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10.1.5 Document loading

- **Explain what the transformer does to the HTML retrieved by the loader**

  The transformer (BeautifulSoupTransformer) processes the loaded HTML documents. It extracts specific tags (in this case, the <article> tag) to isolate relevant content from the HTML structure. This helps filter out non-relevant parts of the HTML such as navigation bars, sidebars, or advertisements.

- **Examine the document cleaning code. What kinds of characters are removed when the text is cleaned?**

  The clean_text function performs the following operations:

- Converts non-ASCII characters to their closest ASCII equivalents using unidecode.

- Replaces multiple whitespace characters (like tabs, newlines, and spaces) with a single space.

- Strips leading and trailing whitespace. These steps ensure that the text is consistent and free of extraneous formatting.

- **What size chunks is the content split into?**

  The content is split into chunks of size 10,000 characters each.

- **What amount of overlap is there between chunks?**

  There is an overlap of 1,000 characters between chunks. This overlap ensures continuity of context between chunks
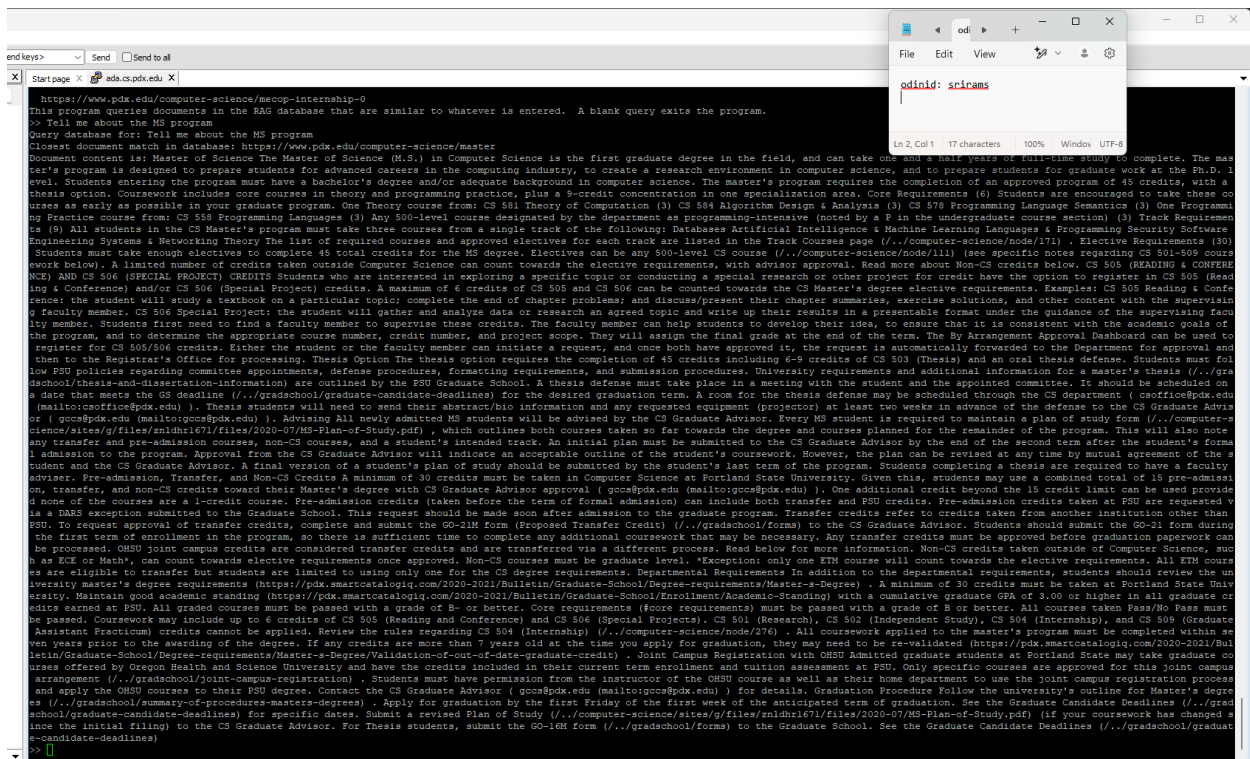
- **How many documents are loaded at a time into the vector database?**

  The function add_documents loads documents into the vector database in batches of 300 at a time. This batching process is controlled by the variable n set to 300 in the script.
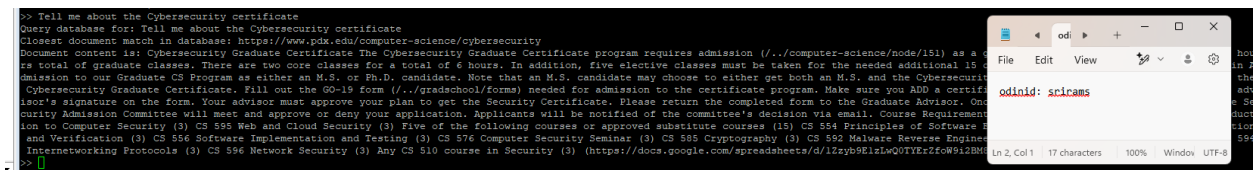
10.1.6 Document searching

