Review of solutions of D-Link for providing QoS/SLA and network control CPE

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- ✓ IoT and necessity QoS/SLA
- ✓ Solutions of SLA from D-Link:
  - SLA-agent
  - ACS-server
  - SNMP-agent
  - Mobile app “Click'n'Connect”

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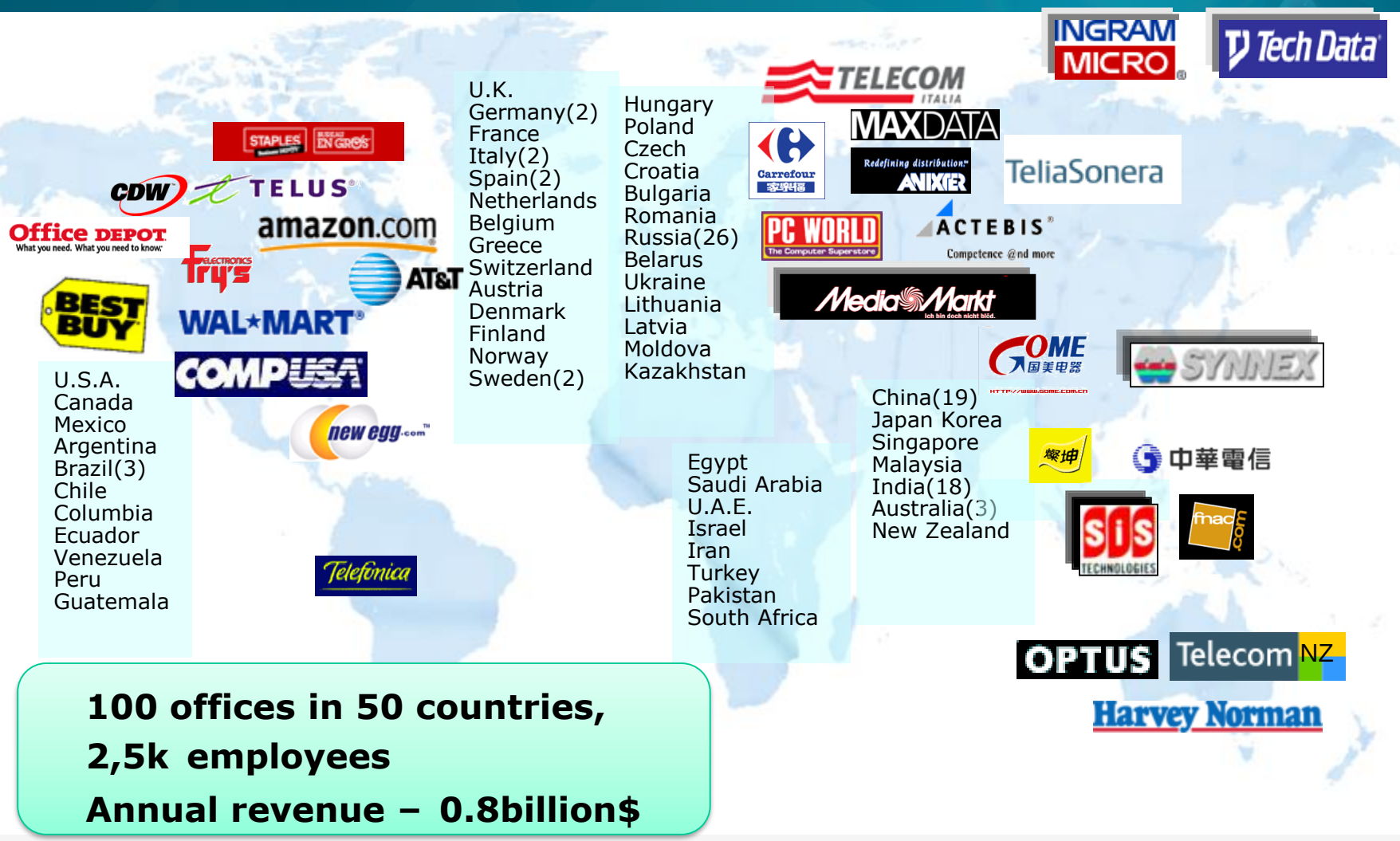
D-Link in the world



100 offices in 50 countries,
2,5k employees
Annual revenue – 0.8billion$

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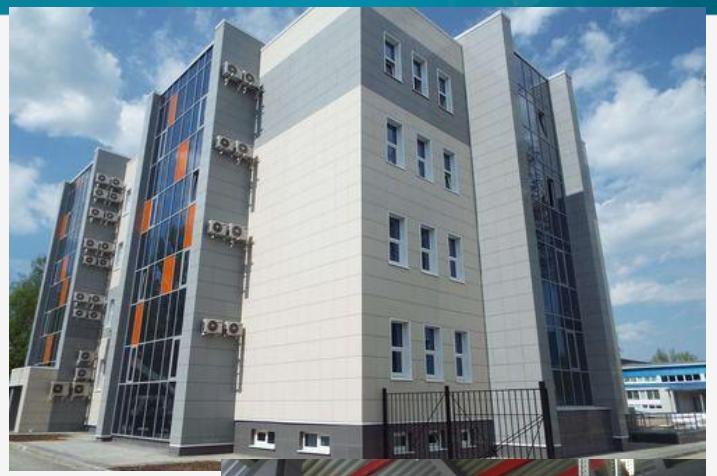
D-Link in Russia

