ARCHITECTURE CONSIDERATIONS FOR INTEGRATED DIGITAL SERVICES

Digital Omnichannel Transformation in Action

ComputationWorld 2022 Congress
April 24 to 28, 2022, Barcelona, Spain (or, more precisely, on video)

Dr. Hans-Werner Sehring, hans-werner.sehring@tallence.com
Tallence AG, Hamburg, Germany
// Agenda

01 About the Speaker
02 Digital Omnichannel Transformation (DOT)
03 DOT Systems Landscape
04 DOT Systems Integration
05 DOT Solution Architecture
06 Coherence of DOT Processes in Heterogeneous Systems
07 Summary and Outlook
Architecture Considerations for Integrated Digital Services / Hans-Werner Sehring / Tallence

Tallence
Merkle (Namics)
T-Systems MMS

Clients from media // insurance // automotive // telco // retail // finance // travel // industry
Architecture // CMS // DAM // PIM // Commerce // App

TUHH
TuTech
IARIA

Fellow of the International Academy, Research, and Industry Association (IARIA) // editor-in-chief of the International Journal on Advances in Intelligent Systems // Steering of the International Conference on Creative Content Technologies
Content management // knowledge representation // personalization // software architecture // Software engineering // model-driven software development // adaptive systems // Cloud // e-learning

Dr. Hans-Werner Sehring
Unit Lead
Digital Omnichannel Transformation
Tallence AG
Neue Gröningerstraße 13
20457 Hamburg
+49 151 422 201 06
hans-werner.sehring@tallence.com
Tallence AG is a technology and management consultancy for digital transformation. We support our clients to use digitization to their advantage and to create competitive advantages. We advise, develop, and take leadership. We proceed in a concrete and result-oriented manner. Whether international technology group, traditional medium-sized company or the public sector: The benefit for the end customer is always the guiding principle and drive of Tallence. We ensure this through real expert performance and the highest level of commitment. Our clients come from industries as diverse as telecommunications, information, media and energy. As Tallence AG, we work with more than 130 IT developers, machine learning specialists and management consultants in Hamburg, Frankfurt, Marburg, Darmstadt, Görlitz and Karlsruhe on pioneering topics in the digital economy.
The digital transformation is happening for some time now. Changing the process tooling, communication behavior, ... of an organization to the work in the digital domain.

Digital transformation is not only about the introduction of IT tools. It allows to explore new business models, rethink processes, intensify communication, increase the reach of services, etc.

There are many aspects of digital transformation. Two (commercially) important aspects are:

- Digitization of value-adding processes (e.g., Industry 4.0) and
- Digitization of communication and customer engagement (e.g., web- and app-based services)

Based on my personal experience, I concentrate on the latter: digital omnichannel transformation (DOT).
In particular, we consider digital communication of organizations (companies, institutions, ...) with users of their services.

Due to the professional focus on commercial applications, we concentrate on companies as service providers, though many aspects also apply to public institutions and others.

We use the term customer for end users with whom to communicate. This is to distinguish them from internal users like marketers, sales personnel, editors, curators, etc.

Customers interact with companies at touchpoints.

- They use digital or digitized services: information, online shopping, etc.
- They communicate with representatives of companies: support, etc.
- They communicate with each other: messaging, forums, etc.
Communication should be easy and enjoyable for customers. Therefore, user experience / customer experience is important for successful communication.

Communication between customers and companies takes place in various ways:

- **Omnichannel**: alternately on all communication channels used, and customers expect companies to use the communication channels they use in daily life: the WWW, mobile apps, social media platforms, chats (one-to-one or group communication), voice, and also personal communication with agents.

- **Cross-channel**: customers change communication channels in the course of an interaction to use the medium and device that is most appropriate and convenient in a specific situation.

In order to provide a suitable experience, the context of customers needs to be considered:

- Mobile device or stationary computer depending on current location.
- Searching and browsing or dialogs (chat/speech) depending on device.
- Customers can be addressed individually when they (or at least their demands) are known.
Dialogical Communication

The Digital Omnichannel Transformation is based on systems integration.

