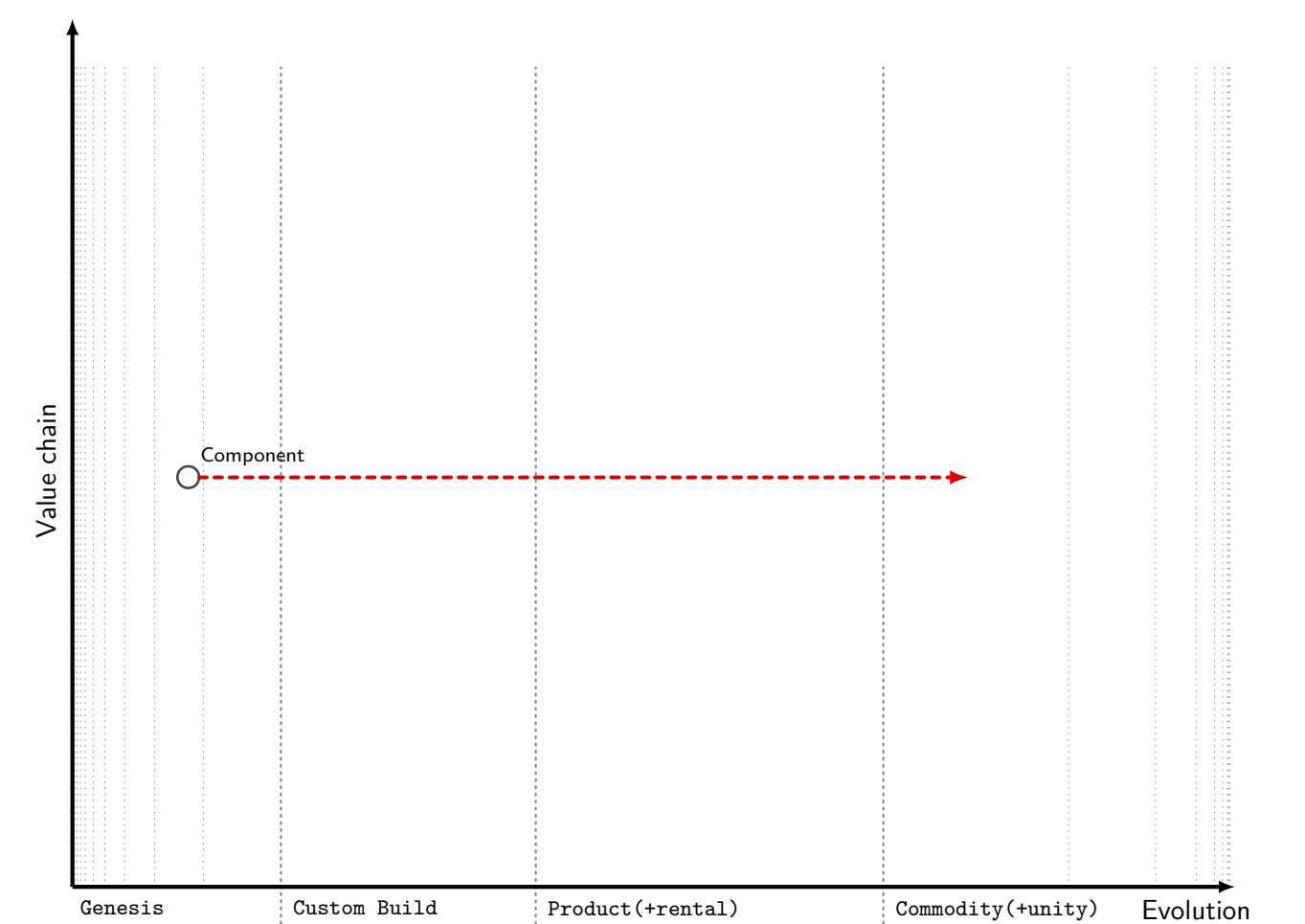


Structural Deepening

An all-vector Wardley-TikZ reconstruction

This standalone document recreates the eight figures published with the *Structural Deepening* post. Wardley maps use the semantic `wardley-tikz` API and its calibrated structural rendering profile. Figure 3 and article-specific overlays use ordinary TikZ as the package's vector escape hatch. No source raster is embedded in this PDF. The complete reconstruction source is printed after every figure.

Figure 1



Map showing the evolution of a component through four stages, from Genesis to Commodity.

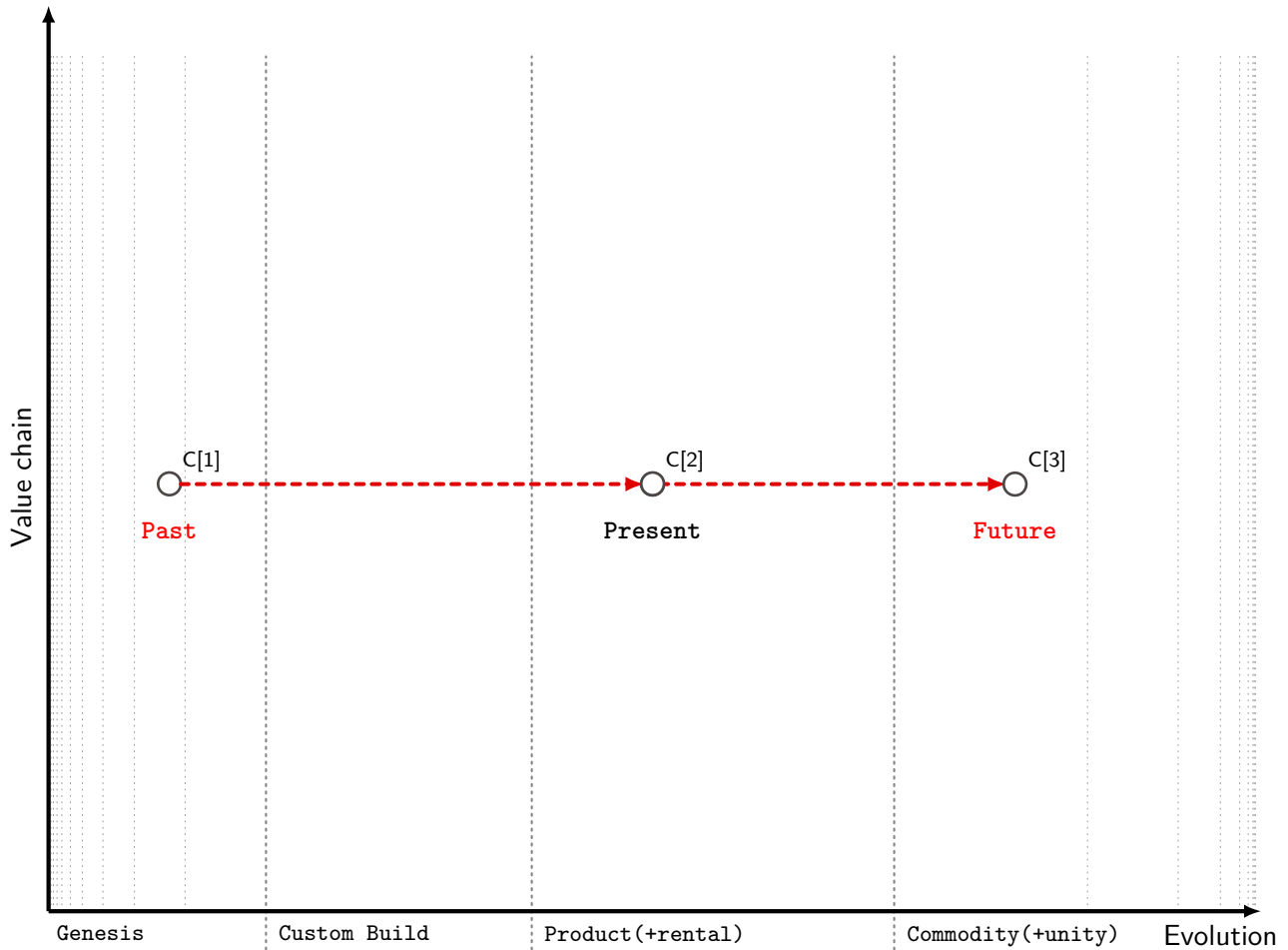
Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 1 source: figures/figure-01.tex

```
\begin{wardleymap}[
  width=16cm,
  aspect ratio=1.414,
  style=structural,
  format=structural,
  canvas=white,
  stages={Genesis,Custom Build,Product(+rental),Commodity(+unity)},
  stage boundaries={.18,.40,.70},
  show chart labels=false,
  show visibility labels=false,
  trace=true
]
\WardleyComponent[
  id=sd-one-component,
  label position=above right
]{Component}[.50,.10]

\WardleyEvolve[
  id=sd-one-evolution,
  show target=false
]{sd-one-component}{.78}
\end{wardleymap}
```

Figure 2



Evolution of a component from past to present to future through the successive realisations C[1], C[2], and C[3].

