
ePTRI
EUROPEAN PAEDIATRIC TRANSLATIONAL RESEARCH INFRASTRUCTURE
DISTRIBUTED AI INFRASTRUCTURE
Translating AI Research from the Bench to the Bedside
June 25, 2024
3AM
Hawaii-Aleutian Standard Time


PEDIATRIC MOONSHOT
Reduce healthcare inequity, lower cost and improve outcomes
for children rurally, nationally and globally
by creating and deploying, privacy-preserving, real-time,
trustworthy AI applications
based on access to data from 1,000,000 healthcare machines
in all 500 children's hospitals in the world

Building scalable, accurate, AI applications **requires large** amounts of **diverse*** training data

*ethnic, age, geographic diversity as well as diverse sources of data beyond the EMR

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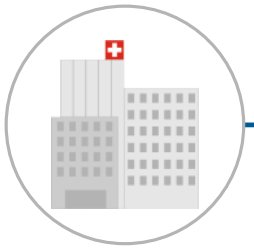
We have all the data we need – **in the buildings**



Real-time Clinical

- Ultrasound
- CT
- MRI
- Xray
- PET
- Microscope
- Blood Analyzer
- ECG/EKG
- EEG
- Bedside Monitor

Real-time Research

- Next-gen sequencers (NGS)
- RNA sequencers
- Sanger sequencers
- Single-molecule sequencer microarrays
- Nuclear magnetic resonance (NMR) spectrometers
- Mass spectrometers
- Multiplex immunofluorescence imaging systems
- Multiplexed ion beam imaging (MIBI) machines
- Spatial proteomics imaging systems
- Spatial genomic machines

PACS

- Syngo
- AGFA
- Muse
- Carestream
- Centricity
- …

EMR

- Epic
- Cerner
- Dedalus
- TrakCare
- …

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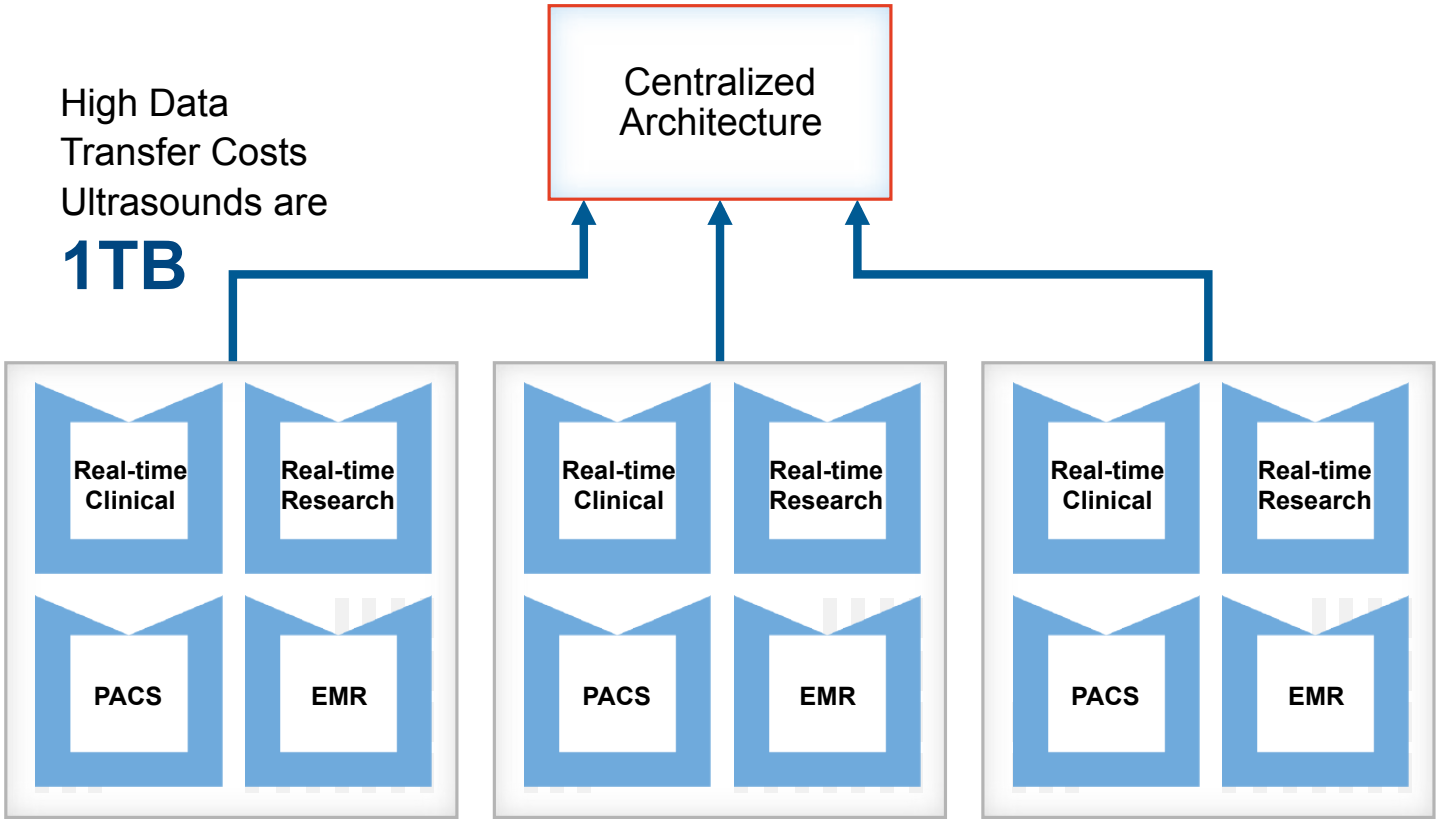
But, yesterday's centralized architectures will NOT work for AI in medicine



