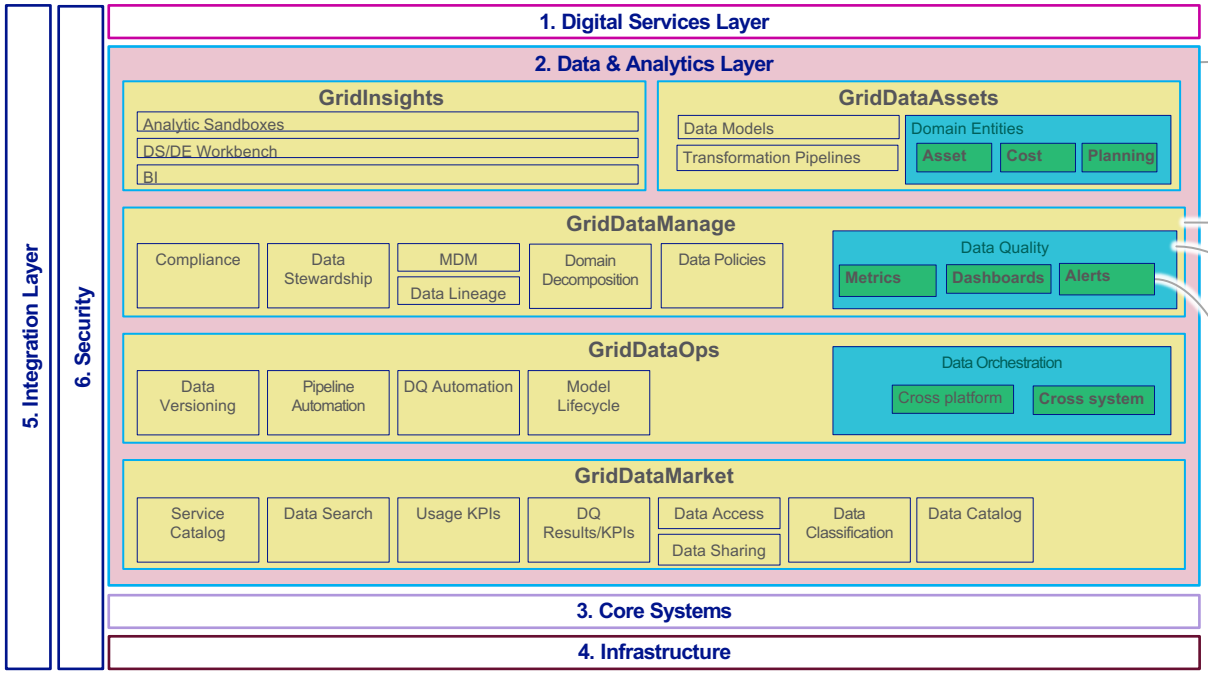
Full Map

Illustrative

Recall: 4 Levels of Capability Reference Architecture

FN example: Capability reference helps ground users



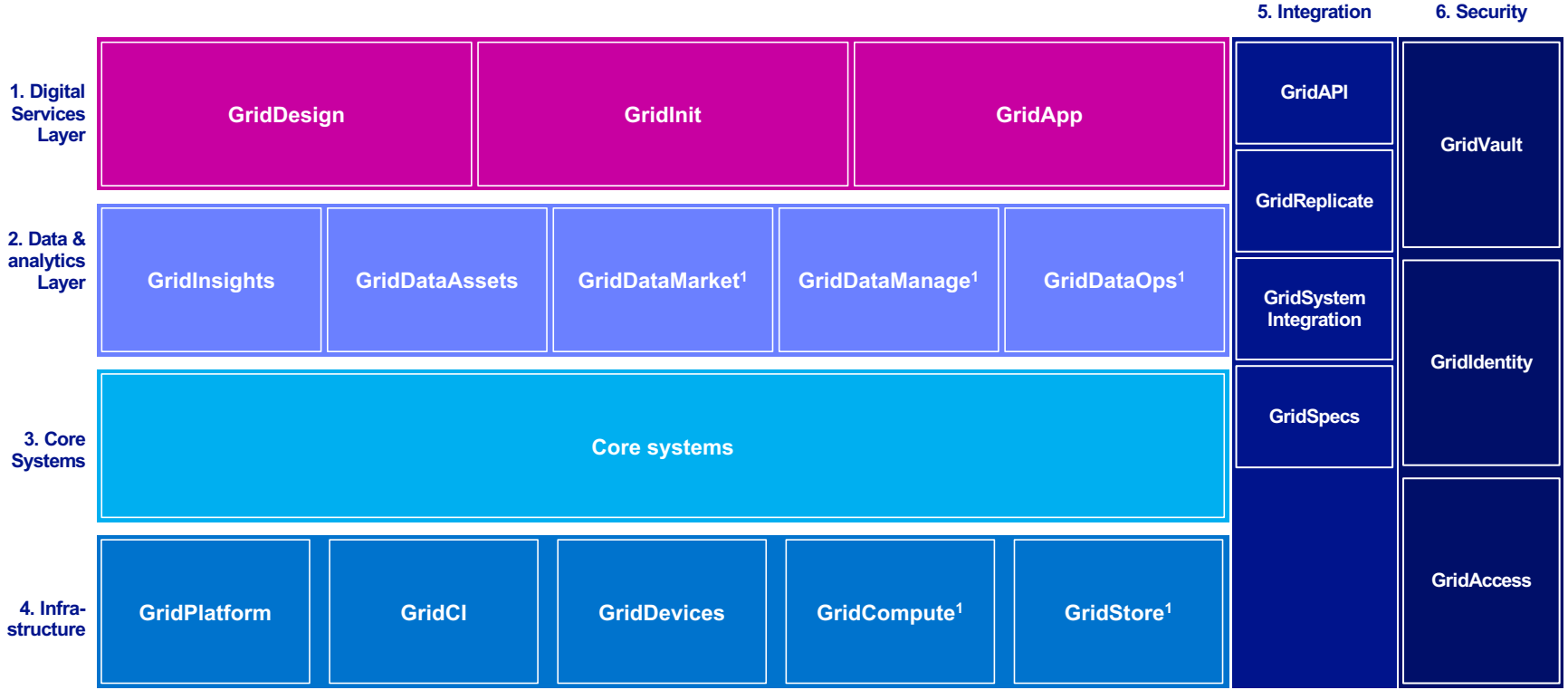
L1 Stack level
e.g. Data and Analytics
The layer of the stack that defines the fundamental area of scope, for the FN example we focus on data & analytics

L2 Product level
e.g. GridDataManage
The GridStack platform product level. For FN the D&A products required are DataAssets, DataManage and DataOps

L3 Capability level
e.g. Data Quality
Primary capabilities within each GridStack product. In FN data quality measures input and output before sending to C55

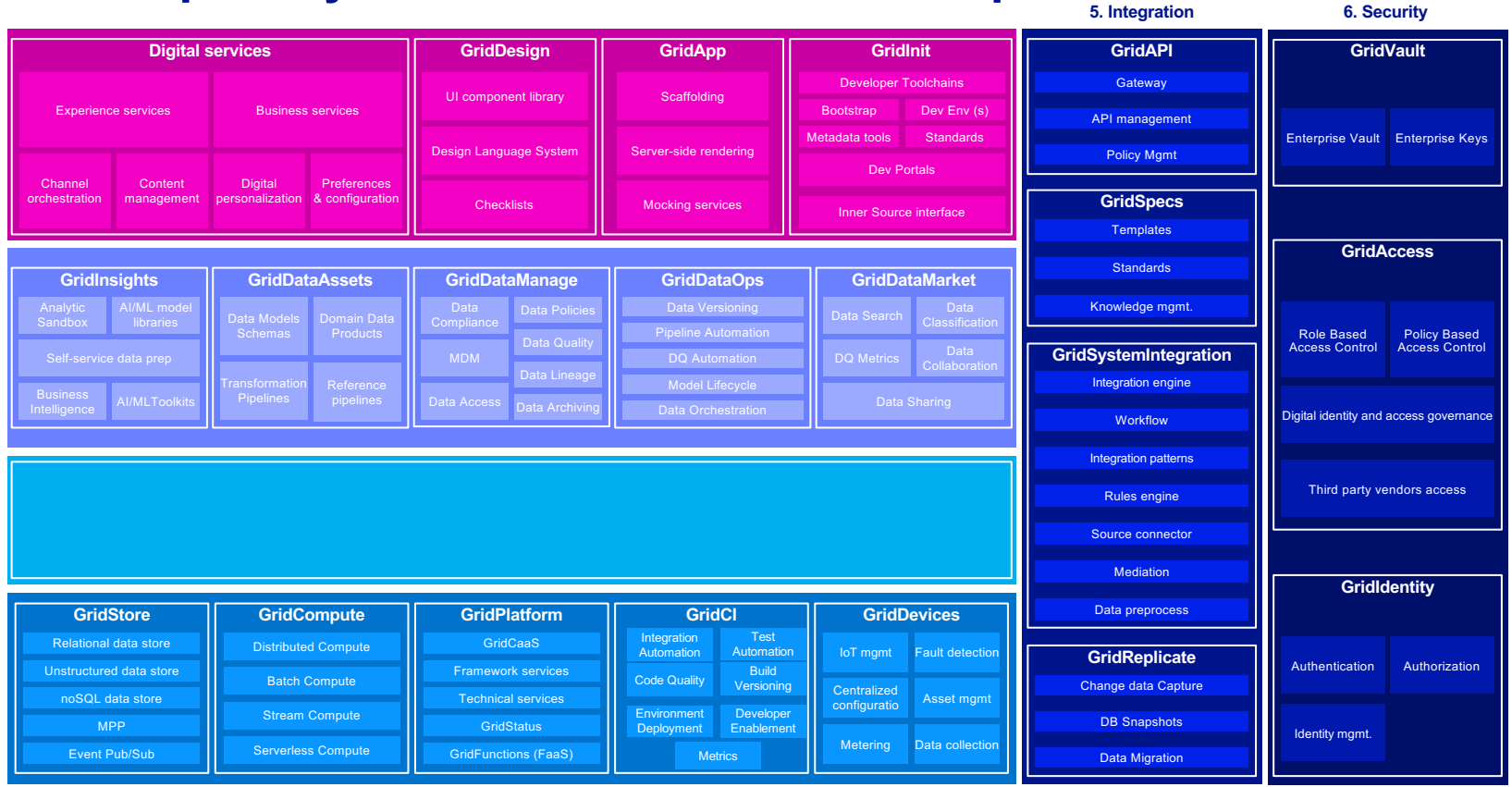
L4 Epic / Feature level
e.g. Alerts
The epic level features for a capability, such as the alerts that can be automatically sent and generated upon identifying data quality issues in FN