> Communication with customers should take place in the form of a dialog
  > as opposed to one-way communication of sending messages
  > dialog means that responses from the user are taken into account
  > customers expect service providers to act accordingly
  
> Example: different perspectives on a customer that are combined in a common view on a customer

> Perspectives cover those aspects that are relevant in a communication situation / at a touchpoint
Example of DOT Communication

> Before buying a car, a potential customer first gets some inspiration on driving experiences on social media.

> When using a smartphone for first research on cars, the car manufacturers’ apps utilize information on previous social media activities.

> After deciding for one car model, the user changes to a desktop computer for larger product images and a more convenient use of the car configurator on the manufacturer’s website. When stuck with configuring, a chat dialog offered by the manufacturer is used to receive help from a sales agent. Finally, the customer books a test drive.

> The sales representative of a car dealer is provided with the information of the preferred car configuration of the customer.

> After the test drive, the car dealer can follow up on the test drive by mail or phone. Alternatively, the customer can automatically be approached on the digital channels by mail, text messages, banner ads, etc.

> Etc.
Omnichannel Communication Requires Integrated Systems Support
The Digital Omnichannel Transformation is based on systems integration.

> Customers expect context-dependent communication
  ⇒ There need to be different user interfaces to the provided services

> Customers use communication channels at their convenience, not for the service they are going to use
  ⇒ User interfaces on the communication channels interact with all components

> Customers use different communication channels interchangeably
  ⇒ Dialog state needs to be transferred from one channel to another, and the need to be preserved over time

> Typically, various technical components work in concert in a digital solution
  > At different points on the customer journey, customers interact with different components
  > For dialogical communication, information needs to be passed between components, and these need to share the same notion of customers, entities, etc.

  ⇒ Processes spanning multiple component, data exchange between components according to the processes
DOT SYSTEMS LANDSCAPE
The DOT System Landscape

Digital solutions are composed of multiple components.

> An overall DOT system incorporates many functionalities
  
  > Primary functionality for customer interaction and service fulfilment  
  e.g., website publication and handling of commerce transactions
  
  > Secondary functionality for business operations  
  e.g., aggregating data gathered through customer interactions
  
  > Supporting functionality that enables primary and secondary functionalities  
  e.g., tracking to explore customer behavior

> Since many specialized functionalities are incorporated, there is no single system that implements them all

> Since highly specialized functionalities are required, typical solutions are built from readily available COTS and services

We call these components

> We are typically facing a landscape of specialized DOT components that together form a digital solution
Technology Considerations
Software components that build the foundation of digital solutions

> There are many classes of components that are currently used as the foundation of digital solutions.

> They operate on different layers of digital solutions, and they provide different functionality, like
  
  > Content Management
  
  > Presentation of content as documents and of applications
  
  > Document processing, e.g., to adapt presentations for specific uses
  
  > Playout, i.e., the delivery of documents to viewers
  
  > Transaction management, e.g., online purchases
  
  > User interaction, e.g., handling user input in the course of a dialog
  
  > Backend systems and data, e.g., product catalogs or warehouse mgmt.
Examples of Components of a Digital Solution

- Functionality is provided by a multitude of components, e.g.,
  - Content Management by a CMS, a DAM system, and content planning tools
  - Presentation by a CMS, a static site generator, and document generators
  - Document processing by A/B testing tools and personalization engines
  - Playout by (web) servers
  - Transaction management by a commerce platform, CPQ tools, and payment and logistics gateways
  - User interaction, by tracking/analytics, retargeting, a customer journey orchestration engine, and CIAM
  - Backend systems and data, like a PIM, CRM, CDP, DMP
For every class of component, there is a range of software products and services filling that role.

The Real Story Group (RSG), for example, names quite a few.
Or, More Complete: the “Supergraphic”

There is a plethora of components available – and the number is constantly growing

Classification of Digitization Components

The enumerations of known digitization products also aim to provide component classes in order to be able to abstract from single products.