In the buildings at
UCSF – San Francisco

In the buildings at
Sick Kids –Toronto

In the buildings at
Lurie's Children's Chicago

- Schemas are rigid – difficult to agree on
- ETL and data cleansing is expensive and difficult
- Privacy Management – not purpose limited
- Creates a larger attack surface
- Not scalable, not global, not extensible

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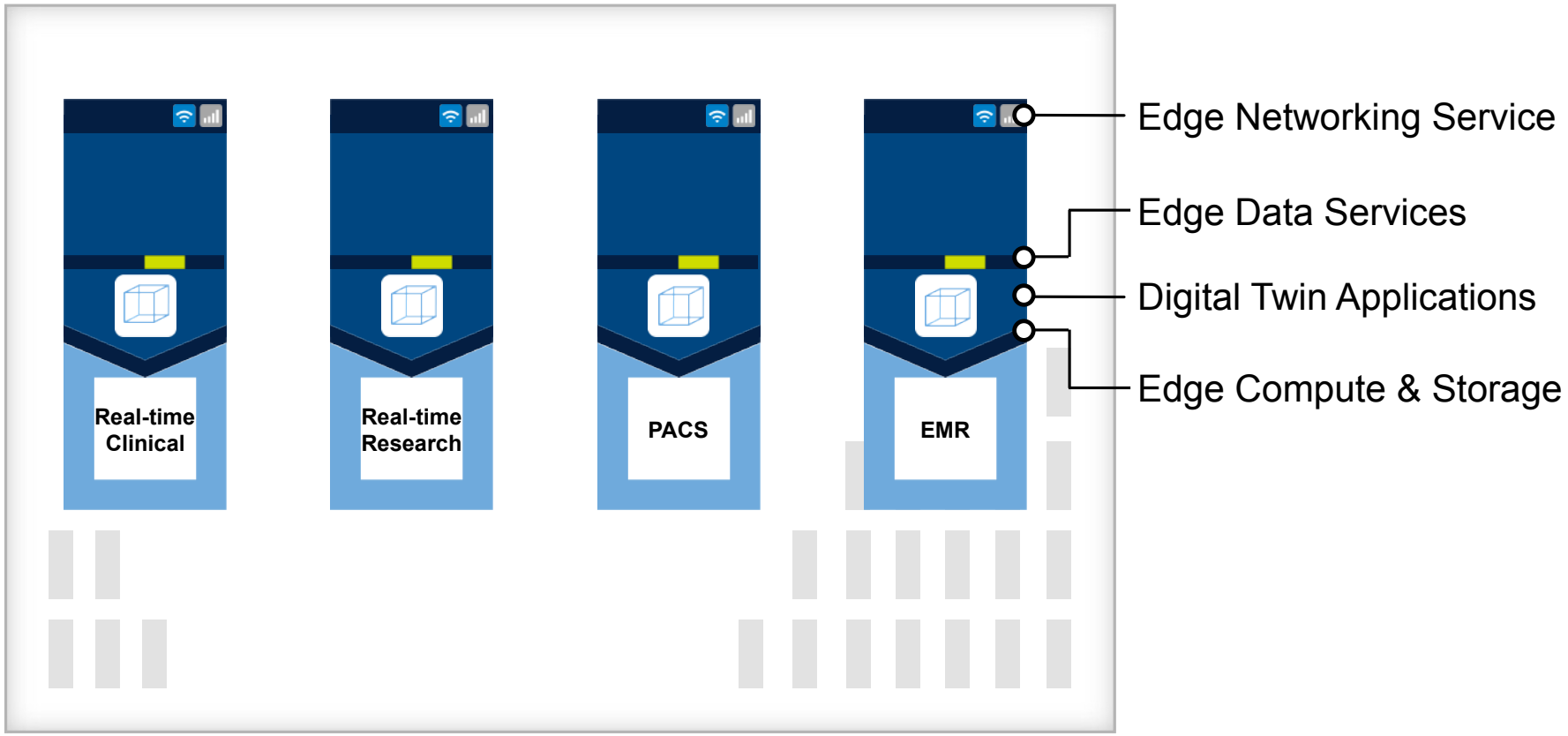
Instead, we have built a decentralized scalable architecture where we can standardize data at the source – in the buildings