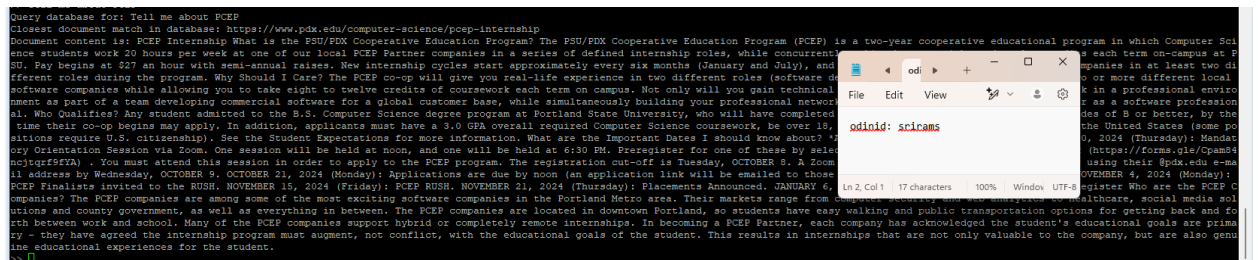**Show the document URLs that are returned for the following queries:**
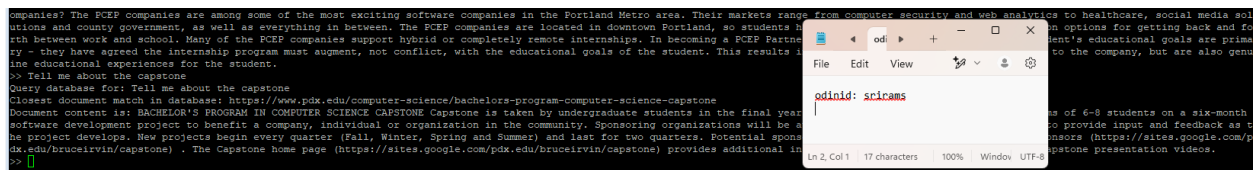
- **Tell me about the MS program**

```
https://www.pdx.edu/computer-science/mecop-internship-0
This program queries documents in the RAG database that are similar to whatever is entered.  A blank query exits the program.
>> Tell me about the MS program
Query database for: Tell me about the MS program
Closest document match in database: https://www.pdx.edu/computer-science/master
Document content is: Master of Science The Master of Science (M.S.) in Computer Science is the first graduate degree in the field, and can take one and a half years of full-time study to complete. The mas
ter's program is designed to prepare students for advanced careers in the computing industry, to create a research environment in computer science, and to prepare students for graduate work at the Ph.D. l
evel. Students entering the program must have a bachelor's degree and/or adequate background in computer science. The master's program requires the completion of an approved program of 45 credits, with a
thesis option. Coursework includes core courses in theory and programming practice, plus a 9-credit concentration in one specialization area. Core Requirements (6) Students are encouraged to take these co
urses as early as possible in your graduate program. One Theory course from: CS 581 Theory of Computation (3) CS 584 Algorithm Design & Analysis (3) CS 578 Programming Language Semantics (3) One Programmi
ng Practice course from: CS 558 Programming Languages (3) Any 500-level course designated by the department as programming-intensive (noted by a P in the undergraduate course section) (3) Track Requiremen
ts (9) All students in the CS Master's program must take three courses from a single track of the following: Databases Artificial Intelligence & Machine Learning Languages & Programming Security Software
Engineering Systems & Networking Theory The list of required courses and approved electives for each track are listed in the Track Courses page (/../computer-science/node/171) . Elective Requirements (30)
Students must take enough electives to complete 45 total credits for the MS degree. Electives can be any 500-level CS course (/../computer-science/node/111) (see specific notes regarding CS 501-509 cours
ework below). A limited number of credits taken outside Computer Science can count towards the elective requirements, with advisor approval. Read more about Non-CS credits below. CS 505 (READING & CONFERE
NCE) AND CS 506 (SPECIAL PROJECT) CREDITS Students who are interested in exploring a specific topic or conducting a special research or other project for credit have the option to register in CS 505 (Read
ing & Conference) and/or CS 506 (Special Project) credits. A maximum of 6 credits of CS 505 and CS 506 can be counted towards the CS Master's degree elective requirements. Examples: CS 505 Reading & Confe
rence: the student will study a textbook on a particular topic; complete the end of chapter problems; and discuss/present their chapter summaries, exercise solutions, and other content with the supervisin
g faculty member. CS 506 Special Project: the student will gather and analyze data or research an agreed topic and write up their results in a presentable format under the guidance of the supervising facu
lty member. Students first need to find a faculty member to supervise these credits. The faculty member can help students to develop their idea, to ensure that it is consistent with the academic goals of
the program, and to determine the appropriate course number, credit number, and project scope. They will assign the final grade at the end of the term. The By Arrangement Approval Dashboard can be used to
register for CS 505/506 credits. Either the student or the faculty member can initiate a request, and once both have approved it, the request is automatically forwarded to the Department for approval and
then to the Registrar's Office for processing. Thesis Option The thesis option requires the completion of 45 credits including 6-9 credits of CS 503 (Thesis) and an oral thesis defense. Students must fol
low PSU policies regarding committee appointments, defense procedures, formatting requirements, and submission procedures. University requirements and additional information for a master's thesis (/../gra
dschool/thesis-and-dissertation-information) are outlined by the PSU Graduate School. A thesis defense must take place in a meeting with the student and the appointed committee. It should be scheduled on
a date that meets the GS deadline (/../gradschool/graduate-candidate-deadlines) for the desired graduation term. A room for the thesis defense may be scheduled through the CS department ( csoffice@pdx.edu
(mailto:csoffice@pdx.edu) ). Thesis students will need to send their abstract/bio information and any requested equipment (projector) at least two weeks in advance of the defense to the CS Graduate Advis
or ( gccs@pdx.edu (mailto:gccs@pdx.edu) ). Advising All newly admitted students will be advised by the CS Graduate Advisor. Every MS student is required to maintain a plan of study form (/../computer-s
cience/sites/g/files/znldhr167l/files/2020-07/MS-Plan-of-Study.pdf) , which outlines both courses taken so far towards the degree and courses planned for the remainder of the program. This will also note
any transfer and pre-admission courses, non-CS courses, and a student's intended track. An initial plan must be submitted to the CS Graduate Advisor by the end of the second term after the student's forma
l admission to the program. Approval from the CS Graduate Advisor will indicate an acceptable outline of the student's coursework. However, the plan can be revised at any time by mutual agreement of the s
tudent and the CS Graduate Advisor. A final version of a student's plan of study should be submitted by the student's last term of the program. Students completing a thesis are required to have a faculty
adviser. Pre-admission, Transfer, and Non-CS Credits A minimum of 30 credits must be taken in Computer Science at Portland State University. Given this, students may use a combined total of 15 pre-admissi
on, transfer, and non-CS credits toward their Master's degree with CS Graduate Advisor approval ( gccs@pdx.edu (mailto:gccs@pdx.edu) ). One additional credit beyond the 15 credit limit can be used provide
d none of the courses are a 1-credit course. Pre-admission credits (taken before the term of formal admission) can include both transfer and PSU credits. Pre-admission credits taken at PSU are requested v
ia a DARS exception submitted to the Graduate School. This request should be made soon after admission to the graduate program. Transfer credits refer to credits taken from another institution other than
PSU. To request approval of transfer credits, complete and submit the GO-21M form (Proposed Transfer Credit) (/../gradschool/forms) to the CS Graduate Advisor. Students should submit the GO-21 form during
the first term of enrollment in the program, so there is sufficient time to complete any additional coursework that may be necessary. Any transfer credits must be approved before graduation paperwork can
be processed. OHSU joint campus credits are considered transfer credits and are transferred via a different process. Read below for more information. Non-CS credits taken outside of Computer Science, suc
h as ECE or Math', can count towards elective requirements once approved. Non-CS courses must be graduate level. *Exception: only one ETM course will count towards the elective requirements. All ETM cours
es are eligible to transfer but students are limited to using only one for the CS degree requirements. Departmental Requirements In addition to the departmental requirements, students should review the un
iversity master's degree requirements (https://pdx.smartcatalogiq.com/2020-2021/Bulletin/Graduate-School/Degree-requirements/Master-s-Degree) . A minimum of 30 credits must be taken at Portland State Univ
ersity. Maintain good academic standing (https://pdx.smartcatalogiq.com/2020-2021/Bulletin/Graduate-School/Enrollment/Academic-Standing) with a cumulative graduate GPA of 3.00 or higher in all graduate cr
edits earned at PSU. All graded courses must be passed with a grade of B- or better. Core requirements (#core requirements) must be passed with a grade of B or better. All courses taken Pass/No Pass must
be passed. Coursework may include up to 6 credits of CS 505 (Reading and Conference) and CS 506 (Special Projects). CS 501 (Research), CS 502 (Independent Study), CS 504 (Internship), and CS 509 (Graduate
Assistant Practicum) credits cannot be applied. Review the rules regarding CS 504 (Internship) (/../computer-science/node/276) . All coursework applied to the master's program must be completed within se
ven years prior to the awarding of the degree. If any credits are more than 7 years old at the time you apply for graduation, they may need to be re-validated (https://pdx.smartcatalogiq.com/2020-2021/Bul
letin/Graduate-School/Degree-requirements/Master-s-Degree/Validation-of-out-of-date-graduate-credit) . Joint Campus Registration with OHSU Admitted graduate students at Portland State may take graduate co
urses offered by Oregon Health and Science University and have the credits included in their current term enrollment and tuition assessment at PSU. Only specific courses are approved for this joint campus
arrangement (/../gradschool/joint-campus-registration) . Students must have permission from the instructor of the OHSU course as well as their home department to use the joint campus registration process
and apply the OHSU courses to their PSU degree. Contact the CS Graduate Advisor ( gccs@pdx.edu (mailto:gccs@pdx.edu) ) for details. Graduation Procedure Follow the university's timeline for Master's degre
es (/../gradschool/summary-of-procedures-masters-degrees) . Apply for graduation by the first Friday of the first week of the anticipated term of graduation. See the Graduate Candidate Deadlines (/../grad
school/graduate-candidate-deadlines) for specific dates. Submit a revised Plan of Study (/../computer-science/sites/g/files/znldhr167l/files/2020-07/MS-Plan-of-Study.pdf) (if your coursework has changed s
ince the initial filing) to the CS Graduate Advisor. For Thesis students, submit the GO-16M form (/../gradschool/forms) to the Graduate School. See the Graduate Candidate Deadlines (/../gradschool/graduat
e-candidate-deadlines)
>> ||
```