> Although there is an understanding of the functionalities and components that supply them, there is no universal definition of component classes.

> Component classes are often defined after the application areas that single components are built for:
  > Many existing products and services do not address one functionality only
  > They fulfill multiple requirements to a certain degree
  > Classifications reflect subjective definitions based on typical products, and they are not free of intersections

> Here we use a different approach by main content / main use of a component as part of an overall solution:
  > Content, data, or customer
  > Transactions
  > Behavior

> As any classification, it is ambiguous because of overlapping functionalities.
Classes of Customer-facing Components

From the vast range of DOT components, we focus on the customer-facing ones – components the customer communicates with and components that support these.
Example: Content-driven Components

Everything that is required to manage content, produce media files, and to distribute them.

> Content is an important ingredient to every digital solution ("content is king"). Consequently, several component classes deal with content.

> Content management:
  > Content Management Systems (CMSs) for structured content
  > Digital Asset Management (DAM) systems for unstructured content
  > Content planning and campaign management tools give direction to content production.

> Other sources of data also provide content, including product information management (PIM), and enterprise resource planning (ERP) systems.

> Content is distributed by playout components like rendering engines, web servers, application servers, etc.

> Document processing is employed to adjust presentations, e.g., to adapt images to different devices.
## Content-driven Component Integrations

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Webpage</th>
<th>Video Player</th>
<th>Client / Touch App</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playout</td>
<td>Document Delivery</td>
<td>Streaming</td>
<td>API</td>
</tr>
<tr>
<td>Content Management</td>
<td>Quality Assurance (Structured)</td>
<td>Quality Assurance (Unstructured)</td>
<td>License Management</td>
</tr>
<tr>
<td>Content Planning</td>
<td>Content Editing (Structured)</td>
<td>Content Editing (Unstructured)</td>
<td></td>
</tr>
</tbody>
</table>

**Examples:**

> Different content management systems need to be integrated with respect to the lifecycles of the content they manage.

> APIs used for applications include the utilization of content.

> The throughput from streaming servers is measured and fed back by video players.
Example: Behavioral Components
Targeting content and content representations to Contexts, Audiences, and Single Users

> Personalization technology is used to adapt content and content presentations for
  > target groups / audiences
  > specific user groups (e.g., employees of one company that is a customer)
  > individual users

> Personalization has to be applied dynamically because it takes the requester and context into account.

> Personalized presentations can be explicit (defined by user) and implicit (based on behavior and context).

> Other behavioral components direct the customer along the customer journey
  > Retargeting
  > Customer journey orchestration

> Behavior is recognized by, e.g., tracking, A/B testing, transactions, and customer feedback
Behavioral Component Integration – Personalization

Examples:

> Personalization rules are evaluated on content.
> Personalization rules can take behavioral data into account.
> Personalization rules can take customer data into account.
Institutions want users to complete critical customer journeys. I.e., those which constitute the main business processes.

When users deviate from such customer journeys, they shall be brought back on track by means of retargeting.

Typical means of retargeting are email reminders and banner ads.
Example: Customer-centric Component Integration
Collecting data about customers and interactions supports communication and all processes.

Customer data has an impact on many operations of the digital platform.

> Traditionally, customer relationship management (CRM) systems maintain customer information.

> Customer data platforms (CDPs) extend the view on a customer by incorporating information coming from all channels.
Varying Applications of Components

There may be a more universal use of basic functionality above that of a component’s main purpose.

> Considering base functionality provided by components in a more basic way opens a perspective on different applications and combinations.

> **Sample applications of a personalization engine**

  > Some campaigns may be implemented by personalization

  > A customer is assigned to a campaign by being placed in a user segment

  > Content is prepared in a way that suits the campaign, e.g., to point out a service that is promoted by the campaign

  > **A/B testing may be implemented by personalization**

  > The variants of a dialog are prepared as “personalized” presentations

  > Customers are randomly assigned to one of the test groups

  > The test groups are used as user segments to present one of the dialog alternatives

  > Tracking is used to measure the performance of the respective alternative
DOT SYSTEMS INTEGRATION
Integration of DOT Components

Systems integration requires consistent data handling for coherence in communication and processes.