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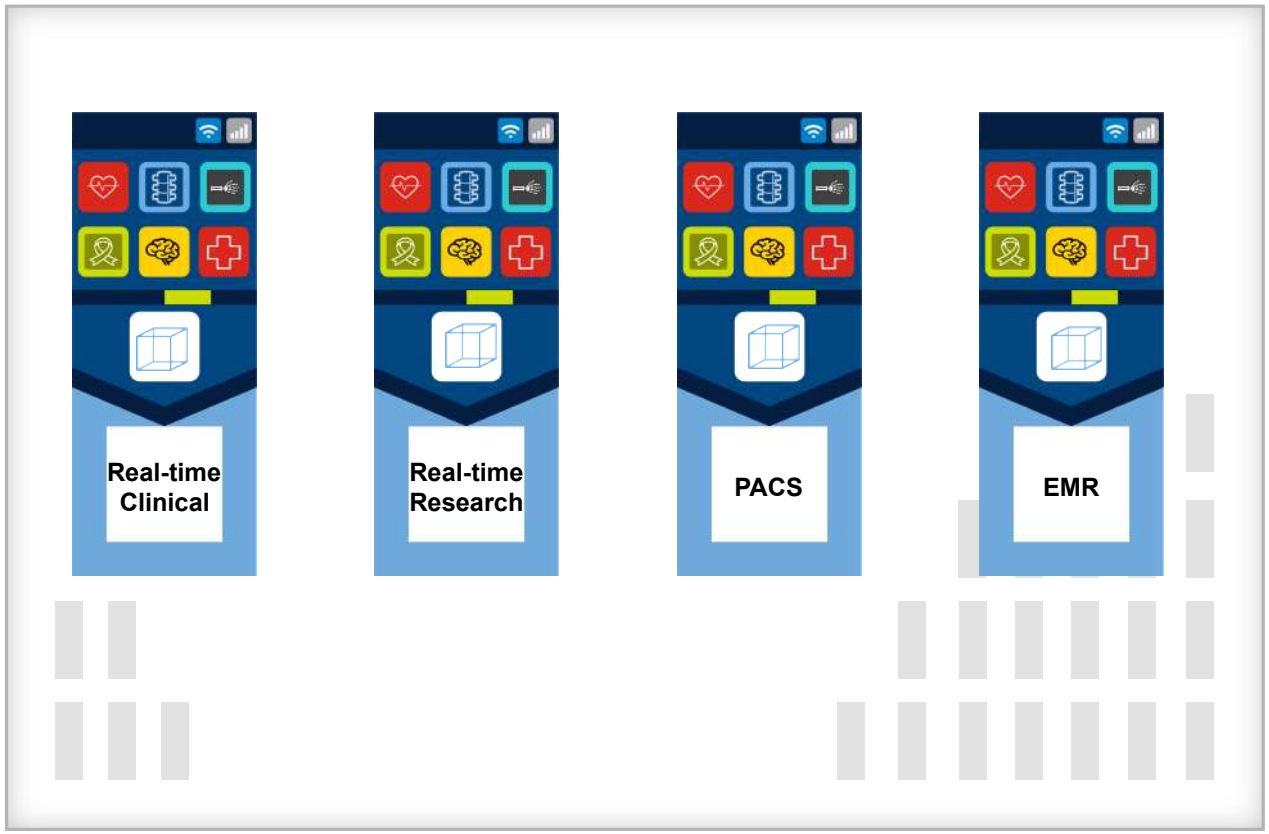
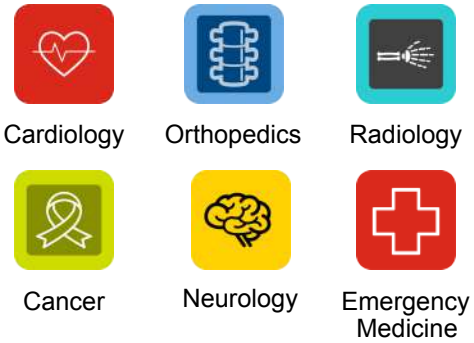
With fine-grained* access control enable authorized applications to share, infer or learn on the data





* A machine or application owner can decide whether to share with an application. The application defines the purpose for the use of the data – a fundamental of privacy management.