- **Tell me about the Cybersecurity certificate**


```
>> Tell me about the Cybersecurity certificate
Query database for: Tell me about the Cybersecurity certificate
Closest document match in database: https://www.pdx.edu/computer-science/cybersecurity
Document content is: Cybersecurity Graduate Certificate The Cybersecurity Graduate Certificate program requires admission (/../computer-science/node/151) as a
rs total of graduate classes. There are two core classes for a total of 6 hours. In addition, five elective classes must be taken for the needed additional 15 cr
dmission to our Graduate CS Program as either an M.S. or Ph.D. candidate. Note that an M.S. candidate may choose to either get both an M.S. and the Cybersecurit
Cybersecurity Graduate Certificate. Fill out the GO-19 form (/../gradschool/forms) needed for admission to the certificate program. Make sure you ADD a certifi
isor's signature on the form. Your advisor must approve your plan to get the Security Certificate. Please return the completed form to the Graduate Advisor. Onc
curity Admission Committee will meet and approve or deny your application. Applicants will be notified of the committee's decision via email. Course Requirement
ion to Computer Security (3) CS 595 Web and Cloud Security (3) Five of the following courses or approved substitute courses (15) CS 554 Principles of Software E
and Verification (3) CS 556 Software Implementation and Testing (3) CS 576 Computer Security Seminar (3) CS 585 Cryptography (3) CS 592 Malware Reverse Enginee
Internetworking Protocols (3) CS 596 Network Security (3) Any CS 510 course in Security (3) (https://docs.google.com/spreadsheets/d/1Zzyb9ElzLwQ0TYErZfoW9i2BM8
>> ||
```