Level 2 articulates the GridStack products under consideration by the blueprint



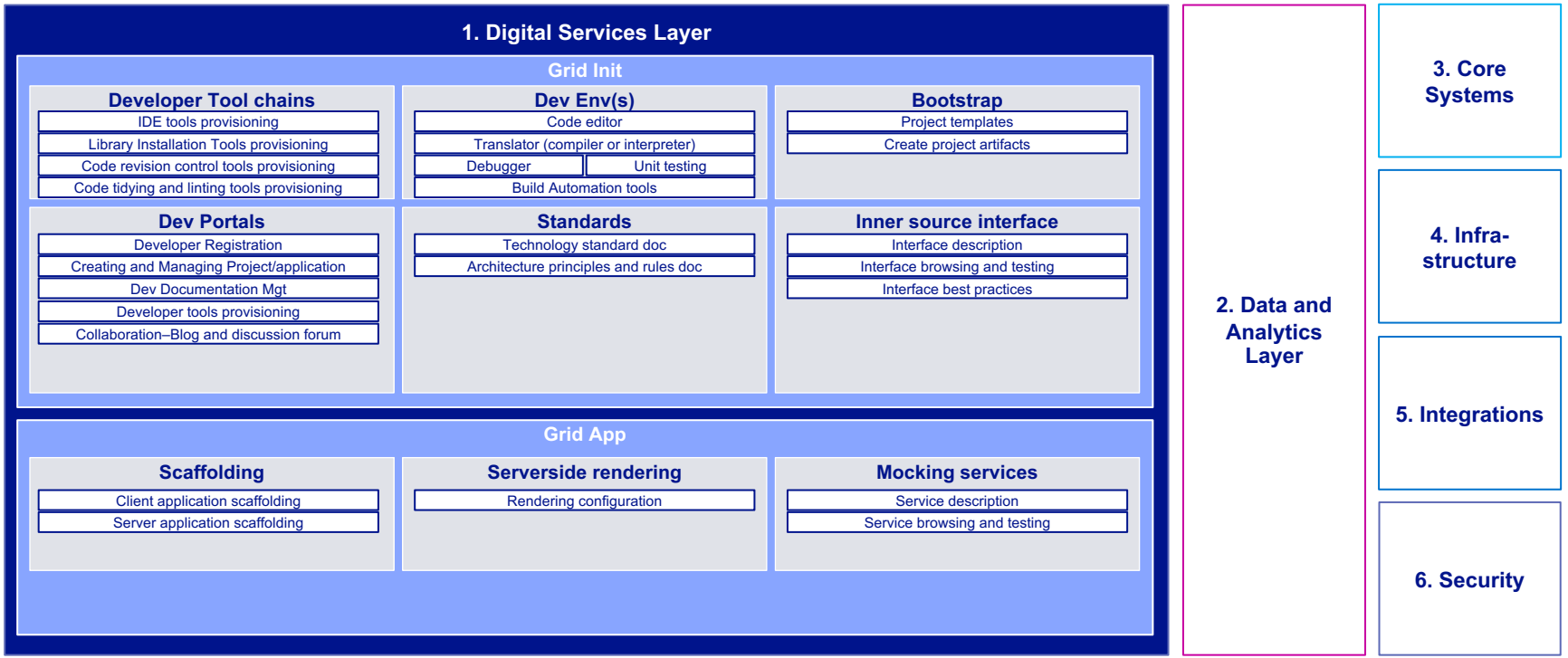
1. Used to be GridLake

L3 - The Capability North Star consists of ~20 products

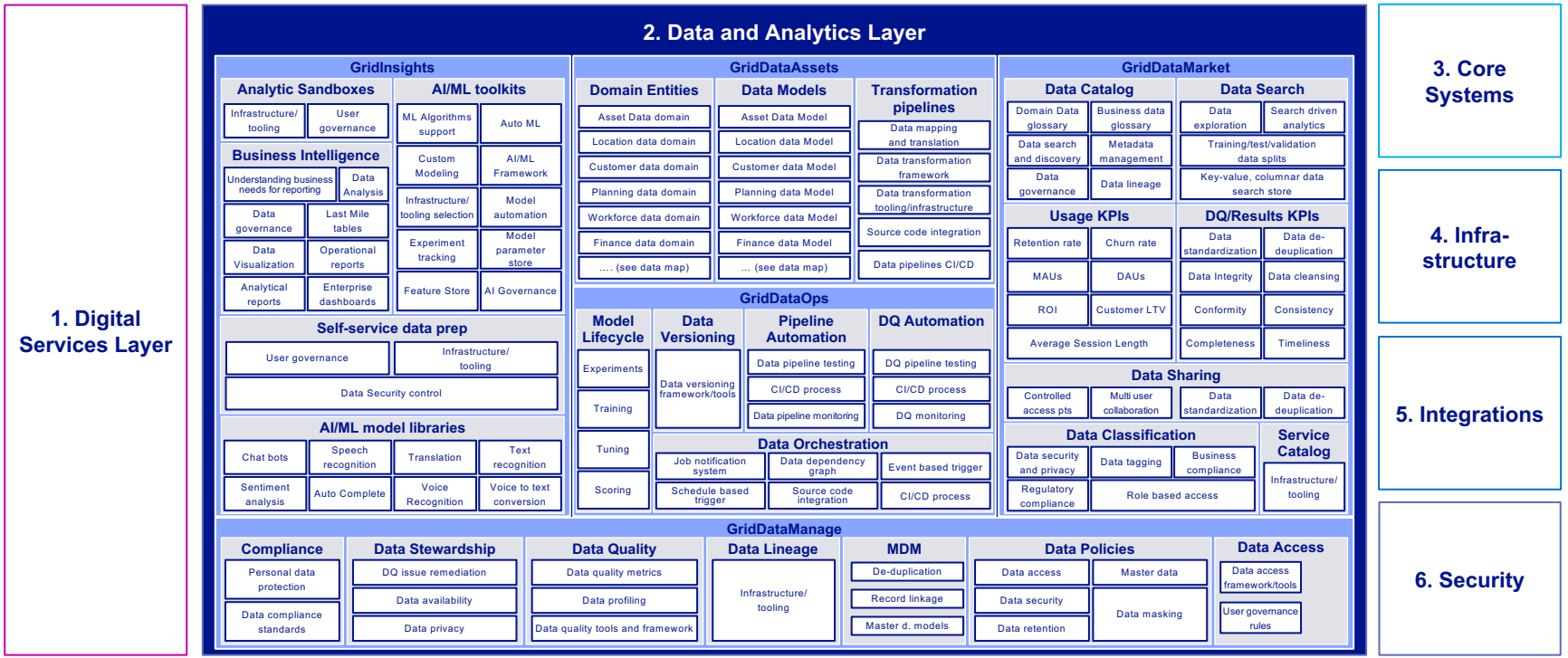


1. Analysis of Gridstack capabilities may lead to restructuring the current products into more or less products, especially GridFunctions and GridLake