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 2 source: figures/figure-02.tex

```
\begin{wardleymap}[
  width=16cm,
  aspect ratio=1.414,
  style=structural,
  format=structural,
  canvas=white,
  stages={Genesis,Custom Build,Product(+rental),Commodity(+unity)},
  stage boundaries={.18,.40,.70},
  show chart labels=false,
  show visibility labels=false,
  trace=true
]
% Evolution currently exposes path styling but not target-marker styling.
% Keep the semantic movements and locally restore the source's solid,
% graphite state markers for their generated targets.
\tikzset{
  wardley future component/.style={
    circle,
    draw=wardleystructuralcomponent,
    fill=white,
    solid,
    line width=1pt,
    minimum size=3mm,
    inner sep=0pt
  },
  sd two state label/.style={
    font=\ttfamily\bfseries\small,
    inner sep=0pt
  },
  sd two past future/.style={sd two state label,text=red},
  sd two present/.style={sd two state label,text=black}
}
```

```

\WardleyComponent[
  id=sd-two-c-one,
  label position=above right
]{C[1]}.50,.10

\WardleyEvolve[
  id=sd-two-one-to-two,
  new name={C[2]},
  label position=above right
]{sd-two-c-one}{.50}

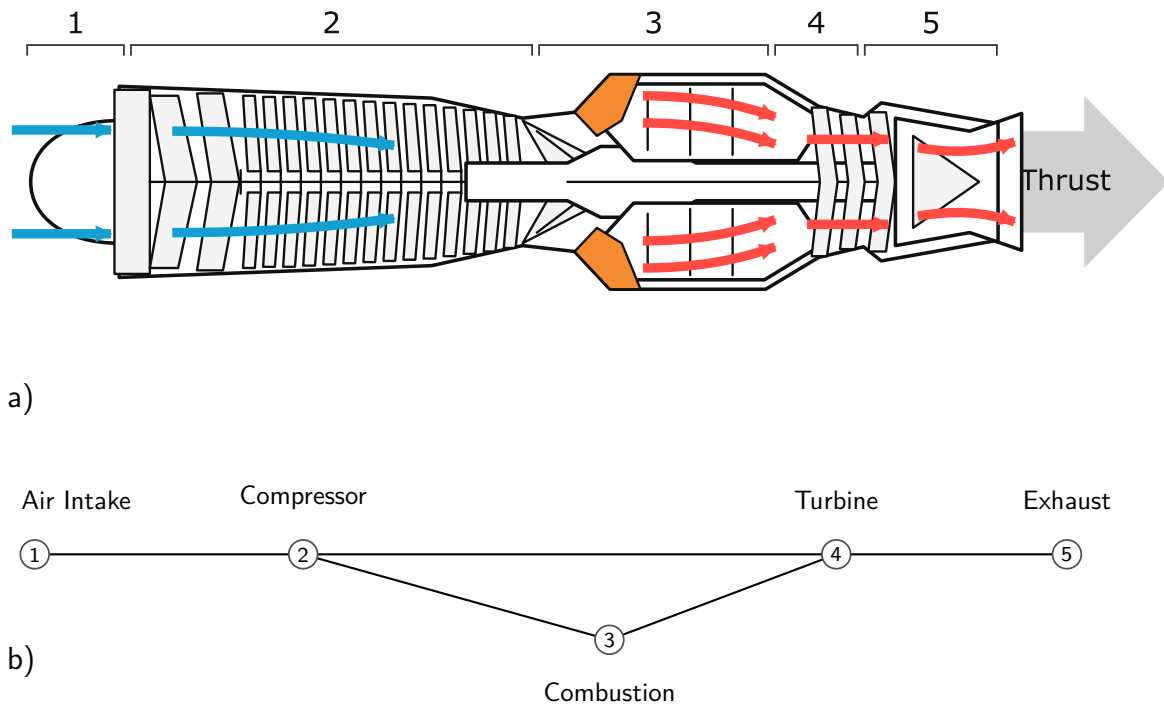
\WardleyEvolve[
  id=sd-two-two-to-three,
  new name={C[3]},
  label position=above right
]{C[2]}.80}

% The second movement is painted after the generated C[2] target. Repaint
% that marker so the continuous red path passes behind the component.
\node[wardley future component] at (.50,.50) {};

\WardleyMapLabel[
  at={.445,.10},
  style={sd two past future}
]{Past}
\WardleyMapLabel[
  at={.445,.50},
  style={sd two present}
]{Present}
\WardleyMapLabel[
  at={.445,.80},
  style={sd two past future}
]{Future}
\end{wardleymap}

```

Figure 3



A simple jet engine: (a) simplified from Jeff Dahl's original *Jet engine.svg*, used under CC BY-SA 4.0; fine detail and shading removed, cropped, recoloured, relabelled, and augmented with five system spans. This adaptation is also licensed CC BY-SA 4.0. (b) The corresponding dependency graph, including the compressor–combustion–turbine cycle.

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 3 source: figures/figure-03.tex

```
\begin{tikzpicture}[
  x=1cm,
  y=1cm,
  font=\sffamily,
  line cap=round,
  line join=round,
  sdthree/graph/.style={draw=black,line width=.8pt},
  sdthree/graphnode/.style={circle,draw=black!70,fill=white,
    line width=.65pt,minimum size=3.8mm,inner sep=0pt,
    font=\sffamily\scriptsize}
]
% Panel a uses a deliberately simplified adaptation of Jeff Dahl's editable
% SVG: it retains the major engine systems and airflow, removes the source's
% fine mechanical detail and gradients, and adds the five system spans used
% by the dependency graph below. The PDF is a generated vector companion so
% the standalone document builds without shell escape.
\node[anchor=south west,inner sep=0pt] at (0,4.18) {%
  \includegraphics[width=15.6cm]{assets/jet-engine-figure3.pdf}%
};
\node[anchor=north west,font=\sffamily\large] at (-.05,4.08) {a});

% Dependency graph. Edges precede nodes so their endpoints terminate at the
% component boundaries.
\coordinate (sdthree-g-one) at (.45,1.68);
\coordinate (sdthree-g-two) at (4.00,1.68);
\coordinate (sdthree-g-three) at (8.05,.55);
\coordinate (sdthree-g-four) at (11.05,1.68);
\coordinate (sdthree-g-five) at (14.10,1.68);

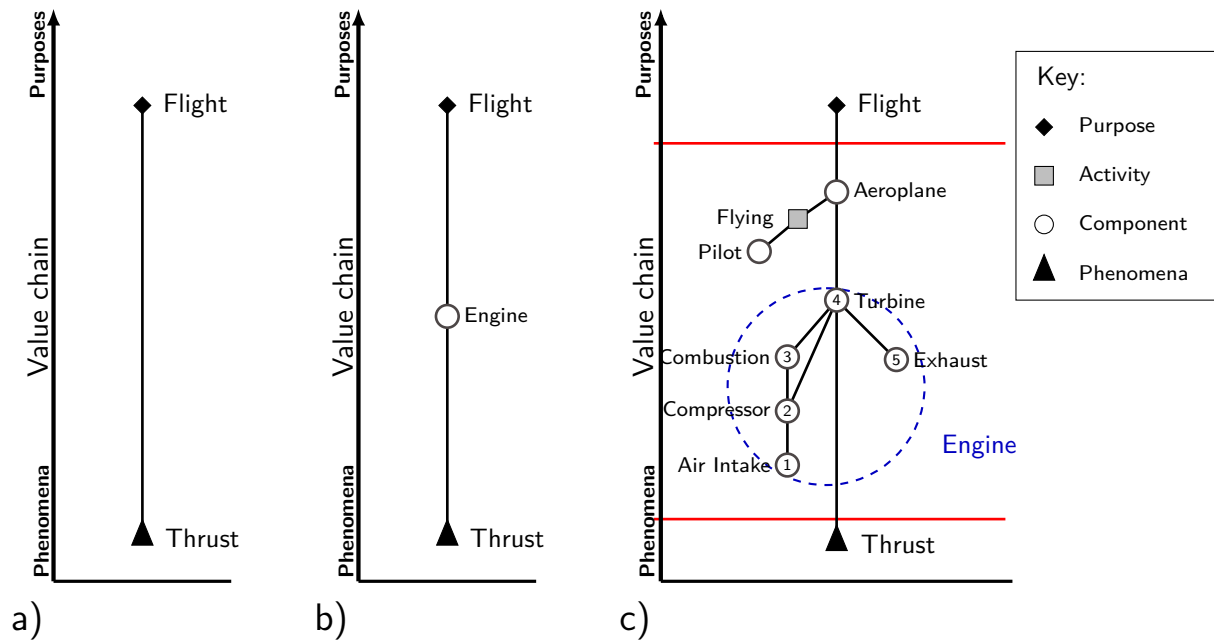
\draw[sdthree/graph] (sdthree-g-one) -- (sdthree-g-two) --
  (sdthree-g-four) -- (sdthree-g-five);
\draw[sdthree/graph] (sdthree-g-two) -- (sdthree-g-three) --
  (sdthree-g-four);

\node[sdthree/graphnode] at (sdthree-g-one) {1};
\node[sdthree/graphnode] at (sdthree-g-two) {2};
\node[sdthree/graphnode] at (sdthree-g-three) {3};
\node[sdthree/graphnode] at (sdthree-g-four) {4};
\node[sdthree/graphnode] at (sdthree-g-five) {5};

\node[anchor=south,font=\sffamily\small] at (1.00,2.14) {Air Intake};
```

```
\node[anchor=south,font=\sffamily\small] at (4.00,2.14) {Compressor};  
\node[anchor=south,font=\sffamily\small] at (11.05,2.14) {Turbine};  
\node[anchor=south,font=\sffamily\small] at (14.10,2.14) {Exhaust};  
\node[anchor=north,font=\sffamily\small] at (8.05,.12) {Combustion};  
\node[anchor=south west,font=\sffamily\large] at (-.05,-.08) {b});  
\end{tikzpicture}
```

