



3GPP Standards Self Organizing Networks

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Outline



What is 3GPP

- 3GPP structure

3GPP SON features

- Rel-8 to Rel-12

SON Management

- SON targets and control

Annexes

- SON work plan & related specifications



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What is 3GPP?



Organizational Partners

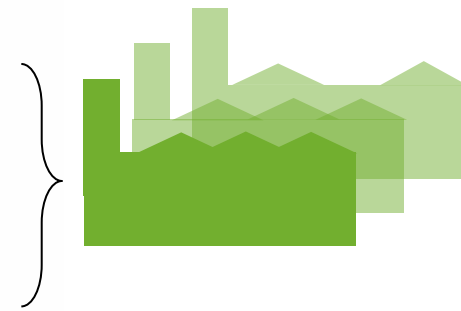
- 6 Regional standards organizations (Asia, Europe & North America)



Market Representative Partners

Partners

- 11 Market partners representing the broader industry





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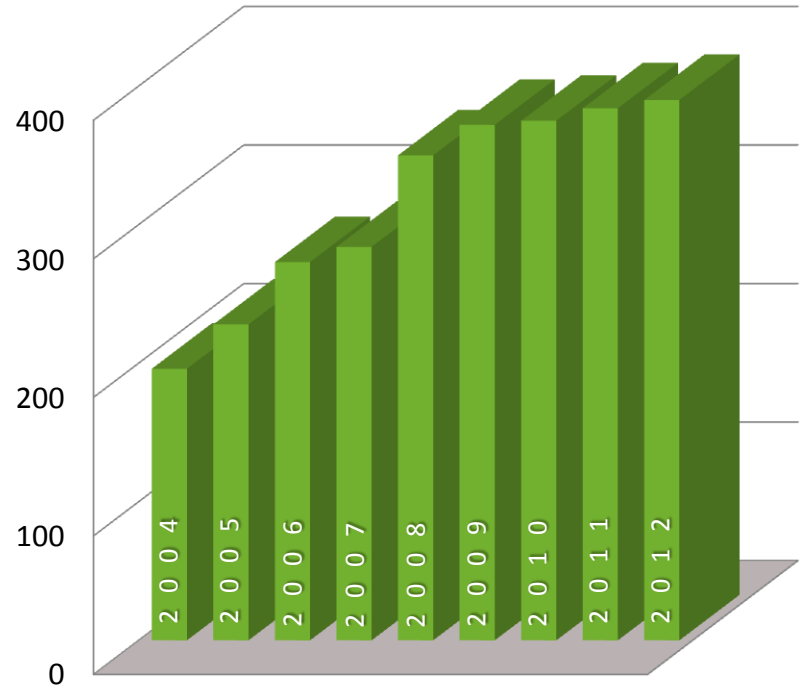
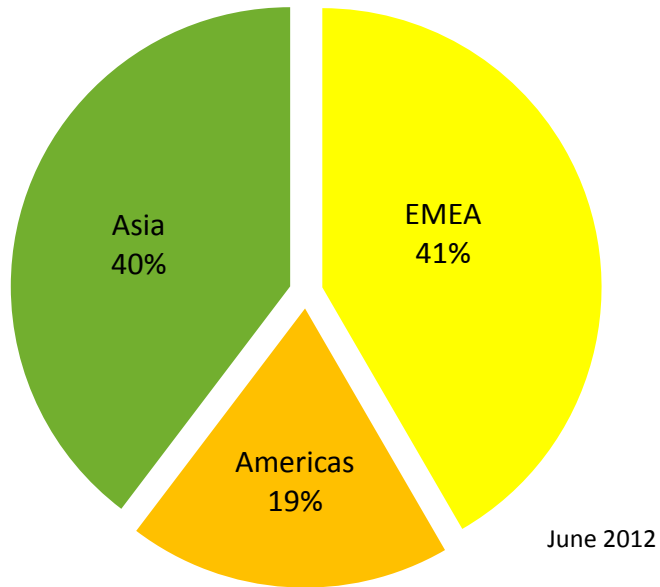
3GPP Membership



 39 Countries

 390 Companies (via Organizational Partners)

Participation by Region





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3GPP Group Structure



- 📶 Leaders elected from Member Companies
- 📶 Each Technical Specification Group has Working Groups
- 📶 Quarterly Meetings cycle



TSG GERAN

GSM EDGE
Radio Access Network

GERAN WG1
Radio Aspects

GERAN WG2
Protocol Aspects

GERAN WG3
Terminal Testing

TSG RAN

Radio Access Network

RAN WG1
Radio Layer 1 spec

RAN WG2
Radio Layer 2 spec
Radio Layer 3 RR spec

RAN WG3
Iub spec, Iur spec, Iu spec
UTRAN O&M requirements

RAN WG4
Radio Performance
Protocol aspects

RAN WG5
Mobile Terminal
Conformance Testing

TSG SA

Service & Systems Aspects

SA WG1
Services

SA WG2
Architecture

SA WG3
Security

SA WG4
Codec

SA WG5
Telecom Management

TSG CT

Core Network & Terminals

CT WG1
MM/CC/SM (Iu)

CT WG3
Interworking with external
networks

CT WG4
MAP/GTP/BCH/SS

CT WG6
Smart Card Application
Aspects



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3GPP Specifications



Technical Specifications

Revised versions of 3GPP specifications are published - free of charge - up to four times a year following the quarterly Technical Specification Group plenary meetings.

Work Plan

In the Work plan "Features" of the 3GPP system are divided into "Building Blocks" and "Work Tasks", which lead to the production of Technical Specifications (or Reports) and / or Change Requests to existing Specifications.