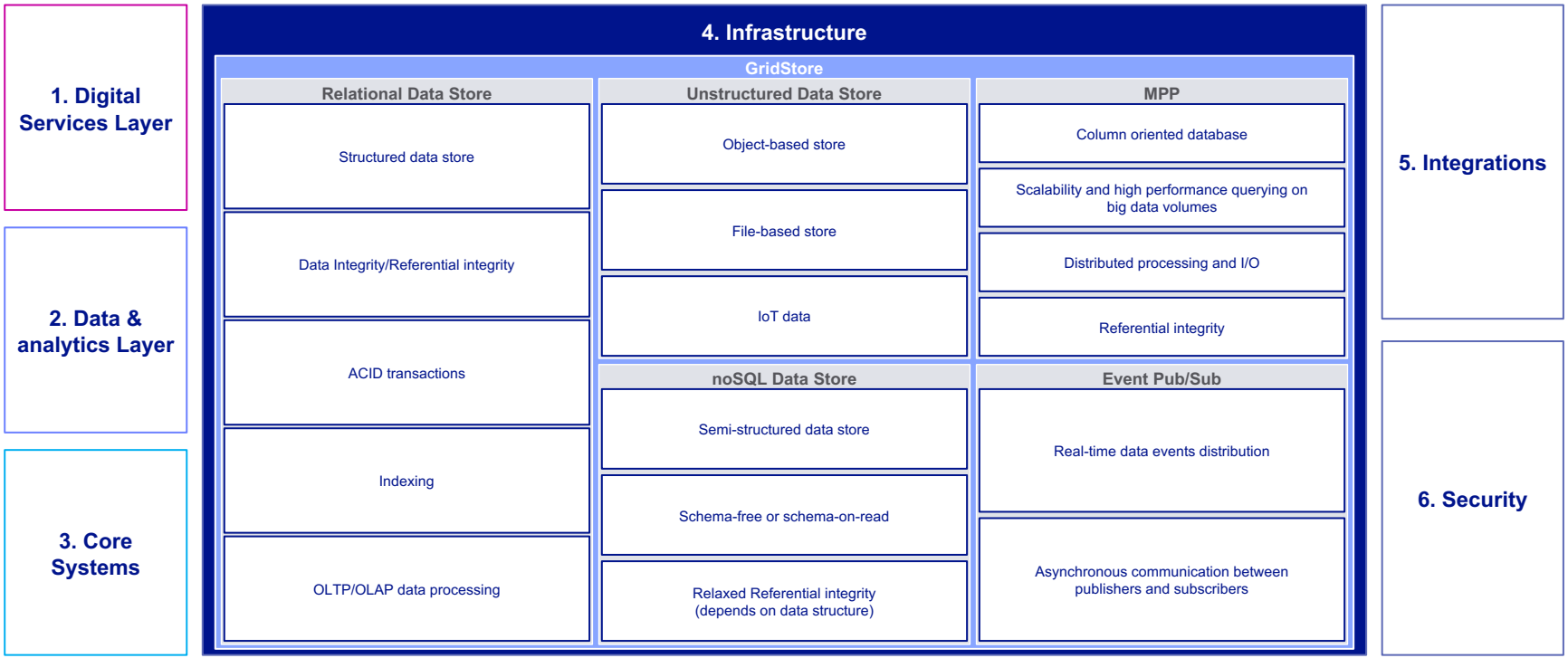
L4 - Digital services layer



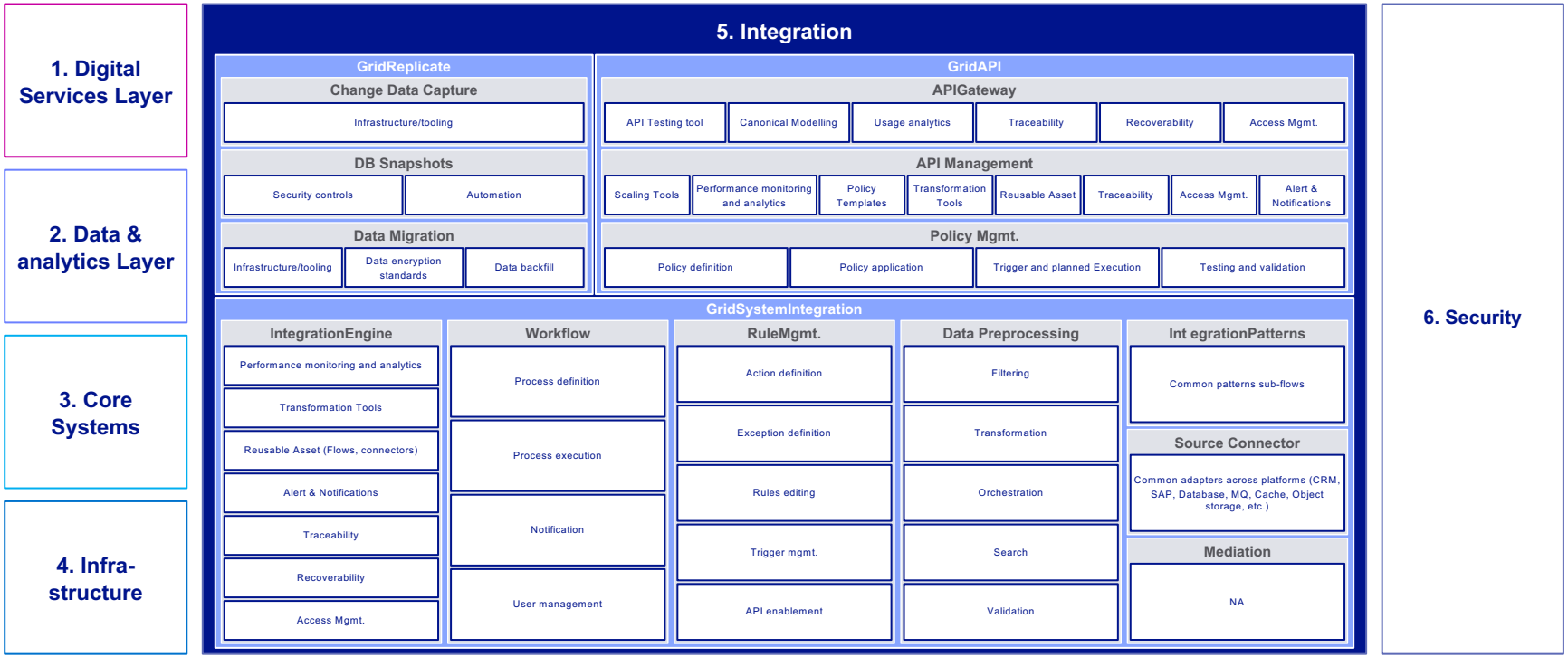
L4 - Data & Analytics



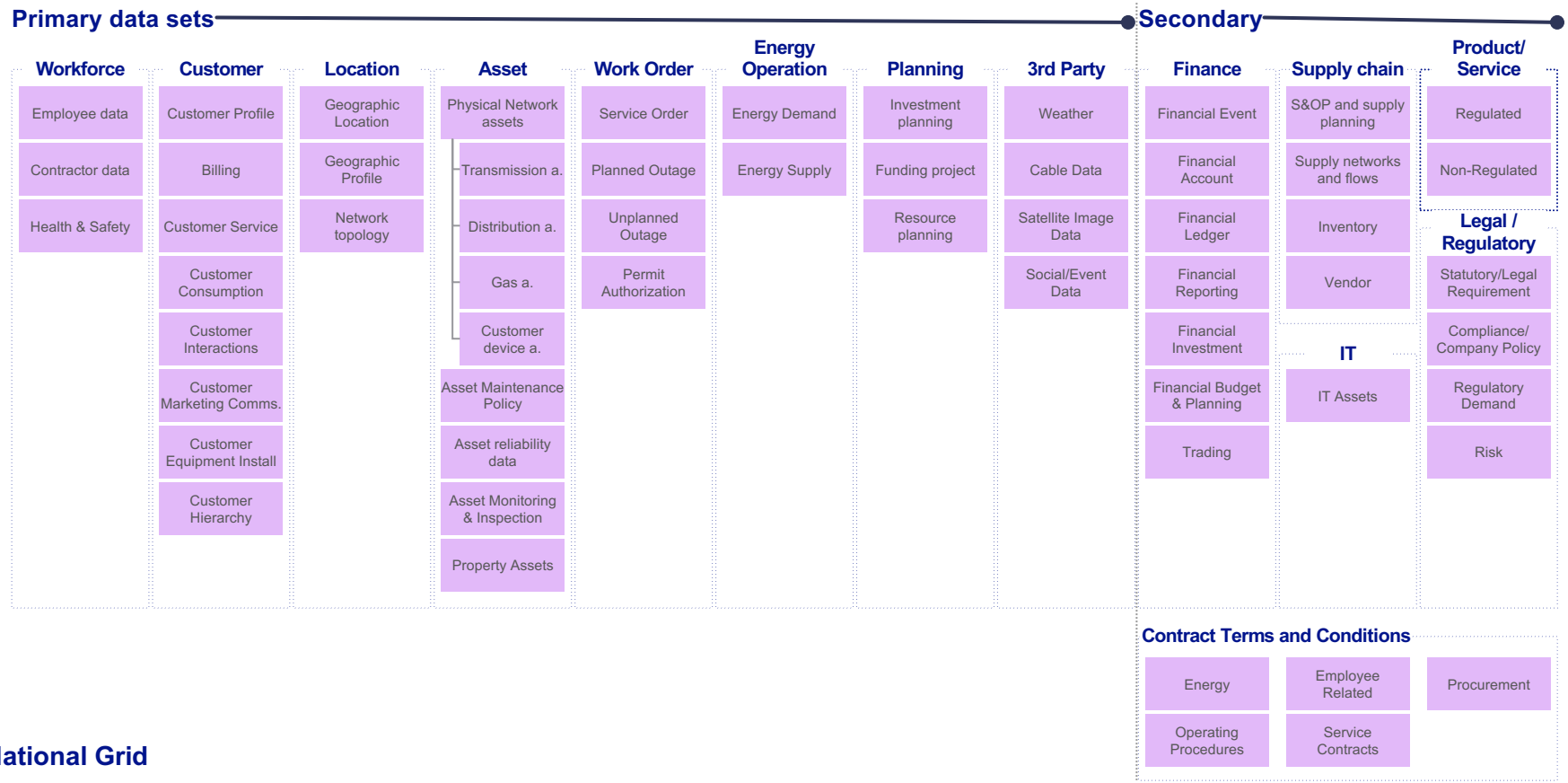
L4 - Infrastructure Capabilities



L5 - Integration Capabilities



Data domains initial view



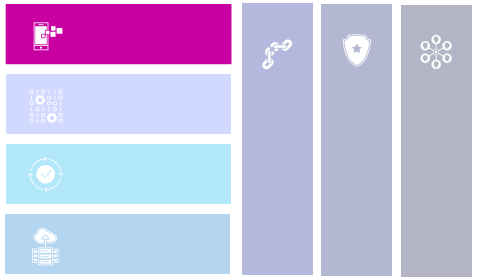
Digital services layer – the vision

Software builders

Data builders

Product Managers

Business "end" users



	How we re-image the developer experience	What is the value?
GridInit	*I have access to a standardized development environment with minimal ramp-up time using consistent and well documented practices*	Reduces developer onboarding time and delivery risk, improves quality
GridApp	*I can prevent double work by using ready-to-use application components from GridApp (e.g. Single Sign-on integration)*	Reduces application component's development time
GridDesign	*I can pick and choose from the user interface building blocks to ensure a common user look & feel without wasting time on double work*	Consistent NationalGrid UX across apps, reduces app development time

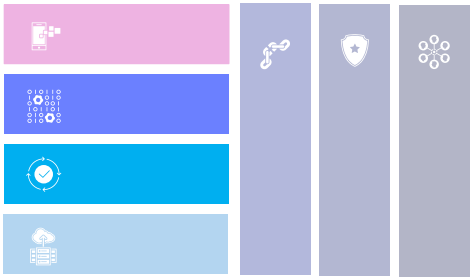
Data & core systems layer – the vision

Software builders

Data builders

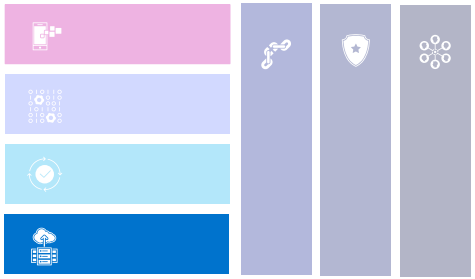
Product Managers

Business "end" users



	How we re-image the developer experience	What is the value?
GridInsight	*I can reuse components like model libraries, engines and data versioning to make it easier to build analytical/AI models.*	Speeds-up data pipeline and analytics model build for Digital Products
Grid DataAssets	*I use and reuse quality assured data sets, regardless of the number of digital products and spokes*	Reduces model development time and enables high ambitions setting by providing reliable data
Grid DataOps	*I can use data processes which are automated end to end irrespective of where they are running, from mainframe to on-prem to the cloud. Failures are gracefully automated and processes restarted*	Reduce maintenance time, long nights of running jobs manually, restarting and manually debugging issues
Grid DataMarket	*I can search for any available data throughout NG from one location and I can understand the data independently through documentation and analysis examples. I can get data access withing 24 hours after my request*	Data accessibility for available data is no longer a bottleneck. Key person risk for data knowledge is eliminated and interoperability enhanced.
Grid DataManage	*I can confidently work with data with different classifications without risking compliance, security issues or violation of policy*	Reduction in risk when building data tools and processes to manage, develop and use data

Infrastructure layer – the vision



	How we re-image the developer experience	What is the value?
GridPlatform	*I can develop applications or services utilizing common and standardized building components*	Rapid time to market and promotes re-usability of components
Grid Compute	*I can freely access the compute necessary to power any data transformation I can imagine*	Increased scalability and stability when the compute and the desired transformation match
GridDevices	*I can manage our IoT devices remotely and capture data from them*	Creates new value streams by allowing real-time data usage from IoT devices
