

ZINO 2.0

THE RESEARCH NETWORK STATE MONITOR

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20th SIG-NOC, Helsinki 2024-05-08

WHAT IS ZINO?

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 - (Recursive acronyms are fun!)
- A toolset that has monitored Nordic research networks for **nearly 30 years**

BACK-END COMPONENTS (SNMP)

- Zino state monitor
 - With accessible API to inspect and modify events
- Traffic poller (tpoll)
- Shared Tcl libraries in original implementation

THE STATE MONITOR

Trap-directed SNMP polling:

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- Router reachability

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- BFD session state
- Juniper chassis alarms

THE STATE MONITOR API

- Text-based, stateful API (similar to SMTP)
- Provides:

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- Provides:
 - Insight into ongoing network events

THE STATE MONITOR API

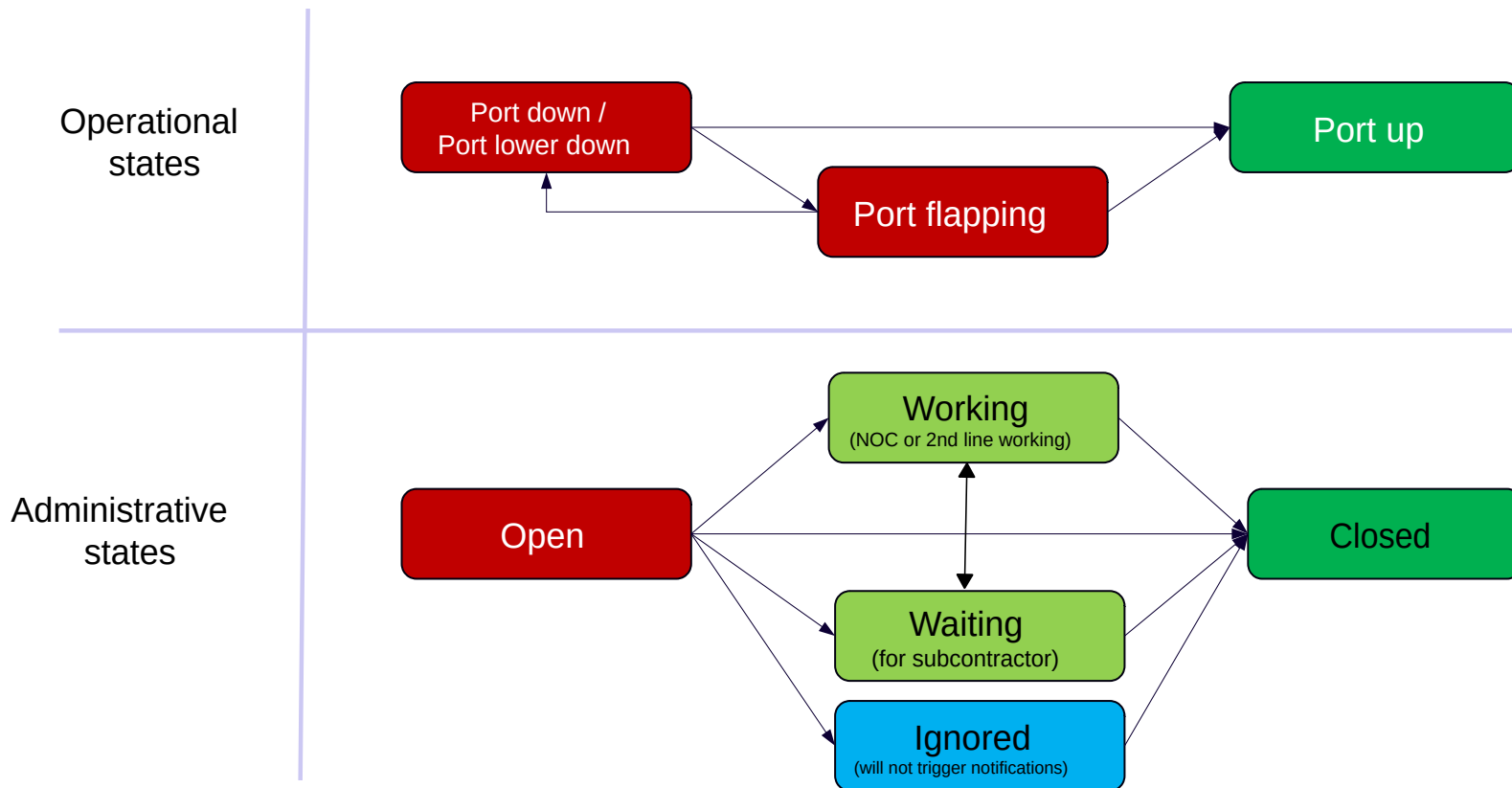
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- Provides:
 - Insight into ongoing network events
 - Administrative management of events

