

Infosim[®] StableNet[®]

Next Generation 3 in 1 Performance-, Fault-, Root-Cause- and Configuration-Management Software Solution for the unified IP-, IT-, IPTV and Cloud Services Infrastructure

Solution Example

StableNet[®] regional and E2E Monitoring with the StableNet[®] Embedded Agent (SNEA) on a Banana PI™ type hardware platform



Prepared by:	Infosim GmbH & Co. KG Friedrich Bergius-Ring 15, D-97076 Wuerzburg, Germany Office +49 931 20592-200, Fax +49 931 20592-209 www.infosim.net		
Document ID: Revision:	StableNet [®] -Embedded-Agent-(SNEA)-on-Banana-PI-type-platform 1.1.4		
Dictribution	To kov sustamors and Infosim [®] partners		

- Distribution: To key customers and Infosim[®] partners Author(s): Dmitry Scherbakov, Peter Moessbauer
- Reviewer: Marketing Infosim[®]

© 2014 Infosim[®]

StableNet[®] Embedded Agent (SNEA) Monitoring



Index		
1 Сн	ALLENGES	3
2 Wi	HAT DOES STABLENET [®] SOLVE	4
2.1	Typical use cases	4
2.2	Typical applied monitoring	5
3 Ap	PLICATION EXAMPLES	7
3.1	Active services monitoring within cloud multimedia environments	7
3.2	Distributed enterprise network with SOHO attached via DSL	8
3.3	IT infrastructure monitoring	9
3.4	StableNet $^{ extsf{w}}$ active multimedia traffic simulation & service quality monitoring	9
3.5	Applications E2E reference monitoring	11
3.6	Next-Hop monitoring	11
3.7	Multimedia, IPTV distribution, web access monitoring multiple, distributed reference sites	12
4 So	LUTION ARCHITECTURE AND CAPABILITIES	13
4.1	StableNet [®] overall scope	13
4.2	StableNet [®] solutions architecture	13
4.3	StableNet [®] Embedded Agents (SNEA)	13
4.4	Remote reference site SNEA setup and configuration	14
4.5	Infrastructure discovery, local and distributed	15
4.6	Reporting and visualization	16
4.7	Active reference measurements – Agent-to-Agent	17
4.8 4.8 4.8 4.8	Measurements3.1Measurements with StableNet® Embedded Agents3.2E2E Application Monitoring3.3Passive Monitoring19	18
4.9	Solution access and operations security	20
4.10	Infrastructure discovery and measurements with regular StableNet $^{m \otimes}$ Agents	20
5 Ad	DENDUM	21
5.1 5.1 5.1	Multimedia, application and network monitoring parameters 1.1 Active Measurements - Measurement Input Parameters 1.2 Active Measurements - Measurement Output Parameters	21
5.2	StableNet [®] Embedded Agent (SNEA) capabilities and limitations	22
5.3	Customer references	23
5.4	Customer feedback	23
5.5	Trademarks & legal	24
5.6	Your Infosim [®] contacts	24



1 Challenges

- Gain visibility on services quality (QoE) at large numbers of remote and small sites
- Establish secure management and monitoring across public internet, VPNs, firewalls on larger numbers of remote sites
- Deploy cost-efficient monitoring of large numbers of small remote sites
- Gain online services quality reference information at distributed customer reference sites
- Gain performance metrics like "download speed" from key websites (URL) from the distributed customer perspective
- Gain services availability and quality independent of user devices and applications
- Test service availability, quality, and performance of multimedia encoded streams End-to-End or Hop-to-Hop in relation to multimedia stream container, carrying audio and video coded traffic from distributed customer perspectives