GridCI	*I can re-use code pipelines for application deployment, infrastructure provisioning, database migrations, and data engineering*	Allow for frequent faster releases while reducing human-error risk
GridStore	*I can utilize common database stacks solving for specific problems (structured data, unstructured data, warehouses etc.)*	Provides fit for purpose data stores and allows faster and consistent data interfaces

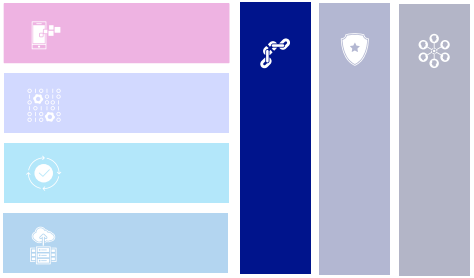
Integration layer – the vision

Software builders

Data builders

Product Managers

Business "end" customers



	How we re-image the developer experience	What is the value?
Grid API	*I can utilize on a standard API portal and gateway to utilize all the exposed API's of different services*	Improves consistency in product development and improves developer output
GridSpecs	*I can rely on a set of standards to guide my work rather than defining new standards within each team*	Further reduces integration time and costs by standardizing the usage of APIs
Grid System Integration	*I can use a consistent set of patterns for integrating different apps (eg. Messages/events) and data exchange between services*	Promotes reusability and leverages common security patterns for reduced testing times
Grid Replicate	*I can play with core system data without ever touching the core system*	Allows core data experimentation without risk to fragile core systems

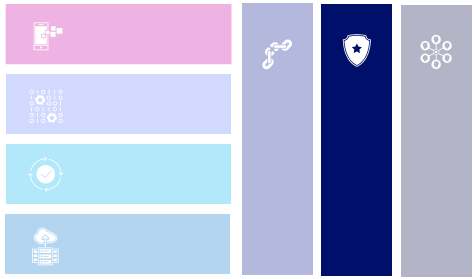
Security layer – the vision

Software builders

Data builders

Product Managers

Business "end" customers



	How we re-image the developer experience	What is the value?
GridVault	*I can ensure secure and consistent data storage if the product I am developing processes highly sensitive data & information, as well as secure usage of sensitive data like passwords and API keys*	Facilitates compliance to NG standards for securing sensitive data, reducing build & operating time
GridIdentity	*I can incorporate ready-to-use single-sign on or other identity modules into the product I am developing*	Facilitates compliance to NG standards, reduces build time via re-use & improves UX
GridAccess	*I can incorporate ready-to-use access management tooling into the product I am developing*	Facilitates compliance to NG standards & reduces build/operate time

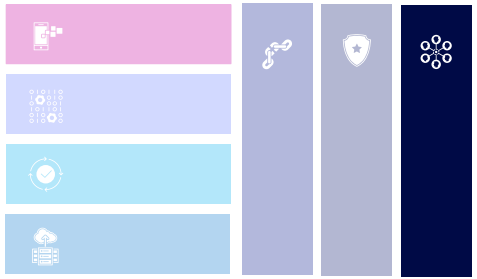
Org & ways of working – the vision

Software builders

Data builders

Product Managers

Business "end" customers



	How we re-image the developer experience	What is the value?
Product operating model	*I am creating business value by developing products that are centered around the users' needs*	Focus only on highest marginal business value, fail quickly & deliver fast
Multi-disciplinary teams	*As a team, we have all the necessary skills to build the product within our own team*	Limiting internal hand-overs and skill-based dependencies
Multi-tier governance	*I can minimalize inter-team coordination across the software development lifecycle*	Saving time and overhead costs
Federated resources	*Our team can leverage expert skills and knowledge whenever necessary (e.g., Apache Spark expert)*	Optimal combination of BU-specific and technical expertise