Figure 4



A purposed system at three levels of abstraction: purpose to phenomenon, the engine as one component, and the engine expanded into its dependencies.

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 4 source: figures/figure-04.tex

```
% Structural Deepening, Figure 4: successive levels of engine structure.
\begingroup
\centering
\def\SDFourVisibilityLabels{%
  \node[wardley label,rotate=90,anchor=south east,
    font=\sffamily\scriptsize\bfseries] at (-.008,1.06) {Purposes};
  \node[wardley label,rotate=90,anchor=south west,
    font=\sffamily\scriptsize\bfseries] at (-.008,0) {Phenomena};
}
\begin{wardleymap}[
  width=2.35cm,
  height=7.15cm,
  style=structural,
  format=structural,
  canvas=white,
  show evolution axis=false,
  show value chain axis=true,
  show stage separators=false,
  show stage labels=false,
  minor stage guides={},
  show chart labels=false,
  show visibility labels=false
]
% The source panels keep a plain maturity baseline without the usual
% Evolution arrow or caption.
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);
\SDFourVisibilityLabels

\WardleyAnchor[id=sd-four-a-flight,show label=false]
  {Flight} [.88,.50]
\WardleyAnchor[id=sd-four-a-thrust,show label=false]
  {Thrust} [.08,.50]
\WardleyLink{sd-four-a-flight}{sd-four-a-thrust}

\node[diamond,draw=black,fill=black,minimum size=6.5pt,inner sep=0pt]
  at (.50,.88) {};
\node[isosceles triangle,shape border rotate=90,draw=black,fill=black,
  minimum size=8pt,inner sep=0pt] at (.50,.08) {};
\node[anchor=west,font=\sffamily\small] at (.56,.88) {Flight};
\node[anchor=west,font=\sffamily\small] at (.57,.08) {Thrust};
\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {a});
\end{wardleymap}%
\hspace{.35cm}%
\begin{wardleymap}[
  width=2.35cm,
  height=7.15cm,
  style=structural,
```

```

format=structural,
canvas=white,
show evolution axis=false,
show value chain axis=true,
show stage separators=false,
show stage labels=false,
minor stage guides={},
show chart labels=false,
show visibility labels=false
]
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);
\SDFourVisibilityLabels

\WardleyAnchor[id=sd-four-b-flight,show label=false]
{Flight} [.88,.50]
\WardleyComponent[id=sd-four-b-engine,label position=right]
{Engine} [.49,.50]
\WardleyAnchor[id=sd-four-b-thrust,show label=false]
{Thrust} [.08,.50]
\WardleyLink{sd-four-b-flight}{sd-four-b-engine}
\WardleyLink{sd-four-b-engine}{sd-four-b-thrust}

\node[diamond,draw=black,fill=black,minimum size=6.5pt,inner sep=0pt]
at (.50,.88) {};
\node[isosceles triangle,shape border rotate=90,draw=black,fill=black,
minimum size=8pt,inner sep=0pt] at (.50,.08) {};
\node[anchor=west,font=\sffamily\small] at (.56,.88) {Flight};
\node[anchor=west,font=\sffamily\small] at (.57,.08) {Thrust};
\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {b});
\end{wardleymap}%
\hspace{.35cm}%
\begin{wardleymap}[
width=4.65cm,
height=7.15cm,
style=structural,
format=structural,
canvas=white,
show evolution axis=false,
show value chain axis=true,
show stage separators=false,
show stage labels=false,
minor stage guides={},
show chart labels=false,
show visibility labels=false
]
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);
\SDFourVisibilityLabels

\begin{pgfonlayer}{wardley regions}
\draw[draw=blue!75!black,dashed,line width=.8pt]
(.47,.542)
.. controls (.625,.542) and (.750,.461) .. (.750,.360)
.. controls (.750,.260) and (.625,.178) .. (.470,.178)
.. controls (.315,.178) and (.190,.260) .. (.190,.360)
.. controls (.190,.461) and (.315,.542) .. cycle;
\draw[draw=red,line width=1pt] (-.02,.81) -- (.98,.81);
\draw[draw=red,line width=1pt] (-.02,.115) -- (.98,.115);
\end{pgfonlayer}

\WardleyAnchor[id=sd-four-c-flight,show label=false]
{Flight} [.88,.50]
\WardleyComponent[id=sd-four-c-aeroplane,label position=right]
{Aeroplane} [.72,.50]
\WardleyComponent[id=sd-four-c-pilot,label position=left]
{Pilot} [.61,.28]
\WardleyAnchor[id=sd-four-c-flying,show label=false]
{Flying} [.67,.39]
\WardleyComponent[id=sd-four-c-turbine,label position=right]
{Turbine} [.52,.50]
\WardleyComponent[id=sd-four-c-combustion,label position=left]
{Combustion} [.415,.36]
\WardleyComponent[id=sd-four-c-compressor,label position=left]
{Compressor} [.315,.36]
\WardleyComponent[id=sd-four-c-air-intake,label position=left]
{Air Intake} [.215,.36]
\WardleyComponent[id=sd-four-c-exhaust,label position=right]
{Exhaust} [.410,.67]
\WardleyAnchor[id=sd-four-c-thrust,show label=false]
{Thrust} [.07,.50]

\WardleyLink{sd-four-c-flight}{sd-four-c-aeroplane}
\WardleyLink{sd-four-c-pilot}{sd-four-c-flying}
\WardleyLink{sd-four-c-flying}{sd-four-c-aeroplane}
\WardleyLink{sd-four-c-aeroplane}{sd-four-c-turbine}
\WardleyLink{sd-four-c-turbine}{sd-four-c-combustion}
\WardleyLink{sd-four-c-turbine}{sd-four-c-compressor}
\WardleyLink{sd-four-c-turbine}{sd-four-c-exhaust}
\WardleyLink{sd-four-c-turbine}{sd-four-c-thrust}
\WardleyLink{sd-four-c-combustion}{sd-four-c-compressor}
\WardleyLink{sd-four-c-compressor}{sd-four-c-air-intake}