THE STATE MONITOR API

- Text-based, stateful API (similar to SMTP)
- Provides:
 - Insight into ongoing network events
 - Administrative management of events
 - Realtime notifications of event changes

ZINO EVENT STATES

Deliberate separation of operational and administrative states



1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for ensuring the integrity and reliability of financial data. This section also outlines the various methods and tools used to collect and analyze data, highlighting the need for consistency and transparency in the reporting process.

2. The second part of the document focuses on the challenges and risks associated with data management. It identifies common pitfalls such as data loss, corruption, and unauthorized access, and provides strategies to mitigate these risks. The text also discusses the importance of data security and the role of encryption and access controls in protecting sensitive information.

3. The third part of the document addresses the legal and ethical considerations surrounding data collection and use. It reviews relevant regulations and standards, such as the General Data Protection Regulation (GDPR) and the Fair Information Practices (FIP) principles. The text emphasizes the need for transparency and informed consent from individuals whose data is being collected and processed.

4. The fourth part of the document discusses the impact of data on decision-making and organizational performance. It highlights how data-driven insights can be used to identify trends, optimize processes, and improve customer experiences. The text also discusses the importance of data literacy and the role of data science in driving innovation and growth.

5. The fifth part of the document concludes with a summary of the key findings and recommendations. It reiterates the importance of a robust data management strategy and the need for ongoing monitoring and evaluation. The text also provides a call to action for organizations to embrace data as a strategic asset and to invest in the necessary infrastructure and talent to support their data-driven goals.

TRAFFIC STATS

- Also part of legacy Zino suite:
 - Traffic stats
 - Error reports from stats data

TRAFFIC STATS

- Also part of legacy Zino suite:
 - Traffic stats
 - Error reports from stats data
- But we dont have time to delve into that here....

STATE MONITOR CLIENTS

- ritz (*Tcl/Tk*)
- curitz (*Python*)
- emt (*Tcl*)