Not exhaustive – to be further detailed in the POM work

L3 Definitions

L3 Definitions (I/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Data and Analytics	GridDataAssets	Domain Entities	Consists of all the domain entities needed for all the different digital products; does not contain last-mile datasets
		Data Models	Models and relationships between different data entities
		Transformation Pipelines	Data transformation pipelines for creating the domain entities as per the data models
	GridInsights	BI	Reporting and dashboards
		Analytical Sandbox	Scalable and developmental platforms to explore organization's data sets
	GridDataMarket	Data Catalog	Capability to help data users to find the data they need, serves as an inventory of available data, and provides information to evaluate fitness data for intended uses
		Data Search	Ability to search the data elements
		Usage KPIs	Metrics which determine the usage of different data assets; like downtime, maintenance costs, capacity utilization etc.
		Data Quality Results/KPIs	Data quality indicates how reliable a given data set is
		Data Access	Output from ML/AI models for the digital products to consume
		Data Classification	Capability to label (or tags) data elements that indicate the value or sensitivity of the content.
		Data Sharing	Defined roles and rules to share data effectively and securely
		Service Catalog	Organized and curated collection of any and all business and IT related services that can be performed by, for, or within an enterprise
	GridDataOps	Data Versioning	Ability to track changes associated with ‘dynamic’ data that is not static over time
		Pipeline Automation	Automated process to integrate and deploy data pipelines to the right environments

L3 Definitions (II/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Data and Analytics	GridDataOps	Data Quality Automation	Automated process of assuring the highest possible quality of data
		Model Lifecycle	Process for tracking the lifecycle of analytical models
		Data Orchestration	Automated arrangement and management of complex data workflows
	GridDataManage	Compliance Reporting	Reporting needed for regulatory compliance
		Metadata Management	Involves establishing policies and processes that ensure information can be integrated, accessed, shared, linked, analyzed and maintained to best effect across the organization
		Data Lineage	Data lineage is the process of understanding, recording, and visualizing data as it flows from data sources to consumption
		Data Modeling	Organizing and defining how data elements relate to one another
		MDM	Practice of aggregating all the organization's critical business entity data (e.g. customer, asset, work order) into one master reference source
		Data Stewardship	Describe accountability and responsibility for data and processes that ensure effective control and use of data assets
		Data Policies	Set of guidelines for data management, archiving and the sharing of data
Infrastructure	GridPlatform	Framework Services	Set of common business and IT services that orchestrate data across multiple systems to support a process for multiple solutions (e.g., customer account mgmt)
		Technology Services	Set of common services that enable and accelerate framework services and custom services built by solution team (e.g., Caching, Monitoring)
		GridFunction	Independent business function deployed as an API-first strategy so that products benefit from services built by each other and reduce external dependencies
		GridStatus	Capabilities to provide higher visibility into issues and downtimes by communicating the status of all products at any given time

L3 Definitions (III/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Infrastructure	GridPlatform	GridCAAS	Capabilities that enable the platform-agnostic deployment and orchestration of self-contained services
	GridDevices	Iot Devices Mgmt	Ability to manage the lifecycle of IoT devices across the organization
		Fault Detection	Ability to Proactively and reactively detect the fault in data transmission via IoT device
		Centralized Config	Ability to manage base configuration and policies that controls the behavior of IoT devices from single location
		Asset Mgmt	Ability to track IoT Devices assets
		Metering	Ability to capture utilization data for billing or other business analytics purpose
		Data Collection	Ability to transmit data across various IoT and API networks to be processes
	GridCI	Integration Automation	Automated build, test, and deploy scripts Note: Deploy automation is TBD. Currently scoping final automated deploy capabilities
		Test Automation	Tests are automatically run after the build and results are emailed to designated stakeholders
		Code Quality	Sonarqube integration
		Build Versioning	Each build and corresponding artifacts are versioned using SemVer format
		Environment Deployment	Automated deployment of binaries using a process
		Developer Enablement	Standardization efforts to improve dev experience and enable devs with correct tools to be successful, to include documentation
		Metrics	Ability to measure value in terms of productivity using data from platforms
	GridCompute	Distributed Compute	Ability to link multiple computer servers over a network to share data and coordinate processing power for big data computation scalability
		Batch Compute	Capability to execute a series of programs/jobs on machines without manual intervention; specifically for jobs running at specified time intervals

L3 Definitions (IV/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Infrastructure	GridCompute	Stream Compute	Capability to execute a data stream of events coming from a variety of data sources; streams, sensors etc.
		Serverless Compute	Capability to execute data jobs without worrying about servers, i.e. the cloud provider handles the server provision intelligently based on data loads
	GridStorage	Relational Data Store	Type of data store which provides access to data points that are related to one another and has a defined data model
		Unstructured Data Store	Information that cannot be arranged according to a pre-defined data model
		NoSQL Data Store	Storage of structured, unstructured and semi-structured data, mainly catering to semi-structured data like JSON, XML
		MPP	Datastore optimized for data processing operation in parallel by using multiple operators which work on different parts of a program
		Event Pub/Sub	Data moving through a messaging queue as events where multiple publishers publish the data and the data events are immediately received by all subscribers of the topic
Integration	GridAPI	APIGateway	Set of capabilities that support interface between a client and a collection of backend services. The gateway accepts API calls, aggregates the various services required to fulfill them, and returns the appropriate result
		API Management	Set of capabilities that support the process of creating and publishing API and collecting and analyzing usage statistics, and reporting on performance
		Policy Mgmt.	Set of capabilities that support policies enforcement (e.g. Ratelimiting, service tiering) usage policies, controlling access, etc.
	GridSystem Integration	IntegrationEngine	Set of capabilities that support the process of creating and publishing non-API (Batch, Streaming, Event) and collecting and analyzing usage statistics, and reporting on performance
		IntegrationPatterns	Set of capabilities that support build and testing of keys patterns REST/SOAP/File/MQ
		Workflow	Set of capabilities that support process orchestration generally via niche platform in order to serve integration and application requests

L3 Definitions (V/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Integration	GridSystem Integration	RuleMgmt	Set of capabilities that allow business and IT to manage business rules for solutions dynamically
		Source Connector	Capabilities to support data exchange via wrapper layer over complex legacy mainframe or databases
		Mediation	Capabilities for objects to be decoupled with each other, but instead, communicate through the mediator This reduces the dependencies between communicating objects
		Data Preprocessing	Capability to apply filter the data early in order to improve the quality and process time because of limited volume
	GridSpecs	Templates	Set of templates to enable and accelerate the SDLC processes and team collaboration
		Standards	Set of standards tools, specifications, guidelines to be followed by developers in order to improve the overall quality of solutions
		Knowledge Mgmt	Set of capabilities to improve adoption, self enablement and exchange knowledge across the IT, external partners, and business organization
		GridGovernance	Capabilities to manage the overall governance in SDLC (e.g., intake, release mgmt., change mgmt., ownership, etc.)
		Inner source	Capabilities to use open source software development best practices and the establishment of an open source-like culture within organizations for the development of its non-open-source and/or proprietary software
		QA/Testing	Capabilities to support quality control for Integrations and application development
Security	GridVault	Enterprise Vault	The ability for enterprise information archive, retain, and retrieval in a secure platform
		Enterprise Keys	The ability to manage and rotate the lifecycle of data encryption keys for secure enterprise information
	GridAccess	Role-based access	Access control based on standardized roles
		Policy-based access	Access control based on standardized policies for assets access
		Digital Identity and access governance	Ability to have governance and defined process for digital identities mgmt

L3 Definitions (VI/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Security	GridAccess	Third-party access	Ability to open and manage access control for third-party partners without enterprise ids
	GridIdentity	Authentication	Standardized authentication capabilities that can be leveraged by multiple solutions to reuse or extend for specific use cases
		Authorization	Standardized authorization capabilities that depend on access control capabilities to execute business logic and provide access to data or processes
		Identity Mgmt.	Application Identity Lifecycle management capabilities

