Understand

○●○○○

goal: gather, observe, and research available information to find the needs of the user

artifacts: design requirements

generate

1) identify the challenge & users

*think big! what is the **problem**? who is affected by it? what is known/unknown? orient yourself with all of the project's who, what, why, when, & how.*

What is known about cyber analysts?

what are known design guidelines to follow?

2) find questions & tasks

*what can you **ask** about the challenge? what do users want to do with data? think high and low level. revisit this worksheet to break these down further.*

tasks:
- access data
- analyze trends
- annotate
- generate reports/share
- correlation & triage

! ! box #3 may help you revisit this box later

3) check with users or explore data

users: what did you find out? what sparked curiosity? data: characterize aspects of the data. what is it like?

see attached
↳ @ symbol means it is attached!

categorized several papers who extensively studied users

! ! get the real data and talk to real users if possible!

4) brainstorm design requirements

what are recurring trends? what are key design opportunities? are there constraints worth listing?

- data scalability
- interoperability
- provenance
- templating/reporting
  (+ more ... see @)

evaluate

5) compare and rank design requirements

choose a method for comparison: pros/cons table, rank based on your findings/user needs/tasks, cross out the list based on listed justifications, or pick top 3 to keep and why. explain and review with a group or partner.

1) data storing : must quickly support navigating snapshots of data

2) visualizing dynamics : allow for seeing days or weeks of data

3) show context : every network is unique and tool should adapt as such

U / I

category	sub-category	sub-sub-category	evidence	author	pages notes
data	raw data	temporal	"interpret individual events and sequences of events"	Fink	47.5
design guidelines	management	large displays	"enable multiple, simultaneous investigations and information foraging ... solution space for organizing data"	Fink	45
design guidelines	data scalability		"visualizations ... cannot handle the amount of data" & "slow database access, update, and retrieval causes slow refresh" & "analysts expect the data volume to increase by several orders of magnitude in the future"	Fink	47,47.5
design guidelines	data storing		Visualization designers must consider carefully how much data to store, how long to store it, and how to provide timely access to data that is needed. Perhaps an adaptive strategy that predictively fetches data associated with features like the ones the user has most recently investigated would help.	Fink	47
design guidelines	human factors		"user requirements should apply to the design of CND visualization tools" & "needs of human analysts will remain a critical component"	D'Amico	20
design guidelines	interoperability		ease of input and output from the tool	D'Amico	35
design guidelines	perspective/role		"identifying more effective, abstract concepts to be visualized" & "network manager needs a higher-level (and different) view" & "visualization must understand the various perspectives of the different users"	Erbacher	207,207.5
design guidelines	provenance		management of evidence and analysis	D'Amico	35
design guidelines	report findings		support for report building	D'Amico	35
design guidelines	show alert status	color	"One simple, but effective visual cue observed in the CTA was an alert management system that used color to reflect the status of the alert."	D'Amico	34
design guidelines	show context		"value of ... contextual data immediately available for viewing"	D'Amico	35
design guidelines	templating		"ability to set up templates to handle different situations"	Erbacher	207.5
design guidelines	tools that interoperate		Analysts need tools that interoperate. Their tools (and queries) are highly specialized, and they spend much of their time joining data tables and translating information between tools	Fink	46.5
design guidelines	tutorial		"tutorial on how to get started; not just the user's manual .... certification process so people can become certified"	Erbacher	212
design guidelines	uncertainty visualization		"visualization should have a weight based on the accuracy of info" & "force-directed graphs where trust is the primary spring force"	Erbacher	210,212
design guidelines	visual analytics		"visual analytics capabilities are needed to analyze and interpret the data" & "interaction techniques are needed to focus the environment more on visual analytics techniques"	Erbacher	208

Understand

●○○○

generate

1) identify the challenge & users

think big! what is the **problem**? who is affected by it? what is known/unknown? orient yourself with all of the project's who, what, why, when, & how

challenge: build a cyber security dashboard for communicating data

users: cyber analysts & researchers who study them

2) find questions & tasks

what can you **ask** about the challenge? what do users want to do with data? think high and low level. revisit this worksheet to break these down further.

— what parts of communication are tricky to show?

— what datasets are most important for the process?

!! box #3 may help you revisit this box later

3) check with users or explore data

users: what did you find out? what sparked curiosity? data: characterize aspects of the data. what is it like?

users: reports do not always map back to the data well

data: reports are one data source IDS alerts are another both have location

!! get the real data and talk to real users if possible

4) brainstorm design requirements

what are recurring trends? what are key design **opportunities?** are there **constraints** worth listing?

— understandable visualizations
— scalable vis
— multiple datasets
— link data sets
— simplify aspects of data

evaluate

5) compare and rank design requirements

choose a method for comparison: **pros/cons table, rank** based on your findings/user needs/tasks, **cross out** the list based on listed justifications, or **pick top 3** to keep and why. explain and review with a group or partner.