```



```

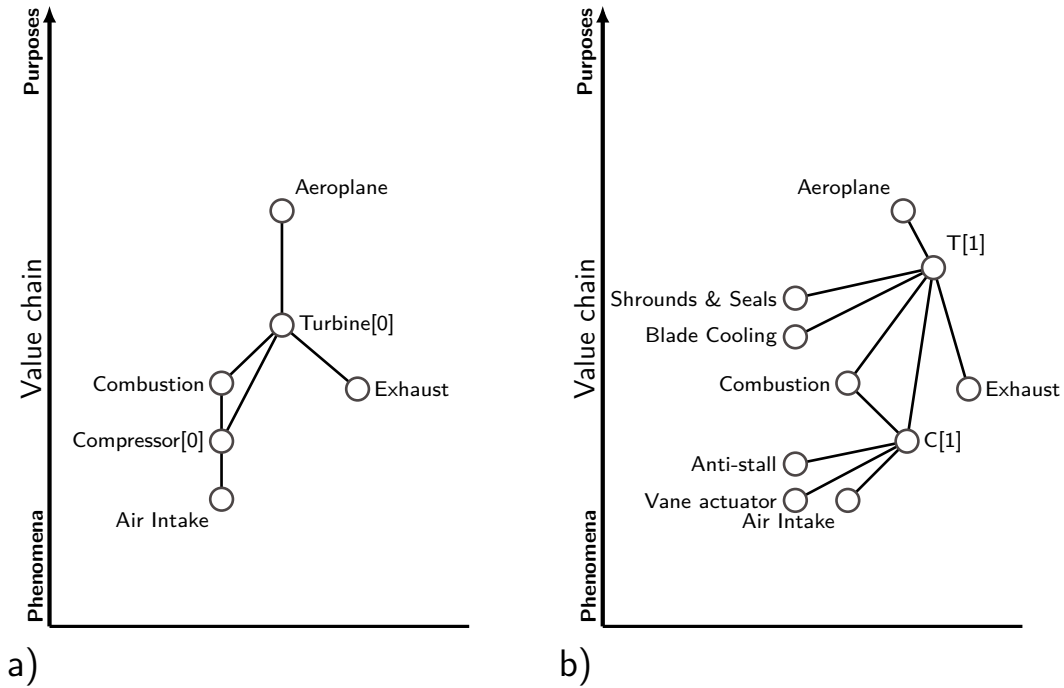
\node[diamond,draw=black,fill=black,minimum size=6.5pt,inner sep=0pt]
  at (.50,.88) {};
\node[rectangle,draw=black,fill=black!25,minimum size=7pt,inner sep=0pt]
  at (.39,.67) {};
\node[isosceles triangle,shape border rotate=90,draw=black,fill=black,
  minimum size=8pt,inner sep=0pt] at (.50,.07) {};

\node[anchor=west,font=\sffamily\small] at (.53,.88) {Flight};
\node[anchor=east,font=\sffamily\scriptsize] at (.35,.67) {Flying};
\node[anchor=west,font=\sffamily\small] at (.54,.07) {Thrust};
\node[anchor=center,font=\sffamily\tiny] at (.36,.215) {1};
\node[anchor=center,font=\sffamily\tiny] at (.36,.315) {2};
\node[anchor=center,font=\sffamily\tiny] at (.36,.415) {3};
\node[anchor=center,font=\sffamily\tiny] at (.50,.52) {4};
\node[anchor=center,font=\sffamily\tiny] at (.67,.410) {5};
\node[anchor=west,font=\sffamily\small,text=blue!75!black]
  at (.77,.25) {Engine};

\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {c});
\draw[draw=black,line width=.4pt] (1.01,.52) rectangle (1.58,.98);
\node[anchor=west,font=\sffamily\small] at (1.04,.93) {Key:};
\node[diamond,draw=black,fill=black,minimum size=6.5pt,inner sep=0pt]
  at (1.09,.84) {};
\node[anchor=west,font=\sffamily\scriptsize] at (1.16,.84) {Purpose};
\node[rectangle,draw=black,fill=black!25,minimum size=7pt,inner sep=0pt]
  at (1.09,.75) {};
\node[anchor=west,font=\sffamily\scriptsize] at (1.16,.75) {Activity};
\node[circle,draw=black,fill=white,minimum size=7pt,inner sep=0pt]
  at (1.09,.66) {};
\node[anchor=west,font=\sffamily\scriptsize] at (1.16,.66) {Component};
\node[isosceles triangle,shape border rotate=90,draw=black,fill=black,
  minimum size=8pt,inner sep=0pt] at (1.09,.57) {};
\node[anchor=west,font=\sffamily\scriptsize] at (1.16,.57) {Phenomena};
\end{wardleymap}%
\par
\endgroup

```

Figure 5



A slightly less simple jet engine: the original assembly and a later version with additional compressor and turbine subsystems.

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 5 source: figures/figure-05.tex

```
% Structural Deepening, Figure 5: a component deepens into a larger assembly.
\begin{group}
\centering
\def\SDFiveVisibilityLabels{%
  \node[wardley label,rotate=90,anchor=south east,
    font=\sffamily\scriptsize\bfseries] at (-.008,1.06) {Purposes};
  \node[wardley label,rotate=90,anchor=south west,
    font=\sffamily\scriptsize\bfseries] at (-.008,0) {Phenomena};
}
\begin{wardleymap}[
  width=5.55cm,
  height=7.75cm,
  style=structural,
  format=structural,
  canvas=white,
  show evolution axis=false,
  show value chain axis=true,
  show stage separators=false,
  show stage labels=false,
  minor stage guides={},
  show chart labels=false,
  show visibility labels=false
]
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);
\SDFiveVisibilityLabels

\WardleyComponent[id=sd-five-a-aeroplane,label position=above right]
  {Aeroplane} [.709,.554]
\WardleyComponent[id=sd-five-a-turbine,label position=right]
  {Turbine[0]} [.514,.554]
\WardleyComponent[id=sd-five-a-exhaust,label position=right]
  {Exhaust} [.405,.734]
\WardleyComponent[id=sd-five-a-combustion,label position=left]
  {Combustion} [.415,.410]
\WardleyComponent[id=sd-five-a-compressor,label position=left]
  {Compressor[0]} [.316,.410]
\WardleyComponent[id=sd-five-a-air-intake,label position=below left]
  {Air Intake} [.217,.410]

\WardleyLink{sd-five-a-aeroplane}{sd-five-a-turbine}
\WardleyLink{sd-five-a-turbine}{sd-five-a-exhaust}
\WardleyLink{sd-five-a-turbine}{sd-five-a-combustion}
\WardleyLink{sd-five-a-combustion}{sd-five-a-compressor}
\WardleyLink{sd-five-a-compressor}{sd-five-a-air-intake}
```

```

\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);
\SDFiveVisibilityLabels

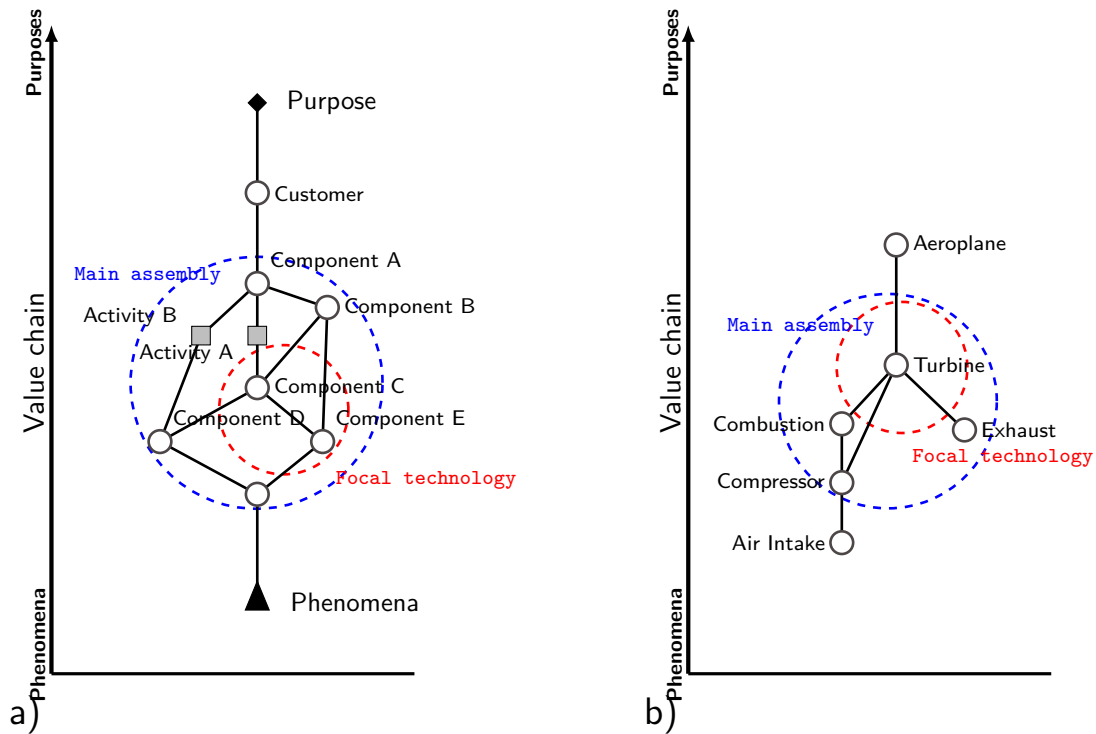
\WardleyComponent[id=sd-five-b-aeroplane,label position=above left]
  {Aeroplane} [.709,.716]
\WardleyComponent[id=sd-five-b-turbine,label position=above right]
  {T[1]} [.612,.788]
\WardleyComponent[
  id=sd-five-b-shrouds,label position=left,label distance=2mm
]{Shrouds \& Seals} [.560,.459]
\WardleyComponent[
  id=sd-five-b-blade-cooling,label position=left,label distance=2mm
]{Blade Cooling} [.494,.459]
\WardleyComponent[id=sd-five-b-combustion,label position=left]
  {Combustion} [.415,.584]
\WardleyComponent[id=sd-five-b-compressor,label position=right]
  {C[1]} [.316,.725]
\WardleyComponent[
  id=sd-five-b-anti-stall,label position=left,label distance=2mm
]{Anti-stall} [.277,.459]
\WardleyComponent[
  id=sd-five-b-vane-actuator,label position=left,label distance=2mm
]{Vane actuator} [.215,.459]
\WardleyComponent[id=sd-five-b-air-intake,label position=below left]
  {Air Intake} [.215,.584]
\WardleyComponent[id=sd-five-b-exhaust,label position=right]
  {Exhaust} [.405,.872]

\WardleyLink{sd-five-b-aeroplane}{sd-five-b-turbine}
\WardleyLink{sd-five-b-turbine}{sd-five-b-shrouds}
\WardleyLink{sd-five-b-turbine}{sd-five-b-blade-cooling}
\WardleyLink{sd-five-b-turbine}{sd-five-b-combustion}
\WardleyLink{sd-five-b-turbine}{sd-five-b-compressor}
\WardleyLink{sd-five-b-turbine}{sd-five-b-exhaust}
\WardleyLink{sd-five-b-combustion}{sd-five-b-compressor}
\WardleyLink{sd-five-b-compressor}{sd-five-b-anti-stall}
\WardleyLink{sd-five-b-compressor}{sd-five-b-vane-actuator}
\WardleyLink{sd-five-b-compressor}{sd-five-b-air-intake}

\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {b});
\end{wardleymap}%
\par
\endgroup

```

Figure 6



Purposed systems showing the main assembly and the focal technology, first generically and then for the jet engine.