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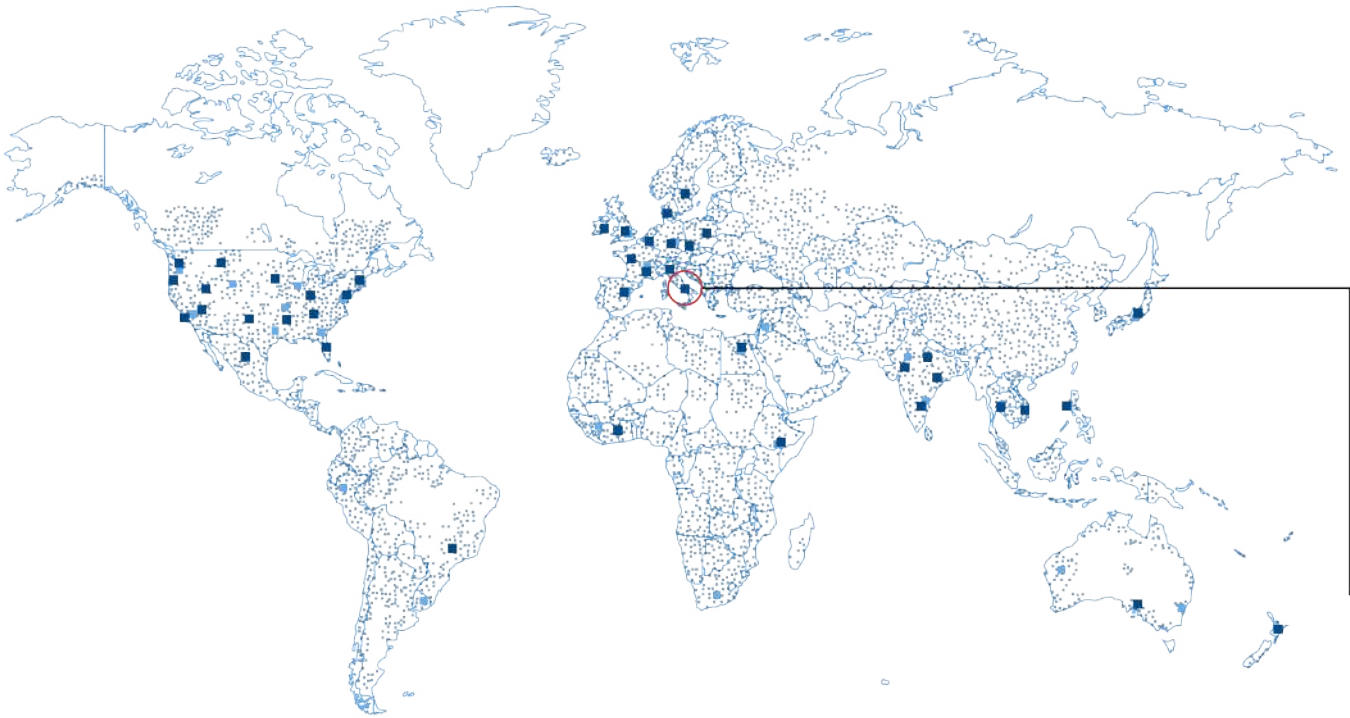
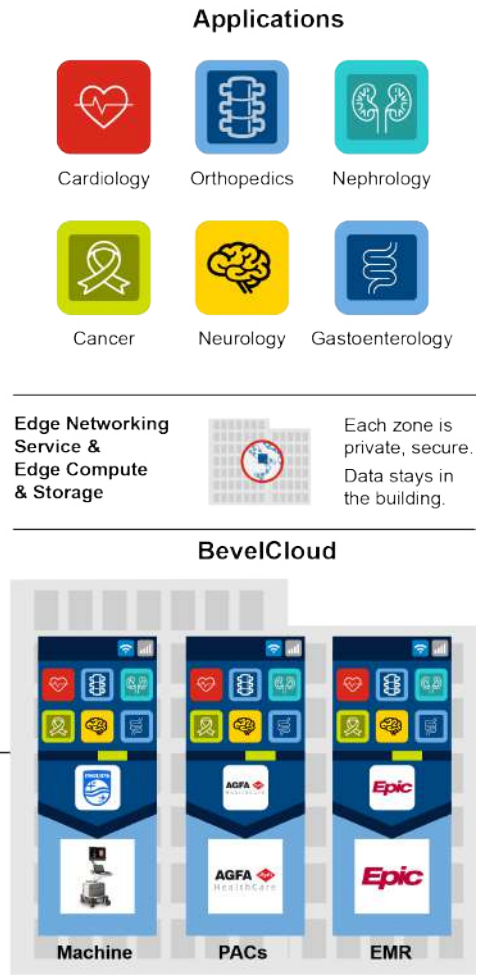
A global distributed AI infrastructure