Specification series	3G / GSM (≥R99)	GSM only (≥R4)	GSM only (< R4)
Requirements	21 series	41 series	01 series
Service aspects ("stage 1")	22 series	42 series	02 series
Technical realization ("stage 2")	23 series	43 series	03 series
Signalling protocols ("stage 3") - user equipment to network	24 series	44 series	04 series
Radio aspects	25 series	45 series	05 series
CODECs	26 series	46 series	06 series
Data	27 series		07 series
Signalling protocols ("stage 3") - (RSS-CN) and OAM&P and Charging (overflow from 32.- range)	28 series	48 series	08 series
Signalling protocols ("stage 3") - intra-fixed-network	29 series	49 series	09 series
Programme management	30 series	50 series	10 series
Subscriber Identity Module (SIM / USIM), IC Cards. Test specs.	31 series	51 series	11 series
OAM&P and Charging	32 series	52 series	12 series
Security aspects	33 series	(2)	(2)
UE and (U)SIM test specifications	34 series	(2)	11 series
Security algorithms (3)	35 series	55 series	(4)
LTE (Evolved UTRA) and LTE-Advanced radio technology	36 series	-	-
Multiple radio access technology aspects	37 series	-	-



3GPP Releases



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3 Stages of a Release

Parallel “Releases”, each at its own state of maturity, give a stable platform for implementation:

- Stage 1 - Service description from a service-user’s point of view.
- Stage 2 - Logical analysis, functional elements, information flows & reference points between functional entities.
- Stage 3 - Implementation

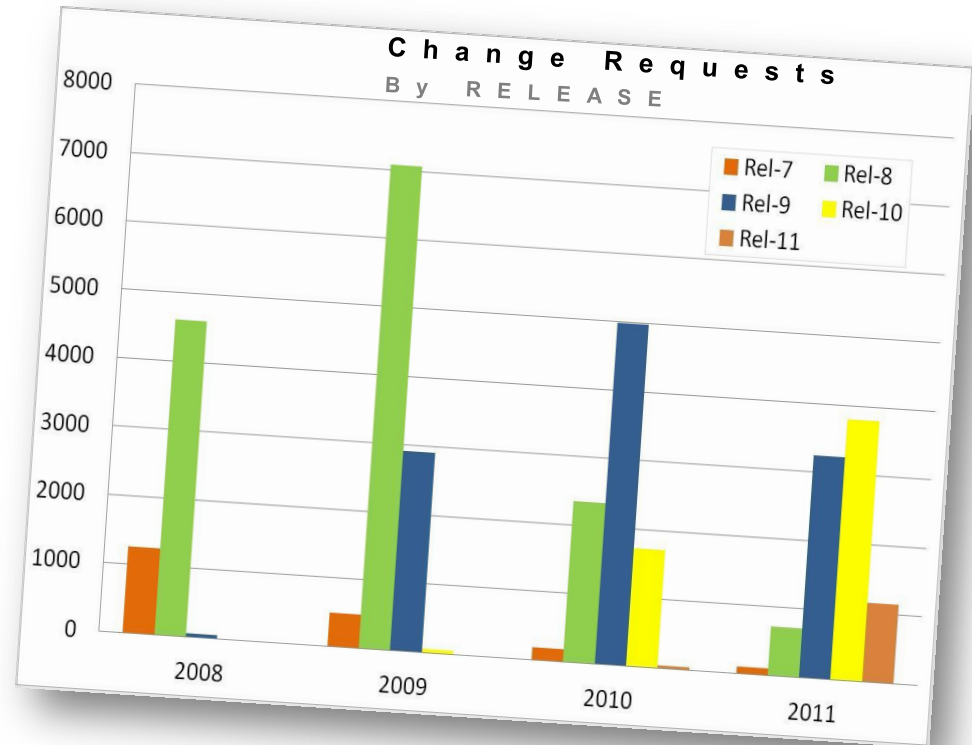
NB: Test specifications are completed after Stage 3 Freeze.

Change Requests

To create revised versions of 3GPP specifications:

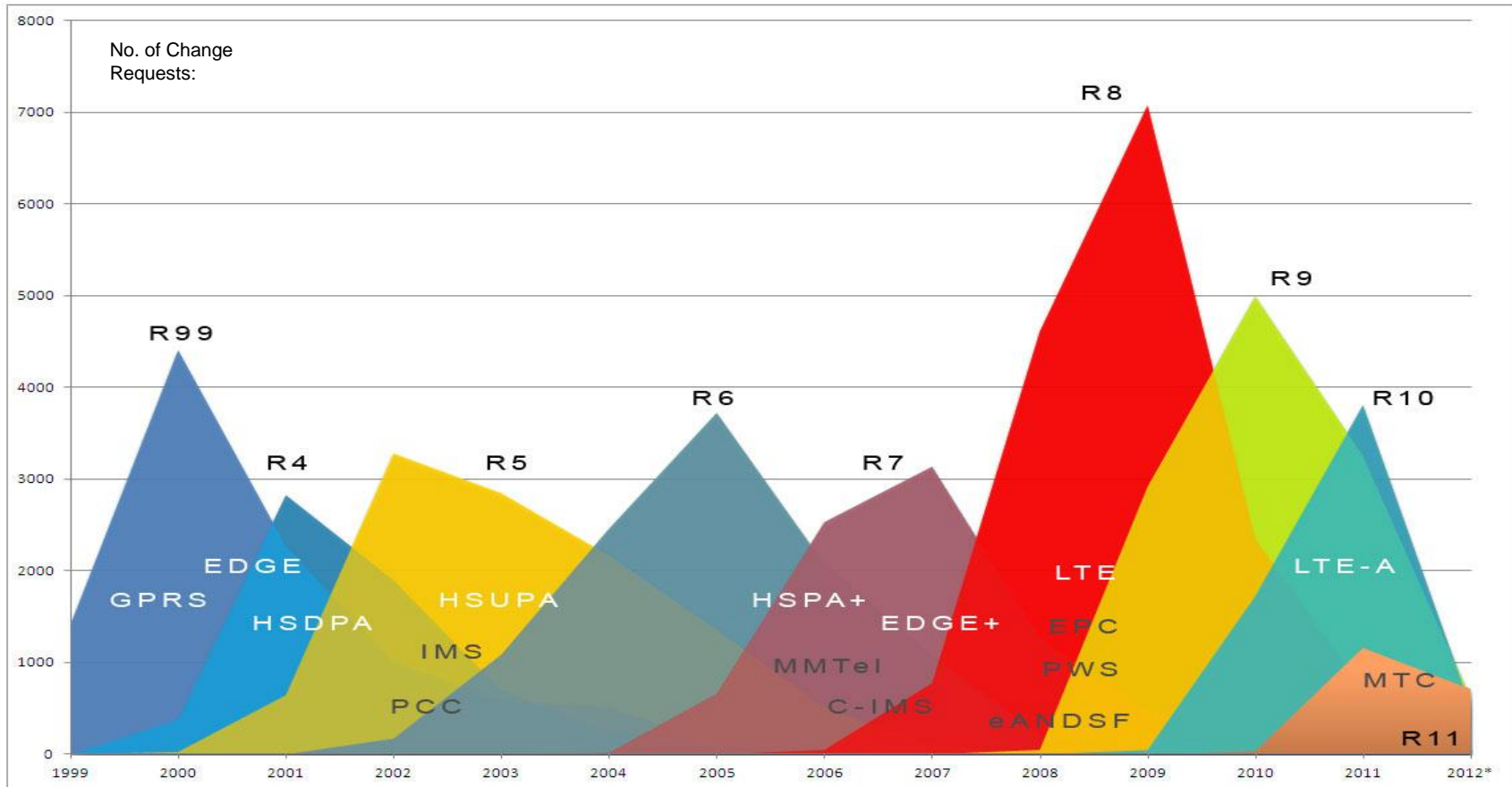
- Add a new feature
- Correct / clarify / enhance an existing feature of a Release still under development
- Correct an error in a Specification

