

Inter federation incident response (IR) in eduGAIN

eduGAIN security Table Top Exercise (TTX)

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Motivation/Goal

The goal of the exercise:

Raising awareness of the complexity of IR in large/federated environment

Motivation for the TTX

Test IR procedures and policies in eduGAIN and promote/explain the role/utility of eduGAIN CSIRT

Questions to answer

Identify the organisational obstacles in IR, are the available policies complete enough?

Role-play

Why a role-play:

- ▶ Handling a simulated real-life incident affecting a complex environment, to get a better understanding of the risks.
- ▶ “Cheap” way to test available policies and procedures, are they sufficient, do they “work”?

Enabled learning objectives

- ▶ IdP/SP logfile analysis (check for/find a reported Id).
- ▶ know SIRTfI v2, and understand to apply it.
- ▶ Know how eduGAIN is organised, role of Federations, eduGAIN and eduGAIN CSIRT.
- ▶ Name the risks of federated Identity Management.

Agenda

- ▶ Intro to eduGAIN (M. Kremers)
- ▶ Token Technology, what are the implications to IR (M. Hardt)
- ▶ eduGAIN CSIRT (S. Gabriel)
- ▶ eduGAIN TTX (S. Gabriel, D. Kouřil, D. Groep, M. Kremers, D. Kelsey, D. Vaghetti, T. Dussa, M. Waleczek)

Intro to eduGAIN (M. Kremers)

eduGAIN CSIRT (S. Gabriel)

Approach: security in eduGAIN

- ▶ Organization
 - ▶ What is the organizational structure (see previous talks), Governance, Responsibility Accountability.
 - ▶ What are the existing policies, agreements etc.
- ▶ Options
 - ▶ Set up trust network. **Trust is in individuals.**
 - ▶ Formally set up a security team (▶ RFC 2350 , ▶ TOR , mandate, services, ...etc.). **Trust is in Organizations/Processes.**

Organizational, Governance, Policies

eduGAIN Policy Framework Constitution:

- ▶ 2 Governance and Governing Bodies
- ▶ 2.1 eduGAIN Executive Committee (eEC), *Decisions about possible changes to the constitution are taken here*
- ▶ 2.2 eduGAIN Steering Group (eSG) ▶ Committee *Reviewing and approving the membership of new Federations, Approving the disqualification or temporary suspension for Member Federations as described in section 3.6*
- ▶ 2.3 Operational Team (OT)

Constituency

eduGAIN Policy Framework ▶ Constitution

1.2 Goal

The goal of eduGAIN is to support Identity Federations primarily engaged in research and education by providing a service which enables them to inter-federate.

eduGAIN entities: 9500+ (IdPs 5700+, SPs 3700) organised in 78 participants (Federations).

Primary Asset: Function which enables federations to inter-federate.

Role, Functions of the Security Team

- ▶ Role: Advisory only.
- ▶ Coordination function: *The eduGAIN-CSIRT provides computer security incident response coordination for eduGAIN.*
- ▶ It serves as the primary contact point for all security related issues affecting eduGAIN and more specifically for all the security issues affecting multiple entities from different Federations.

IT Security Incident Response (IR) and Root Cause Analysis (RCA)

- ▶ One of the goals of IR is to understand why an IT Security Incident has happened, identify which Security Measures could prevent this incident from happening again.
- ▶ The RCA concept is rather old and known for example in addressing aviation disasters. IT development (here in particular sophisticated adversaries) is much more dynamic than engineering and faces challenges.
- ▶ It's beyond identifying a compromised account, or a malware, question is rather why an account could be compromised, or why a particular malware succeeded to infiltrate the systems.
- ▶ A way to get to the Root Cause is the "5 Whys" iterative method¹, Example

¹Other Methods would be Fishbone (Ishikawa) or an Analysis Tree Diagram, many of these were developed by doing RCA in aviation.