2 What does StableNet[®] solve

2.1 Typical use cases

Gain visibility on your distributed services, incl. the customer site areas

- The critical part: Cost-efficient services assurance on large numbers of small sites
- User and application usage independent services monitoring of large numbers of distributed small sites
 - o Small offices and home offices QoE for distributed customer site, connectivity and availability
 - Bank offices, retail shops, franchise shops
 - Regional government, community offices, police stations, fire stations
 - Industrial distributed small sites, e.g. pump stations, power stations, base stations etc.
 - Distributed installations, e.g. IP addressable equipment in
 - Next-Hop services and distributed IT infrastructure monitoring
 - Distributed offices running across provider networks
 - Monitoring regional company offices connectivity via DSL or IP/cable
- E2E reference monitoring
 - \circ $\,$ Remote site reference simulation and QoE monitoring of IP multimedia audio and video encoded traffic
 - Remote site reference call simulation of IP telephony calls monitoring quality and call availability
 - o Centrally managed remote execution of monitoring tasks
- Inventory: Discovery of regional small sites IT devices and infrastructure
- Security:
 - Detecting rogue devices and unwanted devices within small offices
 - \circ Secure monitoring of small sites behind firewalls across public internet





2.2 Typical applied monitoring

Typical use cases with StableNet[®] can be summarized as follows:

- 1) Use SNEAs for monitoring availability and service performance on larger numbers of small sites/offices, instead of an economically often not applicable shadow router: Jitter, RTT, etc.
 - Regionally distributed small offices, regional bank offices
 - Regionally distributed services users, e.g. retail shops, petrol stations, franchise shops
 - Regional government, local community offices
 - Police stations, fire stations
 - Distributed, automated monitoring stations with multiple measurement and monitoring equipment using common IP services
- 2) Use SNEAs to run plug-in/scripts in distributed small sites,

e.g. if you have:

- several thousand customer sites to reference check your IP or multimedia services
- several 1000 branch offices to run periodic availability and performance reference check on
- numerous ATM machines, cash desks, etc. which you need to check if they are accessible and can provide their services



- 3) Use SNEAs to measure E2E tests like:
 - IPT/VoIP availability and call quality test (simulate VoIP encoded traffic, simulate SIP IP telephony call)
 - Video tests (simulate IPTV encoded traffic and video conferencing traffic)



- 4) Use of SNEA to execute IP, data or VoIP reference calls via mobile sticks
- 5) "Next-Hop" measurements Monitor entire distribution and infrastructure chains by performing costefficient "Next-Hop" monitoring, e.g. IP: IP-SLA type measurements like Jitter, delay, RTT, packet loss, ICMP Echo/Ping or encoded traffic simulation
- 6) Use of SNEA to independently monitor IP connected equipment like:
 - Equipment in distributed TV transmission and head-end stations
 - Equipment in mobile base stations
 - Cloud services environment to monitor QoE from the cloud users perspective



3 Application examples

3.1 Active services monitoring within cloud multimedia environments

Active, reference measurements on multimedia streams

StableNet[®] does support the End-to-End creation and monitoring of RTP streams by flexible, multimedia scripts, which do define the monitoring and measurement methods.

Parameters for various codec are already preset. As the relevant codec parameter settings are only relevant for the packet size and bandwidth parameters, the presets can be easily extended by the user. This does allow in general supporting of all codec types.



• Monitoring Scope

- Cross Silo
- Distributed
- Holistic services views
- Reports, Trends, Real-Time
- Infrastructure Monitoring
 - Cloud / IT internal
 - Cloud external, SPs
- E2E Monitoring
 - Application integrated
 - Cross Application
 - STM- Application E2E

Small Site Monitoring

- Utilizing small Agents
- Banana Pi[™] type platform
- User site / technical
 Customer Experience QoE
- E2E Agent-to-App, e.g. Netflix, Mail, Netflix
- Hop-to-Hop Agent-to-Agent
- User/App independent monitoring
- Cost-efficient installation of larger numbers of small Agents for reference monitoring
- Option to add StableNet[®] small Agent software to customer routers (on request)



3.2 Distributed enterprise network with SOHO attached via DSL

- Monitoring IP-SLA parameters with small sites/offices, instead of an economically often not applicable shadow router: Jitter, RTT, etc.
- Used to measure End-to-End tests like:
 - Audio tests (simulate VoIP)
 - Video tests (simulate IPTV and video conferencing traffic)
- Use a SNEA to run plug-in/scripts in small offices (for example, if you have 1000 branch offices or to use in ATM machines, cash desks, etc.)