Release 8	Stage 3 freeze	December 2008
Release 9	Stage 3 freeze	December 2009
Release 10	Stage 3 freeze	March 2011
Release 11	Stage 3 freeze	September 2011





Feature Rich Releases

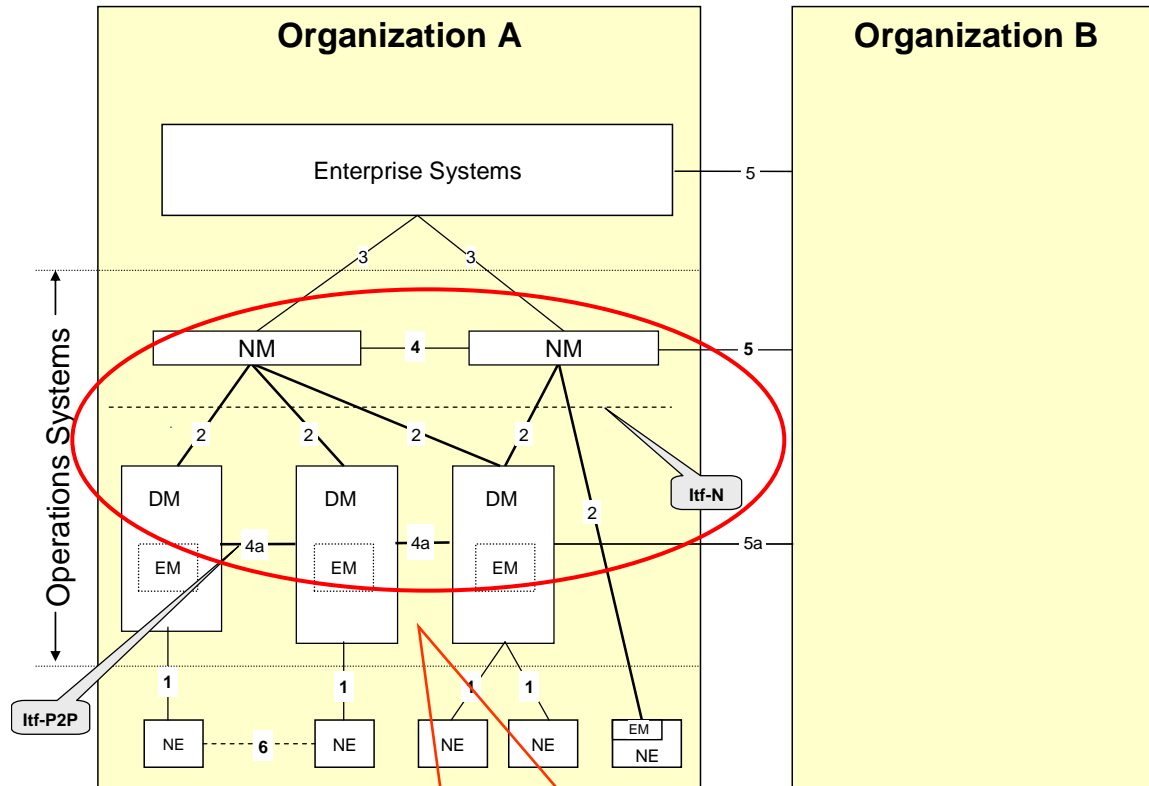




3GPP Management Reference Model (TS 32.101)