The “5 Whys” iterative method

- ▶ **Why** could the malware be planted → using legit account

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- ▶ **Why** can weak password be used? → No policy, no policy enforcement

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- ▶ **Why** is there no password policy, → Organisational security problem

Goal of RCA

Organize potential causes into key categories²:

- ▶ People: Training gaps, security awareness
- ▶ Process: Access management, change control
- ▶ Technology: System vulnerabilities, patch management
- ▶ Environment: Network architecture, security controls
- ▶ Management: Policy enforcement, resource allocation

²https://en.wikipedia.org/wiki/Root_cause_analysis

Some Remarks on Communication

How to Communicate Securely

- ▶ We don't mean encryption here!
- ▶ Rather, how to contain the *dissemination* of information by legitimate recipients.
- ▶ In other words: How to make sure that if you tell somebody a secret, that somebody does not blabber the secret to the rest of the world.
- ▶ Obviously an organizational measure, so all we can do is specify rules and then trust that everybody sticks to these rules.
- ▶ It should also be obvious that if somebody does not stick to these rules, they will not be trusted any longer.
- ▶ The set of generally-accepted rules is called the “Traffic Light Protocol” ▶ TLP .

TLP Principles

- ▶ Information is classified by the *sender* into one of these four categories: TLP:CLEAR, TLP:GREEN, TLP:AMBER, TLP:RED.
- ▶ The *recipient* is expected to treat the thusly-classified information in accordance with the TLP rules as laid out below.
- ▶ Information must be marked clearly with a TLP classification; it is generally a good idea to define a *default* classification in case there is no explicit marking. TLP:AMBER is usually a good starting point.
- ▶ The classification of a given bit of information may change over time (the classification is usually relaxed).

The TLP Classifications

- ▶ TLP: CLEAR (formerly TLP: WHITE): Information that can be shared freely with anybody—for instance, may be published on a public web page or released to the press.
- ▶ TLP: GREEN: Information that can be shared within the community—for instance, within the high-energy physics community—, but *not* released to the general public.
- ▶ TLP: AMBER: Information that may be shared *within the recipient's organisation and its clients*—for instance, within a university if the recipient is a member of a university, or a company *and its customers* if the recipient works for a company. If unsure, *ask the sender*. Additionally, TLP: AMBER may be restricted arbitrarily by the sender. For instance, TLP: AMBER - FOR EDUGAIN ONLY might be used so signal that information can only be shared with eduGAIN parties.

The TLP Classifications – cont'd

- ▶ TLP:AMBER+STRICT: This is a special, pre-defined restriction for TLP:AMBER that signals that information may be shared only within the recipient's organisation, but *not* with any customers.
- ▶ TLP:RED: This is the strictest classification and signals that information may *not be shared with anybody else whatsoever*. This means that whoever is told something under TLP:RED *cannot* tell *anybody* else this information. Note that this restriction in particular means that TLP:RED information cannot be shared through chat channels if a new member to the chat channel can read the channel history. If new members can read the history, then it is not clear who the ultimate recipients of a message will be because new members could be added at any time and thus gain access to earlier messages. Therefore, TLP:RED conditions cannot be guaranteed.

You will be expected to classify all your communications in this exercise, so contemplate what classification would be the right level of protection for your information and mark it accordingly!

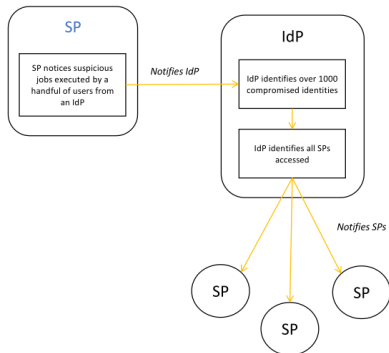
Background, Current Situation

eduGAIN CSIRT, Provided Services

- ▶ eduGAIN CSIRT listed (Feb. 2024) team in TF-CSIRTs
 - ▶ TI-Directory
- ▶ Support in development of an [Incident Response Procedure](#)
- ▶ IR procedure describes roles and responsibilities of *federation operators, IdPs, SPs*
- ▶ Technical IR support for IdP, SP operators with a focus on federation software. (Find relevant info in logs, act on identities, key-rolover etc.)
- ▶ Support in incident triaging, incident coordination, incident resolution.

Coordination, who should talk to who?

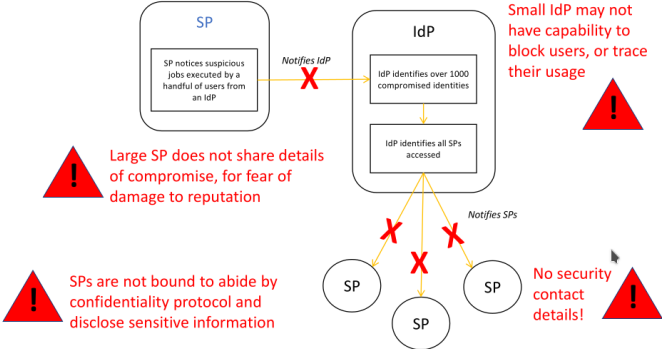
But what appears trivial



Coordination, who should talk to who?