- **Tell me about PCEP**


```
Query database for: Tell me about PCEP
Closest document match in database: https://www.pdx.edu/computer-science/pcep-internship
Document content is: PCEP Internship What is the PSU/PDX Cooperative Education Program? The PSU/PDX Cooperative Education Program (PCEP) is a two-year cooperative educational program in which Computer Sci
ence students work 20 hours per week at one of our local PCEP Partner companies in a series of defined internship roles, while concurrently         each term on-campus at P
SU. Pay begins at $27 an hour with semi-annual raises. New internship cycles start approximately every six months (January and July), and             mpanies in at least two di
fferent roles during the program. Why Should I Care? The PCEP co-op will give you real-life experience in two different roles (software de        o or more different local
software companies while allowing you to take eight to twelve credits of coursework each term on campus. Not only will you gain technical          k in a professional enviro
nment as part of a team developing commercial software for a global customer base, while simultaneously building your professional networ           as a software profession
al. Who Qualifies? Any student admitted to the B.S. Computer Science degree program at Portland State University, who will have completed             the United States (some po
time their co-op begins may apply. In addition, applicants must have a 3.0 GPA overall required Computer Science coursework, be over 18,            0, 2024 (Thursday): Mandat
sitions require U.S. citizenship. See the Student Expectations for more information. What are the Important Dates I should know about? *Z             (https://forms.gle/Cpam94
ory Orientation Session via Zoom. One session will be held at noon, and one will be held at 6:30 PM. Preregister for one of these by sele
ncjtqrf9fYA) . You must attend this session in order to apply to the PCEP program. The registration cut-off is Tuesday, OCTOBER 8. A Zoom           using their @pdx.edu e-ma
il address by Wednesday, OCTOBER 9. OCTOBER 14, 2024 (Monday): Applications are due by noon (an application link will be emailed to those            OVEMBER 4, 2024 (Monday):
PCEP Finalists invited to the RUSH. NOVEMBER 15, 2024 (Friday): PCEP RUSH. NOVEMBER 21, 2024 (Thursday): Placements Announced. JANUARY 6,            egister Who are the PCEP C
ompanies? The PCEP companies are among some of the most exciting software companies in the Portland Metro area. Their markets range from computer security, web and analytics or healthcare, social media so
lutions and county government, as well as everything in between. The PCEP companies are located in downtown Portland, so students have easy walking and public transportation options for getting back and fo
rth between work and school. Many of the PCEP companies support hybrid or completely remote internships. In becoming a PCEP Partner, each company has acknowledged the student's educational goals are prima
ry - they have agreed the internship program must augment, not conflict, with the educational goals of the student. This results in internships that are not only valuable to the company, but are also genu
ine educational experiences for the student.
>> ||
```

- **Tell me about the capstone**


```
ompanies? The PCEP companies are among some of the most exciting software companies in the Portland Metro area. Their markets range from computer security and web analytics to healthcare, social media sol
utions and county government, as well as everything in between. The PCEP companies are located in downtown Portland, so students h                    on options for getting back and fo
rth between work and school. Many of the PCEP companies support hybrid or completely remote internships. In becoming a PCEP Partner,                  dent's educational goals are prima
ry - they have agreed the internship program must augment, not conflict, with the educational goals of the student. This results i                    to the company, but are also genu
ine educational experiences for the student.
>> Tell me about the capstone
Query database for: Tell me about the capstone
Closest document match in database: https://www.pdx.edu/computer-science/bachelors-program-computer-science-capstone
Document content is: BACHELOR'S PROGRAM IN COMPUTER SCIENCE CAPSTONE Capstone is taken by undergraduate students in the final year             ms of 6-8 students on a six-month
software development project to benefit a company, individual or organization in the community. Sponsoring organizations will be a                    to provide input and feedback as t
he project develops. New projects begin every quarter (Fall, Winter, Spring and Summer) and last for two quarters. Potential spons                   nsors (https://sites.google.com/p
dx.edu/bruceirvin/capstone) . The Capstone home page (https://sites.google.com/pdx.edu/bruceirvin/capstone) provides additional i                    apstone presentation videos.
>> ||
```
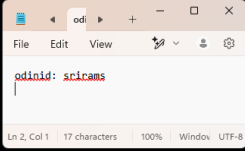
10.1.7 Document querying

10.1.8 -

- **How many credits does it take to complete the MS program?**


```
https://www.pdx.edu/computer-science/bachelor
https://www.pdx.edu/computer-science/master
https://www.pdx.edu/computer-science/research-areas
https://www.pdx.edu/computer-science/undergraduate
https://www.pdx.edu/computer-science/graduate-internship-credit
https://www.pdx.edu/computer-science/graduate
https://www.pdx.edu/computer-science/masters-track-courses
https://www.pdx.edu/computer-science/coronavirus-response
https://www.pdx.edu/computer-science/about
https://www.pdx.edu/computer-science/contact
llm>> How many credits does it take to complete the MS program?
It takes 45 credits to complete the MS program in Computer Science at Portland State University.  There is also a thesis option.

For more information, please visit the following URLs:

* https://www.pdx.edu/computer-science/master
* https://www.pdx.edu/computer-science/masters-track-courses
* https://www.pdx.edu/computer-science/cybersecurity

llm>>
```

