

# Foundations of Pharma 4.0: The Missing Pieces

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Bio-Process Systems Alliance  
*Advancing Single-Use Worldwide*



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# Why Pharma 4.0?

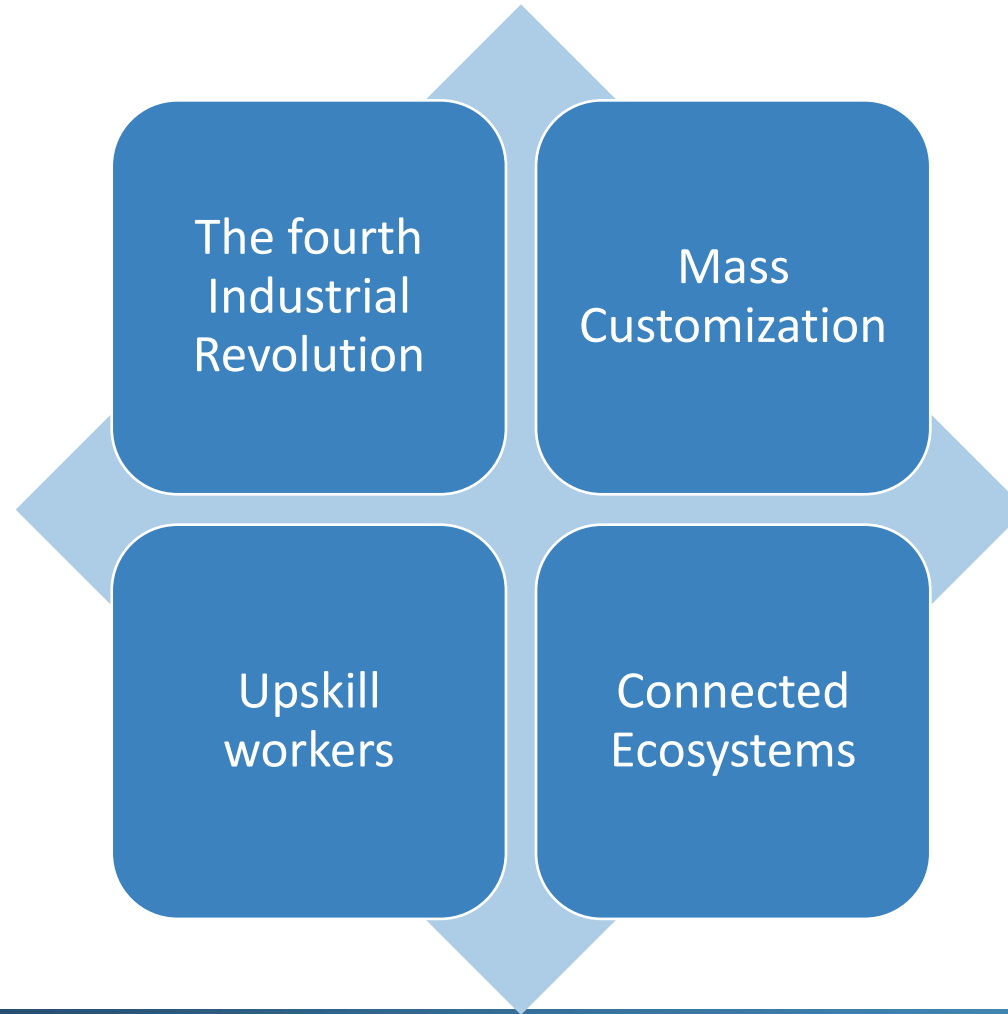


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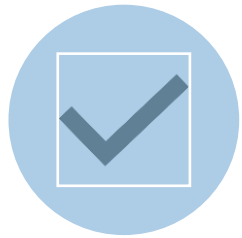