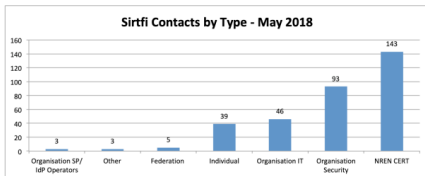
... may not be so ...



Coordination, who should talk to who?... SIRTFI

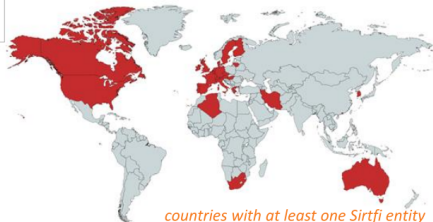


Sirtfi is there today – 561 parties joined, in 28 federations



Incident Response

- Assure confidentiality of information exchanged
- Identify trusted contacts
- Guarantee a response during collaboration



countries with at least one Sirtfi entity

IAM Online Europe

IAM Online Europe webinars are brought to you by <https://refeds.org/SIRTFI> REFEDS + SIRTFI

Incident Response Trust Framework for Federated Identity (Sirtfi) aims to enable the coordination of incident response situations. This assurance framework comprises a list of assertions which an organisation can attest in order to be compliant. Visit our [Wiki](#) to discover how your organisation can prepare itself for Federated Incident Response.

Group has been active since 2014 and combines expertise in operational security and incident response policies community. Work to publish and implement the Sirtfi Trust Framework is supported by the IAAIC.

iamonlineEU.001.Sirtfi
iamOnline
38 views • 4 days ago

- Benefits
- Sirtfi v 1.0
- FAQs

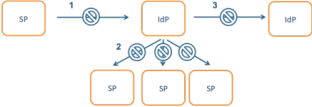
IAAIC <https://refeds.org/SIRTFI> Why should I join? What are the Benefits? View the Sirtfi Framework Need help?

graphics source: AARC2 DNA3.2 Report on Incident Response in FIM; data: technical.edugain.org

Coordination, who should talk to who?... SIRTFI



Incident response process evolution in federations



Incident Response Communication, communication blocks



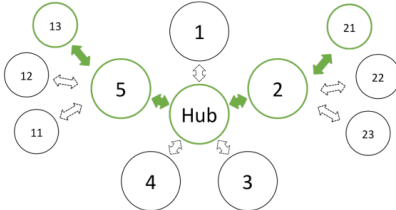
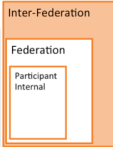
Proposed solutions

- Stronger role for federation operators, as they are known to both SPs and IdPs
- Add hub capability centrally (@ eduGAIN)

Guide to Federated Security Incident Response for Research Collaboration

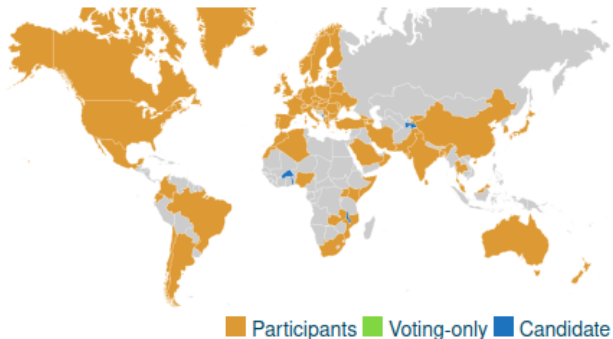


Publication Date: 2019-03-22
 Authors: Hannah Short, David Groep, AARC NAs
 Document Code: AARC-i051



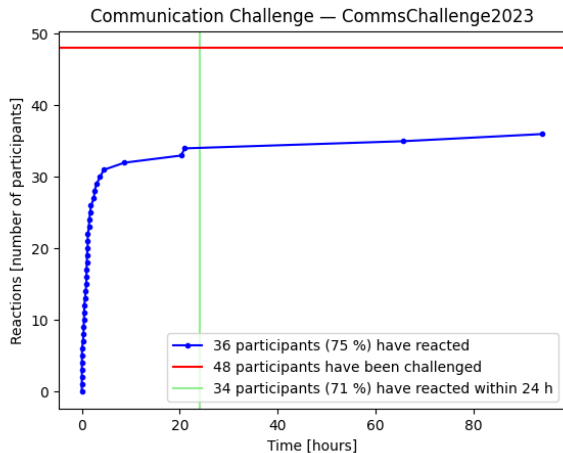
Inter-Federation Incident Response Communication

Testing the Communications Infra



79 participants, only sirtfi'd challenged (48), next slide

Testing the Communications Infra



The eduGAIN TTX, Background, Current Situation.