- **How many core courses are there in the Cybersecurity certificate?**


```
https://www.pdx.edu/computer-science/research-areas
https://www.pdx.edu/computer-science/undergraduate
https://www.pdx.edu/computer-science/graduate-internship-credit
https://www.pdx.edu/computer-science/graduate
https://www.pdx.edu/computer-science/masters-track-courses
https://www.pdx.edu/computer-science/coronavirus-response
https://www.pdx.edu/computer-science/about
https://www.pdx.edu/computer-science/contact
llm>> How many credits does it take to complete the MS program?
It takes 45 credits to complete the MS program in Computer Science at Portland State University.  There is also a thesis option.

For more information, please visit the following URLs:

* https://www.pdx.edu/computer-science/master
* https://www.pdx.edu/computer-science/masters-track-courses
* https://www.pdx.edu/computer-science/cybersecurity

llm>> How many core courses are there in the Cybersecurity certificate?
There are two core courses in the Cybersecurity Graduate Certificate program.  These courses are CS 591 Introduction to Computer Security and CS 595 Web and Cloud Security, for a total of 6 credit hours.

For more information, please visit the following URLs:

* [https://www.pdx.edu/computer-science/cybersecurity](https://www.pdx.edu/computer-science/cybersecurity)
* [https://docs.google.com/spreadsheets/d/1Zzyb9ElzLwQ0TYErZfoW9i2BM83b_PFba6zWmzMELQs/edit#gid=0](https://docs.google.com/spreadsheets/d/1Zzyb9ElzLwQ0TYErZfoW9i2BM83b_PFba6zWmzMELQs/edit#gid=0)

llm>>
```
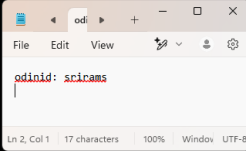
- **How many hours per week does a student work in PCEP?**


```
https://www.pdx.edu/computer-science/contact
llm>> How many hours per week does a student work in PCEP?
Students in the PCEP program work 20 hours per week.

For more information, please visit the following URLs:

* https://www.pdx.edu/computer-science/mecop-internship-0
* https://www.pdx.edu/computer-science/pcep-internship
* https://www.pdx.edu/computer-science/contact

llm>>
```

- **How long is the capstone?**


```
llm>> How many hours per week does a student work in PCEP?
Students in the PCEP program work 20 hours per week.

For more information, please visit the following URLs:

* https://www.pdx.edu/computer-science/mecop-internship-0
* https://www.pdx.edu/computer-science/pcep-internship
* https://www.pdx.edu/computer-science/contact

llm>> How long is the capstone?
The capstone project is a six-month software development project that takes place over two quarters (Fall, Winter, Spring, or Summer).

For more information, please visit the following URLs:

* [https://sites.google.com/pdx.edu/bruceirvin/capstone](https://sites.google.com/pdx.edu/bruceirvin/capstone)
* [https://sites.google.com/pdx.edu/bruceirvin/capstone](https://sites.google.com/pdx.edu/bruceirvin/capstone)
* [https://www.pdx.edu/computer-science/bachelors-program-computer-science-capstone](https://www.pdx.edu/computer-science/bachelors-program-computer-science-capstone)

llm>>
```

10.1.9 LLM agents

10.1.10 Open API agent

10.1.11 -

Take a screenshot showing the results of execution

- **What is the current xkcd?**

- **What is the image link of the current xkcd?**

```
> Entering new AgentExecutor chain...
Plan: 1. GET /info.0.json

Thought: I need to fetch the current comic's information using the '/info.0.json' endpoint.  I'll use 'requests_get' for this.

Action: requests_get

Action Input:
```json
{
  "url": "http://xkcd.com/info.0.json",
  "params": {},
  "output_instructions": "Extract the 'num', 'title', 'img', 'alt', 'safe_title' fields. Return them as a dictionary."
}
```

Observation: ```json
{
  "num": 3021,
  "title": "Seismologists",
  "img": "https://imgs.xkcd.com/comics/seismologists.png",
  "alt": "And even when they're not distracted, they usually get kicked out for illegal under-the-net 'subduction spikes'.",
  "safe_title": "Seismologists"
}
```
Thought:Thought: I have successfully retrieved the comic information. I am finished.

Final Answer: {
  "comic_number": 3021,
  "title": "Seismologists",
  "image_url": "https://imgs.xkcd.com/comics/seismologists.png",
  "alt_text": "And even when they're not distracted, they usually get kicked out for illegal under-the-net 'subduction spikes'.",
  "safe_title": "Seismologists"
}

> Finished chain.

Observation: {
  "comic_number": 3021,
  "title": "Seismologists",
  "image_url": "https://imgs.xkcd.com/comics/seismologists.png",
  "alt_text": "And even when they're not distracted, they usually get kicked out for illegal under-the-net 'subduction spikes'.",
  "safe_title": "Seismologists"
}
Thought:I am finished executing a plan and have the information the user asked for.
Final Answer: The image link of the current xkcd comic is: https://imgs.xkcd.com/comics/seismologists.png

> Finished chain.
{'input': 'What is the image link of the current xkcd?', 'output': 'The image link of the current xkcd comic is: https://imgs.xkcd.com/comics/seismologists.png'}
llm>>
```

- **What was xkcd 327 about?**