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 6 source: figures/figure-06.tex

```
% Structural Deepening, Figure 6: main assemblies and focal technologies.
\begin{group}
\centering
\begin{wardleymap}[
width=4.80cm,
height=8.10cm,
style=structural,
format=structural,
canvas=white,
show evolution axis=false,
show value chain axis=true,
show stage separators=false,
show stage labels=false,
minor stage guides={},
show chart labels=false,
show visibility labels=true
]
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);

\begin{pgfonlayer}{wardley regions}
% Aspect-corrected radii make the Main Assembly boundary circular on the
% physical page despite the panel's unequal horizontal and vertical scale.
\draw[draw=blue,dashed,line width=1pt]
(.565,.475) ellipse [x radius=.347,y radius=.20563];
% The focal boundary is physically circular for the same reason.
\draw[draw=red,dashed,line width=1pt]
(.640,.431) ellipse [x radius=.178,y radius=.10548];
\end{pgfonlayer}

\WardleyAnchor[id=sd-six-a-purpose,show label=false]
{Purpose}[.932,.567]
\WardleyComponent[id=sd-six-a-customer,label position=right]
{Customer}[.785,.567]
\WardleyComponent[id=sd-six-a-component-a,label position=above right]
{Component A}[.637,.567]
\WardleyAnchor[id=sd-six-a-activity-a,show label=false]
{Activity A}[.552,.567]
\WardleyAnchor[id=sd-six-a-activity-b,show label=false]
{Activity B}[.552,.412]
\WardleyComponent[id=sd-six-a-component-b,label position=right]
{Component B}[.598,.760]
\WardleyComponent[id=sd-six-a-component-c,label position=right]
{Component C}[.467,.567]
```

```

\WardleyComponent[id=sd-six-a-component-d,label position=above right]
{Component D}[.379,.299]
\WardleyComponent[id=sd-six-a-component-e,label position=above right]
{Component E}[.379,.747]
\WardleyComponent[id=sd-six-a-foundation,show label=false]
{}[.293,.567]
\WardleyAnchor[id=sd-six-a-phenomena,show label=false]
{Phenomena}[.117,.567]

\WardleyLink{sd-six-a-purpose}{sd-six-a-customer}
\WardleyLink{sd-six-a-customer}{sd-six-a-component-a}
\WardleyLink{sd-six-a-component-a}{sd-six-a-activity-a}
\WardleyLink{sd-six-a-component-a}{sd-six-a-activity-b}
\WardleyLink{sd-six-a-component-a}{sd-six-a-component-b}
\WardleyLink{sd-six-a-activity-a}{sd-six-a-component-c}
\WardleyLink{sd-six-a-activity-b}{sd-six-a-component-d}
\WardleyLink{sd-six-a-component-b}{sd-six-a-component-c}
\WardleyLink{sd-six-a-component-b}{sd-six-a-component-e}
\WardleyLink{sd-six-a-component-c}{sd-six-a-component-d}
\WardleyLink{sd-six-a-component-c}{sd-six-a-component-e}
\WardleyLink{sd-six-a-component-d}{sd-six-a-foundation}
\WardleyLink{sd-six-a-component-e}{sd-six-a-foundation}
\WardleyLink{sd-six-a-foundation}{sd-six-a-phenomena}

\node[diamond,draw=black,fill=black,minimum size=7pt,inner sep=0pt]
at (.567,.932) {};
\node[rectangle,draw=black,fill=black!25,minimum size=7pt,inner sep=0pt]
at (.567,.552) {};
\node[rectangle,draw=black,fill=black!25,minimum size=7pt,inner sep=0pt]
at (.412,.552) {};
\node[isosceles triangle,shape border rotate=90,draw=black,fill=black,
minimum size=9pt,inner sep=0pt] at (.567,.117) {};

\node[anchor=west,font=\sffamily\small] at (.620,.932) {Purpose};
\node[anchor=east,font=\sffamily\scriptsize] at (.530,.522) {Activity A};
\node[anchor=east,font=\sffamily\scriptsize] at (.375,.582) {Activity B};
\node[anchor=west,font=\sffamily\small] at (.630,.117) {Phenomena};
\node[anchor=west,font=\ttfamily\scriptsize,text=blue]
at (.035,.650) {Main assembly};
\node[anchor=west,font=\ttfamily\scriptsize,text=red]
at (.755,.316) {Focal technology};

\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {a});
\end{wardleymap}%
\hspace{1.05cm}%
\begin{wardleymap}[
width=4.80cm,
height=8.10cm,
style=structural,
format=structural,
canvas=white,
show evolution axis=false,
show value chain axis=true,
show stage separators=false,
show stage labels=false,
minor stage guides={},
show chart labels=false,
show visibility labels=true
]
\draw[draw=black,line width=1.2pt] (0,0) -- (1,0);

\begin{pgfonlayer}{wardley regions}
\draw[draw=blue,dashed,line width=1pt]
(.550,.445) ellipse [x radius=.300,y radius=.175];
\draw[draw=red,dashed,line width=1pt]
(.589,.500) ellipse [x radius=.180,y radius=.107];
\end{pgfonlayer}

\WardleyComponent[id=sd-six-b-aeroplane,label position=right]
{Aeroplane}[.700,.573]
\WardleyComponent[id=sd-six-b-turbine,label position=right]
{Turbine}[.504,.573]
\WardleyComponent[id=sd-six-b-combustion,label position=left]
{Combustion}[.408,.423]
\WardleyComponent[id=sd-six-b-compressor,label position=left]
{Compressor}[.312,.423]
\WardleyComponent[id=sd-six-b-air-intake,label position=left]
{Air Intake}[.214,.423]
\WardleyComponent[id=sd-six-b-exhaust,label position=right]
{Exhaust}[.398,.761]

\WardleyLink{sd-six-b-aeroplane}{sd-six-b-turbine}
\WardleyLink{sd-six-b-turbine}{sd-six-b-combustion}
\WardleyLink{sd-six-b-turbine}{sd-six-b-compressor}
\WardleyLink{sd-six-b-turbine}{sd-six-b-exhaust}
\WardleyLink{sd-six-b-combustion}{sd-six-b-compressor}
\WardleyLink{sd-six-b-compressor}{sd-six-b-air-intake}

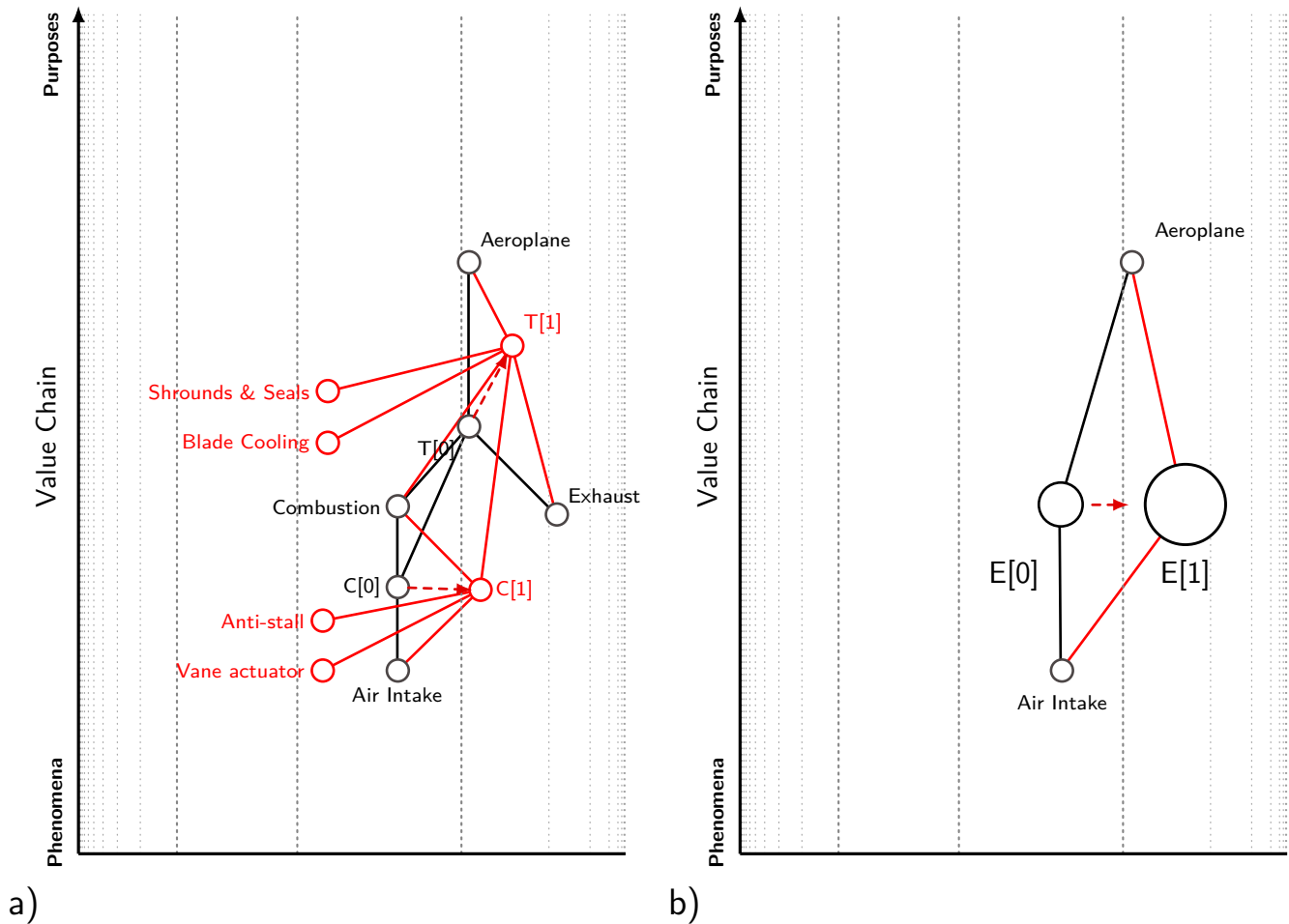
\node[anchor=west,font=\ttfamily\scriptsize,text=blue]
at (.080,.566) {Main assembly};