> Since digital solutions are assembled from components, their components need to be integrated

> Aspects of component integration

  > Architecture – e.g., service-side integration, client-side integration with headless services in backend, etc.

  > Processes – cross-system processes that enable a customer journey

  > Data flows – determined by information demand in each process step

> Two principal integration approaches

  > Readily available integration tools and integrated solutions

  > Custom component integrations
Readily Available Integration Solutions

- Of-the-shelves component integrations basically come in two ways
  - Point-to-point integration by bridge solutions
  - Integrated DOT platforms
- They offer varying degrees of
  - Minimal: technical integration
  - Optimal: support whole use cases / customer journeys

Bridge solutions
- Point-to-point integrations between two components
- Provided by the vendor of one of the integrated software vendors or by a third party

Integrated DOT platforms
- SaaS offerings provide digital solutions that can be customized with comparably small effort
- Companies acquire knowledge on state-of-the-art communication patterns
Integrated „Clouds“

- Prominent examples are the
  - Marketing Clouds and
  - Sales Clouds

of vendors like Adobe, Salesforce, and SAP

ADOBE MARKETING CLOUD

> Vendors allow integrating their “clouds” in order to integrate the provided services further

https://www.forcetalks.com/blog/key-features-of-salesforce-marketing-cloud-connect/
Custom Components Integrations

> Prefabricated integrations provide one way of integrating components and, thus, one way of employing them.

> Therefore, good reasons exist for a custom integration of selected components.

> Examples are:

  > Components are employed differently for specific tasks.
  
  > Application-specific use cases may require different cooperation.
  
  > Integration for a "best of breed" approach of selected components.
  
  > Integration of existing components that were operated as standalone systems before.

> Prefabricated component integration and custom integration allow companies to ...

  > either plan communication with their customers following the possibilities offered by the software solution.
  
  > or shape their digital landscape after their plans for customer interactions.
Different Ways to Utilize and Integrate Systems for Specific Tasks

> Example: content production and the two possible roles of a DAM system

> **Variant A** CMS to manage structured content and text, DAM to manage unstructured content (images etc.)

> **Variant B** DAM stores content items, CMS aggregates them to compound content and adds layout
Component Integration is Application-Specific

As an example, consider the integration of a CMS for structured content and document generation and a DAM for unstructured content and media production.

> Lifecycles of content in CMS and DAM
  > Similar (created, QA'ed, published, deleted)
  > Not synchronized between components

> Integration forms depending on ...
  > Point in lifecycle
  > Kind of integration (copies or references)

> Advantages depend on application
  > Content authoring: selection of media in CMS or in DAM
  > Quality assurance: performed in DAM or in CMS; possibility of broken links vs. possibility of outdated content
  > Media production: specialized functionality of DAM vs. context-specific production by CMS
  > Etc.
Architecture of Digital Solutions

> With the multitude of specialized components that are utilized in a solution come many integration tasks.

> To this end, there need to be architectures that tie together the whole landscape of the digital transformation.

> When companies start their digital transformation, they will not cover all aspects of digital communication.

> They start with some components and probably a roadmap of a potential evolution of their DOT landscape.

> There are reference architectures for DOT solutions.

  > They demonstrate how DOT components are typically combined.

  > They provide a starting point when planning.

  > They furthermore give a more complete picture to indicate in which directions a DOT solution may evolve.
Some organizations and analysts publish reference architectures.

Architecture of Digital Solutions

In practice, it is often the case that digitalized systems are created from what is available and can be combined rather than as a solution for concrete requirements.

Instead, the technological solution that drives the digitization of an enterprise should be based on clients needs and on business goals.