- Region offices in 26 cities in all federal districts RF.
- Capital turnover in Russia in 2017 – more than 70 million$.
- The state of the company in Russia – more than 300 employees.
- Own R&D center (80 engineers).
- Own logistics warehouse terminal.
- Service network in RF – 25 cities.



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IoT and necessity of QoS/SLA

Functional features of IoT devices:

–Remoteness from base stations and issues with “the last inch” at all,

–Difficult conditions of functioning(mobility, hard-to-get access for service, physical burden, climate, electricity etc.),

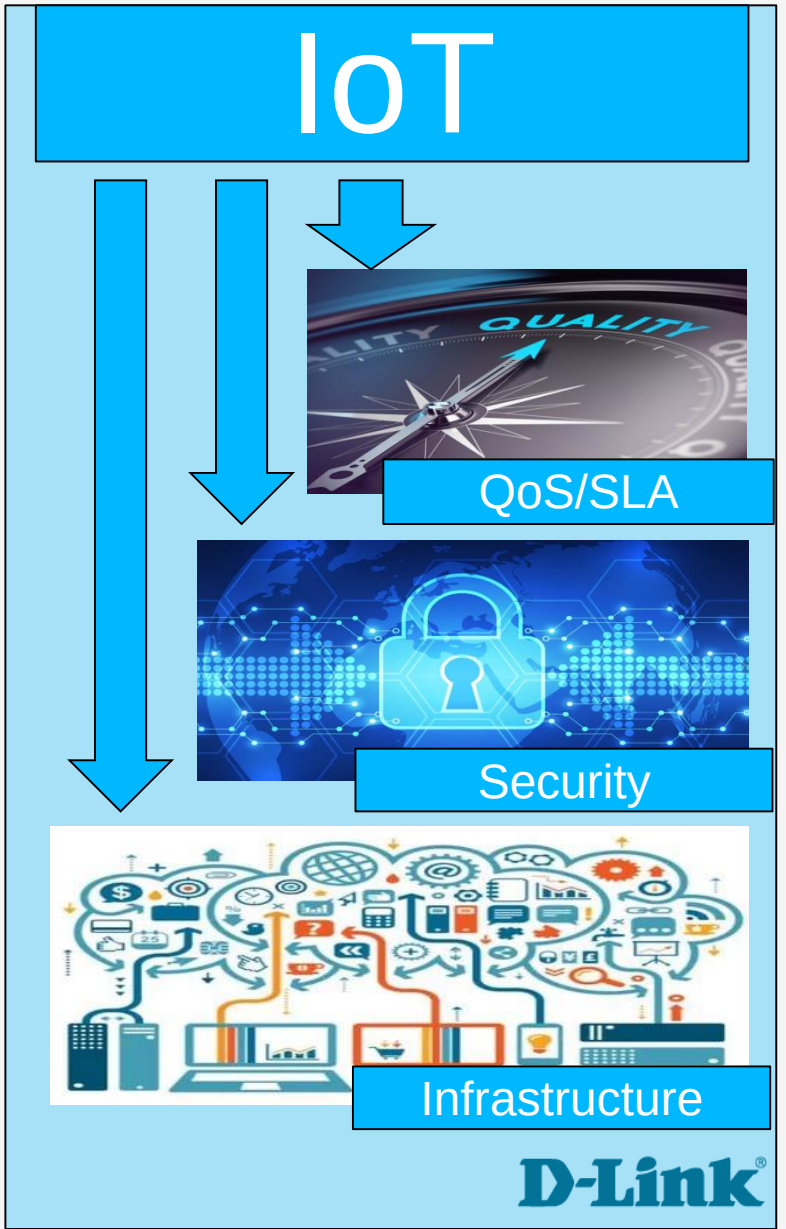
– criticality of services, based on IoT devices.

QoS/SLA – one of “three whales” of IoT architecture, which provides:

– availability of IoT devices.

