Future Telecom
Technologies Playground
Focus:
Telecom software R&D and Professional services
• In business since 1989, first international contract in 1993
• Now: 1500+ engineers with broad expertise and experience within Telecom-, R&D- and Software development services

Key competences:
• Mobile networks infrastructure (2G, 3G, 4G)
• Unified communications & applications
• IP infrastructure
• Mobile devices & applications
• Protocol stacks
• Embedded software
• Multimedia / IPTV

Locations:
Nizhny Novgorod, Russia
HQ & Offshore R&D Center
+ Customer relations offices in the US, Canada, Germany

Customers:
ERICSSON
AVAYA
kapsch

Quality / Standards Compliance:
ISO
TL9000
CMMI® Level 3
Future Telecom Technologies Playground

R&D Expertise Areas:

- Innovative In-house IMS & LTE Playground
- Dedicated research group with focus on LTE Radio Optimization, MIMO, Self Organizing Networks
- Cooperation with Fraunhofer FOKUS, the leading European institute specializing in Next Generation Access and Core Networks (OpenEPC and OpenIMS projects)
- Commercial state-of-the-art projects for LTE Access and Evolved Packet Core Signaling and IP platforms
- Integration with various third party equipment
- IMS Services prototyping

Highlights:

- Innovative In-house IMS & LTE Playground
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The Playground has been set up by the company in order to prototype innovative telecommunication solutions and build up the competence to further provide software R&D services in the field of IP Multimedia Subsystem (IMS) and next generation radio access and core networks.

Key strategic partner of the Playground is Fraunhofer FOKUS, a Berlin-based research institute.
Future Telecom Technologies Playground: Features

- Unified playground for next generation mobile access & core networks and IMS
- Comprises IMS Core, EPC, LTE Access (eNB), app servers and terminal devices
- Compliant with 3rd Generation Partnership Project (3GPP)
- Based on OpenIMS and OpenEPC platforms from Fraunhofer FOKUS
- Used for IMS/LTE components and applications prototyping and demonstrations
- Different implementations of HSS based on C++ and Java
- S6a and Cx interfaces prototyping based on open Diameter stack, development of SQL transactions.

www.merasws.com/playground
MERIA Wireless Research Group: Highlights

- Over 12 years of significant experience in 2G, 3G, 4G Wireless technology research
- 2 Professors and 4 Doctors of Science
- Links to international research entities and projects (Fraunhofer FOKUS NGNI, FP7 SOCRATES, Univerself)
- Research focus on:
  - RF optimization
  - MIMO systems
  - Self-Organizing Networks (SON)
- Research is supplemented by various simulation techniques which are capable of reproducing a system`s behavior in various environments / conditions.

- Highlights of the work done in 2012 are as follows:
  - Two handover optimization algorithms have been improved by Mera’s research group.
  - Two SON scenarios simulated:
    - Handover Parameters Optimization
    - Cell Outage Management
  - 3GPP Rel.10 channel model is applied for signal power simulation
MERA Wireless Research Areas

- Multi-antenna techniques (MIMO systems, Cooperative MIMO and SDMA systems in multipath environment, Supper resolution algorithms),
- Coordinated multi-point (CoMP),
- Advanced interference management techniques (including adaptive antenna array, adaptive interference cancellation and in-house simulation),
- Enhanced user position location, including wireless position location for indoor and outdoor,
- RF network optimization (including signal propagation, in-house algorithm and simulation in 4G networks)
- OFDM-based solutions,
- Adaptive modulation and coding,
- Advanced signal processing algorithms,
- Space-time coding (including in-house simulation)
- Self-Organizing Networks (SON) algorithms.
MERAs together with Fraunhofer FOKUS team is extending the OpenEPC (Open Evolved Packet Core) platform. Summary of additional features developed by MERAs:

**New protocols:**
- GTPv2-U/C protocol stack module
- S1-AP stack module
- NAS protocol stack module

**Components:**
- MME
- UE and eNodeB emulation
- HSS
- SGW
- PDNGW

**New interfaces:**
- S1-MME, S1-U, S11, S5, S6a
- (UE-MME-SGW-HSS)

Demonstrated at FUSECO Forum in Berlin, Germany
Software development, maintenance and testing for Tier-1 telecom vendor including:

- SS7 stack for the SGSN node (SAAL, MTPL3, M3UA, SCCP, TCAP, etc.)
- SCTP/IP stack for the MME node
- Customer support (product integration and upgrade)
- Analyzing customer and 3GPP requirements, breaking down into features, design, development and implementation of the requirements
R&D Case Study: “SGSN/MME Platform. Features”