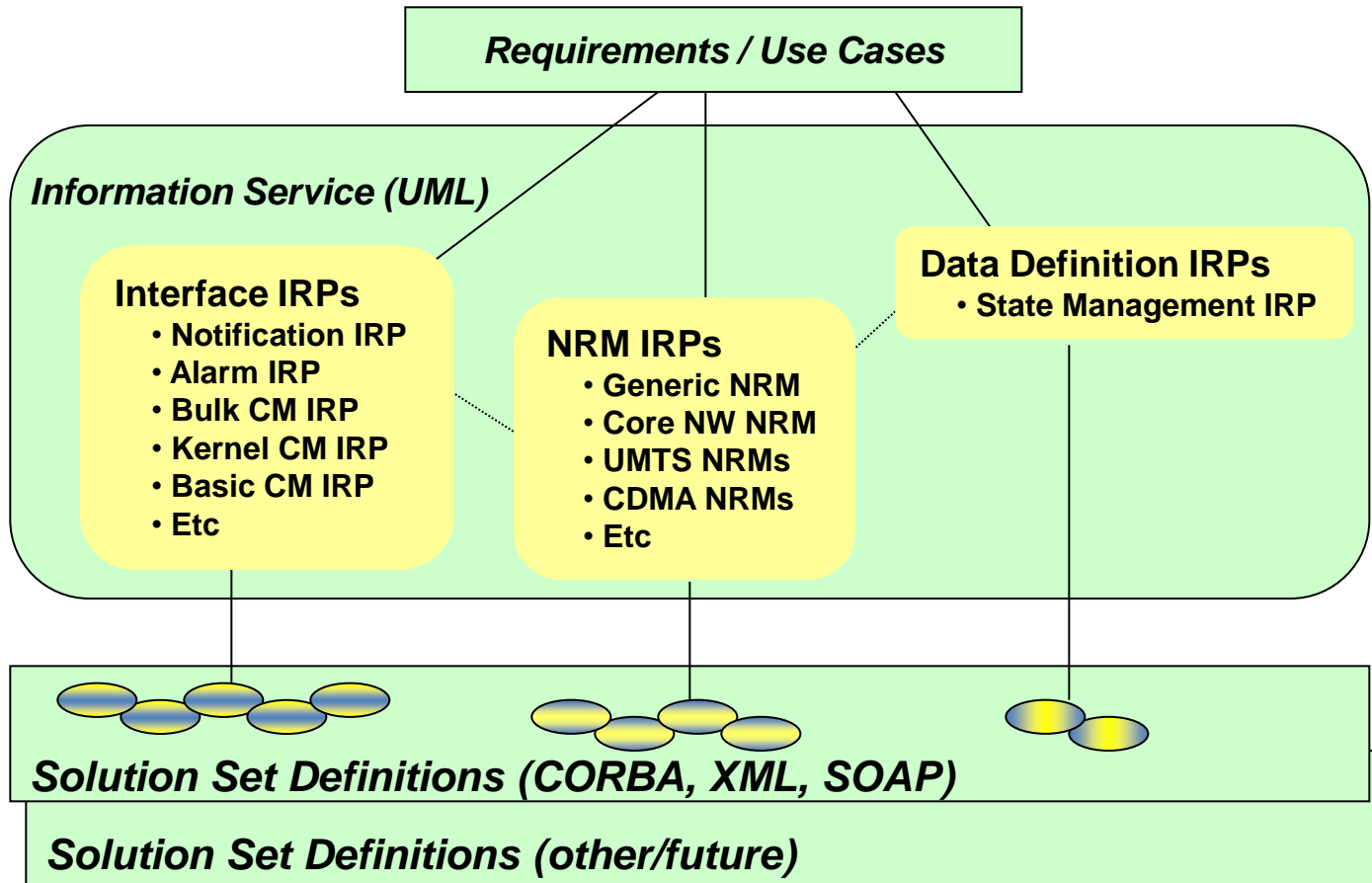
- 1: Between the Network Elements (NEs) and the Element Manager (EM) of a single broadband wireless network
- 2: Between the Element Manager (EM) and the Network Manager (NM) of a single broadband wireless network**
- 3: Between the Network Managers and the Enterprise Systems of a single broadband wireless network
- 4: Between the Network Managers (NMs) of a single broadband wireless network
- 4a: Between the Domain Managers (DMs) of a single broadband wireless network
- 5: Between Enterprise Systems & Network Managers of different broadband wireless networks
- 5a: Between the Domain Managers (DMs) of different broadband wireless networks
- 6: Between Network Elements (NEs)**



3GPP Management Standards Focus



3GPP SA5 IRP Concept



Relatively stable over long period of time

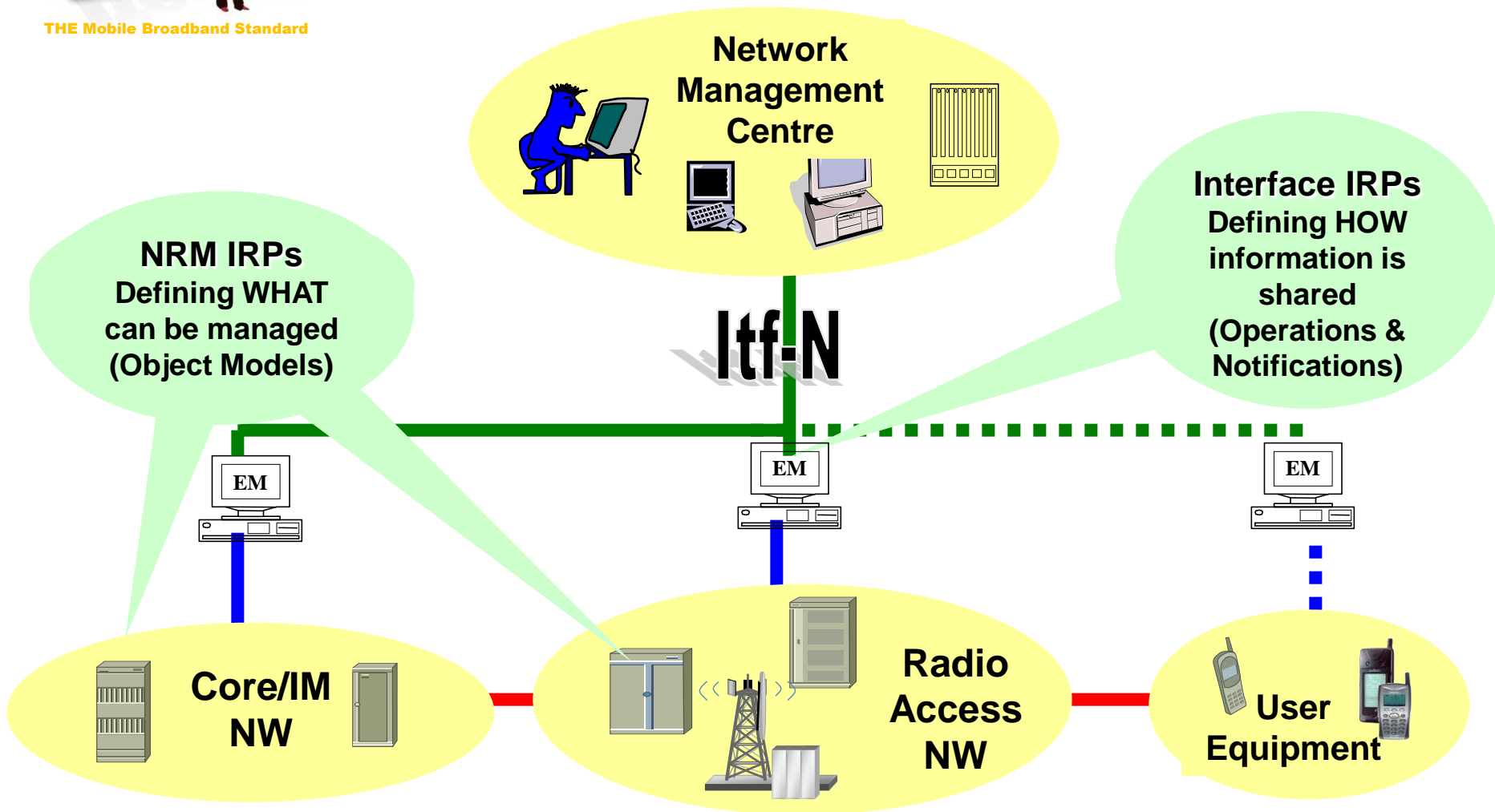
Change only with respect to functional addition and corrections