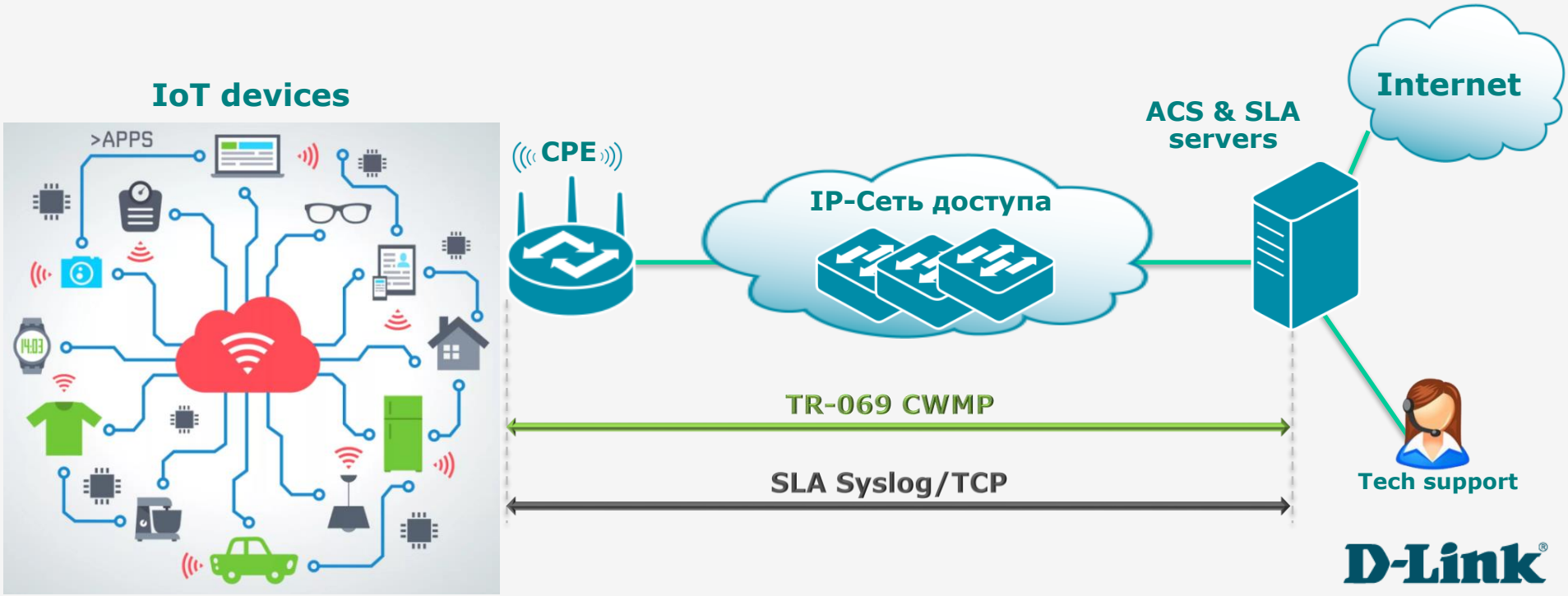
– Final quality of IoT service.

All of these lead to the necessity of implmentation of solutions for providing QoS/SLA based on IoT networks



IoT and necessity of QoS/SLA

- Classic packet networks are still (are they yet?) dominant infrastructure for usability of IoT devices
- CPE – advanced edge of battle for QoS/SLA in classic packet networks



Transformation of home networks

CPE == «customer premises equipment» = customer’s device

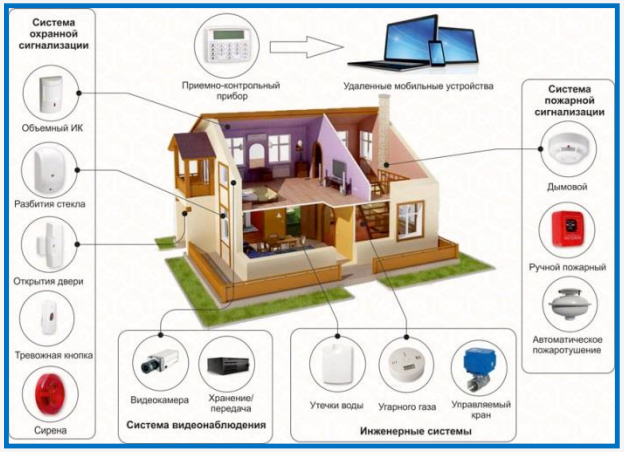
CPE == Ethernet for PC.

CPE == LAN.

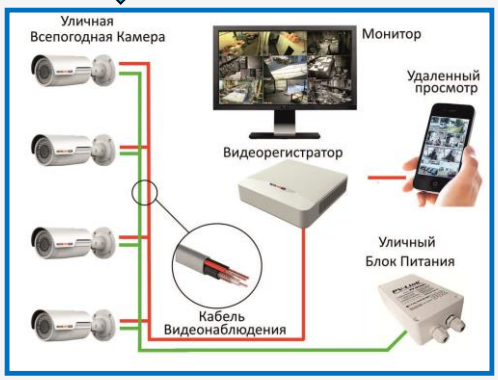
CPE == LAN + **IP-TV**.

CPE == LAN + **IP-TV +** Wi-fi.