Customer constellation: Company has 400 offices in 10 cities. They use DSL connections from their ISP (ISP DSLAM and routers are also visible on the diagram). They want to monitor IP-SLA between headquarters and each branch office.



3.3 IT infrastructure monitoring



3.4 StableNet[®] active multimedia traffic simulation & service quality monitoring

Via the StableNet[®] multimedia scripts Video/VoIP E2E reference stream measurements are performed in between StableNet[®] Agents, e.g.

- Central Site, Server Head-End, Distribution Head-End to a Distributed Site
 - from a central StableNet[®] Agent to regionally distributed StableNet[®] Agent, or
 - reverse, from a regionally distributed StableNet[®] Agent to a central StableNet[®] Agent
- Within the multimedia distribution chain
 - o from a distributed StableNet[®] Agent to another distributed StableNet[®] Agent
 - o from a distributed StableNet[®] Agent to StableNet[®] Agent located at an end customer site
- IPT/SIP calls can be executed and monitored





PBX: e.g. Cisco UCM, Siemens/OpenScape HiPath, Avaya, generic IPT/SIP installations



3.5 Applications E2E reference monitoring

- StableNet[®] Application monitoring scripts
 - Simulate and measure the remote application performance
 - Integrable 3rd party Agents perform synthetic transaction simulations
 - "User-to-Application" or
 - E2E by "StableNet[®] Agents-to-Agent" transaction simulation
- StableNet[®] Agents
 - Monitor dedicate application transactions versus thresholds / timers
 - Detect and parameter outside the defined SLAs parameters
 - Create alarms and triggered configurable actions



3.6 Next-Hop monitoring

StableNet[®] Embedded Agents (SNEA) can be utilized to monitor entire distribution and infrastructure chains by performing cost-efficient "Next-Hop" monitoring, e.g. IP: IP-SLA, Jitter, delay, RTT, packet loss, ICMP Echo/Ping or encoded traffic simulation.

- Run "Next-Hop" monitoring in between key infrastructure data distribution points
- Measure performance from StableNet[®] Agent to StableNet[®] Agent in case independent of access to vendor devices
- Perform and monitor media encoded reference traffic from Agent-to-Agent
- SNEA on Banana PI[™] type platforms can be used wherever it fits





3.7 Multimedia, IPTV distribution, web access monitoring multiple, distributed reference sites

Active multimedia and IPTV services reference monitoring

- Monitor the availability and performance of the multimedia distribution network
- Monitor the accessibility, performance and trends to services on the web from a reference user's perspective, e.g. Netflix, Lync
- Signal and report technical QoE, and automate the generation of trouble tickets



Glossary:

BHR: Broadband Home Router GWR: Gateway Router OLT: Optical Line Terminal PON: Passive Optical Network STP: Set Top Box VAR: Video Aggregation Router VDR: Video Distribution Router VHO: Video Hub Office VSO: Video Services Office



4 Solution architecture and capabilities

4.1 StableNet[®] overall scope

• Service Assurance

- Automated inventory discovery and monitoring
- Performance Management
- Fault Management
- Automated Root-Cause Analysis and signaling

\circ Orchestration

- \circ Automation
- Network Mass Configurations & Change Management
- Policy, Vulnerability and EOx checking

• Technology support (present and next ...)

- Cross Silo networks, services, IT, E2E, Video/VoIP, business processes
- Cloud monitoring globally distributed services
- o SDNs
- Big Data processing
- ITIL and TMF eTOM compliance

• Cost-efficient small Agent support to include customer site reference monitoring

4.2 StableNet[®] solutions architecture

The multimedia and distributed services monitoring solution is utilizing the features and capabilities of the regular distributed StableNet[®] solutions architecture.

This does allow to manage, configure, monitor and execute monitoring scripts on a large number of remote SNEAs, similar to the regular StableNet[®] Agents in a very efficient way. Regular and SNEAs can be combined in any mix.

Please note: By the nature of Banana PI[™] type platform computing power capabilities, the SNEAs are limited by task load and the number of parallel tasks.