```

```
\node[anchor=west,font=\ttfamily\scriptsize,text=red]
  at (.590,.352) {Focal technology};

\node[anchor=north east,font=\sffamily\Large] at (0,-.018) {b});
\end{wardleymap}%
\par
\endgroup
```

Figure 7



Evolution of the main assembly: component-level changes and the shorthand transition from E[0] to E[1].

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 7 source: figures/figure-07.tex

```
% Structural Deepening, Figure 7: detailed and aggregate views of assembly growth.
% This is a fragment for inclusion in the standalone example document.
\begin{group}
\centering
\begin{wardleymap}[
width=17.4cm,
aspect ratio=750/535,
style=structural,
format=structural,
canvas=white,
show evolution axis=false,
show value chain axis=false,
show stage separators=false,
show stage labels=false,
show chart labels=false,
show visibility labels=false,
minor stage guides={},
trace=true
]
\tikzset{
sd seven red component/.style={draw=red},
sd seven red label/.style={text=red},
sd seven aggregate movement/.style={
dashed,shorten <=3.5mm,shorten >=6.5mm
}
}
}

% Figure 7 has two independent map panels. Keep the structural profile for
% semantic glyphs and typography, but compose the duplicated frames locally.
\foreach \sdorigin in {.035,.555}{
\foreach \sdguide in {
.002,.004,.007,.011,.018,.028,.045,.071,.113,
.860,.935,.970,.986,.993,.997,.998,.999
}{
```

```

\draw[draw=black!38,line width=.4pt,dotted,line cap=round]
  ({\sdorigin+.43*\sdguide},.06) --
  ({\sdorigin+.43*\sdguide},.985);
}
\foreach \sdguide in {.18,.40,.70}{
  \draw[draw=black!48,line width=.8pt,dotted,line cap=round]
    ({\sdorigin+.43*\sdguide},.06) --
    ({\sdorigin+.43*\sdguide},.985);
}
\draw[draw=black,line width=1.2pt]
  ({\sdorigin},.06) -- ({\sdorigin+.43},.06);
\draw[draw=black,line width=1.2pt,
  -{Latex[length=2.3mm,width=1.8mm]}]
  ({\sdorigin},.06) -- ({\sdorigin},.995);
\node[rotate=90,anchor=south,font=\sffamily\normalsize]
  at ({\sdorigin-.010},.52) {Value Chain};
\node[rotate=90,anchor=south,font=\sffamily\scriptsize\bfseries]
  at ({\sdorigin-.005},.94) {Purposes};
\node[rotate=90,anchor=south,font=\sffamily\scriptsize\bfseries]
  at ({\sdorigin-.005},.105) {Phenomena};
}
\node[anchor=north east,font=\sffamily\Large] at (.012,.035) {a});
\node[anchor=north east,font=\sffamily\Large] at (.532,.035) {b});

% Panel a: the original engine (black) and its structurally deepened
% successor (red) are superimposed on the same map.
\WardleyComponent[
  id=sd-seven-a-aeroplane,label position=above right
]{Aeroplane} [.712,.342]
\WardleyComponent[
  id=sd-seven-a-t0,label position=below left
]{T[0]} [.531,.342]
\WardleyComponent[
  id=sd-seven-a-combustion,label position=left
]{Combustion} [.443,.286]
\WardleyComponent[
  id=sd-seven-a-c0,label position=left
]{C[0]} [.354,.286]
\WardleyComponent[
  id=sd-seven-a-air-intake,label position=below
]{Air Intake} [.262,.286]
\WardleyComponent[
  id=sd-seven-a-exhaust,label position=above right
]{Exhaust} [.434,.411]

\WardleyComponent[
  id=sd-seven-a-t1,label position=above right,
  style={sd seven red component},label style={sd seven red label}
]{T[1]} [.620,.376]
\WardleyComponent[
  id=sd-seven-a-c1,label position=right,
  style={sd seven red component},label style={sd seven red label}
]{C[1]} [.351,.351]
\WardleyComponent[
  id=sd-seven-a-shrouds,label position=left,label distance=2mm,
  style={sd seven red component},label style={sd seven red label}
]{Shrouds & Seals} [.570,.231]
\WardleyComponent[
  id=sd-seven-a-blade-cooling,label position=left,label distance=2mm,
  style={sd seven red component},label style={sd seven red label}
]{Blade Cooling} [.513,.231]
\WardleyComponent[
  id=sd-seven-a-anti-stall,label position=left,label distance=2mm,
  style={sd seven red component},label style={sd seven red label}
]{Anti-stall} [.317,.227]
\WardleyComponent[
  id=sd-seven-a-vane-actuator,label position=left,label distance=2mm,
  style={sd seven red component},label style={sd seven red label}
]{Vane actuator} [.262,.227]

\WardleyLink{sd-seven-a-aeroplane}{sd-seven-a-t0}
\WardleyLink{sd-seven-a-t0}{sd-seven-a-combustion}
\WardleyLink{sd-seven-a-t0}{sd-seven-a-c0}
\WardleyLink{sd-seven-a-t0}{sd-seven-a-exhaust}
\WardleyLink{sd-seven-a-combustion}{sd-seven-a-c0}
\WardleyLink{sd-seven-a-c0}{sd-seven-a-air-intake}

\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-aeroplane}{sd-seven-a-t1}
\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-t1}{sd-seven-a-shrouds}
\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-t1}{sd-seven-a-blade-cooling}
\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-t1}{sd-seven-a-combustion}
\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-t1}{sd-seven-a-c1}
\WardleyLink[color=red,line width=1pt]
  {sd-seven-a-t1}{sd-seven-a-exhaust}
\WardleyLink[color=red,line width=1pt]