Change with new/better technologies



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Interface IRP & NRM IRP





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Release 8 SON Features 1/3



SON Concepts and Requirements (SA5)

- TS 32.500 “Self-Organizing Networks (SON); Concepts and requirements” describes high level use cases, business level requirements, specification level requirements and SON reference architecture
- SON reference architecture
 - NM-Centralised SON: SON solution where SON algorithms are executed at the Network Management level
 - EM-Centralised SON: SON solution where SON algorithms are executed at the Element Management level
 - Distributed SON: SON solution where SON algorithms are executed at the Network Element level
 - Hybrid SON: SON solution where SON algorithms are executed at two or more levels



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Release 8 SON Features 2/3



- Self-Configuration of eNodeB, including automated Software Management (RAN3/SA5)
 - Self-configuration includes automated download of software and radio configuration data
 - Dynamic configuration of X2 and S1 interfaces may also be done as part of the signalling included in the Transport Network Layer address discovery
- Automatic Neighbour Relation (ANR) management (RAN2-3/SA5)
 - eNB requests to UE to report Intra-LTE/Inter-Frequency neighbours cells identification
 - ANR function deals with automatic NR additions and removals
 - The ANR function in eNB can be enabled or disabled by OAM
 - If the operator chooses, the OAM system can add and configure Neighbour Cell Relations before the eNB goes into operation
 - If the operator chooses, the OAM system can add and configure or remove Neighbour Cell Relations after the eNB goes into operation



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Release 8 SON Features 3/3



Framework for PCI Selection (RAN3/SA5)

- Allows the eNB to select its own PCI based on UE reports and information received from neighbour eNBs
- OAM can configure a list of valid Physical Cell Identifiers (PCI) in the eNB in order to allow the eNB to choose an appropriate PCI for a cell from within this list to support distributed PCI assignment
- OAM can configure a valid PCI in the eNB to support centralized PCI assignment

Support for Mobility Load Balancing (RAN3)

- Load information consists of radio, hardware and transport resource usage
- Load reporting function is executed by exchanging cell specific load information between neighbour eNBs over the X2 interface



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Release 9 SON Features 1/3



Automatic Radio Network Configuration Data Preparation (SA5)

- When eNBs are inserted into an operational radio network, some network configuration parameters cannot be set before-hand because they have interdependencies with the configuration of operational Network Elements
- This functionality allows the generation and distribution of such interdependent parameters to provide fully automatic establishment of an eNB into a network

Self-optimization management (SA5)

- Definition of requirements, targets and control for the use case Hand Over Optimization (distributed architecture)
- Definition of requirements, targets and control for the use case Load Balancing Optimization (distributed architecture)
- Definition of requirements and control for the use case Inter-Cell Interference Coordination (distributed Architecture)
- Definition of Performance Measurements for Hand Over Optimization and Load Balancing Optimization



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Release 9 SON Features 2/3



Self-Organizing Networks (RAN3)

- TR 36.902 introduces solutions for the following SON use cases: Coverage and Capacity optimization, Mobility Load balancing optimization, Mobility Robustness optimization, RACH Optimisation

RACH parameters optimization (RAN2)

- Allows neighbour eNBs to exchange information about their used PRACH resources (and thus avoid interference and RACH collisions)

Mobility Load Balancing (RAN3)

- Load balancing action based on handovers, the eNB may initiate handover due to load
- Added the cell capacity class value as an optional load information
- Added load reporting function for Inter RAT
- Possibility to coordinate adjustment of handover and/or reselection configuration between eNBs



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Release 9 SON Features 3/3



Mobility Robustness Optimisation (RAN3)

- Help to the detection of radio link connection failures that occur due to Too Early or Too Late Handovers, or Handover to Wrong Cell
- eNB aids the detection of handover failure cases by communicating to neighbours a radio link failure indication and a handover report
- During RRC re-establishment, the UE may send a report containing radio measurements at the time of failure

Support for Energy Saving (RAN3)

- Reduce operational expenses through energy savings by signalling information over X2
- Allows, for example in a deployment where capacity boosters can be distinguished from cells providing basic coverage, to optimize energy consumption enabling the possibility for a cell providing additional capacity, to be switched off when its capacity is no longer needed and to be re-activated on a need basis



Release 10 SON Features 1/2



Self-optimization management continuation (SA5)

- Definition of requirements, targets and control for the use case RACH Optimization (distributed architecture)
- Definition of parameters for NM-Centralized architecture for the use case Capacity and Coverage Optimization
- SON range control and NMS-Centralized SON Management
- Performance Measurements for RACH Optimization and Capacity and Coverage Optimization

Self-healing management (SA5)

- Introduction of use cases and high level requirements based on monitoring and analyse of relevant data like fault management, alarms, notifications, and self-test results



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Release 10 SON Features 2/2



OAM aspects of Energy Saving in Radio Networks (SA5)

- Definition of Energy Savings Management OAM requirements and solutions for the following use cases: eNodeB Overlaid, Carrier restricted, Capacity Limited Network
- Definition of OAM requirements and solutions for coordination of ESM with other SON functions and traditional configuration management

LTE Self Optimizing Networks enhancements (RAN3)

- Mobility Load Balancing Load reporting mechanism is extended
 - Multi cell reporting
 - Event triggered reporting
- Mobility Robustness Optimisation reports unnecessary HO to another RAT
- For Mobility Robustness Optimisation, UE is also able to provide information about the failure when performing RRC establishment



Release 11 SON Features 1/2



UTRAN Self-Organizing Networks management (SA5)

- Automatic Neighbour Relation (ANR), including Intra-UTRAN ANR, UTRAN IRAT ANR from UTRAN to GERAN, and UTRAN IRAT ANR from UTRAN to E-UTRAN

LTE Self-Organizing Networks (SON) coordination management (SA5)

- Coordination between Configuration Management and configuration parameters changes made by SON functions
- Coordination between different SON functions to detect, prevent or resolve conflicts or negative influences between SON functions to make SON functions comply with operator's policy



Release 11 SON Features 2/2



Inter-RAT Energy Saving Management (SA5)