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# The Promise of Pharma 4.0



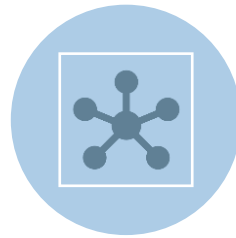
# The Missing Pieces of Pharma 4.0



ProCaaS®



PYTHON



DE-  
CENTRALIZATION



CLOUD



FLEXIBLE  
HARDWARE



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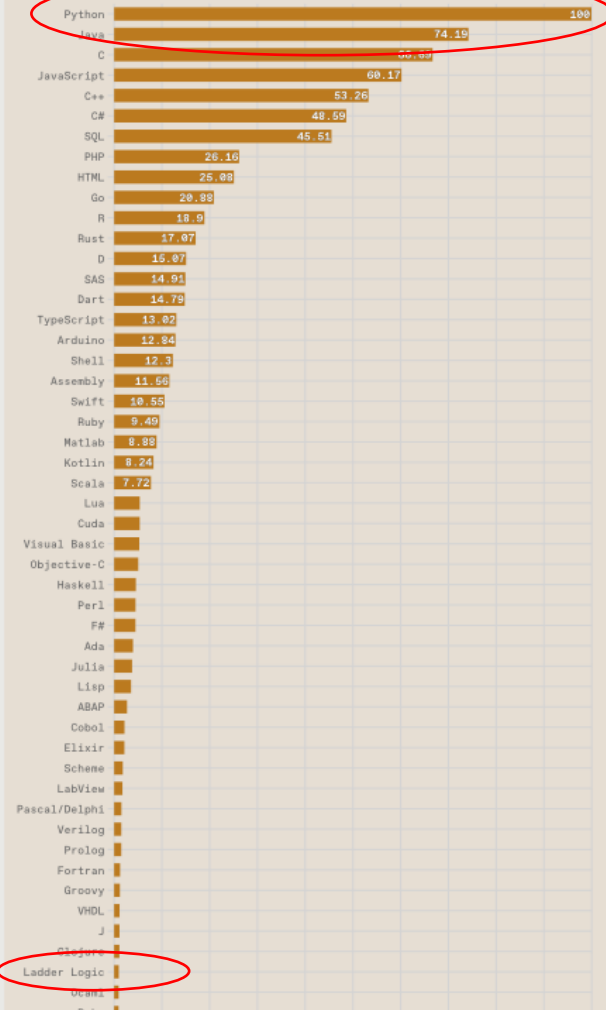


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## Top Programming Languages 2022

Click a button to see a differently weighted ranking

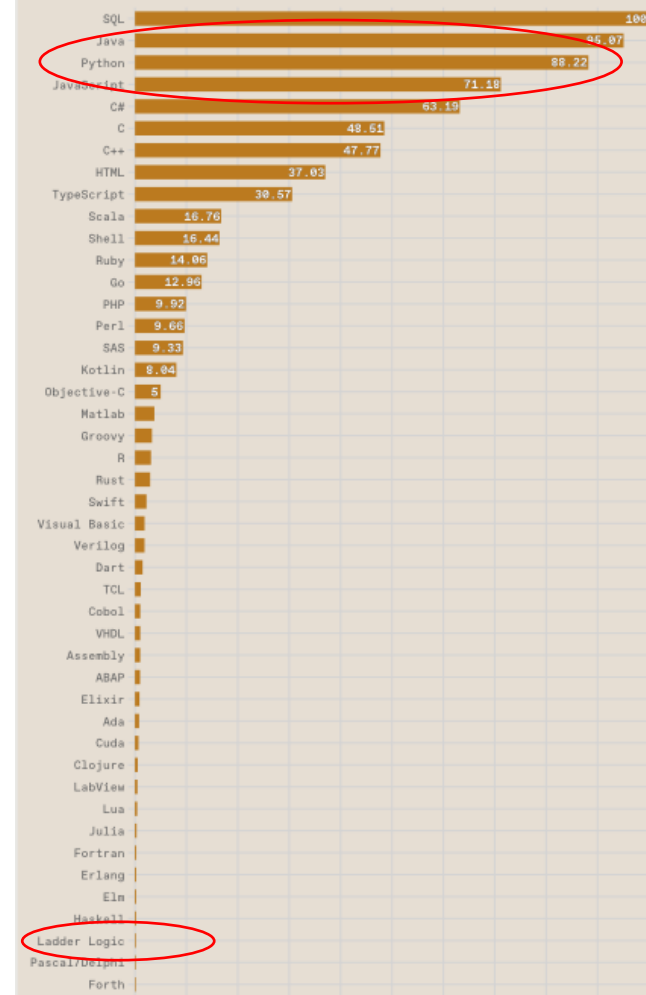
Spectrum Jobs **Trending**



## Top Programming Languages 2022

Click a button to see a differently weighted ranking

Spectrum **Jobs** Trending

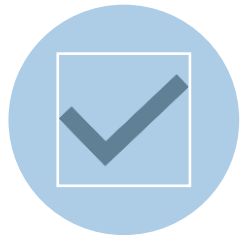


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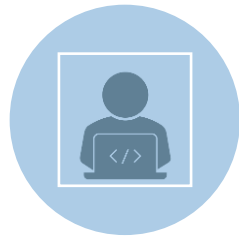


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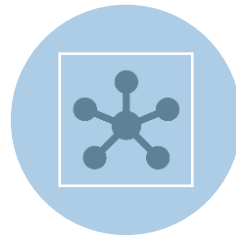
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# Getting to Abundance in Medicine

Remove limitations of PLCs and Ladder Logic

Expand the available labor pool

De-centralize manufacturing with centralized control

Offload repetitive tasks to AI

Leverage flexible, configurable hardware with flexible software

# Best Practices

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Security-focused architecture

Program in the Cloud--Execute at the edge

Capture data differently

Decouple hardware from recipes



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## COVID-bit: New COVert Channel to Exfiltrate Data from Air-Gapped Computers

Dec 08, 2022 Data Protection / Computer Security

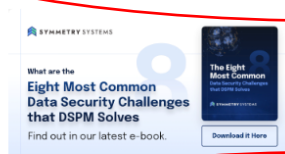
An unconventional data exfiltration method leverages a previously undocumented covert channel to leak sensitive...