- Signaling for dual (GSM + WCDMA) and triple (GSM + WCDMA + LTE) network access for the combined SGSN-MME node
- SCTP/IP stack for both SS7 interfaces in SGSN and S1 and S6a interfaces in MME
- Multi-core boards deployment
- IPv6 support for SCTP (MME) and M3UA (SGSN) protocols
- SCTP enhancements including DNS hostname resolution, Explicit Congestion Notification (ECN), path MTU discovery and scalable SCTP endpoints.
- In-Service Software Upgrade
- Operation and Maintenance features on the SGSN-MME including alarms, statistics, counters and performance measurements
R&D Case Study: “IP Platform for Combined Access Node (BTS/NodeB/eNodeB)”

- Maintenance, development and testing of the components that provide control and user planes for the IP Transport and Ethernet Switching system functions in customer’s generic Packet Platform.
- 4 types of IP exchange terminals are supported.
- 3 types of 1G/10G Ethernet Switches are supported.
- Handling of the most important protocols from TCP/IP stack used in telecommunication systems.

Competences:

- 2.5G, 3G and 4G mobile telecommunication networks architecture
- Software development for real-time operation systems
- Databases
- Link, Internet and Transport levels (L2/L3) protocols
- General concepts and key architectures of the network processors used for IP solutions
- Real-time OS: OSE, MontaVista Linux
- NP solutions: Intel IXP2400, LSI/Agere
- Programming and scripting languages: C, C++, IXP24 assembler, LSI FPL and C-NP, TCL/Expect
- Network protocols: ATM, 1G/10G Ethernet, STP/RSTP, ARP, IP, ICMP, UDP, TCP, GTP, SCTP, NTP, RTP/RTCP, SNMP
- Databases: Enea Polyhedra SQL
Plans
**Future Telecom Technologies Playground.**

**R&D Roadmap**

- Develop software for new nodes and interfaces (eNodeB, MME, UE, SGW, PDNGW)
- IMS Location-Based Services
- IPTV based on IMS (STB and App Server integration)
- Development and Integration of LTE Radio Access Part
- Self Organizing Networks (SON) scenarios

### 2010 to 2012

- Unified test bed for All-IP networks installed
- Comprises IMS Core, EPC, LTE Access (emulation), app servers and terminal devices
- Compliant with 3GPP Release 9 and ETSI TISPAN Release 2
- Based on OpenIMS and OpenEPC platforms byFraunhofer FOKUS

### 2013

- Development of software for new nodes and interfaces (eNodeB, MME, UE, SGW, PDNGW)
- IMS Location-Based Services
- IPTV based on IMS (STB and App Server integration)

### 2010:

- Software emulation of radio access part

### 2013:

- Interphase iSPAN® 36701 Wireless Basestation AMC, Radiocomp Remote Radio Head 2.6 GHz
- UE: commercial handset or LTE modem supporting RRH band
- LTE eNB application based on Interphase s/w package supporting necessary interfaces towards EPC and UE
- Enhanced EPC software to support standardized features, i.e. NAS security, PER-based S1AP etc.
MERA aims at creating operational eNodeB component (with radio interface support), integrating it into Innovative LTE & IMS Playground and verify interoperability with selected commercial LTE devices.

**HW setup:**
- Interphase iSPAN® 36701 Wireless Basestation AMC
- Radiocomp Remote Radio Head LTE band 7
- UE: commercial handset or LTE modem supporting RRH band

**SW design:**
- LTE eNB application basing on Interphase s/w package supporting necessary interfaces towards EPC and UE
- Enhance existing EPC software to support standardized features like NAS security, PER-based S1AP etc.

**Integration:**
- Full setup of network entities to emulate operator’s network towards selected commercial UE.
MERA follows communication technology evolution trends and invests in expertise developments of a new generation of wireless communication standards, including LTE and LTE Advanced.

To enhance its expertise in LTE SON, MERA is developing LTE system-level simulator allowing to evaluate system performance in terms of given metrics subject to variation of different aspects such as LTE-specific PHY level parameters, propagation channel models, users' movement models etc.

New SON scenarios are going to be investigated in 2013.
SON Research Activities: Plans

- **Distributed vs centralized SON concepts study.** Deep SON use cases study. MERA SON simulation concept development,
- **Advanced models support:**
  - mobility (ex: Random walk model, Random waypoint model)
  - traffic (ex: Full queue model, Interactive traffic: web-browsing using HTTP)
  - signal propagation (Multi-path propagation for urban and suburban areas, ex: Okumura-Hata model)
  - radio channel (interference, delays, fading models etc.)
- **Advanced visualization:**
  - Detailed beam model support
  - 3D city model support
  - Metrics
  - Detailed call path
  - QoS aspects
- **SON simulators development**
- **SON playground setup** based on existing IMS/LTE facility
Thank you!

For additional information, please, visit us at www.merasws.com