RITZ

File Edit View Help

OpState	AdmState	Age		Router	Port	Description
port up	closed	0d	0:26:31.00	kristiansund-gw1	ge-0/1/0	(Management for HiMolde kjernesvitsj)
port up	closed	0d	0:26:28.00	kristiansund-gw1	ge-0/1/0.0	(Management for HiMolde kjernesvitsj-l3)
port up	open	0d	0:00:45.00	kristiansund-gw1	ge-0/1/0.0	(Management for HiMolde kjernesvitsi-l3)
port up	open	0d	0:00:45.00	kristiansund-gw1	ge-0/1/0	
port up	waiting	0d	1:27:38.00	oslo-gw1	xe-11/2/0	
port up	waiting	0d	1:27:38.00	kristiansand-gw3	xe-0/1/2	
port up	waiting	0d	1:27:32.00	kristiansand-gw3	xe-0/1/2.0	
port up	waiting	0d	1:27:31.00	oslo-gw1	xe-11/2/0.0	
port up	closed	0d	4:02:37.00	uninett-gsw2	ae0	
bgp established	closed	0d	0:57:01.00	as-gw2	AS 65012 158.37.1	
bgp established	closed	0d	1:00:13.00	ifi2-gw	AS 2119 2001:700:4	
bgp established	closed	0d	1:00:15.00	ifi2-gw	AS 2119 128.39.65	
port up	closed	0d	1:05:06.00	ifi2-gw	TenGigE0/1/0/5	
port up	closed	0d	1:45:53.00	uninett-tor-sw3	ge-0/0/1	
port up	closed	0d	1:45:53.00	uninett-tor-sw3	ge-1/0/1	
port up	closed	0d	1:50:53.00	teknobyen-sw1	ge-0/0/6	
port up	open	0d	16:40:36.00	stavanger-gw4	ge-1/1/2.0	
port up	open	0d	16:50:38.00	stavanger-gw4	ge-1/1/2	
port up	open	0d	16:50:38.00	as-gw1	ge-1/0/2.0	
port down	waiting	0d	10:19:57.00	teknobyen-sw1	ge-1/0/6	
port up	open	0d	14:48:07.00	porsgrunn-gw2	ge-1/1/0	
port up	open	0d	14:48:07.00	stavanger-gw4	ge-1/0/6.0	
port up	ignored	161d	20:10:55.00	uninett-tor-sw2	ge-1/0/4	
port up	ignored	161d	20:10:55.00	uninett-tor-sw2	ge-0/0/4	
port up	open	0d	18:03:43.00	uninett-tor-sw1	ge-2/0/24	
port up	open	0d	18:03:42.00	uninett-tor-sw1	ge-3/0/24	
port up	ignored	161d	22:18:19.00	uninett-tor-sw2	ge-0/0/2	
port up	ignored	161d	22:18:19.00	uninett-tor-sw2	ge-1/0/2	
port up	ignored	161d	20:10:55.00	uninett-tor-sw2	ae10	(lokalt lacp, trd-lgw1.uninett.no)