**Architecture work needs to be done carefully in order build adequate digital solutions.**

We favor a customer-specific architecture for its digital landscape. Therefore, just applying a reference architecture as-is does not suffice.

But knowledge and experience about the digital landscape must be documented on architecture level.

We do so by collecting recurring integration patterns with variants for different applications. On architecture level, this patterns are defined based on component classes that are defined after contributions of components.
## Functional Building Blocks of a Digital Solution Architecture

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Webpage</th>
<th>Client / Touch App</th>
<th>Social Media</th>
<th>Print</th>
<th>Email</th>
<th>Banner Ads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playout</td>
<td>Document Delivery</td>
<td>Streaming</td>
<td>API</td>
<td>User-generated Content</td>
<td>Product Configuration</td>
<td>Shopping Basket</td>
</tr>
<tr>
<td>Content Management</td>
<td>Content Editing</td>
<td>Quality Assurance</td>
<td>Personalization</td>
<td>Content Planning</td>
<td>Ordering</td>
<td>Logistics Interface</td>
</tr>
<tr>
<td>Enterprise Ressource Planning</td>
<td>Catalogue</td>
<td>PLM</td>
<td>PIM</td>
<td>Customer Data</td>
<td>Tracking Data</td>
<td>Customer Journeys</td>
</tr>
<tr>
<td></td>
<td>Stock Quotes</td>
<td>Pricing</td>
<td>Procurement Catalogue</td>
<td></td>
<td>Buying History</td>
<td>Support History</td>
</tr>
</tbody>
</table>
Examples:

> Content management is provided by a CMS and a DAM.

> User interactions consist of ratings, comments, forums, and a support database, and they are measured by web tracking.

> CDP is built from campaign management, web tracking, and CRM components.
COHERENCE OF DOT PROCESSES IN HETEROGENEOUS SYSTEMS
We consider DOT systems that allow companies to communicate and to interact with their customers.

Communication and interactions span multiple single interactions of a customer on one channel and in one context. The overall goals of a company – informing customers, sell their products or services to customers, maintain the loyalty of customers, etc. – are reached at the end of a customer journey.

In the course of a customer journey, a customer interacts with multiple components of a company’s DOT solution.
Customer Journey and Touchpoints, Processes and Dataflows

This reference architecture outlines some prominent systems of the digital landscape. Customers interact with it through various channels.
Customer Journey and Touchpoints

On a customer journey, a customer interacts with several DOT components.

Customer Journey 1

Customer Journey 2

Tracker

Analytics

CIAM

Webserver

POS Systems

Sales Support System

Digital Signage System

App

Website

Store

Sales Representative

Fair

Display

Website

Commerce Platform

DAM

PIM

ERP

CRM

CDP

DMP
Data Flows Required for a Customer Journey

The components that operate the touchpoints have to exchange data that is required during the communication with a customer.
For such communication to work, it needs to be coherent:

- The system needs to understand whether a new communication is established, or an ongoing dialog is continued (possibly on a different channel).
- The system needs to react consistently in all communication steps.

To establish coherence, single communication steps need to:

- Operate on consistent datasets and content.
- Share information in the communication history so that communication forms a dialog.
- Work on consistent, company-wide model of the customer so that all information gathered about one customer reveals a consistent, multi-faceted view on the customer.
> How to establish coherence
>
> For dialogical communication, we need to pass data and interpret it consistently throughout the system
>
> To this end, there need to be mutual agreements at the integration points, or there needs to be a system-wide model of the entities dealt with

> Such a system-wide model about the entities can be ...

> predefined and used as the foundation of all components when they are developed; this is typically the case in integrated platforms

> defined for the application at hand and be used for the definition of all components when they are integrated; this is typically the case when customly integrating components
Common Model of an Integrated Platform

Integrated Platforms have a metamodel, and they allow aggregating and adding entities to that model.