```
Observation: ```json
{
  "title": "Exploits of a Mom",
  "safe_title": "Exploits of a Mom",
  "img": "https://imgs.xkcd.com/comics/exploits_of_a_mom.png",
  "alt": "Her daughter is named Help I'm trapped in a driver's license factory.",
  "transcript": "[[A woman is talking on the phone, holding a cup]]\nPhone: Hi, this is your son's school. We're having some computer trouble.\nMom: Oh dear\u00e2\u0080\u0094did he break something?\nPho
: In a way\u00e2\u0080\u0094\nPhone: Did you really name your son \"Robert'); DROP TABLE Students;--\" ?\nMom: Oh, yes. Little Bobby Tables, we call him.\nPhone: Well, we've lost this year's student rec
ds. I hope you're happy.\nMom: And I hope you've learned to sanitize your database inputs.\n{{title-text: Her daughter is named Help I'm trapped in a driver's license factory.}}",
}
```
Thought:Thought: I have successfully fetched the comic information. I am finished.

Final Answer: {
  "title": "Exploits of a Mom",
  "safe_title": "Exploits of a Mom",
  "img": "https://imgs.xkcd.com/comics/exploits_of_a_mom.png",
  "alt": "Her daughter is named Help I'm trapped in a driver's license factory.",
  "transcript": "[[A woman is talking on the phone, holding a cup]]\nPhone: Hi, this is your son's school. We're having some computer trouble.\nMom: O
: In a way\u00e2\u0080\u0094\nPhone: Did you really name your son \"Robert'); DROP TABLE Students;--\" ?\nMom: Oh, yes. Little Bobby Tables, we call him.\nPhone: Well, we've lost this year's student rec
ds. I hope you're happy.\nMom: And I hope you've learned to sanitize your database inputs.\n{{title-text: Her d
}

> Finished chain.

Observation: {
  "title": "Exploits of a Mom",
  "safe_title": "Exploits of a Mom",
  "img": "https://imgs.xkcd.com/comics/exploits_of_a_mom.png",
  "alt": "Her daughter is named Help I'm trapped in a driver's license factory.",
  "transcript": "[[A woman is talking on the phone, holding a cup]]\nPhone: Hi, this is your son's school. We're having some computer trouble.\nMom: Oh dear\u00e2\u0080\u0094did he break something?\nPho
: In a way\u00e2\u0080\u0094\nPhone: Did you really name your son \"Robert'); DROP TABLE Students;--\" ?\nMom: Oh, yes. Little Bobby Tables, we call him.\nPhone: Well, we've lost this year's student rec
ds. I hope you're happy.\nMom: And I hope you've learned to sanitize your database inputs.\n{{title-text: Her daughter is named Help I'm trapped in a driver's license factory.}}",
}
Thought:I am finished executing a plan and have the information the user asked for.
Final Answer: xkcd 327 was titled "Exploits of a Mom". The comic is about a mother whose son's name is a SQL injection attack that wipes out the school's student records. The title text says, "Her dau
ter is named Help I'm trapped in a driver's license factory."

> Finished chain.
{'input': 'What was xkcd 327 about?', 'output': 'xkcd 327 was titled "Exploits of a Mom". The comic is about a mother whose son\'s name is a SQL injection attack that wipes out the school\'s student re
rds. The title text says, "Her daughter is named Help I\'m trapped in a driver\'s license factory."'}
lim>>
```

10.2g: CDN

10.2.1 Part 1: Networks and VMs

10.2.2 Deployment specification

10.2.3 Network deployment specification

10.2.4 Subnetwork deployment specification

10.2.5 Virtual machine deployment specification

10.2.6 Deployment

- **Take a screenshot of the output to include in your lab notebook. How many networks, subnetworks, and VM instances have been created?**

```
NAME: us-west-s1
TYPE: compute.v1.subnetwork
STATE: COMPLETED
ERRORS: []
INTENT:
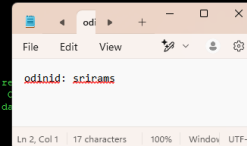
NAME: us-west-s2
TYPE: compute.v1.subnetwork
STATE: COMPLETED
ERRORS: []
INTENT:

NAME: w1-vm
TYPE: compute.v1.instance
STATE: COMPLETED
ERRORS: []
INTENT:

NAME: w2-vm
TYPE: compute.v1.instance
STATE: COMPLETED
ERRORS: []
INTENT:
srirams@cloudshell:~/networking101 (cloud-nurani-srirams)$
```

5-subnetworks 1-network 5-instances

- **Visit the web console for VPC network and show the network and the subnetworks that have been created. Validate that it has created the infrastructure in the initial figure. Note the lack of firewall rules that have been created.**

- **Visit the web console for Compute Engine and show all VMs that have been created, their internal IP addresses and the subnetworks they have been instantiated on. Validate that it has created the infrastructure shown in the initial figure.**

- **Click on the ssh button for one of the VMs and attempt to connect. Did it succeed?**

No it did not connect. ERROR: (gcloud.compute.ssh) [/usr/bin/ssh] exited with return code [255]

10.2.7 Firewall deployment specification

10.2.8 Update deployment

- **Take a screenshot that indicates the new rules have been deployed**

10.2.9 Latency measurements

- **Given this, fill in the table with the measured latencies between the 6 pairs and include it in your lab notebook. Use the shortest latency measured for each pair.**

Location pair	Ideal latency	Measured latency
us-west1 us-east5	~45 ms	49.5 ms
us-west1 europe-west1	~93 ms	133 ms
us-west1 asia-east1	~114 ms	118.3 ms
us-east5 europe-west1	~76 ms	87.4 ms
us-east5 asia-east1	~141 ms	166.4 ms
europe-west1 asia-east1	~110 ms	251.5 ms

10.2.10 Part 2: Scaling via Instance Groups and Load Balancing

10.2.11 Firewall rule for HTTP

10.2.12 Instance templates

10.2.13 Health check

10.2.14 Managed Instance Group (europe-west1-mig)

10.2.15 Managed Instance Group (us-east5-mig)

10.2.16 Test groups

- **Are the instances in the same availability zone or in different ones?**

  They are all in different zones

- **List all availability zones that your servers show up in for your lab notebook.**

cloud-Nurani-srirams

VM instances

VM

Search

VM instances   CREATE INSTANCE   IMPORT VM   REFRESH   LEARN

INSTANCES   OBSERVABILITY   INSTANCE SCHEDULES

ⓘ Your project's VMs use global DNS names by default. To reduce the risk of cross-regional outages, we recommend you use zonal DNS instead. Learn more   USE ZONAL DNS   DISMISS