Case 115470

File Manage

descr: local lacp link, trd-col.cert.uninett.no-phy2

flaps: 2

id: 115470

ifindex: 510

lasttrans: Fri May 20 02:33:32 CEST 2022

opened: Fri May 20 02:33:32 CEST 2022

polladdr: 158.38.0.170

port: ge-1/0/6

portstate: down

priority: 100

router: teknobyen-sw1

state: waiting

type: portstate

updated: Fri May 20 02:33:32 CEST 2022

View Log View History

CURITZ

cuRitz version 0.9.17.dev3+g5b7bdb3 - zino.uninett.no

S	OpState	AdmState	Age	Dt	Router	Port	Description
	PORT up	open	0d 01:40	0s	kristiansund-gw1	ge-0/1/0	Management for HiHolde kjernesvitsj
	PORT up	waiting	0d 05:27	0s	oslo-gw1	xe-11/2/0.0	UN000136 GC11520020, oslo-kristiansand-13, kristiansand-g
	PORT up	waiting	0d 05:27	0s	kristiansand-gw3	xe-0/1/2.0	UN000136 GC11520020, kristiansand-oslo-13
	PORT up	waiting	0d 05:27	6s	kristiansand-gw3	xe-0/1/2	UN000136 GC11520020, kristiansand-oslo
	PORT up	waiting	0d 05:27	4m	oslo-gw1	xe-11/2/0	UN000136 GC11520020, oslo-kristiansand, kristiansand-gw1
	PORT down	waiting	0d 14:19	14h	teknobyen-sw1	ge-1/0/6	local lACP link, trd-col.cert.uninett.no-phy2
	PORT up	open	0d 18:48	6m	stavanger-gw4	ge-1/0/6.0	UPW000127, uis-svg-porsgrunn-l2vpn
	PORT up	open	0d 18:48	6m	porsgrunn-gw2	ge-1/1/0	UN001054, uis-porsgrunn-stavanger, L2vpn AC
	PORT up	open	0d 22:03	4s	uninett-tor-sw1	ge-3/0/24	LACP-link, trd-agw1_ny.uninett.no-phy2
	PORT up	open	0d 22:03	6s	uninett-tor-sw1	ge-2/0/24	LACP-link, trd-agw1_ny.uninett.no-phy1
	PORT up	open	0d 22:03	4m	uninett-tor-sw1	ae21	LACP-link, trd-agw1_ny.uninett.no
	BGP down	waiting	2d 08:51		tullin-gw1	AS29695	2001:7f8:12:2::2:9695 peer is down
	BGP down	waiting	2d 08:51		tullin-gw1	AS29695	185.1.65.16 peer is down
	BGP down	waiting	7d 19:02		tullin-gw1	AS64625	riksantikvaren-gw2.ra.no, peer is down
	BGP down	waiting	7d 19:02		ifi2-gw	AS64625	riksantikvaren-gw1.ra.no, peer is down
	PORT down	working	14d 02:25	14d	ma2-gw	xe-2/1/0	UN001325, ma2-mettromso
	BGP down	waiting	15d 02:52		tromso-fw-gw	AS64526	mettromso-fw.met.no, peer is admin turned off
	PORT down	working	23d 05:56	23d	narvik-gw2	gr-11/0/10.0	lokal tunnel, narvik-janitor.cert, janitor.cert
	PORT down	waiting	23d 07:49	23d	uninett-tor-sw1	ae11	LACP-link, pltrd037,moosefs.fs.uninett.no
	BGP down	waiting	25d 05:19		stavanger-gw2	AS64535	uis-d202-gsw03.uis.no, peer is admin turned off
	BGP down	waiting	25d 05:19		stavanger-gw2	AS64535	uis-d202-gsw03.uis.no, peer is admin turned off
	BGP down	waiting	25d 05:44		stavanger-gw2	AS64535	uis-kkh-gsw01.uis.no, peer is admin turned off
	BGP down	waiting	25d 05:44		stavanger-gw2	AS64535	uis-kkh-gsw01.uis.no, peer is admin turned off
	PORT down	working	25d 05:59	25d	tullin-gw1	xe-100/0/4.20	UN000777 GC10306676, tullin-udir-13
	PORT lower	waiting	28d 05:17	0s	stavanger-gw3	xe-0/1/5.0	UN000528 -- stavanger-uis -- uis-kkh-gsw01.uis.no-13
	BGP down	waiting	28d 05:18		stavanger-gw3	AS64535	uis-kkh-gsw01.uis.no, peer is admin turned off
	BGP down	waiting	28d 05:18		stavanger-gw3	AS64535	uis-kkh-gsw01.uis.no, peer is admin turned off
	PORT lower	waiting	28d 19:45	0s	hamar-gw5	xe-0/1/4.0	UN001347, hamar-udir-13
	BGP down	waiting	28d 19:45		hamar-gw5	AS64668	2001:700:0:800a::1 peer is admin turned off
	BGP down	waiting	28d 19:45		hamar-gw5	AS64668	udir-hmr-fw1-0.c.uninett.no, peer is admin turned off
	BGP down	working	39d 05:08		bergen-gw3	AS64640	bergen-fw1.met.no, peer is down
	BGP down	working	39d 05:08		bergen-gw3	AS64532	2001:700:0:4303::2 peer is down

<=>=Display attributes m=Clear Flapping i=Show/Hide ID X=Restore last selection
s=Set State u=Update History U=Update History and Set State f=Filter y=Remove Closed
KENTER>=Show history <UP/DOWN>=Navigate q=Quit l=Show Logs x=(de)select c=Clear selection

EMT

- Sends email alarms
- Sends SMS alarms (via external mail-to-SMS gateway)
- Implements failover mechanism

BACK TO THE 90S

The Zino suite has been continuously developed, deployed and maintained since the mid-90s

DEPLOYMENT

- Zino is mainly developed by Sikt
- Deployed at Sikt (Uninett), NORDUnet and Sunet

THE GOOD

- Separation of concerns
- Very stable
- Few dependencies
- Battle-proven (for more than 25 years)