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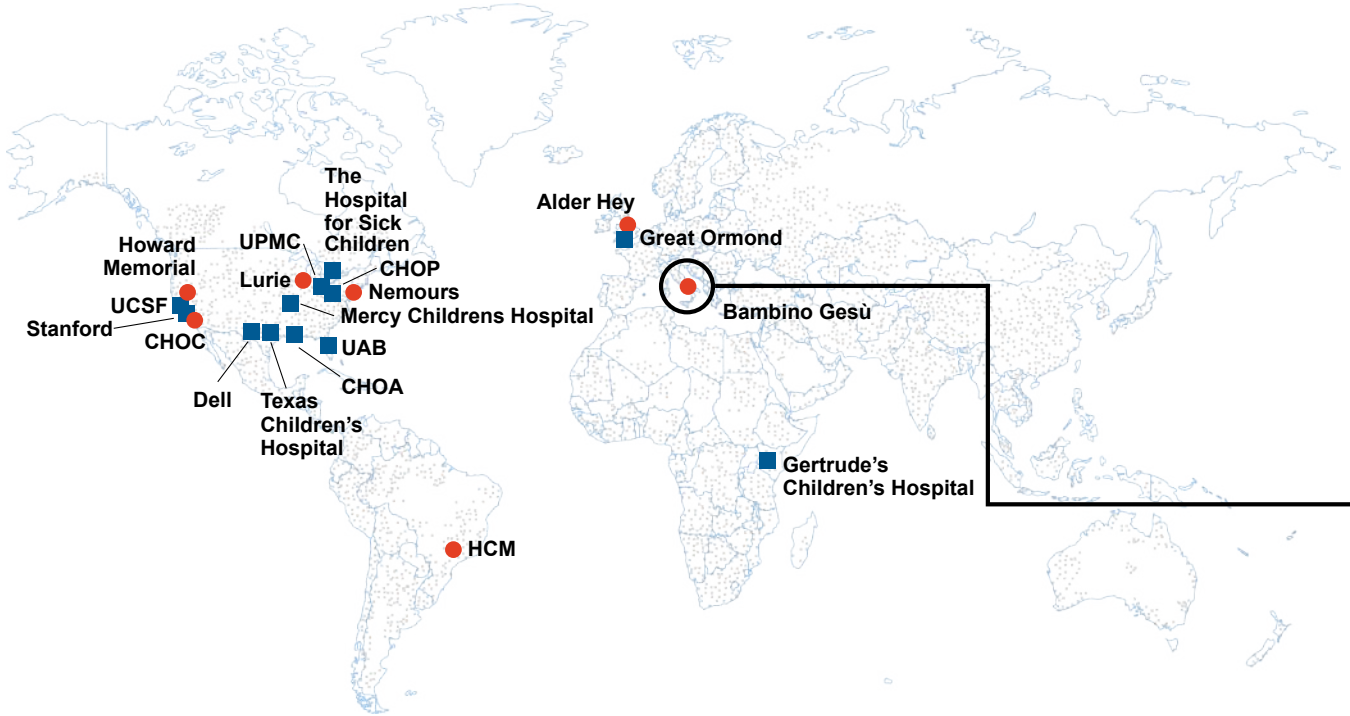
Teleray App: Real-time image sharing application across 6,000 miles https://youtu.be/844RjN-3pPM

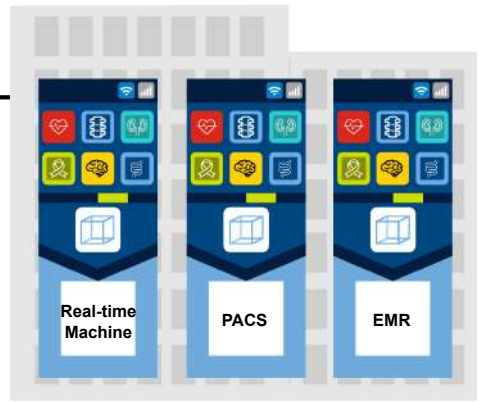
BevelCloud enables building and deploying AI applications like Apple enables building and deploying consumer applications

Distributed AI Lab
32 zones, all imaging machines, 8 applications



Edge Networking Service & Edge Compute & Storage

Each zone is private, secure. Data stays in the building.



- Potential Named Edge Zones
- Deployed Edge Zones
- All Other…

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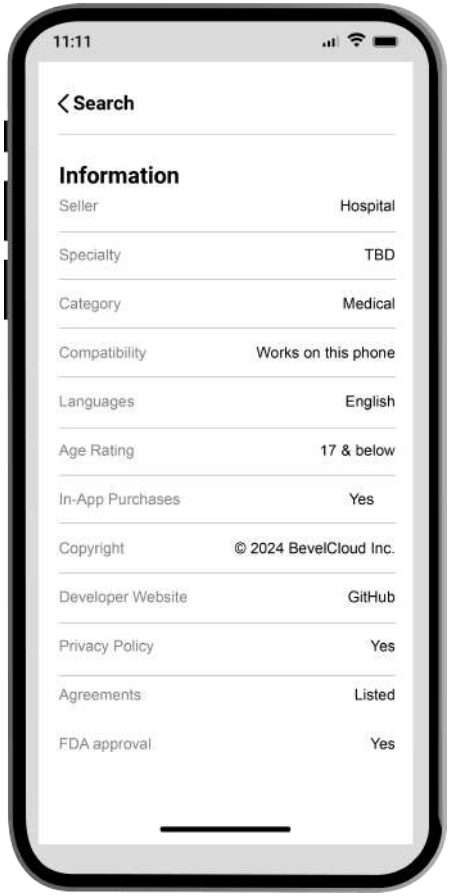
We are creating an App Commons to curate all research and commercial AI (focus first on imaging) applications in medicine



