'Eat our own dogfood'
- Became the original 'Over The Top' (OTT) player
- Bought GSM Mobile Network Assets from 2008 onwards
- Full member of GSMA
- New CEO – Steve Robertson (ex-BT Openreach) joined 8/2011
- Strength today – circa 550 employees globally



Convenience when you travel
1 bill
2 a local number (several if necessary)

truphone

IGGY AZALEA @IGGYAZALEA · 30 Oct 2013

I have the best wallpaper of all time.

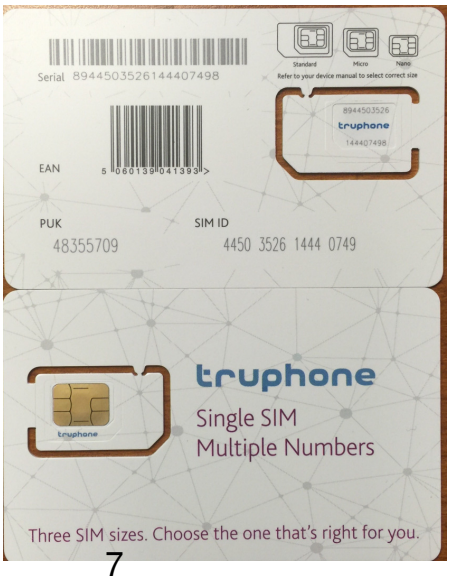
2.7K 6.2K

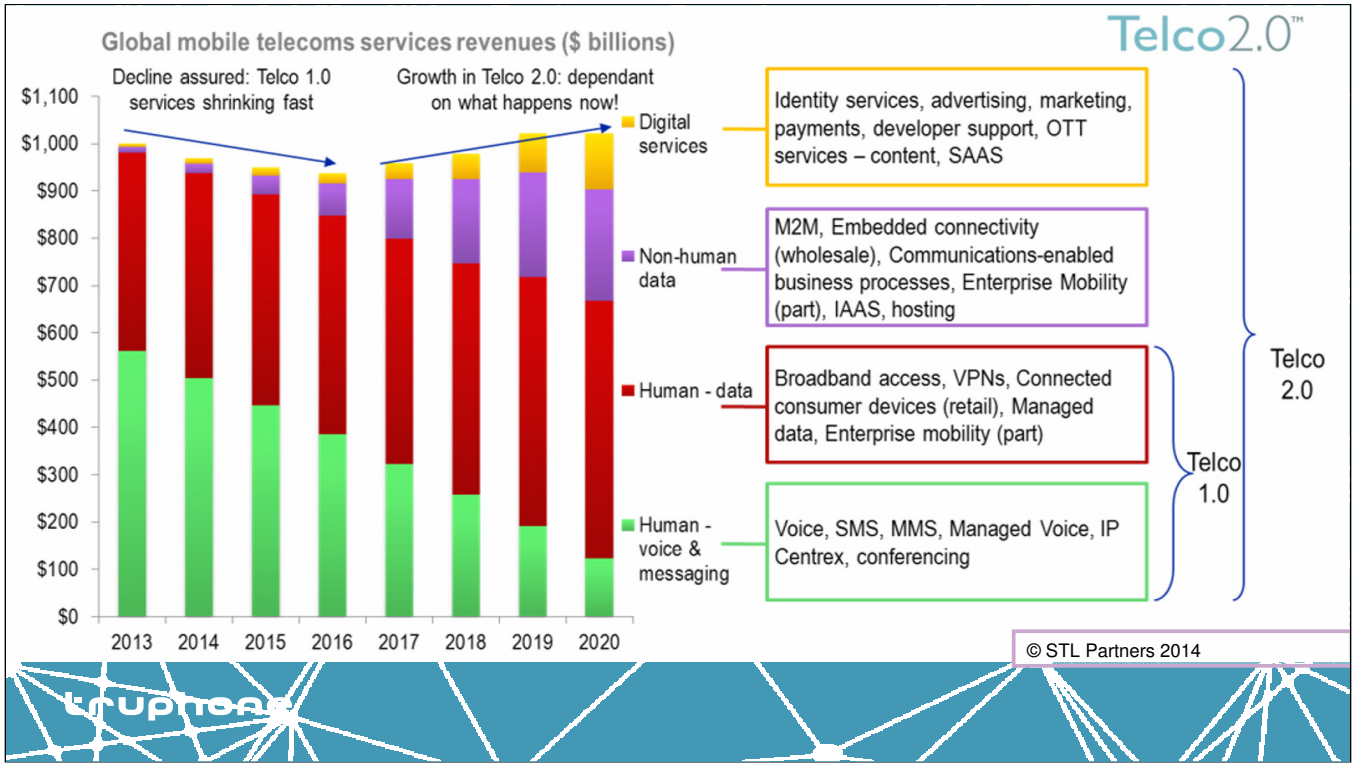
Truphone SIM

- Multi IMSI
- Multi user profiles (All concurrent)
- Only one IMSI active at one time
- ALL user profiles mapped to currently active IMSI

- ARM Processor
- Executes applications independently from UE
- Uses signaling channel (always on)

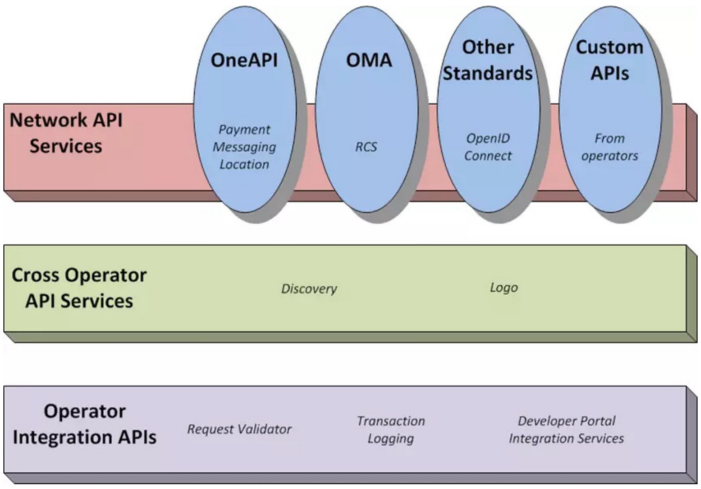
The ONLY operator with a **working** multi IMSI solution and **happy customers!**




Global mobile telecoms services revenues ($ billions)
Telco2.0™
Decline assured: Telco 1.0 services shrinking fast
Growth in Telco 2.0: dependant on what happens now!
$1,100
$1,000
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
2013
2014
2015
2016
2017
2018
2019
2020
Digital services
Non-human data
Human - data
Human - voice & messaging
Identity services, advertising, marketing, payments, developer support, OTT services – content, SAAS
M2M, Embedded connectivity (wholesale), Communications-enabled business processes, Enterprise Mobility (part), IAAS, hosting
Broadband access, VPNs, Connected consumer devices (retail), Managed data, Enterprise mobility (part)
Voice, SMS, MMS, Managed Voice, IP Centrex, conferencing
Telco 1.0
Telco 2.0
© STL Partners 2014

Operator APIs

- GSMA OneAPI
  - Payment
  - Messaging
  - Location
- OMA RCS
- OpenID Connect
- Operator APIs
  - Axiata MIFE (WSO2)



