The history of fire escapes

Tanya Reilly (@whereistanya)
When we first dropped our bags on apartment floors...

*Welcome To New York*
*Taylor Swift*
Content Warning

Fire and deaths caused by fire.
tl;dr

- focus on better buildings, not better fire escapes
- focus on better software, not better incident response
- software needs a fire code
Chinatown
East Village
fire escapes were haphazardly attached to the most elaborately designed facades, with no consideration given to the relationship between the two. The facade was within the realm of architecture and the fire escape in the realm of the law

Richard Plunz, a History of Housing in New York City
A brief history of NYC fires!

(With apologies to actual historians)
Financial District

1835
What happened?

- contingency plans failed
- no failure domains
- exhausted incident responders
Outcome: better incident response

- a bigger, better, non-volunteer fire department
- reliable water: Croton dam and aqueduct
Outcome: better buildings

- they rebuilt in stone
Tenement Fires 1860
What happened?

- bakery in the basement
- no isolation
- obsolete contingency plans
Outcome: better buildings

- An Act to Provide Against Unsafe Buildings in the City of New York
- fire-proof stairs
The Tenement House Act

Tenements must have fire escapes!
What does that mean?
¯\_(ツ)_/¯
Things that are fire escapes

William Houghton, 1891
Things that are fire escapes

Mary McArthur, 1904
Things that are fire escapes

William Bedinger, 1915
Things that are fire escapes

Henry Vieregg
1902
Things that are fire escapes

Anna Gonnelly
1887
Things that are fire escapes

Pasquale Nigro
1909
Things that are fire escapes

BB
Openheimer
1879

R. B. OPPENHEIMER.
Fire-Escape.
No. 221,855.  Patented Nov. 18, 1879.
Things that are fire escapes

Nicholas Borgfeldt
1882
The New Rope Fire-Escape Law for Hotels
The escape plan only works for one of these people -->

LADY HOTEL GUEST.—Slide down a rope in my night-dress, with everybody looking at me? Never! I’ll be cremated first!
The Tenement House Act

Tenements also must have windows!

What does that mean?
¯\_(ツ)_/¯
More Tenement House Acts!
Brooklyn Theater Fire 1876
What happened?

- obsolete contingency plans
- clutter
- clumsy incident response
- delayed response
- locked doors
Outcome: better buildings

- prosecutions
- new laws
- automated response: sprinklers!
Even more Tenement House Acts!

1890-1901

How the Other Half Lives

By Jacob A. Riis
The Newark Factory Fire
What happened?

- No fire alarms
- Locked door
- Not enough fire escapes
- Delayed response, for insurance reasons
- Panic.
Operator error?

NOPE.

"The commissioner of the New Jersey bureau regulating fire safety in factories felt that the building was sufficiently constructed and that the victims merely succumbed to panic."

From "Fire Escapes in Urban America: History and Preservation, by Elizabeth Mary André. (emphasis mine)"
Outcome: ...?

- “They died from misadventure and accident.”
- New York City Fire Chief Croker: "This city may have a fire as deadly as the one in Newark at any time."
- He wasn't wrong.
The Triangle Shirtwaist Factory
1911
What happened?

- no failure domains
- only one fire escape.
- locked doors
- obsolete contingency plans
- and they already knew
Outcome: better incident response

- New fire-fighting equipment
Outcome: better buildings

- 60 new laws in three years
- sprinklers
- professional organisation

"the common outside form of iron ladder-like stairway anchored to the side of the building is a pitiful delusion"
FIREWALL IN ALL BUILDINGS SEEN AS ONLY SAFEGUARD

"Horizontal" Escapes Created in 206 City Structures After Triangle Fire With No Casualties Since

-- New York Times, February 25, 1923
More fires
More very specific laws

1968+ Building Code of the City of New York

Plus Reference Standards and Selected Rules and Regulations of the Department of Buildings

Local Law No. 76 Effective December 6, 1968
Includes Amendments to July 1, 2008
Fire deaths didn't decrease because we built better fire escapes. It was because we built better buildings.
vertical ladders also placed relatively greater stress on their mounts to the building, leading to fire escape collapses during times of intense use – such as during actual fires.