Name:
Description:
Specialty:
Modality:
Training Data:
Pub Author(s):
GitHub:
FDA Approval:

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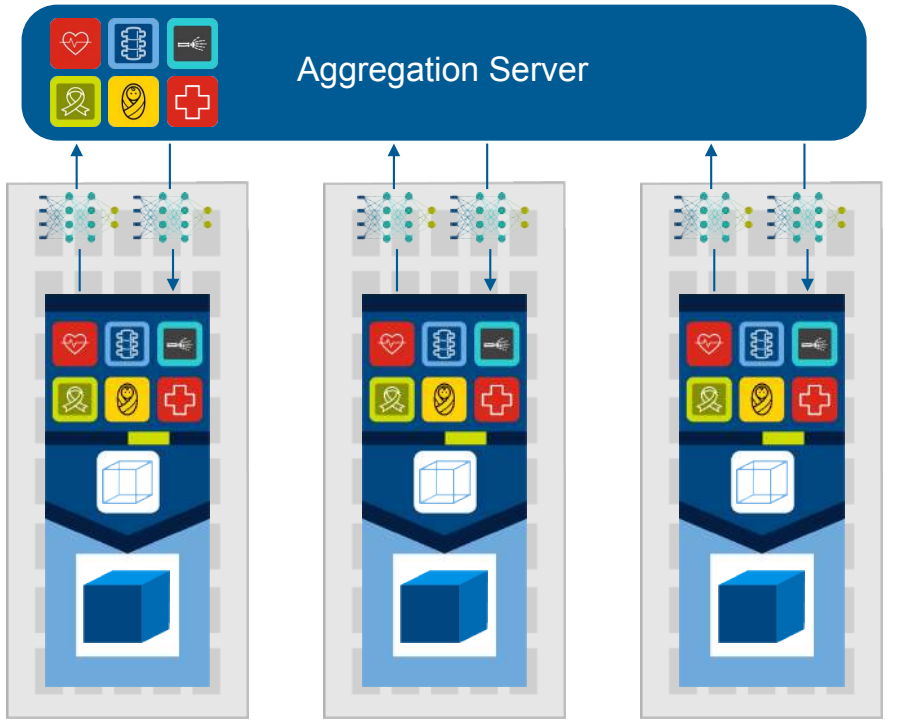
Federated Learning on a distributed AI infrastructure
Network and privacy preserving

AI
Model

Machine or App Data



CHOC
Orange County

GOSH
London

University Hospital
Helsinki

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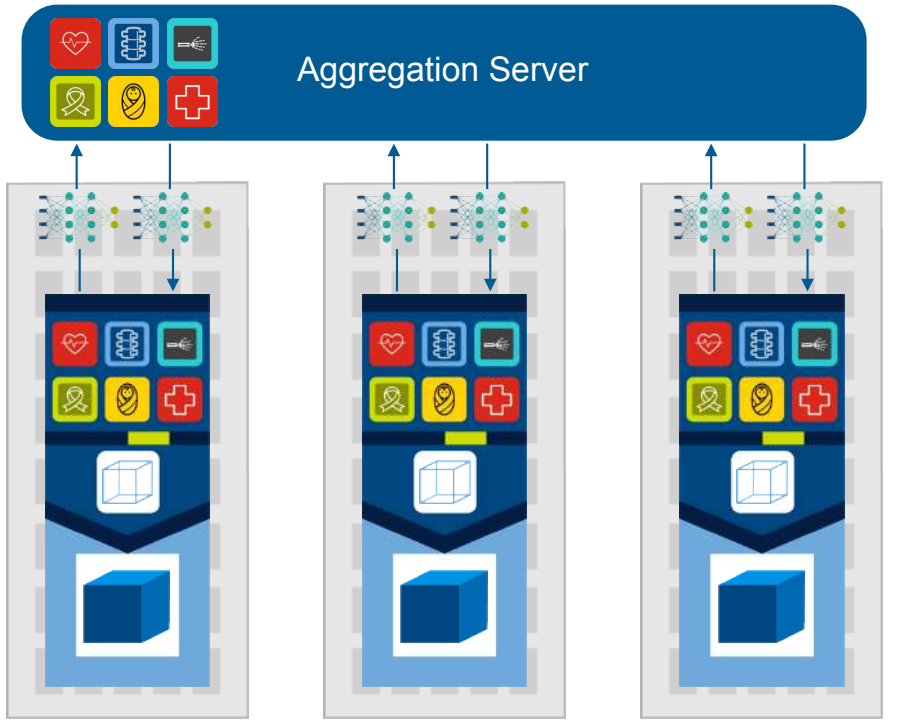
Distributed AI Governance Framework