```



```

    {sd-seven-a-combustion}{sd-seven-a-c1}
\WardleyLink[color=red,line width=1pt]
    {sd-seven-a-c1}{sd-seven-a-anti-stall}
\WardleyLink[color=red,line width=1pt]
    {sd-seven-a-c1}{sd-seven-a-vane-actuator}
\WardleyLink[color=red,line width=1pt]
    {sd-seven-a-c1}{sd-seven-a-air-intake}

\WardleyEvolve[
    id=sd-seven-turbine-shift,
    target visibility=.620,
    show target=false,
    color=red,
    line width=1pt,
    arrowhead={\Latex[length=2.2mm,width=1.7mm]},
    style={dashed}
]{sd-seven-a-t0}{.376}
\WardleyEvolve[
    id=sd-seven-compressor-shift,
    target visibility=.351,
    show target=false,
    color=red,
    line width=1pt,
    arrowhead={\Latex[length=2.2mm,width=1.7mm]},
    style={dashed}
]{sd-seven-a-c0}{.351}

% Panel b: semantic dependency points with locally drawn, size-coded
% aggregate nodes. The rings intentionally grow with assembly complexity.
\WardleyComponent[
    id=sd-seven-b-aeroplane,show label=false
]{Panel B aeroplane}[.712,.863]
\WardleyComponent[
    id=sd-seven-b-air-intake,show label=false
]{Panel B air intake}[.262,.808]
\WardleyComponent[
    id=sd-seven-b-e0,show marker=false,show label=false
]{Panel B E0 point}[.445,.807]
\WardleyComponent[
    id=sd-seven-b-e1,show marker=false,show label=false
]{Panel B E1 point}[.445,.905]

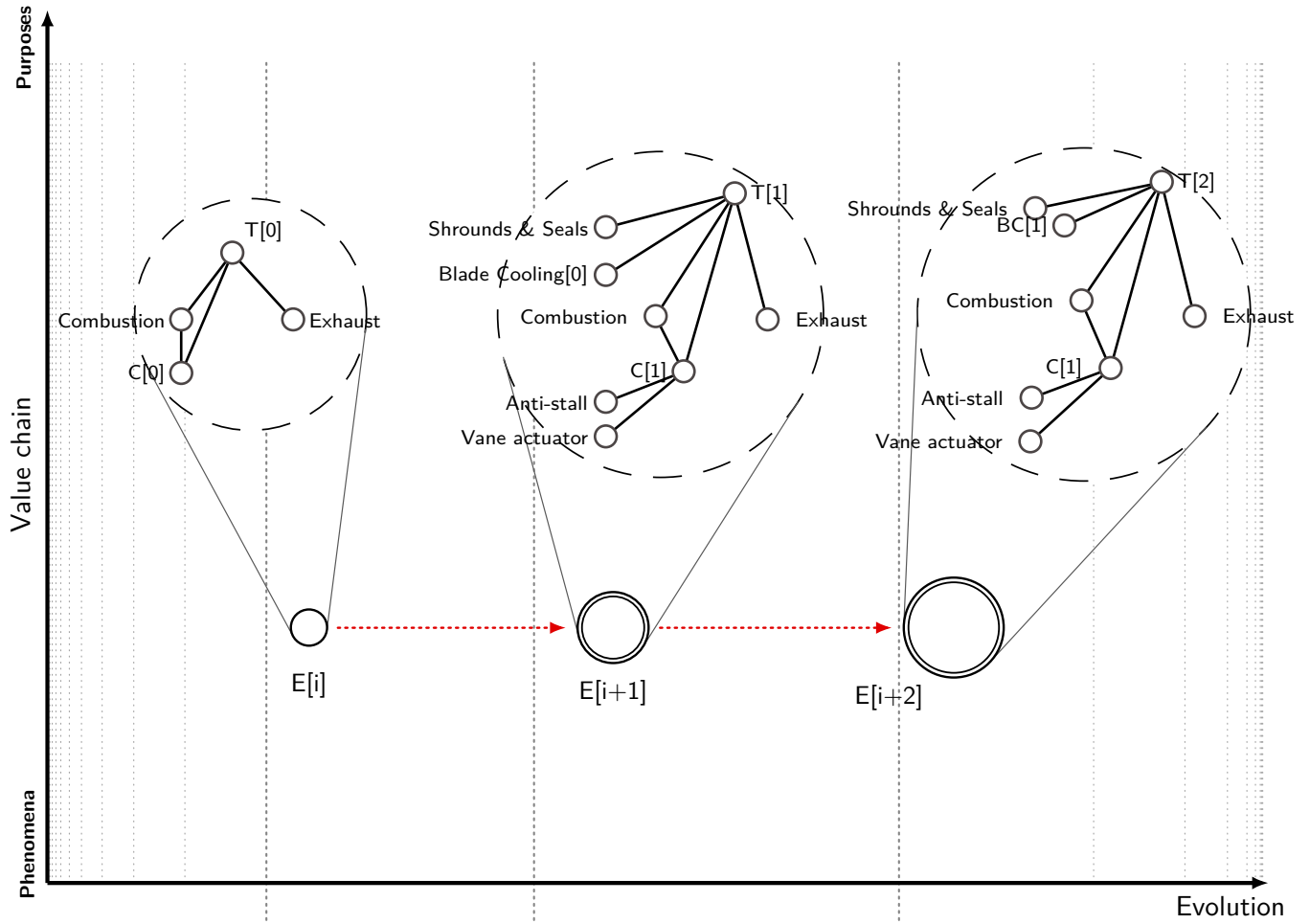
\node[anchor=south west,font=\sffamily\scriptsize]
    at (.873,.725) {Aeroplane};
\node[anchor=north,font=\sffamily\scriptsize]
    at (.808,.246) {Air Intake};

\WardleyLink{sd-seven-b-aeroplane}{sd-seven-b-e0}
\WardleyLink{sd-seven-b-e0}{sd-seven-b-air-intake}
\WardleyLink[color=red,line width=1pt]
    {sd-seven-b-aeroplane}{sd-seven-b-e1}
\WardleyLink[color=red,line width=1pt]
    {sd-seven-b-e1}{sd-seven-b-air-intake}
\WardleyEvolve[
    id=sd-seven-assembly-shift,
    target visibility=.445,
    show target=false,
    color=red,
    line width=1pt,
    arrowhead={\Latex[length=2.2mm,width=1.7mm]},
    style={sd seven aggregate movement}
]{sd-seven-b-e0}{.905}

\node[circle,draw=black,fill=white,line width=1pt,
    minimum size=6mm,inner sep=0pt] at (.807,.445) {};
\node[circle,draw=black,fill=white,line width=1.1pt,
    minimum size=11mm,inner sep=0pt] at (.905,.445) {};
\node[anchor=north east,font=\sffamily\large]
    at (.798,.395) {E[0]};
\node[anchor=north,font=\sffamily\large]
    at (.905,.395) {E[1]};
\end{wardleymap}
\par
\endgroup

```

Figure 8



Structural deepening across three increasingly elaborate main assemblies, shown as $E[i]$, $E[i+1]$, and $E[i+2]$.

Vector reconstruction adapted from A. P. Moore, *Structural Deepening* (2020), CC BY-SA 4.0.