Background, Current Situation

This game mostly consists of elements of incident we handled, though not in the combination we show here.

- ▶ We have a couple of IdP, SP and Federation Operators. All participants have carried out a self assessment and announce to be compliant with SIRTFI v2. (Hey its a perfect world, isn't it :-))
- ▶ Read, discuss your role description, get familiar with your IR tasks.
- ▶ if anything goes wrong, rest easy, finding the obstacles is one of the goals of the play.
- ▶ if anything is unclear, ask us.

What would you do?

During the play you will have to make decisions and report them back to the other players, at each section you should think about what would you do.

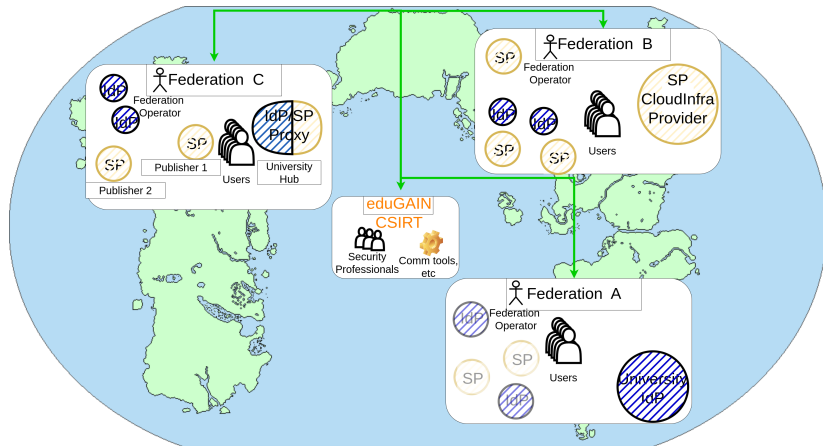
When you need information, have instructions for another participants, just raise your hand, we will establish the communication.



The World



The World with Identity Federations



Connected comm Endpoints

Description of the Services and the Role of the Service Operator

Roles

Roles, in order of appearance.

- ▶ Academic Hub (IdP/SP proxy)
- ▶ Federation of Academic Hub (Fed. C)
- ▶ IdP of university *uni.org*
- ▶ Federation of *uni.org* IdP (Fed. A) (needed)
- ▶ *User*
- ▶ Community cloud
- ▶ Federation of Community cloud (Fed. B)

Some roles have pretty little to do, can/will be covered by the trainers.

Roles

Roles explained.

- ▶ *Federation Operator*: admin of an Identity Federation to which belong IdPs and SPs (entities). Usually, IdPs represent Home Organizations of the Federation's country (Universities, Research Center, etc), while SPs are both services and resources provided by vendors, and home organizations themselves. The Federation Operator is responsible for entities registration and metadata management, eduGAIN membership and relations with other federation operators. With regards to security, the **Federation Operator should publish a security contact that will act as reference for the eduGAIN CSIRT**, other CERTs/CSIRTs and the eduGAIN Participants.

Roles, Federation and Federation Operator

Roles explained.

IdP Operator: admin an Identity Provider of an Home Organization. An IdP Operator has access to IdP logs with traces of users logins to SPs, and she/he's is **expected to comply with SIRTFI requirements on IR, log tracking**, etc. **IdPs adhering to SIRTFI must publish a security contact** that will handle IR and supports TLP.

Roles, SP Operator

Roles explained. *SP Operator*: admin of a Service Provider of the resource. An SP operator has access to SP logs with traces of users' logging from the IdPs and she/he's expected to **comply with SIRTFI on the service side**. As for IdPs, **SPs adhering to SIRTFI must publish a security contact** that will handle IR and supports TLP.