— simplify aspects: we just can't show everything cleanly

— understandable: users should know what is shown with little training needed

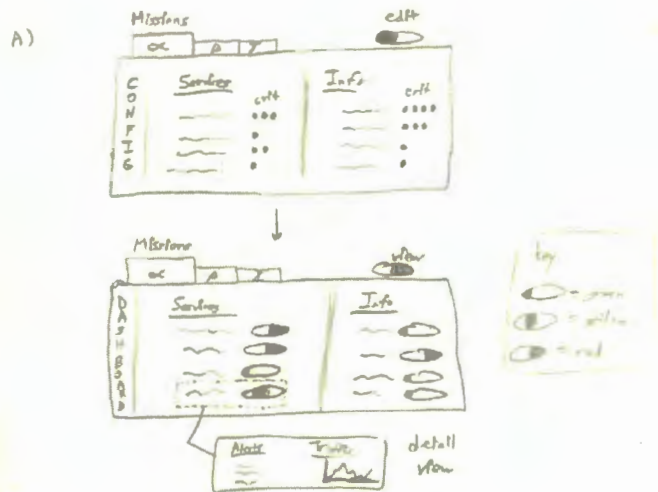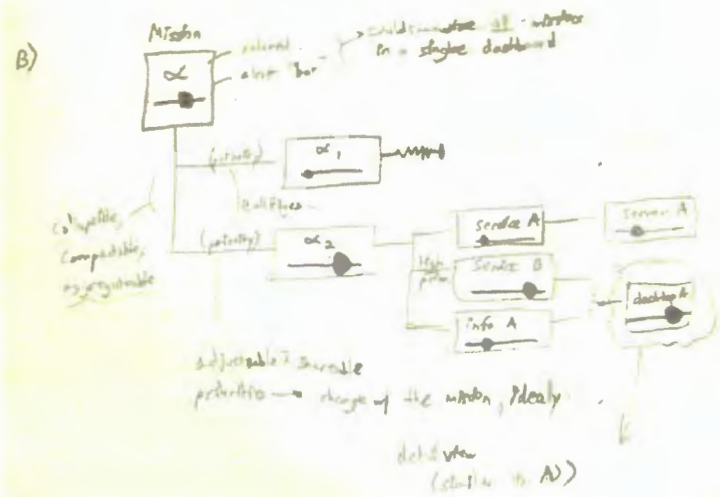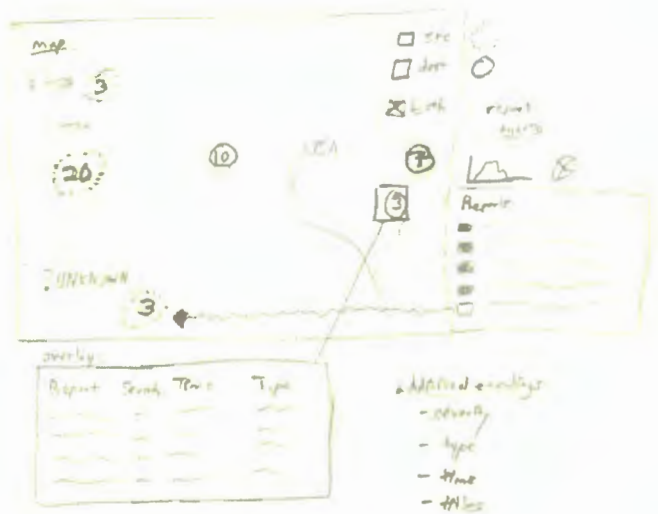— link data sets: to have 1+ datasets, we must ideally link them together!

U / I

Ideate

○ ● ○ ○

goal: generate good concepts and ideas for supporting some of the project's design requirements

artifacts: ideas & sketches

generate

1) select a design requirement

how might we address the challenge using the requirement? which questions would a user ask? revisit this worksheet for each important design requirement.

- link datasets through:
  - missions   or
  - maps / location

!! revisit this worksheet for all important design requirements for your project

2) sketch first idea

show how to address this requirement using an informal sketch - focus on the big idea not the details.

@

3) sketch another idea

try another sketch, think of a new perspective, be different, do not build off of your previous sketch.

@

4) sketch a final idea

think of a different abstraction. challenge constraints and assumptions to draw something new or surprising.

@

!! is three enough? not always. have other ideas? fill out another worksheet!

evaluate

5) compare and relate your ideas

for each sketch, break apart what works well (+) and what doesn't (-) in the table below. make connections, reflect on best parts. can you combine ideas? review the table with a partner or group.

sketch #1	sketch #2	sketch #3
+ fast service & mission info @ a glance	+ multiple missions and complexity shown w/ tree	+ simple linking through a map view
		+ understandable
− only one mission visible	− very abstract view	− less space for details on demand
− weak linking	− weak linking	

U / I / M

I-3-2

A)

Missions — edit
CONFIG — Sorting / Info
(edit)

↓

Missions — view
DASHBOARD — Sorting / Info

Alerts / Traffic — detail view

key:
○ = green
◑ = yellow
◐ = red

I-3-3

B)

Mission — optional alert bar → could structure all interfaces in a single dashboard

α

(priority) α₁

(priority) α₂ — High prio — Service A → Server A
Service B
Info A → desktop A

compatible, compatible, aggregatable

adjustable? durable priorities → change of the mission, Ideally

detail view
(similar to A))

I-3-4

map

3

20   10   USA   ⊤

3

UNKNOWN

3

overlay
Report Sev. Time Type

additional encodings
- severity
- type
- time
- titles

Ideate

○ ● ○ ○

generate

1) select a design requirement

how might we address the challenge using the requirement? which questions would a user ask? revisit this worksheet for each important design requirement.

— link datasets through:
- — location (map) or
- — time

!! revisit this worksheet for all important design requirements for your project

2) sketch first idea

show how to address this requirement using an informal sketch - focus on the big idea not the details.

3) sketch another idea

try another sketch, think of a new perspective, be different. do not build off of your previous sketch.

4) sketch a final idea

think of a different abstraction. challenge constraints and assumptions to draw something new or surprising.

!! is three enough? not always. have other ideas? fill out another worksheet?

evaluate

5) compare and relate your ideas

for each sketch, break apart what works well (+) and what doesn't (-) in the table below. make connections. reflect on best parts. can you combine ideas? review the table with a partner or group.

sketch #1	sketch #2	sketch #3
+ show links with map and missions	+ map view compacts to less space for further views	+ time — view is critical for all ideas so far
— view gets cluttered with less countries it can show at once	— less fleshed out idea for details	+ simple but visually effective
		— what do users expect or prefer to see? may not be optimal

!! combining ideas and sketches is not easy. sometimes it may open up new possibilities and ideas - guess what, ideate again!
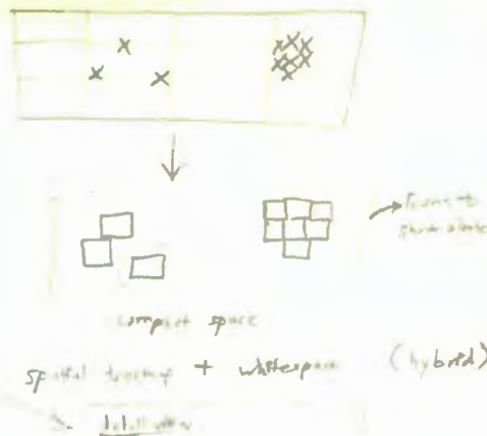
U / I / M

I-4-2

Day / Country Overview

RUSSIA

CHINA

Day/Country Detail

Details
Alerts, reports, etc. for the base

I-4-3

Compact space

Spatial tracking + whitespace (hybrid)

Detail view

I-4-4

Icons

Time

Understand

○●○○○

goal: gather, observe, and research available information to find the needs of the user

artifacts: design requirements

generate

1) identify the challenge & users

*think big! what is the **problem**? who is affected by it? what is known/unknown? orient yourself with all of the project's who, what, why, when, & how.*

what: passing information up a chain of
command for decisions to get made
why: protect computer networks!
who: analysts, managers, directors, executives
when: all the time!
how: briefings, reports, word of mouth

2) find questions & tasks

*what can you **ask** about the challenge? what do users want to do with data? think high and low level. revisit this worksheet to break these down further.*

– what happened on my network last night?
— does this attack matter?

see @ for more!