THE NOT SO GOOD

- Good luck finding Tcl programmers in 2023
- Project "bus factor" is approaching zero...

```
proc pollSingleIf { sh ix } {
    set bpl [basePollList $sh]
    foreach v [split $bpl] {
        lappend pl [format "%s.%d" $v [expr $ix - 1]]
        lappend sl [mib oid $v]
    }
    if [catch {set res [$sh getnext $pl]} msg] {
        log [format "%s: error polling single intf %s: %s" \
            [name $sh] $ix $msg]
        return
    }
    set fres [filterLowestMatching $sl $ix $res]
    if { "$fres" == "" } {
        log [format "%s: error polling single intf %s: no match" \
            [name $sh] $ix]
```

FAST FORWARD TO 2023

NORDUnet is sponsoring a reimplementations of Zino in
two separate work packages

NORDUnet
Nordic Gateway for Research & Education

WP1: STATE MONITOR RE-IMPLEMENTATION

- State monitoring is the most crucial component for NOCs
- The Zino designs are already robust
- Decision: Port codebase to *Python*, using a team of developers



WP1: STATE MONITOR RE-IMPLEMENTATION

- Also: Build a web-based client for the Zino API

WP2: TRAFFIC STATS COLLECTION AND WEATHERMAP

(As presented by Jonas Hagström just a few minutes ago...)

- NORDUnet members already collect traffic stats in different ways
 - SNMP, Telemetry, multiple toolsets
- Concentrate on aggregation of existing data from members into a shared network map.

THE GOAL

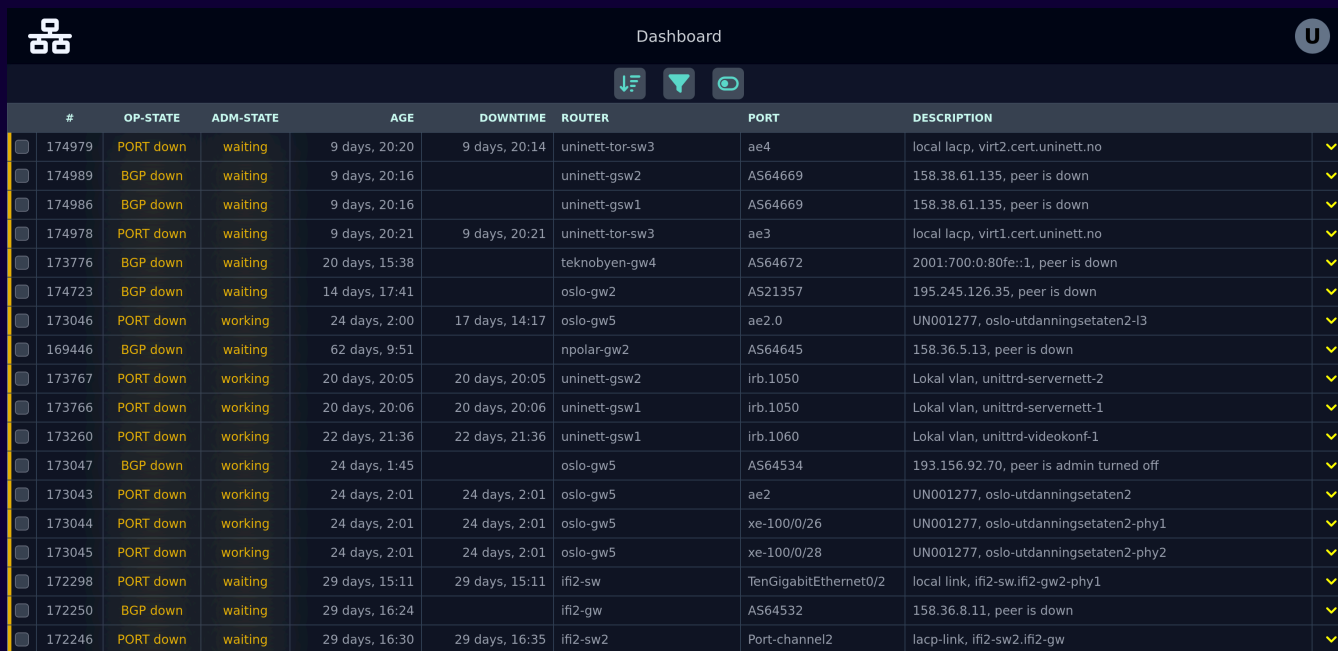
- All 5 NORDUnet members are using Zino in their NOCs