Roles, IdP/SP proxy operator

Roles explained. *IdP/SP proxy operator*: admin of an IdP/SP proxy, which means being responsible for managing both the IdP back end connecting internal services and the SP front end connected to the Federation. **SIRTFI compliance is mostly on the front end (SP) side.**


Authentication as a Service


Email address*


Continue

Don't have an account? [Sign Up](#)

or

 Continue with Google

 Continue with Microsoft Account

 Continue with Apple


Authentication as a Service


Email address*


Continue


Don't have an account? [Sign Up](#)

OR


 Continue with Google

 Continue with Microsoft Account

 Continue with Apple


GEANT
Global Education and Research Network

Username or primary email

Password 

[Forgot your password?](#)

Remember me

Sign in

or sign in with

Federated Authentication

Remember me

Authentication as a Service



Username or primary email

Password

[Forgot your password?](#)

Remember me

[Sign in](#)

or sign in with

Federated Authentication

Remember me

Email address*

Continue

Don't have an account? [Sign Up](#)

OR

Continue with Google

Continue with Microsoft Account

Continue with Apple

All **GEANT** Social networks Guest providers

22 Mayo University
A*STAR - Agency for Science, Technology and Research
AAE_Virtual Home
aai.info.nrae.es
AAJOL_Edu.Hi: Single Sign-On Service
Aalborg University
Aalto University
Aarhus School of Architecture
Aarhus School of Media and Technical Journalism
Aarhus University
AARNet
Aix Teachers University
ABC - Academia Brasileira de Ciências
Bechtel University
Bielefeld University
BIRAC - French-Brazilian Agency for Higher Education
Birkbeck, University of London
Birkbeck University College
Academia Brasileira de Ciências
ACADEMA S.O.O.
Academia das Ciências de Lisboa


Authentication as a Service


[Don't have an account? Sign Up](#)

OR

All **GEANT** Social networks Guest providers


- 22 Mayo University
- A*STAR - Agency for Science, Technology and Research
- AAR Visual Home
- ai4info.rwth-aachen.de
- AAS/EA/HS: Single Sign-On Service
- Aalborg University
- Aalto University
- Aarhus School of Architecture
- Aarhus School of Media and Technical Journalism
- Aarhus University
- AARNet
- Aix Teachers University
- ABC - Academia Brasileira de Ciências
- Berlin University
- Birmingham University
- BIRU - French-Brazilian Agency for Higher Education
- Bremen and Willem Collage
- Boleyn University College
- Academia Brasileira de Ciências
- ACADEMA S.p.A.
- Academia das Ciências de Lisboa


Username or primary email

Password
 
[Forgot your password?](#)
 Remember me

or sign in with

 Remember me



Login

Username

Password

Don't remember login.
 Clear prior granting of permission for release of your information to this service.

[Personal Data Protection](#)

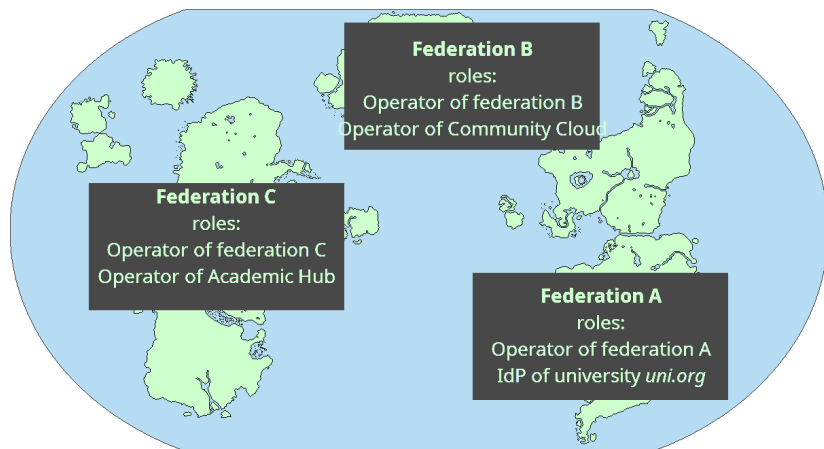
Security tokens

- ▶ *Token* is a proof of authentication and/or authorization
- ▶ If token is compromised (leaked), the user can be impersonated or actions on their behalf can be taken by an adversary
- ▶ A number of token formats and types (HTTP Cookie, Kerberos tickets, X.509 certificates and private key combo)
- ▶ Protocols used for federated authentication/authZ use a number of tokens
 - ▶ SAML Assertions, OIDC ID tokens, OIDC Access token, OIDC Refresh tokens
 - ▶ different lifetimes (e.g., short-lived OIDC Access tokens vs. long-lived Refresh token)
 - ▶ Some tokens are only used in the protocol exchange (SAML assertions), some are designed to be maintained by the user's application (OIDC Refresh token)

eduGAIN TTX, outline of the TTX

- ▶ Intro to the TTX, get into groups, assign roles to groups.
- ▶ Background, Current Situation.
- ▶ Stage-1, Incident begins, report to IdP/SP Proxy
- ▶ Stage-2, Incident verified
- ▶ Stage-3, Incident spreads
- ▶ Stage-4, Investigation starts
- ▶ Stage-5, Incident handling
- ▶ Stage-6, Incident resolved, close out report