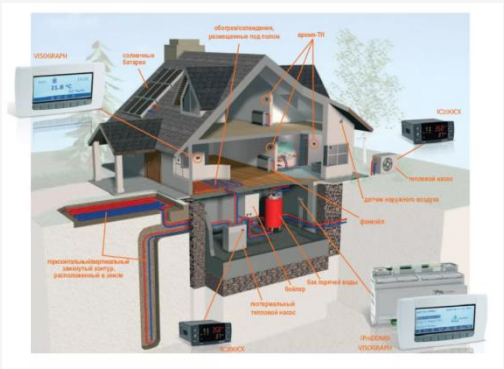
CPE == LAN + **IP-TV +** Wi-fi for IoT.



Devices of «Smart house»



Devices of CCTV



Telemtry devices

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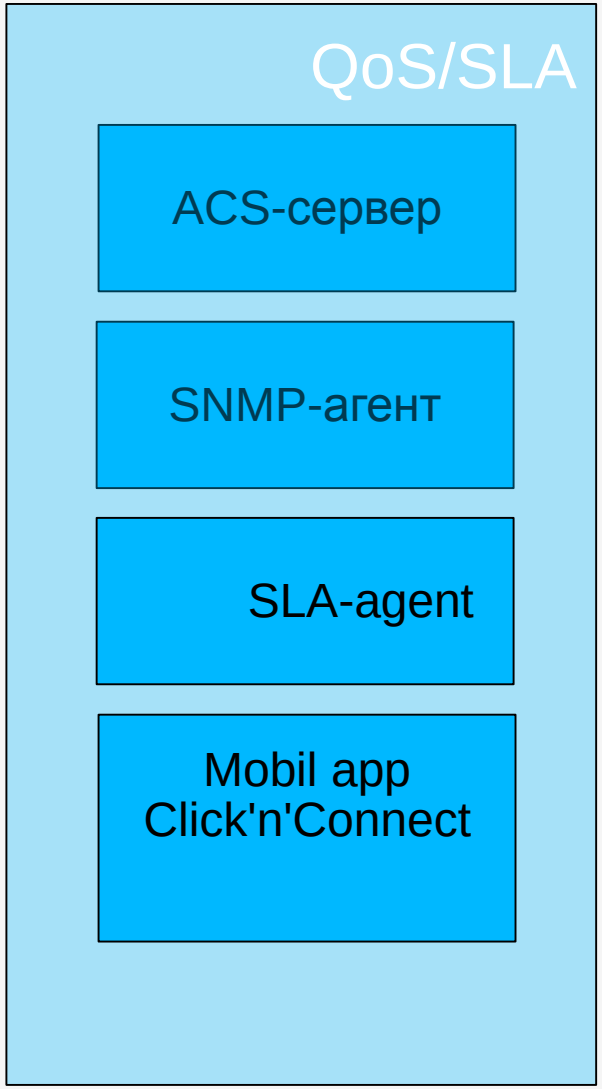
Instrumnets of QoS/SLA from D-Link



Process of managing CPE and QoS/SLA is being implemented by end-to-end control of quality settings, which is being provided by complex of the following instruments:

-Auto-Configuration server,

-SNMP-agent,

-SLA-agent,

-Mobile app “Click’n’Connect”

ACS-Server

Allows you:

- ✓ Remotely change configuration and update terms of use.
- ✓ Execute mass standart operations.
- ✓ Log all devices (remotely debugging and troubleshooting).
- ✓ Diagnostic (remotly monitoring and troubleshooting the client network).
- ✓ Add devices into the system by support of configuration templates.
- ✓ You are able to add any devices, supporting protocol

TR-069.

Free for providers, buying our routers.