THE GOAL

- All 5 NORDUnet members are using Zino in their NOCs
- ... and maybe even more?

2024 STATUS

- Rewritten state monitor nearly complete
- Howitz is a new web-based client to the Zino API



The screenshot shows a dashboard with a dark theme. At the top left is a logo, and at the top right is the word "Dashboard" and a user icon "U". Below the header are three icons: a list, a filter, and a refresh. The main content is a table with columns: #, OP-STATE, ADM-STATE, AGE, DOWNTIME, ROUTER, PORT, and DESCRIPTION. Each row has a checkbox on the left and a dropdown arrow on the right. The table contains 20 rows of data.

#	OP-STATE	ADM-STATE	AGE	DOWNTIME	ROUTER	PORT	DESCRIPTION		
<input type="checkbox"/>	174979	PORT down	waiting	9 days, 20:20	9 days, 20:14	uninett-tor-sw3	ae4	local lacp, virt2.cert.uninett.no	▼
<input type="checkbox"/>	174989	BGP down	waiting	9 days, 20:16		uninett-gsw2	AS64669	158.38.61.135, peer is down	▼
<input type="checkbox"/>	174986	BGP down	waiting	9 days, 20:16		uninett-gsw1	AS64669	158.38.61.135, peer is down	▼
<input type="checkbox"/>	174978	PORT down	waiting	9 days, 20:21	9 days, 20:21	uninett-tor-sw3	ae3	local lacp, virt1.cert.uninett.no	▼
<input type="checkbox"/>	173776	BGP down	waiting	20 days, 15:38		teknobyen-gw4	AS64672	2001:700:0:80fe::1, peer is down	▼
<input type="checkbox"/>	174723	BGP down	waiting	14 days, 17:41		oslo-gw2	AS21357	195.245.126.35, peer is down	▼
<input type="checkbox"/>	173046	PORT down	working	24 days, 2:00	17 days, 14:17	oslo-gw5	ae2.0	UN001277, oslo-utdanningsetaten2-l3	▼
<input type="checkbox"/>	169446	BGP down	waiting	62 days, 9:51		npolar-gw2	AS64645	158.36.5.13, peer is down	▼
<input type="checkbox"/>	173767	PORT down	working	20 days, 20:05	20 days, 20:05	uninett-gsw2	irb.1050	Lokal vlan, unitttd-servernett-2	▼
<input type="checkbox"/>	173766	PORT down	working	20 days, 20:06	20 days, 20:06	uninett-gsw1	irb.1050	Lokal vlan, unitttd-servernett-1	▼
<input type="checkbox"/>	173260	PORT down	working	22 days, 21:36	22 days, 21:36	uninett-gsw1	irb.1060	Lokal vlan, unitttd-videokonf-1	▼
<input type="checkbox"/>	173047	BGP down	working	24 days, 1:45		oslo-gw5	AS64534	193.156.92.70, peer is admin turned off	▼
<input type="checkbox"/>	173043	PORT down	working	24 days, 2:01	24 days, 2:01	oslo-gw5	ae2	UN001277, oslo-utdanningsetaten2	▼
<input type="checkbox"/>	173044	PORT down	working	24 days, 2:01	24 days, 2:01	oslo-gw5	xe-100/0/26	UN001277, oslo-utdanningsetaten2-phy1	▼
<input type="checkbox"/>	173045	PORT down	working	24 days, 2:01	24 days, 2:01	oslo-gw5	xe-100/0/28	UN001277, oslo-utdanningsetaten2-phy2	▼
<input type="checkbox"/>	172298	PORT down	waiting	29 days, 15:11	29 days, 15:11	ifi2-sw	TenGigabitEthernet0/2	local link, ifi2-sw.ifi2-gw2-phy1	▼
<input type="checkbox"/>	172250	BGP down	waiting	29 days, 16:24		ifi2-gw	AS64532	158.36.8.11, peer is down	▼
<input type="checkbox"/>	172246	PORT down	waiting	29 days, 16:30	29 days, 16:35	ifi2-sw2	Port-channel2	lacp-link, ifi2-sw2.ifi2-gw	▼