4.3 StableNet[®] Embedded Agents (SNEA)

In addition to regular StableNet[®] Agent platforms, StableNet[®] Agent monitoring and execution features are now available also on a Banana PI[™] platform type hardware, but at the limited processing capabilities and utilization scope of such platforms.



Key features:

- "Black Box" appliance based on Banana PI[™] compatible hardware
- Includes full featured StableNet[®] Agent
- Supports the StableNet[®] Cloud and SaaS solution
- Preconfigured and completely ready for shipment to sites and deploy:
 - \circ $\:$ Preconfigured automatic registration with central StableNet $^{\otimes}$ Server
 - Only Ethernet and Micro USB Power do need to be connected
- Access via NAT is supported

Typical application:

- Network Base-lining from remote locations
- On Demand Probing
- Network Quality Control from distributed sites
- Service Monitoring from larger numbers of distributed sites
- True End-to-End Monitoring

4.4 Remote reference site SNEA setup and configuration

Via the central StableNet[®] installation StableNet[®] does allow the menu driven remote setup, configuration and operation of a very large number of distributed SNEAs.

Functions include:

- Automatic Agent Registration
 - Pre-definable connect to central StableNet[®] Server
 - o Auto updates for monitoring scripts, Agent software
- Central Agent configuration
- Central deployment of measurement scripts
- Local discovery to central inventory
 - Devices
 - Topology, Connectivity
 - o Software, Device Configuration
- Active Reference Monitoring
- Passive Monitoring
- Systems Security
- o Runs across FWs, VPNs
 - Encrypted communication
- High scalability
 - Supports > 100.000 small Agents with no hard limit







4.5 Infrastructure discovery, local and distributed

StableNet[®] does include a flexible and distributed infrastructure discovery:

- Auto-discovery
- Configurable & flexible, XML-defined
- Discover regional infrastructure via distributed StableNet[®] Agents
- Multi Tenancy support, IPv4 / IPv6 support
- Layered discovery, e.g. L2-/L3-, VPNs, MPLS, topology and connectivity data, systems, software, etc.
- Integrate / Import from CMDBs
- Auto-start monitoring after discovery



The discovery function is mapping the topology and connectivity to a "Dependency Graph".

This does allow to support the generally "rules free" automated Root-Cause Analysis showing the root-cause and the impacted areas.

By this the effort on distributed operations is heavily reduced while reaction time is shorted to the minimum.





4.6 Reporting and visualization

StableNet[®] does include a powerful and flexible analysis and reporting engine.

- Analysis Charts: Network, IT system and service analysis can be run in (near) real-time
- Reports:
 - Reports can be defined and created ad-hoc via the fully integrated, system aided Report Design Wizard
 - Reports can combine real time status dashboard elements with history parts
 - Reports can be distributed by scheduler to different operations groups and to customers
- Alarms and Notification:
 - Root-Cause Alarms are generated and can automatically trigger actions, e.g. create and clear trouble tickets on external systems or send SMS, eMail, traps etc.
 - Business hour and maintenance calendars are supported
- Interfaces: Java GUI and Web GUI, Geo Maps, e.g. OpenStreetMaps

Monitoring the "building blocks" of your services

• IT internal

- IT infrastructure and IT systems within the distributed datacenters
- "Internal" networks and back bones
- Key facility, environmental and support systems, e.g. UPS, Access, DC cooling

• External service provider

- Regional networks and external provider networks, e.g. via SOHO reference monitoring
- IPT/VoIP/VoD services
 - E2E encoded reference traffic injection and monitoring
- Applications
 - URL/HTTP, DNS directly
 - STM on applications: integrate with 3rd party software



Service Dashboard

Services and Infrastructure Status

E L

Documenting the Services Quality

Operations - Report





4.7 Active reference measurements – Agent-to-Agent

To perform E2E reference measurements between StableNet[®] Agents "Multimedia Scripts" are executed on StableNet[®] Agents on both ends.

The executed "Multimedia Scripts" perform data transfers over the network with a StableNet[®] Agent at each end point.