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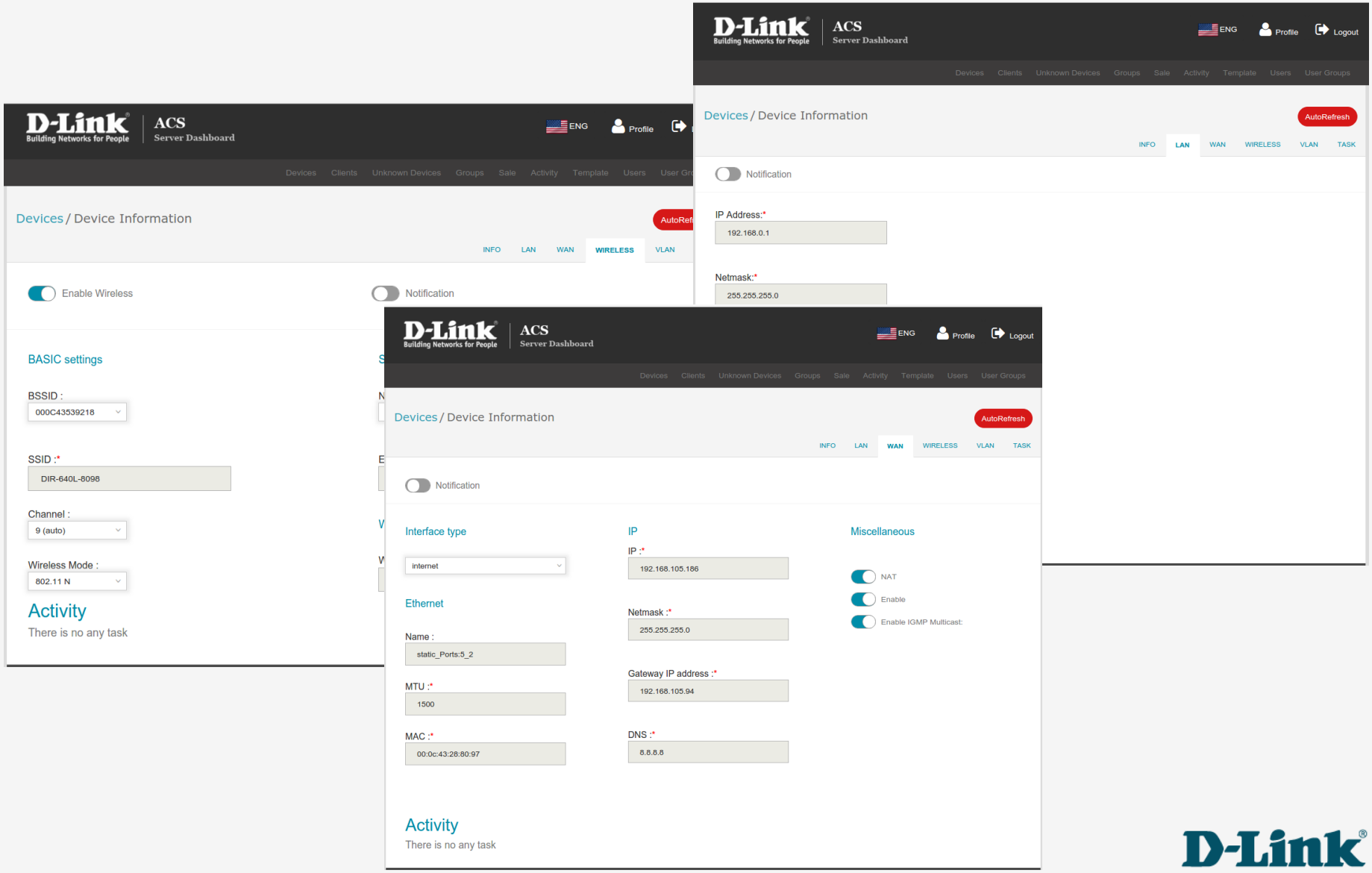
ACS-Server



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ACS-Server

Expanded diagnostic tools

- Status if the device and his port,
- Errors at every device port,
- Status at every switch's port of access, where device is connected,
- Errors at that port.

In addition to the "ping" utility, we added a feature of launching utility tracing a route from the device to analyze it.

Proactive diagnostic

Server **automatically** compile data **about status** of the device and **generates notifications**, which are supportive for **detecting and preventing** critical problems.

Integration with billing systems

When ACS is integrated with billing system, the page will be able to show status of customer's account.

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ACS-Server

Integrative to ACS SNMP-module:

- Compiles **SNMP-statistics** and **warns** about appearance of errors.
- Provides with **automatic port detection** of switch, whoch os connected to the customer’s device, shows **connection state and port errors.**
- Trigger of quantity of errors is able to create **notifications**.

SNMP-agent

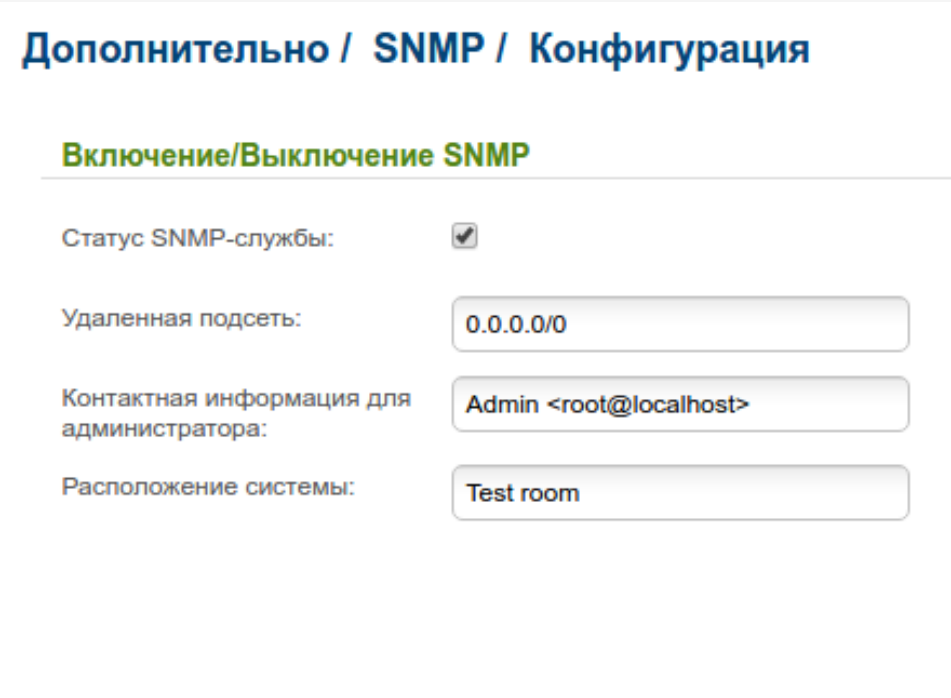
- Now SNMP is aonly available

in the project firmware

(In the future will be added to generic).