Make Exercise Groups



Supporting Materials

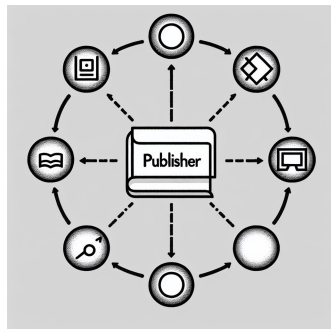


https://drive.google.com/drive/folders/18qA9Lzr9Rh_f_e39bK1DDD6fe4DWfXKc

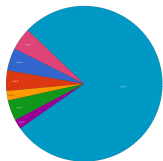
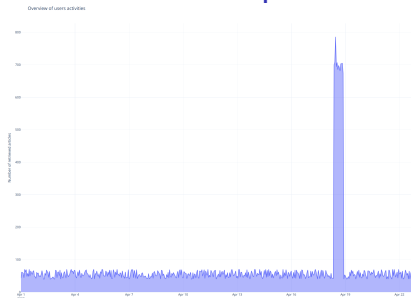
Stage-1, Incident begins, report to the
Academic Hub (IdP/SP Proxy)

Publisher

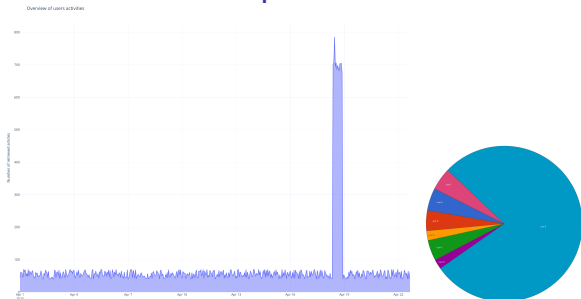
- ▶ Publisher: This entity is responsible for publishing academic papers. They provide services such as peer review, editing, and distribution of research articles.
- ▶ Academic Hub: a consortium of universities that maintains a contract with the publisher.



Usual business at a publisher



Usual business at a publisher



Complaints sent to the customer (the Academic Hub)

Subject: Notice of Excessive Content Downloads in Violation of AUP

Dear University Hub,

We are writing to inform you that our system has detected excessive content downloads from your organization's account, specifically from a user under the identifier **134273@uni-hub.org**, which exceeds the limitations set forth in our Acceptable Use Policy (AUP).

We understand that in some cases, such incidents may occur unintentionally. However, to ensure the continued quality of service and fairness for all users, we kindly request your cooperation in reviewing this matter and taking appropriate corrective actions.

We appreciate your prompt attention to this matter. If no corrective measures are taken, we may be required to take further action, which could include a temporary suspension of services, as per our policy.

Please don't hesitate to reach out if you need assistance or further information.

Thank you for your understanding and cooperation.

Kind regards,

John Smith

I

Stage-1, Incident begins, report reached operators @ Academic Hub

- ▶ Academic Hub operates an IdP/SP Proxy covering connected universities
- ▶ IdP/SP Proxy receives a request to verify legitimacy of a user, checks the logs.
- ▶ The user identifier is `134273@uni-hub.org`, the Academic Hub operator needs to verify the report

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- ▶ The access to the publisher SP is logged in logs of *Academic Hub* (logs-einfra.tx):

```
3 Apr 18 08:05:10 login3-d10 proxyaai/simplesamlphp[936]: 185.177.126.151 uni-hub NOTICE [ac2e8bef12] User ID: 134273, identifiers:  
  ~ [eduPersonUniqueId: 8ece13c45965afea5d48e203ac65d20f37bb0437d2bc38c3854290b714439382@uni.org, eduPersonPrincipalName:  
  ~ 19382@uni.org], service: https://brno-publishing.org/shibboleth/, external identity: 19382@uni.org from  
  ~ https://idp2.uni.org/idp/shibboleth
```

- ▶ Token life time issue.