VM instances

Filter   Enter property name or value

Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Labels	Connect
✓	asia1-vm	asia-east1-b			10.40.0.2 (nic0)	34.81.133.192 (nic0)	goog-dm : networking101	SSH ▾
○	course-vm	us-west1-b			10.138.0.2 (nic0)			SSH ▾
✓	e1-vm	us-east5-a			10.20.0.2 (nic0)	34.162.18.57 (nic0)	goog-dm : networking101	SSH ▾
✓	au1-vm	europe-west1-d			10.30.0.2 (nic0)	34.38.223.36 (nic0)	goog-dm : networking101	SSH ▾
✓	europe-west1-mig-988c	europe-west1-c		europe-west1-mig	10.30.0.3 (nic0)	35.195.178.173 (nic0)	goog-dm : networking101	SSH ▾
✓	europe-west1-mig-n633	europe-west1-d		europe-west1-mig	10.30.0.5 (nic0)	35.241.177.43 (nic0)		SSH ▾
✓	europe-west1-mig-vp6z	europe-west1-b		europe-west1-mig	10.30.0.4 (nic0)	34.38.251.35 (nic0)		SSH ▾
✓	us-east5-mig-rjq9	us-east5-b		us-east5-mig	10.20.0.3 (nic0)	34.162.4.50 (nic0)		SSH ▾
✓	w1-vm	us-west1-b			10.10.0.2 (nic0)	34.19.120.250 (nic0)	goog-dm : networking101	SSH ▾
✓	w2-vm	us-west1-b			10.11.0.100 (nic0)	35.199.188.167 (nic0)	goog-dm : networking101	SSH ▾

Related actions   ∧ HIDE

---

odinid: srirams

Ln 2, Col 1   17 characters   100%   Window   UTF-8

⚠ Not secure | 34.162.4.50

Networking 101 Lab

Client IP

Your IP address : 131.252.218.119

Hostname

Server Hostname: us-east5-mig-rjq9

Server Location

Region and Zone: us-east5-b

File   Edit   View

odinid: srirams

Ln 2, Col 1   17 characters   100%   Window   UTF-8

⚠ Not secure | 35.195.178.173

Networking 101 Lab

Client IP
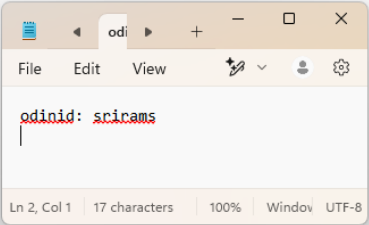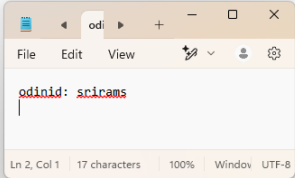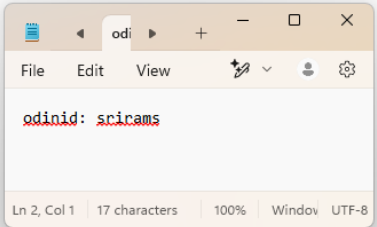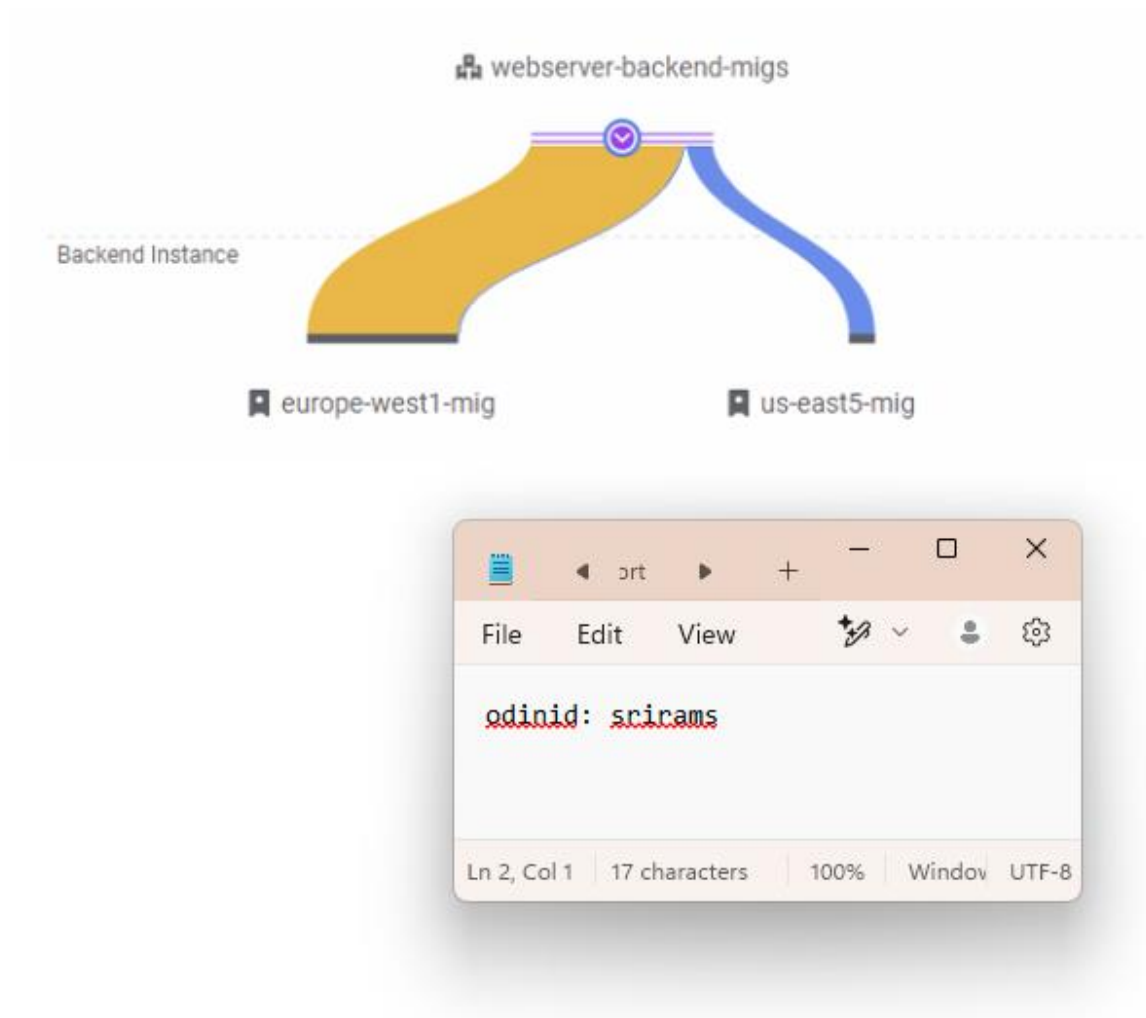
Your IP address : 131.252.218.119