L3 Definitions (VII/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Digital services	GridDesign	UI Component Library	Set of reusable UX libraries and widgets to drive reusability and brand consistency across various customer and internal-facing digital assets
		Design Language System	A framework to combine the set of reusable components, standards, and documentation in order to provide consistency in the products, streamline the process of design, and development
		Checklists	A set of checklists to be used by the UX team to standardize the build, test, and release of UI apps
	GridApp	Scaffolding	The ability for a meta-programming method of building data-dependent applications.
		Server-side rendering	Ability to maximize server to fully render HTML page for the client in order to optimize response time
		Mocking services	Ability to mock the backend code while it is being built by use of contracts and data exchange protocols with a set of template response
	GridInit	Developer Toolchains	Define list of tools developers need and advocate for having the right set of tools available for developers to download
		Bootstrap	Ability to quickly start up a new project from 0-1 with basic NG configuration and recommended practices
		DevEnv(s)	Ability for developers to have complete control to configure their development environment to meet needs for project

L3 Definitions (VIII/VIII)

WorkStream (L1)	Product (L2)	Capability (L3)	Definition
Digital services	GridInit	Metadata tools	Ability for teams and projects to surface metadata and make it visible to the rest of the organization to ensure reusability and consistency
		Standards	Ability to centrally review documentation on recommended practices and norms for working within National Grid Digital product build
		DevPortals	Ability to quickly browse and understand the broader status of various NationalGrid Digital Products and GridStack components
		Inner source Interface	Ability to standardize practices that will promote inner source within National Grid

L4 Definitions

L4 (1)

L1	L2	L3	L4	L4 definition
Data and Analytics Layer	Grid Insights	Analytic Sand boxes	Data processing and compute	I/O for big data processing
			Data storage	Local data storage for easy access on sandbox environment
			Networking setup	Correct network access set up to data source
			Data access and integration	Connections to data store for data access needed for analytics, if not local
			Source Code Integration	Code versioning for better collaborations on source code development and easier code deploys
	Business Intelligence		Business reporting	Reports determining business trends and outcomes
			Enterprise Dashboards	A combination of business reports formulating the strategy for an enterprise; combined with storytelling features
			Data Analysis	Quick data analysis functionality to determine structure of reports or dashboards
			Last Mile Tables	Feature tables with different levels of aggregation done for reporting needs
			Data Integration	Connections to data store for data needs
			Operational reports	Detailed reports for day-to-day organizational operations
			Analytical reports	Reports which use qualitative and quantitative company data for business strategy evaluation or process
		DS/DE Work bench	Analytical pipeline Monitoring	Analytics model pipeline monitoring for errors and logging for performance
			Pipeline scheduling	Event-based (e.g., file drop) or time-based scheduling of pipeline runs
			Email alerts	Failure/success notification of pipelines through emails to the necessary stakeholders
			Data engineer/ scientist preferred Libraries	Specific libraries/packages more frequently used for data analytics by DE/DS; e.g.,: Pandas, TensorFlow etc.
			Source Code Integration	Code versioning for better collaborations on source code development and easier code deploys
		AI/ML model libraries	Chat bots	Libraries that can make it easy to create software for human engagement; e.g..: Chatter Bot
			Speech recognition	Designed to take input of human speech, interpret it and transcribe it into text; e.g.,: Speech Recognition
			Language translation	Translate a piece of text from one human language to another; e.g.,: translate

L4 (2)

L1	L2	L3	L4	L4 definition
			Text recognition	Electronic identification and digital encoding of printed or handwritten characters; e.g.,: tesseract
			Sentiment analysis	Process of determining whether a piece of text is positive, negative or neutral based on scoring methods; E.g.,: NLTK
			Auto complete	Application which predicts the rest of the words a user is typing; e.g.,: autoComplete.js
			Voice recognition	Ability for a machine to convert spoken words to text; e.g.,: assembly ai
		Self-service data prep	Data querying and analysis	Quick querying capability for business users on data in the lake for analysis
			Data formats support	Data in the lake can be in different formats; self-service data prep needs to support multiple formats
			Data integration	Integration with right data sources for business users to leverage
		AI/ML tool kits	ML Algorithms support	Out of box support for popular ML algorithms
			Auto ML	Process of automating the task of applying ML to problems, covers complete pipeline from raw dataset to deployable ML models
			Custom modeling	Ability to define and download packages for ML models not pre-baked into the toolkit
			AI/ML Framework	Support distinct ML framework runs
			Model automation	Automatic runs of ML models to generate results
			Experiment tracking	Process of saving all experiment related information for evert experiment run by the data science team
			Model parameter store	Store of commonly used parameters for ML models
			Feature Store	Data store for files/tables used to define features which would be inputs for ML models
			AI Governance	Defining policies to guide creation and deployment of AI systems
	Grid data assets	Domain entities	Asset Data domain	Data store for loading electrical/gas assets data
			Location data domain	Data store for location specific data
			Customer data domain	Customer data store
			Planning data domain	Work planning data store
			Workforce data domain	Data store for field force
			Finance data domain	Data store for finance data

L4 (3)

L1	L2	L3	L4	L4 definition
			EnergyOps data domain	Data for energy operations
		Data models	Model validation	Checking if the data model entities are syntactically correct and comply with database modeling standards
			Data elements definition	Ability to define all data elements like table, data formats, data types etc.
			Support for all object types	Work with different object types like string, integer, varchar etc.
			Denormalization/ normalization	Tool should be able to normalize if there is redundancy in data store or denormalize if the focus of the table is for quick data querying
			Dependency management Between model and model-objects	
			Re-use of models and Model objects, including model patterns	Identification of model and model objects which are frequently used across the data model and re-use them, similar to object oriented models
			Business vocabulary definition, mapped to usage within models	Definition for all objects within the data model as well as business speak for easy understanding across the org
			DB generated data models	Automatic ability to create data models when integrated with databases where data relationships are predefined
		Transformation on pipelines	Data Pipeline compute	Computation engine on which the data pipelines run; E.g.,: databricks, snowflake
			Data Pipeline store	Data store on which the pipeline depends, whether its for ingesting the data or loading
			Pipeline Automation	Data pipelines running at given interval of time
			Source Code Integration and CI/CD	Code versioning for better collaborations on data pipeline code development and easier code deploys
			Data mapping and translation	Defining data fields needed before/after transformation pipeline run
		Reference architecture		

L4 (4)

L1	L2	L3	L4	L4 definition
	Grid Data Manage	Compliance	GDPR	General Data Protection Regulation(GDPR) lays out ran ge of rules regarding people's right to know what data businesses have on them, how companies should go about processing this data, and tighter rules on the reporting of breaches
			HIPAA	HIPAA, or more formally the Health Insurance Portability and Accountability Act of 1996, sets out how US organizations that deal with individuals' healthcare and medical data need to ensure the safety and confidentiality of these records.
			PCIDSS	For businesses dealing with customers' financial information, the Payment Card Industry Data Security Standard (PCI DSS) is a vital part of any compliance process, as it sets out rules regarding how companies handle and protect cardholder data such as credit card numbers
			SOX	Sarbanes-Oxley Act of 2002 (SOX) is intended to protect against any repeat of the corporate accounting scandals
			CCPA	California Consumer Privacy Act, or CCPA broader view of what is defined as private data, including any information from which inferences can be drawn to create a customer profile that reflects a person’s “preferences, characteristics, psychological trends, predispositions, behavior, attitudes, intelligence, abilities and aptitudes”
			Regulatory compliance reporting	Any other kind of regulatory reporting required by energy companies to the state or national governments
		Data Quality	Data Governance	Degree to which the data is accurate, complete, timely and consistent based on policies defined for the dataset
			Data Matching	Reducing data duplication and improving accuracy in a data source by matching it to the original
			Data Matching	Reducing data duplication and improving accuracy in a data source by matching it to the original
			Data Profiling	Examining the data from existing source and collecting statistics on it to define quality metrics
			Data Quality Monitoring and Reporting	Setting up monitors in place which go off when there is bad data and goes against the metrics defined
			Data Asset Management	Ensuring all of organization's data content gets treated as corporate assets with value
		Data Line age	Pattern based lineage	Relies on metadata of tables, columns, business reports to look for patterns and determine lineage

L4 (5)