Commercial/Research Center Cloud App

Commercial/Research Edge Cloud App

Platform (BevelCloud)

Machine/App Owner



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AI Governance Framework

	ToU	BAA	DUA	DPIA	IRB
Commercial (ISV) or Research App					
Platform (BevelCloud)					
Machine/ App Owner					

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Translate AI Research from Bench to Bedside

App v1

Tested Globally
Deployed in all edge zones

Improve Accuracy
with federated learning
App v2,3,4…

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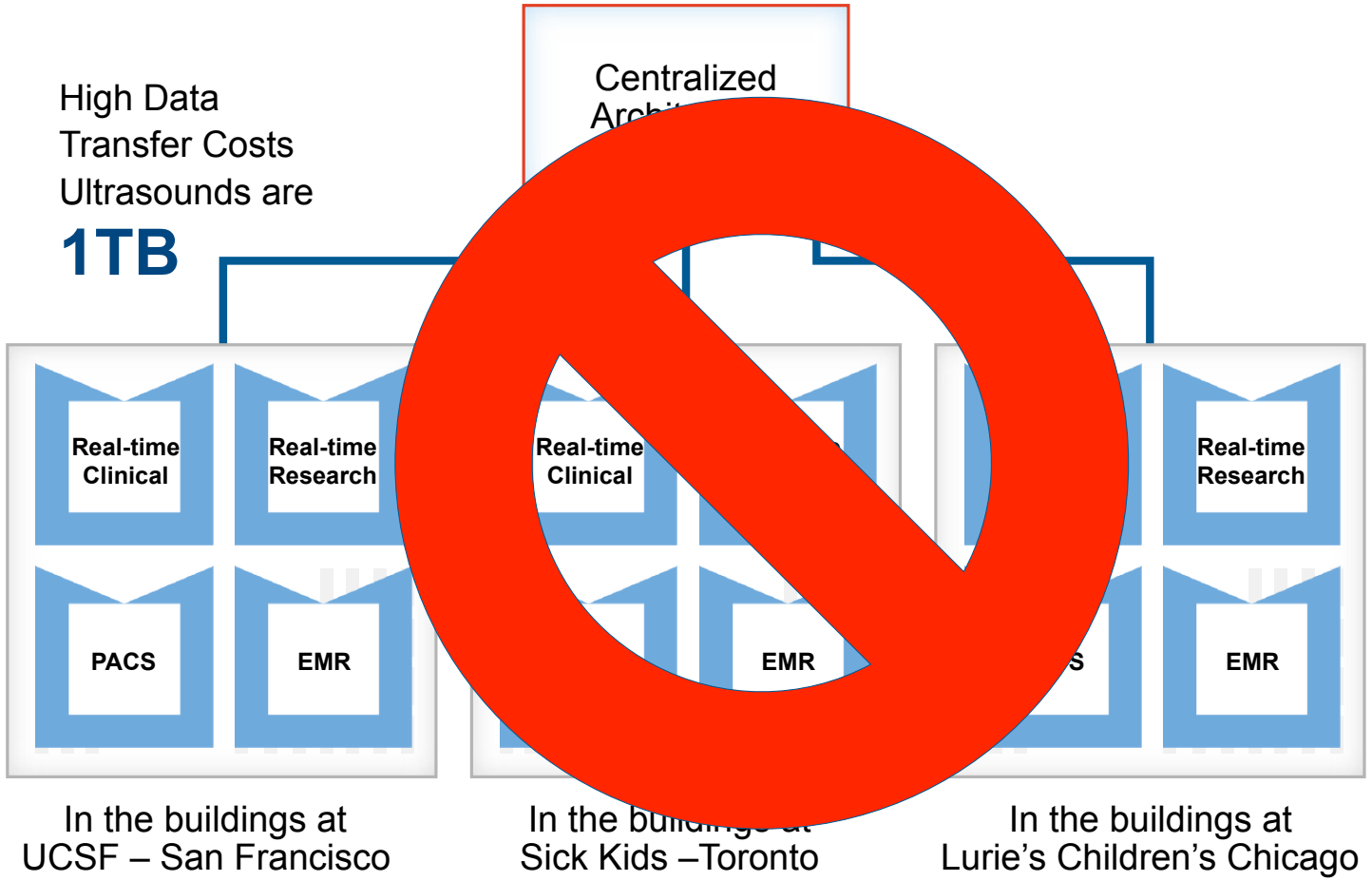
Yesterday's centralized architectures will NOT work for AI in medicine