> Typically, integrated platforms come with vast, universal models that
  > are used throughout the whole system
  > are composed of singular models maintained by one component
  > are used by all components for the interpretation of data
> E.g., typical Cloud solutions allow selecting single services whose models are compatible

Some example:

[Image of a diagram showing a model of an integrated platform with various components and relationships.]

A model of all entities that is shared by all components is established in different ways, depending on the integration approach.

> When using COTS components with built-in models of the entities they manage, there need to be adapters that map the custom model to the generic model of the COTS.

> When using COTS components that can be parameterized with individual models for the entities they manage, then the individual models have to be set up in accordance with a system-wide model.

> When using an application-specific system-wide model of all entities, then the DOT system needs to be custom developed or be generated from the model.

> In previous and ongoing research, we study the latter.
We developed two approaches to create consistent and coherent digital landscapes.

The first approach is Concept-Oriented Content Management (COCoMa).

With COCoMa, systems are generated from a domain model.

It is based on the observation that the functionality of each component is quite standard, and that the focus is on a model of the entities handled by a component.

It is based on ...

- A modeling language that allows combining models along different dimensions
- The generation of components
- An architecture that allows to define functionality by means of component composition, and that supports systems evolution
// A Multi-domain Model in COCoMa

```python
class ArtHistoryDocument refines Document{
    content scan : byte[]
    concept
        relationship placement:Library
}

class Person

class ArtHistory
from Documents import Document

class PersonalRightsProtection refines Bill {
    content paragraphs : LegalText*
    concept characteristic restrictionPeriod : Years
    relationship protectedDocument : Document
    constraint protectedDocument.author.deathDate + restrictionPeriod <= create Date
}

class CivilLaw
from Documents import Document
from Temporal import Date

class Temporal

class Date
```

---

model ArtHistory

model Biography

model Documents

model CivilLaw

model Temporal

model Documents

model Temporal

model Biographies

model Documents

Overview Over the COCoMa Compilation Process

Domain model (source)

model M
class A refines B {
  content ...
  concept ...
}
class B {
  content ...
  concept ...
}
...

Intermediate model (parse tree)

m:Model
a:AssetClass
b:AssetClass
...
...
...
...

API

interface AbstractA { ... }
interface A extends AbstractA { ... }

abstract intf. for A AbstractA
persistent intf. for A A
...
...
factory for B BFactory

DDL

create table ATab ( ...
)
table for A ATab
table for B BTab

Code

class AImpl
implements A, ...
{
  ... select from ATab ...
}
class for A Almpl
class for B BImpl
COCoMa Architecture Sketch

> Scenarios ...
  > integration
  > personalization
  > revision

> ... of two models M₁ and M₂
Approaches to Custom Digital Solutions – Minimalistic Meta Modeling Language

> We use the Minimalistic Meta Modeling Language (M³L) to study coherent system interaction

> M³L allows defining concepts in contexts, where each concept has relationships with other concepts and contains content

  > M³L was designed with Model-driven Software Development tasks in mind

  > M³L proved useful for content modeling and management

> We are currently investigating the benefits of using M³L throughout the whole digital landscape

> Advantages are, amongst others,

  > Coherent modeling of content, business rules, transmission protocols, support services, etc.

  > Extendibility and evolvability of models
Modeling Digital Solutions with the M³L

M³L’s way of defining Concepts in Contexts is well suited to create model the digital landscape of a company component-wise.

Using the M³L, we model DOT components together with the entities they handle.

Integration is reflected by importing and amending models e.g., a system-wide Customer is created from CRM {Customer}, Targeting{Customer}, Account{Customer}, etc.

Customization is achieved by refining entities in the models of the respective components.