Hostname

Server Hostname: europe-west1-mig-988c

Server Location

Region and Zone: europe-west1-c

File   Edit   View

odinid: srirams

Ln 2, Col 1   17 characters   100%   Window   UTF-8

Networking 101 Lab

Client IP

Your IP address : 131.252.218.119

Hostname

Server Hostname: europe-west1-mig-n633

Server Location

Region and Zone: europe-west1-d

odinid: sricams

Networking 101 Lab

Client IP

Your IP address : 131.252.218.119

Hostname

Server Hostname: europe-west1-mig-vp6z

Server Location

Region and Zone: europe-west1-b

odinid: sricams

us-east5-b, europe-west1-c, europe-west1-d, europe-west1-b

10.2.17 HTTP load balancer

10.2.18 HTTP load balancer

10.2.19 Test load balancer

Show a screenshot of the page that is returned.

Networking 101 Lab

Client IP

Your IP address : 35.191.42.177

Hostname

Server Hostname: us-east5-mig-rjq9

Server Location

Region and Zone: us-east5-b

odinid: sricams

Ln 2, Col 1   17 characters   100%   Window   UTF-8

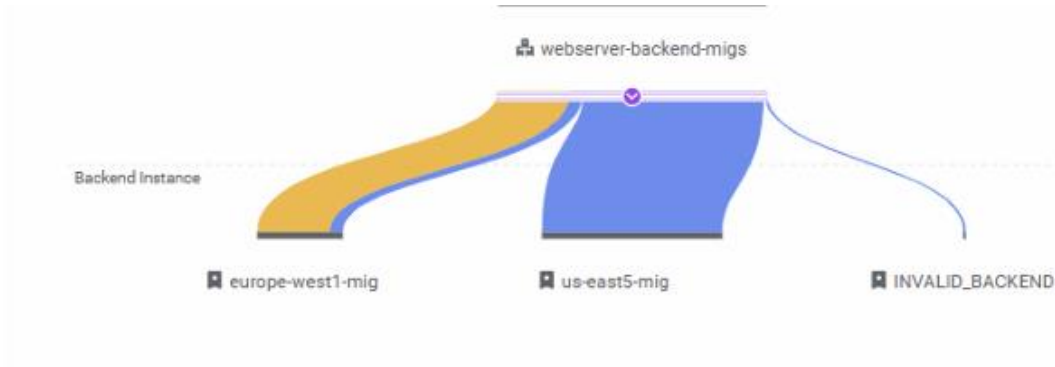- **Which availability zone does the server handling your request reside in?**

  us-east5-b

10.2.20 Siege! (Part 1)

- **Take a screenshot of the initial traffic distribution**

webserver-backend-migs

Backend Instance

europe-west1-mig   us-east5-mig

odinid: scirams

File   Edit   View

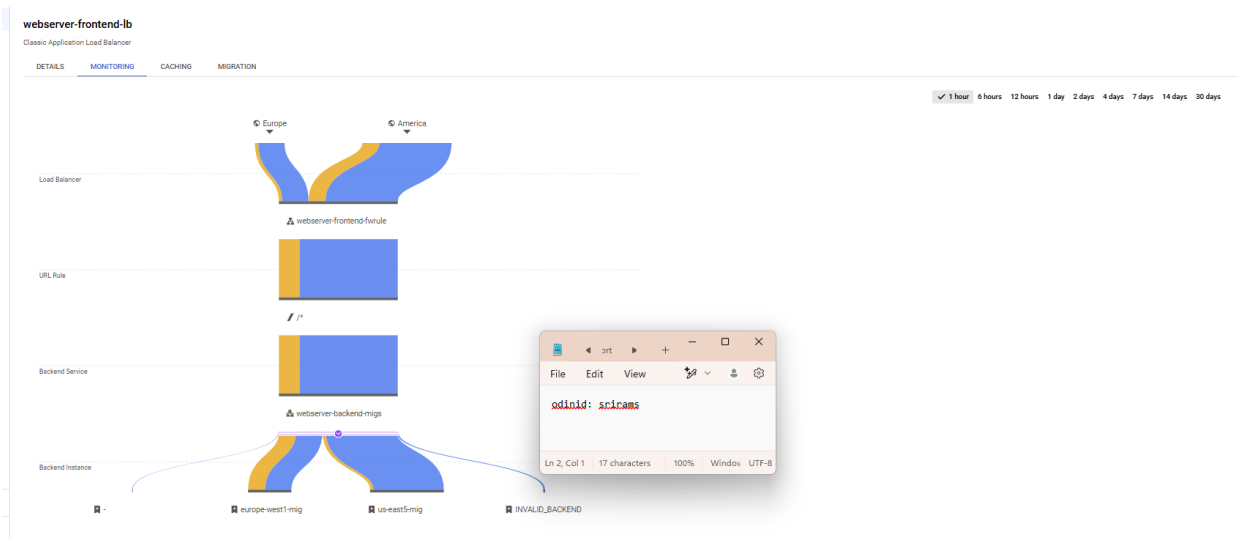Ln 2, Col 1   17 characters   100%   Window UTF-8

- **Take a screenshot of the UI as additional instances are brought up and show that the traffic distribution shifts**

10.2.21 Siege! (Part 2)

- **Show a screenshot of the final traffic distribution.**

10.2.22 Clean-up