## New Air-Gap Attack Uses SATA Cable as an Antenna to Transfer Radio Signals

Jul 19, 2022

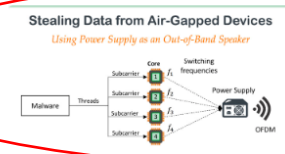
A new method devised to leak information and jump over air-gaps takes advantage of Serial Advanced Technology...



## It's Never Too Late to Find Your Sensitive Data and Secure It. Everywhere

www.symmetry-systems.com Data Security

It's always the same data security issues. To fix them you need to understand them. Get the e-book.



## New Malware Jumps Air-Gapped Devices by Turning Power-Supplies into Speakers

May 04, 2020

Cybersecurity researcher Mordechai Guri from Israel's Ben Gurion University of the Negev recently demonstrated a new...



## Hacker Can Steal Data from Air-Gapped Computers through Power Lines

Apr 12, 2018

Do you think it is possible to extract data from a computer using its power cables? If no, then you should definitely read...



## Hacker Can Steal Data from Air-Gapped Computers Using IR CCTV Cameras

Sep 20, 2017

Air-gapped computers that are isolated from the Internet and physically separated from local networks are believed to be th...



## 10 Things You Need To Know About 'WikiLeaks CIA Leak'

Mar 08, 2017

Yesterday WikiLeaks published thousands of documents revealing top CIA hacking secrets , including the agency's abili...



## WikiLeaks Exposed CIA's Hacking Tools And Capabilities Details

Mar 07, 2017

WikiLeaks has published a massive trove of confidential documents in what appear to be the biggest ever leak involvin...



## This Malware Can Transfer Data via USB Emissions from Air-Gapped Computers

Sep 05, 2016

Air-gapped computers that are isolated from the Internet or other networks and believed to be the most secure computers...



## New Hack Uses Hard Drive's Noise to Transfer Stolen Data from Air-Gapped Computer

Aug 12, 2016

Air-gapped computers that are isolated from the Internet and other computers are long considered to be the most secure a...



## AirHopper – Hacking Into an Isolated Computer Using FM Radio Signals

Nov 01, 2014

In order to secure sensitive information such as Finance, many companies and government agencies generally use totally...

Next Page >

# Best Practices

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Security-focused architecture

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Decouple hardware from recipes



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# Best Practices

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# “Garbage in, garbage out”



Your analysis is as good as your data.

# Best Practices

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## Systems

[+ Add system](#)

IDLE



Cloud mule #0

IDLE



Carson solo #1

OFFLINE



Tallinn skid #1

OFFLINE



Test QR system

OFFLINE



Carson #2

OFFLINE



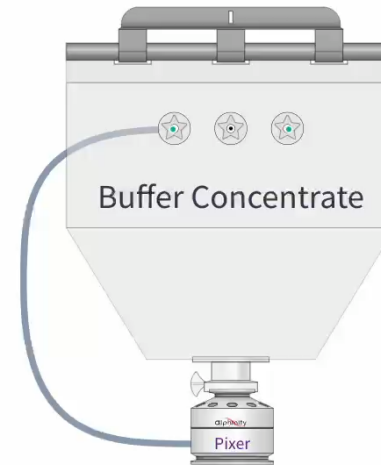
New York Solo #2

OFFLINE



### Carson solo #1

Edited: 04/05/2022, 17:01

[Deploy a CNS](#)[Open](#)

0 RPM



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Delivering:  
*The ProCaaSo™ Platform*  
*“The Art of Process Control™”*