2024 STATUS

- "Bus factor" is now closer to 5!
- Zino is in active alpha release
- Fully open source and available on GitHub and PyPI

WHAT'S NEXT?

What comes after Zino 2.0 is complete?

WHAT'S NEXT?

- API modernization (REST + TLS encryption)?

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- Optical state monitoring?

WHAT'S NEXT?

- API modernization (REST + TLS encryption)?
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 - ... probably not ...

WHAT'S NEXT?

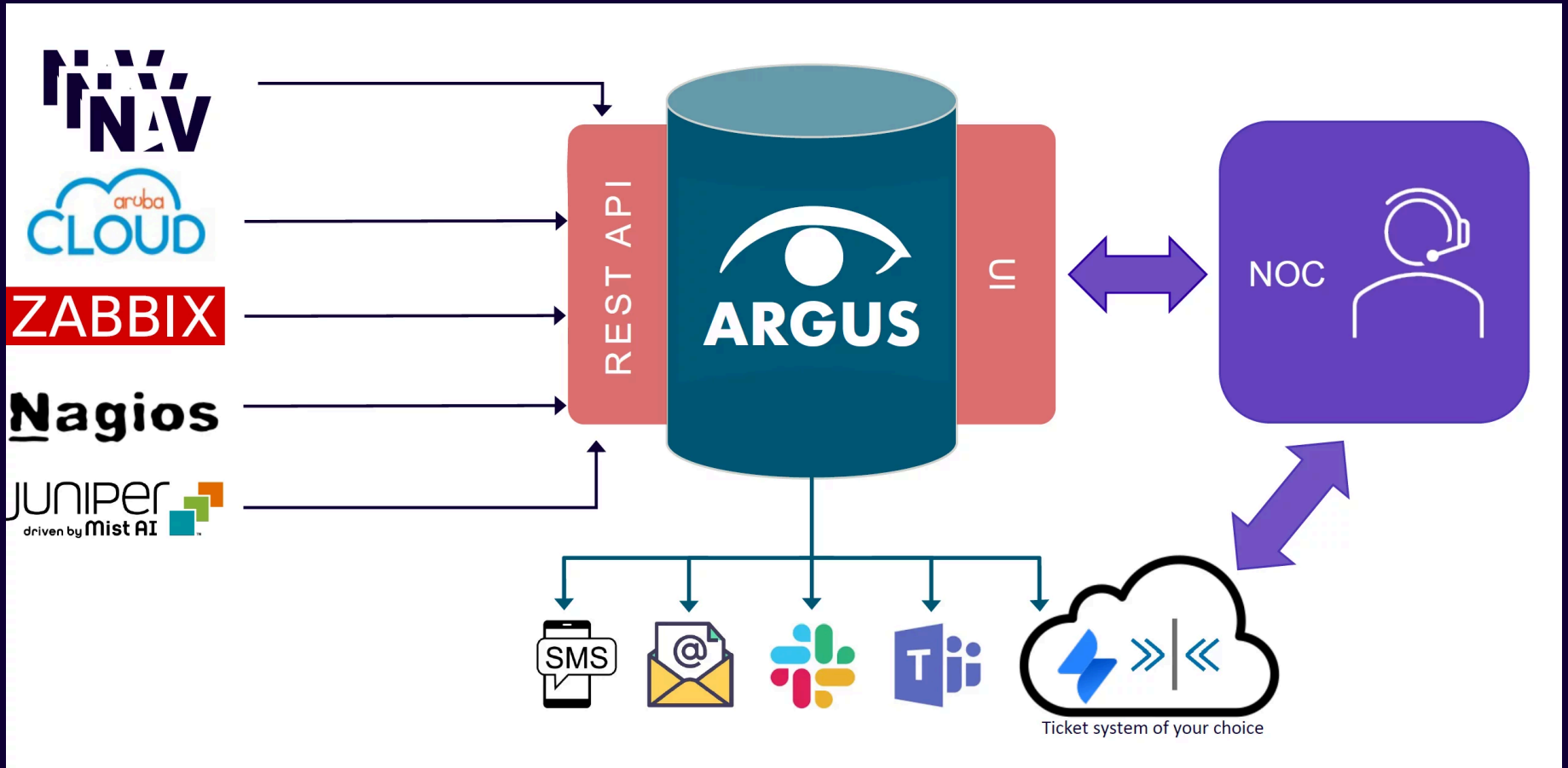
- API modernization (REST + TLS encryption)?
- Optical state monitoring?
 - ... probably not ...
- Argus integration is more likely!