Identifiers insight

- ▶ eduPersonPrincipalName: scoped identifier for a person.
 - ▶ SYNTAX: user @ scope where:
 - ▶ user is a name-based identifier (often the employee or student number).
 - ▶ scope is the administrative domain of the identity system.
- ▶ eduPersonUniqueId: unique, long-lived, non re-assignable, omnidirectional identifier.
 - ▶ SYNTAX: uniqueID @ scope
 - ▶ uniqueID is a string of 64 alphanumeric characters.
 - ▶ scope is the administrative domain of the identity system.

Stage-1, Incident verified

- ▶ The Academic Hub reaches out to university *uni.org* (the user's Identity provider), forwarding the publisher's complain is passed and the user's identifier (*19382@uni.org*)

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- ▶ The Uni Identity provider determines the recent activities to confirm or deny the report (*logs-uni.txt*)

```
4 2023-04-18T08:04:29.526861+02:00 id1.idm.uni.org 185.177.126.151 simplesamlphp NOTICE STAT [52c5045275] audit-login  
↳ https://aai.uni-hub.eu/sp/shibboleth UNI_IdP 19382@uni.org
```

- ▶ IdP has a report of an Id potentially involved in activities violating AUP. What do they do?

```
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- ▶ IdP has a report of an Id potentially involved in activities violating AUP. What do they do?
 - ▶ IdP operator to contact user?

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 - ▶ User (reliably) denies any relation to the activity in question

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 - ▶ To who to report these findings?
- ▶ report to Fed Operator

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- ▶ report to Fed Operator
- ▶ What would/should the Fed Operator do with this info?

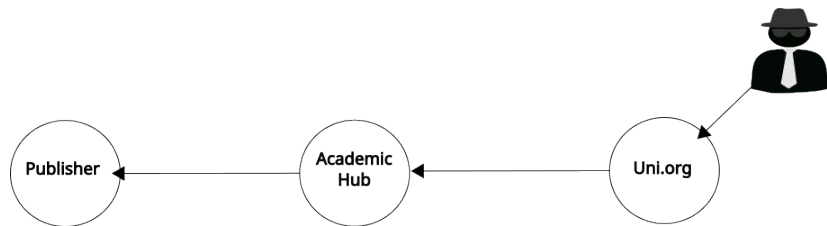
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 - ▶ Case has the potential to affect other federations, eduGAIN CSIRT gets informed.

End of Stage-1



Stage-2, Incident spreads

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- ▶ eduGAIN CSIRT aggregates current findings and reports on the compromised identity
 - ▶ Two identifiers so far: *19382@uni.org* and *134273@uni-hub.org*
- ▶ Compromised identity is shared with the federation operators
- ▶ What does the IdP hosting the compromised identity do?

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- ▶ Fed Ops share IoC (compromised Identity) with end entities/Federation Participants (IdPs, SPs)
- ▶ SPs need to check their logs for IoCs

Stage-2, Incident spreads

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2023-04-19T16:30:30.751015+02:00 idp3.community.edu 212.8.243.71 simplesamlphp INFO [7769d2ae22] Authentication source
  → 'https://aai.uni-hub.eu/sp/shibboleth': User 134273 logged in to service OpenStack@community.edu; UA Mozilla/5.0 (Android 13;
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```

Note: the access could also be identified by uni-hub (from the IdP log)

- ▶ The compromised identity was used to obtain an account in the Community cloud facility