- Based on Intra-RAT mechanisms, definition of OAM requirements and solutions for Inter-RAT energy saving
- Use case E-UTRAN Cell overlaid by multiple UTRAN/GERAN Cells

Further Self Optimizing Networks enhancements (RAN3)

- Mobility Robustness Optimisation
 - Support for inter RAT mobility optimisation
 - Support for context retrieval in eNB analysing the failure. This enables the eNB to take into account UE specific configurations at the time of failure
 - Detection of inter RAT ping pong events
- Support for Energy Saving
 - Support for Inter RAT energy saving
 - Support for enhanced switch on of dormant cells



Release 12 SON Features



Enhanced Network Management (NM) Centralized Coverage and Capacity Optimization (SA5)

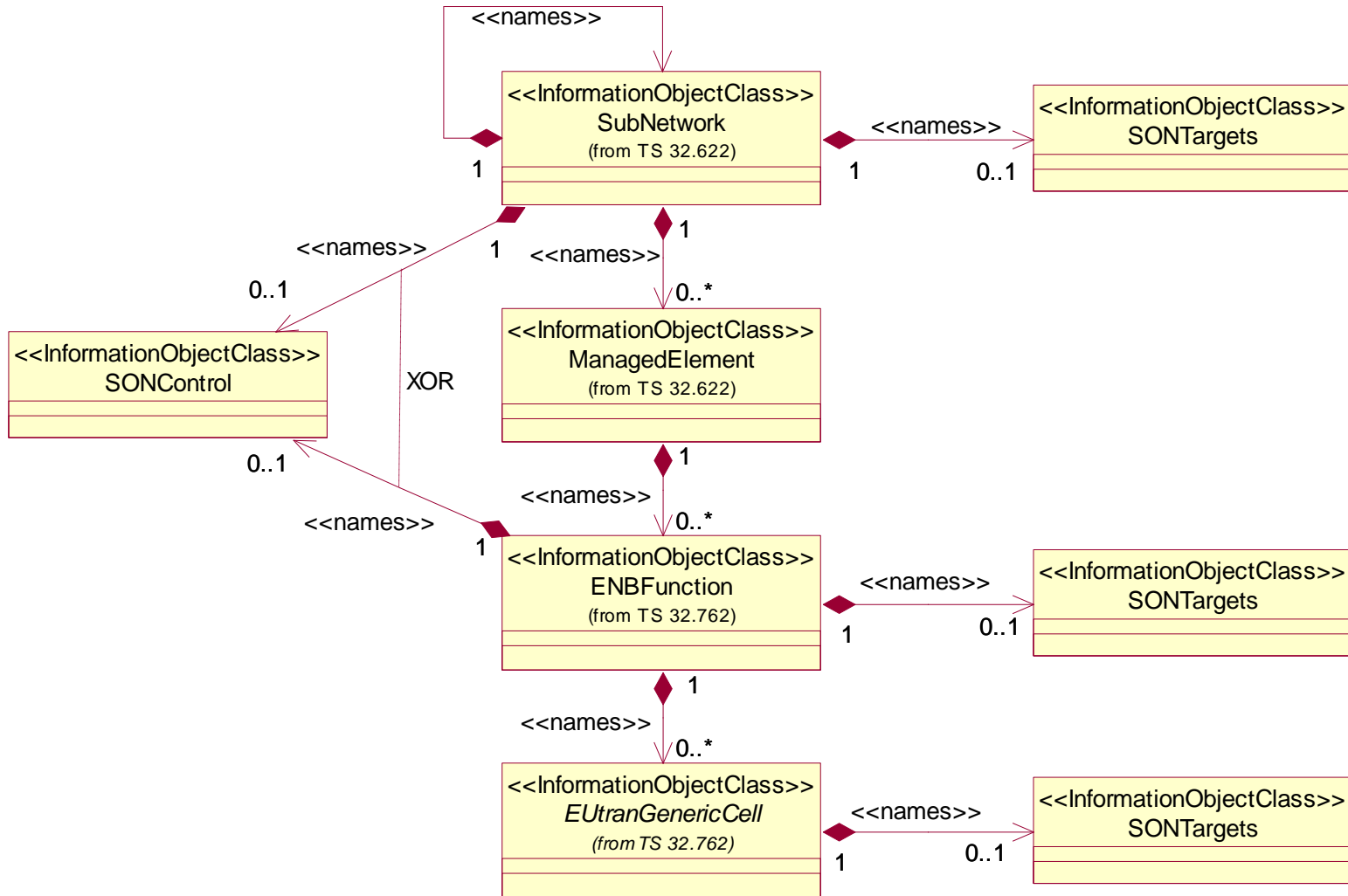
- Identification of required (potentially new) UE and network based measurements for an NM centralized CCO function
- Identification of the required configuration attributes for an NM centralized CCO function

Multi-vendor Plug and Play eNB connection to the network (SA5)

- Existing self-configuration function is mainly focused on radio network element parameters
- Extension to enable automatic set-up of a secure connection between eNB and its EMS



SON Policy Network Resource Model (TS 32.522)





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SON Control



- 📶 This Information Object Class represents the possibility to switch on or off SON functions (TS 32.522)
- 📶 This is provided for Handover optimization, Load Balancing optimization, Energy Saving, RACH optimization and Cell Outage Compensation

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
hooSwitch	CM	M	M
lboSwitch	CM	M	M
esSwitch	CM	M	M
roSwitch	CM	M	M
cocSwitch	CM	M	M



SON Targets



Definition of Target (from TS 32.521)

- Target provides a clear basis for assessing performance of self-optimization functions. Targets need to be carefully specified in terms of a series of performance measurements and/or KPIs, which can be specific, and which can be used also to identify problems. A target should be expressed in terms of a specific value or specific value range. The present document does not specify the specific value or desired value range of each target since those should be set by operators according to their policy and different network situation.
- Operators should assign weights for targets being used.