Measurement scripts can be setup and configured via the central StableNet[®] installation and be applied to the regionally distributed StableNet[®] Agents.

The Agent that is configured to execute the measurement first, establishes a control connection to the remote StableNet® Agent. The remote StableNet® Agent then does start the remote measurement process.



	Measurem	ent Wizard				
Measurement er Script Parameter				- 50	1	-
Script: linux_multimedia		×	Execute		<u>R</u> efresh	
Script Parameter						
Remote Agent Port:	5100					1
Remote Agent Username:	infosim					
Remote Agent Password:	*****					
Remote Multimedia Destination Port:					12,889	÷
Local Agent IP:	10.11.11.11					
Local Multimedia Destination Port.					12,889	* E
Codec:	H264 4Mbit/s					•
Overwrite Media Rate kbit/s:	Bandwidth 10Mbit/s G711-PCMA 64kbit/s					
Type of Service:	G711-PCMU 64kbit/s					
Duration:	G723 6.3kbit/s					-
	G729 8kbit/s					
	H261 680kbit/s					
	H264 4Mbit/s					



4.8 Measurements

4.8.1 Measurements with StableNet[®] Embedded Agents

Active Reference Monitoring

Active monitoring is typically performed via generating reference traffic via distributed StableNet[®] Agents or via IP-SLA, RPM, Ether 0&M or by E2E polling of web applications (HTTP, DNS) etc.

- E2E Video / VoD / Multimedia StableNet[®] Agent to StableNet[®] Agent
- E2E StableNet[®] Agent to application reachability: e.g. Mail, Netflix, Lync, URL, DNS
- E2E VoIP / IPT, SIP
- MOS, R-Factor
- Encoded reference traffic
 - o G.711, G.722,
 - G.723, G.729
 - o H.261, H.263, H.264/MPEG-4/AVC
 - Add own encoded traffic samples
- IP Traffic, RTT, Jitter, Packet Loss
- URL, download speed, DNS access etc.
- Execution of centrally deployed measurement scripts
- IPv4, IPv6 support
- Multi Tenancy support
- Trend indication, analysis and reporting





Standard Deviation RTT chart

This chart displays the standard deviation of the RTT. Standard deviation RTT Standard deviation Delay dest => src Standard deviation Delay src => dest

Availability Chart

Failure chart

Sequence error

Failure pie chart

Busies

Frror

This chart displays the availability of a device. You see all correctly received packets.

Availability (Ratio of lost and correct packets.)

This chart displays the different error types.





es: 20.0 % = 24 • error: 20.0 % = 24 • loss

This chart displays the distribution of the different error types. Busies Error Loss destination => source Loss source => destination Missing in action Sequence error

Loss destination -> source

Loss source -> destination Missing in action

Source => destination Jitter chart

This chart displays the Jitter of the data packets send from source to destination. The Jitter measures the deviation of the original frequency from the sent packets to the frequency of the received packets.

- + min Jitter
- + average Jitter
- + max Jitter
- min Jitter
- average Jitter - max Jitter
- max Jitter

Fig.1 Injection and monitoring of reference traffic between StableNet® Agents

Fig.2 Monitoring E2E performance



4.8.2 E2E Application Monitoring

StableNet[®] Agents can be configured to poll and monitor certain web applications and network functions directly E2E

- URL/HTTP/HTTPS access,
- Download time per website,
- DNS connectivity,
- Web applications access, e.g.
 - Netflix
 - Salesforce
 - Lync (Microsoft)
 - o Mail
- etc.

Complex Synthetic Transaction Monitoring (STM) can be supported by integration of 3rd. party STM tools.



Fig.3 URL monitoring charts

· av2

4.8.3 Passive Monitoring

Passive monitoring is typically performed via SNMP MIB parameter polling or reading in parameters from other sources like databases, CDRs, alarms, notifications and syslog etc.