- ▶ What the Community cloud service needs to do?

Stage-2, Incident spreads

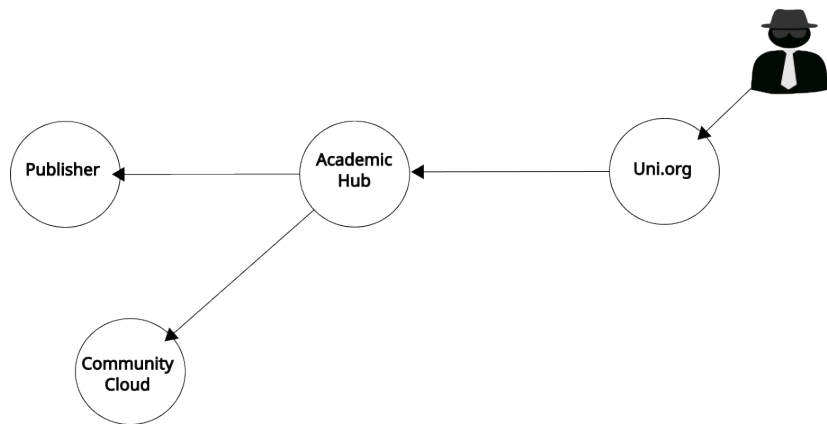
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```

Note: the access could also be identified by uni-hub (from the IdP log)

- ▶ The compromised identity was used to obtain an account in the Community cloud facility
- ▶ What the Community cloud service needs to do?
- ▶ Cloud checks network connections to VM and other activities. The machine is:
 - ▶ deleted
 - ▶ stopped

End of Stage-2



Stage-3, Investigation starts

Stage-3, eduGAIN CSIRT starts own investigation

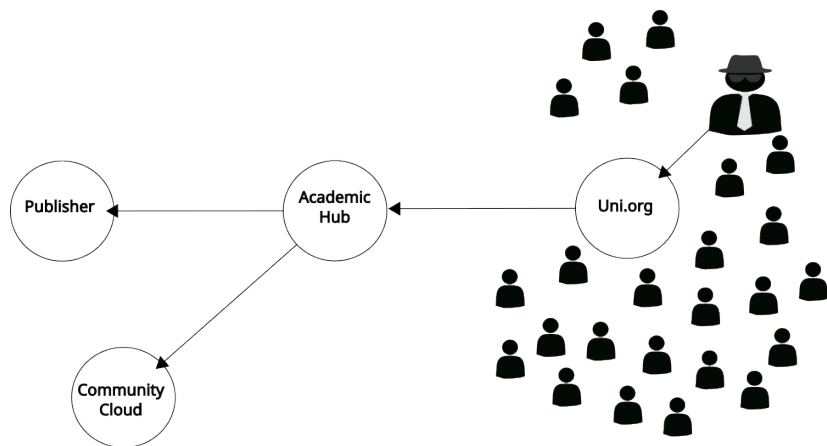
(Spoiler, we never did this). Rumours has it that Identities/Accounts are traded on the darkweb <http://abacusmu340oa6hoyg7xic5j2gztky3rplpsbvmqxxk6ywnyqb433poyd.onion>.

Some of us tried to log in, but failed to pass the captcha challenge :-(so no fancy screen shots.

Findings:

- ▶ many Ids from IdP in question are on the market, selling cheap.
- ▶ checking the software of the IdP in question show its heavily outdated.
- ▶ assumption IdP is compromised

End of Stage-3



Stage-4, Compromised IdP you say ...

If you need some advise on how this problem **can** be addressed **and** get some international attention, , ask Univ. Giessen:



Bei der Ausgabe der neuen Passwörter kommt es zum Teil zu langen Schlangen. FOTO: LKL © Lena Karber

<https://www.bbc.com/news/technology-50838673>

Stage-4, Situation

Situation:

- ▶ Compromised identity, how it got lost unclear.
- ▶ Moreover, indications that the IdP is controlled by someone else.
- ▶ Identity used at IdP/SP proxy to create an identity (token) which is used at SP-1 (publisher) and SP-2 (Community cloud)
- ▶ Compromised identity is suspended at IdP

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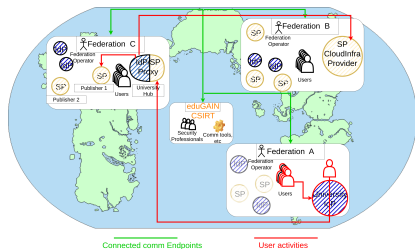
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- ▶ Compromised identity is suspended at IdP
- ▶ What is the effect of suspending the compromised identity?
- ▶ Started VMs will continue to run until the SP-2 manually suspends VMs
- ▶ Created token will remain valid, no means to “revoke” it

Stage-5, Incident handling

Stage-5, Incident Handling

given the situation described in the previous section, groups try to find answers to the following question (10 min):

- ▶ What can/would the Federation Operator of the potentially compromised IdP do?
- ▶ if the Fed Operator suggests the IdP shuts down, IdP Operator explains his/her situation (see ../../supporting_material/compromised_idp_situation.txt)
- ▶ What would the IdP operator do (besides reading job adverts)?
- ▶ What can/would eduGAIN CSIRT do?
- ▶ What can/would SP operators do,



Stage-6, Incident resolved, close out report

Stage-6, Incident resolved, close out report (lessons learned)

All groups collectively provide input to the close out report:

- ▶ What happened?
- ▶ How was it addressed?
- ▶ Did the procedures work?
- ▶ What to change in the procedures/policies?