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Annexes



3GPP
A GLOBAL INITIATIVE

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Statistics
7638 unique visitors average per day

3GPP Satisfaction Survey
5 minute survey Please help us by completing the new 2012 Survey. Take the Survey

TSG Structure

Project Co-ordination Group (PCG)

TSG GERAN	TSG RAN	TSG SA	TSG CT
<ul style="list-style-type: none"> UMTS E-UTRAN Radio Access Network GERAN WG1 Radio Aspects GERAN WG2 Protocol Aspects GERAN WG3 Terminal Testing 	<ul style="list-style-type: none"> Radio Access Network RAN WG1 Radio Layer 1 spec RAN WG2 Radio Layer 2 spec Radio Layer 3 RAN spec RAN WG3 Full spec, full spec, full spec UTRAN UTRAN requirements RAN WG4 Radio Performance Protocol aspects RAN WG5 Mobile Terminal Conformance Testing 	<ul style="list-style-type: none"> Service & Systems Aspects SA WG1 Services SA WG2 Architecture SA WG3 Security SA WG4 Codec SA WG5 Telecom Management 	<ul style="list-style-type: none"> Core Network & Terminals CT WG1 MM/CCSM (U) CT WG3 Interworking with external networks CT WG4 MAP/OTP/BCH/SS CT WG6 Smart Card Application Aspects

Click on any TSG or WG - in the chart below - to go to that Group's home page to find information on its elected officials, its meeting schedule, the Work Items and Specifications for which it is responsible, etc.



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Load Balancing Optimization Targets



Target	Definition	Legal Values
RRC connection establishments failure rate related to load	The number of Failed RRC connection establishments related to load/ The total number of Attempted RRC connection establishments. The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage
E-RAB setup failure rate related to load	The number of E-RAB setup failure related to load/ The total number of attempted E-RAB setup For E-RAB setup failure related to load, the causes “Reduce load in serving cell” and “Radio resources not available” defined in TS 36.413 [12] could be used. The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage
RRC Connection Abnormal Release Rate Related to Load	The number of abnormal RRC connection release related to load/ The total number of RRC connection release. The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage
E-RAB Abnormal Release Rate Related to Load	The number of E-RAB abnormal release related to load/ The total number of E-RAB release For E-RAB setup failure related to load, the causes “Reduce load in serving cell” and “Radio resources not available” defined in TS 36.413 [12] could be used. The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage
Rate of failures related to handover	(the number of failure events related to handover) / (the total number of handover events) The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage



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Load Balancing Optimization Measurements



Measurement	Description	Targets
The number of Failed RRC connection establishments related to load	Refer to 3GPP TS 32.425 [8] Failed RRC connection establishments	RRC connection establishments failure rate related to load
The total number of Attempted RRC connection establishments	Refer to 3GPP TS 32.425 [8] Attempted RRC connection establishments	RRC connection establishments failure rate related to load
The number of E-RAB setup failure related to load	Refer to 3GPP TS 32.425 [8] Number of initial SAE Bearers failed to setup	E-RAB setup failure rate related to load
The total number of attempted E-RAB setup	Refer to 3GPP TS 32.425 [8] Number of initial SAE Bearers attempted to setup	E-RAB setup failure rate related to load
The number of abnormal RRC connection release related to load	Number of UE CONTEXT Release Request initiated by eNodeB	RRC Connection Abnormal Release Rate Related to Load
The total number of RRC connection release	Number of Successful UE Context Release	RRC Connection Abnormal Release Rate Related to Load
The number of E-RAB abnormal release related to load	Refer to 3GPP TS 32.425 [8] Number of SAE Bearers requested to release initiated by eNodeB per cause	E-RAB Abnormal Release Rate Related to Load
The total number of E-RAB release	Refer to 3GPP TS 32.425 [8] Number of SAE Bearers successfully released	E-RAB Abnormal Release Rate Related to Load
the number of failure events related to handover	Refer to 4.3.5	Rate of failures related to handover
the total number of handover events	Refer to 4.3.5	Rate of failures related to handover



Handover Parameter Optimization Targets



Target	Definition	Legal Values
Rate of failures related to handover	(the number of failure events related to handover) / (the total number of handover events) The target is met if the actual rate is smaller than the target value.	Integer [0..100] in unit percentage



Handover Parameter Optimization Measurements



Measurement	Description	Targets
Number of handover events	Includes successful handovers plus all identified failures	Rate of failures related to handover
Number of HO failures	All failure cases	Rate of failures related to handover
Number of too early HO failures	Too early HO failure cases	Rate of failures related to handover
Number of too late HO failures	Too late HO failure cases	Rate of failures related to handover
Number of HO failures to wrong cell	HO failures to wrong cell	Rate of failures related to handover
Number of unnecessary HOs to another RAT	Unnecessary HOs to each of different RATs	



RACH Optimization Targets



Target	Definition	Legal Values
Access Probability, <i>AP</i>	The probability that the UE has access after a certain random access attempt number. The target is met if the actual access probability is higher than the target probability value.	CDF of access attempts. See section 5.5.1
Access Delay Probability, <i>ADP</i>	The probability distribution of Access Delay expected to be experienced by UEs accessing the RACH Channel. The target is met if the actual access probability is higher than the target probability value.	CDF of delays. See section 5.5.1



RACH Optimization Measurements



Measurement	Description	Targets
Distribution of RACH preambles sent	Refer to 3GPP TS 32.425 [8] Cumulative Distribution of RACH preambles sent by UE	Access Probability, AP
Distribution of RACH access delay	Refer to 3GPP TS 32.425 [8] Cumulative Distribution of RACH Access Delay	Access Delay Probability, ADP



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3GPP Work Plan SON Rel-8 & Rel-9



Release	ID	Work Item	WG
Rel-8	20068	Rel-8 LTE – 3G Long Term Evolution - Evolved Packet System RAN part	RP,S5
	390004	Self-Organizing Networks (SON)	S5
	390104	SON Concepts and requirements	S5
	390005	Self-Establishment of eNBs, including automated Software Management	S5
	390006	SON Automatic Neighbour Relations (ANR) List Management	S5
Rel-9	420029	Rel-9 Operations, Administration, Maintenance and Provisioning (OAM&P)	S5
	430043	Rel-9 Self-Organizing Networks (SON) - OAM aspects	S5
	390007	SON self-optimization management	S5
	440067	Automatic Radio Network Configuration Data Preparation	S5
	420011	Rel-9 Self-Organizing Networks (SON)	R3,R2
	360007	Study on Self-Organizing Networks (SON) related OAM interfaces for Home NodeB	S5
	390017	Study on Self-healing of Self-Organizing Networks (SON)	S5



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3GPP Work Plan SON Rel-10 & Rel-11