!! box #3 may help you revisit this box later

3) check with users or explore data

users: what did you find out? what sparked curiosity? data: characterize aspects of the data. what is it like?

different users know different
aspects of the cyber data and
operations of a company.

different focuses of temporal data.
see @!

!! get the real data and talk to real users if possible

4) brainstorm design requirements

*what are recurring trends? what are key design **opportunities**? are there **constraints** worth listing?*

– some knowledge of the cyber data & network
– synthesize certain aspects of the data
– identify who is attacking the network

evaluate

5) compare and rank design requirements

*choose a method for comparison: **pros/cons table**, **rank** based on your findings/user needs/tasks, **cross out** the list based on listed justifications, or **pick top 3** to keep and why. explain and review with a group or partner.*

these, plus a focus on analysts and managers
from the personas to focus the project

U / I

CEO (decision-making)

Goals — **Coordinate personnel and operations**

Knowledge	Operations ●●●●●	Cyber ●○○○○
Cyber SA	Attention ●○○○○	Temporal Window

Key Questions
- How can we maintain ongoing operations?
- What could happen if a critical system is impacted?
- What are the most critical systems at risk of attack?
- What cyber resources will be needed in the future?

Decisions

Director of IT (decision-making)

Goals — **Maintain cyber situational awareness**

Knowledge	Operations ●●●○○	Cyber ●●●○○
Cyber SA	Attention ●●○○○	Temporal Window

Key Questions
- Does this attack matter?
- How serious is the attack?
- What do I do about the attack?
- Are there any negative effects?
- What did the bad guys do/take?
- Is it a good day on the network?
- How is my network different
- from last week?

NOC Manager (information-synthesis)

Goals — **Communicate impact on operations**

Knowledge	Operations ●●○○○	Cyber ●●○○○
Cyber SA	Attention ●●●○○	Temporal Window

Key Questions
- Does this attack matter?
- How serious is the attack?
- What do I do about the attack?
- Are there any negative effects?
- How successful was the attack?
- What did the bad guys do?
- What did the bad guys take?

Information

Cyber Analyst (information-gathering)

Goals — **Identify anomalous network behavior**

Knowledge	Operations ●○○○○	Cyber ●●●●●
Cyber SA	Attention ●●●●○	Temporal Window

Key Questions
- What does my network look like?
- What happened on the network last night? What's different?
- Is something bad happening?
- How was my network attacked?
- Who is attacking my network?
- Does this attack matter?
- What did the bad guys do?

Ideate

○ ● ○ ○

goal: generate good concepts and ideas for supporting some of the project's design requirements

artifacts: ideas & sketches

generate

1) select a design requirement

how **might we** address the challenge using the requirement? which questions would a user ask? revisit this worksheet for each important design requirement.

U-5-4

↳ identify who is attacking the network

‼ revisit this worksheet for all important design requirements for your project

2) sketch first idea

show how to address this requirement using an **informal sketch** - focus on the big idea not the details.

see

I-3-4

3) sketch another idea

try another **sketch**, think of a new perspective, be different, do not build off of your previous sketch.

see @

inspiration sketch
(from other paper)

4) sketch a final idea

think of a different abstraction, challenge constraints and assumptions to **draw** something new or surprising.

see @

(inspiration too)

‼ is three enough? not always. have other ideas? fill out another worksheet!

evaluate

5) compare and relate your ideas

for each sketch, break apart **what works well** (+) and **what doesn't** (-) in the **table** below. make connections. reflect on best parts. can you **combine ideas?** review the table with a partner or group.

sketch #1	sketch #2	sketch #3
+ simple map view − lots of space wasted on the map!	+ space-filling treemap + still spatially oriented − too many colors in this example	+ show movement from original location − vectors distract and are not necessary in a dashboard setting