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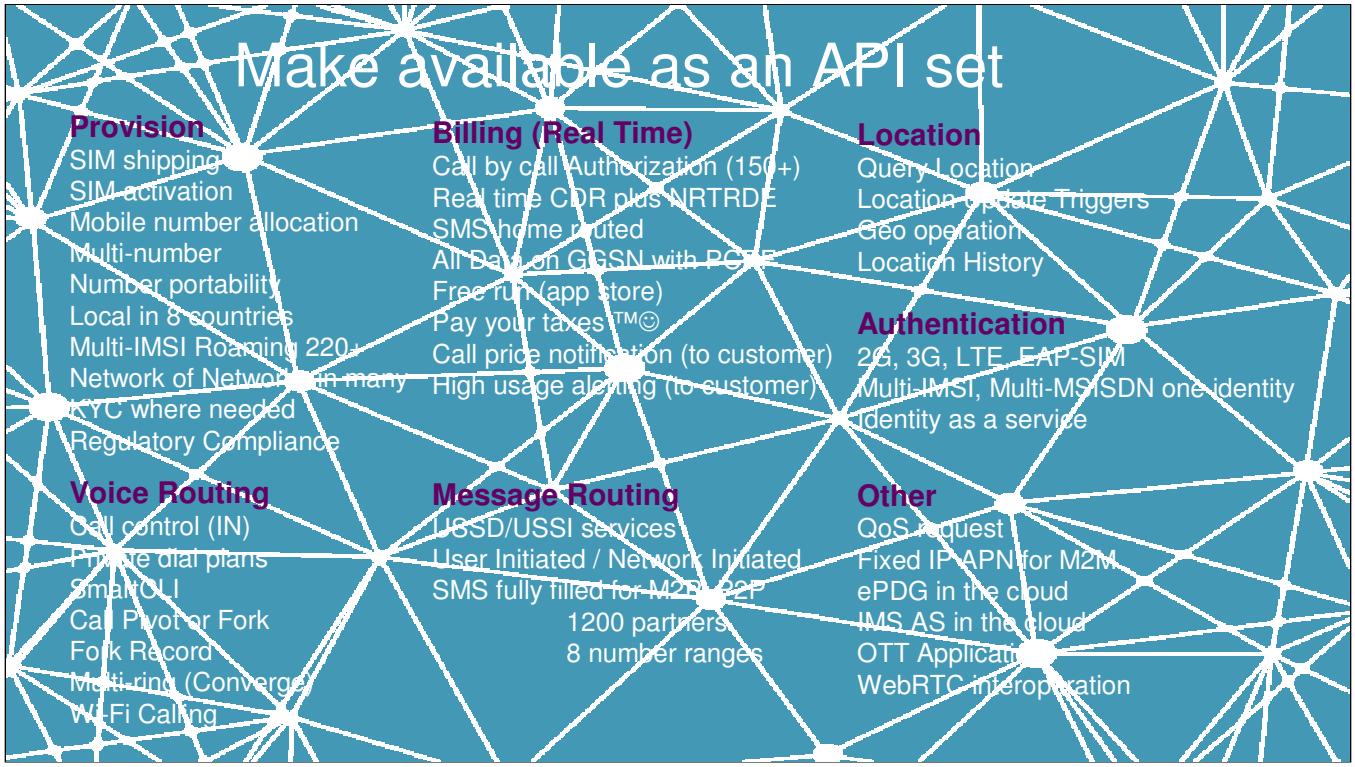
Open Source Communications Framework (OSCF)

- Why Open Source?



I'm not going to go through an API, Tropo, Twilio did a good job of that.
But our API is very rich because we are a multi-IMSI, LTE operator…

Provisioning

- SIM Shipping
- SIM Activation/Management
  - International Mobile allocation
  - Multi-number
- Mobile Number Portability
- Virtual APN
- WiFi Calling [3GPP I-WLAN]
- Multi-IMSI operation
- Alternative Roaming Provider (ARP)

Billing as a Service (Real Time)

- Able to generate billing events to charge user account
- Real time CDRs and Near Real Time Roaming Data Exchange (NRTRDE)
- Pay Your Taxes – International Taxation Functionality
- Call by call Authorization
- Full usage feed from GGSN/PDN-GW with PCRF
- Call Price Notification (to customer)
- High usage alerting (to customer)

Location Based Services (LBS)