Typ. monitoring areas are as follows:

- Availability
- Utilization, Performance
- IP Multicast monitoring
 - Router dependent
 - Monitoring packet rates per stream class
 - Packet ordering
- CDR Analysis
- Syslog Analysis
- Trends



Fig.4 StableNet® Desktop monitoring status



4.9 Solution access and operations security

StableNet[®] Server to StableNet[®] Agent communication security measures:

(1) Data integrity

- The StableNet[®] Server to StableNet[®] Agent communication can be encrypted
- The communication link can use VPNs
- One definable IP Port (default: TCP 5100) allows to run communication across firewalls (no requirement to open multiple or dynamic port ranges)
- Monitoring data stored on the StableNet[®] Agent will only be released after storage is confirmed by the central StableNet[®] Server / central DB

(2) Temporary offline operation of distributed StableNet® Agents

- StableNet[®] Agent can operate independently of a permanent online connection to the central StableNet[®] Server
- Once the IP connection to the central server is reestablished the monitoring data will be uploaded

(3) Secure MSP operation

- StableNet[®] is designed for secure, multi customer operation (monitoring, reporting, access)
- Access to StableNet[®] functions is protected by a role system and by authentication The role defines access to specific functions, the level of access, the level of execution, regional restrictions etc.
- Web user access can be restricted to HTTPS and access rights can be preset per role
- StableNet[®] is supporting auditing

4.10 Infrastructure discovery and measurements with regular StableNet[®] Agents

- Please see our StableNet[®] documentation for more information about regular StableNet[®] Agent features and large scaling
- Multiple additional monitoring and analysis features, which can be enabled with regular StableNet[®] Agents:
 - Netflow monitoring, analysis and reporting
 - Syslog processing
 - Syslog and Log event mass data processing
 - CDR data processing
 - IT infrastructure, database, VM monitoring

Please note:

The above functions can be also applied with StableNet[®] Embedded Agent installations, but are limited by processing power and memory storage of Banana PI[™] type platforms to a reduced scope.



5 Addendum

5.1 Multimedia, application and network monitoring parameters

StableNet[®] does support passive and active monitoring.

5.1.1 Active Measurements - Measurement Input Parameters

Name	Description	Default
Remote Agent IP	IP address of the remote Agent	10.0.0.1
Remote Agent Port	TCP port on which the remote Agent is listening	5100
Remote Agent Username	Username used to connect to the remote Agent	Infosim
Remote Agent Password	Password used for authentication	
Remote Multimedia Destination Port	Port to which the VoIP partner will send the VoIP traffic	12345
Local Agent IP	IP address of the source Agent	10.1.2.27
Local Multimedia Destination Port	Port to which the voice traffic will be sent to	12345
Streaming Mode	Codec to emulate and its media rate	
Overwrite Media Rate kbit/s	Sets the media rate manually	
Clocks Synchronized	Specifies if the clocks on the test hosts are synchronized	False
Type of Service	Specifies the type of service for QoS implementations	0
Duration	Specifies duration of the measurement in seconds	20
Parallel Streams	Specifies the number of parallel Video/VoIP streams	1

5.1.2 Active Measurements - Measurement Output Parameters

Name	Description	Unit
Receive Packet Count Source -> Destination	Number of lost IP packets for traffic	%
	from local to remote host	
Lost Packets Source -> Destination	Number of lost IP packets for traffic	#
	from remote to local host	
Packet Loss Rate Source -> Destination		%
Packet Continuity Error Count Source -> Destination		#
Packet Continuity Error Rate Source -> Destination		#
Sent Packet Count Destination -> Source		#
Expected Packet Count Destination -> Source		#
Received Data Rate Destination -> Source		kbit/s
DelayFactor Min Source -> Destination		ms
DelayFactor Max Source -> Destination		ms
DelayFactor Mean Source -> Destination		ms
DelayFactor Median Source -> Destination		ms
DelayFactor Standard Derivation Source -> Destination		ms
Positive Jitter Max Source -> Destination	Maximum positive Jitter	ms
Positive Jitter Avg Source -> Destination	Average positive Jitter	ms
Negative Jitter Max Source -> Destination	Maximum negative Jitter	ms
Negative Jitter Avg Source -> Destination	Average negative Jitter	ms
Receive Packet Count Destination -> Source		#
Lost Packets Destination -> Source		#
Packet Loss Rate Destination -> Source		%
Packet Continuity Error Count Destination -> Source		#
Packet Continuity Error Rate Destination -> Source		#
Sent Packet Count Source -> Destination		#
Expected Packet Count Source -> Destination		#
Received Data Rate Source -> Destination		kbit/s
DelayFactor Min Destination -> Source		ms
DelayFactor Max Destination -> Source		ms