U / I / M

I-6-2

"Inspiration" sketches

spatial treemap

from: http://openaccess.city.ac.uk/536/1/wood_spatially_2008.pdf

I-6-3
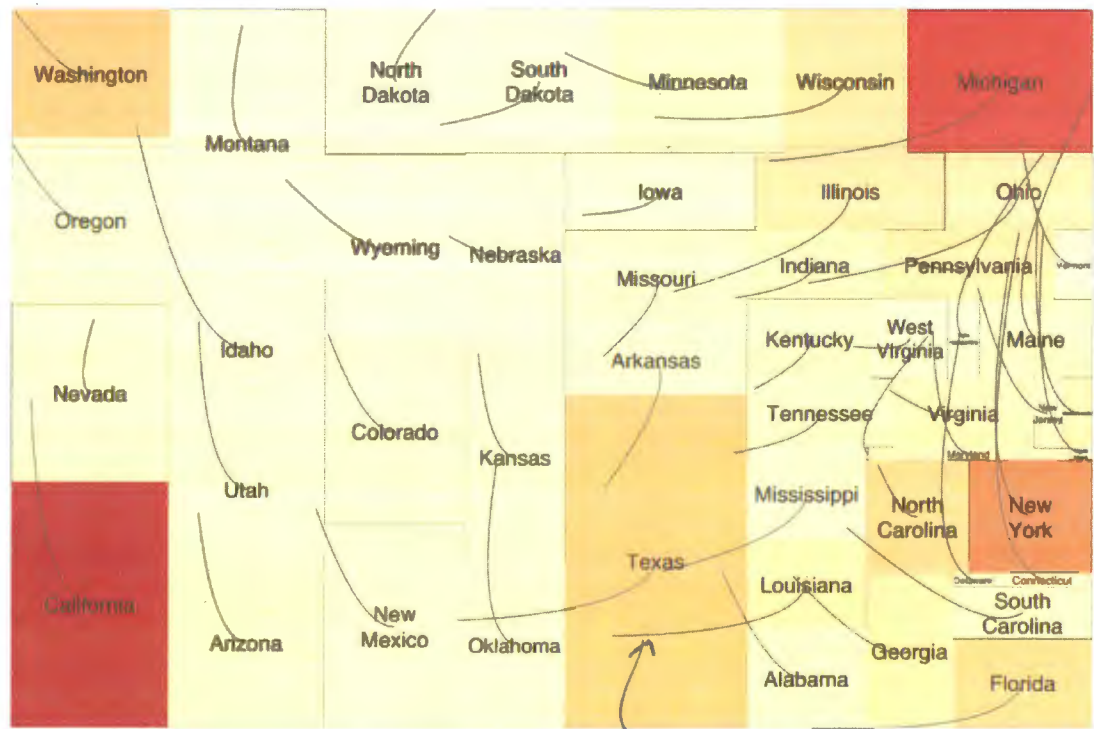
movement vectors

Make

○○●○

goal: concretize ideas into tangible prototypes which are approximations of a product in some aspects

artifacts: prototypes

generate

1) set an achievable goal

*what should the prototype **achieve**? what are the specific criteria for success? break a larger goal into parts with clearer feature sets.*

1 — plan layouts to use in interface

2 — implement spatial treemap

3 — develop a working prototype

!! break a goal apart into multiple and create a worksheet for each sub-goal

2) plan encodings & layouts

*what are good visualization **encodings** or **layouts** for which data? use the ideas you just came up with, and remember to justify for users and their tasks.*

planned a UI wireframe,

see @

3) plan support for interactions

*what can the user do? what is required given the chosen encodings? **justify** your design decisions.*

some interactions in
wireframes, see @

& in prototype → @

4) sketching additional views

what other parts of the data must be seen? brainstorm how to show this data in the tool.

— reports, time, attributes
⤷ shown in prototype

see @

!! if you are thinking up new ideas to visualize, go back to the ideate activity!

evaluate

5) build the prototype and check-in

*are your **goals met** by the prototype? test with users if possible. are design decisions properly justified? do any need to be revisited? were any new constraints or limitations discovered? write down your progress and additional justifications below. review this progress and the prototype with a partner or your group.*

no. failed to meet goal #2.

spatial treemap: tricky to implement
elements got too small quickly
trade-offs with "squarified" algorithm (aspect ratio)
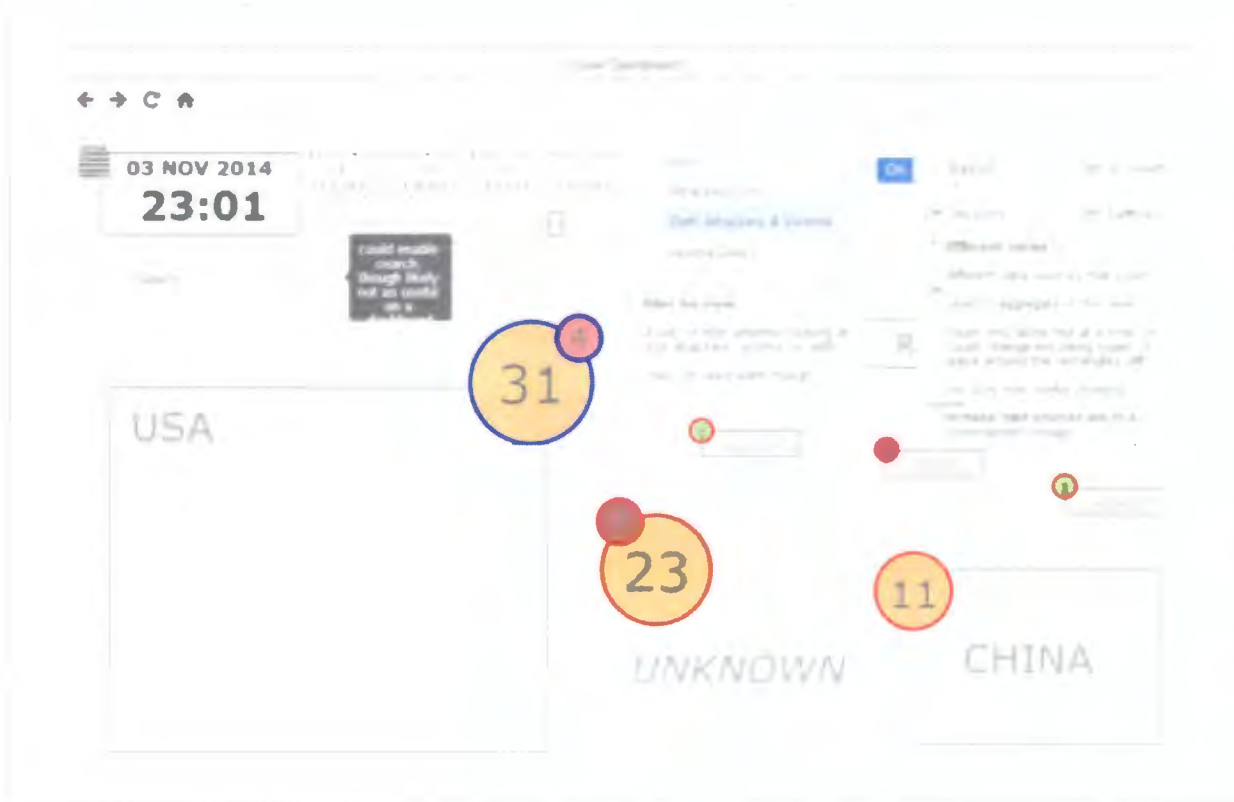⤷ is this really the right layout for all users in a dashboard?
→ need to revisit this!