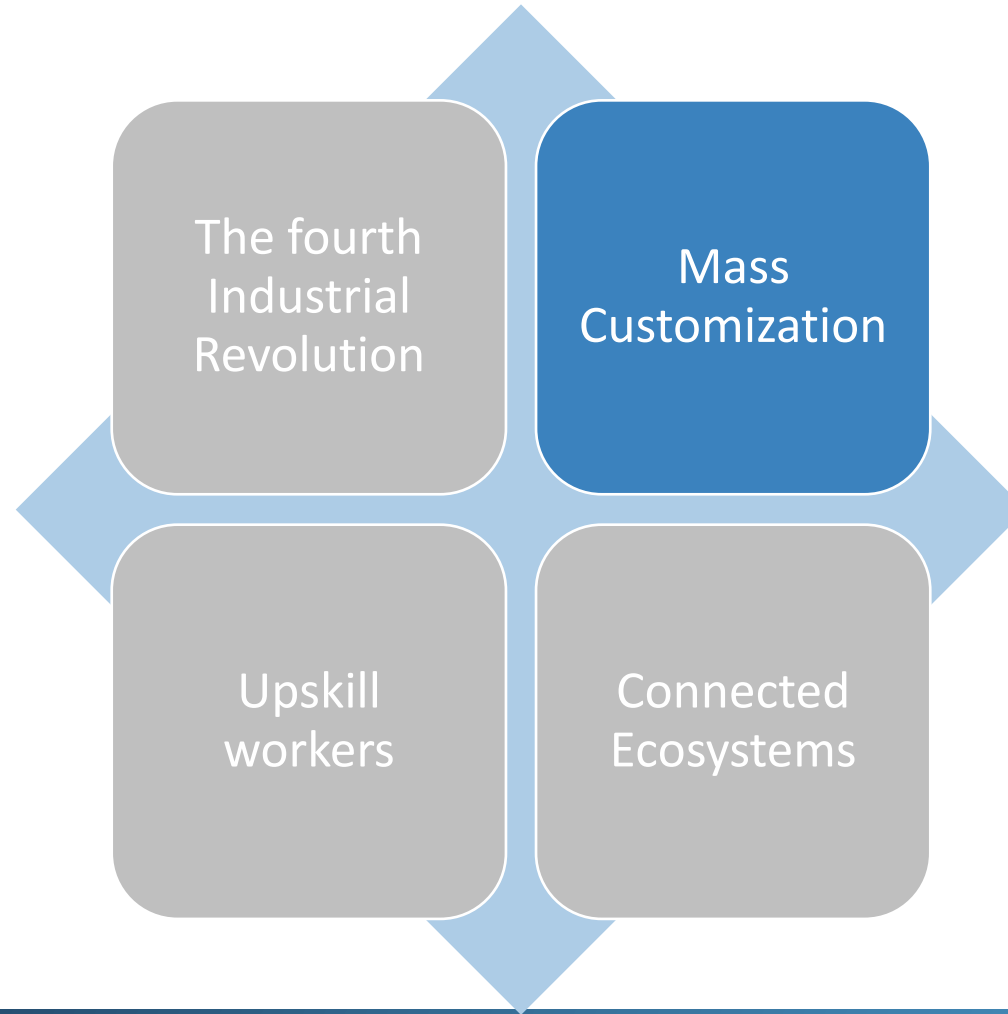
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