Release	ID	Work Item	WG	
Rel-10	460031	Rel-10 Operations, Administration, Maintenance and Provisioning (OAM&P)	S5,C4	
	460034	Rel-10 Self-Organizing Networks (SON) - OAM aspects	S5	
	460035	SON Self-optimization management continuation	S5	
	460036	SON Self-healing management	S5	
	470037	OAM aspects of Energy Saving in Radio Networks	S5	
	470011	LTE Self Optimizing Networks (SON) enhancements	R3,R2,R4	
	470111	Core part: LTE Self Optimizing Networks (SON) enhancements	R3,R2,R4	
	430044	Study on Telecommunication Management; Energy Savings Management	S5	
	Rel-11	510051	Rel-11 Operations, Administration, Maintenance and Provisioning (OAM&P)	S5
		510351	Rel-11 Self-Organizing Networks (SON) - OAM aspects	S5
510059		UTRAN Self-Organizing Networks (SON) management	S5	
530051		LTE Self-Organizing Networks (SON) coordination management	S5	
540031		Inter-RAT Energy Saving Management	S5	
530030		Further Self Optimizing Networks (SON) enhancements	R3,R2	
530130		Core part: Further Self Optimizing Networks (SON) enhancements	R3,R2	



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3GPP Work Plan SON Rel-12



Release	ID	Work Item	WG
Rel-12	560031	Rel-12 Operations, Administration, Maintenance and Provisioning (OAM&P)	S5
	560131	Rel-12 Self-Organizing Networks (SON) - OAM aspects	S5
	560032	Enhanced Network Management (NM) Centralized Coverage and Capacity Optimization	S5
	560033	Multi-vendor Plug and Play eNB connection to the network	S5



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General SON Specifications



Number	Title
TR 32.821	Telecommunication management; Study of Self-Organizing Networks (SON) related Operations, Administration and Maintenance (OAM) for Home Node B (HNB)
TS 32.500	Telecommunication management; Self-Organizing Networks (SON); Concepts and requirements
TS 32.103	Telecommunication management; Integration Reference Point (IRP) overview and usage guide
TR 36.902	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Self-configuring and self-optimizing network (SON) use cases and solutions



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ANR Related Specifications



Number	Title
TS 32.511	Telecommunication management; Automatic Neighbour Relation (ANR) management; Concepts and requirements
TS 32.761	Telecommunication management; Evolved Universal Terrestrial Radio
TS 32.762	Access Network (E-UTRAN) Network Resource Model (NRM) Integration
TS 32.766	Reference Point (IRP)
TS 36.300	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.484	Automatic Neighbour Relation (ANR) for UTRAN; Stage 2
TS 36.331	Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification



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Self-Configuration Related Specifications



Number	Title
TS 32.501	Telecommunication management; Self-configuration of network elements
TS 32.502	Integration Reference Point (IRP)
TS 32.506	
TS 32.531	Telecommunication management; Software management (SwM);
TS 32.532	Integration Reference Point (IRP)
TS 32.536	
TS 36.300	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2
TS 36.331	Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification
TS 36.423	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)



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Self-Optimization Related Specifications



Number	Title
TS 32.521	Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP)
TS 32.522	
TS 32.526	
TS 32.425	Telecommunication management; Performance Management (PM); Performance measurements Evolved Universal Terrestrial Radio Access Network (E-UTRAN)
TS 32.761	Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP)
TS 32.762	
TS 32.766	
TS 36.300	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2
TS 36.413	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)
TS 36.423	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)
TS 36.314	Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2 - Measurements
TS 25.413	UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling



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Self-Healing Related Specifications



Number	Title
TR 32.823	Telecommunication management; Self-Organizing Networks (SON); Study on self-healing
TS 32.541	Telecommunication management; Self-Organizing Networks (SON); Self-healing concepts and requirements
TS 32.521	Telecommunication management; Self-Organizing Networks (SON) Policy
TS 32.522	Network Resource Model (NRM) Integration Reference Point (IRP)
TS 32.526	
TS 32.761	Telecommunication management; Evolved Universal Terrestrial Radio
TS 32.762	Access Network (E-UTRAN) Network Resource Model (NRM) Integration
TS 32.766	Reference Point (IRP)



Energy Saving Related Specifications



Number	Title
TR 32.834	Study on Operations, Administration and Maintenance (OAM) aspects of inter-Radio-Access-Technology (RAT) energy saving
TS 32.551	Telecommunication management; Energy Saving Management (ESM); Concepts and requirements
TS 32.521 TS 32.522 TS 32.526	Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP)
TS 32.641 TS 32.642 TS 32.646	Telecommunication management; Configuration Management (CM); UTRAN network resources Integration Reference Point (IRP); Network Resource Model (NRM)
TS 32.761 TS 32.762 TS 32.766	Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP)
TS 32.405	Telecommunication management; Performance Management (PM); Performance measurements; Universal Terrestrial Radio Access Network (UTRAN)
TS 32.425	Telecommunication management; Performance Management (PM); Performance measurements Evolved Universal Terrestrial Radio Access Network (E-UTRAN)
TS 36.413	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)
TS 36.423	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)



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TSG Structure

Project Co-ordination Group (PCG)

- TSG GERAN**
 - GSM EDGE
 - Radio-Access Network
 - GERAN WG1
 - Radio Aspects
 - GERAN WG2
 - Protocol Aspects
 - GERAN WG3
 - Terminal Testing
- TSG RAN**
 - Radio Access Network
 - RAN WG1
 - Radio Layer 1 spec
 - RAN WG2
 - Radio Layer 2 spec
 - Radio Layer 3 RR spec
 - RAN WG3
 - Uu spec, Iu-M, Iu-CS, Iu-PS
 - UTRAN QoS requirements
 - RAN WG4
 - Radio Performance
 - Protocol aspects
 - RAN WG5
 - Mobile Terminal
 - Conformance Testing
- TSG SA**
 - Service & Systems' Aspects
 - SA WG1
 - Services
 - SA WG2
 - Architecture
 - SA WG3
 - Security
 - SA WG4
 - Codec
 - SA WG5
 - Telecom Management
- TSG CT**
 - Core Network & Terminals
 - CT WG1
 - MM/CCSM (U)
 - CT WG3
 - Interworking with external networks
 - CT WG4
 - MAP/GTP/BCH/SS
 - CT WG6
 - Smart Card Application Aspects

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