ARGUS

- Alarm Aggregation and correlation tool
- Manages your incidents across all your monitoring tools
- A GÉANT production service

ARGUS



ARGUS

INCIDENTS TIMESLOTS PROFILES N NOC

Open State: OPEN CLOSED BOTH Acked: ACKED UNACKED BOTH Sources: Press enter to add new source Tags: Press enter to add new tag Max level: 5 - Information

Filter: + + + +

Select from your filters

Incidents

	Timestamp	Status	Severity level	Source	Description	Actions
<input type="checkbox"/>	2022-04-28 09:56	Open Non-acked	3 - Moderate	nav.customer1.example.org	box down example-sw.customer1 192.168.42.42	
<input type="checkbox"/>	2022-04-27 11:42	Open Non-acked	4 - Low	mobility-master.example.org	AP down: AP1553 at somecollege	
<input type="checkbox"/>	2022-04-02 13:12	Open Acked	1 - Critical	nav.customer1.example.org	box down main-gsw.customer1 192.168.0.1	
<input type="checkbox"/>	2022-04-02 09:32	Open Acked	3 - Moderate	nav.someschool.example.org	nav.devices.holophonor-sw1_someschool.sensors.xe-1_2_2_jnxDomCurrentRxLaserPower exceeded at -37.32 <-14	
<input type="checkbox"/>	2022-04-02 08:32	Open Acked	2 - High	zabbix.example.org	slurm.example.org: Software RAID: Device md0 is active,degraded	

Rows per page: 25 1-5 of 5 < >

Last refreshed 2022-05-03 15:35:50 updating every 30

Backend v.1.5.1.dev1+g18faa05, API v1(stable), frontend v.1.5.4

1. The first part of the document discusses the importance of maintaining accurate records of all business transactions. This is essential for ensuring the integrity of the financial statements and for providing a clear audit trail. The document emphasizes that every transaction, no matter how small, should be properly documented and recorded in the accounting system.

2. The second part of the document focuses on the importance of regular reconciliation. This involves comparing the company's internal records with external statements, such as bank statements, to ensure that they match. Regular reconciliation helps to identify any discrepancies or errors early on, allowing them to be corrected before they become more significant.

3. The third part of the document discusses the importance of maintaining proper documentation for all business transactions. This includes keeping receipts, invoices, and other supporting documents for each transaction. Proper documentation is crucial for providing evidence in the event of an audit and for ensuring that all transactions are properly recorded and accounted for.

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REFERENCES

- New state monitor back-end:
<https://github.com/Uninett/zino>
- Howitz interface to Zino:
<https://github.com/Uninett/howitz>
- cuRitz interface to Zino:
<https://github.com/Uninett/curitz>
- Argus: <https://network.geant.org/argus/>