!! did the prototype meet its goal/s? measure its success. make sure you have addressed the design requirement. does the prototype try to do too much?
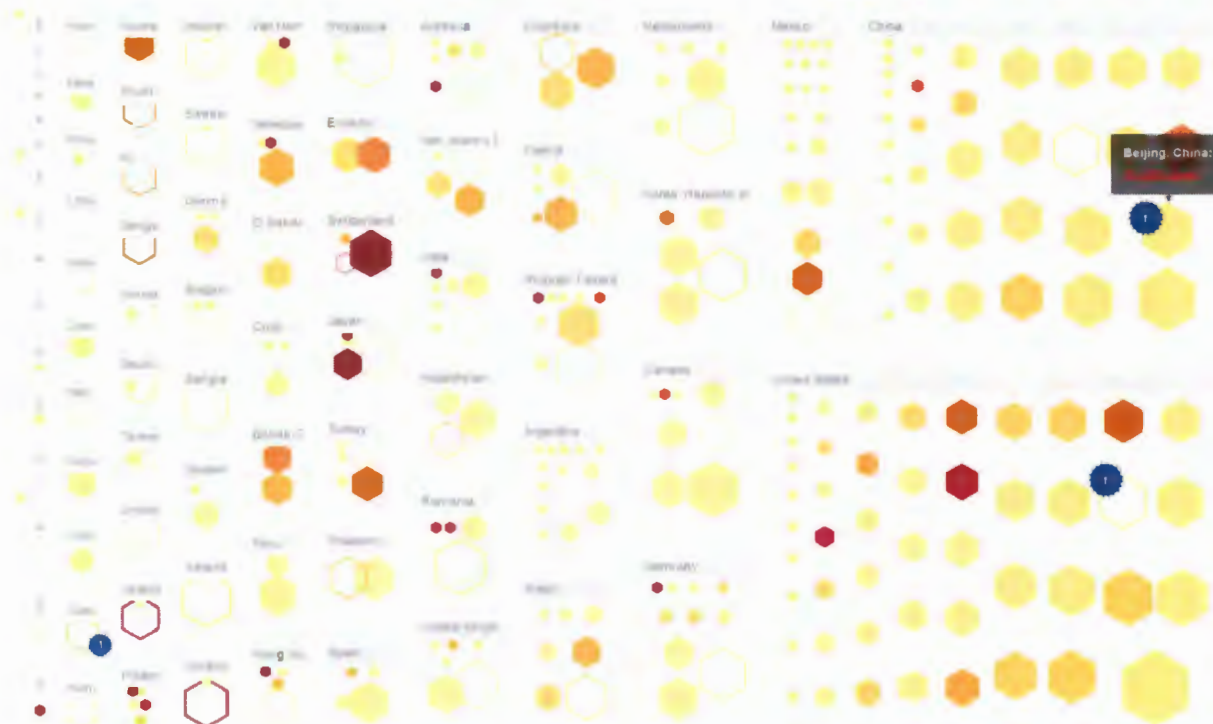
U / I / M / D

03 NOV 2014
23:01

USA

RUSSIA

31

23

11

3

CHINA

UNKNOWN

03 NOV 2014
23:01

USA

31

23

11

UNKNOWN   CHINA

M—7—3/4/5

first prototype

Thursday 3 July 2014

23:58·19 (currently)

Daily Summary

199 908 alerts & 1 report   ↓ 6 1% fewer alerts

Alerts   Emphasize Many Alerts   Emphasize Few Alerts

few alerts   many alerts   unknowns   reports

06-26 06-27 06-28 06-29 06-30 07-01 07-02 07-03
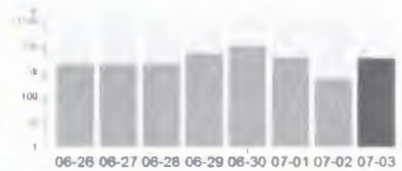
Bar Chart Axes   Log

Priorities of Alerts

High   Medium   Low

Categories of Alerts

Potential   Attempt   Detected   Other

Recent Report   more...

#43 - Beijing China IP addresses are sending to public addresses

Dates June 29, 2014 - ?

Intent network attack   Result: unknown

Methodology

Understand

●○○○

goal: gather, observe, and research available information to find the needs of the user

artifacts: design requirements

generate

1) identify the challenge & users

think big! what is the problem? who is affected by it? what is known/unknown? orient yourself with all of the project's who, what, why, when, & how.

the primary view of the dashboard must be well-justified and explored broadly across many kinds of encodings

2) find questions & tasks

what can you ask about the challenge? what do users want to do with data? think high and low level. revisit this worksheet to break these down further.

- what do analysts & managers want out of a dashboard?

- what is the best first/primary encoding to use?

!! box #3 may help you revisit this box later

3) check with users or explore data

users: what did you find out? what sparked curiosity? data: characterize aspects of the data. what is it like?

interviewed an analyst at Univ. of Utah to better understand these aspects & what are some analyst needs

!! get the real data and talk to real users if possible!

4) brainstorm design requirements

what are recurring trends? what are key design opportunities? are there constraints worth listing?

- temporal views are crucial

- some attributes of the data are "meaningless" (e.g. size)

- interactive, fast, & flexible

evaluate

5) compare and rank design requirements

choose a method for comparison: pros/cons table, rank based on your findings/user needs/tasks, cross out the list based on listed justifications, or pick top 3 to keep and why. explain and review with a group or partner.

(already filtered from an interview transcript)
↳ 2 hrs!

ranking :   1,   → must show time better than M-7-5

3,   → can safely ignore some attributes

2   → must scale to more data gracefully and provide details on interaction

finding patterns is the most important analyst task!

U / I

Ideate

○ ● ○ ○

goal: generate good concepts and ideas for supporting some of the project's design requirements

artifacts: ideas & sketches

generate

1) select a design requirement

how might we address the challenge using the requirement? which questions would a user ask? revisit this worksheet for each important design requirement.

U-2-4

↳ understandable vis

Q: what do analysts know & understand?

↑↑ revisit this worksheet for all important design requirements for your project

2) sketch first idea

show how to address this requirement using an informal sketch - focus on the big idea not the details.

@

3) sketch another idea

try another sketch, think of a new perspective, be different, do not build off of your previous sketch.

@

4) sketch a final idea

think of a different abstraction, challenge constraints and assumptions to draw something new or surprising.

↳ @

+ 17 more Ideas,

all @

↑↑ is three enough? not always. have other ideas? fill out another worksheet!

evaluate

5) compare and relate your ideas

for each sketch, break apart what works well (+) and what doesn't (-) in the table. evaluated with → a real cyber analyst! *parts. can you combine ideas? review the table with a partner or group.*

sketch #1 network graph	sketch #2 map (cartogram)	sketch #3 treemap
+ shows rich connection info	+ understandable	+ hierarchical breakdown of activity of network
− hairball	+ saw patterns right away	− not easily understood
− meaningless to analyst	− distortions are unideal	− elements got too tiny
	− takes up lots of space	− not spatially arranged

↑↑ combining ideas and sketches is not easy, sometimes it may open up new possibilities and ideas - give it a try, don't force it!