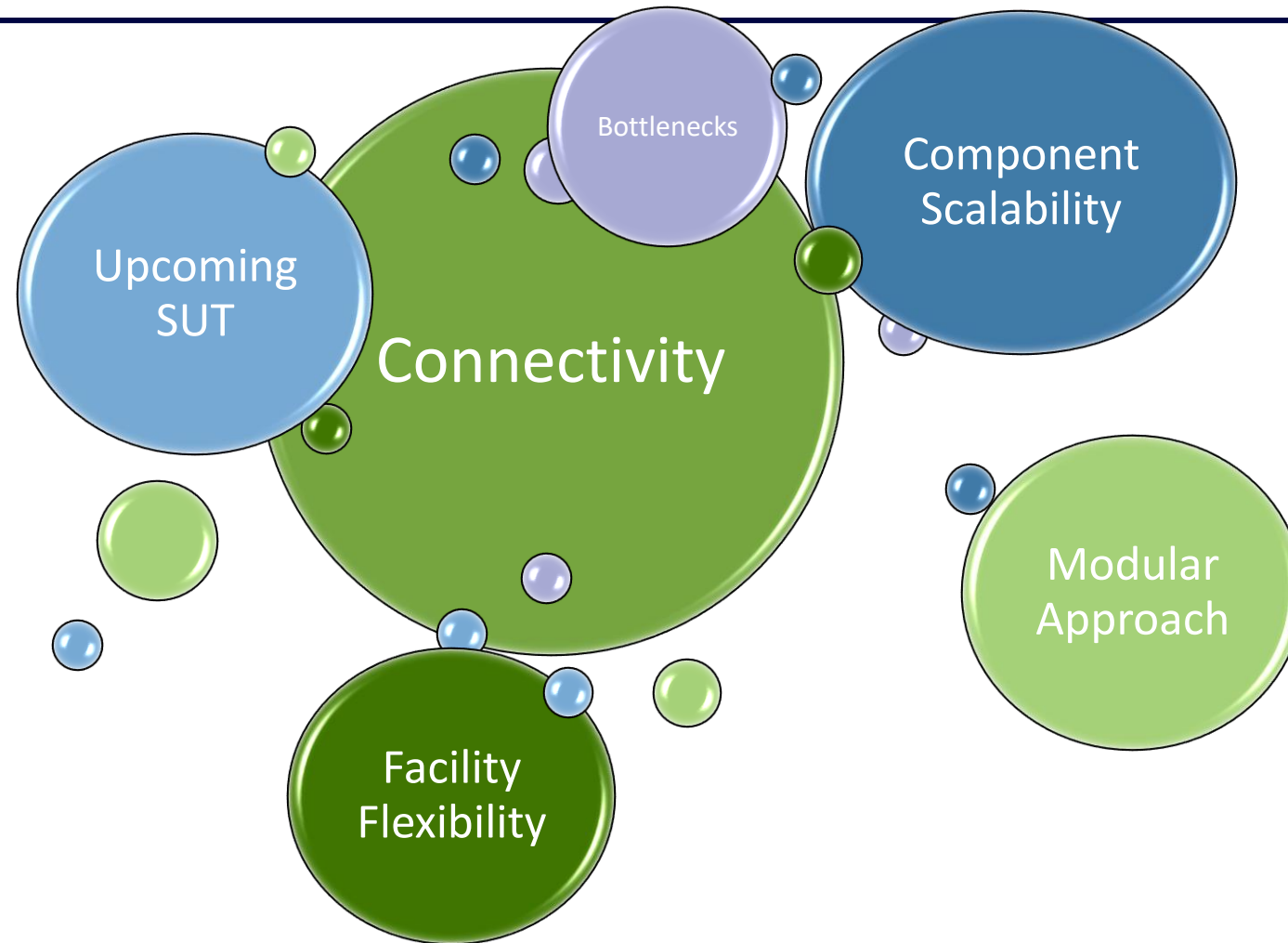
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# The Promise of Pharma 4.0