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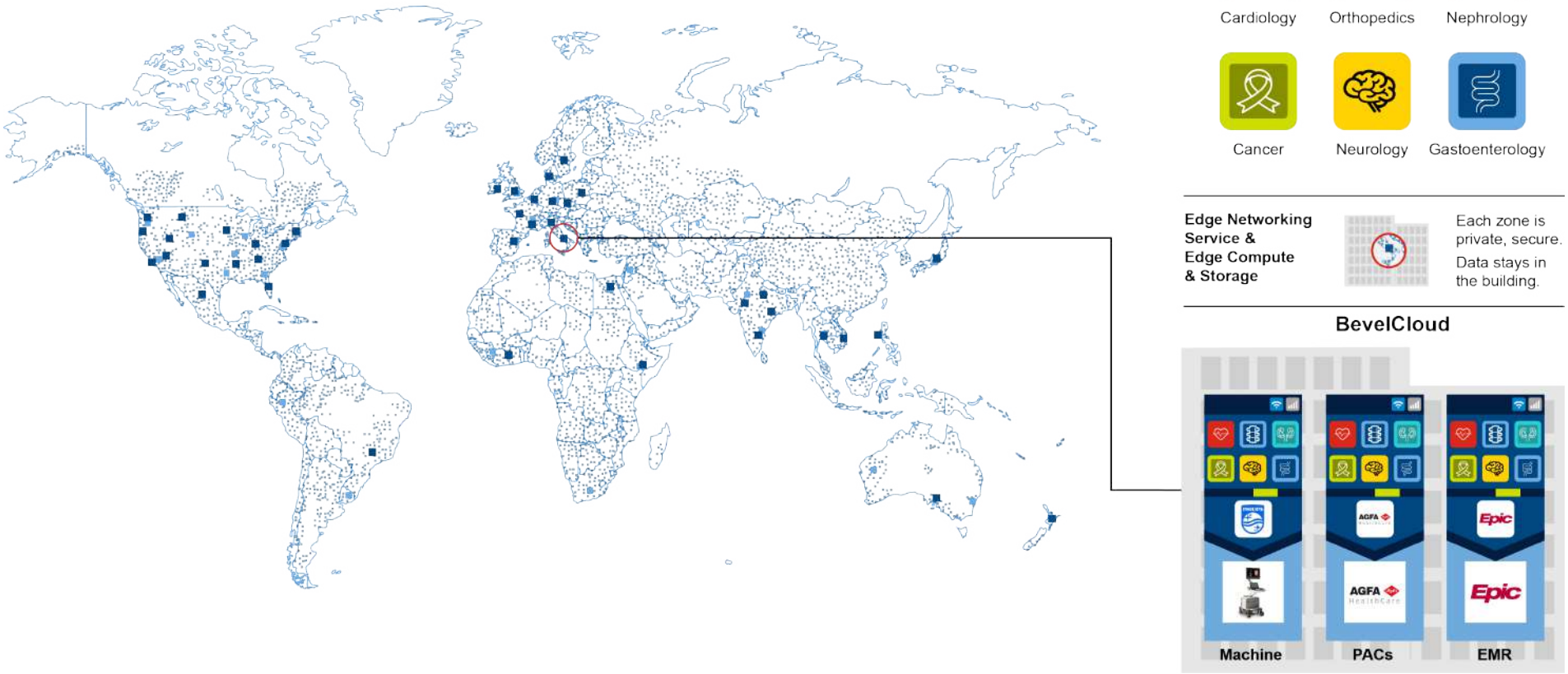
AI in medicine needs a global distributed AI infrastructure



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- Subscribe to the podcast https://pediatricmoonshot.buzzsprout.com

Podcast guests:
Dr. Anthony Chang, who inspired the mission and is Chief Innovation Officer at CHOC
Dr. Marc LaLande, VP of Research at Shriners.
Dr. Laura Jana, who with her books and TED talks advocates for children's healthcare worldwide.
Dr. Diana Ferro, who has returned to Italy to be a leading Research & Data Scientist @OPBG
Dr. Charitha Reddy, Clinical Assistant Professor, Pediatrics - Cardiology at Stanford Children’s
Dr. Rubin Pillay, Professor of Medicine and Assistant Dean, School of Medicine University of Alabama
Dr. Hanmin Lee, Chief, Division of Pediatric Surgery, UCSF
Dr. Wyman Lai, Co-Medical Director, CHOC Heart Institute at CHOC Children's, author of the seminal text on echocardiography

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Children are 25% of the world’s population but 100% of our future.

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PEDIATRIC MOONSHOT
Reduce healthcare inequity, lower cost and improve outcomes
for children acwho are not socially or post-code lucky
by creating privacy-preserving, real-time AI applications