U / I / M

1   I
directed network of src-dest IP addresses
internal = red, external = green
1,000,000 flows - 100,000 IP's - 400,000 edges
zooming in on graph & selecting a node below
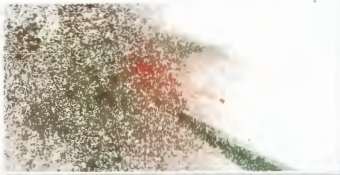
2   I
directed network of src-dest IP addresses
same as before, but new layout
zoomed-in. selecting a group of nodes

3   I
network of src-dest
(not your data)

arranged on circle
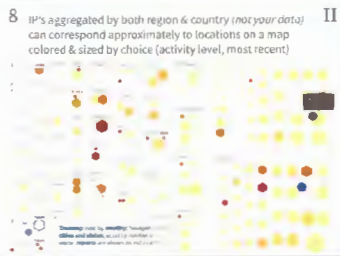bundled by IP groups

would get messy
fast with real data…

I-9-2
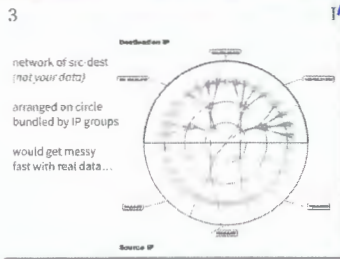
4   II
plotting IP addresses as points on a map
sized by # packets, colored by # bytes

5   II
plotting IP address source & destination as lines on a map
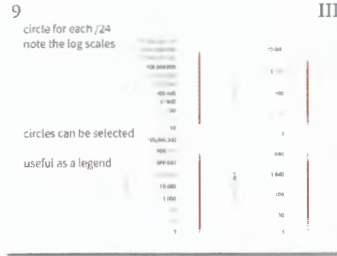centered on Utah; over-plotted for entire dataset…

6   II
IP address,
aggregated by country
(excluding US & Canada,
since too large)

colored by # bytes
and also unique IP's

7   II
bytes
IP address,
aggregated by country

colored & sized by:

unique IP's   unique ports

8   II
IP's aggregated by both region & country (not your data)
can correspond approximately to locations on a map
colored & sized by choice (activity level, most recent)

I-9-3

9   III
circle for each /24
note the log scales

circles can be selected

useful as a legend

10   III
three bar charts
bytes, unique IP's,
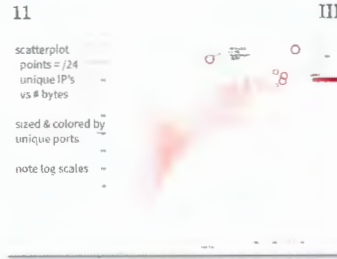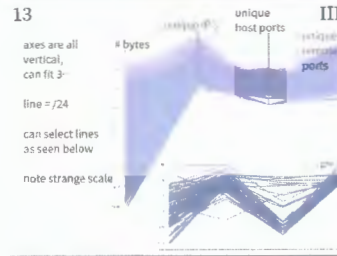and unique ports

each bar is a /8
bars break into /24

colored by # protocols
note the log scales

11   III
scatterplot
points = /24
unique IP's
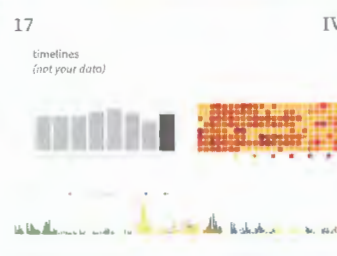vs # bytes

sized & colored by
unique ports

note log scales
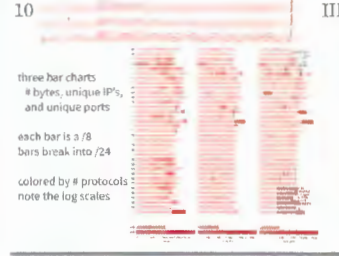
12   III
multiple
scatterplots

points /24
can select, too

13   III
unique host ports
bytes   unique ports
axes are all
vertical,
can fit 3

line = /24

can select lines
as seen below

note strange scale
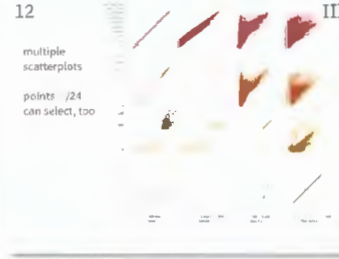
14   III
(not your data)

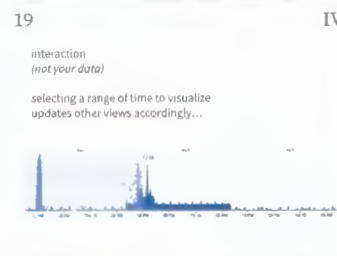3D graph examples

con:
humans are bad with 3D
thus usually avoided

15   III
boxes, broken
from /8 into /24

colored & sized by
unique IP's

internal vs.
external IP's

16   III
circles representing
each /8

colored & sized by
unique IP's

I-9-4

17   IV
timelines
(not your data)
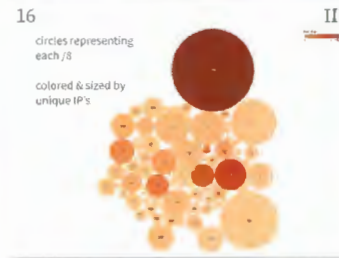
18   IV
animation
(not your data)

imagine little bubbles falling down, aggregating into bars

19   IV
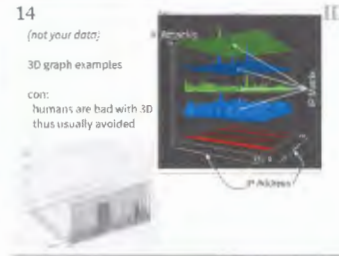interaction
(not your data)

selecting a range of time to visualize
updates other views accordingly…
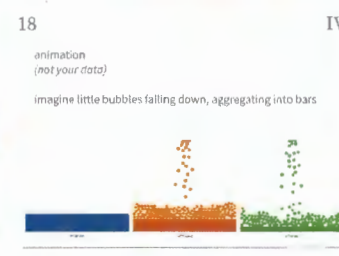
20   IV
aggregation
(not your data)

summarizing regions of time
similar to earlier ideas (aggregated into 5 mins)
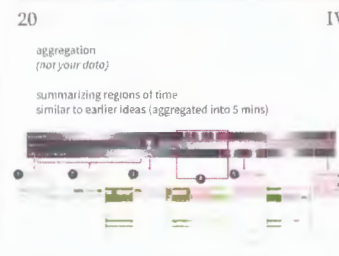
Make