L1	L2	L3	L4	L4 definition
			Data tagging lineage	Tagging each piece of data being moved by the transformation code/engine which tracks the label from source to target
			self-contained lineage	Self-contained lineage tracks every data movement and transformation within an all-inclusive environment that provides data processing logic, master data management etc.
			Metadata management	Metadata management involves managing metadata about other data, whereby this “other data” is generally referred to as content data
		MDM	Data Matching and merging	Taking data from different source systems and finding the possible duplicates, or identical match (and merge as required) to create a golden copy of the record
			Master data rules engine	Pieces of business logic in order to permit customizations to the logic for MDM processing
			Data localization	Feature to allow businesses to store data on any device that is physically available within geographical boundaries of countries and regions where data is generated
			Data enrichment	Set of tools that improves data quality when coming from different sources
		Data Policies	Data access	Access to the right set of data to the right set of users to enable compliance and privacy
			Data security	Setting up role based security policies on datasets to enable data privacy and compliance
			Data retention	Correct retention policies followed for storing data in an organization's systems
			Master data	Process to correct a golden record of data based on data matching and merging
			Data masking	Modifying sensitive data to an extent where it is of no value to unauthorized intruders
			Consent Management	Consent management is a system, process or set of policies for allowing consumers to determine what information they are willing to permit
		Data classification	Data security and privacy	Setting up right data privacy standards in place which would help with right data classification
			Data tagging	Tagging the data sets in the EDP for easy identification and distinguishing
			Business/Regulatory compliance	Setting up right data classification rules for correct business and regulatory compliance
		Domain decomposition		
	Grid Data Ops	Data Versioning	Tagging	Annotated tags to store extra metadata for identification and history while versioning datasets
			Flexible data formats	Data version tools should support multiple file and data formats if on an EDP
			Source Code integration	Code versioning for better collaborations on data pipeline code development and easier code deploys

L4 (6)

L1	L2	L3	L4	L4 definition
			Storage agnostic	Version tools being independent of where the data is stored
			Language/framework agnostic	Version tools being independent of what language the transformation pipelines are written in
		Pipe line Automation	Data dependency graph	A DAG(directed acyclic graph) to identify the order in which the transformations will occur
			Data pipeline monitoring	Monitoring the data pipeline for success/failures
			Schedule/event triggers	Data pipeline triggers based on events (file drop etc.) or based on schedule (time-based)
			Alerts and notifications	Notifying the necessary stakeholders with success/failures of the data pipeline run
			Source Code Integration	Deploying transformation code via source control to the right environments for run
		DQ Automation	DQ Source Code Integration	Deploying data quality code/framework templates via source control to the right environments or run
			DQ Metrics evaluation	Setting up automated process to detect data quality metrics which are beyond thresholds that are set to detect issues
			DQ Pipeline monitoring	Monitoring the dq pipeline runs for success/failures
			DQ schedule/ event triggers	Triggering DQ jobs based on schedule or event based triggering
			DQ alerts and notifications	Setting up DQ alerts which indicate bad data quality every time the thresholds are breached
		Model lifecycle	Experiments	Running experiments on different sets of data to determine viability
			Training	Training data set is data set of examples used during the learning process and is used to fit parameters, i.e., a learning set
			Tuning	Trial-and-error process by which you change some hyper-parameters (e.g.,: the number of trees in a treebased algorithm or the value of alpha in a linear algorithm), run the algorithm on the data again, then compare its performance on your validation set in order to determine which set of values works best
			Scoring	Scoring is also called prediction, and is the process of generating values based on a trained machine learning model, given some new input data
		Model Orchestration	Model Job notification system	Set up notification systems for analytical models run based on success/failures

L4 (7)

L1	L2	L3	L4	L4 definition
			Model Event/schedule based trigger	Trigger mechanisms based on event or schedule for running the model
			Model Source code integration	Setting up integration of model code to version control for following SDLC cycle
			Model CI/CD process	Deployment of analytical models to the right environments along with test procedures
	Grid data market	Data catalog	Domain Data glossary	Data domain glossary is a container for all the domain groups and data domains
			Business data glossary	List of business terms with their definitions which are specific to an org or industry and independent of the db or cloud provider
		Data Search	Data exploration	Exploring and easy discovery of data available in the EDP
			Training/test/validation data splits	Easily able to split any given data set into training or test or validation for being able to set Up analytical models
			Search driven analytics	Doing data analytics based on searching of data available in the EDP
			Key-value, columnar data search store	Different ways to how data search is handled for performance
		Usage KPIs	Retention rate	Percentage of users who continue using your product or service over a given time period
			Churn rate	Percentage rate at which customers stop subscribing to a service
			MAUs	Monthly active users of an application
			DAUs	Daily active users of an application
			Average session length	Number of mins/hrs that a customer spends on a given session in an application
			Customer LTV	Total worth to a business of a customer over the whole period of their relationship
			ROI	Return on investment (ROI) is a performance measure used to evaluate the efficiency or profitability of an investment
		DQ/Results KPIs	Data standardization	Defining a single set of standards for all data that exists in the environment
			Data deduplication	Data available in the environment should not be duplicated; leading to bad data
			Data Integrity	Overall accuracy of the data existing for safeguarding compliance
			Data cleansing	Cleaning bad data for better analytics
			Conformity	Making sure the data is following the standard data definitions like data type, size, format etc.

L4 (8)

L1	L2	L3	L4	L4 definition
			Consistency	Data should be uniform when it moves across a network or between different applications
			Completeness	Ensuring there are no gaps or missing information in the dataset which would effects its accuracy and reliability
			Timeliness	Time expectation for accessibility and availability of information
		Data access	Automated querying on data stores	Setting up direct access to query the data in the environment for quick analysis
			Data Caching for prompt data access	Caching or storing the frequently used data in local memory for quick retrieval and avoiding network overhead
			Query performance	Reasonable query performance irrespective of the size of the data
			File/object formats support	Multiple format support for all data in the environment; whether that is file/object/db based
			Role based access control	Setting up right level of access for data and the right users in the environment
		Data Sharing	Data governance rules	Sharing data with the right governance and access rules to ensure data privacy
			Knowledge and document platform	Having a document sharing platform for the teams to leverage as data is shared across the organization
Integration	Grid Replicate	Change Data Capture	Reducing impact to Production systems	Setting up CDC would enable minimum changes to production systems for ongoing data tables
			Maintain ACID reliability	Ensuring the data in both the source and target maintains ACID properties
		DB Snapshots	Backup Interval and Schedule	Time duration at which the database backups are taken; e.g.,: once every day at 1AM UTC
			Multi-region and Multisubscription support	Ability to move snapshots to different regions or subscription cloud accounts for archival or use by other teams
			Retention period	Time duration for which the DB snapshot will be kept
			Tagging	providing specific naming for each snapshot instances that are taken
		Data Migration	Data Reliability	Transfer of data should be reliable and consistent so as to ensure the migration process is complete
			Integrate with multiple onpremor cloud sources	Setting up multiple access for data which could reside on-prem or on-cloud solutions across the org
			Data encryption standards	Defined standards of encryption for enabling secure data transfers

L4 (9)

L1	L2	L3	L4	L4 definition
			Data backfill	Ability to go back in time to bring in old data for OLAP needs
	Grid API	API Gateway	• API Testing tool	Tools to test API gateway interfaces as consumer and service optimizer
			• Canonical Modelling	Defining standardized model for API gateway interfaces open to consumer
			• Usage analytics	Analytics to capture gateway access from restricted, limited or un-restricted consumers and drive policies implementation and monetization
			• Traceability	Ability to trace the request source and necessary detail for API gateway
			• Recoverability	Ability to automatically recover from service down /connection issue or any time of failure and retry in order to get back to normal state
			• Access Mgmt	Access control for services based on roles and privilege
		API Mgmt	• Scaling Tools	Auto-scaling tool to dynamically manage server computation and memory resources
			• Performance monitoring • And analytics	Analytics for overall API server health(e.g., service utilization, object storage utilization, Request spikes etc.) to optimize server Utilization
			• Policy Templates	Common templates to be applied across integrations (Rate limiting, Tier, DDOS prevention)
			• Transformation Tools	Set of transformation libraries and frameworks for common formats like JSON, XML , CSV or Colon separated data, etc.
			• Reusable Asset	Set of common flows (e.g., HTTP Request --SF API) and libraries to accelerate the development
			• Traceability	Ability to trace the request source and necessary detail for API gateway
			• Access Mgmt	Access control for services based on roles and privilege
			• Alert & Notifications	Proactive alert and reactive notification to various groups of people (Ops, Customer, Business) depending on the use case
		Policy Mgmt	• Policy definition	Policy to be defined to bring tier governance to APIs
			• Policy application	Tools to manage the policy to be executed to bring tier governance to APIs
			• Trigger and planned • Execution	Tools to execute the policy on defined triggers and frequency
			• Testing and validation	Ability to validate and test triggers in different scenarios

L4 (10)

L1	L2	L3	L4	L4 definition
	Grid System Integration	Integration Engine	• Performance monitoring • And analytics	Analytics for overall (Batch/Stream/Other) Integration server health (e.g., service utilization, storage utilization, Record processed etc.) to optimize server Utilization
			• Transformation tools	set of transformation libraries and frameworks for common formats like JSON, XML , CSV or Colon separated data, etc.
			• Reusable Asset (Flows, • connectors)	Set of common flows (e.g., DB --File) and libraries to accelerate the development
			• Alert & Notifications	Proactive alert and reactive notification to various groups of people (Ops, Customer, Business) depending on the use case
			• Traceability	Ability to trace the progress of full life cycle of integration from ingestion source to export target
			• Recoverability	Ability to automatically recover from integration down/connection issue or any time of failure and retry in order to get back to normal state
			• Access Mgmt	Access control for services and logs based on roles and privilege
		Integration patterns	• Common patterns subflows	Set of common integration patterns (Pub-sub, aggregation, orchestration etc.) across various use cases to be supported
		Workflow	• Process definition • Process execution • Notification • User management	
		Rule Mgmt	• Action definition • Exception definition • Rules editing • Trigger mgmt • API enablement	