Figure 8 source: figures/figure-08.tex

```
% Structural Deepening, Figure 8: three stages of structural deepening.
% This is a fragment for inclusion in the standalone example document.
\begin{group}
% Draw both common external tangents between two circular nodes. The
% homothety centre and tangent points are calculated in physical page space,
% so the construction remains exact inside a non-uniformly scaled map.
\newcommand{\SDEExternalTangents}[6] [] {%
  \begin{group}
    \pgfmathsetmacro{\SDt}{\#4/(\#4-\#6)}%
    \begin{scope}[reset cm]
      \coordinate (#2-h) at (\$ (\#3.center)! \SDt! (\#5.center) \$);
      \draw[line cap=butt, #1]
        (tangent cs:node=\#3,point={(\#2-h)},solution=1) --
        (tangent cs:node=\#5,point={(\#2-h)},solution=1);
      \draw[line cap=butt, #1]
        (tangent cs:node=\#3,point={(\#2-h)},solution=2) --
        (tangent cs:node=\#5,point={(\#2-h)},solution=2);
    \end{scope}
  \end{group}
}
\centering
\begin{wardleymap}[
  width=16.8cm,
  aspect ratio=815/552,
  style=structural,
  format=structural,
  canvas=white,
  stage boundaries={.18,.40,.70},
  show stage separators=true,
  show stage labels=false,
  show chart labels=false,
  show visibility labels=true,
  trace=true
]
```

```

\tikzset{
  sd eight shift one/.style={
    dotted,shorten <=3mm,shorten >=5.5mm
  },
  sd eight shift two/.style={
    dotted,shorten <=5.5mm,shorten >=7.5mm
  }
}

% Dashed contours are magnified views rather than semantic regions. Their
% connectors are likewise explanatory lines, not component dependencies.
\begin{pgfonlayer}{wardley regions}
  \node[circle,draw=black,fill=white,dashed,
    dash pattern=on 4mm off 3mm,line width=.65pt,
    minimum size=32mm,inner sep=0pt,outer sep=0pt]
    (sd-eight-assembly-i) at (.167,.690) {};
  \node[circle,draw=black,fill=white,dashed,
    dash pattern=on 4mm off 3mm,line width=.65pt,
    minimum size=45mm,inner sep=0pt,outer sep=0pt]
    (sd-eight-assembly-i-plus-one) at (.504,.690) {};
  \node[circle,draw=black,fill=white,dashed,
    dash pattern=on 4mm off 3mm,line width=.65pt,
    minimum size=46mm,inner sep=0pt,outer sep=0pt]
    (sd-eight-assembly-i-plus-two) at (.852,.690) {};
\end{pgfonlayer}

% E[i]: the compact original assembly.
\WardleyComponent[
  id=sd-eight-left-t0,label position=above right
]{T[0]}.765,.152]
\WardleyComponent[
  id=sd-eight-left-combustion,label position=left
]{Combustion}.684,.110]
\WardleyComponent[
  id=sd-eight-left-c0,label position=left
]{C[0]}.619,.110]
\WardleyComponent[
  id=sd-eight-left-exhaust,label position=right
]{Exhaust}.684,.202]
\WardleyLink{sd-eight-left-t0}{sd-eight-left-combustion}
\WardleyLink{sd-eight-left-t0}{sd-eight-left-c0}
\WardleyLink{sd-eight-left-t0}{sd-eight-left-exhaust}
\WardleyLink{sd-eight-left-combustion}{sd-eight-left-c0}

% E[i+1]: the turbine and compressor gain supporting subsystems.
\WardleyComponent[
  id=sd-eight-middle-t1,label position=right
]{T[1]}.837,.565]
\WardleyComponent[
  id=sd-eight-middle-shrouds,label position=left,label distance=2mm
]{Shrouds & Seals}.796,.459]
\WardleyComponent[
  id=sd-eight-middle-blade,label position=left,label distance=2mm
]{Blade Cooling[0]}.738,.459]
\WardleyComponent[
  id=sd-eight-middle-combustion,show label=false
]{Middle combustion}.688,.500]
\WardleyComponent[
  id=sd-eight-middle-c1,label position=left
]{C[1]}.621,.523]
\WardleyComponent[
  id=sd-eight-middle-exhaust,show label=false
]{Middle exhaust}.684,.592]
\WardleyComponent[
  id=sd-eight-middle-anti-stall,label position=left,label distance=2mm
]{Anti-stall}.584,.459]
\WardleyComponent[
  id=sd-eight-middle-vane,label position=left,label distance=2mm
]{Vane actuator}.542,.459]

\WardleyLink{sd-eight-middle-t1}{sd-eight-middle-shrouds}
\WardleyLink{sd-eight-middle-t1}{sd-eight-middle-blade}
\WardleyLink{sd-eight-middle-t1}{sd-eight-middle-combustion}
\WardleyLink{sd-eight-middle-t1}{sd-eight-middle-c1}
\WardleyLink{sd-eight-middle-t1}{sd-eight-middle-exhaust}
\WardleyLink{sd-eight-middle-combustion}{sd-eight-middle-c1}
\WardleyLink{sd-eight-middle-c1}{sd-eight-middle-anti-stall}
\WardleyLink{sd-eight-middle-c1}{sd-eight-middle-vane}

% E[i+2]: blade cooling evolves from the named subsystem to BC[1].
\WardleyComponent[
  id=sd-eight-right-t2,label position=right
]{T[2]}.851,.916]
\WardleyComponent[
  id=sd-eight-right-shrouds,show label=false
]{Right shrouds and seals}.819,.812]
\WardleyComponent[
  id=sd-eight-right-bc1,label position=left
]{BC[1]}.798,.836]
\WardleyComponent[

```

```

    id=sd-eight-right-combustion,show label=false
  ]{Right combustion} [.707,.850]
  \WardleyComponent[
    id=sd-eight-right-c1,show label=false
  ]{Right C1} [.625,.874]
  \WardleyComponent[
    id=sd-eight-right-exhaust,show label=false
  ]{Right exhaust} [.688,.943]
  \WardleyComponent[
    id=sd-eight-right-anti-stall,show label=false
  ]{Right anti-stall} [.589,.809]
  \WardleyComponent[
    id=sd-eight-right-vane,show label=false
  ]{Right vane actuator} [.536,.808]

% The registry requires display names to be unique within a map. Repeated
% labels in the magnified states are therefore local presentation labels.
\node[anchor=east,font=\sffamily\scriptsize] at (.485,.688) {Combustion};
\node[anchor=west,font=\sffamily\scriptsize] at (.607,.684) {Exhaust};
\node[anchor=east,font=\sffamily\scriptsize] at (.797,.819)
  {Shrouds \& Seals};
\node[anchor=east,font=\sffamily\scriptsize] at (.835,.707) {Combustion};
\node[anchor=east,font=\sffamily\scriptsize] at (.859,.625) {C[1]};
\node[anchor=west,font=\sffamily\scriptsize] at (.958,.688) {Exhaust};
\node[anchor=east,font=\sffamily\scriptsize] at (.794,.589) {Anti-stall};
\node[anchor=east,font=\sffamily\scriptsize] at (.793,.536) {Vane actuator};

\WardleyLink{sd-eight-right-t2}{sd-eight-right-shrouds}
\WardleyLink{sd-eight-right-t2}{sd-eight-right-bc1}
\WardleyLink{sd-eight-right-t2}{sd-eight-right-combustion}
\WardleyLink{sd-eight-right-t2}{sd-eight-right-c1}
\WardleyLink{sd-eight-right-t2}{sd-eight-right-exhaust}
\WardleyLink{sd-eight-right-combustion}{sd-eight-right-c1}
\WardleyLink{sd-eight-right-c1}{sd-eight-right-anti-stall}
\WardleyLink{sd-eight-right-c1}{sd-eight-right-vane}

% Aggregate assembly states are semantic points. Native TikZ rings encode
% their increasing size; evolution remains a Wardley semantic movement.
\WardleyComponent[
  id=sd-eight-e0,show marker=false,show label=false
]{Aggregate state i} [.310,.215]
\WardleyComponent[
  id=sd-eight-e1,show marker=false,show label=false
]{Aggregate state i plus 1} [.310,.465]
\WardleyComponent[
  id=sd-eight-e2,show marker=false,show label=false
]{Aggregate state i plus 2} [.310,.745]

\WardleyEvolve[
  id=sd-eight-shift-one,
  target visibility=.310,
  show target=false,
  color=red,
  line width=.9pt,
  arrowhead={\Latex[length=2.2mm,width=1.7mm]},
  style={sd eight shift one}
]{sd-eight-e0}{.465}
\WardleyEvolve[
  id=sd-eight-shift-two,
  target visibility=.310,
  show target=false,
  color=red,
  line width=.9pt,
  arrowhead={\Latex[length=2.2mm,width=1.7mm]},
  style={sd eight shift two}
]{sd-eight-e1}{.745}

\node[circle,draw=black,fill=white,line width=.9pt,
  minimum size=5mm,inner sep=0pt,outer sep=0pt]
  (sd-eight-ring-i) at (.215,.310) {};
\node[circle,draw=black,fill=white,line width=.9pt,
  minimum size=9.8mm,inner sep=0pt,outer sep=0pt]
  (sd-eight-ring-i-plus-one) at (.465,.310) {};
\node[circle,draw=black,fill=white,line width=.7pt,
  minimum size=8.6mm,inner sep=0pt] at (.465,.310) {};
\node[circle,draw=black,fill=white,line width=.9pt,
  minimum size=13.8mm,inner sep=0pt,outer sep=0pt]
  (sd-eight-ring-i-plus-two) at (.745,.310) {};
\node[circle,draw=black,fill=white,line width=.7pt,
  minimum size=12.5mm,inner sep=0pt] at (.745,.310) {};

% Each pair of lines denotes a magnified view. They are the two common
% external tangents of the E ring and its enlarged assembly boundary.
\begin{pgfonlayer}{wardley regions}
  \SDExternalTangents[draw=black!65,line width=.45pt]
    {sd-eight-tangents-i}{sd-eight-ring-i}{2.5}
    {sd-eight-assembly-i}{16}
  \SDExternalTangents[draw=black!65,line width=.45pt]
    {sd-eight-tangents-i-plus-one}{sd-eight-ring-i-plus-one}{4.9}
    {sd-eight-assembly-i-plus-one}{22.5}

```

```

\SDExternalTangents[draw=black!65,line width=.45pt]
  {sd-eight-tangents-i-plus-two}{sd-eight-ring-i-plus-two}{6.9}
  {sd-eight-assembly-i-plus-two}{23}
\end{pgfonlayer}

\node[anchor=north,font=\sffamily\small] at (.215,.268) {E[i]};
\node[anchor=north,font=\sffamily\small] at (.465,.258) {E[i+1]};
\node[anchor=north east,font=\sffamily\small] at (.728,.252) {E[i+2]};
\end{wardleymap}
\par
\endgroup

```