○○●○

goal: concretize ideas into tangible prototypes which are approximations of a product in some aspects

artifacts: prototypes

generate

1) set an achievable goal

what should the prototype **achieve?** what are the specific **criteria for success?** break a larger goal into parts with clearer feature sets.

— better temporal views

— implement cartogram map

— scale prototype to more data

!! break a goal apart into multiple and create a worksheet for each sub-goal

2) plan encodings & layouts

what are good visualization **encodings** or **layouts** for which data? use the ideas you just came up with, and remember to justify for users and their tasks.

— temporal heatmap for hourly patterns → larger

— Dorling cartogram for simple map-based view

3) plan support for interactions

what can the user do? what is required given the chosen encodings? **justify** your design decisions.

— select countries on hover/click
  ↳ update in all views

— select attribute for coloring and sizing map view

4) sketching additional views

what other parts of the data must be seen? brainstorm how to show this data in the tool.

— attribute bullet-like charts

— selection summary

— temporal bullet-like charts

!! If you are thinking up new ideas to visualize, go back to the ideate activity!

evaluate

5) build the prototype and check-in

are your **goals met** by the prototype? test with users if possible. are design decisions properly justified? do any need to be revisited? were any new constraints or limitations discovered? write down your progress and additional justifications below. review this progress and the prototype with a partner or your group.

See @ prototype

evaluated with other researchers and a few analysts

never met goal #3, must work on data process later (D)

also, interactions can be scaled to more elements, differentiate colors across views, no need for dual map/circle encoding, and NEED a new view on alert details or useless to analysts!

!! did the prototype meet its goals? measure its success. make sure you have addressed the design requirement. does the prototype try to do too much?

U | I | M | D

second prototype

cd Cyber Dashboard   ×

← C localhost.d...

Time:

Jun 26 27   30 Jul 01 02 03

00:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00

Thu 3 July '14
00:00 - 23:59

25 5k alerts
↓ 21 7% fewer

Alerts:

Quantity
1 . . . 4 . . . 50+

Priorities
50+
4
1
High Medium Low

Categories
50+
4
500
1
Detected Attempt Potential Other

Norway Sweden
Denmark
Lithuania Latvia
United Kingdom Moldova
Luxemb Ireland
Belgium Austria Slovakia Geolgia
Europe Italy Hungary Armenia
Portugal Bulgaria
Spain Albania
Greece Cyprus Pakistan
Malta
Tunisia Egypt Israel Saudi Arab United Arab India

China:

Bangladesh Hong Ko Taiwan, Provi
Viet Nam
Philippines
Cambo
Brunei Daruss
Singapore Malaysia
Indonesia

Bermuda
Honduras Dominican Rep
Guatem
Costa Rica Bo
El Salvador Panama
Guyana

Côte d'Ivoire

Uganda Kenya
Seychelles

Chile
Uruguay
Argentina

Lesotho

Australia

proxy

Make

○○●○

generate

1) set an achievable goal

what should the prototype **achieve**? what are the specific criteria for success? break a larger goal into parts with clearer feature sets.

— enable analysts and managers to find and communicate patterns in a data

!! break a goal apart into multiple and create a worksheet for each sub-goal

2) plan encodings & layouts

what are good visualization **encodings** or **layouts** for which data? use the ideas you just come up with, and remember to justify for users and their tasks.

−same as M-10-2

— new color scheme for map to show deviation from an average

3) plan support for interactions

what can the user do? what is required given the chosen encodings? justify your design decisions.

— cross-view interactions, see @

4) sketching additional views

what other parts of the data must be seen? brainstorm how to show this data in the tool.

—details alert view, see @

!! if you are thinking up new ideas to visualize, go back to the ideate activity!

5) build the prototype and check-in

are your **goals met** by the prototype? test with users if possible. are design decisions properly justified? do any need to be revisited? were any new constraints or limitations discovered? write down your progress and additional justifications below. review this progress and the prototype with a partner or your group.

see @

evaluated with both analysts and managers

minimal training and found that users could both discover and present patterns using the dashboard → success! ✓

!! does the prototype meet its goal/s? measure its success... move on if you have addressed the design requirement, does the prototype try to do too much?

evaluate

U / I / M / **D**

M - 11 - 3/4

final prototype

bubble-net dashboard

http://localhost:80880

more temporal interactions

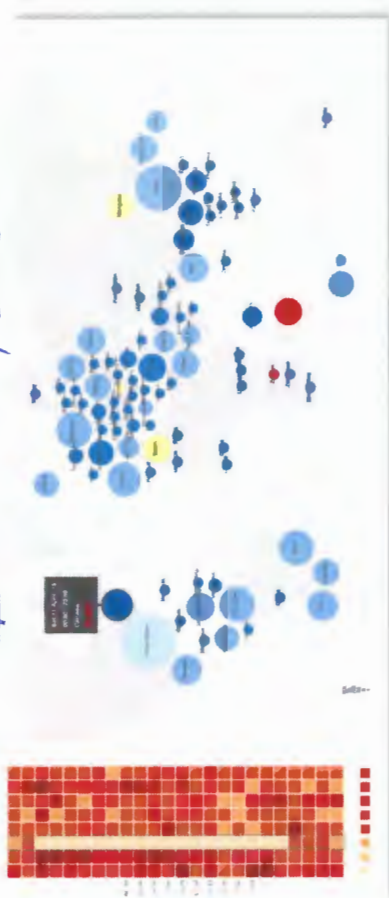used for map's color scheme

→ completed interactions

→ new alert details view

patterns found by users !