- Based on net-snmp utility.
- Supportative:

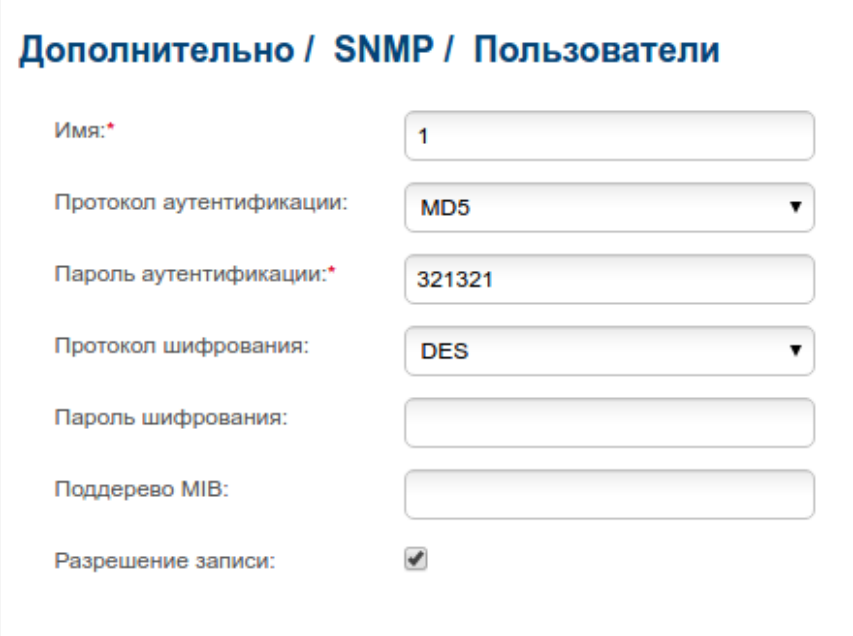
- Protocol SNMP v1/v2c/v3;
- Users;
- Authentication MD5/SHA1;
- Encryption DES/AES.



SNMP-agent

Are supportive next MIBs:

- MIB-2 is main network statistic (RFC 1213 and subsequent revisions)
- Resourcs of host (RFC 1514 and 2790)
- SNMPv3 framework (RFCs 2571-5, 3411-3418)



SLA-agent

We know EVERYTHING about our network,

and we know almost nothing about customer's...

What is support engineer doing, when he comes to the customer to get reasons of network access problems?

- He will ping a couple of addresses
- He will trace a route
- He will check cable condition
- He will check load of Wi-Fi range
- He will ask customer – What had happened?
- He will check router's software
- He will set up router/ He will reset router to the default settings – if there was a customization…

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SLA-agent

SLA-agent — machanism of diagnostic of network's status at the customer area. It has to send periodically statistic data, which was compiled by the device from system counters, moreover, it has to send the results of checking availability of predefined nodes by Ping and Traceroute.

Work's princible

SLA-agent, built-in the software of the device, collect necessity information on the device.
Aftr data compiling it checks availability of given before nodes in th network. Addresses of nodes are set by the domain name, which makes integration to the provider's network much easier.

Each node of PingN will get some icmp-requests. By the received information we can conclude losses of the packets in the networkand and response delay.

SLA-agent

SLA-agent, integrated in router

1 time in 15 minutes:

- It will ping 3 addresses (ping1/2/3.xxx – addrsses are resolved through the DNS).
- It will do a route trace ping3.
- It will compile stats about WAN and LANs + errors of crc, drop, link.
- It will compile loads of channels of Wi-Fi-range.
- It will also add service information: router's model, software version, UPTIME, current WiF-channel tc.
- It will send everything to syslog-server to the address server... (is resolvd on DNS).
- Server will get a package like – DIR-620A 2.5.39 00000425 00217245 00021244 and other counters.

SLA-agent

Part of server:

- Syslog-server and necessity software for creation of storage systems, compiling and showing data – free, Linux distributive.
- By the moment of presentation we will give our own realization of the server's part.

What will we get?

- We know about router's status in the current time period.
- We are able to see status of our network from the customer's point of view and fix our errors before customer's call to the tech support.
- We are able to see status of customer's network errors before customer's call to make a solution/to recommend something about fixing.