# SUBJECTS & THEMES – BPSA 2023



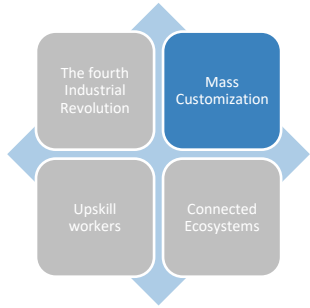
# The Challenge

Pivot to Adapt to New Modalities & Market Demands

2,408 Gene Therapy Clinical Trials (July 4, 2023, [clinicaltrials.gov](https://clinicaltrials.gov))

457,560 Total Clinical Trails (July 4, 2023, [clinicaltrials.gov](https://clinicaltrials.gov))

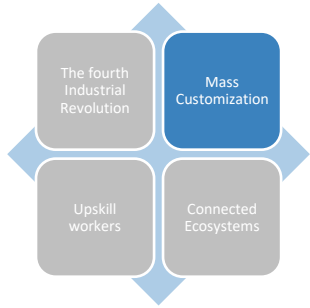
# The Goal




“...ability to create tailored products at high speed and on a scale never before possible.”

-Henrik von Scheel

# Key Issues and Challenges Facing the Single-Use Ecosystem



Mass Production  Mass Customization

Fast and Adaptive

Produce Diverse Products with Efficiency of Mass Production

Highly flexible, agile, and smart production lines

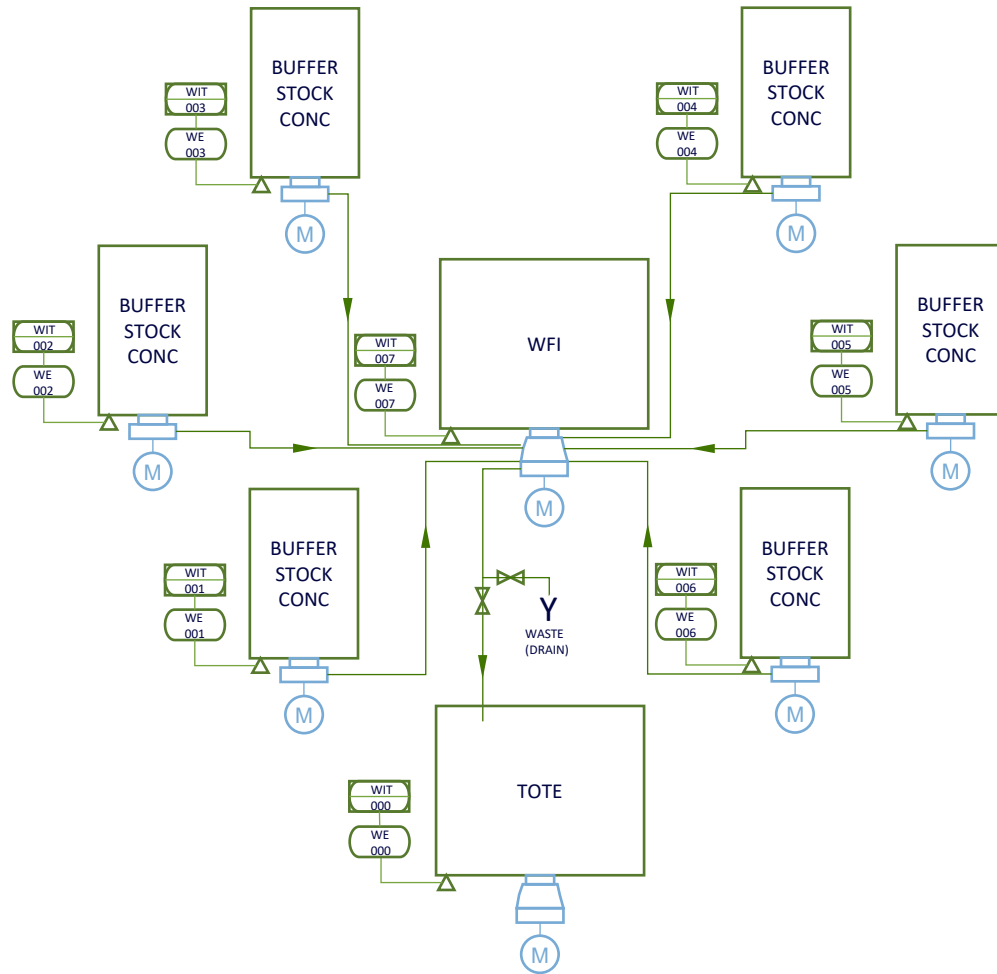


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# Highly flexible, agile, and smart production lines



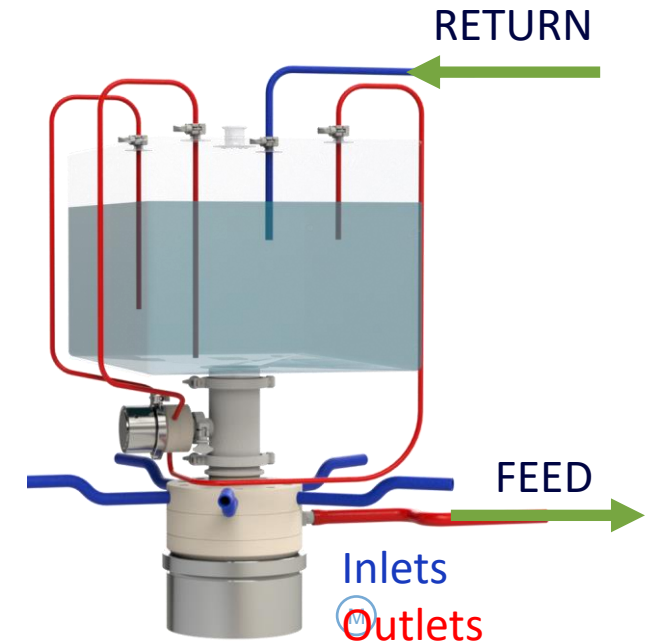
# Pivot to Adapt to New Modalities & Market Demands