### CMS

```plaintext
MyContent {
  Keynote2019 is an Article {
    "Solution Landscape" is the Title
    "In this talk I will present you..." is the Text }
}
```

```plaintext
MySite {
  Keynote2019Page is a Page {
    MyContent { Keynote2019 } is the Content }
}
```

### PIM

```plaintext
MyCatalog is a Catalog {
  Photo is an Image |- DAM { Asset { ID is the UPC } }
  Electronics is a Category {
    "TV and Video" is a Category {
      "TV Sets" is a Category {
        VX_389_ABC is a ProductFamily {
          VX_389_ABC_00 is a Product {
            VX_389_ABC_00_b is an Article { ... } } }
      }
    }
  }
}
```

### DAM

```plaintext
Image is an Asset {
  ColorDepth is a Number
  FileName is a String
}
```

```plaintext
Picture0815 is an Image {
  "img0815.png" is the FileName
}
```

### Component Integration

```plaintext
MySite {
  ProductDetailPagePage4711 {
    DAM { Image { 12345 is the ImageID
      Left is the Position } } is a Picture
    "Welcome to the Page" is the Title
    Product { 789 is the UPC } is the Content
    Shop { Basket { Session {User} is the Customer } }
  }
}
```
Digital transformation is not achieved through single systems. The DOT solution of a company is a composition of multiple components that work in concert.

We have a look at the established DOT systems that may be used for single interaction tasks or in concert. These systems form the DOT landscape in which they act as components.

Manifold forms of DOT system integration are used to implement a DOT solution. Software vendors meet this demand by providing integrated DOT platforms or services. But there also are strong points for custom solutions created by an application-specific integration of components.

In any case, the overall DOT solution architecture is key to use components in a way that meets the digital transformation goals of a company.

DOT solutions as discussed in this talk allow companies to communicate and interact with their customers. Since DOT solutions consist of multiple components, coherence of communication has to be reflected by coherence of DOT processes.
Conclusion and Outlook

> To conclude, the digital transformation is driven by technology, and there is an increasing wealth of technology for digitalized institutions.

> Solutions for digitalized institutions must not be designed by looking at the functionality of available software components only.

> Instead, solutions are built for business goals at hand in order to achieve competitive advantages.

> An adequate combination of components can be achieved by means of architecture that follows proven principles but allows designs that are targeted at the business goals.

> An outlook on the future of the digital transformation is hardly possible. New requirements, and thus products and services emerge constantly.

> One constant is convergence: E.g., sales, marketing, and aftersales support functions are no longer separated, as are communication channels, no to mention the “real world” and the digital realm.

> Consequently, future work will continue to not define reference architectures, but to collect patterns for integration tasks.
<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamburg</td>
<td>Tallence AG Neue Gröningerstraße 13 20457 Hamburg</td>
<td>+49 40 36 09 35 100</td>
<td>+49 40 36 09 35 200</td>
<td><a href="mailto:info@tallence.com">info@tallence.com</a></td>
</tr>
<tr>
<td>Frankfurt/Main</td>
<td>Tallence AG Walther-von-Cronberg-Platz 1 60594 Frankfurt am Main</td>
<td>+49 69 401 50 76 60</td>
<td>+49 40 36 09 35 200</td>
<td><a href="mailto:frankfurt@tallence.com">frankfurt@tallence.com</a></td>
</tr>
<tr>
<td>Karlsruhe</td>
<td>Tallence AG Erbprinzenstraße 23 76133 Karlsruhe</td>
<td>+49 721 38 13 49 10</td>
<td>+49 40 36 09 35 200</td>
<td><a href="mailto:karlsruhe@tallence.com">karlsruhe@tallence.com</a></td>
</tr>
<tr>
<td>Görlitz</td>
<td>Tallence AG Neißstraße 27 02826 Görlitz</td>
<td>+49 40 36 09 35 100</td>
<td>+49 40 36 09 35 200</td>
<td><a href="mailto:goerlitz@tallence.com">goerlitz@tallence.com</a></td>
</tr>
<tr>
<td>Marburg</td>
<td>Tallence AG Am Grün 40 35037 Marburg</td>
<td>+49 40 36 09 35 100</td>
<td>+49 40 36 09 35 200</td>
<td><a href="mailto:info@tallence.com">info@tallence.com</a></td>
</tr>
</tbody>
</table>