M-11-5

Deploy

○○○●

goal: bring a prototype into effective action in order to support real world users' work & goals

artifacts: visualization system

generate

1) pinpoint a target audience

who are you deploying to? what are their goals? what will qualify this deployment as a success?

— analysts & managers at a given organization

— connect to live, updating data daily

!! does this audience match your users back on the Understand sheet? if not, revisit previous sheets!

2) fix usability concerns

can the tool be easier to use? what elements & interactions can be tweaked to avoid frustration?

performed usability study with both users (9 total)

see @ for score results

!! is this a new kind of interaction? should you ideate on the idea here instead?

3) improve points of integration

integrate data/tools. maximize algorithmic or storage efficiency. how does this fit in a user's workflow?

— sped up Python processing script

— compacted data storage

— computed data months back

— simplified auto-creation of dashboard data source

4) refine the aesthetics

is the use of color and typography consistent? what about the layout or use of whitespace? make it look pleasing!

— done throughout the design process,

— made temporal views more prominent after interviews

— improved color choices with user feedback

evaluate

5) consider a method to evaluate your system

take a look at the provided supplement of possible methods. how would you test your system? what would be a successful test of this system? write an evaluation plan here. talk through this plan with a partner or your group. if you have time: test with one or more users, summarize your findings, insights, and recommendations below.

usability study: 9 analysts & managers

walked through visual and interactive bugs (fixed after)

and added views on demand (back to M—11)

very iterative process

deployed to an organization with their live data, updated daily shown to other users

!! did any of the usability, integration, or aesthetic changes result in new ideas or requirements? revisit earlier worksheets as needed!
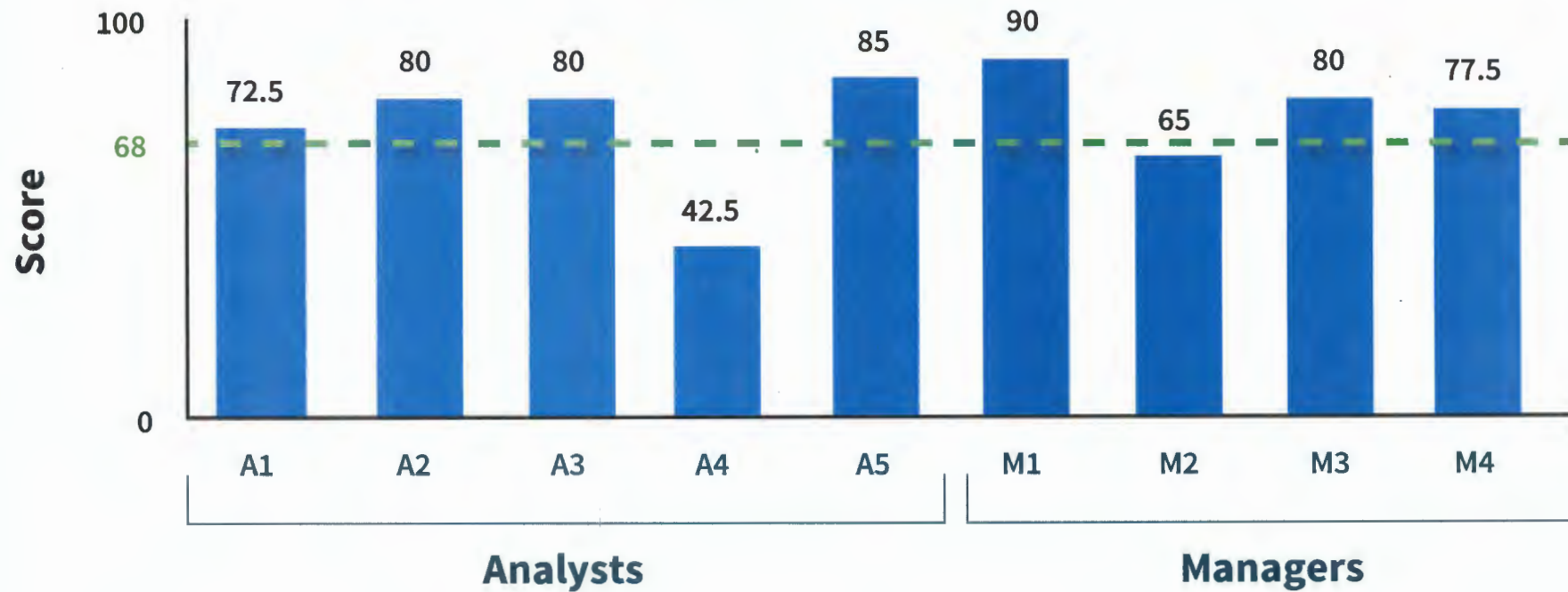
U / I / M / D

BubbleNet's score: **75 / 100**

System Usability Score by User

Deploy

○○○●

goal: bring a prototype into effective action in order to support real world users' work & goals

artifacts: visualization system

generate

1) pinpoint a target audience

who are you deploying to? what are their goals? what will qualify this deployment as a success?

- new organization
- users with less technical skill
- limitations of an existing framework
Success: some ideas implemented in "

!! *does this audience match your users back on the Understand sheet? If not, revisit previous sheets!*

2) fix usability concerns

can the tool be easier to use? what elements & interactions can be tweaked to avoid frustration?

- support swapping multiple "layers" of data

!! *is this a new kind of interaction? should you ideate on the idea here instead?*

3) improve points of integration

integrate data/tools. maximize algorithmic or storage efficiency. how does this fit in a user's workflow?

- new framework sacrifices many interactions
- scale to dozens of datasets
- use color (traffic) standards and map standard icons

4) refine the aesthetics

is the use of color and typography consistent? what about the layout or use of whitespace? make it look pleasing!

- good, simpler map view (gray)
- circle representation for nodes
- multiple linked views, including details on demand

evaluate

5) consider a method to evaluate your system

take a look at the provided supplement of possible methods. how would you test your system? what would be a successful test of this system? write an evaluation plan here. talk through this plan with a partner or your group. if you have time: test with one or more users. summarize your findings, insights, and recommendations below.

└ this system, see @ , was implemented by others after showcasing the dashboard in M-11.

this system sacrifices some aspects of the prototyped system, but it got deployed to hundreds of users and scaled to many more datasets. future evaluation could be done to further improve this design.

U / I / M / D