**Bioreactor**



**Single Use Mixer**



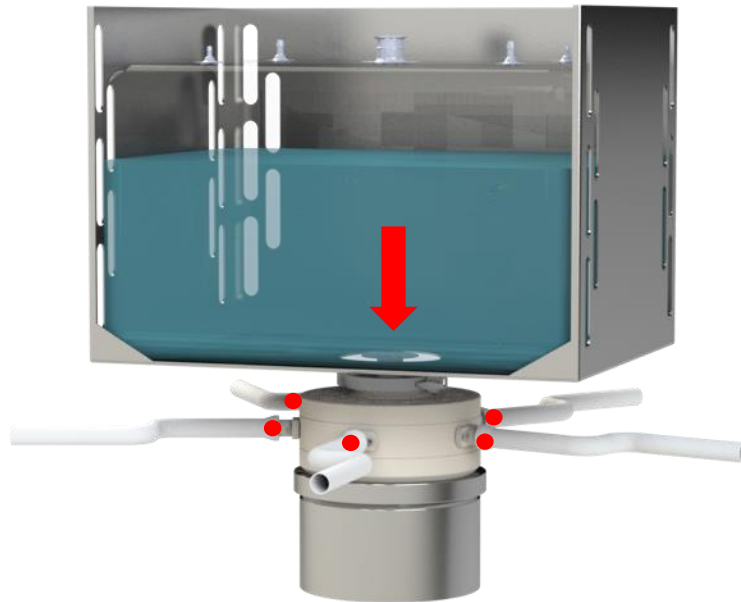
**UF/DF TFF  
Tulip Tank**

# Polymorphic Pump Technology™

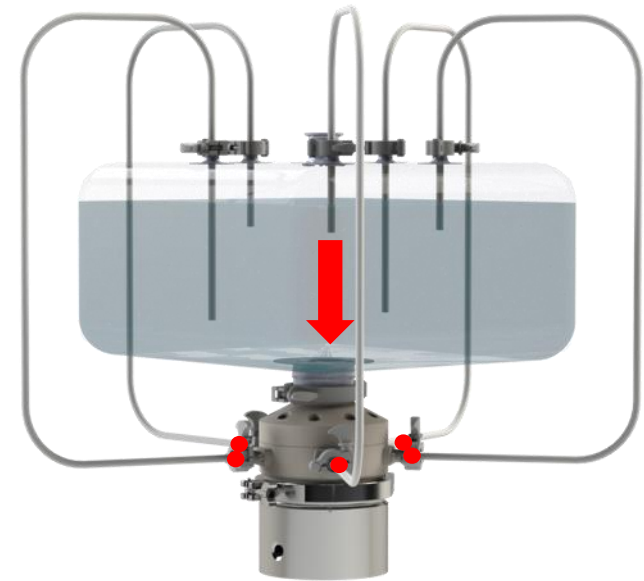
## PIXER®



**ParaFlow™**



**ParaFlow Multi™**



**ParaFlow™ Mixer**



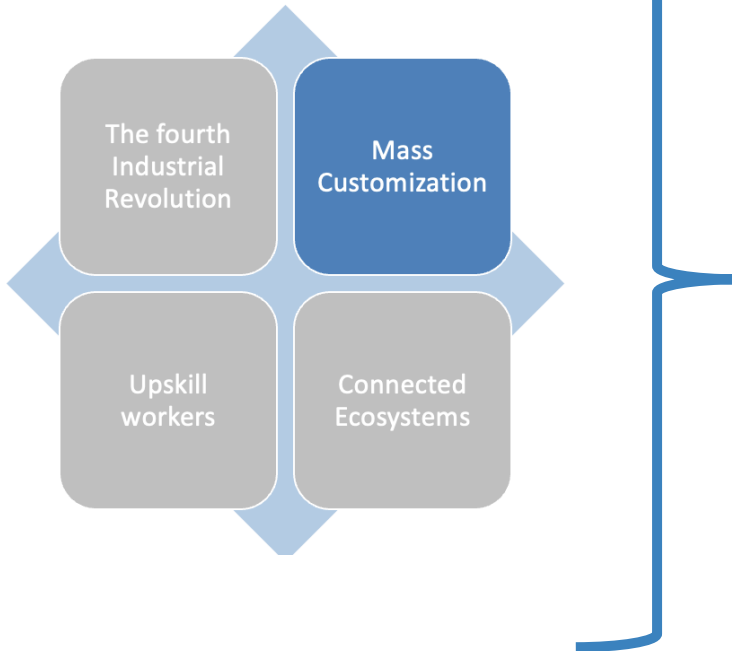
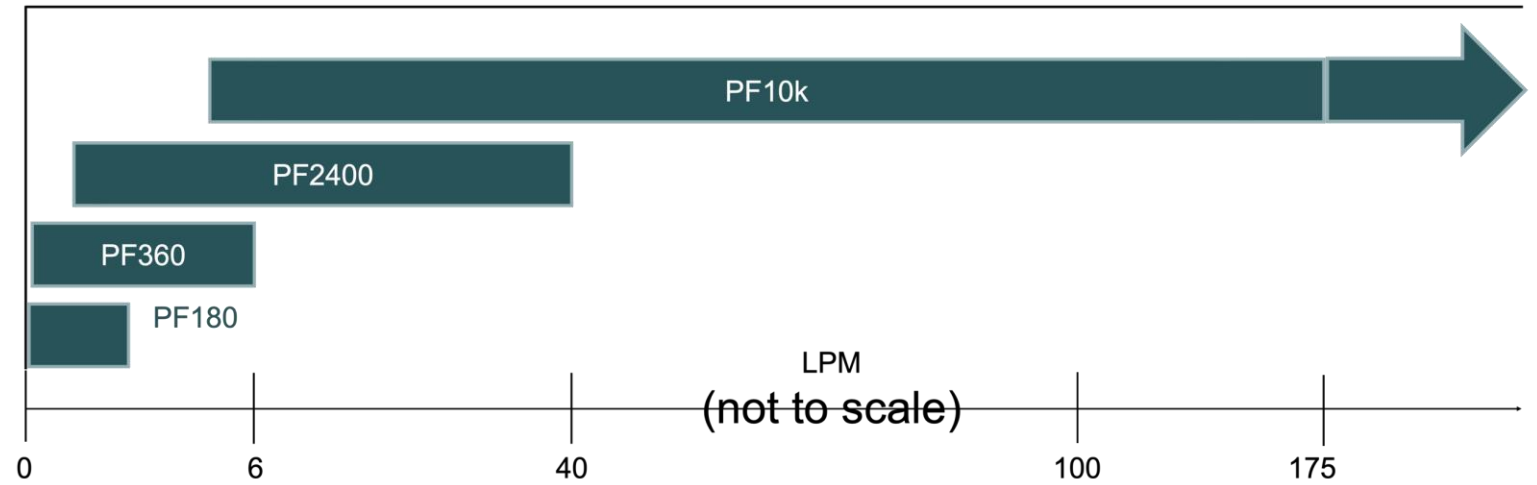