John W. Cramer, The Story of a Tenement House
If we're using a (terrifying) contingency plan, a lot had to go wrong.
we could have prevented the spark!
we could have automatically fixed it!
we could have contained it!
ok I guess we're reacting to a fire :-(
75% of site reliability is not firefighting at least!
Design for failure: prevention

prevent the spark!
solid structures

- choose your stack carefully
- design review
- think about weak points
wiring inspections

- component design review
- code review
- testing
- fault injection
- be paranoid
hiding the matches

- restrict access
- clean interfaces
- sudo not root
operating with care

- plan changes
- canary everything
- feature flags
fire safety campaigns

- best practices
- conferences!
Design for failure: detection

automatically

fix it!
smoke alarms

- early warning.
  But don't burn out your responders!
fire extinguishers

- rollback buttons
sprinklers

- automatic recovery
- automatic response
Design for failure: Isolation

contain it!
fire barriers

- isolation
- sharding
- failure domains
fire drills

- controlled outages
- disaster tests
avoiding encumbrances

- clean ops
- fatigue awareness
Design for failure: response

react with urgency
not locking fire exits :-(

- no encumbrances
- don't comment out the safety system
communication

- status dashboards
- known issues
- announcement email
documented exits

- anticipate what you'll do in a disaster
- playbooks
- gotchas
controlled burns

- practice responding
- wheel of misfortune
- find unexpected dependencies
Reliability can't be added at the end. That's why we do DevOps.
NYC Fire Deaths by Year

- 1970: 310 people
- 2016: 48 people

Data from: http://www.baruch.cuny.edu/nycdata/public_safety/civilianfire.htm
Graph made with gnuplot
444 pages!!!
444 ---> pages!!!
“Millions of computers throughout the world are executing millions of instructions per second for millions of seconds without a single error [...] In spite of this, nobody trusts a computer; and this lack of faith is amply justified.”

Software: A Vital Key to UK Competitiveness (C) Crown Copyright 1986 via Risks Digest (https://catless.ncl.ac.uk/Risks) h/t joe Thompson @caffeinepresent
The UK Advisory Council for Applied Research and Development recommended...

- Before any organization can operate a life-critical computer system it **must first obtain a License To Operate** (LTO)
- **Each life-critical system must be operated by a Certified Software Engineer** who is named as being personally responsible for the system.
Some Post-WWII History

Industries that saw massive WWII-era development

- Commercial Air Travel - Radar, ATC, Jets, Aluminum
- Nuclear Power - Fermi/U. Chicago, Manhattan Project
- EMS - Air Transport, Radio, Combat medics
- Space Flight - Project Paperclip
- Electronics Industry/Silicon Valley - Terman
- Computing/Sysadmin - Bletchley Park/WRNS

slide stolen from @jkuroda's amazing LISA keynote. Used with permission
The stakes are lower?
The stakes are lower?

- (1992) London Ambulance dispatch failure
- (2013) "Character substitution errors may occur"
- (2017) "autocorrects medications to names of different medications [...] without telling the user"
It took an Iroquois Theater fire to improve the safety of theaters. It took a Titanic disaster to improve the safety of vessels. It took a Newark fire and a Triangle fire to bring New York State's fire legislation to its present inefficiency.

Inis Weed, New Outlook volume 104, 1913
Maybe software could improve without a disaster?

Let's choose not to build tenements.
http://noidea.dog/fires

- Escapes in Urban America: History and Preservation, Elizabeth Mary Andre
- No exit: the rise and demise of the outside fire escape: Sara E Wermiel
- How Fire Disaster Shaped the Evolution of the New York City Building Code, Charles Shelhamer
- The Creative and forgotten fire escape designs of the 1800s, Lauren Young
- New Outlook vol 104 (May-August 1913)
- RISKS Digest
- 1910 Newark Factory Fire, Mary Alden Hopkins
- New York City (NYC) Disasters, Baruch College
- Presentation template by SlidesCarnival

Questions, objections?
Find me at @whereistanya or fires@noidea.dog

#GetAlarmedNYC
East Harlem