L4 (11)

L1	L2	L3	L4	L4 definition
		Source connector	• Common adapters across platforms (CRM, SAP, Database, MQ, Cache, Object storage, etc.)	Set of common connectors to enterprise platform wrapped in NG libraries along with required policies
		Mediation	• <NA>	
		Data Preprocessing	• Filtering • Transformation • Orchestration • Search • Validation	
Infrastructure	Grid store	Relational Data Store	Structured data store	Datasets following a specific structure and schema properties; also maintaining relations between the datasets
			Strict Referential Integrity	Referential integrity refers to the relationship between tables which exists in a relational database in the form of primary, foreign key relations
			ACID transactions	Atomicity, consistency, isolation, durability of transactions happening in the data store
			Indexing	Index are created using one or more columns of a table and are used to improve speed of data retrieval
			OLTP/OLAP data processing	Online transaction processing (OLTP) captures, stores, and processes data from transactions in real time Online analytical processing (OLAP) uses complex queries to analyze aggregated historical data from OLTP systems
		Unstructured Data Store	Object-based store	Data such as music, images, and videos. Backup and log files. Large sets of historical data. Archived files
			Indexing	Index are created using one or more columns of a table and are used to improve speed of data retrieval
			IoT data	Storing data collected or generated by IoT sensors, weather stations etc.

L4 (12)

L1	L2	L3	L4	L4 definition
		noS QL Data Store	Semi-structured data store	Form of structured data that does not obey the tabular structure of data models associated with relational databases or other forms of data tables
			Schema-free or schema-onread	An application that can change without the time consuming process of editing the schema, including adding more tables or columns; so developers do not have to early bind the schema
			Relaxed referential integrity (depends on data structure)	Tables existing in the data store do not necessarily relate to each other since schemas change frequently
		MPP	Column oriented database	Column-oriented DBMS is a database management system (DBMS) that stores data tables by column rather than by row
			Scalability and high performance querying on big data volumes	Massively parallel database store data in columns which is used to access the data more precisely than looking at rows and discarding them based on the query
			Distributed processing and I/O	Coordinated processing of data which spans multiple machines for faster performance and handling large data volumes
			Referential integrity	Referential integrity refers to the relationship between tables which exists in a relational database in the form of primary, foreign key relations
		Event Pub/Sub	Real-time data events distribution	publishing real time data events from sources to enable subscribers to read the data "streams" for real time analytics
			Asynchronous communication between Publishers and subscribers	Communication that happens "out-of-sync" with applications that publish data to queue and tools that read data off of the queue
Infrastructure	Grid CI	Integration Automation	Unique repository	Maintain a single source repository to manage the source code. All artifacts required to build the project should be placed in the repository.
			Pipeline Creation (to Build app, Run test, and Create artifacts) – via code or UI	Create a pipeline, connect the pipeline to the source repository, and define the different steps to build, test, and deploy your application

L4 (13)

L1	L2	L3	L4	L4 definition
			Pipeline Configuration - via code or UI	Configure each step of your pipeline. It will require to define the command and parameters to execute actions in your systems
			Pipeline Debugging	Debug pipeline based on log outputs.
		Test Automation	UI, Service, and Unit Testing	Run UI, services and unit test automatically
			Recorder	Record day-to-day activities that can then be converted into automated test cases
			Test script	Run automatically test script (UI, services, and unit test) with test data to check behavior of an application
			API testing	Validate automatically Application Programming Interfaces (APIs). Check the functionality, reliability, performance, and security of the API
			Cross-browser testing	Validate web pages across multiple browsers for complete compatibility
			Desktop testing	Examine the functionality, security, usability, and stability of the app after it is deployed in the desktop
			Test reporting	Show the test scripts execution process – execution time, checkpoints that were passed, failed, skipped, and broken as well as related reason
		Environment Deployment	Pipeline Creation	Create a pipeline and define the different steps to deploy your application
			Features flag deployment	Deploy new code in feature flag that helps to activate or deactivate code in an application
			Resource provisioning	Deploy automatically testing infrastructure resources/environment
			Resourcing Rolling out	Rollout automatically infrastructure resources/environment
			Staging environments	Deploy automatically application code in different staging environments
			Monitor and alerts	Show the execution process - execution time, checkpoints that were passed, failed, skipped, and broken as well as related reason
		Build Versioning	Track changes	Generate version-numbers and tags using semantic versioning
			Commit/push, pull, update and sync Artifacts	Store and share every-changing code, avoid merge conflicts, and easily create different versions of the app
			Artifact conflicts management	Resolve version conflict when artifact requires dependencies with different versions

L4 (14)

L1	L2	L3	L4	L4 definition
			Artifacts comparison	Automatically compare difference between artifacts with different versions
			Branches and merges management	Create branches from mainline source code to allow changes and merge branches source code to mainline source code when tested
			Reporting	Show how the progress toward a completion of a version
		Code Quality	Code analyzer (style, security, error, etc.)	Reviews, analyzes and reports on the source code structure
			Code auto format	Auto-format code based on style convention to improve understanding of the reader of your code
			Issue auto-fix	Choose and confirm auto fix issue relating to bug risks, anti-patterns, performance issues, and potential security vulnerabilities
			Reporting	Show code metric related to Reliability, Maintainability, etc.
		Metrics	Data platform	Collect and store GridCI tool logs and data
			Analytics	Build analytics related to application performance and team performance
			Reporting	Show application and team performance metrics
	Grid platform	Grid class	Container hosting	Upload and organize container in cloud or On-premise infrastructure
			Container deployment	Start, stop, and scale up or down container in cloud or On-premise infrastructure
		Framework services	Environment provisioning via code	Deploy automatically testing infrastructure resources (via code)
			Environment configuration via code	Configure automatically testing infrastructure resources with coding parameters
		Grid Status	Telemetry: Log, metric data	Collect and store log and metric data
			Analytics/AIOps	Build analytics and leverage AIOps to get insights
			Reporting and Alerting	Show systems behavior and alert smartly key stakeholders
Digital Services Layer	Grid Init	Developer tool chains	IDE tools provisioning	Use case based IDE tool provisioning
			Library installation Tools provisioning	Use case based Library installation tool provisioning

L4 (15)

L1	L2	L3	L4	L4 definition
			Code revision control tools provisioning	Use case based Code revision control tool provisioning
			Code tidying and linting tools provisioning	Use case based code tidying and linting tool provisioning
		Dev Env(s)	Code editor	IDE with code editor solution per use cases/programming languages
			Translator (compiler or interpreter)	IDE with compiler or interpreter solution per use cases/programming languages
			Debugger	IDE with debugger solution per use cases/programming languages
			Unit testing	IDE with unit testing solution per use cases/programming languages
			Build automation tools	IDE integrated with CI/CD pipeline
		Boot strap	Project templates	Project template description per use cases/programming languages
			Create project artifacts	Project template standard artifacts per use cases/programming languages
		Dev Portals	Developer Registration	Register developer role and project in the developer portal
			Creating and managing Project/application	Define and select project template per use cases/programming languages
			Dev Documentation Mgt – code example, Architecture rules, principles as well as Standard technologies	Browse, search, and upload relevant project documentations in the developer portal
			Developer tools provisioning	Integrate provisioning capabilities in the develop portal
			Collaboration -Blog and discussion forum	Collaborate with team members or cross project team members via internal blog or forum
		Standards	Technology standard doc	Browse, search, and upload relevant Technology standard documentations in the developer portal
			Architecture principles and rules doc	Browse, search, and upload relevant architecture principles and rules documentations in the developer portal

L4 (16)

L1	L2	L3	L4	L4 definition
		Inner Source interface	Interface description	Source system interface description per data domain
			Interface browsing and testing	Browse, search, and test source system interfaces in the IDE
			Interface best practices	Browse, search, and upload relevant Interface best practices documentations in the developer portal
	Grid app	Scaffolding	Client application scaffolding	Skeleton client app based on programming language
			Server application scaffolding	Skeleton server app based on programming language
		Server side rendering	Rendering configuration	Convert HTML files on the server into a fully rendered HTML page for the client
		Mocking Services	Service description	Mocking service description per domain
			Service browsing and testing	Browse, search, and test service interfaces in the IDE