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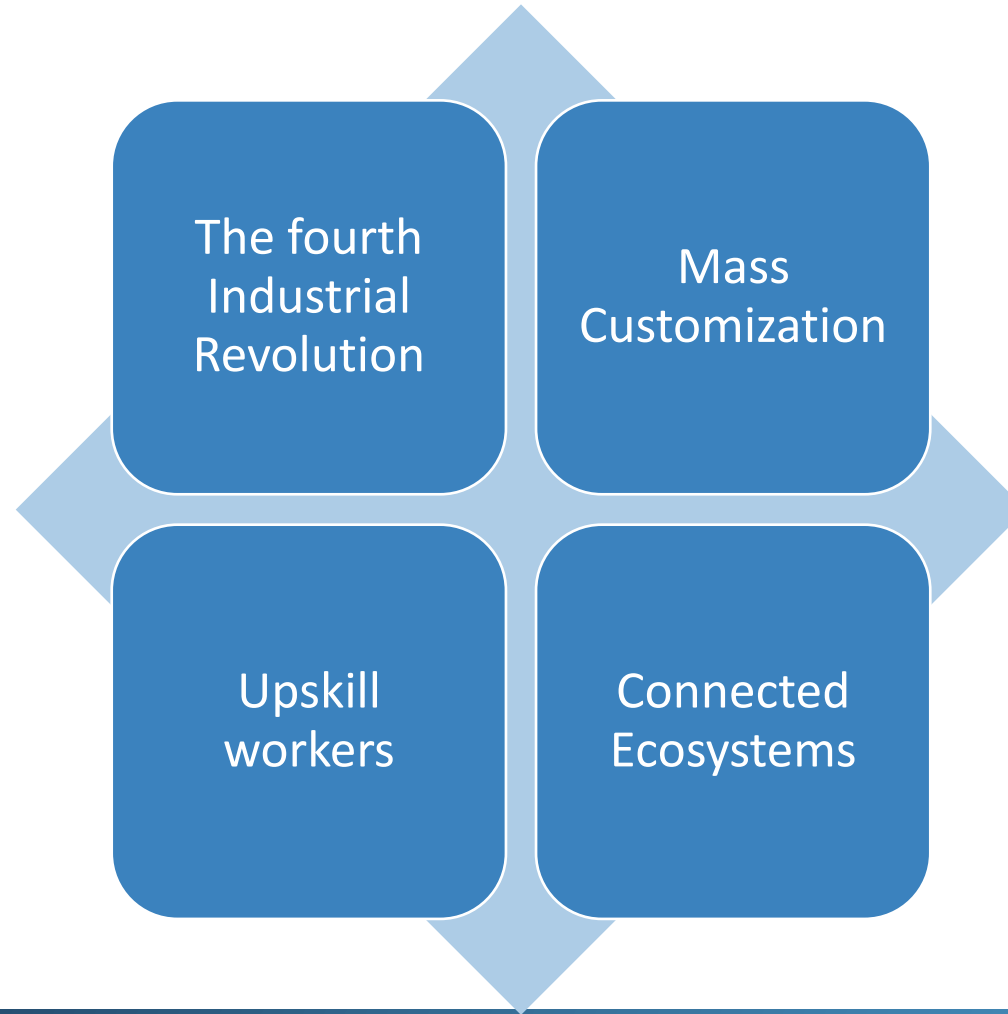
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## Flow rates from ml/min to 200L/min



# The Promise of Pharma 4.0



# Enabling Abundance in Medicine



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