SLA-agent

Supported counters:

Time	Time of sending a message
IP	IP-address of router
Model	Model of device
Firmware version	
Uptime	Uptime since was started
WAN General	
CRC	Total quantity of frames with FCS errors at the interface.
DROP	Total quantity of declined packages at the interface
64bytes	Packages<=64 bytes. Huge amount of small packages is able to influence on the speed of broadband.
Link down	Quantity of turnings off WAN-cabels. Big amount can point out problems with physical connections.
Fragments	Quantity of packages less than 64 bytes with incorrect FCS.
Speed	Speed of port and duplex mode. Data can help in diagnostic of cable condition.
Flow Control	Mode of Flow Control. Mechanism allows to stop sending traffic with high loading of port and common loading of port. In case with IPTV it can lead to the appearance of «artefacts».
SND	Total quantity of sended packages
WAN unicast	
SND	Quantity of sended packages unicast
RCV	Quantity of sended packages unicast
WAN multicast	
SND / RCV	Quantity of sended / received packages multicast

SLA-agent

Supported counters :

WAN broadcast	
SND	Quantity of sended packages broadicast
RCV	Quantity of sended packages broadcast
WAN pause frames	
SND	Total quantity of frames stops (control of stream)
RCV	Total quantity of frames stops (control of stream)
NAT	
Sum	Total quantity of set sessions through NAT devices
Peak	Max quantity of same-time sessions NAT through the device for the last reported period. The main part of D-Link devices is provided with apparatic NAT, that is an opportunity to translate traffic without loading on CPU. His table is limited by 1024 strings, and for established/assured sessions there are going to be 2 sessions (because it is bidirectional traffic). Finally, simultaneosly we can set through the apparatic table, for example, 512 TCP sessions. Huge exceeding of limit can lead to the losses productivity, because packages will go through the proccesor.
LLDP	
Switch MAC	MAC-address of higher/upper router, received by LLDP protocol
Port Description	Description about higher/upper router, eceived by LLDP protocol

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SLA-agent

Supported counters:

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Device selection

Summary

Time:	11:24:24 03-02-2017
IP:	192.168.228.115
Model:	DIR_615S_ANTENNA
Firmware version:	1.0.0
Uptime:	00:00:30:39

Previous log

Time:	11:21:23 03-02-2017

WAN General

CRC:	0
DROP:	517 (+111)
64bytes:	292 (+107)
Link down:	3
Fragments:	0
Speed:	100M-Full
Flow Control:	Off
SND:	6106 (+3371)

WAN unicast

SND:	6018 (+3331)
RCV:	4835 (+2550)

WAN multicast

SND:	62 (+28)
RCV:	1027 (+228)

WAN broadcast

SND:	26 (+12)
RCV:	73 (+25)

WAN pause frames

SND:	0
RCV:	0

WiFi

SSID:	ASplus_1AB5123123
CRC:	0
DROP:	549 (+259)
SND:	143938 (+69716)
Channel:	9
Noise:	5568999877654

NAT

Sum:	3975 (+1841)
Peak:	532 (-92)

LLDP

Switch MAC:	FF:FE:9E:B2:AB:00
Port Description:	

LAN1

CRC:	0
DROP:	0
Fragments:	0
SND:	0
SND pause frames:	0
RCV pause frames:	0

LAN2

CRC:	0
DROP:	0
Fragments:	0
SND:	13943 (+5310)
SND pause frames:	0
RCV pause frames:	0