- Query Location
  - Country
  - Timezone
  - Area
  - Precise coordinates
- Composite GMLC – using Cell-based, GPS and WiFi positioning
- Location Update Triggers (Harvesting LUs to HLR/HSS)
- Location History (Snail trail)
- Geo Operation, e.g.
  - geo-fencing,
  - location based routing,
  - Interaction between different users

USSD/USSI

- Unstructured Supplementary Service Data for both
  - Legacy SS7/MAP
  - IMS-based systems
- Always on / tariff free
- Private schema (within pre-defined format)
- Works on just about all devices (including those with no native IP capability) and most networks
- Useful for low bandwidth interactions between UE and application services

Traffic Routing

- Voice Routing
  - Always in the media path
- Message Routing
  - All messages Home Routed

Voice Routing

CONTROL OF MEDIA PATH IN ALL SCENARIOS

- Call Control / Intelligent Networking (IN)
- Private Dial Plans
  - Individual
  - Enterprise
- SmartCLI – Presentation of outbound CLI controlled by App
- Call Pivot or Fork
- Fork Record
- Multi-Ring (Converged operation)
- UE dependent routing

Messaging (SMS et al)

- All messages Home Routed
- Cloud based message history
- User Initiated and Network Initiated Traffic
- Multi-identity aliasing
- Multiple client support
- Non-volatile multi-party messaging
- Support for multiple messaging transports

Authentication

- 2G, 3G, LTE, EAP-SIM
- Able to offer multiple concurrent identities
- Offers authentication services for other applications
- Multiple sets of crypto KVs

- ARP Scenario support
- Example applications – PIN-less Mobile Conference Platform

- Future development: SIM-based Web Server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SMALL CELL FORUM

CHAMPIONS

ROME

Multi-Operator Neutral Host

8 SEPTEMBER 2015

ROME, ITALY

www.smallcellschampion.com

Operator proposed priorities/strawman
(Singapore Plenary 2015)

Delivering Small Cells for Future Networks	•Virtualisation – design, support, promotion, flexibility & interoperability •Neutral Hosting – impact assessment •5G Preparation – best practice sharing, role of SC •Machine2Machine / Internet of Things – design review with new M2M Tech including security impact •DAS – understand more applicability on scenarios •Security – ensuring progressive development of network security & regulatory requirements / LI. •Service Enablement- LI, privacy, virtualised arch and evolution.
Maximising the HetNet	•SON/HETNET enrichment – consistent parameter exchange, new feature enablement, dynamic capacity management •Quality of Experience – ensuring good experience between macro, sc, wifi, & across backhaul •Green Small Cell / Power Management – management of large small cell networks / opex control •Wifi Integration (inc LAA/LTE-U) – architecture, synergies, benefits •LAA/LTE-U – role in small cells
Business Development and Positioning	•Enterprise Case-Study – compelling examples, combined service offering (inc wifi) •WiFi Calling vs Small Cell – trade-off analysis and promotion •Service API Development – new service enablement, IOT •Promoting Deployment - landlord/municipalities on SC benefit promotion •Public Safety – role of small cell and capabilities

Need to raise visibility of our extensive work on HetNet

Champions to lead Work Items

Work Item	ends	Operator	Vendor
License Exempt	MWC 16	Alan Law	Caleb Banke
Virtualisation	Q3 16	SHI Xiaohui	Mark Grayson, Neil Piercy
HetNet and SON	May 16	David Orloff	M. Ljungberg, Joe Thome
Multi Operator	Q3 16	James Body	Nick Johnson
Enterprise	MWC16	Benoit Graves, Tarek Amin	Art King, Ray Williamson

Working Group Chairs	Market	Radio	Interop	Network	Deployment	Regulatory	Services
	Lisa Garza	Nick Johnson	Kreso Bilan	Prabhakar Chitrapu	Peter Love	Stephen Priestman	Andy Germano

What's wrong with this picture?

Yo s a
vertical market with a single operator solution

-Why?