DelayFactor Mean Destination -> Source		ms
DelayFactor Median Destination -> Source		ms
DelayFactor Standard Derivation Destination -> Source		ms
Positive Jitter Max Destination -> Source	Maximum positive Jitter	ms
Positive Jitter Avg Destination -> Source	Average positive Jitter	ms
Negative Jitter Max Destination -> Source	Maximum negative Jitter	ms
Negative Jitter Avg Destination -> Source	Average negative Jitter	ms
Round Trip Time Min		ms
Round Trip Time Max		ms
Round Trip Time Mean		ms
Round Trip Time Median		ms
Round Trip Time Standard Derivation		ms
Mean Packet Loss Rate	Average positive Jitter	ms
Packet Loss Burst Ratio		#
R-Factor		#
MOS		#

5.2 StableNet[®] Embedded Agent (SNEA) capabilities and limitations

- Solutions scalability (up to 100.000+ small Agents, with no hard limit)
- Typical limitations when using SNEA on small hardware platforms like Banana PI[™] and similar hardware

Management / Function	Typical Scaling	Typical Interval	Remarks	
Discovery	50-100 Devices	1 per day	e.g. Discovery at night	
Ping / ICMP Echo	100 - 200 Devices	5 Minutes		
Measurements	About 1. 000 Measurements typical (e.g. with Banana PI™)			
E2E Monitoring	2 -10 Streams	5 Minutes		
VoIP Reference Monitoring, VoIP and Video call simulation	2 – 10 Calls	5 Minutes	Depends on Call Re- spond times	
	Up to 200 MBit/s with Multimedia Script		1 GBit/s Interface on Banana PI	

Please note:

By the limited system resource and processing capabilities of a Banana PI[™] type platform, a high system load can impact VoIP and IP E2E measurement results.

In our StableNet[®] Embedded Agent "Black Box" appliance we do use in case a more performing device, but functionally similar to a Banana PI™ device.



5.3 Customer references



5.4 Customer feedback

• Key benefits as seen by the customers

- The use of the less expensive Banana PI[™] type platform based Agent was the big key. All of the other solutions that we looked at would have been much more expensive for each end point so for each test point it was only a total of about €150 (plus some measurement costs etc.).
- We also really liked the scalability of the architecture and the flexibility that they can develop custom scripts for their particular need.
- Solution to
 - Establish routine voice, data or video measurements from within customer premises that are representative of the entire service providers footprint.
 - \circ $\:$ Establish a baseline for performance and detect anomalies through alarms for targeted resolution.
 - Provide test tools to at various points within network path to isolate points of failure in network segments.



5.5 Trademarks & legal

Although the information and recommendations in this product overview are presented in good faith and believed to be correct, Infosim[®] makes no representations or warranties as to the completeness or accuracy of the content.

The company and product names used in this document are for identification purposes only. All trademarks and registered trademarks are the property of their respective owners.

5.6 Your Infosim[®] contacts

Please feel free to contact us if you have any questions or need more information.

You can reach us at:



www.infosim.net

EMEA (HQ)

Infosim GmbH & Co. KG Friedrich-Bergius-Ring 15 97076 Wuerzburg Germany

Phone: +49 931 20592 200 Email: <u>info@infosim.net</u>

AMERICAS

Infosim, Inc. 3721 Executive Center Drive Bldg 11, Suite 215 Austin, TX 78731, USA

Phone: +1 512 879 9969 Email: <u>info@infosim.net</u>

APAC

Infosim Asia Pacific Pte Ltd. 8 Ubi Road 2 #08-04 Zervex 408538 Singapore

Phone: +65 6562 8286 Email: <u>info@asia.infosim.net</u>