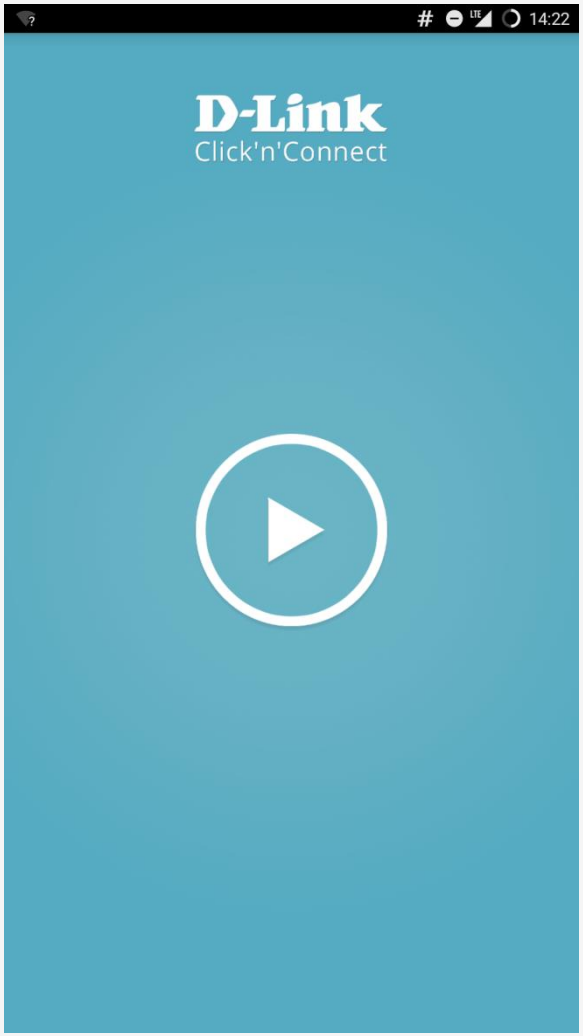
LAN3

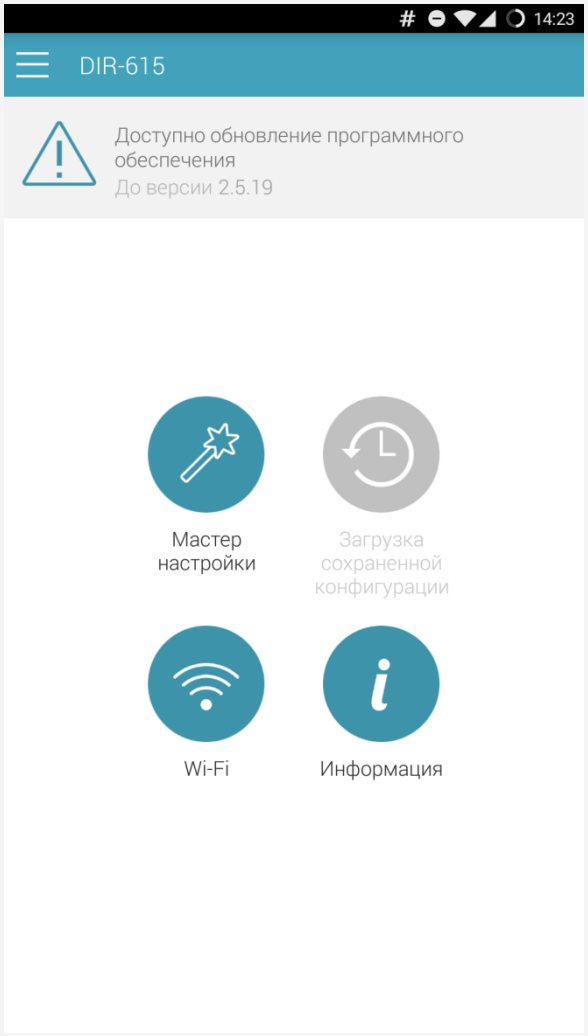
CRC:	0
DROP:	0
Fragments:	0
SND:	0
SND pause frames:	0
RCV pause frames:	0

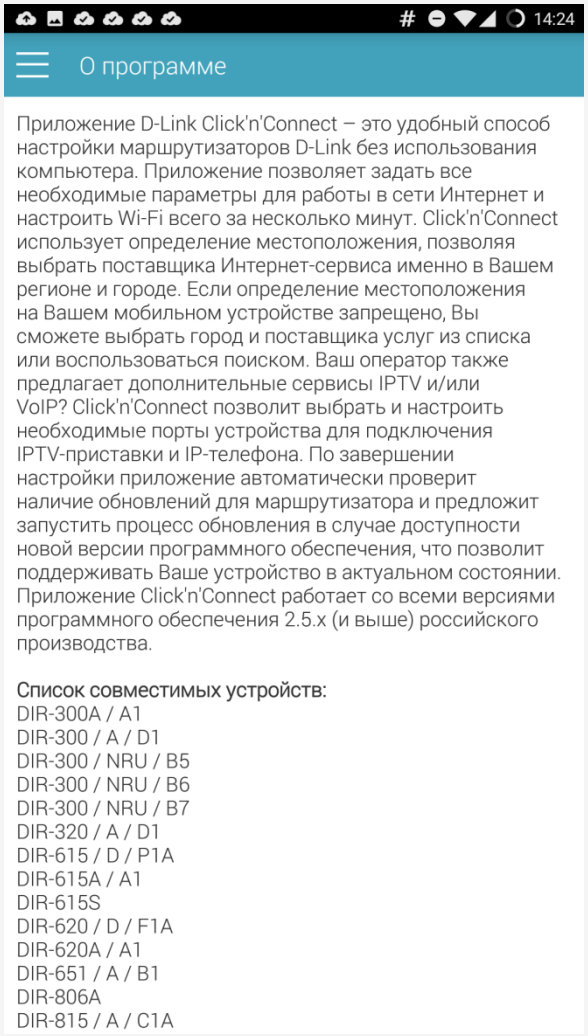
LAN4

CRC:	0
DROP:	0
Fragments:	0
SND:	0
SND pause frames:	0
RCV pause frames:	0

Mobile app
Click'n'Connect







Mobil app
Click'n'Connect

- Simple and comfy customisation of router from cell phone or table.
- For customisation user’s devices engineer does not need a computer.
- After choosing provider from the list, the device gets recommended customisation.
- We will add to the list every provider.
- It is available at the Play Market, in proccess of creating for iOS.

Summary: SLA-solutions from D-Link

- **ACS-server** — automatic configuration server.
- **SNMP-agent** — monitoring on a demand.
- **SLA-agent** — built-in agent of monitoring provider's and customer's networks.
- **Mobile App "Click'n'Connect"** – setup of a router from the mobile device, presetup for each provider.

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Building Networks for People

Thank you for your attention!