WiFi is the default Multi-Operator solution

Are we happy with that?

Vendor Perspective:

•We have technology that can provide Multi-Operator solutions, at least as cost-effective and high-performance as WiFi

Laws of Physics Perspective:

•In the congested spectrum future, we need a technology that manages and coordinates spectrum well – this is LTE, not WiFi

Operator Perspective

•Why should I enable my competitors?

Customer Perspective:

•With existing small cell offers, I can't get a licensed radio solution that works for all my customers.

•Even if I deploy DAS, I can't get all the operators interested

•So I just use WiFi

Are we happy with that?

Small Cells – A Good Solution?

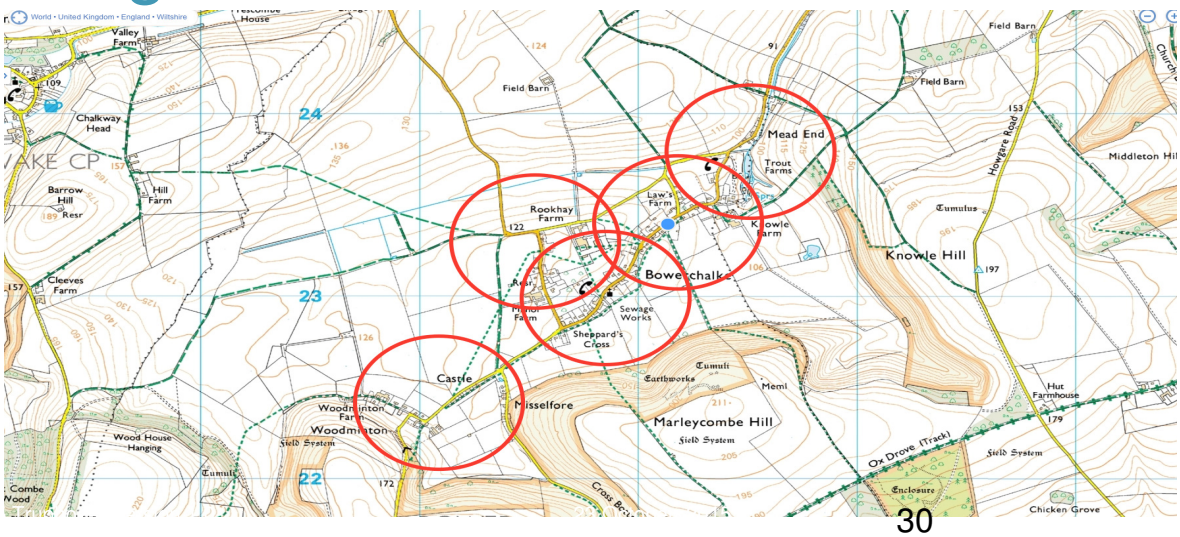
- Potentially much less expensive to deploy
- Able to concentrate service in areas where people need to communicate from!
- Quicker to deploy
- Planning issues minimized
- Close proximity offers low power operation/efficiency from handset
- Excellent spectrum reuse

Vodafone Rural Small Cell - Cranborne

ll Cell Deployment

- 9 Men
- 4 vehicles
- Main road through valley closed for half a day!

Bowerchalke – Small Cell Configuration



Our mission – which we just accepted

Make Licensed Radio Small Cells the preferred solution for Vertical Market, Multi-Operator Applications

To achieve this, we are addressing issues in multiple field

Business Case
Existing and upcoming Technology
Regulatory
Spectrum Licensing – existing and new licensing regimes

SPECTRUM

- Virtually all usable spectrum (i.e. that supported by handsets) is licensed to large MNOs
- Challenge: To incentivize MNOs with spectrum to deploy infrastructure to cover Not Spots
- If MNOs decide NOT to deploy infrastructure, spectrum is ‘blocked’
- ‘Secondary use of mobile spectrum on a non-interference basis’
- White space spectrum management techniques

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